Pulse Sens'O AtEx Zone 1

Declaration of conformity

Download the declaration of conformity

AtEx Certification

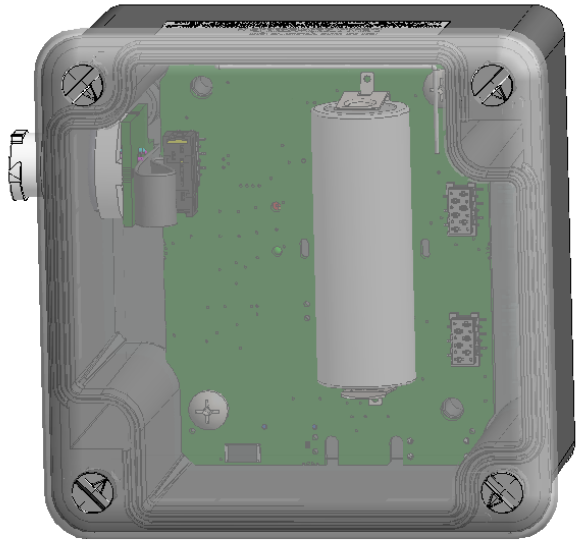
Presentation

The Pulse Sens'O AtEx Zone 1 device is a LoRaWAN class A sensor that uses a disposable LS17500 3.6V A-type battery as power supply.

USE ONLY SAFT TYPE LS17500 BATTERIES.

The Pulse Sens'O AtEx Zone 1 device incorporates 3 digital inputs, and also includes an internal antenna.

The level or a counter can be transferred to the different inputs. It is also possible to get the voltage of the power supply.



Family code

The family code of Pulse Sens'O AtEx zone 1 devices is: 50-70-123-(000 and upper) and 50-70-228 [with external antenna]

LoRaWAN release

v1.0.2 Region Parameter rev B

User guide

The Quick Start and installation preconisation is available on watteco website download center

AtEx

Installation, maintenance and use must only be carried out by personnel who are competent in the use of electrical equipment in explosive atmospheres as defined in EN 60079-14. Any repair or modification is strictly prohibited without the written permission of Watteco. Risk of electrostatic discharge: The user must implement any action to control the risks of electrostatic discharge, especially by cleaning the product only with a damp cloth.

Electronic input

Inputs characteristics:

- Impedance: > 1MOhm
- Voltage: 0-25Vcc
- Delivered current: 3.5µA

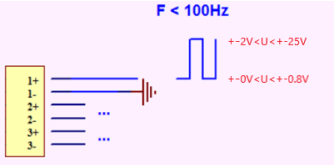
- Maximum frequency signal: 0-100Hz by input

> **Only the use of accessories in accordance with the intrinsic safety parameters below is permitted:**
>
> - Uo = 6.33V, Io = 33µA, Po = 23µW, Co = 650µF[IIB], Co = 28µF[IIC], Lo = 1H[IIB], Lo = 1H[IIC]
> - Ui = 25V, Ii = 450mA, Ci = 3.3nF, Li ~ 0

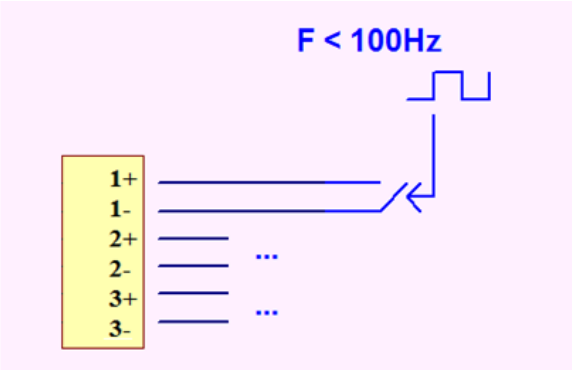
The schematic of the different inputs of the Pulse Sens'O AtEx zone 1 device is illustrated below:

Electrical schematic example for input with external compatible AtEx:

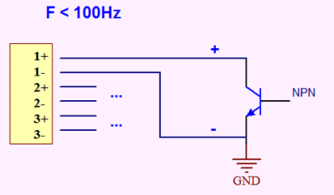
Output Signal:



