Roll-out of the programs

"Tests of Enclosures & Battery Testing – Test Round 2019"

1. Introduction

As a result of the IECEx meeting in Denver 2007, ExTAG WG10 received the mandate by ExTAG to check the possibilities of performing interlaboratory comparisons in the field of explosion protection. Interlaboratory comparisons are in general essentially required for accredited laboratories which work on the basis of standard ISO/IEC 17025 and - thus - also for the IECEx ExTLs. In Melbourne 2009, the convenor of ExTAG WG10 reported that - in respect of the importance and the good resonance in the IECEx family - PTB has launched a project team in this regard. In compliance with the requirements of standard ISO/IEC 17043, this team has developed a proposal for the concept of a Proficiency Testing Scheme within the scope of IECEx. In analogy with the internal policy of IECEx (peer assessments), it was suggested that PTB will act as a "(peer) coordinator" for this program.

The pilot phase with 44 participating laboratories was successfully completed in July 2012. The fruitful results and the positive resonance of the Ex community were the motivation to continue the PTB Ex Proficiency Testing Scheme. In the following six years the six further programs / test rounds "Temperature Classification", "Flame Transmission", "Electrostatic Charge", "Intrinsic Safety", "Pressurized Enclosures" and an updated "Explosion Pressure" have been successfully completed. In total 96 laboratories have been participated in these programs so far.

During the IECEx meeting in The Hague in September 2014 it was decided, that all accepted and applicant IECEx ExTLs and their associated laboratories are obligated to participate in a Proficiency Testing Program specifically designed for Ex safety protection methods (ExMC/976/RM - The Sixteenth Meeting of the ExMC held in The Hague, Netherlands 28th and 29th August 2014 - Draft Formal Minutes; Decision 2014/53). Furthermore, IECEx appointed PTB as the IECEx Proficiency Testing Program Provider officially (ExMC/1181/DL - The Eighteenth Meeting of the ExMC
held in Umhlanga, South Africa 8th and 9th September 2016 - Confirmed List of Decisions; Decision 2016/59).

Based on the input from participating laboratories, PT workshop participants and PTB experts and the discussion at the IECEx meeting in Cannes 2018, the members of ExTAG agreed on the two next programs / test rounds for the cycle 2019/2020. As a result, the new programs "Tests of Enclosures" and "Battery Testing" are being launched for Test Round 2019. All ExTLs, ExTL applicants and other Ex laboratories which meet the requirements of ISO/IEC 17025 are invited to participate in these programs. Additionally, manufacturers with own testing facilities are welcome as well.

2. Objectives and Purposes

Participation within an Ex Proficiency Testing Scheme is essential for the compliance with the requirements of ISO/IEC 17025 and IECEx laboratory assessment requirements regarding the need of the Ex laboratories to perform interlaboratory comparisons. In addition, the results of Ex PT programs will contribute considerably to the development of the "Peer concept" within the global community of Ex laboratories. With the practical experience gained in its performance, the PTB Ex Proficiency Testing Scheme shall be further developed and improved (continuous improvement process). The vision is to

extend the PT scheme step by step to all fields of conformity assessment (not only testing) within the scope of the IEC/TC 31 standards.
The results of this Ex Proficiency Testing Scheme will also be of direct use for all participants, among others for:

- proving the competence to
  - customers,
  - regulators, and
  - end users
- the identification and avoidance of problems in and between the test laboratories and the initiation of measures for improvement
- the establishment of the effectiveness and comparability of the applied testing and measurement methods
- the provision of additional confidence to the customer
- the avoidance of distortions of competition between the manufacturers as the customers of the test laboratories
- promotion of the “fair play” culture.

The implementation of this Ex PT scheme will allow to detail test methods (required by the applicable IEC standards) in “Best Practice Papers” realized as ExTAG Decisiosn Sheets (to be published on the IECEx website), providing continuous improvement of the performance of the IECEx system.

