

DSCA8-DM | DESTRATIFICATION CONTROLLER

Mounting and operating instructions



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1. SAFETY AND PRECAUTIONS



Read all the information in this manual, in the datasheet and in the Modbus Register Map before working with the product. For personal and equipment safety and for optimum product performance, make sure you fully understand the content before installing, using or servicing this product.



For safety and licensing (CE) reasons, unauthorised conversions and / or modifications of the product are inadmissible.



The product should not be exposed to abnormal conditions, such as extreme temperatures, direct sunlight or vibrations. Long-term exposure to chemical vapours in high concentrations can affect the product performance. Make sure the work environment is as dry as possible and avoid condensation.



All installations must comply with local health and safety regulations and local electrical standards and approved codes. This product should only be installed by an engineer or a technician with expert knowledge of the product and safety precautions.



Avoid contact with energised electrical parts. Always disconnect the power supply before connecting, servicing or repairing the product.



Always check that you are connecting the correct power supply to the product and use wires with the correct characteristics and cross-section. Make sure all screws and nuts are properly tightened and fuses (if any) are in place.



Consideration should be given to recycling the equipment and packaging. These should be disposed of in accordance with local and national laws and regulations.



If there are questions that are not answered, contact your technical support or consult a professional.

2. PRODUCT DESCRIPTION

Typically, in large indoor spaces such as warehouses, factories and halls, warm air rises to the ceiling level, whereas cool air remains at the floor level. This process, known as stratification, is one of the main causes of ineffective indoor heating and energy inefficiency. Stratification can be avoided with ceiling fans moving the warm air downward and mixing it with the cool air to create a balanced indoor climate — a process known as destratification.

DSCA8-DM is a destratification controller designed for motors equipped with an analogue input (EC motors or fan speed controllers for AC motors). Fan speed control is achieved via a single analogue output. The controller features three application states — Delta control, Summer control and Override control, each specifically designed to provide optimal motor regulation and indoor climate comfort.

- In Delta control, fan speed is regulated based on the temperature difference between the floor and the ceiling levels (ΔT). It has an integrated thermostat function, which allows for the connection of a heating unit for additional heating of the indoor environment.
- Summer control allows for the fan to operate at a fixed speed providing a cooling effect during the warmer seasons. It can be activated manually via a button on the device enclosure or automatically when the floor temperature exceeds a summer setpoint.
- Override control allows the fan speed to be set manually via Modbus communication. When this state is activated, the fan runs at a fixed speed and all automatic application states are suspended. The fan continues operating at the selected speed even if an alarm occurs. To exit this state, a different control state must be selected.

DSCA8-DM is equipped with two temperature probe inputs for connecting two PT500 temperature sensors — one at the floor level and one at the ceiling level, which allow the controller to calculate ΔT and control fan speed accordingly.

3. ARTICLE CODES

Article code	Analogue output	Relay output
DSCA8-DM	1	1

4. INTENDED AREA OF USE

- Destratification control in buildings with high ceilings, warehouses and industrial environments where stratification occurs.
- Ceiling fan control in HVAC applications.

5. TECHNICAL DATA

- Supply voltage: 85–264 VAC, 50–60 Hz
- Power supply for an external device: 24 VDC, 500 mA
- Modbus RTU communication
- Two temperature probe inputs for connecting PT500 temperature sensors
- Analogue output types
 - 0–10 VDC (load resistance $\geq 1 \text{ k}\Omega$)
 - 2–10 VDC (load resistance $\geq 1 \text{ k}\Omega$)
 - 0–5 VDC (load resistance $\geq 1 \text{ k}\Omega$)
 - 0–20 mA (load resistance $\leq 500 \Omega$)
 - 4–20 mA (load resistance $\leq 500 \Omega$)
 - PWM Push-Pull (frequency = 1 kHz, load resistance $\geq 1 \text{ k}\Omega$, output voltage level = 12 VDC)
 - PWM Open Collector (frequency = 1 kHz, pull-up resistance $\geq 1 \text{ k}\Omega$, pull-up voltage level $\leq 12 \text{ VDC}$)
- Relay output
 - Maximum switching voltage: 220 VDC / 250 VAC
 - Rated current: 2 A (resistive load)
- Storage conditions
 - Temperature: 0–20 °C
 - Relative humidity: 15–80 % rH
- Operating conditions
 - Temperature: -10–60 °C
 - Relative humidity: 15–90 % rH, non-condensing
- Enclosure
 - Ingress protection: IP54
 - Material: Acrylonitrile Butadiene Styrene (ABS) plastic
 - Colour: Grey (RAL 7035)

