



## National Unit Specification: general information

**UNIT** Tungsten Inert Gas (TIG) Welding Skills (SCQF level 6)

**CODE** F5FC 12

### SUMMARY

This Unit can be taken as part of a National Qualification Group Award in Engineering but can also be taken as a free-standing Unit by candidates who wish to enhance their skills in a fabrication and welding environment. It is also suitable for those who are studying the subject for the first time.

This practical Unit is designed to allow candidates to apply the basic principles and components required for Tungsten Inert Gas (TIG) welding, to develop manual skills in the TIG welding of low carbon steels and non-ferrous materials and to provide the opportunity to recognise the requirements of welding standards and specifications.

Candidates will be made aware of and required to practise the relevant health and safety regulations and requirements relating to the welding process.

### OUTCOMES

- 1 Select the equipment and demonstrate the welding of joints.
- 2 Produce and inspect joints.
- 3 Comply with safety regulations and requirements in TIG welding.

### RECOMMENDED ENTRY

Access is at the discretion of the centre. However it would be beneficial if the candidate had some competence in welding or relevant industrial experience.

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#### Administrative Information

**Superclass:** XE

**Publication date:** March 2008

**Source:** Scottish Qualifications Authority

**Version:** 01

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## **National Unit Specification: general information (cont)**

**UNIT**        Tungsten Inert Gas (TIG) Welding Skills (SCQF level 6)

### **CREDIT VALUE**

1 credit at Higher (6 SCQF credit points at SCQF level 6\*).

*\*SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

### **CORE SKILLS**

There are opportunities to develop the Core Skills of *Problem Solving*, *Working with Others* and *Communication* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

## **National Unit Specification: statement of standards**

### **UNIT Tungsten Inert Gas (TIG) Welding Skills (SCQF level 6)**

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

#### **OUTCOME 1**

Select the equipment and demonstrate the welding of joints.

##### **Performance Criteria**

- (a) Selection of the power source, ancillary equipment and consumables is correct.
- (b) Setting up joints prior to welding is correct.
- (c) Selection of process parameters/variables is correct.
- (d) Joints are produced to current industrial standards.

#### **OUTCOME 2**

Produce and inspect joints.

##### **Performance Criteria**

- (a) TIG welded joints are produced to current industrial standards.
- (b) Inspection of welded joints is correct.
- (c) Completion of inspection reports are correct.

#### **OUTCOME 3**

Comply with safety regulations and requirements in TIG welding.

##### **Performance Criteria**

- (a) Personal Protective Equipment (PPE) relevant to TIG welding is used.
- (b) Observation of safe working practices is correct.
- (c) The use of specialised safety equipment TIG welding is correct.

## **National Unit Specification: statement of standards (cont)**

### **UNIT Tungsten Inert Gas (TIG) Welding Skills (SCQF level 6)**

#### **EVIDENCE REQUIREMENTS FOR THIS UNIT**

Evidence is required to demonstrate that the candidates have achieved all of the Outcomes and Performance Criteria.

Performance evidence supported by assessor checklists and written and/or recorded oral evidence is required to show that all Outcomes and Performance Criteria have been achieved. Assessment should take place under supervised conditions and should last no more than two hours.

Performance evidence supplemented by assessor observation checklists is required to demonstrate that the candidate has safely carried out the following:

- ◆ selected equipment and consumables to produce a single vee butt joint in the downhand position in low carbon steel to current industrial standards
- ◆ selected equipment and consumables to produce a fillet weld in the horizontal vertical position in stainless steel to current industrial standards
- ◆ visually inspected the completed single vee butt weld and completed an inspection report
- ◆ complied with all health and safety requirements

## **National Unit Specification: support notes**

### **UNIT      Tungsten Inert Gas (TIG) Welding Skills (SCQF level 6)**

This part of the Unit Specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

#### **GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT**

The Unit is in the National Qualification Group Award (NQGA) in *Fabrication and Welding Engineering* but it may also be taken as a free-standing Unit.

On completion of this Unit, the candidate will be aware of the statutory safety regulations applicable to tungsten inert gas welding. The candidate will know the factors which affect and control the making of a quality weld and will have developed the manual skills to make a selection of quality welds in low carbon steel and stainless steel.

The candidate will have visually inspected her/his own welds using criteria laid down in relevant International (ISO), European (BS EN) and British (BS) standards and thus have a good basic foundation to enhance skills in other metals and/or other welding position.

