

Altivar Process ATV600

Variable Speed Drives for Asynchronous and Synchronous Motors

Embedded Ethernet Manual

10/2017



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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Important Information

NOTICE

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 a drive for three-phase synchronous, asynchronous motors and 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. Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.

Product Related Information

Read and understand these instructions before performing any procedure with this drive.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- The system integrator is responsible for compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Many components of the product, including the printed circuit boards, operate with mains voltage.
- Only use properly rated, electrically insulated tools and measuring equipment.
- Do not touch unshielded components or terminals with voltage present.
- Motors can generate voltage when the shaft is rotated. Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- AC voltage can couple voltage to unused conductors in the motor cable. Insulate both ends of unused conductors of the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors or the braking resistor terminals.
- Before performing work on the drive system:
 - 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 drive system.
 - Lock all power switches in the open position.
 - Wait 15 minutes to allow the DC bus capacitors to discharge.
 - Follow the instructions given in the chapter "Verifying the Absence of Voltage" in the installation manual of the product.
- Before applying voltage to the drive system:
 - 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.

Drive systems 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.

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.

WARNING

LOSS OF CONTROL

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

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

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

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.

The temperature of the products described in this manual may exceed 80 °C (176 °F) during operation.

WARNING

HOT SURFACES

- Ensure that any contact with hot surfaces is avoided.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the product has sufficiently cooled down before handling it.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

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

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.

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).
- 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.

 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.

About the Book



At a Glance

Document Scope

The purpose of this document is to:

- Show you how to connect the Ethernet fieldbus on your drive.
- Show you how to set up the drive to use Ethernet for monitoring and control.
- Provide examples of setup using commissioning software

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

Validity Note

Original instructions and information given in this manual is written in English (before optional translation).

This documentation is valid for the Altivar Process drives.

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

Step	Action
1	Go to the Schneider Electric home page www.schneider-electric.com .
2	In the Search box type the reference of a 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 .

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.

Related Documents

Use your tablet or your PC to quickly access detailed and comprehensive information on all our products on www.schneider-electric.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 drive, listed below:

You can download these technical publications and other technical information from our website at <http://www.schneider-electric.com/en/download>

(Other option manuals and Instruction sheets are available on www.schneider-electric.com)

Title of Documentation	Catalog Number
ATV600 Getting Started	EAV63253 (English), EAV63254 (French), EAV63255 (German), EAV63256 (Spanish), EAV63257 (Italian), EAV64298 (Chinese)
ATV600 Getting Started Annex (SCCR)	EAV64300 (English)
ATV630, ATV650 Installation Manual	EAV64301 (English), EAV64302 (French), EAV64306 (German), EAV64307 (Spanish), EAV64310 (Italian), EAV64317 (Chinese), EAV64301PT (Portuguese)
ATV600 Programming Manual	EAV64318 (English), EAV64320 (French), EAV64321 (German), EAV64322 (Spanish), EAV64323 (Italian), EAV64324 (Chinese), EAV64318PT (Portuguese)
ATV600 Modbus Serial Link Manual (Embedded)	EAV64325 (English)
ATV600 Ethernet Manual (Embedded)	EAV64327 (English)
ATV600 Ethernet IP - Modbus TCP Manual (VW3A3720, 721)	EAV64328 (English)
ATV600 BACnet MS/TP Manual (VW3A3725)	QGH66984 (English)
ATV600 PROFIBUS DP manual (VW3A3607)	EAV64329 (English)
ATV600 DeviceNet manual (VW3A3609)	EAV64330 (English)
ATV600 PROFINET manual (VW3A3627)	EAV64331 (English)
ATV600 CANopen Manual (VW3A3608, 618, 628)	EAV64333 (English)
ATV600 Communication Parameters	EAV64332 (English)
ATV600 Embedded Safety Function manual	EAV64334 (English)
Altivar Process Drive Systems Installation manual	NHA37119 (English), NHA37121 (French), NHA37118 (German), NHA37122 (Spanish), NHA37123 (Italian), NHA37130 (Chinese), NHA37124 (Dutch - End of 2017), NHA37126 (Polish), NHA37127 (Portuguese), NHA37129 (Turkish)
ATV660 Handbook	NHA37111 (English), NHA37110 (German)
ATV680 Handbook	NHA37113 (English), NHA37112 (German)
ATV600F, ATV900F Installation Instruction sheet	NVE57369 (English)
ATV600, ATV900 ATEX manual	NVE42416 (English)
Catalog: Altivar Process ATV600 variable speed drives	DIA2ED2140502EN (English), DIA2ED2140502FR (French)
SoMove: FDT	SoMove_FDT (English, French, German, Spanish, Italian, Chinese)
Altivar Process ATV600: DTM (Install English DTM version before translations)	ATV6xx_DTM_Library_EN (English), ATV6xx_DTM_Lang_FR (French), ATV6xx_DTM_Lang_DE (German), ATV6xx_DTM_Lang_SP (Spanish), ATV6xx_DTM_Lang_IT (Italian), ATV6xx_DTM_Lang_CN (Chinese)
Application Note: ATV600 Multi Drives Booster Control Optimized	QGH36060 (English)

Title of Documentation	Catalog Number
ATV600 Multi Masters Booster Control Pressure Feedback with Service Continuity	QGH36061 (English)
Application Note: ATV600 Multi Drives Standard Level Control	QGH36059 (English)

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 drive systems 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:

- IEC 61800 series: Adjustable speed electrical power drive systems
- IEC 61508 Ed.2 series: Functional safety of electrical/electronic/programmable electronic safety-related
- EN 954-1 Safety of machinery - Safety related parts of control systems
- 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

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

Also see the glossary at the end of this manual.

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Chapter 1

Presentation

What Is in This Chapter?

This chapter contains the following topics:

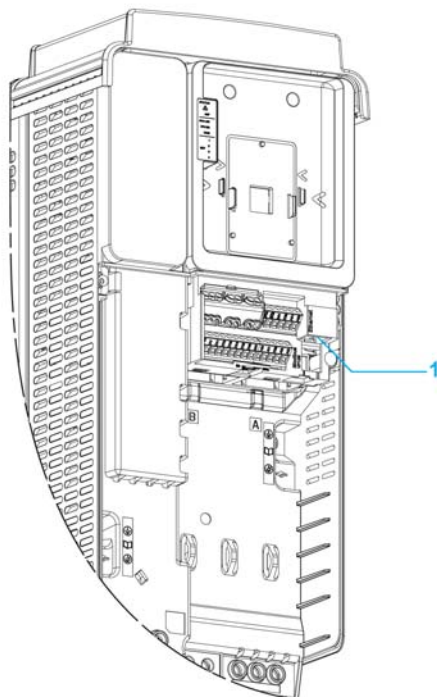
Topic	Page
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Hardware Overview

General

The drive embeds an Ethernet communication port that can be used for Modbus TCP industrial communication protocol.

In addition of the communication services provided by the protocol, embedded adapter provides a set of services at the Ethernet and TCP/IP level. The embedded adapter offers an embedded Web server (in 6 languages) which offers comfortable displaying and commissioning functions directly from a standard web browser.



1 Ethernet Modbus TCP communication port

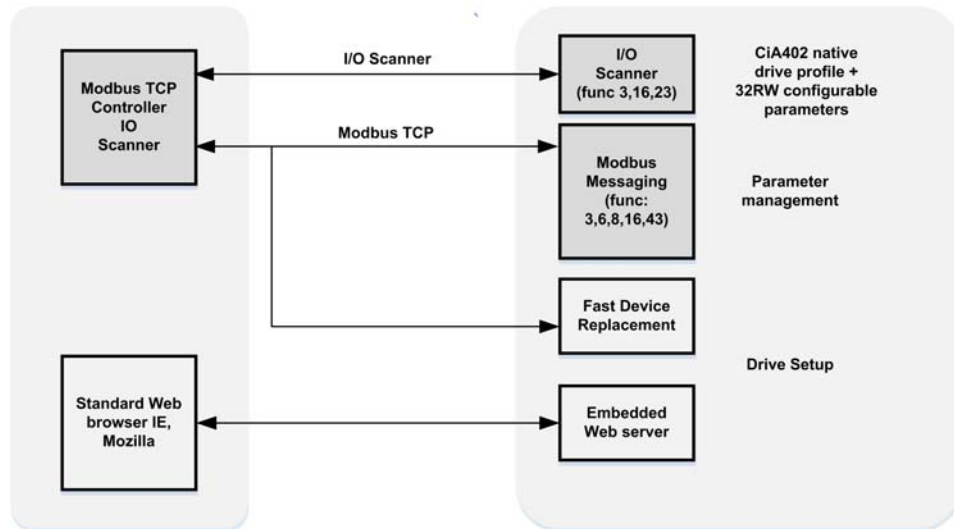
Software Overview

Simplified TCP/IP Model

The table provides the basic overview to the simplified TCP/IP model

Application	Modbus TCP
Transport	TCP / UDP
Network	IP
Link	Ethernet

Modbus TCP- Features Overview



NOTE: When using ModbusTCP, it is advisable to use function codes 16 or 23 to control the drive.

Chapter 2

Basics

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
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2.2	Modbus TCP Features	23

Section 2.1

Introduction

What Is in This Section?

This section contains the following topics:

Topic	Page
Introduction	19
Network Layer Supported Functions/Protocols	20
TCP and UDP Protocol	21

Introduction

Modbus TCP

The Modbus application layer is standard. Many of the manufacturers are already implementing this protocol. Many have already developed a Modbus TCP/IP connection and numerous products are currently available. With the simplicity of its protocol and the fast Ethernet throughput data rate of 100 Mbit/s, Modbus TCP/IP achieves excellent performance.

TCP/IP and Ethernet Features

The product supports the following functions via:

- Manual IP address assignment
- Automatic IP address assignment via BOOTP or DHCP
- Automatic configuration data via FDR
- Commissioning via DTM-based commissioning software
- Diagnostics and configuration via integrated Web server

Web Server

The standard webserver (in six languages) provides access to pages such as:

- Drive monitor
- Data viewer/editor
- Save and restore configuration
- Network parameters
- iPar client settings
- Administration
- TCP/IP statistics
- Modbus statistics

Network Layer Supported Functions/Protocols

ARP Protocol

The ARP (Address resolution protocol) is a protocol used to map network addresses (IP) to hardware addresses (MAC).

The protocol operates below the network layer as a part of the OSI link layer, and is used when IP is used over Ethernet. A host, wishing to obtain a physical address, broadcasts an ARP request onto the TCP/IP network. A unique IP address is assigned to the host, and is sent to its hardware address.

ICMP Protocol

The embedded module manages the ICMP protocol.

- ICMP client: not supported
- ICMP server: the managed requests are the following:

Type	Description
0	Echo reply (ping)
3	Destination unreachable
4	Sources quench
5	Redirect
6	Alternate host address
8	Echo request (ping)
9	Router advertisement
10	Router solicitation
11	Time exceeded
12	Parameter problem
13	Time stamp request
14	Time stamp reply
15	Information request
16	Information reply
17	Address mask request
18	Address mask reply

IP Protocol

The Ethernet adapter implements the IPV4 and IPV6 (for DPWS) protocols.

SNMP Services

The Ethernet adapter accepts the community name “private” for writing and the community name “public” for Reading.

MIB

Objects	Description	Access	Default Value
SysDescr	Text description of the product	Read only	Schneider Electric Altivar Ethernet TCP/IP
SysObjectID	Points in the private MIB on the product part number	Read only	1.3.6.1.4.1.3833.1.100.4.1
SysUpTime	Time elapsed since the last power-up	Read only	Managed by the option
SysContact	Information allowing to contact the node manager	Read/write	" "
SysName	Node administrative name	Read/write	"" or FDR device name if configured
SysLocation	Physical location of the product	Read/write	" "
SystemService	Indicates the service type offered by the product.	Read only	72

TCP and UDP Protocol

Connections

The Ethernet adapter supports up to 32 concurrent TCP/IP and/or TCP/UDP connection.

BOOTP and DHCP Protocol

The Ethernet adapter can use BOOTP and DHCP protocols.

The BOOTP frame is the same: only the OP field is different.

The following table describes the DHCP frame format:

OP (1 byte)	HTYPE (1 byte)	HLEN (1 byte)	HOPS (1 byte)
XID (4 bytes)			
SECS (2 bytes)		FLAGS (2 bytes)	
CIADDR (4 bytes)			
YIADDR (4 bytes)			
SIADDR (4 bytes)			
GIADDR (4 bytes)			
CHADDR (16 bytes)			
SNAME (64 bytes)			
FILE (128 bytes)			
OPTIONS (312 bytes)			

DHCP frame fields are described as follows:

Field	Description
op	Message type DHCP request / DHCP reply
htype	Address hardware type
hlen	Hardware address length
hops	Used by relay agent
xid	Transaction identifier, random number chosen by the client allowing to associate the request and the response
secs	Time in seconds since the beginning of the transaction
flags	First bit used for the broadcast reply flag
ciaddr	Client IP address, only used if the client can respond to ARP request
yiaddr	Client IP address, "your" IP address proposed by the server
siaddr	IP address of the server
giaddr	Gateway IP address, used when a relay agent needs to be crossed
sname	Server name
file	Location of boot file
options	Optional parameters with DHCP extensions

DHCP Message

The DHCP protocol uses 8 different types of message during the IP assigning process.

The following table describes the 8 messages:

Message	Description
DISCOVER	The client tries to discover the DHCP server using a broadcast
OFFER	The server proposes a configuration
REQUEST	The client chooses a DHCP server and declines other offers
ACK	The chosen server assigns the IP configuration
NAK	The server rejects the client request
DECLINE	The client declines the assigned IP configuration
RELEASE	The client releases its IP address before the end of the lease
INFORM	The client asks for network information (it already has an IP address)

Operating Modes

The choice between DHCP, BOOTP, and fixed configuration is made through one parameter:

- Fixed: the Ethernet adapter uses the address stored in parameter.
- BOOTP: the Ethernet adapter receives the addresses from BOOTP server.
- DHCP: if the device name [XXX] is valid, the Ethernet adapter receives the addresses from the DHCP server.

