

# TOPAS

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## Traffic Open Products and Specifications

### ***TOPAS 2505B***

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

<b>Revision</b>	<b>Date</b>	<b>Scope</b>	<b>Authorised by</b>
B	21/6/21	Final	Board

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# TOPAS 2505B

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

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# 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
- c) Section 2.27 (Reliability) updated to require a defined design life (rather than a MTBF calculation).
- d) Items in the Informative Guide (appendix G) moved to the main body of the specification and rationalised.

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

#### Corrigendum 15/5/24:

- Removal of clause 1.6
- Amendment to clause 2.29
- Amendment to A.2
- Updated Appendix Z

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

1.8 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 the process defined in TOPAS 0600. Once confirmed Product Registration information will be migrated on the TOPAS website.

1.9 For Products previously Registered against TOPAS 2504A which are compliant with this amended specification, manufacturers are simply required to confirm in writing that the Products are compliant using the process defined in TOPAS 0600. Once confirmed Product Registration information will be migrated to TOPAS 2505B Appendix F on the TOPAS website.

## **Glossary of Terms**

1.10 A comprehensive glossary of terms and abbreviations may be found in the Institute of Highway Engineers guidance note “Traffic Control and Information systems”.

1.11 TOPAS Terms are defined in TOPAS 0600 and TOPAS 0601.

1.12 The DfT Traffic Signs Manual, provides guidance on the application of traffic signals in the United Kingdom.

## 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

2.9 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  $25 \pm 10$ mm apart;
- ii) at right angles with housings  $25 \pm 10$ 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.

### Interface Cable Connections

2.14 The Interface cable shall be 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), with the colour designations as defined in Table 2.14 and shall have a minimum terminated length of 1 meter.

2.15 The Product shall be supplied with a Bulgin Buccaneer plug, Series PX0728/P 9 pole (or equivalent), with connection designations as defined in Table 2.14.

2.16 Alternatively, if requested by the Purchasing Contract, the Product may be supplied with a flying lead without the Bulgin plug. The flying lead shall meet the requirements defined in section 2.14

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 2.14**

### Electrical Requirements

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

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

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

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

### Additional Requirements for Detection Variants

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

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

### Construction

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

2.24 The housing shall be coloured black to align with signal head housing colour, as defined in TSRGD 2016.

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

2.26 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

2.27 The Product shall be designed to have a minimum in-service life of 10 years with suitable maintenance.

## **Fault Modes**

### **Category 1**

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

2.29 When power is restored, the Product shall resume normal operation within 300s. During the start up process before normal operation all detector outputs shall take the state of a detection event being present..

### **Category 2**

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

2.31 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.

## **Marking and Labelling**

2.32 Each Product shall 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.

### 3 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](http://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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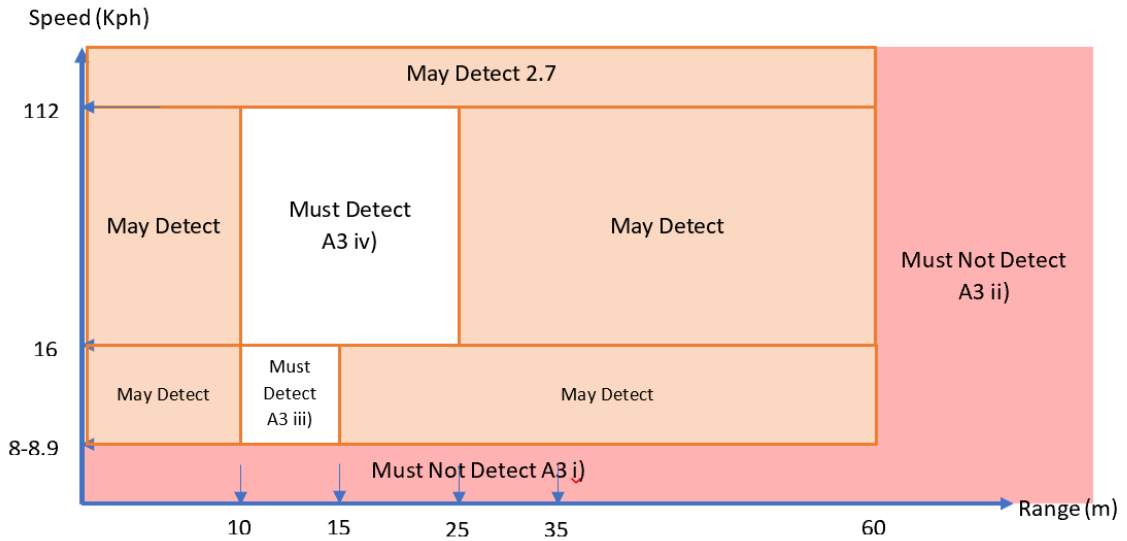
## APPENDIX A DYNAMIC DETECTION MULTIPLE LANE

A.1 The width to the detection zone shall be nominally 7.0 metres wide. The Product shall be capable of performing to Specification when positioned at either side of the detection zone.

