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

TITLE: Comments from DEKRA BV NL on Discussion paper ExTAG/435/CD – Relating to ExTAG Agenda Item 6.1

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INTRODUCTION

This document contains comments from DEKRA NL relating to ExTAG agenda item 6.1 of the 2016 ExTAG Umhlanga Meeting (ExTAG/423B/DA) "**Application of Clause 7.6 of IEC 60079-11 to small and portable devices"** and issued to ExTAG Members as requested by DEKRA NL

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Response of DEKRA to PTB paper ExTAG/435/CD

Comments and answers to the text of the paper:

"The standards are interpreted by manufacturers and ExTLs in different approaches, therefore in some cases the products do not meet the requirements of IEC 60079-11."
Comment: an interpretation of the standard does not imply that a product in some cases does not comply with the standard, as suggested here.

1. Application of IEC 60079-0 and ff
"Is it permitted according to IEC 60079-0 and ff to allow relaxations other than explicitly stated in the standards for portable equipment?"
Answer: No, since a relaxation would imply that the level of safety (EPL) is not realized anymore.

2. Application of IEC 60079-11
Clause 7.6 d) has been applied for many years without significant problems during the assessment of Ex i equipment. However, since the publication of the latest edition of 60079-11 in 2011 the world of electronic equipment has changed tremendously. Completely new techniques became available, resulting in completely new components where the world never heard of when the work for the 2011 edition was started in 2008:

a. OLED displays,
b. flexible printed circuit boards (with components mounted on it or even in it),
c. touch screens,
d. systems on a chip (SoC),
e. (s)CMOS, CCD and TDI cameras (with and without Peltier cooling),
f. sensors (e.g. gyroscope, barometer, proximity, magnetometer, etc) built in a single chip,
g. hybrid integrated circuits,

are just some examples found everywhere in modern electronics. None of these were available when the work for the 2011 edition was started, and looking at the still increasing speed of new techniques becoming available (e.g. 3D printing of electronic components), most of the components that we know today will be non-existing within 5 years. None of these components can be assessed anymore according to the requirements of 60079-11, simply because we do not know how such components behave when driven to a state by failure of other components, as required by 7.6 d). The state where they can be driven cannot be determined by a manufacturer or ExCB since detailed information and knowledge of the internals (both construction and operation) of the component must be available, which is not the case. For example:

1. Can an OLED display get a hot spot?
2. Can a touch screen generate a spark?
3. Can a SoC dissipate matched power long enough to reach the temperature class limit?
4. Should a flexible printed circuit board be considered as a conventional solid PCB or should it be considered as internal wiring?
5. Does the thermal resistance value of a component (°C/W) as specified in the datasheet, when mounted on a flexible PCB, still apply although the value is based on one of the standard test methods specified in JEDEC standards, using a completely different PCB material and dimensions?

All these issues require a very flexible application of the IEC 60079-11 standard, since none of these issues is dealt with in the standard.

It is however allowed to use other techniques as stated in the standard(s) according to IEC 60079-0, chapter 1 (Scope), Note 3:

NOTE 3 It is acknowledged that, with developments in technology, it may be possible to achieve the objectives of the IEC 60079 series of standards in respect of explosion prevention by methods that are not yet fully defined. Where a manufacturer wishes to take advantage of such developments, this International Standard, as well as other standards in the IEC 60079 series, may be applied in part. It is intended that the manufacturer prepare documentation that clearly defines how the IEC 60079 series of standards has been applied, together with a full explanation of the additional techniques employed. The designation "Ex s" has been reserved to indicate special protection. A standard for special protection "s", IEC 60079-33, is in preparation.

Reading this Note, it is clear that IEC 60079-33, published in 2012, would be the standard to use if developments in technology are not yet fully defined by the other parts of the IEC 60079 series.

