Thatcham Research

BULLETIN

TL934

Vehicle Headlamp Repair Guide

This guide is intended to provide best practice guidance that supports decision making throughout the repair workflow when:

- Replacing headlamps with new parts
- Replacing headlamps with used (green) parts
- Repairing headlamps
- Removing and refitting headlamps

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REPLACING HEADLAMPS WITH NEW PARTS

Table 1 provides the key factors to consider during the repair workflow when replacing headlamps with new parts:

All guidance highlighted in red should be followed with caution.

Key Factors	Best Practice
Diagnostic Procedures	**1. Pre-repair diagnostic procedures** will help to identify any accident or non accident related faults that could impact the headlamp(s) correct functionality, for example, faults with: • Ride height or sensors. • ADAS. • Control modules. • Wiring. • Electrical connectors. **2. Diagnostic Procedures** can also be required during the repair process, for example: • **Diagnostic Coding** of the headlamp(s) and / or the headlamps(s) control module(s) could be required to enable communication between the replacement headlamp(s) and the vehicle. • **Beam Pattern Diagnostic Mode** could require activation prior to correctly checking and adjusting the headlamp(s) beam pattern. • If the headlamp(s) control module(s) do not need to be replaced and are being reused, it should not be assumed that a diagnostic coding, beam pattern alignment check / adjustment procedure is not required and are being reused, a diagnostic coding, beam pattern alignment check / adjustment procedure may still be required. • **Important:** Refer to the relevant repair information to identify any diagnostic requirements. **3. Post Repair Diagnostic** Procedures should be carried out to identify any faults that could impact: • Correct functionality of the headlamps. • Correct calibration of the vehicles ADAS (when required).
ADAS Calibration	**4. ADAS Calibration** could be required to ensure that the operational parameters between a vehicle's ADAS and its headlamp(s) are functioning within tolerance. • Headlamp technologies, such as, adaptive / Matrix LED can produce intensely bright and precise light beam patterns. A vehicle's ADAS can use a variation of sensors to gain a view of the road. This view of the road is then communicated to the headlamps to make decisions on behalf of the driver, such as, adapting their light pattern when: • Approaching oncoming traffic. • Ascending / descending behind traffic. • Cornering. • Detecting hazards in or on the side of the road. **5. Important: refer to the relevant repair information to identify any ADAS calibration requirements.**
Headlamp Position	**6. Correctly positioned headlamps,** when fitted to the vehicle will ensure that the headlamps are able to operate within their parameters of tolerance. • Incorrect headlamp positioning, could result in: • **Not** being able to correctly check and adjust the headlamp's beam pattern. • **Not** being able to correctly calibrate the vehicle's ADAS (when required).
Beam Pattern Alignment	**7. Headlamps of all types** require their beam pattern alignment to be confirmed as being correct, when: • Fitting replacement headlamp(s). • Removing and refitting headlamp(s). • Any repair or modifications to the vehicle have been undertaken that could change the position of the headlamp(s). • Beam Pattern Alignment Equipment is required for all types of headlamps to: • **Check** the beam pattern alignment. **Adjust** the beam pattern alignment. • The type of beam pattern alignment equipment required will depend on headlamp technology type, for example, beam pattern alignment equipment for non adaptive, halogen and Xenon headlamps is often not suitable for adaptive, LED / Matrix headlamps.

Table 1

REPLACING HEADLAMPS WITH USED (GREEN) PARTS

Table 2 provides the key factors to consider during the repair workflow when replacing headlamps with used (green) parts:

All guidance highlighted in red should be followed with caution.

Important: Sections 1, 2, 3, 4, 5, 6, 7 from Table 1 must be referred to in addition to this table.

Key Factors	Best Practice
Use of Green Parts	**8. When making the decision** to use a green a part, it is advised to: • Use a reputable green part supplier that: • Carries out robust quality checks, damage assessment and condition grading. • Provides the appropriate warranty and returns policy. • Is certified to recognised compliance, such as the Vehicle Recyclers Association (VRA). • Ensure that the headlamp being purchased is correct for the vehicle being repaired. • Clarify service level expectations by communicating the use of green parts to both the vehicle owner and the work provider. **9. In addition to section 2 – table 1 (diagnostic procedures):** If a diagnostic coding procedure is required, it is **important** to understand: • Can the headlamp(s) and / or the control module(s) be re-coded to another vehicle? • Are additional diagnostic procedures required, such as component protection adjustment? **10. It is important** to note that a green part that's listed as being damaged may still be suitable for use. • **Caution** is required when assessing if a repair could impact the correct functionality of the headlamp(s). **Refer to Table 3 – for guidance on repairing headlamps.**

Table 2

REPAIRING HEADLAMPS

Table 3 provides the key factors to consider during the repair workflow when repairing headlamps:

All guidance highlighted in red should be followed with caution.

Important: Sections 1, 2, 3, 4, 5, 6, 7 from Table 1 must be referred to in addition to this table.

