

DETAILED SOFTWARE SPECIFICATIONS

ICT data exchange between the sensors and the SigFox network

Document revision history

DATE	REV	OBJECT	Author
06/01/15	0	Document creation	MC
24/03/15	1	Additional details on the little endian encoding of variables for every structure	MC
08/07/15	2	SigFox outdoor temperature sensor added	MC
24/07/15	3	SigFox TH and Pulse S0 sensors added	MC/PLG
17/09/15	4	Additional information	SD/MC
21/10/15	5	Transfer of software and product configuration versions and subversions to information frames added, and additional details regarding the size of the data transferred by the sensors	MC
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18/02/16	11	Outdoor temperature sensor (currently being modified)	PLG
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15/06/17	19	Correction concerning the order of measurements in the measurement frame (§3.3.4) Additional information on the measurement frame.	PLG
03/10/17	20	SigFox CMV Gas sensor added	MC
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15/01/18	22	Temperature sensor correction. SigFox CMV Gas sensor added	PLG MC
30/01/18	23	SigFox Skydome sensor added	MC
05/02/18	24	SigFox 20mA Loop 0-10V sensor added Temperature sensor and TH correction.	MJ PLG
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06/04/18	27	Add Limitations paragraph for for 20mA Loop 0-10V sensor.	MJ
22/05/18	28	Radio waiting between radio frames	PLG
22/06/18	29	Correction (waiting)	PLG
21/09/18	30	CMV Gas sensor evolution	PLG
15/10/18	31	Delay information complement	PLG
28/01/19	32	S0 Information frame example	FV
29/06/20	33	CMV Temperature frame complements	FV

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1. OBJECT OF THE DOCUMENT

Description of data exchange between the sensors and the SigFox network.

2. APPLICABLE DOCUMENTS - REFERENCE DOCUMENTS

General specifications of SigFox ventilation sensor ref.:

- ✓ 50-09-034_SPG_SigFox_Ventilation_Sensor.doc

General specifications of SigFox TH sensor ref.:

- ✓ 50-09-036_SPG_SigFox_TH_Sensor.doc

General specifications of SigFox Pulse S0 sensor ref.:

- ✓ 50-09-038_SPG_SigFox_Pulse_S0_Sensor.doc

General specifications of SigFox alarms transfer sensor ref.:

- ✓ 50-09-046_SPG_SigFox_Alarms_Transfer_Sensor.doc

General specifications of SigFox outdoor temperature sensor ref.:

- ✓ 50-09-039_SPG_SigFox_Outdoor_Temperature_Sensor.doc

General specifications of SigFox remote outdoor temperature sensor ref.:

- ✓ 50-09-062_SPG_SigFox_Remote_Outdoor_Temperature_Sensor.doc

General specifications of SigFox dual input state sensor ref.:

- ✓ 50-09-073_SPG_SigFox_Dual_Input_State_Sensor.docx

General specifications of SigFox CMV Gas sensor ref.:

- ✓ 50-09-074_SPG_CMV_Gas_Sensor_SigFox.doc

General specifications of SigFox Skydome sensor ref.:

- ✓ 50-09-078_SPG_Skydome_Sensor_SigFox.doc

General specifications of SigFox 20mA Loop/0-10V sensor ref.:

- ✓ 50-09-077_SPG_Rev5_Capteur_Boucle_20mA_SigFox.doc

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3. SPECIFICATIONS

3.1 General remarks

Numerous data exchanges are performed between the sensors and the SigFox network.

These different data exchanges are made in upload mode and initiated by the sensors in order to transfer their various measurements.

The software and configuration of sensors that use the SigFox technology cannot be remotely updated.

Upon exiting from the factory, the sensor boards have a configuration defined at the time of the order, as well as a unique identifier per SigFox sensor type. When the sensor is switched on (reed switch activation), it sends a system start-up alarm and starts recording measurements at the frequency set in the configuration. It also transfers the corresponding data at the frequency set in the configuration. Based on the same principle, when the sensor is switched off (reed switch reactivation), it sends a system shut-down alarm and stops recording measurements.

3.2 Product type

In order to maintain consistency with the other ICT products already developed, the SigFox sensors are added to the list of product types defined at a later stage (hence the SigFox product types start at number 200).

With the exception of the ventilation sensor, the sensors can transmit compressed or uncompressed data, depending on their configuration (factory settings).

Type	Description
200	SigFox ventilation sensor
201	SigFox outdoor temperature sensor (remote or not)
202	SigFox TH sensor
203	SigFox Pulse S0 sensor (ATEX or not) and Flash'O sensor
204	Alarms transfer sensor
205	Indoor temperature sensor
207	Dual input state sensor
208	CMV Gas sensor
209	Skydome Sensor
210	20mA Loop / 0-10V Sensor
211	...

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3.3 SigFox general frames structure

All SigFox radio frames are based on a common structure regardless of the type of data sent (measurements, alarms...), the size of which varies depending on the message type, without exceeding the maximum limit of 12 bytes set for SigFox radio frames. Each variable in the structure is encoded in little endian order, i.e. with the least significant byte first. There remains only one difference between the SigFox ventilation sensors and the other sensors.

Structure of SigFox messages *	
Product type	[bits 0 ... 7]
Message type from 0 to 3	[bits 8 ... 9]
Compression type from 0 to 3 **	[bits 10 ... 11]
Frame index from 0 to 15	[bits 12 ... 15]
Data according to message and compression type	[bits 16 ... 96]

(*) The structure of messages from the ventilation sensor (older) differs somewhat from the rest of the sensors and has a different structure.

(**) If compression type equals 0 (bit 10 and bit 11), there is no compression.

NB: Warning: Data compression reduces the amount of data to be transmitted so it increases the autonomy

NB: All the frames sent by the sensors have this header (2 bytes) – the data are self-carried. The payload is therefore 10 bytes / frame.

With the exception of the "Frame index" field, the header is constant from one frame to another, and allows recognition of the sensor / message / compression type, whatever the frame index received.

See sensors sections for more details on data content.

3.3.1 Messaging type

Up to 4 different message types can be defined:

Type	Message	Description
00	standard data	Relates to standard data according to the product type
01	extended data	Relates to extended data (option or variant) according to the product type
02	alarm	Relates to all of the alarms
03	information data	Relates to information (battery voltage, number of radio transmissions, software and configuration version and subversion) on the sensors, other than the SigFox ventilation.

3.3.2 Compression type

If the compression type is 0, there is no compression. The data are transmitted as they are in chronological order.

If the compression type is 1, nke "Delta compression" is applied. Using the principle of Delta compression and simplified Huffman coding. The data are transmitted in reverse chronological order.

The SigFox ventilation sensor does not incorporate this notion of data compression.

3.3.3 Frame index

Frame indexes in the header of SigFox frames are of major interest in the system.

If the SigFox backend does not detect the frame with index 0, the frames that follow cannot be correctly decoded, which implies that they must be silently discarded.

Even more generally, if the backend does not "see" the frame with index "N", then every frame with a greater index must be retrieved from the backend and silently discarded.

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3.3.4 Type of data and measurement period

When a sensor transmits data, the first frame (frame index = 0) comprises a number of fields that allow the analysis of the message to come.

All standard frames have a generic pseudo header of the form:

Payload of sensors (Index = 0 → pseudo-header)	
Function number	[bits 16 ... 23]
Measurement period	[bits 24 ... 31]

These two fields define the type of data to be processed in the remainder of the frame, as well as the set measurement period.

3.3.4.1 Standard data

Field value	Description
0	Temperature/Humidity measurement
1	Pulse count measurement
2	Instant temperature measurement
3	4-20 mA analog measurement
4	Status measurement (on/off)
5	Pressure measurement
6	Reserved
7	Raw analog measurement

3.3.4.2 Extended data

Field value	Description
0	UDD measurement
1	...

For sensors that allow several measurements to be sent, the first datum in the table for each measurement corresponds to the oldest measurement and the last datum corresponds to the most recent measurement.

