Railway safety control systems

Furrer+Frey®
Overhead contact lines

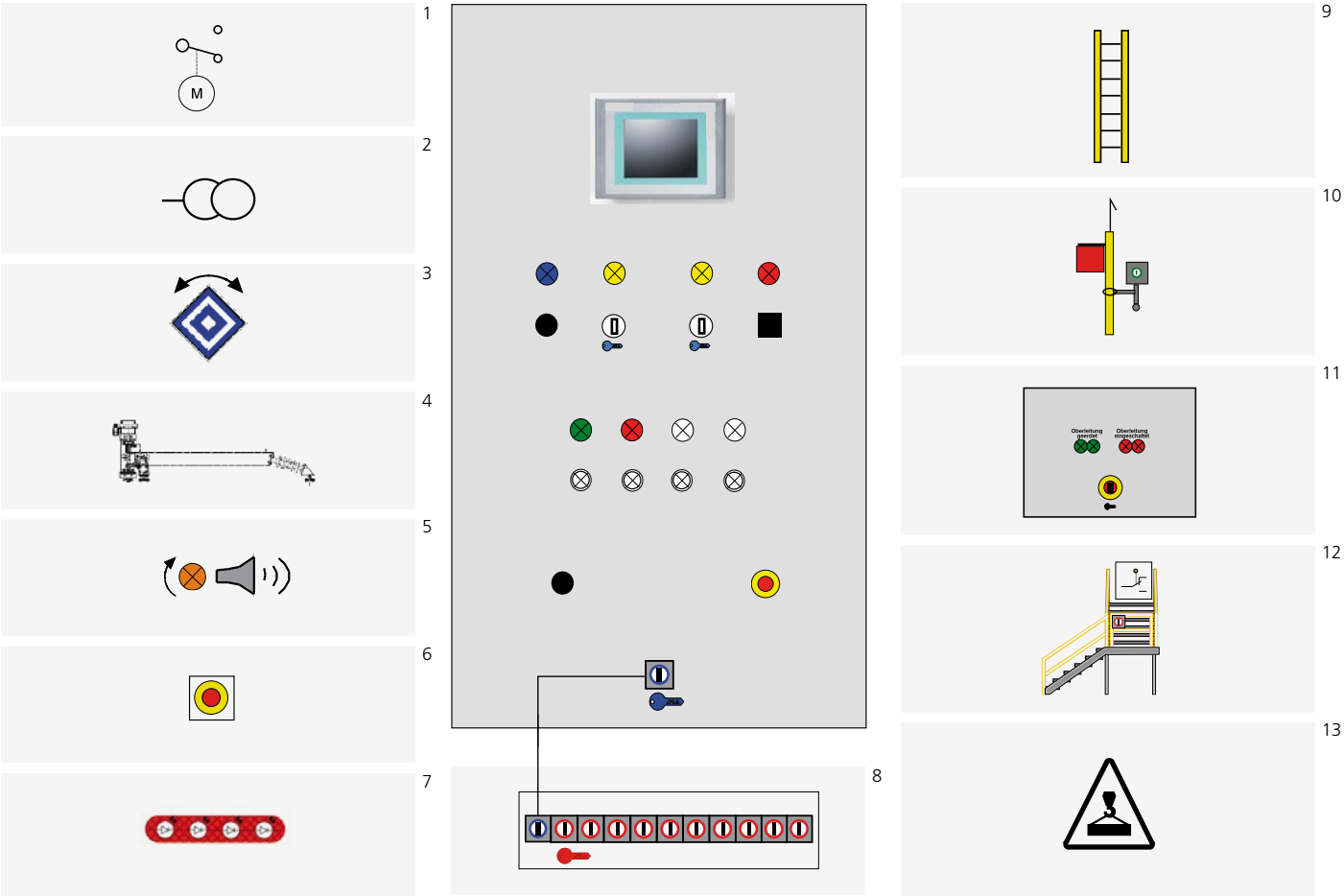
Railway safety control systems

Furrer+Frey mainly designs control systems for workshops and depots. The primary objective of the control systems is to ensure that work can be carried out safely on rail vehicles and enables free access to units located on top of the trains. The OHL is switched off and earthed. The control systems also contribute to more efficient working procedures and ensure that different system statuses are clearly indicated.

