Specification of Competency Standards
for the Automotive Industry
Unit of Competency

Functional Area - Vehicle Servicing

Title	Master complicated techniques of power systems
Code	108733L4
Range	This unit of competency is applicable to the technicians working at vehicle servicing and inspection departments. Practitioners should be able to obtain thorough understanding of the operating principles of various types of power systems and their impact on power output and fuel consumption to inspect and diagnose complicated system faults with enhanced efficiency and accuracy.
Level	4
Credit	9 （For Reference Only）
Competency	Performance Requirements 1. Knowledge (Power generation of internal combustion engines) • Fuel: o Good understanding of the characteristics of different fuels (e.g. petrol, diesel, liquefied petroleum gas, natural gas and hydrogen.) including heating value, combustibility, anti-knock property, boiling point and combustion temperature. o Good understanding of related sciences of chemistry, fluid and heat, including basic knowledge in safety aspect o The principle of power generation o Master the requirements and processes of combustion for different fuels performing in the internal combustion engines; and understand the factors affecting combustion efficiency and heat releasing rate o Good understanding of the methods and process of power generation by internal combustion engines o Good understanding of the factors affecting engine power output o Master the relation between engine setting and relevant specification, such as capacity, compression ratio, intake efficiency, engine speed, quantity of mixture, mean effective pressure, power and revolving resistance, etc. o Good understanding of the methods to increase engine power output and their application limits, such as breathing efficiency, ignition and fuel injection timings • Engine design: o Master the structure, materials and functions of various components o Good understanding of the configuration of various movable components and the principle of dynamic balance o Good understanding of the principles of devices enhancing breathing efficiency, such as variable intake and exhaust tracts lengths, variable valve timing and lift, matching of pressure charging system with engine o Good understanding of the principles of engine working temperature control and reduction of movable components wear o Good understanding of the principle of fuel metering for various types of engines, so as to optimise power output and comply with the requirements of exhaust emission o Master the basic principles of controlling or treatment of engine pollutants, such as exhaust gas recirculation and catalytic devices, etc. • Power system o Good understanding of the structure, functions, controlling methods, operating principles and specifications of engine and various sub systems (including related components), such as closed-loop control, electronic fuel-injection and ignition as well as intake and exhaust

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	○ Master the integrated electronic control principles and the operating characteristics of various sub systems 2. Performance (Inspection, fault diagnosis and analysis of the performance of power systems) • Conduct analysis procedures according to diagnostic results of the various engine sub systems and related components, such as: ○ Conductivity and insulation of control circuits ○ Electronic actuation and feedback signals ○ The operating condition of electronic control devices and actuators ○ The output signals of sensors ○ Pressure variations of cylinders, intake and exhaust systems ○ Operating pressure of fuels and lubricants. • Conduct inspection, fault diagnosis and analysis procedures according to the fault symptoms (including recurrent or intermittent defects) of various types of engines, their sub systems and related components, such as: ○ Stall or fail to start ○ Insufficient power or weak acceleration ○ Abnormal pressure charging (only applicable to pressure charged engines) ○ Rough engine running or abnormal speed ○ Excessive fuel consumption ○ Abnormal engine operating temperature ○ Abnormal wear of engine components ○ Occurrence of unusual noise (including detonation) or vibration. ○ Excessive emission of pollutants • Review the causes of defects and diagnostic methods; submit report to seniors covering preventive measures, instructions on inspection and maintenance as well as suggestions for improvement.
Assessment Criteria	The integrated outcome requirements of this unit of competency are that the practitioner being assessed shall prove that he/she is: • Capable of obtaining a thorough understanding of the structure, functions and operating principles of various types of power systems, including engines, their sub systems and related components, so as to enhance the efficiency and accuracy of inspection and diagnosis of complicated system faults; • Familiar with the principles of power generation by internal combustion engines, and understand the impact of factors such as efficiencies of intake, exhaust and combustion, etc. on the performance of power output to solve the complicated technical problems, such as excessive fuel consumption and emission of pollutants, effectively and accurately; and • Capable of compiling reports covering preventive measures, instructions on inspection and maintenance as well as providing suggestions for improvement, in accordance with the specific defects found in respective power systems.
Remark	The credit for this competency unit assumes that the practitioner already has acquired extensive knowledge of automotive, vehicle repair and testing procedures.