The candidate should achieve the level of competence of someone who can manually weld, using the tungsten inert gas process, the majority of work in low carbon steel providing the joint is in the downhand, or flat, position and she or he is not welding to an approved welding procedure.

Safety should be heavily emphasized in all its aspects, eg filter glass grades, earthing, fumes and gases, etc.

Safety Regulations: UK legislation; Euro-norm. Support sheets could also be used.

The core of the Unit requires between 70% and 75% of the available time predominately in the workshop.

A simple explanation is required of the functions of the power source and ancillary equipment, of polarity, of voltage and amperage, of gas selection and pressure, of types and sizes of tungstens, filler rod types, backing and purging. It is not intended that candidates become involved in filler wire classification or tungsten types, simply that they are aware of the existence of different types of filler wires, tungstens and gases. British standards state that pulsed TIG should be treated as a separate process. Pulsing should not be included in this Unit.

Demonstration, practice, examination, correction of defects, and yet more practice is required. The techniques, which are considered by tutor/trainers to be the most appropriate, should obviously be used, however 'step-by-step' techniques, eg: tilting a T joint so as to weld in the bottom of a vee before trying to weld in the horizontal-vertical position is a well-tried technique in the instruction of basic welding. The techniques used in basic instruction are largely a matter of personal choice.

Weld procedure and weld procedure sheets have deliberately been omitted from this Unit.

## National Unit Specification: support notes (cont)

### UNIT Tungsten Inert Gas (TIG) Welding Skills (SCQF level 6)

#### GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The delivery of the Unit could be organised in such a way that practically all activities could be carried out in a workshop. Equipment, safety, parameter selection and techniques need to be covered before any meaningful welding can take place; however these could be enlarged upon as the course progresses thus integrating the minimum necessary theory with the practice. Candidates should practice weld joints in a variety of positions to enable them to become familiar with the positions.

This Unit should be delivered by a combination of teaching and learning approaches which could include:

- ◆ Practical activities
- ◆ Group discussions
- ◆ Tutorials
- ◆ Directed study
- ◆ Site visits
- ◆ Audio visual

#### OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Candidates will have opportunities to develop skills in *Problem Solving* as they investigate and select equipment and consumables appropriate to welding processes. A range of issues has to be examined and considered to assure safe use of equipment and resources as welding is completed to current industrial standards. Results are visually inspected and reported to comply with safety regulations and requirements. Discussion during formative work will allow candidates to analyse all the factors impacting on the process, including best practice in safety, and will also enhance oral communication skills in work related contexts. Practical work can provide an environment in which to discuss, review and evaluate the process and product, developing problem solving techniques and approaches.

There may be practical ways to foster skills in group communication and co-operative working. Candidates could be encouraged as a group to discuss approaches taken, analyse the task and its component elements and discuss and agree the nature and scope of team goals, roles and responsibilities in practical welding work. They could explain or demonstrate methodology and equipment selected, reviewing and evaluating their own contribution to the workplace environment.

Access to and evaluation of complex technical literature and health and safety requirements should provide and support underpinning knowledge. Candidates should produce and present written reports to industry standard; models of inspection reports should indicate acceptable formats, terminology and structures.

## National Unit Specification: support notes (cont)

### UNIT Tungsten Inert Gas (TIG) Welding Skills (SCQF level 6)

#### GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

##### Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by information and communications technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

The sequence of assessment of the completed test pieces shall be:

- ◆ visual examination of the test welds

and where found necessary:

- ◆ selection of the appropriate destructive test
- ◆ implementation of the appropriate test

The assessment of this Unit should be approached in an integrated way with documentation covering all Outcomes developed as an integrated whole.

Welds for each candidate must be retained. In addition inspection checklists must be completed by each candidate for the joint covering, where appropriate, the following areas:

- (i) before welding; weld preparation, cleanliness, fit-up, consumables.
- (ii) during welding; inter-run cleaning if required.
- (iii) after welding, penetration and root examination, weld width and contour, undercut, overlap, weld flaws, stray arcing, tool marks and macro-etch.

It would be advantageous if prepared inspection checklists were available to the candidates prior to the commencement of welding.

#### CANDIDATES WITH DISABILITIES AND/OR ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs (www.sqa.org.uk)*.