

WiMag Vehicle Detection System TR2512A Statement of Compliance

Part no.
667/BB/47200/000

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CHANGE HISTORY:

Version	Date	Change	Author
1	Mar 2012	Release	A Rhodes
2	Mar 2012	Second Release	A Rhodes
3	Oct 2012	Third Release - TS006736	A Rhodes
4	Feb 2013	Incorporating WiMag Loop Replacement Card - TS006813	A Rhodes

Table 1 - Issue History

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1 Introduction

1.1 Purpose and scope

Siemens Mobility, Traffic Solutions are marketing the Sensys Wireless Magnetometer Vehicle Detection system under the pseudonym of WiMag (wireless magnetometer).

The HA TR2512A performance specification was written specifically for inductive loop based products but is now considered the standard for any below-ground detection technology.

This document is a review of the WiMag performance against the HA approval requirements TR2512A.

1.2 System Overview

The Wireless Vehicle Detection System uses pavement-mounted magnetic sensors to detect the presence and movement of vehicles. The magneto-resistive sensors are wireless, transmitting their detection data in real-time via low-power radio technology to a nearby access point that then relays the data to one or more local or remote traffic management controllers and systems. Each Sensys installation consists of:

- a number of **wireless sensors** installed in or on the roadway at various locations as required by the particular vehicle detection application;
- an **access point** to receive the detection data from the sensors and process and communicate it upstream;
- an **interface card** which communicates with the access point and provides the detector states in the appropriate format for the controller.

there are also some optional elements

- one or more **repeaters** as required to support sensors installed beyond the radio range of the Sensys access point.

The WiMag wireless communication between the sensor and the access point, and/or repeater, is based around the 2.4GHz ISM band. This allows for licence free operation.

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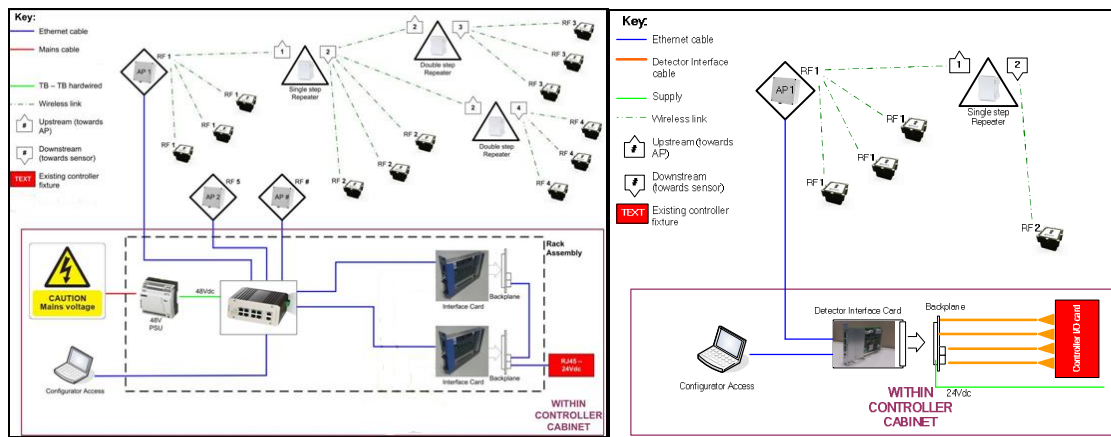


Figure 1 : Two Example Implementations the WiMag Vehicle Detection System

1.3 The VNS240 Magnetometer

The WiMag detection system is a below ground vehicle detection equipment for use with permanent vehicle actuated traffic signals or other vehicle detection applications. The product detects the passage or presence of a vehicle by means of the change in the state of a magnetic sensor buried below the surface of the carriageway.

There are various applications for this type of detection as defined by the Highways agency specification TR2512A.

The WiMag vehicle detection system is analysed against Appendices, A, C and D only.



Figure 2 – VNS240 Magnetometer

The VSN240 sensors are wireless have an inbuilt in battery that along with the low-power wireless module should be active for at least 10 years. Siemens provides a 5 year warranty.

The detectors will continuously self-calibrate so that the earths magnetic fluctuations are always considered as part of the detection decision.

The VSN240-F variant is used road and stop-line applications.

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1.4 The AP240 Access Point

The access point is an intelligent device operating under the Linux operating system that maintains two-way wireless links to an installation's sensors and repeaters, establishes overall time synchronization, transmits configuration commands and message acknowledgements, and receives and processes data from the sensors. The access point then uses a wired connection to relay the sensor detection data to a roadside traffic controller via an interface card.

