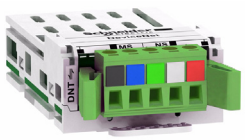
Altivar 32

Variable speed drives for synchronous and asynchronous motors

DeviceNet Communication Manual

09/2012



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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.

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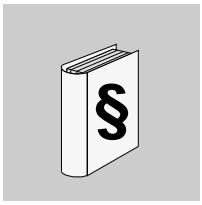
Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, 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.

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.

⚠ DANGER

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

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

CAUTION

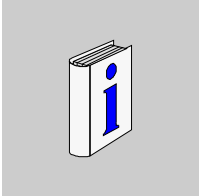
CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result** in equipment damage.

PLEASE NOTE

The word “drive” as used in this manual refers to the controller portion of the adjustable speed drive as defined by NEC.

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.

About the Book



At a Glance

Document Scope

The purpose of this document is to:

- show you how to install the DeviceNet fieldbus on your Altivar 32,
- show you how to configure the Altivar 32 to use DeviceNet for monitoring and control,
- provide examples of setup using SoMachine and Unity.

NOTE: Read and understand this document and all related documents (see below) before installing, operating, or maintaining your ATV32.

Validity Note

This documentation is valid for the Altivar 32 DeviceNet fieldbus.

Related Documents

Title of Documentation	Reference Number
ATV32 Quick Start	S1A41715
ATV32 Installation manual	S1A28686
ATV32 Programming manual	S1A28692
ATV32 Modbus manual	S1A28698
ATV32 CANopen® manual	S1A28699
ATV32 Communication parameters	S1A44568
ATV32 Atex manual	S1A45605
ATV32 Safety manual	S1A45606
ATV32 certificates and other option manuals: see www.schneider-electric.com	

You can download the latest versions of these technical publications and other technical information from our website at www.schneider-electric.com.

Product Related Information

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Read and understand this manual before installing or operating the Altivar 32 drive.
- Any changes made to the parameter settings must be performed by qualified personnel.

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

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Read and understand this manual before installing or operating the Altivar 32 drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical code requirements with respect to grounding of all equipment.
- Many parts of this drive, including the printed circuit boards, operate at the line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA/+ and PC/– or across the DC bus capacitors.
- Before servicing the drive:
  - Disconnect all power, including external control power that may be present.
  - Place a “DO NOT TURN ON” label on all power disconnects.
  - Lock all power disconnects in the open position.
  - WAIT 15 MINUTES to allow the DC bus capacitors to discharge.
  - Measure the voltage of the DC bus between the PA/+ and PC/– terminals to ensure that the voltage is less than 42 Vdc.
  - If the DC bus capacitors do not discharge completely, contact your local Schneider Electric representative. Do not repair or operate the drive
- Install and close all covers before applying power or starting and stopping the drive.

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

⚠ WARNING

DAMAGE DRIVE EQUIPMENT

Do not operate or install any drive or drive accessory that appears damaged.

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

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain 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 and overtravel stop.
- 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.(1)

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

(1) For 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.”

Presentation

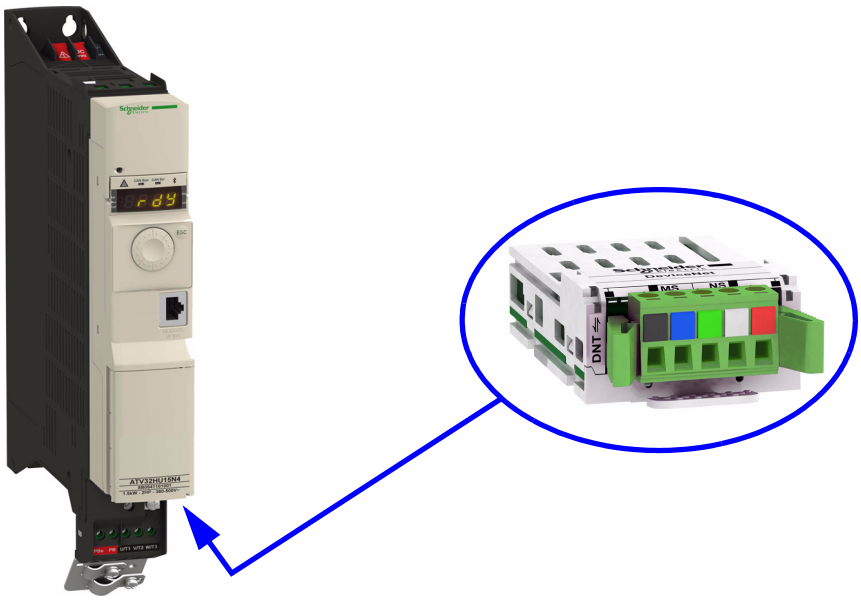
1

What's in this Chapter?

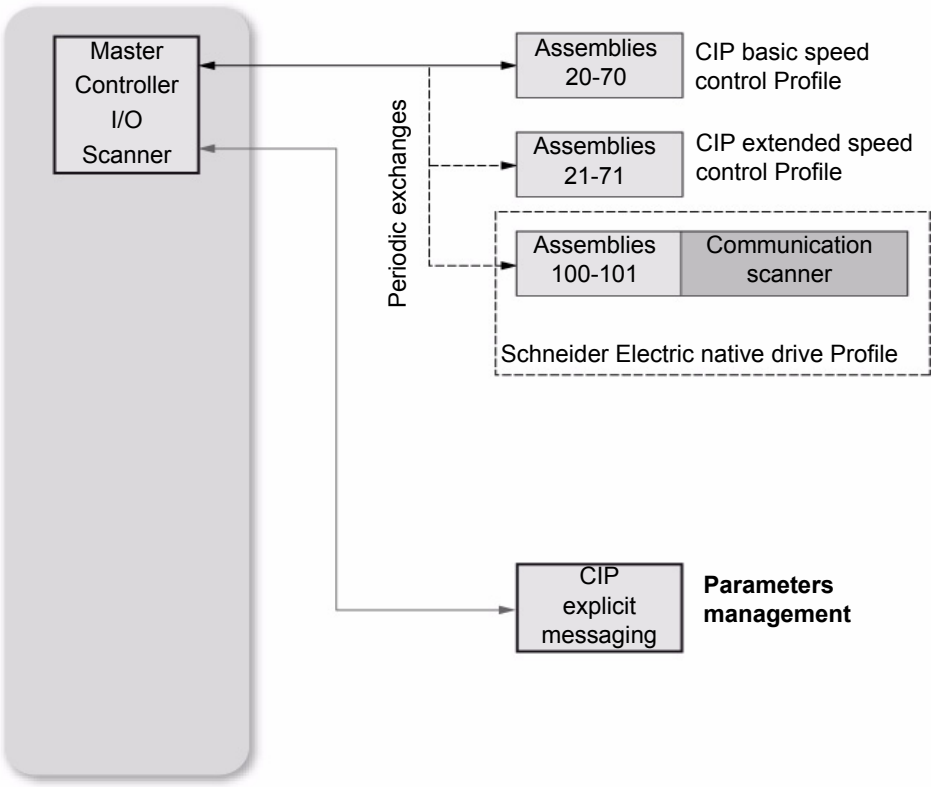
This chapter contains the following topics:

Overview

The VW3 A3 609 communication card enables the integration of an Altivar 32 variable speed drive into a DeviceNet network. This card offers the possibility to control its host drive in native profile or with several AC drive profiles from the ODVA:



DeviceNet Communication Card Features Overview



Notation

Drive Terminal Displays

The graphic display terminal (to be ordered separately - reference VW3 A1 101) menus are shown in square brackets.

Example: **[COMMUNICATION]**

The integrated 7-segment display terminal menus are shown in round brackets.

Example: (COM-)

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

Example: **[Fallback speed]**

Parameter codes are displayed on the integrated 7-segment display terminal in round brackets.

Example: (LFF)

Formats

In this manual, hexadecimal values are written as follows: 16#

Vocabulary

Depending on DeviceNet document and tools, equivalent wordings are used. The table below shows vocabulary used in the present document and other corresponding definitions:

In this document	Other	Comments
Node address	DeviceNet address, MAC ID	
Data rate	Baud rate	
kbit/s	kBPS, kbps, k	
Setpoint	Reference, target	
Path	Object Address	Class, instance, attribute

The reader should avoid mixing two terms:

- DeviceNet scanner, which is the master device on the DeviceNet network.
- Communication scanner, which is a function inside the Altivar drive.

Abbreviations

Req. = Required

Opt. = Optional

Cond. = Conditional

Hardware Setup

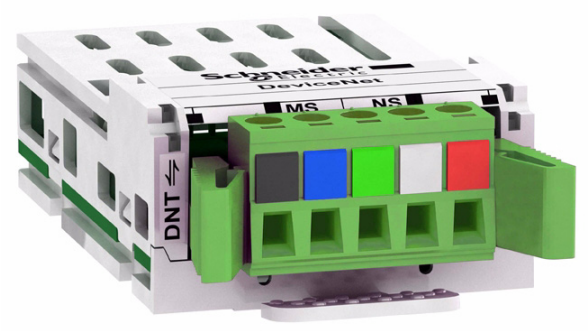
2

What's in this Chapter?

This chapter contains the following topics:

Hardware Presentation

The following figure presents the DeviceNet module:



Firmware and EDS Version Compatibility

Only VW3 A3 609 option cards, with minimum 1.1IE01 firmware version, are compliant with ATV32.

NOTE: Check the firmware version, on the packaging label (on the right part of the label).

The associated EDS is the following SE_DN_ATV32_0101E.eds. This file is available on www.schneider-electric.com.

Installation

Check that the card catalog number marked on the label is the same as that on the delivery note corresponding to the purchase order.

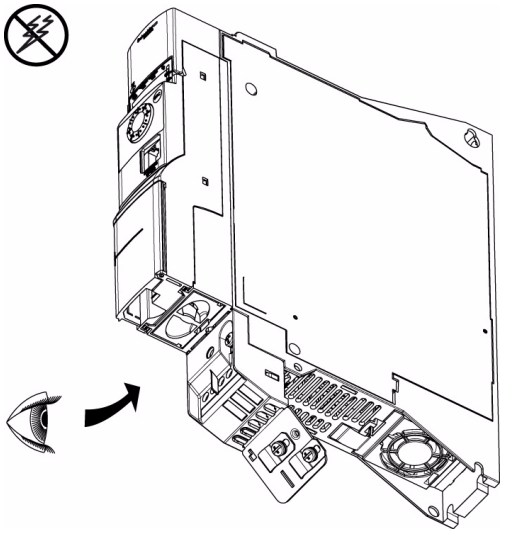
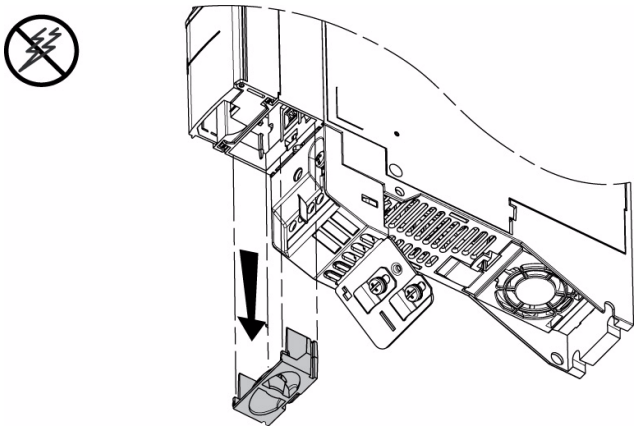
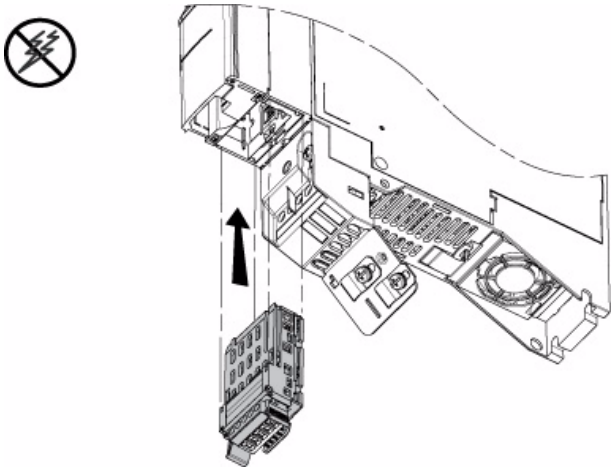
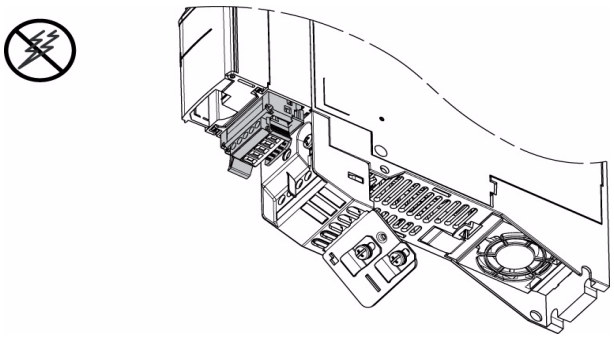
Remove the communication module from its packaging and check that it has not been damaged in transit.

CAUTION
RISK OF DAMAGE TO THE DRIVE Install only communication modules designed for ATV32. See references in the catalog. **Failure to follow these instructions can result in equipment damage.**

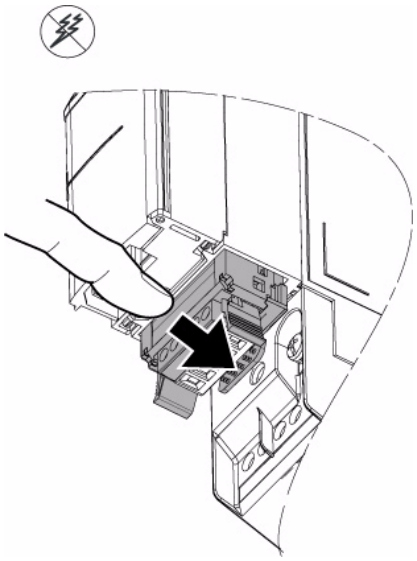
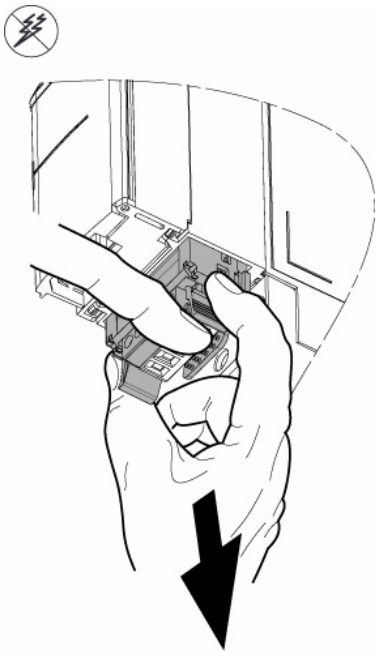
⚠⚠ DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH Read and understand the precautions in “About the Book” on page 6 before performing the procedure in this section. **Failure to follow these instructions will result in death or serious injury.**

NOTE: The CANopen signals on the base port are deactivated if an option card is plugged in the drive.

Install the DeviceNet communication module in ATV32 as follows:

Step	Action	Comment
1	Ensure that the power is off. Locate the option card port on the bottom of the ATV32.	
2	Extract the cover.	
3	Insert the DeviceNet communication module.	
4	Check that the module is correctly inserted and locked mechanically in the drive.	

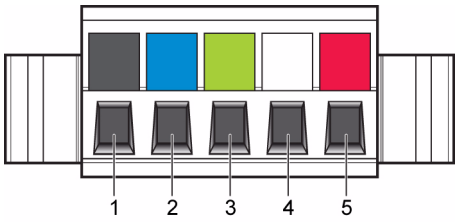
Extract the communication module as follows:

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

Wiring

The figure and the table below show the pin-out of the DeviceNet card connectors:

Pin	Name	Color
1	GND	Black
2	CAN-L	Blue
3	SHIELD	Bare
4	CAN_H	White
5	V+	Red



Line Termination

If the drive is the first or the last device on the DeviceNet network, a line terminator (121 Ω resistor) must be wired on the removable DeviceNet connector, between pins 2 and 4 (CAN_L and CAN_H).

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

Bus termination	Accessories	
DeviceNet module VW3 A3 609	DeviceNet terminating resistor, 120 Ohm, for screw terminal	TCSCAR01NM120

Cable Routing Practices

When wiring Altivar 32 drives to a DeviceNet network, follow all wiring practices required by national and local electrical codes. Also observe the following guidelines:

- Avoid areas of high temperature, moisture, vibration, or other mechanical stress.
- Secure the cable where necessary to prevent its weight and the weight of other cables from pulling or twisting the cable.
- Use cable ducts, raceways, or other structures to help the cable. Use these structures for signal wiring paths. They must not contain power wiring.
- Avoid sources of electrical interference that can induce noise into the cable. Use the maximum practicable separation from such sources. When planning cable routing within a building, follow these guidelines:

Maintain a minimum separation of X m from the following equipment	
1 m	**3 m**
air conditioners and large blowers elevators and escalators radios and televisions intercom and security systems fluorescent, incandescent, and neon lighting fixtures	line and motor power wiring transformers generators alternators

When wiring in electrical equipment rooms or large electrical equipment line-ups, observe the following guidelines for cable segregation and separation of circuits:

- Use metallic conduit for drive wiring. Do not run control network and power wiring in the same conduit.
- Separate non-metallic conduits or cable trays used to carry power wiring from metallic conduit carrying low-level control network wiring by at least 300 mm.
- Separate metallic conduits carrying power wiring or low-level control network wiring by at least 80 mm.
- Cross the metallic conduits and non-metallic conduits at right angles whenever power and control network wiring cross.
- Attenuate conducted emissions from the drive to the line in some installations to prevent interference with telecommunication, radio, and sensitive electronic equipment. Such instances may require attenuating filters. Consult the Altivar catalog for selection and application of these filters.

The ODVA standards (Release 2.0) specify 7 types of cables for use in DeviceNet networks.

The table below lists the main specifications of the cables. For more information, refer to the ODVA specifications:

Type of cable	**Data conductor pair size**	**Power conductor pair size**	**Data impedance**
Thick cable	18 AWG	15 AWG	120Ω +/- 10%(at 1 MHz)
Thin cable	24 AWG	22 AWG	120Ω +/- 10%(at 1 MHz)
Flat cable	16 AWG	16 AWG	120Ω +/- 10%(at 500 KHz)
Cable I	24 AWG	22 AWG	120Ω +/- 10%(at 1 MHz)
Cable II	18 AWG	15 AWG	120Ω +/- 10%(at 1 MHz)
Cable IV	18 AWG	16 AWG	120Ω +/- 10%(at 500 KHz)
Cable V	18 AWG	16 AWG	120Ω +/- 10%(at 500 KHz)

The maximum permissible length of the network cable depends on the data rate and the type of cable:

Type of cable	**Data rate**		
	125 kbit/s	**250kbit/s**	**500 kbit/s**
Thick cable	500 m (1640 ft.)	250 m (820 ft.)	100 m (328ft)
Thin cable	100 m (328 ft.)	100 m (328 ft.)	100 m (328 ft.)
Flat cable	420 m (1378 ft.)	200 m (656 ft.)	75 m (246 ft.)
Cable I	100 m (328 ft.)	100 m (328 ft.)	100 m (328 ft.)
Cable II	500 m (1640 ft.)	250 m (820 ft.)	100 m (328 ft.)
Cable IV	-	-	-
Cable V	420 m (1378 ft.)	200 m (656 ft.)	75 m (246 ft.)

For maximum length of the drops refer to table below, whatever type of cable:

Data rate	**Cumulative drop**	**Maximum drop**
125 kbit/s	156 m (516 ft.)	6 m (20 ft.)
250 kbit/s	78 m (256 ft.)	6 m (20 ft.)
500 kbit/s	39 m (128 ft.)	6 m (20 ft.)

