SENSECOM- IMN

Communication device for impulse readings

SENSECOM-IMN, IMNB

Purpose

The SENSECOM-IMN device is designed for pulse readings of 1-2 channels (S0 and voltage-free contact) with the possibility of 2-tariffication resolution on S0 and for sending the readings via the **NB-IOT** IoT network. Sending the power failure message and providing the voltage-free input counter function during power failure is provided by the super-capacitor. The device is manufactured in a DIN rail (3U) version.

Typical use: remote readings from billing and secondary meters with high accuracy, e.g. from electricity meters (via galvanically separated S0 input), gas meters, water meters, calorimeters (via switched voltage-free contact or in open collector connection), or other sensors with pulse output.

Description of equipment:

Pulse inputs and tariff resolution

SENSECOM-IMN has the following inputs:

- **S0** - pulse input from S0 (power meters) with galvanic isolation by optocoupler and with separate optocoupler power supply (in connection with resistance min. 4.5kV), pulse length: 30ms-120ms with minimum 30ms lag,
- **CNT** - pulse input from potential-free contact input (gas meters, water meters). Any voltage signal cannot be applied to this input other than in an open-collector connection. Pulse length: min. 30ms with minimum 30ms leg.
- **T** – 2-tariffs input from tariffs' controller (in switched to grounding mode).

Wireless communication

SENSECOM-IMN sends the readings to the **NB-IOT** IoT network. To ensure successful sending of messages, variations of sending methods can be used according to the type of NB-IOT network availability:

- Seamless network availability
  - small rod antenna (included with the device)
- Lack of network availability inside the cabinet, but available outside the cabinet
  - connection of external antenna (located outside the switchboard) via coaxial cable
  - connection of the equipment to a separate plastic switchboard outside the meter cabinet

Data processing

Data from the readout unit can be accessed in two ways:

- In own system by routing IP packets from NB-IOT network with public or private APN (can be set remotely on SENSEPARAM)
- SENSEPARAM(.com) portal - values are made available in processed form.

Data transmission to the customer is possible in SENSEPARAM in the following ways:

- Call-back to customer database
- Email/SMS notifications (alarms, status changes)
- Download to CSV file

Device security

The device sends a Keep-Alive message at least once/day with the battery voltage and CPU temperature status.
Some models are equipped with an accelerometer to detect manipulation.
The device can be configured to E2E SW encryption of the payload message content using the **AES-256** algorithm with individual keys for each device. Message decoding is performed in the SENSEPARAM portal.

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The data sent by the callback from SENSEPARAM to the customer database is sent over a secure SSL connection
Data is forwarded from the mobile operator's network using UDP packets over a public or private APN.

Other device parameters

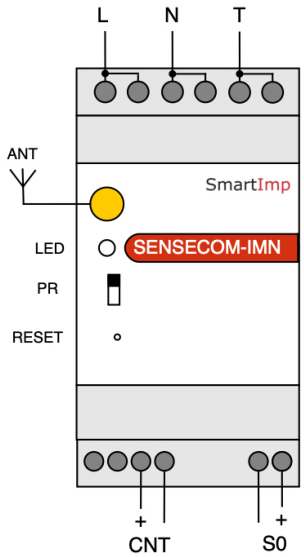
- The average consumption of the device is <0.5VA.
- Mains power is backed up by a supercap
  - Ensuring that the device power loss (and pulse status) message is sent
  - IMNB model - providing power supply for reading pulses from a voltage-free contact for >12h.
- The device synchronizes with real time so that readings are taken at the zero minute of real time of the selected period.

Types of messages

Types of transmitted messages:

- **Periodic reading** - readings from pulse inputs are stored at regular intervals, usually in 15 min intervals (the interval is adjustable in 15 min intervals between 15 min-1440 min) and are sent immediately after the reading or cumulatively in an adjustable multiple (1x-96x) of the reading period, at least once a day.
- **Volume Readout** - A readout status message sent when a preset volume of pulses counted from the previous readout status message is reached. By default, sending this type of message is disabled. The range of configurable pulse volumes is 1, 2, 5, 10, 20, 50, 100, 200, 500, 1k, 2k, 5k, 10k, 20k.
- **Alarm message** - a message generated when the normal consumption thresholds are exceeded in a measured period adjustable in the range of 10-85s, i.e. signaling extreme consumption (accident, media leak). By default, the sending of these alarm messages is disabled. The device is also capable of sending alarms (if enabled) such as mains power failure/restoration, tariff change, tampering (models with accelerometer).
- **Keep-Alive message** - a periodic system message that the device sends by default every 24 hours if it is energized.
- **Downlink message** - a message received by the device from SENSEPARAM as part of the process of sending a Keep-Alive message, if downlink data is available on SENSEPARAM (or the customer back-end) at that time. This message is used to reconfigure the device mode and send messages if the device has sufficient signal to receive messages from the NB-IOT network.

