SISGEO®
RAIL
IOT IN MOTION

RDS

RAILWAY DEFORMATION SYSTEM

RDS

RAILWAY DEFORMATION SYSTEM

The RDS (Railway Deformation System) is a system designed and developed for the automatic monitoring of railways.

RDS consists of a digital MEMS tiltmeter mounted parallel or transverse to the track. Micro-prisms can be installed on RDS-T gauges to integrate the system with optical monitoring.

RDS components are used to monitor settlement, heave, and twist (cant) of the track. The system is designed to be used on active tracks to ensure railway safety.

FEATURES

- Provides high accuracy with digital MEMS sensors
- Accommodates thermal expansion by telescopic joint
- Tolerates shock up to 20000 g
- Removes easily when reballasting is required

APPLICATIONS

- Monitors for possible deformations caused by nearby excavations
- Monitors for stability of temporary supports for railway tracks
- Monitors for safe operation in areas of possible settlement or heave

ME MS

MEMS TECHNOLOGY

CE

Meets the essential requirements of the EMC Directive 2014/30/UE

SISGEO® RAIL IOT IN MOTION

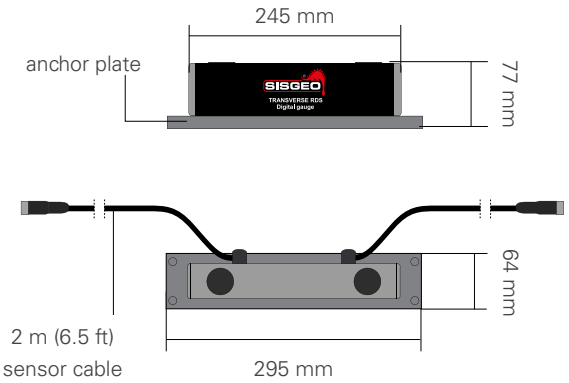
TECHNICAL SPECIFICATIONS

PRODUCT CODE	RRDSHDT0200	RRDSHDL1000 RRDSHDL2000 RRDSHDL3000
Model	RDS-T: Transverse RDS gauge The RDS -T consists of an aluminum sensor body with a steel anchor plate. It can be installed on concrete or wooden ties (sleepers). It is supplied with two 2 meter cables and waterproof connec tors. The RDS-T is suitable for monitoring of railway tracks with temporary support (i.e. Essen method).	RDS-L: Longitudinal RDS gauge The RDS-L consists of a MEMS tilt sensor mounted inside square-section aluminum tubing. The bar includes telescoping joint at one end, an optical target, and an anchor plate. The anchor plate is suitable for concrete ties (sleepers), and has extra mounting holes to allow for up to 150 mm variations in the distance between ties.
Measurement principle	uniaxial MEMS digital inclinometer	uniaxial MEMS digital inclinometer
Measuring range	±10° (±5° on request)	±10° (±5° on request)
Sensor repeatability	0.0013°	0.0013°
Sensor resolution	0.00056°	0.00056°
Sensor mechanical bandwidth	18 Hz	18 Hz
Sensor stability @ 30 days (1)	<0.007°	<0.007°
Sensor accuracy: Lin. MPE(2) Pol. MPE(2)	 <± 0.02% FS (±0.020 mm with ±10° range) <± 0.01% FS (±0.010 mm with ±10° range)	 <± 0.02% FS (<±0.070 mm/m with ±10° range) <± 0.01% FS (<±0.035 mm/m with ±10° range)
Power supply	from 8 to 28 Vdc	from 8 to 28 Vdc
Signal output (3)	RS485, Modbus RTU (5)	RS485, Modbus RTU (5)
Sensitivity (4)	see calibration report	see calibration report
A/D converter	32 bit, precision 38-kSPS	32 bit, precision 38-kSPS
Average consumption	4.3 mA @ 24 Vdc, 8.0 mA @ 12 Vdc	4.3 mA @ 24 Vdc, 8.0 mA @ 12 Vdc
Temperature operating range	-30° to +70°C	-30° to +70°C
Internal temperature sensor: - measuring range - resolution - accuracy	Embedded on electronic board - 40°C to +125°C 0.01 °C ±1°C with temperature range -10°C to +85°C	Embedded on electronic board - 40°C to +125°C 0.01 °C ±1°C with temperature range -10°C to +85°C
IP class	IP67	IP67
Connectors	two 5-pin connectors, waterproof up to 1.0 MPa	two 5-pin connectors, waterproof up to 1.0 MPa
Sensor cables (included)	two cables, 2 m each (5)	two cables, 20 cm each
Max cable lenght to logger	refer to F.A.Q.#073 on Sisgeo web site	refer to F.A.Q.#073 on Sisgeo web site

