



# Installation Guide EtherNet/IP Module

VLT® Compact Starter MCD 201/MCD 202

VLT® Soft Starter MCD 500





## Contents

<b>1 Introduction</b>	<b>3</b>
1.1 Purpose of the Manual	3
1.2 Additional Resources	3
1.3 Product Overview	3
1.4 Approvals and Certifications	3
1.5 Disposal	3
1.6 Symbols, Abbreviations, and Conventions	4
<b>2 Safety</b>	<b>5</b>
2.1 Qualified Personnel	5
2.2 General Warnings	5
<b>3 Installation</b>	<b>7</b>
3.1 Installation Procedure	7
<b>4 Connection</b>	<b>8</b>
4.1 Soft Starter Connection	8
4.2 Network Connection	9
4.2.1 Ethernet Ports	9
4.2.2 Cables	9
4.2.3 EMC Precautions	9
4.2.4 Network Establishment	9
4.3 Addressing	9
<b>5 Device Configuration</b>	<b>10</b>
5.1 On-board Web Server	10
5.2 Ethernet Device Configuration Tool	10
<b>6 Operation</b>	<b>12</b>
6.1 Device Classification	12
6.2 Scanner Configuration	12
6.2.1 EDS File	12
6.3 LEDs	12
<b>7 Packet Structures</b>	<b>13</b>
7.1 Ensuring Safe and Successful Control	13
7.2 Control Commands (Write Only)	13
7.3 Status Commands (Read Only)	14
7.4 Soft Starter Internal Register Address	16
7.5 Parameter Management (Read/Write)	18
7.6 Trip Codes	18

7.6.1 Internal Fault X	19
<b>8 Network Design</b>	<b>20</b>
8.1 Star Topology	20
8.2 Line Topology	20
8.3 Ring Topology	20
8.4 Combined Topologies	21
<b>9 Specifications</b>	<b>22</b>
<b>Index</b>	<b>23</b>

# 1 Introduction

## 1.1 Purpose of the Manual

This installation guide provides information for the installation of the EtherNet/IP option module for VLT® Compact Starter MCD 201/MCD 202 and VLT® Soft Starter MCD 500. The installation guide is intended for use by qualified personnel.

Users are assumed to be familiar with:

- VLT® soft starters.
- EtherNet/IP technology.
- PC or PLC that is used as a master in the system.

Read the instructions before installation and ensure that the instructions for safe installation are observed.

VLT® is a registered trademark.

EtherNet/IP™ is a trademark of ODVA, Inc.

## 1.2 Additional Resources

**Resources available for the soft starter and optional equipment:**

- The *VLT® Compact Starter MCD 200 Operating Instructions* provide the necessary information for getting the soft starter up and running.
- The *VLT® Soft Starter MCD 500 Operating Guide* provides the necessary information for getting the soft starter up and running.

Supplementary publications and manuals are available from Danfoss. See [drives.danfoss.com/knowledge-center/technical-documentation/](http://drives.danfoss.com/knowledge-center/technical-documentation/) for listings.

## 1.3 Product Overview

### 1.3.1 Intended Use

This installation guide relates to EtherNet/IP Module for VLT® soft starters.

The EtherNet/IP interface is designed to communicate with any system complying with the CIP EtherNet/IP standard. EtherNet/IP provides users with the network tools to deploy standard Ethernet technology for manufacturing applications while enabling internet and enterprise connectivity.

EtherNet/IP Module is intended for use with:

- VLT® Compact Starter MCD 201/MCD 202, 24 V AC/V DC and 110/240 V AC control voltage.
- VLT® Soft Starter MCD 500, all models.

### **NOTICE**

The EtherNet/IP Module is **NOT** suitable for use with the MCD 201/MCD 202 compact starters using 380/440 V AC control voltage.

The EtherNet/IP Module allows a Danfoss soft starter to connect to an Ethernet network and be controlled or monitored using an Ethernet communication model.

Separate modules are available for PROFINET, Modbus TCP, and EtherNet/IP networks.

The EtherNet/IP Module operates at the application layer. Lower levels are transparent to the user.

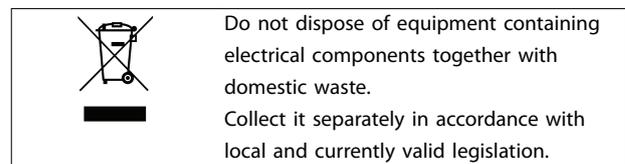
Familiarity with Ethernet protocols and networks is required to operate the EtherNet/IP Module successfully. If there are difficulties when using this device with third-party products, including PLCs, scanners, and commissioning tools, contact the relevant supplier.

## 1.4 Approvals and Certifications



More approvals and certifications are available. For more information, contact a local Danfoss partner.

## 1.5 Disposal



## 1.6 Symbols, Abbreviations, and Conventions

Abbreviation	Definition
CIP™	Common industrial protocol
DHCP	Dynamic host configuration protocol
EMC	Electromagnetic compatibility
IP	Internet protocol
LCP	Local control panel
LED	Light-emitting diode
PC	Personal computer
PLC	Programmable logic controller

Table 1.1 Symbols and Abbreviations

### Conventions

Numbered lists indicate procedures.

Bullet lists indicate other information and description of illustrations.

Italicized text indicates:

- Cross-reference.
- Link.
- Parameter name.
- Parameter group name.
- Parameter option.

## 2 Safety

The following symbols are used in this manual:

### **⚠ WARNING**

Indicates a potentially hazardous situation that could result in death or serious injury.

### **⚠ CAUTION**

Indicates a potentially hazardous situation that could result in minor or moderate injury. It can also be used to alert against unsafe practices.

