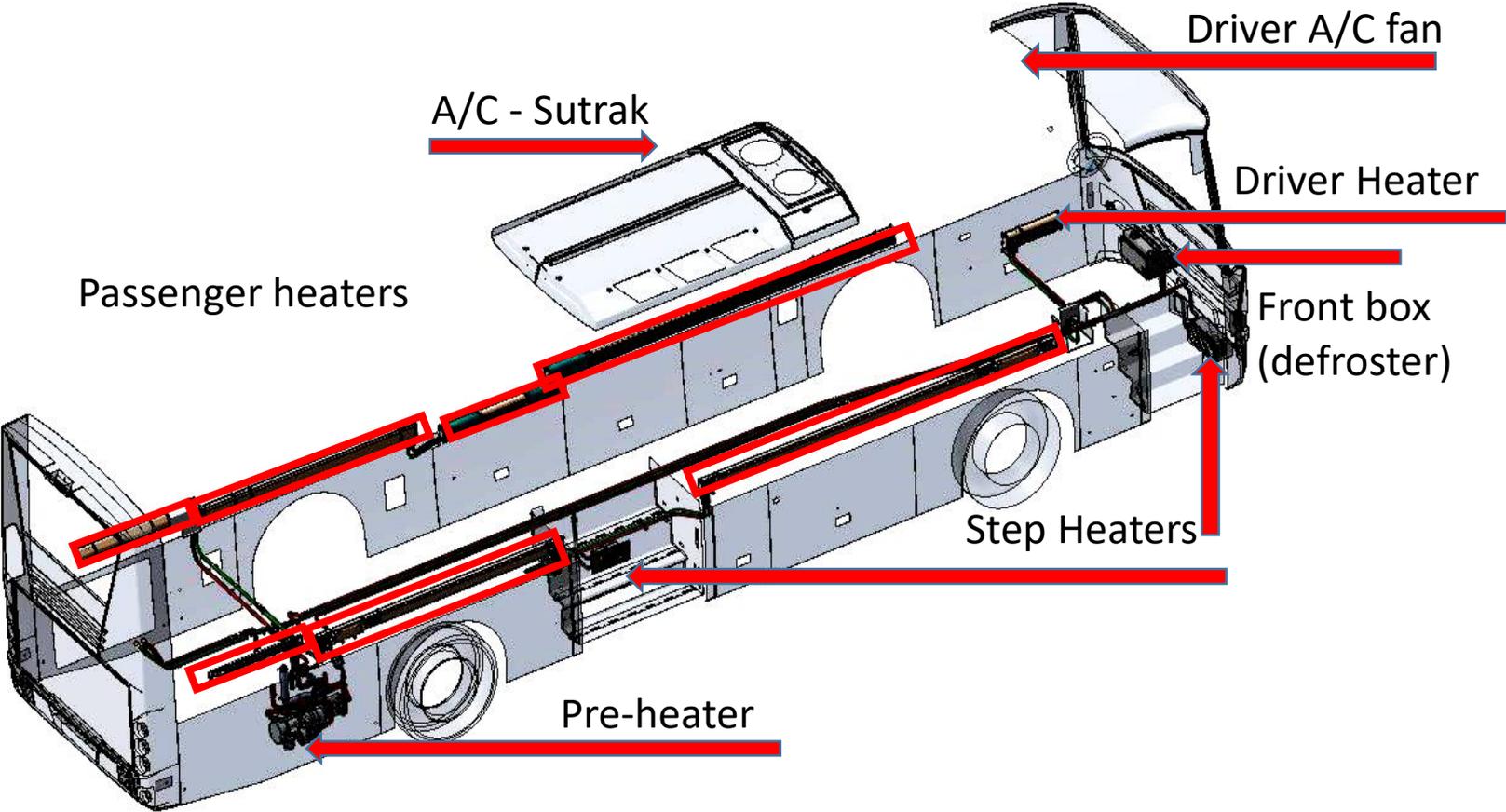


# Merkavim Mars – Heating system



# Heating System - Introduction

schematic layout



# Heating System - Introduction

The bus has 2 independent systems which function independently

- Heating system - Sanz Clima
- A/C system - Eberspächer Sütrak

## Heating system : Sanz Clima

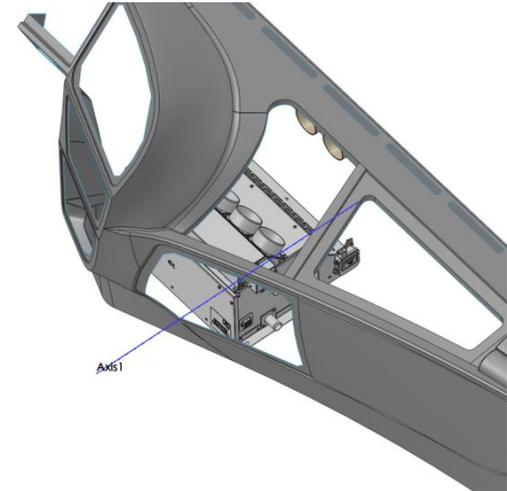
- The bus is fitted with a high capacity heating and ventilating system
- The system has several main components, all fed from the vehicle coolant circuit.
- The bus is also fitted with a Valeo pre-heater which operates to boost the temperature of the supply water if it falls below pre-set levels

# Heating System - Introduction

- Front box (Defroster)

Location: under the dashboard

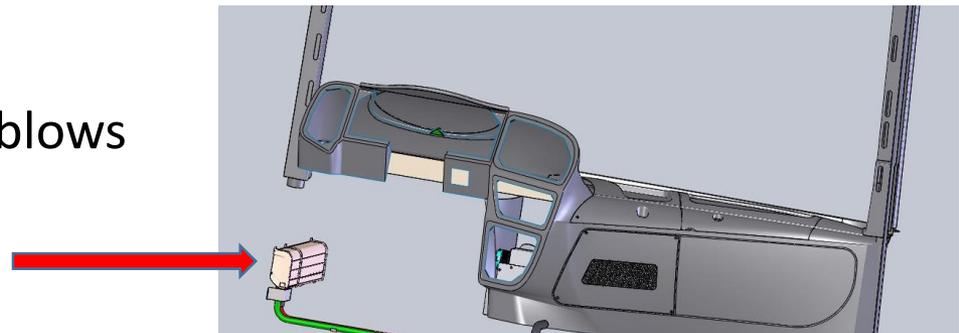
It connect to the bus water circuit. provide warm/cold air to driver area and windscreen



- Driver Heater

Location: left to the driver

Takes air in at the top and blows the air out at floor level



# Heating System - Introduction

- Passenger Heating –

Fitted around the perimeter of the passenger compartment, 7 units of blown air heaters which direct warm air across the floor at strategic locations

The passenger heating is controlled automatically by the system controller on the driver's dash panel.

- Step Heaters -

There are two step heaters, one at each doorway. The step heater air velocity operate automatically.

# Heating System -Introduction

## Control Panel – Star comfort

On/ Off and button for selecting 'Auto' operation

