

SMART point machines

MAKING A POINT: S&C DESIGN, MANUFACTURING, INSTALLATION
AND MAINTENANCE

POINT MACHINE UNISTAR HR

Integrated lock, drive and detection

UNISTAR HR in the UK

Network Rail Product approval (PA05/07280) gained December 2023 following successful trial at Uddingston (Scotland, WCML) and Barking Riverside (London Overground).

NR Standard NR_L2_SIG_19809 Rev 3, Selection of Point Operating Equipment dated 01/03/25 has recently been issued and updated allowing us to supply Unistar to the routes.

5.2 Current POE

The list below outlines the POE considered to be current/modern as of publication. Current/modern POE should be supported with manuals and spare components.

- Hy-Drive (IBCL & SO Supplementary Drive)
- High-Performance Switch System (HPSS) Mk2
- **Unistar HR**
- In-Bearer Clamplock (IBCL)
- Rail Clamp Point Lock (RCPL) excluding Mk1
- HW 2000 series point machine³

5.5 Switch Diamonds

Table 4 provides guidance on selecting the appropriate approved and compatible types of POE in respect to the proposed design of S&C for Switch Diamonds for S&C renewals.

Flat Bottom Vertical (FBV)	NR56V (Full Depth)		NR60 Mk1	NR60 Mk2
	CONCRETE	TIMBER	CONCRETE ONLY	
RCPL HW	UNISTAR HR ^{1,4} RCPL HW	RCPL HW	N/A	Unistar HR

Table 4 – Switch Diamonds

vaRS point machine products in the UK

50+ Unistar
EM on TfL



Unistar HR
is installed
on NR, TfL
and
Manchester
Trams

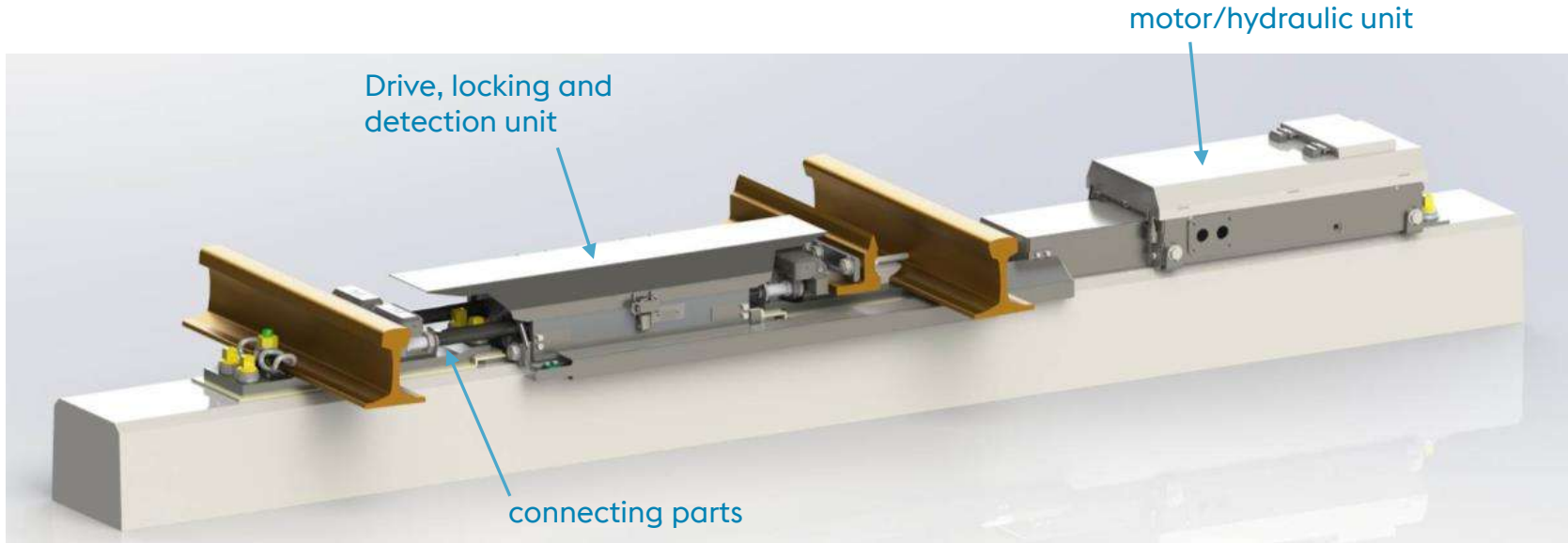


Used on complex junctions, vignole and embedded rail as powered (Unistar/ CSV24) or manual (CSV34) options.



