
Table of Contents

E90 Climate Control

Subject	Page
Introduction	5
New System Components and Features	5
IHKA System Circuit Diagram	6
Electrical System Components	8
Control Units	8
A/C Control and Operating Unit (IHKA)	8
Digital Motor Electronics (DME) Control Unit	9
Junction Box (JB)	9
Roof Control Panel (FZD)	9
Car Access System (CAS)	10
Car Communication Computer (CCC)	10
Central Information Display	10
Center Console Switch Cluster (SZM)	10
Sensors	11
Interior Temperature Sensor	11
Evaporator Temperature Sensor	11
Ambient/Outside Temperature Sensor	11
Ventilation Temperature Sensors	11
Solar Sensor	11
Refrigerant Pressure Sensor	12
AUC II Sensor	12
Condensation Sensor	13
Front Stratification Adjustment Thumbwheel	13
Rear Stratification Adjustment Thumbwheel	13
Outputs	14
Stepper Motors	14
Blower and Blower Output Stage	15
Compressor Valve	15
Rear Window Defogger	16
Seat Heating	16
Water Valves	16
Electric Water Pump	17

Subject	Page
Non-Electrical Components	18
Refrigerant Circuit	18
Heating Circuit	18
Air Cleaner/Microfilter	18
Principles of Operation	19
Temperature Control	19
Evaporator Control	20
Air Distribution Setting	20
Airflow Control	21
Sunlight Adaptation (Solar Sensor)	21
MAX Cooling	21
Residual Heat (REST)	22
Defrost Function	23
AUTO Function	23
Heated Rear Window	23
Defrosting Phase (1st heating period)	23
Pulsing	23
2nd Heating Period	23
OFF	23
Air-recirculation Mode	24
Automatic Air-recirculation Control	24
Condensation Sensor Function	25
Service Information	26
Exchanging Flap Motor	26
Running in A/C Compressor	26
Microfilter	27

**BLANK
PAGE**

Climate Control

Model: E90

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Be familiar with the differences in IHKA features between the E46 and E90
- Know the general location of electric components of the system
- Understand what interfaces are needed for system operation
- Understand why the auxiliary water pump has been eliminated.

Introduction

The E90 is equipped with an integrated automatic climate control system (IHKA) as standard. It supplies the needs for a very competitive market segment and allows the vehicle occupants the latest in climate control functionality with an optional iDrive interface that reduces the number of primary controls on the panel.

