

TOPAS

Traffic Open Products and Specifications

TOPAS 2541B

Performance Specification for Control Systems for Vehicle Activated Discontinuous Variable Messages

Revision	Date	Scope	Authorised by
A	25/08/20	Final	Board
B	06/12/21	Final	Board

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TOPAS 2541A

Performance Specification for Control Systems for Vehicle Activated Discontinuous Variable Messages

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CHANGE LOG

The following outlines significant changes to this specification, from its previous issue which do not impact on currently registered products:

- a) Section 2.9 updated to addresses speed of the road for sign selection.
- b) Section 2.13 viewing time amended to work with min and max speeds limits.
- c) The revisions made in this specification ensure the performance classes in the specification align with BS EN 12966:2014+A1:2018 - Road vertical signs - Variable message traffic signs incorporating corrigenda June 2018 and April 2021
- d) Updated Section 11 of Appendix Z to reference updated RER test requirement.

1 INTRODUCTION

- 1.1 This specification covers the performance requirements for the detection, display and control systems for Vehicle Activated Discontinuous Variable Message Signs that are intended for use on UK public highways, both temporary and permanent.
- 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 Guidance to potential users of this Product is given in Appendix A.
- 1.6 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 TOPAS0600.

Implementation

- 1.7 This specification will be immediately implemented from the date of issue for all new TOPAS registrations.

Authorisation

- 1.8 In England, any legend or symbol intended to be displayed on a signal or sign face shall be either prescribed by the TSRGD or shall have received separate authorisation from the Department for Transport (DfT). In Scotland and Wales the devolved Assemblies provide a similar role. In Northern Ireland the Department for Regional Development undertakes this role.

Glossary of Terms

- 1.9 A comprehensive glossary of terms is available within the IE Guidance Note "Traffic Control & Information Systems"
- 1.10 TOPAS Terms are defined in TOPAS 0600 and TOPAS 0601.

Additional Information

- 1.11 Further guidance is given in TAL 01/03 Traffic Advisory Leaflet Vehicle Activated Signs
- 1.12 Further guidance is given in Chapter 3 Traffic Signs Manual

2 NATIONAL REQUIREMENTS

- 2.1 Equipment conforming to this specification shall comply with those classes of BS EN 12966 as invoked in the following regulations.
- Traffic Signs Regulations and General Directions 2016 (as amended) (TSRGD)
 - Traffic Signs Regulations (NI) 1997 (as amended) (TSRNI)
- 2.2 All Variable Message Signs for use on the public highways in Great Britain are defined in TSRGD 2016 Schedule 16 Part 7 Tables 1, 2, 3 & 4 set out the classes for visual and physical performance and are repeated in this specification.
- 2.3 In Northern Ireland, requirements will be as contained in Traffic Signs Regulations (Northern Ireland) 1997 (as amended) (TSRNI). However, where a specific requirement is not contained in the Northern Ireland regulations [or TSRNI] or, through time has been superseded, reference should be made to the relevant specific requirements contained in the TSRGD 2016 (as amended).
- 2.4 This specification covers the requirements for VMS which are activated by detection systems triggered by vehicles approaching. For requirements for VMS signs not triggered by vehicles please refer to TOPAS 2516.
- 2.5 The scope of BS EN 12966:2014 extends to all VMS used on the highway
- 2.6 Sign faces that are not permitted under TSRGD 2016 (as amended) or do not have Department for Transport Authorisation may be subject to planning permissions. Purchasers and manufacturers should seek appropriate guidance on this.
- 2.7 This specification addresses all systems identified as vehicle activated which includes products identified as speed warning signs, speed indicator devices, speed repeater signs. Purchasers and manufacturers are referred to TSRGD 2016 in the first instance for requirements of sign faces.
- 2.8 Purchasers are also referred to TAL 01/03 2003 Traffic Advisory Leaflet Vehicle Activated Signs

Vehicle Activated Warning Signs (all types) operational requirements

- 2.9 Where equipment displays a TSRGD speed limit or permitted warning sign it must comply with the dimensions given in TRSGD diagrams. Appropriate for the speed of the road onto which it is being installed.
- 2.10 The size of the sign will vary depending on the nature of the site and advice on choosing appropriate sizes is given in Chapter 3 Traffic Signs Manual.
- 2.11 Vehicles detected approaching a sign above a configurable speed threshold will trigger the sign to operate.
- 2.12 The trigger speed shall be configurable in the range 10-80 mph in 1mph increments.

