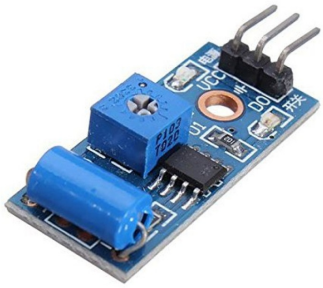


ELECTRONICS4ALL CLS-4-420-TH Wireless Sensor User Manual

Contents

ELECTRONICS4ALL CLS-4-420-TH Wireless Sensor

REVISIONS

Revision	Author	Date	Changes
1.0	Engineering	February 22, 2022	Initial Draft
1.1	Engineering	May 4, 2022	Updated the battery types correcting typ os
1.2	Engineering	September 06, 2022	Added: FCC RF Exposure Statement ISED RF Exposure Statement RSS-Gen Transmit antenna statement

ABBREVIATIONS

Acronym	Description
BLE	Bluetooth Low Energy
LED	Light Emitting Diode
UI	User Interface
USB	Universal Serial Bus
PWR	Power

FCC COMPLIANCE AND ADVISORY STATEMENT

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference

when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Any changes or modifications not explicitly approved by Electronics4All Inc. could cause the device to cease to comply with FCC rules Part 15, and thus void the user's authority to operate the equipment.

FCC RF EXPOSURE STATEMENT

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, this equipment should be installed and operated with minimum distance 20 cm (7.6 inches) between the antenna and your body during normal operation. Users must follow the specific operating instructions for satisfying RF exposure compliance.

ISED RF EXPOSURE STATEMENT

This equipment complies with ISED RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm (7.6 inches) between the radiator and any part of your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

RSS-GEN TRANSMIT ANTENNA STATEMENT

This radio transmitter IC: 26661-CLS01 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device. Under Innovation, Science and Economic Development regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by ISED. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Approved Antenna Types

Maximum gain:	2.0 dBi
Antenna type:	Dipole
Radiation pattern:	Omni-Directional
Impedance:	50 Ohm
Connector type:	SMA-M

INDUSTRY CANADA COMPLIANCE AND ADVISORY STATEMENT

Operation is subject to the following two conditions

1. This device may not cause interference, and
2. this device must accept any interference, including interference that may cause undesired operation of the device.

SAFETY INFORMATION

1. Operate the device only with the specified antenna and AC/DC adapter. See the Specifications section for approved accessories.
2. The device is intended for use only in a clean and dry indoor environment.
3. Always wear personal protective equipment appropriate to the environment where the device is installed and operated.
4. The device contains a lithium-ion battery. The device should not be shipped with the battery installed. See the Internal Battery section for more information.
5. In the event of an emergency, disconnect the DC power plug from the device.
6. The device contains no user-serviceable parts. Do not attempt to repair the unit. See the Contact Information section for support or repair.

INSTALLATION

PROFESSIONAL INSTALLATION
The CLS-4-420-TH 4Ch.4-20mA sensor is designed specifically to operate within an electric power generating facility. Incorrect installation or configuration of the wireless sensor may result in unsatisfactory performance. As such, only authorized personnel should be permitted to install, configure, and access, CLS-4-420-TH (the wireless sensor).
INTENDED USE
The CLS-4-420-TH is intended to be installed and operated in an indoor industrial environment only. The wireless system is Class A equipment and may cause radio interference in residential areas. Only authorized, trained personnel are permitted to possess, install, and operate the CLS-4-420-TH. The device should be installed only in locations where the general public has restricted access. The CLS-4-420-TH is sold directly to electric utility companies by Electronics4All Inc. and is not made available on the retail market. Resale or otherwise making the device available to the general public is not permitted.

PRODUCT DISPOSAL

The CLS-4-420-TH is recycled by Electronics4All Inc. See the Contact Information section to recycle the CLS-4-420-TH.

MAINTENANCE AND CLEANING

Clean the enclosure and antenna using a clean dry cloth.

CONTACT INFORMATION

- **Electronics4All Inc.**
- **110 Didsbury Road Unit 50**
- **Kanata, ON**
- **Canada K2T 0C2**
- **1-613-284-2525**
- **sales@electronics4all.ca**

