10 Troubleshooting

When a protection condition is detected, the VLT® Soft Starter MCD 500 writes this condition to the event log and may also trip or issue a warning. The soft starter response depends on the protection action settings (*parameter group 16 Protection Actions*).

Some protection responses cannot be adjusted. Usually, external events (for example phase loss) or a fault within the soft starter cause these trips. These trips do not have associated parameters and cannot be set to *Warn* or *Log*.

If the soft starter trips:

1. Identify and clear the condition that triggered the trip.

2. Reset the soft starter.

3. Restart the soft starter.

To reset the soft starter, press [Reset] or activate the *Reset remote* input.

If the soft starter has issued a warning, it resets itself when the cause of the warning has been resolved.

10.1 Trip Messages

Table 10.1 lists the protection mechanisms in the soft starter and the probable cause of the trip. Some of these protection mechanisms can be adjusted using *parameter group 2 Protection* and *parameter group 16 Protection Action*. Other settings are built-in system protections and cannot be set or adjusted.

Display	Possible cause/suggested solution
Awaiting data	The LCP does not receive data from the control PCB. Check the cable connection and the fitting of the display on the soft starter.
Battery/clock	A verification error has occurred on the real-time clock, or the back-up battery voltage is low. If the battery is low and the power is off, date/time settings are lost. Reprogram the date and time. Related parameter: • *Parameter 16-12 Battery Clock*.
Controller	Name selected for a programmable input. Refer to *Input A trip*.
Current imbalance	Problems with the motor, the environment, or the installation can cause current imbalance, such as: • An imbalance in the incoming mains voltage. • A problem with the motor windings. • A light load on the motor. • A phase loss on mains terminals L1, L2, or L3 during run mode. An SCR that has failed open circuit. A failed SCR can only be diagnosed accurately by replacing the SCR and checking the soft starter performance. Related parameters: • *Parameter 2-2 Current Imbalance*. • *Parameter 2-3 Current Imbalance Delay*. • *Parameter 16-2 Current Imbalance*.
Current read err lx	Where X is 1, 2, or 3. Internal fault (PCB fault). The output from the current transformer circuit is not close enough to 0 when the SCRs are turned off. Contact the local Danfoss supplier for advice. This trip is not adjustable. Related parameters: None.

10

Display	Possible cause/suggested solution
Excess start time	Excess start time trip can occur under the following conditions: • *Parameter 1-1 Motor FLC* is not appropriate for the motor. • *Parameter 1-4 Current Limit* has been set too low. • *Parameter 1-6 Start Ramp Time* has been set higher than the setting in *parameter 1-9 Excess Start Time Setting*. • *Parameter 1-6 Start Ramp Time* is set too short for a high inertia load when using adaptive control. Related parameters: • *Parameter 1-1 Motor FLC.* • *Parameter 1-4 Current Limit.* • *Parameter 1-6 Start Ramp Time.* • *Parameter 1-9 Excess Start Time.* • *Parameter 7-1 Motor FLC-2.* • *Parameter 7-4 Current Limit-2.* • *Parameter 7-6 Start Ramp-2.* • *Parameter 7-9 Excess Strt Time-2.* • *Parameter 16-7 Excess Start Time.*
Firing fails px	Where X is phase 1, 2, or 3. The SCR did not fire as expected. Check for faulty SCRs and internal wiring faults. This trip is not adjustable. Related parameters: None.
FLC too high	The soft starter can support higher motor full load current values when connected to the motor using inside delta configuration rather than in-line connection. If the soft starter is connected in-line, but the programmed setting for *parameter 1-1 Motor FLC* exceeds the in-line maximum, the soft starter trips at start (see *chapter 4.5 Minimum and Maximum Current Settings*). If the soft starter is connected to the motor using inside delta configuration, check that the soft starter detects the connection correctly. Contact the local Danfoss supplier for advice. Related parameters: • *Parameter 1-1 Motor FLC.* • *Parameter 7-1 Motor FLC-2.*
Frequency	The mains frequency is outside of the specified range. Check for other equipment in the area that could be affecting the mains supply, particularly frequency converters and switch mode power supplies (SMPS). If the soft starter is connected to a generator-set supply, the generator may be too small or could have a speed control problem. Related parameters: • *Parameter 2-8 Frequency Check.* • *Parameter 2-9 Frequency Variation.* • *Parameter 2-10 Frequency Delay.* • *Parameter 16-5 Frequency.*
Heat sink overtemp	Check that cooling fans are operating. If mounted in an enclosure, check if ventilation is adequate. Fans operate during start, run, and for 10 minutes after the soft starter exits the stop state. **NOTICE** **Models MCD5-0021B ~ MCD4-0053B and MCD5-0141B do not have a cooling fan.** **Models with fans operate the cooling fans from a start until 10 minutes after a stop.** Related parameters: • *Parameter 16-6 Heat sink Overtemp.*

