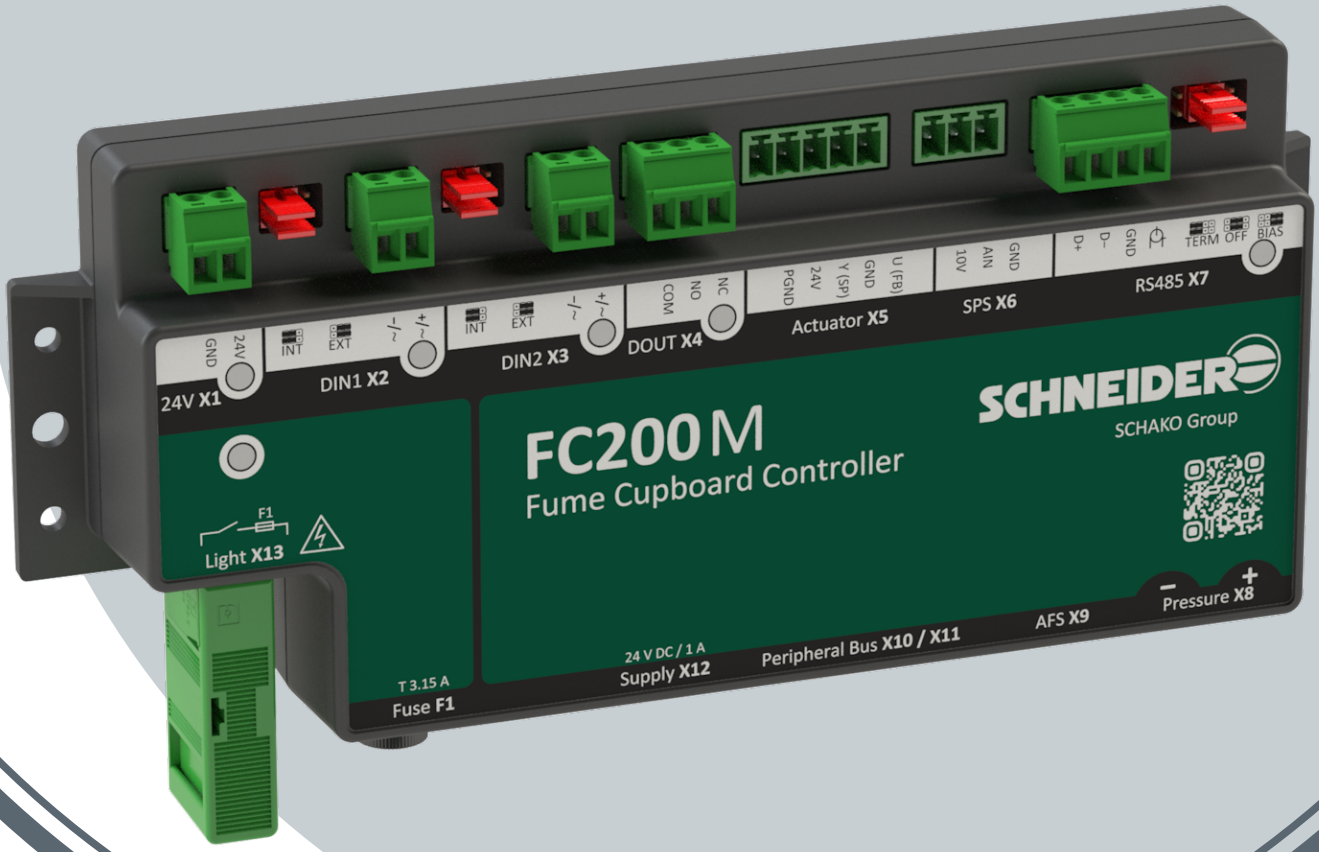


Product Information

Fume Cupboard Controller FC200

SCHNEIDER
SCHAKO Group

Contents

1 Performance Data

Enclosure	
Protection Class	II
Protection Rating	IP 20
Material	PA12 / ABS
Operating Temperature	+15°C to +40°C
Color	RAL 9003
Dimensions (L x W x H)	186 x 86 x 28 mm
Weight	approx. 250 g
Terminal Connectors	0.2 to 1.5 mm²
Plug-in Power Supply	
Input Voltage Range	90 to 264 V AC
Frequency Range	47 to 63 Hz
Efficiency	> 80%
AC Current	0.7 A / 100 V AC 0.4 A / 230 V AC
Output Voltage	24 V DC
Rated Current	1.0 A
Rated Power	24 W

