# CM3022 2.3.x Datasheet

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Nordic Automation Systems

## LoRaWAN® Modularis Module CM3022 Datasheet

LoRaWAN® Modularis Module enables the automatic acquisition of water consumption data from Modularis (compatible) water meters and transmits it wirelessly over LoRaWAN® network or wM-Bus.

### Features

- Hybrid radio: LoRaWAN® and wM-Bus
- Simple touch to connect configuration using NAS Connect Mobile app
- LoRaWAN® ready in wM-Bus mode (automatic switchover)
- Secure communications
- Monthly, daily, hourly, quarter-hourly metering
- Alerts: no usage, backflow, broken pipe, continuous flow , temperature
- Simple configuration profiles
- Pre-installed battery with expected life of n/a years
- Device Firmware Update using phone
- Maintenance free - install and forget
- Durable (IP68 rated)

### Compatible with

- Wehrle Modularis meters
- Bernhardt Modularis compatible meters
- Maddalena CD SD PLUS EVO
- Maddalena VTZ

### Table of Contents



This document does not contain Payload Structure Definitions.
It applies to firmware versions 1.3.x and 2.3.x.

- Simens WFW30/WFK30 series
- Wasser-Geräte ECO type meters
- WaterTech Polaris-S

# 1 Quick Start Guide

Make sure NAS Connect for iPhone (QR code link on the right) is installed and logged in using services.nasys.no account.

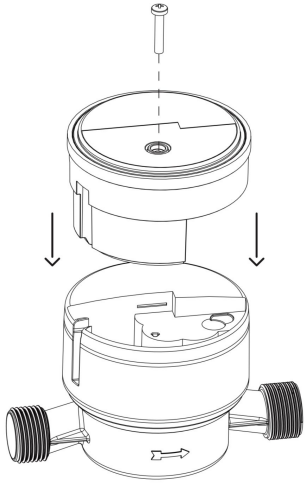
### 1. Provisioning

Add CM3022's keys to available LoRaWAN network server before turning CM3022 on.  Necessary keys are DevEUI, JoinEUI (AppEUI) and AppKey (all keys LSB). Device class Class-A, activation join OTAA, LoRaWAN MAC version 1.0.3, regional param rev A.

Make sure your account has sufficient rights to access your CM3022 using services.nasys.no .

### 2. Installation

Install CM3022 on top of the water meter tightly and fasten the screw.



