DATA SHEET

TOM Digital-Audio-Video

Driving Data Recorder

Safety Functions

HIGH-PERFORMANCE PROCESSING

TOM's powerful features bring driving monitoring to a whole new level, whether it be video recording, storage capacity, cyber protection, or safe driving operations. The hardware modularity and advanced configuration features give TOM great flexibility to meet the needs of all types of rail vehicles.

CUSTOMER BENEFITS

Flexibility for all train, metro, LRV platforms

Time savings during implementation

Long lifetime of storage media

Better driving analysis

NEW STANDARD FOR MODERN RECORDING

- Driving-focused video and audio recording, combined with regular data recording, greatly enhances understanding of driving events.
- High-performance features designed to meet future IEC-EN 62625-Part 3
  - 4 built-in PoE ports for cameras
  - Up to 128 GB crash protected memory
  - 1 extractable SSD

HIGH SPEED CONNECTIVITY

- Live video streaming, telemetry and automatic download
- Integrated 4G/5G modem and Wi-Fi module

FASTER CUSTOMIZATION

- TOM's recording and safety features can be implemented quickly by your own system engineers

OUR KNOW-HOW COMBINED WITH RELIABILITY

- Strong expertise in safety (SIL2/SIL4) and cybersecurity (SL2)
- 25 years of data recording and CCTV experience

SPECIFICATIONS

● Base ○ Option

RECORDING		
Crash Protected Memory	●	Size 8 .. 128GB Lifetime: 20 years *(Video+Audio+Data at 10 Mbits/s write to a 64 GB memory)* Resistance: fire 650°C, crush 110kN, shock 55g, immersion 15m
Extractable Memory	○	Size: 128 GB .. 4 TB, SSD technology Key lock
Audio/Video Inputs	● ○	Audio/Video streams from train network Cameras: 4 x 100 Mbits/s Ethernet ports with PoE - M12 socket Microphones: 2 x dedicated ports
Digital/Analog Inputs	○	Digital inputs: 16 .. 80 ports Analog inputs: 4 .. 12 ports Frequency inputs: 4 .. 6 ports
Train Network Vehicle Bus	● ○	Fast Ethernet: 2 x M12 ports Protocols: TRDP (IEC61375-2-3), CIP, IPTCOM MVB Class 1.0/2.0 port or CAN 2.0 port 2 x RS485 - 2 x RS422
Maintenance	●	Fast Ethernet RJ45 port USB3 port
Wireless Connectivity	○	GNSS receiver: GPS - GLONASS - GALILEO - BEIDOU WAN modem: 4G - LTE WLAN device: Wi-Fi 5 (b/g/n/ac)
SAFETY FUNCTIONS		
SIL-4 Controller	○	SIL-4 driver vigilance monitoring SIL-4 low speed detection Customization capability: parameter adjustment
SIL-2 Controller	○	Built-in SIL-2 functions: speed measurement, speedometer output, speed thresholds, over speed protection, rollback protection, standstill monitoring, platform clearance zone detection, and driver vigilance monitoring Customization capability: Configurable block assembly
GENERAL		
Services	●	Local and remote data transfer Audio/video streaming Embedded website for maintenance purposes Recorder and safety functions configuratio
Data Plugs	○ ○	Train parameter plug: vehicle-related parameters TOM configuration plug: vehicle and device related parameters + configuration, software and security packages
Peripherals	○	Speed sensors and indicators Microphones and cameras
Power Supply	●	Power input 24 - 110 Vdc Sleep mode management
Mechanical Characteristics	●	483 x 133 x 280 mm <13kg
Standards	●	IEC/EN 62625: On-board driving data recording system EN 50126 - EN50129 - EN50128: Safety certification - SIL-2/4 IEC/EN 62443: Cybersecurity - security level 2 IEC 60571/EN 50155: Electronic devices IEC 62236-3-2/EN 50121-3-2: EMC

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Wabtec CORPORATION

SAM 6

Digital, Audio, and Video Driving Data Analysis Software

Accurately identify and track dangerous conditions to increase passenger safety and improve train operations. Wabtec's Software for Analysis and Monitoring – SAM – combines conventional data analysis with audio and video from the onboard driving data recorders, providing a more comprehensive view for a complete understanding of the contributing factors when identifying the causes of rail accidents.

