FRAUSCHER

Your partner for confidence.

Frauscher Sensor Technology

Agenda

- Intro
- About Frauscher
- Reliable Train Detection
- Frauscher Point Control System
- Frauscher Insights
- Data Transmission

About Frauscher

The growth of Frauscher

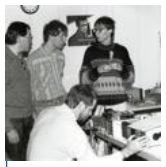
— FROM HUMBLE BEGINNINGS TO A GLOBAL SUCCESS STORY

1987

Company foundation by Josef Frauscher

1993

Product breakthrough in sensor technology



1998

Establishment of the first foreign office: Frauscher Poland

2000

First international projects

2011

Global expansion with offices in China & UK

2013

Opening Indian Office & Office Kazakhstan

2014

100,000th wheel sensor

Est. Frauscher BR and Office Malaysia

2015

Establishment of Frauscher US and Frauscher AUS

2017

Establishment of a location in France

2019

Frauscher joins Delachaux

Establishment of Sensonic

Offices in Vienna and Serbia

2021

Frauscher Germany established

2022

Opening Office in Japan & MENA

2023

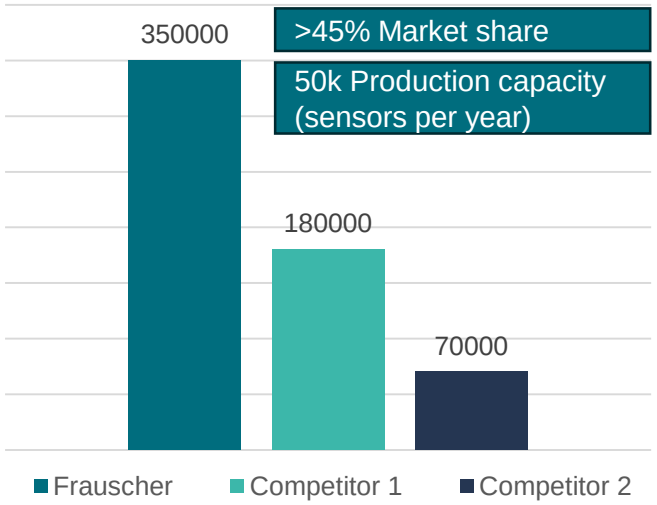
Opening Office Taiwan

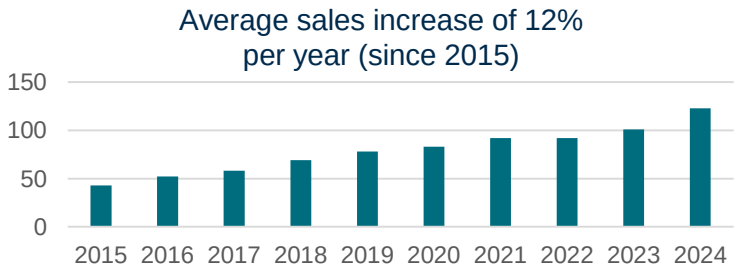
2024

New Portfolio and Positioning

Confidence with global market and technology leader for train detection

Installed base of Wheel Sensors





Proven robustness in all climate zones and conditions

Innovation, that became standard

- rail claws
- double sensor along the track
- sensor robust against eddy current brakes
- axle counting solutions for trams
- software interface to third party IxL
- features for highest availability (STS, CHC)
- open failsafe interface (FSE)
- integration on Eulynx 2.0 to third party IxL
- commercial project SCI-TDS on Eulynx 3.5
- cloud-based monitoring platform

! And more to come!

Customer proximity drives innovation

100+
Countries

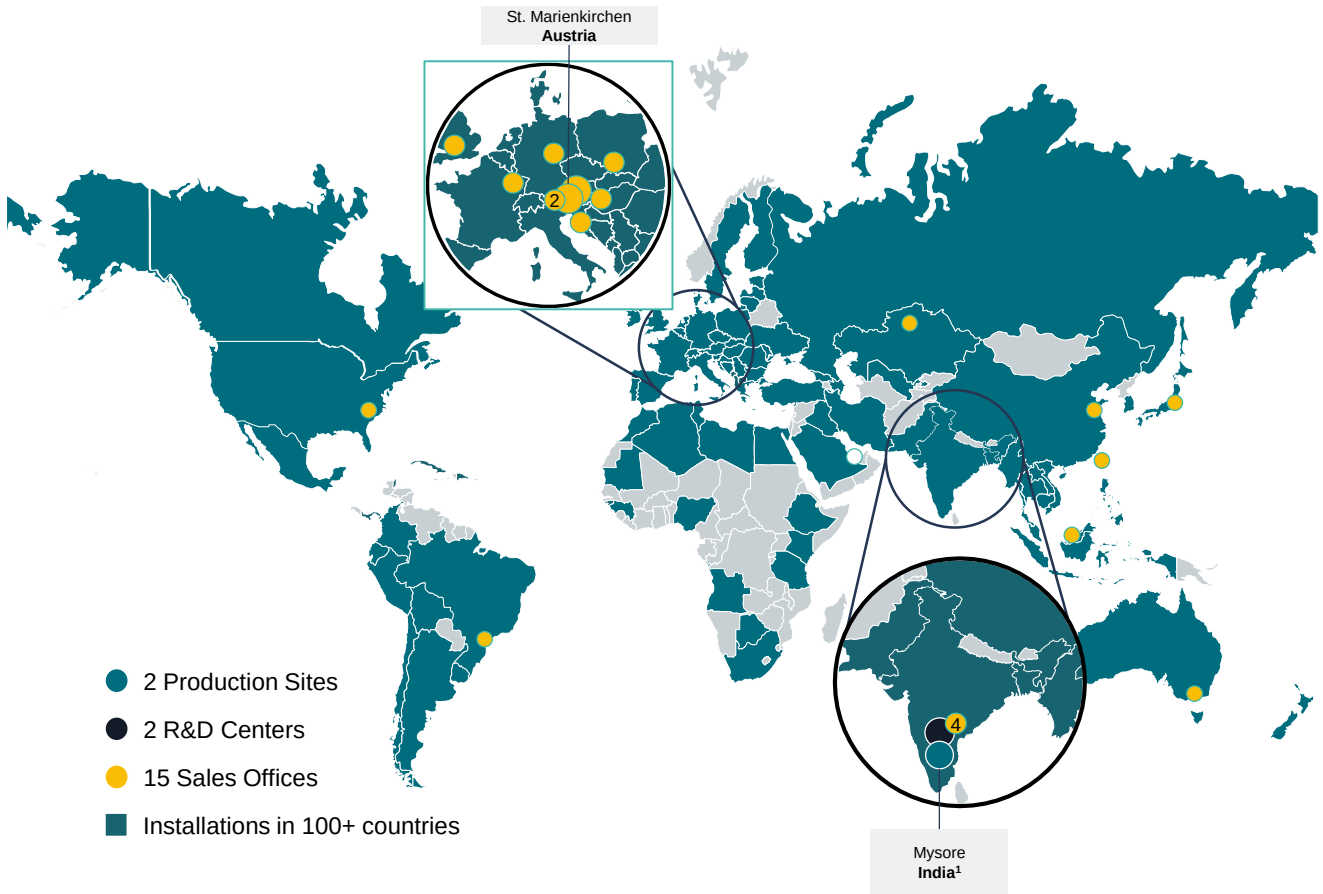
We offer ideal solutions for individual market requirements. This flexibility has been proven more than a 100 times worldwide.

15
Locations

As ‘Your partner for confidence’, our railway experts provide on-site personal service with minimal response time in the local language.

600
Frauscher Employees

More than 600 employees contribute their combined commitment, expertise and decades of experience to our portfolio. Based on a strong supply chain, we guarantee the shortest delivery times and the highest quality.



