WSD12-4D

User Manual

General warnings.

- The following information must be read and understood before proceeding with the installation, commissioning and maintenance of the devices described in this document.
- <u>ATTENTION!</u> Any omission or failure to follow these instructions scrupulously can cause danger.
- <u>ATTENTION!</u> Explosion hazard. In case of batteries substitution, make sure that the type is compatible and complies with the specifications indicated by the manufacturer.
- In case of batteries substitution, <u>DO NOT</u> disconnect the flat cable which connect the electronic boards without removing batteries before
- ALWAYS substitute all the batteries, also in case of one single battery exhausted.
- If the device is powered by a fixed network, make sure you have disconnected the power supply before carrying out any type of intervention. Failure to comply with this indication can cause damage to people and/or property.
- Follow the manufacturer's suggested warm‑up time (*time required to obtain a reliable measurement*) of the transducer.
- Follow the manufacturer's suggested electric wiring of the transducer to measure (*ground shields at a single point, cable length and section*); voltage measures on distances exceed 15/20 meters are subjected to electromagnetic disturbances. 0÷25mA inputs have a superior electromagnetic compatibility (*EMC*).
- Avoid passage in cavities with power or high voltage cables.
- The protection and safety measures and the warranty provided by the Manufacturer with the equipment may be compromised if it's used in a manner that does not comply with this user manual.
- This equipment complies with CE regulations.
- Modifications or tampering not expressly approved by the Manufacturer could void the user's authorization to operate the equipment.
- This equipment must be installed by qualified personnel and in accordance with national regulations and/or related local requirements.
- Make sure that the object is properly fixed to supports/infrastructures capable of withstanding this load. Make sure proper methods and materials are used when fixing the equipment to a wall.
- Only personnel expressly authorized by the manufacturer can open the container. There are no user serviceable parts inside.

1. Description.

The WSD12-4D wireless datalogger, provided with 4 channels, is designed to acquire linear deformation (*up to 4 resistive potentiometers*) and temperature in the structural monitoring field.

2. Configuration.

Using *WineCapManager* software, for each channel, the measure acquired can be selected as showed in the following table:

Channel 1	Channel 2	Channel 3	Channel 4
Temperature	Proportional	Proportional	Proportional
Proportional	Linear deformation	Linear deformation	Linear deformation
Linear deformation	-	-	-

Picture 1 - Product image

Where:

- *Temperature*: datalogger reports the case internal temperature or the temperature acquired by an external transducer (*NTC10K‑FR*). The transducer selection (*internal/external*) is performed using jumpers.
- *Proportional*: datalogger reports a proportional value (*from 0% to 100%*) related to full-scale of potentiometer installed, independently by the stroke.
- *Potentiometric*: datalogger reports the mechanical stroke of the installed potentiometer expressed in mm. Full‑scale is configurable for each channel using *WineCapManager* software.

To properly configure the device:

- Connect the datalogger to PC using the provided USB cable. Datalogger's led will flash *RED/GREEN*.
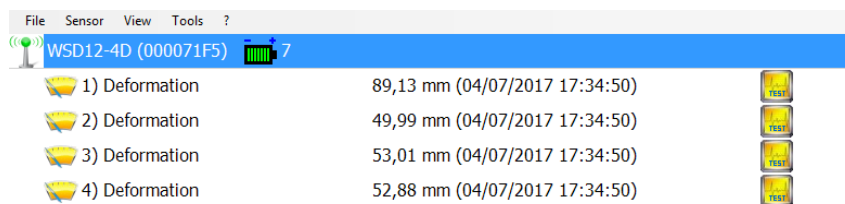
- Execute *WineCapManager* software, create a new database, open it, and wait for datalogger acknowledgement and automatic connection.

