ENGINEERING TOMORROW

Installation Guide
Modbus TCP Module

VLT® Compact Starter MCD 201/MCD 202
VLT® Soft Starter MCD 500

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1 Introduction

1.1 Purpose of the Manual

This installation guide provides information for the installation of the Modbus TCP 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 protocols.
- 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.

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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/* for listings.

1.3 Product Overview

1.3.1 Intended Use

This installation guide relates to Modbus TCP Module for VLT® soft starters, ordering number 175G9904.

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

The Modbus TCP Module allows a Danfoss soft starter to connect to an Ethernet network and be controlled or monitored using an Ethernet communication model.
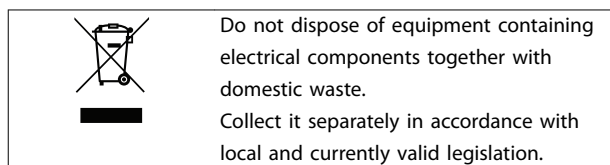
Familiarity with Ethernet protocols and networks is required to operate the device successfully. If there are difficulties when using this device with third-party products, including PLCs, scanners, and commissioning tools, contact the relevant supplier.

1.4 Approvals and Certifications

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

1.5 Disposal

	Do not dispose of equipment containing electrical components together with domestic waste. Collect it separately in accordance with local and currently valid legislation.

1.6 Symbols, Abbreviations, and Conventions

Abbreviation	Definition
DHCP	Dynamic host configuration protocol
EMC	Electromagnetic compatibility
IP	Internet protocol
LCP	Local control panel
LED	Light-emitting diode
LOP	Local operation panel
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 ~ MCD5-0961B:
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 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.**

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⚠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.

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3 Installation

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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 Modbus TCP Module:

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 Modbus TCP Module to the network.

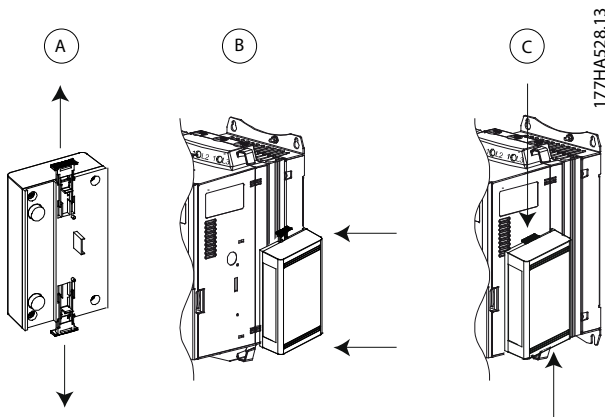6. Apply control power to the soft starter.

Illustration 3.1 Installing the Modbus TCP Module

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).

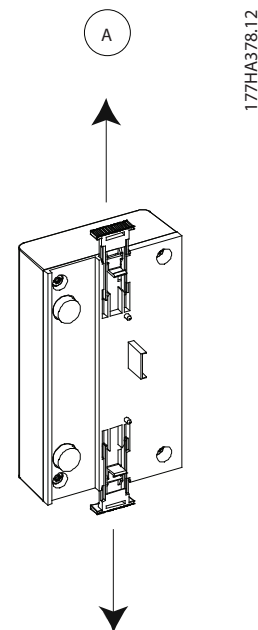4. Pull the module away from the soft starter.

Illustration 3.2 Removing the Modbus TCP Module

4 Connection

4.1 Soft Starter Connection

The device is powered from the soft starter.

VLT® Compact Starter MCD 201/MCD 202
For the Modbus TCP 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 auto-on mode, input links are required across terminals 17 and 25 to terminal 18. In hand-on mode, links are not required.

Modbus TCP 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 auto-on 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	Modbus TCP Module	2	Modbus TCP Module
3	RJ45 Ethernet ports	3	RJ45 Ethernet ports

