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Description

The TSD 250 is a compact true duct smoke detector designed for reliable smoke detection directly inside ventilation ducts.

Detection is performed directly in the airflow using an infrared sensing principle integrated into the sensing probe. Unlike conventional duct smoke detectors, the TSD 250 does not require sampling tubes or built-in fans, resulting in simpler installation and reliable operation.

The detector features adjustable sensitivity, selectable manual or automatic reset function and an SPDT relay output for integration with ventilation control, fire safety and building management systems.

The compact enclosure and direct duct sensing design make the TSD 250 a cost-effective solution for commercial and industrial HVAC applications where reliable smoke detection inside ventilation ducts is required.

Ordering code

Type no.	Description
TSD 250	True Duct Smoke Detector

Key Advantages

- **SPDT relay output and Modbus RS485 RTU communication**
- **True duct detection**
- **No sampling tubes required**
- **Compact and cost-effective design**
- **Designed for HVAC and BMS applications**

Features

- **Direct in-duct smoke detection**
  Fast and reliable smoke detection directly in the airflow

- **No sampling tubes required**
  Eliminates the need for external sampling tubes and built-in fans

- **SPDT relay output**
  Volt-free relay output for control of fans, dampers and alarm systems

- **Modbus RS485 RTU communication**
  Suitable for integration with BMS, PLC and HVAC control systems

- **Manual or automatic reset**
  Configurable reset behaviour via internal jumper selection

- **Fast response time**
  Rapid smoke detection with response time typically within 1–2 seconds

- **Wide airflow operating range**
  Suitable for airflow velocities from 0.03…25 m/s

- **Duct mounting flange with integrated neoprene sealing gasket**
  Improves sealing between detector and ventilation duct and reduces air leakage.

- **Compact and easy installation**
  Compact design for simple installation in ventilation ducts

- **Designed for HVAC and BMS applications**
  Suitable for commercial and industrial ventilation systems

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Technical Specifications

Sensitivity
Adjustable sensitivity setting
via internal DIP switches

Supply voltage
24 Vac, 50–60 Hz
24 Vdc

Power consumption
Approx. 1.5 VA at 24 Vdc

Outputs
SPDT volt-free relay contact
Modbus RS485 RTU communication
Communication
RS485 2-wire half duplex
9600 baud
Relay status monitoring and control
Internal DIP switch address setting

Relay contact rating
5 A @ 120 Vac / 24 Vdc

Response time
Typically 1–2 seconds

Air velocity range
0.03…25 m/s

Reset mode
Manual or automatic reset selectable

Operating conditions
Temperature: 0…50 °C
Humidity: 0…95 % RH, non-condensing

Storage conditions
Temperature: −20…60 °C

Protection class
IP64

Housing material
ABS enclosure

Enclosure
80 × 80 × 43 mm

Probe length
250 mm

Probe diameter
Ø 16.5 mm

Mounting flange diameter
Ø 50 mm

Cable entry
PG 13.5 cable gland

Weight
Approx. 500 g

Compliance
CE compliant

Application

The TSD 250 is designed for installation in ventilation and air conditioning systems to detect smoke directly inside ventilation ducts and help prevent the spread of smoke between fire compartments and building areas.

By detecting smoke directly in the airflow, the detector enables rapid response actions such as:

• Stopping supply and return fans

• Closing fire and smoke dampers

• Activating smoke extraction systems

• Initiating alarm or shutdown sequences

Typical applications include:

• Air handling units (AHU)

• Supply air ducts

• Return air ducts

• Commercial ventilation systems

• Industrial ventilation systems

• HVAC systems crossing fire compartments

The compact design and direct duct detection principle make the TSD 250 particularly suitable for cost-sensitive HVAC applications requiring reliable duct smoke detection without sampling tubes.

Location

Correct positioning of the TSD 250 is important to ensure reliable smoke detection performance.

The detector should be installed with the sensing probe positioned directly in the main airflow inside the ventilation duct.