Data visualization
Multiple & synchronized views fully customizable provide best user experience:
- Graphic, tabular and events
- Audio and video
- Journey overview including route map

Inspection tools
Filters, data search, signal combination, markers, measurements, annotations make analysis faster.

Sharing results
Annotations, markers attached to journey files and exportation to databases and spreadsheets facilitate collaboration and further processing.

Customization
- Available in multiple languages
- Personalized view panels
- Data filter design

Safeguard
Journey file encryption

Compatibility
All TOM and ATESS train data recorders designed by Wabtec

With SAM, Wabtec's Software for Analysis and Monitoring, users benefit from an efficient solution to analyze audio, video and events recorded by its TOM Driving Data Recorder. It is particularly effective in the following areas:
- Legal investigation
- Driver monitoring
- Train commissioning
- Train maintenance

CUSTOMER BENEFITS

- Improve understanding of driving events
- Get the tools for efficient analysis
- Share analysis effectively

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/// Product Datasheet

H.264/H.265 IP Box Camera

This camera is an IP cube camera with a small volume, which makes it easy to integrate into the train, especially if it is not to be visible.

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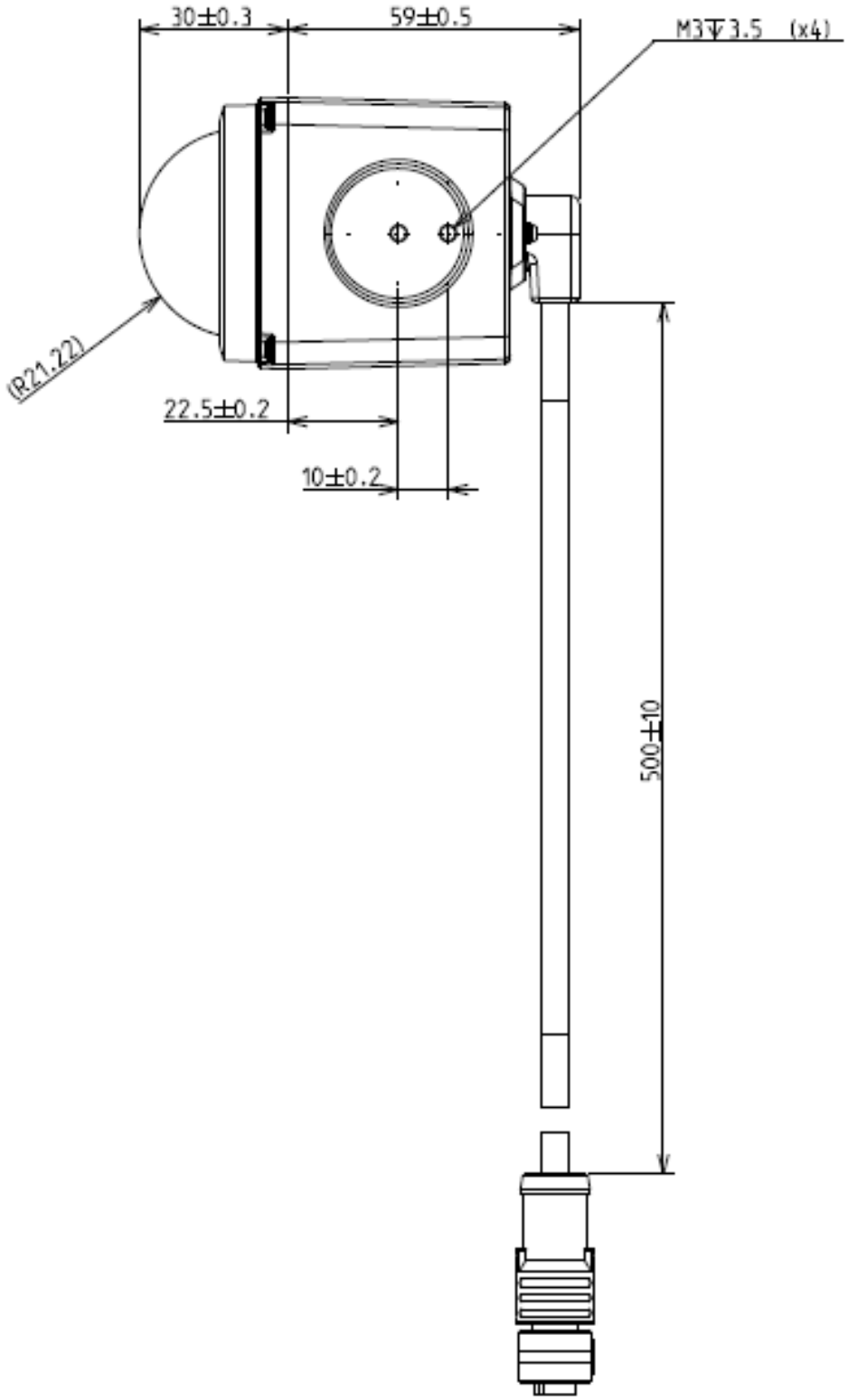
Detailed features

