

DEVELOPMENT OF FUNCTIONAL HAND PROTECTION AND CUSTOMISED TROUSERS FOR SAFETY AND WELLBEING

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Aim

To protect workers working with percussion drills, road-breakers, chainsaw and similar, special PPEs are requested. The developed prototype for anti-vibration gloves aims to prevent severe vibration-induced white finger disease. Customized cloth could provide protection in case of accidents caused by the particularities of leisure/recreational activities and sport, therefore knitted protective trousers for special need were designed, tested and evaluated.

- Anti-vibration gloves are aimed at
 - ensuring improved comfort
 - avoiding health impairment
 - ensuring resistance to cutting and fire
- Issues to be decided upon:
 - Composition
 - Fabrication technologies
 - Materials

- Knitted sport trousers for youngsters
 - assuring and maintaining the wearer's health,
 - providing protection in case of accidents
- Issues to be decided upon:
 - Raw material,
 - Design and knitted structures
 - Production technologies

Experimental

- Specimens in sandwich construction:
 - upper: 100% Kevlar or Dynetex
 - inner: space fabric, PUR, silicon
 - underlining: 100% cotton fabric
- Prototypes :
 - Anti-vibration parts were laser cutted and fixed on the knitted fabrics
- Measurements and tests:
 - Vibration tests of material samples
 - Vibration reduction measurements of gloves
 - Coup test
 - Heat resistance test

- Specimens: interlock, one-sided and plated jersey made of
 - cotton/elastomeric yarns
 - polyamide/elastomeric yarns
 - 7 filling fabrics
- Prototypes:
 - Trousers with a layered composition
- Measurements and tests:
 - stress/elongations

