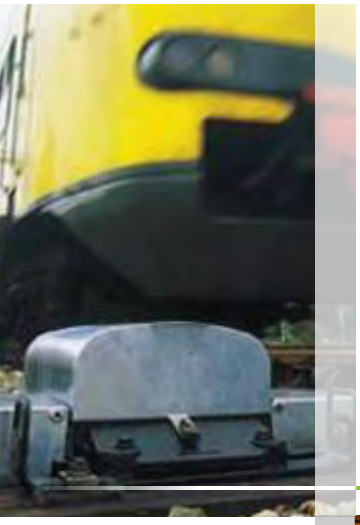
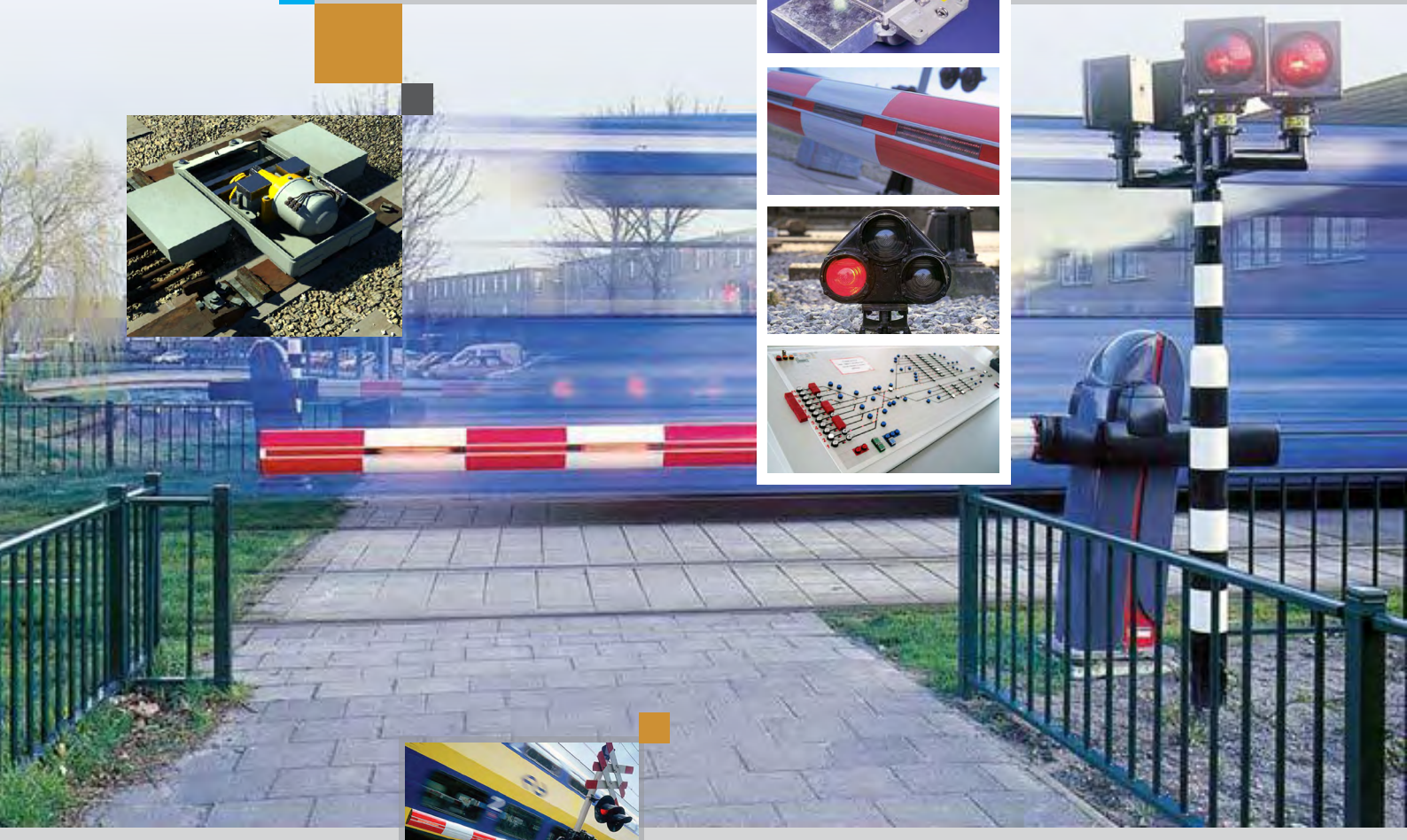


products & services



Transport System Solutions

Transport System Solutions

ENGINEERING
2D & 3D SERVICES

2D CAD SERVICES

Computer Aided Design (CAD)
Transport System Solutions has a specialised Design and Drawing department that can perform a range of services for the road and railway sectors. These services include:

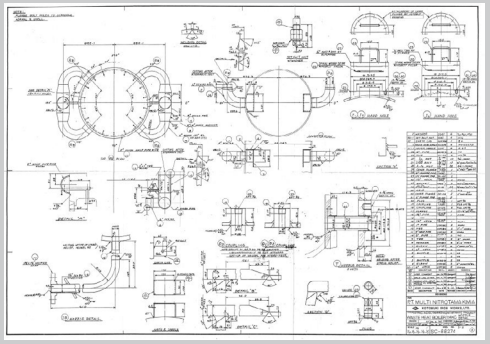
Drawing Digitisation
We can digitise your hard copy drawings into electronic drawings using benchmark tools and techniques.

Drawing Conversion
Our skilled operators can convert between AutoCAD and MicroStation and from Quickdraw to AutoCAD and MicroStation. Additionally, we can convert between AutoCAD Electrical and MicroStation EED or Bentley Electric.

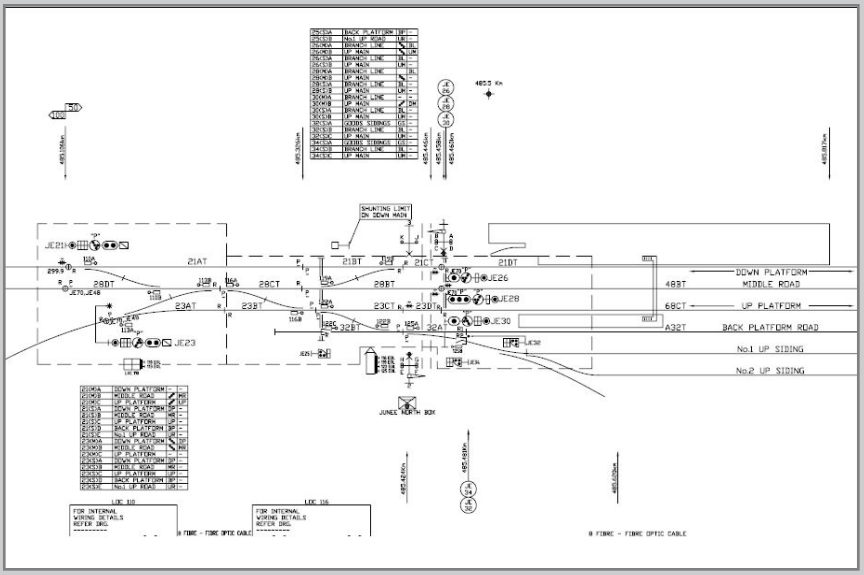
Areas of expertise
- Electrical railway signalling circuits
- Communications circuits
- Mechanical design and drafting
- Civil drafting
- Animations and modelling

Licenses held
- AutoCAD Full version
- AutoCAD Electrical
- MicroStation XM
- Corel Draw
- SolidWorks

