

## Measurement static and dynamic characteristic automobile seats

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**Abstract:** Measurement static and dynamic characteristic automobile seats include all series parameters. On this parameters doubtless belong to acceleration, speed and also e.g. forces in contact zone seat. Article describes prepare measuring installation, which will be instrumental to measurement acceleration in 16 zones sitting area and measurement contact pressure in all of sitting area. It assumes simultaneously measurement of both parameters.

**Keywords:** Accelerometer, Pressure, Analysis, Human

### 1. Introduction

Objective classification effect mechanical vibration on human depends first of all on make real experiment. Experiments along people are liable to accordant with standard and criteria, e.g. ethical and hygienic. Laboratory testing procedure with people is accompanied whole series medical investigation and subsequently medical supervision above alone test. Quality measured data makes it possible to value influence mechanical vibration on human body. Human body like complicated biomechanics organism reacts to mechanical vibration otherwise in short - term also long - term assessment. Short - term response of the human bodies display rather in the area short - term fatigue that the within a few o'clock relaxation vanish. Long - term response of the human bodies display rather in the area enduring damage health, nonreversible mechanical damage spine, inner organs, and nervous system. These displays are very dangerous from standpoint maintainable long - term of the human health. Investigation causes short - term and long - term waste of the human health of mechanical vibrations, possibilities vibroisolation of the human bodies, about are main imposition our research. Complicated in this area research are selection test persons, their maintenance in condition during whole cycle testing. In this article describe laboratory arrangement for testing people.

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## 2. Testing a measuring device

### 2.1. Testing device

For measurement of static and dynamic characteristics of automobile seats we use a special testing device.

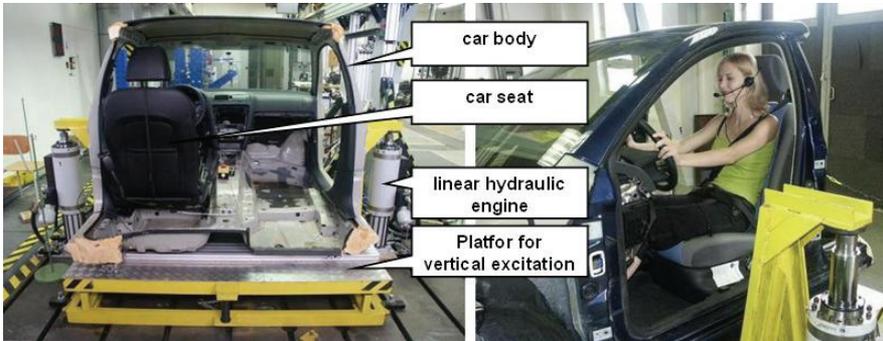


Fig. 1. Testing device.

One half of car body is embedded on a platform for vertical excitation. Two linear hydraulic engines are used for the platform motion. For excitation we can use a lot of various signals – harmonic, random or real signal from a road. The testing device meets safety requirements of the ČSN EN ISO 13090 standard “Mechanical vibration and shock – Guidance on safety aspects of tests and experiments with people”. It means, we can test car seats with a driver and if we use a signal from a road, we can simulate real vehicle drive ability.

### 2.2. Measuring device

Measurement of static and dynamic characteristics of car seats includes measuring of accelerations and contact forces in a contact zone of seat. If we measure both parameters at the same time, accelerometers on the seat contact zone can distort distribution of contact forces. We have to use very small accelerometers to minimize this effect. That's way we made special subminiature sensors.

