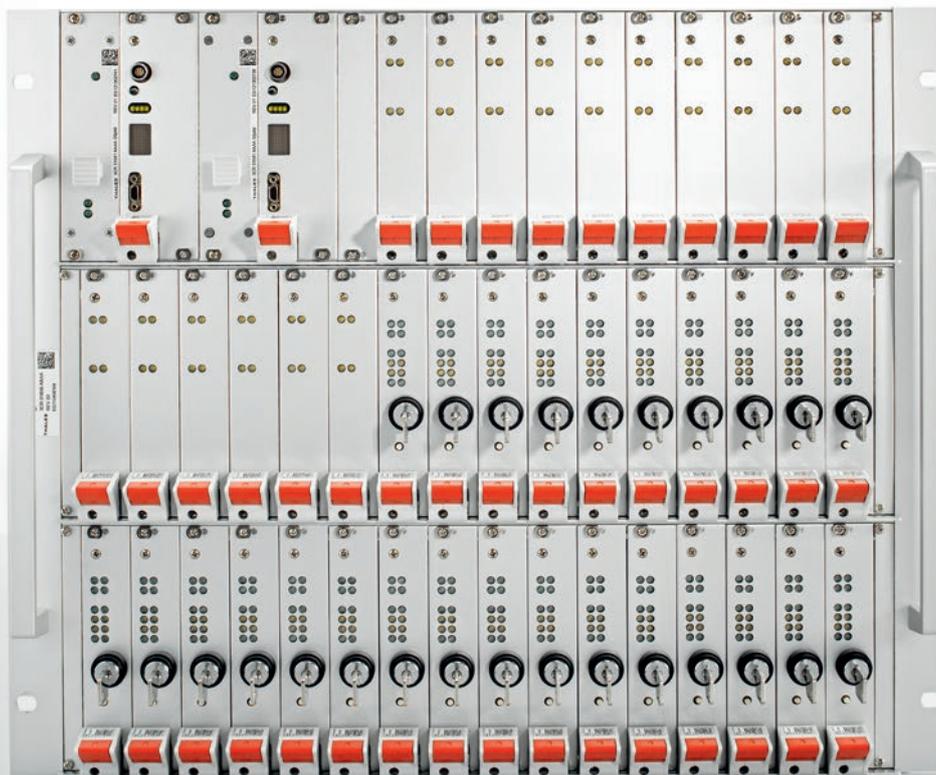


## Axle Counter Az LM

Thales' flagship system for train detection in any application





# Versatile, Safe, Secure and Reliable in Operation

Thales' best-selling Axle Counter System Az LM combines the experience of axle counter dedication since 1965 with the latest technology for safe, secure, reliable and cost-efficient train detection. The comprehensive multi-section axle counter solution in Thales' portfolio is capable of managing almost any train detection application, regardless of the railway segment.

Az LM provides a wide range of benefits in regard to functionality, connectivity, integration as well as diagnostics and has proven its superior degree of reliability, safety and availability in more than 40 countries worldwide.

Thales long-term field proven detection points Zp30H and Zp30K complete the axle counter system. The working principle of the corresponding wheel sensors has demonstrated its performance over several decades, offering an exceptionally high immunity to electromagnetic emissions and covering a diverse range of wheel types as well as rail profiles.

Az LM guarantees a highly reliable and fail safe wheel detection, no matter how complex the application.

## Az LM KEY BENEFITS

- Optimal safety for each type of railway
- Versatile for every signalling system architecture
- Availability scalable to every need
- Best in-class life-cycle cost
- Cyber Security



## Az LM – KEY BENEFITS

### OPTIMAL SAFETY FOR EACH TYPE OF RAILWAY

Safety is the heart of Thales' customer commitment. Az LM offers CENELEC SIL4 safety. No matter which application, main line, suburban rail, metro, tramway or mixed gauge tracks.

### VERSATILE FOR EVERY SIGNALLING SYSTEM ARCHITECTURE

Due to its modular architecture, Az LM integrates seamlessly into any signalling system architecture, no matter if centralised or decentralised.

The outdoor equipment can be deployed using classical copper cable architecture or IP network architecture. With copper cable only two wires are required per detection point, which is best in-class in this application.

Using only five different components, the indoor system scales to almost every application. The track occupancy information can be transferred to the control system through classic relay contacts as well as through any IP network.

