

Australian Standard[®]

Intruder alarm systems

**Part 3: Detection devices for
internal use**

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Australian Electrical and Electronic Manufacturers Association
Australian Security Industry Association
Building Owners and Managers Association of Australia
Confederation of Australian Industry
Department of Administrative Services — Australian Construction Services
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Part 3: Detection devices for internal use

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PREFACE

This Standard was prepared by the Standards Australia Committee on Intruder Alarm Equipment and Installations.

This Standard is Part 3 of a three-part Standard, the parts of which are as follows:

Part 1: *Systems Installed in Client's Premises*

Part 2: *Central Stations and Signalling Links*

Part 3: *Detection Devices for Internal Use* (this part)

This Standard is basically the same as AS 2201.3 — 1985 but incorporates changes to make it suitable for quality assurance certification on detection devices. It details the minimum performance requirements of a variety of detection devices together with their associated test methods. Only commonly used detectors are included and closed-circuit television and the external type of detectors have been excluded. Equipment which can comply with these requirements can be considered to be of high quality and thus help to reduce the high false alarm rate currently being experienced. The test methods have been selected for the worst conditions and these conditions should be avoided in practice.

It should be noted that the requirements and test methods specified may be different and more onerous than those specified in International Standards such as Underwriters Laboratories Standard for Safety, UL 639, Intrusion-detection units, and International Electrotechnical Commission Standard, IEC 839, Alarm systems. It is the intention of the Committee to bring this Standard into line with such International Standards (IEC 839-2, Part 2: *Requirements for intruder alarm systems*, is still under consideration) with the publication of a new edition at a later date.

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STANDARDS AUSTRALIA

Australian Standard
Intruder alarm systems

Part 3: Detection devices for internal use

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard specifies requirements for the performance of detection devices intended for use in intruder alarm systems.

1.2 APPLICATION Detectors shall comply, as appropriate, with the relevant requirements of the following Sections:

- (a) Section 2 — General requirements for detectors.
- (b) Section 3 — Additional general requirements for movement detectors.
- (c) Section 4 — Specific requirements for particular types of detectors.

In addition, the general test requirements given in Appendix A apply to the tests detailed in Appendices B to L.

1.3 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

1259	Sound level meters
2201	Intruder alarm systems
2201.1	Part 1: Systems installed in client's premises
2362	Automatic fire detection and alarm systems — Methods of test for actuating devices
2362.7	Method 7: Electromagnetic interference test
2546	Printed boards
2546.1	Part 1: General requirements and test methods
2772	Maximum exposure levels — Radiofrequency radiation — 300 kHz to 300 GHz
3300	Approval and test specification — General requirements for household and similar electrical appliances

1.4 DEFINITIONS For the purpose of this Standard, the definitions listed in AS 2201.1 and the following apply:

1.4.1 Acoustic detector — a detection device designed to initiate an alarm condition in response to airborne sounds or airborne vibrations.

1.4.2 Beam interruption detector — a detection device designed to initiate an alarm condition when a beam of radiation between a transmitter and a receiver is interrupted.

1.4.3 Capacitive touch detector — a detection device designed to initiate an alarm condition in response to the touch of an intruder on a specified object.

1.4.4 Detection range — the greatest distance at floor level in a specified direction from the reference point, at which the standard target moving in the direction of greatest sensitivity at a specified velocity in the standard test environment, will cause the detector to generate an alarm condition.

1.4.5 Doppler ultrasonic movement detector — a detection device designed to initiate an alarm condition in response to Doppler frequency effect provided by the reflection of ultrasonic waves from a moving intruder.

1.4.6 Doppler microwave movement detector — a detection device designed to initiate an alarm condition in response to Doppler frequency effect provided by the reflection of microwaves from a moving intruder.

1.4.7 Electromechanical detector — a closed/open/changeover circuit device designed to initiate an alarm condition when the circuit arrangement is changed, and does not require power for its operation.

1.4.8 Foil — a detection device consisting of metallic foil affixed to a surface and designed to initiate an alarm condition when the foil is broken.

1.4.9 Movement detector — a detection device designed to initiate an alarm condition in response to an intruder moving within a defined area.

1.4.10 Passive infrared detector — a detection device designed to initiate an alarm condition in response to the change in radiation at wavelengths within the specified band of the infrared spectrum which results from the presence of an intruder.

1.4.11 Polar diagram — a scaled plot of the detection range versus the angular position of the standard target person relative to the reference point.

1.4.12 Pressure mat — a detection device in the form of a thin mat, designed to initiate an alarm condition as a result of a change in surface pressure.

