IRF White Paper

Automated Speed Enforcement:

Accuracy and Integrity of Speedmeters

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EXECUTIVE SUMMARY

1 The International Road Federation (IRF) has developed this policy which acknowledges the inherent accuracy of Automated Speed Enforcement (ASE) equipment that has undergone and passed rigorous type approval and calibration mechanisms by a government-certified laboratory.

ASE devices produce a record of the speed of a motor vehicle when the driver has exceeded the maximum posted speed limit. For an ASE system to be effective and widely accepted, including in a court of law, it is of paramount importance that all readings from these devices are accurate, and that this accuracy can be proven by those operating the devices.

National approval authorities set type approval requirements that generally follow international accuracy & integrity specifications set in guidelines established by the International Organization of Legal Metrology (OIML). However, there remains a residual risk for type-approved ASE systems to be installed or improperly maintained in a way that does not comply with the specified requirements. When this occurs, the accuracy of the readings may diverge sufficiently from the installation parameters to create what drivers, their representatives and courts may consider a 'reasonable doubt'.

4. Once type approval is gained by the manufacturer in the relevant jurisdiction, it is thus up to the operator of the ASE to procure and produce verification services though a laboratory that is certified to provide traceable calibrations on an annual basis, or at an agreed interval. An independent calibration test conducted by an ISO 17025 accredited laboratory that can produce traceable and accurate data in a full on-site system test from the road to the violation record will provide the strongest assurance of the highest accuracy and integrity, and is much less susceptible to legal or technical challenges.

Conversely, if an ASE system is found to be inaccurate during or after a period of uncalibrated enforcement operation, the safety benefit and credibility of the ASE treatment as a whole is at risk. A reduction in the trust in the accuracy of the ASE systems will result in a loss of public support and confidence in the enforcement authority, and could also result in reparations that include the repayment of fines and penalties incorrectly issued as a result of the defect. Finally, the removal of an improperly calibrated speed enforcement system will create a period of increased risk to the public.

The reduction of legal challenges will keep the work of ASE authorities and courts system to a minimum, with challenges restricted to avenues not related to speed accuracy. The resulting cost savings, and decreased threat to reputational risk of the enforcement authority, are just two of the benefits. The main advantage though is to have a system that is fair to members of the driving public. Ultimately, the approach outlined in this paper allows all stakeholders to have confidence in a credible and accurate system, a system which is deployed fundamentally to save lives.

PURPOSE & DEFINITIONS

The main purpose of this paper is to enable all actors of the speed enforcement chain to understand the high-level principles required to achieve accuracy and integrity of ASE equipment.

Actors of the speed enforcement process include, but are not limited to:

- Driving public & motoring associations
- Highways and Roads Authorities
- Judiciary & Prosecuting authorities
- Law enforcement agencies
- Manufacturers of the equipment
- Metrology Institutions
- National Road Safety agencies
- Non-Governmental Road Safety Organizations

Definitions that apply to this paper are presented below:

Accredited – The status of a calibration laboratory, whether in house or independent, that has demonstrated its quality system is compliant with a national accreditation body as well as OIML guidelines. For calibration laboratories the applicable international standard for the accreditation is *ISO/IEC 17025:2017. General requirements for the competence of testing and calibration laboratories.*

Accuracy – The state of an instrument in respect of being precise and correct in terms of the speed reading determined for the subject vehicle.

Calibration – The documented comparison of the speedmeter to be calibrated against a traceable reference device in a way that allows the accuracy to be calculated to a demonstrated uncertainty (see OIML Guidelines[1]).

Integrity – The capability of the device to identify the subject vehicle in the record produced by that device. Data integrity is the way in which the device is protected from attack and malpractice that prevents manipulation of the evidence.

Speedmeter – A device that is designed and constructed to measure, record and produce evidence of the speed of a motor vehicle e.g. car, truck, motorbike, etc. The speedmeter may produce a collection of data and images that also identify the subject of the measurement by visual means.

Traceability - The capability to trace the standard to which the calibrated device has been compared. This offers the ability to verify the comparison of values between the reference and speedmeter devices and is normally shown by a documented trail between the reference and the fixed standard.

Type Approval – The confirmation of a successful testing and approval process, normally defined by a government agency, that sets the standards, requirements and installation parameters that a speedmeter must meet before it is legally authorized for use in enforcement activities.

Verification – The process of confirming that calibration specifications are fulfilled[2].

[1] Refer to http://viml.oiml.info/en/0.14.html

[2] Refer to https://calibrationawareness.com/differences-between-calibration-verification-and-validation-in-measurement-process

PRODUCING ACCURATE READINGS

ASE devices produce a record of the speed of a motor vehicle when the driver has exceeded the maximum posted speed limit. For an ASE system to be effective and widely accepted, it is of paramount importance that all readings from these devices are accurate, and that this accuracy can be proven by those operating the devices. If inaccuracies are identified through legal or technical challenge, the operator of inadequately verified ASE equipment may be liable to a repayment of fine revenue in addition to reparations and damages.

