MANTHINK / INDUSTRIAL IoT

GDO51

LoRaWAN Gateway

Standardized Device Manual

VERSION	DOCUMENT
2.02	Device Manual

Revision History

Version	Change Description
2.02	Current published version

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Document version: 2.02

1. Product Description

GDO51 is an outdoor multi-channel high-performance gateway designed by ManThink for LoRaWAN systems. It is not only suitable for the construction of various low-power networks such as cities, factories, and parks, but also suitable for data collection and transmission in harsh environments such as deserts, grasslands, and Gobi. Due to its strong processing power and flexible secondary development environment, it can also play an important role in the next generation of technology waves such as edge computing, AI, and big data.

2. Main features

- Supports built-in TKL (including LoRaWAN NS and IoT platform)
- Supports historical data storage
- Supports Thing Model
- Supports Dashboard
- IP67 protection level
- Support POE, Type-C power supply
- Support 4G, WIFI, Ethernet
- 8 frequency bands (maximum support 16 frequency points)
- maxium support 32(default 16) demodulators capable of processing 32 packets simultaneously

(16 × SF5-SF12 LoRa®demodulators; 16 × SF5-SF10 LoRa®demodulators)

- maxium 130 (default 65) channels (each channel configuration includes distinct SF, BW, and frequency points; BW = 125 kHz, totaling 65 channels)
- Receiver sensitivity: -141 dBm (SF = 12, BW = 125 kHz)
- Maximum RF transmit power: suffix –2, 22 dBm maximum
- Support US902, AU915, AS923, EU868, EU433, CN470 LoRaWAN standard
- External SIM card and debugging interface for easy maintenance and repair
- Seamless connection to LoRaWAN netservers such as TTN, ChirpStack, and Basicstaion
- Supports remote maintenance and upgrades
- Web-based visualization and friendly configuration

3. Electrical parameters

Category	Parameter	Specification
COMPUTE AND STORAGE		

Category	Parameter	Specification
	SOC	LS1012A 64-bit ARM Cortex-A53 800MHz 2W
	Memory type/rate	Support DDR3L 1066 MHz
	Memory capacity	Memory:512MB
	Storage	≥ 16 GB eMMC

Category	Parameter	Specification
SOFTWARE		
	Platform	Built-in NS and IoT platform (with integrated TKL)
	Protocol/platform support	ThinkLink, ChirpStack, TTN, Basic Station, and GWMP protocols
	Databases	PostgreSQL and Redis
	Historical data	historical data storage
	Leaf mode	Leaf mode
	Thing Model	Thing Model
	Application data parsing	application data parsing
	Visualization	Dashboard

Category	Parameter	Specification
LORA		
	Operating frequency bands	CN470: 470–510 MHz EU868: 863–870 MHz EU433: 433–434 MHz AS923: 920–928 MHz US902: 902–928 MHz AU915: 915–928 MHz
	Communication rate	292bps to 15.625kbps
	Spreading factors	supports SF5 to SF12
	Transmit power	Suffix –2: 22 dBm maximum
	Receiver sensitivity	-141 dBm (SF = 12, BW = 125 kHz)
	Antenna type	Omnidirectional
	Frequency points	8 (maximum 16)(BW = 125 kHz)

Category	Parameter	Specification
	Demodulators	16 (maximum 32)
	Concurrent packets	16 (maximum 32) packets simultaneously
	Demodulator composition	8(maximum 16) × SF5-SF12 LoRa®demodulators; 8 (maximum 16) × SF5-SF10 LoRa®demodulators
	Channels	65(maximum 130)
	Channel definition/note	each channel is defined by a unique combination of SF, BW, and frequency point; BW = 125 kHz, totaling 65 channels
	Operating mode	Half-duplex
	Single-channel bandwidth	125KHz or higher

Category	Parameter	Specification
NETWORK AND BACKHAUL		
	Ethernet	1000M/100M
	4G uplink	The gateway uses CAT1 module for 4G uplink by default
	LTE-FDD bands	B1/3/5/8
	LTE-TDD bands	B34/38/39/40/41
	4G deployment note	If the operator's frequency band in the planned deployment area is not within the above, please contact ManThink technical personnel to replace the appropriate 4G module.