(1) Measured stability after 30 days, reference reading taken 24 hours after installation. Test performend under nearly-repeatability conditions.
(2) MPE is the Maximum Permitted Error on the measuring range (FSR). In the Calibration Report, the accuracies of the gauge are calculated using both linear regression (≤ Lin. MPE) and polynomial correction (≤ Pol. MPE)
(3) RS485 not-optoisolated Modbus communication with RTU Protocol Default output is sen alpha, other units available are degree, mm/m or inch/feet (to be requested at order). Sisgeo Modbus protocol manual is available for download here: https://www.sisgeo.com/uploads/manuali/SISGEO_digitized_instruments_-_Modbus_protocol_specification_EN_04_17.pdf .
(4) Sensitivity is a specific paramenter different for every gauge. The sensitivity is calculated during gauge calibration test and inserted into the Calibration Report.
(5) 5 m, 10 m and 15 m cables available on request

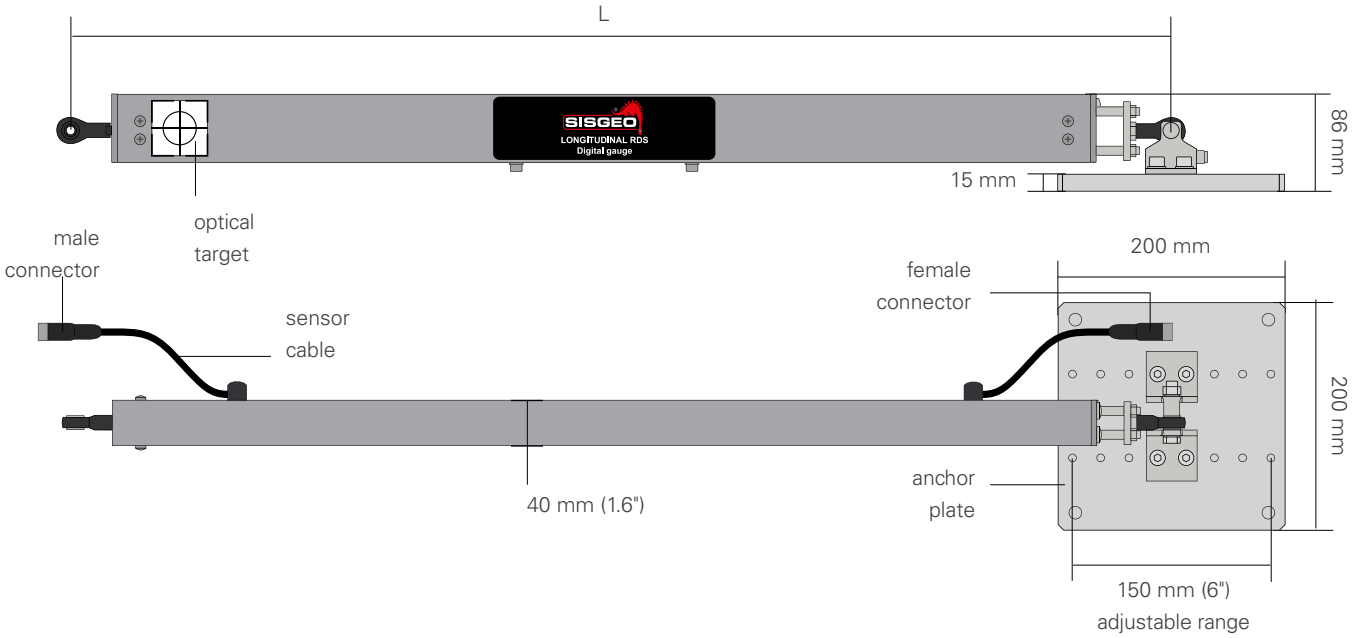
RDS-T PHYSICAL FEATURES

PRODUCT CODE	RRDSHDT0200
Sensor body length	245 mm (9.6")
Total height	76.6 mm (3")
Installation plate	295 x 64 mm (11.6" x 2.5")
Materials	Aluminum body and steel plate



