

# Altivar Soft Starter ATS480

## Soft Starter for Asynchronous Motors

CANopen Manual – VW3A3608, VW3A3618,  
VW3A3628

NNZ85543.01  
03/2022



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# Safety Information

## Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

### ⚠ DANGER

**DANGER** indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

### ⚠ WARNING

**WARNING** indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

### ⚠ CAUTION

**CAUTION** indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

### NOTICE

**NOTICE** is used to address practices not related to physical injury.

## Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

## Qualification of Personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used. All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

## Intended Use

This product is intended for industrial use according to this manual.

The product may only be used in compliance with all applicable safety standard and local regulations and directives, the specified requirements and the technical data. The product must be installed outside the hazardous ATEX zone. Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented. Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design). Any use other than the use explicitly permitted is prohibited and can result in hazards.

## Product related information

**Read and understand these instructions before performing any procedure with this soft starter.**

### **DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Only appropriately trained persons who are familiar with and fully understand the contents of the present manual and all other pertinent product documentation and who have received all necessary training to recognize and avoid hazards involved are authorized to work on and with this equipment.
- Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Only use properly rated, electrically insulated tools and measuring equipment.
- Do not touch unshielded components or terminals with voltage present.
- Prior to performing any type of work on the equipment, block the motor shaft to prevent rotation.
- Insulate both ends of unused conductors of the motor cable.

**Failure to follow these instructions will result in death or serious injury.**

**⚠️! DANGER****HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

Before performing work on the equipment:

- Use all required personal protective equipment (PPE).
- Disconnect all power, including external control power that may be present. Take into account that the circuit breaker or main switch does not de-energize all circuits.
- Place a "Do Not Turn On" label on all power switches related to the equipment.
- Lock all power switches in the open position.
- Verify the absence of voltage using a properly rated voltage sensing device.

Before applying voltage to the equipment:

- Verify that the work has been completed and that the entire installation cannot cause hazards.
- If the mains input terminals and the motor output terminals have been grounded and short-circuited, remove the ground and the short circuits on the mains input terminals and the motor output terminals.
- Verify proper grounding of all equipment.
- Verify that all protective equipment such as covers, doors, grids is installed and/or closed.

**Failure to follow these instructions will result in death or serious injury.**

**⚠️! DANGER****HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Never operate energized switch with door open.
- Turn off switch before removing or installing fuses or making load side connections.
- Do not use renewable link fuses in fused switches.

**Failure to follow these instructions will result in death or serious injury.**

Damaged products or accessories may cause electric shock or unanticipated equipment operation.

**⚠️! DANGER****ELECTRIC SHOCK OR UNANTICIPATED EQUIPMENT OPERATION**

Do not use damaged products or accessories.

**Failure to follow these instructions will result in death or serious injury.**

Contact your local Schneider Electric sales office if you detect any damage whatsoever.

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

**⚠️! DANGER****POTENTIAL FOR EXPLOSION**

Install and use this equipment in non-hazardous locations only.

**Failure to follow these instructions will result in death or serious injury.**

Your application consists of a whole range of different interrelated mechanical, electrical, and electronic components, the soft starter being just one part of the application. The soft starter by itself is neither intended to nor capable of providing the entire functionality to meet all safety-related requirements that apply to your application. Depending on the application and the corresponding risk assessment to be conducted by you, a whole variety of additional equipment is required such as, but not limited to, external encoders, external brakes, external monitoring devices, guards, etc.

As a designer/manufacturer of machines, you must be familiar with and observe all standards that apply to your machine. You must conduct a risk assessment and determine the appropriate Performance Level (PL) and/or Safety Integrity Level (SIL) and design and build your machine in compliance with all applicable standards. In doing so, you must consider the interrelation of all components of the machine. In addition, you must provide instructions for use that enable the user of your machine to perform any type of work on and with the machine such as operation and maintenance in a safe manner.

The present document assumes that you are fully aware of all normative standards and requirements that apply to your application. Since the soft starter cannot provide all safety-related functionality for your entire application, you must ensure that the required Performance Level and/or Safety Integrity Level is reached by installing all necessary additional equipment.

## **⚠ WARNING**

### **INSUFFICIENT PERFORMANCE LEVEL/SAFETY INTEGRITY LEVEL AND/OR UNINTENDED EQUIPMENT OPERATION**

- Conduct a risk assessment according to EN ISO 12100 and all other standards that apply to your application.
- Use redundant components and/or control paths for all critical control functions identified in your risk assessment.
- Verify that the service life of all individual components used in your application is sufficient for the intended service life of your overall application.
- Perform extensive commissioning tests for all potential error situations to verify the effectiveness of the safety-related functions and monitoring functions implemented, for example, but not limited to, speed monitoring by means of encoders, short circuit monitoring for all connected equipment, correct operation of brakes and guards.
- Perform extensive commissioning tests for all potential error situations to verify that the load can be brought to a safe stop under all conditions.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The products may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

## **⚠ WARNING**

### **UNANTICIPATED EQUIPMENT OPERATION**

- Carefully install the wiring in accordance with the EMC requirements.
- Do not operate the product with unknown or unsuitable settings or data.
- Perform a comprehensive commissioning test.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

**⚠ WARNING****LOSS OF CONTROL**

- The designer of any control scheme must consider the potential failure modes of control paths and, for critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines (1).
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

(1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control and to NEMA ICS 7.1 (latest edition), Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems.

Machines, controllers, and related equipment are usually integrated into networks. Unauthorized persons and malware may gain access to the machine as well as to other devices on the network/fieldbus of the machine and connected networks via insufficiently secure access to software and networks.

**⚠ WARNING****UNAUTHORIZED ACCESS TO THE MACHINE VIA SOFTWARE AND NETWORKS**

- In your hazard and risk analysis, consider all hazards that result from access to and operation on the network/fieldbus and develop an appropriate cyber security concept.
- Verify that the hardware infrastructure and the software infrastructure into which the machine is integrated as well as all organizational measures and rules covering access to this infrastructure consider the results of the hazard and risk analysis and are implemented according to best practices and standards covering IT security and cyber security (such as: ISO/IEC 27000 series, Common Criteria for Information Technology Security Evaluation, ISO/ IEC 15408, IEC 62351, ISA/IEC 62443, NIST Cybersecurity Framework, Information Security Forum - Standard of Good Practice for Information Security, SE Recommended Cybersecurity Best Practices\*).
- Verify the effectiveness of your IT security and cyber security systems using appropriate, proven methods.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

(\*) : SE Recommended Cybersecurity Best Practices can be downloaded on [SE.com](http://SE.com)

**⚠ WARNING****LOSS OF CONTROL**

Perform a comprehensive commissioning test to verify that communication monitoring properly detects communication interruptions

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

This product meets the EMC requirements according to the standard CEI 60947-4-1. This device has been designed for environment A. Use of this product in a domestic environment (B environment) may cause unwanted radio interference.

**⚠⚠ WARNING****RADIO INTERFERENCE**

- In a domestic environment (B environment), this product may cause radio interference in which case supplementary mitigation measures may be required.
- The references from ATS480D17Y to ATS480C11Y can be adapted to a domestic environment (B environment) by adding an external bypass contactor. For other ATS480 references, you must consider other mitigation measures.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

**NOTICE****DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE**

Before switching on and configuring the product, verify that it is approved for the mains voltage.

**Failure to follow these instructions can result in equipment damage.**

# About the Book

## At a Glance

### Validity note

Original instructions and information given in the present document have been written in English (before optional translation).

**NOTE:** The products listed in the document are not all available at the time of publication of this document online. The data, illustrations and product specifications listed in the guide will be completed and updated as the product availabilities evolve. Updates to the guide will be available for download once products are released onto the market.

This documentation is valid only for ATS480.

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

The technical characteristics of the devices described in the present document also appear online. To access the information online:

Step	Action
1	Go to the Schneider Electric home page <a href="http://www.se.com">www.se.com</a> .
2	In the Search box type the reference of the product or the name of a product range. <ul style="list-style-type: none"> <li>• Do not include blank spaces in the reference or product range.</li> <li>• To get information on grouping similar modules, use asterisks (*).</li> </ul>
3	If you entered a reference, go to the Product Datasheets search results and click on the reference that interests you. If you entered the name of a product range, go to the Product Ranges search results and click on the product range that interests you.
4	If more than one reference appears in the Products search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click <b>Download XXX product datasheet</b> .

### Document Scope

The purpose of this document is to:

- Show you how to install the CANopen fieldbus on your soft starter.
- Show you how to configure soft starter to use CANopen for monitoring and control.
- Provide examples of setup using Control Expert.

**NOTE:** Read and understand this document and all related documents (see below) before installing, operating, or maintaining your soft starter.

## Related Documents

Use your tablet or your PC to quickly access detailed and comprehensive information on all our products on [www.se.com](http://www.se.com). The Internet site provides the information you need for products and solutions:

- The whole catalog for detailed characteristics and selection guides
- The CAD files to help design your installation, available in over 20 different file formats
- All software and firmware to maintain your installation up to date
- A large quantity of White Papers, Environment documents, Application solutions, Specifications... to gain a better understanding of our electrical systems and equipment or automation
- And finally all the User Guides related to your soft starter, listed below:

Title of documentation	Catalog number
Catalog: Altivar Soft Starter ATS480	DIA2ED2210602EN (English), DIA2ED2210602FR (French), DIA2ED2210602CN (Chinese), DIA2ED2210602DE (German), DIA2ED2210602IT (Italian), DIA2ED2210602SP (Spanish), DIA2ED2210602PTBR (Brazilian Portuguese), DIA2ED2210602TR (Turkish)
ATS480 Getting Started Manual	NNZ85504 (English), NNZ85505 (French), NNZ85506 (Spanish), NNZ85507 (Italian), NNZ85508 (German), NNZ85509 (Chinese), NNZ85510 (Portuguese), NNZ85511 (Turkish)
ATS480 Getting Started Manual Annex for UL	NNZ86539 (English)
ATS480 User Manual	NNZ85515 (English), NNZ85516 (French), NNZ85517 (Spanish), NNZ85518 (Italian), NNZ85519 (German), NNZ85520 (Chinese), NNZ85521 (Portuguese), NNZ85522 (Turkish)
ATS48 to ATS480 Substitution Manual	NNZ85529 (English), NNZ85530 (French), NNZ85531 (Spanish), NNZ85532 (Italian), NNZ85533 (German), NNZ85534 (Chinese), NNZ85535 (Portuguese), NNZ85536 (Turkish)
ATS480 Embedded Modbus RTU Manual	NNZ85539 (English)
ATS480 EtherNet/IP – Modbus TCP Manual VW3A3720	NNZ85540 (English)
ATS480 PROFIBUS DP Manual VW3A3607	NNZ85542 (English)
ATS480 CANopen Manual VW3A3608, VW3A3618, VW3A3628	NNZ85543 (English)
ATS480 Communication Parameter Addresses	NNZ85544 (English)
ATS480 Cascade Function Application Note	NNZ85564 (English)
SoMove: FDT	SoMove FDT (English, French, German, Spanish, Italian, Chinese)
ATS480: DTM	ATS480 DTM Library EN (English – to be installed first), ATS480 DTM Lang FR (French), ATS480 DTM Lang SP (Spanish), ATS480 DTM Lang IT (Italian), ATS480 DTM Lang DE (German), ATS480 DTM Lang CN (Chinese)
EcoStruxure Automation Device Maintenance	EADM (English)
Recommended Cybersecurity Best Practices	CS-Best-Practices-2019-340 (English)

You can download there technical publications and other technical information from our website at [www.se.com/en/download](http://www.se.com/en/download).

## Electronic product data sheet

Scan the QR code in front of the soft starter to get the product data sheet.



## Terminology

The technical terms, terminology, and the corresponding descriptions in this manual normally use the terms or definitions in the relevant standards.

In the area of soft starters this includes, but is not limited to, terms such as error, error message, failure, fault, fault reset, protection, safe state, safety function, warning, warning message, and so on.

Among others, these standards include:

European standards:

- IEC 60947–1 Low-Voltage Switchgear and Control Gear – General rules
- IEC 60947–4–2 Semiconductor Motor controllers, Starters and Soft Starters
- IEC 60529 Degrees of protection provided by enclosures (IP Code) Safety of machinery – Electrical equipment of machines – General requirements
- IEC 60664–1 Insulation coordination for equipment within low-voltage supply systems – Principles, requirements, and tests
- IEC 61000–4–2–4–3/4–4/4–5/4–6/4–11/4–12 Electromagnetic Compatibility
- IEC 60721–3 Classification of environmental conditions
- IEC 61131–2: Programmable controllers – Part 2: Equipment requirements and tests
- IEC 60068: Environmental testing
- IEC 61158 series: Industrial communication networks – Fieldbus specifications
- IEC 61784 series: Industrial communication networks – Profiles
- IEC 62443: Security for industrial automation and control systems

European Community directives:

- 86/188/EEC Protection of Workers for the Risks Related to Exposure to Noise at Work
- 2014/35/EU Low Voltage Directive
- 2014/30/EU EMC Directive
- 2006/42/EC Machine Directive

North American standards:

- UL 60947–4–2: Low-Voltage Switchgear and Control gear – Part 4–2: Contactors and Motor–Starters – AC Semiconductor Motor Controllers and Starters

**Other standards:**

- ISO 12100:2010: Safety of machinery – General principles for design – Risk assessment and risk reduction
- GB/T 14078.6-2016: Low—Voltage Switchgear and Control Gear - - Part 4-2: Contactors and motor starters -- AC Semiconductor Motor Controllers and Starters (including Soft Starters)
- IEC 61800-9-2: Adjustable speed electrical power drive systems – Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driver applications – Energy efficiency indicators for power drive systems and motor starters

In addition, the term zone of operation is used in conjunction with the description of specific hazards, and is defined as it is for a hazard zone or danger zone in the EC Machinery Directive (2006/42/EC) and in ISO 12100-1.

Also see the glossary at the end of this manual.

## Contact us

Select your country on [www.se.com/contact](http://www.se.com/contact).

Schneider Electric Industries SAS

Head Office

35, rue Joseph Monier

92500 Rueil-Malmaison

France

# Presentation

## Hardware Overview

### General

The VW3A3608, VW3A3618, VW3A3628 are CANopen modules that can be used in a CANopen industrial fieldbus.

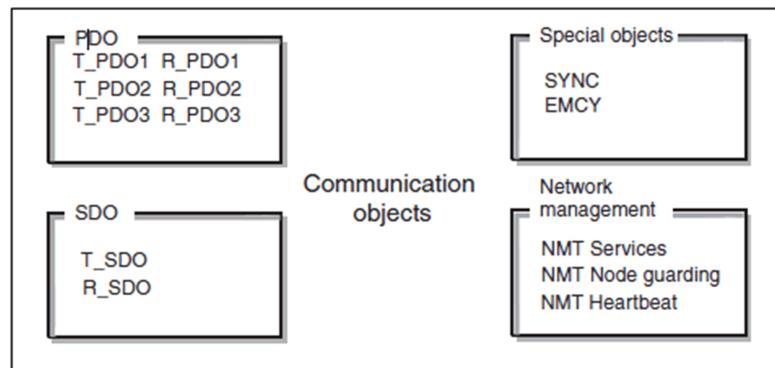
The following figure shows the hardware presentation of these three CANopen modules.



# Software Overview

## General

CANopen manages communication between the network devices with object dictionaries and objects. A network device can use process data objects (PDO) and service data objects (SDO) to request the object data from the object dictionary of another device and, if permissible, write back modified values.



- PDOs (process data objects) for real-time transmission of process data.
- SDOs (service data object) for read and write access to the object dictionary.
- Objects for controlling CAN messages:
  - SYNC object (synchronization object) for synchronization of network devices.
  - EMCY object (emergency object), for signaling errors of a device or its peripherals.
- Network management services:
  - NMT services for initialization and network control (NMT: network management).
  - NMT node guarding for monitoring the network devices.
  - NMT heartbeat for monitoring the network devices.

## Communication Parameter Addresses

For more information about the Communication Parameter Addresses, please refers to the ATS480 Communication Parameter Addresses NNZ85544, page 12.

# Basics

## Profile

### Definition of a Profile

#### Types of Profiles

There are 3 types of profile:

- Communication profiles
- Functional profiles
- Application profiles

#### Communication Profile

A communication profile describes the characteristics of a bus or network:

- Cables
- Connectors
- Electrical characteristics
- Access protocol
- Addressing system
- Periodic exchange service
- Messaging service
- ...

A communication profile is unique to a type of fieldbus (such as Modbus, PROFIBUS DP, and so on) and is used by different types of devices.

#### Functional Profile

A functional profile describes the behavior of a type of device:

- Functions
- Parameters (such as name, format, unit, type, and so on.)
- Periodic I/O variables
- State chart
- ...

#### Application Profile

Application profile defines the services to be provided by the devices on a machine.

#### Interchangeability

The aim of communication and functional profiles is to achieve interchangeability of the devices connected via the fieldbus.

## Functional Profiles Supported by the Altivar Soft Starter

**NOTE:** The following document is valid if [Control Mode] CHCF is set to [Standard Profile] STD.

### ATS48 Compatibility Profile

This profile allows to manage the compatibility with an Altistart ATS48.

