

# **PROFINET Card** VLT<sup>®</sup> Soft Starter MCD 600





Contents

## Contents

1	Saf	ety		5						
	1.1	Discla	mer	5						
	1.2	Warni	ngs	5						
2	Inti	roduc	tion	6						
	2.1	Produ	ct Design	б						
	2.2	Comp	atibility	6						
	2.3	Netwo	rk Connection	6						
3	Ins	tallati	on	7						
	3.1	Install	ng the Expansion Card	7						
	3.2		rk Connections	7						
		3.2.1	Ethernet Ports	7						
		3.2.2	Cables	7						
			EMC Precautions	7						
	3.3	Network Establishment								
	3.4	Addre	ssing	7						
4	Dev	vice C	onfiguration	8						
	4.1		Juration of Device Name	8						
			Identifying the Device with Ethernet Device Configuration Tool	8						
	4.2		ng Network Control	9						
	4.3		ard Web Server	9						
		4.3.1	Connect to the Device	9						
		4.3.2	Manage Users and Passwords	10						
			4.3.2.1 Adding a User	11						
			4.3.2.2 Deleting a User	11						
		4.3.3	Configure IoT Settings	11						
			4.3.3.1 Configuring MQTT Settings	12						
			4.3.3.2 Configuring OPC UA Settings	13						
	4.4	Maste	r Configuration	13						
5	Ор	eratio	n	14						
	5.1	Requi	ements for Successful Operation	14						
	5.2	Device	e Classification	14						
	5.3	Ensuri	ng Safe and Successful Control	14						
	5.4	Feedb	ack LEDs	14						

### **PROFINET Card**

#### Installation Guide



## Contents

6	Pac	ket Structures	15
	6.1	Important Information	15
	6.2	Control Commands (Controller to Device)	15
	6.3	Status Information (Device to Controller)	15
		6.3.1 Bytes 0–1: Control Status	15
		6.3.2 Bytes 2–3: Starter State	16
		6.3.3 Bytes 4–5: Trip Code	16
		6.3.4 Bytes 6–7: Motor Current	16
		6.3.5 Bytes 8–9: Motor Temperature	16
		6.3.6 Bytes 10–63: Extended Information	17
	6.4	Parameter Management	18
		6.4.1 Output	19
		6.4.2 Input	19
	6.5	19	
	6.6	Examples	21
		6.6.1 Control Commands (Controller to Device)	21
		6.6.2 Status Information (Device to Controller)	22
		6.6.3 Parameter Management	22
7	Net	twork Design	23
	7.1	Star Topology	23
	7.2	Line Topology	23
	7.3	Ring Topology	24
	7.4	Combined Topologies	24
8	Spe	ecifications	26
	8.1	Connections	26
	8.2	Settings	26
	8.3	Network	26
	8.4	Power	26
	8.5	Certification	26

Danfoss

## 1 Safety

### 1.1 Disclaimer

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.

## 1.2 Warnings



#### SHOCK HAZARD

Attaching or removing accessories while the soft starter is connected to mains voltage may cause personal injury.

- Before attaching or removing accessories, isolate the soft starter from mains voltage.

## 🛦 W A R N I N G 🛦

### RISK OF PERSONAL INJURY AND EQUIPMENT DAMAGE

Inserting foreign objects or touching the inside of the soft starter while the expansion port cover is open may endanger personnel and can damage the soft starter.

- Do not insert foreign objects in the soft starter with the port cover open.
- Do not touch the inside of the soft starter with the port cover open.

Danfoss

## **2 Introduction**

### 2.1 Product Design

The PROFINET Card allows the 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. For difficulties arising from using this device with 3<sup>rd</sup>-party products, including PLCs, scanners, and commissioning tools, contact the relevant supplier.

## 2.2 Compatibility

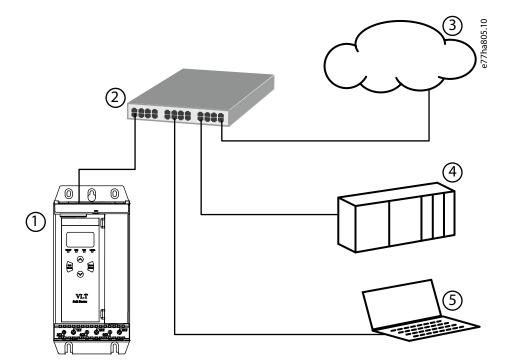
This communication expansion card is suitable for use with VLT® Soft Starter MCD 600.