Camera	
Image sensor	1/2.7'' progressive CMOS
Max. resolution	5MP 2560x1920
Light sensitivity	< 0.2 lux (color)
Shutter Speed	1 s to 1/100,000 s
Lens type	Fixed focal lens
Backlight compensation	Digital WDR
Fields of View (to be confirmed)	Fisheye Lens: 180°x180°x180° 2.8mm Lens: 95°x69°x126° 4mm Lens : 78°x55°x105° 6mm Lens : 49°x35°x63° 8mm Lens : 37°x28°x46° 12mm Lens : 23°x17°x29°
White Balance, Gain Control	Automatic
Video	
Encoding	Up to 3 independent video streams, H.264, H.265 or MJPEG* *Only sub stream supports MJPEG encoding
Framerate	30fps @ 2560x1920pixels Or 60fps @ 1920x1080pixels
Video stream configuration	*Main stream:* H.265/H.264 2560x1920, 3MP, 4MP, 1920 × 1080, 1280 × 960, 1280 × 720, 800x600, 720x480 (30FPS @60Hz, 25FPS @50Hz or less) *Sub stream:* H.265/H.264/MJPEG 1280×720, 800x600, 720x480, 640 × 360, 352 × 288 (30FPS @60Hz, 25FPS @50Hz or less) *Third Stream:* H.265/H.264 1280×720, 800x600, 720x480, 640 × 360, 352 × 288 (30FPS @60Hz, 25FPS @50Hz or less)
Video Bit Rate	32 Kbps to 16 Mbps
Image Enhancement	BLC, 3D DNR
Region of Interest (ROI)	4 fixed regions for mainstream with H.265 and H.264 encodings
Picture Overlay	Yes with a 128x128 pixel logo
Network	
Protocols	HTTPS, TCP/IP, UDP, NTP, RTP/RTSP, DHCP including option 61, ONVIF, Authentication (EAP MD5), Basic and digest authentication for HTTP/HTTPS
ONVIF	ONVIF S profile
Audio	
Microphone	Possibility to connect an external electret microphone with: Vcc=12VDC, Icc< 16mA
Compression	G.711 or G.722.1
Audio Sampling Rate	8 kHz/16 kHz