The control systems essentially consist of a main control cabinet and the control, signalling and monitoring components are connected to terminal blocks of the cabinet. The controls and displays for the system statuses are usually located on the front door of the control cabinet or on the various external operating panels. One or more keyswitches form the interface to the mechanical interlocking system **[8]** via which other aids, such as ladders **[9]**, are secured.

Essentially, the procedure is always the same. Once the overhead contact line has been switched off by the contact line switch **[1]** and the voltage transformer **[2]** has carried out a check, the contact line is earthed either by the earthing rod **[10]** or an automatic earthing switch. The status change is indicated by a signal to lower the pantograph **[3]** and possibly by a running light **[7]** as well. On systems equipped with a movable overhead conductor rail **[4]**, the rail is then moved by the control system to its parking position. Visual and acoustic signalling devices are normally employed to give advance warning that moving and switching procedures are about to take place. These same devices will also indicate emergency shutdowns initiated by emergency stop buttons **[6]** or even by fire service control units **[11]**. Safety electrical interfaces monitor doors to roof working platforms **[12]**; they also release or lock up cranes **[13]** and similar equipment.

Main control cabinet



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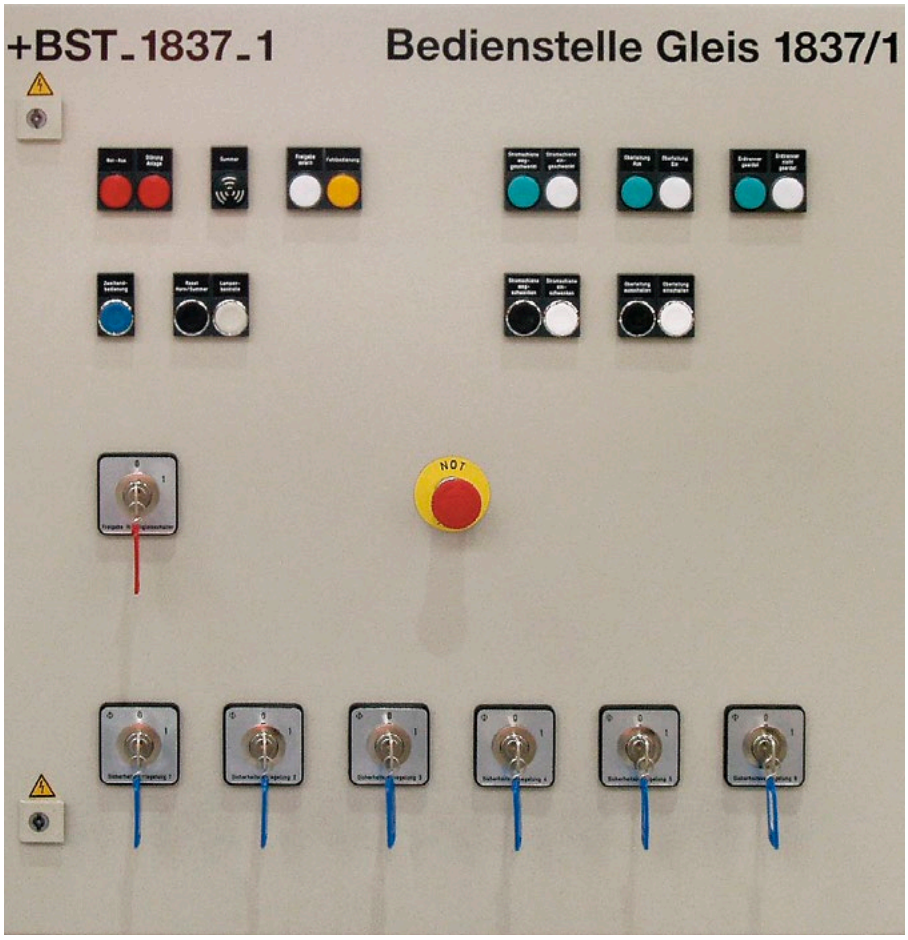

Control cabinet

The control cabinet accommodates all the components necessary to carry out activation, monitoring and display functions, plus additional equipment such as an UPS and isolated network transformers. Depending on the size or complexity of the system, the controls might be designed in relay technology or with programmable logic control (Plc). Indicator lights or even touch panels can be used to display system statuses. Of course, PLCs and touch panels offer great flexibility which is not the case with traditional designs. The operating panels can either be integrated into the main control cabinet or configured as external units.

