Electrical and Mechanical Services Department

GUIDANCE NOTE ON HOUSEHOLD AIR-CONDITIONERS USING MILDLY FLAMMABLE REFRIGERANT

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EMSD

Index

1. Foreword and Scope

1.1 This guidance note covers the safety guidelines related to the standards, storage, transportation, installation, maintenance and disposal of household air-conditioners using mildly flammable refrigerant.

1.2 In accordance with the Electrical Products (Safety) Regulation (Cap. 406G), all household electrical products supplied in Hong Kong, including household air-conditioners, shall comply with applicable safety requirements, such as IEC standards, and be issued with valid Certificates of Safety Compliance.

1.3 This guidance note applies to household air-conditioners containing mildly flammable refrigerant only. It shall be read in conjunction with all relevant statutory provisions under the Laws of the Hong Kong Special Administrative Region, including but not limited to the following:-

- Dangerous Goods Ordinance (Cap. 295);
- Dangerous Goods (General) Regulations (Cap. 295B);
- Electricity Ordinance (Cap. 406);
- Electricity (Wiring) Regulations (Cap. 406E);
- Electrical Products (Safety) Regulation (Cap. 406G);
- Energy Efficiency (Labelling of Products) Ordinance (Cap. 598);
- Fire Services Ordinance (Cap. 95);
- Factories and Industrial Undertakings Ordinance (Cap. 59);
- Factories and Industrial Undertakings (Dangerous Substances) Regulations (Cap. 59AB);
- Factories and Industrial Undertakings (Gas Welding and Flame Cutting) Regulation (Cap. 59AI);
- Gas Safety Ordinance (Cap. 51);
- Occupational Safety and Health Ordinance (Cap. 509);
- Product Eco-responsibility Ordinance (Cap. 603);
- Waste Disposal Ordinance (Cap. 354); and
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C).

1.4 This guidance note shall also be read in conjunction with the manufacturer's instructions and shall not supersede such instructions unless the latter conflict with the relevant statutory provisions.

1.5 This document is for guidance only and is not intended to relieve persons from their statutory responsibilities.

2. Terms and Abbreviations

2.1 Terms

Term	Meaning
Household air-conditioner using mildly flammable refrigerant	Split type or window type air-conditioner using mildly flammable refrigerant and designed for residential application.
Liquefied Petroleum Gas	A gas defined in Cap. 51, which is a mixture of:- (a) hydrocarbons primarily consisting of butanes, butylenes, propane or propylene; or (b) all or any of the hydrocarbons referred to in paragraph (a).
Lower flammability limit	The minimum concentration of the refrigerant that propagates a flame through homogeneous mixture of refrigerant and air.
Maintenance workshop	Premises designated for any activity related to the repair and maintenance of household air-conditioners using mildly flammable refrigerant.
Mildly flammable refrigerant	It refers to refrigerant with flammability class 2L (lower flammability) according to the safety classification of refrigerants of the ASHRAE Standard 34 and ISO 817.
Refrigerant	Fluid used for heat transfer in a refrigerating system, which absorbs heat at a low temperature and a low pressure of the fluid and rejects it at a higher temperature and a higher pressure of the fluid usually involving changes of the phase of the fluid.
Service personnel	Technician who has completed special training, provided by the relevant air-conditioner manufacturer or recognized training institute, additional to usual refrigerating equipment installation, repair, maintenance, servicing and disposal procedures.

Term	Meaning
Standard	means (a) the British Standard published by the British Standards Institution; (b) the European Standard published by the European Committee for Electrotechnical Standardization; (c) the International Standard published by the International Electrotechnical Commission or the International Organization for Standardization; or (d) any other relevant standards.
Supplier	means a person who supplies an electrical product.

