

REGULATED QUALIFICATIONS FRAMEWORK (RQF)

LOGIC CERTIFICATION LIMITED (LCL)

QUALIFICATION SPECIFICATION

- **LCL LEVEL 3 AWARDS IN THE INSTALLATION AND MAINTENANCE OF AIR SOURCE HEAT PUMP SYSTEMS (NON REFRIGERANT CIRCUITS) (601/2504/4)**

1.0 Area and scope of competence:

Know the health and safety risks and safe systems of work associated with air source heat pump systems, the requirements of regulations and standards relating to the installation, testing and commissioning of air source heat pump systems, the purpose and operational characteristics of air source heat pump system components, the different types of air source heat pump systems and the arrangements for hydraulic emitter circuits, the principles of air source heat pump selection and system design the design factors and principles relating to air source heat pump systems, the preparatory work required for air source heat pump installations and the requirements to install, commission and hand over air source heat pump systems.

2.0 Qualification Framework

The installation and maintenance of air source heat pump systems qualification comprises of 4 mandatory Units;

Unit Title	Unit Reference Number	Type of Unit	Level	Credit Rating
<u>Know the requirements to install, commission and handover air source heat pump systems J/505/9036</u>	LCL-R3024	Knowledge	3	.75
<u>Install, commission and handover air source heat pump systems L/505/9607</u>	LCL-R3027	Performance	3	.75
<u>Know the requirements to inspect, service and maintain air source heat pump systems R/505/9038</u>	LCL-R3025	Knowledge	3	.75
<u>Inspect, service and maintain air source heat pump systems Y/505/9039</u>	LCL-R3026	Performance	3	.73

- **LCL LEVEL 3 AWARDS IN THE INSTALLATION AND MAINTENANCE OF AIR SOURCE HEAT PUMP SYSTEMS (NON REFRIGERANT CIRCUITS) (601/2504/4)**

- The Guided Learning Hours (GLH) are **20 hours**
- The Total Qualification Time (TQT) is **30 hours**
- The total credit required to achieve the qualification is **3**

3.0 Grading Structure:

The grading structure for the Units within the Qualification is that the learner is required to achieve a result of **Pass** to be awarded credit for each Unit.

4.0 Qualification Structure:

1. Know the Requirements to Install, Commission and Handover Air Source Heat Pump Systems (non-refrigerant circuits)

Learning Outcome – The learner will:		Assessment Criterion – The learner can:		Assessment Method	Assessment Location
1	Know the health and safety risks and safe systems of work associated with air source heat pump systems	1.1	State which aspects of heat pump installation work pose risk of: <ul style="list-style-type: none"> • electrocution/electric shock • burns • toxic poisoning • personal injury though component/equipment handling 		
		1.2	Describe safe systems of work for heat pump installation work in relation to the prevention of: <ul style="list-style-type: none"> • electrocution/electric shock • burns • toxic poisoning • personal injury though component/equipment handling 		
2	Know the requirements of regulations and standards relating to the installation, testing and commissioning of air source heat pump systems	2.1	State which building regulation and building standards guidance documents are relevant to heat pump installation work in particular relating to: <ul style="list-style-type: none"> • maintaining the structural integrity of the building • maintaining the fire resistant integrity of the building • the prevention of moisture ingress (building water tightness)notification of work requirements • installation requirements • energy conservation • testing and commissioning requirements • compliance certification 		
		2.2	State which water regulation and byelaw guidance documents are relevant to heat pump installation work in particular in relation to: <ul style="list-style-type: none"> • the installation of the system • energy conservation 		

Learning Outcome – The learner will:		Assessment Criterion – The learner can:		Assessment Method	Assessment Location
			<ul style="list-style-type: none"> the safe operation of the system testing and commissioning of the system 		
		2.3	<p>State the requirements of the fluorinated greenhouse gases regulations in relation to the competence of personnel:</p> <ul style="list-style-type: none"> installing heat pumps where the refrigerant circuit has been assembled and tested by the manufacturer installing heat pumps where the refrigerant circuit is to be assembled and tested in the location where the heat pump is to be installed undertaking leakage checking on heat pump refrigerant circuits undertaking recovery of fluorinated greenhouse gases from heat pump refrigerant circuits 		
3	Know the purpose and operational characteristics of air source heat pump system components	3.1	<p>State the purpose and operation of the following heat pump system components:</p> <ul style="list-style-type: none"> Evaporator low pressure switch compressor high pressure switch condenser dryer/receiver sight glass expansion valve expansion valve phial refrigerant four way valve emitter circuit electro-mechanical valves fan coil integrated buffer tank 		
		3.2	Describe how the vapour compression refrigerant circuit within a heat pump unit operates.		
4	Know the different types of air source heat pump systems and the arrangements for hydraulic	4.1	Identify three different types of heat pump system		
		4.2	State the meaning of		