- 2.13 The sign should continue to operate as the vehicle approaches the sign above the speed threshold. It should continue to hold the display to ensure the minimum viewing time of 4s is maintained for the driver to recognise the message. As the speed of the road increases the maximum range of the radar will need to be increased to maintain this timing range. Where a radar detection zone ceases before the vehicle reaches the sign a hold period of 0-4s must be provided in not greater than 0.5s increments to assist meeting the overall minimum viewing time.
- 2.14 Once the vehicle is no longer detected and the viewing time has elapsed the sign shall be extinguished until triggered again.
- 2.15 Speed limit signs must display the speed limit in force at that location.
- 2.16 Purchasers are referred to Road Traffic Act 1984 in respect of repeater requirements
- 2.17 It is not precluded to use yellow flashing conspicuity devices with signs displaying regulatory and safety messages. Sizes, positions, flashing rates, duty cycles and synchronisation shall be as specified in TSRGD 2016 (as amended).
- 2.18 Dimensions and positioning of conspicuity devices are specified in TSRGD 2016 (as amended).
- 2.19 Any deviation in size or placement of conspicuity devices requires Authorisation by the Department for Transport.
- 2.20 The optical performance of conspicuity devices shall conform to BS EN 12966 as invoked in TSRGD 2016 (as amended).

Fault and Data Monitoring and Reporting

- 2.21 Systems may include means for monitoring and reporting faults and for monitoring and reporting detection events and sign activations.
- 2.22 Where such facilities are provided they shall preferably conform to prevailing standards, e.g. UTMC, or similar systems.

Conspicuity Devices

- 2.17 It is not precluded to use yellow flashing conspicuity devices with signs displaying regulatory and safety messages. Sizes, positions, flashing rates, duty cycles and synchronisation shall be as specified in TSRGD 2016 (as amended).

3 PERFORMANCE CLASSES

Except as noted under section 4 below the performance levels and classes stated below have been taken from the National Annex (NA) to BS EN 12966:2014 incorporating corrigendum June 2018 as defined in TSRGD 2016 (as amended) which takes precedence.

NA.2 - Visual Performance Levels

The visual performance level described for any VMS is dependent on its intended use on public highways. In Great Britain the combination of the photometric parameters of colour, luminance, luminance ratio and beam width considered most suitable is stated in this National Annex as class combinations Levels 1 and 2.

Table NA.1 – Approach speed and visual performance

85 percentile approach speed (mph)	Visual performance levels
Up to and including 50	1 or 2
Over 50	1

Table NA.2 – Class combinations

Photometric Parameter	Visual Performance	
	Level 1	Level 2
Colour	C2	C2
Luminance	L3	L1
Luminance Ratio	R3	R1
Beam Width	B1 or B3	B1 or B3

Table NA.3 – Colour and class combinations

White	Colour Chromaticity Area		Area 10
	Luminance		L1 L3
	Luminance Ratio (On Axis)		R3 R1
	Beam Width	Narrow	B1
		Wide	B3
Yellow	Colour Chromaticity Area		Area 9 (Yellow C2)
	Luminance		L1 L3
	Luminance Ratio (On Axis)		R3 R1
	Beam Width	Narrow	B1
		Wide	B3
Green	Colour Chromaticity Area		Area 11 (Green C2)
	Luminance		L1 L3
	Luminance Ratio (On Axis)		R3 R1
	Beam Width	Narrow	B1
		Wide	B3
Red	Colour Chromaticity Area		Area 7 (Red C2)
	Luminance		L1 L3
	Luminance Ratio (On Axis)		R3 R1
	Beam Width	Narrow	B1
		Wide	B3
Blue	Colour Chromaticity Area		Area 12 (Blue C2)
	Luminance		L1 L3
	Luminance Ratio (On Axis)		R3 R1
	Beam Width	Narrow	B1
		Wide	B3

Class designations and performance parameters for colour, luminance, luminance ratio and beam width may be found in clause 4 of BS EN 12966:2014.