Signalling System

Station

AXLE COUNTERS

FAdC®

Motion

Diagnostics

WHEEL SENSORS

FRAUSCHER INSIGHTS

POINT CONTROL

FAdT

Station B

DATA TRANSMISSION

Station A

FAdT

vital

non-vital

Frauscher Connect

SERVICES

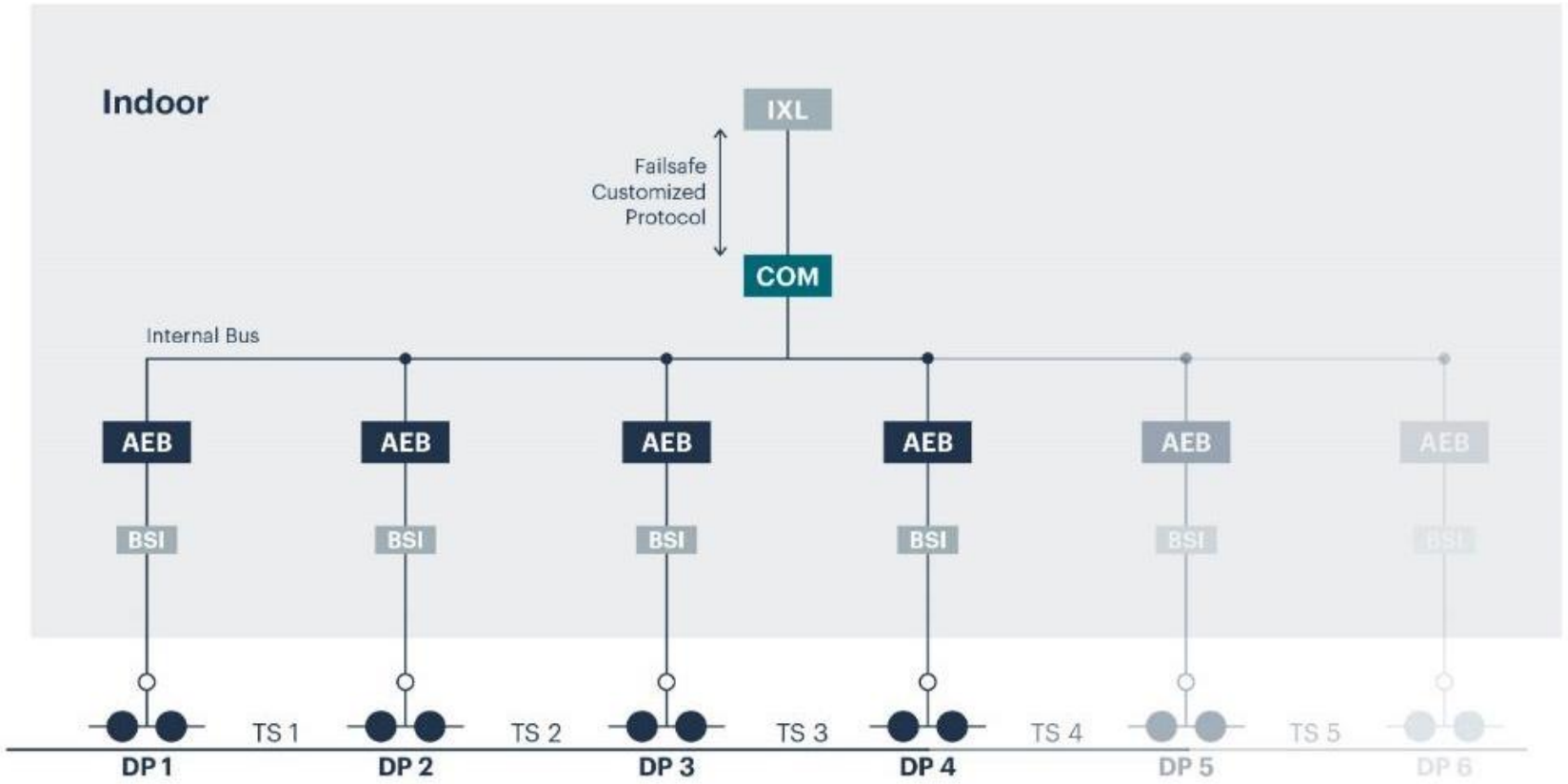
Frauscher Academy

Life Cycle Services

Reliable Train Detection

Pioneer
in wheel detection and axle counting.

Principle of Axle Counting



- Clear/occupied information
- Diagnostics/Statistics
- Number of counted axles
- Further customized information

Abbreviation

IXL	Interlocking
COM	Communication Board
AEB	Evaluation Board
BSI	Overvoltage protection board
TS	Track Section
DP	Wheel Sensor

Applications & Railway Segments

— CONFIDENCE IN ALL AREAS

Track Vacancy Detection
SIL 4 and Non SIL

Switch Point Protection
Fail-safe solution to either allow or block the operation of the switch point machine.

Level Crossing Protection
Maximum flexibility in configuration and customisation to meet the different security regulations and laws in each country.

CBTC Fallback System
Frauscher solutions offer the benefits of high reliability and minimal maintenance requirements as an important part of secondary systems.

Triggering of Systems
Efficient asset management provided by accurately detecting axles, speed, direction, and wheel positioning – improving overall railroad operations.

Main Lines
High Speed Lines, Regional Lines, Conventional Lines, …

Urban & Mass Transit
Metro Lines,
Tram Lines, …

Industrial
Freight Lines, Mining,
Plants, …

Wheel Sensors

— FLEXIBLE AND HIGHLY AVAILABLE WHEEL DETECTION

Presence, direction, speed, wheel diameter: Frauscher wheel sensors reliably collect safe information up to SIL 4 and further output that supports operations. Their maximum availability is the result of their robust design, high-quality components and extremely reliable technology.

