



SLOVENSKI STANDARD
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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

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

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EUROPEAN STANDARD

EN 378-4

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2000

ICS 27.080; 27.200

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 10 October 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard 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 July 2000, and conflicting national standards shall be withdrawn at the latest by July 2000.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

NOTE 1: It should be noted that this standard at the time of publication does not satisfy all essential safety requirements of the Directive 97/23/EC.

NOTE 2: This European Standard had also been proposed for inclusion in the mandate under the EU Directive 89/392/EEC (Machinery Directive). As the mandate has been given after the Standard had been accepted by the Technical Committee for submission to formal vote and in order not to further delay its publication, it will be reviewed within the context of the latest version of the Machinery Directive directly after the publication.

This EN 378-4 is part of a standard consisting of a series of the following parts:

- 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

For the 6-month enquiry, the draft standard was issued in 13 parts. After the discussion of the comments received during the enquiry it was decided to rearrange the content of 12 parts and to publish the final standard in the above 4 parts. The remaining part 13 will be published as a separate standard.

Annex A of this European Standard is normative, the annexes B, C, D and ZA are informative.

Introduction

The introduction of EN 378-1 is applicable.

Gases containing chlorine are damaging the ozone layer. These and other gases which are used as refrigerant also contribute to the global warming (greenhouse) effect. Other refrigerants such as ammonia, although not contributing to environmental damage, should be treated with caution due to their toxic or flammable nature.

NOTE: Also see UNEP (United Nations Environment Program) Montreal Protocol on substances that deplete the ozone layer (latest revision)

All parties concerned (e.g. designers, manufacturers, erectors, instructors, owners, users) should take advantage of any opportunity for reducing or eliminating emissions of environmentally damaging refrigerants.

The elimination of emissions should be one of the principal objectives during recovery, reuse and disposal of refrigerants.

1 Scope

1.1 The scope of EN 378-1 is applicable.

1.2 This Part 4 of the European Standard specifies requirements for safety and environmental aspects in relation to operation, maintenance, repair of refrigerating systems and the recovery, reuse and disposal of all types of refrigerant.

1.3 These requirements are intended to minimize 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.

1.4 Certain clauses and subclauses of this Part 4 are not applicable to unit systems, self contained systems and systems built on site which operate with charges of refrigerant up to

2,5 kg of group L1 refrigerant,

1,5 kg of group L2 refrigerant, and

1,0 kg of group L3 refrigerant.

This clause is:

clause 5.

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2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

EN 378-1

Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Basic requirements, definitions, classification and selection criteria

EN 378-2

Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation

EN 378-3

Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site and personal protection

ISO/DIS 11650

Performance of refrigerant recovery and/or recycling equipment

ISO/DIS 12810

Fluorocarbon refrigerants – Specifications and test methods

3 Definitions

For the purposes of this European Standard the definitions given in EN 378-1 apply.

4 Operational instructions

4.1 General

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 of adequate instruction of operating and supervision personnel.

4.1.2 Personnel in charge of the refrigerating system shall have knowledge and experience of the mode of functioning, operation and day-by-day monitoring of this system.

4.2 Instruction of operating personnel

Before a new refrigerating system is put into service, the person concerned shall ensure 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 and the properties and handling of the refrigerant used.

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

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: However, the frequency of such maintenance depends on the type, size, quality, 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 parties concerned for the refrigerating system shall ensure that the system is inspected, regularly supervised and maintained in a satisfactory manner.

5.1.3 The parties concerned for the refrigerating system shall also be responsible when the refrigerating system is used by another person, unless another division of responsibility has been agreed upon.

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

5.2 Maintenance

5.2.1 Maintenance shall be undertaken in such a way that:

- a) accidents to personnel are minimized;
- b) damage to goods is prevented;
- c) the 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 identified and remedied;
- f) waste of energy is minimized.

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

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

5.2.4 Regular leak tests, inspections and checking of the safety equipment shall be carried out as described EN 378-2.

5.2.5 When oil is drained from a refrigerating system it shall be carried out safely. For refrigerating systems containing ammonia, see normative annex A.

5.3 Repair

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

- a) instructing of the maintenance staff;
- b) disconnecting and safeguarding of the components to be repaired (e.g. powerdrive, pressure vessel, piping);
- c) emptying and evacuating, see EN 378-2;
- d) cleaning and purging respectively (e.g. with nitrogen);
- e) releasing for repair; <https://standards.iteh.ai/catalog/standards/sist/1e5194aa-d985-4905-835c-922b632b0b67/sist-en-378-4-2000>
NOTE: Welding or the use of arc - and flame-producing apparatus may require special work permits.
- f) carrying out the repair;
- g) testing and checking of the repaired component (pressure test, leakage test, functional test), see EN 378-2;
- h) replacing, evacuating and recharging with refrigerant.

5.3.2 Refrigerant leaks shall be identified and repaired as soon as practicable by a competent person and the system shall only be put into service again when all the leaks have been repaired.

