Bonfiglioli

Vectron

AXIA VERT
Communication Module Manual
CMA-IE-01 for POWERLINK
Frequency inverter 230 V / 400 V
0,25 kW ... 15 kW

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CONTENTS

1 General Information about the Documentation

For better clarity, the documentation of the frequency inverter is structured according to the customer-specific requirements.

The present manual was created in the German language. The German manual is the original version. Other language versions are translated.

Quick Start Guide
The "Quick Start Guide" describes the basic steps required for mechanical and electrical installation of the frequency inverter. The guided commissioning supports you in the selection of necessary parameters and the configuration of the software of the frequency inverter.

User manual
The user manual documents the complete functionality of the frequency inverter. The parameters required for special purposes, for adjustment to the application and the numerous additional functions are described in detail.

Separate user manuals are supplied for optional components for the frequency inverter. These manuals complement the operating instructions and the "Quick Start Guide" for the frequency inverter.

Application manual
The application manual complements the documentation to ensure goal-directed installation and commissioning of the frequency inverter. Information on various topics in connection with the use of the frequency inverter is described in context with the specific application.

Installation instructions
The installation manual describes the installation and use of devices, complementing the "Quick Start Guide" and the user manual.

1.1 This document

The present user manual of the CMA-IE-01-PL communication module complements the Operating Instructions and the "Quick Start Guide" for the frequency inverters of the AXIA device series.

The user manual contains important information on the installation and use of the POWERLINK communication module CMA-IE-01-PL in its specified application range. Compliance with user documentation contributes to avoiding risks, minimizing repair cost and downtimes, and increasing the reliability and service live of the frequency inverter.

For this reason, make sure you read the user manual carefully.

IMPORTANT:

Compliance with the documentation is required to ensure safe operation of the frequency inverter. Bonfiglioli Deutschland GmbH shall not be held liable for any damage caused by any non-compliance with the documentation.

ℹ️	In case any problems occur which are not covered by the documentation sufficiently, please contact the manufacturer.

ℹ️	For safe commissioning and operation of the AXV (AXIA) series, the following documentation must be complied with:
	   – The Operating Instructions Document
	   – Safety manual "Safety Manual AXV"

1.2 Warranty and liability

Bonfiglioli Deutschland GmbH (hereinafter referred to as "manufacturer") notes that the contents of this Operating Instructions document do not form part of any previous or existing agreement, assurance or legal relationship between the manufacturer and the user of these Operating Instructions (hereinafter referred to as the "User"). Neither are they intended to supplement or replace such agreements, assurances or legal relationships. Any obligations of the manufacturer shall solely be based on the relevant purchase agreement which also includes the complete and solely valid warranty stipulations. These contractual warranty provisions are neither extended nor limited by the specifications contained in this documentation.

The manufacturer reserves the right to correct or amend the specifications, product information and omissions in these operating instructions without prior notice. The manufacturer assumes no responsibility to update these Operating Instructions. The manufacturer shall not be liable for any damage, injuries or costs which may be caused by the aforementioned reasons.

In addition, the manufacturer excludes any warranty and disclaims all liability, including without limitation direct, indirect, special, punitive, incidental, exemplary or consequential damages arising out of or in connection with one or more of the following causes:

– inappropriate use of the frequency inverter,
– non-compliance with the instructions, warnings and prohibitions contained in the documentation,
– unauthorized modifications of the frequency inverter,
– insufficient monitoring of parts of the machine/plant which are subject to wear,
– repair work at the machine/plant not carried out properly or in time,
– catastrophes by external impact and Force Majeure.

1.3 Obligation

These Operating Instructions must be read before commissioning and complied with. Anybody entrusted with tasks in connection with the

– transport,
– assembly,
– installation of the frequency inverter and
– operation of the frequency inverter

must have read and understood the Operating Instructions and, in particular, the safety instructions in order to prevent personal and material losses.

1.4 Copyright

In accordance with applicable law any copyrights relating to this document shall remain with

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This document is intended for the operator of the frequency inverter. Any disclosure or copying of this document, exploitation and communication of its contents (as hardcopy or electronically) shall be forbidden, unless permitted expressly.

Any non-compliance will constitute an offense against the copyright law, the law against unfair competition and the German Civil Code and may result in claims for damages. All rights relating to patent, utility model or design registration reserved.

1.5 Storage

The documentation forms an integral part of the frequency inverter. It must be stored such that it is accessible to operating staff at all times. If the frequency inverter is sold on to other users, then the documentation must also be handed over.

2 General safety instructions and information on use

The chapter "General safety instructions and information on use" contains general safety instructions for the Operator and the Operating Staff. At the beginning of certain main chapters, some safety instructions are included which apply to all work described in the relevant chapter. Special work-specific safety instructions are provided before each safety-relevant work step.

2.1 Terminology

According to the documentation, different activities must be performed by certain persons with certain qualifications.

The groups of persons with the required qualification are defined as follows:

Operator

This is the entrepreneur/company who/which operates the frequency inverter and uses it as per the specifications or has it operated by qualified and instructed staff.

Operating staff

The term Operating Staff covers persons instructed by the Operator of the frequency inverter and assigned the task of operating the frequency inverter.

Skilled Personnel

The term **Skilled Personnel** covers staff that are assigned special tasks by the Operator of the frequency inverter, e.g. installation, maintenance and service/repair and troubleshooting. Based on their qualification and/or know-how, **Skilled Personnel** must be capable of identifying defects and assessing functions.

Qualified electrician

The term Qualified Electrician covers qualified and trained staff that has special technical know-how and experience with electrical installations. In addition, Qualified Electricians must be familiar with the applicable standards and regulations, they must be able to assess the assigned tasks properly and identify and eliminate potential hazards.

Instructed person

The term Instructed Person covers staff that was instructed and trained about/in the assigned tasks and the potential hazards that might result from inappropriate behavior. In addition, instructed persons must have been instructed in the required protection provisions, protective measures, the applicable directives, accident prevention regulations as well as the operating conditions and verified their qualification.

Expert

The term Expert covers qualified and trained staff that has special technical know-how and experience relating to the frequency inverter. Experts must be familiar with the applicable government work safety directives, accident prevention regulations, guidelines and generally accepted rules of technology in order to assess the operationally safe condition of the frequency inverter.

2.2 Designated use

The frequency inverter is designed according to the state of the art and recognized safety regulations.

The frequency inverters are electrical drive components intended for installation in industrial plants or machines. Commissioning and start of operation are not allowed until it has been verified that the machine meets the requirements of the EC Machinery Directive 2006/42/EC and DIN EN 60204-1.

The frequency inverters meet the requirements of the low voltage directive 2014/35/EU and DIN EN 61800-5-1. CE-labelling is based on these standards. Responsibility for compliance

with the EMC Directive 2014/30/EU lies with the operator. Frequency inverters are only available at specialized dealers and are exclusively intended for commercial use as per EN 61000-3-2.

No capacitive loads may be connected to the frequency inverter.

The technical data, connection specifications and information on ambient conditions are indicated on the rating plate and in the documentation and must be complied with in any case.

2.3 Misuse

Any use other than that described in "Designated use" shall not be permissible and shall be considered as misuse.

For example, the machine/plant must not be operated
- by uninstructed staff,
- while it is not in perfect condition,
- without protection enclosure (e.g. covers),
- without safety equipment or with safety equipment deactivated.

The manufacturer shall not be held liable for any damage resulting from such misuse. The sole risk shall be borne by the operator.

Explosion protection
The frequency inverter is an IP 20 protection class device. For this reason, use of the device in explosive atmospheres is not permitted.

2.4 Residual risks

Residual risks are special hazards involved in handling of the frequency inverter which cannot be eliminated despite the safety-compliant design of the device. Residual risks are not obviously identifiable and can be a potential source of injury or health hazard.

Typical residual hazards include:

Electrical hazard
Danger of contact with energized components due to a defect, opened covers or enclosures or improper working on electrical equipment.

Danger of contact with energized components inside of the frequency inverter if no external disconnection device was installed by the operator.

Electrostatic charging
Touching electronic components bears the risk of electrostatic discharges.

Thermal hazards
Risk of accidents by hot machine/plant surfaces, e.g. heat sink, transformer, fuse or sine filter.

Charged capacitors in DC link
The DC link may have dangerous voltage levels even up to three minutes after shutdown.

Danger of equipment falling down/over, e.g. during transport
Center of gravity is not the middle of the electric cabinet modules.

2.5 Safety and warning signs on the frequency inverter

– Comply with all safety instructions and danger information provided on the frequency inverter.
– Safety information and warnings on the frequency inverter must not be removed.

2.6 Warning information and symbols used in the user manual

2.6.1 Hazard classes

The following hazard identifications and symbols are used to mark particularly important information:

DANGER
Identification of immediate threat holding a **high** risk of death or serious injury if not avoided.

WARNING
Identification of immediate threat holding a **medium** risk of death or serious injury if not avoided.

CAUTION
Identification of immediate threat holding a **low** risk of minor or moderate physical injury if not avoided.

NOTICE
Identification of a threat holding a risk of material damage if not avoided.

2.6.2 Hazard symbols

Symbol	Meaning	Symbol	Meaning
	General hazard		Suspended load
	Electrical voltage		Hot surfaces

2.6.3 Prohibition signs

Symbol	Meaning
	No switching; it is forbidden to switch the machine/plant, assembly on

2.6.4 Personal safety equipment

Symbol	Meaning
	Wear body protection

2.6.5 Recycling

Symbol	Meaning
	Recycling, to avoid waste, collect all materials for reuse

2.6.6 Grounding symbol

Symbol	Meaning
	Ground connection

2.6.7 ESD symbol

Symbol	Meaning
	ESD: Electrostatic Discharge (can damage components and assemblies)

2.6.8 Information signs

Symbol	Meaning
	Tips and information making using the frequency inverter easier.

2.6.9 Font style in documentation

Example	Font style	Use
0x1234	bold	Representation of object numbers
/01	bold, underlined	Representation of sub-index numbers
/d01	bold, underlined	Representation of data set numbers
Object	Italic, Font Times New Roman	Representation of object names
P.1234	bold	Representation of object numbers without name, e.g. in formulas
Q.1234	bold	Representation of source numbers

2.7 Directives and guidelines to be adhered to by the operator

The operator must follow the following directives and regulations:

– Ensure that the applicable workplace-related accident prevention regulations as well as other applicable national regulation are accessible to the staff.

– An authorized person must ensure, before using the frequency inverter, that the device is used in compliance with its designated use and that all safety requirements are met.

– Additionally, comply with the applicable laws, regulations and directives of the country in which the frequency inverter is used.

– Any additional guidelines and directives that may be required additionally shall be defined by the operator of the machine/plant considering the operating environment.

2.8 Operator's general plant documentation

– In addition to the user manual, the operator should issue separate internal operating instructions for the frequency inverter. The Operating Instructions of the frequency inverter must be included in the user manual of the whole plant.

