



Level 4 NVO Extended Diploma in

**Engineering Manufacture**

# ENGINEERING

## Qualification Specification

### Overview

This qualification is a National Vocational Qualification (NVO). It provides learners with the skills and knowledge needed for engineering manufacturing including the ability to organise work, and to identify and prevent problems. The qualification will feature in the updated Higher Apprenticeship for Engineering.

### Typical Job

The qualification is applicable to a variety of engineering manufacturing occupations dependent on the pathway chosen.

Qualification code:	600/9576/3
Level:	4
Total qualification time:	1070 Hours
Guided learning hours:	476
Credits:	107
Minimum age	18

Issue 1.1

## Purpose of the qualification

### What does this qualification cover?

The skills and knowledge in one or more of a wide variety of engineering manufacturing activities including:

- performing engineering operations
- research
- design
- new product development and introduction
- engineering and manufacture
- council for administration
- business improvement techniques.
- It is accredited by Ofqual at QCF Level four.

It applies to a variety of job roles such as:

- Electrical/Electronic engineering senior technician
- Software engineering senior technician
- Systems engineering senior technician
- Manufacturing senior technician
- Senior quality technician
- Senior design technician
- Control and instrumentation senior technician
- Computer Aided Design (CAD) senior technician
- Technical Sales specialist
- Process senior technician

This qualification forms part of the Semta Higher Apprenticeship in Advanced Manufacturing Engineering Level 4 apprenticeship framework.

## Who supports this qualification?

The qualification is supported by The Society of Operations Engineers (SOE).

## What could this qualification lead to?

- EAL Level 4 NVQ Diploma in Business Improvement techniques,
- EAL Level 5 NVQ Diploma in Management
- EAL Level 7 NVQ Diploma in Management.

## Entry Requirements

Learners must have the potential to achieve the assessment criteria set out in the units.

## How is the qualification achieved?

The learner must present evidence (portfolio) which clearly shows they have met the assessment criteria and learning outcomes. The learner must achieve the mandatory and optional units relevant to their pathway (occupational role).

## What will be assessed?

All evidence submitted by the learner against the assessment criteria.

## How will it be assessed?

Evidence for this qualification will be assessed in accordance with the SEMTA engineering assessment strategy, which has been created from engagement with stakeholders (employers etc.) in the engineering sector.

The qualification is not graded and only a pass can be achieved – which indicates the learner's competence.

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## Structure

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### Structure of the EAL Level 3 NVQ Extended Diploma

The Extended Diploma is comprised of a Level 4 Engineering Qualification **extended** by inclusion of technically specific PEO Units as follows:-

**Mandatory Units** – A combination of Level 2 & 4

**Group A** - Level 2 PEO Units x 3 (Engineering Practices pathway)

OR

**Group B** - Level 2 PEO Units x 5 (Technical Support pathway)

And

**Group C/D** - Engineering Pathway – Level 4 optional Units

### Delivery requirements

In the context of the Apprenticeship Framework, the technically specific level 2 PEO units **must** be delivered and assessed in a sheltered work environment **before** starting delivery and assessment of the level 3 components in the working environment.

### PEO:

To support these basic engineering skills and techniques, the learner must be trained in, and continuously practice the relevant Health and Safety, engineering communication requirements along with all the other Mandatory Unit(s) listed within that qualification. The Learner cannot be signed off as being competent for these units in this period.

### Level 4:

**On completion** of the PEO2 Units, the Learner moves on to the Units from the Level 4 qualification which can only be assessed within a workplace environment.

# 4

## EAL Level 4 NVQ Extended Diploma in Engineering Manufacture

This qualification will be achieved when the learner has successfully completed the common mandatory Assessment route followed by the required number of optional Assessment route.

### Mandatory assessment routes: All three assessment routes must be completed

EAL code	Assessment route title	Level	Credit value	Guided learning hours	Ofqual code
QEMF4/001	Complying with statutory regulations and organisational safety requirements	2	5	35	A/601/5013

### Group A (Engineering practices)

**Optional Units:** Learners must complete **three** more units from the following

#### Notes:

Only one unit from **4, 32** and **61** may be included in the learner's choice of three units.

If unit **65** is selected units **5, 6, 8, 11, 12, 15, 16, 17** cannot be included in the learner's choice of three units.

