**INTERNATIONAL ELECTROTECHNICAL COMMISSION SYSTEM FOR CERTIFICATION TO STANDARDS RELATING TO EQUIPMENT FOR USE IN EXPLOSIVE ATMOSPHERES (IECEx SYSTEM)**

**TITLE: Compilation of comments and observations on ExTAG/478A/CD Revised Draft Decision Sheet - The spark ignition test with super capacitor**

**Circulated to: ExTAG – IECEx Testing and Assessment Group**

**INTRODUCTION**

ExTAG/478A/CD Revised Draft Decision Sheet - The spark ignition test with super capacitor, was prepared by PCEC, CN.

This document contains the compilation of comments received on ExTAG/478A/CD with observations from the originator, PCEC, CN.

As a result of comments received and considered, a revised Draft Decision Sheet ExTAG/478B/CD has now been published for consideration during the ExTAG Cannes, 2018 Meeting.

***Please inform the Secretariat immediately of any omissions or errors at***

[***Christine Kane***](mailto:christine.kane@iecex.com)

On behalf of Mr. Julien Gauthier

***Julien Gauthier***

***ExTAG Secretary***

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| **ExCB/**  **ExTL** | **Clause/ Sub-clause** | **Paragraph Figure/**  **Table** | **Type of**  **comment**  **General/**  **technical/**  **editorial** | **COMMENTS** | **Proposed change** | **Observation**  **(to be completed by the originator)** |
| --- | --- | --- | --- | --- | --- | --- |
| **DEKRA Certification B.V.**  **NL** |  |  |  | Do not see the need for the DS, a super capacitor is a capacitor and can be seen as such. The standard states: Alternatively when an infallible current-limiting resistor is used with a capacitor, consider the capacitor as a battery and the circuit as resistive.  Besides that:  In answer bullet 2:  - the wording "should be used" is wrong, 7.1 explicitly mentions "may be used" which is quite different. *- the mention of 1.5CU^2 is misleading, because the way it is worded can be interpreted as applying the safety factor on top of this 1.5CU^2, resulting in 2.25CU²* | Witdraw the DS  However, if it will be released, answer bullet .2 should state "A resistor relied upon to limit the output of the supercapacitor and/or to limit the temperature of the supercapacitor during charging should be rated according to clause 7.1 of IEC 60079-11 Ed. 6". | We agree with **TC 31 MT 60079-11Convenor suggestions**.  The requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. |
| **ExA**  **HR** |  |  |  | **Ex Agencije agree with proposed text in revised TAG document,**  **ExTAG/478A/CD and no further comments.** |  | **We agree.** |
| **ExTC**  **AU** |  | 2 | Technical | The issue regarding the rating of the resistor in series with a capacitor has already been discussed at the IEC MT60079-11 meetings.  The requirement of rating the resistor using 1.5CU2 is not required, as the voltage and resistor value 1.5\*U2/R may give a correct and less onerous requirement. | The requirement of rating the resistor using 1.5CU2 is not required, as the voltage and resistor value 1.5\*U2/R may give a correct and less onerous requirement. | We agree with **TC 31 MT 60079-11Convenor suggestions**.  The requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. |
| **FMG**  **US** |  |  | **ge** | **FMG supports the Decision Sheet as drafted** | **None** | **We agree.** |
| **KIWA**  **NL** |  |  | **G** | **Although the DS is repeating the information in the standard IEC 60079-11, Kiwa has no further comments.** |  | **We agree.** |
| **LOM**  **ES** |  | **Question 1** | **T** | **We agree with the proposal to test this type of capacitors as if they were batteries, but including that they are tested at the maximum voltage that there could be in the circuit, in normal and/or fault conditions. Based on our experience, these types of capacitors overheat, even explode if they are subjected to voltages above their nominal value.** | **Include tests of batteries, short-circuit and electrolyte leak, but also over-voltage tests** | **We agree.**  **The super capacitor has the battery characters. We need to conduct the battery test on the super capacitor. Considering the danger of the over voltage on super capacitor, the manufacture and user should limit the voltage on the super capacitor.** |
| **LOM**  **ES** |  | **Question 2** | **T** | **The CU2 formula expresses energy and not power. It may be appropriate when the capacitance is in the range of hundreds of microfarads or less, but it is nothing useful for large capacitance of this type of capacitors.**  **For example, a super capacitor of 10 F at 2.5 V would give a power, according to the formula, of 93.5 W regardless of the value of the resistance.**  **If we take that the capacitor is an ideal e.m.f. the power required in an infallible resistance of 10 Ω would give 0.935 W.** | **Use the capacitor as if it were a battery, as an ideal e.m.f. but also taking in account it internal resistance (ESR)** | **According to IEC 60079-11 Ed6 clause 7.1”the resistor may be considered to dissipate power in watts numerically equal to CU2, where C is capacitance in farads, U is voltage in volts”**  We agree with **TC 31 MT 60079-11Convenor suggestions**.  The requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. |
| **NANIO CCVE (ExCB and ExTL** | Answer | 2) | Technical | We support the DS ExTAG/478A/CD, but we consider that the last paragraph of the Item 2 of the Answer shall be removed as the power on the resistor shall be calculated using a standard formula – based on the voltage drop on a resistor or the current flowing through the resistor. | 2) A resistor relied upon to limit the output of the supercapacitor shall be rated using the worst case voltage present on the supercapacitor. | We agree with **TC 31 MT 60079-11Convenor suggestions**.  The requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. |
