



Product Manual

Perimeter Sensor

VFS10

PROPRIETARY &
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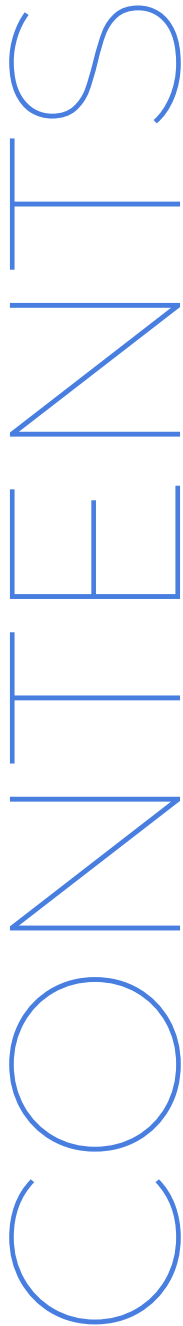
ABOUT THIS DOCUMENT

This manual contains instructions for installing and operating the Perimeter Sensor VFS10.

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 Perimeter Sensor VFS10

Abbreviated name of the device:

VFS10

1.2 Purpose and operating principles of the device

The **wanwave** Perimeter Sensor is an innovative perimeter security solution designed to detect and alert about crossings in real time. Each sensor panel operates autonomously on an internal battery, requiring no external wiring, making deployment quick and flexible even in remote or rugged terrains.

Spaced up to 50 meters apart, the panels create an invisible, yet highly effective, electronic fence capable of detecting the movement of individuals, groups, and vehicles. Upon detecting a perimeter breach, the sensor instantly transmits an alert via the **wanwave** protocol to a central command center or monitoring platform, ensuring rapid response capabilities. Its robust, weather-resistant design and minimal power requirements make it ideal for critical applications such as border security, restricted zone protection, and critical infrastructure monitoring. By leveraging the secure **wanwave** communication network, the Perimeter Sensor ensures reliable, long-range connectivity in areas where traditional solutions may fail, offering unparalleled performance and flexibility for advanced perimeter security.

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

A VFS10 installation kit is supplied with the following items:

- 1 x VFS10 Receiver
- 1 x VFS10 Transmitter
- Preinstalled internal **wanwave** LPWAN antenna
- Preinstalled internal battery
- Tube mount kit with 2 brackets
- Product manual

2. OPERATING THE SENSOR

2.1 Purpose and Operating Principles

2.1.1 Mode of Operation

VFS10 is a wireless perimeter security system that detects unauthorized crossings between two sensor curtains. The system can monitor areas up to 50 meters in length along protected perimeters.

The system establishes an invisible detection zone between two sensor curtains positioned at opposite ends of the monitored area. When a person or large animal crosses this zone, the system immediately transmits an alert through the **wanwave** network.

When a person crosses the detection zone, the signal undergoes modulation. The depth and shape of this modulation are influenced by various factors, including the individual's height and weight, the crossing location, the terrain of the area, and the speed of movement.

The sensor employs a multi-threshold operating algorithm, which significantly reduces false alarm notifications caused by external factors such as vegetation movement, small animals, precipitation, and electromagnetic interference.

The system consists of both transmitting and receiving units, designed with a dust- and splash-proof enclosure for reliable operation in various environmental conditions.

At a distance of 1 meter, the sensor's maximum average microwave energy flux density does not exceed $1 \mu\text{W}/\text{cm}^2$, ensuring compliance with safety standards for individuals not professionally exposed to microwave radiation.

2.1.2 Server Communication

The sensor ensures detection of the fact of a person or a large animal crossing the line between the two parts of the sensor and instantaneously sends a message via the LPWAN radio channel.

The sensor automatically transmits status messages wirelessly to the server at regular intervals. The data transmission interval is set by the manufacturer (see Section 2.2.1).

2.1.3 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.

2.1.4 Wireless Communication Security

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

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

2.1.5 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.

2.1.6 Power Supply

The sensor relies on an internal power source and can work autonomously for up to 2 years.

2.2 Sensor operating parameters

2.2.1 Default Factory Parameter Settings

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

- **Interval Between Service Messages:** 24 hours.