Configuration

3

Overview

This chapters describes the parameters of the VW3 A3 609, these parameters are described here according to the local HMI or the Graphic keypad. These settings are also possible from SoMove.

What's in this Chapter?

This chapter contains the following topics:

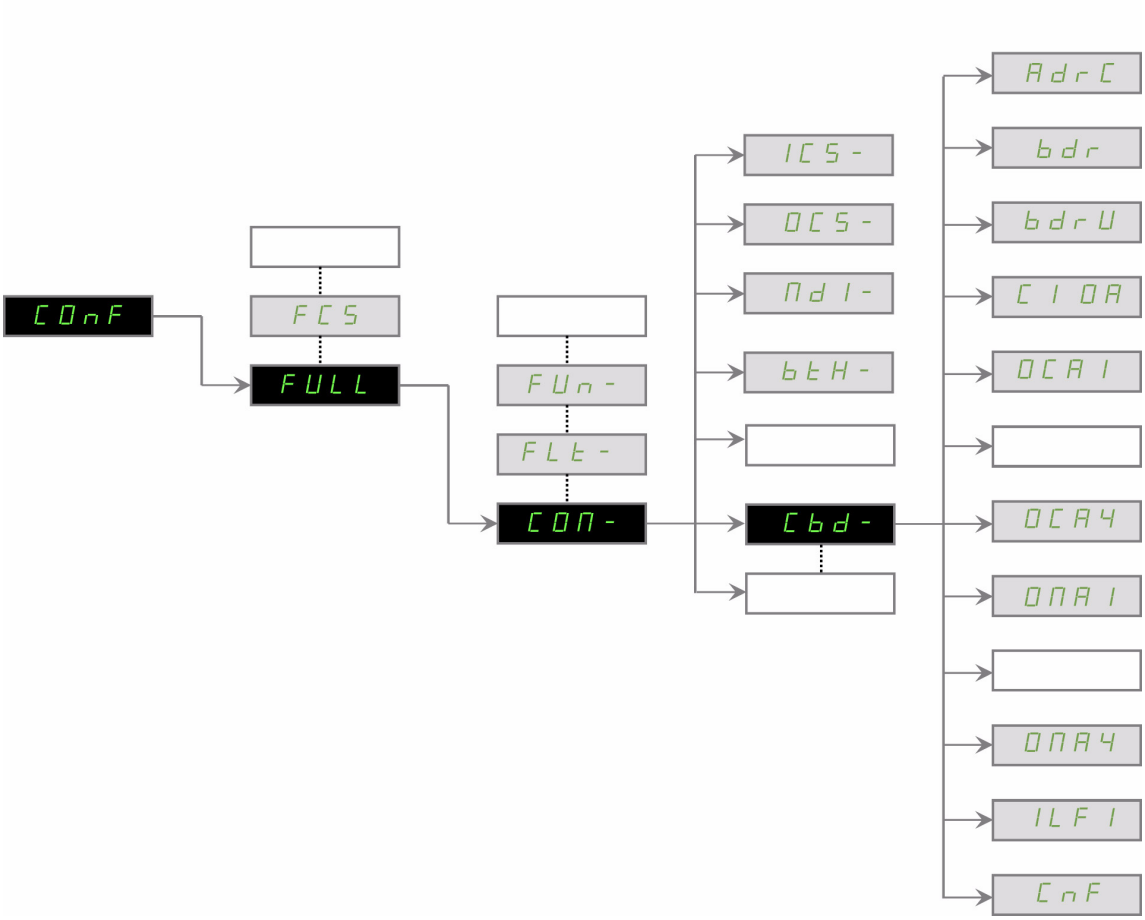
Altivar 32 Setup

From the drive side, the setup of the communication option is simplified: the main parameter to set is the slave address of the drive on the DeviceNet network. All other settings are defined at the DeviceNet master level and transmitted to the device when the network starts up.

However, additional informations are available in the communication menu dedicated to the DeviceNet option. These informations are useful during commissioning and maintenance: they indicate the configured settings and the mode(s) currently in operation.

Configuring the Communication Parameters

Configuration of the DeviceNet communication functions of the Altivar 32 can be accessed from the **[1.3 CONF]** (CONF) / **[FULL]** (FULL) / **[COMMUNICATION]** (COM-) menu / **[COMMUNICATION CARD]** (Cbd-).



Network Settings

Parameter description (HMI mnemonic)	Range or listed values	Default	Long name	Short name	Access	Parameter Number
[Address] (AdrC) Defines the address of the drive on the network	0 to 63	63	**[0] .. [63]**	(0)... (63)	R/W	6601
[Bit Rate] (bdr) This Field displays the baud rate and the transmission mode currently used by the communication card. (Display only)	Automatic 125 kbauds 250 kbauds 500 kbauds	AUTO	**[Auto]** **[125 kbd]** **[250 kbd]** **[500 kbd]**	(AUtO) (125) (250) (500)	R/W	6603
[Data rate used] (bdrU)	Automatic 125 kbauds 250 kbauds 500 kbauds	AUTO	**[Auto]** **[125 kbd]** **[250 kbd]** **[500 kbd]**	(AUtO) (125) (250) (500)	R	6660
[Conf. Assembly] (C IOA) Configured Input/Output assembly	20 21 100 Unconfig.	21	**[20/70]** **[21/71]** **[100/101]** **[Unconfig.]**	(20) (21) (100) (UnCG)	R/W	6667
[Scan.Out1 address] (OCA1)	Eligible modbus address	CMD@	**[OCA1]**	(OCA1)	R/W	15421
[Scan.Out2 address] (OCA2)	Eligible modbus address	LFRD@	**[OCA2]**	(OCA2)	R/W	15422
[Scan.Out3 address] (OCA3)	Eligible modbus address	0	**[OCA3]**	(OCA3)	R/W	15423
[Scan.Out4 address] (OCA4)	Eligible modbus address	0	**[OCA4]**	(OCA4)	R/W	15424
[Scan. IN1 address] (OMA1)	Eligible modbus address	ETA@	**[OMA1]**	(OMA1)	R/W	15401
[Scan. IN2 address] (OMA2)	Eligible modbus address	RFRD@	**[OMA2]**	(OMA2)	R/W	15402
[Scan. IN3 address] (OMA3)	Eligible modbus address	0	**[OMA3]**	(OMA3)	R/W	15403
[Scan. IN4 address] (OMA4)	Eligible modbus address	0	**[OMA4]**	(OMA4)	R/W	15404

(1) OCAx and OMAx are used by the assembly set 100,101

Profiles

4

What's in this Chapter?

This chapter contains the following topics:

Definition of a Profile

There are three types of profile:
- Communication profiles
- Functional profiles
- Application profiles

Communication Profiles

A communication profile describes the characteristics of the 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 network (Modbus CIP, Profibus DP, etc.) and is used by various different types of device.

Functional Profiles

A functional profile describes the behavior of a type of device. It defines:
- Functions
- Parameters (name, format, unit, type, etc.)
- Periodic I/O variables
- State chart(s)
- ...

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

They can feature common or similar parts. The standardized (IEC 61800-7) functional profiles of variable speed drives are:
- CiA402
- PROFIDRIVE
- CIP

DRIVECOM has been available since 1991.

CiA402 “Device profile for drives and motion control” represents the next stage of this standard’s development and is now part of the IEC 61800-7 standard.

Some protocols also support the ODVA (Open DeviceNet Vendor Association) profile.

Application Profiles

Application profiles define in their entirety 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 network.

Functional Profiles Supported by the Altivar 32

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.

With an Altivar 32, the I/O profile can also be used when controlling via a network.

The drive starts up as soon as the run command is sent.

15 bits of the control word (bits 1 to 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
- The network module control word

The I/O profile is supported by the drive itself and therefore in turn by all the communication ports (integrated Modbus, CANopen, Ethernet, Profibus DP, DeviceNet communication modules).

CiA402 Profile

The drive only starts up following a command sequence.

The control word is standardized.

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

The CiA402 profile is supported by the drive itself and therefore in turn by all the communication ports (integrated Modbus, CANopen, Ethernet, Profibus DP, DeviceNet communication modules).

The Altivar 32 supports the CiA402 profile's "Velocity mode".

In the CiA402 profile, there are two modes that are specific to the Altivar 32 and characterize command and reference management:

- Separate mode **[Separate]** (S E P)
- Not separate mode **[Not separ.]** (S I N)

See “CiA®402 - IEC61800-7 Functional Profile” on page 24.

CiA®402 - IEC61800-7 Functional Profile

5

What's in this Chapter?

This chapter contains the following topics:

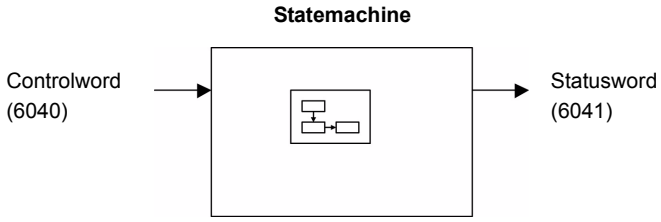
Functional Description

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

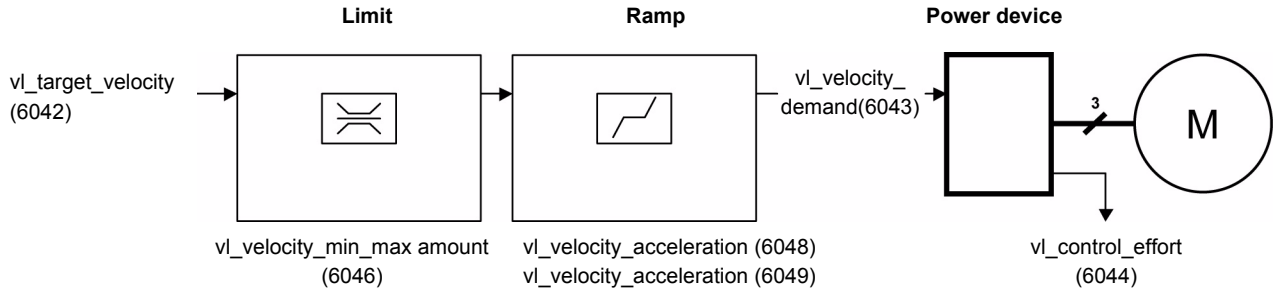
CiA402

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).

Control diagram:



Simplified diagram of speed control in “Velocity” mode:

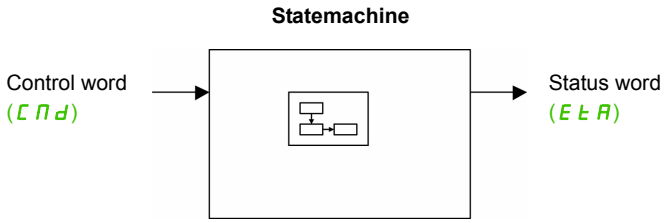


The main parameters are shown with their CiA402 name and their CiA402/Drivecom index (the values in brackets are the parameter codes).

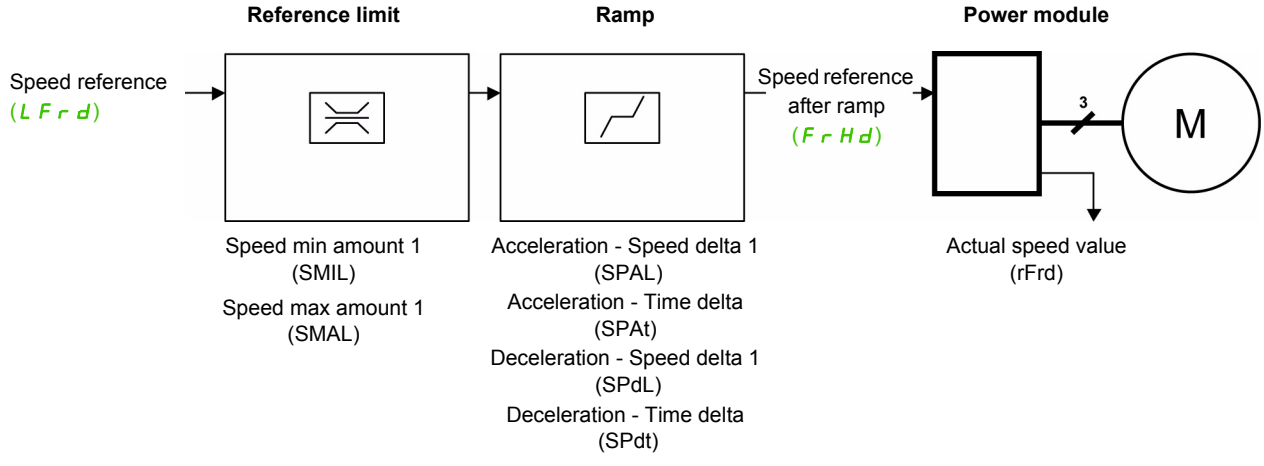
Altivar 32

These diagrams translate as follows for the Altivar system.

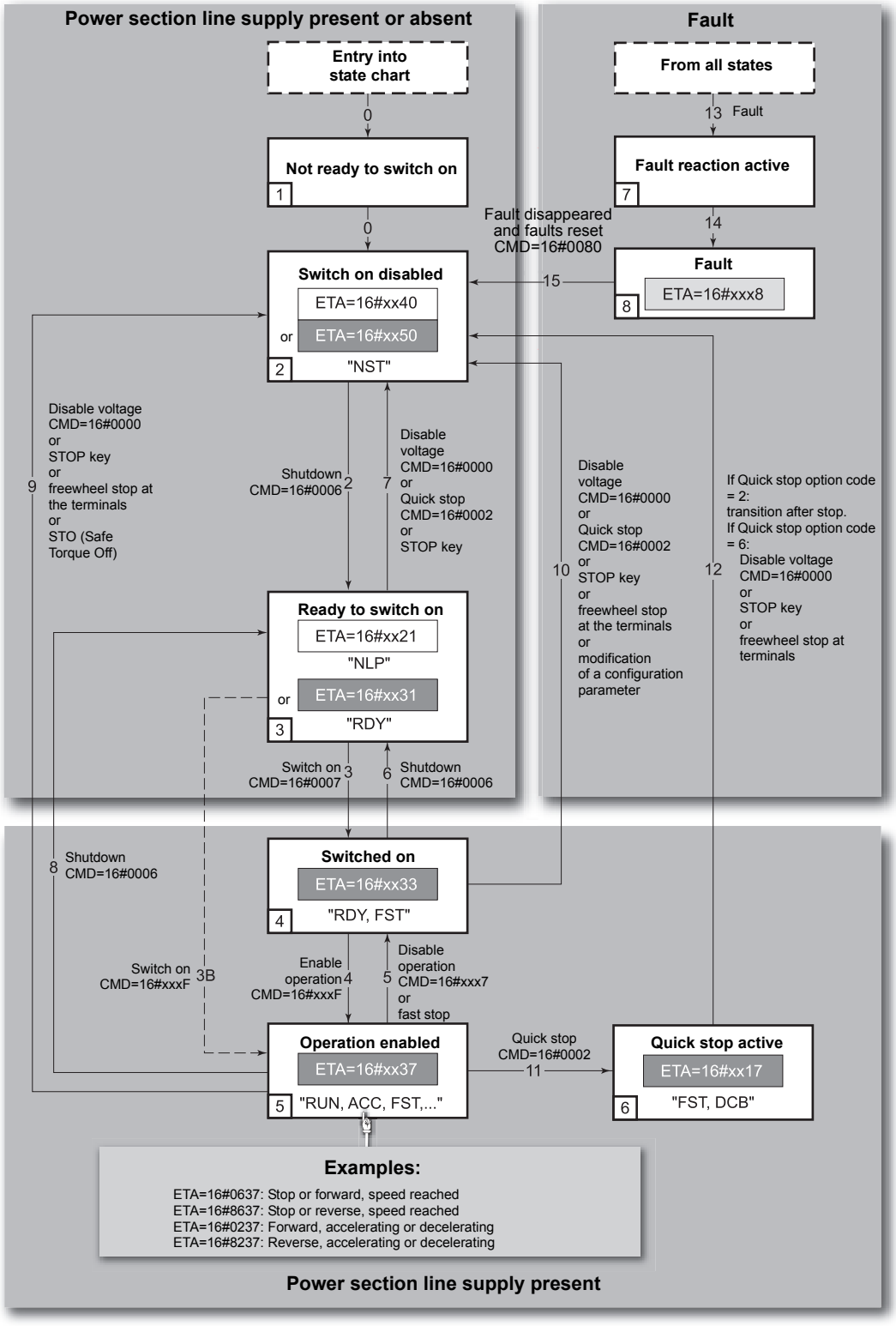
Control diagram:



Simplified diagram of speed control in “Velocity” mode:



CiA402 State Chart



Description of States

Each state represents an internal reaction by the drive.

This chart will change depending on whether the control word is sent (CMd) or an event occurs (a detected fault, for example).

The drive state can be identified by the value of the status word (ETA).

State	Drive internal reaction.
1 - Not ready to switch on	Initialization starts. This is a transient state invisible to the communication network.
2 - Switch on disabled	The drive is inactive. The drive is locked, no power is supplied to the motor. For a separate control section, it is not necessary to supply AC power to the power section. For a separate control section with line contactor, the contactor is not controlled. The configuration and adjustment parameters can be modified.
3 - Ready to switch on	Awaiting power section line supply. For a separate control section, it is not necessary to supply AC power to the power section, but the system will expect it in order to change to state "4 - Switched on". For a separate control section with line contactor, the contactor is not controlled. The drive is locked, no power is supplied to the motor. The configuration and adjustment parameters can be modified.
4 - Switched on	The drive is supplied with AC power but is stationary. For a separate control section, the power section line supply must be present. For a separate control section with line contactor, the contactor is controlled. 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. Modification of a configuration parameter returns the drive to state "2 - Switch on disabled".
5 - Operation enabled	The drive is running. For a separate control section, the power section line supply must be present. For a separate control section with line contactor, the contactor is controlled. 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 is zero or the “Halt” command is applied, no power is supplied to the motor and no torque is applied. **[Auto tuning]** (tUn) requires an injection of current into the motor. The drive must therefore be in state “5 - Operation enabled” for this command. 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, transition 4 will take place only after the reference has been received for the first time. The reaction of the drive to a “Disable operation” command depends on the value of the **[Dis. operat opt code]** (dOtd) parameter: - If the **[Dis. operat opt code]** (dOtd) parameter has the value 0, the drive changes to “4 - Switched on” and stops in freewheel stop. - If the **[Dis. operat opt code]** (dOtd) parameter has the value 1, the drive stops on ramp and then changes to “4 - Switched on”.
6 - Quick stop active	Emergency stop. The drive performs a fast stop, after which restarting will only be possible once the drive has changed to the "Switch on disabled" state. During fast stop, the drive is unlocked and power is supplied to the motor. The configuration parameters cannot be modified. The condition for transition 12 to state “2 - Switch on disabled” depends on the value of the parameter Quick stop mode (QStd): 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". 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: - A "Disable voltage" command is received. - Or the STOP key is pressed. - Or there is a freewheel stop command via the terminals.

State	Drive internal reaction.
7 - Fault reaction active	Transient state during which the drive performs an action appropriate to the type of detected fault. The drive function is activated or deactivated according to the type of reaction configured in the detected fault management parameters.
8 - Fault	Drive has detected a fault. The drive is locked, no power is supplied to the motor.