To achieve optimal performance:

• Avoid installation close to bends, duct branches or sudden changes in duct dimensions

• Select locations with stable airflow conditions

• Ensure adequate access for inspection and maintenance

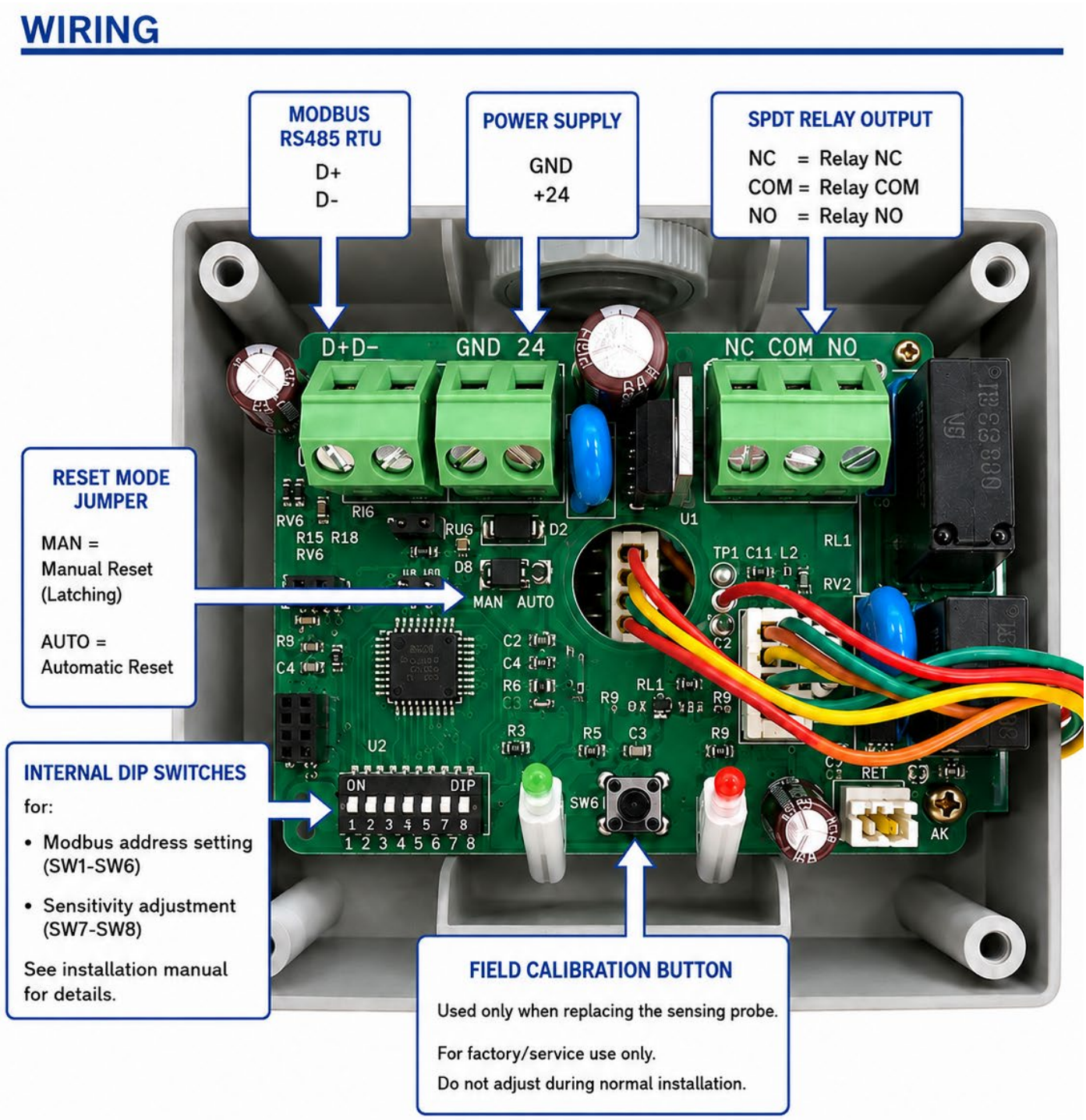
• Install the detector where smoke is expected to reach quickly in the event of a fire

For best detection performance, the sensing probe should be positioned parallel to the airflow direction.