The Tram Unistar equivalent, CSV24, is installed at; Manchester, Glasgow, Edinburgh, Nottingham, Sheffield, Croydon, Blackpool, Wembley, Temple Mills.

UNISTAR HR



UNISTAR HR



Highlights:

- » Designed for all vignole rail applications – SIL4 certified with single or multiple setting levels.
- » Industry leading RAMS figures: high MTBF of more than 500 000h, very low MTTR of only 20min.
- » Low weight of components - no lifting gear required for installation.
- » Space saving.
- » Flexible integration into all kind of signaling and trackwork designs.
- » IP67/68 protection class.
- » 3000+ turnouts are equipped with UNISTAR HR from Light Rail, Metro to Heavy Haul Railway applications, proven design with perfect track records under all climate conditions.

UNISTAR HR



- » Throw time, 3-5 seconds
- » Throw force, 4-6kN
- » Trailable
- » Fully tampable
- » Reduced maintenance (annual FPL/ greasing)
- » Quick and simple installation: Typically 2.5 hours for a 2SL system
- » Low Life Cycle Costs, 20+yrs operation supported with overhaul strategies
- » Plug and Play compatible with disconnection box, supporting PA's and Typical drawings
- » Modern technology with enhanced diagnostic capabilities
 - a. Setting force
 - b. Setting time
 - c. Setting movement/ distance
 - d. Liquid sensor
 - e. Hydraulic pressure
 - f. CT's

UNISTAR HR – Hydraulic unit



Hydraulic Unit

- » SIL 4 according to CENELEC
- » Only one interface to the interlocking system up to 4 setting levels
- » Hydraulic unit includes the electric motor, the monoblock hydraulic tank and the manual operation device
- » Adjustable hydraulic pressure = setting force of the point machine to suit switch design
- » Motor voltages 24 – 750 V AC and DC
- » Separated covers to manage access
- » Lockable covers for additional security

UNISTAR HR – inside the hydraulic unit

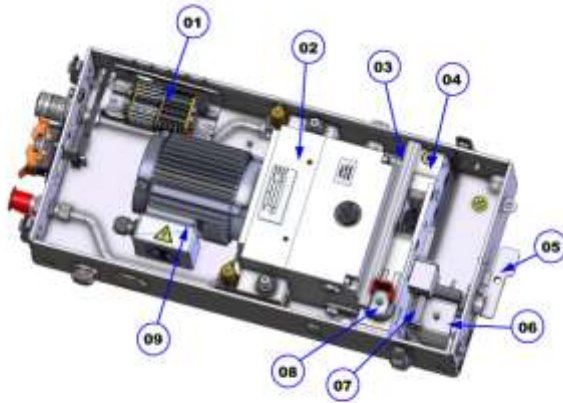


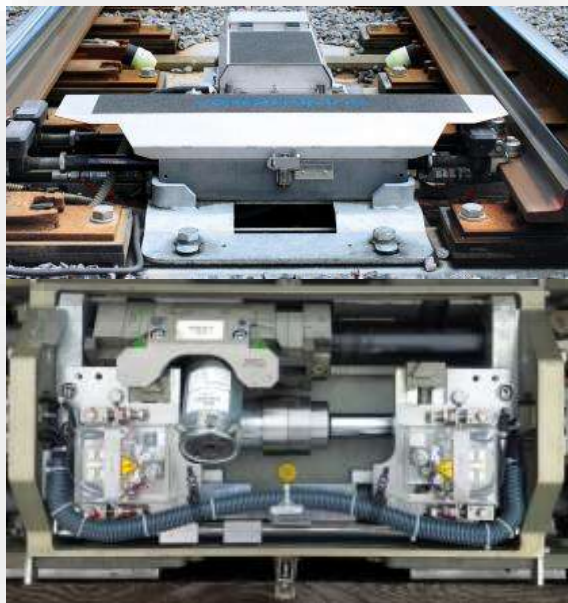
Figure 6: Hydraulic unit – without lid

01	Terminal	06	Cut-off switches
02	Hydraulic aggregate	07	Mechanic for cut-off switch activation
03	Manual pump lever	08	Manual setting valve
04	Manual hydraulic pump	09	Electric motor with terminal box
05	Lever type closure for main lid		

