SIEMENS

Ingenuity for life

ITS Detection Solutions

A variety of detector solutions designed to combat the challenges of a modern-day traffic network

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Overview

At the heart of any safe, clean and efficient traffic management system is a variety of highway detection solutions that provide a live, accurate understanding of what's happening on the road network.

Siemens continues to invest in traffic, pedestrian and cyclist detection solutions, recognising that there is no single solution that will fit all applications. Our family of solutions incorporates proven loop, radar and wireless detectors that are designed to provide the high-quality data inputs needed to solve complex traffic management challenges.

Whilst sensor performance is paramount, other factors such as ease of installation, setup and maintenance are also key to deploying effective solutions and are key inputs in the Siemens design and development process.

Each detection solution is able to operate in either isolation or in combination and technologies can be utilised together to provide additional flexibility and robustness to meet the demands of the application.

The Detection Solutions portfolio includes:

Heimdall
- a radar-based family of detectors, suitable for a wide range of applications

SLD4
- induction loop detection with exceptional accuracy

WiMag
- wireless in-ground sensors providing an alternative to loop-based technology

Sapphire JTM
- Bluetooth® detection for journey time monitoring

Selective Vehicle Detection
- RFID detection of ID tags for vehicle priority and access control

Heimdall

'Heimdall is the Watchman of the Gods in Norse mythology. He requires less sleep than a bird and can see a hundred miles around him, by night as well as by day'

Heimdall above-ground detectors offer a complete range of detection solutions for use in many modern traffic and pedestrian control applications.

Using advanced radar technology, these detectors offer high performance, simple installation and low ongoing maintenance, while their small size ensures that unnecessary street clutter is minimised.

Advanced technology

Incorporating sophisticated technology, each Heimdall detector contains a planar radar antenna system and an innovative digital signal processing engine to facilitate a high performance and accurate detection solution. Patented features enable Heimdall to offer a wide range of detection solutions including:

- Dual lane vehicle approach
- Single lane vehicle approach
- Stop line
- Selectable speed activation
- Pedestrian on-crossing
- Pedestrian kerbside
- SCOOT
- MOVA

Simple installation

Heimdall detectors are supplied pre-configured with standard settings, which are suitable for the majority of installations. Simple configuration switch settings are available if required for on-site customisation, eliminating the need to use expensive and vulnerable PC configuration tools. A PC is only necessary when detailed fault log information or access to advanced settings is required.

Heimdall detectors can also be supplied with Bluetooth® functionality, if necessary, allowing configuration to be carried out from ground level.

PC access is achieved using a simple terminal program, alleviating the need for proprietary or bespoke software.

High performance

Unlike typical vision and video-based solutions, Heimdall's radar technology works equally well in bright and dark locations; it does not suffer from false detections that are a common result of lighting variation and shadows. Fog and rain also go largely unnoticed ensuring the best possible performance on the road network, regardless of the conditions.

Reduced maintenance

Ongoing maintenance costs can often be a concern, particularly with camera-based detection systems, where frequent lens cleaning is required to maintain performance. Heimdall's advanced radar-based technology means such maintenance is not required, providing considerable whole life cost savings.

- Full family of detector solutions
- Simple installation
- Low maintenance
- Immune to changing light conditions
- Advanced radar technology

The Heimdall family

Vehicle Detection

Dual lane vehicle approach

The CW Doppler-based dual lane vehicle detector is typically used to detect vehicles at signalised junctions, to provide demand and extension requests to an associated traffic controller.

The zone is broad enough to cover two approach lanes simultaneously and the detector is able to discriminate between oncoming and leaving traffic.

A set of user-selectable switches is provided to enable the unit's performance to be adapted for a given installation, for example, allowing adjustment of the low speed threshold parameter for optimum detection performance.

Single lane vehicle approach

The single lane vehicle approach detector has all the attributes of the dual lane approach version but provides a very narrow radar beam and is able to resolve targets within a single approach lane. This feature makes it ideal for the specific detection of vehicles in separately signalled right or left turn filter lanes.

Stop line

A unique combination of both CW Doppler and FMCW techniques allows this detector to provide effective detection and monitoring of vehicles at signalised junctions and in other applications where the detection of stationary vehicles is specifically required.

Simple configuration of presence time is achieved via user-selectable switches and may be defined in set durations of between five and 30 minutes.

As well as standard stop line deployments, other typical applications include call/cancel and general queue detection.