Category	Parameter	Specification
PORTS AND TIMING		
	USB Type-C configuration	USB-TypeC
	Ethernet configuration	Ethernet
	Wi-Fi configuration	WiFi
	SIM card interface	nano SIM external interface (no need to open the cover for replacement)
	Timing	GPS

Category	Parameter	Specification
POWER		
	Power supply	POE(48V)
	Power consumption	5W

Category	Parameter	Specification
ENVIRONMENT AND ENCLOSURE		
	Operating temperature	-40℃ ~ 70℃
	Operating humidity	0% ~ 95%RH
	Water and dust resistance	IP67
	Weight	1.2KG
	Dimensions	164x124x50mm
	Installation method	Pole or wall mounting

4. Accessories List

5. Gateway Body

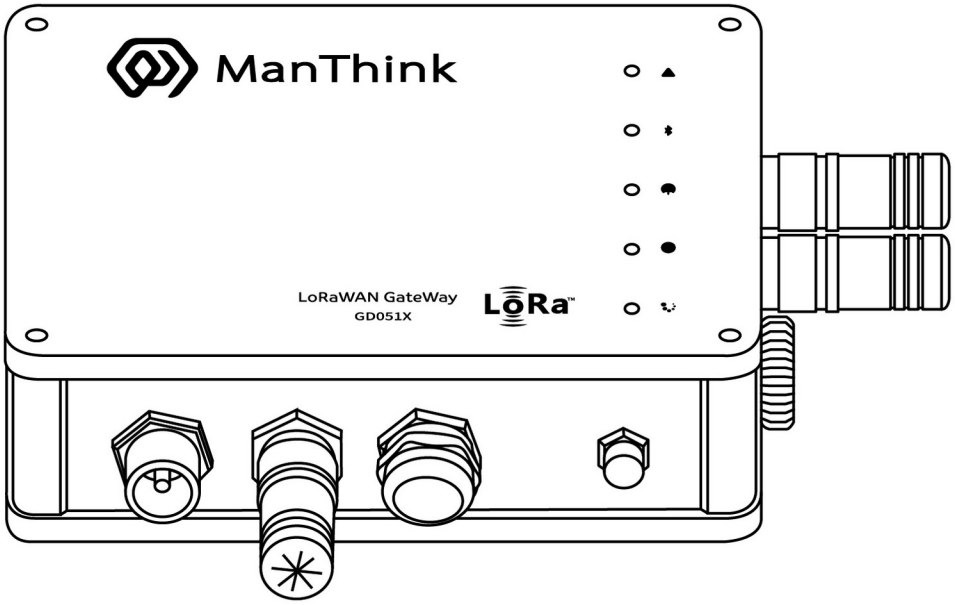

Figure 5. Gateway Body

6. Product Dimensions

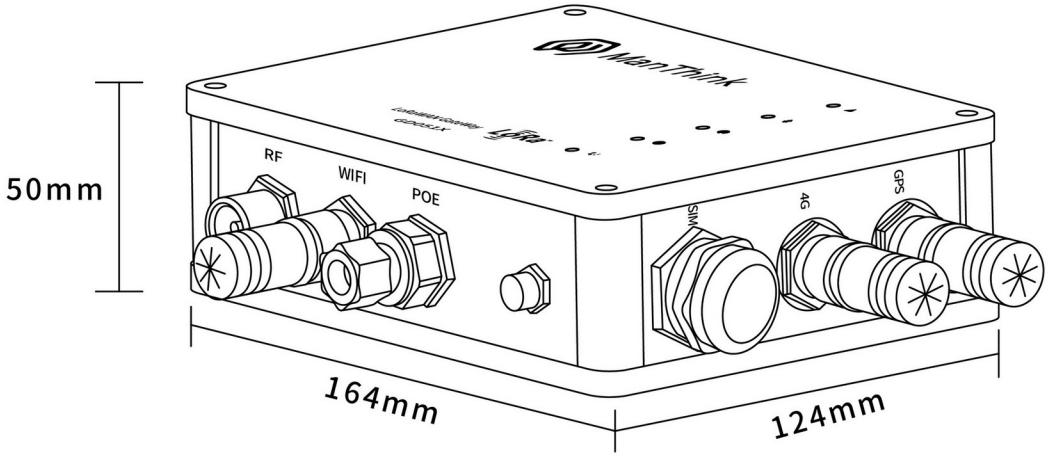

Figure 6. Product Dimensions

7. Interface Description

Interface Name	Description
RF	LoRa Antenna Interface
WIFI	WIFI Antenna Interface
POE	POE Power Interface
SIM	SIM Card Slot
4G	4G Antenna Interface
GPS	GPS Antenna Interface

8. Indicator Light Description

Indicator	Color / network	Light states and meanings
Running indicator	—	**Steady on:** The system is starting. **Off:** Basic system startup is complete and application processes are starting. **Flashing at 1 Hz:** The system is running normally.

