

Waterproof Communication Device for Separation Type Manhole Antenna

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Abstract

In order to reduce the risk of flooding in cities due to the overflow of sewers and rivers, and to create a business of urban disaster prevention solutions using Information and Communication Technology (ICT), we have been working on the development of manhole antenna technology that incorporates a wireless communication device and an antenna into manhole cover and transmits “inside the manhole” information.

Our manhole antenna measures, gathers and monitors sewer flow (pipe water level information) necessary for cloud services such as urban flood risk notice, and provides such data to a cloud server. The management of collected data and settings, such as the measurement period, can be performed on various communication devices via the Internet.

Conventionally, communication device and battery were installed inside the iron cover. In order to improve the maintenance and management of manhole antennas, we separated the communication device and battery and put them inside a water resistance case. Thus, we developed a waterproof communication device.

1 Preface

To achieve real-time visualization of sewer flow (pipe water level information), we have been working on the development of manhole antenna technology in collaboration with Tokyo Metropolitan Sewerage Service Corporation and HINODE, Ltd.

We have been working to create an urban disaster prevention solutions business using our conventional model manhole antennas, but the maintenance and management of manhole antennas, which are installed in large numbers in the system, has become an issue.

To solve the above issue, this paper introduces a waterproof communication device that maintains water resistance while improving the visibility of the operation display, the operability of the switches, and the workability of battery replacement.

2 Overview of Waterproof Communication Device

The waterproof communication device, hereinafter referred to as “this device”, is a device that

reduces the mass of the iron cover of the conventional manhole antenna, hereinafter referred to as “conventional device”, and improves maintenance. Fig. 1 shows the external appearance of this device. This device consists of a TELEMOT box that stores the TELEMOT, which is a communication device, and a battery box that stores the battery.

By separating these two boxes from the iron cover and fixing them to the inner wall of the manhole, the iron cover mass was reduced from 65 kg to 43 kg. TELEMOT box and battery box have IP68 (static pressure 0.1 MPa, 1 hour or more) and have the same waterproof performance as the conventional device.

3 Features of this Device

3.1 Improved Visibility of the Communication Device Operation Display LED

Fig. 2 shows the outline drawing of TELEMOT box. The communication device is equipped with an LED that displays the operation status, such as communication in progress or failure. In the conventional device, the communication device is mounted

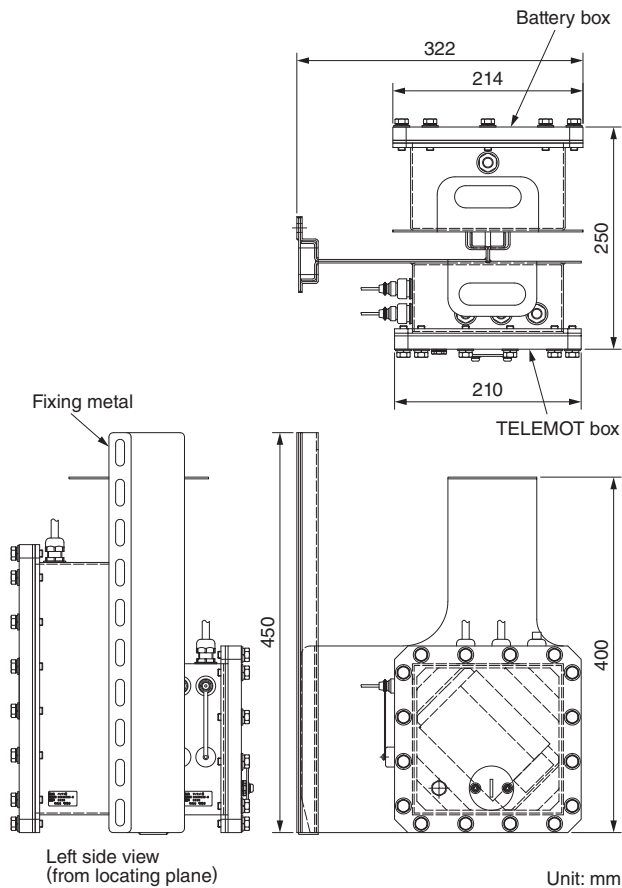


Fig. 1 Outline Drawing of Waterproof Communication Device for Separation Type Manhole Antenna

The outline drawing of waterproof communication device for the separation type manhole antenna is shown.

inside a metal lid that has been waterproofed by caulking, making it difficult to visually check the LED. In this device, the LED can be visually checked from the outside by making part of TELEMOT box lid transparent, making it easier to check the operation status of the communication device.