| **NCC**  **BR** | **10.1.4.2** |  |  | **We agree.** |  | **We agree.** |
| **NEPSI**  **CN** |  |  | **G** | **We support the revised draft decision sheet ExTAG/478A/CD.** |  | **We agree.** |
| **SC 31G MT60079-11** | **2** |  | **T** | MT60079-11 is generally in agreement with the revised DS, although the stated power rating is not correct.  The originator raised a question regarding the power rating of the protective resistor. Clause 7.1 of IEC 60079-11 Ed 6 indicates that for a resistor protecting a capacitor, the power rating may be *CU*2. With large value capacitors this could lead to a significant rating for the resistor.  However, if a resistor *R*is used to limit the output from the supercapacitor, the maximum power possible in the resistor is*U*2/*R*, irrespective of the capacitance value. If this is lower than CU2 then it should be used. This will almost always be the case with supercapacitors. | Replace answer 2 of the DS with:  2. A resistor relied upon to limit the output of the supercapacitor shall be rated using the worst case voltage present on the supercapacitor  Clause 7.1 of IEC 60079-11 Ed 6 states that power in watts numerically equal to *CU*2 may be used when rating the resistor, and this remains the case where the maximum capacitance of the supercapacitor is known.  However, the resistor cannot dissipate more than U2/R, and in the majority of cases with supercapacitors, this will be a lower value than *CU*2.  Therefore the requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. | **We agree.**  The requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. |
| **SGS Baseefa** | Q2 answer |  | te | The many comments suggesting that the power rating for the resistor should be based on treating the super-capacitor as a battery have been incorrectly ignored.  Using the value 1.5 CU2 could result in some unnecessarily physically large resistors being fitted.  Do we really need a 37.5 watt resistor for a 1 Farad capacitor charged to 5 Volts? | Adopt the formula based on treating the capacitor as a battery, suggested by many previous comments. | We agree with **TC 31 MT 60079-11Convenor suggestions**.  The requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. |
| **TIIS**  **JP** |  |  | **G** | The original draft is better than the revised one. TIIS does not see the need for this revised DS. |  |  |
| **UL**  **BR** | **7.1** |  | **Technical** | **ULBR understands that both the current DS and proposed DS revision are modifying the standard requirement. So ULBR proposal is to change the DS text to comply with current standard requirement and take it to MT 79-11 to discuss the need of adding a safety factor for supercapacitor.** | **Revise as follows:**  **Where a resistor and capacitor are connected in series to protect the discharge from the capacitor, the resistor may be considered to dissipate power in watts numerically equal to the smaller of CU² or U2/R, where C is capacitance in farads, U is voltage in volts and R is resistance in ohms.** | According to IEC 60079-11 clause 7.1, the infallible component can only operate at no more than two-thirds of their ratings.  Therefore the requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. |
| **UL-**  **USA** | **7.1** |  | **Technical** | **The proposed interpretation increases the safety factor for infallible resistors connected in series with a capacitor. The current edition requires only that CU2 be used when determining the suitability of the resistor. The addition of a 1.5 factor introducing an additional safety factor that is not needed. Since higher values of capacitor, such as those associated with supercapacitors, can result in very larger energy numbers, it is recommended that the text be clarified to indicate that a normal power calculation can be used.** | **Revise as follows:**  **Where a resistor and capacitor are connected in series to protect the discharge from the capacitor, the resistor may be considered to dissipate power in watts numerically equal to the smaller of CU² or U2/R, where C is capacitance in farads, U is voltage in volts and R is resistance in ohms.**  **If the additional 1.5 factor is felt to be necessary, then this should be referred to the MT.** | According to IEC 60079-11 clause 7.1, the infallible component can only operate at no more than two-thirds of their ratings.  Therefore the requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. |
| **ULD**  **DK** |  |  | **Technical** | **In our opinion this proposal is modifying the standard requirements. Our proposal is to use the current standard requirements and refer this proposal for consideration by the MT 60079-11.** | **Revise as follows:**  **Where a resistor and capacitor are connected in series to protect the discharge from the capacitor, the resistor may be considered to dissipate power in watts numerically equal to the smaller of CU² or U2/R, where C is capacitance in farads, U is voltage in volts and R is resistance in ohms.**  **If the additional safety factor is felt to be necessary, the matter should be referred to the MT.** | According to IEC 60079-11 clause 7.1, the infallible component can only operate at no more than two-thirds of their ratings.  Therefore the requirement for rating the resistor is the lower of 1.5 \* *CU*2 and 1.5 \* U2/R, for all Levels of Protection. |