Selectable speed activation

This detector provides an output when target vehicles exceed a defined speed. The speed threshold is setup via simple configuration switches, with additional parameters such as hold and delay times being configurable via a PC.

Pedestrian Detection

On-crossing

Designed to be used in pairs, this CW Doppler solution provides reliable detection of pedestrians when crossing at Puffin and similar type crossings. The use of on-crossing detectors enables the pedestrian to traffic intergreen period to be kept to a minimum whilst ensuring conflicting vehicle green signals are delayed until the pedestrians have safely crossed the road, significantly enhancing the efficiency of the crossing compared to older fixed crossing period solutions.

Kerbside (Standard & Volumetric)

Utilising a 'dual antenna' design, the Heimdall Kerbside solution provides exceptional detection of pedestrians waiting to cross at Puffin and other similar crossing types, without the need for complex setup software.

The Standard variant of the Kerbside detector offers a 'detect' or 'no detect' output, whilst the Volumetric version uses advanced software to measure the volume occupancy of a pedestrian detection zone to influence pedestrian phases.

In the Volumetric version, low, medium and high volume categories are available to determine the occupancy level of the crossing waiting area.

This can be used, for example, to give dynamic pedestrian priority or extend the green man invitation to cross during periods of high pedestrian flow.

SCOOT and MOVA

Designed to operate in a 'side fire' configuration, this single lane FMCW radar detector, with advanced signal processing, offers excellent count, occupancy and 'gap' detection capabilities which is ideal for SCOOT and MOVA applications.

For optimum performance, the detector is mounted at a height of 4m, but they may be mounted at a range of heights from 4m to 8m. Where dual lane detection is needed, a second Heimdall unit may be mounted above the first to cover the second lane.

SLD4 Loop Detector

In an extensive range of applications, Siemens induction loop detectors have proven themselves invaluable for the essential detection of vehicles, motorbikes and cyclists on the road network. Designed with unrivalled robustness and accuracy in mind, Siemens SLD4 loop detectors ensure the provision of reliable data under all ambient conditions. This state-of-the-art technology can be used in a wide variety of cases and can complement other detectors from the Siemens ITS Sensors portfolio.

Innovative technology

Induction loop detectors function via a magnetic field which is generated by the loop that is placed in the road. Vehicles and cyclists passing over this magnetic field cause an increase in magnetic frequency that is detected by the system allowing for various triggers in different applications.