Section 2.2

Modbus TCP Features

What Is in This Section?

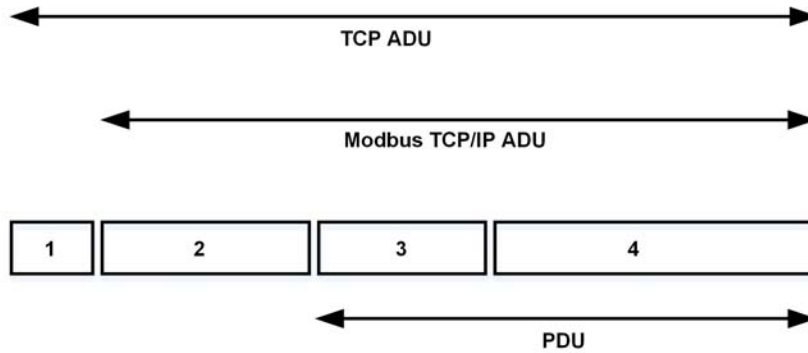
This section contains the following topics:

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Supported Modbus TCP Functions	26
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Modbus TCP Frames

TCP Telegrams

Modbus TCP telegrams are not only Modbus standard requests and responses encapsulated in TCP frames.



- 1 TCP header
- 2 MBPA: Modbus application protocol header
- 3 ADU: Application data unit
- 4 PDU: Protocol data unit (The Modbus message itself)

MBAP Header Structure

Fields	Length	Description	Client	Server
Transaction identifier	2 bytes	Identification of a Modbus request / response transaction	Initialized by the client	Recopied by the server from the received request
Protocol identifier	2 bytes	0= Modbus protocol	Initialized by the client	Recopied by the server from the received request
Length	2 bytes	Number of following bytes	Initialized by the client (request)	Initialized by the server (response)
Unit identifier	1 byte	Identification of a remote slave connected on a serial line or on other buses	Initialized by the client	Recopied by the server from the received request

Modbus TCP Servers

Overview

Unit ID	Modbus TCP server	Accessible parameters
0/248	Variable speed drive	See the file related to drive communication parameters.
255	Drive I/O scanner	See I/O scanner setting (see page 26)

Supported Modbus TCP Functions

Modbus TCP Services

The Modbus TCP option supports the following services:

Function Name	Code		Description	Remarks
	Dec	Hex		
Read holding registers	03	03 hex	Read N output words	Max PDU length: 63 words
Write 1 output word (Unit ID 0-248 only)	06	06 hex	Write 1 output word	
Write multiple registers	16	10 hex	Write N output word	Max PDU length: 63 words
Read/write multiple registers (Unit ID 0-248 and 255)	23	17 hex	Read/write multiple registers	Max PDU length: 32 words (W), 32 words (R)
(Subfunction) Read device identification	43/14	2B hex 0E hex	Encapsulated interface transport / read device identification	See the table below

Identification

Id	Value	Comment
00 hex	Schneider Electric	Device manufacturer
01 hex	ATVXXX	Drive commercial part number
02 hex	0101	Drive version
04 hex	-	-
05 hex	-	-
06 hex	Customized Name	Device name

I/O Scanning Service

The I/O scanning service is used to exchange periodic I/O data between:

- A controller or PLC (I/O scanner).
- Devices (I/O scanning servers).

This exchange is performed by implicit requests, thus avoiding the need to program the controller (PLC).

The I/O scanner periodically generates the read/write multiple registers (23 = 17 hex) request. The I/O scanning service operates if it has been enabled in the PLC and in the drive. The drive parameters assigned to I/O scanning have been selected by default. This assignment can be modified by configuration.

When the I/O scanning service has been enabled in the drive:

- A TCP connection is assigned to it.
- The parameters assigned in the periodic variables are exchanged cyclically between the Ethernet adapter and the drive.
- The parameters assigned to the periodic output variables are reserved for I/O scanning. They cannot be written by other Modbus services, even if the I/O scanner is not sending its periodic output variables.

I/O Scanner Setting

The communication scanner is managed through the DTM-based PC software.

Channel	Factory Setting
Output 1	<i>C P d</i>
Output 2	<i>L F r d</i>
Output 3	0
Up to output 32	0
Input 1	<i>E t R</i>
Input 2	<i>r F r d</i>
Input 3	0
Up to Input 32	0

Application Profile with Modbus TCP

Description

The profiles managed with the drive when it is controlled through Modbus TCP are:

- Native profile (CiA402 - IEC 61800-7),
- I/O profile.

For details, refer to CiA@402 - IEC61800-7 functional profile (*see page 60*)

Chapter 3

Hardware Setup

What Is in This Chapter?

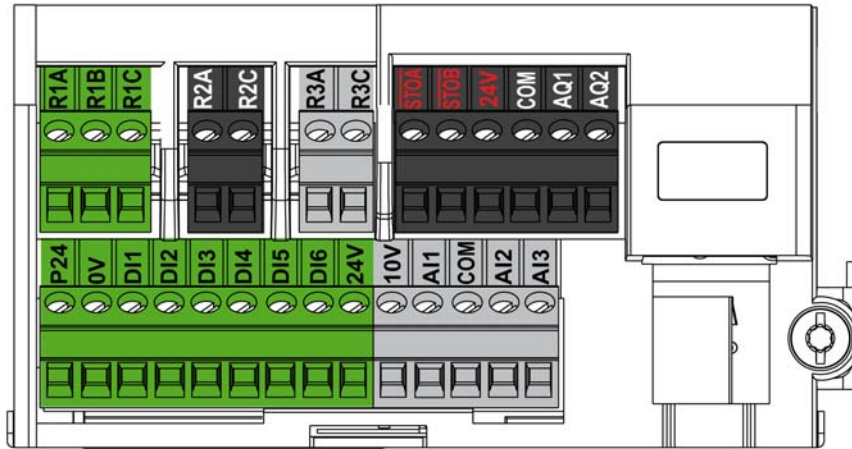
This chapter contains the following topics:

Topic	Page
Hardware Presentation	30
Firmware Version	31
Connection to the Adapter	31
Electrical Installation	32
Cable Routing Practice	33

Hardware Presentation

Modbus TCP Communication Port

The figure presents the Altivar process terminal view:



Firmware Version

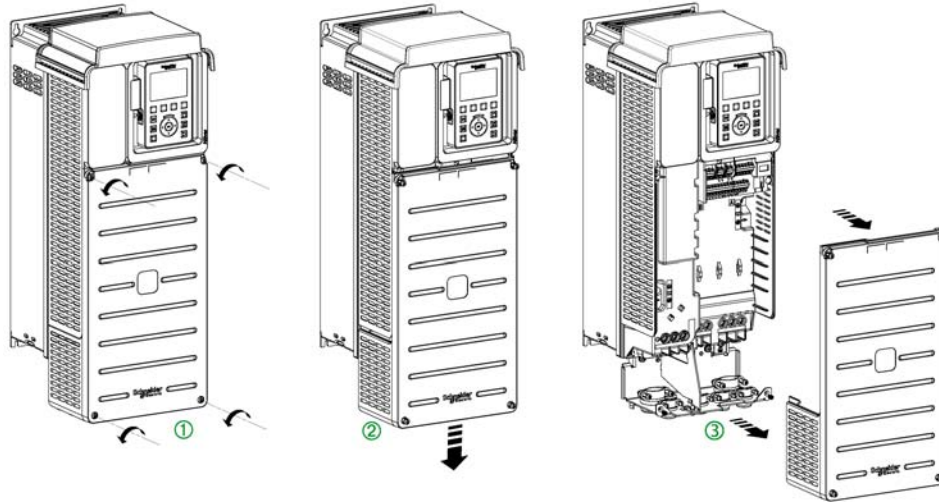
Compatibility

The drive firmware and embedded communication adapter are provided in a common package for updating the drive.

The associated EDS is named as shown in the following example

Connection to the Adapter

Procedure to Remove the Front Cover of the Drive



NOTE: The following procedure is applicable for the drives with power greater than 22kW.

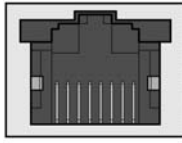
Apply the following instructions to remove the front cover of the drive:

Step	Action
1	Unscrew the four screws attaching the front cover
2	Slide down the front cover
3	Remove the front cover
4	Plug the Ethernet cable in the Ethernet port

Electrical Installation

Pin Layout

The figure shows the RJ45 socket for the Ethernet connection:



8 7 6 5 4 3 2 1

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

Pin	Signal	Description
1	Tx+	Ethernet transmit line +
2	Tx-	Ethernet transmit line –
3	Rx+	Ethernet receive line +
4	–	–
5	–	–
6	Rx-	Ethernet receive line –
7	–	–
8	–	–

Cable Specification

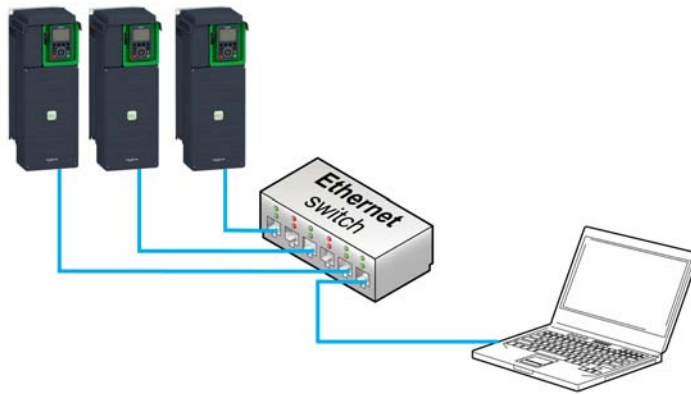
Cable specifications are as follows:

- Minimum Cat 5e,
- Use equipotential bonding conductors
- Connector RJ45
- Shield: both ends grounded
- Twisted-pair cable
- Cable: 8 x 0.25 mm² (8 x AWG 22)
- Use pre-assembled cables to reduce the wiring mistakes,
- Verify that wiring, cables, and connected interfaces meet the PELV requirements.
- Maximum cable length per segment = 100 m (328 ft)

Cable Routing Practice

Installation Topology

The following figure shows the connection between the drive and PC through an Ethernet switch.



Chapter 4

Software Setup

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
4.1	Basic Settings	36
4.2	Additional Settings	46
4.3	Fast Device Replacement	53
4.4	Communication Profile	60
4.5	Embedded Webserver	77

Section 4.1

Basic Settings

What Is in This Section?

This section contains the following topics:

Topic	Page
IP Parameter Settings	37
[Device Name] <i>P A n</i>	38
[IP mode Eth Embd] <i>, n 0 0</i>	38
[IP Eth Embd] <i>, c 0 1 , c 0 2 , c 0 3 , c 0 4</i>	39
[IP Mask Eth Embd] <i>, n 0 1 , n 0 2 , n 0 3 , n 0 4</i>	39
[IP Gate Eth Embd] <i>, G 0 1 , G 0 2 , G 0 3 , G 0 4</i>	40
[Enable FDR] <i>F d v 0</i>	40
[FDR Action] <i>F d r 0</i>	41
[FDR Operating State] <i>F d s 0</i>	41
[FDR Error Status] <i>F d r 0</i>	42
[MAC @] <i>n a c</i>	42
[ETH emb Rx frames] <i>E r X E</i>	43
[ETH emb Tx frames] <i>E t X E</i>	43
[ETH emb error frames] <i>E E r E</i>	43
[Ethernet Rate Data] <i>R r d E</i>	43
[Ethernet Embd cmd.] <i>C n d S</i>	44
[Ethernet Embd Ref Freq] <i>L F r S</i>	44
[Enable Web Services] <i>E w E E</i>	44
[Reset EmbWeb Passwd] <i>r w P E</i>	45
[Ethernet Timeout] <i>t t o b</i>	45

IP Parameter Settings

Assigning IP Parameters

If not using IPV6 functionalities for DPWS, following parameters shall be configured:

- The drive IP address.
- The subnet mask.
- The gateway IP address.

These IP addresses can be entered using the display terminal, the embedded webserver, or the DTM-based PC software.

They can be also provided by:

- A BOOTP server (correspondence between the MAC address and the IP addresses).
- Or a DHCP server (correspondence between device name **[DEVICE NAME]** *P A n* and the IP addresses).

If an IP address other than 0.0.0.0 has been entered manually, assignment using a server is disabled. Regardless of the type of IP address assignment, if the address is modified, then the IP address is effective the next time the drive is turned on (control voltage if a separate power supply is being used).

Entering IP Parameters in the Display Terminal

In the **[Communication]** *C o n -* , **[Comm parameters]** *C n P -* menu and **[Ethernet Embd]** *E t E -* submenu, enter the following IP addresses:

- **[IP Eth Embd]** *, C 0 1 . , C 0 2 . , C 0 3 . , C 0 4 ,*
- **[IP Mask Eth Embd]** *, n 0 1 . , n 0 2 . , n 0 3 . , n 0 4 ,*
- **[IP Gate Eth Embd]** *, G 0 1 , G 0 2 , G 0 3 , G 0 4 .*

If this address is modified, the new IP address entered is displayed.

Configuring BOOTP

The BOOTP service is used to assign IP addresses based on the MAC address. The MAC address consisting of 6 hexadecimal digits (MM-MM-MM-XX-XX-XX) must be entered in the BOOTP server. The MAC address appears on the fieldbus adapter dedicated menu on the display terminal.

In the **[Communication]** *C o n -* , **[Comm parameters]** *C n P -* menu and **[Ethernet Embd]** *E t E -* submenu:

- Leave the IP address **[IP Eth Embd]** *, C 0 1 . , C 0 2 . , C 0 3 . , C 0 4 . . .* at the value **[0.0.0.0]** *0 0 0 .*
- Do not enable the FDR service.

