





Area Classification – An explanation of the importance to correctly address the hazards and extent of these hazards prior to design and operation of any new plant along with the need to control and re-evaluate changes to existing plant and infrastructure

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2023 INTERNATIONAL SYMPOSIUM – EXPLOSIVE ATMOSPHERES

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Introduction

Marino Kelava, M.E.Eng.

- Professional in Ex business since 2002 (testing, certification, inspection, standardization, Ex training, assessment of ExTLs and ExCBs)
- Managing Partner at Fiditas Ltd. (ATEX + IECEx ExCB & ExTL, Member Body for Croatia)
- Secretary IEC SC 31J since 2005
- IECEx Lead Assessor for schemes 02, 03, 04 and 05
- IECEx Management Committee Member
- Member of several IEC TC 31 MTs, PTs and WGs
- Croatian Mirror committee to IEC TC 31 Chair

Presentation

- Explosive Atmospheres in the Industry
- Importance of Hazardous Area Classification (HAC)
- IEC SC 31J Standard Tools Available
- IEC SC 31J Recent Developments
- IEC SC 31J Info Resources

Explosive atmosphere

- Mixture with air, under atmospheric conditions, of flammable substance in the form of **gas, vapour, mist or dust**, which, after ignition, permits self-sustaining flame propagation.

Hazardous areas

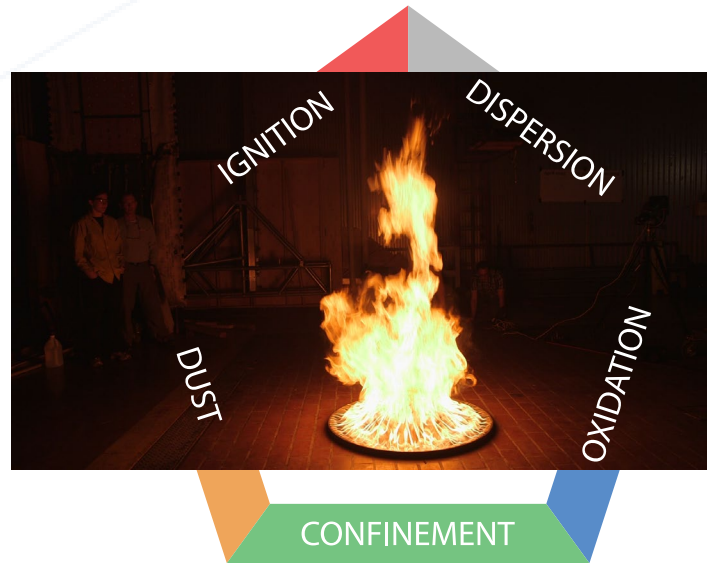
- Areas in which presence of **explosive atmosphere** can be expected in the quantities that requires **special measures** regarding **construction, installation** and **equipment** usage.

Hazardous areas in the industry

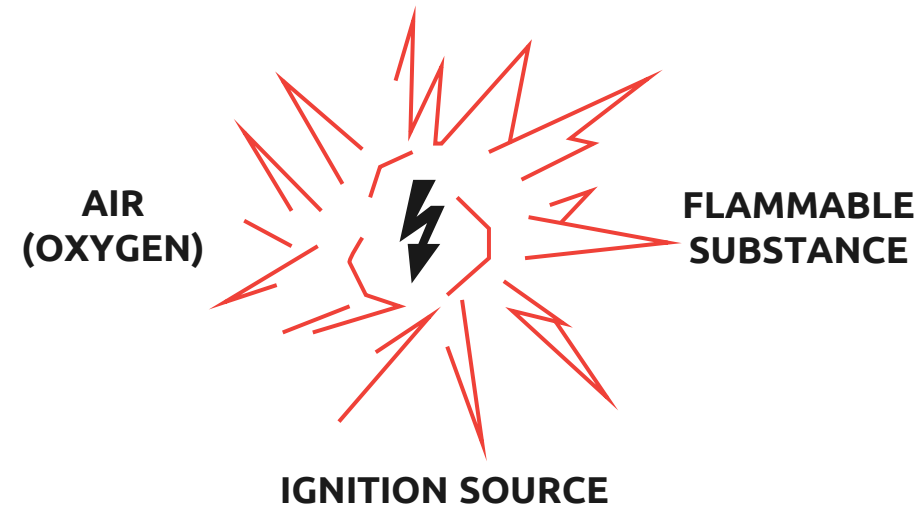


Explosion of explosive atmosphere

Dust



Gas and vapour



Hazardous areas in the industry



2008 Georgia sugar refinery explosion

Pre-design phase

- Identify the purpose of the facility, the scope and complexity of the project
- Select the required **skills** and **competences** for designers
- Identify roles, **responsibilities** and communication path
- Identify **hazards** related to **materials** and **processes**
- Identify relevant **legislation**, good practice guidance and applicable **standards**