In larger ventilation systems, installation in strategically selected duct sections may improve early smoke detection and system response.

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WIRING



Shielded cable recommended for RS485 communication.

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Installation & Operation Notes

Manual reset mode

When manual reset mode is selected, the detector must be reset after an alarm condition.

Automatic reset mode

In automatic reset mode, the detector resets automatically when the smoke condition is removed.

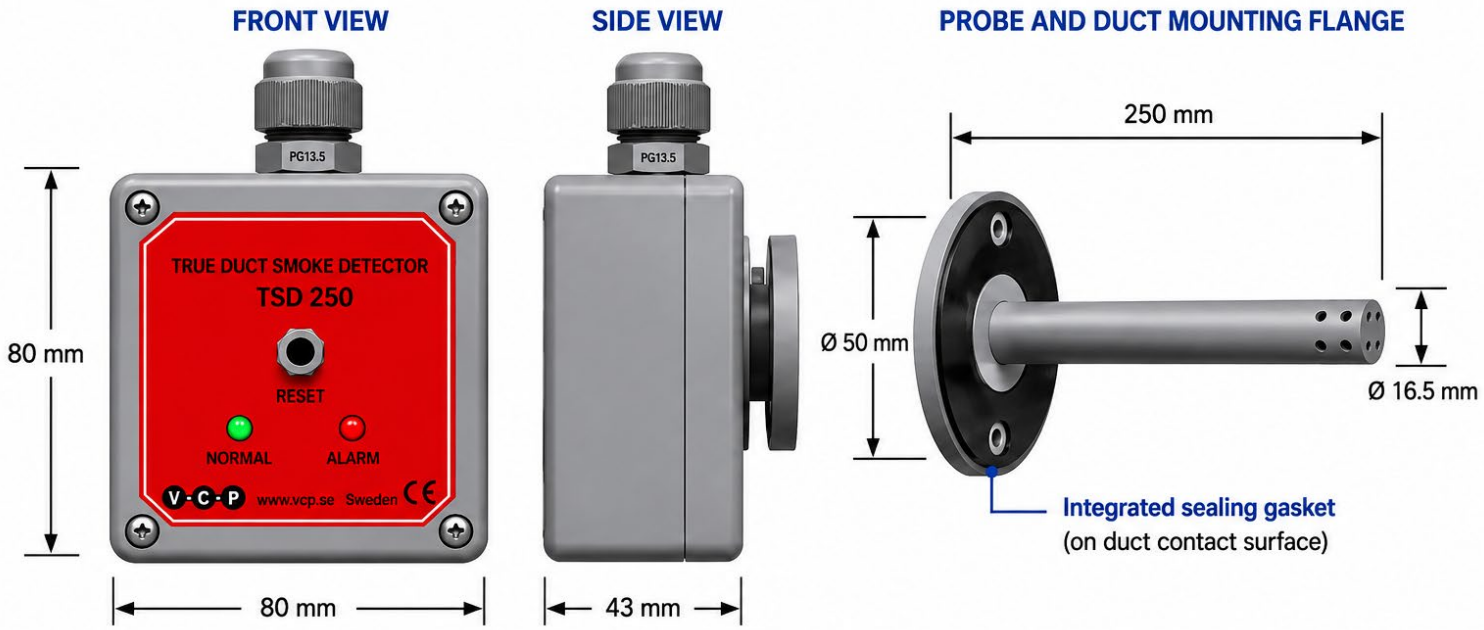
Installation

Install the detector in stable airflow conditions and avoid locations close to bends or duct branches.

Maintenance

Periodic inspection and cleaning of the sensing probe is recommended.

