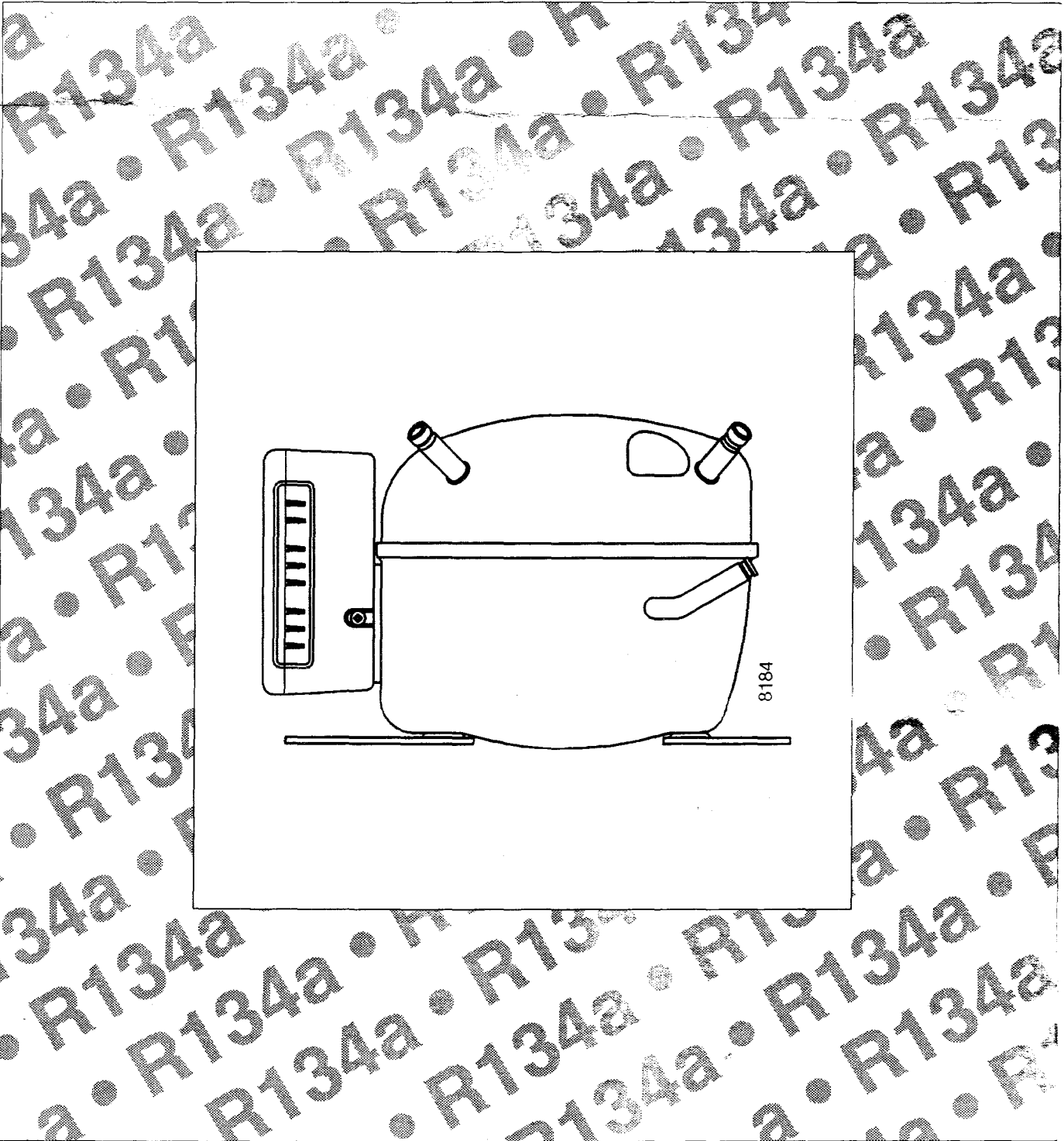




**BD35F**  
**Direct Current Compressor**  
**for R134a**  
**12V and 24V**



**General**

Danfoss refrigeration compressor type BD35F is designed for connection to 12V and 24V batteries and for refrigerant R134a (CF<sub>3</sub>-CH<sub>2</sub>F).

The compressor is intended especially for use in mobile applications, e.g. pleasure craft, commercial shipping, caravans, lorries, buses, etc.

The compressor can be used in refrigerators and freezers and is designed for capillary tube as the throttling device.

