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01-junij-2024

Eksplzivne atmosfere - 2. del: Zaščita opreme z nadtlakom "p"

Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p"

Explosionsgefährdete Bereiche - Teil 2: Geräteschutz durch Überdruckkapselung "p"

Atmosphères explosives - Partie 2: Protection du matériel par enveloppe à surpression interne "p"

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Electrical apparatus for
explosive atmospheres

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TITLE:

Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p"

PROPOSED STABILITY DATE: 2029

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EXPLOSIVE ATMOSPHERES –

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Part 2: Equipment protection by pressurization “p”

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FOREWORD

245 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising
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277 IEC 60079-2 has been prepared by maintenance team MT60079-2: Maintenance of IEC 60079-
278 2, of IEC technical committee 31: Explosive atmospheres. It is an International Standard.

279 This seventh edition cancels and replaces the sixth edition published in 2014, This edition
280 constitutes a technical revision.

281 Users of this document are advised that interpretation sheets clarifying the interpretation of this
282 document can be published. Interpretation sheets are available from the IEC webstore and can
283 be found in the “history” tab of the page for each document.

284 This edition includes the following significant technical changes with respect to the previous
285 edition:

Changes	Type				
	Clause in 6 th edition	Clause in 7 th edition	Minor and Editorial Changes	Extension	Major Technical Changes
Clarification in scope that use of gas detection to eliminate purging is not within the scope of the document.	1	1	x		
Added correlation table to 60079-0		1	x		
Clarification in scope that other oxidizers present in flammable material are not covered	1	1	x		
Changed term dilution to dilution flow	3.3	3.3	x		
Changed term dilution area to dilution volume	3.3	3.4	x		
Added definition for diluted volume		3.5			
Update to term hermetically sealed device to align with others	3.7	3.8	x		
Clarification of what ignition-capable equipment (ICE) is	3.8	3.9	x		
Added definition for pressurization overpressure	-	3.13.1	x		
Added definition for maximum overpressure	-	3.13.2	x		
Clarified definition for pressurization control system	3.14	3.15	x		
Added definition for pressurized equipment	-	3.17	x		
Clarification in definition for purging that it applies to the pressurized equipment	3.18	3.20	x		
Various locations clarified based on newly defined terms		Whole document	x		
Replaced Table 1 and Table 4 with Figure 1 and Figure 2	4 & 13.1	4 & 11.1	x		
Clarification that nR is not permitted for EPL Gc on "pyb" equipment.	4	4			C1
Direction on enclosure requirements for "pyb" and "pzc" when IP54 enclosure is required for EPL Gc equipment used	-	5.1.2			C2
Addition of information for instructions about doors or covers		5.3.1			C3
Moved text found previously in section 5.3.3 about doors opening violently to a general location in 5.3 so it applies to all Groups.	5.3.3	5.3	x for Group II and III		C4 for Group I
Addition of a warning on the enclosure of "pxb" that requires cool-down period	5.3.5	5.3.6			C5
Clarification that safety device if overpressure can occur that would cause deformation of enclosure needs to comply with 8.3.1.	5.4	5.4	x		
Separated part of the clause into new a clause for items that pertain the pressurized equipment, not just the pressurized enclosure	5.5 to 5.10	6	x		
Added equivalent geometries for vents of internal compartments as well as clarified and extended volumes that do not need purged	5.5.2	6.2		x	
Clarified that the section on sealing was relevant to conduit and cable for sealing at installation. Moved to testing section and instruction section.	5.8	13.1 17	x		
Modified the Specific Condition of Use that if the spark and particle barrier is not included that the protective vent shall discharge to a non-hazardous area only	5.9	6.5			C6
Added new section for electric machines		6.6			C7
Added new section for bypass or override function		6.7			C8
Moved detail that originally only applied to "pzc" so it would apply to all levels of protection that the maximum surface temperature of the pressurized equipment shall account for internal equipment that has its own explosion protection that may remain energized	6.3	7.1			C9

