

## BUS BODY ELECTRONICS

# SC1000 OTOKAR

Operating Instructions  
– Bus Driver

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## 1. Introduction

### 1.1 Intended Use

The SC1000 is a device designed to control HVAC components (heating, ventilation, air-conditioning) for buses, e.g. roof-top air-conditioning systems, heaters etc. It comprises always of a control panel (control device with human-to-machine interface) which is integrated into the dashboard, and of one or more substations, which are controlled by means of the control panel. The communication between control panel and the respective substation is done via CAN bus.



Figure 1 - SC1000 Control Panel

A substation is a control device with power outputs for the control of all the components integrated in the AC unit.



Figure 2 - SC1000 Substation

## 1.2 Symbols used



## 1.3 Description of the control panel

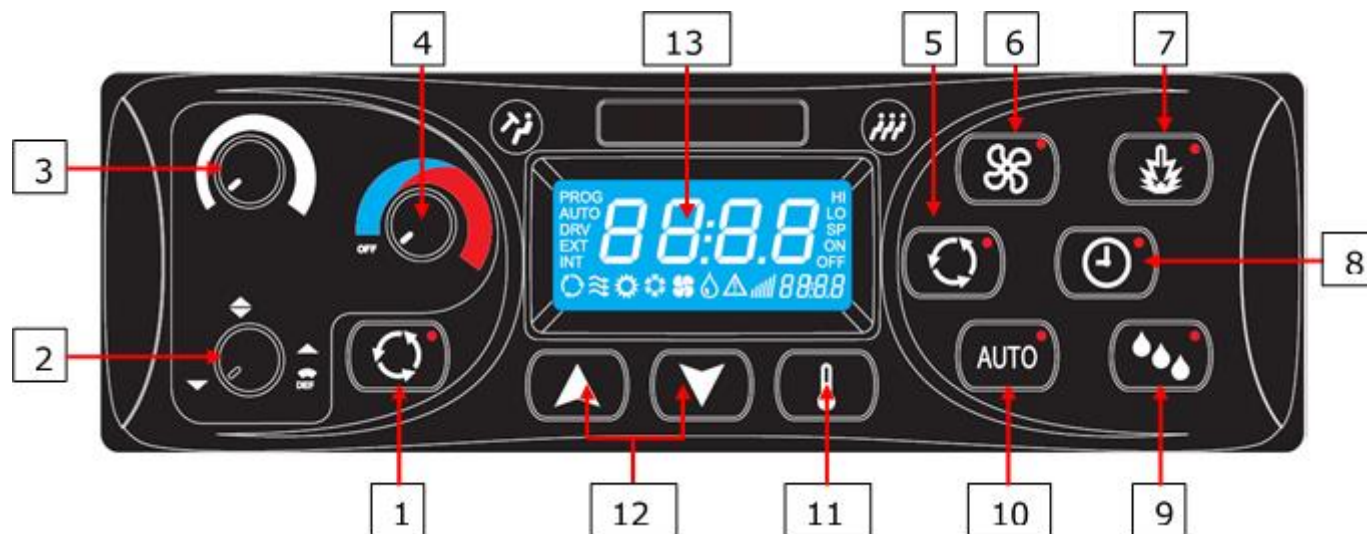


Figure 3 - SC1000 Control Panel

### Driver's seat

1. Fresh air / air recirculation button
2. Air direction control
3. Blower speed control
4. Temperature control

### Passenger Compartment

5. Fresh air / air recirculation button (optional)
6. Blower speed button (optional)
7. Heater button
8. Timer button heater
9. Reheat (dehumidify) button (optional)
10. AUTO mode button
11. Temperature button
12. UP/DOWN button
13. Display



