

TOPAS

Traffic Open Products and Specifications

TOPAS 2505B

Performance Specification for Above Ground Vehicle Detector Systems for use at Traffic Signal Installations

Revision	Date	Scope	Authorised by
B (v2)	25/2/21	Draft	Admin

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TOPAS 2505B

PERFORMANCE SPECIFICATION FOR ABOVE GROUND VEHICLE DETECTOR SYSTEMS FOR USE AT TRAFFIC SIGNAL INSTALLATIONS

CONTENTS

Section

- 1 Introduction
- 2 Functional Requirements
- 3 References

- Appendix A Dynamic Detection – Multiple Lane
- Appendix B Bi-Directional Detection
- Appendix C Dynamic Detection - Single Lane
- Appendix D Dynamic Detection – Selectable Direction Sensing
- Appendix E Static detection
- Appendix F Vehicle Detection Equipment for Vehicle Actuated Portable Traffic Signals
- Appendix G Informative Guide
- Appendix Z Technical File Content

CHANGE LOG

The following outlines significant changes to this specification, from its previous issues which do not impact on currently Registered products;

- a) General clarifications and updated references
- b) Section 2.7 moved to Appendix A

The following outlines significant changes to this specification, from its previous issues which may impact on currently Registered products;

- a) Inclusion of the requirements of TOPAS 2504A as Appendix F

1 INTRODUCTION

- 1.1 This specification covers the requirements for Above Ground Vehicle Detector Systems for use at Traffic Signal Installations on public highways.
- 1.2 TOPAS specifications are explicitly purchasing specifications and compliance with them is not mandatory. However Local and other Purchasing Authorities may typically require that equipment purchased complies with TOPAS specifications and is TOPAS registered.
- 1.3 Manufacturers may register products as being compliant with this specification, using the process defined in TOPAS 0600
- 1.4 TOPAS registration requires manufacturers submit a Technical File to an appropriate Technical Assessor to aid compliance verification. The content requirement for the Technical File is defined in Appendix Z of this specification.
- 1.5 Within this specification, "The Product" shall mean all components necessary to provide a complete operational unit meeting the requirements of this specification and the common requirements defined in TOPAS 0600
- 1.6 Guidance to potential users of this Product is given in Appendix G.

Implementation

- 1.7 For products previously Registered against TOPAS 2505A which are compliant with this amended specification, manufacturers are simply required to confirm in writing that the products remain compliant using Form 005 from TOPAS 0600 Appendices. Once confirmed, Product Registration information will be migrated on the TOPAS website.

For products previously registered against TOPAS 2504A following confirmation of compliance of products as above Product Registration information will be migrated to TOPAS 2505B Appendix F on the TOPAS website.

- 1.8 This specification will be immediately implemented from the date of issue for all new TOPAS Registrations

Glossary of Terms

- 1.9 A comprehensive glossary of terms is given in DMRB TA101 for Traffic Control and Information Systems for All Purpose Roads

2 FUNCTIONAL REQUIREMENTS

General

- 2.1 This Specification defines the essential requirements for vehicle detectors used at permanent and portable traffic signal installations.
- 2.2 The Product shall be designed to detect all vehicles subject to the provisions of the Road Traffic Act within a specified detection zone.
- 2.3 The Product shall be designed to minimise the possibility of false detections from extraneous objects and from objects outside the detection zone.

Performance

- 2.4 The turn on distance shall be less than or equal to 1m for a target travelling at 96 kmh.
- 2.5 The turn off delay time shall be less than 600 ms.
- 2.6 All detection distances are referenced from the stop-line.
- 2.7 The Product shall be capable of detecting all types of vehicle at all approach speeds between the low speed threshold and 112 kph.
- 2.8 The Product shall include an ability to diagnose any malfunction or degradation of performance below that required by this specification and in the event of any such detection; the Product shall follow the process for a category 2 fault.

Mutual Interference

- 2.09 The Product shall not affect, or be affected by, the operation of another similar equipment when correctly mounted and tested in the following positions:
 - i) back to back with the housings $25 \pm 10\text{mm}$ apart;
 - ii) at right angles with housings $25 \pm 10\text{mm}$ apart;
 - iii) face to face with housings 100m apart;
 - iv) side by side at 5m apart, facing the same direction.

