

SBM51/06 Gateway Module for Danfoss Frequency Inverters

Application

The SBM51/06 gateway module can be used to connect up to eight different types of Danfoss frequency inverter (FI), via the Danfoss bus, to the DDC3000/DDC4000 automation system. The connection is made via the RS485 interface of the SBM51/06. Danfoss FC protocol is used for communication.

You can use the following Danfoss series:

VLT 2800 series, VLT 5000 series, VLT 6000 series, VLT HVAC Drive FC 102, VLT AQUA Drive FC 202, VLT AutomationDrive FC 301, VLT AutomationDrive FC 302, VLT Micro Drive FC 51



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Änderungen vorbehalten - Contents subject to change - Sous réserve de modifications - Reservado el derecho a modificación - Wijzigingen voorbehouden - Con riserva di modifiche - Innehåll som skall ändras - Změny vyhrazeny - Zmiany zastrzeżone - Возможны изменения - A változtatások jogát fenntartjuk - 保留未经通知而改动的权力

Important Information Regarding Product Safety

Safety Instructions

This data sheet contains information on installing and commissioning the product "SBM51/06". Each person who carries out work on this product must have read and understood this data sheet. If you have any questions that are not resolved by this data sheet, you can obtain further information from the supplier or manufacturer.

If the product is not used in accordance with this data sheet, the protection provided will be impaired. Applicable regulations must be observed when installing and using the device. Within the EU, these include regulations regarding occupational safety and accident prevention as well as those from the VDE (Association for Electrical, Electronic & Information Technologies). If the device is used in other countries, it is the responsibility of the system installer or operator to comply with local regulations. Mounting, installation and commissioning work on the devices may only be carried out by qualified technicians. Qualified technicians are persons who are familiar with the described product and who can assess given tasks and recognize possible dangers due to technical training, knowledge and experience as well as knowledge of the appropriate regulations.

Legend



WARNING

Indicates a hazard of medium risk which can result in death or severe bodily injury if it is not avoided.



CAUTION

Indicates a hazard of low risk which can result in minor or medium bodily injury if it is not avoided.



NOTICE

Indicates a hazard of medium risk which can result in material damage or malfunctions if it is not avoided.



NOTE

Indicates additional information that can simplify the work with the product for you.

Notes on Disposal

For disposal, the product is considered waste from electrical and electronic equipment (electronic waste) and must not be disposed of as household waste. Special treatment for specific components may be legally binding or ecologically sensible. The local and currently applicable legislation must be observed.

Item

SBM51/06 Gateway Module for Danfoss Frequency Inverters

Technical Data

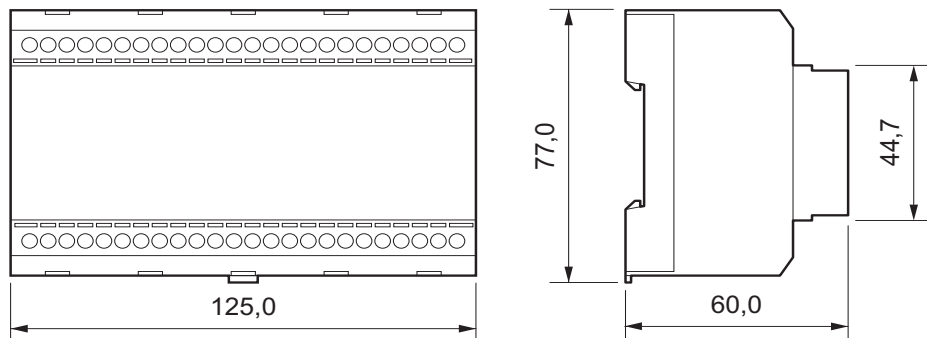
Nominal voltage	For device: AC 24 V \pm 10% / 230 mA, max. 5.4 VA
Fuse	Electronic fuse protection for AC 24 V power
Indicators and Controls	<ul style="list-style-type: none"> ■ 2 LEDs in housing ■ 2 rotary switches in housing, for setting the switch cabinet bus address
Interfaces	<ul style="list-style-type: none"> ■ Switch cabinet bus to DDC system ■ Serial interface/RS485 bus (FC protocol)
Degree of protection	IP20
Ambient temperature	0 °C to 45 °C
Ambient humidity	20 to 80 % r.h., non-condensing
Installation	Switch cabinet installed on top hat rail DIN EN 50022 – 35 x 7.5
Dimensions (WxHxD in mm)	125 x 77 x 60

Compatibility

SBM51/06 is supported as follows:

- DDC3000 as of version 6.7
- DDC4000 as of version 1.2.430
- Photon BMS as of version 6.41

Dimensions



Connection



WARNING

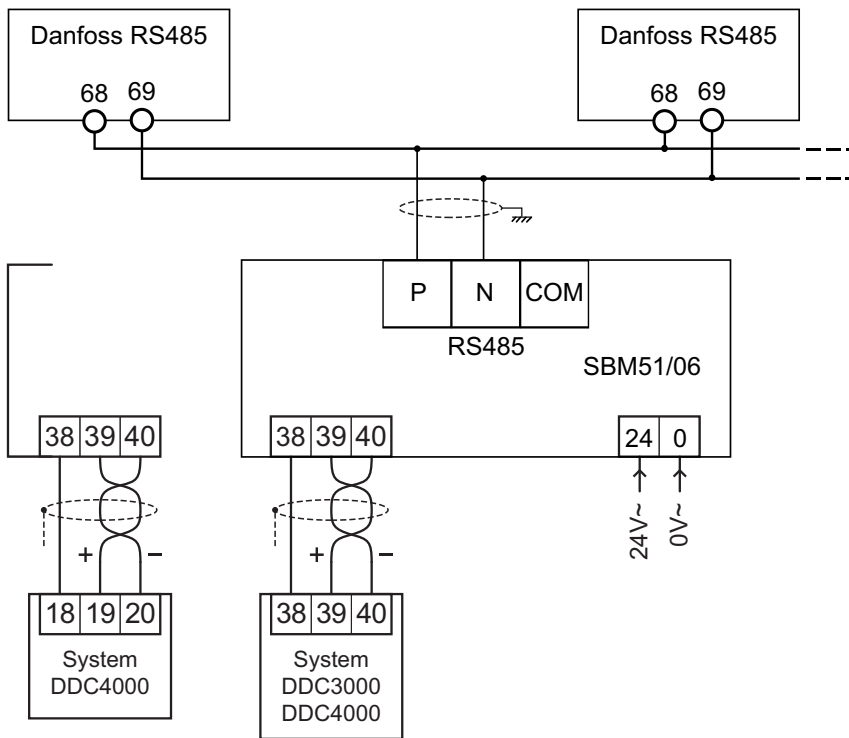
Contact with live parts of electrical domestic installation can cause death due to electric shock. Only connect the device and switch on the power supply if you are qualified to do so. Be sure to comply with VDE guidelines and local wiring regulations.