Reporting Interval
User adjustable reporting rate from 30 seconds to 49 minutes

Industrial
Black ABS Plastic Housing

Mounting
Universal DIN Rail 35mm Width

User Interface
2 User Programmable Push Buttons

1 Power Button

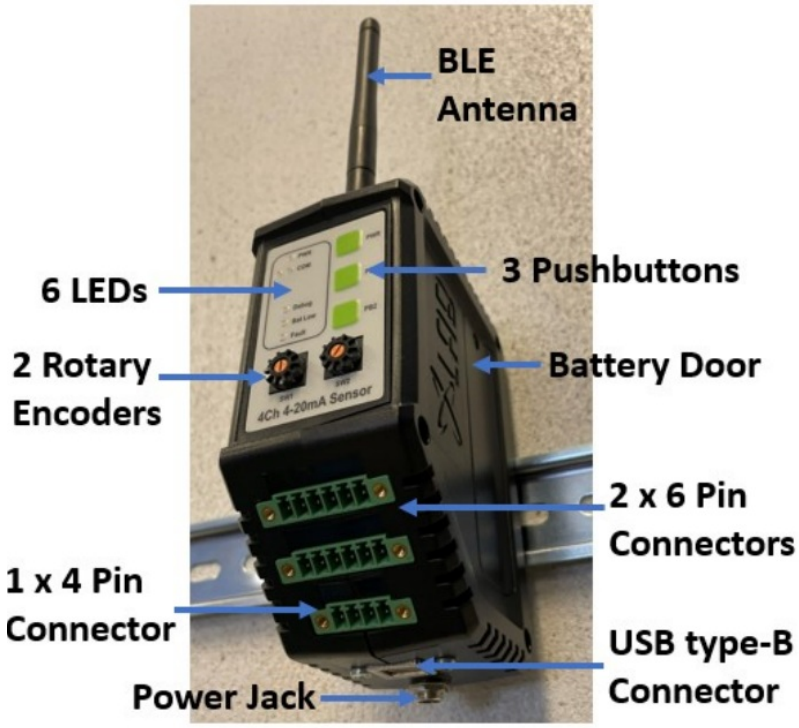
8 LED Indicators

Connection to Equipment
2 x 6 Terminal Block [3 Pins/ Channel]

Compatible with most 4-20mA loop powered transducers, such as but not limited to the following transducer types: **Pressure, Vibration, Temperature**

Interface with 4-20mA transducers

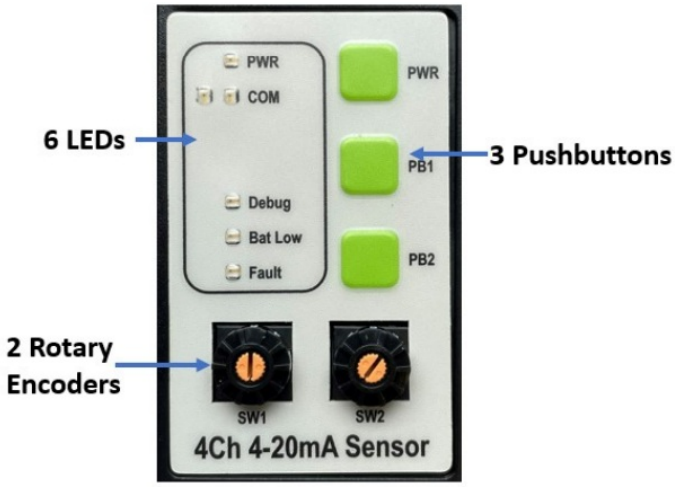
The CLS-4-420-TH wireless sensor is designed to monitor the current (4-20mA) passing through the cable of the sophisticated sensor through four (4) available channels on a 2×6 pin connector. The display membrane has 6 LEDs, 3 pushbuttons, and 2 rotary encoders which have been incorporated into the user interface (UI) logic and are powered by an internal Li-ion battery, USB connector, and AC/DC adapter. The CLS-4-420-TH has 2x6pin connectors for current measurement and 1×4 connectors are not used in this model. The CLS-4-420-TH has a built-in Li-Ion cell, that can power the unit for several days.



INTERFACES

FRONT MEMBRANE

The CLS-4-420-TH contains 3 tactile push buttons, 2 rotary encoders, and 6 status LEDs on the front of the unit.



Button Label	Function
PWR	Turns wireless sensor ON or OFF
PB1	Special function Pushbutton
PB2	Special function Pushbutton

LED Label	Color	Function
PWR	Orange	Indicates the power status of the wireless sensor
COM (LEFT)	Red	Used to indicate status of BLE pairing and transmission of data
COM (RIGHT)	Green	Used to indicate status of BLE pairing and transmission of data
Debug	Orange	Flashes when the USB interface is connected, and data is being sent or received over the interface
Bat Low	Red	Indicates that the internal lithium- ion battery charge is low. The AC/DC adapter or USB should be connected to recharge the battery. Current firmware (Rev. 3122) turns on the LED when less than 500 mAh is remaining, and turns off the LED when the charge exceeds 1000 mAh
Fault	Red	Turns on when a fault is detected. Currently limited to detecting a fault with the internal lithium-ion battery

ROTARY ENCODERS

The rotary encoders are used to set the desired reporting Interval. The rotary encoders set the broadcast interval of the CLS-4-420-TH in 20-second increments, from 01 (20 seconds) to 09, and in 200s increments, from 11 (200 seconds) to 91 (16200 seconds) Setting 92 to 99 is the same as 91. **Setting 00 or 10 disables broadcasts**. The broadcast interval may be set at any time. NB: *Any changes to the broadcast interval after the initial pairing will be reflected only after the next report*.

