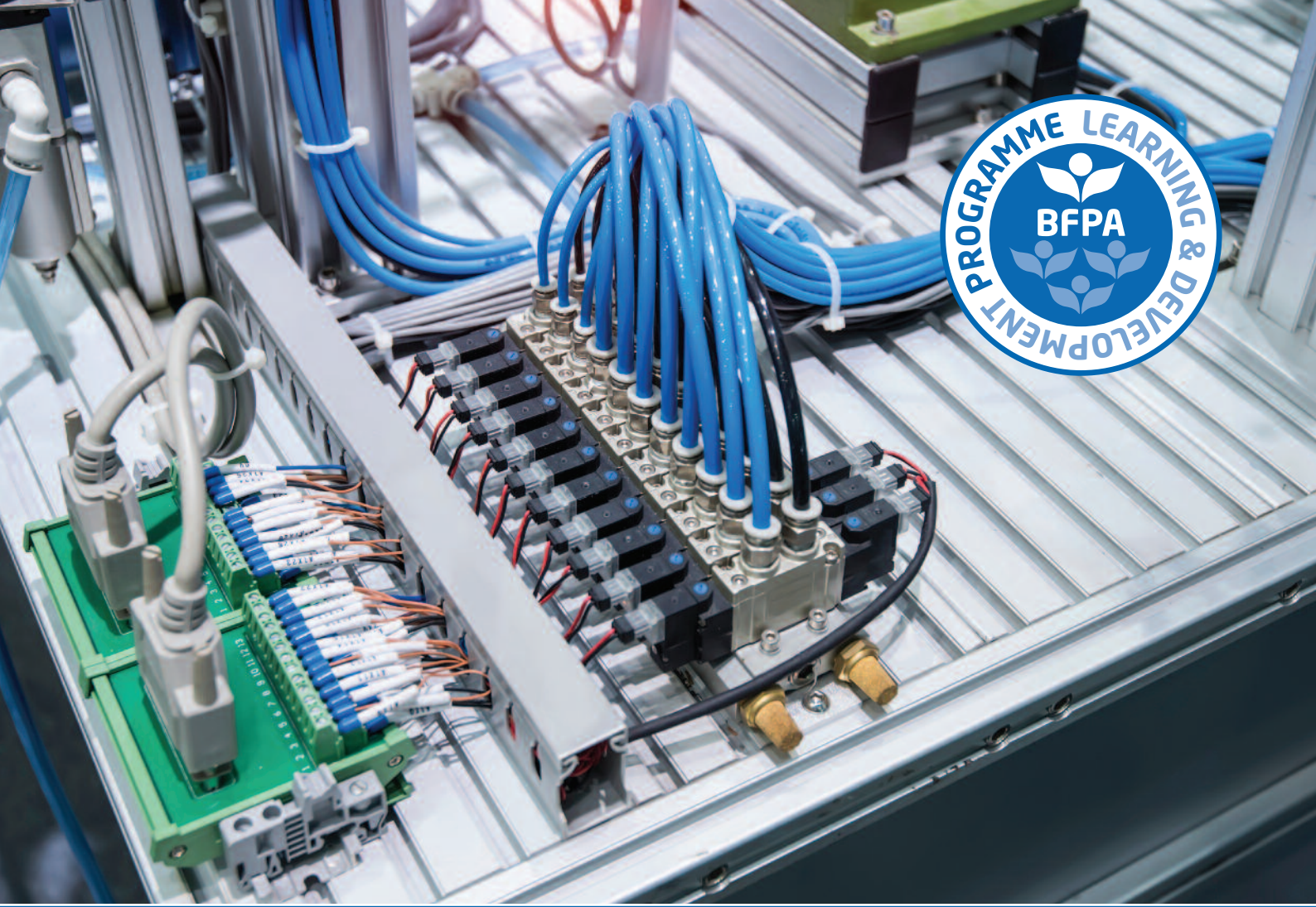

BFPA LEVEL 1 ELECTRO-PNEUMATICS (EP1)

COMPETENCE BASED QUALIFICATION

BFPA
LEARNING & DEVELOPMENT PROGRAMME

BRITISH FLUID POWER ASSOCIATION

VERSION 2 - FEBRUARY 2023

Introduction - BFPA Learning and Development Programme

This is the entry level to the BFPA Learning and Development Programme of a three-tier competence-based qualification in the maintenance and management of pneumatic systems.

It combines the necessary knowledge and skills base to ensure competency may be assessed successfully when working with pneumatic equipment and systems.

On successful achievement of this level, a candidate may wish to attain a higher level complementary qualification inline with their personal career goals.

Level 1: First Line (Advanced Apprentice/Technician)

This person will:

- perform activities, following 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.

