MAKING MODERN LIVING POSSIBLE

BD Controller 101N08xx Series 12-24 V DC

with Tool4Cool® LabEdition software

TOOL4COOL®
Flexible settings control

Operating Instructions

Contents

1. Introduction

1.1 Applications

The Danfoss BD compressors with 101N08xx Series 12-24V DC are designed for use in:

- Comfort cooling in parking anti-idle applications
- Spot and comfort cooling in buses, golf carts, smaller boats, forklifts, campers etc
- Cooling of switchboards and batteries in radio stations for cellular phones
- Mobile refrigeration applications
- Air cargo cooling
- Mobile cooling boxes of volume up to 1000L
- Mobile refrigeration applications

1.2 Capability

For R134a compressor variants:
One application module can control either single or twin compressor configurations.
The cooling capacity of the single compressor configuration is approx. 900 Watt @ Pe/Pc ~+15/+55°C
The cooling capacity of the twin compressor configuration is approx. 1800 Watt @ Pe/Pc ~+15/+55°C
The system is able to operate in ambient temperatures up to +55 °C.
The operating conditions are High Back Pressure (HBP).

For R404A/R507 compressor variants:
The cooling capacity of the compressor is approx. 380 Watt @ Pe/Pc ~-5/+55°C
The system is able to operate in ambient temperatures up to +55 °C.
The operating conditions are Low Back Pressure (LBP).

1.3 Functions

The main functions of the controllers are:

- Operation using either 12 V DC or 24 V DC
- Simultaneous and independent control of two compressors in twin configuration
- ECO function to optimize compressor speed for minimum power consumption
- Detailed error log
- Event log
- Motor / Compressor speed control
- Thermostat control (ON / OFF or electronic via NTC temperature sensor)
- Condenser fan control
- Evaporator fan control
- Communication interface
- Monitoring function
- Battery protection functions
- Main Switch
- Log of specific parameters
- Optimization of specific parameters via PC software before commencing mass production

1.4 Programming Interface

The controller can be accessed using either

- The Danfoss software tool Tool4Cool® LabEdition, or
- A custom interface. Please contact Danfoss for further information regarding custom interfaces

2. Installation

Installation involves the following steps:
- Checklist
- Cable connection
- Software installation and configuration

2.1 Checklist

Check that you have the following:

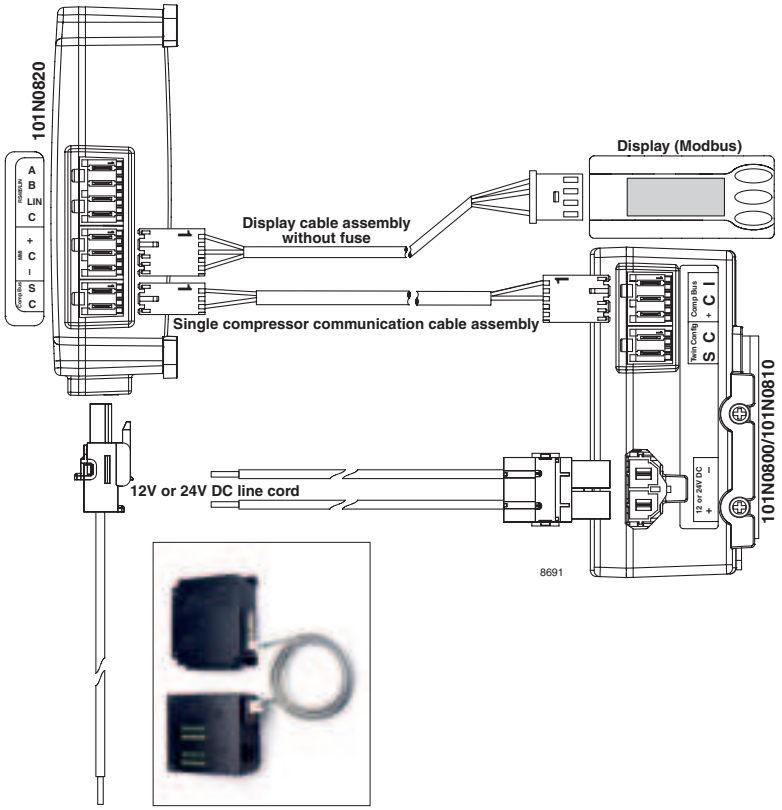
BD Controller 101N08xx Series 12-24 V DC (modules and cables) Image shows compressor/application modules 101N08xx-series in twin compressor configuration with communication cable asembly		
Tool4Cool® LabEdition software installation CD		
NTC temperature sensor (alternative: mechanical thermostat)		
DC line cords		
Product key for BD compressor controller		DH3TT6RBAD1GW8G68ZM1N8G62ZMCOO916IER6GH2YZEIR
Alternative gateways	Danfoss Bluetooth® gateway with USB power supply • Gateway • USB power supply • Bluetooth® connection cable (must be ordered separately)	
	Danfoss One Wire/LIN gateway with connection cables • Gateway • One Wire/LIN gateway Communication cable • USB port connector to PC • USB 2.0 A/B cable	

Ordering: See section *5.0*

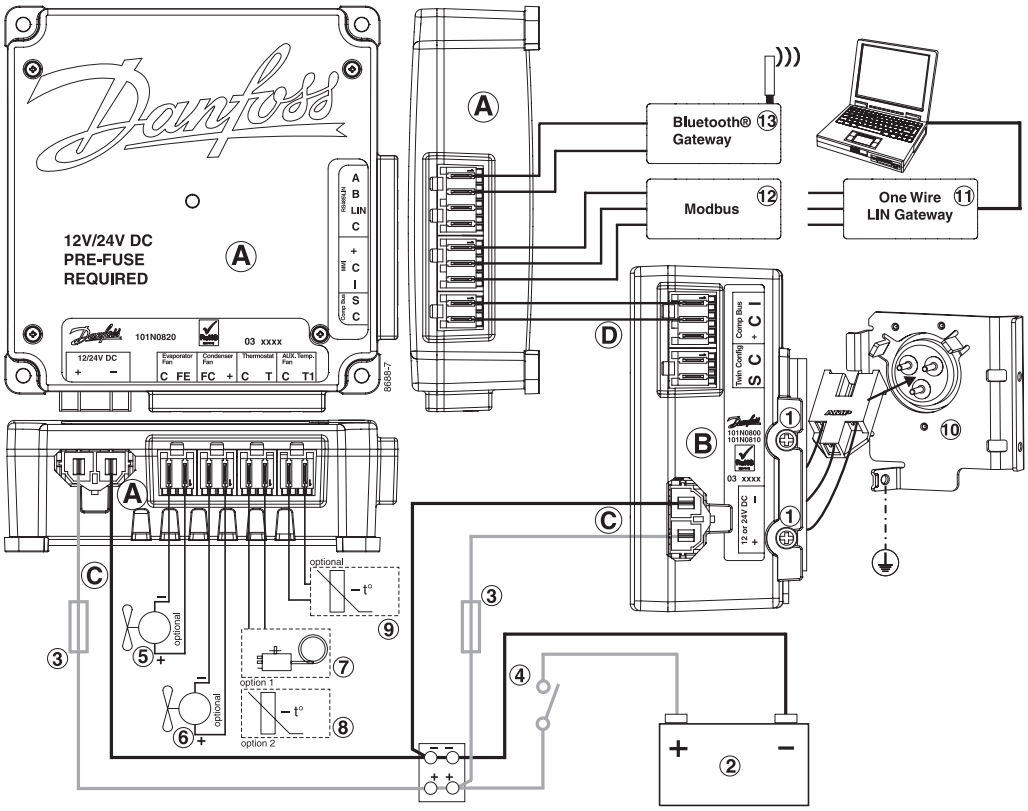
2.2 Connect cables

2.2.1 Single compressor configuration, 12 V DC or 24 V DC

Connect cables as shown. Each type of gateway needs its own adapted connection cable, please refer to our *BD Controller 101N08xx Series 12-24 V DC with Tool4Cool® LabEdition software - **Quick Start Guides***.