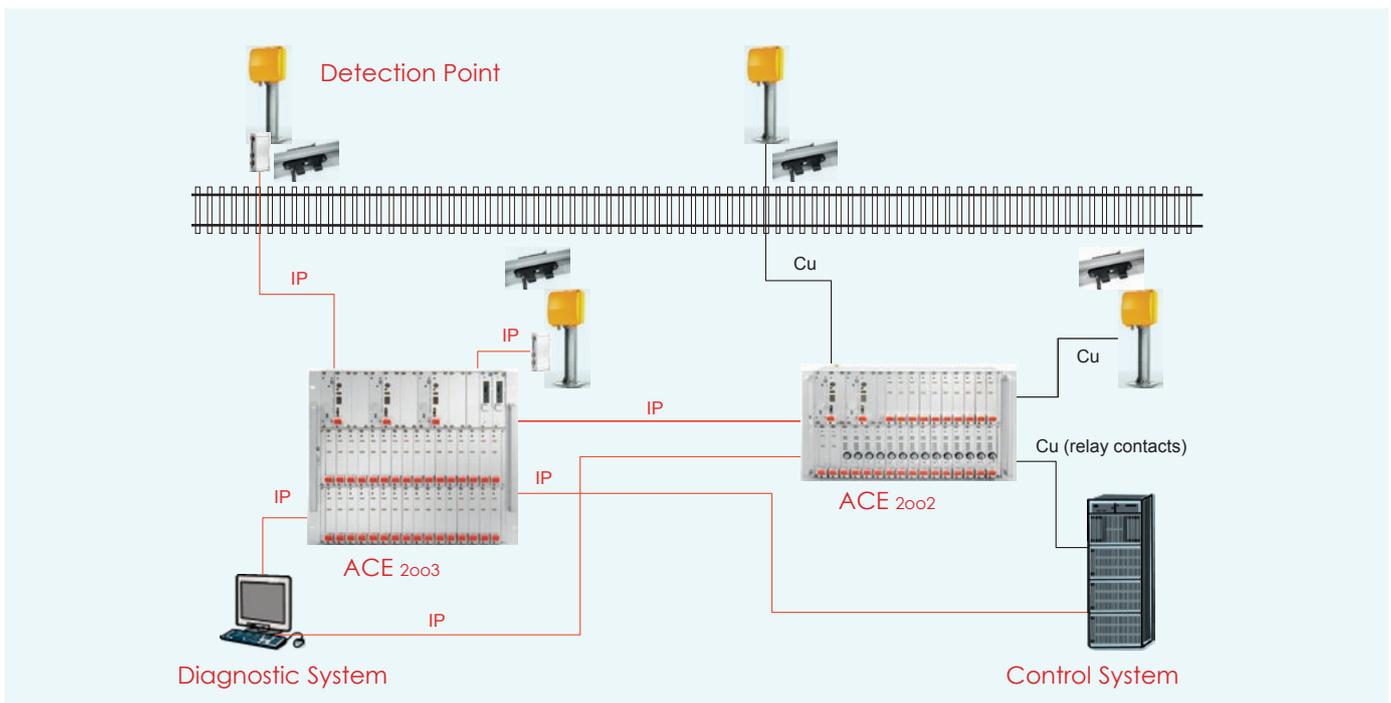
Thales has implemented this IP interface following the SAHARA (SAfe, Highly Available and RedundAnt) protocol standard. SAHARA protocol standard has been defined jointly by leading railway infrastructure operators and suppliers.

### Az LM – KEY TECHNICAL DATA

- Vital SIL4 2oo2 or 2oo3 central Axle Counter Evaluator (ACE)
- 32 detection points per ACE
- IP interface to neighboring ACE
- 16 additional detection points from neighboring ACE
- 4 sections per detection point
- Classical copper or IP interface to the detection points Zp30H and Zp30K
- Train speed up to 380 km/h (optional 440km/h)
- Relay interface or IP interface to the control system

### ADVANTAGES OF SAHARA PROTOCOL

- Proven in use
- Generic protocol stack according to EN 50159
- Offers all services for a safe and highly available communication via redundant physical channels
- The multi-layer concept ensures reliable standardised transmission with independent safety protocols
- Vital protocol standard



IP and classical architecture at a glance

## Az LM – KEY BENEFITS

### AVAILABILITY SCALABLE TO EVERY NEED

The reliable detection of trains is fundamental to the safe operation of modern railways. This puts a great demand on the availability of train detection systems. In areas with high impact on operations, 100% availability is indispensable, for example on lines with a high traffic density, on high speed lines, on key metro lines, in key railway junctions or in tunnels.