If unit **66** is selected units **10, 22, 23, 25, 26, 27, 28, 29, 30, 34** cannot be included in the learner's choice of three units.

If unit **67** is selected units **33, 35, 36, 40** cannot be included in the learner's choice of three units.

If unit **68** is selected units **19, 21, 37, 38, 39, 40, 58, 59** cannot be included in the learner's choice of three units

QPE02/004N	Producing Mechanical Engineering Drawings using a CAD System	2	11	61	F/504/6348
QPE02/005N	Producing Components using Hand Fitting Techniques	2	14	64	J/504/6349
QPE02/006N	Producing Mechanical Assemblies	2	15	68	F/504/6351
QPE02/007N	Forming and Assembling Pipework Systems	2	14	64	L/504/6353
QPE02/008N	Carrying Out Aircraft Detail Fitting Activities	2	14	64	R/504/6354
QPE02/009N	Installing Aircraft Mechanical Fasteners	2	11	61	L/504/6367
QPE02/010N	Producing Aircraft Detail Assemblies	2	14	65	L/504/6370
QPE02/011N	Preparing and Using Lathes for Turning Operations	2	15	68	Y/504/6372
QPE02/012N	Preparing and Using Milling Machines	2	15	68	K/504/6375
QPE02/013N	Preparing and Using Grinding Machines	2	15	68	T/504/6377
QPE02/014N	Preparing and Proving CNC Machine Tool Programs	2	14	64	F/504/6379
QPE02/015N	Preparing and Using CNC Turning Machines	2	14	64	F/504/6382

QPEO2/016N	Preparing and Using CNC Milling Machines	2	14	64	L/504/6384
QPEO2/017N	Preparing and Using CNC Machining Centres	2	14	64	D/504/6387
QPEO2/018N	Preparing and Using Industrial Robots	2	14	64	D/504/6390
QPEO2/019N	Maintaining Mechanical Devices and Equipment	2	14	64	T/504/6394
QPEO2/020N	Assembling and Testing Fluid Power Systems	2	14	64	J/504/6397
QPEO2/021N	Maintaining Fluid Power Equipment	2	14	64	F/504/6401
QPEO2/022N	Producing Sheet Metal Components and Assemblies	2	14	64	J/504/6402
QPEO2/023N	Producing Platework Components and Assemblies	2	14	64	L/504/6403
QPEO2/024N	Cutting and Shaping Materials using Thermal Cutting Equipment	2	14	64	R/504/6404
QPEO2/025N	Preparing and Proving CNC Fabrication Machine Tool Programs	2	14	64	Y/504/6405
QPEO2/026N	Preparing and Using CNC Fabrication Machinery	2	14	64	D/504/6406
QPEO2/027N	Preparing and Using Manual Metal Arc Welding Equipment	2	15	68	K/504/6408
QPEO2/028N	Preparing and Using Manual TIG or Plasma-arc Welding Equipment	2	15	68	M/504/6409
QPEO2/029N	Preparing and Using Semi-automatic MIG, MAG and Flux cored arc Welding equipment	2	15	68	H/504/6410
QPEO2/030N	Preparing and Using Manual Oxy/fuel Gas Welding Equipment	2	14	64	Y/504/6419
QPEO2/031N	Preparing and Using Manual Flame Brazing and Braze Welding Equipment	2	11	61	L/504/6420
QPEO2/032N	Producing Electrical or Electronic Engineering Drawings using a CAD System	2	11	61	R/504/6421
QPEO2/033N	Wiring and Testing Electrical Equipment and Circuits	2	14	64	Y/504/6422
QPEO2/034N	Forming and Assembling Electrical Cable Enclosure and Support Systems	2	13	65	D/504/6423
QPEO2/035N	Assembling, Wiring and Testing Electrical Panels/Components Mounted in enclosures	2	14	64	H/504/6424
QPEO2/036N	Assembling and Testing Electronic Circuits	2	14	64	K/504/6425
QPEO2/037N	Maintaining Electrical Equipment/Systems	2	15	68	M/504/6426
QPEO2/038N	Maintaining Electronic Equipment/Systems	2	15	68	T/504/6427
QPEO2/039N	Maintaining and Testing Process Instrumentation and Control Devices	2	15	68	A/504/6428
QPEO2/040N	Wiring and Testing Programmable Controller Based Systems	2	15	68	F/504/6429
QPEO2/041N	Using Wood for Pattern, Modelmaking and Other Engineering Applications	2	15	68	T/504/6430



