

Altivar Soft Starter ATS490

Soft Starter for Asynchronous Motors

PROFIBUS DP Manual VW3A3607

PKR63425.01

12/2024



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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 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.

Product 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.

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](https://www.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 IEC 60947-4-2. 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.

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

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 ATS490.

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 www.se.com .
2	In the Search box type the reference of the product or the name of a product range. <ul style="list-style-type: none">• Do not include blank spaces in the reference or product range.• To get information on grouping similar modules, use asterisks (*).
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 Download XXX product datasheet .

Document scope

The purpose of this document is to:

- Show you how to install the PROFIBUS DP fieldbus module on the soft starter.
- Show you how to configure the soft starter to use PROFIBUS DP fieldbus.

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

Catalog

Title of documentation	Reference number
Catalog: Altivar Soft Starter ATS490	DIA2ED2240603EN (English) DIA2ED2240603FR (French)

Documentations

Title of documentation	Reference number
ATS490 Getting Started	PKR63410 (English), PKR63411 (French) PKR63412 (Spanish), PKR63413 (Italian) PKR63414 (German), PKR63415 (Chinese) PKR63416 (Portuguese), PKR63417 (Turkish)
ATS490 Getting Started Manual Annex for UL	PKR63418 (English)
ATS490 User Manual	PKR52680 (English), PKR52681 (French) PKR52682 (Spanish), PKR52683 (Italian) PKR52684 (German), PKR52685 (Chinese) PKR52686 (Portuguese), PKR52687 (Turkish)
ATS490 Embedded Safety Function Manual	PKR63419 (English)
ATS490 ATEX Manual	BQT74920 (English)
ATS490 Embedded Modbus RTU Manual	PKR63421 (English)
ATS490 EtherNet Manual	PKR63423 (English)
ATS490 PROFIBUS DP Manual (VW3A3607)	PKR63425 (English)
ATS490 CANopen Manual (VW3A3608, VW3A3618, VW3A3628)	PKR63426 (English)
ATS490 Communication Parameter Addresses	PKR63420 (English)
Recommended Cybersecurity Best Practices	CS-Best-Practices-2019–340 (English)

You can download these technical publications and other technical information from our website at www.se.com/en/download.

Videos

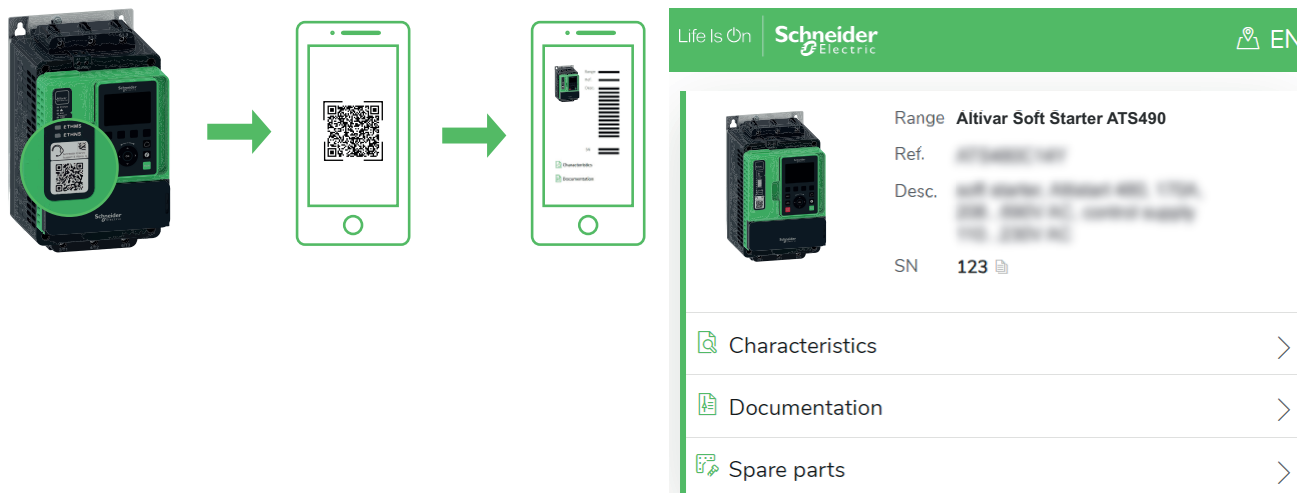
Title of documentation	Reference number
Video: Getting Started with ATS490	FAQ000263202 (English)

Software

Title of documentation	Reference number
SoMove: FDT	SoMove FDT (English, French, German, Spanish, Italian, Chinese)
ATS490: DTM	ATS490 DTM Library EN (English – to be installed first) ATS490 DTM Lang FR (French) ATS490 DTM Lang SP (Spanish) ATS490 DTM Lang IT (Italian) ATS490 DTM Lang DE (German) ATS490 DTM Lang CN (Chinese)

Electronic product data sheet

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



Scanning the QR Code gives you access to :

- Product ID Card : Product range, Reference, short description and a Serial Number (Use the serial number to retrieve the product's manufacturing date).
- The product characteristics : Main characteristics, environment, packing units, sustainability...
- Documentation : Technical Guidance at Glance (Presentation, Dimensions, Mounting, Wiring, Commissioning...) and Product Documentation (User guide, Instructions sheets, Certificates, How To videos...)
- Spare parts for your product

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:




- ISO 13849-1 & 2 Safety of machinery - safety related parts of control systems
- IEC 61158 series: Industrial communication networks - Fieldbus specifications
- IEC 61784 series: Industrial communication networks - Profiles
- IEC 60204-1: Safety of machinery - Electrical equipment of machines – Part 1: General requirements
- IEC 60947-1 Low-Voltage Switchgear and Control Gear – General rules
- IEC 60947-4-2 Semiconductor Motor controllers, Starters and Soft Starters
- IEC 62443: Security for industrial automation and control systems

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.

Also see the glossary at the end of this manual.

Structure of the Parameter Table

General Legend

Pictogram	Description
	Power cycle must be performed after setting this parameter.
	Read only parameter, mainly used for monitoring.
	Expert mode required to access this parameter.

Contact us

Select your country on www.se.com/contact.

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Hardware Setup

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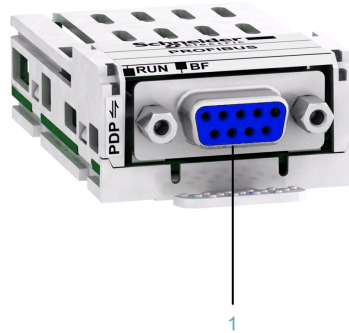
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Hardware Presentation

PROFIBUS DP Fieldbus Module

The figure shows the PROFIBUS DP fieldbus module equipped with a Sub-D 9 connector:



1 Sub-D 9 connector

Firmware version compatibility

The VW3A3607 fieldbus module version 1.16 and higher is compliant with all Altivar process product range.

The associated GSD files are available on www.se.com.

Installation of the fieldbus 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

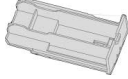
Do not use damaged products or accessories.

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

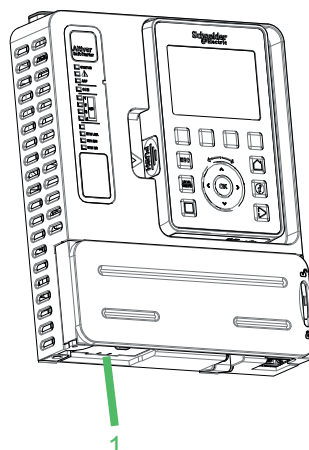
Contact your local Schneider Electric sales office if you detect any damage whatsoever.

Inserting the fieldbus module

The table provides the procedure for insertion of the PROFIBUS DP 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 plastic cover module 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	Wire the PROFIBUS DP fieldbus module to the PROFIBUS DP automate.
7	Add the corresponding sticker on the LED front panel of the soft starter.

1 Fieldbus Module Slot



Removing the fieldbus module

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

Step	Action
1	Ensure that the power is off.
2	Remove the PROFIBUS DP connection cables.
3	Press the strip. 
4	Remove the module while maintaining the strip pressed.

NOTE: When removing or inserting the module at next power on, an error can be triggered if the device topology has changed.

NOTE: If the message is validated, a reset of the error is performed due to a factory setting.

NOTE: In case of incompatible module, the error INF6 is triggered (due to option module version number).

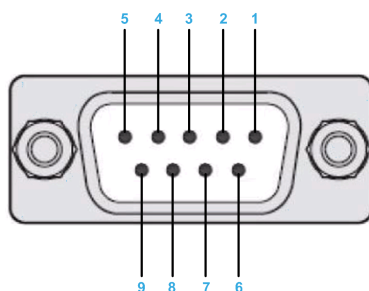
Electrical Installation

Pin Layout

The VW3A3607 fieldbus module is equipped with a sub-D 9 female connector for the PROFIBUS DP connection.

Use only validated PROFIBUS connectors.

- The PROFIBUS connectors are suitable for connecting the fieldbus signal.
- The PROFIBUS connectors are galvanically isolated.
- Connect the PROFIBUS signals.
- If the device is at the end of the network, use a PROFIBUS connector with a terminating resistor.
- Fasten the cables to the cable guide. The cable guide is not a strain relief.



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

Pin	Signal	Meaning
1	Shield	Shield protective ground
2	–	Not connected
3	RxD/TxD-P	Receive/Transmit-data-P
4	CNTR-P	Control-P
5	DGND	Data ground
6	VP	Voltage plus
7	–	Not connected
8	RxD/TxD-N	Receive/Transmit-Data-N
9	–	Not connected

Cable Specification

Cable specifications are as follows:

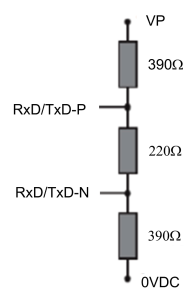
- Use equipotential bonding conductors.
- Use pre-assembled cables to reduce the wiring mistakes.
- Shield: both end grounded.
- Twisted-pair cable.
- Verify that wiring, cables, and connected interfaces meet the PELV requirements.
- The maximum cable length depends on the baud rate and the signal propagation delay, that is, shorter bus cable for higher baud rate.

Data rate (kbps)	9.6	19.2	93.75	187.5	500	1500	3000	6000	12000
Distance m (ft.)	1200 (4000)	1200 (4000)	1200 (4000)	1000 (3300)	400 (1300)	200 (650)	100 (330)	100 (330)	100 (330)

Terminating Resistor

Both ends of the entire PROFIBUS DP network must be terminated with a terminating resistor. Use PROFIBUS connectors with integrated terminating resistors at both ends of the network.

The schematic diagram shows the terminating resistor combination:



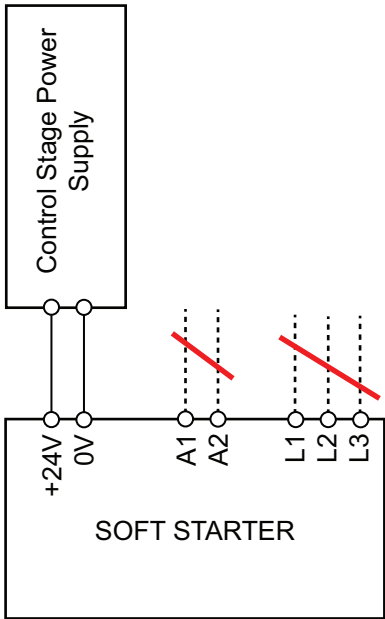
Cable Routing Practices

Installation Topology

The following figure shows an example of a wiring solution between a controller and devices using VW3A3607 fieldbus modules. The connector and cable for connection to the PROFIBUS DP network must be ordered separately.



Automation Commissioning Only

Control stage supplied via +24 V of the control board	Use case
	By supplying the product only with +24V, only programming is possible. No motor power supply is possible.

Cybersecurity Generalities

The objective of Cybersecurity is to help provide increased levels of protection for information and physical assets from theft, corruption, misuse, or accidents while maintaining access for their intended users.

No single Cybersecurity approach is adequate. Schneider Electric recommends a defense-in-depth approach. Conceived by the National Security Agency (NSA), this approach layers the network with security features, appliances, and processes.

The basic components of this approach are:

- Risk assessment
- A security plan built on the results of the risk assessment
- A multi-phase training campaign
- Physical separation of the industrial networks from enterprise networks using a demilitarized zone (DMZ) and the use of firewalls and routing to establish other security zones
- System access control
- Device hardening
- Network monitoring and maintenance

This chapter defines the elements that help you configure a system that is less susceptible to cyber-attacks.

Network administrators, system integrators and personnel that commission, maintain or dispose of a device should:

- Apply and maintain the device's security capabilities.
- Review assumptions about protected environments.
- Address potential risks and mitigation strategies.
- Follow recommendations to optimize cybersecurity.

For detailed information on the system defense-in-depth approach, refer to the TVDA: How Can I Reduce Vulnerability to Cyber Attacks (STN V3.0) on se.com.

To submit a Cybersecurity question, report security issues, or get the latest news from Schneider Electric, visit the Schneider Electric website.

⚠ WARNING

POTENTIAL COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY

- Change default password to help prevent unauthorized access to device settings and information.
- Disable unused ports/services and default accounts, where possible, to minimize pathways for malicious attacks.
- Place networked devices behind multiple layers of cyber defenses (such as firewalls, network segmentation, and network intrusion detection and protection).
- Use cybersecurity best practices (for example: least rights, separation of duties) to help prevent unauthorized exposure, loss or modification of data and logs, interruption of services, or unintended operation.

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

For more details about cybersecurity, refer to the [User Manual](#).

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Software Overview

Compatibility

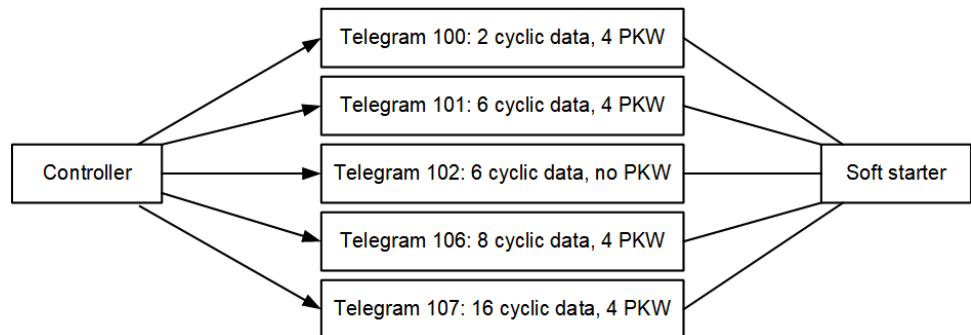
The VW3A3607 communication module enables the integration of a variable speed soft starter into a PROFIBUS DP fieldbus. This module offers the possibility to control its host soft starter in native profile.

Profile	Telegrams
Standard Mode	100,101,102,106, 107

NOTE: PROFIdrive is not supported by the soft starter but the channel access of the parameters is available.

Fieldbus Module Features Overview

There are few modes of operation which are telegram 100, 101, 102, 106 and 107. The other telegrams are based on the native profile of the device.



Data is exchanged in order to make use of all the soft starter functions.

The following features are supported by the VW3A3607 PROFIBUS DP module:

- Five configurable telegrams (Optimizes the I/Os usage of the controller)
- Mapping of the process data from the controller
- Parameter management compliant with PROFIdrive V4.1
- Baud rate from 9.6 to 12000 kbps (Automatic detection of the bus speed)
- Supports standard identification & maintenance requests
- Several DP V1 messaging modes
- Host soft starter can be handled from two controllers (MS0 and MS1)
- Quick setup from soft starter side

PROFIBUS Communication Parameters

[Profibus] menu

Configuration of the PROFIBUS communication functions of the soft starter can be accessed from **[Communication]** ➔ **[Profibus]**.