From version 2.00 of the sensors, bit 7 (0x80) of the measurement period is used to define the order of the measurements.

If the bit is set to 0, the data are arranged in reverse chronological order, otherwise they are in chronological order.

This helps maintain compatibility with the majority of products supplied with compression, i.e. with the data arranged in reverse chronological order.

In addition, the measurement period can be set in minutes. In this case, if bit 6 (0x40) is set to 1, the interval is set in minutes (version 2.xx), otherwise it is set in hours.

3.3.5 Extended data type

Here, the data are of the extended type. At present, this type of data is used for the UDD measurements of the SigFox ventilation and outdoor temperature sensors, remote or not.

See sensors sections for more details.

3.3.6 Information

The payload of an information frame has a pseudo-header common to any sensor, and is of the form:

Payload of sensors (Index = 0 → pseudo-header)	
Information type	[bits 16 ... 23]

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Battery voltage	[bits 24 ... 31]
Number of radio transmissions	[bits 32 ... 47]
Product software version	[bits 48 ... 55]
Product software subversion	[bits 56 ... 63]
Product configuration version	[bits 64 ... 71]
Product configuration subversion	[bits 72 ... 79]

There are no frames that follow (Index > 0).

3.3.7 Generic structure of the SigFox ventilation sensors

```
struct
{
  Unsigned int  uiTransmissionNumber;           // Number of radio transmissions
  Unsigned char ucProductType;                 // Product type
  Unsigned char ucMsgType;                     // Message type
  ...                                           // Data (measurements, alarms, ...)
}
```

3.3.8 Generic structure of the other sensors

```
struct
{
  Unsigned char ucProductType;                 // Product type
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type for alarms or message type (2 bits LSB),
                                                    // compression type (2 bits) and index of successive data
                                                    // frames (4 bits MSB) for the data
  ...                                           // Data (measurements, alarms...)
}
```

3.3.9 Alarms

The payload of an alarm frame has a pseudo-header common to any sensor, and is of the form:

Payload of sensors (Index = 0 → pseudo-header)	
Alarm type	[bits 16 ... 23]
Alarm status	[bits 24 ... 31]
Option	[bits 32 ... XX]

The next frames (Index > 0) which have a payload without the pseudo-header of the form:

Payload of sensors (Index > 0)	
Option	[bits 16 ... XX]

3.3.9.1 Alarm type

Up to 256 different alarms types can be defined:

Type	Alarm	Description
000	system run	Information on system activation or deactivation
001	low battery	Low battery voltage
002	low temperature	Low temperature threshold exceeded
003	high temperature	High temperature threshold exceeded

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004	low pressure	Low pressure threshold exceeded
005	high pressure	High pressure threshold exceeded
006	low humidity	Low humidity threshold exceeded
007	high humidity	High humidity threshold exceeded
008	change of state	Alarms transfer change of state
009	malfunction	Alarms transfer malfunction
010	tearing	Anti-tearing
011	new state	Change of state of one of the inputs
012	measurement error	Pressure measurement error
013	external input detection	Detection of activation of external input
014	Opening detection	Detection of opening
015	analog raw low threshold	Low raw measure threshold exceeded
016	analog raw high threshold	High raw measure threshold exceeded

See sensors sections for more details about specific sensors alarms.

3.3.9.2 Alarms status

The status of an alarm can be:

- 1 = Detection
- 0 = Disappearance

Important: the data are stored without alignment (this means that data alignment is in byte format). In addition, each variable in the structure is encoded in little endian order, i.e. with the least significant byte first.

3.3.9.3 General sensors alarms format (except Ventilation Sensor)

Alarms are sent as a 4-byte structure that specifies the type of alarm and the status of the alarm:

The first frame (Index = 0) which has the payload with the pseudo-header:

```
struct
{
  Unsigned char ucProductType;           // Product type
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "alarm" (02)
                                                    compression type (0) and frame index (0)
  Unsigned char ucAlarmType;           // Alarm type
  Unsigned char ucAlarmStatus;         // Alarm status
  xxOption                               // Option
}
```

The next frames (Index > 0) which have a payload without the pseudo-header of the form:

```
struct
{
  Unsigned char ucProductType;           // Product type
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "alarm" (02)
                                                    compression type (0) and frame index (0)
  xxOption                               // Option
}
```

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3.3.10 *Waiting between frames*

To extend battery lifetime, a configurable waiting between frames transmissions has been added. Default value is 40 seconds (4 x 10 seconds). However, there is no waiting after "power On" and "power Off" frames.

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3.4 SigFox ventilation sensor (200)

3.4.1 Content of the sensor configuration file

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.4.1.1 Configuration settings

This configuration includes numerous informations:

- Minimum interval between two measurements: 1 to 48 hours, in 1 hour increments
- Interval between two radio transmissions: 6 to 48 hours, in 1 hour increments
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V
- Minimum pressure threshold for the exceedance alarm: 0 to 10,000 Pa, i.e. 0 to 10 kPa
- Maximum pressure threshold for the exceedance alarm: 0 to 10,000 Pa, i.e. 0 to 10 kPa

As a variant, if the measurement of temperature is activated on the sensor, two parameters are added to the previous ones:

- Minimum temperature threshold for the exceedance alarm: -200 to 600 1/10°C, i.e. -20°C to +60°C
- Maximum temperature threshold for the exceedance alarm: -200 to 600 1/10°C, i.e. -20°C to +60°C

N.B. : If the minimum and maximum thresholds are identical, the measurement of temperature and associated alarms are deactivated.

3.4.1.2 Example of configuration

Minimum interval between two measurements: 1 (i.e. 1 hour)
Interval between two radio transmissions: 24 (i.e. 24 hours)
Minimum battery voltage threshold: 32 (i.e. 3.2 V)
Minimum pressure threshold: 100 (i.e. 100 Pa)
Maximum pressure threshold: 1000 (i.e. 1000 Pa)
Minimum temperature threshold: -100 (i.e. -10°C)
Maximum temperature threshold: 400 (i.e. 40°C)

3.4.2 Standard data (7 bytes)

```
struct
{
  Unsigned int  uiTransmissionNumber;    // Number of radio transmissions
  Unsigned char ucProductType;          // Product type (SigFox Ventilation sensor: 200)
  Unsigned char ucMsgType;              // Message type "standard data" (000)
  Unsigned int  uiMeanPressure;         // Mean pressure measurement
  Unsigned char ucBatteryVoltage;       // Battery voltage measurement
}
```


3.4.3 Extended data (10 bytes)

3.4.3.1 UDD measurements

Payload of UDD measurements (Index = 0 → pseudo-header)	
Number of bytes transmitted for UDD measurements	[bits 32 ... 39]
Table of UDD measurements	[bits 40 ... XX]

There are no frames that follow (Index > 0).

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```

struct
{
  Unsigned int  uiTransmissionNumber;           // Number of radio transmissions
  Unsigned char ucProductType;                 // Product type (SigFox Ventilation sensor: 200)
  Unsigned char ucMsgType;                    // Message type "extended data" (001)
  Signed  int  iMeanTemperature;              // Mean temperature measurement
  Signed  int  iMaxTemperature;              // Maximum temperature measurement
  Signed  int  iMinTemperature;              // Minimum temperature measurement
}

```

3.4.4 Alarms

- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage
- Type 002 → low temperature: Low temperature threshold exceeded
- Type 003 → high temperature: High temperature threshold exceeded
- Type 004 → low pressure: Low pressure threshold exceeded
- Type 005 → high pressure: High pressure threshold exceeded

3.4.4.1 Format of alarms for the ventilation sensors

Alarms are sent as a 6-byte structure that specifies the type of alarm and the status of the alarm:

