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ANNEXES 1 to 2

## ANNEXES

to the

### **Commission Implementing Regulation**

**establishing, pursuant to Regulation (EU) No 517/2014 of the European Parliament and the Council, minimum requirements and the conditions for mutual recognition for the certification of companies and natural persons as regards stationary refrigeration, air conditioning and heat pump equipment, and refrigeration units of refrigerated trucks and trailers, containing fluorinated greenhouse gases**

## ANNEXES

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#### ANNEX I

##### Minimum requirements as to the skills and knowledge to be covered by the evaluation bodies

1. The examination for each of the Categories referred to in Article 3(2) shall comprise the following:
  - (a) a theoretical test with one or more questions testing that skill or knowledge, as indicated in the Category columns by (T);
  - (b) a practical test where the applicant shall perform the corresponding task with the relevant material, tools and equipment, as indicated in the Category columns by (P).
2. The examination shall cover each of the skill and knowledge groups 1, 2, 3, 4, 5, 10 and 11.
3. The examination shall cover at least one of the skill and knowledge groups 6, 7, 8 and 9. The candidate shall not know in advance of the examination which of these four components will be examined.
4. If there is one single box in the categories columns that corresponds to several boxes (several skills and knowledge) in the skills and knowledge column it means that not necessarily all skills and knowledge have to be tested during the examination.

		CATEGORIES			
SKILLS AND KNOWLEDGE		I	II	III	IV
<b>1</b>	<b>Basic thermodynamics</b>				
1.01	Know the basic ISO standard units as for temperature, pressure, mass, density, energy	T	T	—	T
1.02	Understand basic theory of refrigeration systems: basic thermodynamics (key terms, parameters and processes such as Superheat, High Side, Heat of Compression, Enthalpy, Refrigeration Effect, Low Side, Sub-cooling), properties and thermodynamic transformations of refrigerants including identification of zeotropic blends and fluid states.	T	T	—	—

1.03	Use relevant tables and diagrams and interpret them in the context of indirect leakage checking (including checking of the good operation of the system): log p/h diagram, saturation tables of a refrigerant, diagram of a single compression refrigeration cycle.	T	T	—	—
1.04	Describe the function of the main components in the system (compressor, evaporator, condenser, thermostatic expansion valves) and the thermodynamic transformations of the refrigerant.	T	T	—	—
1.05	Know the basic operation of the following components used in a refrigeration system and their role and importance for refrigerant leakage prevention and identification: (a) valves (ball valves, diaphragms, globe valves, relief valves), (b) temperature and pressure controls, (c) sight glasses and moisture indicators, (d) defrost controls, (e) system protectors, (f) measuring devices as manifold thermometer, (g) oil control systems, (h) receivers, (i) liquid and oil separators			—	—
<b>2</b>	<b>Environmental impact of refrigerants and corresponding environmental regulations</b>				
2.01	Have a basic knowledge of climate change and the Kyoto Protocol	T	T	T	T
2.02	Have a basic knowledge of the concept of Global Warming Potential (GWP), the use of fluorinated greenhouse gases and other substances as refrigerants, the impact of the emissions of fluorinated greenhouse gases on the climate (order of magnitude of their GWP) and relevant provisions of Regulation (EU) No 517/2014 and of the relevant implementing acts.	T	T	T	T
<b>3</b>	<b>Checks before putting in operation, after a long period of non-use, after maintenance or repair intervention, or during operation</b>				
3.01	Carry out a pressure test to check the strength of the system	P	P	—	—
3.02	Carry out a pressure test to check the tightness of the system				
3.03	Use a vacuum pump				
3.04	Evacuate the system to remove air and moisture according to standard practice				
3.05	Fill in the data in the equipment records and fill in a report about one or more tests and checks carried out during the examination.	T	T	—	—
<b>4</b>	<b>Checks for leakage</b>				
4.01	Know potential leakage points of refrigeration, air-conditioning and heat pump equipment	T	T	—	T
4.02	Check equipment records prior to a check for leakage and identify the relevant information on any repeating issues or problem areas to pay special attention to	T	T	—	T
4.03	Make a visual and manual inspection of the whole system in accordance with the Commission Regulation (EC) No 1516/2007 <sup>1</sup>	P	P	—	P
4.04	Carry out a check for leakage of the system using an indirect method in accordance with the Regulation (EC) No 1516/2007 and the instruction manual of the system	P	P	—	P

<sup>1</sup> Commission Regulation (EC) No 1516/2007 of 19 December 2007 establishing standard leakage checking requirements for stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases (OJ L 335, 20.12.2007, p. 10).