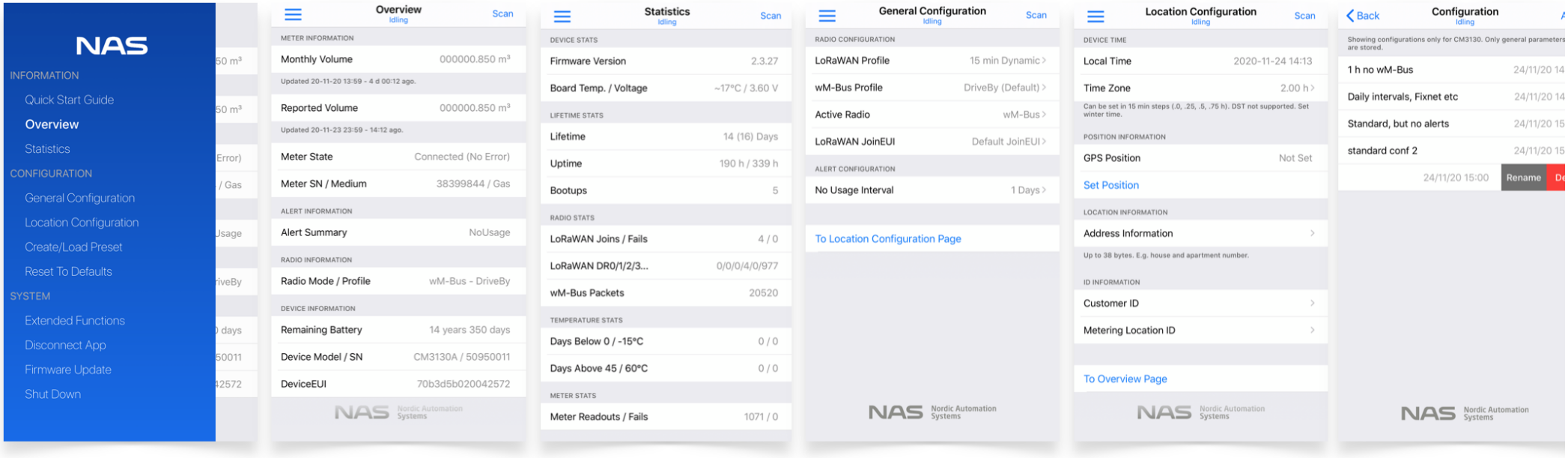
### 3. Configuration

Scan CM3022 with NAS Connect app near the logo. Configure relevant parameters (app screenshots below). Create Preset. Load Preset on other devices.

Notice: If installed during Summer Time it is recommended to manually set Winter Time by decreasing Time Zone value by 1 h.

After LoRaWAN join and some initial packets (*boot_packet* and configurations) sensor calibration starts (needs 5 rotations of the disc).

For LED indication descriptions see CM30xx Datasheet.


NAS
INFORMATION
Quick Start Guide
Overview
Statistics
CONFIGURATION
General Configuration
Location Configuration
Create/Load Preset
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SYSTEM
Extended Functions
Disconnect App
Firmware Update
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Scan
METER INFORMATION
Monthly Volume
000000.850 m³
Updated 20-11-20 13:59 - 4 d 00:12 ago.
Reported Volume
000000.850 m³
Updated 20-11-23 23:59 - 14:12 ago.
Meter State
Connected (No Error)
Meter SN / Medium
38399844 / Gas
ALERT INFORMATION
Alert Summary
NoUsage
RADIO INFORMATION
Radio Mode / Profile
wM-Bus - DriveBy
DEVICE INFORMATION
Remaining Battery
14 years 350 days
Device Model / SN
CM3130A / 50950011
DeviceEUI
70b3d5b020042572
Statistics
Idling
Scan
DEVICE STATS
Firmware Version
2.3.27
Board Temp. / Voltage
~17°C / 3.60 V
LIFETIME STATS
Lifetime
14 (16) Days
Uptime
190 h / 339 h
Bootups
5
RADIO STATS
LoRaWAN Joins / Fails
4 / 0
LoRaWAN DR0/1/2/3...
0/0/0/4/0/977
wM-Bus Packets
20520
TEMPERATURE STATS
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0 / 0
Days Above 45 / 60°C
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METER STATS
Meter Readouts / Fails
1071 / 0
General Configuration
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RADIO CONFIGURATION
LoRaWAN Profile
15 min Dynamic
wM-Bus Profile
DriveBy (Default)
Active Radio
wM-Bus
LoRaWAN JoinEUI
Default JoinEUI
ALERT CONFIGURATION
No Usage Interval
1 Days
To Location Configuration Page
Location Configuration
Idling
Scan
DEVICE TIME
Local Time
2020-11-24 14:13
Time Zone
2.00 h
Can be set in 15 min steps (.0, .25, .5, .75 h). DST not supported. Set winter time.
POSITION INFORMATION
GPS Position
Not Set
Set Position
LOCATION INFORMATION
Address Information
Up to 38 bytes. E.g. house and apartment number.
ID INFORMATION
Customer ID
Metering Location ID
To Overview Page
Back
Configuration
Idling
Showing configurations only for CM3130. Only general parameters are stored.
1 h no wM-Bus
24/11/20 14
Daily intervals, Fixnet etc
24/11/20 14
Standard, but no alerts
24/11/20 15
standard conf 2
24/11/20 15
24/11/20 15:00
Rename
Nordic Automation Systems

# 2 Specifications

| Parameter | Typical |
|---|---|
| Dimensions (D×H) | 64×39 mm |
| Weight | 60 g |
| Enclosure Material | PC |
| IP rating | IP68 |
| Operating Temperature | -5 °C ... +65 °C |
| Communication range | up to 15 km* |
| LoRaWAN Device Class | Class A |
| LoRaWAN Version | 1.0.3a |
| LoRaWAN Activation | OTAA |
| LoRaWAN Transmit Power | +16 dBm (EIRP) |
| LoRAWAN Receive Sensitivity | -137 dBm @ SF12, BW 125kHz |
| wM-Bus Mode | C1 mode-5 encryption |
| OMS version | 4.1.2 |
| Expected battery life | n/a years** |
| Max. Storage Period | 1 year 10°C ... 30°C |

*Communication range depends on the location of the sensor and the nearest base station, surroundings etc.