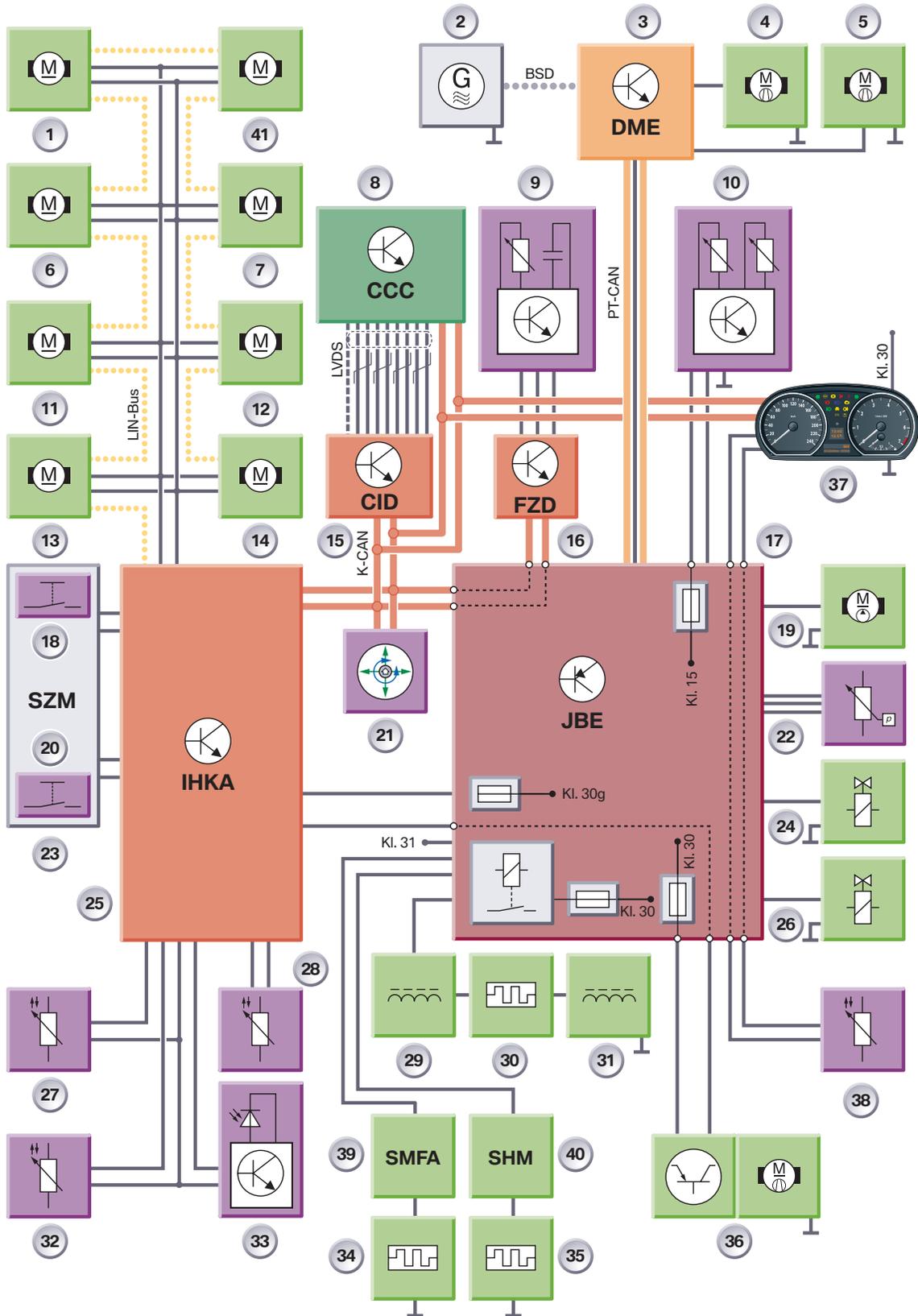
New System Components and Features

- The IHKA system used is a dual zone climate control system allowing the passenger and passenger to control individual temperature settings.
- Residual heat (rest) function.
- Condensation sensor interface
- New bus system (LIN) for control of the stepper motors.
- New stepper motors
- Seat heating control
- New Interfaces (JB, FZD, SZM, CON)
- Clutchless A/C compressor



Integrated automatic climate control (IHKA)

IHKA System Circuit Diagram



Legend for IHKA System Circuit Diagram

Index	Explanation	Index	Explanation
1	Rear blend/stratification motor	22	Pressure sensor
2	Alternator	23	Center console switch cluster (SZM)
3	Digital motor electronics (DME)	24	Water valve
4	Electric water pump	25	Outside temperature sensor
5	Engine cooling fan	26	Auxiliary water pump (not for US)
6	Ventilation motor	27	Evaporator temperature sensor
7	Front blend/stratification motor	28	Footwell temperature sensor
8	Car communication computer (CCC)	29	Blocking circuit (filter)
9	Condensation sensor	30	Rear window defogger
10	AUC II sensor	31	Blocking circuit (filter)
11	Fresh air/recirculation motor	32	Ventilation temperature sensor
12	Mix air flap motor, left	33	Solar sensor (1-channel)
13	Defrost flap	34	Seat heating element, left
14	Footwell flap motor	35	Seat heating element, right
15	Central information display (CID)	36	Blower motor and final stage
16	Roof function center (FZD)	37	Instrument Cluster
17	Junction Box Electronics Control Module (JBE)	38	Outside temperature sensor
18	Seat heater button, left	39	Driver's seat module
19	A/C compressor valve	40	Seat heating module (passenger)
20	Seat heater button, right	41	Mix air flap motor, right
21	Controller		

Electrical System Components

Control Units

A/C Control and Operating Unit (IHKA)

As before, the control and operating unit is the control center of the heating and air conditioning system. It is the point where all the necessary sensor data is processed and the required settings can be entered.

A new feature of the control module is that it no longer directly controls all functions and components but rather makes use of other control units for this purpose (distributed functions).

The IHKA panel is directly responsible for the following:

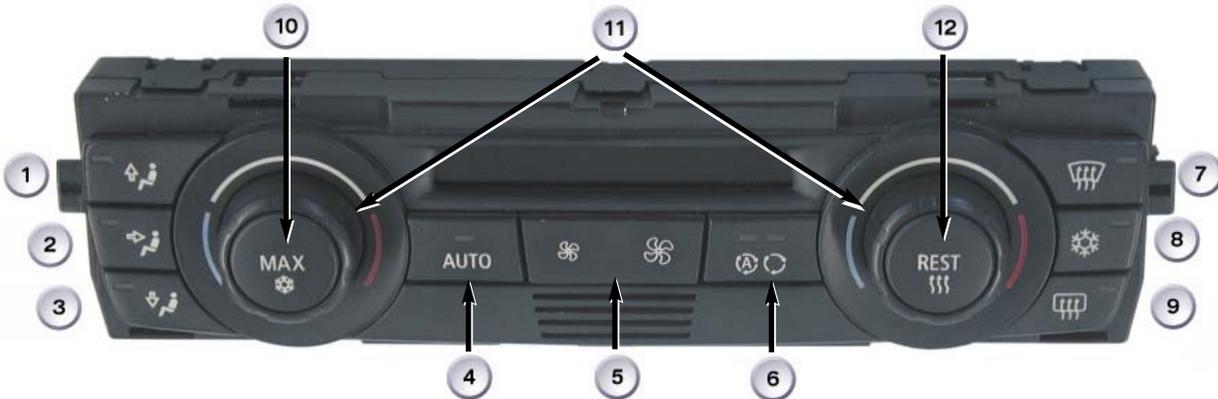
- SZM switch input
- Solar sensor input
- Receives the rear stratification knob (rheostat) signal
- Receives ventilation, footwell, and evaporator temperature sensor signals

The IHKA panel indirectly receives

- Condensation sensor signal via the K-CAN.

The signal path is:

Condensation sensor => FZD => K-CAN => IHKA



Index	Explanation	Index	Explanation
1	Windshield Air Distribution	7	Front Windshield Defrost Program
2	Face Vent Air Distribution	8	Compressor Request
3	Footwell Air Distribution	9	Rear Window Request
4	Automatic Program Select Button	10	MAX A/C Program
5	Blower Motor Control	11	Temperature Control Knob Left/Right
6	Recirculation Control	12	REST Program

Digital Motor Electronics (DME) Control Unit

The DME control unit performs the following functions:

- Actuates the Engine cooling fan for cooling of the condenser.
- Interfaces with the IHKA control unit via the bus network for the compressor release signal.
- Interfaces with the IHKA control unit for operation of the engine's electric water pump for the residual heat feature.

Junction Box (JB)

The junction box is extremely important to the IHKA system.

It is responsible for the following functions:

- Output signal for seat heating.
The signal path is:
SZM => ribbon cable => IHKA => K-CAN=> JBE => SHM/SMFA
- Rear window defogger
The signal path is:
IHKA => K-CAN => JBE (relay) => Rear window defogger filters/grid
- Blower motor operating voltage
- Refrigerant control valve (in compressor)
The signal path is:
IHKA => K-CAN => JBE => Operating voltage for valve
- Gateway to the PT-CAN for bi-directional communication between the IHKA and DME
The signal path is:
IHKA <=> K-CAN <=> JBE <=> PT-CAN <=> DME
- Receives the rear stratification knob (rheostat) signal
- Receives refrigerant pressure sensor signal
The signal path is:
Pressure sensor => JBE => K-CAN => IHKA
- Receives AUC sensor signal
The signal path is:
AUC sensor => JBE => K-CAN => IHKA
- Splice point for the ambient air temperature sensor
The signal path is:
Ambient air temperature sensor => hardwire => through JB => IKE

Roof Control Panel (FZD)

The roof control panel is used to relay the condensation sensor signal to the IHKA. It takes the signal from the condensation sensor and places it on the K-CAN.

Car Access System (CAS)

The CAS assigns a personal identification code to every remote control. The CAS transfers the personal identification code to the IHKA control unit via the K-CAN.

The ID code “Key-based settings” (Key Memory) are stored in the IHKA control unit.

When the vehicle is unlocked, the remote control unit used is recognized. The settings stored for this unit are called up and executed. While entering the sleep mode (run-down period), the current settings are stored for the remote control unit in use at that time.

Car Communication Computer (CCC)

If the vehicle is equipped with a navigation system, the signals from the controller for selecting the menus and submenus are processed in the CCC.

To actuate the CID (Central Information Display), the red-green-blue signals from the graphics processor are converted into Low Voltage Differential Signalling (LVDS) digital signals.

Central Information Display

The following control and display functions are selected and activated with the controller in the CID (Central Information Display):

- Air distribution setting - The defrost flaps, ventilation flaps and footwell flaps can be individually set in the air distribution submenu.
- Automatic mode - The intensity of the IHKA can be set in the automatic mode submenu. In other words, the automatic influence of the climate conditions outside the vehicle on the air volume and the opening angle of the flaps can be set to one of three different settings (low, medium, high).

Center Console Switch Cluster (SZM)

The center console switch cluster (SZM) is connected by means of a 14-wire ribbon cable directly to the IHKA control module. The commands from the SZM are then transmitted via K-CAN to the corresponding systems.