**NOTE:** [Control Mode] CHCF is set to [SE8 Profile] SE8 (factory setting).

**NOTE:**

Fieldbus modules are incompatible with [Control Mode] CHCF set to [SE8 Profile] SE8.

Using the [SE8 Profile] SE8 with an option module (CANopen, Ethernet, PROFIBUS DP) triggers an error [Config Change] CFF2.

To remedy:

- Press the OK key to validate the message displayed on the display terminal. This action will change [Control Mode] CHCF from [SE8 Profile] SE8 to [Standard Profile] STD
- Or turn Off the soft starter, remove the fieldbus module and turn On the soft starter.

### Standard Profile

To be in Standard Profile, [Control Mode] CHCF is set to [Standard Profile] STD.

The Standard Profile supported by the Altivar Soft Starter is based on the CiA402, which has been adapted to the characteristics of the Altivar Soft Starter and therefore to all communication ports.

The control word is compliant according to CiA402.

5 bits of the control word (bits 11...15) can be assigned to a function.

**NOTE:**

- Altivar Soft Starter starts up following a command sequence
- After switching on and when an operating mode is started, Altivar Soft Starter goes through several operating states

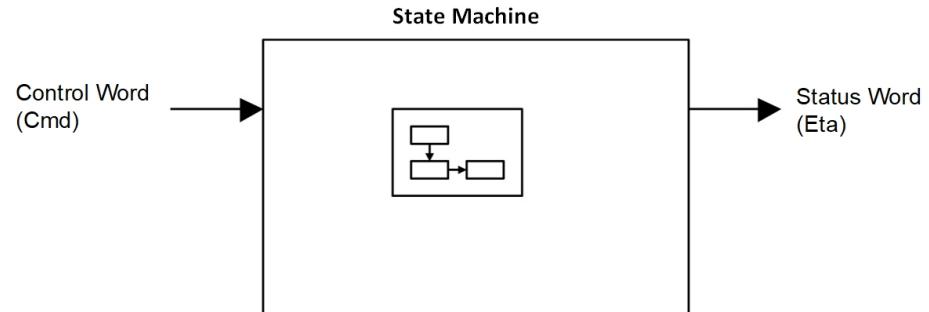
## Functional Description

### Introduction

Soft starter operation involves one main function, which is illustrated in the diagrams below.

### Altivar Soft Starter

The following figure shows the control diagram for soft starter operation:



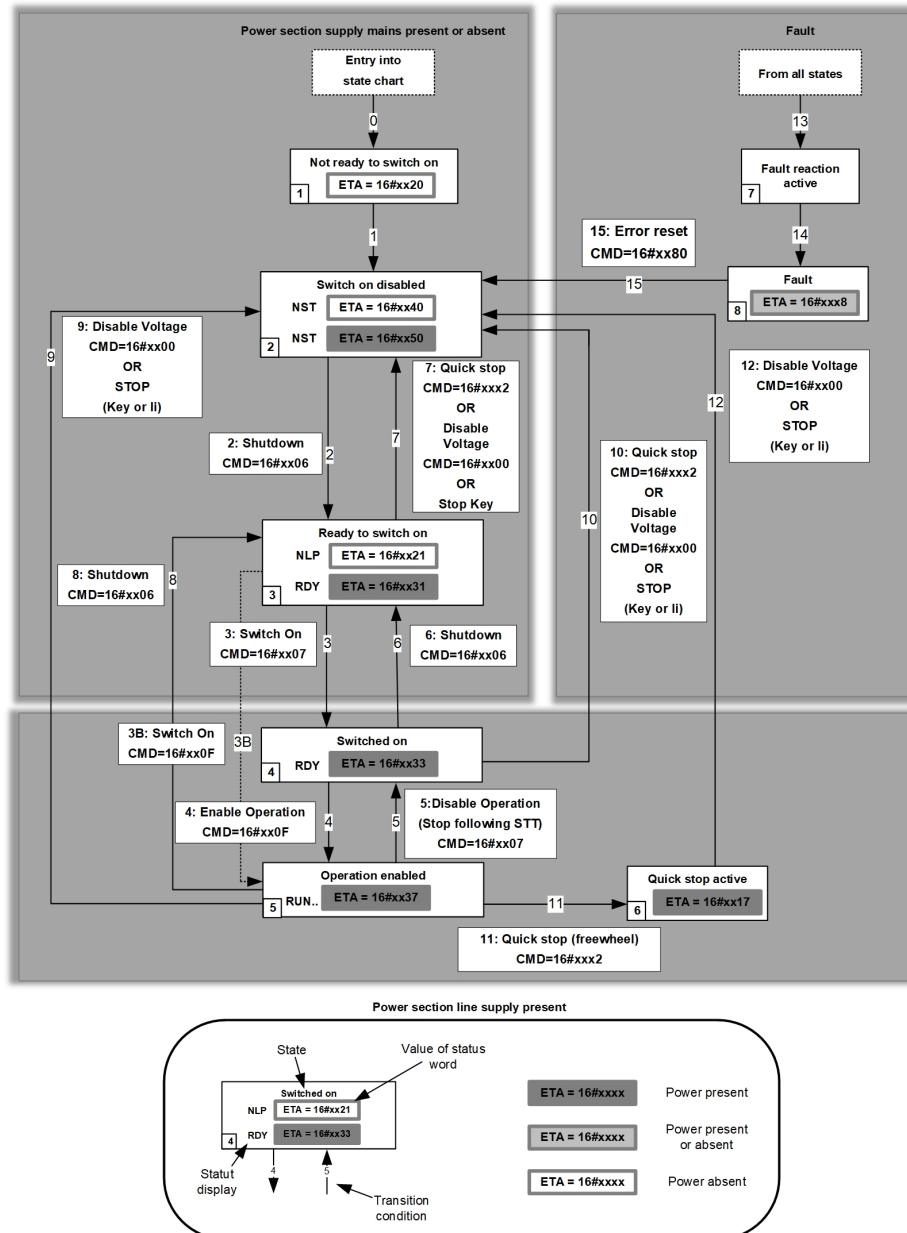
## Standard Mode Operating State Diagram

### State Diagram

After switching on and when an operating mode is started, the product goes through a number of operating states.

The state diagram (state machine) shows the relationships between the operating states and the state transitions. The operating states are internally monitored and influenced by monitoring functions.

The following figure shows the Standard Mode state diagram:



## Description of Operating States

### Soft starter Operating State

Each state represents an internal reaction by the soft starter.

The operating state of the soft starter changes depending on whether the control word is sent to **CMD** or an event occurs (an error detection, for example).

The soft starter operating state can be identified by the value of the status word **ETA**.

Operating State	Description
1 - Not ready to switch on	Initialization starts. This is a transient state invisible to the communication network.
2 - Switch on disabled	<p>The power stage is not ready to switch on.</p> <p>The soft starter is locked, no power is supplied to the motor.</p> <p>The configuration and adjustment parameters can be modified.</p>
3 - Ready to switch on	<p>The power stage is ready to switch on and awaiting power stage supply mains.</p> <p>The soft starter is locked, no power is supplied to the motor.</p> <p>The configuration and adjustment parameters can be modified.</p> <p><b>NOTE:</b> If mains contactor is wired on a relay (<b>[R1 Assignment]</b> R1 is set to <b>[Isolating Relay] ISOL</b> or <b>[R3 Assignment]</b> R3 is set to <b>[Mains Contactor] LLC</b>), mains contactor is not closed and we stay in this state until a run command is given.</p>
4 - Switched on	<p>Power stage is switched on.</p> <p>The power stage of the soft starter is ready to operate, but voltage has not yet been applied to the output.</p> <p>The adjustment parameters can be modified.</p> <p><b>NOTE:</b> By default, Relay R1 <b>[R1 Assignment]</b> R1 is set to <b>[Operating State Fault] FLT</b> then the mains contactor is closed. The soft starter is locked, no power is supplied to the motor.</p> <p><b>NOTE:</b> If mains contactor is wired on a relay (<b>[R1 Assignment]</b> R1 is set to <b>[Isolating Relay] ISOL</b> or <b>[R3 Assignment]</b> R3 is set to <b>[Mains Contactor] LLC</b>), we reach temporarily this state once Run command is applied and mains contactor is closed allowing presence of power stage before switching to 5 - <i>Operation enabled</i>.</p>
5 - Operation enabled	<p>Power stage is enabled. The soft starter is in running state</p> <p>For a separate control stage with mains contactor, the contactor is closed.</p> <p>The soft starter is unlocked, power is supplied to the motor.</p> <p>The soft starter functions are activated and voltage is applied to the motor terminals.</p> <p>If the <b>Halt</b> command is applied, no power is supplied to the motor.</p> <p>The adjustment parameters can be modified.</p> <p>The configuration parameters cannot be modified.</p> <p>The reaction of the soft starter to a <b>Disable operation</b> command is to stop following to the <b>[Type of stop] STT</b>.</p>
6 - Quick stop active	<p>The soft starter performs a freewheel stop and remains locked in the operating state 6-<i>Quick stop active</i>. Before restarting the motor, it is required to go to the operating state 2-<i>switch on disabled</i>.</p> <p>The soft starter stops according to freewheel stop and then remains in state 6 - <i>Quick stop active</i> until:</p> <ul style="list-style-type: none"> <li>• The <b>STOP</b> key is pressed or</li> <li>• A freewheel stop command via the digital input of the terminal.</li> </ul>
7 - Fault reaction active	<p>Transient state during which the soft starter performs a stop due to a detected error.</p> <p>If behavior of the detected error is configurable, then the reaction will depend on setting of its <b>error response</b>.</p>
8 - Fault	<p>End of the stop caused by change to the previous state 7 - <i>Fault reaction active</i>.</p> <p>Power stage is disabled. The soft starter is locked, no power is supplied to the motor if an error detection has been triggered. Else the soft starter change to the step 2- <i>switch on disable</i>.</p> <p>The soft starter function is disabled</p>

## Summary

### Device Status Summary

Operating State	Power Supply to Power Stage	Power Supplied to Motor	Modification of Configuration Parameters
1 - Not ready to switch on	Not required	No	Yes
2 - Switch on disabled	Not required	No	Yes
3 - Ready to switch on	Not required	No	Yes
4 - Switched on	Required	No	Yes
5 - Operation enabled	Required	Yes	No
6 - Quick stop active	Required	No	No
7 - Fault reaction active	Depends on error response configuration	Depends on error response configuration	No
8 - Fault	Not required	No	Yes

#### NOTE:

- Configuration parameters are described in communication parameter file as R/WS access type parameters. Other parameters can be accessed whatever the operating state.
- A Setting parameter can be accessed in all operating state of the soft starter.

## [Cmd Register] CMD

### Bit Mapping of the Control Word

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault reset	Reserved (=0)	Reserved (=0)	Reserved (=0)	Enable operation	Quick stop	Enable voltage	Switch on
0 to 1 transition = Error is reset (after cause of error is no longer active)				1 = Run command	0 = Quick stop active	Authorization to supply AC power	Mains contactor control

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific assignable	<p><b>Decelerated stop order (factory setting).</b></p> <p>The Bit can be set to an other function.</p> <p><b>NOTE:</b> If no function is assigned, the Bit will return to his factory setting.</p>	<p><b>Dynamic braking stop (factory setting).</b></p> <p>The Bit can be set to an other function.</p> <p><b>NOTE:</b> If no function is assigned, the Bit will return to his factory setting.</p>	Manufacturer specific assignable	Manufacturer specific assignable	Reserved (=0)	Reserved (=0)	<p>Halt</p> <p>0 = run asked</p> <p>1 = stop asked</p>

Command	State Transition	Final Operating State	Bit 7	Bit 3	Bit 2	Bit 1	Bit 0	Example Value
			Fault Reset	Enable Operation	Quick Stop	Enable Voltage	Switch On	
Shutdown	2, 6, 8	3 - Ready to switch on	X	X	1	1	0	0006 hex
Switch on	3	4 - Switched on	X	X	1	1	1	0007 hex
Enable operation	4	5 - Operation enabled	X	1	1	1	1	000F hex
Disable operation	5	4 - Switched on	X	0	1	1	1	0007 hex
Disable voltage	7, 9, 10, 12	2 - Switch on disabled	X	X	X	0	X	0000 hex
Quick stop	11	6 - Quick stop active	X	X	0	1	X	0002 hex
Fault reset	15	2 - Switch on disabled	0 → 1	X	X	X	X	0080 hex

X: Value is of no significance for this command.

0→1: Command on rising edge.

## Stop Commands

### Halt Command

The Halt command enables movement to be interrupted without having to leave the 5 - *Operation enabled* state. The stop is performed in accordance with the [Type of stop] **S E** parameter.

If the Halt command is active, no power is supplied to the motor and no torque is applied.

Regardless of the assignment of the [Type of stop] **STT** parameter ([Freewheel] **F**, [Deceleration] **D**, or [Braking] **B**) the soft starter remains in the 5 - *Operation enabled* state.

### Freewheel Command

A Freewheel Stop command using a digital input of the terminal or a bit of the control word assigned to Freewheel Stop causes a change to operating state 2 - *Switch on disabled*.

## Assigning Control Word Bits

### Function Codes

In the Standard profile, fixed assignment of a function input is possible using the following codes:

Bit	CANopen
Bit 11	C211
Bit 12	C212
Bit 13 is set to <b>Dynamic braking stop (factory setting)</b> .  This Bit can be set to an other function.  <b>NOTE:</b> If no function is assigned, the Bit will return to his factory setting.	C213
Bit 14 is set to <b>Decelerated stop order (factory setting)</b> .  This Bit can be set to an other function.  <b>NOTE:</b> If no function is assigned, the Bit will return to his factory setting.	C214
Bit 15	C215

For example, to assign the preheating to bit15 of CANopen, simply configure the [Preheating Assign] **PRHA** parameter with the **[C215] E 2 I 5** value.

## Status Word ETA

### Bit Mapping of the Status Word

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
A warning is active	Power stage supply disabled	0 = Quick stop is active	Power stage supply present	Error detected	Running	Ready	1 = Awaiting power Stage supply

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved (=0)	Manufacturer-specific Stop via STOP key	Reserved (=0)	Reserved (=0)	Reserved (=0)	Reserved (=0)	Remote (local mode control)	Reserved (=0)
						Command via fieldbus	

Operating State	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	ETA Masked by 006F H <sup>(1)</sup>
	Switch On Disabled	Quick Stop	Voltage Enabled	Fault	Operation Enabled	Switched On	Ready to Switch On	
1 -Not ready to switch on	0	X	0	0	0	0	0	0020 hex
2 -Switch on disabled	1	X	X	0	0	0	0	0040 hex 0050 hex
3 -Ready to switch on	0	1	X	0	0	0	1	0021 hex 0031 hex
4 -Switched on	0	1	1	0	0	1	1	0033 hex
5 -Operation enabled	0	1	1	0	1	1	1	0037 hex
6 -Quick stop active	0	0	1	0	1	1	1	0017 hex
7 -Fault reaction active	X	X	X	0	1	1	1	-
8 -Fault	X	X	X	1	0	0	0	0008 hex <sup>(2)</sup> ... 0028 hex

<sup>(1)</sup> This mask can be used by the PLC program to test the diagram state.

<sup>(2)</sup> Detected error following operating state 6 - Quick stop active.

X: In this state, the value of the bit can be 0 or 1.

## Starting Sequence

### Description

The command sequence in the state diagram depends on how power is being supplied to the soft starter.

There are 2 possible scenarios:

Power stage supply	Mains contactor controlled by another device	Mains contactor controlled by the soft starter <sup>(1)</sup>

(1) R\*: R1 or R3:

- [R1 Assignment] R1 is set to [Isolating Relay] ISOL  
NOTE: If R1 is set to [Isolating Relay] ISOL, R3 can't be set to [Mains Contactor] LLC.
- [R3 Assignment] R3 is set to [Mains Contactor] LLC  
NOTE: If R3 is set to [Mains Contactor] LLC, R1 can't be set to [Isolating Relay] ISOL.