This Installation Guide is intended for use with version 3.x of the VLT<sup>®</sup> Soft Starter MCD 600 PROFINET Card. Earlier versions of the PROFINET Card do not support custom users, TCP connection, or IoT operation.

## 2.3 Network Connection

#### Table 1: Supported Protocols

Protocols	
PROFINET	Industrial Ethernet via PROFINET
ТСР	Transmission control protocol to connect to port 4000 of a PC
MQTT	Message queue telemetry transport
OPC UA	Open platform communications unified architecture



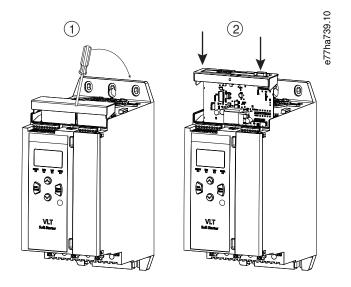
#### Illustration 1: Overview of Network Connections

<ol> <li>Soft starter</li> <li>Network switch</li> <li>IoT connection (MQTT/OPC UA)</li> </ol>	<ul> <li>4 Industrial Ethernet connection to programmable logic controller</li> <li>5 TCP connection to VLT<sup>®</sup> Motion Control Tool MCT 10. Refer to the VLT<sup>®</sup> Motion Control Tool MCT 10 Operating Guide for connection details.</li> </ul>
--	--

<u>Danfoss</u>

## **3 Installation**

## 3.1 Installing the Expansion Card



#### Procedure

- 1. Push a small flat-bladed screwdriver into the slot in the center of the expansion port cover and ease the cover away from the soft starter.
- 2. Align the card with the expansion port. Gently push the card along the guide rails until it clicks into the soft starter.

#### 3.2 Network Connections

#### 3.2.1 Ethernet Ports

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

#### 3.2.2 Cables

When connecting to the device, make sure that the cables are of 1 of the following categories:

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

#### 3.2.3 EMC Precautions

To minimize electromagnetic interference, Ethernet cables should be separated from motor and mains cables by 200 mm (7.9 in). If the Ethernet cable must cross motor or mains cables, the crossing should be at an angle of 90°.

### 3.3 Network Establishment

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

#### 3.4 Addressing

Each device in a network is addressed using a MAC address and an IP 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 MAC address is fixed within the device and is printed on a label on the front of the device.

<u>Danfoss</u>

## **4 Device Configuration**

### 4.1 Configuration of Device Name

Use the Ethernet Device Configuration Tool to configure the device. The tool can be downloaded from <u>www.danfoss.com</u> under *Service and support/Downloads*.

## 4.1.1 Identifying the Device with Ethernet Device Configuration Tool

## The Error LED flashes whenever the device is receiving power but is not connected to a network. The Error LED will flash occasionally during the configuration process.

NOTICE

NOTICE

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

#### Procedure

- 1. Start the Ethernet Device Configuration Tool.
- 2. Click Search Devices.

e <u>O</u> ptions <u>?</u> evices Online	Find:				<u>n</u> ext	previo	ous
MAC Address	Device	Device Name	IP Address	Protocol	Devic	Vend	D
00-02-A2-25-DC-B3	NETIC 50	netIC [SN=	192.168.0.2	NetId			
				Search De	vices	Configure	

The software searches for connected devices.

3. To configure a device name, click *Configure* and select *Device Name*.

Г

**Device Configuration** 

anfoss

Alexandra (	P manufacture and	e77ha626.10
ame of station:	nic50repns	e71
	☐ Store settings <u>t</u> emporary	

## 4.2 Enabling Network Control

ΝΟΤΙΟΕ
If the reset input is active, the soft starter does not operate. If a reset switch is not required, use parameter 7-9 to set the reset
input to normally open or fit a link across terminals RESET, COM+ on the soft starter.