```

struct
{
  Unsigned int  uiTransmissionNumber;           // Number of radio transmissions
  Unsigned char ucProductType;                 // Product type
  Unsigned char ucMessageType;                // Message type "alarm" (02)
  Unsigned char ucAlarmType;                 // Alarm type
  Unsigned char ucAlarmStatus;               // Alarm status
}

```

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3.5 SigFox outdoor temperature sensor remote or not (201)

3.5.1 Content of the sensor configuration file

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.5.1.1 Configuration settings for SigFox non-remote outdoor temperature sensor

This configuration includes numerous informations:

- Minimum interval between two measurements: 1 to 48 hours, in 1 hour increments
"0": deactivation of measurements (from version 3.00).
If bit 6 (0x40) is set to 1, the interval is set in minutes (from version 3.00).
- Interval between two radio transmissions: 2 to 48 hours, in 1 hour increments
"0": deactivation of measurement's frame transmission.
If bit 6 (0x40) is set to 1, the interval is set in minutes (from version 3.00).
- Interval between two radio transmissions of sensor information frames (measured battery voltage, number of radio transmissions, software and configuration version and subversion): 0 to 30 days, in 1 day increments
"0": deactivation of sensor information frame transmission.
If bit 5 (0x20) is set to 1, the interval is set in hours (from version 3.00).
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V
- Minimum temperature threshold for the exceedance alarm: -200 to 600 1/10°C, i.e. -20°C to +60°C
- Maximum temperature threshold for the exceedance alarm: -200 to 600 1/10°C, i.e. -20°C to +60°C
- Alarm thresholds deactivation flag: "0" → Alarm thresholds activated and "1" → Alarm thresholds deactivated
- Data compression type: "0" → Data compression deactivated and "1" → nke "Delta compression" type activated
- Order of measurements: 0: reverse chronological, 1: chronological (only from version 2.00)
- Instant temperature measurement deactivation flag: "0" → Instant temperature measurement activated and "1" → Instant temperature measurement deactivated
- UDD measurement deactivation flag: "0" → UDD measurement activated and "1" → UDD measurement deactivated
- Waiting between 2 consecutives send Sigfox frames: 0 to 10 (100s), default value: 4, step:1 (version >= 3.01)

3.5.1.2 Example of configuration of a SigFox non-remote outdoor temperature sensor

Minimum interval between two measurements: 1 (i.e. 1 hour)
Interval between two radio transmissions: 24 (i.e. 24 hours)
Interval between two radio transmissions of sensor information frames: 2 (i.e. 48 hours)
Minimum battery voltage threshold: 32 (i.e. 3.2 V)
Minimum temperature threshold: 50 (i.e. 5°C)
Maximum temperature threshold: 300 (i.e. 30°C)
Alarm thresholds deactivation: 0 (i.e. alarm thresholds activated)
Compression type: 0 (no data compression)
Order of measurements: 1 (chronological)
Instant temperature measurement deactivation: 0 (i.e. instant temperature measurement activated)
UDD measurement deactivation: 0 (i.e. UDD measurement activated)
Waiting between 2 Sigfox frames: 4 (40 seconds)

3.5.1.3 Configuration settings for SigFox remote outdoor temperature sensor

This configuration includes numerous informations:

- Minimum interval between two measurements: 1 to 48 hours, in 1 hour increments
"0": deactivation of measurements (from version 3.00).
If bit 6 (0x40) is set to 1, the interval is set in minutes (from version 3.00).

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- Interval between two radio transmissions: 2 to 48 hours, in 1 hour increments
"0": deactivation of measurement's frame transmission (from version 3.00).
If bit 6 (0x40) is set to 1, the interval is set in minutes (from version 3.00).
- Interval between two radio transmissions of sensor information frames (measured battery voltage, number of radio transmissions, software and configuration version and subversion): 0 to 30 days, in 1 day increments
"0": deactivation of sensor information frame transmission.
If bit 5 (0x20) is set to 1, the interval is set in hours (from version 3.00).
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V
- Minimum temperature threshold for the exceedance alarm: -400 to 900 1/10°C, i.e. -40°C to +90°C
- Maximum temperature threshold for the exceedance alarm: -400 to 900 1/10°C, i.e. -40°C to +90°C
- Alarm thresholds deactivation flag: "0" → Alarm thresholds activated and "1" → Alarm thresholds deactivated
- Data compression type: "0" → Data compression deactivated and "1" → nke "Delta compression" type activated
- Order of measurements: 0: reverse chronological, 1: chronological (only from version 2.00)
- Instant temperature measurement deactivation flag: "0" → Instant temperature measurement activated and "1" → Instant temperature measurement deactivated
- UDD measurement deactivation flag: "0" → UDD measurement activated and "1" → UDD measurement deactivated
- Waiting between 2 consecutives send Sigfox frames: 0 to 10 (100s), default value: 4, step:1 (version >= 3.01)

3.5.1.4 Example of configuration of a SigFox remote outdoor temperature sensor

Minimum interval between two measurements: 1 (i.e. 1 hour)
Interval between two radio transmissions: 24 (i.e. 24 hours)
Interval between two radio transmissions of sensor information frames: 2 (i.e. 48 hours)
Minimum battery voltage threshold: 32 (i.e. 3.2 V)
Minimum temperature threshold: -100 (i.e. -10°C)
Maximum temperature threshold: 400 (i.e. 40°C)
Alarm thresholds deactivation: 0 (i.e. alarm thresholds activated)
Compression type: 0 (no data compression)
Order of measurements: 1 (chronological)
Instant temperature measurement deactivation: 0 (i.e. instant temperature measurement activated)
UDD measurement deactivation: 0 (i.e. UDD measurement activated)
Waiting between 2 Sigfox frames: 4 (40 seconds)

3.5.2 Standard data(12 bytes)

In the payload of the SigFox frame, the sensor transmits a pseudo-header for the data to be transmitted, which comprises the following:

3.5.2.1 Instant temperature measurements

Payload of outdoor temperature measurements, remote or not (Index = 0 → pseudo-header)	
Number of bytes transmitted for compressed or uncompressed temperature measurements	[bits 32 ... 39]
Table of compressed or uncompressed temperature measurements	[bits 40 ... XX]

The next frames (Index > 0) which have a payload without the pseudo-header of the form:

Payload of outdoor temperature measurements, remote or not (Index > 0)	
Table of compressed or uncompressed temperature measurements	[bits 16 ... ZZ]

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N.B. : The uncompressed temperature data type (remote or not) is described in details in the appendix of this document.

The first frame (Index = 0) which has the payload with the pseudo-header:

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox outdoor temperature sensor,
                                          // remote or not: 201)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                          // compression type and frame index
  Unsigned char ucFunctionNumber;       // Function number: Instant temperature
                                          // measurements (2)
  Unsigned char ucMeasurePeriod;        // Set period for instant temperature
                                          // measurements
  Unsigned char ucTemperatureSize;      // Size of instant temperature measurements
  xxTemperatureMeasure;                // Table of compressed or uncompressed instant
                                          // temperature measurements
}

```

The next frames (Index > 0) which have a payload without the pseudo-header:

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox outdoor temperature sensor,
                                          // remote or not: 201)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                          // compression type and frame index
  xxTemperatureMeasure;                // Table of compressed or uncompressed
                                          // instant temperature measurements
}

```

N.B. : The uncompressed temperature data type is described in details in the appendix of this document.

3.5.3 Extended data (11 bytes)

3.5.3.1 UDD measurements

Payload of UDD measurements (Index = 0 → pseudo-header)	
Number of bytes transmitted for UDD measurements	[bits 32 ... 39]
Table of UDD measurements	[bits 40 ... XX]

There are no frames that follow (Index > 0).

The first frame (Index = 0) which has the payload with the pseudo-header:

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox outdoor temperature sensor,
                                          // remote or not: 201)
}

```

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```

Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "extended data" (01)
                                                    // compression type (0) and frame index
Unsigned char ucFunctionNumber; // Function number: UDD measurements (0)
Unsigned char ucMeasurePeriod; // UDD measurement period (0)
Unsigned char ucTemperatureSize; // Size of UDD measurements (6: 2 bytes x 3 UDD
                                // measurements (mean, max. and min.))
Signed int iMeanTemperature; // Mean temperature measurement (UDD)
Signed int iMaxTemperature; // Maximum temperature measurement (UDD)
Signed int iMinTemperature; // Minimum temperature measurement (UDD)
}

```

UDD measurements are systematically uncompressed.
The UDD measurement period is systematically set at "0" because it cannot be modified.

There are no frames that follow (Index > 0).

3.5.4 Information data (10 bytes)