Level 2: Second Line (Technician)

This person will:

- perform a variety of activities needing some understanding of the technical factors involved.
- carry out activities which may require the interpretation and application of varied and non-routine specifications.
- carry out activities which will involve the use of simple diagnostic checks and the ability to make a positive response to deviations.
- work in co-operation with others in teams or work groups as may be required.

Level 3: Third Line (Senior Technician/Engineer)

This person will:

- be involved in a broad and often complex range of activities, often requiring independent decisions to be made on technical matters concerning specifications, resources or processes.
- be responsible for planning of work as well as the finding and rectification of faults.
- be responsible for the quality of work undertaken and for ensuring the correct required outcomes are achieved.

Emphasis upon health and safety and developing safe working practices are 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, operatin and application

The knowledge-based section will support the development and effective application of practical skills necessary to perform the following in a safe and effective manner:

- Performance testing
- Planned predictive maintenance
- Supervised machine/system management

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

Pre-requisite

BFPA Foundation Level in Pneumatics.

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Methodology and Assessment

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

Both knowledge-based and skills-based sections must be successfully completed within three months of each other, so as to gain the qualification.

Final assessment for the knowledge-based units will be via a written examination of a minimum of 2 hours duration.

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

Practical task preparation and competence-based unit assessment will be carried out by arrangement with the Approved Centre. 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 skills-based units will result in the award of a BFPA Level 1 Electro-Pneumatics Competence Based Qualification (BFPA EP1).

When assessing competence, the following processes must be adhered to:

Relating to the occupational level, a series of performance criteria are identified. These represent the "doing part" of a person's job and requires a combination of both practical skills and applied knowledge.

In all cases candidates must meet the requirements of each performance criteria.

Practical Assessments

Assessed by observation of performance, direct questioning, and written evidence as required.

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

EP1.1 Performance Criteria - Task 1

Interpret electro-pneumatic circuit diagrams.

BFPA Foundation Level subject reference:

- 2/4/7/8/9/10/1113/14/15/17/20/23/24/25/26/27/28/29/30/32/33

Evidence Indicators

EP1.1.1 Obtain the associated risk assessment and establish safe working procedures for the task

EP1.1.2 Components correctly identified. EP1.1.3 Application of components identified.

EP1.1.4 Briefly explain the operation of the electro-pneumatic system relating to control inputs and machine outputs

EP1.2 Performance Criteria - Task 2

Construct electro-pneumatic systems from given information.

BFPA Foundation Level subject reference:

- 2/4/6/7/8/9/10/11/13/14/15/17/20/21/23/25/26/27/28/29/33

Evidence Indicators

EP1.2.1 Obtain the associated risk assessment and establish safe working procedures for the task

EP1.2.2 Select appropriate components as shown on a specific circuit diagram.

EP1.2.3 System assembled in a safe and efficient manner.

EP1.2.4 Start up and commissioning procedures correctly specified and followed.

EP1.2.5 Check system operates according to requirements.

EP1.2.6 Safe working practice and statutory regulations followed at all times.

EP1.3 Performance Criteria - Task 3

Carry out routine maintenance on electro-pneumatic systems.

BFPA Foundation Level subject reference:

- 1/2/4/6/7/8/11/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33

Evidence Indicators

EP1.3.1 Obtain the associated risk assessment and establish safe working procedures for the task

EP1.3.2 Service/maintenance requirements identified and establish corresponding schedule.

EP1.3.3 Service/maintenance undertaken as per schedule, in a safe and efficient manner.

EP1.3.4 Faults identified, recorded and reported in line with the organisation's procedures.

EP1.3.5 System tested after maintenance to ensure efficient working.

EP1.3.6 Safe working practice and statutory regulations followed at all times.

Knowledge Based Units - Written Examination Specification

The examination paper will contain questions from all sections of this programme and core elements will be integrated, as necessary.

- Examination minimum duration two consecutive hours
- Pass mark 60%
- Question style may be single subject, multiple subjects, short answer, and multiple choice

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

EP1.4.1 Fundamental Scientific Principles

Describe the fundamental principles of power transmission by electro-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 electro-pneumatic systems compared to:
- Mechanical systems
- Electrical systems
- Hydraulic systems

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

EP1.4.2 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 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
- Starting and stopping

EP1.4.3 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

EP1.4.4 Legal Regulations

State the legal regulations for electro-pneumatic systems.

