UNISTAR HR
Switch Machines

for Railway and Mass Transit Applications

voestalpine
ONE STEP AHEAD.

Pointing the Way to Technology

Economy and society need mobility. Increasing traffic requires innovative ideas. Growing population, increasing energy costs and transport volumes are big challenges for today's society. Railbound transportation is providing competitive and reliable logistics for humans and freight. In 1980 voestalpine SIGNALING Sainerholz started designing and manufacturing switch machines to improve rail safety. The first units were installed in tramway networks such as Berlin. Soon the product range was extended to cover applications in tramtrain networks and railway applications in Germany and abroad. Based on the international experience and the gathered know how, voestalpine SIGNALING Sainerholz introduced the UNISTAR switch machine series offering a modular switch machine design. Universal application of the switch machines was achieved independent of turnout types, power supply and interlocking systems.

In 2008 the UNISTAR HR Heavy Rail series of switch machine was revealed. It exceeds the toughest railway specifications such as German Railways and AREMA.

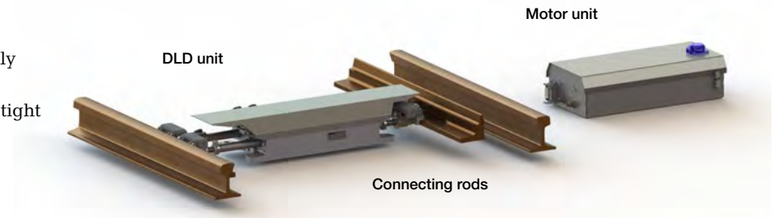
The UNISTAR HR family covers:

- **Railway, Heavy Haul, Metro and Light Rail applications**
- **choice of electro-hydraulic or electro-mechanic drive systems**
- **multiple setting levels**
- **operation of turnouts with and without stretcher bars (track rods)**
- **operation of swing nose crossings (moveable point frogs)**

UNISTAR machines are in service in more than 35 countries and are known for reliable operation even under harsh environments. They are safe, reliable, economical and low in maintenance. A vast network of local support centers jointly established with our voestalpine VAE sister companies lets us "think globally and act locally".

UNISTAR HR SYSTEM Components

Worldwide under various environmental and operational conditions, the UNISTAR HR family proves market leading quality and reliability.
All family members offer watertight and dust-tight boxes certified according to IP67.

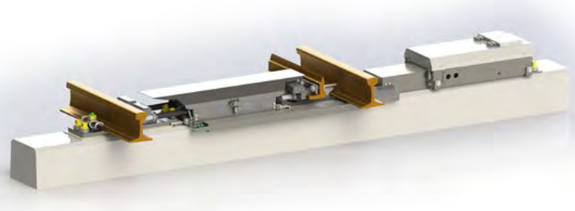


UNISTAR HR: The premium choice

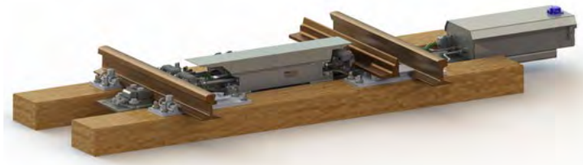
Whether on high speed tracks, heavy haul lines or in major metro systems:
The unique and SIL4 certified design of UNISTAR HR is proving excellent reliability and safety in daily operation. Motor unit and DLD (drive, locking, detection) unit are split into two individual IP67 certified boxes. This allows versatile installation as shown below. The motor unit with hydraulic drive is capable of operating multiple DLD units installed in a turnout. In case of distributed drives in a turnout, identical DLD units are applied. The DLD unit always comes with an integrated locking device with adjustable switch point opening for operation of turnouts and swing nose crossings. The connecting rods compensate for thermal expansion and contraction of the switch points without affecting the end position adjustments. Integrated pressure heads positively close the switch points against the stock rail.

Fixation of UNISTAR HR to Track

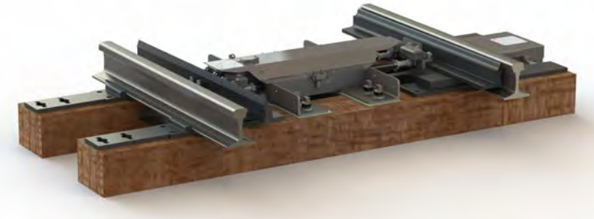
Installation on top of concrete sleepers or hollow steel sleepers
The low profile design of the switch machine allows installation of the units on top of concrete or steel sleepers allowing automatic tamping. The patented installation on top of concrete sleepers increases the track stability and avoids the introduction of steel sleepers with a different behavior in the ballast.



