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TECHNICAL SPECIFICATION

Explosive atmospheres –
Part 40: Requirements for process sealing between flammable process fluids and electrical systems

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FOREWORD

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 60079-40, which is a technical specification, has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
31/1134/DTS	31/1170/RVC

Full information on the voting for the approval of this technical specification 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.

A list of all parts in the IEC 60079 series, published under the general title *Explosive atmospheres*, can be found on the IEC website.

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

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

EXPLOSIVE ATMOSPHERES –

Part 40: Requirements for process sealing between flammable process fluids and electrical systems

1 Scope

This document provides specific requirements for process sealing between a flammable process fluid and an electrical system where a failure could allow the migration of the process fluid directly into the premises wiring system.

NOTE Some definitions differentiate the terms “flammable” and “combustible” liquids on the basis of their flashpoints. Combustible liquids under conditions of elevated pressure and/or temperature can lead to the formation of flammable mists and aerosols which are within the scope of this technical specification.

This document contains requirements for evaluation, construction and testing of single process seal equipment, dual process seal equipment, and add-on secondary process seals.

The requirements of this document do not apply to conduit sealing devices, cable glands and other wiring sealing methods addressed in the IEC 60079 series or other standards.

Requirements for basic electrical safety and explosion protection are not addressed by this document, but may apply to the equipment under investigation. The effects of leakage to the environment are not addressed by this document.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-2, *Explosive atmospheres – Part 2: Equipment protection by pressurized enclosure "p"*

3 Terms and definitions

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

NOTE See Figure 1 for a graphical representation of the various process seal components.

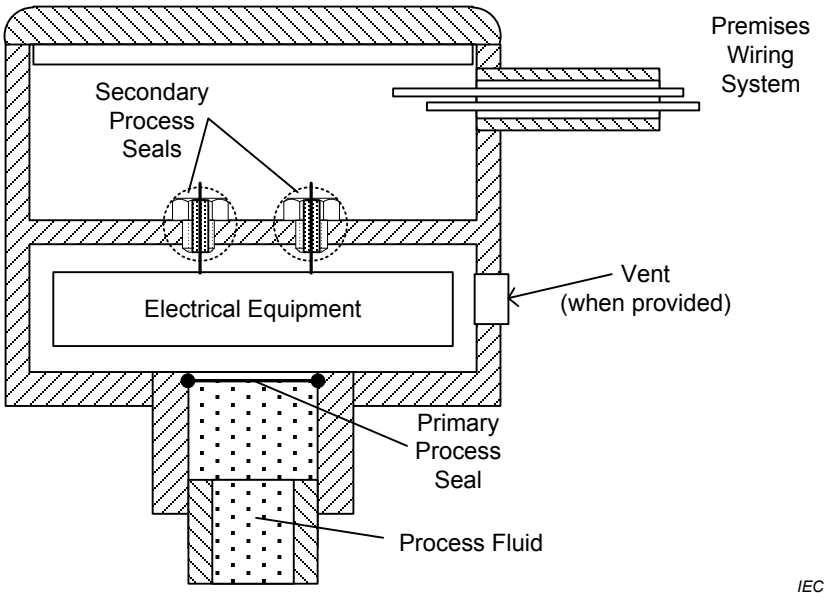

Figure 1 – Equipment process sealing components

3.1
dual process seal equipment
equipment which incorporates, along any single potential leakage path, a primary process seal and one or more secondary process seals such that the failure of two or more independent process seals is required to allow migration of process fluids from their designed containment into the premises wiring system

3.2
process connected equipment
electrical equipment that contains a process seal and is intended for connection to an external system that contains the process fluid

3.3
process fluid
gas, liquid or vapour that is used in or is a by-product of an industrial process

Note 1 to entry: For the purposes of this technical specification, use of the term process fluid refers to a flammable process fluid. For further information, refer to IEC 60079-0, IEC 60079-10-1, and IEC 60079-20-1.

3.4
process seal
seal between the electrical system and a flammable process fluid where a failure could allow the migration of the process fluid into the premises wiring system

Note 1 to entry: Although an entire containment system may constitute a potential source of release under unusual conditions, this technical specification recognizes the concept of infallible containment as defined in IEC 60079-2.

3.5
single process seal equipment
equipment that incorporates, along any single potential leakage path, a single sealing structure such that a failure of the seal would result in the migration of the process fluid from the designed containment into the premises wiring system

Note 1 to entry: Single process seal equipment in compliance with this document is considered to have a negligible probability of failure when used in accordance with the manufacturer's specification.

3.6
primary process seal
process seal that is directly in contact with process fluids under conditions of normal operation

3.7
secondary process seal
process seal that comes into contact with process fluids only in the case of a primary process seal failure

3.8
process seal with moving parts
process seal containing mechanical parts that, under conditions of normal operation, are capable of motion relative to other parts of the seal

Note 1 to entry: Examples include seals of shafts and rods that transmit rotary or linear motion into the sealed area. Process seals incorporating the following are not considered to be process seals with moving parts:

a) Thin diaphragms and other structures that may deflect when pressurized;

b) Vibrating structures such as tuning forks, coriolis tubes, and vortex sensors.

