



**THE FIRST  
*MONITORING*  
CHANNEL**



RDS  
RAILWAY DEFORMATION SYSTEM



# WHY RAILWAY MONITORING?

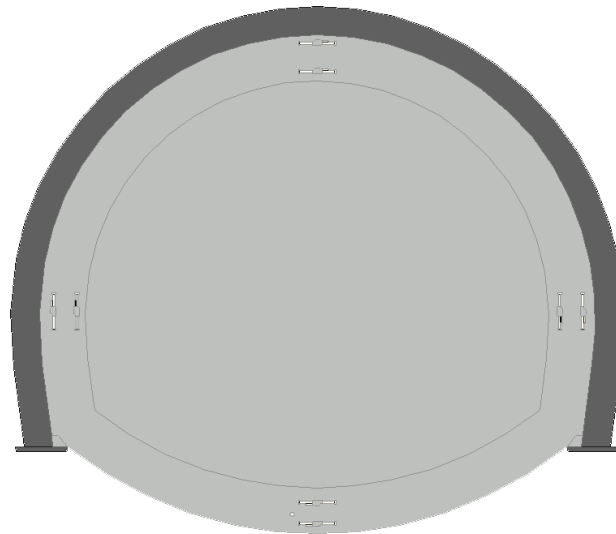
# — WHY RAILWAY MONITORING?



NOW  
IS TOO  
LATE

## — WHY RAILWAY MONITORING?

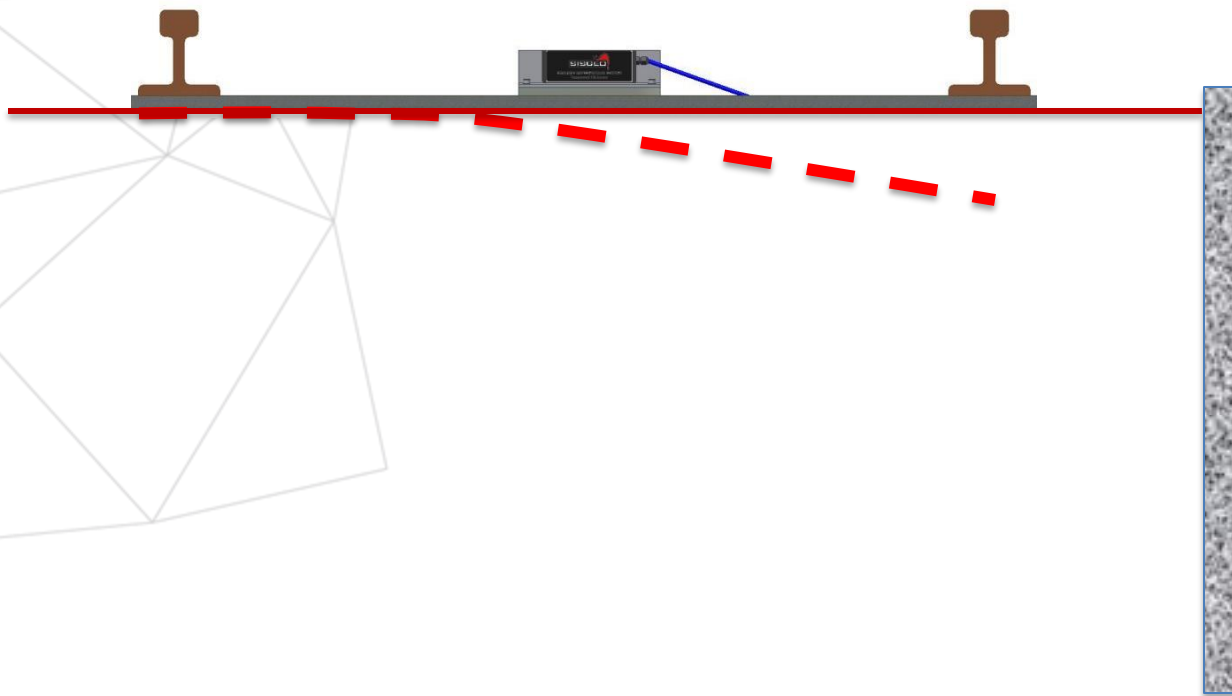
For the measure of *potential collapses or subsidences along a railway section*, is important the use of a chain of longitudinal sensors in order to measure the railway longitudinal deformation



*New tunnel excavation under railway could cause railway critical longitudinal deformation*

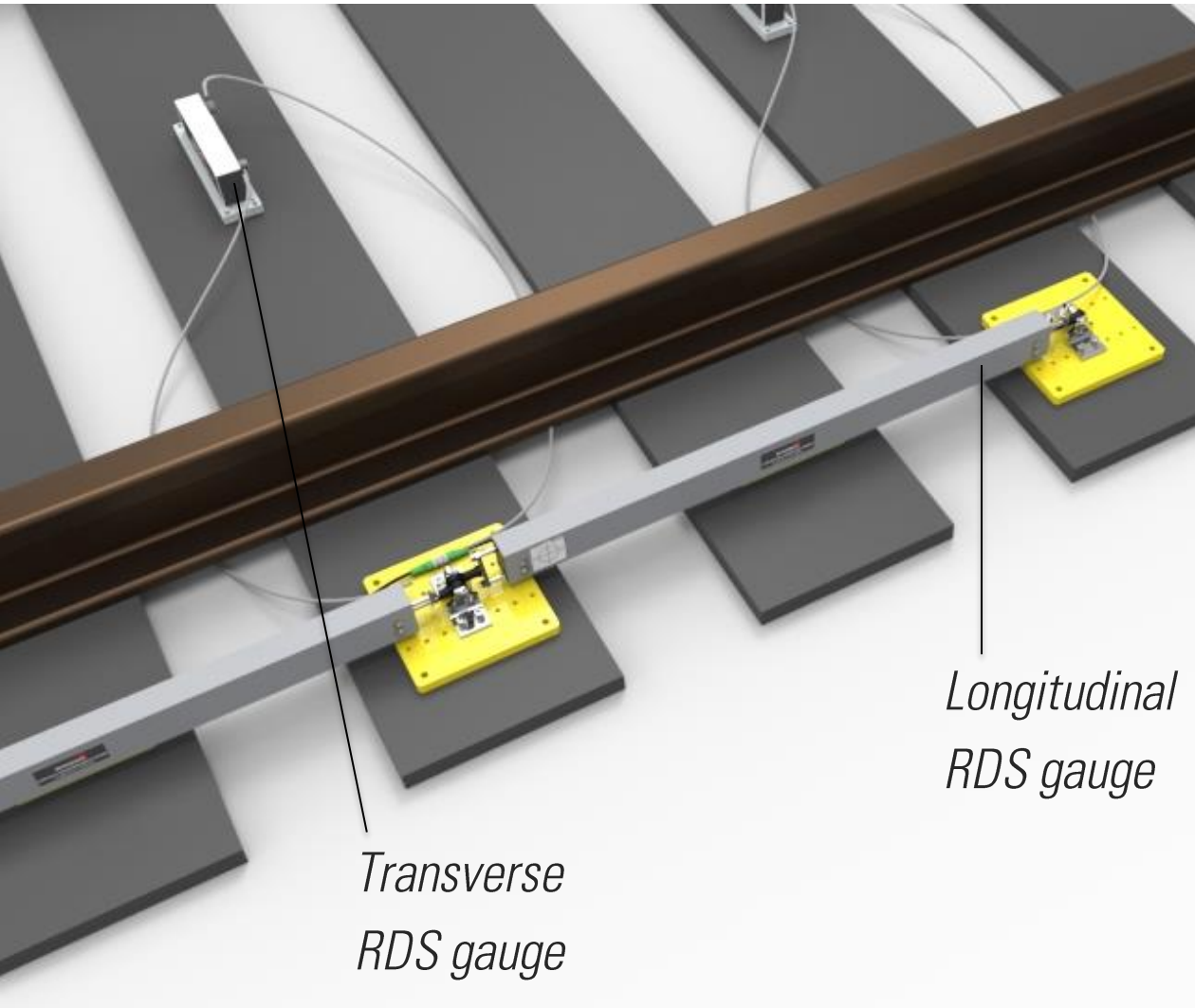
## — WHY RAILWAY MONITORING?