Settings Control	
Maintenance and configuration	Done via the recorder
Events	Motion detection, video tampering alarm, network disconnected, IP address conflicted, illegal login
Privacy Masking	available
Power	
Power supply	PoE (Power over Ethernet) IEEE 802.3af compliant PoE class 2
Power consumption	< 7.5 W
Environmental conditions	
Operating temperature	-25°C to +55°C (+70°C for 10 min. according to EN 50155 class OT1+ST1)
Storage conditions	EN 60721-3-1 1K21 / -25°C to +55°C
Humidity	8% to 90% without condensation
Mechanical Data	
Dimensions	55 x 54.5 x 89mm
Weight (for information only)	< 450g (to be confirmed)
Enclosure material	Metal housing
Cable length	50cm
Cable bending radius	32mm+/-1.2mm (Ethernet cable) 25mm+/-1.2mm (audio and input/output)
Ground plot	M3 Screw
Protection class (rain and dust)	IP66 on the front face and IP54 elsewhere according to EN 60529
Protection class (anti-vandalism)	IK10 according to EN 62262
Standards	
Fire & Smoke Behaviour	EN45545 class HL2 and ECE R118
Shock and Vibration	EN 61373: 2010 Category 1 class B
EMC and Others	EN50155:2021, EN 50121-3-2:2016/A1:2019, ECE R10–06, REACH, ROHS
MTBF	200 000h

Dimensions



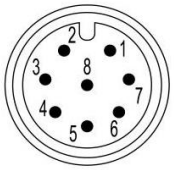
Units : mm

Interfaces

Ethernet

Connector	Pin	Assignment
 M12 D-coded, 4-pin, female	1	TD +
	2	RD +
	3	TD -
	4	RD -

Audio input

Connector	Pin	Assignment
 M12, Female, 8-pin, A-Coded	1	Alarm Input
	2	Alarm Output
	3	Microphone +VCC
	4	Microphone -VCC
	5	Microphone GND
	6	I/O GND
	7	Not Connected
	8	Not Connected

/// Product Datasheet

Hall effect speed sensors

The Hall effect sensors measure the speed of any wheel down to zero speed. The train's direction is detected using the 2-channel model which delivers phase-displaced signals. The sensors include the magnets which makes it unnecessary to magnetize the phonic wheel.

Sensor		
Model	1-channel	2-channel
Number of channels	1	2 (separated galvanically)
Frequency range	0 to 3.5 kHz	
Supply voltage | Supply Current | Reverse polarity protection	U_S=15±5% V | I_S<20mA | Yes	
Output voltage | Output current | Short-circuit-proof	Rectangular signal: V_{OH}=U_S-1.5V, V_{OL}=1V | I_O<8mA | Yes	
Recommended phonic wheel	Metallic, 80 teeth, module 2, diameter 162mm, thickness 16mm	
Air gap	0.5 to 1.5 mm	
MTBF	4 000 000 hours	2 500 000 hours
Cable		
Length	Upon request - From 1m to 5m	
Shielded cables	1 cable 3x0.82mm² EN50306-4	2 cables 3x0.5mm² EN50306-4
Cable protection	Upon request: EPDM tube or PMA sheath	
Cable termination	Plug connector on request: Souriau UTO, VGE1 or FER1 series	
Environment		
Operating temperature | Storage temperature	-40°C to +110°C | -40°C to + 85°C	
Protection class	EN60529 - IP66	
Vibration and shock	EN61373 – Category 3	
Electronics	EN50155, EN50121-3-2	
Fire and Smoke	EN45545 – HL2	
Safety	Meets TOM (Wabtec's Driving Data Recorder) safety requirements	