Wheel Sensor RSR123

Wheel Sensor RSR180

Wheel Sensor RSR110

Wheel Sensor RSR360

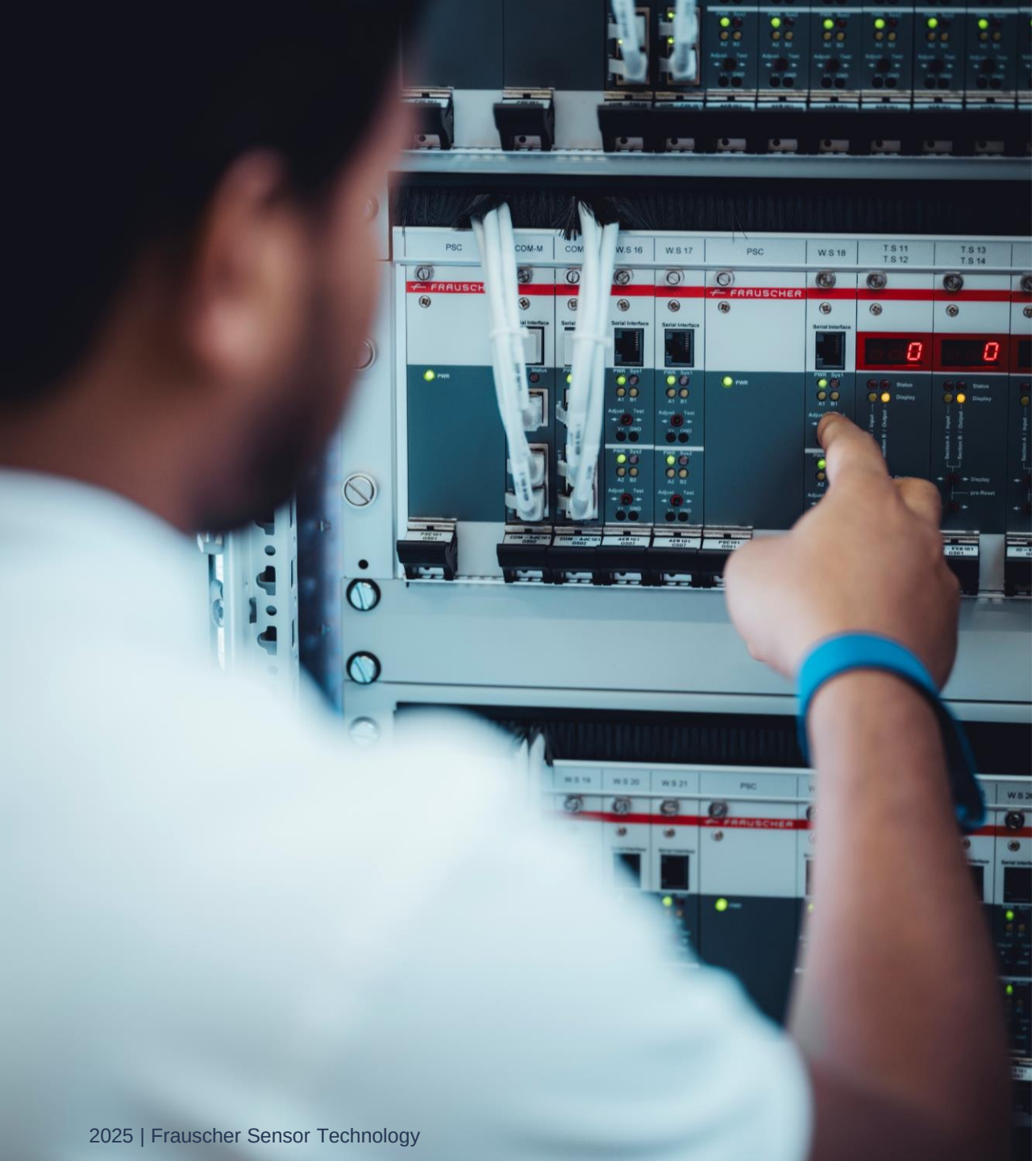
Axle Counters

— FUTURE-PROOF AXLE COUNTING SYSTEMS FOR RAILWAY OPERATIONS

Highly available, flexible and scalable: Frauscher axle counting systems combine reliable wheel sensors and innovative evaluation boards with a range of interfaces. This enables railway operators and system integrators to implement cost-effective track vacancy detection systems for solutions tailored to their needs.

Frauscher Advanced Counter FAdC®

Frauscher Track Vacancy System FTVS



Frauscher Advanced Counter FAdC®

- SIL 4 axle counting
- Transmission of up to 40 track sections
- Cyber security capabilities up to SL3
- Counting Head Control CHC
- Supervisor Track Section STS
- Open software configuration
- Multiple reset options
- Extended diagnostic options

FAdC®

Information

- Clear-occupied indication (SIL 4)
- Traversing direction (SIL 4)
- Wheel detection (SIL 4)
- Vital traversing speed
- Vital number of axles
- Wheel diameter
- Wheel center pulse
- Diagnostic data

Applications

- Track vacancy detection
- Level crossings
- Fallback for CBTC
- Switch point protection
- Automatic switching at sidings
- Yard applications

Benefits

- Wide-ranging portfolio for an optimum combination
- Customer-specific adaptation options
- Flexible architecture
- No active electronics on the track
- High availability, robust and flexible
- Simple mounting and commissioning
- Simple and flexible configuration
- Low life-cycle costs
- Low maintenance
- Extensive diagnostic options
- Various interfaces

Supervisor Track Section STS

Without integration into IXL for short term disturbances such as

- Lightning strikes
- Influences on cable system

With integration into IXL for permanent disturbances

- Especially for highly frequented lines or high speed lines.
- The supervisor section is used for evaluation in the IXL (instead of two track sections in error)

Counting Head Control CHC

Applications

- Trolley Suppression
- Track maintenance vehicles
- Tram applications

Interface

Serial Interface

- Frauscher Safe Ethernet FSE
- Customer-specific protocol

  - Clear/occupied
  - Direction
  - IO-data
  - Reset
  - Diagnostic data
  - Speed, Wheel Diameter
  - Number of axles in a section

Hardware Interface

- Relais
  - Clear/occupied
- Optocoupler
  - Direction
  - Reset

Reliable axle counting for trams

- FAdC® as leading axle counting solution for tram application
- Patented rail claw SK420 for grooved rails
- Counting Head Control CHC:
  - Trolley Suppression
  - Track maintenance vehicles

→ Suppression of unwanted disturbances

→ Increased availability

SK420

Reliable axle counting for trams

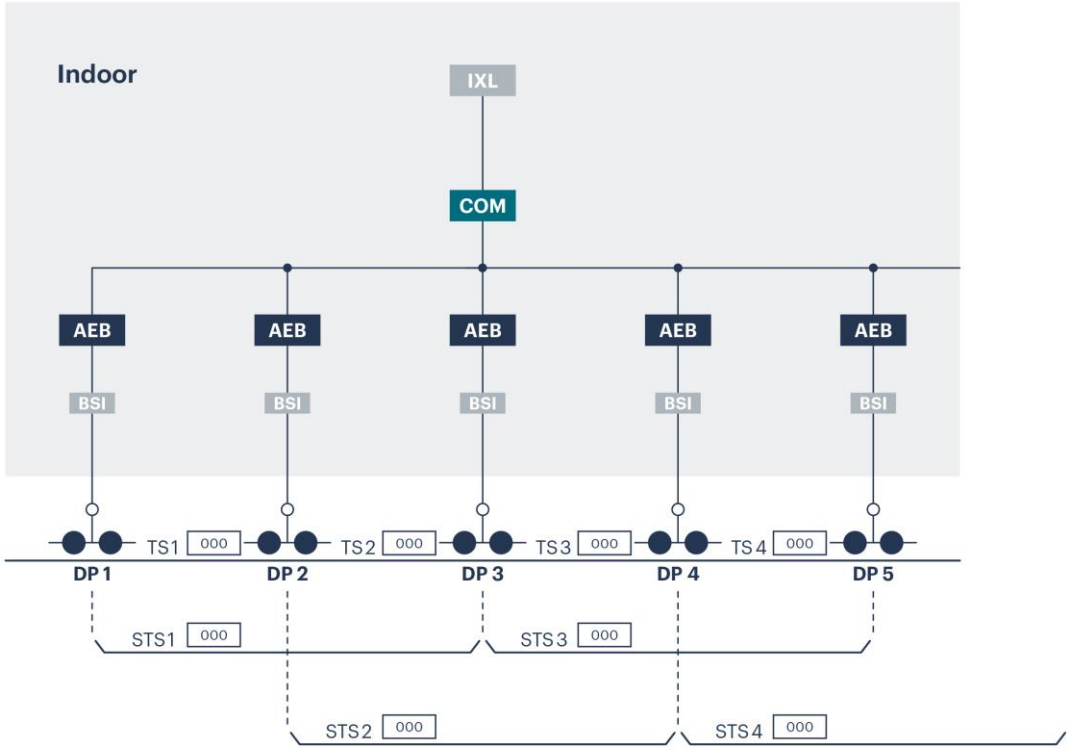
— INTELLIGENT SIL4 FUNCTIONS

Counting Head Control CHC

- Avoidance of counting errors and fault messages due to interference from external factors
- Examples: Road traffic, metal objects, debris on track surfaces

