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Assessment of inadvertent ignition of flammable atmospheres by radio-frequency radiation – Guide

(CENELEC Technical Report 50427:2004)

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Upplysningar om **sakinnehållet** i rapporten lämnas av
Svenska Elektriska Kommissionen, SEK.
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Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

Svenska Elektriska Kommissionen, SEK, svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

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TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

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English version

Assessment of inadvertent ignition of flammable atmospheres by radio-frequency radiation – Guide

Evaluation des risques d'inflammation des atmosphères inflammables par des rayonnements de radiofréquence – Guide

Leitfaden zur Verhinderung der unbeabsichtigten Zündung explosionsfähiger Atmosphären durch hochfrequente Strahlung

This Technical Report was approved by CENELEC on 2004-08-28.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

This Technical Report was prepared by the Technical Committee CENELEC TC 31, Electrical apparatus for explosive atmospheres - General requirements.

The text of the draft was submitted to the formal vote and was approved by CENELEC as CLC/TR 50427 on 2004-08-28.

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Introduction

Electromagnetic waves produced by radio-frequency (RF) transmitters (e.g. radio, television and radar) will induce electric currents and voltages in any conducting structure on which they impinge. The magnitude of the induced current and voltages depends upon the shape and size of the structure relative to the wavelength of the transmitted signal and on the strength of the electromagnetic field. When parts of the structure normally in contact are caused to break or separate momentarily (e.g. during maintenance or as a result of vibration) a spark may occur if the induced voltage and current is sufficiently large. If this happens in a location where a potentially flammable atmosphere may be present a hazardous situation can occur. However, the possibility of ignition will depend on many factors including whether the spark can deliver sufficient energy to ignite a particular flammable atmosphere.

This European Technical Report provides a systematic approach to assist transmitter operators, plant managers and all others concerned with a logical method for the assessment and elimination of RF induced ignition hazards.

The assessment procedures recommended in this European Technical Report are based on measurements of the powers and energy that can be extracted from typical structures, including cranes, and measurements of the minimum powers and energy that are required to ignite various flammable atmosphere gas groups.

The assessment procedures for probability of ignition recommended in this European Technical Report are based on the assumption that worst case conditions apply at all times. The critical features are the coincidence of the structure in resonance and the presence of the gas/air mixture in the optimum proportions for RF spark ignition. Deviation from these optimum conditions will result in significantly higher powers being required for ignition.

NOTE 1 Several studies have been performed which indicate that the power could be twice as great for an assumed risk as detailed in reference [1], if due allowance is taken for probabilistic effects. In order to achieve a probability of ignition comparable with other risks, it would be necessary for effective extractable power calculated to be twice the values determined according to this European Technical Report. The probabilistic elements could be taken into consideration following further research work and practical experience.

NOTE 2 If allowances for probabilities are to be applied then expert advice should be sought.

1 Scope

This European Technical Report provides guidance on assessing the potential ignition hazard from the inadvertent extraction of energy from electromagnetic fields, propagated from communication, radar or other transmitting antennas to plant where a potentially flammable atmosphere may be present. The frequency range covered by this European Technical Report is 9 kHz to 60 GHz. This European Technical Report does not apply to similar hazards arising from electromagnetic fields generated by other means, such as electric storms, electricity generating installations or other radiating electrical equipment, nor does it apply to any hazard arising within telecommunication or other electronic equipment.

NOTE 1 The methods of assessment from 9 GHz to 60 GHz are based on extrapolation of data for frequencies below 9 GHz.

NOTE 2 The ignition of dust is not covered in this European Technical Report. This European Technical Report also provides advice on how to mitigate the hazard in cases where the assessment indicates that a hazard may exist. This European Technical Report does not cover the hazards associated with the use of electro-explosive devices (EED) (see CLC/TR 50426), or the biological hazards of exposure to RF fields.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Publication	Year	Title
EN 60079-0		*Electrical apparatus for explosive gas atmospheres — Part 0: General requirements* (IEC 60079-0)
EN 50020		*Electrical apparatus for potentially explosive atmospheres — Intrinsic safety “i”*
EN 60079-10		*Electrical apparatus for explosive gas atmospheres — Part 10: Classification of hazardous areas (*IEC 60079-10)