1.5 The Interface Card

The interface card provides the linking between the wireless access point (AP240) and the Siemens controller.

There are two interface cards variants;

The WiMag Standard Interface Card is designed for the following levels of integration with approved Siemens controllers only:

- Serial Interface – Using Siemens SPI or GSPI protocol.
- Ethernet interface – Used for the Access Point link and/or card configuration.

The Standard Interface card provides a serial interface to the Siemens controller via the GSPI or SIO serial protocol. Through these protocols a single interface card can provide linking of up to 20 individual detectors and four fault outputs.

The WiMag Loop Detector Replacement Card is a direct WiMag replacement version of a standard loop detector card.

- The Loop Detector Replacement Card uses a standard detector backplane

The WiMag Loop Detector Replacement Card provides a standard detector interface to the Siemens controller via voltage free contacts. Through this interface the card can provide linking of up to 4 individual detectors.

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2 HA TR2512A Below Ground Detector Functional Requirements Analysis

<p>2.1 This Specification defines the requirements of a Product to detect the passage or presence of a vehicle by means of the change in the output state of below ground detection equipment. Applications are specified in the appendices to this specification.</p>	<p>Compliant</p> <p>The sensors are located below ground.</p> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip</p>
<p>2.2 This Specification covers the performance requirements of vehicle detection equipment used for following levels of integration with approved signal controllers:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Isolated; i.e. remote detector packs; <input type="checkbox"/> Serial Interface; i.e. Separate detector cards mounted within the controller cabinet, and addressable via a serial link; <input type="checkbox"/> Fully Integrated within the controller. 	<p>Noted</p>
<p>2.3 Where inductive loops technology is used, the following requirements shall apply:</p> <ul style="list-style-type: none"> ϕ Each detection channel shall be designed to accommodate loop inductive impedance from 50µH to 800µH; ϕ The Product shall have an autotune facility that shall stabilise within 5 seconds; ϕ The Product may have an auto-retune facility to re-stabilise the Product within 5 seconds after an inductance change of not less than +15%; <i>Note This facility shall be capable of being inhibited if required.</i> 	<p>Not Applicable</p> <p>Inductive loops are not used.</p>
<p>2.4 For a multi-channel Product, the specified performance shall be achieved for each channel with all other channels operating normally.</p>	<p>Compliant</p> <p>Each detector within a system has a separate time slot (TDMA).</p> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip</p>
<p>2.5 The Product shall perform as defined by this specification with a confidence limit of not less than 90% in respect of the sensitivity and timing requirements for not less than the sooner of:</p> <ol style="list-style-type: none"> 1. A period of three years after delivery to the purchaser; 2. The number of operations corresponding to 10,000,000 vehicles having been detected. 	<p>Compliant</p> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip</p> <p>Note: The compliance is with appropriate maintenance activities.</p>

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<p>2.6 The Product shall be capable of detecting any of the vehicles defined in the appendices to this Specification.</p>	<p>Compliant</p> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip.</p>
<p>2.7 The Product shall have a minimum of three selectable sensitivity settings for each detector channel as appropriate to the requirements of this specification and the various declared loop configurations.</p>	<p>Compliant</p> <p>Sensitivity settings are available as a configurable item.</p> <p>Loop configurations are not applicable.</p> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip</p>
<p>2.8 Where sensitivity settings and other detector parameters are selected in software the following provisions shall apply:</p> <ul style="list-style-type: none"> <input type="checkbox"/> the settings shall be retained in non-volatile storage for at least one year, in the event of any loss of power supply; <input type="checkbox"/> when settings are being changed, the detector shall output the 'detect' condition, and revert to normal operation within 5 seconds from the completion of the change. 	<p>Compliant</p> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip</p>
<p>2.9 The Product shall incorporate automatic compensation to offset the effects of changes in impedance at the input terminals.</p>	<p>Clarification</p> <p>This is a non-loop based product however the Magnetometers track the background magnetic field changes and compensation is applied.</p>
<p>2.10 The response time of the Product shall not be greater than 64 ms;</p> <p>this period is interpreted from the dynamic characteristics specified in 2.11.</p>	<p>Compliant</p> <p>The setting of ½ frame @ 62.5mS (27 devices) or ¼ frame @ 32.25mS (11 devices) polling is compliant.</p> <p>However the default setting of 127mS full frame polling will be used as this product is not used in SDE/SA applications. This setting is adequate for normal VA/SCOOT and MOVA applications.</p> <p>Test results and technical summary are recorded in 667/UW/47200/000.</p> <p>The settings are available to users.</p> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip</p>
<p>2.11 The dynamic operating characteristics of the Product for any given vehicle type shall be such that the detection point on the road at which the vehicle is detected over the speed range of 40 km/h (25 mph) to 112 km/h (70 mph) shall not vary about a mean by more than ± 0.5 meters for any individual vehicle detector.</p>	<p>Non-compliant</p> <p>However this product is not used in SDE/SA applications. The default setting of 62.5mS is adequate for normal VA/SCOOT and MOVA applications.</p> <p>Test results and technical summary are recorded</p>

