

# Consultation Paper: Single Duct Portable Space Conditioners and Spot Coolers



**SEPTEMBER  
2009**

Prepared for the  
Equipment Energy Efficiency Committee (E3)  
By Energy Efficient Strategies



## Submissions on this paper

This paper sets out a number of new government proposals to regulate single duct portable space conditioners and spot coolers with respect to energy performance.

This paper provides information on the different types of products currently on the market and some rationale as to why these products should now be regulated with respect to energy. The target implementation date for government regulation is October 2011. This paper also summarises the information presented to the stakeholder meeting that was held in Sydney on 28 July 2009 and also documents some of the discussions and issues raised by stakeholders.

Specific stakeholder feedback is sought on the proposals outlined in this paper. Written submissions are invited until **Tuesday 29 September 2009**.

Submissions should be sent to:

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Stakeholder feedback is important and will help to shape the final regulatory proposals which will be implemented by government.

## Next steps

Following the consultation period, government officials will formalise the regulatory proposals in a regulatory impact statement (RIS), to be released for consultation later in 2009. The detailed technical requirements for portable units will be included in the RIS and will provide a further opportunity for formal feedback and consultation with industry and stakeholder groups. The RIS may contain a range of regulatory proposals for other types of space conditioning products as well as portable units.

In parallel to the RIS process and in order to achieve the most effective outcome, details of the proposed labels will be discussed with industry and a range of label designs will be tested with focus groups. E3 is looking for interested industry stakeholders that would be willing to provide feedback and advice during this label development process.

Also in parallel to the RIS process, E3 have offered to test a limited number of representative units to the proposed test procedures in order to inform all stakeholders of the likely range of performance for these types of systems and to inform decision makers on the most sensible technical solutions.

To implement the testing requirements, an Amendment to AS/NZS3823.1.1 will be required to cover single duct portable space conditioners as set out in EN14511. To implement the outcomes of the RIS process, a revision to AS/NZS3823.2 will be necessary.



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# Introduction

Air conditioners have been regulated in Australia for energy labelling since 1987. Minimum Energy Performance Standards (MEPS) were introduced in 2001 for three phase systems and 2004 for single phase systems. Energy efficiency requirements for these products are reviewed and upgraded on a regular basis.

Certain types of small portable systems have been exempted from energy labelling and MEPS regulations to date, partly because there has been no international test method for the determination of efficiency. However, recent increases in the market share of these products has prompted government to propose regulatory measures for these products with respect to energy efficiency.

This consultation paper sets out the government proposals to regulate single duct portable space conditioners and spot coolers with respect to energy performance. The paper covers the following issues:

- Market overview for air conditioners and portable systems
- A summary of the regulatory proposals to label portable products
- Testing related issues for portable products
- An overview of discussions at the stakeholder forum in July 2009.

This paper is focused on two types of portable systems:

- *Single duct portable space conditioners* – these are unitary systems which lie wholly within a conditioned space and draw air from the conditioned space which then flows over the condenser and is exhausted via a single duct to the outside. These products are termed single duct portable space conditioners throughout this report (pending a refinement of terminology);

- So called “*spot coolers*” – these are also unitary systems that lie wholly within a conditioned space but have no duct or air interconnection to the outside. These are generally limited to specific commercial or industrial applications and are rarely used in the residential sector.

There are two other types of portable systems currently on the market. These systems are already covered by the testing requirements outlined in AS/NZS3823.1.1 and the energy labelling and MEPS requirements outlined in AS/NZS3823.2:

- Systems that use twin ducts – these are usually unitary systems that lie within a conditioned space but draw condenser air from outside through a duct and discharge this air through a separate duct to the outside;
- Portable split systems where an indoor and outdoor unit are connected only by refrigeration piping (these units may or may not be separable) but can be moved by the user as required.

These latter two types of portable systems are not affected by these new regulatory proposals as they are already within the scope of current regulations. Regulators will be increasing efforts to ensure that these product types are correctly registered for energy labelling and MEPS.

More detailed descriptions of the different portable product types are provided in Appendix 1.