6. STANDARDS

- Low Voltage Directive 2014/35/EU CE
- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- Commission Delegated Directive (EU) 2015/863 (RoHs 3) of 31 March 2015 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances
- WEEE Directive 2012/19/EU

7. WARNINGS AND ATTENTION POINTS

- Turn off the power supply before servicing and maintenance.
- Avoid mounting the device in locations affected by direct sunlight.
- Do not short-circuit the terminals or the input and output wiring.
- During operation, the unit must be closed.
- If the unit does not work according to the instructions, the wiring connections, supply voltage and settings need to be checked.

8. MOUNTING INSTRUCTIONS IN STEPS

Before you start mounting the unit, read carefully “**Safety and Precautions**”.

Follow these steps:

1. Unscrew and remove the cover of the device enclosure.
2. Fix the enclosure onto the surface by means of suitable fasteners (included) while adhering to the mounting dimensions — **Fig. 1** and the correct mounting position — **Fig. 2**.
3. Switch OFF the power supply before connecting any power cables.
4. Insert the cables through the cable glands and do the wiring according to the wiring diagram — see **Fig. 3**.
5. Close the cover of the device enclosure and fasten it with the screws.
6. Switch ON the power supply.
7. Check the state of the device.

Fig. 1 Mounting dimensions

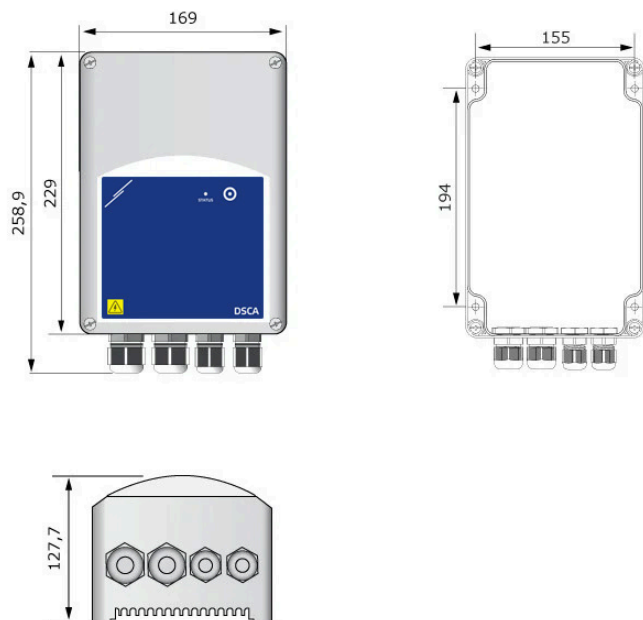
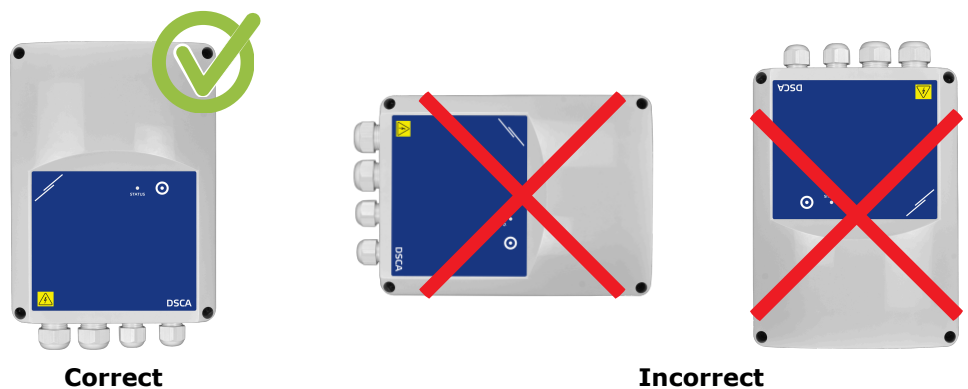