## Sequence for a Soft starter

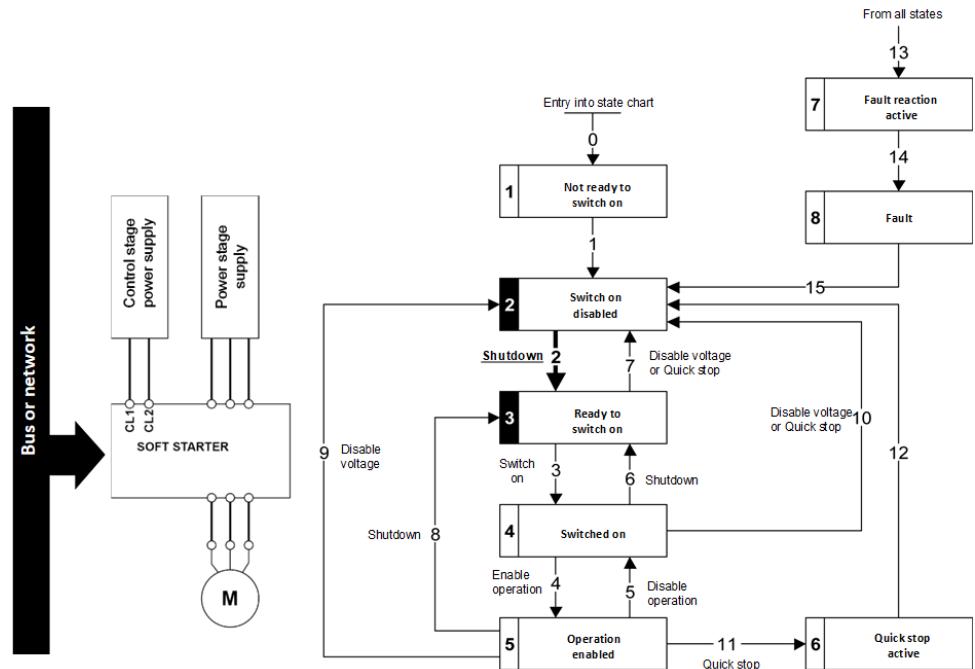
### Description

Power is supplied separately to the power and control stages.

If power is supplied to the control stage, it does not have to be supplied to the power stage as well. The following sequence must be applied:

### Step 1

- The power stage supply is not necessarily present.
- Apply the 2 - *Shut down* command.

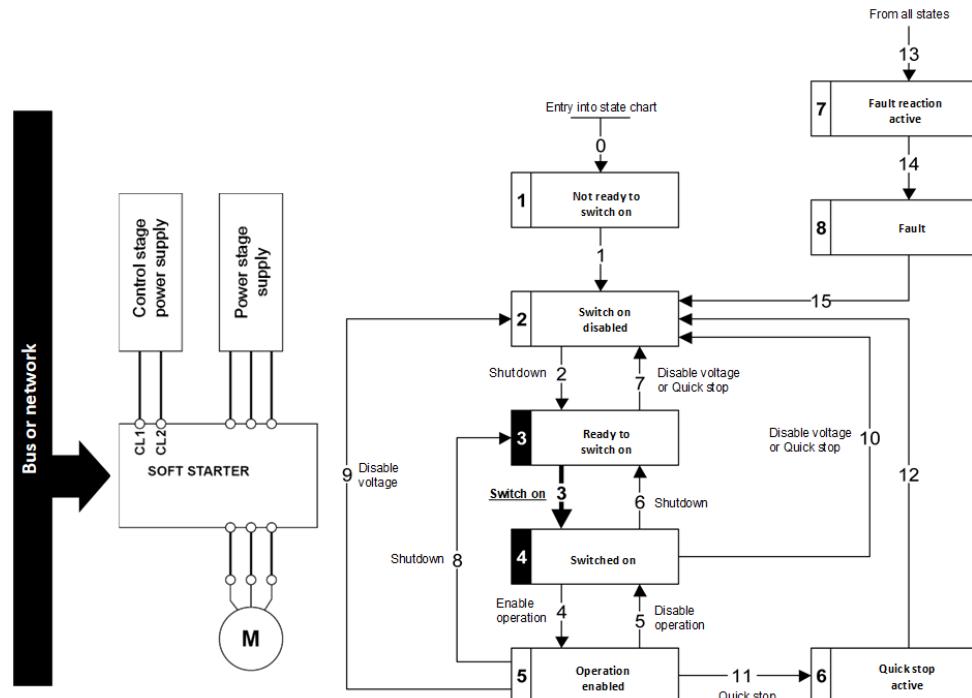


## Step 2

- Check that the soft starter is in the operating state 3 - *Ready to switch on*.
- The power stage supply could be present (*Voltage enabled* of the status word).

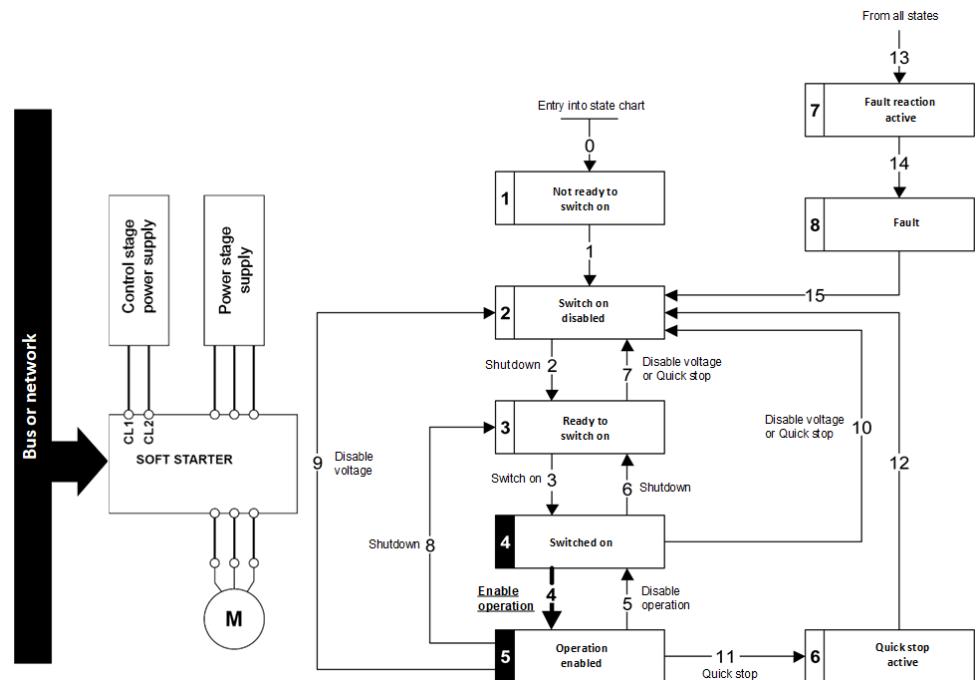
Power Stage Supply	Terminal Display	Status Word
Absent	NLP	21 hex
Present	RDY	31 hex

- Apply the 3 - *Switch on* command



### Step 3

- If power supply is present; check that the soft starter is in the operating state 4 - *Switched on*.
- NOTE:** If power supply is not present, we stay in 3 - *Ready to switch on*.
- Then apply the 4- *Enable operation* command.
  - The motor can be started.



## Sequence for a Soft starter with Mains Contactor Control

### Description

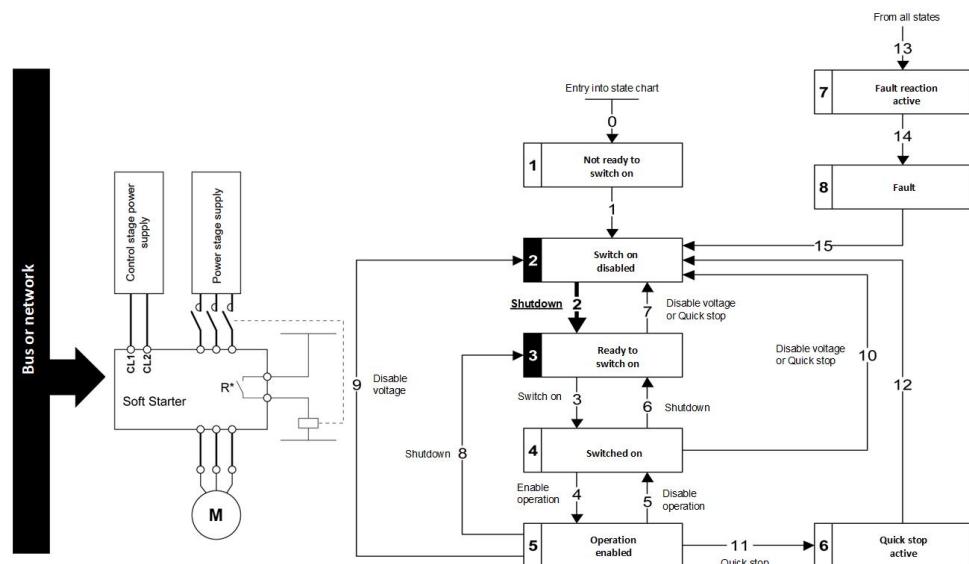
Power is supplied separately to the power and control stages.

If power is supplied to the control stage, it does not have to be supplied to the power stage as well. The soft starter controls the mains contactor.

The following sequence must be applied:

### Step 1

- The power stage supply is not present as the mains contactor is not being controlled.
- Apply the 2 - *Shut down* command.



R\*: R1 or R3:

- **[R1 Assignment]** R1 is set to **[Isolating Relay] ISOL**

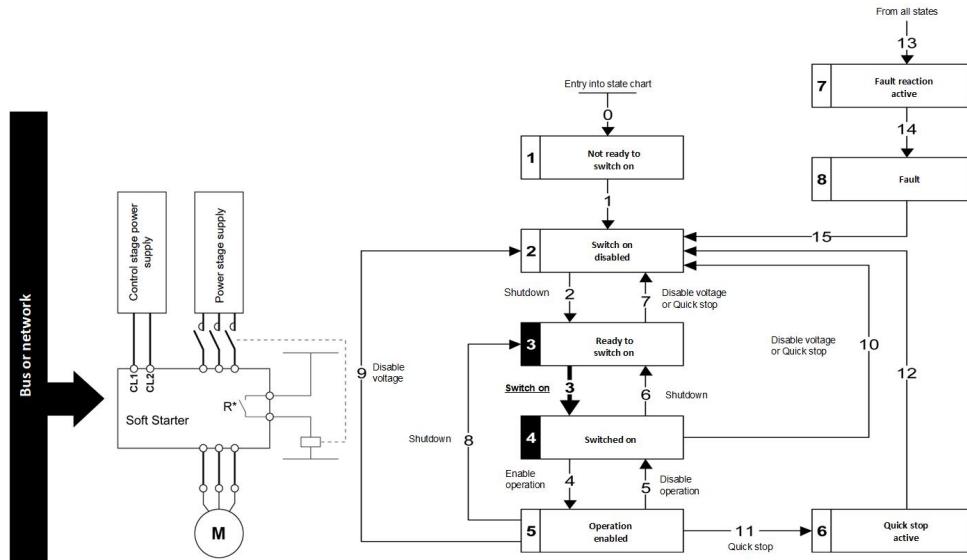
**NOTE:** If R1 is set to **[Isolating Relay] ISOL**, R3 can't be set to **[Mains Contactor] LLC**.

- **[R3 Assignment]** R3 is set to **[Mains Contactor] LLC**

**NOTE:** If R3 is set to **[Mains Contactor] LLC**, R1 can't be set to **[Isolating Relay] ISOL**.

## Step 2

- Check that the soft starter is in the operating state 3 - *Ready to switch on*.
- Apply the 3 - *Switch on* command, which closes the mains contactor and switch on the power stage supply by giving RUN command.
- If the power stage supply is still not present in the operating state 4 - *Switched on* after a time delay [Mains V. time out] LCT, the soft starter triggers an error [**[Input Contactor]** LCF].



### NOTE:

R\*: R1 or R3:

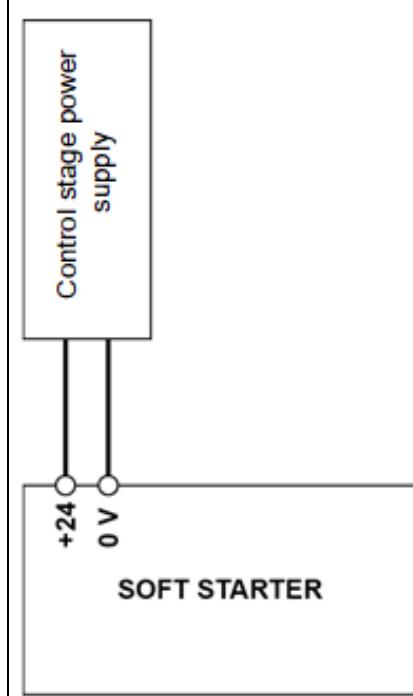
- [**[R1 Assignment]**] R1 is set to [**[Isolating Relay]** ISOL

**NOTE:** If R1 is set to [**[Isolating Relay]** ISOL, R3 can't be set to [**[Mains Contactor]** LLC.

- [**[R3 Assignment]**] R3 is set to [**[Mains Contactor]** LLC

**NOTE:** If R3 is set to [**[Mains Contactor]** LLC, R1 can't be set to [**[Isolating Relay]** ISOL.

## Automation Commissioning Only

Control stage supplied via +24 V of the control board	Use case
 <p>The diagram illustrates a connection setup for commissioning. At the top, a rectangular box labeled "Control stage power supply" has two vertical lines descending to a horizontal bus bar. This bus bar connects to the "+24" terminal of a rectangular component labeled "SOFT STARTER". The "0V" terminal of the soft starter is also connected to the same bus bar.</p>	<p>In case of no electrical accreditation to work on the product with the presence of the supply mains, it is possible to connect a separate 24V supply to commission the soft starter with no supply mains applied to the product.</p>

# Object Dictionary

## Description

Each CANopen device manages an object dictionary which contains the objects for communication.

## Index and Subindex

The objects are addressed in the object dictionary via a 16 bit index.

One or more 8 bit subindex entries for each object specify individual data fields in the object. Index and subindex are shown in hexadecimal notation.

## Description Object Dictionary

The description object dictionary is made of separate chapters:

- Communication profile area
- RPDO
- TPDO
- Manufacturer specific

Index (hex)	Object
0000	Unused
0001...001F	Static data types
0020...003F	Complex data types
0040...005F	Unused (Manufacturer-specific complex data types)
0060...007F	Device profile-specific static data types
0080...009F	Device profile-specific complex data types
00A0...0FFF	Reserved for further use
1000...1FFF	Communication profile area
2000...5FFF	ATS480 specific profile area
6000...9FFF	Standardized device profile area
A000...FFFF	Reserved for further use
<b>NOTE:</b> For more details on object dictionary, refer Appendix A, page 76	

# Communication Object Identifier

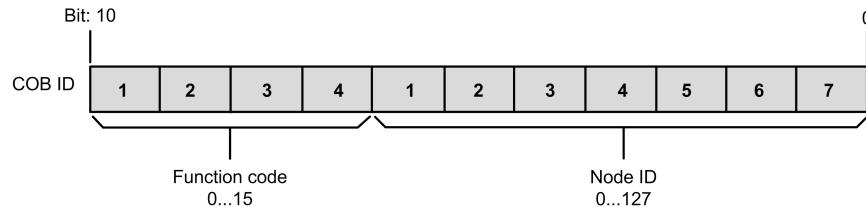
## Description

The COB ID (communication object identifier) has 2 tasks as far as controlling communication object is concerned:

- Bus arbitration: Specification of transmission priorities
- Identification of communication objects

An 11-bit COB identifier as per the CAN 3.0 A specification is defined for CAN communication; it comprises two parts:

- Function code, 4 bits
- Node address (node ID), 7 bits



## Function Code

The function code classifies the communication objects. Since the bits of the function code if the COB ID is more significant, the function code also controls the transmission priorities: Objects with a lower function code are transmitted with higher priority. For example, an object with function code **1** is transmitted prior to an object with function code **3** in the case of simultaneous bus access.

## Node Address

Each network device is configured before it can be operated on the network. The device is assigned a unique 7-bit node address (node ID) between 1 (01 hex) and 127 (7F hex). The device address **0** is reserved for broadcast transmissions which are used to send messages to all reachable devices simultaneously.

## COB IDs of the Communication Objects

The following table provides the COB IDs of the communication objects with the factory settings.

Communication object	Function code	Node address, node ID [1...127]	COB ID decimal (hexadecimal)
Service Network Management (NMT)	0 0 0 0	0 0 0 0 0 0 0	0 (0 hex)
Synchronization service (SYNC)	0 0 0 1	0 0 0 0 0 0 0	128 (80 hex)
Emergency service (EMCY)	0 0 0 1	x x x x x x x	128 (80 hex) + node ID
Transmit PDO1 (TPDO1)	0 0 1 1	x x x x x x x	384 (180 hex) + node ID
Receive PDO1 (RPDO1)	0 1 0 0	x x x x x x x	512 (200 hex) + node ID
Transmit PDO2 (TPDO2)	0 1 0 1	x x x x x x x	640 (280 hex) + node ID
Receive PDO2 (RPDO2)	0 1 1 0	x x x x x x x	768 (300 hex) + node ID
Transmit PDO3 (TPDO3)	0 1 1 1	x x x x x x x	896 (380 hex) + node ID
Receive PDO3 (RPDO3)	1 0 0 0	x x x x x x x	1024 (400 hex) + node ID
Transmit SDO (TSDO)	1 0 1 1	x x x x x x x	1408 (580 hex) + node ID
Receive SDO (RSDO)	1 1 0 0	x x x x x x x	1536 (600 hex) + node ID
NMT error control (Node Guarding, Heartbeat)	1 1 1 0	x x x x x x x	1792 (700 hex) + node ID

## Service Data Communication

### Description

Service Data Objects (SDO) can be used to access the entries of an object dictionary using index and subindex. The values of the objects can be read and, if permissible, also written.

Every network device has at least one SDO server to be able to respond to read and write requests from a different device.