Configuring DHCP

The DHCP service is used to assign IP addresses and FDR configuration file path based on the device name **[DEVICE NAME]** *P A n*.

The device name consisting of an alphanumeric string must be entered in both the DHCP server and the drive.

In the **[Communication]** *C o n -* , **[Comm parameters]** *C n P -* menu and **[Ethernet Embd]** *E t E -* submenu, enter the **[DEVICE NAME]** *P A n*

[Device Name] P R n

About This Parameter

This parameter is used set the device name.

Access

This parameter is accessible via [Communication] C o n - , [Comm parameters] C n P - menu and [Ethernet Embd] E t E - submenu.

This is a read/write parameter

Possible Settings

The FDR (Fast Device Replacement) service is based on identification of the device by a **Device Name**. In the case of the Altivar drive, this is represented by the [Device Name] P R n parameter. Verify that all the network devices have different **Device Name**.

NOTE: The [Device Name] P R n is common for both Ethernet interfaces.

[IP mode Eth Embd] , n o o

About This Parameter

This parameter is used to select the IP address assignment method.

Access

This parameter is accessible via [Communication] C o n - , [Comm parameters] C n P - menu and [Ethernet Embd] E t E - submenu.

This is a read/write parameter

The parameter number is 64400.

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[Fixed]	n r u	0	Manually set the IP address.
[BOOTP]	b o o t	1	Automatically gets the IP address from the Bootp or DHCP server using the MAC address.
[DHCP]	d H C P	2	Automatically gets the IP address from the DHCP server using the device name. Factory setting: DHCP

[IP Eth Embd] , C 0 1 , C 0 2 , C 0 3 , C 0 4**About This Parameter**

This parameter is used to set the IP address and can be edited only when the IP mode is set to fixed address.

Access

This parameter is accessible via **[Communication] C 0 1 -** , **[Comm parameters] C 1 1 P -** menu and **[Ethernet Embd] E E E -** submenu.

This is a read/write parameter

The parameter number for IC01 is 64401

The parameter number for IC02 is 64402

The parameter number for IC03 is 64403

The parameter number for IC04 is 64404

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[139.160.069.241]	1 3 9	0...255	First byte of IP Eth Embd.
	1 6 0	0...255	Second byte of IP Eth Embd.
	0 6 9	0...255	Third byte of IP Eth Embd.
	2 4 1	0...255	Fourth byte of IP Eth Embd.

[IP Mask Eth Embd] , N 0 1 , N 0 2 , N 0 3 , N 0 4**About This Parameter**

This parameter is used to set the IP subnet mask and can be edited only when IP mode is set to fixed address.

Access

This parameter is accessible via **[Communication] C 0 1 -** , **[Comm parameters] C 1 1 P -** menu and **[Ethernet Embd] E E E -** submenu.

This is a read/write parameter

The parameter number for IM01 is 64405

The parameter number for IM02 is 64406

The parameter number for IM03 is 64407

The parameter number for IM04 is 64408

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[255.255.254.0]	2 5 5	0...255	First byte of IP Mask Eth Embd.
	2 5 5	0...255	Second byte of IP Mask Eth Embd.
	2 5 4	0...255	Third byte of IP Mask Eth Embd.
	0	0...255	Fourth byte of IP Mask Eth Embd

[IP Gate Eth Embd] , G 0 1 , G 0 2 , G 0 3 , G 0 4

About This Parameter

This parameter is used to set the default gateway address and can be edited only IP mode is set to fixed address.

Access

This parameter is accessible via **[Communication] C o m -** , **[Comm parameters] C n P -** menu and **[Ethernet Embd] E t E -** submenu.

This is a read/write parameter

The parameter number for IG01 is 64409

The parameter number for IG02 is 64410

The parameter number for IG03 is 64411

The parameter number for IG04 is 64412

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[0.0.0.0]	0	0...255	First byte of IP Gate Eth Embd.
	0	0...255	Second byte of IP Gate Eth Embd
	0	0...255	Third byte of IP Gate Eth Embd
	0	0...255	Fourth byte of IP Gate Eth Embd

[Enable FDR] F d v 0

About This Parameter

This parameter is used to enable or disable the FDR service.

Access

This parameter is accessible via **[Communication] C o m -** , **[Comm parameters] C n P -** menu, **[Embd Eth Config] E t E -** submenu and **[Fast Device Replacement] F d r -** submenu.

This is a read/write parameter.

The parameter number is 64435

This parameter can be accessed if **[IP mode Ether. Embd] , n o o** is set to **[DHCP] d H C P**

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[No]	n o	0	No: FDR service disabled
[Yes]	y e s	1	Yes: FDR service enabled
			Factory setting: No

[FDR Action] F d A D

About This Parameter

This parameter is used to select the FDR action that needs to be performed.

Access

This parameter is accessible via **[Communication] C o m -**, **[Comm parameters] C n P -** menu, **[Embd Eth Config] E t E -** submenu and **[Fast Device Replacement] F d r -** submenu.

This is a read/write parameter.

The parameter number is 64434

This parameter can be accessed if **[IP mode Ether. Embd] i n D D** is set to **[DHCP] d H C P**

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[NOT ACTIVE]	i d L E	0	Not active: No FDR action
[SAVE]	S A V E	1	Save: FDR save command
[REST]	r E S E	2	Restore: FDR restore command

[FDR Operating State] F d S D

About This Parameter

This parameter is used to display the FDR operating state.

Access

This parameter is accessible via **[Communication] C o m -**, **[Comm parameters] C n P -** menu, **[Embd Eth Config] E t E -** submenu and **[Fast Device Replacement] F d r -** submenu.

This is a read-only parameter.

The parameter number is 64433

This parameter can be accessed if **[IP mode Ether. Embd] i n D D** is set to **[DHCP] d H C P**

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[Initialization]	i n i t	0	INIT: Initialization
[Not Active]	i d L E	1	IDLE: Function not active
[Operational]	o P E	2	OPE: Operational
[Ready]	r d Y	4	RDY: Ready
[IP Configuration]	i P C	5	IPC: IP configuration
[Not Configured]	u n C F	7	UNCF: Function not configured
[Reading Configuration]	G E T	8	GET: Download the current configuration
[Writing Configuration]	S E T	9	SET: Save the current configuration
[Applying Configuration]	A P P	10	APP: Applying the configuration to the drive

[FDR Error Status] *F d r D*

About This Parameter

This parameter is used to display the FDR error status.

Access

This parameter is accessible via **[Communication] *С о П -***, **[Comm parameters] *С П P -*** menu, **[Embd Eth Config] *E E E -*** submenu and **[Fast Device Replacement] *F d r -*** submenu.

This is a read-only parameter.

The parameter number is 64432

This parameter can be accessed if **[IP mode Ether. Embd] *, П D D*** is set to **[DHCP] *Д H C P***

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[No Error]	<i>н о</i>	0	NO: No error
[Service Timeout]	<i>т о u t</i>	1	TOUT: Server timeout
[Server No File]	<i>С n F</i>	2	SNF: No file on server
[Server Corrupt File]	<i>С r P t</i>	3	CRPT: Corrupted file on server
[Server Empty File]	<i>E P t y</i>	4	EPTY: Empty file on server
[Drive Invalid File]	<i>H , n V</i>	5	HINV: Invalid file on drive
[CRC Error]	<i>С r C</i>	6	CRC: CRC error
[Version Incompatibility]	<i>V r П</i>	7	VRM: Version incompatibility between drive and file
[Drive No File]	<i>H n F</i>	9	HNF: No file on drive
[Server Reading Size]	<i>С , Z E</i>	10	SIZE: File size reading error on server
[Drive Opening File]	<i>о P E n</i>	11	OPEN: Drive cannot open the file
[Drive Reading File]	<i>р E A d</i>	12	READ: Drive cannot read the file
[Incompatibility]	<i>С C n t</i>	13	SCNT: File incompatibility
[Drive Invalid Name]	<i>н , n V</i>	14	NINV: Drive name is invalid
[Server Incorrect File Size]	<i>F S , Z</i>	15	FSIZ: Incorrect file size on server
[Drive Writing File]	<i>H W F</i>	16	HWF: Drive cannot write the file
[Server Writing File]	<i>С W F</i>	17	SWF: Server cannot write the file

[MAC @] *П A C*

About This Parameter

This parameter displays the MAC address of the device.

Access

This parameter is accessible via **[Display] *П о н -***, **[Communication map] *С П П -*** menu and **[Ethernet Embd Diag] *П P E -*** submenu.

This is a read-only parameter

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[MM-MM-MM-XX-XX-XX]	<i>П П - П П - П П - X X - X X - X X</i>	MM-MM-MM-XX-XX-XX XX	MAC address of the embedded Ethernet port

[ETH emb Rx frames] E r X E**About This Parameter**

This parameter displays the Ethernet embedded received frames counter

Access

This parameter is accessible via **[Display] П о н -** , **[Communication map] C П П -** menu and **[Ethernet Embd Diag] П P E -** submenu.

This is a read-only parameter

The parameter numbers is 64416

[ETH emb Tx frames] E t X E**About This Parameter**

This parameter displays the Ethernet embedded transmitted frames counter

Access

This parameter is accessible via **[Display] П о н -** , **[Communication map] C П П -** menu and **[Ethernet Embd Diag] П P E -** submenu.

This is a read-only parameter

The parameter numbers is 64418

[ETH emb error frames] E E r E**About This Parameter**

This parameter displays the Ethernet embedded error frames counter

Access

This parameter is accessible via **[Display] П о н -** , **[Communication map] C П П -** menu and **[Ethernet Embd Diag] П P E -** submenu.

This is a read-only parameter

The parameter numbers is 64420

[Ethernet Rate Data] R r d E**About This Parameter**

This parameter displays the Ethernet embedded actual rate.

Access

This parameter is accessible via **[Display] П о н -** , **[Communication map] C П П -** menu and **[Ethernet Embd Diag] П P E -** submenu.

This is a read-only parameter

The parameter numbers is 64413

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[Auto]	<i>А u t o</i>	Auto	Data rate is auto detected depending on the first data packet received.
[10M. full]	<i>1 0 F</i>	10 F	Data rate is set to10 Mbit/s full duplex
[10M. half]	<i>1 0 H</i>	10 H	Data rate is set to10 Mbit/s half duplex
[100M. full]	<i>1 0 0 F</i>	100 F	Data rate is set to100 Mbit/s full duplex
[100M. half]	<i>1 0 0 H</i>	100 H	Data rate is set to100 Mbit/s half duplex
			Factory setting: Auto

[Ethernet Embd cmd.] *C P d S*

About This Parameter

This parameter displays the command word built with Ethernet embedded source (same as CMD).

Access

This parameter is accessible via **[Display] *П о н -*** , **[Communication map] *С П П -*** menu and **[Command word image] *С W , -*** submenu.

This is a read-only parameter

The parameter numbers is 8515

[Ethernet Embd Ref Freq] *L F r S*

About This Parameter

This parameter displays the reference frequency built with Ethernet embedded source (same as LFr).

Access

This parameter is accessible via **[Display] *П о н -*** , **[Communication map] *С П П -*** menu and **[Command word image] *С W , -*** submenu.

This is a read-only parameter

The parameter numbers is 8525

[Enable Web Services] *E W E E*

About This Parameter

This parameter is used to manage the embedded Web services.

Access

This parameter is accessible via **[My preferences] *П У Р -*** menu and **[Webserver] *W b S -*** submenu.

This is a read/write parameter

The parameter numbers is 6693

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[No]	<i>н о</i>	0	Web services disabled
[Yes]	<i>у е с</i>	1	Web services enabled Factory setting: Yes

[Reset EmbWeb Passwd] *r w P E*

About This Parameter

This parameter is used to manage the set to factory value the Ethernet webserver settings, including the password.

Access

This parameter is accessible via **[My preferences] *M Y P*** - menu and **[Webserver] *w b S*** - submenu.

This is a read/write parameter

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[No]	<i>n o</i>	0	Reset of the embedded webserver password not requested
[Yes]	<i>y e s</i>	1	Reset of the embedded webserver password requested
			NOTE: The parameter is set to [No] when the operation is done

[Ethernet Timeout] *t t o b*

About This Parameter

This parameter is used to set the Ethernet timeout.

Access

This parameter is accessible via fieldbus using the Modbus address.

This is a read/write parameter

The parameter number is 64415.

Possible Settings

The table presents the parameter settings:

Settings	Description
0.1...30 sec	Factory setting: 10 sec

Section 4.2

Additional Settings

What Is in This Section?

This section contains the following topics:

Topic	Page
FDR Settings	47
[Embedded Eth Com Interrupt] <i>E L H F</i>	48
[External Error] <i>E P F I</i>	48
Configuring I/O Scanning	48
DNS Settings	49
SNTP Settings	50
SNMP Settings	51

FDR Settings

Access

The parameters are accessible via the webserver or the DTM-based PC software

FDR Configuration

The following figure shows FDR settings via webserver:

The table presents the **FDR Configuration** settings:

Parameter	Description	Settings
FDR Activation	This parameter is used to enable or disable the FDR service NOTE: You can enable FDR only if the IP assignment mode selected is DHCP.	Enabled: FDR service enabled Disabled: FDR service disabled. Factory setting: Enabled
Control Configuration	This parameter is used to select the server or local configuration.	Served: Transfers the configuration file from server to drive at power-up. Stored: uses the configuration stored in the drive at power-up. Factory setting: served
Automatic Syncho Cycle (x 10 Sec)	Allows you to select the interval for periodic synchronization of the drive with the FDR server. NOTE: You can configure automatic Syncho cycle only if Synchronization mode check box is selected.	10...655350 sec Factory setting: 2560 sec

[Embedded Eth Com Interrupt] *E E H F*

About This Parameter

This parameter displays the communication option interruption error value.

Access

This is a read-only parameter
 The parameter number is 7136.

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[1]	<i>1</i>	1	1: Modbus TCP timeout

[External Error] *E P F I*

About This Parameter

This parameter displays the external detected error.

Access

This is a read-only parameter
 The parameter number is 7143.

