



Product Manual

Manhole Cover Position Sensor MCPS-10T MCPS-10W

PROPRIETARY &
CONFIDENTIAL

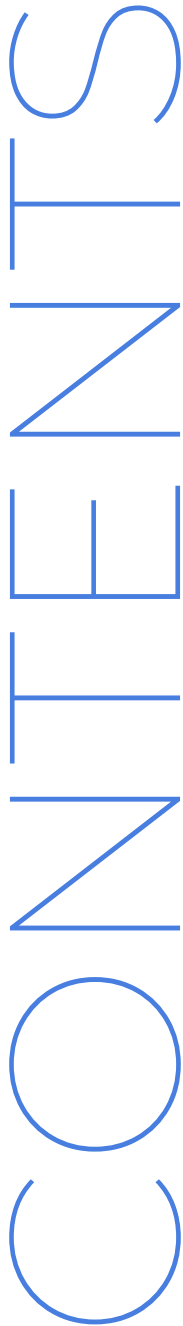
ABOUT THIS DOCUMENT

This manual contains instructions for installing and operating the Manhole Cover Position Sensor MCPS-10T and MCPS-10W.

The manual is intended for personnel familiar with the rules for performing installation work in the field of electronic and electrical equipment.

wanwave LTD. reserves the right to make changes to this document related to improving equipment and software, as well as to eliminate document deficiencies.

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1. BASIC INFORMATION ABOUT THE DEVICE AND ITS PURPOSE

1.1 General information

Full name of the device:

wanwave Manhole Cover Position Sensor MCPS-10T

wanwave Manhole Cover Position Sensor MCPS-10W

Abbreviated name of the device:

MCPS-10



1.2 Purpose and operating principles of the device

Manhole cover theft and displacement pose significant safety hazards and operational challenges for cities. **wanwave**'s Manhole Cover Position Sensor can monitor the status of manhole covers in real-time, providing alerts if a cover is opened, moved, or tampered with. This ensures prompt response to potential hazards, enhancing public safety and reducing maintenance costs.

The sensor facilitates automated, configuration-free delivery of messages and alerts regarding the status of the manhole cover via the unlicensed radio frequency range, transmitting them to the **wanwave** network gateway.

Out of the box, the MCPS-10 requires no configuration or server pairing, and it operates without requiring regular maintenance. All MCPS-10 sensors can be managed through the user's personal account on the **wanwave** portal.

The device features a robust, dust- and moisture-resistant, all-weather design, enabling direct installation on a manhole cover.

1.3 Compliance with requirements and standards

The sensor operates in any of the following unlicensed frequency ranges (the specific range will be set for you, in accordance with your territory's regulations, as part of the manufacturing process): 863.0-870.0 MHz, 920.0-925.0 MHz.

1.4 Delivery set

An MCPS-10 installation kit is supplied with the following items:

- MCPS-10 with pre-installed:
 - Internal **wanwave** LPWAN antenna;
 - Internal battery.
- Product passport.

1.5 Additional equipment

For operation of the sensor, the following is additionally required:

- Fastener kit for installing the sensor on the manhole cover.

2. OPERATING THE SENSOR

2.1 Purpose and Operating Principles

2.1.1 Purpose

The MCPS-10 sensor is specifically designed for continuous, automated monitoring of manhole covers. Its primary applications include detecting the opening of covers above underground utility inspection wells, such as:

- Waste systems
- Storm drainage systems
- Cable or pipeline sewer systems

2.1.2 Purpose

The sensor monitors the position of the manhole cover with a frequency of 10 Hz. It detects any change in the position of the cover based on the following criteria:

- A deviation of any angle by more than 3.5° sustained for 2 seconds.

When an opening is detected, the sensor sends an alarm message multiple times.

2.1.3 Standby Mode

After detecting an opening and transmitting an alarm, the sensor enters standby mode for 10 minutes.

- During this time, it does not monitor the cover's position nor send radio messages.

2.1.4 Channel Control Messages

The sensor automatically sends "channel control" messages to verify its operability:

- Sent at least once every 6 hours if no opening events occur.
- Configurable time intervals are set by the manufacturer.

2.1.5 Installation

The sensor is installed on the inner (lower) side of the manhole cover in a horizontal position.

2.1.6 Unique Identifier

Each sensor has a unique, unalterable hardware identifier (network address), programmed at the manufacturing stage.

- This identifier remains constant throughout the product's lifecycle.

2.1.7 Wireless Communication Security

The combination of data transmission technologies and message integrity checks ensures:

- Protection against denial of service attacks.
- Prevention of false messages.
- Continuous monitoring of product functionality.