Indicator	Color / network	Light states and meanings
Network indicator	Blue/wired network Green/4G network	**Blue, flashing at 1 Hz:** The wired network connection is normal. **Blue, flashing every 500 ms:** The wired network connection is abnormal. **Blue, flashing rapidly:** Network configuration is in progress. **Green, off:** No 4G module is installed. **Green, steady on:** A 4G module is installed, but no SIM card is inserted. **Green, flashing irregularly:** Data is being exchanged over the 4G network.
LoRa data transceiver indicator	Green Blue	**Green, flashing:** A LoRa data packet is being transmitted. **Blue, flashing:** A LoRa data packet is being received.
LAN status light	Red Blue	**Red:** System control status. **Blue:** Wi-Fi connection status.
Fault indicator	—	**Flashing rapidly:** The system is in the second startup phase. **Off:** No system fault is present. **Flashing:** The system has detected a fault.

9. Product Model

9.1 Model example

GDO518–AG–AS923–N–2

9.2 Model component breakdown

- **GDO518: product series and RF band.**
  - GDO51 identifies a fifth-generation outdoor LoRaWAN gateway.
  - 8 identifies the 800 MHz-and-above RF version for EU868, AS923, AU915 and US902.
  - Other band option: 4 identifies the 400 MHz RF version for EU433 and CN470.
- **-AG: LoRa architecture and 4G configuration.**
  - A identifies one LoRa antenna, 8 frequency points, 65 channels and half-duplex operation.
  - Other LoRa architecture option: D identifies two LoRa antennas, 16 frequency points, 130 channels and full-duplex operation.
  - G identifies an integrated 4G module.
  - Other 4G option: N identifies a configuration without a 4G module.
- **-AS923: LoRaWAN regional standard.**
  - AS923 means that the gateway supports the LoRaWAN AS923 regional parameters.

    - Other regional codes are `CN470`, `EU433`, `EU868`, `AU915` and `US902`; `US902` denotes the LoRaWAN US915 (902–928 MHz) regional parameters.
- **-N: default version.**
    - N identifies the default version.
    - Other values are reserved for customized or special versions.
- **-2: transmit-power version.**
    - 2 identifies a maximum transmit power of 22 dBm.

9.3 Complete model meaning

The complete meaning of `GD0518–AG–AS923–N–2` is:

This is a fifth-generation outdoor LoRaWAN gateway in the 800 MHz-and-above RF class. It uses one LoRa antenna, 8 frequency points, 65 channels and half-duplex operation, includes a 4G module, supports the LoRaWAN AS923 regional standard, uses the default version code N, and has a maximum transmit power of 22 dBm.

10. Gateway Installation

Note: It is not necessary to disassemble the Gateway shell during installation.

