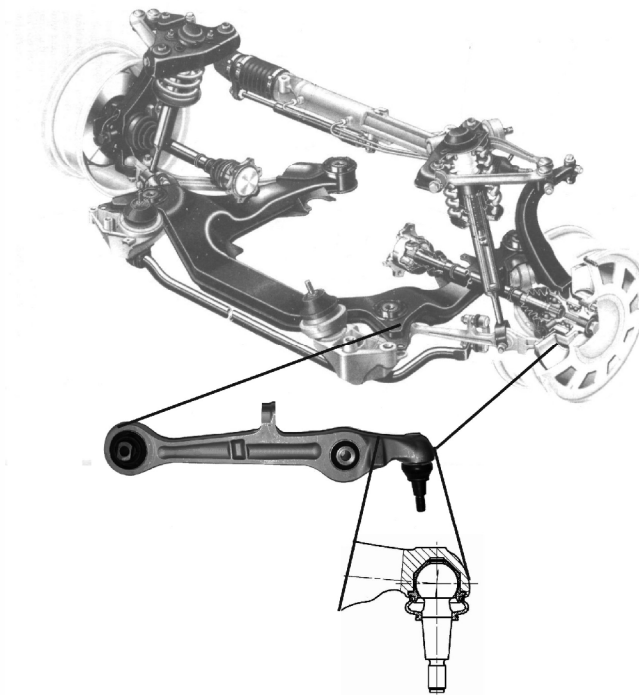


Development of Measuring Equipment for Use in a Working Load Repeatability Test under Environmental Simulation Conditions

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IAMT Group



Engineering
Simulation
Testing



Test stands



Weischlitz



Berlin



München

Stuttgart



Engineering
Simulation



Bochum



Simulation



Wrocław

Service Spectrum IAMT Prüfsysteme GmbH

Development, construction, mounting and start up of system solutions for structural testing under operational conditions

- § Automotive Industry
- § Commercial vehicle industry
- § Medical technology



 Systempartner for special test stands

Development of Measuring Equipment for Use in a Working Load Repeatability Test under Environmental Simulation Conditions

Introduction

Joins in modern chassis systems

- § Example: multi-link front suspension
- § Steel-polymer spherical joints

Example: supporting joint

- § Two-axes movement
 - steering
 - compression
- § Two-axes loading
 - dead weight and dynamics
 - tracking forces
- § Preload



Source: Internet (Ingolstadt Institute of TU München)

Introduction

The joint abrasion test is necessary

- § The behaviour and thus the functionality of the joint must be tested under close-to-real conditions and under load conditions which are relevant for the respective function aspect which has to be verified.
- § For this purpose the movements and loads acting on the joint during running must be applied with a suitable test stand in a time-condensed form. For further simulation of the real environmental conditions the specimens are exposed to thermal load on the test stand.

Performance specifications team

- § Performance specifications developed jointly by the German automobile manufacturers
- § Objective: supplier supplies the completely pretested scope of delivery self-reliantly

Introduction

Requirements of AK-LH 14 for a joint abrasion test stand

- § The spatial arrangement on the test stand has to be the same as the arrangement in the vehicle (mounting position).
- § The kinematic relations of the vehicle have to be maintained.
- § Standard connection components or suitable adaptors have to be used.
- § The joints have to be tested at temperatures defined in the specifications.

Motivation

- § The automotive industry define complex test conditions
 - force, moment and motion in combination
 - high dynamics requirements
 - temperature and climate changes

- § Particularly important in the product development phase
 - information on behaviour of the part in the test promptly
 - use the available test stands efficiently

- § Important for the test of tribological systems such as vehicle joints because
 - test time compression achieved by accelerating the test loads or test speeds is possible only to a limited extent.

Assignment of tasks

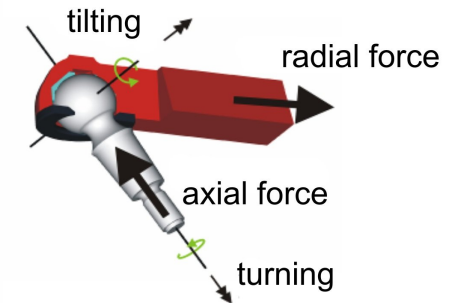
Explanation of the assignment using the example of a 5-component joint abrasion testing apparatus as an example

§ Functionality

- Minimum stiffness
- No free play

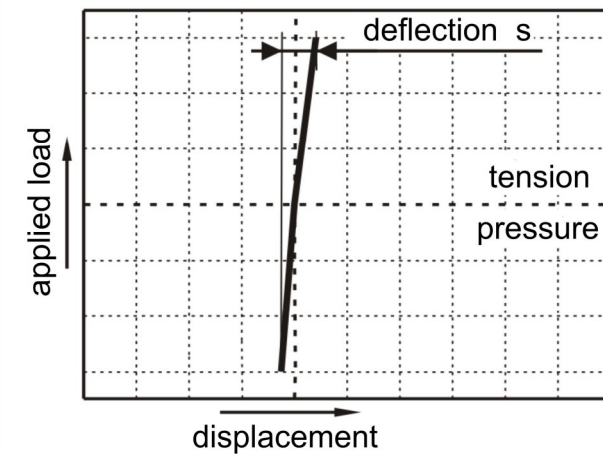
§ Close-to-real loading

- Two-axes movements
- Two-axes loads
- Thermal load (media loading)



Assignment of tasks

- § determination of vehicle joint elasticity during the abrasion test
- § automatic test sequence
- § operator-independent
- § Applicability for all kind of joints, independent of the material of the enclosure, surface finish and geometry
- § The measurement system must be permanently installed in the test stand and consequently it is exposed to high dynamic and climatic stresses during the test



Technical requirements

§ Measured displacement:	$\pm 1.5 \text{ mm}$
§ Resolution:	1 μm across the entire measuring range
§ Repeatability:	better than 0.01 mm
§ Distance:	20 mm – 100 mm
§ Measuring temperature:	24°C
§ Temperature changes between:	-40°C and 150°C