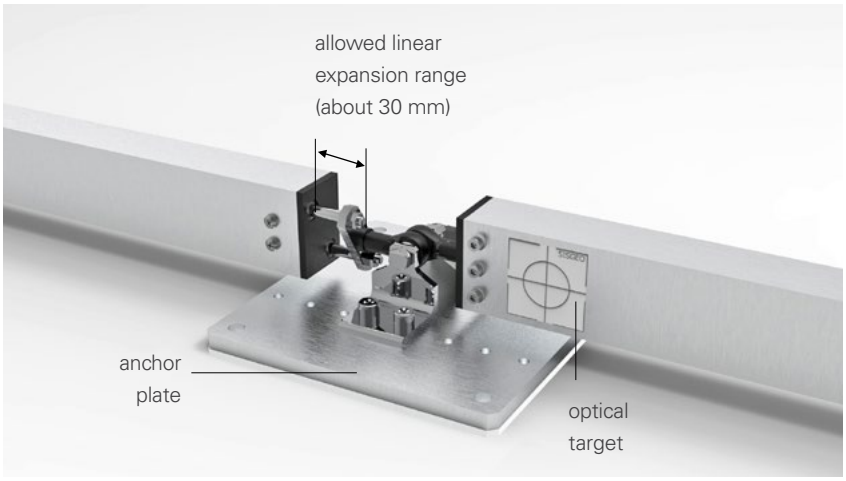
RDS-L PHYSICAL FEATURES

PRODUCT CODE	RRDSHDL0000
Length (L)	1000, 2000 or 3000 mm (L) (3.25 ft, 6.5 ft, 9.8 ft)
Total height	86 mm (3.4")
Anchor plate	200 x 200 mm (8 x 8")
Materials	alluminum bar and steel plate