#### Procedure

1. Set parameter 1-1 Command Source to Network for the soft starter to accept commands from the PROFINET Card.

### 4.3 On-board Web Server

#### 4.3.1 Connect to the Device

To configure settings using the on-board web server, the PROFINET Card must be installed in a soft starter, control power must be available, and the card and computer must both be connected to the Ethernet network.

The computer must use a fixed IP address (not DHCP) and the same subnet mask as the card. The default IP address for the card is 192.168.0.2. The default subnet mask is 255.255.255.0.

Retwork Connections	
GO 🖉 • Control Panel • Network and Internet • Network Connections •	👻 🌠 Search Network Connections 😰
Organize 💌 Disable this network device Diagnose this connection Rename this connection View status	
Local Area Connection       Intervention         Provide Scale       Networking         Retworking       Connect using         Intel® PRO/1000 MT Network       Connection         Intel® PRO/1000 MT Network       Configure         This connection uses the following items:       Configure         Intel® PRO/1000 MT Networks       Configure         Intel® PRO/1000 MT Networks       Configure         Interve Protocol Version 6 (TCP/PV6)       Interve Protocol Version 6 (TCP/PV6)         Interve Protocol Version 6 (TCP/PV6)       Interve Protocol Version 6 (TCP/PV6)         Interve Protocol Version 6 (TCP/PV6)       Interve Protocol Version 6 (TCP/PV6)         Interve Protocol Version 6 (TCP/PV6)       Interve Protocol Version 6 (TCP/PV6)         Interve Protocol Version 6 (TCP/PV6)       Interve Protocol Version 6 (TCP/PV6)         Interve Protocol Version 6 (TCP/PV6)       Interve Protocol Version 6 (TCP/PV6)         Interve Protocol Version 6 (TCP/PV6)       Interve Protocol Version 6 (TCP/PV6)         Interve Protocol Version 6 (TCP/PV6)       Description         Torontiol Protocol Version 7 (Torontol Protocol The default wede area network, protocol The provides communication actors diverse interconnected networks.         OK       Cancel	Internet Protocol Version 4 (TCP/IPv4) Properties     2       General     1       You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.     C       C Qbtain an IP address automatically     C       Q Use the following IP address:     192.168.0.100       Sighnet mask:     255.255.255.0       Qefault gateway:

#### Once connected, the web server reports basic information about the card and the soft starter.

anfoss

**Device Configuration** 

	secure   192.168.0.2/	/home.htm			९ ☆ 8
	Secure   152.100.0.2/	nomeantin			~ ~ 0
					1
Home • IP Setting	Configuration	Administration *		Dan	toss
				0-	
Profinet Adap	ter with TCP/IP \$	Socket and IoT			
Configuration and diag	nostic information.				
Module Info	<u></u>	NetX-52 Info			
Parameter	Value	Parameter	Value		
Protocol	Profinet Adapter	Serial Number	37130		
Protocol Stack Version	V2.13.0.22	Production Date	2018-12-09T00:00:00Z		
Starter Name	MCD 600	Quality Assurance Date	2018-12-09T00:00:00Z		
Starter Serial Number	558601-027	Production Location			
Starter Rating String	0024BP-V5-C-H	Mac Address	00:02:A2:50:F9:3A		
Starter Interface Version	V3.0				
	V3.0				
Starter Motor Version					

## 4.3.2 Manage Users and Passwords

ΝΟΤΙΟΕ

For security reasons, define a custom administrator ID and password. The default username and password are:

- Username: danfoss\_admin
- Password: danfoss\_admin



Version 2.x of the PROFINET Card does not support custom users.

The PROFINET Card supports multiple users and levels of privilege.

- Users can view the home screen and IP settings.
- Supervisors can view the home screen and IP settings, and they can change configuration settings.
- Administrators can view the home screen, change configuration settings, and add or delete users.