When operating ASE in a process that includes the prosecution of drivers, it is thus imperative that all challenges can be robustly met with evidence that the speed reading is accurate, and of a high integrity. These requirements are set in international specifications established under the International Organization of Legal Metrology (OIML)[3].

> The international recommendation for radar speedmeters, OIML R 91, edition 1990 (E) states that a speedmeter should measure speeds with a positive error that is no greater than +3km/h up to 100km/h and no greater than +3% at speeds greater than 100km/h. There is no negative error or under-read in the recommendation. Each jurisdiction and national metrology institute or government department will have its own specification, either based upon the OIML recommendation or a variation of it.

Type Approval is the first step in demonstrating system accuracy. It is an independent verification process usually delivered by a government agency that evidences that all installations of type approved equipment are functioning within limits for accuracy, integrity, reliability and operational usage conditions (i.e. rain, snow, fog, temperature extremes, etc.). Approved speedmeters that are identical to the type approved device can be considered to have the same accuracy and integrity. Accuracy determines that the measurements recorded show a true speed or violation of a traffic direction, whereas integrity determines that the correct vehicle is identified, and that the automated machine is resistant to being tampered into producing misleading violation records.

However, there remains potential for type approved ASE systems to be installed in ways that do not comply with the specified installation guidelines, dimensions and required angles and, as such, may diverge sufficiently from the installation parameters to cause an inaccuracy in a reading or reduction in the integrity. This creates what drivers, their legal representatives and courts, may consider 'reasonable doubt' in the accuracy of evidence produced that could exist even when Type Approved equipment is installed.

Calibrating type approved equipment thus provides enforcement authorities with a much higher degree of accuracy assurance for speedmeters within their responsibility thereby reducing any reputational risk from any errors, and ultimately reducing financial risk from inaccurate equipment. The relevant international standard applicable for the calibration and accuracy assurance in ASE, is '***ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.***[4] This is an internationally recognized procedure for laboratories to provide traceable calibration of equipment with stated uncertainty or known doubt. ASE equipment that is calibrated by an ISO 17025 accredited calibration laboratory is thus much less susceptible to legal or technical challenge.

[3] https://www.oiml.org/en and https://www.oiml.org/en/files/pdf_r/r091-e90.pdf accessed 26/02/20

[4] https://www.iso.org/standard/66912.html accessed 26/02/20

RECOMMENDED CALIBRATION PRACTICES

This policy applies to all speedmeters operated by an enforcement authority.

Calibration period

1. The calibration period for speedmeters will be no longer than one calendar year. Speedmeters must only be operated when they are within a period of calibration.
2. Interim checks of the accuracy of the speedmeter may be performed at any time within the calibration period. When an inaccuracy is demonstrated, the speedmeter must be submitted for calibration. On recalibration, the annual period is restarted from the latest calibration date for one calendar year.

Calibration service provider

1. The manufacturer, or agent of the manufacturer of the speedmeter, who uses measurement equipment that is calibrated by an accredited calibration laboratory, whether in-house or independent.
2. An accredited laboratory that has the measure and 'speed' in its scope of accreditation.

Defective and repaired speedmeters

1. A speedmeter that becomes defective from fault, damage or vandalism, within a calibration period must be decommissioned, repaired and recalibrated.
2. When a speedmeter is repaired it must be examined by an expert to determine whether the repair has impinged the speed measurement mechanism and its accuracy.
3. When the repair has involved the speed measurement mechanism, the speedmeter must be recalibrated; a new calibration period will then commence.
4. When the repair has not involved the speed measurement mechanism, a statement or certificate must be appended to the current calibration certificate to allow the continuation of the current calibration period; no new calibration operation is required in this circumstance.

Validation on the installation of a calibrated speedmeter

1. The accuracy of a calibrated speedmeter may also rely upon its installation at the roadside. Speedmeters that rely on physical alignments for accuracy should be verified by an on-site calibration.
2. On-site calibration should be performed by in-built tests if available. This is a self-check mechanism that may be implemented within the equipment.
3. If no in-built tests are available, a calibration should be performed by an accredited calibration laboratory.
4. Any examination and calibration of an installed speedmeter may be supported and confirmed with the production of an evidential trail that evidences the calibration test.