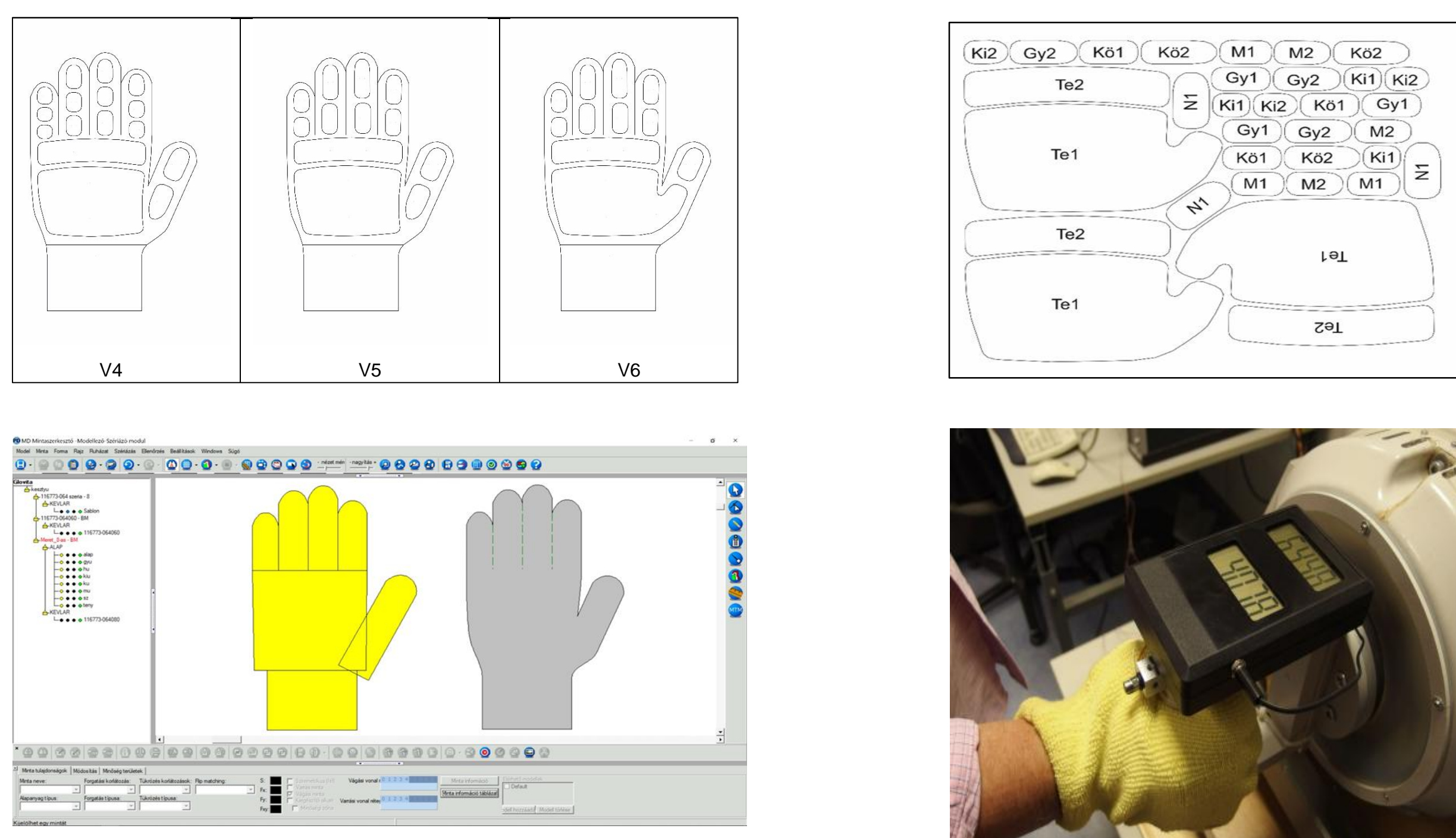


Fig. 1 Pattern for anti-vibration gloves and measurement device according to ISO 10819

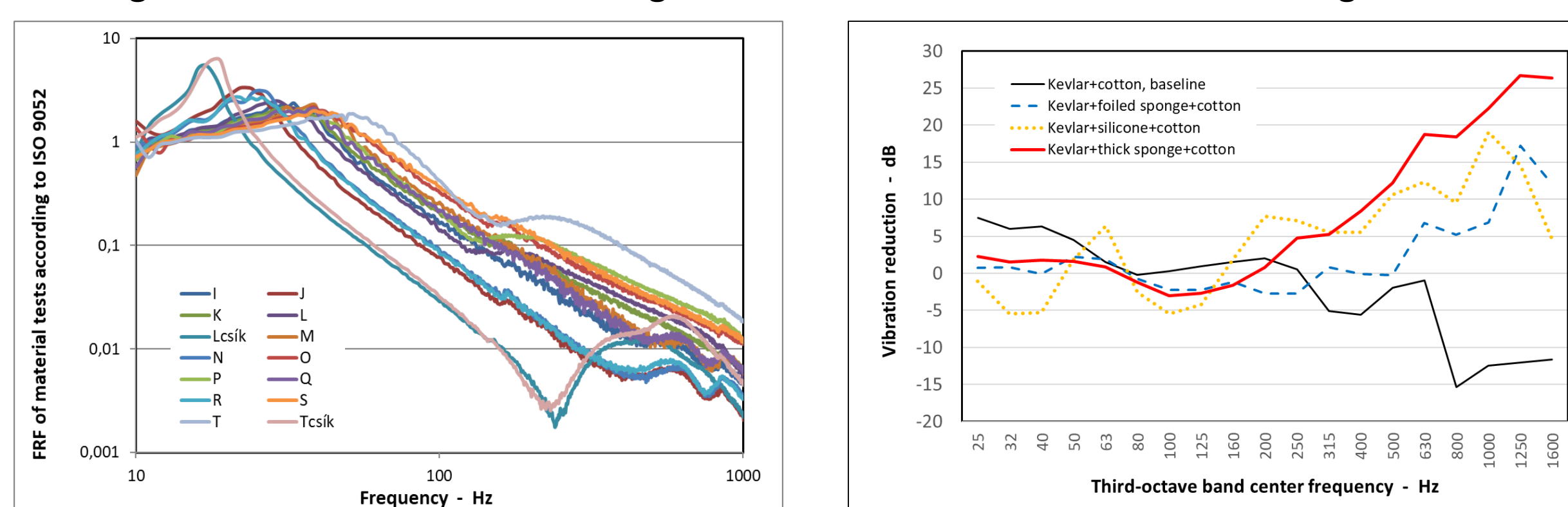


Fig. 2 Results of tests on multilayer samples and prototypes of anti-vibration gloves