Possible Settings

The table presents the parameter settings:

Settings	Code	Value	Description
[1]	<i>1</i>	1	1: Invalid IP address
[2]	<i>2</i>	2	2: Duplicate IP address
[4]	<i>4</i>	4	4: FDR service error

Configuring I/O Scanning

Description

The drive I/O scanning service can be enabled or disabled with the DTM-based PC software.
 It is not possible to modify the assignment of the I/O scanning periodic variables using the display terminal.
 To configure I/O scanning, use the DTM-based PC software.

DNS Settings

Description

The Domain Name System (DNS) is a distributed naming system for devices connected to the network. It translates domain names to IP addresses for locating the devices easily on the network.

DNS Configuration

The DNS configuration can be done using the DTM-based PC software.

The following figure shows the DNS configuration window:

- DNS Configuration

Parameters

1 Obtain DNS server address automatically


Use the following DNS address:

2 Preferred DNS server

3 Alternate DNS server

The table presents the **DNS Configuration** settings:

Item	Description
1	Obtain DNS Server address automatically: When checked, the function is enabled and allows getting automatically the IP address from the DNS server.
2	Preferred DNS server: Enter the IP address of the preferred DNS server.
3	Alternate DNS server: Enter the IP address of the alternate DNS server. NOTE: The alternate IP address is used only if the first server is unavailable.

NOTE: The changes must be applied to the module configuration by clicking the  button.

SNTP Settings

Description

The Simple Network Time Protocol (SNTP) is networking protocol for clock synchronization of devices connected to the network.

SNTP Configuration

The SNTP configuration can be done using the DTM-based PC software. The following figure shows the SNTP Configuration window:

The **SNTP Configuration** window is divided in 2 zones:


- **SNTP Settings**
- **Local Time**

The table presents the **SNTP settings**:

Item	Description
1	Enabled: Enables SNTP service. Disabled: Disables SNTP service.
2	Server 1 IP Address: Enter the IP address of the first preferred SNTP server.
3	Server 2 IP Address: Enter the IP address of the second preferred SNTP server. NOTE: This IP address is used for SNTP only if the first server is unavailable.
4	Polling Interval: Allows you to select the scanning interval for checking the time change.

The table presents the **Local Time** settings:

Item	Description
a	Current Date: Allows you to enter the current date
b	Current Time: Allows you to select the current time

NOTE: The changes must be applied to the module configuration by clicking the  button.

SNMP Settings

Description

Simple Network Management Protocol (SNMP) is an internet-standard protocol used to manage devices on IP networks.

It is used for collecting and organizing information about the devices on the network.

SNMP Configuration

The SNMP configuration can be done using the DTM-based PC software.

The following figure shows the Sntp Configuration window:

The screenshot shows the 'SNMP Configuration' window with the following fields and options:

- Manager's IP Address:**
 - 1a Manager 1: 0 . 0 . 0 . 0
 - 2a Manager 2: 0 . 0 . 0 . 0
- Agent:**
 - 1b System Name: [Empty]
 - 2b System Location: My Location
 - 3b System Contact: Schneider Electric
- Community Names:**
 - 1c Get: public
 - 2c Set: private
 - 3c Trap: trap
- Enabled Traps:**
 - 1d Cold Start Trap
 - 2d Link Down Trap
 - 3d Link Up Trap
 - 4d Authentication Failure Trap

The **SNMP Configuration** window is divided in 4 zones:

- **Manager's IP Address**
- **Agent**
- **Community Names**
- **Enabled Traps**

Manager's IP Address

SNMP manager is a central system used for monitoring and controlling the SNMP agents.

The table presents **Manager's IP Address** settings:

Item	Description
1a	Manager 1: SNMP manager is a central system, which is used for monitoring and controlling the SNMP agents.
2a	Manager 2: Enter the IP address of SNMP manager 2.

Agents

Agents are the devices which are connected to the network. The SNMP manager monitors these devices.

The table presents the **Agents** settings:

Item	Description
1b	System Name: Enter the system name used by the drive.
2b	System Location: Enter the system location of the drive.
3b	System Contact: Contact point to get the information about the system. Enter the system contact of the drive.

Community Names

Community names are used to identify the commands that can be performed by an SNMP manager on a device.

The table presents the **Community Names** settings:

Item	Description
1c	Get: Requests send from manager to agent to retrieve data.
2c	Set: Requests send from manager to agent to change data.
3c	Trap: Requests send from manager to agent to find the available data.

Enabled Traps

Traps are used to inform the SNMP manager of specific events occurring on device.

The table presents the **Enabled Traps** settings:

Item	Description
1d	Cold Start: The agent reinitialized its configuration tables.
2d	Link Down Trap: A network interface card (NIC) on agent reinitializes.
3d	Link Up Trap: A network interface card (NIC) on agent stops responding.
4d	Authentication Failure Trap: SNMP agent gets a request from an unrecognized community name.

Section 4.3

Fast Device Replacement

What Is in This Section?

This section contains the following topics:

Topic	Page
Presentation	54
Startup Detailed Behavior	55
FDR Operation Behavior	56
Local Configuration	57
Downloaded Configuration	58

Presentation

FDR Service

The FDR (Fast Device Replacement) service is used to simplify the maintenance of drives connected to an Ethernet network. In the event of a drive not working correctly, this service automatically reconfigures its replacement.

The new drive (FDR client) retrieves:

- Its IP addresses and the FDR file path from a DHCP server
- The FDR file from an FTP server if the drive is not configured in local configuration

In practice, the DHCP server and the FTP server are the same device (PAC M580, M340 PLC, M251MESE or dedicated PCs).

The FDR file contains:

- The Ethernet parameters (configuration of I/O scanning, FDR, and so on)
- The drive parameters (drive, functions, application, and so on)

The FDR service is based on identification of the device by a **Device Name**. In the case of the drive, this is represented by the **[DEVICE NAME] P R n** parameter.

The configuration of the FDR service is accessible via embedded webserver or DTM-based software or Graphic Display Terminal.

NOTE: Check that all the network devices have different **Device Name**.

The FDR server controls duplication of **Device Name** (it does not assign an IP address that has already been assigned and is active).

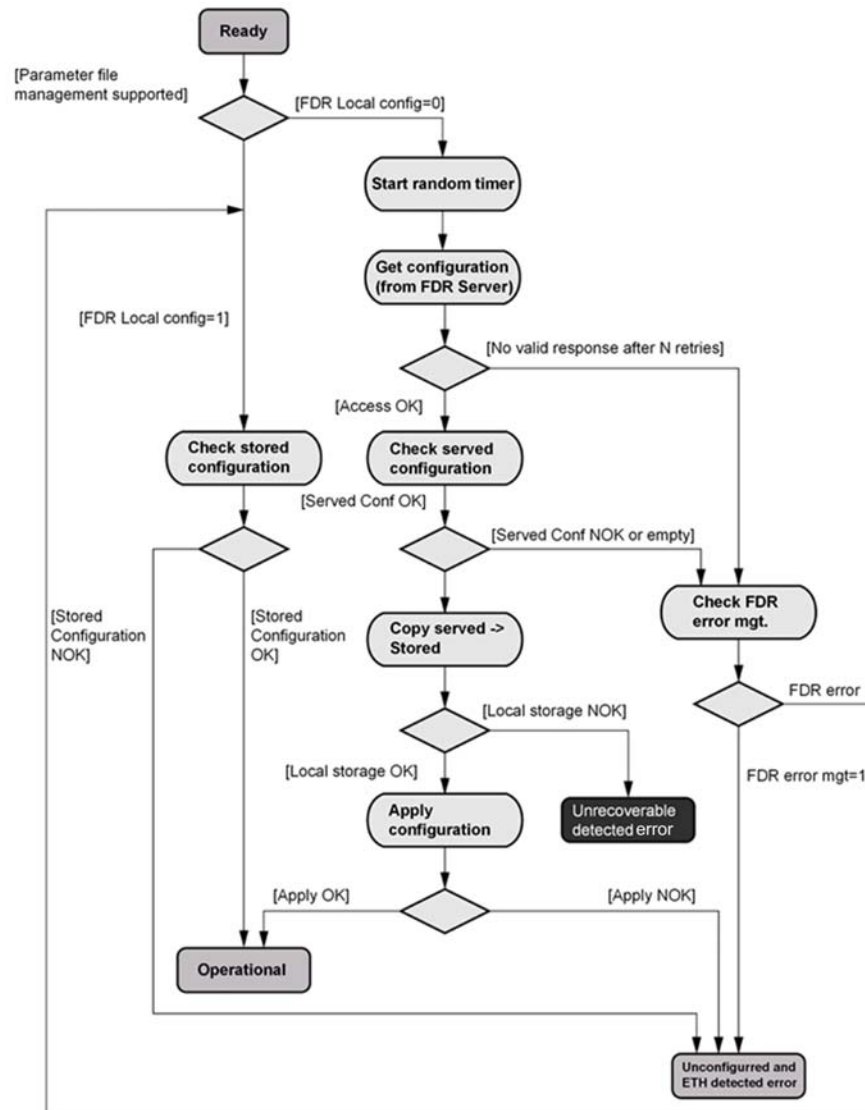
If the same IP address is supplied on 2 devices, the second should trigger an IP address duplication (network management detected error which triggers an **[External Error] E P F I** by default).

If the FDR service has been enabled, the Ethernet adapter attempts to restore its IP addresses on each power-up. Each time the procedure has detected error, the Ethernet adapter reiterates its FDR requests (DHCP).

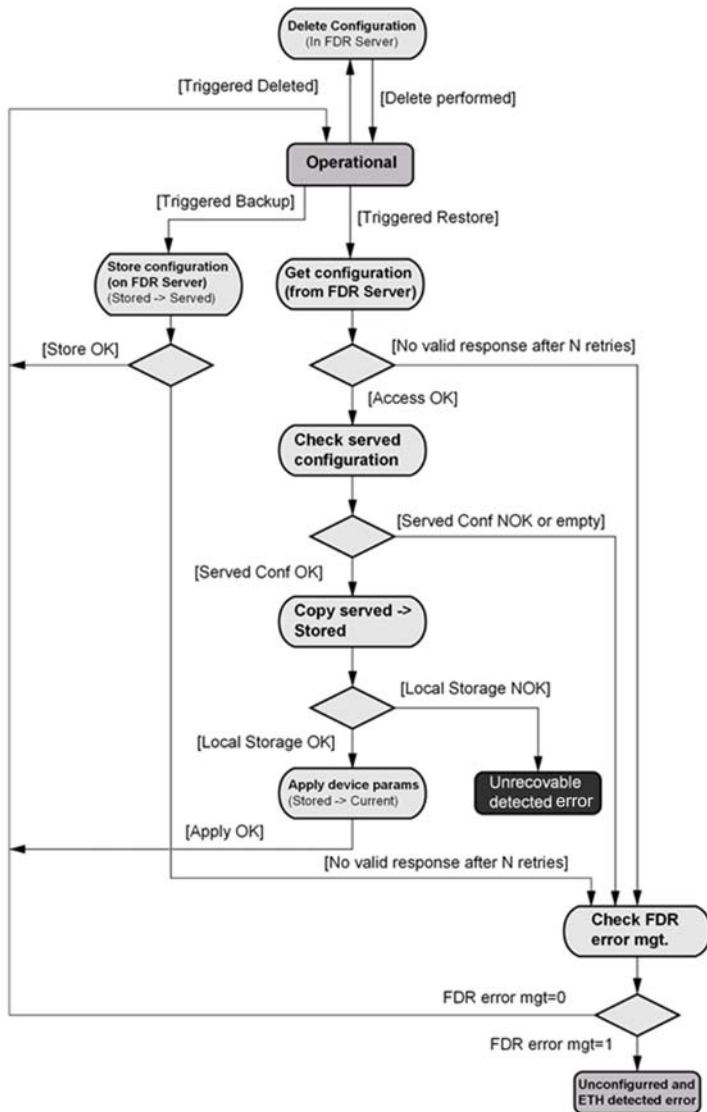
After assigning the Ethernet adapter IP addresses, if the configuration is not downloaded successfully, the Ethernet adapter triggers a **[FDR1 Error] F d r I**.

Startup Detailed Behavior

Presentation

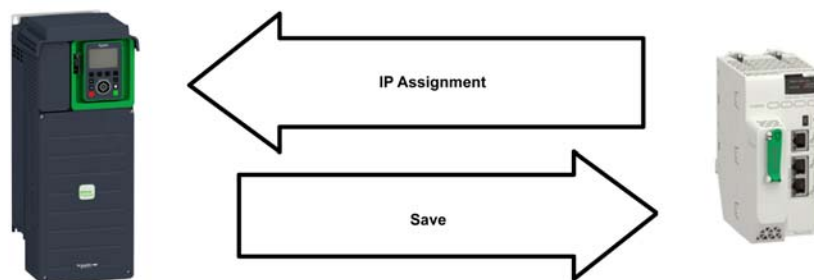


FDR Operation Behavior



Local Configuration

Presentation



IP Assignment Save

If the drive parameter configuration is local, the FDR server only assigns the following IP addresses:

- IP address,
- Subnet mask,
- Gateway IP address.

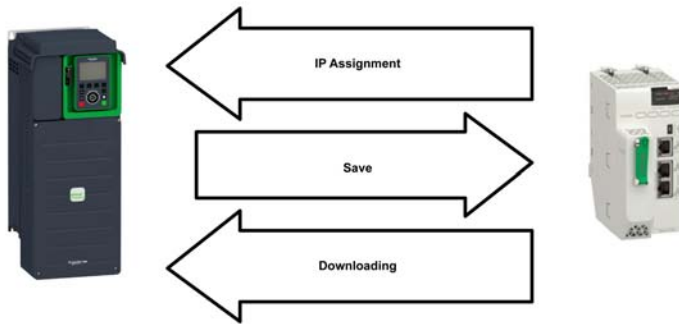
On connection to the network, the drive automatically saves its parameters in the FDR server.

