

## Installing marine pneumatic systems and equipment

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### Overview

This standard identifies the competences you need to install marine pneumatic systems and equipment, in accordance with approved procedures. It includes air start systems, air-to-weapon systems, breathing apparatus panels, wave-guide supplies, reducers, isolating valves, air operated valves, pneumatic controls, compressors, strainers, filters, driers and tank instrumentation. You will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the components to be installed.

The pneumatic components to be installed will include items such as pipework, control valves, portable cylinders, fixed reservoirs, actuating mechanisms, mechanical and electrical controls and safety devices. The installation activities will include making all necessary checks and adjustments, to ensure that components are correctly positioned and aligned, have appropriate travel and/or working clearances, are tightened to the correct torque and that they function as per the specification.

Your responsibilities will require you to comply with organisational policy and procedures for the installation activities undertaken and to report any problems with these activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will ensure that all tools, equipment and materials used in the installation are correctly accounted for on completion of the activities and that all necessary job/task documentation is completed accurately and legibly. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out. \*\*

Your underpinning knowledge will provide a good understanding of your work and will provide an informed approach to applying marine pneumatic installation procedures. You will understand the marine pneumatic system and its application and will know about the components, tools and equipment used in the installation requirements, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the completed installation is to the required specification.

You will understand the safety precautions required when carrying out the pneumatic installation operations. You will be required to demonstrate safe working practices throughout and will understand the responsibility you owe to yourself and others in the workplace, both ashore and afloat.

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### Performance criteria

#### You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow all relevant drawings and specifications for the installation being carried out
3. use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition
4. install, position and secure the equipment and components in accordance with the specification
5. ensure that all necessary connections to the equipment are complete
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. check that the installation is complete and that all components are free from damage
8. complete relevant documentation in line with organisational procedures

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## Knowledge and understanding

## You need to know and understand:

1. the specific safety practices and procedures that you need to observe when installing marine pneumatic systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the procedures to be carried out before starting work on the installation (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements)
3. the hazards associated with installing marine pneumatic systems and with the tools, materials and equipment used and how they can be minimised (such as pressurised systems, moving mechanisms)
4. the health and safety requirements of the work area where you are carrying out the installation activities and the responsibility they place on you
5. how to recognise and deal with emergencies and the procedures to be followed (such as methods of safely evacuating and closing down of compartments in the case of fire or other major incident, first aid, fire fighting and resuscitation of personnel)
6. the protective equipment that you need to use for both personal protection (PPE) and protection of the newly installed equipment
7. the interpretation of drawings, standards, quality control procedures and specifications used for the installation, (including BS and ISO mechanical schematics, symbols and terminology used in marine pneumatic systems)
8. how to carry out currency/issue checks of the specifications you are working with
9. methods of marking out the site for positioning the equipment and the tools and equipment used
10. the basic principle of operation of the pneumatic circuit being installed and the function of the various components being installed within the system
11. the different types of pneumatic pipework, hoses, fittings and manifolds and their application
12. the identification and application of different types of valves (such as reducers, pressure regulators, directional control)
13. the identification and application of different types of sensors and actuators (such as rotary, linear, mechanical, electrical)
14. the identification and application of different types of cylinders (such as single acting, double acting)
15. the identification and application of different types of compressors (such as centrifugal and reciprocating)
16. the application and fitting of static and dynamic seals
17. the various mechanical fasteners that will be used and their method of installation (including threaded fasteners, special securing and

