



BSI Standards Publication

Refrigerating systems and heat pumps — Safety and environmental requirements

Part 1: Basic requirements, definitions, classification and selection criteria

National foreword

This British Standard is the UK implementation of EN 378-1:2016+A1:2020. It supersedes BS EN 378-1:2016, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1

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de sécurité et d'environnement - Partie 1 : Exigences
de base, définitions, classification et critères de choix

Kälteanlagen und Wärmepumpen -
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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 378-1:2016+A1:2020) has been prepared by Technical Committee CEN/TC 182 “Refrigerating systems, safety and environmental requirements”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2021, and conflicting national standards shall be withdrawn at the latest by April 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document includes Amendment 1 approved by CEN on 17 August 2020.

This document supersedes A1 EN 378-1:2016 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

EN 378 consists of the following parts under the general title “Refrigerating systems and heat pumps — Safety and environmental requirements”:

- *Part 1: Basic requirements, definitions, classification and selection criteria;*
- *Part 2: Design, construction, testing, marking and documentation;*
- *Part 3: Installation site and personal protection;*
- *Part 4: Operation, maintenance, repair and recovery.*

The main changes in part 1 with respect to the previous edition are listed below:

- harmonization as far as possible with ISO 5149:2014 and ISO 817:2014;
- adapt definitions for the purpose of harmonizing EN 378-2:2016 with PED.

Following detailed changes are worth noting:

- modification of the term “special machinery room” to “separate refrigeration machinery room” and adapt the definition in view of combustion equipment;
- modifications/inclusion of definitions for “part of the refrigerating system” (3.1.8), “pressure equipment” (3.1.20) and “pressure vessels” (3.4.8) in view of PED;
- movement of the location classification from Annex C to 5.3;
- rewording of the system examples in 5.3 to make the relation clear with location classification;
- replacement of Annex F (safety group) classifications by 5.2;
- modification of the approach to determine the refrigerant charge of a refrigeration system. The charge limit requirement is decided based on the most stringent refrigerant charge that results from the calculation based on toxicity and the calculation based on flammability. To this purpose,

the tables in Annex C are modified. Table C.1 contains requirements based on toxicity classes, Table C.2 contains requirements based on flammability classes;

- addition of the refrigerant classes as determined in ISO 817 to toxicity classes A, B and flammability classes 1, 2L, 2, 3;
- modification of the charge limits for refrigerants of flammability class 3, for location classification III;
- addition of C.3, alternative risk management;
- addition of refrigerants in Annex E that have been approved for publication in ASHRAE 34 in January 2015 (not those approved for public review in January 2015);
- inclusion in Annex E of GWP values for refrigerants in view of REGULATION (EU) No 517/2014 (F-gas).

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard relates to safety and environmental requirements in the design, manufacture, construction, installation, operation, maintenance, repair and disposal of refrigerating systems and appliances regarding local and global environments. It does not related to the final destruction of the refrigerants.

It is intended to minimize possible hazards to persons, property and the environment from refrigerating systems and refrigerants. These hazards are associated with the physical and chemical characteristics of refrigerants and the pressures and temperatures occurring in refrigeration cycles.

Attention is drawn to hazards such as excessive temperature at compressor discharge, liquid slugging, erroneous operation and reduction in mechanical strength caused by corrosion, erosion, thermal stress, liquid hammer or vibration. Corrosion deserves special consideration as conditions peculiar to refrigerating systems arise due to alternate frosting and defrosting or the covering of equipment by insulation.

The extent to which hazards are covered is indicated in Annex G. In addition, machinery should comply as appropriate with EN ISO 12100 for hazards which are not covered by this European Standard.

Commonly used refrigerants except R-717 are heavier than air. Care should be taken to avoid stagnant pockets of heavy refrigerant vapours by proper location of ventilation inlet and exhaust openings. Refrigerants and their combinations with oils, water or other substances, can affect the system chemically and physically. They can, if they have detrimental properties, endanger persons, property and the environment when escaping from the refrigerating system. Refrigerants shall be selected with due regard to their potential influence on the global environment (ODP, GWP) as well as their possible effects on the local environment. Evaluation of the environmental performance requires a life cycle approach. With regard to global climate change the **Total Equivalent Warming Impact** approach is generally used as the basis (see Annex B). Reference should be made to the EN ISO 14040- series to address other environmental aspects. Many factors influence environmental impacts such as:

- location of the system;
- energy efficiency of the system;
- type of refrigerant;
- service frequency;
- refrigerant leaks;
- sensitivity of charge on efficiency;
- minimization of heat load;
- control methods.

Additional investments may be directed towards reducing leaks, increasing energy efficiency or modifying the design in order to use a different refrigerant. A life cycle approach is necessary to identify where additional investments will have the most beneficial effects.

1 Scope

This European Standard specifies the requirements for the safety of persons and property, provides guidance for the protection of the environment and establishes procedures for the operation, maintenance and repair of refrigerating systems and the recovery of refrigerants.

The term “refrigerating system” used in this European Standard includes heat pumps.

This part of EN 378 specifies the classification and selection criteria applicable to refrigerating systems. These classification and selection criteria are used in parts 2, 3 and 4.

This standard applies:

- a) to refrigerating systems, stationary or mobile, of all sizes except to vehicle air conditioning systems covered by a specific product standard e.g. ISO 13043;
- b) to secondary cooling or heating systems;
- c) to the location of the refrigerating systems;
- d) to replaced parts and added components after adoption of this standard if they are not identical in function and in the capacity;

Systems using refrigerants other than those listed in Annex E of this European Standard are not covered by this standard.

Annex C specifies how to determine the amount of refrigerant permitted in a given space, which when exceeded, requires additional protective measures to reduce the risk.

Annex E specifies criteria for safety and environmental considerations of different refrigerants used in refrigeration and air conditioning.

This standard is not applicable to refrigerating systems and heat pumps which were manufactured before the date of its publication as a European Standard except for extensions and modifications to the system which were implemented after publication.

This standard is applicable to new refrigerating systems, extensions or modifications of already existing systems, and for existing stationary systems, being transferred to and operated on another site.

This standard also applies in the case of the conversion of a system to another refrigerant type, in which case conformity to the relevant clauses of parts 1 to 4 of the standard shall be assessed.

Product family standards dealing with the safety of refrigerating systems takes precedence over horizontal and generic standards covering the same subject.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 378-2:2016, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

EN 378-3:2016+A1:2020, *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 3: Installation site and personal protection* 

EN 12263, *Refrigerating systems and heat pumps — Safety switching devices for limiting the pressure — Requirements and tests*

EN 14276-2, *Pressure equipment for refrigerating systems and heat pumps — Part 2: Piping — General requirements*

ISO 817:2014, *Refrigerants — Designation and safety classification*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE See informative Annex A for equivalent terms in English, French and German.

3.1 Refrigerating systems

3.1.1

refrigerating system

heat pump

combination of interconnected refrigerant-containing parts constituting one closed circuit in which the refrigerant is circulated for the purpose of extracting and delivering heat (i.e. cooling and heating)

3.1.2

self-contained system

complete factory-made refrigerating system in a suitable frame and/or enclosure, that is fabricated and transported complete, or in two or more sections and in which no refrigerant-containing parts are connected on site other than by isolation valves, such as companion valves

3.1.3

unit system

self-contained system that has been assembled, filled ready for use and tested prior to its installation and is installed without the need for connecting any refrigerant-containing parts

Note 1 to entry: A unit system can include factory assembled companion valves.

3.1.4

limit charged system

refrigerating system in which the internal volume and total refrigerant charge are such that, with the system idle, the allowable pressure will not be exceeded when complete evaporation of the refrigerant occurs

3.1.5

sorption system

refrigerating system in which refrigeration is effected by evaporation of a refrigerant, the vapour then being absorbed or adsorbed by an absorbent or adsorbent medium respectively, from which it is subsequently expelled at a higher partial vapour pressure by heating and then liquefied by cooling

3.1.6

secondary cooling or heating system

system employing a fluid which transfers heat from the product or spaces to be cooled or heated or from another cooling or heating system to the refrigerating system without compression and expansion of the fluid

3.1.7**sealed system**

refrigerating system in which all refrigerant containing parts are made tight by welding, brazing or a similar permanent connection which may include capped valves and capped service ports that allow proper repair or disposal and which have a tested leakage rate of less than 3 grams per year under a pressure of at least a quarter of the maximum allowable pressure

Note 1 to entry: Joints based on mechanical forces which are prevented from improper use by the need of a special tool (e.g. by glue) are considered as a similar permanent connection.

Note 2 to entry: Hermetically sealed systems in EN 16084 are equivalent to sealed systems in EN 378-2.

3.1.8**part of the refrigerating system**

several components assembled together and exposed to the same pressure in operation or pressure source, respectively, as determined by the manufacturer

Note 1 to entry: The definitions 3.1.9 and 3.1.10 describe the most common situation.

3.1.9**high pressure side**

part of a refrigerating system operating at approximately the condenser or gas cooler pressure

3.1.10**low pressure side**

part of a refrigerating system operating at approximately the evaporator pressure

3.1.11**mobile system**

refrigerating system which is usually in transit during operation

Note 1 to entry: Mobile systems includes refrigerated cargo systems in ships, refrigerating systems in fishing boats, air conditioning on board, and transport of refrigerated cargo by road, train and containers.

3.1.12**cascade system**

two or more independent refrigeration circuits where the condenser of one circuit rejects heat directly to the evaporator of another

3.1.13**transcritical system**

refrigerating system where the compressor discharges refrigerant at a pressure above the critical point

3.1.14**assembly**

several components assembled to constitute an integrated and functional whole

Note 1 to entry: Assemblies are often connected together on-site to make a complete refrigerating system.

3.1.15**component**

individual functional item of a refrigerating system

3.1.16

split system

 refrigerating system, comprising one or more factory-made indoor units in a space and one or more factory made units which are located outside the space and which are connected on site by refrigerant piping in accordance with the instructions of the manufacturers of the factory-made units

Note 1 to entry: Refrigerating systems include air conditioners and heat pumps. 

3.1.17

multisplit system

split system with more than one indoor unit

3.1.18

indoor unit

part of the split system that controls the temperature of the air inside the building or substances located in the building

3.1.19

fixed appliance

appliance that is intended to be used while fastened to a support or while secured in a specific location

3.1.20

pressure equipment

components of the refrigerating system, classified as pressure vessels according to definition 3.4.8, piping including its accessories (e.g. valves) according to definition 3.5, and safety accessories according to definition 3.6

3.2 Occupancies, locations

3.2.1

machinery room

enclosed room or space, with mechanical ventilation, sealed from public areas and not accessible to the public, which is intended to contain components of the refrigerating system

Note 1 to entry: A machinery room can contain other equipment provided design and its installation requirements are compatible with the requirements for the safety of the refrigerating system.

3.2.2

separate refrigeration machinery room

machinery room intended to contain only components of the refrigerating system, accessible only to competent personnel for the purposes of inspection, maintenance and repair

Note 1 to entry: Where the standard refers to the term machinery room, separate refrigeration machinery rooms are included.

3.2.3**occupied space**

space in a building which is bounded by walls, floors and ceilings and which is occupied by persons for a significant period

Note 1 to entry: Where the spaces around the apparent occupied space are, by construction or design, not air tight with respect to the occupied space, these may be considered as part of the occupied space. above; e.g. false ceilings voids, crawl ways, ducts, movable partitions and doors with transfer grilles or undercut doors.

3.2.4**hallway**

corridor for the passage of people

3.2.5**exit**

opening in the outer wall, with or without a door or gate

3.2.6**exit passageway**

passageway immediately in the vicinity of the exit through which people leave the building

3.2.7**cold room**

room maintained by a refrigerating system at a temperature lower than ambient temperature

3.2.8**open air**

any unenclosed space, possibly but not necessarily roofed

3.2.9**crawl space**

space that is in general accessed for maintenance only and where it is not possible to walk or access by walking

Note 1 to entry: Usually, the height of crawl spaces is less than 1 m.

3.2.10**ventilated enclosure**

enclosure containing the refrigerating system that does not enable air to flow from the enclosure to the surrounding space and has a ventilation system that produces airflow from the enclosures to the open air through a ventilation duct

3.3 Pressures**3.3.1****maximum allowable pressure****PS**

maximum pressure for which the system or component is designed for, as specified by the manufacturer

Note 1 to entry: PS is the limit which should not be exceeded whether the system is working or not.

Note 2 to entry: The Pressure Equipment Directive 2014/68/EU designates the maximum allowable pressure as the symbol "PS".

3.4 Components of refrigerating systems

3.4.1

refrigerating installation

assembly of components of a refrigerating system and all the apparatus necessary for its operation

3.4.2

refrigerating equipment

components forming a part of the refrigerating system, e.g. compressor, condenser, generator, absorber, adsorber, receiver, evaporator, surge drum

3.4.3

compressor

device for mechanically increasing the pressure of a refrigerant vapour

3.4.4

motor-compressor

fixed combination of electrical motor and compressor in one unit

3.4.4.1

hermetic motor-compressor

combination of a compressor and electrical motor, both of which are enclosed in the same housing, with no external shaft or shaft seals

3.4.4.2

semi-hermetic (accessible hermetic) motor-compressor

combination consisting of a compressor and electrical motor, both of which are enclosed in the same housing, having removable covers for access, but having no external shaft or shaft seals

3.4.5

open compressor

compressor having a drive shaft penetrating the refrigerant-tight housing

3.4.6

positive displacement compressor

compressor in which compression is obtained by changing the internal volume of the compression chamber

3.4.7

non-positive displacement compressor

compressor in which compression is obtained without changing the internal volume of the compression chamber

3.4.8**pressure vessel**

any refrigerant-containing component of a refrigerating system other than:

- coils (including their headers) consisting of pipes with air as secondary fluid;
- piping and its valves, joints and fittings;
- control devices;
- pressure switches, gauges, liquid indicators;
- safety valves, fusible plugs, bursting discs;
- equipment comprising casings or machinery where the dimensioning, choice of material and manufacturing rules are based primarily on requirements for sufficient strength, rigidity and stability to meet the static and dynamic operational effects or other operational characteristics and for which pressure is not a significant design factor. Such equipment may include: pumps and compressors

Note 1 to entry: The semi-hermetic and open type compressors used in refrigerating systems may be subject to the exclusion article 1.2.j of the Directive 2014/68/EU by referring to the working party group guidelines WPG 1/11, 1/12 and 2/34. The compressor manufacturer needs to decide on the basis of a case by case assessment, if the exclusion article 1.2.j of the Directive 2014/68/EU is applicable.

Note 2 to entry: This definition is aligned to directive 2014/68 EU.

3.4.9**condenser**

heat exchanger in which refrigerant vapour is liquefied by removal of heat

3.4.10**gas cooler**

heat exchanger in a transcritical system in which supercritical refrigerant is cooled by removal of heat

3.4.11**receiver**

vessel permanently connected to a system by inlet and outlet pipes for accumulation of liquid refrigerant

3.4.12**accumulator**

vessel capable of holding liquid refrigerant and permanently connected between the exit of the evaporator and suction of the compressor

3.4.13**evaporator**

heat exchanger in which liquid refrigerant is vaporised by absorbing heat from the substance to be cooled

3.4.14**coil or grid**

component of the refrigerating system constructed from pipes or tubes suitably connected and serving as a heat exchanger (e.g. evaporator or condenser)

3.4.15

compressor unit

combination of one or more compressors and associated components

3.4.16

condensing unit

combination of one or more compressors, condensers, receivers (when required) and the associated components

3.4.17

surge drum

vessel containing refrigerant at low pressure and temperature and connected by liquid feed and vapour return pipes to one or more evaporators

3.4.18

internal net volume

volume calculated from the internal dimensions of a vessel, and excluding the volume of the permanent internal parts

3.4.19

type approved component

component for which examination is performed on one or more samples of this component in accordance with a recognized standard for type approval

3.5 Piping and joints

3.5.1

piping

all piping covered in the scope of EN 14276-2 such as pipes or tubes (including hoses, bellows, fittings, or flexible pipes) for interconnecting the various components of a refrigerating system

3.5.2

joint

connection made between two parts

3.5.3

welded joint

joint obtained by the joining of metal parts in the plastic or molten state

3.5.4

brazed joint

joint obtained by the joining of metal parts with alloys which melt at temperatures higher than 450 °C but less than the melting temperatures of the joined parts

3.5.5

flanged joint

joint made by bolting together a pair of flanged ends

3.5.6

flared joint

metal-to-metal compression joint in which a conical spread is made on the end of the tube

3.5.7**compression joint**

joints which achieve tightness by deforming a compressing ring

3.5.8**taper pipe thread joint**

pipe joint with tapered threads that achieves tightness with filling material or deformation of thread mount

3.5.9**header**

pipe or tube component of a refrigerating system to which several other pipes or tubes are connected

3.5.10**shut-off device**

device to shut off the flow of the fluid, e.g. refrigerant, brine

3.5.11**companion valves**

pairs of mating stop valves, isolating sections of systems and arranged so that these sections may be joined before opening these valves or separated after closing them

3.5.12**isolating valves**

valves which prevent flow in either direction when closed

3.5.13**locked valve**

valve sealed or in other ways constrained, so that it can only be operated by a competent person

3.5.14**nominal size****DN**

numerical designation of size which is common to all components in a piping system other than components indicated by outside diameters or by thread size

Note 1 to entry: It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions. The nominal size is designated by DN followed by a number.

3.6 Safety accessories**3.6.1****pressure relief device**

pressure relief valve or bursting disc device designed to relieve excessive pressure automatically

3.6.2**pressure relief valve**

pressure actuated valve held shut by a spring or other means and designed to relieve excessive pressure automatically by starting to open at a set pressure and re-closing after the pressure has fallen below the set pressure

3.6.3**bursting disc**

disc or foil which bursts at a predetermined differential pressure

3.6.4

fusible plug

device containing a material which melts at a predetermined temperature and thereby relieves the fluid

3.6.5

temperature limiting device

temperature actuated device that is designed to prevent the generation of excessive temperatures

3.6.6

safety switching device for limiting the pressure

pressure actuated device that is designed to stop the operation of the pressure generator

3.6.6.1

pressure limiter

safety switching device for limiting the pressure which automatically resets

Note 1 to entry: A pressure limiter is designated PSH for high pressure protection and PSL for low pressure protection.

3.6.6.2

type approved pressure limiter

safety switching device for limiting the pressure that is type approved according to EN 12263 with automatically reset

Note 1 to entry: A type approved pressure limiter is designated PSH for high pressure protection and PSL for low pressure protection.

3.6.6.3

type approved pressure cut out

safety switching device for limiting the pressure that is type approved according to EN 12263 which is reset manually without the aid of a tool

Note 1 to entry: A type approved pressure cut out is designated PZH for high pressure protection and PZL for low pressure protection.

3.6.6.4

type approved safety pressure cut out

safety switching device for limiting the pressure that is type approved according to EN 12263 which is reset manually only with the aid of a tool

Note 1 to entry: A type approved safety pressure cut out is designated PZH for high pressure protection and PZL for low pressure protection.

3.6.7

changeover valve

valve serving two safety devices and so arranged that only one can be made inoperative at any one time

3.6.8

overflow valve

pressure relief valve discharging to a part of the refrigerating system with lower pressure

3.6.9**surge protection device**

device which shuts down the compressor after a few surge pulses (e.g. by measuring pressure differences across the compressor or current input to the drive motor)

3.6.10**liquid level cut out**

switching device for limiting the liquid level

3.6.11**self closing valve**

valve that closes automatically e.g. by weight or spring force

3.7 Fluids**3.7.1****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 heat at a higher temperature and a higher pressure usually involving changes of the state of the fluid

3.7.2**refrigerant type**

specific nomenclature designation of a chemical compound or blend of compounds used as a refrigerant

3.7.3**heat-transfer fluid**

fluid for the transmission of heat usually without any change in its phase (e.g. brine, water, air) or with evaporating and condensing at approximately the same pressure

Note 1 to entry: When fluids listed in Annex E are used they need to comply with all requirements of refrigerants even if they are used as a heat transfer fluid.

3.7.4**toxicity**

ability of a fluid to be harmful, or lethal, or to impair a person's ability to escape due to acute or chronic exposure by contact, inhalation or ingestion

Note 1 to entry: Temporary discomfort that does not impair health is not considered to be harmful.

3.7.5**acute-toxicity exposure limit****ATEL**

maximum recommended refrigerant concentration determined in accordance with this European Standard and intended to reduce the risks of acute toxicity hazards to humans in the event of a refrigerant release

3.7.6**oxygen deprivation limit****ODL**

concentration of a refrigerant or other gas that results in insufficient oxygen for normal breathing

3.7.7

flammability

ability of a refrigerant or heat-transfer fluid to propagate a flame from an ignition source

3.7.8

lower flammability limit

LFL

minimum concentration of refrigerant that is capable of propagating a flame within a homogeneous mixture of refrigerant and air

3.7.9

practical limit

concentration used for simplified calculation to determine the maximum acceptable amount of refrigerant in an occupied space

Note 1 to entry: RCL is determined by toxicity and flammability tests, but practical limit is derived from RCL or historically established charge limit.

3.7.10

refrigerant concentration limit

RCL

maximum refrigerant concentration, in air, in accordance with and specified in C.3 of this European Standard and established to reduce the risks of acute toxicity, asphyxiation, and flammability hazards

Note 1 to entry: It is used to determine the maximum charge size for that refrigerant in a specific application.

3.7.11

quantity limit with additional ventilation

QLAV

charge density of refrigerant that when exceeded creates an instantaneous dangerous situation, if the total charge leaked within the occupied space

Note 1 to entry: See C.3 for the use of Quantity Limit with Additional Ventilation (QLAV) to manage risk for systems in occupied spaces where the level of ventilation is sufficient to disperse the leaked refrigerant within 15 min.

3.7.12

quantity limit with minimum ventilation

QLMV

charge density of refrigerant that would result in a concentration equal to the RCL in a room of non-air tight construction with a moderately severe refrigerant leak

Note 1 to entry: See C.3 for the use of Quantity Limit with Minimum Ventilation (QLMV) to manage risk for systems in occupied spaces not below ground level where the level of ventilation is not sufficient to disperse the leaked refrigerant within 15 min. The calculation is based on an opening of $0,003 \text{ m}^2$ and a leak rate of $2,78 \text{ g/s}$.

3.7.13

outside air

air from outside the building

3.7.14**halocarbon and hydrocarbon**

either:

- CFC: fully-halogenated halocarbon containing only chlorine, fluorine and carbon;
- HCFC: halocarbon containing hydrogen, chlorine, fluorine and carbon;
- HFC: halocarbon containing only hydrogen, fluorine and carbon;
- PFC: fully fluorinated halocarbon containing only fluorine and carbon;
- HC: hydrocarbon containing only hydrogen and carbon

3.7.15**recover**

removing refrigerant in any condition from a system and storing it in an external container

3.7.16**recycle**

reducing contaminants in used refrigerants by separating oil, removing non-condensables and using devices such as filters, driers or filter-driers to reduce moisture, acidity and particulate matter

Note 1 to entry: The aim of recycling is to reuse the recovered refrigerant.

3.7.17**reclaim**

processing used refrigerants to new product specifications

Note 1 to entry: Chemical analysis of the refrigerant determines that appropriate specifications are met. The identification of contaminants and required chemical analysis both are specified in national and international standards for new product specifications.

3.7.18**disposal**

to dispose or to convey a product usually for scrapping or destruction

3.7.19**bubble point**

liquid saturation temperature of a refrigerant at a specified pressure at which a liquid refrigerant first begins to boil

Note 1 to entry: The bubble point of a zeotropic refrigerant blend, at constant pressure, is lower than the dew point.

3.7.20**autoignition temperature of a substance**

lowest temperature at or above which a chemical can spontaneously combust in a normal atmosphere without an external source of ignition, such as a flame or spark

3.7.21**response time**

time elapsing from the moment a gas detection probe is placed into a concentration or exposed to a calibration gas or in front of a leak until an alarm is triggered

3.8 Miscellaneous

3.8.1

competence

ability to perform satisfactorily and safely the activities related to a given task

Note 1 to entry: Levels of competence are defined in EN 13313.

3.8.2

human comfort air conditioning

method of air treatment designed to satisfy the comfort requirements of the occupants

3.8.3

self-contained breathing apparatus

breathing apparatus which has a portable supply of compressed air, independent of the ambient atmosphere, where exhaust air passes without recirculation

3.8.4

vacuum procedure

procedure to remove gases and moisture from inside a refrigerating system

3.8.5

factory made

manufactured at a dedicated production location under control of a recognised quality system

3.8.6

operator

natural or legal person exercising actual power over the technical functioning of refrigerating systems

3.8.7

refrigerant detector

sensing device which responds to a pre-set concentration of refrigerant gas in the environment

4 Symbols and abbreviated terms

Table 1 — Quantities

Symbol	Quantity	Unit	Unit Symbol
α_i	Rate of gas recovered from the insulation at end of life, from 0 to 1	-	-
A	Area	square metre	m ²
$ATEL$	Acute toxicity exposure limit	kilogramme per cubic metre	kg/m ³
d	Diameter	metres	m
E_{annual}	Energy consumption	kilowatt-hour per year	kWh/year
GWP	Global warming potential, CO ₂ -related	-	-
GWP_i	The global warming potential of gas in the insulation	-	

Symbol	Quantity	Unit	Unit Symbol
h	Height	metre	m
L	Leakage	kilogramme per year	kg/year
l	Length	metres	m
LFL	Lower flammability limit	kilogramme per cubic metre	kg/m ³
m	Refrigerant charge	kilogramme	kg
m_i	Gas charge in the insulation system	kilogramme	kg
$\dot{m}$	Leak rate	Kilogramme per second	kg/s
n	System operating time	year	year
ODL	Oxygen deprivation limit	kilogramme per cubic metre	kg/m ³
P	Pressure	Pascal	Pa
Q	Air flow	Cubic metres per hour	m ³ /h
$QLAV$	Quantity limit with additional ventilation	kilogramme per cubic metre	kg/m ³
$QLMV$	Quantity limit with minimum ventilation	kilogramme per cubic metre	kg/m ³
RCL	Refrigerant concentration limit	kilogramme per cubic metre	kg/m ³
s	Time since leak starts	Seconds per cubic metre	s/m ³
t	Time	second hour year	s h year
T	Temperature	degrees centigrade Kelvin	°C K
$TEWI$	Total equivalent warming impact	kilogramme (of CO ₂)	kg
V	Volume	cubic metre	m ³
$\dot{V}$	Air flow	Cubic metres per second	m ³ /s
x	Refrigerant concentration in the room	kilogramme per cubic metre	kg/m ³
$\alpha_{recovery}$	Recovery/recycling factor	0 to 1	-
β	CO ₂ -emission	kilogramme per kilowatt-hour	kg/kWh
ρ	Density of the fluid	kilogramme per cubic metre	kg/m ³

Table 2 — Constants

Symbol	Description	Value
c	Flow coefficient	1,0 for orifice
$\dot{m}$	Leak rate	0,00278 kg/s

Table 3 — Abbreviated terms

Abbreviation	Term
<i>DN</i>	Nominal size
<i>GWP</i>	Global warming potential, CO ₂ -related
<i>GWP_i</i>	The global warming potential of gas in the insulation
<i>ODP</i>	Ozone depleting potential
<i>PED</i>	Pressure equipment directive
<i>PS</i>	Maximum allowable pressure

5 Classification

5.1 Access categories

5.1.1 General

Occupancies are categorised with respect to the safety of the persons, who may be directly affected in the event of abnormal operation of the refrigerating system. Considerations of safety in refrigerating systems take into account the site, the number of people occupying the site and the access categories. Machinery rooms (see 3.2.1 and 3.2.2) shall not be considered occupied space except as defined in [A1](#) EN 378-3:2016+A1:2020 [A1](#), 5.1. The access categories are defined in Table 4.

Table 4 — Access categories

Categories	General characteristics	Examples ^a
General access a	Rooms, parts of buildings, building where — sleeping facilities are provided — people are restricted in their movement — an uncontrolled number of people are present — any person has access without being personally acquainted with the necessary safety precautions	Hospitals, courts or prisons, theatres, supermarkets, schools, lecture halls, public transport termini, hotels, dwellings, restaurants
Supervised access b	Rooms, parts of buildings, buildings where only a limited number of people may be assembled, some being necessarily acquainted with the general safety precautions of the establishment	Business or professional offices, laboratories, places for general manufacturing and where people work