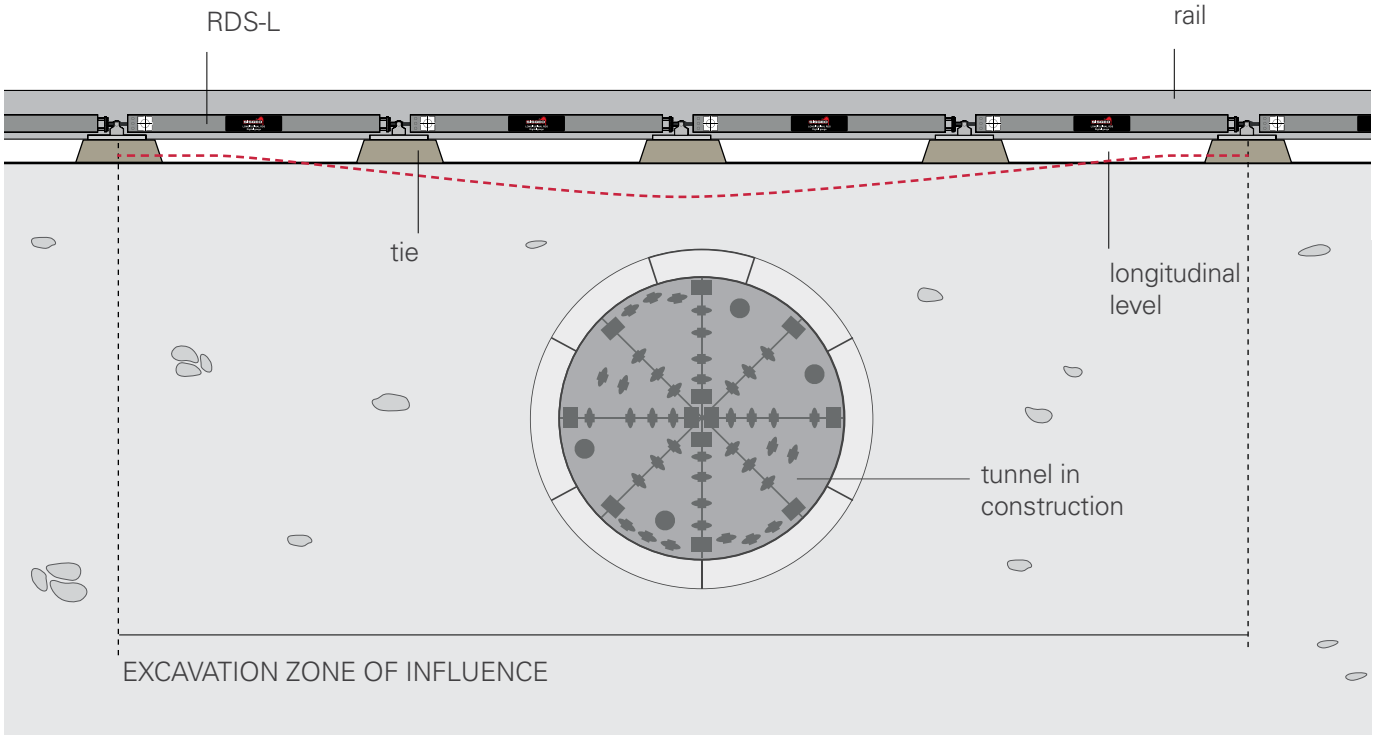
TELESCOPIC JOINT

Sisgeo developed a special telescoping joint for the RDS-L tubing. It accommodates thermal expansion of the aluminum bar to eliminate possible bending that would affect the sensor readings.



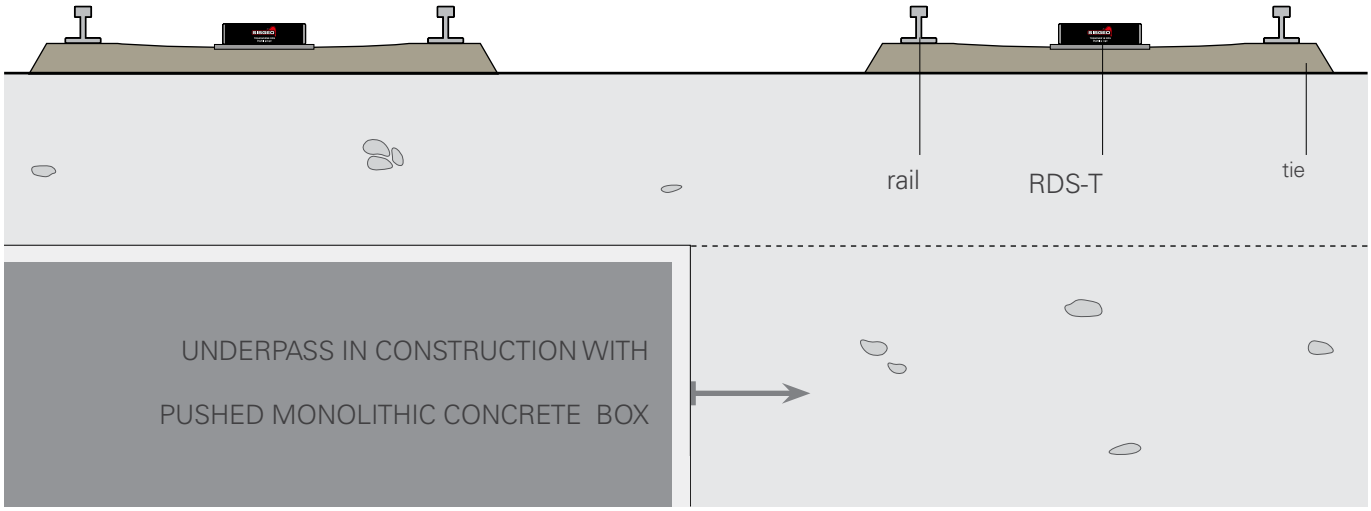
RDS-L: LONGITUDINAL DEFORMATIONS

The RDS-L gauges are installed in continuous chain to monitor the longitudinal level of the tracks. The gauge mounting plates are anchored to the ties with screws or with special resin.



