



Australian Government

UEERA0038 Establish the thermodynamic parameters of refrigeration and air conditioning systems

Release: 1

UEERA0038 Establish the thermodynamic parameters of refrigeration and air conditioning systems

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Application

This unit involves the skills and knowledge required to establish the thermodynamic parameters of refrigeration and air conditioning system.

It includes determining thermodynamic parameters of refrigeration and air conditioning system using measurement and calculation methods and documenting results.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

UEERA0002 Analyse the psychrometric performance of HVAC/R systems

UEERA0003 Analyse the thermodynamic performance of HVAC/R systems

or

UEERA0094 Verify functionality and compliance of refrigeration and air conditioning installations

UEECD0007 Apply work health and safety regulations, codes and practices in the workplace

UEECD0019 Fabricate, assemble and dismantle utilities industry components

UEECD0020 Fix and secure electrotechnology equipment

UEECD0051 Use drawings, diagrams, schedules, standards, codes and specifications

UEECD0016 Document and apply measures to control WHS risks associated with electrotechnology work

UEERA0059 Prepare and connect refrigerant tubing and fittings

UEERA0036 Establish the basic operating conditions of vapour compression systems

UEERA0035 Establish the basic operating conditions of air conditioning systems

UEERA0050 Install refrigerant pipe work, flow controls and accessories

UEERA0081 Select refrigerant piping, accessories and associated controls

UEERA0031 Diagnose and rectify faults in air conditioning and refrigeration control systems

UEERA0092 Solve problems in low voltage refrigeration and air conditioning circuits

UEERL0005 Locate and rectify faults in low voltage (LV) electrical equipment using set

procedures

UEERL0004 Disconnect - reconnect electrical equipment connected to low voltage (LV) installation wiring

UEERL0001 Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply

UEERL0002 Attach cords, cables and plugs to electrical equipment for connection to 1000 V a.c. or 1500 V d.c.

Competency Field

Refrigeration and air-conditioning

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to determine thermodynamic parameters of refrigeration and air conditioning system

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

- 1.1** Work health and safety (WHS)/occupational health and safety (OHS) requirements and workplace procedures for a given work area are identified and applied
- 1.2** WHS/OHS risk control measures and workplace procedures are followed in preparation for refrigeration and air conditioning system work
- 1.3** Refrigeration and air conditioning system operating conditions are obtained from documentation or work supervisor to determine the scope of work to be undertaken
- 1.4** Advice is sought from the work supervisor to ensure refrigeration and air conditioning system work is coordinated effectively with others
- 1.5** Tools, equipment and testing devices needed to determine the refrigeration and air conditioning system operating conditions are obtained and checked for

		correct operation and safety
2	Determine thermodynamic parameters of refrigeration and air conditioning system	
	2.1	WHS/OHS risk control measures and workplace procedures for carrying out refrigeration and air conditioning system work are followed
	2.2	Measurement of thermodynamic system operating parameters is conducted in accordance with WHS/OHS requirements and workplace safety procedures
	2.3	System is checked and isolated in accordance with WHS/OHS requirements and workplace procedures
	2.4	Actual and specified range of thermodynamic parameters are determined from measured and calculated values as they apply to refrigeration or air conditioning system in accordance to workplace procedures
	2.5	Unexpected situations are discussed with appropriate person/s, responded to in accordance with workplace procedures and documented in a manner that minimises risk to personnel and equipment
	2.6	Thermodynamic parameters are determined without damage to apparatus, circuits, the surrounding environment or services using sustainable energy practices
3	Document thermodynamic parameters	
	3.1	WHS/OHS work completion risk control measures and workplace procedures are followed
	3.2	Worksite and equipment are cleaned and made safe in accordance with workplace procedures
	3.3	Thermodynamic parameters are documented, including identification of any parameter that is not within the specified range for the refrigeration and air conditioning system
	3.4	Work supervisor is notified of work completion in accordance with workplace procedures

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of

competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Determining thermodynamic parameters of refrigeration and air conditioning systems must include at least the following:

