WSD15IIDIST

User Manual

Clinometer – Distance meter - Wireless

Capetti
ELETTRONICA

winecap PD

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.
- This equipment contains a Class 2 laser. The user should avoid pointing the laser directly into the eye while the device is powered.
- 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.

⚠️ <u>CAUTION</u>: for a correct configuration and correct operation of the device it is necessary to use the version of WineCapManager 4_10_1 (or later).

1. Description.

The WSD15IIDIST is a datalogger with 4 channels to acquire biaxial inclination, absolute distance, or temperature (*selectable during installation*) and relative distance with storage functionality of samples acquired.

Inclination acquisition is by means of a triaxial accelerometer, which allows free orientation of the instrument with respect to the horizontal plane. Distance measurement is performed by laser.

2. Inclinometer: operating logic.

2.1.Measure.

The datalogger furnishes X and Y axis values related to sampled movements after installation and its position zeroing. Such values are reported on channels CH1 and CH2 respectively.

If a value exceeds the maximum or minimum movement range, the measure will be declared as "invalid".

Normally these values are the result of a progressive average updated every "*Threshold/Following interval*" recorded and sent to the gateway every "*Measure interval*".

For the average to be done correctly, it is necessary that the "**Follower**" function, on CH1 and CH2 channels (*active by default*), must be enabled.

Otherwise, the average will be performed with the cadence of the "*Measure interval*".

The setup of these intervals is configurable and adjustable using *WineCapManager* software or cloud support.

2.2.Measure threshold.

Two thresholds for each inclination channel can be setup: two thresholds for CH2 and two thresholds for CH3.

Measure sample is compared with thresholds values with interval obtained by "*Threshold/Following interval*" value.

## 2.3.Value following – Step answer.

Every "*Threshold/Following interval*" is compared to the "*instant value*" (*average acquired in a time frame of 8 seconds*) with the current sample.

If the deviation is greater than "*Delta increase*" value or less than "*Delta decrease*" value, configured in setup, measure is placed equal to the "*instant value*" and the average initialized again to that value.

This event is notified with recording and sending the new measure value.

Properly adjusting "*Delta*" values becomes possible manage movements and react to unexpected events without waiting for periods introduced by average.

The device **DOES NOT** answer to **SHOCK** events and cannot be intended able to display dynamic events. An "*unexpected event*" must be intended as a significant movement related to the quiet position of the device.
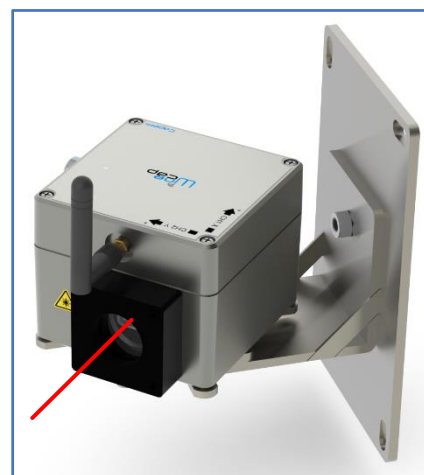
Picture 1 - Product image
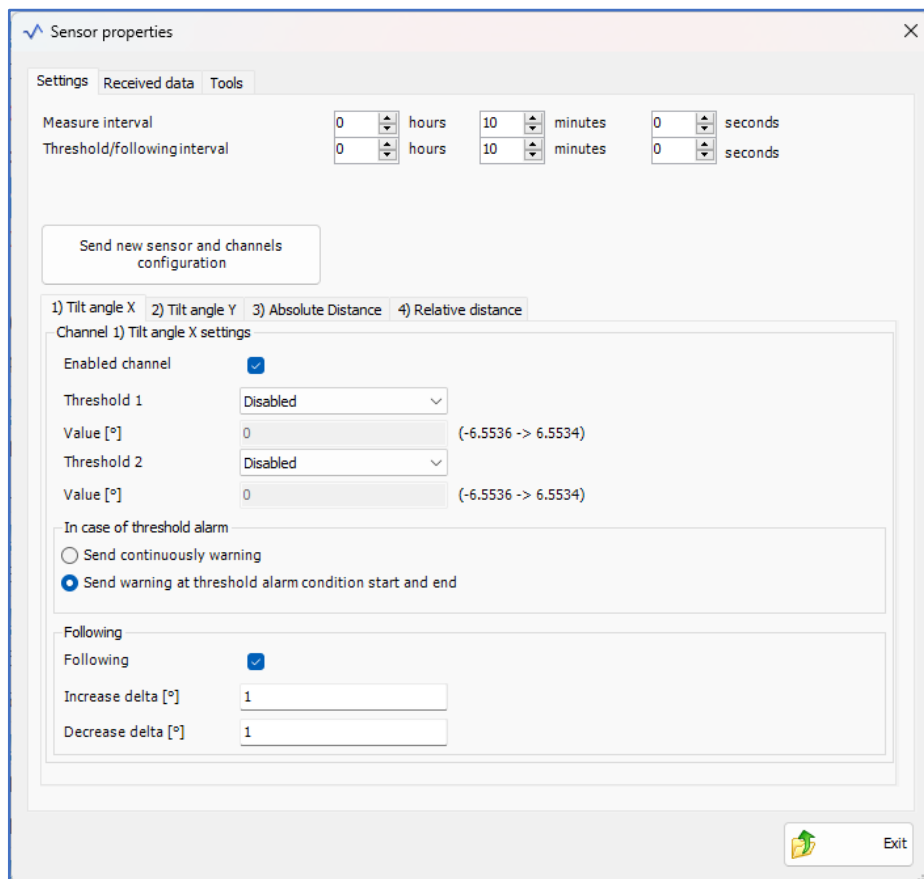
Picture 2 – Device configuration (using gateway)

