

Title: Risk assessment of measuring systems

Abstract

Rapid technological development, for instance Cloud Computing, the Internet of Things or Industry 4.0, opens up new opportunities but also introduces new risks by radically changing how measuring instruments function in society. The software of individual measuring instruments currently on the market may, in exceptional cases, violate the essential requirements of the applicable directives. More stringent demands for adequate risk assessment when securing software can be found in the latest version of the Measuring Instruments Directive. Future benefits (and threats) can be handled by developing new risk assessment procedures, which build on recent research methodologies such as the house-of-security approach to analyse human errors and their prevention.

Keywords

Risk assessment, legal metrology, measuring instruments, measuring systems, IT security, human errors prevention, MID, adequate metrological security

Background to the Metrological Challenges

The Measuring Instruments Directive (MID) [1] concerns “legally controlled measuring instruments” e.g. those used in “public interest, public health, safety and order, protection of the environment and the consumer, of levying taxes and duties and of fair trading”. European Standards support this directive and the European Commission issued a mandate [2] to CEN and CENELEC for the previous version of the directive and is considering a “Standardisation Request” [3] for the current version. Compliance with the standards developed by CEN and CENELEC and recognised by the European Commission is one way of demonstrating compliance with the essential requirements of the Directive.

Threats exist to the secure operation of measuring systems, particularly in today’s period of rapid technological development. Manufacturers and customers want to take advantage of increased connectivity but this can put the reliability of the measurement at risk. For some applications, the need for confidentiality is most evident, i.e. that stored information and completed activities shall not be disclosed to unauthorised persons. In other applications the most important factor may be availability, i.e. that measuring systems actually deliver the expected services. Trust also requires authenticity, i.e. that measured data is transmitted and received by the entities as expected.

For transactions subject to legal metrological control, new requirements are currently being introduced with the revised European directives for non-automatic weighing instruments [4] and measuring instruments. These require, for almost all conformity assessment modules, that:

It shall be possible to evaluate an instrument’s conformity with the essential requirements based on the submitted documentation. The documentation shall contain an adequate assessment of the risks.

The current technological development of distributed systems, cloud computing and Internet-of-Things is rapid. This will lead to measuring instruments with increased functionality and considerable opportunities for flexible configurations to meet diverse customer demands, but it will also lead to heightened risks. Measuring systems are more complex, and it is not always evident how to define the boundaries of the measuring system. The assessment of risks for a “measuring system” which involves humans will be more complex than the assessment of risk in a well-defined “measuring instrument”.

IT security research is based on the identification of threats to the system. A classification of the IT security integrity level needed must be made to be able to select proper techniques to protect the system. In the field of legal metrology, assets that need to be protected may be derived from the legal requirements. The MID, for instance, requires adequate protection of a measuring systems software against manipulation. An estimation

of the probability of occurrence of a threat may be based on the time required, an attacker's expertise, window of opportunity, knowledge about the system and equipment available. A high-risk level will require extensive deployment of techniques to protect the system. Some systems will be assessed to need only a low security level; this will make it possible to deploy cost-efficient techniques for protection.

A "house-of-security" approach, developed in the field of safety and security for prevention of terrorist and criminal attacks against an organisation, has recently been adopted in analogous areas, such as assuring the reliability of measurement in analytical chemistry laboratories in the presence of human error and may be appropriate here.

Objectives

Proposers should address the objectives stated below, which are based on the PRT submissions. Proposers may identify amendments to the objectives or choose to address a subset of them in order to maximise the overall impact, or address budgetary or scientific / technical constraints, but the reasons for this should be clearly stated in the protocol.

The JRP shall focus on metrology research necessary to support standardisation related to the implementation of the Measuring Instruments Directive.

The specific objectives are

1. To implement and test a risk assessment procedure for simple measuring instruments in accordance with the principles being discussed in WELMEC Working Group 7 "Software". The tests should include the participation of instrument manufacturers and result in recommendations to both OIML and WELMEC.
2. To develop a risk assessment procedure for complex measuring systems based on a modular structure of more than one measuring instrument, facilities for storing measured values and communication over open networks.
3. To select techniques and methods to improve IT security in measuring systems by addressing which techniques and methods need to be applied to reach a certain adequate IT security level in a measuring instrument from the viewpoint of the MID.
4. To establish a virtual alert centre for IT security risks related to measuring systems, to be able to quickly exchange and compare risk evaluation results as well as incident reports among European Notified Bodies.
5. To contribute to the relevant standards development work of the key European and International Standards Developing Organisations, including OIML and WELMEC. To ensure that the outputs of the project are aligned with their needs, communicated quickly to those developing the standards and to those who will use them, and in a form that can be incorporated into the standards at the earliest opportunity.

The proposed research shall be justified by clear reference to the measurement needs within strategic documents published by the relevant Standards Developing Organisation or by a letter signed by the convenor of the respective TC/WG. EURAMET encourages proposals that include representatives from industry, regulators and standardisation bodies actively participating in the projects.

Proposers should establish the current state of the art, and explain how their proposed research goes beyond this. In particular, proposers should outline the achievements of the EMRP project NEW04 'Uncertainty' and how their proposal will build on those.

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 0.6 M€, and has defined an upper limit of 0.8 M€ for this project.

EURAMET also expects the EU Contribution to the external funded partners to not exceed 30 % of the total EU Contribution to the project.

Any industrial partners that will receive significant benefit from the results of the proposed project are expected to be unfunded partners.

Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the "end user" community, describing how the project partners will engage with relevant communities during the project to facilitate

knowledge transfer and accelerate the uptake of project outputs. Evidence of support from the “end user” community (e.g. letters of support) is also encouraged.

You should detail how your JRP results are going to:

- Address the SRT objectives and deliver solutions to the documented needs,
- Feed into the development of urgent documentary standards through appropriate standards bodies including OIML and WELMEC,
- Transfer knowledge to measurement instrument manufacturers and regulators.

You should detail other impacts of your proposed JRP as specified in the document “Guide 4: Writing Joint Research Projects (JRPs)”

You should also detail how your approach to realising the objectives will further the aim of EMPIR to develop a coherent approach at the European level in the field of metrology and include the best available contributions from across the metrology community. Specifically the opportunities for:

- improvement of the efficiency of use of available resources to better meet metrological needs and to assure the traceability of national standards
- the metrology capacity of EURAMET Member States whose metrology programmes are at an early stage of development to be increased
- organisations other than NMIs and DIs to be involved in the work

Time-scale

The project should be of up to 3 years duration.

Additional information

The references were provided by PRT submitters; proposers should therefore establish the relevance of any references.

- [1] [Directive 2014/32/EU](#) of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments (recast).
- [2] M/374 EN, Mandate to CEN and CENELEC for standardisation in the field of measuring instruments
- [3] Draft standardisation request as regards harmonised standards for certain measuring instruments in support of Directive 2014/32/EU on measuring instruments (Ref. Ares(2015)650067 - 16/02/2015).
- [4] [Directive 2014/31/EU](#) of the European Parliament and of the Council of 26 February 2014, on the harmonisation of the laws of the Member States relating to the making available on the market of non-automatic weighing instruments (recast)