2.9 Operator's/operating staff's responsibilities

2.9.1 Selection and qualification of staff

– Any work on the frequency inverter may only be carried out by qualified technical staff. The staff must not be under the influence of any drugs. Note the minimum age required by law. Define the staff's responsibility in connection with all work on the frequency inverter clearly.
– Work on the electrical components may only be performed by a qualified electrician according to the applicable rules of electrical engineering.
– The operating staff must be trained for the relevant work to be performed.

2.9.2 General work safety

– In addition to the user manual of the machine/plant, any applicable legal or other regulations relating to accident prevention and environmental protection must be complied with. The staff must be instructed accordingly.
  Such regulations and/or requirements may include, for example, handling of hazardous media and materials or provision/use of personal protective equipment.
– In addition to this user manual, issue any additional directives that may be required to meet specific operating requirements, including supervision and reporting requirements, e.g. directives relating to work organization, workflow and employed staff.
– Unless approved of expressly by the manufacturer, do not modify the frequency inverter in any way, including addition of attachments or retrofits.
– Only use the frequency inverter if the rated connection and setup values specified by the manufacturer are met.
– Provide appropriate tools as may be required for performing all work on the frequency inverter properly.

2.10 Organizational measures

2.10.1 General

– Train your staff in the handling and use of the frequency inverter and the machine/plant as well as the risks involved.
– Use of any individual parts or components of the frequency inverter in other parts of the operator's machine/plant is prohibited.
– Optional components for the frequency inverter must be used in accordance with their designated use and in compliance with the relevant documentation.

2.10.2 Use in combination with third-party products

– Please note that Bonfiglioli GmbH will not accept any responsibility for compatibility with third-party products (e.g. motors, cables or filters).
– In order to enable optimum system compatibility, Bonfiglioli GmbH offers components facilitating commissioning and providing optimum synchronization of the machine/plant parts in operation.
– If you use the frequency inverter in combination with third-party products, you do this at your own risk.

2.10.3 Transport and storage

- The frequency inverters must be transported and stored in an appropriate way. During transport and storage, the devices must remain in their original packaging.
- The units may only be stored in dry rooms which are protected against dust and moisture and are exposed to small temperature deviations only. The requirements of DIN EN 60721-3-1 for storage, DIN EN 60721-3-2 for transport and labeling on the packaging must be met.
- The duration of storage without connection to the permissible nominal voltage may not exceed one year.

2.10.4 Handling and installation

- Do not commission any damaged or destroyed components.
- Prevent any mechanical overloading of the frequency inverter. Do not bend any components and never change the isolation distances.
- Do not touch any electronic construction elements and contacts. The frequency inverter is equipped with components which are sensitive to electrostatic energy and can be damaged if handled improperly. Any use of damaged or destroyed components will endanger the machine/plant safety and shall be considered as a non-compliance with the applicable standards.
- Only install the frequency inverter in a suitable operating environment. The frequency inverter is exclusively designed for installation in industrial environments.
- If seals are removed from the case, this can result in the warranty becoming null and void.

2.10.5 Electrical connections

- The five safety rules must be complied with.
- Never touch live terminals. The DC link may have dangerous voltage levels even up to three minutes after shutdown.
- When performing any work on/with the frequency inverter, always comply with the applicable national and international regulations/laws on work on electrical equipment/plants of the country in which the frequency inverter is used.
- The cables connected to the frequency inverters may not be subjected to high-voltage insulation tests unless appropriate circuitry measures are taken before.
- Only connect the frequency inverter to suitable supply mains.

The five safety rules

When working on/in electrical plants, always follow the five safety rules:

1. Isolate
2. Secure to prevent restarting
3. Check isolation
4. Earth and short-circuit,
5. Cover or shield neighboring live parts.

2.10.6 Safe operation

- During operation of the frequency inverter, always comply with the applicable national and international regulations/laws on work on electrical equipment/plants.
- Before commissioning and the start of the operation, make sure to fix all covers and check the terminals. Check the additional monitoring and protective devices according to the applicable national and international safety directives.
- During operation, never open the machine/plant
- Do not connect/disconnect any components/equipment during operation.
- The machine/plant holds high voltage levels during operation, is equipped with rotating parts (fan) and has hot surfaces. Any unauthorized removal of covers, improper use, wrong installation or operation may result in serious injuries or material damage.
- Some components, e.g. the heat sink or brake resistor, may be hot even some time after the machine/plant was shut down. Don't touch any surfaces directly after shutdown. Wear safety gloves where necessary.
- The frequency inverter may hold dangerous voltage levels until the capacitor in the DC link is discharged. Wait for at least 3 minutes after shutdown before starting electrical or mechanical work on the frequency inverter. Even after this waiting time, make sure that the equipment is deenergized in accordance with the safety rules before starting the work.
- In order to avoid accidents or damage, only qualified staff and electricians may carry out the work such as installation, commissioning or setup.
- In the case of a defect of terminals and/or cables, immediately disconnect the frequency inverter from mains supply.
- Persons not familiar with the operation of frequency inverters must not have access to the frequency inverter. Do not bypass nor decommission any protective facilities.
- The frequency inverter may be connected to power supply every 60 s. This must be considered when operating a mains contactor in jog operation mode. For commissioning or after an emergency stop, a non-recurrent, direct restart is permissible.
- After a failure and restoration of the power supply, the motor may start unexpectedly if the Auto Start function is activated.
  If staff are endangered, a restart of the motor must be prevented by means of external circuitry.
- Before commissioning and the start of the operation, make sure to fix all covers and check the terminals. Check the additional monitoring and protective devices according to EN 60204 and applicable the safety directives (e.g. Working Machines Act or Accident Prevention Directives).

2.10.7 Maintenance and service/troubleshooting

- Visually inspect the frequency inverter when carrying out the required maintenance work and inspections at the machine/plant.
- Perform the maintenance work and inspections prescribed for the machine carefully, including the specifications on parts/equipment replacement.
- Work on the electrical components may only be performed by a qualified electrician according to the applicable rules of electrical engineering. Only use original spare parts.
- Unauthorized opening and improper interventions in the machine/plant can lead to personal injury or material damage. Repairs on the frequency inverters may only be carried out by the manufacturer or persons authorized by the manufacturer. Check protective equipment regularly.
- Before performing any maintenance work, the machine/plant must be disconnected from mains supply and secured against restarting. The five safety rules must be complied with.

2.10.8 Final decommissioning

Unless separate return or disposal agreements were made, recycle the disassembled frequency inverter components:

- Scrap metal materials
- Recycle plastic elements
- Sort and dispose of other component materials

Electric scrap, electronic components, lubricants and other utility materials must be treated as special waste and may only be disposed of by specialized companies.

Always comply with any applicable national disposal regulations as regards environmentally compatible disposal of the frequency inverter. For more details, contact the competent local authorities.

After the end of product service life, the user/operator must take the device out of operation.

For more information about the decommissioning of the device refer to the applicable operating instructions document.

Disposal requirements under European Union WEEE regulations
The product is marked with the WEEE symbol shown below.

This product cannot be disposed as general household waste. Users responsible for the final disposal must make sure that it is carried out in accordance with the European Directive 2012/19/EU, where required, as well as the relative national transposition rules. Fulfil disposal also in according with any other legislation in force in the country.

3 Introduction

The present document describes the possibilities and properties of POWERLINK communication module CMA-IE-01-PL for the frequency inverters of the AXIA device series. The functions and objects in this manual are described to the extent required for the communication module in Axia.

> This manual only describes the communication module CMA-IE-01-PL. This manual is not to be understood as providing general/basic information on the Ethernet POWERLINK protocol.
>
> General/basic knowledge of the methods and function of POWERLINK are a prerequisite for understanding and implementing the instructions provided by this document.

WARNING
Physical injuries or major material damage
With the communication module CMA-IE-01-PL, it is possible to access **ALL** frequency inverter objects from a controller.
Changing objects, the functions of which are not known to the user, can result in unintended movements and material and/or personal losses as well as inoperativeness of the frequency inverter.
– Only qualified persons are allowed to work at the device.

Electronic datasheet

An electronic datasheet is required for the use of a POWERLINK device. The fieldbus descriptions are stored in the electronic datasheet as XDD file (XML Device Description). The file describes the most important parameters of the objects in the object directory as well as the supported communication services.

> To operate with a controller, you will require the fieldbus description file. The latest such file can be downloaded from the Bonfiglioli.com website.

> Hexadecimal values are marked by a preceding "0x".

Ethernet properties
– 100 MB (100Base-TX Fast Ethernet)/1000 MB (Gigabit Ethernet)
– Automatic identification (Auto negotiation)

Ports
The module supports two LAN ports for Ethernet communication.

Software
AXIA Manager is the software for configuration and maintenance of Bonfiglioli frequency inverters. It can connect with a frequency inverter while it is communicating with a PLC. To run the AXIA Manager you require a computer/PC, running on a Windows OS. The manufacturer also provides an iOS and an Android app version of the AXIA Manager, with less functionalities than in the Windows software.

Using the AXIA Manager you can configure and manage objects relevant for the communication module.

4 Installation/Disassembly of the communication module

The CMA-IE-01-PL communication module is delivered in a separate case ready for assembly.

4.1 Installation

CAUTION
Destroying inverter and/or communication module Connecting / disconnecting the module while the inverter is connected to live voltage can destroy the module and/or the inverter. • Disconnect the frequency inverter from the power supply before installation of the communication module. Assembly under live voltage is not permissible. • Do not touch the PCB visible on the back of the module, otherwise components may be damaged.

Work steps:

- Disconnect the frequency inverter from the mains voltage and protect it against being energized unintentionally.
- Disconnect the frequency inverter from the external 24 V if used and protect it against being energized unintentionally.

AXv_All_TD_Module_Installation
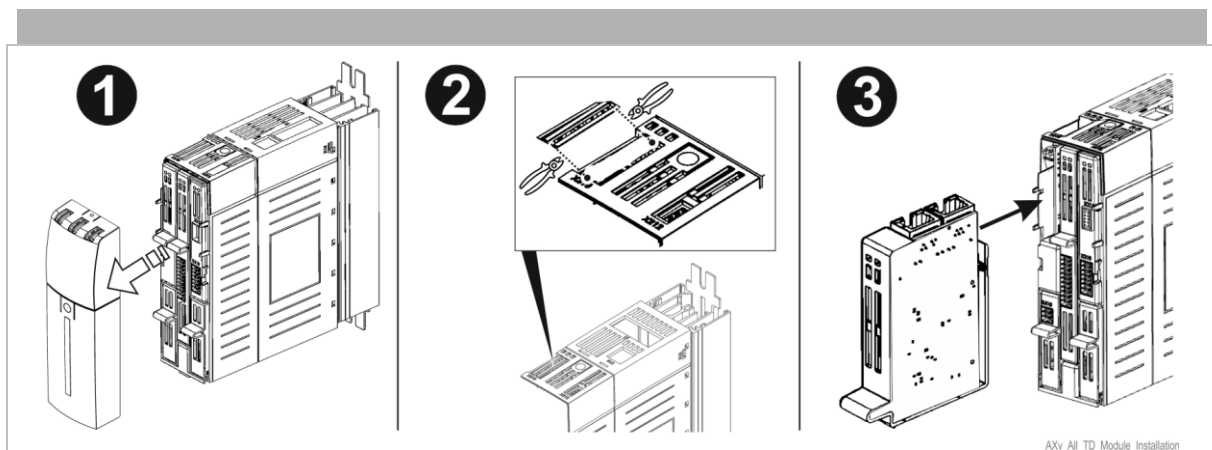
1. Remove covers of the frequency inverter. The upper left slot for the communication module is now accessible.
2. In the upper cover, break out the pre-punched cut-out for the interface X310, if necessary.
3. Insert the communication module into the slot until it engages audibly.

