

Installation Guide

# PROFIBUS Card

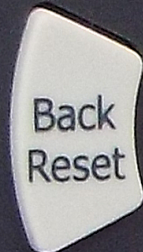
## VLT® Soft Starter MCD 600

READY

RUN

TRIP

LOCAL



VLT®

Soft Starter



## Contents

<b>1</b>	<b>Safety</b>	<b>4</b>
1.1	Disclaimer	4
1.2	Warnings	4
1.3	Important User Information	4
<b>2</b>	<b>Installation</b>	<b>5</b>
2.1	Installing the Expansion Card	5
2.2	Connecting to the Network	5
2.3	Feedback LEDs	6
<b>3</b>	<b>Configuration</b>	<b>7</b>
3.1	Preparations	7
3.2	PROFIBUS Address	7
3.3	Enabling Network Control	7
<b>4</b>	<b>Data Structures</b>	<b>8</b>
4.1	Operating Modes	8
4.2	Soft Starter Control I/O Data Structure	8
4.3	Soft Starter Monitoring I/O Data Structure	9
4.4	Soft Starter Programming I/O Data Structure	12
4.4.1	Outputs	12
4.4.2	Inputs	12
4.5	Trip Codes	14
<b>5</b>	<b>PROFIBUS Diagnostic Telegram and Flag</b>	<b>16</b>
5.1	Diagnostic Telegram Structure	16
5.1.1	PROFIBUS Trip Code	16
5.1.2	Changed Parameter Number	16
<b>6</b>	<b>Supported Modes</b>	<b>17</b>
6.1	PROFIBUS Freeze Mode	17
6.2	PROFIBUS Sync Mode	17
6.3	PROFIBUS Clear Mode	17
<b>7</b>	<b>Specifications</b>	<b>18</b>
7.1	Connections	18
7.2	Settings	18
7.3	Certification	18

# 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

### ⚠ WARNING ⚠

#### 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.

### ⚠ WARNING ⚠

#### 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.

## 1.3 Important User Information

Observe all necessary safety precautions when controlling the soft starter remotely. Alert personnel that machinery may start without warning.

The installer is responsible for following all instructions in this manual and for following correct electrical practice.

Use all internationally recognized standard practice for RS485 communication when installing and using this equipment.

## 2 Installation

### 2.1 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. Line up the card with the expansion port.
3. Gently push the card along the guide rails until it clicks into the soft starter.

#### Example:

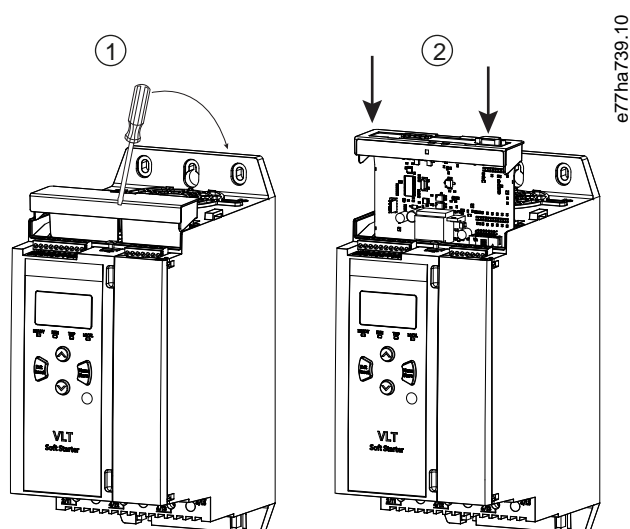


Illustration 1: Installation of the Expansion Cards

### 2.2 Connecting to the Network

#### Prerequisites:

The expansion card must be installed in the soft starter.

#### Procedure

1. Restore control power.
2. Connect field wiring via the DB9 plug.

#### Example:

Table 1: DB9 Connector

Pin number	Assignment
1	Shield
2	24 V DC negative (optional)

Pin number	Assignment
3	RxD/TxD-P
4	Not used
5	DGND
6	VP (end of bus slave only)
7	24 V DC positive (optional)
8	RxD/TxD/-N
9	DGND

## 2.3 Feedback LEDs

	Off	On
Power (red)	Device is not powered up.	Device is powered up and ready to go online.
Network (green)	No connection, offline or data exchange failure.	Device is online and in data exchange state.

### ⚠ NOTICE ⚠

If communication is inactive, the soft starter may trip on *Network Communications*. If *parameter 6-13 Network Communications* is set to *Soft Trip and Log* or *Trip Starter*, the soft starter requires a reset.

### ⚠ NOTICE ⚠

If communication fails between the device and the network, the Bus Status LED goes off. When communication is restored, the Bus Status LED turns back on.

## 3 Configuration

### 3.1 Preparations

Import the latest .gsd file in the Master configuration tool. This file is available from the supplier at [www.danfoss.com/en/service-and-support/downloads/dds/fieldbus-configuration-files/#tab-downloads](http://www.danfoss.com/en/service-and-support/downloads/dds/fieldbus-configuration-files/#tab-downloads).

If the Master uses on-screen icons, 2 graphic bitmap files are available from the website. SSPM\_N.bmp indicates normal mode. SSPM\_D.bmp indicates diagnostic mode.

