OSM/EE DECISION SHEET

Category	Standard:	Clause	Document no.
OFF, TRON	EN 60950-1:2006, A1, A2 EN 60065:2014 EN 62368-1:2014	1.5.1 & 0.3 (60950-1) 3.3 & 14.6.5 (60065) 4.1.5 & G3.5.1 (62368-1)	OSM/EE 17.2A
Subject	**Key words**	**Meeting**	**Status**
Resistor on the primary side as “protective device” (fusible resistors)	Fusible resistor – Primary circuit – Protective device	Zurich 2017 Ljubljana 2019	Provisional
Question			
In which conditions can a resistor be used in the primary circuit, as a “protective device”			
Decision			

We may accept fusible resistors on the primary side to be used as ”protective devices”, provided that they comply with all the following conditions:

a) They shall be used within their specification (see explanatory notes).

b) They shall operate satisfactorily when the appliance is tested.

The short circuit current shall be determined under worst case fault condition, using a supply source with prospective short circuit current of at least 1 500A by performing the test three times, each time with a new resistor.

- If the measured short circuit current during any of the tests is > 35A, fusible resistor(s) shall not be used.
- If the short circuit current is ≤ 35A, satisfactory operation of the fusible resistor shall be checked. Tests and measurements shall demonstrate that during worst case fault condition the resistor operates within its specification and there is no risk of overload (overheating or explosion; refer to attached graphics).

Furthermore the following criteria as specified in EN 60127-8 clause 9.3.2 shall be considered:

It shall operate without any of the following phenomena:

- permanent arcing;
- ignition;
- bursting of the fuse resistor;
- illegibility of marking after test (see item f).

The following phenomena are neglected:

- black spots or other marks on the terminations or the body of the fuse resistor
- arcing times of less than 1ms.

c) Resistors are not accepted in operator access area.

d) Resistors is to be listed as critical component in the test report.

e) Resistors cannot be marked as interchangeable. For alternate type resistors satisfactory operation shall be demonstrated when tested in the appliance.

f) Identification using part number or the like is to be located adjacent to the resistor such as for fuses.

This applies only to service replaceable parts.

g) Test results shall be documented in the test report and a data sheet provided showing all the relevant data for the resistor.

Explanatory notes

This decision replaces OSM-EE decision no. 99/1 which was according LVD AdCo's opinion not complete as proof of evidence for compliance of a fusing resistor used as protective device.

- LVD AdCo supports the Decision. Ref. e-mail from the Chairman of LVD-ADCO Sept. 05, 2017.
- CENELEC TC 108X confirmed the Decision in their Plenary meeting of Dec. 06 & 07, 2017.

Refer to following documents :

- CLC/TC 108X/SEC0305/DC (added below)
- TC 108 Interpretation Panel – Q.02 (added below)
- EN 60127-8:2018

In Ljubjana 2019, OSM-EE decision 17/2 was modified with following changes:

- added reference to EN 60127-8,
- modified number of repetitions from 10 to 3 to align with requirements of the standard EN 62368-1:2014, clause G.3.5.2.

European foreword

The text of document 32C/542/FDIS, future edition 1 of IEC 60127-8, prepared by SC 32C "Miniature fuses" of IEC/TC 32 "Fuses" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60127-8:2018.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-04-30
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-07-31

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 60127-8:2018 was approved by CENELEC as a European Standard without any modification.

EN 60127-8:2018 clause 9.3.2

The fuse resistor with particular overcurrent protection shall operate satisfactorily without any of the following phenomena:

- permanent arcing;
- ignition;
- bursting of the fuse resistor with particular overcurrent protection;
- illegibility of marking after test.

The following phenomena are neglected:

- black spots or other marks on the terminations or the body of the fuse resistor with particular overcurrent protection;
- arcing times of less than 1 ms.

IEC PAS 60127-8:2014 clause 9.3.2

9.3.2 Criteria for satisfactory performance

The requirements of IEC 60127-1:2006, 9.3.2, are replaced as follows:

The fuse resistor with particular overcurrent protection shall operate satisfactorily witho
of the following phenomena:

- permanent arcing;
- ignition;
- bursting of the fuse resistor with particular overcurrent protection;
- illegibility of marking after test.