Once the connection is established, datalogger's led flashes in *GREEN*, meantime on *WineCapManager* main page real time channels data appears (*as shown in the following image*):
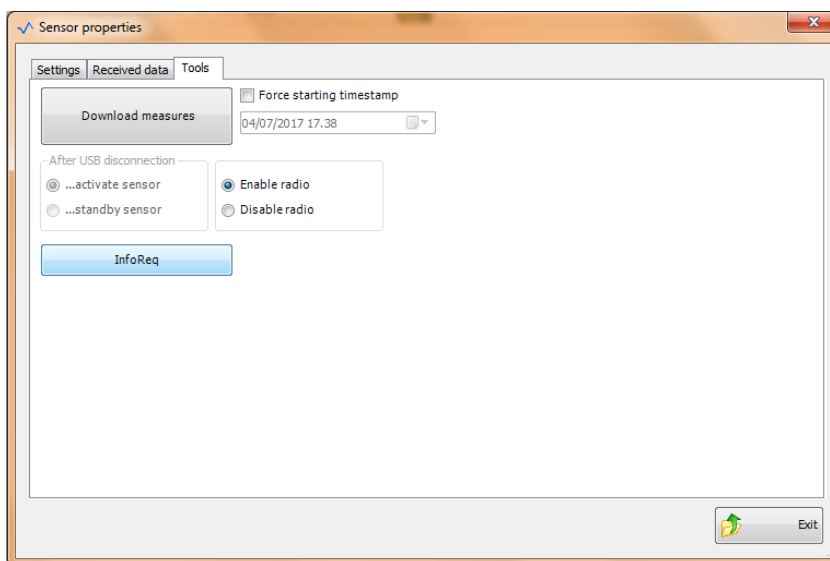

Picture 2 - WineCapManager - Main page

From the "*Sensor*" drop-down menu (*or clicking with right button on sensor's row*) select "*Properties*" to access at the device's configuration page (*Picture 10 – Wireless devices user interface*):
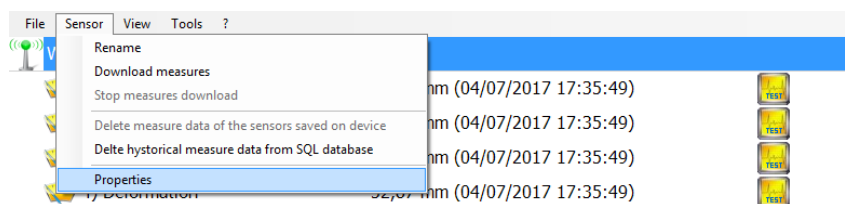
Picture 3 - WineCapManager - Sensor menu

Therefore, select "*Tools*" and click on "*InfoReq*" button:

Picture 4 - WineCapManager - Tools panel

The "*Advanced sensor properties*" panel opens, from which some different parameters for each channel can be modified.

- **Channel type** (*selectable from drop-down menu*) can have following values:

    a. temperature (*only for the first channel*);

    b. proportional (*all channels*), acquires the linear transducer's movement value expressed in percentage (*0 ÷ 100.00%*);

   c. deformation (*all channels*), acquires the linear transducer's movement value expressed in mm.

- Scale factor

Modifies resolution and consequently the transducer's dynamic range.

The correct value to be inserted is the external linear transducer's full scale, expressed in mm, divided per 10,000.

For example, if the full-scale value of a linear transducer is 25mm, the value to be inserted in the "*Scale factor*" field is 25/10,000=0.0025.

This parameter influences only "*Deformation*" measures type; for other measures type this parameter is, however, initialized to "0,01".
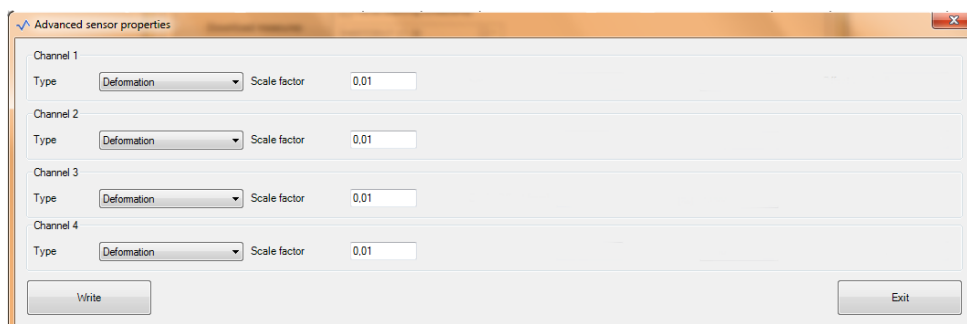

Picture 5 - WineCapManager - Advanced sensor properties

This value depends on the transducer's type used. If not necessary must contain "0".
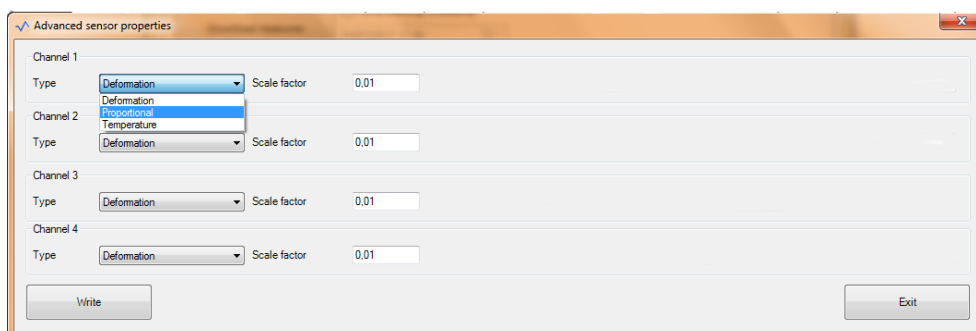
Picture 6 - WineCapManager - Channel type selection

