

Overview

This standard covers a broad range of basic fluid power maintenance competences which will prepare you for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or that will provide a basis for the development of additional skills and occupational competences in the working environment.

You will be expected to prepare for the maintenance activities by obtaining all necessary information, documentation, tools and equipment required, and to plan how you intend to carry out the required maintenance activities and the sequence of operations you intend to use. You will be required to select the appropriate equipment to use, based on the maintenance operations to be carried out and the type of fluid power equipment being maintained, which will include hydraulic, pneumatic or vacuum equipment and circuits.

You will be expected to use a variety of maintenance diagnostic techniques and procedures, such as gathering information from fault reports, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment. You will then be expected to dismantle, remove and replace, or repair any faulty units or components, including pumps, valves, actuators, sensors, intensifiers, regulators, compressors, pipes and hoses, and other specific fluid power equipment. You will be expected to cover a range of maintenance activities, such as draining and removing fluids, removing stored pressure, labelling/proof marking to aid reassembly, dismantling components to the required level, checking components for serviceability, replacing faulty components and 'lived' items, setting and adjusting components, tightening fasteners to the required torque and making 'off-load' checks, before starting up and testing the maintained equipment, using appropriate techniques and procedures.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the fluid power maintenance activities undertaken. You will need to take account of any potential difficulties or problems that may arise with the maintenance activities, and to seek appropriate help and advice in determining and implementing a suitable solution. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate fluid power maintenance techniques and procedures safely. You will understand the maintenance process, and its

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application, and will know about the fluid power equipment being maintained, the system components, tools and consumables used, to the required depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the maintenance activities, and when using maintenance tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Specific Standard Requirements

In order to prove your ability to combine different maintenance operations, at least one of the fluid power maintenance activities must be of a significant nature, and must involve the removal and replacement of a minimum of **five** of the components listed in scope 6.

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Performance criteria

- You must be able to:*
- P1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
 - P2 plan the maintenance activities before you start them
 - P3 obtain all the information you need for the safe isolation, removal and replacement of the system components
 - P4 obtain and prepare the appropriate tools and test equipment
 - P5 apply appropriate maintenance diagnostic techniques and procedures
 - P6 use the appropriate methods and techniques to remove and replace the required components
 - P7 carry out tests on the maintained system in accordance with the test schedule/defined test procedures
 - P8 deal promptly and effectively with problems within your control and seek help and guidance from the relevant people when you have problems you cannot resolve
 - P9 leave the work area in a safe and tidy condition on completion of the maintenance activities

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Knowledge and understanding

You need to know and understand:

- K1 the health and safety requirements, and safe working practices and procedures required for the fluid power maintenance activities undertaken
- K2 the importance of wearing appropriate protective clothing and equipment (PPE) and keeping the work area safe and tidy
- K3 hazards associated with carrying out maintenance activities on fluid power equipment (such as handling fluids, stored energy/force, misuse of tools), and how these can be minimised
- K4 the system isolation procedures or permit-to-work procedure that applies
- K5 how to obtain and interpret drawings, charts, circuit and physical layouts, specifications, manufacturers' manuals, history/maintenance reports, symbols used in fluid power, and other documents needed in the maintenance activities
- K6 the procedure for obtaining drawings, job instructions, related specifications, replacement parts, materials and other consumables necessary for the maintenance activities
- K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards in relation to work undertaken)
- K8 the basic principles of how the fluid power equipment functions, its operating sequence, the purpose of individual units/components and how they interact
- K9 the different types of pipework, fittings and manifolds, and their application
- K10 the identification and application of different types of valve (such as poppet, spool, piston, disc)
- K11 the identification and application of different types of sensors and actuators (such as rotary, linear, mechanical, electrical)
- K12 the identification and application of different types of cylinder (such as single acting, double acting)
- K13 the identification and application of different types of pump (such as positive and non-positive displacement)
- K14 the identification and application of different types compressors (such as screw, piston, rotary vane)
- K15 the application and fitting of static and dynamic seals
- K16 the techniques used to dismantle/assemble fluid power equipment (such as release of energy/force, proof marking, extraction)
- K17 methods of checking that components are fit for purpose
- K18 how to make adjustments to components/assemblies to ensure that they function correctly
- K19 how to determine pressure settings, and their effect on the system

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- K20 selection of fluids for the system
- K21 recognition of contaminants and the problems they can create, and the effects and likely symptoms of contamination in the system
- K22 the various maintenance diagnostic techniques and aids that can be used (such as fault reports, visual checks, measuring, movement and alignment checks, testing)
- K23 the various fault location techniques that can be used, and how they are applied (such as half-split, input-to-output, function testing, unit substitution, and equipment self-diagnostics)
- K24 how to evaluate sensory information (sight, sound, smell, touch)
- K25 how to use a range of fault diagnostic equipment to investigate the problem
- K26 the care, handling and application of mechanical measuring/test equipment (such as measuring instruments, pressure and flow indicators and self-diagnostic equipment)
- K27 types of test equipment to be used, and their selection for particular tests
- K28 how the test equipment is connected into the circuit, and the methods of doing this
- K29 the techniques, methods and procedures to be used during the tests
- K30 how to display/record test results, and the documentation used
- K31 how to interpret the test readings obtained, and the significance of the readings gained
- K32 the importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits
- K33 how to check that tools and test equipment are free from damage or defect, are in a safe and usable condition, are within calibration, and are configured correctly for the intended purpose
- K34 the problems associated with maintaining fluid power equipment, and how they can be overcome
- K35 when to act on your own initiative and when to seek help and advice from others
- K36 the importance of leaving the work area in a safe and clean condition on completion of the maintenance activities (such as returning hand tools and test equipment to its designated location, cleaning the work area, and removing and disposing of waste)

