



FCCA8-DM

Free Cooling Controller

Description

FCCA8-DM is a fan speed controller intended for free cooling applications. In free cooling, colder outside air is used to cool indoor spaces without the use of air conditioning systems. FCCA8-DM features two PT500 temperature probe inputs for indoor and outdoor temperature monitoring. Fan speed is regulated via a single analogue output. The controller also has a relay output, which can be connected to a damper or other auxiliary equipment.

The free cooling controller supports two fan speed control modes that can be selected via Holding Register 84 through Modbus communication:

- Variable fan speed control – To select this control mode, HR84 should be set to 0 %.
- Fixed fan speed control – This control mode is selected when HR84 is set to a value greater than 0 %.

Both Variable and Fixed fan speed control modes support the Boost function activated by pressing the button on the device front panel. During Boost operation, the fan runs at a predefined speed set in Holding Register 14. The fan operates at this speed until the Boost timeout (HR85) expires or the button is pressed again.

To control fan speed manually, FCCA8-DM provides an Override control function, which can be selected via Holding Register 15. When Override control is activated, all automatic control functions are suspended.



Key Features

- Modbus RTU communication for easy integration into HVAC systems
- Different control modes for free cooling applications
- Various alarm states for safe device operation
- RGB LED indication for monitoring the device status
- Button for manual activation of Boost functionality
- Robust enclosure made of Acrylonitrile Butadiene Styrene (ABS) plastic

Standards

- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- WEEE Directive 2012/19/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

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.

Area of Use

- Suitable for ventilation systems where cool outdoor air can be used to reduce the need for mechanical cooling

Article Codes

Article code	Analogue output	Relay output
FCCA8-DM	1	1

Technical Specifications

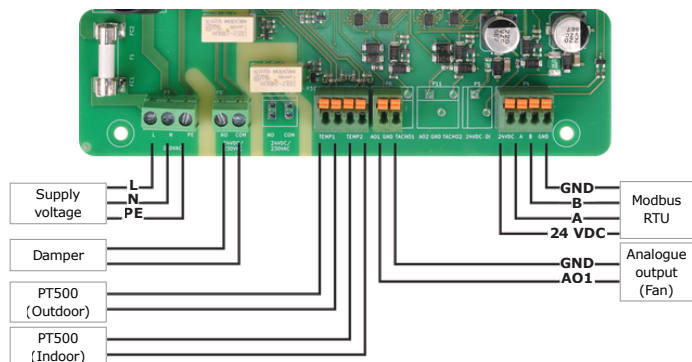
Supply voltage	85—264 VAC, 50—60 Hz
Power supply for an external device	24 VDC, 500 mA
Analogue output types	
0–10 VDC	load resistance $\geq 1 \text{ k}\Omega$
2–10 VDC	load resistance $\geq 1 \text{ k}\Omega$
0–5 VDC	load resistance $\geq 1 \text{ k}\Omega$
0–20 mA	load resistance $\leq 500 \Omega$
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)

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Wiring and Connections



Screw terminal blocks

Supply voltage

L, N, PE	85–264 VAC, 50 / 60 Hz
Connect the supply voltage to L, N and PE.	

Relay output

NO, COM	250 VAC / 24 VDC
If applicable, connect a damper to the the relay output NO and COM.	
Cable characteristics	cross section $\geq 1,5 \text{ mm}^2$

Spring clamp terminal blocks

Temperature probe inputs

TEMP1	Outdoor temperature sensor PT500
Connect the outdoor temperature sensor to TEMP1.	
TEMP2	Indoor temperature sensor PT500
Connect the indoor temperature sensor to TEMP2.	
Cable characteristics	cross section $\leq 1,5 \text{ mm}^2$
To minimise EMC disturbances, avoid creating loops in the PT500 sensor cables and keep the cable length as short as possible.	