Summary

State	Power section line supply for separate control section	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" state
5 - Operation enabled	Required	Yes	No
6 - Quick stop active	Required	Yes, during fast stop	No
7 - Fault reaction active	Depends on detected fault management configuration	Depends on detected fault management configuration	-
8 - Fault	Not required	No	Yes

Control Word (CMd)

bit 7	bit 6	bit 5	bit 4
Fault reset	Reserved (=0)	Reserved (=0)	Reserved (=0)
0 to 1 transition = Ack. fault			

bit 3	bit 2	bit 1	bit 0
Enable operation	Quick stop	Enable voltage	Switch on
1 = Run command	0 = Emergency stop	Authorization to supply AC power	Contactor control

bit 15	bit 14	bit 13	bit 12
Manufacturer specific Assignable	Manufacturer specific Assignable	Manufacturer specific Assignable	Manufacturer specific Assignable

bit 11	bit 10	bit 9	bit 8
Manufacturer specific	Reserved (=0)	Reserved (=0)	Halt
0 = Forward direction asked 1= Reverse direction asked			Halt

Command	Transition address	Final 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	16#0006
Switch on	3	4 - Switched on	x	x	1	1	1	16#0007
Enable operation	4	5 - Operation enabled	x	1	1	1	1	16#000F
Disable operation	5	4 - Switched on	x	0	1	1	1	16#0007
Disable voltage	7, 9, 10, 12	2 - Switch on disabled	x	x	x	0	x	16#0000
Quick stop	11	6 - Quick stop active	x	x	0	1	x	16#0002
	7, 10	2 - Switch on disabled						
Fault reset	15	2 - Switch on disabled	0 ➞ 1	x	x	x	x	16#0080

x: Value is of no significance for this command.

0 ➞ 1: Command on rising edge.

Stop Commands

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

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

Regardless of the assignment of the **[Type of stop]** (StT) parameter (**[Fast stop assign]** (FStT), **[Ramp stop]** (rMP), **[Freewheel]** (nSt), or **[DC injection assign.]** (dC1)), the drive remains in the **“**5 - Operation enabled” state.

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" state. A "Halt" command does not cause this transition.

A Freewheel Stop command at the terminals or using a bit of the control word assigned to Freewheel Stop causes a change to the "2 - Switch on disabled" state. A "Halt" command does not cause this transition.

Assigning Control Word Bits

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

Bit	Network module
bit 11	C311
bit 12	C312
bit 13	C313
bit 14	C314
bit 15	C315

For example, to assign the DC injection braking to bit 13 of DeviceNet, simply configure the **[DC injection assign.]** (dC1) parameter with the **[C313]** (C313) value.

Bit 11 is assigned by default to the operating direction command **[Reverse assign.]** (rrS).

Status Word (ETA)

bit 7	bit 6	bit 5	bit 4
Warning	Switch on disabled	Quick stop	Voltage enabled
Alarm	Power section line supply disabled	0 = Emergency stop	Power section line supply present

bit 3	bit 2	bit 1	bit 0
Fault	Operation enabled	Switched on	Ready to switch on
Fault	Running	Ready	1 = Awaiting power section line supply

bit 15	bit 14	bit 13	bit 12
Manufacturer specific Direction of rotation	Manufacturer specific Stop via STOP key	Reserved (=0)	Reserved (=0)

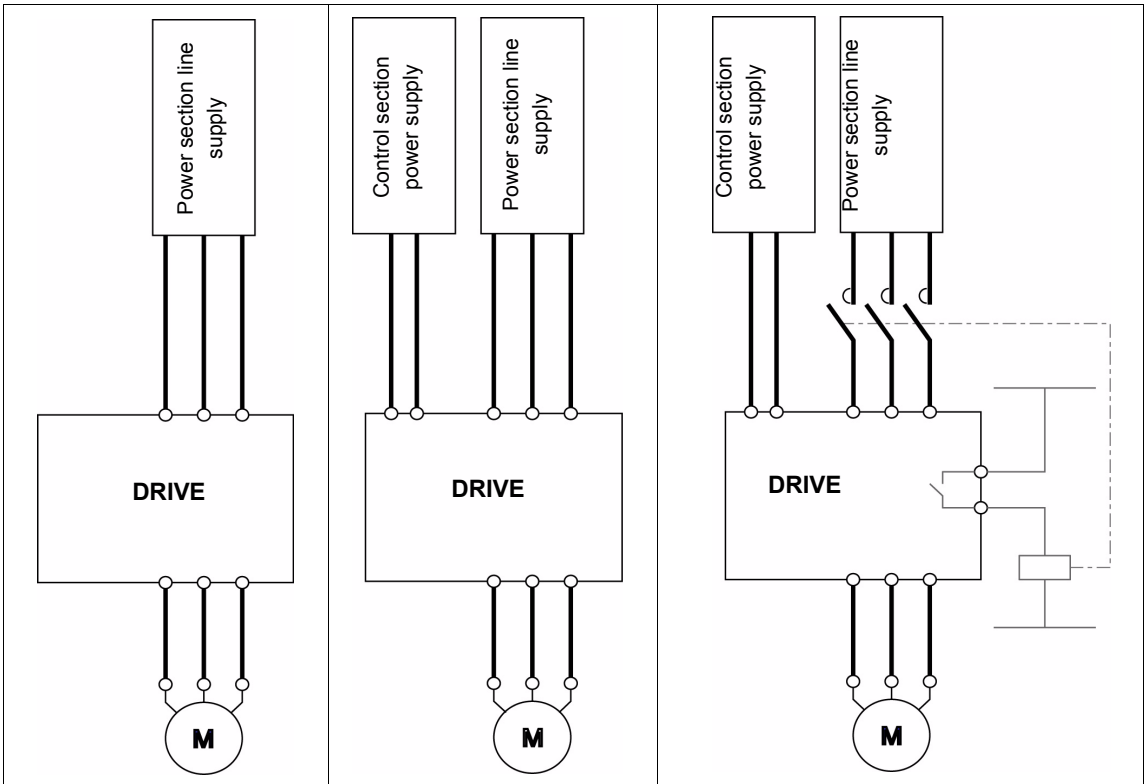
bit 11	bit 10	bit 9	bit 8
Internal limit active	Target reached	Remote	Reserved (=0)
Reference outside limits	Reference reached	Command or reference via network	

Status	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	ETA masked by 16#006F (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	16#0040
3 -Ready to switch on	0	1	x	0	0	0	1	16#0021
4 -Switched on	0	1	1	0	0	1	1	16#0023
5 -Operation enabled	0	1	1	0	1	1	1	16#0027
6 -Quick stop active	0	0	1	0	1	1	1	16#0007
7 -Fault reaction active	0	x	x	1	1	1	1	-
8 -Fault	0	x	x	1	0	0	0	16#0008 (2) or 16#0028

(1) This mask can be used by the PLC program to test the chart state.
(2) Detected fault following state "6 - Quick stop active".
x: In this state, the value of the bit can be 0 or 1.

Starting Sequence

The command sequence in the state chart depends on how power is being supplied to the drive.
There are three possible scenarios:



Power section line supply	Direct	Direct	Line contactor controlled by the drive
Control section power supply	Not separate (1)	Separate	Separate

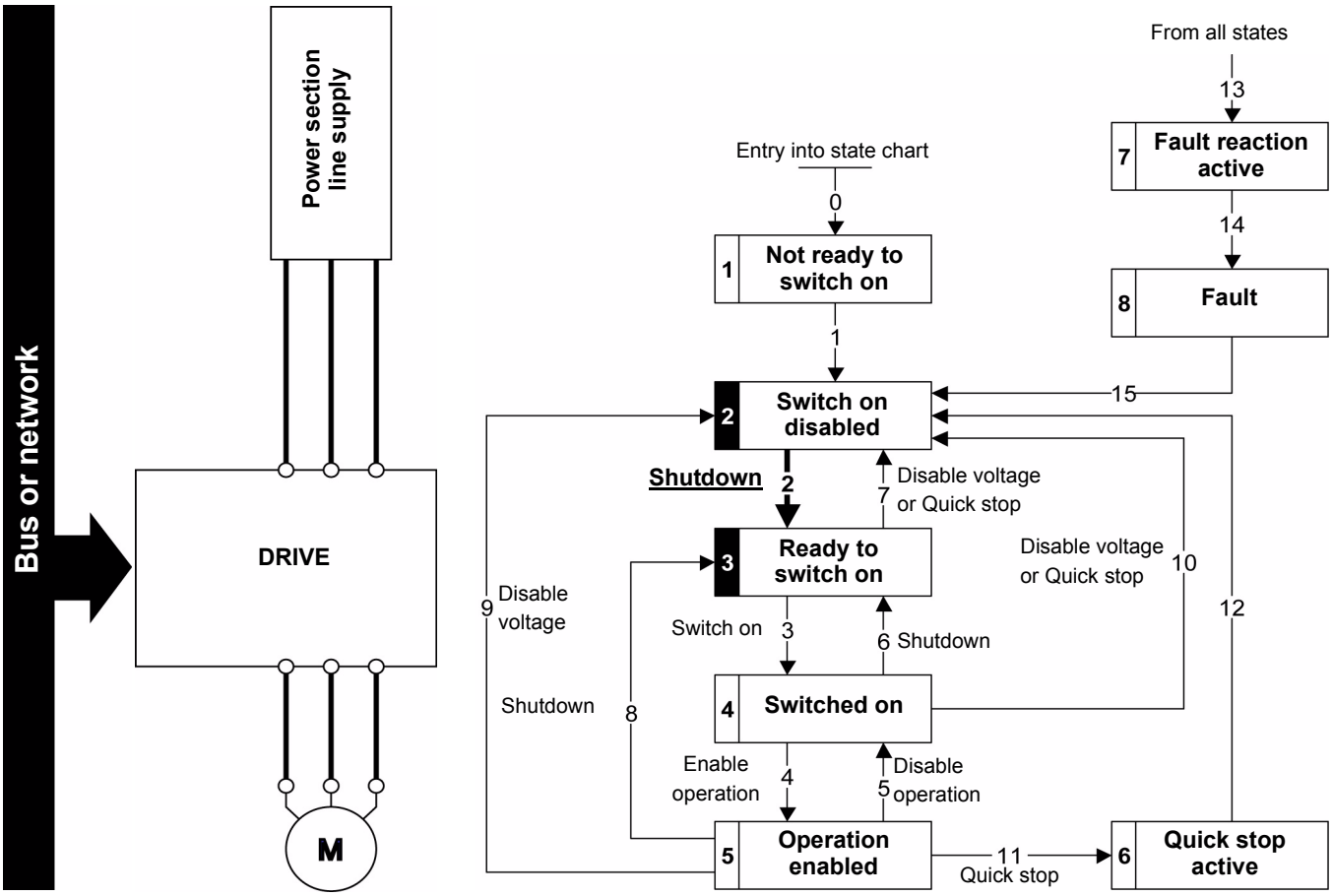
(1) The power section supplies the control section.

Sequence for a Drive Powered by the Power Section Line Supply

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

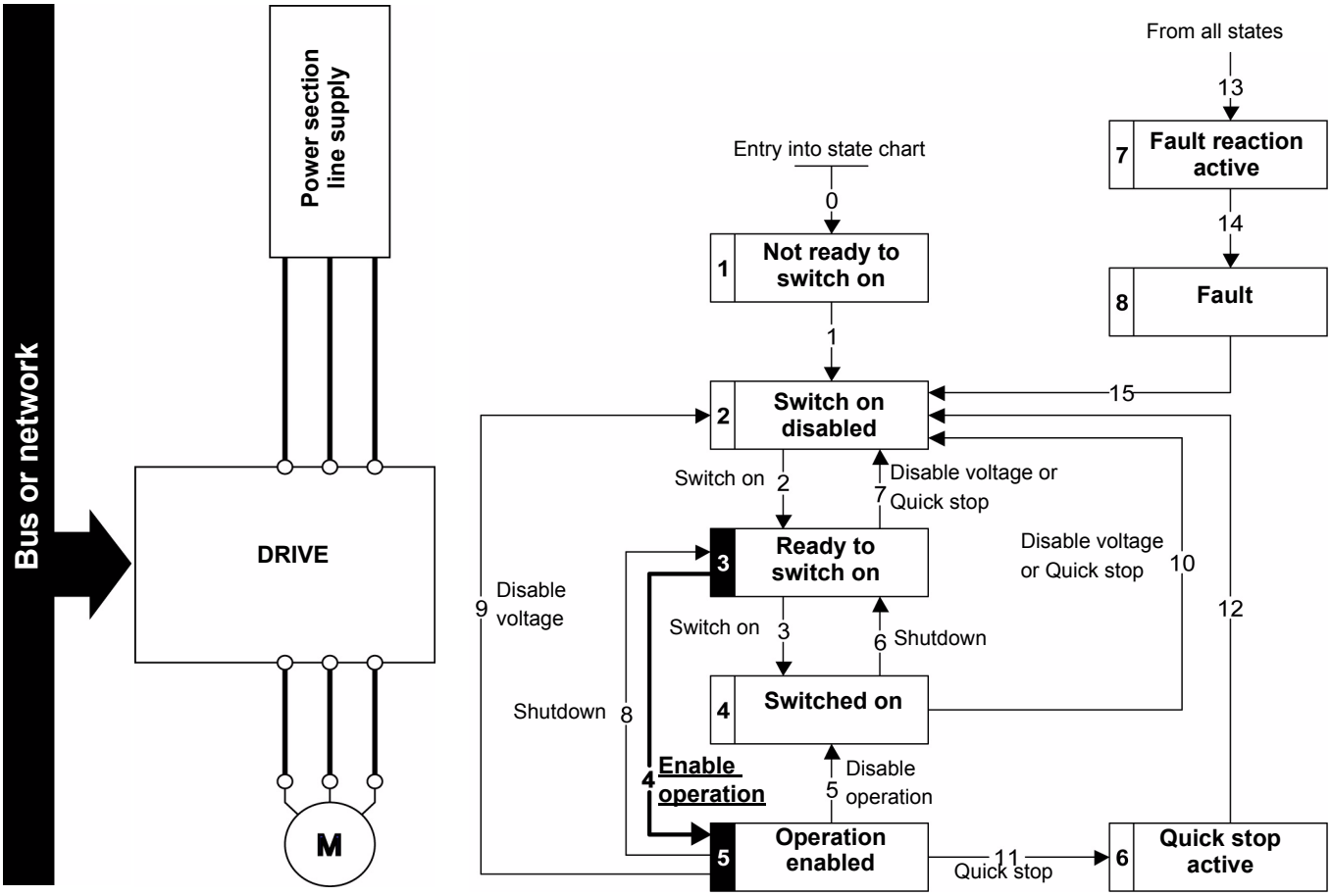
Step 1

Send the "2 - Shutdown" command



Step 2

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



NOTE: It is possible, but not necessary, to send the "3 - Switch on" command followed by the "4 - Enable Operation" command to switch successively into the 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 Section

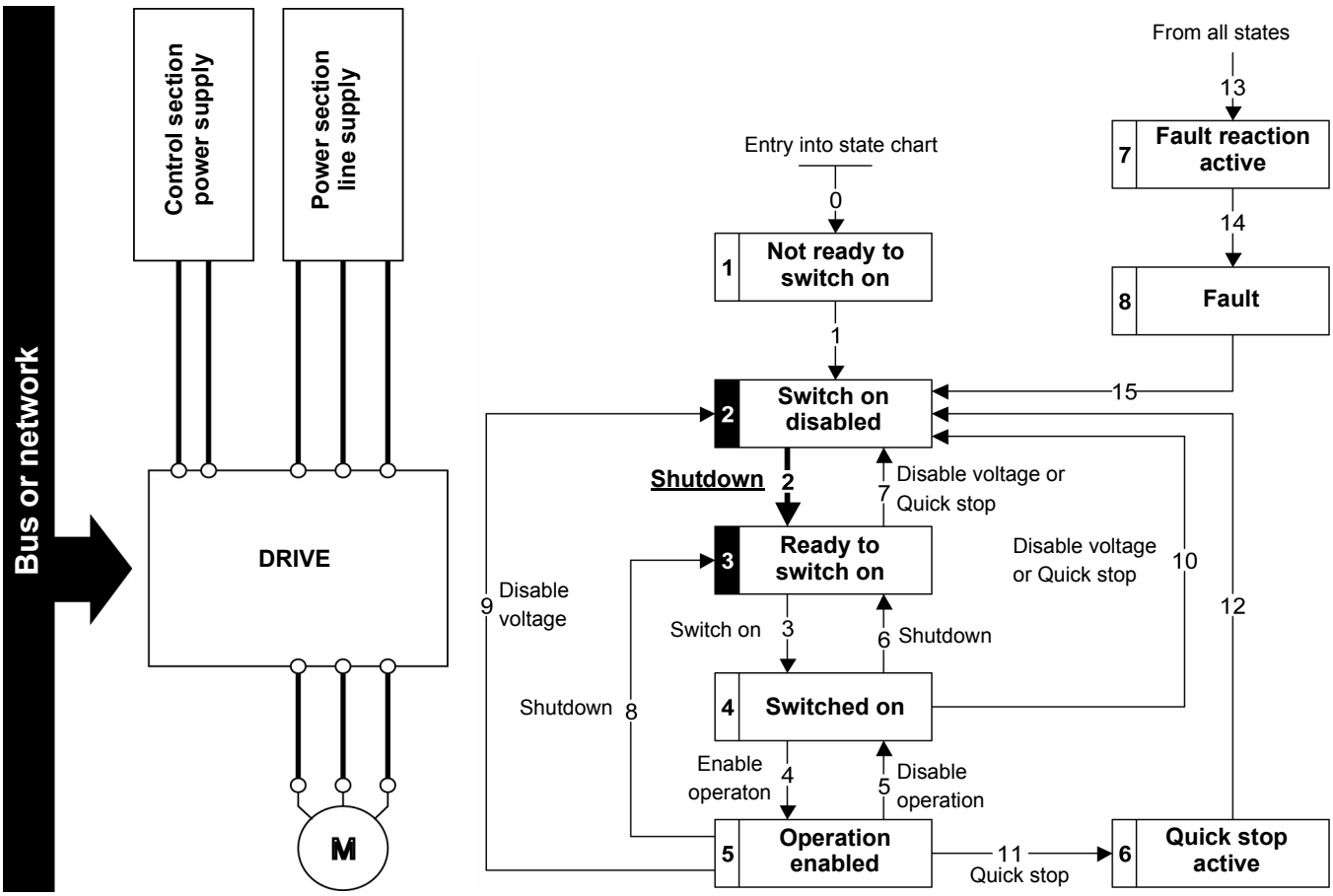
Power is supplied separately to the power and control sections.