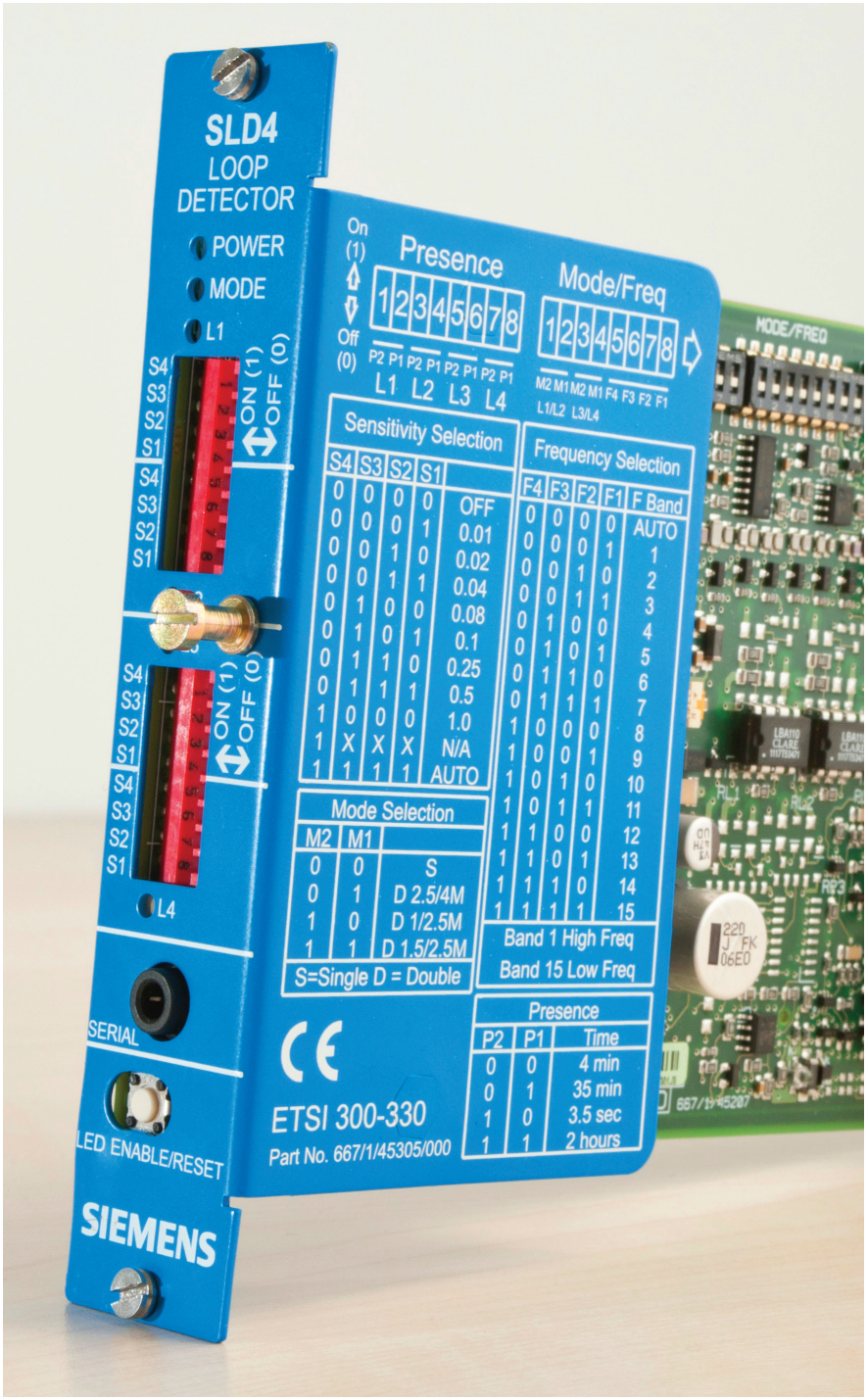
Automatic set-up

Installations and networks involving multiple detectors often pose a significant challenge when manually establishing the settings, detection parameters and frequency of individual loop detectors. These large installations can suffer from poor detection rates, communications failures and reduced efficiency.

To combat this, Siemens' SLD4 provides a unique feature where, when fitted in a rack with other SLD4 detectors, all the units are able to automatically and wirelessly communicate with each other to configure and optimise critical parameters.

The option for manual set-up is available through DIL switches located on the detector unit as well as through a PC configuration tool that is designed for more advanced applications. This allows access to a wide range of customisable parameters where detectors can be individually tailored for specialist applications.

SLD4 – Classification



The enhanced version of the Siemens SLD4 loop detector family features sophisticated length-based classification with configurable outputs which can be set to activate when specific conditions are detected, such as large vehicles exceeding a predefined speed. As well as offering standard vehicle detection the latest version of the SLD4 can also be used in specialised bus, tram and Light Rail Transport (LRT) schemes and other similar applications where excellent detection accuracy is required. The enhanced SLD4 still delivers the self-tuning and fully automatic set-up features of the standard SLD4, ensuring optimum and reliable performance without interference and can also be powered from either AC or DC supplies.

Siemens SLD4 loop detectors use advanced loop detection algorithms to provide exceptional detection that is compliant with TOPAS 2512 specifications. The detectors interface with all typical traffic control equipment and the ability for automatic set-up means that optimal performance is always achieved.

WiMag – Wireless detection

Installing, maintaining and removing extensive ducting and cabling in the highway is typically costly and time-consuming, resulting in increased impacts on the road network. Siemens WiMag Vehicle and Cycle Detection offers an alternative solution that foregoes the traditional expensive installation in favour of a faster and more cost-effective detection system. Designed with a focus on flexibility and functionality, the Siemens WiMag solution provides accurate detection for a wide range of traffic management applications. The sensor units can operate exclusively or in conjunction with the loop and radar solutions offered by Siemens to create a truly dynamic system.

"Versatility is at the core of the WiMag solution: the vehicle detector can function in VA, SCOOT and MOVA applications while the cycle detector has the ability to operate in VA, SCOOT and Stop Line control systems."

Wireless detection

Equipped with sophisticated wireless technology and a dedicated battery, the sensors can operate effectively for extended periods expected to be up to 10 years, with a warranty period of 5 years.

The WiMag vehicle detector contains a magnetometer sensor, equivalent to a typical loop detector device, that detects disturbances in the magnetic field to indicate the presence of a vehicle. Continuous self-calibration for the earth's magnetic fluctuations means the detector is always operating reliably and accurately.

