EUROPEAN
COMMISSION

Brussels, XXX
[…](2024) XXX draft

ANNEXES 1 to 2

ANNEXES

to the

Commission Implementing Regulation

establishing, pursuant to Regulation (EU) 2024/573 of the European Parliament and of the Council, minimum requirements and the conditions for mutual recognition for the certification of natural and legal persons as regards stationary refrigeration, air conditioning and heat pump equipment, organic Rankine cycles and refrigeration units of refrigerated trucks and trailers, refrigerated light-duty vehicles, intermodal containers and train wagons

ANNEX I

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

(1) The examination for each of the Certificates referred to in Article 3(2) shall comprise of the following:

(a) a theoretical test with one or more questions testing that skill or knowledge, as indicated in the category columns by T. In relation to Certificate A, at least one of the questions shall relate to the specifics of alternatives to fluorinated greenhouse gases (for example hydrocarbons, CO2 or ammonia) and at least one question shall relate to energy efficiency of equipment;

(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. In relation to Certificate A, the practical test shall include at least one operation involving the relevant alternatives to fluorinated greenhouse gases (for example hydrocarbons, CO2 or ammonia).

(2) The examination shall cover each of the skills and knowledge groups specified under headings 1, 2, 3, 4, 5, 10 and 11 of the table below. In addition, for Certificate A it shall cover the skills and knowledge group specified under heading 12 of that table, for Certificate B the skills and knowledge group specified under heading 13 of that table and for Certificate C the skills and knowledge group specified under heading 14 of that table.

(3) The examination shall cover at least one of the skills and knowledge groups specified under heading 6, 7, 8 or 9 of the table below. The candidate shall not know in advance of the examination which of these four components will be examined.

		Certificate				
SKILLS AND KNOWLEDGE		A	B	C	D	E
1	**Basic thermodynamics**					
1.00	Basic understanding of the applicable EU and national legislation, in particular f-gas, WEEE and eco design	T	T	T	T	T
1.01	Knowledge of the basic ISO standard units for temperature, pressure, mass, density and energy	T	T	T	T	T
1.02	Understanding of basic theory of refrigeration systems: basic thermodynamics (key terms, parameters and processes such as Superheat, High Side, Heat of Compression, Enthalpy, Refrigeration Effect, Low	T	T	T	T	—

	Side, Sub-cooling), properties and thermodynamic transformations of refrigerants, including identification of zeotropic blends and fluid states					
1.03	Use of relevant tables and diagrams and their interpretation in the context of indirect leak checks (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	T	—	T
1.04	Description of the function of the main components in the system (compressor, evaporator, condenser, thermostatic expansion valves) and the thermodynamic transformations of the refrigerant	T	T	T	T	—
1.05	Knowledge of 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, taking into account specifics of operation involving highly flammable or toxic refrigerants (hydrocarbons or NH_3) and refrigerants operating at high pressure (CO_2)		T	T	—	—

1.06	Knowledge about the specific behaviour, physical parameters, solutions, systems, deviances of alternative refrigerants (synthetic and natural) in the refrigeration cycle and components for their use	T	T	T	T	T
1.07	Knowledge of the characteristics of hydrocarbons, CO_2, and NH_3 and other non-fluorinated refrigerants in contrast to F-gas refrigerants	T	T	T	T	T
1.08	Knowledge about flammability, flame propagation, charge size restrictions, occupancy limits for HFCs, H(C)FOs and hydrocarbons	T	T	T	T	T
1.09	Knowledge about pressure of CO_2, transcritical and subcritical process, log (p),h diagram, saturation tables of CO_2, aggregate status of CO_2 (formation of dry ice)	—	T	—	—	—
1.10	Knowledge about toxicity NH_3, differences between dry expansion and flooded systems, negative pressure in deep-freeze systems	—	—	T	—	—
2	**Environmental impact of refrigerants and relevant environmental regulations**					
2.01	Basic knowledge of the EU and international climate change policy, including the United Nations Framework Convention on Climate Change	T	T	T	T	T
2.02	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)	T	T	T	T	T

