

## **Title: Length measurements for volume metrology**

### **Abstract**

Automatic liquid level measuring devices (ALG) are electronic devices for measuring the level of a liquid, for example the level of fuel in a built-in tank at a petrol station. In some countries ALGs are used in legal metrology, and as such should be periodically inspected in accordance with the metrological legislation and prior to putting into service should pass conformity assessments in accordance with the International Recommendation OIML R85. New measurement standards are needed to enable precise and accurate measurements, to increase confidence in measurements and enable the periodical verifications process to be automated. The new standards should be designed to work under both laboratory and on-site conditions and enable competent authorities for legal metrology and appointed laboratories to make measurements traceable to the unit of length.

### **Keywords**

Automatic liquid level measuring device (ALG), traceability, building capacity, conformity assessment, verification, measurement uncertainty, liquid level

### **Background to the Metrological Challenges**

An automatic liquid level measuring device (ALG) is an electronic device used for measuring the level of a liquid, for the fuel level height in a built in tank at a petrol station. In order for ALGs to be used in legal metrology and to ensure consumer protection, they should be inspected in accordance with the International Recommendation OIML R85. During use these devices should also be routinely verified for a period of 2 years by competent institutions in the country or by appointed laboratories.

Some European countries use ALGs within their legal metrology system, and there is an initiative the Measuring Instrument Directive 2014/32/EU with a new group of measuring instruments, which includes the ALG. However, there are many countries in which these measuring devices do not form part of legal metrology.

Most countries in the Western Balkans use alternative standards for conformity assessment of ALG, which also serve as the primary standards, however, less developed countries do not have the option of using primary standards. In addition, appointed laboratories which perform periodical verifications of ALG do not have the ability to use some alternative standards, due to a lack of adequate measurement equipment and the non-availability of suitable equipment on the market. These appointed laboratories therefore perform the subsequent verifications of ALG only at one point, however OIML recommends that testing should only be done at one point if there is no adjustment of ALG. In most cases it is necessary to remove the ALG from the fuel tank and clean the dirt that accumulates on the device, which can create inaccuracies in the measurements, and in any case legislation in some countries stipulates that ALGs should be removed from the fuel tank after a period of two years, for the purpose of functional testing.

New measurement standards are therefore needed to enable precise and accurate measurements, to increase confidence in measurements and to enable the process of periodical verifications to be automated. The new measurement standard should be designed and suitable for operation in both laboratory and on-site environments and enable competent authorities for legal metrology and appointed laboratories to perform measurement that are traceable to the unit of length.

### **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 the development of metrological capacity for automatic liquid level measuring devices (ALGs) for use in legal metrology.

The specific objectives are

1. To develop standards traceable to the unit of length for the conformity assessment of automatic liquid level measuring devices (ALG) covering a range of 3 m with an expanded uncertainty less than or equal to 0.3 mm in accordance with OIML R85.
2. To develop software for processing data and measurement results in accordance with OIML R85 and develop modules to eliminate errors in the process of conformity assessment and periodical verification through direct communication between the standards and measuring device software for devices from at least three different manufacturers.
3. To develop a calibration procedure for the new or upgraded standards and to develop procedures for periodical verification of ALG in order to strengthen the capacity of NMI/DIs and appointed laboratories in this field.
4. To validate the metrological characteristics of the new or upgraded standards through an inter-laboratory comparison.
5. For each participant, to develop an individual strategy for the long-term operation of the capacity developed, including regulatory support, research collaborations, quality schemes and accreditation. They should also develop a strategy for offering calibration services from the established facilities to their own country and neighbouring countries. The individual strategies should be discussed within the consortium and with other EURAMET NMIs/DIs, to ensure that a coordinated and optimised approach to the development of traceability in this field is developed for Europe as a whole.

Joint Research Proposals submitted against this SRT should identify

- the particular metrology needs of stakeholders in the region (e.g WELMEC),
- the research capabilities that should be developed (as clear technical objectives),
- the impact this will have on the industrial competitiveness and societal needs of the region,
- how the research capability will be sustained and further developed after the project ends.

The development of the research potential should be to a level that would enable participation in other TPs.

Proposers should note that the programme funds the activity of researchers to develop the capability, not the required infrastructure and capital equipment, which must be provided from other sources.

EURAMET has defined an upper limit of 500 k€ for the EU Contribution to any project in this TP, and a minimum of 100 k€.

EURAMET also expects the EU Contribution to the external funded partners to not exceed 10 % of the total EU Contribution to the project.

## 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,
- Provide a lasting improvement in the European metrological capability and infrastructure beyond the lifetime of the project,
- Facilitate improved industrial capability or improved quality of life for European citizens in terms of personal health or protection of the environment,
- Transfer knowledge to the ALG manufacturers, appointed laboratories and the metrology community.

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] OIML R85: Automatic level gauges for measuring the level of liquid in fixed storage tanks
- [2] Measuring Instrument Directive 2014/32/EU, on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments (recast)