



Control and Safety Systems

Safe Transportation All Along The line



HANNING & KAHL

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Control and Safety Systems

Safe Transportation All Along The Line

Control and safety systems made by HANNING & KAHL set technical standards and are successfully deployed all over the world. Our partners are transport authorities, private and industrial railways, point manufacturers and consultants, none of whom are prepared to compromise on safety.

Competence since 1928

The technical superiority of HANNING & KAHL modules and systems results from almost a century of experience: the company has been producing components for rail-based transportation since 1928 and consolidating this core competence ever since.

We offer customers an extensive, systematic range of products for rail-based transportation, and have the right components, systems, techniques and equipment for your application.

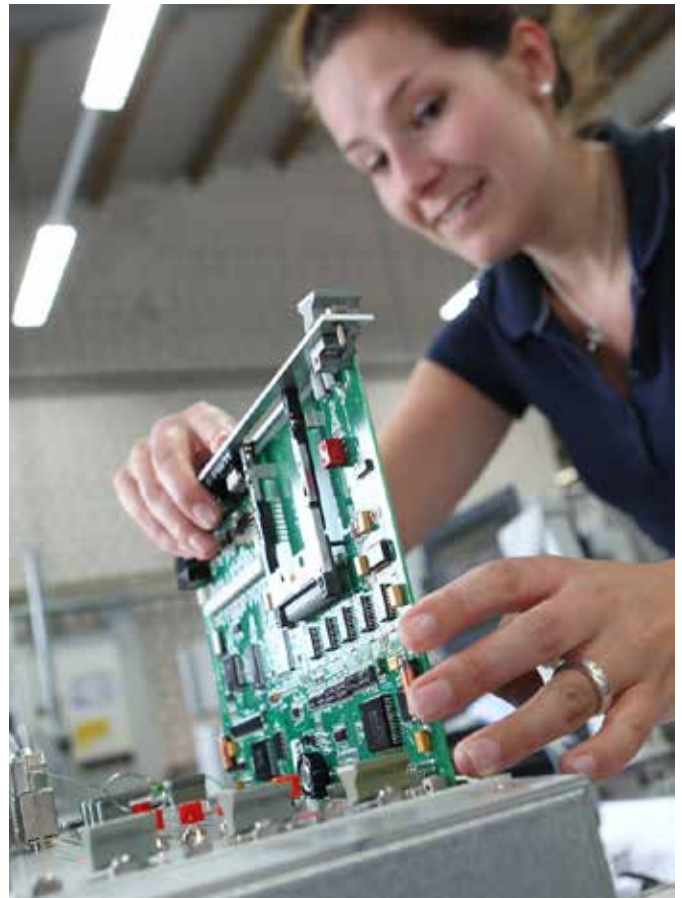
HANNING & KAHL is certified for compliance with all major standards: ISO/TS 22163, DIN EN ISO 9001, DIN EN ISO 14001, ISO 45001, DIN EN 15085-2.

The best solution for you

HANNING & KAHL control and safety technology is individually engineered and designed for each particular application. By accompanying you through the project-planning phase, we quickly learn your requirements and can apply our experience right from the beginning – to your advantage.

Before equipment or components are supplied, they are put through their paces in our Quality Assurance Centre, where a wide range of test environments and methods are available. On request, we also offer a Factory Acceptance Test (FAT) during which the product is assessed and tested in the presence of our customers. FAT also provides instruction in the use of the innovative technology.

HANNING & KAHL control and safety concepts are the result of successful symbioses of economically- efficient series production and individual design. This leads to technically precise and reliable solutions with fast returns for operators – another reason why our products are at home all over the world.



1 | System Components

Getting You There Safely.

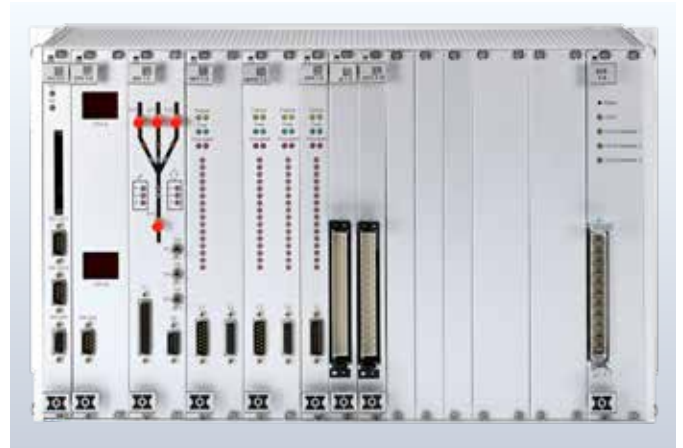
1.1 Control Systems

The **HN-P vital processor system** is modular in design and bespoke to customer requirements. The core of the system: two-channel microprocessor technology with a safety integrity target up to SIL3. With a vital processor system, the HN-P allows the rational realization of simple systems as well as of very complex requirements. Features like the electronic event recorder, connection of external systems and additional components and integration into a networked communication consist are vital components for highly flexible deployment.

Today's complex requirements of the vital processor system as a core component in control and safety equipment, such as automatic train control and electronic interlocking, require safety integrity level SIL 4 in line with CENELEC norms EN 50126, EN 50128 and EN 50129. We meet this challenge with the new **HVIP, HANNING & KAHL Vital Interlocking Processor**.

The HANNING & KAHL Public Process Data Interface (PPDI) in conjunction with modern LAN interface technology ensures future-proof realisation of process visualisation and telecontrol. Complex installations are simplified by division into local control segments with high availability. A large number of interfaces and data services has been defined and developed to cater for all requirements. A special bus is available for integration of standard peripheral components.

From reliable vehicle detection to communication of occupation status (occupied/free) as a safe potentialfree contact, the **HVD vehicle detection system** is based on the vital processor system HN-P and HVIP. The blocking circuit and/or the track circuit also in combination with the mass detector detect the rail vehicle passively in the track area to be safeguarded.



Vital Processor System HN-P



HANNING & KAHL-Vital Interlocking Processor HVIP



HANNING & KAHL Vehicle Detection System HVD

The **HLUmulti controller** forms the technical basis for non-safety-relevant applications, for example an interface to traffic-signalling lights or gate controllers, signal switch-on (request signals, matrix signals), processing setting commands from TWC systems, point heating or time synchronization by radio clock / GPS clock. Such applications also include the processing of substitute requests, like key switches, pushbutton stations, and the formation of a route manager, and more. The HLUmulti controller simplifies and accelerates software maintenance and it also makes it more cost-effective and avoids subsequent modifications in safety-relevant software.



HLUmulti controller

1.2 Vehicle detection

When it comes to registering vehicles, determining positions and securing routes, you have these processes safely under control with HANNING & KAHL systems for vehicle detection. To secure routes and passively detect rail vehicles HANNING & KAHL adapts its own systems to your project requirements.