The compressor is used together with an electronic unit containing overload protection and protection against destructive battery discharge. The electronic unit has internal voltage recording and calibration to the applied voltage. Also the electronic unit can be powered directly from certain types of electronic power supply units and thus no battery is required.

In addition to being especially quiet in operation, the compressor has a low energy consumption. It will operate under continual heeling of 30° such as occurs on yachts.

• The BD compressor must be mounted in a dry and clean place. The compressor will withstand storage temperatures down to -35°C.

Condensing temperatures:

Max. 60°C at stable conditions and max. 70°C at peak load.

Ambient temperatures: Min. -10°C; max. 55°C

**Electrical connection**

The BD compressor is fitted with a brushless direct current motor which through an electronic unit becomes electronically commutated.

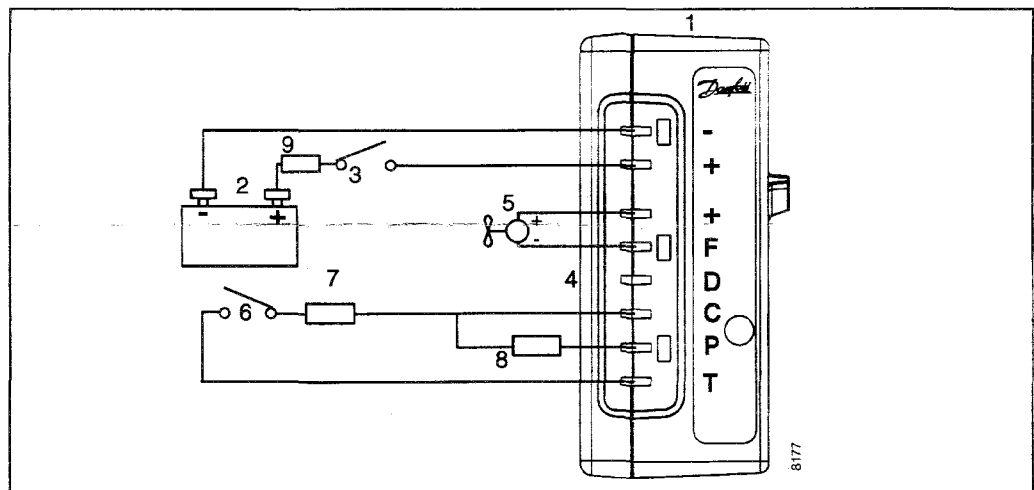
The electronic unit is delivered separately and must be mounted on the compressor. Otherwise all approvals and warranties become void. The electronic unit must always be connected directly to the battery poles. For the protection of the installation an external fuse (max. 15A, blue) must be installed close to the battery (or power supply) in the power supply cable. The cables to the battery must be connected with screws. Avoid extra cable connections. Establish a special wiring for the BD compressor and avoid using the existing installation.

If the wrong polarity is used, the electronic unit will not work.

If the chassis is used as a conductor a good connection at the lead end must be established.

The electronic unit will calibrate to the applied voltage. This means that if the battery voltage is less than 17V, the system assumes that it is working in a 12V system. If the voltage is higher than 17V, the electronic unit assumes that it is working in a 24V system. Consequently, the compressor does not run at power supply voltages between about 17V and the desired battery protection cut-out voltage for 24V systems.

To facilitate longer standstill periods, a main switch can be installed. The switch must have a contact system suitable for min. 20 A, otherwise the voltage drop will cause the battery protection to cut off the compressor sooner.



- 1: Electronic unit
- 2: Battery
- 3: Main switch (optional)
- 4: Used by Danfoss only
- 5: Fan (optional)
- 6: Thermostat
- 7: Resistor for pre-setting speed (optional)
- 8: Resistor for presetting battery protection voltage (optional)
- 9: Fuse



**Cable dimensions**

To ensure correct start and operating conditions the following cable dimensions must be observed:

Cable cross-section mm <sup>2</sup>	Max length* m	
	12V system	24V system
2.5	1.5	5
4	4	8
6	6	12

\* \*Length\* means the distance between battery and electronic unit.

**Thermostat connection**

The BD compressor can operate with normal mechanical type thermostats used in refrigerator appliances, or with electronic thermostats. Always use new thermostats.

The thermostat is normally connected across terminals C and T of the electronic unit.

Compressor current does not flow through the thermostat contacts.

When the thermostat is cut out there will still be power on the electronic unit.

