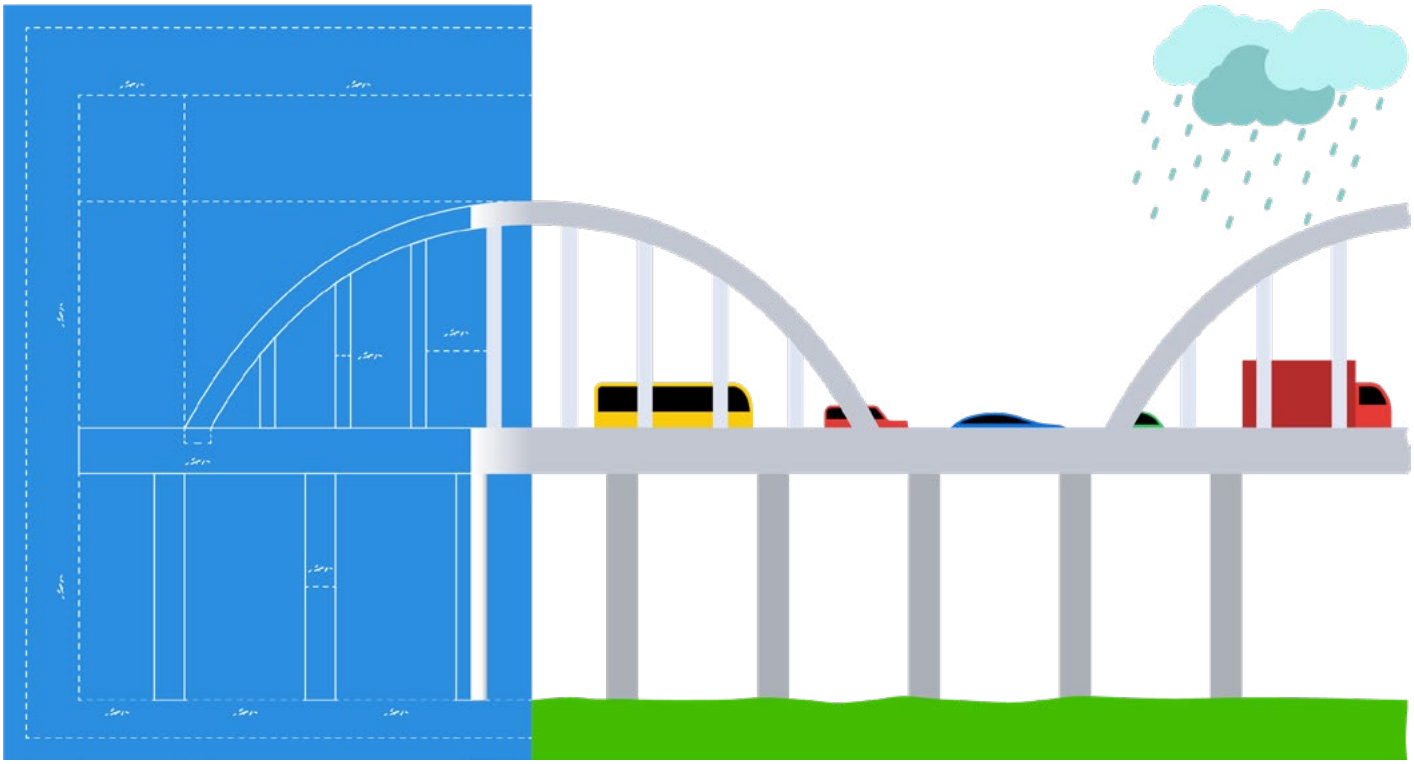
APPLICATION NOTE

Bridges Monitoring

Introduction

The monitoring of a bridge is fundamental both in the construction phase and during its use:

- in the **construction phase**, it allows to check whether the parameters are suitable to the project.
- in the **use phase**, external agents (atmospheric, traffic etc..) and time can cause the impairment of the structure and its reliability. The instruments that are installed during the bridge construction will continue to be monitored. It is in this phase that the bridge and all its components will be checked.