Outline the relevant recognised legislation for the following:
- Pressure systems
- Pneumatic
- Electrical
- Machine safety
- Environmental

EP1.4.5 Airline Components

State the function of the airline components:

a) Shut off valve
b) Filter
c) Pressure regulator
d) Soft start/dump valve
e) Lubricator

EP1.4.6 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
- Single acting
- Double acting
- Rod less
- 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
- Manual
- Mechanical
- Electrical
- Pneumatic
- State the principle and purpose of silencers and reclassifiers

c) Pipe-work and connectors

- Distinguish between rigid and flexible pipework
- Identify couplings and connectors for use with above pipework
- Describe air discharge through an orifice and the relationship with air usage and impact pressures

d) State the function of the listed components

- Solenoids
- Types of solenoid
- Switching ('ac' and 'dc')
- Direct acting
- Solenoid-pilot operated
- Manual override – use and misuse
- Reed switches
- Proximity sensors

e) State the function and application of electric actuators instead of pneumatic devices (overview)

f) Outline the function and operation of Air Intensifiers (overview)

- Application
- Safety hazards

f) Outline the function and operation of vaccum (overview)

- Application
- Safety hazards

EP1.4.7 Circuit and Control Features (Recognition and use of Pneumatic and Electrical Component Symbols)

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

a) Recognise and use the relevant fluid power standard graphical symbols for listed components

- Filters
- Pressure regulator and gauge
- Lubricator
- Single acting cylinder
- Double acting cylinder
- 2/2, 3/2, 4/2, 5/2, 5/3 directional control valves
- Flow control valves

b) 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

c) Know the relevant labelling systems used to identify valve ports

d) Recognise and use the relevant electrical standard graphical symbols

EP1.4.8 Basic Maintenance Procedures

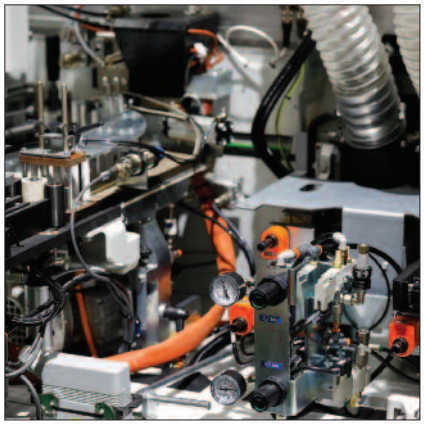
Describe maintenance, monitoring and fault finding procedures.

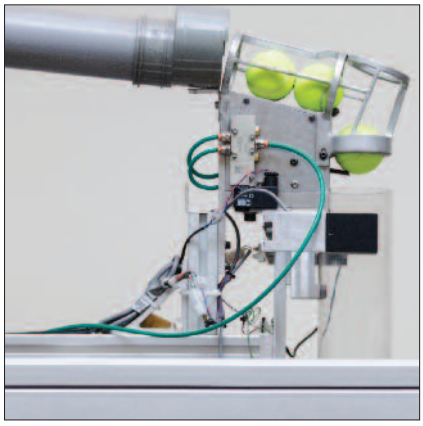
a) Outline the maintenance scheme, involving performance and health monitoring in terms of:

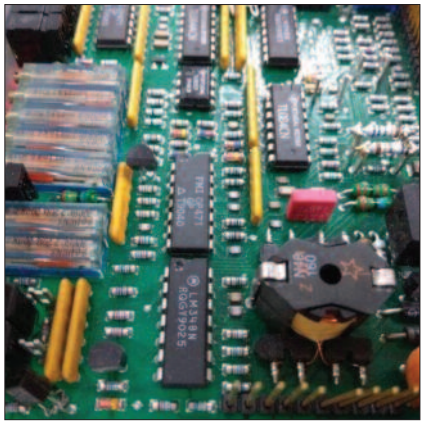
- Maintaining cleanliness standard
- Regular use of diagnostic and test equipment
- Analysis of results and communicating findings
- Keeping up to date records and information systems
- Understanding and using safe working practices and step by step procedures when required to carry out maintenance on electro-pneumatic systems

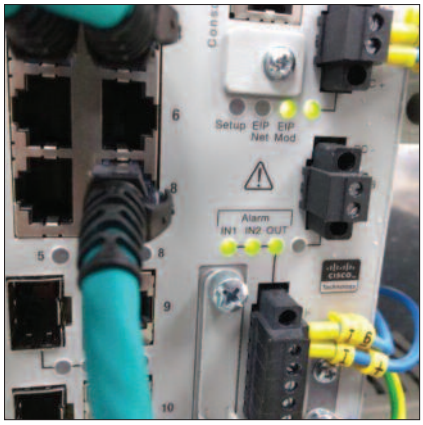
b) Recognise common faults encountered in electro-pneumatic systems and associated components:

- 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
- Check for ruptured fuse or tripped circuit breakers
- Check for broken wires
- Check for damaged cables
- Check for damaged plugs









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