Changes	Type				
	Clause in 6 th edition	Clause in 7 th edition	Minor and Editorial Changes	Extension	Major Technical Changes
Added new requirements for determining maximum surface temperatures of electric machines in "pxb" and "pyb" including a new table	6.2	7.2			C10
Added further details in table to better capture safety devices	Table 3	Table 5	x		
Removed option for manufacturer of equipment to identify missing safety devices with an "X" and give details in a Specific Condition of Use	7.3	8.2			C11
Moved away from term 'single fault tolerant' to focus on terms used in association with EPL Gb/Db, "normal use and expected malfunctions. Based on this, "pxb" has been clarified which safety devices or control functions need to consider 'expected malfunctions.	7.2	8.1			C12
Added requirements that the instructions need to give information on the safety devices and control functions, how to verify proper operation and that verification is needed prior to putting pressurized equipment into service.	7.2	8.2			C13
Changed "safety device" to "control function" in many locations including table 5 to cover pressurization control systems that incorporate a chain of devices to support a safety function	Table 3	Table 5	x		
Re-organized section to better capture details applicable to all pressurization control systems and those certified as Ex associated equipment.	7.4	8.3	x		
Clarification that pressurized equipment shall be supplied with a pressurization control system		8.3.1	x		
Additional marking and instruction requirements for systems with a regulator that has a failure mode that could cause the maximum pressure to be exceeded	7.4.1 7.4.2 7.4.3	8.3.1			C14
Incorporated the details on the functional sequence diagram for "pxb" into the section on "pxb" pressurization control systems	7.5	8.3.4	x		
Added requirements for pressurization control systems evaluated as Ex associated equipment that they require a "X" following of the certificate number and additional information required	7.4	8.3.5			C15
Identification that the purge requirements in old 7.8, now 8.5 are part of the criteria. Additionally, clarified what aspects need to be considered for expected malfunctions	7.7	8.4			C16
Table added to clarify Group I and Group II purging criteria and changed requirements and needed warning labels	7.8	8.5	x		
Added information for pressurization control systems that can manage purge time based on total volume	7.8	8.5		x	
Clarified in requirements and in warning text that after enclosure has been cleaned, pressurization overpressure is required before power can be applied	7.9	8.6			C17
Clarification for "pxb" that control function needs to be appropriate for normal operation and expected malfunctions	7.10	8.7			C18
Clarification that flowmeters used to detect pressurization overpressure in pressurized equipment shall be at the outlet of the pressurized enclosure unless there are additional provisions. Also clarified for "pxb" what needs to be appropriate for normal operation and expected malfunctions	7.11	8.8			C19
Details on what the manufacturer needs to supply in the instructions, and pointing to the type test for maximum overpressure test	7.12	8.9			C20
Clarification that the initial enclosure and any additional enclosures shall be purged before connecting supply	7.13	8.10	x		
Added requirements to either provide the alternate supply with the equipment or have Specific Conditions of Use.	9.1	10.1			C21