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

The following sequence must be applied:

Step 1

- The power section line supply is not necessarily present.
- Send the "2 - Shutdown" command

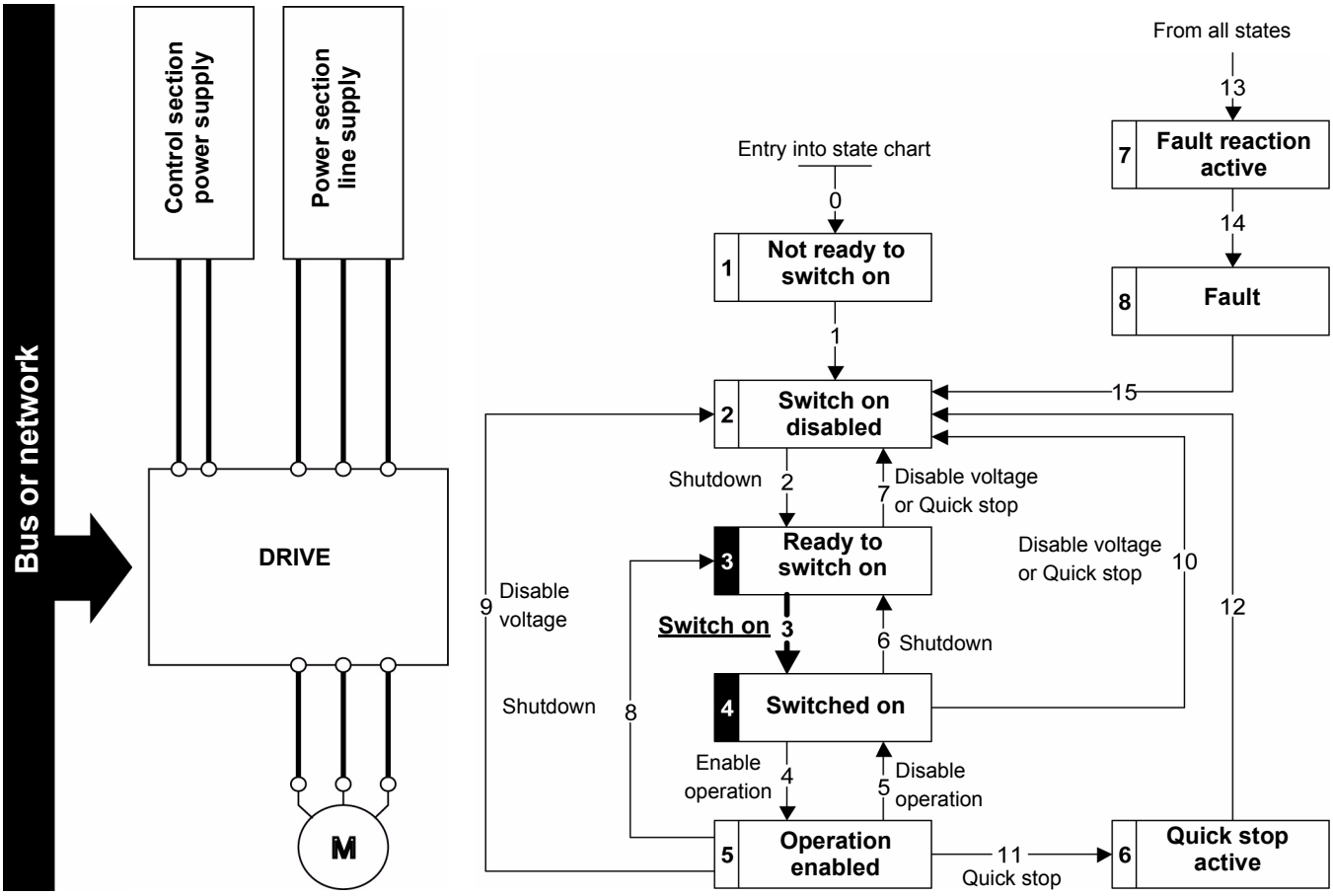


Step 2

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

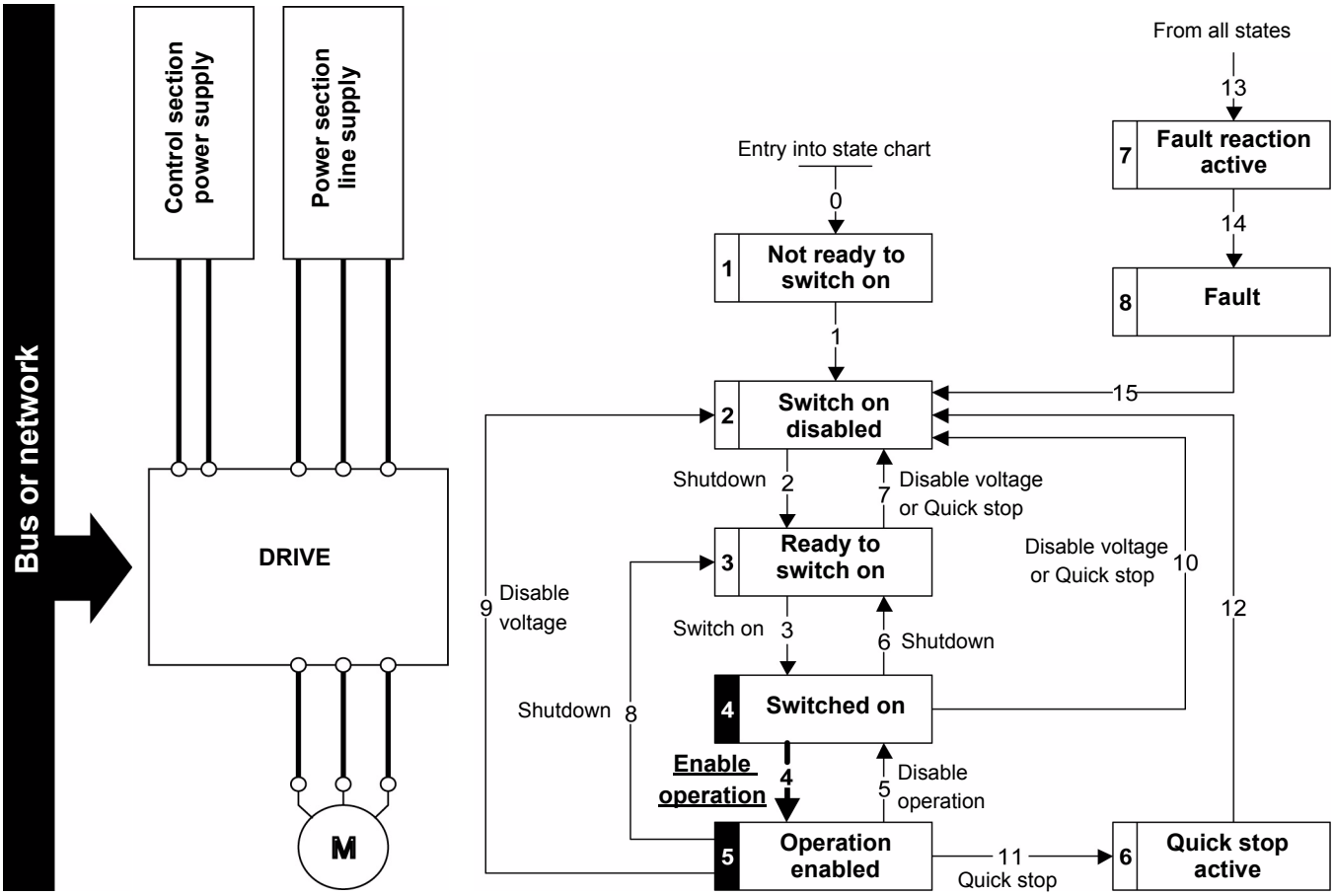
Power section line supply	Terminal display	Status word
Absent	nLP	16#●●21
Present	rdy	16#●●31

- Send the "3 - Switch on" command



Step 3

- Check that the drive is in the "4 - Switched on" state.
- Then send the "4 - Enable operation" command.
- The motor can be controlled (send a reference not equal to zero).
- If the power section line supply is still not present in the “4 - Switched on” state after a time delay **[Mains V. time out]** (LCE), the drive will switch to detected fault mode **[input contactor]** (LCF).



Sequence for a Drive With Line Contactor Control

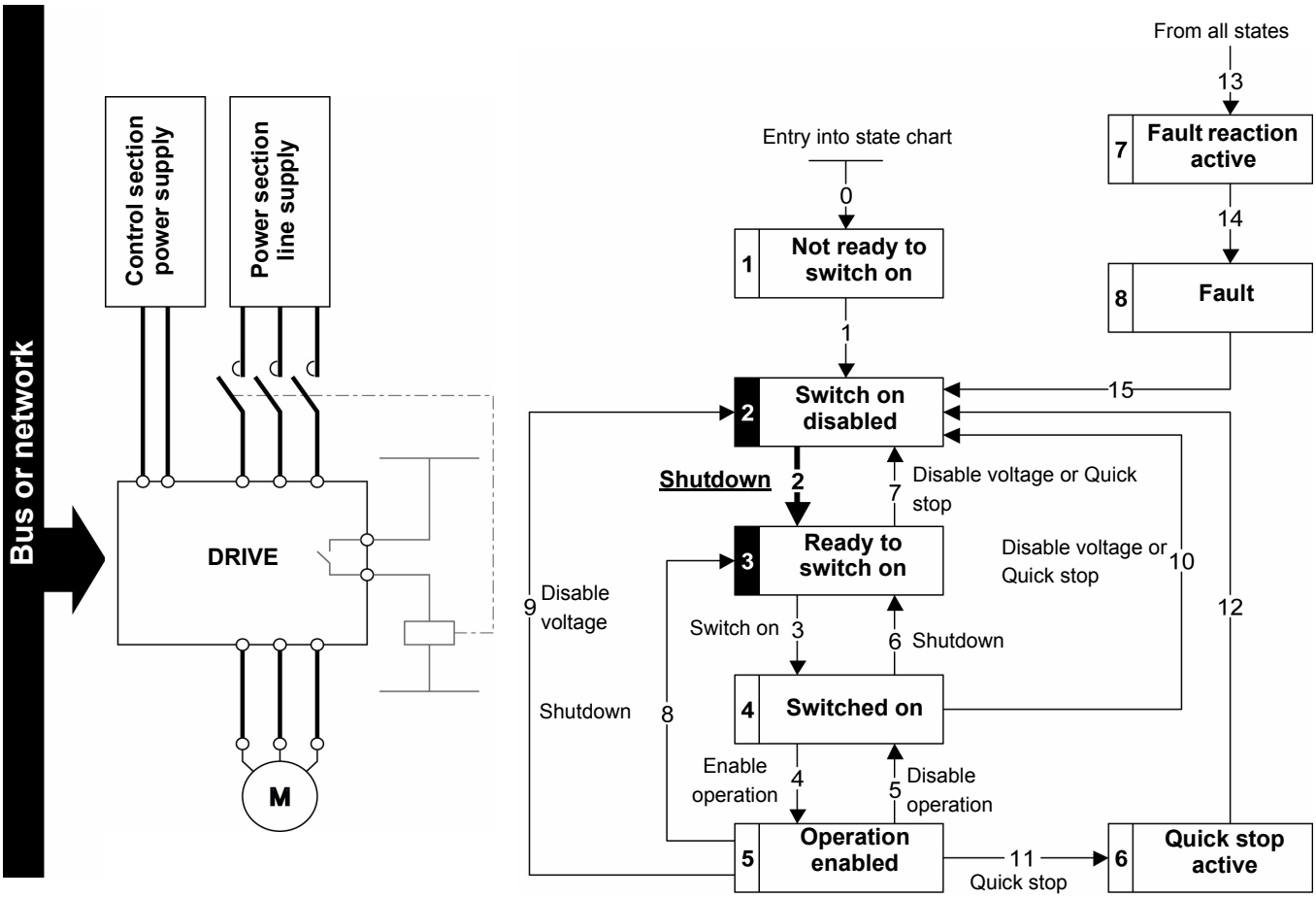
Power is supplied separately to the power and control sections.

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

The following sequence must be applied:

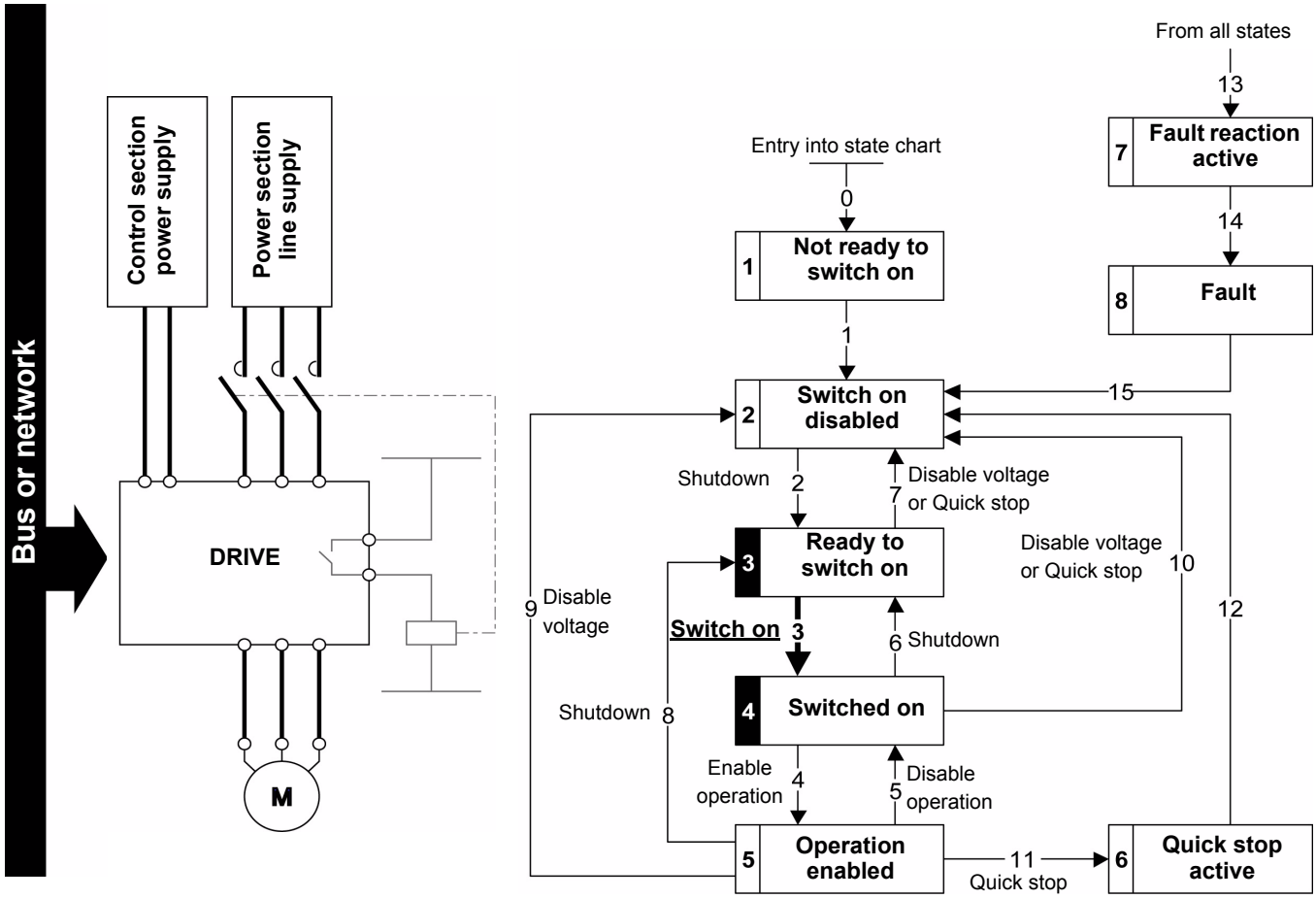
Step 1

- The power section line supply is not present as the line contactor is not being controlled.
- Send the "2 - Shutdown" command



Step 2

- Check that the drive is in the "3 - Ready to switch on" state.
- Send the "3 - Switch on" command, which will close the line contactor and switch on the power section line supply.



Software Setup

6

What's in this Chapter?

This chapter contains the following topics:

Available Profiles With the VW3 A3 609 Card

The VW3 A3 609 communication card enables the control of the ATV32 according to:
- ODVA AC drive profile: basic and extended speed profiles.
- ATV32 native profile (CiA402) through the ATV32 communication scanner.

Output Assemblies

Assembly name	Number	Size
CIP basic speed control output	20	2 words (4 bytes)
CIP extended speed control output	21	2 words (4 bytes)
Native drive output	100	4 words (8 bytes)

The size of the communication scanner is reduced to 4 words for optimal performances.

Input Assemblies

Assembly name	Number	Size
CIP basic speed control input	70	2 words (4 bytes)
CIP extended speed control input	71	2 words (4 bytes)
Native drive input	101	4 words (8 bytes)

The native drive profile assemblies use the communication scanner.

Control With Communication Scanner

If the default assemblies (100, 101) are selected, all possibilities of Altivar 32 drive are available.

It is possible to use all profiles and modes of the drive:

- I/O profile,
- CiA402 profile with separate or non separate mode.

By the configuration of the communication scanner, it is possible to assign any relevant parameter of the drive to the 4 input and 4 output variables of the assemblies.

Assembly 100: Native Drive Output

The following table describes the output assembly mapping:

Word number	Definition
1	Control word
2	Velocity setpoint
3	Scanner write word 3
4	Scanner write word 4

The following table describes the ATV32 assignment:

Word number	Code	Name
1	OCA1	Communication scanner, value of write word 1 (default value: CMD, Control word)
1	OCA2	Communication scanner, value of write word 2 (default value: LFRD, velocity setpoint)
3	OCA3	Communication scanner, value of write word 3
4	OCA4	Communication scanner, value of write word 4

Assembly 101: Native Drive Input

The following table describes the input assembly mapping:

Word number	Definition
1	Status word
2	Actual speed
3	Scanner read word 3
4	Scanner read word 4

The following table describes the ATV32 assignment:

Word number	Code	Name
1	OMA1	Communication scanner, value of read word 1 (default value: Status word, ETA)
2	OMA2	Communication scanner, value of read word 2 (default value: Velocity actual value, RFRD)
3	OMA3	Communication scanner, value of read word 3
4	OMA4	Communication scanner, value of read word 4

Control According to ODVA AC Drive Profile

The ODVA AC drive profile is activated when one of the following assemblies is selected:

- 20: Basic speed control output
- 21: Extended speed control output
- 70: Basic speed control input
- 71: Extended speed control input

The advantage of using the ODVA drive profile standard is the interchangeability with other brands.

The drive must be configured in the CiA402 profile with separate mode.

The DeviceNet card translates the commands, behavior and monitoring informations from of ODVA profile (on the network) to the Drivecom profile (in the drive).

Assembly 20

The following table describes the assembly mapping:

Word number	Definition
0	CIP basic command word
1	Speed setpoint (rpm)

The following tables describes the CIP basic command word:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not used	Not used	Not used	Not used	Not used	Fault reset (1) 0 = No command 1 = Fault reset	Not used	Run Forward (2) 0 = Stop 1 = Run

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used	Not used	Not used	Not used	Not used	Not used	Not used	Not used

(1) Active on rising edge.
(2) Active on level.

Assembly 70

The following table describes the assembly mapping:

Word number	Definition
0	CIP basic status word
1	Actual speed (rpm)

The following tables describes the CIP basic status word:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not used	Not used	Not used	Not used	Not used	Running 0 = Stopped 1 = Running	Not used	Faulted 0 = No fault 1 = Fault

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used	Not used	Not used	Not used	Not used	Not used	Not used	Not used

Assembly 21

The following table describes the assembly mapping:

Word number	Definition
0	CIP extended command word
1	Speed setpoint (rpm)

The following tables describes the CIP extended command word:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1 Bit 0
Not used	Network setpoint 0 = Setpoint by terminals 1 = Setpoint by network	Network command 0 = Command by terminals 1 = Command by network	Not used	Not used	Fault reset (1) 0 = No command 1 = Fault reset	Run forward / reverse 00 = Quick stop 01 = Run forward 10 = Run reverse 11 = Freewheel stop

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used	Not used	Not used	Not used	Not used	Not used	Not used	Not used

(1) Active on rising edge.

Assembly 71

The following table describes the assembly mapping:

Word number	Definition
0	CIP extended status word
1	Actual speed (rpm)

The following tables describes the CIP extended status word:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
At reference 0 = Reference not reached 1 = Reference reached	Setpoint from network 0 = Setpoint from terminals 1 = Setpoint from network	Command from network 0 = Command from terminals 1 = Command from network	Ready 0 = Not ready 1 = Ready	Running forward / reverse 00 = Stopped 01 = Running forward 10 = Running reverse 11 = Not used		Warning 0 = No warning 1 = Warning	Not used

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used	Not used	Not used	Not used	Not used	Bit 8 to bit 10 are used for the drive state 000 = Not used 001 = Startup 010 = Not Ready011 = Ready 100 = Enabled 101 = Stopping 110 = Fault Stop 111 = Faulted		

Configuring the Control by the Drive HMI

7

What's in this Chapter?

This chapter contains the following topics:

Principle

By the configuration of the control, it is possible to decide from what channel the drive receives its commands and setpoint, either permanently or depending on a switching command.

Numerous configurations are possible. The following configurations are some of the possibilities available.