Danfoss

## 4.3.2.1 Adding a User

Home X	+				-		×
← → C ▲ Not secure   192	2.168.0.2/home.htm?pageId=UserPassword	IManagement		0-	9 Q ☆	0	275-2008 10
Home • IP Setting • Configur	ation * Administration *			Dan	foss		
User name admin	Administrator		Supervisor	User			I
Create new user Delete user	Create new user	×		6 Save cha	inges		L
	All fields are required. Name						L
	Bassword						ł
	Retype Password						
	Create an account Can	cel					

#### Procedure

- 1. Connect to the web server and click *Administration*.
- 2. Click Create new user.
- 3. Enter the new username and password.
- 4. Click Create an account.
- 5. Set privileges (user, supervisor, administrator) as appropriate.
- 6. Click Save changes.

#### 4.3.2.2 Deleting a User

#### Procedure

- 1. Connect to the web server and click Administration.
- 2. Select the required entry in the user list and click *Delete*.
- 3. Click *Delete* again to confirm the action.

### 4.3.3 Configure IoT Settings

The PROFINET Card supports soft starter status monitoring via IoT. The card cannot control or program the soft starter.



## 4.3.3.1 Configuring MQTT Settings

C Not secure 192.168.0.2/home.htm?pageld=MQTTBroker								× (+	Home
MQTT Client         MQTT Client         Component Info         Origination         Parameter       Value         Client ID       T         Broker address       192:188.0.100       Broker port [1883         Flags       Clean session @ Reliable Will Prefix will @ Secure Verify Certificate @         Viiit oprefix       Port4000         Will topic         Connection Timeout (s)       10         Connection Timeout (s)       10         Connection Timeout (s)       0	Θ	☆	Q			er	2/home.htm?pageId=MQTTBrol	① Not secure   192.168.0.	$\rightarrow$ G
MQTT Client       MQTT Client       NQTT Client         Component info       Parameter       Value         Client ID       1         Broker address       192:198.0.100       Broker port 1883         Flags       Clean session @ Reliable       Will @ Prefix will @ Secure @ Verify Certificate @         User name	_	_	_						
MQTT Client       MQTT Client       MQTT Client       Value         Connection       Parameter       Value         Client ID       1         Broker address       192:188.0.100       Broker port 1883         Flags       Clean session @ Reliable       Will         User name       Viller       Viller         Password       Vill topic       Connection Timeout (s)       10         Connection Timeout (s)       0       0       0									
MQTT Client       MQTT Client - Connection Configuration         Component info       Parameter       Value         Client ID       1         Broker address       192/188.0.100       Broker port 1883         Flags       Clean session @ Reliable Will Prefix will @ Secure Verify Certificate           Topic prefix       Port4000         User name		)	033	Dante			Administration <	IP Setting      Configuration	Home 🔻
MQTT Client       Parameter       Value         Component Info       Client ID       1         Connection       If 2:188.0.100       Broker port 1883         Flags       Clean session @ Reliable Will Prefix will @ Secure Verify Certificate =         Topic prefix       Port4000         User name		1	_	Jung					
Parameter       Value         Commention       E         Connection       E         Broker address       192/188.0.100       Broker port 1883         Flags       Clean session © Reliable @ Will @ Prefix will © Secure @ Verify Certificate @         Topic prefix       Pon4000         User name       Connection Timeout (s)       10         Connection Idle timeout (s)       0       10								Client	MQTT
Client ID [ Client						figuration	MQTT Client - Connection Cor	MQTT Client	2- 🚞 M0
Actions     Broker address     102:108.0.100   Broker port[1883]     Flags     Clean session @ Reliable     Will Opic     Void opic     Connection Timeout (s)   10     Connection Idle timeout (s)					Value		Parameter		
Broker address     192:188.0.100     Broker port [1883       Flags     Clean session © Reliable Will Prefix will © Secure Verify Certificate C       Topic prefix     Port4000       User name     C       Password     C       Will topic     C       Connection Timeout (s)     10       Connection idle timeout (s)     0						1	Client ID		
Topic prefix     Port4000       User name				port 1883	Broker p	192.168.0.100	Broker address	Actions	
User name				Verify Certificate	fill 📄 Prefix will 🗹 Secure 🗌	Clean session 🗹 Reliable 🗌 Will 🗌	Flags		
Password						Port4000	Topic prefix		
Will topic     Image: Connection Timeout (s)       Connection Idle timeout (s)     0							User name		
Connection Timeout (s)     To       Connection idle timeout (s)     0			_				Password		
Connection idle timeout (s)							Will topic		
						10	Connection Timeout (s)		
MQTT keep alive interval (s) 20						0	Connection idle timeout (s)		
						30	MQTT keep alive interval (s)		
			-	_					
Reload Sub	ubmit	S		Reload					

