ATEX ADCO
Recommendation

Dry installed pumps – Requirements according to explosion protection of dry installed pumps conveying inflammable liquids

Foreword

This document is the result of a discussion in the group in which the market surveillance authorities responsible for the ATEX Directive co-operate throughout Europe (ATEX ADCO)[1].

The objectives of the administrative co-operation are:

- To facilitate the uniform application of Union harmonisation legislation within their area of Directive 2014/34/EU [3] with a view to increase the efficiency of market surveillance throughout the internal market.
- To inform each other of national market surveillance methods and activities and to develop and promote best practices.
- To identify issues of shared interest relating to market surveillance and suggest common approaches to be adopted.
- To exchange views.
- To solve practical problems.
- To establish and coordinate common projects, such as cross-border joint market surveillance activities.
- To exchange information on market surveillance interventions.
- To harmonize the findings of the market surveillance actions.
- To harmonize the quality of the market surveillance actions.

A recommendation of ATEX ADCO aims to inform economic operators and other interested parties as well as market surveillance authorities about the view of the members of ATEX on the application of the Directive 2014/34/EU [3] in a particular case. It is not intended to overrule the ATEX 2014/34/EU Guidelines [4] which are the official guidance document of the EU Commission on the application of the ATEX 2014/34/EU Directive. The recommendation is a more detailed explanation of a question based on the statements in the ATEX 2014/34/EU Guidelines [4]. Neither the ATEX 2014/34/EU Guidelines [4] nor the recommendations of ATEX ADCO have a legal binding force. The legal binding force is restricted to the ATEX 2014/34/EU Directive itself.

[1] The latest version (14.12.2023) has been discussed during the 36th ATEX ADCO meeting held in Brussels (item 7.1.5). This document is a revised version from the meeting version with amendments and editorial changes.

1. Introduction

When emptying storage tanks, storage vessels or tanks filled with flammable liquids, the parties involved repeatedly have different interpretations of the same facts in practice. Likewise, it is often difficult to find a consensus regarding responsibility for compliance with legal and safety requirements.

This document is dealing with the different approaches and shows possible solutions that can be taken without compromising safety to manage the emptying process safely. This document does not apply to products already placed on the market.

“Dry installed pumps” e.g., positive displacement pumps or centrifugal pumps, means, that they are not submerged. This document aids in assigning requirements to equipment (categories) according to the probability of the occurrence of explosive atmospheres for pumps used to convey flammable liquids. The probability of the occurrence of explosive atmospheres is determined by the employer (operator) during the risk assessment in accordance with Articles 4 and 8 and Annex I point 2 of Directive 1999/92/EC [1] (zone classification).

2. General information

Whenever explosion protection-safety measures come into application, it should be emphasized that a manufacturer is requested to perform a risk assessment to systematically record potential hazards, determine the probability of occurrence of explosive atmosphere and potential ignition sources and implement suitable countermeasures. For explosion protection it is established that zone classification using EN 60079-10-1 or appropriate national standards shall be performed by the employer/user. This can be used as a basis for implementing suitable preventive (preventing the generation of explosive atmospheres) and technical (avoiding ignition sources in accordance with the EN 60079 / EN ISO/IEC 80079 standards series) explosion protection measures, as well as operational measures described in the EU Directive 1999/92/EC and the European Standard EN 1127-1:2019.In any case, it must always be kept in mind that, as regards the occupational safety and health of the workers involved, adherence to standards does not necessarily guarantee the fulfilment by the employers of their legal obligations under the applicable legislation on safety and health at work (there is no analogous to the “presumption of conformity” under that legislation), and that, under EU Directives 1999/92/EC [1] and 89/391/EEC [2], employers are in all cases required to conduct individual and comprehensive risk assessments to identify and assess all risks that workers face or could potentially face at work and to take the resulting preventive and protective measures that are necessary to ensure the safety and health of workers in every aspect related to the work, as required by the said EU Directives 1999/92/EC [1] and 89/391/EEC [2]. In addition, it must also be noted that, as regards the occupational safety and health of the workers involved, attention must be paid also to other applicable legislation on safety and health at work. For example, pumps used at work will constitute “work equipment” under EU Directive 2009/104/EC and, therefore, the national legislation transposing that Directive will also have to be complied with. Similarly, the use of any personal protective equipment must comply with Directive 89/656/EEC. Useful advice for the proper application of EU Directive 1999/92/EC [1] can be found in the *Non-binding guide to good practice for implementing the European Parliament and Council Directive 1999/92/EC*, available at: https://op.europa.eu/en/publication-detail/-/publication/c23f5429-1632-4b61-9eb1-a6c0e60828e0.