	2024/573 and of the relevant implementing acts and a basic knowledge of possible threats to the environment, including from decomposition products of certain fluorinated substances (PFAS) such as HFCs, HFOs and HCFOs.					
3	**Checks before activating equipment, after a long period of non-use, after maintenance or repair intervention, or checks during operation**					
3.01	Carrying out a pressure test to check the strength of the system	P	P	P	—	—
3.02	Carrying out a pressure test to check the tightness of the system		P	P	—	
3.03	Using a vacuum pump		P	P	P	
3.04	Evacuation of the system to remove air and moisture according to standard practice		P	P	—	
3.05	Filling in of the data in the equipment records and filling in of a report about one or more tests and checks carried out during the examination	T	T	T	—	—
4	**Checks for leakage**					
4.01	Knowledge of potential leakage points of refrigeration, air conditioning and heat pump equipment	T	T	T	—	T
4.02	Check of equipment records prior to a check for leakage and identification of the relevant information on any repeating issues or problem areas to pay special attention to	T	T	T	—	T
4.03	Carrying out a visual and manual inspection of the whole system in accordance with Commission Regulation (EC) No 1516/2007 [1]	P	P	P	—	P

[1] Commission Regulation (EC) No 1516/2007 of 19 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, 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, ELI: http://data.europa.eu/eli/reg/2007/1516/oj).

	Carrying out a check for leakage of the system using an indirect method in accordance with Regulation (EC) No 1516/2007 and the instruction manual of the system	P	P	P	—	P
4.05	Using 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	—	P
4.06	Carrying 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	Carrying 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	—	P
4.08	Use of an appropriate electronic leak detection device	P	P	P	—	P
4.09	Filling in of the data in the equipment records	T	T	T	—	T
5	**Environment-friendly handling of the system and refrigerant during installation, maintenance, servicing or recovery**					
5.01	Connection and disconnection of gauges and lines with minimal emissions	P	P	P	—	—
5.02	Emptying and filling a refrigerant cylinder in both liquid and vapour state	P	P	P	P	—
5.03	Use of a recovery set to recover refrigerant and connect and disconnect recovery set with minimal emissions	P	P	P	P	—
5.04	Drainage of F-gas contaminated oil out of a system	P	P	P	P	—

5.05	Identification of refrigerant state (liquid, vapour) and condition (subcooled, saturated or superheated) prior to charging, to ensure correct method and volume of charge. Filling the system with refrigerant (both in the liquid and vapour phase) without loss of refrigerant	P	—	—	—	—
5.06	Choice of the correct type of scales and use of them to weigh the refrigerant	P	P	P	P	—
5.07	Filling in the equipment records with all relevant information concerning the refrigerant recovered or added	T	T	T	T	—
5.08	Knowledge of requirements and procedures for handling, reusing, reclaiming, storage and transportation of fluorinated refrigerant and oils, including when contaminated	T	T	T	T	—
5.09	Knowledge of requirements and procedures for handling, filling, recovering, reclaiming, storage and transportation of hydrocarbons and installation of equipment and systems relying on hydrocarbons	T	T	T	T	—
5.10	Knowledge of requirements and procedures for handling, filling, recovering, reclaiming, storage and transportation of R744 (CO_2) and installation of equipment and systems relying on R744	—	T	—	—	—
5.11	Knowledge of requirements and procedures for handling, filling, recovering, reclaiming, storage and transportation of R717 (NH_3) and installation of equipment and systems relying on R717. Knowledge of the effects of the release of R717 during installation or maintenance work, through leaks or accidents and of how to reduce these effects (for	—	—	T	—	—

	example using scrubbers) with proper planning					
6	**Component: installation, putting into operation and maintenance of reciprocating, screw and scroll compressors, single and two-stage**					
6.01	Explanation of the basic functioning of a compressor (including capacity control and lubricating system) and risks of refrigerant leakage or release associated to it	T	T	T	—	—
6.02	Proper installation of a compressor, including control and safety equipment, so that no leak or major release occurs once the system is put into operation	P	P	P	—	—
6.03	Adjustment of the safety and control switches	P	P	P	—	—
6.04	Adjustment of the suction and discharge valves		P	P		
6.05	Check of the oil return system					
6.06	Starting up and shutting down a compressor and checking the good working conditions of the compressor, including by making measurements during operation of compressor	P	P	P	—	—
6.07	Writing of 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 action be taken	T	T	T	—	—
6.08	Knowledge of measures improving or maintaining the energy efficiency of equipment during installation or maintenance of compressors	T	—	—	T	—
7	**Component: installation, putting into operation and maintenance of air cooled and water-cooled condensers**					
7.01	Explanation of the basic functioning of a condenser and risks of leakage associated to it	T	T	T	—	—
7.02	Adjustment of a discharge	P	P	P	—	—