Table 4.1 Connection Diagrams

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4.2 Network Connection

4.2.1 Ethernet Ports

The device has 2 Ethernet ports. If only 1 connection is required, either port can be used.
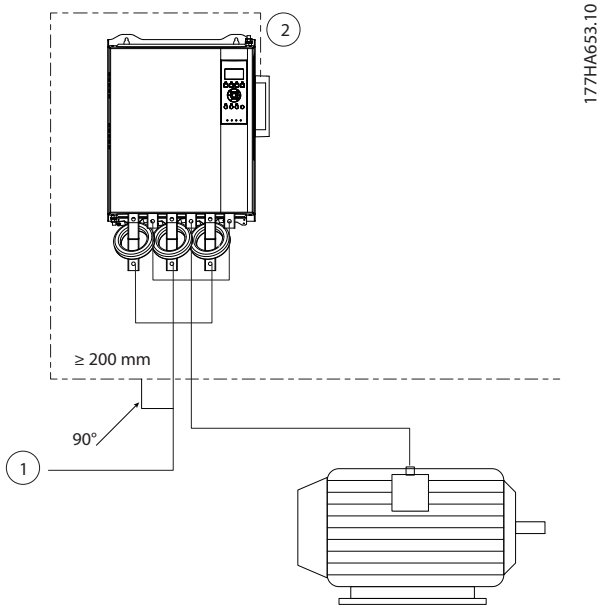
4.2.2 Cables

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 device can be assigned a static IP address during configuration or can be configured to accept a dynamic IP address (via DHCP).
- 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.
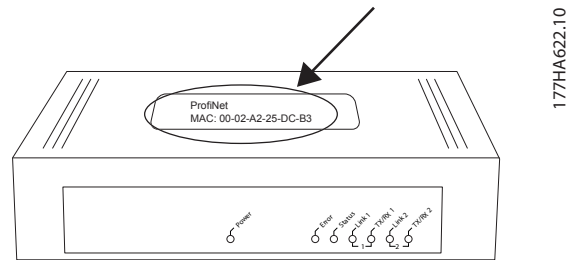

Illustration 4.2 MAC ID Location

5 Device Configuration

5.1 Configuration Overview

NOTICE

The error LED flashes whenever the device is receiving power but is not connected to a network. The error LED flashes throughout the configuration process.

5.2 On-board Web Server

Ethernet attributes can be configured directly in the device using the on-board web server.

NOTICE

The web server only accepts connections from within the same subnet domain.

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 Modbus TCP 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 Modbus TCP Module is 192.168.1.2.
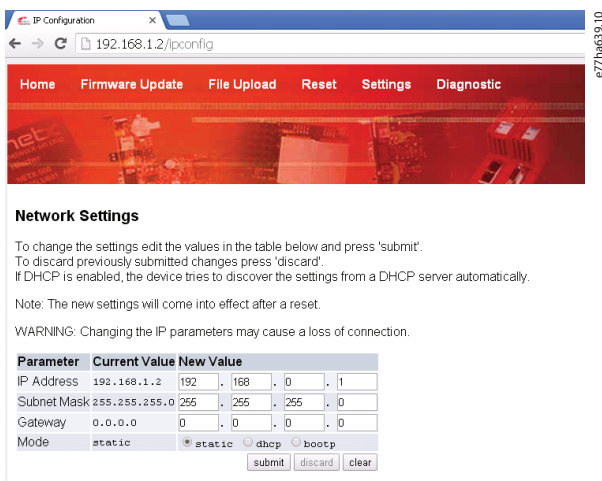

Illustration 5.1 Entering Network Settings

5. Edit the settings as required.

6. Click *Submit* to save the new settings.

7. Tick *Static* to store the settings permanently in the device.

8. If prompted, enter username and password.

8a   Username: danfoss

8b   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.

5.3 Ethernet Device Configuration Tool

If the IP address is unknown, or if the subnet mask of the web server does not match, use the Ethernet Device Configuration Tool to connect to the Modbus TCP Module.

Changes made via the Ethernet Device Configuration Tool cannot be stored permanently in the module and are lost when control power is cycled. Use the Ethernet Device Configuration Tool to change the IP address settings temporarily. After that, use the new address to connect to the module using the on-board web server to save the settings permanently.

Download the Ethernet Device Configuration Tool. To install the software, administrator privileges are required on the PC.

Downloading the tool:

1. Go to *drives.danfoss.com/downloads/pc-tools/* to find the tool.

2. Make sure to have administrator privileges on the PC before starting the installation.

3. Accept the End-User License Agreement.

4. Click *Yes* on the User account control dialog box.

NOTICE

If the PC has a firewall enabled, add the tool to the list of authorized programs.

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 network.