Available Configurations

Communication Scanner

- 100: Communication scanner output
- 101: Communication scanner input there is no limitation in the configuration of the control

ODVA AC Drive Profile

- 20: Basic speed control output
- 21: Extended speed control output
- 70: Basic speed control input
- 71: Extended speed control input

Configuration via the graphic display terminal or the integrated display terminal:

NOTE: Following 2 cases can only be used if the assemblies 20/70 (**[Conf. Assembly]** (C 1 0 A) = **[20/70]** (2 0)) or 21/71 (**[Conf. Assembly]** (C 1 0 A) = **[21/71]** (2 1)) are selected.
If the configuration is not done as described, the drive will trip in **[EXTERNAL FAULT COM.]** (E P F 2) when trying to establish the communication.

- **Case 1:** Setpoint 1B is connected to the functions (Summing, PID, etc) which remain active even after switching:

Menu	Parameter	Permitted value
[COMMAND] (C t L -)	**[Profile]** (C H C F)	**[Separate]** (S E P)
	[Ref.1B channel] (F r 1 b)	**[Ref. AI1]** (A 1 1) or **[Ref. AI2]** (A 1 2)
	[Cmd channel 1] (C d 1)	**[Com. card]** (n E t)
	[Cmd channel 2] (C d 2)	**[Terminals]** (t E r)
	[Cmd switching] (C C S)	**[C312]** (C 3 1 2)
[APPLICATION FUNCT.] (F U n -) **[REFERENCE SWITCH.]** (r E F -)	**[Ref.1 channel]** (F r 1)	**[Com. card]** (n E t)
	[Ref 1B switching] (r C b)	**[C313]** (C 3 1 3)

- **Case 2:** Setpoint 2 is directly connected to the drive reference limit. If switching is performed, the functions that affect the reference (summing, PID, etc.) are inhibited:

Menu	Parameter	Permitted value
[COMMAND] (C t L -)	**[Profile]** (C H C F)	**[Separate]** (S E P)
	[Ref.1 channel] (F r 1)	**[Com. card]** (n E t)
	[Ref.2 channel] (F r 2)	**[Ref. AI1]** (A 1 1) or **[Ref. AI2]** (A 1 2)
	[Cmd channel 1] (C d 1)	**[Com. card]** (n E t)
	[Cmd channel 2] (C d 2)	**[Terminals]** (t E r)
	[Cmd switching] (C C S)	**[C312]** (C 3 1 2)
	[Ref. 2 switching] (r F C)	**[C313]** (C 3 1 3)

NOTE: It is not possible to configure the display terminal as a channel.
To switch to the display terminal, use the function force local and assign the parameter **[Forced local Ref.]** (F L O C) to **[HMI]** (L C C).

Control Via DeviceNet in I/O Profile

NOTE: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected (**[Conf. Assembly]** (C IOA) = **[100/101]** (IOO)).

The command and the setpoint come from DeviceNet.

Control is in I/O profile.

Configure the following parameters:

Parameter	Value	Comment
Profile	I/O profile	The run command is simply obtained by bit 0 of the command word.
Setpoint 1 configuration	Network card	The setpoint comes from DeviceNet.
Command 1 configuration	Network card	The command comes from DeviceNet.

Configuration via the graphic display terminal or the integrated display terminal:

Menu	Parameter	Value
[COMMAND] (CtL-)	**[Profile]** (CHCF)	**[I/O profile]** (IO)
	[Ref.1 channel] (Fr 1)	**[Com. card]** (nEt)
	[Cmd channel 1] (Cd 1)	**[Com. opt card]** (nEt)

Control Via DeviceNet or Via the Terminals in I/O Profile

NOTE: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected (**[Conf. Assembly]** (C IOA) = **[100/101]** (100)).

The command and the setpoint both come from DeviceNet or the terminals. Input LI5 at the terminals is used to switch between DeviceNet and the terminals.

Control is in I/O profile.

Configure the following parameters:

Parameter	Value	Comment
Profile	I/O profile	The run command is simply obtained by bit 0 of the control word.
Setpoint 1 configuration	Network card	Setpoint 1 comes from DeviceNet.
Setpoint 1B configuration	Analog input 1 on the terminals	Setpoint 1B comes from input AI1 on the terminals.
Setpoint switching	Input LI5	Input LI5 switches the setpoint (1 ↔1B).
Command 1 configuration	Network card	Command 1 comes from DeviceNet.
Command 2 configuration	Terminals	Command 2 comes from the terminals.
Command switching	Input LI5	Input LI5 switches the command.

NOTE: Setpoint 1B is connected to the functions (Summing, PID, etc) which remain active even after switching.

Configuration via the graphic display terminal or the integrated display terminal:

Menu	Parameter	Value
[COMMAND] (CtL-)	**[Profile]** (CHCF)	**[I/O profile]** (IO)
	[Ref.1 channel] (Fr1)	**[Com. card]** (nEt)
	[Cmd channel 1] (Cd1)	**[Com. card]** (nEt)
	[Cmd channel 2] (Cd2)	**[Terminals]** (tEr)
	[Cmd switching] (CCS)	**[LI5]** (LI5)
[APPLICATION FUNCT.] (FUn-) **[REFERENCE SWITCH.]** (rEF-)	**[Ref.1B channel]** (Fr1b)	**[AI1 ref.]** (AI1)
	[Ref 1B switching] (rCb)	**[LI5]** (LI5)

Control Via DeviceNet in Drivecom Profile

NOTE: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected (**[Conf. Assembly]** (C IOA) = **[100/101]** (100)).

The command and the setpoint come from DeviceNet.

Configure the following parameters:

Parameter	Value	Comment
Profile	Separate Drivecom profile	The run commands are in Drivecom profile, the command and the setpoint can come from different channels.
Setpoint 1 configuration	Network card	The setpoint comes from DeviceNet.
Command 1 configuration	Network card	Command 1 comes from DeviceNet.

Configuration via the graphic display terminal or the integrated display terminal:

Menu	Parameter	Value
[COMMAND] (CtL-)	**[Profile]** (CHCF)	**[Separate]** (SEP)
	[Ref.1 channel] (Fr1)	**[Com. card]** (nEt)
	[Cmd channel 1] (Cd1)	**[Com. card]** (nEt)

Control Via DeviceNet or the Terminals in CiA402 Profile

NOTE: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected (**[Conf. Assembly]** (CIOA) = **[100/101]** (IOO)).

The command and the setpoint both come from DeviceNet or the terminals. Input LI5 at the terminals is used to switch between DeviceNet and the terminals.

Configure the following parameters:

Parameter	Value	Comment
Profile	Separate Drivecom profile	The run commands are in Drivecom profile, the command and the setpoint can come from different channels.
Setpoint 1 configuration	Network card	Setpoint 1 comes from DeviceNet.
Setpoint 2 configuration	Analog input 1 on the terminals	Setpoint 2 comes from input AI1 on the terminals.
Setpoint switching	Input LI5	Input LI5 switches the setpoint (1 ↔ 2) and the command.
Command 1 configuration	Network card	Command 1 comes from DeviceNet.
Command 2 configuration	Terminals	Command 2 comes from the terminals.
Command switching	Input LI5	Input LI5 switches the command.

NOTE: Setpoint 2 is directly connected to the drive reference limit. If switching is performed, the functions that affect the reference (summing, PID, etc) are inhibited.

Configuration via the graphic display terminal or the integrated display terminal:

Menu	Parameter	Value
[COMMAND] (CtL-)	**[Profile]** (CHCF)	**[Separate]** (SEP)
	[Ref.1 channel] (Fr1)	**[Com. card]** (nEt)
	[Ref.2 channel] (Fr2)	**[AI1 ref.]** (AI1)
	[Ref. 2 switching] (rFC)	**[LI5]** (LI5)
	[Cmd channel 1] (Cd1)	**[Com. card]** (nEt)
	[Cmd channel 2] (Cd2)	**[Terminals]** (tEr)
	[Cmd switching] (CCS)	**[LI5]** (LI5)

Control in Drivecom Profile Via DeviceNet and Setpoint Switching at the Terminals

NOTE: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected (**[Conf. Assembly]** (C IOA) = **[100/101]** (100)).

The command comes from DeviceNet.

The setpoint comes either from DeviceNet or from the terminals. Input LI5 at the terminals is used to switch the setpoint between DeviceNet and the terminals.

Control is in Drivecom profile.

Configure the following parameters:

Parameter	Value	Comment
Profile	Separate Drivecom profile	The run commands are in Drivecom profile, the command and the setpoint can come from different channels.
Setpoint 1 configuration	Network card	Setpoint 1 comes from DeviceNet.
Setpoint 1B configuration	Analog input 1 on the terminals	Setpoint 1B comes from input AI1 on the terminals.
Setpoint switching	Input LI5	Input LI5 switches the setpoint (1 ↔1B).
Command 1 configuration	Network card	Command 1 comes from DeviceNet.
Command switching	Channel 1	Channel 1 is the command channel.

NOTE: Setpoint 1B is connected to the functions (summing, PID, etc) that remain active, even after switching.

Configuration via the graphic display terminal or the integrated display terminal:

Menu	Parameter	Value
[COMMAND] (CtL-)	**[Profile]** (CHCF)	**[Separate]** (SEP)
	[Ref.1 channel] (Fr1)	**[Com. card]** (nEt)
	[Cmd channel 1] (Cd1)	**[Com. card]** (nEt)
	[Cmd switching] (CCS)	**[ch1 active]** (Cd1)
[APPLICATION FUNCT.] (FUn-) **[REFERENCE SWITCH.]** (rEF-)	**[Ref.1B channel]** (Fr1b)	**[AI1 ref.]** (AI1)
	[Ref 1B switching] (rCb)	**[LI5]** (LI5)

Explicit Messaging

Class Code

Hexadecimal	Decimal
16#70 to 16#A8	112 to 424

The drive parameters are grouped in classes:
- Each application class has only 1 instance.
- Each instance groups 200 parameters.
- Each attribute in an instance relates to a parameter.
- The first parameter registered in the first application.

Examples

Class code = ((ADL - 3000)/200) + 70hex

Attribute ID = (ADL modulo 200)+1

Instance = 1

Drive logical address	Hexadecimal path
3 000	16# 70 / 01 / 01
3 100	16# 70 / 01 / 65
3 201	16# 71 / 01 / 02

NOTE: ADL = Parameter Number = Modbus@.

ATV32 Setup With RSNetWorx and RSlogix

8

Overview

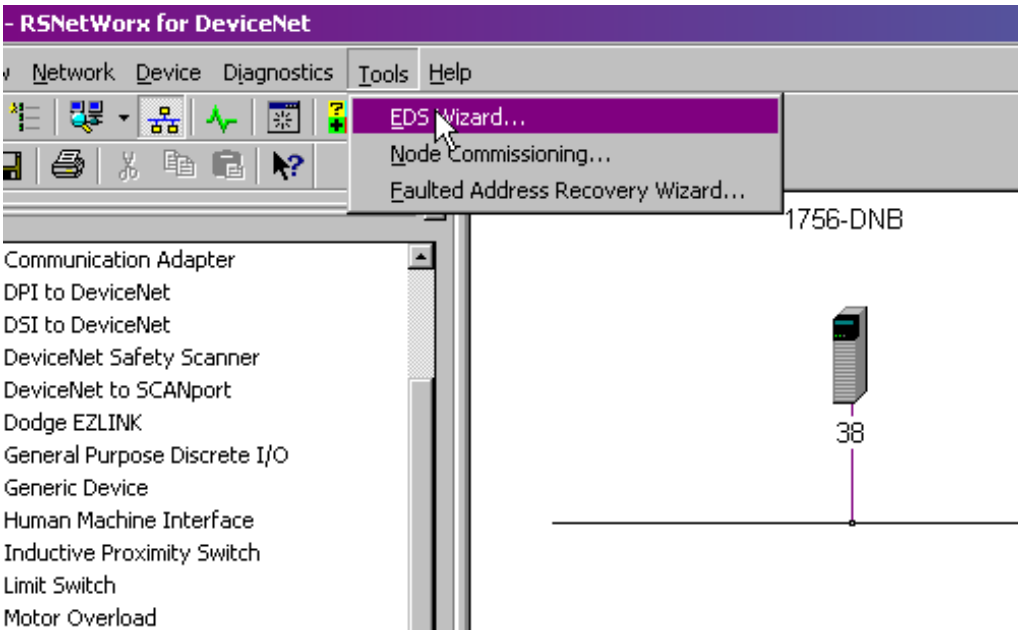
This chapter describes how to integrate the Altivar 32 in a DeviceNet network controlled by a Rockwell Automation PLC.

What's in this Chapter?

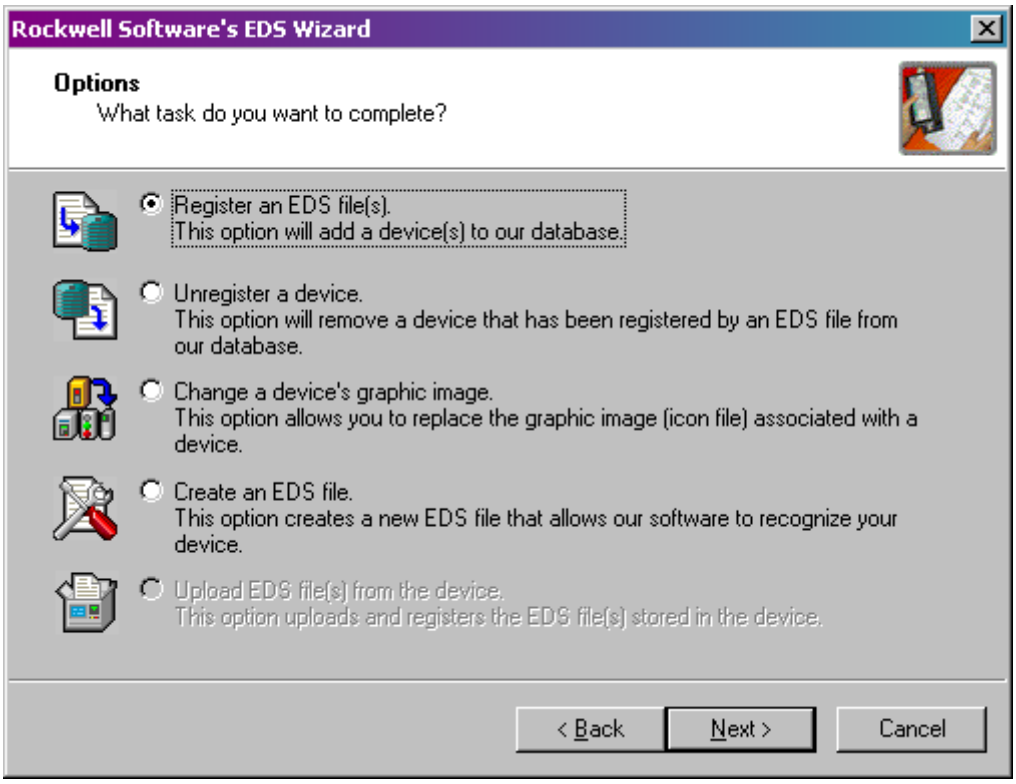
This chapter contains the following topics:

EDS Integration

The EDS file of the VW3 A3 609 communication card can be downloaded from www.schneider-electric.com.
To install the new EDS file, you can launch the EDS wizard from the Tools entry of RSNetWorx menu.

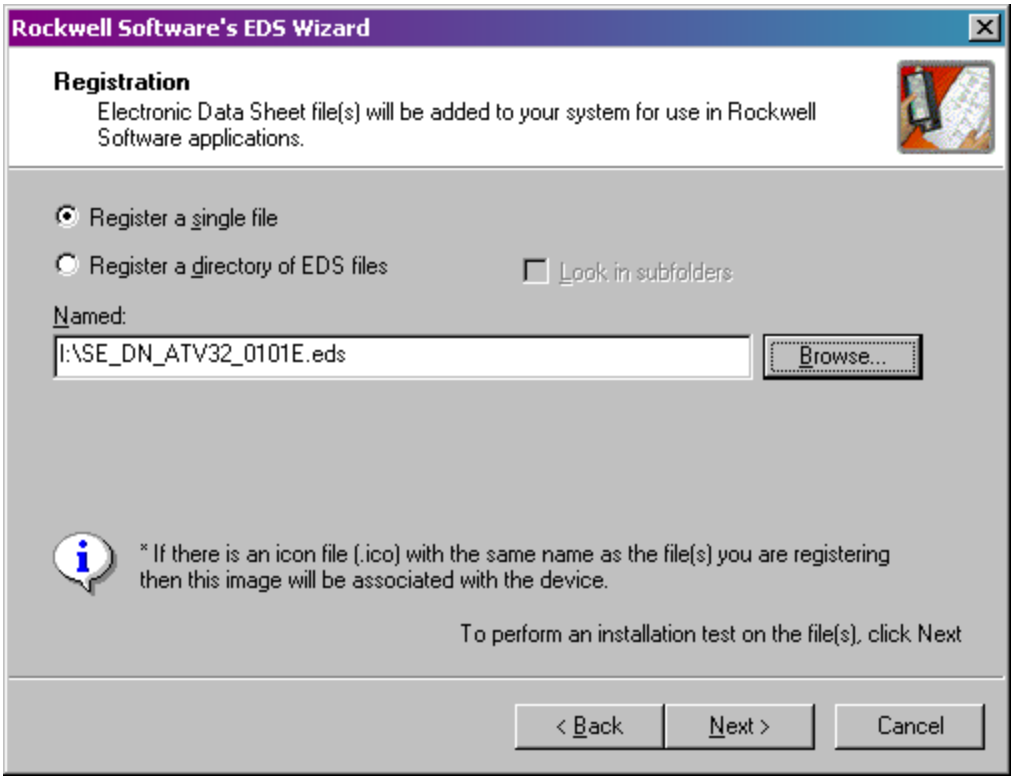


Click “Next” button.



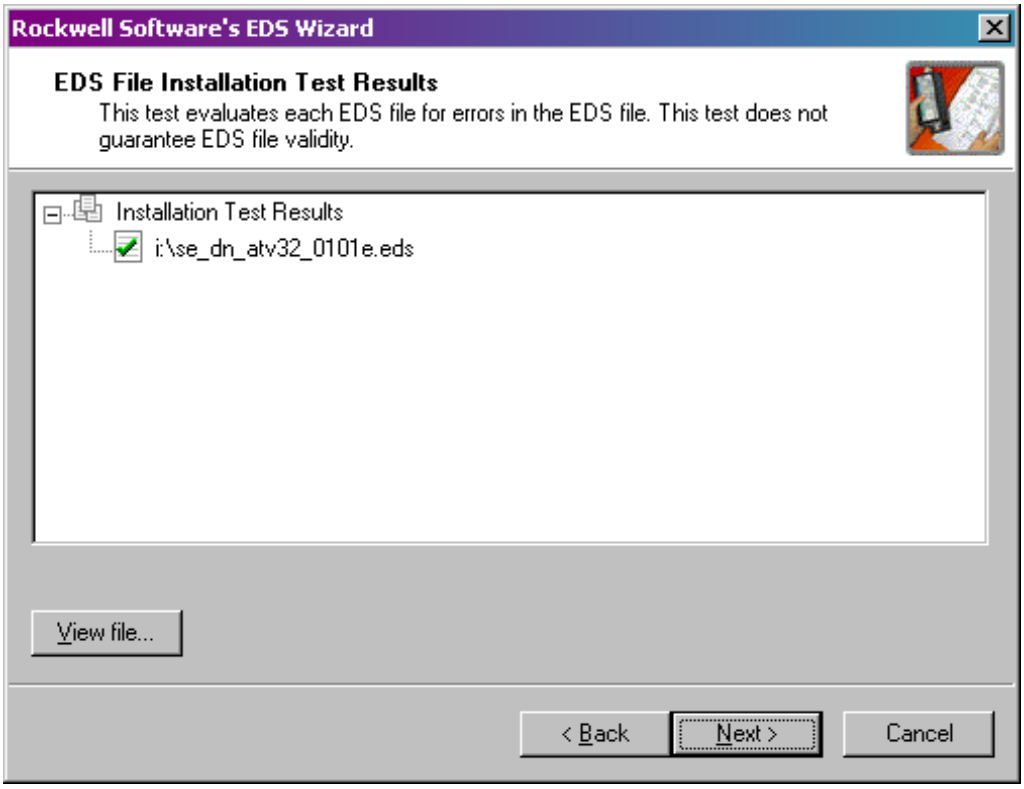
Click “Next” button.