2 Special Features

- Microcontroller-controlled control system for fume cupboards
- Function monitoring for safe fume cupboard operation according to DIN EN 14175-6
- Optical and acoustic alarm in case of malfunctions
- Optical warning for the operating state “Front damper position > 50 cm open”
- Parameterization and retrieval of all system values via a service interface
- Optional: Airflow sensor for measuring the inlet air velocity
- Response time and upward adjustment of the exhaust airflow ≤ 2 s ($\dot{V}_{min}$ to $\dot{V}_{max}$)
- Integrated differential pressure sensor (4 to 300 Pa) for measuring the actual exhaust airflow (volume flow)

3 Product Description

Microcontroller-controlled system for controlling and monitoring the exhaust airflow or the inlet air velocity of fume cupboards based on the front and cross damper position. Depending on the configuration, the following operating modes of the fume cupboard control system can be implemented:

- Fully variable control – multi-sensor control of volume flow, inlet air velocity, and front damper position
- Constant inlet air velocity control (1-/2-/3-point)
- Inlet air velocity control depending on the front damper position
- Inlet air velocity control with limitation to ($\dot{V}_{min}$ and $\dot{V}_{max}$)
- Volume flow control depending on the front damper position
- Constant volume flow control (1-/2-/3-point)

The integrated function monitoring according to DIN EN 14175-6 provides the required safety for laboratory personnel. If the desired exhaust airflow setpoint is not reached, an acoustic and optical alarm is activated via the function display.

4 Functional Description

5 Application Scenarios

5.1 Fully Variable Fume Cupboard Control

5.2 Volume Flow Control

6 Volumenstrom Messung

Um Volumenströme möglichst präzise messen und - je nach Produkttyp - auch regeln zu können, verfügen die meisten Geräte von SCHNEIDER über mindestens einen integrierten Differenzdrucksensor. Die Messung kann dabei entweder über eine Messdüse (z.B. Venturi-Düse), ein Staurohr oder eine Messblende erfolgen. Jedes der Verfahren hat Vor- und Nachteile.

Stehen Wiederholgenauigkeit und geringe Strömungsverluste sowie geringe Lautstärkeentwicklung im Vordergrund, ist generell die Messung über Venturi-Blende zu empfehlen.

6.1 Berechnung aus Differenzdruck

Zur Berechnung wird die folgende, vereinfachte Formel verwendet:

$$\dot{V} = c\sqrt{\frac{\Delta p}{\rho}}$$

In dieser Formel sind sämtliche Geometrie-Konstanten im Blendenfaktor c enthalten. Der zu verwendende Blendenfaktor ist auf der Messdüse abgedruckt.

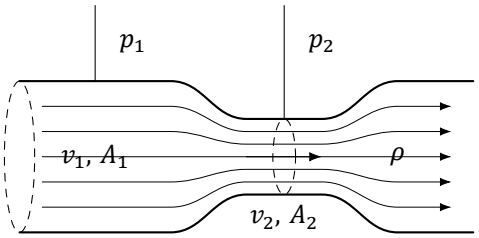


Figure 1: Messprinzip Venturidüse

Wie in Figure 1 zu erkennen ist, ergeben sich bei identischem Volumenstrom unterschiedliche Drücke p_1 und p_2. Aus der Differenz lässt sich der Volumenstrom bestimmen.