10

Display	Possible cause/suggested solution
High level	Name selected for a programmable input. Refer to *Input A trip*.
High pressure	Name selected for a programmable input. Refer to *Input A trip*.
Input A trip	The programmable input is set to a trip function and has activated. Resolve the trigger condition. Related parameters: • *Parameter 3-3 Input A Function*. • *Parameter 3-4 Input A Name*. • *Parameter 3-5 Input A Trip*. • *Parameter 3-6 Input A Trip Delay*. • *Parameter 3-7 Input A Initial Delay*. • *Parameter 16-8 Input A Trip*.
Instant overcurrent	There has been a sharp rise in motor current, probably caused by a locked rotor condition (shear pin) while running. Check for a jammed load. Related parameters: • *Parameter 2-6 Instantaneous Overcurrent*. • *Parameter 2-7 Instantaneous Overcurrent Delay*. • *Parameter 16-4 Inst Overcurrent*.
Internal fault X	The soft starter has tripped on an internal fault. Contact the local Danfoss supplier with the fault code (X). Related parameters: None.
L1 phase loss L2 phase loss L3 phase loss	During prestart, check that the soft starter has detected a phase loss as indicated. In run state, the soft starter has detected that the current on the affected phase has dropped below 3.3% of the programmed motor FLC for more than 1 s. This current drop indicates that either the incoming phase or connection to the motor has been lost. For the soft starter and the motor, check; • The supply connections. • The input connections. • The output connections. A failed SCR can also cause phase loss, particularly an SCR that has failed open circuit. A failed SCR can only be diagnosed accurately by replacing the SCR and checking the soft starter performance. Related parameters: None.
L1-T1 shorted L2-T2 shorted L3-T3 shorted	During prestart checks, the soft starter has detected a short-circuited SCR or a short circuit within the bypass contactor as indicated. Related parameters: None.
Low control volts	The soft starter has detected a drop in the control voltage. • Check the external control supply (terminals A4, A5, A6) and reset the soft starter. If the external control supply is stable: • Check if the 24 V supply on the main control PCB is faulty; or • Check if the bypass driver PCB is faulty (internally bypassed models only). This protection is not active in ready state. Related parameters: • *Parameter 16-13 Low Control Volts*.
Low level	Name selected for a programmable input. Refer to *Input A trip*.
Low pressure	Name selected for a programmable input. Refer to *Input A trip*.

10

Display	Possible cause/suggested solution
Motor overload/ Motor 2 overload	The motor has reached its maximum thermal capacity. The following can cause overload: • The soft starter protection settings do not match the motor thermal capacity. • Excessive starts per hour. • Excessive throughput. • Damage to the motor windings. Resolve the cause of the overload and allow the motor to cool. Related parameters: • *Parameter 1-1 Motor FLC*. • *Parameter 1-2 Locked Rotor Time*. • *Parameter 1-3 Start Mode*. • *Parameter 1-4 Current Limit*. • *Parameter 7-1 Motor FLC-2*. • *Parameter 7-2 Locked Rotor Time-2*. • *Parameter 7-3 Start Mode-2*. • *Parameter 7-4 Current Limit-2*. • *Parameter 16-1 Motor Overload*.
Motor connection tx	Where X is 1, 2, or 3. The motor is not connected correctly to the soft starter for in-line or inside delta use. • Check individual motor connections to the soft starter for power circuit continuity. • Check connections at the motor terminal box. This trip is not adjustable. Related parameters: • *Parameter 15-7 Motor Connection*.
Motor thermistor	The motor thermistor input has been enabled and: • The resistance at the thermistor input has exceeded 3.6 kΩ for more than 1 s. • The motor winding has overheated. Identify the cause of the overheating and allow the motor to cool before restarting. • The motor thermistor input has been opened. ## *NOTICE* **If a valid motor thermistor is no longer used, fit a 1.2 kΩ resistor across terminals 05 and 06.** Related parameters: • *Parameter 16-9 Motor Thermistor*.
Network communication (between module and network)	The network master has sent a trip command to the soft starter, or there could be a network communication problem. Check the network for causes of communication inactivity. Related parameters: • *Parameter 16-11 Network/Comms*.
No flow	Name selected for a programmable input. Refer to *Input A trip*.
Not ready	Check input A (terminals 11 and 16). Check if the soft starter disable function is active. If *parameter 3-3 Input A Function* is set to *Starter disable* and there is an open circuit on terminals 11 and 16, the soft starter does not start.