```

struct
{
Unsigned char ucProductType; // Product type (SigFox temperature sensor: 201)
Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type: "information data" (03), compression
                                                    // type (none: 0), frame index (0)
Unsigned char ucInformationType; // Information type (0)
Unsigned char ucBatteryVoltage; // Battery voltage measurement
Unsigned int uiTransmissionNumber; // Number of radio transmissions
Unsigned char ucSoftwareVersion; // Product software version
Unsigned char ucSoftwareSubversion; // Product software subversion
Unsigned char ucConfigurationVersion; // Product configuration version
Unsigned char ucConfigurationSubversion; // Product configuration subversion
}

```

3.5.5 Alarms

Alarms related to the SigFox outdoor temperature sensor (remote or not):

- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage
- Type 002 → low temperature: Low temperature threshold exceeded
- Type 003 → high temperature: High temperature threshold exceeded

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3.6 SigFox TH sensor (202)

3.6.1 Content of the sensor configuration file

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.6.1.1 Configuration settings

This configuration includes numerous informations:

- Minimum interval between two measurements: 1 to 48 hours, in 1 hour increments
"0": deactivation of measurements (only from version 2.00).
If bit 6 (0x40) is set to 1, the interval is set in minutes (from version 2.00).
- Interval between two radio transmissions of measurement frames: 2 to 48 hours, in 1 hour increments
"0": deactivation of measurement's frame transmission (from version 2.00).
If bit 6 (0x40) is set to 1, the interval is set in minutes (from version 2.00).
- Interval between two radio transmissions of sensor information frames (measured battery voltage and number of radio transmissions): 0 to 30 days, in 1 day increments
"0": deactivation of sensor information frame transmission.
If bit 5 (0x20) is set to 1, the interval is set in hours (from version 2.00).
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V
- Minimum temperature threshold for the exceedance alarm: 0 to 400 1/10°C, i.e. 0°C to +40°C
- Maximum temperature threshold for the exceedance alarm: 0 to 400 1/10°C, i.e. 0°C to +40°C
- Minimum humidity threshold for the exceedance alarm: 0 to 1000 1/10% rH, i.e. 0% rH to 100% rH
- Maximum humidity threshold for the exceedance alarm: 0 to 1000 1/10% rH, i.e. 0% rH to 100% rH
- Alarm thresholds deactivation flag: "0" → Alarm thresholds activated and "1" → Alarm thresholds deactivated
- Data compression type: "0" → Data compression deactivated and "1" → nke "Delta compression" type activated
- Order of measurements: 0: reverse chronological, 1: chronological (from version 2.00)
- Waiting between 2 consecutives send Sigfox frames: 0 to 10 (100s), default value: 4, step:1 (version >= 3.01)

3.6.1.2 Example of configuration

Minimum interval between two measurements: 1 (i.e. 1 hour)
Interval between two radio transmissions of measurement frames: 24 (i.e. 24 hours)
Interval between two radio transmissions of sensor information frames: 2 (i.e. 48 hours)
Minimum battery voltage threshold: 32 (i.e. 3.2 V)
Minimum temperature threshold: 100 (i.e. 10°C)
Maximum temperature threshold: 300 (i.e. 30°C)
Minimum humidity threshold: 300 (i.e. 30% rH)
Maximum humidity threshold: 700 (i.e. 70% rH)
Alarm thresholds deactivation: 0 (i.e. alarm thresholds activated)
Compression type: 0 (no data compression)
Order of measurements: 1 (chronological)
Waiting between 2 Sigfox frames: 4 (40 seconds)

3.6.2 Standard data (12 bytes)

In the payload of the SigFox frame, the sensor transmits a pseudo-header for the data to be transmitted, which comprises the following:

Payload of T°/Hg measurement (Index = 0 → pseudo-header)

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Number of bytes transmitted for compressed or uncompressed temperature measurements	[bits 32 ... 39]
Number of bytes transmitted for compressed or uncompressed humidity measurements	[bits 40 ... 47]
Table of compressed or uncompressed temperature measurements	[bits 48 ... XX]
Table of compressed or uncompressed humidity measurements	[bits XY ... YY]

The next frames (Index > 0) which have a payload without the pseudo-header of the form:

Payload of T°/Hum measurement (Index > 0)	
Table of compressed or uncompressed temperature measurements	[bits 16 ... XX]
Table of compressed or uncompressed humidity measurements	[bits XY ... YY]

N.B. : The uncompressed temperature and humidity data type is described in details in the appendix of this document.

The first frame (Index = 0) which has the payload with the pseudo-header:

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox TH sensor: 202)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                           // compression type and frame index
  Unsigned char ucFunctionNumber;        // Function number: Temperature/Humidity
                                           // measurement (0)
  Unsigned char ucMeasurePeriod;         // Set measurement period and order of measurements
                                           // (bit 7 (0x80)) (>= v2.00)
  Unsigned char ucTemperatureSize;       // Size of temperature measurements
  Unsigned char ucHumiditySize;          // Size of humidity measurements
  xxTemperatureMeasure;                  // Table of compressed or uncompressed temperature
                                           // measurements
  xxHumidityMeasure;                     // Table of compressed or uncompressed humidity
                                           // measurements
}

```

The next frames (Index > 0) which have a payload without the pseudo-header:


```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox TH sensor: 202)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                           // compression type and frame index
  xxTemperatureMeasure;                  // Table of compressed or uncompressed temperature
                                           // measurements
  xxHumidityMeasure;                     // Table of compressed or uncompressed humidity
                                           // measurements
}

```

N.B. : The uncompressed temperature and humidity data type is described in details in the appendix of this document.

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3.6.3 Information data (10 bytes)

```


struct
{
  Unsigned char ucProductType;           // Product type (SigFox TH sensor: 202)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type: "information data" (03), compression
                                                    type (none: 0), frame index (0)
  Unsigned char ucInformationType;      // Information type (0)
  Unsigned char ucBatteryVoltage;       // Battery voltage measurement
  Unsigned int  uiTransmissionNumber;    // Number of radio transmissions
  Unsigned char ucSoftwareVersion;      // Product software version
  Unsigned char ucSoftwareSubversion;   // Product software subversion
  Unsigned char ucConfigurationVersion; // Product configuration version
  Unsigned char ucConfigurationSubversion; // Product configuration subversion
}

```

3.6.4 Alarms

- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage
- Type 002 → low temperature: Low temperature threshold exceeded
- Type 003 → high temperature: High temperature threshold exceeded
- Type 006 → low humidity: Low humidity threshold exceeded
- Type 007 → high humidity: High humidity threshold exceeded
- Type 010 → tearing: Anti-tearing (from software version V01.02)

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3.7 SigFox Pulse S0 sensor (ATEX or not) and Flash'O sensor (203)

3.7.1 Content of the sensor configuration file

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.7.1.1 Configuration settings

This configuration includes numerous informations:

- Minimum interval between two measurements: 1 to 48 hours, in 1 hour increments
"0": deactivation of measurements (only from version 2.00).
If bit 6 (0x40) is set to 1, the interval is set in minutes (from version 2.00).
- Interval between two radio transmissions of measurement frames: 2 to 48 hours, in 1 hour increments
"0": deactivation of measurement's frame transmission (from version 2.00).
If bit 6 (0x40) is set to 1, the interval is set in minutes (from version 2.00).
- Interval between two radio transmissions of sensor information frames (measured battery voltage and number of radio transmissions): 0 to 30 days, in 1 day increments.
"0": deactivation of sensor information frame transmission.
If bit 5 (0x20) is set to 1, the interval is set in hours (from version 2.00).
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V
- Data compression type: "0" → Data compression deactivated and "1" → nke "Delta compression" type activated
- Order of measurements: 0: reverse chronological, 1: chronological (from version 2.00)
- Waiting between 2 consecutives send Sigfox frames: 0 to 10 (100s), default value: 4, step:1 (version >= 3.01)

