SLOVENSKI STANDARD
SIST EN 50402:2005/A1:2008

01-september-2008

Električne naprave za zaznavanje in merjenje vnetljivih ali strupenih plinov, hlapov ali kisika - Zahteve za funkcionalno varnost vgrajenih sistemov za odkrivanje plina

Electrical apparatus for the detection and measurement of combustible or toxic gases or vapours or of oxygen - Requirements on the functional safety of fixed gas detection systems

Elektrische Geräte für die Detektion und Messung von brennbaren oder toxischen Gasen und Dämpfen oder Sauerstoff - Anforderungen an die funktionale Sicherheit von ortsfesten Gaswarnsystemen

Matériel électrique pour la détection et la mesure des gaz ou vapeurs combustibles ou toxiques, ou de l'oxygène - Exigences relatives à la fonction de sécurité des systèmes fixes de détection de gaz

Ta slovenski standard je istoveten z: **EN 50402:2005/A1:2008**

ICS:

13.230	Varstvo pred eksplozijo	Explosion protection
13.320	Alarmni in opozorilni sistemi	Alarm and warning systems
29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres

SIST EN 50402:2005/A1:2008 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50402/A1

May 2008

ICS 13.320

English version

Electrical apparatus for the detection and measurement of combustible or toxic gases or vapours or of oxygen - Requirements on the functional safety of fixed gas detection systems

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This amendment A1 modifies the European Standard EN 50402:2005; it was approved by CENELEC on 2008-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 50402:2005/A1:2008 E

Foreword

This amendment was prepared by SC 31-9, Electrical apparatus for the detection and measurement of combustible gases to be used in industrial and commercial potentially explosive atmospheres, of Technical Committee CENELEC TC 31, Electrical apparatus for explosive atmospheres.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A1 to EN 50402:2005 on 2008-03-01.

The following dates were fixed:

– latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2009-03-01
– latest date by which the national standards conflicting with the amendment have to be withdrawn	(dow)	2011-03-01

5 Modules and elements – Characterisation and requirements

5.1 General requirements

Add a new paragraph at the end of 5.1:

A fault indication shall be released if a deviation in the signals of redundant units is detected. This indication shall be connected to an output function to the periphery, e.g. relay contact (see 5.7.2).

5.4.1 Signal transmission between modules

Replace 5.4.1 by:

5.4.1 Signal transmission between modules

Characterisation: simple or complex module

The signal-transmission includes the physical connection between the modules:

– sensor and sensor interface;

– measuring point selection as well as automatic calibration and the affiliated modules for control;

– separate control units (system communication);

– periphery and module input from periphery;

– module output to periphery and periphery.

Several signal-transmissions, independent from each other, may occur within the gas detection system. The signal-transmissions may be realised differently.

Examples include:

– conventional wiring;

– bus connections (including loops);

– radio link;

– optical transmission.

All digital data transmissions are presumed to be complex.

Requirements for simple modules with safe failure fraction 60 % – 90 %:

All SIL-capabilities: The general requirements of 5.4 apply. A monitoring of data transmission shall be provided to detect failure.

SIL-capability 1: There are no additional requirements.

SIL-capability 2: If the data transmission is used for a single channel the requirements of SIL-capability 1 are sufficient. If the data transmission is used for more than one channel, e.g. bus connection or multiplex transmission, the correct assignment of the channels shall be monitored.

SIL-capability 3: The construction shall be redundant and a comparison of output signals shall be provided.

SIL-capability 4: Shall have a minimum hardware fault tolerance of 2 only.

Requirements for simple modules with safe failure fraction 90 % – 99 %:

To achieve a SIL-capability 1 or 2 the safe failure fraction of 60 % – 90 % is sufficient.

SIL-capability 3: A monitoring of data transmission shall be provided to detect failure. If the data transmission is used for more than one channel, e.g. bus connection or multiplex transmission, an automatic self-testing facility including feed in of an individual test signal for each channel shall be carried out cyclically. The cycle time shall not exceed 24 h.

