

**ENHANCED CAPITAL ALLOWANCE (ECA) SCHEME FOR
ENERGY EFFICIENT TECHNOLOGIES**

ENERGY TECHNOLOGY CRITERIA LIST

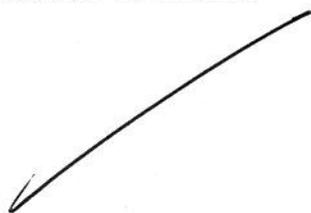
1 JULY 2013

Issued on behalf of the Secretary of State for the Department of Energy and Climate
Change

Signed:

A handwritten signature in black ink, appearing to be 'G. Barker', written in a cursive style.

GREGORY BARKER

A handwritten signature in black ink, appearing to be 'G. Barker', written in a cursive style.

Date: 8 July 2013

ENERGY TECHNOLOGY CRITERIA LIST (2013)

July 2013

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The Energy Technology List comprises the technologies that qualify for the UK Government's Energy-Saving Enhanced Capital Allowance (ECA) scheme and their energy-saving eligibility criteria.

The Energy Technology List is divided into 2 parts:

- The Energy Technology Criteria List which contains details of the energy-saving criteria that must be met for each of the technology classes;
- The Energy Technology Product List which contains a list of products that have been certified as meeting those standards.

The Energy Technology Criteria List is updated and published annually. *This document is a copy of the ETCL as first published in July 2013.*

The Energy Technology Product List is published annually and is updated at the beginning of each month on the ECA website.

For the most up to date copy of the ETL and for further information about the ECA Scheme please refer to the ECA website <http://etl.decc.gov.uk/etl>. General information on ECA Schemes is available as <http://www.hmrc.gov.uk/manuals/camanual/Index.htm>.

Ownership for the ECA Scheme for energy-saving technologies resides with the Department for Energy and Climate Change (DECC) and HM Revenue and Customs. The Carbon Trust promotes the ECA Scheme and manages the Energy Technology List.

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Air-to-Air Energy Recovery Devices

Date added to ETL 2004 (Revised 2013).

1. Definition of Technology

Air-to-air energy recovery devices are heat exchanger products that are specifically designed to recover (or salvage) waste heat from the exhaust air stream from a building ventilation system, and use it to heat the incoming air stream to the same building ventilation system.

2. Technology Description

Air-to-air energy recovery devices use heat exchanger technology to recover heat from the exhaust air of building ventilation systems that would otherwise be lost to atmosphere. The heat exchangers are incorporated into the supply air and extract air ventilation ducts. Some products may also be used to reduce the energy used by air conditioning systems by removing heat from the incoming air.

A wide range of air-to-air energy recovery devices is available. The ECA Scheme aims to encourage the purchase of products with higher levels of effectiveness in heat recovery.

The ECA Scheme covers three categories of product:

1. **Plate heat exchangers (or recuperators).**
These products must consist of heat exchanger with alternate channels for the supply and exhaust airflows that are separated by plates through which heat is conducted. They must not contain any moving parts. This category includes both cross-flow type, and counter-current flow type, plate heat exchangers.
2. **Rotating heat exchangers (including thermal and desiccant heat wheels).**
These products must consist of a circular heat transfer medium (or 'wheel') that is designed to slowly rotate within an airtight container, and to pass the exhaust air stream over one section of the wheel, and the supply air stream over the other section of the wheel in counter flow direction. The product may be designed to recover only sensible heat, or it may incorporate a desiccant material to enable it to recover both latent and sensible heat.
3. **Run-around coils.**
These products must consist of a matched set of two or more air-to-water heat exchangers that are designed to be located in the supply air and exhaust air ducts, and interconnected with a pumped circuit containing water, or water and glycol.

Investments in air-to-air energy recovery devices can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Performance criteria

Products must have:

- A dry heat recovery efficiency at the product's maximum rated air flow balanced flow conditions that is greater than or equal to the values set out in Table 1 below.

- A pressure drop across each side of the heat exchanger(s) within the product at the product’s maximum rated air flow that is less than or equal to the values set out in Table 1 below.

Table 1 Performance requirements for air-to-air recovery devices.

	Product category	Dry heat recovery efficiency (%)	Pressure drop (in pascals)
1.	Plate heat exchangers	$\geq 55\%$	≤ 250 Pa across each side.
2.	Rotating heat exchangers	$\geq 72\%$	≤ 200 Pa across each side.
3.	Run-around coils	$\geq 50\%$	≤ 250 Pa across each air side and ≤ 250 kPa across each water side.

" \geq " means "greater than or equal to"
" \leq " means "less than or equal to"

Where:

- The **maximum rated air flow** is the flow rate specified by the manufacturer according to the product’s design limits, for example, a maximum pressure drop or maximum face air speed.

For the avoidance of doubt test data should be presented to zero decimal places. As an example, a plate heat exchanger with a minimum effectiveness of 54%, or a pressure drop of 251 pascals, would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the relevant procedures and test conditions in one of the following standards:

- BS EN 308:1997 “Heat Exchanger: Test procedures for establishing performance of air to air and flue gases heat recovery devices”.
- ANSI / AHRI 1060:2005 “Performance rating of air-to-air heat exchangers for energy recovery ventilation”, Air-conditioning, Heating & Refrigeration Institute.
- JIS B 8628: 2003, “Air to air heat exchanger”.
- Other equivalent test standards where the resulting performance data can be scientifically proven, using the methodologies in ANSI/ASHRAE Standard 84-2008 “Method of Testing Air-to-Air Heat/Energy Exchangers”, to be equivalent to that obtained under BS EN 308:1997.

The dry heat recovery efficiency must be calculated using the formula for temperature ratio in section 6.4 of BS EN308:1997 and test data collected when rating the product’s performance in heating mode at the test conditions specified in the selected standard for the type of product.

Where products are too large to be tested at their maximum rated air flow under the standard test conditions specified in AHRI 1060: 2005, BS EN 308: 1997 or JIS B 8628: 2003, then performance data

obtained at other test conditions may be extrapolated using validated models (or correlations), in accordance with the methodology outlined in Appendix D of ANSI/ASHRAE Standard 84-2008.

If a single product is submitted for assessment, one detailed test report should be submitted.

For a product range, test results may be submitted in summary form provided:

- Sufficient data is included to confirm that product performance was determined in accordance with the procedures and test conditions laid down in the selected standard.
- Two detailed test reports are submitted per product range.
- Detailed test reports have been prepared for each product tested and are available on request for inspection, where not submitted with the application.

Representative Testing

Where applications are being made for two or more products that are variants of the same basic design, test data may be submitted for a representative selection of models, provided that all variants:

- Use the same heat transfer mechanisms as the representative models.
- Are constructed from materials with same heat transfer characteristics.
- Have the same or better energy effectiveness as the representative models.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Automatic Monitoring & Targeting (AMT)

Automatic Monitoring & Targeting Systems

(Formerly Component Based AMT Systems)

Date added to ETL 2003 (Revised 2012).

1. Definition of Technology

Automatic Monitoring & Targeting systems are products that are specifically designed to measure energy consumption, record and distribute metered energy data, and analyse and report on energy consumption.

2. Technology Description

Automatic Monitoring & Targeting (aM&T) systems help users to save energy by identifying energy wastage which they can then take steps to reduce.

An automatic monitoring & targeting system captures energy consumption information automatically from which users can gain an understanding of their businesses energy consumption. It consists of equipment components that measure, record, transmit, analyse, report and communicate the energy management information that a business needs to manage its energy use and to highlight unusual patterns of energy consumption.

A wide range of automatic monitoring & targeting systems are available. The ECA Scheme aims to encourage the installation of systems that can facilitate the proactive management of energy use in business.

Investments in automatic monitoring & targeting systems can only qualify for Enhanced Capital Allowances if the complete installation meets the eligibility criteria set out below. The individual equipment components or products used in the system are not named on the Energy Technology List.

3. Eligibility Criteria

To be eligible, the automatic monitoring & targeting system must:

1. Include the following:

- a) One or more meters or transducers that measure energy use for metering purposes.
- b) Some means of automatically capturing, retrieving & storing energy metering data electronically, for example: Automatic Metering Reading (AMR) equipment.
- c) Software that enables the analysis of energy metering data and the key factors that influence energy use, and the production of reports on energy consumption.

2. Be able to meter at least one of the following:

- a) Electricity use.
- b) Gas use.
- c) Heat flow.

3. Be able to:
 - a) Automatically capture data from energy meters or transducers at regular intervals. The collection intervals may be user definable or configured for particular meter types.
 - b) Store and process meter readings made on a half hourly basis (as a minimum). The metering data may be transferred into the data store in real-time or at scheduled times.
 - c) Automatically identify and report data collection failures, missing metering data and the failure of communications with meters, transducers and any other system components.
 - d) Distribute data with no loss of accuracy, except for pulse outputs from meters, where the transmitted metered data must be within +/- 0.5% of the total variable measured.
 - e) Present energy consumption data in tabular and graphical reporting formats (for example, histograms, line plots, etc.), and in user selectable time intervals / divisions / bases of 30 minutes, one day, one week, four weeks or one month, and one year.
 - f) Export the collected energy data in a standard format for use in other applications (for example, ASCII files or other formats commonly used by standard office applications).
 - g) Retain a minimum of 2 complete years of metering data without loss of data resolution or accuracy, in a date/time stamped format, suitable for analysis of trends and patterns.

4. Provide facilities to enable the user to:
 - a) Select datasets from individual meters and manipulate them by combining, comparing and calculating in order to analyse, identify and evaluate instances of energy waste.
 - b) Undertake regression analysis using two variables in whatever frequency the dataset was obtained, and to display the results in graphical form with a correlation coefficient.
 - c) Set up automatic exception reporting where energy consumption during a user defined reporting period is outside a selected variance from a standard or selected data set.
 - d) Set up standard management reports that enable total energy consumption during a user selectable period to be compared with the corresponding period in the previous year, including an analysis of energy use by meter, fuel type or energy accounting centre.

In addition where new meters or transducers are being installed, they must comply with the following requirements:

5. Electricity meters must meet the accuracy requirements of one of the following:
 - BS EN62053-21:2003, “Electricity metering equipment (ac) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)”.
 - BS 8431:2010, “Electrical static metering for secondary or sub-metering. Specification” (BSI, ISBN 0 580 451178). Classes 1 or 2.
 - BS EN 50470-3: 2006, “Electricity metering equipment (ac). Particular requirements. Static meters for active energy (class indexes A, B and C)”.
 - BS EN 62053-22:2003, “Electricity metering equipment (ac). Particular requirements. Static meters for active energy (class indexes 0,2 S and 0,5 S)”.

6. Gas meters must meet the accuracy requirements of one of the following standards:

- BS EN12261:2002, “Gas Meters - Turbine gas meters”.
- BS EN12480:2002, “Gas Meters - Rotary displacement gas meters”.
- BS EN1359:1999, “Gas Meters - Diaphragm gas meter”.

7. Heat meters must meet the accuracy requirements of:

- BS EN 1434-1: 2007, “Heat meters- Part 1: General requirements”.

8. Instrument transformers used to measure energy use for metering purposes must conform to the Class 1 accuracy requirements of one of the following:

- BS EN 60044-1:1996, “Instrument transformers. Current transformers”.
- BS EN 60044-2:1999, “Instrument transformers. Inductive voltage transformers”.

Meters offering equivalent or better levels of accuracy to those specified above will be accepted, provided they meet the accuracy requirements of applicable British or European Standards. Please note that this includes all electricity, gas and heat meters conforming to the specific accuracy requirements of the EU Measuring Instruments Directive (MID) 2004/22/EC.

4. Scope of Claim

An Enhanced Capital Allowance (ECA) can only be claimed where the installation of AMT equipment results in a complete automatic monitoring & targeting system that complies with the eligibility criteria.

In some instances, only part of the automatic monitoring & targeting system may be eligible for an ECA:

- An ECA cannot be claimed on any component that is not solely used to monitor energy use for energy management purposes. For example, if data collection is done as part of a BMS, IT network or process control system, then an ECA cannot be claimed on these components.
- An ECA cannot be claimed on any component that is owned by an external service provider. For example, if the software used to analyse the energy metering data is purchased/licensed by an internet-based service bureau, then an ECA cannot be claimed on this component.
- An ECA can only be claimed on the specific types of energy meter or transducer mentioned in the eligibility criteria (e.g. electricity, gas or heat meters). (An ECA may also be claimed on water meters listed under the Water Technology List as part of the ECA water scheme).
- An ECA cannot be claimed on components installed in any tax years prior to the creation of a complete automatic monitoring & targeting system that complies with the eligibility criteria.

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Portable Energy Monitoring Equipment

(Formerly Portable AMT Equipment)

Date added to ETL 2003. (Revised 2013)

1. Definition of Technology

Portable energy monitoring equipment covers products that are specifically designed to temporarily measure energy use in different locations, and to record, analyse and report on energy consumption.

2. Technology Description

Portable energy monitoring equipment helps to save energy by identifying energy wastage and ensuring the long-term effectiveness of other energy saving investment measures.

Portable energy monitoring equipment enables the temporary monitoring of energy use in different locations, and can be used to record energy consumption data and to highlight unusual patterns of consumption.

A wide range of portable energy monitoring equipment is available. The ECA scheme aims to encourage the purchase of products that can measure and analyse energy consumption data, and produce reports containing energy management information that enable businesses to manage their energy use.

Investments in portable energy monitoring equipment can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be a portable measuring instrument package that includes:
 - a) An 'energy use' metering device and associated measurement transducers (or probes).
 - b) A means of electronically capturing and storing energy consumption data.
 - c) A means of transferring data to other computing devices or computer systems.
 - d) A software or hardware based means of analysing and displaying energy consumption data, and of producing energy management reports, that can be used to identify the 'key factors' that influence energy consumption.

- Be able to meter one or more of the following:
 - a) Electricity use.
 - b) Gas use.
 - c) Heat flow.

- Have a measurement accuracy of +/- 3% of meter reading (or better) across the product's entire operating temperature range, for all measurement ranges relevant to the metering of electricity use, gas use, or heat flow.
- Be CE marked.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Boiler Equipment

Biomass Boilers and Roomheaters

Date added to ETL 2001/2003 (Revised 2013).

1. Definition of Technology

Biomass boilers are products that are specifically designed to burn solid biomass fuels in order to heat water, or to raise steam.

Biomass roomheaters are products that are specifically designed to burn solid biomass fuels to release heat, which is transferred by means of radiation and convection, to the surrounding area within a building. They may also heat water for space heating and domestic uses by means of a heat exchanger incorporated into the product.

2. Technology Description

Biomass boilers are used to heat water, or to raise steam, for process or space heating.

Biomass roomheaters are closed combustion appliances typically with a glass door to the front. They heat the space they are installed in by radiation and convection around the body of the roomheater. Some designs can also be used to supply hot water to wet heating systems and domestic hot water cylinders.

Biomass boilers and roomheaters are available with a wide range of efficiencies. The ECA Scheme aims to encourage the purchase of products with the highest thermal efficiency.

The fuels used in biomass boilers and roomheaters are renewable so their use will also reduce the amount of fossil fuel that might otherwise have been consumed.

Five categories of biomass boilers and roomheaters are covered by the ECA Scheme:

1. Biomass hot water boilers with a maximum continuous rated output up to and including 300kW
2. Biomass hot water boilers with a maximum continuous rated output above 300kW
3. Biomass steam and thermal oil boilers
4. Biomass roomheaters
5. Biomass combined roomheaters and hot water boilers

Investments in biomass boilers and roomheaters can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be designed to burn wood, cereal straw, or solid fuels derived from them.

- Fit within one of the five categories of biomass boilers and roomheaters covered by the ECA Scheme.
- Be CE Marked.

Performance criteria

Eligible products must exceed the minimum thermal efficiency set out in Tables 1 to 5 by category of product covered.

Required test procedures

All products must be tested in accordance with the procedures and test conditions set out in Tables 1 to 5 by category of product covered.

For products in Categories 1, 4 and 5 all tests must be carried out by, or witnessed by, an accredited laboratory, where “accredited” means accredited by the United Kingdom Accreditation Scheme (UKAS), or other equivalent national accreditation bodies recognised via the European Co-operation for Accreditation, the International Accreditation Forum, or the International Laboratory Accreditation Co-operation (ILAC) agreements.

For products in categories 2 and 3, products can be either tested in an accredited laboratory or performance may be determined from measurements made during field trials or acceptance tests, provided that the measurements have been made by, or witnessed by, an accredited laboratory or contractor that is accredited to make those measurements. The product’s net thermal efficiency must be calculated by an independent body that is competent to verify the measurement data.

For the avoidance of doubt net thermal efficiency test data must be presented to one decimal place. As an example, a Biomass hot water boiler with a maximum continuous rated output above 300kW and a net thermal efficiency of 88.9% when tested at between 60% and 100% of its maximum continuous rating (MCR) (as specified in Table 2B) would be deemed to be a fail.

Representative Testing

Where applications are being made for products of the same constructional design in category 1 to be included on the Energy Technology Product List (ETPL), the type testing procedures set out in Annex F of BS EN 303-3:1999 or section 5.1.4 of EN 303-5:2012 or Annex C.2.1 of BS EN 304:1992 (as amended) may be used to select representative models for testing and to reduce the overall number of performance tests that must be completed.

Where applications are being made for products of the same constructional design in categories 2 and 3 to be included on the Energy Technology Product List (ETPL), test data may be submitted for a single representative model provided that the maximum rated output of the products being applied for is not more than twice, or less than half, the maximum rated output of the product tested. Where the range of rated outputs exceeds these limits, products should be grouped into size ranges that comply with these rules, and test data submitted for one representative model for each group.

Where representative testing is used, details of the design calculations and data used to predict the performance of products that have not been tested must be submitted.

It should be noted that:

- If a manufacturer voluntarily removes a representative model from the ETPL then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested; then all products based on the same representative models will be removed from the ETPL.

Table 1	Category 1 - Biomass hot water boilers with a maximum continuous rated output up to and including 300kW
SECTION 1A -PERFORMANCE THRESHOLDS	
To be eligible under Category 1 products must have, when tested at maximum continuous rated output:	
<ul style="list-style-type: none"> • A thermal efficiency of at least 89.0 + log (Nominal Heat Output) based on the net calorific value of the fuel. 	
SECTION 1B -TEST PROCEDURES	
All products in Category 1 must be tested in accordance with:	
<ul style="list-style-type: none"> • EN 303-5:2012 “Heating boilers for solid fuels, hand and automatically fired, nominal heat output of up to 500 kW. Terminology, requirements, testing and marking”. 	
The tests must be done using a biomass test fuel (designated A, B1, B2, C & D) in accordance with Table 7 of EN 303-5:2012 that is appropriate to the advertised usage of the product.	
Please note that performance data obtained in accordance with the procedures and standard rating conditions laid down in EN 303-5:1999 and using a biomass test fuel (designated A1, A2, B1, B2, C & D) in accordance with Table 8 will be accepted as an alternative to testing in accordance with EN303-5:2012 until further notice.	

Table 2	Category 2 - Biomass hot water boilers with a maximum continuous rated output above 300kW
SECTION 2A -PERFORMANCE THRESHOLDS	
To be eligible under Category 2 products must have, when tested at an output that is between 60% and 100% of Maximum Continuous Rating (MCR):	
<ul style="list-style-type: none"> • A thermal efficiency, of at least 89.0% based on the net calorific value of the test fuel. 	

SECTION 2B -TEST PROCEDURES

All products in Category 2 must be tested in accordance with:

EITHER

- BS 845-1:1987 “Methods for assessing thermal performance of boilers for steam, hot water and high temperature heat transfer fluids: Concise procedure”.

OR (for shell boilers only)

- BS EN 12953-11:2003 “Shell boilers – Part 11: Acceptance tests”.

OR (for water tube boilers only)

- BS EN 12952-15:2003 “Water-tube boilers and auxiliary installations. Acceptance tests”.

OR

- The testing procedures set out in EN303-5:2012.

OR

- Equivalent procedures within the national standards of EU member states. Where equivalent procedures are used, details of the test procedure used must be supplied in English along with a declaration of equivalence from an accredited laboratory.

The tests must be done using a biomass test fuel (designated A, B1, B2, C & D) in accordance with Table 7 of EN 303-5:2012 that is appropriate to the advertised usage of the product.

Where BS 845-1: 1987 is used, the standard test conditions are:

- A maximum ambient air temperature of 25 degrees Centigrade.
- An excess combustion air level certified as being representative of normal commercial operation.
- The boiler must be operating at a rating of at least 60% of its maximum continuous rating (i.e. 60 - 100% MCR) during the tests.

As an alternative to measurement of losses other than flue gas losses, a standard deduction of 2.0% x 100%/ % load may be used.

Please note that performance data obtained in accordance with the procedures and standard rating conditions laid down in EN 303-5:1999 and using a biomass test fuel (designated A1, A2, B1, B2, C & D) in accordance with Table 8 will be accepted as an alternative to testing in accordance with EN303-5:2012 until further notice.

Table 3 Category 3 - Biomass steam and thermal oil boilers

SECTION 3A -PERFORMANCE THRESHOLDS

To be eligible under Category 3 products must have, when tested at an output that is between 60% and 100% Maximum Continuous Rating (MCR):

- A thermal efficiency of at least 82.0% based on the net calorific value of the test fuel.

SECTION 3B -TEST PROCEDURES

All products in Category 3 must be tested in accordance with:

EITHER

- BS 845-1:1987 “Methods for assessing thermal performance of boilers for steam, hot water and high temperature heat transfer fluids: Concise procedure”.

OR (for shell boilers only)

- BS EN 12953-11:2003 “Shell boilers – Part 11: Acceptance tests”.

OR (for water tube boilers only)

- BS EN 12952-15:2003 “Water-tube boilers and auxiliary installations. Acceptance tests”.

OR

- Equivalent procedures within the national standards of EU member states. Where equivalent procedures are used, details of the test procedure used must be supplied in English along with a declaration of equivalence from an accredited laboratory.

The tests must be done using a biomass test fuel (designated A, B1, B2, C & D) in accordance with Table 7 of EN 303-5:2012 that is appropriate to the advertised usage of the product. Test fuel as stated in EN 303-5:1999 (designated A1, A2, B1, B2, C & D) in accordance with Table 8 will also be accepted until further notice.

Where BS 845-1: 1987 is used, the standard test conditions are:

- A maximum ambient air temperature of 25 degrees Centigrade.
- An excess combustion air level certified by the manufacturer as being representative of normal commercial operation.
- The boiler must be operating at a rating of at least 60% of its maximum continuous rating (i.e. 60 - 100% MCR) during the tests.

As an alternative to measurement of losses other than flue gas losses, a standard deduction of 2.0% x 100%/ % load may be used.

Table 4	Category 4 - Biomass roomheaters
SECTION 4A -PERFORMANCE THRESHOLDS	
To be eligible in Category 4 products must have, when tested at Maximum Continuous Rating (MCR):	
<ul style="list-style-type: none"> ● A thermal efficiency of at least 70.0% based on the net calorific value of the fuel. 	
SECTION 4B -TEST PROCEDURES	
All products in Category 4 must be tested in accordance with:	
EITHER	
<ul style="list-style-type: none"> ● EN 13240:2001 “Roomheaters fired by solid fuel. Requirements and test methods”; AND (for mechanically fed appliances only): ● The test fuel and test period must be in accordance with EN303-5:1999, and be appropriate to the advertised usage of the product. 	
OR	
<ul style="list-style-type: none"> ● BS EN 14785:2006 “Residential space heating appliances fired by wood pellets. Requirements and test methods”. 	

Table 5	Category 5 - Biomass combined roomheater and hot water boilers
SECTION 5A -PERFORMANCE THRESHOLDS	
To be eligible in Category 5 products must have, when tested at Maximum Continuous Rating (MCR):	
<ul style="list-style-type: none"> ● A thermal efficiency of at least 70.0% based on the net calorific value of the fuel. 	
SECTION 5B -TEST PROCEDURES	
All products in Category 5 must be tested in accordance with:	
<ul style="list-style-type: none"> ● EN 13240:2001 “Roomheaters fired by solid fuel. Requirements and test methods”. 	
AND (for mechanically fed appliances only)	
<ul style="list-style-type: none"> ● The test fuel and test period must be in accordance with EN303-5:2012, and be appropriate to the advertised usage of the product. Test fuel as stated in EN 303-5:1999 (designated A1, A2, B1, B2, C & D) in accordance with Table 8 will also be accepted until further notice. 	

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Burners with Controls

Date added to ETL 2001 (Revised 2011).

1. Definition of Technology

Burners with Controls covers products that are specifically designed to create and burn air and fuel mixtures in a safe, efficient and controlled manner, and to direct the heat released through combustion into a pressurised vessel (or other combustion chamber).

2. Technology Description

Burners with controls are used to provide heat for hot water, steam and thermal oil boilers, heaters and processes. They are widely used in industry and commerce.

A wide range of burners is available, and these are fitted with combustion controls that offer different levels of precision and repeatability of control. The ECA Scheme aims to encourage the purchase of products that are able to accurately control combustion and maintain their efficiency over a specified turn down range.

Six different categories of burners with controls are covered:

1. Gas fired and dual fuel burners rated up to, and including, 400 kW.
2. Gas fired and dual fuel burners rated between 401 kW and 1,200 kW.
3. Gas fired and dual fuel burners rated in excess of 1,200 kW.
4. Oil fired burners rated up to, and including, 400 kW.
5. Oil fired burners rated between 401 kW and 1,200 kW.
6. Oil fired burners rated in excess of 1,200 kW.

Products that are designed to use liquid or gaseous biofuels are also covered by these categories.

Investments in burners with controls can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be gas and/or oil fired.
- Be a forced draught burner.

- Be fitted with air dampers that fully close on burner shutdown.
- Automatically respond to changes in heat demand by modulating their output:
 - a) Across the minimum specified turndown ratio set out in Table 1 below.
 - b) In a continuous manner (or alternatively for oil-fired burners rated up to and including 400kW only, in a step-wise manner across at least three stages of output).
 - c) Whilst adjusting the ratio of air and fuel fed to the product's burner in a manner that maintains combustion efficiency across the required turndown range and complies with the maximum permitted levels of oxygen and carbon monoxide in the product's exhaust gases, as set out in Table 1.
- Conform to the requirements of the Pressure Equipment Directive 97/23/EC in respect of their design, manufacture and testing procedures, or be CE Marked.
- **Not** use any form of mechanical linkage between the product's modulating fuel valve, and its air damper or air control valve, to adjust the product's air to fuel ratio.

In addition, products with a thermal output in excess of 400kW must:

- Incorporate a microprocessor based burner control system.
- Where mechanical dampers are used to modulate the **air flow** to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis.
- Where control valves are used to modulate the **fuel flow** to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis. (This requirement shall not apply to pneumatically operated modulating gas valves).
- Where the product is gas fired or dual fuelled, use a variable speed motor controller (or variable speed drive) to operate its forced draught fan.

In addition, gas fired and dual fuelled burners with a thermal output up to, and including, 400kW must incorporate pneumatic or electronic air fuel ratio controls that permit the oxygen levels in the exhaust gases to be adjusted at each of the test points specified in Table 1.

Performance criteria

Products must not exceed the maximum permitted levels of oxygen (O₂) and carbon monoxide (CO) in their exhaust gas at each of test points specified in Table 1.

Table 1 Minimum performance requirements for burners with controls.

	Product category	Minimum turndown ratio	Maximum O ₂ level at test point			Maximum CO level
			High	Mid	Low	All test points
1.	Gas fired and dual fuel burners rated up to, and including, 400 kW	3.33:1	3%	4%	4.8%	20 ppmv
2.	Gas fired and dual fuel burners rated between 401 kW and 1,200 kW	4:1	3%	4%	5.0%	20 ppmv
3.	Gas fired and dual fuel burners rated in excess of 1,200 kW	4:1	3%	4%	5.0%	20 ppmv
4.	Oil fired burners rated up to, and including, 400 kW	3.33:1	3%	4%	4.8%	20 ppmv
5.	Oil fired burners rated between 401 kW and 1,200 kW	3.33:1	3%	4%	4.8%	20 ppmv
6.	Oil fired burners rated in excess of 1,200 kW	4:1	3%	4%	5.0%	20 ppmv

Where the required test points are:

- **High:** the burner is operating at 100% of its maximum continuous rating.
- **Mid:** the burner is operating at 50% of its maximum continuous rating.
- **Low:** the burner is operating at a level corresponding to the specified minimum turndown, which is 25% of maximum continuous rating for 4:1 and 30% for 3.33:1.

And:

- Dual fuel means that the product can separately burn both gas and oil.

Required test procedures

Product performance at the three required test points specified in Table 1 (above) must be determined in accordance with the procedures and test conditions in the following standards:

- BS EN 676:2003 (as amended), “Automatic forced draught burners for gaseous fuels”.
- BS EN 267:2009, “Automatic forced draught burners for liquid fuels”.

Where the product’s turndown ratio is greater than the minimum required, performance at the low and mid test points may be calculated by linear interpolation of the test results. Where operation at the product’s maximum continuous rated output is not possible, performance at the high test point may be determined by extrapolation of test data at two additional test points (e.g. 70% and 90%).

For the avoidance of doubt oxygen levels in the product’s exhaust should be presented to 1 decimal place, and carbon monoxide levels to zero decimal places. As an example, a gas fired burner rated in excess of 1,200 kW and whose exhaust gases contain oxygen levels of 3.1%, or carbon monoxide levels of 21 ppmv, at 100% of its maximum continuous rating, would be deemed to be a fail.

Representative Testing

Where applications are being made for two or more products that are variants of the same basic design, test data may be submitted for a representative selection of models, provided that all variants:

- Are designed to burn the same fuel(s) as the representative models.
- Have the same basic constructional design as the representative models.
- Use the same burner control system / mechanisms as the representative models.
- Have the same or better energy efficiency as the representative models.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Condensing Economisers

Date added to ETL 2001 (Revised 2013).

5. Definition of Technology

Condensing Economisers are products specifically designed to improve boiler net thermal efficiency by recovering both sensible and latent heat from boiler flue gases.

6. Technology Description

Condensing economisers are a type of heat exchanger that enables some of the sensible heat and latent heat from boiler flue gases to be recovered. This heat is normally used to preheat the boiler's feedwater and to supply low grade heating requirements. Typically a condensing economiser will improve boiler net thermal efficiency (expressed in percentage terms) by at least 9 points (i.e. a boiler with efficiency of 84.0% is improved to at least 93.0%).

Investments in condensing economisers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

7. Eligibility Criteria

Performance criteria

The product must increase the net thermal efficiency of the boiler system to which it is designed to be fitted by at least 9.0 %, when the boiler system is operating at the test points set out in Table 1.

Table 1 - Performance test points for condensing economisers

Test point % MCR	Increase in net thermal efficiency of boiler system.
30	$\geq 9.0 \%$
50	$\geq 9.0 \%$
100	$\geq 9.0 \%$

" \geq " means "greater than or equal to"

Where MCR is the maximum continuous rating (MCR) of the boiler system for which the product is designed.

For the avoidance of doubt the increase in net thermal efficiency of the boiler system must be presented to one decimal place. As an example, a condensing economiser that delivers an increase in net thermal efficiency of 8.9% at 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed would be deemed to be a fail.

Required test procedures

The required minimum performance must be demonstrated using Methods A, B or C, as set out in Tables A, B and C below:

TABLE A	METHOD A - INDIRECT MEASUREMENT
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Under this test method, product performance must be demonstrated by measuring the improvement in net thermal efficiency of a test boiler resulting from the addition of the condensing economiser. Net thermal efficiency must be measured at test points that are equivalent to 30%, 50% and 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed.

Boiler net thermal efficiency must be measured in accordance with the procedures set out in BS 845:Part 1:1987, BS EN 303-3:1999 or BS EN 304:1992.

Where BS 845:Part 1:1987 is used, the standard test conditions are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of not less than 15%.

TABLE B	METHOD B - DIRECT MEASUREMENT
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Under this test method, product performance must be demonstrated by calculating the improvement in boiler net thermal efficiency that will occur at 30%, 50% and 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed. This calculation must be based on an assessment of the transfer of heat power that will occur at each of these test points.

The assessment of transfer of heat power must be done in accordance with the procedures set out in EN 305:1997, EN 306:1997 and/or EN308:1997.

TABLE C METHOD C - VALIDATED DESIGN CALCULATIONS

Under this test method:

1. The product's performance is determined from design calculations. The calculations should assess the improvement in the net thermal efficiency of a boiler system that the product will deliver at the full and part load conditions specified in Table 1 when tested in accordance with the procedures and test conditions specified in Method A.
2. The accuracy of these design calculations must be confirmed by interpolation and extrapolation of measurements of the improvement in net thermal efficiency actually realised by the product. The measurements must be obtained using an indirect method (flue gas loss method) from one of the test standards specified in Method A:
 - a) At least one test point between 60% and 100% MCR, **and**:
 - b) At least one test point between 20% and 40% MCR.
3. To be eligible, the improvement in the net thermal efficiency of the boiler system at the full and part load conditions realised by fitting the product to the boiler system must exceed the performance thresholds specified in Table 1.

The test report must include (or be accompanied by):

- a) Details of the calculations used to determine product performance.
- b) A copy of the published performance data for the product.
- c) Manufacturer's design data for the product.
- d) The following test data, which must be obtained with the product operating under stable conditions at each selected test point before and after fitting the product:
 - I) Analysis of flue gas composition, including as a minimum, the levels of oxygen (or carbon dioxide) and carbon monoxide in the flue gas.
 - II) Ambient and flue gas temperatures.
 - III) Net thermal efficiency of the boiler system.
- e) Details of the boiler system used during the test.

Representative Testing

Where applications are being made for condensing economiser products of the same constructional design to be included on the Energy Technology Product List (ETPL), test data may be submitted for a single representative model provided that the maximum rated output of the products being applied for is not more than twice, or less than half, the maximum rated output of the product tested. Where the range of rated outputs exceeds these limits, products should be grouped into size ranges that comply with these rules, and test data submitted for one representative model for each group.

It should be noted that:

- If a manufacturer voluntarily removes a representative model from the ETPL then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative models will be removed from the ETPL.

8. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Flue Gas Economisers

Date added to ETL 2001 (Revised 2013).

9. Definition of Technology

Flue Gas Economisers are products that are specifically designed to improve boiler net thermal efficiency by recovering sensible heat from boiler flue gases.

10. Technology Description

Flue gas economisers are a type of heat exchanger that enables some of the sensible heat in boiler flue gases to be recovered. This heat is normally used to preheat the boiler's feedwater. Typically a flue gas economiser will increase boiler net thermal efficiency (expressed in percentage terms) by at least 3 points (i.e. a boiler with efficiency of 89.0% is improved to at least 92.0%).

Investments in flue gas economisers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

11. Eligibility Criteria

Performance criteria

The product must increase the net thermal efficiency of the boiler system to which it is designed to be fitted by at least 3.0%, when the boiler system is operating at the test points set out in Table 1.

