2. LEGAL BASES

2.2 EXPLOSION PROTECTION IN THE EUROPEAN UNION

Explosion protection is governed by directives and standards in the European Union.

Directives
In 1976 the Council of the European Community established the basis for the free movement of explosion-protected electrical equipment within the European Union with its “Directive on the harmonisation of the laws of the member states concerning electrical equipment for use in potentially explosive atmospheres (76/117/EEC)”. This directive has since been continuously adapted to state-of-the-art standards by means of single and supplementary directives, which however only concerned electrical equipment.

Full harmonisation and extension to all types of equipment, both electrical and non-electrical, was achieved in 1994 by the new 94/9/EC (ATEX) directive. This was followed in 1999 by the 1999/92/EC directive, which governs operation in hazardous areas and defines safety measures for the persons working in those areas. In February 2014, Directive 2014/34/EU (ATEX) was published. Actual implementation with regards to equipment certification took place on 20 April 2016, replacing Directive 94/9/EC.

Standards
The European EN 50014 – EN 50020 electrical equipment standards were issued in 1978 and replaced the previous national standards for this equipment valid across Europe. Aside from the electrical equipment standards (published by the European Committee for Electrotechnical Standardization CENELEC), the European Committee for Standardization (CEN) has drafted respective standards for non-electrical explosion-protected equipment.

According to an agreement between the European Committee for Electrotechnical Standardization CENELEC and the International Committee for Electrotechnical Standardization IEC, international standards for electrical equipment have generally been adopted by CENELEC as they stand. The EN 50014 ff series defining requirements for equipment in explosive gas atmospheres has been gradually replaced by the EN 60079 series (at international level IEC 60079). In Germany these standards are issued as VDE 0170.

Recognised IECEx certification bodies (ExCB = certification body) and IECEx test laboratories (ExTLs) exist worldwide and are accredited on the basis of high standard criteria and regularly monitored. An IECEx certificate is only issued if test sample type testing is successful and an audit verifies that an effective quality management system is in place. However, different regional and national approval procedures currently exist all over the world, including for example the ATEX directive in the European Union or national approvals in the USA (UL, FM).

Besides the IECEx Scheme for testing and certifying new products (IECEx Equipment Scheme), for some years now the system has also included certification of service providers (IECEx Certified Service Facilities Program). The service provider must prove that it maintains a quality assurance system. It is audited every three years by an accredited auditing body (Ex-CB).

The third component of the IECEx Scheme (IECEx Certification of Personnel Competencies) runs on similar lines. It focuses on the certification of the personal skills of professionals working in hazardous areas. This is designed as a guarantee for global operators that employees possess the necessary qualification and experience to perform with perfection highly complex tasks in hazardous areas.

In the “Recognised Training Provider (RTP)” programme the IECEx organisation examines the competence of providers offering explosion protection courses. A list of training providers is available on the IECEx website.
The requirements of protection types for areas with combustible dust were contained in the IEC 61241 series. In Europe these EN 61241 standards replace the former EN 50281 series. However, since most requirements for gas and dust are similar, they are compiled under the series IEC or EN 60079 (see Table 3).

After publication of Directive 94/9/EC in Europe, construction regulations for non-electrical equipment were also specified by the EN 13463 standard series (see Table 4). Some protection principles for electrical equipment were adopted, although amendments were made to address the special requirements of non-electrical equipment. Published in 2016, standards ISO 80079-36 and -37 have been adopted as EN ISO 80079-36 and -37.

### Table 4: Non-electrical equipment for use in hazardous areas

<table>
<thead>
<tr>
<th>EN</th>
<th>Basic Principles and Requirements</th>
<th>Protection by flow restricting enclosure &quot;fr&quot;</th>
<th>Protection by flameproof enclosure “d”</th>
<th>Protection by constructional safety “c”</th>
<th>Protection by control of ignition source “b”</th>
<th>Protection by liquid immersion “k”</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 13463-1</td>
<td>Basic Principles and Requirements</td>
<td>EN 13463-2</td>
<td>EN 13463-3</td>
<td>EN 13463-5</td>
<td>EN 13463-6</td>
<td>EN 13463-8</td>
</tr>
</tbody>
</table>

Other important harmonised standards on explosion protection worthy of mention are EN 11267-1 and -2. They set out methods by which hazards are identified and assessed and outline the respective protection measures. Both preventive explosion protection (avoiding explosive atmospheres and effective ignition sources) and constructive explosion protection (containing explosion effects) are addressed. With the aim of preventing ignition sources as a protective measure, all ignition sources are described and possible measures for their avoidance defined. While Part 2 is relevant for mines, Part 1 deals with other areas (above ground).