4.1.1 Connector assignment

The CMA-IE-01-PL module is connected to the PLC or a hub using RJ45 connectors (LAN).

X310	Ethernet, RJ45
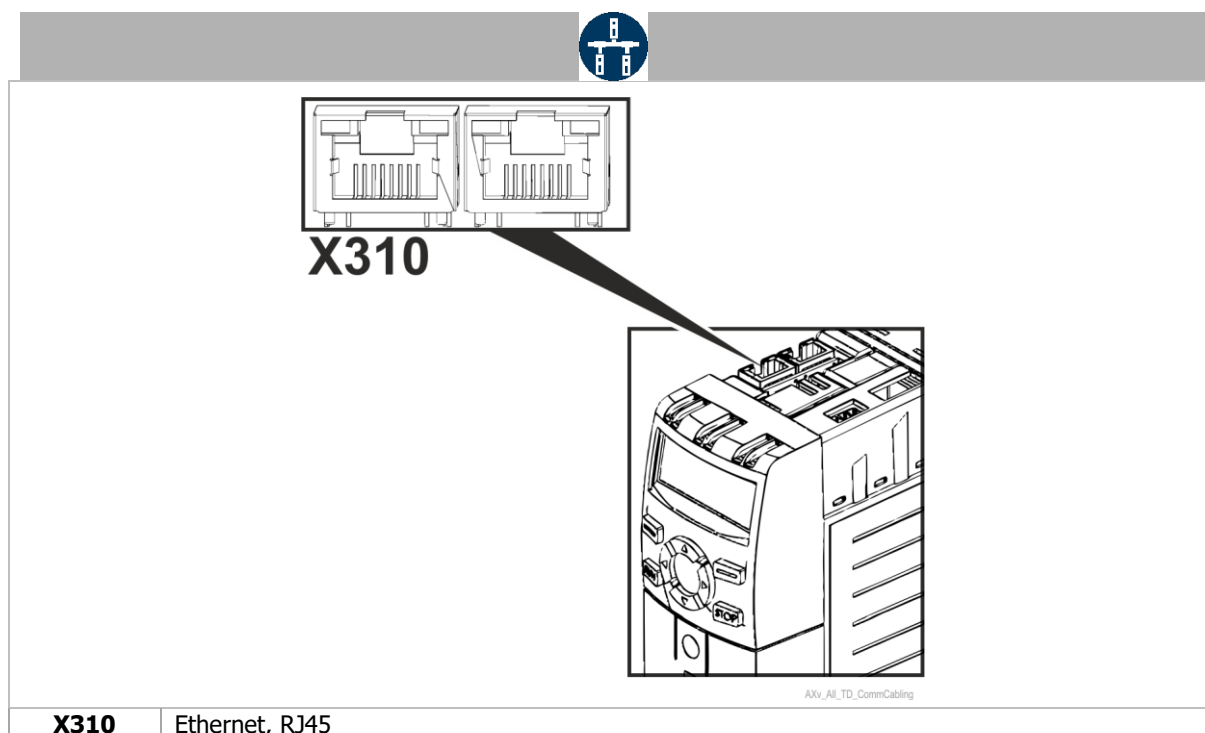
Technical characteristics: Ethernet interface X310

- 2 RJ45 connectors
- Ethernet standard: IEEE 802.3, 100Base-TX (fast Ethernet)
- Cable type: S/FTP
  - cable with braided shield
  - ISO/IEC 11801 or EN 50173, Straight Through or Cross Over
- The cable length is restricted by the BAUD rate, cables must not exceed a length of 100 m.

4.1.2 Status LEDs

> **NOTICE**
>
> **Residual risk**
> When LEDs and/or other indicating elements on the frequency inverter are not active, the inverter still may be energized.
>
> - Before carrying out any work with the device, where contact with energized parts might be possible, always check if the device is deenergized, irrespective of the status of any indicating elements.

- Make sure the adhesive label has been placed correctly according to CEMA leaflet included in the scope of supply.

AXv_CMA_TD_CommCabling
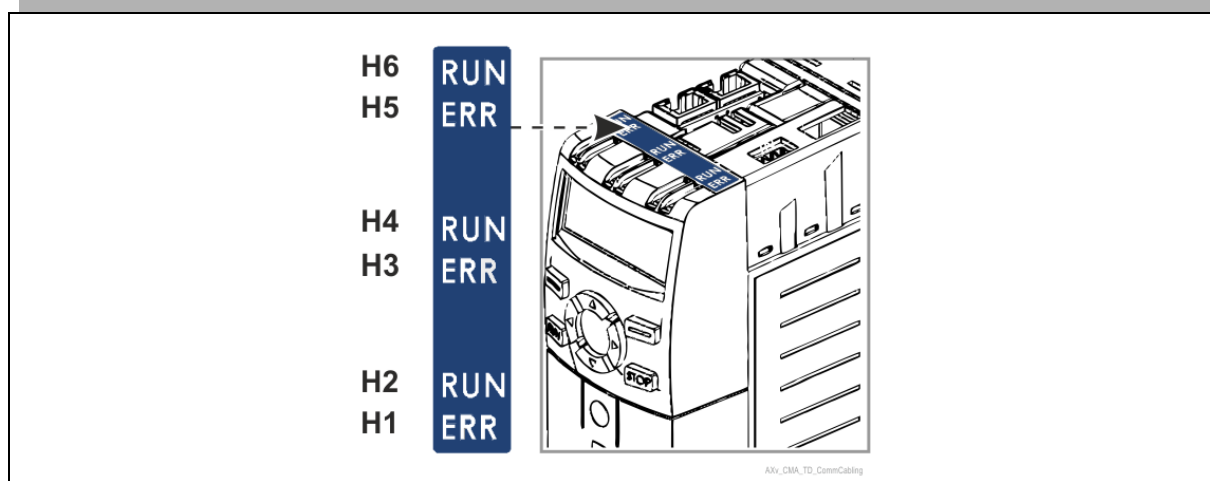
Status output via communication module LEDs:

The front LEDs (H5, H6) indicate the current status of the corresponding port of the communication module.

AXv_All_TD_CommCabling
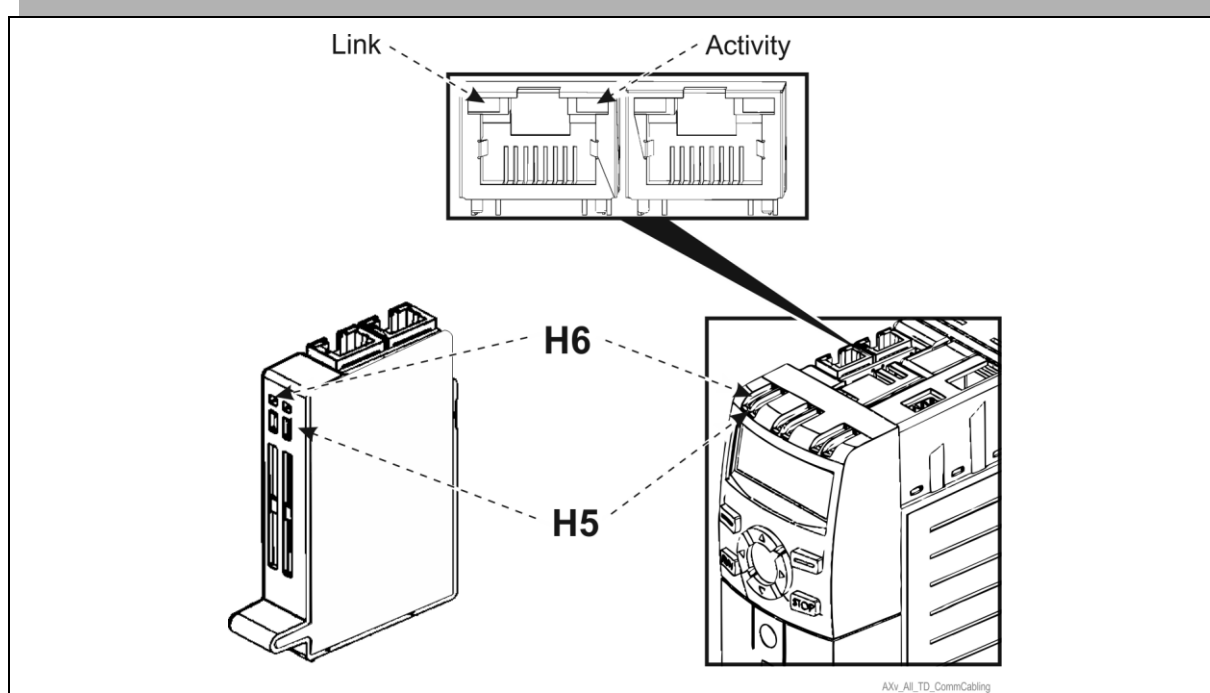
Link/Activity	RJ45 connector LED indicators
H5	Error LED
H6	Status LED

Link/Activity: RJ45 connector LED indicators

The LEDs in the RJ45 connector indicate data activity (green) and the link (yellow) status of the port or module.

H5: Error LED

The Error LED indicates the current status of the network connection.

Error LED									
Non-acknowledgeable error									
	0ms	200ms	400ms	600ms	800ms	1000ms	1200ms	1400ms	1600ms
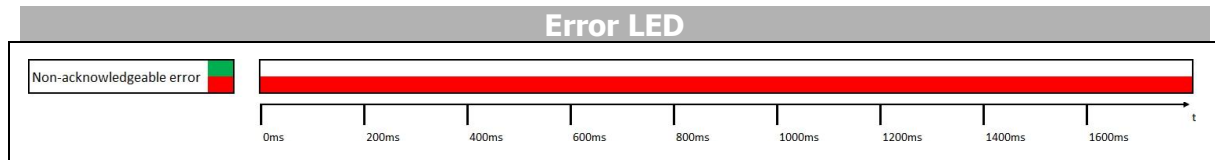
H6: Status LED

The Status LED indicates the current status of the module.

