BS EN 13313:2010

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Refrigerating systems and heat pumps — Competence of personnel

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee RHE/18, Refrigeration safety.

A list of organizations represented on this committee can be obtained on request to its secretary.

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ISBN 978 0 580 67707 6

ICS 27.080; 27.200

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2010.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13313

November 2010

ICS 27.080; 27.200

Supersedes EN 13313:2001

English Version

Refrigerating systems and heat pumps - Competence of personnel

Systèmes de réfrigération et pompes à chaleur - Compétence du personnel

Kälteanlagen und Wärmepumpen - Sachkunde von Personal

This European Standard was approved by CEN on 16 October 2010.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 13313:2010: E

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Foreword

This document (EN 13313:2010) 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of an identical text or by endorsement, at the latest by May 2011, and conflicting national standards shall be withdrawn at the latest by May 2011.

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.

This document supersedes EN 13313:2001.

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

a) this European Standard is completely revised;

b) this European Standard defines different competence levels;

c) this European Standard defines the activities related to refrigerating circuits and the associated competence profiles;

d) this European Standard takes into account an informative Annex B “Electricity”;

e) this European Standard takes into account an informative Annex C “Examples".

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 and the United Kingdom.

Introduction

Refrigerating systems, if not properly constructed, installed, operated and maintained, can be of danger to the health and safety of persons, the safety property, be detrimental to the environment and increase the energy consumption.

It is therefore essential that personnel dealing with such systems are competent to carry out the activity, or activities, listed in this standard. These activities cover the particular sectors in which they may operate from original design to final dismantling and disposal. As job descriptions can vary from country to country and from company to company, this standard specifies the activities to be carried out. Job descriptions should specify these activities.

This standard defines the activities related to the refrigerating circuit.

1 Scope

This European Standard defines the activities related to refrigerating circuits and the associated competence profiles and establishes procedures for assessing the competence of persons who carry out these activities.

NOTE As a refrigerating circuit is considered not to incorporate electrical and electronic systems, activities in this area are not part of this standard. For competences on electrical and electronic systems, it is recommended to refer to national regulations or appropriate European or national standards. This European Standard does not apply to persons carrying out work on self contained refrigerating systems as defined in EN 378-1 from the initial design of the product to the complete manufacture of the product, provided the process is controlled and the methods used are checked by an organisation or individual, responsible for the compliance with statutory requirements on health, safety and environment.

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

EN ISO/IEC 17024, *Conformity assessment — General requirements for bodies operating certification of persons (ISO/IEC 17024:2003)*

3 Terms and definitions

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

3.1
assessment
process by which the evidence generated, gathered and provided about a person is judged to determine competence

3.2
assessment body
evaluation body
organisation which is recognised to assess (evaluate) the competence of persons working on refrigerating circuits

3.3
certification body
organisation which issues/awards certificates proving the competence of persons working on refrigerating circuits

NOTE 1 Depending on national regulations, assessment bodies and certification bodies may be the same or different organisations.

NOTE 2 General criteria for certification bodies can be found in EN ISO/IEC 17024.

3.4
competence
ability to perform safely and satisfactorily the activities within an occupation

3.5
qualification
evidence of a certain level of professional competence

NOTE See 4.2 and Annex A.

3.6
certification
procedure used to demonstrate the qualification of personnel at a specified level and leading to the issue of a certificate

3.7
certificate
document issued under the rules of the assessment system defined in Annex A indicating that the named person is competent to deal with applicable health, safety, environmental protection and energy conservation requirements for refrigerating systems and heat pumps

3.8
designing
collecting all data required for making an effective operating refrigerating circuit, or making the conceptual and detailed plan of the refrigerating circuit (e.g. dimensioning, calculation, component selection, refrigerant piping layout and sizing)

3.9
pre-assembling
fabricating parts and sub-assemblies of a refrigerating circuit in a workshop or on site

NOTE This excludes charging with refrigerant.

3.10
installation
joining two or more pieces of equipment or circuits designed to contain refrigerant, with a view to assembling a refrigerating, air-conditioning or heat pump system in the location where it will be operated

NOTE 1 Installation excludes the action by which a system already assembled is plugged in before being put in operation. It excludes all the operations carried out at the manufacturing site.

NOTE 2 This excludes charging with refrigerant.

3.11
putting into operation
integrity inspection of the refrigerating system and bringing it into work for the first time or after significant changes

NOTE This may include charging with refrigerant.