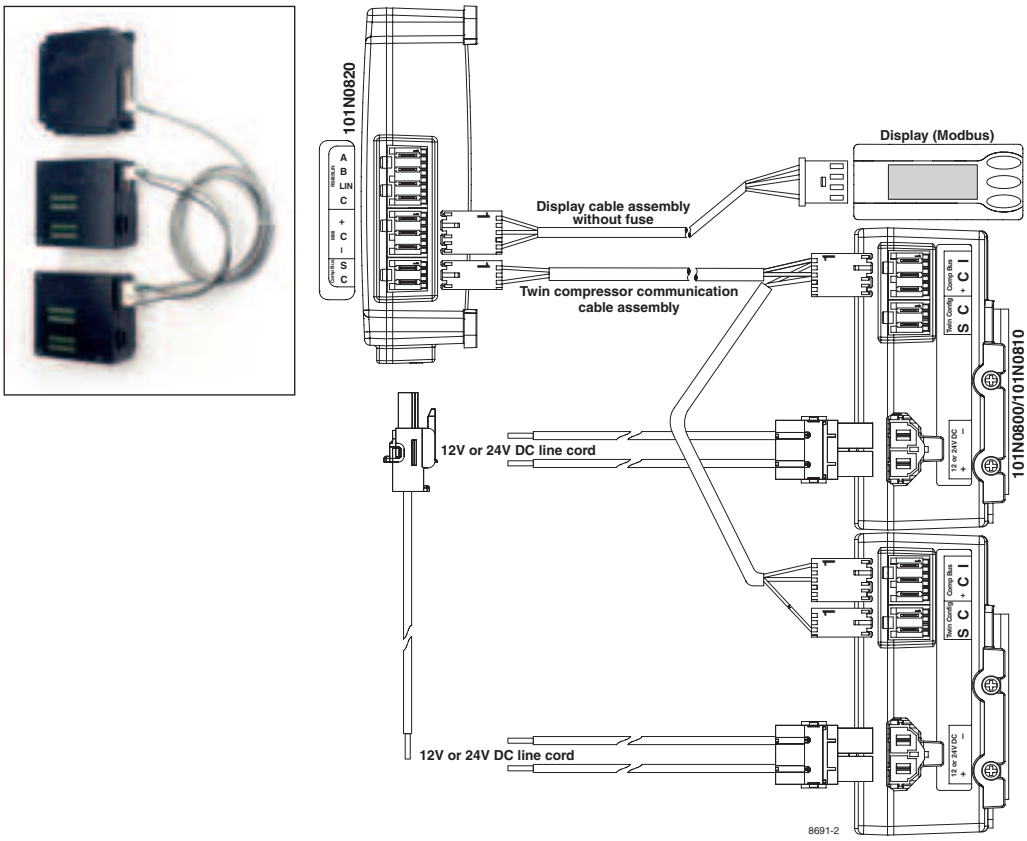


Wiring diagram

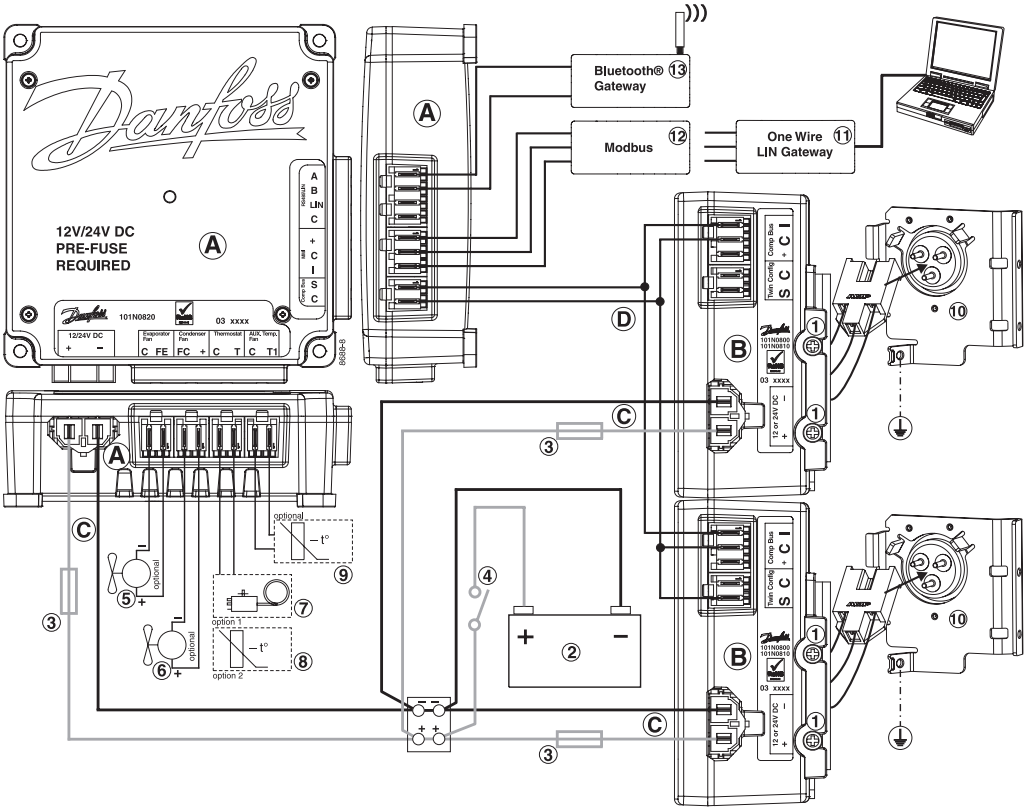


2.2.2 Twin compressor configuration, 12 V DC or 24 V DC

Connect cables as shown. Each type of gateway needs its own adapted connection cable, please refer to our *BD Controller 101N08xx Series 12-24 V DC with Tool4Cool® LabEdition software* - ***Quick Start Guides***.



Wiring diagram



Legend for 2.1 & 2.2

A) Application module 101N0820
B) Compressor module 101N0800, 12 V DC / compressor module 101N0810, 24 V DC
C) Line cords
D) Single or twin compressor communication cable assembly

1) Mounting screws
2) Battery
3) Fuse
4) Main switch
5) Evaporator fan
6) Condenser fan
7) Mechanical thermostat
8) NTC temperature sensor (electrical thermostat), alternative: mechanical thermostat
9) NTC auxiliary temperature sensor
10) Compressor(s)
11) Danfoss One Wire/LIN gateway communication interface
12) Modbus-compatible device
13) Danfoss Bluetooth® gateway communication interface

See Intructions *DEHC.EI.100.V.* for details.