Status LED									
Module Stopped									
Normal operation									
Ready to operate									
Basic Ethernet No Powerlink traffic									
No PDO Data									
Only asynchronous data									
	0ms	200ms	400ms	600ms	800ms	1000ms	1200ms	1400ms	1600ms
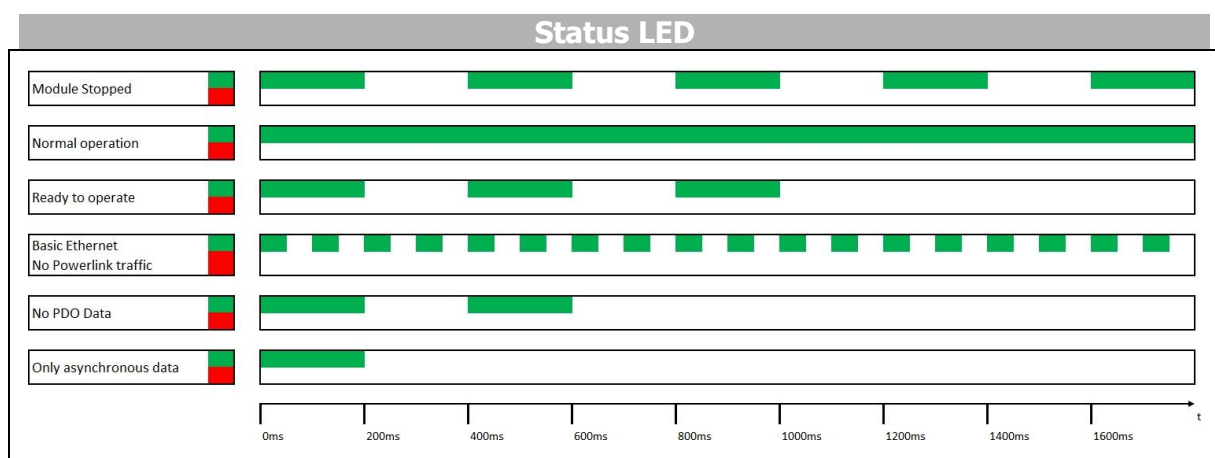
4.2   Disassembly

- Disconnect the frequency inverter from mains voltage and external 24 V and protect it against being energized unintentionally.
- Remove covers of the frequency inverter, if necessary.
- Disconnect/unplug any connected lines.
- Unplug the communication module from its slot by unlocking the locking hooks on the right- and left-hand side of the module from the case of the frequency inverter using a small screwdriver.
- Proceed carefully to not damage the module.

5 Initial Settings

5.1   Setting the Fieldbus System to POWERLINK

The communication module CMA-IE-01-PL can be used for various fieldbus systems with RJ45 connectors. The fieldbus system must be selected at the first start. Use the following object for this purpose:

Index	Sub index	Description	Object code	Data type
0x3904	17 (dec) .11 (hex)	Change Fieldbus	Record	UInt32

- Set the fieldbus system to **0x0000004** `Powerlink`.

> The change of the fieldbus may take some minutes. The process is displayed in object **0x3904.16** and in the converter fault.

5.2   Setting the Node ID

For proper identification, each frequency inverter is assigned a Node ID which must be unique in the system. This ID may only exist once in the system. The setting of the node ID is carried out via object **0x395A/1** *Node Address Set*.

Index	Sub index	Description	Min.	Max.	Default
0x395A	1	Node Address Set	0	239	0

> The actual value is displayed in object **0x3916/02** *Fieldbus Node Address Act*.

6 Configuration process

The configuration process of the frequency inverter with the POWERLINK communication module CMA-IE-01-PL is shown here using the example of the B&R Automation Studio programming tool. The process is principally valid for other configurations in an equivalent form.

6.1 Inserting the electronic datasheet

First, the XDD file is installed in the hardware configurator (if not done already).

- Open a project in the programming tool (here: Automation Studio).
- Select menu "Tools > Manage 3rd Party Devices …".
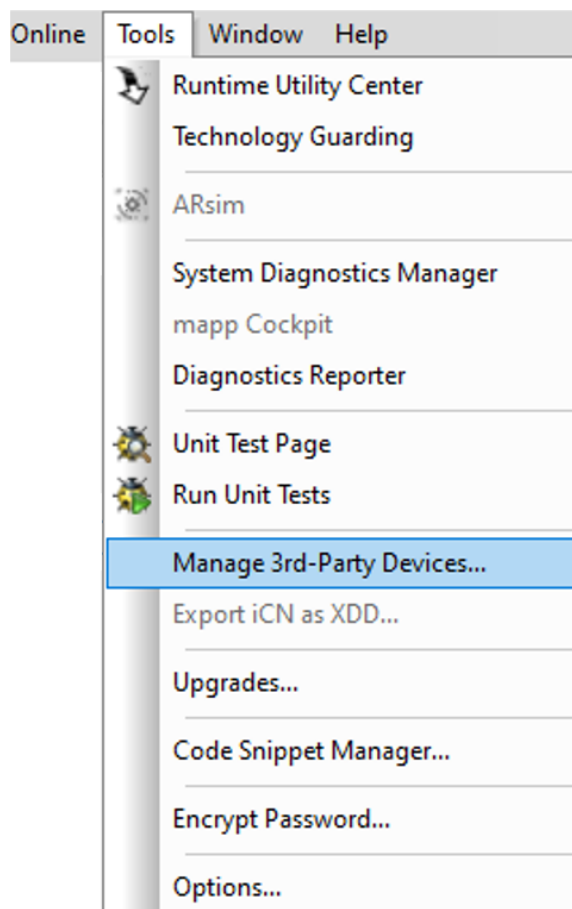
- Select "Import Fieldbus Device(s)".
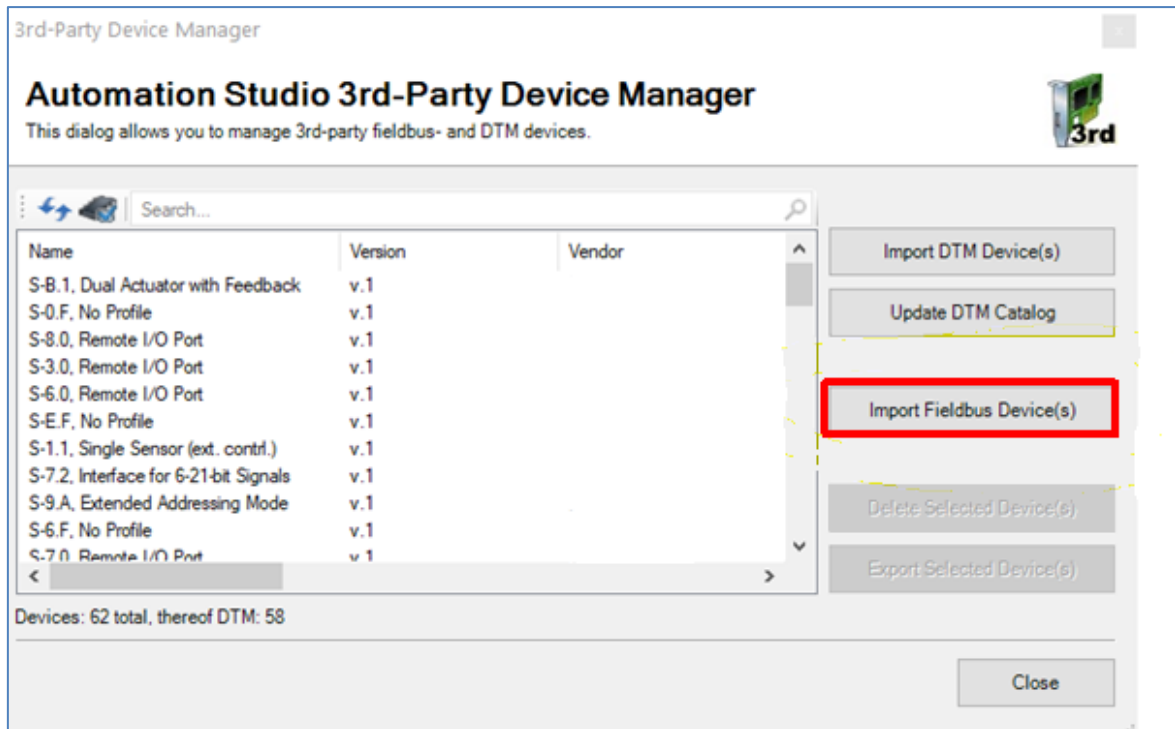
The available XDD files are listed:
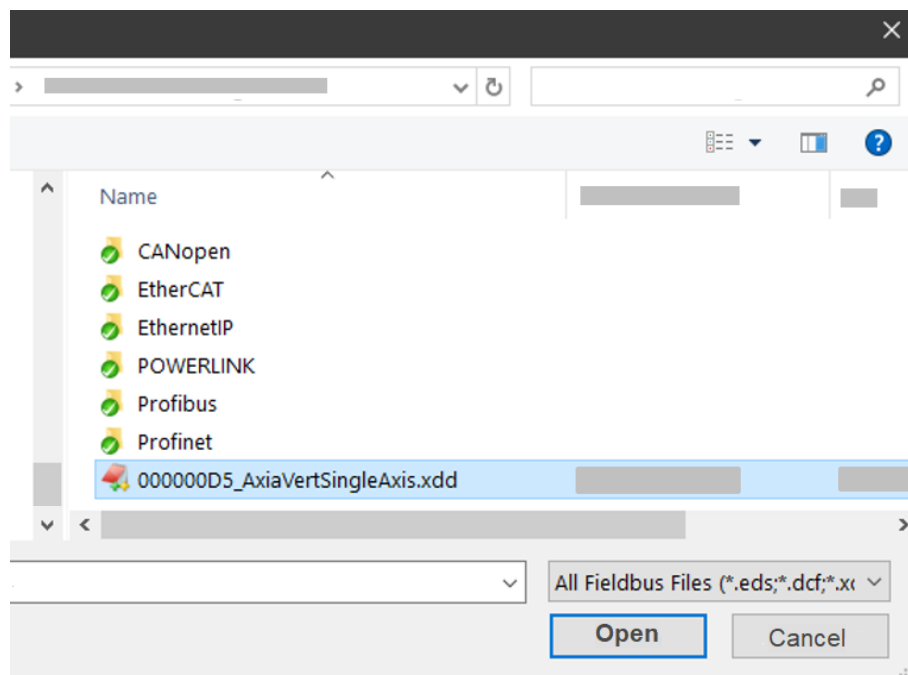
- Select the device and click "Open".

  Once the XDD file is imported, the frequency inverter can be identified in the hardware catalog.

6.2 Adding a frequency inverter to the project

All available frequency inverters are listed in the "Toolbox" window.