*In case of works nearby railway lines (injections, jet-grouting, drillings, pilings etc.) a major importance is given to the evaluation of the twist, and so the application of the transversal sensor.*



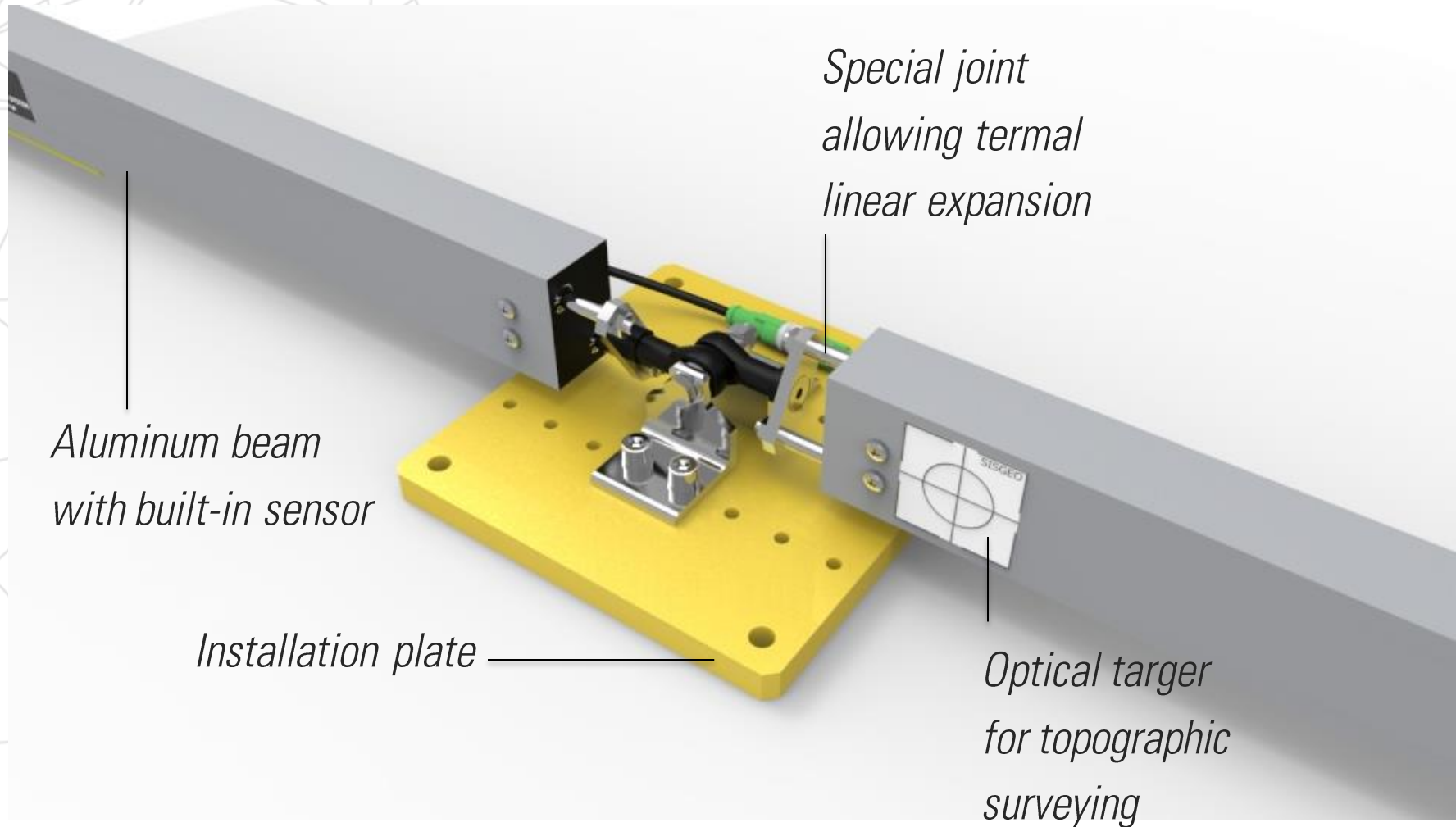
*Nearby excavation could cause differential settlement and so railway transverse deformation*

## — WHAT ARE RDS GAUGES?



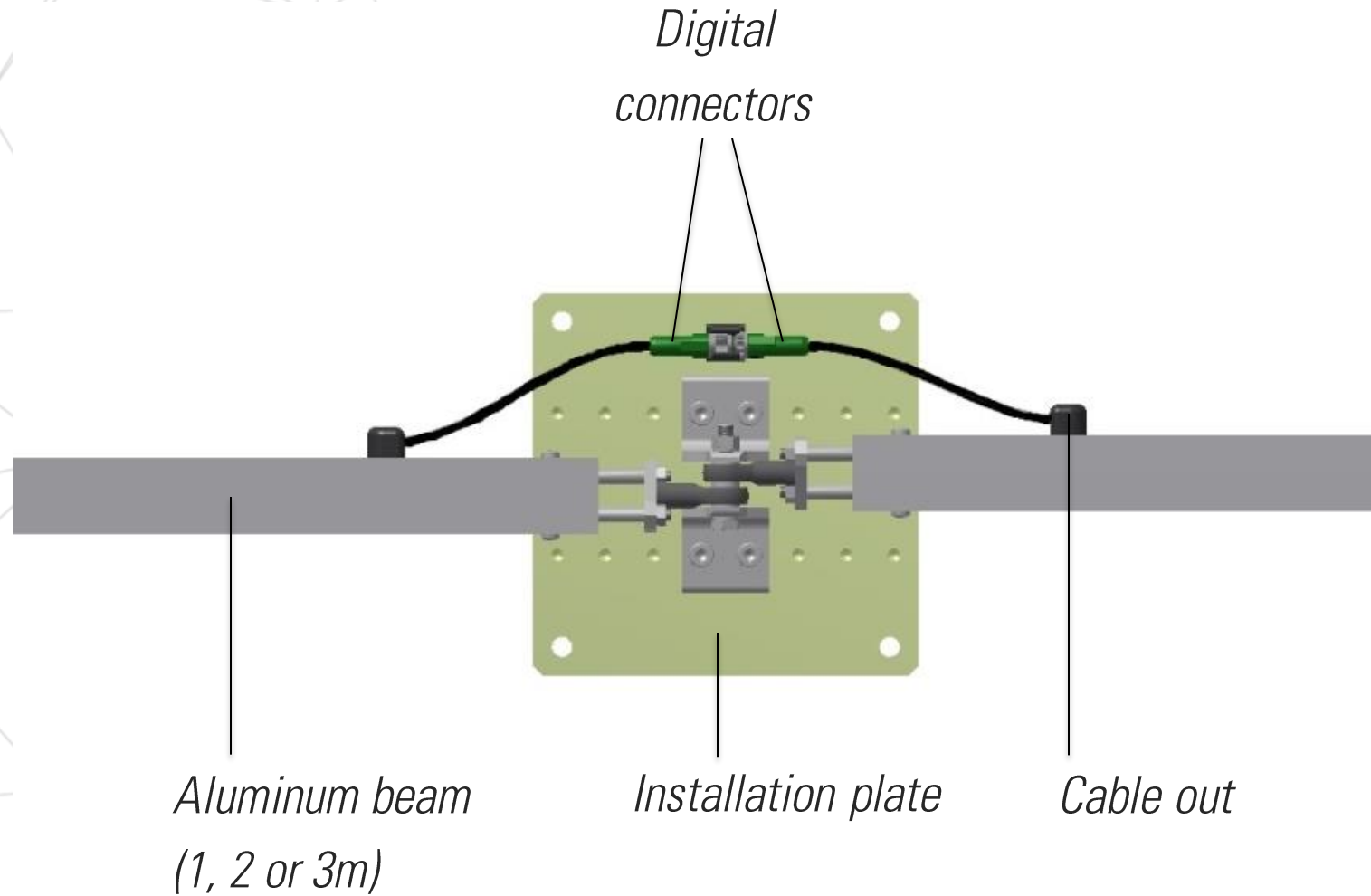
*They are  
digital MEMS  
tilt meters with  
high accuracy  
and  
low thermal  
dependence*