Only Az LM offers the full range of availability scaled to every need:

- Standard 2oo2 system architecture
- 2oo3 system architecture for high availability, which is unique in the market
- Redundant 2oo2 as well as redundant 2oo3 system architecture for almost 100% computing power availability
- Redundant outdoor components for 100% continuous train operation

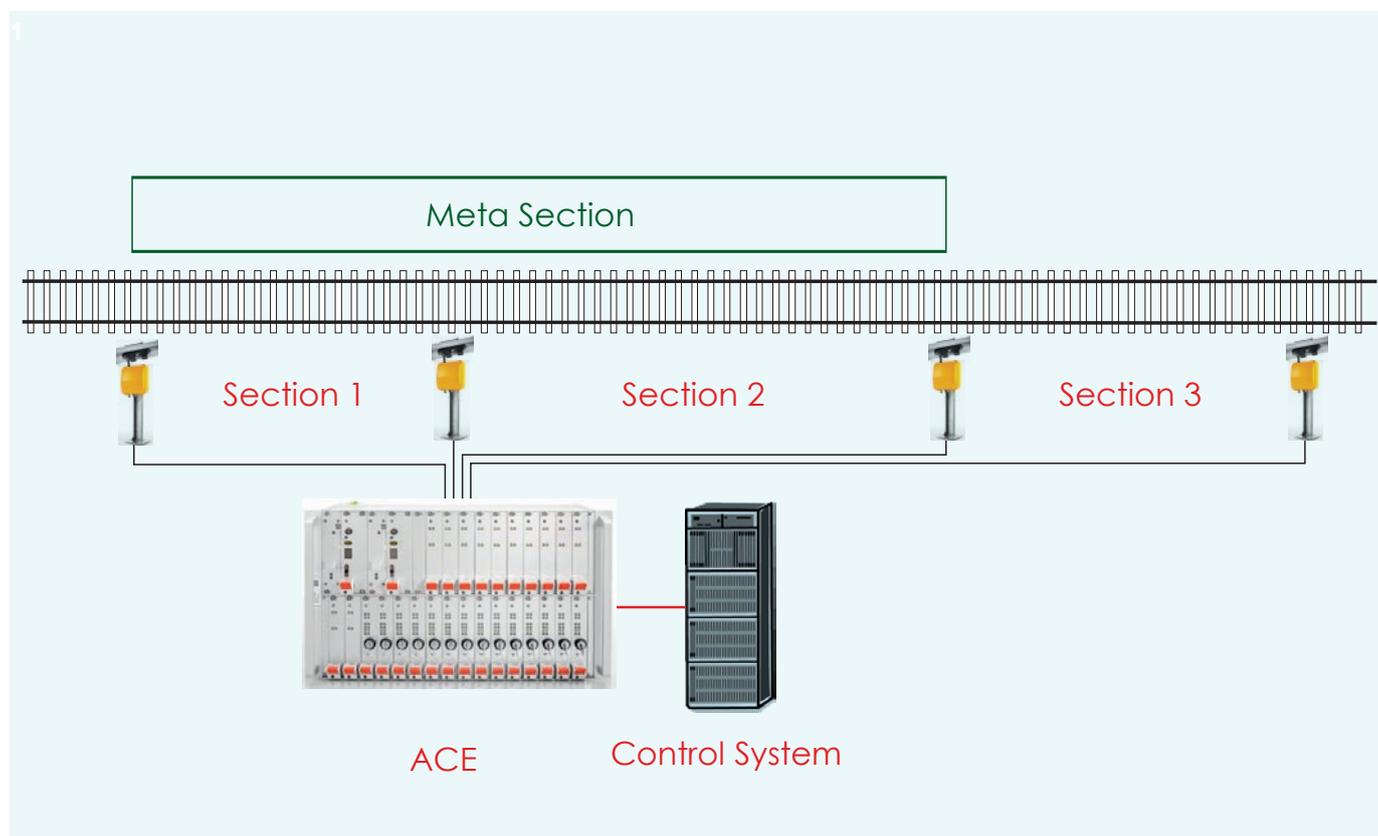
Az LM achieves the highest availability level in the market. Moreover, Az LM is the frontrunner in fully redundant axle counter applications. Az LM seamlessly integrates into the availability concept of the signalling system, no matter if 2oo2, 2oo3, hot-standby or other concept.