Background information on the regulation of air conditioners is provided in Appendix 2.

## Market overview for air conditioners and portable systems

There has been a long history of energy labelling and Minimum Energy Performance Standards (MEPS) for air conditioners in Australia. This is due to the significance of these products both in terms of their ownership in Australian households and their energy consumption characteristics and the corresponding greenhouse gas emissions.

The national air conditioner market is estimated at over 1 million sales annually (for all types and configurations), with 70% of these sales being for residential applications and the remaining 30% for commercial applications. Commercial units are generally much larger than residential installations and tend to be used for longer hours. Spot coolers and single duct portable space conditioners as part of these sales are estimated to be approaching 10% of market share (approximately 100,000 units). Reported GfK sales for spot coolers and single duct portable space conditioners through selected retail outlets has been growing steadily (note though that the market coverage of GfK is limited to large retail outlets, and thus is an understatement of the entire air conditioner market).

**Table 1: Portable System Sales<sup>1</sup>**

Year	Sales	Market Share
2006	55,000	8.3%
2007	67,400	11.8%
2008	62,700	12.6%

Source: GfK Marketing

Historically, regulatory authorities have not been overly concerned with spot coolers or single duct portable space conditioners, as the sales share for these products has been very low. This situation has changed recently and these products are now considered by regulatory authorities to be of importance in terms of energy consumption and sales share for air conditioners. Also of concern is the ability of single duct portable space conditioners to provide viable cooling to end users due to the air exchange between indoor and outdoor spaces.

<sup>1</sup> Sales numbers also include some sales for Twin Duct Unitary and Portable Split Systems.



## Labelling Proposal For Portable Systems

Governments are increasingly concerned about the growth in the single duct portable space conditioner market and to some extent the spot cooler market. While mainstream air conditioners are now subject to stringent MEPS levels and energy labelling, the unregulated part of the market (personal and industrial spot coolers, and single duct portable space conditioners) currently have no performance requirements. Of greater concern from a consumer protection perspective, is that these products may not deliver net cooling to the user – they will almost always result in net heating of the building in which they operate (when outdoor conditions are hot). Most consumers will not be aware of this and the lack of information will potentially mislead them into thinking that they are purchasing an “air conditioner”, whereas in fact it is in many cases a net building heater. These units are attractive to consumers because they are relatively low cost, generally do not require a licensed installer and are highly portable. Thus it is critical that potential purchasers be informed of the consequences of their use.



Image courtesy of Electrolux

## Labelling Proposal for Single Duct Portable Space Conditioners:

- Mandate the registration of all single duct portable space conditioner units with regulatory authorities under the energy labelling and MEPS regulations.
- Products will be required to carry a prominent label that states the capacity of the unit and possibly its efficiency under the specified test method. The label will also provide a warning to consumers concerning the net heating effect of using these products under certain conditions, resulting from discharged air being replaced by air from outside the building.
- Single duct portable space conditioners will not carry a star rating which is directly or indirectly comparable to standard air conditioners.
- The energy label for single duct portable space conditioners will differ significantly from the label for spot coolers (see below - warning only).

A series of focus groups will be held to refine the wording on the energy label for these products, in parallel with stakeholder consultation.

## Labelling Proposal for Spot Coolers:

- Mandate the registration of all **single phase** spot coolers (domestic, commercial and industrial) with regulatory authorities under the energy labelling regulations.
- Each product will be required to carry a prominent warning label that informs consumers and potential users that these products are only suitable for spot cooling applications within large spaces and will provide a net heating effect.
- The energy label for spot coolers will primarily provide a warning regarding their use and will not contain any performance or capacity data.

A series of focus groups will be held to refine the wording on the energy label for these products, in parallel with stakeholder consultation

## Testing Issues

Single duct portable space conditioners and spot coolers are different to normal refrigerative air conditioners as they cannot be tested to the international and national test methods which cover mainstream ducted and non-ducted air conditioners. International and national test methods for refrigerative systems are configured to measure products where the indoor air is circulated internally without interchange with the outside space and only energy (not air) is moved to the outside space<sup>2</sup>. There are some alternative test methods which can measure the performance of these small portable systems which are explored in this paper as a possible basis of regulation for these products.