DIMENSIONS



Enclosure	80 × 80 × 43 mm
Probe length	250 mm
Probe diameter	Ø 16.5 mm
Mounting flange diameter	Ø 50 mm
Cable entry	PG13.5 cable gland



INTEGRATED SEALING GASKET

Duct mounting flange with integrated sealing gasket for improved sealing against the duct surface and reduced air leakage.

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Modbus RTU Communication

The TSD 250 duct smoke detector supports Modbus RTU communication via a two-wire RS485 interface.

The communication interface allows remote monitoring of the relay status and ON/OFF control of the relay.

Communication Settings

• Communication protocol: Modbus RTU
• Interface: RS485, 2-wire, half-duplex
• Baud rate: 9600 bps
• Data bits: 8
• Parity: None
• Stop bits: 1
• CRC: Modbus CRC-16
• CRC polynomial: 0xA001
• CRC initial value: 0xFFFF
• CRC transmission order: Low byte first
• Default Modbus address: 128 (0x80)
• Modbus address range: 128–191 (0x80–0xBF)

Modbus Address Configuration

The Modbus address is configured using DIP switches 1–6 on the main circuit board.

Modbus address = 128 + DIP-switch value

DIP-switch values:
• DIP 1: 1
• DIP 2: 2
• DIP 3: 4
• DIP 4: 8
• DIP 5: 16
• DIP 6: 32

Address examples:

• All switches OFF: 128 (0x80)
• DIP 1 ON: 129 (0x81)
• DIP 1 and DIP 2 ON: 131 (0x83)
• All switches ON: 191 (0xBF)

DIP switches 7–8 are used for smoke sensitivity adjustment and do not affect the Modbus address.

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MODBUS FUNCTIONS AND RELAY STATUS

Supported Modbus Functions

The TSD 250 supports the following Modbus functions:

• Function 0x03: Read relay status
• Function 0x05: Relay ON/OFF control

The register address for relay status and relay control is 0x0001.

Reading Relay Status

The relay status can be read using function code 0x03 (Read Holding Registers).

Request

ID 03 00 01 00 02 CRC

Request description:

• ID: Modbus device address
• 03: Read Holding Registers
• 00 01: Starting register address (0x0001)
• 00 02: Number of registers to read (2)
• CRC: Modbus RTU CRC-16 checksum

Response

ID 03 04 XX XX XX XX CRC

The response contains four data bytes representing the relay status.

Relay status values:

• 00 00 00 00: Relay OFF
• 00 00 00 01: Relay ON
The relay status is represented as a 32-bit value.

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RELAY CONTROL AND RS485 CONNECTION

Relay ON/OFF Control

The relay can be controlled using Modbus function code 0x05.

Relay control address: 0x0001

According to the manufacturer's protocol documentation, the following commands are used:

Relay ON:

ID 05 00 01 00 01 CRC

Relay OFF:

ID 05 00 01 00 00 CRC

Relay control values:

• 0x0001: Relay ON
• 0x0000: Relay OFF

Important:

The manufacturer's relay ON command uses 0x0001 instead of the standard Modbus function 0x05 value 0xFF00.

Compatibility with standard Modbus coil-writing commands has not been confirmed.

Note:

The current TSD 250 version uses 00 01 for Relay ON.

Support for the standard Modbus RTU value FF 00 has not been confirmed for this versio

CRC-16 Calculation

The TSD 250 uses the standard Modbus RTU CRC-16 calculation.

• Polynomial: 0xA001
• Initial value: 0xFFFF
• CRC transmission order: Low byte first, followed by high byte

The CRC is calculated over all transmitted bytes, excluding the CRC bytes themselves.

RS485 Connection

Connect the RS485 communication cable to the Modbus terminals on the TSD 250 main circuit board.

• Terminal +: RS485 positive
• Terminal −: RS485 negative

Use a suitable twisted-pair cable for RS485 communication.

Each TSD 250 must have a unique Modbus address within the RS485 network.

We reserve the right to make changes in our products without any notice which may affect the accuracy of the information contained in this leaflet.

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