Select the location where the EDS file has been recorded:

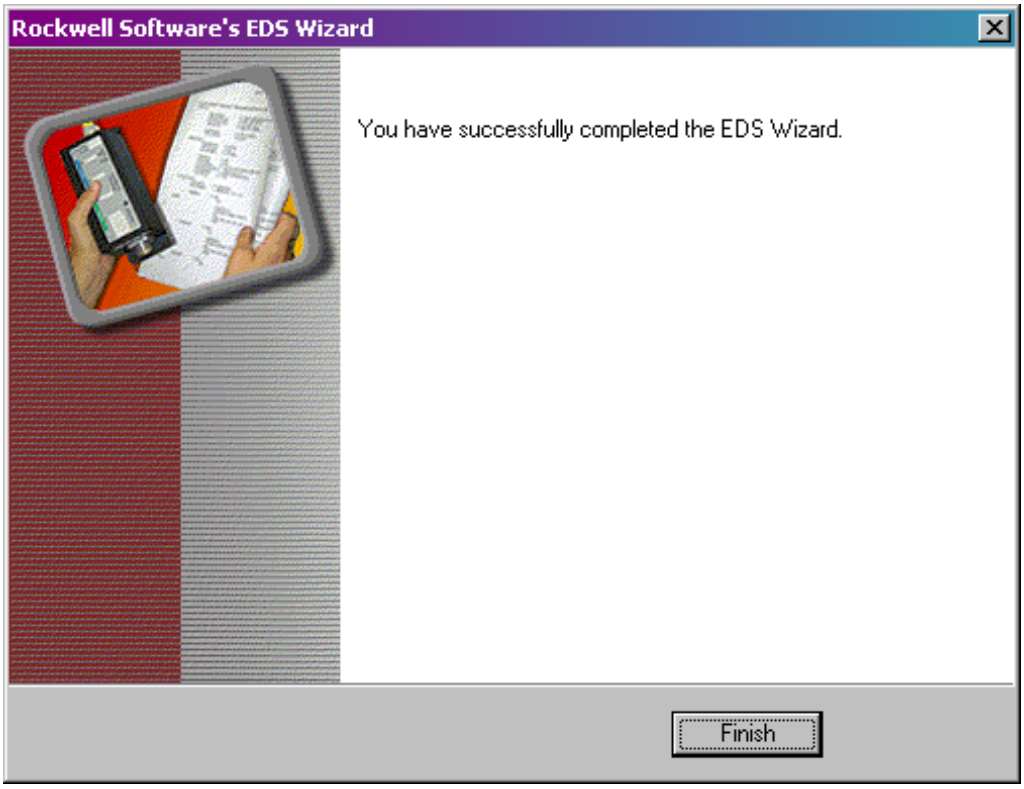


Click “Next” button.

You should get the following result, that indicates that the EDS file has been successfully imported.



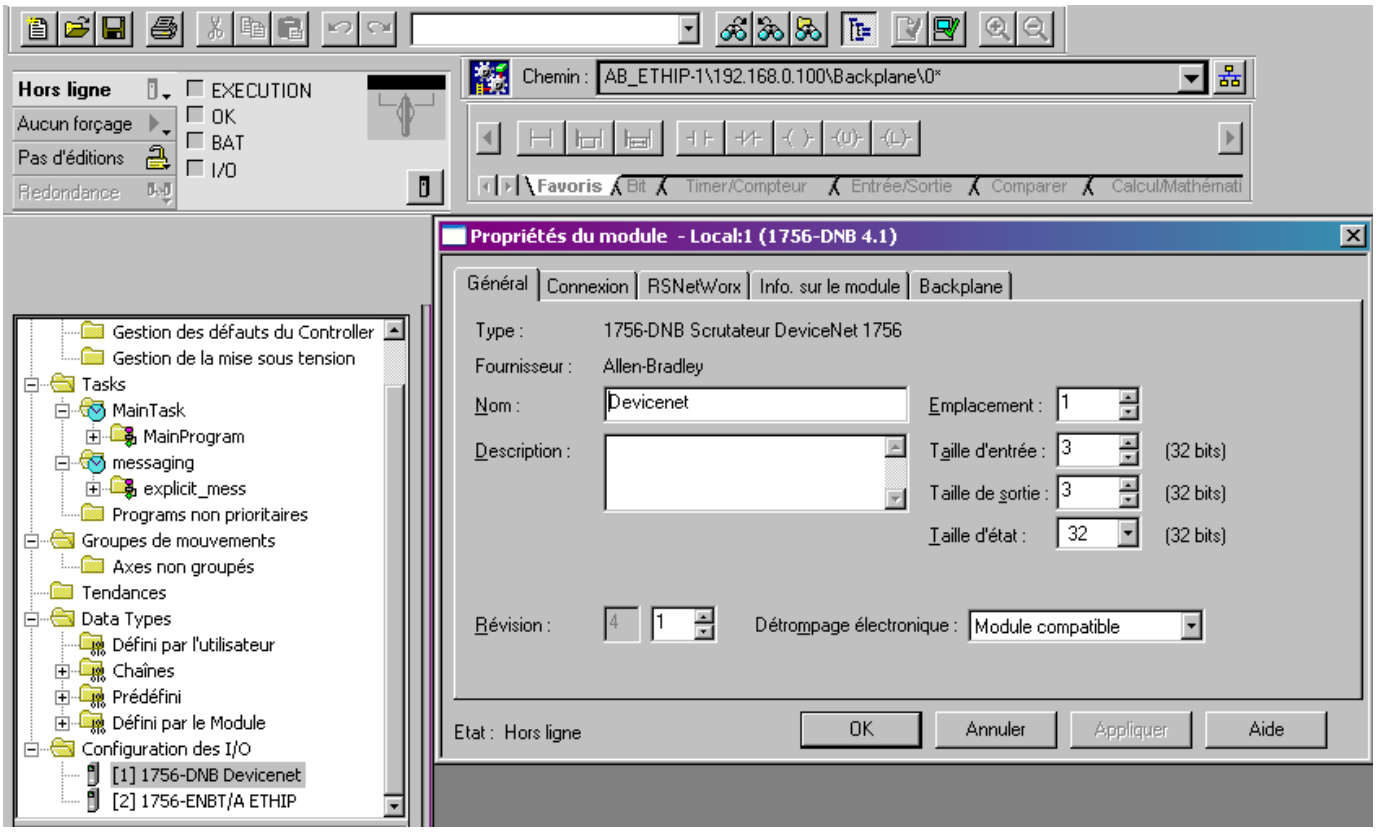
When selecting "next" the wizard will propose you to change the icon picture associated to the device. If you don't need to change the icon file press “next” to terminate the EDS registration.



ATV32 Configuration

Configuration of the DeviceNet Module in the Rockwell PLC

In the example, the module is installed in the first slot of the local base plate of a 1755 CPU:

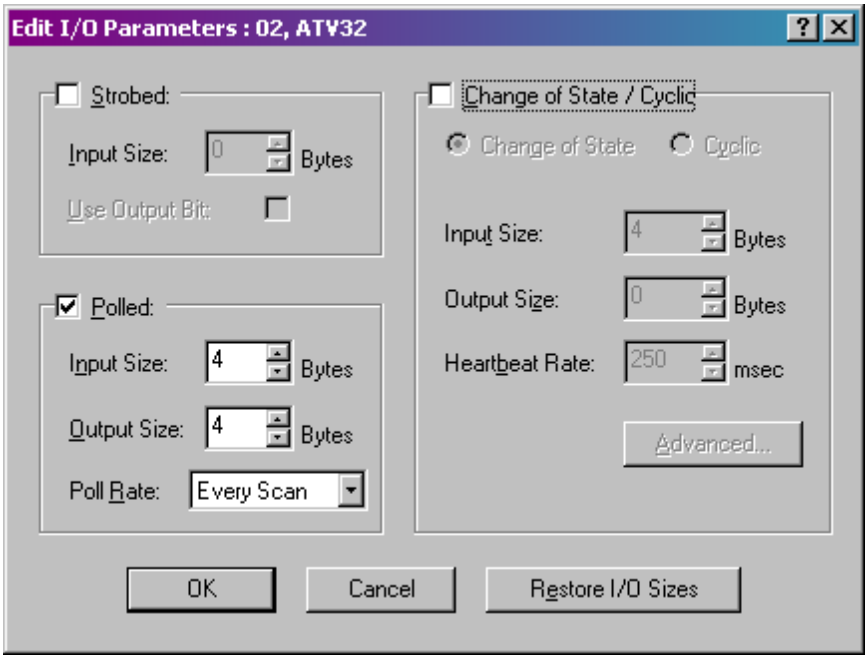


The DeviceNet module is identified with the symbol: Module_DNET. This identifier will be used later with tools like the Class Instance editor.

Configuring the Implicit Exchanges

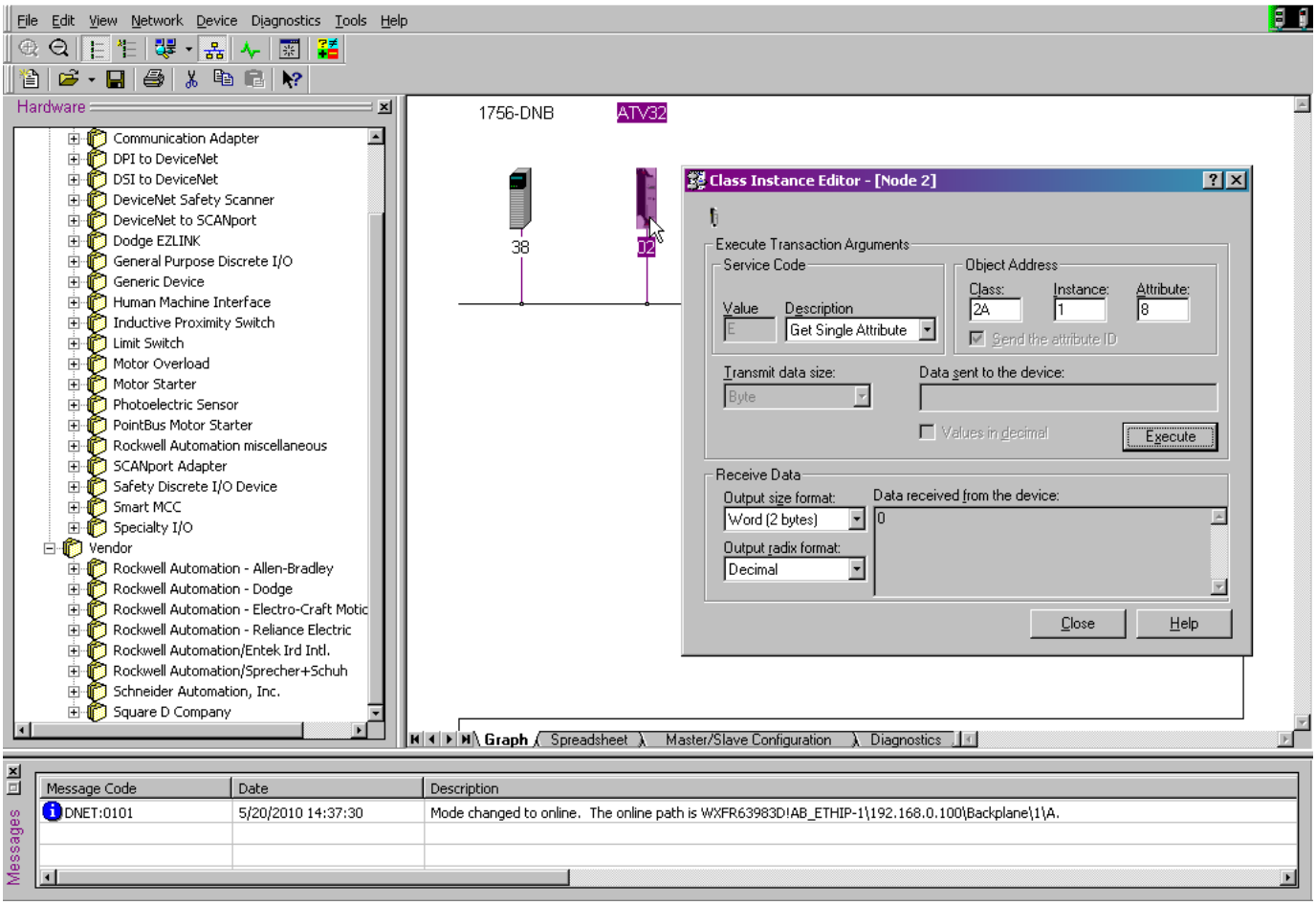
The ATV32 allows the use of 3 assemblies set as described in previous chapter. In the 3 cases the input size and the output size are always the same.

Command word and speed reference = 4 bytes, status word and actual speed = 4 bytes:



Class Instance Editor

With the Class instance Editor, you can directly access to the Device objects and use the methods Get/set to edit drive parameters. The indication about the Class, Instance, Attribute of the ATV32 objects are detailed in the chapter “application objects” of this manual.



Acyclic Messaging From Control Logix PLC

The ATV32 parameters are grouped in classes:

- Each application class has only 1 instance.
- Each instance groups 200 parameters.
- Each attribute in an instance relates to a parameter.
- The first parameter is registered in the first application.

Examples

Class code = ((ADL - 3000)/200) + 70hex

Attribute ID = (ADL modulo 200)+1

Instance = 1

Modbus address	Hexadecimal path
3 000	16# 70 / 01 / 01
3 100	16# 70 / 01 / 65
3 201	16# 71 / 01 / 02

Diagnostics

9

What's in this Chapter?

This chapter contains the following topics:

Monitoring of Communication Channels

Command and Reference Channels

All the drive's command and reference parameters are managed on a channel-by-channel basis.

It is possible to identify the last value written for each channel and each command or reference parameter:

Parameter name	Parameter code			
	Taken into account by the drive	Modbus	CANopen	Communication card
Control word	(CMd)	(CMd 1)	(CMd2)	(CMd3)
Extended control word	(CMI)	(CMI 1)	(CMI2)	(CMI3)
Speed reference (rpm)	(LFrd)	(LFrd 1)	(LFrd2)	(LFrd3)
Frequency reference (0.1 Hz)	(LFr)	(LFr 1)	(LFr2)	(LFr3)
PI regulator reference	(PISP)	(PIr 1)	(PIr2)	(PIr3)
Analog multiplier reference	(MFr)	(MFr 1)	(MFr2)	(MFr3)

Network Monitoring Criteria

The network is monitored according to the protocol-specific criteria:.

Protocol	Criteria	Related detected fault
Integrated Modbus port	Adjustable time-out for received requests destined for the drive.	**[Modbus fault]** (SLF)
DeviceNet card	Time-out: Either for received periodic variables (Polling and COS) destined for the drive Or for network activity, if no periodic variables configured	**[NETWORK FAULT]** (CnF)

Monitoring of Communication Channels

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

- The control word (**[Cmd value]** (CMd)) from the active command channel
- The control word containing the command switch (bit configured on **[Cmd switching]** (CCS))
- The control word containing the switch for reference 1'1B (bit configured on **[Ref 1B switching]** (rCb))
- The control word containing the switch for reference 1'2 (bit configured on **[Ref. 2 switching]** (rFC))
- The frequency or speed reference (**[HMI Frequency ref.]** (LFr) or LFRD: Nominal speed value) from the active reference channel
- Summing frequency or speed reference (**[HMI Frequency ref.]** (LFr) or LFRD: Nominal speed value) 2 (assigned to **[Summing ref. 2]** (SA2))
- Summing frequency or speed reference (**[HMI Frequency ref.]** (LFr) or LFRD: Nominal speed value) 3 (assigned to **[Summing ref. 3]** (SA2))
- Subtracting frequency or speed reference (**[HMI Frequency ref.]** (LFr) or LFRD: Nominal speed value) 2 (assigned to **[Subtract ref. 2]** (dA2))
- Subtracting frequency or speed reference (**[HMI Frequency ref.]** (LFr) or LFRD: Nominal speed value) 3 (assigned to **[Subtract ref. 3]** (dA3))
- The PID regulator reference (PISP)
- The PID regulator feedback (**[AI Virtual 2]** (AIU2))
- The reference multiplication coefficient (**[Multiplying coeff.]** (MFr)) 2 (assigned to **[Multiplier ref. 2]** (MA2))
- The reference multiplication coefficient (**[Multiplying coeff.]** (MFr)) 3 (assigned to **[Multiplier ref. 3]** (MA3))

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

If a communication alarm is sent (in accordance with the protocol criteria) by a monitored port or network card, the drive will trigger a communication interruption.

The drive reacts according to the communication interruption configuration (detected fault, maintenance, fallback, etc.)

If a communication alarm occurs on a channel that is not being monitored, the drive will 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 are enabled.

Example:

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

It is mandatory to write at least one time the reference 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 alarm
- In “forced local” mode.

Note: On exiting **“**forced local**”** mode:

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

Communication Interruption

DeviceNet detected faults are indicated by the LED on the DeviceNet card.

In the factory configuration, if DeviceNet is involved in the command or reference, a DeviceNet detected fault will trigger a resetable drive detected fault **[Com. network.]** (CnF) or **[External fault com.]** (EPF2) and initiate a freewheel stop.

- Following initialization (power-up), the drive checks that at least one command or reference parameter has been written for the first time by DeviceNet.
- Then, if a DeviceNet detects a communication interruption, the drive will react according to the configuration (detected fault, maintain, fallback, etc.).

The response of the drive in the event of a DeviceNet communication interruption can be changed.

- Drive detected fault **[Com. network]** (CnF) or **[External fault com.]** (EPF2) (freewheel stop, stop on ramp, fast stop or DC injection braking stop)
- No drive detected fault (stop, maintain, fallback)

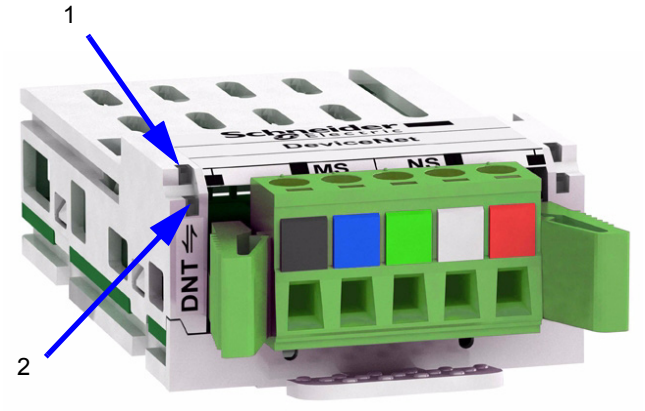
The **[Network fault]** (CnF) parameter can be used to obtain more detailed information about the origin of the last **[Com. network]** (CnF) detected fault. It can be accessed on the graphic display terminal only, in the **[DIAGNOSTICS]** (dGt-) menu, **[MORE FAULT INFO]** (AF I-) submenu.

This parameter is available in the DeviceNet Interface object (16#64 = 100), attribute 4.

