

**SISGEO<sup>®</sup>**  
**RAIL**  
IOT IN MOTION

# FLX-RAIL<sup>®</sup>



# FLX-RAIL®

The FLX-Rail® automatically and continuously measures the maximum vertical deformation of the rail at each passage of a train, a phenomenon commonly known as "rail swing" or "rail dance". The instrument is installed between the track and the ballast, fixed under the rail using two powerful magnets: this solution allows quick and easy installation.

The FLX-Rail® is equipped with an innovative technology called SBV® (Start By Vibe), which activates the instrument just before the train passes.

The FLX-Rail® can also be equipped with a biaxial inclinometer (MEMS technology) for static rail tilting monitoring and a PT-100 temperature probe for measuring the rail skin temperature. As option, a special support for mini-prism is available.

The FLX-Rail® is the innovative instrument which enables complete and accurate active rail monitoring.

## FEATURES

- Innovative sensor for rail swing automatic monitoring
- SBV® technology to wake up the instrument for saving power consumption
- Each FLX-Rail® gauge is individually calibrated
- Compact dimensions
- Easy to install and to remove
- FLX-Rail® gives a number of diagnostic information as the voltage supply, internal temperature and internal humidity.
- Possible calculation of the under load cant and twist



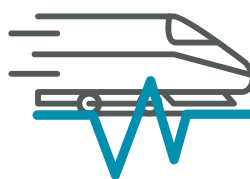
STANDARD COMPLIANT:

EN 61326-1:2013 (EMC Industrial)

EN 50121-1:2017

EN 50121-4:2016+A1:2019 (EMC for Railways)