Stock Rail Fixation
Especially for retrofits or installation in turnouts with the rod attachments located between two sleepers, a supporting frame can be fixed to the stock rails prepared for mounting of the UNISTAR HR modules. The frame is designed to keep gauge.

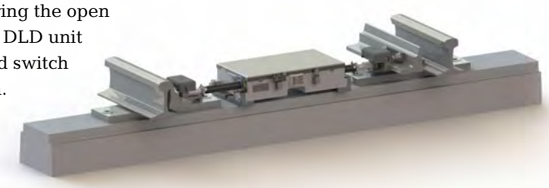


Fixation Brackets
Fixation brackets are available for simple installation on slab track or adjacent sleepers.



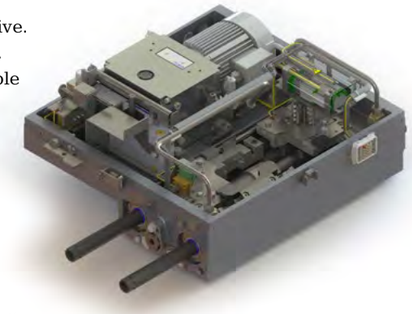
UNISTAR ELP

The UNISTAR ELP provides for additional end position detection between multiple DLD units in a turnout. It offers two detector rods monitoring the open and the closed switch point. The box has the same footprint as the DLD unit allowing use of the same fixation components, connecting rods and switch point attachments thus reducing the number of parts in the system.



UNISTAR HR compact

Budgetary version in conventional design
Motor unit and DLD unit are installed in one box located outside the gauge. Hence the installation is more conventional offering a price competitive alternative. Motor unit and the DLD unit are identical to the ones used in the UNISTAR HR. Besides the integrated locking device, the UNISTAR HR compact is also available with a force lock for yards and sidings. For secondary drives, a DLD only box is available linked to the main unit.



Electro-Hydraulic or Electro-Mechanic Drive at Customers Choice - unique to UNISTAR HR

The type of driving system is often a question of philosophy. To meet customer requirements, the integration of both operating systems was taken into consideration when starting the design phase of the UNISTAR HR series. The vital components like locking device and detector/circuit controller system and the housing remain identical. The EM Drive is integrated into the DLD unit making it the most compact railway switch machine worldwide.


electro-hydraulic drive


electro-mechanic drive

Comparison of Drives

	UNISTAR HR	UNISTAR HR EM
Motor Location	separate module	integrated in setting- and locking unit, extremely compact design, motor controls in junction box
Driving Force	up to 17 000 N	up to 11 000 N
Manual Operation	quick pumping action alternative: cranking	cranking
Multiple Drives	one motor unit operates all DLD units, distributed in a turnout, manual operation at a single point, only one interface to the interlocking, no separate controls required	every DLD unit in a turnout has its own motor, manual operation at each individual motor unit, up to 3 units require one interface to the interlocking, distribution by local controller
Roadmaster Diagnostic System	sensors for installation in motor unit	integrated in motor control
Interlocking Integration	any motor voltage and wiring incl. 4-wire possible and readily available	110 V DC, 230 V AC, 400 V AC other voltages on request

Industry Leading Technology

UNISTAR HR stands for the latest generation of integrated point setting and locking systems. Compact modules allow for unrestricted arrangement in the track. Points as well as crossings are driven with one standardized DLD unit for single or multiple setting levels. The DLD units are driven by a single, central power module with one monoblock hydraulic unit. There are a number of unique features to the UNISTAR HR providing outstanding performance, listed on the following pages. The DLD unit is typically installed in the center of the gauge and the motor unit outside the gauge.

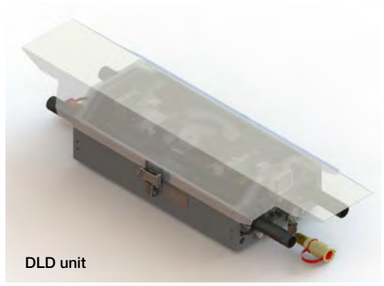
The life cycle cost (LCC) oriented design of the UNISTAR HR is unique on the market and offers benefits for all kind of application. This goes well beyond the machine and its performance. E.g. the size of the modules and the low space requirements help to save costs in civil engineering to prepare the site. The brochure gives an overview on common applications of the UNISTAR HR and the unique features resulting in individual benefits.