National regulations

- EU Directive 1999/92/EC (ATEX 153)
- The Dangerous Substances and Explosive Atmospheres Regulations 2002



Explosion protection measures

PRIMARY MEASURES

To prevent the formation of explosive atmosphere.

SECONDARY MEASURES

To prevent the ignition of existing explosive atmosphere.

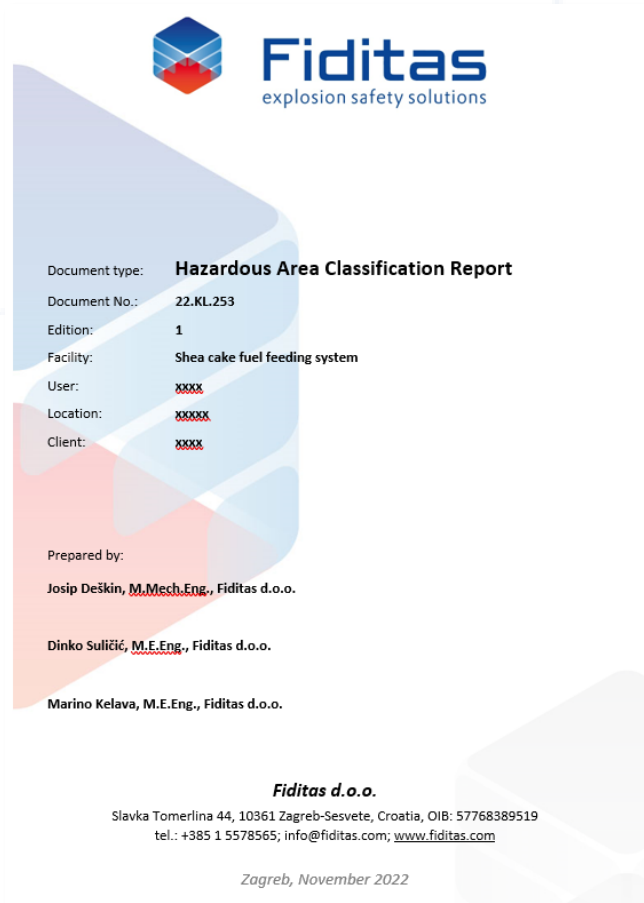
TERTIARY MEASURES

To limit or mitigate harmful effects of explosion.