Regarding already **existing bridges**, the monitoring is needed to control the **structural conditions** and it allows to keep under control the **state of the bridge** in normal conditions but also when it is subjected to an exceptional event.

Bridges can be: **arch bridge**, **cable-stayed bridge**, **bridge with trusses**, **viaduct**. The construction can be made of masonry, steel or cement.

For each type, there is a specific monitoring.

Furthermore, the monitoring can be related to a specific cause or to the place (river, mountain, city etc.).

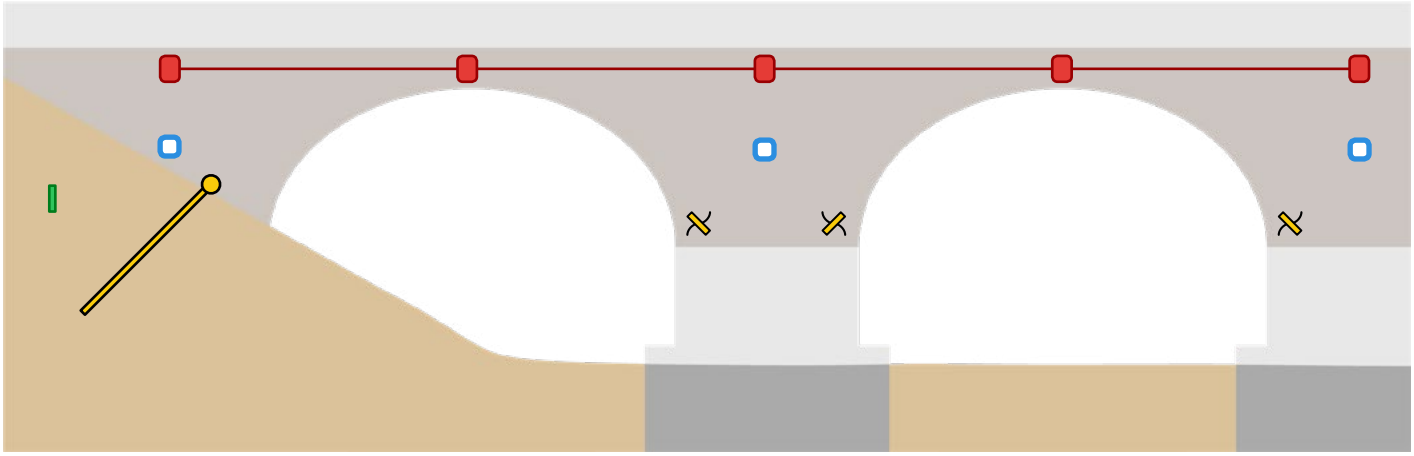
Our solutions

SIM STRUMENTI provides all the necessary facilities for the monitoring (**sensors**, **data acquisition units**, **modem**, **cables**, etc...) as well as **personal assistance on-site or by phone** if needed, during the entire project and monitoring process. In this way, the professional will be able to evaluate the available instrumentation and the data over time.

Monitoring systems can be **manual** or **automatic** and **centralized** or **decentralized**. They can be equipped with **alarm systems** both local and distant. Moreover the acquired data can be sent via **FTP** to a server.