Analogue output

AO1, GND	12 VDC
Connect the fan(s) to the analogue output AO1 and GND.	
Cable characteristics	cross section $\geq 0,5 \text{ mm}^2$

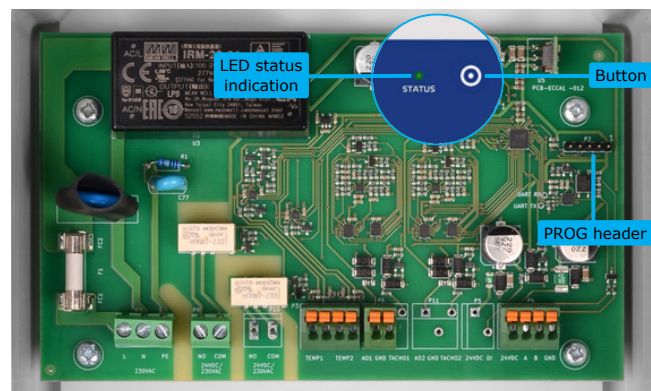
Power supply output

24 VDC, GND	Power supply for an external device
Cable characteristics	Cat5 / EIB cable

Modbus RTU

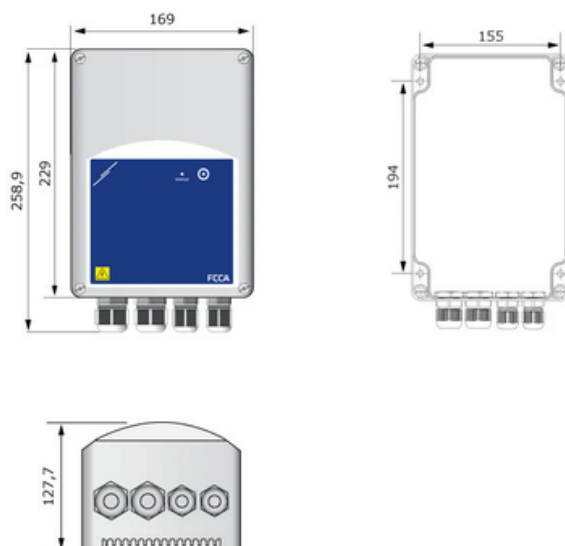
A, /B	Modbus RTU (RS485)
Cable characteristics	Cat5 / EIB cable

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.
Button - Boost function		A button to activate Boost function.
LED status indication		
Red ON	A critical hardware alarm detected (see Input Register 44).	
Red blinking	A locked alarm detected (see Input Register 41).	
Yellow ON	A hardware warning (see Input Register 45).	
Green ON	The system is operating normally.	
Blue blinking	A firmware is being uploaded.	
White ON	The button on the device front cover is pressed. The Boost function is active.	
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".		

Fixing and Dimensions





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Operating Principles

FCCA8-DM can regulate fan speed in two different control modes selected via Holding Register 84:

- Variable fan speed control: If HR84 is set to 0 %, variable fan speed control is selected.
- Fixed fan speed control: If HR84 is set to a value greater than 0 %, fixed fan speed control is selected.

A Boost function is available in both variable and fixed fan speed controls and can be activated by pressing of the button on the device front cover.

Fan speed can also be regulated manually by enabling the Override control function via Holding Register 15. When enabled, the Override control function overrides all operating modes and alarm states. If a damper is connected to FCCA8-DM, it should be taken into account that Override control does not manage the opening and closing of the damper. In this case, appropriate precautions must be taken before enabling Override control.

In both variable and fixed fan speed controls, the fan starts running only when the following conditions are met:

- The indoor temperature is greater than the indoor temperature setpoint (HR61) + the temperature band (fixed at 1 °C, not configurable).
- The temperature difference ($T_{\text{indoor}} - T_{\text{outdoor}}$) is greater than the configured delta temperature threshold (HR62).
- The outdoor temperature is greater than the outdoor temperature threshold (fixed at 5 °C, not configurable).

The fan stops running when either of the following conditions is met:

- The indoor temperature falls below the indoor temperature setpoint (HR61) – the temperature band (1 °C).
- The temperature difference falls below the minimum delta temperature threshold (1 °C).
- The outdoor temperature falls below the outdoor temperature threshold (5 °C) – the threshold band (1 °C).

