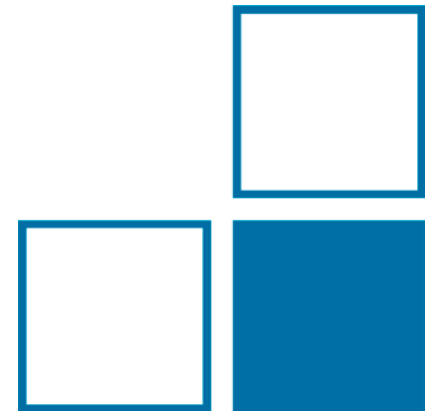


# Outcome of Ex Proficiency Testing Programs

Results and Best Practice of Programs „Intrinsic  
Safety“ and „Electrostatic Charge“

Lisa Zater, Washington D.C. 09/25/2017,  
IECEX ExTAG Training Workshop



“Explosion Pressure –  
Test Round 2010“



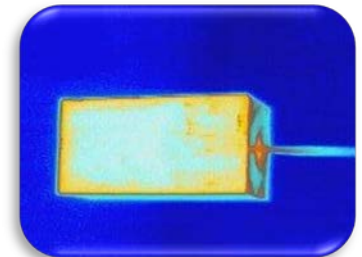
“Spark Ignition“



“Flame Transmission“



“Temperature Classification“



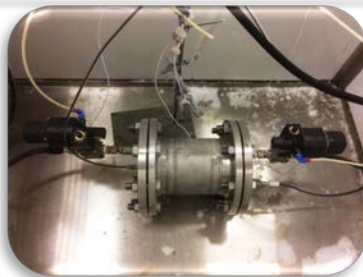
“Electrostatic  
Charge“



“Intrinsic Safety“



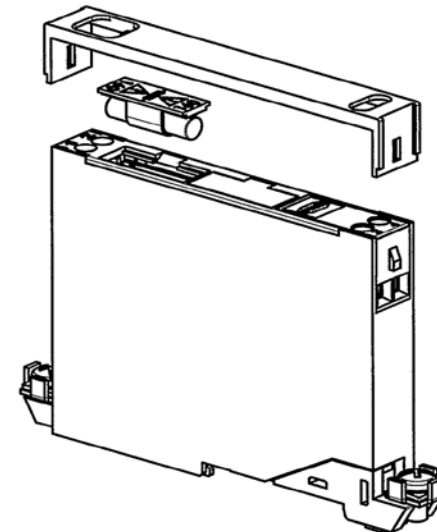
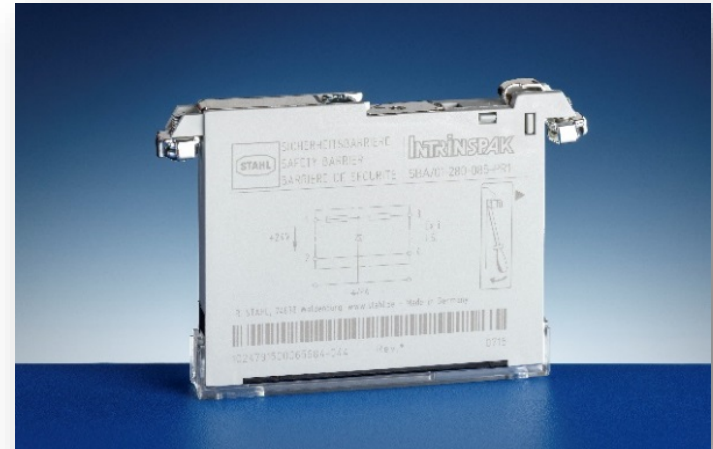
“Explosion Pressure –  
Test Round 2017“