The table presents the menu settings:

HMI label	Setting	
[Address] ADRC	Logic address: 19C9 hex = 6601 Range: 2...126	Type: UINT (Unsigned16) Read/write: R/WS
Device address This parameter defines the PROFIBUS DP device address. <ul style="list-style-type: none"> If [Address] is set to 126, the restart of the soft starter is not required. If [Address] is set to [2...125], the restart of the soft starter is required. 		
[Fieldbus Interrupt Resp] CLL	Logic address: 1B67 hex = 7015 Factory setting: [Freewheel Stop]	Type: WORD (Enumeration) Read/write: R/WS
Response to Fieldbus module communication interruption This parameter defines the PROFIBUS DP error stop mode. <ul style="list-style-type: none"> [Ignore] : Detected error ignored (in this case, the warning [Fieldbus Com Warn] is activated). [Freewheel Stop] : Motor triggers in [Fieldbus Com Interrupt] error and is stopped in freewheel. [Configured Stop] : Motor is stopped according to [Type of stop] parameter. [Deceleration] : Motor is stopped in deceleration and triggers in [Fieldbus Com Interrupt] error at the end of stop. [Braking] : Motor is stopped in dynamic braking and triggers in [Fieldbus Com Interrupt] error at the end of stop. 		
⚠ WARNING		
LOSS OF CONTROL If this parameter is set to [Ignore] , fieldbus module communication monitoring is disabled. <ul style="list-style-type: none"> 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.		

HMI label	Setting	
[Product restart] <small>RP</small>	Logic address: 1BD8 hex = 7128	Type: WORD (Enumeration)
	Factory setting: [No]	Read/write: R/WS
Product restart Restart the device. Can be used to clear a detected error or refresh a modified parameters that requires a device restart. <ul style="list-style-type: none">• [No] : No restart.• [Yes] : Restart the device. Automatically return to [No] after applied. 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.		
<div><div>⚠ WARNING</div><div>UNANTICIPATED EQUIPMENT OPERATION The Restart function performs a Fault Reset and restarts the device.<ul style="list-style-type: none">• Verify that activating this function does not result in unsafe conditions.Failure to follow these instructions can result in death, serious injury, or equipment damage.</div></div>		



[PROFIBUS DIAG] menu




Overview


Configuration of the PROFIBUS communication functions of the soft starter can be accessed from **[Communication]**.

Possible Settings

The table presents the menu settings:

HMI label	Setting	
[Data rate used] BDRU 	Logic address: 1A04 hex = 6660 Factory setting: [Automatic]	Type: WORD (Enumeration) Read/write: R
Data rate used This parameter displays the current baud rate. This parameter can be: <ul style="list-style-type: none"> • [Automatic] • [9600 bps] • [10 Kbps] • [19200 bps] • [45.45 Kbps] • [93.75 Kbps] • [187.5 Kbps] • [500 Kbps] • [1.5 Mbps] • [3 Mbps] • [6 Mbps] • [12 Mbps] 		
[PPO profile used] PRFL 	Logic address: 1A09 hex = 6665 Factory setting: [Not Configured] UNCG	Type: WORD (Enumeration) Read/write: R
PPO profile used This parameter is used to select the actual profile for the device. This parameter can be: <ul style="list-style-type: none"> • [Not Configured] • [100] • [101] • [102] • [106] • [107] 		

HMI label	Setting	
[DP Master Active] DPMA 	Logic address: 1A0A hex = 6666 Factory setting: [Master 1] 1	Type: WORD (Enumeration) Read/write: R
DP Master active This parameter displays the active PROFIBUS DP master. This parameter can be: <ul style="list-style-type: none"> • [Master 1] : Use cyclical communication to exchange process data with its associated devices. • [Master 2] : Used to set device parameters via acyclical communication. 		
[Fieldbus Error] EPF2 	Logic address: FBBA hex = 64442	Type: WORD (Enumeration) Read/write: R
External error detected by Fieldbus An external error has been triggered. The parameter can be: <ul style="list-style-type: none"> • Bit 0: Invalid IP settings • Bit 1: Detected duplicated IP • Bit 2: FDR error • Bit 3: Current configuration not compatible with requested Assembly • Bit 4: Configuration file error • Bit 5-7: (reserved) • MSB (Bit 8-15): if the bit 4=1, the value equals to the error code. 		
[Fieldbus Com Interrupt] CNF 	Logic address: 1BE8 hex = 7144	Type: UINT (Unsigned16) Read/write: R
Fieldbus communication interruption This error is caused by the timeout and appears when the communication is stopped or interrupted with the option module. The parameter can be: <ul style="list-style-type: none"> • 0: No error detected • 1: Network timeout for received requests destined for the soft starter • 2: Identification error between the device and the controller • 3: Controller in clear mode • 4: Controller class 2 timeout 		

HMI label	Setting	
[InternCom Error1] ILF1 	Logic address: 1BDE hex = 7134	Type: UINT (Unsigned16) Read/write: R
<p><i>Internal communication interruption 1</i></p> <p>Communication interruption between the option module and the soft starter.</p> <p>The parameter can be:</p> <ul style="list-style-type: none"> • 0 No error detected • 1 Internal communication interruption with the soft starter • 2 Hardware error detected • 3 Error found in the EEPROM checksum • 4 EEPROM • 5 Flash memory • 6 RAM memory • 7 NVRAM memory • 101 Unknown module • 102 Communication interruption on the soft starter internal bus • 103 Time out on the soft starter internal bus (500 ms) 		

Most Common parameters

For more information about the Communication Parameter Addresses, please refer to the [ATS490 Communication Parameter Addresses](#), page 12.

NOTE: Cannot write cyclically configuration parameters (as the device can remain in **[Freewheel]** [NST](#)) tagged by R/WS.

Base Monitoring

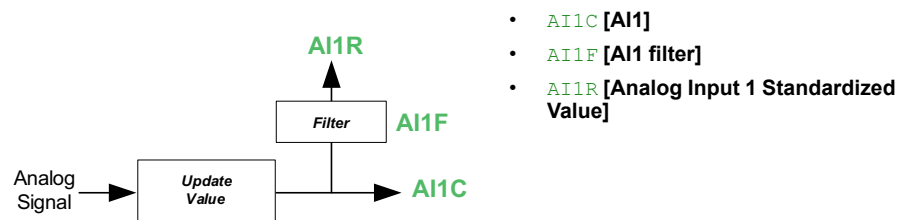
Code	Settings	
[Motor Current] LCR	Logic address: 0C84 hex = 3204	Type: UINT (Unsigned16) Read/write: R Unit: 0.1 A. or 1 A according to the soft starter rating.
Motor current RMS Motor current. Average of the three line currents based on the measurement of the fundamental of the motor line currents.		
[Motor Therm State] THR	Logic address: 259E hex = 9630	Type: UINT (Unsigned16) Read/write: R Unit: 1 %
Motor thermal state This parameter monitors the motor thermal state. 100% corresponds to the nominal thermal state at the nominal motor current set to [Motor Nom Current] .		
[Motor Run Time] RTH via communication	Logic address: 0CAC hex = 3244	Type: UINT (Unsigned32) Read/write: R Unit: 1 s
Motor run time This parameter monitors how long the motor has been energized.		
[Motor Run Time] RTHH via Display Terminal	Logic address: 0CCA hex = 3274	Type: UINT (Unsigned32) Read/write: R/WS Unit: 1 s
Motor run time This parameter monitors how long the motor has been energized.		
[Elc Energy Cons] OCK	Logic address: 299C hex = 10652	Type: UINT (Unsigned32) Read/write: R Unit: kWh
Electrical energy consumed by the motor (kWh) This parameter monitors how much energy consumed by the motor in kWh.		


Digital I/O

Code	Settings	
[Logic Inputs States] IL1R	Logic address: 1452 hex = 5202	Type: WORD (BitString16) Read/write: R Unit: -
<p>Logic inputs states This parameter is used to monitor the real value of the [Logic Inputs States].</p> <ul style="list-style-type: none"> • Bit0 : "DI1" Digital inputs real image • Bit1 : "DI2" Digital inputs real image • Bit2 : "DI3" Digital inputs real image • Bit3 : "DI4" Digital inputs real image <p>NOTE: The status of inputs can be read via [Logic Inputs States] IL1R to which a position or level sensor has been wired.</p>		
[Logic Outputs States] OL1R	Logic address: 145C hex = 5212	Type: WORD (BitString16) Read/write: R/W Unit: -
<p>Logic outputs states This parameter is used to write output value or monitor the value depending on if a function is assigned to the corresponding output:</p> <ul style="list-style-type: none"> • Bit0 : "R1" relay real image • Bit1 : "R2" relay real image • Bit2 : "R3" relay real image • Bit8 : "DQ1" Digital outputs real image • Bit9 : "DQ2" Digital outputs real image <p>NOTE: To write an output through communication, no function should be assigned to the corresponding output. Otherwise, writing on the bit linked to the corresponding output has no impact. If an error is triggered, outputs written through communication returns to 0.</p> <p>NOTE: It is only possible to write the output through the active command channel. Consequently, forced outputs can not be disabled on local channel (such as display terminal).</p>		

Analog input

The following diagram explains how the analog input works:



Code	Settings	
[AI1] AI1C	Logic address: 147A hex = 5242	Type: INT (Signed16) Read/write: R Unit: -
Physical value AI1 This parameter is used to monitor the real value of the [AI1]. <ul style="list-style-type: none"> • [PTC] (0.01kOhm) • [KTY] (1 Ohm) • [PT100]: PT100 (0.1 Ohm) • [PT100 in 3 wires]: PT100 in 3 wires (0.1 Ohm) • [PT1000]: PT1000 (1 Ohm) • [PT1000 in 3 wires]: PT1000 in 3 wires (1 Ohm) 		
 [AI1 filter] AI1F	Setting range: 0...10 s Factory setting: 0 s Logic address: 1164 hex= 4452	Type: UINT (Signed16) Read/write: R/W Unit: seconds
AI1 filter This parameter sets the cutoff time of the low filter for PTC1/AI1. The low pass filter aims to suppress electrical noise and avoid interference issue in the input signal.		
[Analog Input 1 Standardized Value] AI1R	Logic address: 1470 hex= 5232	Type: INT (Signed16) Read/write: R Unit: -
Analog input 1 standardized value Real image of AI1 consumed by functions.		

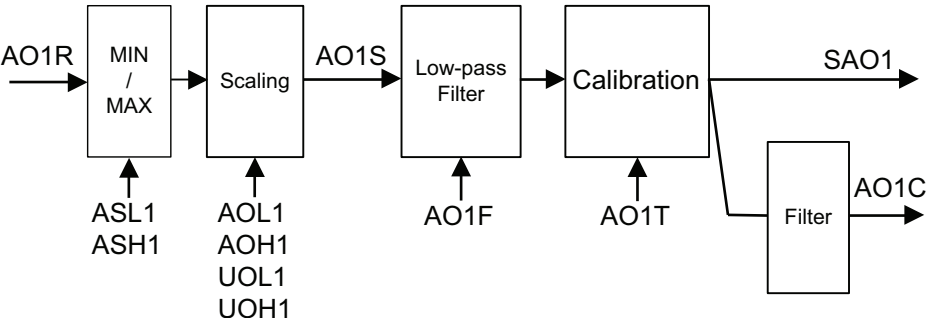
Analog outputs

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

NOTE: To write an output through communication, no function should be assigned to the corresponding output. Otherwise, writing on the register linked to the corresponding output has no impact. If an error is triggered, outputs written through communication returns to 0.

NOTE: It is only possible to write the output through the active command channel. Consequently, forced outputs can not be disabled on local channel (such as display terminal).

The following diagram explains how the analog output works:



- AO1R [Analog Output 1 Standardized Value]
- ASL1 [Scaling AQ1 Min]
- ASH1 [Scaling AQ1 Max]
- AOL1 [AQ1 min output]
- AOH1 [AQ1 max output]
- UOL1 [AQ1 min Output]
- UOH1 [AQ1 max Output]
- AO1S [AQ1 Scaling]
- AO1F [AQ1 Filter]
- AO1T [AQ1 Type] : is too select between mA and V.
- SAO1 [AO1 Physical Value Without Filter]
- AO1C [AQ1]

Code	Settings	
[Analog Output 1 Standardized Value] AO1R	Logic address: 148D hex = 5261	Type: INT (Signed16) Read/write: R/W Unit: -
Analog output 1 standardized value This parameter is used to read and write a value on AO1. Real image of AO1 consumed by functions.		
[AQ1] AO1C	Logic address: 1497 hex = 5271	Type: INT (Signed16) Read/write: R/W Unit: -
AQ1 physical value This parameter is used to read and write a value, readable on display terminal.		

Operation

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Profile

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

Two functional profiles are supported by the Altivar Soft Starter:

- Standard Profile via **[Control Mode]** set to **[Standard Profile]**.
- I/O Profile via **[Control Mode]** set to **[I/O profile]**.

Standard Profile

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.

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

I/O Profile

This profile supported by all channel commands. It mirrors the use of the terminal by allowing to use 1 bit of command register to activate a function.

- I/O profile can also be used when controlling via a fieldbus.
- N bits of **Command register** can be assigned to a specific function.
 - N from 1 to 15 if 2 wires control
 - N from 2 to 15 if 3 wires control.
- **Status Register** is standardized as **[Standard Profile]**.
- According to command sent via **Command register** to operating states diagram, a **Status Register** is updated.

Configuration of the Soft starter command channel according to the selected Profile

This section describes how to configure the command channel settings of the soft starter.

In order to switch in **[Standard Profile]**, **[Expert]** level access should be configured.

The active command channel is then defined by CD1 or CD2 according to **[Command Switching]** (expected if forced local feature is used).

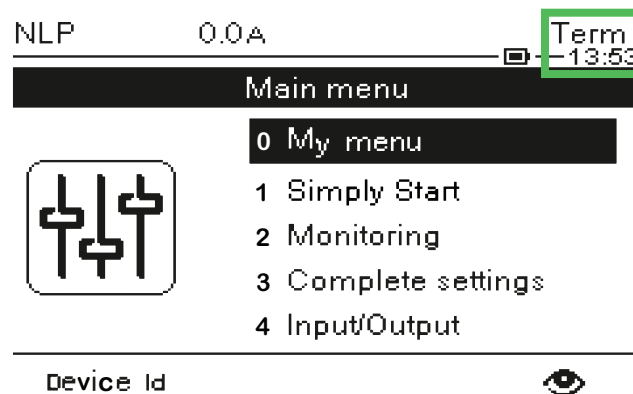
NOTE: for more information about **[Forced Local Assign]** and **[HMI L/R cmd]**, refer to the user manual.

Command Channel

In the **[Complete settings]** menu, **[Command channel]** submenu the user can set the following value to **[Cmd channel 1]** and **[Cmd channel 2]**:



- Terminal board.
- Graphic display terminal.
- Embedded Modbus RTU.
- CANopen option module.
- Other fieldbus option module.
- Embedded Ethernet.

On the right-top of the graphic display terminal screen, the information of the active command is displayed:



With **[Command Switching]**, user chooses which channel takes the command of the device by switching between **[Cmd channel 1]** and **[Cmd channel 2]**.

Access path: **[Complete settings]** → **[Command channel]**

Code	Settings	
[Command Switching]  CCS	Logic address: 20E5 = 8421	Type: WORD (Enumeration) Read/write: R/WS
Command switching <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <div style="text-align: center;">⚠ WARNING</div> <div> UNANTICIPATED EQUIPMENT OPERATION This parameter can cause unintended movements, for example, inversion of the direction of rotation of the motor, sudden acceleration or stops. <ul style="list-style-type: none"> • Verify that the setting of this parameter does not cause unintended movements. • Verify that the setting of this parameter does not result in unsafe conditions. Failure to follow these instructions can result in death, serious injury, or equipment damage. </div> </div> <p>This parameter sets which channel takes the command of the soft starter.</p> <ul style="list-style-type: none"> • [Cmd channel 1]: Channel 1 is the command channel (in this case, switching between [Cmd channel 1] and [Cmd channel 2] is not possible). • [Cmd channel 2]: Channel 2 is the command channel (in this case, switching between [Cmd channel 1] and [Cmd channel 2] is not possible). • [DI•] : Command channel switching assigned to digital input. • [Cy••] : Command channel switching assigned to line channel. <p>NOTE: PROFibus fieldbus, use [C3••].</p> <p>When assigned to a digital input:</p> <ul style="list-style-type: none"> • [Cmd channel 1] active at low level. • [Cmd channel 2] active at high level. 		
[Active Command Channel]  CCC	Logic address: 20FA = 8442	Type: WORD (BitString16) Read/write: R
Active command channel Reading this value allows to monitor which is the active command channel who is controlling the device. <ul style="list-style-type: none"> • Bit0 = 1 : Terminal board. • Bit2 = 1 : Display Terminal. • Bit3 = 1 : Embedded Modbus RTU. • Bit6 = 1 : CANopen option module. • Bit9 = 1 : Other fieldbus option module. • Bit11 = 1 : Embedded Ethernet. • Bit15 = 1 : SoMove (via control panel). 		