Hydraulic tank and motor

- » The hydraulic unit comprises;
 - » Motor
 - » Tank
 - » Electrical terminal block
 - » Manual controls

UNISTAR HR - DLD



Integrated Drive, Lock and Detection unit

- » Compact dimensions.
- » Low weight: 77kgs for hydraulic unit, drive units are 70kg.
- » Switch throw adjustable from 60 to 163 mm.
- » Internal mechanical locking system.
- » Ingression protection class IP67/ 68.
- » Multiple setting levels to suit switch length.
- » Integrated end position detection (both open and closed switch).
- » Trailable.
- » MTTR 20 minutes.
- » End position switches support 4, 7 or 11 wire signaling circuits, inc. double cut with seperated detection.

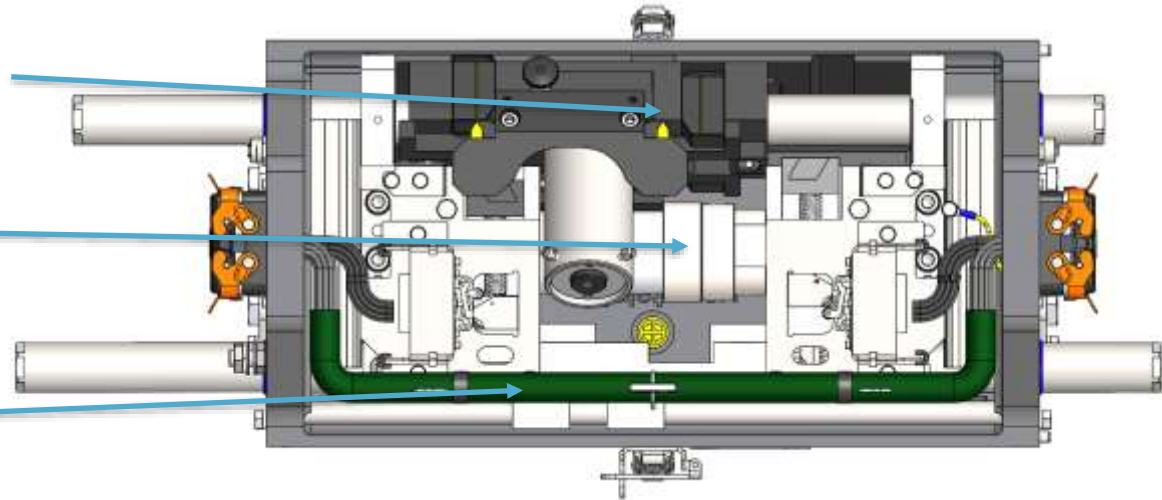
UNISTAR HR –DLD: Integrated drive, lock and detection

The DLD unit comprises of;

Drive carriage with integrated lock

Drive cylinder

Detection bar, pins, wiring and switches



UNISTAR HR – connecting parts



Connecting parts

Switch rail brackets and bolts connect the drive and detection bars to switch rail on each side.

The drive/ lock rod on the left and detection rod on the right in this picture.

Both rods can be adjusted to achieve correct switch fit, FPL and Go/ No Go requirements.

The switch rail brackets can be designed to suit any switch rail type, foot or web fixings.

The pressure head on the drive rod is spring loaded, so can compensate for poor switch fit/ gauge widening, up to 3mm.

UNISTAR HR



Electrical connections

To the hydraulic unit, we can provide glands for the customer to determine most suitable cable connections.

For NR, we supply a plug coupled solution with connecting cable and disconnection box to IP67.