## 1.4 Display description

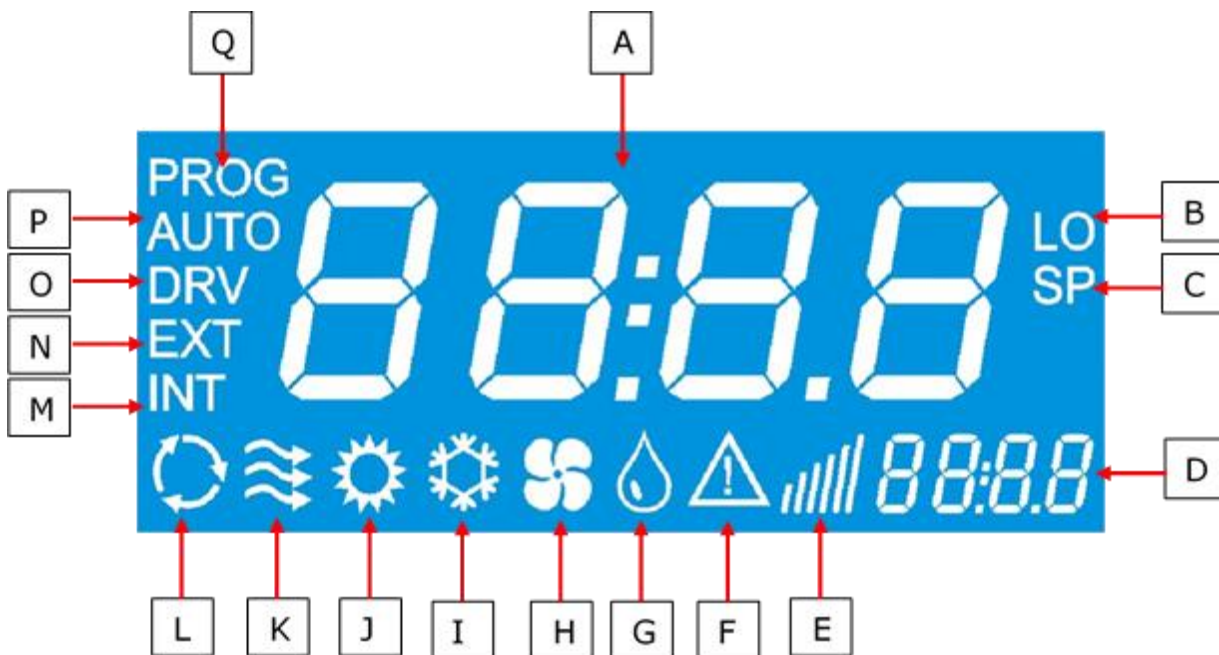


Figure 4 - SC1000 Display Screen

- |   |   |
|---|---|
| A. Indicated value  | J. Heater is on   |
| B. Appears if the lowest adjustable room temperature is reached       | K. Fresh air flaps open   |
| C. Is indicated with the setpoint temperature (passenger compartment) | L. Air recirculation is on (HVAC version only)                      |
| D. Time   | M. Is indicated with the current room temperature                   |
| E. Blower speed level   | N. Is indicated with the current outside temperature                |
| F. Error icon   | O. Is displayed during blower speed adjustment at the driver's seat |
| G. Reheat (dehumidification) active (HVAC version only)               | P. AUTO mode active   |
| H. Blower is on (HVAC Version only)                                   | Q. Is displayed during start time adjustment of the preheater       |
| I. Cooling is activated   |   |



## 2. Usage

### 2.1 Turn ON

Switch on the ignition.

The control panel starts automatically.

The current software version (1.0) and the current release appear on the display (Fig.5).

→ After four seconds the default screen is displayed. (Fig.6).



Figure 5 - SC1000 Release



Figure 6 - SC1000 Standard Screen

### 2.2 Turn OFF

Switch off the ignition.

The system powers down.

### 2.3 Driver's workplace functions

#### 2.3.1 Adjust Temperature



**Note**

The temperature for the driver's seat cannot be adjusted.