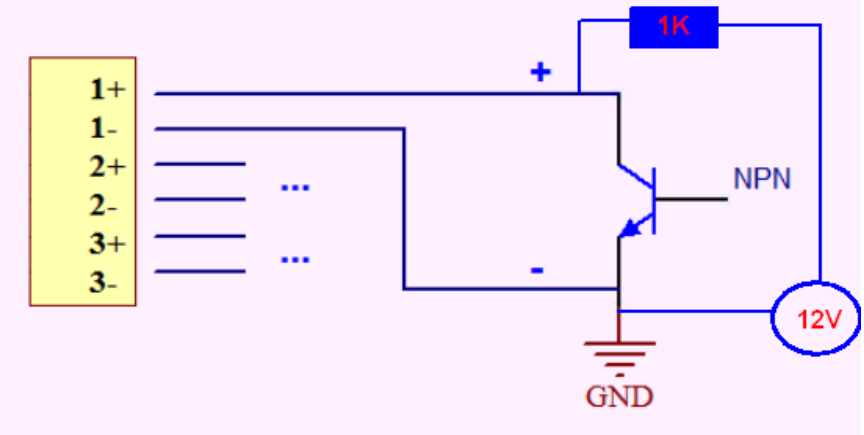
Dry contact:



NPN Open Collector: compatible with voltage of 3V and a current of 3µA.



NPN Open Collector: Others, need to connect **a compatible AtEx zone 1 external power supply** with a resistor to limit the current. Below exemple is given with an external 12V power supply.



Connector

On the device there is a 6 points connector:

Pinout is:

- Pin 1 is connected to 1+
- Pin 2 is connected to 1- [GND]
- Pin 3 is connected to 2+
- Pin 4 is connected to 2- [GND]
- Pin 6 is connected to 3+
- Pin 7 is connected to 2- [GND]

Free wire cable

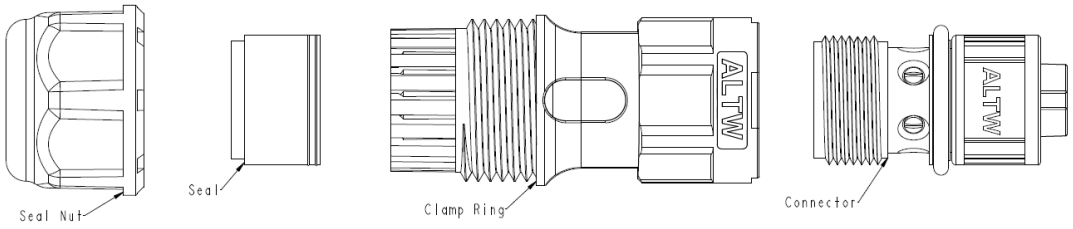
It is possible to use the 18-40-263 cable which is a 2m IP68 cable with 6 x 24 AWG wire conductor.

- White is connected to 1+
- Brown is connected to 1-
- Green is connected to 2+
- Yellow is connected to 2-
- Pink is connected to 3+
- Blue is connected to 3-

screw IP68 connector

It is possible to use the 18-40-298 connector:

- Wire conductor: 20-24AWG
- red color seal: cable diameter 4.0 to 6.0 mm
- blue color seal: cable diameter 6.0 to 8.0 mm

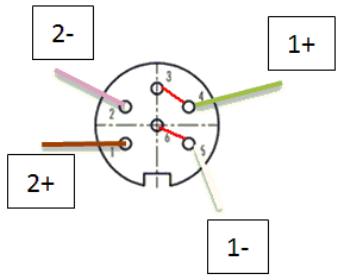


Pinout is:

- Pin 1 is connected to 1+
- Pin 2 is connected to 1- [GND]
- Pin 3 is connected to 2+
- Pin 4 is connected to 2- [GND]
- Pin 6 is connected to 3+
- Pin 7 is connected to 2- [GND]

Elster Binder cable

For Elster meter, it is possible to use the 71-70-115-000 2m cable connected to a binder connector on which pin 3 & 4 and pin 6 & 5 are shunted.