UNISTAR HR



Electrical connections

Connecting cables from the disconnection box to the drive unit allow for separated detection (IN/ OUT) and plug coupled cables. We use C2 cables with Harting Han M plug on the DLD side.

Side entry plugs are used to manage cable entry and positioning.

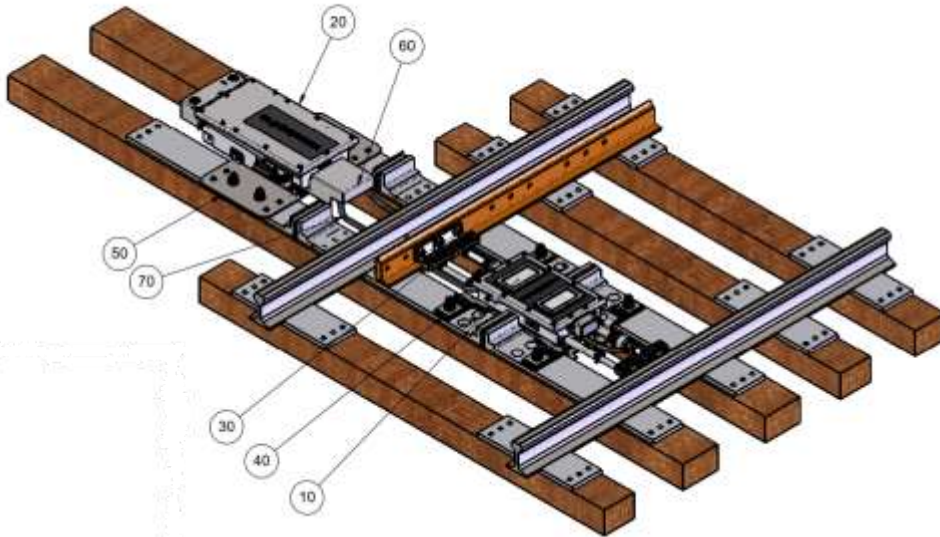
UNISTAR HR

Climate change

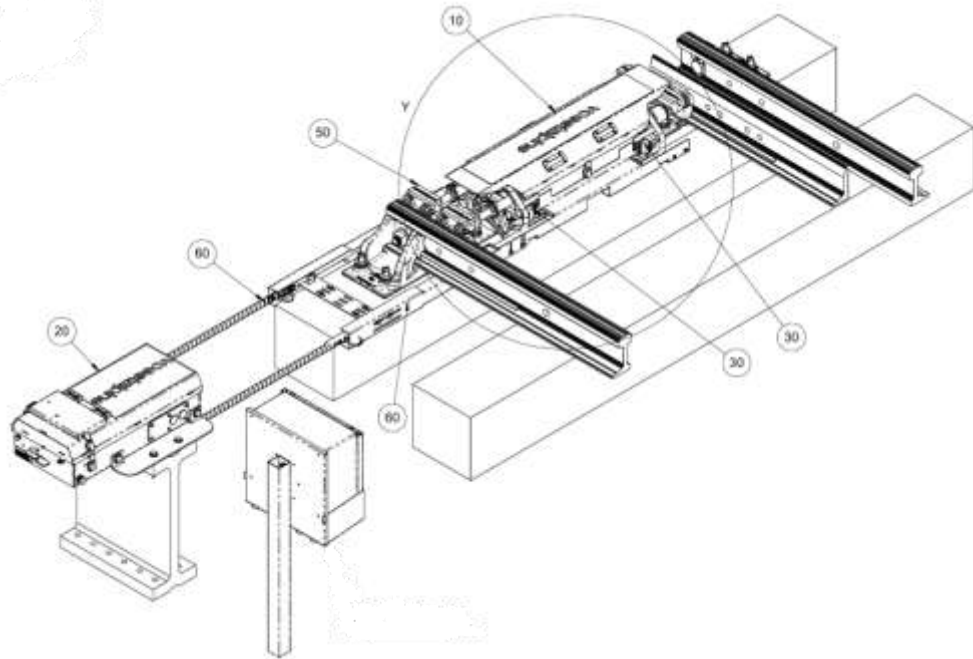
Hydraulic units and drive units are designed, assured and tested to IP68.