### **NOTICE**

Indicates important information, including situations that can result in damage to equipment or property.

### 2.1 Qualified Personnel

Correct and reliable transport, storage, installation, operation, and maintenance are required for the trouble-free and safe operation of the soft starter. Only qualified personnel are allowed to install or operate this equipment.

Qualified personnel are defined as trained staff, who are authorized to install, commission, and maintain equipment, systems, and circuits in accordance with pertinent laws and regulations. Also, the qualified personnel must be familiar with the instructions and safety measures described in this installation guide.

### 2.2 General Warnings

#### **⚠ WARNING**

##### **ELECTRICAL SHOCK HAZARD**

VLT® Soft Starter MCD 500 contains dangerous voltages when connected to mains voltage. Only a qualified electrician should carry out the electrical installation. Improper installation of the motor or the soft starter can cause death, serious injury, or equipment failure. Follow the guidelines in this manual and local electrical safety codes.

Models MCD5-0360C ~ MCD5-1600C:

Treat the busbar and heat sink as live parts whenever the unit has mains voltage connected (including when the soft starter is tripped or waiting for a command).

#### **⚠ WARNING**

##### **PROPER GROUNDING**

Disconnect the soft starter from mains voltage before carrying out repair work.

It is the responsibility of the person installing the soft starter to provide proper grounding and branch circuit protection according to local electrical safety codes. Do not connect power factor correction capacitors to the output of the VLT® Soft Starter MCD 500. If static power factor correction is employed, it must be connected to the supply side of the soft starter.

#### **⚠ WARNING**

##### **IMMEDIATE START**

In auto-on mode, the motor can be controlled remotely (via remote inputs) while the soft starter is connected to mains.

MCD5-0021B ~ MCD5-961B:

Transportation, mechanical shock, or rough handling may cause the bypass contactor to latch into the On state.

To prevent the motor from starting immediately on first commissioning or operation after transportation:

- Always ensure that the control supply is applied before the power.
- Applying control supply before power ensures that the contactor state is initialized.

#### **⚠ WARNING**

##### **UNINTENDED START**

When the soft starter is connected to AC mains, DC supply, or load sharing, the motor can start at any time. Unintended start during programming, service, or repair work can result in death, serious injury, or property damage. The motor can start with an external switch, a fieldbus command, an input reference signal from the LCP or LOP, via remote operation using MCT 10 Set-up Software, or after a cleared fault condition.

To prevent unintended motor start:

- Press [Off/Reset] on the LCP before programming parameters.
- Disconnect the soft starter from the mains.
- Completely wire and assemble the soft starter, motor, and any driven equipment before connecting the soft starter to AC mains, DC supply, or load sharing.

**⚠ WARNING****SAFETY OF PERSONNEL**

The soft starter is not a safety device and does not provide electrical isolation or disconnection from the supply.

- If isolation is required, the soft starter must be installed with a main contactor.
- Do not rely on the start and stop functions for safety of personnel. Faults occurring in the mains supply, the motor connection, or the electronics of the soft starter can cause unintended motor starts or stops.
- If faults occur in the electronics of the soft starter, a stopped motor may start. A temporary fault in the supply mains or loss of motor connection can also cause a stopped motor to start.

To provide safety of personnel and equipment, control the isolation device through an external safety system.

**NOTICE**

Before changing any parameter settings, save the current parameter to a file using MCD PC Software or the *Save User Set* function.

**NOTICE**

Use the *autostart* feature with caution. Read all the notes related to *autostart* before operation.

The examples and diagrams in this manual are included solely for illustrative purposes. The information contained in this manual is subject to change at any time and without prior notice. Responsibility or liability is never accepted for direct, indirect, or consequential damage resulting from the use or application of this equipment.

### 3 Installation

#### 3.1 Installation Procedure

#### **CAUTION**

#### **EQUIPMENT DAMAGE**

If mains and control voltage are applied when installing or removing options/accessories, it may damage the equipment.

To avoid damage:

- Remove mains and control voltage from the soft starter before attaching or removing options/accessories.

Installing the EtherNet/IP option:

1. Remove control power and mains supply from the soft starter.
2. Fully pull out the top and bottom retaining clips on the module (A).
3. Line up the module with the communication port slot (B).
4. Push in the top and bottom retaining clips to secure the module to the soft starter (C).
5. Connect Ethernet port 1 or port 2 on the module to the network.
6. Apply control power to the soft starter.

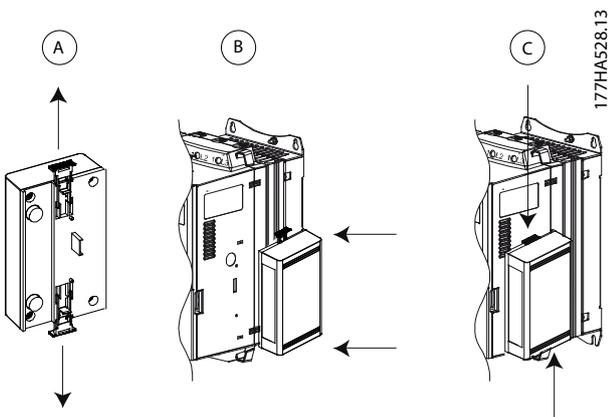


Illustration 3.1 Installing the EtherNet/IP Option

Remove the module from the soft starter:

1. Remove control power and mains supply from the soft starter.
2. Disconnect all external wiring from the module.
3. Fully pull out the top and bottom retaining clips on the module (A).
4. Pull the module away from the soft starter.