Single duct portable space conditioners draw air from the 'conditioned space' which then flows across the condenser and is discharged to the outside via a vent from the conditioned space. Air to replace the discharged air will be drawn into the 'conditioned space' from other parts of the building and ultimately from outside the building. The use of these types of systems when outside temperatures are high eventually result in a net heating of the space in which the unit is used, due to heat energy emitted during the operation of the unit (as a result of mechanical work of the compressor) as well as the unconditioned air drawn into the building from outside to replace the discharged air from the conditioned space.

Spot coolers on the other hand are wholly contained within the conditioned space and result in a net heating effect of that space as there is no direct energy or air discharge to the outside. They essentially blow cold air out of one side and hot air out of the other side.

Single duct portable space conditioners cannot be tested using a standard calorimeter under AS/NZS3823.1.1 as there is air exchange between indoor and outdoor spaces. These products are tested in Europe using EN14511, which uses a calorimeter with both the indoor and outdoor

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2 Many larger commercial systems have air exchange systems where fresh air is introduced into the building but where the energy is transferred between inlet and outlet air streams in order to deliver net heating or cooling as required. Evaporative systems, which are not considered in this paper, also introduce outside air into the building.

conditions set to the ISO outdoor condition. This gives some indication of marginal performance of cooling a room that is already at the outside temperature, but does not take into account the air that enters the building to replace the discharge air as the indoor space is cooled.

Single duct portable space conditioners can also be tested to the US test method, AHAM PAC-1 and the Canadian test method, CSA C370. These use a calculation of the cooling effect of the discharge using the air enthalpy method. In this case the unit is placed in the indoor condition during the test. Once again, the net heating effect of displaced air being drawn into the building is ignored as the calculation is based purely on the energy discharged at the unit outlet inside the room.

As most single duct portable space conditioners originate in Europe or are supplied by Europe based companies, the test method EN14511 appears to be the most relevant standard to use to determine capacity and nominal efficiency of these types of products.

The US AHAM Standard does not cover any heating function, as single duct portable space conditioners are seen purely as a cooling only product. The EU Standard is currently under revision with plans to include heating, so it is possible that a heating test could also be used to test products with a heating function.

Personal, commercial and industrial spot coolers can only be tested using an air enthalpy approach, as found in AHAM or CSA standards. These measurements are based on the calculation of the energy discharged at the unit outlet (evaporator for cooling mode) into the room and ignore the energy discharge from the condenser, which is also into the same room. Any such measurement is fairly meaningless as the condenser and evaporator are both discharged into the same physical space, resulting in a net heating effect equal to the power input into the spot cooler. There is therefore no proposal to mandate testing of spot coolers.

In consideration of the testing options for single duct portable space conditioners and personal and industrial spot coolers, the following proposals have been developed.

**Table 2: Spot Cooler and Portable Space Conditioner Test Standards**

Product	Test Standard	Testing Method	Notes
Industrial or Personal Spot Cooler	AHAM PAC-1 or CSA C370	Air enthalpy	Unit is operated within indoor condition. Any measurement of energy efficiency is essentially meaningless as heat is also discharged into the same space.
Single Duct Portable Space Conditioner	EN14511	Calorimeter	Unit is operated within outdoor condition. This is the most relevant standard to use to determine capacity and nominal efficiency. Ignores heating effect of external air drawn in to replace condenser discharge.
Single Duct Portable Space Conditioner	AHAM PAC-1 or CSA C370	Air enthalpy	Unit is operated within indoor condition. Ignores heating effect of external air drawn in to replace condenser discharge.