	pressure control of the condenser					
7.03	Proper installation of a condenser/outdoor unit, including control and safety equipment, so that no leak or major release occurs when the system has been put into operation	P	—	—	—	—
7.04	Adjusting the safety and control switches	P	—	—	—	—
7.05	Checking the discharge and liquid lines					
7.06	Purging non-condensable gases out of the condenser using a refrigeration purging device	P	—	—	—	—
7.07	Starting up and shutting down a condenser and check of the good working condition of the condenser, including by making measurements during operation	P	—	—	—	—
7.08	Checking the surface of the condenser	P	—	—	—	—
7.09	Writing of 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	—	—	—	—
7.10	Knowledge of measures of improving or maintaining the energy efficiency of equipment during installation or maintenance of condensers	T	—	—	—	—
8	**Component: installation, putting into operation and maintenance of air cooled and water cooled evaporators**					
8.01	Explanation of the basic functioning of an evaporator (including defrosting system) and risks of leakage associated to it	T	—	—	—	—
8.02	Adjustment of an evaporating pressure control of the evaporator	P	—	—	—	—
8.03	Installation of an evaporator including control and safety	P	—	—	—	—

	equipment, so that no leak or major release occurs when the system has been put into operation					
8.04	Adjustment of the safety and control switches	P	—	—	—	—
8.05	Checking the liquid and suction pipelines in the correct position					
8.06	Checking the hot gas defrost pipeline					
8.07	Adjustment of evaporation pressure regulation valve					
8.08	Starting up and shutting down an evaporator and check of the good working condition of the evaporator, including by making measurement during operation	P	—	—	—	—
8.09	Checking the surface of the evaporator	P	—	—	—	—
8.10	Writing of 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	—	—	—	—
8.11	Knowledge of measures of improving or maintaining the energy efficiency of equipment during installation or maintenance of evaporators	T	—	—	—	—
9	**Component: installation, putting into operation and servicing of Thermostatic Expansion Valves (TEV) and other components**					
9.01	Explanation of the basic functioning of different kinds of expansion regulators (thermostatic expansion valves, capillary tubes) and risks of leakage associated to it	T	—	—	—	—
9.02	Installation of valves in the correct position	P	—	—	—	—
9.03	Adjustment of a mechanical/electronic TEV	P	—	—	—	—
9.04	Adjustment of mechanical and electronic thermostats					
9.05	Adjustment of a pressure-					

	regulated valve					
9.06	Adjustment of mechanical and electronic pressure limiters					
9.07	Checking the functioning of an oil separator	P	—	—	—	—
9.08	Checking the condition of a filter dryer					
9.09	Writing of 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	—	—	—	—
9.10	Knowledge of measures of improving or maintaining the energy efficiency of equipment during installation or maintenance of TEV and other components	T	—	—	—	—
10	**Piping: building a leak-tight piping system in a refrigeration installation**					
10.01	Welding, brazing and/or soldering of leak-free joints on metallic tubes, pipes and components that can be used in refrigeration, air conditioning or heat pump systems	P	P	P	—	—
10.02	Making/checking of pipe and component supports	P	P	P	—	—
11	**Information on relevant technologies to replace or to reduce the use of fluorinated greenhouse gases and their safe handling**					
11.01	Knowledge of the relevant alternative technologies to replace or to reduce the use of fluorinated greenhouse gases and of their safe handling	T	T	T	T	T
11.02	Knowledge of relevant system designs to reduce the charge size of fluorinated greenhouse gases and to increase energy efficiency	T	—	—	—	—
11.03	Knowledge of relevant safety regulations and standards for the use, storage and transportation of flammable or toxic refrigerants or	T	T	T	—	—

