

Installation and Operating Instructions



Electronic water meter attachment with LoRa-WAN™ for the Modularis system shaft



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2 Revision history

REVISION	DATE	CHANGE
0.1	10 May 2026	First edition

INSTALLATION AND OPERATING INSTRUCTIONS

GENERATION 2 ELECTRONIC LoRa-WAN WATER METER ADAPTER

3 Intended use

The electronic wireless water meter attachment is used to record and transmit consumption data from mechanical water meters fitted with a Modularis system shaft. LoRa-WAN is used as the wireless standard. It can be fitted to single-jet and multi-jet dry-running water meters, as well as ring-piston and measuring-capsule water meters.

4 Installation instructions

4.1 Remove the blanking cap

The Modularis system shaft is fitted with a blanking cap as standard. Remove the cap using a small screwdriver by prying it out through the cable entry point provided. The blanking cap is no longer required.



4.2 Clean the interior

If necessary, clean the interior of the opened meter housing with water without adding any solvents. Pay particular attention to the area above the silver semicircle.



4.3 Insert and secure the module

To install, insert the wireless add-on module into the opening of the meter and secure it with the screw provided (2.2 x 25 mm). Please ensure that the screw is not overtightened.

4.4 Fitting the security seal

The supplied security seal (adhesive seal) is designed to indicate any unauthorised tampering. Apply the security seal so that the screw head is completely covered.



4.5 Activating the device

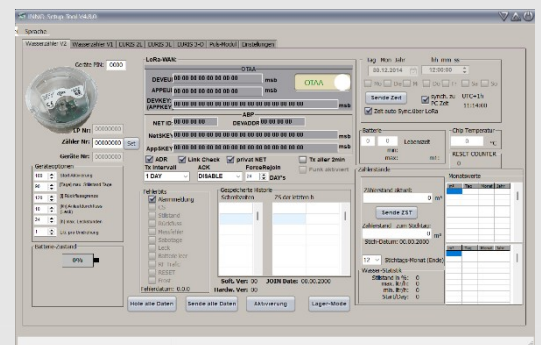
Before installation and activation, the devices must be registered with the LoRa server (provisioning). To do this, the DEVEUI, APPEUI and DEVKEY must be provided to the server. To simplify the process, you will receive an 'electronic delivery note', a CSV file containing all the numbers of the devices supplied.

4.6 Activating the wireless module

The wireless add-on module is supplied ready for use, i.e. flow measurement is already active. The wireless function is deactivated for transport. The factory-set connection method is OTAA.

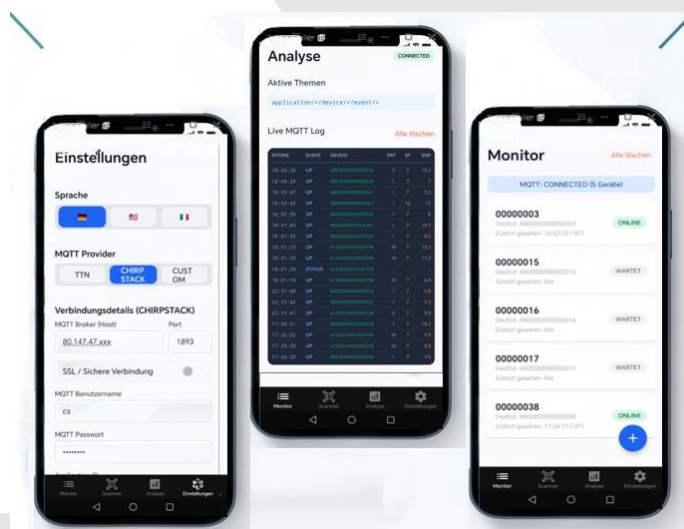
There are four ways to activate the wireless function and start the JOIN process:

- using the activation head, available from Innotas
Note: This only works if the PIN is deactivated!
- using an IrDa optical head and the free INNO-ST software (INNO Setup Tool, formerly LoRa Setup Tool) from Innotas
- using an IrDa optical head and the free Android app for activating our LoRa products.
Note: This only works if the PIN is deactivated!
- via a predefined water flow, usually approx. 10 litres



After activation, a red LED flashes briefly approximately every 10 seconds until the JOIN process is complete. Following successful activation, the device transmits an installation telegram every 2 minutes for one hour. This enables the installer to promptly check with the server whether the device has been successfully integrated into the LoRa network.