NOTICE

Switching on the power supply of unparameterized products can lead to unforeseen consequences such as malfunctions or material damage.

Switch on the power only after the device has been configured by the commissioning technician.



NOTICE

Position the SBM51/06 such that it is connected between two Danfoss frequency inverters on the bus (internal nodes in the network). Terminate the Danfoss bus using an internal DIP switch in the first and last frequency inverter. This means you are able to achieve the best immunity to disturbance for the bus system.

During commissioning, ensure that the Danfoss bus system is connected correctly. The Danfoss bus must not be connected the wrong way round.

If it is not possible to position the SBM51/06 between two frequency inverters (external nodes in the network), terminate the bus using an 180 Ohm terminating resistor between the terminals P and N. Activate the terminating resistor of the FI at the other end of the line.

The shield is positioned on the spring-type terminal (or clamp for older VLT models) on one side of the FI only. The COM terminal on the SBM51/06 is not used and is only used in environments with severe interference. Clarify connection with Danfoss Support.

**NOTE**

The bus-systems switch cabinet bus (DDC3000) and CAN bus (DDC4000) are identical. Hence, all technical information relating to the switch cabinet bus also apply to the CAN bus.

Switch cabinet bus

When connecting the switch cabinet bus, use a cable of at least type JY(St)Y 2x2x0.8 Lg: two x two leads stranded into a pair, plastic insulation and an electrostatic shield with a lead diameter of at least 0.8 mm. Use a stranded pair of leads for the data lines (+ and -) and another free lead for the ground (0).

At the end of the switch cabinet bus (furthest point from the controller), install a terminating resistor of about 180 ohms between the two data lines (+ and -). The terminating resistor is included with the controller.

The maximum cable length for the switch cabinet bus is 200 m.

**NOTE**

For a connection to a DDC4000, the data rate of the CAN bus used must be 40 kBd. Use the "SY_CAN.xx" system variable to make the setting.

Installation and Removal

Installation



WARNING

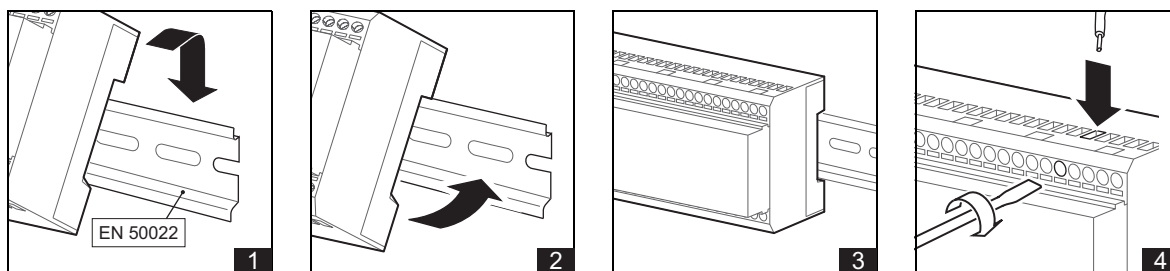
Contact with live parts of electrical domestic installation can cause death due to electric shock. Mounting/removal may only be carried out when power is switched off.



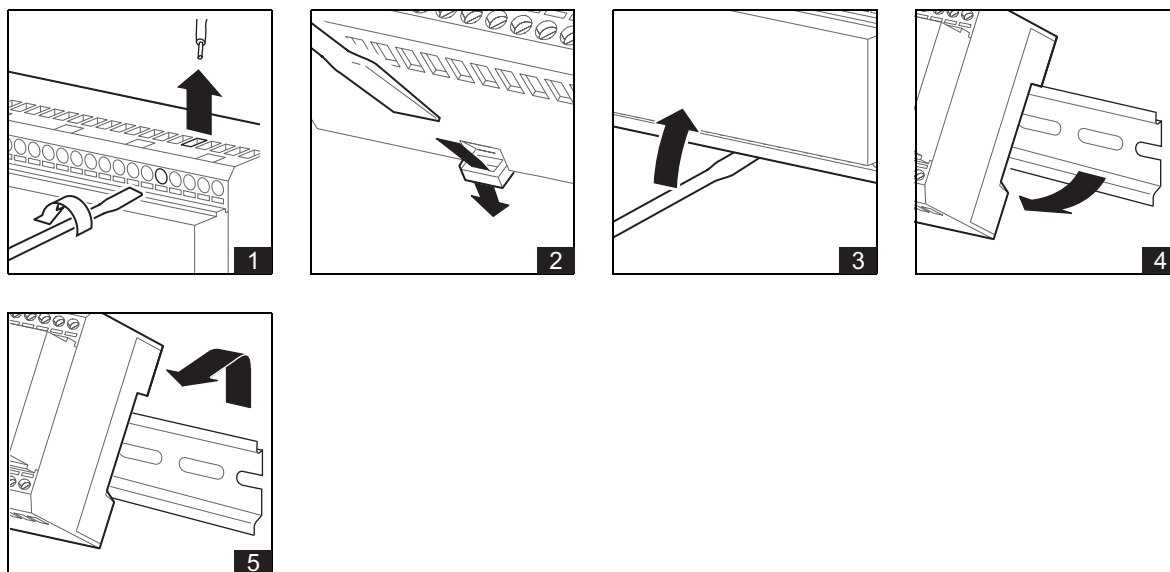
NOTICE

Switching on the power supply of unparameterized products can lead to unforeseen consequences such as malfunctions or material damage.

Switch on the power only after the device has been configured by the commissioning technician.