#### Procedure

- 1. Connect to the web server and click *Configuration*.
- 2. Select MQTT Client.
- 3. Tick the *Enable* checkbox to enable MQTT client operation.

The MQTT client is enabled by default.

- 4. Click *Connection* and configure the settings as required.
- 5. Click Connections ⇒ Actions to select which information the card should publish.
- 6. Click *Submit* to save all settings in the card.

<u>Danfoss</u>

## 4.3.3.2 Configuring OPC UA Settings

Home • IP Setting • • Configuration	n • Administration •	Danfoss
OPC UA Server		
2- 🚔 OPC UA Server	OPC UA Server - Configuration	
Gerver Info     Server Configuration	Parameter	Value
Actions	Server port	100
	Maximum allowed nodes	2000
	Maximum sessions	2
	Maximum session lifetime (ms)	1200000
	OPC UA trace output IP	
	Options	Allow anonymous 🗹 Allow User/Password access 🗹 Support Authorization 🗌
	UA services	Write service 🔽
		Reload Submit

Procedure

- 1. Connect to the web server and click *Configuration*.
- 2. Select OPC UA Server.
- 3. Tick the *Enable* checkbox to enable OPC UA client operation.

The OPC UA client is enabled by default.

- 4. Click Server Configuration and configure the settings as required.
- 5. Select Actions to select the actions for different object instances.
- 6. Click Submit to save all settings in the card.

### 4.4 Master Configuration

Import the latest GDSML file into the Master configuration tool. This file is available from the website. SSPM\_N.bmp indicates normal mode. SSPM\_D.bnp indicates diagnostic mode.

Danfoss

## **5 Operation**

### 5.1 Requirements for Successful Operation

The device has been designed for use in a system complying with the PROFINET standard. For successful operation, the controller must also support all functions and interfaces described in this manual.

### 5.2 Device Classification

The PROFINET Card is a PROFINET I/O-device and must be managed by an I/O-controller over Ethernet.

### 5.3 Ensuring Safe and Successful Control

Data written to the device remains in its registers until the data is overwritten or the device is reinitialized. If the soft starter is controlled via *parameter 7-1 Command Override* or is disabled via the reset input (terminals RESET, COM+), fieldbus commands should be cleared from the registers. If a command is not cleared, it is re-sent to the soft starter once fieldbus control resumes.

## 5.4 Feedback LEDs



LED name	LED state	Description
Power	Off	The device is not powered up.
	On	The device is receiving power.
Error	Off	No error.
	Flashing	Connection not established.
	On	No physical link or slow physical link. No configuration.
Status	Off	No error.
	Flashing	DCP signal service initiated via the bus.
Link x	Off	No network connection.
	On	Connected to a network.
TX/RX x	Flashing	Transmitting or receiving data.

#### Table 2: LED Descriptions

Danfoss

## **6 Packet Structures**

## 6.1 Important Information

ΝΟΤΙΟΕ

The available features and parameter details may vary according to the model and software version of the soft starter. Refer to the VLT<sup>®</sup> Soft Starter MCD 600 Operating Guide for details of parameters and supported features.

## 6.2 Control Commands (Controller to Device)

Use output bytes 0–1 to send a control command to the soft starter.

#### Table 3: Control Command Bits

Byte	Bits	Details			
0	0–1	Reserved.			
	2–3	<ul> <li>0 = Use soft starter remote input to select motor set.</li> <li>1 = Use primary motor set when starting.</li> <li>2 = Use secondary motor set when starting.</li> <li>3 = Reserved.</li> </ul>			
	4	0 = Stop action as selected in the soft starter. 1 = Stop action will be a coast to stop.			
	5–7	Reserved.			
1	0	0 = Stop. 1 = Start.			
	1–2	Reserved.			
	3	1 = Reset.			
	4–7	Reserved.			
2–5		Parameter management.			