The A/C control and operating unit is also responsible for activation of the LEDs for function and backlighting.



Sensors

Interior Temperature Sensor

The interior temperature sensor is mounted on the IHKA panel. It is used by the IHKA control module to achieve the desired cabin temperature.

To aid the flow of air being sampled by the system, there is a small puller type electrical fan (non-replaceable) on the back of the IHKA.

Evaporator Temperature Sensor

The evaporator temperature sensor, mounted close to the evaporator, also transfers its information directly via cable to the IHKA control module.

Ambient/Outside Temperature Sensor

The outside temperature value is sent to the IHKA control module from the instrument cluster via the K-CAN.

The outside temperature sensor signal is hardwire to the instrument cluster. The wiring uses the junction box as a splice.

Ventilation Temperature Sensors

The system utilizes a total of three NTC type ventilation temperature sensors directly wired to the IHKA control module. They are:

- Stratified Temperature Sensor
- Ventilation Temperature Sensor
- Footwell Temperature Sensor

Solar Sensor

The system is equipped with a single zone solar sensor. It is connected directly to the IHKA control module via hard wire.

The solar sensor is mounted on the center of the dashboard cover next to the windshield.



Index	Explanation
1	Center Channel Speaker & Vent
2	Solar Sensor

Refrigerant Pressure Sensor

The refrigerant pressure sensor is located in the pressure line between the condenser and the evaporator. The output of the A/C compressor is reduced by a request from the the IHKA control unit to the JBE in the event of excessively high or low refrigerant pressure.

The junction box provides power to the refrigerant pressure sensor. The data are evaluated in the junction box electronics. The evaluated data are transmitted to the IHKA control unit via the body CAN (K-CAN).

AUC II Sensor

The AUC II sensor is controlled and powered by the junction box. The junction box collects the data from the AUC II sensor and transfers it to the IHKA control module via the K-CAN where the data is then processed.

The AUC sensor has the ability to detect:

- Carbon Monoxide (CO)
- Hydrocarbons (HC)
- Oxides of Nitrogen (NO_x gasses).

The AUC II sensor is mounted in the IHKA filter housing on the bulkhead.



Index	Explanation
1	AUC II Sensor

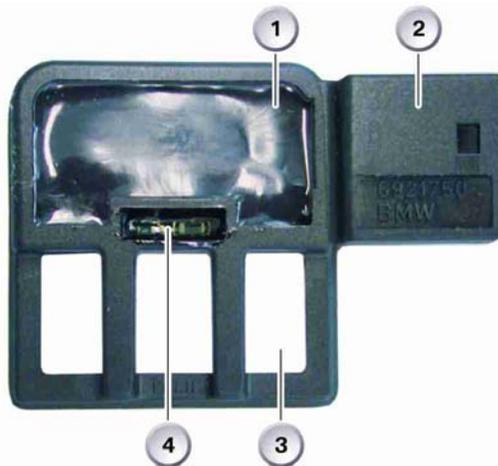
Condensation Sensor

The condensation sensor is controlled and powered by the roof module (FZD). The sensor data are transferred via the K-CAN to the control and operating unit where they are evaluated. The IHKA control module receives all information sent from the FZD control module via the K-CAN spliced through the junction box.

The condensation sensor is mounted under the rain light sensor (RLS) on the mirror base. Other names for the condensation sensor are Mist, Fogging, and Humidity sensor.

When moisture is detected by the Condensation Sensor, the following occurs:

- Defroster Flaps open further
- Blower speed is increased
- Temperature increases
- Fresh Air Flaps open 100%
- Footwell Flaps are closed
- Evap Temp threshold goes to minimum



Index	Explanation
1	Sensor Electronics
2	3 Pin Connector
3	Moisture Measuring Cell
4	Well for Laser Adjusted Resistors

Note: Similar to previous systems, the condensation sensor value is ignored unless the IHKA panel is running in the automatic mode.

Front Stratification Adjustment Thumbwheel

The front adjustment thumbwheel is part of the DSC/DTC/Hazard switch cluster.

The thumbwheel signal is wired directly to the IHKA control unit as an analog/varying voltage signal. The IHKA panel sends the specific position signal to the front mixing flap motor via the LIN bus.

Rear Stratification Adjustment Thumbwheel

The rear adjustment thumbwheels is located to the right of the rear center vent

The thumbwheel signal is wired directly to the JBE control unit as an analog/varying voltage signal. The JBE converts this signal into a digital signal over the K-CAN to the IHKA control unit which then sends the specific position signal to the rear mixing flap motor via the LIN bus.

