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Guidance on

The application of Scaling Factors contained in EN15004-1 Annex I

Revision table

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FOREWORD

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Note: The English version of this document is the approved Euralarm reference document.

Euralarm • Gubelstrasse 11 • CH-6300 Zug • Switzerland

E: secretariat@euralarm.org
W: www.euralarm.org

Table of contents

1. Introduction

In the revision to EN15004-1 published in December 2024, several key changes were introduced from the 2019 edition.

The Euralarm guidance document 'EN 15004-1 title 'Guidance on Key changes between the 2019 and the 2024 editions of the EN 15004-1 standard', gave an overview of the changes. One of changes included Annex I, a new section concerning the use of scaling factors.

This guidance is intended to provide the background to contents of Annex I and explain how it should be applied by system designers.

2. Background

Annex I is an informative Annex dealing with Class B fuels, essentially flammable liquids, which means that it is intended to provide information for designers and specifiers when preparing a system to protect Class B hazards. EN15004-1 explains how to determine the extinguishing concentration for Class B fuel.

However, when used in conjunction with the specific parts for the different agents (EN15004-2 to 11), it raises questions on how to apply the requirement in some cases. Annex I, while informative, offers a reasonable methodology applicable in general that provides a more robust design, which Euralarm recommends using in all cases.

3. Technical details

How to apply Annex I

The EN 15004 standard identifies an extinguishing concentration for a single Class B fuel - heptane, which has been derived from a test using cup-burner apparatus and a full room test. The standard requires that the higher of the values obtained during these tests is used to set the extinguishing concentration before a 1.3 safety factor is added to provide the minimum design concentration.

As there are many Class B fuels that may be protected by gaseous systems it is important that the correct extinguishing concentration is determined. For most agents and for most Class B fuels, only a cup-burner test has been carried out and the full room test has not.

While the cup-burner is considered a reliable means to establish an extinguishing concentration it has been recognised that this has not had the same level of scrutiny with other fuels as with heptane.

As such Annex I, recommends that to determine the extinguishing concentration for a particular agent a set of at least 3 full room tests using heptane, methyl alcohol and acetone should be conducted alongside a cup-burner test for each, to provide an indication of what the difference may be between the experimental cup-burner tests and full room tests.

Once these 3 sets of tests have been carried out, any differences are translated into a scaling factor which should then be used if a design is to be based on a cup-burner only result.

If these 3 sets of tests are not carried out, then Annex I recommends that a scaling factor of 1.15 should be applied.

An example of how this would affect the extinguishing and design concentrations are as follows.

Let's say that the cup-burner value for Fuel A using a particular agent is 10.0 %.

In the absence of the full room and cup burner evaluation having taken place, the extinguishing concentration would be raised by a factor of 1.15, and then the 30 % safety factor is added.

So, the design concentration would be:

10.0 % x 1.15 x 1.3 = 14.95 %.

If, however, a full room test is carried out on the 3 Class B fuels identified above, with the following results, a different design concentration may be used.

Methyl alcohol = cup-burner 12.0 %, room test 12.5 %
Scaling would be 12.5 / 12.0 = 1.04

Heptane = cup-burner 10 %, room test 10 %,
Scaling would be 10.0 / 10.0 = 1.0

Acetone = cup-burner 8.0 %, room test 8.9 %,
Scaling would be 8.9 / 8.0 = 1.11

Given these results a scaling factor of 1.11 may be used, instead of 1.15, allowing a design concentration to be established as follows.

As earlier the Fuel A cup-burner is 10.0 %, so the calculation of the design concentration would be:
10.0 % x 1.11 x 1.3 = 14.4 %.

As a third option if a cup-burner test and a full room test were to be carried out on Fuel A, then the higher of the 2 values obtained would be used as the basis for the design concentration, for example:

If the Fuel A cup-burner is 10.0 % and full room test 10.3 %, the scaling factor would not need to be applied, since the standard determines than the higher of the 2 values is used resulting in a design concentration of:
10.3 % x 1.3 = 13.4 %.

4. Summary

Euralarm believes that the addition of a secondary check to assess the extinguishing concentrations used for Class B fuels provides an extra level of confidence when designing systems using these fuels and as such recommends applying this methodology when designing such systems.

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Euralarm
Gubelstrasse 22
CH-6301 Zug (Switzerland)

Swiss Commercial Registration No: CHE-222.522.503

E secretariat@euralarm.org
W www.euralarm.org