2.3 Install and configure software

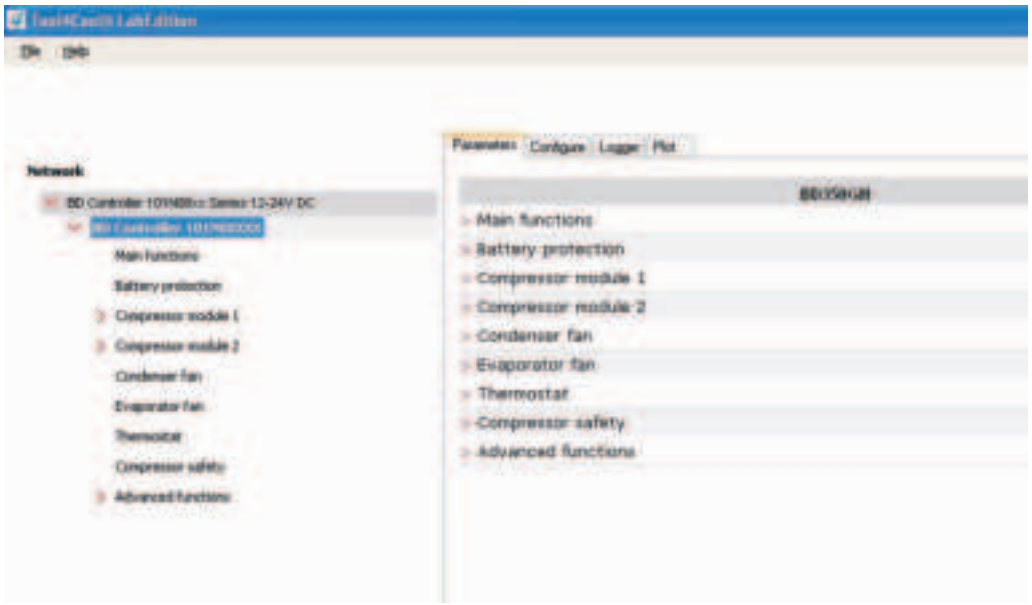
For brief software installation and configuration instructions please refer to our *BD Controller 101N08xx Series 12-24 V DC with Tool4Cool® LabEdition software* - ***Quick Start Guides***.
For detailed instructions please refer to *Tool4Cool® LabEdition* ***Operating Instructions***.
These manuals are supplied with the Tool4Cool® software.

3. Tool4Cool® software interface

3.1 User interface

The controller can be programmed and optimized from a PC using the Tool4Cool® software
An example of the Tool4Cool® user interface showing the main parameter groups of the *BD Controller 101N08xx Series 12-24 V DC* is shown below.

Example:



3.2 Operation

The Tool4Cool® software enables the user to observe and document certain aspects of the compressor operation via the controller. The output of the software is in the form of data logs and plots.

Using Tool4Cool® the user can also change the settings of the controller parameters, and copy settings from one controller to another. Please refer to the Tool4Cool® LabEdition Operating Instructions for operation instructions.

4. Parameters

The user can change settings and observe real-time measurements in the following parameters.
The table in *4.1 Parameter Overview* is intended for easy reference.
For more detail, please refer to *4.2 Description of Parameter Groups*.

4.1 Parameter Overview

Parameter Group	Parameter text	Description	Default	Min value	Max value	Step size	Unit	Type
Main functions								
	Main switch	ON/OFF regulation of power supply to controller	0	0	1	1	0 = OFF 1 = ON	Setting
	Reset power consumption	Resets cumulative powerconsumption of the entire system to zero	0	0	1	1	0 = OFF 1 = ON	Setting
	Total power consumption	Real-time power consumption of the entire system		0	65535	10	W	Measurement
	Total power consumption since start	Cumulative power consumption of the entire system since the most recent startup		0	65535	10	Wh	Measurement
	Total power consumption last period	Cumulative power consumption of the entire system in the previous period		0	65535	10	Wh	Measurement
Main functions Compressor 1								
	Reset power consumption	Resets cumulative power consumption of Compressor 1 to zero	0	0	1	1	0 = OFF 1 = ON	Setting
	Total power consumption	Cumulative power consumption of Compressor 1		0	65535	10	W	Measurement
	Total power consumption since start	Cumulative power consumption of Compressor 1 since the most recent startup		0	65535	10	Wh	Measurement
	Total power consumption last period	Cumulative power consumption of Compressor 1 in the previous period		0	65535	10	Wh	Measurement
Main functions Compressor 2								
	Reset power consumption	Resets cumulative power consumption of Compressor 2 to zero	0	0	1	1	0 = OFF 1 = ON	Setting
	Total power consumption	Cumulative power consumption of Compressor 2		0	65535	10	W	Measurement
	Total power consumption since start	Cumulative power consumption of Compressor 2 since the most recent startup		0	65535	10	Wh	Measurement
	Total power consumption last period	Cumulative power consumption of Compressor 2 in the previous period		0	65535	10	Wh	Measurement

Parameter Group	Parameter text	Description	Default	Min value	Max value	Step size	Unit	Type
Battery protection								
12 V DC	Battery cutout level	Battery protection cut-out voltage level	10.4	9.6	17	0.1	V	Setting
	Battery cutin diff.	Battery protection cut-in	1.3	0.5	10	0.1	V	Setting
24 V DC	Battery cutout level	Battery protection cut-out voltage level	21.3	19.0	27.0	0.1	V	Setting
	Cutout delay	Time to cut-out when non-critical battery protection implemented	3	0	60	1	sec	Setting
	Cut-in level	Calculated value. Cut-in = Cut-out + Diff					V	Measurement
	Supply voltage	Real time voltage measured on + and - terminals					V	Measurement
Compressor 1								
	Requested speed	Compressor speed and therefore capcity definition	4000	2500	4000	1	rpm	Setting
	Start delay	Time to start after compressor is switched ON	4	2	240	1	sec	Setting
	Start Speed	Optional startup speed lower than Requested speed, during the period Start time	2500	2500	4000	100	rpm	Setting
	Start time	Period of time elapsing after startup of compressor until Requested speed is reached	30	0	600	5	sec	Setting
	Compressor speed	Real-time speed (+/- 10%)			100		rpm	Measurement
	Supply voltage	Real time voltage measured on + and - terminals					V	Measurement
Compressor 2								
	Requested speed	Compressor speed and therefore capacity definition	4000	2500	4000	1	rpm	Setting
	Start delay	Time to start after compressor is switched ON	8	2	240	1	sec	Setting
	Start Speed	Optional start-up speed lower than Requested speed, during the period Start time	2500	2500	4000	100	rpm	Setting
	Start time	Period of time elapsing after start-up of compressor until Requested speed is reached	30	0	600	5	sec	Setting
	Compressor speed	Real-time speed (+/- 10%)			100		rpm	Measurement
	Supply voltage	Real time voltage measured on + and - terminals					V	Measurement
Condenser fan								
	Condenser fan speed	Condenser fan speed synchronized with compressor operation	100	40	100	1	%	Setting
	Condenser fan start delay	Time to start as a function of Thermostat	0	0	240	1	sec	Setting
	Condenser fan stop delay	Time to stop as a function of Thermostat	0	0	240	1	sec	Setting
	Condenser fan forced ON	Force condenser fan continuously ON or OFF	0	0	1	1	0 = OFF 1 = ON	Setting
	Detect missing condenser fan	Detect whether condenser fan is connected	0	0	1	1	0 = OFF 1 = ON	Setting
	Condenser fan speed	Real-time condenser fan speed					%	Setting