3. Programs

For performing the programs, the individual routine procedure of each test laboratory needs to be applied (used every day for achieving the test results for real projects). The general routine procedure is described by the basic standards of the applicable type of protection. This means that the basic standard of the respective type of protection must also be used as a basis when the quantities to be compared (measurands or characteristics of interest) are selected, i.e. IEC 60079-0 and IEC 60529 for program “Tests of Enclosures” and IEC 60079-11 for program “Battery Testing”. Additionally, detailed guidance in terms of a procedure instruction will be provided how to perform the tests together with the artificial test samples.

3.1. Tests of Enclosures (“TE”) - Test Round 2019

For the program “Tests of Enclosures (“TE”) - Test Round 2019” the general routine procedure is described by the standard “Explosive atmospheres - Part 0: Equipment – General requirements” - IEC 60079-0, Edition 7.0 and “Degrees of protection provided by enclosures (IP Code)” - IEC 60529, Edition 2.2.
Enclosures used in the field of explosion protection must meet certain criteria and be subjected to certain tests. These tests are defined in the standards mentioned above. Essential characteristics for testing and assessing explosion protection are tests on enclosures for resistance to impact and for protection of the equipment inside the enclosure against ingress of solid foreign objects (dust) and water. Therefore, compliance with the degree of protection (IP) has been selected as the characteristic of interest which is to be compared in the program “Tests of Enclosures - Test Round 2019”. Next to this characteristic of interest, other aspects like “how to perform the thermal endurance test” and the comparison of test conditions during the performance of tests will be analyzed. Due to the better practicability of the program, a selection of enclosure tests is carried out which are partly shortened or modified.

3.1.1. Test Sample “TE”

The Test Sample “TE” (see Figure 1) consists of 12 prepared empty enclosures with the outer-dimensions 170 mm x 170 mm x 91 mm (H x W x D). The simple design and homogeneity tests guarantee homogeneity and stability during the whole test round. In addition, the selected design of the test sample offers convenient manufacturing, preparation and transport possibilities. To ensure comparability and homogeneity, all Test Samples “TE” are completely produced, prepared and provided by the coordinator in cooperation with a manufacturer for terminal boxes.
Detailed information and specifications regarding the test sample are described in the “Procedure Instruction of Program Tests of Enclosures - Test Round 2019”, which will be published at a later date.

Figure 1: Exemplary Test Sample „TE”

3.1.2. Test method

In the program, 12 empty enclosures prepared in different ways will be provided. 9 of them will be tested regarding thermal endurance in accordance with IEC 60079-0, Clause 26.8/26.9 before the resistance to impact test according to IEC 60079-0, Clause 26.4.2 will be performed. After that all 12 empty enclosures will be evaluated regarding compliance with the degree of protection (IP54) using IP tests (IEC 60079-0, Clause 26.4.5 using IEC 60529, Clause 13/14).

The test method for program “TE” consists of three parts:

1. (Shortened) tests of thermal endurance according to IEC 60079-0, Clause 26.8/26.9.
2. Resistance to impact test according to IEC 60079-0, Clause 26.4.2.
3. IP test (IP 54) according to IEC 60079-0, Clause 26.4.5 using IEC 60529, Clause 13/14

The workload to perform this program is approximately 3 working days (separated by additional waiting periods due to thermal endurance tests and IP testing).
Detailed information and specifications regarding the test method are described in the “Procedure Instruction of Program Tests of enclosures - Test Round 2019”, which will be published at a later date.