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

2.2.2 Detection Zone Specifications

Zone Dimensions

- Detection zone length: 5 to 50 m
- Detection zone width varies with section length:
 - 5 m section: ≤ 1 m wide
 - 25 m section: ≤ 1.5 m wide
 - 50 m section: ≤ 2 m wide
- Detection zone height: ≥ 2.5 m (at maximum zone length)

Installation Parameters

- No detection "dead zones" when transmitter and receiver are installed at 0.8-0.9 m height
- Maximum terrain unevenness within the detection zone: ± 0.3 m
- Minimum distance from engineering fences to the receiver-transmitter axis: 4 m (for 50 m section)

NOTE: Rejection zone can be reduced to 1 m, but other sensor parameters must be experimentally determined for each specific installation area.

Detection Performance

- Alarm triggered when a person crosses the detection zone at a speed of 0.1-10 m/s
- Recovery time after alarm: ≤ 3 seconds
- False alarm prevention: No alarms generated for small objects (≤ 0.2 m in linear dimensions) moving within the detection zone at a distance ≥ 1.5 m from the sensor

2.2.3 Operational Specifications

Environmental Performance

- Designed for continuous 24-hour operation in open space
- Operating temperature range: -50°C to +80°C
- Relative humidity tolerance: Up to 98% at +35°C
- IP-67 case protection rating

Weather Resistance

The sensor maintains normal operation without false alarms during:

- Rain and snow
- Solar thermal radiation exposure
- Wind speeds up to 30 m/s
- Vibration (metro, railway, tram, etc.)
- Snow cover up to 0.5 m (without adjustments)
- Grass/vegetation up to 0.3 m in height

Electrical Protection

- Transmitter and receiver input circuits protected against electrical interference (including lightning) up to 900 V
- For protection against interference exceeding 900 V, external lightning protection required

Alarm Conditions

The sensor generates alarm notifications when:

- Supply voltage is lost or drops below 3 V
- Transmitter or receiver failure occurs

Product Lifespan

- Average service life: 8 years

3. INSTALLATION

3.1 Choosing a Placement Location

3.1.1 Support Placement Options and Requirements

1. Mark the perimeter where supports will be installed. Metal or asbestos-cement pipes with 70-90 mm diameter are recommended as supports. Embed supports at least 0.5 m into the ground. Each support can accommodate two identical blocks from adjacent sections (e.g., two RECEIVERS or two TRANSMITTERS).
2. When installing the sensor along the top of a fence, weld or mechanically secure the support to the fence for increased stability. The support should extend at least 0.3 m above the fence line.
3. In high-snowfall areas (over 1 m), ensure the above-ground portion of the support is at least 1500 mm tall. In areas with minimal snowfall, a minimum height of 1000 mm is sufficient.
4. Supports may be installed using concrete footings. Alternative mounting options—such as fence attachment, building wall installation, etc.—should be determined by the user based on security requirements. Note that fences may alter the detection zone configuration, so sensor performance will vary depending on the specific installation location.

3.1.2 Transmitter and Receiver Block Installation

1. Mount the units at a height of 0.8-0.9 m above ground level.
2. Install one Transmitter unit and one Receiver unit on the supports using the provided brackets and clamps.
3. After installation, orient the units so that the antennas face the protected area, ensuring proper radiation direction.

3.2 Site Preparation Requirements

3.2.1 Terrain Requirements

1. The site surface must be leveled, with maximum deviation from the plane passing through the receiver and transmitter support bases not exceeding ± 0.3 m.
2. Minimum separation zone from engineering fences to the transmitter-receiver axis: 2 m.

NOTE: If terrain deviation exceeds ± 0.3 m and the rejection zone is less than 2 m, sensor performance may deteriorate. Suitability must be determined through trial operation.

3. Maximum site slope must not exceed 30 degrees.

3.2.2 Clearance Requirements

1. The site must be free from swinging gate leaves, bushes, tree crowns, etc. at minimum distances of:
 - * 1 m from axis for site lengths up to 5 m
 - * 2 m from axis for site lengths up to 50 m
2. Individual stationary objects (poles, tree trunks without lower branches, etc.) are permitted at minimum distance of 1 m from the transmitter-receiver axis.
3. Maximum vegetation height: 0.3 m
4. Maximum snow cover height: 0.5 m

3.2.3 Additional Considerations

Special Considerations for Vertical Surfaces

Vertical surfaces (fences, walls, vegetation rows) located along the site closer than 20 m from the axis affect sensor operation due to the antenna's wide directional pattern.