Hazardous area classification

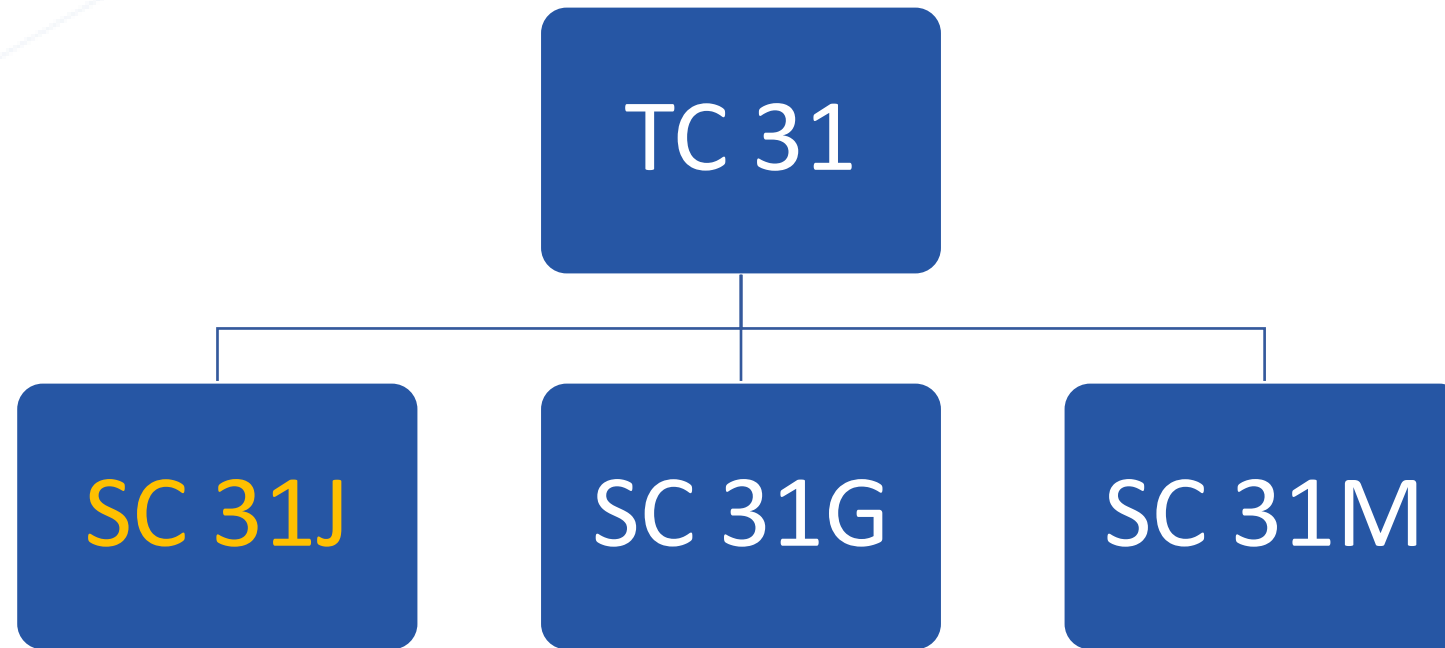
- Hazardous area classification is based on the frequency and duration of occurrence of explosive atmosphere.
- Area classification presents the basis for the correct selection, installation and maintenance of equipment intended for use in hazardous areas.

Importance of HAC Report



- Hazardous Area Classification (HAC) Report is the basis for the design and selection of Ex equipment and installations
- HAC Report provides results of comprehensive analyses that follows the essential criteria against which the ignition hazards can be assessed and gives guidance on the design and control parameters which can be used in order to reduce such hazards.

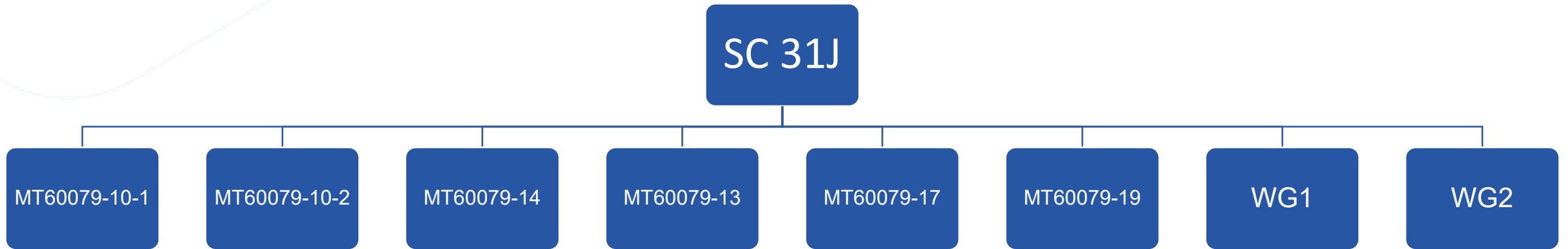
IEC TC 31 – Explosive Atmospheres



IEC TC 31 / SC 31J

- Established in 1981, Secretariat held by Croatia
- To prepare and maintain international standards relating to the **use** of equipment including **area classification**, the **selection** and **installation**, **inspection** and **maintenance**, **repair**, **overhaul** and **reclamation** of equipment where there is a hazard due to the possible presence of explosive atmospheres of gases, vapours, mists or combustible dusts.

SC 31J Structure



MT60079-10-1



- This part of IEC 60079 is concerned with the classification of areas where flammable gas or vapour hazards may arise and may then be used as a basis to support the proper design, construction, operation and maintenance of equipment for use in hazardous areas.