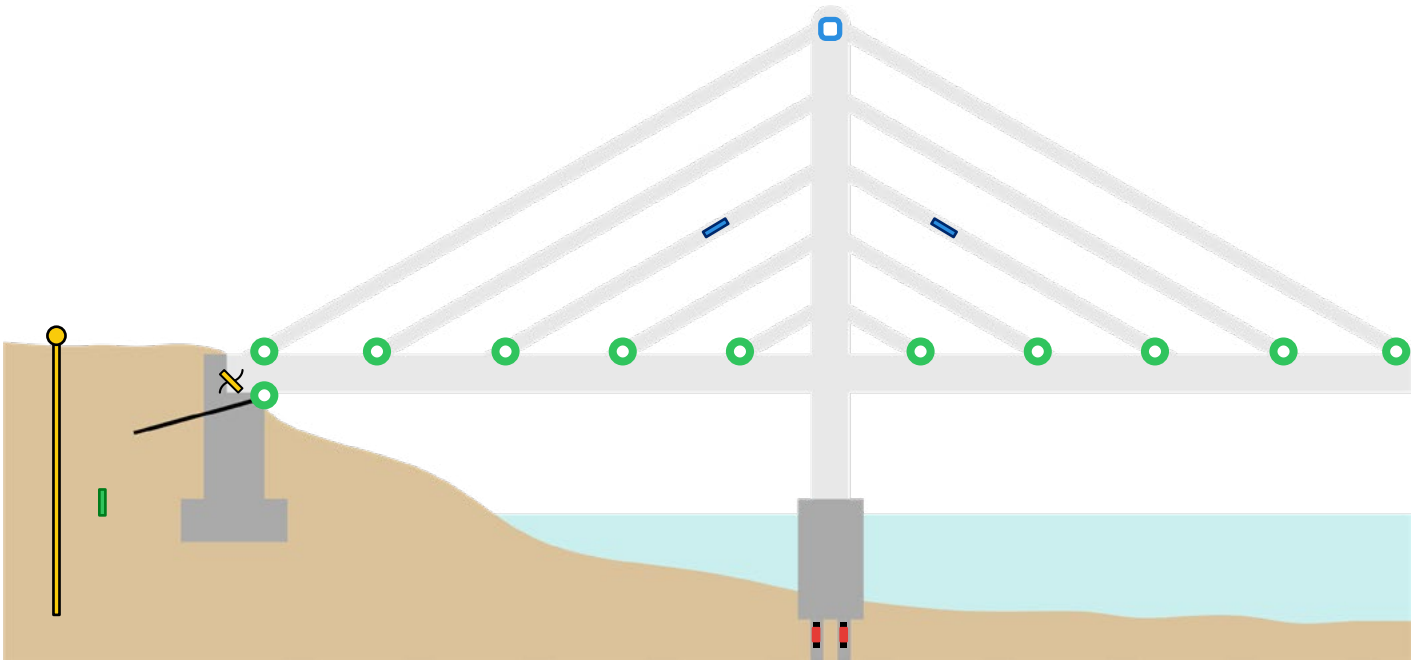
ARCH BRIDGE

Topic	Instrumentation
Crack / movements between bridge components	Joint meter **DS811**
Settlement control	Settlement multipoint system **ST140** / Inclinometric chain **IN920**
Rotation control	Fixed wall inclinometer **IN920**
Control of the possible movement of the bridge shoulder	Multipoint borehole extensometer **DS830** / Inclinometric chain **IN935** / Extenso-inclinometric chain (combination of the two options)
Control of the influence of the stratum and the environment on the bridge	Electric piezometer **LV610** and/or Sensors for environmental monitoring (wind speed and direction, rain etc.)



