



C L E P A
*European Association of
Automotive Suppliers*

Caliper for PC & Light CV justification for ECE R 90



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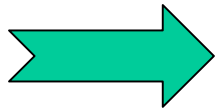
CLEPA's POSITION



Support of principles of safety precaution



Draws attention of all stakeholders
(Contracting Parties, Industry, Consumers, etc...)
of potential risks on road safety)



Proposed solutions



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 curent situation and proposal for future
- CLEPA Proposal



Spare parts types – Current Situation

NEW PARTS	REMANUFACTURED PARTS	REPAIRED PARTS	USED PARTS
<ul style="list-style-type: none">• Full product liability of parts manufacturer• Marking and stamp of parts manufacturer• Full industrialized process to safeguard function and quality	<ul style="list-style-type: none">• Full product liability of remanufacturer• Marking and stamp of remanufacturer• Full industrialized process to safeguard function and quality	<ul style="list-style-type: none">• No liability of original parts manufacturer• No marking of repairer• No process if not authorised by original parts manufacturer	<ul style="list-style-type: none">• No liability of original parts manufacturer• No marking of dismantler• No process of dismantler
↓	↓	↓	↓
NO RISK to the end consumer	NO RISK to the end consumer	RISK to the end consumer	RISK to the end consumer

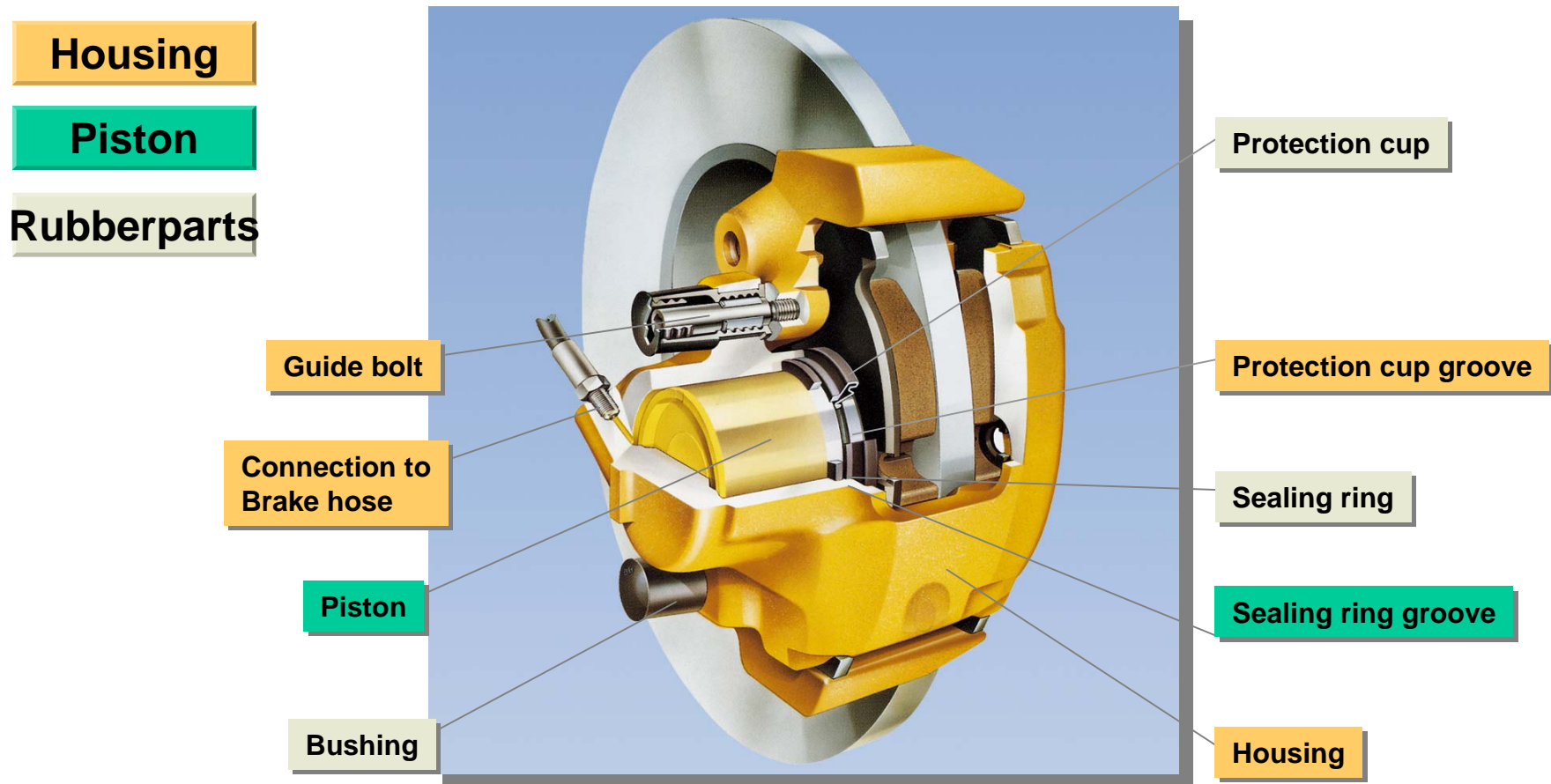
A remanufactured part is not a used part.