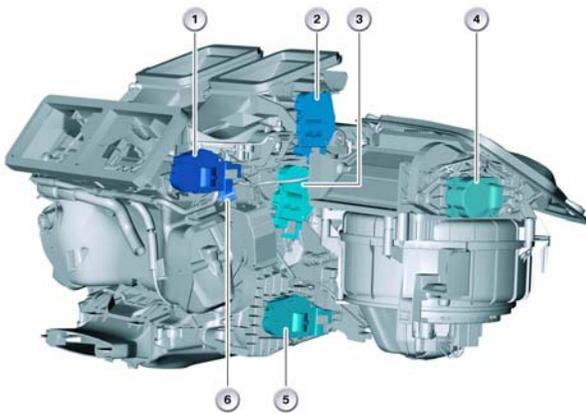
Outputs

Stepper Motors

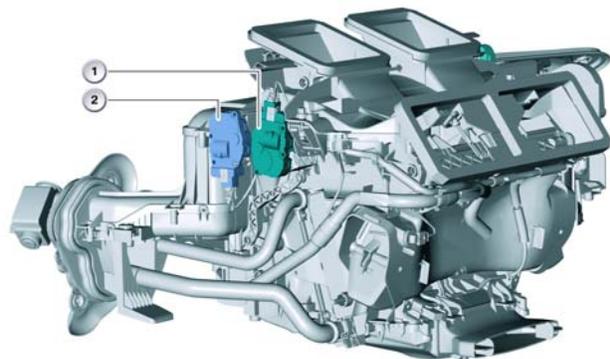
The IHKA system utilizes eight stepper motors that are wired in series for climate control operation. The IHKA control module operates the stepper motors via the LIN-bus.

The eight stepper motors used are for:

- Defroster Flaps
- Fresh/Recirculating Air Flap
- Ventilation Flaps
- Rear Blending/Stratification Flap
- Right Air Mixing Flap
- Front Blending/Stratification Flap
- Left Air Mixing Flap
- Footwell Flaps



Index	Explanation
1	Stepper Motor, Ventilation Flap
2	Stepper Motor, Defroster Flap
3	Stepper Motor Air Mixing Flap, Right
4	Stepper Motor, Fresh / Recirculating Air
5	Stepper Motor, Air Blending, Rear
6	Stepper Motor, Footwell



Index	Explanation
1	Stepper Motor, Air Mixing Flap, Left
2	Stepper Motor, Air Blending, Front

- Note:**
- All eight stepper motors can be replaced without removing the dashboard nor A/C housing.
 - Seven of the eight stepper motors used are identical (same part number). A different stepper motor is used only for the fresh air/recirculation motor. See the Service Information section.

Blower and Blower Output Stage

The blower and blower output stage are mounted in the air conditioning housing behind the glovebox.

The blower output stage is activated via pulse-width modulation by the IHKA control module. This connection is spliced through the junction box. The operating power for the blower motor is supplied by the junction box.

The signal path is:

IHKA => through JB (not processed just spliced) => Final stage => Blower Motor



Index	Explanation
1	Blower Motor
2	Output/Final Stage
3	Junction Box Electronics

Compressor Valve

A clutchless compressor similar to the one used in E60/65 is used. The compressor has a swash plate that can vary the amount of compression on the refrigerant.

The compressor valve is controlled and powered by the junction box. Activation requests are sent via the K-CAN from the IHKA control module.

The signal path is:

IHKA => K-CAN => JBE => Refrigerant valve

Rear Window Defogger

The rear window defogger is also controlled and powered by the junction box. The request is sent to the junction box from the IHKA control module via the K-CAN.

The signal path is:

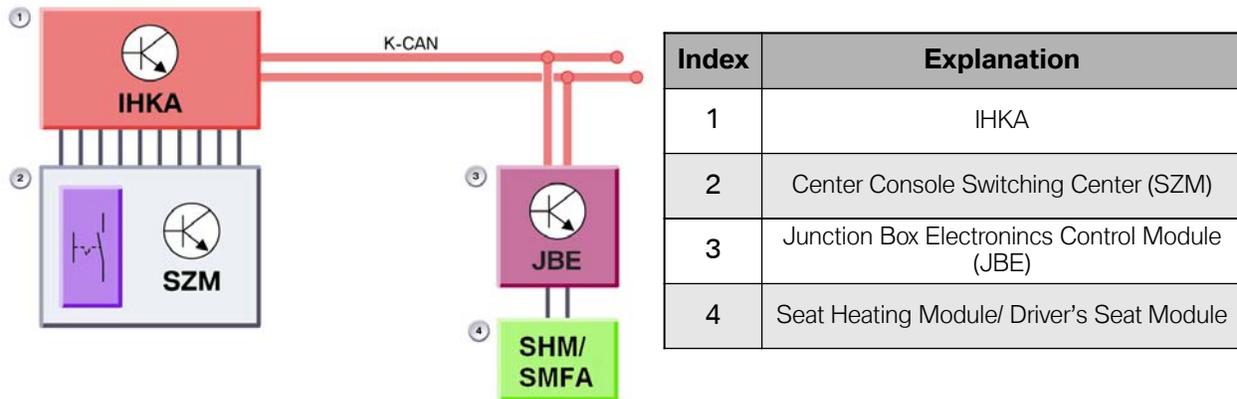
IHKA => K-CAN => JBE (relay) => Rear window defogger filters/grid