Invention patent nr.102020000031274



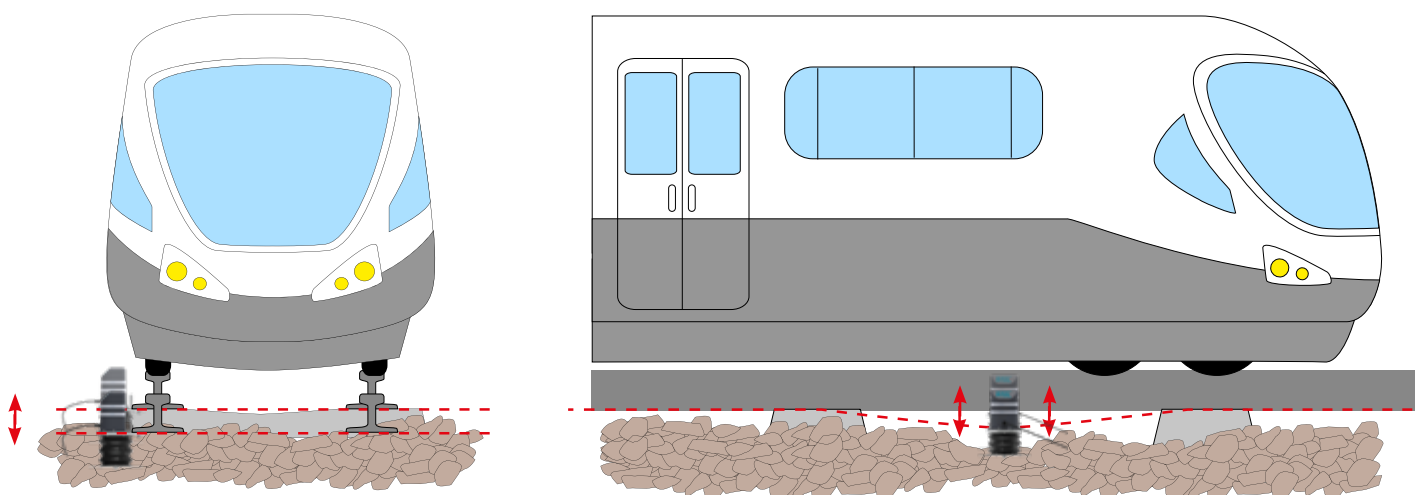
**SBV®**  
**TECHNOLOGY**

## WORKING PRINCIPLE

FLX-Rail® has a pair of powerful magnets to firmly place the gauge under the rail foot. A reference plate is leaned to the ballast, so that the instrument will be able to read the relative movement between the rail and the ballast, while traffic is present. The reading frequency of the rail vertical movement is 350Hz and is activated only during the train's passage, thanks to SBV® technology. Every FLX-Rail® send to the logger the maximum value registered for each event (train's passage). The reading of bi-axial rail tilting and temperature (options) are taken in static and quiet conditions, so only when the train is not passing on the monitored location. This method permits to read accurately the instruments without any vibration. For the monitoring of a section of track, a number of FLX-Rail® gauges are connected to each other, and to the logger with a single cable. The gauges are managed by OMNIAlog dataloggers using a Modbus RTU Protocol (RS485). Loggers are able to power and read the instruments and to push the measurements on FTP server through a VPN router.

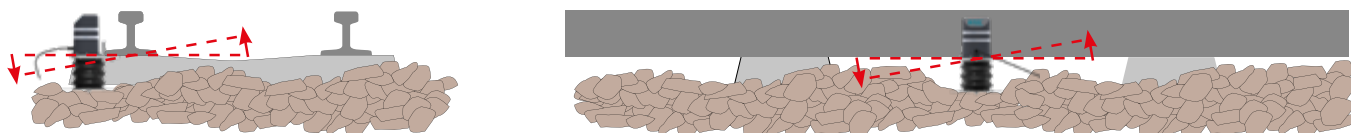
## MONITORING UNDER LOAD - TRAIN PASSAGE

Reading of rail vertical movement



## STATIC MONITORING - NO TRAIN

Reading of rail tilting (biaxial) and rail skin temperature (options)



## PHYSICAL FEATURES

### FLX-RAIL

Overall dimensions	200 x 212 x 284 mm
Working temperature range	-30°C to +70°C
IP class	IP67
Material	Aluminum, stainless steel, polycarbonate



## TECHNICAL SPECIFICATIONS

### DYNAMIC DEFLECTION SENSOR

Sensor type	Optic
FS and Measuring range	70 mm
Sensor resolution	0.01 mm
Reading frequency	350 Hz
Offset temperature dependancy	0.03 mm/°C
Sensor repeatability	±0.01 mm
Sensor 24 hours stability <sup>(1)</sup>	±0.1 mm
Sensitivity <sup>(2)</sup>	See Calibration Report
Sensor accuracy (Lin. MPE) <sup>(3)</sup>	<±0.1 mm



## TECHNICAL SPECIFICATIONS

### EMBEDDED TILT SENSOR (OPTION)

features referred to  $\pm 10^\circ$  measuring range

Sensor type	triaxial MEMS inclinometer (2 axis utilised)
Measuring range	$\pm 10^\circ$ (other measuring ranges available on request)
Sensor resolution	0.0002°
Sensor repeatability	$< \pm 0.008^\circ$
Sensitivity <sup>(1)</sup>	See Calibration Report
Sensor accuracy <sup>(2)</sup> : Lin. MPE	$< \pm 0.10\%$ FS
Pol. MPE	$< \pm 0.05\%$ FS
Sensor 24 hours stability <sup>(3)</sup>	$\pm 0.25$ mm/m
Sensor mechanical bandwidth	10 Hz
Offset temperature dependency	$\pm 0.004^\circ / ^\circ\text{C}$

### RAIL TEMPERATURE GAUGE (OPTION)

Sensor type	RTD, 100 $\Omega$ (PT-100) - Class A EN 60751
Nominal range	-200°C +400°C
Sensor resolution	0.1 °C
Sensor accuracy	$\pm 0.2$ °C @ 0°C

### TEMPERATURE SENSOR <sup>(4)</sup>

	Embedded on electronic board
Measuring range	- 40°C to +125°C
Accuracy	$\pm 1^\circ\text{C}$ with temperature range -10°C to +85°C

### HUMIDITY SENSOR <sup>(4)</sup>

	Embedded on electronic board
Measuring range	0 to 100% RH
Accuracy	$\pm 5\%$ RH with humidity range 0 to 95% RH