Pinout is:

- Binder Pin 3&4 are connected to 1+
- Binder Pin 5&6 are connected to 1-
- Binder Pin 1 is connected to 2+
- Binder Pin 2 is connected to 2-

Gazpar JAE cable

For Gazpar meter, it is possible to use the 71-70-116 cable which is connected like this:

- JAE Pin 1 is connected to 1+
- JAE Pin 2 is connected to 1-

Installation and operation

Installation

The housing is intended to be installed inside or outside a building but it must be protected from vertical water spray and direct sunlight.

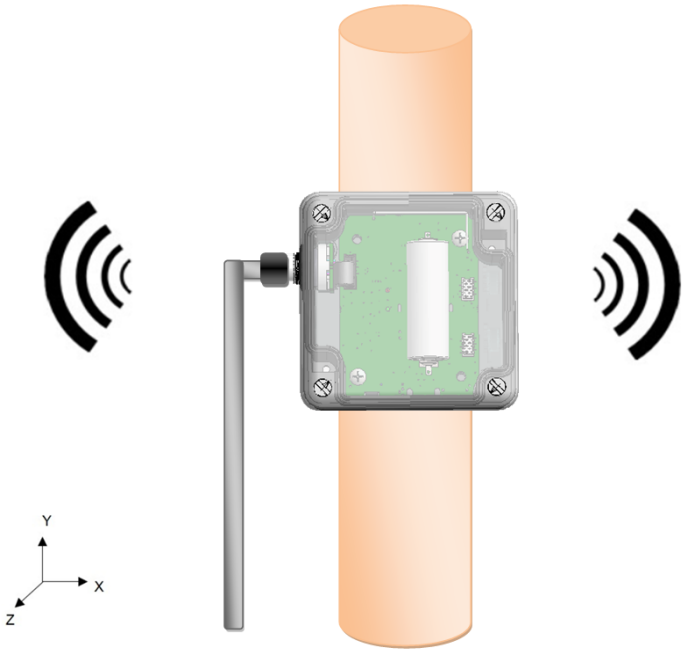
Casing

Flammability rating: UL94HB

Ingress protection: IP55 or IP68 48 hours @1m

Radio propagation

In order for the sensor to operate correctly, the number of obstacles should be limited in order to avoid excessive radio wave attenuation. It is also important to place the sensor as high as possible. The cable gland should be positioned on left side.



Autonomy

The information in the table below represents how long the battery can last. It is based on the default configuration at ambient temperature (+25°C) within the optimal operating range of the sensor via a LoRaWAN network (one uplink frame), when the spreading factor used is SF12.

The disposable battery has a 3.6Ah capacity, of which 85% is used.

Transmission periodicity	Repetition	Spreading Factor	Battery life
12h	0%	SF12	>10 years
4h	0%	SF12	>10 years
4h	200%	SF12	>10 years

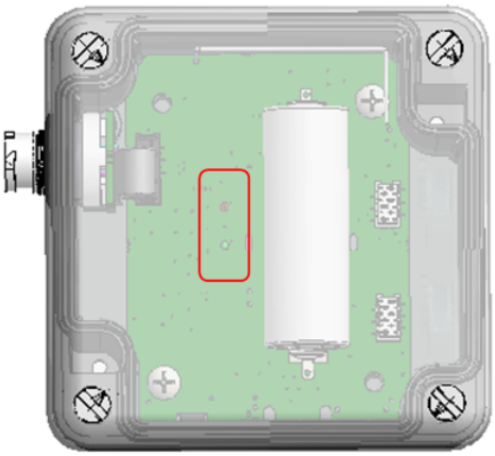
Transmission periodicity	Repetition	Spreading Factor	Battery life
2h	0%	SF12	>10 years
1h	0%	SF12	>8 years
1h	200%	SF12	>3 years
1h	200%	SF9	>10 years

A value of 3µA of consumption is added per input connected (contact closed).