Command Register and Status — [Standard Profile]

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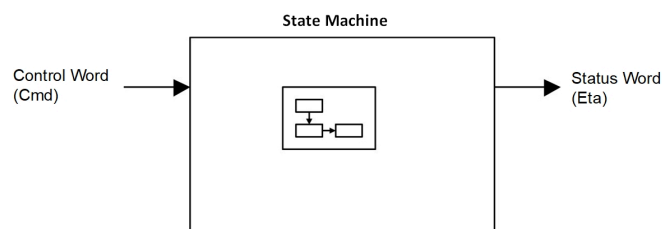
Functional Description

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:

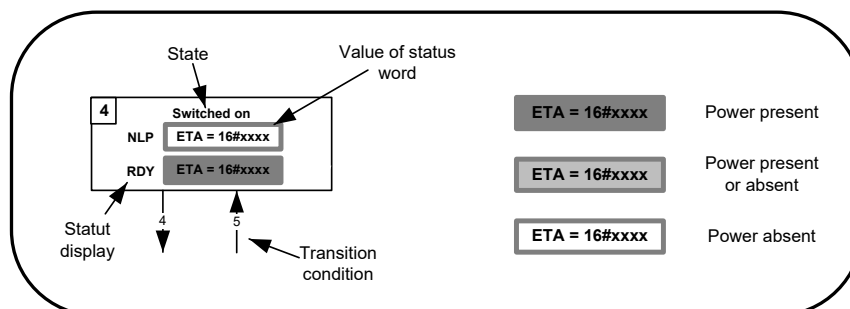
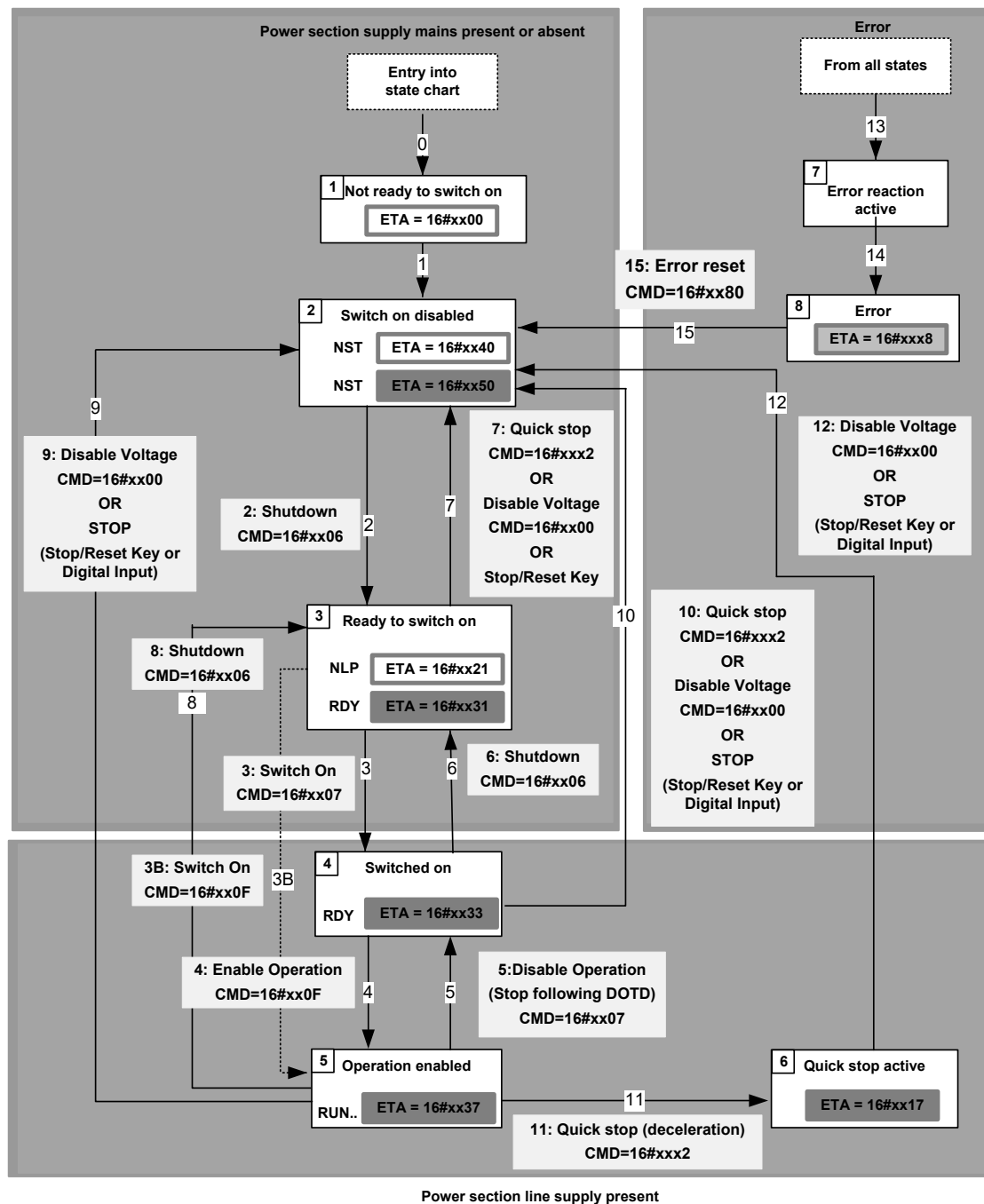


Operating State Diagram in [Standard Profile]

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 Profile]** state diagram:



NOTE: The transition 3B is possible but not included in the CIA402 operating state diagram.

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	Yes, during deceleration	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.
- An adjustment parameter can be accessed in all operating state of the soft starter.

Description of Operating States in [Standard Profile]

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 Register]** [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 **[Status Register]** [ETA](#). For more information, refer to the **[Status Register]** [ETA](#) chapter.

Operating State	Description
1 - Not ready to switch on	<ul style="list-style-type: none"> • Initialization starts. This is a transient state invisible to the communication network.
2 - Switch on disabled	<ul style="list-style-type: none"> • The power stage L1/L2/L3 is not ready to switch on. • The control stage A1/A2 must be supplied to set the configuration and adjustment parameters. • The soft starter is locked, no power is supplied to the motor.
3 - Ready to switch on	<ul style="list-style-type: none"> • The power stage L1/L2/L3 is ready to switch on. • With the control stage A1/A2 supplied, it is not necessary to supply the power stage, but the system expects it in order to change to state 4 - Switched on • The soft starter is locked, no power is supplied to the motor. • The configuration and adjustment parameters can be modified.
4 - Switched on	<ul style="list-style-type: none"> • Power stage is switched on. • The power stage of the soft starter is ready to operate, but voltage has not yet been applied to the output. • The adjustment parameters can be modified. <p>NOTE: By default, Relay R1 [R1 Assignment] is set to [Operating State Fault] then the mains contactor is closed. The soft starter is locked, no power is supplied to the motor.</p> <p>NOTE: If mains contactor is wired on a relay ([R1 Assignment], [R2 Assignment] or [R3 Assignment] is set to [Mains Contactor]), we reach temporarily this state once Run command is applied and mains contactor is closed allowing presence of power stage before switching to 5 - Operation enabled.</p> <p>For more information about Starting sequence, refer to Starting Sequence, page 54.</p>

Operating State	Description
5 - Operation enabled	<ul style="list-style-type: none"> Power stage is enabled. The soft starter is in running state. For a separate control stage with mains contactor, the contactor is closed. The soft starter is unlocked, power is supplied to the motor. The soft starter functions are activated and voltage is applied to the motor terminals. If the Halt command is applied, no power is supplied to the motor expect in preheating. The adjustment parameters can be modified. The configuration parameters cannot be modified. From this state the reaction of the soft starter to a Disable operation command depends on the value of the [SwitchOnDisable Stp] DOTT parameter: <ul style="list-style-type: none"> If the [SwitchOnDisable Stp] DOTT parameter is set to 0, the soft starter changes to operating state 4 - <i>Switched on</i> and stops in freewheel stop. If the [SwitchOnDisable Stp] DOTT parameter is set to 1, the soft starter stops following to the [Type of stop] and then changes to operating state 4 - <i>Switched on</i>.
6 - Quick stop active	<ul style="list-style-type: none"> The soft starter performs a deceleration ramp. After the motor has stopped, the soft starter switches to state 2 - <i>Switch on disabled</i>.
7 - Fault reaction active	<ul style="list-style-type: none"> Transient state during which the soft starter performs a stop due to a detected error. If behavior of the detected error is configurable, then the reaction will depend on setting of its error response.
8 - Fault	<ul style="list-style-type: none"> End of the stop caused by change to the previous state 7 - <i>Fault reaction active</i>. 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>. The soft starter function is disabled.

Command Register in [Standard Profile]

[Cmd Register] is used to control the product defined as followed:

	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Function	Switch	Enable / Disable voltage	Quick Stop	Operation Run command	Reserved			Error reset request
Bit at 0	Off.	Disable.	Activate.	Disable.				Active on rising edge.
Bit at 1	On.	Enable.	Deactivate.	Enable.				

	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15
Function	Halt command	Reserved		Reverse Direction request (1) NOTE: for more information about Reverse function, refer to the user manual.	Manufacturer specific assignable	Dynamic braking stop (1)	Decelerated stop order (1)	Manufacturer specific assignable
Bit at 0	Request not sent.			Deactivate.		Deactivate.	Deactivate.	
Bit at 1	Stop following [Type of stop].			Activate.		Activate.	Activate.	

(1) The Bit can be set to an other function (factory setting).

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

Bit Mapping of the Control Word

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	
<i>Shutdown</i>	2, 6, 8	3 - Ready to switch on	X	X	1	1	0	0006 hex
<i>Switch on</i>	3	4 - Switched on	X	X	1	1	1	0007 hex
<i>Enable operation</i>	4	5 - Operation enabled	X	1	1	1	1	000F hex
<i>Disable operation</i>	5	4 - Switched on	X	0	1	1	1	0007 hex
<i>Disable voltage</i>	7, 9, 10, 12	2 - Switch on disabled	X	X	X	0	X	0000 hex
<i>Quick stop</i>	7, 10, 11	6 - Quick stop active	X	X	0	1	X	0002 hex
<i>Fault reset</i>	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.

Status Word

[Status Register] is used to gives status register as followed:

Code	Settings	
[Status Register] <i>ETA</i>	Logic address: 0C81 hex = 3201	Type: WORD (BitString16) Read/write: R Unit: -
Status Register		

	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Function	<i>Ready to Switch on</i>	<i>Switched on</i>	<i>Operation enabled Running</i>	<i>Detected error</i>	<i>Voltage enabled</i>	<i>Quick stop</i>	<i>Switch on disabled</i>	<i>Warning</i>
Bit at 0	Not ready.	Not ready.	Not running.	No error.	Power stage supply absent.	Active.	Not active. Power section line supply opened.	No warning.
Bit at 1	Ready.	Ready.	Running.	Error is present.	Power stage supply present.	Not active.	Active. Power section line supply locked.	Warning is present.

	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15
Function	Reserved	<i>Local channel active</i>	Reserved				<i>Stop imposed by STOP key on graphic display terminal</i>	<i>Direction</i>
Bit at 0		Active.					Activate.	Forward.
Bit at 1		Not active.					Deactivate.	Reverse.

Bit Mapping of the Status Word

Operating State	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	ETA Masked by 006F H ⁽¹⁾
	Switch On Disabled	Quick Stop	Voltage Enabled	Fault	Operation Enabled	Switched On	Ready to Switch On	
2 -Switch on disabled	1	0	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	0	1	0	1	1	1	0037 hex
6 -Quick stop active	0	0	1	0	1	1	1	0017 hex
8 -Fault	X	X	X	1	0	0	0	xxx8 hex ⁽²⁾ ... xx28 hex
⁽¹⁾ This mask can be used by the PLC program to test the diagram state. ⁽²⁾ Detected error following operating state 6 - <i>Quick stop active</i> . X: In this state, the value of the bit can be 0 or 1.								

Stop and Halt Commands

BIT 13 and BIT 14 of Command register

Only available if [Control Mode] is set to [Standard Profile]. When **dynamic braking stop** or **decelerated stop order** is activated, the soft starter performs a **braked stop** or a **decelerated stop** and remains locked in the operating state 5 - *Operation enabled*.

BIT 8 : Halt command

Only available if [Control Mode] is set to [Standard Profile]. 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] `STT` parameter.

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

I/O Profile

I/O Profile via **[Control Mode]** is set to **[I/O profile]**.

As well as physical digital inputs commanding the soft starter in terminal command, the soft starter can be commanded by line channel and each bit of the control word can be assigned to a dedicated function if the bit is free. **[I/O profile]** makes it possible to go from 4 physical digital inputs to 16 virtual digital inputs.

NOTE: The customer must monitor the **[Device State]** **HMI S**.

NOTE: When communication is used to control the soft starter and **[2/3-Wire Control]** is set to **[3-Wire Control]** / **[Hardwired ctrl mode]**, DI1 must be connected to the +24V

Code	Settings	
[Cmd Register] CMD	Logic address: 2135 hex = 8501	Type: WORD (BitString16) Read/write: R/W
Command register If the [2/3-Wire Control] parameter is set to : <ul style="list-style-type: none"> • [2-Wire Control], the Command register bits are: <ul style="list-style-type: none"> ◦ Bit0 : Run enable + Forward Direction ◦ Bit1 to Bit15 : Free • [3-Wire Control] / [Hardwired ctrl mode] , the Command register bits are: <ul style="list-style-type: none"> ◦ Bit0 : Run enable ◦ Bit1 : Forward Direction ◦ Bit2 to Bit15 : Free 		

A function input can be assigned to:

- A virtual input (Cd00 to Cd15) according to the active command channel, corresponding bit of the control word or digital input of the terminal must be used to activate / deactivate the function.
- A terminal input (DI1 to DI4) irrespective of the active command channel, the function can be activated / deactivated using the corresponding digital input (exception for some function that requires to have the terminal as active command channel to activate / deactivate the function).

The function **[Command Switching]** can be activated / deactivated, irrespective of the active command channel, using the corresponding bit of a terminal input or of the control word **[Cy••]**:

- A modbus control word (**[C100]** to **[C115]**)
- A CANopen control word (**[C200]** to **[C215]**).
- A fieldbus module, such as PROFIBUS, control word (**[C300]** to **[C315]**).
- An embedded ethernet control word (**[C500]** to **[C515]**)

Bit	Fixed assignments		
	Virtual Inputs	Terminals	PROFIBUS
bit 0	Cd00	DI1	C300
bit 1	Cd01	DI2	C301
bit 2	Cd02	DI3	C302
bit 3	Cd03	DI4	C303
bit 4	Cd04	-	C304
bit 5	Cd05	-	C305
bit 6	Cd06	-	C306
bit 7	Cd07	-	C307

Bit	Fixed assignments		
	Virtual Inputs	Terminals	PROFIBUS
bit 8	Cd08	-	C308
bit 9	Cd09	-	C309
bit 10	Cd10	-	C310
bit 11	Cd11	-	C311
bit 12	Cd12	-	C312
bit 13	Cd13	-	C313
bit 14	Cd14	-	C314
bit 15	Cd15	-	C315

Switched assignment

When **[Control Mode]** is set to **[I/O profile]**, the transition of the active command channel to fieldbus does not follow the configuration of the parameters **[2/3-Wire Control]** and **[2-wire type]**. An immediate start will be observed if a run command is active on the **[Cmd Register]** **CMD**.