[1] — *Main cabinet with integral operating panel*

[2] — *External operating panel with touch panel*

[3] — *Main control cabinet as a PLC solution with UPS*

[4] — *Visual display of the system status by a touch panel*

[5] — *External operating panel with keyswitches, operating buttons and indication lights*

[6] — *Main control cabinet with touch panel*

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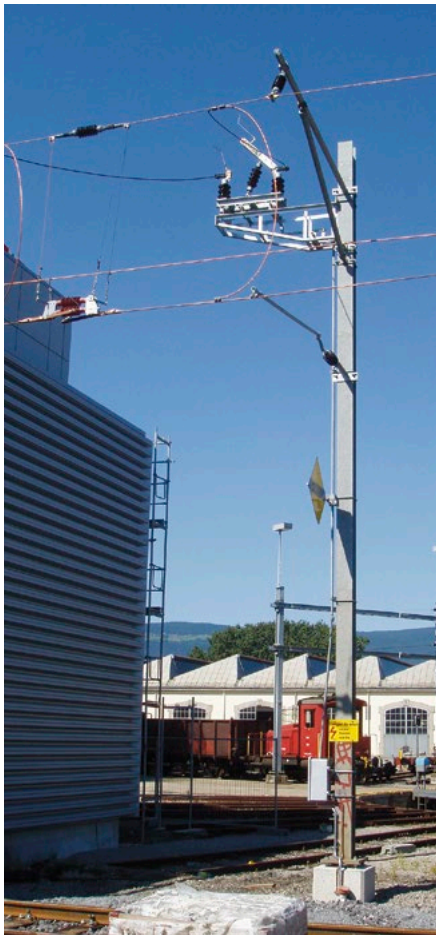
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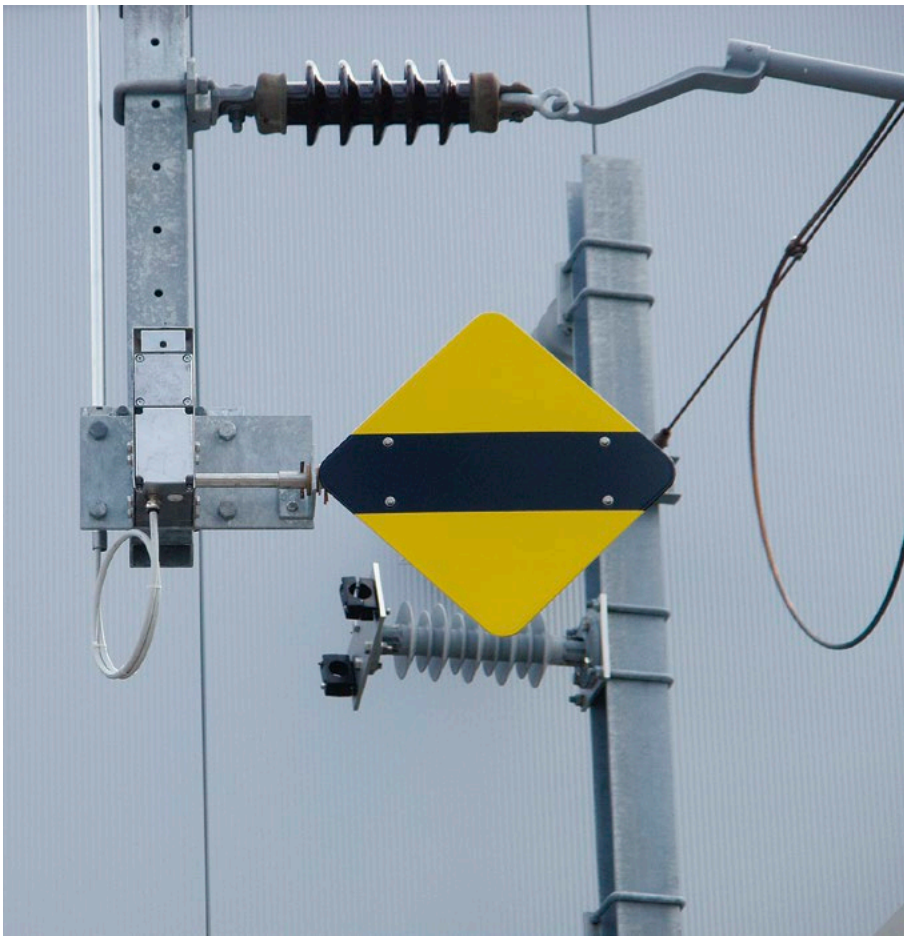
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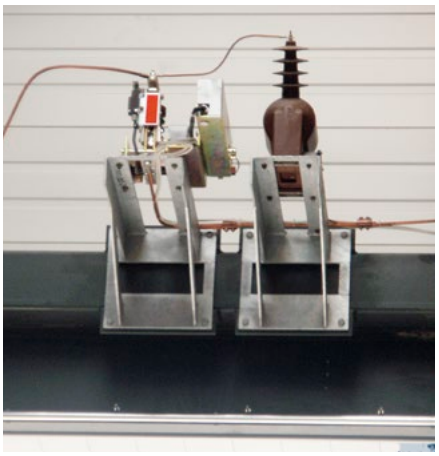
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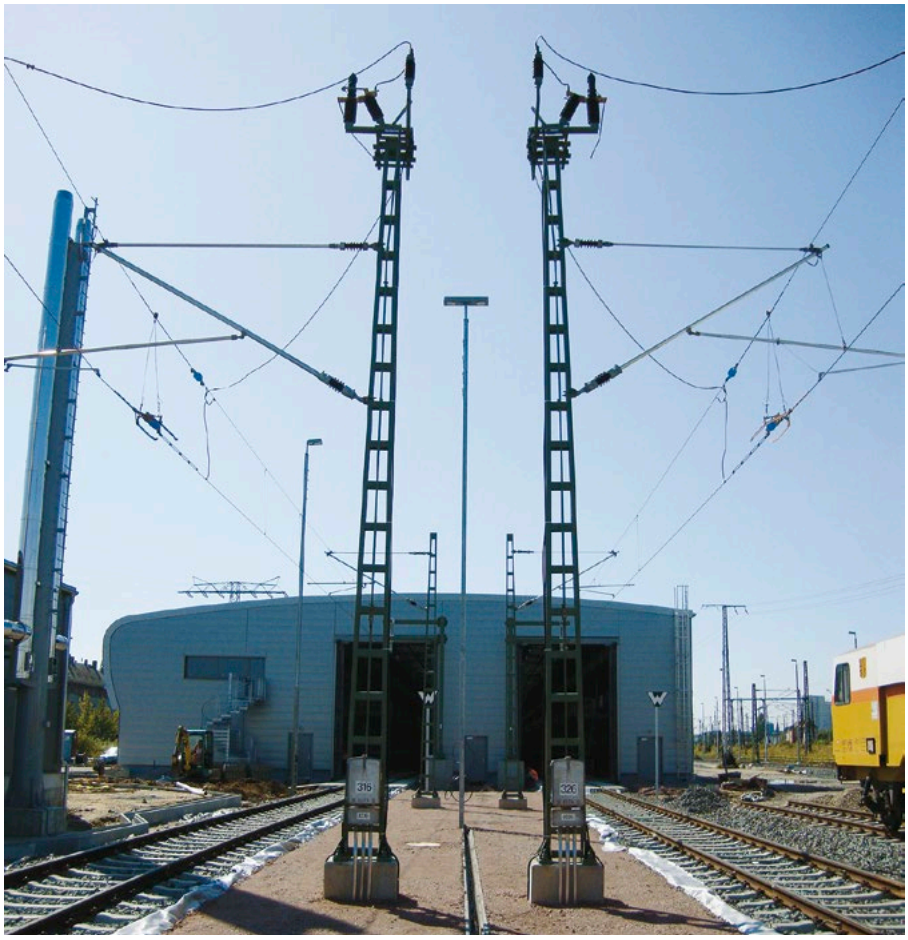