11. Installation Direction

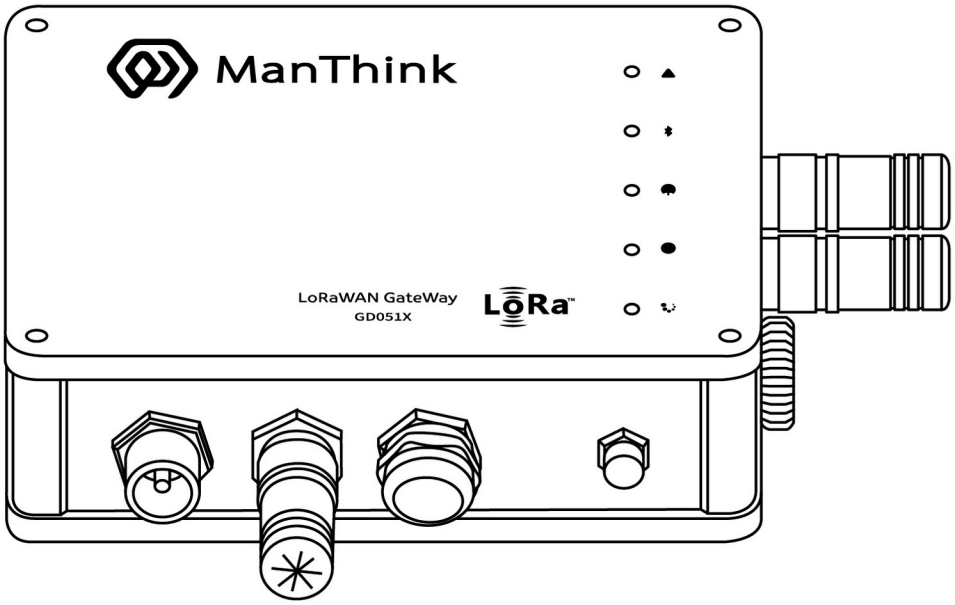

Figure 11. Installation Direction

Note: The front view of the product is shown in the picture above. GPS and 4G antenna interface to the right, WiFi antenna interface down. During the installation process, please ensure that the product orientation is consistent with the above figure for correct installation.

12. Backplane Installation

- Flip the gateway to the direction shown in the figure and confirm that the backplane is tightly connected to the Gateway.
- Align the screw with the screw hole and use a screwdriver to turn it clockwise until the screw cannot turn.

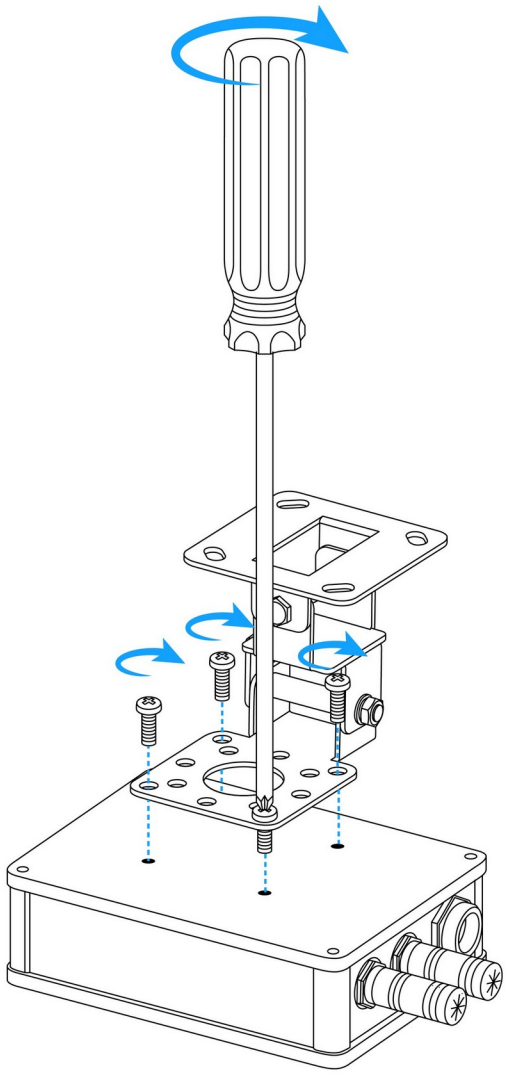

Figure 12. Backplane Installation

13. Network cable installation

- **Thread the waterproof plug into the network cable from right to left in the following order, and assemble parts 1, 2, 3 and 4 tightly**
- **Insert one end of the network cable crystal head into the Gateway POE interface**
- **Move the assembled waterproof plug part to the direction of the Crystal Head, and screw it on the POE interface to ensure that the assembled waterproof plug is tightly connected with the POE interface**.