IEC 60079-10

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE
(affiliée à l'Organisation Internationale de Normalisation — ISO)
RAPPORT DE LA CEI

INTERNATIONAL ELECTROTECHNICAL COMMISSION
(affiliated to the International Organization for Standardization — ISO)
IEC REPORT

Publication 79-10
Première édition — First edition
1972

Matériel électrique pour atmosphères explosives
Dixième partie : Classification des zones dangereuses

Electrical apparatus for explosive gas atmospheres
Part 10: Classification of hazardous areas

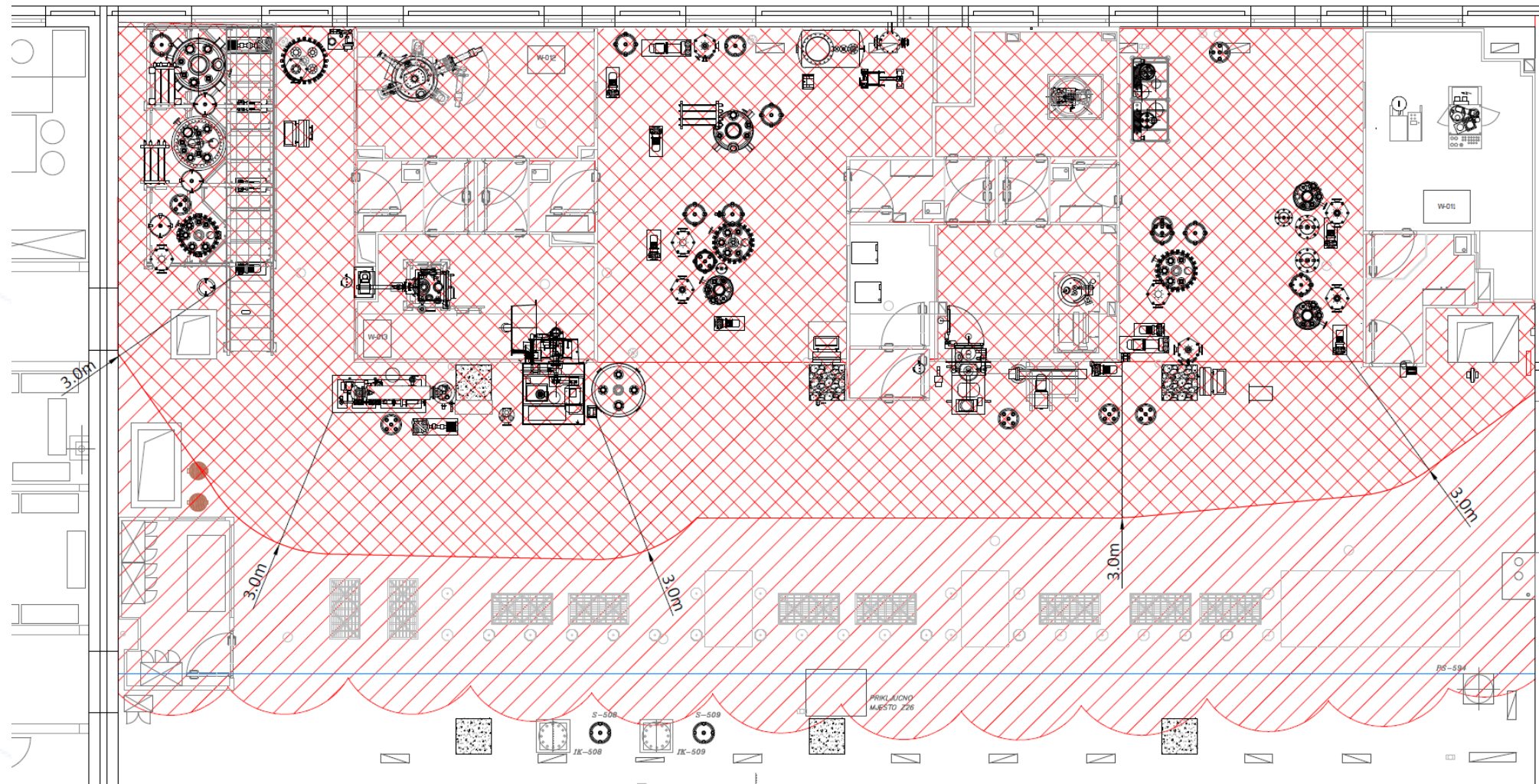


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Bureau Central de la Commission Electrotechnique Internationale
1, rue de Varembe
Genève, Suisse

- Approach to classification is based on :
 - Characteristics of flammable substances
 - Characteristics of potential sources of release
 - Ventilation characteristics
 - Dilution conditions
- First edition published in 1972

IEC 60079-10



LEGEND:

-  ZONE 1 IIA T3
-  ZONE 2 IIA T3
-  ZONE 1 IIB T4

IEC Commented version (CMV) of IEC 60079-10-1



"The comprehension of what a standard requires or allows is one thing but understanding why is an equally important dimension. If you understand why, then following a standard becomes more intuitive."