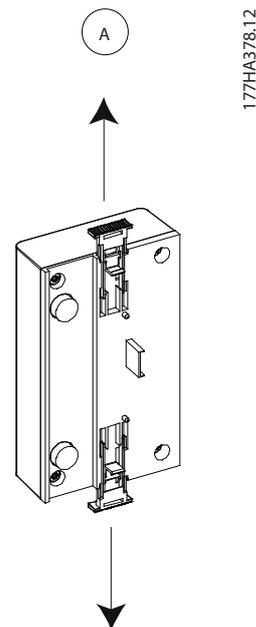


Illustration 3.2 Removing the EtherNet/IP Option

## 4 Connection

### 4.1 Soft Starter Connection

The EtherNet/IP Module is powered from the soft starter.

#### VLT® Compact Starter MCD 201/MCD 202

For the EtherNet/IP Module to accept fieldbus commands, fit a link across terminals A1–N2 on the soft starter.

#### VLT® Soft Starter MCD 500

If the MCD 500 has to be operated in remote mode, input links are required across terminals 17 and 25 to terminal 18. In hand-on mode, links are not required.

#### EtherNet/IP Module Connections

### NOTICE

#### FOR MCD 500 ONLY

Control via the fieldbus communication network is always enabled in local control mode and can be enabled or disabled in remote control mode (*parameter 3-2 Comms in Remote*). See the *VLT® Soft Starter MCD 500 Operating Guide* for parameter details.

MCD 201/202		MCD 500	
1	A1, N2: Stop input	1	(Auto-on mode) 17, 18: Stop input 25, 18: Reset input
2	EtherNet/IP Module	2	EtherNet/IP Module
3	RJ45 Ethernet ports	3	RJ45 Ethernet ports

Table 4.1 Connection Diagrams

## 4.2 Network Connection

### 4.2.1 Ethernet Ports

The EtherNet/IP Module has 2 Ethernet ports. If only 1 connection is required, either port can be used.

### 4.2.2 Cables

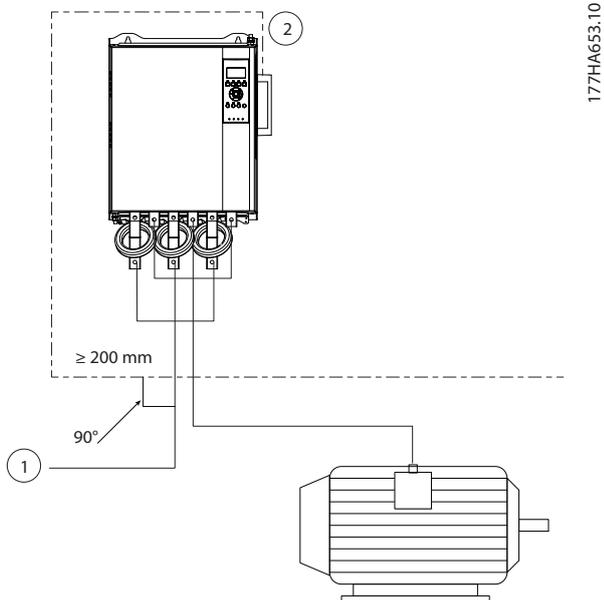
Suitable cables for EtherNet/IP Module connection:

- Category 5
- Category 5e
- Category 6
- Category 6e

### 4.2.3 EMC Precautions

To minimize electromagnetic interference, Ethernet cables should be separated from motor and mains cables by 200 mm (7.9 in).

The Ethernet cable must cross the motor and mains cables at an angle of 90°.



1	3-phase supply
2	Ethernet cable

Illustration 4.1 Correct Running of Ethernet Cables

### 4.2.4 Network Establishment

The controller must establish communication directly with each device before the device can participate in the network.

## 4.3 Addressing

Each device in a network is addressed using a MAC address and an IP address and can be assigned a symbolic name associated with the MAC address.

- The module receives a dynamic IP address when it is connected to the network or can be assigned a static IP address during configuration.
- The symbolic name is optional and must be configured within the device.
- The MAC address is fixed within the device and is printed on a label on the front of the module.

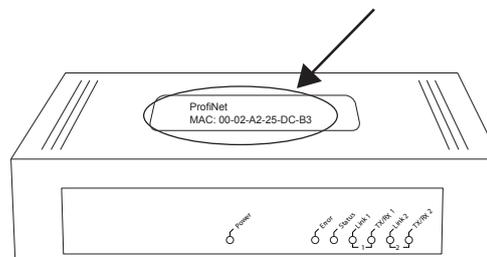


Illustration 4.2 MAC ID Location

## 5 Device Configuration

### 5.1 On-board Web Server

Ethernet attributes can be configured directly in the EtherNet/IP Module using the on-board web server.

#### NOTICE

The Error LED flashes whenever the module receives power but is not connected to a network. The Error LED flashes throughout the configuration process.

#### NOTICE

The default address for a new EtherNet/IP Module is 192.168.0.2. The default subnet mask is 255.255.255.0. The web server only accepts connections from within the same subnet domain. Use the Ethernet Device Configuration Tool to temporarily change the network address of the module to match the network address of the PC running the tool, if required.

To configure the device using the on-board web server:

1. Attach the module to a soft starter.
2. Connect Ethernet port 1 or port 2 on the module to the network.
3. Apply control power to the soft starter.
4. Start a browser on the PC and enter the device address, followed by /ipconfig. The default address for a new EtherNet/IP Module is 192.168.0.2.

