
Mechanisms and Structures

SCQF: level 5 (6 SCQF credit points)

Unit code: J29H 75

Unit outline

The general aim of this Unit is to develop an understanding of mechanisms and structures. Learners will explore a range of mechanical and pneumatic systems and design, simulate, construct, test and evaluate mechanical or pneumatic solutions to solve problems.

Learners who complete this Unit will be able to:

- 1 Investigate a range of mechanical and pneumatic systems
- 2 Develop mechanical or pneumatic solutions to solve problems

This Unit is available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Unit Support Notes* which provides advice and guidance on delivery, assessment approaches and development of skills for learning, skills for life and skills for work. Exemplification of the standards in this Unit is given in the *Unit Assessment Support*.

Recommended entry

Entry to this Unit is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by one or more of the following or equivalent qualifications and/or experience:

- ◆ Numeracy (SCQF level 4)
- ◆ Mechanisms and Structures (National 4)

Equality and inclusion

This Unit Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information, please refer to the *Unit Support Notes*.

Standards

Outcomes and assessment standards

Outcome 1

The learner will:

- 1 Investigate a range of mechanical and pneumatic systems by:**
 - 1.1 Describing or producing diagrams of a range of structures
 - 1.2 Describing or producing diagrams of a range of pneumatic systems
 - 1.3 Describing or producing diagrams of a range of mechanical drive systems
 - 1.4 Carrying out calculations involving energy, work, power and efficiency using given formulae

Outcome 2

The learner will:

- 2 Develop mechanical or pneumatic solutions to solve problems by:**
 - 2.1 Identifying key aspects of a problem
 - 2.2 Applying knowledge and understanding of structures, pneumatics and/or mechanical drive systems
 - 2.3 Designing, and simulating or building, mechanical or pneumatic systems
 - 2.4 Testing and evaluating solutions against a specification

Evidence Requirements for the Unit

Assessors should use their professional judgement, subject knowledge and experience, and understanding of their learners, to determine the most appropriate ways to generate evidence and the conditions and contexts in which they are used.

For this Unit, learners will be required to demonstrate technological skills, knowledge and understanding in the context of mechanical and pneumatic systems.

Evidence of Outcomes may take many forms, including oral or written evidence, or may be demonstrated by carrying out practical tasks. Evidence of Outcomes and Assessment Standards may be generated during one or more activities. Although learners are expected to develop a range of mechanical or pneumatic solutions for Outcome 2, evidence is only required for one.

Exemplification of assessment is provided in the *Unit Assessment Support*. Advice and guidance on possible approaches to assessment is provided in the *Unit Support Notes*.

Assessment standard thresholds

If a candidate successfully meets the requirements of the specified number of Assessment Standards they will be judged to have passed the Unit overall and no further re-assessment will be required.

The specific requirements for this Unit is as follows:

- ◆ 6 out of 8 Assessment Standards must be achieved.

It should be noted that there will still be the requirement for candidates to be given the opportunity to meet all Assessment Standards. The above threshold has been put in place to reduce the volume of re-assessment where that is required.

Development of skills for learning, skills for life and skills for work

It is expected that learners will develop broad, generic skills through this Unit. The skills that learners will be expected to improve on and develop through the Unit are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and drawn from the main skills areas listed below. These must be built into the Unit where there are appropriate opportunities.

2 Numeracy

- 2.1 Number processes
- 2.3 Information handling

4 Employability, enterprise and citizenship

- 4.2 Information and communication technology (ICT)

5 Thinking skills

- 5.3 Applying
- 5.4 Analysing and evaluating

Amplification of these is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work*. The level of these skills should be at the same SCQF level of the Unit and be consistent with the SCQF level descriptor. Further information on building in skills for learning, skills for life and skills for work is given in the *Unit Support Notes*.

Appendix: unit support notes

These support notes provide advice and guidance on approaches to delivering and assessing this unit. They are intended for teachers and lecturers who are delivering this unit. They should be read in conjunction with:

- ◆ the *unit specification*
- ◆ the *unit assessment support packs*

Calculations	manipulating given formulae to obtain answers
Drive systems	<p>motion in mechanical systems - rotary, linear, reciprocating and oscillating</p> <p>simple gear train systems, including idler gears, (diagrams and conventions for representation)</p> <p>compound gear trains</p> <p>calculation of speed (velocity) ratio of simple and compound gear trains</p> <p>the effects of friction in drive systems</p> <p>appropriate British Standard symbols</p>
Pneumatics	<p>symbols and operation of standard pneumatic components (including restrictor, uni-directional restrictor, reservoir, 5/2 valve and actuators: diaphragm, solenoid)</p> <p>pneumatic time delay circuits</p> <p>calculation of relationships between force, pressure and area in single and double acting cylinders.</p> <p>control of speed and force</p>
Structures and forces	<p>examples of effects of a force (tensile and compressive)</p> <p>concurrent forces, equilibrium</p> <p>use of triangle of forces and free body diagrams</p> <p>non-concurrent forces, parallel forces</p> <p>moment of a force</p> <p>calculations involving the principle of moments</p> <p>balance beam, simply supported beam, reaction forces</p>
Materials	<p>selection of appropriate material for given application, with justification</p> <p>calculation of the relationship between direct stress, force and area</p> <p>calculation of strain</p>

Administrative information

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Superclass: XH

History of changes to National Unit Specification

Version	Description of change	Authorised by	Date
1.1	Assessment standard thresholds added Unit Support Notes added.	Qualifications Manager	September 2018
2.0	Unit code updated	Qualifications Manager	July 2019

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