⚠ WARNING

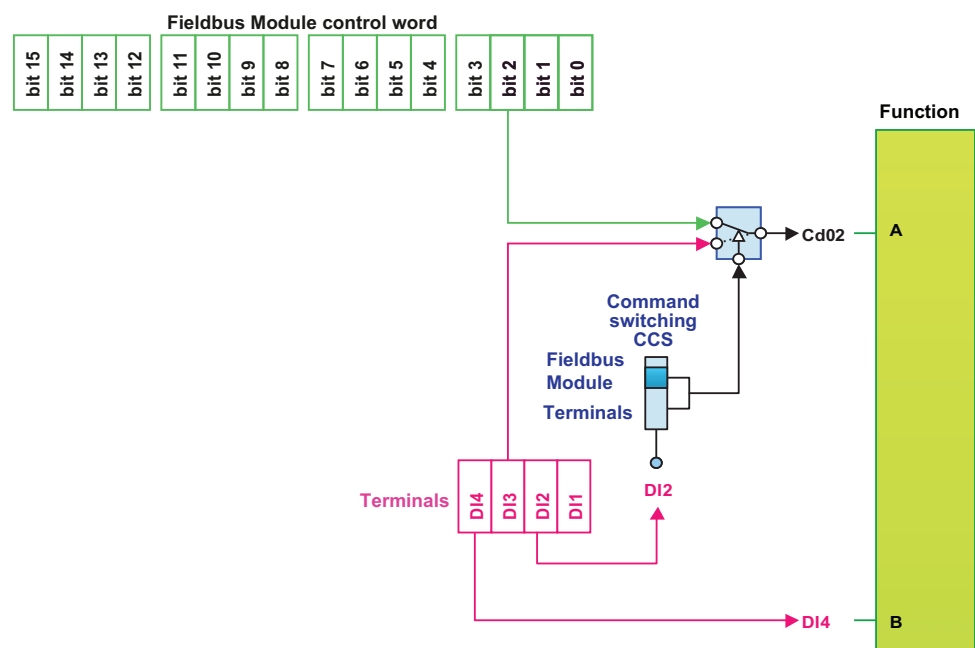
UNANTICIPATED EQUIPMENT OPERATION

- Verify that this behavior does not result in unsafe conditions by performing extensive commissioning tests.
- If the start on transition is not desired, the bits corresponding to the run command must always be reset before switching the active command channel to fieldbus.

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

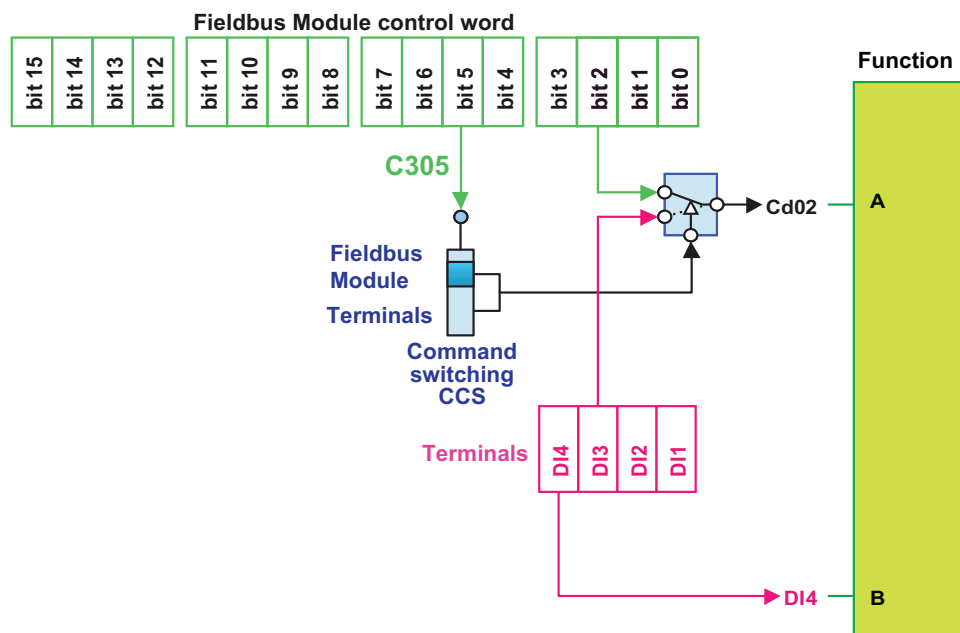
Example with:

- **[Command Switching]** managed by digital input.
- A function assigned to a switched bit (here **CD02**).
- B function assigned to a digital input (here **DI4**).
- **[Cmd channel 1] = [Com. Module]**.
- **[Cmd channel 2] = [Terminal]**.



Example with:

- **[Command Switching]** managed by control word (here **C305**).
- A function assigned to a switched bit (here **CD02**).
- B function assigned to a digital input (here **DI4**).
- **[Cmd channel 1] = [Com. Module]**.
- **[Cmd channel 2] = [Terminal]**.



When a function is assigned to a switched bit (Cd00 to Cd15), the function can be activated via Terminals or selected communication channel according to the active command channel. To switch between Terminals and communication modules, use **[Command Switching]** function.

NOTE: A single function can be assigned to a bit at the same time, here as **[C305]** is assigned to **[Command Switching]**, Cd05 cannot be assigned to another function.

Exemple: I/O profile with monitoring of tank by flow sensors

In this example, a PLC is used to monitor the water level in a tank.

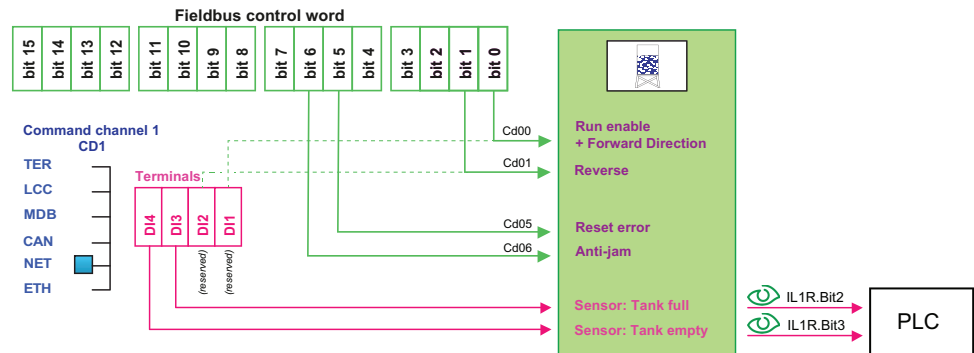
The soft starter is used to manage some functions as anti-jam.

The PLC and the soft starter are connected via a PROFIBUS network. The PLC controls the operation of the installation via the PROFIBUS bus.

Configuration

- **[Control Mode]** is set to **[I/O profile]**.
- **[2/3-Wire Control]** set to **[2-Wire Control]**.
- **[Reverse Assign]** set to **[CD01]**
- **[Fault Reset Assign]** set to **[CD05]**
- **[Ext Anti-Jam Trigger]** set to **[CD06]**.
- **[Cmd channel 1]** set to **[Com. Module]**.

Configuration schematic diagram:



NOTE: Some digital inputs are reserved because bits are already assigned.

In our example:

- Cd00 is assigned to **Run enable + Forward direction**.
- Cd01 is assigned to **Reverse**.

➔ DI1 and DI2 cannot be assigned.

Extended Control Word and Internal State register in [Standard Profile] & [I/O Profile]

What's in This Chapter

Extended Control Word.....	52
Internal State register	53

Extended Control Word

When a configuration parameter is modified by fieldbus, it is not stored automatically in the EEPROM. The value will be lost after a power cycle if the request to store the new configuration has not been done.

⚠ WARNING

LOSS OF PARAMETER CONFIGURATION AFTER A POWER CYCLE

Bit 1 of **[Extended Control Word]** CMI must be written at 1 each time the configuration is modified by fieldbus.

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

NOTE: Do not write **[Extended Control Word]** BITs cyclically (especially BIT 1), as this may damage the EEPROM.

[Extended Control Word] is used to control the product defined as followed:

Code	Settings
[Extended Control Word] CMI	Logic address: 2138 hex = 8504 Type: WORD (BitString16) Read/write: R/W Unit: -
Extended control word	

	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Function	Restore factory settings	Store customer parameters	Restore saved customer parameters	External error	Reserved			
Bit at 0	Active on rising edge when motor is powered off.	Active on rising edge.	Active on rising edge when motor is powered off. Once request is considered, this bit is automatically reset.	Active on rising edge.				
Bit at 1	Once request is considered, this bit is automatically reset.	Once request is considered, this bit is automatically reset.						

	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12 In [Standard Profile]:	Bit 12 In [I/O profile]:	Bit 13	Bit 14	Bit 15
Function	Reserved				Reverse direction request	Reserved	Lock device when motor stopped	Reserved (must always be set to 0).	Disable parameter consistency check
Bit at 0					Request not sent.		Deactivate.		All parameters are validated.
Bit at 1					Request sent. Motor can start in reverse direction (only if CMD bit 11 is assigned to specific function other than reverse).		Activate.		No check of parameter consistency and device is locked when stopped.

Internal State register

[Internal State Reg] is used to gives the extended internal status register as followed:

Code	Settings	
[Internal State Reg] <i>ETI</i>	Logic address: 0C86 hex = 3206	Type: WORD (BitString16) Read/write: R Unit: -
Internal State register		

	Bit 0	Bit 1	Bit 2	Bit 3
Function	Write parameter authorization	Parameter consistency check	Starter reset authorization	Motor preheating
Bit at 0	Access to the non-volatile memory stopped.	Not active.	The device: <ul style="list-style-type: none"> is not in operating state "Error" is in operating state "Error" and the error is active. 	Not active.
Bit at 1	Access to the non-volatile memory in progress.	Active.	The device is in operating state "Error" and the error is no longer active (not reset).	Active.

	Bit 4	Bit 5	Bit 6	Bit 7
Function	Motor operating status	Braking	Starter in continuous operation	Thermal overload warning:
Bit at 0	Not active.	Not active.	Transient state.	Threshold for the active motor not reached.
Bit at 1	Active.	Active.	Steady state.	Threshold for the active motor reached.

	Bit 8	Bit 9	Bit 10	Bit 11
Function	Reserved	Starter accelerating	Starter decelerating	Current limit warning
Bit at 0		Not active.	Not active.	Not active.
Bit at 1		Active.	Active.	Active.

	Bit 12	Bit 13	Bit 14	Bit 15
Function	Torque limit warning	Active mode:		Direction
Bit at 0	Not active.	<ul style="list-style-type: none"> Bit 13 = 0 + Bit 14 = 0: Device controlled by terminal Bit 13 = 1 + Bit 14 = 0: Device controlled by the display terminal Bit 13 = 0 + Bit 14 = 1: Device controlled by Embedded Modbus Bit 13 = 1 + Bit 14 = 1: Device controlled by fieldbus card 		Forward operation applied before the ramp.
Bit at 1	Active.			Reverse operation applied before the ramp.

Starting Sequence

What's in This Chapter

Sequence for a Soft starter.....55

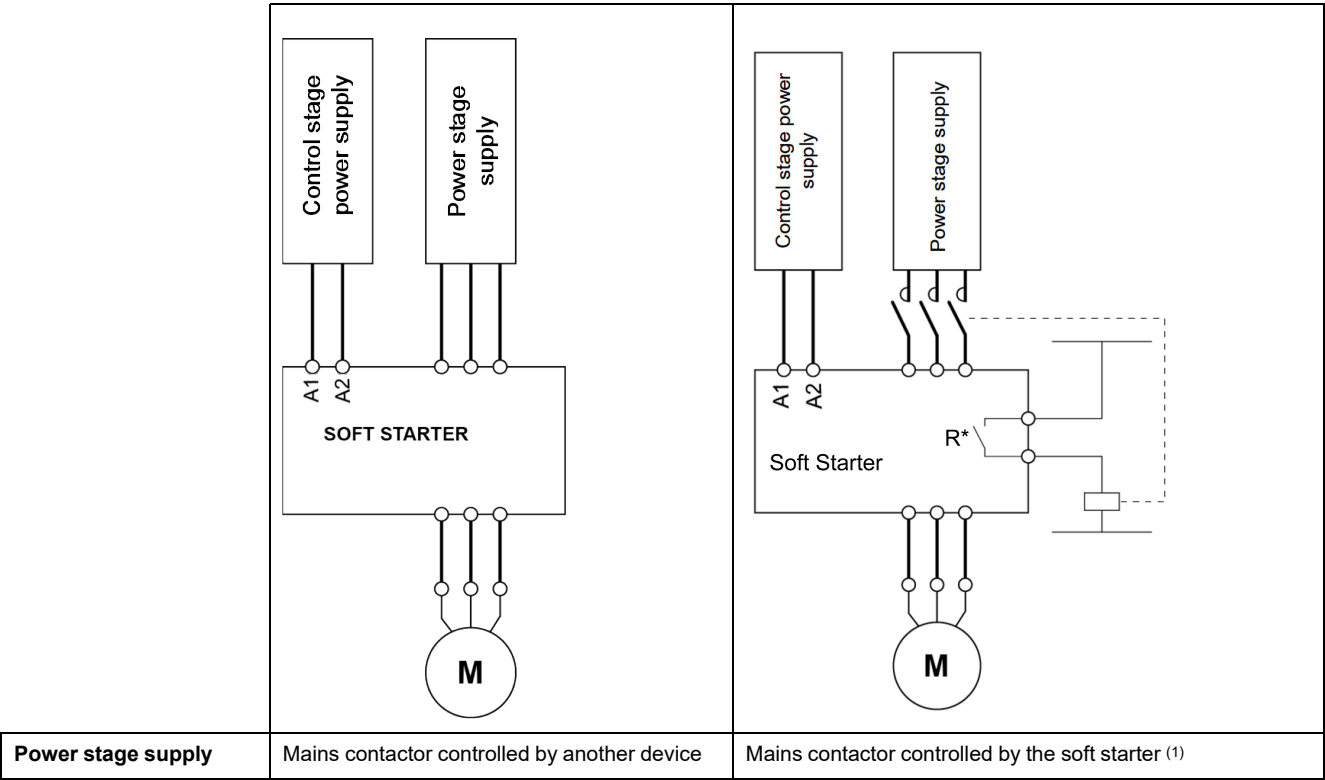
Sequence for a Soft starter with Mains Contactor Control58

Description

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

NOTE: This example is given when **[Control Mode]** is set to **[Standard Profile]**.

There are 2 possible scenarios:



NOTE:
(1) and R*: **[R1 Assignment]** R1, **[R2 Assignment]** R2 or **[R3 Assignment]** R3 assigned to **[Mains Contactor]**.
NOTE: If **[Mains Contactor]** is set to a specific relay (R1, R2 or R3) no other relay can be assigned to this function.

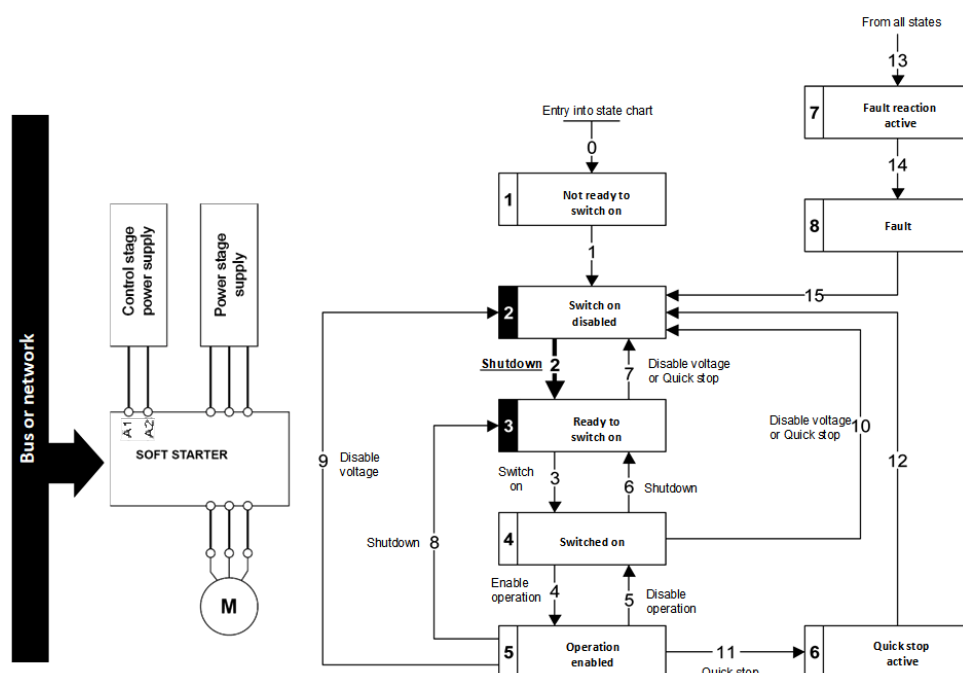
Sequence for a Soft starter

Description

Power is supplied separately to the power and control stages. The following sequence must be applied:

Step 1

- In **[Standard Profile]**, **[Cmd channel 1]** or **[Cmd channel 2]** must be set to and active.
- The power stage supply is not necessarily present.
- Apply the **2 - Shut down** transition command.