	refrigerants requiring higher operating pressure. Understanding of the site-specific conditions under which it is allowed to use equipment not fulfilling the requirements set out in Annex IV to Regulation 2024/573 due to safety requirements					
11.04	Understanding of the respective advantages and disadvantages, notably in relation to energy efficiency, of alternative refrigerants according to the intended application and to the climate conditions of the different regions	T	T	T	—	—
11.05	Knowledge of differences in components and system design for equipment and systems relying on hydrocarbons	T	T	T	T	---
11.06	Knowledge of differences in components and system design for equipment and systems relying on R744 (CO_2), such as requirements for pipework materials, the function of booster-systems, medium-pressure and high-pressure control valves, system and process optimisation of R744 (CO_2) refrigeration systems to increase the system efficiency such as parallel compressors, ejector technology (liquid and gas ejector) and systems with partial flooding, Know safety concepts for limiting standstill pressure and of the use of stagnation cooling systems	—	T	—	—	—
11.07	Knowledge of differences in components and system design for equipment and systems relying on R717 (NH_3), such as compressor designs, compressors with separate motors, capacity	—	—	T	—	—

	control of reciprocating and screw compressors, compressor circuits, single and two-stage compression, Evaporative condensers, separator operation and level control, float switches, thermosyphon, difference in oil management (use of non-mixable oils), oil regulation, basic knowledge of direct systems (DX and recirculation operation) and indirect systems, Scrubber					
12	**Installation and good practice of servicing for equipment and systems relying on hydrocarbons**					
12.01	Knowledge of the labelling requirements and special requirements for flammable refrigerants in equipment, systems and refrigerant cylinders and special requirements on bottle connections	T	T	T	T	—
12.02	Knowledge of the safety requirements for service tools and equipment such as gas detection, leak detection, ventilation, personal protective equipment, vacuum pumps, recovery units; requirements for disposal of recovered gases.	T	T	T	T	—
12.03	Calculation of the charge of flammable refrigerant in a system according to applicable safety standards.	T	—	—	—	—
12.04	Performance of a risk analysis before starting the work and elimination or, if elimination is not possible, identification of sources of danger.	P	P	P	P	—
12.05	Preparation of the work area and selection of appropriate tools, equipment and protective equipment for working on systems relying on flammable refrigerants	P	—	—	—	—
12.06	Recovery of flammable refrigerants safely from the	P	—	—	—	—

	system and filling of the system with nitrogen					
12.07	Opening of the system, removal and exchange of a component, closing of the system	P	—	—	—	—
12.08	Performance of a pressure test to check the tightness of the system	P	—	—	—	—
12.09	Performance of a vacuum test to remove the moisture and check the tightness of the system	P	—	—	—	—
12.10	Charge of the system with the appropriate volume of hydrocarbon refrigerant	P	—	—	—	—
12.11	Performance of a leakage check at the system with a direct method	P	—	—	—	—
12.12	Writing of a report about the performed service work	P	—	—	—	—
12.13	Checking that health and safety measures according to applicable rules are in place at the location of the system (e.g. signs, emergency exits, gas sensors, gas alarms etc.)	P	—	—	—	—
12.14	Knowledge of measures of improving or maintaining the energy efficiency of equipment during installation or maintenance with flammable refrigerants	T	—	—	—	—
13	**Installation and good practice of servicing for equipment and systems relying on R744 (CO2)**					
13.01	Knowledge of the requirements for labelling of R744 in systems and in pressure vessels	—	T	—	—	—
13.02	Reading and understanding of piping and instrumentation diagrams of refrigeration systems with R744 (CO_2)	—	T	—	—	—
13.03	Knowledge of the special requirements for refrigerant cylinders and double valves for liquid and gas extraction	—	T	—	—	—
13.04	Knowledge of the safety requirements for service tools and equipment such as gas	—	T	—	—	—