Aus

$$p_1 - p_2 = \frac{\rho}{2}(v_2^2 - v_1^2)$$

und

$$\dot{V} = v_1 A_1 = v_2 A_2$$

ergibt sich

$$\dot{V} = A_1 \sqrt{\frac{2}{\rho} \frac{p_1 - p_2}{\left(\frac{A_1}{A_2}\right)^2 - 1}}$$

$$\dot{V} = A_1 \sqrt{\frac{2}{\left(\frac{A_1}{A_2}\right)^2 - 1}} \cdot \sqrt{\frac{p_1 - p_2}{\rho}}$$

oder $\dot{V} = c\sqrt{\frac{\Delta p}{\rho}}$ mit $c = A_1 \sqrt{\frac{2}{\left(\frac{A_1}{A_2}\right)^2 - 1}}$ und $\Delta p = p_1 - p_2$.

6.2 Inlet Air Control

6.3 Direct Control of Frequency Inverters

The galvanically isolated analog output included in the A-variant is suitable for directly controlling a frequency inverter. In this case, the fan driven by the frequency inverter serves as the actuator in the volume flow or inlet air control loop. This enables a demand-oriented air supply even without a throttle valve – thus avoiding the associated energy loss. Since a change in rotational speed is usually achieved significantly slower than an adjustment of the damper position, the controller's time constant must be adapted to the installed system.

If the M-variant is used, or if the analog output of the A-variant is already assigned to another function, the motor terminal

Figure 2: Fume Cupboard with Directly Controlled Fan

X5 can alternatively be used to control the fan. In this case, note that the output is not galvanically isolated. Therefore, either the input must have galvanic isolation or the reference potentials of both devices must be identical. Whether this type of control is feasible must be evaluated on an individual basis.

6.4 Connection to Building Management Systems

All controllers in the 400 series are available in two variants:

A Analog variant with two galvanically isolated analog interfaces.
M Modbus variant with a galvanically isolated RS485 interface.

Terminal X7 is designed for one of the above functions depending on the application. Its primary purpose is to connect the fume cupboard control system to a building management system and to monitor its current status. In the A-variant, the two analog outputs are freely configurable; however, typically at least the actual volume flow value is transmitted. The potential-free relay (X4) is often used in this configuration to indicate the alarm state. The amount of information exchanged is limited by the number of available contacts.

In the M-variant, no such limitation exists. Via the galvanically isolated two-wire bus (RS485), it is possible—using the Modbus protocol—to retrieve all data points of the controller and to preset all writable values as needed. The only limitation is a lower maximum achievable sampling cycle, since all connected devices share a common communication channel and all requests must be processed sequentially (i.e., ”waiting in line”). Higher baud rates allow for greater data throughput but also demand higher signal quality and limit the maximum cable length.

For more information on the proper procedure for commissioning Modbus networks, please refer to the whitepaper *Modbus Commissioning*.

6.5 Integration into SCHNEIDER Room Balancing

If no building management system exists or if the devices are not to be integrated into one, room or zone balancing is still possible. For example, the FC200 can be integrated into the balance of a VAV400.

7 Peripherals

7.1 Function Display

Every fume cupboard control system requires a function display. SCHNEIDER offers a complete family of function displays in various installation formats. All displays use the integrated peripheral bus (X10 or X11) and are largely configuration-free. If necessary, unused buttons can be deactivated.

7.2 Displacement Sensor for Determining the Front Damper Position

The optional displacement sensor (Terminal X6) enables the determination of the absolute position of the front damper. This sensor is essential for implementing control modes V and W. SCHNEIDER offers two types: SPS100 (with a 1-meter cable length) and SPS200 (with a 2-meter cable length), with the latter required only for walk-in fume cupboards with a correspondingly large travel. After connecting and installing the displacement sensor, it must be calibrated to the fume cupboard.

7.3 Inlet Air Sensor

An inlet air sensor is required to measure the inlet air velocity (control modes F and V). This sensor is connected via the pre-assembled cable into socket X9 and does not require any further configuration.

8 Commissioning and Configuration

The configuration is carried out using the PC application *PC4500*. This application, including the required programming adapter *UPA100*, is available from SCHNEIDER. An overview of all configuration parameters can be found in the document Configuration Values for Fume Cupboard Control FC200. For detailed commissioning instructions, please refer to the document Assembly and Operating Instructions FC200.