In doing so, the preventing explosion protection measures are intended to prevent the release of flammable mixture by ensuring that the plant parts are sufficiently leak-tight. Since leak-tightness is a critical aspect of most plant safety concepts, it is necessary to improve precise specifications about

leak-tight connections on the equipment. In this document it is assumed that the equipment under consideration is "technically tight" (normal tightness) (see EN 1127-1 "Explosive atmospheres – Explosion protection – Part 1: Basic concepts and methodology" in the form of Annex B: Leak-tightness of devices). Equipment which can be regarded permanently technically tight (enhanced tightness) and the effects on the zones outside needs further consideration.

The extent of the protective measures depends on the likelihood of occurrence of a hazardous explosive atmosphere and the consequences of a possible explosion. This is realized by distinguishing between different categories of equipment as specified by the Directive 2014/34/EU [3]. These categories reflect the requirements of the different zones. The marking must be accordingly to these categories. The zones for the classification of hazardous areas are defined in Directive 1999/92/EC [1].

Hence categorisation is also a subject of cooperation between the “manufacturer” and “employer/user”. However, it must be kept in mind that, as regards the occupational safety and health of the workers involved and under the applicable legislation on safety and health at work, the responsibility for the safety and health of the workers ultimately lies with the employer (see, in particular, Article 5 of Directive 89/391/EEC [2]).

Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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:

- EN 1127-1:2019: Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology.
  This is the European harmonized standard for basic method for explosion prevention and protection measures.
- EN IEC 60079-0: 2018: Explosive atmospheres - Part 0: Equipment - General requirements.
- EN 60079-26:2015: Explosive atmospheres - Part 26: Equipment with separation elements or combined Levels of Protection.
- EN ISO 80079-36:2016: Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic method and requirements.
  This is the European and International basic standard for mechanical (called non-electrical) equipment. The method to perform the ignition hazard assessment is described into there.
- EN ISO 80079-37:2016: Explosive atmospheres - Part 37: Non-electrical equipment for use in potentially explosive atmospheres - Protection by design safety "c", ignition source monitoring "b", liquid encapsulation "k".
  This standard is written in addition of EN ISO 80079-36:2016 for type of protection only.
- EN ISO/IEC 80079-34:2020[2]: Potentially explosive atmospheres - Part 34: Application of quality management systems for the manufacture of explosion-proof products.
- The EN ISO 9001:2015 "Quality management systems – Requirements" is completely embedded into the EN ISO/IEC 80079-34:2020.

[2] This standard is not harmonised. The harmonised version as published in the OJEU is version EN ISO/IEC 80079-34:2011. Version 2020 was not submitted by CEN/CENELEC to the Commission for harmonisation. For this standard, the annex contains for the first time information on quality assurance for non-electrical equipment, which is not included in the 2011 edition.

3. Basics for explosion protection

Dry installed liquid pumps are used under various operating conditions. The range of applications can extend from standard applications without explosion protection measures to applications in which the inlet connection of the pump is connected to a pipe with a permanently or long-term explosive atmosphere. The requirements for explosion protection of pumps depend on the probability of the occurrence of explosive atmospheres in the environment as well as in the connected pipelines (piping). This then determines which type of protection can be used to reach the required category.

The manufacturer is responsible for determining the equipment category according to Directive 2014/34/EU [3] of the pump and the intended use. For the intended use, all operating conditions of the service life including commissioning, start-up and shutdown as well as decommissioning must be taken into account. The manufacturer therefore is responsible for the equipment specific ignition sources.

The probability of the occurrence of an explosive atmosphere and the probability of the occurrence of possible ignition sources must be considered by the employer in a risk assessment in accordance with Directive 1999/92/EC [1]. The employer/user must take care of the technical boundary conditions required for the safe operation of a pump due to its design.

Nevertheless, uncertainty can arise between manufacturers and employers regarding explosion protection requirements. However, as mentioned above, it must be kept in mind that, as regards the occupational safety and health of the workers involved and under the applicable legislation on safety and health at work, the responsibility for the safety and health of the workers ultimately lies with the employer (see, in particular, Article 5 of Directive 89/391/EEC [2]).