3. Clinometer channels zeroing.

After fixing and installation operations, a "6+1" command (refer to *Picture 7 – Wireless devices user interface*) can be issued which performs the reset of inclination channels.

The command starts a first acquisition which defines the device's absolute position and, consequently, the axis rotation to align internal references. At the end of the procedure, the zero value and the axis position will be showed and, at the end of the procedure, saved in memory to be recovered in case of device restart.

This procedure lasts around **5 minutes**. During such period, datalogger MUST NOT be moved.

In addition to commands issued using the *WineCapKey*, clinometer and distance meter zeroing are performable through the WSN radio.

In the *WineCapManager* configuration software there is a ***Zeroing 1*** button, dedicated precisely to the action of resetting X and Y axes (*CH2 and CH3*).

Control buttons are contained in the "Sensor properties" menu.
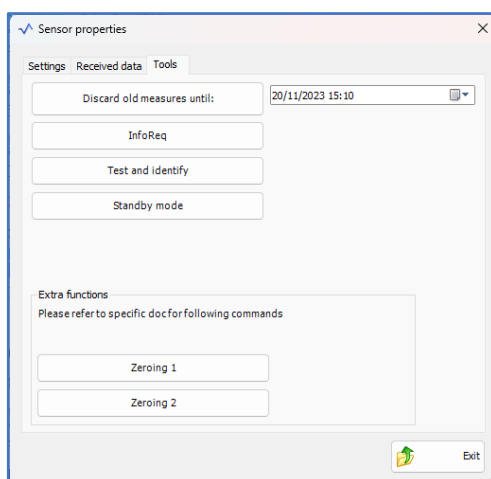
3.1.Measurement Channel Orientation.

