



1. SCOPE

This document informs and supplements CSIRO's requirements for evaluation for conformity of a residential smoke alarm in accordance with AS 3786:2014.

AS 3786:2014 is a reference document to the *Building Code of Australia (BCA) Volumes 1 and 2* (commencing BCA2015) and will subsequently supersede AS 3786-1993 (incorporating amendments 1 to 4) for this purpose.

AS 3786:2014 is based upon ISO 12239, with modifications that vary several specified requirements. Many of the ISO 12239 test methods and requirements related to product function and performance have been derived from EN 14604.

It is provision of this document that a proportion of the documentation submitted as evidence of conformity with AS 3786:2014 shall be records and reports from prior testing in accordance with EN 14604 or ISO 12239. The suitability of the submitted evidence of conformity will be determined in accordance with CSIRO's Recognition Framework, in conjunction with comparison to the results of tests applied by CSIRO's Laboratory and those applied by the external agency (laboratory).

Whilst this document recognises a relationship between AS 3786:2014, ISO 12239 and EN 14604, it requires that specified critical functions of a smoke alarm be validated by CSIRO and evidenced directly in accordance with AS 3786:2014.

Where prior evaluation of the smoke alarm has *not* taken place in accordance with either EN 14604 or ISO 12239, a suitable test plan developed by CSIRO, encompassing all aspects of the physical testing and inspections of AS 3786:2014, will be required.

2. REFERENCED DOCUMENTS

Relevant parts of the following documents are referenced for the purposes of this document as detailed in Table 1.

Table 1. List of documents referenced by this document.

| | |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| AS 3786:2014 +A1 2015 | Smoke alarms using scattered light, transmitted light or ionization |
| AS 3786-1993 +A1 1995 +A2 1995 +A3 2001 +A4 2004 | Smoke alarms |
| EN 14604:2005 +Cor 1 2008 | Smoke alarm devices |
| ISO 12239:2010 | Smoke alarms using scattered light, transmitted light or ionization |
| AS ISO/IEC 17025-2005 +A1 2006 | General requirements for the competence of testing and calibration laboratories |
| AS/NZS 60065:2012 | Audio, video and similar electronic apparatus - Safety requirements (IEC 60065, Ed.7.2 (2011) MOD) |
| AS/NSZ 60950.1:2011 | Information technology equipment - Safety - General requirements (IEC 60950-1, Ed. 2.0 (2005), MOD) |
| VdS 3131en 2010-05 (01) | Guidelines for Smoke Alarm Devices |

3. DIFFERENCES IN REFERENCED DOCUMENTS TO AS 3786-2014

AS 3786:2014 differs from both EN 14604 and ISO 12239 in several areas, as outlined below in Table 2 and Table 3. Evidence of conformity to the specified requirements identified in Table 2 must be sourced from a recognised agency (laboratory) or CSIRO's laboratory.

Table 2. Key differences in requirements of referenced documents (Standards) related to residential smoke alarms.

| Clauses | Title | AS 3786:2014 | ISO 12239:2010 | EN 14604:2005 |
|---------|------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------|
| 4.11 | <i>Service-Disconnect facility</i> | Disconnect facility | Not required | Not required |
| 4.22 | <i>Marking</i> | | Varied | |
| 5.10 | <i>Corrosion test</i> | 21 days | 4 days | 4 days ¹ |
| 5.15 | <i>EMC tests</i> | EN 50130-4:2010 ² | EN50130-4 ³ | EN50130-4:1995 |
| 5.16 | <i>Fire Sensitivity</i> | Samples 17, 18 19 and 20 ⁴ | Samples 1,2, 19 and 20 ⁵ | Samples 1,2, 19 and 20 ⁵ |
| 5.17 | <i>Sounder Durability</i> | Five alarm samples tested following environmental exposures | Five alarm samples tested following environmental exposures | One alarm sample tested without prior environmental exposure. |
| 5.25 | <i>Electrical safety</i> | AS/NZS 60065:2012 AS/NZS 60950:2011 (various clauses) | IEC 60065:2001 IEC 60950-1:2005 (various clauses) | EN 60065:2002 EN 60950-1:2001 (various clauses) |

4. EVALUATION FOR CONFORMITY

Technical Verification with the requirements of this document shall reference the schedule as detailed in Table 3.

