BS EN 45544-3:2015

BSI Standards Publication

Workplace atmospheres — Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours

Part 3: Performance requirements for apparatus used for general gas detection

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee EXL/31/1, Gas detectors.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours - Part 3: Performance requirements for apparatus used for general gas detection

Atmosphères des lieux de travail - Appareillage électrique utilisé pour la détection directe des vapeurs et gaz toxiques et le mesurage direct de leur concentration - Partie 3: Exigences de performance des appareillages utilisés pour la détection de gaz générale

Arbeitsplatzatmosphäre - Elektrische Geräte für die direkte Detektion und direkte Konzentrationsmessung toxischer Gase und Dämpfe - Teil 3: Anforderungen an das Betriebsverhalten von Geräten, die für allgemeine Gaswarnanwendungen eingesetzt werden

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Europäisches Komitee für Elektrotechnische Normung

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Foreword

This document (EN 45544-3:2015) has been prepared by CEN/CENELEC Joint Working Group Continuous Measuring Instruments (JWG CMI).

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-11-24
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2017-11-24

This document supersedes EN 45544-3:1999.

Introduction

National laws and regulations based on European Directives require the assessment of the potential exposure of a worker to chemical agents in workplace atmospheres.

EN 45544, *Workplace atmospheres – Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours*, consists of the following parts:

— *Part 1: General requirements and test methods;*

— *Part 2: Performance requirements for apparatus used for exposure measurement;*

— *Part 3: Performance requirements for apparatus used for general gas detection;*

— *Part 4: Guide for selection, installation, use and maintenance.*

EN 45544 series is based on EN 482 which specifies general performance requirements for procedures for measuring the concentration of chemical agents in workplace atmospheres. These performance requirements are intended to apply under environmental conditions present at the workplace. However, because a wide range of environmental conditions are encountered in practice, this document specifies requirements that have to be fulfilled by measuring procedures when tested under prescribed laboratory conditions.

EN 45544-2 details the performance requirements outlined in EN 482 specifically for electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours intended for exposure measurement.

EN 45544-3 details the performance requirements for general gas detection apparatus, e.g. safety warning, leak detection. The measuring range will be defined by the manufacturer. In general, the requirements for accuracy will be higher for EN 45544-2 apparatus than for EN 45544-3 apparatus.

The same apparatus may be used for applications covered by EN 45544-2 and EN 45544-3.

EN 45544 series will help manufacturers, test laboratories and users of apparatus to adopt a consistent approach to, and provide a framework for, the assessment of performance criteria. It is the manufacturer's primary responsibility to ensure that the apparatus meets the requirements laid down in this European Standard including environmental influences which can be expected to affect performance.

Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours generate readings in clean air (zero readings) which vary with environmental conditions and time. This standard therefore also includes test methods and requirements for acceptable variations in zero readings.

1 Scope

This European Standard specifies the performance requirements for electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours in workplace atmospheres.

This European Standard is applicable to apparatus used for general gas detection.

EXAMPLE Safety warning and leak detection are examples of general gas detection.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 45544-1:2015, *Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours - Part 1: General requirements and test methods*

EN 50270, *Electromagnetic compatibility - Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen*

EN 50271, *Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen - Requirements and tests for apparatus using software and/or digital technologies*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 45544-1:2015 apply.

4 General requirements

Unless otherwise stated, the apparatus shall conform to the general requirements of EN 45544-1:2015, Clause 4 and these requirements shall be verified by visual inspection and by tests according to EN 45544-1:2015, 5.2.5.

5 Performance requirements

5.1 General

The apparatus shall be tested in accordance with rEN 45544-1:2015, Clause 5. A test report shall be prepared in accordance with EN 45544-1:2015, Clause 7.

5.2 Standard requirements

The performance requirements referred to in 5.5 to 5.9 shall be as specified below:

a) the deviation of the measured values in clean air shall be less than or equal to 10 % of the measuring range.

b) the deviation of the measured values in standard test gas shall be less than or equal to 20 % of the measured value.

5.3 Unpowered storage

All apparatus shall meet the relevant requirements of 5.4 to 5.9 after storage.

5.4 Calibration curve

Each measured value shall not differ from the volume fraction of the test gas by more than ± 20 % of the measured value or ± 10 % of the measuring range, whichever is the greater.

5.5 Mechanical tests

5.5.1 Vibration

During the vibration test, the apparatus shall not suffer any loss of function nor give any false alarm or fault signal. The apparatus shall not suffer damage resulting in hazard or loss of function.