RPM	Current mA	Resistance Ω
2000	5.15	0
2000	5	28
2500	4	277
3000	3	692
3500	2	1523

Normally, the compressor speed is pre-fixed to 2,000 rpm. However, the compressor speed (RPM) can be pre-set to a different fixed speed by connecting an optional resistor in series with the thermostat (7) (drawing on page 2). The speed is programmed with the resistor resulting in the currents in the cable. The value of the resistor for the corresponding speed can be seen in the table. Alternatively, the speed of the compressor (2,000 to 3,500 rpm) can be calculated according to the following example,

**Example 2,200 rpm**

$$I_{rpm} = 5 - (2,200 - 2,000) / 500 = 4.6$$

$$R_{rpm} = 1,000 \cdot (0.139 + (2,200 - 2,000)/516) / I_{rpm} = 114\Omega$$

A compressor system with zero stand-by current can be established if the thermostat (6) is replaced by a short circuit and the main switch (3) is replaced by a thermostat. In this case, the full current to the compressor flows through the thermostat, and the thermostat should be rated accordingly.

**Fan connection**

If a fan is to be used it must be connected to the electronic unit terminals + and F.

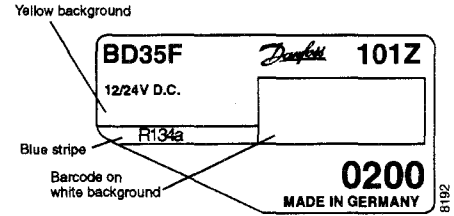
Always use a 12V fan, also in 24V systems, as the electronic unit will automatically reduce the applied voltage to 12V for the fan.

The max. load on the electronic unit is 0.5 A. The fan is allowed to start with a higher current for the first 2 seconds.

If the fan becomes overloaded, both fan and compressor will be cut out by the overload protection.

### Technical data

Compressor	<b>BD35F</b>
Voltage	12V/24V
Code number	101Z0200



### Application

Application		LBP/MBP
Evaporating temperature	°C	-30 to 0
Max. ambient temperature	°C	55
Voltage range	V	9.5 to 17 or 21.1 to 31
Compressor cooling		Static

### Design

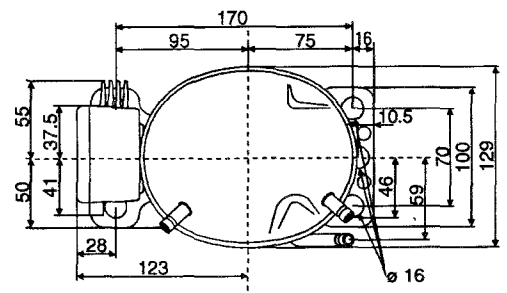
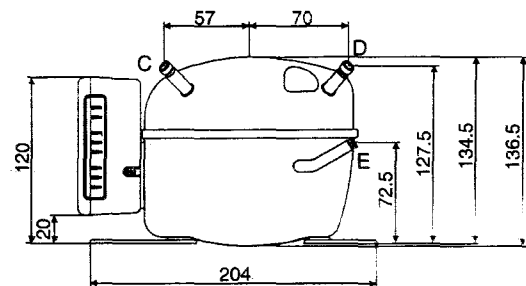
Displacement	cm <sup>3</sup>	3.13
Oil quantity	cm <sup>3</sup>	280
Refrigerant		R134a
Maximum refrigerant charge	g	400
Refrigerant control		Capillary tube ø 0.63 x 3550 mm
Weight without electronic unit	kg	4.3
Weight of electronic unit	kg	0.25
Approvals		

### Accessories

12V/24V electronic unit	101N0200
15A, blue, standard automobile fuse DIN 72581 or similar	Not deliverable from Danfoss
Mounting accessories	
Bolt joint for 1 compressor	118-1917
Bolt joint in quantities	118-1918
Snap on in quantities	118-1919

### Dimensions

I.D. process connector	location/mm	D	6.5 ± 0.09
I.D. suction connector	location/mm	C	6.5 ± 0.09
I.D. discharge connector	location/mm	E	5.0 +0.2 +0.12
Compressors on a pallet	pcs.		125




**Capacity (CECOMAF)**
**Watt**

BD35F RPM	Evaporating temperatures °C							
	-30	-25	-23.3	-20	-15	-10	-5	0
2,000	13	22	25	32	43	55	70	90
2,500	20	30	32	41	55	70	87	108
3,000	24	35	39	50	65	83	105	132
3,500	29	41	46	58	75	96	127	155