- using measurement and calculation methods of a refrigeration or air conditioning system, including:
 - temperature
 - pressure
 - relative humidity
 - enthalpy

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ127A Establish the thermodynamic parameters of refrigeration and air conditioning systems.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEERA0038 Establish the thermodynamic parameters of refrigeration and air conditioning systems

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least one occasion and include:

- selecting and using appropriate measuring devices correctly
- interpreting measurements
- using calculation methods accurately
- identifying parameters not within the specified range
- documenting thermodynamic parameters correctly
- dealing with unplanned events
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) workplace procedures requirements, including the use of risk control measures
- applying sustainable energy principles and practices
- planning to determine thermodynamic parameters of refrigeration and air conditioning system.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- thermodynamic parameters of refrigeration and air conditioning systems, engineering mathematics fundamentals and refrigeration science, including:
 - arithmetic:
 - rational and irrational numbers, surds
 - International System of Units (SI) units and conversion using unity brackets
 - laws of indices (base 10), scientific and engineering notation
 - estimations, errors and approximations, and significant figures
 - algebra:
 - substitution
 - +, -, x on simple polynomials and simple indices

- expanding brackets
- factorising quadratics, common factors and difference of two squares
- simplifying algebraic fractions
- transposition of engineering formulae
- solving one variable equations
- simple algebraic division
- geometry:
 - Pythagoras Theorem
 - angles: degrees, radians and parallel lines cut by a transverse
 - triangles: sum of angles, and properties of equilateral and isosceles triangles
 - congruent triangles
 - similar triangles: ratio of corresponding sides
 - sin, cos, tan: ratios of a right-angled triangle
 - sine and cosine rules
 - circles: circumference, arcs, chords, tangents and circle theorems
 - area and perimeter mensuration on above figures
- coordinate geometry:
 - 2-D plane; x-y axes and s-t axes
 - graph of linear function, $y = ax + b$ and functional notation, $y = f(x)$
 - straight line given slope and one point or given two points
 - linear equations: solving algebraically and geometrically
 - solving two linear functions simultaneously, algebraically and geometrically
 - line segment: length and mid-point
- engineering mechanics:
 - mass/density
 - weight
 - forces
 - specific gravity
 - equilibrium
 - momentum
 - friction loss
 - velocity and speed
 - energy in all forms
 - mechanical advantage
 - efficiency
 - pressure/stress
- molecular theory:
 - changes of state
 - sublimation

- expansion and contraction
- electron flow
- state of aggregation
- internal potential energy
- phase change diagrams
- thermodynamics:
 - temperature scales
 - conservation of energy
 - specific heat
 - sensible, latent and super heat
 - properties of steam
 - enthalpy
 - heat energy/temperature relationship
 - heat balance on a body
 - heat transfer
 - conductivity
 - calorimetry
 - peltier effect
 - 1st and 2nd law of thermodynamics
- gas laws and liquids:
 - pressure
 - Boyles law
 - Charles law
 - volumetric relationship
 - psychrometrics
 - latent heat of vaporisation
 - relative humidity
 - air conditioning processes
 - dynamic pressure loss
 - velocity and static pressure
 - bourdon tubes
 - density and relative density
 - Archimedes principle
 - Bernoulli's equation
 - manometers
 - absorption refrigeration
 - centrifugal compression
 - external work of a liquid
 - pressure volume diagrams

- isothermal and adiabatic processes
- polytropic processes
- Dalton's law of partial pressure
- vapour compression:
 - pressure/enthalpy relationship
 - entropy
 - characteristics of evaporation and condensation
 - compression and pressure drop phases
 - co-efficient of performance
 - theoretical/practical cycles
 - characteristics of refrigerants
 - theoretical power input
 - pressure losses
 - heat exchange
 - effects of condensing condition changes
 - sub-cooling and superheating
- relevant job safety assessments or risk mitigation processes
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace policies and procedures.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated workplace operational situations that replicate workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or other simulations
- relevant and appropriate materials, tools, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

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