Track circuit

When axles produce a short circuit ($< 0.3 \text{ Ohm}$, max. 5 uH) in the track area, rail vehicles are recognised by the electronics. This way, the HFP track circuit detects the vehicle passively and does not require insulated rail joints.

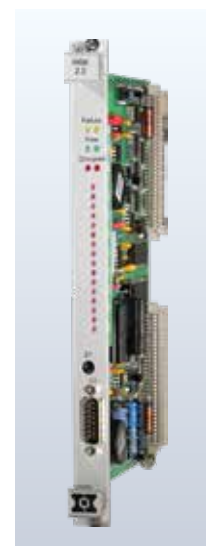
The effective length of the HFP track circuit is limited solely by short circuit connectors from rail to rail. Double track circuits are constructed by adding another track circuit receiver in the track, to detect the driving direction of vehicles. Track circuit length can range from 12 to 400 metres.

Mass detector circuit

The robust system operates via an electric oscillating circuit, which indicates a change in frequency when a rail vehicle crosses the HFK mass detector coil with its metal mass. For safe protection against humidity and mechanical strain, mass detection coils and electronic components are cast in a plastic frame.

Blocking circuit

The blocking circuit recognises the entry of rail vehicles passively by the wheelshunt ($< 1 \text{ Ohm}$, max. 5 uH) produced and it recognises exiting vehicles by the reduction in vehicle mass detected. The blocking circuit functions without insulated rail joints, its effective range is limited by short circuit connectors. Standard length can be 3 to 12 metres. A point controller can reach SIL 3 with just one blocking circuit. The SBC blocking circuit meets all CENELEC requirements for SIL 4.



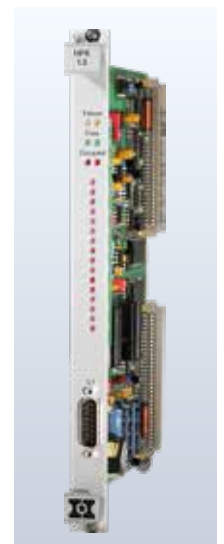
HSK blocking circuit



SBC blocking circuit



HFP track circuit



HFK Mass detector

1 | System Components

Getting You There Safely.

Overhead line contacts

The HON system is a non-contact overhead line contact which is attached to the catenary wire and reacts to the carbon brush on the pantograph. The system includes a buffer stage for galvanic separation of voltages and an evaluating module.

Axle counters

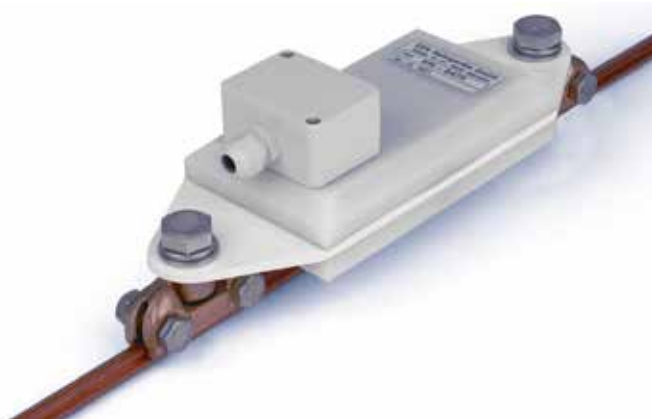
Wheel sensors before and behind the control segment count the axles of entering and exiting trains, ensuring that one train has left the section before another can enter. Untimely point setting or incorrect Drive signals are thus pulsed out.

Automatic train control

In areas where "Driving at Sight" is not possible, e.g. in tunnels or at speeds higher than 70 km/h (BOStrab § 49 Para 2.2), trains must be technically monitored and controlled in the event of dangerous irregularities. Inductive or magnetic immobilisers installed at the Drive/Stop signals are activated when a signal which indicates stop is passed. Brakes are applied automatically if driving errors occur.

1.3 Event recorders

In order to be able to reliably reconstruct and document events on signalling installations or controllers in the event of a malfunction, an electronic event recorder which works independently of the rest of the controller logic is deployed. The event recorder can be deployed in all HANNING & KAHL controllers and also in other makes. Memory capacity can record several hundred runs. Interrogation is possible via laptop on location or remote. Events can be visualised graphically.



Overhead line contacts



Axle counters



Magnetic immobilisers



HCS wayside equipment

1.4 Communication System

HANNING & KAHL's train to wayside communication systems (HCS) take on communication between vehicle and line and vice versa. They forward commands for manual point setting, send information to the next signalling installation, and more.

HANNING & KAHL supplies both carborne and wayside equipment. HCS communication systems carry the CE symbol and fulfil all major international standards: EN 50121 (EMC), EN 50155 (rail standard) and EN 45545 (fire protection).



HCS carborne equipment

The carborne equipment is always customer-specific and supports the interface RS232/RS484, Ethernet, IBIS VDV300 and VDV301 on board. The wayside equipment provides interfaces RS232/RS485, Modbus TCP and Ethernet TCP/IP for system integration.

HCS-R Train to Wayside Communication

For one-way communication, our HCS-R enables wireless transmission of information and commands from the vehicle to the line.

HCS-R has proven itself in operation a thousandfold all over the world. With state-of-the-art microprocessor technology, the HCS-R system is extremely flexible and can be used in multiple applications.

HCS-V Train to Wayside Communication

The two-way HCS-V enables wireless transmission of information and commands from the vehicle to the line and vice-versa.

The HCS-V is function-compatible with HCS-R. This means that vehicles equipped with HCS-R and also vehicles with HCS-V equipment can be detected. The advantage of the HCS-V system is automatic tuning of the transmitter/receiver loops. No further tuning measures are necessary once the electric connection has been made.

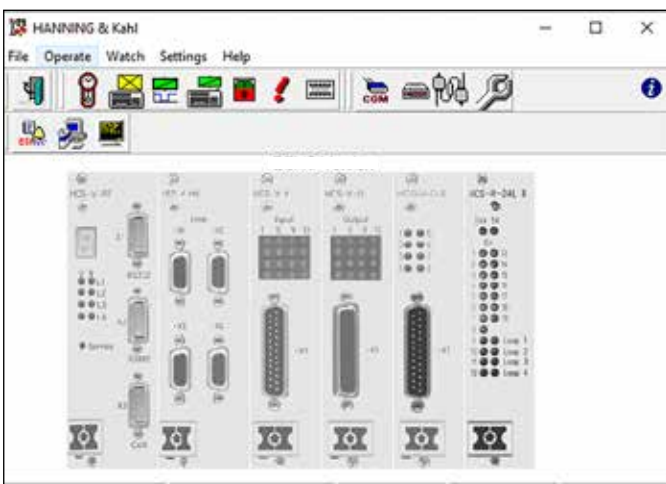


HCS-V control device

Diagnosis of the HCS systems

HCS diagnostic software with the following functions is used for commissioning, testing and maintenance:

- Programming the outputs
- Automatic conversion of bit configurations
- Evaluation with a terminal program
- Just one software for HCS-R and HCS-V
- Read-out and evaluation of the event recorder



Diagnosis of HCS systems

1 | System Components

Getting You There Safely.