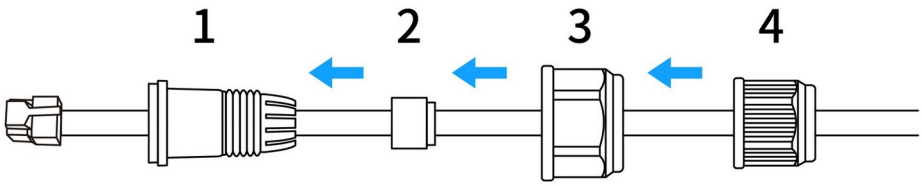

Figure 13. Network cable installation

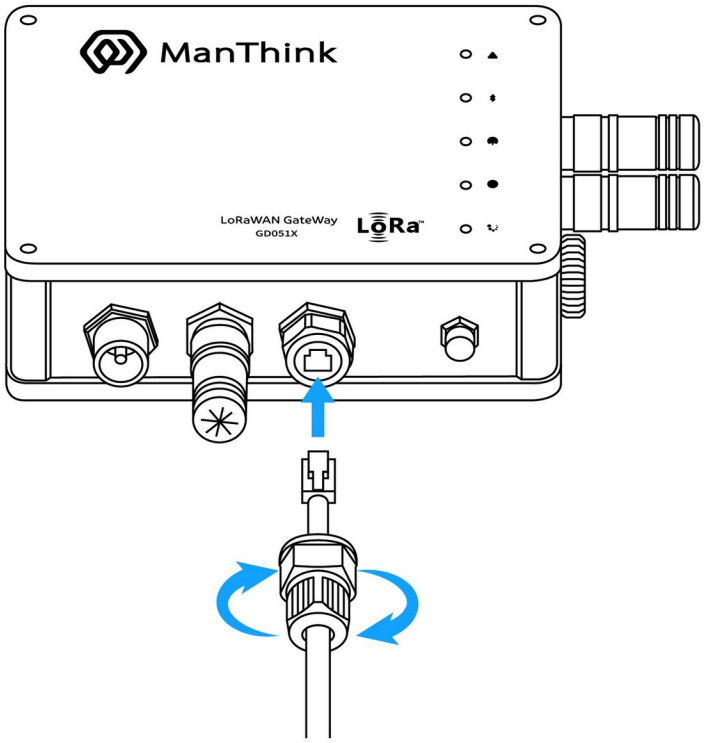

Figure 13. Network cable installation

14. SIM card installation

- **Unscrewing the waterproof cover on the SIM interface**
- **Keep the SIM card metal patch position towards the TYPE-C interface**
- **Insert the SIM card into the card slot and tighten the waterproof cover**.

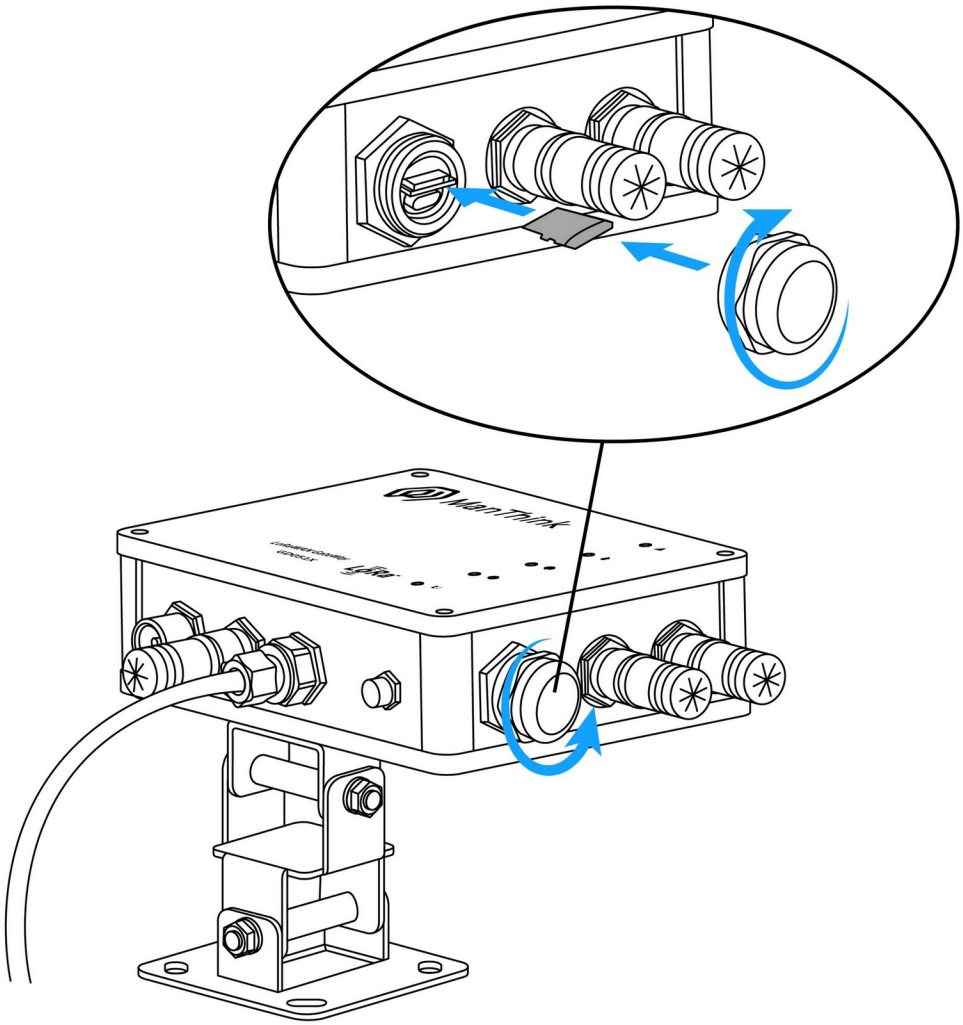

Figure 14. SIM card installation

15. Power connection

- OUT port connection gateway POE interface (power supply)
- The IN port is connected to a switch or router (network supply). If there is 4G, there is no need to connect the IN interface.