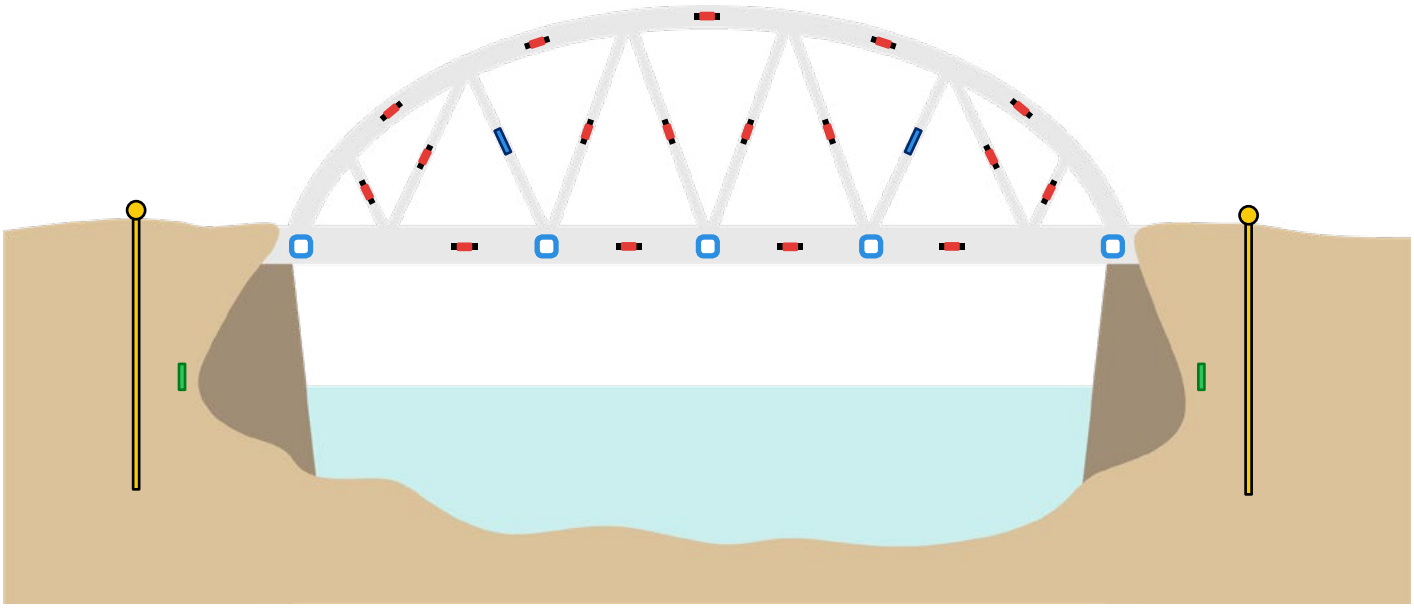
CABLE-STAYED BRIDGE

Topic	Instrumentation
Pylons (antennas) control	Fixed wall inclinometer **IN920**
Tie rods and anchors control	Load cell **LC210**
Foundation piles control	Embedment strain gauge **LC220**
Movements between bridge components	Joint meter **DS811**
Bridge and environment temperature (to evaluate the influence on the structure)	Temperature sensor **WE710**
Control of the possible movement of the bridge shoulder	Multipoint borehole extensometer **DS830** / Inclinometric chain **IN935** / Extenso-inclinometric chain (combination of the two options)
Control of the influence of the stratum and the environment on the bridge	Electric piezometer **LV610** and/or Sensors for environmental monitoring (wind speed and direction, rain etc.)



