Compressors and Condensing Units

Summary of proposed Triple E eligibility criteria changes.

Changes to the Compressors and Condensing Units eligibility criteria document are proposed to the following specific conditions and tables:

Condition 7 – Introducing a new standard updated to most recent edition IS EN 12900:2013 'Refrigerant compressors – Rating conditions, tolerances and presentation of manufacturer's performance data' to replace IS EN 12900:2005

Change to Table 1: Minimum performance thresholds for refrigeration compressors at the Republic of Ireland (RoI) rating point:

- Updated to require stringent performance thresholds for refrigeration compressors to achieve best-in-class standard.
- Alternative condensing temperature performance added to tabulated data – this is to accommodate the increasing use of these higher temperatures in performance figures issued in manufacturer's data tables.
- Adjustments made to ROI COP threshold where it is shown to be out of line with the higher condenser temperature COP figures.

Change to Table 2: Performance thresholds for air-cooled condensing units at the Irish rating points:

- Updated to require stringent performance thresholds to achieve best-in-class standard for Air-Cooled Condensing Units.

The proposed eligibility criteria document is contained on the following pages.

Please follow this link to view the currently published eligibility criteria.

Triple E Eligibility Criteria

Category: Refrigeration and Cooling
Technology: Compressors and Condensing Units

Compressors and Condensing Units are defined as equipment designed to compress refrigerant vapour, and in the case of condensing units to also condense that vapour into a liquid, achieving very high operational efficiencies.

Compressors and Condensing Units equipment is considered to include the following:

Compressors

Refrigeration compressors are products 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 trans-critical CO_2 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.

Condensing Units

Air-cooled condensing units products 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 one or more compressors, an air-cooled condenser and interconnecting pipework. They may include liquid receivers, filter driers, oil separators, shut-off valves and related controls, and a weatherproof housing.

Compressors and Condensing Units Eligibility Criteria

In order to be included on the Triple E Specified List, compressors and condensing units must meet *all* of the requirements set out below

Note: *Supporting documentation that clearly demonstrates Triple E compliance according to the conditions below will be required as part of the Triple E checking process. Detailed information on the types of documents accepted can be found in the separate Supporting Documentation guidelines.*

General eligibility criteria
(applicable to all Refrigeration and Condensing Units)

No.	Condition
1	All products and/or components must be CE marked as required by the specific EU Directive.

2	Be designed to operate with one or more clearly identified standard refrigerants
3	Compressors must be hermetic or semi-hermetic type. Products that depend on an external motor for compressor operation (i.e. 'open'-type compressors) are not eligible

Compressors – specific eligibility criteria
(to be met in addition to the general eligibility criteria)

No	Condition
4	Be either a refrigeration compressor or an economiser package
5	Incorporate a positive displacement type, hermetic or semi-hermetic compressor (with integral electric motor)
6	Have a displacement greater than 9 cubic metres per hour, except for products using R744 which must have a displacement greater than 5 cubic metres per hour
7	Products must have a coefficient of performance (COP) that is greater than the values shown in Table 1 (below) at the specified rating points. COP must be calculated according to IS EN 12900:2013 'Refrigerant compressors – Rating conditions, tolerances and presentation of manufacturer's performance data'.
8	Low-temperature trans-critical/sub-critical 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

Condensing Units – specific eligibility criteria
(to be met in addition to the general eligibility criteria)

No	Condition
9	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 compressors and cooling fan(s)
10	Fall into one or more of the following three temperature categories: a) High-temperature units b) Medium-temperature units c) Low-temperature units
11	Products must have a coefficient of performance (COP that is greater than the values shown in Table 2 (below) at the specified rating points.

Table 1: Minimum performance thresholds for refrigeration compressors at the Republic of Ireland (Roi) and other rating points

Category	Evaporating temperature (dew point)	Condensing temperature (dew point)	Compressor suction gas temperature	Liquid sub-cooling	COP threshold
	deg C	deg C	deg C		
High-temperature with HFC or HC refrigerant	+5	35	20	OK	≥ 5.00
		50			≥ 3.20
Medium-temperature with HFC or HC refrigerant	-10	30	20	OK	≥ 3.36
		45			≥ 2.40
Low-temperature with HFC or HC refrigerant	-35	25	20	OK	≥ 1.94
		40			≥ 1.45
Medium-temperature transcritical/subcritical with R744 refrigerant	-10	15	0	OK	≥ 4.70
Low-temperature transcritical/subcritical with R744 refrigerant	-35	15	-25	OK	≥ 1.80
Low-temperature subcritical with R744 refrigerant	-35	-5	-25	OK	≥ 3.70