Table 1 - Performance test points for flue gas economisers

Test point % MCR	Increase in net thermal efficiency of boiler system.
30	>= 3.0 %
50	>= 3.0 %
100	>= 3.0 %

">=" means "greater than or equal to"

Where MCR is the maximum continuous rating (MCR) of the boiler system for which the product is designed.

For the avoidance of doubt the increase in net thermal efficiency of the boiler system must be presented to one decimal place. As an example, a flue gas economiser that delivers an increase in net thermal efficiency of 2.9% at 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed would be deemed to be a fail.

Required test procedures

The required minimum performance must be demonstrated using Methods A, B or C, as set out in Tables A, B and C below:

TABLE A	METHOD A - INDIRECT MEASUREMENT
<p>Under this test method, product performance must be demonstrated by measuring the improvement in net thermal efficiency of a test boiler resulting from the addition of the flue gas economiser. Net thermal efficiency must be measured at test points that are equivalent to 30%, 50% and 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed.</p> <p>Boiler net thermal efficiency must be measured in accordance with the procedures set out in BS 845:Part 1:1987, BS EN 303-3:1999 or BS EN 304:1992.</p> <p>Where BS 845:Part 1:1987 is used, the standard test conditions are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of not less than 15%.</p>	

TABLE B	METHOD B - DIRECT MEASUREMENT
<p>Under this test method, product performance must be demonstrated by calculating the improvement in boiler net thermal efficiency that will occur at 30%, 50% and 100% of the maximum continuous rating (MCR) of the boiler system for which the product is designed. This calculation must be based on an assessment of the transfer of heat power that will occur at each of these test points.</p> <p>The assessment of transfer of heat power must be done in accordance with the procedures set out in EN 305:1997, EN 306:1997 and/or EN308:1997.</p>	

TABLE C METHOD C - VALIDATED DESIGN CALCULATIONS

Under this test method:

4. The product's performance is determined from design calculations. The calculations should assess the improvement in the net thermal efficiency of a boiler system that the product will deliver at the full and part load conditions specified in Table 1 when tested in accordance with the procedures and test conditions specified in Method A.
5. The accuracy of these design calculations must be confirmed by interpolation and extrapolation of measurements of the improvement in net thermal efficiency actually realised by the product. The measurements must be obtained using an indirect method (flue gas loss method) from one of the test standards specified in Method A:
 - c) At least one test point between 60% and 100% MCR, **and:**
 - d) At least one test point between 20% and 40% MCR.
6. To be eligible, the improvement in the net thermal efficiency of boiler system at the full and part load conditions realised by fitting the product to the boiler system must exceed the performance thresholds specified in Table 1.

The test report must include (or be accompanied by):

- f) Details of the calculations used to determine product performance.
- g) A copy of the published performance data for the product.
- h) Manufacturer's design data for the product.
- i) The following test data, which must be obtained with the product operating under stable conditions at each selected test point before and after fitting the product:
 - IV) Analysis of flue gas composition, including as a minimum, the levels of oxygen (or carbon dioxide) and carbon monoxide in the flue gas.
 - V) Ambient and flue gas temperatures.
 - VI) Net thermal efficiency of the boiler system.
- j) Details of the boiler system used during the test.

Representative Testing

Where applications are being made for flue gas economiser products of the same constructional design to be included on the Energy Technology Product List (ETPL), test data may be submitted for a single representative model provided that the maximum rated output of the products being applied for is not more than twice, or less than half, the maximum rated output of the product tested. Where the range of rated outputs exceeds these limits, products should be grouped into size

ranges that comply with these rules, and test data submitted for one representative model for each group.

It should be noted that:

- If a manufacturer voluntarily removes a representative model from the ETPL then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative models will be removed from the ETPL.

12. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Gas-fired Condensing Water Heaters

Date added to ETL 2004 (Revised 2013).

13. Definition of Technology

Gas-fired condensing water heaters are products that are specifically designed to continuously provide hot water either by the direct heating of water as it passes through the product, or the heating of water contained in an integral storage vessel.

14. Technology Description

Gas-fired condensing water heaters are used to provide hot water for domestic purposes or process heating, and offer an energy efficient method of generating hot water. They can be installed close to the point of use, or in a central plant room.

Gas-fired condensing water heaters are described as 'storage' type products if they generate hot water by heating water stored within the product itself. Other types of gas-fired condensing water heaters are described as 'non-storage' type products, and can be divided into continuous flow type products that are designed to instantaneously generate hot water directly from cold water, and those that heat water as it is circulated round a loop (which may also include buffer vessels).

Gas-fired condensing water heaters are available in a range of different efficiencies. The ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers three categories of gas-fired condensing water heaters:

1. Storage type, gas-fired condensing water heaters not exceeding 150KW
2. Non- storage, instantaneous (or continuous flow) type, gas-fired condensing water heaters
3. Non-storage, circulator (or multi-pass) type, gas-fired condensing water heaters.

Investments in gas-fired condensing water heaters can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

15. Eligibility Criteria

To be eligible products, must:

- Be gas-fired.
- Comply with the requirements of the Water Supply (Water Fittings) Regulations 1999, the Water Byelaws 2000 Scotland and the Water Regulations in Northern Ireland (for example, by inclusion in the Water Regulations Advisory Scheme's Water Fittings and Materials Directory).
- Be CE Marked.

In addition, non-storage - circulator type, gas-fired condensing water heaters must:

- Use fully premixed burners or an appropriately matched forced draught burner (or burners).
- Automatically respond to changes in hot water demand by modulating their output in a continuous manner across a minimum turndown ratio of 3.33:1, without initiating a purge cycle.
- Products with a thermal output in excess of 400kW must **either** use burners from the "burners with controls" part of the Energy Technology Product List **or**:
 - Incorporate a microprocessor based burner control system.
 - Use a variable speed motor controller (or Variable Speed Drive) to operate each forced draught fan incorporated into the product.
 - Where mechanical dampers are used to modulate the **air flow** to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis.
 - Where control valves are used to modulate the **fuel flow** to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis. (This requirement shall not apply to pneumatically operated modulating gas valves).

In addition, non-storage - instantaneous type, gas-fired condensing water heaters exceeding 70kW must be fitted with an integral, fully pre-mixed, modulating burner.

Performance criteria

Eligible products must meet or exceed the minimum net thermal efficiencies set out in Table 1 below, which depend on product category:

Table 1 Minimum net thermal efficiency for gas-fired condensing water heaters

	Product category	Nominal heat input (kW)	Test conditions	Net thermal efficiency %
1	Storage type	<=150kW		>= 104.0 %
2	Non storage - instantaneous type	<= 70kW		>= 104.0 %
		>=70kW	At 100% load, flow/return temperatures of 80/60oC	>= 95.0 %
			At 30% load, return temperature of 30oC	>= 104.0 %
3	Non storage - circulator type	All ratings	At 100% load, flow/return temperatures of 80/60°C	>= 95.0 %
			At 30% load, return temperature of 30°C	>= 104.0 %

“ >= ” means “greater than or equal to”

Please note that, where specified in Table 1 above, products must meet or exceed the minimum net thermal efficiencies at both full load and part load test conditions.

For the avoidance of doubt, all net thermal efficiency test data should be presented to one decimal place. As an example, a 100kW non storage, instantaneous, gas fired condensing water heater with a net thermal efficiency of 94.9% at the full load condition would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures set out in one of the test standards recognised by the ETL as set out in Table 2, or in accordance with equivalent procedures for assessing net thermal efficiency within applicable British or European Standards, or the national standards of EU Member States. The tests must be done at the test conditions specified in Table 1.

Table 2 - ETL recognised test standards

Test standard	Applicable product categories		
	1	2	3
BS EN 89:2000 Gas-fired storage water heaters for the production of domestic hot water	☑		
BS EN 303-3:1999 Heating boilers – Part 3: Gas-fired central heating boilers – Assembly comprising a boiler body and a forced draught burner‘.			☑
BS EN 303-7:2006 Heating boilers – Part 7: Gas-fired central heating boilers equipped with a forced draught burner of nominal heat output not exceeding 1,000 kW‘.			☑
BS EN 483:1999+A4:2007 Gas-fired central heating boilers. Type C boilers of nominal heat input not exceeding 70 kW‘			☑
BS EN 677:1998 Gas-fired central heating boilers. Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW‘			☑
BS EN 26:1998 Gas fired instantaneous water heaters for the production of domestic hot water, fitted with atmospheric burners		☑	☑
BS EN 26:2012 Gas-fired instantaneous water heaters for the production of domestic hot water		☑	☑

Representative Testing

Where applications are being made for gas fired condensing water heaters of the same constructional design and rated outputs up to and including 900 kW to be included on the Energy Technology Product List (ETPL), the type testing procedures set out in Annex F of BS EN 303-3:1999 may be used to select representative models for testing and to reduce the overall number of performance tests that must be completed.

Where applications are being made for products of the same constructional design and rated outputs greater than 900 kW to be included on the Energy Technology Product List (ETPL), test data may be submitted for a single representative model provided that the maximum rated output of the products being applied for is not more than twice, or less than half, the maximum rated output of the product tested. Where the range of rated outputs exceeds these limits, products should be grouped into size ranges that comply with these rules, and test data submitted for one representative model for each group.

It should be noted that:

- If a manufacturer voluntarily removes a representative model from the ETPL then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative models will be removed from the ETPL.

16. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Heat Recovery from Condensate and Boiler Blowdown

Date added to ETL 2001 (Revised 2013).

17. Definition of Technology

Heat recovery from condensate and boiler blowdown covers products that are specifically designed to recover heat from steam condensate and / or water from boiler blowdown, by means of heat exchangers and/or flash steam recovery vessels.

18. Technology Description

Significant amounts of heat can be recovered from the water extracted during boiler blowdown and from steam condensate. However this water can contain significant levels of contaminants that reduce the efficiency of the heat recovery process.

The ECA Scheme encourages the purchase of heat recovery equipment that is specifically designed to recover heat from steam condensate and/or water from boiler blowdown.

The ECA Scheme covers three categories of product:

1. **Flash steam recovery vessels or packages**
with associated control and safety devices
2. **Heat exchanger units or packages**
with associated control and safety devices
3. **Flash steam vessel with heat exchanger packages**
with associated control and safety devices

Where packages may include the following components necessary for operation of the equipment: pressure gauges, vacuum breakers, vent heads, valves and steam traps.

Investments in equipment for heat recovery from condensate and boiler blowdown can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

19. Eligibility Criteria

To be eligible products, must:

- Be specifically designed to recover heat from steam condensate and / or water from boiler blowdown, by means of heat exchangers and/or flash steam recovery vessels.

- Conform to the requirements of the EU Pressure Equipment Directive PED 97/23/EC in respect of their design, manufacture and testing procedures.

20. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Heating Management Controllers (for Wet Heating Systems)

(Formerly Optimising Controls for Wet Heating Systems)

Date added to ETL 2003 (Revised 2013).

21. Definition of Technology

Heating management controllers (for wet heating systems) are products that are specifically designed to control heat generation and distribution within a wet heating system in an energy efficient manner that reflects weather conditions, occupation schedules and user requirements.

22. Technology Description

Heating management controllers (for wet heating systems) realise fuel savings by adapting boiler firing and heat distribution patterns to match variations in heat demand and user requirements.

A wide range of heating management controls is available for wet heating systems including products designed to control space heating within both zoned and un-zoned buildings. The ECA Scheme aims to encourage the purchase of products that automatically adapt to changes in weather conditions, and thermal response time of the building and/or wet heating system.

The ECA Scheme covers three categories of product:

1. **Standalone units** that are self-contained control units that are designed to directly control the operation of, and to be directly connected to, the external control inputs of the boilers/burners, pumps and control valves in a wet heating system.
2. **'Add-on' modules** that designed to be incorporated into other control systems, and to either directly, or indirectly, control the operation of wet heating systems.
3. **Packaged products** that consist of two or more control modules or units that are designed to be connected together during installation, and to either directly, or indirectly, control the operation of wet heating systems.

Investments in heating management controllers (for wet heating systems) can only qualify for Enhanced Capital Allowances if the product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

23. Eligibility Criteria

To be eligible, products must:

1. Incorporate a microprocessor based controller that is pre-programmed to:
 - a) Automatically control heat generation and heat distribution within a wet heating system, in a manner that reflects weather conditions and building occupation schedules.
 - b) Automatically switch between operating modes, in accordance with the predefined weekly occupation schedule of the space (or spaces) being heated.
 - c) Maintain the temperature of the space or spaces being heated within pre-set limits, by modulating the heat flow around each heating circuit, in response to the output of one or more temperature sensors.

2. Be designed to have at least two of the following operating modes:
 - a) A “normal” operating mode in which the wet heating system is operated in a manner consistent with the building being occupied, or prepared for occupation.
 - b) An “economy” mode where the wet heating system operated at a reduced level to reflect, for example, the fact that the building is unoccupied, or reduced levels of activity in the building, or
 - c) A “standby” or “holiday” mode where the wet heating system is switched off or operated solely for fabric, frost and equipment protection.

3. Incorporate:
 - a) An optimum start mechanism that monitors external and/or internal temperatures, and calculates when boilers need to be switched on in order to just reach pre-set temperatures by the start of the next occupancy period.
 - b) A “self-learning” algorithm that automatically monitors the accuracy of the optimum start mechanism and periodically updates the heating curve that the mechanism uses, to reflect changes in building characteristics.
 - c) A “self-adaptive weather compensation” mechanism that automatically saves energy during milder weather conditions, by reducing the temperature set-point of the boiler water circuit as the external temperature rises, and also the temperature of, or heat flow through, any individual zone heating circuits controlled.
 - d) A “frost protection” mechanism that monitors internal or external temperatures (or pipework temperatures), and switches on boilers and heating circuits (as required), in order to prevent equipment and pipework from “freezing up”.
 - e) A building fabric protection mechanism that monitors external or internal temperatures and switches heating on to prevent condensation occurring.
 - f) A mechanism that prevents the boilers supplying the heating system from “dry cycling” (i.e. switching on and off), when there is no change in heat demand.
 - g) Interlock and inhibit mechanisms that can be used to prevent simultaneous heating and cooling, and space heating when windows have been opened.
 - h) An anti-tampering mechanism that prevents the product’s control strategy and configuration settings from being modified and automatic control from being disabled, except during commissioning, maintenance or testing.

4. Provide facilities that enable building managers to:

- a) Define the normal occupation times for the building and for each zone controlled (in intervals of five minutes or less), for each day of the week, including at least two periods of occupation per day (i.e. at least 14 different occupation period per week).
 - b) Define the temperature set-points for each operating mode to +/- 1 degree centigrade, and separate set-points for each space heating circuit controlled.
 - c) Define periods or circumstances throughout the year when the wet heating system should be placed into economy, holiday or standby modes.
 - d) Define a separate seven-day schedule for the operation of any domestic hot water (DHW) system controlled, including at least two periods of operation per day.
 - e) "Temporarily override" or manually adjust the degree (or amount) of weather compensation applied to each heating circuit controlled.
5. Provide facilities that enable building users or managers to:
- a) "Temporarily override" the pre-set time when the heating is scheduled to be switched off for a predefined period not exceeding 24 hours per override.
 - b) Only adjust the temperature set-points in the space (or spaces) being heated for a limited period of time, or by a limited amount (or allow no user adjustment).
 - c) Switch the wet heating system into economy or standby mode for the remaining portion of a pre-set occupation period.
6. Conform with the requirements of the EU EMC Directive 89/336/EEC (as amended) or its replacement EU EMC Directive 2004/108/EC, or be CE Marked.

24. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Hot Water Boilers

Date added to ETL 2001 (Revised 2013).

1. Definition of Technology

Hot water boilers are products that are specifically designed to heat water by means of a heat exchanger that transfers heat from combustion into the water as it passes through the product.

2. Technology Description

Hot water boilers are used to produce hot water for space heating, process heating and domestic uses. They are available in a wide range of different designs and efficiencies.

The ECA scheme aims to encourage the purchase of the higher efficiency, modulating, gas and oil fired hot water boilers, including products that are designed to use liquid and gaseous biofuels.

The ECA Scheme covers three categories of products:

1. **High temperature, high pressure, high efficiency hot water boilers with rated outputs greater than 400kW.**
Boilers designed to operate with a water pressure greater than 6 bar and/or outlet water temperature greater than 105°C, and that are not designed to recover latent heat from flue gases by condensing water vapour.
2. **Low temperature, low pressure, high efficiency hot water boilers with rated outputs greater than 400kW.**
Boilers designed to operate with a water pressure up to and including 6 bar and/or an outlet water temperature up to and including 105°C that are not designed to recover latent heat from flue gases by condensing water vapour.
3. **Condensing hot water boilers (of all rated outputs):**
Boilers designed to recover latent heat from flue gas water vapour.

Investments in hot water boilers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be gas and/or oil fired (where gas includes biogas and oil includes liquid biofuels).
- Automatically respond to changes in hot water demand by modulating their output in a continuous manner across a minimum specified turndown ratio, as set out in Table 1 in the performance criteria below, without initiating a purge cycle.
- Conform to the requirements of the Pressure Equipment Directive 97/23/EC in respect of their design, manufacturer and testing procedures, or be CE Marked.

In addition, products with a rated output greater than 400kW must either use burners from the “burners with controls” part of the Energy Technology Product List or:

- Incorporate a microprocessor based control system that continuously modulates burner output in response to measured boiler temperature or pressure values.
- Use fully pre-mixed burners, or forced draught burners. Where forced draft burners are used, automatic (electronic or pneumatic) air fuel ratio controls must be fitted.
- Where mechanical dampers are used to modulate the air flow to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis.
- Where control valves are used to modulate the fuel flow to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis. (This requirement shall not apply to pneumatically operated modulating gas valves).
- Where the product is gas fired or dual fuelled, use a variable speed motor controller (or variable speed drive) to operate each fan incorporated into the product that controls air flow rate to the burner and, where relevant, the fuel-air pre-mixer.

Performance Criteria

Eligible products must meet or exceed the minimum thermal efficiencies set out in Table 1 below at the specified part and full load test conditions, which vary according to product category and fuel type.

Table 1 - Performance requirements and test points for hot water boilers

Product Category		Fuel Type	Turndown ratio	Test point (% of Maximum Nominal Input)	Net thermal efficiency %
1.	High temperature, high pressure, high efficiency hot water boilers	Gas, oil or dual fuelled	$\geq 3.33:1$	30	$\geq 93.0\%$
				100	
2.	Low temperature, low pressure, high efficiency hot water boilers	Gas, oil or dual fuelled	$\geq 3.33:1$	30	$\geq 93.0\%$
				100	
3.	Condensing hot water boilers	Gas fired or dual fuelled	$\geq 3.33:1$	30	$\geq 108.0\%$
				100	$\geq 97.0\%$
		Oil fired		30	$\geq 101.0\%$
				100	$\geq 95.0\%$

" \geq " means "greater than or equal to"

For the avoidance of doubt net thermal efficiency test data must be presented to 1 decimal place. As an example, a condensing hot water boiler with a net thermal efficiency of 94.9% at 100% of its maximum rated output would be deemed to be a fail.

Required test procedures

Product performance must be demonstrated using Method A, Method B or Method C (as set out in Tables A, B and C below), which are subject to the following restrictions:

- Method A must only be used, where all the burners incorporated in the product are listed on the "burners with controls" part of the Energy Technology Product List.
- Method B must be used to demonstrate the performance of modular boilers, or where any of the burners incorporated in the product are not listed on the "burners with controls" part of the Energy Technology Product List. A modular boiler is defined as an assembly of two or more similar (but not necessarily identical) modules, each with their own heat exchanger, burner, and control and safety devices. The assembly has common water feed and return connections, but the water flow to, and flow from each module is independently controlled.

- Method C may only be used for category 1 and 2 boilers with rated outputs above 400kW and category 3 boilers with rated outputs above 900kW, where it is not possible to measure product performance in a laboratory due to product size.

All performance measurements must be carried out in accordance with the procedures set out in one, or more, of the test standards recognised by the ETL as set out in Table 2, or in accordance with equivalent procedures for assessing net thermal efficiency within applicable British or European Standards, or the national standards of EU Member States. The selected test standard(s) must be appropriate to the specific type of boiler tested.

Table 2 - ETL recognised test standards

Test standard	Applicable product categories		
	1	2	3
BS EN 625:1996 'Gas-fired central heating boilers. Specific requirements for the domestic hot water operation of combination boilers of nominal heat input not exceeding 70 kW'			☑
BS EN 483:1999+A4:2007 'Gas-fired central heating boilers. Type C boilers of nominal heat input not exceeding 70 kW'			☑
BS EN 677:1998 'Gas-fired central heating boilers. Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW'			☑
BS EN 13836:2006 'Gas fired central heating boilers. Type B boilers of nominal heat input exceeding 300 kW, but not exceeding 1 000 kW'			☑
BS EN 15417:2006 'Gas-fired central heating boilers. Specific requirements for condensing boilers with a nominal heat input greater than 70 kW but not exceeding 1000 kW'			☑
prEN 15420:2005 'EN 15420. Gas-fired central heating boilers. Type C boilers of nominal heat input exceeding 70 kW, but not exceeding 1000 kW' (CEN document code 06/30144913 DC)			☑
BS 845-1:1987 'Methods for Assessing thermal performance of boilers for steam, hot water and high temperature heat transfer fluids – Part 1: Concise procedure'.	☑	☑	☑
BS 7190:1989 'Method for assessing thermal performance of low temperature hot water boilers using a test rig'		☑	☑
BS EN 303-3:1999 'Heating boilers – Part 3: Gas-fired central heating boilers – Assembly comprising a boiler body and a forced draught burner'.		☑	☑
BS EN 303-7:2006 'Heating boilers – Part 7: Gas-fired central heating boilers equipped with a forced draught burner of nominal heat output not exceeding 1,000 kW'.		☑	☑
BS EN 304:1992 'Heating boilers – Test code for heating boiler for atomising oil burners' (as amended).	☑	☑	☑
BS EN 12953-11:2003 "Shell boilers – Part 11: Acceptance tests".	☑	☑	☑
BS EN 12952-15:2003 "Water-tube boilers and auxiliary installations. Acceptance tests".	☑	☑	☑
BS EN 14394:2005+A1:2008 "Heating boilers. Heating boilers with forced draught Burners. Nominal heat output not exceeding 10 MW and maximum operating temperature of 110°C".	☑	☑	

Where BS 845- 1:1987 is used, the following standard test conditions must be observed:

- A maximum ambient air temperature of 25°C.

- An excess combustion air level of not less than 15%.

TABLE A	METHOD A - SEPARATE TESTING BOILERS AND BURNERS
<p>Under this test method:</p> <p>Boiler and burner performance are demonstrated separately.</p> <p>Boiler performance can be assessed using any burner (or burners) that can provide the heat input and operational stability needed to complete the test.</p> <p>The boiler's net thermal efficiency at full load (100%) must be measured in accordance with the procedures set out in an ETL recognised standard (Table 2).</p> <p>The boiler's net thermal efficiency at part load (30%) is then inferred from burner performance data and design calculations of burner/boiler matching.</p>	

TABLE B	METHOD B - INTEGRATED TESTING AT FULL AND PART LOADS
<p>Under this test method, overall product performance must be demonstrated by:</p> <ol style="list-style-type: none"> 1. Measuring the net thermal efficiency at the test points specified in Table 1, in accordance with the procedures set out in an ETL recognised standard (Table 2). 	

TABLE C METHOD C - VALIDATED DESIGN CALCULATIONS

Under this test method:

1. The product's net thermal efficiency at the full and part load conditions specified in Table 1 and the test conditions specified in one of the ETL recognised standards (Table 2) is determined from design calculations.
2. The accuracy of these design calculations must be confirmed by using an indirect method (flue gas loss method) from one of the ETL recognised standards (Table 2) to measure the product's actual net thermal efficiency:
 - a) At least one test point between 60% and 100% of product's maximum rated input at the temperature conditions specified for the 100% test point, **and**:
 - b) At least one test point between 20% and 40% of product's maximum rated input at or near the temperature conditions specified for the 30% test point.
3. To be eligible, the product's net thermal efficiency must exceed the performance thresholds specified in Table 1.

The test report must include (or be accompanied by):

- a) Details of the calculations used to determine product performance.
- a) A copy of the published performance data for the product.
- b) Manufacturer's design data for the product.
- c) The following test data, which must be obtained with the product operating under stable conditions at each selected test point:
 - i. Analysis of flue gas composition, including as a minimum levels of oxygen or carbon dioxide and carbon monoxide.
 - ii. Ambient and flue gas temperatures.
 - iii. Total conductive, convective and radiative loss rate.
 - iv. Net thermal efficiency.
- d) Details of the burners used during the test.

Representative Testing

Where applications are being made for products of the same constructional design to be included on the Energy Technology Product List (ETPL), the following rules may be used to select representative models for testing and to reduce the overall number of performance tests that must be completed:

- For products in Category 1 and 2 with rated outputs up to and including 400 kW, and in Category 3 with rated outputs up to and including 900 kW, the type testing procedures in Annex F of BS EN 303-3:1999 or Annex C.2.1 of BS EN 304:1992 (as amended) must be used.
- For other products, test data may be submitted for a single representative model provided that the maximum rated output of the products being applied for is not more than twice, or less than half, the maximum rated output of the product tested. Where the range of rated outputs exceeds these limits, products should be grouped into size ranges that comply with these rules, and test data submitted for one representative model for each group.

It should be noted that:

- If a manufacturer voluntarily removes a representative model from the ETPL then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative models will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Localised Rapid Steam Generators

Date added to ETL 2003 (Revised 2013).

25. Definition of Technology

Localised rapid steam generators are products that are specifically designed to convert water into pressurised steam by means of a burner that converts fuel into heat and a heat exchanger that transfers the heat into the water as it passes through the product, and to achieve full operating steam pressure within a few minutes of being turned on, from a cold condition.

26. Technology Description

Localised rapid steam generators are steam boilers with a low water capacity that are designed to be installed close to the point of use, thereby avoiding the thermal losses associated with steam distribution from a central boiler-house. Their low thermal inertia means that they can respond rapidly to changes in demand.

Localised rapid steam generators are available in a range of different designs and efficiencies. The ECA scheme aims to encourage the purchase of the higher efficiency gas and oil fired localised rapid steam generators.

The ECA Scheme covers two categories of product:

1. Localised Rapid Steam Generators sold with an economiser
2. Localised Rapid Steam Generators sold without an economiser

Investments in localised rapid steam generators can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

27. Eligibility Criteria

To be eligible, products must:

- Be gas and/or oil fired.
- Use an appropriately matched forced draught burner (or burners).
- Automatically respond to changes in steam demand by modulating their output in a continuous manner across a minimum specified turndown ratio, as set out in the performance criteria below, without initiating a purge cycle.
- Conform to the requirements of the Pressure Equipment Directive 97/23/EC in respect of their design, manufacturer and testing procedures, or be CE Marked.

In addition, products with a thermal output in excess of 400kW must either use burners from the “burners with controls” part of the Energy Technology Product List or:

- Incorporate a microprocessor based burner control system.
- Where mechanical dampers are used to modulate the air flow to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis.
- Where control valves are used to modulate the fuel flow to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis. (This requirement shall not apply to pneumatically operated modulating gas valves).
- Where the product is gas fired or dual fuelled, use a variable speed motor controller (or variable speed drive) to operate each forced draught fan incorporated into the product.

Performance criteria

Eligible products must meet or exceed the minimum thermal efficiencies set out in Table 1 below at the specified part and full load conditions, which vary according to product category and fuel type.

Table 1 - Performance test points for localised rapid steam generators

Product Category	Fuel Type	Turndown ratio	Test point % MCR	Net thermal efficiency %
Localised Rapid Steam Generators sold <u>with</u> an economiser	Gas fired or dual fuelled	3.33:1	30	>= 92.0%
			100	>= 92.0%
	Oil fired	2:1	50	>= 92.0%
			100	>= 92.0%
Localised Rapid Steam Generators sold <u>without</u> an economiser	Gas fired or dual fuelled	3.33:1	30	>= 88.0 %
			100	>= 88.0 %
	Oil fired	2:1	50	>= 88.0 %
			100	>= 88.0 %

">=" means "greater than or equal to"

Where MCR is the product's maximum continuous rating (MCR).

For the avoidance of doubt net thermal efficiency test data must be presented to 1 decimal place. As an example, a Localised Rapid Steam Generators sold without an economiser with a net thermal efficiency of 87.9% at 100% of its maximum continuous rating (MCR) would be deemed to be a fail.

Products must also:

- Be capable of achieving maximum working pressure in less than eight minutes starting with a water temperature of less than 25 degrees Centigrade.

Required test procedures

The required minimum performance must be demonstrated using Method A or Method B, as set out in Table A and Table B below.

Method A must only be used, where the all burners incorporated in the product are listed on the "burners with controls" part of the Energy Technology Product List.

Method B must be used to demonstrate the performance of modular boilers, or where any of the burners incorporated in the product are **NOT** listed on the "burners with controls" part of the Energy Technology Product List. A modular boiler is defined as an assembly of two or more similar (but not necessarily identical) modules, each with their own a heat exchanger, burner, and control and safety devices. The assembly has common water feed and steam output connections, but the water flow to, and steam flow from each module is independently controlled.

Representative Testing

Where applications are being made for localised rapid steam generators of the same constructional design to be included on the Energy Technology Product List (ETPL), the type testing procedures set out in Annex F of BS EN 303-3:1999 or Annex C.2.1 of BS EN 304:1992 (as amended) may be used to

select representative models for testing and to reduce the overall number of performance tests that must be completed.

It should be noted that:

- If a manufacturer voluntarily removes a representative model from the ETPL then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative models will be removed from the ETPL.

TABLE A	METHOD A - SEPARATE TESTING OF STEAM GENERATORS AND BURNERS
<p>Under this test method:</p> <ol style="list-style-type: none">1. Steam generator and burner performance are demonstrated separately.2. Steam generator performance can be assessed using any burner (or burners) that can provide the heat input and operational stability needed to complete the test.3. There is no requirement to measure the net thermal efficiency at part loads or standby losses, since these are inferred from burner performance requirements. <p>Steam generator performance must be demonstrated by measuring its net thermal efficiency at 100% of the product's maximum continuous rating (MCR) in accordance with the procedures set out in one of the following standards:</p> <ul style="list-style-type: none">• BS 845:Part 1:1987 'Methods for Assessing thermal performance of boilers for steam, hot water and high temperature heat transfer fluids – Part 1: Concise procedure'.• BS EN 12952-15:2003 'Water-tube boilers and auxiliary installations – Part 15: Acceptance tests'. <p>Where BS 845:Part 1:1987 is used, the standard test conditions that must be used are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of not less than 15%.</p>	

TABLE B	METHOD B - INTEGRATED PRODUCT TESTING AT FULL AND PART LOADS
<p>Under this test method, overall product performance must be demonstrated by:</p> <p>4. Measuring the net thermal efficiency at the test points specified in Table 1, in accordance with the procedures set out in one of the following standards:</p> <ul style="list-style-type: none"> • BS 845:Part 1:1987 ‘Methods for Assessing thermal performance of boilers for steam, hot water and high temperature heat transfer fluids – Part 1: Concise procedure’. • BS EN 12952-15:2003 ‘Water-tube boilers and auxiliary installations – Part 15: Acceptance tests’. <p>Where BS 845:Part 1:1987 is used, the standard test conditions that must be used are: a maximum ambient air temperature of 25 degrees Centigrade and an excess combustion air level of not less than 15%.</p> <p>5. Estimating the standby loss rate from the amount of fuel required to restore the output steam pressure to its starting pressure after a suitable shutdown period.</p>	

28. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Retrofit Burner Control Systems

Date added to ETL 2001 (Revised 2012).

1. Definition of Technology

Retrofit burner control systems are products that are specifically designed to automatically control in an energy efficient manner, the operation of industrial and commercial burners, and the matching of burner heat production with heat demand.

2. Technology Description

Burners are used to provide heat for hot water, steam and thermal oil boilers, heaters and processes. They are widely used in industry and commerce. Traditionally adjustable cams and mechanical linkages have been used to control the fuel valves and air dampers that modulate burner heat output. These mechanisms are susceptible to mechanical wear and hysteresis, and are progressively being replaced by more accurate burner control systems.

A range of retrofit burner control systems is available, and these offer different levels of precision and repeatability of control. The ECA Scheme aims to encourage the purchase of microprocessor-based products that are able to accurately control combustion and maintain burner efficiency over a specified turn down range.

As installers assemble retrofit burner control systems on site from standard components from different manufacturers, which reflect the specific requirements of the installation, only the retrofit burner control units are listed the Energy Technology Product List (ETPL).

Investments in retrofit burner control systems can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate a microprocessor based control system.
- Be designed to:
 - a) Control one or more forced draught, gas and/or oil fired burners.
 - b) Use a precision servomotor to adjust any mechanical airflow dampers and/or modulating gas valves that control the air-fuel ratio of the burners controlled. Each precision servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis.
 - c) Where the burners being controlled are gas fired or dual fuelled, use a variable speed motor drive or controller to operate the burners' forced draught fans.
 - d) Fully close the air dampers of the burners being controlled on shutdown.
- Automatically respond to changes in heat demand by modulating burner output:
 - a) In a continuous manner across a minimum specified turndown ratio of 4:1
 - b) Whilst adjusting the ratio of air and fuel fed to the burner in a manner that maintains combustion efficiency across the required turndown range and complies with the maximum permitted levels of oxygen and carbon monoxide in the burner's exhaust gases, as set out in Table 1.
- Be CE Marked, or conform with the EU EMC Directive 89/336/EEC (as amended) or its replacement EU EMC Directive 2004/108/EC in respect of their design, manufacturer and testing procedures.
- **Not** depend on any form of mechanical linkage between a modulating gas valve, and air damper or air control valve, when adjusting the air fuel ratio of a burner.
- **Not** incorporate any form of control valve, actuator, or variable speed drive.

Performance criteria

Products must be able to control all categories of burners for which they are designed in a manner that does not exceed the maximum permitted levels of oxygen (O₂) and carbon monoxide (CO) in the burners' exhaust gas at each of test points specified in Table 1.

Table 1 Minimum performance requirements for retrofit burner control systems

Maximum O ₂ level at test point			Maximum CO level
100% MCR	50% MCR	25% MCR	All test points
3.0%	4.0%	5.0%	20 ppmv

Where MCR is the product’s maximum continuous rating.

Required test procedures

Product performance at the three required test points specified in Table 1 (above) must be determined by fitting the product to an appropriate burner and testing in accordance with the procedures and test conditions in one of the following standards:

- BS EN 676:2003 (as amended) “Automatic forced draught burners for gaseous fuels”.
- BS EN 267:2009, “Automatic forced draught burners for liquid fuels.”