Technical Data

Safety Level	SIL4 according to DIN EN 50126, 50128 and 50129
MTBF	> 500 000 h
MTTR	< 20 minutes
Environmental Conditions Standard Configuration	temperature -40 to +80°C, Solar Radiation tested with 1120 W/m² humidity up to 95 %
Degree of Protection	IP67
Weight – electro-hydraulic drive	weight DLD unit approx. 80 kg, Motor unit approx. 50 kg
Weight – electro-mechanic drive	DLD unit with integrated motor approx. 85 kg
Throw Time	1 - 5 sec
Throw Force	up to 17 000 N, adjustable
Motor Voltages	24 - 750 V AC or DC
Switch Point Opening	60 - 163 mm, adjustable
Locking System	lock integrated prism lock, trailable or non-trailable
Fixation to Track	concrete or hollow steel sleeper, stock rail fixation, sleeper fixation
Interfaces to Trackwork	all types of turnouts, with or without tongue connecting rods

Maximizing Track Availability

Railways sell track availability and maintain railway networks. Switch machines are becoming a commodity. The simple yet sturdy design of the UNISTAR HR supports to achieve todays and future objectives. Highest quality materials requiring the least possible maintenance are used such as hardened special steel for the locking device, stainless steel and cast aluminium for the boxes and surface treated and forged parts for the connecting rods. Inspection intervals are extended and inspection times reduced since all components are installed at one level with no hidden parts, the locking device is fully visible and the number of parts is down to a minimum.
If the hydraulic drive system is selected, a monoblock hydraulic unit with integrated hand throw device reliably powers multiple DLD units installed in the turnout.



DLD unit

Motor unit

General Benefits of the UNISTAR HR Design

Design Feature	Cost Savings
Short and sturdy connecting rods with thermal expansion compensation	industry leading reliability and availability
Pressure head providing positive point pressure and assures point closure	long term maintenance intervals
Utmost flexibility for installation incl. installation on top of concrete sleepers	reduced track downtime
Fully encapsulated and water tight acc. to IP67	option: condition based maintenance with integrated diagnostic system

Enhance your Network Performance

In a railway network there are significant differences when it comes to the use of track. From rarely used sidings to mega busy tracks, low speeds in shunting yards up to high speeds on mainlines, tight turnouts with high lateral forces and long turnouts with high vibration impacts, multiple drives and swing nose crossings: freight and passengers have to be transported safely and on-time. Switch machines are a very important piece of the puzzle in every railway network and we at voestalpine SIGNALING stand for responsible introduction of latest technology. Our focus is our customer's benefit.

After thorough testing and achieving the SIL4 certification the UNISTAR HR is introduced to railway operators worldwide. The UNISTAR HR is convincing a continuously growing number of customers on every continent and in every climate condition thanks to:

- **low life cycle costs**
- **outstanding reliability**
- **low maintenance requirements**
- **simple yet sturdy set up**
- **innovative installation options**

المؤسسة العامة للخطوط الحديدية
SAUDI RAILWAYS ORGANIZATION

DB

TCDD

الاتحاد للقطارات
ETIHAD RAIL

Too good to be true? Contact us for a free pilot installation to experience the benefits!

UNISTAR HR for Heavy Haul Railways

Much needed commodities and resources are transported over large distances by rail. Especially in case of mining operations, railways are the only means of transport in rather sparsely populated areas with the closest workshop being hundreds of kilometers away. Train delays are extremely expensive as the complete logistics network would be disturbed and lose its balance. Performance of the equipment installed is key. With axle loads of freight trains of up to 40 tons, more than 200 wagons and 30 000 tons per train, the switch machines have to withstand high mechanical and vibration impacts. The capability of solar power supply is mandatory for installation in rural areas.

Heavy Haul operators like the even weight distribution of balance of the UNISTAR HR and the capability of installation on a concrete sleeper resulting in:

- **higher track stability**
- **less requirements for tamping**
- **a homogenous track behavior due to the avoidance of hollow steel sleepers**

The UNISTAR HR and UNISTAR HR compact switch machines are successfully in operation under above conditions at freight line operators.

