

EDUCATION RECOMMENDATIONS



★ **PNEUMATICS PROGRAMME P1**
CETOP Passport Occupational Level 1

PNEUMATICS PROGRAMME (P1):

RE 2015/06.01 - P

CETOP (Passport) Occupational Level 1

INTRODUCTION

This is the LEVEL 1 Pneumatics Programme, forming the start of a series of competence-based qualifications designed around CETOP occupational levels.

It combines the necessary knowledge and competence based skills for those people on route to a higher level qualification at levels 2 and 3, involving the maintenance and management of Pneumatic systems.

Note: In all cases, each programme represents a "stand-alone" qualification but can also be a progressive route to a higher level.

CETOP OCCUPATIONAL LEVEL 1

LEVEL (1) This person will perform activities that follow an established procedure. Activities will be recurring and of a short-term nature. The reaction to most problems will be to summon help or follow a predefined set of actions.

This level 1 programme provides an excellent introduction to power pneumatics and places great emphasis on the understanding of fundamental principles, component functionality and principles of operation.

Emphasis upon health and safety and that of developing safe working practices is applied throughout, as a CORE ELEMENT within the scheme. CORE ELEMENTS are not necessarily taught as specific subject areas but integrated within the scheme.

Throughout the programme, emphasis will be placed upon the development of knowledge relating to "FUNCTION", "OPERATION" and "APPLICATION".

The knowledge-based section will support the development and effective application of Practical Skills necessary to carry out in a safe and effective manner that of:

- INSTALLATION
- COMMISSIONING
- PERFORMANCE TESTING
- PREDICTIVE MAINTENANCE AND MACHINE MANAGEMENT
- SERVICING
- COMPONENT REMOVAL AND REPLACEMENT

The development of Planning and Preparatory Skills, the use of technical information and specifications and the formulation and implementation of safe working procedures will be emphasized throughout all aspects of this programme.

METHODOLOGY AND ASSESSMENT

The programme can be offered via a range of learning modes devised by the Approved Centres but it is envisaged that distance learning supported by a series of centre-based modules will be the normal system used.

Candidates will be expected to complete a series of assignments throughout the programme of study to reinforce the learning process and attend the programme of centre-based modules.

Final assessment for the knowledge-- based units will be by means of a written examination of 2 hours duration. These will be prepared and offered at approved centres or at an engaged external examination centre. The pass mark for the written examination will be 60%.

The expected completion time for this competence based programme is 1 - 2 years and will require a high level of personal commitment to study and research the subjects within the syllabus.

Practical task preparation and competence based unit assessment will be carried out by arrangement with the Approved Centre during the year. Final assessment will be carried out on a "one to one" basis or in groups, candidate to tutor, and the outcome will be pass or fail.

Successful completion of both the knowledge based and competence based units will result in

the award of a CETOP Level 1 Pneumatics Qualification Certificate (P1). Candidates successfully completing only one unit will receive a CETOP Unit Certificate.

PRACTICAL TASK ASSESSMENT (P1)

Assessment Requirements

In practical tasks, candidates must on at least two occasions, prove their ability to carry out the following:

Assessed Ability

P 1.1 Interpret pneumatic circuit diagrams.

Evidence Required

- P 1.1.1 Components correctly identified.
- P 1.1.2 Application of components identified.
- P 1.1.3 Operation of pneumatic system relating to control input and machine output identified.

Assessed Ability

P 1.2 Design pneumatic systems from given information.

Evidence Required

- P1.2.1 Appropriate components selected and adjusted as necessary.
- P1.2.2 System assembled in a safe and efficient manner.
- P1.2.3 Start up and commissioning procedures correctly specified and followed.
- P1.2.4 System operates according to requirements.
- P1.2.5 Safe working practice and statutory regulations followed at all times.

Assessed Ability

P 1.3 Carry out routine maintenance on pneumatic systems.

Evidence Required

- P1.3.1 Service/maintenance requirements, establish schedule.
- P1.3.2 Service/maintenance undertaken as per schedule, in safe and efficient manner.
- P1.3.3 Faulty component, replaced, adjusted or repaired in line with planned procedures.
- P1.3.4 System tested after maintenance to ensure efficient working.
- P1.3.5 Safe working practice and statutory regulations followed at all times.

KNOWLEDGE BASED UNIT (P1) CONTENTS

- P 1.4.1 Fundamental Scientific Principles.
- P 1.4.2 Application of Fundamental Principles. P 1.4.3 Compressed Air Installations.
- P 1.4.4 Legal Regulations (The Pressure Systems Safety Regulations, PED).
- P 1.4.5 Airline Components.
- P 1.4.6 Pneumatic and Electro-Pneumatic Circuit Components.
- P 1.4.7 Circuit and Control Features (Recognition and use of pneumatic and electrical component symbols).
- P 1.4.8 Basic Maintenance procedures.

KNOWLEDGE BASED UNIT – WRITTEN EXAMINATION SPECIFICATION

The examination paper will contain questions from 8 sections of the programme.