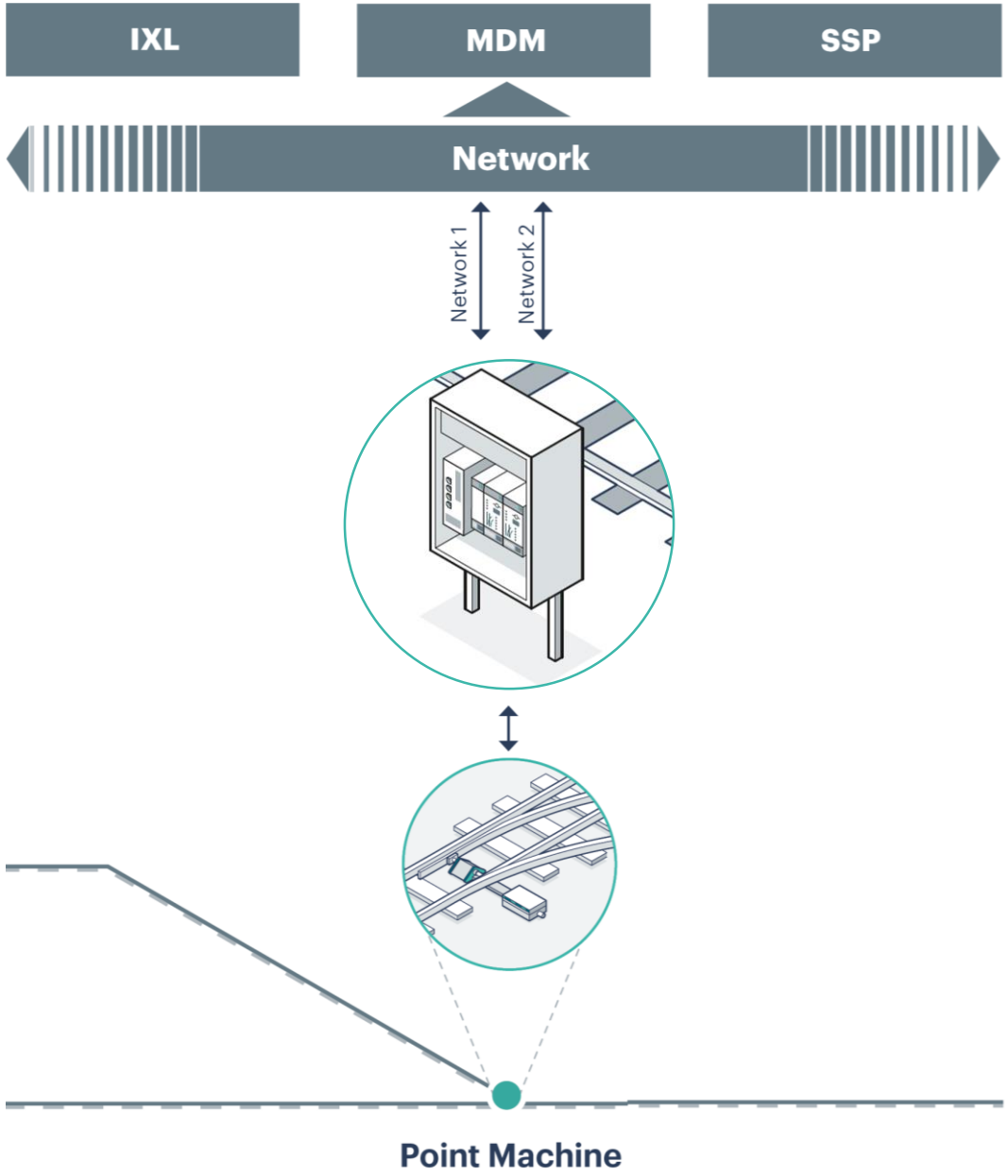
Supervisor Track Sections STS

- Automated fault correction process which enables the system to automatically reset itself without manual intervention
- Working principle based on overlaying track sections



Supervisor Track Section STS

Frauscher Point Control System



Frauscher Point Control System

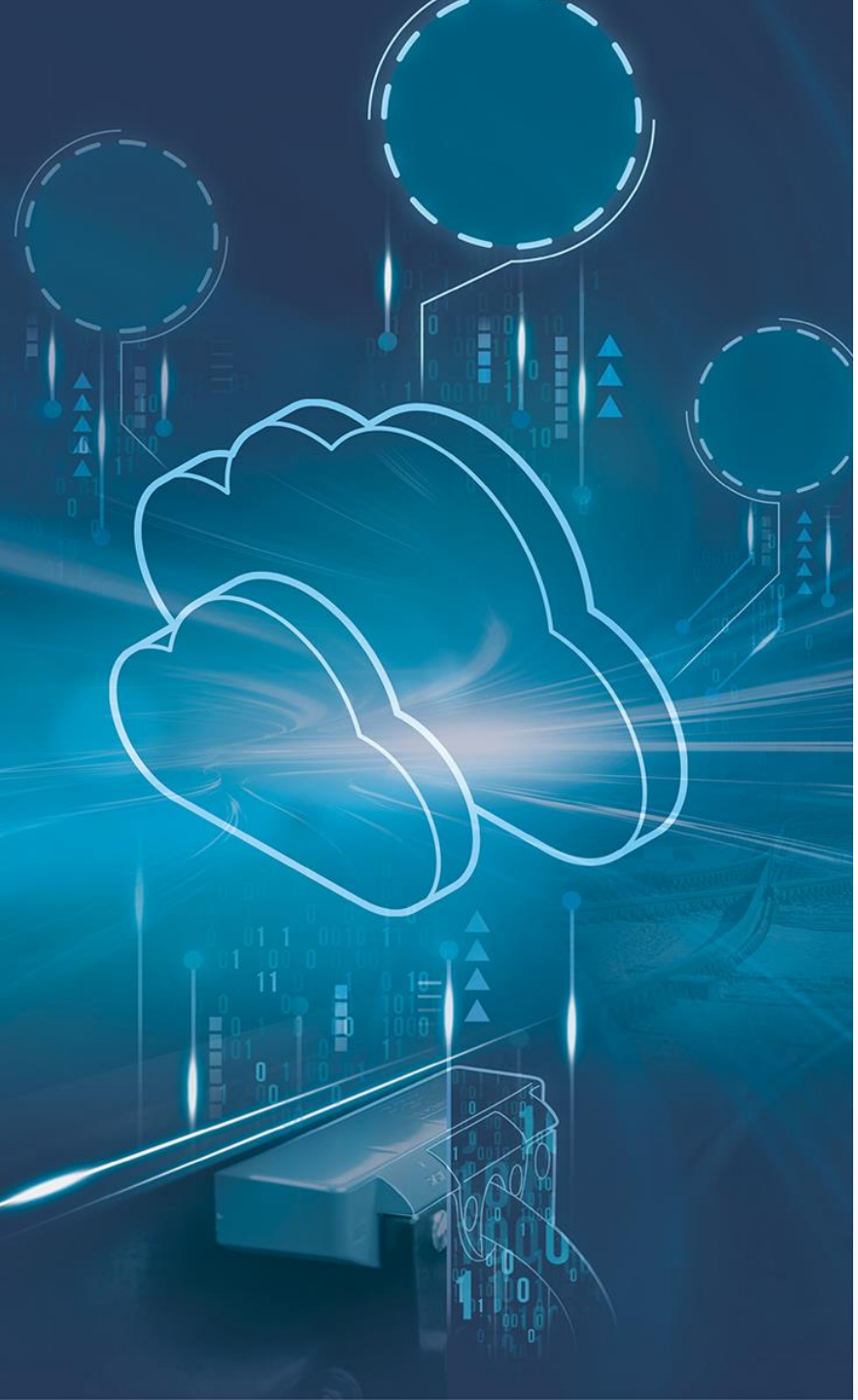
- Wayside Object Controller for safe and reliable control, monitoring, and maintenance of turnouts
- Compliance with EULYNX reference architecture
- Secure communication via open networks

Point Control System

— FEATURES

- **SIL 4** control and monitoring of turnouts
- Execution of **interlocking commands**
- Digital, safe and secure connection to interlocking via **open network**
- Real time **monitoring and reporting** of point status (position) to the interlocking
- Collection and transmission of **diagnostic and condition monitoring data**