Where the product’s turndown ratio is greater than the minimum required, performance at the 25% and 50% test points may be calculated by linear interpolation of the test results. Where operation at the burner’s maximum continuous rated output is not possible, performance at the 100% test point may be determined by extrapolation of test data at two additional test points (e.g. 70% and 90%).

For the avoidance of doubt, the oxygen levels in the test burner’s exhaust should be presented to 1 decimal place, and carbon monoxide levels to zero decimal places. As an example, where the test burner’s exhaust gases contain oxygen levels of 3.1%, or carbon monoxide levels of 21 ppmv, at 100% of the test burner’s maximum continuous rating, the product would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Steam Boilers

Date added to ETL 2001 (Revised 2011).

1. Definition of Technology

Steam boilers are products that are specifically designed to convert water into pressurised steam by means of a burner that converts fuel into heat and a heat exchanger that transfers the heat into the water as it passes through the product.

2. Technology Description

Steam boilers are used to produce steam for process heating, space heating and water heating. They consist of a burner, a pressure vessel containing a heat exchanger, and associated burner control systems and boiler control equipment.

Steam boilers are available in a range of different designs and efficiencies. The ECA Scheme aims to encourage the purchase of the higher efficiency gas and oil fired steam boilers, including products that are designed to use liquid and gaseous biofuels.

Investments in steam boilers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be gas and/or oil fired.
- Use an appropriately matched forced draught burner (or burners).
- Automatically respond to changes in steam demand by modulating their output in a continuous manner across a minimum specified turndown ratio, as set out in the performance criteria below, without initiating a purge cycle.
- Conform to the requirements of the Pressure Equipment Directive 97/23/EC in respect of their design, manufacturer and testing procedures, or be CE Marked.

In addition, products with a thermal output in excess of 400kW must **either** use burners from the “burners with controls” part of the Energy Technology Product List **or**:

- Incorporate a microprocessor based burner control system.
- Where mechanical dampers are used to modulate the **air flow** to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis.
- Where control valves are used to modulate the **fuel flow** to the burners, they must be operated by a precision servomotor. The servomotor must be controlled by a positional or flow based feedback mechanism that automatically adjusts its operation to correct for mechanical wear, valve stiction and hysteresis. (This requirement shall not apply to pneumatically operated modulating gas valves).
- Where product is gas fired or dual fuelled, use a variable speed motor controller (or variable speed drive) to operate each forced draught fan incorporated into the product.

Performance criteria

Products must have a minimum net thermal efficiency of 92.0% at the full load and part load conditions set out in Table 1 below.

Table 1 - Performance test points for steam boilers

Fuel Type	Turndown ratio	Test point % MCR	Net thermal efficiency %
Gas fired or dual fuelled	3.33:1	30	>= 92.0 %
		100	>= 92.0 %
Oil fired	2:1	50	>= 92.0 %
		100	>= 92.0 %

">=" means "greater than or equal to"

Where MCR is the product's maximum continuous rating (MCR).

For the avoidance of doubt net thermal efficiency test data must be presented to 1 decimal place. As an example, a product with a net thermal efficiency of 91.9% at 100% of its maximum continuous rating (MCR) would be deemed to be a fail.

Required test procedures

The required minimum performance must be demonstrated using Method A, Method B or Method C, (as set out in Tables A, B and C below), which are subject to the following restrictions:

- Method A must only be used, where the all burners incorporated in the product are listed on the "burners with controls" part of the Energy Technology Product List.
- Method B must be used to demonstrate the performance of modular boilers. A modular boiler is defined as an assembly of two or more similar (but not necessarily identical) modules, each with their own a heat exchanger, burner, and control and safety devices. The assembly has common water feed and steam output connections, but the water flow to, and steam flow from each module is independently controlled.
- Method C may only be used for products with rated outputs above 600kW, where it is not possible to measure product performance in a laboratory due to product size.

All performance measurements must be carried out in accordance with the procedures set out in one of the following test standards:

- BS 845: Part 1:1987 'Methods for assessing thermal performance of boilers for steam, hot water and high temperature heat transfer fluids – Part 1: Concise procedure'.
- BS EN 12953-11:2003 'Shell boilers – Part 11: Acceptance tests'.

Where BS 845- 1:1987 is used, the following standard test conditions must be observed:

- A maximum ambient air temperature of 25°C.
- An excess combustion air level of not less than 15%.

Representative Testing

Where applications are being made for products of the same constructional design to be included on the Energy Technology Product List (ETPL), test data may be submitted for a single representative

model provided that the maximum rated output of the products being applied for is not more than three times, or less than one third of, the maximum rated output of the product tested. Where the range of rated outputs exceeds these limits, products should be grouped into size ranges that comply with these rules, and test data submitted for one representative model for each group.

It should be noted that:

- If a manufacturer voluntarily removes a representative model from the ETPL then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative models will be removed from the ETPL.

TABLE A	METHOD A - SEPARATE TESTING OF BOILERS AND BURNERS
Under this test method:	
<ol style="list-style-type: none"> 1. Boiler and burner performance are demonstrated separately. 2. Boiler performance can be assessed using any burner (or burners) that can provide the heat input and operational stability needed to complete the test. 3. The boiler’s net thermal efficiency at 100% of product’s maximum continuous rating (MCR) in accordance with the procedures in one of the specified standards. 4. The boiler’s net thermal efficiency at part load (30%) is then inferred from burner performance data and design calculations of burner/boiler matching. 	

TABLE B	METHOD B - INTEGRATED TESTING AT FULL AND PART LOADS
Under this test method, overall product performance must be demonstrated by:	
<ol style="list-style-type: none"> 1. Measuring the net thermal efficiency at the test points specified in Table 1, in accordance with the procedures in one of the specified test standards. 	

TABLE C METHOD C - VALIDATED DESIGN CALCULATIONS
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Under this test method:

1. The product's net thermal efficiency at the full and part load conditions specified in Table 1 is determined from design calculations.
2. The accuracy of these design calculations must be confirmed by interpolation and extrapolation of measurements, obtained using the procedures in one of the specified test standards, of the product's net thermal efficiency:
 - a) At least one test point between 60% and 100% MCR, and:
 - b) At least one test point between 20% and 40% MCR.

The test report must include (or be accompanied by):

- a) Details of the calculations used to determine product performance.
- b) A copy of the published performance data for the product.
- c) Manufacturer's design data for the product.
- d) The following test data, which must be obtained with the product operating under stable conditions at each selected test point:
 - i. Analysis of flue gas composition, including as a minimum levels of oxygen or carbon dioxide and carbon monoxide.
 - ii. Ambient and flue gas temperatures.
 - iii. Total conductive, convective and radiative loss rate.
 - iv. Net thermal efficiency.
- e) Details of the burners used during the test.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Combined Heat and Power

Combined Heat and Power is the simultaneous generation of heat and power (usually electricity) in a single process. CHP Schemes are by their nature bespoke and approval of a given CHP manufacturer or product would not provide sufficient assurance of environmental benefit. With CHP, case by case Certification is needed to ensure support is provided for 'good quality' CHP. Certification is achieved using the CHP Quality Assurance programme (CHPQA). Because a certificate is used, no specific products appear on the Energy Technology Product List.

Guidance on claiming Enhanced Capital Allowances for CHP is set out below in DECC's CHP Quality Assurance Guidance Note 42.

Further information about CHP eligibility criteria and the CHPQA programme can be found at <http://chpqa.decc.gov.uk>

Questions on CHP eligibility should be directed to the CHPQA Hotline - 01235 75 3004 or chpqainfo@chpqa.com

GUIDANCE NOTE 42

USE OF CHPQA TO OBTAIN ENHANCED CAPITAL ALLOWANCES

GN 42.1 One of the aims of the CHPQA programme is to ensure that entitlements to fiscal and other benefits are in line with, and incentivise, the environmental performance of CHP Schemes. Eligibility for Enhanced Capital Allowances (ECAs) is one of the fiscal benefits available to Good Quality CHP certified under the programme. ECAs give relief for the full cost of qualifying expenditure incurred in the accounting period. To qualify for the allowances in respect of a CHP Scheme a "Certificate of Energy Efficiency" must be obtained from the Secretary of State. This is separate and distinct from the CHPQA Certificate.

GN 42.2 The purpose of this Guidance Note is to provide developers with step-by-step guidance on how to use CHPQA Certificates pertaining to proposed new or upgraded CHP Schemes to obtain ECAs. It will assist developers of Schemes:

- understand the overall procedure for applying for ECA, including the role of the CHPQA Certificate in the process
- with specific guidance on the timing and detail of each step of your application
- interpret the application of the CHPQA Standard for ECA eligibility under specific circumstances, e.g. mixed fuel use.

GN 42.3 The administration ECAs is the responsibility of the Inland Revenue. This guide has been prepared in consultation with and has been approved by the Inland Revenue.

GN 42.4 Further information can be obtained from

- The ECA web site: www.eca.gov.uk
- The Inland Revenue web site: www.inlandrevenue.gov.uk

Readers seeking further clarification on the procedures described herein should refer initially to these sites. Subsequent queries on tax issues should be addressed to the reader's local tax office.

Glossary

GN 42.5 The following terms are used in this Guidance Note, the majority of which are defined in more detail in the CHPQA Standard, Issue 1, November 2000.

Annual Operation is a period commencing on 1st January and finishing on 31st December of the same year.

Initial Operation is the period during which reduced Threshold Criteria apply and will include at least one full Annual Operation.

Qualifying Power Capacity is the registered power generation capacity (MWe) qualifying as Good Quality CHP.

Qualifying Expenditure is the expenditure incurred on Plant and Machinery. Further guidance is contained in the CHP pages of the ECA web site. Such expenditure may be eligible for ECAs if installed as part of a CHP Scheme for which all or part of the capacity is certified as Good Quality CHP.

Total Power Capacity is the registered maximum power generation capacity of a CHP Scheme (MWe).

GN 42.6 To qualify for a Combined Heat and Power Certificate of Energy Efficiency a CHPQA Certificate must be obtained.

CHPQA Certification

GN 42.7 The CHPQA Certificate for a CHP Scheme in design (either a new Scheme or a proposed modification to an existing Scheme):

- records parameters, valid until the end of the year of issue, relating to the projected energy efficiency and the environmental performance of the Scheme
- must be renewed by annual submission of CHPQA Form F3 from each January, to confirm or update the proposed design.

» See CHPQA GN3.

- A CHPQA Certificate is required to obtain a Combined Heat and Power Certificate of Energy Efficiency. However, possession of a CHPQA Certificate does not compel applicants to obtain a Combined Heat and Power Certificate of Energy Efficiency.

Combined Heat and Power Certificate of Energy Efficiency

GN 42.8 The Combined Heat and Power Certificate of Energy Efficiency for each Scheme:

- is valid from the date of issue, unless varied or revoked, provided the operator maintains its validity by sending a copy of a valid CHPQA Certificate to the CHPQA Administrator annually by 30th June
- states the CHPQA Scheme Reference Number, the Total Power Capacity and the Qualifying Power Capacity all as recorded in the CHPQA Certificate.
- states the percentage of total Qualifying Expenditure eligible as ECA
- **may be revoked if**
 - the CHP Scheme design changes during its development
 - the Scheme development ceases

- the Scheme is not built in accordance with the design certified under CHPQA

GN 42.9 To obtain a Combined Heat and Power Energy Efficiency (ECA Eligibility) Certificate, which is issued on behalf of the Secretary of State by the CHPQA Administrator, simply tick the box on CHPQA Form F3 when making your annual Self-Assessment.

GN 42.10 Any change in design, whether or not it causes a change to the Qualifying Power Capacity or Power Efficiency, must be notified to the CHPQA Administrator by resubmitting a revised Form F3. This may trigger the revocation of any existing Certificate of Energy Efficiency and, if one is still required, the issue of a new Certificate of Energy Efficiency. An example Combined Heat and Power Certificate of Energy Efficiency is given in Appendix A.

Eligible Organisations

GN 42.11 In considering the UK notification of the proposed ECA scheme, the European Commission ruled that, in the case of CHP, the award of ECAs does not constitute State Aid (and is therefore allowable) provided that

“the main intended business will be to provide heat and power for clearly identified users on site or to known third parties, and not to generate power for sale to or via unspecified third parties.”

This statement is elaborated in a further reference:

“ECAs for CHP will be available for all companies except for companies whose core business is electricity production, insofar as they use the CHP system to produce electricity to be sold to unknown end users.”

GN 42.12 The statements above are clearly intended to avoid unfair competition in the Electricity Generating Industry between Member States. They should not affect the vast majority of CHP Scheme operators in UK however and provided that applicants can demonstrate their intention to supply heat and power to known end users they should fall outside the exclusion.

GN 42.13 Such intention is recorded in the CHPQA Form F3, which asks for details about intended power exports. It should also be in the financial interests of the Scheme once in operation, since direct sales of CHP Qualifying Power Output to end users are exempt from the Climate Change Levy.

Leased Equipment

GN 42.14 Inland Revenue rules state that the purchase of energy-saving equipment for leasing does not qualify for 100% ECAs. However, energy services companies (ESCOs) can qualify for the 100 per cent first year allowances on their investment in equipment that is required under a comprehensive energy management contract.

GN 42.15 To be considered comprehensive and therefore distinct from straightforward commercial leasing, which does not involve the lessor in the day-to-day operation of the equipment, the energy management package must include the design, procurement, installation and maintenance of the equipment and its operation to secure energy savings or efficiencies. The payments in respect of the operation of the CHP Scheme must be linked to energy savings or increases in energy efficiency.

Threshold Criteria for ECA Eligibility

GN 42.16 The Threshold Criteria for ECA eligibility are based on the CHPQA Threshold Criteria for Good Quality CHP for Proposed New Power Generation Capacity as set out in the CHPQA standard, Issue 1, November 2000. However, the Threshold Power Efficiency Criterion is relaxed for Schemes that burn a proportion of biomass or solid or liquid waste fuels as shown in the table below.

› See CHPQA GN 14 for more information on biomass or solid or liquid waste fuels

	Q1 Threshold		Power Efficiency Threshold
All new or upgraded Schemes Except for the special cases below	≥ 105 under annual operation	&	≥ 20% under annual operation
	OR ≥ 110 at MaxHeat	&	≥ 35% under annual operation
New or upgraded Schemes that use only biomass or solid or liquid waste fuels	≥ 105 under annual operation	&	≥ 10% under annual operation
	OR ≥ 110 at MaxHeat	&	≥ 10% under annual operation
New or upgraded Schemes that use part biomass or solid or liquid waste fuels (See note below)	≥ 105 under annual operation	&	≥ (20 - 10 x Fw) % under annual operation
	OR ≥ 110 at MaxHeat	&	≥ (35 - 25 x Fw) % under annual operation

Note: Fw = fraction of total energy inputs as biomass plus solid waste plus liquid waste fuels

Calculation of ECA Value

GN 42.17 ECAs are claimed in the same way as other capital allowances on the Corporation Tax Return for companies and the Income Tax Return for individuals and partnerships. The responsibility for notifying the Inland Revenue of any changes in eligibility lie with the tax payer and significant penalties are possible in the event of fraudulent or negligent claims.

GN 42.18 Where the Scheme fails to meet the Threshold Quality Index Criterion the entitlement to ECAs is restricted. Claims are made in respect of the individual items of plant and machinery within the Scheme and qualifying expenditure on these may not exceed a maximum calculated as follows:

1. identify the expenditure incurred on qualifying plant and machinery in the CHP Scheme
2. add any additional Eligible Costs listed on the web site such as transportation and installation charges
3. multiply the total value of Qualifying Expenditure and Eligible Costs, as identified in points 1 and 2, by the percentage of total Qualifying Expenditure eligible as ECA as shown on the Combined Heat and Power Certificate of Energy Efficiency
4. select individual items from the list of Qualifying Expenditure and Eligible Costs, the value of which add up to, but do not exceed, the value calculated in point 3

The value of the items selected in point 4 is the value of ECA to be claimed. The remaining expenditure will qualify for capital allowances.

Important Note: CHP Schemes failing to meet the relevant Threshold Power Efficiency Criterion do not qualify for ECA on any expenditure incurred.

GN 42.19 ECAs are claimed on the relevant Tax Return for the year in which the Qualifying Expenditure was incurred. Claims cannot be made for expenditure committed before 1st April 2001 and can only be whilst in possession of a valid Combined Heat and Power Certificate of Energy Efficiency.

Annual Review/Variations

GN 42.20 A Certificate of Energy Efficiency may be withdrawn and any allowances recovered if, for example, the CHP Scheme is not built to the design certified under CHPQA. An application may be made for a new Certificate of Energy Efficiency where appropriate.

APPENDIX A: Combined Heat and Power Certificate of Energy Efficiency (example)

ENHANCED CAPITAL ALLOWANCES FOR ENERGY-SAVING INVESTMENTS: CERTIFICATE OF ENERGY EFFICIENCY - COMBINED HEAT AND POWER

For the CHP Scheme referred to below the Secretary of State certifies that:

Address of Scheme

Date of Exemption Certificate	DD/MM/YYYY
CHPQA Scheme Reference Number	XXXX X
Qualifying Power capacity (MWe)	Total Power Capacity (MWe)

Qualifying Expenditure:

Expenditure on plant and machinery of a description specified under the heading “combined heat and power” in the Energy Technology Criteria List issued by the Secretary of State, which does not exceed [QPO/TPO]% of the total expenditure on such specified plant and machinery for the Scheme to which this Certificate applies.

Signed by authority of the Secretary of State

Signature:

Name in block capitals:

(For the CHPQA Administrator)

Notes

1. This Certificate of Energy Efficiency is issued in accordance with, and for the purposes of Section 45B of the Capital Allowances Act 2001.
2. This Certificate is valid from the date of issue onwards, unless revoked.
3. This Certificate may be revoked if the Scheme is not built in accordance with the design certified under CHPQA.
4. This certificate may be revoked if it has been issued in the basis of incorrect information supplied for the purposes of an application for a Certificate of Energy Efficiency.

5. If a person who has made a tax return becomes aware that, as a result of the revocation of a Certificate of Energy Efficiency after the return was made, the return has become incorrect, he or she must give notice to the Inland Revenue specifying how the return needs to be amended. The notice must be given within 3 months beginning with the day on which the person first became aware that anything in the tax return had become incorrect because of the revocation of the Certificate.

Compressed Air Equipment

Flow Controllers

Date added to ETL 2008.

1. Definition of Technology

Flow controllers are products that are specifically designed to regulate the pressure in compressed air systems in a manner that maintains a set pressure regardless of volumetric changes caused by a fluctuating compressed air demand.

2. Technology Description

Flow controllers can be used, in conjunction with appropriate air storage capacity, to reduce the pressure fluctuations that normally occur in compressed air distribution systems when machines turn on and off, or compressed air demand is variable. This enables compressed air generation systems to be operated closer to the minimum required air distribution pressure, thereby realising energy savings.

Investments in flow controllers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate a pressure transducer that has a measurement accuracy of at least (i.e. \leq) $\pm 0.5\%$ of full scale output across its rated operating pressure range and across a rated temperature range of -25 to 80 degrees Centigrade.
- Incorporate one or more precision control valves and associated valve positioning devices that do not vent more than 10 standard litres per minute (SLPM at 20 degrees Centigrade) of compressed air to atmosphere during normal operation.
- Incorporate a microprocessor based controller that is pre-programmed to:
 - a) Define the downstream air pressure set-point in intervals not exceeding 0.1 bar.
 - b) Calibrate the operation of the product's control valve(s) and associated valve positioner(s) to ensure correct operation across the product's turn down range.
 - c) Tune the controller operation to eliminate controller hunting, minimise valve overshoot, and compensate for valve hysteresis and/or stiction.
- Be able to automatically regulate the air pressure downstream of the product, to within ± 0.1 bar of a set-point, across a minimum turn down range of $5:1$, as air demand varies between the product's minimum and maximum rated air flows.
- Incorporate an anti-tampering mechanism that prevents automatic control from being disabled, except during commissioning, maintenance or testing.
- Conform with the requirements of the EU Pressure Equipment Directive (PED) 97/23/EC, and be CE Marked.
- **Not** incorporate facilities to directly control the operation of air compressors.

Where the product provides facilities for users to temporarily override automatic control, the product must automatically reset the override within 24 hours.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Master Controllers

Date added to ETL 2008 (Revised 2010).

1. Definition of Technology

Master controllers are products that are specifically designed to control the operation of multiple air compressors in a manner that maintains the operating pressure of the compressed air system within a narrow band, thereby minimising energy consumption.

2. Technology Description

Master controllers are microprocessor-based controllers that can be used to improve the control of compressed air systems with two or more compressors. They realise energy savings by reducing the pressure fluctuations that are normally present in compressed air systems when simple cascade or sequence controls are used to maintain system pressure, and by allowing users to schedule compressor operations that reflect working patterns.

Investments in master controllers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be able to automatically control the operation of:
 - a) At least two air compressors.
 - b) Both fixed speed and variable speed compressors.
 - c) Any positive displacement compressor that is capable of accepting a remote load/unload control signal via a volt-free switching circuit or electromechanical pressure switch, or in the case of variable speed drives capable of accepting a speed control signal or a remote pressure set point adjustment.
- Incorporate a microprocessor based controller that is pre-programmed to provide facilities for users to:
 - a) Prioritise the use of more efficient compressors over less efficient ones, whilst making optimal use of any variable speed compressors being controlled.
 - b) Schedule the times of the week (in intervals of five minutes or less) when the compressed air system should be switched on and off, and be operated at a reduced pressure.

- c) Schedule at least two different operating pressures for the compressed air system (to enable for example operation at lower pressure at off peak times).
- d) Define the minimum and maximum limits for the operating pressure (or pressure band) that the controller must maintain the compressed air system within.
- Incorporate an anti-tampering mechanism that prevents automatic control from being disabled, except during commissioning, maintenance or testing.
- Incorporate a pressure transducer that has a measurement accuracy of at least (i.e. \leq) $\pm 0.5\%$ of full scale across its rated operating pressure range and across a rated temperature range of -25 to 80 degrees Centigrade.
- Incorporate automatic control algorithms that monitor rate of change in system air pressure/flow and prevent compressors from being brought on load or unloaded in response to small fluctuations in demand.
- Be capable of automatically regulating the operating pressure of the compressed air system (where all compressors in the system are situated at a single location), based on the output of a single pressure transducer, to within ± 0.2 bar of the operating pressure set-point, as air demand varies between 10% and 100% of the maximum combined, continuous, rated output of air compressors being controlled.
- Conform with the requirements of the EU EMC Directive 89/336/EEC (as amended) or its replacement EU EMC Directive 2004/108/EC, and be CE Marked.

Where products provide facilities for operators to override automatic control, they must be pre-programmed to return to automatic control at the next scheduled time for system switch off / on, and to automatically reset the override within 24 hours.

Where products are also designed to control desiccant air dryers, they must also satisfy the eligibility criteria for 'energy saving controls for desiccant air dryers'.

Automatic control may be implemented either directly by means of an analogue or digital signal connection, or indirectly by means of another control device or network. Where products are designed to indirectly control variable speed compressors, they must be capable of monitoring the operating speed of the variable speed compressors, and of remotely adjusting the speed or pressure set points (or pressure or speed range limits) within the variable speed compressor's control device.

Products that cannot directly control the speed (or speed range) of a variable speed compressor, or indirectly control their speed of operation by adjusting their pressure set points, are not eligible.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Refrigerated Air Dryers with Energy Saving Controls

Date added to ETL 2003 (Revised 2013).

5. Definition of Technology

Refrigerated air dryers are products that are specifically designed to extract water vapour from industrial compressed air systems by means of cooling with a refrigeration cycle.

6. Technology Description

Refrigerated air dryers are commonly fitted to compressed air systems to prevent moisture from condensing within pipe work and equipment. They work by cooling the air to a desired dewpoint temperature, thus forcing moisture to condense out of the air. This resulting condensate is then drained from the compressed air system.

A refrigerated air dryer typically increases the energy used in compressed air generation by between 2% and 5% depending on the type of product selected and how it is controlled. The pressure drop across the refrigerated air dryer is also a key factor in the amount of additional energy consumed as a result of the use of refrigerated air dryers. The aim of the ECA Scheme is to encourage the purchase of higher efficiency models, which have low pressure drops across them.

Investments in refrigerated air dryers with energy savings controls can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

7. Eligibility Criteria

To be eligible, products must:

- Incorporate energy saving controls that automatically reduce the cooling output of the refrigerated air dryer as the average flow rate and temperature of the inlet air decreases in a manner that reduces the energy consumption of the product.
- Modulate their output between 20% to 100% in response to changes in the flow rate and/or temperature of the inlet air and/or outlet air.
- **Not** exceed the limits set out in the performance criteria below for pressure drop corrected composite specific energy consumption (SEC) at 50%, 75% and 100% load (i.e. rated air flow).
- Conform with the requirements of the EU Pressure Equipment Directive PED 97/23/EC in respect of their design, manufacture and testing procedures, or be CE Marked.

Performance criteria

Products must not exceed the values for pressure drop corrected composite specific energy consumption (SEC) set out in the Table 1 below at the specified percentage of full load.

Table 1 Maximum Allowable Composite SEC in kWh/m³/min

Percentage of full load (i.e. rated air flow)	Maximum allowable Composite SEC (kWh/m ³ /min)
50 %	<= 0.36
75 %	<= 0.48
100 %	<= 0.60

The pressure drop-corrected composite SEC should be calculated as follows:

$$SEC = \frac{P + (1.67 \times \Delta p \times Q)}{Q}$$

Where:

P = Total electrical power consumed by air dryer, kW

Δp = Pressure drop across air dryer, bar

Q = Flow rate of air, m³/min

For the avoidance of doubt composite SEC data must be presented to 2 decimal places. As an example, a product with a composite SEC of 0.49 at 75% of full load) would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures and test conditions laid down in BS ISO 7183:2007, which specifies how to measure the electrical power consumed by the product at full load, the pressure drop across the dryer and the flow rate of air through the product. The test results should be presented in the format laid down in Annex B of BS ISO 7183-2:2007.

Products must also meet the Class 4 specifications for moisture removal in BS ISO 8573-1:2010, “Table 2 Compressed air purity classes for humidity and liquid water”

In addition, manufacturers should use the above procedures to evaluate the pressure drop corrected composite SEC of their products at two part load conditions (50% and 75%).

Please note that performance data obtained in accordance with the procedures in ISO 7183: 1986 will be accepted as an alternative to testing in accordance with ISO 7183:2007 until further notice.

8. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Heat Pumps

Air Source: Air to Water Heat Pumps

Date added to ETL 2009 (Revised 2012).

1. Definition of Technology

Air to water heat pumps are products that are specifically designed to transfer heat from the air outside a building to a water-based heating system, by means of a refrigerant cycle.

2. Technology Description

An air to water heat pump uses an electrically driven refrigeration system to transfer heat from outside air into a water-based heating system. They can be used to provide space heating in a wide range of buildings, and some products also are able to provide cooling by reversing the refrigerant flows around the product.

Air to water heat pumps are available with a wide range of efficiencies and the ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers two categories of products:

1. **Single split air to water heat pumps**
that consist of one 'outdoor' unit and one 'indoor' unit.
2. **Packaged air to water heat pumps**
that consist of a single factory assembled unit.

Investments in air to water heat pumps can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate an electrically driven refrigeration system.
- Be designed for, and include fittings for, permanent installation.
- Be CE marked.

In addition, single split products must consist of an 'outdoor' unit and one 'indoor' unit that are:

- Factory-built sub-assemblies.
- Supplied as a matched set of units.
- Designed to be connected together during installation.

Performance criteria

Eligible products must meet the performance criteria set out in Table 1 below for:

- Coefficient of Performance (COP) across the range of connected capacities and including 100% (full) load in heating mode.
- Energy Efficiency Ratio (EER) across the range of connected capacities and including 100% (full) load in cooling mode, where the product is designed to provide cooling.

Table 1 Performance thresholds for air to water heat pumps

	Product Category	Heating Capacity (kW)	Heating mode (COP)	Cooling mode (EER)
1.	Single split air to water heat pumps	<= 20kW	> 4.00	> 3.10
		> 20kW	> 3.80	> 3.00
2.	Packaged air to water heat pumps	<= 20kW	> 4.00	> 3.10
		> 20kW	> 3.80	> 3.00

">" means "greater than"

"<=" means "less than or equal to"

For the avoidance of doubt test data should be presented to two decimal places. As an example, a single split air to water heat pump with a cooling mode COP of 4.00 would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures in BS EN 14511:2011. The standard rating conditions are set out in the Table 2 below.

Table 2 Test conditions for air to water heat pumps

	Product category	Heating mode (COP)	Cooling mode (EER)
1.	Single split air to water heat pumps	BS EN 14511-2:2011 Table 12 Standard rating conditions, Outdoor air	BS EN 14511-2:2011 Table 16 Standard rating conditions, water (for low temperature heating application)
2.	Packaged air to water heat pumps	BS EN 14511-2:2011 Table 12 Standard rating conditions, Outdoor air	BS EN 14511-2:2011 Table 16 Standard rating conditions, water (for low temperature heating application)

Test results may be submitted in summary form provided that:

- Sufficient data is included to confirm that the heating / cooling capacity (kW), COP and EER of each product was determined in accordance with the test procedures in BS EN 14511: 2011 and determined at the standard rating conditions outlined in Table 2.
- At least two detailed test reports are submitted for each range of products and for each laboratory used. The data must be recorded in a detailed test report as defined in Table

6 of BS EN 14511:2011. The test report must include details of the data recording period and duration of the performance measurement.

Please note that performance data obtained in accordance with the corresponding procedures and standard rating conditions laid down in BS EN 14511: 2004 or BS EN 14511: 2007 will be accepted as an alternative to testing in accordance with BS EN 14511: 2011 until further notice.

Representative Testing

Where applications are being made for a range of two or more products that are variants of the same basic design, test data may be submitted for a representative selection of models, provided that all variants:

- Use the same refrigerant as the representative model.
- Have the same compressor type (i.e. manufacturer, method of compression (e.g. reciprocating or scroll) and type of enclosure (e.g. hermetic or semi-hermetic)) as the representative model.
- Use the same defrosting method (e.g. hot gas defrost).
- Fit within the same product category (e.g. are all single split air to water heat pumps).

The representative models must be selected by dividing the range of products into groups of models with similar design characteristics, and testing a model in each group. The performance of each model in the group must be predicted using a validated mathematical model. As a minimum, at least two models must be tested in each range of products and in each laboratory used for testing.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Air Source: Gas Engine Driven Split and Multi-Split (including Variable Refrigerant Flow) Heat Pumps

Date added to ETL 2004 (Revised 2010).

1. Definition of Technology

Air-source, gas engine driven (GED), heat pumps covers products that are specifically designed to transfer heat from the air in one space to the air in another space by means of a refrigeration cycle that is driven by a gas-fired internal combustion engine.

'Split' type heat pumps have separate heat collection and rejection units for each space known as 'indoor' and 'outdoor' units. The 'indoor' and 'outdoor' units are specifically designed to be connected together during installation by refrigerant pipework to form a single functional unit.

Variable refrigerant flow (VRF) heat pumps are specifically designed to automatically adjust the flow of refrigerant to each indoor unit so that the heat delivered is matched to the demand.

2. Technology Description

Air-source gas engine driven (GED) split and multi-split heat pumps use a gas-fired internal combustion engine driven refrigeration system to transfer heat from air outside a building to the air inside it. They can be used to provide space heating in a wide range of buildings, and some products also are able to provide cooling by reversing the refrigeration flows around the product. (These products are known as reversible gas engine driven 'air-cooled' air conditioning units).

Air source gas engine driven split and multi-split heat pumps are available with a wide range of efficiencies. The ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers four categories of products:

1. **Air source: GED single split (non-VRF) heat pumps**
that consist of one 'outdoor' unit and one 'indoor' unit.
2. **Air source: GED dual split (non-VRF) heat pumps**
that consist of one 'outdoor' unit and two 'indoor' units.
3. **Air source: GED multi-split (non-VRF) heat pumps**
that consist of one 'outdoor' unit connected to two or more 'indoor' units using either individual refrigerant circuits (with the indoor units individually controlled) or using a common refrigerant circuit with the indoor units controlled as one.
4. **Air source: GED split or multi-split variable refrigerant flow (VRF) heat pumps**
that consist of one 'outdoor' unit connected to one or more 'indoor' units using a common refrigerant circuit with the indoor units individually controlled.

Investments in air source gas engine driven split and multi-split (including variable refrigerant flow) heat pumps can only qualify for Enhanced Capital Allowances if the specific product identified by the outdoor unit and the matching indoor unit(s) is named in the ETL Heat Pump Master List. To be eligible for inclusion on the ETL Heat Pump Master List, products must meet the eligibility criteria as set out below AND the Heat Pump Master List Listing Mechanism.

3. Eligibility Criteria

To be eligible, products must:

- Consist of an 'outdoor' unit and one or more 'indoor' units that are:
 - a) Factory-built sub-assemblies.
 - b) Supplied as a matched set of units.
 - c) Designed to be connected together during installation.
- Incorporate a refrigeration system that is driven by a gas-fired internal combustion engine.
- Be designed for, and include fittings for, permanent installation.
- Be CE marked.

Performance criteria

Eligible products must meet the performance criteria set out in Table 1 below for:

- Coefficient of Performance (COP) across the range of connected capacities and including 100% (full) load in heating mode.
- Energy Efficiency Ratio (EER) across the range of connected capacities and including 100% (full) load in cooling mode, where the product is designed to provide cooling.

Table 1 Performance requirements for air source: gas engine driven (GED) split and multi-split heat pumps

	Product Category	Heating mode (COP)	Cooling mode (EER)
1.	Air source: GED single split (non VRF) heat pumps.	>1.30	>1.10
2.	Air source: GED dual split (non VRF) heat pumps.	>1.30	>1.10
3.	Air source: GED multi-split (non VRF) heat pumps.	>1.30	>1.10
4.	Air source: GED split and multi-split variable refrigerant flow (VRF) heat pumps.	>1.30	>1.10

">" means "greater than"

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, an air source gas engine driven single split (non-VRF) heat pump product with a heating mode COP of 1.30 would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures laid down in the following standards:

- JIS B 8627-1: 2006, "Gas engine driven heat pump air conditioners - Part 1 General requirements".
- JIS B 8627-2: 2000 "Gas engine driven heat pump air conditioners - Part 2: non-ducted gas engine driven heat pump air conditioners - Testing and rating for performance".
- JIS B 8627-3: 2000 "Gas engine driven heat pump air conditioners - Part 3: Ducted gas engine driven heat pump air conditioners - Testing and rating for performance".

The standard rating conditions are set out in the Table 2 below.