### Testing Proposals for Single Duct Portable Space Conditioners:

- Mandate the testing of all single duct portable space conditioners and registration with regulatory authorities under the energy labelling and MEPS regulations. Rated capacity and efficiency on the energy label will have to be consistent with tested values.
- Use the test method and conditions found in the revised EN14511 Standard for cooling (and include the reverse cycle heating test, if tests for heating are required) for all single duct portable space conditioners.
- Require an indication in the product registration whether the unit has reverse cycle ability.
- Require an indication in the product registration whether the unit recirculates condensate.
- DEWHA will commission tests on a range of market representative single duct portable space conditioners, with industry providing units. These tests will be to EN14511 as well AS/NZS3823.1.1 T1 (for standard air conditioners) and possibly other conditions. The results of these tests will be made public to inform the debate on these regulatory proposals and their energy performance under a range of conditions, while retaining brand and model confidentiality.
- The introduction of MEPS for single duct portable space conditioners may be considered at a later date, if required. This level would be in-line with the levels required for window wall type air conditioner units; a minimum EER of 2.84, pending a review of performance data.

### Testing Proposals for Personal, Commercial and Industrial Spot Coolers:

- **Single phase** personal, commercial and industrial spot coolers to be registered with regulatory authorities, but with no testing required.
- The product registration will indicate whether the unit is intended for residential, commercial or industrial applications.
- The product registration will indicate whether the unit has reverse cycle capability.

## Stakeholder Meeting Held on 28 July 2009

E3 held an Industry Stakeholder Meeting to canvass regulatory proposals with key industry representatives in Sydney on 28 July 2009. The meeting was attended by many of the larger portable system suppliers as well as government representatives and consultants. Several presentations were given concerning the status of the product market, MEPS, energy labelling, standards, testing, as well as a number of regulatory proposals for portable systems. These presentations are available from <http://www.energyrating.gov.au/meeting-2009-portable-ac.html>.

Attendees were invited to make submissions on the background information and the presentations supplied at the meeting. Two written submissions were received. The following section attempts to document the main issues raised by meeting attendees on the day and in the written submissions.

# Key Issues Arising from the Stakeholder Meeting

## Product Naming

- There were a range of views regarding suitable product names for the portable systems of interest. There appeared to be agreement about the term “spot coolers” but there were different opinions about a term for single duct portable systems. The term “single duct portable space conditioners” was developed for use in this paper. Particular feedback on a more suitable term for this type of product is sought as part of the consultation process.
- It was agreed that the initial nomenclature of Type 1, Type 2 and Type 3 is unacceptable and will not be used.

## Testing

- Some industry participants asserted that despite having a net heating effect under certain test conditions, single duct portable space conditioners can provide a level of consumer comfort when used in real world conditions. It was noted that performance of single duct portable space conditioners is dependant on the ambient conditions present. They will perform well when the outside air is cooler than the indoor air temperature<sup>3</sup> or where replaced air is drawn from a separately conditioned space or cool part of a building<sup>4</sup>. It was also noted that some systems can provide some dehumidification (latent) cooling capacity, which may be difficult to quantify in lab testing.
- Concerns were raised about the potential for suppliers of spot coolers to make false claims about a product’s capacity if this information was not included on the proposed warning label. DEWHA stated that sales growth of these products will be monitored and testing mandated in the future if necessary.
- The issue of heating performance for single duct portable space conditioners was raised – it was noted that EN14511 is likely to include an assessment of heating performance in the near future, so this will be examined.
- It was noted that some newer models recirculate condensate from the evaporator over the condenser, usually resulting in a higher operating EER and an increased latent cooling (dehumidification). There were discussions whether the test procedure could adequately quantify this latent cooling effect, given the air interchange between the outdoor and indoor spaces of the test room. This needs to be investigated. The registration system should indicate whether the whether the unit disposes of indoor condensate through the air exhaust.
- There was concern whether the stability requirements in the proposed test method could be maintained for single duct portable space conditioners given the air interchange that occurs between the indoor and outdoor spaces.



Image courtesy of Electrolux

<sup>3</sup> Opening windows or doors will also be effective when outdoor conditions are milder than indoor.

<sup>4</sup> Relying on the thermal mass of a building may provide some short term advantage. Using a single duct system to draw conditioned air from another operating air conditioner is not a very effective cooling strategy as this air conditioner will have to cool the replaced air from outside instead.