# — RDS LONGITUDINAL GAUGES





# — RDS LONGITUDINAL GAUGES – THE JOINT



# — RDS TRANSVERSE GAUGES

*Aluminum box with  
built-in sensor*

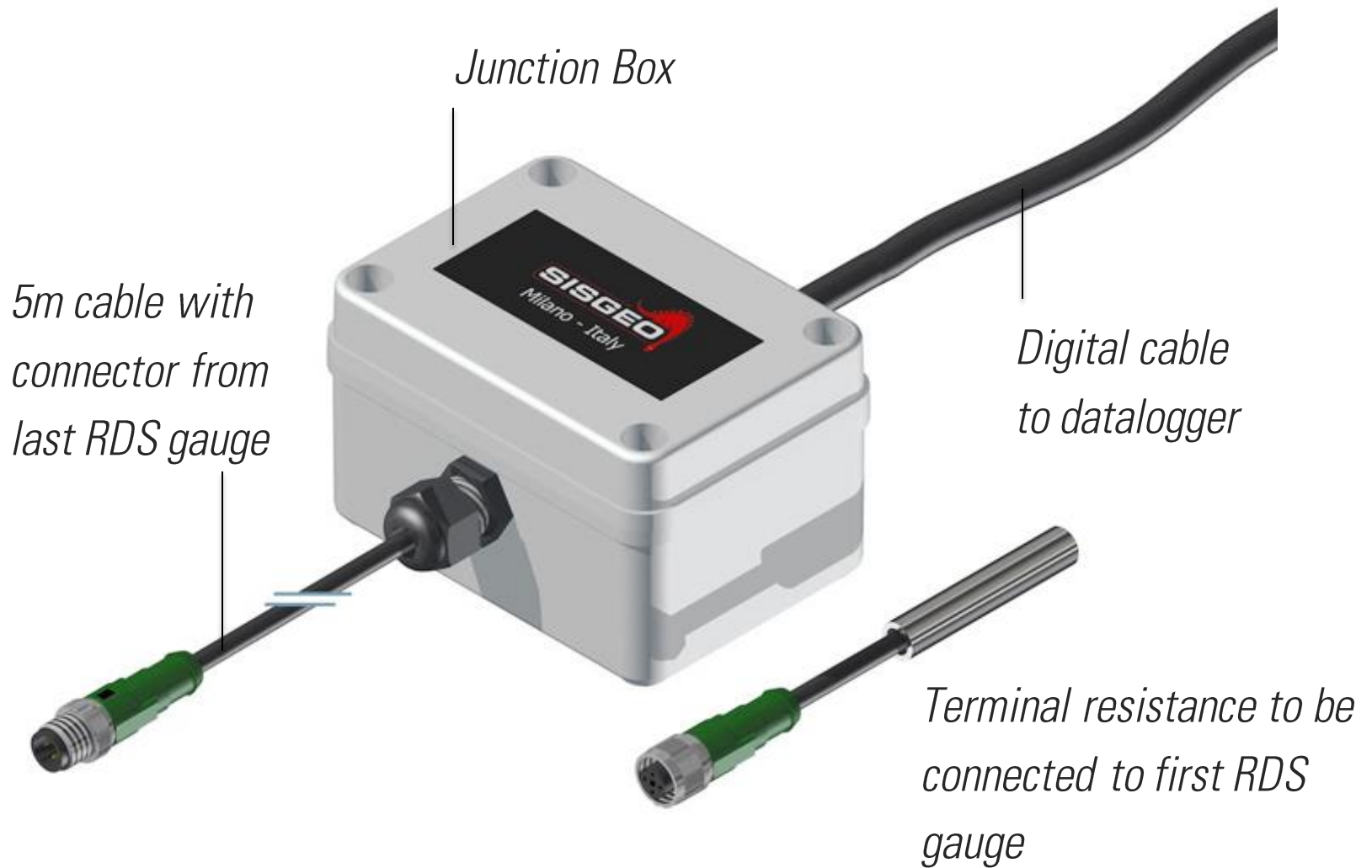
*Signal cable*

*Cable out*

*Installation plate*



# — RDS JB AND TERMINAL RESISTANCE



## — INSTALLATION PROCEDURES

*Installation usually takes place with railway cut-off power, so RDS gauges installation must take less time as possible → RDS has been designed to be simple and quick to be installed.*

- 1. Supports are positioned and fixed with mechanical bolts or with appropriate resins*
- 2. Gauges are fixed to the supports and fast connected one to each other by connectors*
- 3. Using the terminal JB, RDS gauge chain(s) is connected to OMNIAlog data acquisition system*

## — DATA ACQUISITION SYSTEM



*OMNIAlog is the right solution for RDS automatic monitoring, data transmission and alerting:*

- 1. OMNIAlog, through 3G router or other communication interface, sends the data packages at a preset intervals to a dedicated server*
- 2. Data are subjected to a first automatic validation in order to delete peaks and abnormal readings*
- 3. OMNIAlog can be set to send alarms (i.e. through SMS/email)*
- 4. or activation of sirens / flashings at the pre-set thresholds overcoming.*

## \_\_ DATA MANAGEMENT AND INTERPRETATION



*WMS Web Monitoring System is a SW platform for data management for geotechnical and structural monitoring systems, with the possibility to import data from both automatic data acquisition systems or manual readings.*

*With WMS platform, data are sorted, converted into engineering units, validated, corrected by temperature variations, processed and plotted on special navigable and interactive charts.*