- Examination with a minimum duration 2 consecutive hours
- Pass mark will be 60%
- Question style may be single subject, multiple subject, short answer and multiple choice

Where calculations and formulae are involved, all progressive stages of the calculation together with the corresponding units must be shown.

PNEUMATICS - (Knowledge Based Unit)

P1.4.1 Fundamental Scientific Principles

Describe the fundamental principles of power transmission by pneumatics and associated scientific principles underlying their use.

- a) List the basic components and describe their function
 - prime movers, compressor, coolers, air receiver, dryers and pipe-work
- b) Know the quantities and units
 - pressure, force, area, air consumption, flow rate, speed/velocity, torque and power
- c) State and use the relationship between:
 - pressure, force and area
- d) List the advantages and disadvantages of pneumatic systems compared to:

- mechanical systems
- electrical systems
- hydraulic systems

e) State and use the relationship between voltage, current, resistance and power

P1.4.2 Application of the Fundamental Principles

Describe the application of the fundamental principles relating to:

- a) Relationship between flow rate, pressure drop, pipe size and length
- b) Control of Pressure
- distinguish between gauge pressure and absolute pressure
 - compression ratio
 - pressure relief
 - pressure reduction
- c) Control of flow
- Directional
 - soft start/dump
 - flow control, bi-directional
 - flow control with by-pass
 - non-return
- d) Control of movement
- speed
 - stopping or preventing movement
 - changing direction

P1.4.3 Compressed Air Installations

Describe compressed air installations:

- a) Draw a typical compressed air installation system block diagram showing the relative position of the following components:
- compressors
 - coolers
 - air receiver
 - dryers
 - filters
 - water traps
 - service units
- b) State the function of the components listed in a) above

P1.4.4 Legal Regulations (The Pressure Systems Safety Regulations)

State the legal regulations for pressure systems (The Pressure Systems Safety Regulations)

P1.4.5 Airline Components

State the function of the airline components:

- a) shut off valve
- b) filter
- c) pressure regulator and gauge
- d) soft start/dump valve
- e) lubricator

P1.4.6 Pneumatic and Electro-Pneumatic Circuit Components

Describe pneumatic and Electro-Pneumatic circuit components:

- a) air cylinders, motors and semi-rotary actuators
- state that air cylinders and motors convert fluid energy into work
 - describe how speed can be adjusted using flow control valves
 - identify the main features and state typical applications of the following types of cylinder
 - A) single acting
 - B) double acting
 - state the reason for cushioning in double acting cylinders
- b) control valves
- identify the need in a circuit for directional control and flow regulation valves
 - identify the main features of 2/2, 3/2, 4/2, 5/2 spool and poppet valves
 - identify the different methods of valve actuation
 - A) manual
 - B) mechanical
 - C) electrical
 - D) pneumatic
 - state the principle and purpose of silencers and reclassifiers
- c) pipe-work and connectors
- distinguish between rigid and flexible pipe-work
 - identify couplings and connectors for use with above pipe-work
- d) state the function of the listed components
- solenoids
 - types of solenoid
 - switching ('ac' and 'dc')
 - direct acting
 - solenoid-pilot operated
 - manual override
 - reed switches
 - proximity sensors

**P1.4.7 Circuit and Control Features
(Recognition and use of Pneumatic and Electrical Component Symbols)**

Describe and prepare listed pneumatic circuits and associated methods of control.

- a) recognize and use ISO graphical symbols for listed components
 - filter
 - pressure regulator and gauge
 - lubricator
 - single acting cylinder
 - double acting cylinder
 - 2/2, 3/2, 4/2, 5/2 directional control valves
 - flow control valves
- b) sketch single cylinder circuit diagrams to control piston movements
 - manual operation of single acting cylinder
 - manual operation of double acting cylinder
 - manual operation of double acting cylinder with speed control
- c) recognize the numerical system ISO standard
- d) recognize and use IEC graphical symbols

P1.4.8 Basic Maintenance Procedures

Describe maintenance, monitoring and fault-finding procedures:

- a) Outline the maintenance scheme, involving performance and health monitoring in terms of:
 - maintaining cleanliness standard
 - regular use of diagnostic and test equipment
 - analysis of results and actions to be taken (prognosis)
 - keeping up to date records and information systems
 - establishing safe working practices

and step by step procedures when dealing with system breakdowns/component failures/replacement/ re-commissioning start up and testing

- b) Checks for common faults encountered in Pneumatic systems and associated components:
 - check air supply pressure indicated on pressure gauge
 - check contamination level in filter bowl
 - check oil level in lubricator (if fitted)
 - check positional sensors
 - check speed control settings
- c) Describe procedures to follow when carrying out fault finding, in terms of:
 - identifying and determining the nature of the fault
 - planning stages
 - safe working practices to be followed and associated risk assessment
 - information necessary to effectively carry out fault diagnosis and rectification process
 - application of FAULT-CAUSE-REMEDY procedures
 - use of diagnostic equipment and recording results
 - procedures to follow to rectify problems (adjustments, replacements, repair and re-commissioning)
 - establishing system re-start procedures
 - re-establish work place- 'fit for purpose'
 - completion of all necessary reports/ documentation