Interface

- 2.10 The interface between the Product and an associated Signals Controller shall be in accordance with TOPAS 2523.
- 2.11 An indicator showing the output status of the Product and, if available, the fault status, shall be positioned such that it is visible from behind and below the unit.
- 2.12 An option may be included that will extinguish the status indicator when the ambient light falls below 55 LUX.
- 2.13 The Product may provide an addition output that will present the fault status condition. Where this is present, the output that indicates a fault shall be the logic '1' state as defined in TOPAS 2523.

Electrical Requirements

- 2.14 Any Product for a Permanent installation shall require a $24\text{v} \pm 20\%$ supply either AC (RMS, 50Hz) or DC.

2.15 Any product for a Portable application shall require 10.8 to 13.2V Smooth DC supply.

2.16 Fixed metal parts of the Product shall be bonded together and connected to earth.

2.17 An interruption of the Product's electrical supply shall cause a category 1 fault.

Additional Requirements for Detection Variants

2.18 Individual Products may be designed to perform to one or more than one Appendix.

2.19 The Product shall include an internal fault monitor to validate the operational performance at all times.

Construction

2.20 The equipment housing shall be constructed in such a manner and from materials to meet the environmental requirements defined in TOPAS 2130.

2.21 The housing shall be coloured in accordance with TSRGD 2016.

2.22 The housing shall be supplied with a fixing bracket that will permit a detector to be accurately aligned to meet the performance requirements.

2.23 The bracket shall be supplied with a locking arrangement capable of maintaining the alignment of a detector and should be designed to resist vandalism.

Reliability

2.24 The Product shall to be certified as having a MTBF (Mean Time Between Failure) prediction figure of greater than or equal to 20,000 hours in continuous operation.

Fault Modes

Category 1

2.25 The Product shall present a high impedance output within 3000 ms.

2.26 When power is restored, the Product shall resume normal operation within 5000 ms.

Category 2

2.27 The Product shall present a high impedance output within 3000 ms.

2.28 If the Product is designed with auto fault correction and the fault condition ceases, then the Product shall resume normal detection operation and the fault output signal shall be removed.

3 REFERENCES

References

3.1 Where undated references are listed, the latest edition of the publication applies.

British Standards

3.2 The British Standards Institution, London, publishes British Standards.

BS 7671	Requirements for Electrical Installations
BS EN 50293	Electromagnetic Compatibility Road Traffic Signal Systems Product Standard

Specifications

3.3 TOPAS Limited specifications are available at www.topasgroup.org.uk

TOPAS 0600	TOPAS Registration Process
TOPAS 0601	TOPAS Specification Review Process
TOPAS 2500	Specification for Traffic Signal Controller
TOPAS 2523	Traffic Control Equipment Interface Specification
TOPAS 2130	Environmental Tests for Road Traffic Control Equipment