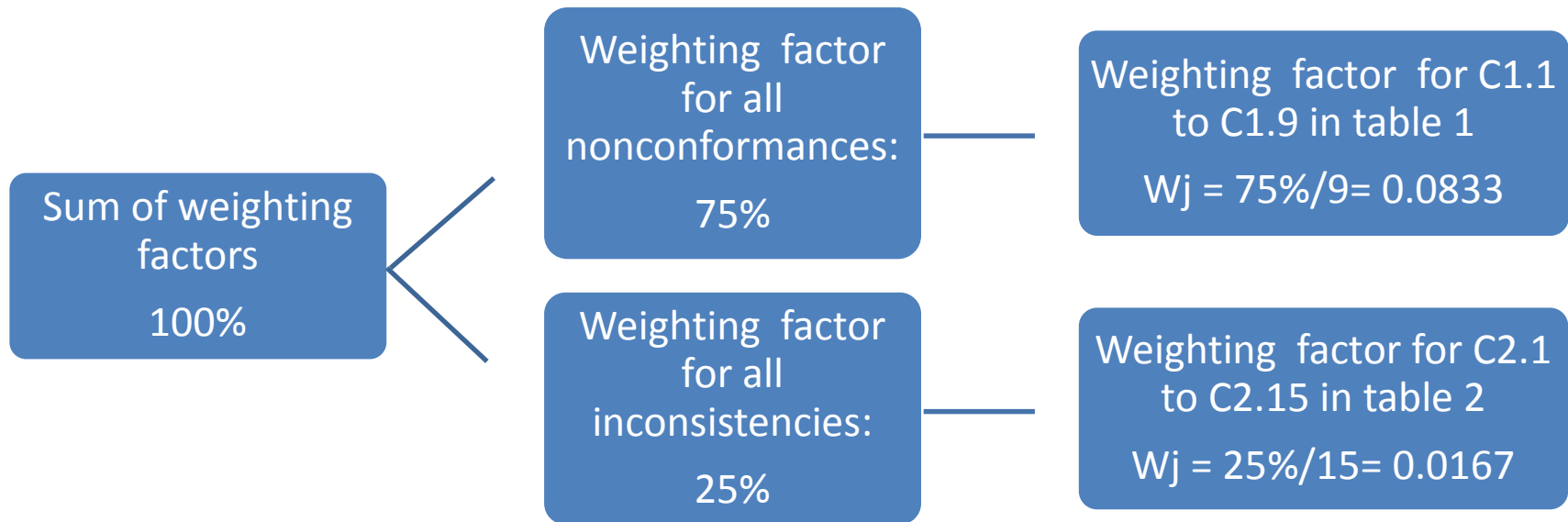
“Pressurized  
Enclosure“



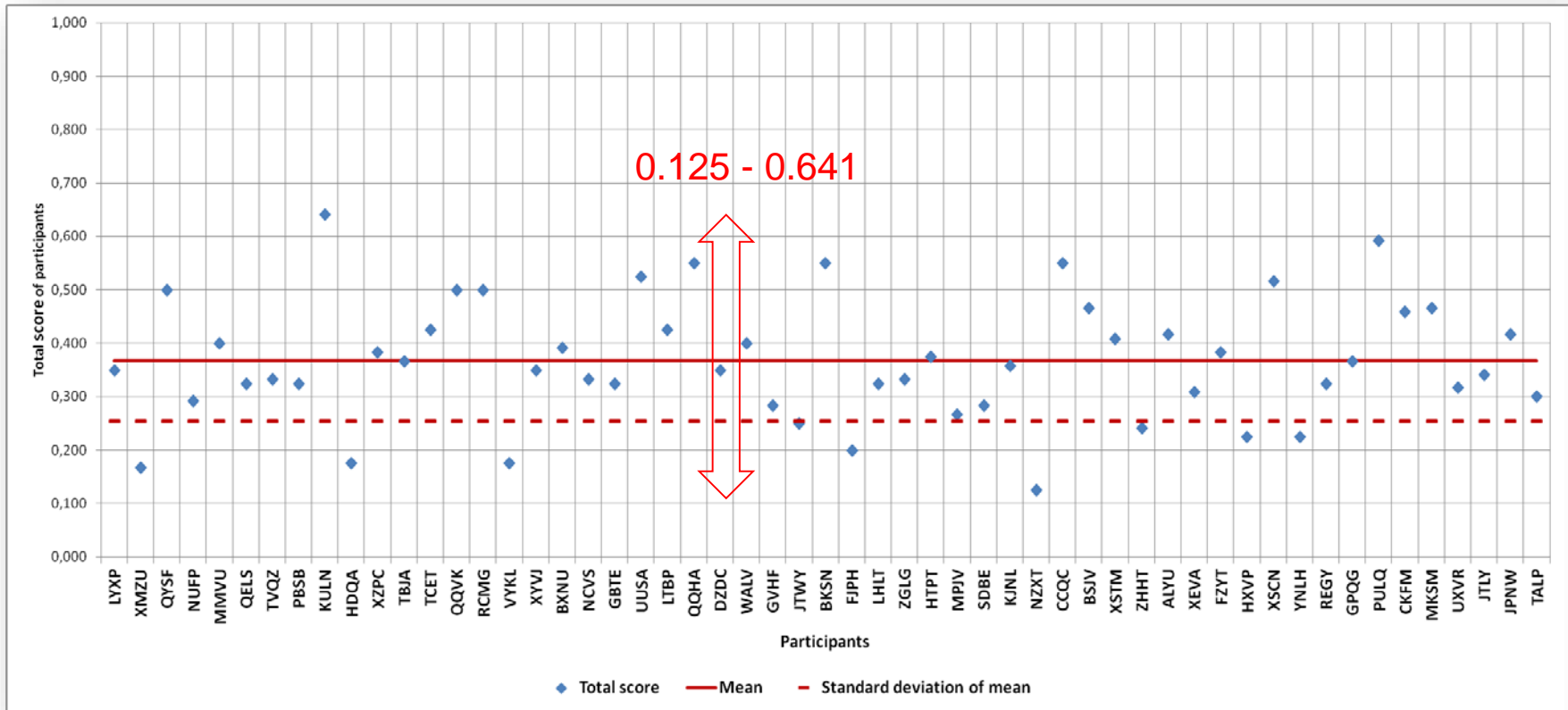
- Normative background:  
IEC 60079-0 and IEC 60079-11
  