3.12
commissioning
ensuring that the system is performing according to the predefined conditions after putting the system into operation

NOTE This may include charging with refrigerant.

3.13
operating
running the refrigerating system in a routine manner ensuring that the system works within the conditions required in the user manual

3.14
in-service inspection
all activities needed to check if the refrigerating system complies to predefined requirements (e.g. functionality, correlation of temperature and pressure, capacity checks, quality checks of joints for existence of corrosion)

3.15
leak checking
identifying if there is a leak of refrigerant from the refrigerating system and if yes, identifying the exact location of the leak and reporting the results

3.16
general maintenance
keeping or restoring a refrigerating system to a state from which the desired operation can be provided, without breaking into the refrigerating circuit

3.17
circuit maintenance
keeping or restoring a refrigerating system to a state from which the desired operation can be provided, by breaking into the refrigerating circuit

3.18
decommissioning
ensuring that the refrigerating system is in a safe and environmentally proper condition during the period that it is out of operation

3.19
removing of refrigerant
recovering the refrigerant out of a refrigerating circuit

3.20
dismantling
breaking the refrigerating circuit down into pieces

NOTE This excludes removing of refrigerant.

3.21
basic appreciation level
BA
level of expertise required to discuss main elements of the skill with others

3.22
working knowledge level
WK
level of expertise required for direct involvement in decisions and actions

3.23
fully operational level
FO
level of expertise required to perform personally the majority of the activities

3.24
leading edge level
LE
level of expertise required for significant development of the skill area

4 Requirements

4.1 General

Persons shall be deemed competent if it can be demonstrated that they are capable of carrying out the activities listed in this standard.

4.2 Competence levels

4.2.1 General

Persons shall demonstrate a level of predefined competence as defined in 3.21, 3.22, 3.23, and 3.24, of their theoretical and/or practical ability as necessary for the activity in question, as set out in Annex A.

4.2.2 Requirements for evaluation and certification procedures

The evaluation and certification procedures dealing with the competence of persons related to the refrigerating circuit shall be done according to the procedures defined in EN ISO/IEC 17024.

4.2.3 Requirements for competence assessment methods

If competence assessment methods are defined by national regulations, they shall be used.

If competence assessment methods are not defined by national regulations, they shall be used according to Annex A.

Annex A
(normative)

Competence assessment methods

A.1 General

If no national legislation for a scheme to access and certify competence exists, the following methods shall be used.

A.2 Areas of assessment

A.2.1 General

All persons who demonstrate their practical and theoretical competence by being successfully assessed by an approved organisation should receive a certificate of competence.

A.2.2 Tables

The following tables indicate areas and subjects that need to be assessed to demonstrate competence.

The row on the top of each table denotes the activities to be assessed as defined in Clause 3.

The column on the left side of each table denotes the subject to be assessed.

The cells of the table give the level of expertise as defined in 3.21(BA), 3.22(WK), 3.23(FO) and 3.24(LE).

Theoretical assessment is shown by an unshaded cell and practical assessment by a shaded cell.

A.2.3 Type of assessment

A.2.3.1 Theory is the knowledge of the subject of operation without the ability to demonstrate practical skills.

The assessment should be by written or oral examination.

A.2.3.2 Practice is the ability to perform an operation by demonstrating practical skills in the subject the assessment should be by practical tests.

Table A.1 — Basic thermodynamics

Basic thermodynamics	Tasks												
Description of tasks, see Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** 3.11	**Commissioning** 3.12	**Operating** 3.13	**In-service Inspection** 3.14	**Leakage checking** 3.15	**General Maintenance** 3.16	**Circuit Maintenance** 3.17	**Decommissioning** 3.18	**Removing Refrigerant** 3.19	**Dismantling** 3.20
Skills to assess													
Know the basic SI units, for example: temperature, pressure, mass, density, energy	FO	BA	BA	WK	WK	WK	WK	FO	BA	WK	BA	WK	
Understand basic refrigeration terms, for example: Enthalpy and Entropy, Pressure, Temperature, Refrigerating Capacity, Power consumption, COP, Superheat, Sub-cooling, Liquid and Vapour properties	FO		BA	FO	FO	WK	WK	WK	BA	FO	BA	WK	
Know the layout as well as use of the log p-h-diagrams of refrigerants	FO		BA	WK	WK	WK	WK	BA	BA	BA	BA	BA	
Know and use of the saturated and superheated vapour tables of refrigerants in correlation with the log p-h-diagrams as well	FO		BA	WK	WK	WK	WK	BA	BA	BA	BA	BA	
Draw a scheme of a compression refrigeration cycle	FO		BA	WK	WK	WK	WK	BA	BA	BA	BA	BA	
Understand the meaning of different kind of pressures (e.g. design pressure, absolute and gauge pressure, strength test pressure, test pressure for leak detection)	FO	BA	BA	WK	WK	WK	WK	FO	BA	FO	BA	BA	

