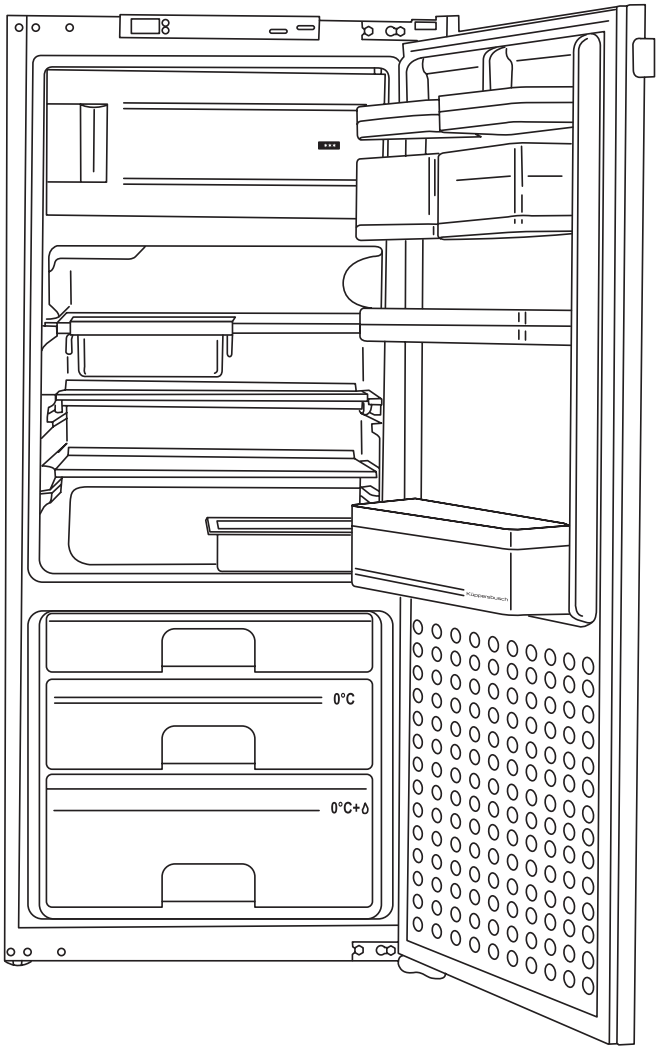

Built-in Refrigerator with Fresh Compartment

IKF 209-4

IKF 249-4

Küppersbusch

THE HEART OF A GOOD KITCHEN

GB

Service Manual: H8-420-02-02

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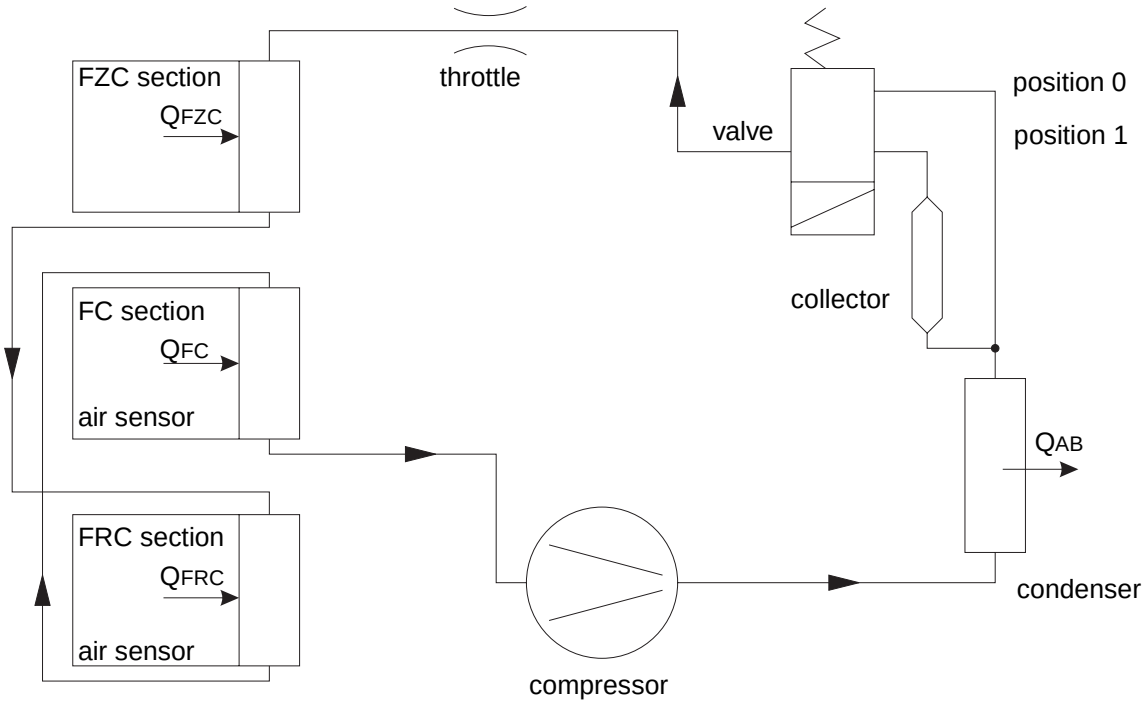
1. Refrigerant circuit