ROTARY SWITCH CODING

Rotary Dial Setting	Reporting Interval (s)
00	0 (disabled!)
01	20
02	40
||	||
09	180
10	0 (disabled!)
11	200
12	400
||	||
21	2200
||	||
91	16200 (4.5 hrs max)
92	16200

||	||
99	16200

Formularized

- Let **T** = target interval (in **seconds**), **H** = High switch setting, **L** = Low switch setting Range 1: If T < 200s: H = 0 and L = T / 20
- Range 2: If T >= 200s: H = 1 + T / 2000 and L = (T – (H – 1) x 2000) / 200
- (NB: All above operations are based on integers only! (No decimal)

CONNECTIONS

1. 24V
2. 4-20mA
3. GND

The DROK signal generator is connected to the screw terminals on the bottom of the CLS-4-420-TH. Each 6-pin connector represents two channels. The upper half has Ch.1 and Ch. 2 (as shown in the picture). The lower half has Ch.3 and Ch.4 (As shown in the picture). We are not using a 4-pin connector for this application. Each channel has 3 pins. Pin 1 is 24 VDC input. Pin 2 is output current between 4-20mA. Pin 3 is GND. A USB type B connector and a 2.5 mm ID power jack are on the bottom of the CLS-4-420-TH wireless sensor. Both the USB connection and the DC input will automatically charge the internal lithium-ion battery. The DC input accepts a voltage range of 7 VDC to 15 VDC. The power adapter supports up to 2A.

MOUNTING BRACKET

A mounting bracket is provided on the rear of the CLS-4-420-TH that connects to a standard 35 mm DIN rail.

ANTENNA

The CLS-4-420-TH is designed to operate with the following antenna

- **Manufacturer:** PulseLarsen Antennas
- **Part Number:** W1010
- **Frequency:** 2.4 – 2.5 GHz
- **Gain:** 2.0 dBi
- **Nominal Impedance:** 50 Ω
- **VSWR:** ≤ 2.0
- **Polarization:** Vertical
- **Electrical Length:** ¼ Dipole
- **Radiation:** Omni

PAIRING

PAIRING STATUS

To determine if the CLS-4-420-TH wireless sensor has been paired with a Gateway, press and release the PB1 pushbutton. If the GREEN COM LED turns on for 1 second, the wireless sensor is paired with a Gateway. If the RED COM LED turns on for 1 second, the wireless sensor is not paired with a Gateway.

PAIRING A WIRELESS SENSOR TO A GATEWAY

1. Place the target Gateway in Pairing Mode by pressing and releasing the PB1 pushbutton on the Gateway. The GREEN COM LED will turn ON.

2. Press and hold the PB1 button on the CLS-4-420-TH. The RED COM LED on the CLS-4-420-TH will turn on for 1 second. Release the PB1 button on the CLS-4-420-TH.
3. If pairing is successful, the GREEN COM LED on the CLS-4-420-TH will then turn on for 1 second, and the GREEN COM LED on the Gateway will turn OFF.
4. If the pairing was not successful, the GREEN COM LED on the CLS-4-420-TH will not turn ON and the GREEN COM LED on the Gateway will remain ON. If this occurs, simply reattempt this step.

UNPAIRING A WIRELESS SENSOR FROM GATEWAY

To unpair a CLS-4-420-TH from a Gateway, press and hold the PB1 button. After 5 seconds, the RED COM LED will start to flash rapidly. The PB1 button may then be released. The CLS-4-420-TH is now no longer paired to the Gateway.

INTERNAL BATTERY

A 3300 mAh lithium-ion battery is installed in the CLS-4-420-TH to provide power in the absence of an AC/DC adapter and USB connector. The internal battery provides power to the external interfaces, the Bluetooth Link, and the 2×6 pin connector circuitry.