9 Ordering Codes

01 – Type

Fume cupboard controller for controlling and monitoring the exhaust airflow or the front speed of fume cupboards based on the front damper and cross baffle, with integrated function monitoring according to DIN EN 14175-6.

FC200M Base unit with integrated Modbus RTU functionality, without analog functionality.

FC200A Base unit with integrated analog functionality, without Modbus RTU functionality.

02 – Control Mode

V Fully variable control – multi-sensor control of volume flow, inlet air velocity, and front damper position

F Constant inlet air velocity control (1-/2-/3-point)

FW Inlet air velocity control based on the front damper position

FP Inlet air velocity control with limitation to ($\dot{V}_{min}$ and $\dot{V}_{max}$)

W Volume flow control based on the front damper position

K Constant volume flow control (1-/2-/3-point)

03 – Power Supply Unit

EU Power supply unit with EU plug.

UK Power supply unit with UK plug.

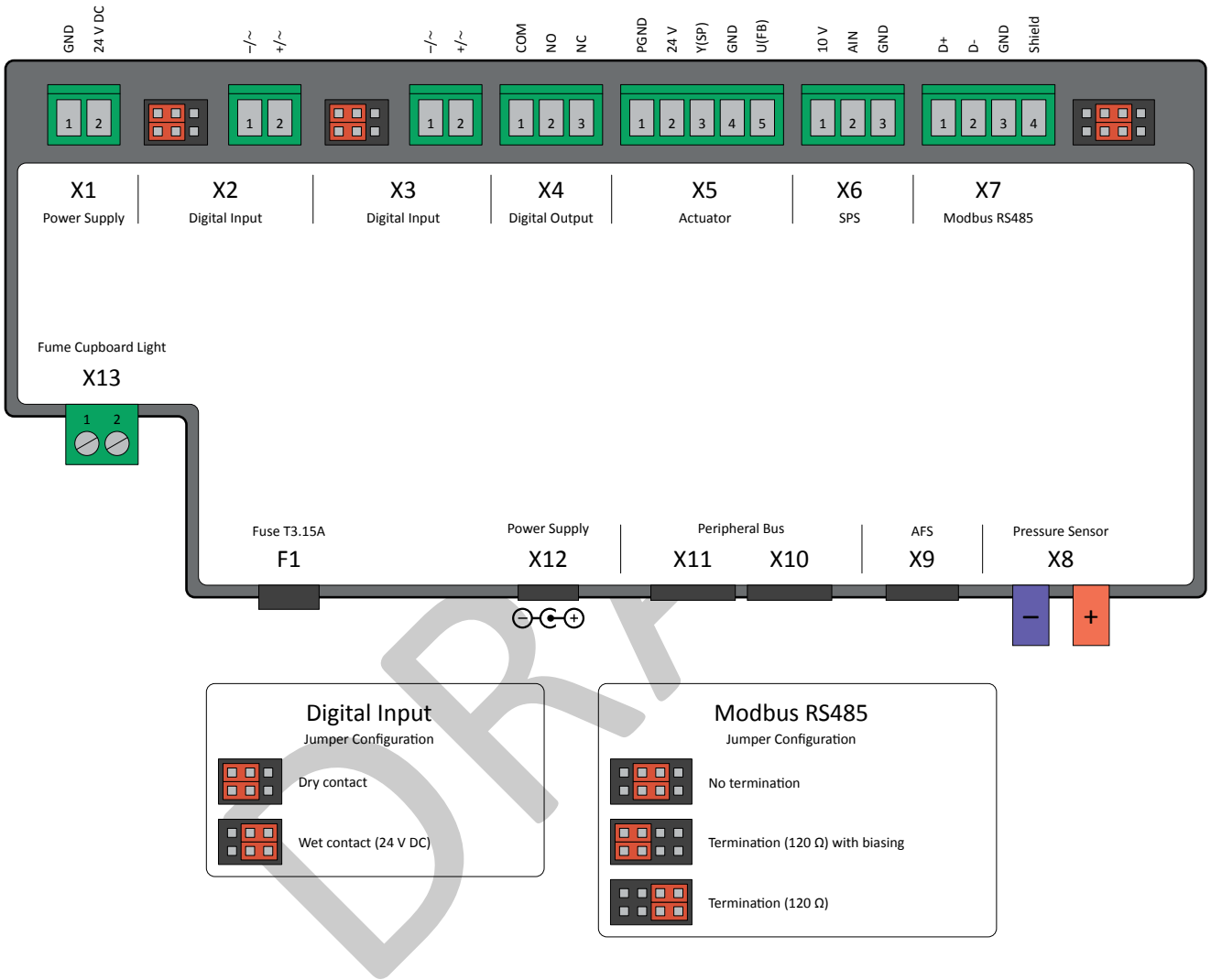
Example:

