



CELS'O

USER GUIDE



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DOCUMENT HISTORY

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Jun 2016	1.0	First revision
Juillet 2016	1.1	update
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CONTENTS

1	Introduction.....	5
1.1	General description.....	5
1.2	Installation	6
1.3	Propagation radio	7
2	Applicative Layer	8
2.1	Default parameters	8
2.1.1	<i>Examples of new configuration</i>	<i>9</i>
2.2	Examples	9
2.2.1	<i>Data logger: batch report.....</i>	<i>9</i>
2.2.2	<i>Alarm: standard report.....</i>	<i>10</i>
2.3	Temperature historical recording	10
2.3.1	<i>Command to send</i>	<i>10</i>
2.3.2	<i>Command of response.....</i>	<i>10</i>
2.4	Consumption.....	12
2.5	Errata	12

1 INTRODUCTION

This document describes the usage of the Celso sensor. It is necessary to read the website <http://support.nke-watteco.com/> for all generic information or to have more details.

1.1 GENERAL DESCRIPTION

Celso permits the measurement of temperature in a large set. The remote sensor can measure from -30°C to +35°C at a following **precision** :

Temperature range	Precision
[-40°C ; -34°C]	+/-1.5°C
[-33°C ; +9°C]	+/-1.0°C
[+10°C ; +37°C]	+/-0.5°C

Its casing is IP66.

Three different functions are available in Celso:

1. **Data logger**: measures and records at a specific resolution the temperature on periodicity or/and on variation. Sends all recorded measures on periodicity in a “batch” report. *By default the **resolution** is set to **0.1°C**, the periodicity of recording is set to 15 minutes, and the report is sent all one hour.*
2. **Alarm**: possibility to set alarm on variation of temperature. The measure is done all minutes. The “standard” report is used for this feature. The **resolution** is **0.01°C**. *By default the alarm is set on variation of 5°C.*
3. **Historical**: records each hour the temperature at the **resolution** of **1°C**. Possibility to request this historical of **30 days** by specific command.

Its **resolution** is **0.1°C** by default for “batch” report and **0.01°C** for “standard” report.

1.2 INSTALLATION

There is two leds on the device, and a button activated by a magnet as on the following pictures:

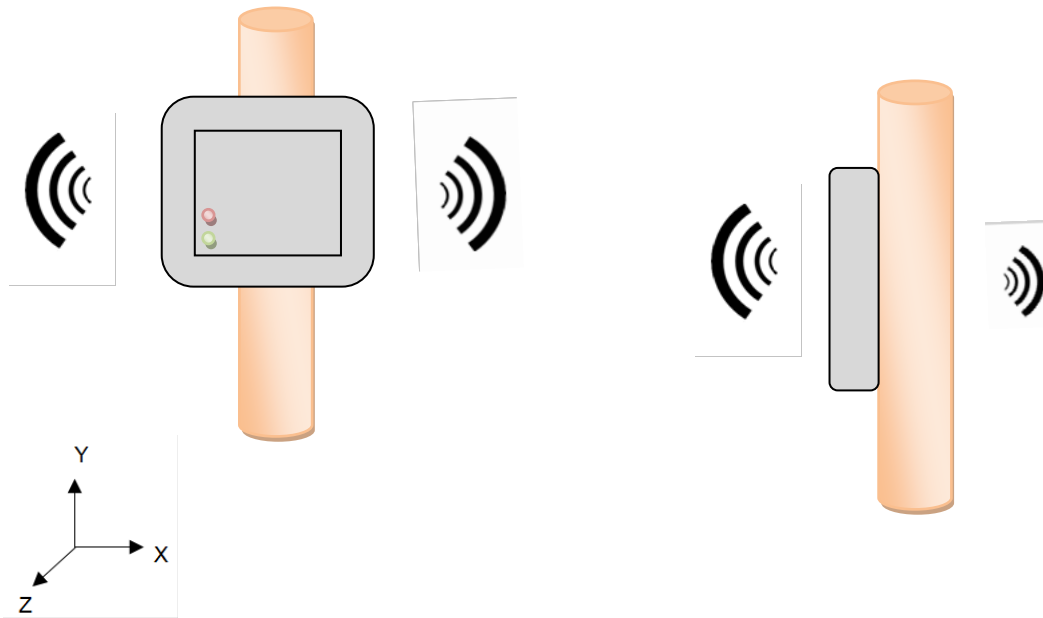


The set of features is described in this table:

Action	Magnet	Leds
Switch ON	1 second	/ go to association /
Switch OFF	5 seconds	
New Association	3 times	/ go to association /
Association	/	
Association Success	/	
Magnet passages	/	Fast red blinking

1.3 PROPAGATION RADIO

In order for the sensor to function correctly, it is better to limit the number of obstacles in order to avoid excessive attenuation of the radio wave, it is also important to put the sensor as high as possible. The celso device should be positioned as below to have the best radio propagation:



2 APPLICATIVE LAYER

The Celso device is a sleepy Class A device. It integrates these following clusters:

Cluster	Cluster name	Managed attributes
0x0000	Basic	All
0x0050	Configuration	All
0x8004	LoRaWAN	All
0x0402	Temperature Measurement	All

2.1 DEFAULT PARAMETERS

A default configuration is set:

- The device measures the temperature all the 15 minutes and sends a report each 1 hour including the last 4 measurements with a resolution of 0.1°C. The batch configuration is:
 - Tag size : 1
 - Resolution: 10
 - Label: 0
- The device sends automatically a report when a variation of 5 °C is measured.
- The device reports in the “batch” once a week the voltage of battery. The batch configuration is:
 - Tag size : 1
 - Resolution: 100
 - Label: 1

To decode the batch, it is necessary to use *br_uncompress* with the following command:

```
echo "26150060a08981dc5e817101" | ./br_uncompress -a 1 0,10,7 1,100,6
```


2.1.1 EXAMPLES OF NEW CONFIGURATION

To change the default configuration, you can for example send the following frame on the fport 125:

Sending report on new variation of temperature (10°C):

11 06 04 02 00 00 00 29 80 01 FF FF 03 E8

80 01 : minimum elapsed time since last "sending", to accept "sending" a new sample. 1 minute in this case . It is the periodicity of measure too.

