

**BRITISH FLUID POWER
ASSOCIATION
QUALIFICATIONS**

**PNEUMATICS
(P1)**

**CETOP (PASSPORT) OCCUPATIONAL
LEVEL 1**

FOREWORD

Developed by the BFPA Education and Training Committee, this programme represents one of a range of new competence-based qualifications launched in 2001.

They are intended for those personnel involved in the maintenance and management of pneumatic systems and associated controls who require knowledge and competence based skills to support such work based activities as: planning and preparation, interpreting and using technical information, devising and following sound procedures associated with the operation, installation, commissioning, testing, fault diagnosis, rectification, maintenance, servicing and re-establishing a machine "fit for purpose".

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
PROACTIVE 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 emphasised 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 ranging from that of short courses to distance learning and centre based modules. The timescale can also be flexibly managed by the approved centres.

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 via a written examination of 2 hours duration.

This will be prepared by BFPA and offered at approved centres in June each year. (Approved centres can apply to BFPA to request additional examination dates).

The pass mark for the written examination will be 60%.

The expected completion time for this competence base programme is 1 year 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, candidate to tutor, and the outcome will be pass or fail.

Successful completion of both the knowledge based and competence base units will result in the award of a BFPA Level 1 Pneumatics Certificate. Candidates successfully completing only one unit will receive a BFPA Unit Certificate.

Reference should be made to the Guideline Document to Qualifications BFPA/Q1 for further details.

No part of this publication may be photocopied or otherwise reproduced without the prior permission in writing of the Association. BFPA Guideline documents are regularly reviewed and readers are advised to check the validity by contacting the Association at the address given below.

Whilst the Association does its best to ensure that any information that it may give is accurate, no liability or responsibility of any kind is accepted in this respect by the Association, its members, its servants or agents.

Further copies of this document can be obtained from British Fluid Power Association, Cromwell Park, Chipping Norton, Oxon OX7 5SR. Tel: 01608 647900. Fax: 01608 647919.

© 2003

PRACTICAL TASK ASSESSMENT (P1)**Assessment Requirements**

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

P1.1 **Assessed Ability**
Interpret pneumatic circuit diagrams.

Evidence Required

- P1.1.1 Components correctly identified.
 P1.1.2 Application of components identified.
 P1.1.3 Operation of pneumatic system relating to control input and machine output identified.

P1.2 **Assessed Ability**
Construct 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.

P1.3 **Assessed Ability**
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

P1.4.1	Fundamental and Scientific Principles.
P1.4.2	Application of Fundamental Principles.
P1.4.3	Compressed Air Installations.
P1.4.4	Legal Regulations (The Pressure Systems Safety Regulations 2000).
P1.4.5	Airline Components.
P1.4.6	Pneumatic Circuit Components.
P1.4.7	Circuit and Control Features (Recognition and use of pneumatic component symbols).
P1.4.8	Basic Maintenance procedures.

KNOWLEDGE BASED UNIT - WRITTEN EXAMINATION SPECIFICATION

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

- Examination 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 and 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
 - i) prime movers, compressor, coolers, air receiver, dryers and pipework
- b) Know the quantities and Units
 - i) pressure, force, area, air consumption, flow rate, speed/velocity, torque and power
- c) State and use the relationship between:
 - i) pressure, force and area
- d) List the advantages and disadvantages of pneumatic systems compared to:
 - i) mechanical systems
 - ii) electrical systems
 - iii) hydraulic systems

P1.4.1 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:-
 - i) compressors
 - ii) coolers
 - iii) air receiver
 - iv) dryers
 - v) filters
 - vi) water traps
 - vii) service units

- b) state the function of the components listed in (a) above

P1.4.4 Legal Regulations (The Pressure Systems Safety Regulations 2000)

State the legal regulations for pressure systems (The Pressure Systems Safety Regulations 2000)

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 Circuit Components

Describe pneumatic circuit components:-

- a) air cylinders, motors and semi-rotary actuators
 - i) state that air cylinders and motors convert fluid energy into work
 - ii) describe how speed can be adjusted using flow control valves
 - iii) identify the main features and state typical applications of the following types of cylinder
 - A) single acting
 - B) double acting
 - iv) state the reason for cushioning in double acting cylinders

- b) control valves
 - i) identify the need in a circuit for directional control and flow regulation valves
 - ii) identify the main features of 2/2, 3/2, 4/2, 5/2 spool and poppet valves
 - iii) identify the different methods of valve actuation
 - A) manual
 - B) mechanical
 - C) electrical
 - D) pneumatic
 - iv) state the principle and purpose of silencers and reclassifiers
- c) pipework and connectors
 - i) distinguish between rigid and flexible pipework
 - ii) identify couplings and connectors for use with above pipework

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

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

- a) recognise and use ISO1219/1 graphical symbols for listed components
 - i) filter
 - ii) pressure regulator and gauge
 - iii) lubricator
 - iv) single acting cylinder
 - v) double acting cylinder
 - vi) 2/2, 3/2, 4/2, 5/2 directional control valves
 - vii) flow control valves
- b) sketch single cylinder circuit diagrams to control piston movements
 - i) manual operation of single acting cylinder
 - ii) manual operation of double acting cylinder
 - iii) manual operation of double acting cylinder with speed control
- c) recognise the numerical system ISO5599/3 and CETOP RP68P rev.

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:
 - i) maintaining cleanliness standard
 - ii) regular use of diagnostic and test equipment
 - iii) analysis of results and actions to be taken (prognosis)
 - iv) keeping up to date records and information systems
 - v) establishing safe working practices and step by step procedures when dealing with system breakdowns/component failures/replacement/re-commissioning start up and testing

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