Utilising different technology, the WiMag cycle detector unit identifies bicycles, based on their speed, by using microwave radar technology. To increase flexibility, the detector has a configurable range meaning there is no reliance on bicycles passing directly over the in-road detector.

Reliable communications

Much like other traffic detection systems, WiMag relies on a dependable communications system to function at optimal efficiency. To achieve this, each detector transmits data to an intelligent WiMag Access Point that is typically installed on a signal pole. The access point serves as a wireless gateway to maintain connection with the detector and effortlessly establish overall time synchronisation. Configuration details are also managed and sent through the access point to other devices whilst receiving and processing all data gathered from the detectors. Detection data is then sent by Ethernet connection to the roadside controller via a detector interface card.

In larger installations, WiMag Repeater units can be used to extend the range between an installed detector and the access point up to approximately 300m. Two repeaters can operate in tandem for an even further distance (up to 600m) to facilitate a larger, more extensive, detector network.

WiMag – A versatile system

Flexible system interfaces

The Siemens WiMag solution provides cost-effective and flexible means to connect numerous WiMag detectors to a wide variety of controller types.

- For large sites using ST900, ST750ELV and ST950 controllers, a dedicated WiMag communications rack is available to neatly accommodate all controller mounted equipment to provide support for up to 60 sensors and 7 Access Points.
- For smaller sites, or other controller types, the WiMag 4-channel loop replacement detector card is offered which replicates a stand-alone loop detector card and provides support for 4 sensors and a single Access Point. Cards can be linked together to extend the number of detectors and Access Points that can be supported. This solution is ideal for existing sites upgrading from loop detectors or for small sites where a limited number of detectors are required (typically less than 12).

Sapphire JTM

The Siemens Sapphire JTM solution provides a complete Journey Time Measurement System (JTMS) using Bluetooth® technology for traffic monitoring. Each Sapphire detector is simple to install and compact, reducing street clutter. The system is integrated into Stratos, the Siemens hosted traffic management platform, providing the necessary tools for the analysis and monitoring of journey times.

Bluetooth® technology

The Sapphire JTM solution utilises Bluetooth® technology which is commonly found in mobile phones, aftermarket accessories, in-car communication and audio systems. Typically used for audio communication devices over a range of less than 10m, the Siemens Sapphire JTM detectors have been designed with an extended detection range of up to 100m for traffic environments.

Simple installation and configuration

Each Sapphire JTM detector can be easily retrofitted to existing street furniture, typically attached to street columns using a banding kit. The detector contains a directional antenna with the option to be be fitted with an additional external antenna to provide bi-directional detection. Once installed, equipment sensitivity is tested and configured using a PC.

Cost-effective

The initial capital investment per detector is significantly lower than that of camera-based journey time solutions, allowing a higher density of detectors and a wider network for the same capital outlay. Ongoing maintenance costs are also reduced as frequent cleaning of lenses and alignments are not required.

Security matters

All data gathered by the detectors is anonymous, encrypted and securely stored in a central repository for journey time calculation and analysis purposes.