3.7.1.2 Example of configuration

Minimum interval between two measurements: 1 (i.e. 1 hour)
Interval between two radio transmissions of measurement frames: 24 (i.e. 24 hours)
Interval between two radio transmissions of sensor information frames: 2 (i.e. 48 hours)
Minimum battery voltage threshold: 32 (i.e. 3.2 V)
Compression type: 1 (nke "Delta compression")
Order of measurements: 1 (chronological)
Waiting between 2 Sigfox frames: 4 (40 seconds)

3.7.2 Standard data (12 bytes)

In the payload of the SigFox frame, the sensor transmits a pseudo-header for the data to be transmitted, which comprises the following:

Payload of pulse measurement (Index = 0 → pseudo-header)	
Number of bytes transmitted for compressed or uncompressed count measurements	[bits 32 ... 39]
Table of compressed or uncompressed count measurements	[bits 40 ... XX]

The next frames (Index > 0) which have a payload without the pseudo-header of the form:

Payload of pulse measurement (Index > 0)	
Table of compressed or uncompressed count measurements	[bits 16 ... ZZ]

N.B. : The uncompressed count data type is described in details in the appendix of this document.

The first frame (Index = 0) which has the payload with the pseudo-header:

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```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox Pulse S0 sensor: 203)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                           compression type and frame index
  Unsigned char ucFunctionNumber;        // Function number: Pulse count
                                           measurement (1)
  Unsigned char ucMeasurePeriod;         // Set measurement period and order of measurements
                                           (bit 7 (0x80)) (>= v2.00)
  Unsigned char ucIndexSize;              // Size of pulse count measurements
      xxIndexMeasure;                    // Table of compressed or uncompressed index
                                           measurements
}

```

The next frames (Index > 0) which have a payload without the pseudo-header:

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox Pulse S0 sensor: 203)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                           compression type and frame index
      xxIndexMeasure;                    // Table of compressed or uncompressed index
                                           measurements
}

```

N.B. : The uncompressed count data type is described in details in the appendix of this document.

3.7.3 Information data (10 bytes)

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox Pulse S0 sensor: 203)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type: "information data" (03), compression
                                           type (none: 0), frame index (0)
  Unsigned char ucInformationType;       // Information type (0)
  Unsigned char ucBatteryVoltage;        // Battery voltage measurement
  Unsigned int  uiTransmissionNumber;     // Number of radio transmissions
  Unsigned char ucSoftwareVersion;       // Product software version
  Unsigned char ucSoftwareSubversion;    // Product software subversion
  Unsigned char ucConfigurationVersion;  // Product configuration version
  Unsigned char ucConfigurationSubversion; // Product configuration subversion
}


```

Example :

CB0300240100025A0000 :

0xCB = 203	Product type SigFox Pulse S0 sensor
0x03 = 3	Message type: "information data"
0x00 = 0	Information type
0x24 = 36	Battery voltage measurement
0x0001 = 1	Number of radio transmissions
0x02 = 2	Product software version
0x5A = 90	Product software subversion

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0x00 = 0 Product configuration version
0x00 = 0 Product configuration subversion


3.7.4 Alarms

- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage

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3.8 Alarms transfer sensor (204)

3.8.1 Content of the sensor configuration file

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.8.1.1 Configuration settings

This configuration includes numerous informations:

- Interval between two radio transmissions of sensor information frames (measured battery voltage and number of radio transmissions): 0 to 30 days, in 1 day increments.
"0": deactivation of sensor information frame transmission.
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V
- Minimum interval between two Open → Closed or Closed → Open changes of state: 1 to 240 minutes, in 1 min increments (this setting allows excessively frequent changes of state to be filtered out)
- Reversal of contact type by default. If the state of the non-alarm contact is NC (Normally Closed), i.e. in the resting state, the signal is grounded, then this parameter must be set to 0; if the state of the non-alarm contact is NO (Normally Open), i.e. in the activated state, the signal is grounded, then this parameter must be set to 1
- Waiting between 2 consecutives send Sigfox frames: 0 to 10 (100s), default value: 4, step:1 (version >= 2.90)

3.8.1.2 Example of configuration

Interval between two radio transmissions of sensor information frames: 2 (i.e. 48 hours)

Minimum battery voltage threshold: 32 (i.e. 3.2 V)

Minimum interval between two O->C or C->O changes of state: 5 (i.e. 5 min)

Reversal of contact type by default: Yes (Contact reversed)

- Waiting between 2 Sigfox frames: 4 (40 seconds)

3.8.2 Information data (10 bytes)

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox alarms transfer sensor: 204)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type: "information data" (03), compression
                                              type (none: 0), frame index (0)

  Unsigned char ucInformationType;       // Information type (0)
  Unsigned char ucBatteryVoltage;        // Battery voltage measurement
  Unsigned int  uiTransmissionNumber;    // Number of radio transmissions
  Unsigned char ucSoftwareVersion;       // Product software version
  Unsigned char ucSoftwareSubversion;    // Product software subversion
  Unsigned char ucConfigurationVersion;  // Product configuration version
  Unsigned char ucConfigurationSubversion; // Product configuration subversion
}

```

3.8.3 Alarms

- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage
- Type 008 → change state: Change of state
- Type 009 → malfunction: Alarms transfer malfunction

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3.9 Indoor temperature sensor (205)

3.9.1 Content of the sensor configuration file

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.9.1.1 Configuration settings

This configuration includes numerous informations:

- Minimum interval between two measurements: 1 to 48 hours, in 1 hour increments
"0": deactivation of measurements (only from version 3.00).
If bit 6 (0x40) is set to 1, the interval is set in minutes (only from version 3.00).
- Interval between two radio transmissions: 2 to 48 hours, in 1 hour increments
"0": deactivation of measurement's frame transmission.
If bit 6 (0x40) is set to 1, the interval is set in minutes (only from version 3.00).
- Interval between two radio transmissions of sensor information frames (measured battery voltage, number of radio transmissions, software and configuration version and subversion): 0 to 30 days, in 1 day increments
"0": deactivation of sensor information frame transmission.
If bit 5 (0x20) is set to 1, the interval is set in hours (only from version 3.00).
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V
- Minimum temperature threshold for the exceedance alarm: -200 to 600 1/10°C, i.e. -20°C to +60°C
- Maximum temperature threshold for the exceedance alarm: -200 to 600 1/10°C, i.e. -20°C to +60°C
- Alarm thresholds deactivation flag: "0" → Alarm thresholds activated and "1" → Alarm thresholds deactivated
- Data compression type: "0" → Data compression deactivated and "1" → nke "Delta compression" type activated
- Order of measurements: 0: reverse chronological, 1: chronological (only from version 2.00)
- Instant temperature measurement deactivation flag: "0" → Instant temperature measurement activated and "1" → Instant temperature measurement deactivated
- UDD measurement deactivation flag: "0" → UDD measurement activated and "1" → UDD measurement deactivated
- Waiting between 2 consecutives send Sigfox frames: 0 to 10 (100s), default value: 4, step:1 (version >= 3.01)

3.9.1.2 Example of configuration

Minimum interval between two measurements: 1 (i.e. 1 hour)
Interval between two radio transmissions: 24 (i.e. 24 hours)
Interval between two radio transmissions of sensor information frames: 2 (i.e. 48 hours)
Minimum battery voltage threshold: 32 (i.e. 3.2 V)
Minimum temperature threshold: 50 (i.e. 5°C)
Maximum temperature threshold: 300 (i.e. 30°C)
Alarm thresholds deactivation: 0 (i.e. alarm thresholds activated)
Compression type: 1 (data compression activated)
Order of measurements: 1 (chronological)
Instant temperature measurement deactivation: 0 (i.e. instant temperature measurement activated)
UDD measurement deactivation: 1 (i.e. no UDD measurement)
Waiting between 2 Sigfox frames: 4 (40 seconds)

3.9.2 Standard data (12 bytes)

The first frame (Index = 0) which has the payload with the pseudo-header:

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```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox outdoor temperature sensor,
                                          // remote or not: 201)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                          // compression type and frame index
  Unsigned char ucFunctionNumber;        // Function number: Instant temperature
                                          // measurements (2)
  Unsigned char ucMeasurePeriod;         // Set period for instant temperature
                                          // measurements
  Unsigned char ucTemperatureSize;       // Size of instant temperature measurements
  xxTemperatureMeasure;                  // Table of compressed or uncompressed instant
                                          // temperature measurements
}

```

The next frames (Index > 0) which have a payload without the pseudo-header:

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox outdoor temperature sensor,
                                          // remote or not: 201)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                          // compression type and frame index
  xxTemperatureMeasure;                  // Table of compressed or uncompressed
                                          // instant temperature measurements
}

```

N.B. : The uncompressed temperature data type is described in details in the appendix of this document.