Parameter Group	Parameter text	Description	Default	Min value	Max value	Step size	Unit	Type
Evaporater fan								
	Evaporator fan speed	Evaporator fan speed synchronized with compressor operation	100	40	100	1	%	Setting
	Evaporator fan start delay	Time to start as a function of Thermostat	6	0	240	1	sec	Setting
	Evaporator fan stop delay	Time to stop as a function of Thermostat	0	0	240	1	sec	Setting
	Evaporator fan forced ON	Force condenser fan continuously ON or OFF	0	0	1	1	0 = OFF 1 = ON	Setting
	Detect missing Evaporator fan	Detect whether condenser fan is connected	0	0	1	1	0 = OFF 1 = ON	Setting
	Evaporator fan speed	Real-time condenser fan speed					%	Measurement
Thermostat								
	Thermostat type	Detect mechanical or NTC sensor thermostat	2 (Auto)	0 (Mechanical)	2 (Auto)	1		Setting
	Cutout temperature	Compressor cuts out below cut-out temperature	25	-40	40	0.1	°C	Setting
	Difference	Compressor cuts in above cut-in(cut out+ difference) temperature	3	1	15	0.1	K	Setting
	Forced ON	Force thermostat operation to continuously ON or OFF	0	0	1	1	0 = OFF 1 = ON	Setting
	Cutout temperature 2	In a twin configuration, Compressor 2 cuts out below this temperature	25	-40	40	0.1	°C	Setting
	Difference 2	Compressor cuts in above cut-in(cut out+ difference) temperature	3	1	15	0.1	K	Setting
	Forced ON 2	Force thermostat operation to continuously ON or OFF	0	0	1	1	0 = OFF 1 = ON	Setting
	Auxiliary temperature sensor	0 - not connected 1 - connected	0	1	1	1	0 = OFF 1 = ON	Setting
	Runtime	During cooling OFF (Thermostat cut-out), the Runtime will show the duration of the last cooling period. Runtime is reset at cooling ON period. At power-up the reading is reset.				1	min	Measurement
	Actual temperature	Real-time air temperature when an NTC sensor is used. When a mechanical thermostat is used, only thermostat status ON or OFF is displayed.					°C	Measurement
	ECO mode	Turns the ECO mode on and off	off	off	on	on		Setting
	ECO speed	Speed applied when temperature falls below ECO temperature	4000	2500	4000	1	rpm	Setting
	ECO temperature	Temperature where ECO speed is applied	25	-40	40	0.1	°C	Setting
	Automatic ECO temperature	cut-out + cut-in / 2	1	0	1	1	0 = OFF 1 = ON	Setting
	Synchronic mode	In order to operate with only one set point during twin operation	1	0	1	1	0 = OFF 1 = ON	Setting
Compressor safety								
	Restart delay	Delay before restart after short cycling	60	60	120	1	sec	
Communication								
	Node number (application module)	Modbus address	1	1	247	1		Setting
	Bits per second	Communication speed	19200 bps	9600 bps	19200 bps	1		Setting
	Set Main Switch to OFF when communication timeout occurs		0	0	1	1	0 = OFF 1 = ON	Setting
	Communication timeout	Maximum duration of each communication attempt.	900	15	7200	1	sec	Setting
	Settings protection code	Privacy function code must be entered twice	0	0	9999			Setting
	Settings protection status		0	1	0	1		Measurement

Parameter Group	Parameter	Description	Default	Min value	Max value	Step size	Unit	Type
Product information application module								
	Unit name	The user's own identification for the unit can be entered here (optional)	0	0	250	1	characters	
	Product code (Code number)	Danfoss product code number						Measurement
	Firmware version	Application module software version						Measurement
	Unit ID	Danfoss unit ID						Measurement
	Production Date	Danfoss production date						Measurement
	Serial (Serial number)	Danfoss serial						Measurement
	Vendor name	Vendor name						Measurement
	ProdText (Text that appears on the label)							
Product information compressor module 1								
	Unit name	The user's own identification for the unit can be entered here (optional)						
	Product code	Danfoss product code number						Measurement
	Firmware	Compressor module software version						Measurement
	Production Date	Danfoss production date						Measurement
	Serial (Serial number)	Danfoss serial						Setting
	Vendor name	Vendor name						Measurement
	ProdText (Text that appears on the label)							
Product information compressor module 2								
	Unit name	The user's own identification for the unit can be entered here (optional)						
	Product code	Danfoss product code number						Measurement
	Firmware	Compressor module software version						Measurement
	Production Date	Danfoss production date						Measurement
	Serial (Serial number)	Danfoss serial						Setting
	Vendor name	Vendor name						Measurement
	ProdText(Text that appears on the label)							
Custom registers								
	Register 1	Custom-designed interface parameter	65535	0	65535	1		Setting
	Register 2	Custom-designed interface parameter	65535	0	65535	1		Setting
	Register 3	Custom-designed interface parameter	65535	0	65535	1		Setting
	Register 4	Custom-designed interface parameter	65535	0	65535	1		Setting
	Register 5	Custom-designed interface parameter	65535	0	65535	1		Setting
	Register 6	Custom-designed interface parameter	65535	0	65535	1		Setting
	Register 7	Custom-designed interface parameter	65535	0	65535	1		Setting
	Register 8	Custom-designed interface parameter	65535	0	65535	1		Setting
	Register 9	Custom-designed interface parameter	65535	0	65535	1		Setting
	Register 10	Custom-designed interface parameter	65535	0	65535	1		Setting

Parameter Group	Parameter	Description	Default	Min value	Max value	Step size	Unit	Type
BD status								
	Actual error (application module)			0	40	1	0 = No error 1 = Battery protection failure 2 = Fan failure 3 = Motor failure 4 = Min. speed failure 5 = Thermal failure 6 = NTC failure 7 = Communication Error	
	Actual error (compressor module 1)			0	40	1	0 = No error 1 = Battery protection failure 3 = Motor failure 4 = Min. speed failure 5 = Thermal failure	
	Actual error (compressor module 2)			0	40	1	0 = No error 1 = Battery protection failure 3 = Motor failure 4 = Min. speed failure 5 = Thermal failure	
Logs on application								
	Event log					1	0 = OFF 1 = ON	Measurement
	Clear event log		0	0	1	1		Setting
	Error log							Measurement
	Clear error log		0	0	1	1		Setting
Logs on Compressor 1								
	Event log					1	0 = OFF 1 = ON	Measurement
	Clear event log		0	0	1	1		Setting
	Error log							Measurement
	Clear error log		0	0	1	1		Setting
Logs on Compressor 2								
	Event log					1	0 = OFF 1 = ON	Measurement
	Clear event log		0	0	1	1		Setting
	Error log							Measurement
	Clear error log		0	0	1	1		Setting

4.2 Description of Parameters

4.2.1 Main Functions

Main switch
In order to start and stop the compressor the Main Switch can be set to On or OFF .
OEMs making an interface with custom design electronics via Modbus must be able to control the CCU ON / OFF via the Main Switch.
ON: All functions are active.
OFF: All main functions are inactive, however

- Battery monitoring active
- NTC temperature sensor monitoring active
- Auxiliary temperature sensor monitoring active
- PCB inverter temperature monitoring inactive

Power consumption monitoring
Compressor power consumption is monitored at 10 minute intervals. The following information can be viewed via the Tool4Cool® interface:
For single configuration, individual compressor power consumption
For twin configuration, combined compressor power consumption (application module + 2 compressor modules)
Power consumption for each compressor can also be logged.
Cumulative power consumption since startup
Cumulative power consumption last period
The user can reset power consumption to zero using the *Reset power consumption* function

Settings:

Name	Default	Min value	Max value	Step	Unit
Main switch	OFF	OFF	ON	1	-
Reset power consumption	0	0	1	1	-

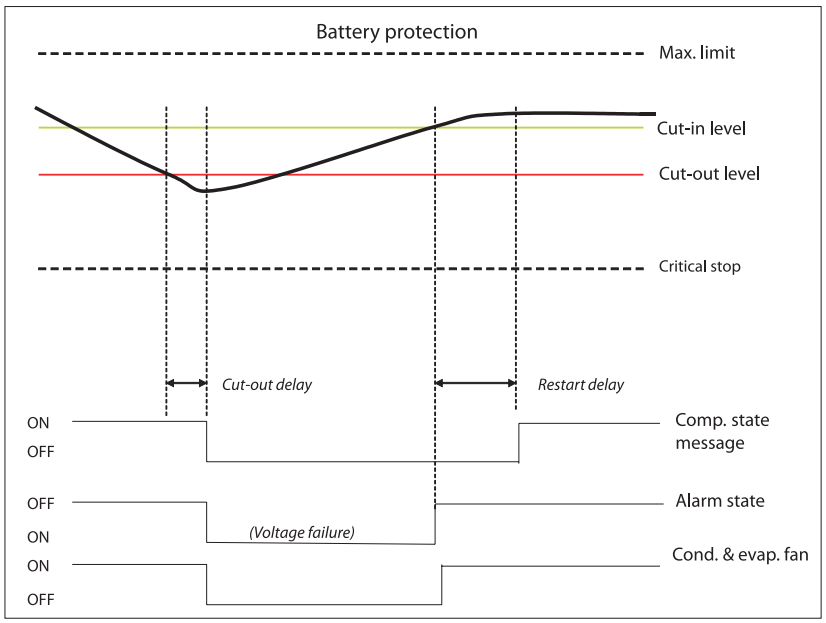
Measurement:

Name	Default	Min value	Max value	Step	Unit
Power consumption		0	65535	10	W
Power consumption since start		0	65535	10	Wh
Power consumption last period		0	65535	10	Wh

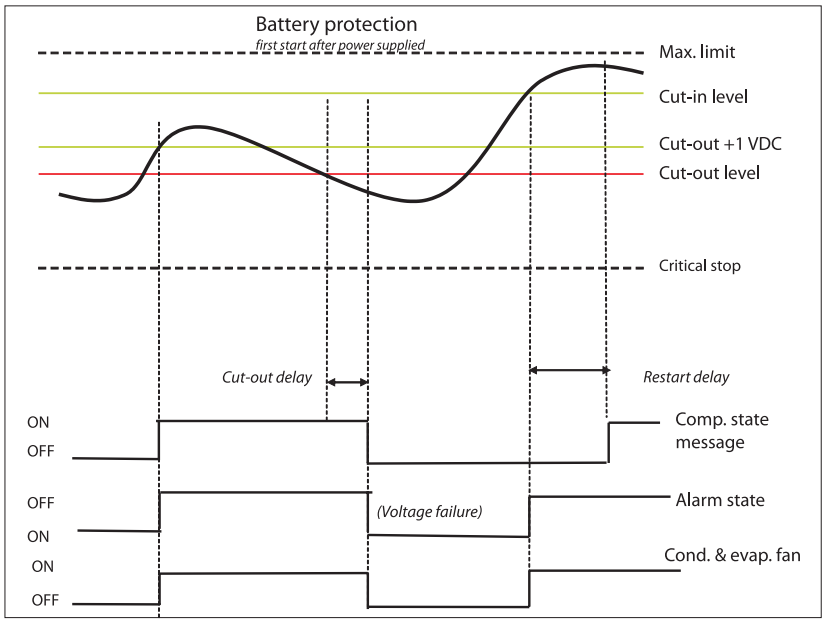
4.2.2 Battery protection

The battery protection serves to avoid permanent damage to the battery by discharge.
For 12V DC systems, the setting range is 9.6-15 V DC, with critical stop without delay if voltage stops, below 8 V DC. The setting range for 24 V DC systems is 19 to 27 V DC, with critical stop without delay if voltage drops below 15 V DC or exceeds 31.5 V DC. Tolerances are ± 0.30 V DC.

For normal operation:



For initial startup after power ON, extra protection has been provided by allowing cut in only when the voltage exceeds cut out + 1 V DC :



Settings:

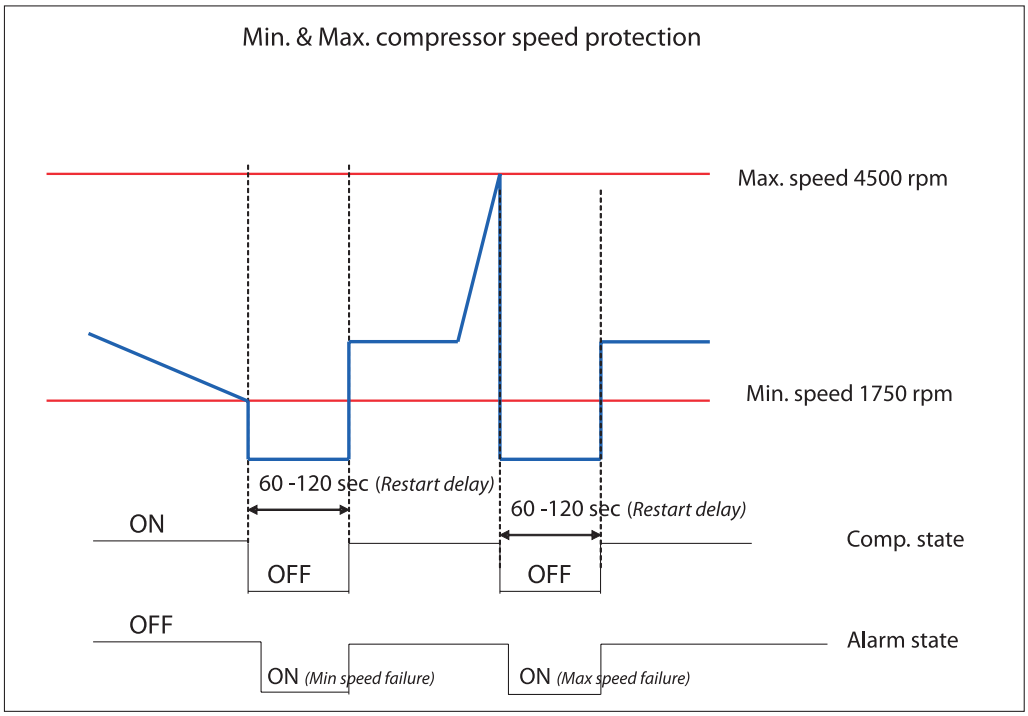
Name	Default	Max value	Min value	Step	Unit
Battery cut-out level 12 V DC power supply	10.4	17.0	9.6	0.1	V DC
Battery cut-out level 24 V DC power supply	21.3	27.0	19.0	0.1	V DC
Battery cut-in difference power supply	1.3	10.0	0.5	0.1	V DC
Cut-out delay	3	60	0	1	sec

Measurements:

Name	Description	Step	Unit
Cut-in level	Calculated value. Cutin = Cutout + Diff.	0.1	Volt
Supply voltage	Real-time - voltage measured on + & - terminals	0.1	Volt

4.2.3 Compressor

The speed and thereby the capacity of the compressor is set using the *Requested speed* parameter.
During start up, the compressor can be run at a lower speed, *Start speed*, than Requested speed.
The duration of the period running at *Start speed* is set using the *Start time* parameter.
The compressor is protected against operation below minimum speed. Lubrication of the compressor will be very poor at excessively low speed and therefore low speed operation can lead to destruction of the compressor. Speed limits are: min 1850 rpm; max speed 4300 rpm.
If the compressor speed falls below the minimum or exceeds the maximum speed, the compressor will stop and an alarm *Min speed failure or Max. speed failure* will be sent. The compressor will try to restart after the set *Restart time*. The *Restart time* default is 60 sec.
In the event of failure the entire system will shut down (all 3 modules)



Settings:

Name	Default	Max value	Min value	Step	Unit
Requested speed	4000	4000	2500	100	rpm
Start delay	4	240	2	1	Seconds
Start speed	2500	4000	2500	100	rpm
Start time	30	600	0	1	Seconds

Measurements:

Name	Description	Step	Unit
Compressor speed	Real-time compressor speed(+/-10%)	1	rpm

4.2.4 Condenser fan

The speed of the condenser fan can be controlled in order to save energy, reduce noise and optimize the fan operation.

The fan is synchronized with the compressor operation.
Start and stop delays can be set up as a function of the state of the parameter *Thermostat*.
Furthermore, the fan can be set to run continuously (forced ON operation).
Some fan defects are detectable, and are displayed in the parameter *Error*.
The speed of the fan can be controlled in the range from 40% to 100%.
For 12 V DC systems 12 V DC fans should be used, and correspondingly for 24 V DC systems, 24 V fans should be used.