Once parameters are modified, they must be saved on the device clicking on "*Write*" button. A message pop-up appears warning about consequences of writing operation as the device's flash memory erase. Click on "Yes" to confirm operation.
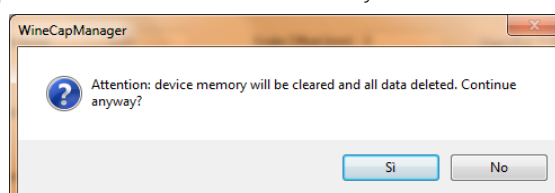
Picture 7 - WineCapManager - Configuration alert

A new pop-up appears confirming the successful writing operation:
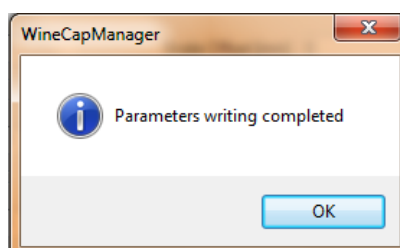
Picture 8 - WineCapManager - Confirmation pop-up

ATTENTION: Whenever the full-scale value is changed, the "REACTIVATE" command must be given to the datalogger
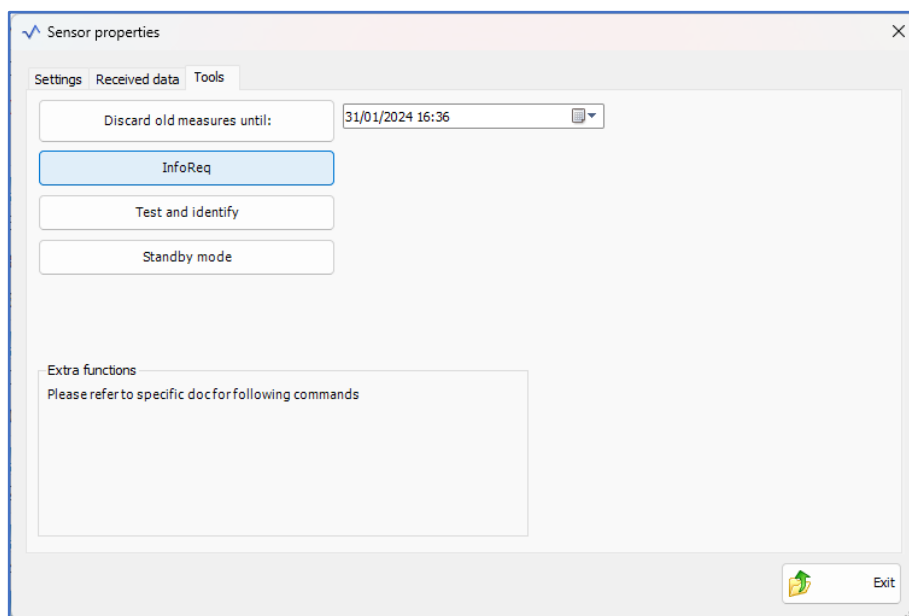
- **Channel Calibration.**

If you need to add calibration values to a measurement channel, you can access the "Advanced sensor properties" screen and set the gain and offset values in the appropriate fields on the "Calibration" tab.

This configuration is done via the WSN network by accessing the "Properties" tab from the "Sensor" drop-down menu after selecting the device row from the WineCapManager main screen.

The "Sensor Properties" screen appears. Select the "Tools" tab and click on the "InfoReq" button.

The 'Advanced Sensor Properties' screen opens. Select the "Calibration" tab where you can set the desired gain and offset values in the appropriate fields.

This procedure must be repeated on each channel for which calibration is to be performed.

