

Air-Cooled Condensing Units

(added August 2004)

1. Technology Description

A condensing unit is defined as "an assembly of a condenser and one or more compressors, complete with interconnecting pipe work. Other components such as liquid receivers, filter driers and oil separators can also be included."

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.

2. Eligibility Criteria

Condensing units have to be fitted with positive displacement hermetic and semi hermetic compressors, and be air-cooled. They can be with and without sub-cooling coils/ economisers.

Testing shall be in accordance with an adapted version of EN13771-1 "Compressor and condensing units for refrigeration. Performance testing and test methods. Refrigerant compressors". Adaptations are detailed in Appendix 1 below.

Note: prEN13771-2 will cover the testing of condensing units in due course. The test methodology described in these criteria is consistent with the expected content of prEN13771-2.

Condensing unit / refrigerant combination

Eligibility is assessed for a condensing unit combined with a specific stated refrigerant, for its performance at a particular temperature rating point (see also "Data Presentation and Rating Points" below). The condensing unit/refrigerant and temperature combinations for which Energy Technology List categories have been set up are:

- High temperature with R407C
- Medium temperature with R404A
- Low temperature with R404A.

Note: A condensing unit may be proposed for inclusion under one or more of these headings.

Data presentation and rating points

Data submitted shall be presented in accordance with EN13215:2000 "*Condensing units for refrigeration - Rating conditions, tolerances and presentation of manufacturer's performance data*".

Test data shall be from typical production condensing units as sold for end-use.

The Coefficient of Performance (COP) is the measure of efficiency to be used, as defined in EN13215:2000: COP = refrigerating capacity / power absorbed

The power absorbed shall be measured at full load, without condenser pressure control.

As the qualifying condensing units are for use in the UK, they are required to meet the stated COP thresholds as measured at conditions representing typical UK conditions. Hence capacity and COP data shall be assessed at the rating points given in the table below.

Temperature range	Evaporating temperature	Ambient (condenser air-on) temperature	Compressor suction gas temperature
H (high)	+5°C	20°C	20°C
M (medium)	-10°C	20°C	20°C
L (low)	-35°C	20°C	20°C

Data for medium and low temperature ranges must be derived from physical testing at a suction gas temperature of 20°C. Data for a suction gas temperature of 20°C may be obtained by thermodynamic translation of data physically tested at 10K for the high temperature category only.

Note: Capacity and COP data is also required to be submitted for a 32°C ambient rating point for the purposes of data verification.

Refrigerant thermodynamic properties

Refrigerant properties used as the basis for compressor performance analysis are to be as defined in 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/>

Contact details: Standard Reference Data Program, National Institute of Standards and Technology, 100 Bureau Dr., Stop 2310, Gaithersburg, MD 20899-2310, USA (301) 975-2008 (VOICE)(301) 926-0416 (FAX), srdata@nist.gov

Alternatively, the ASERCOM properties database may be used as defined in the ASERCOM Certification scheme, which is based closely on the NIST database (see <http://www.asercom.org/>).

Required evidence of compliance

1. The onus is on the manufacturer or supplier to prove that their product meets the criteria.
2. Applications must include submission of all data as required on the on-line application form. This information must be generated in accordance with these criteria.
3. Applications must enclose a test report for the condensing unit that includes a statement of achieved performance at the required UK rating point. If the test report is not from an independent body, the applicant must submit evidence that a representative sample of the data for all their products is independently verified or cross-checked.
4. The manufacturer or supplier must provide evidence that the products are subject to adequate quality assurance procedures to ensure consistency of performance between one production item and any other. (For example, a copy of the relevant parts of the applicant's Quality Manual and a copy of the ISO 9000 series certificate).
5. The data supporting any product's application shall be reasonably up to date. Once a product is on the Energy Technology List, the Carbon Trust reserve the right to require refresh of old or obsolete data.

6. The data submitted for the Energy Technology List must be the same as that published in the manufacturer's technical data.

Representative model condensing units

To minimise the burden of testing, where two or more condensing unit models differ only slightly, test data from one condensing unit may be used as a proxy for that from the similar model(s). For fairness, it is necessary to limit what can be deemed as a 'representative model', as described below.

Representative models shall:

- Be tested with the same refrigerant and
- 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)) and body size (e.g. semi-hermetic K, L, or R) and
- Have the same number of condenser fans and
- Have the same sub cooling arrangement and
- Have energy efficiency the same, or inferior (ie the 'representative model' chosen for a family of models should be that with the worst energy performance)

...as/to those of the model(s) being represented.

Performance thresholds for eligibility

The COP at the stated conditions must exceed the values in the table below:

High temperature with R407C	>3.930
Medium Temperature with R404A	>2.835
Low Temperature with R404A	>1.610

">" means "greater than "

For the avoidance of doubt test data should be presented to 3 decimal places. As an example a COP of less than 3.931 for a high temperature with R407C would be deemed to be a fail.

3. 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](#).

APPENDIX 1

Test Specification for Air-cooled Condensing Units

Testing of condensing units shall be in accordance with EN13771-1 "*Compressor and condensing units for refrigeration. Performance testing and test methods. Refrigerant compressors*" with the following amendments:

1. In addition to the basic test conditions and their allowable deviations listed in table 2 (EN13771-1 section 4.9), the following condition should be included: Air onto condenser, $\pm 0.5^{\circ}\text{C}$.
2. The condensing unit must be located in an area where the temperature is controlled. This must be of a sufficient volume for an unrestricted air flow through the condenser (EN13771-1 section 5.1).
3. Test method C (water cooled condenser on the discharge side) cannot be used (EN13771-1 section 5.2.1.2.1).
4. Condenser refrigerant inlet and exit temperatures and condensing unit refrigerant inlet and outlet must also be recorded (EN13771-1 sections 5.3.5, 5.4.5, 5.6.4, 5.7.4).
5. Condenser fan motor power must also be measured. The total power consumption of the compressor and fan motors must be measured with an accuracy of $\pm 1\%$ (EN13771-1 section 6.1).
6. The fan motor power is added to the compressor power to give total power consumption of the condensing unit (EN13771-1 section 6.2).
7. The test report basic data will also include condensing unit model and serial number and number of condenser fans (EN13771-1 section 7.2).
8. The test report additional data will also include the temperature of air onto the condenser (EN13771-1 section 7.3).
9. The test report test results will include refrigerating capacity of the condensing unit at the basic test conditions in place of that for the compressor, and the power absorbed by the compressor and the condenser fans at the basic test conditions (EN13771-1 section 7.4).