FMG Fortescue
The New Force in Iron Ore

ALL
AMÉRICA LATINA LOGÍSTICA

Benefits in Heavy Haul Environments

Design Feature	Cost Savings
Even weight balance	less tamping
Optimized ballast stability	less track downtime and train delays
Installation on top of concrete sleepers: no steel sleepers and therefore homogenous track condition	integrated monitoring system
Fully encapsulated and water tight acc. to IP67	low weight components – no lifting gear required for installation or maintenance

UNISTAR HR for Slab Track and Elevated Guideway

The Direct Fix

Slab track or direct fixation trackwork eliminates the need for ballast maintenance machines. For that reason the envelope becomes smaller and there is less space beside the track. When pouring the concrete, an even surface with no cut outs is preferred. Alterations at a later stage are time consuming and expensive. Conventional switch machines located outside the gauge often require special designs. The machine has to be located in the emergency walkway with special covers and difficult access for maintenance. Cable pipes need the room which is unexpectedly occupied by a switch machine. Cut outs have to be foreseen in the concrete to allow room for the rodding and it can only be hoped that turnouts and switch machines will be installed as planned – thus avoiding costly relocation of the cut outs.

The UNISTAR HR offers considerable advantages for this special installation:

- due to the low height of the boxes fixation directly on top of the concrete slab is possible, no cut outs required
- no interference with walkways, cable pipes
- motor unit can be installed at center gauge as well
- no extra civil works – huge cost benefit

UNISTAR HR is immediately fixing any installation issue

Benefits for Direct Fixation Track

Design Feature	Cost Savings
Short and sturdy connecting rods with thermal expansion compensation	industry leading reliability and availability
Pressure head providing positive point pressure and assuring point closure	long term maintenance intervals
Utmost flexibility for installation incl. installation on top of concrete sleepers	reduced track downtime
Fully encapsulated and water tight acc. to IP67	option: condition based maintenance with integrated diagnostic system

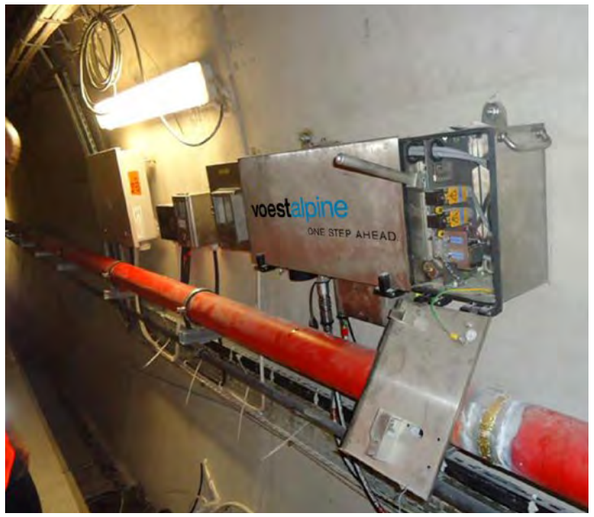
UNISTAR HR for Metro and Tunnel Applications

Ease City Congestion

Metro systems often carry millions of passengers per day. The headway of trains is reduced to increase capacity on the lines and cope with the demands. Implementing new lines or additional tracks is very costly since most of the lines are either underground or elevated. Often switch machines in highly frequented turnouts have to operate 1000 times per day or more. 24 hour service will be introduced at weekends thus eliminating time available for maintenance and inspection. Driverless systems with maintenance crews available at a centralized depot only further the demand for highest performance of switch machines as the traffic will collapse in case of failures.

Today, UNISTAR HR is working reliably in some of the busiest metro systems in the world such as Paris, Sao Paulo, Taipei or Berlin. Its heavy duty design and large reserves in throw force and locking forces clearly distinguish the UNISTAR HR from other machines. The fully modular structure and the plug coupler connection for all electric and hydraulic lines allow for very fast installation and lowest MTTR values. The low weight of the components eliminates the need for lifting and transporting equipment.

Besides the center track installation, the motor unit can also be installed at the tunnel wall. This is saving the requirement for a niche typically provided for switch machine installation at a cost of up to 500 000 EUR! Furthermore, the tunnel diameter can be reduced.



