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INDUSTRIAL-PROCESS CONTROL – SAFETY OF ANALYSER HOUSES

FOREWORD

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International Standard IEC 61285 has been prepared by subcommittee 65D: Analysing equipment, of IEC technical committee 65: Industrial-process measurement and control.

This second edition cancels and replaces the first edition published in 1994. This edition constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

a) incorporation of previously issued corrigendum;
b) minor updates to several sections and references

The text of this standard is based on the following documents:

FDIS	Report on voting
65D/107/FDIS	65D/110/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

Process analysers measure the characteristics of a process stream continuously and automatically. The process sample is introduced automatically and the system is designed for unattended operation and minimal maintenance.

This document is designed to set forth minimum safety requirements for typical analyser houses (AHs). It shall be superseded in all cases by national, local, or corporate requirements, which may be more stringent.

The measured output is transmitted continuously for process control, operator action or documentation. Process analysers are used for

– environmental analysis;
– personnel protection;
– equipment protection;
– quality measurement/control;
– process control (plant optimization);
– energy conservation.

In the simplest case, the analyser sensor is mounted directly in the material to be measured, and there is no need to extract a sample. In other cases, a sample is extracted from the main stream and transported to the analyser. The system may include many functional elements such as

– sample extraction;
– sample transport;
– sample conditioning;
– sample stream disposal and/or return to process;
– utilities and auxiliary materials supply;
– stream switching;
– automatic or manual calibration and validation system;
– signal processing;
– performance monitoring and control.

(See IEC 61115.)

Analyser elements can be arranged modularly and located separately. There are advantages in grouping analysers and systems and further advantages in enclosing them. Advantages include

– lower cost of installation of utilities and signals;
– protection of personnel and complex modules and equipment from adverse ambient conditions;
– ease of maintenance;
– safety.

Analysers are constructed to various standards: some are ex-proof, some intrinsically safe, some suitable for Zone 2 and some suitable only for a non-hazardous area. Not all analysers are available in all variants.

Process plants usually include all zones – 0, 1, 2 and non-hazardous.

The selection of the AH location, the source of ventilation air, and the classification of the house interior and its analysers is an economic exercise.

Factors include the distance from the sample point to the AH , classification of the area around the AH, distance from the AH to the source of non-hazardous air, and the cost of analysers of classification appropriate to the house interior.

INDUSTRIAL-PROCESS CONTROL – SAFETY OF ANALYSER HOUSES

1 Scope

This International Standard describes the physical requirements for the safe operation of the process analyser measuring system installed in an AH in order to ensure its protection against fire, explosion and health hazards. This standard extends beyond IEC 60079-16 to include houses with Zone 2 interiors and to apply to toxic hazards. (Appropriate national guidelines on toxic hazards are to be followed.)

This standard does not address facilities where dust is the hazard.

Clause 4 addresses the location of the AH and connection within the process plant areas.

Clause 5 addresses the design, construction and layout of the AH. It does not address parts of the analyser measuring system installed in other locations such as sample conditioning rooms (SCR) or switchgear rooms.

Clause 6 addresses measures for reducing the danger of explosion for AHs while permitting maintenance of equipment with the power on and the case open.

NOTE For most fluids, the major constraint is that the concentration of vapours, which are hazardous for personnel, is lower than the lower explosive (flammable) limit (LEL) (see Clause 7).

Using n-Pentane as an example, the LEL is 1,4 % or 14 000 × 10^{-6}. The level immediately dangerous to life or health (which is the maximum level from which a worker could escape within 30 min without any escape-impairing symptoms or any irreversible health effects) is only 0,5 % or 5 000 × 10^{-6}.

Classification of a house interior as Zone 1 may imply that no technician can enter without protective equipment such as breathing gear. Placing an AH in a Zone 1 area would usually imply that no technician could approach the house without wearing protective equipment.

Clause 7 addresses those measures for protecting personnel from materials in the atmosphere of AHs that are hazardous to health.

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.

IEC 60079-16:1990, *Electrical apparatus for explosive gas atmospheres – Part 16: Artificial ventilation for the protection of analyser(s) houses*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
analyser cabinet
small housing in which analysers are installed individually or grouped together. Maintenance is performed from outside the cabinet with the door(s) open

3.2
analyser shelter
structure with one or more sides open and free from obstruction to the natural passage of air, in which one or more analysers are installed. The maintenance of the analysers is normally performed in the protection of the shelter

3.3
analyser house (AH)
enclosed building or part of a building containing process analysers and associated equipment where streams for analysis are brought in and which is regularly entered by authorized personnel

NOTE Within the scope of this standard, the term AH is used regardless of the structure configuration as either a room, cabinet or building and whether or not it is an integral part of, or attached to, another structure.

3.4
sample conditioning room
SCR
room that is separated from the AH and has modules for sample conditioning, auxiliary material, or sample disposal equipment.

3.5
toxic material
material that is a health hazard by inhalation from the surrounding atmosphere. Atmospheric routes such as skin absorption or ingestion are not addressed

3.6
safety back-up
additional personnel, in constant contact with a person or persons in dangerous working conditions, who could assist or get additional help

3.7
external and internal hazards
distinction is made between "external" and "internal" explosion hazards. An external explosion hazard exists when the AH is erected at a location where flammable material can be introduced from the outside resulting in dangerous concentrations of flammable gases and vapours inside the AH. An internal explosion hazard exists when a flammable mixture can result from the leakage of samples or auxiliary supplies inside the AH

3.8
lower explosive limit
LEL
lower flammable limit
LFL
volume ratio of the flammable gas or vapour in air below which an explosive gas atmosphere will not be formed

3.9
explosive gas atmosphere
mixture with air, under atmospheric conditions, of a flammable material in the form of gas or vapour in which, after ignition, combustion spreads through the unconsumed mixture

3.10
hazardous area
area in which an explosive gas atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of the analysers (includes Zones 0, 1, and 2 – Division 1 and 2 are also utilized as hazardous area definitions in many regions – refer to appropriate authorities and standards for detail definitions)

3.11
non-hazardous area
area in which an explosive gas atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of the analysers

3.12
Zone 0
area in which an explosive gas atmosphere is present continuously or for long periods

3.13
Zone 1
area in which an explosive gas atmosphere is likely to occur in normal operation

3.14
Zone 2
area in which an explosive gas atmosphere is not likely to occur in normal operation and, if it does occur, is likely to do so only infrequently and will exist for a short period only

3.15
flashpoint
lowest liquid temperature at which, under certain standardized conditions, a liquid gives off vapours in a quantity such as to be capable of forming an ignitable vapour/air mixture

3.16
ignition temperature (T-rating)
lowest temperature of a heated surface at which, under specified conditions, the ignition of a flammable substance in the form of a gas or vapour mixture with air will occur

4 Location of AHs and connection within the process plant areas

When determining the location of the AH, the following factors should be considered.

4.1 Response time

Line lengths from sample points to the analysers shall be estimated and the necessary flow rates calculated to determine whether resultant dead times, sample deterioration and flow rates are acceptable.

4.2 Utilities

Connection lengths to all utilities such as air, steam, electricity, sample return, signals, etc. shall be estimated.

4.3 Safety

4.3.1 Location

The AH should be located a safe distance from sources of toxic or flammable release, and in a place where accumulation of these materials is not likely to occur.