



*passion* for the cold

# 12 - 42 V DC

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CGD30FDC Direct Current Condensing Unit for R134a

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INSTALLING GUIDE



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## CGD30FDC INSTALLING GUIDE

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### 1. BEFORE INSTALLING THE UNIT

Please read the following instructions carefully. CGD30FDC Condensing Unit is available in three model versions corresponding to three different geometries (H1, H2 and V1). All models are fan cooled and use the 12-42V DC powered GD30FDC compressor, which works with R-134a and, with certain restrictions, depending on the selected speed applications, can operate as LBP, MBP and HBP. First of all, be sure the unit is suitable for the application.

All units are supplied with special oil and a helium/nitrogen protection charge. Three connectors are also supplied to make the compressor run at three different speeds plus a fourth speed (minimum) without using any connector.

CGD30FDC is suitable for systems using capillary tube and is supplied with a molecular filter and without a receiver. The system is to be connected to the suction and liquid lines through self-sealing couplings. A Schrader valve is also provided at the compressor service port.

### 2. INSTALLATION GUIDELINES

- ❖ Do not add any oil.
- ❖ Only connect a clean, dry evaporator.
- ❖ Pull the vacuum down to a level of 0.5 Torr (0.67 mbar) so that water content in the system is less than 200 ppm.
- ❖ Charge the system with R-134a with a minimum quantity compatible with the desired working conditions.



- ❖ Do not exceed the capacity of the condenser.
- ❖ After completing the installation, check the circuit integrity with a leak detector suitable for R-134a.
- ❖ In R-134a systems no components containing chlorine are to be used. At no time should the tubes be left open for more than 15 minutes. For the vacuum process, use a pump with special ester oil.
- ❖ Free fresh air circulation around the Condensing Unit must be always guaranteed.

### 3. OPERATING VOLTAGE, WIRING AND CONNECTIONS

CGD30FDC is designed to operate within 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: 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: actual voltage is below 17V  
24 to 28V: actual voltage is within 17 and 33V  
36 to 42V: actual voltage is within 33 and 42.4V*

#### General rules

CGD30FDC must always be powered through the dedicated electronic driver FDC1, which is attached to the compressor.



*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 supply polarity. The compressor will not run correctly if it is wrongly connected.

*"-" 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 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 previous rules, considering the maximum voltage at the variable DC Source.

### Voltage drop in the power leads

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

Cross section mm	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

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  $10\text{m}\Omega$ . If the resistance is higher than  $5\text{m}\Omega$ , the maximum length of the wires indicated in Table 1 should be halved or the cross section doubled.

### Wiring Diagram

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

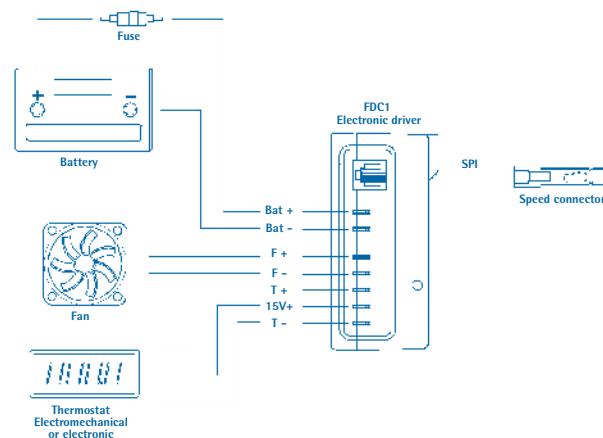


Fig. 1. FDC1 wiring diagram

The 15V+ terminal is supplied only for powering up electronic thermostats. If a standard electromechanical thermostat is to be used, this terminal is of no use.

## 4. SETTING UP THE SPEED

The electronic control unit FDC1 OF CGD30FDC Condensing Unit 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 make that easier, together with the electronic driver three connectors are supplied. The compressor will run at a certain speed depending on the used connector as table 2 shows:



Connector	Speed (rpm)
none	1,500
black	2,167
blue	2,833
red	3,500

Table 2. relationship between connector and compressor speed

When selecting the right speed many considerations have to be taken into account, as, for example, the size of the cabinet and the evaporator, the inside and ambient temperature and relative humidity, the opening door frequency, etc. Select an evaporator according with the performance data of the CGD30FDC and the design parameters of the cabinet. As a first approximation, use the table 3 to setup the speed and validate the system by means of a trial-and-error procedure.

	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

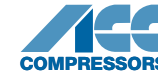
Table 3. Suggested connector as a function of the appliance.

More sophisticated methods for controlling the speed may be implemented. Please, refer to the GD30FDC User Manual for details.

## 5. PROTECTIONS

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: this protection operates when the compressor speed drops below the set up speed, or when the current drawn in is excessive, thus preventing the appliance from operating under overload conditions, causing refrigerating overload or compressor failure.
- ❖ Electronic driver overheat: in case the temperature of the electronic components of the control becomes too high, an internal sensor will stop the unit.

In case of battery protection there is no limit to the number of automatic attempts to restart. In the rest of the cases, 10 automatic attempts to restart are allowed. Once the sequence of automatic attempts to restart the compressor is finished, the unit will remain permanently unable to operate until it is 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.

For monitoring alarms a LED should be connected at SPI. Please, refer to GD30FDC user manual for details.