### SUPPLY VOLTAGE MONITOR <sup>(4)</sup>

	Embedded on electronic board
Measuring range	0 to 36 V
Accuracy	$\pm 5\%$ FS

### ELECTRICAL INFORMATION

Signal output	RS485 non-optoisolated with MODBUS RTU communication protocol
Power supply	from 8 to 28 Vdc
Average consumption	$< 100$ $\mu\text{A}$ in sleep mode 5mA @ 24Vdc 10mA @ 12Vdc
Max cable length to logger	1000 m (for more information see F.A.Q.#077 on Sisgeo web site)

(1) Sensitivity is a specific parameter different for every gauge. The sensitivity is calculated during gauge calibration test and inserted into the Calibration Report.

(2) MPE is the Maximum Permitted Error on the measuring range (FSR). In the Calibration Report, the accuracy of the gauge is calculated using the linear regression.

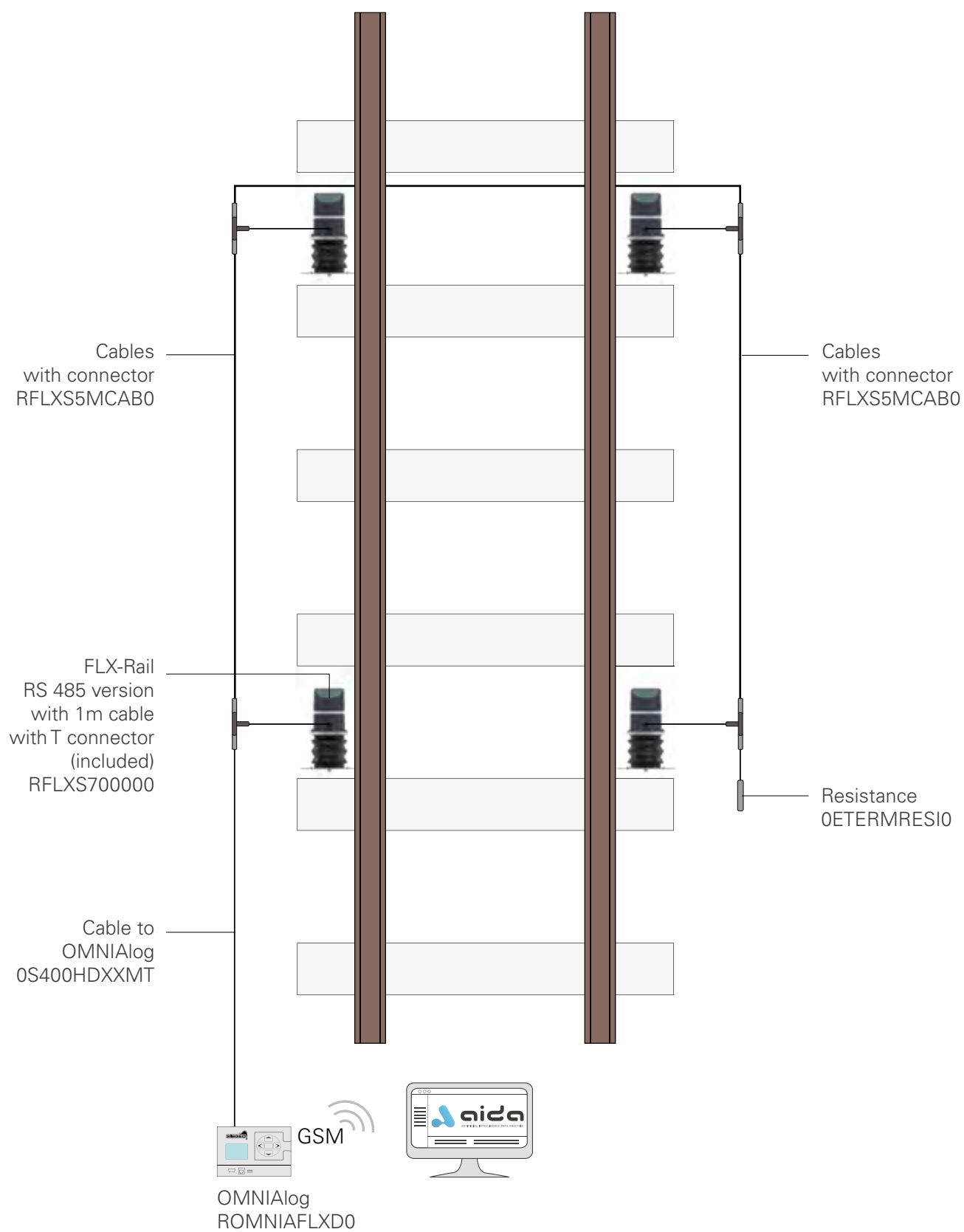
(3) Stability calculated as difference after a 24 h period under repeatability conditions.