QPEO2/042N	Assembling Pattern, Model and Engineering Woodwork Components	2	14	64	A/504/6431
QPEO2/043N	Producing Composite Mouldings using Wet Lay-up Techniques	2	14	64	F/504/6432
QPEO2/044N	Producing Composite Mouldings using Pre-Preg Laminating Techniques	2	14	64	L/504/6434
QPEO2/045N	Producing Composite Mouldings using Resin Flow Infusion Techniques	2	14	64	R/504/6435
QPEO2/046N	Producing Composite Assemblies	2	14	64	Y/504/6436
QPEO2/047N	Producing Components by Rapid Prototyping Techniques	2	11	61	D/504/6437
QPEO2/048N	Producing and Preparing Sand Moulds and Cores for Casting	2	14	64	H/504/6438
QPEO2/049N	Producing and Preparing Molten Materials for Casting	2	14	64	K/504/6439
QPEO2/050N	Producing Cast Components by Manual Means	2	13	65	D/504/6440
QPEO2/051N	Fettling, Finishing and Checking Cast Components	2	11	61	H/504/6441
QPEO2/052N	Finishing Surfaces by Applying Coatings or Coverings	2	9	41	M/504/6443
QPEO2/053N	Finishing Surfaces by Applying Treatments	2	9	41	T/504/6444
QPEO2/054N	Carrying Out Heat Treatment of Engineering Materials	2	9	41	A/504/6445
QPEO2/055N	Carrying Out Hand Forging of Engineering Materials	2	9	41	F/504/6446
QPEO2/056N	Stripping and Rebuilding Motorsport Vehicles (Pre-Competition)	2	14	64	J/504/6447
QPEO2/057N	Inspecting a Motorsport Vehicle During Competition	2	14	64	L/504/6448
QPEO2/058N	Diagnosing and Rectifying Faults on Motorsport Vehicle Systems (During a Competition)	2	15	68	R/504/6449
QPEO2/059N	Carrying Out Maintenance Activities on Motor Vehicle Electrical Equipment	2	15	68	J/504/6450
QPEO2/060N	Stripping and Rebuilding Motorsport Engines (Pre – Competition)	2	14	64	L/504/6451
QPEO2/061N	Producing CAD Models (Drawings) using a CAD System	2	11	61	R/504/6452
QPEO2/065N	General Machining, Fitting and Assembly Applications	2	12	55	K/504/6456
QPEO2/066N	General Fabrication and Welding Applications	2	12	55	M/504/6457
QPEO2/067N	General Electrical and Electronic Engineering Applications	2	12	55	T/504/6458
QPEO2/068N	General Maintenance Engineering Applications	2	12	55	A/504/6459
QPEO2/069N	Joining Public Service Vehicle Components by	2	11	61	L/503/4056

Mechanical Processes					
QPEO2/070N	Assembling Structural Sub-Assemblies to Produce a Public Service Vehicle	2	14	64	R/503/4057
QPEO2/071N	Fitting Sub-Assemblies and Components to Public Service Vehicles	2	14	64	Y/503/4058
QPEO2/072N	Preparing and Manoeuvring Armoured Fighting Vehicles AFVs for Maintenance and Transportation	2	14	64	R/503/7198
QPEO2/073N	Producing Composite Mouldings using Resin Film Infusion Techniques	2	14	64	J/504/3404

Or

**Group B: (Technical Support)**

**Learners must complete one of the following PEO Level 2 assessment routes:**

QPEO2/004N	Producing Mechanical Engineering Drawings using a CAD System	2	11	61	F/504/6348
QPEO2/032N	Producing Electrical or Electronic Engineering Drawings using a CAD System	2	11	61	R/504/6421
QPEO2/061N	Producing CAD Models (Drawings) using a CAD System	2	11	61	R/504/6452