4.05	Use portable measuring devices such as manometer sets, thermometers and multi-meters for measuring Volt/Amp/Ohm in the context of indirect methods for leakage checking, and interpret the measured parameters.	P	P	—	P
4.06	Carry out a check for leakage of the system using one of the direct methods referred to in Regulation (EC) No 1516/2007	P	—	—	—
4.07	Carry out a check for leakage of the system using one of the direct methods which does not entail breaking into the refrigeration circuit, referred to in Regulation (EC) No 1516/2007	—	P	—	P
4.08	Use an electronic leak detection device	P	P	—	P
4.09	Fill in the data in the equipment records	T	T	—	T
<b>5</b>	<b>Environment-friendly handling of the system and refrigerant during installation, maintenance, servicing or recovery</b>				
5.01	Connect and disconnect gauges and lines with minimal emissions	P	P	—	—
5.02	Empty and fill a refrigerant cylinder in both liquid and vapour state	P	P	P	—
5.03	Use a recovery set to recover refrigerant and connect and disconnect recovery set with minimal emissions	P	P	P	—
5.04	Drain F-gas contaminated oil out of a system	P	P	P	—
5.05	Identify refrigerant state (liquid, vapour) and condition (subcooled, saturated or superheated) prior to charging, to ensure correct method and volume of charge. Fill the system with refrigerant (both in the liquid and vapour phase) without loss of refrigerant	P	P	—	—
5.06	Use scales to weight refrigerant	P	P	P	—
5.07	Fill in the equipment records with all relevant information concerning the refrigerant recovered or added	T	T	—	—
5.08	Know requirements and procedures for handling, storage and transportation of contaminated refrigerant and oils	T	T	T	—
<b>6</b>	<b>Component: installation, putting into operation and maintenance of reciprocating, screw and scroll compressors, single and two-stage</b>				
6.01	Explain the basic functioning of a compressor (including capacity control and lubricating system) and risks of refrigerant leakage or release associated to it.	T	T	—	—
6.02	Install a compressor properly, including control and safety equipment, so that no leak or major release occur once the system is put into operation	P	—	—	—
6.03	Adjust the safety and control switches	P	—	—	—
6.04	Adjust the suction and discharge valves				
6.05	Check the oil return system				
6.06	Start up and shut down a compressor and check the good working conditions of the compressor, including by making measurements during operation of compressor	P	—	—	—
6.07	Write a report about the condition of the compressor which identifies any problems in the functioning of the compressor that could damage the system and eventually lead to refrigerant leakage or release should no	T	—	—	—

	action be taken				
<b>7</b>	<b>Component: installation, putting into operation and maintenance of air cooled and water cooled condensers</b>				
7.01	Explain the basic functioning of a condenser and risks of leakage associated to it	T	T	—	—
7.02	Adjust a discharge pressure control of the condenser	P	—	—	—
7.03	Install a condenser, properly, including control and safety equipment, so that no leak or major release occur when the system has been put into operation	P	—	—	—
7.04	Adjust the safety and control switches	P	—	—	—
7.05	Check the discharge and liquid lines				
7.06	Purge non condensable gases out of the condenser using a refrigeration purging device	P	—	—	—
7.07	Start up and shut down a condenser and check the good working condition of the condenser including by making measurements during operation	P	—	—	—
7.08	Check the surface of the condenser	P	—	—	—
7.09	Write a report about the condition of the condenser which identifies any problems in the functioning that could damage the system and eventually lead to refrigerant leakage or release should no action be taken	T	—	—	—
<b>8</b>	<b>Component: installation, putting into operation and maintenance of air cooled and water cooled evaporators</b>				
8.01	Explain the basic functioning of an evaporator (including defrosting system) and risks of leakage associated to it	T	T	—	—
8.02	Adjust an evaporating pressure control of the evaporator	P	—	—	—
8.03	Install an evaporator including control and safety equipment, so that no leak or major release occur when the system has been put into operation	P	—	—	—
8.04	Adjust the safety and control switches	P	—	—	—
8.05	Check the liquid and suction pipelines in the correct position				
8.06	Check the hot gas defrost pipeline				
8.07	Adjust evaporation pressure regulation valve				
8.08	Start up and shut down an evaporator and check the good working condition of the evaporator, including by making measurement during operation	P	—	—	—
8.09	Check the surface of the evaporator	P	—	—	—
8.10	Write a report about the condition of the evaporator which identifies any problems in the functioning that could damage the system and eventually lead to refrigerant leakage or release should no action be taken	T	—	—	—
<b>9</b>	<b>Component: installation, putting into operation and servicing of Thermostatic Expansion Valves (TEV) and other components</b>				
9.01	Explain the basic functioning of different kinds of expansion regulators (thermostatic expansion valves, capillary tubes) and risks of leakage	T	T	—	—

	associated to it				
9.02	Install valves in the correct position	P	—	—	—
9.03	Adjust a mechanical/electronic TEV	P	—	—	—
9.04	Adjust mechanical and electronic thermostats				
9.05	Adjust a pressure regulated valve				
9.06	Adjust mechanical and electronic pressure limiters				
9.07	Check the functioning of an oil separator	P	—	—	—
9.08	Check the condition of a filter dryer				
9.09	Write a report about the condition of these components which identifies any problems in the functioning that could damage the system and eventually lead to refrigerant leakage or release should no action be taken	T	—	—	—
<b>10</b>	<b>Piping: building a leak tight piping system in a refrigeration installation</b>				
10.01	Weld, braze and/or solder leak free joints on metallic tubes and pipes that can be used in refrigeration, air-conditioning or heat pump systems	P	P	—	—
10.02	Make/check pipe and component supports	P	P	—	—
<b>11</b>	<b>Information on relevant technologies to replace or to reduce the use of fluorinated greenhouse gases and their safe handling</b>				
11.01	Know the relevant alternatives to fluorinated greenhouse gases and their main characteristics, including properties requiring specific safety measures	T	T	T	T
11.02	Know relevant system designs to reduce the charge size of fluorinated greenhouse gases and to increase energy efficiency	T	T	—	—
11.03	Know relevant safety regulations and standards for the use of flammable, toxic or pressurised refrigerants	T	T	—	—

## ANNEX II

### Correlation table

<b>Regulation (EC) No 303/2008</b>	<b>This Regulation</b>
Article 1	Article 1
Article 2	Article 2
Article 3	-
Article 4(1) and (2)	Article 3(1) and (2)
Article 4(3)(a)	Article 3(4)
Article 4(3)(b) and (c)	Article 3(3)(a) and (b)
Article 4(4)	-
Article 5	Article 4
Article 6	-
Article 7	Article 5
Article 8	Article 6
Article 9	-
Article 10	Article 7
Article 11	Article 8
Article 12	Article 9
Article 13	Article 10
-	Article 11
Article 14	Article 12

Annex	Annex I
-	Annex II