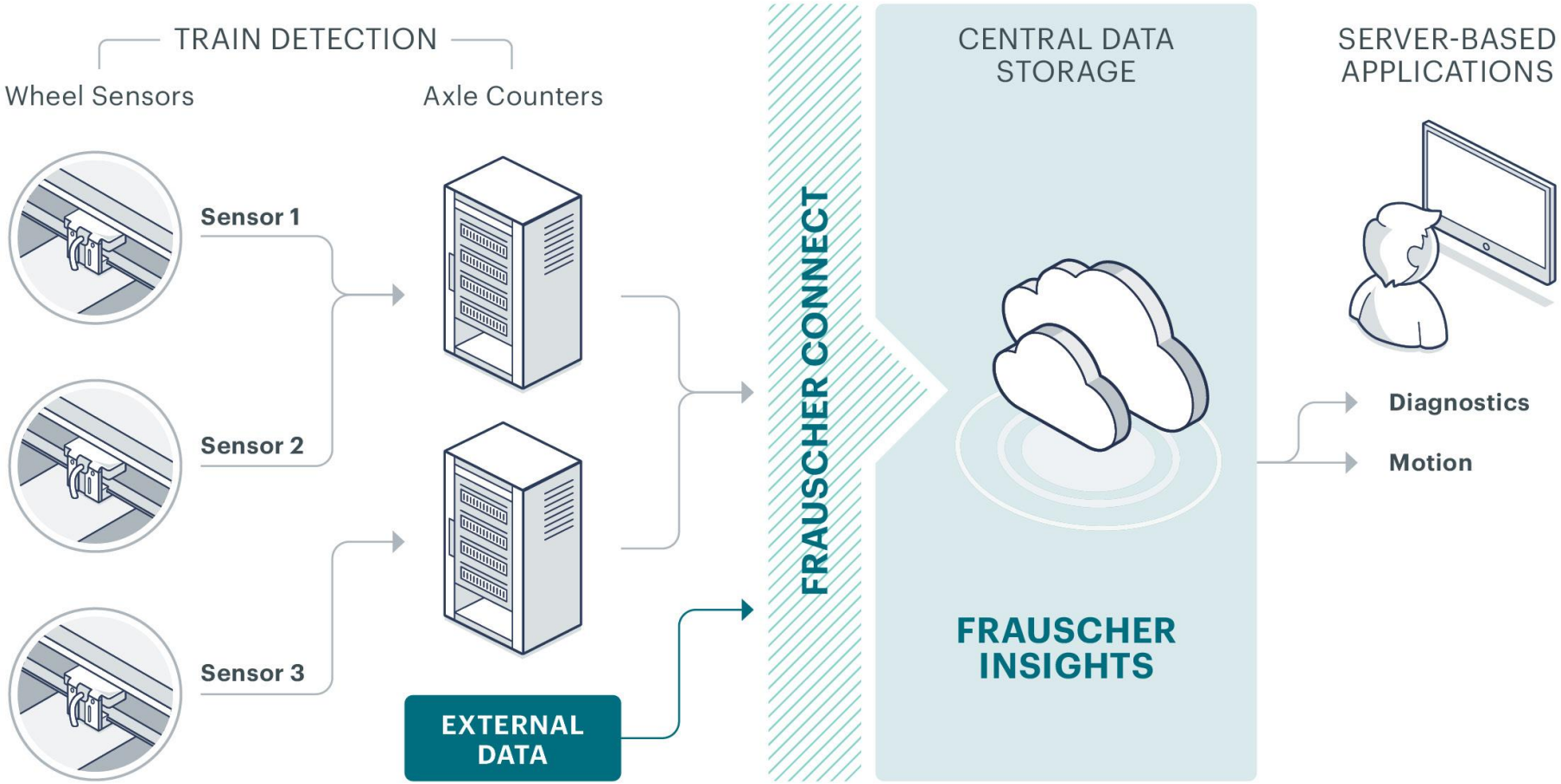
Frauscher Insights



Data platform for diagnostics and maintenance of Frauscher solutions

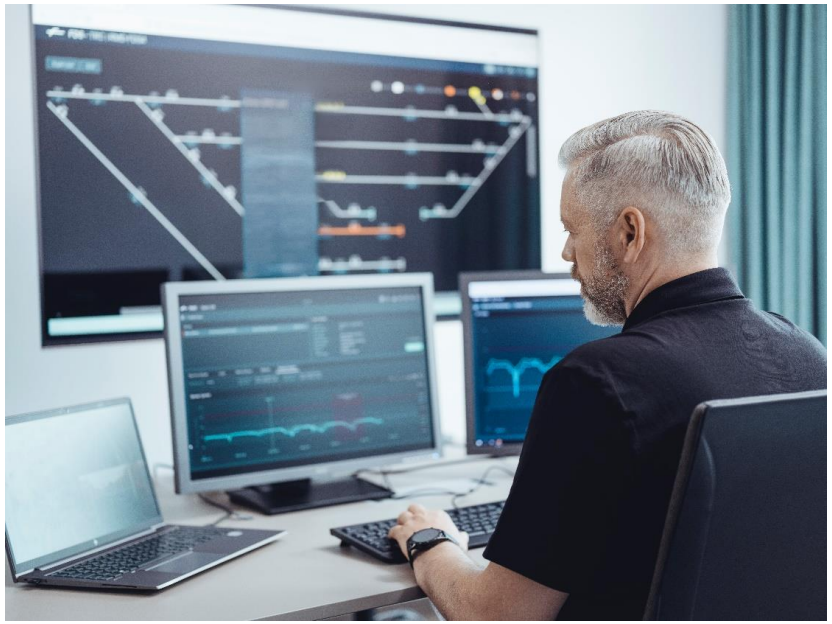
Frauscher Insights

— THE SOLUTION FOR INTELLIGENT RAILWAY OPERATIONS



Frauscher Insights

— APPLICATIONS OVERVIEW



Diagnostics
Effortless access to data,
alerts when it matters

Motion
Efficient coordination of field
service assignments

Application Diagnostics

— DASHBOARD OVERVIEW

Overview of affected elements, errors and warning

Time trends: Errors, warnings, resets,...

Track plan with view of all elements

Application Diagnostics

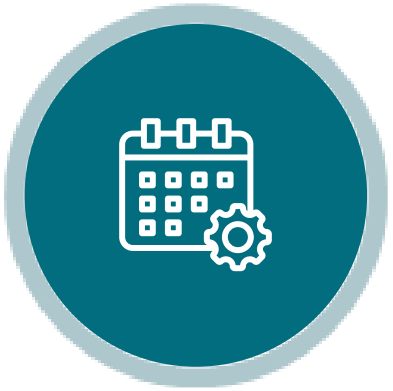
— ALL DATA AT A GLANCE

- Higher-ranking diagnostic system
- Main features:
  - System overview via dashboard
  - Logging and messages in in the event of errors and warnings
  - Integrated interactive track plan
  - Element overview
  - Monitoring of wheel sensor status
  - Identification of affected elements