- Select the tab "System Designer" view in the work area window.
- Select the tab "Catalog" in the Toolbox window.
- Click on the Axia inverter you want to add (in this example: AxiaVert Single Axis).
  For better clarity, you can type "Axia" in the search field.
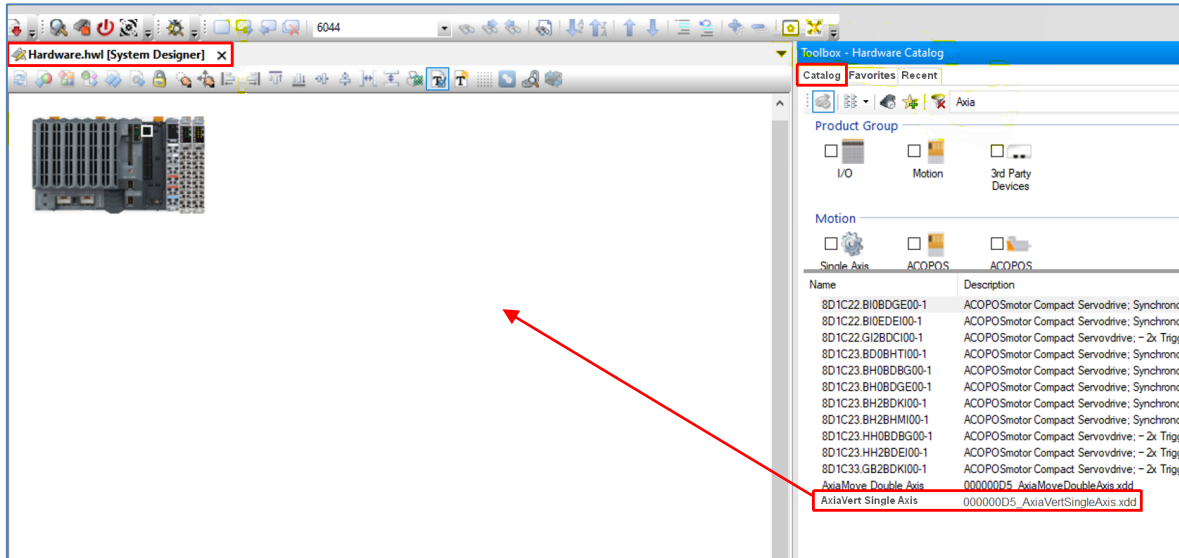
- Add the inverter by dragging & dropping the device into the System Designer window.

  The Axia inverter will appear in the work area:
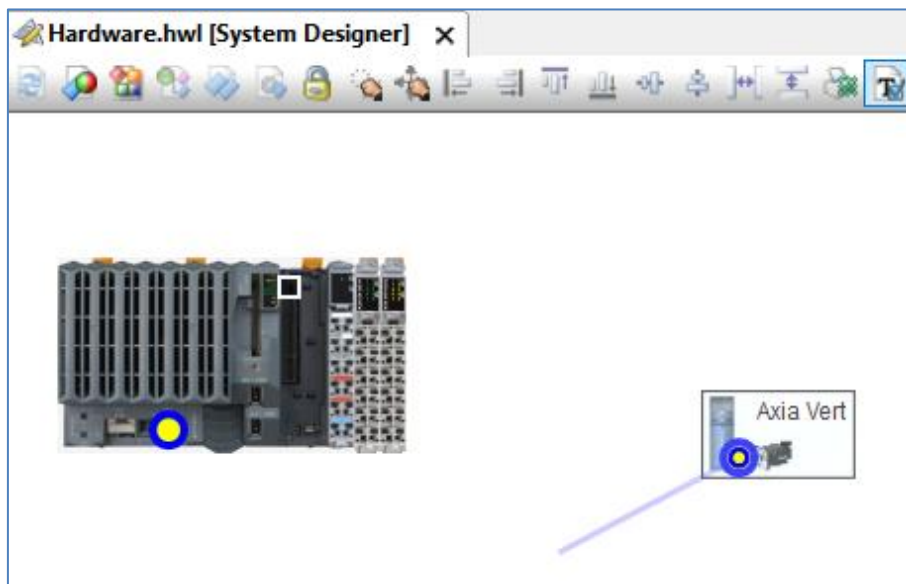
- Select the desired port in the frequency inverter.

  The beginning of the connection line will appear.

- Click on the desired port in the PLC.

    The line connects between both selected ports.
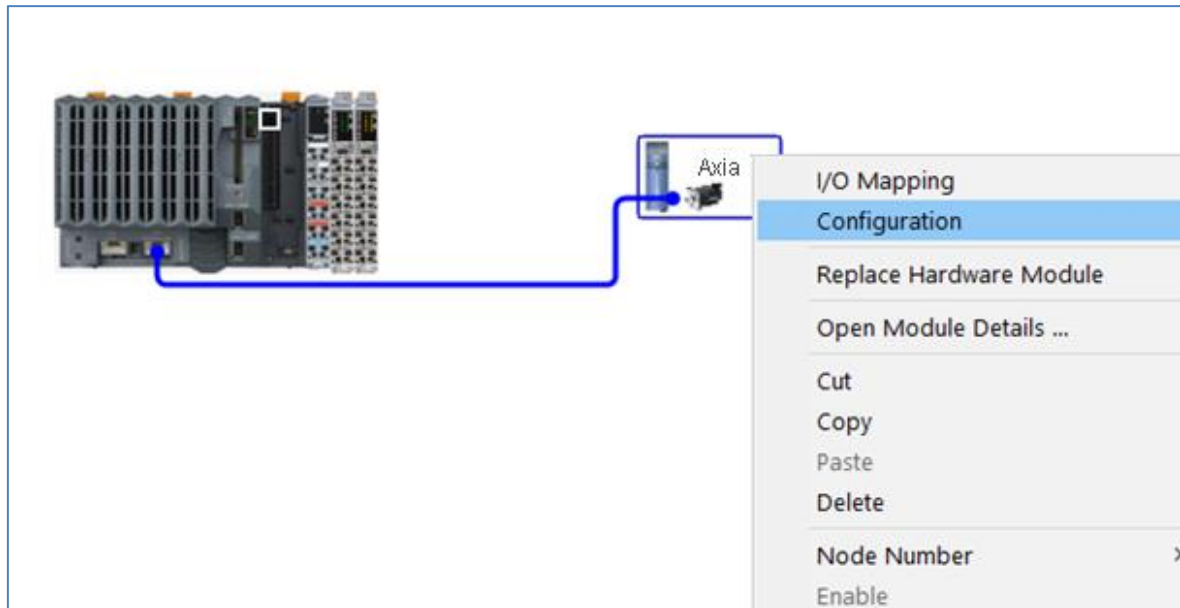
Open the drop-down menu with a right-click on the Axia symbol to start the configuration by clicking the "Configuration" command.

The configuration can be realized in several ways which are explained in the next sections.

6.3 Configuration with Mapp Motion

- In the window "Configuration View" of the project explorer, open the menu "mappMotion" and select the Axia inverter you want to add (in this example: Config_BV.axis > gAxia_2).
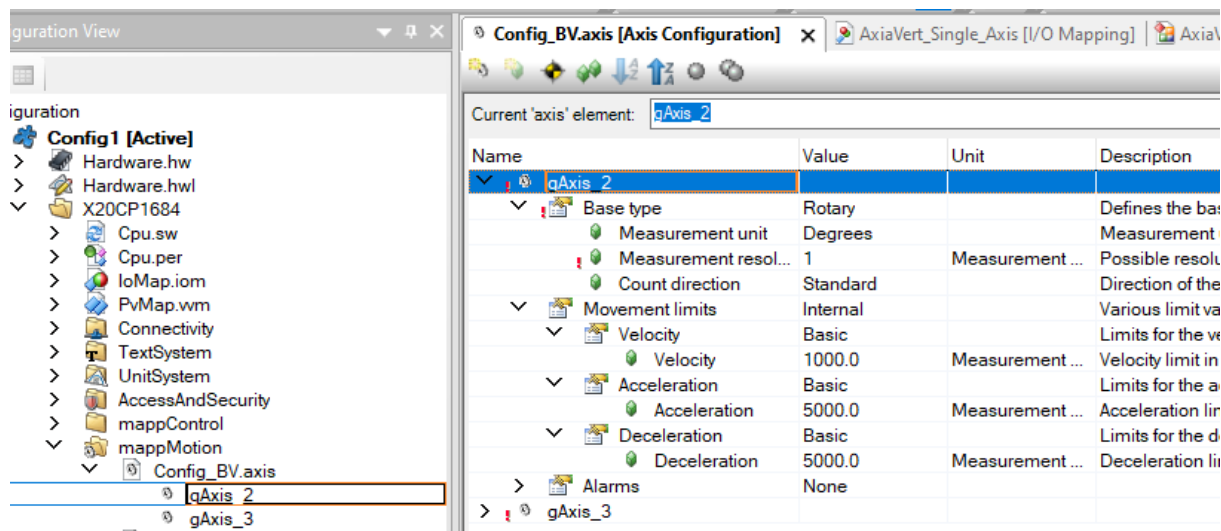
- In the work area, select the tab "Axis Configuration" and click on "gAxis_2".
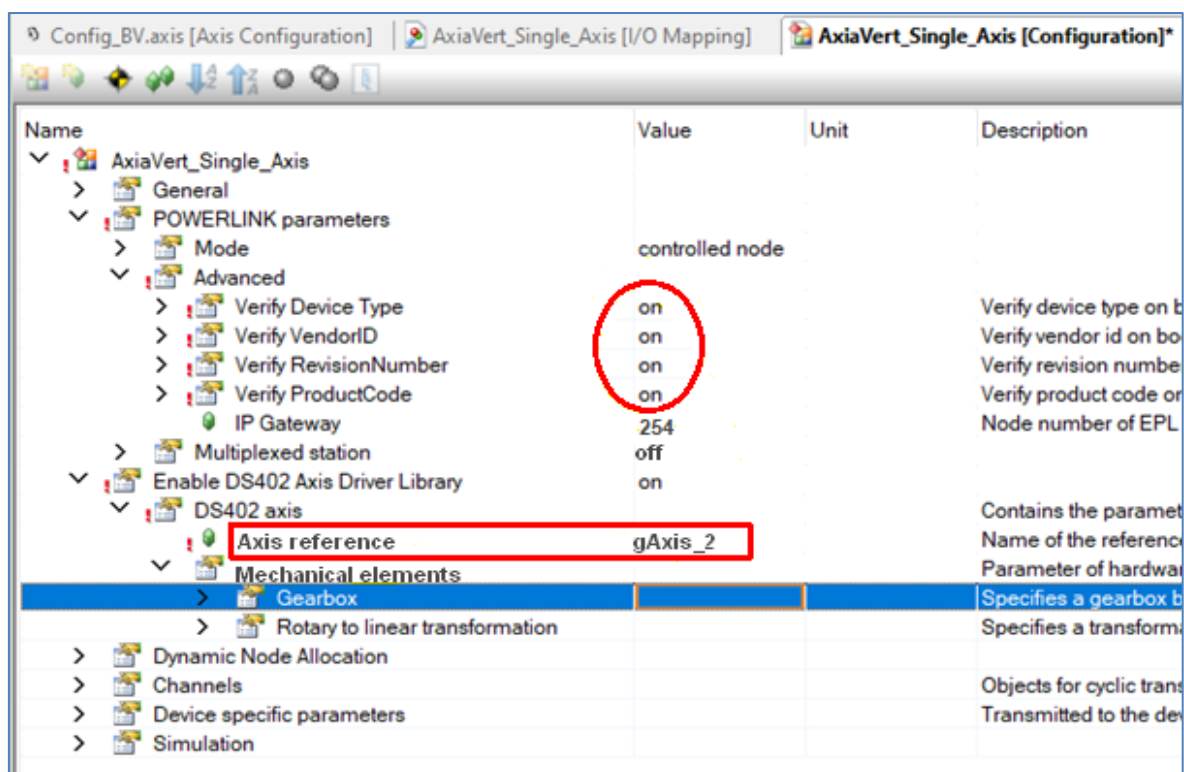
- In the work area, select the active configuration tab.
- Check the settings of the following parameters and set values accordingly:

POWERLINK parameters > Advanced

Verify Device Type: on

Verify Vendor ID: on

Verify Revision number: on

Verify Device Product Code: on

Enable DS402 Axis Driver Library > DS402 axis

Axis Reference: gAxis_2

6.4   Configuration via Channels

- In the work area, select the active configuration tab and unfold the menu "Channels".
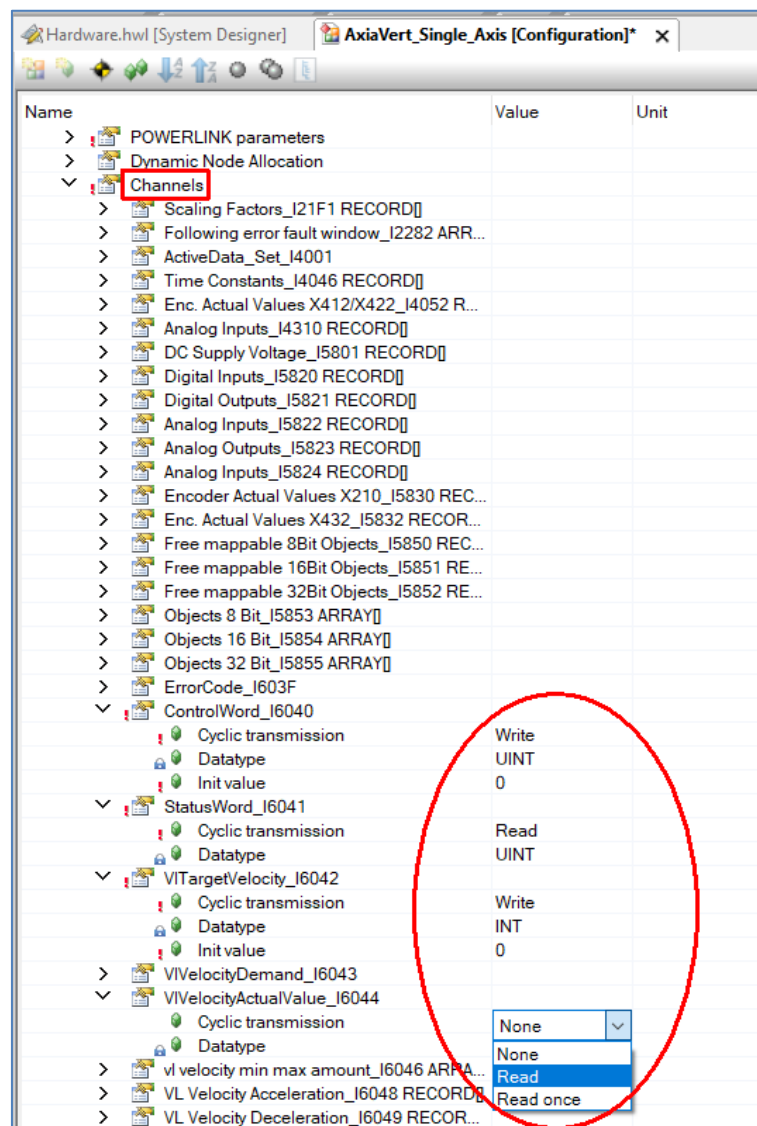
- Check the settings of the following parameters and set values accordingly:

Control Word_I6040

Cyclic transmission: Write

Datatype: UINT

Init value: 0

Status Word_I6041

Cyclic transmission:	Read
Datatype:	UINT

Target Velocity I_6042

Cyclic transmission:	Write
Datatype:	INT
Init Value:	0

Velocity Demand 6044

Cyclic transmission	Read
Datatype	INT

6.5   Parametrization

- In the work area, select the active configuration tab and unfold the menu "Device specific parameters > Motor Type_2001 ARRAY".
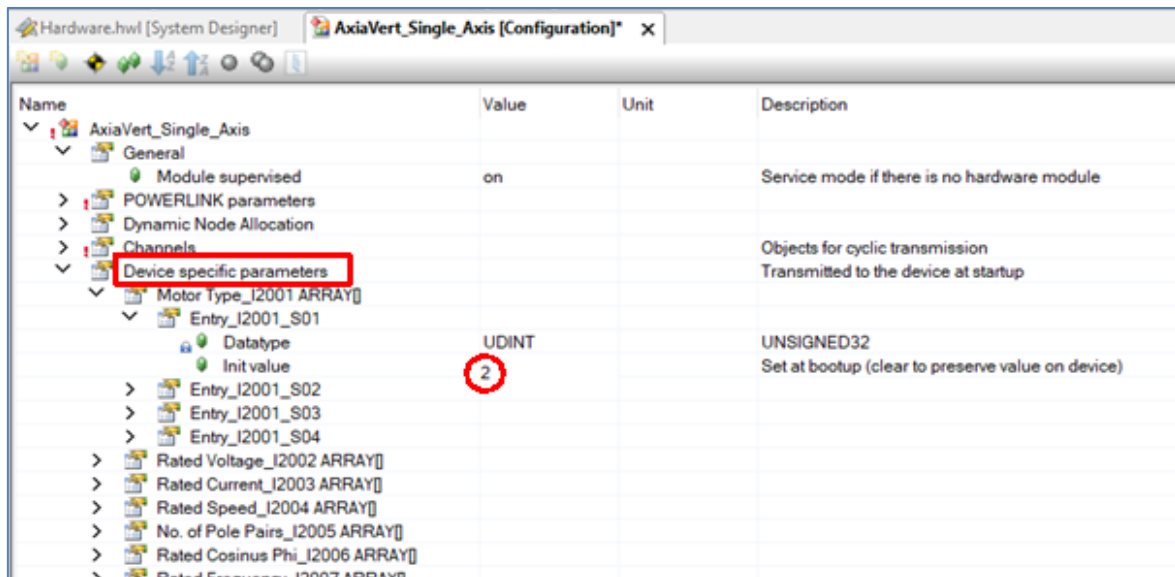
- Check the settings of the following parameters and set values accordingly:

Entry_I2001_S01

Datatype:	UDINT
Init value:	2

7 Operating behavior in the case of bus connection failure

The operating behavior in the case of failure of the bus system can be parameterized. The required behavior can be set via the object **0x6007** *Abort conn. option code* .

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x6007	0	Abort Conn. option code	Integer16	rw	No	1

Object *Abort conn. option code* defines the operating characteristics of the frequency inverter in the case of an error in the bus connection due to BusOff, RxPDO length error or NMT state change (leaving of NMT state "Operational").

Depending on the setting of **0x2200** *Control Mode*, the response of the setting of object **0x6007** will change as shown in the following table.

Object 0x6007	
Operation mode	**Function**
0	No action
1	Fault signal
2	Disable voltage command
3	Quick Stop command
-1	Slow Down Ramp, Fault
-2	Quick Down Ramp, Fault

8 POWERLINK overview

POWERLINK is preferably used as a communication system in applications such as motion control, robotics, CNC or control engineering. POWERLINK offers a transmission speed of 100 Mbit/s offering real-time capabilities based on the Ethernet standard. POWERLINK provides the transfer of time-critical data and synchronization of all nodes in a network. Transmission is realized in very short isochronous cycles with a configurable response time. Less time-critical data is transmitted in a dedicated asynchronous channel.

All devices in a network operate as nodes. The PLC, an industrial PC or a drive unit is defined as a managing node (MN). All other devices in the network are defined as controlled nodes (CN).

The POWERLINK communication structure is based on CANopen® fieldbus standard protocol for data exchange over Ethernet and uses the same device profiles, object directories and communication mechanisms. This includes process data objects (PDO, ☞🖹 8.5), service data objects (SDO, ☞🖹 8.4) and the network management (NMT, ☞🖹 8.7).

8.1 Object directory

Every POWERLINK device contains an object directory with all supported objects. The objects can be divided into the two main groups – communication objects and application objects. The object directory is the link between the application and the communication unit. The objects are addressed by their index **0xnnnn** (16 bit) and sub-index **0xnn** (8 bit).

8.2 Communication Objects

The communication objects are located in the index range **0x1nnn**. These objects describe the communication behavior of a CANopen® device. Some of the communication objects comprise device information (e. g. manufacturer's vendor-ID or inverter serial number). With the help of communication objects the application objects for device control are mapped to the PDO messages.

8.3 Application Objects

Application objects are divided in two groups. Index range **0x2000** … **0x5FFF** is reserved for manufacturer-specific objects, and index range **0x6nnn** is reserved for specific device profile objects. These objects are defined by CANopen® DS402 "drive and motion control". They are used for controlling device functions (Start/Stop, speed, positioning functions).

8.4 SDO Function

The SDO (Service Data Objects) messages are used for reading and writing the objects located in the object directory.

8.5 PDO Function

PDO (Process Data Objects) messages contain up to 32 bytes of process data per axis. Using communication objects (communication/mapping objects) the process data objects are mapped to Rx/Tx-PDOs. The frequency inverters support three RxPDOs (PLC ➔ frequency inverter) and three TxPDOs (frequency inverter ➔ PLC).

Process data objects are linked directly to the functions of the frequency inverter.

8.6 CAN-Systembus SYNC

If an Axia inverter synchronizes to a PLC via the CMA module the CAN-Systembus SYNC functionality can be activated. In this special situation the SYNC telegrams triggered by CAN-Systembus SYNC are synchronized to the PLC while those inverters that are not connected to PLC by their CMA board are able to synchronize as CAN-Systembus SYNC slave. This method works only with Systembus. If a field bus other than Systembus is active, CANopen will not be able to activate, as the internal administration structures will be already occupied.

8.7 NMT Functions

The NMT (= Network Management) functions describe the NMT Statemachine and NMT error saving functions.

The NMT state machine is controlled by NMT commands. The error control functions are set up by associated communication objects and controlled by special protocols.

