



TÜV NORD GROUP

Brief Introduction & Railway Services

Safety Features for High-Speed (HS) – Systems

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TÜV NORD GROUP

Excellence for your Business

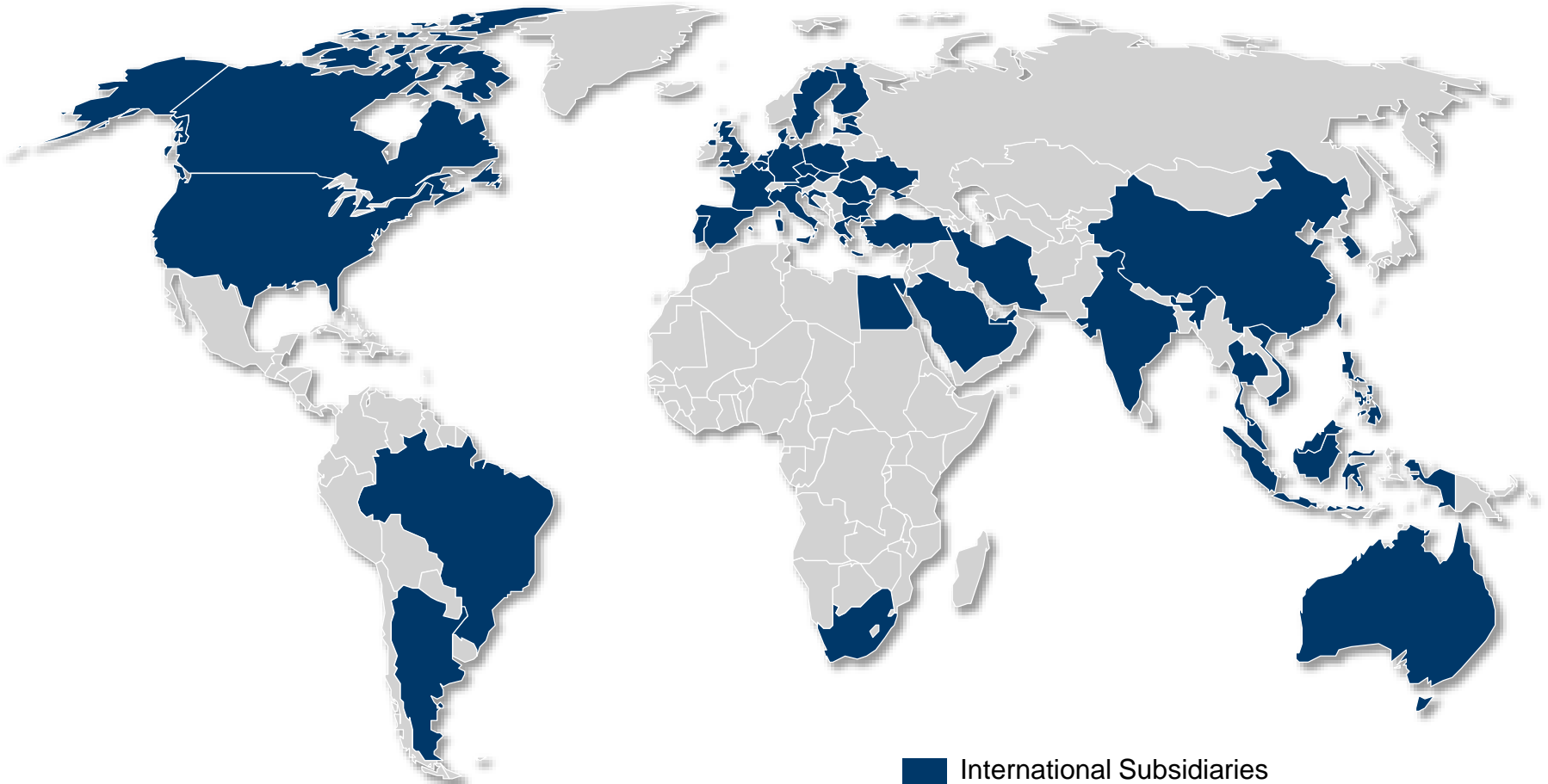
AT TÜV NORD GROUP, SERVICE AND RESPONSIBILITY HAVE MORE THAN 10,000 FACES

- A leading international technology service provider
- Focus: people, technology, the environment and material assets
- Safety experts and technology consultants
- Unique in the sector – with business units Natural Resources and Aerospace
- Corporate philosophy based on independence and integrity
- Motto: Excellence for your Business