Button to select control of Driver or Passenger areas

Frontbox fresh air / recirc. air intake button

Button to select maximum demist

Button to select pre heater connection / disconnection (press for less than 2 seconds).



Increase or decrease frontbox blower speed OR to select Passenger area temperature - use in conjunction with the button above this

Display

Driver Zone Increase or decrease selected temperature of driver's zone.



# Heating System -Introduction

## Control Panel – Star comfort - display



- 1 Lamp indicates AUTO control is ON or OFF
- 2 Indicates control set to 'Driver' zone
- 3 Indicates fresh air or recirculated air intake
- 4 Not applicable
- 5 Indicates Pre heater connected.
- 6 Indicates control set to 'Passenger' zone
- 7 Icon indicates a system error
- 8 Temperature in driver zone
- 9 Front-box blower speed display
- 10 Temperature in passenger zone

# Heating System -Introduction

## Control Panel – Star Comfort

The Star Comfort controller is designed to provide a comfortable environment in the passenger and driver areas and to ensure clear visibility through the windscreen.

The driver can select the desired temperature and the system will automatically maintain that temperature.

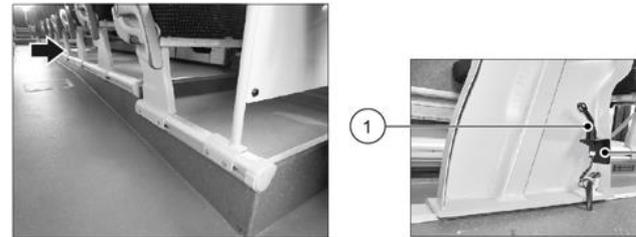
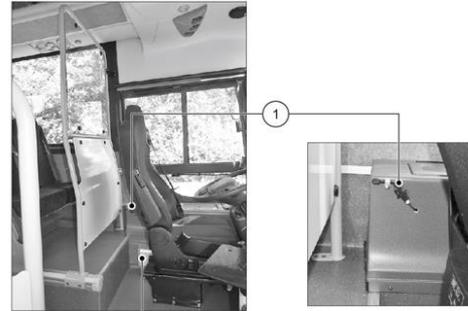
### Control functions :

- Front-box – fresh air / recycle air intake. Automatic.
- Front-box blower speed. Automatic.
- Pre-heater operation. Automatic/manual.
- Flow rate of water through the front-box. Automatic.
- Flow rate of water through the convectors. Automatic.