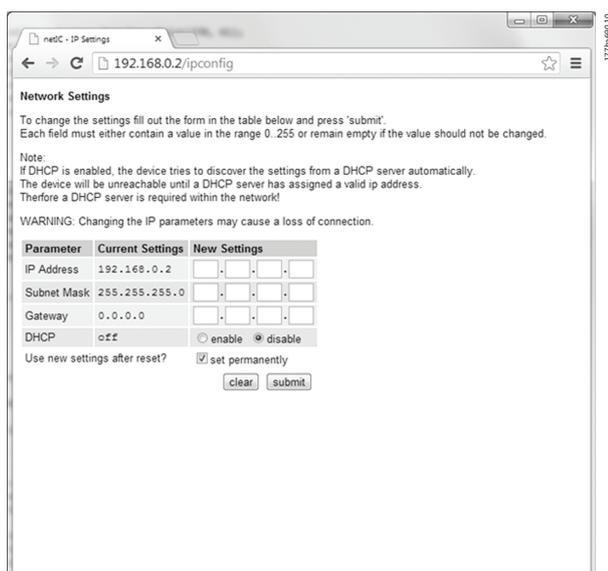


Illustration 5.1 Entering Network Settings

5. Edit the settings as required.
6. Click *Submit* to save the new settings.
  - 6a To store the settings permanently in the module, tick *Set permanently*.
7. If prompted, enter username and password.
  - 7a Username: danfoss
  - 7b Password: danfoss

#### NOTICE

If an IP address is changed and its record is lost, use the Ethernet Device Configuration Tool to scan the network and identify the module.

#### NOTICE

If changing the subnet mask, the server is unable to communicate with the module after the new settings are saved.

### 5.2 Ethernet Device Configuration Tool

Download the Ethernet Device Configuration Tool from [www.danfoss.com/drives](http://www.danfoss.com/drives).

Changes made via the Ethernet Device Configuration Tool cannot be stored permanently in the EtherNet/IP Module. To configure attributes permanently in the EtherNet/IP Module, use the on-board web server.

#### Configuring the device using the Ethernet Device Configuration Tool:

1. Attach the module to a soft starter.
2. Connect Ethernet port 1 or port 2 on the module to the Ethernet port of the PC.
3. Apply control power to the soft starter.
4. Start the Ethernet Device Configuration Tool.

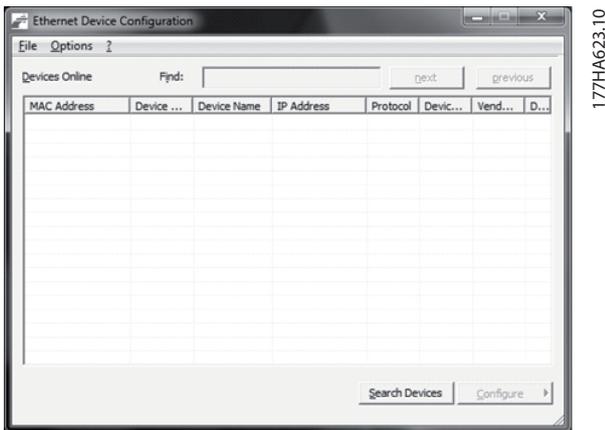


Illustration 5.2 Starting the Tool

5. Click *Search Devices*.
  - 5a The software searches for connected devices.

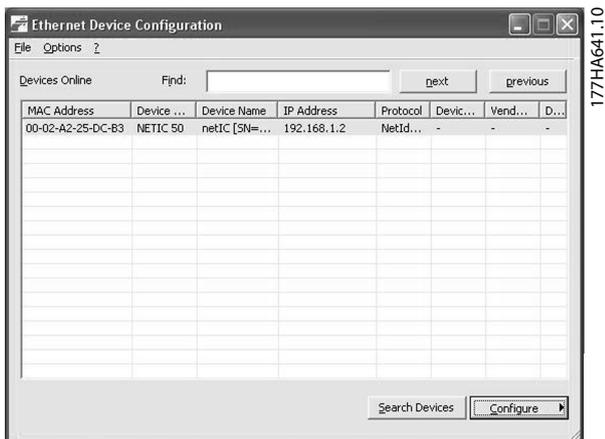


Illustration 5.3 The Tool Shows the Connected Devices

6. To set a static IP address, click *Configure* and select *Set IP address*.

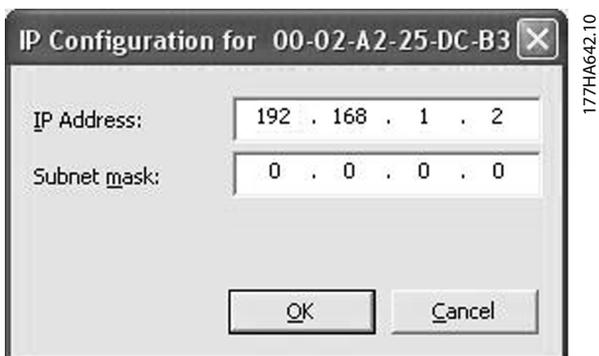


Illustration 5.4 Setting a Static IP Address

## 6 Operation

The EtherNet/IP Module is designed for use in a system complying with the ODVA Common Industrial Protocol. For successful operation, the scanner must also support all functions and interfaces described in this manual.

### 6.1 Device Classification

The EtherNet/IP Module is an Adapter class device and must be managed by a Scanner class device over Ethernet.

### 6.2 Scanner Configuration

#### 6.2.1 EDS File

Download the EDS file from [drives.danfoss.com/services/pc-tools](http://drives.danfoss.com/services/pc-tools). The EDS file contains all required attributes of the EtherNet/IP Module.

Once the EDS file is loaded, define the individual EtherNet/IP Module. Input/output registers must be 240 bytes in size and type INT.