(4) These sensors are installed on the internal electronic board for sensor diagnostics.

(5) RS485 not-optoisolated MODBUS communication with RTU Protocol. Sisgeo Modbus protocol manual is available for download on [www.sisgeo.com](http://www.sisgeo.com).

## TYPICAL APPLICATION SCHEME FOR 4 UNITS

**UP TO 50 UNITS CAN BE CONNECTED TO ONE SINGLE OMNIALOG.**



## AVAILABLE VERSIONS AND ACCESSORIES

<b>RFLXS700000</b>	<b>FLX-RAIL® GAUGE</b> , vertical displacement range 70mm
<b>RFLXS7000T0</b>	<b>FLX-RAIL® GAUGE</b> , vertical displacement range 70mm with rail skin temperature sensor
<b>RFLXS701000</b>	<b>FLX-RAIL® GAUGE</b> , vertical displacement range 70mm with rail biaxial tiltmeter
<b>RFLXS7010T0</b>	<b>FLX-RAIL® GAUGE</b> , vertical displacement range 70mm with rail biaxial tiltmeter and rail skin temp. sensor
<b>RFLXSPRISMO</b>	<b>KIT FOR TOPOGRAPHIC PRISM</b> composed by FLX-Rail® support belt and miniprism
<b>RFLXS5MCAB0</b>	<b>SIGNAL CABLE FOR FLX-RAIL®</b> , 5m length (SPARE)
<b>ROMNIAFLXD0</b>	<b>OMNIALOG MODULE</b> , with FLX-Rail® special firmware
<b>ROMX24V030W</b>	<b>DC/DC POWER SUPPLY BOARD FOR FLX-RAIL®</b> , 12 to 24V, 30W. Support maximum N.50 FLX-Rail® gauges
<b>OETERMRESIO</b>	<b>RESISTANCE ENDING DEVICE</b> , needed to close the RS-485 string



## AIDA - ARTIFICIAL INTELLIGENCE DATA ANALYSIS



FIELD S.r.l., part of Sisgeo Group, has developed a dedicated service for data/measurement management from automatic and manual monitoring systems called AIDA (artificial intelligence data analysis).

The measurements provided by each FLX-Rail®, are requested and stored in OMNIAlog or other DAS, sent to a distant Server and imported to a dedicated Database, where they are divided by project, instruments and measurements. Data are later validated, processed and represented in graphic and table format.

The AIDA platform allows quick visualisation in real-time of the charts, showing both the measurements of the maximum displacement at each recorded event and the detected inclinations and temperature. Also complex calculations can be displayed on a specific chart.

For further information, visit the dedicated web page on the Field Srl web site: [www.aidaiot.com](http://www.aidaiot.com)

This AIDA screenshot shows the histogram with the maximum displacement for each train passage. Enlarging the zoom makes possible to verify at which time the train pass on the FLX-Rail® installation point, as well as the corresponding maximal vertical displacement reading. Under load cant and twist can be automatically calculated and monitored.



This graph shows the under load short twist from pairs of FLX-Rail® installed 3m apart.



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### AFTER SALES SUPPORT

SISGEO offers customers e-mail and phone assistance to ensure proper use of instruments and readout and to maximize performance of the system.

For more information, email us: [assistance@sisgeo.com](mailto:assistance@sisgeo.com)

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