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**Hladilni sistemi in toplotne črpalke - Varnostnotehnične in okoljevarstvene zahteve**  
**- 4. del: Delovanje, vzdrževanje, popravilo in recikliranje**

Refrigerating systems and heat pumps - Safety and environmental requirements - Part 4:  
Operation, maintenance, repair and recovery

Kälteanlagen und Wärmepumpen - Sicherheitstechnische und umweltrelevante  
Anforderungen - Teil 4: Betrieb, Instandhaltung, Instandsetzung und Rückgewinnung

Systèmes de réfrigération et pompes à chaleur - Exigences de sécurité et  
d'environnement - Partie 4: Fonctionnement, maintenance, réparation et récupération

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27.080	Toplotne črpalke	Heat pumps
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EUROPEAN STANDARD  
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English Version

**Refrigerating systems and heat pumps - Safety and  
environmental requirements - Part 4: Operation, maintenance,  
repair and recovery**

Systèmes de réfrigération et pompes à chaleur - Exigences  
de sécurité et d'environnement - Partie 4: Fonctionnement,  
maintenance, réparation et récupération

Kälteanlagen und Wärmepumpen - Sicherheitstechnische  
und umweltrelevante Anforderungen - Teil 4: Betrieb,  
Instandhaltung, Instandsetzung und Rückgewinnung

This European Standard was approved by CEN on 13 October 2007 and includes Amendment 1 approved by CEN on 23 January 2012.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This document (EN 378-4:2008+A1:2012) has been prepared by Technical Committee CEN /TC 182, "Refrigeration 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of an identical text or by endorsement, at the latest by November 2012, and conflicting national standards shall be withdrawn at the latest by November 2012.

This document includes Amendment 1, approved by CEN on 2012-01-23.

This document supersedes A1 EN 378-4:2008 A1.

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

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

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*

According to the CEN/CENELEC Internal Regulations, the national standards organizations 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

**EN 378-4:2008+A1:2012 (E)****1 Scope**

The scope of **EN 378-1:2008+A2:2012** is applicable.

This European Standard specifies requirements for safety and environmental aspects in relation to operation, maintenance, and repair of refrigerating systems and the recovery, reuse and disposal of all types of refrigerant, refrigerant oil, heat transfer medium, refrigerating system and part thereof.

These requirements are intended to minimise risks of injury to persons and damage to property and the environment resulting from improper handling of the refrigerants or from contaminants leading to system breakdown and resultant emission of the refrigerant.

Certain clauses and subclauses of this European Standard are not applicable to unit systems self contained systems and systems built on site which operate with charges of refrigerant up to 3 kg of refrigerant.

These subclauses are 4.1.1, 4.1.2, 4.2, 4.3, 5.1.1 to 5.1.4, 5.2, 5.3.1, 5.3.3 and 6.6.

For these systems, the necessary maintenance has to be described in the instruction manual and should repairs be necessary, contact the nearest authorised repair service centre.

**2 Normative references**

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

**EN 378-1:2008+A2:2012**, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria*

**EN 378-2:2008+A2:2012**, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

**EN 378-3:2008+A1:2012**, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 3: Installation site and personal protection*

ISO 11650, *Performance of refrigerant recovery and/or recycling equipment*

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in **EN 378-1:2008+A2:2012** apply.

## 4 General requirements

### 4.1 Operational instructions

**4.1.1** Care shall be taken to ensure that the personnel charged with the operation, supervision and maintenance of the refrigerating system are adequately instructed and are competent with respect to their tasks. The installer of the refrigerating system shall draw attention to the necessity for adequate instruction of operating and supervising personnel.

**4.1.2** Personnel in charge of the refrigerating system that contain more than 3 kg of refrigerant shall have knowledge and experience of the mode of functioning, operation and day-by-day monitoring of this system.

**4.1.3** The mixing of different refrigerants within a system is not permitted under any circumstances. In the event of a change of the refrigerant type, it shall be done in accordance with 5.4.

### 4.2 Instruction of operating personnel

Before a new refrigerating system is put into service, it shall be ensured that the operating personnel are instructed on the basis of the instruction manual about the construction, supervision, operation and maintenance of the refrigerating system, as well as the safety measures to be observed, if necessary the required personal protection equipment (see [A1](#) EN 378-3:2008+A1:2012 [A1](#), Annex A) and the properties and handling of the refrigerant used.

NOTE It is advisable that the operating personnel are present during evacuation, charging with refrigerant and adjustment of the refrigerating system as well as, if possible, during assembly on site.

### 4.3 Documentation

**4.3.1** The owner / operator shall keep an updated logbook of the refrigerating system if the refrigerant charge exceeds 3 kg.

**4.3.2** In the logbook the following information shall be recorded:

- a) details of all maintenance and repair work;
- b) quantities and kind of (new, reused or recycled) refrigerant which have been charged on each occasion, and the quantities of refrigerant which have been transferred from the system on each occasion, see also 6.6;
- c) analysis of a reused refrigerant, if available, the results of which shall also be kept in the log-book;
- d) source of the reused refrigerant;
- e) changes and replacements of components of the system;
- f) results of all periodic routine tests;
- g) record of significant periods of non-use.