3.2. Battery Testing (“BT”) – Test Round 2019

For the program “Battery Testing (“BT”) - Test Round 2019” the general routine procedure is described by the standard “Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"” - IEC 60079-11 Edition 6.
The constantly advancing digitalization and networking of processes and applications in the field of explosion protection is leading to new challenges regarding mobility. As a result, the number of batteries and cells that supply energy for mobile devices is also rising significantly. These batteries and cells are often used in devices of the type of protection “intrinsic safety” and must be tested in accordance with the standard mentioned above. Essential characteristics for testing and assessing explosion protection are the maximum surface temperature and the internal resistance of batteries and cells. Therefore, the maximum surface temperature and the internal resistance have been selected as the measurands / characteristics of interest which are to be compared in the program “Battery Testing - Test Round 2019”.

3.2.1. Test sample “BT”

The test sample is a long-lasting primary cell with type IEC LR6 (see Figure 2).

Figure 2: Exemplary Test Sample “BT”

Based on the one-way test for each battery, 13 samples for each phase (a total of 26 samples for Phase I and Phase II) will be provided by the coordinator at the beginning of the program. To ensure comparability and homogeneity, a sufficient number of samples is tested by the coordinator regarding statistical requirements to estimate the characteristics of the whole population.
Detailed information and specifications regarding the test sample are described in the “Procedure Instruction of Program Battery Testing” which will be published at a later date.

3.2.2. Test method

In the program, 13 batteries are available for each phase. Therefrom 3 batteries are intended to be used for individual preliminary tests and 10 batteries are for the program testing. During the testing each battery shall be connected with a short-circuit test setup usually used in the participating laboratory (see Figure 3). The maximum short-circuit current and the maximum surface temperatures of the battery are determined according to clause 10.5.3 of IEC 60079-11. To calculate the minimum value of internal resistance, the most onerous value of short-circuit current from a test of 10 batteries together with the peak open-circuit voltage in accordance with 7.4.3 is used.

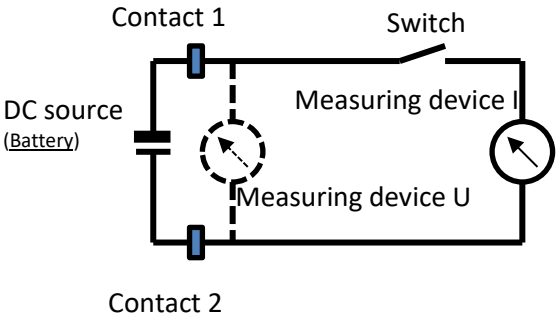


Figure 3: Principle of test setup

The tests for program “BT” consist of three parts:

1. Determination of maximum surface temperature according to IEC 60079-11, clause 10.5.3.
2. Determination of maximum short-circuit current according to IEC 60079-11, clause 10.5.3
3. Calculation of internal resistance of battery according to IEC 60079-11, clause 10.5.3.

Time required for the performance of the program will be approximately 3 working days.
Detailed information and specifications regarding the test method are described in the “Procedure Instruction of Program Battery Testing - Test Round 2019” which will be published at a later date.

4. Results

All test results, data and information will be recorded and archived by the coordinator. PTB provides access to the database by a website which also will be used for other communication, e.g. publication of the results. The system guarantees total confidentiality for the handling of all relevant data. The test results forwarded by the participants to the Ex PT coordinator must always be original data (no edited curves, summarized tables, etc.). All analysed and evaluated participant-related test results are foreseen to be published within the group of participants after approval from those laboratories being involved in the programs. All results will be published in an anonymous way. After accomplishment of the programs, the coordinator will elaborate a report in compliance with the requirements of ISO/IEC 17043, clause 4.8 for each program.
Detailed information and specifications regarding the data analysis and evaluation of the results are described in the respective “Procedure Instruction” and the reports of the programs which will be published at a later date.

5. Scheme website

The organization, communication and coordination of all processes of the PTB Ex Proficiency Testing Scheme will be based on a specific information system. The information system has been developed by PTB and made available as a website. Data security and confidentiality are guaranteed by an access-protected data base. The system represents a comprehensive information base for all participants, it serves as a basis for the complete data exchange within the scope of the PTB Ex Proficiency Testing Scheme. PTB is the administrator of this Internet platform. At the beginning of the test rounds, each participant will get access to the internet platform. Thus access to all detailed information, descriptions and data for the performance of the programs of the PTB Ex Proficiency Testing Scheme is provided.
Detailed information and specifications regarding the handling instructions for the website are described in the respective “Procedure Instruction” of the program which will be published at a later date.