**Standard conditions of use and temperature. Theoretical life, with no guarantee.

# 3 Metering

## 3.1 Timings

CM3022 is updating meter readouts every 15 minutes . Meter readouts are timed 2 seconds early (xx:59:58, xx:14:58, xx:29:58, xx:44:58) so that monthly readout would have the date of previous month. *meter_actuality_duration__minutes* indicates the age of the readout value.

## 3.2 Alerts

Alerts are updated together with timed meter readouts. *active_alerts* are reported as a flags in next packets. In LoRaWAN mode confirmed *usage_with_status_packet* clears pending *active_alerts* flags. In wM-Bus mode *active_alerts* flags are immediate values and not accumulated.

Timed meter readouts to detect alert conditions are performed even in *wmbus_privacy* and *lorawan_24_h_privacy* modes.

| Alert | Condition | Reset at |
|---|---|---|
| *alert_continuous_flow* | no zero-flow intervals within 24 h | first zero-flow interval |
| *alert_backflow* | negative difference with last timed readout >= *alert_backflow_threshold__L* | zero flow or any flow in positive direction |
| *alert_broken_pipe* | 2x 15 min consequent readout flow *alert_broken_pipe_threshold__L_h* | flow rate below *alert_broken_pipe_threshold__L_h* |
| *alert_no_usage* | no flow within *alert_no_usage_interval__days* period | any flow |
| *alert_low_battery* | <182 days left of expected CM3022's lifetime | never |
| *alert_temperature* | *alert_temperature_threshold_low__C* or *alert_temperature_threshold_high__C* exceeded | neither of the thresholds exceeded |

## 3.3 Measurement Method

Many water meters are equipped with rotating disk as the only means of remote reading. CM3022 reads the volume by inductively sensing the rotating disk partially covered with metal.

This method has some advantages: immunity to external light, immunity to static external magnetic field. This method has some inherent limitations: only relative counting which can introduce error. This method is not guaranteed to ensure Liter-to-Liter precision.

Meter removal is not detected by CM3022, it can be verified by broken seal.

## 3.4 Configuration

*meter_nominal_flow__L_h* - determines sampling rate of the meter and *meter_multiplier* (Liters per disk revolution).

*meter_accumulated_volume__L* - since CM30xx counts revolutions it has no absolute reference, current meter reading has to be entered

*meter_serial* - serial number of the water meter can be configured, it is reported in *usage_with_status_packet.*

## 3.5 Calibration

Calibration is the initial process to determine optimal signal ranges for inductive sensing. Calibration cycle needs 5 disk revolutions (if 1 L = 1 revolution, its 5 L).

The device internally monitors signals, temperature changes and intervals to trigger recalibration to ensure valid signal ranges. Magnetic, electric, mechanical etc external disturbance must be avoided especially during calibration.

# 4 LoRaWAN

CM3022 implements LoRaWAN specification v1.0.3 class A device. CM3022 listens for downlinks only briefly after uplink. LoRaWAN payloads are all LSB.

LoRaWAN parameter NbTrans (formerly NbRep) determines transmission count of unconfirmed packets, it can be adjusted by backend (to increase Quality of Service). CM3022 overrides NbTrans to be 1 at all times to avoid increased battery consumption.

## 4.1 Joining

After boot-up CM3022 performs LoRaWAN Over-the-Air Activation(OTAA) join procedure. The data-rates used and duration of the cycle are region dependant. In LoRaWAN (except US915, AU915 and AS923 regions) the join cycle consists of 5 join request messages (DR4, DR3, DR2, DR1, DR0). The whole cycle can take up to 3 minutes in total. At successful join CM3022 will decrement DataRate by one when higher DataRates (DR3 → DR2, DR4 → DR3).

When using ≤8 channel gateway in AU915 or US915 region with 64 channels, joining is roulette unless join channel group mask is manually set (see *lorawan_ch_mask_group*).

## 4.2 Recovery / Rejoin Mechanisms

LoRaWAN link quality can be assessed after join by looking at DataRate (DR0 - worst, DR5 - best). Additionally Send Usage With LinkCheck button on Extended Functions page sends LoRaWAN LinkCheck MAC command to get the number of gateways and SNR.