Components

Examples of some of the switching, protection and signalling components directly related to the overhead contact line system:

[1] — *Motorized contact line switch and mechanical signal to lower the pantograph*

[2] — *Indoor motorized contact line switch*

[3] — *Motorized signal to lower the pantograph*

[4] — *Indoor earthing switch with motor drive and voltage transformer*

[5] — *Contact line switch with earth contact and motor drive*

[6] — *LED technology EL6 signal*

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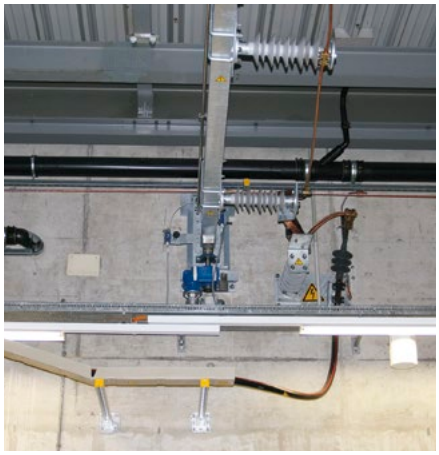
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Overhead conductor rail

Some illustrations of systems with fixed or movable overhead conductor rail:

[1] — *Power supply and connection point on movable overhead conductor rail*

[2] — *Movable overhead conductor rail above test track*

[3] — *Movable overhead conductor rail in the maintenance shop*

[4] — *Movable overhead conductor rail with power supply via electrical contact from the fixed element*

[5] — *Liftable overhead conductor rail at the entrance to enable crane moving*

[6] — *Movable overhead conductor rail above maintenance track*

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Signalling devices

Certain signalling devices such as running lights or traffic light systems indicate the status of the overhead contact line; other devices, such as rotary or flashing lights and acoustic horns, provide a warning before and during switching and moving procedures. These devices can also indicate that an emergency shutdown or a malfunction has occurred. In larger systems, the dispersed emergency stop buttons can all be monitored by special control boxes. In certain facilities, special fire service emergency control units are provided.

[1] — *Visual and acoustic warning prior to switching procedures and in the event of emergency shutdown*

[2] — *Emergency shutdown control box in maintenance shop*

[3] — *Clearly-signed emergency stop button*

[4] — *Fire service control unit for emergencies*

[5] — *Running light system in commissioning shop*

[6] — *Control box for running light system*

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Monitoring

With more modern or more complex installations, those external aids or other systems/controls, whose function is safety related to the control system of the overhead contact line, are monitored and/or locked via electro-mechanical (keyswitches) or purely electrical safety interfaces.

[1] — *Monitoring and locking mechanism for controlling access to roof working platform*

[2] — *Key cabinet for crane release*

[3] — *Monitoring and locking mechanism for controlling access to roof working platform*

[4] — *Key cabinet for releasing and operating the access stairs to the roof working platform*

[5] — *Access stairs to the roof working platform incl. monitoring of the parking position*

[6] — *Key cabinet for crane release*

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Interlocking devices

In addition to the electrical interfaces and interlocking mechanisms, simpler systems also have purely mechanical interlocking devices with mechanically interlocked keys for interfaces. Furrer+Frey manufactures these devices (usually equipped with a protected key system) to meet individual customer requirements; it is, therefore, possible to replace or convert an existing interlocking mechanism at reasonable cost.

[1] — *Earthing rod interlocking device*

[2] — *Ladder interlocking device (with ladder shackle)*

[3] — *Locked manual operated high voltage switches*

[4] — *Locked roof access in front of a shop entrance*

[5] — *Guardrail interlocking device*

[6] — *Key duplication with employee keys*

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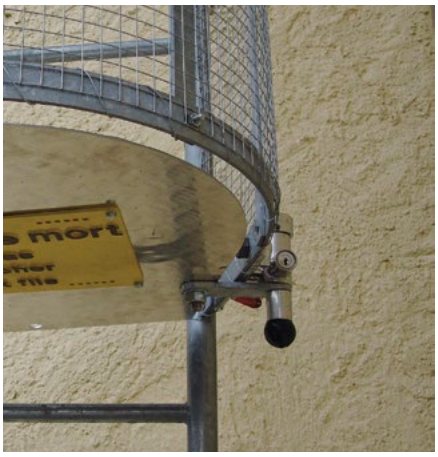

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Special systems

Furrer+Frey also designs and constructs, frequently at the customer's request, special systems for particular applications or for test purposes.