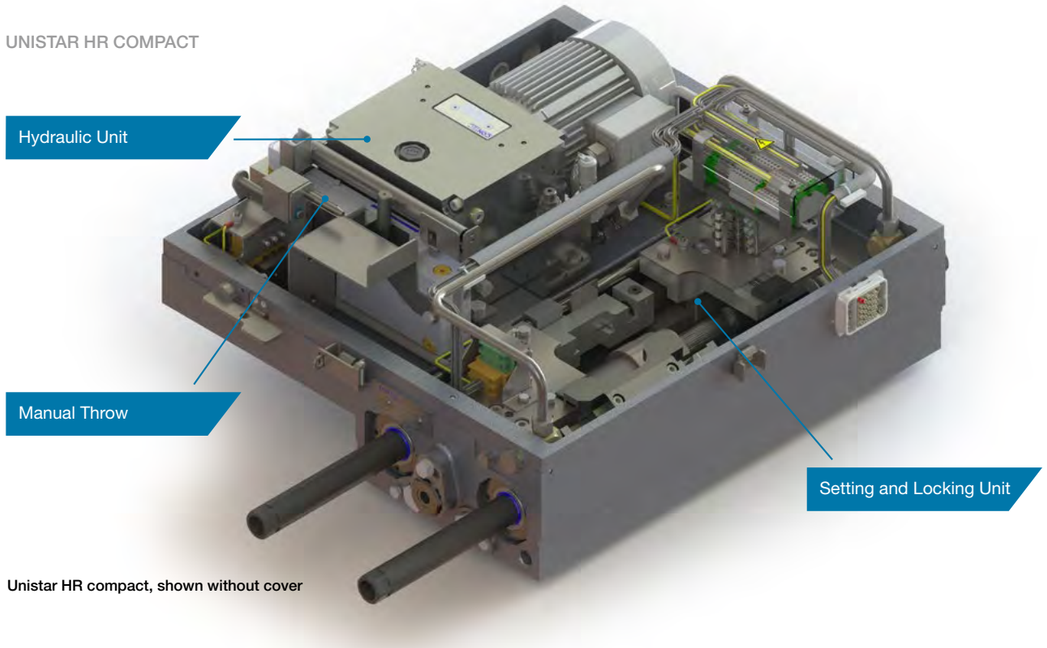
At the tunnel wall:
the hydraulic motor unit

- stainless steel box with integrated handles for easy transport
- clear emergency walkways
- reduced tunnel diameter and no niches
- plug couplers for all electric and hydraulic lines
- monoblock hydraulic unit with integrated manual setting device
- optional: LED-end position indicators

Benefits for Tunnel Installation

Design Feature	Cost Savings
Quick and easy installation at short night breaks	no niches in tunnels
Plug coupler compatible integration into existing infrastructure	reduction of tunnel diameter
Low weight components	no lifting gear required
Quick throw times for fast route settings	reduction of headways and capacity increase
Optional Roadmaster Diagnostic System	condition based maintenance

UNISTAR HR COMPACT



Unistar HR compact, shown without cover

UNISTAR HR compact
leading technology – price competitive

The UNISTAR HR compact combines both units in one box, installed outside the gauge and relates from the installation point of view more to conventional point machines with internal lock.

It can be installed either left hand or right hand without any modifications to the machine. In this regard it is more similar to a conventional switch machine. All components are identical to the ones used in the UNISTAR HR. One main lid covers the switch machine housing. A separate lid provides access to the manual hydraulic pump for manual operation.

Customers such as the Brazilian freight line operator ALL are making advantage of the UNISTAR HR compact for their modernization programs.

Unistar HR compact at Untervaz, Switzerland

Benefits UNISTAR HR compact

Design Feature	Cost Savings
Short and sturdy connecting rods with thermal expansion compensation	industry leading reliability and availability
Pressure head providing positive point pressure and assures point closure	long term maintenance intervals
Utmost flexibility for installation incl. installation on top of concrete sleepers	reduced track downtime
Fully encapsulated and water tight acc. to IP67	option: condition based maintenance with integrated diagnostic system

UNISTAR ELP
End Position Detector

The UNISTAR ELP is designed for individual switch point detection and allows installation between or outside the gauge. It can be applied between setting levels in long switch points or at the tips of the switch points.

Two individual detector rods are provided. Each rod is operating two sets of end position contacts for monitoring the open and the closed position of the respective switch point.

The IP67 class box is flooding safe and dust proof allowing reliable operation in harsh environments. The lid is fixed by 4 quick fasteners – no bolts are applied. It can be secured by padlock.

For electric connection, a cable gland or an IP68 rated plug coupler can be provided.