LoRaWAN connection is daily monitored using *usage_with_status_packets* confirmations (ACKs).

| Mechanism | Mode | Precondition | Reason | Action | Following action |
|---|---|---|---|---|---|
| ADR recovery | Hybrid / LoRa only | LoRaWAN joined | No downlink in 48 h | ADR disabled temporarily,<br>data-rate decreased, TX power increased* | no downlink: DR decrease in 48 h<br>downlink received: ADR re-enabled |
| Network lost rejoin | Hybrid | LoRaWAN joined | No downlink in 7 days | LoRaWAN Rejoin | join failure: fall back to wM-Bus, rejoin after 7 days |
| | LoRa only | LoRaWAN joined | | | join failure: rejoin after 24 h |
| Periodic rejoin | LoRa only | LoRaWAN not joined | Join failed 24 h ago | LoRaWAN Rejoin | join failure: rejoin after 24 h |
| | Hybrid | wM-Bus active | wM-Bus active for 7 days | LoRaWAN Rejoin | join failure: fall back to wM-Bus, rejoin after 7 days |

*ADR recovery step decreases DataRate by dividing DataRate index by two (e.g. DR4 → DR2) and increases TX power by dividing power reduction value (relative to max power of region) by two (e.g. 3 dBm → 9 dBm, 9 → 12, 11 → 13).

## 4.3 Profile Timings

LoRaWAN timed payloads are transmitted with specific time offset after meter readout to reduce packet collisions. The time offset is calculated randomly once at boot (system reset) ranging from 30 sec to 14 min 30 sec.

Dynamic profiles ensure battery lifetime by lowering transmission interval at lower data-rates (which means longer air-times). Static profiles do not alter transmission intervals at the expense of reduced battery lifetime.

In *lorawan_24_h_privacy* (GDPR) mode reported meter readout value is updated once a month to hide the consumption patterns. Internally readouts are still updated frequently so that *alert_backflow*, *alert_continuous_flow* and *alert_broken_pipe* are detected.

| LoRaWAN Profile | LoRaWAN packet interval | Metering value update interval | Internal meter readout interval | Reduced lifetime |
|---|---|---|---|---|
| *lorawan_24_h_privacy* | 24 h | monthly | 15 min | no |
| *lorawan_24_h* | 24 h | 24 h | 15 min | no |

| LoRaWAN Profile | LoRaWAN packet interval | Metering value update interval | Internal meter readout interval | Reduced lifetime |
|---|---|---|---|---|
| *lorawan_12_h* | 12 h | 12 h | 15 min | no |
| *lorawan_1_h_dynamic* | 1 h / 2 h (DR0) | 1 h / 2 h (DR0) | 15 min | no |
| *lorawan_15_min_dynamic* | 15 min / 1 h (DR1, DR2) / 2 h (DR0) | 15 min / 1 h (DR1, DR2) / 2 h (DR0) | 15 min | no |
| *lorawan_1_h_static* | 1 h | 1 h | 15 min | yes |
| *lorawan_15_min_static* | 15 min | 15 min | 15 min | yes |

## 4.4 Packets Overview

CM3022 sends out *usage_packet*s on configured interval with the exception of midnight and noon when *usage_with_status_packet* is sent instead. This payload contains everything that is needed for billing purposes. *usage_with_status_packet differs from usage_packet* only by added *device_status* block.

After every LoRaWAN join, CM3022 sends out a *boot_packet*. If any configuration parameter is changed (via app or LoRaWAN downlink) or configuration restored at boot, CM30xx sends out corresponding configuration packet.