**Capacity (ASHRAE)**
**Watt**

BD35F RPM	Evaporating temperatures °C							
	-30	-25	-23.3	-20	-15	-10	-5	0
2,000	15.8	26.7	30.4	38.9	52.3	66.9	85.1	109.0
2,500	24.3	36.5	38.9	49.9	66.9	85.1	106.0	131.0
3,000	29.2	42.5	47.4	60.8	79.0	110.0	128.0	161.0
3,500	35.2	49.8	60.0	70.5	91.2	117.0	154.0	188.0

**Power consumption (12V)**
**Watt**

BD35F RPM	Evaporating temperatures °C							
	-30	-25	-23.3	-20	-15	-10	-5	0
2,000	17.3	24.2	26.3	30.4	35.8	40.7	46.7	56.3
2,500	25.0	32.3	33.0	38.3	45.8	52.6	59.2	68.8
3,000	29.0	37.2	40.2	46.7	53.7	63.4	71.4	84.6
3,500	35.4	43.6	47.4	54.2	62.5	72.7	87.0	98.7

**Current consumption (12V) (For 24V application the following must be halved)**
**A**

BD35F RPM	Evaporating temperatures °C							
	-30	-25	-23.3	-20	-15	-10	-5	0
2,000	1.7	2.1	2.2	2.6	3.0	3.5	4.1	4.7
2,500	2.2	2.7	2.8	3.3	3.7	4.4	5.2	6.0
3,000	2.7	3.2	3.3	3.8	4.6	5.3	6.2	7.0
3,500	3.0	3.7	3.9	4.5	5.3	6.2	7.2	8.5

**COP (CECOMAF) (12V)**
**W/W**

BD35F RPM	Evaporating temperatures °C							
	-30	-25	-23.3	-20	-15	-10	-5	0
2,000	0.75	0.91	0.95	1.05	1.20	1.35	1.50	1.60
2,500	0.80	0.93	0.97	1.07	1.20	1.33	1.47	1.57
3,000	0.82	0.94	0.97	1.07	1.21	1.31	1.47	1.56
3,500	0.82	0.94	0.97	1.07	1.20	1.32	1.46	1.57

**COP (ASHRAE) (12V)**
**W/W**

BD35F RPM	Evaporating temperatures °C							
	-30	-25	-23.3	-20	-15	-10	-5	0
2,000	0.91	1.10	1.16	1.28	1.46	1.64	1.82	1.94
2,500	0.97	1.13	1.18	1.30	1.46	1.62	1.79	1.91
3,000	1.01	1.14	1.18	1.30	1.47	1.59	1.79	1.90
3,500	1.00	1.14	1.18	1.30	1.46	1.61	1.78	1.91

Test conditions  
 Condensing temperature  
 Ambient and suction gas temperature  
 Liquid temperature  
 Static cooling  
 1 Watt = 0.86 kcal/h

CECOMAF	ASHRAE
55°C	54.4°C
32°C	32°C
55°C	32°C



**Protection system**

The BD compressor protection system protects the compressor on overload and start failure. It also prevents destructive battery discharge.

**Overload protection**

The start and overload protection cuts off power to the compressor when the compressor speed drops below approximately 1900 r/min. At start this can be caused by lack of pressure equalizing or too high a pressure during operation. If a fan is fitted it will continue to run. When the protection is activated, the compressor enters a cycle in which it makes start attempts at about 60 seconds intervals. An overheating of the cooling element of the electronic unit will cause the compressor to stop until a normal temperature has been reached.

**Battery protection**

Rprotection kΩ	12V cut-out V	12V cut-in V	24V cut-out V	24V cut-in V
0.82	9.6	10.9	21.3	22.7
1.6	9.7	11.0	21.5	22.9
2.4	9.9	11.1	21.8	23.2
3.6	10.0	11.3	22.0	23.4
4.7	10.1	11.4	22.3	23.7
6.2	10.2	11.5	22.5	23.9
8.2	10.4	11.7	22.8	24.2
11	10.5	11.8	23.0	24.5
14	10.6	11.9	23.3	24.7
18	10.8	12.0	23.6	25.0
24	10.9	12.2	23.8	25.2
33	11.0	12.3	24.1	25.5
47	11.1	12.4	24.3	25.7
82	11.3	12.5	24.6	26.0
not mounted	10.4	11.7	22.8	24.2

To ensure sufficient battery power for the engine re-start or to avoid permanent damage to the battery because of heavy discharge, the BD electronic unit is fitted with a protection device. The battery protection voltage can be pre-set by connecting an optional resistor (8). The battery protection then cuts the compressor in and out at voltages as shown in the table.