# Heating System -Introduction

## Temperature sensors

- 2 Sanz Clima internal temperature sensors, located at the driver and passenger area (the left 4<sup>th</sup> seat line).



- A/C Sutrak temperature sensor is located at A/C inlet



# Heating System -Introduction

## Switches

NO.	Switch Description	Prerequisites for operation	Location
1	Driver fan button (10 velocities)	Running engine	Main panel
2	Driver heater air flow button (no flow/low flow/high flow)	Running engine + driver heating activated	Main panel
3	Stairs heating button	Running engine	Main panel
4	Preheater button	Running engine + heat activation	Left Panel
5	Passenger heating blower control switches (no flow/low flow/high flow)	passenger heating + Running engine activated	Left Panel



# Heating System -Operation

## Heating system principals

Star-Comfort can be started automatically and remember the last activation conditions :

- Passengers convectors temperature
- Passenger convectors air flow is controlled thru 3 position switch on the left panel, which remain at the last selected position
- Driver area (front box) air flow and temperature



When the engine is on and S.C is on, than turning off the engine, S.C. switched on automatically and activate the last selected parameters in the next drive

- Recommended temperature: 22 C
- It is recommended to function with the same temp of the A/C

# Heating System -Operation

## Heating system principals

- Pre-heater will start automatically just if pre-heater switch on the left panel is on



- All the functions which controlled with the buttons on the main panel, have no memory and have to be switch on again in the next drive

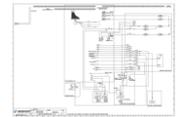


# Heating System -Operation

## Pre-heater activation

### Engine off:

- Programming: Star comfort [S.C] is programmed – the pre-heater is activated
- Switch on the star comfort: pre-heater switch on S.C. on – the pre-heater is activated
  - Max operation time: 120 minutes
- External signal from ITxPT + 24v
  - Activate the pre-heater but no fans as long as we have an active signal (see electric drawing)



### Engine on:

- Star comfort on heating position, S.C. “remember” the last requested temperature, pre-heater switch (panel switch) off: pre-heater could be activated Manually with switching on S.C pre-heater switch
- Star comfort on heating position, star comfort “remember” the last requested temperature, pre-heater Switch (Panel switch) on: pre-heater activated automatically



# Heating System -Operation

## Driver and passenger convectors activation

### Engine off:

- Pre-heater on, driver and passengers convectors heating up, no air flow

### Engine on:

- Pre-heater on, driver and passengers convectors heating up from engine + pre-heater, air flow is possible when switching on + hot water in pipes
- Pre heater off, driver and passengers convectors heating up from the engine water, air flow is possible when switching on + hot water in pipes