4.1. Critical Functions

Residential smoke alarms operate by detecting airborne smoke particles, typically either by a light scattering or ionisation technique, and immediately emit an alert signal through the operation of an inbuilt sounder. Detection of smoke followed by generation of an alarm signal are considered to be the two critical functions of a residential smoke alarm.

To validate the evidence of conformity provided in the form of test reports from a recognised agency, critical functions of each model of smoke alarm shall be verified by CSIRO through evaluation in accordance with clauses 5.3 (*Initial sensitivity*) and 5.18 (*85 dBA sound output*).

Results of critical function tests to clauses 5.3 and 5.18 shall provide:

1. Demonstration that critical functional performance of the submitted product(s) is within the specified requirements of AS 3786:2014, and
2. Data which is sufficient to ensure that the product submitted for evaluation to AS 3786:2014 is identical to the product previously evaluated. Once correspondence to prior evaluation is suitably demonstrated, the detail in the supplied test report(s) may then be accepted as demonstrating conformity to the remainder of requirements of AS 3786:2014 where appropriate.

Additional tests shall be necessary if differences are identified between AS 3786:2014 and prior evaluations conducted in accordance with EN 14604 or ISO 12239 (see Section 3)

For mains-powered smoke alarms, conformance with the relevant parts of AS/NZS 60065:2012, as required by clause 5.25 (*Electrical safety*), shall be verified by CSIRO as suitably documented, relevant, and complete

¹ The additional requirements to EN 14604 specified in [VdS 3131](#) include a SO₂, corrosion (endurance) test of 21 days duration. It is anticipated, therefore, that EN 14604 may include this requirement in a future revision or amendment. Evaluation smoke alarms in Germany by VdS may therefore include, or have included, some or all of the noted variations between AS 3786:2014 and EN 14604 and ISO 12239, depending on the date(s) of prior testing. However, the variation between AS 3786:2014, ISO 12239 and EN 14604 related to the Sounder Durability test is likely to mandate a 21 day corrosion test during evaluation to AS 3786:2014.

² AS 3786:2014 requires evidence of conformity to the latest version of EN50130-4, which is at date of issue of this document is EN50130-4:2010. Smoke alarms evaluated to EN 14604 or ISO 12239 may have been subjected to EMC tests in accordance with an earlier revision of EN50130-4 and therefore require re-evaluation for EMC immunity.

³ Undated reference, where the latest edition applies. Therefore, depending on the date of evaluation, either the 1995 or 2010 revision of EN50130-4 may have applied.

⁴ Test samples are ordered following Initial Sensitivity (Clause 5.3) from most to least sensitive. Samples 17, 18, 19 and 20 are therefore the least sensitive of all of the (twenty) alarm samples required to be tested.

⁵ Two most (1, 2) and two least (19, 20) alarm samples following Initial Sensitivity ranking (also see Footnote 4).

(also see Section 4.3, below). Where necessary, CSIRO may co-ordinate an electrical safety assessment at a suitable external laboratory.

Evaluation to Clause 5.25 (via assessment to AS/NZS 60065:2012) ensures that the submitted product meets electrical safety requirements for smoke alarms in Australia and New Zealand. It remains the responsibility of the *Responsible Supplier* to ensure that any and all further electrical safety requirements are met. More information may be obtained from the Electrical Regulatory Authorities Council⁶.

4.2. Marking and Data

The requirements of AS 3786:2014 vary significantly from EN 14604 and ISO 12239 to the extent that clauses 4.22 (*Marking*) and 4.23 (*Data*) require mandatory evaluation by CSIRO's laboratory.