Fume cupboard controller for controlling the exhaust airflow or the front speed of fume cupboards based on the vertical and horizontal damper position, with integrated function monitoring according to DIN EN 14175-6, connected to a building management system via Modbus RTU. Fully variable control via differential pressure sensor, flow sensor, and front damper position sensor, with a plug-in power supply featuring an EU plug.

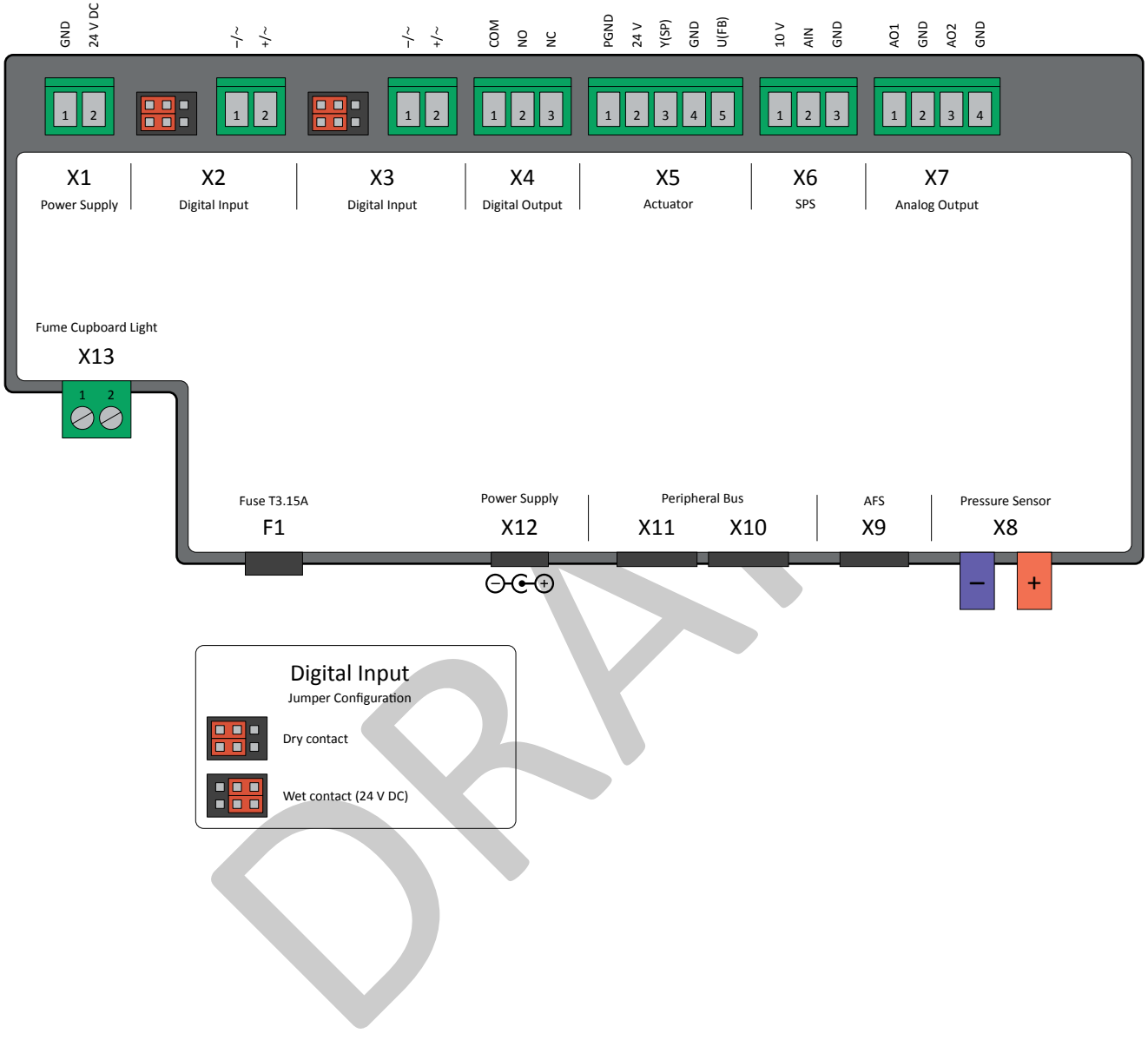
01	-	**02**	-	**03**
FC200 M	-	V	-	EU

10 Terminal Diagram

10.1 FC200M



10.2 FC200A



11 Dimensions and Installation

The FC200 fume cupboard control system is suitable for direct mounting on sheet metal, wood, or wood-based panels using appropriate screws. Additionally, mounting on a control cabinet DIN rail is possible via the adapter bracket available separately from SCHNEIDER. SCHNEIDER recommends mounting the pressure connection with the outlet facing downward to reduce the likelihood of dust and moisture inadvertently entering the sensor. However, the sensor is generally orientation-independent and may be installed in any orientation if necessary.