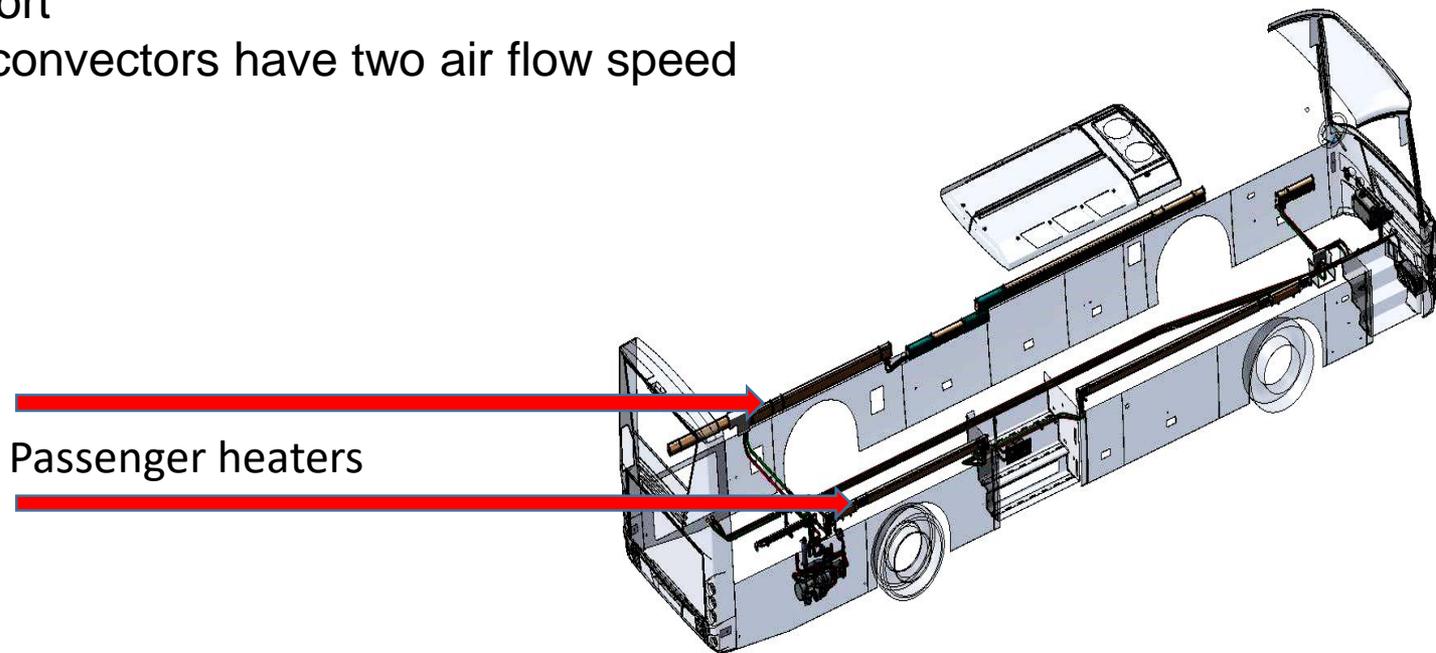
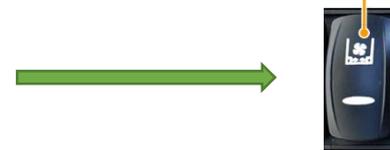


# Heating System -Operation

## Driver and passenger convectors activation

### Passenger convectors activation

- Air flow - Passengers air flow switch has 3 mechanical positions
- Convector temp' – selected with star comfort
- The convectors have two air flow speed