The TSDO of a SDO client is used to send the request for data exchange; the RSDO is used to receive.

The data frame of a SDO consists of 8 bytes.

SDOs have a higher COB ID than PDOs, therefore they are transmitted over the can bus at a low priority.

### Example of Read Request

This example explains how to read the acceleration (ACC) parameter on a soft starter located at CANopen address 4 (COB ID = 580 hex + Node ID or 600 hex + Node ID). The index / subindex value of this parameter is 203C/02 hex. Values are given in hexadecimal.

Read request: **Controller → Soft Starter**

	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
COB ID	Request code	Object index		Subindex	Request data			
604	40	3C	20	02	00	00	00	00

Read response: **Controller ← Soft Starter**

	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
COB ID	Request code	Object index		Subindex	Request data			
584	4B	3C	20	02	E8	03	00	00

The value of parameter read is equal to 1000 (03E8 hex), equivalent to an acceleration (ACC) of 100 s, as the unit of this parameter is 0.1 s.

### Example of Write Request

This example explains how to write the value 100 s to the acceleration (ACC) parameter on a soft starter located at CANopen address 4 (COB ID = 580 hex + NodeID or 600 hex + Node ID). The index / subindex value of this parameter is 203C/02 hex. Values are given in hexadecimal.

The request code is 2B hex for an item of 2 bytes data length.

Write request: **Controller → Soft Starter**

	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
COB ID	Request code	Object index		Subindex	Request data			
604	2B	3C	20	02	E8	03	00	00

The request data field indicates the value 03E8 hex as value written is 1000, equivalent to an acceleration (ACC) of 100 s, as the unit of this parameter is 0.1 s.

Write response: **Controller ← Soft Starter**

	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
COB ID	Request code	Object index		Subindex	Request data			
584	60	3C	20	02	00	00	00	00

## Request Codes and Response Codes

The SDO request code differs depending on the scenarios detailed in the following table:

Request code	Description of the command	Byte 4	Byte 5	Byte 6	Byte 7
23 hex	Write 4 bytes data length (ex: UNSIGNED32)	Bits 7 - 0	Bits 15 - 8	Bits 23 - 16	Bits 31 - 24
2B hex	Write 2 bytes data length (ex: UNSIGNED16)	Bits 7 - 0	Bits 15 - 8	00 hex	00 hex
2F hex	Write 1 byte data length (ex: UNSIGNED8)	Bits 7 - 0	00 hex	00 hex	00 hex
40 hex	Read 1, 2 bytes or 4 bytes data length	00 hex	00 hex	00 hex	00 hex
80 hex	Cancel current SDO command	00 hex	00 hex	00 hex	00 hex

The SDO response codes correspond to the request codes and are detailed in the following table:

Request code	Description of the command	Byte 4	Byte 5	Byte 6	Byte 7
43 hex	Read 4 bytes data length (response to 40 hex request code)	Bits 7 - 0	Bits 15 - 8	Bits 23 - 16	Bits 31 - 24
4B hex	Read 2 bytes data length (response to 40 hex request code)	Bits 7 - 0	Bits 15 - 8	00 hex	00 hex
4F hex	Read 1 byte data length (response to 40 hex request code)	Bits 7 - 0	00 hex	00 hex	00 hex
60 hex	Write data 1, 2 bytes or 4 bytes data length (response to 23 hex, 2B hex, or 2F hex request codes)	00 hex	00 hex	00 hex	00 hex
80 hex	Error : sending abort code <sup>(1)</sup> .	00 hex	00 hex	00 hex	00 hex
(1): The response data (bytes 4 to 7) corresponds to a 32 bit abort code detailed below.					

## Abort Codes

The following table describes the possible abort code that may occur during data exchange with the product:

Abort Code	Description
0503 0000 hex	Segmented transfer: the toggle bit is not toggled
0504 0001 hex	Command Specifier (CS) incorrect or unknown
0601 0000 hex	Access to object not possible
0601 0002 hex	Attempt to execute a write request on a read-only parameter
0602 0000 hex	Object does not exist in object dictionary
0604 0041 hex	PDO object assignment: the object cannot be assigned to the PDO, this error is triggered when writing to parameters assign to PDO1, PDO2, and PDO3
0604 0042 hex	PDO object assignment : the number and/or length of the parameters to be assigned exceeds the maximum PDO length
0609 0011 hex	The subindex of the object sent in the request does not exist in object dictionary
0609 0030 hex	Outside parameter value limits (for a write request only)
0609 0031 hex	Value of parameter written too high
0800 0000 hex	General error triggered
<b>NOTE:</b> The abort codes listed in this table have been written in accordance with general convention and must, therefore, be inverted in the case of byte-by-byte representation for "bytes 4 to 7" (example: 0609 0030 hex becomes byte 4: 30 hex, byte 5: 00 hex, byte 6: 09 hex, byte 7: 06 hex)	

## Process Data Communication

### Description

Process Data Objects (PDO) are used for real-time data exchange of process data such as actual and reference values or the operating state of the device. Transmission is fast because the data is sent without administration data and data transmission acknowledgment from the recipient is not required. Each PDO can be enabled or disabled independently using the bit 31 (valid bit) in subindex 01 hex of the respective communication object.

The communication of the device embeds a specific soft starter profile based on the CIA402 named "standard profile".

For more information about the Communication Parameter Addresses, please refers to the ATS480 Communication Parameter Addresses NNZ85544, page 12.

### PDO1 Details

The first PDO set (PDO1) is a specific soft starter adaptation based on CIA402.

For the input TPDO1, from Device to Controller:

- Status word: ETA (6041/0 hex).
- Motor current: LCR (2002/05 hex)
- Motor thermal state: THR (2042/1F hex)
- Fault code: ERRD (2038/07 hex)

For the output RPDO1, from Controller to Device:

- Command register: CMD (6040/0 hex).

## PDO2 Details

The second PDO set (PDO2) is deactivated by default and can be fully configurable (1 to 4 words of the user choice). It is reserved for adjustments and for additional control and monitoring functions.

## PDO3 Details

The third PDO set (PDO3) is mapped by default. Deactivated by default, it cannot be configured and comprises:

- RPDO3 (receive), containing four output (from Controller to Device) words of the communication scanner NC1 to NC4
- TPDO3 (transmit), containing four input (from Device to Controller) words of the communication scanner NM1 to NM4

## Transmission Mode

By default, the three PDOs are asynchronous, although the transmission mode of each PDO can be reconfigured by the user in accordance with requirements:

- Asynchronous mode (255): The transmit PDO is only sent when the value of its data changes. In this mode, the inhibit time and event timer can be modified in order to adjust the PDO transmission frequency on the bus.
- Cyclic synchronous mode (1...240): The transmit PDO is sent each time a synchronization object (SYNC) is received or when a preconfigured number of synchronization objects (from 1 to 240) is received.
- Acyclic synchronous mode (0): The transmit PDO is sent each time the value of its data changes, but only during the synchronous window authorized by the next synchronization object (SYNC).

## Synchronization Object

The synchronization object (SYNC) is sent cyclically by the CANopen controller. It does not contain data and its frame is limited to its unique COB ID identifier (080 hex). The purpose of this object is essentially to authorize synchronous communication modes for CANopen devices.

# Network Management Services

## Description

Network management (NMT) is part of the CANopen communication profile; it is used to initialize the network and the network devices and to start, stop, and monitor the network devices during operation on the network.

NMT services can be divided into two groups:

- Services for device control, to initialize devices for CANopen communication and to control the behavior of devices during operation on the network.
- Services for connection monitoring to check the status of network devices.

## Network Management State Machine

The CANopen NMT device implements a state machine, which brings automatically after power-on and internal initialization every device in pre-Operational state. In this state the node may be configured and parameterized using SDO, no PDO communication is allowed.

The NMT controller may switch all nodes or a single node to operational state and conversely. In operational state PDO transfer is allowed. By switching a device into the stopped state, it is forced to stop PDO and SDO communication. Furthermore, this state can be used to achieve certain application behavior.

In the operational state, all communication objects are active. Object Dictionary access through SDO is possible.

## NMT Message Description

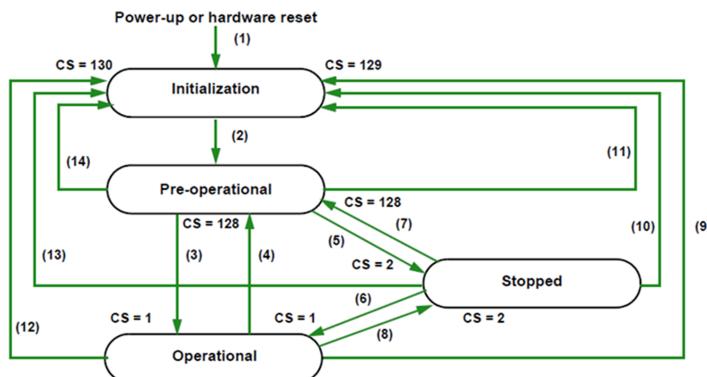
The NMT services for device control are transmitted as unconfirmed messages with COB ID 0. By default, they have the highest priority on the CAN bus.

COB ID	Byte 0	Byte 1
0 (000 hex)	Command specifier (CS)	Node ID <sup>(1)</sup>
<sup>(1)</sup> If Node ID is 0, the command specifier is broadcast to all CANopen devices.		

The following table provides the command specifier used to manage the NMT state machine.

Command specifier (CS)	Meaning
1 (01 hex)	Start_Remote_Node
2 (02 hex)	Stop_Remote_Node
128 (80 hex)	Enter_Pre-Operational_State
129 (81 hex)	Reset_Node
130 (82 hex)	Reset_Communication

## NMT State Chart



Transition	Description
(1)	On power-up, the node automatically changes to the initialization state
(2)	Once initialization is complete, the pre-operational state is activated automatically
(3), (6)	Start_Remote_Node
(4), (7)	Enter_Pre-Operational_State
(5), (8)	Stop_Remote_Node
(9), (10), (11)	Reset_Node
(12), (13), (14)	Reset_Communication

Depending on the communication status of the soft starter, the following services are available:

	Initialization	Pre-Operational	Operational	Stopped
PDO			X	
SDO		X	X	
Synchronization (SYNC)		X	X	
Emergency (EMCY)		X	X	
Bootup Service	X		X	
Network Management (NMT)		X	X	X

In Pre-Operational mode, the controller can only perform SDO (the monitoring is not activated).

In operation mode, the controller can perform SDO and PDO. The device can be controlled only if the user has selected CANopen as the command channel.

In Stop mode, the controller cannot perform SDO and PDO.

In the event of a resettable detected error, the soft starter must be in the Operational NMT state in order that the PDO carrying the control word CMD can reset the soft starter using the CMD Fault reset bit.

## Node Guarding Service

Either the Node Guarding service described here or the Heartbeat service described below can be used for communication monitoring. Only one of these two services can be active at any one time. The Node guarding service is deactivated by default.

The controller scans the soft starter at regular intervals (*Life Time*) by sending "Remote Transmit Requests" (RTR). The "Life Time" is calculated by multiplying the *Guard Time* by the *Life Time Factor*.

If, once the *Life Time* has expired, the soft starter has not received the RTR:

- It triggers a *Life Guarding error*
- Sends an emergency telegram (*EMCY*)

## Node Guarding Frame Description

COB ID	Byte 0	
1792 (700 hex) + Node ID	Bit 7	Bit 6 - 0
	Toggle bit	Node State

The soft starter indicates its NMT state via the "NMT information field, described here:

Bit 6-0 (node state):

- Current NMT state of the soft starter:
  - Initialization (00 hex)
  - Stopped (04 hex)
  - Operational (05 hex)
  - Pre-Operational (7 F hex)

Bit 7 (toggle bit):

- The value of this bit must alternate from one soft starter response to the other.
- The value of the toggle bit for the first response following activation of the node Guarding service is 0.
- This bit can only be reset by sending the *Reset\_Communication* command to the soft starter.
- If a response is received with the same toggle bit value as the previous one, the new response is treated as if it had not been received.

## Heartbeat Service

- If you do not activate the node Guarding service described above, you can use the Heartbeat service to monitor communication with another node that supports this service.
- The Heartbeat service is deactivated by default on the soft starter.
- Each Heartbeat Producer sends Heartbeat messages at regular intervals (*Producer Heartbeat Time*).
- All Heartbeat Consumer check that they receive these messages in a time less than the *Consumer Heartbeat Time*.
- The *Producer Heartbeat Time* must be less than the *Consumer Heartbeat Time*.

### NOTE:

If the soft starter has been configured as a consumer and a period equal to the *Consumer Heartbeat Time* elapses without a Heartbeat message being received, the soft starter triggers a *Heartbeat event* and send an emergency telegram (*EMCY*).

## Heartbeat Frame Description

COB ID	Byte 0	
1792 (700 hex) + Node ID	Bit 7	Bit 6 - 0
	Reserved	Heartbeat Producer State

The Heartbeat message sent from the soft starter contains a Heartbeat Producer state field (byte 0), described here:

Bit 6-0:

- Current NMT state of the soft starter:
  - Initialization (00 hex)
  - Stopped (04 hex)
  - Operational (05 hex)
  - Pre-Operational (7F hex)

Bit 7 (toggle bit):

- This bit is equal to 0.

## Emergency Object

An Emergency object (EMCY) is sent by the soft starter to other CANopen devices, with a high priority, each time an error is detected or cleared. This is the case in particular for Heartbeat of Life Guard type detected errors. An Emergency object is never repeated.

COB ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
128 (80 hex) + NodeID	Error code <a href="#">ERRD</a>		Error register	0	0	0	0	0
	LSB	MSB	Bit 0 = 0 (no error) or 1 (error)	–	–	–	–	–

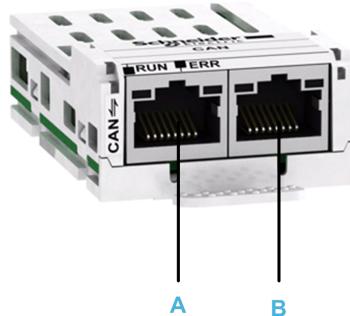
The error code [ERRD](#), and its possible values, is described in the communication parameter file available on the [ATS480 Communication Parameter Addresses NNZ85544](#), page 12.

# Hardware Setup

## Hardware Presentation

### CANopen Fieldbus Modules

The following figure shows the VW3A3608 CANopen module with 2 RJ45 connectors:



Item	Description	Comment
A	Port A	RJ45 connector
B	Port B	RJ45 connector

The following figure shows the VW3A3618 CANopen module with a SubD9 connector:



Item	Description	Comment
-	-	SubD9 connector

The following figure shows the VW3A3628 CANopen module with an open style connector:



Item	Description	Comment
-	-	Open style connector

## Installation of the Module

### Before Starting

Verify that the catalog number printed on the label corresponds to the purchase order.

Remove the fieldbus module from its packaging and check that it has not been damaged in transit.

Damaged products or accessories may cause electric shock or unanticipated equipment operation.

#### **DANGER**

#### **ELECTRIC SHOCK OR UNANTICIPATED EQUIPMENT OPERATION**

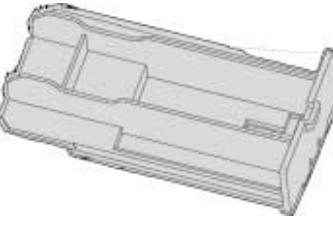
Do not use damaged products or accessories.

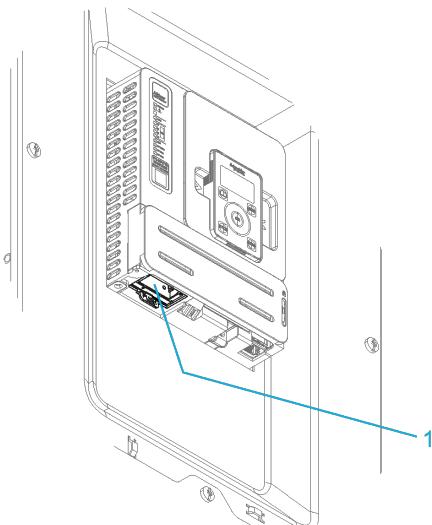
**Failure to follow these instructions will result in death or serious injury.**

Contact your local Schneider Electric sales office if you detect any damage whatsoever.

### Insertion of the Fieldbus Module

The table provides the procedure for insertion of the CANopen fieldbus module in the soft starter:

Step	Action
1	Ensure that the power is off.
2	Locate the fieldbus module slot on the bottom of the control part.
3	Remove the false module (VY1G480C01) with the help of a screwdriver. 
4	Insert the module.
5	Check that the module is correctly inserted and locked mechanically in the soft starter.
6	Add the corresponding sticker on the LED front panel of the soft starter.



**1 Fieldbus Module Slot**

## Removal of the Fieldbus Module

The table provides the procedure for removal of the CANopen fieldbus module from the soft starter:

Step	Action
1	Ensure that the power is off.
2	Press the strip. 
3	Remove the module while maintaining the strip pressed.

