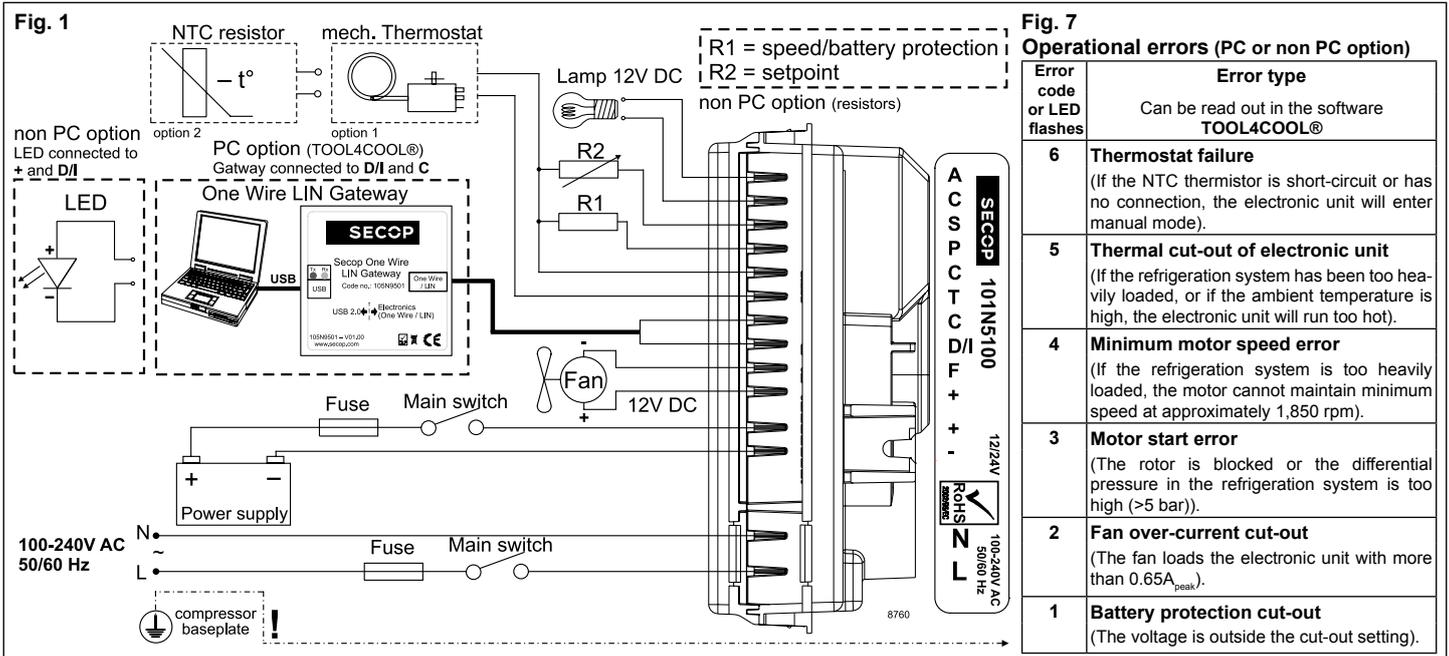


TOOL4COOL®
Flexible control settings

Instructions

SECOP

Electronic Unit for BD1.4F-VSD Compressor,
101N5100, 12/24V DC & 100-240V AC 50/60Hz



ENGLISH

The electronic unit is a multi voltage device. It can be used in both 12V/24V DC and 100-240V AC 50/60Hz power supply systems. Max. voltage is 17V DC for a 12V DC system and 31.5V DC for a 24V DC power supply system. Max. voltage is 265V AC and min. 85V AC for an AC power supply system. Max. ambient temperature is 55°C. The electronic unit has a built-in thermal protection which is actuated and stops the compressor operation if the electronic unit temperature becomes too high (100°C / 212°F on the PCB). It can be connected to a PC through the *Secop One Wire/LIN Gateway* communication interface on the terminal D/I and C (Fig. 1). Communication gateway modules incl. communication cables can be ordered at Secop. The PC interface allows you to create different settings and reads out several measurements by using the software tool *TOOL4COOL®* supplied by Secop.

Installation (Fig. 1)

Mount the electronic unit directly on the compressor plug and fix it with screws.