2.1.8 Firmware Integrity

The sensor operates without an external operating system. Key security features include:

- Integrity checks are performed during firmware loading.
- Debugging modes, memory rewrite capabilities, and input/output ports are disabled.
- Protection against unauthorized modifications to firmware and memory data.

The sensor's robust design and secure communication protocols ensure reliable and secure operation in monitoring underground utility access points.

2.2 Design Options of the Sensor

2.2.1 Design Variants

The sensor is available in two physical designs:

- MCPS-10T - Tube design
- MCPS-10W - Washer design (low-height cylinder)

2.2.2 Fastening for Tube Design (MCPS-10T)

The tube-shaped sensor is mounted using:

- Non-metallic clamps
- Clips
- Holders



FIG. 1 MCPS-10T SENSOR IN THE FORM OF A TUBE

2.2.3 Fastening for Washer Design (MCPS-10W)

The washer-shaped sensor is secured using:

- Screws
- Self-tapping screws
- Installed through designated holes on the sensor body

These design options and fastening methods offer flexibility for different installation environments and requirements.



FIG. 2 MCPS-10W SENSOR IN THE FORM OF A WASHER

2.3 Switching On the Sensor

2.3.1 Activating the Tube Version (MCPS-10T)

To switch on or off the sensor in its tube design:

1. **Remove the Cover:** Detach the cover from the rear part of the sensor.
2. **Access the Switch:** Use the switch to turn the sensor on or off.
3. **Replace the Cover:** Secure the cover back onto the rear part of the sensor.

2.3.2 Activating the Washer Version (MCPS-10W)

The washer-shaped sensor is supplied in an "off but inactive" state. To activate it:

1. **Position the Magnet:** Bring a powerful neodymium magnet (minimum 25 mm diameter) to the sensor body, aligning with the Δ mark.
2. **Hold the Magnet:** Maintain the magnet's position for at least 10 seconds.
 - If the LED blinks rapidly, continue holding the magnet for another 10 seconds.
3. **Confirm Activation:** The sensor activates when the LED begins blinking slowly. Remove the magnet immediately after this occurs.

2.3.3 Deactivation

Deactivation is not supported for either version of the sensor.

2.3.4 Initial Operations After Switching On

Upon being switched on, both versions of the sensor perform the following steps:

1. Transmit "alarm" and "control channel" messages via the radio channel.
2. Enter an idle state for 10 minutes.
3. Begin monitoring the manhole cover position after the idle period.

This ensures the sensor is operational and ready for its designated functions.