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	<p>in 667/UW/47200/000.</p> <p>Note: The loop variance is tied to the transmit interval. The following transmit intervals are user selectable;</p> <table border="1" data-bbox="879 443 1407 663"> <thead> <tr> <th>Transmit Interval/Latency</th> <th>Maximum Number of Devices</th> <th>Potential Loop Variance (@50mph)</th> <th>Potential Loop Variance (@30mph)</th> </tr> </thead> <tbody> <tr> <td>32.25 ms</td> <td>11</td> <td>+/- 0.7m</td> <td>+/- 0.4m</td> </tr> <tr> <td>62.5 ms</td> <td>27</td> <td>+/- 1.4m</td> <td>+/- 0.8m</td> </tr> <tr> <td>125 ms</td> <td>54</td> <td>+/- 2.8m</td> <td>+/- 1.7m</td> </tr> </tbody> </table> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001 Rev D – Siemens copy kept in 667/QF/47200/001.zip</p>	Transmit Interval/Latency	Maximum Number of Devices	Potential Loop Variance (@50mph)	Potential Loop Variance (@30mph)	32.25 ms	11	+/- 0.7m	+/- 0.4m	62.5 ms	27	+/- 1.4m	+/- 0.8m	125 ms	54	+/- 2.8m	+/- 1.7m
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125 ms	54	+/- 2.8m	+/- 1.7m														
<p>2.12 The Product shall maintain an unbroken vehicle detection signal for the periods specified in the appendices to this specification dependent on detector application.</p>	<p>Reference individual appendix SOC at end of document.</p>																
<p>2.13 Presence Time(s) may be selectable.</p>	<p>Compliant</p> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip</p>																
<p>2.14 The Product shall return to a non-detecting state in less than 50 milliseconds following the zone of detection being vacated.</p>	<p>Compliant</p> <p>Compliance is met if the transmit interval of 32.25mS is used.</p> <p>However, the default setting of 62.5mS is adequate for normal VA/SCOOT and MOVA applications.</p> <p>Test results and summary are recorded in 667/UW/47200/000</p> <p>Note: The return to non-detect state is related to the communications transmit interval. The following frame rates are user selectable;</p> <table border="1" data-bbox="879 1491 1407 1666"> <thead> <tr> <th>Transmit Interval/Latency</th> <th>Maximum Number of Devices</th> </tr> </thead> <tbody> <tr> <td>32.25 ms</td> <td>11</td> </tr> <tr> <td>62.5 ms</td> <td>27</td> </tr> <tr> <td>125 ms</td> <td>54</td> </tr> </tbody> </table> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001 Rev D – Siemens copy kept in 667/QF/47200/001.zip</p>	Transmit Interval/Latency	Maximum Number of Devices	32.25 ms	11	62.5 ms	27	125 ms	54								
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125 ms	54																
<p>2.15 For isolated detectors, the output conditions shall comply with the interface requirements defined in TR 2523.</p>	<p>Compliant</p> <p>WiMag Loop Detector Replacement Card only.</p>																
<p>2.16 The Product shall provide a visual indication of the</p>	<p>Compliant</p>																