Especially in the tank farm sector, centrifugal (rotodynamic) pumps are predominantly used for pumping flammable liquids. For an accurate function of such a pump, a permanently and completely filling with liquid is evident, otherwise a continuous pumping of liquid is not guaranteed and the so-called dry running occurs immediately. The task of these pumps includes:

- the removal of e.g. fuels from underground tanks into tank trucks and
- the storage of e.g. fuels from tank trucks into underground tanks using the gas shuttle method.

In the first case, the suction line to the pump may run dry after the pump unit is switched off. When restarting the pump, the empty suction line is evacuated by the pump. At this point, there is a liquid/gas mixture delivery.

In the second case a connected tank truck and the pipe/hose connection are drained completely by a pump. Here again a liquid/gas mixture is conveyed (at the end of the conveying process).

4. Relationship between zoning and category

Risk analysis

An important activity of the manufacturer is to carry out a comprehensive risk analysis (e.g. according to the Machinery Directive [5] or the Machinery Regulation [6][3]), in order to check, among other things, whether a pump as a piece of equipment falls within the scope of Directive 2014/34/EU [3]. Pumps not in contact with flammable liquids and without the presence of an explosive atmosphere in the environment do not come into contact with an explosive atmosphere and consequently do not fall within the scope of Directive 2014/34/EU [3]. If the occurrence of an explosive atmosphere cannot be avoided, the employer must determine the probability of the occurrence of an explosive atmosphere based on directive 1999/92/EC [1]. Depending on this probability, the employer may have to divide the hazardous areas into zones.

Zone classification

The required category of a device results from the zone classification of the employer/user. The zone classification is carried out in accordance with EU Directive 1999/92/EC [1] as has been transposed and implemented accordingly in national law in the EU member states. The method of classification is not specified in the EU Directive 1999/92/EC [1] further to what is provided for in Annex I. On an international level the methods for classification of EN 60079-10-1:2020 are available for use by the end-users. In any case, the method and results of the classification must be in line with the requirements of Directives 1999/92/EC [1] and 89/391/EEC [2].

The Directive 2014/34/EU [3] explicitly refers to the placing of equipment on the market and describes the manufacturer's responsibility and the associated conformity assessment procedures.

The category requirements at the connecting flanges may vary depending on the design of the pipe flanges. To introduce the different explosion protection requirements for pumps, some examples are presented below. Depending on the potential of explosion hazards and the category of the pump as non-electrical equipment/product, the requirements lead to different conformity assessment procedures, for which in some cases a notified body must be consulted.

The employer can deviate from the rigid assignment of zones to categories of equipment under the conditions of Annex II B of Directive 1999/92/EC [1], if equivalent safety is documented in the explosion protection document. Equivalent safety can only be achieved by additional measures such as switching on the pump when there is sufficient liquid cover, provided that the basic principles for the prevention of and protection against explosions and the order of priority of the relevant measures are respected (see, in particular, Article 3 of Directive 1999/92/EC [1] and Article 6 of Directive 89/391/EEC [2]).

Coupled conditions

Coupled conditions, i.e. the simultaneous occurrence of an explosive atmosphere and an ignition source, e.g. in a self-priming pump, where the explosive atmosphere reaches the internal parts of the pump and an ignition source, e.g. due to dry running, can become effective. Another example is electrostatic charging liquids of low conductivity in self-priming pumps. When the liquids are nebulized, static charges can occur and this can lead to ignition of the explosive atmosphere inside the pump in the further course. Such conditions require supplementary measures for explosion protection.

[3] Article 54 of the Machinery Regulation sets out the dates of entry into application of the Regulation as a whole and of certain of its provisions in particular.

5. Conformity assessment procedure

General

The conformity assessment for a pump unit depends on whether it can be considered as a whole, in the sense of combined equipment with ignition sources newly occurring due to the assembly according to § 44 par. 1. and 2.c) of the ATEX Guidelines [4], or as an assembly of several devices without additional ignition hazards according to par. 2.a) and 2.b). An assembly may consist of several devices, e.g. a dry installed pump, a coupling and a motor. However, each individual piece of equipment in the assembly must comply with the requirements and go through the designated conformity assessment procedure.

The conformity assessment procedure for equipment as defined in Directive 2014/34/EU [3] consists mainly of two measures:

- assessment of the construction or design of the equipment, and
- assessment of the quality control of the production/manufacturing process.