Neil Dennis, IEC SC 31J chair

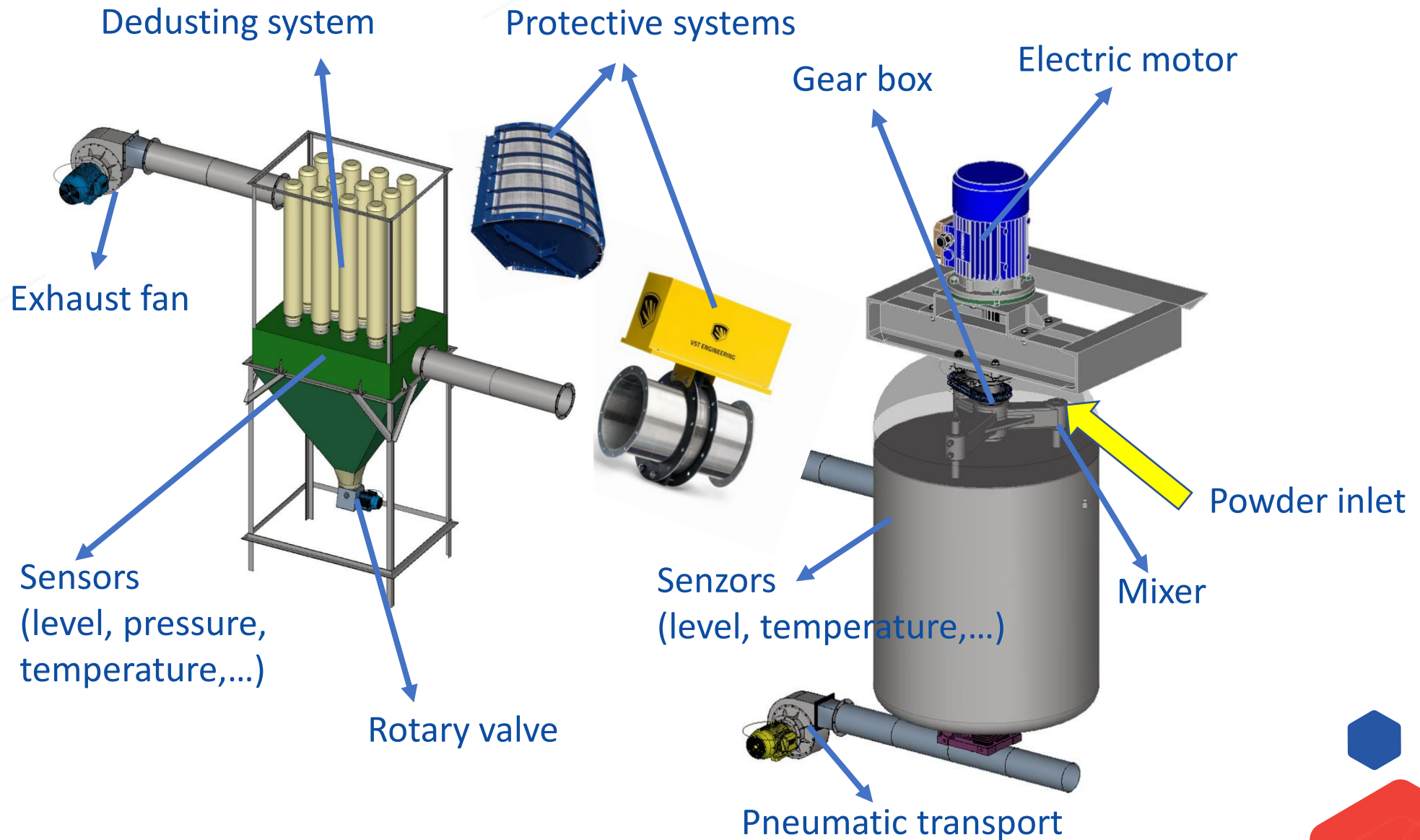
- Consensus-based content
- Highlighted changes between versions
- Experts' technical commentary

MT60079-10-2



- This part of IEC 60079 is concerned with the identification and classification of areas where explosive dust atmospheres and combustible dust layers are present, in order to permit the proper assessment of ignition sources in such areas.

