

TISA Guideline

Digital Map Quality Assessment Framework
for In-Vehicle Intelligent Speed Assistance
(ISA) Systems

The logo for TISA (Traveller Information Services Association) features the letters 'TISA' in a bold, sans-serif font. The 'T' and 'I' are blue, while the 'S' and 'A' are orange. The 'A' has a unique design with a vertical bar on its right side.

Traveller Information Services
Association

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LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviation	Meaning
ADAS	Advanced Driver Assistance Systems
ISA	Intelligent Speed Assistance
FRC	Functional Road Class
OEM	Original Equipment Manufacturer
OpenLR	Open Location Referencing
RDS-TMC	Radio Data System – Traffic Message Channel
SAE	Society of Automotive Engineers
SCF	Speed Control Function
SLIF	Speed Limit Information Function
SLWF	Speed Limit Warning Function
TISA	Traveller Information Services Association
TPEG	Transport Protocol Experts Group
VMS	Variable Message Sign

Table 1 – List of abbreviations and acronyms

1. INTRODUCTION

Intelligent Speed Assistance, also known as 'ISA', for short, is an active safety system assisting the driver that is becoming more commonly available in new vehicles across the world in a bid to improve road safety. ISA systems need to correctly determine the applicable speed limit (usually at a 90% accuracy performance rate), provide information to the driver on the current limit and provide feedback to the driver when the vehicle travels faster than the speed limit. ISA systems can be powered by two different input sources: sensor derived observations from front-facing in-vehicle cameras and digital maps. These two input sources are complementary and can work alongside each other in a 'fused' ISA system approach. More pressure is being placed on automotive suppliers to demonstrate the quality of their individual components for ISA systems, however there is discrepancy between the knowledge and expertise in the industry on how to correctly assess the performance of in-vehicle cameras and digital maps amongst stakeholders, with the latter being less widely known and understood from a technical perspective. **Without a quality assessment framework in place on how to correctly assess the quality of digital maps for ISA, there is a risk that results may vary from one 3rd party assessment body to another.** There is also a risk that assessments may be carried out incorrectly in an unfair and inappropriate way if their knowledge on digital maps is insufficient. At the same time, how quality assessment and benchmarking is organized and performed is one way map providers innovate and compete against one another which must be respected. **TISA therefore wishes to recommend a fair, appropriate and relevant digital map quality assessment framework** for its members who seek a 3rd party quality assessment. It is also the objective of TISA to provide supplementary information to increase the expertise and understanding of digital maps, their creation process and the important role they play in ISA amongst all stakeholders, especially amongst regulators and NCAPs. This guideline merely offers guidance and does not prescribe any procedure that a map provider must follow.

This guideline is divided into 11 chapters, and each one have specific objectives and key questions to answer:

Chapter 2 describes the road safety objectives of ISA, the basics of the technology and explains in which countries it is mandated. It also compares the relevant ISA testing protocols of the New Car Assessment Programs worldwide.

Chapter 3 explains map-making and updating. It also explains the difference between SD, ADAS and HD maps and how maps relate to real-time information services and navigation software.

Chapter 4 explains the basics about how map updates, and notably speed limit changes, are delivered in-vehicle.

Chapter 5 summarises the most relevant performance, testing and report requirements for digital maps and map providers from EU 2021/1958.

Chapter 6 recommends a fair, appropriate and relevant quality assessment framework for digital maps that can be applied worldwide covering: quality assessment methodologies for the relevant quality criteria; the suitability of different testing environments; technical considerations and relevant requirements for ISA map delivery software.

Chapter 7 attempts to standardize and harmonize the approach to determine the acceptable integrity and reliability level of speed limit data in digital maps for overall ISA system performance.

Chapter 8 explains how functional road classifications (FRCs) vary from different organisations, what level of harmonization could be achieved in the industry and how this is relevant to ISA testing requirements.

Chapter 9 details a list of challenging situations where ISA may find it harder to identify the correct speed limit.

Chapter 10 provides interpretation guidance to map providers on three topics which are insufficiently defined in EU 2021/1958 (assumed speed limits, determining correct country location and road work speed limits via C-ITS).

Chapter 11 explains under which circumstances this guideline will be updated and how this process will be organised.

If deemed necessary, an additional document specifically intended for 3rd party assessment bodies with more detailed instructions on how to carry out a public road drive test assessment to assess digital maps and how to correctly validate the results may be produced if this guideline is deemed insufficient. A dedicated template may be prepared for map providers to use when reporting their in-house testing results and disclosing those to relevant stakeholders.