Removal



Commissioning

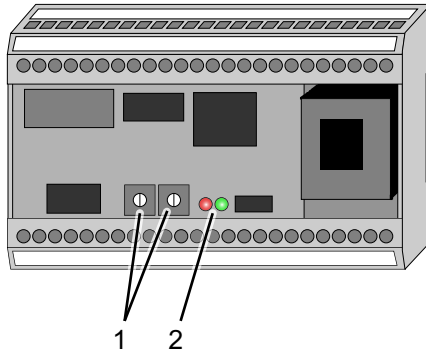


NOTICE

Power may only be switched on after the DDC controller and device have been configured by the commissioning technician.

Configuration of the DDC controller is described in the respective project planning documentation.

Indicators and Controls

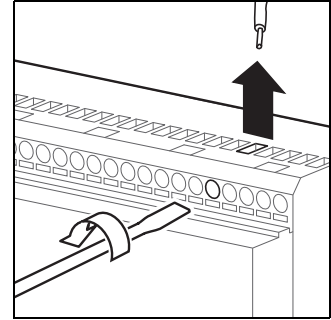


- 1 Rotary switch for setting the switch cabinet bus address
- 2 Switch cabinet bus LED

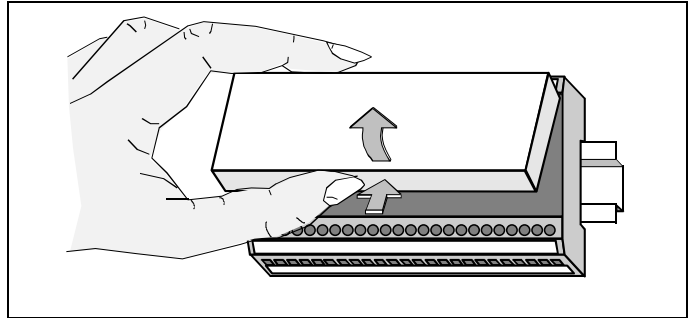
LED	Signal	Meaning
Switch cabinet bus LED	Green	SBM51/06 is operating
Switch cabinet bus LED	Flashing green	Data transmission
Switch cabinet bus LED	Red	SBM51/06 not registered
Switch cabinet bus LED	Flashing red, on/off time at a ratio of 50:50	Doubled address
Switch cabinet bus LED	Flashing red, on/off time at a ratio of 25:75	Invalid address

Setting the switch cabinet bus address

- ▶ Disconnect the power supply of the SBM51/06.

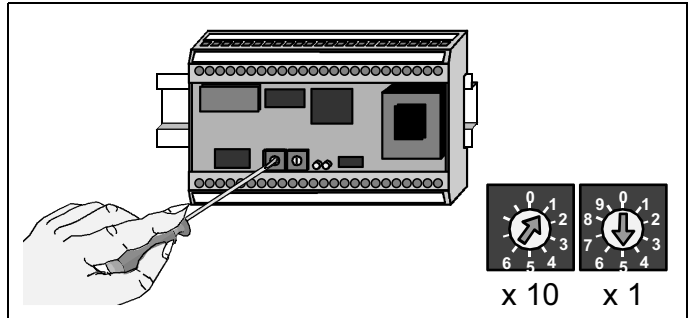


- ▶ Press the lower edge of the front cover and remove the cover.
The rotary switches for setting the switch cabinet bus address are located inside the SBM51/06.

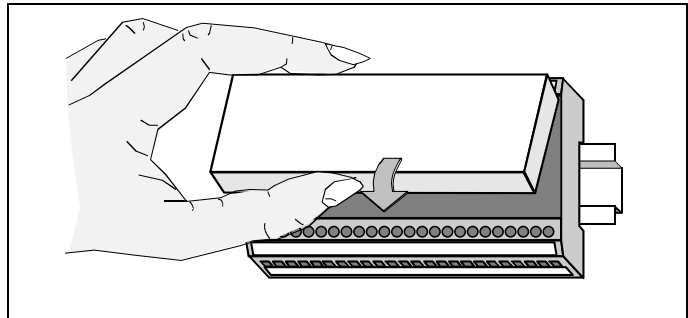


- ▶ Set the first rotary switch to the first digit of the switch cabinet bus address, and the second rotary switch to the second digit.

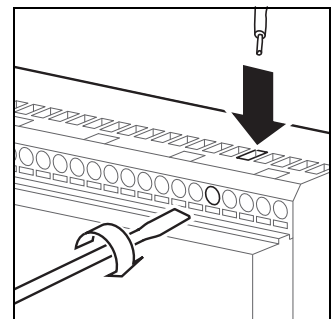
The example shows the address "15".
Permitted range for the switch cabinet bus address: 01 to 16



- ▶ Insert the front damper along the top edge and lock it in with the bottom edge.



- ▶ Reconnect the power supply of the SBM51/06.



Switching on the Power

**WARNING**

Contact with live parts of electrical domestic installation can cause death due to electric shock. Only connect the device and switch on the power supply if you are qualified to do so. Be sure to comply with VDE guidelines and local wiring regulations.

Before switching on the power, ensure that the device has been mounted correctly and check the electrical connection.

After turning on the power, check the transmission function of the SBM51/06.

SBM51/06 Parameter Description

Content of the parameter description

The **parameter description** contains information regarding SBM51/06 DDC3000/DDC4000 system parameterization.

Firmware version

This parameter description describes SBM51/06 firmware as of version 6.0.



NOTE

When using frequency inverters, it may, depending on the series and the application, be necessary to take interference suppression measures. In this case, please contact Danfoss.



NOTICE

Per DDC3000/DDC4000 system, a maximum of five SBM51, regardless of type, may be connected to the switch cabinet bus.

Basic Program

Registering the SBM51/06 on the DDC

After switching the supply voltage on, the SBM51/06 checks the availability of the switch cabinet bus and uses the basic program to register with the DDC3000/DDC4000 automation system. In addition, the SBM51/06 automatically registers the connected frequency inverter with the DDC.

Parameter List in the DDC3000 System

The SBM51/06 basic program contains the following parameters:

Parameter No.	Parameter plain text	Value range (Initial value)
899	Central unit/KK version	Text (invalid)
2202	Q bus mode	0; 1 (0)
2203	Q cycle	0; 1 (0)
2204	Foreign bus OK	0; 1 (invalid)

These parameters apply for all Danfoss frequency inverters connected to the SBM51/06.

Parameter 899 “Central unit/KK version”

In parameter 899 Central unit/KK version, the SBM51/06 registers its firmware version.