Connectivity options

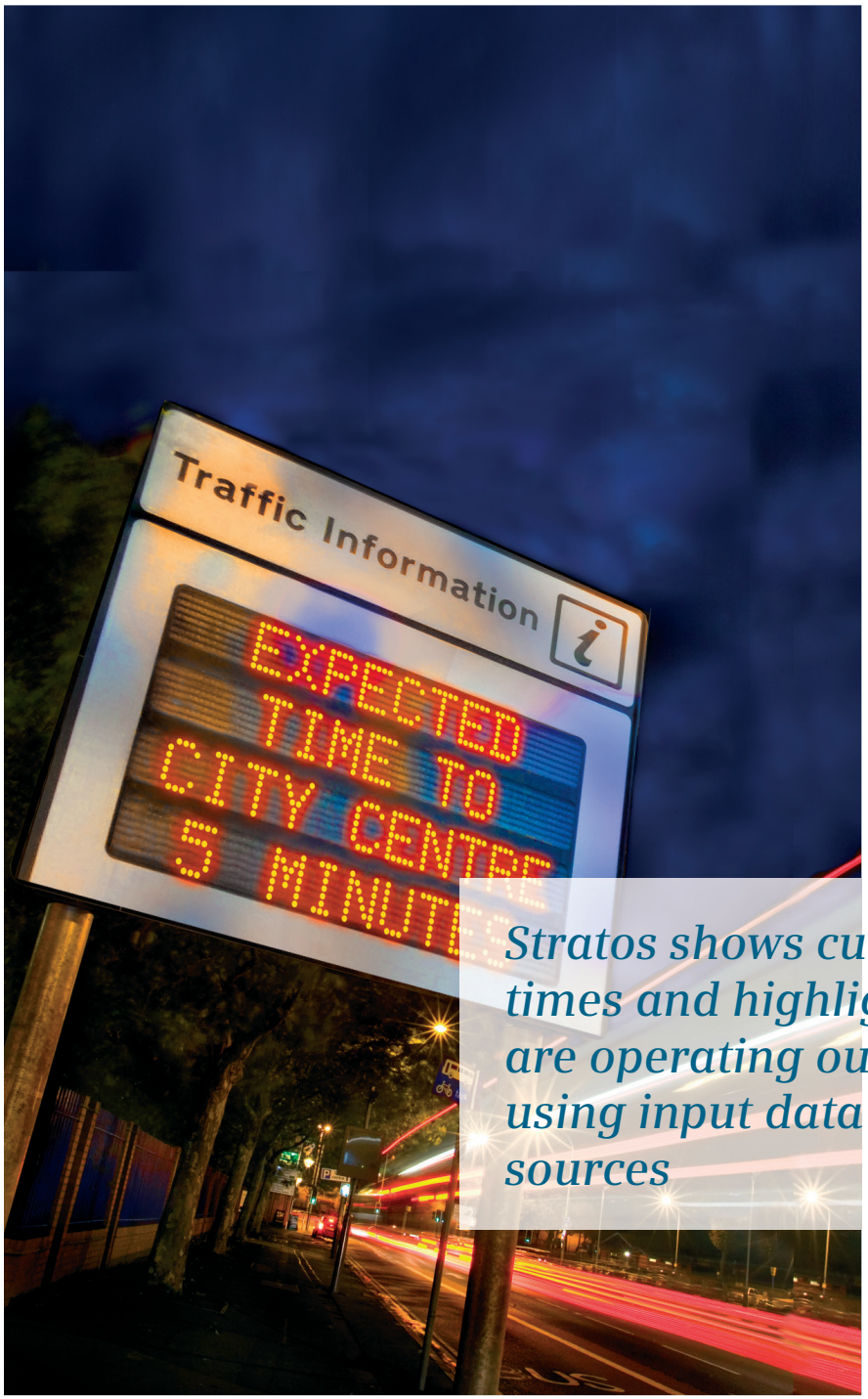
There are two connectivity options available for the Siemens Sapphire JTM solution:

- Ethernet[1], where the detector connects to a router for transmission over ADSL or fibre networks
- Mobile communications, over a mobile telephone data network[2] (including support to GPRS or 3G networks)

1 This connectivity module can be shared with existing UTC communications

2 Mobile data charges may apply

Sapphire JTM – Stratos integration



Integration with Siemens Stratos

Real-time journey time monitoring is an essential element of any traffic management system and an invaluable tool for the traffic manager to ensure optimal network operation.

The Sapphire JTM detectors are integrated into the Stratos Journey Time Monitoring module, with links to ANPR cameras and third-party systems. All inputs contribute to a rich source of information for the analysis and monitoring of traffic.

With user-friendly overview dashboards and maps, Stratos shows current journey times and highlights routes that are operating outside their norms using input data from various sources, including the Bluetooth® JTMS detectors.

Journey time data links to the Strategy Manager module in Stratos where various strategies can be created to automatically push out information to on-street signs or make changes to the traffic network.

Stratos shows current journey times and highlights routes that are operating outside their norms using input data from various sources

Selective Vehicle Detection

The Selective Vehicle Detection (SVD) solution provided by Siemens is an unobtrusive above-ground selective detection system offering both high quality and unbeatable reliability.

The SVD system allows authorities to provide selective vehicle priority to groups of vehicles, or even individual vehicles.

The SVD solution uses automatic Radio Frequency Identification (RFID) to selectively detect suitably tagged vehicles. Flexibility and performance are key factors when delivering a complete end to end SVD solution. Traditional vehicle detection and priority systems require road closures and extensive civil engineering works.

The Siemens SVD solution can be installed on existing street infrastructure and can interface with existing roadside controllers to grant priority or access to recognised and identified vehicles.

