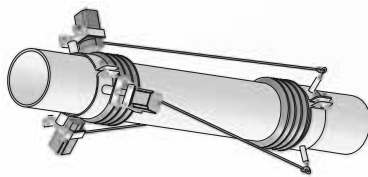


I.S.I.F. S.R.L. SENTINEL

# SENTINEL



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**S.S.N. 4**  
**PORRETTANA**  
**Km. 36.029**

# **INNOVATION AND RELIABILITY**

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# REMOTE CONTROL SYSTEM

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**SENTINEL** is a purpose engineered system for remote monitoring of expansion compensators (joint/bellows) and of the static stability of structures, buildings.





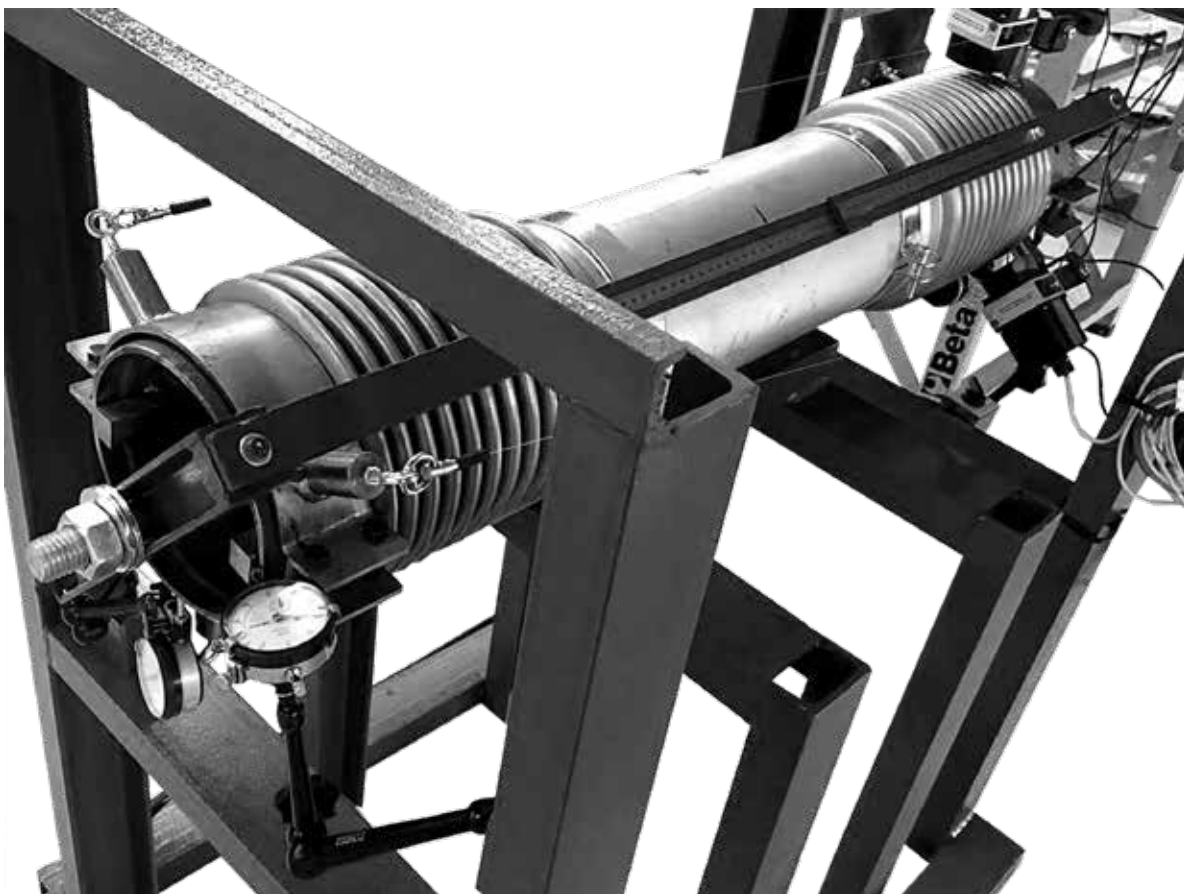
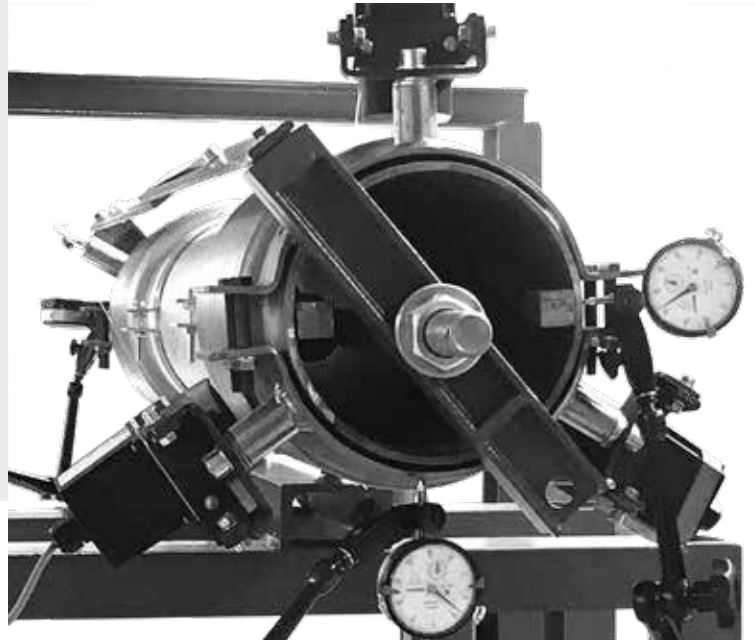
**SENTINEL** makes it possible to avoid periodical testing and checking of expansion compensators.

