ENGINEERING
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Installation guide

Danfoss **Light Commercial Refrigeration** Compressors **GD30FDC**

Electronic driver connection manual, 12-42V, Direct Current - R134a

lightcommercialrefrigeration.danfoss.com

General rules

GD30FDC must always be powered through the dedicated electronic driver FDC1, which is supplied with the compressor as a separate device.

NEVER CONNECT THE COMPRESSOR'S HERMETIC PINS (FUSITE) TO THE TERMINALS OF A BATTERY OR ANY OTHER DC OR AC SOURCE DIRECTLY.

DO NOT TRY TO FIT AN ELECTRONIC DRIVER OTHER THAN THE FDC1. THE COMPRESSOR WILL NOT OPERATE AND IRREVERSIBLE DAMAGE MAY OCCUR.

The FDC1 driver is directly connected to the battery poles as well as to the compressor pins. It checks battery voltage and adjusts itself to the voltage value for proper compressor operation, or switches itself off if the battery voltage is not adequate. The driver also controls the compressor speed.

ALWAYS RESPECT THE POLARITY OF THE BATTERY WITH THE POWER INPUT TERMINALS OF THE ELECTRONIC DRIVER.

The unit is protected against damage caused by wrong polarity of the supply. The compressor will not run correctly if it's wrongly connected.

THE POWER INPUT TERMINAL "-" OF THE ELECTRONIC DRIVER SHOULD BE REFERRED TO THE CHASSIS OF THE VEHICLE AS WELL AS THE APPLIANCE FRAME*

A FUSE MUST BE PLACED BETWEEN THE "+" POLE OF THE BATTERY OR DC POWER SUPPLY, AND THE "+" POWER INPUT TERMINAL OF THE ELECTRONIC DRIVER

12V SYSTEMS: 30A FUSE
24V SYSTEMS: 15A FUSE
42V SYSTEMS: 10A FUSE

In some special vehicles, the chassis is connected to "+" terminal of the battery instead of "-" terminal (positive reference systems). In such cases, "+" should be understood as "-" and vice-versa.

In systems powered by a variable DC source, the fuse should be selected following the rules above mentioned, considering the maximum voltage at the variable DC Source.

Voltage drop in the power leads

To avoid excessive voltage drop in the leads, their length and cross section must be related to the voltage supply, as indicated in Table 1.

Table 1: Maximum length of leads (m)

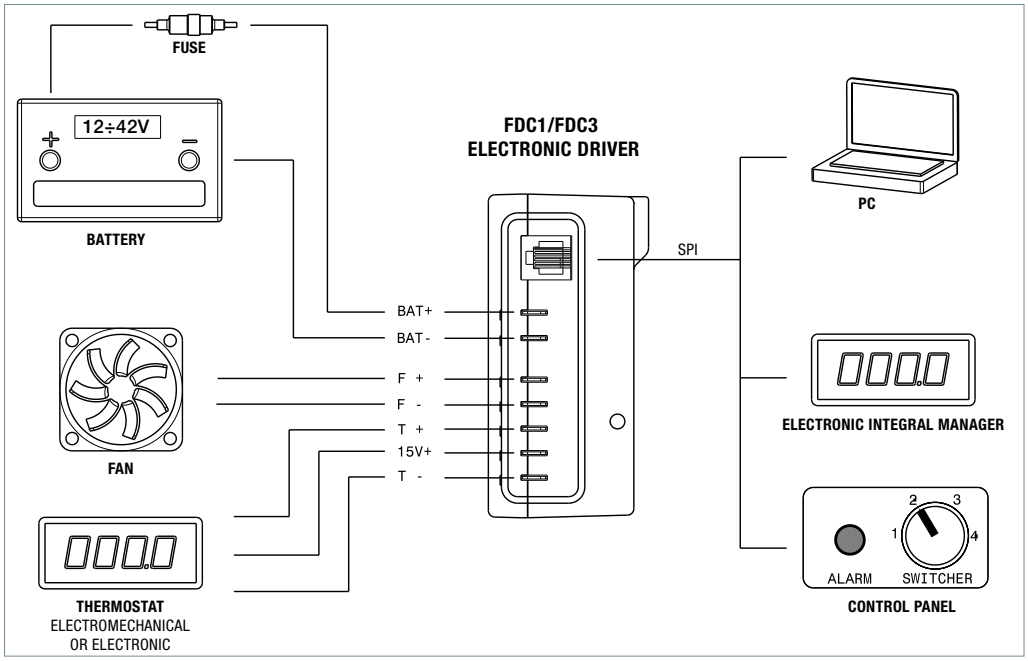
Cross section mm^2	Rated Operating Range		
	12 - 14 V	24 - 28 V	36 - 42 V
2.5	1.5	3	4.5
4	2.5	5	7.5
6	4	8	12
10	6	12	18

If any kind of connector or switch is placed between the battery poles and the power terminals of the electronic driver, its resistance should be less than 10mΩ. If the resistance is higher than 5mΩ, the maximum length of the wires indicated in Table 1 should be halved or the cross section should be doubled.

