



ARTIDOR

# Handbook Explosion Safety

for gas and dust environments



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Artidor Explosion Safety B.V.

## **Handbook Explosion Safety for gas and dust environments**

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## Preface

Daily practice proves time and again that explosion safety is a difficult subject. For many, it is a subject they only have to deal with occasionally and it is therefore difficult to tell the difference between the various zones, categories and protection methods. The underlying technical standards are constantly changing due to continuous improvement and globalization, and certification of explosion-safe equipment has become a compromise between European and American standards. Frequent updating of technical standards does not make things any easier. Fortunately, the physical principles behind any explosion remain unchanged and the approach to designing a safe installation still holds.

This book provides an overview and insight into the many aspects of explosion safety and thus provides a good basis for every machine builder, manufacturer, purchaser, installer and user dealing with zones, categories, protection methods, markings and standards.

Special thanks go to Henk Jan Reins for his translation of the Dutch version of the book into English. His sense of language and the fascinating conversations about word choice and sentence structure have further increased my knowledge of the English language and have led to a very easy to read book.

We hope that after reading you will be as excited about our beautiful field as we are.

Geldrop, October 2023

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## INTRODUCTION

Explosion prevention is of great importance whenever safety is concerned, since an explosion endangers the life and health of workers due to the uncontrolled effects of fire, explosion pressure, toxic products from chemical reactions and the consumption of oxygen from breathing air. That is why measures must be taken in the workplace to prevent explosions. This book is written in line with the assessment process of an explosion-safe installation. This starts with basic knowledge about explosion risks.

The first chapter provides insight into what an explosion actually is, under what circumstances an explosion may occur and what gas or dust properties are important in determining the risks.

Chapter two gives a brief overview of the origins of the European Union and the most important decisions leading to the current European explosion safety directives. These directives, which are laid down in both the Dutch Commodities Act and the Health and Safety Act, are briefly explained below. The use of harmonized standards, Dutch codes of practice and the IECEx certification process are also discussed.

Chapter three examines the scope of and compliance with Directive 1999/92/EC (ATEX 153) "on minimum requirements to improve health and safety protection for workers at risk from explosive atmospheres".

Seven questions are used to assess whether there is a risk a hazardous explosive atmosphere may form, whether the additional measures taken are sufficient to prevent the occurrence of such a hazardous explosive atmosphere, whether the area must be divided into zones and whether ignition in the area is prevented.

If conditions may cause a hazardous explosive environment, measures must be taken to protect against the risk of explosion. Chapter four focuses on the technical measures that can be taken to reduce this risk. Priority lies in preventing the hazardous explosive environment, followed by zoning of the area, avoiding sources of ignition and implementing constructive measures to minimize the effects of an explosion. Selecting the right work equipment and devices is also discussed here.

Chapter five discusses the organizational measures to be taken if safety cannot be guaranteed by technical measures alone. In practice, a combination of technical and organizational measures will create a safe working environment.

Chapter six discusses the explosion safety document (ESD) which must be drafted and maintained by the employer on the basis of Directive 1999/92/EC. An example ESD which meets the requirements is provided and can be used as an aid in drafting.

There is only a risk of explosion if, in addition to the presence of an explosive mixture, a source of ignition is present. Chapter seven discusses the thirteen possible sources of ignition as mentioned in European technical standard EN 1127-1 on the basic principles of explosion prevention.

Electrical equipment often contains several sources of ignition. Special measures are needed to ensure that these sources cannot take effect. They are known as protection methods against ignition. Chapter eight discusses the various methods of protection against ignition by electrical equipment and chapter nine covers the methods of protection for non-electrical (mechanical) equipment.

Chapter ten briefly discusses the special requirements for equipment intended for use in hazardous areas classified as zone 0 and for equipment placed where a zone 0 borders on a zone 1 or 2 area.

If personnel safety depends on it, gas detection equipment must be used. Chapter eleven covers the selection of suitable measuring equipment, its use and the basic rules for working in zoned areas

Chapter twelve discusses the Ex-certification applied in Europe and explains the North American system.

Lastly, chapter thirteen describes the ATEX and IECEx certification process and where manufacturer and user responsibilities lie.