2. Electronic section

2.1 Design of the electronic section

Hardware:

The electronic section has a serial interface. The connections are accessible via an edge connector.

The connection is located on the left-hand side of the control panel, sealed by a plastic cover.

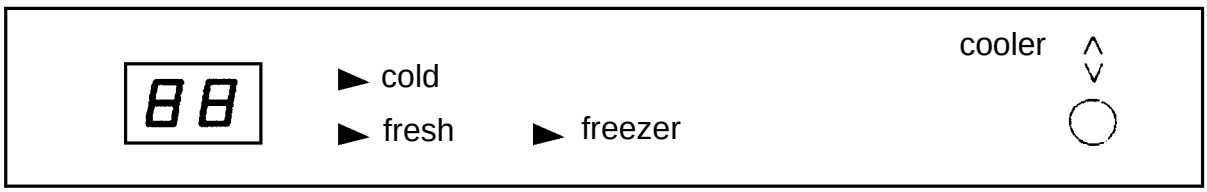
Software:

The M 38503M4 is used as the µC.

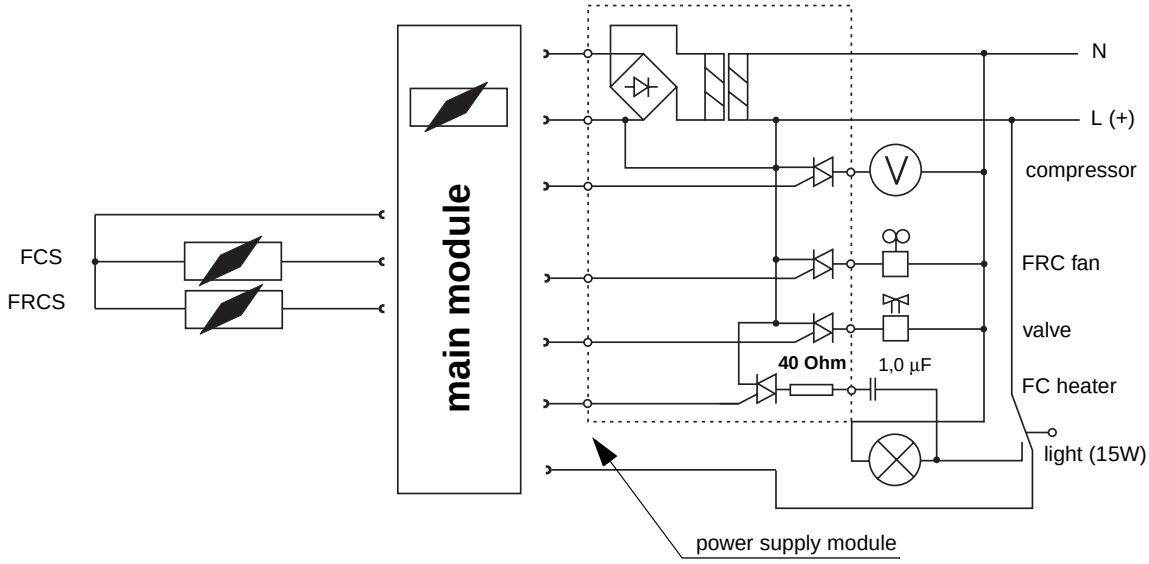
2.2 Equipment features

Type of control:	µC control
Compressor:	single-phase induction motor
Solenoid valve:	bistable
FC light:	15 W bulb