## 6.3 Status Information (Device to Controller)

Soft starter status information is always available when the device is active.

## ΝΟΤΙΟΕ

For models MCD6-0063B and smaller, current reported via communications is 10 times greater than the actual value (shown on the LCP).

## 6.3.1 Bytes 0–1: Control Status

Bits	Details
0–5	Current (% of motor FLC)
6	Command source 0 = Network, timer 1 = Remote LCP, digital input, clock
7	1 = Ramping (starting or stopping)
8	1 = Ready

#### **PROFINET Card**

## Installation Guide

Danfoss

## **Packet Structures**

Bits	Details
9	1 = Starting, running, or stopping
10	1 = Tripped
11	1 = Warning
12–15	Reserved

## 6.3.2 Bytes 2–3: Starter State

Bits	Details
0–3	The decimal value of bits 0–3 indicates the state of the soft starter:
	0 = Communication error between device and soft starter.
	1 = Ready.
	2 = Starting.
	3 = Running.
	4 = Stopping.
	5 = Not ready (restart delay, restart temperature check, run simulation, reset input is open).
	6 = Tripped.
	7 = Menu open (cannot start)
	8 = Jog forward.
	9 = Jog reverse.
4	0 = Negative phase sequence.
	1 = Positive phase sequence.
5	1 = Current exceeds FLC.
6	0 = Uninitialized.
	1 = Initialized.
7	1 = Communication error between device and soft starter.
8–15	Reserved.

## 6.3.3 Bytes 4-5: Trip Code

Bits	Details
0–15	See the chapter Trip Codes.

## 6.3.4 Bytes 6–7: Motor Current

Bits	Details
0–15	Average rms current across all 3 phases.

## 6.3.5 Bytes 8–9: Motor Temperature

Bits	5	Details
0–1	5	Motor thermal model (%)

Danfoss

Packet Structures

## 6.3.6 Bytes 10–63: Extended Information

Table 4: Information from Internal Registers of the Soft Starter

Byte	Description	Bits	Details
10–11	Version	0–8	Reserved.
		9–15	Product type code: 15 = MCD 600.
12–13	Model number	0–7	Reserved.
		8–15	Soft starter model ID.
14–15	Reserved		
16–17	Reserved		
18–19	Starter state	0-4	<ul> <li>0 = Reserved.</li> <li>1 = Ready.</li> <li>2 = Starting.</li> <li>3 = Running.</li> <li>4 = Stopping.</li> <li>5 = Not ready (restart delay, restart temperature check, run simulation, reset input is open).</li> <li>6 = Tripped.</li> <li>7 = Programming mode.</li> <li>8 = Jog forward.</li> <li>9 = Jog reverse.</li> <li>1 = Warning.</li> </ul>
		6	0 = Uninitialized. 1 = Initialized.
		7	Command source: 0 = Network, timer. 1 = Remote LCP, digital input, clock.
		8	Reserved.
		9	0 = Negative phase sequence. 1 = Positive phase sequence.
		10–15	Reserved.
20–21	Current	0–13	Average rms current across all 3 phases.
		14–15	Reserved.
22–23	Current	0–9	Current (% motor FLC).
		10–15	Reserved.
24–25	Motor temperature	0–7	Motor thermal model (%).
		8–15	Reserved.
26–27	Reserved		