NA3 – Physical Performance

The physical performance regulations intended for use on UK public highways are described in the National Annex and given in Table 4.

Table NA.4 – Physical performance

Temperature	T1
Ingress protection against water and dust	IP56
Resistance to pollution	D1
Resistance to corrosion	P2
Temporary deflections caused by wind loads	WL
Temporary deflections caused by bending	TDB
Permanent deflections caused by dynamic snow loads	DSL0

The temporary and permanent deflections shall be in accordance with EN 12899-1:2007.

NA.4 – Sign Selection

Annex N of BS EN 12966:2014 provides the purchaser and manufacturer with guidance on the selection of the appropriate character size for the intended application. The two basic factors to be considered are:

- (a) The legibility distance, depending on the size and design of the message and its visual performance (luminance, luminance ratio, beam width and colour) and
- (b) The recognition time (the duration of legibility) depending on the approach speed.

range and heights are shown in Table NA.5 below and have been taken from Annex N tables N.1 and N.5.

Table NA.5 – Character size range and heights

Size Range	Character height mm
A	100
B	160
C	240
D	320
E	400

The character heights are upper case and can be based on 7 x 5 (7 elements vertically and 5 elements horizontally), alternatively fixed pixel display will be arranged to suit. More information on character height, character width, character spacing, word spacing, line spacing and backing board dimensions can be found in Annex N Table N.1.

Annex M of BS EN 12966:2014 provides guidance on the layout of light emitters to ensure optimum light performance is maintained for triangle, circle and characters for matrix and non-matrix signs.

In accordance with BS EN 12966 it is expected that a photo detector or equivalent will be provided within the sign to ensure optical performance is maintained across varying ambient light levels.

4 DETECTION

General

- 4.1 Detectors housed internally or externally are required to trigger operation of the sign.
- 4.2 Internal detectors must conform to the following requirements in EN12966:
- ◆ Environmental: UK National Annex NA Table NA.4
 - ◆ Electrical Requirements: Section 4.5.3
 - ◆ Electromagnetic Compatibility: Section 4.5.4
- 4.3 External detectors must also conform to the requirements detailed in section 4.2, however equivalents may also be used as follows:
- ◆ Environmental: TOPAS2130 to requirements of TOPAS2505
 - ◆ Electromagnetic Compatibility: TOPAS 2505 Appendix Z
 - ◆ Interface Requirements: TOPAS 2523 Section 2.4
- 4.4 To support the use of separate detection, then where an external detector is powered from the sign the power supply from the sign shall be ELV and preferably shall be 12VDC +/-20% or 24VDC +/-20%. The power supply should be correctly protected, and maximum rating clearly labelled.
- 4.6 The Product shall detect the presence of the following moving targets as a minimum.
- ◆ Mopeds; (Small)
 - ◆ Motorcycles; (Small)
 - ◆ Saloon Cars.
- 4.7 The detection shall be limited to:
- ◆ Detect approaching targets only.
 - ◆ Detect targets above 20kph
 - ◆ Detect target at least 40m upstream of the detector while ensuring the driver has a 4s viewing time from the initial sign activation.
 - ◆ Detection range should take account of local speed regulation.
- 4.8 The Product shall be designed to minimise the detection of extraneous targets.

Performance

- 4.5 Due to difference in range and speed requirements, products designed and configured for traffic signal control applications specified in TOPAS 2505 and TOPAS 2512 may not be suitable for vehicle activated signs as defined in this specification. Section 4.6-4.8 define the minimal detection requirements to meet the required specification.