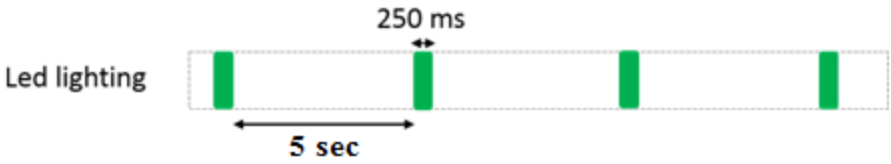
Human Machine Interface

Video Tutorials - WATTECO

There are Two LEDs on the Pulse Sens'O AtEX zone 1 device:



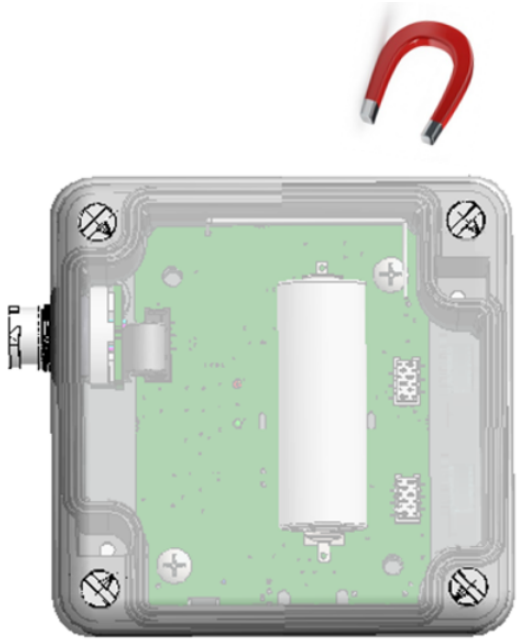
ASSN: blinking until the association with a network is done. Since release v3.5.2.5530, after 6 hours in association searching the led blinks all 1 minute.



CNF: blinking in configuration mode.

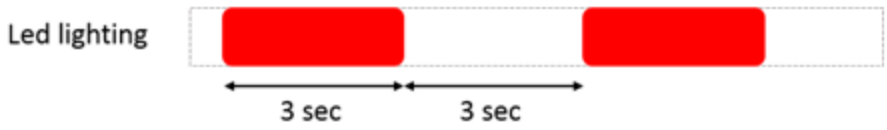
To start up the device, a magnet must be placed next to the sensor for one second (behind the "ILS" sticker). The red LED blinks quickly during this step. After one second, the red LED stops blinking and the green LED blinks slowly until the association is done.

To switch off the device, repeat the same operation by placing the magnet next to the sensor for 5 seconds. After those 5 seconds, the red LED blinks 5 times slowly.



A reed switch is available under the "ILS" sticker. A magnet can be used to activate it and perform specific actions on the sensor (switch off, switch on, reassociation…). When the reed switch is activated, the red LED blinks quickly.

Configuration



Configuration mode	
Way to trigger it	One passage of the magnet near the reed switch or specific ZCL command
Way to stop it	Another passage of the magnet or specific ZCL command
Effects on the sensor	The CONF led (red) blinks (3 sec. OFF, 3 sec. ON) and the sensor sends an uplink frame every minute.
Duration	The configuration mode lasts 10 minutes

A reassociation procedure can be requested if no downlink frame is received by the sensor during a given periodicity (4 days by default) or if a given number (100 by default) is reached or in case of failure (no acknowledgement received) by sending an applicative frame to the sensor or via the sensor's IHM.

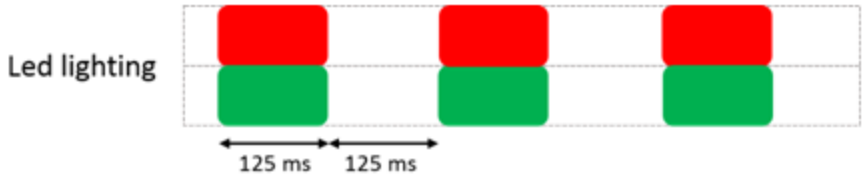
The sensor keeps the AppEUi and DevAddr configured, Confirmed/Unconfirmed configuration and all applicative configurations. However, LoRaWAN configurations (channel, data rate …) are lost.

ReAssociation Mode

Way to trigger it	Three passages of the magnet near the reed switch or ZCL command from LoRaWAN cluster.
Effects on the sensor	The ASSN led (green) blinks as the "no commissioned sensor" LED is lit.

A factory reset is available on Watteco's sensors. It deletes all the applicative settings saved in the flash memory (i.e. configured batches and reports will be deleted).

The sensor keeps the AppEUi and DevAddr configured. However, LoRaWAN configurations (channel, data rate…) and applicative configurations are lost.