6. Information for Participation

6.1. Time Schedule

It is intended to conduct both programs “Tests of Enclosures– Test Round 2019” and “Battery Testing - Test Round 2019” in 2019/2020. Please find enclosed the detailed time schedules (see Annex A).

6.2. Costs of participation

The basic costs of the PTB Ex Proficiency Testing Scheme (e.g. concept development of the programs and related test samples, manufacturing of the samples, evaluation procedures of the results) are covered by PTB. Nevertheless, PTB cannot cover all expenses caused by the various programs, offered every two years. The PTB Ex PT Scheme is not organized like a commercial provider; it is using instead the non-profit approach in cooperating with the non-profit registered association (e.V.) “Ex Network e.V.” in order to process financial transactions. The association works under financial supervision of the local tax authority of the City of Braunschweig. PTB as governmental organization is allowed to receive financial resources from the Ex Network e.V. under the umbrella of a cooperation contract with the scope of offering and conducting Ex proficiency testing programs. The costs for the PT programs within the PTB Ex PT Scheme are as follows:

- **Participation in the PTB Ex PT Scheme is considered as a subscription with annual costs of 3000 € (value added tax excluded) for each participant.**

To avoid a high level of bureaucracy, every laboratory which is requested to participate in the PTB Ex PT Scheme (IECEx ExTLs, ExTL Applicants and Additional Testing Facilities (ATFs)) will receive an invoice after registration at the beginning of each two-year cycle (6000 € each two years) which allows the participating laboratory to perform both new PTB Ex PT program test rounds provided by the coordinator (two new program test rounds every two years). It also allows to perform two previous PTB Ex PT program test rounds which do not have the status “closed”. The chosen program test rounds must be completed within the respective two-year cycle.
Laboratories which are not required to participate in the PTB Ex PT Scheme with a limited scope shall contact the coordinator directly to find an individual solution.
Every financial transaction will be confirmed by the coordinator. Payment deadlines are announced with the invoice or in direct contact with the participant. Non-payment or late payment may result in test samples and/or reports not being distributed.

The invoices will be sent out after registration of the laboratories. Payment will be confirmed together with the “Confirmation of Participation”. The participant confirms to agree with these conditions by emailing us the signed “Declaration of Participation”.

6.3. How to participate

The interested ExTLs, ExTL applicants and other Ex laboratories will confirm their participation by completing the respective forms enclosed as Annex B and send them back to PTB in accordance with the schedule

before 2019-04-15.

The coordinator will confirm the receipt of the declaration of participation accordingly. The programs are considered as two separate programs, so it is possible to participate in both programs or in just one of them.

6.4. Contact

6.4.1. Coordinator:

Physikalisch-Technische Bundesanstalt (PTB)
Bundesallee 100
D-38116 Braunschweig

Tim Krause M. Eng.
Convenor IECEx ExTAG WG10
E-Mail: tim.krause@ptb.de
Phone: (+49)531-592-3540