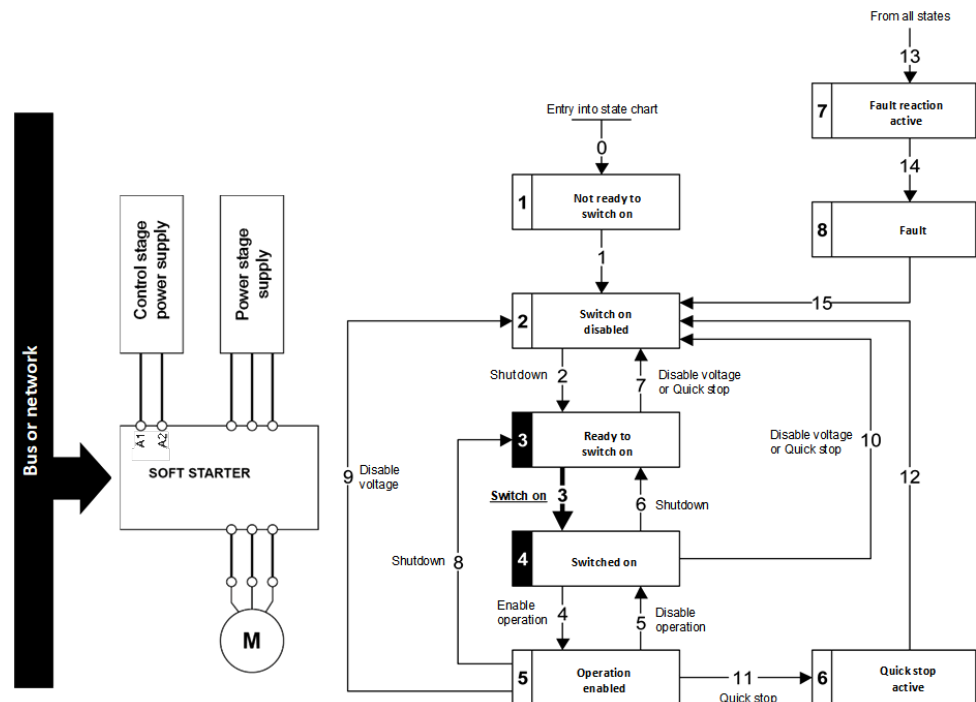


Step 2

- 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* transition command

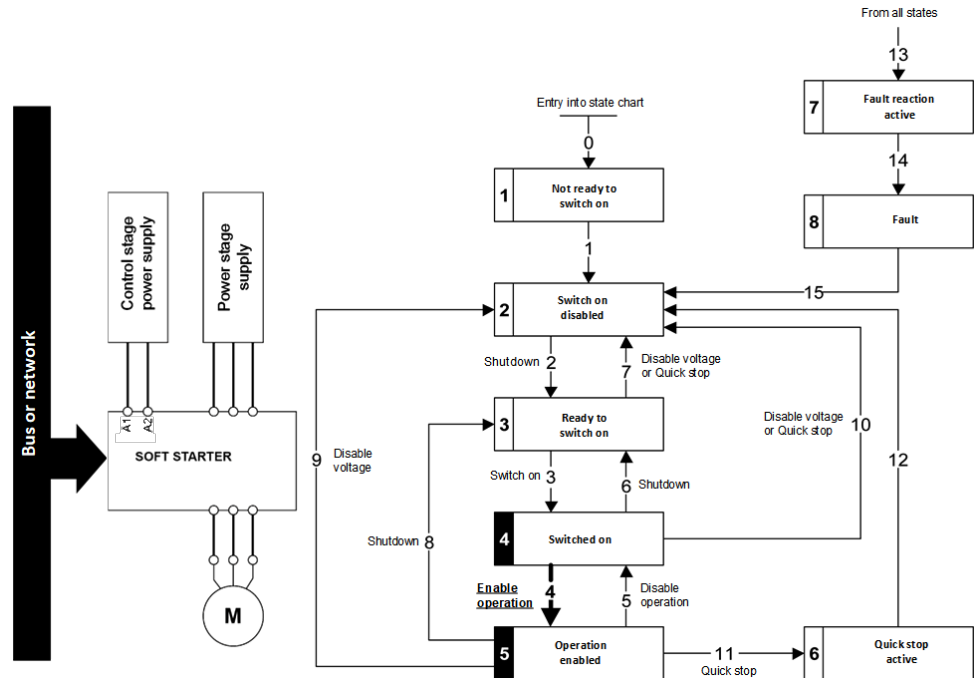


Step 3

- 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* transition command.
- The motor starts.



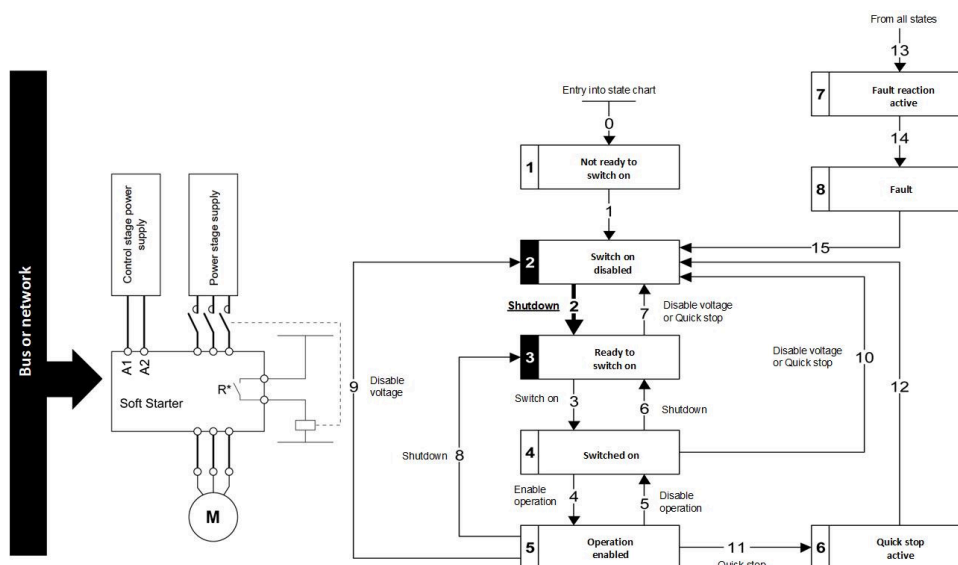
Sequence for a Soft starter with Mains Contactor Control

Description

Power is supplied separately to the power and control stages. If the soft starter controls the mains contactor the following sequence must be applied:

Step 1

- In **[Standard Profile]**, **[Cmd channel 1]** or **[Cmd channel 2]** must be set to and active.
- The power stage supply is not present as the mains contactor is not being controlled.
- Apply the 2 - *Shut down* transition command.

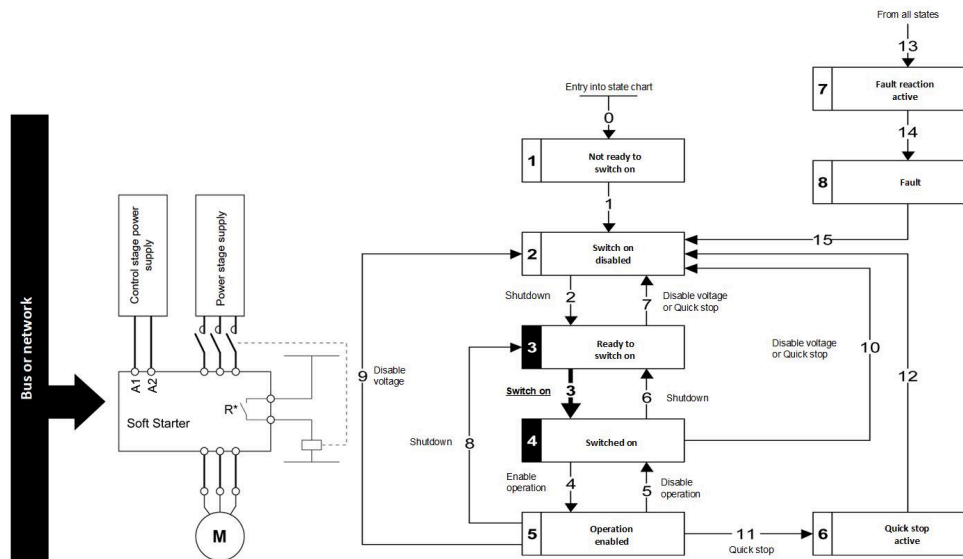


Step 2

- Check that the soft starter is in the operating state 3 - *Ready to switch on*.

Power Stage Supply	Terminal Display	Status Word
Absent	NLP	21 hex

- Apply the 3 - *Switch on* transition command.

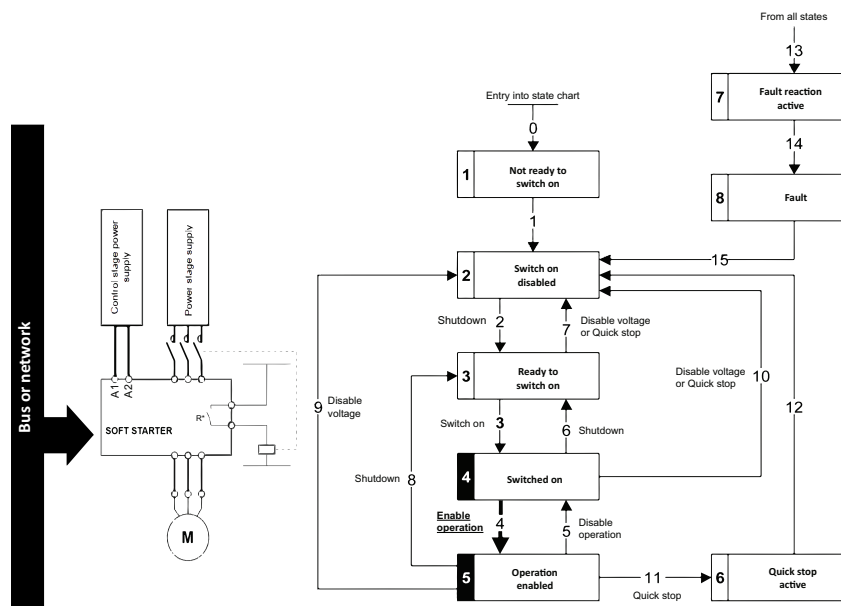


Step 3

- Apply the 4- *Enable operation* transition command which closes the mains contactor and switch on the power stage supply by giving RUN command.

NOTE: If the power stage supply is still not present in the operating state 5 - *Operation enabled* after a time delay [**Mains V. time out**], the soft starter triggers an error [**Input Contactor**].

- The motor starts.

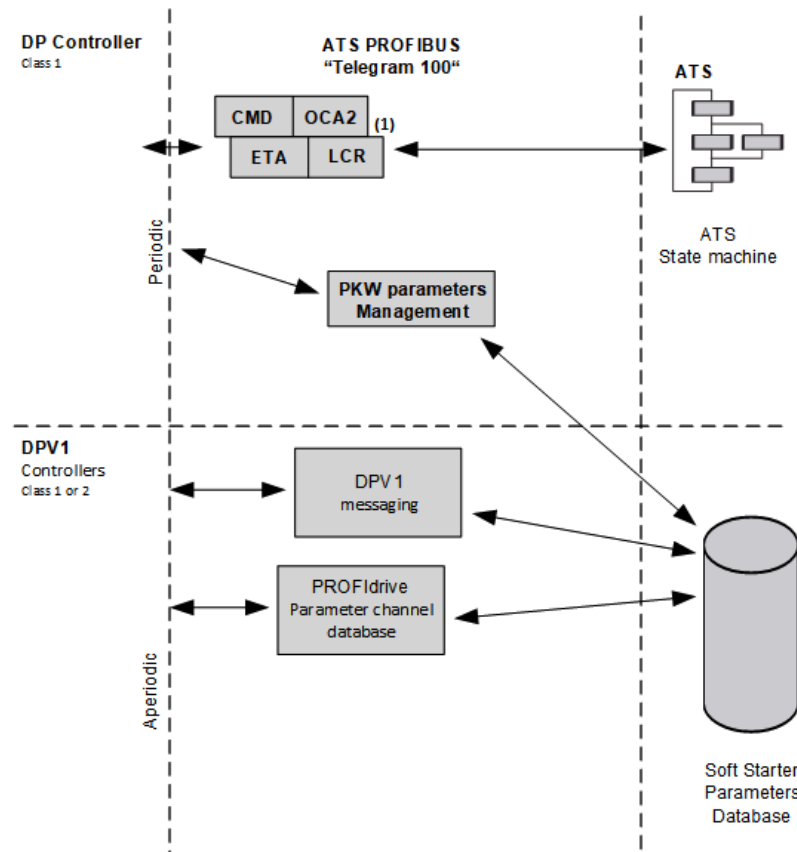


Description Telegram 100, 101, 102, 106, 107

Overview

The telegrams 100, 101, 102, 106, 107 are compliant with the native mode (CIA402 native profile).

The following diagram shows the native modes for telegram 100:

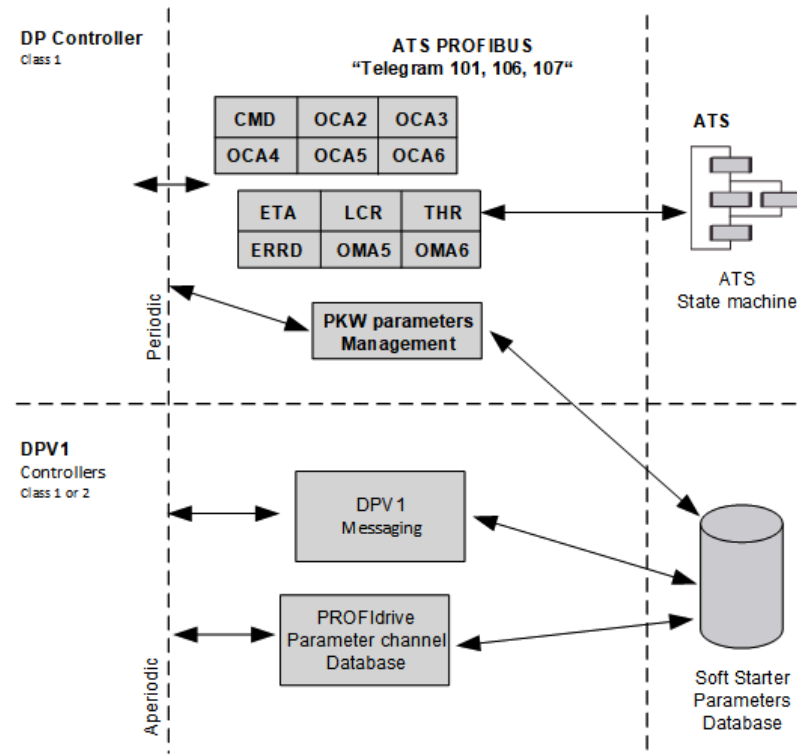


The native mode of the PROFIBUS DP VW3A3607 is used when telegram 100 is used.