**Plus two from the following PEO Level 2 assessment routes:**

QPEO2/062N	Producing Engineering Project Plans	2	8	37	Y/504/6453
QPEO2/063N	Using Computer Software Packages to Assist with Engineering Activities	2	8	37	D/504/6454
QPEO2/064N	Conducting Business Improvement Activities	2	8	41	H/504/6455

**Plus two more from the following PEO Level 2 assessment routes:**

QPEO2/065N	General Machining, Fitting and Assembly Applications	2	12	55	K/504/6456
QPEO2/066N	General Fabrication and Welding Applications	2	12	55	M/504/6457
QPEO2/067N	General Electrical and Electronic Engineering Applications	2	12	55	T/504/6458
QPEO2/068N	General Maintenance Engineering Applications	2	12	55	A/504/6459





In addition to the PEO Level 2 unit requirements in Group A or B, learners must complete the unit requirements for the following Level 4 Engineering Leadership pathways.

At Level 4, The Learner must complete the common mandatory assessment route plus 11 units optional assessment routes from the Engineering Manufacture pathway which must include a minimum of three assessment routes from Group C and one assessment routes from either Group D or E

**Group C:**

Optional assessment routes: At least three of the following assessment routes must be taken:

**Research:**

QEMF4/002	Identify and Define Areas of Engineering Research	4	16	56	J/505/0952
QEMF4/003	Develop a Research Methodology for Engineering	4	16	56	L/505/0953
QEMF4/004	Propose and Specify Engineering Research	4	16	56	R/505/0954
QEMF4/005	Undertake Engineering Research	4	16	56	L/505/0936
QEMF4/006	Evaluate the Results of Engineering Research	4	16	56	Y/505/0955

**Design:**

QEMF4/007	Identify Engineering Design Requirements of Clients	4	16	56	F/505/0934
QEMF4/008	Establish an Engineering Design Brief	4	16	56	Y/505/0938



QEMF4/009	Develop a Strategy for the Engineering Design Process	4	16	56	D/505/0956
QEMF4/010	Create Engineering Designs	4	16	56	D/505/0939
QEMF4/011	Evaluate Engineering Designs	4	16	56	R/505/0940
QEMF4/012	Contribute to a Team Feasibility Review of a New Product Design	4	16	56	Y/505/1006
QEMF4/013	Control the New Product Design Change Process	4	16	56	H/505/1008
QEMF4/014	Plan and Control New Product Design Benchmarking Activities	4	16	56	K/505/1009

**Group A: New Product Development and Introduction (cont):**

QEMF4/015	Establish New Product Development and Introduction Brief	4	16	56	H/505/1011
QEMF4/016	Produce and Evaluate Conceptual Design Options for New Products	4	16	56	D/505/1010
QEMF4/017	Verify New Product Designs using a Computer Model	4	16	56	K/505/1012
QEMF4/018	Verify New Product Designs using a Physical Model	4	16	56	L/505/1018
QEMF4/019	Produce New Product Designs for Manufacture and Assembly	4	16	56	T/505/1045
QEMF4/020	Plan and Control New Product Manufacturing Process Benchmarking Activities	4	16	56	J/505/1048
QEMF4/021	Establish Manufacturing Process Design Brief for New Product Introduction	4	16	56	L/505/1049
QEMF4/022	Develop a New Product Manufacturing Process Design Strategy	4	16	56	F/505/1050
QEMF4/023	Develop a New Product Manufacturing Process Flow and Floor Plan Layout	4	16	56	J/505/1051
QEMF4/024	Plan and Manage the Installation of the New Product Manufacturing Process	4	16	56	R/505/1053
QEMF4/025	Commission a New Product Manufacturing Process	4	16	56	T/505/1059

**Engineering and Manufacture:**

QEMF4/026	Solve Engineering or Manufacturing Problems	4	16	56	A/505/0933
QEMF4/027	Undertake Project Management Activities	4	16	56	T/505/0963
QEMF4/028	Determine the Requirements for Engineering Activities	4	16	56	Y/505/0941
QEMF4/029	Produce Engineering Specifications	4	16	56	J/505/0935
QEMF4/030	Specify Methods and Procedures to Achieve Engineering Requirements	4	16	56	D/505/0942
QEMF4/031	Schedule Engineering Activities	4	16	56	H/505/0943
QEMF4/032	Obtain Resources for the Implementation of Engineering Activities	4	16	56	K/505/0944