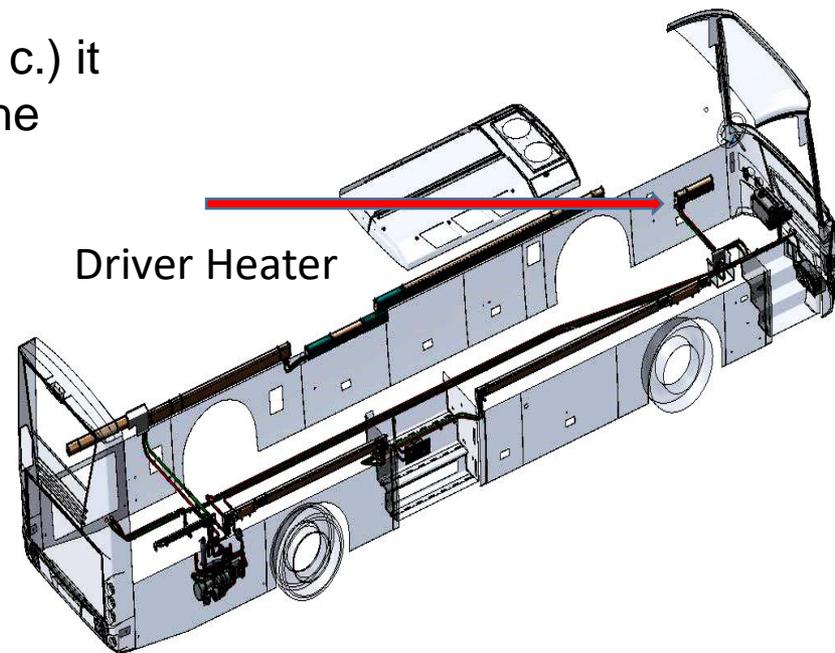


# Heating System -Operation

## Driver and passenger convectors activation

### Driver convector activation

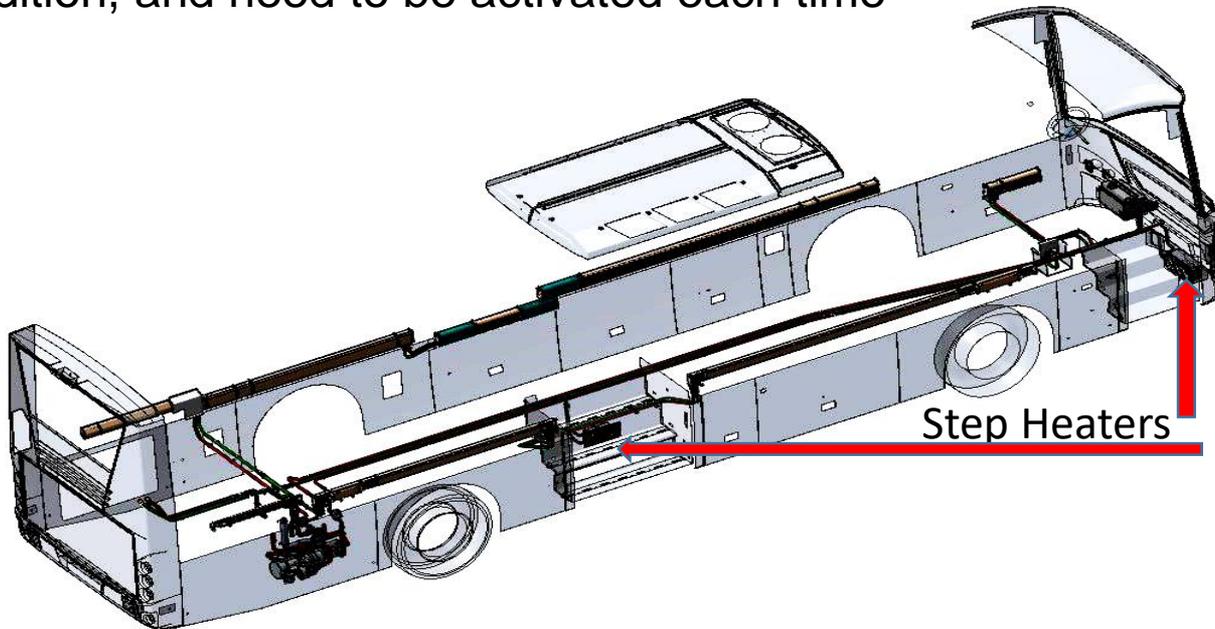
- Driver air flow button is a spring button
- The convectors have two air flow speed
- When the engine is cold (up to 73 c.) it gets priority, water circle bypass the convectors



# Heating System -Operation

## Step heaters activation

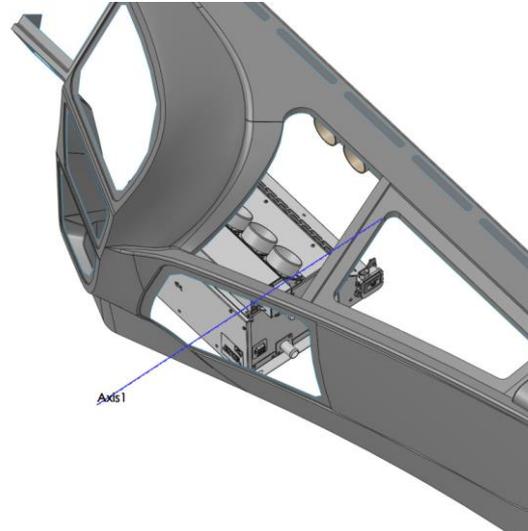
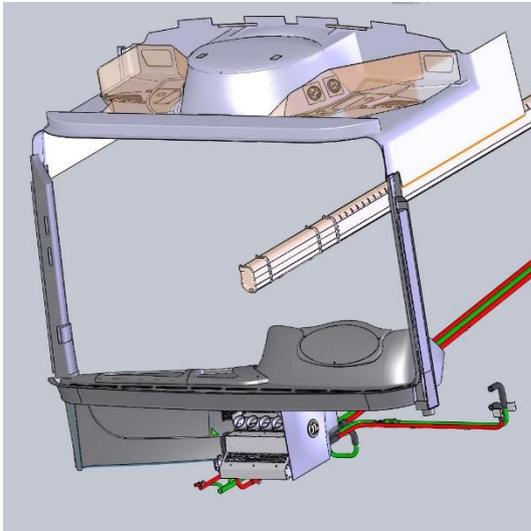
- Engine on, Step heater switch on, hot air flow
- Air flow decrease when the doors are opened
- Function does not remember the last activation condition, and need to be activated each time



# Heating System -Operation

## Front box activation

- Engine on or engine off + switch on, controlled from the Smart-comfort controller
- Activate with the values last operation
- No A/C air

