SL FORPS UIC60 HS Fiber-Optic Rail Sensor

Load and Vibration Measurement
Engineered for High-Speed Track

Overview

High-speed rail leaves little margin for uncertainty. At speeds approaching 500 km/h, wheel and rail forces are higher, small defects escalate faster, and the consequences of a missed fault are more serious than on conventional lines. At the same time, maintenance windows on busy high-speed corridors are short and hard to schedule, so operators need measurement that runs continuously and holds up without frequent attention.

The SL FORPS UIC60 HS is the high-speed member of the SL FORPS fiber-optic sensor family. It replaces the intermediate rail pad on UIC60 HS track and measures the vertical load each train applies to the rail, capturing vibration and shock across a wide frequency range. Because the sensing element sits inside the rail pad, it gathers data from within the existing track structure rather than adding separate trackside hardware to a high-speed environment.

Powered by Sensor Line technology, the UIC60 HS variant brings a field-proven fiber-optic measurement approach to Quarterhill's high-speed rail portfolio.

Reinforced for High-Speed Loads

The UIC60 HS is built to handle the higher forces of high-speed operation. It uses a larger, thicker pad than the standard SL FORPS variants, measuring 220 × 150 × 9 mm, and is rated for a maximum wheel load of 250 kN, compared with 150 kN on the standard profiles. It supports train speeds of up to 500 km/h while still resolving loads as low as 1 kN, so it captures both the heavy dynamic forces of a passing high-speed train and the finer signals used for wheel and track diagnostics.

Optical Sensing Built Into the Pad

The UIC60 HS works as a direct replacement for the elastomer intermediate layer beneath the rail. A special fiber-optic structure is embedded in the pad. As a train passes, the vertical load transmitted from the rail to the sensor reduces the amount of light passing through that structure, and opto-electronic interfaces convert this change in light transmission into signals for analysis.

Because the measurement is optical at the point of sensing, the sensor is immune to the electromagnetic interference that is unavoidable

around high-speed electrified track, and the fiber-optic signal path stays free of electrical noise over long cable runs.

Diagnostics That Matter Most at Speed

A single UIC60 HS installation supports the measurements high-speed operators rely on, including:

- Vibration and shock analysis
- Flat-wheel detection
- Axle load and weigh-in-motion measurement
- Track-bed condition analysis
- Axle and wagon counting
- Speed measurement
- Direction detection
- Train-length detection

At high speed, wheel defects and load imbalances put more energy into the track, so early detection of flat wheels and overloaded axles is particularly valuable for protecting both rolling stock and infrastructure.

Fits Into Existing High-Speed Track

The UIC60 HS installs quickly and in nearly any weather, without mechanical processing of the rail or sleeper. Because it takes the place of the intermediate pad, there is no need to drill, cut, or alter existing track components, which helps keep track possession time to a minimum, an important consideration on high-speed lines where access windows are short and tightly scheduled.

Engineered for a Harsh, High-Energy Environment

High-speed track subjects equipment to intense vibration, aerodynamic effects, weather, and constant electrical noise. The UIC60 HS is designed for a long service life with minimal maintenance and requires no recalibration once installed. Its fiber-optic design is immune to electromagnetic interference, and the sensor body carries an IP 67 rating (excluding the fiber-optic connectors). The connecting cable is protected by a metal-spiral cover that guards against animal damage, and the sensor is built to resist theft and vandalism. An integrated temperature sensor is available as an option where thermal data is also useful.

Signal Processing and Integration

The sensor pairs with opto-electronic interface units that digitize its signal for analysis. The SL XD-1100 provides a single-channel digital interface, while the SL MX-210 series offers multi-channel interfaces in two-, three-, and four-channel configurations, allowing several sensors along a high-speed section to feed a single processing point.

Proven on High-Speed Corridors

SL FORPS sensors are deployed on demanding high-speed and heavy-traffic rail networks, including the high-speed lines between Madrid and

Barcelona and between Madrid and Seville in Spain, the Marmaray crossing and the Ankara-Istanbul line in Turkey, the Barcelona-Figueras main line, the Madrid metro, and tram networks in Poland. This track record spans the full range of conditions, from urban transit to intercity service above 300 km/h.

UIC60 HS Specifications

Performance

Specification	Value
Rail profile	UIC60 HS
Maximum train speed	up to 500 km/h
Maximum wheel load	250 kN
Minimum detectable load	1 kN
Average life (MTTF)	more than 5 years
Operating temperature	-30 °C to 85 °C
Storage temperature	-30 °C to 85 °C
Humidity	up to 100%
Protection rating	IP 67 (excluding fiber-optic connectors)

UIC60 HS Dimensions & Weight

Model	Dimensions	Weight
SL FORPS UIC60 HS	220 × 150 × 9 mm	350 g

Fiber-Optic Cable

Property	Value
Outer diameter	10 mm
Length	Up to 40 m (20 m with temperature sensor option)
Weight	135 g/m

Maximum short-term pull tension	50 N
Minimum bending radius	50 mm
Protective cover	Metal spiral

Connector

Property	Value
Construction	Plastic FSMA
Length	34 mm
Maximum diameter	8.5 mm

Ordering the UIC60 HS

UIC60 HS sensors are specified using the format **SL FORPS X-Y-ZZ(T)**

Code	Description
X	Rail type (UIC60 HS)
Y	Connector type (1 = plastic FSMA, 2 = reusable metal FSMA)
ZZ	Cable length in meters (10 m standard)
(T)	Optional integrated analog temperature sensor

Customized versions are also available where a project calls for non-standard dimensions or configurations.

Built for the Demands of High-Speed Rail

The UIC60 HS extends the SL FORPS platform to the most demanding rail environments, combining a reinforced, high-load pad with the same durable, low-maintenance fiber-optic measurement used across the family. Powered by Sensor Line technology, it gives high-speed operators a continuous source of load, speed, and condition data from inside the track itself, supporting safety, maintenance planning, and long-term infrastructure decisions where reliability matters most.