Seat Heating

The seat heating is controlled and powered by the junction box. Request for set heating activation is initiated from the SZM directly to the IHKA control module and transmitted via K-CAN to the junction box.

The signal path is:

SZM => ribbon cable => IHKA => K-CAN=> JBE => SHM/SMFA



Water Valve

A single water valve is used to control the amount of heat sent to the heater core.

To control the temperature desire by the dual zone climate control system, mixing flaps are used.

The water valve is sprung open and pulse width modulated closed by the JBE.

The signal path is:

IHKA => K-CAN => JBE => Water valve

Electric Water Pump

The E90 does not utilize an auxiliary water pump as other BMW's, thanks to the N52 engine's cooling system.

The N52 engine is equipped with an electronically controlled water pump. There are many advantages to this setup. One advantage is decreased warmup time for the engine.

When the residual heat (REST) function is activated on the E90, the IHKA control unit interfaces with the DME control module to activate the electric water pump. The water pump allows hot/warm coolant to flow through the heater core and warm up the passenger cabin.



Note: More information on the N52 engine's cooling system benefits can be found in the training material for ST501 - New Engine Technology.

Non-Electrical Components

Refrigerant Circuit

The refrigerant circuit consists of the A/C compressor, expansion valve, evaporator, and condenser.

The new features on the system are:

- Aluminum lines and the arrangement of the filler connections
- The receiver-drier (with replaceable desiccant) is integrated in the condenser
- The compressor has no clutch. It is controlled by the IHKA logic through the JBE.
- The expansion valve is accessible from the engine compartment.

Heating Circuit

The heated water is pumped out of the engine via an electric water pump through the water valve to the heater core (heat exchanger). From here, the water is routed back to the engine and engine thermostat.

An auxiliary water pump is not needed in the vehicle due to the electric water pump used by the engine. This electric water pump can satisfy the needs of the heating circuit during idle/low engine RPMs and for the REST function.

Air Cleaner/Microfilter

The E90 is equipped with a carbon activated microfilter which is accessible from the engine compartment.

Once the cover has been removed from the bulkhead, the filter can be easily replaced or cleaned. The filter change is indicated via the CBS.



Index	Explanation
1	Air cleaner housing with filter

Principles of Operation

The IHKA comprises the following functions:

- Temperature control
- Evaporator control
- Air distribution setting
- Airflow control
- Sunlight adaptation (solar sensor)
- MAX cooling
- Residual heat
- Defrost function
- AUTO function
- Heated rear window
- OFF
- Air recirculation mode
- Automatic air-recirculation control
- Condensation sensor program

Temperature Control

The temperature for the best possible interior climate is regulated with a mixer flap in the heater/air conditioner.

The air-mass flow is fed through the evaporator. As this happens, the air-mass flow is cooled and dried (providing the air-conditioning system is switched on). The mixer flap then feeds the air-mass flow completely or in part over the heating system heat exchanger and the electric auxiliary heater (depending on the desired temperature value set at the IHKA control panel). The air flows are subsequently mixed again. The air-mass flow is then fed through the ventilation flaps and into the vehicle interior.

The temperature inside the vehicle is controlled by means of a master controller.

Control is based on the nominal values set and the calculated actual value (the nominal values are set with 2 temperature selector knobs. The actual value is calculated from the temperatures measured by the interior temperature sensor and the footwell temperature sensor).

The lead parameter is calculated from the comparison between the actual value for the interior temperature and the corrected nominal value (calculated from temperature request, interior temperature and ambient temperature). Compared to the set specification, the interior temperature is raised in the cold so that a comfortable level is achieved even at negative temperatures, despite the temperature setting being unchanged.

The ambient temperature is transmitted to the IHKA control unit via the K-CAN.

The separate temperature setting for the driver's side and the front-passenger side makes 2 mixer flaps necessary.