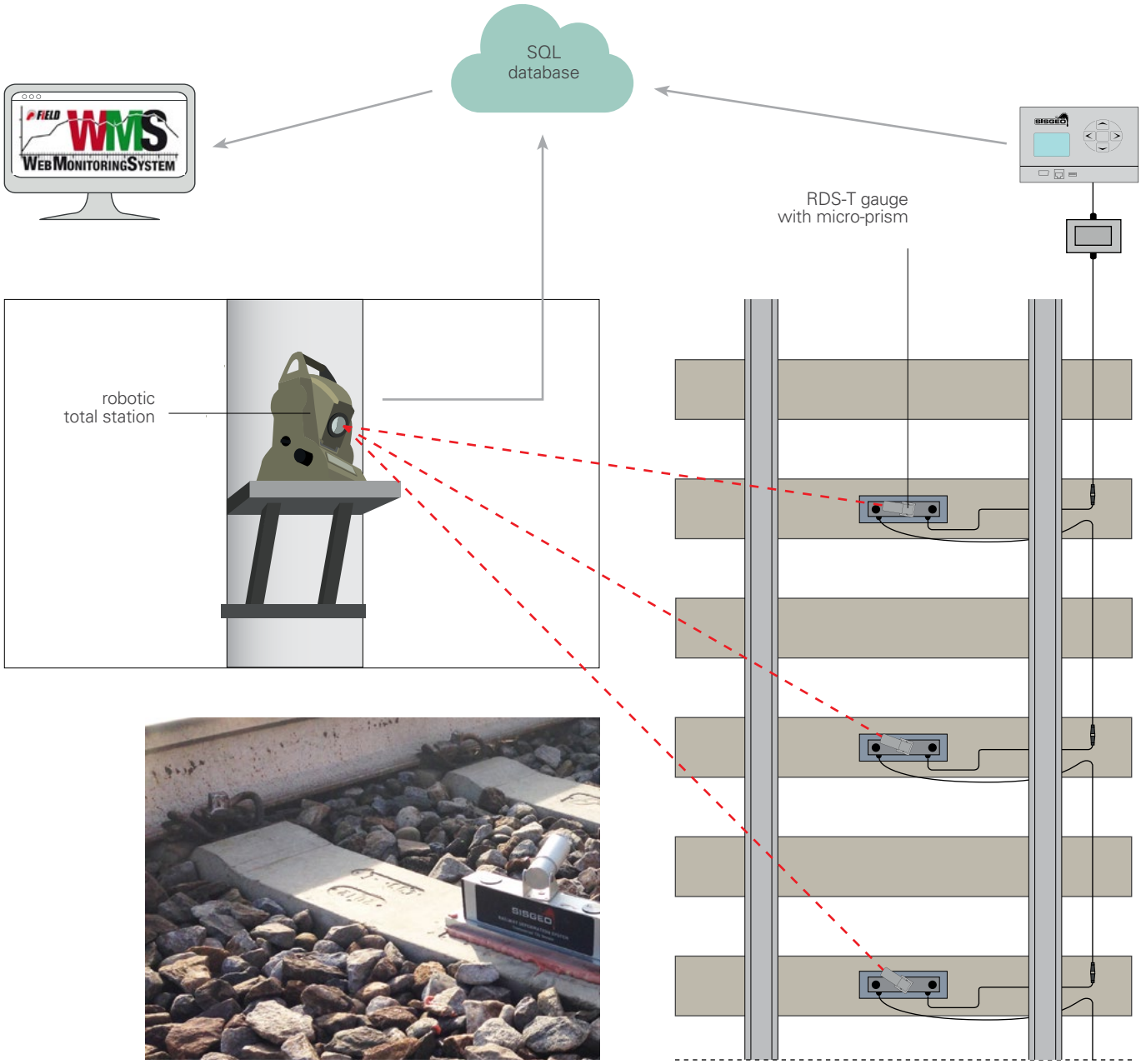
RDS-T: TRANSVERSE DEFORMATION

The RDS-T are installed to monitor the inclination of the ties and consequentely the cant (or "skew") of the railway. The twisting is usually expressed in ‰ as the relative inclination of one rail Vs the other.