Other Publications

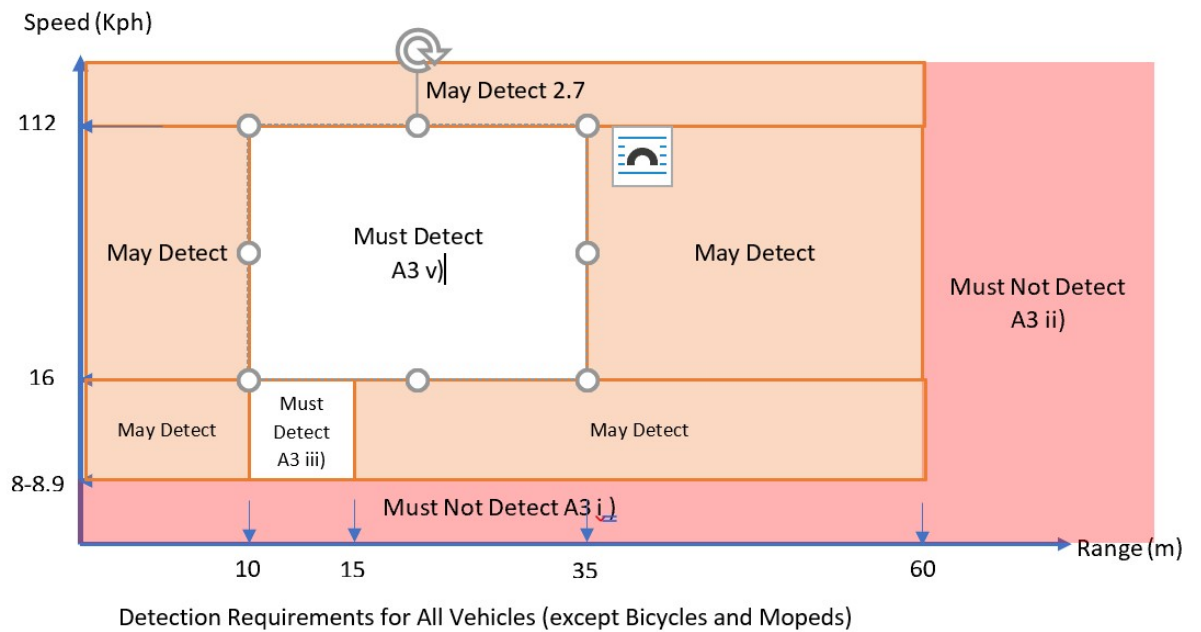
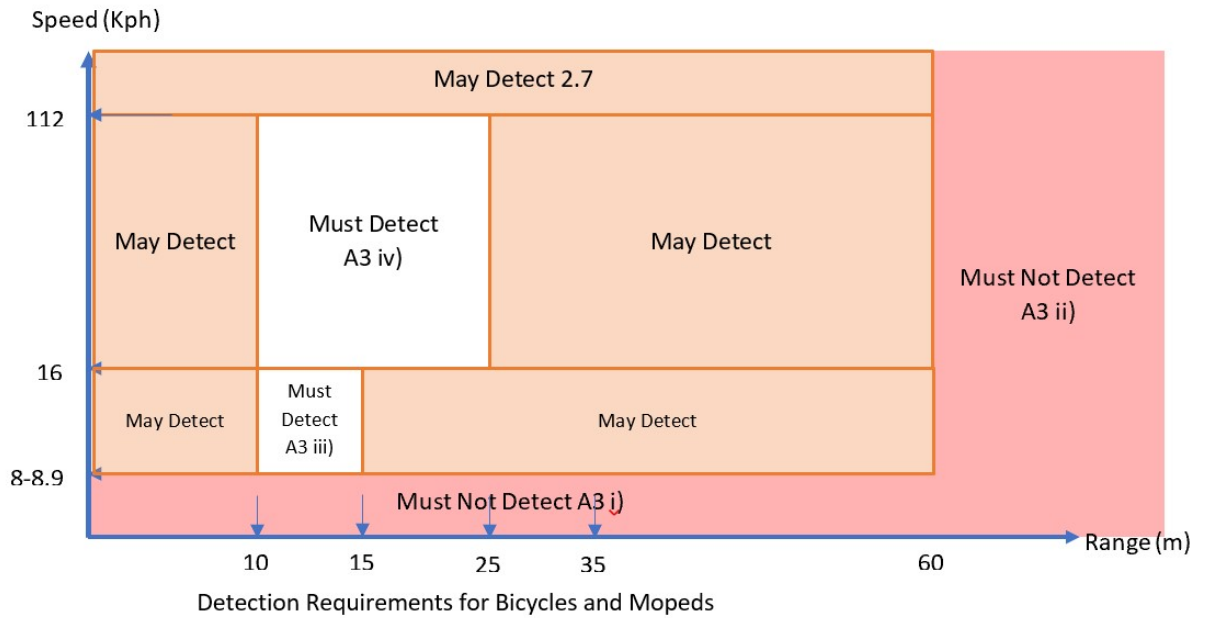
3.4 Other publications

TSRGD	Traffic Signs Regulations and General Directions
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APPENDIX A

DYNAMIC DETECTION – MULTIPLE LANE

- metres for all vehicles, except bicycles and mopeds, traveling at speeds above 16 kph and up to 112 kph.
- A1 The width to the detection zone shall be 7.0 metres nominal wide. The Product shall be capable of performing to Specification when positioned at either side of the detection zone.
- A2 The Product shall not detect vehicles or other targets when crossing or is beyond the detection zone.
- A3 The performance criteria shall be as follows:
- i) The low speed threshold setting shall be 6 kph -2 kph $+2.5$ kph, no detection shall occur below this setting;
 - ii) Vehicles shall not be detected at more than 60 metres from the stop-line except in Scotland where the boundary shall be increased to 120 metres.
 - iii) The detector shall produce a reliable "detect" condition over the range 10 to 15 metres for all vehicles traveling above the low speed threshold and below 16 kph;
 - iv) The detector shall produce a reliable "detect" condition over the range 0 -10 to 25 - 60 metres for all bicycles and mopeds traveling at speeds above 16 kph up to 112 kph;
 - v) The detector shall produce a reliable "detect" condition over the range 0 -10 to 35 - 60



APPENDIX B

BI-DIRECTIONAL DETECTION

B1 The Product shall be designed to meet the requirements of either Appendix A, Appendix C or Appendix D except it shall detect both approaching and receding targets.