| Packet | fPort | Condition for sending | Confirmed, retries | Direction | Contains |
|---|---|---|---|---|---|
| *usage_packet* | 25 | timed, 1 - 94 times per day, | no | up | *active_alerts*, *meter_actuality_duration__minutes* , *meter_accumulated_volume__L* |
| *usage_with_status_packet* | | *device_status* block added at 00:00 and 12:00 | yes, 0 | | *usage_packet* + *meter_serial, battery_*, *temperature_* and *radio_* parameters |
| *boot_packet* | 99 | first packet after a successful join. | yes, 1 | up | *device_serial*, *device_firmware_version*, wakeup_*info* etc |
| *shutdown_packet* | 99 | right before shutdown or switch from LoRaWAN to wM-Bus | yes, 1 | up | *shutdown_reason*, full *usage_with_status_packet* |
| *general_configuration_packet* | 50 | *general_configuration_request* or any contained configuration changed | no | both | *radio_lorawan_profile, radio_wmbus_profile*, *meter_* and *alert_* configurations |
| *location_configuration_packet* | 50 | *location_configuration_request* or any contained configuration changed | no | both | *gps_position_*, *time_zone, address, id_customer, id_location* |
| *configuration_request* | 49 | - | - | down | either request for *general_configuration_packet* or *location_configuration_packet* |
| *enter_dfu_command* | 60 | - | - | down | - |
| *local_time_request* | 60 | - | - | down | - |
| *local_time_response* | 60 | response for *local_time_request* | no | up | *device_local_time__s* |
| *faulty_downlink_packet* | 99 | when any configuration or command packet has an error | no | up | *packet_fport*, *packet_error_reason* |

Note: LoRaWAN DeviceTimeReq MAC command is added to *boot_packet* and *usage_with_status_packets* once every 96h to synchronise CM30xx time. This *usage_with_status_packets* has been reported to be hidden in certain networks (e.g. TTN) due to added MAC command, in that case please contact the service provider.

# 5 wM-Bus

wM-Bus operates in C1 mode, using mode-5 encryption. wM-Bus is only available on CM3022A (LoRaWAN EU868 region), disabled in all other regions.

wM-Bus Serial is the second half of CM3022 DevEUI (e.g. 70b3d5b020042593 → 20042593).

## 5.1 Profile Timings

In *wmbus_privacy* (GDPR) mode reported meter readout value is updated once a month to hide the consumption patterns. Internally readouts are still updated frequently so that *alert_backflow*, *alert_continuous_flow* and *alert_broken_pipe* are detected.

| wM-Bus Profile | Internal meter readout interval | Metering value update interval | wM-Bus packet interval | Battery life ensured |
|---|---|---|---|---|
| *wmbus_privacy* | 15 min | monthly | 17 s | yes |
| *wmbus_driveby* | 15 min | 24 h | 17 s | yes |
| *wmbus_fixnet* | 15 min | 15 min | 60 s | yes |

## 5.2 Reported Parameters List

Details about the parameters contained in wM-Bus frame.

| Parameter | Updated | Data Record Header | Total length |
|---|---|---|---|
| *meter_actuality_duration__s* | always (for *volume*) | 0x02 0x74 | 5 |
| *meter_accumulated_volume__L* | *wmbus_fixnet* - 15 min, *wmbus_driveby* - 24 h, *wmbus_privacy* - n/a | 0x04 0x1x | 6 |
| *meter_key_date_accumulated_volume__L* | monthly | 0x44 0x1x | 6 |
| *meter_key_date* | monthly | 0x42 0x6C | 4 |
| *remaining_battery* | always | 0x02 0xFD 0x74 | 5 |
| *manufacturer_specific* (Alerts and *battery_remaining__semesters*) | always | 0x0F 0x01 | 4 |

# 6 Configuration

CM3022 can be configured using NAS Connect app at installation and in case of need also remotely via LoRaWAN. Changes of parameters in the App will trigger a LoRaWAN uplink packet with the corresponding configuration right after leaving corresponding page in app. Common settings can be stored in NAS Connect app using "Create/Load Preset" button so that specific presets could be easily loaded on to other CM3022 devices. Creating preset stores current configuration as a preset, so apply desired configurations first. "Reset To Defaults" button in app resets all the configurations to factory defaults.

Configuration downlink packet over LoRaWAN will either respond with the new configuration packet if parsing was successful or with an error code. Device configuration can be requested, see Configuration Request.

All configurations are divided into two categories: General Configuration and Location Configuration. There is separate LoRaWAN configuration packet and separate page in NAS Connect app for each of these categories. Changing a parameter using NAS Connect app sets corresponding LoRaWAN configuration packet pending, the packet is sent after leaving corresponding configuration page in the app.