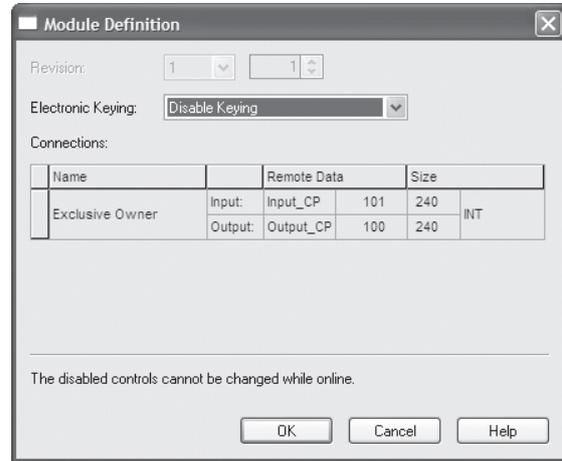


Illustration 6.1 Module Definition of the EtherNet/IP Module, Using RSLogix 5000

### 6.3 LEDs

LED name	LED status	Description
Power	Off	The module is not powered up.
	On	The module receives power.
Error	Off	The module is not powered up or does not have an IP address.
	Flashing	Connection timeout.
	On	Duplicate IP address.
Status	Off	The module is not powered up or does not have an IP address.
	Flashing	The module has obtained an IP address but has not established any network connections.
	On	Communication has been established.
Link x	Off	No network connection.
	On	Connected to a network.
TX/RX x	Flashing	Transmitting or receiving data.

Table 6.1 Feedback LEDs

## 7 Packet Structures

### **NOTICE**

All references to registers refer to the registers within the module unless otherwise stated.

### **NOTICE**

Some soft starters do not support all functions.

### 7.1 Ensuring Safe and Successful Control

Data written to the Ethernet Module remains in its registers until the data is overwritten or the module is reinitialized. The Ethernet Module does not transfer successive duplicate commands to the soft starter.

### 7.2 Control Commands (Write Only)

### **NOTICE**

To operate reliably, only 1 bit in byte 0 may be set at a time. Set all other bits to 0.

### **NOTICE**

If the soft starter is started via fieldbus communications but stopped via the LCP or a remote input, an identical start command cannot be used to restart the soft starter.

To operate safely and successfully in an environment where the soft starter may also be controlled via the LCP or the remote inputs (and fieldbus communications), a control command should be immediately followed by a status query to confirm that the command has been actioned.

Byte	Bit	Function
0	0	0 = Stop command.
		1 = Start command.
	1	0 = Enable start or stop command.
		1 = Quick stop (coast to stop) and disable start command.
	2	0 = Enable start or stop command.
1 = Reset command and disable start command.		
3-7	Reserved.	
1	0-1	0 = Use soft starter remote input to select motor set.
		1 = Use primary motor when starting. <sup>1)</sup>
		2 = Use secondary motor when starting. <sup>1)</sup>
		3 = Reserved.
	2-7	Reserved.

Table 7.1 Structures Used for Sending Control Commands to the Soft Starter

1) Ensure that the programmable input is not set to Motor set select before using this function.

### 7.3 Status Commands (Read Only)

#### **NOTICE**

Some soft starters do not support all functions.

Byte	Bit	Function	Details
0	0	Trip	1 = Tripped.
	1	Warning	1 = Warning.
	2	Running	0 = Unknown, not ready, ready to start, or tripped. 1 = Starting, running, stopping, or jogging.
	3	Reserved	–
	4	Ready	0 = Start or stop command not acceptable. 1 = Start or stop command acceptable.
	5	Control from net	1 = Always, except in program mode.
	6	Local/Remote	0 = Local control. 1 = Remote control.
	7	At reference	1 = Running (full voltage at the motor).
1	0–7	Status	0 = Unknown (menu open).
			2 = Soft starter not ready (restart delay or thermal delay).
			3 = Ready to start (including warning state).
			4 = Starting or running.
			5 = Soft stopping.
			7 = Trip.
			8 = Jog forward.
			9 = Jog reverse.
			2–3
4 <sup>1)</sup>	0–7	Motor current (low byte)	Current (A).
5 <sup>1)</sup>	0–7	Motor current (high byte)	
6	0–7	Motor 1 temperature	Motor 1 thermal model (%).
7	0–7	Motor 2 temperature	Motor 2 thermal model (%).
8–9	0–5	Reserved	–
	6–8	Product parameter list version	–
	9–15	Product type code <sup>2)</sup>	–
10	0–7	Reserved	–
11	0–7	Reserved	–
12 <sup>3)</sup>	0–7	Changed parameter number	0 = No parameters have changed.
			1~255 = Index number of the last parameter changed.
13	0–7	Parameters	Total numbers of parameters available in the soft starter.
14–15	0–13	Changed parameter value <sup>3)</sup>	Value of the last parameter that was changed, as indicated in byte 12.
	14–15	Reserved	–