5 REFERENCES

General

5.1 Where undated references are listed, the latest issue of the publication applies.

UK Legislation and EU Directives

SI 2019 No 492	Restriction of the use of certain hazardous substances in electrical and electronic equipment (Amendment) Regulations 2019
SI 2016 No 362	The Traffic Signs Regulations and General Directions 2016 (as amended)
SI 2016 No 1091	The Electromagnetic Compatibility Regulations 2016
SI 2016 No 1101	The Electrical Equipment (Safety) Regulations 2016
SI 2017 No 1206	Radio Equipment Regulations 2017
SI 1989 No 728	Low Voltage Electrical Equipment (Safety) Regulations 1989
2014/53/EU	Radio Equipment Directive (RED)
2014/30/EU	Electromagnetic Compatibility Directive (EMC)
2014/35/EU	Low Voltage Directive (Safety) (LVD)
2011/65/EU	Restriction of Hazardous Substances Directive (RoHS)

British & European Standards

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

BS 7671	Requirements for Electrical Installations
BS EN 12767	Passive safety of support structures for road equipment - Requirements and test methods
BS EN 12899	Fixed Vertical Traffic Signs
BS EN 12966	Road Vertical Sign - Variable Message – Traffic Signs
BS EN 50293	Electromagnetic Compatibility Road Traffic Signal Systems Product Standard
BS EN 50556	Road traffic signal systems

BS EN 62262	Degrees of protection provided by enclosures for electrical equipment against mechanical impacts (IK code)
BS EN 60068	Environmental testing
BS EN 60529	Degrees of protection provided by enclosures (IP Code)
BS EN 60950	Information Technology Equipment

Specifications

5.3 TOPAS Limited publications are available from www.topasgroup.org.uk

TOPAS 0600	Self-Certification and Approval of Equipment for the Control of Vehicular and Pedestrian Traffic on Roads
TOPAS 2505	Above Ground Vehicle Detection Systems for use at permanent traffic signal installations
TOPAS 2516	Discontinuous Variable Message Signs
TOPAS 2523	Traffic Control Equipment Interfacing
TOPAS 2130	Environmental Tests for Traffic Control Equipment

Other Publications

5.4 Other publications can be obtained from the Stationary Office. UK legislation is available to download at www.gov.uk

TAL 01/03 2003 Traffic Advisory Leaflet Vehicle Activated Signs

Chapter 6 Traffic Signs Manual

Chapter 3 Traffic Signs Manual

Chapter 8 Traffic Signs Manual

APPENDIX A INFORMATIVE GUIDE

General

- A1 This appendix is an informative guide to highway authorities who wish to purchase and use discontinuous variable message sign that has been declared compliant to this specification. Prospective purchasers should ensure that the contract specification provides details of the following:
- (a) The system power supply requirements if these differ from the standard mains supply;
 - (b) Whether flashing amber conspicuity devices are required their size, placement and if required, Departmental Authorisation;
 - (c) The cable infrastructure requirements;
 - (d) Details of any built-in legends and pictograms that are required;
 - (e) The detection performance and detection logic to ensure that activated signs may be presented to traffic for sufficient time starting at an appropriate range and under appropriate conditions to maximise message effectiveness;
 - (f) Note : The purchaser should note the importance of ensuring legends and pictograms to be used are authorised before manufacture commences where these are not already prescribed by TSRGD.

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 2541.

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 (An example template can be found on the TOPAS website)	A clause-by-clause statement of compliance against TOPAS 2541B confirming compliance and/or listing caveats or deviations.	✓
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	(a) Title, document number, version and date of the EMC test performance requirement document. (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.	✓
9	Optical test procedures and results required by this specification	(a) Title, document number, version and date of the optical test performance requirement document. (b) 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.	✓
10	Environmental test results	(a) A list of relevant Environmental tests performance requirements defined in TOPAS 2130. (b) 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.	✓

11	Radio Equipment Regulations test results	<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>(d) 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 Control equipment:</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	Title, document number, version and date of the product failure mode analysis requirements and results.	N/A