**Packet Structures** 

Byte	Description	Bits	Details
28–29	% Power factor	0–7	100% = power factor of 1.
		8–15	Reserved.
30–31	Voltage	0–13	Average rms voltage across all 3 phases.
		14–15	Reserved.
32–33	Current	0–13	Phase 1 current (rms).
		14–15	Reserved.
34–35	Current	0–13	Phase 2 current (rms).
		14–15	Reserved.
36–37	Current	0–13	Phase 3 current (rms).
		14–15	Reserved.
38–39	Voltage	0–13	Phase 1 voltage (rms).
		14–15	Reserved.
40–41	Voltage	0–13	Phase 2 voltage (rms).
		14–15	Reserved.
42–43	Voltage	0–13	Phase 3 voltage (rms).
		14–15	Reserved.
44–45	Parameter list version number	0–7	Parameter list minor version.
		8–15	Parameter list major version.
46–47	Digital input state		For all inputs, 0 = open, 1 = closed (shorted).
		0	Start/stop.
		1	Reserved.
		2	Reset <sup>0</sup> .
		3	Input A.
		4	Input B.
		5–15	Reserved.
48–49	Trip code	0–15	See the chapter Trip Codes.
50–59	Reserved		
60–63	Parameter management		See the chapter Parameter Management.

## 6.4 Parameter Management

The PROFINET Card can read parameter values from and write parameter values to the soft starter. The card handles 1 parameter at a time.

The device references parameters according to their position in the soft starter parameter list. Parameter number 1 corresponds to *parameter 1-1 Command Source*. Refer to the VLT<sup>®</sup> Soft Starter MCD 600 Operating Guide for details of the soft starter parameters.



<u>Danfoss</u>

## **Packet Structures**

## 🛦 C A U T I O N 🛦

#### UNPREDICTABLE BEHAVIOR

Changing the values of the parameters in *parameter group 20 Advanced Parameters* may cause unpredictable behavior in the soft starter.

- Consult the local supplier before adjusting the Advanced Parameters.

## 6.4.1 Output

Use output bytes 2–5 to read or write a parameter to the soft starter. Controller $\Rightarrow$ Device output bytes are structured as follows:

#### Table 5: Output Byte Details

Byte	Bits	Details	
2	0–7	Parameter number to read/write	
3	0	Reserved	
	1	1 = Read parameter	
	2	1 = Write parameter	
	3–7	Reserved	
4	0–7	Low byte parameter value to write to the soft starter/0 data values for read	
5	0–7	High byte parameter value to write to the soft starter/0 data values for read	

## 6.4.2 Input

Parameter data from the soft starter is reported in bytes 60–63. Device  $\Rightarrow$  Controller input bytes are structured as follows.

#### Table 6: Input Byte Details

Byte	Bits	Details			
60	0-7	cho parameter number			
61	0	1 = Invalid parameter number			
	1	1 = Invalied parameter value			
	2–7	Reserved			
62	0–7	Low byte parameter value read from soft starter			
63	0–7	High byte parameter value read from soft starter			

## 6.5 Trip Codes

Code	Description
255	No trip
1	Excess start time
2	Motor overload
3	Motor thermistor
4	Current imbalance

#### **PROFINET Card**

## Installation Guide

Packet Structures

Code	Description
5	Frequency
6	Phase sequence
7	Overcurrent
8	Power loss
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	Communications card fault
16	Network communication
18	Overvoltage
19	Undervoltage
23	Parameter out of range
24	Input B trip
26	L1 phase loss
27	L2 phase loss
28	L3 phase loss
29	L1-T1 shorted
30	L2-T2 shorted
31	L3-T3 shorted
33	Time-overcurrent (bypass overload)
34	SCR overtemperature
35	Battery/clock
36	Thermistor circuit
47	Overpower
48	Underpower
56	LCP disconnected
57	Zero speed detect
58	SCR Itsm
59	Instantaneous overcurrent



Packet Structures

<u>Danfoss</u>

Code	Description
60	Rating capacity
70	Current Read Err L1
71	Current Read Err L2
72	Current Read Err L3
74	Motor connection T1
75	Motor connection T2
76	Motor connection T3
77	Firing fail P1
78	Firing fail P2
79	Firing fail P3
80	VZC fail P1
81	VZC fail P2
82	VZC fail P3
83	Low control volts
84–96	Internal fault x. Contact the local supplier with the fault code (x).

