IFA
Institut für Arbeitsschutz der
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Focus on IFA's work

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# Knee protection

## Problem

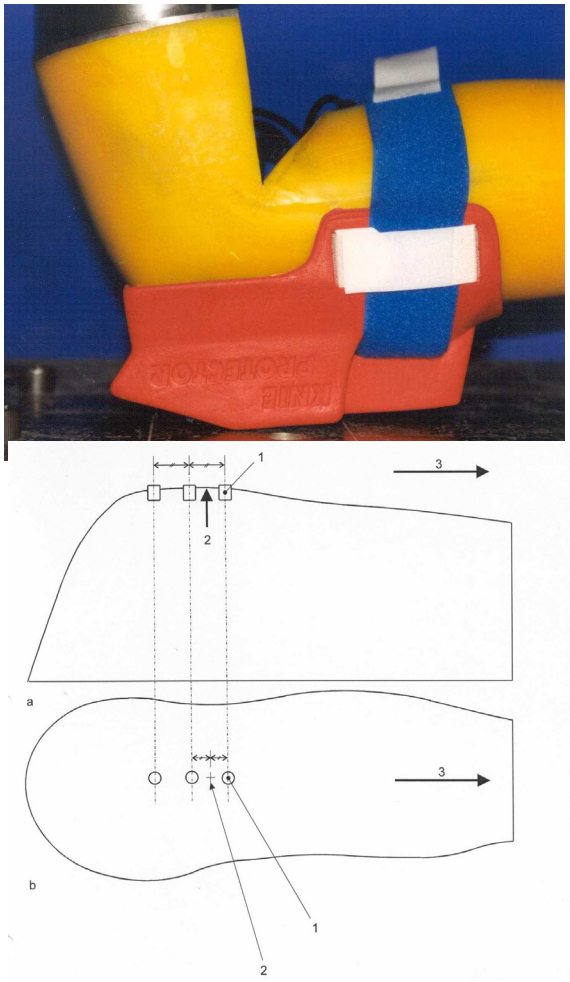
Work activities that put strain on the knee occur as much as 70 percent of the time, especially in occupations in the fields of mining and construction. Kneeling is essentially an unnatural working posture that can lead to health problems. Enterprises and the German Statutory Accident Insurance Institutions incur high absentee costs every year resulting from injuries and occupational disease-related benefit payments.

Work in a kneeling posture should actually be entirely avoided by applying the appropriate work organisation measures. But as this is often not practicable due to the specific demands of the job, workers need to wear knee protection.

Padded knee protection is personal protective equipment of the Category II in terms of the PPE (personal protective equipment) directive, which means it has to be certified. A test procedure for assessing knee protection was developed.

## Activities

Along with the general requirements for knee protection, such as for physiological harmlessness of the materials used, its size and its mechanical resilience and ergonomics, there are also special requirements for an even distribution of pressure.




Test knee "Kandy" (top);
schematic depiction of the test knee (below)
from the side a) and from above b)
1 force sensors, 2 highest point of the knee, 3 direction of the heel

The test of pressure distribution assesses whether the knee protector takes enough of the burden off of a user's kneecap and tibial tuberosity and whether the pressure is distributed evenly. The test knee “Kandy” was designed in order to measure the remaining force that is passed on to the kneecap and tibial tuberosity when a knee pad is used. It is a cast of a male's knee and contains three measurement points below the kneecap and along the tibial tuberosity. The protective knee pad is affixed to the test knee and put under load; the force is recorded as it is transmitted to the three measurement points and then evaluated.

**Results and Application**

The working group for foot protection in the Expert Committee personal protective equipment of the DGUV collaborated with IFA to develop a specific measurement procedure to assess the protective function of knee pads and initiated a corresponding standards setting process at the European level. Based upon this work, a harmonized European standard was drawn up in Technical Committee CEN/TC 162, "Protective clothing including hand and arm protection and lifejackets". The test apparatus in the form of the "Kandy" test knee is described in this standard.

**Area of Application**

Notified testing and certification bodies for personal protective equipment, the construction and mining industries, knee pad manufacturers

**Additional Information**


- DIN EN 14404: Persönliche Schutzausrüstung – Knieschutz für Arbeiten in kniender Haltung (05.10). Beuth, Berlin 2010
- Richtlinie des Rates vom 21. Dezember 1989 zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten für persönliche Schutzausrüstungen (89/686/EWG). ABl. EG L 399 vom 30.12.1989, S. 18-38
- Opara, D.; von der Bank, N.: Entwicklung eines Prüfverfahrens für Knieschutz. Die BG (2002) Nr. 11, S. 574-577


**Expert Assistance**

IFA, Division 5: Accident prevention – Product safety

Expert Committee personal protective equipment of the DGUV, Specialist field feet protection, Berlin

**Literature Requests**

IFA, Central Division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Edited by: Nicola von der Bank
Institut fuer Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA)
Alte Heerstrasse 111, 53757 Sankt Augustin, Germany
Phone: +49 2241 231-02/Fax: -2234
E-mail: ifa@dguv.de, Internet: www.dguv.de/ifa