### 3.2 PROFIBUS Address

Set the network address for the card via the soft starter (*parameter 12-7 PROFIBUS Address*). For details on how to configure the soft starter, see the VLT® Soft Starter MCD 600 Operating Guide.

#### ⚠ NOTICE ⚠

The PROFIBUS Card reads the network address from the soft starter when control power is applied. If parameters are changed in the soft starter, cycle control power for the new values to take effect.

### 3.3 Enabling Network Control

The soft starter only accepts commands from the PROFIBUS Card if *parameter 1-1 Command Source* is set to *Network*.

#### ⚠ NOTICE ⚠

If the reset input is active, the soft starter does not operate. If a reset switch is not required, fit a link across terminals RESET, COM+ on the soft starter.

If the PROFIBUS network fails, the device leaves data exchange mode after the network watchdog timeout period has expired. This timeout period is set at the Master configuration tool.

A Communication Timeout parameter in the GSD file sets how soon after this event the soft starter is forced into a trip state.

Adjust the Communication Timeout parameter in the GSD file to any setting from 0–100 s. The default setting is 10 s.

#### ⚠ NOTICE ⚠

If the Communication Timeout parameter is set to 0, the current state of the soft starter remains unchanged on a network failure. This gives the option of operating the soft starter via local control, but is NOT failsafe.

## 4 Data Structures

### 4.1 Operating Modes

The GSD file contains 3 operating modes, supporting data I/O structures as follows:

Data structure	Basic mode	Extended mode	Parameter upload/download mode
Soft Starter Control I/O Data Structure	✓	✓	✓
Soft Starter Monitoring I/O Data Structure	✗	✓	✓
Soft Starter Programming I/O Data Structure	✗	✗	✓

The basic mode allows starting and stopping the soft starter and reading limited information on operating status.

The extended mode defines more bytes allowing to read soft starter operating data such as actual motor current and motor temperature.

The parameter upload/download mode allows reading and writing soft starter parameter values.

### 4.2 Soft Starter Control I/O Data Structure

Table 2: Master/Slave Control Word Structure

Byte	Bits	Details
0	0-1	Reserved
	2-3	0=Use soft starter remote input to select motor set 1=Use primary motor set when starting 2=Use secondary motor set when starting 4=Reserved
	4	0=Stop action is a soft stop (as selected on the soft starter) 1=Stop action is a quick stop (coast to stop)
	5-7	Reserved
1	0	0=Stop 1=Start
	1-2	Reserved
	3	1=Reset
	4-7	Reserved

#### ⚠ NOTICE ⚠

Bit 4 of byte 0 must be set to 0 for the soft starter to start.



Table 3: Master/Slave Status Word Structure

Byte	Bits	Details
0	0–5	Motor current (%FLC) <sup>(1)</sup>
	6	Command source 0=Remote LCP, digital input, clock 1=Network
	7	1=Ramping (starting or stopping)
1	0	1=Ready
	1	1=Starting, running, or stopping
	2	1=Tripped
	3	1=Warning
	4–7	Reserved

<sup>1</sup> Motor current (%FLC) shows current as a percentage of the set motor full load current. A value of 63 represents 200% full load current. To convert this value to a readable percentage, divide by 0.315. For models MCD6-0063B and smaller, this value is 10 times greater than the value shown on the LCP.

### 4.3 Soft Starter Monitoring I/O Data Structure

Table 4: Structure of Master/Slave Output Bytes Structure

<b>Byte 2</b>
Operating data request (data request numbers 1–16)

Table 5: Structure of Master/Slave Input Bytes in Response to an Operating Data Request

Byte	Bit
<b>Byte 2</b>	
Echo data request number	
<b>Byte 3</b>	
Bits 7–1 Reserved	Bit 0=1: Invalid data request number
<b>Byte 4</b>	
Data value (high byte)	
<b>Byte 5</b>	
Data value (low byte)	

**⚠ NOTICE ⚠**

An invalid data request number results in the invalid data request number bit being set to 1.

**Table 6: Definition of Data Values**

Data request number	Description	Bits	Details
0	Reserved		
1	Production information	0-7	Reserved
		8-15	Product type code: 15=MCD 600
2	Starter state	0-3	1=Ready
			2=Starting
			3=Running
			4=Stopping (including braking)
			5=Not ready (restart delay, restart temperature check, run simulation, reset input open)
			6=Tripped
			7=Programming mode
		8=Jog forward	
4	0=Negative phase sequence 1=Positive phase sequence (only valid if bit 6 = 1)		
		5	1=Current exceeds FLC
6	0=Uninitialized 1=Initialized		
		7	1=Communication error between device and soft starter
8-15	See <a href="#">4.5 Trip Codes</a>		
3	Motor current	0-7	Average rms current across all phases (low byte)
		8-15	Average rms current across all 3 phases (high byte)
4	Motor temperature	0-7	Motor thermal model (%)
		8-15	Reserved
5	% Power factor	0-7	100% = power factor of 1
		8-15	Reserved