## 6.6 Examples

## 6.6.1 Control Commands (Controller to Device)

#### Table 7: Start the Motor Using Parameter Set 1

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
4	1						

#### Table 8: Start the Motor, Select via Remote Input

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0	1						

Table 9: Stop the Motor Using the Programmed Soft Stop for Motor Set 2

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
8	0						

#### Table 10: Quick Stop the Motor

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
16	0						

## PROFINET Card

## Installation Guide



#### Table 11: Reset a Trip

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
≤28	8						

## 6.6.2 Status Information (Device to Controller)

#### Table 12: Read Control Status - Ready

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0	1						

Table 13: Read Control Status - Running

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
		3	0				

Table 14: Read Control Status - Trip Code 4 (Current Imbalance)

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
		6	0	4	0		

## 6.6.3 Parameter Management

Table 15: Write Parameter to Soft Starter: Parameter Number 2, 1-2 Motor Full Load Current = 55

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
		2	4	55	0		

Table 16: Parameter Write Response

Byte 56	Byte 57	Byte 58	Byte 59	Byte 60	Byte 61	Byte 62	Byte 63
				2	0	55	0

Table 17: Read Parameter Number 16, 2-9 Stop Mode

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
		16	2	0	0		

Table 18: Parameter Read Response: Parameter 2-9 Stop Mode = 1 (TVR Soft Stop)

Byte 56	Byte 57	Byte 58	Byte 59	Byte 60	Byte 61	Byte 62	Byte 63
				16	0	1	0

Panfoss

## 7 Network Design

### 7.1 Star Topology

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

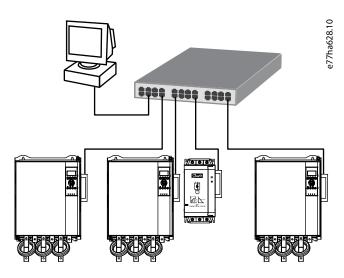


Illustration 2: Example of Star Topology

### 7.2 Line Topology

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

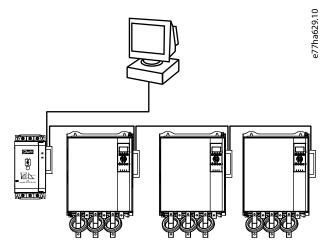


Illustration 3: Example of Line Topology



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.



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

Dantoss





Each connection adds a delay to the 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.

## 7.3 Ring Topology

In a ring topology network, the controller connects to the 1<sup>st</sup> card via a network switch. The 2<sup>nd</sup> Ethernet port of the card 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.

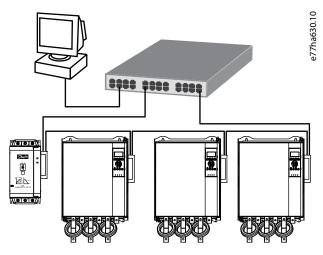


Illustration 4: Example of Ring Topology

## ΝΟΤΙΟΕ

The network switch must support loss of line detection.

## 7.4 Combined Topologies

A single network can include both star and line components.

<u>Danfoss</u>

Network Design

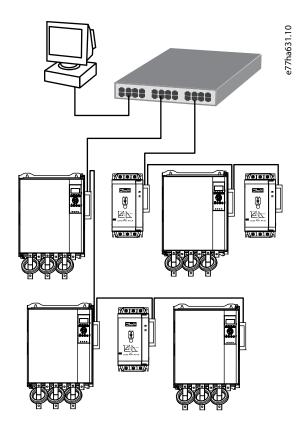


Illustration 5: Example of Combined Topologies



## Specifications

# 8 Specifications

81	Connections	
0.1	CONNECTIONS	

Soft starter	16-way pin assembly
Contacts	Gold flash
Network	RJ45
8.2 Settings	
IP address	Automatically assigned
Device name	Automatically assigned, configurable
8.3 Network	
Link speed	10 Mbps, 100 Mbps (auto-detect)
Full duplex	
Auto crossover	
8.4 Power	
Consumption (steady state, maximum)	35 mA@24 V DC
Reverse polarity protected	
Galvanically isolated	
8.5 Certification	
RCM	IEC 60947-4-2
CE	EN 60947-4-2
PROFIBUS & PROFINET International	



Danfoss

Specifications



ENGINEERING TOMORROW

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

Danfoss can accept no responsibility for possible errors in catalogs, 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 © 2020.12

AN353424578485en-000101 / 130R0947