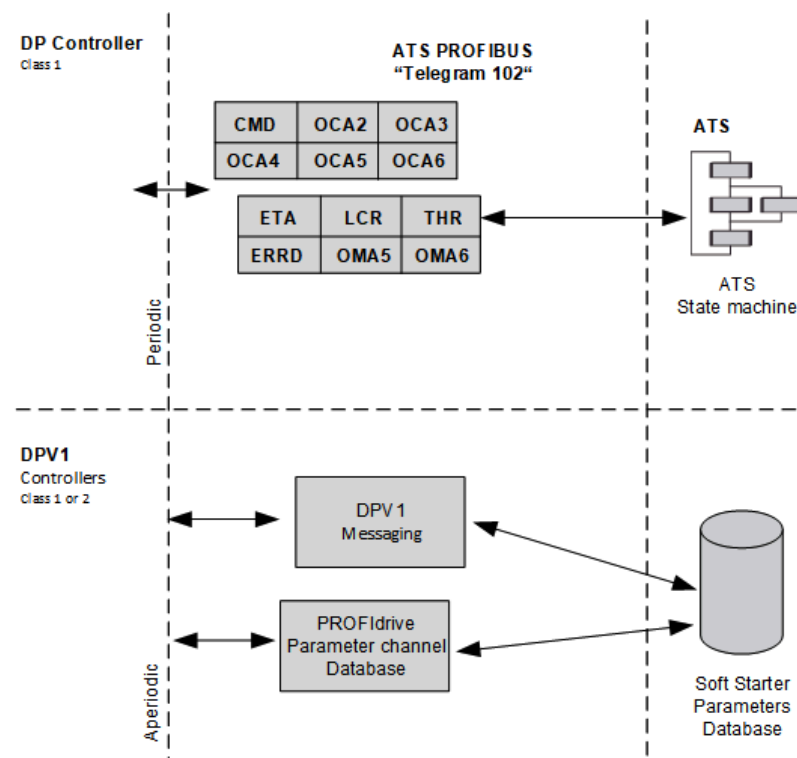
The PKW area of telegram 100, which is used for a simple parameter management, is compliant with the PKW mechanism used with the PROFIBUS DP fieldbus module.

NOTE: After switching from one telegram to another, the soft starter shall be restarted to validate the new configuration.

The following diagram shows the native modes for telegram 101, 106, 107:



The following diagram shows the native modes for telegram 102:



Periodic Exchanges

The following table provides the details of telegram 100, 101, and 102

	Telegram 100		Telegram 101		Telegram 102	
	PLC>Soft Starter	Soft Starter>PLC	PLC>Soft Starter	Soft Starter>PLC	PLC>Soft Starter	Soft Starter>PLC
PKW 1	PKE	PKE	PKE	PKE	-	
PKW 2	R/W	R/W	R/W	R/W		
PKW 3	PWE	PWE	PWE	PWE		
PKW 4	PWE	PWE	PWE	PWE		
Cyclic data 1	OCA1 address of CMD =8501*	OMA1 address of ETA =3201*	OCA1 address of CMD =8501*	OMA1 address of ETA =3201*	OCA1 address of CMD =8501*	OMA1 address of ETA =3201*
Cyclic data 2	OCA2 default =0	OMA2 address of LCR=3204*	OCA2 default =0	OMA2 address of LCR=3204*	OCA2 default =0	OMA2 address of LCR=3204*
Cyclic data 3			OCA3 default =0	OMA3 adress of THR = 9630*	OCA3 default =0	OMA3 adress of THR =9630*
Cyclic data 4			OCA4 default =0	OMA4 adress of ERRD = 8606*	OCA4 default =0	OMA4 adress of ERRD =8606*
Cyclic data 5			OCA5 default =0	OMA5 default =0	OCA5 default =0	OMA5 default =0
Cyclic data 6			OCA6 default =0	OMA6 default =0	OCA6 default =0	OMA6 default =0
*:default Modbus address.						

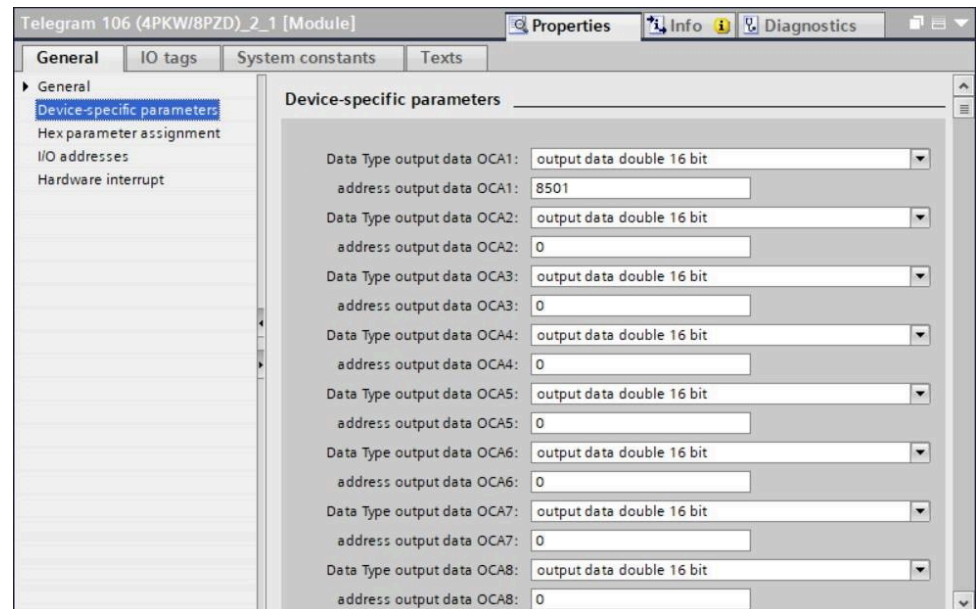
The following table provides the details of telegram 106 and 107

	Telegram 106		Telegram 107	
	PLC>Soft Starter	Soft Starter>PLC	PLC>Soft Starter	Soft Starter>PLC
PKW 1	PKE	PKE	PKE	PKE
PKW 2	R/W	R/W	R/W	R/W
PKW 3	PWE	PWE	PWE	PWE
PKW 4	PWE	PWE	PWE	PWE
Cyclic data 1	OCA1 address of CMD =8501*	OMA1 address of ETA =3201*	OCA1 address of CMD =8501*	OMA1 address of ETA =3201*
Cyclic data 2	OCA2 default =0	OMA2 address of LCR=3204*	OCA2 default =0	OMA2 address of LCR=3204*
Cyclic data 3	OCA3 default =0	OMA3 adress of THR = 9630*	OCA3 default =0	OMA3 adress of THR = 9630*
Cyclic data 4	OCA4 default =0	OMA4 adress of ERRD = 8606*	OCA4 default =0	OMA4 adress of ERRD = 8606*
Cyclic data 5	OCA5 default =0	OMA5 default =0	OCA5 default =0	OMA5 default =0
Cyclic data 6	OCA6 default =0	OMA6 default =0	OCA6 default =0	OMA6 default =0
Cyclic data 7	OCA7 default =0	OMA7 default =0	OCA7 default =0	OMA7 default =0
Cyclic data 8	OCA8 default =0	OMA8 default =0	OCA8 default =0	OMA8 default =0
Cyclic data 9			OCA9 default =0	OMA9 default =0
Cyclic data 10			OCAA default =0	OMAA default =0
Cyclic data 11			OCAB default =0	OMAB default =0
Cyclic data 12			OCAC default =0	OMAC default =0
Cyclic data 13			OCAD default =0	OMAD default =0
Cyclic data 14			OCAE default =0	OMAE default =0
Cyclic data 15			OCAF default =0	OMAF default =0
Cyclic data 16			OCAG default =0	OMAG default =0
*:default Modbus address.				

The configuration of the cyclic data is made with the PROFIBUS DP controller configuration tool. The Modbus address of the parameter linked to each cyclic data must be defined as in the following example with the HW configuration software:

Input cyclic data 1 and output cyclic data 1 / 2 / 3 / 4 are already preconfigured to **[Cmd Register]** *CMD* (8501); **[Status Register]** *ETA* (3201), **[Motor Current]** *LCR* (3204), **[Motor Therm State]** *THR* (9630) and **[CiA402 Error Code]** *ERRD* (8606).

If a null address Modbus is entered, no link between the related cyclic data and the soft starter is established. In any case, the 6 cyclic data are not disabled and the 6 cyclic data takes place in the I/O memory image of the controller.



Configuring the soft starter with TIA Portal

GSD Installation

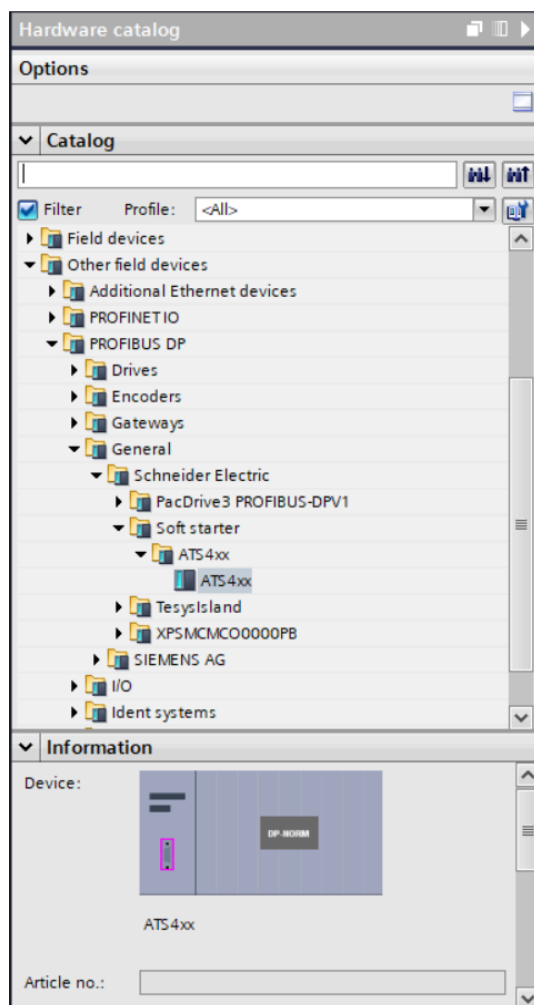
First download, and install the GSD file of the soft starter in the hardware configuration tool of the TIA Portal software.

NOTE: SIMATIC STEP7® is supported by TIA Portal.

You can find the GSD file and its associated picture on www.se.com.

From the menu > **Options** > **Install GSD File...**

Once installed you can see the soft starter, in the library, as follow:

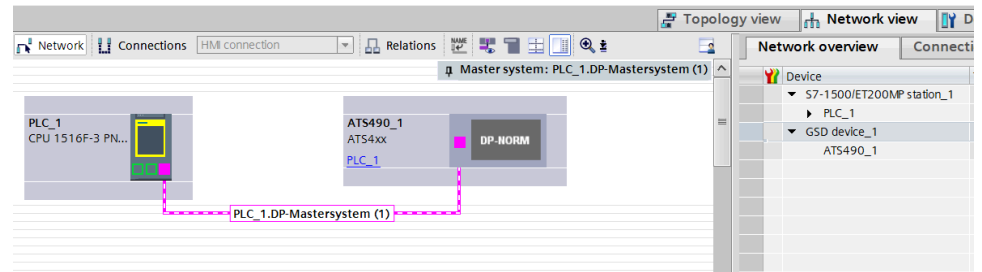


Configuration of a soft starter with the Telegram 100

Description

With this telegram, the soft starter is controlled with two process data.

Configure the PLC and its PROFIBUS DP network. Then select and place the soft starter from the library to the bus:



Define the addresses of the cyclic data (PZD) and PKW data in the PLC periphery:

Device overview									
Module	Rack	Slot	I address	Q address	Type	Article no.	Firmware	Comment	
ATS490_1	0	0			ATS4xx		Version 1.16		
Telegram 100 (4PKW/2PZD)...	0	1	264...271	266...273	Telegram 100 (4PK...				
Telegram 100 (4PKW/2PZD)...	0	2	272...275	274...277	Telegram 100 (4PK...				

NOTE: On this example, Telegram 100 Slot 1 shows the PKW and Telegram 100 Slot 2 shows the PZD.

By default, the process data are linked to **[Cmd Register]** CMD; **[Status Register]** ETA and **[Motor Current]** LCR.

Parameter	Value
address output data OCA1:	8501
address output data OCA2:	0
address input data OMA1:	3201
address input data OMA2:	3204

Check that the exchanges are working properly with the **Watch and force tables**:

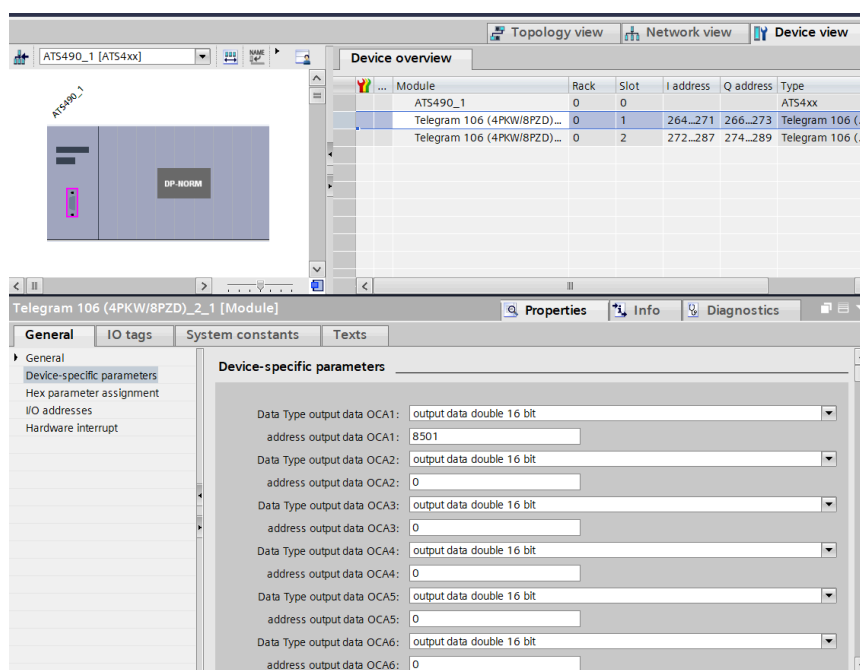
UNIT1_Siemens_V19 - PLC_1 [CPU 1516F-3 PN/DP] - Watch and force tables - Watch table_2							
	Name	Address	Display format	Monitor value	Modify value		Comment
1	"ATS490_1_CMD"	%QW274	Hex	16#000F			
2	"ATS490_1_ETA"	%IW272	Hex	16#0237			
3	"ATS490_1_LCR"	%IW274	DEC+/-	20			
4	<Add new>						

Configuring a soft starter with the Telegram 101, 102, 106, or 107

Configuring the soft starter Communication Scanner

The configuration of the fieldbus module is defined by the controller, by default the 2 first read and write are linked to the default parameters: **[Cmd Register]** **CMD**; **[Status Register]** **ETA**, **[Motor Current]** **LCR**, **[Motor Therm State]** **THR** and **[CiA402 Error Code]** **ERRD**. The 4 next read or write parameters are not configured.

To add new parameters or modify the default configuration of the communication scanner, open the properties dialog box of the device and configure the OCA/OMA values in the parameter assignment tab.



New parameters are added or modified by entering the soft starter Modbus address.

Parameters Management with the Telegram 100, 101, 102, 106, 107

Description

In native modes several accesses to the soft starter parameters are possible:

- The standard acyclic requests from PROFIdrive, for more information see PROFIdrive Parameters Channel, page 73.
- PKW mechanisms for 16-bit data.

Parameter Management Through the PKW Area

With telegram 100, 101, 106, 107 you can read or write any soft starter parameter by using this PKW area. (This addressing format is identical to the PKW mechanism).

NOTE: The management of the parameters using PKW area is a mechanism implemented by Schneider Electric, while PROFIdrive has separately defined its own PKW mechanism for parameter management. It's important to note that these two mechanisms are not compatible.