The manufacturer of an assembly can assume conformity of these devices and limit an additional risk assessment of the assembly to the additional ignition hazards that become relevant due to the final combination. The pump unit as a combined device is supplied with separate declarations of conformity for each contained device and a manufacturer's declaration containing the references to the operating instructions of the devices combined in this assembly. This procedure does not require the intervention of a notified body. Regarding the external parts of the pump, the manufacturer carries out the necessary tests and assessments under his own responsibility, draws up the technical documentation, including the necessary test reports, and forwards it to the notified body. He marks the pump with the CE mark and issues an EU declaration of conformity. The manufacturer shall keep a copy of the EU declaration of conformity and the technical documentation for ten years[4] after the product has been placed on the market. Internal control of production ensures that manufacturing is carried out in accordance with the technical documentation and the requirements of the Directive as a quality assurance module for category 2 non-electrical equipment. In any case, work equipment and connecting devices (such as pipework or electrical connections) must be so assembled that they cannot cause or trigger an explosion. They may be put into service only if the assessment of explosion risks establishes that their operation does not cause ignition of an explosive atmosphere. This also applies to work equipment and associated connecting devices which are not equipment and protective systems within the meaning of Directive 2014/34/EU [3].

NOTE: Harmonized standards EN ISO 80079-36:2016 and EN ISO 80079-37:2016 define basic measures for the explosion-proof design of non-electrical equipment.

Conformity assessment procedure for a category 1 equipment/product

The conformity assessment procedure for category 1 devices requires increased effort. The involvement of a notified body is essential. The manufacturer can use two different procedures to issue the EU declaration of conformity. In this procedure, unit verification (2014/34/EU, Annex IX) or EU-type examination (2014/34/EU, Annex III) by a notified body are the relevant and possible test modules. To carry out an EU-type examination procedure, the manufacturer submits an application to a notified body of his choice and encloses the technical documentation. If required, he provides a representative sample for the tests. The notified body checks the conformity of the equipment, components and, if applicable, protective systems with the requirements of the directive and the relevant standards based on the technical documentation. The conformity of the devices with the

[4] The new Machinery Regulation (EU) 2023/1230 [6] requires, that documents (e.g. technical documentation, EU declaration of conformity, instructions for use) shall be kept at the disposal of the relevant national authorities for at least 10 years after the machinery or related product has been placed on the market.

technical documentation is confirmed. The corresponding tests are carried out on the representative sample. Upon completion of the tests, the notified body shall issue an EU-type examination certificate, keep a copy of the technical documentation, and inform other notified bodies of withdrawn certificates.

The manufacturer shall keep the EU-type examination certificate and the technical documentation for 10 years[4] after the last product has been manufactured and shall inform the notified body of any changes affecting compliance with the essential health and safety requirements. The EU-type examination certificate alone does not constitute an authorisation to affix the CE marking but must be supplemented by a quality/product assurance module.

Production monitoring control module

An essential module is the production surveillance control of devices and components for which an EU-type examination certificate has been issued. For Category 1 equipment and components, the application of Annexes IV or V of Directive 2014/34/EU [3] is foreseen.

For the quality assurance elements of equipment for normal use in potentially explosive atmospheres, the annex of EN ISO/IEC 80079-34:2020 contains information[2].

Production quality assurance procedures (Annex IV)

The manufacturer shall operate a quality system for production, final product inspection and testing, and shall lodge an application for assessment of the quality management systems. It shall include all relevant information and documents, with a notified body of his choice. He shall take measures to ensure that the quality management system functions at all times adequately and efficiently ensure conformity of the equipment with the type indicated in the EU-type examination certificate and shall guarantee access of the notified body to facilities and documents. Planned modifications affecting the conformity of the equipment with the type indicated in the EU-type examination certificate and/or the compliance with the essential health and safety requirements shall be disclosed. The manufacturer shall keep documents concerning the quality management system and its updates, as well as decisions and reports from the notified body for 10 years after the product has been placed on the market.

The notified body shall assess the quality management system for compliance with the relevant requirements, carry out an audit at the manufacturer's premises and issue a "production quality assessment communication". It conducts repeat audits at regular intervals (including unannounced visits to the manufacturer's production sites, if necessary) to ensure that the manufacturer is complying with the quality management system. The notified body shall inform other notified bodies of withdrawn certificates and amendments.

The quality management system audit primarily verifies all functions of a complete quality management system (not product specific). As a rule, this is a prerequisite for the Ex-audit, i.e. already existing certificates according to EN ISO 9001 are taken into account. The so-called Ex-audit or an additional audit checks the inclusion of explosion protection in the existing quality management system as well as the concrete technical implementation of the EU-type examination certificates (product-specific). The product groups and the applied protection types or protection concepts determine the content of the audit. During the audit, all relevant manufacturing and testing steps must be observable.