Data request number	Description	Bits	Details
6	Power (kW)	0–11	Power
		12–15	Power scale 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	Power (kVA)	0–11	Power
		12–15	Power scale 0=Multiply power by 10 to get VA 1=Multiply power by 100 to get VA 2=Power (kVA) 3=Multiply power by 10 to get kVA
8	Voltage	0–13	Average rms voltage across all 3 phases
		14–15	Reserved
9	Current	0–13	Phase 1 current (rms)
		14–15	Reserved
10	Current	0–13	Phase 2 current (rms)
		14–15	Reserved
11	Current	0–13	Phase 3 current (rms)
		14–15	Reserved
12	Voltage	0–13	Phase 1 voltage
		14–15	Reserved
13	Voltage	0–13	Phase 2 voltage
		14–15	Reserved
14	Voltage	0–13	Phase 3 voltage
		14–15	Reserved
15	Version	0–7	Software minor version number
		8–15	Software major version number

Data request number	Description	Bits	Details
16	Digital input state		For all inputs, 0=open, 1=closed (shorted)
		0	Start/stop
		1	Reserved
		2	Reset
		3	Input A
		4	Input B
		5–15	Reserved

## 4.4 Soft Starter Programming I/O Data Structure

The soft starter programming I/O data structure allows uploading (reading) and downloading (writing) starter parameter values across the network.

### ⚠ NOTICE ⚠

Do not change the default values of the advanced parameters (*parameter group 20-\*\* Advanced Parameters*). Changing these values may cause unpredictable behavior in the soft starter.

### 4.4.1 Outputs

**Table 7: Structure of Master/Slave Output Bytes**

Byte	Bits	Details
3	0–7	Parameter number to read/write
4	0	Reserved
	1	1=Read parameter
	2	1=Write parameter
	3–7	Reserved
5	0–7	High byte parameter value to write to soft starter/0 data values for read
6	0–7	Low byte parameter value to write to soft starter/0 data values for read

### 4.4.2 Inputs

**Table 8: Structure of Master/Slave Input Bytes**

Byte	Bits	Details
6	0–7	Echo parameter number

Byte	Bits	Details
7	0	1=Invalid parameter number
	1	1=Invalid parameter value
	2-7	Reserved
8	0-7	High byte parameter value read from soft starter
9	0-7	Low byte parameter value read from soft starter

## 4.5 Trip Codes

Code	Description
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
9	Undercurrent
10	Heatsink 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	Forced network trip
17	Internal fault
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)

Code	Description
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
60	Rating capacity
70	Current read err L1
71	Current read err L2
72	Current read err L3
73	Remove mains volts (mains voltage connected in run simulation)
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).

## 5 PROFIBUS Diagnostic Telegram and Flag

### 5.1 Diagnostic Telegram Structure

The PROFIBUS Card supports external diagnostics. The following telegram is sent to the Master if the soft starter trips or if a parameter is changed at the soft starter.

Byte	Detail
0	User diagnostic length (always set = 3)
1	Trip code
2	Changed parameter number

#### 5.1.1 PROFIBUS Trip Code

When the soft starter trips, a diagnostic flag is set at the Master and the trip code is reported in byte 1. When the soft starter is reset, the diagnostic flag and trip code data are reset = 0, if the trip condition does not still exist (see [4.5 Trip Codes](#)).

#### 5.1.2 Changed Parameter Number

If a parameter number is changed via the LCP, the affected parameter number is reported in byte 2. When the Master reads or writes the changed parameter, byte 2 is reset = 0.

A changed parameter number does not set a diagnostic flag.



## 6 Supported Modes

### 6.1 PROFIBUS Freeze Mode

In Freeze Mode, inputs are only updated with new data from the soft starter when another Freeze action is carried out. An unfreeze action returns the device to normal operation.

### 6.2 PROFIBUS Sync Mode

In Sync Mode, commands to the soft starter are not processed until another sync action is carried out. An unsync action returns the device to normal operation.

### 6.3 PROFIBUS Clear Mode

If the Master sends a global clear command, the device sends a quick stop command to the soft starter.

## 7 Specifications

### 7.1 Connections

Soft starter	6-way pin assembly
Network	5-way male and unpluggable female connector (supplied)
Maximum cable size	2.5 mm <sup>2</sup> (14 AWG)

### 7.2 Settings

Address range	1–125
Data rate (bps)	9.6 kb/s–12.0 Mb/s (auto-detect)

### 7.3 Certification

RCM	IEC 60947-4-2
CE	EN 60947-4-2
RoHS	Compliant with EU Directive 2011/65/EU



Illustration 2: PROFIBUS International

## Index

<b>B</b>	
Basic mode .....	8
<b>C</b>	
Control word structure .....	8
<b>D</b>	
Data structure	
Output .....	12
Input .....	12
DB9 plug .....	5
Diagnostic flag .....	16, 16
<b>E</b>	
Expansion card .....	5
Expansion port cover .....	5
Extended mode .....	8
<b>P</b>	
Parameter upload/download mode .....	8
<b>T</b>	
Telegram .....	16
Tools	
Flat-bladed screwdriver .....	5





ENGINEERING  
TOMORROW

*Danfoss*

.....  
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