[1] — *Contact wire heating system*

[2] — *Train pre-heating system*

[3] — *Multi-voltage system switching point (3 kV DC / 15 kV AC)*

[4] — *Test stand switching point (15 kV AC)*

[5] — *Test system transformer (1 kV AC)*

[6] — *Interior switching point for DC power feed*

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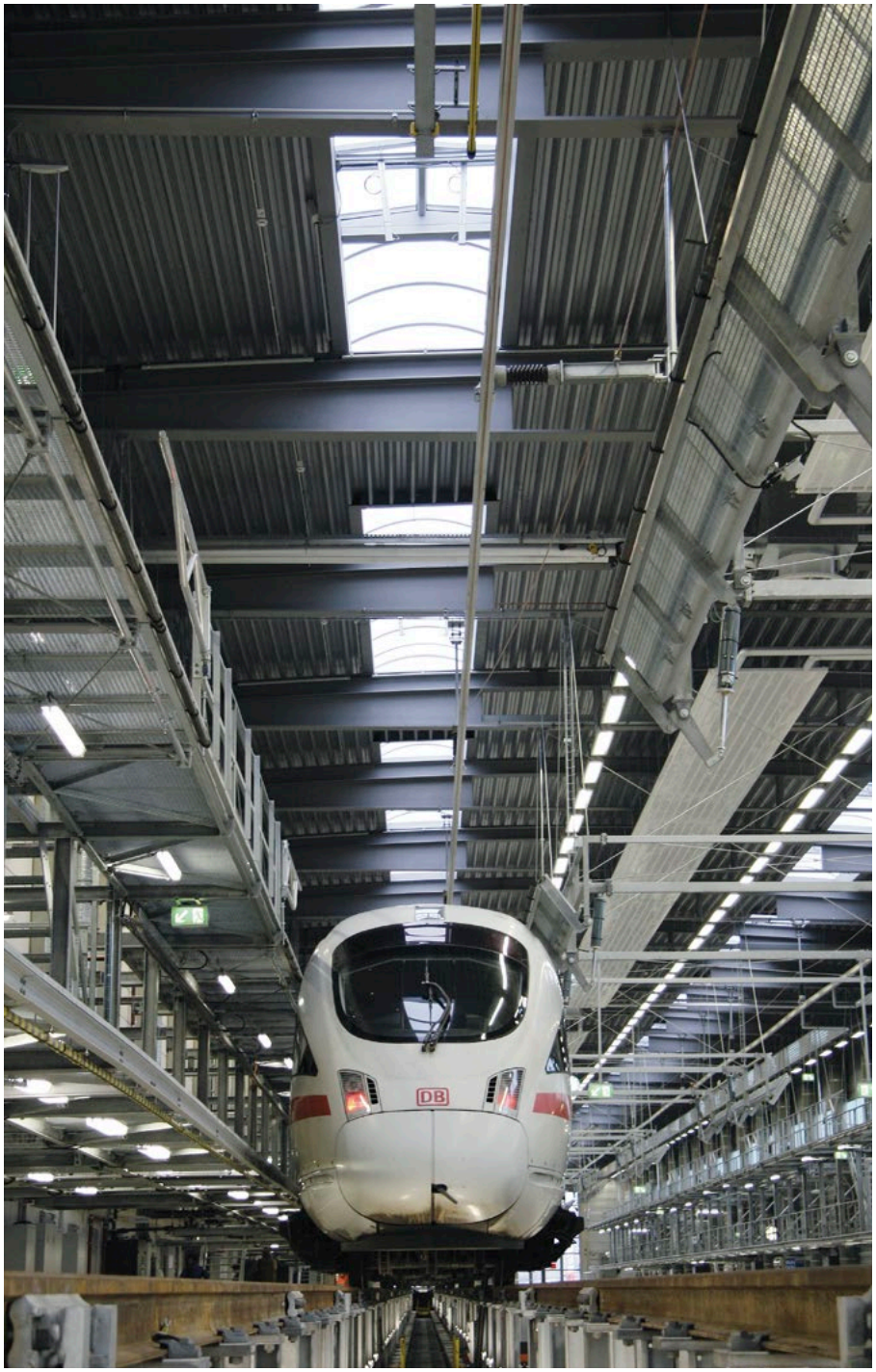

References

Customers with Furrer+Frey AG control systems:

- Swiss Federal Railways SBB
- Bern Lötschberg Simplon BLS
- Südostbahn AG
- Appenzeller Bahnen
- Matterhorn Gotthard Bahn
- ZB Zentralbahn AG
- Regionalverkehr Bern-Solothurn RBS
- Aare Seeland mobil
- Jungfraubahnen
- Montreux Oberland Bernois
- Transports Publics Fribourgeois
- Bernmobil
- Deutsche Bahn AG
- NordWestBahn GmbH
- Osthannoversche Eisenbahnen AG
- Stadler Rail AG
- Bombardier Transportation AG

Your partner for the design, delivery and construction of railway safety control systems.

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