TÜV NORD GROUP: WORLDWIDE ACTIVITIES

- Operating in 70 countries with 150 group companies





TÜV NORD RAILWAY TECHNOLOGY

SAFETY FEATURES FOR HIGH SPEED LINES AND HIGH SPEED SYSTEMS

FOR HIGH SPEED SYSTEMS BE SURE TO HAVE

a reliable track



safe crossings



comprehensive signaling



and functionally safe AC systems



SAFETY ASPECTS IN HIGH SPEED SYSTEMS



Infrastructure

Railway stations, platforms
Track construction
Level crossings
Safety in Railway Tunnels (SRT)
Fire Safety in Stations
Catenary



Vehicle

Mechanics (structure)
Functional safety
Fire Safety
Human Factors
(driver, vigilance device)
Operational Safety
Reliability, Availability,
Maintainability and Safety
analysis (RAMS)



Operation / Signaling

Control, command and signaling
(CCS)
Automatic train protection (ATP)
Automatic train operation (ATO)
Independent Verification &
Validation (IV&V)
Independent Safety Assessment
(ISA)

IEC EN Standards, IEEE, TSI, UIC, CSM, CENELEC / ECM / IRIS / ISO



Infrastructure Safety Features (1)

- **Catenary**
 - Tensioning of catenary, dynamic behaviour
 - Precision of geometry of overhead line, contact forces
- **Power supply**
 - Installation
 - Protecting earthings
 - Reliability parameters
 - Harmonics control / compensation
 - Transient control
 - Electric arc protection
 - Overvoltage protection
 - Continuity of power supply





Infrastructure Safety Features (2)

■ Infrastructure

- Safety in railway tunnels (SRT)
 - Fire protection and evacuation concepts
- Safety of stations and platforms
 - Fire safety and evacuation
 - Access control
- Safety of track components as well of track construction and superstructure
 - Concrete sleepers, rail fasteningsystems
- Safety of bridge constructions, stability
- Safety of employees with regard to the protection of health at maintenance and operations
- Stability of noise reduction wall





Safety features for high Speed Vehicles (1)

- **Mechanical solidness**
 - Crash heads

- **Running gauge**
 - Derailment sensors

- **Bogies / Wheelset**
 - Bearing sensors
 - Slip control

- **Brake system**
 - Dynamic brakes
 - Track brake
 - Slide control

- **Doors**
 - Closed door loop





Safety features for high Speed Vehicles (2)

- **Electric / electronic installations**
 - Diagnostic features
- **Functional Safety**
 - Computer controlled operation
- **Fire protection**
 - Automatic fire detection and fire fighting systems
- **Onboard control and command systems / trainguarding installations**
 - Dead man safety systems
 - Automatic train protection (ATP)
 - Automatic train operation (ATO)



Safety features for High Speed Line Operation and Control, Command and Signaling (CCS) (1)



- **Interlockings, Operational Control Center**
 - Safety interlocking
 - Access security to all safety relevant devices and buildings to avoid unauthorized access
 - Safety of cabling and communication systems
 - Permanent position detection of all vehicles
 - ...



Safety features for HS-line Operation and Control, Command and Signaling (CCS) (2)



- **Onboard Train Protection Systems**
 - Functional Safety of all onboard devices used for train control and radio (voice) and data communication
 - Driver machine interface, display, safety of information
 - Safe displaying of movement authorities
 - Safe data recording, juridical recording of all driving data
 - Vehicle specific integration of CCS-System
 - Reliability of odometry for safe operations
- **Trackside equipment**
 - Safe train detection systems like track circuits, axle counters
 - Realization of safety according to CENELEC Standards , ISA (independent safety assessment)
 - Safe operations of signals, point machines



High-Speed-Systems related Services of TÜV NORD



- **Testing**
 - Execution of independent verification and validation (IV&V)
- **Inspection**
 - Inspection according to CENELEC Standards
 - Inspection according to CSM-RA 402/2013
- **Certification**
 - Certification of systems, products, persons
 - Conformity of products and deliveries
- **Approval support**
- **Assessment of systems and components**
 - Independent safety assessment (ISA)
 - RAMS assessment
 - Functional safety assessment
- **Consulting / Coaching / Advisory**
 - Support during optimization of processes and workflows
- **Training**
 - Conducting of workshops





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