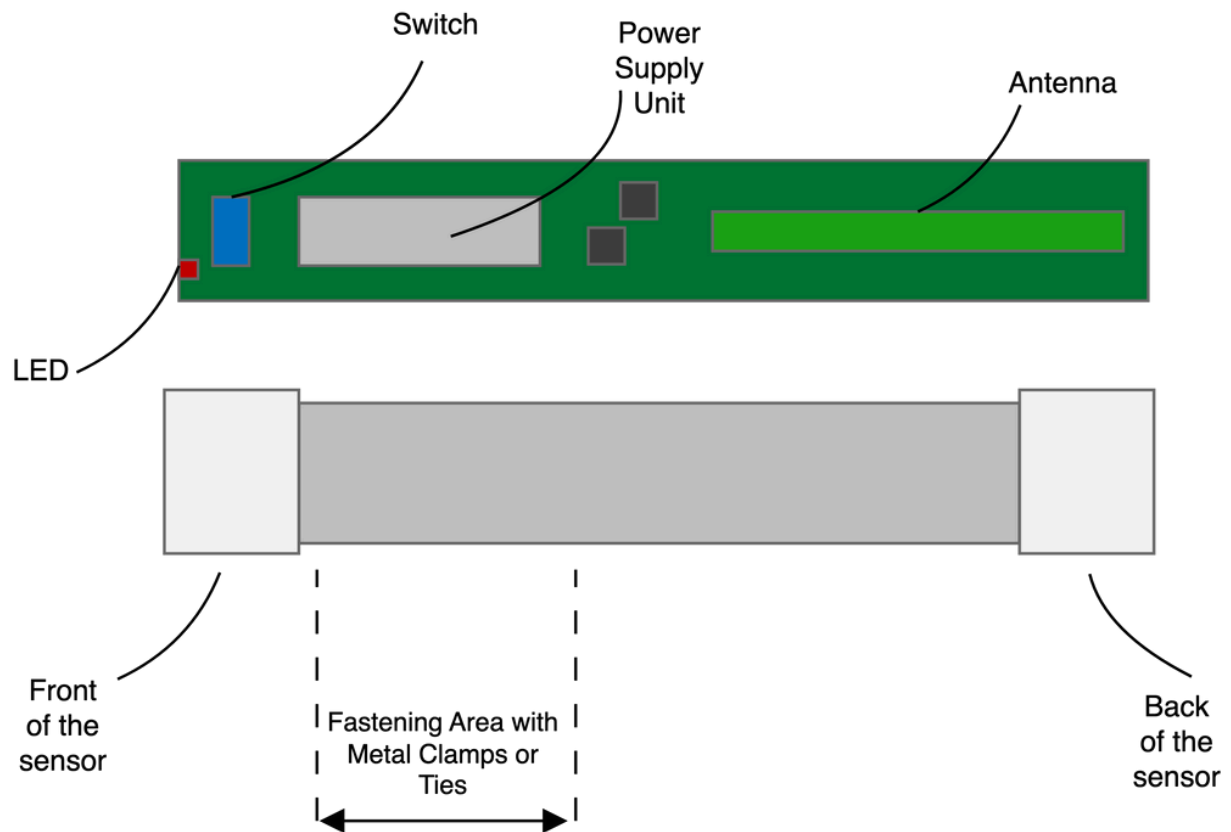


FIG. 3. MANHOLE COVER POSITION SENSOR - MCPS-10T

2.4 Sensor operating parameters

2.4.1 Configurable Parameters of the Sensor

The sensor allows for factory configuration of specific operational parameters to meet individual requirements:

1. Interval Between "Channel Control" Messages:

- Defines the time period for transmitting periodic "channel control" messages that confirm sensor functionality.

2. Angle Threshold (in degrees):

- Specifies the deviation angle of the manhole cover beyond which the sensor identifies an opening event.

3. Time Threshold (in seconds):

- Determines the duration for which the angle deviation must persist before being registered as a manhole cover opening event.

2.4.2 Default Factory Parameter Settings

When ordered, the sensors are pre-configured with the following default values:

- Interval for "Channel Control" Messages: 6 hours.
- Angle Threshold for Detection: 3.5°.
- Time Threshold for Detection: 2 seconds.

These default settings ensure reliable and consistent operation under typical conditions. For custom configurations, adjustments must be specified during the ordering process.

2.5 Routine Maintenance

2.5.1 Maintenance Frequency

The frequency of maintenance for the sensor is dependent on its operating conditions, including:

- Environmental factors such as dust or potential flooding.
- Contamination levels at the installation site.

2.5.2 Maintenance Procedures

Routine maintenance tasks include:

- **Inspecting Fasteners:** Ensuring all fastenings are secure and undamaged.
- **Cleaning the Sensor:** Removing foreign objects or debris from the area around the sensor to ensure optimal performance.

Proper and regular maintenance is essential for reliable sensor operation, especially in challenging environments.

3. INSTALLATION

3.1 Choosing a Placement Location

3.1.1 Sensor Attachment Requirements

The sensor is designed to detect the opening of a manhole cover when securely attached to it. For effective operation:

- **Attachment Location:** The sensor must be affixed to the inner (lower) side of the manhole cover.
- **Installation Integrity:** The sensor's attachment should maintain the integrity of its body, ensuring it remains undamaged during any actions involving the manhole cover.

Proper attachment is crucial for the sensor's accurate and reliable performance.

3.2 Installation Prerequisites and Instructions

3.2.1 Pre-Installation Check

- Ensure there is sufficient clearance between the manhole cover and any protruding parts on its inner surface.
- **Minimum Clearance:** At least 35 mm is required to prevent damage to the sensor body and maintain its tightness when the cover is closed.

3.2.2 Sensor Attachment

- **Attachment Location:** Affix the sensor to the inner (lower) side of the manhole cover.
- **Positioning:** The sensor must be installed in a horizontal orientation.
- **Fastening Requirements:** The sensor's attachment should be rigid, preventing any unintended displacement or movement during operation.

Proper preparation and secure installation are essential to ensure the sensor's longevity and performance.