1.5 Remote Monitoring and Diagnosis

ConnAct® is a system for remote monitoring and diagnosis of vital infrastructure components. Variances and potential malfunctions on your equipment can be detected in good time; corresponding measures taken and maintenance work minimised. By detecting critical status in good time, you increase the availability of your infrastructure. Signalling installations of major transportation hubs can be continuously monitored by ConnAct®, which consists of a **HLUmulti controller and professional connection management**.

Service

Connection management guarantees the connectivity of your equipment with machine-to-machine (M2M) technology. With our services you ensure the best basis for your M2M communication.

We provide 24/7 telephone support. This includes technical support during normal working hours from 8 a.m. to 5 p.m. We also guarantee on-call support outside of these hours. You can also reach us at service@hanning-kahl.com. Successful monitoring of technical equipment depends on reliable monitoring of the connection/connectivity itself, we make sure a trained engineer keeps an eye on all your connections.

Diagnosis

Continuous real-time monitoring (online monitoring) of infrastructure takes malfunction management in maintenance operations to new quality heights and thus creates the decisive basis for increased system availability and further cost reduction. ConnAct® continuously monitors point machines and point controllers, signalling installations as well as level crossing installations, communication systems and rail lubrication equipment. Malfunctions are automatically identified and forwarded in regulation-based manner to the processor in the control centre, the workshop, the on-call service or the mobile unit.

Continuous system monitoring is the pre-condition for timely detection of anomalies and thus for needs-based maintenance. Apart from the bespoke diagnostic possibilities of HANNING & KAHL products, further products and systems from external suppliers can be integrated and monitored.

Operation

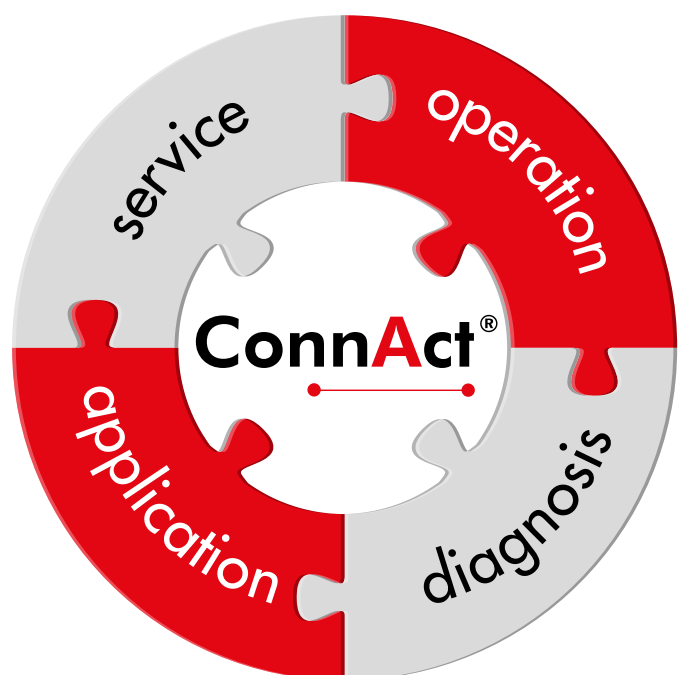
These software modules enable real-time detection of process states of the proven HANNING & KAHL infrastructure and the visualisation of the process sequences in particular on signalling installations and complex depot controllers.

Apart from this observation process, at the same time, the setting of routes and diverse further (auxiliary) operating actions are enabled via the operating channel. This means that as human-machine interface, the system often forms the basis of the operating workstation of depot controllers or the basis for operations monitoring in LRT systems as control centre workstation.

Application

The HLUmulti forms the technical basis for non-safety relevant applications. These can be applications like interfaces to traffic signalling installations or gate controllers, switch-on of signals (request signals, matrix signals), setting-command processing by communication systems, point heating, time synchronisation via radio-controlled GPS clock, processing of substitute requests, such as key switches, pushbuttons and formation of a route manager. It enables rapid and economically-efficient software maintenance without intervention in existing safety-relevant software.

For us, ConnAct® means connecting and acting – active cooperation with our customers to detect malfunctions immediately and increase availability.



1.6 Interfaces and Networking

We offer safe and powerful technology to connect HN-P and HVIP vital processor systems to each other, and to connect them to a central control room.

Interconnection of vital processor systems

Vital processor systems of type HN-P are serially connected to each other via a SIL3-certified RS485 interface, allowing an architecture of a master and up to 8 slaves.

HVIP vital processor systems are connected to each other via a safe communication protocol per DIN EN50159, based on an Ethernet network. Each individual HVIP system can communicate with up to 16 other systems. Meshed networks can be built up with much greater availability and flexibility in comparison to master / slave networks.

Connection of vital processor systems to a central control room

Connection via Mobile Network

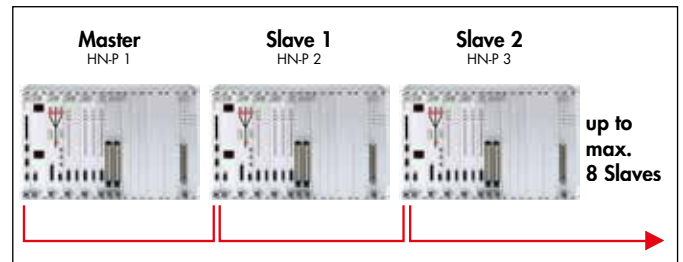
Connection via the mobile network is through a modem in the ConnAct® HLUmulti controller. Access via these existing communication channels can be implemented cost-effectively as no investments in cabling are required. We offer global SIM cards with different data tariffs for domestic and foreign networks with maximum network coverage. These make the connection to a network which is monitored by our provider. This ensures secure data connection to the systems in the field. Customers and, if necessary, also HANNING & KAHL can access the systems via VPN.

The capacity to remotely read out event and error memory data is a central element of ConnAct® Service.

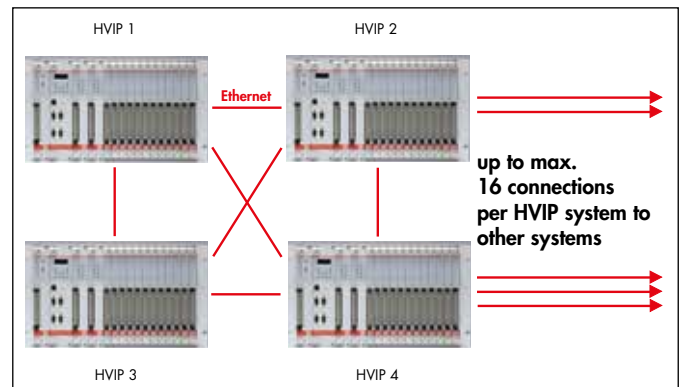
Connection to ConnAct® Operation installed in the central control room can also be realized via public networks.

