

# RESEARCH AND STANDARDISATION

## RESPONSE FORM for Standardisation groups



### To contribute to *EMPIR - the European Metrology Programme for Innovation and Research* \*

**Objective: to collect standardization needs and suggestions to develop research projects in testing and measurements for the upcoming EMPIR calls (2019 and 2020)**

In the frame of the between CEN, CENELEC and EURAMET, CEN and CENELEC have been invited by the EURAMET Management to put forward their **testing and measurement needs in research** for consideration by metrology institutes for future calls under EMPIR.

**Relevant technical groups** (sector fora, advisory boards, coordination groups, TCs, WGs...) **are invited to contribute with**

- a short introduction or an overview paper of their unaddressed standardization needs for testing and measurement, and
- a contact person (secretary, chair, convenor, liaison officer, etc.) whom proposers for the Potential Research Topics can contact,

by using this Response Form and send it at :

STAIR EMPIR secretariat, Mr Ortwin Costenoble: [empir@nen.nl](mailto:empir@nen.nl)

Deadline for the consultation: **14 December 2018**.

*Proof of need by the TC/SC is highly recommended for a successful submission.*

<b>Source of the identified need</b> (identification of TC, WG, etc, incl. title)	<input type="checkbox"/> CEN/TC 0/WG 0 <input type="checkbox"/> CLC/TC 0/WG 0 <input type="checkbox"/> ISO/TC 0/SC 0 / WG 0 <input checked="" type="checkbox"/> IEC/TC 38 – Instrument Transformers <input type="checkbox"/> Other, namely <i>Identification, Title</i>
<b>European entity</b> responsible for submission of the need	<i>CEN/CLC TC38 Instrument Transformers</i>
<b>Person that can be contacted for more detail</b>	<i>Filippo Frugoni filippo@frugoni.it +39 049 5384606 Italy</i>
<b>Unaddressed need</b> (short description)	<u>Measurement methods and test procedures for assessing accuracy performance of Instrument Transformers intended to be used for Power Quality measurements.</u> <i>Many Standards are dealing with measurement methods of Power Quality (PQ) parameters and accuracy requirements for PQ measuring instruments, however although Instrument Transformers (IT) are essential devices for the evaluation of these phenomena, no standards about IT tests</i>

	<i>for accuracy when measuring these phenomena are available.</i>
<p><b>Further explanation of need</b> (TC business plan, road map, formal decision, work item, etc.)</p>	<p><b><u>Background:</u></b> <i>In recent years there is a growing request to measure frequency components of voltage and current at higher frequencies, even up to 150 kHz, mainly in power networks with the presence of renewable energy sources. There is a lack of standardization on such a topic.</i> <i>The clear need for standards that can be used to assess the performance of Instrument Transformers inserted into a measurement chain for Power Quality measurements was officially first addressed to TC38 in 2007 when TC38 received an enquiry from IEC SC77A (see Annex1), from which it was clear that the topic of the use of Instrument Transformers beyond the traditional frequency bandwidths was becoming very market relevant.</i> <i>IEC TC38 promptly reacted during its following meeting in Paris (see Annex2, point IX at page 7) establishing an Ad-Hoc Group (see Annex3) with the scope to prepare a publication. Such publication (IEC/TR 61869-103) was issued in 2012 with the title “The use of instrument transformers for power quality measurement”.</i> <i>This publication is just a survey of the existing knowledge and experience of manufacturers and users who volunteered to share their experience of measurements that anyway had been done on equipment beyond their specifications to explore their capabilities.</i> <i>Nothing more could be done because IEC has no resources to sponsor extensive researches to study test methods and measurement procedures.</i> <i>It was however immediately recognized that TR 61869-103 cannot in any way be used to qualify an Instrument Transformer for power quality applications, therefore a new Working Group was established (see Annex4) in 2012 with the scope to prepare the background for the future TC38 publication that can fill this gap.</i> <i>However this new WG suffered the same lack of resources as before, so this work was not completed so far.</i> <i>During the last meeting in Frankfurt some contributions have reported additional gaps in TC38 standards, such as the missing coverage of the effects of combined influencing factors in the present accuracy test requirements or the need to cover the high frequency passband feature of Instrument Transformers that is currently exploited for travelling wave relaying applications, without being specified anywhere in TC38 standards.</i> <i>It was therefore decided (see Annex5, decisions #22 and #25) to add these topics to the same WG47, in order to cover all these issues consistently.</i> <i>It is however clear that this WG needs additional resources to achieve these goals, as extensive tests and measurements need to be done. For this reason TC38 is looking for the contribution from Test Laboratories and Academic institutions.</i></p> <p><b><u>Planning:</u></b> <i>IEC TC38, during the last Plenary Meeting in Frankfurt, has</i></p>