However there is currently only one ExCB with -33 in their scope: CML (UK), with no certificates have been issued using -33 and the comments of MT 60079-33 to OD233 are still to be considered by the ExMC (see the report of MT 60079-33 to the IEC TC31 meeting in Minsk, 2015). Also the use of Independent Verifiers is a concern (see ExTAG/439/Inf).
As a result of the lack of progress in IECEx, the MT60079-33 has proposed to extend the stability date of -33 to 2020. It also has decided that the MT will have a meeting when required.

Application of an FMEA (Failure Mode and Effect Analysis) under the Ex s procedure may be a method that could provide evidence that the equipment does provide the required level of safety (EPL). Since an FMEA is a well known and accepted method in the process industry, and in fact fully in line with the approach in the 60079-11 standard (assuming countable and non-countable faults / failure modes and see / calculate what the effect is), it seems a logical step to use that method as alternative to 7.6. Applying FMEA was discussed in MT 60079-11 indeed, but many years ago, and rejected "due to the high complexity of modern integrated circuits and other reasons". Does this mean that we really certify electronic equipment for use in an explosive atmosphere that is too complex to assess in the required way (e.g. normal operation and foreseeable fault conditions for EPL Gb) and that we therefore apply very simple, may be old-fashioned, techniques such as assuming matched power in any component, neglecting the possibility that it may not match with the EPL definition and may be an approach that is too severe because matched power is physically impossible? It seems to be that way, since this thought is supported by the fact that IEC 60079-11 (2011) was considered not suitable for use in the USA for portable land mobile radio applications. Since there was an urgent need to have a suitable standard, ANSI/TIA-4950-A-2014 – "Requirements for Battery-Powered, Portable Land Mobile Radio Applications in Class I, II and III, Division 1, Hazardous (Classified) Locations" was developed and published relying heavily on a contribution of UL (UL913, 5th edition, 1997). This is just an example. But if on a national level IEC TC31 standards are considered no longer practicable, IEC TC31 should take immediate action. Therefore we fully support the intention of IEC TC31 to install an advisory group for portable equipment with experts from TC31 and its subcommittees with the chairman of SC 31G Mr. Manfred Kaiser as proposed convenor, see 31/1271/Q (closing date 26-8-2016). But we also think that this is not enough to serve the industry in very near future.

Conclusion:
Based on the above information, it is unlikely that there will be a proper system in place to deal with products within IECEx 02 that apply new technologies that are not fully defined in

the standards. The only alternative solution to the problem is that it should be avoided that a standard is out-of-date and we have to use Ex s.

Proposals:
The root cause of the problem lies in the IEC TC31 system of having a standard stable for at least 5 years. If the maintenance cycle of IEC 60079-11 was changed from 5 years to 2 years or even just ongoing, as with the standards writing bodies for telecommunication equipment, it would be possible to have a standard that is kept up-to-date and that can be applied to modern electronics any time. To support this, the work of MT60079-11 should be aligned and supported with the work of other TCs in the field of electronics.
Therefore we propose the following:

1. To ask TC31 to change the maintenance cycle of IEC 60079-11 to a realistic shorter period, assuring continued applicability of IEC 60079-11 to modern electronics.
2. To have MT60079-11 work in close cooperation and with support of other IEC Technical Committees such as TC47 (Semiconductor devices), TC103 (Transmitting equipment for radio communication) and TC110 (Electronic display devices), if possible by liaison with these committees (according to the Strategic Business Plan of TC31, dated 2012-12-17, there is no liaison yet between TC31 and these committees).
3. To ask TC31 / SC31G to include requirements for modern electronic components in the 7th edition of IEC 60079-11 which is now in preparation by MT 60079-11. Components that should be addressed should include the already mentioned examples.
4. To ask TC31 / SC31G to take into account the intended use of the equipment when determining the requirements for:
    a. Stationary equipment (mounted in a certain hazardous area and stays there “forever” as integral part of the installation), for example transmitters
    b. Portable equipment (carried on the person and as such in a potentially hazardous area for a limited time), for example (smart)phones, tablets, smartwatches, Google glasses, etc.

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