6.4.2. Person to be contacted for general questions and organization:

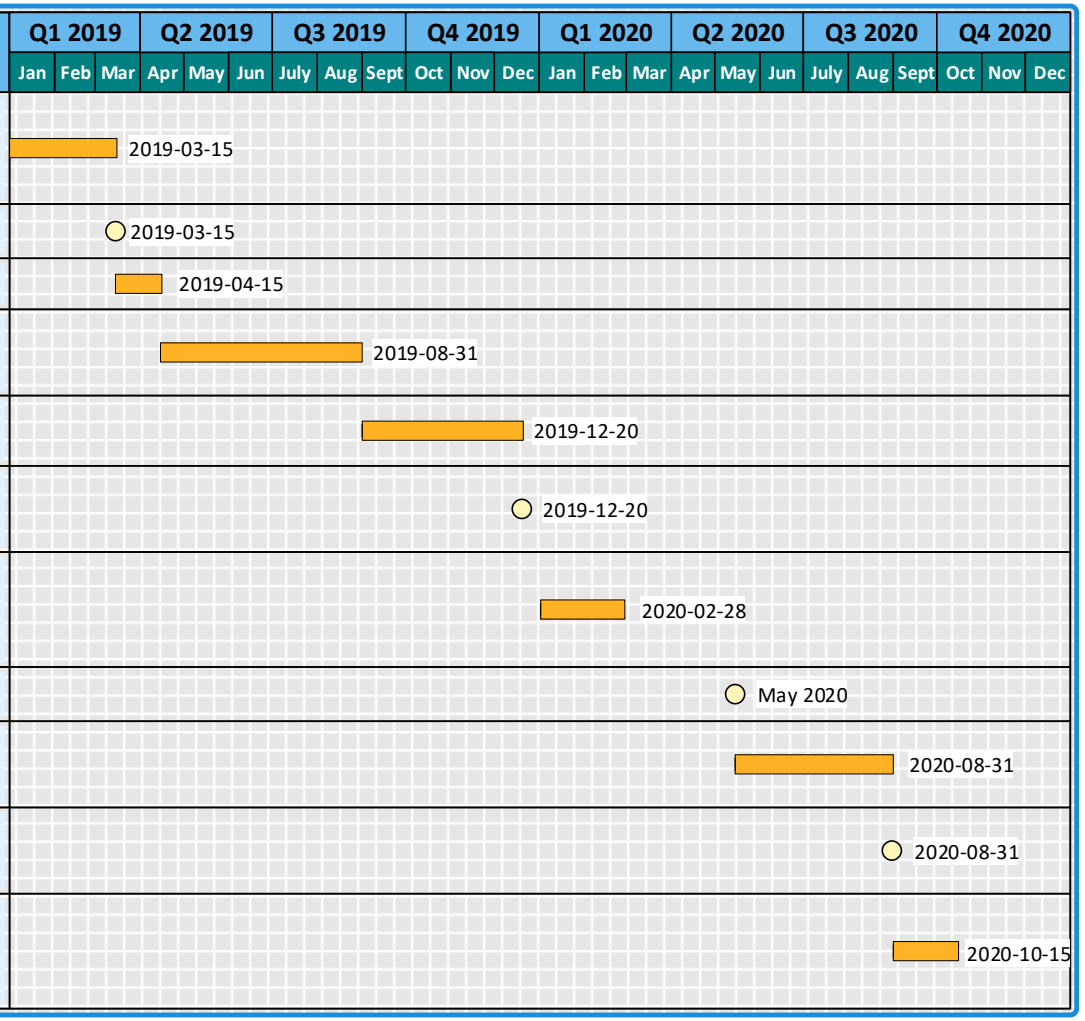
Harun Kanbur B.Eng.
E-Mail: Ex-proficiency-testing@ptb.de; (Harun.Kanbur@ptb.de)
Phone: (+49)531-592-3554

Jia Wu M. Eng.
E-Mail: Ex-proficiency-testing@ptb.de; (Jia.Wu@ptb.de)
Phone: (+49)531-592-3548