Connection via Ethernet

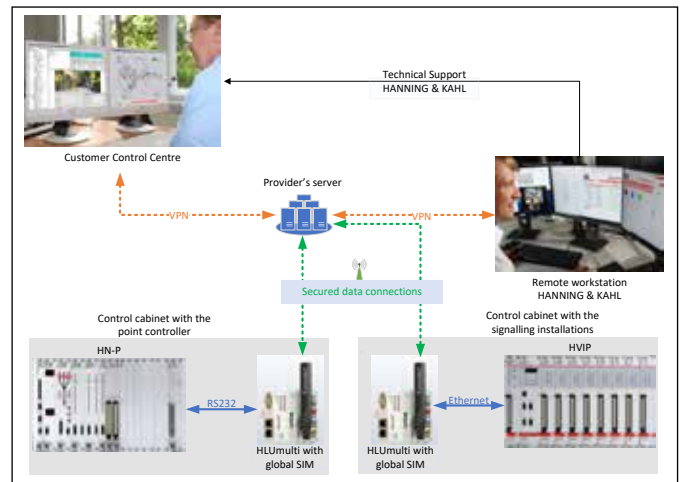
For customers who administer their own cable-connected data network and who would like to integrate point controllers or signalling installations, connection is via Ethernet. Here, too, the main component is the ConnAct® HLUmulti controller with two integrated and independent Ethernet interfaces.



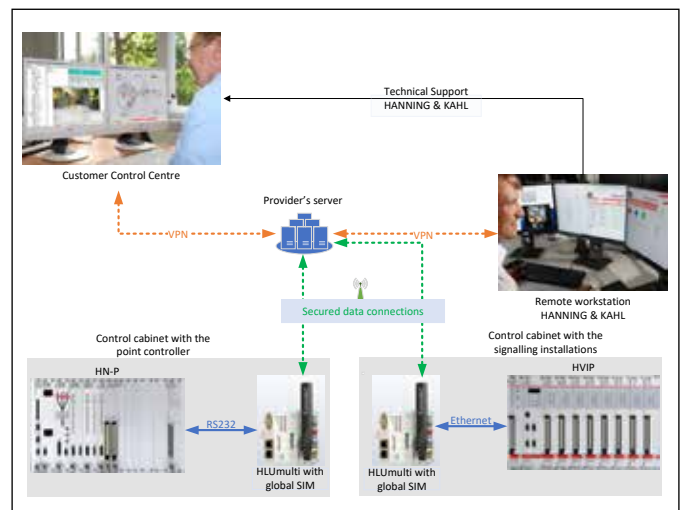
Networking HN-P systems



Networking concept HVIP systems



Remote access via public network



Remote access via LAN

2 | Applications

Getting You There Safely.

2.1 Point Controllers

At the heart of every HANNING & KAHL point controller is the microprocessor-controlled vital processor system. This powerful and stable system operates with unsurpassed reliability and can be supplied with all commercially available detection and TWC systems. Our point controllers meet German BOSTrab requirements and fulfil international standards.

2.2 Signalling Installations

HANNING & KAHL designs signalling installations for each individual application. HANNING & KAHL's exemplary safety level complies with current standards. User-friendly operation ensures error-free sequences. The advantages include:

- Easy installation and commissioning
- High availability with low maintenance
- Integrated event recorder with convenient evaluation software
- Networking via fibre optics, bus systems etc.

Single-line track safety devices

If two-track operation is not possible for technical reasons; if it is interrupted by construction work or not economically efficient, driving operations are regulated by single-line track-safety devices. We offer you stationary and transportable equipment for connection of different types of switching equipment.

Terminal loops

At terminal stations and on line networks, vehicles have to change driving direction or park. This normally entails driving onto the opposite track (oncoming trains). This area must be secured with signalling technology to prevent collisions.

Crossovers

Crossovers which require signal protection are generally at the beginning and at the end of the line. They consist of electric points and a number of Drive/Stop signals. The task of crossovers is to guide trains into and out of stop station tracks safely and without delay. Controllers prevent collision and derailling.

2.3 Safety installations for level crossings

HANNING & KAHL's modular SILC concept offers you solutions in different technical versions and price categories to ensure safety at level crossings. SILC can be adapted to actual system environments. The focus is on the optimal cost/benefit ratio.



Point controller



Single-line track safety devices



Terminal loop



Crossovers

A further advantage of the modular system: each SILC safety system can be adapted when safety or convenience requirements change with optimally coordinated system components.

The result is precision-engineered, objective-oriented solutions that only an experienced partner can provide. At HANNING & KAHL, you profit from decades of experience with consummate concepts and sophisticated solutions: logically-consistent and functional equipment.



Level crossing with additional barrier for greater safety



Safety installations for level crossings on industrial railways and factory sidings

2 | Applications

Getting You There Safely.

2.4 Depot controllers

You would like to reliably dispatch and move tram and light rail vehicles safely, and organise and control sequences? HANNING & KAHL systems for control of depots make complex sequences transparent and safe.

HANNING & KAHL depot controllers prove themselves in daily operation all over the world. Users benefit from the following advantages:

- Basis of design engineering „Driving at sight“ (SIL 2, if requested up to SIL 3)
- Route selection central or/and local
- Automatic route cancellation
- Modern VDU workstation or conventional control panel
- Storage of several route entries and partial delocking
- Possibility to set single points
- Integration into depot management systems possible
- Distributed intelligence, LAN and fibre optic technology
- Realisation of all runs which the track geometry allows, side protection possible
- Vehicle identification via HCS-R, HCS-V, HCS-P, HCS-Z or other makes such as VETAG, VECOM, IMU, ZUB and many more, for automatic route selection

Individual and economic solutions are possible with the modular design of HANNING & KAHL depot controllers.



Depot controllers

2.5 HN-EOW electric locally-set points

On secondary lines and depots and on industrial and factory railways, line systems have to fulfil specific requirements. The electrical locally-set point HN-EOW streamlines rail operations and relieves the strain on drivers simply and efficiently. When „driving at sight“, the train driver can set points without getting out of his cab. He simply has to push the pushbutton at an operating station directly beside the track. The points are set electrically and the setting command is displayed visually. Rail vehicle detection switches and point position indicators ensure a high level of safety. Further HNEOW components are available for even greater convenience and functionality – when ordering or later.