Furthermore, it is anticipated that the product(s) being submitted for evaluation by CSIRO may be designated differently to those described and reported by prior evaluations. Such changes to product labelling, packaging and point-of-sale information (e.g. Instruction Manual) shall require re-evaluation to clause 4.22 (*Marking*) and 4.23 (*Data*).

4.3. Electrical Safety

Clauses 4.14 and 5.25 (*Electrical safety*) of AS 3786:2014 require that smoke alarms do not present hazards to the human body related to electrical currents (shock), excessive temperature, or the start and spread of fire.

Various electrical safety requirements, as specified by AS/NZS 60065:2012, are nominated by Clause 5.25 of AS 3786:2014. AS/NZS 60065:2012 is an adoption of IEC 60065 Ed. 7.2 (2011) with further specific variations for Australia and New Zealand to Sections 7 (*Heating under normal operating conditions*), 14 (*Components*), 15 (*Terminals*), 16 (*External flexible cords*), 19 (*Stability and mechanical hazards*), 20 (*Resistance to fire*), and Annex B (*Apparatus connected to the Telecommunications Networks*).

The electrical safety requirements of ISO 12239:2010 and EN 14604:2005 are principally drawn from IEC 60065:2005 and EN 60065:2002, respectively.

For the purposes of demonstrating compliance to AS 3786:2014, prior evaluation of a smoke alarm to Clause 20 of IEC 60065 Ed 7.2 will be sufficient to meet the requirements of AS/NZS 60065:2012 if both of the following can additionally be demonstrated:

1. Mechanical parts with mass in excess of 4 g, that are not metal, glass or ceramic, are constructed from materials with a flammability category of V-1 or greater (i.e. V-0) according to IEC 60695-11-10.
For evaluation of smoke alarms, this requirement may be interpreted as being relevant to housings, bases, smoke chambers, top covers or the like, which are typically moulded from thermoplastic materials
2. Bare printed circuit board (PCB) materials (i.e. PCBs excluding small electrical components that are typically fitted such as transistors, capacitors, and integrated circuits and the like) are constructed from materials with a flammability category V-1 or greater (i.e. V-0) according to IEC 60695-11-10.

It is anticipated that the above may be satisfied by review and assessment of the relevant material datasheets for plastic materials used in the construction of mechanical parts, and the datasheets of the bare PCB materials used.

Revisions of IEC 60065 earlier than edition 7.2 may not correlate with AS/NZS 60065:2012, and evaluation in strict accordance with either EN 14604 or ISO 12239 may therefore *not* satisfy the relevant electrical safety requirements of AS 3786:2014.

Additional specified electrical safety requirements of AS 3786:2014 include selected clauses of AS/NZS 60950.1:2011, which is an adoption of IEC 60950-1:2005 +TC:2006 +A1:2009 with further specific variations for Australia and New Zealand. The corresponding requirements of ISO 12239:2010 and EN 14604:2005 are drawn from IEC 60950-1:2005 and EN 60950-1:2001, respectively).

Therefore, the requirements of published revisions of IEC 60950-1 may not correlate with AS/NZS 60065:2012, and evaluation in strict accordance with either EN 14604 or ISO 12239 may therefore *not* satisfy the relevant electrical safety requirements of AS 3786:2014.

To ensure that smoke alarms are assessed to the appropriate electrical safety requirements, it is mandatory that smoke alarms are evaluated exactly as specified in Clause 5.25 of AS 3786:2014. To ensure this,

⁶ More information is available at www.erac.gov.au

evidence of conformity to the relevant and specified requirements of AS/NZS 60065:2012 and AS/NZS 60950.1:2011 shall be provided. CSIRO may facilitate an electrical safety evaluation at an external laboratory in Australia to assist in meeting these requirements, if necessary.

Appendix A of this Technical Specification lists various published revisions of electrical safety standards, covering AS/NZS, EN and IEC documents and their relationship to AS 3786:2014, EN 14604 and ISO 12239.