IEC 60079-10-2 typical application



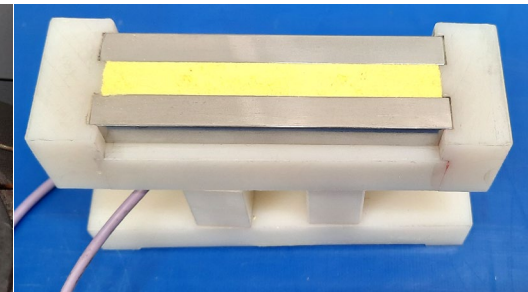
MT60079-10-2: Development highlights



- The need to document material characteristics (laboratory tests)
 - particle size
 - moisture content
 - cloud and layer minimum ignition temperature
 - minimum ignition energy of dust/air mixtures
 - maximum explosion pressure p_{max} of dust clouds
 - maximum rate of explosion pressure rise $(dp/dt)_{max}$ of dust clouds
 - lower explosion limit (LEL) of dust clouds
 - limiting oxygen concentration LOC of dust clouds
 - electrical resistivity of dusts

MT60079-10-2: Development highlights

Parameter	Standard
Minimum ignition energy (MIE)	EN IEC/ISO 80079-20-2 Explosive atmospheres Part 20-2: Material characteristics - Combustible dusts test methods
Minimum Ignition Temperature of a Dust Cloud (MIT)	
Hot Surface Ignition Temperature of Dust Layers (LIT)	
Electrical resistivity of Dust	
Burning behaviour of dust layers	EN 17077 Determination of burning behaviour of dust layers