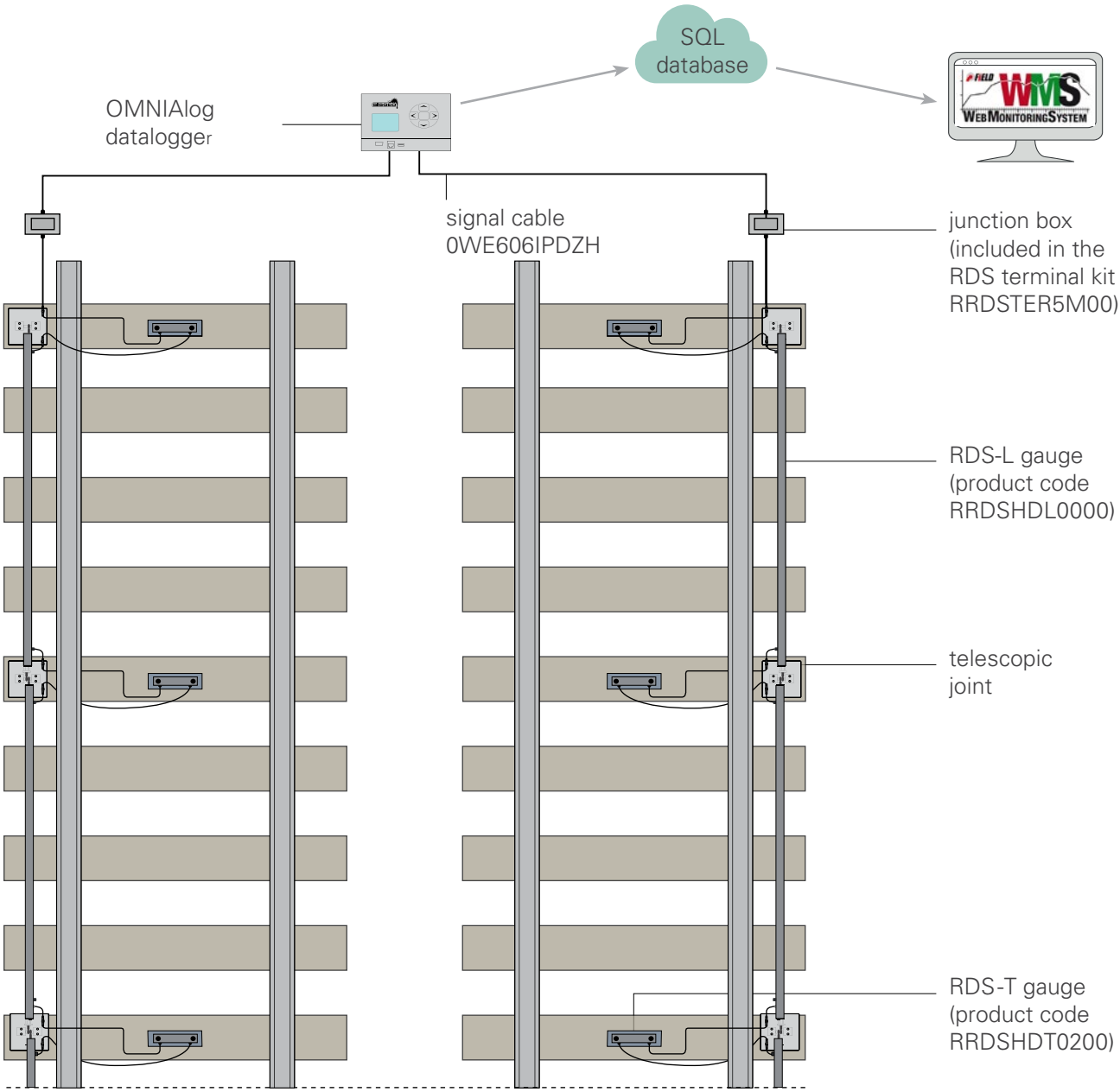
OPTICAL-RDS INTEGRATED SYSTEM

The OPTICAL - RDS integrated system consists of a number of RDS-T gauges, each with a micro prism for optical monitoring. The RDS-T gauges are usually installed on the sleepers at 1 m, 3 m or 9 m intervals. Longitudinal deformations are measured with an high-accuracy (0.5") robotic total station, able to detect the vertical position of the micro prism and, with processing, the settlement or heave of the tracks. Transverse deformations are monitored with the RDS-T gauges, all connected to an RS-485 bus by waterproof 5-pin connectors, and then to the OMNIAlog through a junction box and digital cable. Both the robotic total station and the OMNIAlog data logger collect and send data to an SQL database through GSM/GPRS modem, 3G/VPN router, fiber optic cable, radio or satellite interface. The web platform WMS (Web Monitoring System) validates, processes, converts, manages and publishes data on dedicated web pages, as requested by the customer. RDS-T gauges are developed for easily removal when reballasting is required or when the system must be moved to a different location. The OPTICAL - RDS integrated system is recommended when the monitored area is too long for RDS-L gauges. Optical systems are not recommended where there is heavy fog or rain. Also, it should be noted that microprisms must be cleaned monthly to remove dust created by train braking systems



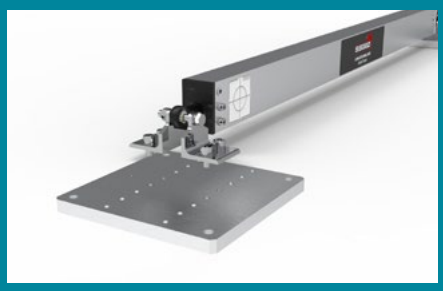
RDS SYSTEM

The RDS system consists of a number of RDS-L and RDS-T gauges spanning the entire area where track deformation may occurs. RDS-L are installed in continuous chain, and RDS-T are installed at preset intervals (usually 1 m, 3 m or 9 m). All the gauges connected to an RS-485 bus by waterproof 5-pin connectors. The RS-485 bus cable is terminated in the junction box included with the RDS terminal kit (RRDSTER5M00). A digital cable 