3.9.3 Extended data (11 bytes)

The first frame (Index = 0) which has the payload with the pseudo-header:

```


struct
{
  Unsigned char ucProductType;           // Product type (SigFox outdoor temperature sensor,
                                          // remote or not: 201)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "extended data" (01)
                                          // compression type (0) and frame index
  Unsigned char ucFunctionNumber;        // Function number: UDD measurements (0)
  Unsigned char ucMeasurePeriod;         // UDD measurement period (0)
  Unsigned char ucTemperatureSize;       // Size of UDD measurements (6: 2 bytes x 3 UDD
                                          // measurements (mean, max. and min.))
  Signed int iMeanTemperature;           // Mean temperature measurement (UDD)
  Signed int iMaxTemperature;           // Maximum temperature measurement (UDD)
  Signed int iMinTemperature;           // Minimum temperature measurement (UDD)
}

```

UDD measurements are systematically uncompressed.

The UDD measurement period is systematically set at "0" because it cannot be modified.

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There are no frames that follow (Index > 0).

3.9.4 Information data (10 bytes)

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox temperature sensor: 201)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type: "information data" (03), compression
                                                type (none: 0), frame index (0)
  Unsigned char ucInformationType;       // Information type (0)
  Unsigned char ucBatteryVoltage;        // Battery voltage measurement
  Unsigned int  uiTransmissionNumber;     // Number of radio transmissions
  Unsigned char ucSoftwareVersion;       // Product software version
  Unsigned char ucSoftwareSubversion;    // Product software subversion
  Unsigned char ucConfigurationVersion;   // Product configuration version
  Unsigned char ucConfigurationSubversion; // Product configuration subversion
}

```

3.9.5 Alarms

- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage
- Type 002 → low temperature: Low temperature threshold exceeded
- Type 003 → high temperature: High temperature threshold exceeded
- Type 010 → tearing: Anti-tearing (from software version V01.02)

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3.11 Dual input state sensor (207)

3.11.1 *Content of the sensor configuration file*

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.11.1.1 *Configuration settings*

This configuration includes numerous informations:

- Interval between two radio transmissions of sensor information frames (measured battery voltage and number of radio transmissions): 0 to 30 days, in 1 day increments ("0": deactivation of sensor information frame transmission)
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V

3.11.1.2 *Example of configuration*

Interval between two radio transmissions of sensor information frames: 2 (i.e. 48 hours)
Minimum battery voltage threshold: 32 (i.e. 3.2 V)

3.11.2 *Information data (10 bytes)*

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox Pulse S0 sensor: 203)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type: "information data" (03), compression
                                              type (none: 0), frame index (0)
  Unsigned char ucInformationType;       // Information type (0)
  Unsigned char ucBatteryVoltage;        // Battery voltage measurement
  Unsigned int  uiTransmissionNumber;     // Number of radio transmissions
  Unsigned char ucSoftwareVersion;       // Product software version
  Unsigned char ucSoftwareSubversion;    // Product software subversion
  Unsigned char ucConfigurationVersion;  // Product configuration version
  Unsigned char ucConfigurationSubversion; // Product configuration subversion
}

```

3.11.3 *Alarms*


- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage
- Type 011 → new state: Change of state

For the alarm of type 11 (New state), the status shifts the state of each input over 1 bit, i.e. bit 0 corresponds to input 1 and bit 1 to input 2. If the bit is at 1, the input is open, otherwise it is closed.

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3.12 CMV Gas sensor (208)

3.12.1 *Content of the sensor configuration file*

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.12.1.1 *Configuration settings*


This configuration includes numerous informations:

- Minimum interval between two measurements: 0 to 48 hours, in 1 hour increments ("0": deactivation of measurements).
If bit 6 (0x40) is set to 1, the interval is set in minutes: 0 to 59 minutes, in 1 minutes increments.
- Interval between two radio transmissions of measurement frames: 0 to 48 hours, in 1 hour increments ("0": deactivation of measurement's frame transmission).
If bit 6 (0x40) is set to 1, the interval is set in minutes: 0 to 59 minutes, in 1 minutes increments.
- Interval between two radio transmissions of sensor information frames (measured battery voltage and number of radio transmissions): 0 to 30 days, in 1 day increments ("0": deactivation of sensor information frame transmission).
If bit 5 (0x20) is set to 1, the interval is set in hours: 0 to 23 hours, in 1 hour increments.
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V.
- Minimum pressure activation threshold for the exceedance alarm: 0 to 500 Pa, in 1 Pa increments.
- Minimum pressure deactivation threshold for the exceedance alarm: 0 to 500 Pa, in 1 Pa increments.
- Maximum pressure deactivation threshold for the exceedance alarm: 0 to 500 Pa, in 1 Pa increments.
- Maximum pressure activation threshold for the exceedance alarm: 0 to 500 Pa, in 1 Pa increments.
- Reversal of contact type by default. If the state of the non-alarm contact is NC (Normally Closed), i.e. in the resting state, the signal is grounded, then this parameter must be set to 0; if the state of the non-alarm contact is NO (Normally Open), i.e. in the activated state, the signal is grounded, then this parameter must be set to 1.
- Temperature measurement disabled: "0" → Temperature measurement activated and "1" → Temperature measurement disabled.
- Alarm thresholds deactivation flag: "0" → Alarm thresholds activated and "1" → Alarm thresholds deactivated.
- Alarm confirmation measures number: 1 to 16 (version >= 1.02)
- Confirmation alarm waiting: 0 to 10 seconds (version >= 1.02)
- Input activation delay: 0 to 240 minutes (Mode 1 and 2) (version >= 1.02)
- Input deactivation delay: 0 to 240 minutes (Mode 1 and 2) (version >= 1.02)
- Operating mode: (version >= 1.02)
 - Mode 0: normal operating (measure, alarm), input disabled
 - Mode 1: normal operating (measure, alarm). On input state modification, a measure is done and an alarm is transmitted
 - Mode 2: normal operating (measure, alarm). On input activation, system is suspended.
- Waiting between 2 consecutives send Sigfox frames: 0 to 10 (100s), default value: 4, step:1 (version >= 1.02)

3.12.1.2 *Example of configuration*

Minimum interval between two measurements: 1 (i.e. 1 hour)
Interval between two radio transmissions of measurement frames: 24 (i.e. 24 hours)
Interval between two radio transmissions of sensor information frames: 7 (i.e. 1 week)
Minimum battery voltage threshold: 30 (i.e. 3.0 V)
Minimum pressure activation threshold: 90 (i.e. 90Pa)
Minimum pressure deactivation threshold: 110 (i.e. 110Pa)
Maximum pressure deactivation threshold: 390 (i.e. 390Pa)
Maximum pressure activation threshold: 410 (i.e. 410Pa)