Fig. 2 Mounting position

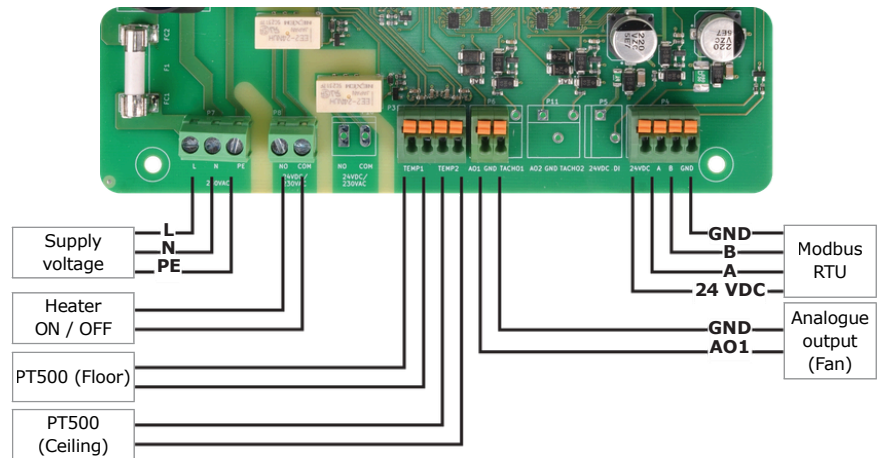


Correct

Incorrect

9. WIRING AND CONNECTIONS

Fig. 3 Wiring diagram



Screw terminal block

Supply voltage

L, N, PE 85–264 VAC, 50 / 60 Hz

Relay output

NO, COM 250 VAC / 24 VDC

Cable characteristics cross section $\geq 1,5 \text{ mm}^2$

Spring clamp terminal block

Temperature probe inputs

TEMP 1 Floor temperature sensor PT500

TEMP 2 Ceiling temperature sensor PT500

Cable characteristics cross section $\leq 1,5 \text{ mm}^2$

Analogue output

AO1, GND 12 VDC

Cable characteristics cross section $\geq 0,5 \text{ mm}^2$

Power supply output

24 VDC, GND Power supply for an external device

Cable characteristics Cat5 / EIB cable

Modbus RTU

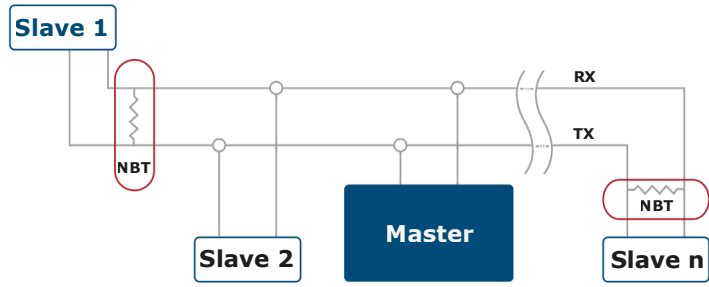
A, /B Modbus RTU (RS485)

Cable characteristics Cat5 / EIB cable

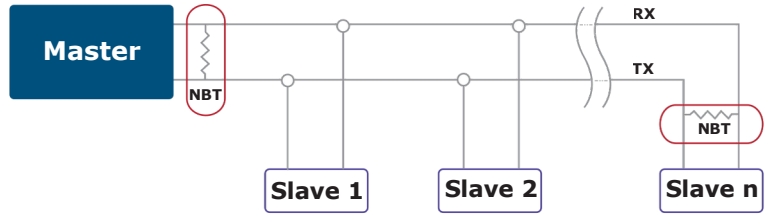
Optional settings

The Network Bus Termination (NBT) Resistor is controlled via Modbus RTU and is disconnected by default. For correct communication, the NBT needs to be activated only in the two furthest devices on the Modbus RTU network. If necessary, enable the NBT resistor through SenteraWeb via Holding register 9.