Power supply (Fig. 1)

DC: The electronic unit must always be connected directly to the battery poles. Connect the plus to + and the minus to -, otherwise the electronic unit will not work. The electronic unit is protected against reverse battery connection.

For protection of the installation, a fuse must be mounted in the + cable as close to the battery as possible. It is recommended to use 15A fuses for 12V and 7.5A fuses for 24V circuits. If a main switch is used, it should be rated to a current of min. 20A. The wire dimensions in Fig. 4 must be observed. Avoid extra junctions in the power supply system to prevent voltage drop from affecting the battery protection setting.

AC: The wires must be connected to the terminal marked L and N on the electronic unit. Nominal voltages from 100 to 240 VAC 50/60Hz. Upper safety cut-out limit = 270V AC and lower limit 80V AC. A 4A fuse must be mounted in the live (L) cable to protect the installation.

If a main switch is used, it should be rated to a current of min. 6A. The wire dimensions must be min. 0.75 mm² or AWG 18.

NB: Earth connection can be used if required.

General: Both the AC and the DC power supply can be connected to the electronic unit at the same time. In this case, AC will be preferred power supply source. If the AC power supply is disconnected or drop below 85V AC on a 12V DC supply system, a time delay of 1 min. will be activated before the compressor continues on DC power supply. If AC power supply is re-established there will be no delay in compressor operation.

Battery protection (Fig. 2)

The compressor stops and restarts again according to the designated voltage limits measured on the + and - terminals of the electronic unit. The standard settings for 12V and 24V power supply systems are shown in Fig. 2. (**PC option**) Other settings are (Fig. 5) optional if a connection which includes a resistor (R1) is established between terminals C and P (**non PC option**).

Thermostat (Fig. 1)

The thermostat is connected between the terminals C and T. Either a NTC (electrical thermostat) or a mechanical thermostat can be connected. Three different thermostat modes can be chosen in the software - *Auto* (both NTC and mechanical), *NTC* or *Mechanical*. Standard setting is *Auto*. In case of using a NTC the set point in the range between -40°C and 40°C is set with the software and the temperature can also be seen by using the interface. When using the *Auto* setting in the software it is not possible to obtain NTC failures, so it is recommended to set the thermostat mode to *NTC* when using a NTC.

Setpoint selection (Fig. 6)

In order to utilize the finally intergrated temperature control. You can connect a 10kΩ potentiometer between S and C (R2). Via this resistor a temperature setpoint between -20°C and 10°C can be selected. The compressor will stop when the set point is measured on the NTC and restart at set point +1kΩ or 3K (**non PC option**).

Speed selection (Fig. 5)

The compressor will run with a fixed speed of 4,000 rpm when the thermostat is switched on. Other fixed compressor speeds and start speeds in the range between 2,000 and 4,000 rpm can be obtained when changing the speed settings in the software (**PC option**) or with the resistor (**non PC option**). A start delay in the range from

0-240 sec. (factory setting 4 sec.) after thermostat cut-in can also be chosen. By default the compressor will start with a speed of 2,500 rpm for the first 30 seconds.

Fan (Fig. 1)

A fan can be connected between the terminals +(F) and F. Connect the plus to +(F) and the minus to F. Since the output voltage between the terminals +(F) and F is always regulated to 12V, a 12V fan must be used for both 12V and 24V power supply systems.

The fan output can supply a continuous power of 6W_{avg}. A higher current draw is allowed for 2 seconds during start.

Fan settings can be adjusted via *TOOL4COOL®*. The factory default setting in the controller is: *Detect missing fan - Disabled*.

The unit has to be restarted when these settings have been changed. If a fan is used without adapting the *TOOL4COOL®* settings, the fan will run but no error signal will be sent in case of fan failure. It is also possible to set a start delay on the fan in the range from 0 - 240 sec. but only if a fan is connected and not running.

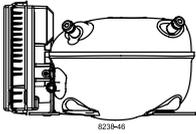
Factory default setting for a fan is 0 seconds. Fan speed can be adjusted through the interface from 40 - 100%.

Lamp (Fig. 1)

A 12V DC 5 Watt lamp (for 12V and 24V power supply systems) can be connected between the terminals C and A. The output voltage between the terminals C and A is always regulated to 12V DC. The lamp output can supply a continuous current of 0.5A_{avg}.