Learning Outcome – The learner will:		Assessment Criterion – The learner can:		Assessment Method	Assessment Location
	emitter circuits		<ul style="list-style-type: none"> • monovalent system • bivalent system 		
		4.3	Identify the following monovalent hydraulic emitter circuits: <ul style="list-style-type: none"> • heating only • heating with buffer tank • heating with buffer tank and indirect stored domestic hot water • heating with buffer tank and indirect stored domestic hot water with solar coil • heating with thermal store 		
		4.4	Identify the following parallel bivalent hydraulic emitter circuits which incorporate a secondary heat source other than an immersion heater: <ul style="list-style-type: none"> • heating with buffer tank • heating with buffer tank and indirect stored domestic hot water • heating with buffer tank and indirect stored domestic hot water with solar coil • heating with buffer tank and thermal store 		
		4.5	State the requirements for connecting buffer tanks: <ul style="list-style-type: none"> • in series • in parallel 		
5	The principles of air source heat pump selection and system design	5.1	State the meaning of the Coefficient of Performance (CoP)		
		5.2	State the relationship between Coefficient of Performance and the: <ul style="list-style-type: none"> • heat pump input temperature • heat pump emitter temperature 		
		5.3	State the effect that ambient temperature can have on: <ul style="list-style-type: none"> • coefficient of performance • heat pump output 		

Learning Outcome – The learner will:	Assessment Criterion – The learner can:		Assessment Method	Assessment Location
	5.4	State the meaning of the Seasonal Performance Factor (SPF)		
	5.5	Identify the factors that can affect the Seasonal Performance Factor		
	5.6	State the meaning of System Efficiency		
	5.7	Identify the factors that can affect the 'System Efficiency'		
	5.8	State why achieving minimum heat loss from the building is important when designing a heat pump system		
	5.9	State the effect that oversizing of a heat pump has on: <ul style="list-style-type: none"> • system efficiency • operation 		
	5.10	State the effect that undersizing of a heat pump has on: <ul style="list-style-type: none"> • system efficiency • operation 		
	5.11	State how to identify heat pump hydraulic flow rate requirements		
	5.12	State how to use manufacturer's data to select heat pump units:		
	5.13	State the meaning of bivalent points.		
	5.14	State how bivalent points are used to determine auxiliary heat requirements		
	5.15	State how heat pump output capacity is affected by: <ul style="list-style-type: none"> • heat pump input temperature • heat pump output temperature 		
	5.16	Describe the suitability of the following types of hydraulic heating system emitters for use with heat pump systems: <ul style="list-style-type: none"> • underfloor heating • fan assisted convector heaters • panel radiators 		
	5.17	State the typical mean water temperature recommended when designing a hydraulic emitter circuit that incorporates:		

Learning Outcome – The learner will:		Assessment Criterion – The learner can:		Assessment Method	Assessment Location
			<ul style="list-style-type: none"> • underfloor heating • fan assisted convector heaters • panel radiators 		
		5.18	State how correction factors are used to determine emitter output requirements in relation to mean water temperature and room temperature difference		
		5.19	State the advantages and disadvantages of including a buffer tank in the system design.		
		5.20	Describe the method of determining the size of a monovalent heat pump system.		
		5.21	State the typical annual operating hours for a heat pump that is being used for: <ul style="list-style-type: none"> • heating only • heating and domestic hot water 		
		5.22	State why heat pump annual operating hours vary		
6	Know the design factors and principles relating to air source heat pump systems	6.1	State the factors to be considered in selecting and positioning air source heat pumps in relation to its fan coil unit.		
		6.2	State the options available to provide a defrost cycle for an air source heat pump.		
		6.3	State the requirements for sizing a buffer tank to provide for an air source heat pump defrost cycle.		
7	Know the preparatory work required for air source heat pump installations	7.1	State the pre-installation checks for air source heat pump systems connected to hydraulic emitter circuits		
		7.2	State the pre-installation checks that are specific to the positioning of fan coil units.		
8	Know the requirements to install, commission and hand over air source heat pump systems	8.1	State the requirements for moving and handling heat pump units to avoid damage to the unit.		
		8.2	Identify the installation requirements where heat transfer fluid circuit pipework passes through the external building fabric in relation to: <ul style="list-style-type: none"> • provision for movement 		