Electric locally-set point HN-EOW



Signal transmitters for factory sidings

2.6 Driver Assistance Systems

VABnet obu is the hardware for the new generation of on-board computers of the control and information systems supplied by VAB. Development of the on-board computer software follows many years of experience with smart-phones and tablets as driver devices. Apart from typical control functions such as determination, monitoring and visualisation of vehicle locations and timetable situation, data, text and language communication between vehicle and OCC, a new software function complex has been implemented in the form of a driver assistance system. This software is offered in modular form with the modules "general driver information services", "line information", "malfunction registration" and an option for energy-saving driving.



Information is displayed on the on-board monitor

2.7 Equipment for testing vehicles

When it comes to registering vehicles, determining positions and securing routes, you have these processes safely under control with HANNING & KAHL systems for vehicle detection. To secure routes and passively detect rail vehicles, HANNING & KAHL adapts its own systems to your project requirements.

HFP track circuit for detection of wheel shunt

Rail vehicles are detected safely by the electronics when its axles produce a short circuit ($< 0.3 \text{ Ohm}$, max. $5\mu\text{H}$) in the track area.

HSK blocking circuit for detection of combination of wheel shunt and vehicle mass.

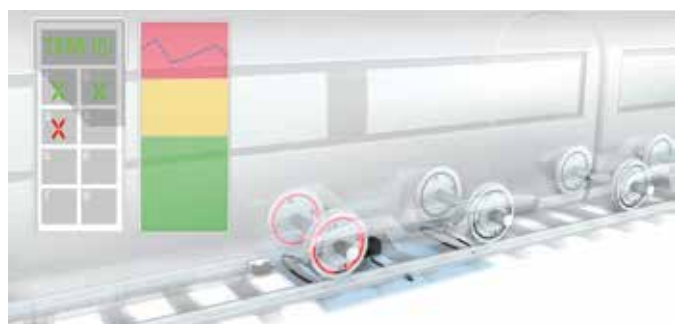
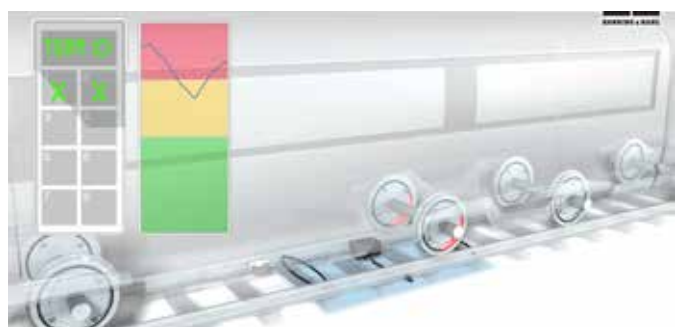
The HSK blocking circuit passively recognises entry of rail vehicle by the wheel shunt produced ($< 1 \text{ Ohm}$, max. $5\mu\text{H}$), and it recognises exiting vehicles by the reduction in vehicle mass. In both detection procedures, a wheel shunt of $< 0.3 \text{ Ohm}$ or $< 1 \text{ Ohm}$ is necessary.

With ConnAct® or a depot management system it is possible to visualise technical parameters like:

- Wheel shunt,
- TWCs,
- Vehicle identification and
- Automatic train control.



Wheel shunt detector HAP II



Wheel shunt detection

2 | Applications

Getting You There Safely.

2.8 Point heater systems

HANNING & KAHL offers a wide selection of point heater systems with different voltage and capacity ranges for wintry regions. A point heater controller ensures that the point tongues do not freeze up / are not blocked by snow slush in winter. The point heater controllers can work independently with their own temperature and humidity sensors or be controlled centrally from a control room. An interface is provided for connection to ConnAct® or a HN-P.

2.9 Depot Management

Before trains begin their daily operations, multifaceted planning, dispatch and monitoring tasks have to be performed on depots. Vehicles, parking places and workshop appointments are allocated allowing for the requirements of timetable provision, technical vehicle service and maintenance work.

Depot management system (BMS)

BMS supplied by VAB controls all standard sequences on a depot to the greatest possible extent. Cross-depot vehicle deployment can be coordinated and controlled if all depots operated by a transport authority are compiled into one system. With numerous interfaces to peripheral systems, BMS functions as a central data hub.

Operate & Observe

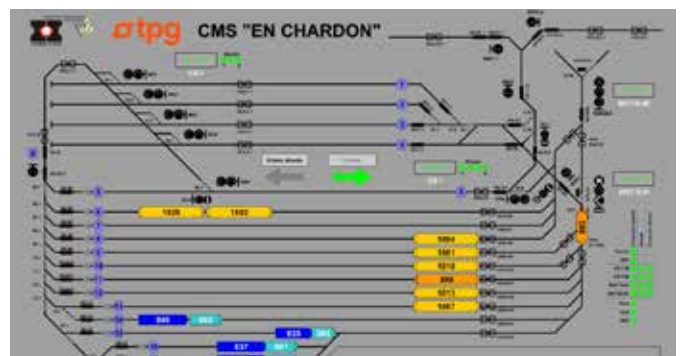
The Operate & Observe (O&O) system is used by tram operators and feeder and industrial railways for management of complex depots and also for smaller signalling installations like intersections, level crossings, tunnels or termini as well as single point controllers in the network. It is thus the operating user interface for our controllers.



Point heater control systems



Depot management system



Operate & Observe

Getting You There Safely.

3.1 Signals

Signalling technology plays a critical role in rail-based public transport. The components deployed in signalling devices must provide a high level of safety and a great degree of availability.

These requirements are met by HANNING & KAHL's next generation of state-of-the-art and compatible LED signal transmitters.

The next generation of LED signal transmitters use long-life, SMD light-emitting diodes with a wide beam angle ($\pm 60^\circ$). This means the same luminosity is achieved with less power. It also makes for greater compactness and reduced weight. The new day/night switch-over is activated via a separate control input which generates less luminosity (about 50%) as daylight fades. Signal transmitter current consumption is measured with corresponding HANNING & KAHL components. Our LED signal transmitters are available in white, yellow, red, green and blue with diameters 200 mm and 300 mm.

We offer a wide range of metal and plastic masts for mounting the signal transmitter housing. From simple straight masts to whip masts – all prepared for easy mounting and optimised installation time.



The day/night switchover generates less luminosity as daylight fades

3.2 Point position indicators

The point position indicator is equipped with intensive LEDs. They shine brighter and more distinctly than conventional illuminants and can be easily identified even when exposed to direct sunlight because they stand out so well. LEDs are low maintenance and have a much longer service life than incandescent lamps. LED status is checked centrally via the current monitoring device and possible malfunctions are detected immediately. Point position indicators made by HANNING & KAHL are future-oriented because the signals they emit can be recognised much more easily than conventional technology. The signals can be multi-coloured, and blue LEDs are also possible.



