cetop

The Voice of the European Fluid Power Industry

EDUCATION RECOMMENDATIONS

★**PNEUMATICS PROGRAMME P1**

CETOP Passport Occupational Level 1

RE 2025/01.01 - P1

PNEUMATICS PROGRAMME (P1):
RE 2025/01.01 - P1
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.
- use suitable test equipment to ensure safe isolation of systems when performing specific tasks.
- carry out activities which will be of short duration, and which reoccur frequently.
- identify problems which will be reported and rectified through predefined actions.

This level 1 programme introduces electro pneumatics and places great emphasis on the understanding of fundamental principles, component functionality and principles of operation.

Health, safety and 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.

The development of planning and preparatory skills, the use of technical information and specifications, implementation of safe working procedures and delegate learning and development will be emphasised throughout all aspects of this programme.

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

- Installation
- Commissioning
- Performance testing
- 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

Approved training providers may deliver the knowledge- based content either remotely/digitally (online) or face to face. The practical skills-based section must be delivered face to face.

Candidates will be expected to complete a series of assignments throughout the programme of study to reinforce the learning process. The final assessment for the knowledge-based units will be by means of a written examination, of agreed duration. These can be prepared and offered at approved centres or at an approved external examination centre. The pass mark for the written examination will be 60%.

It is anticipated that delegates will have to include a level of 'learning and development' in the process, which should be reinforced at their workplace, if appropriate.

Practical task preparation and competence-based unit assessment will be carried out by arrangement with the Approved Centre and can be integrated into the workshops. during the year.

Overall final assessment will be a combination of competence and knowledge results. It can be a carried out as independent "one to one", groups, or course integrated units, but always with a high level of tutor to candidate overview.

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:

Performance Criteria

P 1.1 Interpret pneumatic circuit diagrams.

Evidence Indicators

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.

Performance Criteria

P 1.2 Construct pneumatic systems from given information.

Evidence Indicators

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. System operates according to requirements.
P1.2.5 Safe working practice and statutory regulations always followed.

Performance Criteria

P 1.3 Carry out routine maintenance on pneumatic systems.

Evidence Indicators

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 always followed.

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 .
P 1.4.5 Airline Components.
P 1.4.6 Pneumatic and Electro-Pneumatic Circuit Components.
P 1.4.7 Circuit and Control Features (control valves)
P 1.4.8 Circuit and Control Features (tubing and connectors)
P 1.4.9 Circuit and Control Features (electro and vacuum)
P 1.4.10 Circuit and Control Features (symbols)
P1.5.0 Basic maintenance and fault finding procedures
P 1.5.1 Basic maintenance and fault finding procedures (maintenance scheme outlines)
P1.5.2 Basic maintenance and fault finding procedures (common fault recognition)
P1.5.3 Basic maintenance and fault finding procedures (procedure outlines)

KNOWLEDGE BASED UNIT – WRITTEN EXAMINATION SPECIFICATION

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

- Examination with an agreed duration
- Pass mark will be 60%
- Question style may be single subject, multiple subjects, short answer, and multiple choice
- The questions will be provided by the CETOP member organisation within the relative country (these will be from a standardised CETOP question pool to ensure CETOP quality parity).

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.

- basic components and their function:
  - compressor
  - after-cooler
  - air receiver
  - dryer
  - pipework
  - power supply
  - wiring
- quantities and units:
  - pressure
  - force
  - area
  - air consumption
  - flow rate
  - speed/velocity
  - torque
  - power
  - voltage
  - amperage
  - electrical power
- State and use the relationship between:
  - pressure
  - force
  - area
- List the advantages and disadvantages of pneumatic systems compared to:
  - mechanical systems
  - electrical systems
  - hydraulic systems
- 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:

- Relationship between flow rate, pressure drop, pipe size and length
- Control of Pressure:
  - distinguish between atmospheric, gauge, absolute and vacuum pressure
  - pressure relief
  - pressure reduction
- Control of flow:
  - flow control, uni-directional
  - flow control, bi-directional
  - soft start/dump
  - non-return
- Control of movement:
  - speed
  - stopping or preventing movement
  - changing direction

P1.4.3 Compressed Air Installations

Describe compressed air installations:

- Draw a typical compressed air installation system block diagram showing the relative position of the following components:
  - compressor
  - after-cooler
  - air receiver
  - dryer
  - filters
  - regulator
  - pressure relief valve
  - drip leg drains/water traps
  - modular service units
- State the function of the components listed above

P1.4.4 Legal Regulations (Relating to compressed air/gas)

State the current legal regulations for pressure systems

P1.4.5 Airline Components

State the function of the airline components:

- shut off valve
- filter (standard and coalescing)
- pressure regulator
- gauge
- dump valve
- soft start valve
- lubricator

P1.4.6 Pneumatic and Electro-Pneumatic Circuit Components

Describe pneumatic and Electro-Pneumatic circuit components:

Air cylinders, motors, and semi-rotary actuators:

- why a cylinder/actuator is used within a system
- how air cylinders and motors convert potential energy into mechanical motion
- how speed can be adjusted using flow control valves
- the main features and state typical applications of the following types of cylinders:
  - single acting
  - double acting
  - rodded
  - rod less
  - rotary
- the reason for cushioning in cylinders

P1.4.7 Pneumatic and Electro-Pneumatic Circuit Components

Describe pneumatic and Electro-Pneumatic circuit components

Control valves:

- the need in a circuit for directional control and flow regulation valves
- the main features of 2/2, 3/2, 4/2, 5/2
- the main features of spool and poppet valves
- the different methods of valve actuation.
  - manual
  - mechanical
  - electrical
  - pneumatic
- the principle and purpose of silencers and reclassifiers

P1.4.8 Pneumatic and Electro-Pneumatic Circuit Components

Describe pneumatic and Electro-Pneumatic circuit components

Tubing, pipework and connectors:

- why tubing comes in different materials
- distinguish between rigid and flexible pipework
- identify couplings and connectors for use with above pipework

P1.4.9 Pneumatic and Electro-Pneumatic Circuit Components

Describe pneumatic and Electro-Pneumatic circuit components

State the function of the listed components:

- solenoids
- relay
- programmable logic controller
- direct acting solenoid
- solenoid-pilot operated
- manual override
- reed switches
- solid state 'reed' switch
- proximity sensor
- vacuum generator
- vacuum cup

P1.4.10 Circuit and Control Features (Recognition and use of Pneumatic and Electrical Component Symbols)

Recognize and use the relevant graphical symbols for listed components:

- supply/mains air
- filter (standard and coalescing)
- pressure regulator
- gauge
- lubricator
- single acting cylinder
- double acting cylinder
- 2/2, 3/2, 5/2 directional control valves
- Exhaust silencer
- flow control valve, (uni/bi-directional)

- interpret 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
- describe the relevant labelling systems used to identify valve ports (both ISO and Asian standards)
- recognize and use the relevant electrical standard graphical symbols

P1.5.0 Basic Maintenance, Monitoring and Fault-Finding Procedures:

Describe maintenance, monitoring and fault finding procedures:

P1.5.1 Outline the maintenance scheme, 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

P1.5.2 Recognise common faults encountered in Pneumatic systems and associated components:

- air supply pressure indicated on pressure gauge
- contamination level in filter bowl
- oil level in lubricator (if fitted)
- positional sensors loose
- speed control settings against stated values
- electrical power on

P1.5.3 Outline 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 workplace- ‘fit for purpose’
- completion of all necessary reports/ documentation