## 6.1 *General_configuration_packet* Parameters

Configures *radio_* profiles, *meter_* and *alert_* parameters.

| Parameter | Config via App/LoRaWAN | Part of Preset | Availability | Default | Comments |
|---|---|---|---|---|---|
| *radio_lorawan_profile* | yes/yes | yes | | *lorawan_1_h_dynamic* | determines packet (and metering readout) interval. Options: *lorawan_disabled* , *lorawan_24_h_privacy* …. *lorawan_15_min_static* |
| *radio_wmbus_profile* | yes/yes | yes | | *wmbus_driveby* | determines packet (and metering readout) interval. Options: *wmbus_disabled* , *wmbus_privacy* , *wmbus_driveby* , *wmbus_fixnet* |
| *lorawan_joineui* | yes/no | yes | not if *lorawan_disabled* | Distributed JoinEUI | not reset with Reset To Defaults button |
| *lorawan_ch_mask_group* | yes/no | yes | only in US915 and AU915 regions | all channels | pre-select channel mask to make join procedure faster, button disabled after joining |
| *meter_serial* | yes/yes | no | | *not_set* | |
| *meter_accumulated_volume__L* | yes/yes | no | | 0 | |
| *meter_accumulated_volume_offset__L* | yes/yes | no | | 0 | |
| *meter_multiplier* | yes/yes | yes | | 1 | |
| *meter_nominal_flow__L_h* | yes/yes | yes | | 2.5 $m^3$/h | Determines *meter_multiplier* and sensor sampling frequency |
| *alert_backflow_threshold__L* | yes/yes | yes | | *disabled* | irrelevant decimal places rounded off |
| *alert_broken_pipe_threshold__L_h* | yes/yes | yes | | *disabled* | irrelevant decimal places rounded off |
| *alert_continuous_flow_enabled* | yes/yes | yes | | *disabled* | |
| *alert_no_usage_interval__days* | yes/yes | yes | not with gas meters | *disabled* | |
| *alert_temperature_threshold_* | yes/yes | yes | | *disabled* | *low_threshold* and/or *high_threshold* |

## 6.2 *Location_configuration_packet* Parameters

Configures optional meta information that is stored inside CM3022 and reported over LoRaWAN when added and can be requested at any time over LoRaWAN.

*id_customer* and *id_location* can be used as customer EIC and metering EIC. All text fields are UTF-8 compatible strings (not null-terminated). Notice: all the lengths of the text fields are in bytes, not symbols (UTF-8 symbol can take multiple bytes).

The content may be sent in two portions if all the fields are filled and available payload length insufficient.

| Parameter | Config via App/LoRaWAN | Part of Preset | Availability | Comments |
|---|---|---|---|---|
| *gps_position* | yes/yes | no | not if *lorawan_disabled* | phone's coordinates, stored only on manual button press, adjustments on map allowed |
| *address* | yes/yes | no | | up to 38 bytes utf-8 |
| *id_customer* | yes/yes | no | | Customer ID, 16 bytes of utf-8 |
| *id_location* | yes/yes | no | | Metering Location ID, 16 bytes of utf-8 |
| *time_zone* | yes/yes | yes | | automatically set by App |

# 7 Functionality Description

## 7.1 Hybrid Radio Mode

CM3022 has two radio stacks: wM-Bus and LoRaWAN and it can automatically switch back and forth between them on specific conditions, preferring LoRaWAN network if available.

Modes are determined by the combination of *radio_lorawan_profile* and *radio_wmbus_profile*. CM30xx operates in regular single radio mode if the other profile is *_disabled*.

| Mode | Description | Case |
|---|---|---|
| Hybrid mode (wM-Bus active) | CM3022 transmits wM-Bus packets and tries to join to LoRaWAN weekly | Plans of installing LoRaWAN network in the future |
| Hybrid mode (LoRaWAN active) | CM3022 transmits LoRaWAN packets, if packet confirmations are missing for a week, try to rejoin. If join fails, enter wM-Bus | Falls back to wM-Bus if LoRaWAN network fails |

## 7.2 Battery Lifetime

*battery_remaining__years* is reported in *usage_with_status_packet* and wM-Bus packet. All profiles except *lorawan_1_h_static* and *lorawan_15_min_static* are calculated to ensure specified battery lifetime. Operating CM3022 for more than 10 days in one of these static modes invalidates the remaining battery estimations. *active_alerts.low_battery* means that less than 182 days of battery is left. The flag remains on until the end of life.