Point position indicators

3.3 Receiver loops for communication systems (HCS)

HANNING & KAHL's receiver loops, coupling coils and antennas are tuned to receive. Available in different versions for all current communication systems, the equipment comes with appropriate mounting devices and attachment materials for installation in common permanent way.



HCS receiver loops

3 | Accessories

Getting You There Safely.

3.4 Vehicle detection

Mass detection coils

HFK mass detection coils have been developed specially for track installation and construction of HFK mass detection circuits. The following versions are available depending on deployment:

- HFK coil with external tuning module
- HFK coil with external tuning module, mounted in polymer concrete
- Mold set for mounting of the coil in concrete
- Attachment kit for mounting of the HFK coil on sleepers in open track



Mass detector coils

Track circuit transformers

HANNING & KAHL's track circuit transformers have proven themselves over years in the construction of HFP track circuits:

- Symmetric connecting cable (mounting in the centre of the track in a rail box)
- Asymmetric connecting cable (one-sided mounting in a rail box)
- Symmetric connecting cable (mounting in the centre of the track without rail box)
- The transformers have protected connections for the connection cable to the controller.



Blocking circuit terminal box

Blocking circuits

HANNING & KAHL supplies all track installation components required for operation of blocking circuit systems. The components have proven themselves in years of practical application and are available in numerous versions: insulated tie bars, short circuit connector cables, blocking circuit connector cables, rail boxes, tuning capacitors, input/output junction boxes, connecting cable.

3.5 Rail boxes

HANNING & KAHL's rail boxes protect electric contacts in the track bed and components for vehicle detection against environmental impact and mechanical strain. Opening the cover allows easy access to the electric connections.

The robust cast HANNING & KAHL rail box is suitable for all rail profiles and can be flexibly deployed for all cable-laying concepts. Cables can be routed from the side and from the bottom.

With a slip-resistant, profiled cover upper side, the rail box can be mounted on the guiding edge level of grooved rails. Thanks to its modular construction, corpus and cover are the same for all applications. The rail box can be individually adjusted to all rail profiles with bespoke attachment kits. The length of the contact bolts can be freely selected to ensure convenient accessibility.



Rail boxes

3.6 Insulated tie bars

Direct rail contact must be avoided when assembling track, mass detector or blocking circuits. In these track segments the gauge is held by insulated tie bars.

Carefully designed and manufactured, insulated tie bars supplied by HANNING & KAHL guarantee a high degree of functional safety. They are available for all gauges and rail profiles and also in special dimensions, if required. Insulated tie bars have a central insulation point and can be insulated full length against stray current on request.



Insulated tie bars

3.7 Local operating elements

Local operating elements ensure convenient setting of several points on the way to a destination track.

Route-setting boards/Pushbutton station/Keyswitches

Route-setting boards provide more convenience when several points have to be set (e.g. point fans) on the way to destinations. Simple user guidance, e.g. self-explanatory display dialogues, allows staff to set one or more routes. These are defined and can be stored via starting track and destination track buttons. All points en route to destinations are automatically established and their setting and status is visualised. It is thus no longer necessary to set each point individually.

As an alternative, we offer our programmable HPS Panel Station. The hardware platform for the HPS is a panel PC with touch display which is approved for rail applications. The HPS can be deployed as a local, normal control element in conjunction with signalling installations which comply with the German BO-Strab ordinance on the construction and operation of trams and also within shunting systems which conform to the ordinance on the construction and operation of branch lines (BOA). The HPS is designed to be used by drivers and shunters.

The basis for intuitive start-destination operation is the graphic display of the track diagram on the screen. Starting points and destinations are shown as operable objects on the track diagram and geographically allocated. A robust pushbutton fulfils the stringent demands of the ordinance on the construction and operation of branch lines (BOA) which often consider purely touch operation unsuitable on account of the environment. One-button operation is almost as intuitive as direct operation via touchscreen because it allows the operator to concentrate exclusively on the screen.



Route-setting boards



HPS Panel Station

3 | Accessories

Getting You There Safely.

HPTS intelligent selection stations

The intelligent selection station HPTS facilitates selection of destination tracks by communication with the central control room. The train driver identifies himself with his PIN number and enters the code for the destination track.

An illuminated display allows representation of context-dependent, local-language texts. Entries are made via a hard-wearing ten-key keyboard with additional function keys. The components are in a UV-resistant plastic housing. The following interfaces are available for data communication: Ethernet, CAN, RS485, RS232. HPTS is freely programmable and supports standard network services such as FTP, HTTP and SMTP.

Pushbuttons

The operating station is directly beside the track. Train drivers can set points per pushbutton without getting out of the cab. This saves time, relieves driving staff and makes rail operations a lot safer. Handling is clear and simple. Visual signals indicate whether the setting command has been executed.

3.8 Miscellaneous

Control cabinets and plinths

Customer and application-specific requirements with regard to size, finishing, accessibility, convenience and economic efficiency call for different types of control cabinets.

Pole fuses

To easily disconnect power from control cabinets, the power lines for controllers and point heaters are usually pre-fused before the control cabinet.

Lightning arresters

Where contact wire voltage is required for operation of point heater controllers and other types of controllers, lightning arresters protect the voltage supply lines from overvoltages (e.g. lightning).

Cable and connecting materials

All cables which have to fulfil particular requirements are made especially for HANNING & KAHL.



Intelligent Selection Station HPTS



Pushbuttons



Control cabinet

4 | Service

Getting You There Safely.

4.1 Project management

Meticulous project planning is essential for smooth execution of construction projects. It prevents technical and organisational errors from the word go, errors which can cause delays and have expensive consequences. Well-devised project management pays off. The HANNING & KAHL team provides competent and committed assistance with the following tasks:

- Calculation of braking and slip distances
- Analysis of track diagrams and proposals for optimal vehicle detection
- Determination of signal locations and request points
- Compilation of system requirement specifications
- Creation of schematic diagrams
- Creation of cable diagrams
- Processing of given CAD diagrams
- Compilation of documents for determination of driving operations
- Site supervision
- Project management
- As-built documentation for approval bodies

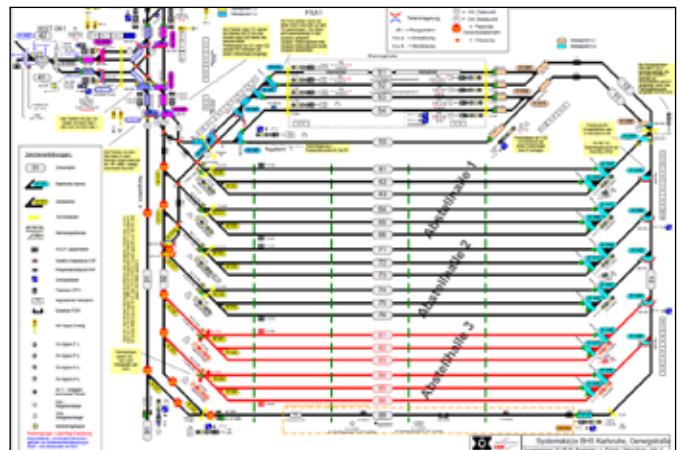
Benefit from our long years of experience in project management and in the execution of major construction projects.

