Caliper for PC & Light CV justification for ECE R 90
CLEPA’s POSITION

- Support of principles of safety precaution
- Draws attention of all stakeholders (Contracting Parties, Industry, Consumers, etc…) of potential risks on road safety
- Proposed solutions
Caliper justification for ECE R 90

Summary

• Scope: Spare calipers which are new and remanufactured for Passenger cars & Light commercial vehicles
• Spare parts – current situation
• Why caliper should comply to ECE R 90
• Tests current situation and proposal for future
• CLEPA Proposal
Spare parts types – Current Situation

**NEW PARTS**
- Full product liability of parts manufacturer
- Marking and stamp of parts manufacturer
- Full industrialized process to safeguard function and quality

**REMANUFACTURED PARTS**
- Full product liability of remanufacturer
- Marking and stamp of remanufacturer
- Full industrialized process to safeguard function and quality

**REPAIRED PARTS**
- No liability of original parts manufacturer
- No marking of repairer
- No process if not authorised by original parts manufacturer

**USED PARTS**
- No liability of original parts manufacturer
- No marking of dismantler
- No process of dismantler

A remanufactured part is **not** a used part.

A used part will remain a used part. However, risks for the end consumer should be avoided.
What is a Brake Caliper?

- Housing
- Piston
- Rubberparts

Guide bolt
Connection to Brake hose
Piston
Bushing
Protection cup
Protection cup groove
Sealing ring
Sealing ring groove
Housing
Why calipers (new/remanufactured) should comply to ECE R90:

- Brake calipers are parts relevant to safety. To ensure proper operation and full performance according to OE-design, spare calipers should fulfil minimum standards in terms of:
  - Correct functional dimensions (housing and main components)
  - Braking performance
  - Resistance against corrosion and brake fluid
  - Material strength and fatigue behaviour
  - Compatibility to ABS and ESP-systems

Non fulfilment of minimum standards might lead to malfunctions within the braking and safety systems.
Critical impact on end-user safety:

- Leakage inside the caliper will result in pressure loss and malfunction of the braking system.
- Insufficient piston rollback leads to malfunction of ABS and ESP systems or in worst case leads to overheating and damage of caliper, brake disc and pads.
- Failure of the parking brake might cause uncontrolled vehicle movement.
- Poor caliper efficiency due to insufficient clamping force, wrong modules of elasticity or uncontrolled material fatigue will lead to extended stopping distance or malfunction of ABS and ESP-systems.

Therefore tests, certificates or definitions are requested
Caliper justification for ECE R 90

Test for New & Remanufactured calipers:

Tests are developed and implemented during of the process from the R&D to the part delivery. A strong OE knowledge and/or a close collaboration with the car maker are essential.

We have to test the material & product during the following steps:

- The product development
- The validation of the specifications
- The production – in line
- The end of the production
- The storage
Caliper justification for ECE R 90

Test status – Current Situation:

<table>
<thead>
<tr>
<th>End of line</th>
<th>Low pressure</th>
<th>High pressure</th>
<th>Roll back</th>
<th>&amp; Others</th>
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<tr>
<th>Design verification (material, fatigue, performance &amp; others)</th>
<th>new</th>
<th>Reman</th>
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<th>process verification (performance in statistical quantity)</th>
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Caliper justification for ECE R 90

Benchmark of various remanufactured calipers

Sealing ring Ø 1mm smaller than OE-Ate ring -> marginal pressing between sealing ring and piston borehole

Used protection cup (4,6mm) Not mountable to original groove (2,5mm) -> Design mix of TRW protection cup to ATE brake system (piston)

Galvanized surface Not chromate free Flaking surface

Thread of bleeder nozzle is greased with copper paste -> CU-Ion-Reaction together with brake fluid. This can lead to accumulations in the brake system!
Fatigue life test helps to determine the life prediction of a brake caliper.

Fatigue life test for new calipers is the result of a close collaboration between the car manufacturer and the parts supplier.

A specific focus on fatigue life behavior and performance is required during the remanufacturing process.
Fatigue test results for new & reman calipers:

**Housings**
- The main design criteria for cast iron housings is stiffness. The fatigue life for reman calipers works generally well.
- For Aluminium housings the fatigue life is mandatory for both new and reman calipers.

**Carriers (Brackets)**
- The main design criteria for carriers (brackets) is fatigue life. For new & reman calipers this test is a key test.
Proposal for the Future:

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KTI
Examination of Used Automotive Parts on behalf of PARTSLIFE
Purpose

To check availability and quality of used automotive parts currently offered in the market

Examination of
- correct delivery (as ordered)
- assignment (according to preconditions regarding vehicle type and model year)
- damages during transport
- optical condition
- functionality according to parts manufacturer’s quality guidelines
- safety and environmental aspects
Test Result Used Brake Parts - Calipers

- Calipers partially damaged during transport or upon dismantling
- None of the brake lines were sealed (penetration of water)
- Parts badly maintained and dirty
- Parts from accident cars
- Operating time unclear
- Wrong assignment
Conclusions

• It was our duty, as manufacturers of new parts, to draw your attention on the potential safety risks of new & reman parts for the end-user.

• CLEPA’s proposal to reduce the risk:
  - New and reman calipers for PC & Light CV should comply with ECE R90

• Global solution favoured