Parameter 2202 “Q Bus Mode”

Parameter 2202 Q bus mode turns the communication for the bus system (FC bus) on or off:

- “0” → FC bus OFF
- “1” → FC bus ON.

Parameter 2203 “Q Cycle”

The parameter 2203 Q cycle is **not** needed for SBM51/06.

Parameter 2204 “Foreign Bus OK”

In parameter 2204 foreign bus OK, the SBM51/06 registers malfunctions on the FC bus:

- “1” → The FC bus is working without errors.
- “0” → Errors occurred on the FC bus.

DDC Software Menu M090 (SBM51 gateway)

The DDC software menu, M090 SBM51 gateway (previously gateway menu), can be set to the SBM51/06 basic program up to 32 times. Two gateway menus with addresses 1 and 2, 3 and 4, etc. and the menu with address 32 are automatically created per FI. A maximum of 17 M090 menus are therefore required for a maximum of eight FIs that can be connected.

The parameter lists for the DDC software menu M090 are described in section “Parameter Lists for the DDC Software Menus M090 and CD_SB51 (SBM51 Gateway)” from page 12.

Parameter List in the DDC4000 System

SY_SBM51 “System SBM51” System Object

The SY_SBM51 “System SBM51” system object contains parameters that represent the special characteristics of an SBM51/06 as a gateway module:

Parameter	Plain text	Setpoint / value	Type
Cycle	Readout cycle	Setpoint	Binary value
Enable	Bus enable	Setpoint	Binary value

Cycle Parameter: “Readout cycle”

The parameter cycle readout cycle is not needed for SBM51/06.

Enable parameter: “Enable bus”

The Enable parameter turns the communication for the bus system (FC bus) on or off:

- “0” → FC bus OFF
- “1” → FC bus ON.

Hardware Object H000 “Device on Bus”

When creating an SBM51/06 in the DDC4000 central unit, 32 H000 hardware objects “Device on bus” are automatically created under /b1/00. Of those, only the following 17 hardware objects are used: 01 to 16 and 32.

Each H000 hardware object contains the **Active** and **Config** parameters that represent the special characteristics of a frequency inverter on the bus.

Parameter	Plain text	Setpoint / value	Type
Active	Pin active	Value	Binary value
Config	Configuration	Setpoint	Binary value

Active Parameter

The parameter **Active** shows if the FI was registered on the bus.

- “1” → FI is registered on the bus.
- “0” → FI is not registered on the bus.

Parameter Config

Create the gateway menu CD_SB51 “SBM51 Menu” via Parameter Config.

Parameter Lists for the DDC Software Menus M090 and CD_SB51 (SBM51 Gateway)

M090 (for DDC3000) and CD_SB51 (for DDC4000)

According to the following principle, **two** DDC software menus M090 or CD_SB51 are assigned to every Danfoss frequency inverter:

- the menus /01 and /02 for the frequency inverter with address 1
- the menus /03 and /04 for the frequency inverter with address 2, etc.

When using a DDC3000, the basic program of the SBM51/06 is expanded with additional DDC software menus M090 according to the number of frequency inverters to be added. When using a DDC4000, all 32 menus are automatically created.

Software Menu M090 and CD_SB51: Resync/Diag /31 Menu

The Resync/Diag menu is activated with parameter 2216. The SBM51/06 recognizes the menu used by the DDC based on the menu number of parameter 2216.

The module manages the parameters as standard analog actual values in software menu /31 and sends this as Q analog actual value 1 - Q analog actual value 8 to the automation station.

Parameter	Plain text	Meaning
2209	External system ok (only DDC3000)	Participant is registered
2210	Analog actual value 1	Can_Resync_Counter
2211	Analog actual value 2	DDC timeout
2212	Analog actual value 3	Prompt to register again
2251	Analog actual value 4	BUSOFF
2215	Analog actual value 5	CAN hardware error
2252	Analog actual value 6	CAN message error
2253	Analog actual value 7	New address
2254	Analog actual value 8	Doubled address
2240	Q analog setpoint 1	Can_Resync_Time
2216	Q digital setpoint 1	ActivateMenu
2220	Q digital setpoint 2	Can_Resync_Counter Reset
2245	Q digital setpoint 3	ActivateResync



NOTE

The Resync/Diag menu is not explicitly registered with the automation station by the SBM51/06.

Parameter 2209 “External System OK”

Only applies for DDC3000.

Parameter 2251 “Analog Actual Value 4” and 2215 “Analog Actual Value 5”

Contains a CAN controller message.

All Parameters “Analog Actual Value x”

Upon exceeding the upper limit, the “Analog actual value x” parameters are set to zero.

Parameter 2252 “Analog Actual Value 6”

Contains CAN messages addressed to the SBM, but which have not yet been processed.

Parameter 2240 “Q Analog Setpoint 1”

Parameter 2240 specifies the time period in seconds after a CAN bus error, within which data integrity and communication with the automation station is to be restored using the Resync process.

A module reset is performed if the Resync process could not be completed for all registered frequency inverters.

Parameter 2216 “Q Digital Setpoint 1”

Parameter 2216 switches bus system (FC bus) communication on or off:

- “0” or “invalid” → Diagnosis function is inactive
- “1” → Diagnosis function is active

Parameter 2245 “Q Digital Setpoint 3”

You can activate or deactivate the Resync function with parameter 2245.

- “0” or “invalid” → Resync function is inactive
- “1” → Resync function is active

First DDC Software Menu M090 and CD_SB51 (Odd-Numbered Addresses)

Menus /01, /03, /05, /07, /09, /11, /13, /15 --- Danfoss frequency inverter VLT 5000, VLT 6000, VLT 2800, FC 102, FC 202, FC 301, FC 302, FC 51