2. LEGAL BASES

2.2.1 INSTALLATION AND OPERATION

**Directive 1999/92/EC** “Minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres” explains the principles of the operation of systems in hazardous areas. It is thus directed at operators (employers). They must assess the explosion hazard, classify the system into hazardous zones and document all measures to protect employees in the explosion protection document.

**Evaluation of explosion risks**

When assessing explosion risks, the following should be taken into account:

- Likelihood and duration of the presence of the explosive atmosphere.
- Likelihood of ignition sources being present, activated, and becoming effective.
- Materials and methods used and their possible interaction.
- The extent of the expected impacts of explosions.
**Zone classification**
The operator must classify the areas in which explosive atmospheres may be present into zones. It should also ensure compliance with the directive stipulating the minimum requirements (in an organisational and technical respect).

**Explosion protection document**
The explosion protection document must compulsorily contain details on the following aspects:

- Risk assessment.
- Protection measures adopted.
- Zone classification.
- Observance of minimum requirements. These are divided into organisational measures (e.g. instruction of employees) and technical measures (explosion protection measures).

Directive 1999/92/EC only contains minimum requirements, which may be freely extended on implementation in national legislation.
2. LEGAL BASES

2.2.2 SELECTION OF EQUIPMENT

In 1994 EC Directive 94/9/EC “on the approximation of the laws of the Member States concerning equipment and protective systems for use in potentially explosive atmospheres” was issued to further standardise explosion protection in the EU. It was replaced in 2014 by EU Directive 2014/34/EU (ATEX). It stipulates the requirements for the quality of explosion-protected equipment and protective systems (e.g. by setting out provisions for conformity assessment, protective levels, certification, manufacture and quality assurance, operating manuals and declarations of conformity), in that it prescribes the essential health and safety requirements which must be satisfied by manufacturers and importers. The directive thus ensures the free movement of goods within the European Union and must be adopted as it stands into national legislation. In Germany for instance, this took the form of the Explosion Protection Product Ordinance as 11th Ordinance of the Equipment and Product Safety Act (11. ProdSV). It applies to all industrial hazardous areas (including mining).
The directive applies to equipment, components and protective systems for use in hazardous areas. It also applies to safety, control and regulating apparatus used outside the hazardous area, if the latter is necessary in respect of explosion hazards for the safe operation of equipment in the hazardous area. The directive does not refer to established standards, but sets out fundamental safety requirements, which are deemed as binding quality requirements. Protection from other hazards (e.g. electric shock) which may be caused by this equipment must also be taken into account.

Equipment means machines, apparatus, fixed or mobile devices, control components and instrumentation thereof and detection or prevention systems which, separately or jointly, are intended for the generation, transfer, storage, measurement, control and conversion of energy and/or the processing of material and which are capable of causing an explosion through their own potential sources of ignition.

Component means any item essential to the safe functioning of equipment and protective systems but with no autonomous function.

Protective systems means devices other than components of equipment that are intended to halt incipient explosions immediately and/or to limit the effective range of an explosion. These are generally available in the market for use as autonomous systems.

A hazardous atmosphere means an atmosphere which could become explosive due to local and operational conditions.

Equipment categories
Manufacturers whose equipment may represent a potential ignition source and thus may cause an explosion must submit the latter for an ignition hazard assessment. In addition, measures corresponding to the fundamental safety requirements should be envisaged to preclude the risk of ignition by this equipment. The directive classes equipment for hazardous areas (with the exception of mine workings) into three categories with different levels of safety. The required protective measures are adopted to the respective required level of safety (Chapter 3.2).

Conformity assessment and certification
Equipment for use in hazardous areas must first be submitted to the conformity assessment procedure prescribed by the directive before being put into circulation or on the market. Category 1 and M1 equipment must be submitted to a type approval test and certification by a notified inspection authority. The same applies to Category 2 and M2 electric equipment and combustion engines. Manufacturers can determine and document conformity with the directive requirements for other non-electric equipment in this category and for Category 3 equipment. The certificates from a notified inspection authority are recognised throughout the EU. Existing EC type examination certificates continue to retain their validity under the new EU Directive 2014/34/EU.

Marking
EU Directive 2014/34/EU requires special marking:

- CE marking.
- Symbol @ with group, category and additional letter G or D.

(See Chapter 3.6 for more details.)

Operating instructions
The manufacturer's operating instructions must clearly define the intended use of the equipment by the operator. Minimum requirements of operating instructions include details on safe commissioning, use, mounting and dismantling, upkeep (maintenance and fault clearance) and safe setting-up. It may also be necessary to specify special conditions for safe use (including information on improper use).

Equipment and systems may only be put on the market if they bear the CE mark and the manufacturer's operating instructions and declaration of conformity are enclosed. The CE mark and written EU declaration of conformity confirm the product's compliance with all requirements and assessment procedures stipulated in the EU directives.