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, see EN 378-2;
- d) adjustment of refrigerant charge;
- 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 a competent person.

5.3.6 Replacements of components or changes to the refrigerating system shall be ordered and carried out by a competent person.

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

In the event of a change of the refrigerant type used in the refrigerating system the following shall be observed:

- a) verify the refrigerating system manufacturer permits the refrigerant type change;
- b) pay special attention to the content of the gas cylinders to be sure that the correct refrigerant is added;
- c) examine all materials used in the refrigerating system to ensure they are compatible with the new refrigerant type;
- d) verify the possibility of exceeding the allowable pressure;
- e) verify the new refrigerant type can be used without recertifying the pressure vessels;
- f) verify the motor capacity;
- g) pay attention to the refrigerant classification;
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- h) replace or readjust, if necessary, control and safety devices;
- i) verify the content of the liquid receiver;
- j) prevent mixtures with residual refrigerant and residual oil;
- k) amend all indications as to the refrigerant type used;
- l) update the log book and documentation including machine card;
- m) ensure the original refrigerant is recovered in accordance with clause 6.

6 Requirements for recovery, reuse and disposal

6.1 General requirements

6.1.1 Personnel

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

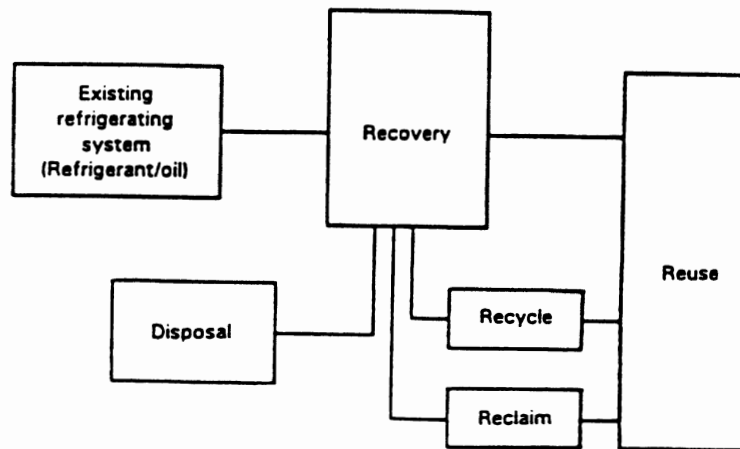


Figure 1: Simplified representation of the relationship between the processes

6.1.2 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.

6.1.3 Refrigerants

All refrigerants shall be recovered for reuse, recycled or reclaimed for reuse or shall be disposed of properly, see 6.5. CFC's, HCFC's, HFC's, PFC's, and HC's shall not be released into the atmosphere. If other refrigerants are released it shall be done in a controlled manner in order that any danger to persons or property is avoided.

NOTE: Destruction of refrigerants can require an authorized facility for destruction.

6.1.4 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).

Such decision will be based upon considerations that shall include:

- the history of the refrigerating system;
- the type and disposition of the refrigerant in the refrigerating system;
- the reason for removal of the refrigerant from the refrigerating system;
- the condition of the refrigerating system or the equipment and whether or not it is to be returned to service.

6.2 Requirements for recovery and reuse of refrigerant

6.2.1 General

The directions given regarding the treatment of recovered refrigerant before reuse shall apply to all types of refrigerant.

Dependent on the situation, recovered refrigerant can follow any one of the paths indicated in the flow chart shown in figure 2.

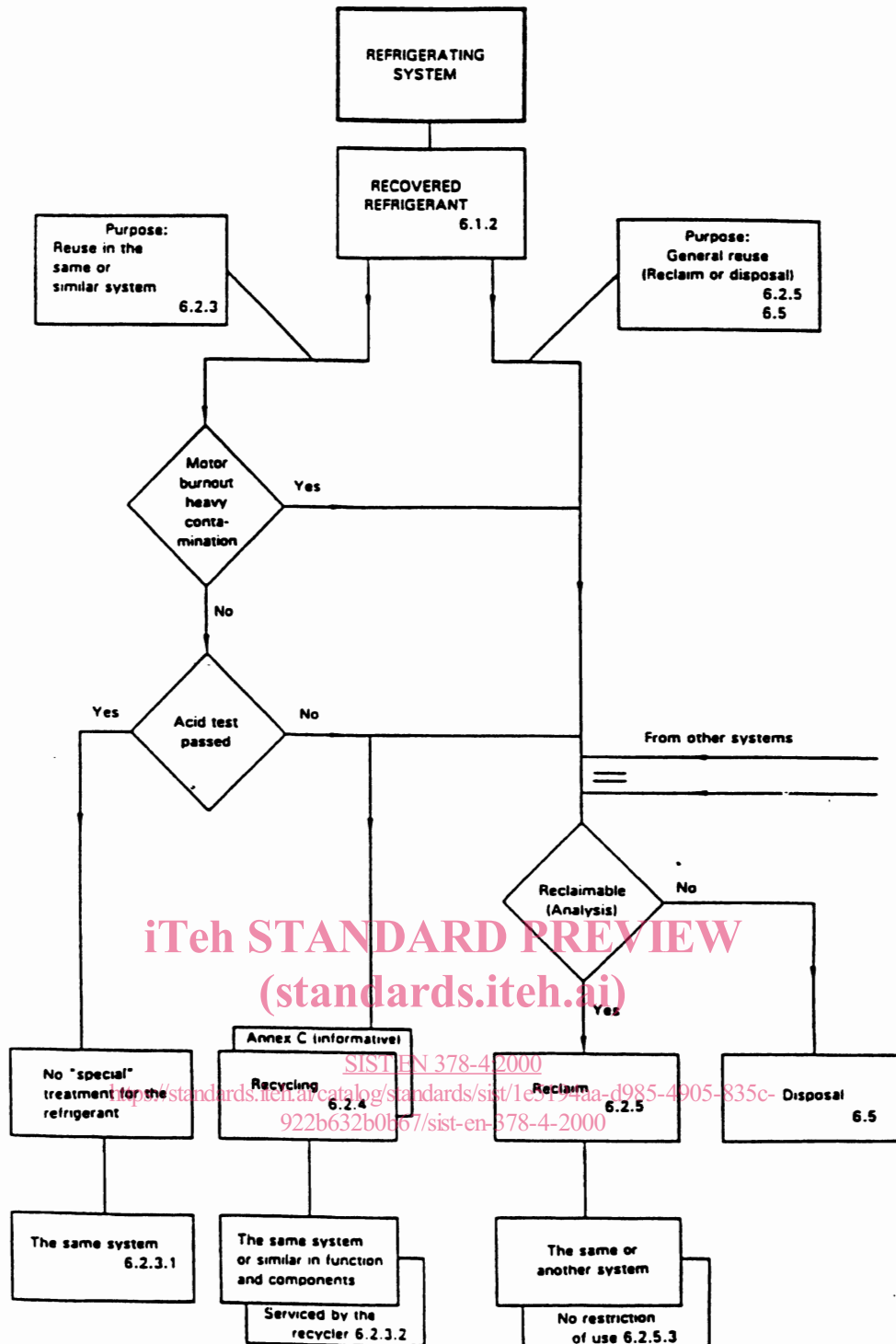


Figure 2: Flow chart for recovered refrigerant

6.2.2 Recovery for general reuse

For general reuse, recovered refrigerants shall be reclaimed and comply with the appropriate specification for new refrigerants.

6.2.3 Recovery for reuse in the same or similar system

6.2.3.1 For reuse in the same system

For a halocarbon refrigerant, an acid test shall be carried out.

NOTE 1: The acid test uses the titration principle to detect any compound that ionizes as an acid. The test requires a sample of a 100 g to 120 g and has a lower detection limit of $0,1 \times 10^{-6}$ by mass.

If the acid test fails, the total refrigerant charge shall undergo a recycling or reclaiming process, and the filter drier(s) in the refrigerating system shall be replaced.

Such a test is normally not required if recovery is from a refrigerating system during its manufacture.

NOTE 2: Refrigerant recovered from a refrigerating system (e.g. removed overcharge, refrigerant taken out for system service, local non-contaminating repair, major overhaul or replacement of a component) can normally be returned to the same system.

When a refrigerating system has been taken out of service because of heavy contamination of the refrigerant or motor burnout, the refrigerant shall be reclaimed or disposed of.

NOTE 3: The evacuation and charging procedures specified in this European standard should be followed when returning the refrigerant to the refrigerating system.

NOTE 4: It is recommended that the refrigerant is recharged through a filter drier to remove any moisture which may have contaminated the fluid during recovery.

6.2.3.2 For use in a similar system

The use of recycled refrigerant in a refrigerating system which is similar in function and components shall comply with the following requirements:

- the system is serviced by the competent person or company who recycled the refrigerant;
- the recycling equipment complies with the requirements of 6.2.4;
- the history of the refrigerant and the refrigerating system is known from the date of commissioning;
- the competent person or company informs the party concerned when recycled refrigerant is used and the source from which it comes and the result of the tests or, if necessary, of the analysis.

The acid test is carried out in accordance with 6.2.3.1.

If any of the above conditions is not met or the history of the refrigerant indicates a heavy contamination of the refrigerant, e.g. motor burnout, then the refrigerant shall be either reclaimed or disposed of properly.

NOTE: A recycled refrigerant should comply with the specifications in the informative annex B.

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6.2.4 Requirements for refrigerant recycling equipment and procedures

Recycling equipment for halocarbon refrigerants shall comply with ISO/DIS 11650 or similar standard requirements.

Recycling equipment shall be regularly inspected to verify that equipment and instruments are well maintained and in good order. Equipment and instruments shall be function tested and calibrated regularly.

6.2.5 Reclaim

6.2.5.1 Analysis

A refrigerant sent for reclaim shall be analysed and either reclaimed or disposed of properly.