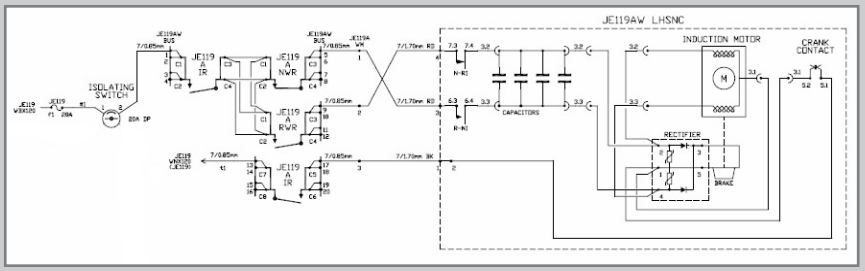
Mechanical drawing: from 2D to 3D



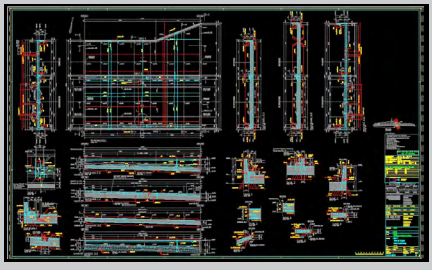
Signalling circuits

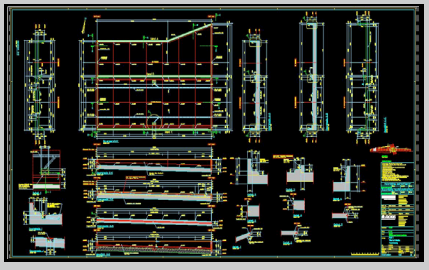


Electrical control circuits



Structural calculations





Transport System Solutions

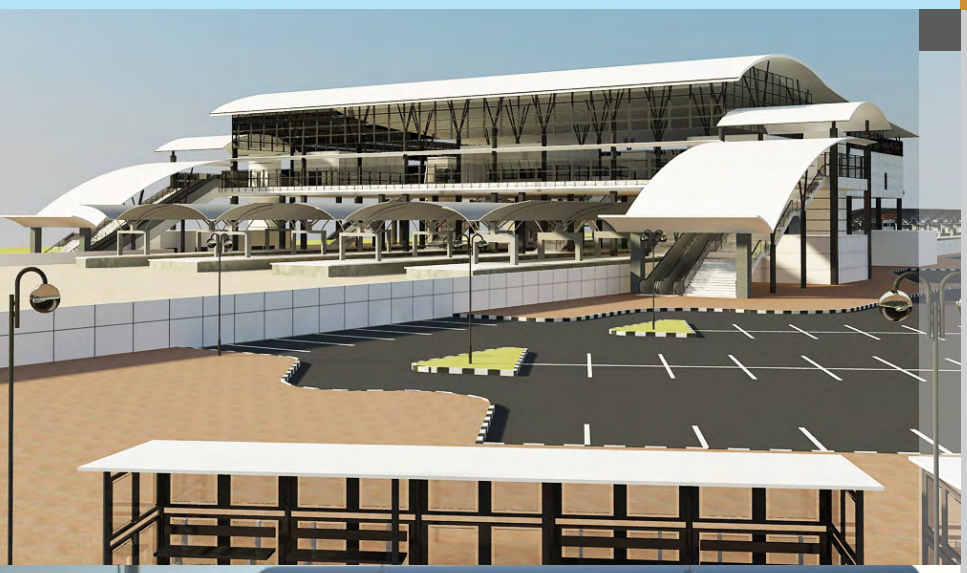
Our 3D Visualisation Department can provide 3D images from your sketches, drawings or photographs.

Transport System Solutions provided 3D visualisations to Japanese transportation consultants in connection with various projects across the Asia Pacific region.

We can accommodate customers who are looking for:

- 3D realistic images
- 3D animation
- 3D interactive
- 3D step-by-step construction / assembling processes

We can incorporate 3D virtual reality into our design process, enabling easy understanding of ideas and design conflict resolutions prior to production.



Areas of expertise

- 3D animation and modelling
- 3D simulation
- 3D game development

Licenses held

- 3DS MAX
- V-Ray
- ArchiCAD
- AutoCAD Full version
- AutoCAD Electrical
- MicroStation XM
- Corel Draw
- MS Visio Pro
- MS Visual Studio
- Sony Vegas
- Enterprise Architect
- Unity
- Adobe Photoshop
- Blender
- GIMP

Transport System Solutions

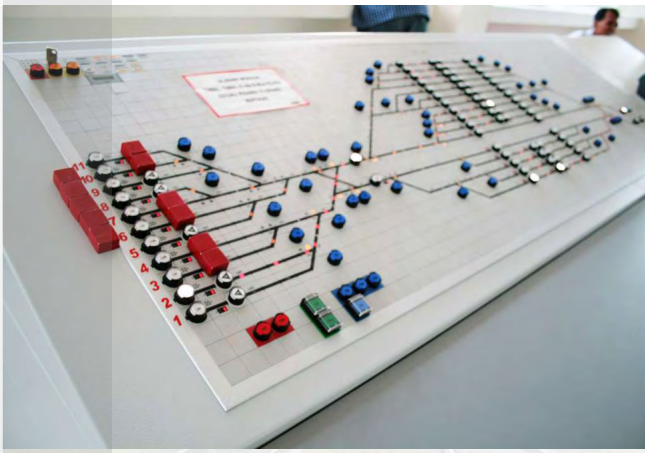
ENGINEERING

CENTRALISED TRAFFIC CONTROL SYSTEM

Introduction

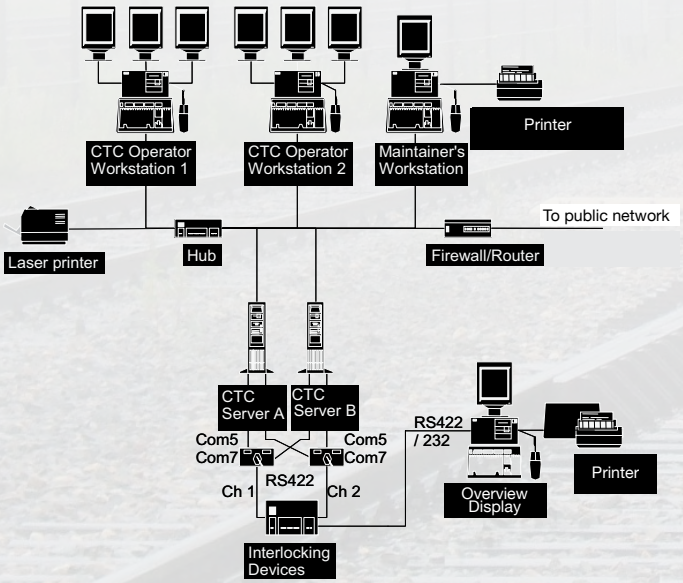
The Centralised Traffic Control (CTC) system is a SCADA application running on one or more redundant servers. Its modular design and extremely flexible configuration supports:

- multiple operators
- fully customised graphical user interfaces (GUI)
- wall-mounted or freestanding overview displays (both LCD and mosaic tile screens)
- interfaces with many types of equipment
- many different interface protocols
- redundant networks
- remote and web access
- logging and alarms



CTC Architecture

The example below shows two operator work stations, one maintenance work station, redundant server and overview display server.



Centralised Traffic Control System Options

Train Graph

Train Graph is a tool to plan and track trains based on train ID number, indicating when the train is arriving or departing each station. Train Graph provides a graphical representation of the planned and actual timetables and is easy to use. It allows the user to analyse the feasibility of a planned timetable and indicates critical timing. It can show the actual position of trains on the track in relation to the timetable. It also allows you to analyse train data logs and identify cause and consequence of delays in the timetable.

Train Graph in Sri Lanka

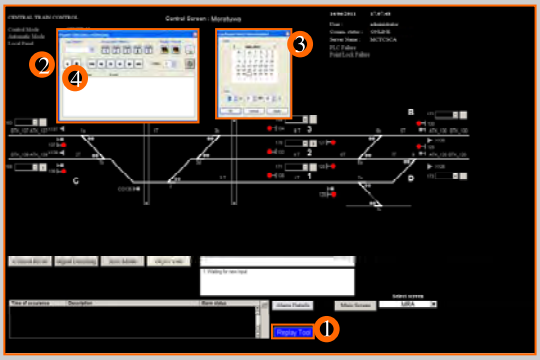
Web-based Monitoring

Web-based Monitoring is an easy-to-use tool to monitor train locations and routes over the internet.

Web-based Monitoring

Replay

With the Replay tool, you can analyse incidents by replaying log files containing operator actions, system behaviour and train movements.



CTC Replay in Sri Lanka

Automatic Train Numbering (Timetable)

This module compares trains entering the controlled area with the timetable. If the train is found in the timetable, it automatically assigns the correct train number to the train.

Passenger Information System

With this system, the names of stations and departure and arrival times can be displayed at the stations and inside the train.

Automatic Route Setting

This module automatically sets routes based on the timetable and availability of trains.

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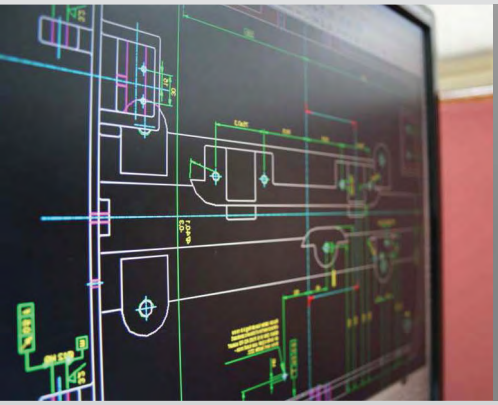
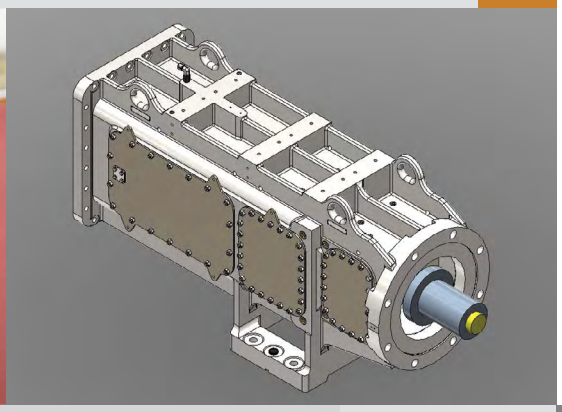
Transport System Solutions

ENGINEERING
MECHANICAL ENGINEERING SERVICES

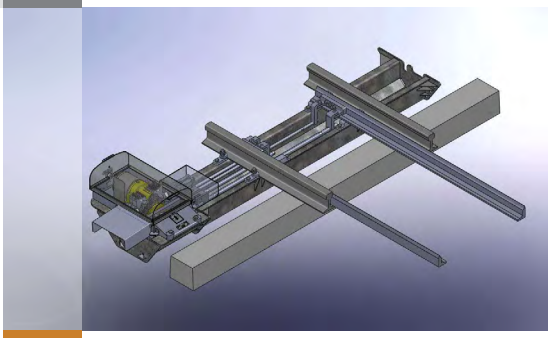
MECHANICAL ENGINEERING SERVICES

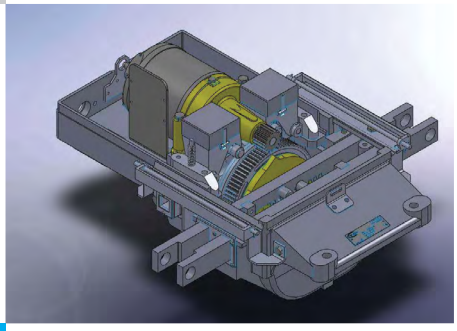




Besides providing mechanical design and drafting services in both 2D and 3D, we also engineer, supply and install the following products:

- **Point Machines including Rodding**
- **Point Locks and Detectors**
- **Colour Light Signals, LED and Incandescent**
- **Level Crossing Protection Systems**
- **Electronic Bells**

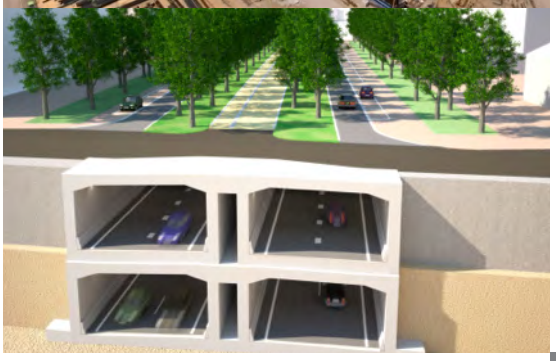




Transport System Solutions

ENGINEERING
CIVIL ENGINEERING SERVICES

CIVIL ENGINEERING SERVICES



Large and complicated constructions such as tunnels, viaducts, underpasses or stations require exact calculations, precise design and detailed drawings. Our Civil Engineering Department, established in 2006, is staffed by experienced drafters and engineers who are able to produce high quality products in accordance with the timelines set by the customer.

Since its formation, our Civil Engineering Department has successfully executed over fifteen projects. One of the largest projects is the Maastricht A2 Tunnel, divided into sixty-five tunnel sections, with more than 20,000 hours spent and 975 drawings produced (dimensioning and reinforcement).

We can provide the following services:

- Detailed AutoCAD drawings of viaducts, underpasses, tunnels, buildings, etc.
- Project calculation using SAP, ETABS and ESA-Prima
- 3D model construction using Allplan and Revit

Would you like to know more about our services, products or projects?

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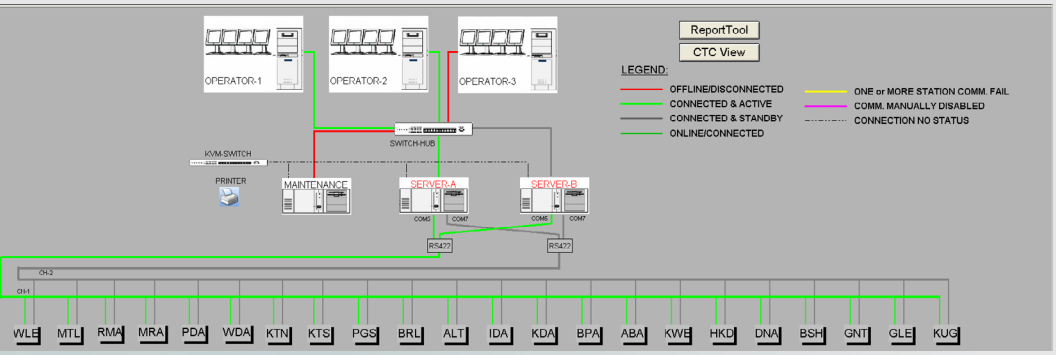
Transport System Solutions

ENGINEERING
SCADA APPLICATIONS

SCADA for Centralised Traffic Control

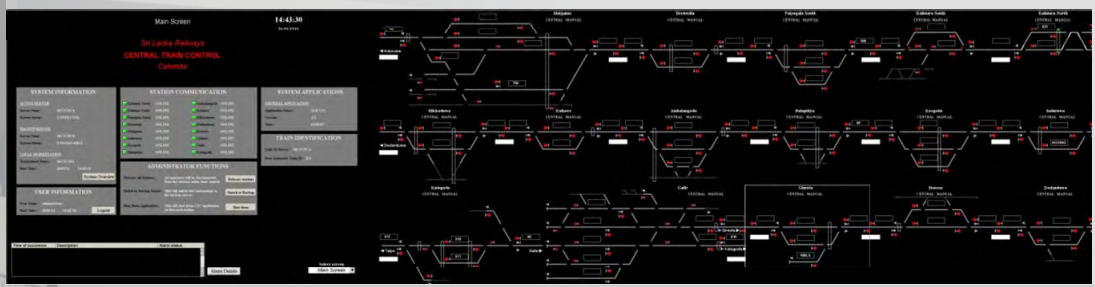
Transport System Solutions has many years of experience in customising Centralised Traffic Control (CTC) SCADA systems, for example in Sri Lanka, Australia and the Netherlands.

The example below shows one implementation of our SCADA CTC architecture. On the bottom row you can see the individual stations and the network backbone, in the middle the redundant server and maintenance terminal and at the top the operator workstations.



CTC Architecture

Our CTC system supports route setting, route cancellation, point control, system and power alarms, provides an overview of the track layout, the location of the trains and the routes set. This system has four user categories: Operator, Supervisor, Administrator and Maintenance.



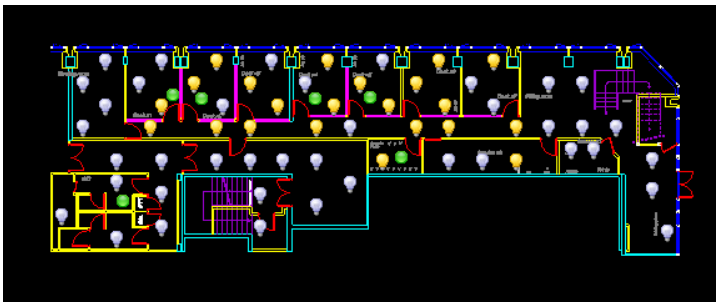
CTC Overview Panel

Other SCADA Applications

Transport System Solutions is not only able to supply and customise SCADA systems for railway signalling, but also for any other system where SCADA control and monitoring is required, such as power monitoring, facility monitoring or alarm management. Our SCADA system supports multiple communications options, including serial, ethernet and radio. If requested, all these SCADA applications can be integrated into one system.

Power Monitoring

The SCADA system can be used to monitor and control electric power sources and distribution systems feeding the traction power substations, and the distribution for the overhead catenary or third rail power.



Example of SCADA Power Monitoring

Examples of the kind of devices our SCADA system can monitor:

- Breakers
- Transformers
- Rectifiers
- Power feeders
- Power sensors
- Switchgear
- Generators
- Health and safety sensors (temperature, equipment alarms, etc)
- Voltage and amperage sensors

Facility Monitoring

Our Facility Monitoring system can monitor and control devices such as access or intrusion alarms, escalators, elevators, lighting, fire and smoke alarms, automatic doors and CCTV.

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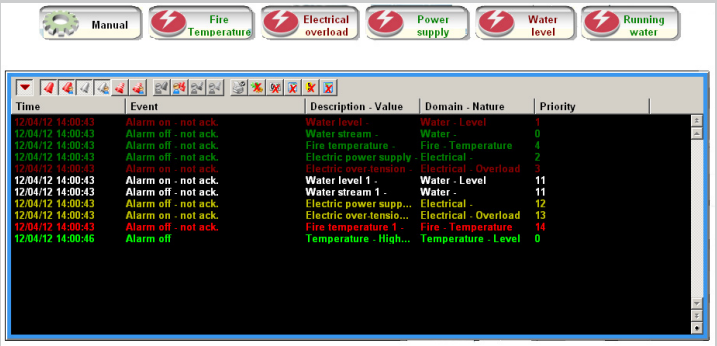
Operation Control Centre

Alarm Management

Our SCADA system supports remote alarm messaging, for example to mobile phones, email or pagers, as well as remote access so you can analyse the alarm from any location.



Example of Facility Alarm Management

The example shows our capability to manage alarm such as Fire Temperature, Electrical Overload, Power Supply Failure, Water Level and Running Water.

Transport System Solutions

LEVEL CROSSINGS

Level Crossing Systems

The automatic level crossing systems of Transport System Solutions protect level crossings between road and railway traffic. A barrier prevents road traffic from entering the dangerous area around the tracks, allowing the train to pass safely. Reliability, a long lifespan and minimal maintenance are merely some of the cast-iron qualities of the level crossing systems of Transport System Solutions.

Well thought-out design, robust components

The level crossing systems of Transport System Solutions are durable down to the smallest detail and consist of the following components:

- Post with plinth
- Barrier mechanism
- Road signals
- St Andrew's cross
- Electronic bell
- Oval aluminium barrier with a maximum length of 5.25 meters, or
- Wooden barrier with a maximum length of 9.5 meters
- Counterweights

The barrier mechanism consists of a gearbox driven by a 24 or 12V DC motor. The motor shaft has a holding magnet with a one-way coupling. As long as the magnet is energised, the level-crossing barrier cannot come down. When the magnet is not energised, gravity pulls the barrier down. From an angle of 52° down to the horizontal position, the motor slows down the movement of the barrier.

low maintenance, high durability, maximum safety

In order to prevent possible damage caused by overload, a friction clutch is built in. The level crossing barriers are limited in their vertical and horizontal position by means of rubber end stops.

The barrier mechanism is housed in a cast iron box provided with a hinged aluminium cover. The box is vandal-proof, provided with a coating and locked by means of a padlock. Ventilation caps in the box prevent condensation.