3.9
unspecified process connected equipment
equipment not assessed in accordance with this document but designed in accordance with applicable standards for the specific type of equipment

3.10
add-on secondary process seal
secondary process seal intended to be installed between unspecified process connected equipment and the premises wiring system (see Figure 2)

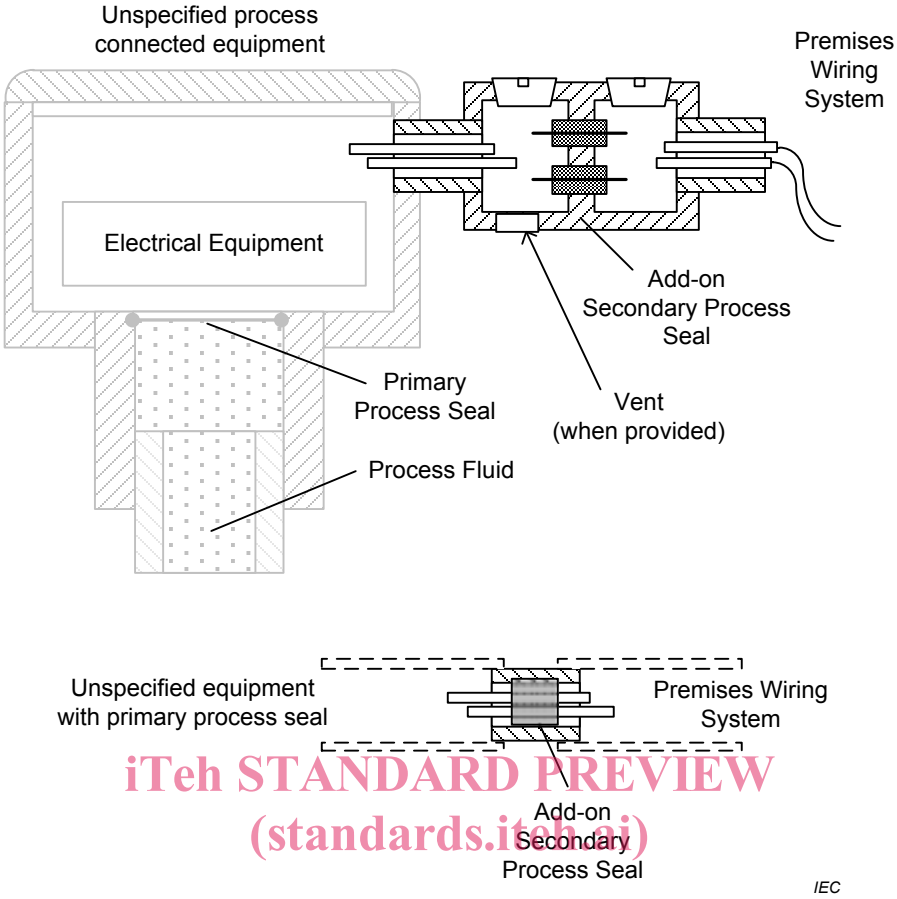

Figure 2 – Examples of add-on secondary process seals

3.11
equipment with limited pressure at the electrical connections
process connected equipment that is rated for a maximum process pressure of 1,5 kPa gauge or is provided with a drain, vent or other means sufficient to prevent pressurizing the premises wiring connection above 1,5 kPa in the event of a failure of the primary process seal

3.12
premises wiring (system)
interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed including (a) wiring from the service point or power source to the outlets or (b) wiring from and including the power source to the outlets where there is no service point

Note 1 to entry: Such wiring does not include wiring internal to appliances, luminaires, motors, controllers, motor control centres, and similar equipment.

3.13
aerosol
suspension in air or gas of solid or liquid particles

4 General requirements

4.1 Basis for requirements

The manufacturer's process seal specifications shall include the following:

a) Process temperature range (the process seal temperature may be different than the published process temperature range for the equipment);

b) Working pressure range;

c) Process wetted materials of construction.

NOTE 1 It is assumed for the purposes of this document that installers will follow standard engineering practice and adhere to industry standards for the selection, installation, and operation of equipment that contains process seals.

Under normal operating conditions, flammable process fluids shall not be released to the atmosphere.

NOTE 2 It is not a requirement of this technical specification that prevention of process fluid leakage to the atmosphere be verified.

4.2 Single process seal equipment

Single process seal equipment shall be subjected to the conditioning and acceptance tests specified in 5.2. Single process seal equipment shall not depend upon Bourdon tubes or process seals with moving parts as the primary process seal.

4.3 Dual process seal equipment

Dual process seal equipment shall be tested in accordance with 5.3.

Dual process seal equipment incorporating a purge or pressurization of the space between the primary and secondary process seals shall comply with the requirements of IEC 60079-2 relevant to the purging and pressurization apparatus.

The design and manufacture of seals incorporated into equipment with no annunciation and no venting shall minimize the probability of common mode failure.

NOTE 1 For dual process seal equipment incorporating annunciation of a primary process seal failure, long term degradation of the primary and secondary process seals of dual process seal equipment is not considered.

NOTE 2 Local, national or end user regulations can mandate additional requirements.

4.4 Equipment with limited pressure at the electrical connections

Equipment that is rated for a maximum process pressure of 1,5 kPa gauge need not be subjected to the conditioning and testing requirements of this technical specification and is considered to meet the requirements of this technical specification.

Equipment rated above 1,5 kPa and provided with a drain, vent or other means sufficient to prevent pressurizing the premises wiring connection above 1,5 kPa in the event of a failure of the primary process seal shall be evaluated in accordance with 5.4.

4.5 Purged or pressurized equipment

Process connected equipment using continuous-flow purged enclosures or pressurized equipment with infallible containment that meets the requirements of IEC 60079-2 or similar techniques such that a leak of the containment cannot produce a flammable mixture in the enclosure need not be subject to the conditioning and testing of this technical specification, and is considered to meet the requirements of this technical specification.

NOTE This requirement is not meant to apply to purged or pressurized rooms which are addressed in IEC 60079-13 and IEC TR 60079-16.

4.6 Add-on secondary process seals

Add-on secondary process seals shall be subjected to the secondary process seal leakage test of 5.3.5 and shall be marked in accordance with Clause 6 item d).