- Characteristic of interest:  
Nonconformances and inconsistencies
  
- Principle: Identification of  
nonconformances and inconsistencies  
in the documentation of a safety barrier
  
- Scope: Assessment according to the  
respective standards on the basis of  
the given documentation and  
presentation object (no practical test  
required)



## Participants' results – Determination of weighting factors



## Participants' results – total score



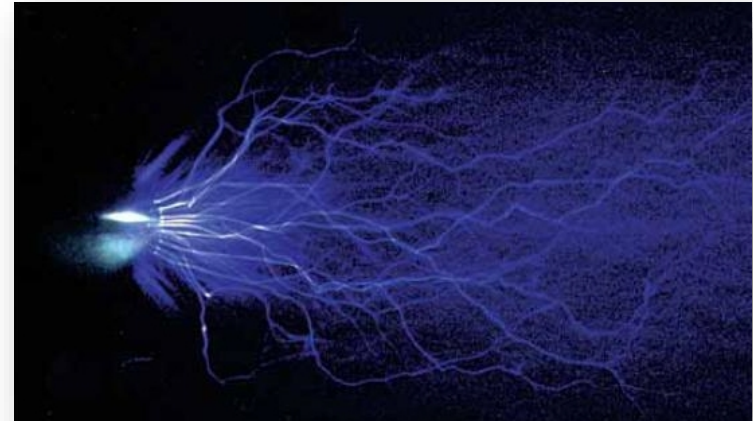
## Outcome of the “Intrinsic Safety” program

- “IS” program no common proficiency test (neither practical test, nor actual measurand)
- Results and discussions during workshop have shown large scope for interpretation of standard



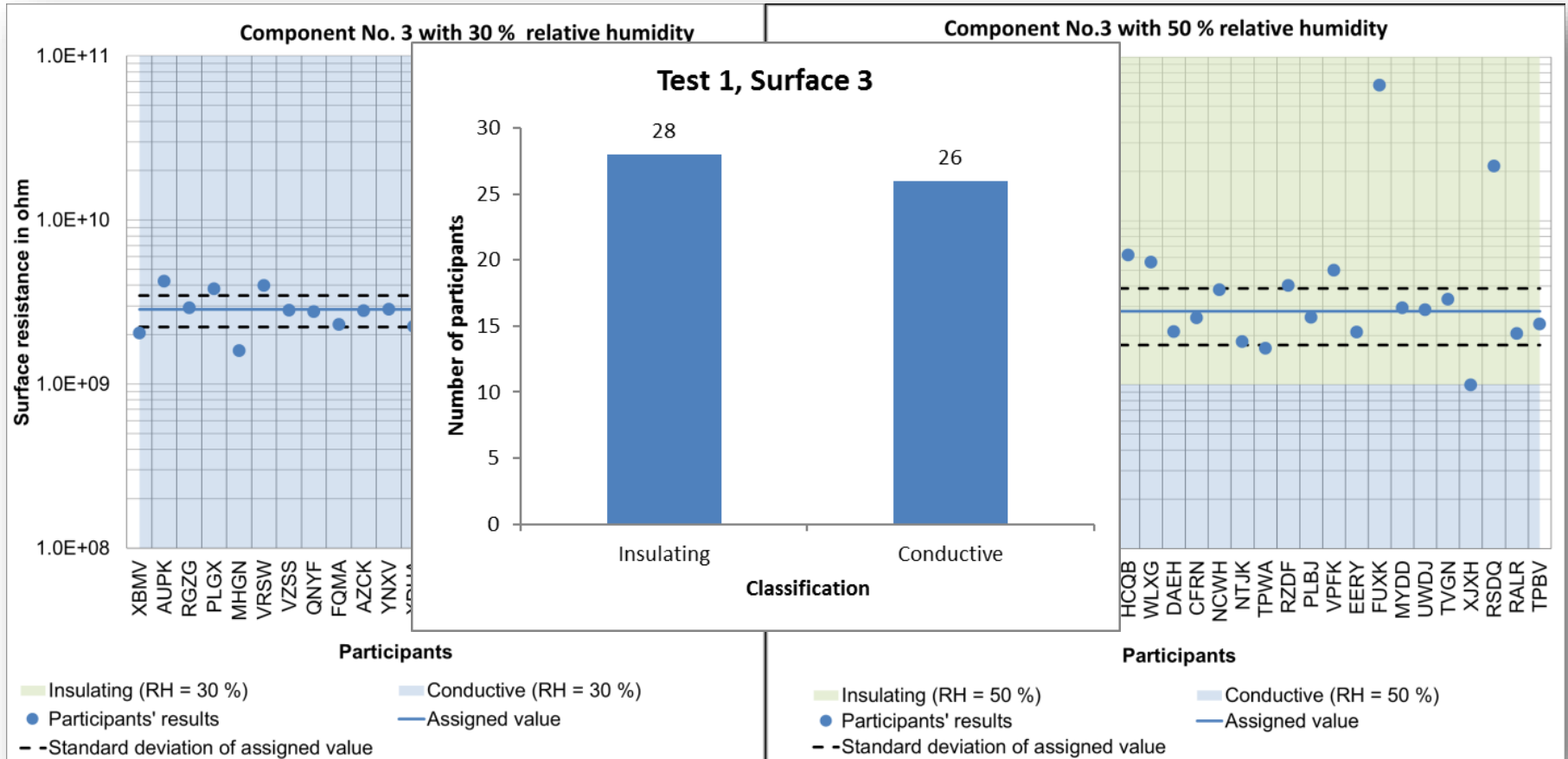
→ Summarized best practice is not possible