1.4.13 Printed circuit detector — a detection device consisting of conductors printed onto a base substrate, designed to initiate an alarm condition when any conductor is broken or short-circuited.

1.4.14 Range (of a detector) — the distance over which movement of the standard target will cause the detector to initiate an alarm condition or signal to a processing device.

1.4.15 Reference point — the vertical projection to floor level of a point in the centre of an imaginary line drawn between the transmitting and receiving elements.

NOTE: Where a detector consists of either a transmitting or receiving element only, the reference point is taken as the vertical projection to floor level immediately below the transmitting or receiving element.

1.4.16 Sensitivity — the magnitude of the change which the detector has been designed to detect within the range of the detector without causing the detector to enter the alarm state.

1.4.17 Sound pressure level — the ratio of the root-mean-square pressure (P) of a sound to a reference pressure, expressed in decibels as 20 times the logarithm to the base 10 of this ratio, the standard reference pressure being 20 μPa , i.e. $\text{dB} = 20 \log_{10} (P/20)$ where P is in micropascals (μPa).

1.4.18 Standard target — a person having a height of 178 ± 8 cm, weight of 77 ± 9 kg, having arms folded, facing the reference point, clothed in fully fastened, light coloured, pre-washed cotton overalls of cloth weight 310 ± 40 g/m² and having footwear selected for minimal noise generation.

1.4.19 Test panel — a 1-metre square piece of particleboard of nominal 12.5 mm thickness, rigidly mounted at the specified height and orientation by means of a light tubular metal frame or stand.

1.4.20 UHF radio movement detector — a detection device designed to initiate an alarm condition when an ultra-high-frequency radio field is disturbed by the motion of an intruder.

1.4.21 Vibration detector — a detection device designed to initiate an alarm condition in response to vibrations conducted through solid material.

1.4.22 White noise — noise, having constant power over a specified bandwidth.

SECTION 2 GENERAL REQUIREMENTS FOR DETECTORS

2.1 ENVIRONMENTAL CONSIDERATIONS

2.1.1 Temperature and relative humidity The detector shall be capable of operating under the following conditions:

- (a) Temperature 0°C to 50°C.

NOTE: For infrared detectors see Paragraph M5 of Appendix M.

- (b) Relative humidity 20 percent to 90 percent (non-condensing) at 30°C.

When tested in accordance with Appendix B, the sensitivity or range of the detector shall not vary by more than ± 25 percent of that specified by the manufacturer and may be determined by the use of a mechanical target for repetitive testing.

2.1.2 Special environment conditions Detectors intended for installations in locations subject to special environmental conditions shall comply with AS 2201.1.

NOTE: Some detectors can be significantly affected by changes in the environment. For an indication on possible variations in detection see Appendix M.

2.2 IMMUNITY FROM SUPPLY VOLTAGE VARIATIONS Detectors requiring power for their operation shall be capable of withstanding a voltage variation of not less than ± 10 percent of the manufacturer's nominal supply voltage without any change in performance. In addition, an alarm condition shall be initiated if the supply voltage to the detector is reduced to a level specified by the manufacturer.

When tested in accordance with Appendix F, there shall be no discernible change in the detector performance for a change in the manufacturer's nominated supply voltage of not greater than ± 10 percent.

2.3 IMMUNITY FROM ELECTROMAGNETIC INTERFERENCE Detectors requiring power for their operation shall be adequately protected against externally generated electrical interference, and mains-borne interference which may be expected to occur within the working environment.

Where applicable, suitable filters shall be provided to protect against noise and radio frequency interference for both input and output circuits.

When tested in accordance with AS 2362.7, the detector shall suffer no damage and shall not enter an alarm state or indicate a fault condition.

2.4 ACCESSIBILITY Detectors enclosed in a housing shall be constructed and mounted so that electrical test and adjustment operations are possible without removal of the device from its mounting. It shall not be possible to adjust the equipment without operating the tamper detection device specified (see Clause 2.5).

2.5 TAMPER DETECTION Tamper detection of detectors enclosed in a housing shall comply with AS 2201.1 (see Clause 3.5). The mounting arrangements of the detector shall not be capable of being altered sufficiently to change its existing area of coverage or range without causing an alarm condition. A tamper switch shall be provided which causes the device to signal an alarm before the cover or cover screws have moved a sufficient distance to permit access to the electrical circuits, adjustment controls and tamper switch.

When the tamper device is tested in accordance with Appendix C, it shall enter the alarm condition before access can be made to the electrical circuits and controls.