Factory reset

Way to trigger it	Two quick passages and a long passage of the magnet near the reed switch
Effects on the sensor	The CONF LED (red) and ASSN LED (green) blink at the same time briefly. All the applicative settings (for batches and reports) are deleted. The blinking is illustrated below this table.

Applicative layer

> **Codecs are available to decode frames: Downloads**
>
> **Encoder are available on Online Codec**

The Pulse Sens'O AtEx Zone 1 device implements “Binary Input” cluster associated to its Inputs. The link between the connectors and the EndPoint is given below:

Connector	End Point	Cluster	Fctrl
Input 1+/1-	0	Binary Input	11
Input 2+/2-	1	Binary Input	31
Input 3+/3-	2	Binary Input	51

Pulse Sens'O integrates the following clusters:

Cluster	Cluster name	Managed attributes
0x0000	Basic	All
0x0050	Configuration	All
0x000F	Binary Input	All
0x8004	LoRaWAN	All
0x8005	Multi Binary Inputs	All

Default configuration

A default configuration is set:

- The device reports a batch each 4 hours containing one recording per hour of the counter value associated with input 1+/1- (EndPoint 0 / Cluster Binary Input / Attribute Count), input 2+/2- (EndPoint 1 / Cluster Binary Input / Attribute Count), and input 3+/3- (EndPoint 2 / Cluster Binary Input / Attribute Count).
- To decode the default "batch" is necessary to use this argument: **4 0,1,10,Index1 1,1,10,Index2 2,1,10,Index3 3,1,1,State1 4,1,1,State2 5,1,1,State3 6,100,6,BatteryLevel 7,1,6,MultiState**

Every change made to the default configuration must comply with the legal duty cycle (for example, the most restrictive in the EU is 0.1%, which corresponds to approximately 1 frame per hour with SF12)

Frame examples

> **All frames have to be sent on port 125**

Standard report

Report

Report of the state of connector input 1+/1-

→ Applicative payload is: ***11 0a 00 0f 00 55 10 01***

11: Fctrl (Endpoint=0)

01: current binary value

Report the counter associated to connector input 2+/2-

→Applicative payload is: ***31 0a 00 0f 04 02 23 00 00 00 01***

31: Fctrl (Endpoint=1)

00 00 00 01: current value of the counter

Configuration

Configure a standard report on the state of connector input 3+/3-

Report the state of connector Input 3+/3- at each variation. The value has to be reported at least every 15 minutes, and a minimum time delay of 20 seconds between 2 reports has to be set to optimise consumption:

→The value on Input 3+/3- is the End Point 2, Cluster "Binary Input" is 0x000F, and Attribute "present value" is 0x0055. The maximum field has to be 0x800F to have a report every 15 minutes and the minimum field has to be 0x0014 to have a minimum time delay between two reports. The delta has to be configured to 0x01 for a report at each variation.

Applicative payload is: ***51 06 00 0f 00 00 55 10 00 14 80 0f 01***

51: Fctrl (Endpoint=2)

00 14: minimum reporting interval (20 seconds)

80 0f: maximum reporting interval (15 minutes)

01: reportable change (at each variation)

→Response: 51 07 00 0f 00 00 00 55

To disable the previous configuration, change the value of the minimum and maximum sending intervals and the delta to 0: ***51 06 00 0f 00 00 55 10 00 00 00 00 00***

Configure a standard report on the counter associated to connector input 1+/1-

Report the counter value every 5 pulses on connector Input 1+/1-. The counter value has to be reported at least every 2 hours:

→A counter on Input 1+/1 is the End Point 0, Cluster "Binary Input" is 0x000F, and Attribute "Count" is 0x0402. The maximum field has to be 0x1c20 to have a report every 2 hours and the minimum field has to be 0x0000 to have a report immediately after the right incrementation. The delta has to be configured to 0x05 for a report every 5 pulses.