- Normative background:  
IEC 60079-0 and IEC 60079-32-2
- Measurand of interest: Surface resistance (partly optional) and transferred charge (optional)
- Principle: Performance of “surface resistance” and “transferred charge” tests on test samples according to the respective standard
- Scope of testing: Measurements on six single components and a resistance box





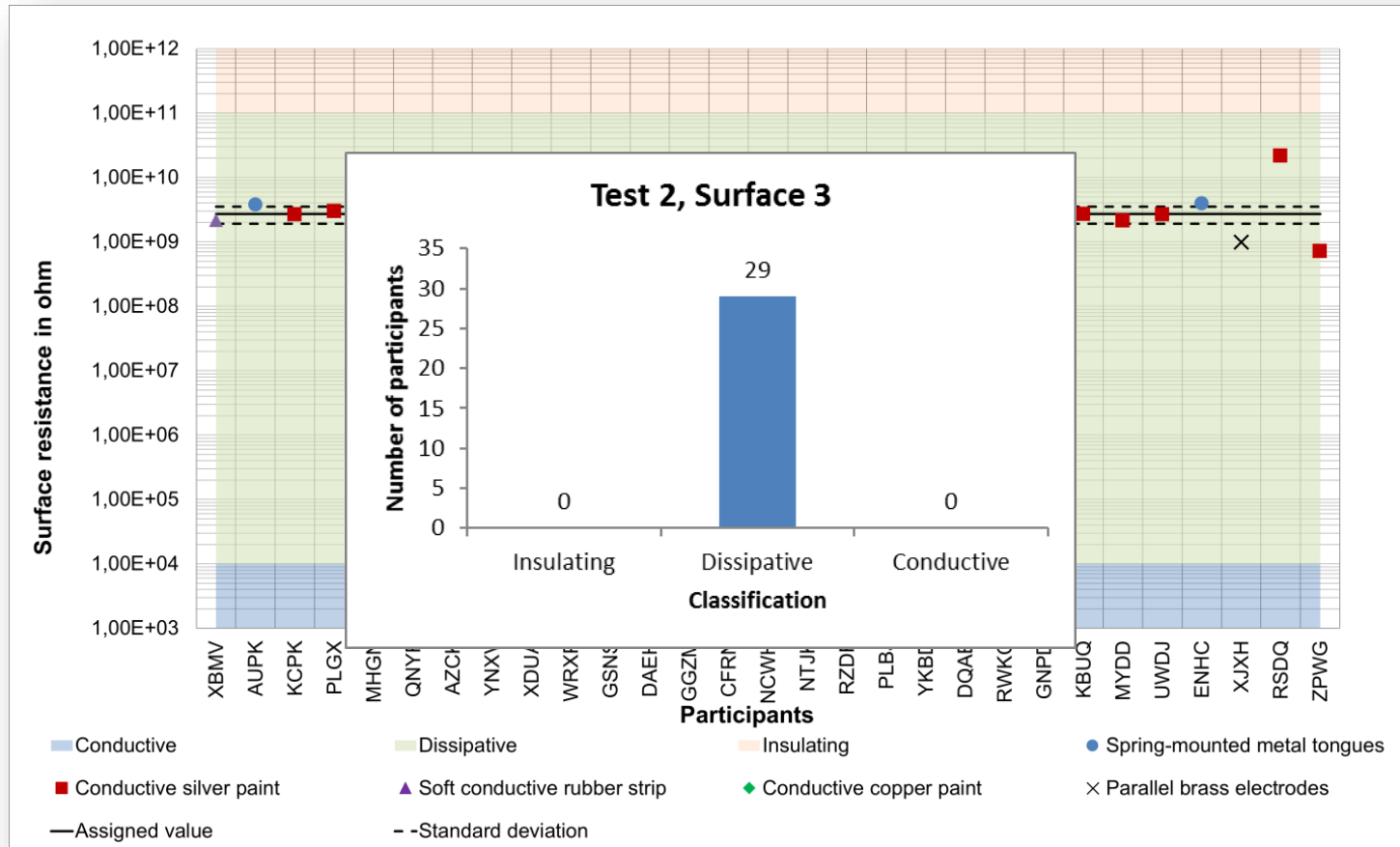
## Test 1 - Component no. 3 - Foam mat cutting