Table A.2 — Components and tests of refrigerating systems

Components and tests of refrigeration systems	Tasks												
Description of tasks, see Clause 3 Terms and definitions	Design 3.8	Pre-assembling 3.9	Installation 3.10	Putting into Operation 3.11	Commissioning 3.12	Operating 3.13	In-service Inspection 3.14	Leakage checking 3.15	General Maintenance 3.16	Circuit Maintenance 3.17	Decommissioning 3.18	Removing Refrigerant 3.19	Dismantling 3.20
Skills to assess													
The refrigerating circuit (RAC and Heat pump installation)	LE	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Compressor (e.g. comparable)	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Lubrication system	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	BA	BA	BA
Capacity control	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	BA	BA	BA
Pressure vessel	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Condenser	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Gas cooler	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Liquid receiver	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Liquid separator	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Evaporator	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Defrosting systems on evaporators	FO	BA	WK	FO	FO	WK	WK	FO	WK	FO	WK	BA	BA
Expansion devices	FO	WK	FO	FO	FO	WK	WK	FO	WK	FO	FO	FO	BA
Preassembled units	WK		WK	FO	FO	WK	WK	FO	WK	FO	WK	FO	
Strength pressure test	FO	BA	WK	FO	FO	BA	BA	BA	BA	WK	WK	BA	
Tightness pressure test for leak detection	FO	BA	WK	FO	FO	BA	BA	BA	BA	FO	WK	BA	
Removing moisture and non-condensable gases from the refrigerating system by evacuation with vacuum pumps	BA	BA	WK	FO	FO	BA	BA	BA	BA	FO	WK	BA	
Vacuum test	BA	BA	WK	FO	FO	BA	BA	BA	BA	FO	WK	BA	
Determination of required refrigerant charge	LE	BA	WK	FO	FO	WK	WK	WK	WK	FO	WK	FO	
Fill the system with refrigerant	BA	BA	BA	FO	FO	BA	BA	BA	BA	FO	WK	BA	
Check the charge of refrigerant including leakage checking	BA			FO	FO	WK	WK	WK	WK	FO	WK	WK	BA

Table A.3 — Piping, joints and valves

Piping, joints and valves	Tasks												
Description of tasks, see Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** 3.11	**Commissioning** 3.12	**Operating** 3.13	**In-service Inspection** 3.14	**Leakage checking** 3.15	**General Maintenance** 3.16	**Circuit Maintenance** 3.17	**Decommissioning** 3.18	**Removing Refrigerant** 3.19	**Dismantling** 3.20
Skills to assess													
Piping	FO	FO	FO	WK	WK	WK	WK	WK	WK	FO	WK	BA	FO
Joints	FO	FO	FO	WK	WK	WK	WK	WK	WK	FO	WK	FO	FO
Valves	FO	FO	FO	FO	WK	WK	WK	WK	WK	FO	WK	FO	FO
Thermal insulation	FO	FO	FO	WK	WK	WK	WK	WK	WK	WK	WK		
Pipe supports	FO	FO	FO	WK	WK	WK	WK	WK	WK	WK	WK		

Table A.4 — Safety equipment

Safety equipment [a]	Tasks												
Description of tasks see, Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** 3.11	**Commissioning** 3.12	**Operating** 3.13	**In-service Inspection** 3.14	**Leakage checking** 3.15	**General Maintenance** 3.16	**Circuit Maintenance** 3.17	**Decommissioning** 3.18	**Removing Refrigerant** 3.19	**Dismantling** 3.20
Skills to assess													
Pressure relief device	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Pressure relief valve	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Bursting disc	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Fusible plug	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Temperature limiting device	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Type approved temperature limiter	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Safety switching device for limiting the pressure	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Type approved pressure limiter	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Type approved pressure cut out	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Type approved safety pressure cut out	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Changeover device	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Refrigerant detector	FO	WK	WK	FO	WK	WK	WK	FO	WK	FO	WK	WK	
Overflow valve	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Surge protection device	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	
Liquid level cut out	FO	WK	WK	FO	WK	WK	WK	BA	WK	FO	WK	WK	
Self closing valve	FO	WK	WK	FO	WK	WK	WK	WK	WK	FO	WK	WK	

[a] Definitions the same as EN 378.

