SEMAUT3063

Removing and refitting braking systems on motorsport vehicles

Overview

This standard identifies the competencies you need to carry out the removal and refitting of motorsport vehicle braking systems, such as master cylinders, hard lines, callipers, handbrake mechanisms, flexible hoses, pedals, brake linings, data sensors and `lifed' components, in accordance with approved procedures.

It covers a range of motorsport vehicles such as single seater, rallying, sports cars, karts, historic and other specific approved competition vehicles. The removal and refitting methods and techniques will include dismantling the equipment to sub-assembly and component level, protecting exposed components, checking components for serviceability, making mechanical and electrical connections, setting, aligning and adjusting refitted components, tightening fasteners to the required torque, and replenishing fluids.

On completion of the removal and refitting activities, you will be required to carry out a range of final checks, tests and adjustments, such as pressure checking the system for potential fluid leaks, checking electrical looms for correct routeing and security for prevention of wear and chafing, checking hoses and pipework for correct routing and security for prevention of wear and chafing, adjusting brake balance to correct position, checking `float' between discs and bells to ensure that it is to correct specification, ensuring that hydraulic fluid is of the correct specification and set to the desired level in the reservoir, ensuring that the pedal position is adjusted to the correct setting, and ensuring that the brake linings are marked and measured before use.

Your responsibilities will require you to comply with organisational policy and procedures for the removal and refitting activities undertaken, and to report any problems with these activities that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used 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 as a member of a team, 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. Where team working is involved, you must demonstrate a

significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying the appropriate removal and refitting techniques and procedures to motorsport vehicle braking systems. You will understand the removal and refitting methods and procedures, and their application. You will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the removal and refitting activities, correcting faults and ensuring that the equipment is replaced to the required standard. You will also have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out the refitting activities.

You will understand the safety precautions required when working on motorsport vehicles, especially those for isolating the equipment. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

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 the relevant instructions, vehicle manuals and publications to carry out the required work
3. remove and refit the components in their correct positions using appropriate methods and techniques
4. take suitable precautions to prevent damage to components and surrounding structure
5. ensure that the removed components are clean and free from dirt, oil and debris, and that they are in a usable condition, prior to being refitted and tested
6. replace and secure the components, using the specified connectors and securing devices
7. check that all operations have been completed, and that the finished assembly meets the required specification
8. label and store components that require repair or overhaul
9. deal promptly and effectively with problems within your control and report those that cannot be solved
10. ensure that work records are completed, stored securely and available to others as per organisational requirements
11. leave the work area in a safe condition on completion of the activities, as per organisational and legal requirements

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
4. the personal protective equipment and clothing (PPE) to be worn during the activities
5. the procedures for obtaining the various types of manual/drawing, job instructions and specifications that are used during the removal and refitting of braking systems to motorsport vehicles, and how to interpret them correctly
6. how to identify the different types of motorsport vehicle braking systems and the components used
7. the removal and refitting methods and procedures to be used, and the importance of adhering to these procedures
8. how the components are to be aligned and positioned prior to securing, and the tools and equipment that are used (including jigs and fixtures)
9. the various mechanical fasteners and other components that are used (threaded fasteners and studs, banjo fittings, `t' and bulkhead fittings, and other specialised fasteners)
10. the application of greases, sealants and adhesives within the removal and refitting activities, and the precautions that must be taken when working with them
11. the company `lifing' procedure for components, to meet the team's requirements
12. the operational function of the various motorsport braking system components
13. the use of torque wrenches, and the importance of ensuring that fasteners are adjusted to the required settings
14. how to charge the braking system with fluid and carry out the brake bleeding activities (to include the use of brake bleeding/setting equipment)
15. how to set and adjust brake balance systems, and the equipment that is used for the activities

16.
the consumables, tools and equipment used for removal and refitting of the braking systems to the vehicle
17.
the importance of using the specified fasteners for the removal and refitting of motorsport vehicle braking systems, and why you must not use substitutes
18. how to deal with components or fastening devices that are incorrectly fitted, damaged or have other faults
19. the quality control procedures to be followed during the removal and refitting activities
20. the various tests, checks and adjustments to be carried out on completion of the brake system refitting activities
21. how to recognise defects (incorrect removal and refitting, ineffective fasteners, component damage, fluid leaks)
22. the importance of ensuring that the completed assembly is free from blanked-off hoses or foreign objects
23. the importance of ensuring that brake fluids are of the correct type and do not come into contact with brake linings/pads or any part of the vehicle paintwork
24. how to check that the tools and equipment to be used are correctly calibrated, and are in a safe, tested and serviceable condition
25. the importance of ensuring that all tools are used correctly, checked and stored after use
26. problems with the removal and refitting operations, and the importance of informing appropriate people of non-conformances
27. the recording documentation to be completed for the activities undertaken
28. the procedure for the safe disposal of waste materials, scrap components, oils and fluids
29. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve
30. how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1.