→ The classification depends on the relative humidity

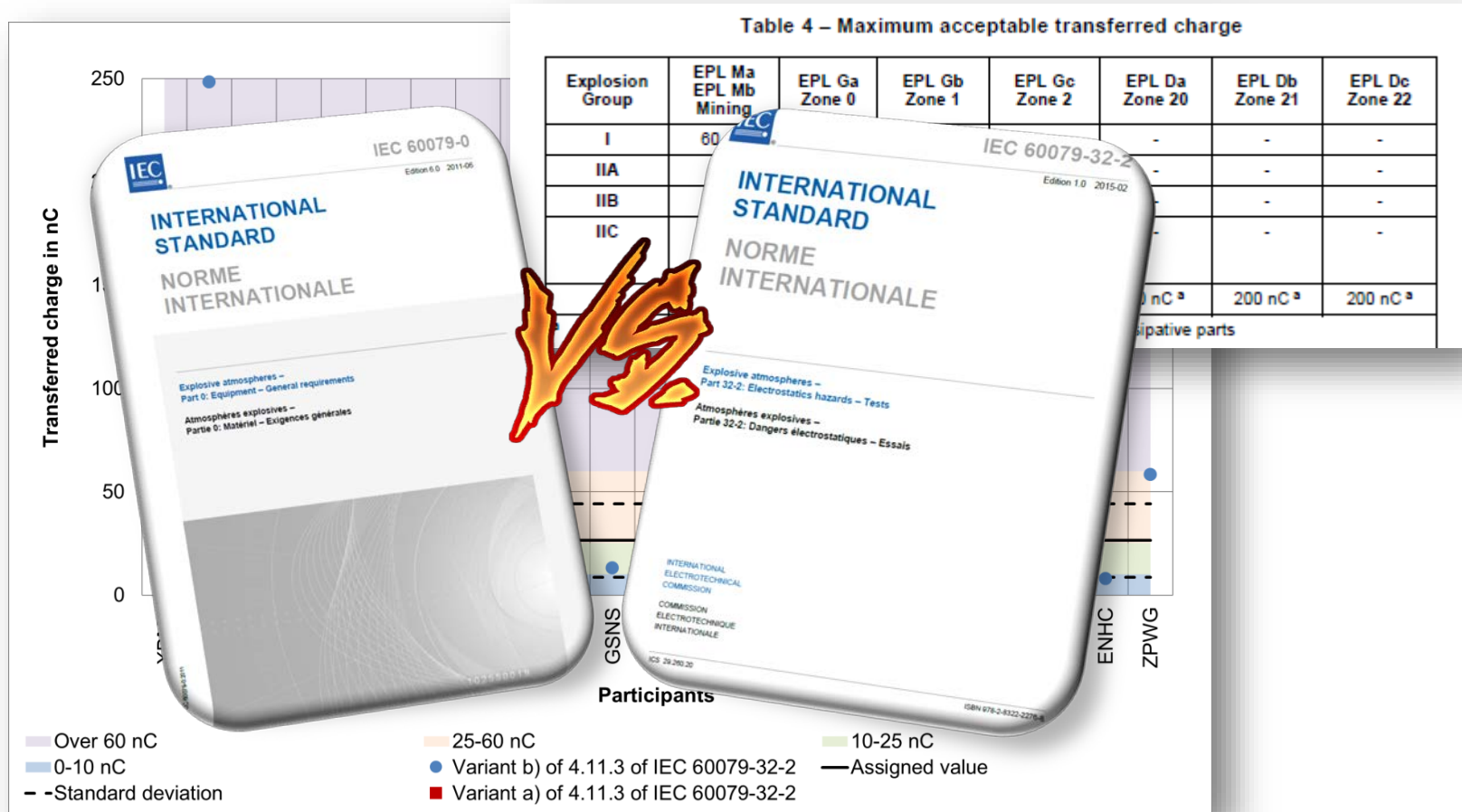


## Test 2 - Component no. 3 - "Foam mat cutting"



→ IEC 60079-32-2 (2015): 100 % of participants classified as dissipative

## Test 3 - Component no. 5b - "Blow-molded part cutting (Side 2)"



→ IEC 60079-0 (2011): 89 % of participants classified as insulating

→ IEC 60079-32-2 (2015): 83 % of participants classified as suitable for limited use



What is the use of the outcome of the PTB Ex PT programs?

→ Improvement of standardization

→ Discussion material for specialized conferences

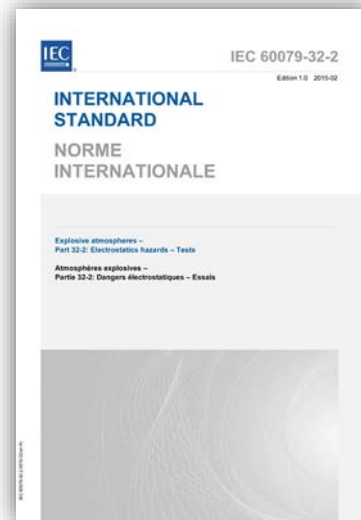
→ Publications

→ Best Practice Paper



## Best practice for the measurement of surface resistance and transferred charge:

- **In general:** Critical analysis and plausibility check of all measured results
- In principle, **IEC 60079-32-2** gives applicable information for best practice



Best practice for **preparation**:

- **Preparation** of test sample:

Cleaning by brush (Solvent leaves a dissipative residual layer)