Use Cases

— FRAUSCHER INSIGHTS DIAGNOSTICS

Remote Troubleshooting

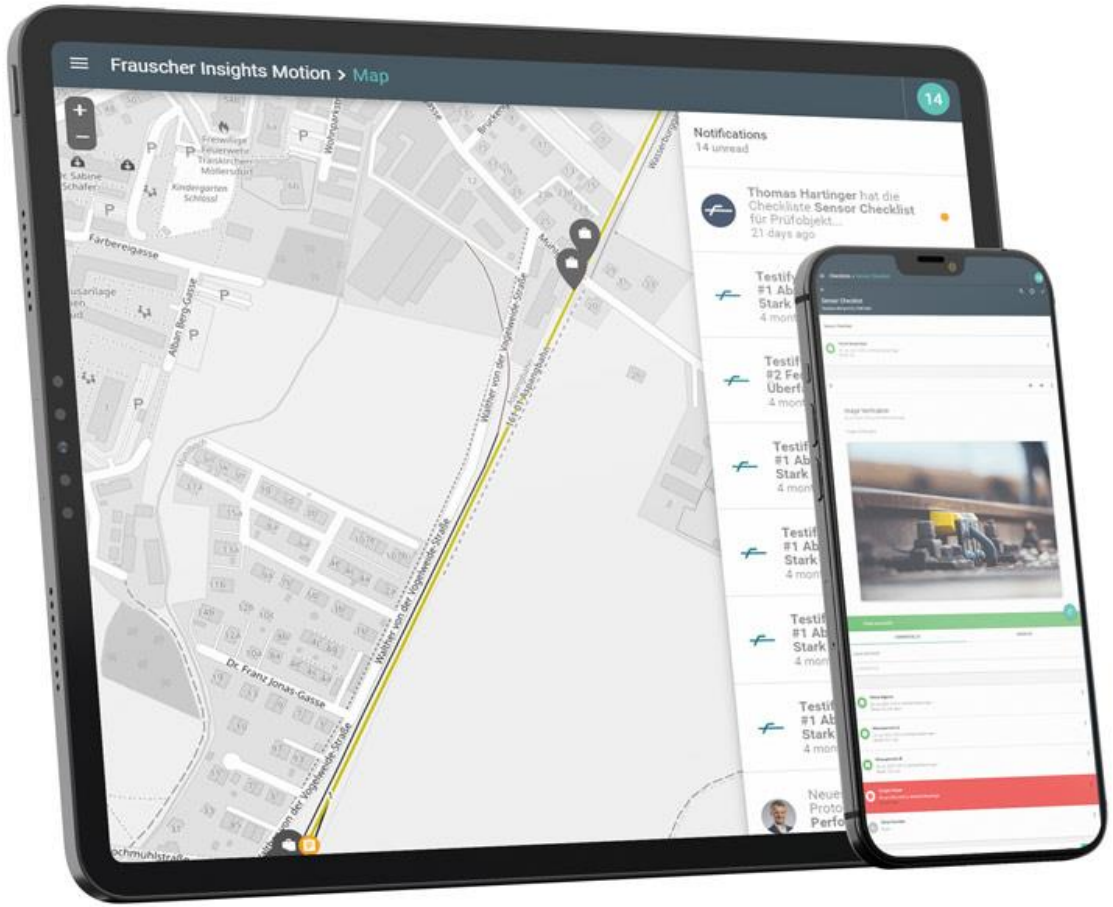


Proactive maintenance and servicing

Causal and historical analysis

Application Motion

— USE CASES



Digital documentation of planned maintenance work

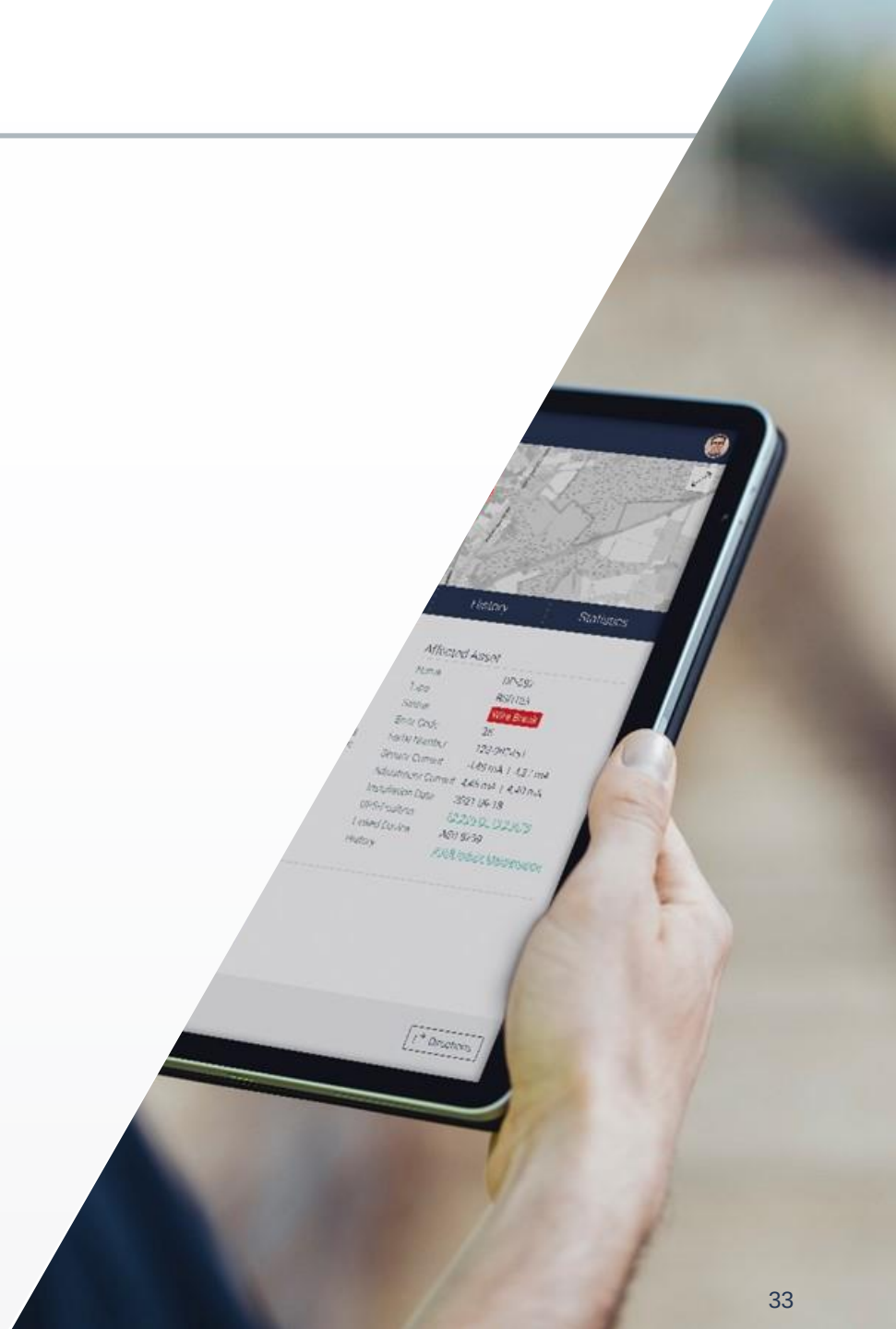
Repair and Troubleshooting

Installation and Commissioning

Application Motion

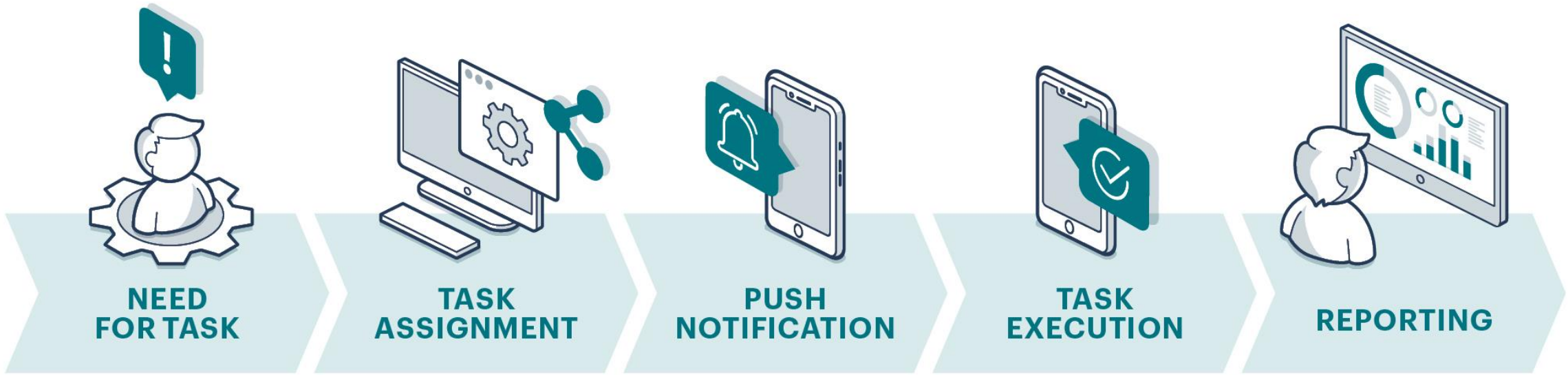
— EFFICIENT TASK MANAGEMENT

- Application for a completely digital process for coordination of field service operations
- Streamlining of tasks and field operations for dispatchers, team leads and field technicians
- Clear communication
- Eliminiation of queries and searches