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output. The indicator shall be clearly visible in all ambient light conditions.	WiMag Loop Detector Replacement Card only.																								
2.17 For detectors that are connected by a serial interface or are fully integrated the output conditions shall comply with paragraph 2.23 1 and 2.23 2.	Non-Compliant WiMag Standard Interface Card only. The serial interface system is dedicated to Siemens integrated controller system.																								
2.18 Optional, secondary outputs for non-control applications may be provided, such as secondary vehicle counting equipment.	Noted																								
2.19 Following a sustained actuation the detector shall recover to normal operation within 100 milliseconds after the zone of detection is vacated. Alternatively the recovery time for equipment incorporating the anti-locking facility; may be within 1 second of the zone of detection being vacated. This excludes equipment designed to Appendices E and F.	Non-compliant Vehicles that have been within detection zone for longer than the timeout period may cause a detection of equal period after leaving. However, our experience has shown that this is unlikely to have any negative effect due to the unlikely scenarios envisaged. The timeouts are user configurable with the default set at 4 minutes. Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001 Rev D 2010 – Siemens copy kept in 667/QF/47200/001.zip																								
2.20 Where loop technology is used these loops shall be installed to comply with MCE 0108. Loop dimensions are to be in accordance with 7th Edition Specification for Highway Works, Volume 3 Highway Construction Details Section 1, G series drawings.	Not Applicable																								
2.21 The Manufacturer shall determine the shape of the installed loop.	Not Applicable																								
2.22 General strategy is specified in MCE 0108 "Siting of Inductive Loops for Vehicle Detecting Equipments at Permanent Road Traffic Signal Installations"	Clarification The wireless detectors will be placed in similar places to the inductive loops.																								
2.23 Where alternative interfaces are permitted in the appendices hereto they shall comply with the connection types, tables and configurations of 2.23 1, 2.23 2. 1. Connector Device RJ45 (Optional Front Panel Connector).	Compliant (Connector Device Option 2) WiMag Loop Detector Replacement Card only. With regards to the WiMag Standard Interface Card; Reference section 2.24 The serial interface system is dedicated to Siemens integrated controller system.																								
<table border="1"> <thead> <tr> <th>Pin</th> <th>Signal</th> <th>Input/Output</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>RTS</td> <td>Output</td> </tr> <tr> <td>2</td> <td>DTR (TXD-)</td> <td>Output (TX)</td> </tr> <tr> <td>3</td> <td>TX (TXD+)</td> <td>Output (TX)</td> </tr> <tr> <td>4</td> <td>0V</td> <td>Common</td> </tr> <tr> <td>5</td> <td>0V</td> <td>Common</td> </tr> <tr> <td>6</td> <td>RX (RXD+)</td> <td>Input (RX)</td> </tr> <tr> <td>7</td> <td>DSR (RXD-)</td> <td>Input (RX)</td> </tr> </tbody> </table>	Pin	Signal	Input/Output	1	RTS	Output	2	DTR (TXD-)	Output (TX)	3	TX (TXD+)	Output (TX)	4	0V	Common	5	0V	Common	6	RX (RXD+)	Input (RX)	7	DSR (RXD-)	Input (RX)	
Pin	Signal	Input/Output																							
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5	0V	Common																							
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7	DSR (RXD-)	Input (RX)																							

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8	CTS	Input																									
<p>Table 2.1 RJ 45 Pin Connections</p> <p>TERMINAL INTERFACE. The interface shall conform to RS 232 or RS 485. (RS 485 connections shown in brackets)</p> <p>BAUD RATE. The Baud Rate must be capable at 9600 Bd or higher rates. Operation at 9600 Bd is recommended.</p> <p>CHARACTER SET. The Character Set shall be ISO Alphabet No 5 (ASCII).</p> <p>User Terminal. The manufacturer shall specify an appropriate P.C. terminal device and required software.</p> <p>2. Connector Device – Rear Terminations on Euro-Connector</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Pin</th> <th style="width: 35%;">Signal</th> <th style="width: 50%;">Input/Output</th> </tr> </thead> <tbody> <tr> <td>26a</td> <td>RTS</td> <td>Output</td> </tr> <tr> <td>25b</td> <td>DTR (TXD-)</td> <td>Output (TX)</td> </tr> <tr> <td>25a</td> <td>TX (TXD+)</td> <td>Output (TX)</td> </tr> <tr> <td>32b</td> <td>0V</td> <td>Common</td> </tr> <tr> <td>28b</td> <td>RX (RXD+)</td> <td>Input (RX)</td> </tr> <tr> <td>28a</td> <td>DSR (RXD-)</td> <td>Input (RX)</td> </tr> <tr> <td>27b</td> <td>CTS</td> <td>Input</td> </tr> </tbody> </table> <p>Table 2.2 Connections to Euro-Connector</p> <p>TERMINAL INTERFACE. The interface shall conform to RS 232 or RS 485. (RS 485 connections shown in brackets).</p> <p>BAUD RATE. The Baud Rate must be capable at 9600 bd or higher rates. Operation at 115.2 KBd is recommended.</p> <p>CHARACTER SET. The Character Set shall be ISO Alphabet No 5 (ASCII).</p> <p>The manufacturer shall specify an appropriate personal computer terminal device and required software.</p> <p>Integrated Detector Link</p>			Pin	Signal	Input/Output	26a	RTS	Output	25b	DTR (TXD-)	Output (TX)	25a	TX (TXD+)	Output (TX)	32b	0V	Common	28b	RX (RXD+)	Input (RX)	28a	DSR (RXD-)	Input (RX)	27b	CTS	Input	
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28a	DSR (RXD-)	Input (RX)																									
27b	CTS	Input																									
2.24 Where detectors are fully integrated on the controller circuit board, the detector/controller interface can be manufacturer specific.			Noted																								
2.25 Where required the product shall provide a reset facility.			Compliant																								
			Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip																								