The rotation axes and angular value growth directions, reported by Channels 1 and 2, change and depend on the position of the datalogger DURING the zeroing procedure. The datalogger always takes as its reference the vertical axis, normal to the ground, then records the offset from this position and takes a relative measurement.
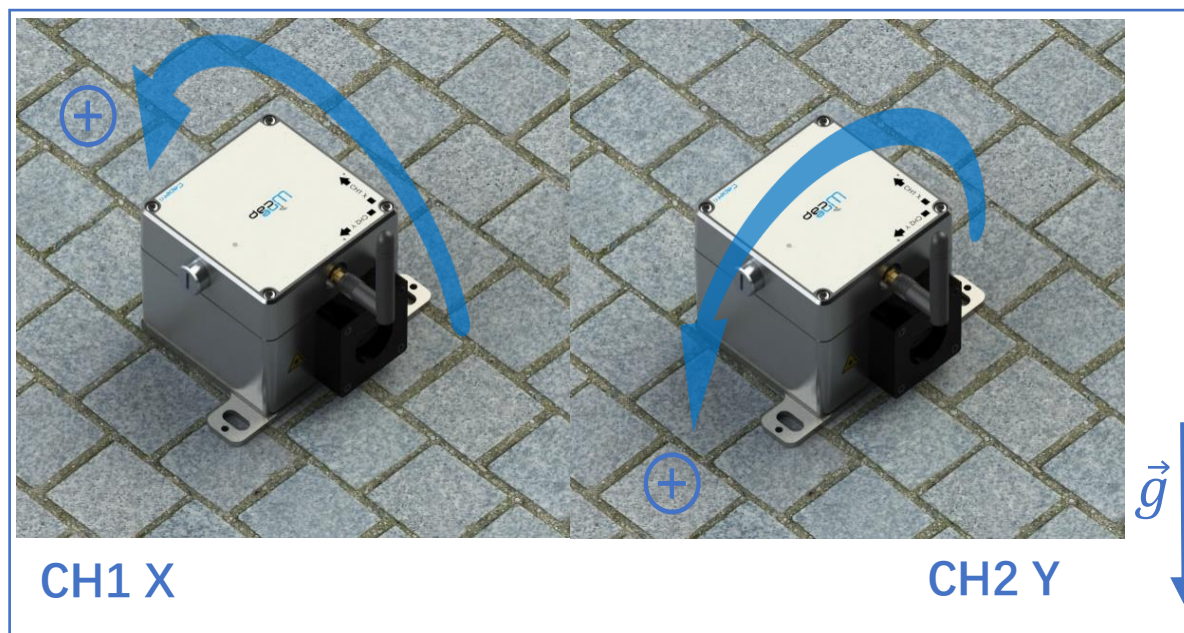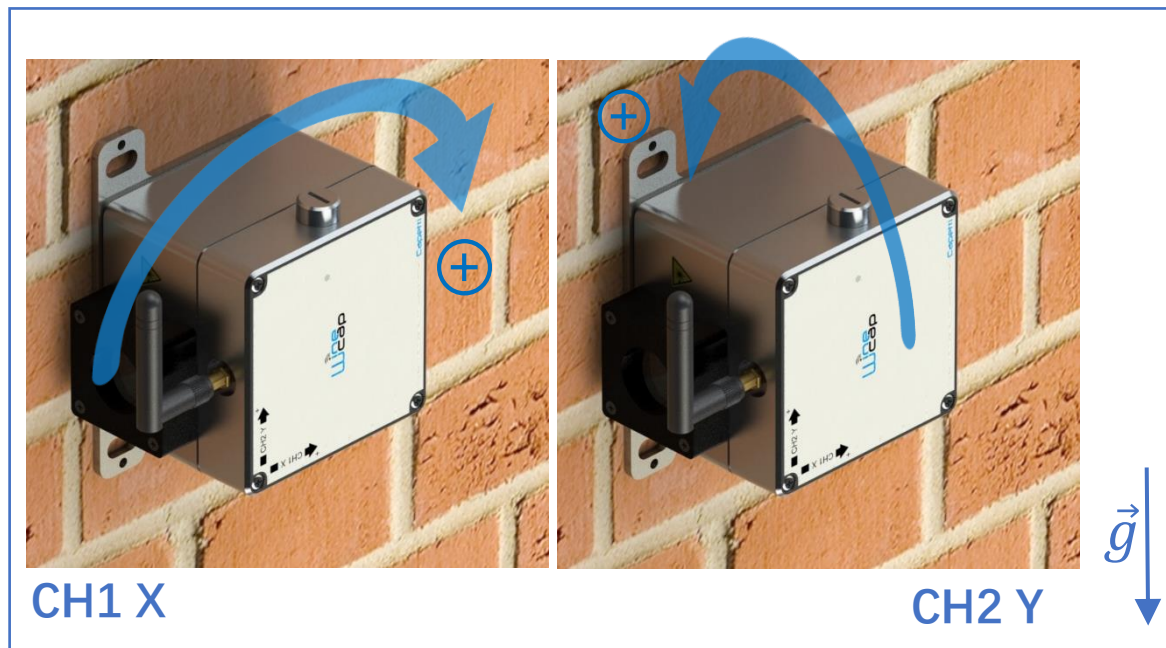

Picture 3 – HORIZONTAL axis/channel correspondence

Below are conventions regarding the rotations and increasing directions of the channels under the three possible conditions that may occur during installation. Each configuration is also valid for the upside-down situation, tilted 180° from the drawing.

*Picture 4 – VERTICAL axis/channel correspondence*

Picture 5 – VERTICAL LATERAL axis/channel correspondence

4. Distance meter: operating logic.

The laser pointer acquires the distance. The absolute distance is reported on CH3, while the distance relative to the reset position is reported on channel CH4. If these values exceed the maximum and minimum displacement range, the measurement is declared "invalid".