2. INTRODUCTION TO INTELLIGENT SPEED ASSISTANCE (ISA)

2.1 ISA Technology

As described in the TRL report MIS038 prepared for the European Commission, ISA is an active safety system which assists the driver, who should have control of the vehicle at all times. An ISA system should:

- Determine the speed limit for the driven road based on observation of road signs and signals, with current state of technology typically combining input from cameras and digital maps at an accuracy performance rate of 90%
- Provide feedback to the driver if the vehicle is exceeding the applicable speed limit with either an informative/advisory or intervening approach
- Not cause annoyance to the driver with unnecessary or incorrect speed alerts/restrictions, which will encourage drivers to switch off the system completely

The first of these functions is the speed limit determination, i.e. the capability of the system to correctly identify the speed limit for the section of the road on which the vehicle is travelling at any given moment. Speed limits are not just static/permanent but can also be temporary (on a road with road works). This would be accomplished by visually perceiving and interpreting information from speed limit road signs from a front-facing in-vehicle cameras and/or using speed limit data from a digital map. ISA systems are capable of working in different operational conditions i.e. both day & time, during adverse weather conditions and different vehicles. They are capable of processing explicit, implicit and conditional speeds limits. Below is a sample of some signs found in the EU and USA:

Explicit	Implicit	Conditional
Speed limit which shows the permanent or temporary traffic regulation as a numerical value on a traffic sign (incl. dynamic digital speed limits shown on a VMS)	Traffic regulation speed limit which is not shown a numerical value (implicit non-numerical traffic sign) or shows a strikethrough numerical value (implicit numerical traffic sign)	Specifies a conditional maximum traffic regulation speed limit on a road which only applies under certain circumstances (i.e. time of day, weather or traffic conditions)
 		

The second element is the Speed Limit Information Function (SLIF), which provides information to the driver on the speed limit currently in force for that vehicle to assist them in maintaining the speed of the vehicle within the legal speed limit. This information is typically visually shown in the cluster display next to the steering wheel or in the infotainment HMI with the applicable speed limit icon.

The third element is the Speed Limit Warning Function (SLWF), which provides feedback to the driver when the vehicle is exceeding the posted speed limit. This is also known as *informative* or *advisory* ISA and the feedback can be either audible (i.e. beeping sound) or haptic (i.e. vibrating speed pedal). ISA can also be used as a Speed Control Function (SCF) that actively controls the speed of the vehicle via torque reduction or the application of the service brakes and is also known as *intervening* ISA.

ISA is currently used in the following vehicle classifications:

- **M1** (e.g. car) – vehicle carrying less than 8 passengers
- **M2** (e.g. minibus) – vehicle carrying 8 passengers or more + mass at most 5 tonnes
- **M3** (e.g. bus) – vehicle carrying 8 passengers or more + mass more than 5 tonnes
- **N1** (e.g. van) – vehicle carrying goods + mass at most 3.5 tonnes
- **N2** (e.g. small lorry) – vehicle carrying goods + mass 3.5-12 tonnes
- **N3** (e.g. big lorry) – vehicle carrying goods + mass more than 12 tonnes

ISA is not a stand-alone safety function but can support other ADAS features such as adaptive cruise control. It can also be provided as an after-market device, not just embedded in-vehicle systems and digital maps can also power these devices.

2.2 Safety Motivation for ISA

Road accidents and fatalities are still a prevalent issue in almost all countries around the world. According to the latest World Health Organisation report, there were 1.19 million road deaths in 2023. Road traffic deaths are still the leading cause of death in children and young people aged 5-29 around the world.

There are several causes of road traffic accidents and fatalities, but it is widely documented that over speeding plays a significant role in multiple regions around the world. In a sample of 11 different countries, the OECD were able to identify that inappropriate speed is responsible for 20-30% of all fatal crashes and in the United States, the National Highway Transport Administration (NHTSA) recently claimed that one-third of traffic fatalities are speed related crashes.

It is important to stress that speed limit thresholds are defined by the relevant competent authority in order to keep road users safe, roads with lower speed limits are primarily configured in such a way for safety purposes. For example, the European Transport Safety Council (ETSC) identified that pedestrians are 5 times more likely to be killed in a collision at 50km/h vs 30km/h. By warning about over speeding with informative/advisory systems or even preventing it with intervening systems, the ETSC believes that ISA has the potential to reduce fatalities by up to 20% depending on the system configuration.

For a more comprehensive overview of all the literature published on ISA including the expected safety benefit, we recommend reading the report on 'ISA: A Review of the Literature' by the Irish Road Safety Authority (RSA).