2.2 Abbreviations

Abbreviation	Meaning
ASHRAE	The American Society of Heating, Refrigerating and Air-Conditioning Engineers
Cap.	Chapter
^{o}C	degree Celsius
EMSD	Electrical and Mechanical Services Department
EPD	Environmental Protection Department
FSD	Fire Services Department
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
K	kelvin (unit of temperature in the International System of Units)
kg	kilogram
kW	kilowatt
LD	Labour Department
LFL	Lower flammability limit
LPG	Liquefied petroleum gas
m^2	square metre
m^3	cubic metre
mm	millimetre
MEELS	Mandatory Energy Efficiency Labelling Scheme
MSDS	Material Safety Data Sheet
REC	Registered electrical contractor
REW	Registered electrical worker

3. Product Safety, Marking and Safety Instructions

3.1 Electrical product safety

All household electrical products, including household air-conditioners, shall comply with the applicable safety requirements stipulated in the Regulation – Electrical Products (Safety) Regulation (Cap. 406G). The Guidance Notes for the Electrical Products (Safety) Regulation are guidelines for suppliers of electrical products to understand the requirements of the Regulation. The Guidance Notes also set out lists of standards that are deemed to satisfy the applicable safety requirements of the Regulation. For household air-conditioners, the applicable safety standards are IEC 60335-2-40 in conjunction with IEC 60335-1. Should household air-conditioners be conforming to other safety standards, such standards should be proved to be equivalent to IEC 60335-2-40.

3.1.1 A certificate of safety compliance shall include the following information in English or Chinese:-

(a) a reference number;

(b) the name and model or type reference of the electrical product;

(c) the name and address of the manufacturer;

(d) the name and address of the person or company who requested testing of the electrical product;

(e) a standard to which the electrical product was tested and found in conformity;

(f) the name, address, authorized signature and, if applicable, company seal of the recognized certification body or recognized manufacturer, as the case may be; and

(g) the date of certification.

3.2 Refrigerant safety

3.2.1 The refrigerant safety requirements are made by reference to ISO 817, ASHRAE Standard 34 and IEC 60335-2-40 in conjunction with IEC 60335-1.

3.2.2 The safety classification shall consist of two alphanumeric characters with a third

character L designating low burning velocity. The capital letter indicates the toxicity; the Arabic numeral denotes the flammability.

3.2.3 For toxicity classification, refrigerants shall be assigned to one of two classes:-

- Class A (lower chronic toxicity);
- Class B (higher chronic toxicity).

3.2.4 For flammability classification, refrigerants shall be assigned to one of four classes below based on lower flammability limit testing:-

- Class 1 (no flame propagation);
- Class 2L (lower flammability);
- Class 2 (flammable);
- Class 3 (higher flammability).

3.2.5 The toxicity and flammability classifications described in Clauses 3.2.3 and 3.2.4 yield eight separate safety classifications for refrigerants. These classifications are represented by the matrix below:-

	Safety Group	
Higher Flammability	A3	B3
Flammable	A2	B2
Lower flammability	A2L	B2L
No flame Propagation	A1	B1
	Lower Toxicity	Higher Toxicity

3.2.6 The requirement for installation space of household air-conditioners with A2L refrigerant is determined in accordance with IEC 60335-2-40. The case applicable based on the relationship of the refrigerant charge (m_c) and m_1, m_2 , m_3 defined as follows shall firstly be determined:-

For IEC 60335-2-40:2013 +AMD1:2016	For IEC 60335-2-40:2018
m_1 = 4 x LFL m_2 = 26 x LFL m_3 = 130 x LFL	m_1 = 6 x LFL m_2 = 52 x LFL m_3 = 260 x LFL

where

LFL is the lower flammability limit, in kg/m^3

The lower flammability limit (LFL) of R32 is listed below for reference:-

For IEC 60335-2-40:2013 +AMD1:2016	For IEC 60335-2-40:2018
LFL of R32 is 0.306 kg/m^3	LFL of R32 is 0.307 kg/m^3

3.2.7 In accordance with IEC 60335-2-40, for fixed household air-conditioner with a refrigerant charge $m_c \leq m_1$, there is no restriction on the indoor room area size.