LED road signals, electronic bells and aluminium level crossing barriers

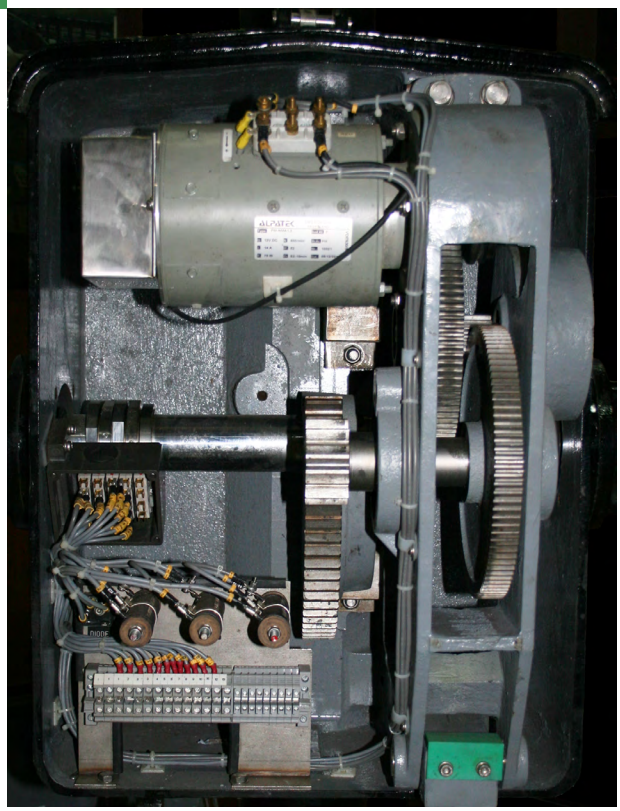
Especially for level crossing protection systems, Transport System Solutions has developed the LED crossing control signal. Using LEDs guarantees maximum reliability and safety: even if one LED group fails, the signal will remain lit and visible. Moreover, LEDs rapidly reach their maximum brightness and switch off quickly, resulting in flashing signals with much higher visibility.

The level crossing protection system is equipped with an electronic bell assembly (EBA). This unique bell has adjustable sound pressure and a day/night switch function. The bell is available for numerous connection voltages and with a number of different tones.

The Transport System Solutions aluminium level crossing barrier with integrated LED modules provides maximum safety. The barrier is designed to break off at a given point in case of a collision, thus preventing damage to the mechanism. A cable tethers the arm to the support, preventing further damage due to flying parts. LED lighting modules and retro-reflecting foil in white and red are both featured on the arm, maximising visibility. Both sides of the barrier have a permanent anti-graffiti coating.

- Complete design
- High-grade Transport System Solutions components
- Vandal-proof
- Maximum visibility thanks to LED technology
- Virtually maintenance-free
- Extremely reliable
- Long life guaranteed

Transport System Solutions also has a level crossing especially designed for crossings with cycle tracks.



Motor Specifications

Voltage rating	24 VDC	12 VDC
Motor speed	800 r.p.m.	600 r.p.m.
Current rating	4.5 A - 7.9 A	14 - 20 A

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Transport System Solutions

LEVEL CROSSINGS
BARRIER MECHANISM

BS600 Barrier mechanism

At intersections between rail and road, barrier mechanisms are used to visually and physically close off the crossings. Smooth functioning under all circumstances, reliability, a long lifespan and minimal maintenance are the core qualities of the Transport System Solutions BS600 barrier mechanism, guaranteeing the safety of road users, train passengers, personnel and goods.

safe,
reliable,
easy
to install

Safe and reliable

The mechanism of the BS600 barrier consists of a steel frame bolted by its base plate onto a pre-cast concrete plinth, ensuring maximum rigidity. The plinth has built-in cable channels.

The position of the barrier can be remotely monitored via the position contacts. A strong holding magnet keeps the barrier in the vertical position. As long as the magnet is energised, the level-crossing barrier cannot come down. When the magnet is not energised, gravity pulls the barrier down. If a shorter lowering time is required, the barrier can also be driven downward mechanically. The BS600 barrier mechanism moves very rapidly, but closing and opening times are adjustable. The BS600 barrier is also available with an emergency battery.

Easy installation

The Transport System Solutions BS600 barrier mechanism has a vandal-proof, flame-retardant plastic housing.

If required, the control cabinet can be placed at some distance. The BS600 barrier mechanism can handle 12 volts, 24 volts and 220 volts.

Because the mechanical adjustments are preset in the factory, the BS600 barrier mechanism can be easily and quickly installed on site.

The BS600 barrier mechanism is available in a standard and in a modular design. The modular design has a mounting post for an electronic bell assembly (EBA), road signals, St Andrew's cross and other components. In case of a longer barrier, an extra counterweight is added to the short end of the barrier to keep it balanced.

- Easy installation due to factory presets
- Optional emergency battery
- Adjustable opening and closing times
- Long life
- Low maintenance
- Low energy consumption

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Specifications

Height of main shaft	1100 mm from base plate
Height of top of barrier	1000 mm from base plate
Operation	Automatic remote
During power outage	Normal: barrier closes by means of gravity Optional: barrier goes up and stays open
Supply voltage	24 V DC
Required electrical current	< 15 A
Quiescent current	0.1 A (holding magnet in vertical position)
Temperature range	-25 °C to +60 °C
Degree of protection	IP44
Fastening	Crank lock
Weight	Main Housing: 100 kg Barrier: 35 kg (excluding counterweight)
Barrier length	Max 6000 mm from tip to main shaft
Integrated LED lighting	24 V DC
Interlock of open position	With hook
Fail-safe dropping	Up to upper limit of wind force 8 (21 m/s)
Vandalism load for barrier	Vertical max: 100 kg (at barrier length of 6 m) Horizontal max: 75 kg (at barrier length of 6m)

Optional

- Emergency battery with battery charger
- Supply voltage other than 24 V DC
- Shear pin construction

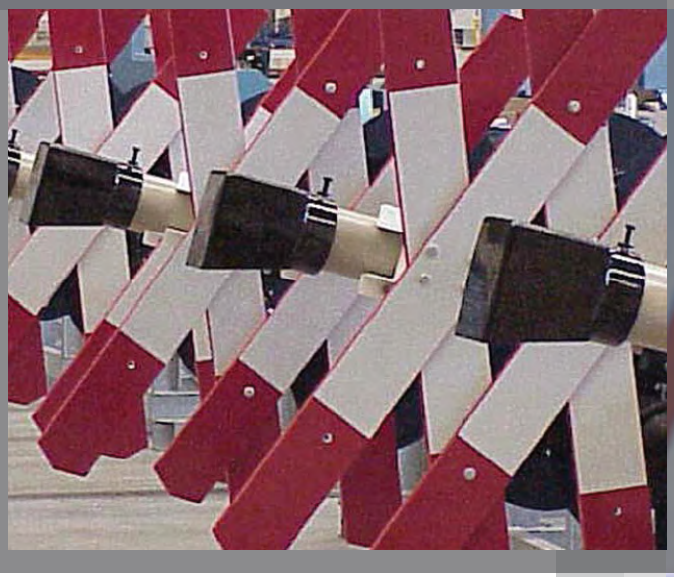
Transport System Solutions

LEVEL CROSSINGS
ELECTRONIC BELL ASSEMBLY

Electronic Bell Assembly (EBA)

Many railway crossings are still equipped with electromechanical bells. The disadvantage of such bells is that they may malfunction due to mechanical reasons, such as corrosion. The Transport System Solutions electronic bell assembly does not have these disadvantages. It can withstand virtually all weather circumstances and handle almost all supply voltages.

for use anywhere in any type of weather



Not only for railway

The Transport System Solutions electronic bell assembly (EBA) replaces the electromechanical bell. The EBA can not only be used for railway crossings, but for example also in systems for closing off bridges. A special feature is that the sound level can be adjusted and that the bell has a day/night switch. These innovations make the electronic bell assembly suited for use in any environment.

Stand-alone or built-in

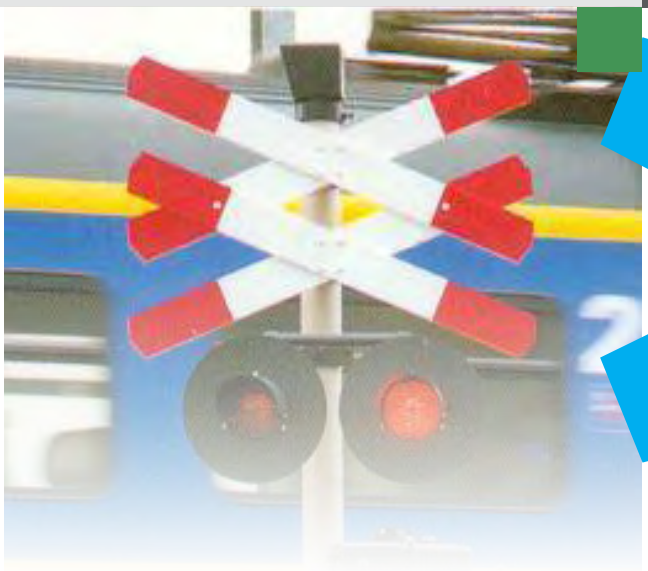
The casing of the electronic bell assembly is made of cast aluminium. This makes the bell suitable for all weather conditions, including tropical climates. The EBA can be used as a stand-alone unit, but it can also be built in by mounting the loudspeaker behind a grid in a signal back plate. In the latter case, the controller board can be accommodated in the terminal box.

The electronic bell assembly can handle a large variety of supply voltages. Almost all types of barrier mechanisms in the Netherlands are equipped with an Transport System Solutions electronic bell assembly. The bell is available in a number of different tones.