Table 2 Test conditions for air source: gas engine driven (GED) split and multi-split heat pumps

	Product Category	Heating mode (COP)	Cooling mode (EER)
1.	Air source: GED single split (non-VRF) heat pumps.	JIS B 8627-1:2006 Table 1.1 Heating standard test	JIS B 8627-1:2006 Table 1.1 Cooling standard test
2.	Air source: GED dual split (non-VRF) heat pumps.	JIS B 8627-1:2006 Table 1.1 Heating standard test	JIS B 8627-1:2006 Table 1.1 Cooling standard test
3.	Air source: GED multi-split (non-VRF) heat pumps.	JIS B 8627-1:2006 Table 1.1 Heating standard test	JIS B 8627-1:2006 Table 1.1 Cooling standard test
4.	Air source: GED split and multi-split variable refrigerant flow (VRF) heat pumps.	JIS B 8627-1:2006 Table 1.1 Heating standard test	JIS B 8627-1:2006 Table 1.1 Cooling standard test
Notes			
<p>1. The heating standard test requires an entering air temperature on the indoor side of 20°C (Dry-bulb), and an entering air temperature on the outdoor side of 7°C (Dry-bulb) and 6°C (Wet-bulb).</p> <p>2. The cooling standard test requires an entering air temperature on the indoor side of 27°C (Dry-bulb) and 19°C (Wet-bulb), and an entering air temperature on the outdoor side of 35°C (Dry-bulb).</p>			

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Air Source: Packaged Heat Pumps

Date added to ETL 2002 (Revised 2012).

1. Definition of Technology

Air source heat pumps are products that are specifically designed to transfer heat from the air in one space to the air into another space by means of a refrigeration cycle.

‘Packaged’ type heat pumps are single factory assembled units that incorporate all the elements of the refrigeration system and air distribution mechanisms for space heating.

2. Technology Description

Air source packaged heat pumps use an electrically operated refrigeration system to transfer heat from air outside a building to the air inside it. They can be used to provide space heating in a wide range of buildings, and some products also are able to provide cooling by reversing the refrigeration flows around the product. (These products are known as reversible 'air-cooled' air conditioning units).

Air source packaged heat pumps are available with a wide range of efficiencies. The ECA Scheme aims to encourage the purchase of higher efficiency products.

Investments in air source packaged heat pumps can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Consist of a single factory-built unit.
- Incorporate an electrically driven refrigeration system.
- Be designed for, and include fittings for, permanent installation.
- Be CE marked.

Performance criteria

Eligible products must meet the performance criteria set out in Table 1 below for:

- Coefficient of Performance (COP) at 100% (full) load in heating mode.
- Energy Efficiency Ratio (EER) at 100% (full) load in cooling mode, where the product is designed to provide cooling.

Table 1 Performance requirements for air source: packaged heat pumps

Product Category	Heating mode (COP)	Cooling mode (EER)
Air source: packaged heat pumps	>3.20	>2.80

">" means "greater than"

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, a product with a heating mode COP of 3.20 would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures in BS EN 14511:2011. The standard rating conditions are set out in the Table 2 below.

Table 2 Test conditions for air source packaged heat pumps

Product Category	Heating mode (COP)	Cooling mode (EER)
Air source: packaged heat pumps	BS EN 14511-2:2011 Table 3 Standard rating Conditions, Outdoor air/recycled air	BS EN 14511-2:2011 Table 4 Standard rating Conditions, Comfort Outdoor air/recycled air

Please note that performance data obtained in accordance with the corresponding procedures and standard rating conditions laid down in BS EN 14511: 2004 or BS EN 14511: 2007 will be accepted as an alternative to testing in accordance with BS EN 14511: 2011 until further notice.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Air Source: Split and Multi-Split (including Variable Refrigerant Flow) Heat Pumps

Date added to ETL 2002 (Revised 2013).

1. Definition of Technology

Air source heat pumps are products that are specifically designed to transfer heat from the air in one space to the air into another space by means of a refrigeration cycle.

‘Split’ type heat pumps have separate heat collection and rejection units for each space known as ‘indoor’ and ‘outdoor’ units. The ‘indoor’ and ‘outdoor’ units are specifically designed to be connected together during installation by refrigerant pipework to form a single functional unit.

Variable refrigerant flow (VRF) heat pumps are specifically designed to automatically adjust the flow of refrigerant to each indoor unit so that the heat delivered is matched to the demand.

2. Technology Description

Air source split and multi-split heat pumps use an electrically operated refrigeration system to transfer heat from air outside a building to the air inside it. They can be used to provide space heating in a wide range of buildings, and some products also are able to provide cooling by reversing the refrigeration flows around the product. (These products are known as reversible ‘air-cooled’ air conditioning units).

Air source split and multi-split heat pumps are available with a wide range of efficiencies. The ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers four categories of products:

1. **Air source: single split (non-VRF) heat pumps**
that consist of one 'outdoor' unit and one 'indoor' unit.
2. **Air source: dual split (non-VRF) heat pumps**
that consist of one 'outdoor' unit and two 'indoor' units.
3. **Air source: multi-split (non-VRF) heat pumps**
that consist of one 'outdoor' unit connected to two or more 'indoor' units using either individual refrigerant circuits (with the indoor units individually controlled) or using a common refrigerant circuit with the indoor units controlled as one.
4. **Air source: split or multi-split, variable refrigerant flow (VRF) heat pumps**
that consist of one 'outdoor' unit connected to one or more 'indoor' units using a common refrigerant circuit with the indoor units individually controlled.

Investments in air source split and multi-split (including variable refrigerant flow) heat pumps can only qualify for Enhanced Capital Allowances if the specific product identified by the outdoor unit and the matching indoor unit(s) is named in the ETL Heat Pump Master List. To be eligible for inclusion on the ETL Heat Pump Master List, products must meet the eligibility criteria as set out below AND the Heat Pump Master List Listing Mechanism.

3. Eligibility Criteria

To be eligible, products must:

- Consist of an 'outdoor' unit and one or more 'indoor' units that are:
 - a) Factory-built sub-assemblies.
 - b) Supplied as a matched set of units.
 - c) Designed to be connected together during installation.
- Incorporate an electrically driven refrigeration system.
- Be designed for, and include fittings for, permanent installation.
- Be CE marked.

Performance criteria

Eligible products must meet the performance criteria set out in Table 1 for:

- Coefficient of Performance (COP) across the range of connected capacities and including 100% (full) load in heating mode.
- Energy Efficiency Ratio (EER) across the range of connected capacities and including 100% (full) load in cooling mode, where the product is designed to provide cooling.

Except for non-VRF products with a rated cooling capacity less than, or equal to, (\leq) 12kW which must meet the performance criteria set out in Table 1 for:

- Seasonal Performance (SCOP) across the range of connected capacities.
- Seasonal Energy Efficiency Ratio (SEER) across the range of connected capacities.

Table 1 Performance requirements for air source split and multi-split heat pumps

Rated Cooling Capacity		>12kW		≤12KW	
	Product Category	Heating mode (COP)	Cooling mode (EER)	Heating mode (SCOP)	Cooling mode (SEER)
1.	Air source: single split (non-VRF) heat pumps	>3.70	>3.20	≥4.00	≥6.10
2.	Air source: dual split (non-VRF) heat pumps	>3.70	>3.20	≥4.00	≥6.10
3.	Air source: multi-split (non-VRF) heat pumps	>3.70	>3.20	≥4.00	≥6.10
4.	Air source: split or multi-split variable refrigerant flow (VRF) heat pumps	>3.80	>3.40	N/A	N/A

">" means "greater than" and "≥" means "greater than or equal to"

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, a 20kW air source, single split (non-VRF) heat pump product with a heating mode COP of 3.70 would be deemed to be a fail.

Required test procedures

Non-VRF products with a cooling capacity greater than 12kW and all VRF products must be tested in accordance with the procedures in BS EN 14511:2011. The standard rating conditions are set out in the Table 2 below.

Table 2 Test conditions for air source split and multi-split heat pumps >12kW and VRF

	Product Category		Heating mode (COP)	Cooling mode (EER)
1.	Air source: single split (non VRF) heat pumps		BS EN 14511-2:2011 Table 3 Standard rating Conditions, Outdoor air/recycled air.	BS EN 14511-2:2011 Table 4 Standard rating Conditions, Comfort Outdoor air/recycled air
2.	Air source: dual split (non VRF) heat pumps		BS EN 14511-2:2011 Table 19 Standard rating Conditions.	BS EN 14511-2:2011 Table 20 Standard rating Conditions.
3.	Air source: multi-split (non VRF) heat pumps		BS EN 14511-2:2011 Table 19 Standard rating Conditions.	BS EN 14511-2:2011 Table 20 Standard rating Conditions.
4.	Air source: split or multi-split variable refrigerant flow (VRF) heat pumps:	Single split	BS EN 14511-2:2011 Table 3 Standard rating Conditions, Outdoor air/recycled air.	BS EN 14511-2:2011 Table 4 Standard rating Conditions, Comfort Outdoor air/recycled air
		Multi-split	BS EN 14511-2:2011 Table 19 Standard rating Conditions.	BS EN 14511-2:2011 Table 20 Standard rating Conditions.

Please note that performance data obtained in accordance with the corresponding procedures and standard rating conditions laid down in BS EN 14511: 2004 or BS EN 14511: 2007 will be accepted as an alternative to testing in accordance with BS EN 14511: 2011 until further notice.

Performance data for non-VRF products with a cooling capacity less than or equal to 12kW must be determined and submitted following the requirements of Commission Regulation (EU) No 206/2012 Annex II. Where calculated results are provided then calculation should be on the basis of design and/or extrapolation from other combinations of indoor and outdoor units in accordance with the Commission Regulation. In this case, details of such calculations and/or extrapolations, and of tests undertaken to verify the accuracy of the calculations undertaken (including details of the mathematical model for calculating performance of such combinations, and of measurements taken to verify this model) must be submitted to support product applications.

Testing for non-VRF products with a cooling capacity less than or equal to 12kW should be carried out in accordance with the procedures in BS EN 14825: 2012 under the test conditions set out in the Table 3 below.

Table 3 Test conditions for air source split and multi-split heat pumps ≤12kW (Excluding VRF)

	Product Category	Heating mode (SCOP)	Cooling mode (SEER)
1.	Air source: single, dual or multi split (non VRF) heat pumps	BS EN 14825:2012 Table 6 Average heating conditions.	BS EN 14825:2012 Table 2

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

CO₂ Heat Pumps for Domestic Hot Water Heating

Date added to ETL 2013.

1. Definition of Technology

CO₂ heat pumps for domestic hot water heating are products that are specifically designed to transfer heat from the ambient air, ground, or water into a system for heating domestic hot water by means of a carbon dioxide based refrigeration cycle.

2. Technology Description

CO₂ heat pumps for domestic hot water heating use an electrically operated refrigeration system to transfer heat from the ambient source into a water heating system. The refrigeration system uses carbon dioxide as the working fluid. They can be used to provide sanitary hot water in a wide range of buildings.

CO₂ heat pumps for domestic hot water heating are available in a range of efficiencies. The ECA Scheme aims to encourage purchase of higher efficiency products. CO₂ heat pumps for domestic hot water heating can realise substantial reductions in carbon emissions when used instead of fossil fuel based water heating.

The ECA Scheme covers three categories of products:

1. Air Source CO₂ heat pumps for domestic hot water heating
2. Ground Source CO₂ heat pumps for domestic hot water heating
3. Water Source CO₂ heat pumps for domestic hot water heating

Investments in CO₂ heat pumps for domestic hot water heating can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Consist either of a single factory built unit or of an ‘outdoor’ unit and one or more ‘indoor’ units that are:

- a) Factory-built sub-assemblies.
- b) Supplied as a matched set of units.
- c) Designed to be connected together during installation.
- Incorporate an electrically driven refrigeration system that uses carbon dioxide (R744) as the refrigerant.
- Be designed for, and include fittings for, permanent installation.
- Be designed primarily to provide domestic hot water heating, by being connected to or incorporating a storage tank
- Be CE marked.

Performance criteria

Eligible products must meet the performance criteria set out in Table 1 below for:

- Coefficient of Performance for domestic hot water (COP_{DHW}) at the declared tapping cycle.

Table 1 Performance thresholds for CO₂ domestic hot water heat pumps

Product Category	Coefficient of performance (COP_{DHW})
Air Source CO ₂ heat pumps for domestic hot water	>2.70
Ground Source CO ₂ heat pumps for domestic hot water	>2.70
Water Source CO ₂ heat pumps for domestic hot water	>2.70

">" means "greater than"

For the avoidance of doubt test data should be presented to two decimal places. As an example, an air source domestic hot water CO₂ heat pump product with a heating mode COP of 2.70 would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures in BS EN 16147:2011 at the test conditions set out in the table 2 below.

Table 2 Test conditions for CO₂ heat pumps for domestic hot water heating

Product Category	Heat source air temperature		Heat source temperature	
	dry-bulb (°C)	wet-bulb (°C)	Inlet temperature (°C)	Outlet temperature (°C)
Air Source CO ₂ heat pumps for domestic hot water	7°C	6°C		
Ground Source CO ₂ heat pumps for domestic hot water			0°C	-3°C
Water Source CO ₂ heat pumps for domestic hot water			10°C	7°C

The incoming cold water during testing will be at 10 °C.

The tapping cycle for the test must be declared by the manufacturer and should be the maximum load profile for the product.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Ground Source: Brine to Water Heat Pumps

Date added to ETL 2004 (Revised 2013).

5. Definition of Technology

Ground source brine to water heat pumps are products that are specifically designed to transfer heat from the ground to a water-based heating system by means of a refrigeration cycle.

The heat is collected from the ground by circulating a solution of water and anti-freeze (known as 'brine') through a buried, closed-loop, ground heat exchanger.

6. Technology Description

Ground source brine to water heat pumps use an electrically operated refrigeration system to transfer heat from the ground into a water-based heating system. They can be used to provide space heating in a wide range of buildings, and some products may be also able to provide cooling by reversing the refrigerant flows around the product.

The ECA Scheme aims to encourage purchase of higher efficiency ground source brine to water heat pumps, which can be used to realise substantial reductions in carbon emissions.

Investments in ground source brine to water heat pumps can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

7. Eligibility Criteria

To be eligible, products must:

- Consist of a single factory built unit.
- Incorporate an electrically driven refrigeration system.
- Be designed to use an indirect, closed-loop ground heat exchanger.
- Be designed for, and include fittings for, permanent installation.
- Be CE marked.

Performance criteria

Eligible products must meet the relevant performance criteria set out in Table 1 below for:

- Coefficient of Performance (COP) at 100% (full) load in heating mode.
- Energy Efficiency Ratio (EER) at 100% (full) load in cooling mode, where the product is designed to provide cooling.

Table 1 Performance thresholds for ground source brine to water heat pumps

Product Category	Heating Capacity (kW)	Heating mode (COP)	Cooling mode (EER)
Ground source brine to water heat pumps	≤45kW	>4.20	>3.20
	> 45kW	>4.00	>3.20

">" means "greater than"

"≤" means "less than or equal to"

For the avoidance of doubt test data should be presented to two decimal places. As an example, a product with a heating capacity of 25kW and a heating mode COP of 4.20 would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures in BS EN 14511:2011. The standard rating conditions are set out in the table 2 below.

Table 2 Test conditions for ground source brine to water heat pumps

Product Category	Heating mode (COP)	Cooling mode (EER)
Ground source brine to water heat pumps	BS EN 14511-2:2011 Table 7 Standard rating Conditions, Brine	BS EN 14511-2:2011 Table 11 Standard rating Conditions, Water to water (for low temperature heating applications) from cooling tower.

Please note that performance data obtained in accordance with the corresponding procedures and standard rating conditions laid down in BS EN 14511: 2004 or BS EN 14511: 2007 will be accepted as an alternative to testing in accordance with BS EN 14511: 2011 until further notice.

8. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Heat Pump Dehumidifiers

Date added to ETL 2008 (Revised 2011).

1. Definition of Technology

Heat pump dehumidifiers are products that are specifically designed to remove water vapour from moist air using an electrically driven refrigeration cycle.

2. Technology Description

Heat pump dehumidifiers are widely used to improve personal comfort, to protect building fabric and stored goods or materials, and to dry industrial products. They work by circulating the moist air over the evaporator of the refrigeration system. This reduces the temperature of the air, which causes the water vapour to condense. The resulting condensate can be then drained away.

Heat pump dehumidifiers are available in a range of different designs and efficiencies. The ECA Scheme aims to encourage the purchase of the higher efficiency products that recover both sensible and latent heat released during dehumidification, and use it to heat the air as it leaves the product or for other useful purposes, such as water heating.

Investments in heat pump dehumidifiers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- **Either** be a single packaged unit **or** consist of two or more factory built sub-assemblies that are designed to be connected together during installation.
- Incorporate an electrically driven refrigeration system that is designed to remove water vapour from the surrounding atmosphere, as the air is recirculated through the product.
- Recover both sensible and latent heat released during dehumidification, and use it to heat the air as it leaves the product and/or for other useful purposes (such as water heating).
- Incorporate a control system that monitors the relative humidity of the surrounding atmosphere, and automatically switches off dehumidification, or modulates the rate of dehumidification, when the relative humidity falls below a pre-set value.
- Be designed for, and include fittings for, permanent installation within a building.
- Have a dehumidification capacity that is greater than or equal to (\geq) 0.625 litres per hour.
- **Not** be designed to be connected to compressed air systems.
- Be CE marked.

Performance criteria

Products must have a dehumidification efficiency ratio (DER) equal to or greater than the thresholds set out in Table 1 below, which depend on the dehumidification capacity (C) of the product.

Table 1 - Performance test points for heat pump dehumidifiers

Dehumidification capacity (C) (Litres/hour)	Dehumidification efficiency ratio (DER) (Litres/kWh)
≥ 0.625 and < 1.5	≥ 1.40
≥ 1.5 and < 2.3	≥ 1.80
≥ 2.3	≥ 2.30

" \geq " means "greater than or equal to"

Where the product's dehumidification capacity and dehumidification efficiency ratio are defined in sections 3.5 and 3.6 (respectively) of BS EN 810:1997 "Dehumidifiers with electrically driven compressors. Rating tests, marking, operational requirements and technical data sheet".

For the avoidance of doubt, test data should be presented to 2 decimal places. As an example, a DER of 1.39 litres/kWh for a heat pump dehumidifier with a dehumidification capacity of 1.2 litres per hour would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures laid down in BS EN 810:1997.

The dehumidification capacity must be determined at the appropriate rating test conditions for the type of product (or intended application) as set out in Tables 2, 3 and 4 of BS EN 810:1997.

The dehumidification efficiency ratio must be determined at an air inlet temperature of 27 degrees Centigrade (dry bulb) and 21 degrees Centigrade (wet bulb) and, where applicable, include the corrections for the power input of fans and water pumps specified in section 4.1 of BS EN 810:1997.

Test results may be submitted in summary form provided that:

- Sufficient data is included to confirm that the dehumidification capacity (kW), COP and DER of each product was determined in accordance with the test procedures in BS EN 810:1997 and at the appropriate rating test conditions as described above.
- At least two detailed test reports are submitted for each range of products and for each laboratory used. The data must be recorded in a detailed test report as defined in Section 5 of BS EN 810:1997. The test report must include details of the data recording period and duration of the performance measurement.

Representative Testing

Where applications are being made for a range of two or more products that are variants of the same basic design, test data may be submitted for a representative selection of models, provided that all variants:

- Use the same refrigerant as the representative model.
- Have the same compressor type (i.e. manufacturer, method of compression (e.g. reciprocating or scroll) and type of enclosure (e.g. hermetic or semi-hermetic)) as the representative model.
- Use the same defrosting method (e.g. hot gas defrost).
- Consist of the same number of units (e.g. are all single packaged units).

The representative models must be selected by dividing the range of products into groups of models with similar design characteristics, and testing a model in each group. The performance of each model in the group must be predicted using a validated mathematical model. As a minimum, at least two models must be tested in each range of products and in each laboratory used for testing.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Heat Pump Driven Air Curtains

Date added to ETL 2012.

1. Definition of Technology

Heat Pump Driven Air Curtains are products that are specifically designed to be fitted above a doorway or similar opening, and to produce an air curtain that is specifically designed to reduce the infiltration or transfer of air from one space to another, and that is heated and/or cooled by a heat pump that transfers heat by means of a refrigeration cycle.

2. Technology Description

Air curtain heaters are used to reduce losses by disrupting the natural convection between two adjacent areas, or spaces, in a building that are at differing temperatures thereby reducing the amount of heating or cooling needed to maintain the temperature of a space. They are typically used in commercial premises for situations where an open door is required to allow uninterrupted access or where traffic through the doorway is so high that the door is open for extended periods.

Heat pump driven air curtains use a heat pump to heat or cool the air curtain expelled by the product. This reduces the need to heat the air with electricity or heat derived from other fuels.

The ECA Scheme aims to encourage the purchase of higher efficiency split type heat pump driven air curtains, which have separate heat collection and rejection units for each space known as 'indoor' and 'outdoor' units. The 'indoor' and 'outdoor' units are specifically designed to be connected together during installation by refrigerant pipework to form a single functional unit.

The ECA Scheme covers two categories of products:

1. **Single-split Heat Pump Driven Air Curtains**
that consist of one 'outdoor' heat pump unit and one air curtain unit or package.
2. **Heat Pump Driven Air Curtains Units for Multisplit (including VRF) Heat Pumps**
that consist of one air curtain unit or package that is specifically designed to replace one or more 'indoor' heat pump units within an ECA eligible multi-split (including VRF) heat pump.

Where a package is a combination of one or more air curtain units, and associated control units.

Investments in heat pump driven air curtains can only qualify for Enhanced Capital Allowances if the specific product is named in the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Include an air curtain unit or package that:
 - a) Is specifically designed to be fitted above a doorway or similar opening.
 - b) Is specifically designed to use a heat pump to heat and/or cool the air curtain expelled by it, and to use electrical air heaters (where fitted) only during defrosting or heat pump failure.
 - c) Has been rated in terms of air curtain airflow rate, outlet air velocity uniformity and air curtain velocity projection in accordance with the procedures in BS ISO 27327-1:2009.

- Be able to automatically modulate in response to changes in air inlet temperature and/or space temperature(s), the amount of heating and/or cooling applied to the air curtain between 20% and 100% of its nominal rated heating/cooling capacity output.
- Be designed for, and include fittings for, permanent installation.
- Be CE marked.

In addition, single split heat pump driven air curtain products must:

- Consist of one air curtain unit (or package) and one outdoor heat pump unit that are:
 - a) Factory-built sub-assemblies.
 - b) Supplied as a matched set of units.
 - c) Designed to be connected together during installation.
- Incorporate an electrically driven refrigeration system.

Performance criteria

Eligible products must meet the performance criteria set out in Table 1 below for:

- Coefficient of Performance (COP), across the range of connected capacities, including at 100% (full) load, in heating mode, where the product is designed to heat the expelled air.
- Energy Efficiency Ratio (EER) across the range of connected capacities, including at 100% (full) load in cooling mode, where the product is designed to cool the expelled air.
- Outlet air velocity uniformity (u_{ACU}), as defined in Section 5.4.4 of BS ISO 27327-1: 2009, over the range of doorway/opening heights that they are designed to be fitted above.

Table 1 Performance requirements for heat pump driven air curtains

	Product Category	Heating mode (COP)	Cooling mode (EER)	Outlet air velocity uniformity (u_{ACU})
1.	Single-split heat pump driven air curtains	>2.80	>2.80	>=60%
2.	Heat pump driven air curtain units for multi-split (including VRF) heat pumps	>3.00	>3.00	>=60%

">" means "greater than"

">=" means "greater than or equal to"

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, a single split heat pump driven air curtain with a heating mode COP of 2.80 would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures in BS EN 14511:2011 using the standard rating conditions as set out in the Table 2 below.

Table 2 Test conditions for heat pump driven air curtains

Product Category		Heating mode (COP)	Cooling mode (EER)
1.	Single-split heat pump driven air curtains	Air source	Table 3 Standard rating conditions, Outdoor air/recycled air.
		Water Source	Table 5 Standard rating conditions, Water Loop
2.	Heat pump driven air curtain units for multi-split (including VRF) heat pumps	Air source	Table 19 Standard rating conditions.
		Water source	Table 22 Standard rating conditions, Water Loop

Heat pump driven air curtain units for multi-split (including VRF) heat pumps must be tested with a matched ECA eligible multi-split (including VRF) heat pump product, with the air curtain unit replacing one or more indoor units.

Please note that performance data obtained in accordance with the corresponding procedures and standard rating conditions laid down in BS EN 14511:2004 or BS EN 14511:2007 will be accepted as an alternative to testing in accordance with BS EN 14511:2011 until further notice.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Water Source: Split and Multi-Split (including Variable Refrigerant Flow) Heat Pumps

Date added to ETL 2002 (Revised 2012).

1. Definition of Technology

Water source heat pumps are products that are specifically designed to transfer heat from water (in an internal water loop) into the air within the space to be heated by means of a refrigeration cycle.

‘Split’ type heat pumps have separate heat collection and rejection units for each space known as ‘indoor’ and ‘outdoor’ units. The ‘indoor’ and ‘outdoor’ units are specifically designed to be connected together during installation by refrigerant pipework to form a single functional unit.

Variable refrigerant flow (VRF) heat pumps are specifically designed to automatically adjust the flow of refrigerant to each indoor unit so that the heat delivered is matched to the demand.

2. Technology Description

Water source split and multi-split heat pumps use an electrically operated refrigeration system to transfer heat from an internal water loop into the air within the space to be heated. They can be used to provide space heating in a wide range of buildings, and some products also are able to provide cooling by reversing the refrigeration flows around the product. (These products are known as reversible 'water cooled' air conditioning units).

Water source split and multi-split heat pumps are available with a range of efficiencies. The ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers four categories of products:

1. **Water source: single split (non-VRF) heat pumps**
that consist of one 'outdoor' unit and one 'indoor' unit
2. **Water source: dual split (non-VRF) heat pumps**
that consist of one 'outdoor' unit and two or more 'indoor' units.
3. **Water source: multi-split (non-VRF) heat pumps**
that consist of one 'outdoor' unit connected to two or more 'indoor' units using either individual refrigerant circuits (with the indoor units individually controlled) or using a common refrigerant circuit with the indoor units controlled as one.
4. **Water source: split or multi-split variable refrigerant flow (VRF) heat pumps**
that consist of one 'outdoor' unit connected to one or more 'indoor' units using a common refrigerant circuit with the indoor units individually controlled.

Investments in water source split and multi-split (including variable refrigerant flow) heat pumps can only qualify for Enhanced Capital Allowances if the specific product identified by the outdoor unit and the matching indoor unit(s) is named in the ETL Heat Pump Master List. To be eligible for inclusion on the ETL Heat Pump Master List, products must meet the eligibility criteria as set out below AND the Heat Pump Master List Listing Mechanism.

3. Eligibility Criteria

To be eligible, products must:

- Consist of an 'outdoor' unit and one or more 'indoor' units that are:
 - a) Factory-built sub-assemblies.
 - b) Supplied as a matched set of units.
 - c) Designed to be connected together during installation.
- Incorporate an electrically driven refrigeration system.
- Be designed for, and include fittings for, permanent installation.
- Be CE marked.

Performance criteria

Eligible products must meet the performance criteria set out in Table 1 below for:

- Coefficient of Performance (COP), across the range of connected capacities and including 100% (full) load in heating mode.
- Energy Efficiency Ratio (EER) across the range of connected capacities including 100% (full) load, where the product is designed to provide cooling.

Table 1 Performance thresholds for water source split and multi-split heat pumps

	Product Category	Heating mode (COP)	Cooling mode (EER)
1.	Water source: single split (non-VRF) heat pumps	>3.70	>3.30
2.	Water source: dual split (non-VRF) heat pumps	>3.70	>3.30
3.	Water source: multi-split (non-VRF) heat pumps	>3.70	>3.30
4.	Water source: split and multi-split variable refrigerant flow (VRF) heat pumps	>4.10	>3.50

">" means "greater than"

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, a water source single split (non VRF) product with a heating mode COP of 3.70 would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures in BS EN 14511:2011. The standard rating conditions are set out in the Table 2 below.

Table 2 Test conditions for water source split and multi-split heat-pumps

	Product Category		Heating mode (COP)	Cooling mode (EER)
1.	Water source: single split (non-VRF) heat pumps		BS EN 14511-2:2011 Table 5 Standard rating Conditions, Water loop.	BS EN 14511-2:2011 Table 6 Standard rating Conditions, Cooling tower.
2.	Water source: dual split (non-VRF) heat pumps		BS EN 14511-2:2011 Table 22 Standard rating Conditions, Water loop.	BS EN 14511-2:2011 Table 23 Standard rating Conditions.
3.	Water source: multi-split (non-VRF) heat pumps		BS EN 14511-2:2011 Table 22 Standard rating Conditions, Water loop.	BS EN 14511-2:2011 Table 23 Standard rating Conditions.
4.	Water source: split and multi-split variable refrigerant flow (VRF) heat pumps:	Single split	BS EN 14511-2:2011 Table 5 Standard rating Conditions, Water loop.	BS EN 14511-2:2011 Table 6 Standard rating Conditions, Cooling tower.
		Multi-split	BS EN 14511-2:2011 Table 22 Standard rating Conditions, Water loop.	BS EN 14511-2:2011 Table 23 Standard rating Conditions.

Please note that performance data obtained in accordance with the corresponding procedures and standard rating conditions laid down in BS EN 14511: 2004 or BS EN 14511: 2007 will be accepted as an alternative to testing in accordance with BS EN 14511: 2011 until further notice.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Heating, Ventilation and Air Conditioning (HVAC) Equipment

Building Environment Zone Controls

(Formerly Heating, Ventilation and Air Conditioning (HVAC) Zone Controls)

Date added to ETL 2004 (Revised 2013).

1. Definition of Technology

Building environment zone controls (formerly listed as HVAC zone controls) are products that are specifically designed to automatically control in an energy efficient manner, the amount of heating, cooling, ventilation or air conditioning that is applied to individual rooms or defined areas within a building, known as “zones”.

“HVAC” is the collective term used to refer to the combination of heating, cooling, ventilation, or air conditioning, that is specifically employed within a particular building.

2. Technology Description

Building environment zone controls are used to control the environmental conditions (i.e. temperature, ventilation rate and/or air condition) in individual zones (i.e. rooms or areas) within a building. They can be programmed to maintain these environmental conditions within pre-set limits in a manner that reflects occupation schedules, occupation status and/or level of activity in the zone, whilst also taking account of environmental conditions, and the specific operating requirements of the zone.

Some products are also able to switch lighting and electrical appliances in a zone on and off in line with its occupation schedule or occupation status, and some can control the operation of window shading equipment in a manner that minimises the amount of cooling needed to maintain zone environmental conditions without excessively reducing the amount of natural light that can be used.

A wide range of building environment zone controls is available. The ECA Scheme aims to encourage the purchase of products that automatically minimise the energy consumption of building heating, cooling, ventilation, or air conditioning equipment, and associated distribution systems.

The ECA Scheme covers four categories of products:

1. **Standalone control units** that are self-contained zone control units that are designed to control one or more zones, but not centralised HVAC plant.
2. **Centralised control units** that are self-contained central control units that are designed to control two or more zones, and centralised HVAC plant.
3. **Packaged control products** that consist of two or more control modules or units that are designed to be connected together during installation, and that are designed to control one or more zones. They may also control centralised HVAC plant, provided they are also designed to control at least two zones.
4. **‘Add-on’ control modules** that are not self-contained units, but are designed to incorporate zone control facilities into HVAC control units or equipment.

Investments in building environment zone controls can only qualify for Enhanced Capital Allowances if the product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

1. Incorporate a microprocessor based controller that is pre-programmed to:
 - a) Automatically control the individual environmental conditions in one or more zones within a building, in an energy efficient manner that reflects the occupation status or the level of activity in each zone and/or predefined zone occupation schedules.
 - b) EITHER automatically switch between pre-defined operating modes, in accordance with the predefined occupation schedule or occupation status of the zones being controlled, OR automatically modulate the amount of zone heating, cooling, ventilation and air-conditioning applied in a manner that reflects the level of activity in the zone.
2. Be able to automatically control the operation of the equipment:
 - a) Heating and/or cooling the zones being controlled; and/or:
 - b) Ventilating and/or air-conditioning the zones being controlled.
3. Be designed to have at least two of the following zone operating modes:
 - a) A “normal” operating mode where zone environmental conditions are maintained within predefined levels consistent with zone occupation or a high level of activity in the zone.
 - b) An “economy” mode where zone environmental conditions are maintained at reduced levels to reflect, for example, the fact that the zone is unoccupied, or a reduced level of activity in the zone or
 - c) A “standby” mode where the zone heating, cooling, ventilation and air-conditioning is switched off or operated solely for fabric, frost and equipment protection.
4. Incorporate an anti-tampering mechanism that prevents the product’s control strategy and configuration settings from being modified, and automatic control from being disabled, except during commissioning, maintenance or testing.
5. Comply with the relevant requirements for particular type of zone control and type of HVAC plant controlled, as set out in Tables 1 to 6 below, for products that:
 - a) Control zone temperature (see Table 1).
 - b) Control zone ventilation rate or air condition (see Table 2).
 - c) Control based on zone occupation status or level of activity (see Table 3).
 - d) Control based on zone occupation schedules (see Table 4).
 - e) Control centralised HVAC plant (see Table 5).
 - f) Control wet heating systems (see Table 6).
6. Not incorporate any form of control valve, actuator, damper, motor, pump, fan or variable speed drive, except for fans or pumps incorporated solely for the purpose of product cooling.

7. Conform with the requirements of the EU EMC Directive 89/336/EEC (as amended) or its replacement EU EMC Directive 2004/108/EC, or be CE Marked.

In addition, products that are designed to control any type of heating or cooling equipment (including centralised heating or cooling plant) must control zone temperature.

Table 1 CONTROL OF ZONE TEMPERATURE
<p>All products that are designed to control zone temperature must:</p> <ol style="list-style-type: none"> 1. Be designed to directly measure zone temperature by means of a temperature sensor, and automatically adjust heat flow into, or out of, the zone to maintain temperature within the predefined temperature limits for the operating mode. 2. Provide facilities that enable building managers to define the temperature set-points for each operating mode in each zone to +/- 1 degree centigrade. 3. Limit the ability of building users to adjust the temperature set-point within individual zones, so any adjustments are restricted in terms of duration. <p>In addition, products that are designed to control both zone heating and cooling must:</p> <ol style="list-style-type: none"> 4. Provide facilities that enable building managers to define separate temperature set-points for zone heating and zone cooling in each zone. 5. Incorporate a mechanism or mechanisms that prevent simultaneous zone heating and cooling, and frequent cycling of heating and cooling equipment on and off. <p>In addition, products that are designed to control window shading equipment must:</p> <ol style="list-style-type: none"> 6. Be designed to monitor the position of the sun by means of a solar tracking sensor, and automatically adjust the position of window blinds or orientation of louvres in a manner that minimises the entry of solar radiation without excessive reduction in natural light
Notes
<ol style="list-style-type: none"> 7. Products that solely rely on an external thermostatic device (for example, a digital thermostat) to determine when additional heating or cooling is required within a zone, are not eligible. 8. Products must automatically reset temperature set-point adjustments made by building users either after a pre-defined time interval (that may be fixed or defined by the building manager), or where zone control is based on occupation schedule, at the next scheduled switching time.