Learning Outcome – The learner will:	Assessment Criterion – The learner can:		Assessment Method	Assessment Location
		<ul style="list-style-type: none"> • protection against freezing • prevention of water ingress 		
	8.3	State the requirements for flushing and treating hydraulic heat emitter circuits.		
	8.4	Confirm the hydraulic test requirements for hydraulic emitter circuits.		
	8.5	State the conditions required for dynamic commissioning of heat pump systems.		
	8.6	State the commissioning requirements for heat pump system controls.		
	8.7	State the industry handover procedures for heat pump systems in relation to the: <ul style="list-style-type: none"> • provision of written information • provision of diagrammatic information • provision of verbal information and demonstration to the client relating to system operation and use. 		

2. Install, Commission and Handover Air Source Heat Pumps (Non-Refrigerant Circuits)

<p>Performance Assessments <i>Where this assessment is conducted in full or in part, either in the work place or a simulated Realistic Work Environment (RWE), the performance assessment must be carried out using installations that will enable the learner to demonstrate competence to install, inspect, test, commission and handover to the end user a heat pump (non refrigerant circuit), and associated components covered by this assessment and that the assessment will enable the Unit’s performance and knowledge assessment criteria to be met.</i></p> <p>Workplace Performance Assessments. <i>Work place performance assessments must be undertaken with the learner being directly supervised by a competent person.</i></p>
<p>It is the responsibility of the assessor to ensure that;</p> <ul style="list-style-type: none"> • The assessment being undertaken by the learner is carried out in accordance with the requirements of prevailing legislation and normative standards at the time of assessment. • A risk assessment has been carried out by the learner and that the assessment has taken into account and mitigated potential or actual risks either before or during the assessment. • The supervising engineer holds valid certificates of competence in the areas of work being undertaken by the learner. • Confirmation has been given by the responsible person of the property for the work to be carried out.

Learning Outcome – The learner will:		Assessment Criterion – The learner can:		Assessment method	Assessment Location
<u>1</u>	be able to plan and prepare for the installation of air source heat pump systems.	<u>1.1</u>	<p>Undertake pre-installation checks on heat pump systems which include:</p> <ul style="list-style-type: none"> the authorisation for the work to proceed the availability of appropriate access to all work areas the availability and collation of relevant information confirmation of the suitability of the proposed location of the fan coil unit confirmation that the heat pump rating is suitable for the design load confirmation of the suitability of the proposed location of the heat pump unit confirmation that the emitter circuit design or existing installation is compatible with the proposed heat pump installation. confirmation that the buffer tank size is correct confirmation of a suitable electrical input service the proposed siting of internal system components the suitability of the building structure in relation to the proposed installation 		
		<u>1.2</u>	Confirm that tools, materials and equipment required for the installation work are available and are in a safe usable condition.		
<u>2</u>	be able to install air source heat pump systems.	<u>2.1</u>	Install the heat pump to the hydraulic emitter circuit in accordance with manufacturer's instructions, regulatory requirements and industry recognised procedures.		
<u>3</u>	be able to test and commission air source heat pump systems.	<u>3.1</u>	<p>Prepare a heat pump system for testing and commissioning which includes checks and actions to confirm:</p> <ul style="list-style-type: none"> compliance with the system design and specification compliance with system/component manufacturer requirements the suitability of the electrical 		

Learning Outcome – The learner will:		Assessment Criterion – The learner can:		Assessment method	Assessment Location
			supply circuit <ul style="list-style-type: none"> the system is ready for flushing of installation debris the system is ready for filling and venting the hydraulic circuits the system is ready for adding protection against freezing the client requirements are met the system is compliant with statutory regulations and/or industry recognised procedures 		
		3.2	Commission the system in accordance with manufacturer's instructions, design specification, client's and statutory requirements and industry recognised procedures.		
		3.3	Undertake final checks to ensure that the system is ready for handover to client.		
4	be able to handover to the client air source heat pump systems.	4.1	Explain and demonstrate to the client the operation and use of the heat pump system using manufacturer's / users instructions.		
		4.2	Explain to the client any aspects of the system at variance with the agreed design specification.		
		4.3	Obtain confirmation of acceptance from the client of the handover of the heat pump system.		
		4.4	Ensure that handover documentation is completed and passed to the client in accordance with manufacturer's instructions.		

3. Know the Requirements to Inspect, Service and Maintain Air Source Heat Pump System Installations (Non-Refrigerant Circuits).