10

Display	Possible cause/suggested solution
Overpower	The motor has experienced a sharp rise in power. Causes can include a momentary overload condition which has exceeded the adjustable delay time. Related parameters: • 2U. • 2V. • 16P.
Parameter out of range	• A parameter value is outside the valid range. The soft starter loads the default value for all affected parameters. To go to the first invalid parameter and adjust the setting, press [Main Menu]. Related parameters: None.
Phase sequence	The phase sequence on the soft starter mains terminals (L1, L2, L3) is not valid. Check the phase sequence on L1, L2, and L3, and ensure that the setting in *parameter 2-1 Phase Sequence* is suitable for the installation. Related parameters: *Parameter 2-1 Phase Sequence*.
PLC	Name selected for a programmable input. Refer to *Input A trip*.
Power loss	The soft starter is not receiving mains supply on 1 or more phases when a start command is given. Check that the main contactor closes when a start command is given and remains closed until the end of a soft stop. If testing the soft starter with a small motor, it must draw at least 2% of its minimum FLC setting on each phase. Related parameters: None.
Pump fault	Name selected for a programmable input. Refer to *Input A trip*.
Starter/communication (between module and soft starter)	• There is a problem with the connection between the soft starter and the optional communications module. Remove and reinstall the module. If the problem persists, contact the local distributor. • There is an internal communication error within the soft starter. Contact the local distributor. Related parameters: • *Parameter 16-10 Starter/Comms*.
Starter disable	Name selected for a programmable input. Refer to *Input A trip*.
Thermistor cct (thermistor circuit)	The thermistor input has been enabled and: • The resistance at the input has dropped below 20 Ω (the cold resistance of most thermistors is above this value) or • A short circuit has occurred. Check and resolve this condition. Check that a PT100 (RTD) is not connected to terminals 05 and 06. Related parameters: None.
Time - overcurrent	The soft starter is internally bypassed and has drawn high current during running. (The 10 A protection curve trip has been reached, or the motor current has risen to 600% of the motor FLC setting.) Related parameters: None.
Undercurrent	The motor has experienced a sharp drop in current, caused by loss of load. Causes can include broken components (shafts, belts, or couplings) or a pump running dry. Related parameters: • *Parameter 2-4 Undercurrent*. • *Parameter 2-5 Undercurrent Delay*. • *Parameter 16-3 Undercurrent*.
Unsupported option (function not available in inside delta)	The selected function is not available (for example jog is not supported in inside delta configuration). Related parameters: None.
Vibration	Name selected for a programmable input. Refer to *Input A trip*.

10

Display	Possible cause/suggested solution
VZC fails px	Where X is 1, 2, or 3.
	Internal fault (PCB fault). Contact the local Danfoss supplier for advice.
	This trip is not adjustable.
	Related parameters: None.

Table 10.1 Trip Messages

10.2 General Faults

Table 10.2 describes situations where the soft starter does not operate as expected but neither trips nor issues a warning.