Byte	Bit	Function	Details
16	0-4	Soft starter state	0 = Reserved.
			1 = Ready.
			2 = Starting.
			3 = Running.
			4 = Stopping.
			5 = Not ready (restart delay, restart temperature check).
			6 = Tripped.
			7 = Programming mode.
			8 = Jog forward.
			9 = Jog reverse.
16	5	Warning	1 = Warning.
	6	Initialized	0 = Uninitialized. 1 = Initialized.
	7	Local control	0 = Local control. 1 = Remote control.
17	0	Parameters	0 = Parameters have changed since last parameter read. 1 = No parameters have changed.
	1	Phase sequence	0 = Negative phase sequence. 1 = Positive phase sequence.
	2-7	Trip code <sup>4)</sup>	See trip codes in <i>Table 7.4</i> .
18-19	0-13	Current	Average rms current across all 3 phases.
	14-15	Reserved	-
20-21	0-13	Current (% motor FLC)	-
	14-15	Reserved	-
22	0-7	Motor 1 thermal model (%)	-
23	0-7	Motor 2 thermal model (%)	-
24-25 <sup>5)</sup>	0-11	Power	-
	12-13	Power scale	-
	14-15	Reserved	-
26	0-7	% power factor	100% = power factor of 1.
27	0-7	Reserved	-
28	0-7	Reserved	-
29	0-7	Reserved	-
30-31	0-13	Phase 1 current (rms)	-
	14-15	Reserved	-
32-33	0-13	Phase 2 current (rms)	-
	14-15	Reserved	-
34-35	0-13	Phase 3 current (rms)	-
	14-15	Reserved	-
36	0-7	Reserved	-
37	0-7	Reserved	-
38	0-7	Reserved	-
39	0-7	Reserved	-
40	0-7	Reserved	-
41	0-7	Reserved	-
42	0-7	Parameter list minor revision	-
43	0-7	Parameter list major revision	-
44	0-3	Digital input state	For all inputs, 0 = open, 1 = closed.
			0 = Start.
			1 = Stop.
			2 = Reset.
	3 = Input A		
4-7	Reserved	-	

Byte	Bit	Function	Details
45	0-7	Reserved	-

**Table 7.2 Structures Used for Querying the Status of the Soft Starter**

1) For models MCD5-0053B and smaller, this value is 10 times greater than the value shown on the LCP.

2) Product type code: 4=MCD 200, 5=MCD 500.

3) Reading bytes 14-15 (changed parameter value) reset byte 12 (changed parameter number) and bit 0 of byte 17 (parameters have changed). Always read bytes 12 and 17 before reading bytes 14-15.

4) Bits 2-7 of byte 17 report the soft starter's trip or warning code. If the value of bits 0-4 of byte 16 is 6, the soft starter has tripped. If bit 5=1, a warning has activated and the soft starter continues operation.

5) Powerscale functions as follows:

0 = Multiply power by 10 to get W.

1 = Multiply power by 100 to get W.

2 = Power is shown in kW.

3 = Multiply power by 10 to get kW.

### 7.4 Soft Starter Internal Register Address

Internal registers within the soft starter have the functions listed in *Table 7.3*. These registers are not directly accessible via fieldbus.

Register	Description	Bits	Details		
0	Version	0-5	Binary protocol version number.		
		6-8	Product parameter list version.		
		9-15	Product type code. <sup>1)</sup>		
1	Device details	-	-		
2 <sup>2)</sup>	Changed parameter number	0-7	0 = No parameters have changed. 1-255 = Index number of the last parameter changed.		
		8-15	Total number of parameters available in the soft starter.		
		0-13	Value of the last parameter that was changed, as indicated in register 2.		
3 <sup>2)</sup>	Changed parameter value	14-15	Reserved.		
		0-4	0 = Reserved. 1 = Ready. 2 = Starting. 3 = Running. 4 = Stopping. 5 = Not ready (restart delay, restart temperature check). 6 = Tripped. 7 = Programming mode. 8 = Jog forward. 9 = Jog reverse.		
4	Soft starter state	5	1 = Warning.		
		6	0 = Warning. 1 = Initialized.		
			7	0 = Local control. 1 = Remote control.	
		8		0 = Parameters have changed. 1 = No parameters have changed. <sup>2)</sup>	
			9	0 = Negative phase sequence. 1 = Positive phase sequence.	
		10-15		See trip codes in <i>Table 7.4</i> . <sup>3)</sup>	
		5	Current	0-13	Average rms current across all 3 phases. <sup>4)</sup>
				14-15	Reserved.
		6	Current	0-9	Current (% motor FLC).
				10-15	Reserved.

Register	Description	Bits	Details
7	Motor temperature	0–7	Motor 1 thermal model (%).
		8–15	Motor 2 thermal model (%).
8 <sup>5)</sup>	Power	0–11	Power.
		12–13	Power scale.
		14–15	Reserved.
9	% Power factor	0–7	100% = power factor of 1.
		8–15	Reserved.
10	Reserved	0–15	–
11 <sup>4)</sup>	Current	0–13	Phase 1 current (rms).
		14–15	Reserved.
12 <sup>4)</sup>	Current	0–13	Phase 2 current (rms).
		14–15	Reserved.
13 <sup>4)</sup>	Current	0–13	Phase 3 current (rms).
		14–15	Reserved.
14	Reserved	–	–
15	Reserved	–	–
16	Reserved	–	–
17	Parameter list version number	0–7	Parameter list minor revision.
		8–15	Parameter list major revision.
18	Digital input state	0–15	For all inputs, 0 = open, 1 = closed (shorted).
			0 = Start.
			1 = Stop.
			2 = Reset.
		3 = Input A.	
4–15	Reserved.		
19–31	Reserved	–	–

**Table 7.3 Functions of Internal Registers**

1) Product type code: 4=MCD 200, 5=MCD 500.

2) Reading register 3 (changed parameter value) resets registers 2 (changed parameter number) and 4 (parameters have changed). Always read registers 2 and 4 before reading register 3.

3) Bits 10–15 of register 4 report the soft starter's trip or warning code. If the value of bits 0–4 is 6, the soft starter has tripped. If bit 5=1, a warning has activated and the soft starter continues operation.

4) For models MCD5-0053B and smaller, this value is 10 times greater than the value shown on the LCP.

5) Powerscale functions as follows:

0 = Multiply power by 10 to get W.

1 = Multiply power by 100 to get W.

2 = Power is shown in kW.

3 = Multiply power by 10 to get kW.

### 7.5 Parameter Management (Read/Write)

Parameter values can be read from or written to the soft starter.