Learning Outcome – The learner will:		Assessment Criterion – The learner can:		Assessment Method	Assessment Location
1	Know the requirements to inspect service and maintain air source heat pump systems.	1.1	State the documentation to be available to inspect, service and maintain heat pump systems.		
		1.2	State the inspection, service and maintenance requirements for heat pump systems.		
		1.3	State the industry requirements for		

Learning Outcome – The learner will:		Assessment Criterion – The learner can:		Assessment Method	Assessment Location
			recording the outcomes of inspection, service and maintenance of heat pump systems.		
		<u>1.4</u>	State the action(s) to be taken in the event of a failure or suspected failure of the refrigerant circuit and/or a suspected refrigerant circuit defect.		
<u>2</u>	Know how to diagnose and rectify defects and malfunctions in air source heat pump systems.	<u>2.1</u>	State the information to be available to enable fault diagnosis and rectification of system defects and malfunction.		
		<u>2.2</u>	State the sequence of actions to enable diagnosis and rectification of heat pump system defects and malfunctions.		

4. Inspect, Service and Maintain Air Source Heat Pump Installations (non-refrigerant circuits)

Learning The learner will:		Assessment Criterion – Outcome – The learner can:		Assessment Method	Assessment Location
<u>1</u>	be able to undertake inspection, service and maintenance of air source heat pump systems.	<u>1.1</u>	Obtain the relevant information required to enable the work to be undertaken.		
		<u>1.2</u>	Undertake an inspection of an air source heat pump system to include checks in relation to: <ul style="list-style-type: none"> • compliance with manufacturer’s installation instructions • compliance with statutory regulations • condition of system components including cleanliness • the system fluid levels • the system pressure levels • the settings of electrical controls and temperature sensors • leakage and/or dampness • positioning of system components • quality, condition and positioning of pipework insulation • the provision of information and safety labels • the security of fixing of system components 		
		<u>1.3</u>	Undertake servicing of air source heat pump systems in accordance with manufacturer’s instructions including: <ul style="list-style-type: none"> • checking for protection of the system water against freezing • cleaning, adjustment and lubrication of system components and controls 		

Learning The learner will:	Assessment Criterion – Outcome – The learner can:	Assessment Method	Assessment Location
	<u>1.4</u> Undertake service and maintenance functional tests on an air source heat pump systems to include: <ul style="list-style-type: none"> • safe operation • efficient operation • the function of system components/controls • noise or vibration levels 		
	<u>1.5</u> Complete service and maintenance records.		
<u>2</u> be able to carry out fault diagnosis and rectification of defects and malfunctions on air source heat pump systems.	<u>2.1</u> Obtain the information required to enable fault diagnosis and rectification to be undertaken.		
	<u>2.2</u> Identify the cause of the following faults on heat pump systems and carry out remedial work; <ul style="list-style-type: none"> • heat pump high pressure trip/alarm activated by an emitter circuit malfunction • insufficient heat output to emitter circuit • domestic hot water heat up is satisfactory but space heating is not operating • system noise and/or vibration 		
	<u>2.3</u> Advise the client of the cause of the malfunction and the actions required to rectify.		
	<u>2.4</u> Take precautionary actions to prevent unauthorised use of the system prior to or during fault rectification.		
	<u>2.5</u> Take precautionary actions to minimize the risk of injury to self or others during fault rectification.		
	<u>2.6</u> Undertake post-rectification functional tests in accordance with manufacturer's instructions.		

5.0 National Occupational Standard:

The qualification has a direct relationship with the National Occupational Standards for the areas of work.

6.0 Target Groups:

The target groups for the qualification are those learners who are;

1. Preparing for employment, new entrants to the occupation
2. Confirming occupational competence and or obtaining a licence to practice
3. Preparing for further learning or training and/or developing knowledge and or skills in a subject area who are existing workers in the occupation seeking to extend their range of work

7.0 Descriptor Level 3.

Knowledge descriptor:

Has factual, procedural and theoretical knowledge and understanding of a subject or field of work to complete tasks and address problems that while well-defined, may be complex and non-routine. Can interpret and evaluate relevant information and ideas. Is aware of the nature of the area of study or work. Is aware of different perspectives or approaches within the area of study or work

Skills Descriptor:

Identify, select and use appropriate cognitive and practical skills, methods and procedures to address problems that while well-defined, may be complex and non-routine. Use appropriate investigation to inform actions. Review how effective methods and actions have been

8.0 Prior knowledge, skills or understanding which the learner is required to have before taking the qualification.

- N/SVQ Level 2/3 in Plumbing or equivalent earlier certification that provides evidence of competence;
- or
- N/SVQ Level 2/3 in Heating and Ventilating (Domestic Installation) or equivalent earlier certification that provides evidence of competence;
- or
- N/SVQ Level 2/3 in Heating and Ventilating (Industrial and Commercial Installation) or equivalent earlier certification that provides evidence of competence;
- or
- N/SVQ Level 2/3 in Oil-Fired Technical Services or equivalent earlier certification that provides evidence of competence;
- or
- N/SVQ Level 2/3 in Gas Installation and Maintenance or equivalent earlier certification that provides evidence of competence.