When finished, click on the "Write" button to confirm the new parameters.
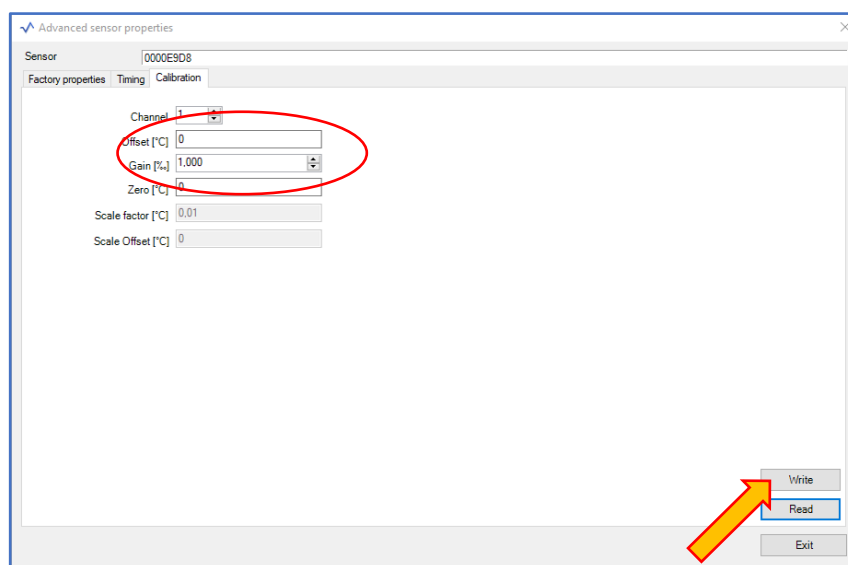
3. Resetting channels.

Once the device has been installed in the desired location, it is possible to proceed with resetting the channels previously configured for acquiring strain or proportional measurement values.

This procedure can be performed via WineCapManager or by using the wireless device user interface directly on the device (see *Wireless device user interface.*).

It is possible to reset the channels to the factory state or to the field positioning of the device.

To proceed with channel zeroing via WineCapManager, access the "Properties" tab from the "Sensor" drop-down menu after selecting the device row from the main WineCapManager screen.

The 'Sensor Properties' screen appears. Select the "Tools" tab and click on the "InfoReq" button.

On the "Advanced Sensor Properties" screen, set the value to "0" in the appropriate field on the "Calibration" tab. Setting the value to '0' resets the channel to its factory state.

If the channel is to be zeroed with respect to the field position, it is necessary to wait for a measurement on the channel of interest and enter the measured value in the appropriate field but with the opposite sign.

This procedure must be repeated on each channel for which zeroing is to be performed.

Once the entry is complete, click on the "Write" button to confirm the new parameter.
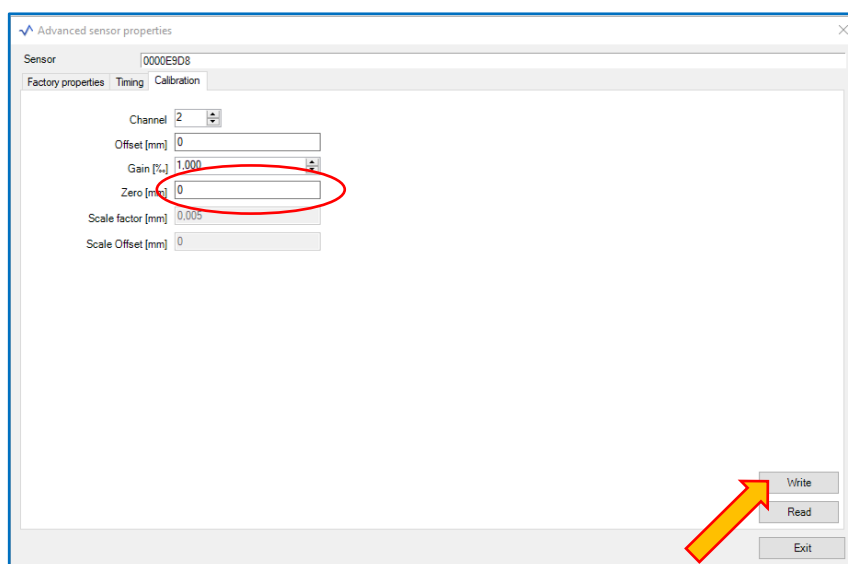
4. Device pre-set and use mode.

a. Wireless Mode:

In this use mode, the datalogger records and transmits each measure sampled to the linked gateway. Typically, the monitoring system is configured in factory, so, if the device is already associated to the system gateway is in **STANDBY** mode (*refer to Picture 11 - Status table – Wireless mode*). In this case, it is necessary to start it with the **TEST** command (*refer to Picture 10 – Wireless devices user interface*). After this operation, the datalogger reactivates, resumes measure activity, and performs the connection to the gateway or to a *repeater WR12.* Connection The onboard LED shows the radio signal quality for 2 minutes (*refer to Picture 11 - Status table – Wireless mode*).