Product testing procedure (Annex V)

The notified body performs the relevant tests and assessments by inspecting and testing each individual product (unit verification), affixing its identification number to the device and issuing a "Certificate of Product Verification".

The "product verification" module is rarely used. For larger quantities, an enormous amount of coordination is required. As a rule, the Ex-relevant features cannot be fully tested on the finished

product. The necessary test steps are distributed throughout the entire manufacturing process. Since most manufacturers operate a certified quality management system, it is usually much easier and less expensive to provide proof of conformity with other modules. Product verification is therefore only interesting for very small series of "very large" and expensive devices. For single devices, it is cheaper to perform the unit verification according to Annex IX. This module combines EU-type examination and product verification in one procedure.

6. Examples - Equipment category and zone classification

In the following examples, the various cases, with different probabilities of the occurrence of explosive atmospheres inside and outside a pump and the associated categories are presented in the following examples. The order of marking considers the inside first and the outside second. The electrical equipment is to be considered as independent from the pump therefore the conformity assessment procedure of the electrical equipment must be performed separately.

In any case it is essential to consult the instruction manual and check what measures are to be provided for the inside and the outside of the pump.

Case a:

Non-electrical Pump in an area where explosive atmosphere is likely to occur occasionally ("zone 1"[5]) without connection to an explosive atmosphere inside the connecting flanges.

Note: the picture contains an example of a pump

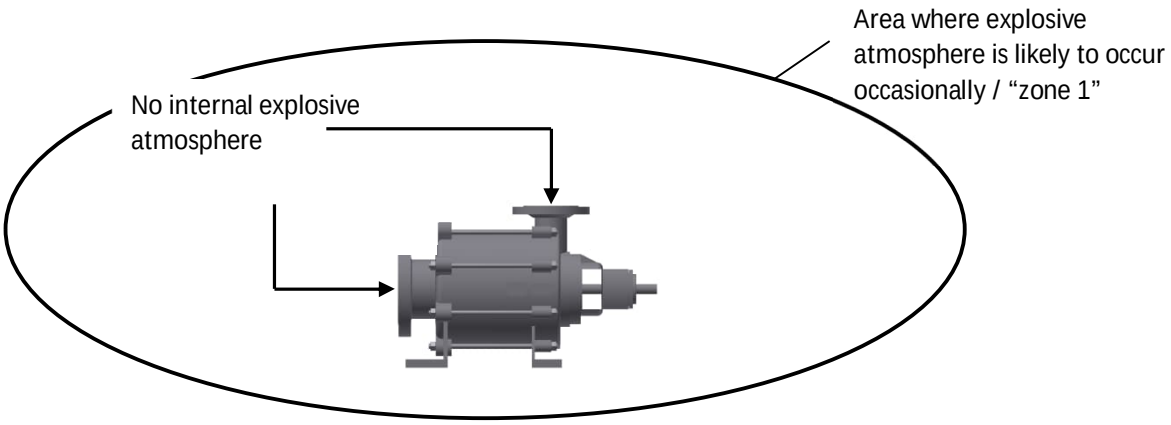

Figure 1 – Pump of category -/2; installed in zone 1, not connected to any zone

The pump is intended for use in an area, where an explosive atmosphere is likely to occur occasionally. The category outside of the pump must be category 2.

The employer/user ensures that on the process side, the boundary conditions required by the unit for trouble-free operation are maintained (e.g., ensuring liquid filling before start-up, venting the pump, adherence to a start-up process, adherence to certain min. and max. volume flows). Also, compliance with the technical data important for the design (NPSH value, viscosity, substances compatible with the materials, ...) need to be ensured.

[5] See Annex I point 2(b) of Directive 2014/34/EU and Annex I point 2 of Directive 1999/92/EC [1]. In principle, category 2 equipment has to be used (see Annex I point 2(b) of Directive 2014/34/EU and Annex II B "Criteria for the selection of equipment and protective systems" of Directive 1999/92/EC [1]).

In this case no category is required for the inside of the connection flanges. The conformity assessment procedure for category 2 non-electrical equipment applies. The internal parts of the pump are not tested for contact with an explosive atmosphere.

Marking

The specific explosion protection marking in accordance with Directive 2014/34/EU [3] of such a pump shows two categories:

 II -/2 G

The "dash" or better the marking "without category" indicates that part of the pump has no provisions for explosion protection. The slash and the number 2 show that category 2 is realized on the outer parts of the pump. Overall, the pump can be used in a zone 1 environment and is not protected on the internal parts.