The distance is acquired with the frequency indicated by the "*Measurement time*" parameter. There are 2 thresholds per channel which, if activated and configured, bring the acquisition cadence to the "*Threshold / Tracking time*" (*default: disabled*).
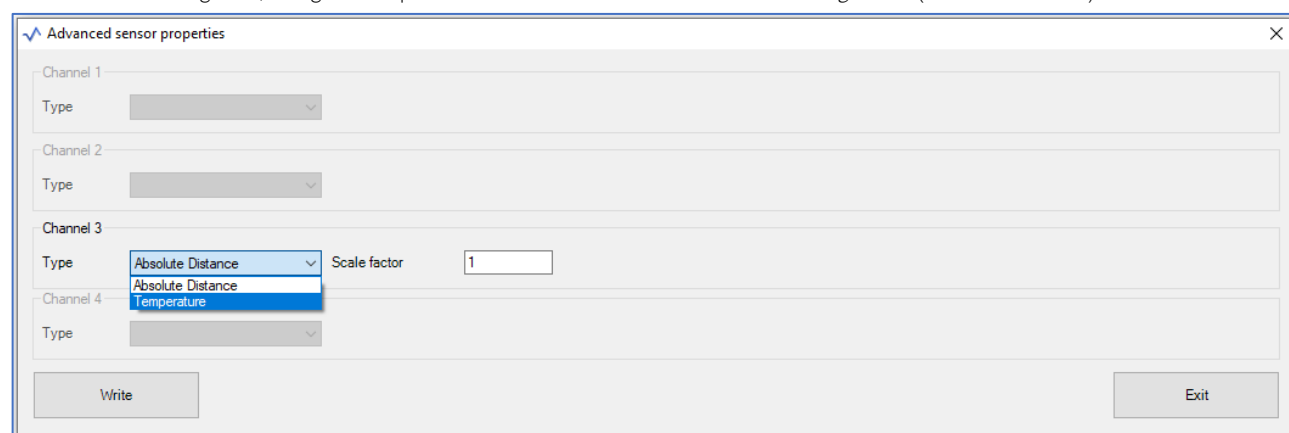
In case CH3 Channel has been configured as temperature, its scale must be set as 0.01; otherwise, if the CH3 Channel has been configured as deformation, its scale factor must be set as 1.

4.1. Relative distance channel reset.

By giving the command "6+4" (see *Picture 7 – Wireless devices user interface*), the channel dedicated to the measurement of the relative distance is reset.

In alternative, the zeroing operation can be performed using the *Zeroing 2* control button available in the "Sensor properties" menu in *WineCapManager*.

4.2. Laser pointer.

There is a "laser aiming" function: by giving the command "7" (see *Picture 7 – Wireless devices user interface*) the laser is activated and allows a precise aim at the target. This function ceases when a measurement is performed by the datalogger, or if command "1" is given again.

Refer to Technical Information (*chapter 13*)

5. Thermometer: operating logic.

The value reported on channel CH3 can be configured to provide the temperature acquired by the datalogger which is sampled at each "*Threshold / Tracking time*" like the other channels.

To perform the configuration, it is necessary to connect the WSD15IIDIST datalogger to the PC via USB cable and use *WineCapManager*. In the "Sensor➔Properties" section, on the "Tools" page, it is possible to decide the behaviour of channel 3 (*default ABSOLUTE DISTANCE*).

<u>ATTENTION</u>: after this modification it is necessary to enrol the datalogger with the gateway again.

6. Default settings.

The default settings of the device at first start-up are as follows:

- "Measurement time" = 60 minutes
- "Threshold / Tracking time" = 5 minutes
- CH1 e CH2 "Follower" = Active with "*Delta Increment*" = 1° and "*Delta Decrement*" = 1° values
- CH3 setup as ABSOLUTE DISTANCE

7. Device pre-set and use mode.

7.1. 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 8 - Status table – Wireless mode*). In this case, it is necessary to start it with the **TEST** command (*refer to Picture 7 – 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 8 - Status table – Wireless mode*).

7.2. 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 11 - 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 11 - 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.