*assigned the task to TC38/WG47 to establish Task Forces to study the topic of extend frequency response qualification of Instrument Transformers for PQ measurement and travelling wave relaying and to study the topic of effects of combined influencing factors on accuracy of Instrument Transformers. The deadline to produce a report is set to September 2020, to be presented at the next Plenary Meeting (see Annex6, item 9 at page 6).*

*Based on the results of this Report the standardization activity will be planned.*

#### **Detailed work items:**

*The main need is linked to the fact that the accuracy class is, at now, defined only at power frequency, but there is clear evidence in scientific literature that the errors, introduced by the ITs, in the measurement of other quantities than just the fundamental component at power frequency, exceed the limit for their own accuracy class.*

*In particular, some recent scientific literature demonstrates:*

- *the incidence of non-linearity of inductive ITs on harmonic measurement (errors of some percents in amplitude measurements)*
- *The effect of radiated electromagnetic fields on current LPIT*
- *The effect of temperature that can lead accurate ITs (mainly Current Transformers of class 0.2) to exceed the accuracy class also at power frequency*

*Currently, the only indications on possible setup for the frequency characterization of VT and CT for medium voltage application are provided by Technical report IEC/TR 61869-103, 2012.*

*Moreover, the WG 55 of TC38 is working on a technical specification IEC/IEEE TS 61869-105 regarding the uncertainty evaluation in the calibration of Instrument Transformers – the document is just for 50 Hz ITs.*

*Therefore, there is the need of a new standard that is focused on:*

- *defining test procedures to evaluate ITs (for low and high voltage application) performance used for Power Quality (PQ) measurements according to the limits reported in the main International Standards, like EN 50160, IEC 61000-4-30, IEC 61000-4-7;*
- *how to evaluate the uncertainty contribution of ITs to PQ indices;*
- *defining new parameters and indices for evaluating the accuracy of IT vs. harmonics, interharmonics and other PQ disturbances;*
- *proposing a synthetic performance index of ITs for PQ measurements;*
- *defining the requirements of the reference setups to calibrate ITs for PQ measurements;*
- *testing procedures and on evaluating the uncertainty in calibration of ITs for PQ;*

	<p>- <i>assessing the performance accounting for the contemporary presence of more than one influence factor such as 1) Temperature, 2) Different temperatures in different parts of the same device, 3) Adjacent phases, 4) Proximity effect, 5) Vibrations, 6) Electro Magnetic Interferences (EMI), 7) Industrial Frequency electric-magnetic fields.</i></p> <p><b><u>Connection with other organizations:</u></b>  <i>There is a direct link between these work items and the associated metrological issues.</i>  <i>The Italian Istituto Nazionale di Ricerca Metrologica (INRIM_ member of the Power&amp; Energy SC of the EURAMET TC Electricity and magnetism) is presently working on the development of methods and procedure for the characterization of inductive ITs and sensors for the measurement of grid voltage and current under actual conditions. There are customer requests to develop methods to perform measurements and procedures (see Annex7).</i></p>
<b>Enclosures</b>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

\*See more information at [EMPIR website](#)  
[CEN/CENELEC website "Standards and metrology"](#)