Display elements:	
FRC status display	2 x green LEDs, wedge-shaped
FZC status display	green LED, wedge-shaped
FC actual/target temperature	2 x 7-segment LED display, green



2.3 Wiring diagram



FRCS	-	Fresh compartment sensor
FCS	-	Fridge compartment sensor
FRC	-	Fresh compartment
FC	-	Fridge compartment
FZC	-	Freezer compartment

2.4 Function activation

♦ Activation functions

Special control functions can be activated by pressing the temperature setting button when the appliance is being switched on.

- If the button is pressed for 2 sec., you go into the FRC mode.
- If the button is pressed for another 3 sec. (total of 5 sec.), you go into the demo mode.

♦ FC temperature setting button (basic setting = 6 °C)

When the FC temperature setting button is activated, the temperature display is changed over from the actual to the target temperature display.
If the target button is not pressed for some time, the display switches back to the actual temperature.
The temperature setting range possible is between 8 °C and 3 °C. Adjustment is made in increments of one degree. Each time the button is pressed, the temperature is reduced by 1 K
If the button is kept depressed, the target temperature changes continuously every second. The default target temperature is 6 °C.

♦ FRC temperature adjustment

To make a fine adjustment of the FRC temperature, the customer has a relatively simple possibility of changing the FRC target temperature. If the FC temperature setting button is pressed, the fridge is on and the button is kept depressed for 2 sec., the display goes to the “FRC temperature adjustment mode”.

- The FRC display flashes in a 1-second cycle.
- The FC display indicates the FRC target temperature.
  (basic setting = 3 °C = sensor value)
- The FRC target temperature can be adjusted using the FRC temperature setting button. The possible setting range is between 6 °C and 0 °C. Adjustment is made in increments of one degree. Each time the button is pressed, the temperature is increased by 1 K. The FRC temperature adjustment mode is quit by not using the appliance for 1 minute. When the FRC temperature adjustment mode has been quit, the “FRC target temperature” set is stored in the EEPROM. The displays then revert to the normal status.

Important note: As the 7-segment display does not have a minus sign, it must be noted when adjusting the FRC that 0 is not equal to 0 °C.
There is a risk that 0° is undershot.

♦ FC temperature display (actual display)

In order to prevent the display from flickering, the display only changes in increments of 1 K.

If the temperature in the FCS is higher than 16 °C, the temperature changes by 1 K every 2 min.

If the temperature in the FCS is lower than 16 °C, the temperature changes by 1 K every 10 minutes.

The FC display indicates a corrected measured FCS temperature. The correction of the displayed temperature T_{dis} from the measured temperature T_{meas} is made according to the following system:

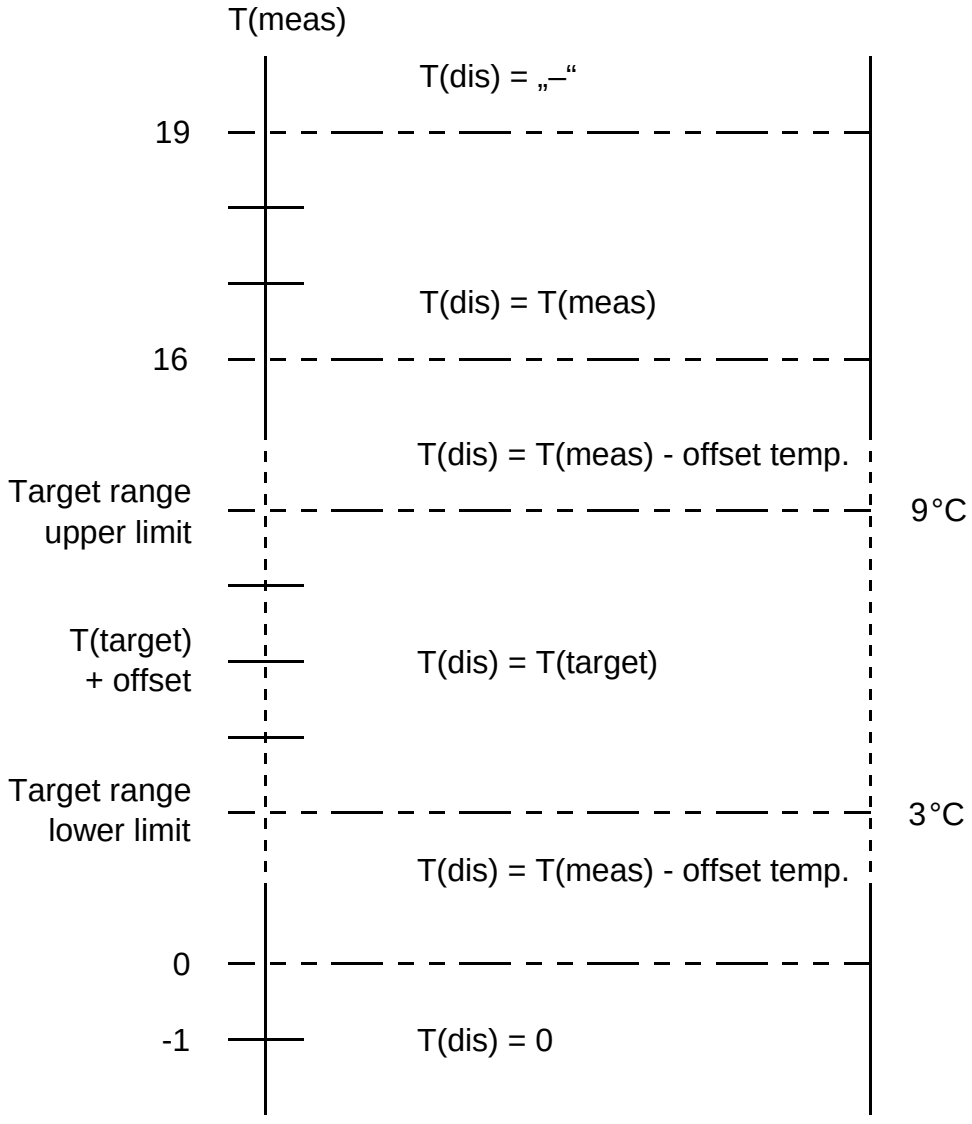
1. If $T_{meas} > 19$ °C, T_{dis} = “–”
2. If $T_{meas} \leq 0$ °C, $T_{dis} = 0$ °C
3. Target range: if (target temperature + offset temperature + warm tolerance) $\geq T_{meas} \leq$ (target temperature + offset temperature - cold tolerance), the target temperature is displayed:
   T_{dis} = target temperature
4. Ambient temperature limit: if $T_{meas} \geq 16$ °C, $T_{dis} = T_{meas}$
5. If the T_{dis} has still not been established by one of the preceding steps, the display means $T_{dis} = T_{meas}$ – offset temperature.

During the FRC defrosting phase and 100 min. ± 20 min. after the FRC defrosting phase, the FC temperature display is maintained.

Example:

Target temp.	+	offset temp.	+	warm tolerance	=	target range upper limit
6°C	+	1K	+	2K	=	9°C

Target temp.	+	offset temp.	+	cold tolerance	=	target range lower limit
6°C	+	1K	+	4K	=	3°C



offset temperature = 1K
warm tolerance = 2K
cold tolerance = 4K

- FRC display (cold + fresh)
  The FRC display comes on when the fridge is switched on.

- FZC display
  The FZC display comes on when the fridge is switched on.

- Normal control mode FC
  If the fridge compartment needs to be colder, only the solenoid valve is activated. The compressor is not affected.

- Normal control mode FRC
  The compressor is switched on at temperatures ≥ activation temperature.
  The compressor is switched off when the de-activation temperature has been reached or after the actual temperature of the FRC has been colder than the activation temperature for 60 min.

2.5 Influence of outside temperature

The FC heater (reduced bulb power) is controlled by the outside temperature.

Outside temperature:	Action:
≤ 22 °C	Heating if compressor off
≤ 16 °C	Continuous heating

- Adaption of the FRC target temperature by the outside temperature
  If the outside temperature exceeds 31 °C, the FRC target temperature is reduced by 0.5 K. If the outside temperature falls below 21 °C, the FRC target temperature is increased by 0.5 K.