- Solid and weatherproof casing of cast aluminium
- Stand-alone or built-in
- Available for various supply voltages
- Adjustable sound levels and tones
- Day/night switch for decreasing sound level
- High operational reliability

Specifications

Material	Cast aluminium
Weight	5 kg
Colour	RAL 9005 (black)
Dimensions	220 mm x 175 mm (exclu-sive of mast flange)
Degree of protection	Mechanical: IP44 according to IEC 529 Loudspeaker: IP67 according to IEC 529
Supply voltage	10 to 18 V DC / 16 to 36 V DC / 20 to 27 V DC / 230 V DC
Sound	Various tones and frequencies available
Sound level	Nominal 83 dB(A) ± 2
Night position	-6 dB(A) ± 2
Temperature range	-25 °C to +50 °C in accordance with IEC 68-2-38
Voltage-current pulse text	In accordance with IEC 801-5 level 4
Insulation value	3 kV



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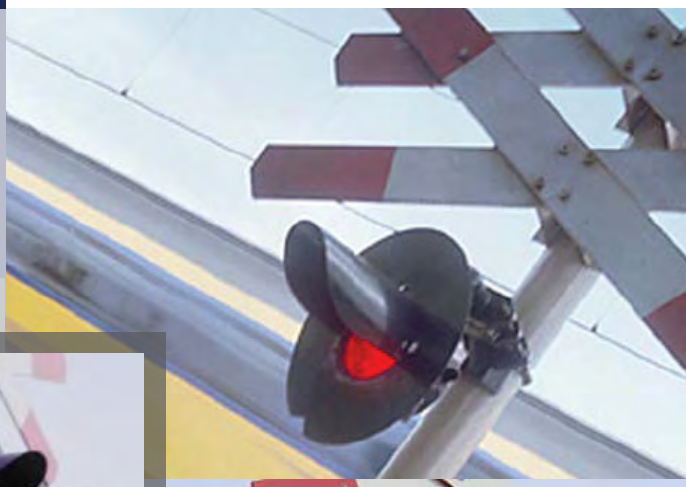
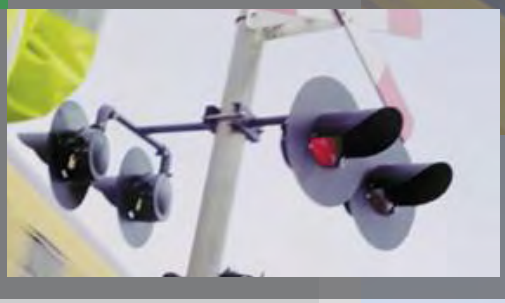
Transport System Solutions

LEVEL CROSSINGS
LED SIGNALS

LED Signals for Level Crossings

Especially for level crossing protection systems, Transport System Solutions has developed the LED XC signal. Our LED signals are reliable, virtually maintenance-free and visible under all circumstances and from all angles. Transport System Solutions makes no concessions when it comes to safety and reliability.





high visibility, low energy consumption

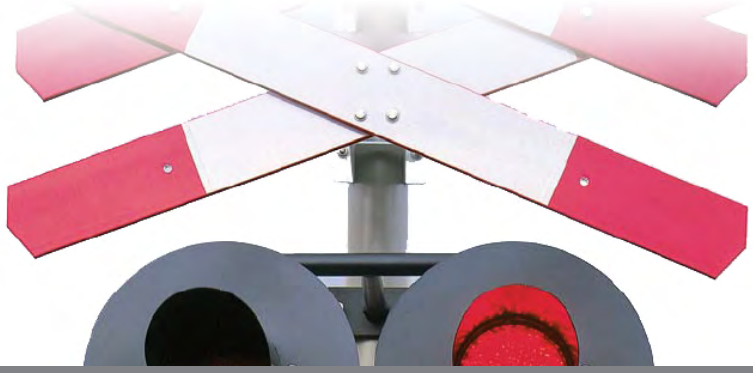
High visibility, high reliability, low energy consumption

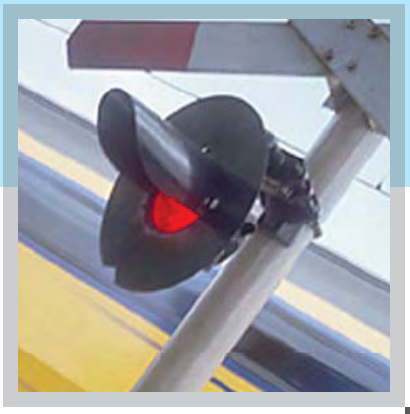
Maximum visibility and maximum reliability were the two major criteria in the development of the LED XC signal, which is why we opted for LED technology. LEDs require virtually no maintenance and guarantee maximum reliability and safety: even if one LED group fails, the signal will remain lit and visible. Moreover, LEDs rapidly reach their maximum brightness and switch off quickly, resulting in flashing signals with much higher visibility. The colours comply with the Dutch NEN 3322 standard.

A remarkable feature of LEDs is that they yield a lot of light while using only little energy. Added to the fact that maintenance is negligible, investing in Transport System Solutions LED signals means investing in durability.

Easy conversion to LED technology

Signals and barrier lights currently fitted with incandescent bulbs can be upgraded easily by installing the LED module specially designed for existing casings, eliminating the need for adjustable resistors.





The main features of Transport System Solutions LED signals and barrier lights:

- Very reliable
- Virtually maintenance-free
- Very long lifespan
- Minimum phantom aspect
- Special LED modules for upgrading conventional signals and barrier lights

Installation, maintenance and service

In addition to supplying LED signals and upgrading conventional signals and barrier lights, Transport System Solutions also supplies all types of signal poles and gantries. Naturally, we also provide signal installation and maintenance services. Our service operates on a national level and is available 24 hours a day. With the LED signals of Transport System Solutions, you have one thing less to worry about.

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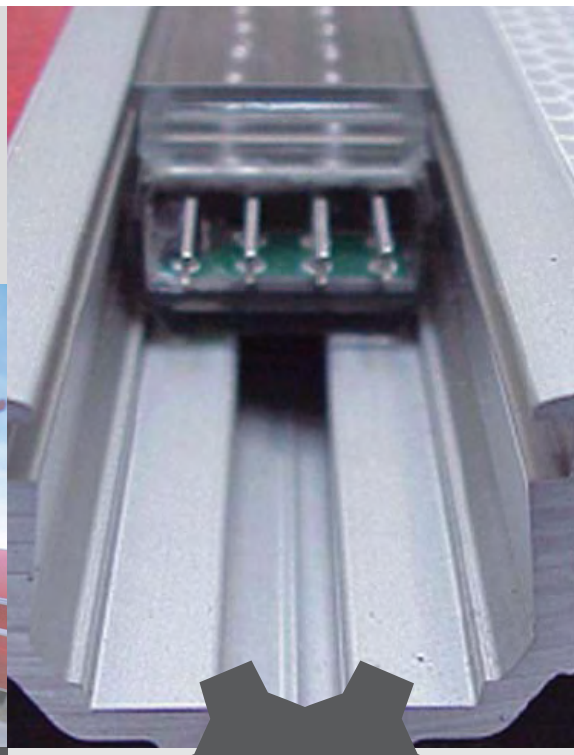
Transport System Solutions

LEVEL CROSSINGS
BARRIERS WITH LED MODULES

Level Crossing Barriers with LED Modules

The Transport System Solutions barrier mechanisms can be fitted with several types of barrier. Our aluminium level crossing barrier with integrated LED modules meets all the necessary requirements. The design is modern with an oval, asymmetrical cross section. It is highly visible, lightweight, virtually maintenance-free, safe and graffiti-proof.



safe and highly visible

Maximum safety

At intersections between rail and road, barrier mechanisms are used to visually and physically close off the crossing. The Transport System Solutions aluminium level crossing barrier with integrated LED modules has an innovative design. The barrier is designed to break off at a given point in case of a collision, thus preventing damage to the mechanism. A cable tethers the arm to the support, preventing flying parts and further damage and injury.

Maximum visibility

LED lighting modules and retro-reflecting foil in white and red are both featured on the arm, maximising visibility both in the daytime and at night. In addition, the Transport System Solutions barrier is unrivalled in a modern street scene. Both sides of the barrier have a permanent, durable anti-graffiti coating, making sure the barrier maintains its original state. Thanks to the coating, the barrier can be cleaned in just minutes.