- **Ambient conditions:**

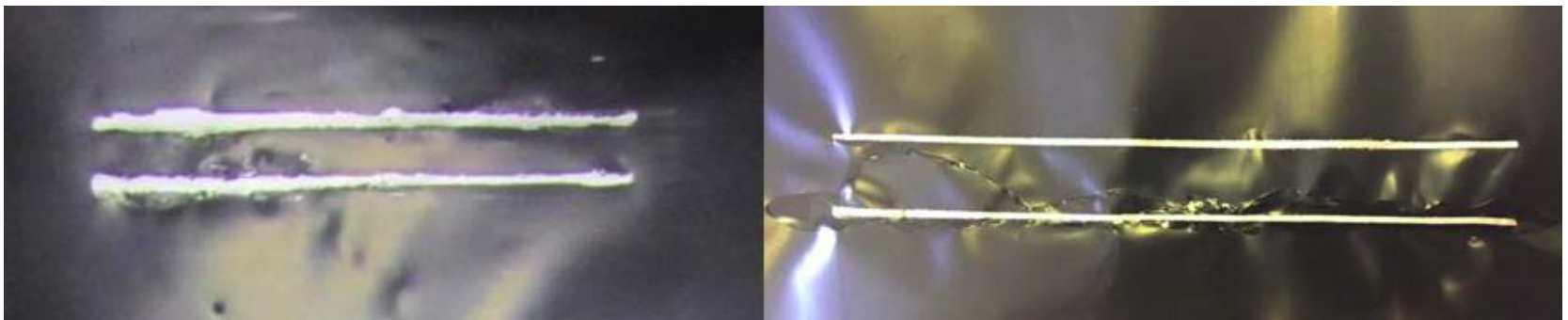
Should comply with applied standard:

→ Surface resistance decreases with increasing temperature and increasing relative humidity

Best practice for **surface resistance** measurement:

- **Type of electrode**

- IEC 60079-0: silver paint (application through stencil)
- IEC 60079-32-2: preferably soft conductive rubber or foam strip electrodes



→ Chem. reaction of the silver paint (acetone, toluene) with the material's surface

Best practice for **surface resistance** measurement:

- As **ground material** the sample should be placed on insulation pad with surface resistance  $> 10 \text{ T}\Omega$ 
  - prevents unintentional current path → lower surface resistance
- Taking the **readings** from the measuring instrument:  
Values should be observed over a period of time.
- **Time period** of measurement:
  - IEC 60079-0:  $(65 \pm 5) \text{ s}$
  - IEC 60079-32-2:  $(65 \pm 5) \text{ s}$
  - However, values should be observed over a period of time.