4.4. Evaluation Schedule

Recognising prior evaluation, plus evaluation of critical conformity elements of AS 3786:2014, the schedule detailed in Table 3 shall be applied.

Table 3. AS 3786:2014 conformity evaluation schedule.

Notes:

1. Critical functions are denoted in **bold** text.
2. Results of critical function tests applied by CSIRO shall be compared to results recorded in the test report produced by the recognised agency.
3. Evidence of conformity to Clause 3.5 of AS 3786-1993 may be suitable if obtained from CSIRO within the last five (5) years from date of application.
4. Required to be conducted to provide pre-conditioned samples for the Sounder Durability test (Clause 5.17 of AS 3786:2014).
5. Evidence of conformity to Clause 5.15 EN 14604:2005 is deemed to be suitable evidence of conformity to clause 5.16 of AS 3786:2014.

| Clauses | Title | Acceptable source(s) of evidence of conformity | Additional Information and Correlation |
|--------------|------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------|
| 4 | <i>General</i> | - | |
| 4.1 to 4.10 | Various | Validated evaluation by a recognised agency | |
| 4.11 | <i>Service-Disconnect facility</i> | CSIRO | Variation from ISO 12239 and EN 14604. |
| 4.12 to 4.21 | Various | Validated evaluation by a recognised agency | |
| 4.22 | <i>Marking</i> | CSIRO (if smoke alarm marking is varied for Australian specific model) | EN 14604 Cl. 4.19 ISO 12239 Cl. 4.21 |
| 4.23 | <i>Data</i> | CSIRO (if associated smoke alarm product data is varied for Australian specific model) | EN 14604 Cl. 4.19 ISO 12239 Cl. 4.22 |
| 4.34 | <i>Software</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 4.17 ISO 12239 Cl. 4.23 |
| 5 | <i>Tests</i> | - | |
| 5.1 | <i>General</i> | - | EN 14604 Cl. 5.1 ISO 12239 Cl. 5.1 |
| 5.2 | <i>Directional Dependence</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.3 ISO 12239 Cl. 5.2 |
| 5.3 | <i>Initial sensitivity</i> | CSIRO (See Note 2, above) and comparison to validated evaluation by a recognised agency. | EN 14604 Cl. 5.4 ISO 12239 Cl. 5.3 |
| 5.4 | <i>Repeatability</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.2 ISO 12239 Cl. 5.4 |
| 5.5 | <i>Air Movement</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.5 ISO 12239 Cl. 5.5 |
| 5.6 | <i>Dazzling</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.6 ISO 12239 Cl. 5.6 |
| 5.7 | <i>Dry Heat (operational)</i> | CSIRO (See Note 4, above) | EN 14604 Cl. 5.7 ISO 12239 Cl. 5.7 |
| 5.8 | <i>Cold (operational)</i> | CSIRO (See Note 4, above) | EN 14604 Cl. 5.8 ISO 12239 Cl. 5.8 |
| 5.9 | <i>Damp heat (operational)</i> | CSIRO (See Note 4, above) | EN 14604 Cl. 5.9 ISO 12239 Cl. 5.9 |