To automate the installation process, the LoRa Installer app can be used, which not only logs the integration into the LoRa network but also records all installation and replacement data. [Link to the Play Store.](#)



4.7 Configuration via IrDa optical head

In conjunction with the LST (LoRa Setup Tool) or MDC (Meter Device Commander) software, or the Android app, the following parameters can be changed:

- Date and time
- Meter reading
- Reference month (for the annual reference date)
- Meter number
- Device PIN
- LoRa settings:
 - Connection type: OTAA / ABP
 - APPEUI, DEVKEY, NETID, NetSKEY, AppSKEY
 - ADR, Link Check, ACK, ForceRejoin
 - Transmission interval
- Start activation (number of litres for automatic start)
- Max. days until inactivity notification
- Number of litres until backflow notification
- Counter start-up rate in litres/h
- Maximum hours without standstill before a leakage alert
- Meter ratio in litres per revolution
- Alarm messages

4.8 Factory configuration

If the EHKVs are supplied to the customer's specifications, the customer must complete an order form. The following settings can be specified:

- Time zone
- Connection settings OTAA
- Reference month (for the annual reference date)
- APPEUI DEVKEY
- Measurement parameters such as non-metering months, start month, Kc values, etc.
- Device PIN '0000' (disabled) or customer-specific
- Transmission interval, ADR, link check, ACK, ForceRejoin as per customer requirements
- Start activation, 10 litres
- Maximum days until inactivity report, 90
- Number of litres until backflow notification, 120
- Meter start-up rate in litres/h, 10
- Max. hours without standstill until leakage report, 24
- Counting ratio in litres per revolution, 1
- Alarm notifications, ON

4.9 LoRa wireless settings

4.9.1 Important note on LoRaWAN™ wireless technology

LoRaWAN™ wireless technology is designed to manage the load on radio frequency bands, transmission power and connection stability via the LoRa Network Server (LNS). This management is carried out using special control commands within the LoRa protocols, which enable optimal use of resources.

The calculation of battery life for our end devices is based on precise and optimised interaction between the end device and the server. Changes to the system that generate additional data traffic may exceed the originally planned battery budget and result in a shorter battery life. For this reason, it is crucial to actively monitor the communication actually taking place, rather than simply checking for the arrival of expected payload data.

INNOTAS GmbH accepts no liability whatsoever for premature battery discharge caused by excessive communication traffic

4.9.2 ADR setting

The ADR (Automatic Data Rating) setting means that the data rate or spreading factor of the radio transmission is controlled dynamically and automatically. The LoRa device sends a radio protocol with an acknowledgement request to the server. If no acknowledgement is received, the device will first repeat the protocol and subsequently increase the spreading factor. If the server receives the packet correctly and in good quality, it sends a command to the device to reduce the spreading factor. High spreading factors lengthen the packet and thus increase the likelihood of a collision with another radio packet, whilst also consuming more energy. For example, with SF7, a packet is approximately 50–120 ms long, and with SF12, it is 2–3 s long.

4.9.3 Link Check Setting

Here, the device periodically checks whether a connection to the server still exists. The link check is performed every 5 radio telegrams. If no response is received 5 times in a row, the device assumes that there is no longer a connection to the server and enters the ReJoin state in order to reconnect to a server.

4.9.4 JOIN process

In the OTAA connection setting (factory setting), the device requests a connection to the LoRa-WAN™ network using its device identifier (DEVEUI) and application identifier (APPEUI). The protocol is encrypted using the DEVKEY. The server responds to the device if it recognises it. The server then negotiates new private keys with the device. These are the NetSKey and the AppSKey. From this point onwards, communication is encrypted using private keys. During the join process, the LoRa server also transmits all important network settings – such as frequency channels, reception window spacing, etc. – to the device being connected.



4.9.5 Behaviour in the event of a connection failure

After activation, the device attempts to connect to the LoRaWAN™ network. It begins by making its first JOIN attempt with SF7. If this fails, it repeats the attempt and then gradually increases the spreading factor up to SF12. If no connection is established, the radio switches to sleep mode for 24 hours. Afterwards, the JOIN sequence is attempted twice more with SF12. If this fails again, the device pauses for a further 24 hours, and so on.