**SENTINEL** is the first system to enable remote control of movements of expansion compensators as well as of their remaining useful life and performances.



**SENTINEL** has been built to be applied to different types of control processes.

**SENTINEL** is the right solution to control the movement of expansion compensators or of any other structure or building, the static stability of which is crucial to the common safety.



**SENTINEL** is available in two different versions:

- 1** The first one is designed for complete monitoring of axial movements.
- 2** The second one is designed for complete monitoring of the 6 spatial movements.

The version enabling complete visualisation of all of the 6 movements in space, makes it possible to visualise the movements of the monitored element on the interface page by means of two three-dimensional active images, one of which represents the position of the monitored element/component at the moment of its installation, whereas a semi-transparent image represents its ongoing expansion.

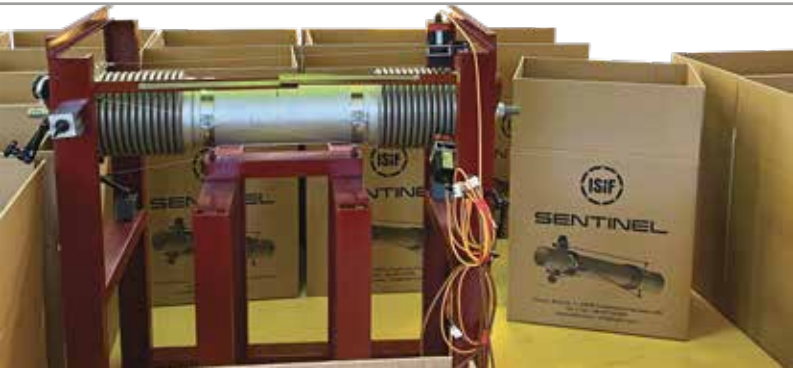




**SENTINEL** is also a key system to control expansion compensators installed underwater up to a 100 m depth.







The **SENTINEL** system has already been installed on the whole of the Italian territory to control expansion compensators.

**SENTINEL** offers the possibility to perform a real-time and constant check as regards the static stability of structures and buildings.

Any company dealing with the management of important infrastructures is aware of the most critical areas concerning its plants, such as for example in case of geologically unstable areas, or areas subject to landslide hazard.

**SENTINEL** offers a 24H monitoring system of plants or structures/ buildings through a simple smartphone.





Thanks to its ability to monitor torsions, elongations, extensions and compressions, **SENTINEL** is the ideal device for several application and use fields.

**1** Sentinel controls the movements and life-cycle of components, the duration of which depends on a precise number of movements. Sentinel is an essential control device for remote monitoring of expansion compensators.

**2** Sentinel can perform a real-time and constant check on the static stability of obsolete buildings or structures subject to stress due to weather conditions, geological, thermal/temperature conditions, or on precarious and unstable structures, bridges, viaducts, flyovers, structures/buildings, which are necessary to ensure proper functioning of cable or funicular railways, as well as dams. Any structure with an important operating life-cycle needs to be constantly and carefully monitored.