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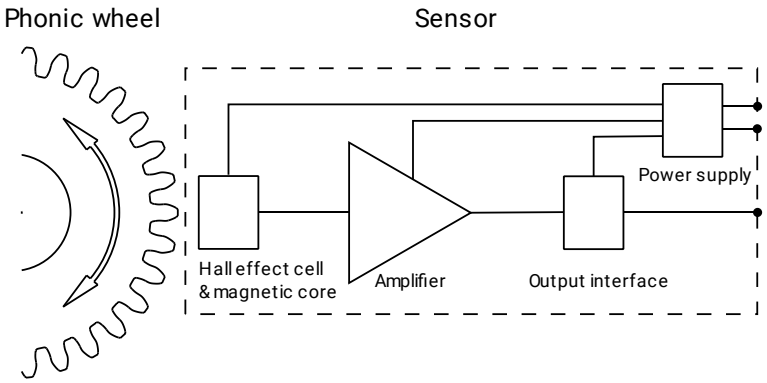
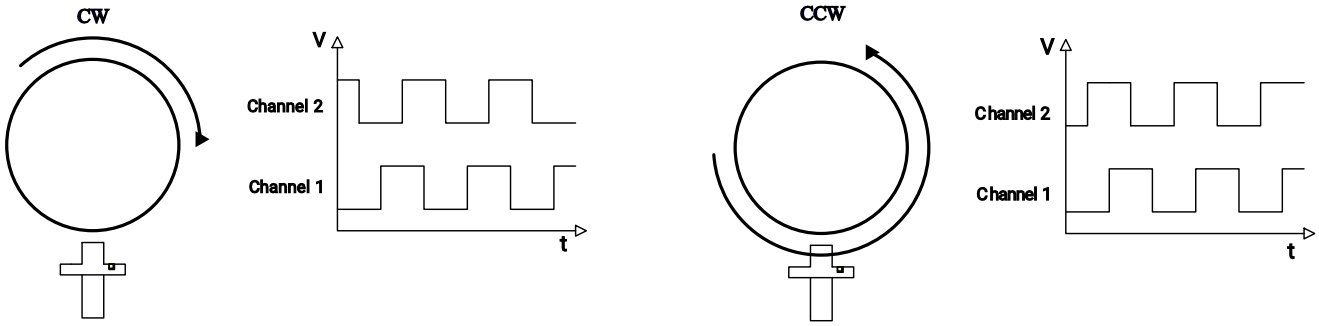
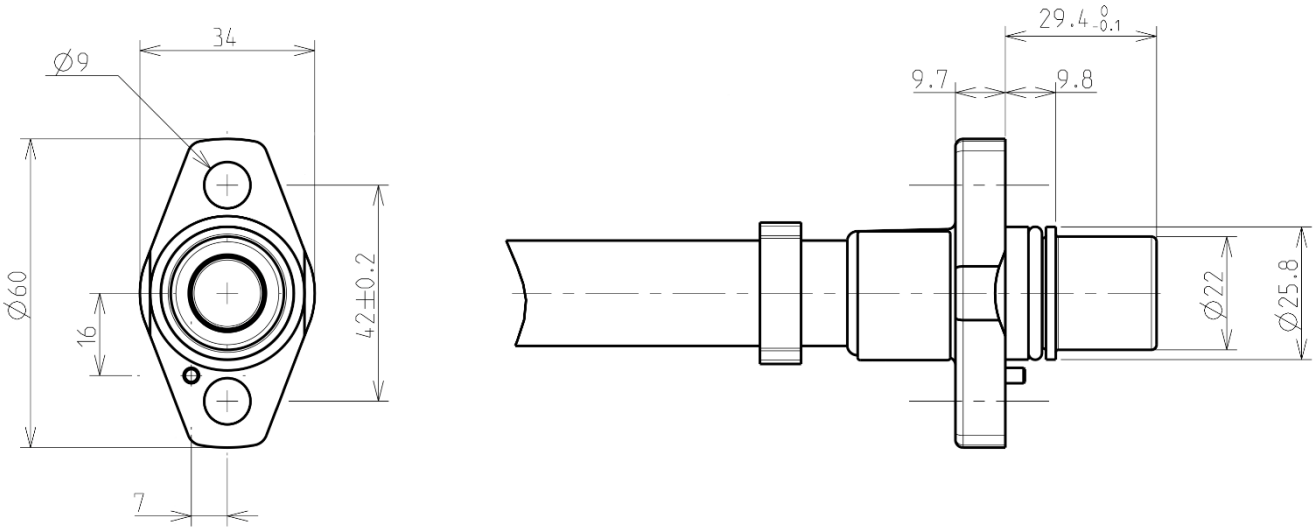
Block diagram (1-channel model)



Output signals (2-channels model)



Dimensions (all models)



Unit: mm

Note: All pictures appearing in this document are not contractual.

Wabtec CORPORATION

SAFETY SYSTEMS & EVENT RECORDERS **IEC/EN SOLUTIONS**

WABTEC'S IEC/EN SAFETY SYSTEMS & EVENT RECORDERS

Wabtec is a leading supplier providing railway solutions. Safety of train operations has always been a part of our strategy.