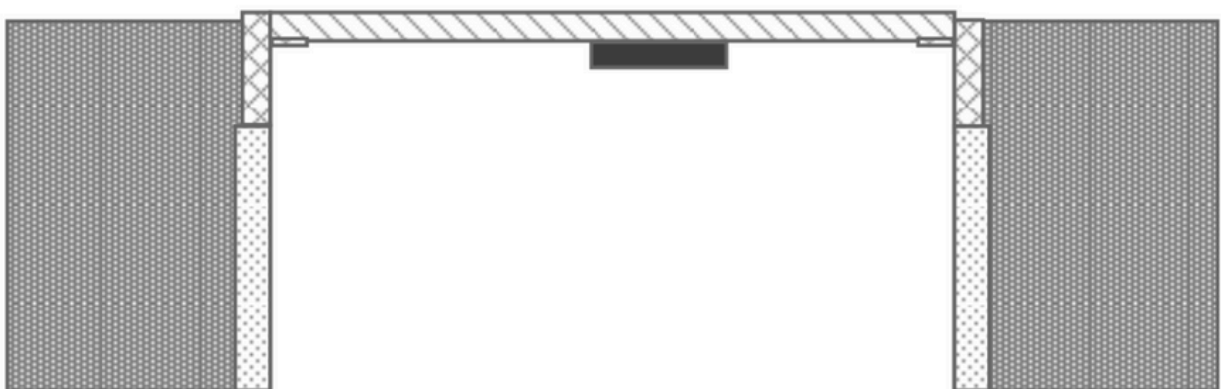


FIG. 4 MOUNTING THE SENSOR ON THE MANHOLE COVER

3.2.3 Sensor Attachment Methods

MCPS-10T - Tube-Shaped Sensor

- Attachment Materials: Use non-metallic clamps, clips, or holders for securing the sensor.

WARNING: Avoid covering the rear part of the sensor when using metal fasteners. The sensor must only be secured by its front part (refer to Fig. 3).

MCPS-10W - Washer-Shaped Sensor

- Attachment Materials: Secure the sensor using screws or self-tapping screws. Use the designated holes provided on the sensor body.

General Note

Fasteners are not provided in the delivery set and must be sourced separately.

Proper installation ensures the sensor's performance and avoids interference with its operation.

3.2.4 Installation Procedure

The installation of the sensor should be carried out in the following steps:

1. Determine the Installation Location:

- Choose a suitable location for the sensor's placement.

2. Check the Radio Signal:

- Ensure the selected location provides adequate radio signal strength for communication.

3. Turn On the Sensor:

- Follow the activation process outlined in section 2.3 to switch on the sensor.

4. Install the Sensor:

- Secure the sensor in place following the appropriate attachment method.

5. Check Functionality:

- Verify the sensor is operating correctly by checking its functionality after installation.

3.2.5 Testing the Sensor

To test the sensor after installation, perform the following steps:

1. Close the Manhole Cover:

- Ensure the manhole cover is fully closed.

2. Wait for 10 Minutes:

- Allow the sensor to remain in its idle state for at least 10 minutes.

3. Open or Lift the Manhole Cover:

- After waiting, open or lift the manhole cover to simulate an opening event.

4. Verify Message Reception:

- Check that a message indicating the sensor's status has been received in the user application or the [wanwave](#) portal, confirming the sensor is working properly.

4 TECHNICAL SUPPORT

4.1 Requesting support

For technical assistance, contact the **wanwave** support team at support@wanwave.com. Note that support will be provided based on the SLA terms provided at the time of purchase of the equipment.

To ensure a faster and more effective response, please include the following details in your inquiry:

- **Organization Name:** Provide the name of your organization and the contact information for the person requesting support.
- **Issue Description:** Clearly describe the nature of the issue and the time it occurred.
- **Device Information:** Include the device number.
- **Visual Documentation:** Attach relevant screenshots or photographs that illustrate the problem, if applicable.

Providing this information will help expedite the resolution process.

5 TECHNICAL SPECIFICATIONS

5.1 Manufacturer Information

Manufacturer

wanwave LTD.

Physical address

12 Woodlands Park, Bridgend, CF33 6DY, UK

Mailing address

12 Woodlands Park, Bridgend, CF33 6DY, UK

Contact information

info@wanwave.com

Technical support

support@wanwave.com

5.2 Main parameters and characteristics

The MCPS-10 manhole cover position sensor has the following parameters and characteristics:

#	PARAMETER	UNIT	VALUE
1	Autonomous operation time (not less than)	months	12
2	Operating temperature range	°C	From -40 to +80
3	Protection against external influences (in accordance with IEC 60529:2013)	Class	IP67
4	Power supply	Type	Autonomous
5	Nominal supply voltage	V	3.6
6	Battery Type	Type	14505
7	Dimensions (tube version)	mm	170x28x28
8	Dimensions (washer version)	mm	123x123x25
9	Frequency range	MHz	863.0 - 870.0 920.0 - 925.0
10	Transmitter output power	mW	25
11	Length of unique identifier	bit	32
12	Probability of non-delivery in the radio coverage area of a message about a manhole opening	-	10^{-3}

THANK YOU

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