2.3 Confirmed and Unconfirmed ISA Mandates Worldwide

There are a number of frontrunners around the world have already decided to make ISA a mandatory safety feature in all new vehicles sold in their market. It is also known that several countries are considering introducing similar legislation. Below is an overview of the current situation at the time of publication in 2024:

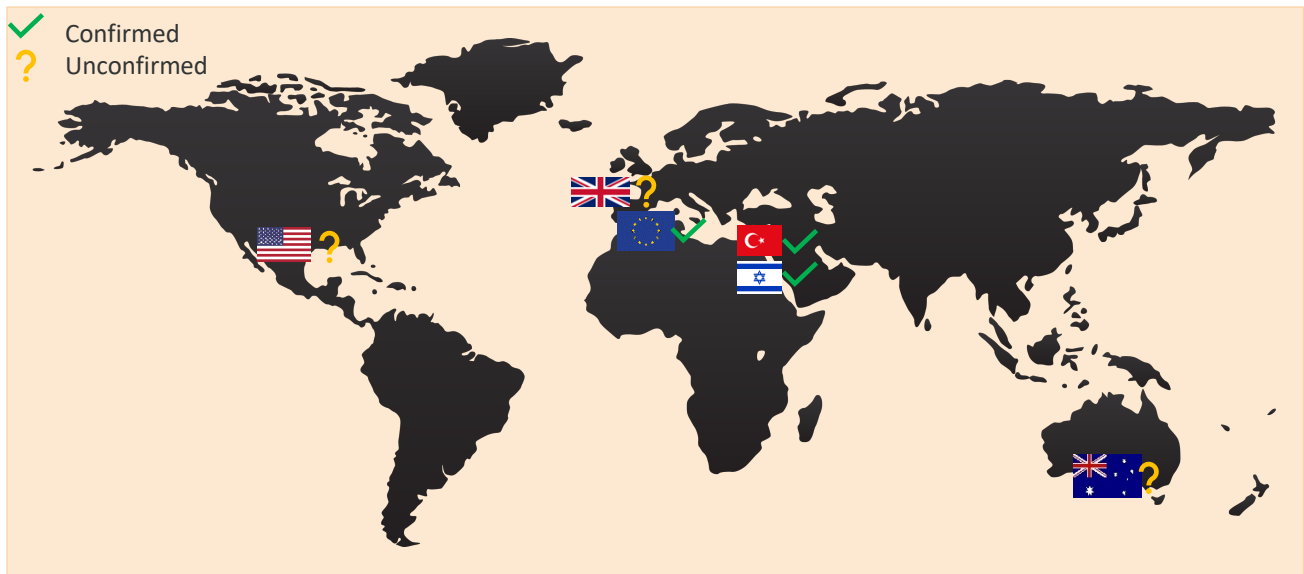


Figure 1 – ISA mandates worldwide

European Union/European Economic Area – the General Safety Regulation (GSR) EU 2019/2144 mandates that all new category M and N vehicles must be fitted with an ISA system. Following a two-step approach, new vehicle types brought to the market for the first time needed by fitted with ISA from 7 July 2022 and thereafter all new vehicles manufactured and sold in the territory applied from 7 July 2024. The technical specifications laid down in the corresponding Delegated Regulation EU 2021/1958 specify that the ISA system must reach a 90% accuracy performance for explicit and implicit speed restrictions laid down in the Road Sign Catalogue. A summary of the requirements can be found in Chapter 5.

Turkey – the EU’s General Safety Regulation (GSR) EU 2019/2144 was adopted in Turkey with AB/2019/2144 with the same performance requirements and implementation dates. No Turkish equivalent of the Road Sign Catalogue has been published yet.

Israel – EU-type approved vehicles imported into Israel from January 2025 must be fitted with an ISA system capable of reading local speed signs, according to a letter sent to importers by the transport ministry in July 2023. It is understood the same performance specifications will apply.

United Kingdom – a report from TRL on the application of the EU GSR incl. ISA is too due to be submitted to the UK Department of Transport later this year. It is expected that the UK will make a decision on whether to adopt ISA and other GSR safety functions and the associated transitional provisions by the end of 2024.

United States – at a federal level there is still no decision from the NHTSA on whether or not to introduce an ISA mandate following the recommendation from the National Transport Safety Board (NTSB) in November 2023. It is expected that a decision may be taken in the next 3-5 years. In January 2024, state regulators in California proposed a draft bill for a mandatory ISA system to be fitted in all new vehicles manufactured and sold in the State of California from 2027. However, in September 2024 the bill was vetoed by Governor Gavin Newsom, and it is unclear if this bill will be tabled again in the future.