8.7.1 NMT State Machine
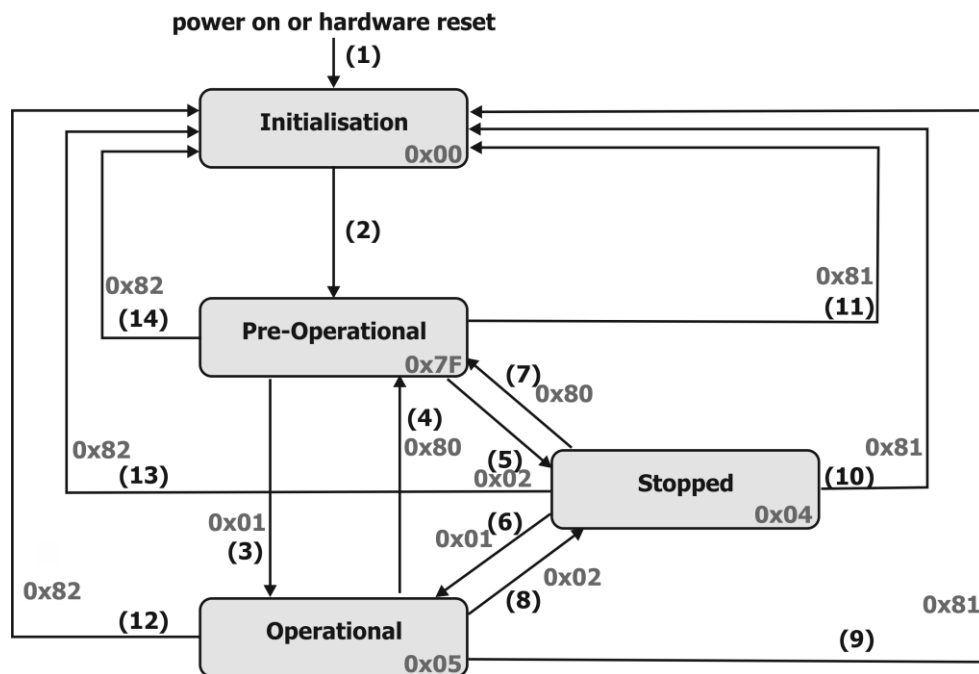
A change of NMT-State may also be triggered by a communication object (e. g. Bus-off).

transition	NMT command
(1)	At power on NMT state Initialization is entered autonomously
(2)	NMT state Initialization finished → NMT state Pre-Operational entered automatically, device sends Boot-Up message
(3)	Start Remote Node
(4), (7)	Enter Pre-Operational
(5), (8)	Stop Remote Node
(6)	Start Remote Node
(9), (10), (11)	Reset Node. Communication objects 0x1nnn and application objects 0x6nnn are reset.
(12), (13), (14)	Reset Communication. Communication objects 0x1nnn are reset.

8.7.2 NMT commands

	Byte 0	Byte 1	
Identifier	Command Specifier	Node-ID	
0	cs	id	

id = 0   command addressed to **all** devices

id = 1…0x7F (=127) command addressed to device with Node-ID = id

cs: 1   Start Remote Node

      2   Stop Remote Node

0x80 (=128) Enter Pre-Operational

0x81 (=129) Reset Node

0x82 (=130) Reset Communication

NMT states and active communication objects:

	Pre-Operational	**Operational**	**Stopped**
PDO		X	
SDO	X	X	
SYNC	X	X	

8.8 OS Synchronization

The operating system (OS) of the frequency inverter can be synchronized with a PLC or other device. Synchronization of the operating system will improve the operating characteristics of the machine. Synchronization is used to eliminate CPU **phase** shifting between master and slave devices to make sure that calculations are carried out at the same time. The synchronization time must be a natural number (multiple of 1 ms: in CANopen 1ms; in EtherCAT 125µs; in PROFInet IRT 250 µs, POWERLINK 1 ms).

Synchronization via CANopen:
When using CANopen® without Systembus, the synchronization can be switched on and off. Synchronization can be done with CANopen® SYNC telegrams.

Synchronization via Systembus:
When using CANopen® simultaneously with Systembus, the synchronization can be set to either CANopen, Systembus or it can be switched off. Synchronization can be done with Systembus SYNC telegrams or Systembus RxPDO telegrams.

> When synchronizing the OS via CANopen®, the master has to support the synchronization mechanisms of CANopen®.

Sync Source **0x3906/14**	
Operation mode	**Function**
0 - Off	The OS is not synchronized with other devices.
1 - Automatic	The synchronization source is selected automatically by the frequency inverter*. **Factory setting.**
2 - CM Module	The OS is synchronized via communication module.
3 - CANopen®	The OS is synchronized via CANopen®.
4 - Systembus	The OS is synchronized via System bus.
5 - IO Module	The OS is synchronized via IO module.

*) The search order for the synchronization source in Automatic mode is: CM module, IO module, CANopen®, Systembus.

CANopen® active	Systembus active	Synchronization
Yes	Yes	Synchronization via CANopen®
Yes	No	
No	Yes	Synchronization via Systembus
No	No	No Synchronization activated.

In the object **0x3906/15** *Active Sync Source* you can read the active sync source.

The CANopen "active status for synchronization" is recognized by the object setting **0x3911/1** *CANopen Node ID* >0 and a running synchronous PDO.

8.9 Resetting errors

Depending on the settings and operating state of the device, errors can be reset in various ways:

When you are using statemachine, parameter *Control Mode* **0x2200** = `3 - State-machine`:

− Set bit 7 in **0x6040** *Control word* = `0x0080`.

When using control via Keypad, parameter *Control mode* **0x2200** = Keypad:

• Press the STOP button of the keypad.

− Resetting by pressing the STOP button is only possible if parameter *Control Mode* **0x2200** permits control via the keypad.

When using control via IOs, parameter *Control mode* **0x2200** = IOs:

• Reset the error by activating the corresponding digital input.

− Resetting via digital signal can only be carried out when parameter *Control Mode* **0x2200** permits this or when an input with the additional (hardware) is selected in the case of physical inputs.

> Some errors will occur again after an error reset. In such cases, it may be necessary to take certain measures (e.g. moving from a limit switch in the non-disabled direction).

9 Object Structure

The available objects are marked with Index and Subindex and must be addressed via this ID.

POWERLINK offers the possibility to use CANopen® objects via Ethernet. The objects are listed in this chapter. The following definitions apply:

Access type		
Read only	The PLC can only read data from the frequency inverter.	
Read/Write	The PLC is granted unlimited access (reading and writing) to the frequency inverter data.	
Data type		
Unsigned32	32 Bit value:	$0...2^{32}-1$ 0...0xFFFF FFFF	
Unsigned16	16 Bit value:	$0...2^{16}-1$ 0...0x FFFF	(0...65535)
Unsigned8	8 Bit value:	$0...2^{8}-1$ 0...0xFF	(0...255)
Integer32	Signed 32 Bit value:	$-2^{31}...2^{31}-1$ 0x8000 0000...0x7FFF FFFF	
Integer16	Signed 16 Bit value:	$2^{15}...2^{15}-1$ 0x8000...0x7FFF	(-32768...32767)
Integer8	Signed 8 Bit value: -	$2^{7}...2^{7}-1$ 0x80...0x7F	(-128...127)
Boolean		FALSE... TRUE	0...1
Float32	Floating-point number with 4 digits after the point	$-2^{31}...2^{31}-1$ 0x8000 0000...0x7FFF FFFF	
Visible string	String up to 99 characters long. Transmission via Segmented Transfer.		
PDO Mapping		
No	This object cannot be used for exchange of PDO. Only SDO can be used.	
Tx	This object can be transmitted from the frequency inverter in a TxPDO.	
Rx	This object can be transmitted to the frequency inverter in a RxPDO.	

> "Highest sub index supported" shows the highest subindex supported by the object.

9.1 Objects table

Object Grouping

Every object is addressed via a 16 Bit index, which is displayed as a 4-digit hexadecimal number.

The object indexes are sorted in groups as follows:

− DS301 Communication Objects: **0x1000 − 0x1FFF**
− Bonfiglioli-specific objects: **0x2001 − 0x5FFF** with

Axis-dependent object ranges:

− **0x2001 − 0x27FF**
− **0x4000 − 0x47FF**

The Bonfiglioli-specific objects can be subdivided in axis-dependent objects versus axis-independent objects. There is an offset of 0x0800 per axis in the axis-dependent range.

For example:

0x2001 Motor Type on Axis 1 and **0x2801** Motor Type on Axis 2. The Bonfiglioli-specific objects in the range

- **0x3000** − **0x37FF**
- **0x5800** - **0x5FFF**

are not axis-dependent.

- DS402 Drive Profile objects: **0x6000** − **0x7FFF**

Object-no		Group
from	to	
0x2001	0x27FF	Configuration: Axis 1, Settings for Axis 1 Example: 0x2001 for motor type Axis 1
0x2801	0x28FF	Configuration: Axis 2, Settings for Axis 2 Example: 0x2801 for motor type Axis 2
0x3800	0x3FFF	Configuration: Axis independent settings Example: 0x3801 for serial-no. of Axia device
0x4000	0x47FF	Actual Values: Readings for Axis 1 Example: 0x4001 for active data set Axis1
0x4800	0x4FFF	Actual Values: Readings for Axis 2 Example: 0x4801 for active data set Axis2
0x5800	0x5FFF	Actual Values: axis independent readings Example: 0x5801 for DC-link Voltage
0x6000	0x67FF	CiA 402 objects Axis 1
0x6800	0x6FFF	CiA 402 objects Axis 2

9.2   Communication Objects (0x1nnn)

Communication objects **0x1nnn** contain all parameters for communication.

Abbreviations used

r/w: Read/Write
ro: Read only
wo: Write only
Map: Mapping
Def.-Val: Default value

> The headings are displayed in the format *Index/Subindex Object name*.

9.2.1 0x1000 Device Type

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1000	0	Device Type	Unsigned 32	ro	No	0

The device identification is carried out upon network startup. The information about the device type and functionality (type) is defined by the CANopen® DS402 standard.

Object 0x1000			
Additional Information		**Device Profile Number**	
Mode Bits	**Type**		
31 24	23 16	15 0	

The standard device profile "Drives and Motion Control" used by the frequency inverter is shown as device profile number 402. The other information specifies the device functionality of the frequency inverter.

Device Profile Number   = 402   drives and motion control

Type   = 41   Frequency inverter

Mode bits   = 0   unused

9.2.2 0x1001 Error Register

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1001	0	Error Register	Unsigned 8	ro	No	0

Object **0x1001** is the register for internal frequency inverter faults. Status "no fault" (**0x1001** = 0) or "fault" (**0x1001** ≠ 0) is displayed.

Object 0x1001/0			
Bit		**Bit**	
0	Generic error	**4**	Communication error
1	Current	**5**	Device profile specific error
2	Voltage	**6**	Reserved
3	Temperature	**7**	Manufacturer specific error

9.2.3 0x1003/n Pre-Defined Error Field

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1003	0	Pre-defined error field	Unsigned32	ro	No	0

SubIndex 0 gives the number of stored errors (max 5) and is 8 Bit wide. The other subindexes give the stored errors as 32-bit vars.

„Error Code" is the DS402 Error number. „Additional Information" is the Axia Error Number.

9.2.4 0x1005 COB-ID SYNC Message

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1005	0	COB-ID SYNC message	Unsigned32	rw	No	0x80

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9.2.5 0x1006 Comm Cycle Period

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1006	0	Comm cycle period	Unsigned32	rw	No	0

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9.2.6   0x1008 Manufacturer Device Name

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1008	0	Manufacturer Device name	Visible string	ro	No	See Text

The device name is displayed as a sequence of ASCII characters.

Example: **"AXIA Vert Single Axis"**

9.2.7   0x1009 Manufacturer Hardware Version

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1009	0	Manufacturer Hardware version	Visible string	ro	No	See Text

The device version is displayed as a sequence of ASCII characters.

Example: **"AXV 123 456 789"**

9.2.8   0x100A Manufacturer Software Version

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x100A	0	Manufacturer Software version	Visible string	ro	No	See Text

The software version is displayed as a sequence of ASCII characters.

Example: **V4.00**

9.2.9   0x1010 Store Parameters

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1010	255	Store parameters	Unsigned32	ro	No	0

With object **0x1010** object/object settings can be stored to non-volatile memory.