3. Apply control power to the soft starter.

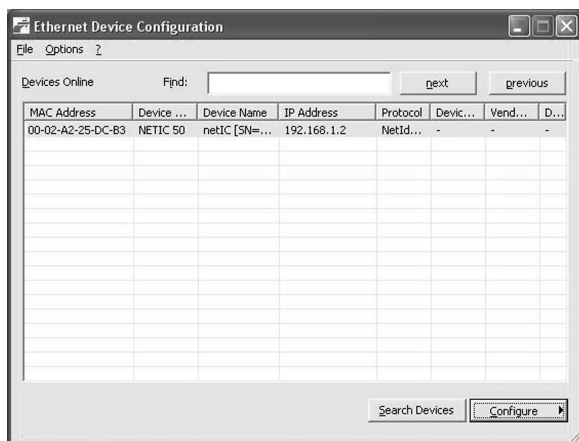4. Start the Ethernet Device Configuration Tool.
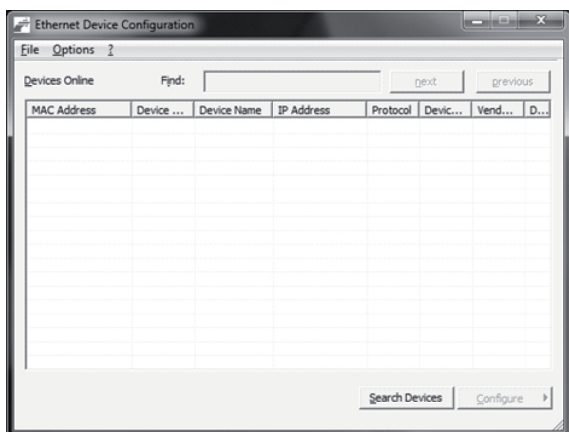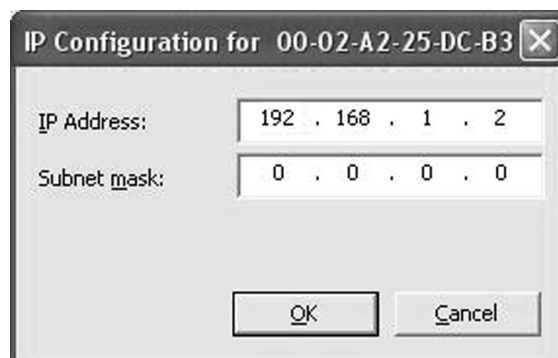

Illustration 5.2 Starting the Tool

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 Modbus TCP Module must be controlled by a Modbus client (such as a PLC) which complies with the Modbus Protocol Specification. For successful operation, the client must also support all functions and interfaces described in this manual.

6.1 Device Classification

The Modbus TPC Module is a Modbus server managed by a Modbus client over Ethernet.

6.3 LEDs

6.2 Configuration

Configure the device directly in the PLC. No additional files are required.

LED name	LED status	Description
Power	Off	The module is not powered up.
	On	The module receives power.
Error	Off	No error.
	Flashing	System error.
	On	Communication error.
Status	Off	Not ready.
	Slow flash	Ready, but not configured.
	Fast flash	Configured and waiting for communication.
	On	Communication has been established.
Link x	Off	No network connection.
	On	Connected to a network.
TX/RX x	Flashing	Establishing connection.
	On	Normal operation.
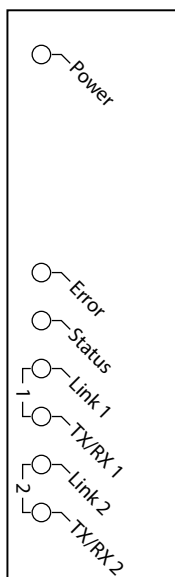
Table 6.1 Feedback LEDs

7 Modbus Registers

7.1 Compatibility

The Modbus TCP Module supports 2 modes of operation:

- In *standard mode*, the module uses registers defined in the Modbus Protocol Specification.

- In *legacy mode*, the module uses the same registers as the Modbus Module from Danfoss. Some registers differ from those specified in the Modbus Protocol Specification.

The values of bit 15 in register 40001 determine the operating mode.

- Standard mode: Set bit 15 = 1. Bits 0–7 of register 40001 are used for command.

- Legacy mode: Set bit 15 = 0. The remaining bits of register 40001 are reserved.

Examples

10000000 00000001 = Start the motor (standard mode).

10000000 00000000 = Stop the motor (standard mode).

00000000 xxxxxxxx = Switch to legacy mode. The module ignores the remaining bits in register 40001 and checks the value in register 40002.

7.2 Ensuring Safe and Successful Control

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

- 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.

- If the soft starter may also be controlled via the LCP or the remote inputs (and via fieldbus communications), a control command should be immediately followed by a status query to confirm that the command has been actioned.

7.3 Configuring Soft Starter Parameters

Parameter management is always multiple write of the entire parameter block.

When configuring parameters in the soft starter, the PLC must be programmed with the correct values for all parameters. The card updates every parameter in the soft starter to match the values in the PLC.