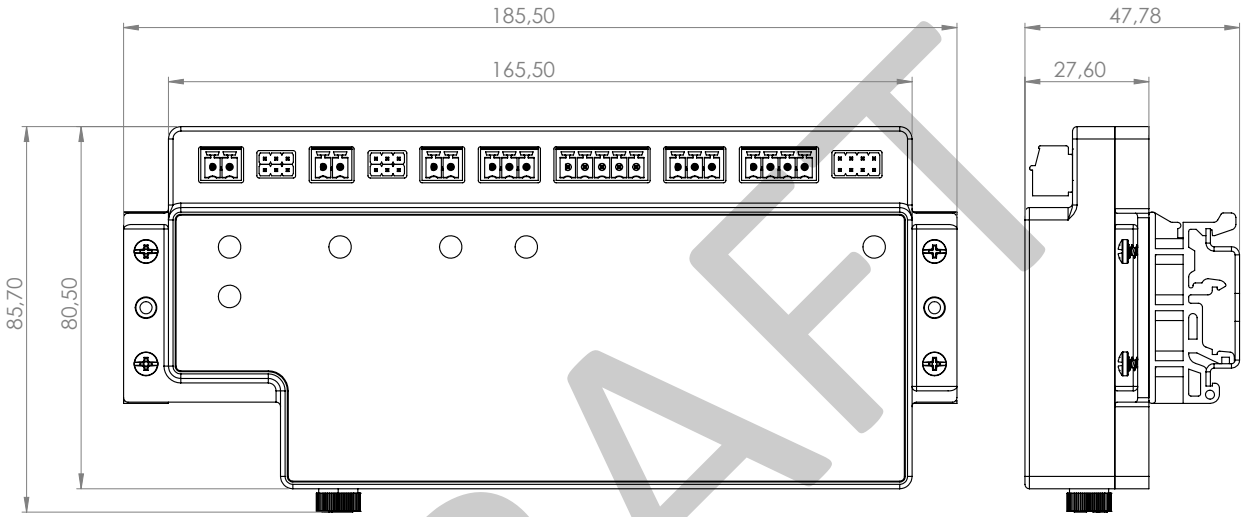


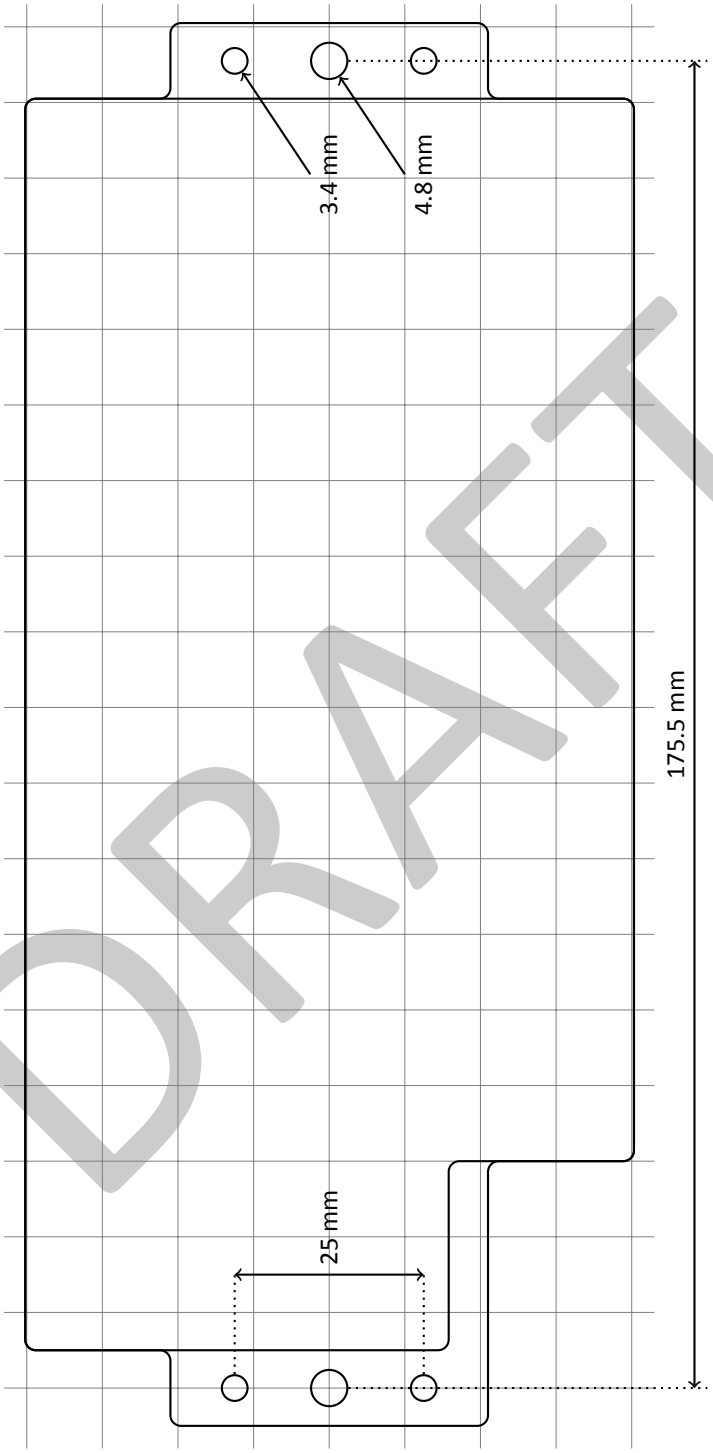
Figure 3: Dimensions FC200

11.1 Mounting on DIN Rail

The enclosure of the FC200 is designed for use with a DIN rail. Optionally available adapters can be used for this purpose.

Figure 4: FC200 on DIN Rail

11.2 Drilling and Mounting Template



The information and data contained in this documentation have been compiled to the best of our knowledge and in accordance with the current state of the art (subject to technical changes). The currently valid version applies. The proven properties of SCHNEIDER products are based on the use of the products recommended in this documentation. Diverging situations and individual cases are not taken into account, so that we cannot assume any warranty and liability.

As of February 2025

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Do you have any questions? We look forward to your message:

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