

Simple apparatus in Intrinsic Safety type of protection

1. Purpose

The principle of so-called simple apparatus is known and established for a long time in Intrinsic Safety type of protection. In connection with the European Directive 2014/34/EU (ATEX) [1] (formerly 94/9/EG), governing “placing on the market” of explosion protected products, still doubts and questions arise respecting the practical implementation.

This information sheet shall support manufacturers and operators in handling simple apparatus in intrinsically safe circuits under the scope of the ATEX-Directive.

2. Application

Directive 2014/34/EU Article 1, paragraph (2)
EN 60079-11:2012 clause 5.7

3. Description

3.1 Safety-related fundamentals

The goal of Intrinsic Safety type of protection is the prevention of ignitable sparks and hot surfaces. “Simple apparatus” in terms of Intrinsic Safety shall – among others – provide the following properties acc. to EN 60079-11:2012 [2]:

- No internal cells or batteries (exception: thermoelements, photocells etc. with the limiting values 1.5 V, 100 mA and 25 mW),
- Connection to one single source only,
- No internal voltage-/current transformation,
- The sum of all internal inductances and capacitances including their tolerances are taken as the basis for the effective concentrated inductance/capacitance,
- Safety-relevant clearances and creepage distances are not considered.

If these conditions are fulfilled protection against spark ignition is mainly safeguarded by the source (the “associated apparatus”). This associated apparatus shall always be tested and certified as category-1 or category-2 equipment. For classification into temperature classes it can be assumed that the maximum surface temperature of the simple apparatus can be determined – in the simplest case – from the maximum source power (P_o) and the components thermal resistance to ambience ($R_{TH, C-A}$). For temperature class T4 it is also possible to use table 3 of EN 60079-0 [3]. As the worst case scenario power matching shall be assumed for all components such as semiconductors, resistors, electrolytic capacitors, etc..

Simple apparatus may be used as category-2 equipment in intrinsically safe circuits without further measures. If simple apparatus shall be applied as category-1 equipment the standards which are

harmonized under the ATEX Directive become relevant. This applies also to EN 60079-26 [4] and EN 1127-1 [5].

Traditionally, category-1 equipment has not yet been applied according to the “simple apparatus”-concept in Germany, i.e. it has generally been assessed by a test body.

The current rules and standards, however, do not prohibit explicitly to apply the “simple apparatus”-concept also to category-1 equipment.

3.2 Impact of Directive 2014/34/EU on the concept of “simple apparatus”

Since the Directive generally requires an examination certificate within the scope of the conformity assessment by a “Notified Body” for placing electrical equipment of category 1 and 2 on the market, the status of simple apparatus gave already reason to discussions.

The commission in Brussels has then instructed the responsible standardization committee in CENELEC to remove all information from EN 50020 respecting the obligatory certification. Therefore, the wording was already changed in clause 5.4 of the standard EN 50020:2002.

The definition in EN 50020:2002 read as follows:

“3.11 simple apparatus

electrical component or combination of components of simple construction with well-defined electrical parameters which is compatible with the intrinsic safety of the circuit in which it is used”.

In the current standard EN 60079-11:2012 [2] the definition reads:

“3.1.5 simple apparatus

electrical component or combination of components of simple construction with well-defined electrical parameters which is compatible with the intrinsic safety of the circuit in which it is used”.

Both definitions are identical. Changes, however, are given in clause 5.4:

Citation from clause 5.4 of **EN 50020:1994**:

“Simple apparatus shall conform to all relevant requirements of this standard but need not be marked in accordance with clause 12. In particular, the following aspects shall always be considered...”.

Citation from clause 5.4 of **EN 50020:2002**:

“Simple apparatus shall conform to all relevant requirements of this standard but is not considered to contain a potential source of ignition capable of causing an explosion and need not be marked in accordance with clause 12. In particular, the following aspects shall ...”.

Citation from clause 5.7 of **EN 60079-11:2012 [2]**:

“5.7 Simple apparatus

The following shall be considered to be simple apparatus:

- a) passive components, for example switches, junction boxes, resistors and simple semiconductor devices;*
- b) sources of stored energy consisting of single components in simple circuits with well defined parameters, for example capacitors or inductors, whose values shall be considered when determining the overall safety of the system;*
- c) sources of generated energy, for example thermocouples and photocells, which do not generate more than 1.5 V, 100 mA and 25 mW. “*

Simple apparatus shall comply with all applicable requirements of this standard. The manufacturer or designer of an intrinsically safe system have to provide evidence regarding compliance with this clause including material data sheets and test reports as far as necessary. Simple apparatus need not conform to clause 12 of EN 60079-11.