⚠CAUTION

UNPREDICATABLE BEHAVIOR

Do not change the default values of *parameter group 20- Factory Parameters*. Changing these values may cause unpredictable behavior in the soft starter.**

7.4 Standard Mode

7.4.1 PLC Configuration

The PLC must be configured to map registers within the module to addresses within the PLC.

Illustration 7.1 Example Mapping of PLC Registers to Registers within the Modbus TCP Module (Target)

7.4.2 Command and Configuration Registers (Read/Write)

Register	Description	Bits	Details
40001	Command (single write)	0–7	To send a command to the soft starter, write the required value: 00000000 = Stop 00000001 = Start 00000010 = Reset 00000100 = Quick stop (coast to stop) 00001000 = Forces communication trip 00010000 = Start using Parameter Set 1[1)] 00100000 = Start using Parameter Set 2[1)] 01000000 = *Reserved* 10000000 = *Reserved*
		8–14	*Reserved*
		15	Must = 1
40002	*Reserved*		
40003	*Reserved*		
40004	*Reserved*		
40005	*Reserved*		
40006	*Reserved*		
40007	*Reserved*		
40008	*Reserved*		
40009[2)]– 40200	Parameter management (single/multiple read or multiple write)	0–15	Manage soft starter programmable parameters

Table 7.1 Command and Configuration Registers

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

2) See the relevant soft starter manuals for a complete parameter list. The first product parameter is always allocated to register 40009. The last product parameter is allocated to register 40XXX, where XXX = 008 plus total number of available parameters in the product. The Modbus TCP Module can read or write a maximum of 125 registers in 1 operation. These registers support multiple write (Modbus function code 16). Attempting to write a single register returns a fault code 01 (illegal function code).

7.4.3 Status Reporting Registers (Read Only)

NOTICE

For models MCD5-0053B and smaller (soft starter model ID 1–4), the current reported via communication registers is 10 times greater than the actual value.

NOTICE

The following functions are only available with MCD 500 soft starters:

- **Parameter management**
- **Dual motor control**
- **Digital inputs**
- **Jog**
- **Current measurement in amperes**
- **Power information**
- **Warnings**

MCD 201 open-loop soft starters do not support motor current and motor temperature information.

Register	Description	Bits	Details
30240	Soft starter state	0–3	1 = Ready 2 = Starting 3 = Running 4 = Stopping (including braking) 5 = Restart delay (including temperature check) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		4	1 = Positive phase sequence (only valid if bit 6 = 1)
		5	1 = Current exceeds FLC
		6	0 = Uninitialized 1 = Initialized
		7–15	*Reserved*
30241	Trip code	0–7	See *chapter 7.6 Trip Codes*
		8–15	*Reserved*
30242	Motor current	0–7	Average 3-phase motor current [A]
		8–15	*Reserved*
30243	Motor temperature	0–7	Motor thermal model (%)
		8–15	*Reserved*
30244– 30249	*Reserved*		

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Register	Description	Bits	Details
30250	Version	0–5	*Reserved*
		6–8	Product parameter list version
		9–15	Product type code: 4 = MCD 200 7 = MCD 500
30251	Model number	0–7	*Reserved*
		8–15	Soft starter model ID
30252	*Reserved*		
30253	*Reserved*		
30254	Soft starter state	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
		5	1 = Warning
		6	0 = Uninitialized 1 = Initialized
		7	0 = Local control 1 = Remote control
		8	*Reserved*
		9	0 = Negative phase sequence 1 = Positive phase sequence
		10–15	See *chapter 7.6 Trip Codes*
30255	Current	0–13	Average rms current across all 3 phases
		14–15	*Reserved*
30256	Current	0–9	Current (% of motor FLC)
		10–15	*Reserved*
30257	Motor temperature	0–7	Motor thermal model (%)
		8–15	*Reserved*
30258[1]	Power	0–11	Power
		12–13	Power scale
		14–15	*Reserved*
30259	% power factor	0–7	100% = power factor of 1
		8–15	*Reserved*
30260	*Reserved*		
30261	Current	0–13	Phase 2 current (rms)
		14–15	*Reserved*
30262	Current	0–13	Phase 2 current (rms)
		14–15	*Reserved*
30263	Current	0–13	Phase 3 current (rms)
		14–15	*Reserved*
30264	*Reserved*		
30265	*Reserved*		
30266	*Reserved*		

Register	Description	Bits	Details
30267	Parameter list version number	0–7	Parameter list minor version
		8–15	Parameter list major version
30268	Digital input state	0–15	For all inputs, 0 = open, 1 = closed (short-circuited) 0 = Start 1 = Stop 2 = Reset 3 = Input A 4–15 = *Reserved*
30269–30281	*Reserved*		

Table 7.2 Status Reporting Registers

1) Power scale functions as follows:
0 = Multiply power by 10 to get W.
1 = Multiply power by 100 to get W.
2 = Power (kW).
3 = Multiply power by 10 to get kW.