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2.26 It shall not be possible for any vehicle, or combination of vehicles, to produce input conditions that either damage the Product or render it non-operational.	Compliant
2.27 The equipment shall not suffer damage if any loop and/or feeder is short circuited or disconnected.	Not Applicable
2.28 An external fault applied to the input or output of one channel shall not affect the operation of any other channel(s).	Compliant Each detector channel is isolated.
2.29 The Product shall be powered from one of the following supplies:	Noted
2.30 The Product shall operate as required by this specification when the Extra Low Voltage varies between +13% and -10% of its nominal voltage of 24V AC or 40V AC and over the range $\pm 4\%$ of its nominal frequency.	Compliant The detectors are battery powered and thus meet ELV conditions. The detector interface does meet the requirements as stated. The repeaters are battery powered and are therefore completely isolated. The AP, however, is powered 48V (POE) as standard.
2.31 The Product shall operate as required by this specification when the nominal 24V DC supply voltage varies over the range $\pm 20\%$ of its nominal value.	Clarification The detectors are battery powered and thus meet ELV conditions. The repeaters are battery powered and are therefore completely isolated. The AP, however, is powered 48V (POE) as standard.
2.32 Under no conditions shall the voltage produced by the Product measured across the loop and feeder terminals, or between any such terminal and earth, exceed 70 volts peak to peak. This requirement shall apply to the voltage across the feeder cables whether the loop be connected to or disconnected from the rest of the vehicle detection equipment.	Not Applicable Detectors are electrically isolated and are battery powered.
2.33 All wiring, termination, earthing bonding and labelling shall be in accordance with BS 7671.	Compliant Reference Sensys Certificate of Declaration – Siemens copy kept in 667/QF/47200/001.zip
2.34 All vehicle detectors supplied to this specification shall comply, where appropriate, with the current requirement of:	Noted
2.35 ETSI EN 300 220-1 Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz Part 2: Harmonized EN under article 3.2 of the R&TTE Directive	Compliant Tested against EN 300328 & EN301489 (as per R&TTE Directive 1999/5/EC, 73/23/EEC). Reference Sensys Certificate of Declaration – Siemens copy kept in 667/QF/47200/001.zip

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<p>2.36 The vehicle detection equipment shall operate correctly, as required by this specification, when subjected to the EMC conditions, which may be met in use. Evidence of compliance with Specification EN 50293 shall demonstrate this.</p>	<p>Compliant</p> <p>Reference Sensys Certificate of Declaration – Siemens copy kept in 667/QF/47200/001.zip</p>
<p>2.37 Adequate precautions shall be taken in the design of the equipment to prevent mutual interference between equipment of the same type when connected to adjacent loops. These precautions shall be at least sufficient to avoid any interaction between equipment connected to a pair of loops each 2 metres square, with adjacent sides parallel to each other and spaced 0.5 metres apart throughout their length under all operating conditions at high sensitivity.</p>	<p>Clarification</p> <p>The equipment, within a single access point control, uses TDMA in order to avoid interference.</p> <p>Each access point can and will use a separate frequency of operation.</p>
<p>2.38 The vehicle detection equipment shall operate as required by this specification when subjected to the tests listed below, as specified in the relevant clauses of BS 7987 for;</p> <ul style="list-style-type: none"> <input type="checkbox"/> Change of temperature; <input type="checkbox"/> Damp Heat; <input type="checkbox"/> Random Vibration. <p>NOTE: It is not necessary to meet this requirement the below ground detectors are installed in the vicinity of high or low current heating mats.</p>	<p>Compliant</p>
<p>2.39 The general design, construction and assembly of the Product shall be based on sound proven engineering principles.</p>	<p>Compliant</p>
<p>2.40 The front panel of rack mounted Products is to be fitted with a means to assist easy removal and replacement of units.</p>	<p>Compliant</p>
<p>2.41 Products used with traffic signal controllers shall preferably be mounted in the controller cabinet. Where this is not possible, remote detector housings may be used.</p>	<p>Noted</p>
<p>2.42 Remote detector housings shall meet the relevant "Constructional Requirements" section of the of TR 2206 and the environmental requirements of BS 7987 for;</p> <ul style="list-style-type: none"> <input type="checkbox"/> Dry Heat Class AB3; <input type="checkbox"/> Cold Class AE2; <input type="checkbox"/> Damp Heat, Cyclic; <input type="checkbox"/> Solar Radiation; <input type="checkbox"/> Water Penetration; <input type="checkbox"/> Random Vibration. 	<p>Compliant</p>
<p>2.43 The contact designations for DIN 41612 type B rear panel plug shall be in accordance with Appendix G1 for all purpose road applications (Appendices A, B, C, and D) and Appendix G2 for motorway applications (Appendices E and F).</p>	<p>Compliant (Appendix G1 only)</p> <p>WiMag Loop Detector Replacement Card only.</p> <p>With regards to the WiMag Standard Interface Card;</p> <p>The serial interface system is dedicated to</p>

