Packaged Chillers

Date added to ETL 2003 (Revised 2009).

1. Definition of Technology

Packaged chillers covers products that are specifically designed to cool liquid by means of a refrigeration system that is packaged within a single factory assembled unit.

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 brine needed by industrial process cooling. Reverse cycle packaged chillers are able to provide space heating in winter, as well as space cooling.

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 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 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

Product Category			Cooling Capacity (kW)	Performance thresholds	
				Cooling EER	Heating COP
1.	Air-cooled packaged chillers that provide cooling only.	**without** integral free cooling mechanism.	Up to 100kW	>= 2.60	
			Over 100 to 500 kW	>=2.60	
			Over 500 to 750 kW	>= 2.70	
			Over 750 to 1,500 kW	>= 2.80	
		with integral free cooling mechanism.	Up to 100kW	>= 2.50	
			Over 100 to 500 kW	>= 2.50	
			Over 500 to 750 kW	>= 2.60	
			Over 750 to 1,500 kW	>= 2.70	
2.	Air-cooled, reverse cycle, packaged chillers that provide heating and cooling.		Up to 100kW	>= 2.70	>= 2.70
			Over 100 to 500 kW	>= 2.70	>= 2.70
			Over 500 to 750 kW	>= 2.80	>= 2.80
3.	Water-cooled packaged chillers that provide cooling only.		Up to 100kW	>= 4.10	
			Over 100 to 500 kW	>= 4.10	
			Over 500 to 750 kW	>= 4.50	
			Over 750 to 2,000 kW	>= 5.00	
4.	Water-cooled, reverse cycle, packaged chillers that provide heating and cooling.		Up to 100kW	>= 4.10	>= 3.70
			Over 100 to 500 kW	>= 4.10	>= 3.70
			Over 500 to 750 kW	>= 4.50	>= 4.10
			Over 750 to 2,000 kW	>= 4.60	>= 4.20

">=" 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.

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 4.49, or a heating COP of 4.09, would be deemed to be a fail.

Required test procedures

All products must be tested in accordance with the procedures set out in:

- BS EN 14511: 2004 or 2007, "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: 2004 or 2007 Table 10, Standard rating conditions, Water	
2.	Air-cooled, reverse cycle, packaged chillers that provide heating and cooling.	BS EN 14511: 2004 or 2007 Table 10, Standard rating conditions, Water	BS EN 14511: 2004 or 2007 Table 9, Standard rating conditions, Outdoor air.
3.	Water-cooled packaged chillers that provide cooling only.	BS EN 14511: 2004 or 2007 Table 8, Standard rating conditions, Water to water	
4.	Water-cooled, reverse cycle, packaged chillers that provide heating and cooling.	BS EN 14511: 2004 or 2007 Table 8, Standard rating conditions, Water to water	BS EN 14511: 2004 or 2007 Table 7, Standard rating conditions, Water
Note: The standard rating conditions "for floor cooling or similar application" must not be used.			

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 and standard rating conditions in BS EN 14511:2004 or 2007 as 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 14511:2004 or 2007. 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 will be accepted as an alternative to testing in accordance with BS EN 14511:2004 or 2007 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 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 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.