FF FF : no periodicity report

03 E8: 1000 = 10 °C is the variation on which a report will be sent

Change the periodicity of temperature recording in the batch:

11 06 04 02 15 00 00 00 80 0A 80 3C 00 00 00 0A 01

80 0A : periodicity of record. 10 minutes in this case

80 3C: periodificy of sending batch. 60 minute in this case

2.2 EXAMPLES

2.2.1 DATA LOGGER: BATCH REPORT

The following payload is received: 100140803634010c0cb47ba1772fd4ee850c. The first bit of the first Byte is 0 so the report is a batch.

With *br_uncompress*, the result is:

cnt: 1	
180016	→ Timestamp in seconds of the sending
177313 0 2400	→ measure of temperature (label 0), measured at 177313 seconds. The value is 24°C
178213 0 2410	→ measure of temperature (label 0), measured at 178213 seconds. The value is 24.1°C
179113 0 2400	
180013 0 2400	

2.2.2 ALARM: STANDARD REPORT

The following payload is received: 110A04020000290761. The first bit of the first Byte is 1 so the report is standard.

The signed last two bytes give the temperature: 0x0761 = 18.89°C

2.3 TEMPERATURE HISTORICAL RECORDING

All one hour, a temperature is recorded at the 1°C resolution. The recording keeps the 30 last days of temperature measurement.

New commands are integrated in the cluster temperature to retrieve these historical.

2.3.1 COMMAND TO SEND

This command is done to retrieve the recorded temperatures. It is necessary to indicate the start index and the end index of the temperature that will be retrieved. The step of index is one hour.

Flag	commandID	ClusterID	cmd	Index Start	Index End
11	50	0402	10	xxxx	yyyy

Index Start: Index of start corresponding to the n^{th} recorded sample. From 0 to 719 with 0 the last recorded sample.

Index End: Index of end corresponding to the n^{th} recorded sample. From 0 to 719 with 0 the last recorded sample.

Necessary **Index End** >= **Index Start**. If **Index End = Index Start = 0xffff** then all recorded measured are sent.

2.3.2 COMMAND OF RESPONSE

The response generates one or several frames, depending of number of samples to send.

In each frame the first sample is delta-timestamped. This delta-timestamp corresponds to the number of minutes between the measure of the first sample and the sending of frame. A simplified Tag Length Value compression is used.

Flag	Command ID	Cluster ID	Cmd	N°Frame	Delta First Sample (minutes)	TimeStamp Sample	NBRepeatedValue [0]	Value [0]	NBRepeatedValue [n]	Value [n]	...
11	50	0402	11	0xnt	0xmmm	0xnn	0xvv	0xnn	0xvv	...	

N°Frame: $n+1$ corresponds to the number of sent frame; $t+1$ corresponds to the number of frame to send

Delta TimeStamp First Sample (minutes): number of minutes when the first **Value[0]** has been measured. (unsigned short)

NBRepeatedValue[]: number of times the **Value[]** is repeated by step of one hour. (unsigned char)

Value[]: Value in °C. (signed char)

2.3.2.1 ERROR FRAME:

There are two possible errors:

Flag	commandID	ClusterID	Cmd
11	50	0402	87 89

0x87 : invalid field Start > End ; Start > 719 ou End > 719 ; no available sample.

0x89: Not enough buffer for send all samples.

2.3.2.2 EXAMPLE

The Celso sends two frames:

11 50 0402 11 01 000a 0a EC 05 E9

- ⇒ frame 1 on 2
- ⇒ TimeStamp of the last recorded sample = TimeStamp of receipt – 10 minutes
- ⇒ There are 10 values to -20 °C then 5 values to -23 °C

11 50 0402 11 11 038E 01 00 03 05

- ⇒ frame 2 on 2
- ⇒ TimeStamp of the last recorded sample = TimeStamp of receipt – 910 minutes
- ⇒ There are 1 values to 0 °C then 3 values to 5 °C

So the result is:

minutes	-10	-70	-130	-190	-250	-310	-370	-430	-490	-550	-610	-670	-730	-790	-850	-910	-970	-1030	-1090
Temperature	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-23	-23	-23	-23	-23	0	5	5	5

2.4 CONSUMPTION

Transmission periodicity	Measurement periodicity	Battery life*
1 hour	15 minutes	7 years

* measured at -30°C in SF12

2.5 ERRATA

- On revision v3.4.0.3903.0:

Function: Historical recording

Issue: The field *Delta TimeStamp First Sample* on the command response is wrong when the request is on an *Index Start* up to 18.

Work around: on all response frames after a request, it is necessary to add a calculate number of minutes to the *Delta TimeStamp First Sample*. The New *Delta TimeStamp First Sample* begins:

New Delta TimeStamp First Sample =

$$\text{Delta TimeStamp First Sample} + \text{Floor}[\text{Index Start} * 3600 / 65535] * (65535 / 60)$$