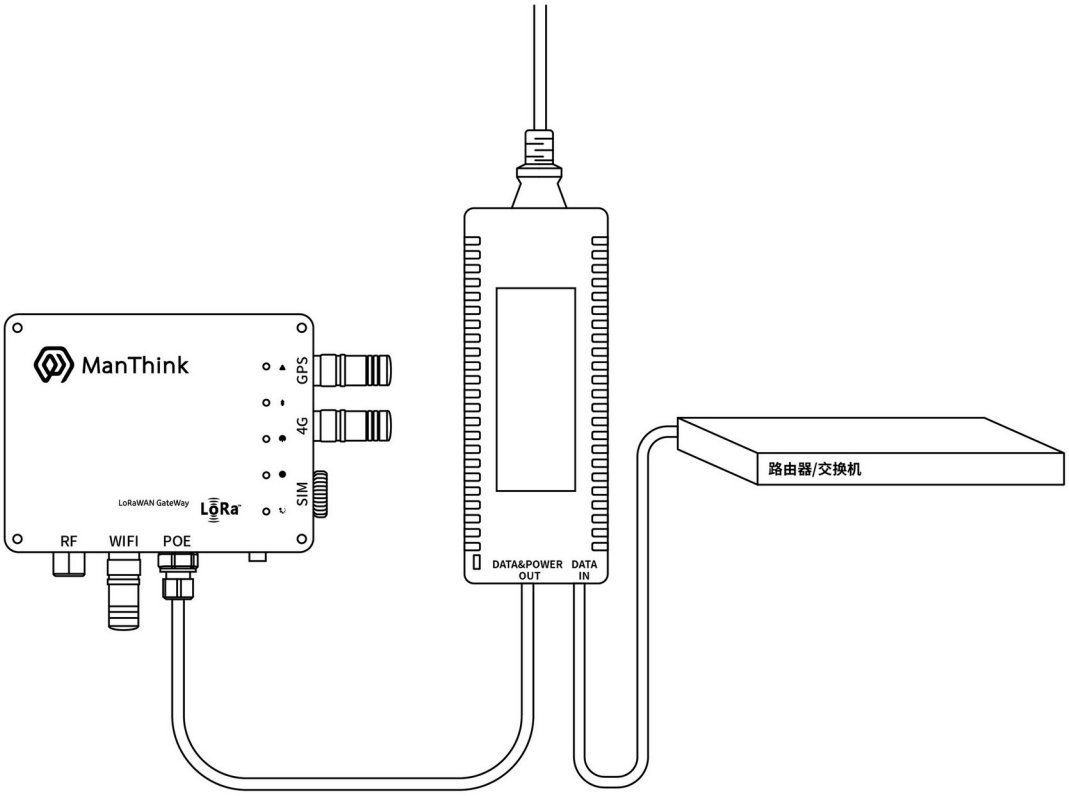

Figure 15. Power connection

16. FRP antenna installation

- **Connect the LoRa antenna to the Gateway RF interface**

Note: This step is required for the optional lora antenna.