Wiring Diagram

The FDC1 electronic driver features a terminal board where all connections are made. The terminal lay out is described in Figure 1:

Fig 1. FDC1 Wiring scheme

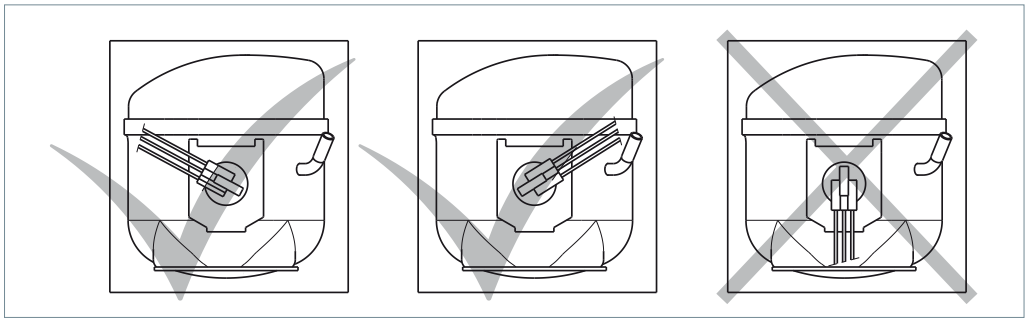


NO RESISTOR IS NEEDED TO BE INSTALLED IN FDC1 ELECTRONIC DRIVER

When connecting the electronic driver to the compressor, any position of the connector is possible under an electrical point of view.

However, in practice, the vertical position is not possible because the electronic box cannot be assembled. The connector should be rotated 120° clockwise or counter clockwise with respect to the vertical position as shown below.

Fig 2. Connection of the FDC's electronic driver to the compressor



The electronic control unit FDC1 is supplied with the exclusive Serial Port Interface (SPI), featuring a RJ11 telephone type connector. This port is configured to set up the compressor speed through physical connections between their terminals. To facilitate this procedure, three connector cables are supplied together with the electronic driver. The compressor will run at a certain speed depending on the used connector, as shown in Table 2:

Table 2. Compressor speed for each connector

Connector	Speed
NONE	1.500
BLACK	2.167
BLUE	2.833
RED	3.500

Furthermore, if a FDC programming kit is available, the new FDC1 electronic driver can be set up by programming it using the kit and a computer.

NEVER USE FDC1 ELECTRONIC DRIVER IN OTHER DC COMPRESSOR DIFFERENT THAN GD30FDC.

If the compressor or the FDC1 electronic driver should be replaced for servicing a refrigerator or a freezer, one of the next procedures should be followed.

Replacing a GD30FDC compressor or FDC1 electronic driver

1. If a FDC programming kit is available, use it to check the settings of the old FDC1 electronic driver and set up the new one by programming the same parameters.

2. Otherwise, check the old FDC1 electronic driver for the presence of a connector at the SPI to set up the speed. If so, take it away and connect it again at the new FDC1 electronic driver.

3. Otherwise check the appliance for some information about compressor speed set up. If so, select the proper connector which gives the nearest speed set up from table 2.

4. Otherwise compressor speed can be set up by a trial and error procedure. In this case, take as a first approximation the connectors indicated in table 3 depending on the type of appliance and its net volume.

Table 3. Suggested connector as a the function of the appliance

Connector	Refrigerator	Freezer	Refrigerator + freezer
None	less than 60 liters	less than 40 liters	less than 50 liters
Black	from 60 to 150 liters	from 40 to 100 liters	from 50 to 125 liters
Blue	from 120 to 300 liters	from 80 to 200 liters	from 100 to 250 liters
Red	from 180 to 450 liters	from 120 to 300 liters	from 150 to 375 liters

Replacing a DC compressor model BD35F, BD50F or BD80F

1. Check the compressor model and speed.

2. If speed S_0 is known and a FDC programming kit is available, set up GD30FDC compressor speed by programming the following speed:

$S = S_0 / 1.5$ for BD35F
$S = S_0 / 1.2$ for BD50F
$S = S_0$ for BD80F

3. Otherwise, set up GD30FDC compressor speed according to Table 4.

Table 4. Type of connector to be used to replace Danfoss compressor when speed is known

Compressor	Without connector	Black connector	Blue connector	Red connector
BD35F	rpm < 2.750	rpm >2.750	-	-
BD50F	rpm < 2.200	rpm = 2.200 a 3.000	rpm > 3.000	-
BD80F	-	rpm < 2.500	rpm = 2.500 a 3.150	rpm > 3.150

4. If speed is not known, measure the value of the resistor R1 placed in series with the thermostat and connected to "C" terminal. Then set up GD30FDC speed according to Table 5.