## 7.3. 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 9 - Status table - *).

8. 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 6 - WineCapKey positioning*) shows device's sensible points.
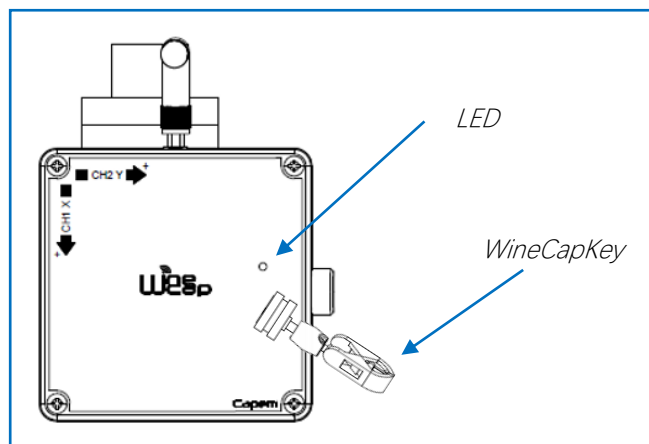
Picture 6 - WineCapKey positioning

The following COMMAND table describes the available commands:

WIRELESS MODE COMMAND table

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 8 - 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 8 - 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 9 - Status table - Stand-alone mode"*). A new association (*ENROL command*) is possible to a new gateway.
6 flashes + 1 flash	CH1 and CH2 Reset	The device carries out the procedure of zeroing the inclination channels of the X and Y axes, determining the absolute position of the instrument and the consequent ROTATION OF THE AXES, aligning the internal references, and saving the ZERO position.
6 flashes + 4 flashes	CH4 Reset	The device carries out the zeroing procedure of the relative distance acquisition channel
6 flashes + 6 flashes	Cancellation of resets	The device performs the procedure for cancelling all the zeroing operations carried out on channels 1, 2 and 4. The initial values are restored.
7 flashes	Pointing	The laser pointer is turned on. To interrupt this phase, it is necessary to issue the command again or wait for the next measurement.

Picture 7 – Wireless devices user interface

9. 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 7 – Wireless devices user interface*).

10. 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 7 – Wireless devices user interface)* command: position the *WineCapKey* in the spot indicated in *Picture 6 - 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
🔴 (long)	1 red flash 2" long	OUT OF RANGE Network searching
🔴··⚪··🔴 (long)	2 red flashes 2" long	STANDBY Radio off - No Logging
🔴··⚪··🔴··⚪··🔴	Short-long-short red flashes series	FACTORY RESET Device not enrolled – No logging

Picture 8 - 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.

11. Stand-alone USB datalogger installation.
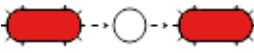
Install the datalogger in appropriate place.

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 7 – 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

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 9 - Status table - Stand-alone mode

12.   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 7 –)*. 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 6 - 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.

13. Technical Information.

Power supply	19 Ah - 3,6 V type "D" lithium internal battery (*BAT3*)
Battery life (*)	Up to 5 years (*samples every 60 minutes and radio signal quality at least sufficient*)
Measures acquired *(4 input channels)*	• X and Y biaxial inclination • Absolute distance (*or outdoor temperature*) • Relative distance
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 • Distance meter functionality (****): -10°C ÷ +50°C • Warehousing: -40 °C ÷ +70 °C
Radio frequency	ISM 868 MHz
Radio coverage	Up to 6 km in line of sight (*can be extended using* WR12 *battery powered repeaters*)
Sealing	IP67
Dimensions	100x100x80 mm
Weight	1,6000 g
Case material	Aluminium
Mounting	Using basic clamp or optional *FIX-DIST* clamp (*free adjustment on 2 axis*)
Connections	Wireless, USB
Inclination - Transducer type	Three axis accelerometer
Inclination - Measure range	-6.5000° ÷ +6.5000°
Inclination - Measure accuracy	± 0.5% of measure
Inclination - Measure resolution	0.0002°
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
Relative distance– Transducer type	LASER distance meter
Relative distance – Measure range	• ±3,200 mm • 0.05÷15 m (*target: natural surface*) • 15÷40 m (*target: white matte surface*) • 40÷150 m (*target: orange reflective***)
Relative distance – Measure resolution	0.1 mm
Relative distance – Measure accuracy @2σ (*@1σ*)	±1 mm (*±0,5 mm*)
Relative distance – Repeatability @2σ (*@1σ*)	±0.3 mm (*±0,15 mm*)
Absolute distance – Transducer type	LASER distance meter
Absolute distance – Measure range	• 50÷65,000 mm • 0.05÷15 m (*target: natural surface*) • 15÷40 m (*target: white matte surface*) • 40÷65 m (*target: orange reflective***)
Absolute distance – Measure resolution	1 mm
Absolute distance – Measure accuracy	±1 mm
Absolute distance – Repeatability	±0.3 mm
Type	Class 2 – 655 nm (*visible red*)
Typical elliptical laser point on target	17 mm / 9 mm @ 30 m

* battery life may be influenced by fieldwork conditions, sampling 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.*
*** to avoid possible damage to the laser, the reflective target supplied must <u>NOT</u> *be used in the range 0.05 ÷ 40mt*
**** laser samples are available only in this temperature interval. Laser will not be active outside of this interval.