Example 1



Example 2

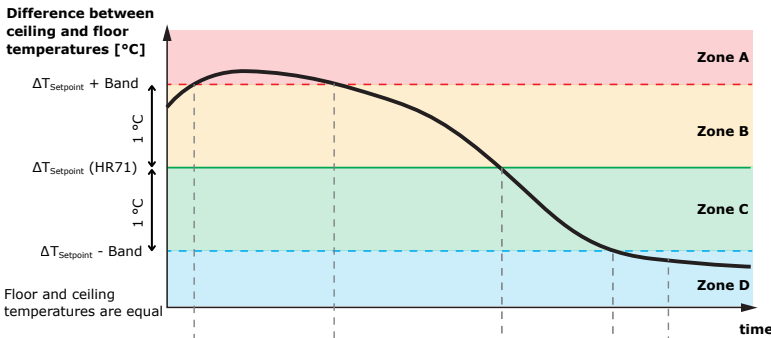


NOTE

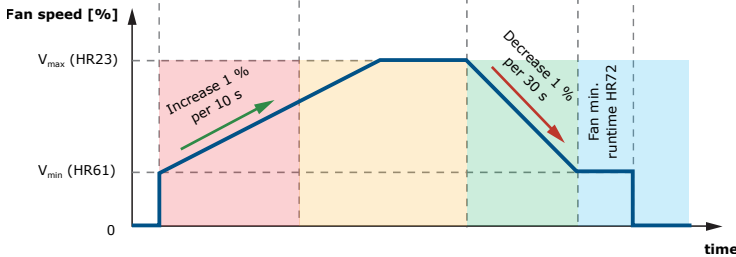
On a Modbus RTU network, two bus terminators (NBTs) need to be activated.

10. OPERATIONAL DIAGRAMS

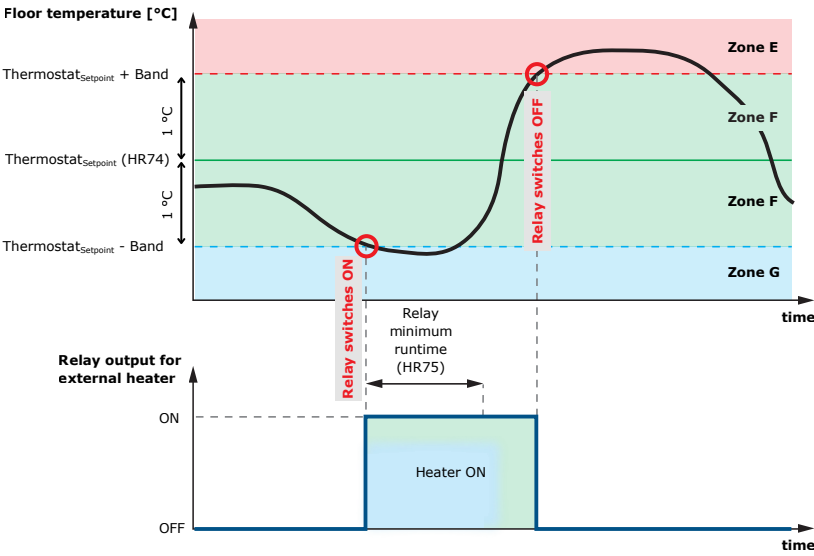
Delta Control



Temperature difference between ceiling and floor	Fan speed
ΔT is too high - more destratification is required.	Ceiling fans accelerate until v_{max} and keep on running at the maximum speed.
ΔT is within the acceptable range. Slightly higher than the setpoint.	Fan speed increases 1 % per 10 s.
ΔT is within the acceptable range. Slightly lower than the setpoint.	Fan speed decreases 1 % per 30 s.
ΔT is too low - no more destratification required.	After Fan min. runtime has elapsed, the ceiling fans stop.