- Very high visibility
- Modern design
- Durable anti-graffiti coating
- Safety guaranteed due to breaking-off point
- Lightweight
- Virtually maintenance-free
- Available in any length in increments of 250 mm
- Optional fencing

Specifications

Barrier

Design	Oval, asymmetric
Surface layer	Retro-reflecting foil
Length	500 to 6000 mm in increments of 250 mm
Material	Aluminium
Vandalism load	Vertical max: 125 kg (at barrier length of 6 m) Horizontal max: 60 kg (at barrier length of 6m)

LED modules

Supply voltage	9.2 to 17 V AC/DC
Electrical current	AC: 370 mA at 9.2 V to 440 mA at 17 V DC: 340 mA at 9.2 V to 515 mA at 17 V
Ignition timing	< 1 ms
Colour of light	Red, wavelength approx. 623 nm in conformity with the Dutch NEN 3322 standard
Opening angle	Total angular width 30°
Light intensity	20 lm (+ 30% -15%) at 10.2 V AC
Dimensions	310 mm x 33 mm x 22 mm
Voltage/power pulse test	In conformity with IEC 801-5 level 4
Degree of protection	IP68 according to IEC 529
Electro Magnetic Compatibility (EMC)	In conformity with IEC 801-3, EN 50081-1, EN 50082-1, EN 50022

Environmental conditions

Temperature range	-25 °C to +55 °C
Storage temperature range	-30 °C to +70 °C
Relative humidity	Max 95% (with- out condensation)

Repair and maintenance

Mean time before failure	> 1,000,000 hours or > 1,000,000 movements
Mean time to repair	30 minutes
Inspection frequency	Once every 3 years
Maintenance frequency	Once every 6 years

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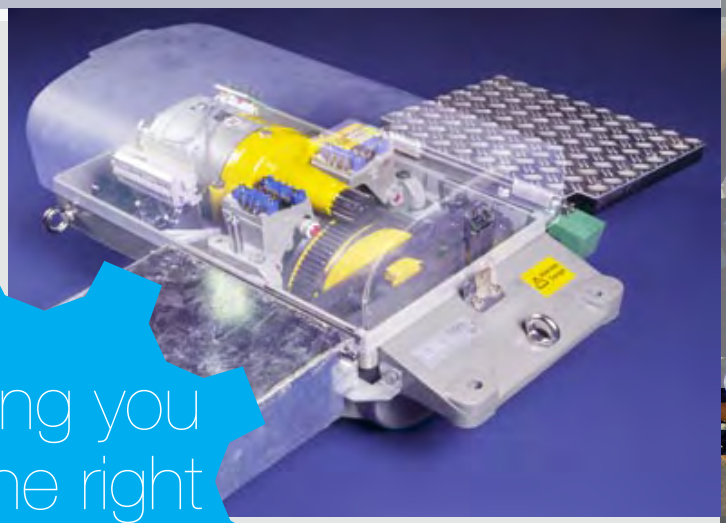
Transport System Solutions

POINT MACHINES

NSE2 and NSE2 HL Point Machines

There may be serious consequences when a point is not properly closed or not closed at all. With the Transport System Solutions NSE2 and NSE2 HL point machines, there is no need for concern. Transport System Solutions point machines are reliable, safe and low maintenance. We have supplied a large number of point machines to many countries in the world.

This product specification applies to both NSE2 and NSE2 HL point machines.



taking you in the right direction

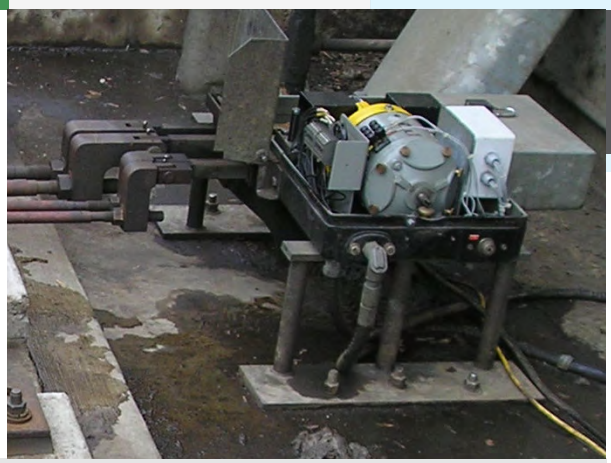
Made to keep on going

The NSE2 point machine is fitted with a maintenance-free sliding bar. Durability tests have proven that the sliding bar still works perfectly and shows virtually no wear after one million strokes. The NSE2 point machine's reliability and durability are significantly enhanced compared to other models. For example, the brass contact blocks are coated with a 3 mm silver tungsten top, preventing oxidation from isolating the contact points. The NSE2 point machine is also fitted with an Entrelec terminal block that meets the Dutch NEN 1010 standard. To enhance safety, the connections to the motor are electrically insulated.

Durable down to the smallest detail

The Transport System Solutions NSE2 point machine is fitted with extremely durable ceramic sliding blocks. This material is extremely hard and resistant to abrasions, eliminating the need for greasing the sliding blocks. Our point machine requires maintenance only once every two years. The hot-dip galvanised cover is designed in such a way that moisture cannot enter the vital parts of the NSE2 point machine, preventing mechanical and electrical failures.

The NSE2 point machine is available in two types: the NSE2 is suitable for installation on wooden or concrete sleepers; the NSE2 HL is suitable for installation in steel hollow sleepers. Both are available with maintenance-free rods.



Specifications

These product specifications apply to both NSE2 and NSE2 HL point machines.

Electrical

Supply voltage	120 V AC single phase
Detection circuit	2 A up to 28 V DC 1 A up to 250 V AC
current at nominal load	max 5 A
Slip current	max 7 A
Isolation value (new)	50 MΩ (tested at 500 V DC for 10 min)
EMC compliant	Yes
Degree of protection	IP54

Mechanical

Stroke	120 mm
Throwing force/Load	3000 N - 5500 ± 500 N
Retention force	7.5 kN ± 0.5 kN (adjustable)
Running time for normal load	< 3 sec at nominal load
Blocking force	>> 10,000 N
Manual operation	Yes, with hand crank
Lifespan	Approx. 1,000,000 single strokes

Rodding

Transport System Solutions also supplies various types of rodding. Point rodding forms the connection between the tongues of the turnout and point machines. Maintenance-free versions, supplied with high-quality ball joint heads, are also available. All point rods come with an adjustment function, so that the point can be fine-tuned on location.

- Low maintenance
- Extremely reliable
- Cost-effective
- Safe
- Available in two standard versions
- Available with or without rod sets

Maintenance and servicing

In addition to supplying NSE2 point machines, Transport System Solutions also provides point machine maintenance. Our service operates on a national level and is available 24 hours a day. We can also service, maintain and supply spare parts for your point machines.

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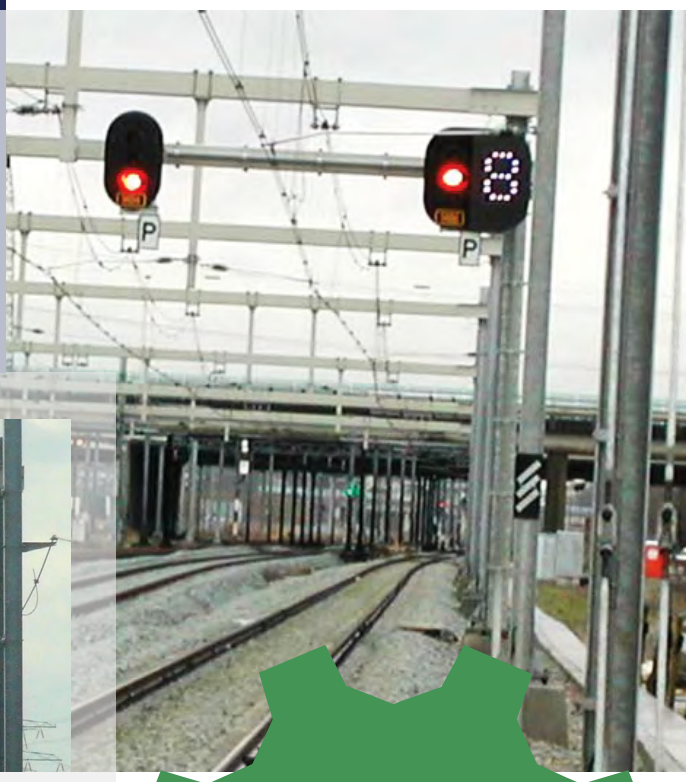
Transport System Solutions

SIGNALS
LED MATRIX

LED Matrix Signals

Matrix signals are used in combination with conventional signals to provide additional information to the train driver, for example on the turnout speed limit. For this reason, it is important that the signals offer optimum visibility under all weather circumstances and all angles of vision, in addition to optimum operational safety. Transport System Solutions has developed a LED matrix signal, in combination with the optical system, for this type of application.



highly visible, extremely durable

High visibility, low maintenance costs

The Transport System Solutions LED matrix signal has unprecedented operational safety thanks to LED technology. Redundancy in the design ensures high availability. Compared to applications equipped with bulbs, the Transport System Solutions LED matrix signal needs no technical maintenance. One inspection every ten years is sufficient, resulting in considerably lower maintenance costs. The LED technology ensures a very clear picture. The brightness of the lights can be set to day or night levels by adjusting the supply voltage, so as not to dazzle the train drivers at night time.