The above ground reader can be simply mounted onto existing traffic poles, lighting columns or any other piece of roadside infrastructure. The reader can detect passing tags up to 14 metres away at speeds of up to 350kph. The read range can be adjusted to trim the detection area.

The tag is easily and simply mounted in the windscreen of the vehicle. Each semi-passive tag is equipped with a small battery, which keeps the ID-tag awake but is not used to transmit its own signal.

This enables a prediction of battery life, under normal conditions. No power is induced from the reader's output signal, hence the extremely low RF power output. The ID-tag can be read an unlimited number of times, without reducing the battery's energy.

Each tag has a unique ID that is associated with the equipped vehicle. Lists of tag IDs can be stored in the reader creating blacklists and whitelists, allowing the reader to decide whether the vehicle passing is allowed access or should be granted priority over other traffic. Once a whitelisted tag has been detected, the reader outputs a signal to the traffic controller for traffic priority or to the barrier/bollard for access control.

Selective Vehicle Detection – Applications

Bus priority
The Siemens SVD solution is able to provide local bus priority at traffic signal junctions. Buses can be equipped with tamper evident tags that are linked to the bus by a unique ID. Whitelists can be generated within the reader so that only a recognised tag associated with a particular bus route is granted priority. When a bus passes a reader, and a whitelisted tag ID is recognised, an output is generated to the traffic controller that will enable priority for that junction. This is especially effective when used on bus corridors.

Emergency vehicle priority
Similar to the bus priority application, the SVD system can be implemented to prioritise emergency vehicles at junctions. Installing the SVD solution and enabling priority at critical junctions along an emergency vehicle's route can reduce unnecessary travel delay, ultimately improving a vital service that is heavily dependant on rapid response times.

Access control
There are numerous access control applications where the SVD solution is the perfect fit. These can range from the automatic lowering of bollards for bus access, through to the automatic raising of barriers at private residential areas. In all cases, the unbeatable levels of accuracy and performance allow for seamless access control.

Barrier-free traffic control
The SVD system can be used in multi-lane free-flow situations, where removing the need to stop at barriers is essential for enabling smooth traffic flows.

Fleet management
Large vehicle fleets can be equipped with SVD tags to give the fleet owner reliable, accurate and up-to-date information regarding the location of all vehicles within the fleet.

Technical Specifications

Heimdall

Approval:
- UK Highways England specifications as appropriate for the detector type
- EMC: EN50293
- Radio Approval: EN 300 440

Supply Voltage:
- 24V AC ± 20% (48 to 63 Hz), or 24V DC ± 20%

Typical Supply Current:
- 143mA (AC)
- 113mA (DC)
- 186mA (AC) – with wireless or serial data options
- 147mA (DC) – with wireless or serial data options

Operating Frequencies
- 24.05 GHz to 24.25 GHz
- 13.4 GHz to 14.0 GHz (Kerbside and On-crossing

Dimensions:
- 150mm x 135mm x 90mm (to the bottom of the mounting bracket)

Weight:
- less than 1.6kg (including bracket)

Standard Connection:
- defined Bulgin Buccaneer connector and pin-out or internal screw connector for connection of customer defined termination

Dual lane vehicle approach

Operating Range:
- at least 10m to 35m from the Stop Line - typically up to 70m for saloon car

Lane Width:
- typically 7m

Vehicle Approach Speed:
- 8 km/hr (5 mph) to greater than 112 km/hr (70 mph). Configurable Detection Direction: oncoming, leaving, or both

Detector Mounting Height:
- various heights (above the ground) can be accommodated from 3.3m to 4m

Single lane vehicle approach

Operating Range:
- at least 10m to 35m from the Stop Line - typically up to 70m for saloon car

Lane Width:
- typically 3.5m

Vehicle Approach Speed:
- 8 km/hr (5 mph) to greater than 112 km/hr (70 mph). Configurable Detection Direction: oncoming, leaving, or both

Detector Location:
- can be located on either the 'nearside' primary signal pole or the 'off side' primary signal pole

Stop line

Operating range:
- at least 3m from the Stop Line

Lane Width:
- typically 3.5m

Vehicle Approach Speed:
- stationary detection system but can also be configured to detect vehicles moving through the detection zone

Detection Presence Time:
- at least 30 minutes – configurable by DIP switch settings and terminal

Detector Location:
- can be located on either the 'nearside' primary signal pole or the 'off side' primary signal pole