SIL-capability 4: Additionally to SIL-capability 3 the construction shall be redundant and a comparison of output signals shall be provided.

Requirements for complex modules with safe failure fraction 60 % – 90 %:

All SIL-capabilities: The general requirements of 5.4 apply. A monitoring of data transmission shall be provided to detect failure.

SIL-capability 1: If the data transmission is used for more than one channel, e.g. bus connection or multiplex transmission, the correct assignment of the channels shall be monitored.

SIL-capability 2: Additionally to SIL-capability 1 the construction shall be redundant and a comparison of output signals shall be provided.

SIL-capability 3: Additionally to SIL-capability 1 the construction shall have a minimum hardware fault tolerance of 2 and a comparison of output signals shall be provided.

SIL-capability 4: Is not achievable.

Requirements for complex modules with safe failure fraction 90 % – 99 %:

To achieve a SIL-capability 1 the safe failure fraction of 60 % – 90 % is sufficient.

All SIL-capabilities: The general requirements of 5.4 apply.

SIL-capability 2: Measures to detect data transmission failures shall be included. The measures for ensuring the reliable data transmission shall take into account transmission errors, repetitions, deletion, insertion, resequencing, corruption, delay and masquerade.

SIL-capability 3: Additionally to SIL-capability 2 the construction shall be redundant and a comparison of output signals shall be provided.

SIL-capability 4: Additionally to SIL-capability 2 the construction shall have a minimum hardware fault tolerance of 2 and a comparison of output signals shall be provided.

Requirements for complex modules with safe failure fraction > 99 %:

To achieve a SIL-capability 2 the safe failure fraction of 90 % – 99 % is sufficient.

All SIL-capabilities: The general requirements of 5.4 apply.

The level of the safe failure fractions shall be verified e.g. by a transmission system approved separately.

SIL-capability 3: Measures to detect data transmission failures shall be included. The measures for ensuring the reliable data transmission shall take into account transmission errors, repetitions, deletion, insertion, resequencing, corruption, delay and masquerade.

SIL-capability 4: Additionally to SIL-capability 3 the construction shall be redundant and a comparison of output signals shall be provided.

5.4.2 Signal-transmission within a control unit

Replace 5.4.2 by:

5.4.2 Signal-transmission within a control unit

Characterisation: simple or complex module

The signal-transmission serves the data exchange between all elements of a control unit. It includes the physical connection as well as handling and monitoring of the data-exchange. Examples for the implementation of the internal signal-transmission are as follows:

– wired connections on the back plane of a mounting rack;

– ribbon cable or flexible circuit board;

– I/O-Bus, parallel or serial.

All digital data transmissions are presumed to be complex.

The probability of failure is smaller than presupposed in 5.4.1 because it is assumed that the physical link is mechanically protected and the distance between sender and receiver is very short.

Requirements for simple modules with safe failure fraction 60 % – 90 %:

All SIL-capabilities: The general requirements of 5.4 apply.

SIL-capability 1: Plug connections shall be protected against erroneous connection or disconnection.

SIL-capability 2: A monitoring of data transmission shall be provided to detect failure. If the data transmission is used for more than one channel, e.g. bus connection or multiplex transmission, the correct assignment of the channels shall be monitored.

SIL-capability 3: Additionally to SIL-capability 2 the construction shall be redundant.

SIL-capability 4: Additionally to SIL-capability 2 the construction shall have a minimum hardware fault tolerance of 2.

Requirements for simple modules with safe failure fraction 90 % – 99 %:

To achieve a SIL-capability 1 or 2 the safe failure fraction of 60 % – 90 % is sufficient.

SIL-capability 3: A monitoring of data transmission shall be provided to detect failure. If the data transmission is used for more than one channel, e.g. bus connection or multiplex transmission, an automatic self-testing facility including feed in of an individual test signal for each channel shall be carried out cyclically. The cycle time shall not exceed 24 h.

SIL-capability 4: Additionally to SIL-capability 3 the construction shall be redundant and a comparison of output signals shall be provided.

Requirements for complex modules with safe failure fraction 60 % – 90 %:

All SIL-capabilities: The general requirements of 5.4 apply.