Variable Fan Speed Control

State	Description	Damper	Fan
Standby	Idle state. Waiting for all free cooling start conditions to be met.	Closed	OFF
Damper start up	The damper is being opened and the controller is waiting for the configured Damper open time (HR83) to elapse.	Opening / open	OFF
Always ON	The damper is fully open and the fan starts at the configured Minimum fan speed (HR12). This state is maintained until ramp-up conditions are evaluated.	Open	Minimum speed
Ramp up	Fan speed is increased by 5 % every 10 seconds, up to the configured Maximum fan speed (HR13), as long as the indoor temperature stays above the setpoint.	Open	Increasing
Ramp down	Fan speed is reduced by 1 % every 30 seconds, down to the configured Minimum fan speed (HR12), once the indoor temperature falls to or below the setpoint.	Open	Decreasing
Shutting down	Once shutdown conditions are detected, fan speed steps down quickly — 5 % every second — until it reaches the Minimum fan speed (HR12). It then remains at that minimum speed until the configured Minimum fan runtime (HR82) elapses.	Open	Minimum speed
Fan coast down	The fan is stopped and the controller waits for the configured Fan coast-down time (HR81) before closing the damper.	Open	OFF
Boost	Optional operating state for boost ventilation.	Open	Boost speed

Fixed Fan Speed Control

State	Description	Damper	Fan
Standby	Idle state. Waiting for all free cooling start conditions to be met.	Closed	OFF
Damper start up	The damper is being opened and the controller is waiting for the configured Damper open time (HR83) to elapse.	Opening / open	OFF
Always ON	Applicable only when the Analogue output always ON function is enabled. The fan operates at the configured Minimum fan speed (HR12) until the controller transitions to Run state.	Open	Minimum speed (HR12)
Run state	Normal free cooling operation. The fan operates at the configured Application fixed fan speed (HR84) while the start conditions remain fulfilled.	Open	Fixed speed (HR84)
Shutting down	Once shutdown conditions are detected, fan speed steps down quickly — 5 % every second — until it reaches the Minimum fan speed (HR12). It then remains at that minimum speed until the configured Minimum fan runtime (HR82) elapses.	Open	Minimum speed (HR12)
Fan coast down	The fan is stopped and the controller waits for the configured Fan coast-down time (HR81) before closing the damper.	Open	OFF
Boost	Optional operating state for boost ventilation.	Open	Boost speed

Boost Function

The Boost function is available in both Variable and Fixed speed control modes. When the Boost function is activated by pressing of the button on the device front cover, the free cooling conditions are bypassed and the controller executes the following actions:

1. Open the damper.
2. Wait for the configured Damper opening time (HR83) to elapse.
3. Start the fan at the configured Boost fan speed (HR14).

The fan operates at the configured boost speed until the Boost timeout (HR85) expires or the button on the device front cover is pressed again.

After the boost period ends, the controller returns to the previously selected fan control mode (Variable fan speed control or Fixed fan speed control) and resumes normal operation according to the free cooling conditions.

The standard shutdown sequence, including the Fan coast-down time and the damper closing sequence, is maintained during Boost operation.

Override Control

Override Control allows fan speed to be regulated manually by setting the analogue output to a predefined value, overriding the automatic control logic.

- Override control is activated when the user selects Override as the analogue output source in Holding Register 15.
- In this state, the fan operates at an Override speed selected in Holding Register 14.
- All automatic control functions are suspended while Override control is active.
- Override control bypasses alarm-related output shutdowns. During Override control, the analogue output remains active and the fan continues to operate at the configured speed even if an alarm condition is present.
- To exit Override control, the user must change the analogue output source from Override to any other available control source.