Connecting the SENSECOM-IMN device

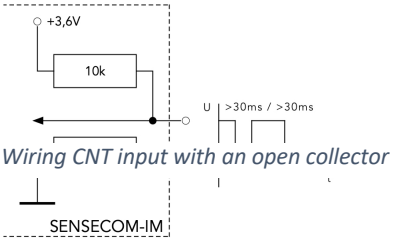


The device is supplied in a plastic **DIN-type** housing**, 3U wide** with IP20 protection, which is mounted on a DIN rail. The front panel can be accessed even after sealing the cabinet:

Legend:
L ... phase supply 220-240V
N ... zero conductor
T ... tariffs signalization from the tariff's controller (by switching to zero conductor)
S0 ... pulse input S0 (with built-in galvanic isolation for electric meter), powered by built in power supply
CNT ... pulse input from voltage-free contact (for water meter, gas meter or similar)
+ ... positive side of power supply in open collector input connection (see scheme below)

ANT ... output to small rod or external antenna via SMA connector
LED ... two-colour indicative LED for initiation and operation
PR ... switch (not connected)
RESET ... device reset (does not reset the readings, permanent press is ignored)

Warning:
The installation must only be carried out by a person authorised to work on the low-voltage network. The connection of the S0 input to the billing meters is carried out by an authorised person of the electricity distributor after the installation is completed.



Wiring CNT input with an open collector

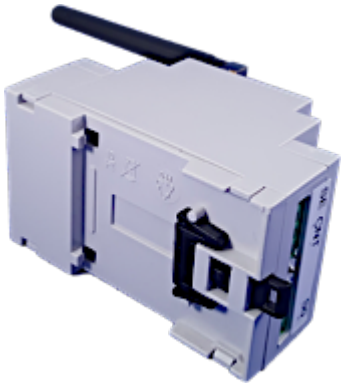
Remark:
The device has a built-in galvanic isolation of the 4.5kV S0 input by means of an optocoupler (with built-in power supply), so e.g. ČEZ Distribuce (Power distributor) does not require the installation of a separate isolation component and its power supply for this device.

Technical parameters

Parameter	SENSECOM-IMN	SENSECOM-IMNB
Main reading inputs	Primary - **S0 pulse input** (with galvanic isolation by optocoupler, resistance min 4,5kV, built-in optocoupler power supply), pulse length 30-120ms, lag min 30ms Secondary - **CNT pulse input** (voltage-free contact input, possibly in open-collector connection), pulse length min 30ms, lag min 30ms	
Accuracy of readings	>99% of pulses	
Network for data transmission	**NB-IoT**	
Types of messages	▪ Regular periodic (multiple readings can be combined into one message) or volumetric with values ▪ Initialization (configuration) ▪ Alarm - excessive consumption/media leakage, change of power supply status, change of tariff (adjustable) ▪ Keep-Alive (24h) with downlink requirement	
Periodic readings	15-1440min(24h) in 15min increments	
Period of sending readout messages	1 times the reading period above (default) or up to max 96 sets of grouped readings in one message (configurable). The message is sent eventually earlier when the message buffer is close to full.	
Pulse volumes for volume messages	1,2,5,10,20,50,100,200,500,1k,2k,5k,10k,20k, **0-off** (default),	
Hold between sending messages	**10min**, the first alarm message of a given type is without jamming	
Mode	▪ Standard ▪ Operational (OMM) - allows monitoring of consumption peaks at short intervals (10-85s) on the S0 input	
Power	Mains 240V with supercap backup for sending outage message	with backup >12h (pulse counting on CNT input)
Access to data	SENSEPARAM portal with data incorporation: ▪ Callback (push) for sending processed data to the customer system via a secure SSL connection ▪ Email / SMS notifications (alarms, status changes) ▪ CSV download or in its own system with IP packet processing directly from the NB-IOT network (via public or private APN)	
Data encryption	Possible **E2E** encryption using **AES-256** with individual keys for each device. Decryption on the SENSEPARAM portal side or in the customer database (with delivery >100pcs of devices).	
Manipulation detection (Accelerometer)	Selected models	
Antenna	Bar antenna, connected via a connector (SMA-M) on the front panel of the device	
Input and power connections	For screw clamps	
Coverage	IP20	
Weight	120g	
Dimensions	3U (DIN rail mounted), 90x53x50mm	

Device design

The SENSECOM-IMN is in an IP20-rated housing in a 3U DIN-rail version, SMA bar antenna



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