SEMPEO220

Assembling and testing fluid power systems

Overview

This standard covers a broad range of basic fluid power assembly competences that 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 assembly activities by obtaining all necessary information, documentation, tools and equipment required, and to plan how you intend to carry out the required assembly activities and the sequence of operations you intend to use. You will be required to select the appropriate equipment to use, based on the assembly operations to be carried out and the type of fluid power equipment being assembled, which will include hydraulic, pneumatic or vacuum systems.

In carrying out the fluid power assembly operations, you will be required to follow specific assembly techniques in order to assemble the various components, which will include rigid and flexible pipework, hoses, valves, actuators and cylinders, regulators, switches and sensors. The assembly activities will also include making all necessary checks and adjustments to ensure that fluid power components are correctly positioned and aligned, are dimensionally accurate and secure; pipework is dimensionally accurate and free from ripples, creases and damage; and joints are checked for security, with threaded devices tightened correctly. You will also be expected to carry out appropriate test procedures (such as leak or pressure) to confirm that the fluid power assembly meets the operational performance required.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the fluid power assembly activities undertaken. You will need to take account of any potential difficulties or problems that may arise with the assembly 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 assembly techniques and procedures safely. You will understand the assembly process, and its application, and will know about the fluid power equipment being assembled, 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 assembly activities, and when using assembly 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 fluid power assembly operations, at least one of the fluid power assemblies produced must be of a significant nature, and must contain a minimum of **six** of the components listed in scope 3.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. plan the assembly activities before you start them
3. obtain all the information you need for the safe assembly of the fluid power system
4. obtain and prepare the appropriate components, assembly tools and test equipment
5. use the appropriate methods and techniques to assemble the components in their correct positions
6. secure the components, using the specified connectors and securing devices
7. check the completed assembly to ensure that all operations have been completed and that the finished system meets the required specification
8. carry out tests on the assembled system, in accordance with the test schedule/defined test procedures
9. deal promptly and effectively with problems within your control, and seek help and guidance from the relevant people if you have problems that you cannot resolve
10. leave the work area in a safe and tidy condition on completion of the assembly activities

Knowledge and understanding

You need to know and understand:

1. the health and safety requirements, and safe working practices and procedures required for the fluid power assembly activities undertaken
2. the importance of wearing appropriate protective clothing and equipment (PPE), and keeping the work area safe and tidy
3. hazards associated with carrying out assembly activities on fluid power equipment (such as handling fluids, stored energy/force, misuse of tools), and how these can be minimised
4. how to obtain and interpret drawings, charts, circuit and physical layouts, specifications, manufacturers' manuals, symbols used in fluid power, and other documents needed in the assembly activities
5. 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
6. the procedure for obtaining drawings, job instructions, related specifications, components, materials and other consumables necessary for the assembly activities
7. the basic principles of how the fluid power equipment functions, its operating sequence, the purpose of individual units/components and how they interact
8. the different types of pipework, fittings and manifolds, and their application
9. the identification and application of different types of valve (such as poppet, spool, piston, disc)
10. the identification and application of different types of sensors and actuators (such as rotary, linear, mechanical, electrical)
11. the identification and application of different types of cylinder (such as single acting, double acting)
12. the identification and application of different types of pump (such as positive and non-positive displacement)
13. the identification and application of different types compressors (such as screw, piston, rotary vane)
14. the application and fitting of static and dynamic seals
15. the techniques used to assemble/install fluid power equipment (such as marking out the positions of components; making pipe bends using fittings and by hand bending methods; connecting components using rigid and flexible pipework;