Evaporator Control

The evaporator temperature is regulated by means of the evaporator temperature sensor and the expansion valve. The evaporator temperature is set to the predefined specification of 2°C. Lower temperatures are not possible due to the risk of icing.

If the function gradual evaporator control is encoded, the nominal value for the evaporator temperature will be calculated between 2°C and 7°C. The specification depends on the ambient temperature, the ventilation temperature and the refrigerant pressure. A variable evaporator control reduces dehumidification. This reduces the risk of mucous membranes drying out.

Air Distribution Setting

For the best possible operation of the air distribution, it is important for the manually adjustable air vents to be open.

Occupants have the possibility of allowing the air distribution to be decided by the automatic program (AUTO button).

Alternatively, individual, personal settings are possible through manual selection (defrost, ventilation, footwell).

If the vehicle is equipped with navigation/CCC, it is also possible to make a fine adjustment via the CID (Central Information Display) in the submenu Air distribution.

Compared to manual selection, fine adjustment offers the additional possibility of further individualization of the air distribution.

Airflow Control

The airflow control is dependent on the following settings and control actions:

- Manual blower setting
- Automatic blower and flap setting - The automatic blower and flap functions are activated when the AUTO button is pressed:
- Dynamic pressure compensation - The air volume at the air inlet grills increases disproportionately with increasing road speed. This effect is compensated for by the opening angle of the fresh-air flap being reduced as speed increases (dynamic pressure compensation).
The opening angle is regulated according to the programming.
- Blower control - If necessary, the power management system will assign priority levels to reduce the blower output (via K-CAN).
- Effect of terminal 50 - When the engine is being started (terminal 50 ON), the electric auxiliary heater and blower are switched OFF to reduce the load on the vehicle battery.

Sunlight Adaptation (Solar Sensor)

How the solar sensor affects the IHKA regulation on the driver's side and on the front-passenger side is not programmed separately.

The following functions are modified when automatic mode is activated (depending on the intensity of sunlight):

- Blower output is increased or reduced
- Desired temperature value is increased or reduced

MAX Cooling

The MAX button makes it possible for the user to select maximum cooling with just one press of a button at the IHKA controls.

When the MAX button is pressed, all functions, including the defrost function, are deactivated. The air conditioning function is activated (if it was not already activated) and defined settings are selected. (*example: temperature control is deactivated, ventilation flaps are fully opened*)

Residual Heat (REST)

The residual-heat function allows the heat from the engine to be used to heat up the vehicle interior when the engine is not running (e.g. during a stop at a level crossing). The residual-heat function is only possible for a certain run-down period (15 minutes from terminal 15 OFF). The DME is signaled to activate the electric water pump via the bus system to circulate the coolant.

Switch-on conditions:

- Terminal 15 OFF
and
- Run-down period active (up to 15 minutes after terminal 15 OFF)
and
- REST button in IHKA controls ON
and
- Ambient temperature below 25°C
and
- Engine temperature at some point above 60°C
and
- On-board supply voltage over 11.4 volts

Conditions for switching off:

- Terminal 15 ON
or
- Residual heat ON (15 minutes) expired
or
- REST button in IHKA control panel OFF
or
- OFF condition activated with residual heat active (terminal R)
or
- Prompt from power management to switch off auxiliary consumers
or
- On-board supply voltage less than 11 volts

Defrost Function

When the defrost function is activated, the defroster flap (on the inside in front of the windscreen) is opened fully. The fresh-air/air-recirculation flaps move to the fresh air position. All other flaps are closed. The blower is run up to maximum output.

AUTO Function

When this button is pressed, all IHKA functions are set to automatic mode. If one or more automatically controlled functions are manually set, automatic control for the functions concerned will be cancelled.

All other functions remain automatically controlled.

Heated Rear Window

The heated rear window is switched on when the button in the IHKA control panel is pressed. The function indicator lamp in the button lights up.

The heated rear window is switched off by pressing the button again or automatically after the heating time has expired.

Defrosting Phase (1st heating period)

When terminal 15 is switched ON, the first time the system is switched on, the time span for the heated rear window is defined as follows:

- Ambient temperature down to -15°C: Heating period: 10 minutes
- Ambient temperature below 15°C: Heating period: 17 minutes

Pulsing

After the defrosting phase, the heating phase (25 minutes with pulsed heat output (on-off cycle: 40 seconds ON, 80 seconds OFF)).

The function indicator lamp in the button is off during pulsing.

2nd Heating Period

After the 1st heating period has expired, each subsequent time the button is pressed will cause the heated rear window to be switched on for a further 30 minutes (defrosting phase).

After the 2nd heating period has expired, output is again pulsed.