### REDUNDANCY PROVEN IN KEY PROJECTS

- Germany: 300 km/h high-speed line
- Switzerland: 250 km/h Loetschberg and Gotthard base tunnel
- Netherlands: 300 km/h HSL Zuid high-speed line

While redundant systems provide an unquestionable outstanding performance, this requires investment into redundancy, which is too high for many railway lines. The standard Az LM already offers outstanding features, which guarantee high availability:

- Fault suppression through the high signal/noise ratio of the wheel detection regarding electromagnetic interference
- Fault tolerant data transmission between the detection point and the axle counter evaluator
- Fault tolerant and redundant IP transmission from the axle counter evaluator to the control system as well as to neighboring axle counter systems
- Automated fault correction through internal system reset via meta sections: the main principle of using meta sections is an automatic reset of the disturbed sections if the overlying meta section reports that no vehicle is in a disturbed section.



Automated fault correction through automatic reset via meta sections

## Az LM – KEY BENEFITS

### BEST IN-CLASS LIFE CYCLE COST

Thales is a global signalling system supplier offering unique solutions in order to protect the customer's investments into axle counter systems over decades.

#### Low investment cost

Az LM enables significant savings of investment costs:

- Using a standard IP interface between the Axle Counter Evaluator (ACE) and the control system (interlocking) instead of classical relay interface reduces investment cost due to less hardware for both the axle counter and the control system
- Using IP for the communication between remote detection points and the ACE or between neighboring ACE's enables the use of any new or existing network and hence leads to a significant reduction of investment into copper cables

#### Low maintenance and repair costs

Az LM is virtually maintenance free due to a sophisticated self-diagnostic system and its fixing concept: The trackside equipment executes numerous cyclic self-tests and can operate without annual visual checks and mechanical readjustments.

Using the IP diagnostic interface enables the connection of every ACE and every detection point to a centralised diagnostic system.

This enables a significant reduction in operational spending; maintenance staff can diagnose any defective or damaged parts remotely before travelling to the site.

#### Minimal train delays

Traffic interruption due to failure of train detection is increasing the operational cost of a railway. Thales' unique detection point using double side detector technology (mounted at both sides of the rail) is the most robust wheel detection principle in the market. The robustness of the sensing technology results in a primary reliability, which with single side detection systems (mounted at one side of the rail) can not be achieved.

#### CYBER SECURITY

While safety is taken for granted in the transportation sector, security is becoming the focus. As a world leader in cryptographic security products and cutting edge strategies, Thales provides complex safeguard solutions for the transportation sector. Cyber security, especially data protection, is of the utmost importance in railway signalling. The railway signalling products of Thales are secured in accordance with ISO 27001 and NIST 800-53 security requirements.



Installing a Sk30K wheel sensor in the Swiss Gotthard base railway tunnel; the longest railway tunnel in the world

# Az LM COMPONENTS

## INDOOR EQUIPMENT



The CPU evaluates the counting data from detection points and generates track occupancy information. The processor board is delivered with a program plug which contains the site-specific engineering data.



The serial board is the link between the indoor system and the detection point in the outdoor plant. It forwards the counter data of each detection point to the CPU.



The parallel board is used for connecting the control system via relay interface. Resets can be configured using the optocouplers or key switch and push button.



The system power supply feeds the CPU, the serial boards and – if supplied – the parallel boards.



The sub rack of the ACE can be adjusted according to customer requirements. The sub rack hosts the components and is provided with one, two, or three lines, according to the applications size. All components inside the sub rack communicate via CAN-bus. The power supply as well as CAN-bus transmission is provided via the backplane.

## OUTDOOR EQUIPMENT

The Az LM indoor system is fully interface-compatible to the existing and field proven Thales detection points Zp30H and Zp30K.

The outdoor electronic units connect the wheel sensor to the Az LM Evaluator unit:

- The EAK30H can be combined with the classical wheel sensors Sk30 and Sk30H or the slimline wheel sensor Sk30K
- The EAK30K can be combined with the slimline wheel sensor Sk30K



Classical electronic unit EAK30H



Slimline electronic unit EAK30K



Drill mounting

Classical wheel sensor Sk30 and Sk30H.



Drill mounting

Slimline wheel sensor Sk30K. Also available with clamp mounting to mount the wheel sensor without drilling, which leads to short installation and removal times.