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		Siemens integrated controller system, as allowed for in section 2.24
2.44	The equipment housing shall be to BS EN 60529 IP 55.	Compliant
2.45	The equipment housings shall be manufactured from a suitable material to provide mechanical protection to IP XX9.	Compliant
2.46	Any open short circuit fault condition continuously presented to an input connection port of the detector for more than 30 ms shall, after an interval not exceeding 5 seconds, produce a detect signal for as long as the fault persists unless otherwise specified.	Not Applicable Although sensor devices are wirelessly linked, any fault condition will produce a detect indication to the controller.
2.47	The above faulty condition shall not damage the Product or, if it a multi-channel design, affect the operation of the other channels	Not Applicable
2.48	An interruption of the power supply to the Product shall, after an interval not exceeding 5 seconds, automatically produce a vehicle detection signal (indicating the presence of a vehicle) from the Product for so long as the interruption persists. The Product shall regain its specified operation within 5 seconds of the restoration of the power supply.	Compliant Fault output provided if the detector fails. The controller conditioning to be applied will ensure that interface failure will set detection.
2.49	A separate fault output signal shall be provided in accordance with 2.46. In the quiescent (i.e. non fault) condition the fault output shall be a normally closed relay or +ve solid state as indicated in Appendix G2.	Compliant (Appendix G1 Only) WiMag Loop Detector Replacement Card only. WiMag Standard Interface Card; The serial interface system is dedicated to Siemens integrated controller system. However, any fault condition will produce a detect indication to the controller. In addition the interface card provides 4 fault outputs (via the GSPI/SIO protocol), each of which comprise of 5 detectors' faults, multiplexed together.
2.50	The Product may also provide an additional visual indication of the fault conditions as defined in 2.46, 2.47, and 2.48 for as long as the fault exists. The Product shall provide a visual indication of the output. The indicator shall be clearly visible in all ambient light conditions. The Indicator shall be illuminated when no fault is present.	Compliant WiMag Loop Detector Replacement Card only. WiMag Standard Interface Card; The interface card offered provides linking to 20 detectors. The use of a PC/laptop provides detect indication. Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip
2.51	For power conservation purposes the visual indication described in 2.50 may be normally off and only brought into circuit via a readily accessible means.	Compliant WiMag Loop Detector Replacement Card only. WiMag Standard Interface Card; The interface card offered provides linking to 20 detectors. The use of a PC/laptop provides