Applicative payload is: ***11 06 00 0f 00 04 02 23 00 00 1c 20 00 00 00 05***

11: Fctrl (Endpoint=0)

00 00: minimum reporting interval (0 seconds)

1c 20: maximum reporting interval (2 hours)

00 00 00 05: reportable change (5 pulses)

→Response:11 07 00 0f 00 00 04 02

To disable the previous configuration, change the value of the minimum and maximum sending intervals and the delta to 0: ***11 06 00 0f 00 04 02 23 00 00 00 00 00 00 00 00***

Configure the polarity on connector Input 1+/1-

→Write attribute no response: ***11 05 00 0f 00 54 10 nn***

11: Fctrl (Endpoint=0)

nn: current polarity of the sensor (normal : 00, reversed: 01)

Configure the edge selection on connector Input 1+/1-

→Write attribute no response: ***11 05 00 0f 04 00 18 nn***

11: Fctrl (Endpoint=0)

nn: the current edge selection (01: falling edge, 02: rising edge, 03: rising and falling edge, 04: polling)

Configure the debounce period on the connector 3+/3-

→Write attribute no response: ***51 05 00 0f 04 01 21 00 7D***

51: Fctrl (Endpoint=2)

00 7D: debounce period (125 ms)

Batch report

It is recommended to use this default parameters:

	Label (size = 4)	resolution
EP0 / Count [input 1+]	0	1
EP1 / Count [input 2+]	1	1
EP2 / Count [input 3+]	2	1
EP0 / State [input 1+]	3	1
EP1 / State [input 2+]	4	1
EP2 / State [input 3+]	5	1
Battery Level	6	100

• Configure a batch report on connector input 2+/2- and connector input 3+/3-:

Timestamp and record Input 2+/2- every 200 pulses; and timestamp and record the level of Input 3+/3-. A report has to be sent at least every 24 hours:

→A counter on Input 2+/2- is the End Point 1, Cluster “Binary Input” is **0x000F**, and Attribute “Count” is **0x0402**.

A level on Input 3+/3- is End Point 2, Cluster “Binary Input” is **0x000F**, and Attribute “Present Value” is **0x0055**.

There are two different measurements to be recorded in the batch, use the default tag size 4. Label 1 can be used for counter and Label 5 for level.

For counter, the delta is 200 and resolution 1. For level, the delta is 1 and resolution 1. The maximum has to be configured for all to **0x850a.**

Two frames must be sent to configure this batch.

Label number	Tag label	Tag size
1 or 2	0/1	1
3 or 4	00/01/11/10	2
5 or 6 or 7 or 8	000/001/010/011/100/101/110/111	3
...	...	...

Applicative payload of the count on input 2+/2-

31 06 00 0f 1d 04 02 00 00 00 85 0a 00 00 00 c8 00 00 00 01 0c

31: Fctrl (Endpoint=1)

1d: 0b00011101 => 0001110: size of configuration string after attribute ID (14 bytes)

00 00: minimum recording interval (0 seconds)

85 0a: maximum recording interval (24 hours)

00 00 00 c8: required delta value (size: 4 bytes for attribute Count => attribute type = 23, 200 pulses)

00 00 00 01: required resolution

01: tag value (ob00001100 => 00001: tag label, 100: tag size)

→Response: 31 07 00 0f 00 01 04 02

Applicative payload of the present value of input 3+/3-

51 06 00 0f 11 00 55 00 00 00 85 a0 01 01 2c

51: Fctrl (Endpoint=2)

11: 0b00010001 => 0001000: size of configuration string after attribute ID (8 bytes)

00 00: minimum recording interval (0 seconds)

85 a0: maximum recording interval (24 hours)

01: required delta value (size: 1 byte for attribute PresentValue => attribute type = 10, 1 pulse)

01: required resolution

09: tag value (ob00101100=> 00101: tag label, 100: tag size)

→**Response: 51 07 00 0f 00 01 00 55**

To decode the batch reception, use br_uncompress. Type for binary input attribute counter is **U32 (10)**, Type for binary input attribute PresentValue is **Boolean (1). Use the online Codec to have the attributes to decode the batch.**

Application Note

Send a report after a specific delay of stable state

Known Issues

Binary Input:

- Version: V3.5.2.5537
- Issue: Counting Indexes are always to 0 in batch report.
- Workaround: Set a standard report on each input on which a counting is necessary:
  - Input 1: 1106000f000402230000ffffffffffe => send never a standard report
  - Input 2: 3106000f000402230000ffffffffffe => send never a standard report
  - Input 3: 5106000f000402230000ffffffffffe => send never a standard report