**4.3.3** The log-book shall either be kept by the owner / operator and in the machinery room, or the data shall be stored in a computer with a printout in the machinery room, in which case the information shall be accessible to the competent person when servicing or testing.

**EN 378-4:2008+A1:2012 (E)****5 Maintenance and repair****5.1 General**

**5.1.1** Each refrigerating system shall be subjected to preventive maintenance in accordance with the instruction manual, see EN 378-2.

NOTE 1 The frequency of such maintenance depends on the type, size, age, use etc. of the system. In many cases more than one maintenance service is required in the course of one year in accordance with legal requirements.

NOTE 2 For personal protective equipment against refrigerants see EN 378-3.

**5.1.2** The user / owner concerned for the refrigerating system shall ensure that the system is inspected, regularly supervised and maintained in a satisfactory manner.

**5.1.3** Systems with a charge larger than 3 kg should be subject to tightness inspection at least on an annual basis. If, during the inspection the suspicion of a leak exists, e.g. through refrigerant temperature checks or capacity reduction, then leak has to be located with suitable detection equipment and should be repaired and checked again after the repair in accordance with national regulations. The results of the inspection and measures taken afterwards should be included in the logbook.

Refer to Annex D for detailed specification regarding in service inspection.

**5.1.4** The parties concerned for the refrigerating system shall also be responsible when another person uses the refrigerating system, unless another division of responsibility has been agreed upon.

**5.1.5** Regular maintenance which does not include interference with, nor adjustment of, the refrigerating system and which requires no specialised knowledge of refrigeration can be carried out by a person of appropriate competence employed by the person responsible.

Examples of such non-specialist maintenance include air-side cleaning of heat exchangers, cleaning of condensate systems.

**5.1.6** It is not permitted to charge a refrigerating system with a refrigerant type that does not comply with the machine card nor with the specifications of the manufacturer. In the case of appliances, the refrigerant type has to conform to the rating label data. In the case of retrofitting of an installation, see 5.4.

**5.1.7** In the case of refrigerating systems located within an enclosure and considered as indirect systems under EN 378-1, no unauthorised persons shall remain in the occupancy during maintenance and repair operations since the separation between refrigerant containing parts and occupants of the room is no more effective and leaks of refrigerant into the occupancy become possible.

**5.1.8** Ensure that any marking to the compressor or equipment is replaced if any of the existing text has become unreadable.

**5.2 Maintenance**

**5.2.1** Maintenance shall be undertaken in such a way that:

- a) accidents to personnel are minimised;
- b) damage to goods is minimised;
- c) components of the system remain in good working order;
- d) the purpose and availability of the system are maintained;
- e) leakage of refrigerant or oil are identified and remedied;



f) waste of energy is minimised.

**5.2.2** The extent and time schedule for maintenance shall be fully described in the instruction manual, see EN 378-2.

**5.2.3** If the discharge line of a pressure relief device is led into a common discharge line or forms part of a dual assembly with a change over device and the valve is temporarily dismantled for reasons of testing and maintenance, the connecting ends are to be closed e.g. by means of blank flanges.

**5.2.4** When a secondary cooling or heating system is used, the heat-transfer medium shall be periodically inspected for its composition and the secondary system for the presence of refrigerant.

**5.2.5** Regular leak tests, inspections and checking of the safety equipment shall be carried out as described in Annex D.

**5.2.6** When oil is drained from a refrigerating system it shall be carried out safely in accordance with the instruction manual. A procedure is provided in Annex A.

### 5.3 Repair

**5.3.1** Repairs on refrigerant containing components shall be carried out in the following order, if appropriate:

- a) conducting a hazard analysis and risk assessment for the proposed repair;
- b) instructing of the maintenance staff;
- c) disconnecting and safeguarding of the components to be repaired (e.g. powerdrive, pressure vessel, piping);
- d) emptying and evacuating; [SIST EN 378-4:2008+A1:2012](https://standards.iteh.ai/catalog/standards/sist/41fc75f7-2718-4755-a6ea-5791e13790e9/en-378-4:2008a1-2012)
- e) cleaning and purging respectively (e.g. with nitrogen); <https://standards.iteh.ai/catalog/standards/sist/41fc75f7-2718-4755-a6ea-5791e13790e9/en-378-4:2008a1-2012>
- f) releasing for repair;

Welding or the use of arc — and flame-producing apparatus requires specific personnel and welding or brazing procedure approvals.

- g) carrying out the repair;
- h) testing and checking of the repaired component (pressure test, leakage test, functional test, see EN 378-2);
- i) replacing, evacuating and recharging with refrigerant.

**5.3.2** Refrigerant leaks shall be identified and repaired as soon as practicable by a competent person.

**5.3.3** During each periodic maintenance and following each repair, if appropriate, at least the following tasks shall be performed:

- a) all safety, control and measurement devices as well as alarm systems shall be checked to verify their correct operation and perfect working order;
- b) leakage tests shall be carried out at the relevant part of the refrigerating system;
- c) evacuating;
- d) adjustment of refrigerant charge;

**EN 378-4:2008+A1:2012 (E)**


e) functional test of safety devices.

**5.3.4** Maintenance and repair requiring the assistance of other skilled personnel (such as welders, electricians, measuring and control specialists etc.) shall be carried out under the supervision of a person competent in refrigeration.

**5.3.5** Welding and brazing shall only be carried out by competent personnel and only after the section has been purged according to an approved procedure.

**5.3.6** Replacements of components or changes to the refrigerating system shall be ordered and carried out by a competent person or by authorised repair service centre for maintenance free systems.

**5.3.7** After a pressure relief valve, which discharges to atmosphere, has been actuated, it shall be replaced if it is not tight.


**5.4 Change of refrigerant type****5.4.1  General**

In the event of a change of the refrigerant type used in the refrigerating system the following planning and execution activities shall be carried out and conformance to the relevant requirements of EN 378-1, EN 378-2 and EN 378-3 shall be implemented where applicable:

**5.4.2 Planning of the change of refrigerant type**

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- a) Verify that all the refrigeration equipment, components, materials, piping and joints used in the refrigerating system and residual oil are compatible with the new refrigerant type;
- b) verify that the allowable pressure shall not be exceeded or re-certify the refrigeration system for a higher pressure;  
<https://standards.iteh.ai/catalog/standards/sist/41fc75f7-2718-4755-a6ea-25cee1a9bd35/sist-en-378-4-2008a1-2012>
- c) verify the motor capacity;
- d) verify the capacity of the liquid receiver;
- e) incorporate the requirements of a change of refrigerant classification into the design of the installation;
- f) verify the pressure relief devices' capacity, set pressure, inlet and outlet pipework connections and ultimate discharge location and the suitability of the safety accessories.

**5.4.3 Execution of the change of refrigerant type**

- a) Check whether residual oil is in good condition. If not, change the oil and run refrigerating system with original refrigerant for at least one hour before recovering the refrigerant;
- b) recover the original refrigerant in accordance with Clause 6;
- c) pay special attention to the content of the gas cylinders to be sure that the correct refrigerant is added;
- d) prevent mixtures with residual refrigerant and residual oil;
- e) amend all indications as to the refrigerant type used;
- f) replace or readjust, if necessary, indicating control and safety devices, including software modifications if required;
- g) update the log book and documentation including machine card. 

## 6 Requirements for recovery, reuse and disposal

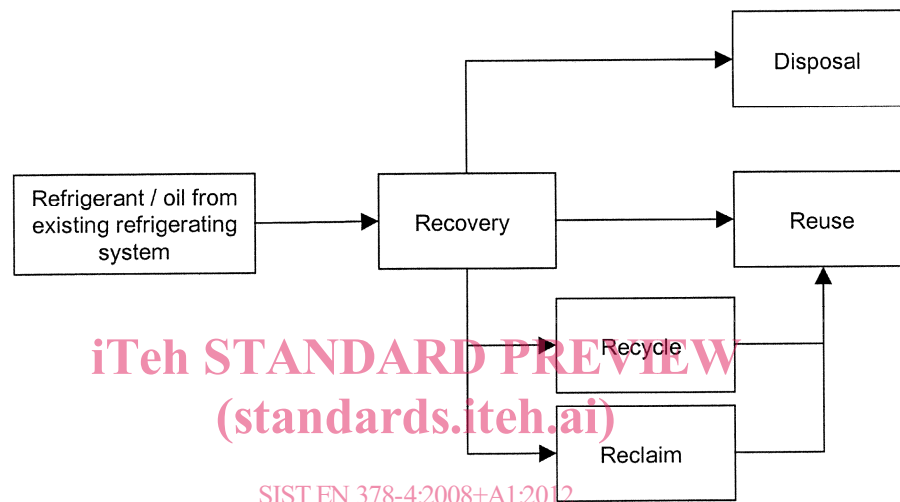
### 6.1 General requirements

#### 6.1.1 Disposal

Disposal of refrigerating systems and parts shall be undertaken in accordance with national regulations.

#### 6.1.2 Personnel

Recovery, reuse, recycle, reclaim and disposal shall only be undertaken by competent persons, see Figure 1 for the relationship between the processes.



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**Figure 1 — Simplified representation of the relationship between the processes**

#### 6.1.3 Parts of refrigerating systems

All parts of refrigerating systems, e.g. refrigerant, oil, heat-transfer medium, filter, drier, insulation material, shall be recovered, reused and/or disposed of properly, see 6.5.

#### 6.1.4 Refrigerants

All refrigerants shall be recovered for reuse, recycled or reclaimed for reuse, or shall be disposed of properly, see 6.5.

Destruction of refrigerants can require an authorised facility for destruction.

#### 6.1.5 Handling

The method of handling of the refrigerant shall be decided before it is removed from the refrigerating system or the equipment, see also Annex C.