Otherwise, in case the device is in **FACTORY RESET** mode (*refer to refer to Picture 11 - Status table – Wireless mode*), that means it's ready for connecting to an existing system, in order to associate it using the **ENROL** command, Refer to the *"WineCap System - User Manual R31"* software manual. It is necessary to use the *WineCapManager* software on the PC connected to the gateway that will be linked with the device.

b. USB Logger Mode:

For this operation mode, the dataloggers works in stand-alone, recording data in its internal memory and without any wireless connection. This is not the factory setup so, to select it, the connection with the PC and the *WineCapManager* running on it is necessary to modify the device 's operation mode. The device must be set in **STAND-ALONE** *(refer to 8 - Stand-alone USB datalogger installation.)* mode and the sample time must be configured; automatically, the device 's clock is aligned with the PC's clock, in order to assure the temporal reference of the sample.

Sampling operations start may be selected disconnecting the USB cable or giving the proper command with the magnetic key (*refer to 8 - Stand-alone USB datalogger installation.*). More details on device 's connection/disconnection through the USB cable are available on the *WineCap System - User Manual R31* manual.

c. On field transition from USB to Wireless datalogger:

This transition is practicable in field, during the sampling period, using the wireless network association command. When the association is done, the datalogger becomes a wireless datalogger and, besides sending new measures to the gateway, starts a download process towards the same gateway of the measures acquired during the stand-alone period (*refer to Picture 12 - Status table - *).

5. Wireless device user interface.

The user interface consists of a "virtual" button that can be activated using the *WineCapKey* and of a two-colours led.

To give a command, user must approach the *WineCapKey* to the device's sensible area and keep it in that position.; the following picture (*Picture 9 - WineCapKey positioning*) shows device's sensible points.
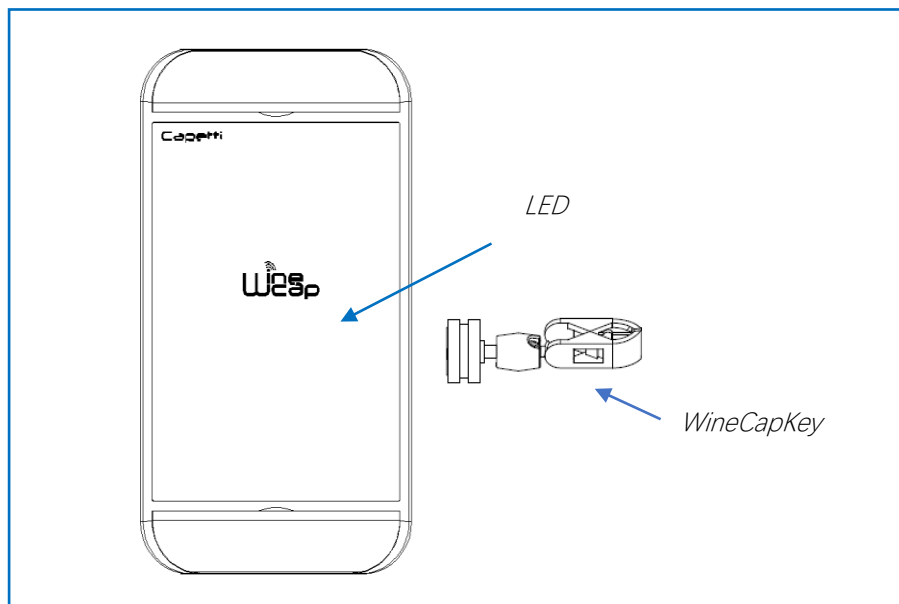
Picture 9 - WineCapKey positioning

The following COMMAND table describes the available commands:

WIRELESS DEVICES USER INTERFACE

Flash count	Command	Description
1 flash	STATUS	Shows the device **STATUS**. As answer the led perform a flash sequence as reported in the **STATUS** table. If the device is performing the **TEST** (*refer to TEST command*) this command stops it.
2 flashes	TEST	Enter in **TEST** mode and transmits status and measurements every 5 seconds. If the device is in **STANDBY** mode or it is out of radio range, this command forces the connection procedure to the WSN and the return to the operative mode. The **TEST** stops after 120 seconds. During **TEST**, the led continuously shows the **STATUS** to monitor the received radio signal quality. <u>CAUTION: Measures acquired during TEST phase are NOT saved.</u>
3 flashes	ENROL	Association to the network: must be used when the device has not yet been included in a network, starts the entry and association procedure to the gateway (*refer to "WineCap System - User Manual R31"*).
4 flashes + 4 flashes	STANDBY	Temporary device deactivation: the device is stopped. The sampling process and the radio are/is. turned off losing the connection to the network. To reactivate, a **TEST** command is necessary. The **STANDBY** command must be given twice to confirm it: at the first sequence the led flashes alternating RED and GREEN lights, waiting for the second confirm sequence within 15 seconds. At the command execution the led flashes as the **STANDBY** status (*refer to "Picture 11 - Status table – Wireless mode"*).
5 flashes + 5 flashes	FACTORY RESET	The device performs the memory deleting procedure and goes in STOP status. All samples, configuration and wireless network data associated are LOST. To reactivate the device a new association and configuration procedure is necessary (*ENROL command*). Also in this case, the **FACTORY RESET** command must be given twice to confirm it. At the command execution the led flashes as the "PROBE/DATALOGGER NOT ASSOCIATED" status (*refer to "Picture 11 - Status table – Wireless mode"*).
5 flashes + 3 flashes	LOGGER NO WSN	As the previous command but performs only the WSN deleting procedure and disassociate from the gateway. The device enters in **LOGGER STAND ALONE** mode: data are kept, and the sampling activity **CONTINUES** with previous setup. Command must be given with 2 sequences: 5 flashes and then 3 flashes. At the command execution wait for the device reboot. At the STATUS command, "**LOGGER**" will be the answer (*refer to "Picture 12 - Status table - Stand-alone mode"*). A new association (*ENROL command*) is possible to a new gateway.
6 flashes + 6 flashes	RESETTING CHANNEL #1	Resets channel #1 to the current position
7 flashes + 7 flashes	RESETTING CHANNEL #2	Resets channel #2 to the current position
8 flashes + 8 flashes	RESETTING CHANNEL #3	Resets channel #3 to the current position
9 flashes + 9 flashes	RESETTING CHANNEL #4	Resets channel #4 to the current position

Picture 10 – Wireless devices user interface

6. Device enrolment.

Not necessary if performed in factory before delivery.

Enrol the device to the wireless network referring to the *"WineCap System - User Manual R31"*. In case the device is already enrolled but in **STANDBY** status, a **TEST** command must be issued (refer to *Picture 10 –)*.

7. Installation procedure.

After installing the gateway in appropriate place in charge, (*refer to "WineCap System - User Manual R31"*), be sure that the device is enrolled to the gateway and activated.

Head for the installation point. On the way, to check the quality of the radio coverage, use the "Field Measurer" function.

This function is activated issuing the **TEST** *(refer to Picture 10 –)* command: position the *WineCapKey* in the spot indicated in *Picture 9 - WineCapKey positioning* and wait for two AMBER flashes, then remove the *WineCapKey* from device. The "Field Measurer" function lasts enabled for two minutes.

To issue commands to the device, place the *WineCapKey* where indicated.

Once the *WineCapKey*, is detected, the led periodically emits AMBER flashes with a 2 second cadence.

For each flash, a different command is associated; to confirm the command the *WineCapKey* must be removed from the sensible area immediately after the number of flashes corresponding at the desired command. The **TEST** corresponds to the second pulse and activate the "Field Measurer" function.

The device will give back the radio signal quality through led flashes:

WIRELESS MODE STATUS Table

FLASH COUNT – WIRELESS MODE		STATUS/RADIO SIGNAL QUALITY
	5 green flashes	ACTIVE - Radio signal: Excellent
	4 green flashes	ACTIVE - Radio signal: Good
	3 green flashes	ACTIVE - Radio signal: Fair
	2 amber flashes	ACTIVE - Radio signal: Sufficient
	1 red flash	ACTIVE - Radio signal: Insufficient
	1 red flash 2" long	OUT OF RANGE Network searching
	2 red flashes 2" long	STANDBY Radio off - No Logging
	Short-long-short red flashes series	FACTORY RESET Device not enrolled – No logging

Picture 11 - Status table – Wireless mode

Optimize reception selecting the best position: small movements can help.

If the signal is absent or insufficient at the install point, a *repeater WR12* should be put between (*refer to "WineCap System - User Manual R31"*). The *repeater WR12* itself must be in a position where the signal level is at least sufficient.

The network will reconfigure itself automatically; the signal will be good again when the device synchronizes with the *repeater WR12*.