Drive Connection Procedure

Step	Action	Description
1	Configure the FDR server	See the PLC manual or the section on software setup using Unity
2	Configure the drive	In the [Communication] C o m - , [Comm parameters] C P P - menu, [Ethernet Emdb] E E E submenu: Configure [IP mode] , P P = [DHCP] d H C P Enable the FDR service via webserver or DTM-based software or Graphic Display Terminal. Select local drive configuration with webserver or DTM-based software. Enter the device name, DEVICE NAME , in the [Communication] C o m - , [Comm parameters] C P P - menu, [Ethernet Emdb] E E E submenu.
3	Turn off the drive	Turn off the drive and then back on again (control voltage supply if a separate power supply is being used), otherwise the device name is not taken into account
4	Connect the drive to the network	Connect the drive and the FDR server (PLC) to the Ethernet network

Downloaded Configuration

Presentation



IP Assignment Save

If the drive parameter configuration has been downloaded, the FDR server assigns the following addresses:

- IP address,
- Subnet mask,
- Gateway IP address,
- FDR server IP address.

Periodic Saving

Periodic saving of the drive configuration can be configured on the FDR server in either local configuration or downloaded configuration mode

Using the embedded webserver or the DTM-based software:

- Set FDR synchronization to automatic mode
- Set the synchronization cycle time

NOTE: Saving too often overburden the fieldbus and adversely affects its performance (factory setting: 2.560 s.).

Limitations

The FDR service is able to store the current configuration of the drive, but does not provide the possibility to store multi-parameters configurations.

Drive Parameters (Configuration)

In the procedure described below, the configuration file is transferred to the FDR server, via the Ethernet network, using a manual save command.

Step	Action	Description
1	Configure the drive	<p>In the [Communication] C o P -, [Comm parameters] C P P - menu, [Ethernet Embd] E t E - submenu:</p> <ul style="list-style-type: none"> • Leave the IP address [IP Eth Embd] , C 0 1 . , C 0 2 . , C 0 3 . , C 0 4 at the value [0.0.0.0] 0 0 0 0 <p>Using the embedded webserver or the DTM-based software:</p> <ul style="list-style-type: none"> • Set FDR synchronization to manual mode. • Before the first connection, select local drive configuration. The drive needs first to push the configuration to the server. <p>Enter the device name, DEVICE NAME, in the [Communication] C o P -, [Comm parameters] C P P - menu, [Ethernet Embd] E t E - submenu.</p>
2	Turn off the drive	Turn off the drive and then back on again (control voltage if a separate power supply is being used), otherwise the device name is not taken into account
3	Connect the drive to the fieldbus	Connect the drive and the FDR server (PLC) to the Ethernet fieldbus.
4	Configure the FDR server (see the PLC manual)	<p>The server downloads the IP addresses to the Ethernet module .</p> <p>Check that the operation has proceeded correctly: you can also check, in the [Communication] C o P -, [Comm parameters] C P P - menu, [Ethernet Embd] E t E - submenu. Whether the [IP Eth Embd] , C 0 1 . , C 0 2 . , C 0 3 . , C 0 4 ., [IP Mask Eth Embd] , 1 0 0 1 , 1 0 0 2 , 1 0 0 3 , 1 0 0 4 and [IP Gate Eth Embd] , G 0 1 , G 0 2 , G 0 3 , G 0 4 parameters have values other than [0.0.0.0] 0 0 0 0</p>
5	Supply the FDR server with the configuration file	<p>Using the embedded webserver or the DTM-based software</p> <ul style="list-style-type: none"> • Specify that the drive configuration is downloaded from the FDR server on each power-up • Send a save command to the FDR server.
6	Check that the system is operational	If the save operation has not been successful, the adapter detects a communication error which, in factory settings mode, triggers a [FDR1 Error] F d r 1

Replacing a Drive

For replacing a drive, it is necessary to follow the procedure below:

Step	Action	Action
1	Configure the drive	<p>In the [Communication] C o P -, [Comm parameters] C P P - menu, [Ethernet Embd] E t E - submenu:</p> <ul style="list-style-type: none"> • Leave the IP address [IP Eth Embd] , C 0 1 . , C 0 2 . , C 0 3 . , C 0 4 . at the value [0.0.0.0] 0 0 0 0 <p>Using the embedded webserver or the DTM-based software:</p> <ul style="list-style-type: none"> • Set FDR synchronization to manual mode. • Before the first connection, select served drive configuration. The drive needs first to transfer the configuration from the server. <p>Enter the device name, DEVICE NAME, in the [Communication] C o P -, [Comm parameters] C P P - menu, [Ethernet Embd] E t E - submenu.</p>
2	Turn off the drive	Turn off the drive and then back on again (control voltage if a separate power supply is being used), otherwise the device name is not taken into account
3	Connect the drive to the fieldbus	Connect the drive and the FDR server (PLC) to the Ethernet fieldbus
4	Check that the drive is operational	<p>Check that the operation has proceeded correctly.</p> <p>If downloading has not been possible after a period of 2 min following assignment of the IP addresses, the adapter detects a communication error which, in factory settings mode, triggers an [FDR1 Error] F d r 1</p>

Section 4.4

Communication Profile

What Is in This Section?

This section contains the following topics:

Topic	Page
Definition of a Profile	61
Functional Profiles Supported by the Drive	62
Functional Description	63
CIA402 Operating State Diagram	64
Description of Operating States	65
Summary	67
Cmd Register <i>C P d</i>	68
Stop Commands	69
Assigning Control Word Bits	70
[CIA402 State Reg] <i>E L R</i>	71
Starting Sequence	72
Sequence for a Drive Powered by the Power Stage Supply	73
Sequence for a Drive with Separate Control Stage	74
Sequence for a Drive with Mains Contactor Control	76

Definition of a Profile

Types of Profiles

There are 3 types of profile:

- Communication profiles
- Functional profiles
- Application profiles

Communication Profile

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

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

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

Functional Profile

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

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

A functional profile is common to all members of a device family (such as variable speed drives, encoders, I/O modules, displays, and so on).

They can feature common or similar parts. The standardized (IEC 61800-7) functional profiles of variable speed drives are:

- CiA402
- PROFIDRIVE
- CIP AC Drive

CiA402 device profile for drives and motion control represents the next stage of this standard development and is now part of the IEC 61800-7 standard.

Application Profile

Application profile defines the services to be provided by the devices on a machine. For example, CiA DSP 417-2 V 1.01 part 2: CANopen application profile for lift control systems - virtual device definitions.

Interchangeability

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

Functional Profiles Supported by the Drive

I/O Profile

Using the I/O profile simplifies PLC programming.

The I/O profile mirrors the use of the terminal strip for control by utilizing 1 bit to control a function.

The I/O profile for the drive can also be used when controlling via a fieldbus. The drive starts up as soon as the `run` command is sent. 15 bits of the control word (bits 1...15) can be assigned to a specific function.

This profile can be developed for simultaneous control of the drive via:

- The terminals
- The Modbus control word
- The CANopen control word
- Ethernet Modbus TCP embedded control word
- The fieldbus module control word

The I/O profile is supported by the drive itself and therefore in turn by all the communication ports.

CiA402 Profile

The drive only starts up following a command sequence.

The control word is standardized.

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

The CiA402 profile is supported by the drive itself and therefore by all the communication ports.

The drive supports the `velocity` mode of CiA402 profile.

In the CiA402 profile, there are two modes that are specific to the drive and characterize commands and references value management:

- Separate [**Separate**] `S E P`
- Not separate [**Not separ.**] `S , P`,

Functional Description

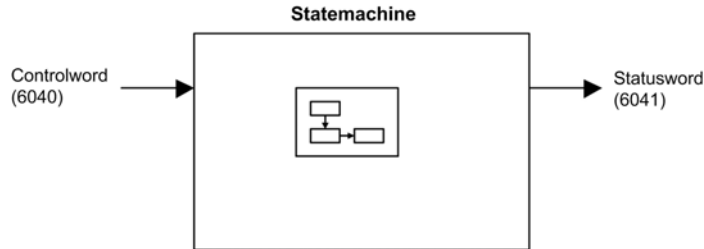
Introduction

Drive operation involves two main functions, which are illustrated in the diagrams below.

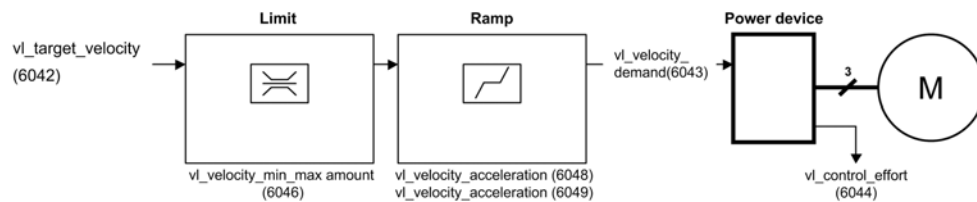
CiA402

The main parameters are shown with their CiA402 name and their CiA402/Drivecom index (the values in brackets are the CANopen addresses of the parameter).

The following figure shows the control diagram for drive operation:



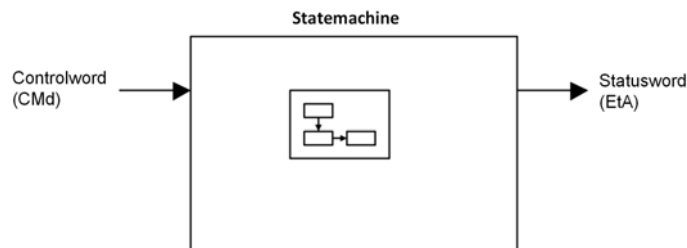
Simplified diagram for speed control in Velocity mode:



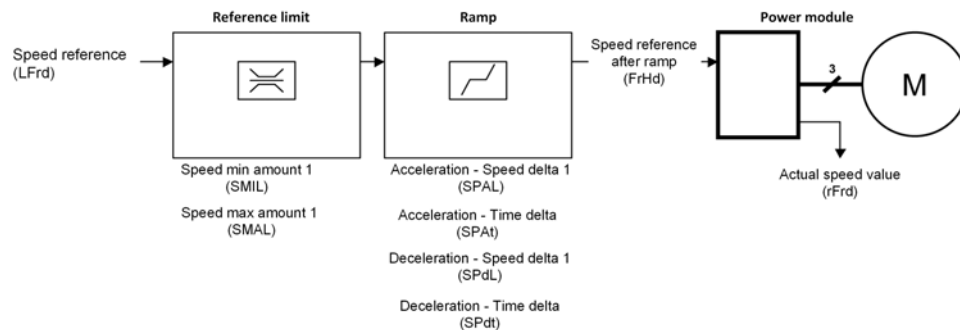
Altivar Drive

These diagrams translate as follows for the Altivar drive.

The following figure shows the control diagram for drive operation:



Simplified diagram for speed control in Velocity mode:



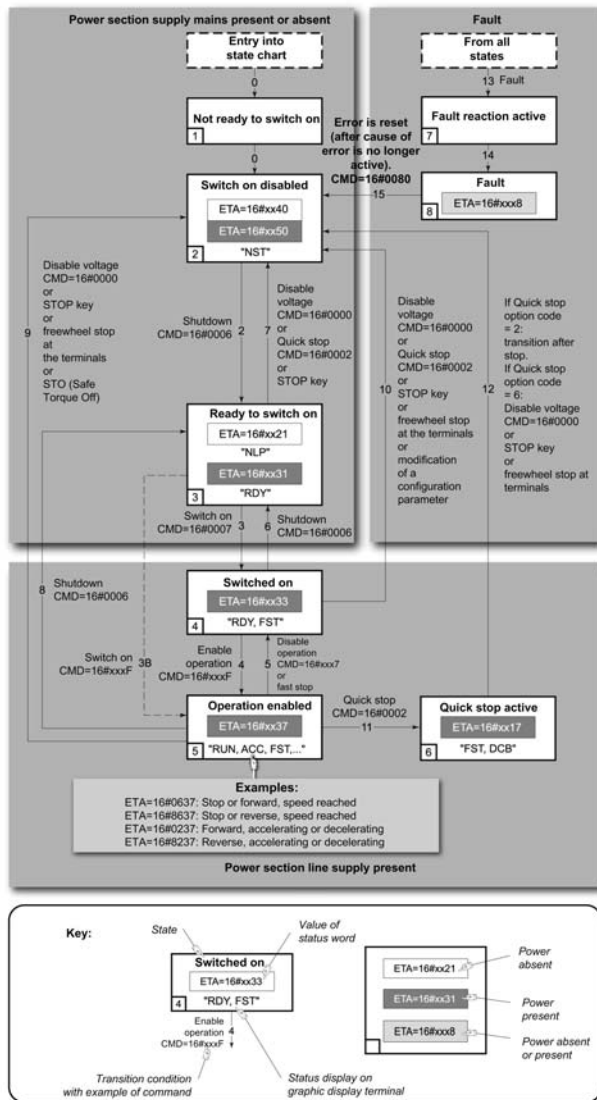
CIA402 Operating State Diagram

State Diagram

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

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

The following figure shows the CIA402 state diagram:



Description of Operating States

Drive Operating State

The operating state of the drive changes depending on whether the control word **[Cmd Register] *C n d***, is sent or an event occurs (an error detection, for example).

The drive operating state can be identified by the value of the status word **[CIA402 State Reg] *E E R***.