Parameter	Plain text	Meaning	Unit
2209	External system ok (only DDC3000)	Participant is registered	-
2210	Analog actual value 1	FI type	-
2211	Analog actual value 2	Voltage type	-
2212	Analog actual value 3	Service life	h
2251	Analog actual value 4	Operating time	h
2215	Analog actual value 5	Rated motor speed	rpm
2252	Analog actual value 6	Absolute speed	rpm
2253	Analog actual value 7	User-defined display	-
2254	Analog actual value 8	Relative rotary frequency	%
2255	Analog actual value 9	Absolute rotary frequency	Hz
2256	Analog actual value 10	Motor current IRMS	A
2257	Analog actual value 11	Performance	kW
2258	Analog actual value 12	Energy consumption	kWh
2240	Q analog setpoint 1	Relative setpoint rotary frequency	%
2241	Q analog setpoint 2	Minimum setpoint PS1	Hz
2242	Q analog setpoint 3	Maximum setpoint PS1	Hz
2222	Digital actual value 1	Error/malfunction	-
2224	Digital actual value 2	General warning	-
2225	Digital actual value 3	Ready for operation	-
2226	Digital actual value 4	switched on	-
2227	Digital actual value 5	Setpoint reached	-
2228	Digital actual value 6	Warning Load shedding	-
2216	Q digital setpoint 1	Motor enable	-
2220	Q digital setpoint 2	Freewheel stop	-
2245	Q digital setpoint 3	Malfunction acknowledgment	-
2246	Q digital setpoint 4	Parameter set selection	-
2217	Operating mode	Stop, automatic, manual 1 = Stop 7 = Auto 8 = Manual	-



NOTE

The Danfoss frequency inverters that can be connected to the SBM51/06 do not support all possible parameters (see parameter reference tables from page 22).

Parameter 2209 “External System OK”

Is set to “0” when the communication to the external system is interrupted.

Parameter 2251 “Analog Actual Value 4”

Counts the operating hours of the connected motor.

Parameter 2215 “Analog Actual Value 5”

Parameter 2215 is only read once when the FI is registered. If the parameter is changed during operation, the new value is only valid when the FI has been registered again.

Parameter 2253 “Analog Actual Value 7”, 2254 “Analog Actual Value 8” and 2240 “Q Analog Setpoint 1”

Further parameterization information can be found in the following project planning sections.

Parameter 2222 “Digital Actual Value 1”

The FI switches off in the event of a malfunction. The malfunction must be acknowledged via digital setpoint 3 (2245) = 1. Remedy the cause of the error before acknowledgment.

Parameter 2224 “Digital Actual Value 2”

Warning messages are automatically canceled when the operating conditions are back within the normal range.

Parameter 2217 Operating mode

Auto = Motor running

Stop = Motor not running

Manual = FI is in manual mode

Parameter 2241 “Q Analog Setpoint 2” and 2242 “Q Analog Setpoint 3”

Contain the setpoint limits for parameter set 1.

Second DDC Software Menu M090 and CD_SB51 (Even-Numbered Addresses)

Menus /02, /04, /06, /08, /10, /12, /14, /16 --- Danfoss frequency inverter VLT 5000, VLT 6000, VLT 2800, FC 102, FC 202, FC 301, FC 302, FC 51

Parameter	Plain text	Meaning	Unit
2209	External system ok (only DDC3000)	Participant is registered	-
2211	Analog actual value 2	Active parameter set	-
2251	Analog actual value 4	Setpoint error	-
2215	Analog actual value 5	Actual value error	-
2252	Analog actual value 6	Rel. error	-
2253	Analog actual value 7	Analog input terminal 54	V
2254	Analog actual value 8	Motor voltage	V
2255	Analog actual value 9	Minimum setpoint	Hz
2256	Analog actual value 10	Maximum setpoint	Hz
2240	Q analog setpoint 1	Parameter set selection, actual value mode	-
2241	Q analog setpoint 2	Minimum setpoint PS2	-
2242	Q analog setpoint 3	Maximum setpoint PS2	-
2222	Digital actual value 1	Mains phase error	-
2224	Digital actual value 2	Thermal warning	-
2225	Digital actual value 3	Voltage high/low	-
2226	Digital actual value 4	Not in freq. range	-
2227	Digital actual value 5	Dig. input terminal 32	-
2228	Digital actual value 6	Dig. input terminal 33	-
2216	Q digital setpoint 1	Relay 1 on	-
2220	Q digital setpoint 2	Relay 2 on	-
2245	Q digital setpoint 3	Activate relay	-
2246	Q digital setpoint 4	DC brake	-
2217	Operating mode	Stop, automatic, manual 1 = Stop 7 = Auto 8 = Manual	

NOTE



The Danfoss frequency inverters that can be connected to the SBM51/06 do not support all possible parameters (see parameter reference tables from page 22).

Parameter 2241 “Q Analog Setpoint 2” and 2242 “Q Analog Setpoint 3”

Contain the setpoint limits for parameter set 2.

Parameter 2240 “Q Analog Setpoint 1”

Special features for registering/deregistering FIs in the event of invalid parameter 2240 configuration in the second DDC software menu:

- If “1” - “4” (no external selection) is configured as a parameter set in the FI, the SBM is in actual value mode and parameter 2240/02 is not relevant.

When the FI is registered again:

- If an external selection is configured as a parameter set in the FI and the parameter 2240/02 has the values “0”, > “4” or “invalid”, the SBM switches to actual value mode and returns the value “0” for parameter 2211/02.

During operation:

- If an external selection is configured as a parameter set in the FI and parameter 2240/02 is "0", is larger than "4", or becomes invalid, parameter 2211/02 then stays at the last valid value.
- If an external selection is configured as a parameter set in the FI and the parameter 2240/02 has the values "1" - "2", the SBM sets the selected parameter set and sends the setpoints.



NOTE

The SBM51/06 can switch to four parameter sets. Only the first two parameter sets can be parameterized in the SBM51/06. The settings are active in the FI for parameter sets 3 and 4.

Parameters 2215, 2251 and 2252

The parameters 2251, 2215 and 2252 have special functions which you enable in menu 32:

- Parameter 2251 - Parameterization communication error, setpoints
- Parameter 2215 - Communication error, actual values
- Parameter 2252 - Communication error, relay control

Software Menu M090 and CD_SB51 Menu 32

In software menu "Menu 32" (Address = 32), it is possible to set special parameters, e.g. maximum number of FIs on the bus and the display of error values.

Parameter	Plain text	Meaning
2209	External system ok (only DDC3000)	Participant is registered
2210	Analog actual value 1	Number of FIs on the bus
2240	Q analog setpoint 1	Max. number of FIs
2241	Q analog setpoint 2	Parameter retention
2242	Q analog setpoint 3	Display error values

Parameter 2210 "Analog Actual Value 1"

Number of FIs found on the bus

Parameter 2240 "Q Analog Setpoint 1"

Selection of the maximum number of FIs that can be operated on the bus

Specifying a smaller number of FIs (e.g. three) reduces the cycle time, as only FIs with addresses 1, 2 and 3 are known on the bus. FIs with higher addresses are not taken into account and their parameters are not updated.