To avoid an infringement of Directive 94/9/EG as well as a statement respecting the obligation for examination and certification, a gimmick was applied in EN 50020:2002 at that time, that is also transferable to EN 60079-11 and Directive 2014/34/EU. If simple apparatus do not represent a potential ignition source (provided that they are operated in certified intrinsically safe circuits) they are not subject to the Directive and hence need not be examined and certified by a certification body.

Due to global standardization (IEC) the reference to a potential ignition source was unfortunately omitted in EN 60079-11 edition 2007 or 2012. Only the omission of the marking is mentioned here.

Paragraph 38 of the current ATEX 2014/34/EU Guidelines [6] reads:

§ 38 Examples for equipment not covered by Directive 2014/34/EU

“Simple” products

For “simple” electrical products, European harmonized standards provide a good basis to assess the effectiveness of electrical ignition source and, consequently, to determine whether or not these can be considered effective or not.”

So, for “simple” electrical products a reference is given here to harmonized standards to be used as a basis for a classification. According to the current state clause 5.7 of EN 60079-11 shall hence be used as a decision support whether an electrical product can be classified as “simple apparatus” in an intrinsically safe circuit.

In 2000 in Brussels the CENELEC SC31-3 committee compiled the following statement:

„Simple apparatus“ do not require a certification by a “Notified Body”. Responsibility for conformity with the relevant parts of the standard lies with the person who claims this conformity, this can be a manufacturer or an operator. A certification according to the ATEX Directive is not required because only very low energy values are added to the intrinsically safe circuit by the apparatus. Simple apparatus have to be marked clearly as such with the installation. In this connection it is necessary that “simple apparatus” are restricted to those which represent a fundamentally simple design. A qualified engineer should be able to assess their safety easily by visual inspection or reference to available data.

When a manufacturer contemplates a certification by a “Notified Body”, he is allowed to do so. Possibly, the simple apparatus has to be certified in the same way as more complex equipment

according to EN 60079-11 and the “Essential Safety- and Health Requirements” of the ATEX Directive and it has to be marked correspondingly.

Furthermore, the European Commission has made the following statement in 2003 under the reference ENTR/G/3/DE D(2003):

”Simple Apparatus“ is a term defined in the European Standards EN 50014 and EN 50020.

This statement applies also to the current standards EN 60079-0 [3] und 60079-11 [2].

Such apparatus are excluded from the Directive since they do not feature an internal ignition source. Hence, they do not need to comply with the applicable “Essential Safety- and Health Requirements” and need not be subjected to the conformity assessment procedure according to Directive 2014/34/EU.

The identification of such equipment forms part of the manufacturer’s risk analysis.

3.3 What does this mean in practice?

A **manufacturer** who wants to place a simple apparatus on the market has the following options considering the mentioned boundary conditions:

- The manufacturer ascertains that the simple apparatus complies with all applicable requirements of the standard EN 60079-11 and hence need not be regarded as a potential ignition source. Then he should incorporate this assessment into the operating instructions manual and specify limiting values for the intrinsically safe circuit to be connected. Since – in this case – the simple apparatus is not subject to Directive 2014/34/EU, a conformity assessment procedure by a notified body is not carried out. This, however, means also that **the equipment must not be provided with an ATEX marking**.
- For marketing reasons the manufacturer decides to apply the conformity assessment procedure (EU-Type Examination Certificate) also to the simple apparatus and to commission a “Notified Body”. **In this case all requirements of the Directive including the marking shall be complied with.** The corresponding module for quality assurance shall be applied too.

In addition to the above mentioned options to use equipment that is specified by the manufacturer as simple apparatus (or certified equipment) the operator has the choice to purchase uncommitted equipment (e.g. a standard terminal box that is not approved for Intrinsic Safety type of protection). Then he has the obligation to check compliance with the requirements of EN 60079-0 or 60079-11 (e.g. clearance between separate intrinsically safe circuits, IP degree of protection, electrostatics, etc.) and document this in suitable form (e.g. explosion protection documents, industrial safety regulations). A marking on the equipment according to the Directive is not permitted.

4. Further applicable documents

- [1] DIRECTIVE 2014/34/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres.
- [2] EN 60079-11:2012-06. Explosionsgefährdete Bereiche - Teil 11: Geräteschutz durch Eigensicherheit "i".
- [3] EN 60079-0:2014-06 + A11:2013. Explosionsgefährdete Bereiche - Teil 0: Betriebsmittel - Allgemeine Anforderungen.
- [4] DIN EN 60079-26:2015-05. Explosionsgefährdete Bereiche - Teil 26: Betriebsmittel mit Geräteschutzniveau (EPL) Ga.
- [5] DIN EN 1127-1:2011-10. Explosionsfähige Atmosphären - Explosionsschutz -Teil 1: Grundlagen und Methodik.
- [6] ATEX 2014/34/EU Guidelines. Guide to the application of the DIRECTIVE 2014/34/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast). 1st Edition. April 2016.