Operating State	Description
1 - Not ready to switch on	Initialization starts. This is a transient state invisible to the communication network.
2 - Switch on disabled	The power stage is not ready to switch on. The drive is locked, no power is supplied to the motor. For a separate control stage, it is not necessary to supply the power. For a separate control stage with mains contactor, the contactor is not closed. The configuration and adjustment parameters can be modified.
3 - Ready to switch on	The power stage is ready to switch on and awaiting power stage supply mains. For a separate control stage, it is not necessary to supply the power stage, but the system expects it in order to change to state 4 - Switched on. For a separate control stage with mains contactor, the contactor is not closed. The drive is locked, no power is supplied to the motor. The configuration and adjustment parameters can be modified.
4 - Switched on	Power stage is switched on. For a separate control stage, the power stage must be supplied. For a separate control stage with mains contactor, the contactor is closed. The drive is locked, no power is supplied to the motor. The power stage of the drive is ready to operate, but voltage has not yet been applied to the output. The adjustment parameters can be modified. If a configuration parameter is modified, the drive returns to the state 2 - Switch on disabled.
5 - Operation enabled	Power stage is enabled. The drive is in running state For a separate control stage, the power stage must be supplied. For a separate control stage with mains contactor, the contactor is closed. The drive is unlocked, power is supplied to the motor. The drive functions are activated and voltage is applied to the motor terminals. If the reference value is zero or the Halt command is applied, no power is supplied to the motor and no torque is applied. To perform [Auto tuning] <i>t u n</i> , the drive must be in state 5 - Operation enabled. The adjustment parameters can be modified. The configuration parameters cannot be modified. NOTE: The command 4 - Enable operation must be taken into consideration only if the channel is valid. In particular, if the channel is involved in the command and the reference value, transition 4 is possible only after the reference value has been received once. The reaction of the drive to a Disable operation command depends on the value of the [SwitchOnDisable Stp] <i>d o t d</i> parameter: <ul style="list-style-type: none"> • If the [SwitchOnDisable Stp] <i>d o t d</i> parameter is set to 0, the drive changes to operating state 4 - Switched on and stops in freewheel stop. • If the [SwitchOnDisable Stp] <i>d o t d</i> parameter is set to 1, the drive stops on ramp and then changes to operating state 4 - Switched on.

Operating State	Description
6 - Quick stop active	<p>The drive performs a fast stop and remains locked in the operating state 6-Quick stop active. Before restarting the motor, it is required to go to the operating state 2-switch on disabled.</p> <p>During fast stop, the drive is unlocked and power is supplied to the motor. The configuration parameters cannot be modified.</p> <p>The condition for transition 12 to state 2 - Switch on disabled depends on the value of the parameter</p> <p>Quick stop mode (QStd):</p> <p>If the Quick stop mode parameter has the value FST2, the drive stops according to the fast stop ramp and then changes to state 2 - Switch on disabled .</p> <p>If the Quick stop mode parameter has the value FST6, the drive stops according to the fast stop ramp and then remains in state 6 - Quick stop active until:</p> <ul style="list-style-type: none">● A Disable voltage command is received or● The STOP key is pressed or● A freewheel stop command via the digital input of the terminal.
7 - Fault reaction active	<p>Transient state during which the drive performs an action corresponding to the selected error response.</p>
8 - Fault	<p>Error response terminated. Power stage is disabled.</p> <p>The drive is locked, no power is supplied to the motor.</p>

Summary

Device Status Summary

Operating State	Power Stage Supply for Separate Control 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, return to 2 - Switch on disabled operating state
5 - Operation enabled	Required	Yes	No
6 - Quick stop active	Required	Yes, during fast stop	No
7 - Fault reaction active	Depends on error response configuration	Depends on error response configuration	-
8 - Fault	Not required	No	Yes

NOTE:

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

Cmd Register [7]

Bit Mapping of the Control Word

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

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific assignable	Manufacturer specific assignable	Manufacturer specific assignable	Manufacturer specific assignable	Manufacturer specific	Reserved (=0)	Reserved (=0)	Halt
				0 = Forward direction asked 1 = Reverse direction asked			Halt

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

X: Value is of no significance for this command.
0→1: Command on rising edge.

Stop Commands

Halt Command

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

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

Regardless of the assignment of the `[Type of stop] 5 L L` parameter `[Fast stop Assign] F 5 L`, `[Ramp stop] r P P`, `[Freewheel Stop] n 5 L`, or `[DC Injection Assign] d L i`, the drive remains in the `5 - Operation enabled` state.

Fast Stop Command

A `Fast Stop` command at the terminals or using a bit of the control word assigned to `Fast Stop` causes a change to the `4 - Switched on`

Freewheel Command

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

Assigning Control Word Bits

Function Codes

In the CiA402 profile, fixed assignment of a function input is possible using the following codes:

Bit	Ethernet Embedded
Bit 11	C511
Bit 12	C512
Bit 13	C513
Bit 14	C514
Bit 15	C515

For example, to assign the DC injection braking to bit13 of embedded Ethernet, simply configure the **[DC Injection Assign]** `dc_i` parameter with the **[C513]** `C513` value.

Bit 11 is assigned by default to the operating direction command **[Reverse Assign]** `rr5`.

[CIA402 State Reg] E L F

Bit Mapping of the Status Word

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

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer-specific Direction of rotation	Manufacturer-specific Stop via STOP key	Reserved (=0)	Reserved (=0)	Internal limit active	Target reached	Remote	Reserved (=0)
				Reference value outside limits	Reference value reached	Command or reference value via fieldbus	

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	
1 -Not ready to switch on	0	X	X	0	0	0	0	-
2 -Switch on disabled	1	X	X	0	0	0	0	0040 hex
3 -Ready to switch on	0	1	X	0	0	0	1	0021 hex
4 - Switched on	0	1	1	0	0	1	1	0023 hex
5 - Operation enabled	0	1	1	0	1	1	1	0027 hex
6 -Quick stop active	0	0	1	0	1	1	1	0007 hex
7 -Fault reaction active	0	X	X	1	1	1	1	002F hex
8 -Fault	0	X	X	1	0	0	0	0008 hex ⁽²⁾ .. .0028 hex

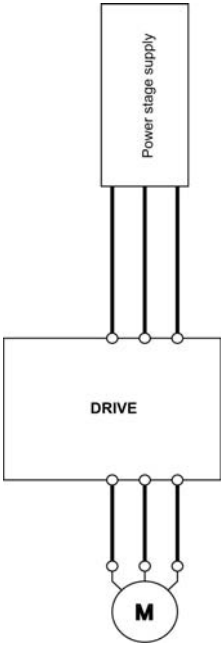
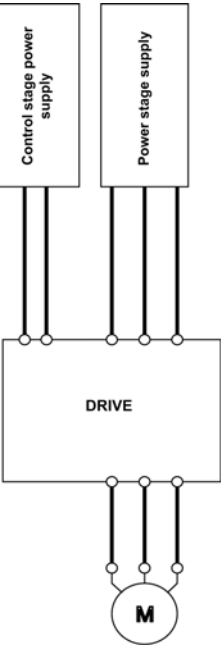
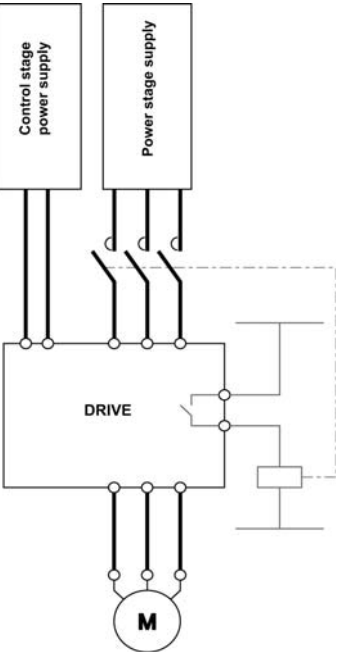
(1) This mask can be used by the PLC program to test the diagram state.
(2) detected error following operating state 6 - Quick stop active.
X: In this state, the value of the bit can be 0 or 1.

Starting Sequence

Description

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

There are 3 possible scenarios:

			
Power stage supply	Direct	Direct	Mains contactor controlled by the drive
Control stage supply	Not separate ⁽¹⁾	Separate	Separate
⁽¹⁾ The power stage supplies the control stage.			

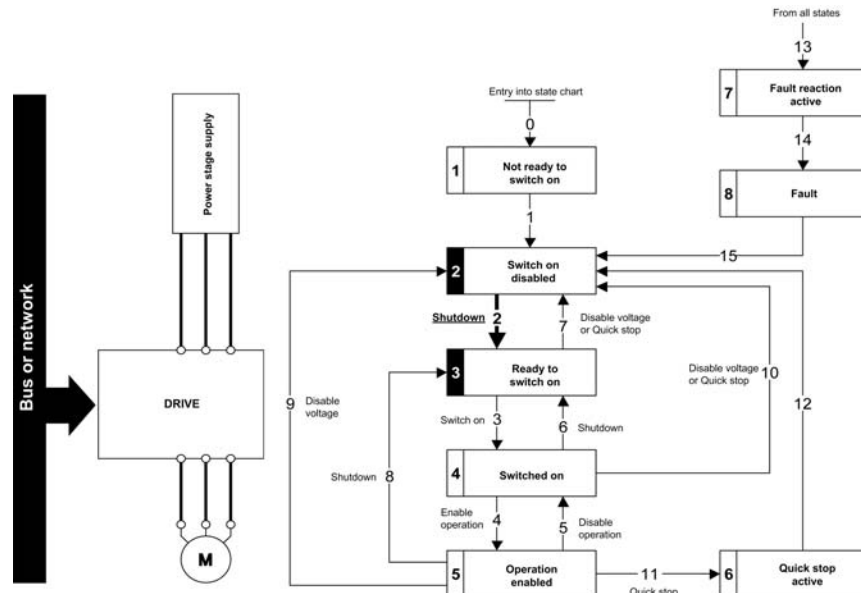
Sequence for a Drive Powered by the Power Stage Supply

Description

Both the power and control stages are powered by the power stage supply.
If power is supplied to the control stage, it has to be supplied to the power stage as well.
The following sequence must be applied:

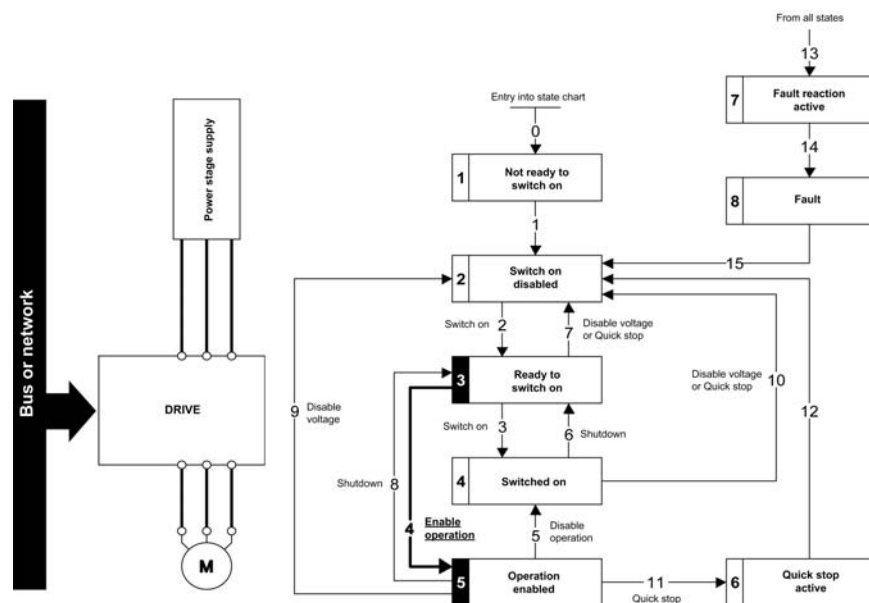
Step 1

Apply the 2 - Shut down command



Step 2

- Check that the drive is in the operating state 3 - Ready to switch on.
- Then apply the 4 - Enable operation command.
- The motor can be controlled (send a reference value not equal to zero).



NOTE: It is possible, but not necessary to apply the 3 - Switch on command followed by the 4 - Enable Operation command to switch successively into the operating states 3 - Ready to Switch on, 4 - Switched on and then 5 - Operation Enabled. The 4 - Enable operation command is sufficient.

Sequence for a Drive with Separate Control Stage

Description

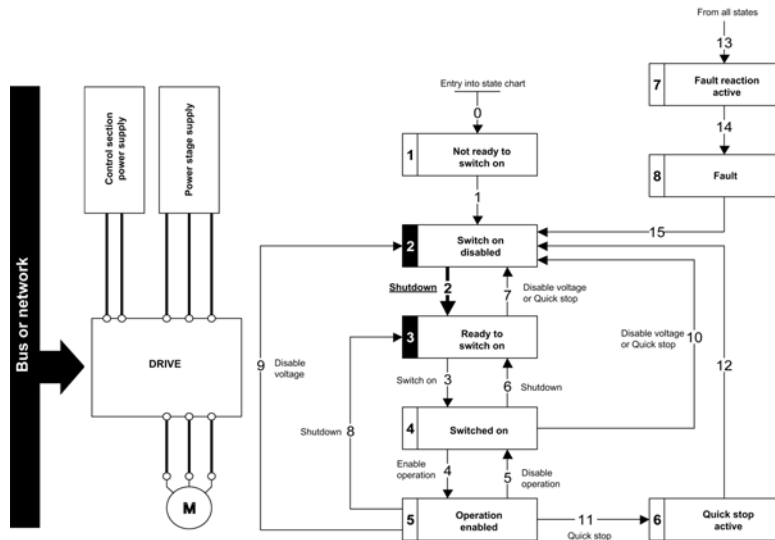
Power is supplied separately to the power and control stages.

If power is supplied to the control stage, it does not have to be supplied to the power stage as well.