Parameter 2241 "Q Analog Setpoint 2"

Only applies for DDC3000:

- "0" → The existing parameters will be deleted.
- "1" → Following an interruption in bus communication, the frequency inverters will be configured with retained parameters when registering again (parameter setpoint min/ max 1/2, current setpoint, enable, freewheel stop, malfunction acknowledgment).

Parameter 2242 "Q Analog Setpoint 3"

The internal error counter display in the second FI menu

- "0" → Display inactive
- "1" → Display active

The counters are deleted when the SBM51/06 is restarted.

Function description

Function of the Analog Setpoint and Parameter Set Switching

The central unit specifies a frequency setpoint for each frequency inverter via the parameter **2240 “Q analog setpoint 1”** of the **first** respective menu, SBM51 gateway.

Using the following parameters of the first respective menus M090 and CD_SB51, you can scale the specified parameters for the first parameter set of the frequency inverter:

- **2241 “Q analog setpoint 2”** for the minimum frequency setpoint (parameter 204)
- **2242 “Q analog setpoint 3”** for the maximum frequency setpoint (parameter 205)

You can specify the scaling for the second parameter set of the frequency inverter using the same parameters of the second respective menu, SBM51 gateway.

If no parameters are set, the local frequency inverter settings apply.

Entering negative frequency setpoint values leads to incorrect setpoint calculation.



NOTICE

The values of parameters **2241 “Q analog setpoint 2”** and **2242 “Q analog setpoint 3”** are only sent to the FI when parameter 2241 is smaller than parameter 2242. Otherwise, FI malfunctions can result which can only be reset by switching off the FI. The maximum FI setpoint can, due to the above-mentioned condition, not be set to zero by parameter 2242. Value “0” can; however, be set manually on the FI.

Always set the parameter for the maximum frequency setpoint before setting the parameter for the minimum frequency setpoint.

The parameters for the minimum and maximum frequency setpoint values cannot be changed during operation. Changes made are only active following motor stop.

Switch the parameter set using parameter **2240 “Q analog setpoint 1”** of the second respective menu, SBM51 gateway (see Parameter 2240 “Q Analog Setpoint 1”, page 16).

The “remote” setpoint is only adopted by the SBM51/06 in automatic FI mode. When the FI is in manual mode, the frequency inverter uses the “on-site setpoint”.

If necessary, the actual value is sent as the setpoint if no parameters are set (display “deleted”) in parameter **2240 “Q analog setpoint 1”**. If a setpoint was set on-site on the frequency inverter, the motor will continue to operate with the setpoints set on-site.

No setpoints are sent to the FI for actual value mode (parameter 2240 of the second respective menu). The FI runs with the on-site setpoints.

Function Following Interruption of the Danfoss Bus to the SBM51/06 (Using the VLT 6000 as an Example)

Using the frequency inverter parameters “555 bus time interval” and “556 bus time interval”, you can define which operating state the frequency inverter should adopt following bus interruption. “OFF” is set as standard. The frequency inverter starts automatically as soon as the bus is ready for operation again.

Refer to the Danfoss project planning documentation for information on settings for other types of FI.

SBM Behavior in the Event of an Error on the Switch Cabinet Bus (Diagnosis Function)

Resync functions are not yet supported by DDC3000 and DDC4000. Parameter **2240 “Q analog setpoint 1”** (Can_Resync_Time) in Resync/Diag menu is used for the diagnosis function (see page 12).

- When the Resync process is inactive on the DDC, the parameter 2240/31 [00] acts as a timeout for SBM re-registration. FI operation is then interrupted.
- Parameter **2245 “Q digital setpoint 3”** does not have any effect.

Digital Parameter Function

First Menu SBM51 Gateway (Odd-Numbered Addresses)

Set the FI motor enable via the parameter 2216 “Q digital setpoint 1”.



NOTICE

If the parameter **2216 “Q digital setpoint 1”** has not been configured, it is not possible to enable the motor in automatic FI mode. The motor remains at a standstill.



NOTE

When the value of parameter **2216 “Motor enable”** changes, parameter 2254 can adopt a negative value.

Motor freewheel stop is activated using parameter **2220 “Q digital setpoint 2”**.

If the value of parameter 2220 is 1, the motor will coast down to a stop. This function has higher priority than motor enable (parameter 2216). This function has no effect if parameter 2220 has not been configured. This function is used in conjunction with the motor flying start function (see the commissioning instructions from Danfoss).

Acknowledging Alarms

Set FI alarm acknowledgment via the parameter **2245 “Q digital setpoint 3”**. Messages are always acknowledged via the 0/1 edge of the assigned digital signal.

Second Menu SBM51 Gateway (Even-Numbered Addresses)

You can control the first two relay outputs with the SBM51/06 if the Danfoss frequency inverter is equipped with relay outputs. Relay control is enabled via the parameter **2245 “Q digital setpoint 3”**. If the value of parameter 2245 is 1, the frequency inverter relay outputs can be controlled via the DDC system.

Relay 1 is controlled via the **2216 “Q digital setpoint 1”** parameter, relay 2 is controlled via the parameter **2220 “Q digital setpoint 2”**.

The values of the parameters 2216 and 2220 result in the following relay contact state:

- “0” or “deleted” → Relay is switched
- “1” → Relay is not switched

The DC brake of the frequency inverter is activated using parameter **2246 “Q digital setpoint 4”**.

The value of parameter 2246 has the following effect on the state of the DC brake:

- “0” or “deleted” → The DC brake is switched off.
- “1” → The DC brake is active.

Project Planning: Frequency Inverter - SBM51/06

Commissioning (Using the VLT 6000 as an Example)

You can connect one to eight different types of Danfoss frequency inverter to the SBM51/06.

For commissioning, make the following settings on the frequency inverter:

- “FI Parameter 500, protocol: FC protocol (default setting)
- “FI parameter 501, bus address: set an address between 1 and 8
- “FI parameter 502, baud rate: 9600 Bd (default setting)
- “FI parameter 106, rated motor speed: is important when the speed is to be displayed on the parameter “User-defined display 2253/01”.
- “FI parameter 006, unit of the “Free display”: 0, when the SBM51/06 is to perform configuration for determining speed.