If output register 57 of the scanner is greater than 0, the EtherNet/IP interface writes all parameter registers to the soft starter.

Enter the required parameter values in the output registers of the scanner. The value of each parameter is stored in a separate register. Each register corresponds to 2 bytes.

- Register 57 (bytes 114–115) corresponds to *parameter 1-1 Motor Full Load Current*.
- The VLT® Soft Starter MCD 500 has 109 parameters. Register 162 (bytes 324–325) corresponds to *parameter 16-13 Low Control Volts*.

**NOTICE**

When writing parameter values, the EtherNet/IP Interface updates all parameter values in the soft starter. Always enter a valid value for every parameter.

**NOTICE**

The numbering of parameter options via fieldbus communications differs slightly from the numbering shown on the LCP. Numbering via the Ethernet Module starts at 0, so for *parameter 2-1 Phase Sequence*, the options are 1–3 on the LCP but 0–2 via the module.

### 7.6 Trip Codes

Code	Trip type	MCD 201	MCD 202	MCD 500
0	No trip	✓	✓	✓
11	Input A trip			✓
20	Motor overload		✓	✓
21	Heat sink overtemperature			✓
23	L1 phase loss			✓
24	L2 phase loss			✓
25	L3 phase loss			✓
26	Current imbalance		✓	✓
28	Instantaneous overcurrent			✓
29	Undercurrent			✓
50	Power loss	✓	✓	✓
54	Phase sequence		✓	✓
55	Frequency	✓	✓	✓
60	Unsupported option (function not available in inside delta)			✓
61	FLC too high			✓
62	Parameter out of range			✓
70	Miscellaneous			✓
75	Motor thermistor		✓	✓
101	Excess start time		✓	✓
102	Motor connection			✓
104	Internal fault x (where x is the fault code detailed in Table 7.5)			✓
113	Starter communication (between module and soft starter)	✓	✓	✓
114	Network communication (between module and network)	✓	✓	✓
115	L1-T1 short-circuited			✓
116	L2-T2 short-circuited			✓
117	L3-T3 short-circuited			✓
119 <sup>1)</sup>	Time-overcurrent (bypass overload)		✓	✓
121	Battery/clock			✓
122	Thermistor circuit			✓

Table 7.4 Trip Code Reported in Bytes 2–3 and 17 of the Status Commands

1) For VLT® Soft Starter MCD 500, time-overcurrent protection is only available on internally bypassed models.

### 7.6.1 Internal Fault X

Internal fault	Message on LCP
70–72	Current Read Err. Lx
73	ATTENTION! Remove Mains Volts
74–76	Motor connection Tx
77–79	Firing Fail Px
80–82	VZC Fail Px
83	Low Control Volts
84–98	Internal fault X. Contact the local supplier with the fault code (X).

Table 7.5 Internal Fault Code Associated with Trip Code 104

**NOTICE**

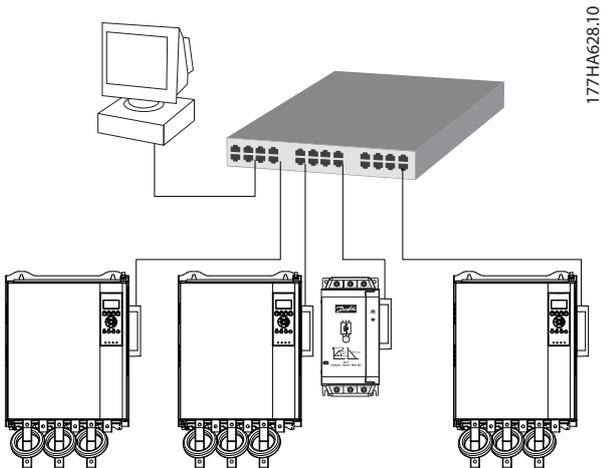
Only available on VLT® Soft Starters MCD 500. For parameter details, see the *VLT® Soft Starter MCD 500 Operating Guide*.

## 8 Network Design

The Ethernet Module supports star, line, and ring topologies.

### 8.1 Star Topology

In a star network, all controllers and devices connect to a central network switch.

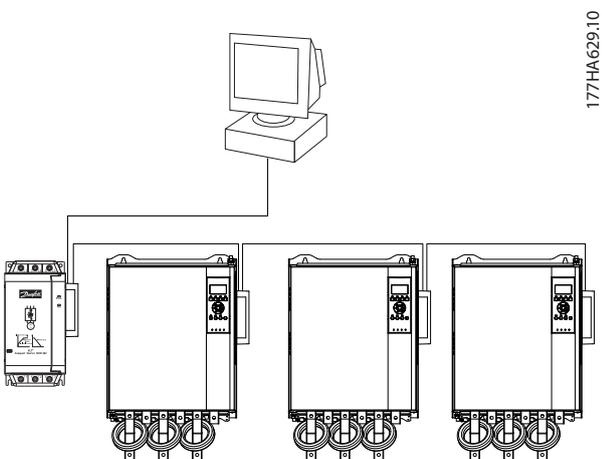


177HA628.10

Illustration 8.1 Star Network Topology

### 8.2 Line Topology

In a line network, the controller connects directly to 1 port of the first EtherNet/IP Module. The 2<sup>nd</sup> Ethernet port of the EtherNet/IP Module connects to another module, which in turn connects to another module until all devices are connected.



177HA629.10

Illustration 8.2 Line Network Topology

### NOTICE

The EtherNet/IP Module has an integrated switch to allow data to pass through in line topology. The EtherNet/IP Module must be receiving control power from the soft starter for the switch to operate.