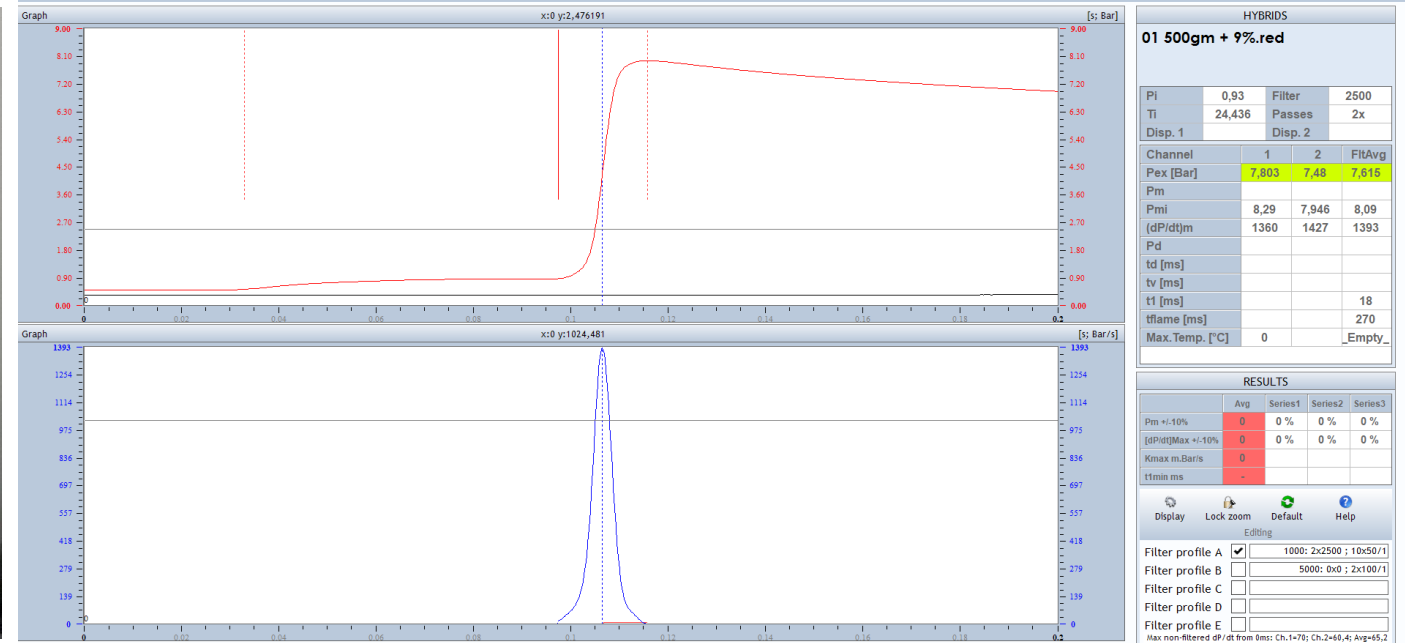


MT60079-10-2: Development highlights

Parameter	Standard
Explosion Severity Test (K_{St} , P_{max} and dP/dt_{max})	EN 14034-1 Determination of explosion characteristics of dust clouds -- Part 1: Determination of the maximum explosion pressure P_{max} of dust clouds EN 14034-2 Determination of explosion characteristics of dust clouds -- Part 2: Determination of the maximum rate of explosion pressure rise dP/dt_{max} of dust clouds
Lower explosion limit (LEL)	EN 14034-3 Determination of explosion characteristics of dust clouds -- Part 3: Determination of the lower explosion limit LEL of dust clouds
Limiting oxygen concentration (LOC)	EN 14034-3 Determination of explosion characteristics of dust clouds -- Part 4: Determination of the limiting oxygen concentration LOC of dust clouds

Hybrid mixtures explosivity determination

p_{max} and $(dp/dt)_{max}$ hybride mixture (St3)



Europska unija
Zajedno do fondova EU



Project Fidilab was cofinanced by the European Union from European Fund for Regional Development



Fiditas
explosion safety solutions

MT60079-14



- This part of the IEC 60079 series contains the specific requirements for the design of electrical systems, selection, installation and the required initial inspection of electrical installations of Ex Equipment including requirements for documentation and personnel competency in, or associated with, explosive atmospheres.


Selection of Ex equipment

AREA CLASSIFICATION		SECONDARY PROTECTION	
PRESENCE OF EXPLOSIVE ATMOSPHERE	ZONE	EPL	EQUIPMENT SHALL NOT BE SOURCE OF IGNITION UNDER:
continuous or is expected to occur frequently or for long periods	0	Ga	Normal operation / Expected malfunction / Rare malfunction
	20	Da	
expected to occur periodically or occasionally during normal operation	1	Ga or Gb	Normal operation / Expected malfunction
	21	Da or Db	
not expected to occur in normal operation and, if it does occur, is likely to do so only for short periods	2	Ga or Gb or Gc	Normal operation
	22	Da or Db or Dc	

Info Resources – SC 31 Dashboard

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SC 31J Classification of hazardous areas and installation requirements

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[Work programme](#)
[Publications](#)
[Stability Dates](#)
[Project files](#)

[en](#)
[fr](#)

SC 31J Work programme (4)

Project Reference	Document Reference	Init. Date	Current Stage	Next Stage	Working Group	Project Leader	Fcst. Publ. Date
IEC 60079-13 ED3 Explosive atmospheres - Part 13: Equipment protection by pressurized room "p" and artificially ventilated room "v"	31J/336/CD  575 kB	2023-03	CD 2023-03	PCC 2023-05	MT 60079-13	Dalia El Tawy	2025-02
IEC 60079-14 ED6 Electrical installation design, selection and installation of equipment, including initial inspection	31J/317/CD  2323 kB	2019-11	TCDV 2023-03	CCDV 2023-04	MT 60079-14	Peter Thurnherr	2024-06
IEC 60079-17 ED6 Explosive atmospheres - Part 17: Electrical installations inspection and maintenance	31J/312/CDV  628 kB	2019-03	PRVC 2021-04	2023-02	MT 60079-17	Colin Henderson	2024-01
IEC TS 60079-48 ED1 Explosive atmospheres - Part 48 - Portable Electronic Equipment – Guide for the use of equipment without a certificate for use in Hazardous Areas	31J/320/CD  285 kB	2020-12	PCC 2022-05	2023-05	WG 2	Tonya Woods	2024-03

14th to 29th March 2024
Hotel Le Méridien, Split - Croatia

**International IEC/IECEX/UNECE conference
and series of IEC TC 31 / SCs / WGs /PTs /MTs
meetings**

thank you

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tesekkür ederim
gracias tapadh leat
obrigado

спасибо
bedankt
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sukriya
terima kasih
merci

Баярлалаа
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