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

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

Other values can be setup. Please, refer to GD30FDC User Manual for details.

## 6. TECHNICAL DATA

### General data

Application		LBP - MBP - HBP
Refrigerant		R134a
Evaporation temp. range	°C	-30 to +10
Compressor cooling		Fan cooling
Max. ambient temperature	°C	43

### Compressor data

Displacement	cm <sup>3</sup>	3.00
Bore/stroke	mm	18.0/12.1
Motor type		Brush-less, Sensor-less, permanent magnet rotor
Voltage	V	DC 12 to 42
Voltage range	V	DC 10 to 42.4

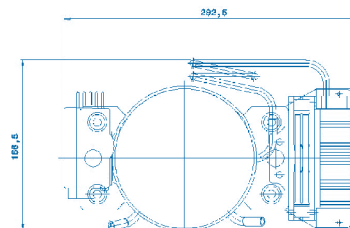
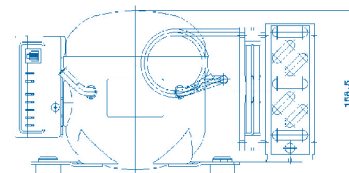
### Condenser data

Condenser type		CU-AL
Condenser model		ST 3R
Fan motor	V/A/W	12 / 0.37 / 4.44
Fan blade diameter	mm	115

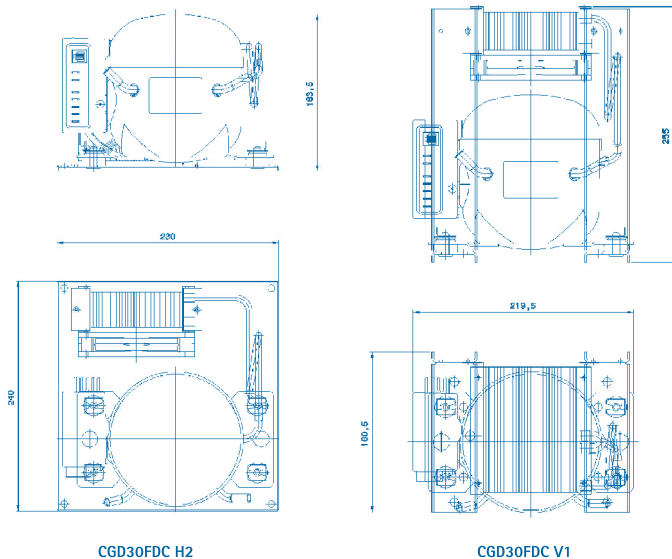
### Connections

Suction line		Self-sealing 5/8" - 18UNF (male)
Liquid line		Self-sealing 5/8" - 18UNF (female)
Service port		Schrader valve

## Outline dimensions



CGD30FDC H1



CGD30FDC H2

CGD30FDC V1

CGD30FDC PERFORMANCE DATA										
rpm	-30	-25	-23,3	-20	-15	-10	-5	0	5	10
<b>Cooling Capacity (kCal/h)</b>										
1500	24,0	31,2	34,8	41,6	54,3	70,0	88,1	109,1	133,0	160,0
2167	34,0	44,1	47,5	57,3	74,8	94,9	116,4	141,0	168,0	200,0
2833	41,5	53,8	58,8	71,2	92,8	117,0	142,5	173,0	-	-
3500	48,1	66,0	72,7	88,5	114,8	146,0	-	-	-	-
	10	12		15	17	21	25	30	35	40
<b>Condensing Temperature (°C)</b>										
1500	34,2	35,0	35,2	36,0	37,5	39,1	40,9	43,0	45,5	48,2
2167	35,4	36,5	36,9	38,1	40,0	42,3	44,6	47,3	50,4	54,0
2833	36,6	38,2	38,7	40,0	42,3	45,0	48,1	51,9	-	-
3500	37,7	39,3	40,0	41,7	44,4	47,9	-	-	-	-
<b>Input Power (W)</b>										
1500	23,3	25,6	26,7	29,4	33,8	38,8	43,7	49,6	55,9	63,5
2167	34,1	38,0	39,7	43,5	50,1	57,0	65,2	75,5	88,5	105,3
2833	45,2	51,8	54,3	59,7	69,0	80,0	94,9	114,9	-	-
3500	52,6	66,3	71,1	81,5	98,5	117,2	-	-	-	-
<b>C.O.P. (W/W)</b>										
1500	1,198	1,417	1,516	1,647	1,868	2,098	2,343	2,558	2,767	2,930
2167	1,159	1,349	1,391	1,532	1,736	1,936	2,076	2,172	2,207	2,209
2833	1,068	1,208	1,259	1,387	1,564	1,705	1,746	1,751	-	-
3500	1,063	1,158	1,189	1,263	1,355	1,449	-	-	-	-
<b>Current (A)</b>										
1500	1,94	2,13	2,23	2,45	2,82	3,23	3,64	4,13	4,66	5,29
2167	2,84	3,17	3,31	3,63	4,18	4,75	5,43	6,29	7,38	8,78
2833	3,77	4,32	4,53	4,98	5,75	6,70	7,91	9,58	-	-
3500	4,38	5,53	5,93	6,79	8,21	9,77	-	-	-	-

Ambient Temperature:  
Voltage:

32°C  
12 V DC