Settings:

Name	Default	Max value	Min value	Step	Unit
Fan speed	100	100	40	10	%
Fan start delay	0	240	0	1	Seconds
Fan stop delay	0	240	0	1	Seconds
Fan forced ON	OFF	ON	OFF	1	-
Detect missing fan	OFF	ON	OFF	1	-

Measurements:

Name	Description	Step	Unit
Fan speed	Actual fan speed	1	%

4.2.5 Evaporator fan

The speed of the evaporator fan can be controlled in order to save energy, reduce noise and optimize the fan operation.

The fan is synchronized with the compressor operation.
Start and stop delays can be set up as a function of the state of the parameter *Thermostat*.
Furthermore, the fan can be set to run continuously (forced ON operation).
Some fan defects are detectable, and are displayed in the parameter *Error*.
The speed of the fan can be controlled in the range from 40% to 100%.
For 12 V DC systems 12 V fans should be used, and correspondingly for 24 V DC systems, 24 V fans should be used

Settings:

Name	Default	Max value	Min value	Step	Unit
Fan speed	100	100	40	10	%
Fan start delay	0	240	0	1	Seconds
Fan stop delay	0	240	0	1	Seconds
Fan forced ON	OFF	ON	OFF	1	-
Detect missing fan	OFF	ON	OFF	1	-

Measurements:

Name	Description	Step	Unit
Fan speed	Real-time fan speed	1	%

4.2.6 Thermostat

Thermostat type
Two types of thermostat can be utilized for temperature control.

Electronic thermostat (NTC sensor)
The electronic thermostat provides active temperature control.
Disconnected sensor error alarm *(NTC sensor failure)* is sent when the measured temperature is > +100°C
Short circuited sensor error alarm *(NTC sensor failure)* is sent when the measured temperature < - 50°C

Mechanical thermostat
A mechanical ON/OFF thermostat can be connected at terminals C & T.
No detection of faulty thermostat is provided when an ON/OFF thermostat is used.

Automatic thermostat selection
The *Thermostat* parameter displays the type of thermostat connected to the controller: either a mechanical thermostat or NTC temperature sensor.
An NTC sensor is recommended for the temperature range -50 °C to +100 °C
A mechanical thermostat is recommended for temperatures below -50 °C and above +100 °C

Note: An NTC sensor error is not detectable when the NTC sensor is operating in automatic thermostat selection mode.
An over temperature alarm (*NTC sensor failure*) is raised if the measured temperature exceeds+100°C
An under temperature alarm (*NTC sensor failure*) is raised if the measured temperature drops below - 10°C

Settings:

Name	Default	Max value	Min value	Step	Unit
Thermostat type	Auto	Electronic	-	-	-
Cutout temperature	+ 25	+ 40	-40	1	Celsius (°C)
Difference	3	15	1	1	Kelvin (K)
Forced ON	OFF	ON	OFF	1	-
Cutout temperature 2	25	40	-40	0.1	°C
Difference 2	3	15	1	0.1	K
Forced ON 2	0	1	0	1	0 = OFF 1 = ON
Synchronic mode	1	1	0	1	0 = OFF 1 = ON

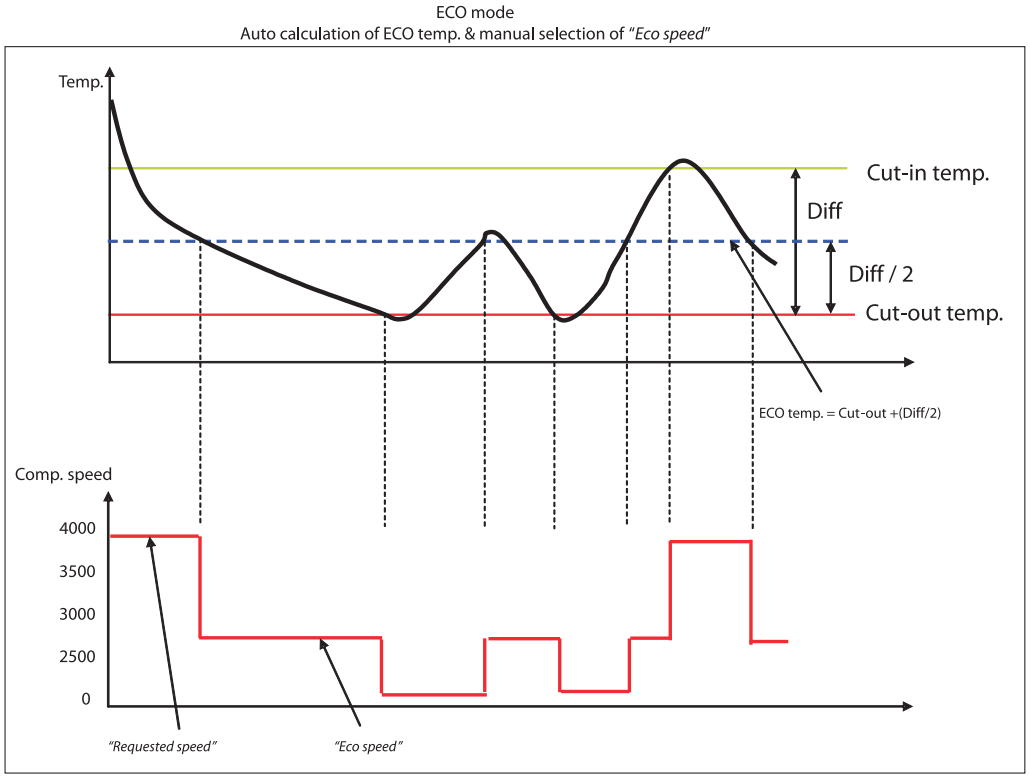
Measurements:

Name	Description	Step	Unit
Runtime	Runtime is provided to record cooling-time (thermostat cut-in period). The runtime is updated during cooling, starting with 0 at start of cooling. During cooling OFF (Thermostat cut-out), the *Runtime* parameter will show the time for the last cooling period. Runtime is reset at the beginning of a cooling ON period, and at power-up.	1	Minutes
Actual temperature	Real-time air temperature when a NTC sensor is used. When a mechanical thermostat is used, only thermostat status ON or OFF is displayed.	-	°C

4.2.7 ECO function

Operation in ECO mode reduces energy consumption and noise by controlling compressor speed as a function of temperature. ECO mode can be selected only when using an NTC temperature sensor.
It is only possible to select ECO mode when running a single configuration or a twin configuration with *Synchronic mode* turned ON.
In case of switching from selectable ECO mode to non selectable ECO mode, the ECO function is going to be switched OFF autmatically.
In ECO mode,

- when operating below ECO temperature, compressors run at the set ECO speed, and the *Start speed* setting will be overruled, if it differs from ECO speed.
- when operating above ECO temperature, the compressors run at Requested speed.

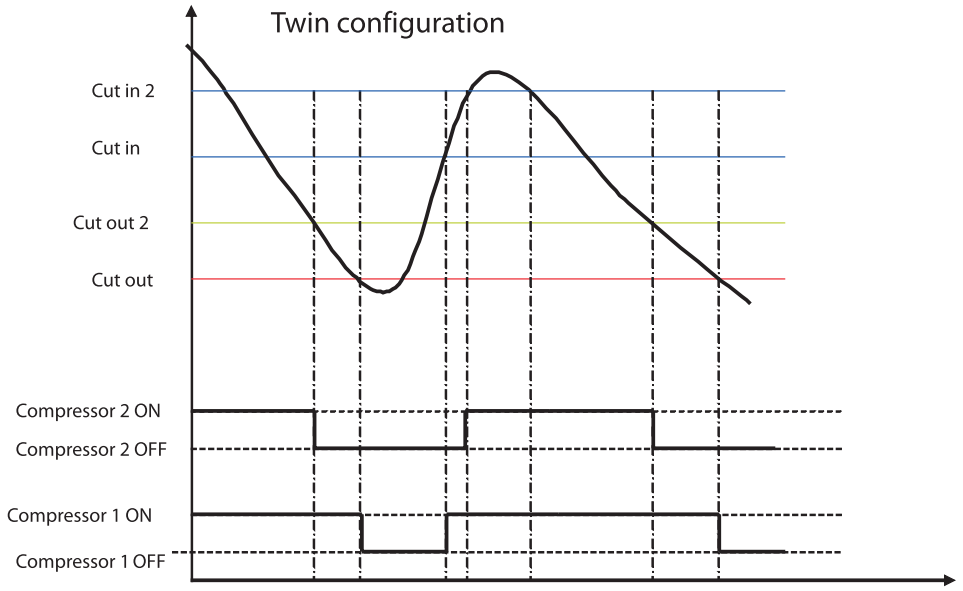


Settings:

Name	Default	Max value	Min value	Step	Unit
ECO mode	OFF	ON	OFF	1	
ECO speed	2500	4000	2500	1	rpm
ECO temperature	25	40	-40	0.1	Celsius (°C)
Automatic ECO temperature	1	1	0	1	0 = OFF 1 = ON

4.2.8 Twin function

When operating in twin configuration, the thermostat cut-in and cut-out settings for each of the two compressors can be established independently. In *Synchronic mode* only one set point is valid for both compressors.



4.2.9 Communication

Lost communication
The unit will automatically detect if an external MMI has been connected to the application module. Once it has been detected it will ensure that the system will not continue to run, when the communication has been lost.

When the communication is lost the entire system will stop and a communication error will be prompted. The communication will stay off until there will be a valid frame on the bus. The error will be erased and the system will start to run again.

Set main to off when communication is lost.
When choosing this setting the main will be set to off when the communication is lost. Through that the system will stop. The system will remain off until the MMI has set the main switch to on again.

Protection of settings
A coded privacy function protects customers' settings from being read by third parties.
The code must be verified by entering twice.

Settings:

Name	Default	Min value	Max value	Step	Unit
Node number	1	1	247	1	-
Bits per second	19200	19200	9600	9600	0 = Disabled 1 = Enabled
Communication	0	0	1	1	Seconds
Communication timeout	900	15	7200	1	-
Setting protection code & status	0	0	9999	1	-

4.2.10 Compressor safety

In order to prevent the compressor from short cycling a minimum restart time is built in.
After timeout of *Compressor restart time* a new start of the compressor is permitted.

Settings:

Name	Default	Max value	Min value	Step	Unit
Compressor restart tme	60	120	60	1	Seconds

4.2.11 Product information

Settings:

Name	Description
Unit name	Possible to fill in customer name for the unit when presented in PC software programme Tool4Cool®

Measurements:

Product code (Code number)
Firmware version
Unit ID
Production Date
Serial (Serial number)
Unit name
Vendor name
Supplier data
Production location
FFT date
Supplier part number
ProdText (Text that appears on the label)

4.2.12 Customer register

The customer register enables the user to set and change values in custom-designed interface modules.
These parameters are visible even when in protected mode.
Contact Danfoss for further information.

Settings:

Name	Default	Max value	Min value	Step	Unit
Register 1	65535	65535	0	1	-
to					
Register 2	65535	65535	0	1	-

4.2.13 Actual error

The alarm function notifies the user when an error arises in the system, and implements measures which prevent damage to the refrigeration system.

When an error occurs it is indicated at the PC in the software tool interface.

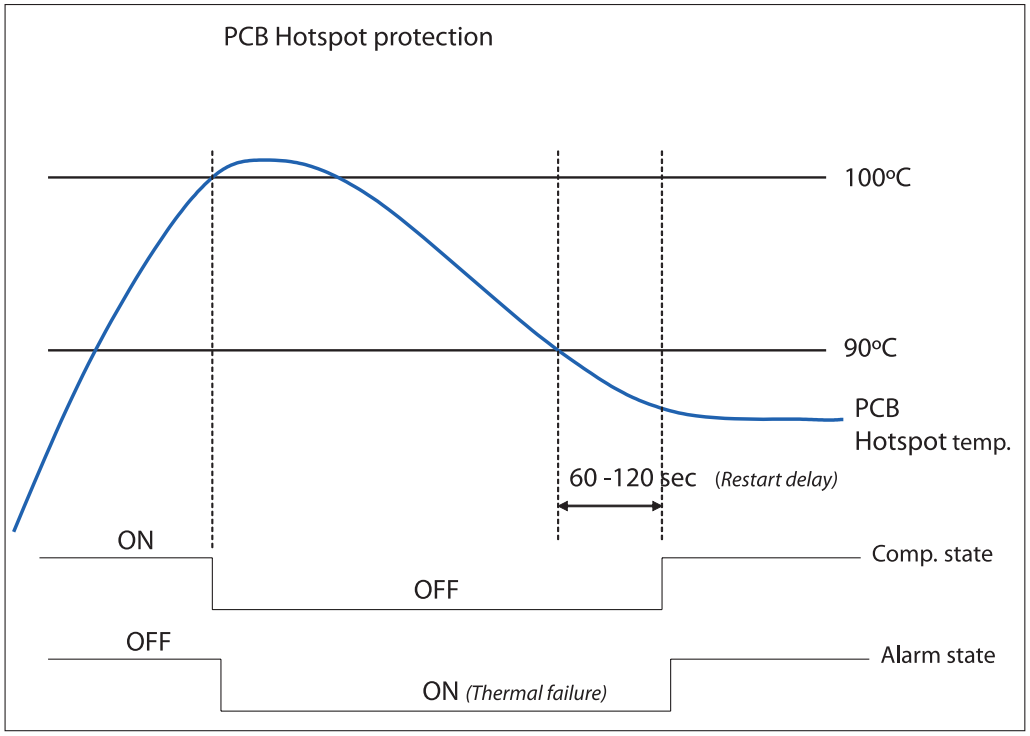
This parameter is on view in all parameter groups.

Output:

Name	Description
Actual error (application module)	0 = No errror 1 = Battery protection failure 2 = Fan failure 3 = Motor failure 4 = Min. speed failure 5 = Thermal failure 6 = NTC failure 7 = Communication Error
Actual error (compressor module 1)	0 = No errror 1 = Battery protection failure 3 = Motor failure 4 = Min. speed failure 5 = Thermal failure
Actual error (compressor module 2)	0 = No errror 1 = Battery protection failure 3 = Motor failure 4 = Min. speed failure 5 = Thermal failure

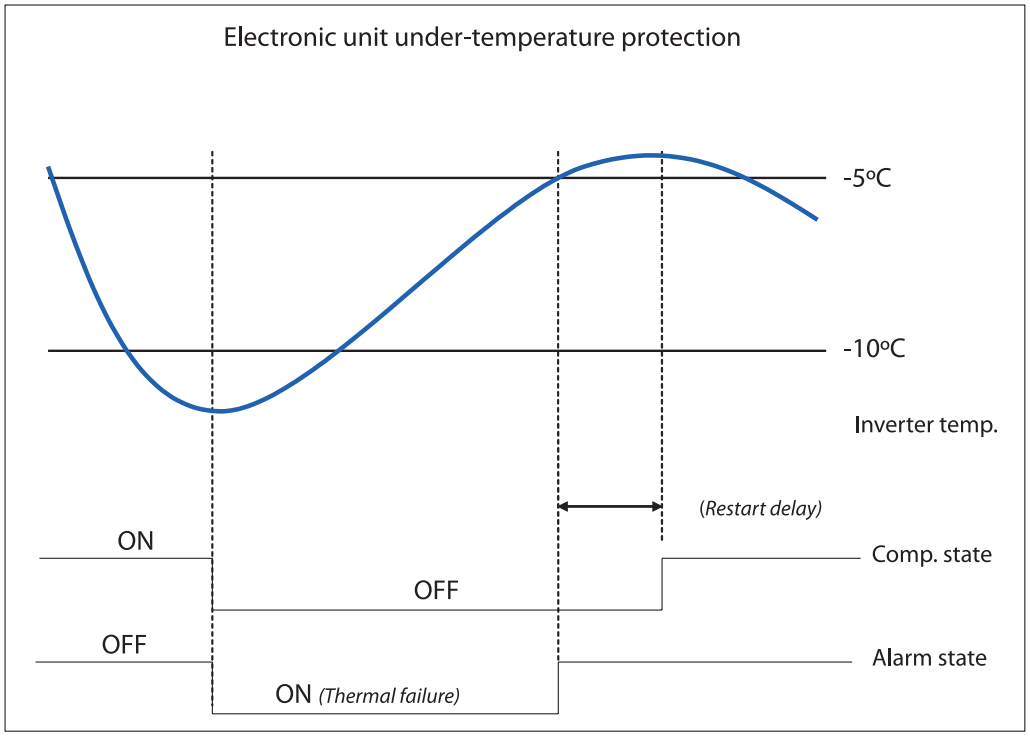
4.2.14 Inverter Temperature (PCB)