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Reversal of contact type by default: 1 (Contact Normally Open)
 Temperature measurement disabled: 1 (i.e. temperature measurement disabled)
 Alarm thresholds activation: 0 (i.e. alarm thresholds activated)
 Alarm confirmation measures number: 3 measures to confirm alarm
 Confirmation alarm waiting: 2 seconds between confirmations
 Input activation delay: 5 minutes
 Input deactivation delay: 1 minute
 Operating mode: 1 (input is enabled)
 Waiting between 2 Sigfox frames: 4 (40 seconds)

3.12.2 Standard data (12 bytes)

The first frame (Index = 0) which has the payload with the pseudo-header:

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox CMV Gas sensor: 208)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                              compression type (none: 0) and frame index (0)
  Unsigned char ucFunctionNumber;       // Function number: Pressure measurement (5)
  Unsigned char ucMeasurePeriod;        // Set measurement period and order of measurements
                                              (bit 7 (0x80))
  Unsigned char ucMeasureSize;          // Size of pressure measurements (6 : 2 bytes for mean
                                              pressure measurement, 2 bytes for maximum pressure
                                              measurement and 2 bytes for minimum pressure
                                              measurement) and of temperature measurements (12 :
                                              6 of pressure measurements and 2 bytes for mean
                                              temperature measurement, 2 bytes for maximum
                                              temperature measurement and 2 bytes for minimum
                                              temperature measurement) if activated
  Unsigned int  uiMeanPressure;          // Mean pressure measurement
  Unsigned int  uiMaxPressure;          // Maximum pressure measurement
  Unsigned int  uiMinPressure;          // Minimum pressure measurement
}
  
```

The next frames (Index > 0) which have a payload without the pseudo-header if temperature measurement is activated:

```


struct
{
  Unsigned char ucProductType;           // Product type (SigFox CMV Gas sensor: 208)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                              compression type (none: 0) and frame index (1)
  Signed   int  iMeanTemperature;       // Mean temperature measurement (if activated)
  Signed   int  iMaxTemperature;       // Maximum temperature measurement (if activated)
  Signed   int  iMinTemperature;       // Minimum temperature measurement (if activated)
}
  
```

N.B.: The uncompressed pressure and temperature data type is described in details in the appendix of this document.

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Example with 2 frames for pressure and temperature measurements: d00005c50c3101550110010e et d0100115010001

- Product type : 0xD0 = 208 SigFox CMV Gas sensor
- Message type : 0x00 Standard data
- Function number: 0x05 Pressure measurement
- Set measurement period and order of measurements : 0xC5 = 0b1100 0101 : Order (Chronological) 1 : Unit (1 : minutes – 0 : hours)
- Size of pressure measurements : 0x0C = 12 bytes
- Mean pressure : 0x0131 = 305 Pa
- Max pressure : 0x0155 = 341 Pa
- Min pressure : 0x0110 = 272 Pa
- Mean temperature : 0x010E = 27.0°C
- Maximum temperature : 0x0115 = 27.7°C
- Minimum temperature : 0x0100 = 25.6°C

3.12.3 Information data (10 bytes)

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox CMV Gas sensor: 208)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type: "information data" (03), compression
                                              type (none: 0), frame index (0)

  Unsigned char ucInformationType;       // Information type (0)
  Unsigned char ucBatteryVoltage;        // Battery voltage measurement
  Unsigned int  uiTransmissionNumber;     // Number of radio transmissions
  Unsigned char ucSoftwareVersion;       // Product software version
  Unsigned char ucSoftwareSubversion;    // Product software subversion
  Unsigned char ucConfigurationVersion;  // Product configuration version
  Unsigned char ucConfigurationSubversion; // Product configuration subversion
}

```

Example : d00300240c0001030105

- Battery voltage : 0x24 = 3.6V
- Number of radio transmissions : 0x000C = 12
- Product software version and subversion : 0x0103 = V1.03
- Product configuration version and subversion : 0x0105 = V1.05

3.12.4 Alarms


- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage
- Type 004 → low pressure: Low pressure threshold exceeded
- Type 005 → high pressure: High pressure threshold exceeded
- Type 012 → measurement error: Pressure (or temperature) measurement error
- Type 013 → external input detection : Detection of activation of external input (with pressure measure)

This last alarm (013) has an option (last bytes of the alarm structure) which corresponds to the instant pressure measurement (two bytes) carried out on detection of activation of the external input.

3.12.4.1 Particular case: Format of alarms of detection of activation of external input for the SigFox CMV Gas sensor (alarm type: 013)

Alarms are sent as a 6-byte structure that specifies the type of alarm and the status of the alarm:

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```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox CMV Gas sensor: 208)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "alarm" (02)
                                                    compression type (0) and frame index (0)
  Unsigned char ucAlarmType;           // Alarm type (external input detection: 013)
  Unsigned char ucAlarmStatus;         // Alarm status
  Unsigned int  uiOption;               // Option: Instant pressure measurement (two
    bytes) carried out on detection of activation and of deactivation of the external input
}

```

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3.13 Skydome Sensor (209)

3.13.1 Content of the sensor configuration file

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.13.1.1 Configuration settings

This configuration includes numerous informations:

- Minimum interval between two measurements: 0 to 59 minutes, in 1 minute increments ("0": deactivation of measurements).
If bit 6 (0x40) is set to 1, the interval is set in seconds: 0 to 59 seconds, in 1 second increments.
- Interval between two radio transmissions of sensor information frames (measured battery voltage and number of radio transmissions): 0 to 30 days, in 1 day increments ("0": deactivation of sensor information frame transmission)
If bit 5 (0x20) is set to 1, the interval is set in hours: 0 to 23 hours, in 1 hour increments.
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V
- Opening detection angle: 10 to 180°, in 1° increments (hysteresis is 5°below)
- Number of confirmation: 0 to 10, in 1 increments
- Waiting between 2 consecutives send Sigfox frames: 0 to 10 (100s), default value: 4, step:1

3.13.1.2 Example of configuration

Minimum interval between two measurements: 10 (i.e. 10 seconds)
Interval between two radio transmissions of sensor information frames: 7 (i.e. 7 days)
Minimum battery voltage threshold: 30 (i.e. 3.0 V)
Minimum opening detection angle: 30°
Number of confirmation: 3
Waiting between 2 Sigfox frames: 4 (40 seconds)

3.13.2 Information data (10 bytes)

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox Skydome sensor: 209)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type: "information data" (03), compression
                                              type (none: 0), frame index (0)
  Unsigned char ucInformationType;       // Information type (0)
  Unsigned char ucBatteryVoltage;        // Battery voltage measurement
  Unsigned int  uiTransmissionNumber;    // Number of radio transmissions
  Unsigned char ucSoftwareVersion;       // Product software version
  Unsigned char ucSoftwareSubversion;    // Product software subversion
  Unsigned char ucConfigurationVersion;  // Product configuration version
  Unsigned char ucConfigurationSubversion; // Product configuration subversion
}

```


3.13.3 Alarms

- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage
- Type 012 → measurement error: Acceleration measurement error
- Type 014 → Opening detection: Detection of opening

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3.13.3.1 *Particular case: Format of alarms of detection of opening for the SigFox Skydome sensor (alarm type : 014)*


Alarms are sent as a 6-byte structure that specifies the type of alarm and the status of the alarm:

```

struct
{
  Unsigned char ucProductType;           // Product type (SigFox CMV Gas sensor: 208)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "alarm" (02)
                                                    compression type (0) and frame index (0)
  Unsigned char ucAlarmType;           // Alarm type (opening detection: 014)
  Unsigned char ucAlarmStatus;         // Alarm status
  Unsigned char ucOption;             // Option: opening detection angle (one
byte) carried out on detection of opening and closing detection.
}

```

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3.14 20mA Loop / 0-10V Sensor (210)

3.14.1 *Content of the sensor configuration file*

The sensor is supplied with factory settings, defined at the time of the order, and for a minimum volume of 100 sensors.