SIL-capability 1: Plug connections shall be protected against erroneous connection or disconnection and one-bit redundancy shall be provided, e.g. by parity checking. If the data transmission is used for more than one channel, e.g. bus connection or multiplex transmission, the correct assignment of the channels shall be monitored.

SIL-capability 2: Additionally to SIL-capability 1 the construction shall be redundant.

SIL-capability 3: Additionally to SIL-capability 1 the construction shall have a minimum hardware fault tolerance of 2.

SIL-capability 4: Is not achievable.

Requirements for complex modules with safe failure fraction 90 % – 99 %:

All SIL-capabilities: The general requirements of 5.4 apply.

To achieve a SIL-capability 1 the safe failure fraction of 60 % – 90 % is sufficient.

SIL-capability 2: Measures to detect data transmission failures shall be included. The measures for ensuring the reliable data transmission shall take into account transmission errors, repetitions, deletion, insertion, resequencing, corruption, delay and masquerade.

SIL-capability 3: Additionally to SIL-capability 2 the construction shall be redundant and a comparison of output signals shall be provided.

SIL-capability 4: Additionally to SIL-capability 2 the construction shall have a minimum hardware fault tolerance of 2 and a comparison of output signals shall be provided.

5.6 Signal processing in the control unit

Replace the paragraphs related to **"Requirements for complex modules with safe failure fraction 90 % – 99 %"** by:

Requirements for complex modules with safe failure fraction 90 % – 99 %:

To achieve a SIL-capability 1 the safe failure fraction of 60 % – 90 % is sufficient.

SIL-capability 2: Additional special hardware facilities support self-test function to detect failures in the control unit, for example a hardware unit which cyclically monitors the output of a certain bit pattern according to the watchdog principle.

SIL-capability 3: By redundant signal processing the interruption of signal processing in the module shall be detected and indicated. By exchange and comparison of calculation results between parallel working processing units, most faults in the module shall be detected and indicated. The comparison shall include measuring values or status and alarm signals.

SIL-capability 4: Additionally to SIL-capability 3 the construction shall have a minimum hardware fault tolerance of 2. The level of safe failure fraction above 90 % shall be verified by calculation.

Replace the paragraph related to **"Requirements for complex modules with safe failure fraction > 99 %"** by:

Requirements for complex modules with safe failure fraction > 99 %:

SIL-capability 4: The interruption of signal processing in the module shall be detected and indicated by redundant signal processing. Nearly all faults in the module shall be detected and indicated by exchange and comparison of calculation results between parallel working processing units. The comparison shall include status and alarm signals, measuring values, intermediate calculation results and results of self-testing within the single processing units. The level of safe failure fraction above 99 % shall be verified by calculation.

5.7.2 Relay output

Replace 5.7.2 by:

5.7.2 Switching output

Characterisation: simple module

The switching output (e.g. relays, optocouplers) includes the switching element for transmission of signals to the periphery. It provides alarms and status signals or may initiate safe actions in equipment external to the gas detection system e.g. shutdown valves. Logical combination by hardware are an element of the switching output.

Requirements:

All SIL-capabilities: Signals (faults or alarms) which belong to a single measuring point shall trigger the related switching output.

Signals which belong to several measuring points may be combined to a single signal and/or trigger the switching output of all related measuring points.

At least one switching output shall be provided for the common signalling of all detected faults.

The instruction manual shall specify that the switching outputs shall be checked at least once per diagnostic test interval (see 6.3.2).

SIL-capability 1: There are no additional requirements.

SIL-capability 2:

Using the idle current principle (deenergizing on alarm or on fault).

or

The input circuit of the switching outputs shall be monitored.

SIL-capability 3: Two independent switching outputs shall be provided for each safety function.

SIL-capability 4: Is achievable with a hardware fault tolerance of 2 only.

NOTE Monitoring the output circuit (e.g. by using relays with constraint contacts or assessment of a feedback contact) does not improve the safe failure fraction because a possible fault will be detected not until the safety function is required.