14. Mechanical dimensions.
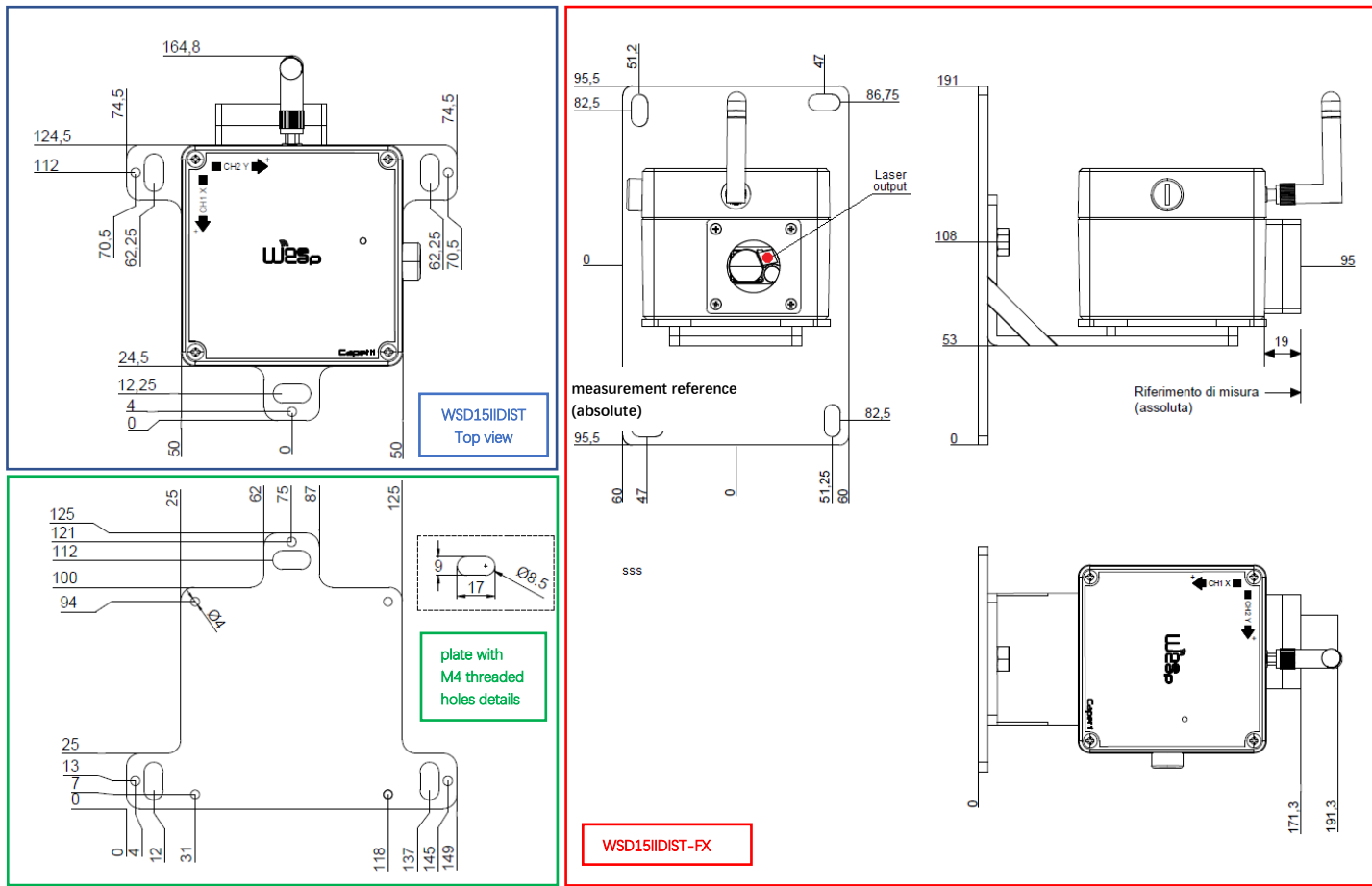
Picture 10 - Mechanical dimensions

15. 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.

16.   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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