#### 2.3.1.1 Cooling (if the roof-top air-conditioning unit is in cooling mode only)



Rotate the knob (Fig.3, No.4) counterclockwise into the blue area.

#### 2.3.1.2 Heating



Rotate the knob clockwise into the red area.

## 2.3.2 Adjust blower speed



### Note

The blower can be set from 20 to 100 in steps of 10. 20 is the smallest blower speed, on level 100 the blower runs at full speed. If the knob is turned counterclockwise to its most left position, on the screen displays "OFF" and the blower is switched off.

If the defrost function is active the blower runs on maximum speed



Figure 7 - SC1000 Current Blower Speed Level

### 2.3.2.1 Increase blower speed



Turn the knob (Fig.3, No.3) clockwise to 5 o'clock position.

Blower speed increases incrementally by 10.

The current blower speed level is shown in the display (Fig. 7).

### 2.3.2.2 Reduce blower speed



Turn the knob counterclockwise to 7 o'clock position to decrease blower speed level.

Blower speed decreases incrementally by 10

The current blower speed level is shown in the display (Fig. 7).

## 2.3.3 Adjust air flow direction /defrost function

### 2.3.3.1 Adjust air flow direction



Rotate knob (Fig.3, No.2) counterclockwise into 7 o'clock position

→ air flow onto the floor



Rotate knob clockwise into 12 o'clock position

→ air flow against the wind screen and the floor



Rotate knob clockwise into 2 o'clock position

→ air flow against the wind screen



Rotate knob clockwise into 4 o'clock position

→ air flow against the wind screen.

## 2.3.3.2 Defrost function



Rotate knob clockwise into 5 o'clock position

→ air flow is directed against the wind screen. The water valve opens to generate heated air and the blower runs with maximum speed.

## 2.3.4 Toggle between fresh air and air recirculation



**Note**

The air recirculation mode is not limited in time.



Press button (Fig.3, No.1), to toggle between fresh air and air recirculation modes.

- Fresh air: the LED next to the fresh air / air recirculation button is not lit.
- Air recirculation: the LED next to the fresh air / air recirculation button lights up.

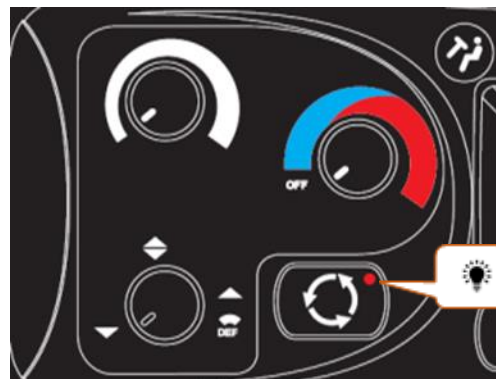


Figure 8 - SC1000 Air Recirculation Mode Driver's Seat Active

## 2.4 Passenger compartment functions

### 2.4.1 AUTO mode



**Note**

The AUTO mode can be activated only when the engine is running.

While AUTO mode is active, the system turns the cooling or heating on and off automatically (Fig. 10 and 11)

The blower speed is automatic unless it has been manually set.

#### 2.4.1.1 Activate



Press button (Fig.3, No.10) shortly.

Mode is activated.

the LED next to the button lights up, "AUTO" appears on the display.



Figure 9 - SC1000 AUTO Mode Active



Figure 10 - SC1000 AUTO mode active, cooling

## 2.4.1.2 Terminate

 Press button shortly.

Mode deactivated.

the LED next to the button goes out, "AUTO" disappears from the display.



Figure 11 - SC1000 AUTO mode active, heating



Figure 12 - SC1000 AUTO Mode OFF



### Note

When the AUTO mode is deactivated the compressor and the heating are off.

The blower speed is automatic unless it has been manually set.

## 2.4.2 Adjust blower speed level



### Note

The blower can be set from 10 to 100 in steps of 10. 10 is the smallest blower speed, on level 100 the blower runs at full speed.