## \_\_ EXAMPLE OF APPLICATIONS

- *Milan-Bologna  
high speed railway*

- *Milan M5 metro line,  
Domodossola Station*

# — MILAN-BOLOGNA HIGH SPEED RAILWAY





# — MILAN-BOLOGNA HIGH SPEED RAILWAY

## INSTALLATION OF SUPPORT PLATES



# — MILAN-BOLOGNA HIGH SPEED RAILWAY

## LONGITUDINAL RDS GAUGE MOUNTING (3M LENGTH)



# MILAN-BOLOGNA HIGH SPEED RAILWAY

## TRANSVERSE RDS GAUGE (1M LENGTH)



# MILAN-BOLOGNA HIGH SPEED RAILWAY

## JUNCTION BOX FOR ANALOGUE GAUGES



*"JB" NOT needed anymore.*

*New digital RDS gauges are installed in chain (ModBUS)*

# — MILAN-BOLOGNA HIGH SPEED RAILWAY

FINAL  
RESULTS



# MILAN-BOLOGNA HIGH SPEED RAILWAY

## DATA ACQUISITION SYSTEM



*GPRS antenna*

*Battery pack  
for solar panel*

*Data acquisition  
system*

# MILAN-BOLOGNA HIGH SPEED RAILWAY

## SOLAR PANEL FOR DATA ACQUISITION SYSTEM

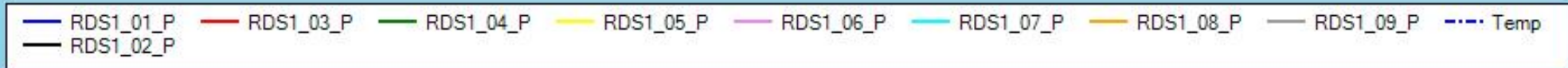
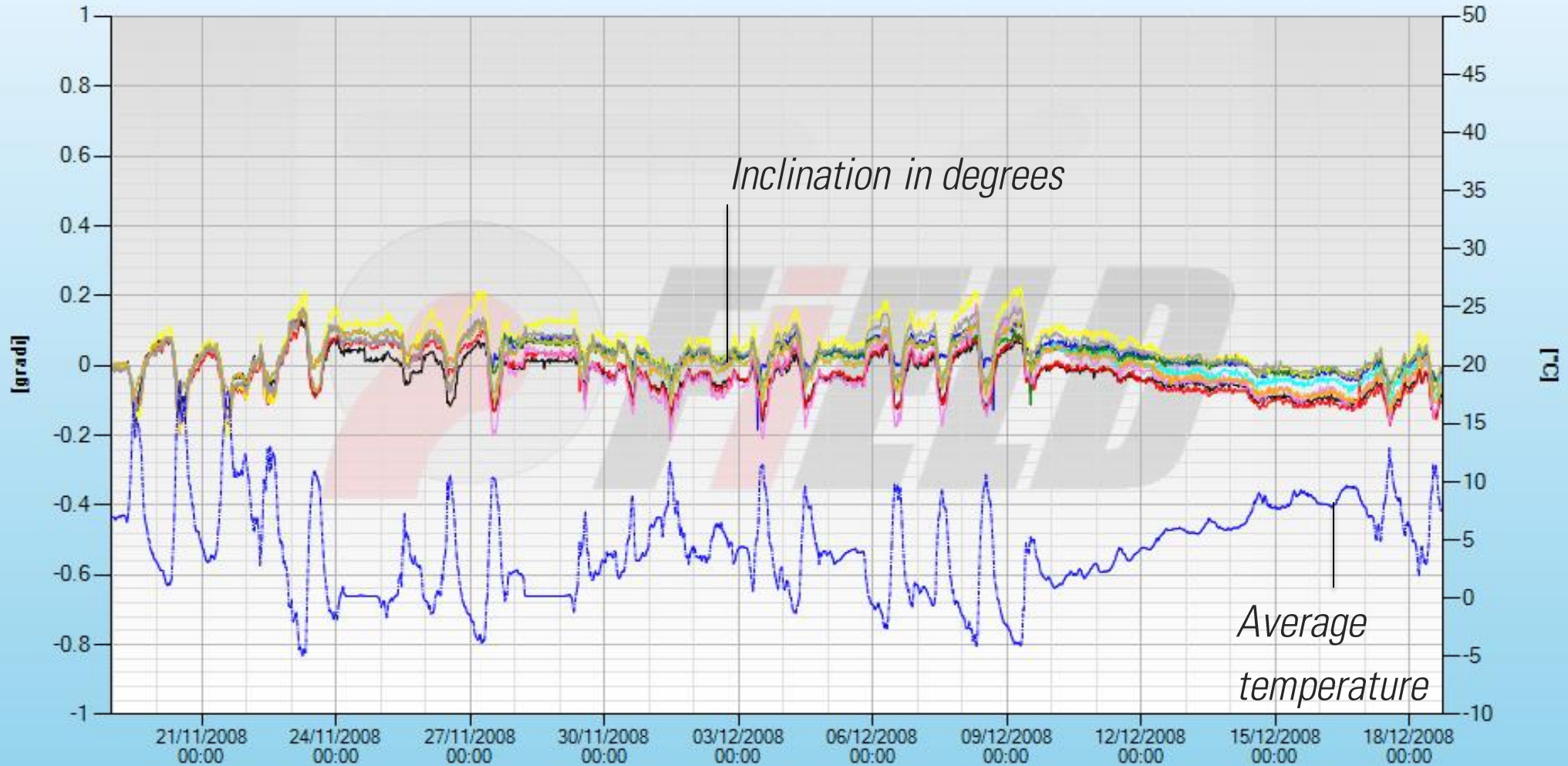