HFC = Hydrofluorocarbon
HC = Hydocarbon

Note: *For economiser packages, zero subcooling refers to the liquid condition at the condenser*

Table 2: Performance thresholds for air-cooled condensing units at the Roi rating points

Temperature category	Evaporating temperature (dew point)	Ambient (condensing air-on) temperature	Compressor suction gas temperature	COP threshold
	deg C	deg C	deg C	
High-temperature units	+5	20	20	≥ 3.4
Medium-temperature units	-10	20	20	≥ 2.0
Low-temparature units	-35	20	20	≥ 1.1

Where:

COP = refrigerating capacity/power absorbed, including the compressor and the condenser fans (and any other power use associated with the air-cooled condensing unit)

The refrigerating capacity and power absorbed are as defined in IS EN 13215:2016 +A1:2020 – '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.

---------- End of Triple E eligibility criteria ----------

Please see next section for guidance on:

1. **Technical details required in product submission.**
2. **Supporting documentation required**

Guidance on product details and supporting documentation

NOTE: The following information is not part of the official criteria document published within the relevant Statutory Instrument. It has been added here for guidance purposes only in order to help you to provide (a) product details and (b) the required supporting documentation.

All information contained in this guidance document is subject to change without notice.

Technical information required in product submission

The following are the specific technical values required as part of the product submission for this technology:

Refrigeration and Cooling product type

You must first select which type of Refrigeration and Cooling CCU your product is. Only one type can be chosen per product.

COP

. It must be entered as number only without units. There should be no spaces or full stops after the number submitted. The figure must comply with the criteria requirements for minimum COP values.

Supporting documentation required

Described below is the list of documents that are accepted as proof of compliance for the specific Refrigeration and Cooling CCU condition.

Note: This information will only be requested AFTER you submit your product's basic details online

Important Notes to Product Providers

Please ensure that you read the "Important Notes for Product Providers" section at the end of this document prior to submitting documentation

General Conditions

(applicable to all Compressor and Condensing Unit equipment

No	Condition	Supporting Documentation Requirements
1	All products and/or components must be CE marked as required by the specific EU directive.	Official and published manufacturer's technical data sheet or brochure that demonstrates CE marking compliance. **OR** A copy of an official signed declaration on headed paper which confirms CE marking compliance. Official declarations should explicitly state the product for which CE marking is being confirmed (i.e. do not provide a letter simply stating general compliance with the relevant Triple E Condition). Where a document is used to demonstrate conformance for a number of products or range of products it should clearly specify each individual product covered by that document.
2	Be designed to operate with one or more clearly identified standard refrigerants	Official and published manufacturer's technical data sheet or brochure that demonstrates compliance with the requirements of this condition
3	Compressors must be hermetic or semi-hermetic type. Products that depend on an external motor for compressor operation (i.e. 'open'-type compressors) are not eligible	Official and published manufacturer's technical data sheet or brochure that demonstrates compliance with the requirements of this condition

Compressors – specific eligibility criteria

(to be met in addition to the general eligibility criteria)

No	Condition	Supporting Documentation Requirements
4	Be either a refrigeration compressor or an economiser package	Official and published manufacturer's technical data sheet or brochure that demonstrates compliance with the requirements of this condition
5	Incorporate a positive displacement type, hermetic or semi-hermetic compressor (with integral electric motor)	Official and published manufacturer's technical data sheet or brochure that demonstrates compliance with the requirements of this condition
6	Have a displacement greater than 9 cubic metres per hour, except for products using R744 which must have a displacement greater than 5 cubic metres per hour	Official and published manufacturer's technical data sheet or brochure that demonstrates compliance with the requirements of this condition
7	Products must have a coefficient of performance (COP) that is greater than the values shown in Table 1 (above) at the specified rating points. COP must be calculated according to IS EN 12900:2013 'Refrigerant compressors – Rating conditions, tolerances and presentation of manufacturer's performance data'.	See Supplementary Notes on Testing, below
8	Low-temperature trans-critical/sub-critical 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	Official and published manufacturer's technical data sheet or brochure that demonstrates compliance with the requirements of this condition

Condensing Units – specific eligibility criteria

(to be met in addition to the general eligibility criteria)

No	Condition	Supporting Documentation Requirements
9	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 compressors and cooling fan(s	Official and published manufacturer's technical data sheet or brochure that demonstrates compliance with the requirements of this condition
10	Fall into one or more of the following three temperature categories: a) High-temperature units b) Medium-temperature units c) Low-temperature units	Official and published manufacturer's technical data sheet or brochure that demonstrates compliance with the requirements of this condition
11	Products must have a coefficient of performance (COP) that is greater than the values shown in Table 2 (above) at the specified rating points	See Supplementary Notes on Testing, below

Supplementary Notes on Testing

All products must be tested in accordance with one of the following standards:

· IS EN 13771-1:2016 '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 subcooling of 0K.