### Group C: Engineering and Manufacture: (cont)

QEMF4/033	Implement Engineering Processes	4	16	56	M/505/0945
QEMF4/034	Monitor and Evaluate Engineering Processes	4	16	56	T/505/0946
QEMF4/035	Provide technical advice and guidance on engineering or manufacturing requirements	4	16	56	F/505/0951
QEMF4/036	Implement Quality Assurance Methods and Procedures	4	16	56	J/505/0949
QEMF4/037	Improve the Quality of Engineering Products or Processes	4	16	56	A/505/0950
QEMF4/038	Specify Risk Reduction Methods and Procedures	4	16	56	F/505/0948
QEMF4/039	Evaluate Engineering Risk Assessments	4	16	56	A/505/0947
QEMF4/040	Investigate Incidents Relating to Engineering Activities	4	16	56	K/505/0961
QEMF4/041	Configure Engineering Products, Processes or Facilities	4	16	56	H/505/0957
QEMF4/042	Transfer Control of Engineering Products, Processes or Facilities	4	16	56	K/505/0958
QEMF4/043	Propose Decommissioning of Engineering Products, Processes or Facilities	4	16	56	M/505/0959
QEMF4/044	Plan and Decommission Engineering Equipment, Processes or Facilities	4	16	56	H/505/0960
QEMF4/045	Commission Engineering Products, Processes or Facilities	4	16	56	M/505/0962
QEMF4/046	Determine Welding and Related Technical Requirements to Achieve Objectives	4	16	56	D/505/0987
QEMF4/047	Plan Welding Production Resources and Activities	4	16	56	H/505/0988
QEMF4/048	Implement Welding Production Methods and Procedures	4	16	56	K/505/0989
QEMF4/049	Solve Welding Problems in Production	4	16	56	D/505/0990
QEMF4/050	Monitor Welding Activities in Production	4	16	56	H/505/0991
QEMF4/051	Inspect Welded Components or Structures for Visual Quality and Dimensional Accuracy	4	16	56	K/505/0992
QEMF4/052	Lead Welding and Fabrication Activities	4	16	56	L/505/0967
QEMF4/053	Lead Rail Welding Activities	4	16	56	R/505/0968
QEMF4/054	Lead Maintenance Activities	4	16	56	A/505/0964
QEMF4/055	Lead Mechanical Manufacturing or Inspection Activities	4	16	56	F/505/0965
QEMF4/056	Lead Installation or Commissioning Activities	4	16	56	J/505/0966
QEMF4/057	Lead Electrical/Electronic Product Manufacturing or Testing Activities	4	16	56	Y/505/0969
QEMF4/058	Carry Out the Testing and Calibration of Instrumentation Control Equipment and Circuits	4	16	56	L/505/0970
QEMF4/059	Carry out Maintenance Activities on Mechanical	4	16	56	R/505/0971

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	Equipment				
QEMF4/060	Carry out Maintenance Activities on Electrical Equipment	4	16	56	Y/505/0972

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QEMF4/061	Carry out Maintenance Activities on Fluid Power Equipment	4	16	56	D/505/0973
QEMF4/062	Carry out Maintenance Activities on Instrumentation and Control Equipment	4	16	56	H/505/0974
QEMF4/063	Carry out Maintenance Activities on Mechanical Equipment within an Engineered System	4	16	56	K/505/0975
QEMF4/064	Carry out Maintenance Activities on Electrical Equipment within an Engineered System	4	16	56	M/505/0976
QEMF4/065	Carry out Maintenance Activities on Fluid Power Equipment within an Engineered System	4	16	56	A/505/0978
QEMF4/066	Carry out Maintenance Activities on Process Controller Equipment within an Engineered System	4	16	56	F/505/0979

**Group D:  
Council for Administration:**

**Optional assessment routes: At least one of the following assessment routes must be taken or one assessment route from group E:**