*Solar panel*

*Data acquisition  
system*

# MILAN-BOLOGNA HIGH SPEED RAILWAY

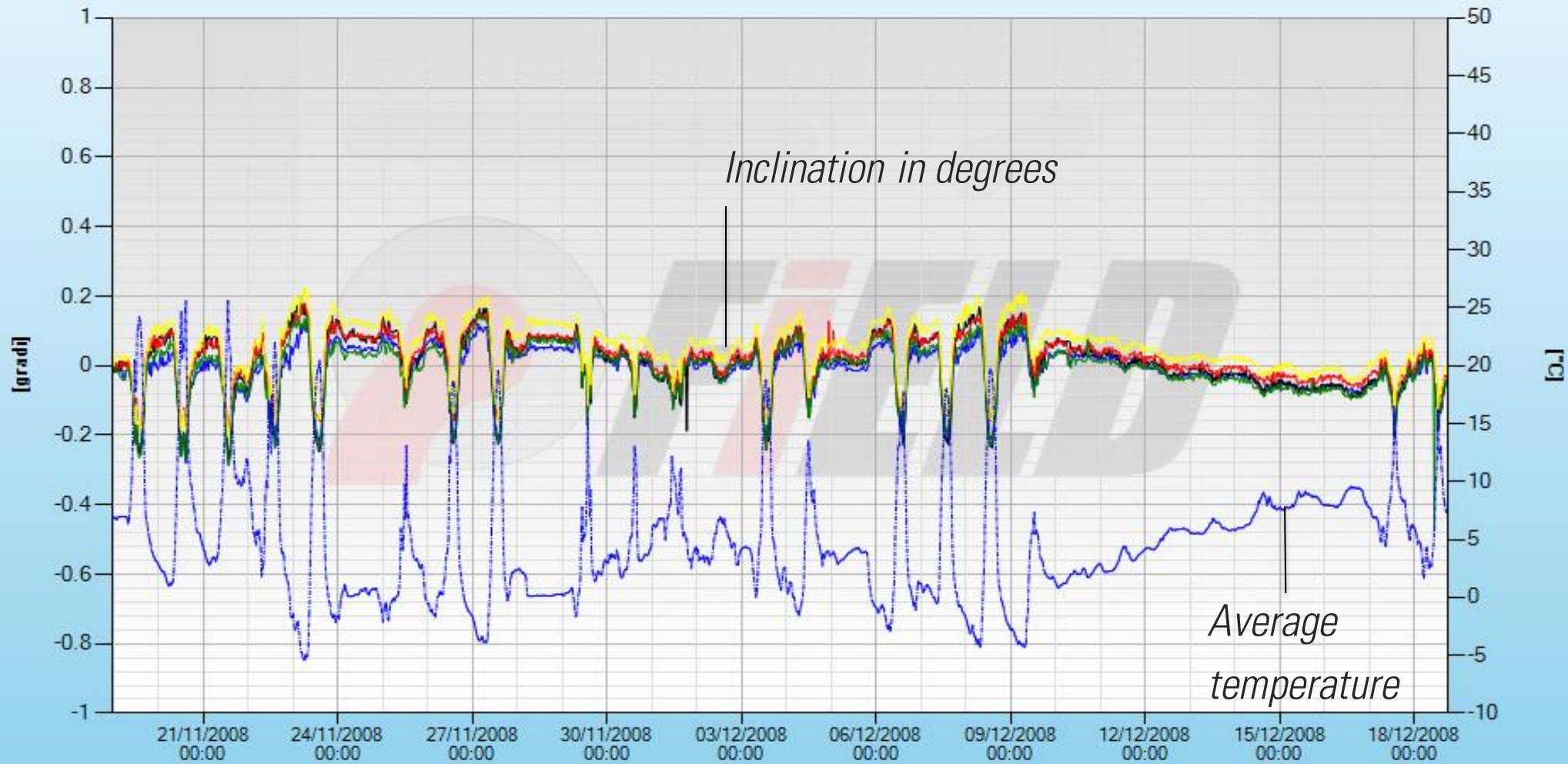
## RDS TRANVERSE GAUGES - RAW DATA





# MILAN-BOLOGNA HIGH SPEED RAILWAY

## RDS LONGITUDINAL GAUGES - RAW DATA

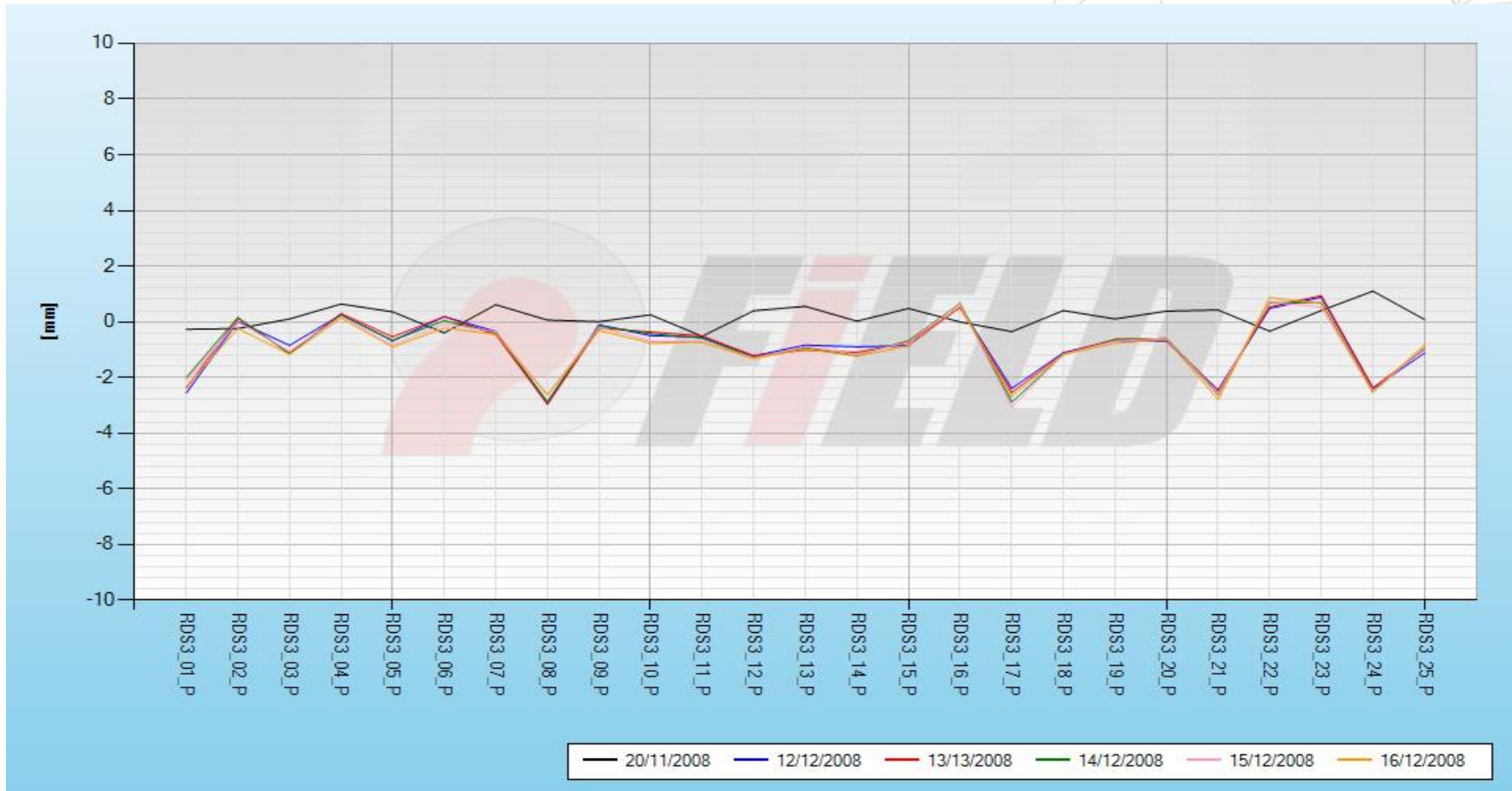


— RDS3\_11\_P — RDS3\_12\_P — RDS3\_13\_P — RDS3\_14\_P — RDS3\_15\_P — Temp

# MILAN-BOLOGNA HIGH SPEED RAILWAY

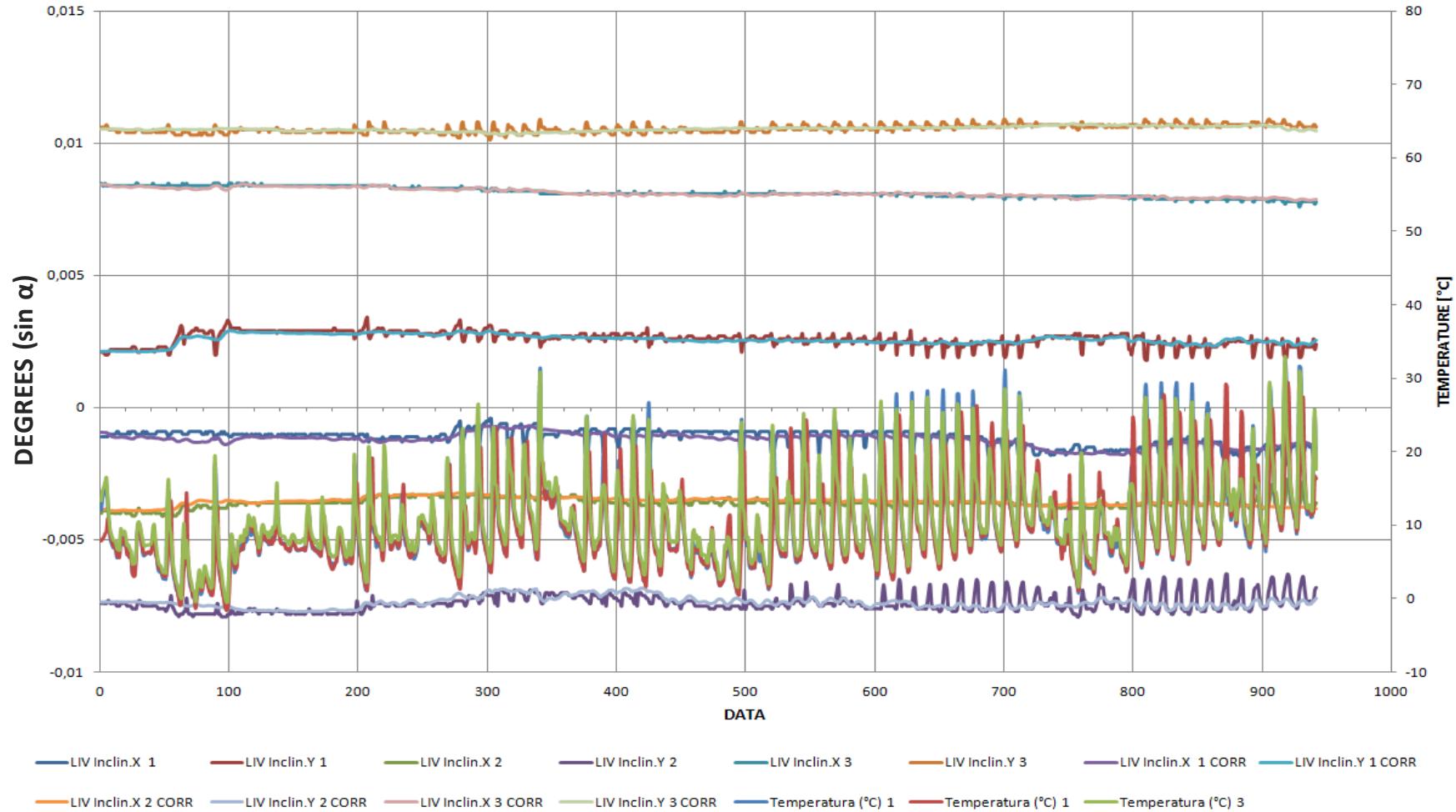


LONGITUDINAL RDS DATA ELABORATED  
WITH FIELDSTAT - ZERO READING @ 19.11.2008