Currently in use in America.

IP68 CSV24's are also available and recently supplied to Manchester Trams within the UK and Canberra, Australia.



UNISTAR HR



HW retro fit options

Working with Schwihag, an adaptor plate has been developed to secure the DLD on bearer.

The hydraulic unit and disconnection box can be located up to 20m away.

Designs have been submitted to NR TA for review.

SMART point machines

- » All Unistar and CSV24 machines can be supplied with the following sensors;

Image below is from Unistar HR, hydraulic unit.

- » CT's
- » Pressure sensors
- » Hydraulic tank, low level alarms
- » Moisture sensors for hydraulic unit
- » Vibration monitoring (not shown in this picture)



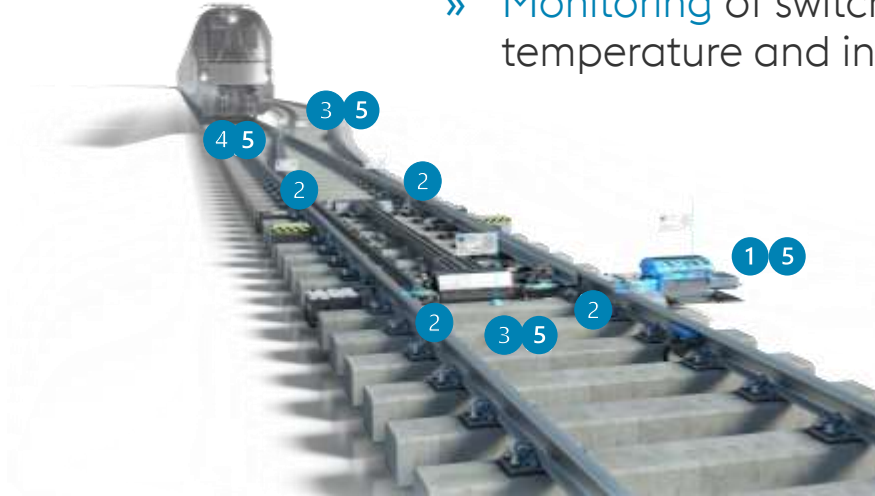
zentrak

INFRASTRUCTURE MONITORING

Diagnostic & Monitoring
Technologies for Infrastructure

zentrak INTELLIGENT TURNOUT

- » Comprehensive **maintenance management** to increase efficiency
- » Reduction of **downtime** and optimization of **train intervals**
- » **Monitoring** of switch device, track quality, crossing area, component temperature and intelligent switch machines



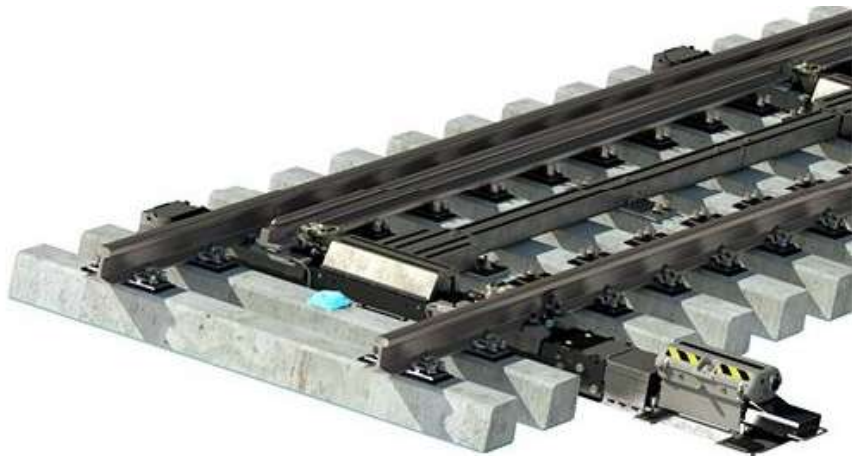
- 1 INTELLIGENT SWITCH MACHINE
- 2 SWITCH DEVICE MONITORING
- 3 TRACK QUALITY MONITORING
- 4 CROSSING AREA MONITORING
- 5 COMPONENT TEMPERATURE MEASUREMENT