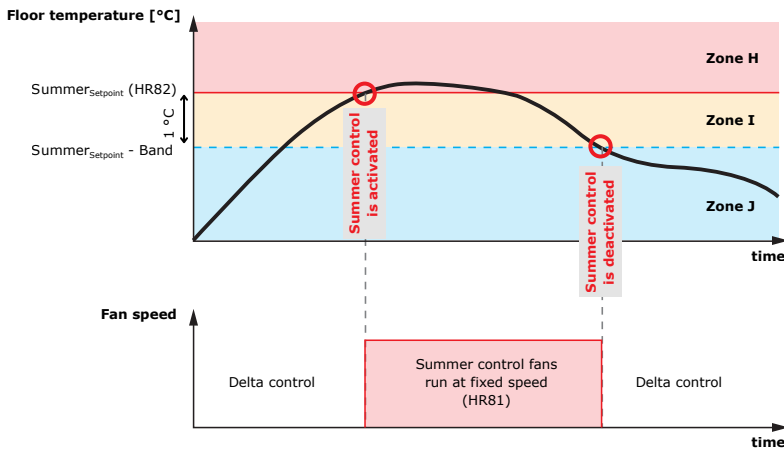


Thermostat Function in Delta Control



Floor temperature	Relay output for external heater
Temperature is high enough, no need for extra heating.	Switch the relay OFF.
Floor temperature is close to the Thermostat setpoint.	Relay stays in the same status.
Destratification only is not sufficient to reach the floor Thermostat setpoint. Extra heating is required.	Switch the relay ON. Relay always stays ON during the minimum runtime. After the minimum runtime has expired, it switches OFF when T_{Floor} enters Zone E.

Summer Control



Floor temperature	Fan speed
Temperature rises above the Summer _{setpoint} . It is too warm, summer control is activated to generate a cool breeze.	Ceiling fans run at fixed speed (HR81).
Temperature is close to the Summer _{setpoint} .	No change.
Temperature drops below the Summer _{setpoint} - 1°C. Summer control stops.	Summer control stops, Delta control takes over again.

11. OPERATING INSTRUCTIONS

Application States

The DSCA8-DM controller operates in three main application states, each with a defined priority and operating logic. During normal operation, Delta control is active. Summer control and Override control can temporarily take over the automatic operation when required. In all application states, safety functions (Alarm States) have the highest priority and can interrupt or overtake any current operation. The only exception is the Override control, which bypasses the alarm-related output shutdowns.

Delta Control (with Thermostat Function)

In Delta control, fan operation is controlled based on the temperature difference (ΔT) between the ceiling and floor temperatures. The additional thermostat function controls the relay output for auxiliary heating control.

- The fan starts running at minimum speed (HR16) when the temperature is higher than the setpoint (HR71) plus a fixed hysteresis band of 1 °C.
- If the temperature difference stays above the setpoint, the fan speed increases slowly by 1 % every 10 seconds until it reaches maximum speed or the required temperature difference is reached.
- When the temperature difference drops below the setpoint, the fan speed decreases slowly by 1 % every 30 seconds.
- If the temperature difference rises again above the setpoint, the fan starts increasing speed again.
- When the temperature difference falls below the setpoint minus the hysteresis band, the fan continues running at minimum speed for a set time (HR72) before stopping.

Integrated thermostat function

- If the fan runs at maximum speed continuously for a set time (HR73) and the floor temperature is below the thermostat setpoint minus a fixed hysteresis band of 2,5 °C, a relay output is switched on to enable auxiliary heating.
- The relay stays on until the floor temperature rises above the thermostat setpoint plus the hysteresis band.
- To avoid frequent switching, the relay stays on for a set time (HR75) after activation.

This combined control strategy ensures efficient destratification while enabling auxiliary heating only when necessary, optimising both energy consumption and thermal comfort.

Summer Control

Summer control can be activated manually via a button or automatically when the floor temperature exceeds the summer temperature threshold (HR82). In Summer control, the fan runs at a fixed speed (HR81) and stays at this speed until one of the following conditions occurs:

- The floor temperature drops below the summer setpoint.
- The state is switched off manually via the control button.

The state is deactivated automatically when the floor temperature falls below the summer setpoint minus a fixed hysteresis of 1 °C, which prevents frequent switching between Delta and Summer controls. This application state provides air circulation during warm conditions and helps maintain thermal comfort.

Override Control

Override control allows manual control of the fan speed by setting a fixed output, ignoring the automatic control logic. The state is activated when the user selects Override as the analogue output source via Holding register 15. In this state, the fan runs at a fixed speed set by the user (HR14).