3.2.8 For fixed household air-conditioner with a refrigerant charge $m_1 < m_c \leq m_2$, the required minimum floor area A_{min} to install a household air-conditioner with refrigerant charge m_c (kg) shall be as follows:-

For IEC 60335-2-40:2013 +AMD1:2016	For IEC 60335-2-40:2018
$A_{min} = (m_c / (2.5 \times (LFL)^{(5/4)} \times h_0))^2$	$A_{min} = (m_c / (2.5 \times (LFL)^{(5/4)} \times h_0))^2$, but not less than $A_{min} = m_c / (SF \times LFL \times h_0)$

where

m_c is the refrigerant charge in household air-conditioner, in kg

A_{min} is the required minimum room area, in m^2

LFL is the lower flammability limit, in kg/m^3

SF is a safety factor with a value of 0.75

h_0 is the release height, the vertical distance in metres from the floor to the point of release when the household air-conditioner is installed

3.2.9 In general, the refrigerant charge within household air-conditioner would not exceed m_2.

3.2.10 In case of additional charge of mildly flammable refrigerant is required, the resulting total refrigerant charge in the household air-conditioner shall be used to calculate the required minimum floor area A_{min} as described in Clause 3.2.8.

3.2.11 For household air-conditioners using mildly flammable refrigerants, the construction of appliances shall be complied with the following:-

(a) Refrigerant tubing shall be protected or enclosed to avoid mechanical damage. The tubing shall be protected to the extent that it will not be handled or used for carrying during moving of the product. Tubing located within the confines of the cabinet is considered to be protected

from mechanical damage.

(b) Low temperature solder alloys, such as lead/tin alloys, are not acceptable for pipe connections or any other refrigerant pressure containing purposes.

(c) Appliances shall be constructed so that any leaked refrigerant will not flow or stagnate so as to cause a fire or explosion hazard in areas within the appliance and connected ducts where electrical components, which could be a source of ignition and which could function under normal conditions or in the event of a leak, are fitted.

(d) For appliances complying with IEC 60335-2-40:2013+AMD1:2016, temperatures on surfaces that may be exposed to leakage of flammable refrigerants shall not exceed the auto-ignition temperature of the refrigerant reduced by 100 K.

(e) For appliances complying with IEC 60335-2-40:2018, temperatures on surfaces that may be exposed to leakage of flammable refrigerants shall not exceed the maximum allowable surface temperature given in Annex BB of IEC 60335-2-40:2018.

3.2.12 For partial units, condensing units and evaporating units shall be equipped with a pressure-limiting device or equivalent to assure that the equipment does not exceed the maximum allowable pressure.

3.3 Marking

3.3.1 The markings and labelling on household air-conditioners provide information for safe use and safe installation of the appliances. They shall be in compliance with Clause 7: Marking and instructions of IEC 60335-2-40 in conjunction with IEC 60335-1.

3.3.2 For household air-conditioners using mildly flammable refrigerants, a flame symbol of "Risk of fire/Flammable materials" or "low burning velocity material", subject to the edition of IEC 60335-2-40 being tested, and the operator's manual symbol shall be visible when viewing the household air-conditioner after it has been installed. For household air-conditioners that are not single package units, the flame symbol shall be provided on all indoor and outdoor units.

3.3.3 The flame symbol shall be accompanied with a yellow triangular sign in

accordance with flame symbol: ISO 7010-W021, warning: Risk of fire/Flammable materials or warning: low burning velocity material. The perpendicular height of the triangle for the symbol shall be at least 30 mm.

3.3.4 The flame symbols are shown below:-

For IEC 60335-2-40:2013 +AMD1:2016	For IEC 60335-2-40:2018
 (Note: This symbol is for flammability classes 2L, 2 and 3.)	 (Note: This symbol is for flammability class 2L only.)

3.3.5 An additional flame symbol shall be placed on the nameplate of the unit near the declaration of the refrigerant type and charge information. The perpendicular height of the symbol shall be at least 10 mm and the symbol needs not be in colour.

3.4 Safety instructions to be shown in the user manual

3.4.1 Safety instructions shall be in compliance with Clause 7: Marking and instructions of IEC 60335-2-40 in conjunction with IEC 60335-1.

3.4.2 The user manual shall include the following basic safety requirements:-

(a) The flame symbol in Clause 3.3.4 to alert users and service personnel that the household air-conditioner is using mildly flammable refrigerant.

(b) Minimum installation height and minimum room area.

(c) The maximum refrigerant charge of the household air-conditioner.

(d) Instruction on how to determine the additional refrigerant charge and how to complete the refrigerant charge.

(e) The instructions shall include information pertaining to the handling, installation, cleaning, servicing and disposal of refrigerant and the household air-conditioner.

(f) The household air-conditioner shall not be installed near ignition sources

or open flames.