The following sequence must be applied:

Step 1

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

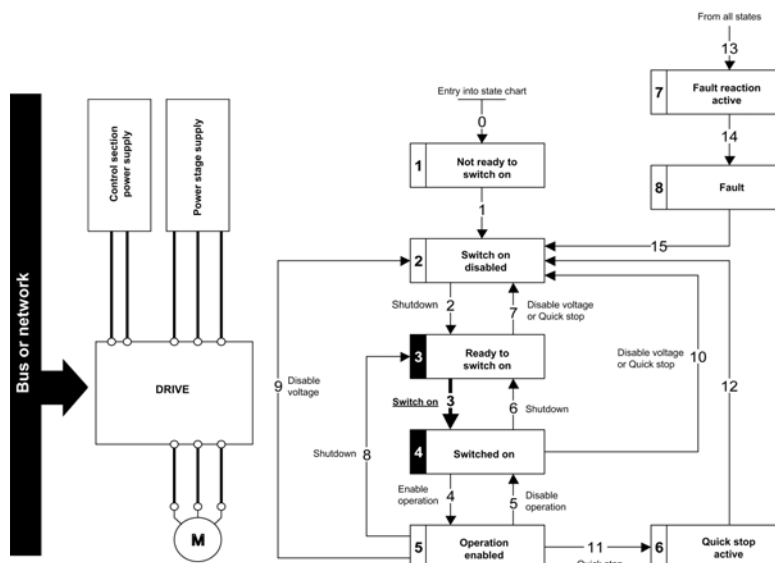


Step 2

- Check that the drive is in the operating state 3 - Ready to switch on.
- Check that the power stage supply is present (Voltage enabled of the status word).

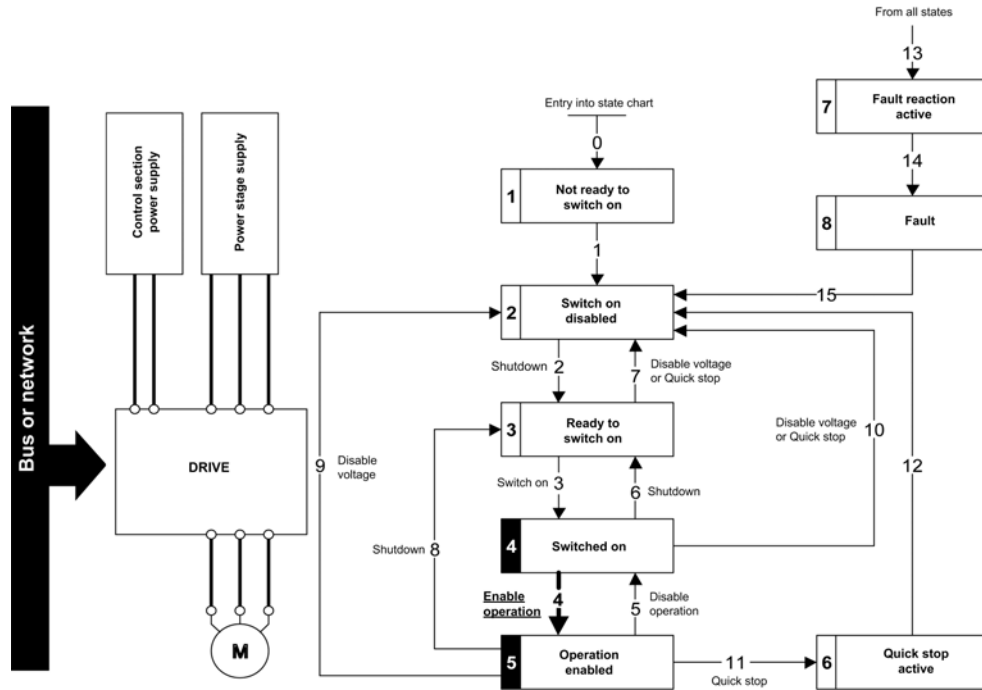
Power Stage Supply	Terminal Display	Status Word
Absent	<i>n L P</i>	21 hex
Present	<i>r d Y</i>	31 hex

- Apply the 3 - Switch on command



Step 3

- Check that the drive is in the operating state 4 - Switched on.
- Then apply the 4 - Enable operation command.
- The motor can be controlled (send a reference value not equal to zero).
- If the power stage supply is still not present in the operating state 4 - Switched on after a time delay [Mains V. time out] L C E, the drive triggers an error [Input Contactor] L C F.



Sequence for a Drive with Mains Contactor Control

Description

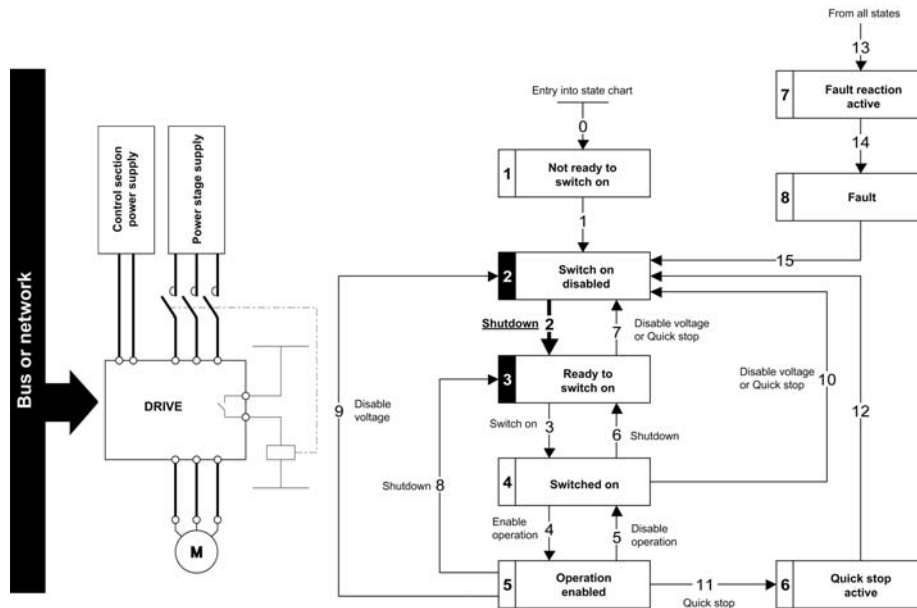
Power is supplied separately to the power and control stages.

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

The following sequence must be applied:

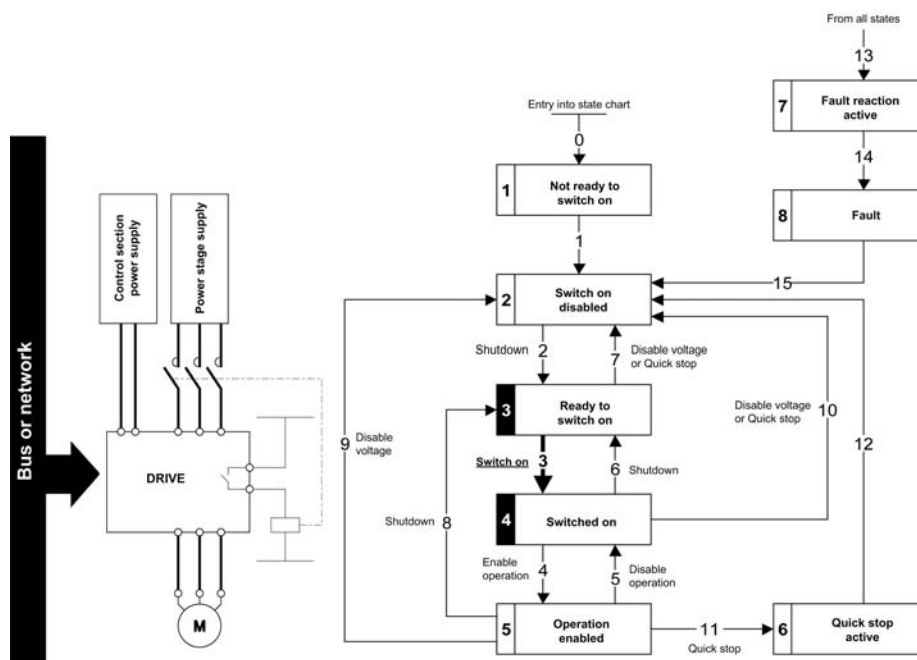
Step 1

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



Step 2

- Check that the drive is in the operating state 3 - Ready to switch on.
- Apply the 3 - Switch on command, which closes the mains contactor and switch on the power stage supply.



Section 4.5

Embedded Webserver

What Is in This Section?

This section contains the following topics:

Topic	Page
Overview	78
Connection to the Webserver	79

Overview

Webserver

The Ethernet adapter provides an integrated Web server which allows several functions like: display, parameter settings, and diagnostics. This chapter describes the services provided by this webservice.

The webservice can be accessed from standard browsers like Internet Explorer, Chrome, Safari, or Firefox.

Connection to the Webserver

Access

The webserver can be accessed from standard browsers.

First connect the computer to the drive by typing http:// followed by the drive IP address.

You are asked to first enter a **User Name** and a **Password**.

By default the user name is ADMIN. If you are connecting to the webserver for the first time, the password is available from the Graphic Display Terminal of the drive in the **[Main Menu] / [My preference] / [Webserver] W b S - / [Webserver default password] W d P** menu. Once logged in you are asked to change the default connection ID (User Name and Password), according to the default security access rule. Access rules can be modified in the Setup/Access Management web page.

Once connected, the webserver home page is displayed.

Using IPV6 network discovery service, there is no need to set IP parameters. The drive appears automatically in the network explorer of the PC while physically connected.

The drive is identified as ATV6.....-MMMM where MMMM is the two last bytes of the MAC address.

Right-click and select **Display device web page** to open the webserver.

User Rights - Password and User Names

A new password is required if you are connecting to the webserver for the first time. Default security access rule requires minimum eight characters for the new password.

The user names and the password of both level can be modified from the administration section.

Web Server Site Map

My Dashboard		Widget-based page to be customized
Display	Drive	Drive parameters for display. Customised tab can be created.
	Energy Dashboard	Trend view and energy report.
	Pump Dashboard	Pump and process data, pump curves
	Chart Viewer	Charts for display. Customized chart can be created.
Diagnostics	Drive	Drive related diagnostics.
	Fieldbus	Fieldbus-related diagnostics
Drive	Drive parameter	Drive configuration
	Drive communication	Fieldbus configuration
Setup	Fieldbus	Ethernet services configuration
	File transfer	Data transfer management
	My Preference	Webserver configuration

Chapter 5

Operations

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
5.1	Operating States	82
5.2	Operating Modes	84

Section 5.1 Operating States

Configuring Communication Error Response

Description

The response of the drive in the event of an Ethernet communication interruption can be configured. Configuration can be performed using the display terminal from the **[Complete settings] C 5 E -**, **[Error/Warning handling] C 5 W Π -** menu, **[Embedded modbus TCP] E Π E C -** via the **[Eth Error Response] E E H L** parameter.

The values of the **[Eth Error Response] E E H L** parameter, which triggers a transition to the operating state fault **[Embedded Eth Com Interrupt] E E H F** are:

Value	Meaning
[Freewheel Stop] Y E 5	Freewheel stop (factory setting)
[Ramp stop] r Π P	Stop on ramp
[Fast stop] F 5 E	Fast stop
[DC injection] d C ,	DC injection stop

The values of the **[Eth Error Response] E E H L** parameter, which does not trigger a transition to the operating state fault are:

Value	Meaning
[Ignore] n o	Detected error ignored
[Per STT] 5 E E	Stop according to configuration of [Type of stop] 5 E E
[Fallback Speed] L F F	Change to fallback speed, maintained as long as the detected error persists and the run command has not been removed
[Speed maintained] r L 5	The drive maintains the speed at the time the detected error occurred, as long as the detected error persists, and the run command has not been removed

The fallback speed can be configured in the **[Complete settings] C 5 E -**, **[Error/Warning handling] C 5 W Π -** menu, **[Fallback speed] L F F -** submenu, using the **[FallbackSpeed] L F F** parameter.

WARNING

LOSS OF CONTROL

If this parameter is set to **n o**, Ethernet 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.

Detected Errors

Parameter	Description	Possible Values	Terminal Display
[Embedded Eth Com Interrupt] <i>E E H F</i> Written to the device	This parameter is used to indicate that fieldbus error has been detected. When the detected error is active, the value of ETHF corresponds to the cause of the error. When the cause of the error is no longer active, ETHF is reset to 0.	1: Modbus TCP timeout	[1] 1
[Internal Link Error] <i>L F</i>	This parameter is used to indicate that an internal error has been detected. The error can only be reset by switching off the product.		
[External Error] <i>E P F I</i>	-	1: Invalid IP address 2: Duplicate IP address 4: FDR service error	[1] 1 [2] 2 [4] 4

Section 5.2

Operating Modes

What Is in This Section?

This section contains the following topics:

Topic	Page
Configuring the Control Channel	85
Configuration of the Drive for Operation in I/O Profile	86
Configuration of the Drive for Operation with CiA 402 Profile in Combined Mode	87
Configuration of the Drive for Operation with CiA 402 Profile in Separate Mode	88

Configuring the Control Channel

Overview

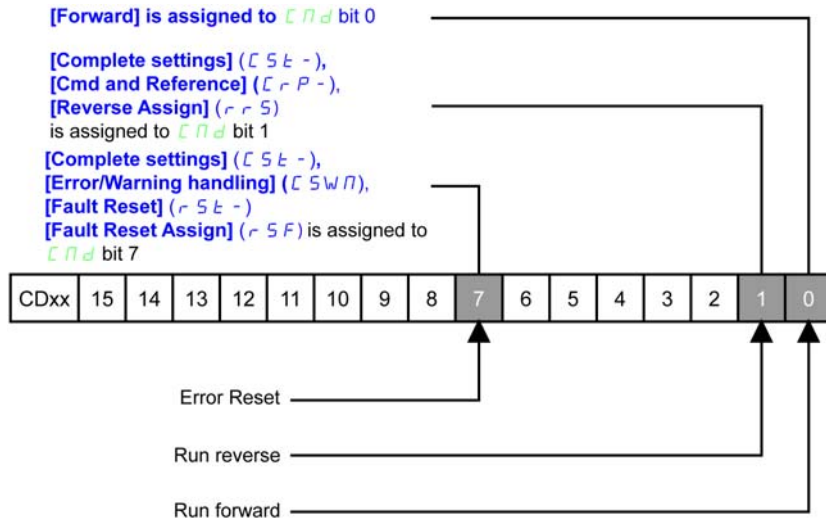
This chapter explains how to configure the drive for operation from the communication network through three following examples.