The wireless communication will not be reconfigured until completely lost by the device. Because of this, in some cases it could be necessary to force the operation. In such cases, put the device in **STANDBY** mode, then run the **TEST** again (*refer to "WineCap System - User Manual R31"*).

NOTE: The display equipped datalogger *(WD04T)* is recommended, to verify the signal quality during devices installation.

8. Stand-alone USB datalogger installation.

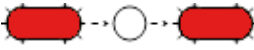Install the datalogger in appropriate place.

If the sampling process has not yet been activated, you can start it through the *WineCapKey*.

Bring it closer to the sensitive point, wait for 2 flashes (*TEST*) *(refer to Picture 10 – – Wireless devices user interface)* and remove. The datalogger begins sampling according to your settings through your PC.

Through the *WineCapKey* is possible to ask for the status, bring it close to the datalogger for 1 flash (*STATUS*) and remove it.

STAND-ALONE DEVICE – STATUS TABLE Table

| FLASH COUNT –STAND ALONE MODE		STATUS
	1 green flash 2 seconds long	ACTIVE
	2 red flashes 2 seconds long	STANDBY
	Sequence of red flashes: short, 2 seconds long, short	FACTORY RESET **INVALID datalogger clock!** PC connection required.

Picture 12 - Status table - Stand-alone mode

9. Shutting off/Reactivating the device.

If the device is shut off and left unused for a long time, you can issue the **STANDBY** command *(refer to Picture 10 – – Wireless devices user interface)*. It corresponds to the command number 4 and must be issued twice to confirm the operation.

Position the *WineCapKey* in the spot indicated in (*Picture 9 - WineCapKey positioning*), and wait for four AMBER flashes, then remove the *WineCapKey* from device. Verify that the device asks for confirmation of **STANDBY** command with alternate GREEN/RED flashing, then position again the *WineCapKey* and wait for four flashes again. The device will confirm the **STANDBY** status lighting the RED led for 2 seconds twice. To reactivate the device the **TEST** command must be issued.

10. Transducer's connection layout.
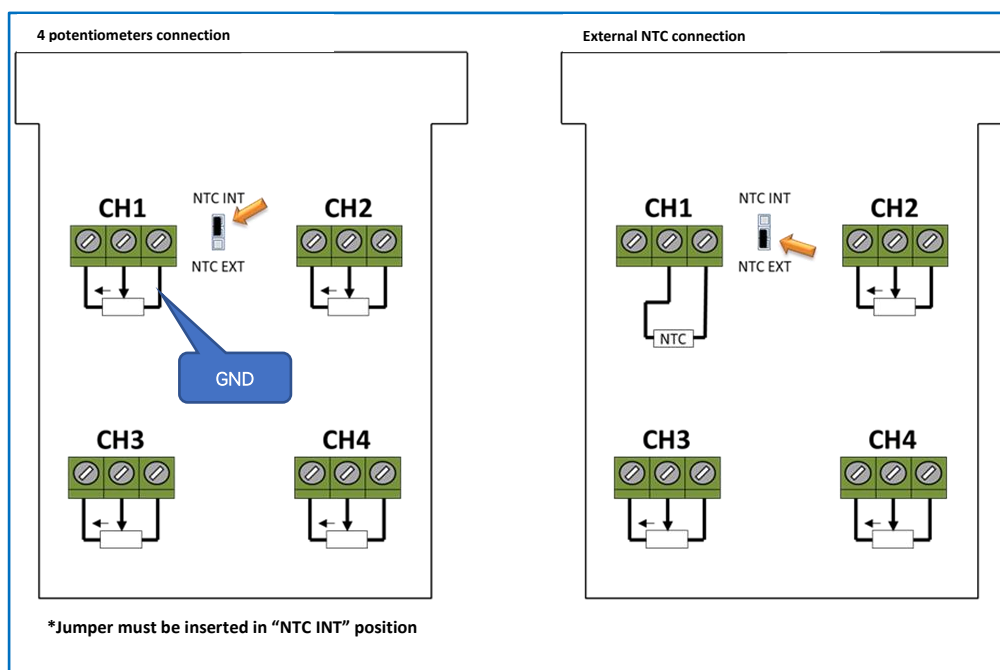
Picture 13 - Connections layout

Arrow indicates the moving **versus** of the potentiometer's indicator which corresponds to **measure growth** reported by datalogger.