	detection, leak detection, personal protective equipment					
13.05	Calculation of the charge of R744 (CO_2) in a system according to applicable safety standards	—	T	—	—	—
13.06	Performance of a risk analysis before starting the work and elimination or, if elimination is not possible, identification of sources of danger.	—	P	—	—	—
13.07	Preparation of the work area and selection of appropriate tools, equipment and protective equipment for working on systems relying on R744 (CO_2)	—	P	—	—	—
13.08	Performance of a pressure test to check the pressure resistance and tightness of the system	—	P	—	—	—
13.09	Safe removal of R744 refrigerant from the system	—	P	—	P	—
13.10	Charge of the system with the appropriate volume of R744 (CO_2) in gaseous and liquid phase	—	P	—	—	—
13.11	Performance of a leakage check at the system with a direct method	—	P	—	—	—
13.12	Writing a report about the performed service work	—	P	—	—	—
13.13	Checking that health and safety measures according to applicable rules are in place at the location of the system (for example signs, emergency exits, gas sensors, gas alarms etc.)	—	P	—	—	—
13.14	Knowledge of the significance of high pressure at the triple point and the formation of dry ice	—	T	—	—	—
13.15	Knowledge of the safety requirements for operating a system with R744 refrigerant	—	T	—	—	—
13.16	Knowledge of measures of improving or maintaining the energy efficiency of equipment during installation	—	T	—	—	—

	or maintenance with toxic refrigerants					
14	**Installation and good practice of servicing for equipment and systems relying on R717 (NH_3)**					
14.01	Reading and understanding of piping and instrumentation diagrams of refrigeration systems with R717 (NH_3)	—	—	T	—	—
14.02	Knowledge of the special requirements for refrigerant cylinders and gas extraction	—	—	T	—	—
14.03	Knowledge of the requirements for labelling of toxic refrigerants in systems and in pressure vessel	—	—	T	—	—
14.04	Knowledge of the safety requirements for service tools and equipment (recovery stations, vacuum pumps, electronic leak detectors) including gas detection, leak detection, personal protective equipment especially gas masks, Scrubbers	—	—	T	—	—
14.05	Knowledge of the rules of safe operation, including precautions against fires and explosions as well as injuries due to toxicity	—	—	T	—	—
14.06	Knowledge of the materials compatible with R717 (NH_3)	—	—	T	—	—
14.07	Preparation of the work area and selection of appropriate tools, equipment and protective equipment for working on systems relying on R717 (NH_3)	—	—	P	—	—
14.06	Performance of a risk analysis before starting the work and elimination or, if elimination is not possible, identification of sources of danger.	—	—	P	—	—
14.07	Basic knowledge of the correct construction and installation or service activities of systems	—	—	P	—	—
14.08	Opening of the system by welding (or other appropriate procedure), removal and exchange of a component and	—	—	P	—	—

	closing of the system by welding (or other appropriate procedure).					
14.09	Carrying out a pressure test to check the tightness of the system	—	—	P	—	—
14.10	Carrying out a vacuum test to remove moisture and check the tightness of the system	—	—	P	—	—
14.11	Charge of the system with designed charge of toxic refrigerant	—	—	P	—	—
14.12	Carrying out a check for leakage of the system using one of the direct methods	—	—	P	—	—
14.13	Safe recovery of toxic refrigerant from the system and filling the system with nitrogen	—	—	P	P	—
14.14	Writing of a report about the performed service work	—	—	P	—	—
14.15	Visual inspection of the tightness of system components such as safety valves and their inspection interval	—	—	P	—	—
14.16	Checking that health and safety measures according to applicable rules are in place at the location of the system (for example signs, emergency exits, gas sensors, gas alarms etc.)	—	—	P	—	—
14.17	Calculation of allowed toxic refrigerant charge in a system according to applicable safety standards	—	—	T	—	—
14.18	Knowledge ofmeasures of improving or maintaining the energy efficiency of equipment during installation or maintenance with toxic refrigerants	—	—	T	—	—

ANNEX II

Correlation table

Commission Implementing Regulation (EU) 2015/2065	This Regulation
Article 1	Article 1
Article 2	Article 2
Article 3	Article 3
Article 4	Article 4
Article 5	Article 5
Article 6	Article 6
Article 7	Article 7
Article 8	Article 8
Article 9	—
Article 10	Article 9
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