### NOTICE

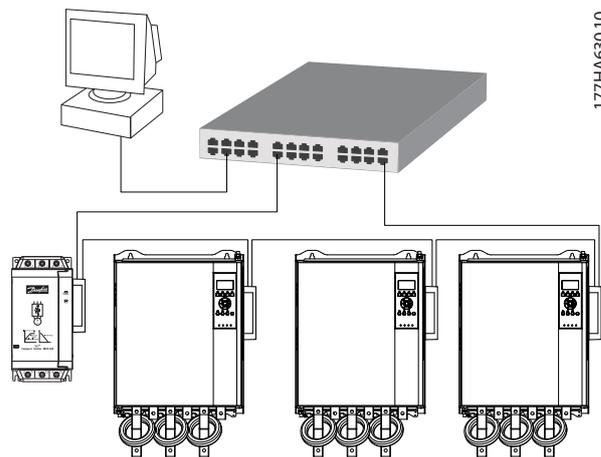
If the connection between 2 devices is interrupted, the controller cannot communicate with devices after the interruption point.

### NOTICE

Each connection adds a delay to communication with the next module. The maximum number of devices in a line network is 32. Exceeding this number may reduce the reliability of the network.

### 8.3 Ring Topology

In a ring topology network, the controller connects to the 1<sup>st</sup> EtherNet/IP Module via a network switch. The 2<sup>nd</sup> Ethernet port of the EtherNet/IP Module connects to another module, which in turn connects to another module until all devices are connected. The final module connects back to the switch.



177HA630.10

Illustration 8.3 Ring Network Topology

### NOTICE

The network switch must support loss of line detection.

### 8.4 Combined Topologies

A single network can include both star and line components.

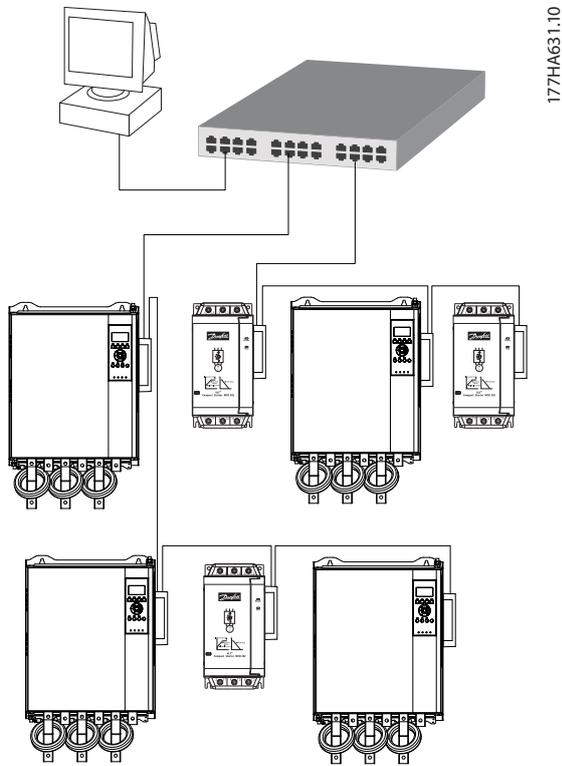


Illustration 8.4 Combined Star/Line Network Topology

## 9 Specifications

### Enclosure

Dimensions, W x H x D [mm (in)]	40 x 166 x 90 (1.6 x 6.5 x 3.5)
Weight	250 g (8.8 Oz)
Protection	IP20

### Mounting

Spring-action plastic mounting clips	2
--------------------------------------	---

### Connections

Soft starter	6-way pin assembly
Contacts	Gold flash
Networks	RJ45

### Settings

IP address	Automatically assigned, configurable
Device name	Automatically assigned, configurable

### Network

Link speed	10 Mbps, 100 Mbps (auto-detect)
Full duplex	
Auto crossover	

### Power

Consumption (steady state, maximum)	35 mA at 24 V DC
Reverse polarity protected	
Galvanically isolated	

### Certification

RCM	IEC 60947-4-2
CE	IEC 60947-4-2
ODVA	EtherNet/IP conformance tested

**Index**

**A**

Abbreviations..... 4  
 Additional resources..... 3  
 Approvals..... 3  
 Auto-on mode..... 5

**B**

Busbar..... 5

**C**

Cable  
   category..... 9  
   Ethernet cable..... 9  
 Capacitors  
   Power factor correction capacitor..... 5  
 Certifications..... 3  
 Connections..... 22  
 Contactors  
   Bypass contactor..... 5  
   Main contactor..... 6  
 Conventions..... 4

**D**

Dimensions..... 22

**E**

Electromagnetic interference..... 9  
 Ethernet attribute..... 10

**H**

Heat sink..... 5

**I**

Inputs  
   Remote..... 5  
 Installing EtherNet/IP option..... 7  
 Intended use..... 3  
 IP address..... 9, 12, 22

**L**

LED  
   Description..... 12  
   LED..... 4  
   Name..... 12  
   Status..... 12

**M**

MAC address..... 9  
 Motor  
   connection..... 6

**N**

Network  
   Auto crossover..... 22  
   Full duplex..... 22  
   Line..... 20  
   Link speed..... 22  
   Ring..... 20  
   Star..... 20

**Q**

Qualified personnel..... 3, 5

**R**

Removing EtherNet/IP Option..... 7  
 Reset mode..... 8

**S**

Subnet mask..... 10  
 Supply..... 5, 6  
 Symbols..... 4

**T**

Terminals  
   A1..... 8  
   N2..... 8

**U**

Unintended start..... 5

**W**

Weight..... 22



.....  
Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequential changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.  
.....

Danfoss A/S  
Ulsnaes 1  
DK-6300 Graasten  
vlt-drives.danfoss.com