- I/O mode - a simple command word (based on forward, reverse, and reset binary commands).
- Combined mode (with native profile CiA 402) - Both reference value and command word come from the communication network.
- Separate (with native profile CiA 402) - reference value and command word come from separate sources: for example, the command word (in CiA 402) comes from the communication network and the reference value from the HMI.

Configuration of the Drive for Operation in I/O Profile

Description

For the I/O profile, here is a simple example, which can be extended with additional features. The command word is made of run forward (bit 0 of CMd), run reverse (bit 1 of CMd), and the function fault reset (bit 7 of CMd). Reference frequency value is obtained from the Graphical Display Terminal..



The settings are the following:

[Ref Freq 1 Config] FRI	[HMI] HPI
[Control Mode] CHCF	[I/O profile] IO
[Command switching] CLCS	[Cmd Channel 1] CD1
[Cmd channel 1] CD1	[Ethernet] ETH

The bits of the command word can now be configured.

In the menu configure:

[Reverse Assign] RRS	[CD01] CD01
----------------------	-------------

In the menu, [Fault Reset] RSE- submenu, configure:

[Fault Reset] RSF	[CD07] CD07
-------------------	-------------

Configuration of the Drive for Operation with CiA 402 Profile in Combined Mode

Description

This section describes how to configure the settings of the drive if it is controlled in CiA 402 mode. The example focuses on the not separate mode. Additional modes are detailed in the drive programming manual.

In the

- **[Ref Freq Channel 1] F_{r1}** : is set on according to the communication source you can choose in the following table:

Origin of the Control	Ref1 Channel Setting
Modbus TCP	[Ethernet] E_{LH}

- **[Freq Switch Assign] r_{FL}** is set to default value (**[Ref Freq 1 Config] F_{r1}**).
- **[Control Mode] L_{HCF}** : defines if the drive operates in combined mode (reference and command from the same channel).

For the current example, **[Control Mode] L_{HCF}** is adjusted to **[Not separ.] $S_{,N}$** as reference and control are originated from the communication network.

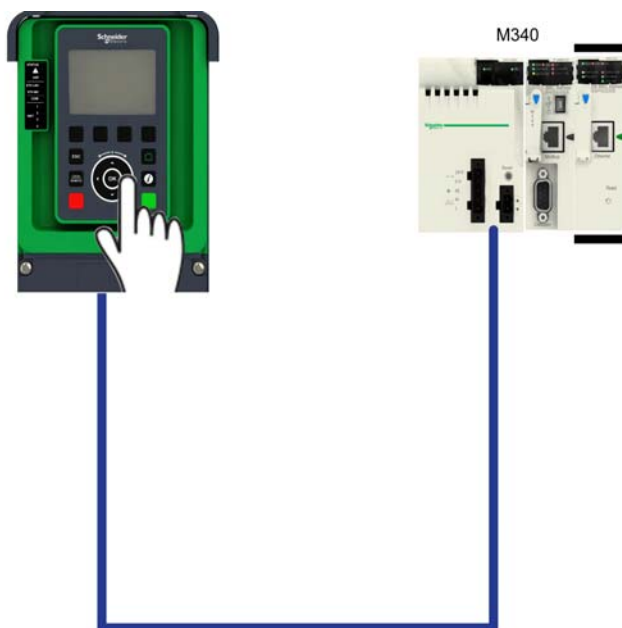
Profile	Ref1 Channel setting
CiA 402 combined mode	[Not separ.] $S_{,N}$
CiA 402 separate mode	[Separate] S_{EP}
I/O profile	[I/O profile] $,O$

Configuration of the Drive for Operation with CiA 402 Profile in Separate Mode

Description

Alternate combinations are possible, see the drive programming manual for the list of possible settings.

For example:



The drive is controlled from the communication (Ethernet) but the reference value is adjusted on the display terminal. The control word comes from the controller and is written according to CiA 402 profile.

The settings are as shown in the table:

[Ref Freq 1 Config] <i>F r 1</i>	[HMI] <i>H Π 1</i>
[Control Mode] <i>C H C F</i>	[Separate] <i>S E P</i>
[Cmd channel 1] <i>C d 1</i>	[Ethernet] <i>E t H</i>

Chapter 6

Diagnostic and Troubleshooting

What Is in This Chapter?

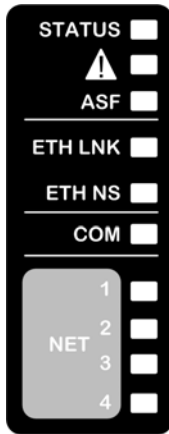
This chapter contains the following topics:

Topic	Page
Fieldbus Status LEDs	90
Connection for Fieldbus Mode	91
Fieldbus Functions Test	92

Fieldbus Status LEDs

LED Indicators

The following figure describes the LEDs status for fieldbus monitoring



LED Description

Item	LED	Description
1	ETH LNK	ETH LNK: Connection
2	ETH NS	ETH NS: Network status

LED 1ETH, LNK: Link Activity

These LEDs indicate the status of the Modbus TCP port:

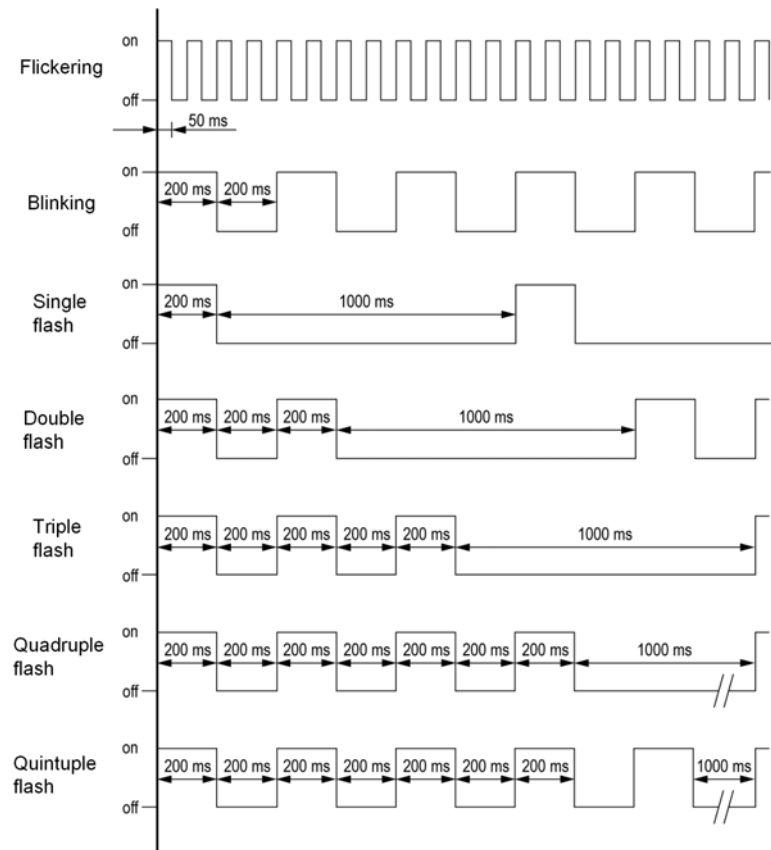
Color & status	Description
OFF	No link
Flashing Green/Yellow	Power on testing
Green ON	Link established at 100 Mbit/s
Yellow ON	Link established at 10 Mbit/s
Green blinking	Fieldbus activity at 100 Mbit/s
Yellow blinking	Fieldbus activity at 10 Mbit/s

NS: Network Status

This LED indicates the status of Modbus TCP

Color & status	Description
OFF	The device does not have an IP address or powered off
Blinking Green/Red	Power on testing
Green ON	A connection is established to control the command word.
Blinking Green	Device has a valid IP, but no command word connection.
Red ON	Duplicated IP
Blinking Red	An established connection to control the command word is closed or timed out

LED Behavior



Connection for Fieldbus Mode

Description

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

Verify the following:

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

Fieldbus Functions Test

Channels for Commands and Reference Values

All the drive commands and reference value parameters are managed on a channel-by-channel basis.

Parameter Name	Parameter Code				
	Taken Into Account by the Drive	Modbus Serial	CANopen	Fieldbus Module	Ethernet Embedded
Control word	<i>CNd</i>	<i>CNd1</i>	<i>CNd2</i>	<i>CNd3</i>	<i>CNd5</i>
Extended control word	<i>CNi</i>	<i>CNi1</i>	<i>CNi2</i>	<i>CNi3</i>	<i>CNi5</i>
Reference speed (rpm)	<i>LFr d</i>	<i>LFr d1</i>	<i>LFr d2</i>	<i>LFr d3</i>	<i>LFr d5</i>
Reference frequency (0.1 Hz)	<i>LFr</i>	<i>LFr1</i>	<i>LFr2</i>	<i>LFr3</i>	<i>LFr5</i>
Reference value for torque control mode (0.1% of the nominal torque) ⁽¹⁾	<i>LEr</i>	<i>LEr1</i>	<i>LEr2</i>	<i>LEr3</i>	<i>LEr5</i>
Reference value supplied by PI controller	<i>PiSP</i>	<i>Pi r1</i>	<i>Pi r2</i>	<i>Pi r3</i>	<i>Pi r5</i>
Reference value supplied by analog multiplier function	<i>PFr</i>	<i>PFr1</i>	<i>PFr2</i>	<i>PFr3</i>	<i>PFr5</i>
(1): If available					

Fieldbus Monitoring Criteria

The fieldbus is monitored according to the protocol-specific criteria.

Protocol	Criteria	Related Detected Error
Embedded Ethernet	FDR detected error IP address duplication detected error Adjustable time-out for received control word (I/O scanning or messaging) Fieldbus overload	[External Error] EPF1 [Embedded Eth Com Interrupt] ELHF

Monitoring of Communication Channels

Product software versions below or equal to V1.6IE15 do not provide a communication monitoring function to detect communication interruptions when function code 6 is used (write single register with messaging service).

Higher product software versions provide a communication monitoring function to help detect communication interruptions when function code 6 is used.

WARNING

LOSS OF CONTROL

- Do not use function code 6 (write single register) to control the drive with product software versions up to V1.6IE15.
- If your product software version is below or equal to V1.6IE15 and your PLC supports only function code 6, contact your local Schneider Electric sales office to update the firmware of your product.

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

Refer to the manual of the PLC for information on selecting function codes.

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

- The control word (**[Cmd Register]** *L P d*) from the active command channel
- The control word containing the command switch (bit configured on **[Cmd switching]** *L L 5*)
- The control word containing the switch for reference value 1*1B (bit configured on **[Ref 1B switching]** *r L b*)
- The control word containing the switch for reference value 1*2 (bit configured on **[Freq Switch Assign]** *r F L*)
- The reference frequency or reference speed (**[Ref Frequency]** *L F r* or LFRD: Nominal speed value) from the active channel for reference value
- Summing reference frequency or reference speed (**[Ref Frequency]** *L F r* or LFRD: Nominal speed value) 2 (assigned to **[Summing Input 2]** *S A 2*)
- Summing reference frequency or reference speed (**[Ref Frequency]** *L F r* or LFRD: Nominal speed value) 3 (assigned to **[Summing Input 3]** *S A 3*)
- Subtracting reference frequency or reference speed (**[Ref Frequency]** *L F r* or LFRD: Nominal speed value) 2 (assigned to **[Subtract Ref Freq 2]** *d A 2*)
- Subtracting reference frequency or reference speed (**[Ref Frequency]** *L F r* or LFRD: Nominal speed value) 3 (assigned to **[Subtract Ref Freq 3]** *d A 3*)
- The reference value given by the PID controller (PISP)
- The PID controller feedback (**[AI Virtual 1]** *A i u 1*)
- The multiplication coefficient of the reference values (**[Multiplying coeff.]** *P F r*) 2 (assigned to **[Ref Freq 2 Multiply]** *P A 2*)
- The multiplication coefficient of the reference values (**[Multiplying coeff.]** *P F r*) 3 (assigned to **[Ref Freq 3 Multiply]** *P A 3*)

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

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

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

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

Enabling of Communication Channels

A communication channel is enabled once all the parameters involved have been written at least one time. The drive is only able to start if all channels involved in command and reference value are enabled.

For example:

A drive in DSP402 profile is connected to an active communication channel.

It is mandatory to write at least 1 time the reference value and the command in order to switch from 4-Switched on to 5-Operation enabled state.

A communication channel is disabled:

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

NOTE: On exiting forced local mode:

- The drive copies the run commands, the direction, and the forced local reference value to the active channel (maintained).
- Monitoring of the active channels for the command and reference value resumes following a time delay **[Time-out forc. local] F L o t**.
- Drive control only takes effect once the drive has received the reference and the command from the active channels.



A

Abbreviations

Req. = Required

Opt. = Optional

C

CAN

Controller Area Network is an internally standardized serial bus system

COB

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

COB ID

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

D

Display terminal

The display terminal menus are shown in square brackets.

For example: **[Communication]**

The codes are shown in round brackets.

For example: *(C a 1)* -

Parameter names are displayed on the display terminal in square brackets.

For example: **[Fallback Speed]**

Parameter codes are displayed in round brackets.

For example: *(L F F)*

DP

Decentralized Periphery

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

Default configuration of the product.

Fault

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

Fault Reset

A function used to restore the drive 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.

L**LSB**

Least Significant Byte

M**MEI**

Modbus Encapsulated Interface

Monitoring function

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

MS0, MS1

Number of a master 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**Parameter**

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

PDO

Process Data Object

PELV

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

PLC

Programmable logic controller

PNO

PROFIBUS Nutzerorganisation e.V. (PROFIBUS User organization).

Power stage

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

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**RPDO**

Receive PDO

S**SNMP**

Simple Network Management Protocol

SNTP Simple Network Time Protocol

SYNC Synchronization Object

T

TPDO Transmit PDO

V

VSD Variable Speed Drive

W

Warning If the term is used outside the context of safety instructions, a warning alerts to a potential problem 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.