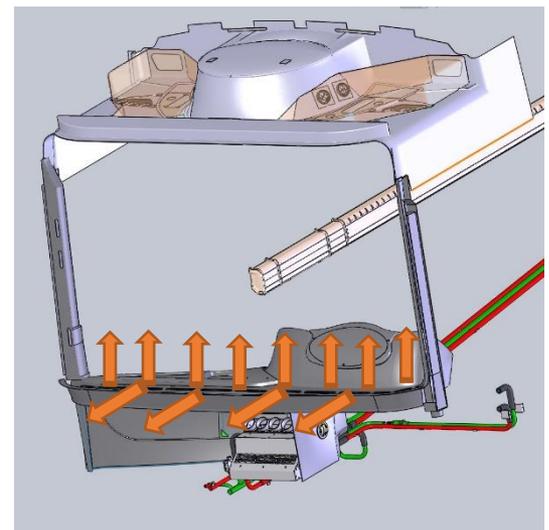
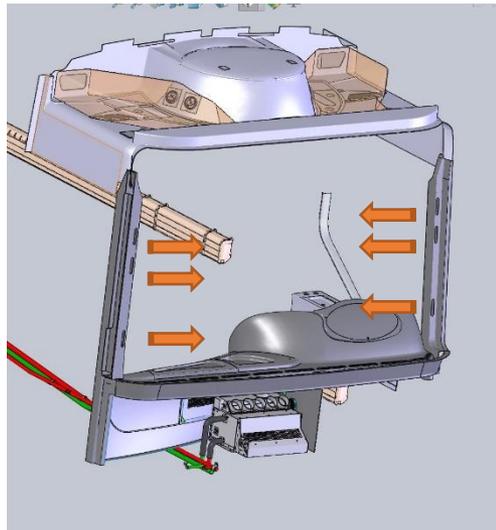
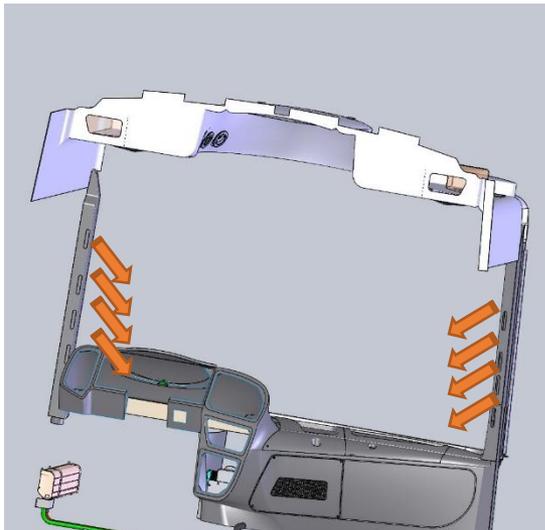
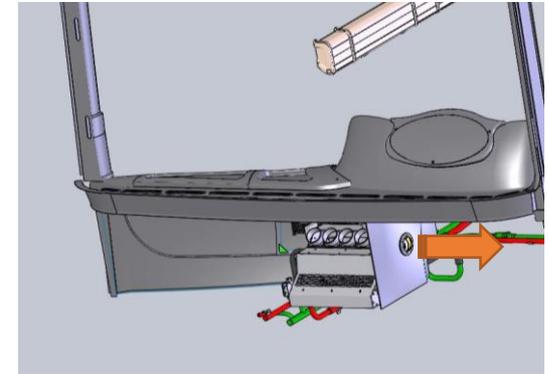


# Heating System -Operation

## Front box activation

Air outlet:

- Left + right air duct backwards direction
- Left + right air duct windshield direction
- Front and up to the windshield
- Driver legs



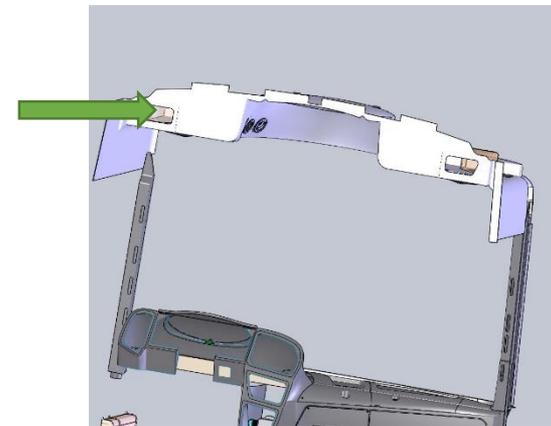
# Driver A/C ventilation System -Operation

## Driver A/C fan activation

Condition to activate:

Driver fan button + engine running

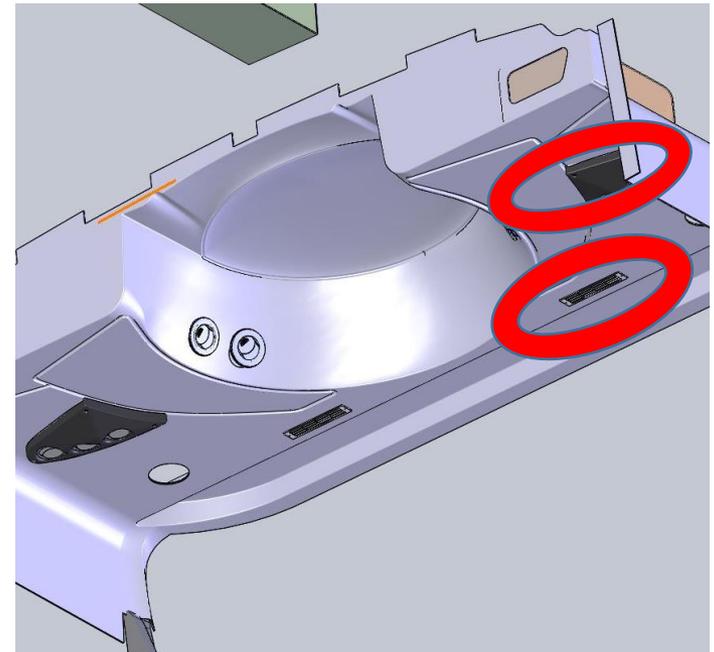
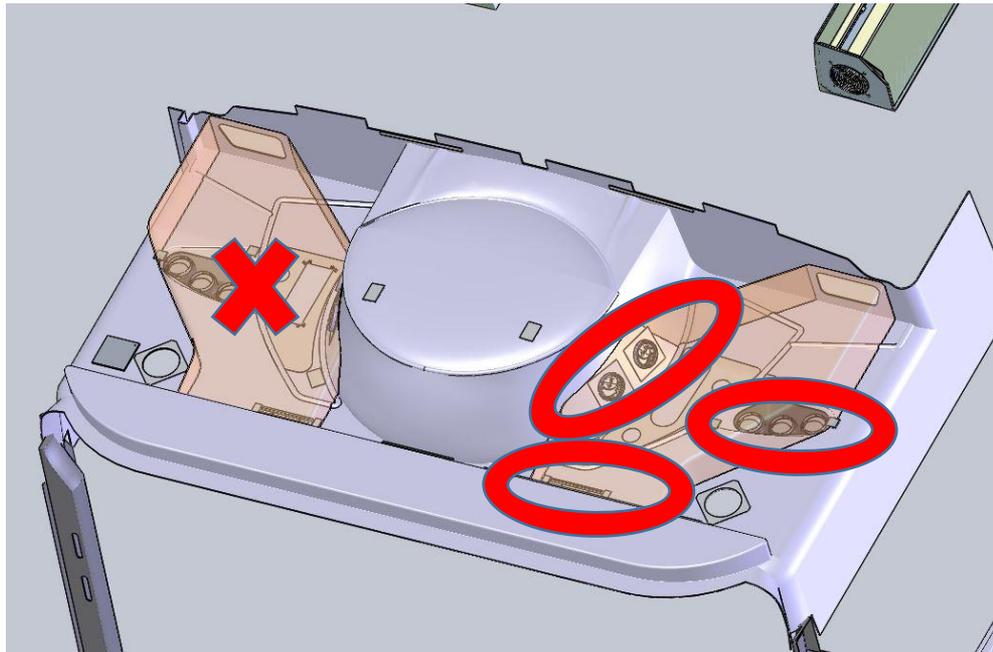
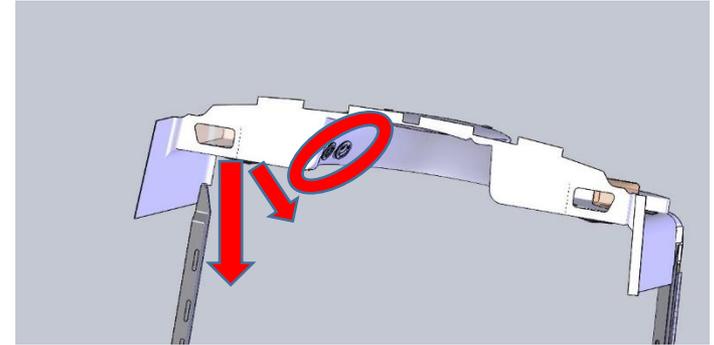
- Air source from the A/C tunnel
- The system has a separate blower from the A/C system, which boost the A/C tunnel air toward the driver
- Can be operated with or without the A/C system
- 10 Velocities
- Function can not be programmed or remember the last activation condition