Refer to the commissioning instructions from Danfoss for further information.

Determining Speed (Using the VLT 6000 as an Example)

Parameter 2253/01 can be used to determine the speed if parameter **2252/01 “Absolute Speed”** is not supported by the FI type at hand. To do this, enter the nominal motor speed for FI parameter 005 (maximum value for user-defined display) on the frequency inverter. This value must completely match the output frequency value.

FI parameter 2253/01 then outputs the speed.

If the SBM51/06 is to apply the speed via parameter **2253 “Analog actual value 7”**, FI parameter 006 (unit of the scaled display) must be left at 0 (= default setting).

The unit from FI parameter 006 (nominal motor speed) is automatically set to rpm.

If the free display is to be used in another way, FI parameter 006 (unit of the scalable value) must be set such that it is not equal to “0”. In this case, automatic configuration of the SBM51/06 remains undone. The value displayed in the first respective software menu, SBM51 gateway, parameter **2253 “Analog actual value 7”** is then a different value.

Malfunction messages

The parameter **2222 “Malfunction”** of the first respective software menu, SBM51 gateway, is generated in the frequency inverter using all bits from the frequency inverter alarm word.

Every alarm in the frequency inverter triggers the following actions:

- Sets the malfunction message contact and sets parameter **2222 “Malfunction”** to “1”
- Switches the frequency inverter off

Acknowledge the alarm by pressing the reset button on the frequency inverter. Alternatively, there is a way to acknowledge alarms via the DDC system (see page 19).

Warnings do not lead to a collective malfunction message.

Thermal Monitoring

Parameter **2224 “Digital actual value 2”** of the second respective software menu, SBM51 gateway, indicates motor thermal overload.

Thermal overload on the motor is determined either via monitoring of the electrical values of the motor in the frequency inverter or by a thermistor installed in the motor. The motor protection type is set on the FI (e.g. using parameter 117 for the VLT6000).

Thermal monitoring messages for the FI are reported in the collective malfunction message parameter **2222 “Malfunction”** of the first respective software menu, SBM51 gateway.

V-Belt Monitoring (Load shedding)

On the frequency inverter (e.g. using parameter 221 for the VLT6000), set the **Lower current limit** that corresponds to load shedding due to a V-belt tear. Doing this makes it possible for parameter 2228 “Digital actual value 6” of the second respective software menu, SBM51 gateway, to display the “V-belt malfunction” message correctly.

Danfoss recommends you set the lower current limit (idle current without V-belt) to a maximum frequency of + 5 %.

The behavior of the FI in the event of minimum current can be set on the FI.

Additional Alarms and Warnings

Refer to the parameter table in this document for additional alarms and warnings.

Special functions

The number of frequency inverters can be set in order to ensure an optimal readout time (see Software Menu M090 and CD_SB51 Menu 32, page 17). If, for instance, only three frequency inverters are set, the SBM51/06 will only search addresses 1 to 3. This results in a shorter cycle time.

Comparison Tables for the Software Menu M090 and CD_SB51: Parameter - Data Points

Parameter Reference Table

Software Menu M090 and CD_SB51: /01, /03, /05, /07, /09, /11, /13, /15 --- Danfoss Frequency Inverters VLT 6000, VLT 5000, VLT 2800

Para meter	DDC Parameter Text	Meaning	VLT 6000 Data Points	VLT 5000 Data Points	VLT 2800 Data Points
2210	Analog actual value 1	FI type	621	621	621
2211	Analog actual value 2	Voltage type	621	621	621
2212	Analog actual value 3	Service life	600	600	600
2251	Analog actual value 4	Operating time	601	601	601
2215	Analog actual value 5	Rated motor speed	106	106	106
2252	Analog actual value 6	Speed calculated	-	-	-
2253	Analog actual value 7	User-defined display	513	558	-
2254	Analog actual value 8	Relative rotary frequency	State word/ output frequency	State word/ output frequency	State word/ output frequency
2255	Analog actual value 9	Absolute rotary frequency	512	518	518
2256	Analog actual value 10	Motor current IRMS	514	520	520
2257	Analog actual value 11	Performance	515	522	522
2258	Analog actual value 12	Energy consumption	602	602	602
2240	Q analog setpoint 1	Relative rotary frequency setpoint	Control word/ setpoint frequency	Control word/ setpoint frequency	Control word/ setpoint frequency
2241	Q analog setpoint 2	Minimum setpoint PS1	204	204	204
2242	Q analog setpoint 3	Maximum setpoint PS1	205	204	205
2222	Digital actual value 1	Error/malfunction	State word. 03/ 04	State word. 03	State word. 03/ 04
2224	Digital actual value 2	General warning	State word. 07	State word. 07	State word. 07
2225	Digital actual value 3	Ready for operation	State word. 01	State word. 01	State word. 01
2226	Digital actual value 4	switched on	State word. 11	State word. 11	State word. 11
2227	Digital actual value 5	Setpoint reached	State word. 08	State word. 08	State word. 08
2228	Digital actual value 6	Warning Load shedding	-	-	-
2216	Q digital setpoint 1	Motor enable	Control word. 06	Control word. 06	Control word. 06
2220	Q digital setpoint 2	Freewheel stop	Control word. 03	Control word. 03	Control word. 03
2245	Q digital setpoint 3	Malfunction acknowledgment	Control word. 07	Control word. 07	Control word. 07
2217	Operating mode	Stop, manual, automatic	State word. 11/ 09	State word. 11/ 09	State word. 11/ 09

Parameter 2253 on the Frequency Inverter VLT 5000

The “User-defined display” parameter is not available on the FI VLT 5000. Data point 558 (“Motor rpm x scaling”) is output to parameter 2253/01 “User-defined display”.