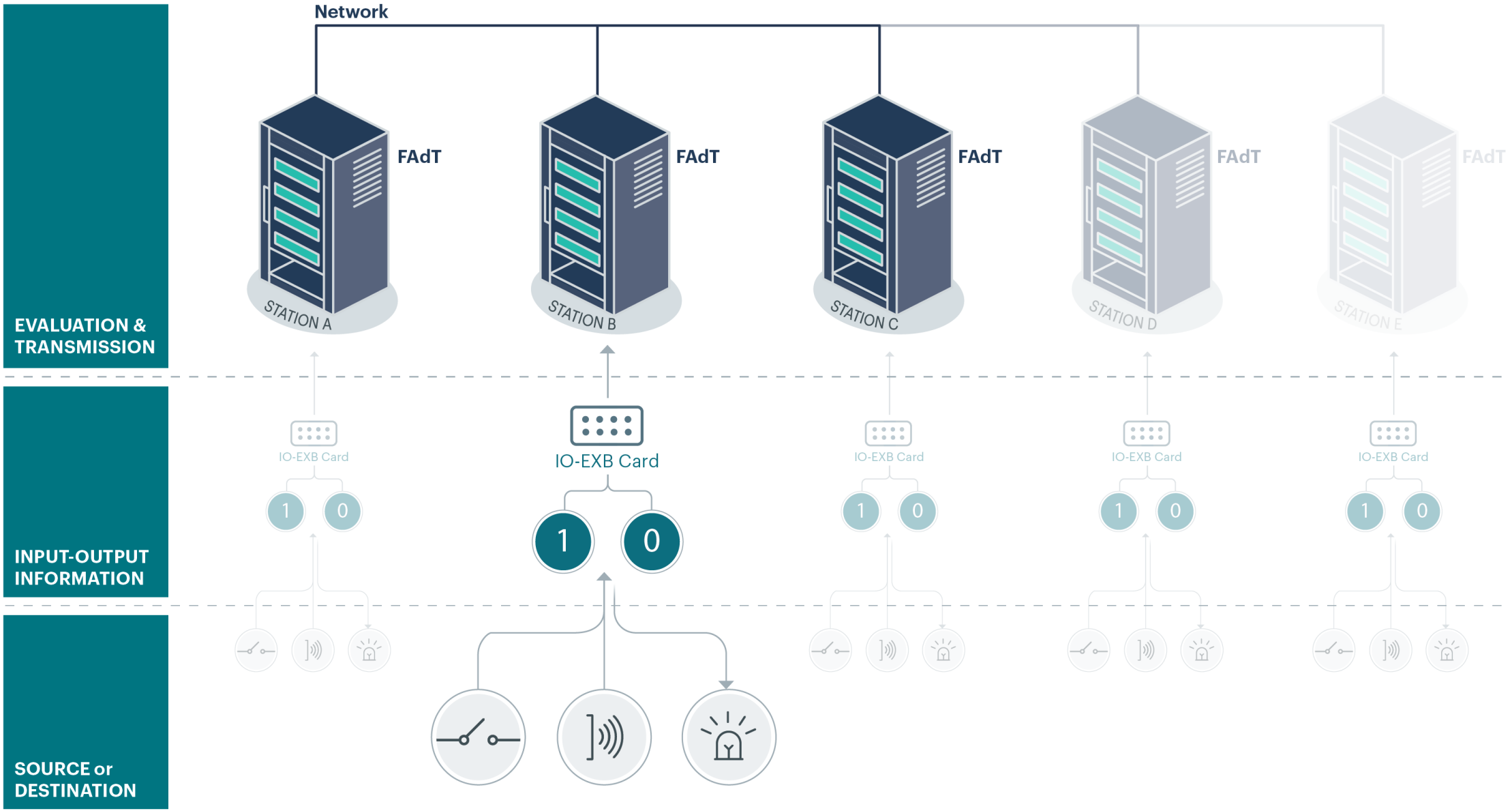
Application Motion

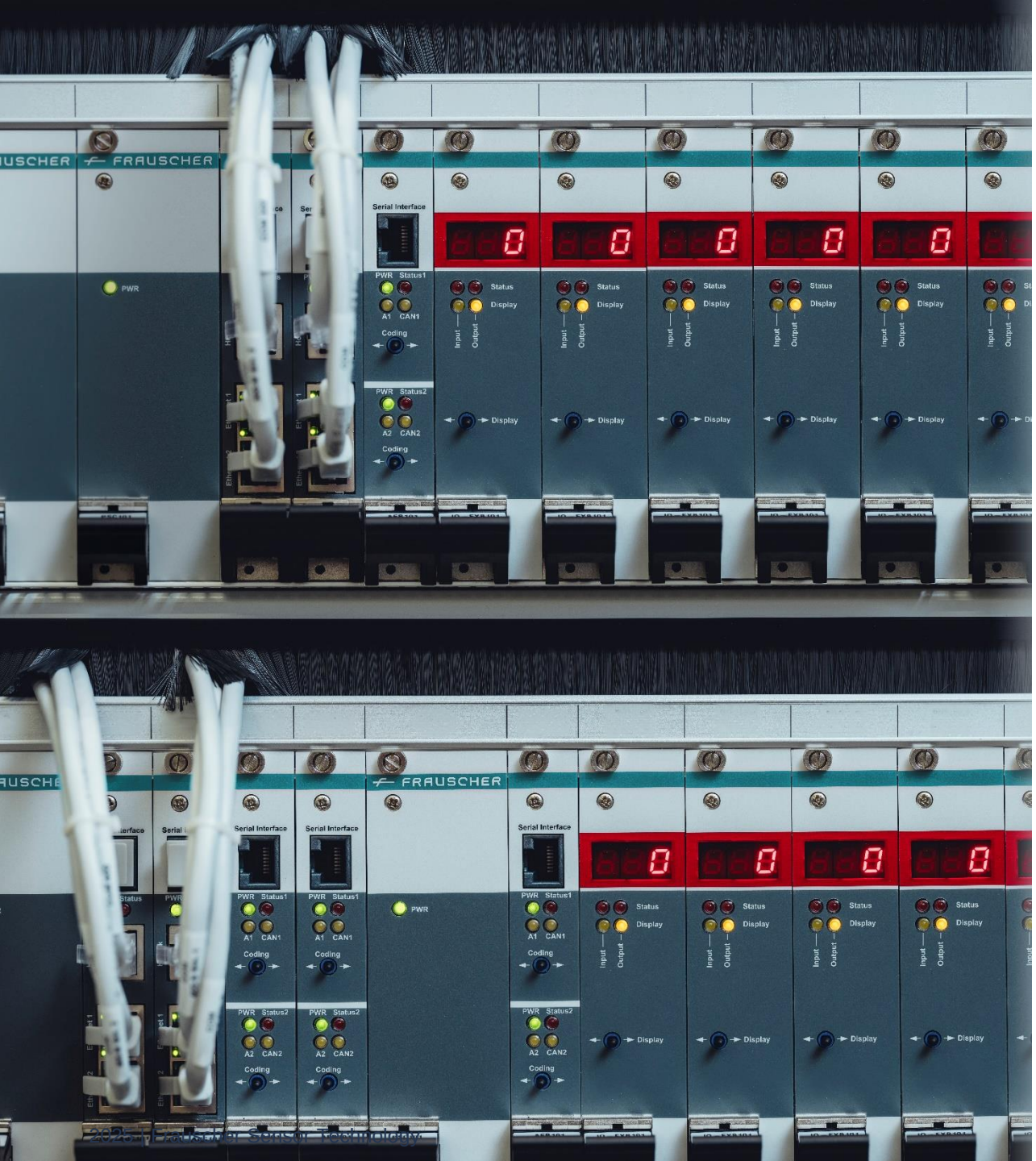
— PROCESS TASK ASSIGNMENT



Data Transmission

Distribution of Input-Output data for vital and non-vital railway solutions


EVALUATION & TRANSMISSION
INPUT-OUTPUT INFORMATION
SOURCE or DESTINATION
Network
FAdT
FAdT
FAdT
FAdT
FAdT
STATION A
STATION B
STATION C
STATION D
STATION E
IO-EXB Card
IO-EXB Card
IO-EXB Card
IO-EXB Card
IO-EXB Card
1
0
1
0
1
0
1
0
1
0



Frauscher Advanced Data Transmission FAdT

- Integration of IO-EXB card
- Connection of any IO-devices without limitation to specific components
- Data exchange between stations or stations and higher-ranking systems
- Integration into new and existing infrastructure
- Applicable for applications up to SIL 4

Data Transmission – Vital Information

— SAFETY CRITICAL APPLICATIONS (SIL4)