Australia – it is understood that the Australian government are closely following the implementation of ISA in Europe and will decide whether or not to introduce their own mandate in the near future.

2.3.1 ISA as part of UNECE DCAS Driver Control Assistance Systems

As aforementioned in section 2.1, ISA is not a standalone system and can be used to support other ADAS functions in the vehicle. In January 2025 it is expected that the new UNECE regulation on 'DCAS' (Driver Control Assistance Systems) will enter into force which sets the technical provisions for L2+ functionality. The law will apply for those countries that signed the UNECE 1958 agreement harmonizing vehicle regulations worldwide.

In section 5.3.7.4 of DCAS there is a dedicated section related to 'Speed Limit Compliance Assistance' which is essentially an ISA system. If a vehicle manufacturer wishes to deploy DCAS functionality in the vehicle it must be supported by an ISA system. For what concerns digital maps, the relevant requirements can be summarized as follows:

- The system shall aim to determine the permitted road speed limit relevant to the current lane of travel.
- The system shall continuously display the system-determined road speed limit to the driver.
- The maximum speed up to which the system and any of its features provides assistance, shall not exceed the maximum speed limit in the country where the vehicle is currently operating.

2.3.2 Mandatory Speed Limit Data as part of EU Delegated Regulation on Real-Time Traffic Information (RTTI) 2022/670

On 1st January 2025, the revised EU Delegated Regulation on Real-Time Traffic Information (RTTI 2022/670) will enter into force which establishes the specifications necessary in order to ensure the accessibility, exchange, re-use and update of data by data holders and data users for the provision of EU-wide real-time traffic information services, and to ensure that these services are accurate and available across borders to end-users. For what concerns ISA, speed limit data falls under the scope of static and dynamic traffic regulations which must be made accessible to data users on the National Access Points (NAPs) across the EU in DATEX II or TN-ITS format. ITS Service providers have an obligation to process and include in the relevant services they provide the speed limit data developed by the competent authorities and made accessible via the national access point when the data reaches a minimum quality threshold.

TISA is currently leading the development of a 5-star quality rating standard to help define the minimum quality threshold which includes speed limit data. Version 1.0 of the standard is expected to be ready at the beginning of 2025.

2.4 New Car Assessment Programs (NCAPs) on ISA Worldwide

Each region around the world has a neutral and independent organisation that performs a safety assessment of new vehicles brought to the market. These New Car Assessment Programs (NCAPs) use a scoring system to rate the safety level of these vehicles, typically awarding up to 5 stars based on the performance requirements laid down in their testing protocols. ISA is already part of several testing protocols from NCAPs around the world (typically part of Safety Assist or ADAS or preventive safety), although the quality levels and testing requirements vary from one to another. To compare the quality requirements of the different protocols, there are links embedded below:



NCAP	Region	Latest ISA Testing Protocol
ANCAP	Australia/NZ	Available as part of the Speed Assist System protocol v2.0 2018
BHARAT NCAP	India	Not yet available
ASEAN NCAP	South East Asia	Available as part of the Safety Assist Protocol 3.0 from May 2024
C-NCAP	China	Available as part of the Active Safety ADAS 2024 protocol under ISLS Intelligent Speed Limit System (download document 'L' 2024)
EuroNCAP	Europe	Available as part of the latest Safety Assist v10.4 2023 in section Speed Assist System (SAS). Included in testing protocols since 2009. Also available in the Assisting Driving protocol v1.0 2020.
J-NCAP	Japan	Not yet part of their 2023 preventive safety assessment
K-NCAP	South Korea	Available as part of their Accident Prevention – Safety Assist protocol
Latin NCAP	Latin America	Available as part of their Speed Assist System protocol
NHTSA IIHS	United States	Not yet available

Table 2 – New Car Assessment Programs on ISA worldwide

Already a member?

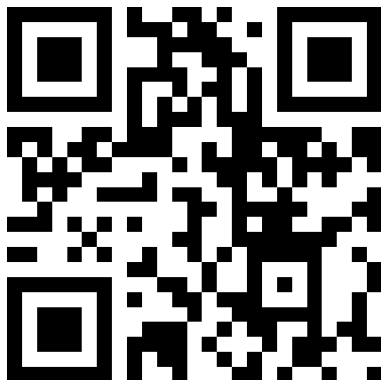
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