Key Factors	Best Practice
Repair over Replace Decision	**11. The decision to repair** headlamp(s) over replacing should be approached with caution. The main question we must ask ourselves when deciding to repair headlamp(s) is; could a repair impact the correct functionality of the headlamp(s)? • **Important:** Communicating a repair over replace decision to both the vehicle owner and work provider will clarify service level expectations. **12. A robust damage and repair assessment** is key to a safe, cost effective repair. It is important to research and understand: • **Safety:** The structure of the headlamp(s) could feature sacrificial headlamp mounting bracket(s), that as part of the headlamp(s) design could have a pedestrian safety function. **Refer to: Table 4 – Pedestrian Safety.** • **The extent of damage:** during a thorough inspection of the headlamp(s) condition, look for signs of: • Deformation • Fractures • Abrasions • Water/dirt ingress • Loose or misaligned internal components • **The headlamp(s) technology and features:** For example, the parameters of tolerance required for correct functionality with adaptive / matrix LED headlamps will be narrower than with halogen / Xenon non-adaptive type headlamps. • **Repair information:** Should be referred to for guidance on permitted / prohibited types of repair. • **VM approved repair parts:** Repair parts could be available from the VM, for example: • Replacement headlamp mounting bracket repair kit. • Replacement headlamp lens. • **Suitability of a repair:** If VM approved parts or repair information for permitted / prohibited types of repair are not available or suitable for the damage scenario, proceed with caution to ensure safe repair, referring to sections: 13, 14, 15, 16, 17, 18, 19, 20.
VM Approved Repair Parts: Replacement Headlamp Mounting Bracket Kits	**13. Replacement Headlamp Mounting Bracket Repair Kits** that are provided by the VM are the safest and most efficient way to repair a headlamp's broken mounting brackets. This is because they are designed to reinstate the headlamp(s) to manufactured specifications. Refer to: Table 5 – Headlamp Mounting Bracket Repair Kits. • **Important:** Follow the fitting instructions within the relevant repair information. • Fitment procedures can vary, but commonly involve: • **Removing** the remnant of the broken mounting bracket(s) from the headlamp housing to allow the new mounting bracket to align with the pre-drilled screw fixing holes. • **Installing** the fixing screws that fix the new bracket to the pre-drilled fixing screw holes in the headlamp housing, the fixing screws are usually supplied as part of the repair kit. **14. Caution must be applied to ensure a safe and efficient repair, for example:** • Remove the headlamp(s) from the vehicle to carry out the repair procedure. • To avoid damaging the pre-drilled fixing screw holes that are used to attach the replacement mounting brackets to the headlamp housing: • **Do not** over tighten the fixing screws. • **Do not** remove and reinstall the fixing screws multiple times. • **Do not** use the incorrect fixing screws. • Safeguard the headlamp(s) during the repair procedure • **Seal** any openings and electrical connectors on the headlamp(s). • **Protect** the vulnerable components of the headlamp, for example, the lens. • **Apply** soft padding to the surface of the work station.

Table 3

Key Factors	Best Practice
VM Approved Repair Parts: **Replacement Headlamp Lenses**	**15. Replacement Headlamp Lenses** supplied by the VM can be a cost effective alternative to replacing a complete headlamp assembly. • Follow the fitting instructions that are provided within the relevant repair information. • Fitment procedures will vary, caution must be applied to ensure a safe and efficient repair, for example: • Take caution when releasing the clips that fix the headlamp lens to the headlamp casing. The clips will be delicate, avoid over stretching them. • If applying heat to release an adhesive bead between headlamp lens and the headlamp housing, be careful not to damage the headlamp and its components by overheating. • When separating the lens from the headlamp housing, be careful not to damage the headlight housing. • When preparing the headlamp housing before fitting the new lens, be careful not to damage the headlamp housing when removing a sealing gasket or adhesive residue, and ensure that: • The internal areas of both the headlamp lens and the headlamp housing are clean. • Any area that requires the application of a sealing gasket or adhesive is clean prior to application. • When handling fragile electronic components, using anti static mats, tools and PPE can reduce the risk of damage caused by Electrostatic Discharge (ESD) • When Fitting the new headlamp lens to the headlamp housing, carry out the work on a soft surface to avoid damaging the new headlamp lens and ensure the correct positioning, fastening and sealing between the new headlamp lens and the headlamp housing.
Additional Repair Guidance:	**16. This additional repair guidance** is intended to support a repair over replace decision when: • VM approved repair parts are **not available** or are **not suitable** for the damage scenario. • Specific repair information that gives guidance on permitted and prohibited repairs is **not** available.
Headlamp Mounting Bracket Repair	**17. Repairing Damaged Headlamp Mounting bracket(s)** should be approached with Caution, for example: • Do not carry out repairs that could compromise any element of Pedestrian Safety. Headlamp mounting bracket(s) often feature sacrificial breaking points that are designed to break during pre determined impact loads. Refer to: Table 4 – Pedestrian Safety. • Do not carry out repairs that could drastically increase or decrease the strength of the mounting bracket(s) substrate, for example when: • Changing the thickness / profile of the mounting bracket • Using repair products that are dissimilar to the material being repaired, for example: staples, metal strips, metal mesh, plastic mesh, adhesives, dissimilar plastic. • Do not carry out repairs that could result in the headlamp's position being outside of its parameter of tolerance. **18. Recommendations** for safe and efficient headlamp mounting bracket repair include: • **Nitrogen or Hot Air Plastic Welding** is the most suitable method of repairing a broken headlamp mounting bracket, this is because the type of material being repaired can be matched with the material being used to repair: • **Ensure** the type of plastic being repaired is identified. • **Ensure** the type of plastic welding rod is suitable for the type of plastic being repaired. • **Ensure** that the settings of the plastic welding equipment are correct. The 'right first time' approach is critical for a durable repair. A test weld on a similar piece of plastic can help. • **Test** the repair for durability, a simple manual stress test will indicate whether the repair is going to be durable. • **Ensure** that the repair is pleasing to the eye, where required, the repaired area can be dressed and re-finished.
Headlamp Housing Repair	**19. Repairs to the headlamp(s) housing** are generally prohibited: • Do not repair damage that has compromised the air tight seal of the headlamp(s). • Do not repair damage that has compromised the structural integrity of the headlamp(s).
Headlamp Lens Repair	**20. Repairs to the headlamp(s) lens** need to be approached with **Caution:** • Various products are available to repair / refinish headlamp lenses: • **Caution:** Check with the product supplier to confirm that the product is suitable for headlamp(s) being repaired. • **Caution:** Refer to the relevant repair information for guidance on permitted / prohibited types of headlamp repair. • **Caution** – The sanding and buffing of a headlamp lens could compromise its: • Optical performance. • Ultra violet protective coating.