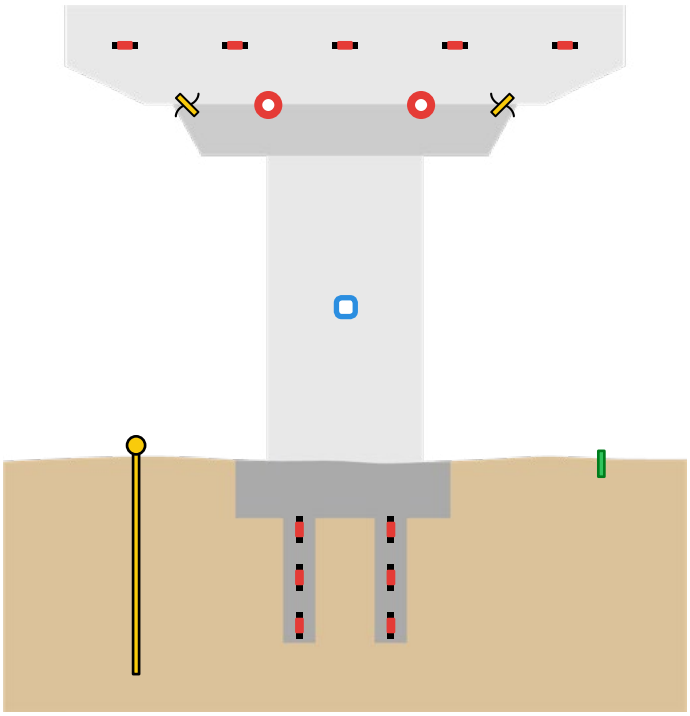
BRIDGE WITH TRUSSES

Topic	Instrumentation
Control of the deformation of the steel structure	Embedment strain gauge **LC220**
Rotation control	Fixed wall inclinometer **IN920**
Bridge and environment temperature (to evaluate the influence on the structure)	Temperature sensor **WE710**
Control of the possible movement of the bridge shoulder	Multipoint borehole extensometer **DS830** / Inclinometric chain **IN935** / Extenso-inclinometric chain (combination of the two options)
Control of the influence of the stratum and the environment on the bridge	Electric piezometer **LV610** and/or Sensors for environmental monitoring (wind speed and direction, rain etc.)