Value	**Description of the values of [Com. network] (CnF) parameter**	
0	No detected fault	
1	Fault mode triggered by the user. This type of event can be triggered by the parameter “Force Fault/Trip” of the Control Supervisor object (16#28 = 41), attribute 17	
2	Duplicate node address (MAC ID)	
3	CAN FIFO RX error	These events may be cause by loose or broken cables or by noise
4	CAN FIFO TX error	
5	CAN overrun	
6	CAN transmit error	These events may be cause by loose or broken cables or by noise.
7	CAN bus off	
8	Control time out. COS, cycling, polling or explicit messaging restart the timer. The time out can be configured in the parameter “Expected-packed-rate” of the Connection object (5), attribute 9.	
9	Acknowledge detected error, for COS or cyclic only. The detected error can be configured in the parameters “Acknowledge Timer” and “Retry Limit” of the Acknowledge Handler object, attributes 1 and 2.	
10	Reset DeviceNet	
11	Delete IO Connection	
12	Loss of network power	
13	Invalid scanner configuration	

Diagnostic LED

The DeviceNet card is equipped with two bicolor LEDs:



LED	Description
NS (1)	Network status
MS (2)	Module status

"NS" LED status	Option card status	Description
Off	Device is not on line	- The device is not powered. - The device has not completed the duplicate node address test.
Flashing green	Device is operational and on line but not connected OR Device is on line but needs commissioning	The device is on line and operating in a normal condition, but network connections are not established: - The device has passed the duplicate node address test and is on line, but has not established connections to other nodes. - The device is not allocated to a master. - Configuration is missing, incomplete, or incorrect.
Green	Device is operational, online, and connected	The device is operating in a normal condition.It is allocated to a master.
Flashing red	Recoverable detected fault and/or connection time-out	- The device has detected a recoverable detected fault. - One or more I/O connections timed out.
Red	Unrecoverable detected fault or critical link failure	- The card has a unrecoverable detected fault and may need replacing. - The device has detected an error that has rendered it incapable of communicating on the network (duplicate node address or bus turned off).
Flashing green / red	Communication interruption	The device has detected a Network Access error and is in the Communication Faulted state. The device has subsequently received and accepted an Identify Communication Faulted Request-Long Protocol message.

“MS” LED status	Option card status	Description
Off	Device is not on line	The device is not powered.
Green	Device is operational	The device is on line and operating in a normal condition,
Flashing green	Device is in standby	The device needs commissioning due to configuration missing, incomplete or incorrect. The device may be in the standby state.
Flashing red	Minor detected fault	Recoverable detected fault.
Red	Unrecoverable detected fault	The device has unrecoverable detected fault. It may need replacing.
Flashing green / red	Device self testing	The device is in self test.

CIP Objects

10

What's in this Chapter?

This chapter contains the following topics:

Supported Classes

Object class	Class ID		Need for ODVA conformance	No. of instances	Effect on behavior	Interface
	Hex.	Dec.				
Identity	16#01	1	Required	1	Supports the reset service	Message router
Message router	16#02	2	Optional	1	-	Explicit message connection
DeviceNet	16#03	3	Required	1	Configures node attributes	Message router
Assembly	16#04	4	Required	13	Defines I/O data format	Message router, assembly, or parameter object
DeviceNet connection	16#05	5	Required	3	Logical ports into or out of the device	I/O connection or message router
Motor data	16#28	40	Required	1	Defines motor data for the motor connected to this device	Message router or parameter object
Control supervisor	16#29	41	Required	1	Manages drive functions, operational states, and control	Message router, assembly, or parameter object
AC/DC drive	16#2A	42	Required	1	Provides drive configuration	Message router, assembly, or parameter object
Acknowledge handler	16#2B	43	Optional	1	-	I/O connection or message router
Application	16#70 - A8	112-424	Optional	-	Vendor specific object	Message router or parameter object
DeviceNet interface	16#64	100	Optional	1	-	-

Identity Object

The Identity object provides identification and status information about the drive.

Class Code

Hexadecimal	Decimal
16#01	1

Class Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	-
2	Get	Max Instances	Opt.	UINT	1	1 defined instance

Instance Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Vendor ID	Req.	UINT	243	-
2	Get	Device type	Req.	UINT	16#02	AC/DC drive profile
3	Get	Product code	Req.	UINT	5	-
4	Get	Revision	Req.	Struct of: USINT USINT	-	Module version (1)
5	Get	Status	Req.	WORD	-	See definition in the table below
6	Get	Serial number	Req.	UDINT	-	Serial number of the drive
7	Get	Product name	Req.	Struct of: USINT STRING	-	11 (product name length) “ATV32 Drive”
8	Get	State (see “State Diagram for the Identity Object” on page 69)	Opt.	USINT	-	0: Non existent 1: Device self-testing 2: Standby 3: Operational 4: Major recoverable detected fault 5: Major unrecoverable detected fault
10	Get/Set	Heartbeat interval (2)	Opt.	USINT	0-255	Interval in seconds between two heartbeat messages 0: No message

(1) Mapped in a word: MSB minor revision (second USINT), LSB major revision (first USINT).
Example: 517 = 16#0205 means revision V5.2.
(2) The heartbeat message broadcasts the current state of the device.

Attribute 5–Status

Bit	Definition
0	Owned by master (predefined master/slave connection)
2	Configured (not used)
8	Minor recoverable detected fault (not used)
9	Minor unrecoverable detected fault (not used)
10	Major recoverable detected fault
11	Major unrecoverable detected fault
Others	Reserved 0 (reset to 0)

Class Service

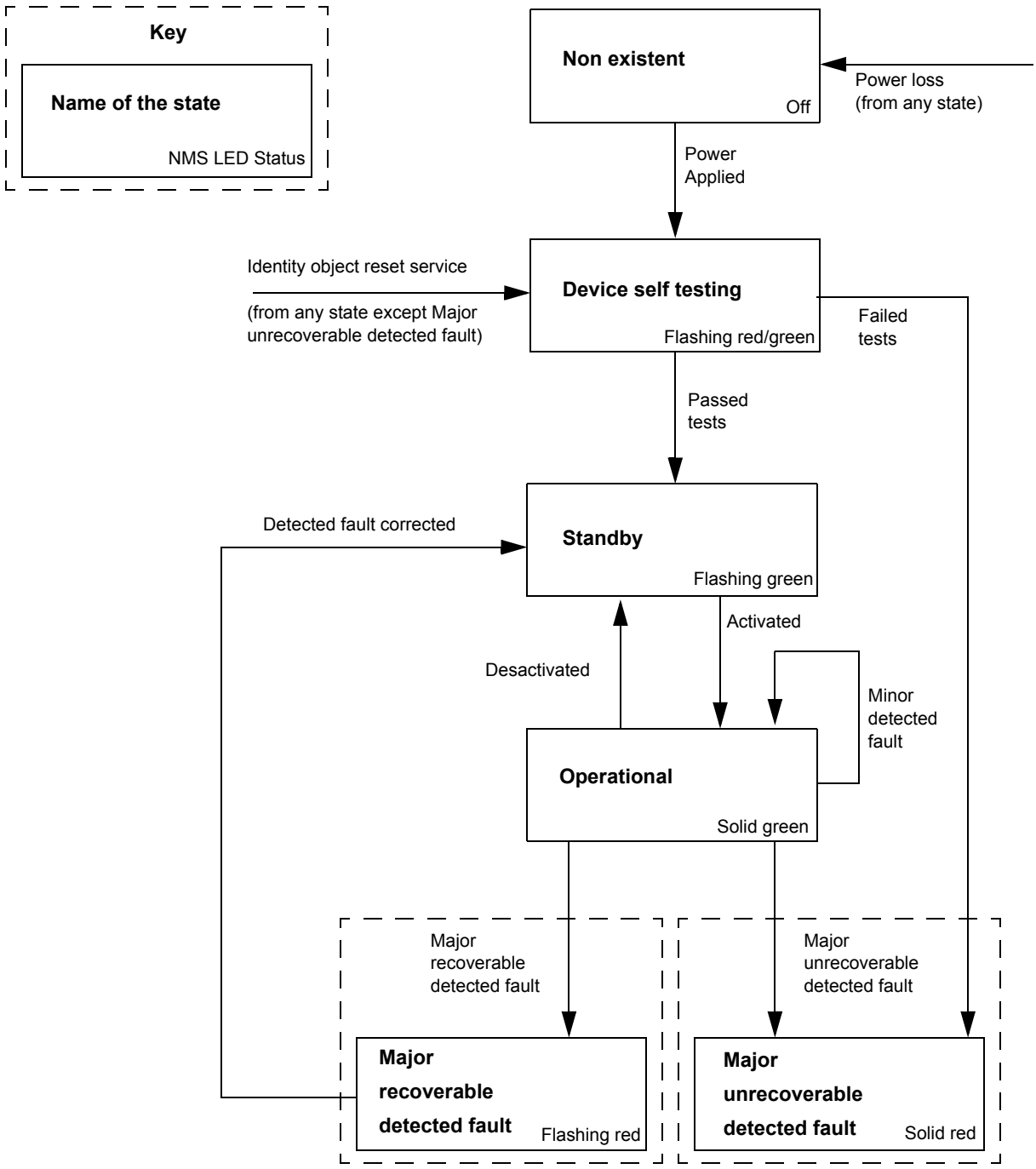
Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	(1)	Write an attribute
16#05	Reset	Req.	Reset DeviceNet module

(1) Required if the heartbeat interval must be defined.

State Diagram for the Identity Object



Message Router Object

The Message router object is the element through which all the “Explicit messages” objects pass in order to be directed towards the objects they are truly destined to.

Class Code

Hexadecimal	Decimal
16#02	2

Class Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	-
2	Get	Max instances	Opt.	UINT	1	1 Defined instance

Instance Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
2	Get	Number available	Opt.	UINT	1	Maximum number of simultaneous connections
3	Get	Number active	Opt.	UINT	1	Number of active connections
4	Get	Active connections	Opt.	UINT [ ]	1	List of active connections (referred to with their respective Connection instance ID)

Class Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

DeviceNet Object

The DeviceNet object provides the status and configuration of a DeviceNet node.

Class Code

Hexadecimal	Decimal
16#03	3

Class Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	2	-
2	Get	Max Instances	Opt.	UINT	1	1 Defined instance

Instance Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get/Set	Node address	Req.	USINT	0 - 63	Option board address
2	Get/Set	Data rate	Opt.	USINT	0 - 2	0 = 125 kbit/s; 1 = 250 kbit/s; 2 = 500 kbit/s
3	Get/Set	BOI (Bus Off Interrupt)	Opt.	BOOL	-	Upon BusOff event: 0: CAN component remains in BusOff 1: Component is reset and communication resumes
4	Get/Set	BusOff counter	Opt.	USINT	0 -255	Number of occurrences of BusOff state. Set access is used to reset this counter.
5	Get	Allocation information	Opt.	BYTE USINT	- 0 - 63	Allocation choice Master address (255 not allocated)

Class Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Opt.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute
16#4B	Allocate Master/Slave Connection Set	Opt.	Allocation connection master/slave
16#4C	Release Master/Slave Connection Set	Opt.	Release connection master/slave

Assembly Object

The Assembly object binds together the attributes of multiple objects so that information to or from each object can be communicated over a single connection.

Assembly objects are static.

The assemblies in use can be modified through the parameter access of the network configuration tool (RSNetWorx).

The drive needs a power off to take into account a new assembly assignment.

Class Code

Hexadecimal	Decimal
16#04	4

Class Attribute

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	2	-
2	Get	Max instance	Opt.	UINT	101	-

Instances Supported

Instance	Name	Data size
20	ODVA Basic speed control output	4 bytes
21	ODVA Extended speed control output	4 bytes
70	ODVA Basic speed control input	4 bytes
71	ODVA Extended speed control input	4 bytes
100	Communication scanner output	8 bytes
101	Communication scanner input	8 bytes

Instance Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
3	Get/Set (1)	Data	Req.	-	-	-

(1) Set access is restricted to output instances only (instances 20, 21, and 100).

Class Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute

Output Assembly 100

Bytes	Description
0, 1	1st Scanner out parameter (OCA 1)
2, 3	2nd Scanner out parameter (OCA2)
4, 5	3rd Scanner out parameter (OCA3)
6, 7	4th Scanner out parameter (OCA4)

Input Assembly 101

Bytes	Description
0, 1	1st Scanner in parameter (ONA 1)
2, 3	2nd Scanner in parameter (ONA2)
4, 5	3rd Scanner in parameter (ONA3)
6, 7	4th Scanner in parameter (ONA4)

NOTE:

- For the assignment of the scanner parameters by the drive HMI, see “Configuring the Control by the Drive HMI” on page 45.
- For monitoring of the scanner parameters by the drive HMI, see “Diagnostics” on page 60.
- For the assignment and monitoring of the scanner parameters by the network configuration software (RSNetWorx...), see “ATV32 Setup With RSNetWorx and RSlogix” on page 53.

Output Assembly 20

- Byte 0:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
not used	not used	not used	not used	not used	Fault reset (active at 1)	not used	Run forward 0 = Stop 1 = Run

- Byte 1:

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
not used	not used	not used	not used	not used	not used	not used	not used

- Bytes 2 and 3: Speed setpoint (RPM)

NOTE:

- Stop mode is configured by the parameter **[Type of stop]** (STT):
  - drive HMI menu **[APPLICATION FUNCT.]** (FUn -),
    sub-menu **[STOP CONFIGURATION]** (STT -),
  - path 16#99/01/02.
- Output assembly 20 controls the drive if the parameter NetCtrl is set to 1 (attribute 5 of Control Supervisor object; path 16#29/01/05, the default setting is 0).
- Output assembly 20 gives the speed setpoint to drive if the parameter NetRef is set to 1 (attribute 4 of AC/DC Drive object, path 16#2A/01/04, the default setting is 0).

In default setting, output assembly 20 controls the drive but the speed setpoint is controlled via terminals (AI1 or AI2).

The default setting applies each time the connection is closed (Power on of the drive, DeviceNet disconnected from the card).

Input Assembly 70

- Byte 0:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
not used	not used	not used	not used	not used	Running 0 = Stopped 1 = Running	not used	Faulted 0 = No fault 1 = Faulted

- Byte 1:

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
not used	not used	not used	not used	not used	not used	not used	not used

- Bytes 2 and 3: Actual speed (RPM)

Output Assembly 21

- Byte 0:

<table>
<tr><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td rowspan="5">not used</td><td>Network reference</td><td>Network control</td><td rowspan="5">not used</td><td rowspan="5">not used</td><td rowspan="5">Fault Reset (active at 1)</td><td>Run reverse</td><td>Run forward</td></tr>
<tr><td>0</td><td>0</td><td colspan="2">0
Stop</td><td>0</td></tr>
<tr><td colspan="2">Control and reference by terminals</td><td colspan="2">0
Run forward</td><td>1</td></tr>
<tr><td>0
Control by network
Reference by terminals</td><td>1</td><td colspan="2">1
Run reverse</td><td>0</td></tr>
<tr><td>1
Control by terminals
Reference by network</td><td>0</td><td colspan="2">1
No Action</td><td>1</td></tr>
<tr><td>1</td><td>1</td><td colspan="2">Control and
Reference by network</td><td></td></tr>
</table>

- Byte 1:

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
not used	not used	not used	not used	not used	not used	not used	not used

- Bytes 2 and 3: Speed setpoint (RPM)

NOTE: Stop mode is configured by the parameter **[Type of stop]** (StT):
- drive HMI menu **[APPLICATION FUNCT.]** (FUn-), sub-menu **[STOP CONFIGURATION]** (StT-),
- path 16#99/01/02.

Input Assembly 71

- Byte 0:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
At reference	Reference from network	Control from network	Ready	Running reverse	Running forward	Warning	Faulted
0 Speed reference not reached	0	0	0	0	0	0 No warning	0 Not faulted
	Control and reference by terminals		Not ready	Stopped			
	0	1	1	0	1	1 Warning	1 Faulted
	Control by network Reference by terminals		Ready	Running forward			
1 Speed reference reached	1	0		1	0		
	Control by terminals Reference by network			Running reverse			
	1	1		1	1		
	Control and reference from network			Stopped			

- Byte 1:

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Drive state (see “Control supervisor state transition diagram” on page 83) (0 = Vendor Specific, 1 = Startup, 2 = Not_Ready, 3 = Ready, 4 = Enabled, 5 = Stopping, 6 = Fault_Stop, 7 = Faulted)							

- Bytes 2 and 3: Actual speed (RPM)

Connection Object

Class Code

Hexadecimal	Decimal
16#05	5

Class Attributes

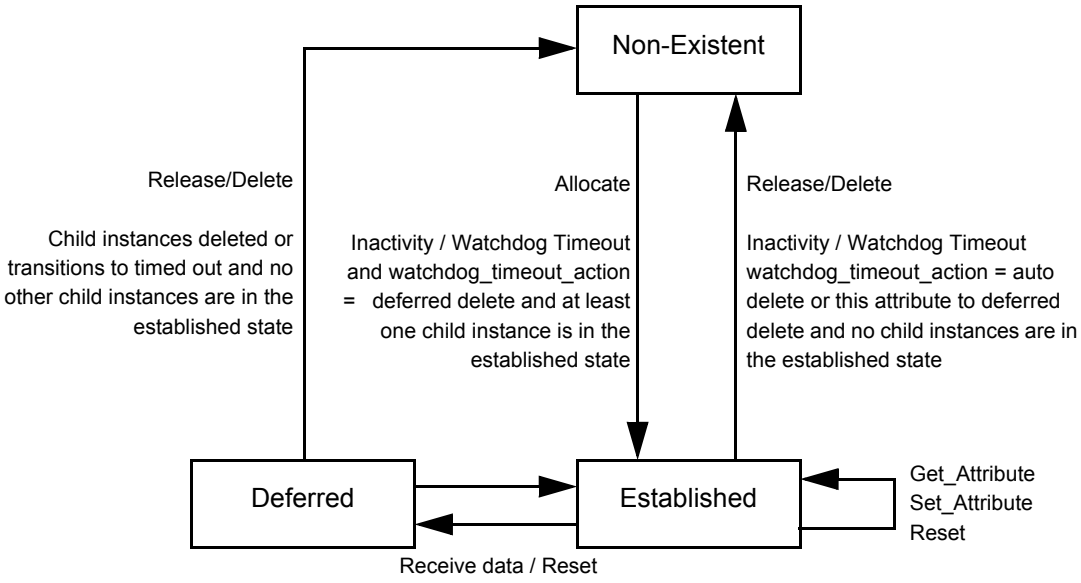
Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	-
2	Get	Max instances	Opt.	UINT	4	5 defined instances

Attributes of Instance 1 - Explicit Message Instance

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	State	Req.	USINT	-	0: Non-existent 3: Established 5: Deferred Delete
2	Get	Instance_type	Req.	USINT	0	Explicit Message
3	Get	TransportClass_trigger	Req.	BYTE	16#83	Class 3 server
4	Get	Produced_connection_id	Req.	UINT	10xxxxxx011	xxxxxx = Node address
5	Get	Consumed_connection_id	Req.	UINT	10xxxxxx100	xxxxxx = Node address
6	Get	Initial_comm_characteristics	Req.	BYTE	16#21	Explicit messaging via Group 2
7	Get	Produced_connection_size	Req.	UINT	36	Produced data maximum size (in bytes)
8	Get	Consumed_connection_size	Req.	UINT	36	Consumed data maximum size (in bytes)
9	Get/Set	Expected_packet_rate	Req.	UINT	2500	2.5 sec. (TimeOut)
12	Get/Set	Watchdog_timeout_action	Req.	USINT	1 or 3	1: Auto-Delete 3: Deferred Delete (Default)
13	Get	Produced connection path length	Req.	UINT	0	Length of attribute 14 data
14	Get	Produced connection path	Req.	Array of UINT	Null	Empty
15	Get	Consumed connection path length	Req.	UINT	0	Length of attribute 16 data
16	Get	Consumed connection path	Req.	Array of UINT	Null	Empty

Refer to DeviceNet specification for more information.