Clamp mounting

# DIAGNOSTICS AND KNOW-HOW TRANSFER

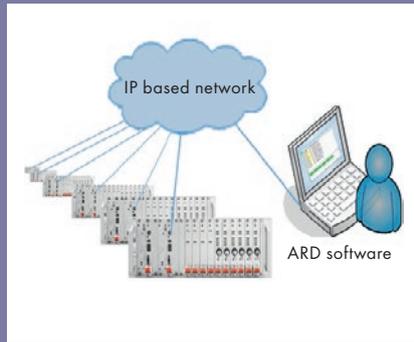
## CENTRALISED DIAGNOSTIC SYSTEM

Az LM provides all real time data required to support condition based maintenance, enabling prioritised and optimised maintenance actions. Only one computer equipped with Thales' Az LM Remote Diagnostics software (ARD) is required to access all diagnostic data. The Az LM systems can be connected over any IP network.

ARD is an evolution of Thales' Graphical Diagnostic Interface software (GDI) which enables the user to drill down and diagnose each of the connected Az LM using the proven functions of GDI without switching workplace.

ARD provides all real time data in a

plain data format ready for analysis with standard office software. The usage of standard office software for the data analysis enables the concerned staff to freely choose the indicators and thresholds for



Centralised Diagnostic System ARD

condition-based maintenance. There is virtually no limitation on graphical representation of decision analysis and the presentation of results of the maintenance actions.

## KEY BENEFITS OF THE CENTRALISED DIAGNOSTIC SYSTEM

- Real time supervision of all the connected systems
- Drill down to a remote detailed analysis on each connected system
- Storage of the real time data over any period
- All actions are traceable and recordable
- Multi language and customisable

## KNOW-HOW TRANSFER SCALABLE TO YOUR INVESTMENT POLICY

A scalable and flexible allocation of tasks is key for optimal investment into a train detection system. Engineering,

installation, commissioning or maintenance of the axle counter system may be carried out by customers, contractors and railway staff.

The transfer of the specific knowledge is required for each task and ensured

by Thales' exhaustive training and certification program. This unique program comprises all tasks with certification levels for participants, experts and trainers.

For further information, please visit [rail.myproducts-thales.de](http://rail.myproducts-thales.de)



Axle Counter training and certification

# TECHNICAL DATA

## Indoor Equipment

Dimensions	Format of rack 19"; 3,6 or 9 height units of subrack
System architecture	2oo2 and 2oo3
Supply voltage	24, 48 or 60VDC
Temperature (operation)	Class T1 and T2 [EN 50125-3] -20 ... +55 °C
Humidity (operation)	Class TX [EN 50125-3]
Altitude	Class AX [EN 50125-3] < 2000 m above sea level
Lightning	Separation of interfaces according [EN50124-1]
Degree of pollution	[EN 50124-1] PD2 [EN 50125-3] 3B1, 3C2, 3S1
Shock and Vibration	[EN50125-3]
EMC/EMI	[EN 50121-4] [EN 50238-3] (Rolling Stock)
Safety level	SIL 4 [EN 50129]
Network connectivity	Redundant communication interface between detection points to evaluator via (standard) TCP/IP network (up to Category 3 [EN50159]).  Vital and redundant interface to other ACEs for 'shared detection points' (e.g. block applications).  Vital and redundant interface to the interlocking via SAHARA protocol

## Outdoor Equipment (Detection points)

Supply voltage	24VDC or 60-120VDC
Temperature (operation)	Class T1 und T2 [EN 50125-3] - 40 ... + 70 °C
Humidity (operation)	Class TX (with Tunnel) [EN 50125-3] up to 100% (< 60 % average/year)
Altitude	Class AX [EN 50125-3] < 2000 m above sea level
Degree of protection	IP67
Lightning	Separation of interfaces according [EN50124-1]
Degree of pollution	[EN 50124-1] PD4 [EN 50125-3] 4B1, 4C3, 4S3
Shock and Vibration	[EN50125-3]
EMC/EMI	[EN 50121-4] [EN 50238-3] (Rolling Stock)

### AXLE COUNTING REDEFINED: AN OPTICAL FIBRE-BASED REVOLUTION



For the past 50 years, axle counting technology was based on electromagnetic sensors. Thales has developed a new generation of sensor, fibre optic based which will revolutionise axle counting, especially when it comes to investment and life-cycle cost:

- Neither electronic components nor copper cable are required in the outdoor plant. Only the sensor and a fibre optic cable to the evaluator. Investment cost is hence reduced significantly
- The fibre optic sensor is very easy to install. Once glued to the rail, it requires no more maintenance in its whole lifetime – mechanical as well as electronic adjustments are no longer required
- Track maintenance like tamping and grinding are possible with no restrictions at all – the equipment can return to operation immediately after completion of maintenance
- Drop off detection included in the sensor
- Immune against electromagnetic interference

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