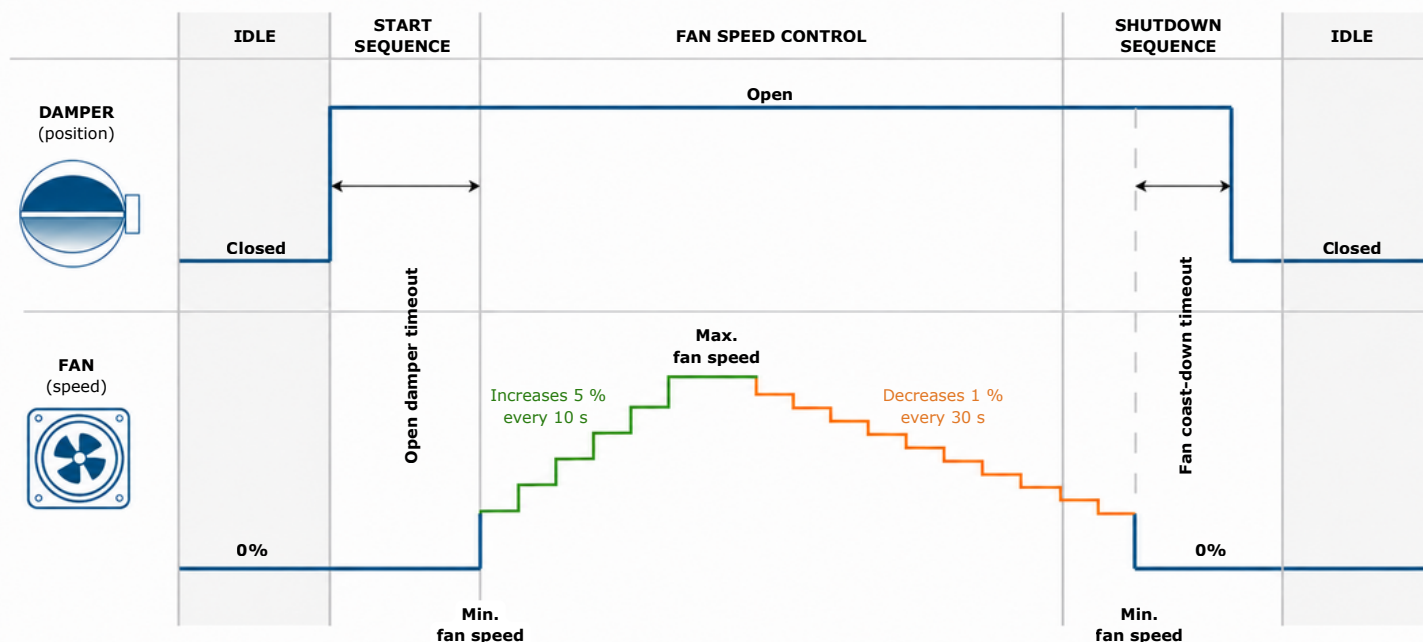
Override control is intended for manual operation when direct fan speed control is required.