QEMF4/067	Build, support and manage a team	4	4	20	F/600/9682
QEMF4/068	Develop, maintain and review personal networks	4	4	25	R/600/9587
QEMF4/069	Review risk management processes in own area of responsibility	4	3	20	L/600/9622
QEMF4/070	Provide leadership and direction for own area of responsibility	4	5	30	T/600/9601
QEMF4/071	Ensure compliance with legal, regulatory, ethical and social requirements	4	5	25	H/600/9609
QEMF4/072	Implement change in own area of responsibility	4	6	25	M/600/9659
QEMF4/073	Support individuals to develop and take responsibility for their performance	4	4	20	D/600/9690
QEMF4/074	Know how to follow disciplinary procedures	4	4	20	H/600/9691
QEMF4/075	Managing grievance procedures	4	3	10	K/600/9692
QEMF4/076	Support the management of redundancies in own area of responsibility	4	3	15	M/600/9693
QEMF4/077	Develop working relationships with colleagues and stakeholders	4	4	20	K/600/9661
QEMF4/078	Support learning and development within own area of responsibility	4	5	25	M/600/9676
QEMF4/079	Address performance problems affecting team members	4	3	20	F/600/9679
QEMF4/080	Manage a tendering process	4	4	20	H/600/9738
QEMF4/081	Develop and implement a risk assessment plan in own area of responsibility	4	6	20	L/600/9703
QEMF4/082	Manage physical resources	4	3	25	K/600/9711
QEMF4/083	Manage the environmental impact of work activities	4	5	10	M/600/9712

### Group D: Council for Administration (cont):

QEMF4/084	Prepare for and support quality audits	4	4	20	Y/600/9798
QEMF4/085	Develop and implement marketing plans	4	6	25	K/600/9790
QEMF4/086	Analyse the market in which your organisation operates	4	5	25	M/600/9791
QEMF4/087	Develop and evaluate operational plans for own area of responsibility	5	6	25	Y/600/9588
QEMF4/088	Manage the achievement of customer satisfaction	4	5	25	A/600/9793
QEMF4/089	Plan, allocate and monitor work in own area of responsibility	4	5	25	H/600/9674
QEMF4/090	Manage budgets	4	5	29	T/601/2552
QEMF4/091	Agree a budget	3	4	25	J/601/2552
QEMF4/092	Make decisions in a business environment	4	4	24	H/601/2560
QEMF4/093	Negotiate in a business environment	4	7	40	K/601/2561
QEMF4/094	Prepare specifications for contracts	4	5	30	F/601/2565

### Group E:

#### B-IT:

**Optional assessment routes: At least one of the following assessment routes must be taken or one assessment route from group D:**

QEMF4/095	Leading workplace organisation activities	4	10	25	F/600/5406
QEMF4/096	Leading continuous improvement (Kaizen) activities	4	14	32	M/600/5420
QEMF4/097	Leading the development of visual management systems	4	9	25	M/600/5434
QEMF4/098	Leading the creation of flexible production and manpower systems	4	7	25	K/600/5447
QEMF4/099	Leading value stream mapping (VSM) activities	4	13	32	M/600/5563
QEMF4/100	Leading the carrying out of statistical process control procedures (SPC)	4	8	25	J/600/5665
QEMF4/101	Leading value management (value engineering & value analysis) activities	4	11	32	A/600/5713
QEMF4/102	Leading potential failure modes and effects analysis (FMEA) activities	4	9	25	L/600/5733
QEMF4/103	Leading measurement systems analysis (MSA) activities	4	9	25	R/600/5748
QEMF4/104	Carrying out design of experiments (DOE)	4	9	25	L/600/5862
QEMF4/105	Leading mistake/error proofing (POKA YOKE) activities	4	9	25	K/600/5867
QEMF4/106	Applying quality function deployment (QFD)	4	9	25	J/600/5875
QEMF4/107	Leading the creation of standard operating procedures	4	8	25	F/600/5888
QEMF4/108	Leading the application of Six Sigma methodology	4	14	32	D/600/5896



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	to a project				
QEMF4/109	Leading Six Sigma process mapping activities	4	14	32	T/600/5905
QEMF4/110	Leading the carrying out of basic statistical analysis	4	10	25	T/600/5919

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QEMF4/111	Leading the application of Six Sigma metrics to a project	4	9	25	Y/600/5931
QEMF4/112	Leading the production of a characteristic selection matrix	4	9	25	R/600/5944
QEMF4/113	Leading the carrying out of capability studies	4	14	32	L/600/5957