In addition, if not included in the above current certification in relation to:

- Water Regulations/Water Byelaws (WRAS or equivalent)
- Energy Efficiency for Domestic Heating

9.0 Units which a learner must have completed before the qualification will be awarded and any optional routes.

Learners must complete all Mandatory units before the qualification will be awarded. See Section 4.0 above.

10.0 Other requirements which a learner must have satisfied before the learner will be assessed or before the qualification will be awarded.

None

11.0 The knowledge, skills and understanding which will be assessed as part of the qualification.

The knowledge, skills and understanding which will be assessed as part of the qualification are detailed in the assessment and examination specification for each unit.

12.0 The method of any assessment and any associated requirement relating to it.

The method of any assessment and any associated requirement relating to it are detailed in the assessment and examination specification for each unit.

12.1 The design and delivery of the examination associated with these units are based on the following documents:

Manufacturer's Installation and Commissioning Instructions
Building Regulations Approved Document Part L
Water Regulations
BS 7671 17th Edition IET Wiring Regulations
MIS 3005 Heat Pump Systems

12.2 Performance Assessment Facilities and Equipment (*see centre guidance / facility check list*)

13.0 The criteria against which learners' level of attainment will be measured.

The Learning Outcomes and Assessment Criteria against which learners' level of attainment will be measured are detailed in the assessment and examination specification for each unit.

14.0 Specimen assessment materials.

None

15.0 Specified levels of attainment

Learners must satisfy all Assessment Criteria for all Learning Outcomes within the Unit.

Learners must achieve;

- A mark of 75% per question or more to pass the short response written examinations for the qualification to be awarded.
- A mark of 100% to pass the multiple choice examinations for the qualification to be awarded.
- Satisfy all performance assessment criteria for the qualification to be awarded.

16.0 Other information

SSAs: 5.2 Building and Construction

Qualification Review Date: 31 December 2021

Assessment and Examination Terminology

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AC – *Approved Centre; an examination conducted either at the approved centre or a location approved by the centre, using staff approved by the centre to conduct the examination.*

CE – *Customer Evidence; evidence provided by a customer in the form of a written witness statement confirming a competent performance by the learner. That evidence may also be provided by an employing supervisor or manager of the learner. Witness statements that relate to a technical competence will only be accepted from a person technically competent in that particular activity to provide the statement.*

IK – *Inferred Knowledge; inferred knowledge is assessed as part of a performance assessment by a centre approved assessor. To deem the learner as having sufficient knowledge the learner must satisfactorily pass the performance assessment.*

LE – *Learner Evidence; learner generated evidence is for example documented recordings of readings, calculations or the production of a risk assessment or other procedural document.*

OP – *Observed Performance; the assessment of a learner's performance by an approved assessor either in the learner's work place or at the approved centre or a location approved by the centre.*

OQ – *Oral Questions; oral questions may be asked by an assessor as part of a performance assessment or knowledge examination to confirm the understanding of the criteria by the learner.*

PA – *Performance Assessment; a performance assessment conducted either in the learner's work place or at the approved centre or a location approved by the centre.*

RWE – *Realistic Work Environment; an area at the approved centre or a location approved by the centre which replicates and has the features of a Work Place. The learner must not be permitted to be familiar with the simulated environment prior to undertaking assessment.*

WP – *Work Place; is the naturally occurring environment in which the learner works, typically that would be in a customer's premise where work is being paid for by the customer.*

WQMC – *Written Question Multi-Choice; multi-choice questions will be set by the awarding organisation and administered and marked locally at the approved centre by approved markers. Learners will be able to answer multi-choice questions using reference to appropriate industry normative or informative sources.*

WQSR – *Written Question Short Response; Short response written questions will be set by the awarding organisation and administered and marked locally at the approved centre by approved markers. Learners will be able to answer short response questions using reference to appropriate industry normative or informative sources*