**Troubleshooting**

The compressor windings can be checked for defects by measuring the resistances on the current lead-in pins. If the measured values between all pins are approximately the same, the compressor motor is OK. The electronic unit cannot be repaired and should not be opened.

**Data stamping**

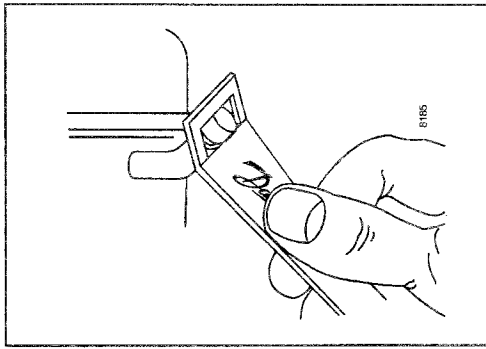
The data stamping is situated on the top of the compressor, e.g.  
D35F-0200  
F017C127

The first line gives model designation and code no.  
D35F = Last part of the model designation (BD35F)  
0200 = Last part of compressor code no. (101Z0200).

The second line gives date of manufacture and motor supplier.  
F = manufacturing place (F = Flensburg, Germany)  
01 = Week 1  
7 = 1997  
C = Wednesday (A = Monday etc.)  
12 = Rated d.c. voltage  
7 = Motor supplier

A corresponding code for date of manufacture is located on the rear part of the electronic unit.

## Connectors

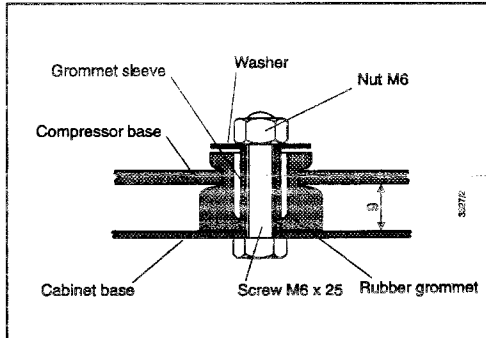


The compressor is equipped with DANCON connectors which consist of a thick-walled, copper-plated steel tube with great corrosion resistance, and a solderability equal to that of conventional copper connectors.

DANCON connectors are equipped with a seal in the form of an aluminium cap (Capsolut) which gives a tight sealing.

The seal cap is easily removed with an ordinary pair of pliers or with a special tool.

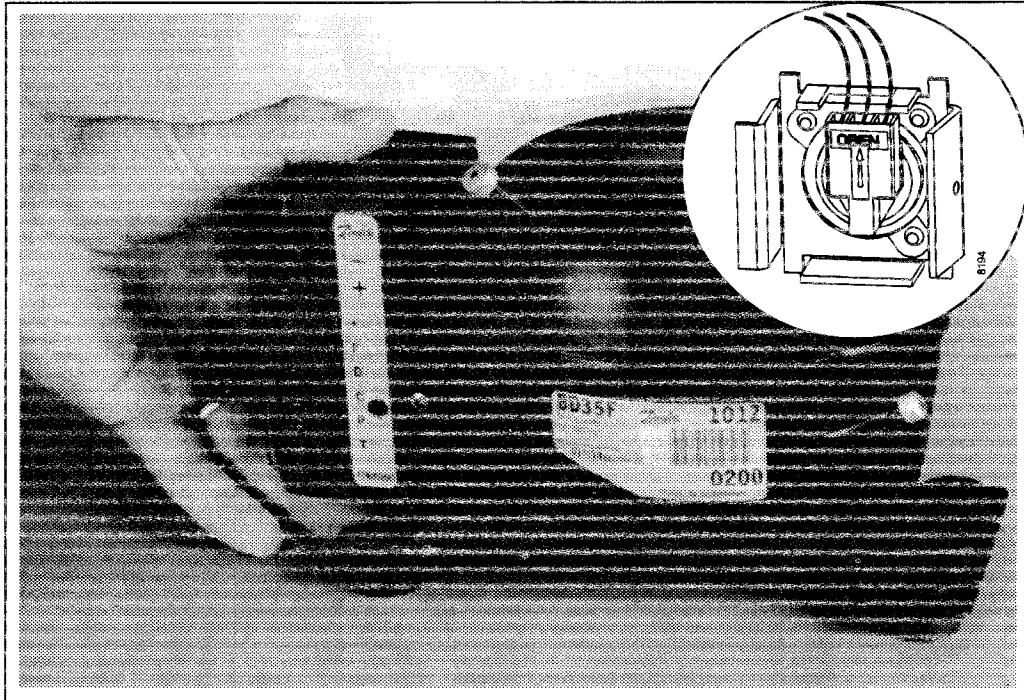
## Mounting accessories



Mounting accessories for BD compressors are supplied as a screw and nut assembly 118-1917. The screw and nut assembly 118-1917 is supplied in a bag containing four such assemblies (for mounting one compressor).