The performance requirements as specified in 5.2a and 5.2b shall be met.

5.5.2 Drop test

The apparatus shall not suffer damage resulting in hazard or loss of function. The apparatus shall remain in the measuring mode during and after the test.

The performance requirements shall be as stated in 5.2a and 5.2b.

EXAMPLE Alarm devices, pump function, controls or display can lose function.

5.6 Environmental tests

5.6.1 Temperature

The deviation of the measured values at all temperatures from that at 20 °C shall be in accordance with 5.2a and 5.2b.

5.6.2 Pressure

The deviation of the measured values in clean air at all pressures from that at 100 kPa shall be in accordance with 5.2a.

The deviation of the measured values in standard test gas at all pressures from that at 100 kPa shall be less than 35 %.

5.6.3 Humidity

The deviation of the measured values at any relative humidity from that at adjustment shall be in accordance with 5.2a and 5.2b.

5.6.4 Air velocity

The deviation of the measured values at any velocity from that under conditions of no forced ventilation shall be in accordance with 5.2a and 5.2b.

5.7 Performance tests

5.7.1 Alarm set point(s)

The alarm shall be activated by the test gas at each set point within t_{90}.

5.7.2 Time to alarm or alarm reading

The time to alarm or alarm reading shall not be greater than 20 s for temperatures at and above 5 °C and 30 s for temperatures below 5 °C.

5.7.3 Flow rate

The low flow signal shall be activated.

The performance requirements specified in 5.2b shall be met.

5.7.4 Warm-up time

The performance requirements specified in 5.2a and 5.2b shall be met.

5.7.5 Time of response

The response time t_{90} shall not exceed 150 s. The response time t_{50} shall not exceed 60 s.

For apparatus equipped with a sample line or a probe, 3 s per metre length of sample line or probe shall be added to these values.

5.7.6 Time of recovery

The recovery time t_{10} shall not exceed 300 s. The recovery time t_{50} shall not exceed 60 s.

For apparatus equipped with a sample line or a probe, 3 s per metre length of sample line or probe shall be added to these values.

5.7.7 Addition of sampling probe (portable and transportable apparatus only)

The performance requirements specified in 5.2a and 5.2b shall be met.

5.7.8 Field calibration kit

The performance requirements specified in 5.2a and 5.2b shall be met.

5.7.9 Gas concentrations above the full scale indication

The performance requirements specified in 5.2a and 5.2b shall be met.

All gas concentrations above full scale indication shall result in an over-range indication and, where fitted, an alarm.

5.7.10 Extended operation in test gas

The performance requirements specified in 5.2a and 5.2b shall be met.

5.7.11 Orientation tests

The performance requirements specified in 5.2a and 5.2b shall be met.

5.8 Electrical tests

5.8.1 Battery capacity

The performance requirements specified in 5.2a and 5.2b shall be met.

The low battery indication shall be activated.

5.8.2 Power supply variations

The performance requirements specified in 5.2a and 5.2b shall be met.

No false alarm shall be activated. All output functions shall operate correctly.

5.8.3 Electromagnetic compatibility

The apparatus shall conform to EN 50270.

5.8.4 Time-weighted average (TWA) function

The mean percentage shall be between 45 % and 55 % of the standard test gas volume fraction.

The TWA alarm shall activate when (50 ± 5) % of the TWA period has elapsed.

5.9 Stability

The performance requirements specified in 5.2a and 5.2b shall be met.

5.10 Verification of software and digital components

The apparatus shall conform to EN 50271.

Annex A
(informative)

Table of significant changes in comparison to EN 45544-3:1999

	Type		
	Minor and editorial changes	**Extension**	**Substantial change**
Title change			X
Introduction modified: Titles of Part 2 EN 45544-2 and Part 3 EN 45544-3 changed. Change in intended use of EN 45544-3 apparatus: EN 45544-3 details performance requirements for general gas detection apparatus, e.g. safety warning, leak detection.			X
Modification of the scope: EN 45544-3 is applicable to apparatus used for general gas detection.			X
Normative references: EN 50271 added.			X
Performance requirements modified: 5.2 Standard requirements: a) the deviation of the measured values in clean air shall be less than or equal to 10 % of the measuring range; b) the deviation of the measured values in standard test gas shall be less than or equal to 20 % of the measured value. New 5.8.4 introduced on time-weighted average function. New 5.10 introduced on verification of software and digital components.			X

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