Carry out all of the following during the removal and refitting of the motorsport vehicle braking systems:

1.1 plan the removal and refitting activities prior to beginning the work
1.2 obtain and use the appropriate documentation (such as job instructions, assembly drawings, manuals, quality control documentation)
1.3 adhere to procedures or systems in place for risk assessment, hazardous substances, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
1.4 provide safe access and working arrangements for the working area, and ensure that any appropriate environmental conditions can be met
1.5 ensure that the work area is suitably prepared for the removal and refitting activities to take place
1.6 obtain approval to carry out the brake removal and refitting activities
1.7 position and secure the vehicle, using the correct equipment
1.8 ensure that any required consumables are available
1.9 leave the work area in a safe condition and free from foreign object debris
1.10 return all tools and equipment to the correct location on completion of the activities

2.

Remove and refit components on one of the following types of motorsport vehicle:

2.1 single seater
2.2 karts
2.3 historic vehicles
2.4 rallying
2.5 sports cars
2.6 other specific approved competition vehicles

3.

Use appropriate methods and techniques to remove and refit braking systems, to include all of the following:

3.1 removing wheels, cooling ducts, blanking and bodywork
3.2 making an initial judgment of the condition of the braking system (such as damage, missing components)
3.3 setting, aligning and adjusting replaced components
3.4 disconnecting electrical connections (where appropriate)
3.5 making mechanical connections and tightening fastenings to the required torque
3.6 disconnecting hoses and pipework, and protecting exposed hose/pipes and components
3.7 making electrical connections (where appropriate)
3.8 dismantling the system to an appropriate level

3.9 supporting items of equipment to be removed
3.10 re-assembling braking system components
3.11 refitting hydraulic hoses and wiring looms, following the correct routeing
3.12 marking and labelling components to aid reassembly
3.13 checking components for serviceability
3.14 replenishing fluids and bleeding individual braking systems
3.15 replacing all 'lifed' items (such as pads, seals, gaskets
3.16 replacing damaged/defective components
3.17 refitting wheels, cooling ducts, blanking and bodywork

4.

Use four of the following during the removal and refitting activities:

4.1 jigs
4.2 specialist tools
4.3 flaring tools
4.4 fixtures
4.5 torque wrenches
4.6 fluid filling devices
4.7 hand tools
4.8 measuring equipment
4.9 bleeding devices

5.

Remove and refit eight of the following motorsport braking system components:

5.1 master cylinders
5.2 flexible hoses
5.3 brake balance bars
5.4 reservoirs
5.5 wheel cylinders
5.6 pedals
5.7 brake balance cables
5.8 brake ducts
5.9 hard lines
5.10 brake linings/pads
5.11 brake discs/drums
5.12 brake bells
5.13 callipers
5.14 data sensors
5.15 pressure equalising units
5.16 servo units
5.17 handbrake mechanisms

6.

Carry out final checks and adjustments on the refitted braking system, to include ten of the following:

6.1 checking that all brake components are free from foreign objects, dirt or other contamination
6.2 checking that the brake assembly is complete and complies to specification

6.3 checking that all mechanical fixings are secure and have been `torqued' to specification and, where appropriate, that bolt locking devices are fitted
6.4 checking electrical looms for correct routeing and security for prevention of wear and chafing
6.5 checking hoses and pipework for correct routeing and security for prevention of wear and chafing
6.6 pressure checking the system for potential fluid leaks
6.7 adjusting brake balance to correct position
6.8 checking `float' between discs and bells to ensure it is to correct specification
6.9 ensuring that hydraulic fluid is of the correct specification and set to the desired level in the reservoir
6.10 ensuring that the system is free from air, and that the pedal position is adjusted to the correct setting
6.11 ensuring that brake linings are marked and measured before use
6.12 carrying out other specific tests

7.

Check removal and refit of motorsport vehicle braking systems complies with one of the following:

7.1 race associations
7.2 vehicle manufacturer's specification
7.3 team/company standards and procedures
7.4 specific vehicle requirements

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