Changes	Clause in 6 th edition	Clause in 7 th edition	Type		
			Minor and Editorial Changes	Extension	Major Technical Changes
Combined old clauses 10 through 15 under single clause to have a single section on pressurized equipment with internal source of release	10-15	11	x		
Figure replaces part of table 1. All details in table 1 that were involved with equipment that contained a source of release now detailed in Figure 2. The requirement for "pyb" when there is an internal source of release of gas or vapor, the external EPL required Gc and the pressurized enclosure did not contain ICE has been reduced to "pzc"	Table 1	Figure 2		x	
For pressurized equipment with containment systems, the instructions shall include the maximum rate of process pressure change	12.1	11.3.1			C22
Changes in wording for Specific Conditions of Use	12.3	11.3.3			C23
Further details and considerations when liquids are released	13.1	11.4.1			C24
Expanded the requirements	13.3.4	11.4.3.4			C25
Possible further documentation requirements	14	11.5			C26
Added requirement for alarm actuation	15	11.6			C27
Clarification on order of tests for Pressurized enclosures and sample requirements	-	13.1			C28
Added requirement to include any increase from limited normal release containment systems	16.1	13.2			C29
Changes to criteria for passing overpressure test	16.2	13.3			C30
Added clarification on testing pressurized equipment using a pressurization control system that can manage purge time based on total volume		13.6.1			C31
Clarification that the minimum purging time specified by the manufacturer shall not be less than the measured purge time	16.4.2	13.6.2	x		
Additional considerations for equipment that has moving parts that can affect internal airflow	16.6	13.8			C32
Change to pressure increase rate for overpressure test for containment systems	16.7.1	13.9.1			C33
Added type tests for pressurization control systems		13.11			C34
Added requirement where the warnings shall be placed on the pressurized equipment	18.1	15.9			C35
added new requirement for start-up and operation instructions of the pressurization control system	18.3	15.3			C36
Added restriction marking for no additional oxidizers	18.4	15.4			C37
Clarified and add marking requirements for pressurization control systems evaluated as Ex associated equipment	18.6	15.6			C38
New marking for systems that contain flammable substance		15.8			C39
Added new section for documentation (schedule drawings) with specific requirements	-	16			C40
Added needed references and new requirements to instruction section and further details of what needs to be included in the instructions	19	17			C41
Annex A moved to type test section	Annex A	13.5	x		
Clarification of Figure F.1 through Figure F.3	Annex F	Annex F	x		
Extensions and Further requirement details in E.3 and E.4	Annex E	Annex E	x		C42
Cell and battery requirements updated	Annex G/H	12			C43
Annex A – informative annex for containment systems with liquid	-	Annex A	x		

Changes	Clause in 6 th edition	Clause in 7 th edition	Type		
			Minor and Editorial Changes	Extension	Major Technical Changes
Annex G – new – informative guidance on evaluation of safety control functions		Annex G	x		

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287 **Explanations:**288 **A) Definitions**

289 **Minor and editorial changes** clarification decrease of technical requirements minor
290 technical change editorial corrections

291 These are changes which modify requirements in an editorial or a minor technical way. They
292 include changes of the wording to clarify technical requirements without any technical
293 change, or a reduction in level of existing requirement.

294 **Extension** addition of technical options

295 These are changes which add new or modify existing technical requirements, in a way that
296 new options are given, but without increasing requirements for equipment that was fully
297 compliant with the previous document. Therefore, these will not have to be considered for
298 products in conformity with the preceding edition. 5.

299 **Major technical changes** addition of technical requirements increase of technical
300 requirements

301 These are changes to technical requirements (addition, increase of the level or removal)
302 made in a way that a product in conformity with the preceding edition will not always be able
303 to fulfill the requirements given in the later edition. These changes have to be considered
304 for products in conformity with the preceding edition. For these changes additional
305 information is provided in clause B) below

306 **B) Information about the background of 'Major Technical Changes'**

307 C1 – technical change to identify that “nR” is not a permissible protection concept for
308 “pyb” since “nR” is based in part on the expectation that the equipment is generally
309 sitting in an area that is not hazardous. This may not be the case in the EPL Gb
310 pressurized enclosure when not pressurized.

311 C2 – major technical change for “pyb” and possibly “pzc” when incorporating EPL Gc
312 equipment that has a Specific Condition of Use that requires an IP54 enclosure to
313 IEC 60079-0 requirements. This additional text clarifies how to handle these
314 requirements when integrating into a pressurized enclosure, where the pressurized
315 enclosure does not meet IP54 due to the pressure relief vent.

316 C3 – major technical change for additional information either in instructions or in marking
317 that now needs to be provided to the user about details on the doors and covers
318 and risks associated in opening them.

319 C4 – the concern of pressure on a door or cover and the risk it poses is not limited to
320 applications only in Groups II and III.

321 C5 – the addition of a warning and marked time period to assure the required cooling
322 time is clearly communicated.