OFF

The IHKA control panel is switched off when the blower speed is set to 0 (The control panel/control unit continues to run in the background.)

Air-recirculation Mode

In air-recirculation mode, the flow of outside air can be stopped to prevent pollution from entering the vehicle, e.g. in traffic congestion. Air inside the vehicle is continually recirculated.

To make sure that there is a sufficient supply of fresh air, air-recirculation mode is only available for a limited time (30 minutes air recirculation -> 30 seconds partial fresh air -> 30 minutes air recirculation -> etc.)

Automatic Air-recirculation Control

If the AUC II sensor detects an increased level of pollutants in the environment from spark-ignition and diesel engines, the IHKA control unit will automatically switch to air-recirculation mode.

To make sure there is still an adequate supply of fresh air, air recirculation is only available for a limited time:

- At ambient temperatures less than 0°C:
2 minute recirculated air mode -> 20 seconds fresh air mode -> 2 minute recirculated air mode -> etc.
- At ambient temperatures from 0°C to 6°C:
3 minute recirculated air mode -> 20 seconds fresh air mode -> 3 minute recirculated air mode -> etc.
- Operation without a/c function at ambient temperatures greater than 6°C:
4 minute recirculated air mode -> 20 seconds fresh air mode -> 4 minute recirculated air mode -> etc.
- Operation with a/c function at ambient temperatures greater than 6°C:
12 minute recirculated air mode -> 20 seconds fresh air mode -> 12 minute recirculated air mode -> etc.

When the engine is started and the AUC function activated, fresh-air mode is always selected for approx. 40 seconds due to the warming phase of the AUC sensor.

Condensation Sensor Function

The following conditions must be satisfied for the condensation sensor to operate:

- The engine must be running
- The IHKA must be in automatic mode

The IHKA control unit evaluates the condensation sensor signal (humidity). If condensation on the windscreen is imminent, the following measures are initiated in sequence to prevent condensation from forming:

- Open defrost flaps further
- Switch from air-recirculation/AUC/automatic air-recirculation mode to partial fresh-air mode
- Switch from partially fresh air in air-recirculation/AUC/automatic air-recirculation mode to fresh air
- Increase blower air volume
- Reduce air volume for the footwell
- Increase desired temperature value

If one measure proves to be ineffective, the next measure is initiated.

Once successful, the measures previously performed are reversed step-by-step in reverse order.

Service Information

Exchanging Flap Motor

After the exchange of a flap motor, the flap motor must be re-addressed. The new address will be triggered by the diagnosis software via:

Service Functions => Body => Heating and Air Conditioning => re-address motors

The flap motor will automatically receive the address from the IHKA control unit. The control unit will recognize the correct address from the order of flap motors.

Because of this, care should be taken during the exchange the each flap motor is connected in the correct order to the correct connector.

The correct order for the stepper motors is:

1. Defroster flap
2. Fresh/Recirculating air flap
3. Ventilation flap
4. Rear blending/stratification flap
5. Right air mixing flap
6. Front blending/stratification flap
7. Left air mixing flap
8. Footwell flap

Note: Flap motors are wired in series. Each flap motor has a measuring resistance of approx. 1 ohm. Each flap motor is connected to its predecessor via this measuring resistance. For this reason, troubleshooting must be performed in the order stipulated in the schematic circuit diagram.

Running in A/C Compressor

If the A/C compressor has been replaced or if the refrigerant circuit has been recharged, the A/C compressor must be placed in the “running in” mode. Running in is needed to make sure that adequate lubrication (oil distribution) is available.

The A/C compressor must be run in the specified engine speed range during running in. The oil added by the manufacturer is then mixed with the liquid refrigerant.

Running in will automatically be aborted if the engine speed exceeds the specified engine speed range. Running in must then be repeated in full.

Note: When the IHKA is programmed it is automatically placed in the running in mode. This mode should be cancelled or finished before handing over the vehicle to the customer to avoid confusion or inconvenience (no compressor activation is possible when at low rpm).

Microfilter

The wear level of the microfilter is monitored by the IHKA control unit.

To do this, the control unit uses a calculation model (algorithm) to simulate the condition of the microfilter from the following factors:

- Outside temperature
- Signal from rain/light sensor (IHKA only, otherwise default value)
- Signal from solar sensor (IHKA only)
- Blower voltage
- Air conditions (recognized from frequent or infrequent use of air recirculation)
- Vehicle road speed
- Service interval display (SIA) timer

The IHKA control unit forwards the following data to the cluster via the K-CAN:

- Odometer reading
- Microfilter availability in percent
- Time remaining until next service