Table 2 CONTROL OF ZONE VENTILATION RATES OR AIR CONDITION
<p>All products that are designed to control zone ventilation rate or air condition must:</p> <ol style="list-style-type: none"> 1. Be designed to monitor zone ventilation rate or air condition by means of a presence detector or activity sensor (see Table 3, note 3), and automatically adjust the airflow into, or out of, the zone to maintain zone ventilation rates or air condition within the predefined limits for the operating mode. 2. Incorporate a mechanism that automatically minimises ventilation rates in unoccupied zones, and in zones operating in economy or standby modes.
Notes
<ol style="list-style-type: none"> 3. Products that solely rely on an electronic or mechanical ‘timing out’ mechanism (for example, a spring loaded button) to determine when a zone is unoccupied are not eligible. 4. Products must not allow building users to adjust ventilation rate set-points, but may incorporate facilities that enable them to temporarily override ventilation rates for a limited period. 5. Products that have a “night cooling mode” that is designed to make use of natural ventilation to remove excess heat and cool the building fabric when the zone is unoccupied are eligible.

Table 3 CONTROL BASED ON ZONE OCCUPATION STATUS OR LEVEL OF ACTIVITY

All products that are designed to control zones based on occupation status must:

1. Be able to monitor zone occupation status by means of presence detector or activity sensor, and automatically adjust zone-operating mode to maintain environmental conditions within the predefined limits for the zone occupation status.
2. Provide facilities that enable building managers or users to manually switch the zone into economy or standby mode, without disabling automatic zone controls.

All products that are designed to control zones based on level of activity must:

3. Be able to monitor the level of activity in the zone by means of presence detector or activity sensor, and automatically modulate the amount of heating, cooling, ventilation and air-conditioning applied in a manner that reflects the level of activity in the zone.
4. Provide facilities that enable building managers or users to manually switch the zone into economy or standby mode, without disabling automatic zone controls.

In addition, products that are designed to control kitchen ventilation equipment must:

5. Be designed to monitor the level of fumes resulting from the cooking activity, and to automatically reduce the rate of extraction to the minimum necessary to maintain air condition within predefined limits

Notes

6. The product may monitor zone occupation status by means of one or more presence detectors, or activity sensors, which may include for example, CO2 level monitors, heat or motion detectors, moisture sensors etc. However, manually operated devices (for example, electrical switches, electronic touch buttons or entry detection devices) are not considered to be presence detectors unless they automatically reset to a “no presence detected state” after a pre-set period of time.
7. A key card activated master control switch may be used as an alternative to a presence detector, provided that when the key card is removed from it: it is designed to switch the zone controller into economy or standby mode and to switch off all lighting and electrical appliances being controlled.
8. Products that are designed to monitor the usage of lighting and electrical appliances by measuring energy use are eligible, provided that they are also designed to use a presence detector or activity sensor to detect that the zone is unoccupied, and then to automatically switch such equipment off.
9. Products that are designed to monitor the operation of plant and machinery within a zone and raise an alarm when a fault or fire is detected, or when unauthorised occupation is detected, are eligible. In this context, a fault may include the local override of control settings or automatic control.
10. Products that are designed to share the use of presence detectors and activity sensors with other types of management and control systems (e.g. building management systems) are eligible.

Table 4 CONTROL BASED ON ZONE OCCUPATION SCHEDULES

All products that are designed to control zones based on occupation schedules must:

1. Automatically switch zones between operating modes, in accordance with the predefined and individual weekly occupation schedule for each zone controlled.
2. Provide facilities that enable building managers to define the normal occupation times in each zone (in intervals of five minutes or less), for each day of the week, including at least two periods of occupation per day (i.e. at least 14 different occupation periods a week).
3. Provide facilities that enable building users to temporarily override the predefined schedules and/or to cancel the remaining portion of a pre-defined occupation period.
4. Provide facilities that enable building managers to define future dates (e.g. holidays) when zone heating, cooling, ventilation and air-conditioning should be completely switched off, or operated at frost, fabric or equipment protection levels.

In addition, products that also control zone heating and cooling must:

5. Incorporate a zone “optimum start” mechanism that monitors external and/or internal temperatures, and calculates when heating or cooling needs to begin in the zone in order to reach the pre-set temperature by the start of the next occupancy period.
6. Provide facilities that enable building managers to define different temperature set-points for each scheduled period of normal occupation throughout the day and week.

Notes

7. Products that control domestic hot water (DHW) systems must provide facilities that enable building managers to define a separate operating schedule for the operation of DHW systems.
8. Products must automatically reset overrides, either after a pre-defined time interval (which may be fixed or defined by the building manager) or at the next scheduled switching time.

Table 5 CONTROL OF CENTRALISED HVAC PLANT

Where products control the operation of centralised HVAC plant, they must:

1. Incorporate a mechanism that enables the building’s HVAC systems to be easily switched into economy or standby mode, for example, when a scheduled activity finishes early.

In addition, products that control central heating or cooling systems must:

2. Provide facilities to control the operation of the centralised heating or cooling systems, and zone environmental conditions based on zone occupation schedules (as defined in Table 4).
3. Monitor internal temperatures and automatically switch zone heating circuits on or cooling circuits off, to stop condensation occurring and to protect building fabric.
4. Incorporate an overall “optimum start” mechanism that monitors external or internal temperatures, and calculates when the heating or cooling system needs to be switched on in order to reach pre-set temperatures by the start of the next occupancy period, after taking account of the requirements of each zone.

Notes

5. Products that control centralised HVAC plant must be designed to control at least two zones.

Table 6 CONTROL OF WET HEATING SYSTEMS

Where products control the overall operation of wet heating systems, they must:

1. Incorporate a “self-adaptive weather compensation” mechanism that automatically saves energy during milder weather conditions, by reducing the temperature set-point of the boiler water circuit as the external temperature rises, and also the temperature of, or the heat flow through, the individual heating circuits for each zone controlled. The mechanism must be able to ‘learn’ the thermal characteristics of the zone(s) and to automatically optimise the amount of weather compensation applied to each zone.
2. Incorporate a “frost protection” mechanism that monitors external and/or internal temperatures (or pipework temperatures), and switches on boilers and heating circuits as required to prevent equipment and pipework from “freezing up”.
3. Provide facilities for building managers to “temporarily override” or manually adjust the degree (or amount) of weather compensation applied to each zone controlled.

Notes

4. The requirements in Table 5 also apply to products that control wet heating systems.

Where:

- Automatic control may be implemented either directly by means of an analogue or digital signal connection, or indirectly by means of another control device or network.
- A mechanism is defined as “any sequence of pre-defined actions that performs a given function, where an action can be defined in hardware and/or software”.
- An algorithm is defined as “a mechanism that is defined in software”.
- In this context: “activity” includes the unattended operation of plant and machinery.
- The product’s control strategy is the combination of automatic control functions, mechanisms and facilities specified for particular type of zone control or HVAC plant controlled. In this context, products may be pre-programmed in one of the following ways:
 - a) One or more fixed control strategies that are designed to control specific type of zone, or set of equipment (or plant), and that can be selected during commissioning.
 - b) One or more flexible control strategies that can be configured to control different types of zones, and equipment, as part of a clearly defined commissioning procedure.
- Products designed to control the types of equipment specified in Table 7, must also comply with the relevant parts of the eligibility criteria for ECA compliant products in those areas.
- Products that are designed to other types of equipment not specified in Table 7 are only eligible, if control is based on zone occupation schedules, status or levels of activity.

Table 7 Additional requirements when other types of equipment are controlled

Type of equipment controlled	Relevant ECA eligibility criteria
Electrical lighting equipment	Lighting controls
Automatic monitoring and targeting equipment	Component based AMT systems
Commercial refrigeration equipment	Refrigeration system controls
Two or more air compressors	Master controllers

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Close Control Air Conditioning Equipment

Date added to ETL 2009 (Revised 2012).

1. Definition of Technology

Close control air conditioning equipment covers products that are specifically designed to provide the cooling needed to maintain the air temperature, and optionally the relative humidity, in rooms that contain equipment or processes with high sensible heat loads.

2. Technology Description

Close control air conditioning equipment is used to control temperature (and optionally humidity) in rooms and enclosures containing heat generating equipment, such as servers, computers or telecommunications devices, and in some types of manufacturing process (e.g. clean rooms). The equipment typically operates continuously and has a much higher unit floor area cooling load requirement than conventional air conditioning.

Close control air conditioning equipment is available with a wide variety of efficiencies. The ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers seven categories of product:

1. DX air cooled close control air conditioning equipment (without free cooling coil).
2. DX air cooled close control air conditioning equipment with integral chilled water free cooling coil(s).
3. DX water cooled close control air conditioning equipment (without free cooling coil).
4. DX water cooled close control air conditioning equipment with integral chilled water free cooling coil(s).
5. Chilled water (CHW) cooled close control air conditioning equipment.
6. Dual mode: DX air cooled and chilled water (CHW) cooled close control air conditioning equipment (without free cooling).
7. Dual mode: DX water cooled and chilled water (CHW) cooled close control air conditioning equipment (without free cooling).

Where DX stands for 'direct expansion' and refers to products that effect cooling, or partial cooling, of the air by evaporating a refrigerant in their indoor heat exchangers.

Investments in close control air conditioning equipment can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- **Either** be a single packaged unit **or** consist of two or more factory built sub-assemblies that are designed to be connected together during installation.
- **Either** incorporate an electrically powered compressor (or compressors) **and / or** incorporate a chilled water cooling coil with fittings for connection to an external chilled water circuit.
- Have a ratio of sensible cooling capacity to the total cooling capacity (i.e. sensible heat ratio) that is greater than or equal to (\geq) 0.9 at the standard rating condition.
- Be CE marked.

Performance criteria

Products must have an energy efficiency ratio (EER), and a free cooling capacity (where applicable) that is greater than or equal to the values set out in Table 1 below.

Table 1 Performance thresholds for close control air conditioning equipment

	Product category	EER	Free cooling capacity
1.	DX air cooled (without free cooling).	≥ 2.70	
2.	DX air cooled with integral chilled water free cooling coil(s).	≥ 2.50	Free cooling coil cooling capacity $\geq 90\%$ of cooling capacity in DX operating mode at the standard rating condition (BS EN 14511-2:2011 Table 6, close control)
3.	DX water cooled (without free cooling).	≥ 3.00	
4.	DX water cooled with integral chilled water free cooling coil(s).	≥ 2.70	Free cooling coil cooling capacity $\geq 90\%$ of cooling capacity in DX operating mode at the standard rating condition (BS EN 14511-2:2011 Table 6, close control)
5.	Chilled water (CHW) cooled (only).	≥ 16.70	
6.	Dual mode: DX air cooled and chilled water cooling (without free cooling).	DX mode	≥ 2.70
		CHW mode	≥ 16.70
7.	Dual mode: DX water cooled and chilled water cooled (without free cooling).	DX mode	≥ 3.00
		CHW mode	≥ 16.70

' \geq ' means 'greater than or equal to'.

Where EER is the ratio of cooling capacity (Watts) to the electric power absorbed by the unit (P_{elec}).

For the avoidance of doubt test data should be presented to 2 decimal places. As an example an EER of 2.69 for a DX air cooled product would be deemed a fail.

Required test procedures

All products must be tested in accordance with the procedures and test conditions laid down in the standards specified in Table 2 below.

Table 2 Required test procedures for close control air conditioning equipment

	Product category		Standard	Rating condition
1.	DX air cooled (without free cooling).		BS EN 14511:2011	BS EN 14511-2:2011, Table 4, Standard rating conditions, Close control
2.	DX air cooled with integral chilled water free cooling coil(s).	DX refrigeration part	BS EN 14511:2011	BS EN 14511-2:2011, Table 4, Standard rating conditions, Close control
		Free cooling coil	BS 4856-3:1975 (if ducted) BS 4856-2:1975 (if not ducted) or BS EN 1397:1999	Liquid side conditions inlet/outlet 7/12°C Indoor heat exchanger BS EN 14511-2: 2011, Table 4, Standard rating conditions, Close control
3.	DX water cooled (without free cooling).		BS EN 14511:2011	BS EN 14511-2:2011, Table 6, Standard rating conditions, Close control
4.	DX water cooled with integral chilled water free cooling coil(s).	DX refrigeration part	BS EN 14511:2011	BS EN 14511-2:2011, Table 6, Standard rating conditions, Close control
		Free cooling coil	BS 4856-3:1975 (if ducted) BS 4856-2:1975 (if not ducted) or BS EN 1397:1999	Liquid side conditions inlet/outlet 7/12°C Indoor heat exchanger BS EN 14511-2: 2011, Table 4, Standard rating conditions, Close control
5.	Chilled water (CHW) cooled (only).		BS 4856-3:1975 (if ducted) BS 4856-2:1975 (if not ducted) or BS EN 1397:1999	Liquid side conditions inlet/outlet 7/12°C Indoor heat exchanger BS EN 14511-2: 2011, Table 4, Standard rating conditions, Close control
6.	Dual mode: DX air cooled and chilled water cooling (without free cooling).	DX mode	BS EN 14511:2011	BS EN 14511-2: 2011, Table 4, Standard rating conditions, Close control
		CHW mode	BS 4856-3:1975 (if ducted) BS 4856-2:1975 (if not ducted) or BS EN 1397:1999	Liquid side conditions inlet/outlet 7/12°C Indoor heat exchanger BS EN 14511-2: 2011, Table 4, Standard rating conditions, Close control
7.	Dual mode: DX water cooled and chilled water cooling (without free cooling).	DX mode	BS EN 14511:2011	BS EN 14511-2: 2011, Table 6, Standard rating conditions, Close control
		CHW mode	BS 4856-3:1975 (if ducted) BS 4856-2:1975 (if not ducted) or BS EN 1397:1999	Liquid side conditions inlet/outlet 7/12°C Indoor heat exchanger BS EN 14511-2: 2011, Table 4, Standard rating conditions, Close control

Where an external static pressure of at least (\geq) 20 Pascals must be used for testing downflow units with ducted outlets.

Please note that performance data obtained in accordance with the corresponding procedures and standard rating conditions laid down in BS EN 14511:2007 will be accepted as an alternative to testing in accordance with BS EN 14511:2011 until further notice.

Representative Testing

Where applications are being made for a range of two or more products that are variants of the same basic design, test data may be submitted for a representative selection of models, provided that all variants:

- Use the same refrigerant as the representative model.
- Have the same compressor type (i.e. manufacturer, method of compression (e.g. reciprocating or scroll) and type of enclosure (e.g. hermetic or semi-hermetic)) as the representative model.
- Fit within the same product category (e.g. are all DX air cooled without free cooling).
- Use the same indoor heat exchanger configuration (e.g. 4-row and fan blow through).

The representative models must be selected by dividing the range of products into groups of models with similar design characteristics, and testing a model in the lowest quartile of predicted performance in each group. The performance of each model in the group must be predicted using a validated mathematical model. As a minimum, at least two models must be tested in each range of products and in each laboratory used for product testing.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

High Speed Hand Air Dryers

Date added to ETL 2011 (Revised 2012)

1. Definition of Technology

High speed hand air dryers are products that are specifically designed to dry human hands by moving air past the hands in a manner that removes water from the hands by physical displacement and/or evaporation.

2. Technology Description

Hand air dryers are widely used in washrooms to dry hands after washing, as an alternative to paper or linen hand towels. They use an electric blower to produce one or more jets of air that are used to dry hands placed under, or into, the hand air dryer unit. Some models heat the air jets prior to use with electrical heating elements or by passing it over the electric motor that drives the blower.

Hand air dryers are available with a wide range of efficiencies. The ECA Scheme aims to encourage the purchase of high speed hand air dryer products with the highest efficiency.

Investments in hand air dryers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate an electrically driven blower that produces one or more jets of high speed air that can be used to dry human hands that are placed beneath, or into, the product.
- Automatically switch off power to the blower and air heater (where fitted) when hands are removed from the product's drying zone.
- **Not** incorporate facilities to wash or apply soap to hands, or to dispense towels.
- Be CE Marked.

Performance criteria

Eligible products must use less than 6.9 kWh of electricity per 1,000 standard drying cycles in its normal mode of operation.

For the avoidance of doubt, test data should be presented to one decimal place. As an example, a product uses 7.0 kWh per 1,000 standard drying cycles would be deemed to be a fail.

Required test procedures

The product's standard drying time should be determined in accordance with the procedures and test conditions set out in:

- Sections 5.3 and 6.3, NSF Protocol P335, "Hygienic Commercial Hand Dryers", May 2007.

The amount of electricity consumed by the product per standard drying cycle should be determined from the product's electrical power rating, which must be verified using calibrated instrumentation.

Where the product is fitted with an air heater this must be switched on during the tests.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Lighting

High Efficiency Lighting Units

Date added to ETL 2001 (Revised 2013).

1. Definition of Technology

High efficiency lighting units are products that are specifically designed to provide efficient illumination.

2. Technology Description

High efficiency lighting units (HELUs) are a combination of a light fitting (or luminaire), one or more lamps, and associated control gear that have been assembled either into a single packaged unit or a luminaire with remote control gear. Neither light fitting, lamp or control gear alone can be said to 'comply with the ETL'. HELUs may also incorporate lighting control devices such as light regulation (dimming) and 'presence' controls.

HELUs have been included in the Enhanced Capital Allowance (ECA) scheme because they offer substantial energy and carbon savings. A wide variety of products are available with a range of performance levels. The ECA Scheme aims to encourage the purchase of higher efficiency products that meet certain minimum design and performance standards.

The ECA Scheme covers four categories of products:

1. Amenity, accent and display lighting units
2. General interior lighting units
3. Exterior area lighting units
4. Exterior floodlighting units

Where:

- **Amenity lighting** is decorative lighting intended to enhance the appearance of a building or outdoor area in order to promote the activities of a business. It can include 'mood' lighting of hotels, bars and restaurants and other leisure activities; and decorative lighting for public areas of buildings and parts of buildings or the surrounding grounds (where such lighting is necessary to the enhancement of the business function). It does not include lighting to provide general illumination or circulation, or building lighting that would be present regardless of the type of business being carried out.
- **Display lighting** comprises lighting intended to highlight displays of exhibits or merchandise. It includes spot or projector lighting in shops, theatres, galleries and studios; illuminated signs associated with the business function; and display case lighting.
- **Accent lighting** comprises lighting that is intended to provide additional light over a specific small area in order to carry out or promote the activities of a business. This may include lighting required for a particular task (e.g. medical or dental examination, supplementary lighting for fine machining work or critical inspection work). It does not cover general lighting for an entire room or a large part of a room.
- **General interior lighting** covers all other interior lighting.

- **Exterior area lighting** covers all exterior lighting which is intended to provide downward light onto horizontal or near horizontal surfaces, including roadways, car parks, paths, stairs, ramps, gardens and other open spaces. This includes illuminated bollards and post-top lanterns.
- **Exterior floodlighting** covers exterior lighting that is intended to light vertical or near vertical surfaces, including floodlighting of buildings, monuments and statues.

Investments in products containing high efficiency lighting units can only qualify for Enhanced Capital Allowances if the products meet the eligibility criteria set out below. The individual products purchased do not need to be named on the Energy Technology Product List.

3. Eligibility Criteria

To be eligible, products must:

- Include one or more lamps, a luminaire and associated control gear.
- Use lamps other than light emitting diodes i.e. solid state lighting devices. (Products that use light emitting diodes are covered under White Light Emitting Diode Lighting Units).

In addition:

- The luminaire, lamps and control gear must be CE marked.
- Where products incorporate fluorescent or compact fluorescent lamps, they must be controlled by non-dimmable 'warm start' or 'dimmable' (regulating) type, high frequency (HF) electronic control gear.
- Where products incorporate compact fluorescent lamps, they must be of the non-integral type (i.e. those types that do not incorporate the control gear in the lamp cap).
- Where products incorporate high intensity discharge lamps rated below 200W, they must use electronic control gear.

In addition, lamps and control gear must comply with the following performance standards (where relevant):

- Compact fluorescent lamps must comply with BS EN 60901:1996 (as amended), "Single-capped fluorescent lamps. Performance specifications".
- Linear fluorescent lamps must comply with BS EN 60081:1998 (as amended), "Double-capped fluorescent lamps. Performance specifications".
- "Warm start" high-frequency control gear (where fitted) for fluorescent lamps must comply with BS EN 60929:2011, "AC and/or DC supplied electronic control gear for tubular fluorescent lamps. Performance requirements" or be ENEC marked.

Where products include light emitting diode(s) as well as another lamp type, they must also comply with the relevant parts of the White Light Emitting Diode Lighting Units criteria.

Performance criteria

All products must:

- Have a luminaire efficacy (i.e. lighting efficiency) that is greater than, or equal to, the thresholds set out in either Table 1 or Table 2 (as relevant) below, when tested after 100 hours of continuous operation.
- Have a power factor that is greater than, or equal to, 0.7 at all levels of product light output.

In addition:

- General lighting units installed indoors must comply with the glare and angular exclusion zone recommendations in paragraph 94 of HSG 38 (1997).
- Individual control gear must have a standby power not exceeding 0.5 Watts when the lighting unit incorporates an electronically addressed dimming or switching circuit. If the product is not fitted with an automatic switching or dimming circuit, the product must not consume power when it is switched off.
- Fluorescent and compact fluorescent lamps in all categories, and all lamps used in amenity, accent and display lighting units must have a colour rendering index that is at least Ra 80. All other lamps must have a colour rendering index of at least Ra 20.
- If the product incorporates dimming control it shall be tested at its highest light output level.

Table 1 - Minimum luminaire efficacies for high efficiency lighting units with CRI \geq 80 OR with lamp rated power less than 200 Watts per lamp.

Category	Minimum luminaire efficacy (in luminaire lumens per circuit watt)	
	With dimmer and photocell control	Without dimmer and photocell control
Amenity, accent and display lighting units	≥ 60	≥ 60
General interior lighting units using downlighting (DLOR/LOR \geq 0.9)	≥ 60	≥ 65
General interior lighting units using uplighting (DLOR/LOR $<$ 0.1)	≥ 75	≥ 80
General interior lighting units using combined up and down lighting (DLOR/LOR \geq 0.1 and $<$ 0.9)	$\geq 75 - (15 \times \text{DLOR/LOR})$	$\geq 80 - (15 \times \text{DLOR/LOR})$
Exterior area lighting units	≥ 65	≥ 65
Exterior floodlighting units	≥ 65	≥ 65

Table 2 - Minimum luminaire efficacies for high efficiency lighting units with CRI<80 AND with lamp rated power greater than or equal to 200 watts per lamp.

Product Category	Minimum luminaire efficacy (in luminaire lumens per circuit watt)	
	Lamp Watts >= 200 and < 500 per lamp	Lamp Watts >= 500 per lamp
General interior lighting units using downlighting (DLOR/LOR>=0.9)	>= 85	>= 105
General interior lighting units using uplighting (DLOR/LOR<0.1)	>= 105	>= 130
interior lighting units using combined up and down lighting (DLOR/LOR>=0.1 and <0.9)	>= 105 - (20 x DLOR/LOR)	>= 130 - (25 x DLOR/LOR)
Exterior area lighting units	>= 85	>= 105
Exterior floodlighting units	>= 85	>= 105

">=" means "greater than or equal to".

Where:

- Luminaire efficacy is defined in terms of lumens of light output emitted by the luminaire per circuit watt of electrical power consumed.
- The electrical power consumed (in circuit watts) is defined as the total power consumed by the whole lighting unit from main circuit connection point to lamp, including losses in the control gear (ballast).
- For amenity, accent and display lighting units, general interior lighting units, and exterior floodlighting units, light output is defined as:

Initial (100 hour) lamp lumen output x Light Output Ratio (LOR)

where the Light Output Ratio (LOR) is the ratio of the light emitted by the unit to that emitted by the bare lamp(s).

- For exterior area lighting units, light output is defined as:

Initial (100 hour) lamp lumen output x Downward Light Output Ratio (DLOR)

where the Downward Light Output Ratio (DLOR) is the ratio of the light emitted by the unit in a downward direction to that emitted by the bare lamp(s) in any direction. Thus for this type of lighting, upward light emitted by the unit does not count towards its light output.

- Lighting units 'with dimmer and photocell control' are defined as those that incorporate a light sensor which detects the ambient light level and a dimming controller that decreases the power consumed by the lamp(s) when the ambient light level exceeds the required value. The light sensor may be integrated into the luminaire or supplied with it as an essential component of the product.

Required test procedures

All products must be tested in accordance with the procedures laid down in:

- BS EN 13032-1:2004 (as amended), “Light and lighting. Measurement and presentation of photometric data of lamps and luminaires. Measurement and file format”.

For the avoidance of doubt test data should be presented to zero decimal places. As an example, an efficacy of 59 lumens per circuit watt for a display lighting unit would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Lighting Controls

Date added to ETL 2001 (Revised 2012).

1. Definition of Technology

Lighting controls are products that are specifically designed to switch electric lighting on or off, and/or to dim its output.

2. Technology Description

Lighting controls switch lighting on and off and enable electric lighting levels within specific areas to be adjusted, as and when required by changes in daylight or occupancy, or individual activities.

A wide variety of lighting control products are available, and these range from simple manual switches to fully automatic control systems that adjust electric lighting levels to reflect planned operating hours, occupation levels and the availability of daylight in specific areas.

The Enhanced Capital Allowance scheme aims to encourage the purchase of lighting controls that realise energy savings by automatically switching or dimming lighting in these ways.

Five different categories of lighting controls are covered by the ECA Scheme:

1. Time controllers that automatically switch off lighting, or dim it down, at predetermined times.
2. Presence detectors with associated switching controllers that monitor occupancy or movement of personnel, and automatically switch off lighting, or dim it down, when the area is unoccupied.
3. Daylight detectors with associated switching controllers that monitor daylight availability, and automatically switch off lighting when daylight is sufficient to illuminate the area.
4. Daylight detectors with associated dimming controllers that monitor daylight availability, and automatically dim lighting, by reducing its power consumption, to the level needed to sufficiently illuminate the area.
5. Central control units that provide the facility to manage the overall operation of electric lighting installations that include some or all of the categories of lighting controls above.

The above categories of lighting controls may be installed either individually or in combination.

Investments in lighting controls can only qualify for Enhanced Capital Allowances if the product meets the criteria as set out below. The individual products purchased do not need to be named on the Energy Technology Product List.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate one or more of the categories of lighting controls set out in Tables 1 to 5 below, and comply with the specific eligibility criteria in the relevant table(s).
- Be CE Marked.

Products may also incorporate the facility that permits the automatic switching of lights to be overridden on a central basis for maintenance or security purposes, or to ensure the safety of occupants during particular events or activities.

Table 1 Time Controllers
SECTION 1A -ELIGIBILITY CRITERIA
<p>To be eligible under this category of Lighting Controls:</p> <ul style="list-style-type: none"> The product must automatically switch the lighting off, or dim it down, at predetermined times of the day or week, or after a predefined interval. <p>Where automatic dimming controls are used, they must be capable of reducing the power consumption of the controlled lamps by at least 50%.</p> <p>Where fluorescent lighting is being dimmed, it must incorporate high frequency dimmable ballast and electronic control gear. Other forms of lighting may incorporate either mains frequency or high frequency dimmable ballasts and associated controls.</p>
SECTION 1B -Notes
<ol style="list-style-type: none"> The product may also be set to automatically switch on the lighting at predetermined times. Products may incorporate the facility for local users to manually switch on and off lighting in a local area and thus to override the predetermined lighting levels at that particular time. However products that allow local users to locally override subsequent predetermined times for the lighting to be automatically switched off, or dimmed down, are not eligible. If the product is designed to control any form of heating, ventilation or air conditioning (HVAC) equipment then, it must be listed under the HVAC Zone Controls part of the Energy Technology Product List (ETPL).

Table 2 Presence detectors with associated switching controllers
SECTION 2A -ELIGIBILITY CRITERIA
<p>To be eligible under this category of Lighting Controls:</p> <ul style="list-style-type: none"> The product must automatically switch off the lighting, or dim it down, after the area has become unoccupied. <p>Where automatic dimming controls are used, they must be capable of reducing the power consumption of the controlled lamps by at least 50%.</p> <p>Where fluorescent lighting is being dimmed, it must incorporate high frequency dimmable ballast and electronic control gear. Other forms of lighting may incorporate either mains frequency or high frequency dimmable ballasts and associated controls.</p>
SECTION 2B -Notes
<ol style="list-style-type: none"> The product may also automatically switch on the lighting when the space becomes occupied. Alternatively local users may manually switch on the lighting at the start of occupancy. Products may incorporate the facility for local users to manually override the presence detector/controller and to switch the lighting off at any particular instance. However products that allow local users to override the ability of the presence detector/controller to automatically switch off the lighting, or dim it down are not eligible.

Table 3 Daylight detectors with associated switching controllers

SECTION 3A -ELIGIBILITY CRITERIA
To be eligible under this category of Lighting Controls: <ul style="list-style-type: none">• The product must monitor the availability of daylight and automatically switch the lighting off when sufficient daylight is available to illuminate the area.
SECTION 3B -Notes
<ol style="list-style-type: none">1. The product may also automatically switch on the lighting when daylight has fallen below the required level. Alternatively local users could be allowed to switch on the lighting manually, when daylight has fallen below the required level.2. Products may incorporate the facility for local users to manually override daylight detector/controller and switch the lights off at any particular instance. However products that allow local users to override the ability of the daylight detector/controller to automatically switch off the lighting are not eligible.

Table 4 Daylight detectors with associated dimming controllers

SECTION 4A -ELIGIBILITY CRITERIA
To be eligible under this category of Lighting Controls: <ul style="list-style-type: none">• The product must monitor the availability of daylight and automatically dim the electric lighting to the level just needed to sufficiently illuminate the area.• The product must be able to reduce the power consumption of the lamps being controlled by at least 50% through dimming. <p>Where fluorescent lighting is being dimmed, it must incorporate high frequency dimmable ballasts and electronic control gear. Other forms of lighting may incorporate either mains frequency or high frequency dimmable ballasts and associated controls.</p>
SECTION 4B -Notes
<ol style="list-style-type: none">1. The product may also automatically switch on the lighting when daylight has fallen below the required level. Alternatively local users could be required to switch on the lighting manually, as and when needed.2. Products may incorporate the facility for local users to manually override the dimming controller at any particular instance and to set the lighting to a lower level than it would be under automatic control, or switch it off. However products that allow local users to override the ability of the daylight detector/controller to automatically dim the lighting are not eligible.

Table 5 Central control units (for lighting)
SECTION 5A -ELIGIBILITY CRITERIA
To be eligible under this category of Lighting Controls:
<ul style="list-style-type: none"> The product must be able to manage the overall operation of the electric lighting installation that includes some or all of the categories of lighting controls set out in Tables 1 to 4 above.
SECTION 5B -Notes
<ol style="list-style-type: none"> The product may make use of pre-programmed “scenes” that configure the lighting levels in different areas for a particular activity or daylight level or occupancy status in the most energy efficient manner. However products that are only capable of manual scene setting are not eligible. Products may also incorporate the facility to monitor lighting energy consumption. If the product is designed to control any form of heating, ventilation or air conditioning (HVAC) equipment then, it must be listed under the HVAC Zone Controls part of the Energy Technology Product List (ETPL).

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

White Light Emitting Diode Lighting Units

Date added to ETL 2008 (Revised 2013).

1. Definition of Technology

White light emitting diode lighting units are products that are specifically designed to provide white light by means of solid-state lighting devices.

2. Technology Description

White light emitting diodes (LEDs) are solid-state lighting devices that can be used to efficiently provide the levels of light output generally needed for all lighting applications.

White LED lighting units are products that consist of one or more white LEDs, incorporated into a light fitting (or luminaire) and includes associated electronic control gear. The luminaire generally also includes an optical system that reflects and/or focuses the product’s light output onto the item(s) being illuminated. White LED lighting units may also incorporate lighting control devices such as light regulation (dimming) and 'presence' controls. Luminaires designed to incorporate or supplied with LED based ‘lamps’ that retrofit to traditional light sources such as LED T8 replacement tubes or MR16 Low Voltage lamps are not included in the scope.

A wide variety of LED lighting units are available in a range of designs with different performance levels. The ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers four categories of products:

1. Amenity, accent and display lighting units
2. General interior lighting units
3. Exterior area lighting units
4. Exterior floodlighting units

Where:

- **Amenity lighting** is decorative lighting intended to enhance the appearance of a building or outdoor area in order to promote the activities of a business. It can include ‘mood’ lighting of hotels, bars and restaurants and other leisure activities; and decorative lighting for public areas of buildings and parts of buildings or the surrounding grounds (where such lighting is necessary to the enhancement of the business function). It does not include lighting to provide general illumination or circulation, or building lighting that would be present regardless of the type of business being carried out.
- **Display lighting** comprises lighting intended to highlight displays of exhibits or merchandise. It includes spot or projector lighting in shops, theatres, galleries and studios; illuminated signs associated with the business function; and display case lighting.
- **Accent lighting** comprises lighting that is intended to provide additional light over a specific small area in order to carry out or promote the activities of a business. This may include lighting required for a particular task (e.g. medical or dental examination, supplementary lighting for fine machining work or critical inspection work). It does not cover general lighting for an entire room or a large part of a room.
- **General interior lighting** covers all interior lighting other than amenity, accent and display lighting as defined above. General interior lighting includes **Industrial lighting** which comprises hi-bay, installations for manufacturing processes and storage.
- **Exterior area lighting** covers all exterior lighting which is intended to provide downward light onto horizontal or near horizontal surfaces, including roadways, car parks, paths, stairs, ramps, gardens and other open spaces. This includes illuminated bollards and post-top lanterns.
- **Exterior floodlighting** covers exterior lighting that is intended to light vertical or near vertical surfaces, including floodlighting of buildings, monuments and statues.

Investments in products containing white light emitting diode lighting units can only qualify for Enhanced Capital Allowances if the products meet the eligibility criteria set out below. The individual products purchased do not need to be named on the Energy Technology Product List.

3. Eligibility Criteria

To be eligible, products must:

- Include one or more solid-state LED devices, luminaire and associated electronic control gear.
- Be capable of producing white light. White light is defined in Annex 2, paragraph 3b of EC Regulation 245/2009 “Implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for fluorescent lamps without

integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps”.

- Use electronic control gear that complies with the following standards:
 - BS EN 61347-2-13:2006, “Lamp control gear. Particular requirements for dc. or ac supplied electronic control gear for LED modules”.
 - BS EN 62384:2006 (as amended), “DC or AC supplied electronic control gear for LED modules. Performance requirements”.
- Be CE Marked.

Where products also combine both light emitting diode(s) and another lamp type, they must also comply with the relevant parts of the High Efficiency Lighting Units criteria.