- Adaption of the defrosting reset temperature by the outside temperature
  If the outside temperature exceeds 31 °C, the defrosting reset temperature is increased by 1 K. If the outside temperature falls below 21 °C, the defrosting reset temperature is reduced by 1 K.

  Defrosting reset temperature = 6 °C
  Of the measurements of the outside temperature sensor < -20 °C or > +45 °C, the outside temperature function is no longer activated.

2.6 New power supply module

Previous appliances had a so-called RC power supply unit which was characterised by its relatively simple and reasonably priced design.
With this electronic system, however, difficulties arise if

- the electronics are operated with a converter-powered mains
- the electronics are operated with soft-voltage mains.

In these cases it is possible that some components will not withstand the load and be destroyed.

With the new power supply module (transformer solution) the limits of what is possible are to be considerably expanded.

However, reference must always be made to the instructions for use where it states that the appliance is to be connected to 220-240V / 50 Hz / AC.

In general, the following tolerances apply to the electronic system:

Supply voltage	**Frequency range**
180 - 254 V	50 - 60 Hz

2.7 Power failure protection

The following data are stored in the EEPROM if the power fails:

- FC target temperature
- FRC target temperature

3. FRC fan

Priority list (descending):

1. While the FC door is open, the fan is always switched off.
2. During defrosting the fan is always switched on.
3. When the FC door is closed, the fan is switched on for 30 seconds.
4. The fan is switched on when the FRC demands cold.
5. The fan is switched on in the cycles “Fan-Standstill-On” and “Fan-Standstill-Off” after 4 min. standstill and then runs for 12 min.

Each point is only applied if the preceding points have not been fulfilled.

4. Solenoid valve

Bistable valve, R = 1650 Ω

Activation with 4 identical half waves. When the compressor is running, this activation signal is emitted every 60 seconds; with the compressor switched off, it is only emitted for changeover.

Solenoid valve position (related to N potential):

FZC/FRC/FC cooling:	negative half waves
FZC/FRC cooling:	positive half waves
No cooling:	solenoid valve position at FC/FRC/FC

Solenoid valve safety function

If the display temperature of the FC leaves the capture range towards the cold range during the standstill period, the valve is briefly switched over. A check is made every 30 min. to determine whether the temperature rises again. If not, the valve is activated again. This process is repeated until the FC is in the capture range again.

This also applies to the FRC as a pseudo capture range is specified here.

5. PC interface

Other data can be retrieved via the serial interface and, in the near future, processed by a diagnosis program:

EEPROM

- Sum of the switching cycles of compressor and solenoid valve
- Date of the last repair and filling
- Number of the valve switchovers initiated under the section “Solenoid valve safety function”.
- Works control number

RAM

- Mean relative duty factor of the FRC
  (ratio of operating to standstill time of the FRC as a value between 0 and 100%)
- Mean relative duty factor of the FC.

6. Defrosting

FC defrosting

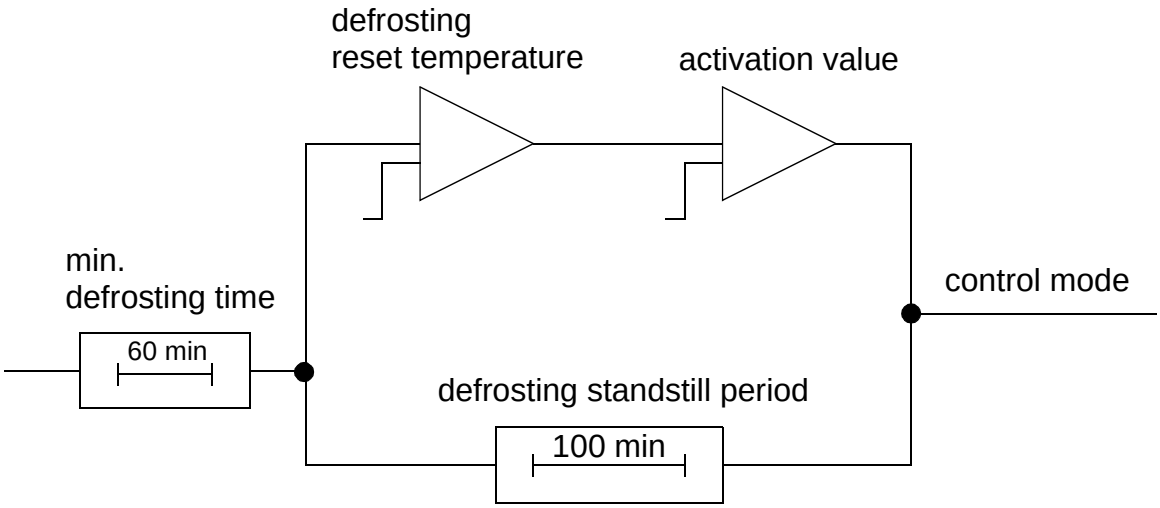
No special defrosting is provided for the FC. Defrosting takes place with the FRC.