# MILAN-BOLOGNA HIGH SPEED RAILWAY

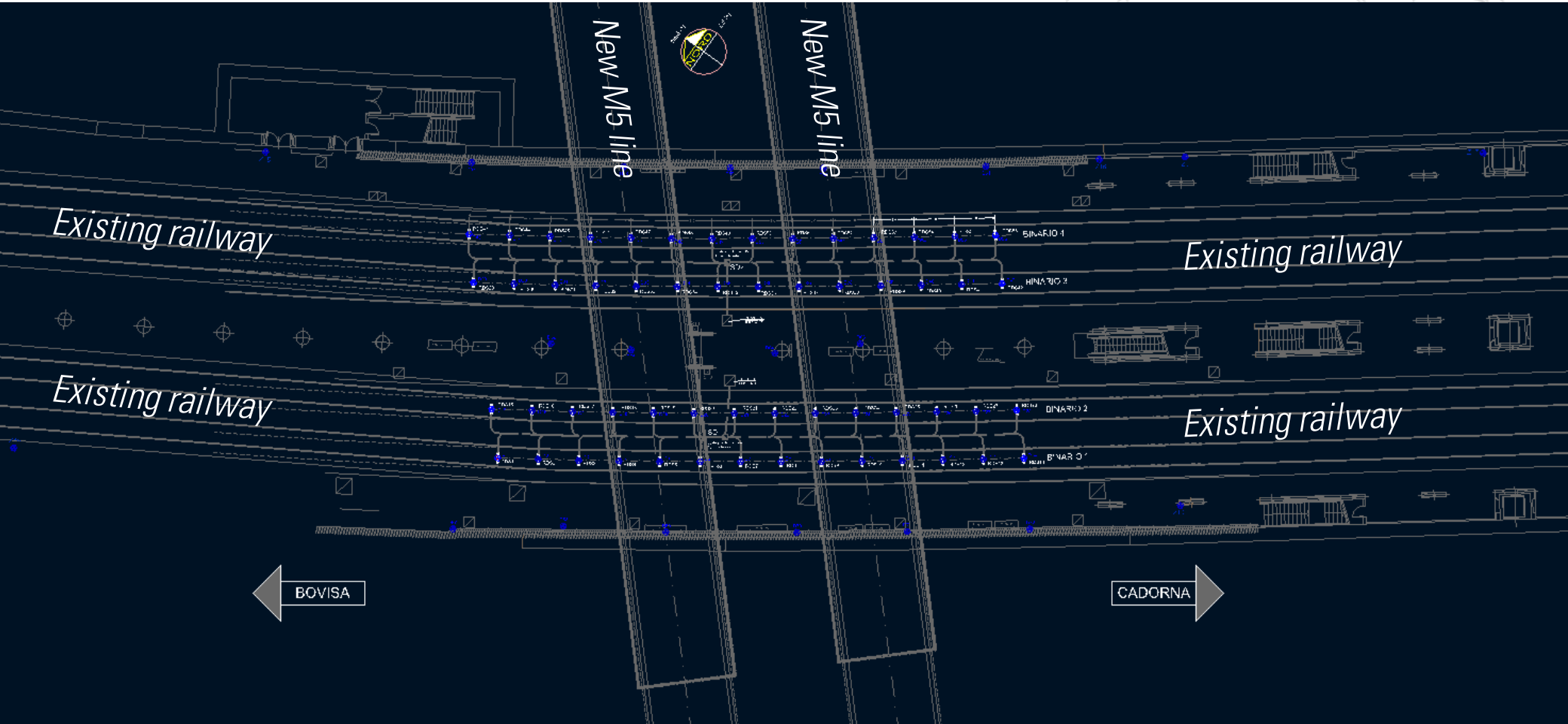
## NEW DIGITAL TILTMETERS DATA



# — “DOMODOSSOLA” TRAIN STATION MONITORING, MILAN

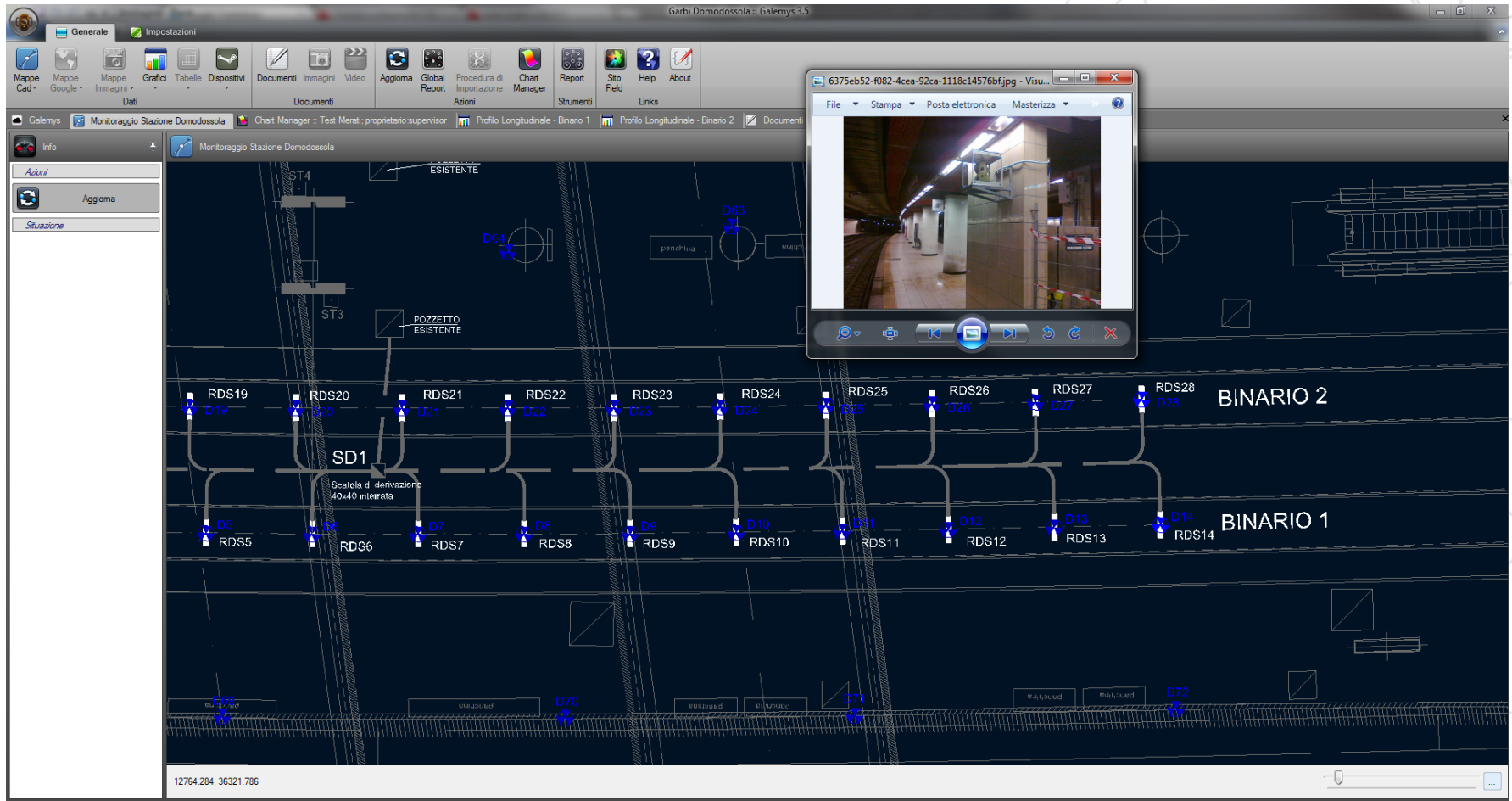


# “DOMODOSSOLA” TRAIN STATION MONITORING, MILAN



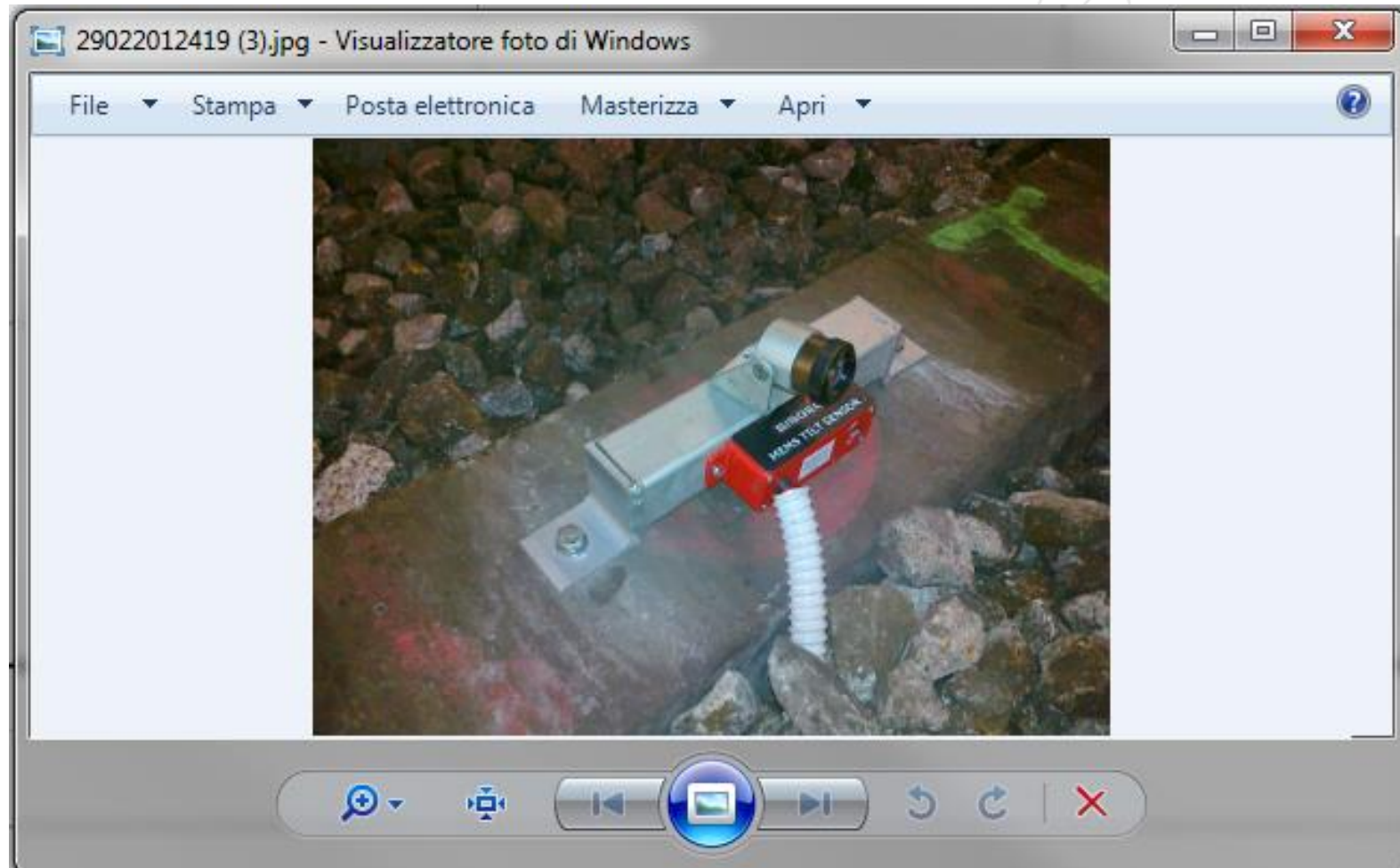
# “DOMODOSSOLA” TRAIN STATION MONITORING

## RDS SYSTEM SCHEME



# — “DOMODOSSOLA” TRAIN STATION MONITORING

RDS TRANSVERSE GAUGE + PRISM



# “DOMODOSSOLA” TRAIN STATION MONITORING

## RDS TRANSVERSE GAUGE DATA AND GRAPHS



The screenshot displays the 'Garbi Domodossola - Galemys 3.5' monitoring application. The main window shows a data table with columns for 'Data', 'Battenti', 'Temperatura Int.', and RDS01 through RDS14. A 'Grafici' window is open, showing a line graph titled 'RDS33 - RDS trasversali Binario 3 - Sghembo' with three data series: RDS32-RDS33 (1.1318), RDS33-RDS34 (1.0813), and TEMP MEDIA (27.9871). A 'Report' window is also visible, showing a table with columns for 'Tipo', 'Status', and 'Quantità'. A photo viewer window shows a photograph of the train tracks at the station.