BENEFITS OF THE POLICY

This policy is designed to provide law enforcement agencies, the judiciary, highways authorities, and of course drivers, with the highest practical degree of assurance that can be achieved for a measurement instrument. Since the end user of the speedmeter is the accused driver, it is important to engender a high measure of trust and integrity, especially when it strikes at a driver's sensibilities surrounding their driving ability and/or respect of the law. When an ASE system is used to deter drivers from errant behaviors, it is necessary to deploy it in a way that encourages the behavioral changes by maximizing the deterrent effect of that system.

A component of the deterrent effectiveness of any enforcement system is the perceived reliability and accuracy of that enforcement system, as well as any prosecution system that follows. If a system record can be challenged and easily overturned, the deterrent effect has the potential to be reduced. Equally, if prosecution authorities find that it is burdensome to prove that the evidence is accurate and reliably identifies the subject vehicle, then detected violations will not be prosecuted and the system will fall into disrepute. Deterrence is lost when this occurs.

In some jurisdictions, the violation record from Type Approved equipment will be assumed to be correct until the contrary is proven. In other jurisdictions, however, there will be an additional requirement for the operators of the ASE system and the prosecution to produce evidence of the accuracy and integrity of the ASE equipment. If the operator of the ASE relies entirely upon the approval of the type of camera and limits the approval testing to a test of accuracy without extensive integrity testing, then the potential for challenge increases.

If a prosecution is not continued, then the deterrent effect of the ASE is undermined. Media pressure may also result in reparations that usually include the repayment of fines and penalties that have been incorrectly issued as a result of the defect. The resulting loss of public support and confidence in the enforcement authority and a reduction in the trust in the accuracy of the ASE systems have the potential to reduce the road safety benefit of the ASE treatment of the road system and could create a period of increased road safety risk to the public.

Thus, an independent calibration test that is conducted by an accredited laboratory that can produce traceable and accurate data in a full system test from the road to the violation record will provide the strongest assurance of accuracy and integrity. Done this way, it is difficult to contest in a reasonable way and, when challenged, it can withstand the sternest of tests.

A laboratory that is accredited by a national body to the ISO17025 standard can produce traceable calibration measurements of speedmeters at the point of use, that is, when installed on the roadside. To be accredited to that standard, the laboratory must not only demonstrate the competence and consistency that the standard requires, it also must demonstrate impartiality. It is the impartiality that can be critical in having the evidence of the verification procedures accepted by a court of law when providing the evidence of the accuracy and compliance of an ASE device. When drivers learn that the roads and enforcement authorities have carried out end-to-end checks on the installed ASE systems, challenges to evidence is less attractive and compliance is far more likely.

CONCLUSION: THE IMPERATIVE OF PRESERVING PUBLIC TRUST IN ASE

When an ASE system is type approved and independently calibrated in its operational site then the avenues for challenge to the accuracy of its measurements and evidence are greatly reduced. The reduction of challenges to the operator of the ASE, the law enforcement authorities and the law courts will keep the work of these authorities to a minimum, with challenges restricted to avenues not related to speed accuracy. The resulting cost savings, not to mention the decreased threat to reputational risk of the enforcement authority, are just two of the benefits.

In summary, the main advantage is to have an ASE system that is fair to members of the public using the highways and road network. Ultimately, the approach outlined allows all stakeholders to have confidence in a credible and accurate system, a system which is deployed fundamentally to save lives.

ABOUT THE AUTHORS

The authors of this paper have expert knowledge, understanding and experience of working within an ASE environment and a Type Approval Process. Further, the organization that they represent has over 13 years of experience working as the Government's Approved Agency for delivering the Type Approval Process within the UK. As a Test Laboratory able to operate worldwide, the organization ensures that the accuracy and integrity of ASE equipment is calibrated to the highest of standards. Road Safety Support's specialists act as expert witnesses and have appeared in courts of law to aid police forces to deliver justice to those who flout the law.

Steven. E Callaghan BSc (Hons) MIET, MISM, AMICE
Technical Support & Calibration Laboratory Manager
Road Safety Support Limited
e: steve.callaghan@roadsafetysupport.co.uk

Emma Kelly MBA BA (Hons)
Development, PR & Advocacy Manager
Road Safety Support Limited
e: emma.kelly@roadsafetysupport.co.uk

Philip Wijers
Director Government Affair, SensysGatso Group
& Chair, IRF Committee on Enforcement
e: p.wijers@sensysgatso.com

Brendan Halleman
Vice President, Europe & Central Asia
International Road Federation
e: bhalleman@irf.global

ABOUT THE IRF

The International Road Federation is a global not-for-profit organization, headquartered in Washington, DC since 1948 and supported by regional operations throughout the world. The IRF serves a network of public and private sector members in more than 70 countries by providing world-class knowledge resources, advocacy services, and continuing education programs which together offer a global marketplace for best practices and industry solutions. For more information about IRF activities and member services, please visit www.irf.global.