## Firmware and Description File

### Compatibility

The associated EDS file is named as the following example:

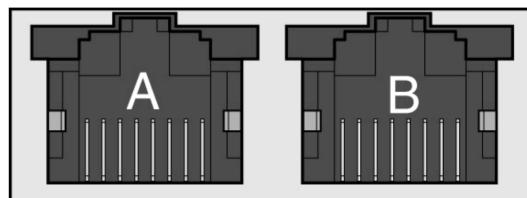
SEATS480\_010101E.eds

The files are available on [www.se.com](http://www.se.com).

## Electrical Installation

### Pin Layout of VW3A3608

The VW3A3608 option module is equipped with 2 RJ45 female sockets for the CANopen connection.

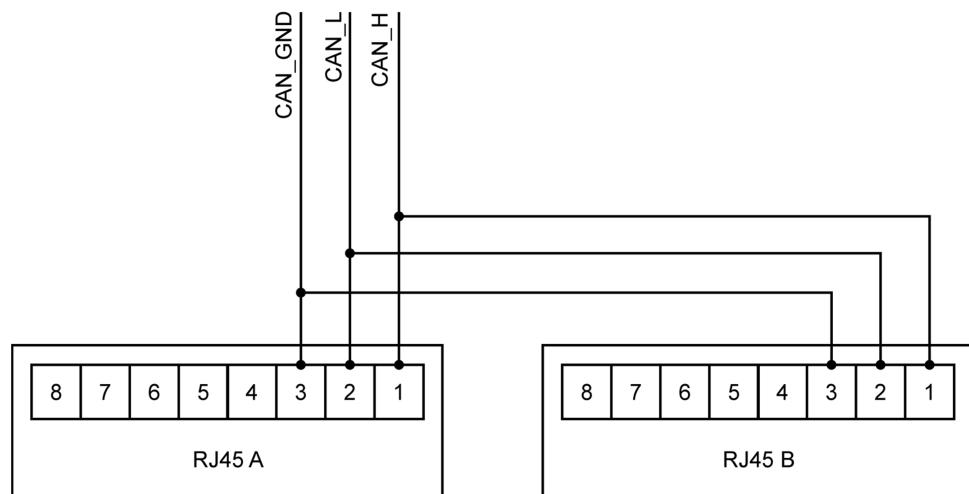


8 7 6 5 4 3 2 1    8 7 6 5 4 3 2 1

The table provides the pin out details of each RJ45 connector:

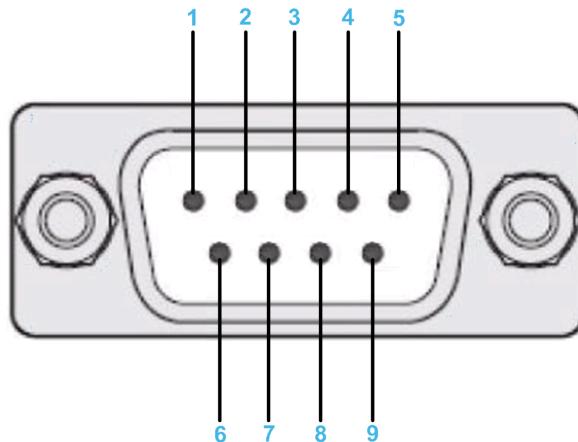
Pin	RJ45 signal
1	CAN_H
2	CAN_L
3	CAN_GND
4	Not connected
5	Not connected
6	Not connected
7	Not connected
8	Not connected

**NOTE:** Both RJ45 are interconnected internally as on the diagram below:



## Pin Layout of VW3A3618

The VW3A3618 option module is equipped with 1 SubD9 male connector for the CANopen connection.

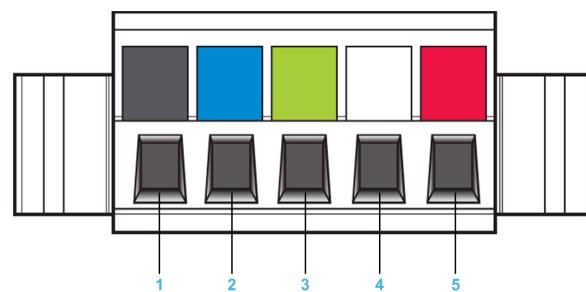


The table provides the pin out details of the SUB-D 9 connector:

Pin	SubD signal
1	Reserved
2	CAN_L
3	CAN_GND
4	Reserved
5	CAN_SHLD
6	CAN_GND
7	CAN_H
8	Reserved
9	Reserved

## Pin Layout of VW3A3628

The VW3A3628 option module is equipped with 1 open style male connector for the CANopen connection.



The table provides the pin out of the open style connector:

Pin	Signal
1	CAN_GND
2	CAN_L
3	CAN_SHLD
4	CAN_H
5	Reserved

## Cable Specification and Maximum Bus Length

The following table describes the maximum length:

Baud rate KBit/s	Maximum bus length m (ft)
50	1000 (3280)
125	500 (1640)
250	250 (820)
500	100 (328)
1000	20 (65)

The reference potential CAN\_GND and the shield connection (connector housing) are galvanically isolated.

- Keep the galvanic isolation in order to avoid ground loops via the CAN bus.
- Use equipotential bonding conductors.
- Use pre-assembled cables to reduce wiring errors.
- Verify that wiring, cables, and connected interfaces meet the PELV requirements.

## Terminating Resistor

Terminating resistors must be placed on both ends of a CAN bus line. A 120 Ohms terminating resistor between CAN\_L and CAN\_H is used for this purpose.

## Cable Routing Practices

### Installation Topology

The following image shows the connection of multiple soft starters equipped with VW3A3608 CANopen modules.



**NOTE:** A 120 ohm terminating resistor between CAN\_L and CAN\_H is used for this purpose.

# Accessories Presentation

## Introduction

Both ends of a CAN bus line must be terminated.

A 120 ohm terminating resistor between CAN\_L and CAN\_H is used for this purpose. According to the CANopen several solutions are available (See accessories and wear parts).

The following table describes the CANopen accessories for the different bus termination:

Bus termination	Accessories	
CANopen RJ45 module VW3A3608	CANopen terminating resistor, 120 Ohm, integrated in RJ45 connector	TCSCAR013M120
	CANopen cordsets equipped with 2 RJ45 connectors 0.3m	VW3CANCARR03
	CANopen cordsets equipped with 2 RJ45 connectors 1m	VW3CANCARR10
CANopen SubD9 module VW3A3618	CANopen cables Standard cable, e mark Low smoke zero halogen. Flame-retardant (IEC 60332-1) 50m	TSXCANCA50
	CANopen cables Standard cable, e mark Low smoke zero halogen. Flame-retardant (IEC 60332-1) 100m	TSXCANCA100
	CANopen cables Standard cable, e mark Low smoke zero halogen. Flame-retardant (IEC 60332-1) 300m	TSXCANCA300
	CANopen cables UL certification, e mark Flame-retardant (IEC 60332-2) 50m	TSXCANCB50
	CANopen cables UL certification, e mark Flame-retardant (IEC 60332-2) 100m	TSXCANCB100
	CANopen cables UL certification, e mark Flame-retardant (IEC 60332-2) 300m	TSXCANCB300
	CANopen cables Cable for harsh environments or mobile installations, e mark Low smoke zero halogen Flame-retardant (IEC 60332-1) 50m	TSXCANCD50
	CANopen cables Cable for harsh environments or mobile installations, e mark Low smoke zero halogen Flame-retardant (IEC 60332-1) 100m	TSXCANCD100
	CANopen cables Cable for harsh environments or mobile installations, e mark Low smoke zero halogen Flame-retardant (IEC 60332-1) 300m	TSXCANCD300
	IP 20 straight CANopen connector 9-way female SUB-D connector with line terminator that can be deactivated	TSXCANKCD-F180T

# Software Setup

## Basic Settings

### Structure of the Parameter Table

#### General Legend

Pictogram	Description
	This parameter can be set during operation or when stopped. <b>NOTE:</b> It is advisable to stop the motor before modifying any of the settings
	The motor must be stopped to set this parameter.
	Power cycle must be performed after setting this parameter.
	Read only parameter, mainly used for monitoring.
	Expert mode required to access this parameter.

#### Menu Presentation

Below an example of a menu presentation:

**[Short Label] CODE**

Access path: **[Menu] → [Sub-menu]**

**About this menu**

Description of the menu.

#### Parameter Presentation

Below an example of a parameter presentation:

HMI label	Setting or Display	Factory setting
<b>[Short Label] CODE</b> (pictogram)	XXX...XXX [unit] [additional informations]	<b>Factory setting:</b> <b>[Short Label] CODE</b>
<b>[Long label]</b>		
Access path: <b>[Menu] → [Sub-menu]</b>		
Reference exclusivity and required optional modules. Example: Fieldbus Module VW3A3607 is required.		
Description of the parameter.		
Parameter incompatibilities and / or required configuration. Example: This parameter can be accessed if <b>[Short Label] CODE</b> is set to <b>[Short Label] CODE</b> . This parameter is not compatible with <b>[Short Label] CODE</b> .		
Impact on other parameters. Example: If this parameter is modified, the parameter <b>[Short Label] CODE</b> is set to factory settings.		

## Finding a Parameter in This Document

### Display on HMI Tools

A parameter is identified by:

- Its short label displayed on the Plain Text Display Terminal, and on the Graphic Display Terminal
- Its long label displayed on SoMove DTM Parameter list tab, on the Graphic Display Terminal by pressing  , and on the Webserver
- Its code displayed on SoMove DTM Parameter list tab, on the Graphic Display Terminal by pressing  , and on the Webserver

Example: **[Acceleration]** is a short label, its code is **ACC** and its long label is ***Acceleration ramp time***.

### With the Manual

It is possible to use either the parameter name or the parameter code to search in the manual the page giving details of the selected parameter.

## [CANopen] CNO –

### Overview

The parameters are described according to the display terminal. These settings are also possible from commissioning software.

The modification of communication parameters is taken into account after a power cycle of the soft starter.

### Access

In [Communication] COM – ➔ [CANopen] CNO –

### Possible Settings

The table presents the parameter settings:

HMI label	Setting	
[CANopen Address] ADCO	Logic address: 17A3 hex = 6051 CANopen index: 201E/34 hex Range: 0..127	Type: UINT (Unsigned16) Read/write: R/W/S Factory setting: [OFF] OFF
This parameter defines the address of the soft starter on the network. This parameter is taken into account after a power cycle.		
This parameter can be set to: <ul style="list-style-type: none"><li>• [OFF] OFF: CANopen address is not assigned (value: 0).</li><li>• [1 to 127] 1 ... 127: CANopen address is assigned (value : 1...127).</li></ul>		
[CANopen Baudrate] BDCO	Logic address: 17A5 hex = 6053 CANopen index: 201E/36 hex	Type: WORD (Enumeration) Read/write: R/W/S Unit: bps Factory setting: [250 kbps] 250K
This parameter defines the baud rate at which data is transferred. This parameter is taken into account after a power cycle.		
This parameter can be set to: <ul style="list-style-type: none"><li>• [50 kbps] 50K: Baud rate is set to 50 Kbps (value: 38).</li><li>• [125 kbps] 125K: Baud rate is set to 125 Kbps (value: 52).</li><li>• [250 kbps] 250K: Baud rate is set to 250 Kbps (value: 60).</li><li>• [500 kbps] 500K: Baud rate is set to 500 Kbps (value: 68).</li><li>• [1 Mbps] 1M: Baud rate is set to 1 Mbps (value: 76).</li></ul>		
[CANopen Error Resp] COL	Logic address: 1B63 hex = 7011 CANopen index: 2028/C hex	Type: WORD (Enumeration) Read/write: R/W/S Factory setting: [Freewheel Stop] YES

HMI label	Setting
This parameter defines the CANopen error stop mode:	
<ul style="list-style-type: none"> <li>• <b>[Ignore]</b> NO : Detected error ignored (in this case, the warning <b>CANopen Com Warn</b> COLA is activated).</li> <li>• <b>[Freewheel Stop]</b> YES : Motor triggers in error and is stopped in freewheel.</li> <li>• <b>[Per STT]</b> STT : Motor is stopped according to <b>Type of stop</b> STT parameter.</li> <li>• <b>[Deceleration]</b> DEC : Motor is stopped in deceleration and triggers in error at the end of stop.</li> <li>• <b>[Braking]</b> BRK : Motor is stopped in dynamic braking and triggers in error at the end of stop.</li> </ul>	
<p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>LOSS OF CONTROL</b></p> <p>If this parameter is set to <b>[Ignore]</b> NO, CANopen communication monitoring is disabled.</p> <ul style="list-style-type: none"> <li>• Only use this setting after a thorough risk assessment in compliance with all regulations and standards that apply to the device and to the application.</li> <li>• Only use this setting for tests during commissioning.</li> <li>• Verify that communication monitoring has been re-enabled before completing the commissioning procedure and performing the final commissioning test.</li> </ul> <p><b>Failure to follow these instructions can result in death, serious injury, or equipment damage.</b></p>	

<b>[Product restart]</b> RP	Logic address: 1BD8 hex = 7128 CANopen index: 2029/1D hex	Type: WORD (Enumeration) Read/write: R/WS Factory setting: <b>[No]</b>
-----------------------------	--	--

#### **Product restart**

Restart the device. Can be used to clear a detected error or refresh a modified parameters that requires a device restart.

- **[No]** NO: No restart.
- **[Yes]** YES: Restart the device.

The Restart function performs a Fault Reset and then restarts the device. During this Restart procedure, the device goes through the same steps as if it had been switched off and on again. Depending on the wiring and the configuration of the device, this may result in immediate and unanticipated operation.

<p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>UNANTICIPATED EQUIPMENT OPERATION</b></p> <p>The Restart function performs a Fault Reset and restarts the device.</p> <ul style="list-style-type: none"> <li>• Verify that activating this function does not result in unsafe conditions.</li> </ul> <p><b>Failure to follow these instructions can result in death, serious injury, or equipment damage.</b></p>
---

## [CANopen map] CNM

### Overview

The parameters are described according to the display terminal. These settings are also possible from commissioning software.

### Access

[Communication] COM → [Communication map] CMM → [CANopen map] CNM

### Possible Settings

The table presents the menu settings:

HMI label	Setting
[Canopen NMT state] NMTS 	Logic address: 17A9 hex = 6057 CANopen index: 201E/3A hex Type: WORD (Enumeration) Read/write: R
<b>Canopen NMT state</b> This parameter indicates the NMT state.	
<ul style="list-style-type: none"> <li>[Boot] BOOT: Bootup state (value is 0).</li> <li>[Operation] OPE: Operational state (value is 1).</li> <li>[Stopped] STOP: Stopped state (value is 2).</li> <li>[Pre-op] POPE: Pre-operational state (value is 4).</li> </ul> <p><b>NOTE:</b> If the motor is running, a [CANopen Com Interrupt] COF is triggered in case of change of NMT state.</p>	
[Number of TX PDO] NBTP 	Logic address: 330E hex = 13070 CANopen index: 2064/47 hex Range: 0..65535 Type: UINT (Unsigned16) Read/write: R
<b>Number of TX PDO</b> This parameter indicates the number of transmit PDO.	
[Number of RX PDO] NBRP 	Logic address: 330F hex = 13071 CANopen index: 2064/48 hex Range: 0..65535 Type: UINT (Unsigned16) Read/write: R
<b>Number of RX PDO</b> This parameter indicates the number of received PDO.	
[CANopen Error] ERCO 	Logic address: 17A8 hex = 6056 CANopen index: 201E/39 hex Range: 0..5 Type: UINT (Unsigned16) Read/write: R

HMI label	Setting
<b>CANopen error</b>	This parameter indicates the last active CANopen detected error.  In the following list, the value and the description: <ul style="list-style-type: none"> <li>• [0]: No errors detected since the last start of CANopen communication.</li> <li>• [1]: Bus off or CAN overrun.</li> <li>• [2]: Node guarding error requiring a return to the NMT initialization state.</li> <li>• [3]: CAN overrun (possible alternative values: 32, 64 or 128).</li> <li>• [4]: Heartbeat error requiring a return to the NMT initialization state.</li> <li>• [5]: NMT states chart error.</li> </ul> <p><b>NOTE:</b> If the motor is running, a <b>[CANopen Com Interrupt] COF</b> is triggered in case of change of NMT state.</p>
<b>[RX Error Counter]</b> REC1 	Logic address: 17AB hex = 6059 CANopen index: 201E/3C hex Range: 0..65535
<b>RX error counter</b>	This parameter indicates the CANopen controller Rx error counter.
<b>[TX Error Counter]</b> TEC1 	Logic address: 17AA hex = 6058 CANopen index: 201E/3B hex Range: 0..65535
<b>TX error counter</b>	This parameter indicates the CANopen controller Tx error counter.

## [CANOPEN\_ERROR]

### Overview

The parameters are described according to the display terminal. These settings are also possible from commissioning software.

In this section, we focuses about CANOPEN errors.

For more information about others errors, please refers to the ATS480 User Manual NNZ85515, page 12.