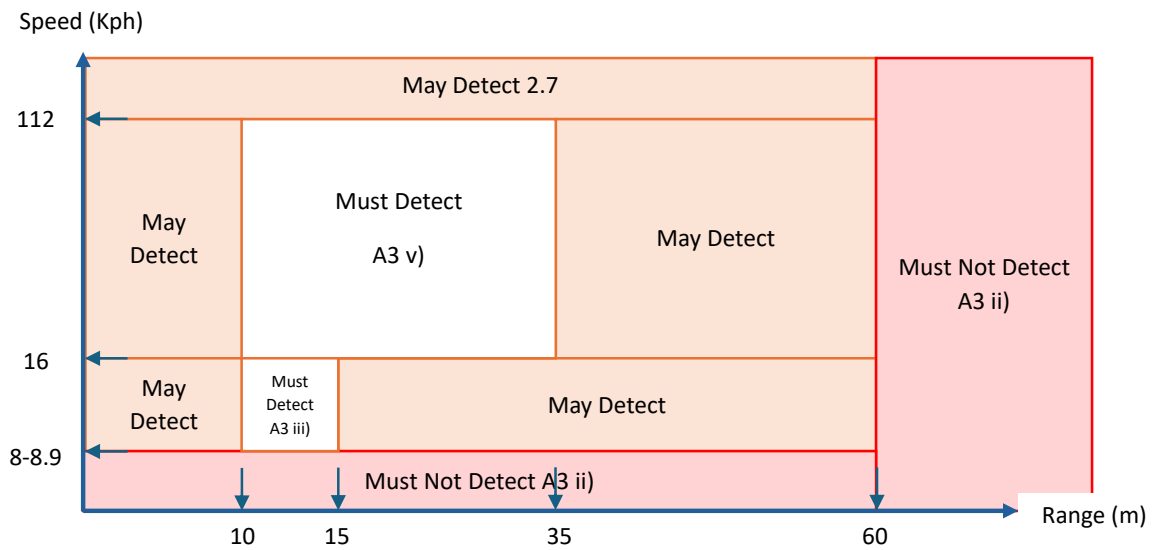
A.2 The Product shall not detect vehicles or other targets crossing the carriageway.

A.3 The performance criteria shall be as follows and as shown in diagram A.3.

- 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 metres for all vehicles, except bicycles and mopeds, traveling at speeds above 16 kph and up to 112 kph.



Detection Requirements for Bicycles and Mopeds



Detection Requirements for All Vehicles (except Bicycles and Mopeds)

Diagram A.3

## **APPENDIX B BI-DIRECTIONAL DETECTION**

B.1 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**

C.1 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.

C.2 The Product shall not detect vehicles in adjacent lanes.

C.3 The Performance criteria shall be as defined in section A.3.

## **APPENDIX D DYNAMIC DETECTION SELECTABLE DIRECTION SENSING**

D.1 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**

E.1    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.

E.2    Vehicles in adjacent lanes shall not be detected.

E.3    All targets shall be detected and produce an output signal when stationary within the range 0 to 3 metres.

E.4    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 E.1.

# APPENDIX F VEHICLE DETECTION EQUIPMENT FOR VEHICLE ACTUATED PORTABLE TRAFFIC SIGNALS

F.1 The performance criteria shall be as follows and as shown in diagram F.1:

- i) Approaching targets only. Receding targets shall not be detected.
- ii) Targets down to 3.6Kph ± 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.

F.2 The Product shall be designed to minimise the detection of extraneous targets.

F.3 The turn-on time for the “Detect Condition” signal shall be less than 500ms.

F.4 The “Detect Condition” signal shall be maintained for 500ms ±20% after the object has left the detection zone.

F.5 A “Nudge” signal shall be provided in the form of a 700ms “Detect Condition” signal every 2.5 minutes ± 20% from the time of the last terminated target detection period.

F.6 Registering products to this Appendix notes the variation to the environmental test reference for (use on) portable signals listed in TOPAS 2130.

