

LANLEO11 - SQA Unit Code F9GV 04

Service and repair engines on land-based equipment



Overview

This standard covers the construction and operating principles of two-stroke and four-stroke spark ignition and compression ignition engines and their configurations. It includes the identification and function of components, removal and replacement of engine assemblies and components and the dismantling, repairing and reassembly methods and techniques.

This standard covers engine systems and performance bringing in the systems used to deliver the fuel (including carburettors and injection systems) and air supplied by inlet manifolds or pressure charged intake systems as well as air required in an engine combustion process, the types, construction and function of the components.

It also includes the techniques used to diagnosis and rectify mechanical engine faults and the process used to verify measurements, (e.g. piston ring gapping, cylinder, liner, taper, ovality, end-float, piston/head clearances, valve, guide, seat, train, operating system, cylinder head and ancillary components, compression, fuel and oil consumption).

This standard also covers the procedures and practices used to perform the following:

1. Recondition cylinder heads and valve train assembly
2. Remove and refit pistons, rings and liner assemblies
3. Engine component timing e.g. camshaft, balancer
4. Crankshaft remove and replacement

This standard is for those who work under the supervision of a more competent person.

Performance criteria

- You must be able to:*
- P1 remove and replace engine and/or components from vehicles and machines
 - P2 where applicable dismantle, repair and reinstate engine system components to manufacturer's specifications and standards, e.g.
 - P2.1 carburettors
 - P2.2 spark plugs
 - P2.3 injection pumps
 - P2.4 fuel delivery pumps
 - P2.5 injectors
 - P2.6 governors
 - P2.7 cold start aids
 - P2.8 air filtration systems
 - P2.9 exhaust systems
 - P2.10 turbo and superchargers
 - P3 dismantle, repair and reinstate engines and/or components to manufacturers' specifications and standards, e.g.
 - P3.1 recondition cylinder heads and valve train assembly
 - P3.2 pistons, rings and liner assemblies
 - P3.3 engine component timing, e.g. camshaft, balancer
 - P3.4 crankshaft
 - P4 test and set static and dynamic injection and ignition timing
 - P5 carry out engine specific measuring tasks, e.g.
 - P5.1 piston ring gapping
 - P5.2 cylinder, liner, taper, ovality and protrusion
 - P5.3 crankshaft journal ovality and end-float
 - P5.4 piston/head clearances
 - P5.5 valve, guide, seat, train, operating system
 - P5.6 cylinder head distortion
 - P6 identify direct and indirect fuel injection systems
 - P7 determine appropriate firing order for multi-cylinder engines
 - P8 adjust engine performance within specified operating limits
 - P9 identify and rectify engine system faults

Knowledge and understanding

You need to know and understand:

- K1 how to remove and replace engine and/or components
- K2 how to dismantle, repair and reinstate engines and/or components to manufacturers' specifications and standards (excluding fuel, induction and exhaust systems)
- K3 the types, construction and operating principles of engines and components, e.g.
 - K3.1 two-stroke and four-stroke spark ignition and compression ignition engines and their configurations
 - K3.2 air cooled and water cooled
 - K3.3 wet and dry liners, monoblock
 - K3.4 naturally aspirated and pressure charged (to include turbo compounding and supercharging)
 - K3.5 balancers and vibration suppression
 - K3.6 carburettors
 - K3.7 spark plugs
 - K3.8 injection pumps
 - K3.9 fuel delivery pumps
 - K3.10 injectors
 - K3.11 governors
 - K3.12 cold start aids
 - K3.13 air filtration systems
 - K3.14 exhaust systems
- K4 how to identify and rectify the cause of engine problems, e.g.
 - K4.1 engine performance
 - K4.2 misfire
 - K4.3 backfire
 - K4.4 engine oil pressure
 - K4.5 overheating
 - K4.6 seizure
 - K4.7 abnormal noise
 - K4.8 non starting
 - K4.9 excessive crank case breathing
 - K4.10 oil consumption
 - K4.11 fuel delivery and system pressures
 - K4.12 air intake charge pressures
 - K4.13 abnormal fuel usage,
 - K4.14 injection, camshaft and ignition timing
 - K4.15 emissions, e.g. blue, white or black smoke
 - K4.16 engine performance not in accordance with manufacturers' specifications
 - K4.17 weak and rich fuel mixtures

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- K4.18 restricted intake and exhaust air flow
- K4.19 verifying governor operation
- K4.20 operation of cold start devices
- K5 the methods and techniques of taking engine specific measurements
 - K5.1 piston ring gapping
 - K5.2 cylinder, liner, taper, ovality and protrusion
 - K5.3 crankshaft journal ovality and end-float
 - K5.4 piston/head clearances
 - K5.5 valve, guide, seat, train, operating system
 - K5.6 cylinder head and ancillary components
- K6 the methods of sealing combustion chambers, fuel and ignition systems
- K7 the effects of moisture and contaminants in fuel and ignition systems
- K8 the effects of enhancements in fuel and ignition systems
- K9 engine running in procedures
- K10 engine starting and stopping procedures
- K11 the causes of excessive engine wear

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