

## Air-Cooled Condensing Units

Date added to ETL 2004 (Revised 2009).

### 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).
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- 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 including the compressor and the condenser fans (and any other power use associated with the ACCU).

The refrigerating capacity and power absorbed are as defined in EN13215:2000 "*Condensing units for refrigeration - Rating conditions, tolerances and presentation of manufacturer's performance data*", and the power absorbed must be measured at full load, without condenser pressure control and must include the fan power.

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 3.9 would be deemed to be a fail.

### Required test procedures

Product performance can either be calculated using Method A or measured using Method B.

#### 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 three test conditions within +/- 1°C of the temperatures in Table 1 by measuring key parameters in the refrigeration system. The test conditions need not include the actual standard UK rating point.
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- b) The level of uncertainty (at 95% confidence) in the calculated values for COP at the relevant UK rating point must be determined using standard statistical methods.
- To be eligible, the product's COP at the relevant UK rating point must exceed the threshold specified in Table 1 by at least the level of uncertainty in the calculations.
- The test report must include (or be accompanied by):
  - a) Details of the calculation method used to determine product performance.
  - b) A copy of the published performance data for the product.
  - c) Manufacturer's design data for the product and its key components, including type of refrigerant used, condenser fan motor power, and product's compressor.
  - d) 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. Where applicable, evidence that it 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.
  - e) The following test data, which must be obtained with the product operating under stable conditions at full load:
    - i. Condensing and evaporating pressures and dew temperatures at the compressor inlet and outlet.
    - ii. Superheat and sub-cooling at the compressor's inlet and the unit's outlet.
    - iii. Condenser air inlet temperature.
    - iv. Compressor input power in kW (where the compressor is not listed on the Energy Technology Product List, or its performance independently verified).

#### 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"*.

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/>).
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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.

A 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.

### 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 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](#).