ANNEX A

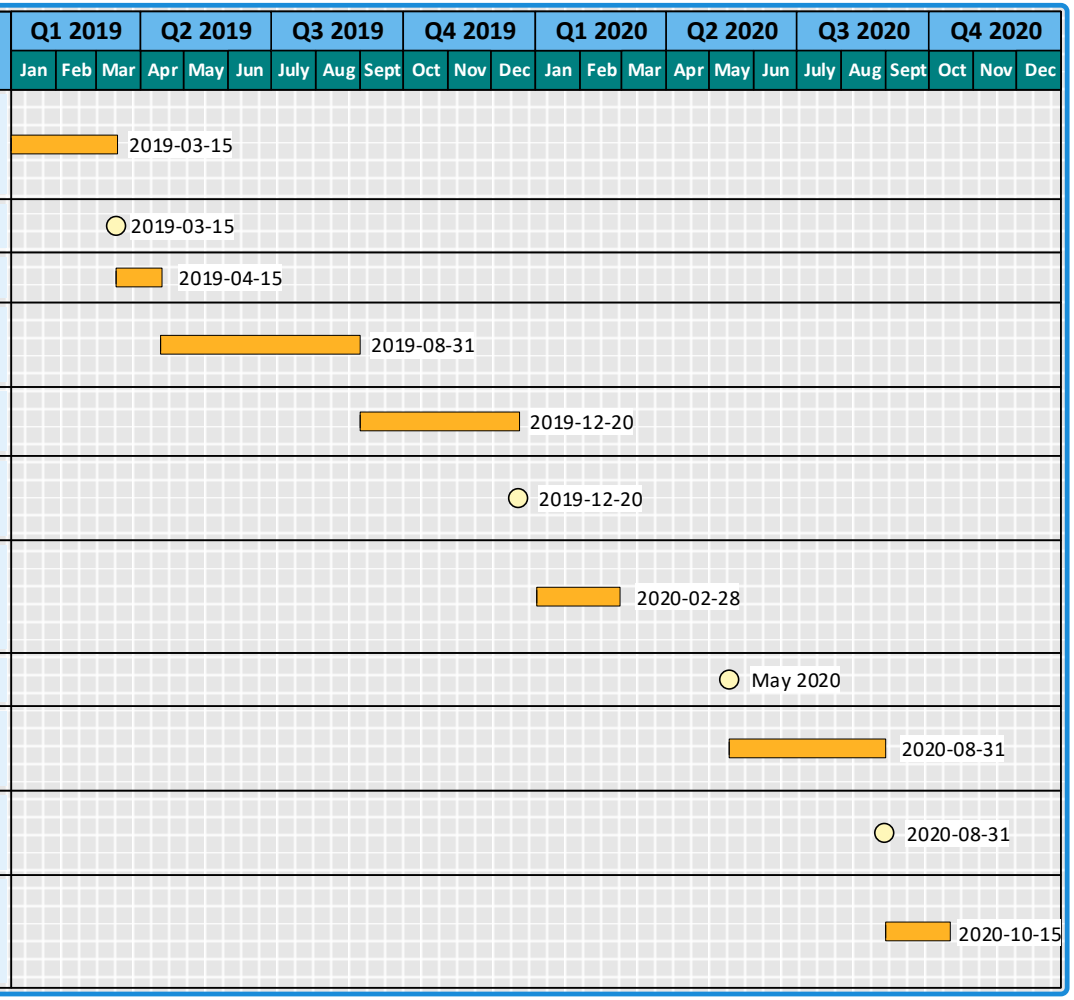
Overview of the time schedule for program “Tests of Enclosures– Test Round 2019”

No.	Task
1	Development of program “Tests of Enclosures – Test Round 2019“ and preparation of the prototype test sample by the coordinator
2	Roll out of program “Tests of Enclosures – Test Round 2019“
3	Registration phase for participation
4	Preparation and shipment of the test samples to the participants
5	Performance of the tests of Phase I and forwarding of the results to the coordinator
6	Deadline for uploading the test results of program “Tests of Enclosures – Test Round 2019“ Phase I
7	Evaluation and publication of the test results of program “Tests of Enclosures – Test Round 2019“ and release of the interim report
8	Workshop at PTB
9	Performance of the tests of Phase II and forwarding of the results to the coordinator
10	Deadline for uploading the test results of program “Tests of Enclosures – Test Round 2019“ Phase II
11	Evaluation and publication of the test results of program “Tests of Enclosures – Test Round 2019“ and release of the final report



