



passion for the cold

12 - 42V DC

GD30FDC Direct Current Compressor for R134a

ELECTRONIC DRIVER CONNECTION MANUAL



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FDC1 Electronic driver connection manual

1. WIRING AND CONNECTIONS

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.

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

Table 1: Maximum length of leads (m)

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 10m Ω . If the resistance is higher than 5m Ω and lower than 10m Ω , 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 layout is described in Fig. 1:

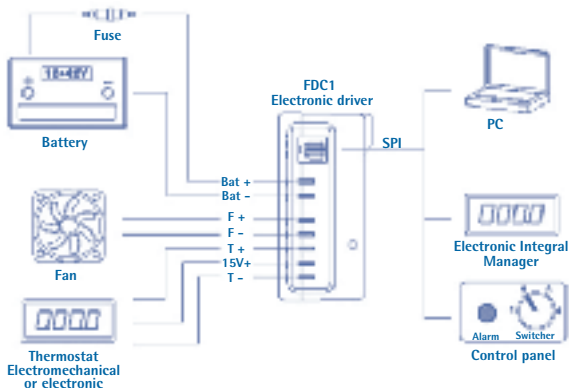


Fig. 1. FDC1 wiring scheme

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.

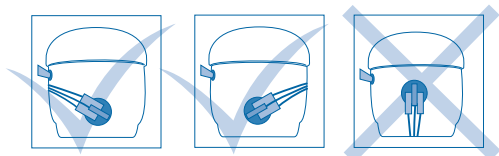


Fig. 2. Connection of the FDC's electronic driver to the compressor

2. SETTING UP THE SPEED

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 connectors 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:

Connector	Speed (rpm)
NONE	1,500
BLACK	2,167
BLUE	2,833
RED	3,500

Table 2. Compressor speed for each connector

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.

	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

Table 3. Suggested connector as a function of the appliance



Replacing a Danfoss 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.

Compressor	Without connector	Black connector	Blue connector	Red connector
BD35F	rpm < 2,750	rpm > 2,750	-	-
BD50F	rpm < 2,200	rpm = 2,000 to 3,000	rpm > 3,000	-
BD80F	-	rpm < 2,500	rpm = 2,500 to 3,150	rpm > 3,150

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

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.

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

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



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:

$$S = D_0 \cdot S_0 / 3 \text{ (} D_0 \text{ in cm}^3\text{)}$$

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 and error procedure. In this case, try the connector shown in Table 3 depending on the type of appliance and its net volume.

3. OPERATING VOLTAGE

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 FROM 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



4. BATTERY PROTECTION SYSTEM

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 = 38.5V

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

5. PROTECTIONS AND ALARMS

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.



6. PERFORMANCE DATA										
rpm	-30	-25	-23,3	-20	-15	-10	-5	0	5	10
Cooling Capacity ASHRAE (kCal/h)										
1500	19	25	28	33	43	60	78	100	126	160
2000	26	36	40	49	64	87	112	142	179	223
2500	32	45	50	62	82	110	142	180	227	281
3000	37	52	58	72	97	129	168	214	270	-
3500	41	57	64	79	109	144	190	244	-	-
Cooling Capacity CECOMAF (W)										
1500	18	24	26	31	41	57	73	94	119	150
2000	25	34	38	46	60	82	106	134	169	210
2500	30	42	47	58	77	104	134	170	214	264
3000	35	49	55	68	91	122	158	202	254	-
3500	39	54	60	74	103	136	179	230	-	-
Input Power (W)										
1500	23	25	26	29	34	41	47	52	57	63
2000	30	35	36	40	47	56	64	71	78	86
2500	38	44	46	53	63	73	83	92	101	110
3000	44	52	54	63	77	88	100	112	122	-
3500	50	58	61	71	89	102	116	130	-	-
C.O.P. ASHRAE (W/W)										
1500	0.97	1.17	1.24	1.33	1.47	1.70	1.95	2.23	2.58	2.94
2000	1.01	1.21	1.28	1.41	1.57	1.82	2.05	2.33	2.66	3.02
2500	0.99	1.19	1.26	1.37	1.52	1.76	2.00	2.28	2.62	2.98
3000	0.97	1.17	1.24	1.33	1.47	1.70	1.95	2.23	2.58	-
3500	0.95	1.15	1.22	1.29	1.42	1.64	1.90	2.18	-	-
C.O.P. CECOMAF (W/W)										
1500	0.79	0.97	1.03	1.07	1.21	1.39	1.57	1.80	2.10	2.37
2000	0.84	0.98	1.05	1.14	1.27	1.48	1.67	1.89	2.16	2.45
2500	0.80	0.96	1.02	1.12	1.23	1.43	1.62	1.85	2.12	2.41
3000	0.79	0.95	1.01	1.08	1.19	1.38	1.59	1.81	2.09	-
3500	0.78	0.94	0.98	1.04	1.15	1.33	1.54	1.77	-	-
Current (A)										
1500	1.90	2.07	2.19	2.40	2.83	3.42	3.88	4.35	4.73	5.27
2000	2.49	2.88	3.03	3.37	3.95	4.63	5.29	5.91	6.52	7.16
2500	3.13	3.66	3.85	4.39	5.23	6.06	6.88	7.65	8.40	9.10
3000	3.70	4.31	4.53	5.25	6.39	7.35	8.35	9.30	10.10	-
3500	4.18	4.80	5.08	5.93	7.44	8.51	9.70	10.80	-	-

	ASHRAE	CECOMAF
Condensation temperature:	55°C	55°C
Liquid temperature entering expansion:	32°C	55°C
Ambient and return temperature:	32°C	32°C
Voltage: 12V DC		