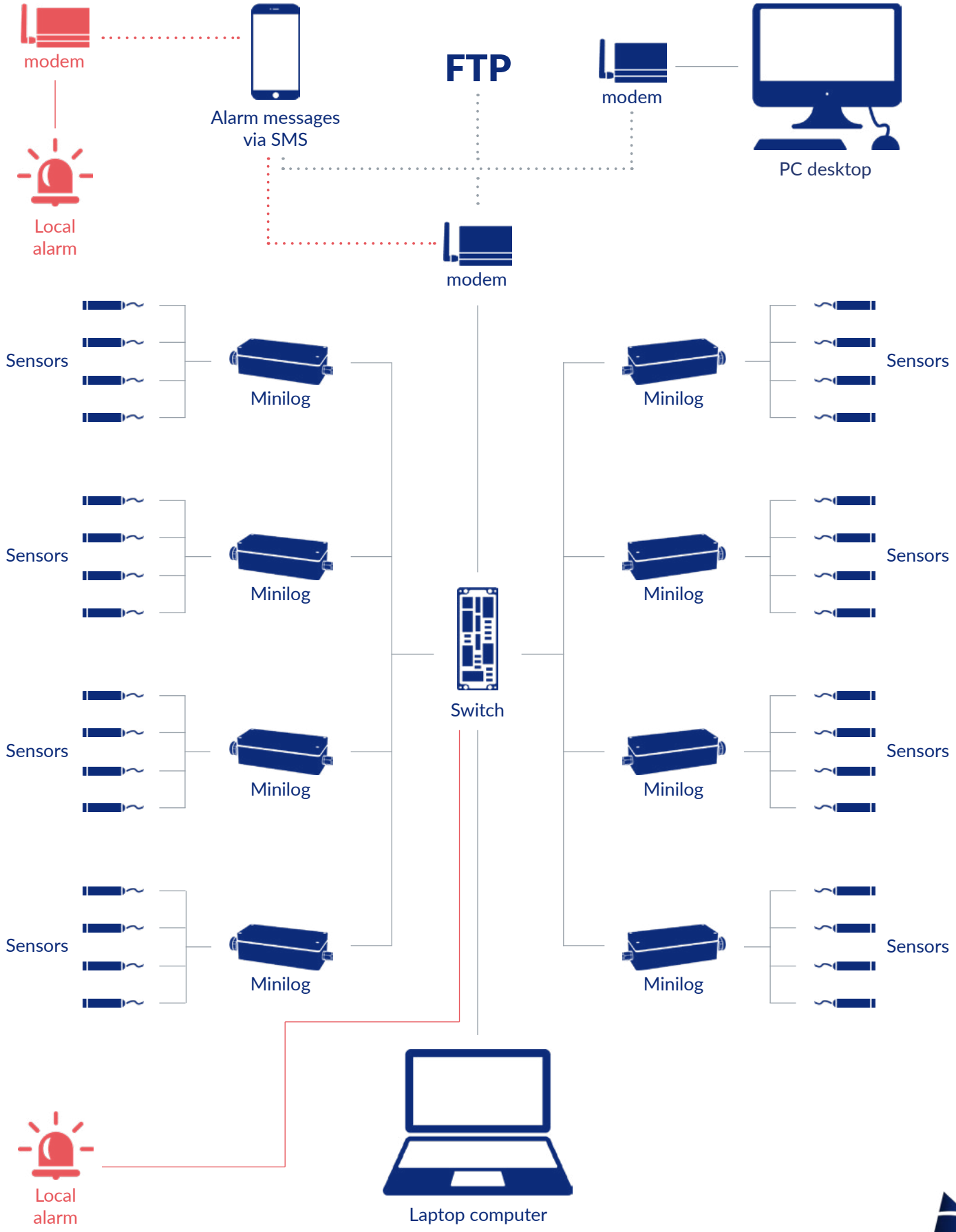


VIADUCT

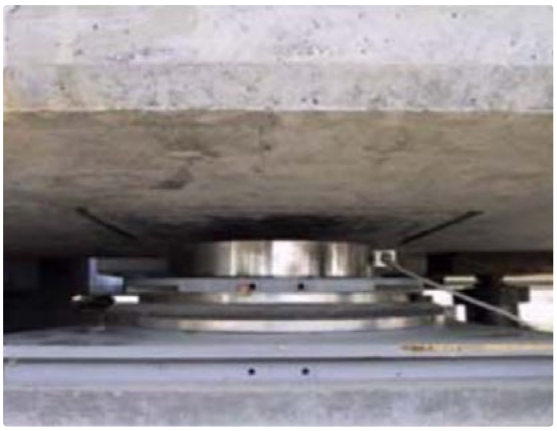
Topic	Instrumentation
To be drowned in beams and foundation piles	Embedment strain gauge **LC220**
Movements between bridge components (shoulder-beam; beam-pylon) in the three XYZ axes	Joint meter **DS811**
Rotation control	Fixed wall inclinometer **IN920**
Control of supports between beam and pillar	Load cell **LC255**
Control of the possible movement of the bridge shoulder	Multipoint borehole extensometer **DS830** / Inclinometric chain **IN935** / Extenso-inclinometric chain (combination of the two options)
Control of the influence of the stratum and the environment on the bridge	Electric piezometer **LV610** and/or Sensors for environmental monitoring (wind speed and direction, rain etc.)



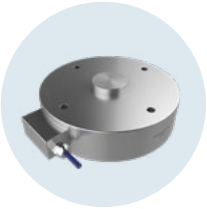
Monitoring system



Case study: High Speed viaduct



Installed instrumentation



Load cells - LC250

For balancing the beam **load** on the pylons.

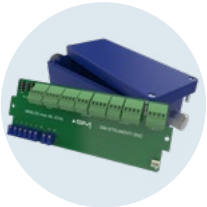
Embedment strain gauge - LC220

For the control of the **tensional state**.

(in construction phase)

Manual readout unit - DATAVIEW

For **Data** reading of the **load cells** used.



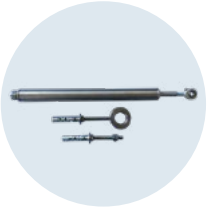
Data acquisition unit - MINILOG

For the **Data** control.
Links:

- via USB cable
- via modem GSM / GPRS

Case study: Salinello viaduct - A14 highway

Installed instrumentation

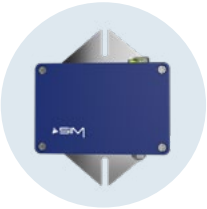


Joint meters - DS811

For the control of **sliding** between beam and pylons.

Inverted pendulum - IN950

For the control of the **rotation**.

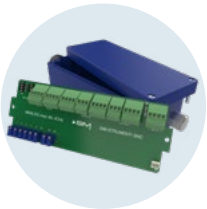


Fixed wall inclinometers - IN920

For the control of the **rotation**.

Temperature sensors - WE711

For the control of the **temperature influence** on **sliding** between beam and pylons.



Data acquisition unit - MINILOG

For the **Data** control.
Equipped with **alarm system** (via SMS).
Links:
- via USB cable
- via modem GSM / GPRS

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