Detector Mounting
- Height: various heights (above the ground) can be accommodated from 3.3m to 4m

Selectable speed activation

Operating Range:
- At least 10m to 35m from the Stop Line – typically up to 70m for saloon car

Lane Width:
- typically 7m

Vehicle Approach Speed:
- 8 km/hr (5 mph) to greater than 112 km/hr (70 mph)

Speed Threshold Settings:
- 8 km/hr (5 mph) to 112 km/hr (70 mph) by simple DIP switch settings – can be configured from 8 km/hr to 150 km/hr in 1km/hr increments via the terminal facility

Detector Location:
- can be located on either the 'nearside' primary signal pole or the 'off side' primary signal pole

Detector Mounting Height:
- various heights (above the ground) can be accommodated from 3.3m to 4m

On-crossing

Operating Range:
- up to 12m

Crossing Width:
- typically up to at least 4m when used as a pair

Pedestrian Minimum Threshold Speed:
- <0.5 m/s

Detector Location:
- either side of crossing – no special adjustment needed to avoid interference between units

Detector Mounting Height:
various heights (above the ground) can be accommodated from 3m to 4.5m

Kerbside (Standard & Volumetric)

Operating Range
- wait areas up to 4.5m wide (DIP switch setting for short and long wait areas)

Wait Area Width:
- typically 1m (typically 2m adjacent to pedestrian demand unit)

Detector Location:
- on pole with associated pedestrian demand unit

Detector Mounting Height
- various heights (above the ground) can be accommodated from 3.3m to 4m

SCOOT / MOVA

Operating Range:
- single lane adjacent to mounting pole

Lane Width:
- replicates the function of a normal SCOOT / MOVA loop

Vehicle Approach Speed:
- 0 km/hr (0 mph) to greater than 112 km/hr (70 mph)

Detection Presence Time:
- at least 30 minutes – configurable by terminal

Data Accuracy:
- Count: better than 98%
- Occupancy: better than 98%

Detector Location:
- can be located on either the 'nearside primary signal pole or the 'off side' primary signal pole towards traffic flow or 'side fire' across lane being monitored

Detector Mounting Height
- various heights (above the ground) can be accommodated from 3.3m to 8m – actual SCOOT 'footprint' will be dependent on the mounting height

Technical Specifications

SLD4 Loop Detector

Approvals
- Approved to TR2512
- Radio approvals to ESTI 300-330
- CE marked

Physical Characteristics
- Standard 3U Eurocard outline
- 4 independent loop channels with solid state outputs
- Loop Parameters
- Loop Operating Frequency: 30-120 KHz
- Loop Inductance: 20-2000 microhenries (including feeder cable)
- Loop Feeder Length: 300m minimum
- Extended Loop Feeder Length: up to 1000m (limitations on tuning frequency and sensitively ranges apply)
- Sensitivity: 8 switch setting levels from 0.01% to 1% dL/L
- Advanced Detector Version is freely settable from 0.004% to 10% dL/L using configuration tool
- Four preset presence time selections between 3.5 seconds and 2 hours (all basic parameters settable by DIL switches)

Automatic Set-up Features
- loop operating frequency
- loop sensitivity
- (operates up to 16 detector cards)

Manual PC Set-up Features
- Vehicle capture
- Vehicle simulation
- USB cable access (through front panel)

Detection Speeds
- Vehicles: 0 – 250 km/hr (includes motorcycles)
- Cycles: 0 – 40 km/hr

Power Supplies
- 10V to 32V DC
- 18V to 29V AC RMS
- Max power 1W (LEDs not illuminated)
- **Power Break Support Times:**
  - 50ms @24V AC
  - 20ms @24VDC
- Guaranteed to restart automatically after a power break

Safety
- Meets electrical safety requirement EN 60950

Environmental
- Operating Temperature: -25°C to +80°C
- Humidity: 95% (non-condensing)

Electromagnetic Compatibility
- Meets emission and susceptibility requirement EN 50293

WiMag

WiMag Vehicle Detection
- Detection: 3-axis magnetic field sensing
- Dimensions: 74mm x 74mm x 49mm
- Power Supply: non-replaceable primary Li-SOCl2 3.6V battery pack
- Range: typically up to 30m to Repeater/ Access Point
- Operating Temperature: -40°C to +85°C
- Weight: 0.3kg
- Frequency Band: 2400 to 2483.5 MHz
- Installation Core Size: Ø100mm x 57mm deep
- Installation Compound: two-part silicone polyurea sealant
- Ingress Protection Rating: IP68