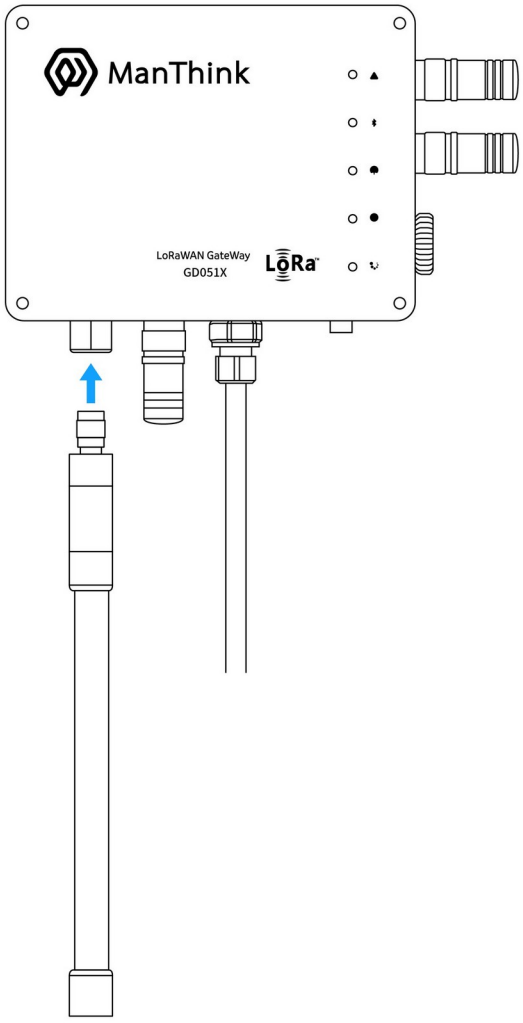

Figure 16. FRP antenna installation

17. Gateway fixed

17.1 Wall-mounted fixed

- **Install with the Gateway face up (Figure 1)**
- **Four holes corresponding to the holes of the back plate bracket are made in the wall, and then the expansion bolts are driven in (the positions of the four holes of the back plate bracket can be marked on the wall first)**
- **Pass the expansion screw through the back bracket and screw in the expansion screw with a tool.**

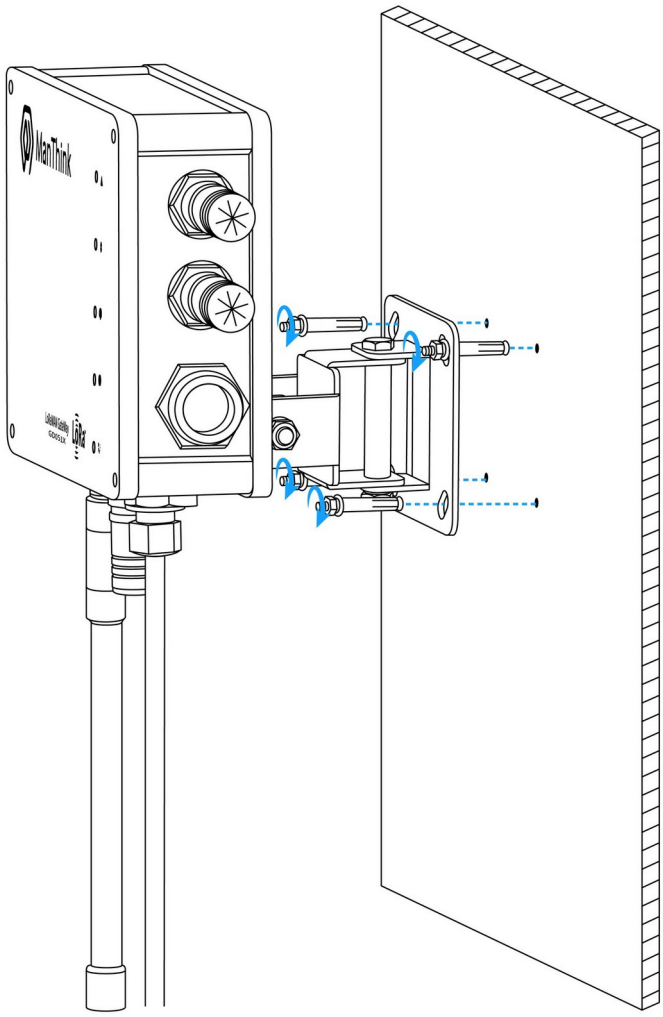

Figure 17.1 Wall-mounted fixed

17.2 Holding Rod fixing

- **Install with the Gateway face up (Figure 2)**
- **Confirm that the pole diameter is between 30mm-52mm**
- **Combine the holding Rod clamps according to the position shown in the figure, and tighten the screws.**