By eliminating physical site inspections, Sentinel represents a paramount opportunity to spare money and to reduce polluting gas emissions into the atmosphere.

**SENTINEL** represents a technological improvement opportunity for future oriented companies.



**SENTINEL** performs data management by availing itself of an electronic peripheral device located within a mechanical housing and powered through a photovoltaic panel.

**SENTINEL** detects movements with decimal accuracy.





**SENTINEL** is equipped with a movement control system for expansion joints named Sentinel Web. Through a data collection monitoring station, the system collects data from potentiometers installed within the expansion joint and forwards them to the portal so that they are memorised and visualised. After the first configuration the system is completely self-reliant, since power supply is granted by a battery, which is recharged through the solar panel.

The main components of the system are the following:

- 20 W solar panel
- Battery charger
- 12V 7ah battery
- Control unit for data acquisition from transducers
- 2G/3G antenna

More in detail the data collection/acquisition control unit, which is the real core of the system, is made up of:

- Sentinel data acquisition card, which is designed to read the values of sensors giving them a timestamp.
- Being the device with the highest computing power, the SBC card deals with data processing of data received from the Sentinel acquisition card and with the forwarding to the server as well as with the management of the user interface for the first system configuration.
- Gprs Modem

The RGB Led on the acquisition card can have different colours as shown below:

- Yellow: the card is on and ready to execute commands
- Blue: acquisition status of the zero points
- Green: data forwarding to portal
- Red: error/failure
- Violet: system update





## CONFIGURATION INTERFACE

Through the interface the operator can both set up the system and control the progress status of operations.

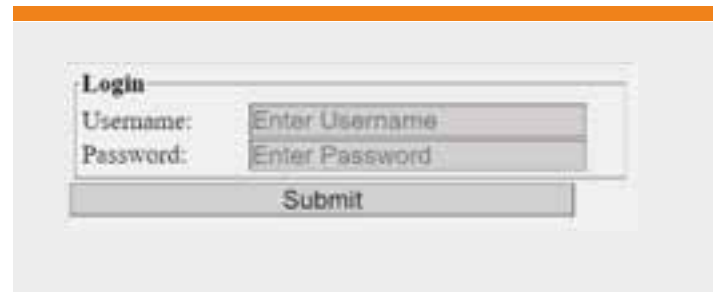
## LOGIN PAGE

Insert the following credentials into the login page:

Username: "xxxxxxxxl"

Password: "xxxxxxxxxx"

Press the "Submit" key to access and visualise the setup/configuration page.



The image shows a screenshot of a login page. It features a white background with a grey border. At the top left, the word "Login" is displayed in a bold, black font. Below it, there are two input fields: "Username:" followed by a text box containing "Enter Username", and "Password:" followed by a text box containing "Enter Password". At the bottom of the form, there is a "Submit" button.





## SETUP/CONFIGURATION PAGE

The setup page makes it possible to set and manage the Sentinel device. It is subdivided into two parts: settings and information.

## SETTINGS:

### SMARTPHONE APP:

Open the smartphone camera App and focus the camera on the QR code concerning the Access Point. The QR code scanning shall generate a request to create a connection with the access point of the capture/acquisition card and to create a Wi-Fi connection with SSID "SentinelAP". Scan the QR code of the user interface link by means of the smart phone camera app. The user interface for the system setup will be shown on the browser.

### ACCESS POINT



### LINK INTERFACCIA



### STATION:

- Id: Station identification number (read-only)
- Ton: Time interval between two starts (in hours) (read-only – modifiable through web Server)

### SIM:

- Pin: Field to enter the pin code of the sim card (this field can be left blank in case the sim does not require the presence of a pin).
- Apn: It is the field to insert the Apn code of the sim card (compulsory field).

### POTENTIOMETERS:

Select the potentiometers which have been installed onto the device (the user shall select at least one).

### PIPE/TUBE DIAMETER:

Select the diameter of the tube/pipe which has been installed.





## CALIBRATION OF POTENTIOMETERS:

Acquisition/capture of zero points: in case this key is selected, the calibration of zero points will be performed at the moment of data storage.

## SIM SIGNAL:

This key starts the procedure of the SIM signal detection; it is possible to evaluate the level of the signal received by the GPRS modem before performing the zero-point settings of the potentiometers.

## STORE:

This key makes it possible to save/store configuration parameters and starts the acquisition/capture procedure of zero points in case the flag "zero-point acquisition" is selected.