7.4.4 Examples

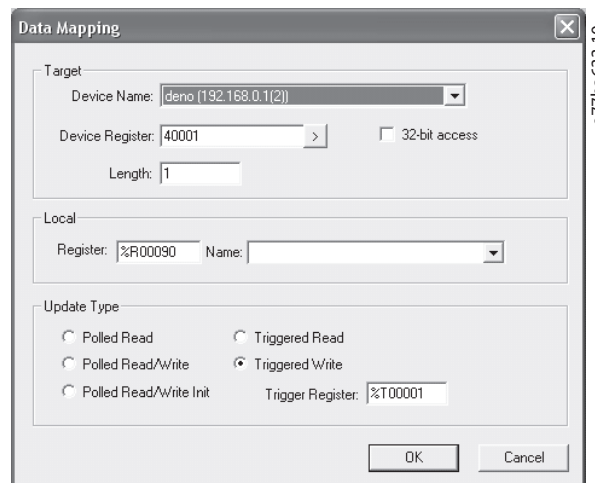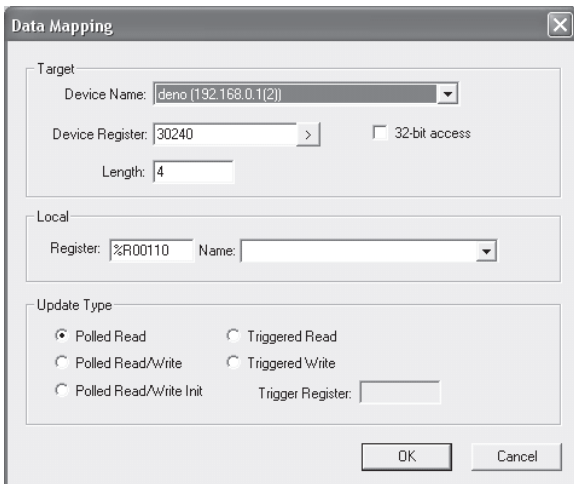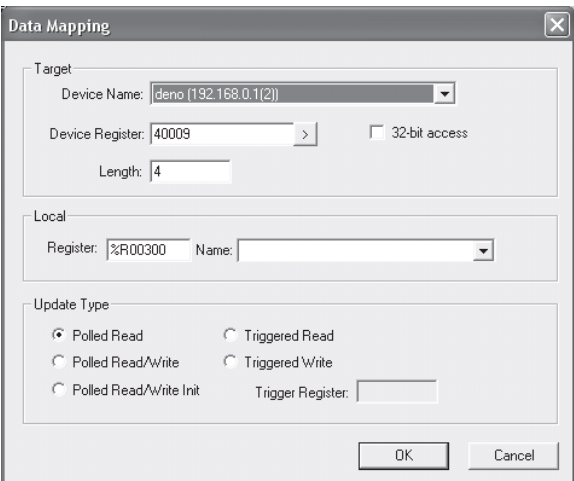**Illustration 7.2 Send Start Command (Register 40001)**

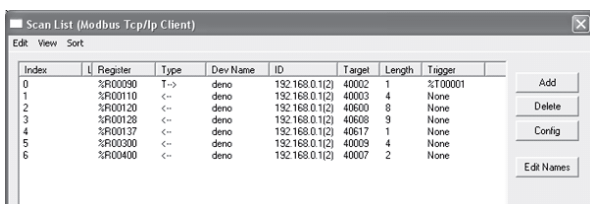**Illustration 7.3 Get Status (Starting at Address 30240)**

Illustration 7.4 Get Parameter Values (Starting Register 40009)

7.5 Legacy Mode

7.5.1 PLC Configuration

The PLC must be configured to map registers within the module to addresses within the PLC.