3.14.1.1 *Configuration settings*

- Minimum interval between two measurements :
 - 1 to 48 hours, in 1 hour increments, (if bit 6 (0x40) is set to 0), default value 1h.
 - 1 to 59 minutes, in 1 minutes increments, (if bit 6 (0x40) is set to 1), default value 15 min.
- Interval between two radio transmissions of measurement frames: 0 to 48 hours, in 1 hour increments ("0": deactivation of measurement's frame transmission).
If bit 6 (0x40) is set to 1, the interval is set in minutes: 0 to 59 minutes, in 1 minutes increments.
- Interval between two radio transmissions of sensor information frames (measured battery voltage, number of radio transmissions, software and configuration version and subversion): 0 to 30 days, in 1 day increments ("0": deactivation of sensor information frame transmission), default value 7 days.
- Minimum battery voltage threshold for the exceedance alarm: 1 to 36 1/10 V, i.e. 0.1 V to 3.6 V.
- Data compression type value: "0": No data compression, "1": NKE "Delta compression" mode, default mode "1".
- Measurements storage order: "0": reverse chronological, "1": chronological
- Warmup time interval before measurement 0 to 1000, step 10ms, i.e. 0ms to 10 seconds, default value 0ms.
- Low threshold for exceedance alarm: 0 to 1023 ADC points by 1 point step, default value 0 pts.
- Hysteresis of low threshold : 10 ADC pts to 200 ADC points, by 1 point step, default value : 50pts
- Low threshold disable flag: "0" Low threshold enabled, "1" Low threshold disable, default state : "1"
- High threshold for exceedance alarm: 0 to 1023 ADC points by 1 point step, default value 1023 pts.
- Hysteresis of high threshold : 10 ADC pts to 200 ADC points, by 1 point step, default value : 50pts
- High threshold disable flag: "0" High threshold enabled, "1" High threshold disable, default state : "1".
- Number of measures to confirm threshold exceedance : 1 to 16 measures, default value: 1, step 1
- Waiting between 2 exceedance threshold measures : 1 to 5 seconds default value: 1s, step :1s
- Waiting between 2 consecutives send Sigfox frames: 0 to 10 (100s), **default value: 4**, step:1

3.14.1.2 *Example of configuration*

Interval between to measure: 1 (1 hour).
 Interval between two information frames send: 3 (3 days).
 Minimum battery threshold: 30 (3.0V).
 Data compression Mode: 1 (NKE Delta Compression).
 Warmup time: 10 (100ms).
 Low threshold: 200 (200pts ADC).
 Hysteresis Low threshold: 50 (50pts).
 Low threshold disable: 0 (low threshold enabled).
 High threshold: 1023 (1023pts ADC).
 Hysteresis high threshold: 10 (10pts).
 High threshold disable: 1 (high threshold disabled)
 Number of measure to confirm threshold alarm: 4
 Waiting between confirmation measure: 1 (1 second)
 Waiting between 2 Sigfox frames: **4 (40 seconds)**


3.14.1.3 *Limitations*

The sensor is able to store one measure every 15 minutes during 24 hours. This matches with a buffer size of 96 measurements.

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3.14.2 Standard data (12 bytes)

In the payload of the SigFox frame, the sensor transmits a pseudo-header for the data to be transmitted, which comprises the following:

Payload of raw measurements of intensity or voltage (Index = 0 → pseudo-header)	
Number of bytes transmitted for compressed or uncompressed raw measurements	[bits 32 ... 39]
Table of compressed or uncompressed raw measurements	[bits 40 ... XX]

The next frames (Index > 0) which have a payload without the pseudo-header of the form:

Payload of raw measurements of intensity or voltage (Index > 0)	
Table of compressed or uncompressed raw measurements	[bits 16 ... ZZ]

The first frame (Index = 0) which has the payload with the pseudo-header:

struct

```

{
  Unsigned char ucProductType;           // Product type (20mA Loop / 0-10V Sensor: 210)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                           compression type and frame index
  Unsigned char ucFunctionNumber;       // Function number: Pulse count
                                           measurement (1)
  Unsigned char ucMeasurePeriod;        // Set measurement period
  Unsigned char ucIndexSize;            // Size of analog measurements
                                           xxIndexMeasure; // Table of compressed or uncompressed analog
                                           measurements
}

```

The next frames (Index > 0) which have a payload without the pseudo-header:

struct

```

{
  Unsigned char ucProductType;           // Product type (20mA Loop / 0-10V Sensor: 210)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type "standard data" (00)
                                           compression type and frame index
                                           xxIndexMeasure; // Table of compressed or uncompressed analog
                                           measurements
}

```

3.14.3 Information data (10 bytes)

struct

```


{
  Unsigned char ucProductType;           // Product type (20mA Loop / 0-10V Sensor: 210)
  Unsigned char ucMessageAndCompressionTypeAndIndex; // Message type: "information data" (03), compression
                                           type (none: 0), frame index (0)
  Unsigned char ucInformationType;       // Information type (0)
  Unsigned char ucBatteryVoltage;        // Battery voltage measurement
  Unsigned int  uiTransmissionNumber;    // Number of radio transmissions
  Unsigned char ucSoftwareVersion;       // Product software version
  Unsigned char ucSoftwareSubversion;    // Product software subversion
  Unsigned char ucConfigurationVersion;  // Product configuration version
}

```

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```
Unsigned char ucConfigurationSubversion;           // Product configuration subversion
}
```


3.14.4 Alarms

- Type 000 → system run: Information on system activation or deactivation
- Type 001 → low battery: Low battery voltage
- Type 015 → analog raw low threshold: Low raw measure threshold exceeded
- Type 016 → analog raw high threshold: High raw measure threshold exceeded

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4. APPENDIX

4.1 Type of data according to the type of sensor

Important: the data are stored without alignment (this means that data alignment is in byte format). In addition, each variable in the structure is encoded in little endian order, i.e. with the least significant byte first.


The data are transferred with a structure specific to the type of sensor.

Sigfox Sensor type	Standard data	Extended data	Information data
Ventilation sensor (200)	Mean pressure measurement Battery voltage measurement	Mean temperature measurement (UDD) Maximum temperature measurement (UDD) Minimum temperature measurement (UDD)	No information data
Outdoor temperature sensor, remote or not (201)	Instant temperature measurements	Mean temperature measurement (UDD) Maximum temperature measurement (UDD) Minimum temperature measurement (UDD)	Battery voltage measurement Number of radio transmissions
TH sensor (202)	Compressed temperature and humidity measurements	No extended data	Battery voltage measurement Number of radio transmissions
Pulse S0 and Flash'O sensors (203)	Consumption index measurement	No extended data	Battery voltage measurement Number of radio transmissions
Alarms transfer sensor (204)	Battery voltage measurement Number of radio transmissions
Indoor temperature sensor (205)	Instant temperature measurements	No extended data	Battery voltage measurement Number of radio transmissions
Dual input state sensor (207)	No standard data	No extended data	Battery voltage measurement Number of radio transmissions
CMV Gas sensor (208)	Mean pressure measurement Maximum pressure measurement Minimum pressure measurement If temperature measurement activated : Mean temperature measurement (UDD) Maximum temperature	No extended data	Battery voltage measurement Number of radio transmissions

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	measurement (UDD)	Minimum temperature measurement (UDD)	
Skydome sensor (209)	No standard data	No extended data	Battery voltage measurement Number of radio transmissions
20mA Loop / 0-10V Sensor (210)	Analog raw Measurement Compressed or not	No extended data	Battery voltage measurement Number of radio transmissions

4.2 Uncompressed data type

Data type	Uncompressed data type
Temperature measurements	Signed int (2 bytes) in 1/10 °C
Humidity measurements	Unsigned int (2 bytes) in 1/10 %Hum
Index measurements	Unsigned longint (4 bytes)
4-20 mA analog measurement	(to be defined)
Pressure measurement	Unsigned int (2 bytes) in Pa
Opening detection angle	Unsigned char (1 byte) in °
Analog Raw measurement	Unsigned int (2 bytes) in ADC pts

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