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Additional Information

Scope/range related to performance criteria

You must be able to:

1. Carry out **all** of the following during the maintenance activity:
 - 1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
 - 1.2 ensure the safe isolation of equipment (such as mechanical, electrical, gas, air or fluids)
 - 1.3 follow job instructions, maintenance drawings and procedures
 - 1.4 check that tools and test instruments to be used are within calibration and are in a safe and usable condition
 - 1.5 ensure that the system is kept free from foreign objects, dirt or other contamination
 - 1.6 return all tools and equipment to the correct location on completion of the maintenance activities

2. Carry out maintenance activities on **one** of the following types of fluid power equipment:
 - 2.1 pneumatic
 - 2.2 hydraulic
 - 2.3 vacuum

3. Use **four** of the following maintenance diagnostic techniques, tools and aids:
 - 3.1 fault finding techniques (such as six point, half-split, input/output, unit substitution, emergent sequence)
 - 3.2 diagnostic aids (such as manuals, flow charts, troubleshooting guides, maintenance records)
 - 3.3 information gathered from fault reports
 - 3.4 inspecting (such as checking for damage, wear/deterioration, leaks, loose fittings and connections)
 - 3.5 sensory input (such as sight, sound, smell, touch)
 - 3.6 monitoring equipment or gauges
 - 3.7 operating the equipment (such as manual operation, timing and sequencing)
 - 3.8 test instrumentation measurement (such as pressure, flow, timing, sequence, movement)

4. Use **two** of the following types of fluid power test instruments:

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- 4.1 measuring devices
 - 4.2 flow indicators
 - 4.3 self-diagnostic equipment
 - 4.4 pressure indicators
 - 4.5 test rigs
5. Carry out **all** of the following maintenance activities, as applicable to the equipment being maintained:
- 5.1 chocking/supporting cylinders/rams/components
 - 5.2 draining and removing fluids (as applicable)
 - 5.3 releasing stored energy
 - 5.4 disconnecting/removing hoses and pipes
 - 5.5 removing and replacing units/components (such as pumps, cylinders, valves, actuators)
 - 5.6 proof marking/labelling of removed components
 - 5.7 checking components for serviceability
 - 5.8 replacing damaged/defective components
 - 5.9 replacing all 'lived' items (such as seals, filters, gaskets)
 - 5.10 tightening fastenings to the required torque
 - 5.11 setting, aligning and adjusting replaced components
 - 5.12 prime, bleed and recharge the system (as applicable)
 - 5.13 making de-energised checks before re-pressurising the system
6. Remove and replace a range of fluid power components, to include **all** of the following:
- 6.1 pipework/hoses
 - 6.2 valves
 - 6.3 cylinders/actuators
- Plus **five** more of the following:
- 6.4 reservoirs/storage devices
 - 6.5 pumps
 - 6.6 switches
 - 6.7 accumulators
 - 6.8 motors
 - 6.9 sensors
 - 6.10 pressure intensifiers
 - 6.11 gaskets and seals
 - 6.12 lubricators
 - 6.13 compressors
 - 6.14 pistons
 - 6.15 filters
 - 6.16 receivers
 - 6.17 spools
 - 6.18 cables and wires
 - 6.19 regulators
 - 6.20 bearings

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- 6.21 gauges/indicators
 - 6.22 timers
 - 6.23 coolers
 - 6.24 other specific components
7. Carry out tests on the maintained equipment, to include **both** of the following:
- 7.1 leak test
 - 7.2 operational performance
- Plus **one** more from the following:
- 7.3 pressure line pressure tests
 - 7.4 speed
 - 7.5 return line pressure test
 - 7.6 sequence
 - 7.7 flow
 - 7.8 fluid contamination test
8. Carry out **all** of the following checks to ensure the accuracy and quality of the tests carried out:
- 8.1 the test equipment is correctly calibrated
 - 8.2 the test equipment used is appropriate for the tests being carried out
 - 8.3 test procedures used are as recommended in the appropriate specifications
 - 8.4 test readings are taken at the appropriate points, and where appropriate components are adjusted to give the required readings
 - 8.5 test equipment is operated within its specification range
9. Maintain fluid power equipment in compliance with **one** or more of the following:
- 9.1 organisational guidelines and codes of practice
 - 9.2 specific system requirements
 - 9.3 equipment manufacturers' operation range
 - 9.4 BS and/or ISO standards

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