Parameter Reference Table

Software Menu M090 and CD_SB51: /02, /04, /06, /08, /10, /12, /14, /16 --- Danfoss Frequency Inverters VLT 6000, VLT 5000, VLT 2800

Parameter	DDC Parameter Text	Meaning	VLT 6000 Data points	VLT 5000 Data Points	VLT 2800 Data Points
2211	Analog actual value 2	Active parameter set	002	002	002
2253	Analog actual value 7	Analog input terminal 54	523	530	-
2254	Analog actual value 8	Motor voltage	517	524	524
2255	Analog actual value 9	Minimum setpoint	204	204	204
2256	Analog actual value 10	Maximum setpoint	205	205	205
2240	Q analog setpoint 1	Parameter set selection, actual value mode	Control word. 13/14	Control word. 13/14	Control word. 13/14
2241	Q analog setpoint 2	Minimum setpoint PS2	204	204	204
2242	Q analog setpoint 3	Maximum setpoint PS2	205	205	205
2222	Digital actual value 1	Mains phase error	Warning word. 14	Warning word. 14	Warning word. 14
2224	Digital actual value 2	Thermal warning	State word. 15	State word. 15	State word. 15
2225	Digital actual value 3	Voltage high/low	State word. 13	State word. 13	State word. 13
2226	Digital actual value 4	Not in freq. range	State word. 10	State word. 10	State word. 10
2227	Digital actual value 5	Dig. input terminal 32	521	528	-
2228	Digital actual value 6	Dig. input terminal 33	521	528	528
2216	Q digital setpoint 1	Relay 1 on	Control word. 11	Control word. 11	Control word. 11
2220	Q digital setpoint 2	Relay 2 on	Control word. 12	Control word. 12	-
2245	Q digital setpoint 3	Activate relay	323 + 326	323 + 326	323
2246	Q digital setpoint 4	DC brake	Control word. 02	Control word. 02	Control word. 02
2217	Operating mode	Stop, manual, automatic	State word. 11/09	State word. 11/09	State word. 11/09

Parameter Reference Table

Software Menu M090 and CD_SB51: /01, /03, /05, /07, /09, /11, /13, /15 --- Danfoss frequency inverters FC-102/FC-202, FC-301/302, VLT Micro Drive FC 51

Parameter	DDC Parameter Text	Meaning	FC-102/ FC-202 Data Points	FC-301/ FC-302 Data Points	VLT Micro Drive FC 51 Data Points
2210	Analog actual value 1	FI type	15-40	15-40	15-40
2211	Analog actual value 2	Voltage type	15-42	15-42	15-42
2212	Analog actual value 3	Service life	15-00	15-00	15-00
2251	Analog actual value 4	Operating time	15-01	15-01	15-01
2215	Analog actual value 5	Rated motor speed	1-25	1-25	1-25
2252	Analog actual value 6	Speed calculated	16-17	16-17	-
2253	Analog actual value 7	User-defined display	16-09	16-09	16-09
2254	Analog actual value 8	Relative rotary frequency	State word/ output frequency	State word/ output frequency	State word/ output frequency
2255	Analog actual value 9	Absolute rotary frequency	16-13	16-13	16-13
2256	Analog actual value 10	Motor current IRMS	16-14	16-14	16-14
2257	Analog actual value 11	Performance	16-10	16-10	16-10
2258	Analog actual value 12	Energy consumption	15-02	15-02	15-02
2240	Q analog setpoint 1	Relative setpoint rotary frequency	Control word/ setpoint frequency	Control word/ setpoint frequency	Control word/ setpoint frequency
2241	Q analog setpoint 2	Minimum setpoint PS1	3-02	3-02	3-02
2242	Q analog setpoint 3	Maximum setpoint PS1	3-03	3-03	3-03
2222	Digital actual value 1	Error/malfunction	State word. 03/04	State word. 03/ 04	State word. 03/04
2224	Digital actual value 2	General warning	State word. 07	State word. 07	State word. 07
2225	Digital actual value 3	Ready for operation	State word. 01	State word. 01	State word. 01
2226	Digital actual value 4	switched on	State word. 11	State word. 11	State word. 11
2227	Digital actual value 5	Setpoint reached	State word. 08	State word. 08	State word. 08
2228	Digital actual value 6	Warning Load shedding	Warning word 2. 08	-	-
2216	Q digital setpoint 1	Motor enable	Control word. 06	Control word. 06	Control word. 06
2220	Q digital setpoint 2	Freewheel stop	Control word. 03	Control word. 03	Control word. 03
2245	Q digital setpoint 3	Malfunction acknowledgment	Control word. 07	Control word. 07 (Reset)	Control word. 07 (Reset)
2217	Operating mode	Stop, manual, auto- matic	State word. 11/09	State word. 11/ 09	State word. 11/09

Parameter Reference Table

Software Menu M090 and CD_SB51: /02, /04, /06, /08, /10, /12, /14, /16 --- Danfoss frequency inverters FC-102/FC-202, FC-301/302, VLT Micro Drive FC 51

Parameter	DDC Parameter Text	Meaning	FC-102/ FC-202 Data Points	FC-301/ FC-302 Data Points	VLT Micro Drive FC 51 Data Points
2211	Analog actual value 2	Active parameter set	0-10	0-10	0-10
2253	Analog actual value 7	Analog input terminal 54	16-54	16-64	-
2254	Analog actual value 8	Motor voltage	16-12	16-12	16-12
2255	Analog actual value 9	Minimum setpoint	3-02	3-02	3-02
2256	Analog actual value 10	Maximum setpoint	3-03	3-03	3-03
2240	Q analog setpoint 1	Parameter set selection, actual value mode	Control word. 13/14	Control word. 13/14	Control word. 13/14
2241	Q analog setpoint 2	Minimum setpoint PS2	3-02	3-02	3-02
2242	Q analog setpoint 3	Maximum setpoint PS2	3-03	3-03	3-03
2222	Digital actual value 1	Mains phase error	Warning word. 14	Warning word. 14	Warning word. 14
2224	Digital actual value 2	Thermal warning	State word. 15	State word. 15	State word. 15
2225	Digital actual value 3	Voltage high/low	State word. 13	State word. 13	State word. 13
2226	Digital actual value 4	Not in freq. range	State word. 10	State word. 10	State word. 10
2227	Digital actual value 5	Dig. input terminal 32	16-60	16-60	-
2228	Digital actual value 6	Dig. input terminal 33	16-60	16-60	16-60
2216	Q digital setpoint 1	Relay 1 on	Control word. 11	Control word. 11	Control word. 11
2220	Q digital setpoint 2	Relay 2 on	Control word. 12	Control word. 12 (only for FC-302)	-
2245	Q digital setpoint 3	Activate relay	5-40	5-40	5-40
2246	Q digital setpoint 4	DC brake	Control word. 02	Control word. 02	Control word. 02
2217	Operating mode	Stop, manual, automatic	State word. 11/09	State word. 11/09	State word. 11/09