Illustration 7.5 Example Mapping of PLC Registers to Registers within the Modbus TCP Module (Target)

7.5.2 Registers

> **NOTICE**
>
> **For models MCD5-0053B and smaller (soft starter model ID 1–4), the current reported via communications registers is 10 times greater than the actual value.**

> **NOTICE**
>
> **Some soft starters do not support some functions.**

Register	Description	Bits	Details
40001	*Reserved*	0–14	*Reserved*
		15	Must be 0.
40002	Command (single write)	0–2	To send a command to the soft starter, write the required value: 1 = Start 2 = Stop 3 = Reset 4 = Quick stop (coast to stop) 5 = Forced communication trip 6 = Start using Parameter Set 1 7 = Start using Parameter Set 2
		3–15	*Reserved*
40003	Soft starter state	0–3	1 = Ready 2 = Starting 3 = Running 4 = Stopping (including braking) 5 = Tripped 6 = Programming mode 7 = Jog forward 8 = Jog reverse
		4	1 = Positive phase sequence (only valid if bit 6 = 1)
		5	1 = Current exceeds FLC
		6	0 = Uninitialized 1 = Initialized
		7–15	*Reserved*
40004	Trip code	0–7	See *chapter 7.6 Trip Codes*
		8–15	*Reserved*
40005	Motor current	0–7	Average 3-phase motor current [A]
		8–15	*Reserved*
40006	Motor temperature	0–7	Motor thermal model (%)
		8–15	*Reserved*
40007	*Reserved*		
40008	*Reserved*		

Register	Description	Bits	Details
40009[1]– 40200	Parameter management (single/multiple read or multiple write)	0–15	Manage soft starter programmable parameters
40600	Version	0–5	Binary protocol version
		6–8	Parameter list version number
		9–15	Product type code: 4 = MCD 200 7 = MCD 500
40601	*Reserved*		
40602	*Reserved*		
40603	*Reserved*		
40604	Soft starter state	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
		5	1 = Warning
		6	0 = Uninitialized 1 = Initialized
		7	0 = Hand on 1 = Auto on
		8	*Reserved*
		9	0 = Negative phase sequence 1 = Positive phase sequence
		10–15	*Reserved*
40605	Current	0–13	Average rms current across all 3 phases
		14–15	*Reserved*
40606	Current	0–9	Current (% motor FLC)
		10–15	*Reserved*
40607	Motor temperature	0–7	Motor thermal model (%)
		8–15	*Reserved*
40608[2]	Power	0–11	Power
		12–13	Power scale
		14–15	*Reserved*
40609	% power factor	0–7	100% = power factor of 1
		8–15	*Reserved*
40610	*Reserved*		
40611	Current	0–13	Phase 1 current (rms)
		14–15	*Reserved*

Register	Description	Bits	Details
40612	Current	0–13	Phase 2 current (rms)
		14–15	*Reserved*
40613	Current	0–13	Phase 3 current (rms)
		14–15	*Reserved*
40614	*Reserved*		
40615	*Reserved*		
40616	*Reserved*		
40617	Parameter list version number	0–7	Parameter list minor version
		8–15	Parameter list major version
40618	Digital input state	0–15	For all inputs, 0 = open, 1 = closed (short-circuited) 0 = Start 1 = Stop 2 = Reset 3 = Input A
40619– 40631	*Reserved*		

Table 7.3 Legacy Mode Registers

1) See the relevant soft starter manual for a complete parameter list. The first product parameter is always allocated to register 40009. The last product parameter is allocated to register 40XXX, where XXX = 008 plus total number of available parameters in the product. The Modbus TCP Module can read or write a maximum of 125 registers in 1 operation. These registers support multiple write (Modbus function code 16). Attempting to write to a single register returns a fault code 01 (illegal function code).
2) Power scale functions as follows:
0 = Multiply power by 10 to get W.
1 = Multiply power by 100 to get W.
2 = Power (kW).
3 = Multiply power by 10 to get kW.
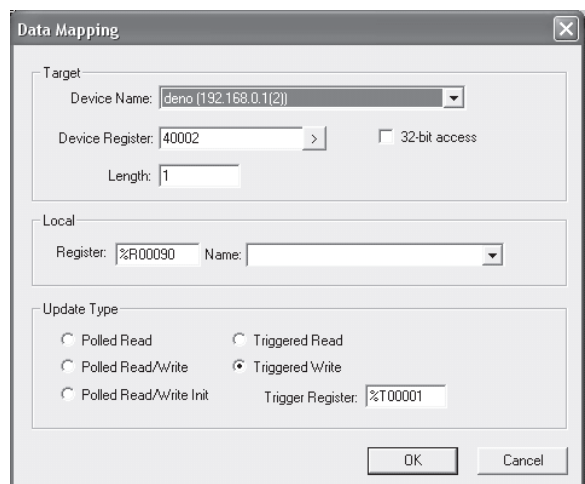
7.5.3 Examples