Performance criteria

All products must:

- Have a luminaire efficacy (i.e. lighting efficiency) that is greater than, or equal to, the thresholds set out in Table 1 below, after 100 hours of continuous operation.
- Be able to provide a light output (in lumens) after 6000 hours of continuous operation that is not less than 90% of their initial light output (in lumens).
- Have a colour rendering index that meets the requirements of Section 2.1 of Commission Regulation (EU) no 1194/201 (implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for directional lamps, light emitting diode lamps and related equipment)
- Have a power factor that is greater than, or equal to, 0.7 at all levels of product light output.

In addition:

- General lighting units installed indoors must comply with the glare and angular exclusion zone recommendations in paragraph 94 of HSG 38 (1997), “Lighting at work” (ISBN: 9780717612321).
- Individual control gear must have a standby power not exceeding 0.5 Watts when the lighting unit incorporates an electronically addressed dimming or switching circuit. If the product is not fitted with an automatic switching or dimming circuit, the product must not consume power when it is switched off.
- Amenity, accent and display lighting units to be installed indoors must have a minimum light output of at least 100 lumens after 100 hours of continuous operation. All other luminaires must have a minimum light output of at least 200 lumens after 100 hours of continuous operation.

Table 1 - Minimum luminaire efficacies for white LED lighting units

Category	Minimum luminaire efficacy (in luminaire lumens per circuit watt)	
	With dimmer and photocell control	Without dimmer and photocell control
Amenity, accent and display lighting units	≥ 60	≥ 60
General interior lighting units using downlighting (DLO/TLO \geq 0.9)	≥ 60	≥ 65
General interior lighting units using uplighting (DLO/TLO $<$ 0.1)	≥ 75	≥ 80
General interior lighting units using combined up and down lighting (DLO/TLO \geq 0.1 and $<$ 0.9)	$\geq 75 - (15 \times \text{DLO/TLO})$	$\geq 80 - (15 \times \text{DLO/TLO})$
Exterior area lighting units	≥ 65	≥ 65
Exterior floodlighting units	≥ 65	≥ 65

" \geq " means "greater than or equal to".

Where:

- Luminaire efficacy is defined in terms of the lumens of light output emitted by the luminaire per circuit watt of electrical power consumed.
- The electrical power consumed (in circuit watts) is defined as the total power consumed by the whole lighting unit from main circuit connection point to 'LED module', including losses in the power supply and constant current source, and losses due to the effects of temperature. It is not the 'rated wattage' of the LED chip.
- The product must perform at the minimum required efficacy at each drive current for which the product is designed to operate, when tested after 100 hours of continuous operation. If the product incorporates dimming control it shall be tested at its highest light output level.
- For amenity, accent and display lighting units, general interior lighting units, and exterior floodlighting units, light output is defined as the total light output in all directions (TLO), which is the sum of:
 - a) Light output in a downward direction (DLO) i.e. below the horizontal as installed, and
 - b) Light output in an upward direction (ULO) i.e. above the horizontal as installed.
- For exterior area lighting units **only**, light output is defined as total light output in a downward direction (DLO) only i.e. below the horizontal as installed (i.e. light output in an upward direction is not included in the calculation of product light output or luminaire efficacy).
- Lighting units 'with dimmer and photocell control' are defined as those that incorporate a light sensor which detects the ambient light level and a dimming controller that decreases the power consumed by the lamp(s) when the ambient light level exceeds the required value. The light sensor may be integrated into the luminaire or supplied with it as an essential component of the product.

Required test procedures

All products must be tested in accordance with the procedures laid down in one of the following:

- BS EN 13032-1:2004, “Light and lighting. Measurement and presentation of photometric data of lamps and luminaires. Measurement and file format”.
- IES LM-79-08, “Electrical and Photometric Measurements of Solid-State Lighting Products”.
- DD IEC/PAS 62722-2-1:2011. “Luminaire performance Part 2-1: Particular requirements for LED luminaires”.

However if a product is sold solely for use in refrigerators or freezers with a declared application temperature of 5°C or below, its efficacy and luminous flux may be measured at a temperature of between 0° and 5°C on its external casing. The light output measurements at 0 and 6000 hours shall both be made at the same temperature.

The following test conditions must be observed:

- Testing of efficacy, minimum light output, power factor and standby power must be conducted on the complete product (i.e. solid state LED device(s), luminaire and associated electronic control gear) and under normal operating conditions.
- Measurements of the reduction in product light output with time shall be made over a period of 6000 hours according to the methods in either DD IEC/PAS 62722-2-1:2011 “Luminaire performance Part 2-1: Particular requirements for LED luminaires” or IES LM-80-08, “Measuring Lumen Maintenance of LED Light Sources”. These measurements must be carried out on the complete product.
- Measurements of the product’s light output and electrical power consumption at different drive currents must be taken after the junction temperature has stabilised to a constant level after selecting the particular drive current.

For the avoidance of doubt test data should be presented to zero decimal places. As an example, an efficacy of 59 lumens per circuit watt for a display lighting unit would be deemed to be a fail.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Motors and Drives

Integrated Motor Drive Units

Date added to ETL 2001 (Revised 2009).

1. Definition of Technology

An integrated motor drive unit is a product that is specifically designed to rotate a drive shaft and vary its speed in a controlled manner in response to an external signal, by means of an electronic variable speed drive (VSD) and 3 phase ac induction motor. The VSD and motor are permanently mechanically and electrically connected in a manner that does not require an external connection to be made between the VSD and the motor prior to use.

2. Technology Description

An integrated motor drive unit is a combination of an electronic variable speed drive (VSD) and an ac induction motor. The VSD is physically mounted on the motor, and is specifically designed to drive that particular motor and thus is optimally matched to it. This makes an integrated motor drive unit easier to deploy than purchasing two separate components.

An integrated motor drive unit may be purchased as a stand-alone product or purchased as part of another item of plant or machinery. These products are included on the Energy Technology Product List because they can realise substantial energy savings when used to control the speed of non-positive-displacement type machinery, instead of traditional methods of flow regulation such as mechanical dampers and throttle valves.

Investments in integrated motor drive units can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Eligible products must:

- Incorporate a 3 phase ac induction motor.
- Incorporate an electronic VSD that generates a controlled variable frequency, variable voltage, 3 phase power output (with each phase displaced by approximately 120 degrees) that is suitable for operating the 3 phase ac induction motor.
- Be configured for direct connection to the UK public electricity supply system, or a private alternating current supply of nominally fixed frequency and voltage.
- Provide an adjustable, controlled variable-torque output that can be matched to the torque-speed characteristic of the load (being driven by the product's motor), including both loads with a quadratic torque-speed and linear torque-speed characteristics. The relationship between the speed of the product's output and the torque applied to the load must either be:
 - a) Predefined prior to sale to match a number of specific motor loads, which can be selected during commissioning; OR
 - b) Programmed into the product during installation using a multi-point approximation as part of a clearly defined commissioning procedure; OR

- c) Determined during commissioning by a self-tuning algorithm that automatically minimises the energy consumption of the drive; OR
 - d) Automatically adjusted during operation in a manner that ensures the product's output matches the characteristics of the motor and its load; OR
 - e) Any combination of (a) to (d) above.
- Be able to automatically vary, in response to an external control signal, the frequency of its output between 5% (or less) and 100% (or greater) of the frequency of its alternating current supply.
 - Be CE Marked.
 - **Not** incorporate any type of mechanical apparatus that derives its motive force from the product's motor, except for fans or pumps incorporated solely for the purpose of product cooling or lubrication.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Permanent Magnet Synchronous Motors

Date added to ETL 2010.

1. Definition of Technology

Permanent magnet synchronous motors are products that are specifically designed to rotate a mechanical drive shaft by converting a multi-phase electrical power input into a rotating magnetic field, and applying it to an array of permanent magnets that turns the mechanical drive shaft.

Permanent magnet synchronous motor drives consist of a permanent magnet synchronous motor, and a matched, electronic, variable speed drive (VSD) that is specifically designed to provide the variable frequency, multi-phase electrical power input needed to operate the permanent magnet synchronous motor, and to vary its speed in a controlled manner in response to an external signal.

2. Technology Description

A permanent magnet synchronous motor is a 'self-excited' synchronous motor that uses permanent magnets to provide the rotational forces needed to turn the mechanical drive shaft, when electric power is applied to the motor. The permanent magnets are integrated into the rotating part of the motor or 'rotor', and perform a similar function to the rotor windings within an ac induction motor.

Permanent magnet synchronous motors are generally more compact and are more energy efficient than an ac induction motor with the same power rating, because they do not require rotor windings.

A permanent magnet synchronous motor drive is a combination of synchronous permanent magnet motor and an electronic variable speed drive (VSD). The VSD can either be physically mounted on the motor to form a single factory assembled, integrated unit, or the VSD and motor can be supplied as a package of two units that are designed to be connected together during installation.

Permanent magnet synchronous motors are available in a wide range of designs and efficiencies. The ECA Scheme aims to support the purchase of higher efficiency products.

The ECA Scheme covers three categories of product:

1. Permanent magnet synchronous motors (sold without VSD).
2. Integrated permanent magnet synchronous motor drive units.
3. Matched permanent magnet synchronous motor drive packages.

Investments in permanent magnet synchronous motors can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

Eligible products must:

- Incorporate a permanent magnet synchronous motor that:
 - a) Has a rated operating voltage between 200 and 700 Volts ac.
 - b) Is CE Marked.
- **Not** incorporate any type of mechanical apparatus that derives its motive force from the product's motor, except for fans or pumps incorporated solely for the purpose of product cooling or lubrication, integrated torque couplings, and position encoding mechanisms.

In addition, all products that include an electronic variable speed drive (VSD) must:

- Be configured for direct connection to the UK public electricity supply system, or a private alternating current supply of nominally fixed frequency and voltage.
- Provide an adjustable, controlled variable-torque output that can be matched to the torque-speed characteristic of the load (being driven by the product's motor). The relationship between the speed of the product's output and the torque applied to the load must either be:
 - a) Predefined prior to sale to match a number of specific motor loads, which can be selected during commissioning; OR
 - b) Programmed into the product during installation using a multi-point approximation as part of a clearly defined commissioning procedure; OR
 - c) Determined during commissioning by a self-tuning algorithm that automatically minimises the energy consumption of the drive; OR
 - d) Automatically adjusted during operation in a manner that ensures the product's output matches the characteristics of the motor and its load; OR
 - e) Any combination of (a) to (d) above.
- Be able to automatically vary, in response to an external control signal, the speed of its output between 5% (or less) and 100% (or greater) of its rated maximum continuous speed.

- Be CE Marked, or otherwise demonstrate conformity with the requirements of the EU EMC Directive 89/336/EEC, or its replacement EU EMC Directive 2004/108/EC.

Performance criteria

Products must have an efficiency at 100% of their maximum continuous speed rating that is greater than or equal to the values shown in Table 1 below, which vary with power rating and maximum continuous speed rating. If the product's specific power rating is not shown in Table 1, then the performance threshold for the next highest power rating should be used to determine eligibility.

Table 1 Performance thresholds for permanent magnet synchronous motors

Power Rating (kW)	Maximum continuous speed rating (RPM)					
	Up to 325	326 to 750	751 to 1,000	1,001 to 1,500	1,501 to 3,000	Over 3,000
<=0.75	>= 71.7	>= 75.3	>= 78.9	>= 82.5	>= 80.7	>= 78.9
1.1	>= 74.8	>= 77.9	>= 81.0	>= 84.1	>= 82.7	>= 81.3
1.5	>= 76.9	>= 79.7	>= 82.5	>= 85.3	>= 84.2	>= 83.1
2.2	>= 79.5	>= 81.9	>= 84.3	>= 86.7	>= 85.9	>= 85.1
3.0	>= 81.4	>= 83.5	>= 85.6	>= 87.7	>= 87.1	>= 86.5
4.0	>= 83.2	>= 85.0	>= 86.8	>= 88.6	>= 88.1	>= 87.6
5.5	>= 84.8	>= 86.4	>= 88.0	>= 89.6	>= 89.2	>= 88.8
7.5	>= 86.5	>= 87.8	>= 89.1	>= 90.4	>= 90.1	>= 89.8
11.0	>= 88.1	>= 89.2	>= 90.3	>= 91.4	>= 91.2	>= 91.0
15.0	>= 89.4	>= 90.3	>= 91.2	>= 92.1	>= 91.9	>= 91.7
18.5	>= 89.9	>= 90.8	>= 91.7	>= 92.6	>= 92.4	>= 92.2
22.0	>= 90.6	>= 91.4	>= 92.2	>= 93.0	>= 92.7	>= 92.4
30.0	>= 91.5	>= 92.2	>= 92.9	>= 93.6	>= 93.3	>= 93.0
37.0	>= 92.1	>= 92.7	>= 93.3	>= 93.9	>= 93.7	>= 93.5
45.0	>= 92.7	>= 93.2	>= 93.7	>= 94.2	>= 94.0	>= 93.8
55.0	>= 93.1	>= 93.6	>= 94.1	>= 94.6	>= 94.3	>= 94.0
75.0	>= 93.8	>= 94.2	>= 94.6	>= 95.0	>= 94.7	>= 94.4
90.0	>= 94.3	>= 94.6	>= 94.9	>= 95.2	>= 95.0	>= 94.8
110.0	>= 94.5	>= 94.8	>= 95.1	>= 95.4	>= 95.2	>= 95.0
132.0	>= 95.0	>= 95.2	>= 95.4	>= 95.6	>= 95.4	>= 95.2
160.0	>= 95.2	>= 95.4	>= 95.6	>= 95.8	>= 95.6	>= 95.4
>= 200.0	>= 95.4	>= 95.6	>= 95.8	>= 96.0	>= 95.8	>= 95.6

">=" means "greater than or equal to"

"<=" means "less than or equal to"

Where the power rating is the ‘Duty type S1 - Continuous running duty’ as defined in Section 4.2.1 of BS EN 60034-1: 2004 (as amended) “Rotating electrical machines - Part 1: Rating and performance” and is determined with the product operating at 100% of its maximum continuous speed rating.

For the avoidance of doubt test data should be presented to 1 decimal place. As an example, a product with a rated power output of 45.0 kW, maximum continuous rated speed of 1,200 rpm, and an efficiency of 94.1 % would be deemed to be a fail.

Required test procedures

Product efficiency at 100% of maximum continuous speed rating must be determined using:

- The low uncertainty, direct measurement method in Section 9.1.1 of BS EN 60034-2-1:2007 “Rotating electrical machines - Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)”. Where the input power P_1 , must be measured at the main input terminals to the electronic variable speed (VSD) drive.

Products must be operated from a standard 230, 400 or 690 Volt ac, 50Hz electrical power supply during testing, and any filters that are required by the product in order to comply with EU EMC Directives must be fitted.

Where the product does not include a VSD, it may be tested using any appropriately matched VSD.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Single Speed AC Induction Motors

Date added to ETL 2001 (Revised 2012).

1. Definition of the Technology

Single speed ac induction motors covers products that are specifically designed to convert electrical power into mechanical power, and to rotate a drive shaft at a fixed speed that is directly related to the frequency of the electrical power supply, by means of standard, three phase, ac induction motor.

2. Technology Description

Single speed ac induction motors are used to drive plant and machinery throughout industry and commerce, and a wide range ‘general purpose’ products are available in internationally agreed, standard designs with different rated power outputs, frame sizes, fixed operating speeds, and energy efficiency ratings.

The ECA Scheme aims to encourage the purchase of higher efficiency single speed ac induction motors.

Investments in single speed ac induction motors can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet minimum performance criteria as set out below.

3. Eligibility Criteria

To be eligible products must:

- Be a totally enclosed, squirrel cage type, three-phase, single speed, ac induction motor that has:
 - a) A maximum rated operating voltage less than or equal to 1,000 Volts ac
 - b) 2, 4, 6 or 8 poles.
 - c) A built in method of cooling that is classified according to BS EN 60034-6:1994, “Rotating electrical machines. Methods of cooling (IC Code) as:
 - IC 410: (frame surface cooled - free convection),
 - IC 411: (frame surface cooled - self circulation)
 - IC 418: (frame surface cooled circulation by relative displacement.)
 - d) Dimensions and a power rating that conform with the requirements of IEC 60072-1: 1991-02 (sixth edition), “Dimensions and output series for rotating electrical machines - Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080”.
- Be rated at 50 Hz in accordance BS EN 60034-1:2010 (or IEC 60034-1: 2010) “Rotating electrical machines - Part 1: *Rating and performance*”.
- Have a ‘Duty type S1 - Continuous running duty’ rated power output that is greater than or equal to 0.75kW and less than or equal to 400kW as defined in Section 4.2.1 of BS EN 60034-1: 2010.
- Be CE Marked.

Performance Criteria

Products must have an efficiency when tested in accordance with BS EN 60034-2-1: 2007 at full load (i.e. 100% of their maximum continuous rated power output) that is greater than or equal to the values shown in Table 1 below, which vary with rated power output and number of poles. If the product’s specific rated power output is not shown in Table 1, then the performance threshold by interpolation in accordance with the method set out in Section 5.4.1.1 of BS EN 60034-30: 2009.

Table 1 Performance thresholds for single speed ac induction motors

Rated Power Output (kW)	Efficiency at full load			
	2 Pole	4 Pole	6 Pole	8 Pole
0.75	>= 80.7	>= 82.5	>= 78.9	>= 75.0
1.1	>= 82.7	>= 84.1	>= 81.0	>= 77.6
1.5	>= 84.2	>= 85.3	>= 82.5	>= 79.6
2.2	>= 85.9	>= 86.7	>= 84.3	>= 81.9
3	>= 87.1	>= 87.7	>= 85.6	>= 83.6
4	>= 88.1	>= 88.6	>= 86.8	>= 85.0
5.5	>= 89.2	>= 89.6	>= 88.0	>= 86.5
7.5	>= 90.1	>= 90.4	>= 89.1	>= 87.8
11	>= 91.2	>= 91.4	>= 90.3	>= 89.3
15	>= 91.9	>= 92.1	>= 91.2	>= 91.2
18.5	>= 92.4	>= 92.6	>= 91.7	>= 91.7
22	>= 92.7	>= 93.0	>= 92.2	>= 92.2
30	>= 93.3	>= 93.6	>= 92.9	>= 92.9
37	>= 93.7	>= 93.9	>= 93.3	>= 93.3
45	>= 94.0	>= 94.2	>= 93.7	>= 93.7
55	>= 94.3	>= 94.6	>= 94.1	>= 94.1
75	>= 94.7	>= 95.0	>= 94.6	>= 94.6
90	>= 95.0	>= 95.2	>= 94.9	>= 94.9
110	>= 95.2	>= 95.4	>= 95.1	>= 95.1
132	>= 95.4	>= 95.6	>= 95.4	>= 95.4
160	>= 95.6	>= 95.8	>= 95.6	>= 95.6
200	>= 95.8	>= 96.0	>= 95.8	>= 95.8
250	>= 95.8	>= 96.0	>= 95.8	>= 95.8
280	>= 95.8	>= 96.0	>= 95.8	>= 95.8
315	>= 95.8	>= 96.0	>= 95.8	>= 95.8
355	>= 95.8	>= 96.0	>= 95.8	>= 95.8
375	>= 95.8	>= 96.0	>= 95.8	>= 95.8
400	>= 95.8	>= 96.0	>= 95.8	>= 95.8

">=" means "greater than or equal to"

For the avoidance of doubt test data should be presented to 1 decimal place. As an example, a 4 pole, single speed motor with a rated power output of 45.0 kW and an efficiency at full load of 94.1% would be deemed to be a fail.

Required test procedures

Product efficiency at full load (100% of maximum continuous rated power output) must be determined in accordance with:

- The low uncertainty method according to Table 2 (Induction Machines) of BS EN 60034-2-1:2007 “Rotating electrical machines - Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)”.

Products must be operated from a 400 Volt ac, 3 phase, 50Hz electrical power supply during testing. (If the product is not designed to operate at this voltage, then product testing should be undertaken using a 230V ac or 690 Vac electrical power supply, or alternatively at all rated operating voltages).

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Variable Speed Drives

Date added to ETL 2001 (Revised 2013).

5. Definition of Technology

A variable speed drive is specifically designed to drive a motor in a manner that rotates the motor’s drive shaft at a variable speed dictated by an external signal.

6. Technology Description

A variable speed drive is essentially an electronic power converter that generates a multi-phase, variable frequency output that can be used to drive a standard ac induction motor, or permanent magnet synchronous motor, and to modulate and control the motor’s speed, torque and mechanical power output.

Variable speed drives may be purchased either as a stand-alone product or purchased as part of another item of plant or machinery. They are included on the Energy Technology Product List because they can realise substantial energy savings when used to control the speed of machinery.

The ECA Scheme covers two categories of products:

1. Variable Speed Drives for ac induction motors
2. Variable Speed Drives for permanent magnet synchronous motors

Investments in variable speed drives can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

7. Eligibility Criteria

Eligible products must:

- Incorporate an electronic VSD that generates a controlled variable frequency, variable voltage, 3 phase power output (with each phase displaced by approximately 120 degrees) that is suitable for operating a 3 phase motor.
- Provide an adjustable variable-voltage, variable-frequency output that can be matched to the torque-speed characteristic of the load (being driven by the motor), including both loads with a quadratic torque-speed and linear torque-speed characteristics. The relationship between the voltage and frequency of the product's output must either be:
 - a) Predefined prior to sale to match a number of specific motor loads, which can be selected during commissioning; OR
 - b) Programmed into the product during installation using a multi-point approximation or parametric motor model as part of a clearly defined commissioning procedure; OR
 - c) Determined during commissioning by a self-tuning or automatic model identification algorithm that automatically minimises the energy consumption of the drive; OR
 - d) Automatically adjusted during operation as part of a vector control algorithm in a manner that ensures the product's output matches the characteristics of the motor and its load and minimises energy consumption of the drive; OR
 - e) Any combination of (a) to (d) above.
- Be able to automatically vary, in response to an external control signal, the frequency of its output between 5% (or less) and 100% (or greater) of the frequency of its alternating current supply.
- Be configured for direct connection to the UK public electricity supply system, or a private alternating current supply of nominally fixed frequency and voltage.
- Be designed to make smooth controlled transitions between speed changes by the use of predefined, programmable, or automatically adjusted, acceleration and deceleration ramps.
- **Be CE Marked, or otherwise demonstrate conformity with the requirements of the EU EMC Directive 89/336/EEC, or its replacement EU EMC Directive 2004/108/EC.**
- **Not** incorporate any type of mechanical apparatus that derives its motive force from the product's variable frequency output, including any form of electric motor or fluid movement mechanism, except for fans or pumps incorporated solely for the purpose of product cooling.

Where the relationship between the voltage and frequency of the product's output is determined by a multi-point approximation, then flux optimisation must be adjustable at a minimum of five points.

8. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Pipework Insulation

Date added to ETL 2001 (Revised 2013).

9. Definition of Technology

Pipework insulation covers products that are specifically designed to be applied to the outer circumference of a pipe with the primary objective of reducing thermal flow into or out of the pipe.

10. Technology Description

Pipework insulation is used to reduce the amount of heat lost from pipework containing hot fluids, and the amount of heat gained by pipework containing cold and chilled fluids, thus reducing the amount of energy wasted on maintaining the temperature of the fluids.

The ECA Scheme covers six categories of pipework insulation:

1. Refrigeration pipework.
2. Chilled water pipework
3. Process pipework.
4. 'Domestic' heating & hot water services (excluding insulation within individual dwellings).
5. Non-domestic hot water services.
6. Non-domestic heating services.

Investments in pipework insulation can only qualify for Enhanced Capital Allowances if the installation meets the eligibility criteria set out below. Individual products used in an installation do not need to be named on the Energy Technology Product List.

11. Eligibility Criteria

To be eligible, installations of pipework insulation must:

1. For categories 1, 2 and 3, comply with the relevant clauses, tables and annexes of BS 5422: 2009 as set out in Table 1 below.

Table 1: Relevant clause, table(s) and annex(es) of BS 5422 (2009) used to determine the minimum required thickness for each category of pipework insulation covered by the ECA Scheme.

	Category	Relevant Clause	Relevant Table(s)	Relevant Annex
1.	Refrigeration pipework.	6	None	F
2.	Chilled water pipework.	7	10 & 11	A
3.	Process pipework.	10	21	A

2. For categories 4, 5 and 6, comply with the maximum permissible heat loss criteria found within Tables 2, 3 & 4 below, which duly form the basis for determining the minimum required thickness of pipework insulation for each category for an eligible installation.

Table 2: Maximum Permissible Heat Losses for Domestic Heating & Hot Water

Domestic Heating & Hot Water Maximum permitted heat loss (W/m), where temperature = 60°C	
Outside pipe diameter (mm)	Permitted Heat loss (W/m)
8	<= 5.82
10	<= 6.20
12	<= 6.52
15	<= 7.03
22	<= 8.02
28	<= 8.87
35	<= 9.63
42	<= 10.58
54	<= 11.83

Table reproduced with kind permission from the 'ECA Enhanced' tables of NES Y-50 (2011).

Table 3: Maximum Permissible Heat Losses for Non-Domestic Hot Water Supply

Non-Domestic Hot Water Supply Maximum permitted heat loss (W/m), where temperature = 60°C	
Outside pipe diameter (mm)	Permitted Heat loss (W/m)
17.2	<= 6.04
21.3	<= 6.45
26.9	<= 7.00
33.7	<= 7.71
42.4	<= 8.46
48.3	<= 9.01
60.3	<= 9.94
76.1	<= 11.25
88.9	<= 12.17
114.3	<= 14.29
139.7	<= 16.09
168.3	<= 18.24
219.1	<= 22.06
273 and above	<= 25.95

Table reproduced with kind permission from the 'ECA Enhanced' tables of NES Y-50 (2011).

Table 4: Maximum Permissible Heat Losses for Non-Domestic Heating Supplies

Non-Domestic Heating Installations Maximum permitted heat loss (W/m)			
Temperature	Low	Medium	High
	$\leq 95^{\circ}\text{C}$	$96-120^{\circ}\text{C}$	$121-150^{\circ}\text{C}$
Outside pipe diameter (mm)	Permitted Heat loss (W/m)	Permitted Heat loss (W/m)	Permitted Heat loss (W/m)
17.2	≤ 7.78	≤ 10.57	≤ 13.27
21.3	≤ 8.42	≤ 11.25	≤ 14.06
26.9	≤ 9.05	≤ 12.06	≤ 15.02
33.7	≤ 9.86	≤ 13.04	≤ 16.07
42.4	≤ 10.83	≤ 14.12	≤ 17.34
48.3	≤ 11.42	≤ 14.80	≤ 18.09
60.3	≤ 12.61	≤ 16.22	≤ 19.62
76.1	≤ 14.12	≤ 17.88	≤ 21.41
88.9	≤ 15.28	≤ 19.20	≤ 22.87
114.3	≤ 17.51	≤ 21.66	≤ 25.53
139.7	≤ 19.72	≤ 23.99	≤ 27.98
168.3	≤ 22.34	≤ 26.63	≤ 30.69
219.1	≤ 26.61	≤ 31.15	≤ 35.25
273 and above	≤ 30.91	≤ 35.83	≤ 40.05

Table reproduced with kind permission from the 'ECA Enhanced' tables of NES Y-50 (2011).

Where:

- Where “ \leq ” means “less than or equal to”
- If the pipe diameter differs from the parameters used to generate these tables, then linear interpolation methods may be used to calculate the maximum permissible heat flows and, in combination with information on the thermal conductivity of the chosen product at the relevant mean temperature, the minimum required thickness of insulation.
- If the parameters of the specific installation are outside the scope of these tables (e.g. different ambient air temperature, or linear interpolation is not possible) then the minimum required thickness of insulation must be calculated from first principles using the methodology set out in Annex A of BS 5422: 2009.
- The methodology set out in Annex F of BS 5422: 2009 must be used to calculate the minimum required thickness for refrigeration pipework insulation needed to comply with clause 6.3.2 of BS 5422: 2009.

12. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the pipework insulation products, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Radiant and Warm Air Heaters

Biomass Fired Warm Air Heaters

Date added to ETL 2010.

1. Definition of Technology

Biomass fired warm air heaters covers products that are specifically designed to provide space heating by using the heat generated by a continuously stoked biomass burner to raise the air temperature in the space(s) being heated.

2. Technology Description

Biomass fired warm air heaters are used to provide space heating for workshops, factories, warehouses, retail sheds, sports centres, and other buildings containing similarly large spaces. They contain a continuously stoked burner that is used to heat the air in the space indirectly by means of heat exchanger. A fan is used to distribute the warm air throughout the space(s) being heated.

Biomass fired warm air heaters are available in a range of different types and efficiencies. The ECA Scheme encourages the purchase of higher efficiency biomass fired warm air heaters.

Investments in biomass fired warm air heaters can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be designed to burn wood, cereal straw, or solid fuels derived from them.
- Incorporate an automatic stoker that supplies a continuous flow of fuel into the combustion chamber at a rate corresponding to the rate of combustion.
- Incorporate a fan to distribute warm air within the heated space.
- Be CE marked.

Performance criteria

All products must have a net thermal efficiency when operating at 100% of their maximum continuous rating (MCR) that is greater than, or equal to, 82.0%.

For the avoidance of doubt net thermal efficiency test data should be presented to 1 decimal place. As an example, a biomass fired warm air heater with a net thermal efficiency of 81.9% at 100% of its maximum continuous rating (MCR) would be deemed to be a fail.

Required test procedures

The product's net thermal efficiency at 100% of its maximum continuous rating (MCR) must be determined in accordance with:

- The method in BS EN 1020:1998, “Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, incorporating a fan to assist transportation of combustion air and/or combustion products”.

The product’s flue gas losses must be determined in accordance with the procedures at BS EN 13240:2001, “Roomheaters fired by solid fuel. Requirements and test methods”.

All tests must be done using either a biomass test fuel (designated A1, A2, B1, B2, C & D) in accordance with Table 8 of BS EN 303-5:1999, or using sawdust and/or shavings from woodworking operations.

All testing must be carried out, or witnessed and certified, by a contractor that is accredited by the United Kingdom Accreditation Scheme (UKAS), or other equivalent national accreditation bodies recognised via the European Co-operation for Accreditation, the International Accreditation Forum, or the International Laboratory Accreditation Co-operation (ILAC) agreements for the measurements made during the testing.

Representative Testing

Where applications are being made for products of the same constructional design to be included on the Energy Technology Product List (ETPL), test data may be submitted for a single representative model provided that the maximum rated output of the products being applied for is not more than twice, or less than half, the maximum rated output of the product tested. Where the range of rated outputs exceeds these limits, products should be grouped into size ranges that comply with these rules, and test data submitted for one representative model for each group.

It should be noted that:

- If a manufacturer voluntarily removes a representative model from the ETPL then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative models will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Radiant Heating Equipment

Date added to ETL 2003 (Revised 2012).

1. Definition of Technology

Radiant heating equipment covers products that are specifically designed to heat people or objects in the space below them by infrared radiation without heating the surrounding air directly, and optimising controllers that ensure radiant heating systems operate in an efficient manner.

2. Technology Description

Radiant heaters are widely used to provide space heating for warehouses, retail sheds, sports centres, factories, and other buildings containing similarly large spaces. Radiant heaters contain a gas or oil fired burner that is used to heat a tube, cone or plaque that emits infrared radiation when hot. This infrared radiation is focussed and directed downwards by reflectors within the product.

Radiant heaters are available in a range of different types and efficiencies. The ECA Scheme encourages the purchase of higher efficiency radiant heaters. It also encourages the purchase of optimising controllers that ensure that radiant heating products and systems operate in an energy efficient manner that reflects weather conditions, occupation schedules and user requirements.

The ECA Scheme covers five categories of product:

1. Unitary radiant tube heater units and packages.
2. Multi burner radiant tube heater units and packages.
3. Continuous radiant tube heater units and packages.
4. Radiant plaque and cone heater units and packages.
5. Optimising controllers for radiant heating systems.
(including both standalone unit and add-on module type products).

Where packages consist of a combination of radiant heater units, and an optimising controller.

Investments in radiant heating equipment can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, all products must comply with the relevant requirements set out below:

7. All products incorporating radiant heaters must:
 - Be gas or oil fired.
 - Be designed to be permanently mounted above head height.
 - Be CE marked.
8. All products incorporating radiant tube type heaters must incorporate a reflector (with end caps) that directs the radiated heat downwards.
9. All products that incorporate optimising controllers must:
 - Incorporate a microprocessor based controller that is pre-programmed to:
 - a) Automatically control the temperature in one or more zones within a building in an energy efficient manner that reflects predefined zone occupation schedules.
 - b) Automatically switch radiant heating equipment on and off in accordance with the predefined occupation schedule for each of the zones being controlled.
 - Incorporate the following automatic control mechanisms:

- a) A frost protection mechanism that monitors internal air temperature, and switches on the radiant heaters to prevent equipment and/or pipework from freezing up.
 - b) A building fabric protection mechanism that monitors external or internal temperatures and switches heating on to prevent condensation from occurring.
 - c) An anti-tampering mechanism that prevents the product’s control strategy from being modified, and the specified automatic control mechanisms from being disabled, except during commissioning, maintenance or testing.
- Provide facilities that enable building managers to:
 - a) Define the normal occupation times for the building and for each zone controlled (in intervals of five minutes or less), for each day of the week, including at least two periods of occupation per day (i.e. at least 14 different occupation period per week).
 - b) Define the temperature set-points for each zone to +/- 1 degrees centigrade.
 - Provide facilities that enable building users to “temporarily override” the pre-set times when the radiant heating is scheduled to be switched off within an individual zone.
 - Incorporate, or be packaged with, a black bulb sensor.
 - Conform with the requirements of the EU EMC Directive 89/336/EEC (as amended) or its replacement EU EMC Directive 2004/108/EC, or be CE Marked.

Where:

- A mechanism is defined as “any sequence of pre-defined actions that performs a given function, where an action can be defined in hardware and/or software terms”.
- Products that incorporate control strategies that are specifically designed to control other types of equipment (other than warm air or radiant heaters) are not eligible.

Performance criteria

All products that incorporate radiant heaters must have a radiant efficiency, and a net thermal efficiency, when operating at 100% of their maximum continuous rating (MCR) that is greater than or equal to the values set out in Table 1 below.

Table 1 Performance requirements for radiant heating equipment.

	Product category	Radiant efficiency %		Net thermal efficiency %
1.	Unitary radiant tube heater units and packages.	>= 62.5 %	AND	>= 86.0 %
2.	Multi burner radiant tube heater units and packages.	>= 60.0 %	AND	>= 90.0%
3.	Continuous radiant tube heater units and packages.	N/A		>= 91.0%
4.	Radiant plaque and cone heater units and packages.	>= 65.0 %		N/A

">=" means "greater than" and "N/A" means "not applicable".