NOTE: Soft starter parameters can be accessed through acyclic requests as defined in the PROFIdrive standard.

The PKW area is made of four input words and four output words.

The table lists the controller-to-soft starter parameters in the input PKW area:

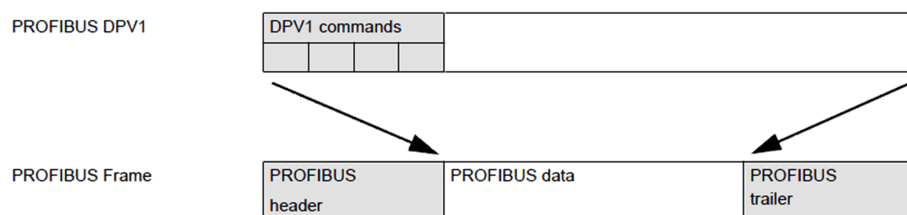
PKW Number	PKE Name	Description
PKW1	PKE	The Modbus address of the parameter is detailed here.
PKW2	R/W	Request code: 0: no request 1: read 2: write (16 bit) 3: write (32 bit)
PKW3	PWE	Parameter is used when PKW2 = 3
PKW4	PWE	Parameter value in case of write request

The table lists the soft starter-to-controller parameters in the output PKW area:

PKW Number	PKE Name	Description
PKW1	PKE	Copy of the input PKE
PKW2	R/W	Response code: 0: no request 1: read done (16 bit) 2: write done (16 bit) 3: request in progress 4: read done (32 bit) 5: write done (32 bit) 7: read or write error
PKW3	PWE	Parameter is used when PKW2 = 4 or 5
PKW4	PWE	If the request is successful, the parameter value is copied here.

DP V1 / Acyclic Messaging - Schneider Electric Specific

The PROFIBUS DPV1 telegram includes a header, described in the following diagram:



The following table lists the content of the DPV1 header:

DU	Byte - nr
Function code	0
Slot_num	1
Index	2
Length	3
Data	4 - 5

An indirection mechanism is used:

- Step 1:

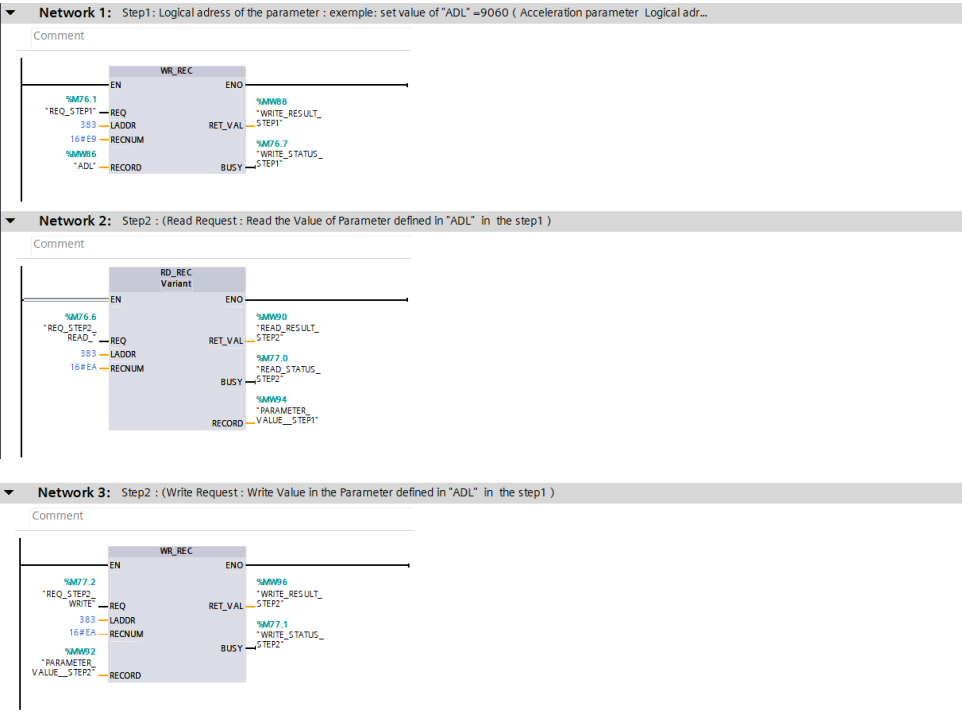
DU	Bytes	Request	Positive answer	Negative answer
Function code	0	5E hex (read) 5F hex (write)	5E hex (read) 5F hex (write)	DF hex (read) DE hex (write)
Slot_num	1	–	1	80 hex
Index	2	E9 hex	E9 hex	XX hex (error type)
Length	3	2	–	YY hex (error type)
Data	4 - 5	ZZZZ hex (ZZZZ is the Modbus address)	–	0

- Step 2:

DU	Bytes	Request	Positive answer	Negative answer
Function code	0	5E hex (read) 5F hex (write)	5E hex (read) 5F hex (write)	DF hex (read) DE hex (write)
Slot_num	1	–	1	80 hex
Index	2	EA hex	E9 hex	XX hex (error type)
Length	3	2	–	YY hex (error type)
Data	4 - 5	Read: - Write: 0010 hex	–	0

Basic DPV1 Messaging with Standard SFCs

The example below relies on the SFC58 and 59 (Integrated functions blocks of Simatic® PLC). The read or write operation is processed in two steps. In a first time, the Modbus address parameter is sent, and in a second step the value is either written or read.



Identification and Maintenance Data

Overview

Identification & maintenance (I&M) is established through PNO.

Supports the user during various scenarios of the device life cycle, such as:

- Configuration
- Commissioning
- Repair and update
- Operation and visualization

The access to the identification & maintenance data can be achieved using the PROFIBUS DPV1 mechanisms (IEC 61158-6).

I&M Record

Read/write access to I&M records

DP-V1 header

Champ	Number of Bytes	Value	Description
Function_Num	8 bytes	5F hex	Fixed
Slot_Number	8 bytes	0...255	Variable
Index	8 bytes	255	Fixed
Length	8 bytes	4 / 68	Call Header only / Write

Data

Champ	Number of Bytes	Value	Description
Extended_Function_Num	8 bytes	08 hex	Indicates "Call", fixed
Reserved	8 bytes	00 hex	Fixed
FI_Index	16 bytes	FDE8 hex	Subindex of I&M0 Record

Response structure for I&M0 (Read-only)

Champ	Number of Bytes	Value	Description
HEADER_MANUF_SPEC	10 bytes	String	Manufacturer-specific field
MANUFACTURER_ID	2 bytes	01 hex, 29 hex	129 hex: Schneider Electric
ORDER_ID	20 bytes	Identification object ID 1	Commercial name of the soft starter
SERIAL_NUMBER	16 bytes	Serial number	Serial number of the module
HARDWARE_REVISION	2 bytes	00 hex	–
SOFTWARE_REVISION	4 bytes	'V', A, B, C	A = MSB of software version B = LSB of software version C = MSB of software revision
REVISION_COUNTER	2 bytes	xx hex, yy hex	Rev xy
PROFILE_ID	2 bytes	–	Defined by the PNO (3A00...3AFF, drive profile)
PROFILE_SPECIFIC_TYPE	2 bytes	–	Profile specific number
IM_VERSION	2 bytes	01 hex, 02 hex	Version I&M: 1.2
IM_SUPPORTED	2 bytes	00 hex, 01 hex	Managed index

PROFIdrive Parameters Channel

What's in This Chapter

Acyclic soft starter parameters access 74

Device profile request structure 75

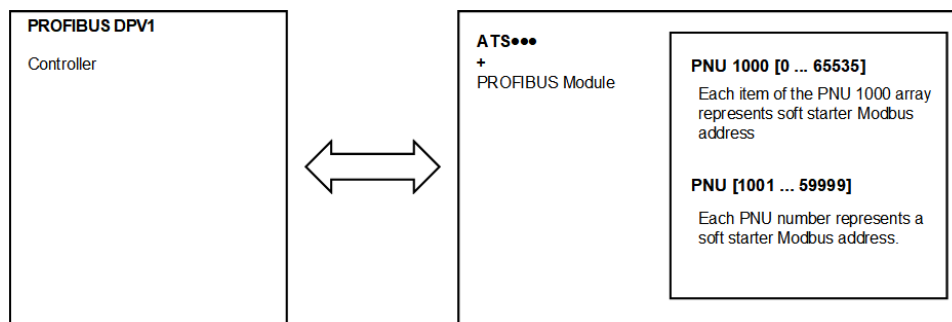
Soft Starter Parameters Access..... 76

Acyclic soft starter parameters access

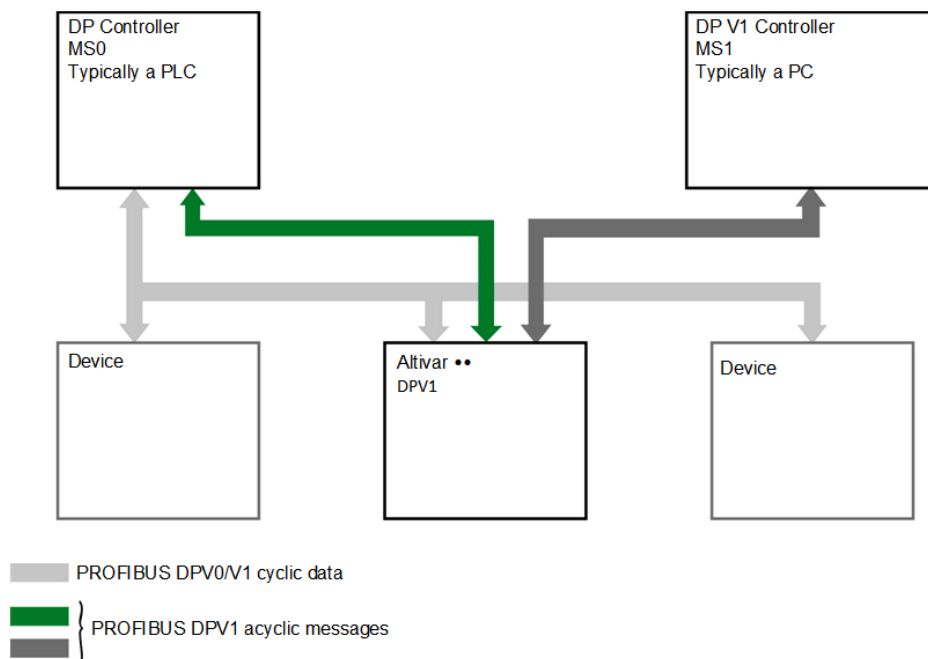
The soft starter parameters are organized as defined by PNU numbering and addressing modes. However, this addressing mode keeps the native structure of the device (based on Modbus addressing). PNU is numbered from 0...65535 and each PNU represents a parameter (from single type as words to complex data structure or arrays). All others PNUs are manufacturer-specific.

In the case of this soft starter, parameters can be separated in two groups:

- Soft starter parameters which are gathered in a single PNU entry point: PNU1000 and Modbus address as subindex. It is also possible to access the parameters using the Modbus address as PNU for each parameter (1001...59999) and 0 as subindex.



When the soft starter is operated in PROFIdrive profile, the parameter management takes benefit of the PROFIBUS acyclic messaging features. With PROFIBUS, it is possible to exchange messages of variable length between both controllers (MS0 or MS1). These messages come in addition of the periodic data exchange.



Device profile request structure

The table describes the device profile header as used for the device parameters access:

DU	Byte Nr	Request
Function code	0	–
Slot_num	1	0: global parameters
Index	2	2f hex : Base Mode Parameter Access-Global
Length	3	Length of the PROFIdrive parameter channel frame
Data	4...5	PROFIdrive parameter channel frame: check

Device Parameter Structure

A parameter is defined with its PNU number from 1...65535.

Each parameter consists of 3 main areas:

- **PWE**: the value
- **PBE**: describes the parameter attributes
- Text area

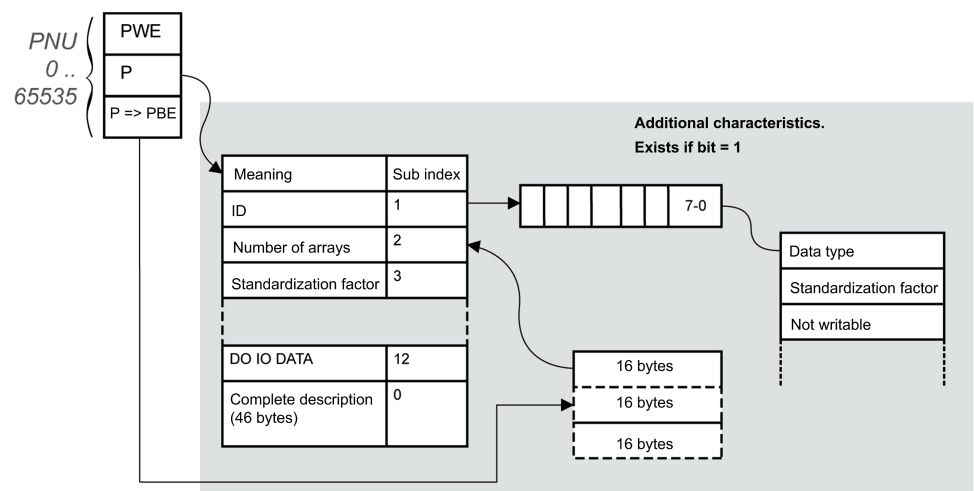
The access to the 3 different areas of a parameter is specified by the **attribute field** of the parameter request.

The parameters and their sub parts are identified as follows:

PNU number + attribute	10 hex	PWE	+ Sub index
	20 hex	PBE	+ Sub index
	30 hex	Text	+ Sub index

Detail of the PBE Attribute

The diagram describes the PBE attribute:



Soft Starter Parameters Access

Each soft Starter parameter can be represented according to the PNU standard structure. Soft Starter parameters are part of the PNU 1000 or can be accessed using the Modbus address as PNU number.

The table provides the possible values of a parameter according to the PNU properties:

Parameter Property	Soft Starter Implementation	Example
PNU number	1000	–
Sub index	Modbus address	[Status Register] ETA (3201)
PWE	Value of the parameter 0...65535	–
PBE	Describes an array of 65535 words	Constant
Text	–	Soft Starter parameter

Parameters Requests

There are 2 types of request:

- Request device parameter (parameters are PNU number, attribute, and sub index)
- Change device parameter (parameters are PNU number, attribute, and sub index)

These requests are able to manage one or more parameters or several attributes of one parameter. In order to access to a specific attribute of a parameter, the request header contains: the PNU, the sub index, and an attribute. This attribute defines whether the request mentions the value, the description area, or the text area.

Parameter Reading

Request

	Byte n+1	Byte n
Request data	Request reference = 01	Request ID = 01
	Axis = 01 hex	Number of parameters = 01
	Attribute = 10 hex *	Number of elements = 01
	PNU number = 3E8 hex	
	Device parameter address = C81 hex (3201) ETA Modbus address	
*refers to field value (PWE), 20 hex refers to the description field (PBE) and 30 hex to the text field.		

Response

	Byte n+1	Byte n
Response header	Request reference = 01	Request ID = 01
	Axis = 01 hex	Number of parameters = 01
Response data	Format = 42 hex *	Number of elements = 01
	PNU value = xxxx hex (value of ETA)	
*format 42 hex specifies that the returned value is a WORD.		

NOTE: Format is defined by the following returned value: byte 41 hex, word: 42 hex, standard integer: 03 hex, double word: 43 hex.

Parameter Writing

Request

	Byte n+1	Byte n
Request header	Request reference = 01	Request ID = 02
	Axis = 01 hex	Number of parameters = 01
Parameter number	Attribute = 10 hex *	Number of elements = 01
	PNU number = 3E8 hex	
	Sub index = 2364 hex (9060) ACC Modbus address	
Parameter value	Format = 42 hex	Amount values = 01
	Value = 50 (ACC is set to 5 s)	
*refers to field value (PWE), 20 hex refers to the description field (PBE) and 30 hex to the text field.		

Response

	Byte n+1	Byte n
Response header	Request reference = 01	Request ID = 02
	Axis = 01 hex	Number of parameters = 01

NOTE: for acyclic messages (through PNU1000), the default mapping of the telegram cannot be modified and replaced with configuration parameters of the soft starter.