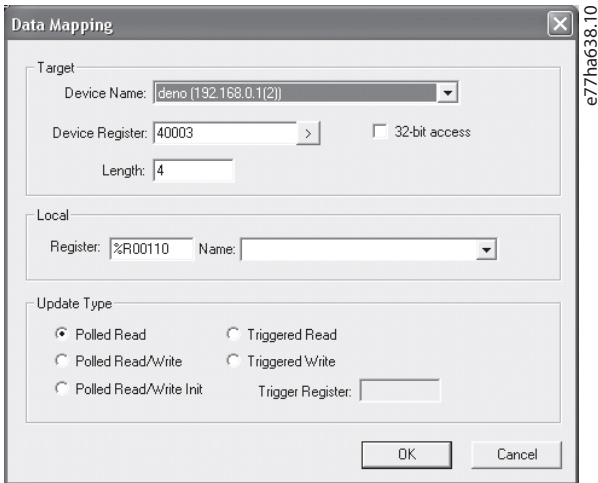**Illustration 7.6 Send Start Command (Register 40002)**

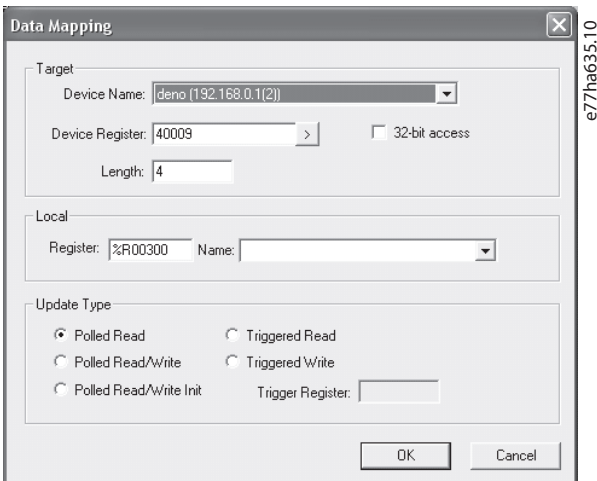**Illustration 7.7 Get Status (Starting at Register 40003)**

Illustration 7.8 Get Parameter Values (Starting at Register 40009)

7.6 Trip Codes

Trip codes are reported in registers 30241 and 30254 (*standard mode*) and register 40604 (*legacy mode*).

Trip code	Description	MCD 201	MCD 202	MCD 500
0	No trip	✓	✓	✓
1	Excess start time		✓	✓
2	Motor overload		✓	✓
3	Motor thermistor		✓	✓
4	Current imbalance		✓	✓
5	Frequency	✓	✓	✓
6	Phase sequence		✓	✓
7	Instantaneous overcurrent			✓
8	Power loss	✓	✓	✓

Trip code	Description	MCD 201	MCD 202	MCD 500
9	Undercurrent			✓
10	Heat sink overtemperature			✓
11	Motor connection			✓
12	Input A trip			✓
13	FLC too high			✓
14	Unsupported option (function not available in inside delta)			✓
15	Soft starter communication (between device and soft starter)	✓	✓	✓
16	Network communication (between device and soft starter)	✓	✓	✓
17	Internal fault x (where x is the fault code detailed in *Table 7.5*)			✓
23	Parameter out of range			✓
25	Bypass fail (bypass contactor)			✓
26	L1 phase loss			✓
27	L2 phase loss			✓
28	L3 phase loss			✓
29	L1-T1 short-circuited			✓
30	L2-T2 short-circuited			✓
31	L3-T3 short-circuited			✓
33[1]	Time-overcurrent (bypass overload)		✓	✓
35	Battery/clock			✓
36	Thermistor circuit			✓

Table 7.4 Trip Codes

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

7.6.1 Internal Fault X

Internal fault	Message shown on the 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 17

8 Network Design

The device supports star, line, and ring topologies.

8.1 Star Topology

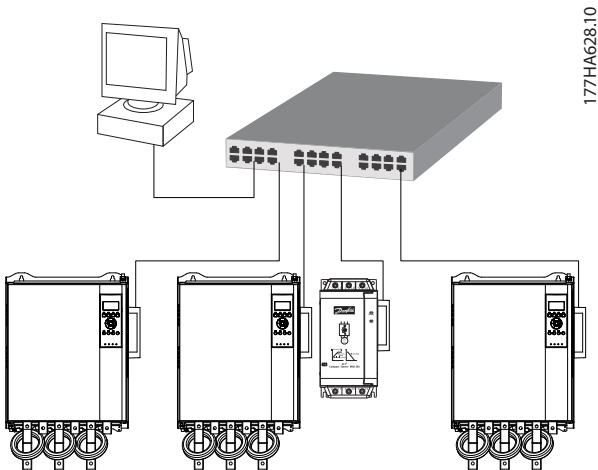In a star network, all controllers and devices connect to a central network switch.