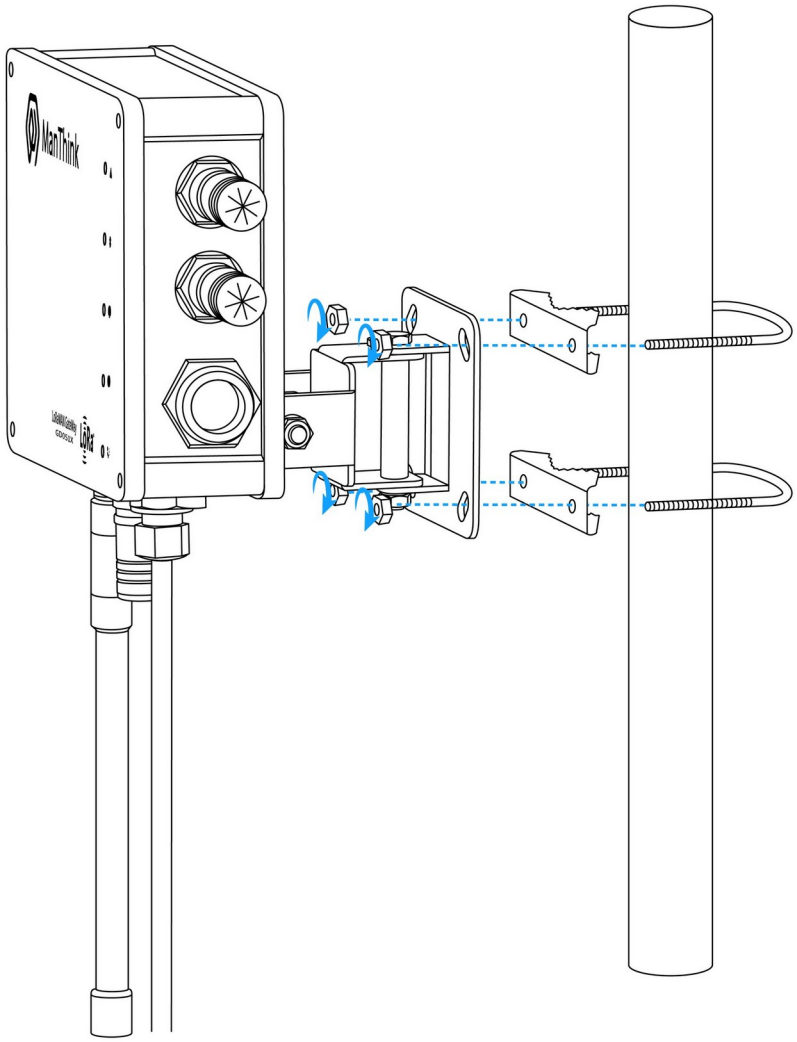

Figure 17.2 Holding Rod fixing

18. Waterproof protection

- Use insulating tape or waterproof material to wrap and seal the connection to ensure that it is not penetrated by moisture and moisture.
- Pay special attention to areas where moisture can easily enter, such as outdoor installations or areas exposed to rain or high humidity.
- The insulating tape is tightly wrapped around the connection, completely covered, and forms a waterproof barrier.
- Check the waterproof condition regularly, and re-coat or replace the insulating tape as needed to maintain effective protection.
- Ensure that all connections and cables are properly sealed and protected to prevent moisture damage and maintain the integrity of the installation.

19. Gateway waterproof

- Ensure all cable entry points and connectors on the Gateway are properly sealed following the installation steps
- Pay particular attention to areas where moisture may enter, such as cable connections, antenna interfaces, and power input ports.
- Apply a layer of waterproof material around the cable entry point and connector, completely covering to prevent moisture penetration.
- Check the waterproof condition regularly, and re-coat or replace the waterproof material as needed to maintain effective protection.

20. POE adapter waterproof installation

- Cose a suitable location to install the POE Adapter, making sure it is away from direct water sources or areas that may splash water.
- Make sure that the POE Adapter is installed vertically with the connection port down to prevent water from entering.
- Use a waterproof material, such as insulating tape or waterproof casing, to cover and seal the connection of the POE Adapter.
- Pay attention to the entry points of the cables and make sure they are properly sealed to prevent water from entering.
- Check waterproofing measures regularly and re-coat or replace any damaged or aged materials.

Please note that waterproofing requirements may vary depending on the specific environment and installation conditions. To ensure effective waterproofing, follow best practices and consult a professional if needed.

21. Gateway Configuration

gwTool7 Gateway Administrator Manual

22. Using ThinkLink

\ThinkLink User Guide

23. Connecting to Chirp Stack

Connect to ChirpStack with Basic Station (gwTool7)

24. Connecting to TTN

Connect to TTN with Basic Station (gwTool7)

NOTE Legacy WebServer (old batches only): Old GDO51 batches use the legacy WebServer. Connect to the gateway Wi-Fi and open `http://192.158.1.1`; if the login page displays `Welcome to Your WebConfigure`, use these historical guides: - AN-25100108 legacy gateway guide - AN-25100201 legacy built-in NS guide - GW-AN08 legacy ChirpStack connection - GW-AN09 legacy TTN connection

25. Contact Us

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