The following phenomena are neglected:

- black spots or other marks on the terminations or the body of the fuse resisto
  particular overcurrent protection;
- arcing times of less than 1 ms.

CENELEC

CLC/TC 108X/SEC0305/DC

2014-12-05

EUROPEAN COMMITTEE FOR ELECTROTECHNICAL STANDARDIZATION (CENELEC)

TECHNICAL COMMITTEE No. 108X: SAFETY OF ELECTRONIC EQUIPMENT WITHIN THE FIELDS OF AUDIO/VIDEO, INFORMATION TECHNOLOGY AND COMMUNICATION TECHNOLOGY

Proposal for EN 60950-1 to deal with the risk of fusible resistors.

Introduction

In the CLC/TC 108X meeting on 3 and 4 December 2014 we discussed the issue brought forward by LVD Adco related to safety issues when using fusible resistors as a protective device. The meeting decided to draft a common modification to EN 60950-1 to clarify the issue. The document is providing background information and proposes text to be added in EN 60950-1.

Background and problem description

Fusible resistors have been used extensively over the last couple of decades. They are reliable components, similar as fuses, assuming they are used within their specifications.
Recently however, they have been used in different products where they might be used outside of their specifications. This might result in either high temperatures and fire or in explosion. As a result, these fusible resistors should be used within their specifications to avoid these problems.

Coverage by TC 108 related standards

This requirement is at least partly covered in IEC/EN 60065 and IEC/EN 62368-1. Unfortunately, this is not sufficiently covered in IEC/EN 60950-1.

IEC 60065:

3.3 Constructions and components not specifically covered

Where the equipment involves technologies, components and materials or methods of construction not specifically covered in this standard, the equipment shall provide safety measures not less than that generally afforded by this standard and the principles of safety contained herein.

14.6.5 Protective devices not mentioned in Fehler! Verweisquelle konnte nicht gefunden werden., Fehler! Verweisquelle konnte nicht gefunden werden. **or** Fehler! Verweisquelle konnte nicht gefunden werden.

Such protective devices, for example fusing resistors, fuses not standardized in IEC 60127 or miniature circuit breakers, shall have adequate breaking capacity.

IEC 62368-1:

4.1.5 Constructions and components not specifically covered

Where the equipment involves technologies, components and materials or methods of construction not specifically covered in this standard, the equipment shall provide **safeguards** not less than that generally afforded by this standard and the principles of safety contained herein.

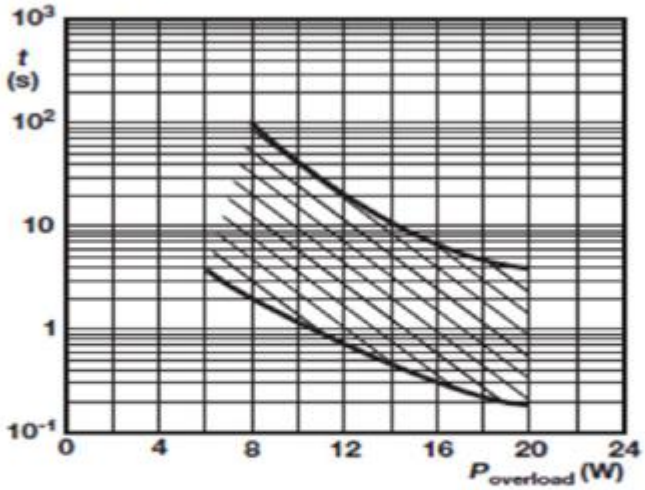
G.3.5 Safeguard components not mentioned in G.3.1 to G.3.4