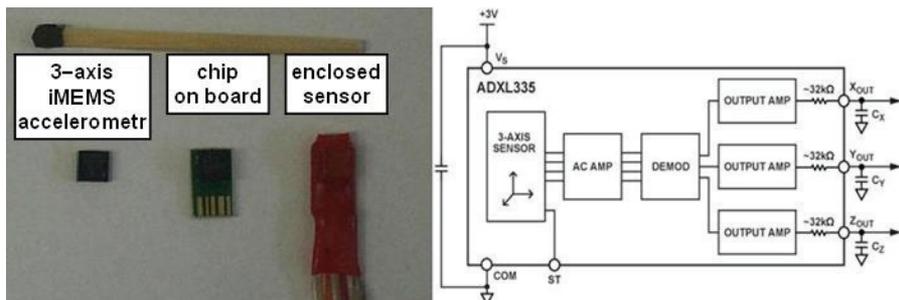


Fig. 2. Subminiature 3-axis accelerometer and its block diagram.

3-axis iMEMS accelerometer ADXL 335 by Analog Devices is the base of our sensor. It's fixed on a board and signals are connected with a special very flexible cable. The board with chip and cable is enclosed in stretch foil.

Pressure distribution in the contact layer is measured by using special prototype sensor with 7500 measuring points and sample frequency 150 frames per second. This sensor is placed in the contact between human and seat. Time synchronization with other measuring values is made by using trigger signal, which enables both measuring (acceleration and pressure distribution sensor). There are different sample frequencies (acceleration: 1 kHz and pressure distribution sensor: 150 Hz).



Fig. 3. Test equipment.

Software enables monitoring of time synchronized data from two different measuring systems. Contact pressure distribution sensor records pressure maps in contact layer of the human seating on automobile seat. This measurement is necessary to time synchronize with measurement of acceleration, displacement, force etc. The main benefit is to monitor pressure distribution maps and time response signals in parallel. For easier time orientation is in graph window time cursor, which determinates the time position. It's in use visualization software.

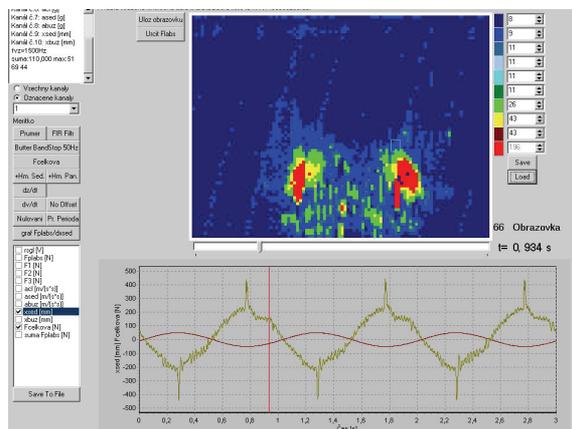


Fig. 4. Visualisation software.

### 3. Testing a measuring schema

Measurement are surveying in a few level  $H_0, H_1, \dots, H_n$ . In these surfaces are determination energy flows, first of all is concerned measurement acceleration  $a_0, a_1, \dots, a_n$ , speeds and forces  $F_0, F_1, \dots, F_n$ . Follow-up are under consideration input and output energy and dissipation energy. Part energy absorbs by herself seat and part energy absorbs by human body. It's subject our research.

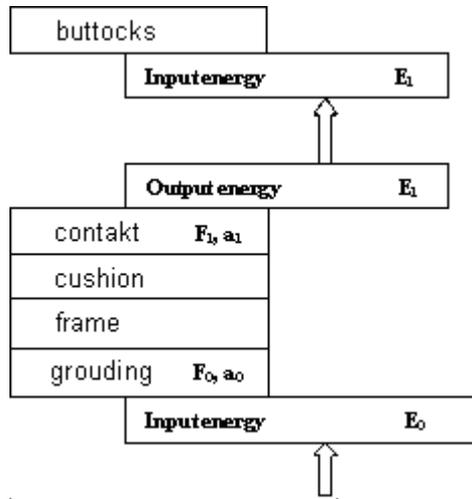


Fig. 5. Schematic layout.

### Acknowledgement

This paper arised by the subvention research project of Ministry of Education of the Czech Republic under contract code MSM 4674788501.

### References

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