For the avoidance of doubt efficiency test data must be presented to 1 decimal place. As an example, an unitary radiant tube heaters with a radiant efficiency of 62.4% or a net thermal efficiency of 85.9%, at 100% of its maximum continuous rating (MCR) would be deemed to be a fail.

Required test procedures

The radiant efficiency of the heating units within the product must be determined in accordance with the relevant procedures and test conditions in the following standards:

- BS EN 416-2:2006, “Single burner gas-fired overhead radiant tube heaters for non-domestic use - Part 2: Rational use of energy”.
- BS EN 419-2:2006, “Non-domestic gas-fired overhead luminous radiant heaters - Part 2: Rational use of energy”.

The net thermal efficiency of the product must be determined in accordance with the procedure and test conditions in:

- Section 7.4 of BS EN 1020:2009, “Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, incorporating a fan to assist transportation of combustion air and/or combustion products” (as amended).

The product must be tested with the minimum possible length of flue that is consistent with the product’s design specification, and where the product is supplied in several parts that must be connected together during installation, with the minimum possible interconnecting pipework.

If the test report has not been prepared by an independent body, then evidence must be provided that a representative sample of product test data has been independently verified or cross-checked.

Please note that performance data obtained in accordance with the procedures and standard rating conditions laid down in Section 6.4 of BS EN 1020:1998 will be accepted as an alternative to testing in accordance with section 7.4 of BS EN 1020:2009 until further notice.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Warm Air Heating Equipment

Date added to ETL 2003 (Revised 2012).

1. Definition of Technology

Warm air heating equipment covers products that are specifically designed to provide space heating by using the heat generated by a burner to raise the air temperature in the space(s) being heated, and optimising controllers that ensure warm air heating systems operate in an efficient manner.

2. Technology Description

Warm air heaters are widely used to provide space heating for warehouses, retail sheds, sports centres, factories, and other buildings containing similarly large spaces. Warm air heaters contain a gas or oil fired burner that is used to heat the air in the space directly, or indirectly by means of heat exchanger. A fan is used to distribute the warm air throughout the space(s) being heated.

Warm air heaters are available in a range of different types and efficiencies. The ECA Scheme encourages the purchase of higher efficiency warm air heaters. It also encourages the purchase of optimising controllers that ensure that warm air heating products and systems operate in an energy efficient manner that reflects weather conditions, occupation schedules and user requirements.

The ECA Scheme covers three categories of product:

1. **Indirect fired condensing packaged warm air heater units**
including on/off, high/low and fully modulating type products.
2. **Indirect fired condensing packaged air heater modules**
including on/off, high/low and fully modulating type products.
3. **Optimising controllers for warm air heating systems**
including both standalone unit and add-on module type products.

Investments in warm air heating equipment can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, all products must comply with the relevant requirements set out below:

1. All products incorporating warm air heaters must:
 - Be gas or oil fired (where gas includes biogas and oil includes liquid biofuels).
 - Be designed to be permanently installed in one of the following ways:
 - a) As a suspended, wall mounted or floor-standing unit.
 - b) As a heating module within an air handling unit.
 - Incorporate a fan to distribute warm air within the heated space, unless they are warm air heating modules that are specifically designed to be installed in an air handling unit.
 - Be CE marked.
2. All products that incorporate optimising controllers must:
 - Incorporate a microprocessor based controller that is pre-programmed to:
 - a) Automatically control the air temperature in one or more zones within a building in an energy efficient manner that reflects predefined zone occupation schedules.
 - b) Automatically switch warm air heating equipment on and off in accordance with the predefined occupation schedule for each of the zones being controlled.
 - Incorporate the following automatic control mechanisms:
 - a) An optimum start mechanism that monitors external and/or internal temperatures, and calculates when the warm air heating equipment need to be switched on in order to just reach pre-set temperatures by the start of the next occupancy period.

- b) A “self-learning” algorithm that automatically monitors the accuracy of the optimum start mechanism and periodically updates the heating curve that the mechanism uses, to reflect changes in building characteristics.
 - c) A frost protection mechanism that monitors internal air temperature, and switches on the warm air heaters to prevent equipment and/or pipework from freezing up.
 - d) A building fabric protection mechanism that monitors external or internal temperatures and switches heating on to prevent condensation from occurring.
 - e) An anti-tampering mechanism that prevents the product’s control strategy from being modified, and the specified automatic control mechanisms from being disabled, except during commissioning, maintenance or testing.
- Provide facilities that enable building managers to:
 - a) Define the normal occupation times for the building and for each zone controlled (in intervals of five minutes or less), for each day of the week, including at least two periods of occupation per day (i.e. at least 14 different occupation period per week).
 - b) Define the temperature set-points for each zone to +/- 1 degree centigrade.
 - c) Define future dates (e.g. holidays) when the warm air heating equipment should be completely switched off, or operated at frost, fabric or equipment protection levels.
 - Provide facilities that enable building users to “temporarily override” the pre-set times when the warm air heating is scheduled to be switched off within an individual zone.
 - Conform with the requirements of the EU EMC Directive 89/336/EEC (as amended) or its replacement EU EMC Directive 2004/108/EC, or be CE Marked.

Where:

- A mechanism is defined as “any sequence of pre-defined actions that performs a given function, where an action can be defined in hardware and/or software terms”.
- Products that incorporate control strategies that are specifically designed to control other types of equipment (other than warm air or radiant heaters) are not eligible.

Performance criteria

All products must have a net thermal efficiency that is greater than, or equal to, the value set out in Table 1 below at the specified load point, which depends on whether the product is fitted with on/off, high/low, or fully modulating controls.

Table 1 Performance requirements for warm air heating equipment.

	Type of controls	Load point (% of nominal heat input)	Net thermal efficiency %
1.	On/off controls	100%	>= 101.0 %
2.	High/low controls	60%	>= 101.0 %
3.	Fully modulating controls	60%	>= 101.0 %

">=" means "greater than or equal to"

For the avoidance of doubt net thermal efficiency test data must be presented to 1 decimal place. As an example, an indirect fired, condensing, packaged warm air heater unit fitted with on/off controls and a net thermal efficiency of 100.9% at 100% of its nominal rated input would be deemed to be a fail.

Similarly products fitted with fully modulating or high/low controls that cannot reduce their average firing rate to at least 60% of nominal heat input without turning off would be deemed to be a fail.

Required test procedures

The product's net thermal efficiency must be determined at 100% of nominal heat input in accordance with the methods set out in:

- BS EN 1196:2011, "Domestic and non-domestic gas-fired air heaters. Supplementary requirements for condensing air heaters". Section 6.8 and Annex A.

In addition, the net thermal efficiency of products fitted with high/low and fully modulating controls must be determined at a low test point corresponding to 30% of nominal heat input (or the product's minimum heat input where the product is not able to operate down to 30%).

The tests should be carried out under the general test conditions in one of the following standards:

- BS EN 1020:2009, "Non-domestic forced convection gas-fired air heaters for space heating not exceeding a net heat input of 300 kW, incorporating a fan to assist transportation of combustion air or combustion products".
- BS EN 13842:2004, "Oil fired forced convection air heaters. Stationary and transportable for space heating".
- BS 5991:2006, "Specification for indirect gas fired forced convection air heaters with rated heat inputs greater than 330 kW but not exceeding 2 MW for industrial and commercial space heating. Safety and performance requirements (excluding electrical requirements) (2nd family gases)".
- BS EN 621:2009, "Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, without a fan to assist transportation of combustion air and/or combustion products"

For products fitted with modulating and hi/low controls, the net thermal efficiency at the 60% load point should be calculated by linear interpolation using the following formula:

$$\eta_{60\%} = \eta_{100\%} - 40 * (\eta_{100\%} - \eta_{low}) / (100 - Q_{low})$$

Where:

- $\eta_{100\%}$ is the net thermal efficiency at 100% nominal heat input.
- η_{low} is the net thermal efficiency at the low test point.
- Q_{low} is the heat input at the low test point (as a percentage of nominal heat input).

If the test report has not been prepared by an independent body, then evidence must be provided that a representative sample of product test data has been independently verified or cross-checked.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Refrigeration Equipment

Absorption & Other Heat Driven Cooling & Heating Equipment

This category only covers products installed as part of a CHP scheme that has been awarded a certificate from the CHP Quality Assurance (CHPQA) programme. The absorption chiller's useful chilling effect must be driven by heat derived from the CHP plant. The absorption plant is assessed with the CHP plant under CHPQA programme - for further information go to www.chpqa.com.

Air Blast Coolers

(Formerly Forced Air Pre-Coolers)

Date added to ETL 2003. (Revised 2013)

1. Definition of Technology

Air blast coolers are products that are specifically designed to cool water or process liquid by means of a heat exchanger, over which air is forced by a fan(s), prior to transfer to a refrigeration system.

2. Technology Description

Air blast coolers (including 'ambient air pre-coolers' and 'dry adiabatic coolers', and commonly known as 'free coolers' and 'hybrid coolers', and previously referred to as 'forced air pre-coolers') normally consist of a finned tube heat exchanger and a cooling fan(s). The cooling fan is used to force air over the heat exchanger and to cool water and other process liquids as they passed through the heat exchanger. Some products also make use of adiabatic cooling for limited periods.

Air blast coolers can be used to reduce the load on refrigeration systems by cooling water and other process liquids, prior to their transfer into the refrigeration system.

The ECA Scheme encourages the purchase of free standing air blast coolers that **either** turn off the cooling fan when the ambient air temperature is high, **or** feature variable speed drives to modulate the cooling fan speed according to cooling demand.

Air blast coolers that are sold as an integrated part of a mechanical chiller are not included in this category, but are covered by the 'Packaged Chillers' sub-technology of the ETL.

Investments in air blast coolers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate a heat exchanger designed to cool water or other process liquids.
- Incorporate a fan(s) which forces air over the heat exchanger.
- Conform with the requirements of the EU Pressure Equipment Directive PED 97/23/EC in respect of its design, manufacture and testing procedures, or be CE Marked.

In addition air blast coolers must incorporate:

Either:

- a series of control valves (or “by-pass mechanism”) that re-direct the water or other process liquid around the pre-cooler in response to a control signal, **and** a controller that operates the by-pass mechanism and turns off the cooling fan at times when the ambient air temperature is higher than the water/process liquid inlet temperature.

And/Or:

- a variable speed drive which reduces the duty of the cooling fan as the cooling demand decreases, or as the ambient air temperature decreases

Performance criteria

Eligible products must have:

- A minimum energy efficiency rating (EER) that, at 10K approach temperature difference, is greater than or equal to (\geq) 10.0.

Where $EER = \text{net cooling capacity (kW)} / \text{effective power input (kW)}$.

Required test procedures

The required minimum performance must be demonstrated using Method A or B, as set out in Tables A and B below:

TABLE A	METHOD A - DIRECT MEASUREMENT
Product performance must be demonstrated by measuring the cooling capacity and power input in accordance with the test procedure in EN 1048:1998 at 3 test points corresponding to a 10K, 15K and 20K difference in approach temperature. The EER should be determined for each test point. The approach temperature is the difference in temperature between the water into the product and the air onto the product (or ambient temperature).	

TABLE B	METHOD B - INDIRECT MEASUREMENT
Product performance must be demonstrated by two separate tests conducted on the same product model and in accordance with EN 1048: 1998, using a different set of operating conditions for each test. The product performance and EER at 10K approach temperature difference shall then be determined by extrapolation from the test results.	

For both methods A and B, the liquid for the test shall be water. Effective measured power input is the electricity required to run the fan(s) at full speed plus any control equipment. Water pump

power shall not be included. The measurement of air flow will not be required as part of the test. Hybrid coolers must be run dry i.e. without adiabatic cooling.

Representative Testing

Where applications are being made for two or more products that are variants of the same basic design, heat exchanger test data may be submitted for a single representative model, provided that all variants:

- Use air to liquid heat exchangers of the same constructional design.
- Have the same general arrangement of fans and heat exchangers.
- Are constructed from materials with same heat transfer characteristics.
- Have the same (+/- 5%) or better energy efficiency as the representative models.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Air-Cooled Condensing Units

Date added to ETL 2004 (Revised 2012).

1. Definition of Technology

Air-cooled condensing units covers products that are specifically designed to provide cooling to other equipment and systems that incorporate evaporators (and associated expansion valve control systems). Air-cooled condensing units are factory-assembled units that consist of an air-cooled condenser, one or more compressors, and interconnecting pipe work. They may include liquid receivers, filter driers, oil separators, shut off valves and related controls, and a weatherproof housing.

2. Technology Description

An air-cooled condensing unit is a factory-assembled, packaged unit that consists of a refrigeration compressor, an air-cooled condenser and various ancillary components. This packaged unit does not contain a complete refrigeration system, but is designed to provide a convenient method for cooling a cold room or other equipment fitted with an evaporator that is controlled by an expansion valve.

Air-cooled condensing units are used in a variety of commercial and industrial cooling applications, including cold rooms, refrigerated display cabinets, back-bar equipment, temperature controlled food preparation areas, and for air conditioning systems.

Air-cooled condensing units are available in a range of different designs and efficiencies. The ECA Scheme aims to encourage the purchase of the higher efficiency products.

The ECA Scheme covers products in three temperature categories:

- High temperature units.
- Medium temperature units.
- Low temperature units.

These categories are defined in terms of the product performance at a particular temperature rating point. Products may be submitted under more than one category.

Investments in air-cooled condensing units can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be designed to operate with one or more clearly identified standard refrigerants.
- Be a factory assembled unit that incorporates at least the following components:
 - a) Air-cooled refrigerant condenser.
 - b) One or more electrically driven refrigeration compressors.
 - c) A control system that controls the product’s compressor(s) and cooling fan(s).
- Conform to the requirements of the Pressure Equipment Directive 97/23/EC in respect of their design, manufacture and testing procedures.

Performance Criteria

Products must have a coefficient of performance (COP) that is greater than the values shown in Table 1 below at the specified UK rating points.

Table 1. Performance thresholds for air-cooled condensing units at the UK rating points

Temperature Category	Evaporating temperature (Dew Point)	Ambient (condenser air-on) temperature	Compressor suction gas temperature	COP threshold
High temperature units	+5 °C	20 °C	20 °C	>=3.9
Medium temperature units	-10 °C	20 °C	20 °C	>=2.8
Low temperature units	-35 °C	20 °C	20 °C	>=1.6

">=" means "greater than or equal to"

Where

- COP = refrigerating capacity / power absorbed.
- Refrigerating capacity and power absorbed are as defined in Sections 3.2 and 3.5 of EN13215:2000 "Condensing units for refrigeration - Rating conditions, tolerances and presentation of manufacturer's performance data".
- The power absorbed must be measured at full load, without condenser pressure control.
- Any condenser sub-cooling factored into the refrigerating capacity must be clearly declared, noting that when a liquid receiver is incorporated into the product with no subsequent sub-cooler, the liquid temperature at the unit outlet should be used to determine capacity.

For the avoidance of doubt test data should be presented to 1 decimal place. As an example, a product in the high temperature category with a COP of 3.8 would be deemed to be a fail.

Required test procedures

Product performance can either be determined using Method A or Method B, subject to the following reporting requirements:

1. A detailed test report must be provided and include a statement of achieved performance at the required UK rating point. Data on refrigerating capacity and COP at the 32°C ambient temperature standard reference point specified in EN13215:2000 for air cooled condensing units must also be included in the test report to enable the test results at the UK rating point to be cross-checked against the manufacturers published rating data for the product.
2. The refrigerant properties used in the analysis of product / compressor performance must be obtained from one of the following sources:
 - The US National Institute of Standards & Technology (NIST) Standard Reference Database 23 Thermodynamic and Transport Properties of Refrigerants and Refrigerant Mixtures Database: Version 6.0 or later. See <http://fluidproperties.nist.gov/> or <http://www.nist.gov/>.
 - The ASERCOM properties database as defined in the ASERCOM Compressor Certification scheme, which is based closely on the NIST database (see <http://www.asercom.org/>).
3. For the high temperature category only, data for a suction gas temperature of 20°C may be obtained by the thermodynamic translation of data physically tested at 10K superheat.
4. To enable calculations to be checked, the report must include (or be accompanied by) the manufacturer's design data for the product and its key components, including the type of refrigerant used, condenser fan motor power, and compressor make and model number.

Method A

Under method A:

- The product's coefficient of performance (COP) at relevant UK rating point (as specified in Table 1) must be calculated with the method used to generate its published performance over the standard range of air temperature and evaporating temperature conditions.
- The accuracy of these calculations must be confirmed in the following manner:
 - a) Actual product performance should be determined at two test conditions close to the relevant UK rating point specified in Table 1 that comply with the following limits:
 - i. Evaporation temperature must be within +/- 1°C of the UK rating point.
 - ii. Ambient temperature must be within +/- 5°C of the UK rating point, and one point must be above the standard rating condition, and one below it.
 - iii. Suction Temperature must be within +/- 1°C of the UK rating point.

The following measurements must be made at each test condition with the level of measurement uncertainty specified in Table 2 of BS EN 13771-2: 2007, whilst the product operating under stable conditions at full load:

- i. Condensing and evaporating pressures and dew point temperatures at the compressor inlet and outlet.
 - ii. Superheat and sub-cooling at the compressor's inlet and the product's outlet.
 - iii. Condenser air inlet temperature.
- b) The condenser's UA value is determined at each test condition using the verified compressor performance data to establish the heat rejection rate.
 - c) The arithmetic mean of the UA values at the two test conditions is used to determine the condensing temperature, and the product's performance at the UK rating point.
- The test report must include (or be accompanied by):
 - a) Details of the calculation used to determine product performance.
 - b) The following information on the product's compressor:
 - i. Refrigerating capacity and COP at the appropriate standard rating point specified in EN 12900: 2005, and at the relevant UK rating point specified in the eligibility criteria for 'refrigeration compressors'.
 - ii. Evidence that the product's compressor is listed on the Energy Technology Product List, or that its performance has been independently verified.
 - iii. A copy of the manufacturer's published performance data (or a print out of its key performance data from the manufacturer's design/selection software).

Method B

Under method B, product performance must be demonstrated by testing the product in accordance with the following standard: *BS EN13771-2: 2007 "Compressor and condensing units for refrigeration. Performance testing and test methods. Part 2: Condensing units"*.

Representative Testing

Where applications are being made for a range of two or more products that are variants of the same basic design, test data may be submitted for a representative selection of models, provided that all variants:

- Use the same refrigerant as the representative model.
- Have the same compressor type (i.e. manufacturer, method of compression (e.g. reciprocating or scroll) and type of enclosure (e.g. hermetic or semi-hermetic)) as the representative model.
- Have the same sub cooling arrangement as the representative model.
- Fit within the same product category (e.g. are all high temperature units).

The representative models must be selected by dividing the range of products into groups of models with similar design characteristics, and testing a model in the lowest quartile of predicted performance in each group. The performance of each model in the group must be predicted using a validated mathematical model. As a minimum, at least two models must be tested in each range of products and in each laboratory used for product testing.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Automated Permanent Refrigerant Leak Detection Systems

Date added to ETL 2001 (Revised 2013).

1. Definition of Technology

Automated permanent refrigerant leak detection systems are products that are specifically designed to continuously monitor the atmosphere in the vicinity of refrigeration equipment and, in the event of detection of refrigerant, give an alarm.

2. Technology Description

An automated permanent refrigerant leak detection system continuously monitors the atmosphere in the vicinity of refrigeration equipment, and other components or pipework that contain refrigerant. The detection system must be permanently fixed in place at the site of the refrigeration equipment.

The ECA Scheme aims to encourage the purchase of products that give an early warning of refrigerant leaks, to allow their early repair, and thus improve the energy efficiency of the refrigeration system and reduce carbon emissions.

Investments in automated permanent refrigerant leak detectors can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Continuously monitor the refrigeration system for refrigerant leakage.
- Detect the presence of one or more refrigerants (which must be clearly named in the information supporting the application) and raise an audible alarm when a pre-set level of refrigerant is reached.
- Have fittings to allow permanent fixing to the wall or floor.
- Be able to operate in conditions of between 0 to 50°C and humidities of up to 90%.
- Be CE marked.

Automated permanent refrigerant leak detectors must be calibrated for each refrigerant named in the application. The product must be capable of detecting at least one of the following types of refrigerant: HCFC, HFC, HC, HFO or Carbon Dioxide (CO₂).

Automated permanent leak detection systems dedicated to ammonia detection are not eligible.

Performance criteria

To be eligible, products must:

- Generate an alarm signal when the level of refrigerant in the atmosphere exceeds the relevant threshold set out in Table 1 below, which varies with refrigerant type.
- Have a measurement accuracy of +/- 20 ppm and be able to detect a change of 10 ppm in the level of refrigerant in the atmosphere at refrigerant concentrations up to the relevant alarm threshold in Table 1.

Table 1 - Performance thresholds for automated permanent refrigerant leak detection systems

Refrigerant	Alarm signal threshold (parts per million, ppm)
HCFC, HFC, HFO or HC	>=100
CO ₂	>=1,500

">=" means "greater than or equal to"

Required test procedures

The performance of the equipment must be tested at the concentrations stated in the performance criteria using calibration gases produced using methods that are traceable to national standards.

A calibration report must be supplied that demonstrates the product's sensitivity, accuracy and alarm setting using test gases.

The following test procedures can be used to demonstrate product performance:

- BS EN 14624:2005 “Performances of mobile leak detectors and of room controllers of halogenated refrigerants”. (Section 11.2 - Efficiency tests of room controller).
- Gas Detector Selection and Calibration Guide, SIRA, 2005, ISBN 10: 1856092976 ISBN 13: 9781856092975

Representative Testing

Where applications are being made for two or more products that are constructed using a common set of sensors and electronic modules, then test data may be submitted for a representative selection of models that clearly demonstrate the performance of each type of sensor with each refrigerant, and impact on performance of using different electronic modules.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Cellar Cooling Equipment

Date added to ETL 2003 (Revised 2010).

1. Definition of Technology

Cellar cooling equipment covers products that are specifically designed to maintain, by means of a refrigeration system, an indoor environment at a condition suitable for the storage of chilled beverages below 12°C.

2. Technology Description

Cellar cooling equipment is permanently installed and uses the standard refrigeration cycle of evaporation, compression and condensation to cool a cellar or other storage space.

Cellar cooling equipment is available in a range of different designs and efficiencies. The ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers three categories of cellar cooling equipment:

- **Packaged units** where all components mounted on one base for "through the wall" installation.
- **Split systems** with the equipment supplied in two parts (evaporator and condensing unit) to be connected on installation.
- **Remote systems** with equipment supplied in three parts (evaporator, compressor/receiver, and condenser) to be connected on installation.

Investments in cellar cooling equipment can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet minimum eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Have a cooling capacity of between 2 kW and 12 kW at the standard rating conditions for ambient air temperature of 32°C and a cellar air temperature of 10°C.
- **Either** be a single packaged unit, **or** consist of two or three factory-built sub-assemblies that are designed to be connected together during installation.
- Conform with the requirements of EU Pressure Equipment Directive PED 97/23/EC.

Performance Criteria

Products must have a coefficient of performance (COP) equal to or greater than the figures shown in Table 1 below.

Table 1 Performance thresholds for cellar cooling equipment

Cooling capacity	COP
Less than 8 kW	≥ 2.90
8 kW and over	≥ 3.20

" \geq " means "greater than or equal to"

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, a COP of 2.89 for a unit with a cooling capacity of less than 8 kW would be deemed to be a fail.

Required test procedures

Testing must be carried out in accordance with:

- BSI Publicly Available Specification PAS 57:2003 “Cellar cooling equipment - Procedure for determining performance and calculating energy efficiency”.

With following amendments:

Section 6.2 “Cooling capacity measurement”

- The test period shall be at least 1 hour and at the end of the test period, the temperature of the thermal mass must be at or below the temperature that it was at when the test period started.

Section 6.3 “System energy consumption measurement”:

- System energy measurement conditions - room B temperature at $10\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.
- Steady state conditions:
 - b) air on to the evaporator is maintained within the band $8\text{ }^{\circ}\text{C}$ to $12\text{ }^{\circ}\text{C}$.
 - d) the thermal mass is maintained at a temperature of $10\text{ }^{\circ}\text{C} \pm 0.5\text{ }^{\circ}\text{C}$.
- The temperature in test room B for the system efficiency test shall be $10\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, with the average temperature during the test period being $10\text{ }^{\circ}\text{C} \pm 0.5\text{ }^{\circ}\text{C}$.
- The test period shall be at least 2 hours and must end at the same point in the temperature control cycle for room B that the test started at.
- At the end of the test period, the temperature of the thermal mass must be at or below the temperature that it was at when the test period started.

Section 6.4 “Conditions to be recorded”:

- Section 6.4.2 “Temperature ($^{\circ}\text{C}$), accuracy $\pm 0.5\text{ }^{\circ}\text{C}$ of the:”
 - Add m) thermal mass at two locations (the closest location to, and furthest location from, the air off the evaporator).

Test reports must be submitted and contain a statement of achieved performance at the required rating points and the information specified in section 8 of PAS 57:2003.

The following additional information shall be included in the test report:

- A copy of data recorded for both the capacity and energy consumption tests.
- Thermal mass - type, temperature and quantity. Number and type of containers used.
- Photograph(s) of the interior of Room B clearly showing the position of the evaporator(s) and the thermal mass.
- Room A & B dimensions, insulation type and U value.

If the test report has not been prepared by an independent body, then evidence must be provided that a representative sample of product test data has been independently verified or cross-checked.

Representative Testing

Where applications are being made for a range of two or more products that are variants of the same basic design, test data may be submitted for a representative selection of models, provided that all variants:

- Use the same refrigerant as the representative model.
- Have the same compressor type (i.e. manufacturer, method of compression (e.g. reciprocating or scroll) and type of enclosure (e.g. hermetic or semi-hermetic)) as the representative model.
- Have the same sub cooling arrangement as the representative model.
- Have the same number of evaporators.
- Fit within the same product category (e.g. are all split systems).

The representative models must be selected by dividing the range of products into groups of models with similar design characteristics, and testing a model in the lowest quartile of predicted performance in each group. The performance of each model in the group must be predicted using a validated mathematical model. As a minimum, at least two models must be tested in each range of products and in each laboratory used for product testing.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Commercial Service Cabinets

Date added to ETL 2003 (Revised 2010).

1. Definition of Technology

Commercial service cabinets are products that are specifically designed to store, but not to display, chilled and frozen foodstuffs.

2. Technology Description

Commercial service cabinets are widely used in the catering industry to store frozen or chilled foodstuffs (including super-chilled or partly-frozen foodstuffs), but a door, lid or drawer must be opened to view or access the contents of the cabinet.

Commercial service cabinets are available in a range of different designs and efficiencies. The ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers three categories of product:

- Single door commercial service cabinets.
- Double door commercial service cabinets.
- Under counter and counter commercial service cabinets with solid doors or drawers.

Investments in commercial service cabinets can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below. The ECA Scheme aims to encourage the purchase of higher efficiency products.

3. Eligibility Criteria

To be eligible, products must:

- Be designed to store chilled or frozen foodstuffs, whilst maintaining them within prescribed temperature limits.
- Be fitted with solid-faced lids, drawers or doors that:
 - a) Are normally kept closed, but can be opened to access the contents.
 - b) Obscure the contents of the cabinet from view when closed.
 - c) Enable users to access the contents of any part of the interior without stepping into the refrigerated space.
- Be a 'plug in' type cabinet with an integral refrigeration system (i.e. incorporating a compressor and condensing unit).
- Have a gross internal volume equal to that specified in Table 1; where the gross internal volume is as defined in Section 3.6 of BS EN 441-1: 1995.
- Be CE marked.

Performance Criteria

Products must have an Energy Efficiency Index (EEI) that is less than, or equal to, the thresholds set out in Table 1 below, which depend on the type of cabinet and temperature classification.

Table 1 Performance thresholds for commercial service cabinets

Type	Gross internal volume (litres)	EEI performance threshold (kWh/48hrs/m ³)	
		Chilled (M1)	Frozen (L1)
Single door commercial service cabinets	400 and 600 (+/-15%)	<= 16.0	<= 38.0
Double door commercial service cabinets	1,300 (+/-15%)	<= 12.0	<= 34.0
Under counter and counter commercial service cabinets with solid doors or drawers	150 to 800 (+/-15%)	<= 21.6	<= 40.0

"<=" means "less than or equal to"

Where the Energy Efficiency Index (EEI) is defined as the Total Electrical Energy Consumption (in kWh) of the product over a 48 hour test period divided by the product's Net Volume (in m³), and:

- Net Volume is as defined in Section 3.7 of BS EN 441-1: 1995.
- Total Electrical Energy Consumption is as defined in BS EN 441-9:1995.

For the avoidance of doubt test data should be presented to 1 decimal place. As an example, a frozen, single door commercial service cabinet with an EEI of 38.1 would be deemed to be a fail.

Required test procedures

All cabinets must be tested in a test room conforming to BS EN 441:1995/1996.

All cabinets must be able to conform to the following temperature classifications (as defined in BS EN 441-6:1995) when tested to BS EN 441:1995/1996 in climate class IV (30°C, 55% RH):

- For chilled cabinets: M1 (all measurement packs must be between -1 and 5°C).
- For frozen cabinets: L1 (the highest temperature of the warmest measurement pack must be less than or equal to -15°C and the lowest temperature of the warmest measurement pack must be less than or equal to -18°C).

All cabinets must be tested according to the requirements for closed refrigerated cabinets contained in BS EN 441:1995/1996 with the following test conditions:

- **Loading:** as described in BS EN 441-5:1996. Cabinets with shelves, to be fitted with a minimum of 1 shelf per 300 mm of open height at equal distances apart. For upright units this equates to a minimum of 4 shelves and for under counter units to a minimum of 2 shelves. The lowest height shelf should be located at the lowest available height fitting.
- **Temperature test:** as described in BS EN 441-5:1996, specifically section 3.6.
- The **Total Electrical Energy Consumption** of cabinets fitted with integral condensing units must be measured in accordance with sections 4.1 and 5 of BS EN 441-9:1995, and to the accuracy specified in section 4.4.6 of BS EN 441-4:1995.

If the test report has not been prepared by an independent body, then evidence must be provided that a representative sample of product test data has been independently verified or cross-checked.

Representative Testing

Where applications are being made for two or more cabinet models that are variants of the same basic design, test data may be submitted for a single 'representative model'. The rules in Table 2 must be used to select the representative model that should be performance tested.

Table 2 Rules for selecting the representative model for performance testing

Variation between models	Selection rule
Cosmetic differences to the exterior	Any model may be selected to be the representative model.
Heaters (door, trim etc.), fans, defrosts, lighting and other accessories	The model with the greatest energy consumption must be the representative model.
Cabinets with the same refrigeration system components but different refrigerants	The model with the greatest energy consumption must be the representative model.
Two or more of the above variations	The rules set out above must be combined when selecting the representative model.

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Curtains, Blinds, Doors and Covers for Refrigerated Display Cabinets

Date added to ETL 2001 (Revised 2012).

1. Definition of Technology

Curtains, blinds, doors and covers (for refrigerated display cabinets) are products that are specifically designed to reduce the infiltration of ambient air into a refrigerated display cabinet.

2. Technology Description

Curtains, blinds, doors and covers are flexible or rigid barriers that can be used to reduce the infiltration of ambient air (and heat flow) into refrigerated display cabinets, thereby reducing the energy consumption of the cabinet.

The ECA Scheme covers five categories of products:

1. **Strip curtains** that consist of transparent, flexible strips hung adjacent to each other, and fastened at both ends to neighbouring strips, in a manner that allows temporary openings to be made in the curtain for the purpose of removing items from the cabinet.
2. **Blinds** that consist of a flexible fabric mounted on a roller mechanism that enables the blind to be deployed across the display window of the cabinet when the retail outlet is closed or during trading. The blind may also incorporate a motorised control system.
3. **Transparent chest freezer covers** (or 'bubble lids') that consist of a rigid transparent material that fits across the display window of the cabinet, and incorporates access holes that enable items to be removed from the cabinet without removing the cover.
4. **Transparent sliding doors** that consist of doors with a heat reflective coating, mounted in a mechanism (that is designed to be installed in the window of the cabinet) that enables the doors to be opened when items need to be removed from the cabinet.
5. **Transparent hinged doors** that consist of doors with a heat reflective coating, mounted in a mechanism (that is designed to be installed in the window of the cabinet) that enables the doors to be opened when items need to be removed from the cabinet.

Investments in curtains, blinds, doors and covers for refrigerated display cabinets can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Provide a flexible or rigid barrier that can be used to reduce the infiltration of ambient air (and heat flow) through the open display window of a refrigerated display cabinet.
- Be designed to fit one or more specific types or models of refrigerated display cabinet in a manner that ensures that when fitted there is no air gap around the edges of the product's rigid barriers, and an air gap of less than 20mm around the edges of the product's flexible barriers.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Evaporative Condensers

Date added to ETL 2001 (Revised 2012).

1. Definition of Technology

Evaporative Condensers are specifically designed to cool and condense high-pressure refrigerant vapour by means of a heat exchanger that has a continuously wetted external surface across which air is blown by a fan.

2. Technology Description

Evaporative condensers allow refrigeration systems to operate with lower head pressures and higher efficiencies than can be achieved using air-cooled condensers or water-cooled condensers. They use evaporative cooling to remove heat from the refrigerant vapour.

Evaporative condensers are generally used in larger refrigeration systems and the ECA Scheme aims to encourage their purchase as an alternative to lower efficiency solutions.

Investments in evaporative condensers can only qualify for Enhanced Capital Allowances if the product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate:
 - a) A heat exchanger that is designed to cool and condense refrigerant vapour.
 - b) A fan that blows air over the heat exchanger.
 - c) A mechanism that continually wets the external surface of the heat exchanger that includes a water pump and a water storage tank.
 - d) A blow down facility for the water storage tank to enable total dissolved solids content of the water in the storage tank to be controlled.
- Conform with the requirements of the EU Pressure Equipment Directive PED 97/23/EC in respect of its design, manufacture and testing procedures, or be CE marked.

In addition, where products incorporate an automatic blow down control system, they must also incorporate a means of measuring total dissolved solids content of the water in the storage tank.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Packaged Chillers

Date added to ETL 2003 (Revised 2012).

1. Definition of Technology

Packaged chillers cover products that are specifically designed to cool liquids by means of a refrigeration system that is packaged within a single factory assembled unit. Optionally products also may be designed to heat liquids.

2. Technology Description

Packaged chillers generate chilled water that can be used to provide space cooling in summer in large air-conditioned buildings. They can also be used to generate chilled water or other fluids for industrial process cooling. Reverse cycle packaged chillers are able to heat fluids and can be used to provide space heating in winter, or for industrial process heating. Some air cooled packaged chillers also incorporate free cooling mechanisms that can be used to reduce the amount of electricity needed by the product to provide cooling at lower ambient temperatures.

Packaged chillers are available in a wide range of different designs and efficiencies. The ECA Scheme aims to encourage the purchase of the higher efficiency products.