Predefined Master/Slave Explicit Messaging State Transition Diagram



Attributes of Instance 2 - Polled I/O Message Instance

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	State	Req.	USINT	-	0: Non-existent 1: Configuring 3: Established 4: TimeOut
2	Get	Instance_type	Req.	USINT	1	I/O Message
3	Get	TransportClass_trigger	Req.	BYTE	16# 83	Class 3 server
4	Get	Produced_connection_id	Req.	UINT	01111xxxxxx	xxxxxx = Node address
5	Get	Consumed_connection_id	Req.	UINT	10xxxxxx101	xxxxxx = Node address
6	Get	Initial_comm_characteristics	Req.	BYTE	16# 01	Group 1 / Group 2
7	Get	Produced_connection_size	Req.	UINT	4, 6, or 8	Size of data produced
8	Get	Consumed_connection_size	Req.	UINT	4, 6, or 8	Size of data consumed
9	Get/Set	Expected_packet_rate	Req.	UINT	-	Exchange frequency (ms)
12	Get/Set	Watchdog_timeout_action	Req.	USINT	0, 1, or 2 (2)	0: Transition to TimeOut 1: Auto-Delete 2: Auto-Reset
13	Get	Produced_connection_path length	Req.	UINT	8	Default: 8 bytes
14	Get/Set (1)	Produced_connection_path	Req.	Array of UINT	16# 20 04 24 46 30 03 16# 20 04 24 47 30 03 16# 20 04 24 48 30 03 16# 20 04 24 49 30 03 16# 20 04 24 65 30 03 16# 20 04 24 68 30 03 16# 20 04 24 69 30 03	Input assembly (Default: Instance 101, 16# 20 04 24 65 30 03)
15	Get	Consumed_connection_path length	Req.	UINT	8	Default: 8 bytes
16	Get/Set (1)	Consumed_connection_path	Req.	Array of UINT	16# 20 04 24 14 30 03 16# 20 04 24 15 30 03 16# 20 04 24 16 30 03 16# 20 04 24 17 30 03 16# 20 04 24 64 30 03 16# 20 04 24 67 30 03	Output assembly (Default: Instance 100, 16# 20 04 24 64 30 03)
17	Get	Production_inhibit_time	Cond.	UINT	0	Minimum time between 2 data productions. Undefined

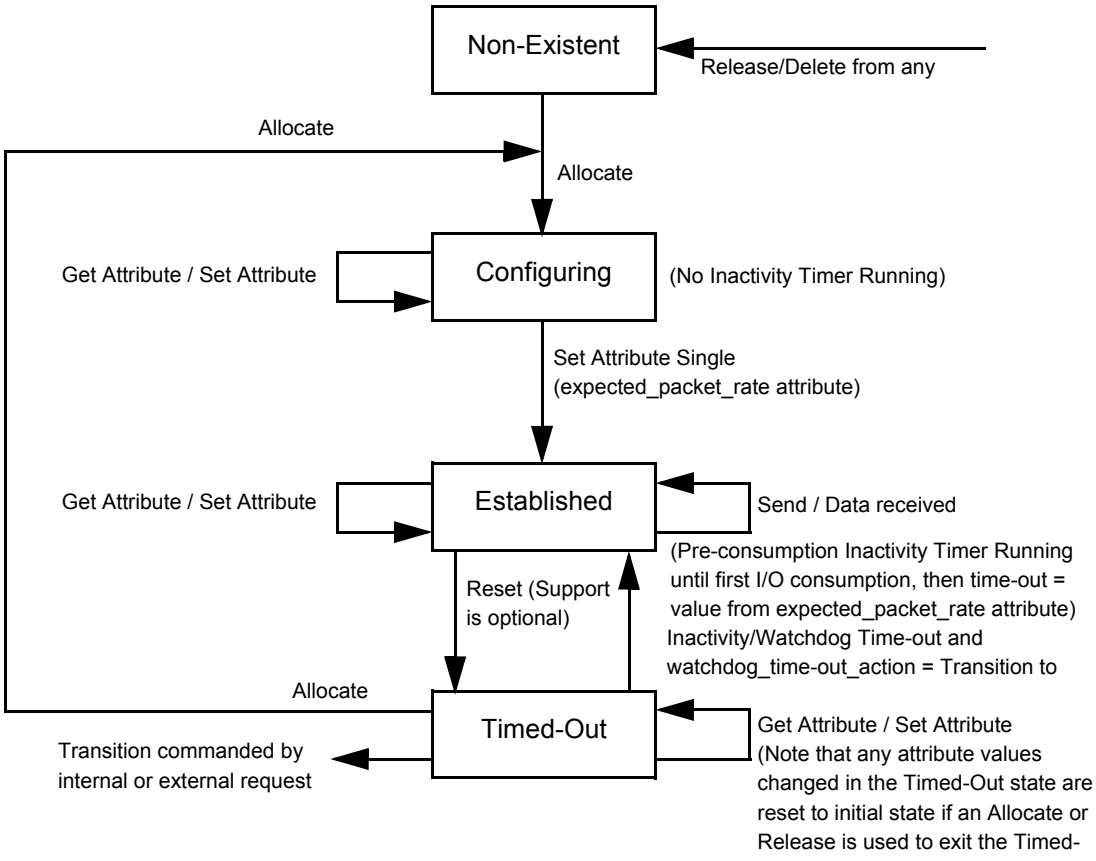
(1) Assembly assignment should not be modified in a running application.
If you Set any one of the values displayed in the “Value” column, it will be saved in EEPROM and then used at each power-up. Any other value will not be saved.
(2) 0 and 1: when the drive is disconnected from the network a DeviceNet detected fault occurs. In factoring settings the DeviceNet detected fault triggers a [Com. network] (CnF) and a freewheel stop.
2: The DeviceNet detected fault is automatically cleared (drive immediately restarts when RUN command is applied).

Attributes of Instance 4 - Change of State/Cyclic Message Instance

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	State	Req.	USINT	-	0: Non-existent 1: Configuring 3: Established 4: TimeOut
2	Get	Instance_type	Req.	USINT	1	I/O Message
3	Get	TransportClass_trigger	Req.	BYTE	16# X2	Class 2 Client Cos:16# 12 - Cyclic:16# 02
4	Get	Produced_connection_id	Req.	UINT	01101xxxxxx	xxxxxx = Node address
5	Get	Consumed_connection_id	Req.	UINT	10xxxxxx101	xxxxxx = Node address
6	Get	Initial_comm_characteristics	Req.	BYTE	16# 01	Group 1 / Group 2
7	Get	Produced_connection_size	Req.	UINT	4, 6, or 8	Size of data produced
8	Get	Consumed_connection_size	Req.	UINT	0	Size of data consumed
9	Get/Set	Expected_packet_rate	Req.	UINT	-	Exchange frequency (ms)
12	Get/Set	Watchdog_timeout_action	Req.	USINT	0, 1, or 2 (2)	0: Transition to TimeOut 1: Auto-Delete 2: Auto-Reset
13	Get	Produced_connection_path_length	Req.	UINT	8	Default: 8 bytes
14	Get/Set (1)	Produced_connection_path	Req.	Array of UINT	16# 20 04 24 46 30 03 16# 20 04 24 47 30 03 16# 20 04 24 48 30 03 16# 20 04 24 49 30 03 16# 20 04 24 65 30 03 16# 20 04 24 68 30 03 16# 20 04 24 69 30 03	Input assembly (Default: Instance 101, 16# 20 04 24 65 30 03)
15	Get	Consumed_connection_path_length	Req.	UINT	8	Default: 8 bytes
16	Get/Set (1)	Consumed_connection_path	Req.	Array of UINT	16# 20 2B 24 01 30 03	Output assembly: The first and only one instance of the Acknowledge handler object (Class ID 16#2B)
17	Get/Set	Production_inhibit_time	Cond.	UINT	0	Minimum time between 2 data productions. Undefined

(1) Assembly assignment should not be modified in a running application.
If you Set any one of the values displayed in the “Value” column, it will be saved in EEPROM and then used at each power-up. Any other value will not be saved.
(2) To ensure a DeviceNet detected fault (and by default **[Network fault]** (CnF)) in case of time out, configure “Polled I/O”.

Predefined Master/Slave I/O Connection State Transition Diagram



NOTE: The Allocate and Release services send the connection instance back to initial state. All Object attributes are reset to their default values.

Class Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute
16#05	Reset	Opt.	Reset Inactivity/Watchdog timer

Motor Data Object

The Motor data object acts as a motor parameter database.

Class Code

Hexadecimal	Decimal
16#28	40

Class Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	-
2	Get	Max instance	Opt.	UINT	1	-
6	Get	Max ID number of class attribute	Opt.	UINT	7	-
7	Get	Max ID number of instance attribute	Opt.	UINT	15	-

Instance Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
3	Get/Set	MotorType	Req.	USINT	7	6 = Wound rotor induction motor 7 = Squirrel cage induction motor
6	Get/Set	RatedCurrent	Req.	UINT	Depends on the drive rating	**[Rated mot. current]** (nCr)
7	Get/Set	RatedVoltage	Req.	UINT	Depends on the drive rating	**[Rated motor volt.]** (UnS)
9	Get/Set	RatedFreq	Opt.	UINT	50/60	**[Rated motor freq.]** (FrS)
15	Get/Set	BaseSpeed	Opt.	UINT	Depends on the drive rating	**[Rated motor speed]** (nSP)

Class Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute

Control Supervisor Object

The Control supervisor object models the functions for managing all devices within the hierarchy of motor control devices.

Class Code

Hexadecimal	Decimal
16#29	41

Class Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	-
2	Get	Max instance	Opt.	UINT	1	-
6	Get	Max ID number of class attribute	Opt.	UINT	7	-
7	Get	Max ID number of instance attribute	Opt.	UINT	17	-

Instance Attributes

Attribute ID	Access	Name	Need	Data type	Details
3	Get/Set	Run Fwd	Req.	BOOL	On an edge (0 ➞1)
4	Get/Set	Run Rev	Opt.	BOOL	On an edge (0 ➞1)
5	Get/Set	NetCtrl	Opt.	BOOL	0: Local Control (Channel 1) 1: Network Control (default)
6	Get	State	Opt.	USINT	0 = Vendor Specific, 1 = Startup, 2 = Not_Ready, 3 = Ready, 4 = Enabled, 5 = Stopping, 6 = Fault_Stop, 7 = Faulted
7	Get	Running Fwd	Req.	BOOL	-
8	Get	Running Rev	Opt.	BOOL	-
9	Get	Ready	Opt.	BOOL	-
10	Get	Faulted	Req.	BOOL	-
12	Get/Set	FaultRst	Req.	BOOL	Fault reset (0 ➞1)
13	Get	FaultCode	Opt.	UINT	Refer to the Communication parameters manual: DSP402 fault code (Errd)
15	Get	CtrlFromNet	Opt.	BOOL	0 = Local Control; 1 = Network Control
16	Get/Set	DNFaultMode	Opt.	USINT	Action on loss of DeviceNet command: 0 = DeviceNet detected fault; 1 = Ignored
17	Get/Set	ForceFault/Trip	Opt.	BOOL	Force a DeviceNet detected fault (0 ➞1)

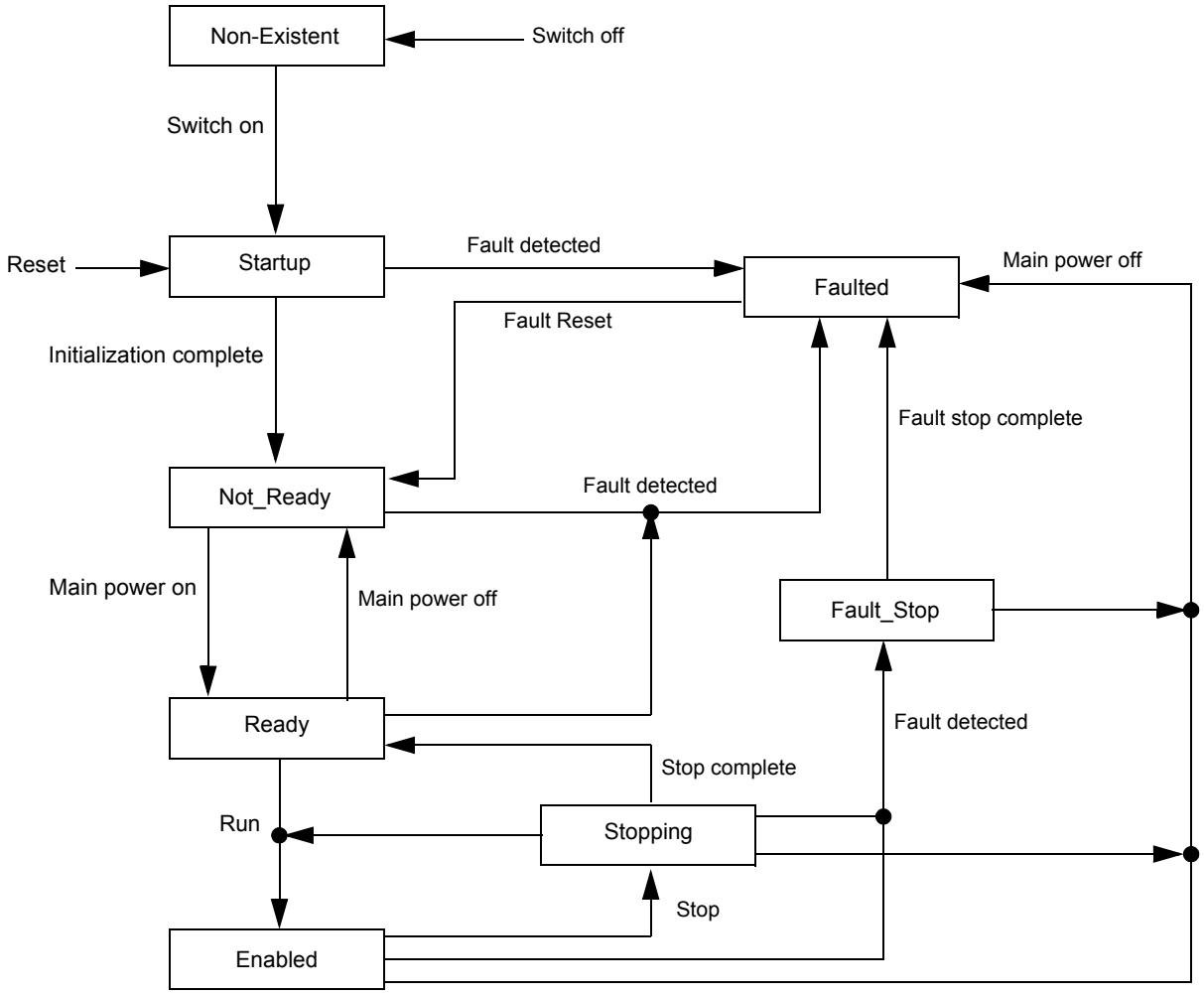
Class Service

Service Code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Service

Service Code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Req.	Write an attribute
16#05	Reset	Req.	Drive reset

Control supervisor state transition diagram



AC/DC Drive Object

The AC/DC Drive object models the functions (such as torque control and speed ramp) that are specific to drives.

Class Code

Hexadecimal	Decimal
16#2A	42

Class Attributes

Attribute ID	Access	Name	Need	Data Type	Value	Details
1	Get	Revision	Opt.	UINT	1	-
2	Get	Max instance	Opt.	UINT	1	-
6	Get	Max ID number of class attribute	Opt.	UINT	7	-
7	Get	Max ID number of instance attribute	Opt.	UINT	21	-

Instance Attributes

Attribute ID	Access	Name	Need	Data type	Details
3	Get	AtReference	Opt.	BOOL	-
4	Get/Set	NetRef	Req.	BOOL	0: Local speed setpoint 1: Speed setpoint via the network
6	Get/Set	Drive mode	Req.	USINT	1: Open loop
7	Get	SpeedActual	Req.	INT	Output speed (rFrd)
8	Get/Set	SpeedRef	Req.	INT	Speed setpoint (LFrd)
9	Get	CurrentActual	Opt.	INT	Motor current (LCr)
10	Get/Set	CurrentLimit	Opt.	INT	**[Current lim.]** (CLI)
11	Get	TorqueActual	Opt.	INT	Output torque (Otrn)
18	Get/Set	AccelTime	Opt.	UINT	Acceleration time (ACC)
19	Get/Set	DecelTime	Opt.	UINT	Deceleration time (dEC)
20	Get/Set	LowSpdLimit	Opt.	UINT	Parameter **[Low speed]** (LSP) converted in RPM
21	Get/Set	HighSpdLimit	Opt.	UINT	Parameter **[High speed]** (HSP) converted in RPM

Class Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute

Acknowledge Handler Object

The acknowledge handler object directs the acknowledgment of messages received.

Class Code

Hexadecimal	Decimal
16#2B	43

Class Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	-
2	Get	Max instance	Opt.	UINT	1	-

Instance Attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get/Set	Acknowledge timer	Req.	UINT	16	Default: 16 ms
2	Get/Set	Retry limit	Req.	USINT	1	-
3	Get	COS producing connection instance	Req.	UINT	4	Assembly

Class Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Req.	Write an attribute

Application Objects

Class Code

Hexadecimal	Decimal
16#70 to 16#A8	112 to 424

The option manages application objects with class codes from 70h to C7h.

There is one instance of each application object.

Each instance attribute of an application object is mapped on a parameter.

Each class can have up to 200 object attributes (giving access to 200 parameters per class).

In the device, parameters are grouped by “functions”. Each “function” has up to 100 parameters. Then, each application object gives access to the parameters of 2 “functions”.

The links between the class code, the object attribute ID and the parameter logical address (AdI) are given with following formulas:

- Class code = ((AdL - 3000) / 200) + 70h
- Attribute ID = (AdL modulo 200) + 1
- AdL = (Class code - 70h) * 200 + Attribute ID - 1 + 3000

With class codes from 70h to C7h, we give access to logical address in [3000; 20599]. The other address are not accessible.

Example:

Parameter logical address	Hexadecimal path: Class Code / Instance Nb / Attribute ID
3 000	16# 70 / 01 / 01
3 100	16# 70 / 01 / 65
3 201	16# 71 / 01 / 02

Class Attributes

Each application object supports following class attributes:

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	-
2	Get	Max Instance	Opt.	UINT	1	-
6	Get	Max ID Number of class attribute	Opt.	UINT	7	-
7	Get	Max ID Number of Instances attribute	Opt.	UINT	200	-

Instance Attributes

Attribute ID	Access	Name	Data type	Value
1	Get/Set	First parameter of the class	UINT / USINT	Value returned by the drive
...	...	...	...	...
X	Get	Last parameter of the class	UINT / USINT	Value returned by the drive

NOTE: Depending on the parameter, write access may be prohibited.

Class Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Services

Service Code	Service Name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute

DeviceNet Interface Object

Class Code

Hexadecimal	Decimal
16#64	100

Class Attributes

Attribute ID	Access	Name	Need	Data type	Value
1	Get	Revision	Opt.	UINT	1
2	Get	Max instance	Opt.	UINT	1
6	Get	Max ID number of class attribute	Opt.	UINT	7
7	Get	Max ID number of instance attribute	Opt.	UINT	12

Instance Attribute

Attribute ID	Access	Name	Data type	Details
1	Get/Set	Polled/ COS/Cyclic Instance	USINT	70, 71, 101
2	Get	OB firmware version	USINT	Ex:1003h (1.0ie03)
3	Get	OCA1	USINT	Get and set the address of the parameters written using assembly 100
4	Get	OCA2	USINT	-
5	Get	OCA3	USINT	-
6	Get	OCA4	USINT	-
7	Get	OMA1	USINT	Get and set the address of the parameters written using assembly 101
8	Get	OMA2	USINT	-
9	Get	OMA3	USINT	-
10	Get	OMA4	USINT	-
11	Get	Communication fault code	USINT	Give the reason of the Communication interruption on the DeviceNet Network. Possible values are given in 3.6.1

NOTE: Writing the attributes 1 triggers an EEPROM back-up. The option must be restarted to take this information into account.

Class Service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance Services

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute