



Distr.: General  
31 August 2018

English only



**United Nations  
Environment  
Programme**

**Thirtieth Meeting of the Parties to  
the Montreal Protocol on Substances  
that Deplete the Ozone Layer**  
Quito, 5–9 November 2018

## **Tabular overview of safety standards for refrigeration, air-conditioning, and heat-pump systems and appliances**

### **Note by the Secretariat**

1. By the time of the adoption of the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer at the Twenty-Eighth Meeting of the Parties in October 2016, the parties to the Protocol had identified ways of dealing with the various challenges associated with the adoption of the amendment. One of those challenges was ensuring the safe market introduction, manufacturing, operation, maintenance and handling of flammable zero-global-warming-potential (GWP) and low-GWP refrigerants that are alternatives to hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs). In that regard, the Twenty-Eighth Meeting of the Parties adopted decision XXVIII/4, on the establishment of regular consultations on safety standards, including requests addressed to the Secretariat, the Technology and Economic Assessment Panel and the parties.<sup>1</sup>
2. In response to decision XXVIII/4, the following actions were undertaken:
  - The Secretariat liaised with international and regional standards bodies<sup>2</sup> with a view to holding regular consultations on safety standards and informing the parties accordingly.
  - The Technology and Economic Assessment Panel established a task force which prepared a report on safety standards for the consideration of the Open-ended Working Group at its thirty-ninth meeting in July 2017. The report provided information on progress in the revision of international safety standards; information concerning tests and/or risk assessments and their results relevant to safety standards; and assessment of the implications of international standards for the implementation of the decisions of the meetings of the parties on the accelerated phase-out of HCFCs and HFC control measures and relevant recommendations to the parties.<sup>3</sup>

<sup>1</sup> Decision XXVIII/4: Establishment of regular consultations on safety standards.

<sup>2</sup> Including the International Electrotechnical Commission (IEC), International Standards Organization (ISO), the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC), UL (formerly known as Underwriters Laboratories), the American National Standards Institute (ANSI), the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

<sup>3</sup> Technology and Economic Assessment Panel May 2017: Decision XXVIII/4 Task Force Report – Safety standards for flammable low global-warming-potential (GWP) refrigerants (volume 3).

- A number of parties<sup>4</sup> submitted to the Secretariat information on their domestic safety standards relevant to the use of low-GWP flammable refrigerants which were considered by the Technology and Economic Assessment Panel in the preparation of its report and were compiled in a note by the Secretariat (UNEP/OzL.Pro.WG.1/39/INF/4).<sup>5,6</sup>
  - A one-day workshop on safety standards relevant to the safe use of low-GWP alternatives was held prior to the thirty-ninth meeting of the Open-ended Working Group in July 2017, a summary of which was presented to the Open-ended Working Group at its thirty-ninth meeting (UNEP/OzL.Pro.WG.1/39/4).<sup>7</sup>
3. To facilitate the parties' discussions on the matter at the workshop and the thirty-ninth meeting of the Open-ended Working Group, the Secretariat also prepared the following three briefing notes:
- (a) Safety standards relevant to refrigeration, air-conditioning and heat pump equipment;<sup>8</sup>
  - (b) Updating the refrigeration, air-conditioning and heat pump (RACHP) safety standards;<sup>9</sup>
  - (c) Application of safety standards to refrigeration, air-conditioning and heat pump equipment – a lifetime perspective.<sup>10</sup>
4. Further consideration of safety issues relevant to zero-GWP and low-GWP alternatives in refrigeration, air-conditioning and heat pump equipment led to the adoption of decision XXIX/11, on safety standards, by the Twenty-Ninth Meeting of the Parties in November 2017.<sup>11</sup> By that decision, the Secretariat was requested to hold regular consultations with relevant standards bodies with a view to providing, with regard to standards for flammable low-GWP refrigerants, a tabular overview of relevant safety standards, drawing on the 2017 report of the task force on decision XXVIII/4 and the outcome of the consultations.
5. In accordance with decision XXIX/11, the tabular overview, which should also include any relevant information submitted on a voluntary basis to the Secretariat by parties or by national and regional standards bodies, will provide concise information on the:
- (a) Scope of activities, appliances or products covered;
  - (b) Content, namely the safety and relevant technical aspects addressed;
  - (c) Responsible standards body and its subsidiary body in charge of the standard, including hyperlinks to publicly accessible contact details and to information on content and the review process;
  - (d) Status of the review (process and content under review).
6. In decision XXIX/11, the Secretariat was also requested to make the above information accessible on its website and to ensure an update of the tabular overview at least prior to each meeting of the parties up until the Thirty-Fourth Meeting of the Parties, when parties should consider whether to renew that request to the Secretariat. Parties were further invited to update information submitted pursuant to decision XXVIII/4 by 1 January 2020.

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<sup>4</sup> Andorra, Armenia, Barbados, Brazil, Burkina Faso, Cabo Verde, the European Union, Islamic Republic of Iran, Iraq, Italy, Jamaica, Japan, Malaysia, Maldives, Nigeria, Panama, Serbia, Singapore, the United States of America and Zimbabwe.

<sup>5</sup> Submissions by parties on their domestic safety standards relevant to the safe use of low-global-warming-potential flammable refrigerants.

<sup>6</sup> One party, Montenegro, submitted information on its domestic safety standards on the use of low-GWP flammable refrigerants after the finalization of the decision XXVIII/4 task force report of the Technology and Economic Assessment Panel. The Secretariat has shared the submission with the Panel for consideration in future work.

<sup>7</sup> Summary of the workshop on safety standards relevant to the safe use of low-global-warming-potential alternatives.

<sup>8</sup> Safety standards relevant to refrigeration, air-conditioning and heat pump equipment (briefing note 1).

<sup>9</sup> Updating the refrigeration, air-conditioning and heat pump (RACHP) safety standards (briefing note 2).

<sup>10</sup> Application of safety standards to refrigeration, air-conditioning and heat pump equipment – a lifetime perspective (briefing note 3).

<sup>11</sup> Decision XXIX/11: safety standards.

7. In response to decision XXIX/11, the Secretariat continued its liaison with international and regional standards bodies and prepared, in consultation with those bodies as well as a number of experts on standards, a first version of the requested tabular overview, presented in the following section. The Secretariat wishes to express its appreciation to all the standards bodies and experts that have provided valuable contributions in the preparation of the present overview.

8. The Secretariat would appreciate receiving comments from parties and other stakeholders with a view to taking them into account in the further development of the tabular overview, which would include information submitted by parties on their domestic safety standards in accordance with decision XXIX/11. The Secretariat is also considering developing an online tool that would enable easy navigation and updating of the tabular overview.

9. The current version of the tabular overview covers the main safety standards for refrigeration, air-conditioning and heat-pump systems and appliances. The overview is presented below following a description of its basic structure.

### Basic structure of the tabular overview

10. The tabular overview follows the basic structure of the Technology and Economic Assessment Panel task force report on decision XXVIII/4, in which International Electrotechnical Commission (IEC) and International Standards Organization (ISO) safety standards were listed in chapter 2. The standards are separated into two categories:

#### *Main system safety standards (see table 1)*

- Vertical system safety standards (also known as product standards) comprising safety aspects for a specific product or system, or a family of products or systems.
- Horizontal system safety standards (also known as group safety standard) comprising safety aspects applicable to several products or systems, or a family of similar products or systems.

#### *Supplementary standards (see table 2)*

- These standards support the main system safety standards for refrigeration, air-conditioning and heat-pump systems and appliances, for example, standards for refrigerant classification or standards for hazardous areas.

11. A deliberate choice has been made not to include a complete list of supplementary standards at this stage but only mention a few selected examples. For instance, the IEC 60079-15 is included, but not the complete list of the 33 parts of the IEC 60079 series, though most of them are relevant to the use of flammable refrigerants. With regard to national standards, only limited information is included in the overview at present.

12. The columns of tables 1 and 2 contain the following information:

- **“Standard”**: The designation of the standard, typically comprising letters which are an abbreviation of the standardization organization and type of standard, followed by a number, which is typically simply a serial number. For instance, for IEC 60335-2-40 the “IEC” is an abbreviation of “International Electrotechnical Commission”, 60335 is the serial number shared by the 100+ standards of the IEC 60335-series, and -2-40 are serial numbers that in the 60335 series indicate the type of application covered by the specific standard.
- **“Scope of the standard/title”**: the title describing the scope of the standard; sometimes this is a short **version** of the official title.
- **“Technical aspects”**: **specification** of aspects covered by the standard.
- **“Specific committee”**: the committee responsible for preparing the standard. The drafting itself can be delegated to **working groups**, but the committee maintains responsibility.
- **“Status”**: description of when the last version or amendment to the standard was published, and dates for the next **official** step in the process for the revision or review of the standard, when those dates are available.
- **“Further information”**: additional information about the standard and the activities in the working groups drafting the standard, especially information linked to the requirements for flammable refrigerants.

13. For table 1 (vertical and horizontal standards), there are a number of additional columns to describe the market sectors and the stages in the product life cycle which are within the scope of the standard:

- **Market sectors:** “Domestic refrigeration”, “Commercial refrigeration”, “Industrial systems”, “Transport refrigeration”, “Air-to-air conditioners and heat pumps”, “Water heating heat pumps”, “Chillers”, “Tumble driers”, and “Vehicle air conditioning”.
- **Stages in the product life cycle:** “Equipment/system design”, “Installation of new equipment/system”, “Operation”, “Maintenance and repair”, and “Decommissioning”.

**Table 1: System safety standards**

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>a</sup>	Further information <sup>b</sup>	Market sectors							Life cycle stages <sup>c</sup>				
						Domestic refrigeration	Commercial refrigeration	Industrial systems	Transport refrigeration	Air-to-air conditioners and heat pumps	Water heating heat pumps	Chillers	Tumble driers	Vehicle air conditioning	Installation of new equipment/system	Operation	Maintenance and repair
<b>Vertical standards</b>																	
<b>ISO 13043</b>	Road vehicles – Refrigerant systems used in mobile air-conditioning systems (MAC)	Safety requirements	ISO/TC22/SC34 <a href="https://www.iso.org/comitee/5383858/x/catalogue">https://www.iso.org/comitee/5383858/x/catalogue</a>	Published 2011 Confirmed 2015 Next review is 2020	This standard addresses the use of only R-134a, R-1234yf and R-744.							X	X	X	X		
<b>IEC 60335-2-11</b>	Household and similar electrical appliances – Safety	Particular requirements for tumble dryers	IEC/TC61 <a href="http://www.iec.ch/tc61">www.iec.ch/tc61</a>	Published 2015	Currently allows 150 g of flammable refrigerant. No open proposals on changes to the refrigerant charge limits.							X	X	X	X		

<sup>a</sup> The year of the latest complete publication and/or amendment is given.

<sup>b</sup> The details on future work will not be final until the final voting on each individual standardization project has taken place.

<sup>c</sup> Standards derived from the IEC 60335 series (the name usually includes “Household and similar electrical appliances – Safety”) cover explicitly only system design. These standards cover installation, operation and repair indirectly by specifying what is required to be written in the manuals of the appliances. This indirect coverage is indicated by “X” in the respective cells.

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>a</sup>	Further information <sup>b</sup>	Market sectors							Life cycle stages <sup>c</sup>				
						Domestic refrigeration	Commercial refrigeration	Industrial systems	Transport refrigeration	Air-to-air conditioners and heat pumps	Water heating heat pumps	Chillers	Tumble driers	Vehicle air conditioning	Installation of new equipment/system	Operation	Maintenance and repair
IEC 60335-2-24	Household and similar electrical appliances – Safety	Particular requirements for refrigerating appliances, ice-cream appliances and ice makers	IEC/TC61/SC61C <a href="http://www.iec.ch/sc61c">www.iec.ch/sc61c</a>	Edition 7.2 Published 2017 and ISH1:2018	Currently allows 150 g of flammable refrigerant. No open proposals on changes to the refrigerant charge limits.	X								X	X	X	
IEC 60335-2-40	Household and similar electrical appliances – Safety	Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers	IEC/TC61/SC61D <a href="http://www.iec.ch/sc61d">www.iec.ch/sc61d</a>	Published 2018 Next version planned for early 2021	Several working groups are addressing aspects relating to charge limits. WG9 focuses on A2L refrigerants, while WG16 focuses on A2/A3 refrigerants. 2 rounds of voting needed to reach publication.				X	X	X			X	X	X	X
IEC 60335-2-89	Household and similar electrical appliances – Safety	Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor	IEC/TC61/SC61C <a href="http://www.iec.ch/sc61c">www.iec.ch/sc61c</a>	Published 2015	CDV passed in July 2018 with new upper limit on refrigerant charge approx. 500 g of propane and 1.2 kg of A2L refrigerant. Proposal needs to pass 1 more round of voting. Publication possible mid-2019.	X								X	X	X	
EN 60335-2-11	Household and similar electrical appliances – Safety	Particular requirements for tumble driers	CENELEC/TC61 <a href="https://www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/householdappliances.html">https://www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/householdappliances.html</a>	Published 2016	Currently allows 150 g of flammable refrigerant. Copies IEC 60335-2-11:2008 with minor modifications related to EU legislation. The general policy is to adopt latest IEC version with minor modifications.						X			X	X	X	

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>a</sup>	Further information <sup>b</sup>	Market sectors							Life cycle stages <sup>c</sup>				
						Domestic refrigeration	Commercial refrigeration	Industrial systems	Transport refrigeration	Air-to-air conditioners and heat pumps	Water heating heat pumps	Chillers	Tumble driers	Vehicle air conditioning	Installation of new equipment/system	Operation	Maintenance and repair
<b>EN 60335-2-24</b>	Household and similar electrical appliances – Safety	Particular requirements for refrigerating appliances, ice-cream appliances and ice makers	CENELEC/TC61 <a href="https://www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/householdappliances.html">https://www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/householdappliances.html</a>	Published 2010	Currently allows 150 g of flammable refrigerant. Copies IEC 60335-2-24:2010 with minor modifications related to EU legislation. The general policy is to adopt latest IEC version with minor modifications.	X								X	X	X	
<b>EN 60335-2-40</b>	Household and similar electrical appliances – Safety	Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers	CENELEC/TC61 <a href="https://www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/householdappliances.html">https://www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/householdappliances.html</a>	Published 2013	Derived from 2002 version of IEC 60335-2-40 with amendments. Proposals to update to 2013 version, but may end with 2018 version.				X	X	X			X	X	X	X
<b>EN 60335-2-89</b>	Household and similar electrical appliances – Safety	Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor	CENELEC/TC61 <a href="https://www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/householdappliances.html">https://www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/householdappliances.html</a>	Published 2016	Copies IEC 60335-2-89 version 2010 and amendment 1 from 2012 with minor modifications related to EU legislation. Currently allows 150 g of flammable refrigerant. When the IEC standard increases the allowed charges, it is likely to be copied into EN 60335-2-89.	X								X	X	X	
<b>GB 4706.13</b>	Household and similar electrical appliances – Safety	Particular requirements for refrigerating appliances, ice-cream appliances and ice makers	Standardization administration of the People's Republic of China SAC/TC46	Published 2014	Equally adopted from IEC 60335-2-24:2012. Currently allows 150 g of flammable refrigerant.	X								X	X	X	

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>a</sup>	Further information <sup>b</sup>	Market sectors							Life cycle stages <sup>c</sup>				
						Domestic refrigeration	Commercial refrigeration	Industrial systems	Transport refrigeration	Air-to-air conditioners and heat pumps	Water heating heat pumps	Chillers	Tumble driers	Vehicle air conditioning	Installation of new equipment/system	Operation	Maintenance and repair
<b>GB 4706.32</b>	Household and similar electrical appliances – Safety	Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers	Standardization administration of the People’s Republic of China SAC/TC46	Published 2012. New revision planned end of 2018 or in 2019	Equally adopted from IEC 60335-2-40:2005, but only applied to systems up to 14 kW capacity. Under revision to adopt the IEC version from 2016.				X	X			X	X	X	X	X
<b>GB 4706.102</b>	Household and similar electrical appliances – Safety	Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor	Standardization administration of the People’s Republic of China SAC/TC46	Published 2010	Equally adopted from IEC 60335-2-89:2010. Currently allows 150 g of flammable refrigerant.	X							X	X	X		
<b>UL 399</b>	Drinking-Water Coolers	Drinking-Water Coolers	UL STP No. 399 <a href="http://www.ul.com">www.ul.com</a>	Published 2017	Allows 270 g of A2 and 60 g of A3 flammable refrigerant. A new proposal was published in March 2018 but does not change charge amounts.	X							X	X	X	X	X
<b>UL 541</b>	Refrigerated Vending Machines		UL STP No. 751 <a href="http://www.ul.com">www.ul.com</a>	Published 2016	Allows 500 g of A2 and 150 g of A3 flammable refrigerant.	X							X	X	X	X	X

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>a</sup>	Further information <sup>b</sup>	Market sectors							Life cycle stages <sup>c</sup>					
						Domestic refrigeration	Commercial refrigeration	Industrial systems	Transport refrigeration	Air-to-air conditioners and heat pumps	Water heating heat pumps	Chillers	Tumble driers	Vehicle air conditioning	Installation of new equipment/system	Operation	Maintenance and repair	Decommissioning
UL 563	Ice Makers		UL STP No. 563 <a href="http://www.ul.com">www.ul.com</a>	Published 2017	Allows 500 g of A2 and 150 g of A3 flammable refrigerant.	X								X	X	X	X	X
UL 621	Ice-Cream Makers		UL STP No. 621 <a href="http://www.ul.com">www.ul.com</a>	Published 2018	Does not allow flammable refrigerants.	X								X	X	X	X	X
UL 60335-2-24	Household and similar electrical appliances – Safety	Particular requirements for refrigerating appliances, ice-cream appliances and ice makers	UL STP 60335-2-24 <a href="http://www.ul.com">www.ul.com</a>	Published 2017	This standard is derived from IEC 60335-2-24. Currently allows 150 g of flammable refrigerant.	X								X	X	X		
UL 60335-2-40	Household and similar electrical appliances – Safety	Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers	UL STP 60335-2-40 <a href="http://www.ul.com">www.ul.com</a>	Published 2017	UL 2-40 edition 2 published 2017 is derived from IEC 60335-2-40 edition 5.1, but with more restrictive amendments for flammable refrigerants. It is under revision for edition 3 to include requirements for A2L refrigerants (derived from IEC 2-40 edition 6 published 2018).					X	X	X		X	X	X	X	X

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>a</sup>	Further information <sup>b</sup>	Market sectors								Life cycle stages <sup>c</sup>				
						Domestic refrigeration	Commercial refrigeration	Industrial systems	Transport refrigeration	Air-to-air conditioners and heat pumps	Water heating heat pumps	Chillers	Tumble driers	Vehicle air conditioning	Equipment/system design	Installation of new equipment/system	Operation	Maintenance and repair
UL 60335-2-89	Household and similar electrical appliances – Safety	Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor	UL LCC	Published in 2017	This standard is derived from IEC 60335-2-89. Currently allows 150 g of flammable refrigerant.	X									X	X	X	
<b>Horizontal standards</b>																		
ISO 5149-1	Refrigerating systems and heat pumps – Safety and environmental requirements	Basic requirements, definitions, classification and selection criteria	ISO/TC86/SC1 <a href="https://www.iso.org/committee/50362/x/catalogue">https://www.iso.org/committee/50362/x/catalogue</a>	Published in 2015. To be reviewed in 2019	Major revision of refrigerant charge limits in 2014, with a correction to A2L requirements in 2015. Several proposals for modifying charge limits are being considered by the working group. No official timeline agreed, but two rounds of voting would be needed, so publication could be in 2020.	X	X	X	X	X	X	X	X	X	X			
ISO 5149-2	Refrigerating systems and heat pumps – Safety and environmental requirements	Design, construction, testing, marking and documentation	ISO/TC86/SC1 <a href="https://www.iso.org/committee/50362/x/catalogue">https://www.iso.org/committee/50362/x/catalogue</a>	Published in 2014. To be reviewed in 2019	Focus of the working group is on part 1 where the charge limits are stated. Some work is ongoing on aligning text with EN378.	X	X	X	X	X	X	X	X	X	X	X		

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>a</sup>	Further information <sup>b</sup>	Market sectors								Life cycle stages <sup>c</sup>				
						Domestic refrigeration	Commercial refrigeration	Industrial systems	Transport refrigeration	Air-to-air conditioners and heat pumps	Water heating heat pumps	Chillers	Tumble driers	Vehicle air conditioning	Equipment/system design	Installation of new equipment/system	Operation	Maintenance and repair
ISO 5149-3	Refrigerating systems and heat pumps — Safety and environmental requirements	Installation site	ISO/TC86/SC1 <a href="https://www.iso.org/committee/50362/x/catalogue">https://www.iso.org/committee/50362/x/catalogue</a>	Published in 2014. To be reviewed in 2019	Focus of the working group is on part 1 where the charge limits are stated. Some work is ongoing on aligning text with EN378.	X	X	X	X	X	X	X	X		X			
ISO 5149-4	Refrigerating systems and heat pumps — Safety and environmental requirements	Operation, maintenance, repair and recovery	ISO/TC86/SC1 <a href="https://www.iso.org/committee/50362/x/catalogue">https://www.iso.org/committee/50362/x/catalogue</a>	Published in 2014. To be reviewed in 2019	Focus of the working group is on part 1 where the charge limits are stated. Since there is a proposal to replace EN378-4 with ISO5149-4 there is likely to come a set of proposals to align with EN378-4 before it is replaced.	X	X	X	X	X	X	X	X			X	X	X
ANSI/ASHRAE 15	Safety Standard for Refrigeration Systems	Design, construction, installation, and operation of refrigeration systems	SSPC 15 <a href="http://www.ashrae.org">www.ashrae.org</a>	Published in 2016. Under continuous review	Work is ongoing on adding requirements for A2L refrigerants to the standard.		X	X		X	X	X			X	X	X	X
ANSI/IIAR 2	American National Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems	Closed-Circuit Ammonia Refrigeration Systems	<a href="http://www.iiar.org">www.iiar.org</a>	Published in 2014	Draft amendment adds requirements for absorption systems using ammonia as refrigerant.			X				X			X	X	X	X

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>a</sup>	Further information <sup>b</sup>	Market sectors										Life cycle stages <sup>c</sup>				
						Domestic refrigeration	Commercial refrigeration	Industrial systems	Transport refrigeration	Air-to-air conditioners and heat pumps	Water heating heat pumps	Chillers	Tumble driers	Vehicle air conditioning	Equipment/system design	Installation of new equipment/system	Operation	Maintenance and repair	Decommissioning	
EN 378-1	Refrigerating systems and heat pumps — Safety and environmental requirements	Basic requirements, definitions, classification and selection criteria	CEN/TC182/WG6 <a href="https://standards.cen.eu/document/get?id=204:7:0:::FSP_ORG_ID:6163&amp;cs=1C49DFDD906E8EEECF036CBD60784EA80">https://standards.cen.eu/dyn/www/f?p=204:7:0:::FSP_ORG_ID:6163&amp;cs=1C49DFDD906E8EEECF036CBD60784EA80</a>	Published in 2016	A2L requirements were added in 2016. Several proposals for modifying charge limits are being considered by the working group. Two rounds of voting will be needed and timeline is not yet agreed. Publication could be in 2020.	X	X	X	X	X	X	X	X	X	X	X	X			
EN 378-2	Refrigerating systems and heat pumps — Safety and environmental requirements	Design, construction, testing, marking and documentation	CEN/TC182/WG6 <a href="https://standards.cen.eu/document/get?id=204:7:0:::FSP_ORG_ID:6163&amp;cs=1C49DFDD906E8EEECF036CBD60784EA80">https://standards.cen.eu/dyn/www/f?p=204:7:0:::FSP_ORG_ID:6163&amp;cs=1C49DFDD906E8EEECF036CBD60784EA80</a>	Published in 2016	Focus of the working group is on the other 3 parts.	X	X	X	X	X	X	X	X	X	X	X	X	X		
EN 378-3	Refrigerating systems and heat pumps — Safety and environmental requirements	Installation site and personal protection	CEN/TC182/WG6 <a href="https://standards.cen.eu/document/get?id=204:7:0:::FSP_ORG_ID:6163&amp;cs=1C49DFDD906E8EEECF036CBD60784EA80">https://standards.cen.eu/dyn/www/f?p=204:7:0:::FSP_ORG_ID:6163&amp;cs=1C49DFDD906E8EEECF036CBD60784EA80</a>	Published in 2016	A proposal for an amendment related to installation site is being reviewed by working group. Can go out for voting mid-2018, with publication in 2019.	X	X	X	X	X	X	X	X	X	X	X	X	X		

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>a</sup>	Further information <sup>b</sup>	Market sectors								Life cycle stages <sup>c</sup>				
						Domestic refrigeration	Commercial refrigeration	Industrial systems	Transport refrigeration	Air-to-air conditioners and heat pumps	Water heating heat pumps	Chillers	Tumble driers	Vehicle air conditioning	Installation of new equipment/system design	Operation	Maintenance and repair	Decommissioning
<b>EN 378-4</b>	Refrigerating systems and heat pumps – Safety and environmental requirements	Operation, maintenance, repair and recovery	CEN/TC182/WG6 <a href="https://standards.cen.eu/dyn/www/f?p=204:7:0:::FS_P_ORG_ID:6163&amp;cs=1C49DFDD906E8EEECF036CBD60784EA80">https://standards.cen.eu/dyn/www/f?p=204:7:0:::FS_P_ORG_ID:6163&amp;cs=1C49DFDD906E8EEECF036CBD60784EA80</a>	Published in 2016	An amendment on tightness testing is prepared for first round of voting (enquiry vote). It is also proposed to remove EN378-4 and use ISO5149-4 instead (possibly with minor modifications). Publication of amendment could be late 2018, switching to ISO5149-4 could be 2020.	X	X	X	X	X	X	X	X			X	X	X
<b>GB/T 9237</b>	Refrigerating systems and heat pumps	Safety and environmental requirements	Standardization administration of the People's Republic of China SAC/TC238	Published in 2017	Derived from ISO 5149:2014 parts 1 to 4, and enforced from 1 January 2018. It is only used in systems with capacity higher than 14 kW.	X	X	X	X	X	X	X		X	X	X	X	X

Abbreviations: AHSRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers, ANSI – American National Standards Institute, CDV – Committee Draft for Vote, EU – European Union, IEC – International Electrotechnical Commission, IIAR – International Institute of Ammonia Refrigeration, ISO – International Standards Organization, kW – kilowatt, UL – formerly known as Underwriters Laboratories.

**Table 2: Supplementary standards**

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>d</sup>	Further information <sup>e</sup>
<b>ISO 817</b>	Refrigerants	Designation and safety classification	ISO/TC 86/SC 8 <a href="https://www.iso.org/committee/50388.html">https://www.iso.org/committee/50388.html</a>	Published in 2017	The refrigerant tables of the standard are being moved to a web-page to allow continuously adding new refrigerants. The long-term plan is to harmonize the requirements with ASHRAE 34 with an eventual goal of one standard.
<b>IEC 60079-10-1</b>	Classification of areas – Explosive gas atmospheres	Provides guidance on assessing and ranking the potential for an explosion due the possible release of flammable gas	IEC/TC31/SC31J <a href="http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1333,25">http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1333,25</a>	Published in 2016	Currently does not consider any special conditions that may be relevant as further guidance for A2L refrigerants. Not applicable for domestic applications.  Drafting for the next revision has begun.
<b>IEC 60079-13</b>	Explosive atmospheres – Part 13: Equipment protection by pressurized room “p” and artificially ventilated room “v”	Provides requirements where mechanically induced ventilation is used to reduce the hazard due to flammable gas	IEC/TC31 <a href="http://www.iec.ch/tc31">www.iec.ch/tc31</a>	Published in 2017	Not applicable for domestic applications.  Drafting for the next revision has begun.
<b>IEC 60079-14</b>	Explosive atmospheres – Part 14: Electrical installations design, selection and erection	Provide requirements for the types of electrical equipment and electrical installations in areas classified under IEC 60079-10-1.	IEC/TC31/SC31J <a href="http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1333,25">http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1333,25</a>	Published in 2016	Currently does not consider any special conditions that may be relevant as further guidance for A2L refrigerants. Refers to other parts of the IEC 60079 series for specific details of equipment construction and other hazards such as ignition due to electrostatic discharges. Not applicable for domestic applications.  Drafting for the next revision has begun.
<b>IEC 60079-15</b>	Explosive atmospheres – Part 15: Equipment protection by type of protection “n”	Equipment protection by type of protection “n”	IEC/TC31 <a href="http://www.iec.ch/tc31">www.iec.ch/tc31</a>	Published in 2017	This standard is referenced by most system safety standards for protection against ignition of leaked flammable refrigerant. The plan is to phase out this standard. For the safety standards, this is a minor problem, since they refer to the 2010 version. This is not a long-term solution, but it is not yet decided which reference to use instead in the system safety standards.

<sup>d</sup> The year of the latest complete publication and/or amendment is given.

<sup>e</sup> The details on future work will not be final until the final voting on each individual standardization project has taken place.

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>d</sup>	Further information <sup>e</sup>
<b>IEC 60079-29-1</b>	Explosive atmospheres – Part 29-1: Gas detectors - Performance requirements of detectors for flammable gases	Performance requirements of detectors for flammable gases	IEC/TC31 <a href="http://www.iec.ch/tc31">www.iec.ch/tc31</a>	Published in 2016	
<b>IEC 60079-29-2</b>	Explosive atmospheres – Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen	Selection, installation, use and maintenance of detectors for flammable gases	IEC/TC31/SC31J <a href="http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1232,25">http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1232,25</a>	Published in 2015	Other parts of the IEC 60079 series specify requirements for construction and performance of gas detectors.  Not applicable for domestic applications.
<b>ISO/IEC 80079-20-1</b>	Explosive atmospheres – Part 20-1: Material characteristics for gas and vapour classification – Test methods and data	Includes methods for testing a range of flammable gas characteristics and data tables for over 300 flammable gases and vapours	IEC/TC31/SC31M <a href="http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1453,25">http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1453,25</a>	Published in 2017	Does not include A2L refrigerants and this gap should be closed so that the IEC 60079 series and ISO 80079 series can be applied correctly. Data for A2 and A3 refrigerants may vary from ISO 817 and variances should be reconciled between both standards.
<b>ISO 80079-36</b>	Explosive atmospheres – Part 36: Non-electrical equipment for explosive atmospheres – Basic method and requirements	Provides basic requirements for prevention of ignition of flammable gases due to mechanical equipment	IEC/TC31/SC31M <a href="http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1453,25">http://www.iec.ch/dyn/www/f?p=103:7:2291137358353:::FSP_ORG_ID,FSP_LANG_ID:1453,25</a>	Published in 2016	New standard currently not widely applied for common refrigeration systems. References other parts of the ISO 80079 series for particular construction details. Not applicable for domestic applications.
<b>ANSI/ASHRAE 34</b>	Designation and Classification of Refrigerants	Designation and Classification of Refrigerants	ASHRAE <a href="http://sspc34.ashraepcs.org">http://sspc34.ashraepcs.org</a>	Published in 2016 Under continuous review and revision. Next edition 2019	The standard is continuously amended with new refrigerants.
<b>ANSI/IIAR 3</b>	Ammonia Refrigeration Valves	Provides minimum construction standard and performance conditions for ammonia valves	IIAR Standards Committee <a href="http://www.iiar.org">www.iiar.org</a>	Updated in 2017	Generally considered a manufacturer's standard. Does not cover atmospheric relief valves.

Standard	Scope of the standard/title	Technical aspects	Specific committee	Status <sup>d</sup>	Further information <sup>e</sup>
EN 13313	Refrigerating systems and heat pumps	Competence of personnel	CEN/TC182/WG4 <a href="https://standards.cen.eu/dyn/www/f?p=CENWEB:7:0:::FSP_ORG_ID:7291&amp;cs=1CF42611292481F65FFBB7BACD0DF26B4">https://standards.cen.eu/dyn/www/f?p=CENWEB:7:0:::FSP_ORG_ID:7291&amp;cs=1CF42611292481F65FFBB7BACD0DF26B4</a>	Published 2010	The plan is to replace this standard with a new ISO standard, ISO 22712. The ISO standard is being developed by the same working group that authored the EN standard and has been sent out for the first of the two rounds of voting before publication.
UL 2182	Refrigerants	Safety classification	UL 2182 Standard Technical Panel (STP)  <a href="https://ulstandards.ul.com/develop-standards/stps/stp-charts/">https://ulstandards.ul.com/develop-standards/stps/stp-charts/</a>	This ANSI/UL Standard for Safety consists of the Second Edition including revisions through 24 January 2017	Classified refrigerants and their manufacturers can be found in the <a href="#">UL Online Certification Directory</a> under product category or CCN of SLGV.

*Abbreviations:* AHSRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers, ANSI – American National Standards Institute, EU – European Union, IEC – International Electrotechnical Commission, EN – European Standard, IEC - International Electrotechnical Commission, ISO – International Standards Organization, UL – formerly known as Underwriters Laboratories.