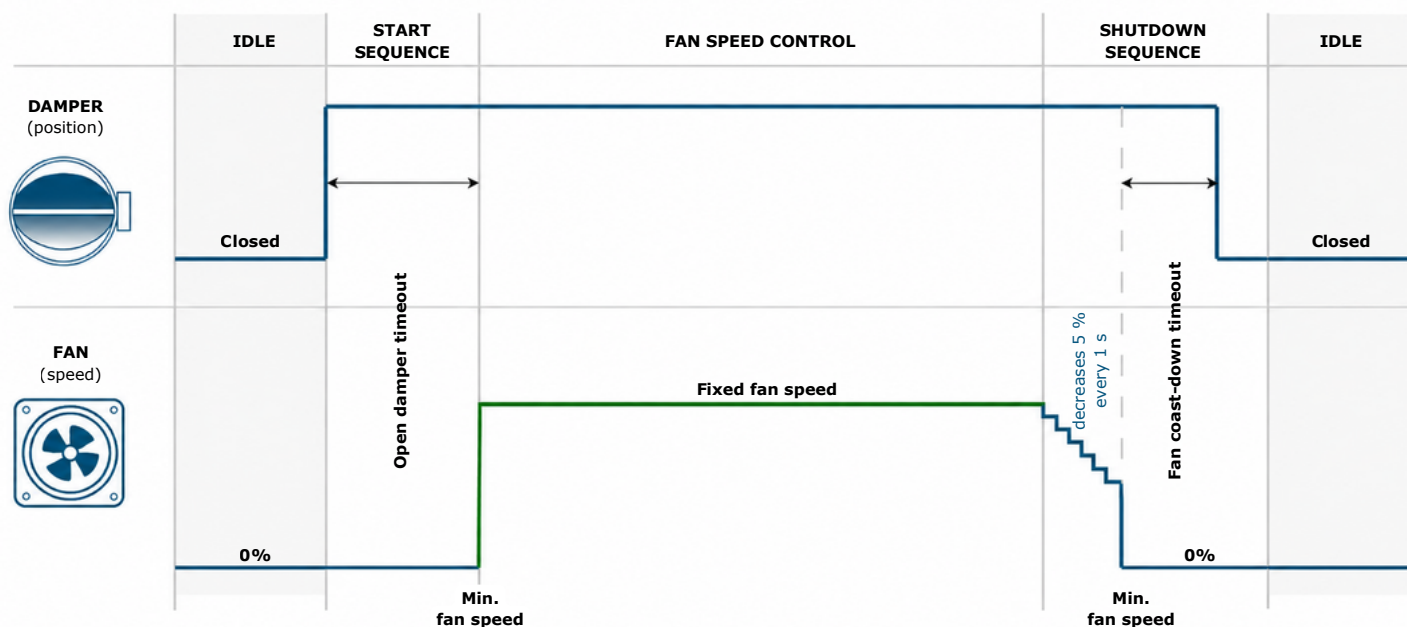
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Variable Fan Speed Control



Fixed Fan Speed Control





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Alarm States

The FCCA8-DM controller continuously monitors the connected sensors and the overall system status. If an abnormal condition is detected, the controller switches to predefined alarm states to maintain safe and reliable operation.

When a fault condition is detected, the controller enters a Pre-alarm state.

The purpose of this state is to place the free cooling system in a safe condition before activating the alarm. If the damper is open, the controller performs the shutdown sequence to ensure that the fan is completely stopped before the damper is closed. The shutdown sequence is as follows:

1. Stop the fan.
2. Wait for the configured Fan coast-down time (HR81) to allow the fan to come to a complete stop.
3. Close the damper.

If the fan is already stopped and the damper is closed, the controller immediately transitions to an alarm state. During an active alarm state, the analogue output is forced 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.

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

If the system enters an alarm state more than 10 times after recovery (primarily due to recurring hardware faults), the controller automatically switches to a locked alarm state. The locked alarm state protects the system against recurrent fault conditions. 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.

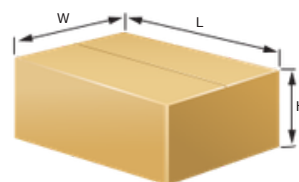
Connect Devices to SenteraWeb



Via a Sentera Internet Gateway you can connect your installation to the SenteraWeb HVAC cloud and:

- Easily change the parameter settings of the connected devices remotely.
 - Define users and give them access to monitor the installation via a standard web browser.
 - Log data - create diagrams and export logged data.
 - Receive alerts or warnings when measured values exceed alert ranges or when errors occur.
 - Create different regimes for your ventilation system - e.g. day-night regime.
- Please refer to the Modbus Register Map of the product for more details regarding the Modbus registers.

Packaging



Article code	Packaging	Length [mm]	Width [mm]	Height [mm]	Net weight [kg]	Gross weight [kg]
FCCA8-DM	Unit (1 pc)	270	180	150	0,38	0,58
	Box	-	-	-	-	-
	Half pallet	-	-	-	-	-
	Pallet	-	-	-	-	-

Global Trade Item Numbers (GTIN 14)

Packaging	FCCA8-DM
Unit	-
Box	-
Half pallet	-
Pallet	-