## Labelling Format and Content

- Some stakeholders suggested that the warning label on spot coolers should be more forceful than the warning label found on single duct portable space conditioners (due to the difference in service that they can give). Others suggested that there was a preference for spot coolers and single duct portable space conditioners to have the same label.
- While many industry stakeholders expressed a preference for an energy label with a star rating for single duct portable space conditioners (comparable with the energy label for standard air conditioners), concern was expressed that this inevitably would encourage direct comparison of portable systems with conventional air conditioners. The capability of these products is totally different so any direct comparison would be unfair. If stars were to be included on an energy label, the test method and algorithm would have to be comparable to those for standard air conditioners (noting that the net capacity and efficiency of single duct portable space conditioners are likely to be close to zero under AS/NZS3823.1.1 condition T1).
- Industry raised concerns about a label without some indicator of energy efficiency as this could skew the market towards inefficient products. It was noted that mandating a statement of capacity on a label without efficiency will encourage products with the highest possible capacity with no regard for efficiency (notwithstanding the other issues associated with the use of these products).
- Industry representatives noted that consumers would probably not use the energyrating website to compare single duct portable space conditioners, as these products are generally an impulse purchase.

## Circumvention Issues

The issue of removable ducting from single duct portable space conditioners was raised. This would essentially convert these products into a spot cooler. Ducts could then be sold as a separate 'accessory'. The removal of ducting at the point of sale could be a means of circumventing the requirement for testing and labelling of capacity and efficiency on the product for single duct portable space conditioners. This type of potential circumvention is considered to be a serious issue and government will examine options to ensure that this does not occur.

Particular comment is sought from stakeholders on approaches that could reduce or eliminate this type of circumvention. It is likely that any product that is capable of having a single exhaust duct fitted (including spot coolers) would be treated as a single duct portable space conditioner in terms of testing and labelling requirements, even where the duct is not supplied as a standard fitting.

## Future MEPS for Single Duct Portable Space Conditioners

Government would consider the option of introducing future MEPS for single duct portable space conditioners if this product type continues to grow in sales share and average product efficiency is poor. MEPS could be in-line with levels for window wall air conditioner units (minimum EER of 2.84). Under a MEPS regime, a substantial share of products on the market could be eliminated.

MEPS Recommendations for Single Duct Portable Space Conditioners:

- Monitor sales of single duct portable space conditioners over time.
- Consider the introduction of an appropriate MEPS level for single duct portable space conditioners, taking into account the MEPS levels already in place for conventional air conditioner types (e.g. window walls).
- Consider a future option of a high efficiency label for the best performing product that would complement any future MEPS.

## Future Requirements for Spot Coolers

Although spot coolers are currently considered to be specialty products with a small sales share, this situation could change in the future. Government will actively monitor the sale of spot coolers and may introduce further regulatory measures if their use becomes more prevalent.

## Dehumidifiers

The issue of dehumidifiers was raised by stakeholders at the meeting. Dehumidifiers are currently unregulated. From a technical and operational perspective, dehumidifiers could be classified as a type of spot cooler. However, they have been excluded from the scope of interest at this stage because they occupy a small specialised market niche in specific climates and their primary function is dehumidification and not cooling - they are not sold as “air conditioners” or “spot coolers”. However, their sales volume could change in the future. Sales growth of these products will be monitored and regulatory measures may be introduced if their use becomes more prevalent. It was noted at the stakeholder meeting that some dehumidifiers have a heating function, and there is a possibility that industry may start to market these products as ‘heating and cooling devices’. In this case, one option could be to treat dehumidifiers as spot coolers in terms of regulatory proposals. It was noted that there is an AHAM Standard for dehumidifiers (ANSI/AHAM DH-1).

# Appendix 1: Portable system configurations

## Spot Cooler and Portable Space Conditioner Types

This section describes the main types of spot coolers and single duct portable space conditioners. The naming format have been developed for this consultation paper and does not refer to existing standard definitions.

All of these products are unitary systems with the compressor, evaporator and condenser all contained in a single box.