Table 3 continued

Pedestrian Safety

- Pedestrian safety elements often feature within the structure of a vehicle headlamp, such as the headlamp mounting brackets that attach the headlamp to the vehicle.
- This safety feature commonly includes perforated sacrificial break zones that are designed to break during pre-defined impact loads, such as the upper or lower leg of a pedestrian.
- **Refer to figure 1** for an example of a headlamp mounting bracket with perforated sacrificial break zone.
- For an example of headlamp pedestrian safety in action:
  See the Euro NCAP Vulnerable Road Users Safety Test for the Volkswagen ID-4 2021 video here:
  https://youtu.be/0pCeUL-GB8U?t=138

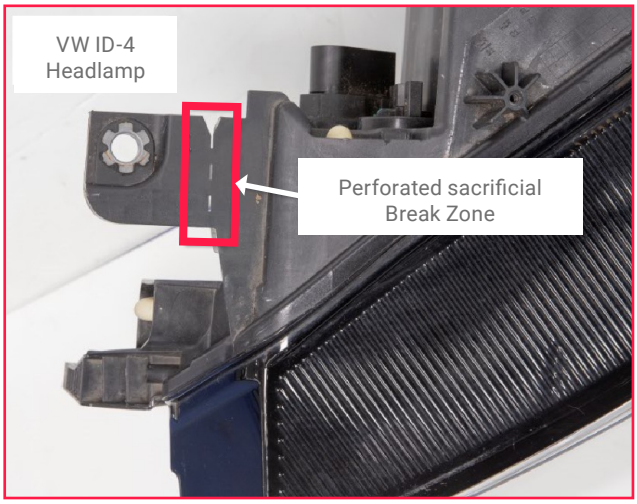

Figure 1

Headlamp Mounting Bracket Repair Kit

- Whether or not a headlamp is designed to accommodate a headlamp mounting brack repair kit can be identified via the presence of headlamp mounting repair kit fixing screw holes, as shown in **Figure 2**.
- **Caution:** Thoroughly inspect the headlamp(s) to ensure that there is no additional damage.
- **Caution:** Check the availability of the headlamp mounting bracket repair kit with the relevant VM parts supply network.
- **Caution:** Refer to the relevant repair information for:
  - Instructions to fit the repair kit.
  - Guidance on permitted / prohibited headlamp repair.

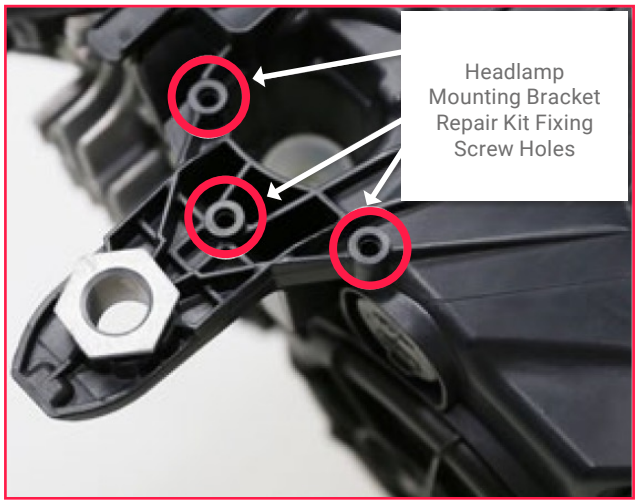

Figure 2