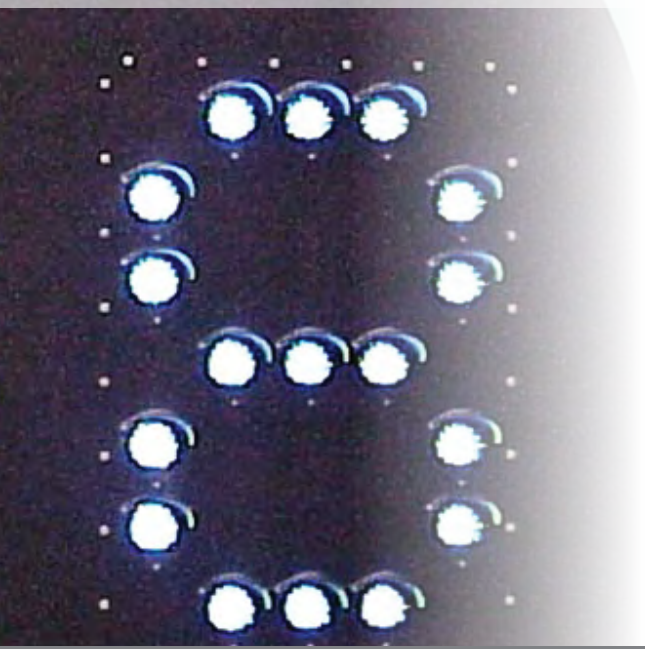
Long lifespan, extremely durable

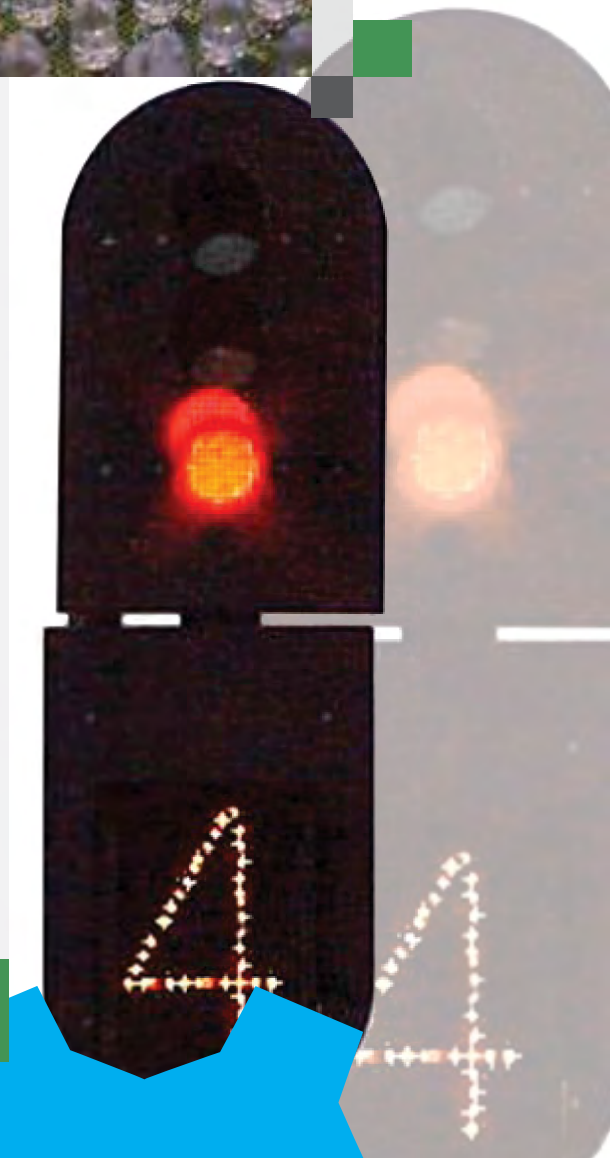
One of the biggest advantages of LED technology, compared to conventional incandescent bulbs, is the long lifespan of LEDs. LED enclosures are impermeable and have an integrated angle of vision. An additional advantage is that there is hardly any phantom effect that could lead to a wrongly interpreted signal. The LED system is resistant to all kinds of circumstances, such as extreme heat and severe cold.

- Virtually maintenance free
- Extremely long lifespan
- Low energy consumption
- Vandal-proof
- Adjustable to day and night levels
- Minimum phantom aspect

Specifications

Maximum number of signal images	4
Supply voltage	100 V AC (-30% +10%) / 50 to 75 Hz
Dim voltage	70 V AC (-30% +10%) / 50 to 75 Hz
Weight	29.3 kg
Voltage range	80 to 120 V in increments of 5 V
Energy consumption	25 VA when showing a ‘4’ signal image
Colour of light	In accordance with NEN-EN 12966 class C1/C2 white/yellow (592 nm amber)
Brightness	In accordance with NEN-EN 12966 class L3 white/yellow
Brightness when dimmed (at approximately 70 V)	10% of nominal brightness
Contrast ratio	NEN-EN 12966
Equableness	NEN-EN 12966
Visibility distance	> 350 m
Readability distance	> 250 m
Temperature range	-30 °C to +65 °C
MTBF	> 5.11 x 10^6 hours
Electro Magnetic Compatibility (EMC)	EN 50121-4 plus additional requirement RLN00007
Dimensions	734 mm x 490 mm x 221 mm





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Transport System Solutions

SIGNALS
INCANDESCENT BULBS

Incandescent Bulb Colour Light Signals

The Transport System Solutions incandescent bulb signals offer optimum visibility and reliability.

Transport System Solutions is more than just a supplier of signals. We develop new signals and signal systems and offer installation, maintenance and service. Transport System Solutions sheds a different light on signals.

visibility guaranteed in a wide range of options

Flexible signal systems

Transport System Solutions **offers a wide range of options for incandescent bulb signals, from simple signals to complex signals. We can supply all standard signals, with colours meeting the international BS1376 standard. Our Design department can design and manufacture signal solutions to meet your specifications. As our signals are pre-assembled in the factory, they can be easily and quickly installed on site.**

High visibility

Transport System Solutions incandescent bulb signals are resistant to the most extreme weather conditions. Our signals are waterproof and extremely rust-proof. To ensure the highest visibility, the lens unit can be adjusted and the signals are equipped with sun hoods and black background plates. The lamp voltage can be adjusted to suit all applications, using transformers and adjustable resistors.

For even higher reliability, Transport System Solutions incandescent bulb signals can be equipped with double filament bulbs. Should one of the filaments break, the second filament will ensure that the signal remains lit.

Specifications

Supply voltage	110 V AC ± 10%
Dim voltage	80 V AC
Power	30W
Isolation voltage	3 kV (1 minute)
Dimensions	Standard signal: 210 mm Dwarf signal: 160 mm
Visibility distance	Standard signal: 400 m Dwarf signal: 200 m
Light intensity	2mlux luminance at 400/200 m
Light opening angle	4 degrees with hotspot (magnifiable with additional lens)
Colours	Red, yellow and green in accordance with BS1376
Brightness when dimmed	30% of daylight value
Temperature range	-30°C to +65 °C
Permissible cable loss	0 to 32 Ω (1.3 km at 1.5 mm²)

Installation, maintenance and service

In addition to supplying signals, Transport System Solutions also provides signal installation and maintenance services. Our service operates on a national level and is available 24 hours a day. With the signals of Transport System Solutions, you have one thing less to worry about.

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Transport System Solutions

SIGNALS
COLOUR LED LIGHTS

8 Inch Incandescent Look LED Road Traffic Signals

For years colour light signals have been equipped with ordinary light bulbs, meaning regular replacements of lamps and, more crucially, regular lamp-outs. The new generation LEDs of Transport System Solutions signals puts an end to these problems.

We produce LED signals for various railway applications. Our special cost-effective LED signal for light and medium rail applications is also suitable for the station area in heavy rail applications where short or mid-range lights are used.

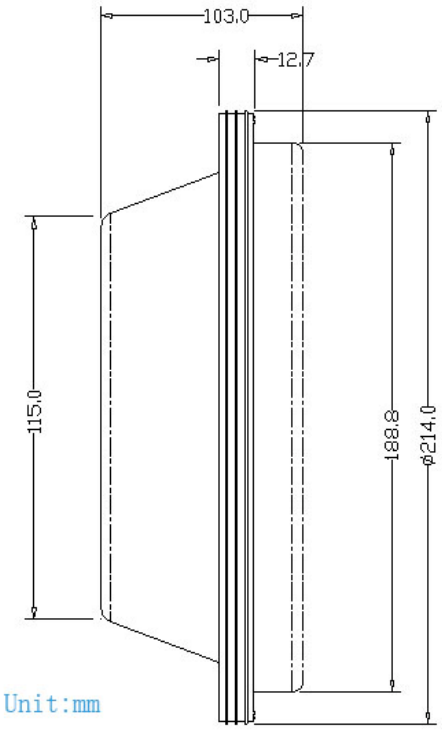
no more lamp-outs or lamp replacements

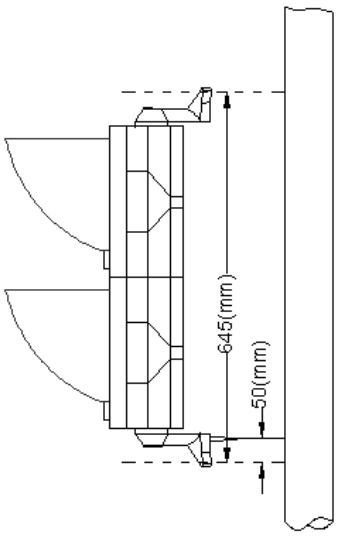
- Reduces overall operating and maintenance costs
- Consumes 90% less energy compared to incandescent lamp
- Highly reliable
- Improved visibility
- Reduces emergency lamp-outs
- Minimizes phantom aspect
- Easy to install into existing signal casing

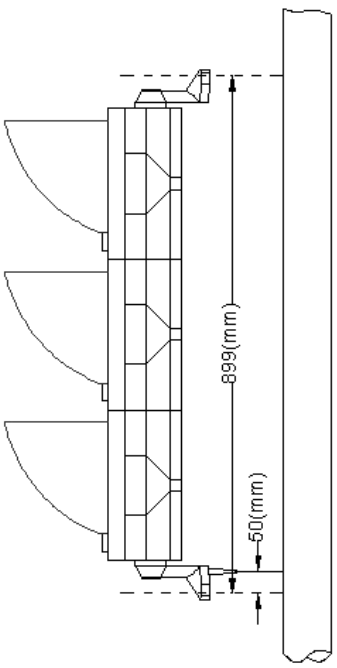
Specifications

Dimensions	200 mm with cobweb lens
Total harmonic distortion	< 20%
Temperature range	-30°C to +60 °C
Operating voltage	12 V DC
Insulation resistance	>2 MΩ
Estimated lifespan	100,000 hours
Optical	High brightness LEDs with integrated optics, moisture- and dust-tight seal (IP65)

Nominal (day) light strength	Red, green: 400 cd Yellow: 500 cd
Power consumption	7W
Operating life	> 5 years
Voltage	100 to 277 V AC / 12 V DC / 24 V DC
LEDs	61 pieces
Typical wavelength	Red: 625 nm ± 5 nm Yellow: 690 nm ± 5 nm Green: 502 nm ± 2 nm







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Transport System Solutions

SIGNALS
LED2

The LED2 Generation

For years colour light signals have been equipped with ordinary light bulbs, meaning regular replacements of lamps and, more crucially, regular lamp-outs. Normal light bulbs have the added disadvantage that phantom aspect may occur. The LED2 generation of Transport System Solutions signals puts an end to these problems. Signals currently fitted with ordinary light bulbs can be upgraded easily by installing the LEDs module specially designed for existing casings.