### Access

In [Diagnostics] DIA – → [Diag. data] DDT –

### Possible Settings

The table presents the parameter settings:

HMI label	Setting	
[Last Error] LFT	Logic address: 1BD1 hex = 7121 CANopen index: 2029/16 hex	Type: WORD (Enumeration) Read/write: R Factory setting: [No Error] NOF

This parameter defines the last error on the soft starter.  
This parameter can be:

- [No Error] NOF: *No error detected*
- [CANopen Com Interrupt] COF: *CANopen communication interruption*
- [CANopen Init Error] COLF: *CANopen initialization error*

# Communication parameters

## About this Section

This section shows the I/O parameters and their communications addressees.

For more information about the Communication Parameter Addresses, please refers to the ATS480 Communication Parameter NNZ85544.

## Comportment when an communication error occurs

If an error appears, the device return to his initial state.

For example, if:

- a pump is connect to R3.
- the pump is assign to **OL1R**.
- the pump is in run state.

If an communication error occurs, the pump is set to stop mode.

## Logic I/O

Code	Settings		
<b>[Logic Inputs States]</b> <b>IL1R</b>	Logic address: 1452 hex = 5202 CANopen index: 2016/3 hex	Type: WORD (BitString16) Read/write: R Unit: -	
<b>Logic inputs states</b>			
<ul style="list-style-type: none"> <li>• Bit0 : "DI1" Digital inputs real image</li> <li>• Bit1 : "DI2" Digital inputs real image</li> <li>• Bit2 : "DI3" Digital inputs real image</li> <li>• Bit3 : "DI4" Digital inputs real image</li> </ul>			
<b>[Logic Outputs States]</b> <b>OL1R</b>	Logic address: 145C hex = 5212 CANopen index: 2016/D hex	Type: WORD (BitString16) Read/write: R/W Unit: -	
<b>Logic outputs states</b>			
<ul style="list-style-type: none"> <li>• Bit0 : "R1" relay real image</li> <li>• Bit1 : "R2" relay real image</li> <li>• Bit2 : "R3" relay real image</li> <li>• Bit8 : "DQ1" digital outputs real image</li> <li>• Bit9 : "DQ2" digital outputs real image</li> </ul>			
The relay or logic outputs can be controlled via the network. Simply write this parameter. The outputs to be controlled must not be assigned to a soft starter function, otherwise the write operation has no effect.			

## Analog inputs

Code	Settings		
[AI1] <span style="color: green;">AI1C</span>	Logic address: 147A hex = 5242 CANopen index: 2016/2B hex	Type: INT (Signed16) Read/write: R Unit: -	
<b>Physical value AI1</b> AI1 customer image (1mV, 0.001mA)			
<ul style="list-style-type: none"> <li>(AI1T == "PTC") : 0.01 kOhm</li> <li>(AI1T == "1PT2") : 0.1 Ohm</li> <li>(AI1T == "1PT23") : 0.1 Ohm</li> <li>else : 0.001 V</li> </ul>			
[Analog Input 1 Standardized Value] <span style="color: green;">AI1R</span>	Logic address: 1470 hex= 5232 CANopen index: 2016/21 hex	Type: INT (Signed16) Read/write: R Unit: -	
<b>Analog input 1 standardized value</b> AI1 real application image			

## Analog outputs

The analog outputs can be controlled via the network. Simply write these parameters. The outputs to be controlled must not be assigned to a soft starter function, otherwise the write operation has no effect

Code	Settings		
[AQ1] <span style="color: green;">AO1C</span>	Logic address: 1497 hex = 5271 CANopen index: 2016/48 hex	Type: INT (Signed16) Read/write: R/W Unit: -	
<b>AQ1 physical value</b> AQ1 customer image (1mV, 0.001mA)			
[Analog Output 1 Standardized Value] <span style="color: green;">AO1R</span>	Logic address: 148D hex = 5261 CANopen index: 2016/3E hex	Type: INT (Signed16) Read/write: R/W Unit: -	
<b>Analog output 1 standardized value</b> AQ1 real application image			

## Base Monitoring

Code	Settings		
[Status Register] <small>ETA</small>	Logic address: 0C81 hex = 3201 CANopen index: 6041/0 hex	Type: WORD (BitString16) Read/write: R Unit: -	
<b>Status Register</b>			
<ul style="list-style-type: none"> <li>Bit0 = 1 : Ready to switch on</li> <li>Bit1 = 1 : Switched on</li> <li>Bit2 = 1 : Operation enabled</li> <li>Bit3 = 1 : Detected error</li> <li>Bit4 = 1 : Voltage enabled</li> <li>Bit5 = 0 : Quick stop active</li> <li>Bit6 = 1 : Switch on disabled</li> <li>Bit7 = 1 : Alarm present</li> <li>Bit8 : Reserved</li> <li>Bit9 = 0 : Local mode control</li> <li>Bit10 to Bit13: Reserved</li> <li>Bit14 = 1 : Stop imposed by STOP key</li> <li>Bit15 : Reserved</li> </ul>			
[Motor Current] <small>LCR</small>	Logic address: 0C84 hex = 3204 CANopen index: 2002/5 hex	Type: UINT (Unsigned16) Read/write: R Unit: 0.1 A	
<b>Motor current</b>			
RMS Motor current. Average of the three line currents based on the measurement of the fundamental of the motor line currents.			
[Motor Therm State] <small>THR</small>	Logic address: 259E hex = 9630 CANopen index: 2042/1F hex	Type: UINT (Unsigned16) Read/write: R Unit: 1 %	
<b>Motor thermal state</b>			
This parameter monitors the motor thermal state. 100% corresponds to the nominal thermal state at the nominal motor current set to [Motor Nom Current] <small>TIN</small> .			
Refers to the ATS480 User Manual NNZ85515 for more information.			
[Motor Run Time] <small>RTH</small>	Logic address: 0CAC hex = 3244 CANopen index: 2002/2D hex	Type: UINT (Unsigned32) Read/write: R Unit: 1 s	
<b>Motor run time</b>			
This parameter monitors how long the motor has been energized.			
[Elc Energy Cons] <small>OCK</small>	Logic address: 299C hex = 10652 CANopen index: 204C/35 hex	Type: UINT (Unsigned32) Read/write: R/WS Unit: kWh	
<b>Electrical energy consumed by the motor (kWh)</b>			

Code	Settings		
[Active Command Channel] ccc	Logic address: 20FA = 8442 CANopen index: 2036/2B	Type: WORD (BitString16) Read/write: R Unit: -	

**Active command channel**  
Active command channels status

- Bit0 = 1 : Terminal board
- Bit2 = 1 : Deported keypad
- Bit3 = 1 : Modbus
- Bit6 = 1 : CANopen
- Bit9 = 1 : COM option board
- Bit14 = 1 : Indus
- Bit15 = 1 : SoMove

## Command Register

Code	Settings		
[Cmd Register] cmd	Logic address: 2135 hex = 8501 CANopen index: 6040/0 hex	Type: WORD (BitString16) Read/write: R/W Unit: -	

The Bit can be set to an other function.

**NOTE:** If no function is assigned, the Bit will return to his factory setting.

- Bit0 = 1 : **Switch on** Mains contactor control
- Bit1 = 1 : **Enable voltage** Authorization to supply power
- Bit2 = 0 : **Quick Stop** active
- Bit3 = 1 : **Enable Operation** Run command active
- Bit4 to Bit6: **Reserved**
- Bit7 : **Error reset request** : active on rising edge
- Bit8 to Bit10: **Reserved**
- Bit11 : **Specific function assignment**
- Bit12 : **Specific function assignment**
- Bit13 : **Dynamic braking stop (factory setting)**.

The Bit can be set to an other function.

**NOTE:** If no function is assigned, the Bit will return to his factory setting.

- Bit14 : **Decelerated stop order (factory setting)**.

The Bit can be set to an other function.

**NOTE:** If no function is assigned, the Bit will return to his factory setting.

- Bit15 : **Specific function assignment**

## Extended Control Word

Code	Settings		
[Extended Control Word] CMT	Logic address: 2138 hex = 8504 CANopen index: 2037/5 hex	Type: WORD (BitString16) Read/write: R/W Unit: -	

- Bit0 – **Restore factory settings request**: Active on rising edge when motor is powered off. Once request is considered, this bit is automatically reset
- Bit1 – **Store customer parameters request**: Active on rising edge when motor is powered off. Once request is considered, this bit is automatically reset
- Bit2 – **Restore saved customer parameters**: Active on rising edge when motor is powered off. Once request is considered, this bit is automatically reset
- Bit3 = 1 : **External error**: Active on rising edge
- Bit4 to Bit12: **Reserved**
- Bit13 = 1 : **Lock device when motor stopped**
- Bit14 = 1 : **Disable line monitoring**
- Bit15 : **Disable parameter consistency check**
  - Bit15 = 1 : no check of parameter consistency and device is locked when stopped
  - Bit15 = 0 : all parameters are validated

# Software Setup with EcoStruxure (M580)

## Introduction

### Overview

Here is an example of an application that shows how to control a soft starter with a M580 PLC equipped with a CANopen port. The operator can control the soft starter directly from EcoStruxure. The version of EcoStruxure used here is EcoStruxure Control Expert.



## Soft Starter Configuration

### Factory Settings

Before configuring the soft starter, it is advised to revert to the factory settings. Go to:

[Device Management] **DMT** menu and [Restore Configuration] **FCS** submenu  
Then configure [Go to Factory Settings] **GFS** parameter to **OK**

### Command Configuration

To control the soft starter with a CANopen fieldbus, it is necessary to select CANopen as command channel active.

Go to:

[Complete settings] **CST** menu and [Command channel] **CCP** submenu.  
Then configure [Cmd channel 1] **CD1** parameter to [CANopen] **CAN** value.

### Communication Configuration

Select the CANopen address and the Baud rate in the menu:

[Communication] **COM** menu and [CANopen] **CNO** submenu.

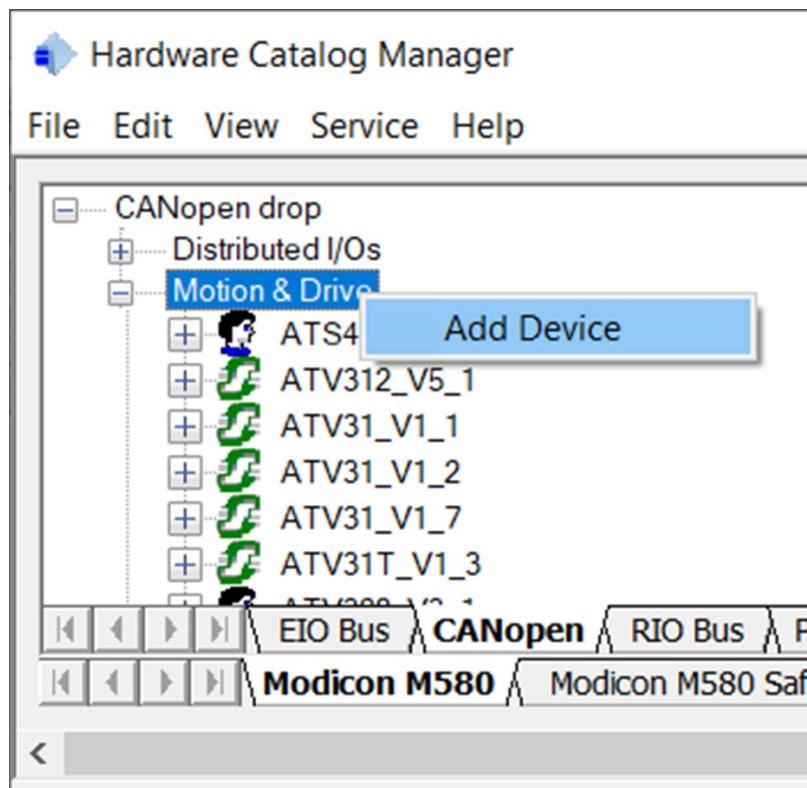
Then configure

- [CANopen Address] **ADCO** parameter to [2] **Z**.
- [CANopen Baudrate] **BDCO** parameter to [500 kbps] **500K**.

The soft starter must be restarted ([Product restart] **RP** parameter to [Yes] **YES**) in order to take into account the CANopen address.

## EDS Integration

If your EcoStruxure Control Expert software does not contain the soft starter in the CANopen catalog. You must add the EDS file to the hardware catalog manager installed with EcoStruxure Control Expert .



Once imported, you should see the soft starter in the **Motion & soft starter** section. The two topics **default** and **PDOsonly** are used in the CANopen device configuration screen of EcoStruxure Control Expert to select which objects are mapped and linked to an application variable.

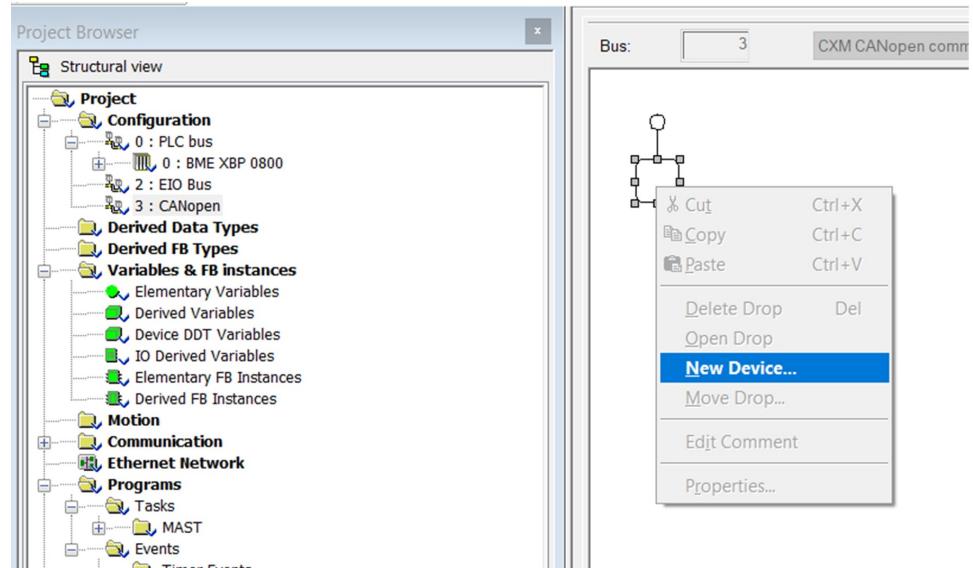
- Default: all the objects described in the EDS have reserved memory in the PLC application.
- PDOs only: Only the TPDO and RPDO objects are mapped in PLC memory. (The current example uses this function).

Your hardware catalog manager is now updated and contains the soft starter. If you import only the EDS file you have only the default choice. You must create new functions in the hardware catalog manager if you need several choices.

**NOTE:** You cannot reopen the project, if the device which is used in an existing EcoStruxure Control Expert project is removed from the hardware catalog manager.

## Configuring the soft starter in the CANopen Controller Project

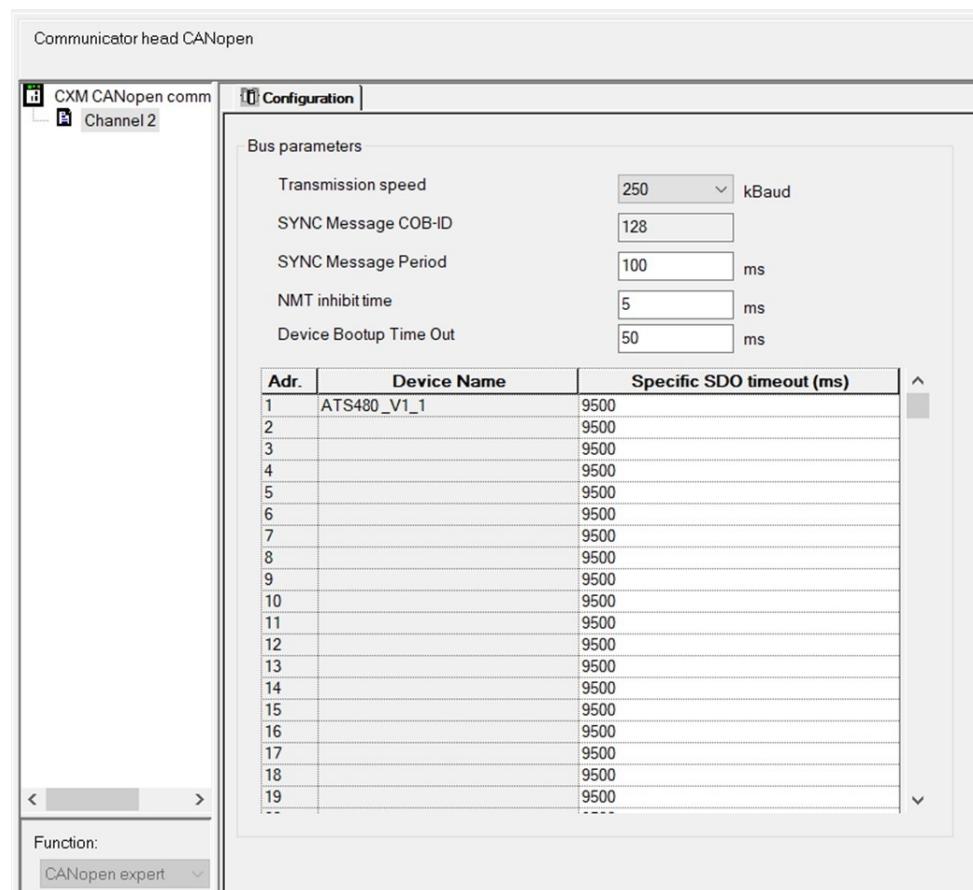
From the project browser opens the CANopen configuration tool by double-clicking the CANopen drop:



## Configuration of the Controller

The controller configuration consists of:

- Setting the baud rate
- Setting the SYNC message period
- Configuring the memory area which is the image of the whole PDOs handled by the PLC.