| Clauses | Title | Acceptable source(s) of evidence of conformity | Additional Information and Correlation |
|-------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 5.10 | <i>Sulfur dioxide (SO₂) corrosion, 21 days</i> | CSIRO (See Note 4, above) | EN 14604 Cl. 5.10 (4 day test duration) ISO 12239 Cl. 5.10 (4 day test duration) |
| 5.11 | <i>Impact (operational)</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.11 ISO 12239 Cl. 5.11 |
| 5.12 | <i>Vibration, sinusoidal (operational)</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.12 ISO 12239 Cl. 5.12 |
| 5.13 | <i>Vibration, sinusoidal (endurance)</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.13 ISO 12239 Cl. 5.13 |
| 5.14 | <i>Extended temperature (operational) – Optional</i> | Validated evaluation by a recognised agency (optional) | Not included in EN 14604 ISO 12239 Cl. 5.14 (optional) |
| 5.15 | <i>EMC tests</i> | Validated evaluation by a recognised agency (CSIRO Fire Systems may co-ordinate at an external if necessary, see Footnote 2 above) | EN 14604 Cl. 5.14 ISO 12239 Cl. 5.15 |
| 5.16 | <i>Fire sensitivity</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.15 ISO 12239 Cl. 5.16 |
| 5.17 | <i>Battery-low condition</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.16 ISO 12239 Cl. 5.17 |
| 5.18 | 85 dBA sound output | CSIRO (See Notes 2 and 3, above) and comparison to validated evaluation by a recognised agency | Several variations to test method and requirements to EN and ISO standards. EN 14604 Cl. 5.17 ISO 12239 Cl. 5.18 (optional) |
| 5.19 | <i>Sounder durability</i> | CSIRO (See Table 2, above). | Differing test method. Additional samples with precondition test required. EN 14604 Cl. 5.18 ISO 12239 Cl. 5.20 |
| 5.20 | <i>Interconnectable smoke alarms</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.19 ISO 12239 Cl. 5.21 |
| 5.21 | <i>Alarm silence means</i> | Validated evaluation by a recognised agency Sample 6. | Mandatory requirements if function is provided. EN 14604 Cl. 5.20 (Sample 16) ISO 12239 Cl. 5.22 |
| 5.22 | <i>Variation in supply voltage</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.21 ISO 12239 Cl. 5.23 |
| 5.23 | <i>Polarity reversal</i> | Validated evaluation by a recognised agency, where prior evaluation is to ISO 12239; or CSIRO, where prior evaluation is to EN 14604. | Differing test method to EN standard. EN 14604 Cl. 5.22 ISO 12239 Cl. 5.24 |
| 5.24 | <i>Secondary power source</i> | Validated evaluation by a recognised agency | EN 14604 Cl. 5.23 ISO 12239 Cl. 5.25 |
| 5.25 | Electrical safety | CSIRO (via co-ordination with an external electrical safety laboratory, where necessary) | EN 14604 and ISO 12239 refer to earlier versions of electrical safety standards that neglect AS/NZS specific variations. |
| 5.26 | <i>Sequence timing for smoke alarms with voice</i> | Validated evaluation by a recognised agency | Mandatory requirements if function is provided. EN 14604 does not specify requirements. ISO 12239 Cl. 5.27 |

4.5. Suitability of External Evidence

Assessment of the suitability of external agencies (laboratory) evidence shall be conducted in accordance with the CSIRO Recognition Framework.

Evidence of conformity, in the form of endorsed test reports written in English, are required to be submitted in full. Where test reports were originally produced in a language other than English, certified translations may be supplied instead. Submitted external test reports must provide sufficient detail to describe the product being evaluated in full and in detail, and establish that an evaluation schedule was designed and applied to each model or variant of smoke alarm submitted to the external agency.

External evidence can only be accepted where verification between the product submitted for evaluation and the specimens in the endorsed test report is considered a critical requirement. Where external reports do not provide sufficient product identification, additional evaluation to specified requirements (testing) may be required.

4.6. Certificates of Conformity

Certificates, such as those published by a Conformity Assessment Body, do not provide direct and sufficient detail for the purposes of evaluation for conformity to AS 3786:2014.

4.7. Normative References

For the purpose of evaluation to AS 3786:2014, the revisions of normative references that shall apply are given in Table 4.