Critical Installation Scenarios

Special attention is required when installing:

*** Along 2-2.5 m high fences (concrete, metal mesh, wet wood):**

- Closer than 5 m for 40-50 m section lengths
- Closer than 2 m for 30 m section lengths

*** Along walls exceeding 4 m height:**

- Closer than 20 m with section lengths over 20 m

*** Along rows of bushes or trees:**

- Closer than 20 m with section lengths over 25 m

Traffic Considerations

* Vehicle traffic (especially trucks) closer than 20 m from the axis may cause false alarms

* Presence of vertical surfaces increases false alarm probability

Vegetation Management

* When installing along vegetation rows closer than 20 m from the axis, wind-swaying branches may trigger alarms

* Worst placement is 10 ± 5 m from vegetation with 30-50 m section length

* To minimize impact:

- Reduce section length to 20-25 m, or
- Reduce the distance between section axis and vegetation to 2 m

3.3 Sensor Setup & Activation

1. Verify that the sensor is correctly positioned.

2. Power on the detector by pressing and holding the button on the front panel for at least 6 seconds until the green LED illuminates.

3. Perform test crossings throughout the protected area. These should be conducted in both standing and crouching positions at various distances from the transmitter and receiver. Begin testing in the middle of the protected area.

4. After each crossing, move 1-2 m away from the detection zone and wait 5-7 seconds before the next test to prevent interference between consecutive tests.

5. Cross the detection zone at speeds ranging from 0.1 to 10 m/s, moving perpendicular to the detection zone axis. The person conducting the test should match the standard target parameters: weight of 50-90 kg and height of 165-180 cm.

6. Conduct test crossings along the entire length of the protected area, paying special attention to challenging areas such as:

- Depressions
- Elevations or overpasses
- Near fences, buildings, or tree trunks within the detection zone

7. After installation, conduct a 2-3 day trial operation to identify and resolve any installation or configuration issues.

WARNING: It is prohibited to carry out installation and maintenance work during a thunderstorm or in a pre-thunderstorm situation.

IMPORTANT: Only persons who have undergone special training and passed an exam on safety precautions are allowed to perform installation, maintenance and repair work on the sensor.

3.4 Routine Maintenance

3.4.1 Maintenance Requirements

Sensor maintenance must be performed only by specially trained and instructed personnel.

3.4.2 Inspection Schedule

Monthly Tasks

1. Conduct external inspection of sensor units
2. Check condition of the receiver and transmitter installation area
3. Verify:
 - No dust, dirt, snow, or ice on the receiver and transmitter antenna radiation surfaces (clean if necessary)
 - No foreign objects in the receiver and transmitter installation areas

Quarterly Tasks

1. Complete all monthly inspection items
2. Inspect condition of cables and cable connections

3.4.3 Seasonal Maintenance

Vegetation Management

Monitor grass height in the sensor's working area. If vegetation exceeds 0.3 m in height, mow or otherwise remove excess growth.

Snow Management

Be aware that changes in snow cover height may cause false alarms due to signal reduction at the receiving unit. When this occurs:

- Clear snow from the detection zone, or
- Adjust the installation height of the receiver and transmitter antennas

IMPORTANT: After any height adjustment, verify sensor functionality using the previously specified testing procedure (section 3.2).

3.5 Storage Rules

1. Store sensors in their original packaging.
2. Maintain warehouse conditions within the following parameters:
 - Temperature: +5°C to +30°C
 - Relative humidity: Not exceeding 85%
3. Do not expose sensors to aggressive environments during storage.

3.6 Transportation

Packaged sensors may be transported:

1. Using any type of transport, including air (in sealed compartments)
2. In covered wagons, holds, or covered vehicle bodies
3. For distances up to 10,000 km

NOTE: Ensure all transportation occurs in covered/protected conditions to maintain product integrity. The boxes must be stacked in such a way as to prevent them from moving or falling when pushed or hit .

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 sensor has the following parameters and characteristics:

#	PARAMETER	UNIT	VALUE
1	Autonomous operation time (not less than)	months	18
2	Operating temperature range	°C	From -50 to +80
3	Protection against external influences (in accordance with IEC 60529:2013)	Class	IP67
4	Power supply	Type	Internal
5	Internal power supply	V	3.6
6	Battery Type	Type	ER 34615
7	Frequency range	MHz	863.0 - 870.0 920.0 - 925.0
8	Transmitter output power	mW	≤25
9	Length of unique identifier	bit	32
10	Dimensions (control unit)	mm	200x200x60

THANK YOU

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