(g) Servicing shall be performed only as recommended by the manufacturer.

(h) In case the refrigerant circuit is damaged, do not use any electric or gas appliances, ensure no source of ignition (e.g. lighter, matches) nearby, and open all windows to provide good ventilation, and should contact supplier/supplier's agent/maintenance agent to follow up. In case of emergency, call 999 immediately.

(i) The markings mentioned in Clause 3.3 shall be kept throughout the life cycle of the air-conditioner. The user manual should be handed over to any person who would use or handle the air-conditioner whenever the air-conditioner would be transferred to another location and delivered to a recycling plant.

3.4.3 For partial units, the instructions or markings shall include the following additional information:-

(a) For evaporating units and condensing units, the instructions or markings shall include a wording to assure that the maximum operating pressure is considered when connecting to any condenser unit or evaporator unit.

(b) The instructions or markings shall include refrigerant charging instructions.

3.4.4 Manufacturers of the household air-conditioners may include other safety requirements.

4. Sales

4.1 Energy label for room air-conditioners

4.1.1 The Mandatory Energy Efficiency Labelling Scheme (MEELS) has been implementing through the Energy Efficiency (Labelling of Products) Ordinance, Cap. 598. Under MEELS, energy labels are required to be affixed on room air-conditioners, which fall into the scope of prescribed products, for supply in Hong Kong to inform consumers of their energy efficiency performance.

4.1.2 The type of refrigerant used for the room air-conditioner shall be shown on the energy label.

4.2 Safety messages to be shown in the sales documents

4.2.1 The sales documents shall include the following safety messages:-

(a) The flame symbol in Clause 3.3.4 to alert consumers that the household air-conditioner is using mildly flammable refrigerant.

(b) The household air-conditioner shall be installed in accordance with manufacturer's recommended minimum installation height and minimum room area.

(c) The installation, repair and maintenance works shall be performed by trained service personnel.

4.2.2 Supplier/supplier's agent shall ensure that sales personnel, either employed by him or his authorized distributors and dealers, are trained to be familiar with safety messages in Clause 4.2.1 and he/she should be able to deliver these messages to consumers.

4.2.3 When viewing the household air-conditioner on display for sale, the flame symbol in Clause 3.3.4 shall be visible on to alert consumers that the household air-conditioner is using mildly flammable refrigerant.

5. Storage and Transportation

5.1 General

5.1.1 Any party who stores, conveys or uses mildly flammable refrigerant shall comply with all relevant regulatory requirements.

5.2 Storage

5.2.1 The household air-conditioners using mildly flammable refrigerants shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).

5.2.2 Storage package protection should be constructed in such a way that mechanical damage to the household air-conditioner inside the package will not cause a leak of the refrigerant charge.

5.2.3 If the composition of a refrigerant falls within the definition of LPG under the Gas Safety Ordinance (Cap. 51), the storage of such refrigerant may be regulated by this Ordinance.

5.2.4 For refrigerants classified as dangerous goods (other than LPG), FSD can invoke the Dangerous Goods Ordinance (Cap. 295) and regulate their manufacture, storage, transport and general use but not their import or supply, nor their use in air-conditioning systems. The cylinders containing non-LPG dangerous goods shall be marked or labelled in accordance with the Dangerous Goods (General) Regulations (Cap. 295B).

5.2.5 Cylinders holding refrigerants shall also be labelled in accordance with the Factories and Industrial Undertakings (Dangerous Substances) Regulations (Cap. 59AB).

5.3 Transportation

5.3.1 Household air-conditioners using mildly flammable refrigerants shall withstand the effects of vibration during transport.

5.3.2 For conveyance of refrigerant which is a non-LPG dangerous goods, a licence issued by the Director of Fire Services is required for any vehicle used for the conveyance of Category 2 dangerous goods exceeding its exempt quantity.

6. Installation

6.1 Competency of service personnel

6.1.1 Employer of service personnel shall comply with the relevant requirements under the Factories and Industrial Undertakings Ordinance (Cap. 59) and the Occupational Safety and Health Ordinance (Cap. 509) and their subsidiary regulations to provide adequate and sufficient training to service personnel and ensure that they are equipped with all the relevant technical knowledge and skills on working safely with mildly flammable refrigerant.