- All automatic control functions are suspended while Override control is active.
- The fan keeps running at the fixed speed even if an alarm occurs. This fixed speed is defined in HR14.
- To exit Override control, the user must change the analogue output source from Override to Auto (Application, based on sensor measurements) via HR15.

This state is intended for manual operation scenarios where direct fan speed control is required.

Alarm States

The DSCA8-DM controller continuously checks the validity of the connected sensors and the overall system condition. If an abnormal situation is detected, the controller switches to predefined alarm states to maintain safe and reliable operation.

Alarm State

An alarm state is triggered when either a critical hardware alarm (sensor fault, device error) or a critical logic alarm (incorrect temperature probe connection) is detected.

During an active alarm condition, the analogue output is set to 0 % and the relay output is deactivated, except when Override control is active. The Override control overrules all alarm states preventing them from interfering with the activity of the analogue output.

Post-Alarm State

After the alarm condition is cleared, the controller enters a post-alarm state – a timeout (20 seconds) is applied before the controller returns to normal operation. This delay ensures that the fault condition has been fully resolved and prevents rapid transitions between alarm and normal states.

Locked Alarm State

The locked alarm state provides protection against repeated fault conditions. If the system enters an alarm condition more than 10 times after recovery (primarily due to recurring hardware faults), the controller transitions into a locked alarm state. In this state normal operation is inhibited and outputs remain disabled. Recovery from the locked alarm state is only possible by power cycling the device.

12. VERIFICATION OF INSTALLATION

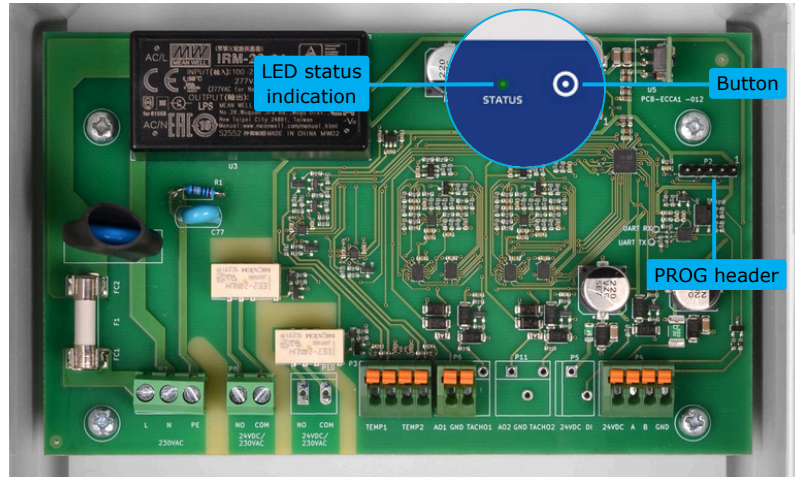
If your unit does not function as expected, please check the connections or refer to the **"Troubleshooting"** section.

13. TROUBLESHOOTING

NOTE

The troubleshooting steps are described in an easy-to-follow order, beginning with the simplest solutions to the more detailed ones. This approach is created to help users resolve any issues they may encounter when working with our product. Please refer to **Fig. 4** when using the troubleshooting steps.

Fig. 4 Settings and indications



PROG header, P2		Put a jumper onto pins 1 and 2 and wait for at least 5 seconds to reset the Modbus communication parameters
Summer control button		The button activates Summer control

RGB LED indication	
Red ON	Critical logical fault detected (refer to Input register 44). The floor and ceiling sensors have been swapped.
Red blinking	Critical hardware fault detected (refer to Input register 42). Sensor error or another hardware defect.
Yellow ON	Logical warning (refer to Input register 45).
Yellow blinking	Hardware warning (refer to Input register 43). Supply voltage is out of range.
Green ON	The system is operating normally in Delta control state.
Blue blinking	A firmware is being uploaded.
White ON	Summer control is activated.

The RGB LED brightness is regulated by setting the value of Holding register 91. The LED can be turned OFF (no indication) by setting the value to "0".

No visible sign of functioning

- **How to recognise this issue?**
 - The RGB LED is not lit.
- **How to solve this issue?**

Verify that:

 - The power supply is enabled.
 - The cable is properly connected to this device.
 - The cable is properly connected to the power supply.
 - The cable pinout is correct.

