Danfoss MCD 600 VLT Soft Starter Installation Guide

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Danfoss MCD 600 VLT Soft Starter

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PROFIBUS Diagnostic Telegram and Flag

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FAQ

- **Q: Can I install the expansion card while the soft starter is powered?**
  A: No, ensure the soft starter is isolated from mains voltage before installing or removing accessories.
- **Q: How do I set the PROFIBUS address?**
  A: Refer to the manual for instructions on setting the PROFIBUS address based on your network configuration.

Installation Guide
PROFIBUS Card
VLT® Soft Starter MCD 600

Safety

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.
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.

3. **Important User Information**
   - Observe all necessary safety precautions when controlling the soft starter remotely. Alert personnel that machinery may start with-out 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.

Installation

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

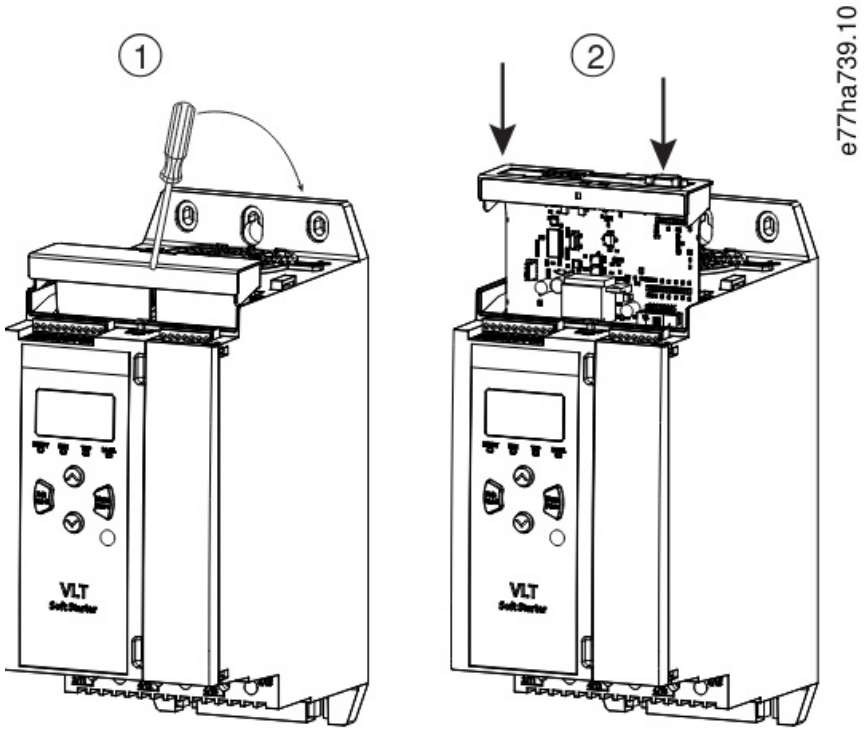

Illustration 1: Installation of the Expansion Cards

Connecting to the Network

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)
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

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.

Configuration

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**.
   - 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.
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.

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.

Data Structures

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

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)[1]
	6	• Command source • 0=Remote LCP, digital input, clock 1=Network
	7	1=Ramping (starting or stopping)

Byte	Bits	Details
1	0	1=Ready
	1	1=Starting, running, or stopping
	2	1=Tripped
	3	1=Warning
	4–7	Reserved

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.

Soft Starter Monitoring I/O Data Structure
Table 4: Structure of Master/Slave Output Bytes Structure

Byte 2
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
Byte 2	
Echo data request number	
Byte 3	
Bits 7–1 Reserved	Bit 0=1: Invalid data request number
Byte 4	
Data value (high byte)	
Byte 5	
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	Productio informatio n	0–7	Reserved
		8–15	• Product type code: • 15=MCD 600
2	Starter state	0–3	1=Ready 2=Starting 3=Running

Data request number	Description	Bits	Details
			• 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 • 9=Jog reverse
		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 4.5 Trip Codes
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
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)

Data request number	Description	Bits	Details
		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	Parameter minor version number
		8–15	Parameter major version number
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

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 val-ues may cause unpredictable behavior in the soft starter.

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

Byte	Bits	Details
	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

Inputs

Table 8: Structure of Master/Slave Input Bytes

Byte	Bits	Details
6	0–7	Echo parameter number
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

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

Code	Description
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
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

Code	**Description**
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).

PROFIBUS Diagnostic Telegram and Flag

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

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).
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.

Supported Modes

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.
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.
3. **PROFIBUS Clear Mode**
   If the Master sends a global clear command, the device sends a quick stop command to the soft starter.

Specifications

1. **Connections**
   - Soft starter 6-way pin assembly
   - Network 5-way male and unpluggable female connector (supplied)
   - Maximum cable size 2.5 mm2 (14 AWG)
2. **Settings**
   - Address range 1–125
   - Data rate (bps) 9.6 kb/s–12.0 Mb/s (auto-detect)
3. **Certification**
   - RCM IEC 60947-4-2
   - CE EN 60947-4-2
   - RoHS Compliant with EU Directive 2011/65/EU

Illustration 2: PROFIBUS International

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

	**Danfoss MCD 600 VLT Soft Starter** [pdf] Installation Guide MCD 600 VLT Soft Starter, MCD 600, VLT Soft Starter, Soft Starter, Starter

References

- **Global AC drive manufacturer - Danfoss Drives | Danfoss**

- **User Manual**