using gaskets/seals and jointing/sealing compounds)
16. the need to ensure that pipework is supported at appropriate intervals, and the need to eliminate stress on the pipework connections
17. the need to ensure cleanliness of the fluid power system, and the ways of purging pipework before connection to components and pressure sources
18. recognition of contaminants and the problems they can create, and the effects and likely symptoms of contamination in the system
19. methods of testing the fluid power system; the types of test equipment to be used, and their selection for particular tests
20. how to make safety checks of the system before carrying out tests, to ensure that all pipes and components are secure and that moving parts are chocked or parked
21. how to connect suitably calibrated test equipment into the circuit, and how to connect the circuit to a suitable pressure source containing appropriate ancillary equipment
22. how to carry out the tests (such as applying test pressures in incremental stages; checking for leaks; taking appropriate test readings; adjusting appropriate components to give required operating conditions)
23. how to determine pressure settings, and their effect on the system
24. how to display/record test results, and the documentation used
25. how to interpret the test readings obtained, and the significance of the readings gained
26. the importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits
27. 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
28. the problems associated with the fluid power assembly and testing activity, and how they can be overcome
29. when to act on your own initiative and when to seek help and advice from others
30. the importance of leaving the work area in a safe and clean condition on completion of the assembly activities (such as returning hand tools and test equipment to is designated location, cleaning the work area, and removing and disposing of waste)

Scope/range related to performance criteria

1.

Carry out **all** of the following during the assembly of the fluid power system:

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, assembly drawings and procedures
1.4 check that assembly tools and test instruments to be used are within calibration date and are in a safe and usable condition
1.5 ensure that the fluid power 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 assembly activities

2.

Assemble **one** of the following types of fluid power system:

2.1 pneumatic
2.2 hydraulic
2.3 vacuum

3.

Produce fluid power assemblies that contain a range of components, including **all** of the following:

3.1 rigid pipework
3.2 hoses
3.3 valves
3.4 cylinders/actuators

Plus **six** more from the following:

5. pumps
6. lubricators
7. switches
8. bearings
9. compressors
10. pressure intensifiers
11. sensors
12. cables and wires
13. accumulators
14. regulators
15. receivers

16. gaskets and seals
17. reservoirs/storage devices
18. gauges/indicators
19. filters
20. motors
21. coolers
22. timers
23. other specific components

1.

Apply fluid power assembly methods and techniques to include **all** of the following:

1.1 checking components for serviceability
1.2 applying screw fastener locking devices
1.3 positioning equipment/components
1.4 tightening fastenings to the required torque
1.5 aligning pipework and connections
1.6 applying hose/cable clips and fasteners
1.7 dressing and securing pipes and hoses
1.8 making de-energised checks before filling and/or pressurising the system
1.9 setting, aligning and adjusting system components
1.10 securing by using mechanical fixings

2.

Carry out quality checks, to include **all** of the following, using appropriate equipment:

2.1 the system is complete, as per specification
2.2 connections to components are tightened to the required torque
2.3 dimensions are within specification requirements
2.4 components are correctly positioned
2.5 pipework is free from ripple and creases
2.6 components are correctly aligned
2.7 electrical connections are correctly made (where applicable)
2.8 direction and flow indicators on components are correct
2.9 components are securely held in place

3.

Carry out tests and adjustments on the assembled system, to include:

3.1 leak test

Plus **one** more from the following:

2. pressure line pressure tests
3. speed
4. return line pressure test
5. sequence

6. flow
7. operational performance
8. contamination

1.

Carry out **all** of the following checks to ensure the accuracy and quality of the tests carried out:

1.1 the test equipment is correctly calibrated
1.2 the test equipment used is appropriate for the tests being carried out
1.3 test procedures used are as recommended in the appropriate specifications
1.4 test readings are taken at the appropriate points, and where appropriate components are adjusted to give the required readings
1.5 test equipment is operated within its specification range

2.

Produce fluid power assemblies which meet **all** of the following:

2.1 all components are correctly assembled and aligned, in accordance with the specification
2.2 moving parts are correctly adjusted and have appropriate clearances
2.3 the system functions in line with the specification requirements
2.4 the system is leak free

Behaviours

Additional Information

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

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