No Modbus communication

- **How to recognise this issue?**
 - The device is not detected on the Modbus network by the Modbus master.
- **How to solve this issue?**

Verify that:

 - The Modbus communication settings (baudrate, parity) match the network configuration.
 - The slave ID of **DSCA8-DM** matches the ID expected by the Modbus master.
 - The slave ID of **DSCA8-DM** does not match the ID of any other device connected to the same Modbus network.
 - **DSCA8-DM** is responding to the broadcast read command (slave ID = 0, read first 4 Holding registers).
 - The RS-485 communication line is wired correctly on both sides (A to A, B to B).
 - The cable length does not exceed 1000 meters.
 - The device is connected to an isolated Modbus network without other slave devices. Then check the communication.

Problems with the temperature probes

- **How to recognise this issue?**
 - The RGB LED is blinking RED.
 - Input register 31 (Floor temperature sensor state) contains the value "Short circuit failure" or "Not connected".
 - Input register 33 (Ceiling temperature sensor state) contains the value "Short circuit failure" or "Not connected".
- **How to solve this issue?**
 - Disconnect the device from the power supply for at least 15 seconds. Then connect it again.
 - Carefully disconnect the temperature probe that is giving the error. Then reconnect it.
 - Try connecting another temperature probe of the same type.

Other problems

- **How to recognise this issue?**
 - Input register 1 (Device status — errors) contains the value "Supply voltage fault".
 - Input register 2 (Device status — warnings) contains the value "Supply voltage warning".
- **How to solve this issue?**
 - Disconnect the device from the power supply for at least 15 seconds. Then connect it again.

14. FREQUENTLY ASKED QUESTIONS (FAQs)

What type of fans can be regulated with DSCA8-DM?

DSCA8-DM is a destratification controller that features a single analogue output. The device can control EC fans via the analogue signal directly or it can be connected to [a Sentera variable fan speed controller](#) with an analogue input to regulate AC fans indirectly. The analogue output of DSCA8-DM provides different types of analogue signal that can be selected via Modbus communication.

When is the relay output activated?

By default the relay output of **DSCA8-DM** is activated automatically when the desired temperature difference between the floor and the ceiling levels is not reached within a specified time frame. Users can set a thermostat trigger time via Modbus communication (HR73), which activates the relay output if destratification is not achieved within the set time. By default the thermostat trigger time is set to 2 minutes, but it can be changed to a value in the range of 0–10 minutes. The relay output remains active until the floor temperature rises above a thermostat setpoint that is set in Holding register 74. However, if the thermostat trigger time is set to "0", the relay output will be active when the fan is running.

The relay can also be activated manually when Holding register 31 is set to "Override" and the relay state is selected via Holding register 32 (Override value for the relay output). For example, when HR31 is set to "Override" and HR32 is set to "ON", the relay will be activated.

Can DSCA8-DM be used as a standalone device?

The destratification controller **DSCA8-DM** can operate both as a standalone device and as part of an HVAC system. All device settings and parameters can be configured effortlessly via SenteraWeb through Modbus communication. To use SenteraWeb it is necessary to connect **DSCA8-DM** to [a Sentera internet gateway](#).

Can DSCA8-DM withstand dust and water ingress?

DSCA8-DM is intended for indoor applications in high-ceiling buildings such as warehouses, factories and halls where the process of stratification occurs. The enclosure of the controller has an IP54 rating, which protects the internal components of the device from dust ingress and water splashes from any direction.

15. TRANSPORT AND STORAGE

Avoid shocks and extreme conditions; stock in original packaging.

16. WARRANTY AND RESTRICTIONS

Two years from the delivery date against defects in manufacturing. Any modifications or alterations to the product after the production date relieve the manufacturer of any responsibilities. The manufacturer bears no responsibility for any misprints or mistakes in this data.

17. MAINTENANCE

In normal conditions, this product is maintenance-free. If soiled, clean with a dry or damp cloth. In case of heavy pollution, clean with a non-aggressive product. In these circumstances, the unit should be disconnected from the supply. Pay attention that no fluids enter the unit. Only reconnect it to the supply when it is completely dry.