We provide innovative safety systems and event recorders to all types of rail worldwide.

Specifically, Wabtec has dedicated a product family, fully compliant with IEC/EN standard applications. To help provide the most suitable answer to the customers applying these international standards.

OUR EXPERTISE

With its IEC/EN solutions, Wabtec provides extensive expertise in embedded electronics that includes:

- Safety developments up to SIL 4
- Cybersecurity up to SL2
- Advanced recording of driving events and audio/video
- High-performance IEC/EN crash protected memory
- Train speeds processing
- Train safety automation

+40

Years of experience
Supplying robust and reliable advanced electronics

Wabtec CORPORATION

EVENT RECORDERS

Driving Data and Video Recording

Improve the safety

TOM
Digital audio video recorder

ATESS
Dedicated to French main lines

IMPROVE SAFETY & PREVENT ACCIDENTS

Wabtec provides a flexible and scalable range of systems addressing all customer applications contexts.

All solutions offer IEC/EN advanced event data recording with the support of optional audio/video recording features (IEC/EN 62625-3 ready), with the ability to store data in high performance crash protected memory.

All our recorders can be complemented by a set of peripherals to meet customer's needs and offer an all-in-one solution.

AVAILABLE FOR ALL TRAIN CONTROL SYSTEMS

Extensive interfacing capabilities with TCMS (e.g., TRDP – with dual homing, MVB), and signaling systems (e.g., ETCS or CBTC).

DATA ANALYSIS - AN END-TO-END VALUE CHAIN

The on-board solutions are supplemented by a suite of application tools.

SAM application is dedicated to graphically analyze data recorded files. It offers to mix driving data events with audio video footages to have a full view of the context of an accident during an investigation.

ADS suite is a cloud-based solution proposing a fleet management application suitable for driving data automated collection and analysis of driving events.

RANGE OF PERIPHERALS

Wheel speed sensor

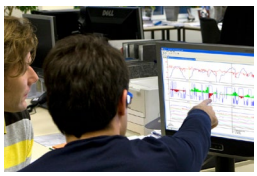
Radar

Speed indicator

Audio-video capture

Connectivity

SAM
User-friendly data driving analytic software



ADS - cloud services
Automated detection of driving anomalies

Wabtec CORPORATION

SAFETY SYSTEMS

Train Speed Processing & Automation

Enhance safety of train operations up to SIL4

Standalone or integrated in the event recorders, Wabtec offers solutions suitable for train speed processing and train safety automation.

TRAIN SPEED PROCESSING

Wabtec offers a large range of solutions related to

train speed processing. From wheel speed sensors to intercorrelation radars, Wabtec covers a wide range of speed and distance measurement applications.

In the context of ETCS, Wabtec has also developed a strong expertise in SIL4 odometry applications by designing certified systems based on sensor fusion.

TRAIN SAFETY AUTOMATION

Wabtec also provides a set of SIL2, SIL4 automated safety solutions: dead man vigilance, overspeed detection, rollback control, train positioning.

Special focus is placed on onboard applications interacting with the wayside through dedicated beacons. Wabtec provides “all-in-one” solutions (e.g. platform docking, type B signaling functions).

The solutions guarantee the safety compliance without compromising the system availability.

The customization of these safety systems allows for a quick personalized configuration.

