

- ☒ **CTL Provisional DECISION SHEET (PDSH)**  
☐ **CTL DECISION SHEET (DSH)**

| Standard(s) (incl. year)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Subclause(s)                              | Tracking No.             |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------|----------------------|--------------------------------|--|--|---------|--------------------------|--------------------------------------|-----|-----|---------------------------------------|-----|-----|
| Generality                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -                                         | PDSH 2302                |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| <b>Category</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                           |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| General                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                           |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| <b>Subject</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Keywords</b>                           | <b>Developed by</b>      |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| Working voltage measurement equipment in case of non-sinusoidal signals (e.g. SMPS)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Working Voltage<br>Non-sinusoidal<br>SMPS | WG1                      |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| <b>Question</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                           |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| What equipment shall be used to measure working voltage in case of non-sinusoidal signals (e.g. in Switch Mode supply -SMPS-)?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                           |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| <b>Decision</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                           |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| <p>Unless specified otherwise by the applicable product standard, working voltage in case of non-sinusoidal signals shall be measured with equipment having suitable bandwidth, able to cover the occurring crest factor.</p> <p>In case of SMPS an oscilloscope with at least 100 MHz bandwidth and high-impedance test probe with input impedance of not less than 100 MΩ not impairing the measurement shall be used.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                           |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| <b>Explanatory notes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                           |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| <p>Rationale: SMPS typically operate at switching frequencies above 30kHz, due to the switching action the signals normally have high crest factors (<math>U_{peak}/U_{RMS}</math>), making it necessary to use equipment with sufficient bandwidth.</p> <p>The use of standard multimeters in this scenario normally results in measurement values much lower than values obtained when measuring the same signal with equipment having suitable bandwidth.</p> <p>supporting evidence: In the PTP Working Voltage 23e37-1 less than 10% of the participants used a multimeter, and 90% used an oscilloscope.</p> <p>Taking the results of multimeters (10%) out narrows the statistical acceptable range significantly:</p> <table border="1"> <tr> <th>Measurement position</th><th colspan="2">Statistically acceptable range</th></tr> <tr> <td></td><th>All (V)</th><th>Excluding multimeter (V)</th></tr> <tr> <td>Q5 primary – secondary 3-A rms @50Hz</td><td>267</td><td>144</td></tr> <tr> <td>Q7 primary – secondary 3-A peak @50Hz</td><td>160</td><td>110</td></tr> </table> |                                           |                          | Measurement position | Statistically acceptable range |  |  | All (V) | Excluding multimeter (V) | Q5 primary – secondary 3-A rms @50Hz | 267 | 144 | Q7 primary – secondary 3-A peak @50Hz | 160 | 110 |
| Measurement position                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Statistically acceptable range            |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | All (V)                                   | Excluding multimeter (V) |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| Q5 primary – secondary 3-A rms @50Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 267                                       | 144                      |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| Q7 primary – secondary 3-A peak @50Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 160                                       | 110                      |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| <p><b>PDSH:</b><br/>Year of publication: 2025<br/>To be approved at CTL plenary: 2026</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                           |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |
| <p><b>DSH</b><br/>Publication date:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                           |                          |                      |                                |  |  |         |                          |                                      |     |     |                                       |     |     |

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