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- locking devices, torque loading requirements)
- 18. the techniques used to position, align, adjust and secure the components and pipes without damage
- 19. methods of lifting, handling and supporting the components/equipment during the installation activities
- 20. the tools and equipment used in the installation activities and their calibration/care and control procedures
- 21. how to make pipe bends using fittings and by hand bending, using approved forming equipment
- 22. elimination of stress on pipe-work/connections and the importance of supporting the pipe at suitable intervals
- 23. the use of seals, sealant, adhesives and anti-electrolysis barriers and the precautions to be taken
- 24. why electrical bonding is critical and why it must be both mechanically and electrically secure
- 25. the quality control procedures to be followed during the installation operations
- 26. how to conduct any necessary checks to ensure the pneumatic system integrity, functionality, accuracy and quality of the installation
- 27. the problems that can occur with the installation operations and how these can be overcome
- 28. how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners and damage)
- 29. recognition of contaminants and the problems they can create; the effects and likely symptoms of contamination in the system
- 30. the importance of ensuring that the completed installation is to the category of cleanliness prescribed and that any exposed components or pipe ends are correctly covered/protected and warning notices are fitted
- 31. the procedure for the safe disposal of waste materials
- 32. the recording documentation to be completed for the activities undertaken and where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation
- 33. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

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### Scope/range related to performance criteria

1. Carry out **all** of the following during the installation of the marine pneumatic system:
  1. use the correct issue of marine installation drawings and planning documentation
  2. use copies of relevant COSHH sheets, risk assessment and marine standards
  3. check the calibration dates of tools and test equipment to be used
  4. obtain clearance to work on the vessel/system and observe the power isolation and safety procedures
  5. return all tools and equipment to the correct location on completion of the activities
  6. leave the work area in a safe condition and to the prescribed category of cleanliness
2. Install marine pneumatic systems and equipment for **one** of the following:
  1. machinery air start
  2. weapons or radar air supply
  3. breathing apparatus air supply
  4. instrumentation air supply
  5. high pressure (HP) air ring main
  6. low pressure (LP) air ring main
3. Install marine pneumatic components, including **twelve** of the following:
  1. compressor
  2. reservoirs/receivers
  3. accumulators
  4. drier
  5. rigid pipework
  6. hoses
  7. cylinders/actuating mechanisms
  8. control valves
  9. isolating valves
  10. safety devices
  11. reducers
  12. unloading devices
  13. strainer
  14. filter
  15. gauges

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16. seals
17. air operated valve
18. pumps (where incorporated in compressor)
19. mechanical controls (such as plungers, springs, rollers)
20. electrical controls (such as solenoids, motors, pressure switches)

4. Use **twelve** the following installation methods and techniques:

1. marking/setting out of locating and securing positions
2. preparing holes (such as drilling, cleaning out threads)
3. positioning equipment/components
4. levelling and aligning pipework and connections
5. assembly/connection of components or sub-assemblies
6. dress and secure piping and hoses
7. setting and adjusting equipment
8. torque setting and locking fasteners
9. earth bonding
10. making flexible hose connections
11. making pipe connections
12. compressor coupling
13. lifting and handling
14. connecting wires and cables
15. setting travel or working clearance
16. securing by using mechanical fixings
17. securing by using adhesives
18. joining and sealing
19. applying screw fastening locking devices
20. ensuring the system cleanliness (such as covering exposed pipe ends/components)

5. Use **six** of the following types of fasteners and securing devices:

1. swing bolts
2. screws
3. dowels
4. quick-release fasteners
5. studs with nuts
6. wing nuts
7. bolts
8. flexible bellows
9. locking devices (such as split, parallel, clevis or taper pin)
10. keys/keyways (such as slotted, semi-circular, woodruff, taper)

6. Produce installations which comply with **one** of the following standards:

1. BS or ISO standards and procedures
2. customer (contractual) standards and requirements

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3. company standards and procedures
  4. specific system requirements
  5. recognised compliance agency/body's standards
  6. other accepted international standards
7. Complete the relevant documentation in line with organisational procedures, to include **one** from the following and pass it to the appropriate people:
1. installation records
  2. acceptance documentation
  3. work authorisation documents
  4. job cards
  5. time sheets
  6. system log
  7. other specific recording method

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### Behaviours

#### **Behaviours:**

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



## Installing marine pneumatic systems and equipment

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