11.   Technical Information.

Power supply	8.5Ah - 3.6V type "C" lithium internal battery (*BAT2*)
Battery life (*)	Up to 10 years *(samples every 60 minutes and radio signal quality at least sufficient)*
Measures acquired *(4 input channels)*	• Linear deformation • Proportional measure • Temperature
Sampling interval *(*)*	Selectable from one minute to 24 hours *(60 minutes default)*
Datalogger capacity	64,000 samples *(for each channel)*
Working temperature	• Operative: -30°C ÷ +60°C • Warehousing: -40°C ÷ +70°C
Radio frequency	ISM 868MHz
Radio coverage	Up to 6Km in line of sight *(can be extended using WR12 battery powered repeaters)*
Sealing	IP65
Dimensions	90x160x50mm
Weight	450g
Case material	ABS
Mounting	Fix on 4 points
Connections	Wireless, USB
Cable external diameter	4.7mm maximum
Copper wire section	0.05 ÷ 2.5mm² / ÷ 14 AWG
Temperature - Transducer type	NTC10KΩ
Temperature - Measure range	-30°C÷+60°C
Temperature - Measure accuracy	• ±0.5°C Range -30°C÷0°C • ±0.2°C Range 0°C÷+60°C
Temperature - Measure resolution	0.01°C
Proportional measure - Transducer type	Potentiometer
Proportional measure - Measure range	0÷100%
Proportional measure - Measure resolution	0.01%
Linear deformation - Transducer type	Potentiometer
Linear deformation - Measure range	Configurable using *WineCapManager* - From 1mm up to 10,000mm
Linear deformation - Measure accuracy	0.1% analog input - Refer to potentiometer's technical sheet
Linear deformation - Measure resolution	14bit

* battery life may be influenced by fieldwork conditions, sampling/measuring interval and system configuration.
** radio coverage can be extended using up to 32 WR12 repeaters (maximum 16 for each path) between the device and the gateway.
** refer to selected transducer's documentation. Setup DIP switches in proper way.

12. Mechanical dimensions.
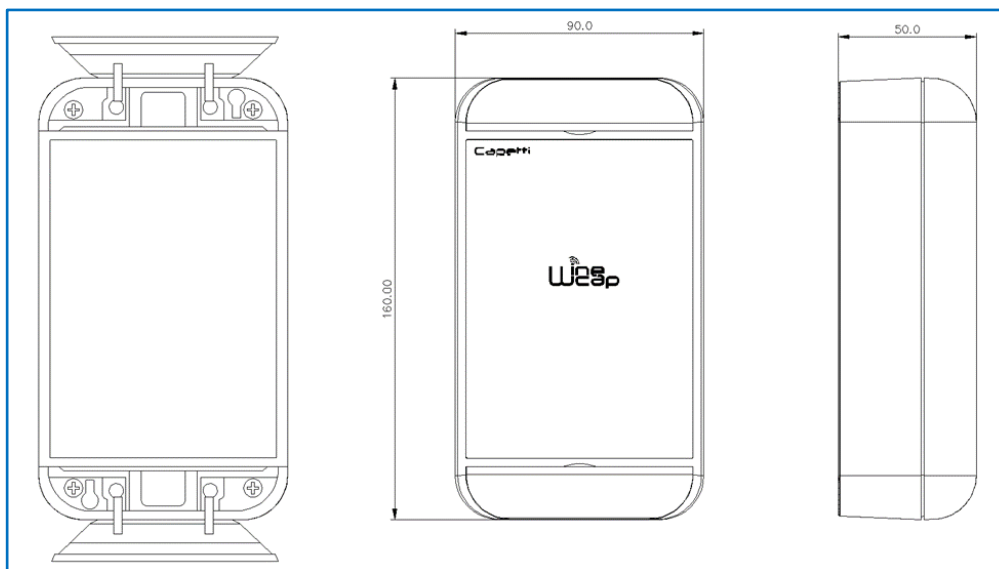
Picture 14 - Mechanical dimensions

13. Disclaimer.

- Specifications are subject to change without notice and should not be interpreted as a commitment on the part of Capetti Elettronica S.r.l.

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- The product is not intended for use in applications where safety is critical, such as life-security systems or medical-related applications.

- If a channel is saturated or disrupted "Frequency hopping" transmitting method allows data integrity and security, but correct functioning of the product in environments with high radio activity is not guaranteed.

14.   Reference standards.

EN 61010 -1

For electromagnetic compatibility

EN 61000 - 3 - 2
EN 61000 - 3 - 3
EN 300 220 -2
EN 301 489 - 03
EN 61000 - 6 -1

This symbol indicates that this product is compliant with the European Directive 2011/65/CE that restricts the use of substances in the manufacturing of electronic devices.

RoHs
2011/65/CE

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