0WE606IPDZH carries the data from the junction box to an OMNIAlog datalogger. The OMNIAlog datalogger collects and sends RDS system data to an SQL database through GSM/GPRS modem, 3G/VPN router, fiber optic cable, radio or satellite interface. The web platform WMS (Web Monitoring System) validate, processes, converts, manages and publishes data on dedicated web pages, as requested by the user. RDS gauges are developed for easily removal when reballasting is required or when the system must be moved to a different location. The rugged RDS system tolerates hard weather and wide temperature ranges. All the components have IP67 protection minimum and a working temperature range of -30°C to +70°C .
If the railway section to be monitored is very long, small errors may accumulate.
In that case, the OPTICAL - RDS integrated system is recommended



ACCESSORIES AND SPARE PARTS

RRDS00LE000	**RDS-L TERMINAL ANCHOR PLATE,** anchor plate used to terminate the RDS-L chain. It accommodates 150 mm of length adjustment, just as other anchor plates.
RRDS00LSP00	**RDS-L SPARE ANCHOR PLATE,** used when an RDS-L must be moved to a new location, and its anchor plate cannot be moved with it.
RRDS00LWP00	**PLATE FOR WOODEN TIES,** steel anchor plate for mounting RDS-L
0WE606IPD2H	**DIGITAL SIGNAL CABLE,** Used to connect the junction box of the RDS terminal kit to the datalogger. Cable has three twisted pairs (4x0.22 mm^2, 2x2.0 mm^2).
0ETERMRESI0	**RESISTANCE ENDING DEVICE,** termination resistance with connector, needed to close every digital RDS chain. The value of resistor depends on the layout of each system. For more detail see the FAQ#076.
RRDSTER5M00	**RDS TERMINAL KIT,** Includes 5 m digital cable with waterproof connector to connect the closest RDS gauge and junction box.
RRDS00TSP00	**RDS-T SPARE ANCHOR PLATE,** used when an RDS-T must be moved to a new location, and its anchor plate cannot be moved with it.