323 C6 – if the spark and particle barrier is needed and not supplied with a piece of
324 pressurized equipment, the Specific Condition of Use is to clearly direct how to
325 safely install the equipment. In this case, due to the risk of ejecting incandescent
326 particles the only option is to have the vent exhaust into a non-hazardous area.

327 C7 – to align with other Ex standards and maintain appropriate protection for electric
328 machines with rated voltages exceeding 1kV, direction on where thermal sensors
329 and their leads are to be placed has been added.

330 C8 – knowing that systems already come with bypass or maintenance switches, the
331 document now provides needed direction to assure minimum safety of the
332 equipment.

- 333 C9 – previously only applied to “pzc” but determined that it needed to be applied to all
334 levels of protection.
- 335 C10 – the combination of motor and converter to determine maximum temperature needs
336 to be considered. In the event that the converter is not specified, tests need to be
337 done to confirm thermal protection is effective with appropriate margin for the
338 assigned maximum surface temperature.
- 339 C11 – the ability for the end user to properly select the needed safety devices to complete
340 a safe installation of the pressurized equipment was determined to not be in line
341 with installation requirements found in IEC 60079-14.
- 342 C12 – moved away from single fault tolerant, in favor of the term ‘expected malfunctions’
343 to align with definition for EPL Db/Gb in IEC 60079-0. Clearly identified which control
344 functions or safety devices need to meet the ‘expected malfunctions’ level of safety
345 for “pxb” Also relaxed the requirement for “pyb” to consider expected malfunctions
346 (previously single fault tolerant) since “pyb” already has a layer of safety based on
347 the restriction to EPL Dc/Gc equipment contained within the pressurized enclosure.
348 Additional requirements for these elements in the schedule drawings. See also
349 Annex G.
- 350 C13 - added clear requirements that the instructions need to provide details to the user
351 on the functions of the safety devices or control functions of the pressurization
352 control system, how to test these devices or control functions, and the interval that
353 they should be checked.
- 354 C14 – added marking requirements for the maximum overpressure of the enclosure now
355 required based on the safety device limit. Also have additional instruction
356 requirements when multiple combinations of regulators and pressure relief vents
357 are available.
- 358 C15 – The pressurization control systems sold as associated equipment do not fully
359 handle all concerns for pressurized equipment when installed. It is essential that
360 when a pressurized control system is used, that the final pressurized equipment is
361 fully assessed to the requirements of this document.
- 362 C16 – for “pxb”, clarification that safety devices or control function involved with
363 verification of overpressure, purge flow and purge timer are the elements that
364 require a design to cover normal operation and expected malfunctions.
- 365 C17 – clarification on the order of operation and needed safety for applications in Group
366 III. <http://standards.iteh.org/catalog/standards/sist/bb731c04-349e-4a7d-96e8-2849ebacda02/osist-pren-iec-60079-2-2024>
- 367 C18 – clarification on “pxb” that pressurized equipment that has a requirement for
368 minimum flow rate of protective gas for temperature control needs to be appropriate
369 to handle expected malfunctions.
- 370 C19 – When a flowmeter is used at the inlet of the pressurized enclosure of the
371 pressurized equipment, special provisions will need to be made to assure that the
372 flow being measured is able to properly pressurize the equipment to the required
373 pressurization overpressure. There could be conditions such as open doors or open
374 apertures that would prevent the required pressurization overpressure from being
375 reached based only the flowmeter at the inlet without additional measures to confirm
376 the defined area to be pressurized and a defined maximum leakage rate are in
377 place.
- 378 C20 – added details of what needs to be provided in the instructions prepared.
- 379 C21 – added requirements that if the backup supply is needed and is part of the
380 pressurized equipment (for example bottled gas or reserve tank) it needs to
381 maintain the protection for the duration need. If it is to be supplied at installation,
382 then Specific Conditions of Use are required,
- 383 C22 – new requirement that instructions need to indicate what the process flow rate of
384 pressure change for pressurized equipment with containment systems.
- 385 C23 – Specific Condition of Use has new wording for clarification, this could require an
386 update to certificates and other documentation.