# Driver A/C ventilation System -Operation

## Driver A/C fan activation

Air outlets located over the driver had  
Right side activated just with A/C system



# A/C-Operation

## A/C system

- Manufacturer: Eberspächer Sütrak
- Model: AC353-530

## A/C principals

- The A/C system can use for heating or cooling
- The A/C air (hot / cold) come just from the roof A/C tunnels
- The A/C can be started automatically and remember the last activation parameters
- It is recommended to use the same temp' as the Star comfort
- It is recommended to use the auto mode
- When one of the doors is open, A/C fans reduced to minimum speed

# Heating System -Introduction

A/C panel location:  
Left main dash board panel



# A/C–Introduction & operation

## Switches



Function key AUTO



- GREEN LED: automatic mode activated for adjusting the fan and fresh air flap settings in **all** compartments. (Our bus has one compartment).
- If **AUTO** is activated, **SMOG** and **REHEAT** are disabled
- RED LED: error in the AC system

# A/C–Introduction & operation

## Switches



Function key FAN



- Open the fan setting menu to adjust the fan speed GREEN LED: the fan setting for this compartment differs from the AUTO fan settings.
- When pushing the fan button from auto position, green led is on auto button till turning the description knob, than the green light goes of on auto and light on fan

# A/C–Introduction & operation

## Switches



Function key SMOG



- GREEN LED: SMOG function is activated. ALL fresh air flaps are closed
- Press the AUTO key to end the SMOG function
- LED OFF: all fresh air flaps follow the settings:

	<b>Automatic</b> = fresh-air flap is automatically adjusted to the optimum position for the current mode
	<b>Fresh air</b> = the fresh air flaps are open to let fresh air inside the bus.
	<b>Recirculation</b> = the fresh air flaps are closed. The air inside the bus is circulated, there is no supply of fresh air from the outside.

# A/C–Introduction & operation

## Switches



Function key REHEAT / DEFROST



- The REHEAT/DEFROST function is only available **when the engine is running!**
- GREEN LED: REHEAT/DEFROST is activated. The REHEAT mode for dehumidifying the passenger compartment is switched on, A/C compressor is on + maximum A/C fan
- For windscreen dehumidifying, it is recommended to set max fan on driver fan + 
- Press the **AUTO** key to end the REHEAT/DEFROST function.
- REHEAT/DEFROST function has a time limit. The default setting is three minutes.

### Note

This time can be extended in the CHANGE PARAMETER menu

# A/C–Introduction & operation

## Switches



MENU key



- Press the **MENU key** to open or close the main menu
- **Note** No LED in this key.
- Within a menu: press the MENU key to return to the previous page or exit the opened menu

## Description knob



Turning Clockwise – increase the adjust value or change selection within the menu



Turning Counterclockwise – decrease the adjust value or change selection within the menu

# A/C—Introduction & operation

## Switches



### **Press briefly:**

- Switches the E-Control AC controller on.  
Opens the settings menu for set-point temperature
- Confirms the chosen option.
- Opens the selected menu.

### **Press and hold:**

- Switches the E-Control AC controller off and the display goes blank.
- **Note** To restart the AC system, press and hold to switch the AC system off, wait for a minute then press briefly to restart.

## Available related documents in Merkavim web site:

<https://www.merkavim-catalog.com/en/>

- Catalog.Star-Comfort.heating\_CONTROL.Sanz
- Drwaing.Star-Comfort.heating\_CONTROL.Sanz
- Drawing.Water\_Valve\_Pass\_7147400540.Sanz
- Drawing.Water\_Valve\_step\_7147400541.Sanz
- Drawing.Water\_Valve\_3\_Ways\_7147400487.Sanz
- Catalog.Convector\_Kit\_8909921709.Sanz
- Catalog.FRONTBOX\_8004121711.Sanz
- Catalog.heating\_sys\_BOM.Sanz
- Catalog.Step\_Heater\_AEROTHERME\_8303121860.Sanz
- Drawing.Strainer\_DN\_25\_8498125\_0000.Sanz
- Drawing.Thermo\_Plus\_300\_Spheros.Valeo
- CAT.AC353-530\_E-C\_88-50-72-01388-00.EBERSPÄCHER
- Manual\_Star\_comfort\_Manual\_Sanz
- Diagnostic\_manual.Star\_comfort.Sanz
- Electrical\_scheme.Heating system+Pre-heater Valeo.Sanz
- Manual.Heating\_Sys.Sanz
- Manual.A/C.Eberspacher

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