For operation the following conditions apply:

- If the engine is not running, the speed of the blowers will reset to a certain value.
- If the doors are opened the speed of the blowers is reset to the above mentioned value.
- In cooling mode it is not possible to turn off the blower completely

### 2.4.2.1 Activate

 press button (Fig. 3, No.6).

Manual blower speed level adjustment active.


➔ The LED next to the button lights up and the current blower speed level can be read on the display (Fig.13).

Blower speed can be changed.




Figure 13 - SC1000 Manual Blower Speed Level

## 2.4.2.2 Change blower speed level

 Press button.

Blower speed level is increased.

The current blower speed level can be read on the display

 Press button.

Blower speed level is decreased.

The current blower speed level can be read on the display.

## 2.4.2.3 Exit

By pressing the  button or automatically after 3 seconds of inactivity.

## 2.4.3 Set temperature

### 2.4.3.1 Adjust temperature

 Press button.

Temperature +1°C.

 Press button.


Temperature -1°C.




#### Note

The temperature can be varied between the values 15°C and 28°C.

### 2.4.3.2 Display the current room or outside temperature

 Press button.

“INT” and the current room temperature are shown on the display (Fig.12).

 Press button again.

“EXT” and the current outside temperature are shown on the display.

### 2.4.3.3 Terminate


Terminate the display by pressing the  button or by timeout automatically after 3 seconds. Standard display screen appears.




Figure 14 - SC1000 Current Room Temperature



Figure 15 - SC1000 Current Exterior Temperature

## 2.4.4 Toggle between fresh air / air recirculation

### 2.4.4.1 Manual operation of the fresh air flaps

 Press button (Fig 5, No.5) when the automatic air recirculation is active.

The LED next to the button lights up and the air recirculation icon (Fig.14) appears on the display.

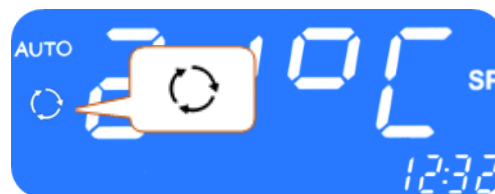



Figure 16 - SC1000 Air Recirculation Mode Active



#### Note

The air recirculation mode is limited to 10 minutes. After this time the fresh air ducts are automatically regulated.

 Press the button when the manual operation of the fresh air flaps is active.

The fresh air flaps are operated automatically again.

The LED next to the button lights up and the air recirculation icon disappears from the display.

## 2.5 Preheating



### Note

Programming, operating the heater and setting up the timer of the heater is the responsibility of the driver.

He must ensure that at the start time the circumstances and the parking situation are suitable.

For security reasons it is only possible to program the timer for the same and the next working day. The Start time delay for Monday is already possible on Friday. To activate the preheating function the engine must be off.

The pre-heating function will only be executed if no low voltage (<22V) is present. Otherwise, the function is automatically terminated after 10 seconds.

### 2.5.1 Set date and time



### Note

Day and time are set in the following order: hours – minutes – day of the week.

The position to be set is flashing.



Press button (Fig.3, No.8) for 3 second.

“Pre” appears on the display (Fig. 17).

Press button  or  (Fig.3, No.12) once.

”ti-A“ appears on the screen (Fig. 18)



Press button to confirm.

”hour“ appears on the screen (Fig. 19) and the hour digits flash.



Press button to increase the number of hours (0-23 h).



Press button to decrease the number of hours (0-23 h).



Press button to confirm value.



Figure 17 - SC1000 Preheat



Figure 18 - SC1000 ti-A

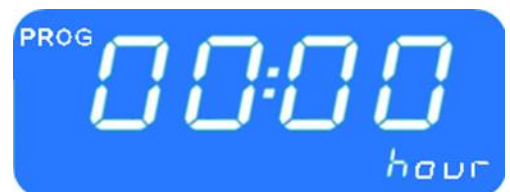



Figure 19 - SC1000 Number of Hours




Minute digits flash.