Error handling (Fig. 7)

If the electronic unit records an operational error, the error can be read out in the software (**PC option**). Error codes are defined as shown in Fig. 7. A 10mA light emitting diode (LED) can alternatively be connected between the terminals D/I and +. In case the electronic unit records an operational error, the diode will flash a number of times. The number of flashes depends on what kind of operational error was recorded. Each flash will last 1/4 second. After the actual number of flashes there will be a delay with no flashes, so that the sequence for each error recording is repeated every 4 seconds (**non PC option**).



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101N5100, 12/24V DC & 100-240V AC 50/60Hz

Fig. 2

Battery protection settings

Voltage (0.1 steps)		Min. value	Default	Max. value
12V	± 0.3V DC, all values	Cut out V DC	9.6	10.4
		Cut in diff. V DC	0.5	1.3
24V	± 0.3V DC, all values	Cut out V DC	19	21.3
		Cut in diff. V DC	0.5	1.3

Fig. 3

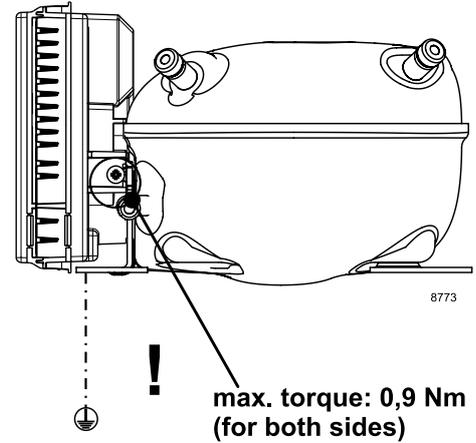


Fig. 4

Wire Dimensions DC

Size		Max. length* 12V operation		Max. length* 24V operation	
Cross section	AWG				
[mm ²]	[Gauge]	[m]	[ft.]	[m]	[ft.]
2.5	12	2.5	8	5	16
4	12	4	13	8	26
6	10	6	20	12	39
10	8	10	33	20	66

*Length between battery and electronic unit

Wire Dimensions AC

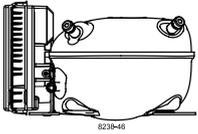
Cross section min. 0,75 mm² or AWG 18

Fig. 5

R1 [kΩ]	Duty Cycle [%]	Speed [RPM]	Cut in level [V]	Cut out level [V]	Cut in level [V]	Cut out level [V]	
open	0	Maintain	Maintain current value. Can be changed via Modbus				
220	3	-	Maintain current value. Can be changed via Modbus				
130	6	-	Maintain current value. Can be changed via Modbus				
91	9	-	Maintain current value. Can be changed via Modbus				ECO
68	12	-	Maintain current value. Can be changed via Modbus				ECO off
51	15		9.6 - 34 V DC				Solar
43	18		Default				Solar off
36	21		Reset battery only				
30	24		Reset battery and speed to default value				
27	27	4000	Maintain current value. Can be changed via Modbus				
22	30	4000	10.9	9.6	22.6	21.3	
20	33	4000	11.4	10.1	23.6	22.3	
18	36	4000	12.4	11.1	24.6	23.3	
15	39	4000	13.4	12.1	25.6	24.3	
13	42	3500	Maintain current value. Can be changed via Modbus				
12	45	3500	10.9	9.6	22.6	21.3	
11	48	3500	11.4	10.1	23.6	22.3	
9.1	51	3500	12.4	11.1	24.6	23.3	
8.2	54	3500	13.4	12.1	25.6	24.3	
7.5	57	3000	Maintain current value. Can be changed via Modbus				
6.2	60	3000	10.9	9.6	22.6	21.3	
5.6	63	3000	11.4	10.1	23.6	22.3	
5.1	66	3000	12.4	11.1	24.6	23.3	
4.3	69	3000	13.4	12.1	25.6	24.3	
3.9	72	2500	Maintain current value. Can be changed via Modbus				
3.3	75	2500	10.9	9.6	22.6	21.3	
2.7	78	2500	11.4	10.1	23.6	22.3	
2.2	81	2500	12.4	11.1	24.6	23.3	
1.8	84	2500	13.4	12.1	25.6	24.3	
1.5	87	2000	Maintain current value. Can be changed via Modbus				
1.0	90	2000	10.9	9.6	22.6	21.3	
0.68	93	2000	11.4	10.1	23.6	22.3	
0.36	96	2000	12.4	11.1	24.6	23.3	
0.051	99	2000	13.4	12.1	25.6	24.3	

