

SENSO8 NB-IoT Temperature Probe Sensor API Document

The API document describes the format of downlink and uplink JSON data for the following models:

- SEN20200-0000
- SEN21200-0000

1. Uplink Data

1.1 Data Reporting

The sensor sends a data uplink data report in the following cases:

- There is a trigger event
- Periodic heartbeat
- Button press

MQTT Topic Format

SENSO8/nbiot/data/<IMEI>

MQTT Message Payload Format

```
{  
  
  "ver":protocol_version,  
  
  "msg":msg_seq_no,  
  
  "time":epoch_time,
```

```

"sn":sensor_imei,

"type":payload_type,

"temp":temperature,

"bat":battery,

"RAT":radio_type,

"rssi":radio_rssi,

"rsrp":radio_rsrp,

"rsrq": radio_rsrq,

"ci":radio_ci,

"tac": radio_tac,

"low_batt":low_batt,

"low_temp":low_temp_alert,

"high_temp":high_temp_alert,

"rtd_fault":rtd_fault,

"event":event_type,

"debug":debug_info

}

```

Field	Description
protocol_version	Protocol version (int)
msg_seq_no	Message sequence number (uint32)
epoch_time	Unix epoch time in ms
serial_no	IMEI of the sensor (string)
payload_type	1 – Temperature Probe
temperature	Temperature reading (°C)
battery	Battery voltage (mV) (invalid when using AC adaptor)
radio_type	Radio Type, e.g. LTE, 3G, ...
radio_rssi	Radio RSSI (int)

radio_rsrp	Radio RSRP (int)
radio_rsrq	Radio RSRQ (int)
radio_ci	Radio cell information (8-bit hex string)
radio_tac	Radio tracking area code (4-digit hex string)
low_batt	0 – battery normal; 1- battery low
low_temp	0 – normal; 1 – temperature below low temperature threshold
high_temp	0 – normal; 1 – temperature above high temperature threshold
rtd_fault	0 – normal; 1 – temperature probe connection problem, only available for Pt100 temperature probe
event_type	Data event type 0 – data update/trigger 1 – user-initiated (by button press) 2 – heartbeat
debug_info	Reserved

1.2 Device Configuration Reporting

The sensor uploads the device information (like IMEI, firmware version, etc) and settings (like data upload period, temperature threshold, etc) on start-up. By default, the sensor also reports these data every 24 hours by default. It is strongly suggested to keep a log of it for keep tracking of the sensor status.

MQTT Topic Format

SENSO8/nbiot/sys/<IMEI>

MQTT Message Payload Format

```
{
  "ver":protocol_version,
  "sn":sensor_imei,
  "iccid":sim_iccid,
```

```

"sampling":[sampling_batt, sampling_ac],

"upload":[upload_batt, upload_ac],

"low_temp":[low_temp_threshold, 0, 1],

"high_temp":[high_temp_threshold, 0, 1],

"mohtm_comp":0,

"cal_temp":cal_temp,

"low_batt":low_batt_alert_lvl,

"batt_pwr_alert":0,

"reg_timeout":registration_timeout,

"band":[band_1, band_2, ... band_n],

"repeat":[0, 60],

"report":regular_report_interval,

"local_port":0,

"en_shutdown":0,

"firmware":fw_version,

"client_prefix":client_id_prefix,

"topic_prefix":topic_prefix,

"stat":stat_info,

}

```

Field	Description
protocol_version	Protocol version (int)
sensor_imei	IMEI of the sensor (string)
sampling_batt	Data sampling period when running on battery (sec)
sampling_ac	Reserved
upload_batt	Data upload period when running on battery (sec)

upload_ac	Reserved
low_temp_threshold	Low temperature alert threshold (°C)
high_temp_threshold	High temperature alert threshold (°C)
cal_temp	Temperature calibration in unit 0.1°C
low_batt_alert_lvl	Battery low alert threshold (mV)
registration_timeout	Mobile network registration timeout (sec)
band_x	NB-IoT frequency band supported (int) 0 – Auto 1 – B1 3 – B3 5 – B5 8 – B8 20 - B20
regular_report_interval	Regular device configuration (sys) report interval in hour (int)
fw_version	Firmware version
client_prefix	MQTT client prefix (string)
topic_prefix	MQTT topic prefix (string) (apply to data, sys, ctrl topics)
stat_info	Reserved

2. Downlink Data

The downlink data is used for updating the device settings online. It is published to the device via the MQTT broker. The format of the downlink commands is described in Section 2.2 below. **After issuing a downlink configuration command, the device will publish a Device Configuration Report (SYS message) acknowledging the command and showing the latest device configuration.**

2.1 MQTT Settings

The sensor is using MQTT persistent connection to receive downlink commands.

In order to support downlink command, the **MQTT broker** needs to support **MQTT 3.1.1**. And, the following setting is required for MQTT client posting downlink data to SENSO8 sensor.

- Publish QoS = 1
- Retain Flag = False

2.2 Download Data Format

2.2.1 High Temperature Threshold Configuration

MQTT Topic Format

SENSO8/nbiot/ctrl/<IMEI>

MQTT Message Payload Format

```
{
  "sn":sensor_imei,
  "high_temp":[high_temp_threshold, 0, 1]
}
```

2.2.2 Low Temperature Threshold Configuration

MQTT Topic Format

SENSO8/nbiot/ctrl/<IMEI>

MQTT Message Payload Format

```
{
  "sn":sensor_imei,
```

```
"low_temp":[low_temp_threshold, 0, 1]
}
```

2.2.3 Data Sampling Period Configuration

MQTT Topic Format

SENSO8/nbiot/ctrl/<IMEI>

MQTT Message Payload Format

```
{
  "sn":sensor_imei,
  "sampling": [sampling_batt, sampling_batt]
}
```

2.2.4 Data Upload Period Configuration

MQTT Topic Format

SENSO8/nbiot/ctrl/<IMEI>

MQTT Message Payload Format

```
{
  "sn":sensor_imei,
  "upload": [upload_batt, upload_batt]
```

}

Field	Description	Type	Default
sensor_imei	IMEI of the sensor	string	
sampling_batt	Data sampling period when running on battery (sec) (min: 10 sec)	number	900 sec
upload_batt	Data upload period when running on battery (sec) (min: 180, max: 43200)*	number	3600 sec
low_temp_threshold	Low temperature alert threshold (°C)	number	18
high_temp_threshold	High temperature alert threshold (°C)	number	30
regular_report_interval	Regular device configuration (sys) report interval in hour (int)	number	24

1. Data upload period must be longer than data sampling period. The sensor can store up to 20 samples between each data upload period.
2. For automatic frequency selection, set "band": [0] on the command. Otherwise, put the desired frequency bands in the JSON array. For example, to support B3 and B8, set "band": [3 , 8] on the command.

3. Revision History

Revision	Date	Description
1.0	Mar 2020	Initial Release.
1.1	Jul 2020	Added new JSON data keys on firmware version 2.01.000.
1.2	Sep 2021	Revise for firmware version 3.xx.xxx
1.3	May 2024	Added SEN21200 to supported models.
1.4	Jul 2024	Corrected the minimum data sampling period and default value.