4.2 Documentation

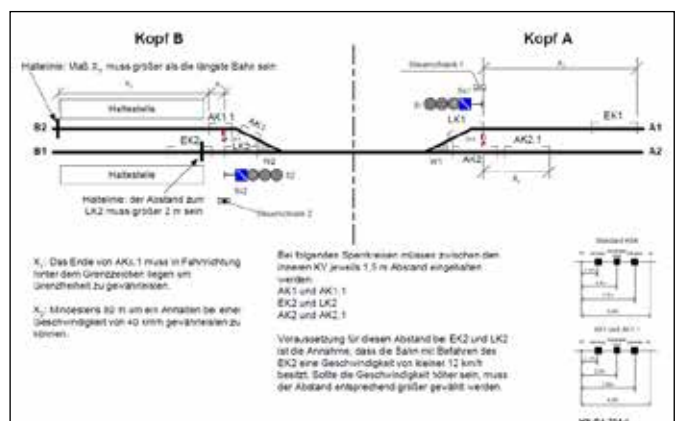
In line with their high safety level, all HANNING & KAHL installations and components are documented thoroughly and precisely. Along with each product, our customers receive structured operating manuals with graphic representations and photos in the file format of their choice (e.g. PDF). Technical data and functional descriptions of the individual components are documented with precision. Setting, maintenance and service work are described in a clear manner with photos.

HANNING & KAHL product documentation contains:

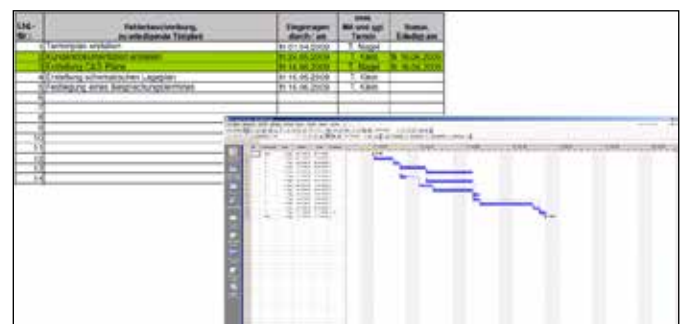
- Installation drawings
- Electric circuit diagrams
- Final assembly inspection protocol
- Safety data sheet and certificate of conformity
- Spare-part catalogue



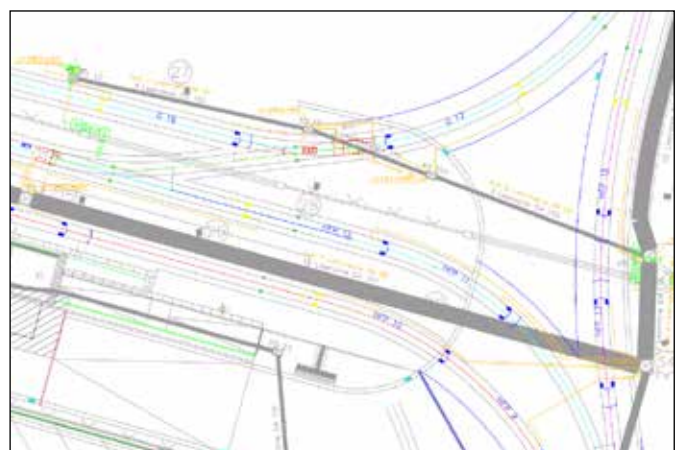
Creation of schematic diagrams



Calculation of braking and slip distances



Project and deadline monitoring



Processing of CAD diagrams

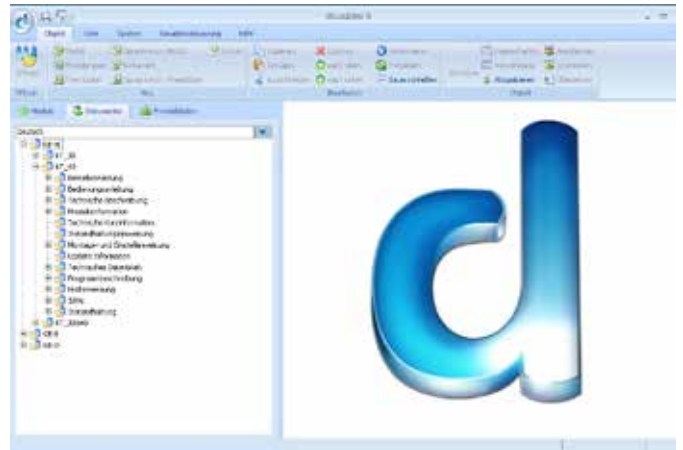
4 | Service

Getting You There Safely.

4.3 Quality assurance

Quality assurance and final inspection are performed on HANNING & KAHL equipment with due diligence and attention to detail. HANNING & KAHL installations and components are subjected to extensive simulation in our test laboratories before supply.

Different power supplies, network sockets, mobile test stations and PCs ensure variable and realistic test conditions. FAT is generally performed in the presence of customers, familiarising them with the innovative technology. The HANNING & KAHL team is also on hand to answer questions and advise.



Content management

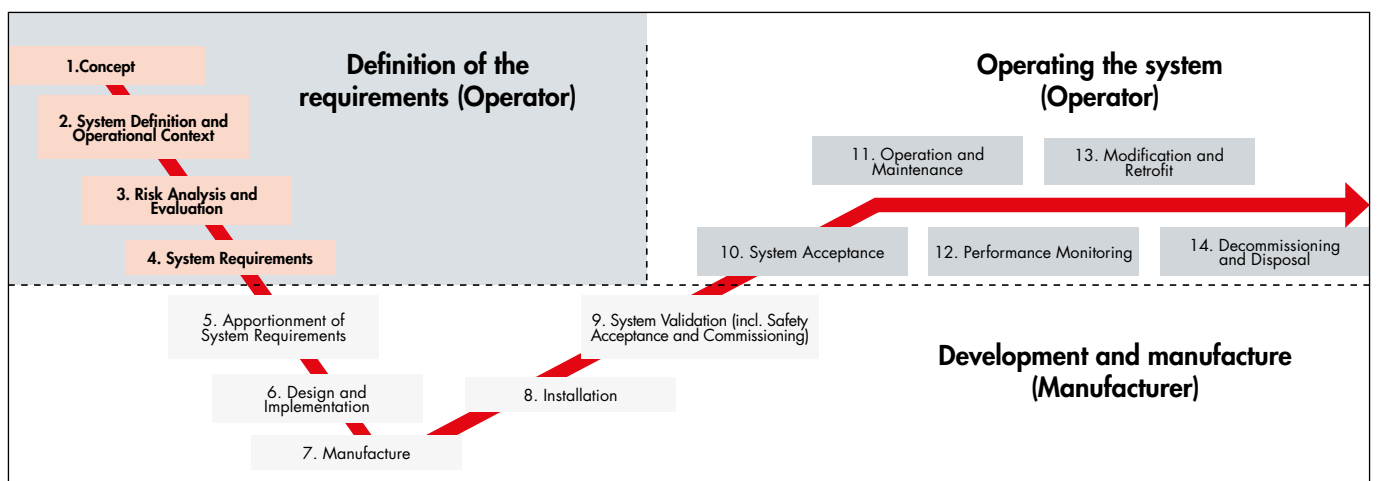
4.4 RAMS-Management and Safety Verification