*Personal Spot Cooler; no exhaust duct (residential application) (formally Type 1):*

These are self-contained unitary units with no external condenser discharge. They take air from the room for both cooling the occupant, and for cooling the condenser. The occupant feels a cool breeze from the discharge grill, but the room temperature will increase because of the rejection of heat from the compressor and condenser into the conditioned space. If humidity exists in the room, it may be lowered in the cooling process, with any moisture removed being collected in a tank within the unit. They are of very limited use and value in residential applications.

*Industrial or Commercial Spot Cooler; no exhaust duct (formally Type 3):*

These units are essentially the same as personal spot coolers, but are larger and are intended for use in the commercial rental market and some industrial applications. They are generally used as spot personal coolers in hot sections of commercial and industrial buildings (i.e. factories), or as temporary air coolers where normal air conditioning systems are inadequate or have broken down. The products are mostly of metal construction and designed for tough environments.

*Single Duct Portable Space Conditioner (residential application – formally Type 2):*

The basic operating unit is similar to a spot cooler, but the main difference is that the condenser discharge air is ducted to the outside via a flexible pipe. Therefore the heat from the condenser does not directly add heat to the room. However, because the unit draws air for the condenser discharge from the indoor room, it acts as an exhaust fan moving what is effectively conditioned air from inside to outside. Internal temperatures will generally rise as unconditioned air must be drawn into the space from other indoor and outdoor sources to replace the discharge. The temperature rise depends on the design of the unit, the size of the building, where replacement air is drawn into the building and the difference between indoor and outdoor temperatures. This product may provide some short term relief in the room in which it operates but ultimately will result in net heating of the whole building in hot weather.

As noted earlier in the report there are two other types of portable systems currently on the market, which are not the focus of this paper.

- Systems that use twin ducts – these are usually unitary systems that lie within a conditioned space but draw condenser air from outside through a duct and discharge this air to the outside through a separate duct;
- Portable split systems where an indoor and outdoor unit are connected only by refrigeration piping (these units may or may not be separable) but can be moved around by the user as required.

# Appendix 2: Regulation of air conditioners for efficiency

## Background

Air conditioners have been regulated in Australia for energy labelling since 1987. MEPS were introduced in 2001 for three phase systems and 2004 for single phase systems.

Certain types of small portable systems have been exempted from energy labelling and MEPS regulations, mainly because there has been no international test method for the determination of efficiency. Recent increases in market share of these products has prompted government to propose regulatory measures for these products.

## Regulatory Overview for Air Conditioners

Energy labelling for air conditioners was introduced in 1987 in NSW and Victoria, this was expanded to other states in the early 1990's. A regrade of the energy label star rating algorithm was undertaken in 2000 together with a redesign of the energy label. For air conditioners, a new energy labelling algorithm and an adjusted label design will be implemented in 2010.

MEPS was introduced for 3 phase air conditioners in 2001, and for single phase units 2004. Upgrades of these MEPS levels were undertaken in 2006 and 2007, with future upgrades to take place in 2010 and 2011.

Along with a long history of energy labelling and MEPS for air conditioners, there is a corresponding history of compliance checking for these products. One important element is check testing of supplier claims in accredited test laboratories. Another element is checking that products are correctly registered for energy labelling and MEPS and that products on display in stores are correctly labelled. Various surveys have been undertaken over the past 10 years.

Recently a team of compliance 'police' have been employed by DEWHA to provide regular and ongoing checks of compliance in retail outlets for all regulated products. Data on brand, model and energy labels of products observed in retailers are recorded in a database. In 2009, about 10,000 products a month have been examined through retail outlets, with unregistered, unlabelled and incorrectly labelled products identified and referred to regulators for further action. In the coming months, compliance teams in the field will be focussing on specialty outlets and air conditioner stockists, with results from these checks being publicly released in October 2009.

Alongside this, a regime of regular market surveillance using retail sales data provided by GfK is also used to identify any unregistered products. This data set covers more than 70% of all air conditioners sold in Australia.

Spot fines and regulatory actions against retailers and suppliers that are selling unregistered product are being actively pursued by State regulatory authorities.