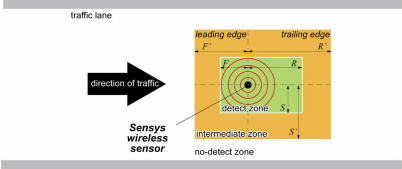
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	detect indication. Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip
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APPENDIX A VEHICLE-ACTUATED TRAFFIC SIGNALS AT JUNCTIONS, HAUL ROUTES AND PEDESTRIAN CROSSINGS – OTHER THAN FOR SPEED MEASUREMENT	
A1 Vehicle detection equipment used to provide vehicle demands and extensions, in accordance with equipment complying with Department of Transport Specification TR 2500, shall comply with the following performance requirements with whatever loop and feeder configuration the manufacturer specifies.	Noted
A2 The vehicle detection equipment shall respond to any vehicles, including pedal cycles, travelling at any speed between 4.8 km/h (3 mph) and 129 km/h (80 mph) (pedal cycles 4.8 km/h (3 mph) to 32 km/h (20 mph), but is not precluded from detecting vehicles at speeds outside this range. The vehicle detection equipment shall preferably give a single unbroken vehicle detection signal for all types of vehicles. If multiple vehicle detection signals are produced, due to varying chassis height, then they shall not occur for more than 20% of all vehicles normally encountered on public roads with 3 or more road wheels.	Compliant
A3 In the event of any type of motor driven vehicle with 3 or more road wheels coming to rest over a below ground detector, after having entered the zone of detection at a speed of not less than 4.8 km/h (3mph), the presence time shall normally be 4 minutes \pm 1 minute. An alternative presence time of 3.5 seconds \pm 0.5 seconds may also be provided.	Compliant
A4 The vehicle detection equipment shall respond to any target object after the presence time has expired. NOTE: A4 is required primarily for those conditions where a single detector is connected in series with other detector configurations to the same Product (parallel configurations may not be used). It is to ensure that if, during saturated traffic conditions, the detector presence time expires, then the movement of vehicles off and onto any detector boundary in the detection system, whilst the other detectors are occupied, again produces a vehicle presence condition giving an extension to hold the green for that stage.	Compliant
A5 The output signal to indicate the presence of a vehicle may be either high or low impedance condition.	<p>Compliant</p> <p>WiMag Loop Detector Replacement Card only.</p> <p>WiMag Standard Interface Card;</p> <p>The serial interface system is dedicated to Siemens integrated controller system. This interface methodology does mean a high/low impedance connection is not available.</p> <p>A high/low impedance condition may also be provided for Siemens controller integration.</p>

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APPENDIX C VEHICLE COUNTING, OCCUPANCY AND QUEUE APPLICATIONS IN UTC																							
C1 Vehicle detection equipments used in accordance with equipment complying with Specification MCH 1932 shall comply with the following performance requirements:		Noted																					
C2 The zone of detection of a vehicle detection equipment shall not be less than the physical area of the detection zone and not greater than an area whose sides are parallel to the physical sides of the detection zone and not further than 200 mm from these sides for any vehicle with 3 or more road wheels, travelling within the speed range 4.8 km/h (3 mph) to 113 km/h (70 mph). The manufacturer shall specify the sensitivity setting(s) that may be used for correct operation in this application.		<p>Clarification</p> <p>The detection area is significantly greater (>200mm) than the area of the detection apparatus. However this has no impact on performance as this is a non-loop technology based detection system.</p> <p>Note: detection zone equivalence:</p>  <table border="1" data-bbox="890 987 1283 1077"> <thead> <tr> <th></th> <th>F</th> <th>F'</th> <th>R</th> <th>R'</th> <th>S</th> <th>S'</th> </tr> </thead> <tbody> <tr> <td>freeway & arterial applications (typical configurations)</td> <td>-2 feet / -0.6 meters</td> <td>-4 feet / -1.2 meters</td> <td>-4 feet / -1.2 meters</td> <td>-6 feet / -1.8 meters</td> <td>-2 feet / -0.6 meters</td> <td>-4 feet / -1.2 meters</td> </tr> <tr> <td>intersection applications (typical configuration for automobiles)</td> <td>-3 feet / -0.9 meters</td> <td>-5 feet / -1.5 meters</td> <td>-3 feet / -0.9 meters</td> <td>-5 feet / -1.5 meters</td> <td>-3 feet / -0.9 meters</td> <td>-5 feet / -1.5 meters</td> </tr> </tbody> </table> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001– Siemens copy kept in 667/QF/47200/001.zip</p>		F	F'	R	R'	S	S'	freeway & arterial applications (typical configurations)	-2 feet / -0.6 meters	-4 feet / -1.2 meters	-4 feet / -1.2 meters	-6 feet / -1.8 meters	-2 feet / -0.6 meters	-4 feet / -1.2 meters	intersection applications (typical configuration for automobiles)	-3 feet / -0.9 meters	-5 feet / -1.5 meters	-3 feet / -0.9 meters	-5 feet / -1.5 meters	-3 feet / -0.9 meters	-5 feet / -1.5 meters
	F	F'	R	R'	S	S'																	
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C3 The vehicle detection equipment shall respond to any vehicle with 3 or more road wheels travelling at any speed between 4.8 km/h (3 mph) and 129 km/h (80 mph) but is not precluded from detecting vehicles at speeds outside this range. If the associated equipment is a vehicle counter, the vehicle detection equipment shall give a single unbroken vehicle detection signal for all motor-driven vehicles with 3 or more road wheels. An exception can be made for special classes of vehicles such as those having a ground clearance greater than 0.5 metres. For the purpose of the single unbroken vehicle detection signal, the vehicle shall traverse the detection zone in such a way that at least 25% of the detection zone area is covered by the vehicle.		Compliant																					
C4 In the event of any type of motor driven vehicle with 3 or more road wheels coming to rest over a boundary of detection, after having entered the zone of detection at a speed of not less than 4.8 km/h (3mph), such that it is positioned midway between the point at which it was first detected on entering the detection zone and the point at which it would just cease to be detected on leaving the detection zone, with the whole width of the vehicle within the detection zone, or with the vehicle occupying at least 50% of the detection zone area, whichever is the		Compliant																					