2.6 END OF LINE SUPERVISION All detectors shall be installed on an alarm input circuit, i.e. electrically supervised to one of the categories detailed in Clause 4.7 of AS 2201.1.

2.7 IMMUNITY FROM VIBRATION Detectors enclosed in a housing shall be adequately protected against vibration in the frequency range of 25 Hz to 200 Hz through an acceleration of 0.1 g_n r.m.s. When subjected to vibration in accordance with Appendix E, and with no movement taking place within the environment, the detectors shall not enter the alarm condition. Vibration detectors are excluded from this requirement.

2.8 CONSTRUCTION In addition to the requirements of Clauses 2.4, 2.5 and 2.6, the detectors shall have adequate mechanical strength and construction. When tested in accordance with Appendix D, there shall be no discernible change in range or sensitivity of the detector.

2.9 RESISTANCE TO CORROSION Components of detection devices shall be inherently resistant to corrosion or plated or otherwise treated to minimize corrosion.

NOTE: Where detectors are to be installed under severe environmental conditions, the supplier and installer shall take specific measures to counter the effects of this environment.

2.10 STABILITY When tested in accordance with Appendix G, detectors requiring power for their operation shall not enter the alarm condition.

2.11 ALARM PERIOD When detectors enter the alarm condition they shall sustain this condition for a minimum period of 350 ms.

NOTES:

- 1 For vibration detectors it may be necessary to fit an analyser in order to achieve the output time required.
- 2 While mechanical switches can operate in less than 350 ms their application as detectors preclude them operating in less than this time.

2.12 TEST FACILITIES Each detector shall be fitted with walk-test facilities for use by a client to check the performance before the system is armed. The operation of this indicator shall show the alarm condition.

This test facility shall be capable of being disabled.

2.13 MARKING Detectors shall be marked, where appropriate, with the following information:

- (a) The name(s), trade name(s), or mark(s) of the manufacturer.
- (b) Model number, serial number and date or batch code of manufacture of the equipment.
- (c) Supply voltage, current and frequency.
- (d) Approval numbers where applicable.
- (e) Maximum range.
- (f) Terminal and control designation.
- (g) An appropriate warning label where the voltage within a detector exceeds 32 V a.c. or 60 V d.c. The label shall be fixed in a readily visible location.

All markings shall be durable and easily legible. Compliance is checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water containing 10% ethyl alcohol and again for 15 s with a cloth soaked with petroleum spirit.

After all the tests of this Standard, the marking shall be easily legible, it shall not be easy to remove marking plates and they shall show no curling.

NOTES:

- 1 Attention is also drawn to marking requirements of AS 3300 for equipment intended for connection to mains supply.
- 2 Manufacturers making a statement of compliance with this Australian Standard on a product, or on packaging or promotional material related to that product, are advised to ensure that such compliance is capable of being verified. Independent certification is available from Standards Australia under the StandardsMark Product Certification Scheme. The StandardsMark, shown below, is a (registered) certification trade mark owned by Standards Australia and granted under licence to manufacturers whose products comply with the requirements of suitable Australian Standards and who operate sound quality assurance programs to ensure consistent product quality. Further information on product certification and the suitability of this Standard for certification is available from Standards Australia's Quality Assurance Services, 1 The Crescent, Homebush, N.S.W., 2140.



SECTION 3 ADDITIONAL GENERAL REQUIREMENTS FOR MOVEMENT DETECTORS

3.1 RANGE REQUIREMENTS The smallest protected range obtainable by the adjustment of a variable gain control shall be not less than 20% of the maximum range, the shape and the linear dimensions of which shall be included in the description of the system prepared by the supplier at the time of installation (see also AS 2201.1).

When tested in accordance with Appendix H, the movement detector shall enter the alarm condition when a standard target moves at a speed of 0.5 m/s at or outside of the range limit claimed by the manufacturer. At speeds between 0.1 m/s and 2.0 m/s, the detection range shall not fall below 80% of the range attained at 0.5 m/s.

3.2 SENSITIVITY Movement detectors shall respond to a standard target moving within the specified range, either towards the detector or tangentially to the detector, as appropriate, through a distance of 0.1 m to 2 m at a speed 0.5 m/s.