Example for a marking considering harmonised standards:

Ex h IIB T3 -/Gb

Leads to a complete marking e.g.:

 II -/2 G Ex h IIB T3 -/Gb

Case b:

Pump in an area where explosive atmosphere is likely to occur occasionally (“zone 1”) with a connection to explosive atmosphere inside the connection flanges, in which explosive atmosphere is unlikely to occur or if they do occur, are likely to do so only in frequently and for a short period of time only (“zone 2”).

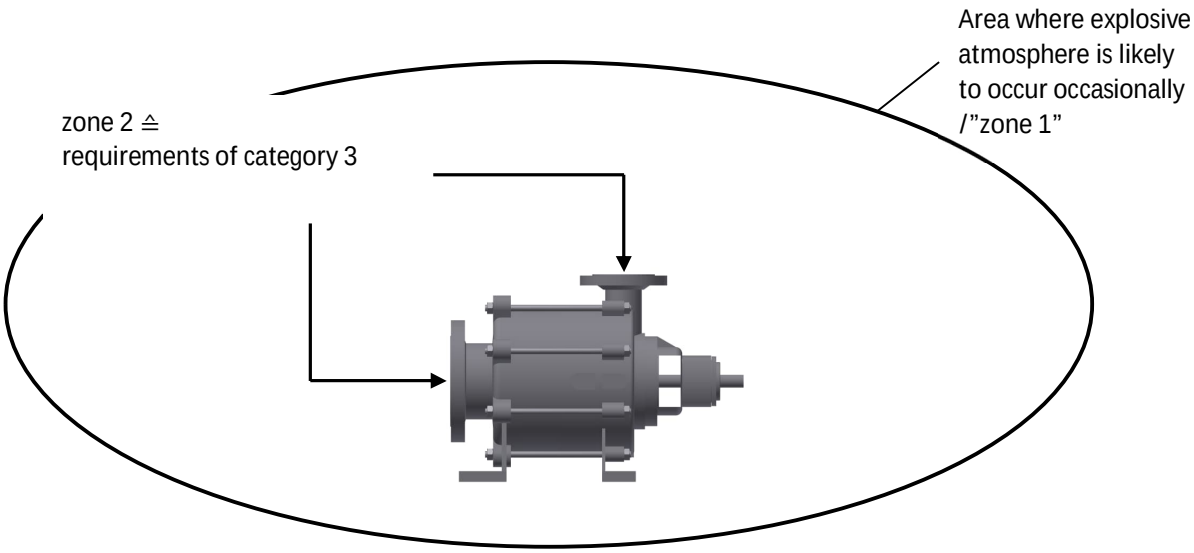

Figure 2 – Pump of category 3/2; installed in zone 1, connected to zone 2

According to the intended use (and in line with the employers’ risk assessment) the category of the outside of the pump is category 2 and inside the connecting flanges is category 3. The conformity assessment procedures for category 3 and 2 equipment apply.

Classification of category 3 inside of the flanges may require additional measures.

Marking

The specific explosion protection marking of such a pump shows two categories:

II 3/2 G

Example for a marking considering harmonised standards:

Ex h IIB T3 Gc/Gb

Leads to a complete marking e.g.:

II 3/2 G Ex h IIB T3 Gc/Gb

In general, the pump can be used in zone 1 environment and is suitable for connection to piping whose interior is classified as zone 2.

Case c:

Pump intended to be used in an area where explosive atmosphere is likely to occur occasionally (“zone 1”) with a connection to flanges, where inside explosive atmosphere is likely to occur occasionally (“zone 1”).