Now proceed exactly as described for setting the number of hours to set the number of minutes.

Now the week days are displayed (Fig. 20).

Set the week day (Mo, Tu, We, Th, Sa, Su) using the  buttons.

 Press button to confirm the day.

The default screen appears.

## 2.5.2 Activate heating (without start time delay)

 Press button (Fig 3. No 7.).

The button's LED lights up and the heating icon appears on the screen (Fig.21).

## 2.5.3 Programming the timer



### Note

Prior to using the timer, the correct time must be set. The timer allows you to heat up the passenger compartment without having to start the engine. By using the timer, the starting and operating time can be selected individually. Up to 7 start times can be set in parallel (PRE1-7).



 Press button 3 seconds.


“PrE” appears on the screen (Fig.22).

### 2.5.3.1 Choose start time

 Press button to display the memory locations.

“PrE1” appears on the display (Fig.23).

  Press buttons to scroll through memory locations PrE1-7 and select one of them.

 Press button to confirm selection.

“00:00” and “hour” appear on the screen (Fig. 24).



Figure 20 - SC1000 Week Day



Figure 21 - SC1000 Heating Icon



Figure 22 - SC1000 PrE



Figure 23 - SC1000 Memory Location



Figure 24 - SC1000 Hour Display

If the start time was already programmed before, it appears instead of "00:00".

The hour digits flash.

▲ Press button to increase number of hours.

▼ Press button to decrease number of hours.

⏹ Press button to confirm value.

Minute digits flash.

Now proceed exactly as described for setting the number of hours to set the number of minutes.

Now the weekdays are displayed (Fig. 25).

Set the week day (Mo, Tu, We, Th, Sa, Su) using the ▼

▲ buttons.

⏹ Press button to confirm the day.

"0'" appears on the screen (Fig.26).

### 2.5.3.2 Set operation time



#### Note

The operation time can be set in steps of 5 between 5 and 60 minutes.

▲ ▼ Press buttons to set operating time.

⏹ Press button to confirm operating time.

### 2.5.3.3 Activate pre-heating mode

🕒 Press button to activate the pre-heating mode with the chosen start and operation time.

### 2.5.3.4 Terminate

🔄 Press button to exit the menu.



#### Note

If more than one preheating time is programmed, pre-heating is done at all programmed starting times.



Figure 25 - SC1000 Display Week Day



Figure 26 - SC1000 Operation Time

## 2.6 Reheat



### Note

The reheat mode can only be activated in the AUTO mode (when the engine is running) and at at least 8°C outside temperature.

In addition, the difference between setpoint of room temperature and the setpoint of duct temperature must be  $<2K$ , and the difference between outside temperature and the setpoint of duct temperature must be  $<5$ .

### 2.6.1 Activate



Press button (Fig. 3, No.9).

The button's LED lights up and the reheating icon appears on the screen (Fig.25).

### 2.6.2 Terminate



Press button.

The button's LED turns off and the heating icon disappears on the screen.



Figure 27 - SC1000 Entfeuchten aktiv

## 2.7 Errors



### Note

If an error occurred, the error icon (Fig.4, F) appears on the display.

### 2.7.1 Error read out

#### 2.7.1.1 Activate



Press button (Fig.3, No.1) at driver's workplace for 2 seconds .

The menu for system fault analysis opens.

The error message (e.g. E2:00) appears on the display

The count (e.g. H000) shows the current frequency of occurrence of the error.

#### 2.7.1.2 Error messages



Press buttons to scroll through error messages.

#### 2.7.1.3 Terminate



Press button (Fig.3, No.1) at the drivers's seat until the standard screen appears.



### Note

If it is a currently existing error, this is indicated by a dot between the third and fourth digit of the error code on the display (Fig.29). If the error is corrected, the point disappears and the count increases.

#### 2.7.1.4 Erase error



Press the button 6 seconds.