If the device is already connected but the server does not respond to acknowledgement requests – for example, because the telegrams are not reaching the server, the acknowledgement is not reaching the device, or the server is switched off – the device first increases the spread factor. Once SF12 has been reached and after several unsuccessful attempts, it reverts to the JOIN sequence and attempts to establish a new connection to the LoRaWAN™ network every 24 hours. If the link check is enabled as described in section 4.9.3, this too will trigger a JOIN state if a missing connection is detected. In addition, a 'ForceReJoin' function can be enabled in the device, which forces a ReJoin after a configurable number of days ranging from 10 to 255. It is also possible to trigger an unscheduled JOIN by sending a command via LoRaWAN. When the device sends a log to the server, this command is transmitted to the device on the return channel together with a time specification. The time specification determines how long after receipt the device will perform a ReJoin.

Summary of when a JOIN is performed:

- after activation, via attachment or optical sensor (SF7–SF12)
- following unsuccessful activation every 24 hours (2x SF12)
- if no acknowledgement is received for 5 consecutive ACK requests
- if no response is received to 5 consecutive LINK check requests
- after the set number of ForceReJoin days have elapsed
- upon receipt of a ReJoin command via LoRa-WAN and after the delay period (in hours) included in the command has elapsed

5 Monitoring functions

During operation, the wireless add-on module monitors the most important basic functions and settings to ensure proper operation and to signal any potential faults in good time.

5.1 Tamper detection

Tamper detection is designed to record attempts to tamper with the device using magnets. A fault bit is set and transmitted via LoRa, and can be read out via the interface. The module continues to operate independently of this. A detected tamper fault can be reset via the interface.

5.2 Battery monitoring

Under normal operating conditions, the battery in the wireless add-on module has a calculated service life of at least 12 years. Further years of power reserve can be achieved through optimised wireless settings. A battery fault is generated either when the battery voltage falls below a critical level or when the battery budget is exceeded. The fault bit is transmitted via radio or read out via the interface. The fault can only be reset via the interface. Battery monitoring is enabled by default. The LoRa server periodically queries the device for its battery status. During this process, the device transmits the calculated battery budget.

5.3 RESET Monitoring

The wireless add-on module detects a software restart in the event of a fault. The fault is communicated via radio and the interface.

5.4 Memory Monitoring

The wireless add-on module monitors the consistency of the set parameters. If it detects an error, a checksum error is triggered. The error is communicated via radio and the interface.

5.5 Standstill detection

If a preset number of days without flow is exceeded, an error bit is set. The error is communicated via radio and the optical interface.

5.6 Backflow detection

If a preset number of litres of backflow is exceeded, an error bit is set. The error is communicated via radio and the interface.

Backflow (even below the backflow threshold) is detected and measured, ensuring that the mechanical and electronic meter readings always match.

5.7 Leak detection

Flow rates above a configurable minimum flow rate (start-up flow) are recorded over time. If this flow rate exceeds a configurable number of hours, an error bit is set. The fault is communicated via radio and the interface.



5.8 RF Traffic Monitoring

The monitoring function records the number of logs sent per day. If a corresponding daily limit is exceeded, this error is set. The error bit is reset in the device status of the next LoRa telegram following transmission. As LoRa-WAN is a wireless network, additional telegrams may be sent in addition to the pre-planned ones. If a limit is frequently exceeded, this indicates that the network has not been optimally configured or that the installation and commissioning process is not correct.

6 Technical data

Standards	EN 61000-4-2, EN 61000-4-3, EN 55011
Measuring principle	inductive
Resolution	1 litre
Operating temperature	0°C to +60°C
Storage temperature	-25°C to +60 °C
Operation	Optical interface, with PIN
Tamper detection	Mechanical via seal/magnetic
Power supply	3 V DC lithium battery
Delivery	Standby mode (radio not active)
Operating time with one battery	12 years
Storage	last 18 months' readings/previous month's readings
Wireless interface	LoRa-WAN™ 868–870 MHz frequency band
LoRa-WAN™ specification	V1.0.3
Transmitted power	< 14 dBm
Number of telegrams per day	2, 1, 1/2, 1/4
Data security	Wireless, dual-channel AES 128, optical via PIN
Self-monitoring	Tampering, leakage, return flow, standstill, operating time, reset, data, frost
Certification mark	CE in accordance with Directive 2014/53/EU (RED)
Protection rating in accordance with DIN 40050	IP67 (1 m depth, 1 week, not IP69K!)



7 Warnings and safety instructions



The water meter attachment is intended solely for the recording and transmission of consumption data. The specified environmental conditions must be observed. The product must be installed correctly and in accordance with the installation guidelines, and must therefore only be fitted by trained specialist personnel.



The water meter attachment contains a battery and must be disposed of correctly.