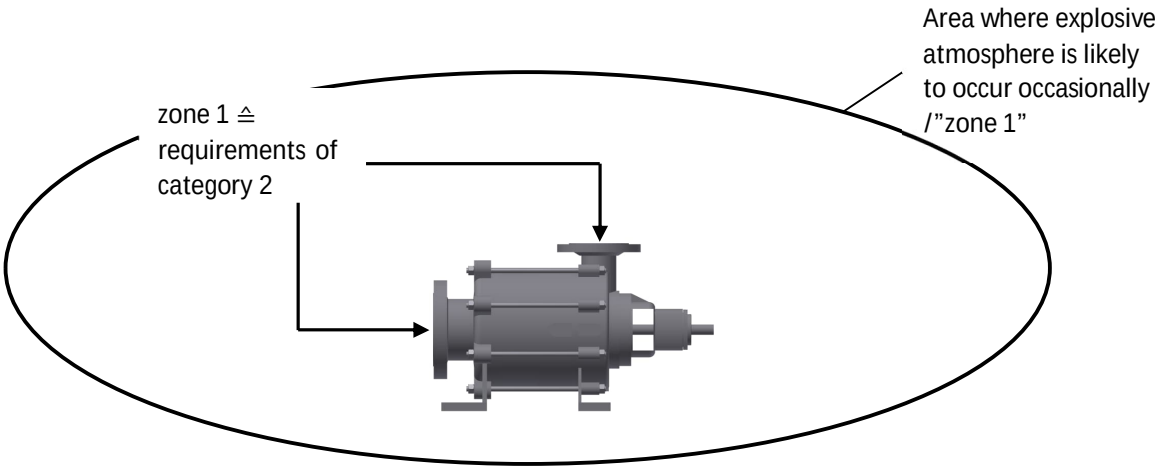

Figure 3 – Pump of category 2; installed in zone 1, connected to zone 1

According to the intended use (and in line with the employers’ risk assessment) the category of the outside of the pump is category 2 and inside the connecting flanges is also category 2. The conformity assessment procedure for category 2 equipment applies in its entirety. Category 2 at the flanges may require additional measures.

Marking

The specific marking of the explosion protection of such a pump shows only one category:

II 2/2 G

Example for a marking considering harmonised standards:

Ex h IIB T3 Gb/Gb

Leads to a complete marking e.g.:

II 2/2 G Ex h IIB T3 Gb/Gb

In general, the pump can be used in zone 1 environment and is suitable for connection to piping whose interior is classified as zone 1.

Case d:

Pump in an area where explosive atmosphere is likely to occur occasionally (“zone 1”) in contact with connection flanges where inside explosive atmosphere is present continuously or for long periods or frequently. Zone 0 inside the connection flanges.

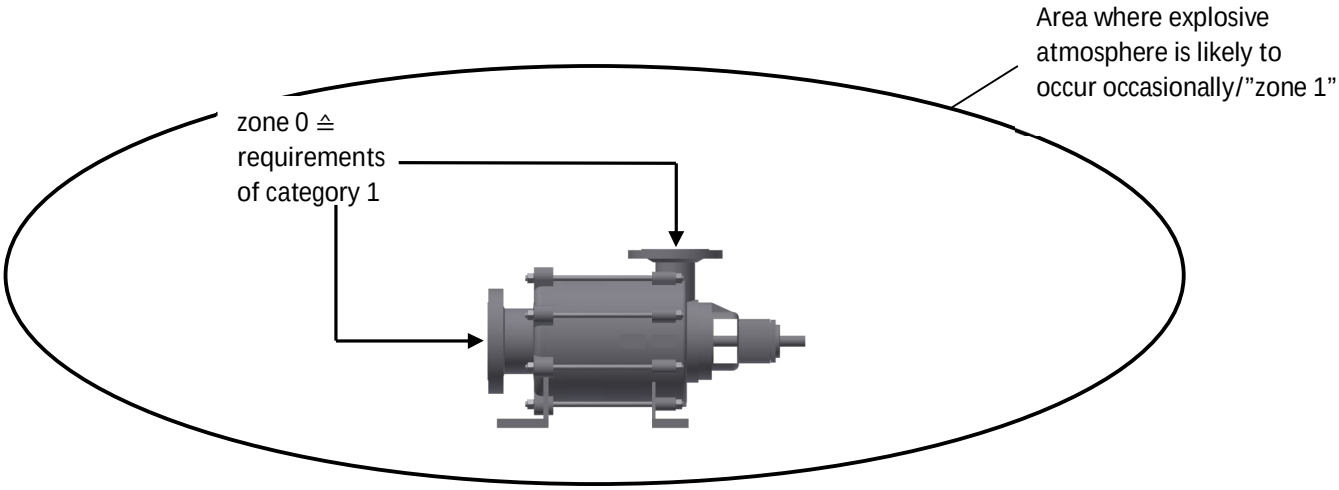

Figure 4 – Pump of category 1/2; installed in zone 1, connected to zone 0

According to the intended use (and in line with the employers’ risk assessment) the category of the outside of the pump is category 2 and inside the connecting flanges is category 1.

Category 1 inside the connecting flanges require additional measures.

The conformity assessment procedures for category 1 and for category 2 equipment apply and may be separately applied.