Writing of "save" in **0x1010** saves all application objects (**0x6nnn**) in the non-volatile memory.

Specification for writing the "save" instruction

LSB			MSB
"s"	"a"	"v"	"e"
0x73	0x61	0x76	0x65

> Writing of values other than "save" will result in cancellation of SDO. The store command is **not** processed.

9.2.10 0x1011 Restore Default Parameters

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1011	255	Restore Default Parameters	Unsigned32	ro	No	0

With object **0x1011**, you can reset objects/objects to the default values.

Writing of "load" in **0x1011** restores all application objects (**0x6nnn**).

Specification for writing the "load" instruction

LSB			MSB
"l"	"o"	"a"	"d"
0x6C	0x6F	0x61	0x64

> Writing of values other than "load" will result in cancellation of SDO. The restore defaults command is **not** processed.

Mapping entry:

MSB			LSB
Object index		Subindex	Length (no. of bits)
High byte	Low byte	si	ll

Example:

Mapping of 0x6040/0 Control word (unsigned16 = 10hex) to 1st mapped object in RxPDO1:

0x1600/1 = 0x60400010

Default mapping

RxPDO1	0x1600/0	0x1600/1	0x1600/2	0x1600/3...8
	2	0x6040 Control word	0x6042 vl target velocity	0x00000000
RxPDO2	0x1601/0	0x1601/1...8		
	1	0x6040 Control word		
RxPDO3	0x1602/0	0x1602/1...8		
	1	0x6040 Control word		
RxPDO4	0x1603/0	0x1603/1...8		
	1	0x6040 Control word		

Example*:

	COB ID	CB	Index	SI	Data
Read Request	601	40	00 16	01	00 00 00 00
Reply	581	43	00 16	01	10 00 40 60
Write Access	601	2F	00 16	00	00
Reply *	581	60	00 16	00	00 00

CB: Control byte   SI: Subindex   All values in hexadecimal without leading 0x

* Note, that Object **1400**/1 Highest bit has to be deactivated first for the correct Write access for Object **1600**/n. See also the Mapping sequence described in the following.

Mapping Sequence

The mapping sequence requires five steps:

Step 1:
Set PDO to "not valid" (**0x1400**, Subindex 1, Bit 31 = 1)

Step 2:
Set subindex 0 to 0 (deactivate current mapping, **0x1600**, Subindex 0 = 0)

Step 3:
Set subindex 1 … n to the new objects (**0x1600**, Subindex 1..n = new object)

Step 4:
Set subindex 0 to the number of mapped objects (activate new mapping, **0x1600**, Subindex 0 = n)

Step 5:
Set PDO valid (**0x1400**, Subindex 1, Bit 31 = 0)

TxPDO **0x1600** is used exemplary above. The same procedure applies to **0x1601, 0x1602** and **0x1603**.

Example (Node ID = 1):

	COB ID	Control byte	Index	Subindex	Data	Data
			LSB MSB	Subindex	LSB …	… MSB
Step 1:	601	23	00 14	01	01 02	00 80
Response	581	60	00 14	01	00 00	00 00
Step 2:	601	2F	00 16	00	00	
Response	581	60	00 16	00	00	
Step 3.1:	601	23	00 16	01	10 00	42 60
Response	581	60	00 16	01	00 00	00 00
Step 3.2	601	23	00 16	02	10 00	40 60
Response	581	60	00 16	02	00 00	00 00
Step 3.3	601	23	00 16	03	08 00	60 60
Response	581	60	00 16	03	00 00	00 00
Step 4:	601	2F	00 16	00	03	
Response	581	60	00 16	00	00	
Step 5:	601	23	00 14	01	01 02	00 00
Response	581	60	00 14	01	00 00	00 00

Resulting mapping

Target velocity (0x6042)	Control word (0x6040)	Modes of operation (0x6060)
00 00	00 00	00

This example shows the necessary telegrams with the according responses of the device.

9.2.11 0x160n/n, RxPDO Mapping Parameter

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1600	0	Number of mapped objects	Unsigned8	rw	No	2
	1	1st mapped obj.	Unsigned32	rw	No	See text
	2	2nd mapped obj.	Unsigned8	rw	No	See text
	3	3rd mapped obj.	Unsigned8	rw	No	See text
	4	4th mapped obj.	Unsigned8	rw	No	See text
	5	5th mapped obj.	Unsigned8	rw	No	See text
	6	6th mapped obj.	Unsigned8	rw	No	See text
	7	7th mapped obj.	Unsigned8	rw	No	See text
	8	8th mapped obj.	Unsigned8	rw	No	See text

RxPDO Mapping objects:

0x1600/n RxPDO1

0x1601/n RxPDO2

0x1602/n RxPDO3

0x1603/n RxPDO4

0x1600/0 = 0   = no object mapped

0x1600/0 = 1 … 8   = 1 … 8 mapped objects

Mapping entry:

MSB			LSB
Object index		Subindex	Length (no. of bits)
High byte	Low byte	si	ll

Example:

Mapping of 0x6040/0 Control word (unsigned16 = 10hex) to 1st mapped object in RxPDO1:

      0x1600/1 = 0x60400010

Default mapping

RxPDO1	0x1600/0	0x1600/1	0x1600/2	0x1600/3…8
	2	0x6040 Control word	0x6042 vl target velocity	0x00000000
RxPDO2	0x1601/0	0x1601/1…8		
	1	0x6040 Control word		
RxPDO3	0x1602/0	0x1602/1…8		
	1	0x6040 Control word		
RxPDO4	0x1603/0	0x1603/1…8		
	1	0x6040 Control word		

Example*:

	COB ID	CB	Index	SI	Data
Read Request	601	40	00 16	01	00 00 00 00
Reply	581	43	00 16	01	10 00 40 60
Write Access	601	2F	00 16	00	00
Reply *	581	60	00 16	00	00 00

CB: Control byte   SI: Subindex   All values in hexadecimal without leading 0x

* Note, that Object **1400**/1 Highest bit has to be deactivated first for the correct Write access for Object **1600**/n. See also the Mapping sequence described in the following.

Mapping Sequence

The mapping sequence requires five steps:

Step 1:
Set PDO to "not valid" (**0x1400**, Subindex 1, Bit 31 = 1)

Step 2:
Set subindex 0 to 0 (deactivate current mapping, **0x1600**, Subindex 0 = 0)

Step 3:
Set subindex 1 … n to the new objects (**0x1600**, Subindex 1..n = new object)

Step 4:
Set subindex 0 to the number of mapped objects (activate new mapping, **0x1600**, Subindex 0 = n)

Step 5:
Set PDO valid (**0x1400**, Subindex 1, Bit 31 = 0)

TxPDO **0x1600** is used exemplary above. The same procedure applies to **0x1601, 0x1602** and **0x1603**.

Example (Node ID = 1):

	COB ID	Control byte	Index	Subindex	Data	Data
			LSB MSB	Subindex	LSB …	… MSB
Step 1:	601	23	00 14	01	01 02	00 80
Response	581	60	00 14	01	00 00	00 00
Step 2:	601	2F	00 16	00	00	
Response	581	60	00 16	00	00	
Step 3.1:	601	23	00 16	01	10 00	42 60
Response	581	60	00 16	01	00 00	00 00
Step 3.2	601	23	00 16	02	10 00	40 60
Response	581	60	00 16	02	00 00	00 00
Step 3.3	601	23	00 16	03	08 00	60 60
Response	581	60	00 16	03	00 00	00 00
Step 4:	601	2F	00 16	00	03	
Response	581	60	00 16	00	00	
Step 5:	601	23	00 14	01	01 02	00 00
Response	581	60	00 14	01	00 00	00 00

Resulting mapping

Target velocity (0x6042)	Control word (0x6040)	Modes of operation (0x6060)
00 00	00 00	00

This example shows the necessary telegrams with the according responses of the device.

9.2.12 0x1A0n/n TxPDO Mapping Object

Index	Sub-index	Meaning	Data type	Access	Map	Def.-Val
0x1A00 0x1A01 0x1A02 0x1A03	0	Number of mapped objects	Unsigned8	rw	No	2
	1	1st mapped obj.	Unsigned32	rw	No	See text
	2	2nd mapped obj.	Unsigned32	rw	No	See text
	3	3rd mapped obj.	Unsigned32	rw	No	See text
	4	4th mapped obj.	Unsigned32	rw	No	See text
	5	5th mapped obj.	Unsigned32	rw	No	See text
	6	6th mapped obj.	Unsigned32	rw	No	See text
	7	7th mapped obj.	Unsigned32	rw	No	See text
	8	8th mapped obj.	Unsigned32	rw	No	See text

TxPDO Mapping objects:

0x1A00/n TxPDO1

0x1A01/n, TxPDO2

0x1A02/n, TxPDO3

0x1A03/n TxPDO4

0x1A00/0 = 0   = no object mapped

0x1A00/0 = 1 … 8   = 1 … 8 mapped objects

Mapping entry:

MSB			LSB
Object index		Subindex	Length (no. of bits)
High byte	Low byte	si	ll

Examples:

Mapping of **0x6041/0** Statusword (unsigned16) to "1st mapped obj." in TxPDO1:

       0x1A00/1 = 0x60410010

Mapping of **0x6064/0** Position actual value (integer32) to "2nd mapped obj." in TxPDO1:

       0x1A00/2 = 0x60640020

Default mapping

TxPDO1	0x1A00/0	0x1A00/1	0x1A00/2	0x1A00/3…8
	2	0x6041 Status word	0x6044 vl velocity actual value	0x00000000
TxPDO2	0x1A01/0	0x1A01/1		
	0	0x6041 Status word		
TxPDO3	0x1A02/0	0x1A02/1		
	0	0x6041 Status word		
TxPDO4	0x1A03/0	0x1A03/1		
	0	0x6041 Status word		

9.2.13 0x1F51, Program control Object

Index	No. of Data sets	Meaning	Data type	Access	Map	Def.-Val
0x1F51	0-3	Program control	Unsigned8	rw	No	1

This object allows changing and querying the state of a program.

The `clear` command is only allowed for the state `Stopped/StoppedReset/NoProg` (Flash must be present and no write or delete process is active). If `clear` is transmitted via CANopen, the file addressed in the subindex shall be deleted. The object is then prepared for the block programming. If transmitted via protocols other than CANopen, the `clear` command shall be ignored.

```
CANopen_EProgramControl_Stop  = 0,
CANopen_EProgramControl_Start = 1,
CANopen_EProgramControl_Reset = 2,
CANopen_EProgramControl_Clear = 3,
CANopen_EProgramState_Stopped      = 0,
CANopen_EProgramState_Started      = 1,
CANopen_EProgramState_StoppedReset = 2,
CANopen_EProgramState_NoProg       = 3,
```

`Stop`, `Start` and `Reset` may always be written. They do not have consequences for the inverter functionality.

The write process is started with the command `CANopen_EProgramControl_Clear`.

Depending on the SubIndex of **0x1F51** the corresponding program is opened. This deletes the memory array. The process takes 30 s to complete.

Index

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