G.3.5.1 Requirements

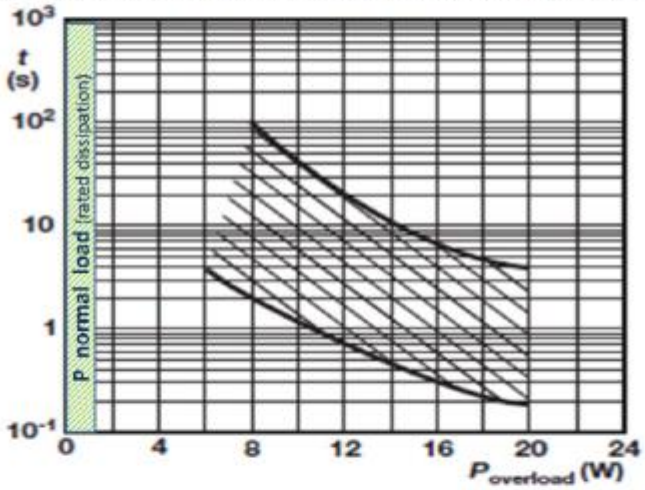
Such protective devices (for example, fusing resistors, fuse-links not standardized in IEC 60127 series or miniature circuit breakers) shall have adequate rating including breaking capacity.

Technical background related to the use of fusible resistors

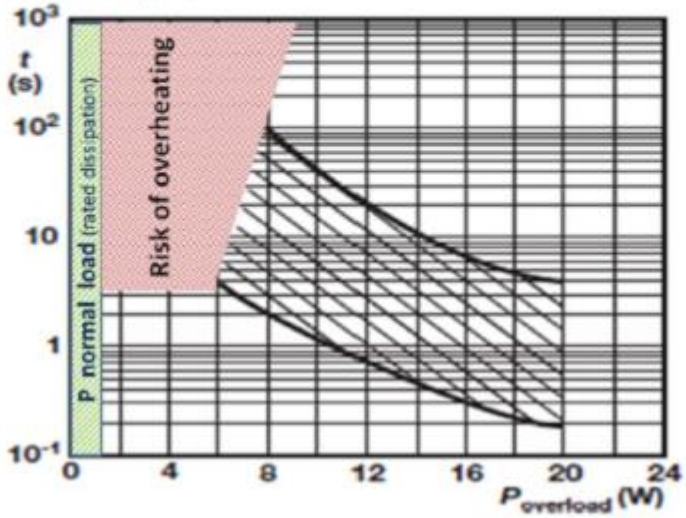
Every fusible resistor has a datasheet with a figure such as the example given below, indicating the behaviour of the fusible resistor during overload:



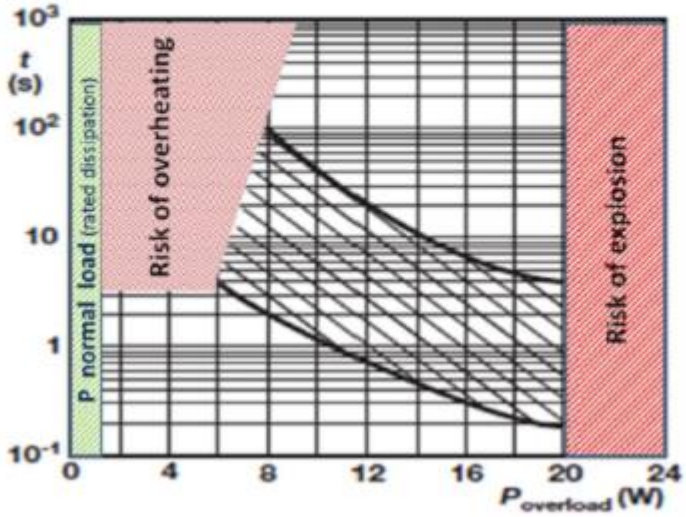
In the component datasheet, it can also be found how much energy the fusible resistor is able to handle during normal load, often called rated dissipation, as indicated in the example below:



If the fusible resistor is used above the normal load, but below the specified overload region, there is a risk of overheating. This is due to the fact that the resistor is overloaded, but does not have enough power available to interrupt in a timely manner. The resistor will heat up, but there is no guarantee that it will interrupt. Due to the fact that the resistor needs some time to heat up, the risk zone does not start from time zero. At least several seconds will be needed to reach an unsafe temperature. This area is represented in the example below:



If the fusible resistor is used above the maximum specified overload, there is a risk of explosion. This is due to the fact that there is much more energy available than what the resistor was designed for. The resistor might not be able to dissipate enough energy in a timely manner. This area is represented in the example below:



TC108 Standards Interpretation Panel QUESTION

October 28, 2015

IEC 60950-1, Ed. 2, Am 2
Information technology equipment – Safety – Part 1: General requirements

2.7.3 Short-circuit backup protection

Background:

Fusible resistors have been used extensively over the last couple of decades. They are reliable components, similar to fuses, assuming they are used within their specifications. Recently however they have been used in different products where they might be used outside of their specifications. This might result in high temperatures, fire or explosion. As a result, these fusible resistors should be used within their specifications to avoid these problems.