Illustration 8.1 Star Network Topology

8.2 Line Topology

In a line network, the controller connects directly to 1 port of the 1st module. The 2nd Ethernet port connects to another module, which in turn connects to another device until all devices are connected.
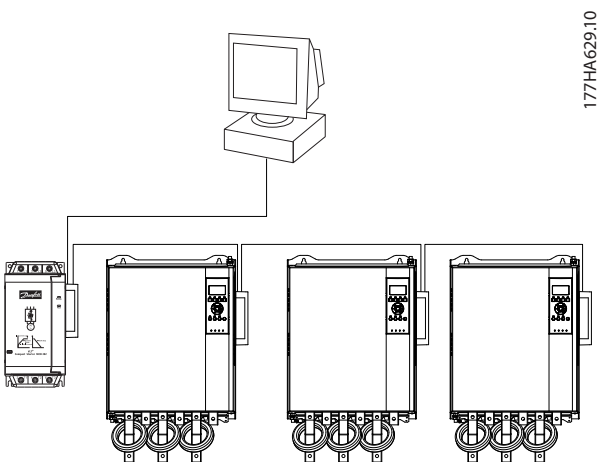

Illustration 8.2 Line Network Topology

NOTICE

The device has an integrated switch to allow data to pass through in line topology. The device 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 device. 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 1st module via a network switch. The 2nd Ethernet port of the module connects to another device, which in turn connects to another device until all devices are connected. The final device connects back to the switch.

The device supports beacon-based ring node configuration.
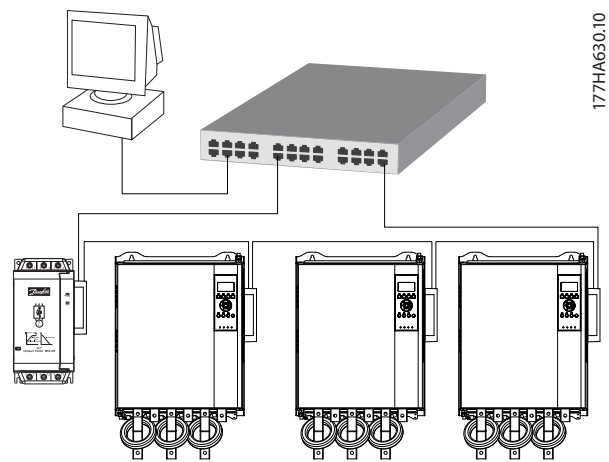
Illustration 8.3 Ring Network Topology

NOTICE

The network switch must support loss of line detection.

8.4 Combined Topologies

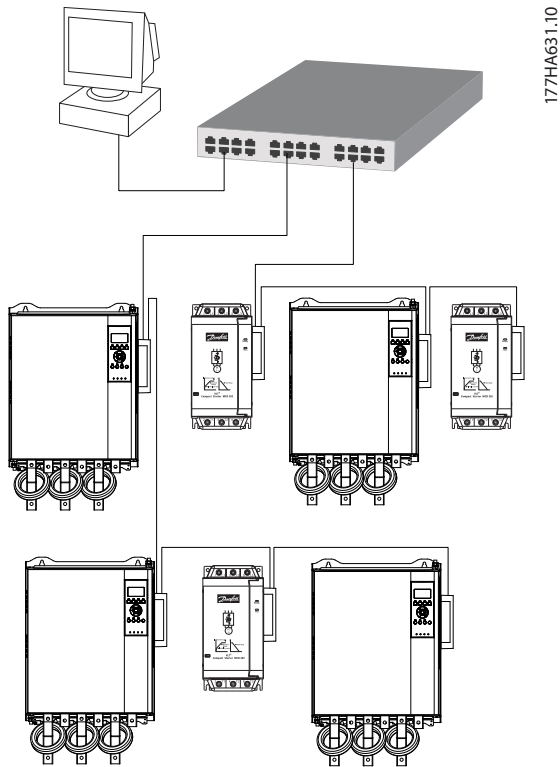A single network can include both star and line
components.

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

CE	IEC 60947-4-2

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