WHEEL SPEED SENSOR
Passive or active technology

SPEED MEASUREMENT RADAR
25 years experience in Doppler technologies

SIL-4 ODOMETRY
High availability with sensors diversity

SPEED INDICATOR
Up to SIL-2 applications

SAFETY AUTOMATION SYSTEM
Enhanced SIL-2 legacy signaling system

BEACON READER
100% compatible with SILEC beacons

TRAIN POSITIONING SYSTEM
Sensor fusion processing

SIL4 DEAD MAN VIGILANCE
Module-based device

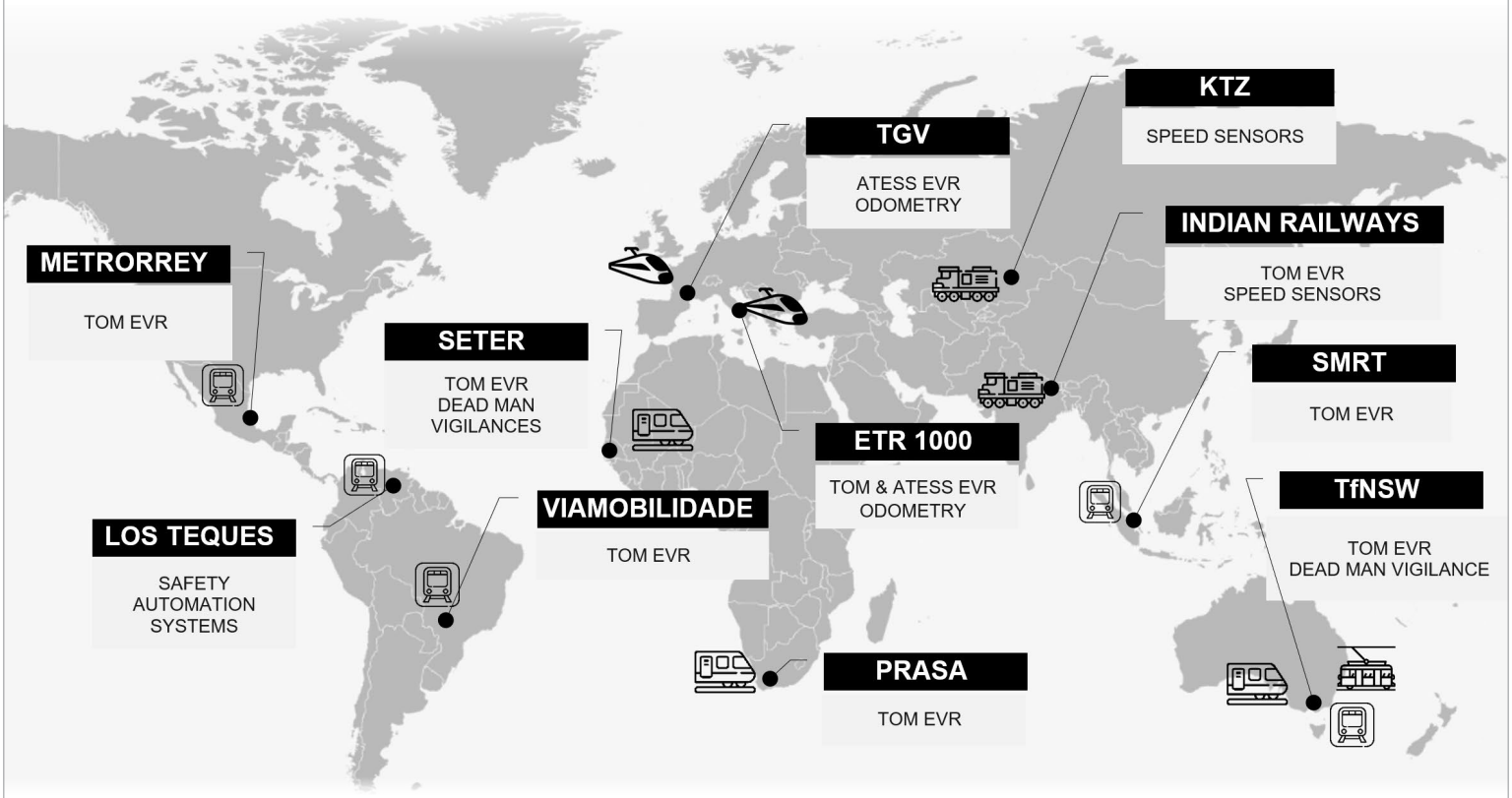
SAFETY CONTROLLER
Generic SIL-2 certified

Wabtec CORPORATION

REFERENCES AT A **GLANCE**

IEC/EN Safety Systems & Event Recoders

Customer applications worldwide for all rail segments



+50
COUNTRIES

+45
CUSTOMERS

Car builders

Signaling companies

Operators

+60 K
SYSTEMS IN SERVICE

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