Request for Negative Response

The table lists the items of a negative response:

	Byte n+1	Byte n
Request header	Request reference = 01	Request ID = 82*
	Axis = 01 hex	Number of parameters = 01
Parameter number	Format = error 44 hex	Number of values
Value	0x00: Impermissible PNU 0x01: Cannot change value 0x02: Low or high limit exceeded + sub index 0x03: Sub index detected error + sub index 0x04: No array 0x05: Incorrect data type 0x06: Setting not permitted + sub index 0x07: Cannot change description + sub index 0x09: No description 0x0B: No operation priority 0x0F: No text array available 0x11: Cannot execute the request. Reason not specified 0x14: Value impermissible	0x15: Response too long 0x16: Parameter address impermissible 0x17: Illegal format 0x18: Number of values inconsistent 0x19: Axis/DO nonexistent 0x20: Cannot change text 0x65: Invalid request reference 0x66: Invalid request ID 0x67: Invalid axis number / DO-ID 0x68: Invalid number of parameters 0x69: Invalid attribute 0x6B: Request too short
*for all negative responses the ID equals to response code or 80 hex.		

With the sub index in addition to the detected error value, the total length of the answer is 10 bytes.

Monitoring of Communication Channel

Communication channels are monitored if they are involved in the control word **[Cmd Register]** from the active command channel.

As soon as this register has been written once to a communication channel, it activates monitoring for that channel.

If an interruption of communication is triggered in accordance with the protocol criteria by a monitored port or fieldbus module, the soft starter react according to **[Fieldbus Interrupt Resp]** configuration, refer to [Configuring Communication Error Response](#), page 84 for more information.

If an interruption of communication is triggered on a channel that is not being monitored, the soft starter does not trigger a communication error/warning.

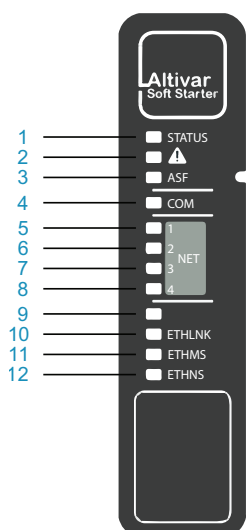
Diagnostics and Troubleshooting

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- Connection problem with the fieldbus module 83
- Configuring Communication Error Response 84
- Communication troubleshooting 85
- Fieldbus Response Test..... 86
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Fieldbus Status LEDs

LED Description



Item	LED		Description
1	STATUS	OFF	Indicates that the soft starter is not ready to start
		Green flashing	Indicates that the soft starter is not running, ready to start
		Green blinking	Indicates that the soft starter is in transitory status (acceleration, deceleration, and so on)
		Green on	Indicates that the soft starter is running
		Yellow on	Indicates that the soft starter localization is in progress
2	Warning/ Error	Red flashing	Indicates that the soft starter has detected a warning
		Red on	Indicates that the soft starter has detected an error
3	ASF	OFF	Indicates Safety Function STO is not active.
		Yellow on	Indicates Safety Function STO is triggered.
4	COM	Yellow flashing	Indicates Modbus serial activity on port Modbus VP12S port.
5	NET 1	Green/ Yellow	<div><div><div>1</div><div>RUN</div></div><div><div>2</div><div>BF</div></div><div><div>-----</div></div></div> <div><div><div>2</div><div>1</div></div><div><div>1</div><div>2</div></div></div> <div><div>1. RUN: Module status</div><div>2. BF: Network Error status</div></div>
6	NET 2	Green/Red	
7	NET 3	Green/Red	
8	NET 4	Green/ Yellow	
9	Reserved		
10	ETHLINK	Green/ Yellow	Indicates port activity
11	ETHMS	Green/Red	Indicates module status.
12	ETHNS	Green/Red	Indicates network status

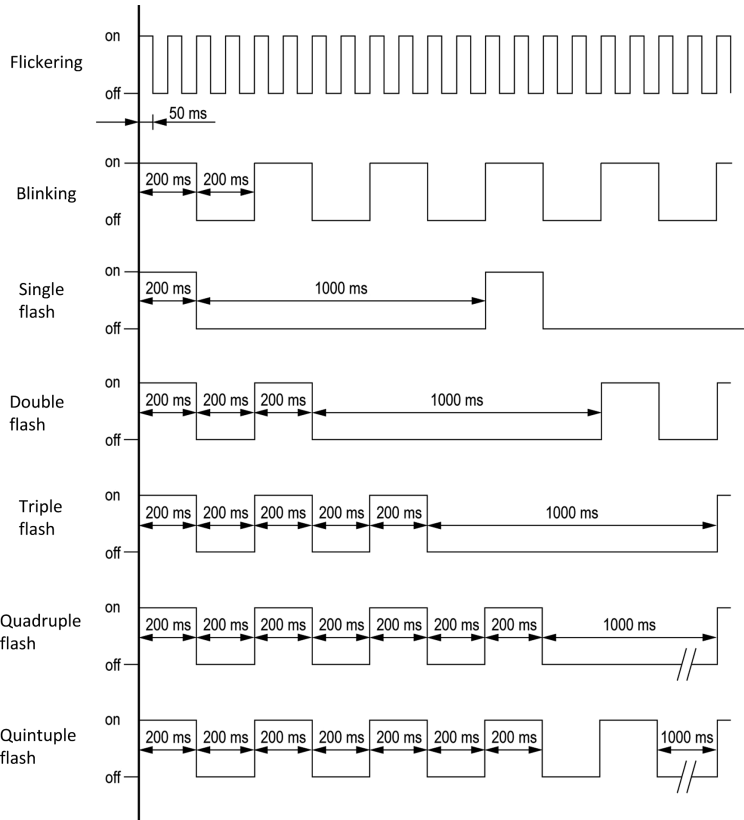
Module Status

This LED indicates the module status:

Color & Status	Description
OFF	The device is powered off
Green ON	Fieldbus communication active

Network Error Status

Color & Status	Description
OFF	The device does not have a server address or is powered off
Red ON	Fieldbus error is detected
Red flashing	Incorrect configuration



Connection problem with the fieldbus module

Description

If the product cannot be addressed via the fieldbus, first check the connections. The product manual 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.

Configuring Communication Error Response

⚠ 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.

The timeout of Communication Error Response can be set via parameter.

The response of the soft starter in the event of a communication interruption can be configured through **[Fieldbus Interrupt Resp]** in the **[Communication]** menu of the graphic display terminal.

The values of the **[Fieldbus Interrupt Resp]** parameter, which triggers a soft starter detected error **[Fieldbus Com Interrupt]** **CNF** are:

Value	Meaning
[Freewheel Stop] YES	Motor triggers in error and is stopped in freewheel. Factory setting
[Deceleration] DEC	Motor is stopped in deceleration and triggers in error at the end of stop.
[Braking] BRK	Motor is stopped in dynamic braking and triggers in error at the end of stop.

The values of the **[Fieldbus Interrupt Resp]** **CLL** parameter which does not trigger a detected error are:

Value	Meaning
[Ignore] NO	Detected error ignored.
[Configured Stop] STT	Motor is stopped according to [Type of stop] STT parameter.

⚠ WARNING

LOSS OF CONTROL

If this parameter is set to **[Ignore]**, fieldbus module 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.

Communication troubleshooting

Checking Connections

If the product cannot be addressed using the fieldbus, verify that:

- The soft starter and the PLC are supplied.
- The wires are correctly connected to the port (if possible).
- The ends of line resistors are connected on both sides of the complete network.
- The ends of line resistors have the good values.
- The wiring of the all devices on the network is consistent.

Comportment when an communication error occurs

Send a word with **[Cmd Register]** to validate the **[Cmd channel 1]** or the **[Cmd channel 2]** to activate this channel.

If a communication interruption appears:

1. After the end of the delay of timeout, the motor is stopped.
2. An error **[Fieldbus Com Interrupt]** **CNF** is triggered, and depending of **[Auto Fault Reset]**, **[R1 Assignment]** is deactivated (if set to **[Operating State Fault]** following the value set on **[Fieldbus Interrupt Resp]**).

Fieldbus Response Test

Description

If the connections are correct, check the settings for the fieldbus addresses. After correct configuration of the transmission data, test the fieldbus mode.

In addition to the controller that knows the device via the data in the GSD file and its address, a bus monitor should be installed. As a passive device, it can display messages.

- Switch off or on the supply voltage of the soft starter system.
- Observe the network messages shortly after switching on the soft starter. A bus monitor can be used to record the elapsed time between telegrams and the relevant information in the telegram.

Possible Errors: Addressing, Parameterization, Configuration

If it is impossible to connect to a device, check the following:

- Addressing: The address of the network device must be a valid IP address. Each network device must have a unique address.
- Parameterization: The parameterized ident number and the user parameters must match the values stored in the GSD file.
- Configuration: The data length in input and output direction must be identical to the length specified in the GSD file.

Communication Interruption

Description

The soft starter triggers an error **[Internal Link Error]** **ILF** when the following events occur:

- Hardware error is detected on the PROFIBUS DP module
- Communication interruption between the PROFIBUS DP module and the soft starter

The response of the soft starter in the event of an **[Internal Link Error]** **ILF** error cannot be configured, and the soft starter stops in freewheel. This detected error requires a power reset.

The diagnostic parameter can be used to obtain more detailed information about the origin of the **[Internal Link Error]** **ILF** (**[InternCom Error1]** **ILF1** if the detected error has occurred on fieldbus module).

The **[InternCom Error1]** **ILF1** parameter can be accessed on the graphic display terminal in **[Communication]** **COMO** → **[Communication map]** **CMM** → **[PROFIBUS DIAG]** **PRB**

Value	Description of the values of the [Internal Link Error] ILF parameter
0	No error detected
1	Internal communication interruption with the soft starter
2	Hardware error detected
3	Error found in the EEPROM checksum
4	EEPROM
5	Flash memory
6	RAM memory
7	NVRAM memory
101	Unknown module
102	Communication interruption on the soft starter internal bus
103	Time out on the soft starter internal bus (500 ms)

Control-Signal Diagnostics

On the display terminal, the **[Communication]**– menu can be used to display control-signal diagnostic information between the soft starter and the controller:

- Active command channel **[Command Channel]**.
- Value of the control word **[Cmd Register]** from the active command channel **[Command Channel]**.
- Value of the operating state word **[Status Register]**.
- Specific data for all available fieldbuses are in dedicated submenus.

Communication error codes




What's in This Chapter

[Incorrect Config] CFF	89
[Invalid Configuration] CFI	89
[Fieldbus Com Interrupt] CNF	90
[Channel Switch Error] CSF	90
[External Error] EPF1	90
[Fieldbus Error] EPF2	91
[Internal Link Error] ILF	91
[Internal Error 6] INF6	91

In this chapter, a list of some of the errors that can be triggered by the communication-related soft starter can be found, for a full description please refer to the user manual.




[Incorrect Config] CFF

Incorrect configuration

 Probable Cause	<ul style="list-style-type: none"> Option module has been changed for another fieldbus or removed. Control block replaced by a control block configured on a soft starter with a different rating. The current configuration is inconsistent.
 Remedy	<ul style="list-style-type: none"> Verify that the option module or the product are not damaged. In the event of the control block being changed deliberately, see the remarks below. Press the OK key to validate the message displayed on the display terminal. This action will set a return to factory settings. Or retrieve the backup configuration if it is valid.
 Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.




[Invalid Configuration] CFI

Invalid configuration

 Probable Cause	Inconsistent, invalid, unauthorized or out-of-bound value written to a parameter via a fieldbus or communication link. The written value is rejected, the previous one is kept and this error is triggered.
 Remedy	<ul style="list-style-type: none"> Writing a correct value on any parameters via communication or fieldbus link. Writing a correct value on any parameters via any HMI (display terminal, SoMove...). Reset to factory settings, new configuration transfer or configuration restoration.
 Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.




[Fieldbus Com Interrupt] CNF

Fieldbus communication interruption

 Probable Cause	<p>Communication interruption on fieldbus module.</p> <p>This error is triggered when the communication between the fieldbus module and the master (PLC) is interrupted.</p>
 Remedy	<ul style="list-style-type: none"> • Verify the environment (electromagnetic compatibility). • Verify the wiring. • Verify the timeout. • Replace the option module. • Contact your local Schneider Electric representative.
 Clearing the Error Code	<p>This detected error can be cleared with the [Auto Fault Reset] or manually with the [Fault Reset Assign] parameter after its cause has been removed.</p>




[Channel Switch Error] CSF

Channel switching detected error

 Probable Cause	<p>Switch to an invalid channel.</p>
 Remedy	<p>Verify the settings of the parameters in the menu [Complete settings] CST → [Command channel] CCP.</p>
 Clearing the Error Code	<p>This detected error is cleared as soon as its cause has been removed.</p>




[External Error] EPF1

External detected error

 Probable Cause	<ul style="list-style-type: none"> • Error raised based on [Ext Error assign] configuration via [DI•] or [CD••]. • Duplicate or invalid IP address.
 Remedy	<p>Remove the cause of the external error.</p>
 Clearing the Error Code	<p>This detected error can be cleared manually with the [Fault Reset Assign] parameter after its cause has been removed.</p>




[Fieldbus Error] EPF2

External error detected by Fieldbus

 Probable Cause	Communication interruption with fieldbus module.
 Remedy	<ul style="list-style-type: none"> • Verify the communication bus is correctly wired. • Verify the fieldbus module is correctly plugged into the soft starter. • Refer to the appropriate fieldbus manual.
 Clearing the Error Code	This detected error can be cleared manually with the [Fault Reset Assign] parameter after its cause has been removed.




[Internal Link Error] ILF

Internal communication interruption with option module

 Probable Cause	Communication interruption between option module and the soft starter.
 Remedy	<ul style="list-style-type: none"> • Verify the environment (electromagnetic compatibility). • Verify that the fieldbus module is well inserted in the soft starter. • Replace the fieldbus module with an identical fieldbus module. • Contact your local Schneider Electric representative. <p>NOTE: it is possible to check the status of ILF through the communication with his register (ADL: 7134).</p>
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.

[Internal Error 6] INF6

Internal error 6 (Option)

 Probable Cause	<p>The compatibility of the option module is monitored internally.</p> <p>If an unknown module is installed, the INF6 error is triggered.</p> <ul style="list-style-type: none"> • The option module is not recognized by the device nor compatible with the device. • An old ethernet embedded version is used.
 Remedy	<ul style="list-style-type: none"> • To identify the error code, convert from decimal (ex: 4111) to hexadecimal (ex: 100F) the code displayed on the display terminal in the parameter [Error Info (INF6)] INF6, read the last two characters on the right (ex: 0F) and refer to the following list: <ul style="list-style-type: none"> ◦ Value = 0x●●00: No error detected. ◦ Value = 0x●●01: No response of the fieldbus module. Unplug and plug back the fieldbus module. ◦ Value = 0x●●09, 0x●●0B, 0x●●11: Incompatible fieldbus module. For the list of compatible fieldbus modules, refer to the catalog and to the fieldbus manuals. ◦ Value = 0x●●0F: Option module software version not compatible. Update the fieldbus module firmware, refer to the user manual. • Verify the catalog number and compatibility of the option module. • If the displayed code is not listed above, contact your local Schneider Electric representative.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.

Glossary

A

AC:

Alternating Current

Adjustment parameter: A parameter always accessible as **[Access Level]**.

C

Configuration Parameter: A parameter affects by the operating states of the machine as **[Motor Nom Current]**.

Controller:

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

Similar to a **Master**, a **Client** or a **Scanner**.

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.

Similar to a **Slave**, an **Adapter** or a **Server**.

DPWS:

Device Profile for Web Service

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:

Machine status in factory settings when the product was 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.

H

hex:

Hexadecimal

L

LSB:

Least Significant Byte

M

MEI:

Modbus Encapsulated Interface

MS0, MS1:

Number of a Controller in the network.

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

PDO:

Process Data Object

Q

QoS:

Quality of Service

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

SNMP:

Simple Network Management Protocol

SNTP:

Simple Network Time Protocol

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.

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