Overview of the time schedule for program “Battery Testing – Test Round 2019”

No.	Task
1	Development of program “Battery Testing – Test Round 2019“ and preparation of the prototype test sample by the coordinator
2	Roll out of program “Battery Testing – Test Round 2019“
3	Registration phase for participation
4	Preparation and shipment of the test samples to the participants
5	Performance of the tests of Phase I and forwarding of the results to the coordinator
6	Deadline for uploading the test results of program “Battery Testing – Test Round 2019“ Phase I
7	Evaluation and publication of the test results of program “Battery Testing – Test Round 2019“ and release of the interim report
8	Workshop at PTB
9	Performance of the tests of Phase II and forwarding of the results to the coordinator
10	Deadline for uploading the test results of program “Battery Testing – Test Round 2019“ Phase II
11	Evaluation and publication of the test results of program “Battery Testing – Test Round 2019“ and release of the final report



ANNEX B

Program "Tests of Enclosures– Test Round 2019"

Declaration of participation

Information about the participant:

Test laboratory:		
Contact person:	**First name:**	
	Surname:	
Phone:		
E-mail:		
(if required) Additional E-mail addresses for "cc":		

Dispatch address for the test sample:

Address:	
ZIP/Postal code:	
City:	
Country:	

Billing address (only to be filled in if different from dispatch address):

Address:	
ZIP/Postal code:	
City:	
Country:	

VAT-ID (if available):	

With the signature we confirm our participation in the PTB Ex Proficiency Testing Program “Tests of Enclosures– Test Round 2019” of the PTB Ex Proficiency Testing Scheme and agree to the following conditions:

In the scope of the PTB Ex Proficiency Testing Scheme test samples will be shipped to the participants of the scheme, in order to perform interlaboratory comparisons. The test objects were developed and prepared at PTB for the PT programs and are made available at the own risk of the participating test laboratories.

PTB assumes no responsibility whatsoever for the use of the test samples by the participants and makes no guarantees, expressed or implied, about its quality, reliability, safety, suitability or any other characteristic. As far as legally permitted PTB refuses any liability for any direct, indirect or consequential damage arising in connection with the use of the test samples. The participants shall bear the risk of the use of test samples and of their internal work. German law shall apply.

PTB will bear the cost for the shipment of the test samples to the participants (CPT airport). The participants shall take on the responsibility for the costs for the return shipment and for all the processes that are involved with the shipment to and from the participant including organisation and coordination of the pre- and on-carriage as well as customs clearance.

The test samples are provided for the use within the PTB Ex PT Scheme. It is not intended to use the test samples for other purposes.

Date: _____ Signature: _____

The completed “Declaration of participation” for the PTB Ex Proficiency Testing Program “Tests of Enclosures - Test Round 2019” must be returned to the coordinator (e-mail: ex-proficiency-testing@ptb.de) by 15st April 2019 at the latest.

The receipt of the “Declaration of participation” will be confirmed by the coordinator.

Program “Battery Testing – Test Round 2019”

Declaration of participation

Information about the participant:

Test laboratory:		
Contact person:	**First name:**	
	Surname:	
Phone:		
E-mail:		
(if required) Additional E-mail addresses for “cc”:		

Dispatch address for the test sample:

Address:	
ZIP/Postal code:	
City:	
Country:	

Billing address (only to be filled in if different from dispatch address):

Address:	
ZIP/Postal code:	
City:	
Country:	

VAT-ID (if available):	

With the signature we confirm our participation in the PTB Ex Proficiency Testing Program “Battery Testing – Test Round 2019” of the PTB Ex Proficiency Testing Scheme and agree to the following conditions:

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