## Configuration of the Device

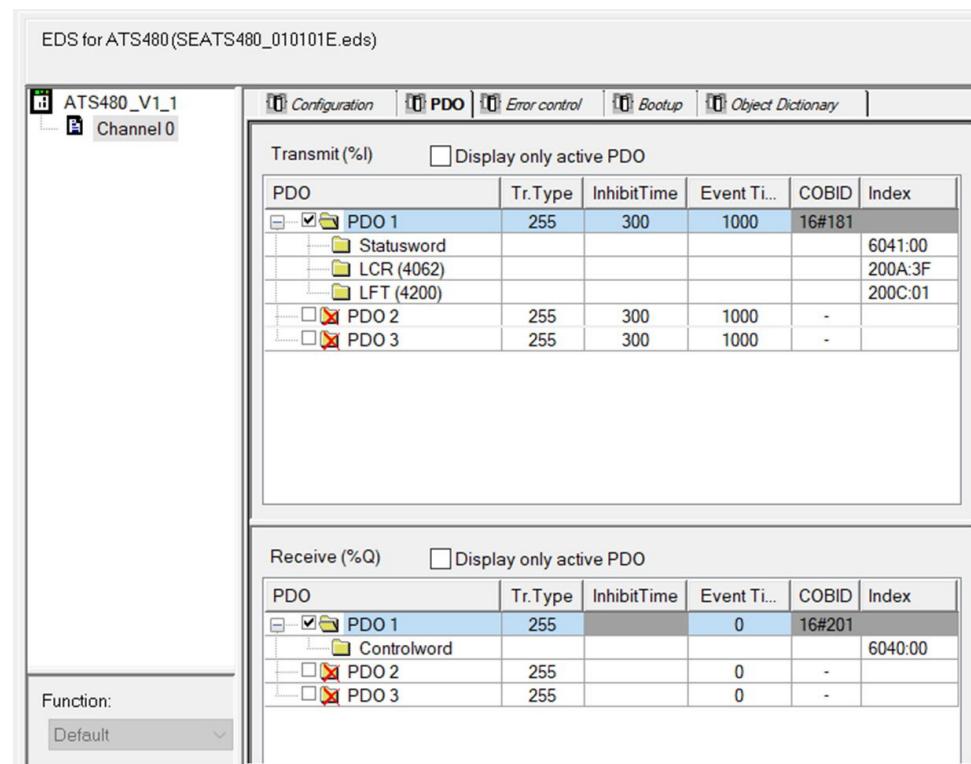
Add a new device and select the soft starter in the catalog. The soft starter was previously added to the catalog by importing the EDS file of the soft starter.

The screenshot shows the SIMATIC Manager interface with two main windows:

- New Device Dialog:** This window is titled "New Device". It contains fields for "Topological Address" (set to [1..63]) and "Node-ID" (set to 1). On the right side, there are buttons for "OK", "Cancel", and "Help".
- Project Browser:** This window shows the project structure under "Structural view". The "Configuration" folder is expanded, showing sub-folders like "PLC bus", "BME XB P 0800", "EIO Bus", and "CANopen". Other sections include "Derived Data Types", "Variables & FB instances", "Motion", "Communication", "Ethernet Network", "Programs", "Tasks", "Events", "Animation Tables", "Operator Screens", and "Documentation".

In the "CANopen" section of the Project Browser, a component named "ATS480\_V1\_1" is selected. This selection is also reflected in the "New Device" dialog, where the "Part Number" field is populated with "ATS480\_V1\_1" and its description is "EDS for ATS480 (SEATS480\_010101E.eds)".

In the example below, TPDO1 and RPDO1 are selected which provides the basic control command of the soft starter with the Standard mode profile.



PDOs are linked to the %Mw variables, the mapping is automatically generated by EcoStruxure Control Expert according to the index defined in the controller configuration panel and to the PDOs and to the device Node ID.

# Operations

## Operating States

### ⚠ WARNING

#### LOSS OF CONTROL

Perform a comprehensive commissioning test to verify that communication monitoring properly detects communication interruptions

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Configuring Communication Error Response

The response of the soft starter in the event of a communication interruption can be configured.

Configuration can be performed using the display terminal from:

[Communication] **COMO** → [Communication Module] **COMO**

Via the **[CANopen Error Resp]** **COL** parameter.

The values of the **[CANopen Error Resp]** **COL** parameter, which triggers a soft starter detected error **[CANopen Com Interrupt]** **COF** are:

Value	Meaning
<b>[Freewheel Stop]</b> <b>YES</b>	Motor triggers in error and is stopped in freewheel. <b>Factory setting</b>
<b>[Deceleration]</b> <b>DEC</b>	Motor is stopped in deceleration and triggers in error at the end of stop. The values are set to <b>[Deceleration]</b> <b>DEC</b> and <b>[End Of Deceleration]</b> <b>EDC</b> .
<b>[Braking]</b> <b>BRK</b>	Motor is stopped in dynamic braking and triggers in error at the end of stop. The values are set to <b>[Braking Level]</b> <b>BRK</b> and <b>[DC Braking To Stop]</b> <b>EBA</b> .

The values of the [CANopen Error Resp] **COL** parameter which does not trigger a detected error are:

Value	Meaning
[Ignore] <b>NO</b>	Detected error ignored (in this case, the warning [CANopen Com Warn] <b>COLA</b> is activated).
[Per STT] <b>STT</b>	Motor is stopped according to [Type of stop] <b>STT</b> parameter.

## ⚠ WARNING

### LOSS OF CONTROL

If this parameter is set to [Ignore] **NO**, CANopen communication monitoring is disabled.

- Only use this setting after a thorough risk assessment in compliance with all regulations and standards that apply to the device and to the application.
- Only use this setting for tests during commissioning.
- Verify that communication monitoring has been re-enabled before completing the commissioning procedure and performing the final commissioning test.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Operating Modes

### Configuration of the Soft starter for Operation with STD Profile

This section describes how to configure the settings of the soft starter if it is controlled in STD mode.

In the [Complete settings] **CST**- menu, [Command channel] **CCP**- submenu:

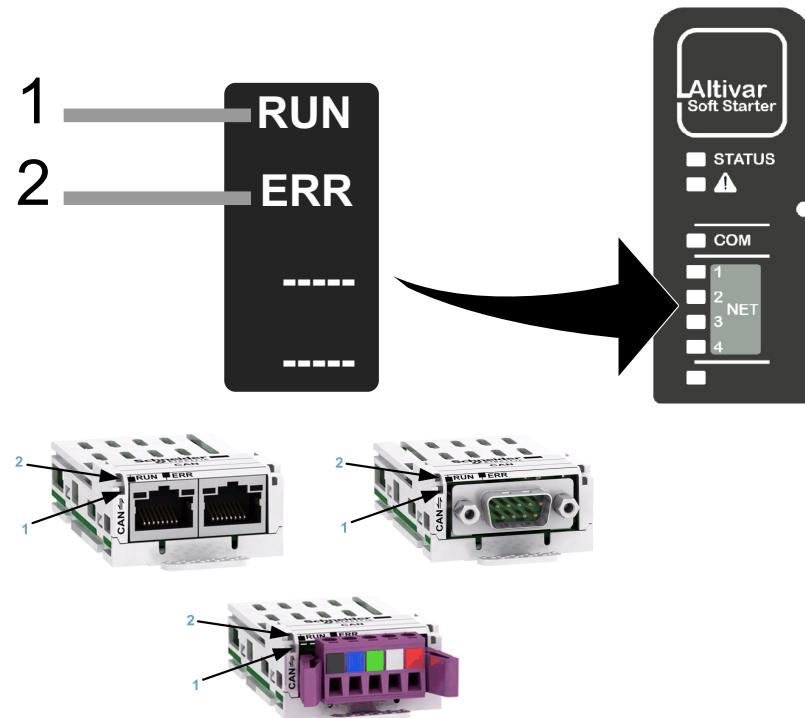
- [Control Mode] **CHCF** is set to [Standard Profile] **STD**.
- Check if [Cmd channel 1] **CD1** (or [Cmd channel 2] **CD2**) is set on according to the communication source ([CANopen] **CAN**).

# Diagnostics and Troubleshooting

## Fieldbus Status LEDs

### LED Indicators

The following figure describes the LEDs status for the module::



### LED Description

Item	LED	Description
1	CAN_RUN	CANopen status
2	CAN_ERR	CANopen error

### CANopen Status

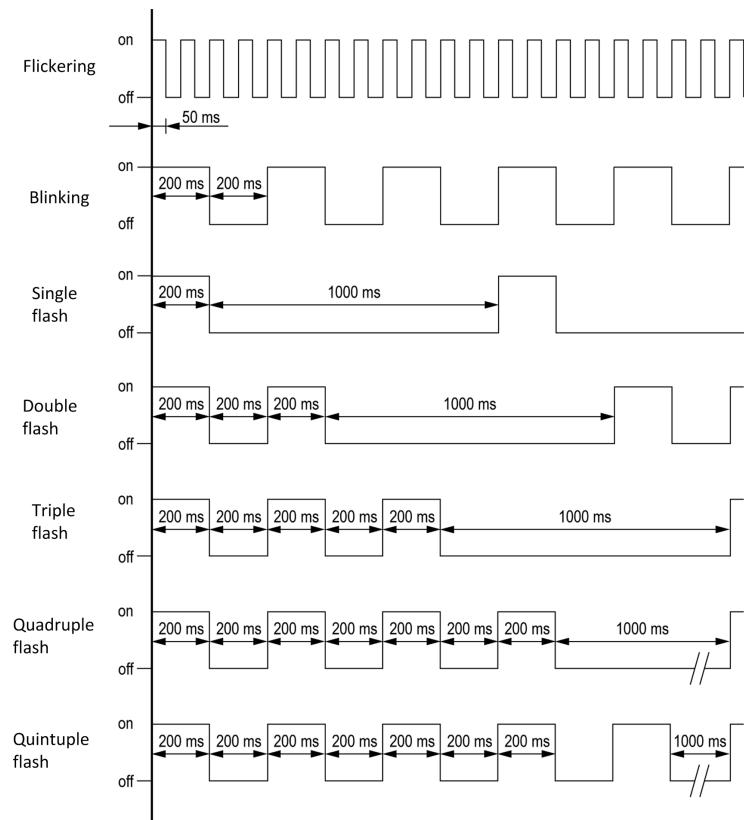
This LED indicates the CANopen status:

Color & Status	Description
OFF	The CANopen controller is in OFF state
Green single flash	The Altivar Soft Starter 4xx is in STOPPED state
Green blinking	The Altivar Soft Starter 4xx is in PRE-OPERATIONAL state
Green ON	The Altivar Soft Starter 4xx is in OPERATIONAL state

## Error Status

This LED indicates the CANopen error status:

Color & Status	Description
OFF	No detected error reported
Red single flash	Detected error reported by the CANopen controller of the Altivar Soft Starter 4xx (example: too many detected error frames)
Red double flash	Detected error due to the occurrence of a Node Guarding or a Heartbeat event
Red ON	The CANopen controller is in Bus OFF state



## NMT Chart

The [Canopen NMT state] `NMTS` parameter (logic address 6057, CANopen index/subindex 201E hex/3A) indicates the NMT chart state. The various possible values are [Boot] `BOOT`, [Stopped] `STOP`, [Operation] `OPE` and [Pre-op] `POPE` (Pre-operational).

This parameter is accessible in the [Communication] `COM` → [Communication map] `CMM` → [CANopen map] `CNM` menu.

## PDO Counter

[Number of RX PDO] `NBRP` and [Number of TX PDO] `NBTP` indicate the number of PDOs received and the number of PDOs transmitted by the soft starter (all PDO sets - PDO1, PDO2, and PDO3 - combined).

The values of the counters are reset to zero once 65535 is reached.

This parameter is accessible in the [Communication] `COM` → [Communication map] `CMM` → [CANopen map] `CNM` menu.

## Last CANopen Detected Error

The **[CANopen Error]** [ERCO](#) parameter (index/subindex 201E hex/39) indicates the last active CANopen detected error and maintains its value until the last detected error has been cleared.

This parameter is accessible:

- in the **[Communication]** [COM](#) → **[CANopen]** [CNO](#) menu.
- in the **[Communication]** [COM](#) → **[Communication map]** [CMM](#) → **[CANopen map]** [CNM](#) menu.

The possible values are listed below:

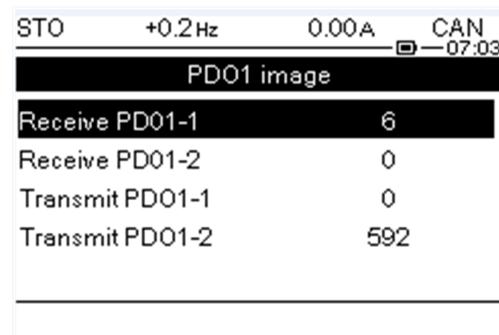
Display	Description
[0]	No errors detected since the start of CANopen communication.
[1]	Bus off or CAN overrun.
[2]	Node guarding error requiring a return to the NMT initialization state.
[3]	CAN overrun (possible alternative values: 32, 64 or 128).
[4]	Heartbeat error requiring a return to the NMT initialization state.
[5]	NMT state chart error

## PDO Value Display

The value of parameters mapped in PDOs can be displayed using **[PDO1 image]** [P01](#), **[PDO2 image]** [P02](#) and **[PDO3 image]** [P03](#) submenus.

These submenus are available in the **[Communication]** [COM](#) → **[Communication map]** [CMM](#) → **[CANopen map]** [CNM](#) menu.

The following figure shows the content of **[PDO1 image]** [P01](#) submenu:



### NOTE:

In each of these screens and for each PDO transmitted or received, only the **[Transmit PDOo-o]** or **[Received PDOo-o]** words transmitted and received on the CANopen bus are displayed. This means, for example, **[PDO1 image]** [P01](#) containing only 4 data bytes (that is **[Receive PDO1-1]** [RP11](#) and **[Receive PDO1-2]** [RP12](#)), the fields **[Receive PDO1-3]** [RP13](#) and **[Receive PDO1-4]** [RP14](#) are not displayed.

## Connection problem with the fieldbus module

### Description

If the product cannot be addressed via the fieldbus, first check the connections. The product manuals contains the technical data of the device and information on fieldbus and device installation.

Verify the following:

- Power connections to the device.
- Fieldbus cable and fieldbus wiring.
- Fieldbus connection to the device.

# Monitoring of Communication Channel

## Command Channels

All the soft starter command parameters are managed on a channel-by-channel basis.

Parameter Name	Parameter Code			
	Taken Into Account by the Soft Starter	Modbus Serial	CANopen	Fieldbus Module (PROFIBUS & Ethernet IP/MODBUS TCP)
<i>Control word</i>	[Cmd Register] <a href="#">CMD</a>	[Modbus Cmd] <a href="#">CMD1</a>	[CANopen Cmd] <a href="#">CMD2</a>	[COM. Module cmd.] <a href="#">CMD3</a>
<i>Extended Control word</i>	[Extended Control Word] <a href="#">CMI</a>			

## Monitoring of Communication Channels

Communication channels are monitored if they are involved in one of the following parameters:

- The control word **[Cmd Register]** [CMD](#) from the active command channel
- The control word containing the command switch bit configured on **[Command Switching]** [CCS](#)

As soon as one of these parameters has been written once to a communication channel, it activates monitoring for that channel.

If a communication warning is sent (in accordance with the protocol criteria) by a monitored port or fieldbus module, the soft starter triggers a communication interruption.

The soft starter reacts according to the communication interruption configuration (operating state Fault, maintenance, fallback, and so on).

If a communication warning occurs on a channel that is not being monitored, the soft starter does not trigger a communication interruption.

## Enabling of Communication Channels

A communication channel is enabled once one parameter involved have been written at least one time. The soft starter is only able to start if the channel involved in command value is enabled.

### Example:

A soft starter in STD profile is connected to an active communication channel.

It is mandatory to write at least one time the command in order to switch from 4-Switched on to 5-Operation enabled state.

A communication channel is disabled:

- In the event of a communication warning.
- In *forced local* mode.

**NOTE:** On exiting *forced local* mode:

- The soft starter copies the `run commands` value to the active channel (maintained).
- Monitoring of the active channels for the command resumes following a time delay **[Time-out forc. local]** [FLOT](#).
- Soft starter control only takes effect once the soft starter has received the command from the active channels.