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<p>lesser, the presence time shall be switch selectable to 4 minutes \pm 1 minute for counting and occupancy, and 35 minutes \pm 5 minutes for counting and queue.</p>	
<p>C5 The vehicle detection signal to indicate the presence of a vehicle may be either the high or low impedance condition.</p>	<p>Compliant</p> <p>WiMag Loop Detector Replacement Card only.</p> <p>WiMag Standard Interface Card;</p> <p>The serial interface system is dedicated to Siemens integrated controller system. This interface methodology does mean a high/low impedance connection is not available.</p> <p>A high/low impedance condition may also be provided for Siemens controller integration.</p>

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APPENDIX D SCOOT and MOVA applications																	
D1 Vehicle detection equipment used to provide occupancy information for the SCOOT and MOVA traffic responsive strategy of traffic control, shall comply with the following performance requirements:	Noted																
D2 The vehicle detection equipment shall respond to any vehicle with 3 or more road wheels, travelling at any speed between 4.8 km/h (3 mph) and 129 km/h (80 mph), but is not precluded from detecting vehicles at speeds outside this range. The equipment shall preferably give a single unbroken vehicle detection signal for all types of vehicles.	Compliant																
D3 In the event of any vehicle with 3 or more road wheels coming to rest over a below ground detector, after having entered the zone of detection at a speed of not less than 4.8 km/h (3 mph), the presence time shall be 4 minutes ± 1 minute for any vehicle. The value of the presence time shall preferably not be adjustable from the front panel.	Compliant																
D4 The 'presence' output signal shall be produced when a vehicle occupies the zone of detection, the output to hold as long as the occupation by the vehicle continues (subject to the limitations of D3).	<p>Non-compliant</p> <p>Vehicles that have been within detection zone for longer than the timeout period may cause a detection of equal period after leaving. However, our experience has shown that this is unlikely to have any negative effect due to the unlikely scenarios envisaged.</p> <p>The timeouts are user configurable with the default set at 4 minutes.</p> <p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001 Rev D 2010 – Siemens copy kept in 667/QF/47200/001.zip</p>																
D5 The vehicle detection signal duration shall be within 30 milliseconds of the time for which a vehicle is over its zone of detection.	<p>Non-complaint</p> <p>However significant testing has indicated that this has negligible effect on SCOOT system, due to the 125mS / LPU value allocation system.</p> <p>In addition, a latency of >64mS has no measurable effect on MOVA operation.</p> <p>Test results and technical summary are recorded in 667/UW/47200/000</p> <p>Note: The loop variance is tied to the transmit interval. The following transmit intervals are made available to the user;</p> <table border="1"> <thead> <tr> <th>Transmit Interval/Latency</th> <th>Maximum Number of Devices</th> <th>Potential Loop Variance (@50mph)</th> <th>Potential Loop Variance (@30mph)</th> </tr> </thead> <tbody> <tr> <td>32.25 ms</td> <td>11</td> <td>+/- 0.7m</td> <td>+/- 0.4m</td> </tr> <tr> <td>62.5 ms</td> <td>27</td> <td>+/- 1.4m</td> <td>+/- 0.8m</td> </tr> <tr> <td>125 ms</td> <td>54</td> <td>+/- 2.8m</td> <td>+/- 1.7m</td> </tr> </tbody> </table>	Transmit Interval/Latency	Maximum Number of Devices	Potential Loop Variance (@50mph)	Potential Loop Variance (@30mph)	32.25 ms	11	+/- 0.7m	+/- 0.4m	62.5 ms	27	+/- 1.4m	+/- 0.8m	125 ms	54	+/- 2.8m	+/- 1.7m
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	<p>Reference Sensys Wireless Vehicle Detection System P/N 152-240-001-001 Rev D – Siemens copy kept in 667/QF/47200/001.zip</p> <p>Reference 667/QF/47200/001.zip</p>
<p>D6 The value of input sensitivity shall be set to accord with requirements of D2 with preferably no manual adjustment accessible from the front.</p>	<p>Compliant</p> <p>Detection apparatus is self-adjusting.</p>

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