The screw and nut assembly can be obtained in quantities under code no 118-1918.

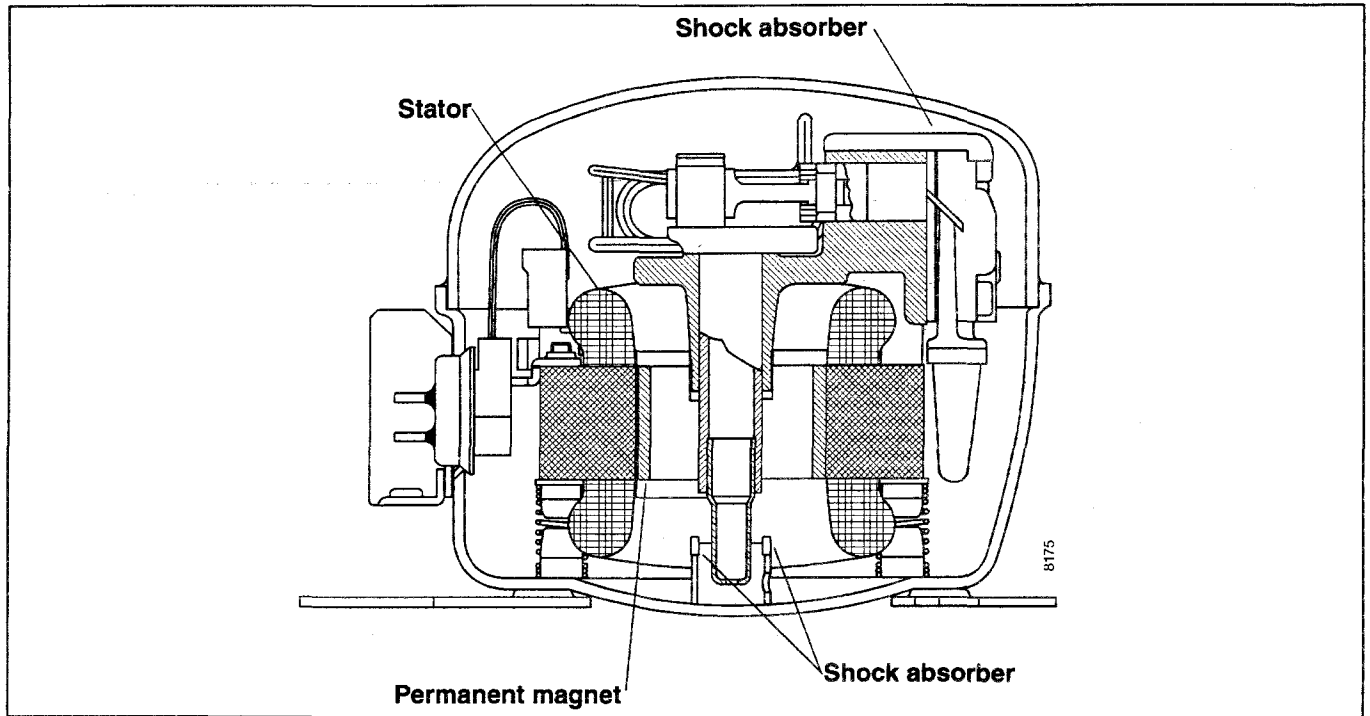
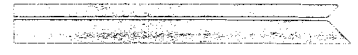
## Mounting the electronic unit



First the plug of the electronic unit is mounted on the current lead-ins of the compressor. The cables of the plug must point upwards (as shown in the above drawing).

Then the electronic unit itself is mounted on the bracket of the compressor. At first the left side is mounted, then the right side is pressed over the screw on the bracket. The electronic unit snaps on to the bracket and is now securely mounted on the compressor.

If the electronic unit is to be dismantled from the compressor, the screw on the bracket of the compressor must first be unscrewed.



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