A test report must be submitted in accordance with the formats specified in IS EN 13771-1:2016. This must include a statement of achieved performance at the required Irish rating point. For products using HFC or HC, data on refrigerating capacity and COP at the appropriate standard rating point specified in IS EN 12900:2013 must also be submitted. This enables the test results at the Irish rating point to be cross-checked against the manufacturer's published rating data for the product.

If the test report has not been prepared by an independent body, evidence must be provided that a representative sample of product test data has been independently verified or cross-checked.

Testing Method A

Under method A, the product's coefficient of performance (COP) at the relevant Irish rating point (as specified in Table 2) 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 2 by measuring key parameters in the refrigeration system. The test conditions need not include the actual standard Irish rating point.

b) The level of uncertainty (at 95% confidence) in the calculated values for COP at the relevant Irish rating point must be determined using standard statistical methods.

- To be eligible, the product's COP at the relevant Irish rating point must exceed the threshold specified in Table 2 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 IS EN 12900: 2013, and at the relevant Irish rating point specified in the eligibility criteria for 'refrigeration compressors'

ii. Where applicable, evidence that it is listed on the Triple E Specified 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

Testing Method B

Under method B, product performance must be demonstrated by testing the product in accordance with the following standard: IS EN 13771-2: 2017 '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/).

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 Irish rating point. Data on refrigerating capacity and COP at the 32°C ambient temperature standard reference point specified in IS EN 13215:2016 +A1:2020 for air-cooled condensing units must also be included in the test report. This enables the test results at the Irish rating point to be cross-checked against the manufacturer's published rating data for the product.

Important Notes to Product Providers

General

There should be a clear link between all supporting documentation supplied and the product being submitted. This will typically take the form of a product code or product name that can be cross referenced between the submitted product and relevant supporting documentation. If product codes / names have been changed since publication of the supporting documentation, then official evidence of this must be provided with the supporting documentation supplied.

Any deviation from these requirements will result in the supporting documentation not being considered adequate for the purposes of demonstrating compliance with the criteria conditions. This will in turn delay the submission and/or result in the product not being considered eligible.

Where the Triple E criteria or help documentation references compliance to appropriate rather than specific standards, the onus is on the product provider to ensure that supporting documentation supplied references recognised standards that apply to the submitted product, i.e. the product must be covered under the scope of a recognised standard.

If any product submitted is later found not to meet the performance or specification criteria, then this product will cease to be considered eligible for the Triple E.

Note: When supplying the supporting documentation through the online process you must ensure that the correct page number(s) of the document is referenced when demonstrating compliance with the relevant condition. An explanatory note should also be given where more than one page number is referenced.

Test Report

A test report must include an outline of the complete test, including:

- √ Introduction
- √ Details on test conditions
- √ The specific model details of the product tested
- √ The steps taken in the test
- √ The results
- √ Graphical representations
- √ Conclusion

All documents should be on headed paper and the document should be officially signed off.

All documentation must be in English or include adequate translation.

Certification

Where certificates are provided, all tests must be carried out by an organisation that is accredited by a national accreditation body recognised via the European Cooperation for Accreditation (preferred) or the International Accreditation Forum.

All documentation must be in English or include adequate translation.

Scientific Equivalence

Some Triple E criteria conditions allow for scientifically equivalent tests and/or standards to be used. In the event that a product has not been designed, manufactured or tested to the specific standard named, then documentation relating to an equivalent internationally recognised standard may be used (where the phrase 'Or scientific equivalent' is included in the Triple E condition or help documentation). In such applications, the onus will be on the product submitter to demonstrate satisfactory equivalence of the standards. However, submissions which reference such supporting documentation may take longer to process, and if the product provider does not provide satisfactory evidence of equivalence, then the product will not be considered eligible for the Triple E register.

All documentation must be in English or include adequate translation.

Note: Where specific standards are cited in a condition or in the Triple E help documentation, then documentation demonstrating that the relevant products have been designed, manufactured or tested to these specific standards is preferred. Scientific equivalence is considered the exception rather than the norm.