Best practice for **transferred charge** measurement:



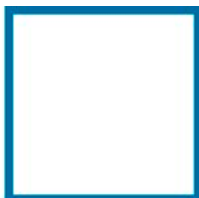
- As **ground material** a common wooden table or a table made of MDF (medium density fiberboard) with insulating (powder-) coating should be used
  - prevents propagating brush discharges
- Sample should be **lifted** after charging with an insulating clamp or glove
  - prevents charge being lost through the human body

Best practice for **transferred charge** measurement:



- **Touching** the sample with the coulombmeter during measurement should be avoided
  - Otherwise charge, which is not available for discharge, will be added
  
- **Calibration** of coulombmeters
  - Test values of coulombmeter should be corrected according to GUM (Guide to the Expression of Uncertainty in Measurement )
    - Most coulombmeters use a one point calibration (normally at 60 nC) which leads to an underestimation of values below 60 nC → safety relevant false results

- The **interpretation** and evaluation of the results as well as standards strongly depend on the type of the PT program
  
- **Differences in between IEC 60079-0 and IEC 60079-32-2:**
  - The classification can vary depending on the applied standard
  - Antistatic surface properties may not be identified when using IEC 60079-0
  
- **Outcome** of the programs is useful on many levels: standardization, specialized conferences, publications, improvement of best practice and for the publication of Best Practice Papers



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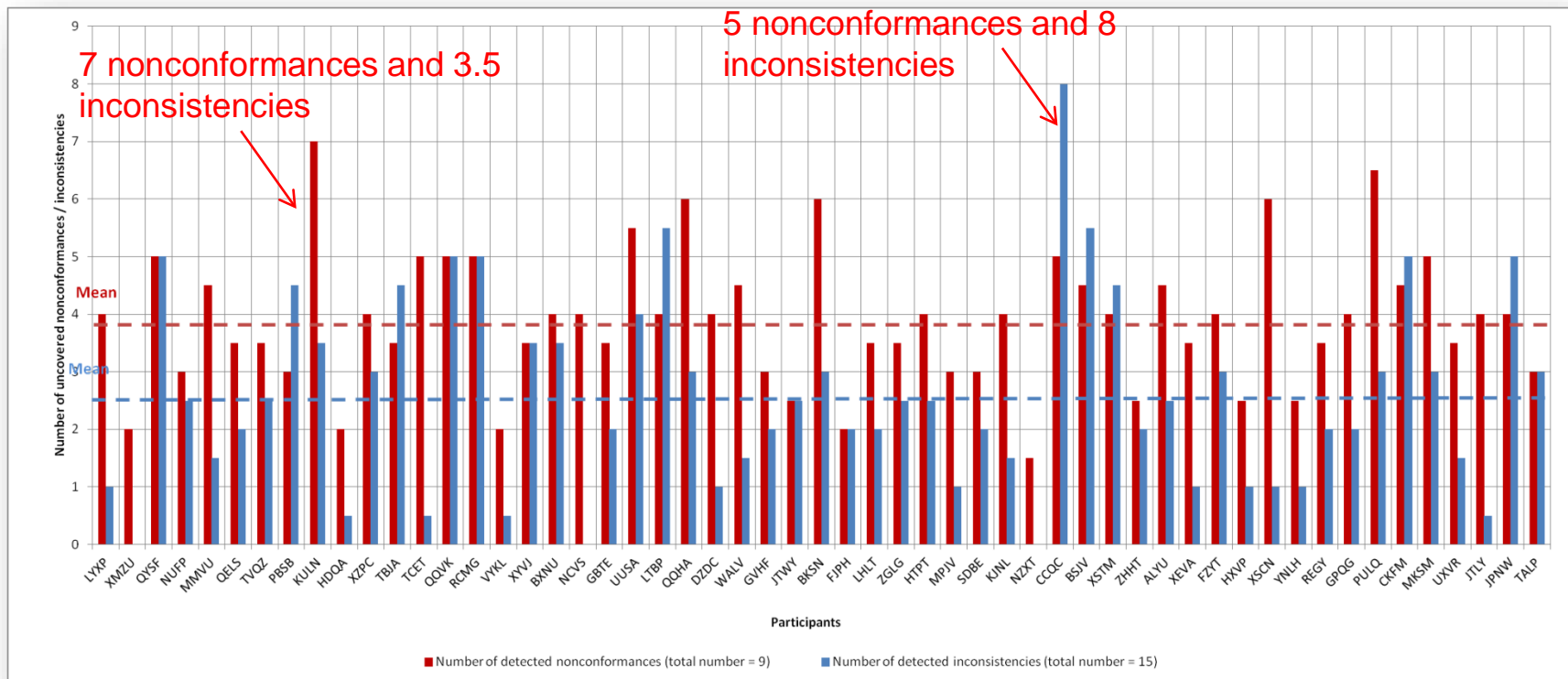