6.1.2 Service personnel shall complete special training on working with mildly flammable refrigerants provided by relevant supplier/supplier's agent or recognized training institute, additional to usual refrigerating equipment installation, repair, maintenance, servicing and disposal procedures.

6.1.3 Service personnel shall understand fully about the installation constraints on minimum installation height and minimum room area for the household air-conditioners using mildly flammable refrigerants.

6.1.4 The electrical installation works shall be conducted by a registered electrical contractor (REC) and the service personnel engaged in such electrical work on fixed electrical installations must be a registered electrical worker (REW).

6.1.5 Supplier/supplier's agent shall issue an identification card to the service personnel who has completed the training as mentioned in Clause 6.1.2.

6.2 Safe work practices

6.2.1 A task-specific risk assessment should be carried out by a competent person before the commencement of work with reference made to the relevant MSDS of the refrigerant to be used so as to devise a work method that is safe and without risk to health.

6.2.2 Service personnel shall assess the room area and installation height for the household air-conditioner using mildly flammable refrigerant to ensure compliance with the manufacturer's requirements.

6.2.3 Service personnel shall ensure no potential sources of ignition in the vicinity of the air-conditioner that could ignite any refrigerant leaks from the air-conditioner.

6.2.4 For uncharged refrigerant system, brazed, welded, or mechanical connection works shall only be made before opening the valves to permit refrigerant to flow between the refrigerating system parts. A vacuum valve shall be provided to evacuate the interconnecting pipe and/or any uncharged refrigerating system part.

6.2.5 For charged refrigerant system, if a leakage is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

6.2.6 When additional charge of mildly flammable refrigerant is required, service personnel shall fill in the resulting total refrigerant charge in label provided from the manufacturer.

6.2.7 Refrigerant tubing shall be protected or enclosed to avoid damage.

6.2.8 Upon the completion of installation work, service personnel should sign the job completion card to verify that the requirements on minimum room area and minimum installation height are met. If welding work is to be carried out during installation of the household air-conditioner, the tubing shall be welded and connected before charging with refrigerant. Gas welding and flame cutting work must be performed by workers holding a valid certificate pursuant to the Factories and Industrial Undertakings (Gas Welding and Flame Cutting) Regulation (Cap. 59AI).

7. Maintenance and Repair

7.1 Occupational safety and health

7.1.1 In accordance with the Factories and Industrial Undertakings Ordinance (Cap. 59) and the Occupational Safety and Health Ordinance (Cap. 509), proprietors/employers shall ensure, so far as is reasonably practicable, the safety and health at work of all persons employed in their workplaces by:-

(a) providing and maintaining plant and systems of work that are safe and without risks to health;

(b) making arrangement for ensuring safety and health in connection with the use, handling, storage or transport of plant, articles or substances;

(c) providing all necessary information, instruction, training, and supervision for ensuring safety and health;

(d) maintaining the workplace in a condition that is safe and without risks to health, and providing and maintaining safe means of access to and egress from the workplaces; and

(e) providing and maintaining a safe and healthy work environment.

7.1.2 Every person employed at work shall comply with the general duties of person employed as stipulated under the Ordinances stated in Clause 7.1.1, which include taking reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions at work; and as regards any duty or requirement imposed on proprietors/employers for securing the health and safety of person employed in the workplaces, co-operating with him

so far as is necessary to enable that duty or requirement to be performed or complied with.

7.2 Maintenance and repair work

7.2.1 The employer and service personnel shall observe the occupational safety and health requirements stipulated in the relevant LD's publications, in particular the Guidance Notes on Work Safety and Health of Air-conditioning Works. Among others, the employer should appoint a competent person to conduct task-specific risk assessments to identify all potential hazards associated with the maintenance and repair work.

7.2.2 Prior to starting the maintenance and repair work on household air-conditioners using mildly flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized. The workplace shall be checked with an appropriate refrigerant detector prior to and during work, to ensure that the service personnel is aware of potentially flammable atmospheres. The leak detection equipment being used is suitable for use with the applicable refrigerants.

7.2.3 Maintenance and repair work in connection with flammable refrigerants should be carried out in a well-ventilated place to avoid suffocation, poisoning or accumulation of flammable gases. Appropriate air monitoring equipment, such as portable gas detectors, should also be provided and used.