RDS-L SPARE ANCHOR PLATE

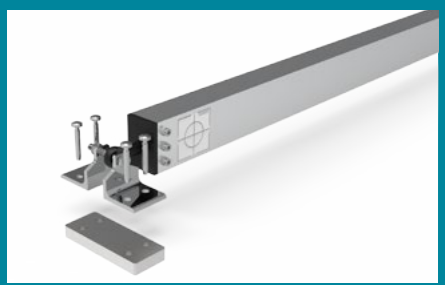
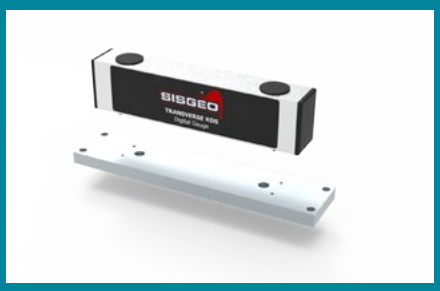


PLATE FOR WOODEN TIES

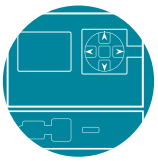


RDS-T SPARE ANCHOR PLATE

READABLE BY

Refer to separate datasheets for further information.

NEW LEO

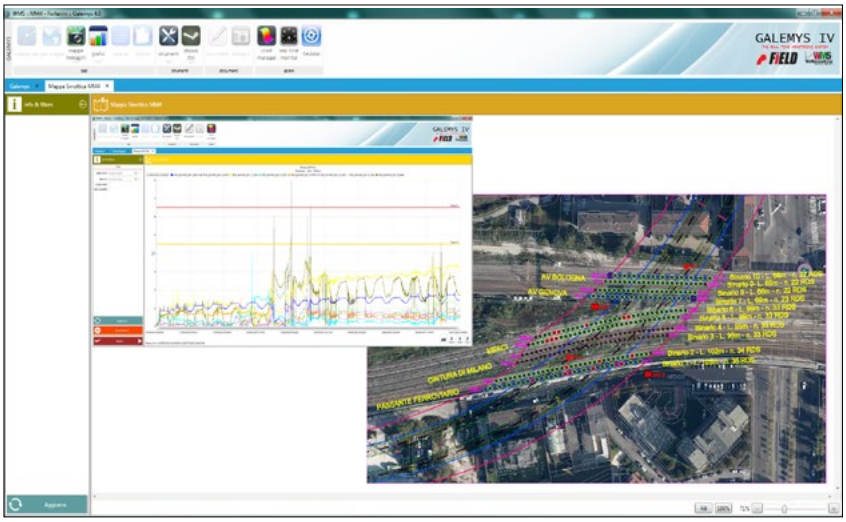


OMNIALOG

WMS THE ADVANCED DATA MANAGEMENT PLATFORM

WEB MONITORING SYSTEM
— MONITORING DATA MANAGEMENT SYSTEM —

FIELD S.r.l., part of Sisgeo Group, has developed a dedicated service for data/measurement management from automatic and manual monitoring systems called WMS (Web Monitoring System).
The measurements provided by each gauge, are requested and stored in OMNIAlog, miniOMNIAlog or other DAS, sent to a 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 WMS platform allows quick visualization in real-time of the charts, showing both the measurements of the maximum drawdown at each recorded event and the detected inclinations and temperature.
For further information, visit the dedicated web page on the Field Srl web site: https://www.fieldsrl.it/en/services/data-management/



This WMS screenshot shows the position of the RDS gauges on job site with nine tracks where an underpass is being constructed. The plot represents the railway twisting. Alert and alarm thresholds are represented by straight yellow and red lines.

SISGEO® RAIL
IOT IN MOTION

A SISGEO BRAND
Via F. Serpero 4/F1
20060 Masate (MI) Italy
Phone +39 02 95764130
Fax +39 02 95762011
info@sisgeo.com

WWW.SISRAIL.COM

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**