Table 5. Connector to be used to replace Danfoss compressor when R1 resistor is known

Compressor	Without connector	Black connector	Blue connector	Red connector
BD35F	R1 < 450 Ω	R1 > 450 Ω	-	-
BD35F with AEO	R1 < 623 Ω	R1 > 623 Ω	-	-
BD50F	R1 < 112 Ω	R1 = 112 to 692 Ω	R1 > 692 Ω	-
BD50F with AEO	R1 < 285 Ω	R1 = 285 to 865 Ω	R1 > 865 Ω	-
BD80F with AEO	-	R1 < 173 Ω	R1 = 173 to 471 Ω	R1 > 471 Ω

Replacing a different brand DC compressor

1. Check for compressor displacement D_0 and Speed S_0. Then calculate the required velocity of GD30FDC as follows:

$S = D_0 \cdot S_0 / 3$ (D_0 in cm3)

and set up GD30FDC speed by programming (if FDC programming kit is available) or by selecting a proper connector according to Table 2.

2. If any parameter, displacement or speed is unknown, GD30FDC compressor speed can be set up by a trial an error procedure. In this case, try the connectors shown in Table 3 depending on the type of appliance and its net volume.

GD30FDC is designed to operate in a wide range of DC voltages, supplied either by a battery or by any other kind of filtered DC power supply.

DC VOLTAGE SUPPLY ALLOWED is 10V to 42.4V

From the value of the applied voltage, the electronic driver automatically decides the rated voltage range of the supply. Three possible ranges are considered:

12 to 14V: voltage is below 17V
24 to 28V: voltage is within 17 and 33V
36 to 42V: voltage is within 33 and 42.4V

There is a protection system for the battery that prevents the compressor from operating if the available voltage becomes too low. Battery protection level is set up for working under normal circumstances in most appliances. Cut-out and cut-in values are:

12V system: cut-out = 10.0V; cut-in = 11.5V
24V system: cut-out = 22.0V; cut-in = 24.5V
42V system: cut-out = 36.0V; cut-in = 38.5 V

Other values can be set up if a FDC programming kit is available.

GD30FDC is electronically protected against a number of possible dysfunctions and failures:

- Battery discharge.
- Fan over current: protects the compressor and the electronic driver against fan over current due to start or running overload, or short-circuit.
- Starting failure: if the running speed is not achieved during the starting sequence, the unit stops and retries the start up after one minute.
- Compressor overload: it operates when the compressor speed drops below the set up speed, or when the current drawn in is excessive, and thus preventing the appliance from operating under overload conditions that may cause otherwise refrigeration overload or compressor failure.
- Electronic driver overheat: if the temperature of the electronic components of the control becomes too high, an internal sensor will stop the unit.

In case of overheating, one automatic attempt to restart the compressor is allowed. In case of battery protection, there is no limit of automatic attempts to restart. In case of any other protection occurring, there will be two automatic attempts to re-start the compressor.

Once the sequence of automatic attempts to restart the compressor is finished, the unit will remain permanently unable to operate until switched off and on again from the power supply. The intervention of the thermostat during the sequence of automatic restart attempts interrupts and resets the sequence.

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Danfoss Commercial Compressors

is a worldwide manufacturer of compressors and condensing units for refrigeration and HVAC applications. With a wide range of high quality and innovative products we help your company to find the best possible energy efficient solution that respects the environment and reduces total life cycle costs.

We have 40 years of experience within the development of hermetic compressors which has brought us amongst the global leaders in our business, and positioned us as distinct variable speed technology specialists. Today we operate from engineering and manufacturing facilities spanning across three continents.

Danfoss Turbocor Compressors

Danfoss Inverter Scrolls

Danfoss Scrolls

Danfoss Optyma Condensing Units

Danfoss Maneurop Reciprocating Compressors

Danfoss Light Commercial Refrigeration Compressors

Our products can be found in a variety of applications such as rooftops, chillers, residential air conditioners, heatpumps, coldrooms, supermarkets, milk tank cooling and industrial cooling processes.

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