The ECA Scheme covers four categories of products:

1. Air-cooled packaged chillers that provide cooling only and have a cooling capacity that is less than or equal to 1,500kW.
2. Air-cooled, reverse cycle, packaged chillers that provide both heating and cooling and have a cooling capacity that is less than or equal to 750kW.
3. Water-cooled packaged chillers that provide cooling only and have a cooling capacity that is less than or equal to 2,000kW.
4. Water-cooled, reverse cycle, packaged chillers that provide both heating and cooling and have a cooling capacity that is less than or equal to 2,000kW.

Investments in packaged chillers can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Incorporate the following items of equipment:
 - a) One or more electrically powered compressors.
 - b) One or more air-cooled or water-cooled condensers.
 - c) One or more evaporators.
 - d) A control system that ensures the safe, reliable and efficient operation of the product.

- Be CE Marked.

Where the product incorporates an integral free-cooling mechanism, it must be:

- Fully integrated into the packaged chiller unit during product manufacturing.
- Directly controlled by the product's control system in a manner that maximises the use of free cooling for outside air, dry bulb temperatures between 2.0 and 15.0°C.
- Able to provide a cooling capacity at an outside air, dry bulb temperature of 2.0°C and an outlet water temperature of 7.0°C that is at least (=>) 50% of the cooling capacity obtained at the standard rating condition specified in Table 2 below.

Performance Criteria

Products must have a cooling energy efficiency rating (EER) that is equal to or greater than the values set out in Table 1, which vary with product category. In addition, reverse cycle products must have a coefficient of performance (COP) equal to or greater than the values set out in Table 1.

Table 1 Performance thresholds for packaged chillers at standard rating conditions.

Product Category			Cooling Capacity (kW)	Performance thresholds	
				Cooling EER	Heating COP
1.	Air-cooled packaged chillers that provide cooling only.	<u>without</u> integral free cooling mechanism.	<= 100kW	>= 2.80	
			101 to 500 kW	>= 2.80	
			501 to 750 kW	>= 2.90	
			751 to 1,500 kW	>= 2.90	
		<u>with</u> integral free cooling mechanism.	<= 100kW	>= 2.70	
			101 to 500 kW	>= 2.70	
			501 to 750 kW	>= 2.80	
			751 to 1,500 kW	>= 2.80	
2.	Air-cooled, reverse cycle, packaged chillers that provide heating and cooling.	<= 100kW	>= 2.70	>= 2.70	
		101 to 500 kW	>= 2.80	>= 2.80	
		501 to 750 kW	>= 2.90	>= 3.10	
3.	Water-cooled packaged chillers that provide cooling only.	<= 100kW	>= 4.20		
		101 to 500 kW	>= 4.20		
		501 to 750 kW	>= 5.00		
		751 to 2,000 kW	>= 5.10		
4.	Water-cooled, reverse cycle, packaged chillers that provide heating and cooling.	<= 100kW	>= 4.20	>= 3.90	
		101 to 500 kW	>= 4.30	>= 3.90	
		501 to 750 kW	>= 5.00	>= 4.70	
		751 to 2,000 kW	>= 5.10	>= 4.70	

">=" means "greater than or equal to"

Where:

- EER = net cooling capacity (kW) / effective power input (kW) in cooling mode.
- COP = net heating capacity (kW) / effective power input (kW) in heating mode.
- The standard rating conditions for packaged chillers are defined in Table 2 below.

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, a water-cooled, reverse cycle, packaged chiller with a refrigeration capacity of 100kW, and a cooling EER of 4.19, or a heating COP of 3.89, would be deemed to be a fail.

Required test procedures

Product performance must be determined using Method A, or for product categories 1, 3 and 4, Method B.

Method A - Laboratory tests under standard rating conditions.

Under Method A, product performance is determined in laboratory conditions in accordance with the procedures set out in:

- BS EN 14511: 2011, “Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling”.

The product’s cooling capacity (kW), EER and COP must be determined at the standard rating conditions set out in Table 2 below, which vary by product category.

Table 2 Standard rating conditions for Packaged Chillers

Product category		Cooling EER AND Cooling capacity (kW)	Heating COP
1.	Air-cooled packaged chillers that provide cooling only.	BS EN 14511-2: 2011 Table 16, Standard rating conditions, Water (for medium temperature applications)	
2.	Air-cooled, reverse cycle, packaged chillers that provide heating and cooling.	BS EN 14511-2: 2011 Table 16, Standard rating conditions, Water (for medium temperature applications)	BS EN 14511-2: 2011 Table 13, Standard rating conditions, Outdoor air.
3.	Water-cooled packaged chillers that provide cooling only.	BS EN 14511-2: 2011 Table 11, Standard rating conditions, Water to water (for medium temperature cooling applications) from cooling tower	
4.	Water-cooled, reverse cycle, packaged chillers that provide heating and cooling.	BS EN 14511-2: 2011 Table 11, Standard rating conditions, Water to water (for medium temperature cooling applications) from cooling tower	BS EN 14511-2: 2011 Table 8, Standard rating conditions, Water

Where testing is not conducted at the standard rating conditions, the product’s cooling capacity (kW), EER and COP may be calculated using the corrections in points 1 and 2 of Method B (with S=0), provided that the test conditions used comply with the requirements in point 1 of Method B.

If the test report has not been prepared by an independent body, then evidence must be provided that a representative sample of product test data has been independently verified or cross-checked.

Test results may be submitted in summary form provided that:

- Sufficient data is included to confirm that the cooling capacity (kW), EER and COP of each product was determined in accordance with the test procedures in BS EN 14511:2011 and determined at, or corrected to, the standard rating conditions outlined in Table 2.
- At least two detailed test reports are submitted for each range of products and for each laboratory used. The data that must be recorded in a detailed test report is defined in Table 6 of BS EN 14511:2011. The test report must include details of the data recording period and duration of performance measurement.
- Detailed test reports have been prepared for each product tested and are available on request for inspection, where not submitted with the application.

Please note that performance data obtained in accordance with the procedures and standard rating conditions laid down in EN 12055, EN 255, BS EN 14511: 2004 or BS EN 14511: 2007 will be accepted as an alternative to testing in accordance with BS EN 14511: 2011 until further notice, provided that the test results have been adjusted to take account of the revised procedure set out in Section 4.1.6 and Annex H of BS EN 14511: 2011 for correcting for the power input of the liquid pumps.

Method B - Factory tests

Under method B, product performance is determined in a factory environment by:

1. Testing products at full load in accordance with the methodology, definitions, calculations and measurement approaches in BS EN 14511: 2011 and the following requirements:
 - a) The liquid temperature into the cooler must be within 3°C of the standard rating conditions.
 - b) The temperature of the fluid entering the condenser must be within the range 20°C to 55°C.
 - c) The flow rate of fluid through the cooler must be between 50% and 150% of the flow rate at standard rating conditions.
 - d) The packaged chiller must be operating in exactly the same mode as at the standard rating conditions (i.e. without head pressure control or other changes that would affect performance).
 - e) A data recording interval of 30 seconds (or less) must be used.
 - f) The data collection period should be not less than 65 minutes and must include:
 - A conditioning period of at least 30 minutes, followed by:
 - A test period of at least 35 minutes, once stable conditions are achieved.
 - g) Products must be operated from a 50Hz electrical power supply during testing.
2. Applying the following corrections to EER and COP to take account of the actual test conditions used during testing:

$$COP_C = (COP / (((305 + 2 \cdot T_{ct} - T_{et}) \cdot (T_{cs} - T_{es} + 22 + X_c)) / ((305 + 2 \cdot T_{cs} - T_{es}) \cdot (T_{ct} - T_{et} + 22)))) \cdot (1 - S)$$

$$EER_C = (EER / (((283 + T_{ct}) \cdot (T_{cs} - T_{es} + 22 + X_c)) / ((283 + T_{cs}) \cdot (T_{ct} - T_{et} + 22)))) \cdot (1 - S)$$

Where:

- T_{ct} is the condenser cooling fluid inlet temperature in degrees centigrade at the test conditions.

- T_{et} is the evaporator fluid (water) inlet temperature in degrees centigrade at the test conditions.
- T_{cs} is the condenser cooling fluid inlet temperature in degrees centigrade at the standard conditions defined in BS EN 14511:2011.
- T_{es} is the evaporator fluid (water) inlet temperature in degrees centigrade at the standard conditions defined in BS EN 14511:2011.
- EER_C is the corrected value of EER at the standard conditions, calculated from the measured EER at the test conditions, which must exceed the threshold conditions.
- COP_C is the corrected value of COP at the standard conditions, calculated from the measured COP at the test conditions, which must exceed the threshold conditions.
- X_c is the factor used to correct for the change in the flow rates through the cooler under different test conditions, and is defined as:

$$X_c = 12 * ((\text{flow rate at test conditions used} / \text{flow rate at standard rating conditions})^{0.6} - 1)$$

- S is a 5% safety factor applied to EER & COP to take account of the additional uncertainty of measurement associated with testing in the factory environment (i.e. $S = 0.05$).
3. Using the following equation to correct the cooling capacity measured during testing to the standard rating conditions used in Table 1 to define the EER & COP performance thresholds.

$$\text{Cooling Capacity}_{\text{corrected}} = \text{Cooling Capacity}_{\text{test}} / ((0.52 + 0.04 * T_{et}) * (1.4 - 0.01 * T_{ct}))$$

Detailed test reports must always be submitted when Method B is used, and include details of the test setup/apparatus, and calculations completed. A copy of the raw measurement data collected during the conditioning period and the test period must also be submitted in electronic format.

Any and all deviations from the standard test methodology defined in BS EN 14511: 2011 must be clearly described in the test report and the impact on the test accuracy quantified.

If the test report has not been prepared by an independent body, then evidence must be provided that a representative sample of product test data has been independently verified or cross-checked.

Representative Testing

Where applications are being made for a range of two or more products that are variants of the same basic design, test data obtained under Method A or Method B may be submitted for a representative selection of models, provided that all variants:

- Use the same refrigerant as the representative model.
- Have the same compressor type (i.e. manufacturer, method of compression (e.g. reciprocating or scroll) and type of enclosure (e.g. hermetic or semi-hermetic)) as the representative model.
- Fit within the same product category (e.g. are all water cooled packaged chillers).

The representative models must be selected by dividing the range of products into groups of models with similar design characteristics, and testing a model in each group. The performance of each model in the group must be predicted using a validated mathematical model. As a minimum, at least two models must be tested in each range of products and in each location (i.e. laboratory or factory) used for product testing.

For Air-cooled packaged chillers that provide cooling only, test data for representative models that incorporate free cooling can only be used to represent variants of similar design that incorporate free cooling. Test data for representative models that do not incorporate free cooling can only be used to represent variants of similar design that do not incorporate free cooling
It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Refrigerated Display Cabinets

Date added to ETL 2004 (Revised 2013).

1. Definition of Technology

Refrigerated display cabinets are products that are specifically designed to store and display chilled and/or frozen foodstuffs.

2. Technology Description

Refrigerated display cabinets are used to maintain foodstuffs and drinks at chilled and frozen temperatures. There are many different designs of refrigerated display cabinets, but all enable the customer to view the foodstuff stored in the cabinet, either through an opening in the cabinet, or through a transparent door or lid.

Refrigerated display cabinets are available in a range of different designs and efficiencies. The ECA Scheme aims to encourage the purchase of higher efficiency products.

The ECA Scheme covers two categories of products:

- 'Plug in' refrigerated display cabinets with integral refrigeration systems (i.e. incorporating a compressor and condensing unit).

- ‘Remote’ refrigerated display cabinets that are designed to work with a non-integral refrigeration system (i.e. where the compressor and condenser, or all or parts of the refrigeration system are located at a different location from the cabinet).

Investments in refrigerated display cabinets can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be designed to display chilled and/or frozen foodstuffs, whilst maintaining them within prescribed temperature limits.
- Conform to one of the temperature classifications in Table 1 when tested to BS EN ISO 23953-2:2005 in climate class III (25 °C, 60% RH).
- Be classified in accordance with the precise 5 digit classification system set out in Annex A of BS EN ISO 23953-1:2005.
- Be CE marked.

Table 1 Classification according to temperature

Class	The highest temperature θ_{ah} of the warmest M-package equal to or lower than °C	The lowest temperature θ_b of the coldest M-package equal to or higher than °C	The lowest temperature θ_{al} of the warmest M-package equal to or lower than °C
L1	-15	-	-18
L3	-12	-	-15
M0*	+4	-1	-
M1	+5	-1	-
M2	+7	-1	-
H1	+10	+1	-
H2	+10	-1	-

*Note: All classes are as described in BS EN ISO 23953-2:2005, except M0, which is based upon recommendations from the British Refrigeration Association.

Performance Criteria

Products must have an Energy Efficiency Index (EEI) that is less than, or equal to, the threshold shown in Table 2 for the relevant temperature class and type of cabinet.

Table 2 Performance thresholds for refrigerated display cabinets

Classification according to temperature	EEI performance threshold (kWh/day/m ²)	
	Integral Type	Remote Type
L1	<= 14.70	<= 21.10
L3	n/a	<= 21.00
M0	<= 11.90	<= 11.20
M1	<= 11.70	<= 11.10
M2	<= 11.10	<= 10.70
H1	n/a	<= 8.00
H2	<= 9.50	<= 8.70

"<=" means "less than or equal to"

Where the Energy Efficiency Index (EEI) is defined as the ratio of the product's Total Energy Consumption (TEC) to Total Display Area (TDA) i.e. $EEI = TEC/TDA$, and:

- TEC is calculated according to BS EN ISO 23953-2:2005 section 5.3.6.3.4.
- TDA is calculated according to BS EN ISO 23953-2:2005 Annex A.

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, a remote type M0 cabinet with an EEI performance threshold of 11.21 would be deemed to be a fail.

Required test procedures

All cabinets must be tested in a test room conforming to BS EN ISO 23953-2:2005.

During testing the cabinet shall comply with the conditions defined in BS EN ISO 23953-2:2005 with the following specifications:

- Section 5.3.2.7 - Lighting and night covers - section (b). Test data must not include tests with night blinds.
- Section 5.3.6 - Heat extraction rate measurement when condensing unit is remote from cabinet shall be calculated according to section 5.3.6.3.1, section (b) and 5.3.6.3.2 method \varnothing_{run75} .

The test report must be prepared in accordance with specification in BS EN ISO 23953-2:2005.

If the test report has not been prepared by an independent body, then evidence must be provided that a representative sample of product test data has been independently verified or cross-checked.

Representative Testing

Where applications are being made for two or more cabinet models that are variants of the same basic design, test data may be submitted for a single 'representative model' provided that have

same precise 5 digit classification according to Annex A of BS EN ISO 23953-1:2005. The rules in Table 3 must be used to select the representative model that should be performance tested.

Table 3 Rules for selecting the representative model for performance testing

Variation between models	Selection rule
Cosmetic differences to the exterior	Any model may be selected to be the representative model.
Heaters (door, trim etc.), fans, defrosts, lighting and other accessories	The model with the greatest direct electrical energy consumption (DEC) must be the representative model.
Temperature level	The model with the lowest temperature setting must be the representative model.
Length	The representative model must be either 2.44 or 2.5 metres in length. This length of model can only be used to represent models between 1.8 m and 5m in length; and separate data must be submitted for each model outside of these limits.
Cabinet depth	The model with the greatest cabinet depth must be the representative model.
Shelves	The model with the lowest number of shelves must be the representative model.
Front-opening height (throat):	The model with the largest front-opening height (throat) must be the representative model.
Two or more of the above variations	The rules set out above must be combined when selecting the representative model

It should be noted that:

- If a manufacturer voluntarily removes the representative model from the Energy Technology Product List (ETPL) then other products linked with that representative model may or may not be permitted to remain on the ETPL.
- If any product submitted under these representative model rules is later found not to meet the performance criteria when independently tested, then all products based on the same representative model will be removed from the ETPL.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Refrigeration Compressors

Date added to ETL 2002 (Revised 2012).

1. Definition of Technology

Refrigeration compressors are products that are specifically designed to raise the pressure, temperature and energy level of a refrigerant vapour by mechanical means as part of a "vapour-compression, economised vapour compression or transcritical CO₂ refrigeration cycle.

Economiser packages consist of a refrigeration compressor, an expansion device, and an economiser that is capable of increasing refrigerant sub-cooling and refrigeration cycle efficiency.

2. Technology Description

Refrigeration compressors are at the heart of every refrigeration system that employs a subcritical vapour-compression refrigeration cycle, or transcritical R744 (CO₂) cycle. They range in size from those used in refrigerated display cabinets used in shops and supermarkets, to those used in large industrial refrigeration systems in breweries.

Refrigeration compressors are available in a range of different designs and efficiencies, and can be manufactured as fully hermetic, semi-hermetic or open products. The ECA Scheme aims to encourage the purchase of the higher efficiency products.

The categories of refrigeration compressor and economiser package covered are:

1. High temperature with HFC or HC refrigerant.
2. Medium temperature with HFC or HC refrigerant
3. Low temperature with HFC or HC refrigerant
4. Medium temperature transcritical/subcritical with R744 refrigerant.
5. Low temperature transcritical/subcritical with R744 refrigerant
6. Low temperature subcritical cascade with R744 refrigerant.

Where:

- These categories are defined in terms of the specific refrigerant type and the product performance at a particular temperature rating point.
- 'Subcritical cascade' refers to the first stage of a two stage process using two vapour compression cycles, the first stage with R744 and the second stage with an HFC or other refrigerant.
- 'Transcritical/subcritical' refers to single stage products that normally operate in a subcritical mode, but can also operate in transcritical mode as and when conditions demand.
- Products may be submitted under more than one category.

Investments in refrigeration compressors can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Use the refrigerant specified by the product category.
- Be either a refrigeration compressor or an economiser package.
- Incorporate a positive displacement type, hermetic or semi hermetic compressor (with integral electric motor).
- Be subject to quality assurance procedures that ensure consistency of performance between one production item and any other.

In addition, all low temperature transcritical/subcritical R744 products must include an appropriately matched gas intercooler that is capable of reducing the intermediate gas temperature to the level required for second stage compression.

Products that depend on an external motor for compressor operation (i.e. 'open' type compressors) are not eligible.

Performance Criteria

Products must have a coefficient of performance (COP) that is greater than the values shown in Table 1 below at the specified UK rating points.

Table 1 Performance thresholds for refrigeration compressors at the UK rating points

Category	Evaporating temperature (Dew Point)	Condensing temperature (Dew Point)	Compressor suction gas temperature	Liquid sub-cooling	COP threshold
High temperature with HFC or HC refrigerant	+5°C	35°C	20°C	0K	>5.20
Medium Temperature with HFC or HC refrigerant	-10°C	30°C	20°C	0K	>3.50
Low Temperature with HFC or HC refrigerant	-35°C	25°C	20°C	0K	>2.00
Medium temperature transcritical/subcritical with R744 refrigerant	-10°C	15°C	0°C	0K	> 4.20
Low temperature transcritical/subcritical with R744 refrigerant	-35°C	15°C	-25°C	0K	> 1.80
Low Temperature Subcritical with R744	-35°C	-5°C	-25°C	0K	> 3.20

">" means "greater than"

Where COP must be calculated in the manner specified in EN12900:2005 "Refrigerant compressors - Rating conditions, tolerances and presentation of manufacturer's performance data".

For economiser packages, zero subcooling refers to the liquid condition at the condenser exit.

For the avoidance of doubt test data should be presented to 2 decimal places. As an example, a product in the high temperature category with a COP of 5.20 would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with one of the following standards:

- BS EN13771-1:2003 “Compressor and condensing units for refrigeration. Performance testing and test methods. Part 1: Refrigerant compressors”.
- ANSI/ASHRAE Standard 23-2005 “Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units”.

The refrigerant properties used in the analysis of compressor performance must be obtained from one of the following sources:

- The US National Institute of Standards & Technology (NIST) Standard Reference Database 23 Thermodynamic and Transport Properties of Refrigerants and Refrigerant Mixtures Database: Version 6.0 or later. See <http://fluidproperties.nist.gov/> or <http://www.nist.gov/>.
- The ASERCOM properties database as defined in the ASERCOM Compressor Certification scheme, which is based closely on the NIST database (see <http://www.asercom.org/>).

For the high temperature category only, data for a suction gas temperature of 20°C may be obtained by the thermodynamic translation of data physically tested at 10K superheat.

Where necessary some liquid sub-cooling may be used during testing to ensure the correct operation of the test apparatus, provided the results are corrected back to a liquid sub-cooling of 0 K.

The product’s performance at the specified UK rating point may be calculated by interpolation of performance data obtained in accordance with the specified test standards at a minimum of three rating points commonly used to independently verify compressor performance characteristics within the industry. The calculated performance must be adjusted to take account for uncertainties in the measurements and interpolation method in line with industry best practice.

A test report must be submitted in accordance with the formats specified in EN13771-1:2003. This must include a statement of measured or calculated performance at the required UK rating point. For products using HFC or HC, data on refrigerating capacity and COP at the appropriate standard rating point specified in EN12900:2005 must also be submitted to enable the test results at the UK rating point to be cross-checked against the manufacturers published rating data for the product.

If the test report has not been prepared by an independent body, then evidence must be provided that a representative sample of product test data has been independently verified or cross-checked.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Refrigeration System Controls

Date added to ETL 2001 (Revised 2009).

1. Definition of Technology

Refrigeration system controls are products that are specifically designed to automatically optimise the operating temperatures and/or pressures within a distributed commercial refrigeration system in a manner that minimises the system's energy consumption, whilst maintaining the spaces or equipment being refrigerated within predefined temperature limits.

2. Technology Description

Refrigeration system controls are used to control the temperatures and pressures within a distributed, commercial refrigeration system, and to automatically adjust the refrigeration system operation to reflect changes in load, weather conditions, and operating requirements.

A wide range of refrigeration system control products is available. The ECA Scheme aims to encourage the purchase of products that automatically optimise the operation of a distributed, commercial refrigeration system and minimise its energy consumption.

The ECA Scheme covers two categories of products:

- **System management units or packages** consisting of one or more control units or modules that are designed to optimise an entire refrigeration system, including the operation of refrigeration compressor(s), evaporator(s) and condenser(s).
- **'Add-on' controllers** that are designed to be used in conjunction with a specific system management unit or package, and enable the operation of additional refrigeration compressors, evaporators and condensers to be optimised.

Investments in refrigeration controls can only qualify for Enhanced Capital Allowances if the product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

1. Incorporate a microprocessor based controller that is pre-programmed to automatically control the rate of flow of refrigerant through, and/or operating temperature of, at least one of the following types of refrigeration equipment:
 - a) Evaporators.
 - b) Condensers.
 - c) Compressors.
2. Be one of the following:
 - a) A system management unit or package that:

- Automatically adjusts system operating set points in a manner that minimises the refrigeration system's energy consumption under different operating loads, weather conditions and surrounding air temperatures.
 - Is pre-programmed to undertake one or more of the following:
 - i. Monitor temperatures and/or pressures around the refrigeration system, and automatically initiate defrost cycles, or inhibit (or delay) scheduled defrost cycles, within individual parts of the refrigeration system, as required, to optimise the overall performance of the refrigeration system.
 - ii. Monitor refrigeration system energy input (kWh) and generate a visual or audible alarm when system power consumption exceeds a pre-defined limit, or when system efficiency degradation is preventing automatic adjustment.
 - iii. Automatically in accordance with a pre-defined weekly time schedule, turn off, or turn down, ancillary power loads around the refrigeration system (such as lighting in display cabinets, trim heaters or fans), or activate night blinds, in order to reduce system energy consumption.
 - Provides facilities that enable system managers to define the default set points, and alarm limits, for each item of refrigeration equipment controlled.
- b) An add-on controller that:
- Automatically accepts instructions from the system manager to change its operating set points or alarm limits, or to initiate or inhibit a defrost cycle.
 - Automatically transmits data on operating temperatures, pressures, or flow rates to the system manager at intervals not exceeding 10 minutes.
3. Comply with the relevant requirements, as set out in Tables 1 to 3 below, for products that directly control by means of an analogue or digital signal connection:
 - a) Evaporators (see Table 1).
 - b) Condensers (see Table 2).
 - c) Compressors (see Table 3).
 4. Incorporate an anti-tampering mechanism that prevents the product's control strategy and configuration settings from being modified, and automatic control from being disabled, except during commissioning, maintenance or testing.
 5. Conform to the requirements of the EU EMC Directive 89/336/EEC (as amended) or its replacement EU EMC Directive 2004/108/EC, or be CE Marked.
 6. **Not** incorporate any form of variable speed drive, fan, pump, heat exchanger or valve, except where incorporated solely for the purposes of cooling electronic circuitry.

Table 1 Control of evaporators

All products that directly control evaporators must:

1. Be designed to directly measure evaporator pressure or temperature by means of a sensor, and automatically adjust the flow of refrigerant through the evaporator to maintain the refrigerated space within pre-defined operating limits.
2. Automatically terminate its defrost cycle when:
 - The temperature of the evaporator or refrigerated space exceeds a pre-set value.
 - A maximum defrost time consistent with sensor failure has been exceeded.
3. Provide facilities that enable system managers to define separate temperature set points and alarm limits for each evaporator being controlled.
4. Provide facilities that enable system managers to take the equipment out of service for cleaning or maintenance.
5. Generate an alarm signal when the temperature of the refrigerated space is in danger of straying outside, or has strayed outside, its pre-defined safe operating limits.

Table 2 Control of condensers

All products that directly control condensers must:

1. Be designed to directly measure condenser pressure or temperature by means of a sensor, and automatically adjust the airflow across the condenser(s) in a manner that maintains condensation at the rate required to maintain the thermal balance of the refrigeration system under different operating loads and weather conditions.
2. Allow the compressor discharge (head) pressure to “float” with ambient temperature down to the minimum safe level for the particular refrigeration system.
3. Provide facilities that enable system managers to define separate temperature set points and alarm limits for each condenser being controlled.
4. Generate an alarm signal when the condensing pressure or temperature is in danger of straying outside, or has strayed outside, the predefined safe limits.

Table 3 Control of compressors

All products that are designed to directly control compressors must:

1. Be able to control the operation of at least two refrigeration compressors.
2. Incorporate automatic control algorithms that monitor rate of change in system suction pressure or refrigerant temperature to prevent compressors from unnecessarily being controlled to load or unload in response to small fluctuations in cooling demand.

Where:

- Automatic control may be implemented either directly by means of an analogue or digital signal connection, or indirectly by means of another control device or network.
- A mechanism is defined as “any sequence of pre-defined actions that performs a given function, where an action can be defined in hardware and/or software”.
- An algorithm is defined as “a mechanism that is defined in software”.
- The product’s control strategy is the combination of automatic control functions, mechanisms and facilities specified for the particular equipment controlled. In this context, products may be pre-programmed in one of the following ways:
 - a) One or more fixed control strategies that are designed to control a specific set of equipment that can be selected during commissioning.
 - b) One or more flexible control strategies that can be configured to control different equipment, as part of a clearly defined commissioning procedure.
- Products that incorporate control strategies that are designed to control any type of equipment that is not directly related to refrigeration systems are not eligible.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Solar Thermal Systems

Date added to ETL 2002 (Revised 2010).

1. Definition of Technology

Solar thermal systems are products that are specifically designed to capture solar energy and convert it to useful heat for water heating applications.

2. Technology Description

Solar thermal systems are an energy saving product that reduces the amount of fossil fuel consumed by conventional water heating plant. They are built around a solar collector that has a dark coloured absorbing surface, which traps solar radiation and converts it into heat. This heat is then transferred to a storage vessel by means of a circulating fluid, or in some instances, the solar collector could be directly connected into the heating circuit.

A solar thermal system either may be assembled by an installer using standard components from different suppliers, or a complete system may be purchased in kit form direct from a single manufacturer. To cover these options, the ECA Scheme covers two categories of product:

- Individual solar collectors for use in installer-assembled solar thermal systems.
- Complete, ready to install, fixed configuration, solar thermal systems.

Investments in solar thermal systems can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List. To be eligible for inclusion on the Energy Technology Product List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must either:

- Use collectors that comply with the requirements of BS EN 12975-1:2006 “Thermal solar systems and components. Solar collectors. General requirements”; or
- Be sold as a complete, ready to install, fixed configuration, solar thermal system that complies with the requirements of BS EN 12976-1:2006 “Thermal solar systems and components. Factory made systems. General requirements”.

Where a solar thermal system may include the following components:

- One or more solar collectors.
- One or more appropriately sized storage vessels (where required).
- The pipework and valves forming the connection loop between the solar collector(s) and storage vessel(s), including any non-return valves, control valves, pressure relief valves, air bleed valves etc., as required for the effective operation of the product.
- Circulation pumps (where required).
- Any controls or sensors (and their associated power supplies) needed to:
 - a) Stop circulation when the yield is low.

- b) Ensure compliance with Health & Safety Executive (HSE) requirements.
- c) Operate a drain down or a frost protection strategy (where required).

The following items shall not be considered to be part of a solar thermal system unless they are required to deliver the functionality outlined above:

- The pipework from the storage vessel(s) to the point of use.
- Any auxiliary tanks used to provide back-up heating to the solar thermal system.
- Any cold water tanks and associated pipework used to replace the water being consumed at the point of use.
- Any re-enforcement to roof or structure required to mount the solar thermal system.

Performance criteria

The solar collector within the product must:

- Achieve a minimum instantaneous efficiency of 50% for operating conditions of $T^*m = 0.05$ (i.e. ambient temperature of 20°C, collector temperature 60°C and solar radiation 800W/m²), where T^*m is as defined in BS EN 12975-2:2006.
- Pass the reliability tests detailed in the standards specified in Table 1 below:

Table 1 - Requirements for reliability tests

Product Category	Applicable Standard
Individual solar collectors	BS EN 12975-2:2006 “Thermal Solar Systems and Components - Solar Collectors - Part 2 test methods”
Complete, ready to install, fixed configuration, solar thermal systems	BS EN 12976-2:2006 “Thermal solar systems and components – Factory made systems – Part 2: Test methods”.

For the avoidance of doubt instantaneous efficiency data must be presented to zero decimal places. As an example, a product containing a solar collector with an instantaneous efficiency of 49% would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures and test conditions laid down in the standards specified in the performance criteria above.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).

Uninterruptible Power Supplies

Date added to ETL 2009 (Revised 2013).

1. Definition of Technology

Uninterruptible power supplies are products that are specifically designed to maintain the continuity and quality of a power supply to electrical appliances or electrically driven equipment. When the mains electricity supply is operating, they charge up an energy storage device, which can be used to provide electrical power for a defined period when the mains electricity supply is interrupted.

2. Technology Description

Uninterruptible power supplies are used to allow electrical equipment to continue operating when the mains power supply is interrupted for a period, or the quality of the power supply deteriorates. They are widely used throughout industry and commerce to maintain the safety critical and business critical systems located in process control stations, computer rooms, data centres and server areas.

Uninterruptible power supplies are available with a wide range of different efficiencies. The ECA Scheme aims to encourage the purchase of products with the highest efficiency.

The ECA Scheme covers two categories of products:

1. **Static uninterruptible power supply units or packages**
that use one or more electronic dc. to a.c converters to generate their output voltage when operating without mains input power.
2. **Rotary uninterruptible power supply units or packages**
that use one or more rotating electrical machines (i.e. ac generators) to generate their output voltage when operating without mains input power.

Investments in uninterruptible power supplies can only qualify for Enhanced Capital Allowances if the specific product is named on the Energy Technology Product List, and in order to be eligible for inclusion on the List, products must meet the eligibility criteria as set out below.

3. Eligibility Criteria

To be eligible, products must:

- Be one of the following categories of product:
 - a) A static uninterruptible power supply as defined in BS EN 62040-3:2011 (or IEC 62040-3: 2011).
 - b) A rotary uninterruptible power supply as defined in BS EN 88528-11:2004 (or IEC 88528-11: 2004).
- Include the following components (within the unit or package):
 - a) An electronic control system that controls the operation of the product.
 - b) Voltage inverter and rectifier devices (required for static uninterruptible power supplies, optional for rotary uninterruptible power supplies).

- c) One or more energy storage devices (for example: batteries, flywheels, etc.).
 - d) One or more power supply filters.
 - e) A bypass switch (where required)
 - f) A motor generator set or alternator (for rotary uninterruptible power supplies only).
- Be designed to be connected to, and to provide electrical power backup to, a three-phase electricity supply of nominally fixed frequency and voltage.
 - Be CE Marked.

Performance criteria

Eligible products must:

- (a) Meet or exceed the minimum efficiencies at full and part load conditions set out in Table 1 below, which depends on the product category.
- (b) Have an input power factor that is greater than or equal to (i.e. \geq) 0.93 at 25%, 50%, 75% and 100% of rated maximum power output.
- (c) Have an input total harmonic distortion (THD) that is less than or equal to (i.e. \leq) 5% at 100% of rated maximum power output.

Table 1 Performance thresholds for uninterruptible power supplies

Product Category	Power range (kVA)	% of rated maximum power (i.e. % full load)			
		25%	50%	75%	100%
Static uninterruptible power supply units or packages	≥ 10 and ≤ 200	≥ 93.0	≥ 94.0	≥ 94.5	≥ 94.5
	> 200	≥ 90.9	≥ 93.5	≥ 94.3	≥ 94.0
Rotary uninterruptible power supply units or packages	> 100	≥ 89.0	≥ 93.0	≥ 95.0	≥ 96.0

" \leq " means "less than or equal to"

" $>$ " means "greater than"

" \geq " means "greater than or equal to"

For the avoidance of doubt, test data should be presented to one decimal place. As an example, a rotary uninterruptible power supply product with an efficiency of 92.9% when operating at 50% of its rated maximum power output would be deemed to be a fail.

Required test procedures

Product performance must be tested in accordance with the procedures and standard rating conditions laid down in the following standard:

- Section 6.4.1.6 and Annex J of BS EN 62040-3:2011 (or IEC 62040-3:2011): "Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements".

With the following amendments:

- Products must be operated in their least efficient normal operating mode from a standard 230/400 Volt ac (+/-3%), 50Hz electrical power supply.
- The package tested must exclude additional isolation transformers that are not physically incorporated into the uninterruptible power supply unit or package, switchgear, low voltage switchboards, and generation sets.
- Any static bypass switches fitted must be in the 'open' position.

Please note that test data obtained in accordance with the corresponding procedures in BS EN 62040-3: 2001, IEC 62040-3: 2001, and BS EN 88528-11: 2004 or IEC 88528-11: 2004 will be accepted as an alternative to testing to BS EN 62040-3:2011 (or IEC 62040-3:2011) until further notice.

Representative Testing

Where applications are being made for two or more products that are constructed out of a number of identical power supply modules, test data may be submitted for a single 'representative model'.

4. Scope of Claim

Expenditure on the provision of plant and machinery can include not only the actual costs of buying the equipment, but other direct costs such as the transport of the equipment to site, and some of the direct costs of installation. Clarity on the eligibility of direct costs is available from [HMRC](#).