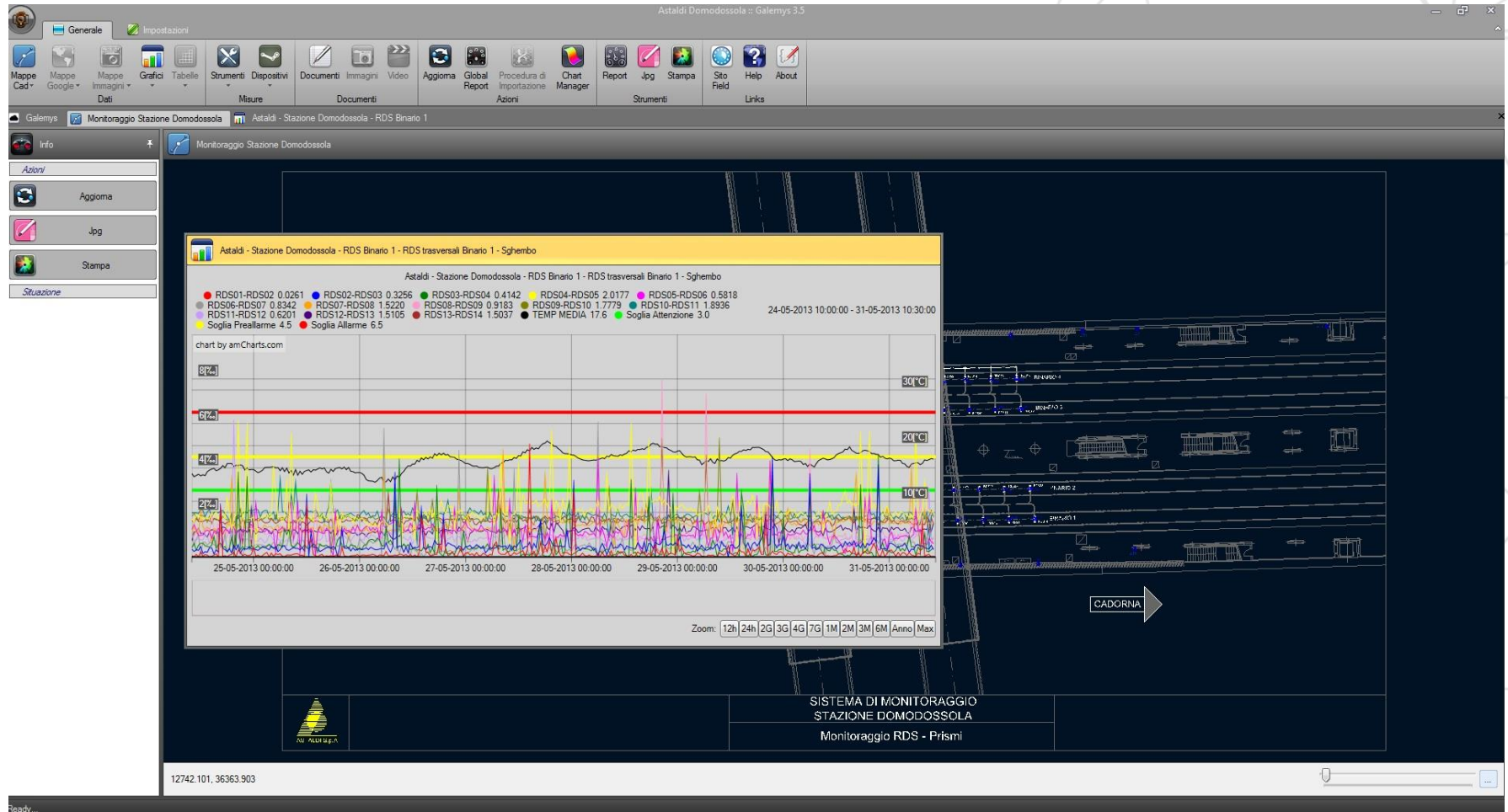
Data	Battenti	Temperatura Int.	RDS01	RDS02	RDS03	RDS04	RDS05	RDS06	RDS07	RDS08	RDS09	RDS10	RDS11	RDS12	RDS13	RDS14
29/08/2012 14:00:00	13.05722	31.61573	-1.82684944001...	-2.25433385739...	-3.81307170060...	-4.71572338569...	-3.20971275239...	-4.67821252191...	-1.73036601175...	-2.356945136336	-1.57732163839...	-1.92555076686...	-3.71858036490...	-2.41910814298...	-1.96432068471...	-1.83828378678...





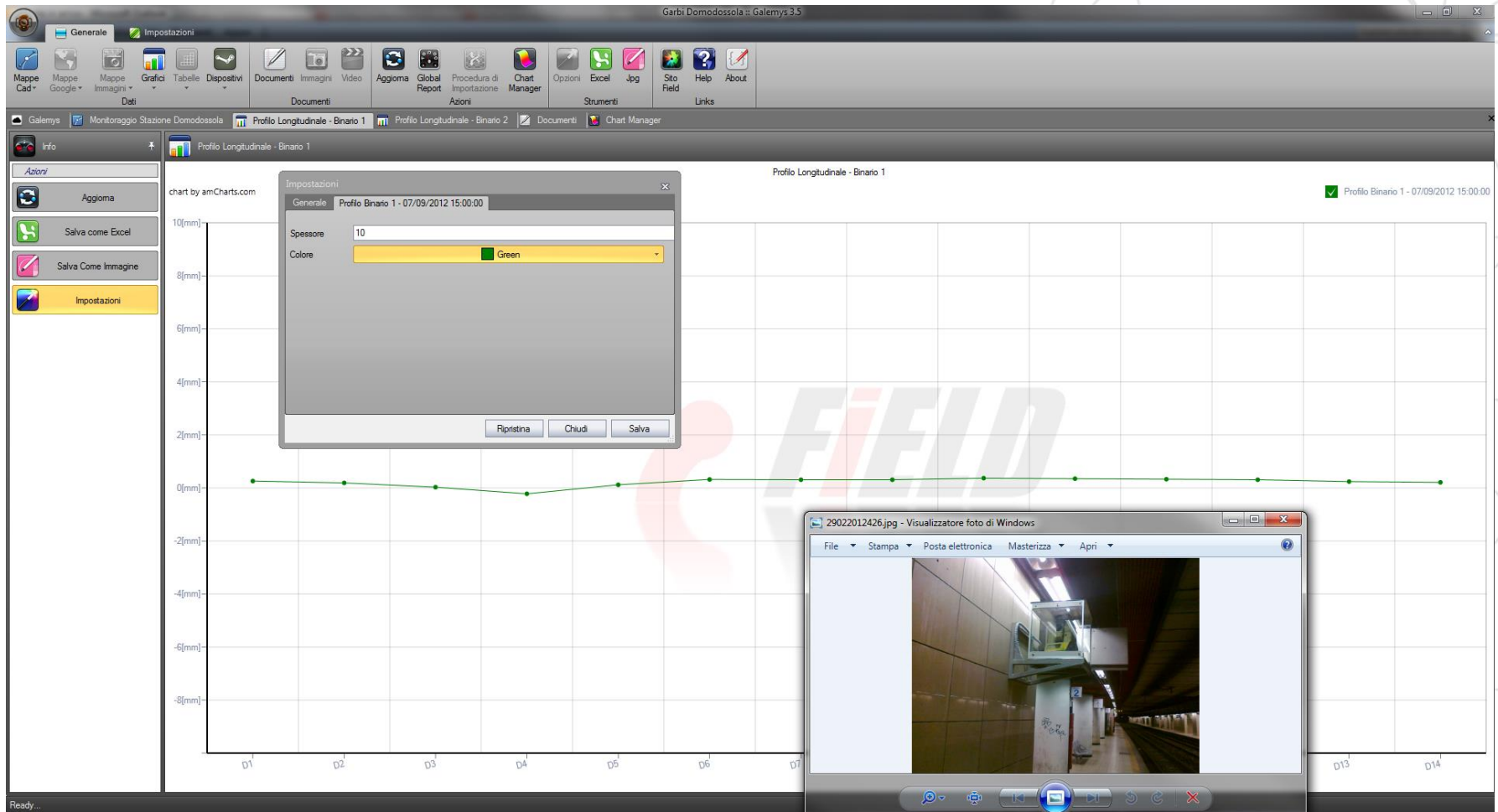
# “DOMODOSSOLA” TRAIN STATION MONITORING

## RDS TRANSVERSE GAUGE DATA AND GRAPHS



# “DOMODOSSOLA” TRAIN STATION MONITORING

## RAILWAY LONGITUDINAL PROFILE



## — CONCLUSIONS

- *RDS System can be effectively used to guarantee the safety of the railways and the safety of the passengers.*
- *RDS can be easily installed and, if needed, could be dismantled and installed on other railway line.*
- *If correctly designed, installed and managed, RDS can offer to the Customers an amazing cost reduction by erasing the need of on-site technicians*



*THANKS FOR WATCHING*

*For any further clarification  
visit [www.sisgeo.com](http://www.sisgeo.com)  
or email us: [info@sisgeo.com](mailto:info@sisgeo.com)*