WiMag Cycle Detection
- Detection: microwave radar
- Dimensions: 74mm x 74mm x 58mm
- Power Supply: non-replaceable primary Li-SOCl2 3.6V battery pack
- Range: typically up to 30m to Repeater/ Access Point
- Operating Temperature: -40°C to +85°C
- Weight: 0.3kg
- Frequency Band: 2400 to 2483.5 MHz
- Installation Core Size: Ø100mm x 57mm deep
- Installation Compound: two-part silicone polyurea sealant
- Ingress Protection Rating: IP67

WiMag 19" Communications Rack Assembly
- Up to 60 detectors and 7 Access Points
- Typically up to two racks can be fitted in ST950 cabinets

WiMag Loop Detector Replacement Card
- Up to 4 detectors and 1 Access Point
- Cards may be connected together to increase capacity
- Standard 3U single Eurocard
- Dimensions: 160mm x 100mm x 25mm
- Number of Channels: 4 optically isolated
- Master Fault: isolated output (n/c and n/o)
- Configuration: with software via Ethernet
- Access Point Connection: via connection on front panel
- Input Voltage: via traffic controller backplane
- DC - 19-29V DC 550mA or AC - 21-28V AC 800mA
- Output Voltage: 48V DC 6W max (Access Point power)
- Operating Temperature: -25°C to +70°C

Access Point
- Range: typically up to 300m to Access Point (standard) or up to 600m to Access Point (Repeater relay)
- Cards may be connected together to increase capacity
- **Interfaces:**
  - to/from detectors or Repeaters via 802.15.4 PHY radio
  - to/from configuration device (PC) via TCP/IP over 10Base T Ethernet
  - to ST950 traffic controller via WiMag Standard Interface card (up to 20 sensors per card)
  - to controllers via WiMag Loop Detector Replacement card (up to 4 detectors per card)
- Frequency Band: 2400 to 2483.5 MHz
- Power Supply: 36V to 58V DC (48V DC nominal) from WiMag Rack or WiMag Loop Detector Replacement card
- Power Consumption: 2W
- Dimensions: 159mm x 159mm x 89mm
- Operating Temperature: -40°C to +80°C
- Weight (including mounting kit): 1.4kg
- Ingress Protection Rating: IP67

Repeater

- Range: typically up to 300m to Access Point (standard) or up to 600m to Access Point (Repeater relay)
- Cards may be connected together to increase capacity
- **Interfaces:**
  - to/from detectors, Access Point and other Repeaters
- Frequency Band: 2400 to 2483.5 MHz
- Frequency Channels: 16
- Power Supply: user replaceable primary Li-SOCl2 3.6V battery pack
- Battery Life: approximately 8 years
- Dimensions: 197mm x 166mm x 137mm
- Operating Temperature: -40°C to +80°C
- Weight (including mounting kit): 2.25kg
- Ingress Protection Rating: IP65

Sapphire JTM

- Antenna designed with specific radiation pattern for detecting devices at intersections
- Compatible with the Bluetooth® versions 1.0, 2.0, 2.1, 3.0, 4.0 and 4.1
- Power Supply: 9V to 30V AC or DC
- Supply Voltage: 0.4W (60mA at 24V AC)
- Operating Temperature: -10°C to +80°C
- Dimensions: 170mm x 150mm x 55mm
- Weight: under 1.5kg
- Ingress Protection Rating: IP68
- Data Transmission: via Ethernet, mobile communications (GPRS, 3G) or local Bluetooth connection®

Selective Vehicle Detection

Approvals:

- CE marked
- FCC marked

Range:

- LR-6 Reader: up to 10m[1]
- LR-6XL Reader: up to 14m[1]

- Maximum Vehicle Speed: 350 km/hr (218 mph)
- Operating Frequency: 2.45 GHz
- Output Power: 75mW
- Power Supply: 10V to 30V DC
- Reader Dimensions: 290mm x 165mm x 56mm
- Tag Dimensions: 70mm x 45mm
- Operating Temperature: -30°C to +60°C
- Weight: 0.95kg
- Ingress Protection Rating: IP65

Siemens Mobility
Sopers Lane
Poole
Dorset
BH17 7ER

Tel: +44 (0) 1202 782000
Email: sales.stc@siemens.com
siemens.co.uk/traffic