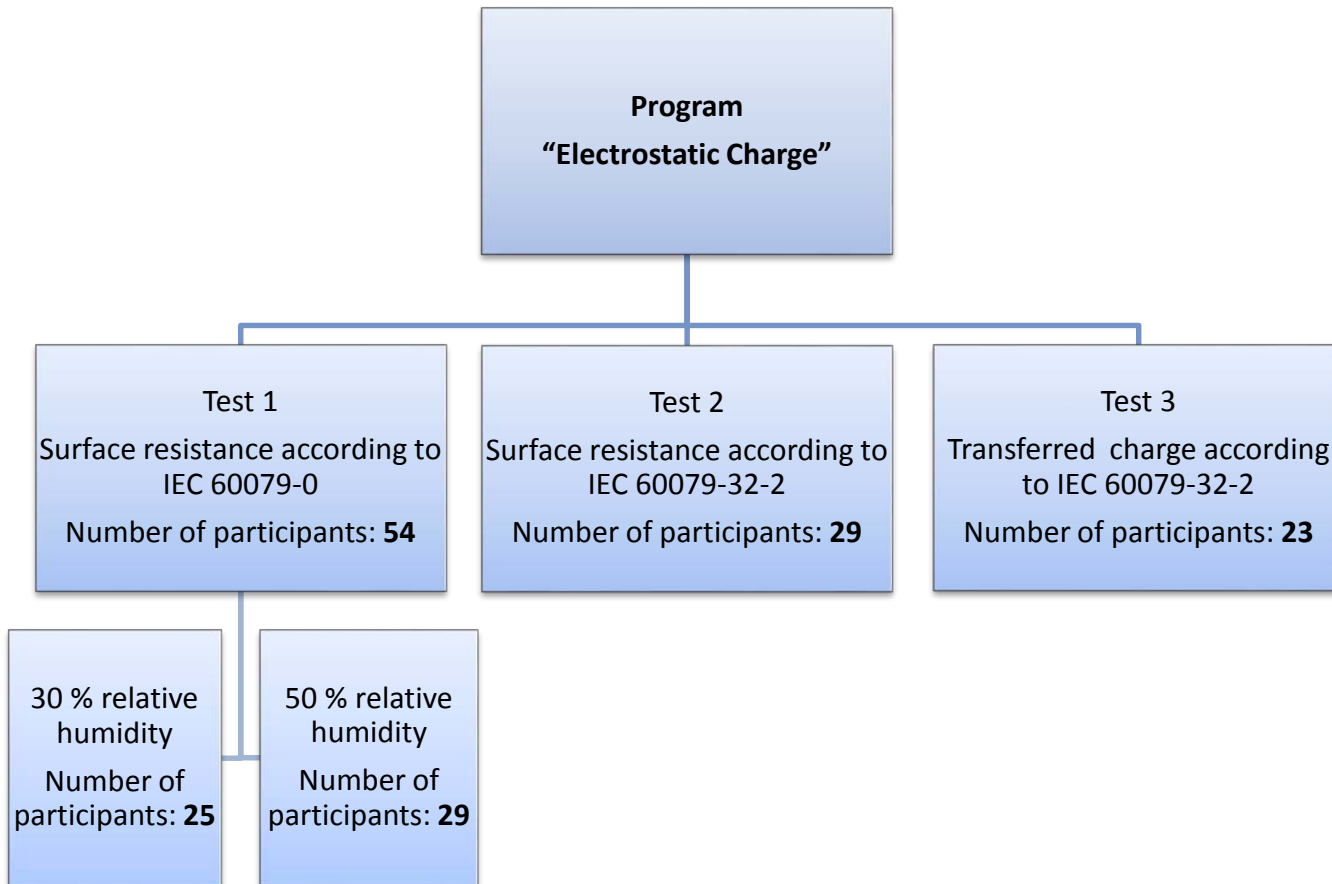
Proficiency  
Testing Program

Results and  
outcome of  
program and  
workshops

Weak point  
analysis and  
knowledge about  
best practice

Participants' results – Number of detected nonconformances and inconsistencies for each participant







## Classification of participants' results