Table A.5 — Fluids

Fluids [a]	Tasks												
Description of tasks, see Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** 3.11	**Commissioning** 3.12	**Operating** 3.13	**In-service Inspection** 3.14	**Leakage checking** 3.15	**General Maintenance** 3.16	**Circuit Maintenance** 3.17	**Decommissioning** 3.18	**Removing Refrigerant** 3.19	**Dismantling** 3.20
Skills to assess													
Refrigerant behaviour	FO	BA	WK	FO	WK	WK	WK	FO	WK	FO	WK	FO	BA
Coolant, secondary loop fluid	FO		BA	WK	BA	BA	BA	BA	BA	WK	BA	WK	
Toxicity	FO		WK	WK	BA	BA	BA	BA	BA	WK			
Flammability	FO		BA	WK	BA	BA	BA	BA	BA	WK			
Fractionation	FO		BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	
Quality of refrigerant	FO		WK	FO	BA	BA	BA	BA	BA	FO	BA	FO	
Recover	FO		BA	BA	BA	BA	BA	BA	BA	FO	BA	FO	
Recycle	FO		BA	BA	BA	BA	BA	BA	BA	FO	BA	FO	
Reclaim	BA		BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	
Disposal	FO		BA	BA	BA	BA	BA	BA	BA	FO	BA	FO	
Auto ignition temperature of a substance	FO		BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	

[a] Definitions the same as EN 378.

Table A.6 — Communication

Communication	Tasks												
Description of tasks, see Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** 3.11	**Commissioning** 3.12	**Operating** 3.13	**In-service Inspection** 3.14	**Leakage checking** 3.15	**General Maintenance** 3.16	**Circuit Maintenance** 3.17	**Decommissioning** 3.18	**Removing Refrigerant** 3.19	**Dismantling** 3.20
Skills to assess													
Arrange an appointment with the client	LE		BA	WK	FO	FO	BA	FO	BA	FO	WK	WK	BA
Properly inform the client about the method of operation of the refrigeration system	LE		BA	WK	FO	FO	BA	BA	BA	FO	WK	WK	BA
Consider the client's wishes	LE		BA	FO	FO	BA	BA	BA	BA	WK	WK	WK	BA
Write a report about the condition of one or more components	WK		BA	FO	FO	BA	BA	BA	BA	WK	WK	WK	BA
Advise the client about the need to repair of one or more components	LE	BA	BA	BA	BA	BA	BA	FO	FO	FO	WK	WK	
Advise the client about the need to replace (SE095) one or more components	LE	BA	BA	BA	BA	BA	BA	FO	FO	FO	WK	WK	
Advise the client about maintenance planning	LE		BA	BA	BA	WK	WK	WK	WK	FO	WK	WK	
Advise the client on saving energy	LE		BA	BA	BA	WK	WK	WK	WK	WK	WK	WK	
Make the client aware of environmental issues	LE		BA	FO	FO	WK	WK	WK	WK	WK	WK	WK	
Advise the client on safety issues	LE		BA	FO	FO	WK	WK	WK	WK	WK	WK	WK	
Process client complaints	LE		BA	BA	BA	WK	WK	WK	WK	WK	WK	WK	
Advise the client with regard to shutting down the refrigeration system	LE		BA	BA	BA	WK	WK	WK	WK	FO	WK	WK	
Explain to the client the work procedures	WK		BA	FO	FO	BA	BA	FO	BA	WK	WK	WK	
Explain to the client the content of a report	WK		BA	FO	FO	BA	BA	FO	BA	WK	WK	WK	
Fill in all the legal required documents and certificates	BA		BA	FO	FO	FO	FO	FO	FO	FO	FO	FO	FO

Annex B
(informative)

Electricity

This standard does not cover the electrical activities related to a refrigerating system. These may be covered by national regulations. If not covered by national regulations, following competences may be assessed:

— explain the use of different kinds of cables and wires;

— explain the use of different kinds of classified connections;

— explain the use of different kinds of classified IP;

— explain the different kinds of safety fuses and switches;

— install electrical equipment and motors;

— lay cables in the cable routes;

— do the wiring of a switch panel;

— connect the power supply at the main switch panel;

— connect a single and/or three phase motor;

— connect the electrical components;

— check the electrical safety according to the EU and national regulations;

— check the power consumption of a motor;

— measure the electrical equipment and cabling;

— adjust the electrical safety switches;

— adjust the electrical equipment;

— take the decision to repair an electrical component;

— write a report about the electrical equipment.

Annex C
(informative)

Examples

C.1 Introduction

For several types of refrigerant, additional regulations and requirements on competence may exist.

This informative Annex C provides guidance on how to convert the assessment schemes from Annex A to fit into schemes for specific refrigerants.

C.2 Relation with Regulation (EC) no 842/2006 of the European Parliament and of the Council of 17 May 2006, on certain fluorinated greenhouse gases ("F-gases Regulation")

Regulation No 842/2006 is mandatory in the European Union. Article 5 “Training and Certification” and the associated Commission Regulation (EC) No 303/2008 with minimum competence requirements for specific categories of personnel.

C.2 gives an informative example of the conversion of EN 13313 in relation with Regulation No 842/2006.

Table C.1 — Conversion Table EN 13313 and F-gases regulation

		EN 13313												
F gases category		Design	Pre-assembling	Installation	Putting into Operation	Commissioning	Operating	In-service Inspection	Leakage checking	General Maintenance	Circuit Maintenance	Decommissioning	Removing Refrigerant	Dismantling
1			X	X	X	X		X	X	X	X	X	X	X
2			X	X	X	X		X	X	X	X	X	X	X
3													X	X
4							X		X	X				

C.3 Relation with competence requirements for personnel working with refrigerating systems using ammonia as refrigerant

C.3 gives an informative example of the conversion of EN 13313 in relation with national requirements for personnel working with refrigerating systems using ammonia as refrigerant.

This example explains the assessment elements for a service technician assigned to the following tasks:

— putting into operation;

— commissioning;

— operating;

— in-service inspection;

— leakage checking;

— general maintenance;

— circuit maintenance;

— decommissioning;

— removing refrigerant.

In this case the certification scheme as presented below covers all tasks which belong to the job description. The Board of Experts (according to EN ISO/IEC 17024) of the Examination Body has to approve the assessment elements. This Board may decide which elements should be mandatory or optional.

Table C.2 — NH_3 − Basic thermodynamics

Basic thermodynamics	Tasks												
Description of tasks, see Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** 3.11	**Commissioning** 3.12	**Operating** 3.13	**In-service Inspection** 3.14	**Leakage checking** 3.15	**General Maintenance** 3.16	**Circuit Maintenance** 3.17	**Decommissioning** 3.18	**Removing Refrigerant** 3.19	**Dismantling** 3.20
Skills to assess													
Know the basic SI units, for example: temperature, pressure, mass, density, energy	**FO**	**BA**	**BA**	**WK**	**WK**	**WK**	**WK**	**FO**	**BA**	**WK**	**BA**	**WK**	
Understand basic refrigeration terms, for example: Enthalpy and Entropy, Pressure, Temperature, Refrigerating Capacity, Power consumption, COP, Superheat, Sub-cooling, Liquid and Vapour properties	**FO**		**BA**	**FO**	**FO**	**WK**	**WK**	**WK**	**BA**	**FO**	**BA**	**WK**	
Know the layout as well as use of the log p-h-diagrams of refrigerants	**FO**		**BA**	**WK**	**WK**	**WK**	**WK**	**BA**	**BA**	**BA**	**BA**	**BA**	
Know and use of the saturated and superheated vapour tables of refrigerants in correlation with the log p-h-diagrams as well	**LE**		**BA**	**WK**	**WK**	**WK**	**WK**	**BA**	**BA**	**BA**	**BA**	**BA**	
Draw a scheme of a compression refrigeration cycle	**LE**		**BA**	**WK**	**WK**	**WK**	**WK**	**BA**	**BA**	**BA**	**BA**	**BA**	
Understand the meaning of different kind of pressures (e.g. design pressure, absolute and gauge pressure, strength test pressure, test pressure for leak detection)	**FO**	**BA**	**BA**	**WK**	**WK**	**WK**	**WK**	**FO**	**BA**	**FO**	**BA**	**BA**	
				NH_3 Service Technician's tasks									

Table C.3 — NH_3 − Components and tests of refrigeration systems

Components and tests of refrigeration systems	Tasks												
Description of tasks, see Clause 3 Terms and definitions	Design 3.8	Pre-assembling 3.9	Installation 3.10	Putting into Operation 3.11	Commissioning 3.12	Operating 3.13	In-service Inspection 3.14	Leakage checking 3.15	General Maintenance 3.16	Circuit Maintenance 3.17	Decommissioning 3.18	Removing Refrigerant 3.19	Dismantling 3.20
Skills to assess													
The refrigerating circuit (RAC and Heat pump installation)	LE			FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Compressor (e.g. comparable)	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Lubrication system	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	BA	BA	BA
Capacity control	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	BA	BA	BA
Pressure vessel	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Condenser	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Gas cooler	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Liquid receiver	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Liquid separator	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Evaporator	FO	BA	WK	FO	FO	WK	WK	BA	WK	FO	WK	FO	BA
Defrosting systems on evaporators	FO	BA	WK	FO	FO	WK	WK	FO	WK	FO	WK	BA	BA
Expansion devices	FO	WK	FO	FO	FO	WK	WK	FO	WK	FO	FO	FO	BA
Preassembled units	WK		WK	FO	FO	WK	WK	FO	WK	FO	WK	FO	
Strength pressure test	LE	BA		FO	FO	BA	BA	BA	BA	WK	WK	BA	
Tightness pressure test for leak detection	FO	BA		FO	FO	BA	BA	BA	BA	FO	WK	BA	
Removing moisture and non-condensable gases from the refrigerating system by evacuation with vacuum pumps	BA	BA		FO	FO	BA	BA	BA	BA	FO	WK	BA	
Vacuum test	BA	BA		FO	FO	BA	BA	BA	BA	FO	WK	BA	
Determination of required refrigerant charge	LE	BA	WK	FO	FO	WK	WK	WK	WK	FO	WK	FO	
Fill the system with refrigerant	BA	BA	BA	FO	FO	BA	BA	BA	BA	FO	WK	BA	
Check the charge of refrigerant including leakage checking	BA			FO	FO	WK	WK	WK	WK	FO	WK	WK	BA
				NH_3 Service Technician's tasks									

Table C.4 — NH_3 − Piping, joints and valves

Piping, joints and valves	Task												
Description of tasks, see Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** 3.11	**Commissioning** 3.12	**Operating** 3.13	**In-service Inspection** 3.14	**Leakage checking** 3.15	**General Maintenance** 3.16	**Circuit Maintenance** 3.17	**Decommissioning** 3.18	**Removing Refrigerant** 3.19	**Dismantling** 3.20
Skills to assess													
Piping	FO			WK	WK	WK	WK	WK	WK	FO	WK	BA	
Joints	FO			WK	WK	WK	WK	WK	WK	FO	WK	FO	
Valves	FO			FO	WK	WK	WK	WK	WK	FO	WK	FO	
Thermal insulation	FO			WK	WK	WK	WK	WK	WK	WK	WK		
Pipe supports	FO			WK	WK	WK	WK	WK	WK	WK	WK		
				NH_3 Service Technician's tasks									

Table C.5 — NH_3 − Safety equipment

Safety equipment [a]	Tasks												
Description of tasks, see Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** 3.11	**Commissioning** 3.12	**Operating** 3.13	**In-service Inspection** 3.14	**Leakage checking** 3.15	**General Maintenance** 3.16	**Circuit Maintenance** 3.17	**Decommissioning** 3.18	**Removing Refrigerant** 3.19	**Dismantling** 3.20
Skills to assess													
Pressure relief device	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Pressure relief valve	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Bursting disc	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Fusible plug	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Temperature limiting device	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Type approved temperature limiter	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Safety switching device for limiting the pressure	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Type approved pressure limiter	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Type approved pressure cut out	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Type approved safety pressure cut out	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Changeover device	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Refrigerant detector	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**FO**	**WK**	**FO**	**WK**	**WK**	
Overflow valve	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Surge protection device	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	
Liquid level cut out	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**BA**	**WK**	**FO**	**WK**	**WK**	
Self closing valve	**FO**	**WK**	**WK**	**FO**	**WK**	**WK**	**WK**	**WK**	**WK**	**FO**	**WK**	**WK**	

[a] Definitions the same as EN 378.

NH_3 Service Technician's tasks

Table C.6 — NH_3 − Fluids

Fluids [a]	Tasks												
Description of tasks, see Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** 3.11	**Commissioning** 3.12	**Operating** 3.13	**In-service Inspection** 3.14	**Leakage checking** 3.15	**General Maintenance** 3.16	**Circuit Maintenance** 3.17	**Decommissioning** 3.18	**Removing Refrigerant** 3.19	**Dismantling** 3.20
Skills to assess													
Refrigerant behaviour	FO	BA		FO	WK	WK	WK	FO	WK	FO	WK	FO	BA
Coolant, secondary loop fluid	FO		BA	WK	BA	BA	BA	BA	BA	WK	BA	WK	
Toxicity	FO			WK	BA	BA	BA	BA	BA	WK			
Flammability	FO			WK	BA	BA	BA	BA	BA	WK			
Fractionation	FO		BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	
Quality of refrigerant	FO		WK	FO	BA	BA	BA	BA	BA	FO	BA	FO	
Recover	FO		BA	BA	BA	BA	BA	BA	BA	FO	BA	FO	
Recycle	FO		BA	BA	BA	BA	BA	BA	BA	FO	BA	FO	
Reclaim	BA		BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	
Disposal	FO			BA	BA	BA	BA	BA	BA	FO	BA	FO	
Auto ignition temperature of a substance	FO		BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	

[a] Definitions the same as EN 378.

NH_3 Service Technician's tasks

Table C.7 — NH_3 − Communication

Communication	Task												
Description of tasks, see Clause 3 Terms and definitions	**Design** 3.8	**Pre-assembling** 3.9	**Installation** 3.10	**Putting into Operation** **3.11**	**Commissioning** **3.12**	**Operating** **3.13**	**In-service Inspection** **3.14**	**Leakage checking** **3.15**	**General Maintenance** **3.16**	**Circuit Maintenance** **3.17**	**Decommissioning** **3.18**	**Removing Refrigerant** **3.19**	**Dismantling** 3.20
Skills to assess													
Arrange an appointment with the client				WK	FO	FO	BA	FO	BA	FO	WK	WK	
Properly inform the client about the method of operation of the refrigeration system				WK	FO	FO	BA	BA	BA	FO	WK	WK	
Consider the client's wishes				FO	FO	BA	BA	BA	BA	WK	WK	WK	
Write a report about the condition of one or more components				FO	FO	BA	BA	BA	BA	WK	WK	WK	
Advise the client about the need to repair of one or more components				BA	BA	BA	BA	FO	FO	FO	WK	WK	
Advise the client about the need to replace (SE095) one or more components				BA	BA	BA	BA	FO	FO	FO	WK	WK	
Advise the client about maintenance planning				BA	BA	WK	WK	WK	WK	FO	WK	WK	
Advise the client on saving energy				BA	BA	WK	WK	WK	WK	WK	WK	WK	
Make the client aware of environmental issues				FO	FO	WK	WK	WK	WK	WK	WK	WK	
Advise the client on safety issues				FO	FO	WK	WK	WK	WK	WK	WK	WK	
Process client complaints				BA	BA	WK	WK	WK	WK	WK	WK	WK	
Advise the client with regard to shutting down the refrigeration system				BA	BA	WK	WK	WK	WK	FO	WK	WK	
Explain to the client the work procedures				FO	FO	BA	BA	FO	BA	WK	WK	WK	
Explain to the client the content of a report				FO	FO	BA	BA	FO	BA	WK	WK	WK	
Fill in all the legal required documents and certificates	BA		BA	FO	FO	FO	FO	FO	FO	FO	FO	FO	FO
				Area of the NH_3 service technician									

Bibliography

[1] Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases

[2] Commission Regulation EC 303/2008 of 2 April 2008 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, minimum requirements and the conditions for mutual recognition for the certification of companies and personnel as regards stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases

[3] EN 378-2:2008+A1:2009, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

[4] EN 378-3, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 3: Installation site and personal protection*

[5] EN 378-4, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 4: Operation, maintenance, repair and recovery*

[6] EN 50110-1:2004, *Operation of electrical installations*

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