LED2 generation:
Fit and Forget

High visibility, high reliability

The Transport System Solutions LED2 light sources are developed especially for railway applications. LED technology ensures maximum visibility and maximum reliability. The reliability of the electronics ensures that the LEDs are always illuminated optimally. And if one or more LEDs fails, the signal will remain lit and visible. LED2 light sources are available in red, yellow and green. The LED2 generation light source is vandal-proof because it is fitted with 80 individual synthetic lenses instead of a glass lens.

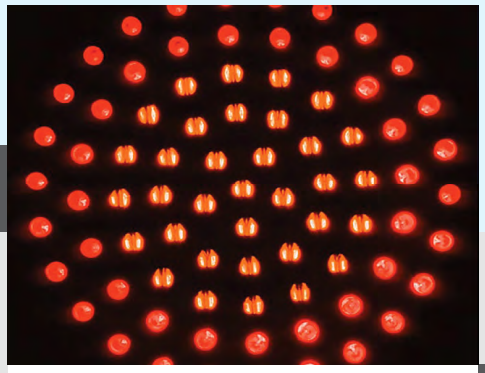
Once the replacement module or the new signal is installed, it requires no further maintenance. The LED2 generation is practically maintenance-free due to its very high operational safety. Cleaning the front of the light once every two years is the only maintenance it requires.

‘Fit and Forget’: low maintenance and cost-efficient

Transport System Solutions LED2 generation signals ensure you can take the term ‘Fit and Forget’ literally. They are virtually maintenance-free and the extremely long lifespan of the LEDs makes them remarkably cost-efficient.

- In almost all cases, conventional light bulbs can be replaced by LED2 light sources
- High visibility in all circumstances
- Extremely long life-span
- Very reliable
- Virtually maintenance-free
- Vandal-proof

Specifications



Electrical

Supply voltage	10.2 V AC at 110 V AC line voltage
Voltage when dimmed	7.4 V AC at 80 V AC line voltage
Cosine phi	> 0.9
Switch on current	< 6 A
Ignition / extinction time	< 50 ms
EMC-compatibility	In accordance with ENV 50121-4 plus reinforcements RLN00007 version 3
Switch on duration	∞
Isolation voltage	2 kV between electrical conductors and metal front plate

Optical

Light colour	Meets IEC S 004 / E-2001 red class A, yellow, green class A
Nominal (day) light strength	Red, green: 400 cd Yellow: 500 cd (in zero-axle)
Brightness when dimmed	50% to 70% of daylight strength
Maximum visibility distance	400 m
Light spread	Usable on straight track and bends with a radius of 160 m to ∞, positioned right or left of the track

Environmental conditions

Operating temperature	-30°C to +55 °C
Climate stability	In accordance with IEC 68-2-38 (Z/AD test) at up to -30 °C
Vibration stability	In accordance with IEC 721-3-4 4M6 4 to 8.4 Hz 7 mm, amplitude 8.4 to 200 Hz 2 g, sweep rate 1 oct/min
Shockproof	Meets IEC-721-3-4 4M6, type 2, acceleration 25 g, duration 6 ms

RAMS

Hazard rate	$< 1x10^{-8}$
Mean time before failure	> 10,000,000 hours (calculated according to IEC 1709/SN29500)
Lifespan	15 years with guaranteed light output

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Transport System Solutions

SIGNALLING INSTALLATION

Signalling equipment cabinets

Wayside location and Equipment cabinets

With need to install wayside signalling equipment along the railway tack, there is a need for secure storage cabinets. These need to protect the internal equipment form the elements and illegal access.
Transport System Solutions has developed with local suppliers to provide a robust, double skinned wayside cabinet assembly to house the critical signalling equipment required to maintain a safe and reliable railway network.

Well thought-out design, Stainless Steele.

SIZES:

The cabinet comes in different sizes as it manufactured to suit each projects need.

VENTILATION:

It is supplied with passive heat management fitting which been proven to reduce the internal temperature by approx. 15%, allowing electronic equipment to installed in the field without the need for forced ventilation.

- Portable with removable sections for easy transport and handling,
- Vandal resistant,
- Cleanable,
- Range of sizes as required,
- Virtually maintenance-free
- Long life guaranteed

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Transport System Solutions

LEVEL CROSSING ROAD SIGNAL

Level Crossing Product Supply for Sri Lanka Railways

The Level Crossing Protection Equipment of Transport System Solutions Systems

The Netherlands has over 2,700 protected level crossings. Almost all of these level crossings are equipped with Transport System Solutions Systems level crossing protection equipment. From Andreas cross, and barrier pole to a complete AHOB installation. Transport System Solutions Systems has the lead in level crossing protection equipment. With more than 125 years of rail experience, we offer great quality and service in our products that customer can rely on.

Everything as you like it

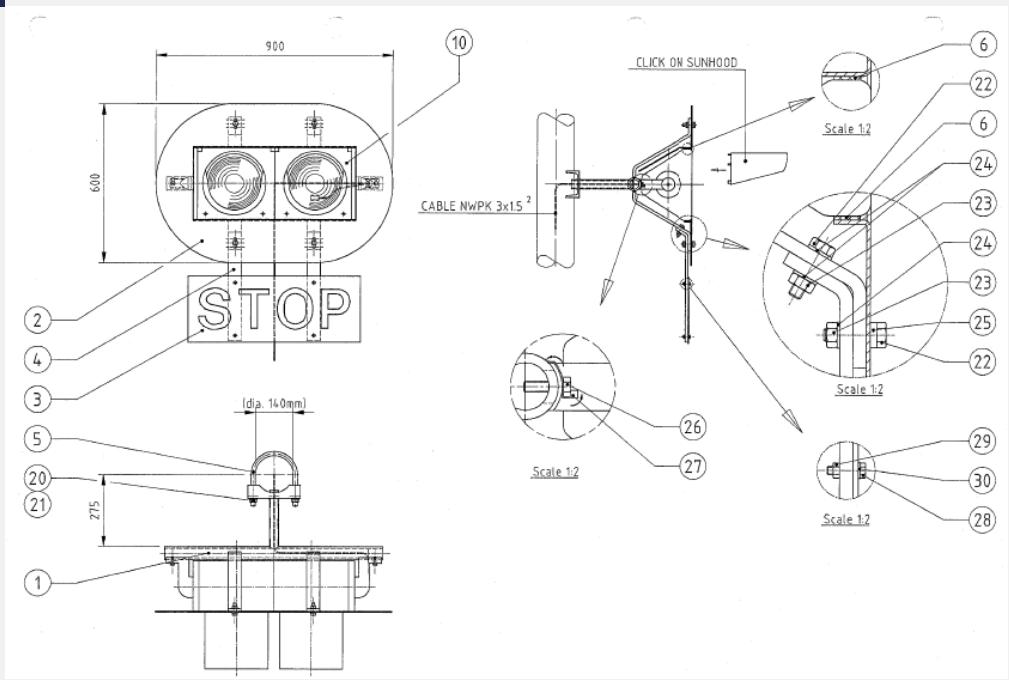
Transport System Solutions Systems has a wide range of level crossing protection equipment. You can consult us for:

- Barrier signs
- Waiting signs
- Barrier poles
- Assembled AHOB posts
- Barrier mechanisms
- LED XC signals
- Andreas crosses
- Electronic warning bells
- Aluminum crossing barriers with LED lights
- Wooden crossing barriers

Our Two Lamp Flasher Unit (Existing SLR Type) – is an existing Level Crossing Road Signal type currently in use by the Sri Lanka Railways. All dimensions and specifications are in accordance to the SLR's requirement. The signal body is built and assembled in Holland.

The photo above shows the Sri Lanka Type Level Crossing Road Signals and the mechanical drawing below illustrates the dimensions and assembly overview of the Signal.

safe and highly visible



Transport System Solutions

Australian Custom Modified Type

Our Australian Custom Modified Type Level Crossing Road Signal is a custom modified road signal, fulfilling all dimensions and specifications as per the Sri Lanka Railways' Specification & Drg No: CS 450/97.

The signal body is an existing road type incandescent lamp signal that is widely used in Australia. This signal has evolved from over twenty five years of experience in road signal lantern design and production. Through the use of thermoplastic or die cast material selection and production control, a long life and durability of the lanterns is ensured.

Our Australian Custom Modified Type Level Crossing Road Signal offers:

- Australian Standard AS/NZS2144:2002 extended range performance
- Proven performance
- Modern durable thermoplastic materials
- Structural strength
- Quality reflectors
- Pre-focused lamp sockets
- Easy access for lamp change and reflector cleaning
- Dual hinging doors
- Design suitable for all weather and operating environments
- Injection molded, or aluminum pressure die cast, modular housing components
- Wide range of accessories

*A different type of background plate is shown in the picture above. A background plate complying to SLR Drg No. CS 450/97 will be supplied

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