Battery lifetime estimations are based Medium Zone temperature profile as seen below.

| -20°C | -10°C | 0°C | 10°C | 20°C | 30°C | 40°C | 50°C |
|---|---|---|---|---|---|---|---|
| 1% | 2% | 12% | 20% | 21% | 20% | 16% | 8% |

## 7.3 CM3022 Local Time

Correct device clock is needed to take e.g. hourly readings on right time. The two methods to synchronise CM3022 clock are:

1. NAS Connect app - time is automatically synced if logged in user has configurator rights for the device.
2. LoRaWAN DeviceTimeReq - synchronises after successful join (with *boot_packet*) and regularly with 4 days interval (with *usage_with_status_packet*).

CM3022 is time zone aware (knows it offset from UTC), but not Summer Time aware. If installed during Summer Time it is recommended to manually set Winter Time by decreasing *time_zone* value by 1 h.

CM3022's local time can be requested for troubleshooting purposes over LoRAWAN using *local_time_request* command.

## 7.4 Boot-up Behaviour

At boot-up CM3022 runs a self-check routine. If there is some internal failure, CM3022 will shut down immediately except when NAS Connect app is connected for user to see the issue (shutdown will still be pending).

At the very end of battery life CM3022 falls into reset loop due to dropping battery voltage. After 4 sequent unfinished wake-ups, CM3022 sleeps for 4 hours and then reboots to retry again 4 times and so on. This 4 hours waiting can be cancelled by scanning CM3022 with NAS Connect app.

## 7.5 Shutdown Behaviour

In LoRaWAN mode a *shutdown_packet* sending is attempted within 5 seconds (LoRaWAN might be duty-cycle locked). *shutdown_packet* contains shutdown reason and last *usage_with_status_packet*. Shutdown does not erase settings.

## 7.6 LED Indications

| Mode | Indication | Duration |
|---|---|---|
| Wakeup | red blinks once a second | 5 sec |
| Shutdown | red blinks twice a second, end with long pulse | 5 sec |
| NAS Connect app connected | blue blinks with 2 second interval | while app connected |
| Magnet switch active | blue blinks with 1 second interval | while magnet switch active |

## 7.7 DFU

CM3022 firmware can be updated using free nRF Toolbox App. DFU mode can be activated via LoRaWAN or using NAS Connect app. Downgrade is not possible, nor LoRaWAN region change. CM3022 retains its configurations. All readouts (monthly etc) are reset to boot moment.

First digit in firmware version number is hardware revision. 1.3.x and 2.3.x are built for different radio chipset. Thus 1.3.x can not be upgraded to 2.3.x, 2.3.x is not newer than 1.3.x.

## 7.8 NAS Connect App

CM3022 can be conveniently configured using NAS Connect App featuring:

- Touch (scan NFC) to connect
- Real-time parameters, states, modes
- Convenient configuration
- Preset storage (create and load preset)
- CM3022 Quick start guide easily accessible
- Triggering DFU of CM3022
- Setting CM3022 GPS coordinates with phone
- Secure communication

The app consists of pages that can be navigated from left sidebar. Additionally some system functions of CM3022 can be accessed on sidebar.

CM3022 can only be turned on and shut down using NAS Connect App. It can be configured either using NAS Connect app or over LoRaWAN.

### 7.8.1 Privacy

NAS Connect does not store anything inside the phone except the login token in secure cell and stored configuration presets.

NAS Connect App needs user to have services.nasys.no account and Internet connection to access device above *guest_level*. The device challenges the server and the server provides *user_right_level*. This request is only to authenticate NAS Connect app access to CM30xx. The authentication request (after scanning CM30xx) is logged on server side, log containing username, timestamp, user right level, device DevEUI.

No parameter visible/configurable in the app is stored/logged/forwaded. Optional meta parameters like *gps_position_,* address, id_customer, id_location etc are only stored in CM30xx, they are transmitted over LoRaWAN once after setting them.

If user has rights above *guest_level* NAS Connect app updates CM30xx time at every connection.

# 8 Frequently Asked Questions

Q: Where do I get the LoRaWAN keys (AppKey etc) for CM3022?
A: The keys are distributed by seller at purchase.