The EU LVD Administrative Co-operation Working Group (LVD ADCO) has expressed concern related to safety issues when fusible resistors are used as a protective device in safety standards maintained by IEC TC108. Upon further study,

- LVD ADCO and CLC/TC108X believe IEC 60065 covers the concern by inclusion in the standard of sub-clauses 3.3, Constructions not specifically covered, and 14.6.5, Protective devices not mentioned in 14.6.2, 14.6.3 or 14.6.4.

- LVD ADCO and CLC/TC108X believe IEC 602368-1 covers the concern by inclusion in the standard of sub-clauses 4.1.5, Constructions not specifically covered, and G.3.5/G.3.5.1, Safeguard components not mentioned in G.3.1 to G.3.4 - Requirements.

However, it remained unresolved whether IEC 60950-1 similarly covered the concern with such fusible resistors.

This Interpretation clarifies that IEC 60950-1 adequately covers safety of fusible resistor used in ITE until the full transition to IEC 62368-1.

Question to the Panel:

Does the Interpretation Panel agree that the published IEC 60950-1 covers safety of fusible resistors used in ITE by nature of the following requirements?

(a) Subclause 1.3.4, Constructions not specifically covered, which requires, “Where the equipment involves technologies and materials or methods of construction not specifically covered in this standard, the equipment shall provide a level of safety not less than that generally afforded by this standard and the principles of safety contained herein.”

(b) Subclause 2.7.3 Short-circuit backup protection, which states, “Unless appropriate short-circuit backup protection is provided, protective devices shall have adequate breaking (rupturing) capacity to interrupt the maximum fault current (including short circuit current) which can flow,” and its compliance statement, “Compliance is checked by inspection and by the tests of 5.3.”

Specifically for Europe, the following is noted in an in some countries note in 2.7/2.7.1, Overcurrent and earth fault protection in primary circuits Basic requirements:

NOTE In the member countries of CENELEC and in China, the protective devices necessary to comply with the requirements of 5.3 must, with certain exceptions, be included as part of the equipment.

(c) Furthermore, subclauses, 5.3.9 Compliance criteria for abnormal operating and fault conditions, and 5.3.9.1 During the tests, states,

During the tests of 5.3.4 c), 5.3.5, 5.3.7, 5.3.8 and Clause C.1:

- if a fire occurs, it shall not propagate beyond the equipment; and
- the equipment shall not emit molten metal; and
- ENCLOSURES shall not deform in such a way as to cause non-compliance with 2.1.1, 2.6.1,2.10.3 (or Annex G) and 4.4.1.

(d) Additionally, a requirement in 4.7.3.2 is included that requires, for plastic materials of fire enclosures located less than 13 mm through air from non-arcing parts which under any condition of normal or abnormal operation could attain a temperature sufficient to ignite the material, an average time to ignition of the samples shall not be less than 15 s per IEC TS 60695-2-20, Fire hazard testing - Part 2-20: Glowing/hot wire based test methods - Hot-wire coil ignitability - Apparatus, test method and guidance. Although IEC TS 60695-2-20 has been withdrawn by IEC TC89 due to concerns with repeatability and reproducibility, by normative reference in IEC 60950-1, it remains a requirement for applicable constructions to comply with IEC 60950-1.

Opinion of the Panel:

The Standards Interpretation Panel agrees that IEC 60950-1 adequately covers the safe use of fusible resistors in ITE, based on the rationale provided in the Question to the Panel.

Action:

None. The existing requirements for fusible resistors used in ITE will be replaced by IEC 62368-1 as part of the transition to IEC 62368-1.