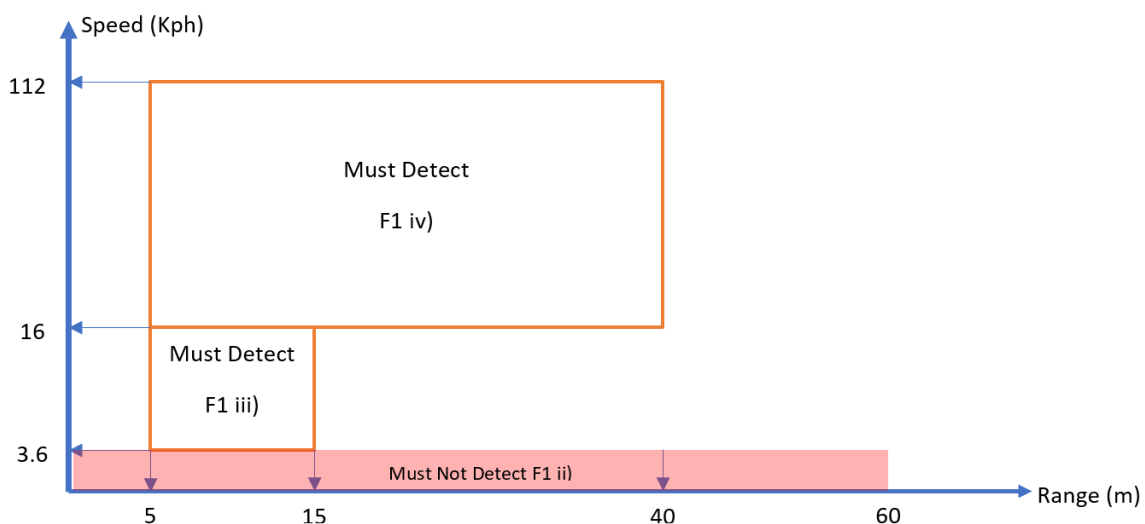


Diagram F.1

## APPENDIX Z TECHNICAL FILE CONTENT

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

The 'ticked' items are required to be present in a Technical File used to support TOPAS Registration against TOPAS 2505B. Please read the description criteria carefully.

Ref	Item	Description	Required
1	Overview document	<p>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.</p> <p>Where external certificates or documents are referred to these shall be included either:</p> <p>(a) within this overview document; or</p> <p>(b) supplied separately as part of this Technical File.</p>	✓
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 required standards and regulations including CE/CA requirements that apply to the Product	<p>A list of all standards to be complied with.</p> <p>Including explicit CE/CA declarations of performance/conformity for those standards, including all certificates, shall be included in this Technical File.</p>	✓
4	A functional design description of the product	Title, document number, version and date of the overall System Design Document for the Product.	✓
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	Statement of Compliance	<p>A clause-by-clause statement of compliance against TOPAS 2505B confirming compliance or non-compliance and referencing supporting evidence.</p> <p>(An example template can be found on the TOPAS website)</p>	✓
7	Functional test procedures and results	A list of all functional test schedules and test result documents (by document number and issue) that substantiate the Statement of Compliance.	✓



8	BS EN 50293 EMC test procedures and results	<p>(a) Title, document number, version and date of the EMC test performance requirement document.</p> <p>(b) Copies of the results of EMC testing undertaken by an appropriately qualified independent approved test house <u>must</u> be included in the Technical File.</p>	✓
9	Optical test procedures and results required by this specification	<p>For all products which have any defined optical performance requirements</p> <p>(a) Title, document number, version and date of the optical test performance requirement document.</p> <p>Copies of the results of optical testing undertaken by an appropriately qualified independent approved test house <u>must</u> be included in the Technical File.</p>	N/A
10	Environmental test results	<p>(a) A list of relevant Environmental tests performance requirements defined in TOPAS 2130.</p> <p>Copies of the results of the Environmental testing undertaken by an appropriately qualified independent approved test house <u>must</u> be included in the Technical File.</p>	✓
11	Radio Equipment Regulations test results	<p>For all products which include any transmitting and/or receiving radio equipment</p> <p>(a) A copy of the RER Declaration Of Conformity</p> <p>(b) Reference to the RER Technical Documentation for the product (by title, document number and version).</p> <p>(c) Copies of the results of radio testing, undertaken by an appropriately qualified independent approved test house <u>must</u> be included in the Technical File. The test results should be those identified in the RER Technical Documentation and should cover any specific IR2030 requirements for the type of radio used.</p> <p>A copy of the Type Examination Certificate for radio equipment not covered by a Designated EN standard.</p>	✓
12	Primary Safety Test procedure and results	<p>For Traffic signal Control equipment only:</p> <p>(a) The title, document number, version and date of the Primary Safety Test schedule.</p> <p>(b) A copy of the test results must be included as part of the Technical File.</p>	N/A

13	Failure Mode Analysis	For Traffic signal Control equipment only Title, document number, version and date of the product failure mode analysis requirements and results.	N/A
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