Q: CM3022 is not joining to LoRAWAN network?
A: Make sure there is a working LoRaWAN gateway nearby. Make sure the device is properly provisioned.
In case of poor LoRAWAN signal (e.g. inside basement), first try to join in better conditions (e.g. outside) to rule out network problems (correct keys, gateway etc) and then make rejoin in real location.
US915, AU915 and AS923 LoRAWAN region specifications define 64 channels and gateways have mostly 8 channels, so joining is a roulette. It can be accelerated (and battery saved) by choosing LoRaWAN Ch. Mask Group from app.
In case of testing in multiple overlapping LoRaWAN networks make sure the keys are deleted from all other network servers.

Q: CM3022 needs to be transferred to another LoRaWAN network, how to rejoin?
A: Make sure the keys are only present in desired network. If the CM3022 can be accessed with NAS Connect app, rejoin can be immediately triggered. If CM3022 is inaccessible, CM3022 will automatically attempt to rejoin in 7 days from last successful ACK.

Q: The packet comes from correct fPort but bytes do not match with payload structures document.
A: The payloads may be encrypted when length and fPort are correct but bytes seems totally random. The packets have to originate from application server (decrypted) not network server.

Q: "Could not connect to NAS device" message in NAS Connect app?
A: Try to scan CM3022 again. NFC reading is sensitive to distance, minimise motion during NFC scanning. Due to continuous NFC scanning on newer phones NFC tag is hidden after each scan for 2 seconds to avoid new connection. Is iPhone Settings → Privacy → Bluetooth → NAS Connect enabled?

Q: NFC of CM3022 not scanning at all?
A: Try again to find optimal position between CM3022 NFC antenna and phone.
Try to scan with some other NFC app, if that works try again with NAS Connect App. Swipe the reed with magnet to reset the NFC tag. If nothing helps, try to rescan after an hour.

Q: Can CM3022 battery be replaced?
A: No, CM30xx is potted in to achieve {nas:erp:meta:INPR} rating.

Q: Why NAS Connect app shows only few pages on CM3022?
A: Reduced functionality means guest access. To achieve higher access level, make sure:

- the phone has Internet connection while connecting to CM3022 (no offline configuration at this point)
- in NAS Connect app, user has to be logged in using services.nasys.no account
- user account must have desired rights for the device in services.nasys.no

Q: Why is CM3022 is not calibrating?
A: Is sufficient water flowing and the disk rotating on the meter? Is the meter mounted properly, sitting as close as possible to the rotating disk?

Q: What is causing CM3022 counting error?
A: Improper attachment on the meter, large external magnetic field, large vibrations , non-static external electric/magnetic fields, no flow for extended periods, quick temperature changes without any flow, low battery, disrupted calibration information (calibrate again) .

Q: Can I upgrade firmware from 1.3.x to 2.3.x?
A: No. 2.3.x is for different radio chipset. Please see DFU chapter above.

# 9 Ordering Information

Example ordering code UM3110A#0001EU consists of following:

| Product | Article region | Separator | Package quantity | SKU region |
|---|---|---|---|---|
| UM3110 | A | # | SS 01 (sample qty)<br>00 25 (bulk qty) | EU |

| Article region | SKU region | LoRAWAN band |
|---|---|---|
| A | EU | EU868 |
| B | AU | AU915 |
| C | US | US915 |
| D | AS | AS923 |
| F | KR | KR920 |
| I | IN | IN865 |
| J | RU | RU864 |

## 9.1 Packaging

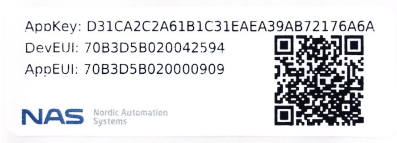
CM3022s are shipped either in a single or bulk package depending on order code package quantity.

Single package each CM3022 has separate 100x100x45 (mm) cardboard box.

Bulk package reduces waste by packing up to n/a CM3022s into larger n/a (mm) cardboard box. Minimum bulk order quantity is 1.

CM3022 package includes:

- n x CM3022 Module
- 1 x Printed Quick Start Guide
- n x QR LoRaWAN/wM-Bus keys on removable sticker (samples only)




## 9.2 Contact Information

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info@nasys.no

# 10 Revision History

1.0 - First version

Pole silte

**Teie Confluence'i hindamise litsents on aegunud. Siin'on informatsioon, mida on teil vaja Confluence'i kasutamise jätkamiseks**