Symptom	Probable cause
The soft starter is not ready.	Check input A (11, 16). Check if the soft starter is disabled via a programmable input. If *parameter 3-3 Input A Function* is set to *Starter disable*, and there is an open circuit on the corresponding input, the soft starter does not start.
The soft starter does not respond to the [Hand On] and [Reset] keys.	Check if the soft starter is in auto-on mode. When the soft starter is in auto-on mode, the hand-on LED on the soft starter is off. Press [Auto On] once to change to local control.
The soft starter does not respond to commands from the control inputs.	• The soft starter waits for the restart delay to elapse. *Parameter 2-11 Restart delay* controls the length of the restart delay. • The motor may be too hot to allow a start. If *parameter 2-12 Motor temperature check* is set to *Check*, the soft starter only allows a start when it calculates that the motor has sufficient thermal capacity to complete the start successfully. Wait for the motor to cool before attempting another start. • Check if the soft starter is disabled via a programmable input. If *parameter 3-3 Input A Function* is set to *Starter disabled*, and there is an open circuit on terminals 11 and 16, the soft starter does not start. If there is no further need to disable the soft starter, close the circuit on the input. **NOTICE** *Parameter 3-1 Local/remote* controls when the [Auto On] is enabled.
The soft starter does not respond to a start command from either the local or remote controls.	• The soft starter may be waiting for the restart delay to elapse. *Parameter 2-11 Restart delay* controls the length of the restart delay. • The motor may be too hot to allow a start. If *parameter 2-12 Motor temperature check* is set to *Check*, the soft starter only allows a start when it calculates that the motor has sufficient thermal capacity to complete the start successfully. • Check if the soft starter is disabled via a programmable input. If *parameter 3-3 Input A function* is set to *Starter disable*, and there is an open circuit on terminals 11 and 16, the soft starter does not start. If there is no further need to disable the soft starter, close the circuit on the input. **NOTICE** *Parameter 3-1 Local/remote* controls when [Auto On] is enabled.
The soft starter does not control the motor correctly during start.	• Start performance may be unstable when using a low motor FLC setting (*parameter 1-1 Motor FLC*). This can affect use on a small test motor with full load current of 5–50 A. • Install power factor correction (PFC) capacitors on the supply side of the soft starter. To control a dedicated PFC capacitor contactor, connect the contactor to run relay terminals.

10

Symptom	Probable cause
Motor does not reach full speed.	• If the start current is too low, the motor does not produce enough torque to accelerate to full speed. The soft starter may trip on excess start time. ## NOTICE **Make sure that the motor starting parameters are appropriate for the application and that the intended motor starting profile is used. If _parameter 3-3 Input A Function_ is set to _Motor Set Select_, check that the corresponding input is in the expected state.** • Check if the load is jammed. Check the load for severe overloading or a locked rotor situation.
Erratic motor operation.	• The SCRs in the soft starter require at least 5 A of current to latch. If testing the soft starter on a motor with full load current less than 5 A, the SCRs may not latch correctly.
Erratic and noisy motor operation.	If the soft starter is connected to the motor using inside delta configuration, the soft starter may not be detecting the connection correctly. Contact the local Danfoss supplier for advice.
Soft stop ends too quickly.	• The soft stop settings may not be appropriate for the motor and load. Review the settings of - _Parameter 1-10 Stop Mode_. - _Parameter 1-11 Stop Time_. - _Parameter 7-10 Stop Mode-2_. - _Parameter 7-11 Stop Time-2_. • If the motor is lightly loaded, soft stop has limited effect.
Adaptive control, DC brake, and jog functions not working.	• These features are only available with in-line installation. If the soft starter is installed inside delta, these features do not operate.
A reset does not occur after an auto-reset when using a remote 2-wire control.	• Remove and reapply the remote 2-wire start signal for a restart.
Remote start/stop command overrides autostart/stop settings when using remote 2-wire control.	• Only use autostart/stop in auto-on mode with 3-wire or 4-wire control.
After selecting adaptive control, the motor used an ordinary start and/or the 2nd start was different from the 1st start.	• The 1st adaptive control start is _Current limit_. The soft starter then learns from the motor characteristics. Subsequent starts use adaptive control.
Non-resettable _Thermistor Cct_ trip, when there is a link between thermistor inputs 05 and 06, or when the motor thermistor connected between 05 and 06 is permanently removed.	• The thermistor input is enabled once a link is fitted and short-circuit protection has activated. Remove the link, then load the default parameter set. This disables the thermistor input and clears the trip. Place a 1k2 Ω resistor across the thermistor input. Turn thermistor protection to _Log only_ (_parameter 16-9 Motor Thermistor_).
Parameter settings cannot be stored.	• Make sure to save the new value by pressing [OK] after adjusting a parameter setting. If pressing [Back], the change is not saved. • Check that the adjustment lock (_parameter 15-2 Adjustment Lock_) is set to _Read/Write_. If the adjustment lock is on, settings can be viewed, but not changed. Knowing the security access code is necessary to change the adjustment lock setting. • The EEPROM may be faulty on the main control PCB. A faulty EEPROM also trips the soft starter, and the LCP shows the message _Par. Out of Range_. Contact the local Danfoss supplier for advice.
The LCP shows message _Awaiting data_.	The LCP does not receive data from the control PCB. Check the cable connection.

Table 10.2 General Fault Messages

10