## NOTIFICATIONS:

It signals the progress status of the procedure and possible errors/failures.

## INFORMATION

### STATUS:

- Sim signal: this is the signal detected from the sim card (NA: not available).
- Web Server: it signals whether or not the device is connected with the Mqtt server.

**!** *The sim signal is formatted as follows:*  
*<rssi>,<ber> where:*

- *<rssi> goes from 0 to 31:*
  - *-1 = NO SIGNAL*
  - *0 = -115 dBm*
  - *2...30 = -110... -54 dBm*
  - *31 = -52 dBm*
  - *> 99 not known or not detectable*
- *<ber> ranges from 0 to 7*

### SERVER:

- Broker ID: Address for connection with "sentinel solutions" platform.
- Username: Username for connection with "sentinel solutions" platform.
- Password: Password for connection with "sentinel solutions" platform.

### GPS:

- Latitude: Latitude of the device.
- Longitude: Longitude of the device.

**!** *Giving consent to device localisation.*

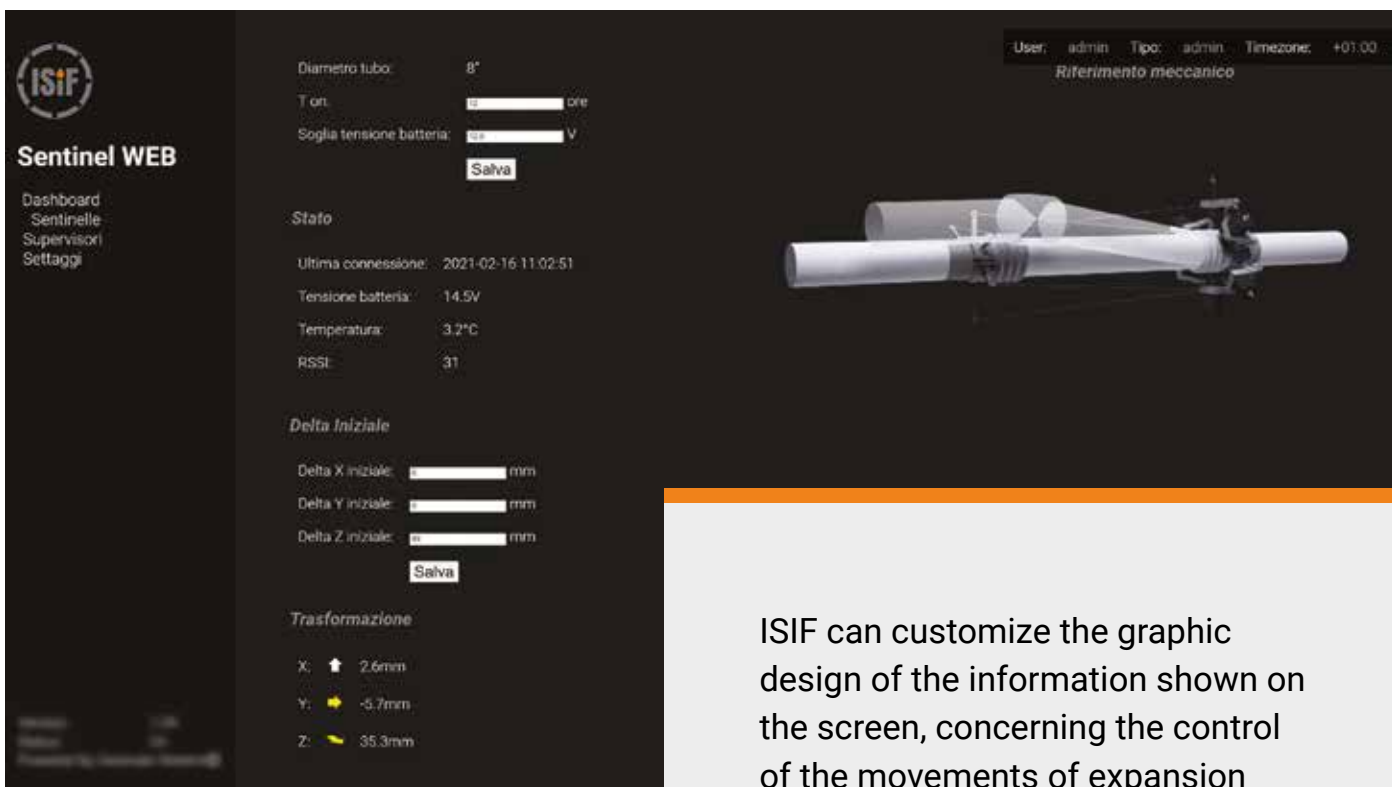
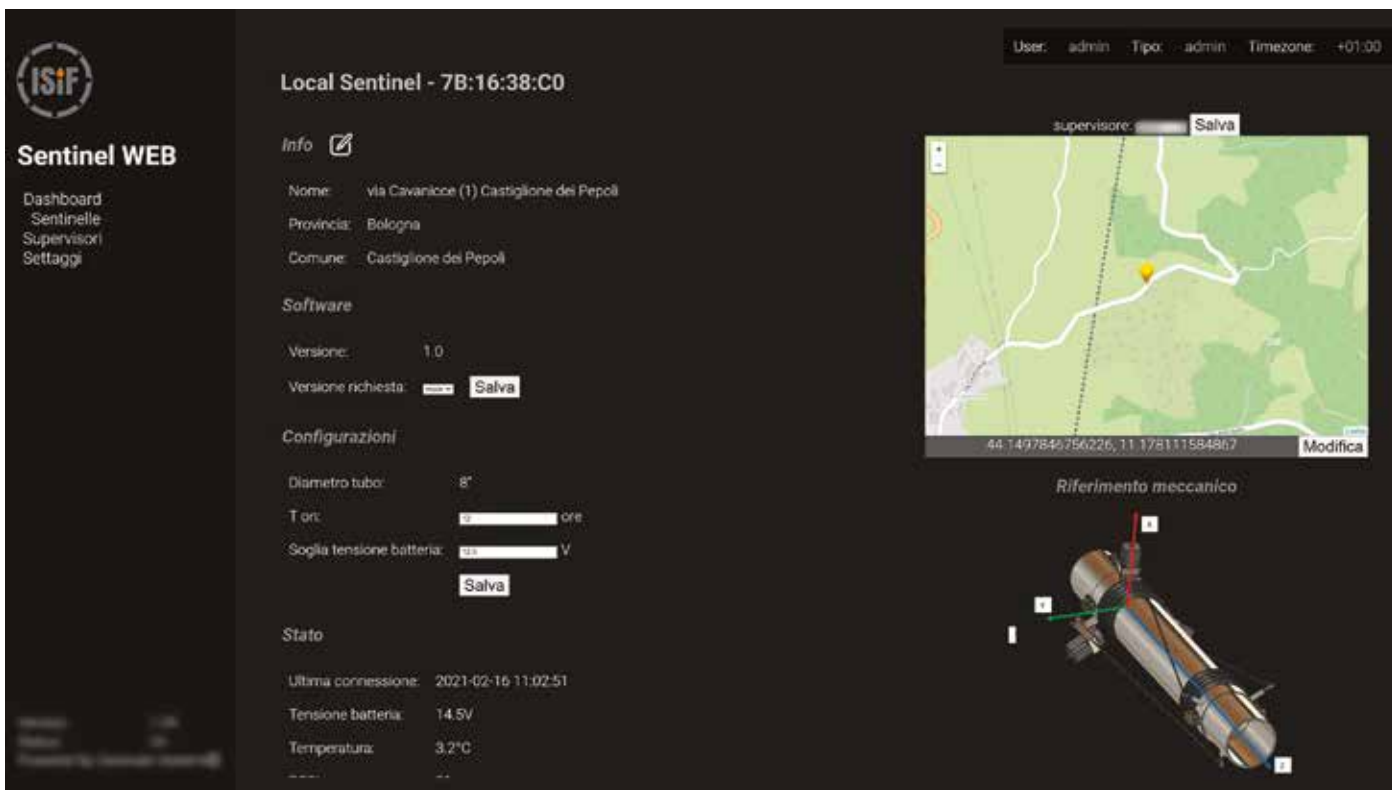
### SOFTWARE:

- Date: Date of last modification to the software system.
- Version: Last software version.

Informazioni	
Stato:	
Segnale Sim:	
Web Server:	
Server	
Broker IP:	
Username:	
Password:	
GPS	
Latitude:	
Longitude:	
Software	
Data:	
Versione:	







ISIF can customize the graphic design of the information shown on the screen, concerning the control of the movements of expansion compensators by reproducing the image in the form of a two-dimensional or a three-dimensional solid shape.