FRC defrosting

If the FRCS is colder than 6 °C when the appliance is switched on for the first time, defrosting of the FRC is initiated after 24 hours. If this is not the case, defrosting of the FRC is initiated after 23 hours 20 min. The following defrosting operations are initiated after 23 hours 20 min. in each case.

Defrosting procedure:

- The FRC is not provided with cold for 60 min.
- The appliance then waits until the FRCS has reached 6 °C and the activation value or after 100 min. have elapsed.
- The FRC then changes over to the control mode.
- During the defrosting phase of the FRC the FRC fan is switched on with the FC door closed.



7. NTC sensor

The previous plug-in and directly accessible air sensor has been replaced by a permanently connected air sensor. It is now considerably better protected against moisture by a plastic cover as the moisture can no longer act directly on the sensor.
When the sensor is being replaced, the plastic cover must now be removed and a repair sensor installed. This repair sensor can be purchased completely pre-assembled from our spare parts store (spare parts No. 430026).

CAUTION:
With this repair sensor it must be ensured that the defective sensor is cut off and the new sensor installed using a flat connector (2.8 mm) and a shrinkage tube.
An installation drawing and all the necessary aids are enclosed in the repair set.

Position of the NTC sensors:

- FC NTC on the bottom right, on the back
- FRC NTC beside the fan under the cover
- room NTC on the electronic section.

Sensor breakage/short circuit

The following functions must be initiated in the event of a breakage or short circuit of the sensor.

The functions of the other sensors are retained.

Sensor	Temperature	Behaviour of the appliance
FCS	≥ 45 °C, ≤ -44 °C	FC display flashes “E1” FC control: “20 min. On” and “28 min. Off”
FRCS	≥ 45 °C, ≤ -44 °C	FC display flashes “E3” FRC control: “20 min. On” and “28 min. Off”

8. FC door function

Definition:

Closed FC door	=	High level at the μC input
Open FC door	=	Low level at the μC input

Internal fan

The FRC internal fan is switched off when the FC door is opened. If the FC door is closed, the FRC internal fan is activated for 30 sec.

Activation of the 7-segment display

The 7-segment display is switched off for energy reasons when the door is closed.

9. Demo mode

You gain access to the salesroom circuit as follows:

Switch on the appliance and keep the temperature adjustment button depressed for at least 5 seconds.

The demo mode simulates the steady-state control mode. All control functions and displays work. No load components are activated.

After the door has been closed, the FRC internal fan is activated for 30 seconds.

FC display = FC target temperature = 6°C.

Demo mode terminated by switching off the appliance.

10. Start-up program

The start-up program becomes active when, at the time the appliance is started for the first time, all temperature sensors, apart from the outside temperature sensor, measure a value of between +12°C and +45°C. The outside temperature sensor must not be defective (-20°C < T < +45°C).

All displays and functions work as in control mode. On termination of the start-up program, the appliance switches over to the control mode.

Program run:

- The valve is activated for 5 sec. (half-wave positive activation)
- The bulb is activated for 5 sec. (partial load)
- The FRC fan is activated for 5 sec.
- The FRC is supplied for 15 min.
- Control mode

11. Equipment

- This built-in appliance is fitted with flat hinges.
- The trays in the FRC are easier to change than before.
- The drawer rails in the FRC can be removed for cleaning without any tools. The customer is also informed about this in the instructions for use.