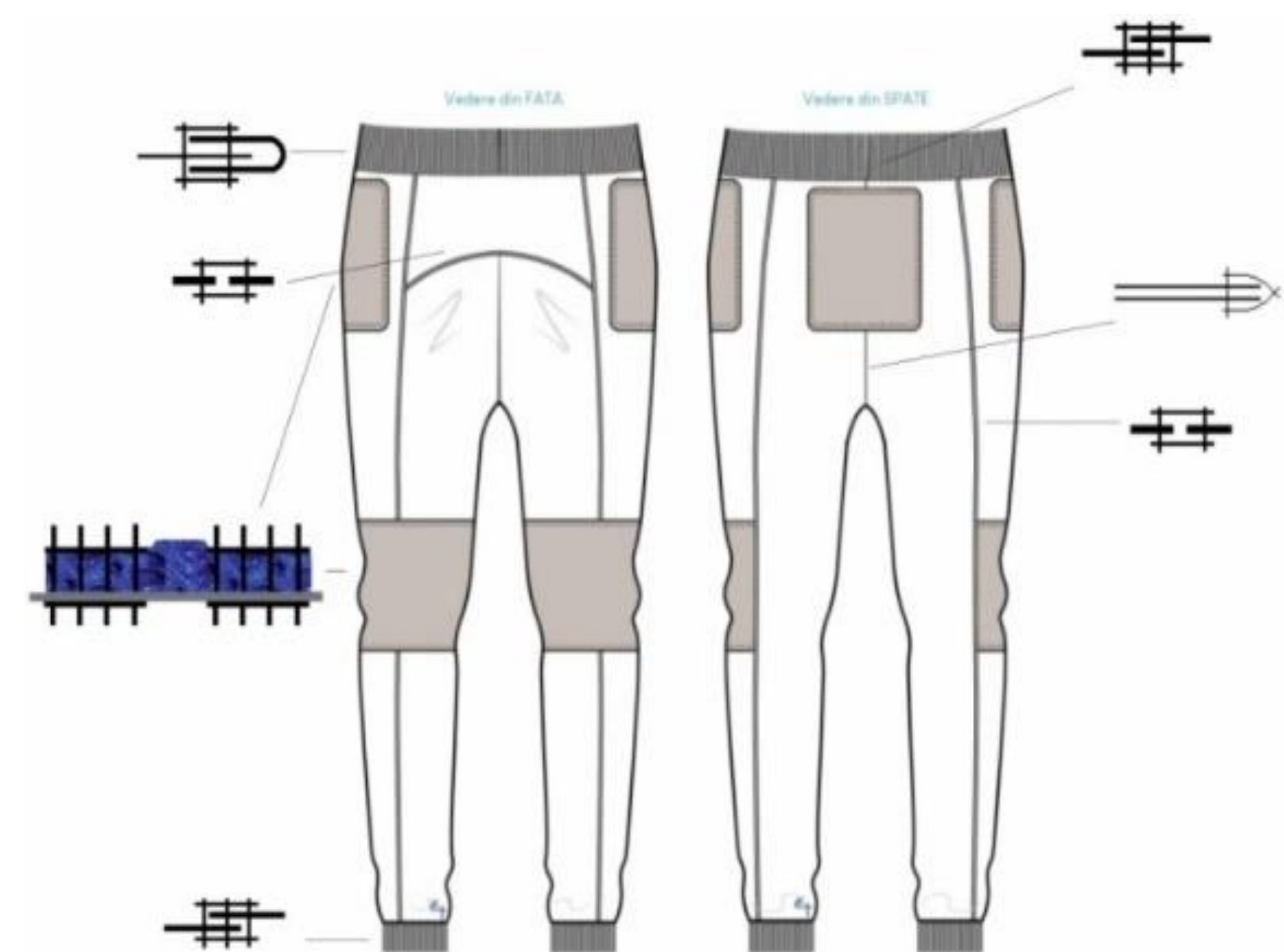


Fig. 3. Model for functional trousers – technological map and result of measurements

Results and discussion:

New testing devices to measure hand-arm vibration and cut resistance according to the relevant standards were developed and validated. 30 multi-layered composite samples with spacer fabrics, anti-shock and non-textile materials were produced and tested (Fig.1). Cut resistance of knitted specimens acc. to EN 388 were 5 and 4 (from rating 1-5), and B according to the TDM-100 method, while abrasion, tear and puncture resistance reached level 1. Samples including anti shock, PUR foam and spacer fabric show significant anti-vibration characteristics above 200 Hz. Results of kevlar glove with silicon and cotton liner TRM = 0.96 < 1, TRH = 0.34 < 0.6 were satisfactory in tests according to ISO 10819 (Fig. 2).

As for the ability to resist external mechanical actions and to dampen shocks, respectively, the best results for trousers were obtained in the case of the three-layered variant corresponding to the following knitting structures: plated jersey + three-dimensional knitted textile support + plated jersey. Using this best variant, a functional trousers model was designed and obtained with the help of the manufacturing technology (Fig. 3).

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Research was supported by the EUREKA ProTexSafe project ID 9918 „Functional Textiles for Vibration Protection, Safety and Well-being”