Technical Data

	Title	Unit	UNISTAR ELP
1	Dimensions	(mm)	540 x 343 x 116
2	Total weight without connecting rods	(kg)	21
3	Switch Point Opening min/max Center gauge installation Outside gauge installation	(mm)	 60 / 150 60 / 170
4	Ingress Protection Rating	(IP)	67

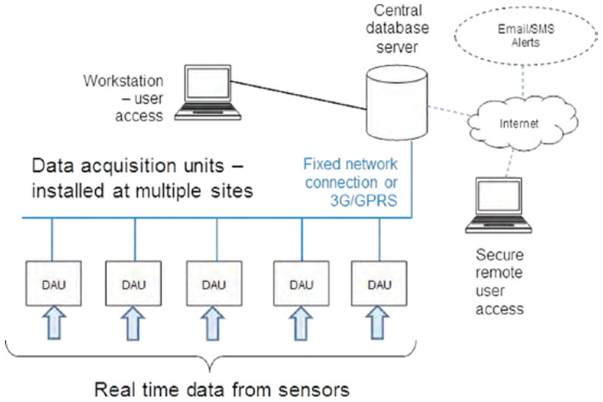
Condition Based Maintenance

Condition Based Maintenance becomes reality with the Roadmaster Diagnostic System for the UNISTAR HR series of switch machines.
The system goes beyond current over time measurements and therefore provides a much more detailed and precise analysis. In the switch machine, a number of sensors are installed.

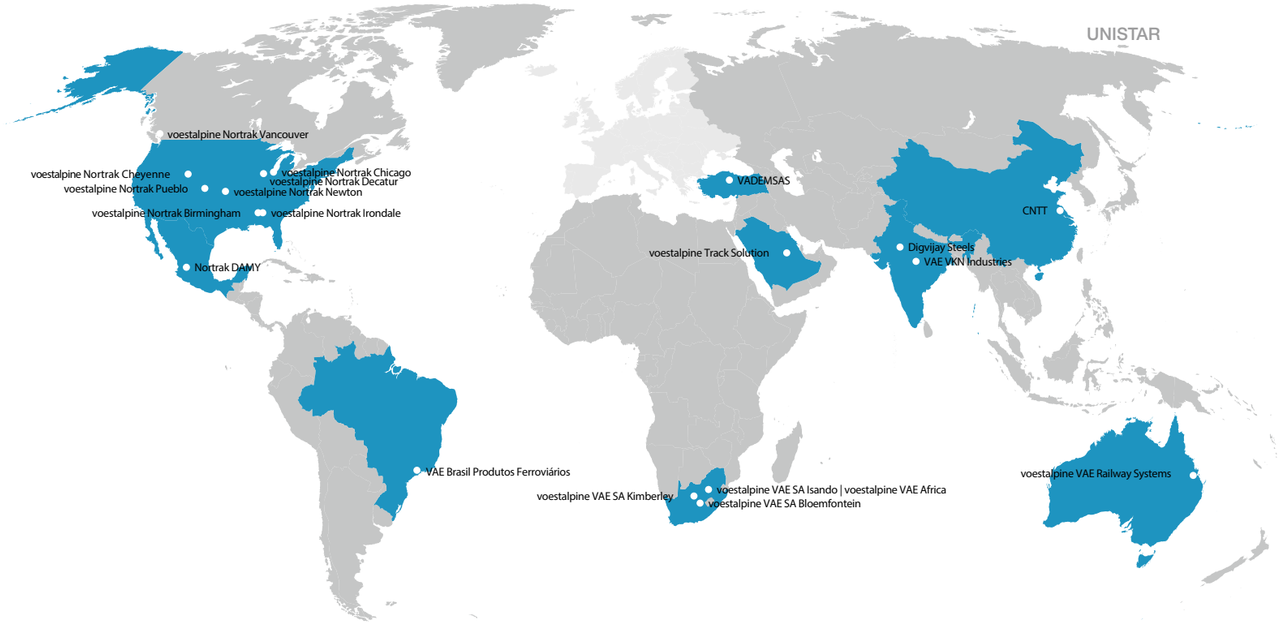
This can include:

- hydraulic pressure
- oil level
- current drain
- remaining force
- reversal time
- switch operation force
- detector rod
- stabilising agents

The data is gathered by a PCB and forwarded via RS485 connection to the DAU – data acquisition units. Each DAU can control up to 8 switch machines.



Secure remote user acess



Projective Design by Reflective Thinking

Reliability in Europe and worldwide

Why voestalpine SIGNALING Sainerholz?

Econony and society need mobility. Increasing energy and material costs are introducing an even stronger focus on rail systems. Increasing traffic requires innovative ideas. We improve rail safety, innovative and economically, by developing and manufacturing state-of-the-art products for railbound traffic.
Our products are:

- safe
- reliable
- economical
- low in maintenance

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