Marking

The specific explosion protection marking in accordance with Directive 2013/34/EU of such a pump shows two categories:

 II 1/2 G

Example for a marking considering harmonised standards:

Ex h IIB T3 Ga/Gb

Leads to a complete marking e.g.:

 II 1/2 G Ex h IIB T3 Ga/Gb

Overall, the pump can be used in a zone 1 environment.

7. Measures to meet the requirements

Equipment may have one or more equipment categories, depending on the conditions at the place of use. This ensures that sufficient explosion protection measures are taken to provide a sufficient level of safety in relation to the zone classified and connected or surrounded by the operator. Measures can be taken to reduce the probability of an explosive atmosphere occurring by the employer/user and the remaining probability of occurrence of hazardous explosive atmosphere outside the pump or at the flanges defined the measures can be taken by the manufacturer to reduce the probability of an effective ignition source.

Essentially, the times for dry running are reduced to the unavoidable minimum for these pumps. Monitoring devices are used as technical measures to safeguard the liquid filling. In relation to the connected pipeline, these measures can consist of monitoring the level in the tank and the flow through the pump. Under these conditions, there is no contact of an explosive atmosphere to a potential ignition source.

In relevant cases, it must be kept in mind that under Article 3 of Directive 1999/92/EC [1], there is an order of priority as regards the prevention of and protection against explosions: prevention of the formation of explosive atmospheres, or where the nature of the activity does not allow that, avoidance of the ignition of explosive atmospheres, and mitigation of the detrimental effects of an explosion so as to ensure the health and safety of workers. In addition, the relevant measures must where necessary be combined and/or supplemented with measures against the propagation of explosions and must be reviewed regularly and, in any event, whenever significant changes occur.

8. Summary

As mentioned, the probability of the occurrence of explosive atmospheres and the probability of possible ignition sources must be determined by the employer in a risk assessment at the place of use in his plant and documented in the explosion protection document as required by Article 8 of Directive 1999/92/EC [1]. Considering this assessment, the manufacturer and employer must agree on equipment with appropriate, intended use (keeping in mind, however, that under the applicable legislation on safety and health at work, the responsibility for the safety and health of the workers ultimately lies with the employer). Coupled conditions, the simultaneous occurrence of an explosive atmosphere and an ignition source, e.g. in a self-priming pump, where the explosive atmosphere reaches the internal parts of the pump and an ignition source, e.g. due to dry running, can become effective, are also subject to assessment.

In cases where coupled conditions exist, this strict separation of zone concept (employer) and risk analysis (manufacturer) is not suitable for identifying and preventing explosion hazards.

In certain circumstances, autonomous protection systems are required in such cases to avoid an effective ignition source for pumps with category 1 requirements. Another option is to detect and avoid such dangerous combinations by controlling/monitoring ignition sources. Depending on the intended use, all ignition sources in normal operation, expected malfunctions and rare malfunctions must be considered and properly combined in the zone concept. Each category is classified as belonging to one zone, but pumps may have more than one category.

To avoid confusion over responsibilities, the employer should provide a complete zone concept, including connected piping, as a basis for the purchasing/procurement process. The required pump can then be ordered from the manufacturer with the assigned categories.

As part of the manufacturer's conformity assessment procedure for a pump unit, consideration must be given to whether an additional ignition hazard is created due to the combination of the units. This must be carried out for each individual piece of equipment. Similarly, a Declaration of Conformity for

an assembly or a "Declaration of Manufacture" can also be included in the assessment procedure. In this way, it can be ensured that a combination (of devices, assemblies, has been installed without additional ignition hazards.

Bibliography

[1] *Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on the minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres.*

[2] *Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work.*

[3] *Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres (recast).*

[4] *Guidelines on the application of Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres, ATEX Guide (3rd edition December 2022).*

[5] *Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery and amending Directive 95/16/EC.*

[6] *Regulation (EU) 2023/1230 of the European Parliament and of the Council of 14 June 2023 on machinery and repealing Directive 2006/42/EC of the European Parliament and of the Council and Council Directive 73/361/EEC.*

[7] *VdTÜV bulletin on tank facilities 967: 11-2012, Requirements for storage facilities with stationary tanks, for active storage in mobile tanks and for filling and emptying points for flammable liquids.*

[8] *Himstedt, M.: Explosion protection concept for liquid pumps of ATEX category 1. in: International Rotating Equipment Conference, Düsseldorf, October 28, 2008.*

[9] *Degener/Krause/Dinkler/Frobese: Storage and Filling of Flammable Liquids, Industrial Safety Regulation, Technical Rules for Flammable Liquids, Collection of Regulations with Commentary.*