Table 4. Versions of normative references which shall apply to the evaluation for conformity of smoke alarms to AS 3786:2014.

| Normative Reference | Title | Revision |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| AS 60068 | Environmental testing—Tests | |
| AS 60068.1 | Part 1: General | 2003 |
| AS 60068.2.1 | Test A: Cold | 2003 |
| AS 60068.2.2 | Test B: Dry heat | 2003 |
| AS 60068.2.6 | Test Fc: Vibration (sinusoidal) | 2003 |
| AS 60068.2.42 | Test Kc: Sulphur dioxide test for contacts and connections | 2004 |
| AS 60068.2.78 | Test Cab: Damp heat, steady state | 2003 |
| AS IEC 61672 | Electroacoustics—Sound level meters | |
| AS IEC 61672.1 | Part 1: Specifications | 2004 |
| AS/NZS 60950 | Information technology equipment—Safety | |
| AS/NZS 60950.1 | Part 1: General requirements (IEC 60950-1, Ed. 2.0 (2005), MOD) | 2011 |
| AS 60065 | Audio, video and similar electronic apparatus—Safety requirements (IEC 60065, Ed.7.2 (2011) MOD) | 2012 |
| ISO 209 | Aluminium and Aluminium Alloys—Chemical Composition | 2007 |
| ISO 2919 | Radiological protection—Sealed radioactive sources—General requirements and classification | 2012 |
| ISO 7240 | Fire detection and alarm systems | |
| ISO 7240-3 or AS 7240.3 ⁷ | Part 3: Audible alarm devices | 2014 |
| ISO 7731 | Ergonomics—Danger signals for public and work areas—Auditory danger signals | 2003 |
| ISO 8201 | Acoustics—Audible emergency evacuation signal | 1987 |
| EN 50130 | Alarm Systems | |
| EN 50130-4 | Part 4: Electromagnetic Compatibility—Product Family Standard: Immunity Requirements for Components Of Fire, Intruder, Hold Up, CCTV, Access Control and Social Alarm Systems | 2011 |

5. REPORTING

The evaluation for conformity report shall include relevant information specified as follows:

- a) A statement of conformity with reference to AS 3786:2014 and unambiguous designation of the following:
 - all models selected and evaluated in accordance with this document.
- b) All other information in accordance with the reporting requirements of Australian Standard AS ISO/IEC 17025-2005.

⁷ ISO 7240-3 was adopted as Australian Standard AS ISO 7240.3 in 2014.

APPENDIX A – ELECTRICAL SAFETY STANDARDS

| AS/NZS | IEC | EN | Notes |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | Referenced by AS 3786-2014 |
| AS/NZS 60065:2012 Adoption of IEC 60065:2011 (Ed 7.2) with local modifications | | | Includes modifications to: Sections 7 (Heating under normal operating conditions), 14 (Components), 15 (Terminals), 16 (External flexible cords), 19 (Stability and mechanical hazards), 20 (Resistance to fire), and Annex B (Apparatus connected to the Telecommunications Networks). Also technically equivalent to AS/NZS 60065:2003 + A1:2008, +IEC A1:2005, + IEC A2:2010 |
| | IEC 60065:2011 (Ed 7.2) Comprises IEC 60065:2001 (Ed 7.0) + TC:2002 +A1:2005 +A2:2010 | | This consolidated version consists of the seventh edition (2001), its amendment 1 (2005) and its amendment 2 (2010). |
| | IEC 60065:2005 | | Referenced by ISO 12239:2010 Understood to include IEC 60065 Ed 7.0 +TC:2002 + A1:2005, only. |
| | | EN 60065:2002 | |
| | | Adoption of IEC 60065:2001 with modifications. | Referenced by EN 14604:2005 +AC:2008 |
| AS/NZS 60950.1:2011 +A1:2012 Adoption of IEC 60950-1:2005 (Ed 2.0) +TC:2006 +A1:2009 with local modifications | | | Referenced by AS 3786-2014 AS/NZ modifications not relevant to smoke alarms (assuming the alarm is not itself provided with a cable for connection to mains). |
| | IEC 60950-1 Ed 2.0 (2005) | | Referenced by ISO 12239:2010 |
| | | EN 60950-1:2001 | |
| | | Adoption of IEC 60950-1:2001 with modifications | Referenced by EN 14604:2005 +AC:2008 |
| | IEC 60950-1 Ed 1.0 (2001) | | Earliest referenced document by current smoke alarm standards. |