The error stops being displayed.

If the error has not been corrected, it appears again with a dot between the third and fourth digit of the error code within the error messages (Fig.28).



Figure 28 - SC1000 Error Read Out



Figure 29 - SC1000 Current Error

## 2.7.1.5 Terminate

- ☐ Press button (Fig.3, No.1) at the driver's workplace until the standard screen appears.

## 2.7.2 Error message overview

Error message displayed	Description	Cause/remedy
00	Unused	-
01	Hot water valve failure in the frontbox	1. Check plug connections - Electrical and visual check of all plug connections
02	The air distribution flap actuator (foot area) of the frontbox has failed	2. Replace component 3. Replace control unit
10	Note: Further errors can arise in conjunction with this error message. They are to be ignored until error 10 is corrected. Communication to the substation is interrupted (substation 1).	1. Verify the substation is active - Check plug connections - Replace substations - Replace control unit
12	Hot water valve has failed (roof) (substation 1)	1. Check plug connections - Electrical and visual check of all plug connections 2. Replace components 3. Replace control unit
20	Note: further errors can arise in conjunction with this error message. They are to be ignored until error 20 is corrected. Communication to the substation is interrupted.	1. Verify the substation is active - Check plug connections - Replace substation - Replace control unit
21	Motor 0 of the convector water valve has failed (substation 2 front)	1. Check plug connections - Electrical and visual check of all plug connections 2. Replace components
22	Motor 1 of the convector water valve	3. Replace control unit

Error message displayed	Description	Cause/remedy
	has failed (substation 2, rear)	
A0	Outside temperature sensor - fault	<ol style="list-style-type: none"> <li>1. Check by means of the block diagram in the chapter "Check system components", where the respective component is connected, and replace the affected control device.</li> <li>2. Visual check of all plug connections                             <ul style="list-style-type: none"> <li>- Replace sensor</li> </ul> </li> </ol>
A1	Passenger compartment sensor - fault (front)	
A2	Passenger compartment sensor - fault (rear)	
A3	Roof duct temperature sensor - fault	
A4	Ice sensor - fault	
A5	Convactor temperature sensor – fault (rear)	
A6	Convactor temperature sensor – fault (front)	
B0	High-/Low pressure ➔ The clutch will be activated after three minutes if the pressure falls.	<ol style="list-style-type: none"> <li>1. Check whether B1 occurred, if this is the case see B1.</li> <li>2. Short-term overload of the airconditioning system due to high engine speed at high ambient temperature.                             <ul style="list-style-type: none"> <li>➔ The air-conditioning system turns off for three minutes.</li> </ul> </li> </ol>
B1	High-/Low pressure (The error message B0 occurred more than three times since the last start of the control unit)	<p>The air-conditioning system is switched off completely. Turn the ignition off and then on again to initiate a reboot of the system. It is not enough to turn off the engine and then on again, because a reboot of the control unit is required. Can an overload caused by high engine speed at high ambient temperature be excluded, the following must be checked:</p> <ul style="list-style-type: none"> <li>- Check the wiring of the compressor pressure switches</li> <li>- Replace the pressure switch</li> <li>- Check the wiring of the solenoid valve</li> <li>- Replace the solenoid valve</li> <li>- Check the wiring of the condenser fan</li> <li>- Replace the condenser fan</li> </ul>

Error message displayed	Description	Cause/remedy
		<ul style="list-style-type: none"> <li>- Check refrigerant charge (too much / too little). If there is too little a leak test must be performed</li> <li>- Examine the roof-top airconditioning unit for soiling and check the function of the fans</li> <li>- Replace substation</li> </ul>
B2	Ice formation at the evaporator	Temporary shutdown of the airconditioning unit. If this message appears frequently, these steps must be followed: <ul style="list-style-type: none"> <li>- Examine air duct for soiling</li> <li>- Check evaporator fan wiring</li> </ul>

Table 1 - SC1000 Error Messages