APPENDIX C

DYNAMIC DETECTION – SINGLE LANE

- C1 The approach to the Product shall be 3.5 metres nominal width. The detector shall be capable of performing to Specification when positioned at either side of the approach.
- C2 The Product shall not detect vehicles in adjacent lanes.
- C3 The Performance criteria shall be as defined in section 0.

APPENDIX D

DYNAMIC DETECTION – SELECTABLE DIRECTION SENSING

- D1 The Product shall be designed to meet the requirements of either Appendix A, Appendix C or Appendix D except it shall be selectable to detect unidirectional targets either approaching or receding.

APPENDIX E

STATIC DETECTION

- E1 The width to the detection zone shall be 3.5 metres nominal wide. The Product shall be capable of performing to Specification when positioned at either side of the detection zone
- E2 Vehicles in adjacent lanes shall not be detected.
- E3 All targets shall be detected and produce an output signal when stationary within the range 0 to 3 metres.
- E4 The Product may provide the option of operating with the approach to the detector being 7.0 metres nominal width. Operation with a wider detection zone may be provided with a different version than that for B1 and B2.

APPENDIX F

Vehicle Detection Equipment for Vehicle Actuated Portable Traffic Signals

20% from the time of the last terminated target detection period.

- F6 Registering products to this Appendix notes the variation to the environmental test reference for (use on) portable signals listed in TOPAS 2130.

F1 The following detection criteria for approaching targets shall apply:

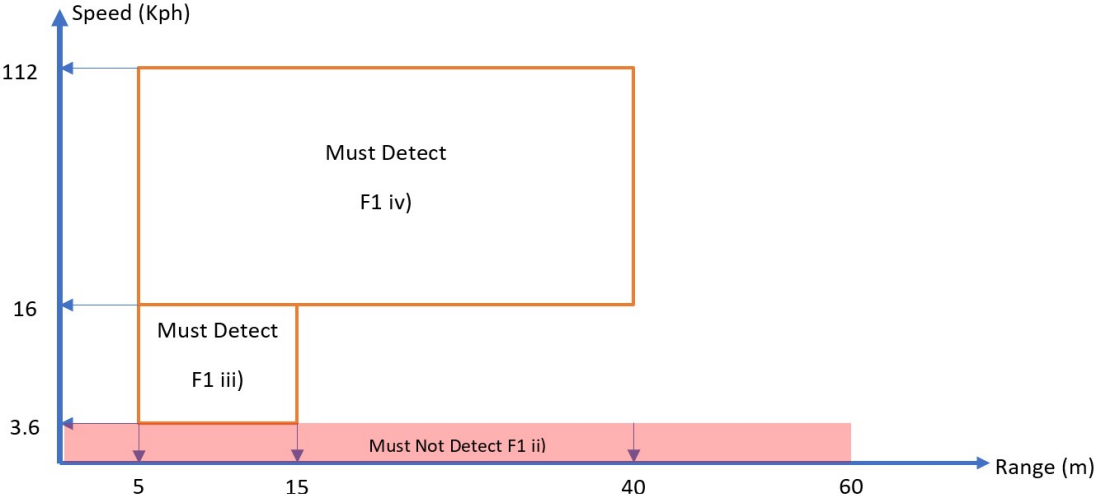
- i. Approaching targets only. Receding targets shall not be detected.
- ii. Targets down to 3.6Kph \pm 0.4Kph. No detections shall be detected below this threshold;
- iii. Targets at speeds between the low speed threshold and 16Kph in a zone between 5m and 15m upstream from the detector;
- iv. Targets at speeds greater than 16Kph in a zone between 5m and 40m upstream from the detector.

F2 The Product shall be designed to minimise the detection of extraneous targets.

F3 The turn-on time for the "Detect Condition" signal shall be less than 500ms.

F4 The "Detect Condition" signal shall be maintained for 500ms \pm 20% after the object has left the detection zone.

F5 A "Nudge" signal shall be provided in the form of a 700ms "Detect Condition" signal every 2.5 minutes \pm



APPENDIX G

INFORMATIVE GUIDE

General

G1 This Appendix is an informative guide to Systems Integrators and Highway Authorities who wish to purchase / hire and use Vehicle Detection Equipment, for use with Permanent Traffic Signal Controllers, that has been declared conformant to this specification. Prospective purchasers/hirers should ensure that the procurement contract address the following issues.