- Status of signal
- Point Position
- Level Crossing Barrier Position
- Track Occupancy information
- Relay status

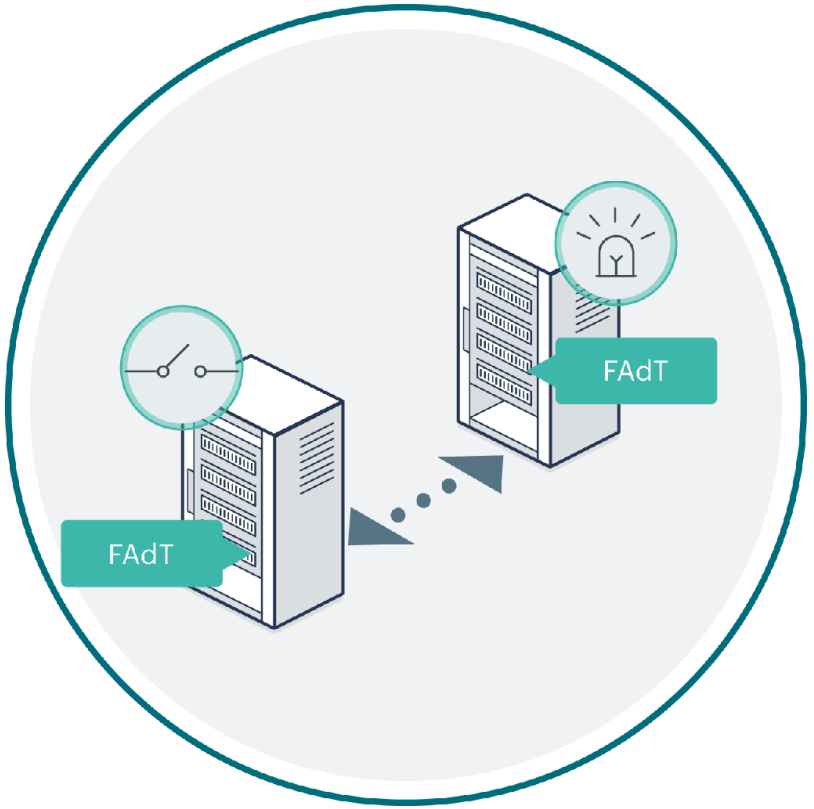
Data Transmission – Non-Vital Information

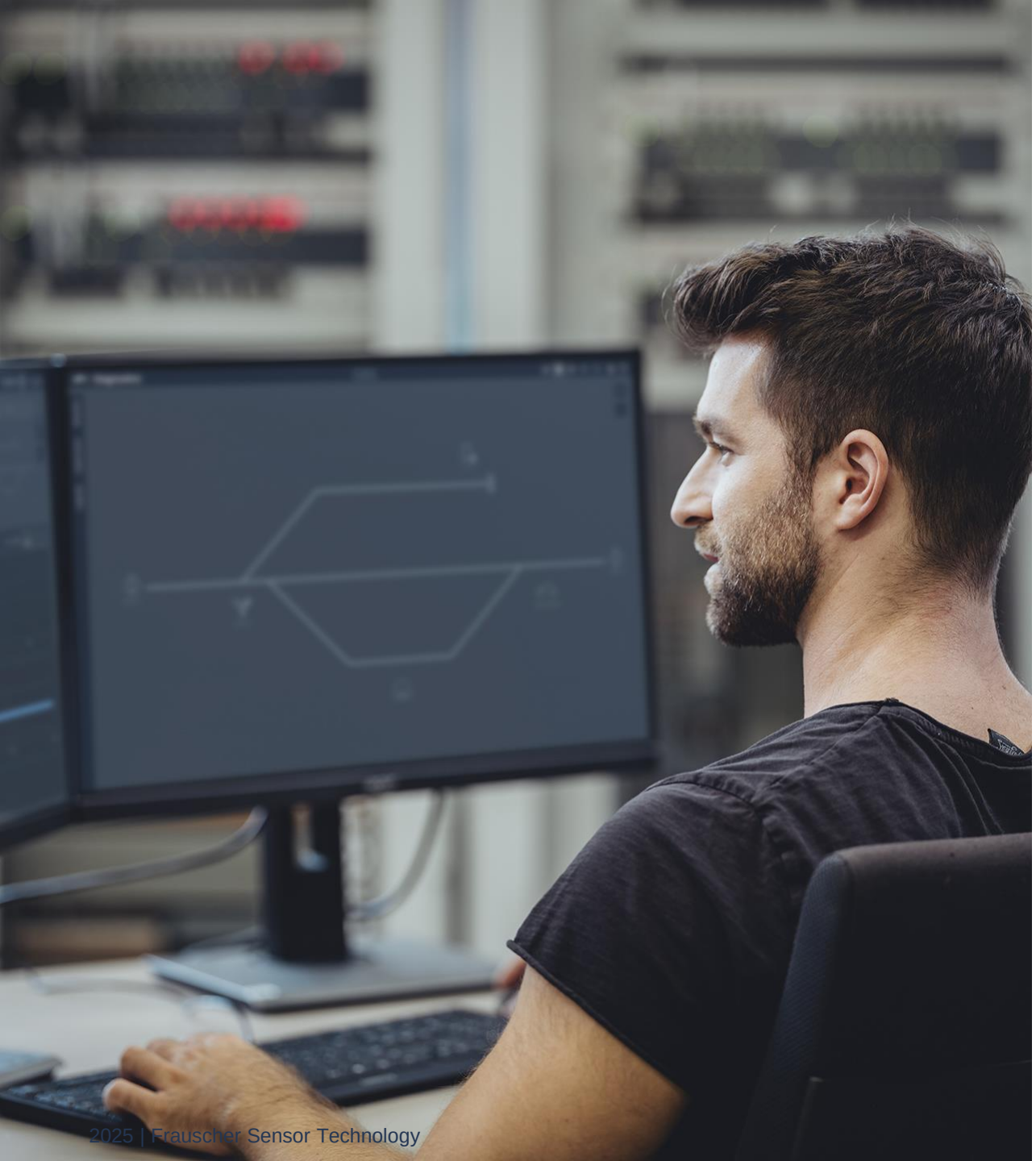
— NON SAFETY CRITICAL APPLICATIONS

- Status of power supply
- Signalling gear information
- Equipment room auxiliary information
- Temperature alarms
- Door alarms

Use Cases

- Transmission of CCTV level crossing controls and indications
- Signal controls
- Signal proving
- Auto block signalling
- Intermediate block signalling
- Existing station alteration with data transmission without much additional hardware of EI





Comprehensive diagnostic and monitoring options

- Integration of advanced data analysis and visualisation options
- Utilisation of cloud-based platform **Frauscher Insights**
- Time-based visualisation and status-overview of IO’s for easy monitoring and analysis
- Real-time status notifications for immediate responsiveness
- Alerts and warnings for potential errors

Input/Output Board IO-EXBt

— FADT COMPONENTS

Generic IO Board configurable for SIL 1 – SIL 4 applications

Configurable for up to 3 SIL 4 or 12 SIL 1 signals

Reads input and outputs failsafe or non-failsafe digital arguments

Usage in combination with AEBt

Advanced Evaluation Board AEBt

— FADT COMPONENTS

- IO controller capable up to 8 inputs or outputs
- Contains the configuration of the IO-EXBt
- 1 AEBt can trigger up to 8 IO-EXBt boards and can handle up to 24 inputs and outputs
- Serial interface connection socket

Communication board COMt

— FADT COMPONENTS

Safe communication and internal configuration server

Forwarding of data via network, design for redundancy possible

Exchange of vital information via FSE protocol

Power Supply with Crowbar PSCt

— FADT COMPONENTS

Protection of internal power supply from overvoltage, overcurrent and external disturbances

Status indication via PWR (LED)

Redundancy possible

Benefits

- Applicable from SIL1 to SIL4
- Simple and flexible configuration
- Reduced cabling
- Highly available, robust and flexible
- Low life cycle and maintenance costs
- \+ Comprehensive diagnostic and monitoring options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