Fig. 6

Set point [°C]	R2 [Ω]
-20	0
-19	330
-18	670
-17	1000
-16	1330
-15	1670
-14	2000
-13	2330
-12	2670
-11	3000
-10	3330
-9	3670
-8	4000
-7	4330
-6	4670
-5	5000
-4	5330
-3	5670
-2	6000
-1	6330
0	6670
1	7000
2	7330
3	7670
4	8000
5	8330
6	8670
7	9000
8	9330
9	9670
10	10000



Instructions

Connecting TOOL4COOL® to Electronic Unit 101N5100



The communication port of the electronic unit (terminal D/I and C) has two functions:

1. Communication mode (PC option):

The first 15 seconds after power up/wake up, both devices (compressor & PC) try to communicate. In case a successful connection is made, the port will stay in communication mode until next power up/wake up.

2. Diode output mode (non PC option):

After 15 seconds with no communication link successful established, the unit switches to diode output mode. No communication is possible until next power up/wake up.

To ensure a trouble free connection using TOOL4COOL®, the following method is recommended:

Change the default TOOL4COOL® network setup to allow TOOL4COOL® to search for the electronic unit every 3 seconds. While TOOL4COOL® is searching, power up the electronic unit and wait for a connection. The following shows how to arrange this setup.

Preconditions:

The electronic unit is physically connected via the gateway to the PC, **but the power to the electronic unit is not yet switched on.**

In the example to the right, the electronic unit is connected to the COM1 network.

Note:

Next to the USB connector of the gateway, there are also two LED's visible:
RED LED: blinks when TOOL4COOL® sends a command to the electronic unit. This must blink every second while TOOL4COOL® is trying to establish a connection with the electronic unit.
GREEN LED: blinks when the electronic unit responds to a TOOL4COOL® command. The node address of the electronic unit must match the command from TOOL4COOL® (The network setting above tells TOOL4COOL® to search for unit node address 1 every 3 sec.).

Step	Description / Display																					
1	Do not power up the electronic unit at this stage.																					
2	Start TOOL4COOL®																					
3	In case the network is already connected, disconnect it first using on screen network option.																					
4	Wait a few seconds, then select <i>Connect Network</i> (below the <i>File</i> menu).																					
5	Select the correct port, in this example <i>COM1</i> is used.																					
6	Click <i>Configure</i> .																					
7	Change <i>Last network node</i> address to 1 and change <i>Refresh rate</i> to 3. Leave the other settings at their default value and click <i>OK</i> twice. Now TOOL4COOL® will only look for an electronic unit with address 1, but every 3 seconds. This will ensure that the connection is established within the 15 second time limit after powering up the unit. Leave all other options unchanged.																					
8	Power up the electronic unit																					
9	The first time the unit is connected, TOOL4COOL® needs to obtain the parameter file from the unit before a connection is shown by the red arrow. Allow a few minutes for this task to complete. You also can read the current status by selecting the network and then select the tab <i>Unit Status</i> .																					
10	Look under <i>Error/Message</i>	<table border="1"> <thead> <tr> <th>Address</th> <th>Name</th> <th>Unit ID</th> <th>Type</th> <th>SW Version</th> <th>Reply Timeout</th> <th>Telegram Error</th> <th>Exception Response</th> <th>Device Response Time(ms)</th> <th>Error/Message</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td>FF118255930</td> <td>101N2100</td> <td>01.00</td> <td>0</td> <td>0</td> <td>0</td> <td>107</td> <td></td> </tr> </tbody> </table> <p>In this example, no errors or messages appear and the unit is working properly.</p>	Address	Name	Unit ID	Type	SW Version	Reply Timeout	Telegram Error	Exception Response	Device Response Time(ms)	Error/Message	1		FF118255930	101N2100	01.00	0	0	0	107	
Address	Name	Unit ID	Type	SW Version	Reply Timeout	Telegram Error	Exception Response	Device Response Time(ms)	Error/Message													
1		FF118255930	101N2100	01.00	0	0	0	107														
11	If the parameter file was already loaded into TOOL4COOL®, a connection should be visible in less than 10 seconds. A red arrow is added before the network name to indicate that a unit is ready.	<p>Click the red arrow to open the menu of the electronic unit.</p>																				