Interface characteristics

G2 The procurement contract should specify that where provided, the Interface cable is in accordance with Def Stan 61-12 (part 4) and the minimum number of wires in each core is 7 with a nominal diameter of each wire being not less than 0.20 mm.

G3 The procurement contract should specify whether the Product should be supplied with a connector as having either the Bulgin plug as described in paragraph 0 or a flying lead as described in 0.

G4 The Product when fitted with a plug, it must be the Bulgin Buccaneer type plugs, Series PX0728/P 9 pole (or equivalent) with connection designations as Table G1.

G5 When the detector is supplied with a flying lead it must comprise of a cable generally in accordance with Def-Stan 61-12 (Part 4) 7/0.2 mm PVC insulated, overall braid screened, PVC sheathed (code 7/2/10C or equivalent). The terminated cable should be a minimum length of 1 metre and have the same colour designations as in Table G1.

Contact	Circuit	Core Colour
Pin 1	24v	Red
Pin 2	24v	Black
Pin 3	Earth/Screen	Green/Screen
Pin 4	Common	White
Pin 5	Output	Yellow
Pin 6	Spare	Blue
Pin 7	Spare	Violet
Pin 8	Spare	Orange
Pin 9	Spare	Pink/Brown

Table G1
Bulgin Plug Pin Designations

Marking and Labelling

G6 The purchase contract should specify that the Product is to be fitted with a label displaying the following:

- i) The unique Product identifier and serial number;
- ii) The TOPAS Specification and associated Appendix against

- which it has been declared compliant;
- iii) The electrical supply requirements of the equipment

APPENDIX Z TECHNICAL FILE CONTENT

This appendix defines the necessary content for a Technical File Pack (a collection of relevant documents) which must be reviewed by an appropriate Technical Assessor as part of the TOPAS Registration process (See TOPAS 0600).

Only the 'ticked' items are required to be present in a Technical File Pack used to support TOPAS Registration against TOPAS 2505B.

Ref	Item	Description	Required
1	Technical File overview document.	A summary document outlining the product, specifying which TOPAS and other relevant specification(s) the product has been designed to comply with, together with a detailed table of contents for the Technical File Pack. Where copies of external certificates or documents are referred to these may be included within the Technical File overview document or supplied separately as part of the Technical File Pack.	√
2	QA accreditation certificate(s).	A copy of the Quality Management Registration Certificates for the organisation applying for TOPAS Product Registration.	√
3	Details of all CE/CA markings that apply to the product.	A list of all directives complied with and how achieved. Typically this would be references to explicit CE/CA Technical Files and certificate's, copies of which would be included in the Technical File Pack.	√
4	A functional design description of the product.	A reference to the overall System Design Documentation for the product (by document part number and issue).	√
5	Product part numbers	A list of top level assembly part numbers and their issue states including all firmware / software part numbers and issues.	√

6	Test procedures and results	A reference to all test schedules and test result documents (by document part number and issue).	√
7	Statement of compliance	A clause by clause statement of compliance against TOPAS 2505 confirming compliance and/or listing caveats or deviations.	√
8	EMC test results	A reference to EMC test performance requirements. Copies of the results of EMC testing undertaken by an appropriately qualified independent approved test house must be included in the Technical File Pack.	√
9	Optical test results	A reference to Optical tests performance requirements. Copies of the results of Optical testing undertaken by an appropriately qualified independent approved test house must be included in the Technical File Pack.	N/A
10	Environmental test results	A reference to Environmental tests performance requirements. Copies of the results of the Environmental testing undertaken by an appropriately qualified independent approved test house must be included in the Technical File Pack.	√
11	Radio Test results (OFCOM IR 2030)	Copies of the results of Radio testing undertaken by an appropriately qualified independent approved test house must be included in the Technical File Pack. Reports should be those listed on the EU Declaration of Conformity & the Technical File or specific IR 2030 requirement.	√
12	Primary Safety Test results	For Traffic Control equipment specifically a reference to the Primary Safety Test schedule and test results by part number and issue. A copy of the test results should be included as part of the Technical File Pack.	N/A

13	Failure Mode Analysis	A reference to the product failure mode analysis requirements and results by document part number and issue.	N/A
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