zentrak INTELLIGENT TURNOUT SWITCH DEVICE MONITORING



- » Ensuring the **safe operation** of the switch by continuously overseeing critical rail positions
- » **Detecting distance** deviations between switch and stock rail
- » Estimating the **nearest flangeway** prevents unsafe operations
- » Improvement of **lifecycle costs** & optimization of **safety standards**

zentrak INTELLIGENT TURNOUT TRACK QUALITY MONITORING



- » Monitoring sleeper displacement and rotation to **diagnose track degradation**, predict critical states and propose optimal timing for maintenance
- » **Detecting** operational parameters of passing rolling stock
- » Use the data for clustering, normalizing acquired data, or capacity monitoring

zentrak INTELLIGENT TURNOUT CROSSING AREA MONITORING



SBAS

- » Vibration and noise monitoring
- » Hard wired direct to data logger or router for transmitting data
- » For HS2, the SBAS is attached to the drive units.



zentrak INTELLIGENT TURNOUT CROSSING AREA MONITORING



Dimensions 50 x 89 x 22 mm
Dimension with Mounting Frame 76 x 104 x 22 mm

Sensors

High-end acoustic emission sensor
Gyroscope (acceleration & inclination)
Temperature sensor

Installation

Rail web
Crossing area
Bearer
Points Operating Equipment

Can detect

Vibration
Voiding
Crossing nose wear
Rail damage

zentrak INTELLIGENT TURNOUT CROSSING AREA MONITORING



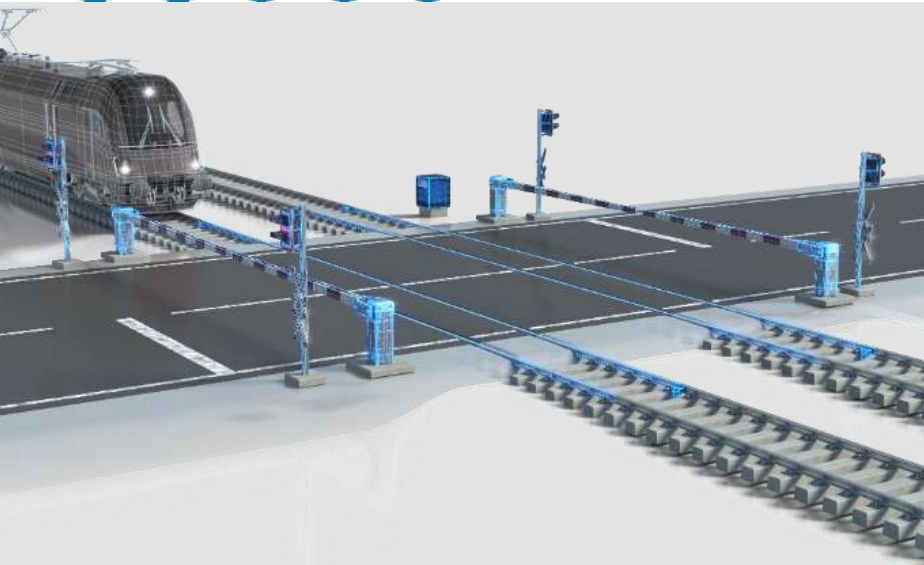
- » Diagnosis and prediction of wear on critical crossing components
- » Targeted monitoring solution for condition-based and prescriptive maintenance strategies
- » Assessing wheel quality to detect worn or hollow wheels
- » Prevention of emerging defects

zentrak TRAIN DETECTION MONITORING



- » Reduction of track circuit failures
- » Comprehensive data about the system status
- » Early alarm in case of deteriorating operating behavior of the track circuit
- » Monitoring ballast condition (contamination/flooding)
- » Detection insulation joint or bonding failure
- » Introduction of necessary measures before failure occurs

zentrak RAILWAY CROSSING MONITORING



- » Fewer breakdowns, road closures, and train delays
- » Potential for reduced maintenance costs
- » Remote monitoring of the status, timing, and sequence of each operation
- » Efficient maintenance and reduced life cycle costs
- » Support for incident investigation
- » Continuous monitoring of system performance