# Control-Signal Diagnostics

## Introduction

On the display terminal, the [Communication] COM — [Communication map] CMM submenu can be used to display control-signal diagnostic information between the soft starter and the controller:

- Active command channel [Command Channel] CMDC
- Value of the control word [Cmd Register] CMD from the active command channel [Command Channel] CMDC
- Value of the operating state word [Status Register] ETA
- Specific data for all available fieldbusses are in dedicated submenus.
- In the [Command word image] CWI submenu: control words from all channels

## Control Word Display

The [Command Channel] CMDC parameter indicates the active command channel.

The [Cmd Register] CMD parameter indicates the hexadecimal value of the control word (CMD) used to control the soft starter.

The [Command word image] CWI submenu ([CANopen Cmd] CMD2) parameter is used to display the hexadecimal value of the control word from the fieldbus.

## Operating State Word Display

The [Status Register] ETA parameter gives the value of the operating state word (ETA).

The table provides the bit details of ETA parameter:

Bit	Description
Bit0 = 1	Ready to switch on
Bit1 = 1	Switched on
Bit2 = 1	Operation enabled
Bit3 = 1	Detected error
Bit4 = 1	Voltage enabled
Bit5 = 0	Quick stop active
Bit6 = 1	Switch on disabled
Bit7 = 1	Warning
Bit8	Reserved
Bit9 = 0	Local mode control
Bit10	Reserved
Bit11	Reserved
Bit12	Reserved
Bit13	Reserved
Bit14 = 1	Stop imposed via STOP key
Bit15	Reserved

# Appendix A - Object Dictionary

## Communication Profile Area

### Communication Objects

The table provides the soft starter supported communication objects:

Index	Subindex	Access	Type	Default value	Description
1000 hex	00 hex	Read only	Unsigned32	00410192 hex	Device type: 0
1001 hex	00 hex	Read only	Unsigned8	00 hex	Detected error register: detected error (1) or no detected error (0)
1003 hex	00 hex	Read/write	Unsigned8	00 hex	Number of detected errors: No detected error (0) or one or more detected errors (>0) in object 16#1003; only the value 0 can be written
	01 hex	Read only	Unsigned32	00000000 hex	Standard detected error Field: Bits 16-31 = Additional information (all 0 s) Bits 00-15 = error code (Errd)
1005 hex	00 hex	Read/write	Unsigned32	00000080 hex	COB ID SYNC MESSAGE
1008 hex	00 hex	Read only	Visible string	ATS4XX	Device name
100C hex	00 hex	Read/write	Unsigned16	0000 hex	Guard Time: By default, the Node Guarding Protocol is inhibited; the unit of this object is 1 ms.
100D hex	00 hex	Read/write	Unsigned8	0000 hex	Life Time Factor: Multiplier applied to the Guard Time in order to obtain a Life Time.
1014 hex	00 hex	Read only	Unsigned32	00000080 hex + Node ID	COB-ID Emergency message: COB-ID used for the EMCY service
1016 hex	00 hex	Read only	Unsigned8	01 hex	Consumer Heartbeat Time - Number of entries
	01 hex	Read/write	Unsigned32	00 hex	Consumer Heartbeat Time: Bits 16-23 = Node-ID of the producer Bits 00-15 = Heartbeat time (unit = 1 ms)
1017 hex	00 hex	Read/write	Unsigned32	00000000 hex	Producer Heartbeat time
1018 hex	01 hex	Read only	Unsigned32	0200005A hex	Vendor ID
	02 hex	Read only	Unsigned32	480	Product code
	03 hex	Read only	Unsigned32	00010101 hex	Revision ID: B0..7: [ID_Card1SoftwareVersion] evolution B8..15: [ID_Card1SoftwareVersion] version B16: Fix (1)
1029 hex	00 hex	Read only	Unsigned8	01 hex	Number of entries
	01 hex	Read/write	Unsigned8	00 hex	Communication error

## SDO Server Parameters

### Communication Object

The table provides the communications objects used by the SDO server of the soft starter:

<b>Index</b>	<b>Subin-dex</b>	<b>Access</b>	<b>Type</b>	<b>Default Value</b>	<b>Description</b>
1200 hex	00 hex	Read only	Unsigned 8	02 hex	SDO Server - Number of entries
	01 hex	Read only	Unsigned 32	00000600 hex + node ID	SDO Server - COB-ID Client → Soft starter (receive)
	02 hex	Read only	Unsigned 32	00000580 hex + node ID	SDO Server - COB-ID Client ← Soft starter (transmit)
1201 hex	00 hex	Read only	Unsigned8	03 hex	2nd SDO server - Highest sub-index supported
	01 hex	Read/write	Unsigned32	80000000 hex	2nd SDO server - COB-ID Client → Soft starter (receive)
	02 hex	Read/write	Unsigned32	80000000 hex	2nd SDO server - COB-ID Client ← Soft starter (transmit)
	03 hex	Read/write	Unsigned8	00 hex	2nd SDO server - COB-ID

# Receive PDOs Parameters

## Communication Objects

The table provides the communications objects used for receive PDOs configuration of the soft starter:

Index	Subindex	Access	Type	Default value	Description
1400 hex	00 hex	Read only	Unsigned8	02 hex	Receive PDO1 - Number of entries
	01 hex	Read/write	Unsigned32	00000200 hex + node ID	Receive PDO1 - COB-ID
	02 hex	Read/write	Unsigned32	000000FF hex	Receive PDO1 - Transmission type: Default value: event driven
	03 hex	Read/write	Unsigned16	00 hex	Receive PDO1 - Inhibit timer
	05 hex	Read/write	Unsigned16	00 hex	Receive PDO1 - Event Timer Unit = 1 ms
1401 hex	00 hex	Read only	Unsigned8	02 hex	Receive PDO2 - Number of entries
	01 hex	Read/write	Unsigned32	80000300 hex + node ID	Receive PDO2 - COB-ID
	02 hex	Read/write	Unsigned32	000000FF hex	Receive PDO2 - Transmission type: Default value: event driven
	03 hex	Read/write	Unsigned16	00 hex	Receive PDO2 - Inhibit timer
	05 hex	Read/write	Unsigned16	00 hex	Receive PDO2 - Event Timer Unit = 1 ms
1402 hex	00 hex	Read only	Unsigned8	02 hex	Receive PDO3 - Number of entries
	01 hex	Read/write	Unsigned32	80000400 hex + node ID	Receive PDO3 - COB-ID
	02 hex	Read/write	Unsigned32	000000FF hex	Receive PDO3 - Transmission type: Default value: event driven
	03 hex	Read/write	Unsigned16	00 hex	Receive PDO3 - Inhibit timer
	05 hex	Read/write	Unsigned16	00 hex	Receive PDO3 - Event Timer Unit = 1 ms

## Receive PDO1, PDO2, and PDO3 Mapping

### Communication Objects

The table provides the communication objects used for the PDOs mapping of the soft starter:

Index	Subindex	Access	Type	Default value	Description
1600 hex	00 hex	Read/write	Unsigned8	01 hex	Receive PDO1 mapping - Number of mapped objects: 0 to 4 objects can be mapped for this PDO
	01 hex	Read/write	Unsigned32	60400010 hex	Receive PDO1 mapping - first mapped object: Control word <a href="#">CMD</a> (6040 hex)
	02 hex	Read/write	Unsigned32	00000000 hex	Receive PDO1 mapping: No second mapped object
	03 hex	Read/write	Unsigned32	00000000 hex	Receive PDO1 mapping: No third mapped object
	04 hex	Read/write	Unsigned32	00000000 hex	Receive PDO1 mapping: No fourth mapped object
1601 hex	00 hex	Read/write	Unsigned8	00 hex	Receive PDO2 mapping - Number of mapped objects: 0 to 4 objects can be mapped for this PDO
	01 hex	Read/write	Unsigned32	00000000 hex	Receive PDO2 mapping -: No first mapped object
	02 hex	Read/write	Unsigned32	00000000 hex	Receive PDO2 mapping -: No second mapped object
	03 hex	Read/write	Unsigned32	00000000 hex	Receive PDO2 mapping: No third mapped object
	04 hex	Read/write	Unsigned32	00000000 hex	Receive PDO2 mapping: No fourth mapped object
1602 hex	00 hex	Read only	Unsigned8	04 hex	Receive PDO3 mapping - Number of mapped objects: 0 to 4 objects can be mapped for this PDO
	01 hex	Read only	Unsigned32	20613E10 hex	Receive PDO3 mapping - first mapped object: NC1 (Comm. Scanner first data)
	02 hex	Read only	Unsigned32	20613F10 hex	Receive PDO3 mapping - second mapped object: NC2 (Comm. Scanner second data)
	03 hex	Read only	Unsigned32	20614010 hex	Receive PDO3 mapping - third mapped object: NC3 (Comm. Scanner third data)
	04 hex	Read only	Unsigned32	20614110 hex	Receive PDO3 mapping - fourth mapped object: NC4 (Comm. Scanner fourth data)

# Transmit PDOs Parameters

## Communication Objects

The table provides the communications objects used for transmit PDOs configuration of the soft starter:

Index	Subindex	Access	Type	Default value	Description
1800 hex	00 hex	Read only	Unsigned8	05 hex	Transmit PDO1 - Number of entries
	01 hex	Read/write	Unsigned32	00000180 hex + Node ID	Transmit PDO1 - COB-ID
	02 hex	Read/write	Unsigned8	FF hex	Transmit PDO1 -- Transmission type: Three modes are available for this PDO: asynchronous (255), synchronously cyclic (1-240), and synchronously acyclic (0)
	03 hex	Read/write	Unsigned16	300	Transmit PDO1 - Inhibit time: Minimum time between two transmissions; Unit = 100 ms
	04 hex	Read/write	Unsigned8	—	Transmit PDO1 - Reserved
	05 hex	Read/write	Unsigned16	1000	Transmit PDO1 - Event timer: In asynchronous mode, this object sets a minimum rate of transmission for this PDO; Unit = 1 ms
1801 hex	00 hex	Read only	Unsigned8	05 hex	Transmit PDO2 - Number of entries
	01 hex	Read/write	Unsigned32	80000280 hex + Node ID	Transmit PDO2 - COB-ID
	02 hex	Read/write	Unsigned8	FF hex	Transmit PDO2 -- Transmission type: Three modes are available for this PDO: asynchronous (255), synchronously cyclic (1-240), and synchronously acyclic (0)
	03 hex	Read/write	Unsigned16	300	Transmit PDO2 - Inhibit time: Minimum time between two transmissions; Unit = 100 ms
	04 hex	Read/write	Unsigned8	—	Transmit PDO2 - Reserved
	05 hex	Read/write	Unsigned16	1000	Transmit PDO2 - Event timer: In asynchronous mode, this object sets a minimum rate of transmission for this PDO; Unit = 1 ms
1802 hex	00 hex	Read only	Unsigned8	05 hex	Transmit PDO3 - Number of entries
	01 hex	Read/write	Unsigned32	80000380 hex + Node ID	Transmit PDO3 - COB-ID
	02 hex	Read/write	Unsigned8	FF hex	Transmit PDO3 -- Transmission type: Three modes are available for this PDO: asynchronous (255), synchronously cyclic (1-240), and synchronously acyclic (0)
	03 hex	Read/write	Unsigned16	30	Transmit PDO3 - Inhibit time: Minimum time between two transmissions; Unit = 100 ms
	04 hex	Read/write	Unsigned8	—	Transmit PDO3 - Reserved
	05 hex	Read/write	Unsigned16	1000	Transmit PDO3 - Event timer: In asynchronous mode, this object sets a minimum rate of transmission for this PDO; Unit = 1 ms

# Transmit PDO1, PDO2, and PDO3 Mapping

## Communication Object

The table provides the communication objects used for the PDOs mapping of the soft starter:

Index	Subindex	Access	Type	Default value	Description
1A00 hex	00 hex	Read/write	Unsigned8	02 hex	Transmit PDO1 mapping - Number of mapped objects.
	01 hex	Read/write	Unsigned32	60410010 hex	Transmit PDO1 mapping - first mapped object: Status word <a href="#">ETA</a> (6041 hex)
	02 hex	Read/write	Unsigned32	20020510 hex	Transmit PDO1 mapping - second mapped object: Motor current <a href="#">LCR</a> (2002/5 hex)
	03 hex	Read/write	Unsigned32	20421F10 hex	Transmit PDO1 mapping: Motor Therm State <a href="#">THR</a> (2042/1F hex)
	04 hex	Read/write	Unsigned32	20380710 hex	Transmit PDO1 mapping: Malfunction code <a href="#">ERRD</a> (2038/7 hex)
1A01 hex	00 hex	Read/write	Unsigned8	00 hex	Transmit PDO2 mapping - Number of mapped objects
	01 hex	Read/write	Unsigned32	00000000 hex	Not mapped
	02 hex	Read/write	Unsigned32	00000000 hex	Not mapped
	03 hex	Read/write	Unsigned32	00000000 hex	Not mapped
	04 hex	Read/write	Unsigned32	00000000 hex	Not mapped
1A02 hex	00 hex	Read only	Unsigned8	04 hex	Transmit PDO3 mapping - Number of mapped objects.
	01 hex	Read only	Unsigned32	20612A10 hex	Transmit PDO3 mapping - first mapped object: NM1 - Comm. Scanner first data
	02 hex	Read only	Unsigned32	20612B10 hex	Transmit PDO3 mapping - second mapped object: NM2 - Comm. Scanner second data
	03 hex	Read only	Unsigned32	20612C10 hex	Transmit PDO3 mapping - third mapped object: NM3 - Comm. Scanner third data
	04 hex	Read only	Unsigned32	20612D10 hex	Transmit PDO3 mapping - fourth mapped object: NM4 - Comm. Scanner fourth data

## Manufacturer Specific Area

### Description

The ATS480 parameters are based and documented with their CANopen address.

**NOTE:** In the communication parameters excel sheet you find CANopen addresses.

## Application Profile Area

### Standardized Objects

The table provides the standardized objects, in conformance with standard mode profile, supported by the soft starter:

Index	Description
603F hex	Error code
6040 hex	Control Word
6041 hex	Status Word
605A hex	Quick stop option code
605C hex	Disable option code
6060 hex	Modes of operation
6061 hex	Modes of operation Display
6502 hex	Supported soft starter modes

# Glossary

## A

**Abbreviations:**

Req. = Required

Opt. = Optional

**AC:**

Alternating Current

## C

**CAN:**

Controller Area Network is an internally standardized serial bus system

**COB ID:**

Each COB is uniquely identified in a CAN network by a number called the COB Identifier (COB-ID).

**COB:**

Communication Object. A unit of transportation in a CAN network. Data must be sent across a CAN Network inside a COB. There are 2048 different COB's in a CAN network. A COB can contain at most 8 bytes of data.

**Controller:**

A **controller** is a device that is actively polling for data from one or multiple devices.

## D

**DC:**

Direct Current

**dec.:**

Decimal

**Device:**

A **device** is the passive device, waiting for the **controller** to poll for data to actually send it.

## E

**Error :**

Discrepancy between a detected (computed, measured, or signaled) value or condition and the specified or theoretically correct value or condition.

## F

**Factory setting:**

Factory settings when the product is shipped

**Fault Reset:**

A function used to restore the soft starter to an operational state after a detected error is cleared by removing the cause of the error so that the error is no longer active.

**Fault:**

Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault reset" is required to exit this operating state after the cause of the detected error has been removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

**H****hex:**

Hexadecimal

**L****LSB:**

Least Significant Byte

**M****MEI:**

Modbus Encapsulated Interface

**Monitoring function:**

Monitoring functions acquire a value continuously or cyclically (for example, by measuring) in order to check whether it is within permissible limits. Monitoring functions are used for error detection.

**MSB:**

Most Significant Byte

**N****NMT:**

Network Management. One of the service elements of the application layer in the CAN Reference Model. The NMT serves to configure, initialize, and handle detected errors in a CAN network.

**P****Parameter:**

Device data and values that can be read and set (to a certain extent) by the user.

**PDO:**

Process Data Object

**PELV:**

Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41.

**PLC:**

Programmable logic controller.

**Power stage:**

The power stage controls the motor. The power stage generates current for controlling the motor.

**Q****Quick Stop:**

The quick Stop function can be used for fast deceleration of a movement as a response to a detected error or via a command.

**R****R/WS:**

Read and write (write only possible when the soft starter is not in RUN mode). It is not possible to write these parameters in "5-Operation enabled" or "6-Quick stop active" states. If the parameter is written in the "4-Switched on" state, transition to "2-Switch on disabled" is activated.

**RPDO:**

Receive PDO

**S****SYNC:**

Synchronization Object

**T****TPDO:**

Transmit PDO

**W****Warning:**

If the term is used outside the context of safety instructions, a warning alerts to a potential error that was detected by a monitoring function. A warning does not cause a transition of the operating state.

**Z****Zone of operation:**

This term is used in conjunction with the description of specific hazards, and is defined as it is for a **hazard zone** or **danger zone** in the EC Machinery Directive (2006/42/EC) and in ISO 12100-1.

**Schneider Electric**  
35 rue Joseph Monier  
92500 Rueil Malmaison  
France

+ 33 (0) 1 41 29 70 00

[www.se.com](http://www.se.com)

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NNZ85543.01 – 03/2022