HANNING & KAHL advises and supports you with the development and introduction of new products, and also with the planning and realisation of new equipment and new projects. We offer bespoke advice and implementation on the basis of VDV regulations, BOStrab (German ordinance on the construction and operation of trams), building site regulations and on the basis of the CENELEC standards EN 50126, EN 50128 and EN 50129. Phases 1 to 4 of the CENELEC process are indispensable modules essential for successful product design and project implementation which are the responsibility of the operator and the contractor.



FAT with customers at HANNING & KAHL

We would be pleased to offer you our services in conceptual design, definition of application conditions, risk analysis and the compilation of system requirements. These demanding tasks can be elaborated in parts or as a whole by our team in direct cooperation with you as operator and together with your independent assessor.



Life-cycle phase process ensures safety and availability



Telephone support with video conference

4.5 Service

Together with our subsidiaries and partner companies, HANNING & KAHL offers you services on site all over the world. Our experts can also assist you directly from our company headquarters. That's what we call remote service. Whether by remote monitoring, service hotline or video communication – we back up your team with our expertise –without delay.

Online service portal
service.hanning-kahl.de

24-hour hotline Infrastructure

+49 5202 707 707 - 2
 +49 171 3 360 360
service@hanning-kahl.com



Construction management and project monitoring

4.6 Assembly and Commissioning

HANNING & KAHL's competent service team gets to work on site even before scheduled supply of our safety solutions. We help you prepare and carry out assembly and commissioning. If you wish, we can also take over other elements and systems of infrastructure projects – from underground engineering and cable laying to construction management and project monitoring.

4.7 On-Site Service

Regular preventive maintenance of all safety-relevant components ensures trouble-free operation. Benefit from HANNING & KAHL's experience: in-depth product knowledge, bespoke, special-purpose tools, and trained and experienced staff ensure protection and safety, today and tomorrow.

With a HANNING & KAHL maintenance contract, you reduce your costs and optimise the availability of system-based products. You can concentrate on your core tasks knowing that your technical equipment is in good hands. Inspections are performed in compliance with BOStrab on our infrastructure & signalling products.

Whether repairing, restoring function or eliminating damage caused in accidents - we make sure that your equipment is up and running again on schedule and in accordance with your wishes – on site and in our workshop. Exclusive use of original HANNING & KAHL spare parts ensures the mandatory safety standard.



Regular preventative maintenance ensures trouble-free operations

4 | Service

Getting You There Safely.



Workshops on customer premises

4.7 Training workshops

There is no doubt about it: the tasks which your service staff face are becoming more complex. HANNING & KAHL training workshops convey basics and also the nitty gritty. Learn from the experts – and profit from a high standard of theory and practice communicated in a lucid and graphic manner.

Would you prefer general training at HANNING & KAHL or customized courses on your own premises? We would be pleased to discuss dates and topics. Just let us know your wishes.

You can find our seminar program under:
service.hanning-kahl.com



ISKO device for locating insulation and contact faults for trouble-shooting short circuits and contact resistance in the track

4.8 Testing and Service Equipment

Whether for assembly or commissioning, inspection or maintenance: HANNING & KAHL's testing equipment and service devices help you to identify possible sources of malfunction at an early stage and avoid unnecessary costs. Technically speaking, you are always one step ahead.

Working closely together with transport authorities and vehicle manufacturers, we have developed a range of practical testing and service equipment especially for the requirements of rail transportation. This equipment offers optimum support when trouble shooting and recording test results, and it supplies reliable data to help you plan service work.

Continuous upgrades and new developments enhance the user-friendliness and the wide range of deployment possibilities of our testing and service equipment. HANNING & KAHL's service team also deploys our cutting-edge equipment in all on-site operations.

Developing the Future Together

| | | |
|-----------------------|-------------------|----------------|
| Adelaide | Hakodate | Phoenix |
| Amsterdam | Halberstadt | Pittsburgh |
| Antwerp | Halle/Saale | Ploesti |
| Arad | Heidelberg | Portland |
| Athens | Helsinki | Posen/Poznan |
| | Hong Kong | Potsdam |
| Barcelona | Hudson Bergen, NJ | Prague |
| Basel | | |
| Bergamo | Iasi | Rimini |
| Bern | Innsbruck | Rome |
| Bielefeld | Istanbul | Rostock |
| Birmingham | Izmir | Rotterdam |
| Bochum | | |
| Brandenburg | Jena | Salt Lake City |
| Bremen | Jerusalem | Samsun |
| Brisbane (Gold Coast) | | San Diego |
| Brünn | Karlsruhe | San Jose |
| Brussels | Kassel | Sanya |
| Budapest | Katowice | Sarajewo |
| Bucharest | KCRC | Sassari |
| Bydgoszcz | Konya | Schwerin |
| | Krakow | Seattle |
| | Krefeld | Shangai |
| Cagliari | Kumamoto | Sofia |
| Calgary | | Stuttgart |
| Camden-Trenton, NJ | La Coruna | Suzhou |
| Charleroi | Latvia | |
| Chemnitz | Leipzig | Tacoma |
| Chur | Linz | Tallinn |
| Cottbus | Lisbon | Tenerife |
| Croydon (London) | Lodz | The Hague |
| | Los Angeles | Tokyo |
| Dallas | | Toyama |
| Danzig | Madrid-Parla | Turin/Torino |
| Darmstadt | Magdeburg | |
| Denver | Milan | Ulm |
| Dessau | Mainz | Utrecht |
| Dortmund | Manchester | |
| Dresden | Mannheim | Valencia |
| Dublin | Melbourne | Velez-Malaga |
| Duisburg | Memphis | Vienna |
| Düsseldorf | Messina | |
| | Minneapolis | Warsaw |
| Erfurt | Moscow | Würzburg |
| Eskisehir | Murcia | |
| Essen | | Zhuhai |
| | Neuenburg | Zürich |
| Florence | Nijgata | Zwickau |
| Frankfurt / Oder | Nordhausen | |
| Frauenfeld-Wil-Bahn | Norrköping | |
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Control and Safety Systems

Getting You There Safely



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