When tested in accordance with Paragraph I2 of Appendix I, the detector shall enter the alarm condition as follows:

- (a) *At 80% range position* The detector shall comply with the following:
 - (i) With the sensitivity control (where provided) set to minimum, the detector shall enter the alarm condition before the standard target moving at 0.5 m/s traverses a distance of 2 m.
 - (ii) With the sensitivity control (where provided) set to maximum, the detector shall not enter the alarm condition before the standard target moving at 0.5 m/s traverses a distance of 100 mm.
- (b) *At 20% range position* The detector shall comply with the following:
 - (i) With the sensitivity control (where provided) set to minimum, and the standard target moving at 0.5 m/s, the average of three consecutive tests shall be equal to that obtained in (a)(i) within an accuracy of $\pm 20\%$.
 - (ii) With the sensitivity control (where provided) set to maximum and the standard target moving at 0.5 m/s, the average of three consecutive tests shall be equal to that obtained in (a)(ii) within an accuracy of $\pm 20\%$.

SECTION 4 SPECIFIC REQUIREMENTS FOR PARTICULAR TYPES OF DETECTORS

4.1 DOPPLER ULTRASONIC MOVEMENT DETECTORS

4.1.1 Classification The Doppler ultrasonic movement detectors shall be classified into two types according to their operating configuration, and each type shall be further classified by a category according to the signal processing utilized. The types and categories are as follows:

(a) *Types* The types are as follows:

- (i) *Type 1* A Doppler ultrasonic movement detector having both the transmitting and receiving elements in the same enclosure.
- (ii) *Type 2* A Doppler ultrasonic movement detector having the transmitting and receiving elements in separate enclosures.

(b) *Categories* The categories are as follows:

- (i) *Category O* A Doppler ultrasonic movement detector that does not employ signal processing to discriminate between positive and negative Doppler shifts in order to reject reciprocating motion.
- (ii) *Category P* A Doppler ultrasonic movement detector that employs signal processing to discriminate between positive and negative Doppler shifts in order to reject reciprocating motion, e.g. moving curtains and swinging signs.
- (iii) *Category Q* A Doppler ultrasonic movement detector that employs signal processing to reject airborne noise and employs signal processing to discriminate between positive and negative Doppler shifts in order to reject reciprocating motion.

The detector shall be adequately protected against externally generated acoustic white noise to a sound pressure level of 52 dB. The white noise shall have a band width of 20 Hz to 20 kHz and a level of 50 ± 2 dB(A) at the face of the detector under test.

NOTE: In special cases a requirement may exist for the initiating of an alarm when the detector is subjected to 'jamming' attempts. This Standard does not address this issue and where this feature is required, it will need to be specified separately.

4.1.2 Operating frequency When tested in accordance with Appendix K, the detector's transmission shall be an acoustic signal equal to or greater than 22 kHz.

4.1.3 Maximum output When tested in accordance with Appendix L, the sound pressure level shall not exceed 110 dB at 22 kHz and above, measured at a distance of 1 m in the direction of maximum output from the transmitting element.

Where audible frequencies are produced, they shall not exceed 40 dB(A) at any point 1 m or more from the detector.

4.1.4 Detection category A detector shall initiate an alarm condition in accordance with its category as follows:

- (a) *Category O* A Category O detector shall respond to a start/stop motion of a standard target moving at a speed of 0.5 m/s towards the detector through a specified distance, i.e. 50 percent of the average maximum sensitivity test results reported in Paragraph I2.4(c) of Appendix I, and then pausing for 3 s before continuing on with this motion. When tested in accordance with Paragraph J5.1 of Appendix J, the detector shall enter the alarm condition at least once.
- (b) *Category P* A Category P detector shall comply with the requirements for Category O, and in addition shall not respond to a backward and forward motion of a standard target moving in a straight line facing the detector in a forward and reverse direction at an average speed of 0.5 m/s over a specified distance. When tested in accordance with Paragraph J6.2 of Appendix J, the detector shall not enter the alarm condition within a period of 30 s.

A Category P detector shall respond to a standard target moving at an average radial speed of 0.5 m/s in a continuous forward and backward motion through a specified forward distance, and backwards for 50% of that distance. When tested in accordance with Paragraph J6 of Appendix J, the detector shall enter the alarm condition at least once.

- (c) *Category Q* A Category Q detector shall comply with the requirements for Category P in the presence of an acoustic white noise signal level of 52 dB(A).

4.1.5 Range The range in which a Doppler ultrasonic detector responds, shall be specified by the manufacturer. When tested in accordance with Appendix H, the detector shall respond to a standard target moving from outside of the manufacturer's polar diagram area at a speed of 0.5 m/s towards the detector. At speeds between 0.1 m/s and 2.0 m/s, the detection range shall not fall below 80% of the range attained at 0.5 m/s.

NOTE: Atmospheric changes have a large effect on the performance of all ultrasonic systems. Appendix M explains the atmospheric effects on the range of ultrasonic detectors.