A used part will remain a used part. However, risks for the end consumer should be avoided



Caliper justification for ECE R 90

What is a Brake Caliper?





Caliper justification for ECE R 90

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



Caliper justification for ECE R 90

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



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



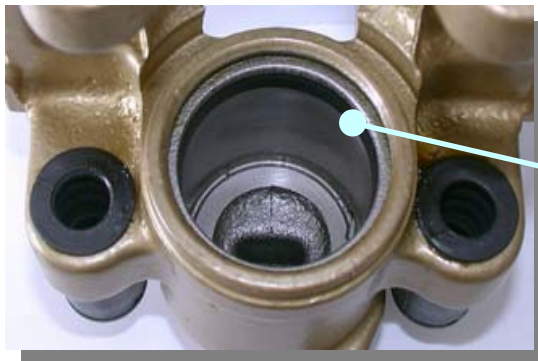
Test status – Current Situation:

		new	Reman	reused	repaired
Design verification (material, fatigue, performance & others)		X	X (?)	--	--
process verification (performance in statistical quantity)		X	X (?)	--	--
in process tests (regular repeated performance tests)		X	X (?)	--	--
End of line	Low pressure	X	X (?)	--	--
	High pressure	X	X (?)	--	--
	roll back	X	--	--	--
	& Others	X	--	--	--



Caliper justification for ECE R 90

Benchmark of various remanufactured calipers



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



Galvanized surface
Not chromate free
Flaking surface



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



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!



Caliper justification for ECE R 90

- **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**



Caliper justification for ECE R 90

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:

		New	Reman	Reuse	Repair
Design verification (material, fatigue, performance)		X	X	--	--
process verification (performance in statistical quantity)		X	X	--	--
in process tests (CoP) (regular repeated performance tests)		X	X	--	--
End of line	Low pressure	X	X	--	--
	High pressure	X	X	--	--
	roll back	X	X	--	--
	others	X	X	--	--

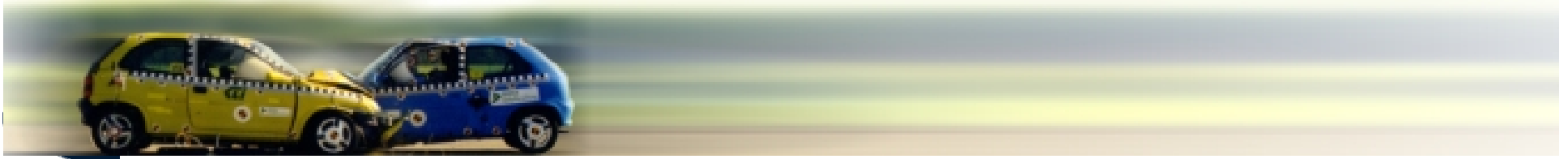


KTI

Examination of
Used Automotive Parts
on behalf of
PARTSLIFE



Kraftfahrzeugtechnisches
Institut und Karosseriewerkstätte
GmbH & Co. KG



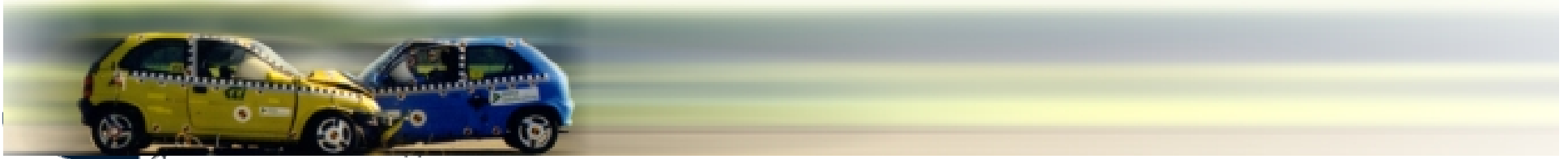
Purpose

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