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**Overview**

This standard is about diagnosing and rectifying faults occurring within lift truck gearboxes (hydrostatic, automatic or powershift types), hubs and bearings, driveline shafts, differentials and final drive units.

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**Performance****criteria**

- You must be able to:
- P1 wear suitable personal protective equipment throughout all diagnostic methods and rectification activities
  - P2 support the identification of faults, by reviewing lift truck:
    - P2.1 technical data
    - P2.2 diagnostic test procedures
  - P3 prepare, connect and test all the required equipment following manufacturers' instructions prior to use
  - P4 use diagnostic methods which are relevant to the symptoms presented
  - P5 collect diagnostic information in a systematic way relevant to the diagnostic methods used
  - P6 collect sufficient diagnostic information to enable an accurate diagnosis of transmission and driveline system faults
  - P7 identify and record any system deviation from acceptable limits accurately
  - P8 ensure your assessment of dismantled sub-assemblies, components and units identifies their condition and suitability for repair or replacement, accurately
  - P9 promptly inform the relevant person(s) ~~promptly~~ where repairs are uneconomic or unsatisfactory to perform
  - P10 use the equipment required correctly and safely throughout all rectification activities
  - P11 carry out all rectification activities following:
    - P11.1 manufacturers' instructions
    - P11.2 your workplace procedures
    - P11.3 health and safety requirements.
  - P12 work in a way which minimises the risk of :
    - P12.1 damage to other lift truck systems
    - P12.2 damage to other components and units
    - P12.3 injury to yourself and others
    - P12.4 contact with hazardous substances
    - P12.5 instability when working on the lift truck
  - P13 ensure all repaired and replaced components and units conform to the lift truck operations specification and any legal requirements

- P14 adjust components and units correctly to ensure that they operate to meet system requirements, when necessary
- P15 promptly record and report any additional faults you notice during the course of work ~~promptly~~
- P16 use testing methods which are suitable for assessing the performance of the system rectified
- P17 ensure the transmission and driveline system rectified performs to the lift truck operating specification and any legal requirements prior to return to the customer
- P18 ensure your records are accurate, complete and promptly passed to the relevant person(s) ~~promptly~~ in the format required
- P19 complete all system diagnostic activities within the agreed timescale
- P20 promptly report any anticipated delays in completion to the relevant person(s) in authority ~~promptly~~

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**Knowledge and understanding**

You need to know and understand:

**Legislative and organisational requirements and procedures**

- K1 the health and safety legislation and workplace procedures relevant to diagnosing and rectifying driveline faults including PPE
- K2 legal requirements relating to the lift truck
- K3 your workplace procedures for:
  - K3.1 recording fault location and correction activities
  - K3.2 reporting the results of tests
  - K3.3 the referral of problems
  - K3.4 reporting delays to the completion of work
- K4 the importance of working to recognised diagnostic procedures and processes and obtaining the correct information for diagnostic activities to proceed
- K5 the importance and purpose of recording diagnostic and rectification activities
- K6 the importance of working to agreed timescales and keeping others informed of progress
- K7 the relationship between time, costs and profitability
- K8 the importance of promptly reporting anticipated delays to the relevant person(s) in authority promptly

**Electrical and electronic principles**

- K9 electrical and electronic principles associated with transmission and driveline systems, including types of sensors and actuators, their application and operation
- K10 how electrical and electronic transmission and driveline systems operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles
- K11 the interaction between electrical, electronic and mechanical components within lift truck transmission and driveline systems
- K12 how transmission and driveline electrical systems interlink and interact, including multiplexing
- K13 electric, units, terms and schematics
- K14 electrical safety procedures

**Use of diagnostic and rectification equipment**

- K15 how to prepare and test the accuracy of diagnostic testing equipment
- K16 how to use diagnostic and rectification equipment for transmission and driveline mechanical, electrical, hydraulic and fluid systems, specialist repair tools and general workshop equipment

**Transmission and driveline faults, their diagnosis and correction**

- K17 how transmission and driveline mechanical, electrical, electronic and hydraulic and fluid systems are constructed, dismantled, reassembled and operate
- K18 the types and causes of transmission and driveline mechanical, electrical, electronic and hydraulic and fluid system, component and unit faults and failures
- K19 transmission and driveline mechanical, electrical and hydraulic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action
- K20 how to find, interpret and use sources of information on transmission and driveline electrical operating specifications, diagnostic test procedures, repair procedures and legal requirements
- K21 lift truck operating specifications for limits, fits and tolerances relating to transmission and driveline mechanical, electrical, electronic and hydraulic and fluid systems for the lift truck(s) on which you work
- K22 how to select the most appropriate diagnostic testing method for the symptoms presented
- K23 how to carry out systematic diagnostic testing of transmission and driveline mechanical, electrical and electronic, hydraulic and fluid systems using a prescribed process or format
- K24 how to assess the condition evident within transmission and driveline mechanical, electrical, electronic, hydraulic and fluid components and units
- K25 how to interpret test results and lift truck data in order to identify the location and cause of lift truck system faults
- K26 how to carry out the rectification activities listed in the Scope for this standard in order to correct faults in the transmission and driveline mechanical, electrical, electronic and hydraulic and fluid systems

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- K27 the relationship between test methodology and the faults repaired – the use of appropriate testing methods
  - K28 how to make cost effective recommendations for rectification

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**Scope/range**

- 1. Transmission and driveline systems** include:
  - 1.1. gearbox
  - 1.2. hubs and bearing
  - 1.3. driveline shafts
  - 1.4. torque converter
  - 1.5. final drive assembly
  
- 2. Diagnostic methods** include:
  - 2.1. measurements
  - 2.2. functional testing
  - 2.3. pressure
  - 2.4. electrical and electronic systems testing
  
- 3. Equipment** includes:
  - 3.1. diagnostic and rectification equipment for transmission
  - 3.2. mechanical systems
  - 3.3. diagnostic and rectification equipment for transmission electrical systems
  - 3.4. diagnostic and rectification equipment for transmission hydraulic and fluid systems
  - 3.5. specialist repair tools
  - 3.6. general workshop equipment
  
- 4. Faults** can be:
  - 4.1. mechanical
  - 4.2. electrical and electronic
  - 4.3. hydraulic and fluid

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**Glossary**

**Diagnostic Testing is defined as:**

- verify the fault
- collect further information
- evaluate the evidence
- carry out further tests in a logical sequence
- rectify the problem
- check all systems

**Rectification activities are defined as:**

A suitable repair or replacement that rectifies the fault(s) identified from the diagnostic activities carried out.

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## IMILT13

### Diagnose and rectify lift truck transmission and driveline system faults



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