3.2 Improved Operability of Communication Device Power Switch

When directly operating the communication device in the conventional device, it was necessary to remove the waterproof metal lid. In addition, after operation, the waterproofing treatment was performed again, but there was a risk of the waterproof performance decreasing due to on-site construction. In this device, a lid for operating the power switch is installed on part of TELEMOT box lid. By removing this lid, the power switch of the communication device can be directly touched, improving operability.

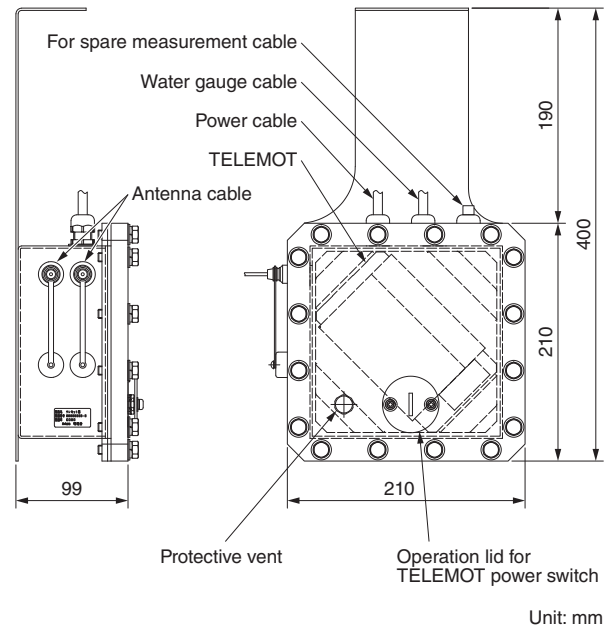


Fig. 2 Outline Drawing of TELEMOT Box

The outline drawing is shown for separation type manhole antenna, waterproof communication device, and TELEMOT box.

In addition, this lid uses an O-ring to ensure water resistance, so the structure does not cause a decrease in water resistance when it is opened or closed.

3.3 Integration of Atmospheric Release Function by Built-in Vent

When measuring water levels by the conventional device, it was necessary to prepare a dedicated measurement box with an atmospheric release function separate from the iron lid. In this device, the protective vent is installed in TELEMOT box, integrating the atmospheric release function and simplifying the device configuration.

3.4 Improved Workability when Replacing Battery

Fig. 3 shows the outline drawing of the battery box. In this device, the battery is separated from the iron lid and installed in the battery box alone. When replacing the battery, it is only necessary to remove the box weighing about 10 kg from the manhole, which reduces the physical burden on the worker compared to the total mass of about 65 kg when installed inside a conventional iron lid. In addition, the lid is attached with a hexagonal bolt, eliminating the need for waterproof treatment by caulking, which was previously performed.

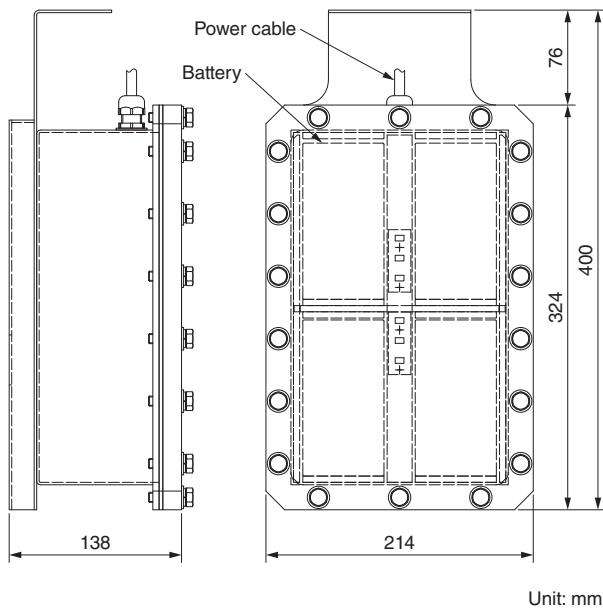


Fig. 3 Outline Drawing of Battery Box

The outline drawing is shown for separation type manhole antenna, waterproof communication device, and battery box.

4 Postscript

We introduced a waterproof communications device for use with the separation type manhole antennas.

By utilizing this device and through partnerships, we will respond to recent social issues, such as urban disaster prevention solutions and solutions for aging water pipelines.

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