7.2.4 Work related to the handling and replacement of refrigerants must be carried out by workers with relevant training and experience.

7.2.5 If welding work has to be carried out to the refrigerant circuit of household air-conditioner, the refrigerant must first be completely removed, followed by inert gas purging of the tubing of the refrigerant circuit before welding. Gas welding and flame cutting work must be performed by workers holding a valid certificate pursuant to the Factories and Industrial Undertakings (Gas Welding and Flame Cutting) Regulation (Cap. 59AI). In addition, requirements stipulated in the Code of Practice: Safety and Health at Work for Gas Welding and Flame Cutting should be observed.

7.2.6 Refrigerant cylinders should be kept away from any source of ignition or corrosive substances. Service personnel shall be cautious of the fire and

explosion hazards when handling flammable refrigerants.

7.2.7 Sufficient and suitable fire extinguishers should be provided in the workplace.

7.2.8 The maintenance workshop shall not be built below ground level. If a gully or drain in the workshop floor area is unavoidable, the opening/drain shall either be securely covered or suitably sealed.

8. Dismantling and Disposal

8.1 Regulated Electrical Equipment (REE) including household air-conditioners are defined under the Product Eco-responsibility Ordinance (Cap. 603). Waste REE or e-waste is subject to disposal bans at refuse transfer stations and landfills, and e-waste disposal licensing control. E-waste should be directed to licensed e-waste disposal facilities under Waste Disposal Ordinance (Cap. 354) for disposal. Except under certain circumstances, any person engaging in the disposal, i.e. storage, treatment, reprocessing or recycling, of such air-conditioners must first obtain a waste disposal licence from EPD and shall observe the requirements stipulated in relevant EPD's guidelines on e-waste control and chemical waste control.

8.2 When a household air-conditioner using mildly flammable refrigerant is to be scrapped, all mildly flammable refrigerant shall be removed before disposal of the air-conditioner.

8.3 The machine used for refrigerant recovery must be suitable for mildly flammable refrigerants and should not have any potential sources of ignition.

8.4 The recovery cylinder must be suitable for the refrigerant used. Refrigerants of different safety group classifications must not be mixed in recovery cylinders. The recovered refrigerants should be reused as far as practicable.

8.5 Prior to disposal of the air-conditioner, the refrigerant content inside the refrigerant circuit of the air-conditioner shall be removed to ensure safety. No work involving naked flame or high temperature shall be carried out during the process.

8.6 As unwanted refrigerants are classifiable as chemical waste under Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C), their handling and disposal are subject to control under the Waste Disposal Ordinance (Cap. 354) and its subsidiary Regulations.

8.7 Any person or company who produces unwanted refrigerants should first register with EPD as a chemical waste producer. The waste producer is required to properly package, label and store chemical waste, and engage licensed chemical waste collectors to collect and deliver the waste to licensed waste disposal facilities. If there is no proper disposal facility available for the refrigerant in Hong Kong, the waste producer will need to make other disposal arrangements, subject to EPD's approval.

9. Reference

9.1 ASHRAE Standard 15-2019 Safety Standard for Refrigeration Systems

9.2 ASHRAE Standard 34-2019 Designation and Classification of Refrigerants

9.3 Code of Practice: Safety and Health at Work for Gas Welding and Flame Cutting published by the Labour Department, Hong Kong

9.4 Fire Protection Notice No.4 – Dangerous Goods, published by the Fire Services Department, Hong Kong

9.5 Guidance Notes for the Electrical Products (Safety) Regulation (2019 Edition), published by the Electrical and Mechanical Services Department, Hong Kong

9.6 Guidance Notes on Work Safety and Health of Air-conditioning Works published by the Labour Department, Hong Kong

9.7 IEC 60335-1:2010+AMD1:2013+AMD2:2016 Household and similar electrical appliances – Safety – Part 1: General requirements

9.8 IEC 60335-2-40:2018 Household and similar electrical appliances – Safety – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

9.9 ISO 817:2014+AMD1:2017 Refrigerants – Designation and safety classification

9.10 ISO 5149-1:2014 to ISO 5149-4:2014 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1 to Part 4

9.11 ISO 15042:2017 Multiple split-system air conditioners and air-to-air heat pumps – Testing and rating for performance