Electronic unit overheating protection
The controller overheating protection system ensures that the controller does not operate at extremely high temperatures, because under these conditions the quality of the soldered joints will be endangered. When the unit reaches 100 °C the system will shut down and an alarm error *(Alarm 5: Thermal failure)* will be sent. The system restarts automatically after the temperature has dropped below 90 °C. Hereafter the set delay *Compressor restart delay* must be terminated. The default duration is 60 sec.



Electronic unit under-temperature protection

The protection system ensures that the compressors, including the magnets in the motor, are not damaged by excessively low temperatures.



4.3 Error and event logs

4.3.1 Error log

The error log records the following data for each error arising:
- Time of occurrence related to compressor power up, with 1 sec as sample time
- The sequence of occurrence
- Number of occurrence (when no value is related to the parameter)
- Error name
- Sub Error name
- The value of the parameter which caused the failure (if connected to a parameter)
- Event list reference (changes which caused the failure if a parameter change caused the failure)

The error log can be cleared using the clear function.

4.3.2 Event log

The event log records the following parameter and event data to assist in service situations:
- Parameter changes (Parameters defined in the parameter)
- Power up
- Start/Stop signal from application module

The following information is recorded for each event:
- Time of occurrence related to compressor power up, with 1 sec as sample time
- The sequence of occurrence (Event list reference)
- Parameter/Event description
- The value of the parameter
- Number of occurrence (when no value is related to the parameter)

5. Ordering

	Model	Code no	Description
Compressors	BD350GH 12 V DC supply	102Z3015	
	BD350/350GH 12 V DC supply - twin compressor	102Z3018	
	BD350GH 24 V DC supply	102Z3016	
	BD350/350GH 24 V DC supply - twin compressor	102Z3017	
	BD220CL 12 V DC supply	102Z3020	
Single-Pack	Compressor module 12 V DC	101N0800	used together w. 101N0820
	Compressor module 24 V DC	101N0810	used together w. 101N0820
	Application module 12 & 24 V DC	101N0820	used together w. 101N800/810
	24 V DC line cord, 900 mm, 6mm²	105N9542	accessories
	24 V DC line cord, 2000 mm, 6 mm²	105N9540	accessories
	24 V DC line cord, 5000 mm, 6 mm²	105N9538	accessories
	Temperature sensor, 470 mm, spade connectors	105N9612	accessories
	Temperature sensor, 1000 mm, spade connectors	105N9614	accessories
	Temperature sensor, 1500 mm, spade connectors	105N9616	accessories
	Danfoss One Wire/LIN gateway with cables & driver	105N9501	accessories
	One Wire/LIN gateway communication cable	105N9524	accessories (101N8xxx series)
	Danfoss Bluetooth® gateway with power supply	105N9502	accessories
	Bluetooth® gateway communication cable	105N9525	accessories
Industrial-Pack (I-Pack)	Compressor module 12 V DC	101N0801	30 pcs.
	Compressor module 24 V DC	101N0811	30 pcs.
	Application module 12 & 24 V DC	101N0821	24 pcs.
	Compressor communication cable assembly 1500 mm	105N9553	80 pcs.
	Compressor communication cable assembly 3000 mm	105N9554	45 pcs.
	Twin compressor communication cable assembly 800 mm	105N9561	65 pcs.
	Twin compressor communication cable assembly 1500 mm	105N9555	65 pcs.
	Twin compressor communication cable assembly 3000 mm	105N9556	40 pcs.
	12 V DC line cord, 900 mm, 8 mm²	105N9560	40 pcs.
	12 V DC line cord, 2000 mm, 8 mm²	105N9559	20 pcs.
	24 V DC line cord, 5000 mm, 6 mm²	105N9539	36 pcs.
	24 V DC line cord, 900 mm, 6mm²	105N9543	36 pcs.
	24 V DC line cord, 2000 mm, 6 mm²	105N9541	36 pcs.
	Temperature sensor, 470 mm, spade connectors	105N9613	200 pcs.
	Temperature sensor, 1000 mm, spade connectors	105N9615	100 pcs.
	Temperature sensor, 1500 mm, spade connectors	105N9617	100 pcs.
	Display cable assembly without fuse 1500 mm	105N9557	65 pcs.
	Display cable assembly without fuse 3000 mm	105N9558	35 pcs.
Software Package	Tool4Cool® LabEdition, 1 license	105N9300	PC software, 1 licence version
	Tool4Cool® LabEdition, 2 license	105N9301	PC software, 2 licence version
	Tool4Cool® LabEdition, 5 license	105N9302	PC software, 5 licence version

6. Further information

For detailed installation and operation instructions, please refer to other literature, currently availabe from Danfoss:

Title	Danfoss Literature Number
Tool4Cool® LabEdition *Operating Instructions* Tool4Cool® LabEdition *Bedienungsanleitung* (German)	DEHC.PI.300.B__.02 DEHC.PI.300.B__.03
BD Controller 101N08xx Series 12-24 V DC with Tool4Cool® LabEdition software *Operation Instructions*	DEHC.PS.100.M__.02
BD Controller 101N08xx Series 12-24 V DC with Tool4Cool® LabEdition software and Danfoss One Wire/LIN gateway *Quick Start Guide*	DEHC.PS.100.N__.02
BD Controller 101N08xx Series 12-24 V DC with Tool4Cool® LabEdition software and Danfoss Bluetooth® gateway *Quick Start Guide*	DEHC.PS.100.P__.02
Danfoss Bluetooth® Gateway with Tool4Cool®LabEdition *Operation Instructions*	DEHC.PS.300.D__.02
Danfoss One Wire/LIN Gateway 105N9501 *Instructions*	DEHC.PI.100.K__.02
Compressor Module 101N0800, 12V DC Compressor Module 101N0810, 24V DC Application Module 101N0820, 12/24V DC *Instructions*	DEHC.EI.100.V__.02
12V & 24V DC Line Cords for Application Module 101N0820 & Compressor Modules 101N0800/0810 *Instructions*	DEHC.EI.100.E__.02
Display Cable without Fuse for Application Module 101N0820 Cord Sets for 101N0820 & 101N0800/0810 *Instructions*	DEHC.PI.100.L__.02
Single Compressor Communication Cable Assembly for 101N0800/101N0810 & 101N0820 Cord Sets for 101N0820 & 101N0800/0810 *Instructions*	DEHC.PI.100.M__.02
Twin Compressor Communication Cable Assembly for 101N0800/101N0810 & 101N0820 Cord Sets for 101N0820 & 101N0800/0810 *Instructions*	DEHC.PI.100.O__.02
Temperature Sensors for BD350GH Electronic Unit *Instructions*	DEHC.PI.100.G__.02

"__" = version number (changes)

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