The battery is accessed by removing the battery cover on the right side of the CLS-4-420-TH enclosure. The Red 'Bat Low' LED will turn on when the wireless sensor detects that less than 500 mAh is remaining in the internal battery. The internal battery may be recharged in the CLS-4-420-TH by connecting either the included AC/DC power adapter (CUI Inc. SWI24-12-N-P6), or via a USB connection to a PC or dedicated USB charging device. The approximate charging times for each method are provided in the table below:

Charging Method	**Maximum Charging Current**	**Charge Time (80% / 100%)**
AC/DC Adapter	1.5 A	2.2 hours / 3.2 hours
USB	500 mA	6.6 hours / 7.6 hours

The **'Bat Low' LED** will automatically turn off once more than 1000 mAh of capacity has been returned to the internal battery during recharge.
The CLS-4-420-TH contains protection circuitry that automatically disables battery charge operation when the battery temperature is below 0 °C or above 50 °C. The battery will continue to provide power if charge operation is inhibited. Charge operation will resume once the temperature returns to within the permissible range. The CLS-4-420-TH will disable all operation once the battery temperature exceeds 65 °C. Discharge operation will resume once the temperature drops below 55 °C.
NOTE: The CLS-4-420-TH should not be shipped with the internal battery installed. When transporting a portable gateway, the lithium-ion battery should be removed and shipped separately using an approved UN/DOT 38.3 shipping container.

RESET

The CLS-4-420-TH may be reset at any time by pressing and holding both the PB1 and PB2 buttons for at least 4 seconds. The CLS-4-420-TH will need to be re-paired after a reset.

SPECIFICATIONS

Parameter	Description
Power	
Overvoltage Category	1
Supply Voltage (DC Input)	7.00 DC to 15.00 VDC (2.5 × 5.5 mm Barrel Jack)
Supply Current (DC Input)	8.1 mA @ 4.00 VDC, 25 °C Ambient
Battery	
Manufacture	Panasonic or Samsung
Part Number	NCR18650B or INR18650-35E
Rated Capacity	3400 mAh
Nominal Voltage	3.60 VDC
Over-Voltage Protection	4.215 VDC
Under-Voltage Protection	2.50 VDC
Over-Current Protection	3.6 A Charge, 4.8A Discharge, 14.6 A Short-Circuit
Over-Temperature Protection	> 50 °C Charge Disabled, > 65 °C Discharge Disabled
Under-Temperature Protection	< 0 °C Charge Disabled
Environmental	
Protection Rating	IP30
Pollution Degree	2
Operating Temperature	· -40 °C to 75 °C · Internal Battery Charge Disabled above 50 °C · Internal Battery Charge Disabled below 0 °C · Internal Battery Discharge Disabled above 65 °C

Storage Temperature	-40 °C to 85 °C (Battery Installed)
Storage Temperature	-40 °C to 85 °C (No Battery Installed)
Permissible Humidity	20 % to 85 % (Operation and Storage)
Maximum Altitude	2000 m
Radio	
Wireless Processor	· 48 MHz Arm Cortex M4F Processor · 2.4-GHz RF Transceiver Compatible with BLE 5.0 · Output Power up to +5 dBm with Temperature Compensation · Receiver Sensitivity: -105 dBm, 125 kbps
Security	· AES 128- and 256-bit Crypto Accelerator · ECC and RSA Public Key Hardware Accelerator · SHA2 Accelerator (Full Suite Up to SHA-512) · True Random Number Generator (TRNG)
Communication Range	300 m Line of Sight (Depending on Bluetooth Sensor)
Communication Interval	User Programmable in 20- and 200-seconds Increments
I/O	
Analog Front End (AFE)	· 4 Channels for current Measurement · 4-20 mA Output per Channel · 12-bit Resolution
Temperature Measurement	-40 °C to 85 °C (± 0.5 °C, +15 to +40 °C)
Humidity Measurement	20% to 85 % Relative Humidity (± 3.5 % RH, 20 to 85 % RH)
Communication Port	USB 2.0 Debugging Interface
Interface	
Indicators	Top Fascia Membrane (Red, Green, and Orange LEDs)
User Interface	· Top Fascia Membrane (3 Push Buttons) · Dual Rotary Encoders (0-9 selection via Dial)
Mechanical	
Dimensions (Enclosure)	152 mm (L) x 129 mm (W) x 40 mm (H)
Weight	250 g

Certifications	
FCC	
Industry Canada	
Safety	61010-1
Accessories	
AC/DC Adapter	CUI Inc. SWI24-12-N-P6
Mating Connectors	(6 Pin): Phoenix Contact 1827745 (4 Pin): Phoenix Contact 1827729

Documents / Resources

	ELECTRONICS4ALL CLS-4-420-TH Wireless Sensor [pdf] User Manual CLS-4-420-TH, Wireless Sensor, CLS-4-420-TH Wireless Sensor

Manuals+,