Measuring set for diagnostics of time-based development of stress states in continuous welded rail

Functioning sample

UNIVERSITY OF PARDUBICE
FACULTY OF TRANSPORT ENGINEERING

Functioning sample identification

Name: Measuring set for diagnostics of time-based development of stress states in continuous welded rail
Identification code: TJ04000301-V2
Project No.: TJ04000301
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Technical specifications

The measuring set was developed within the investigation of the project No. TJ04000301 Non-destructive determination of mechanical stress in continuous welded rail supported by a grant from the ZETA programme of the Technological Agency of the Czech Republic.

The measuring set is composed out of a track and a mobile part. The track part contains a K-CLY4-0060-1-350-4-050-Y strain gauge type produced by HBM, polypropylene tube of length of 150 mm and outer diameter of 40 mm, and a polyurethane foam cube of an edge length of 50 mm. The strain gauge is connected to the investigated rail at its neutral axis with the main axis of the strain gauge being parallel to the neutral axis of the rail. Corresponding area of the rail surface must be cleaned from rust and unevennesses and degreased. Strain gauge is attached by 1-Z70 fast-acting superglue and, after drying, painted over by 1-PU140 polyurethane lacquer, both produced by HBM. After the covering material is dry, the strain gauge is covered by 1-ABM75 aluminium foil coated with kneadable putty produced by HBM, too. The polypropylene tube is attached to the lower part of the rail web by a pair of cable ties and cable ties holders and Chemopren Extreme glue. Strain gauge conductors with RJ male connector are placed into the polypropylene tube closed from one end, while the other end of the tube is plugged by the polyurethane foam cube. Mobile part contains an MX840A data acquisition system and a SCM-SG350 quarter bridge adaptor produced by HBM, a connecting cable and an RJ11 female connector produced by ENCITECH. Mechanical deformation is measured directly by the MX840A data acquisition system.

The track part of the measuring set is currently installed in 44 spots in the Hostinné – Pilníkov railway line section and in 16 spots in the Ústí nad Orlicí – Brandýs nad Orlicí railway line section. Former development stages of the track part of the measuring set were installed in the Mostek – Horka u Staré Paky and Brno-Horní Heršpice – Střelice railway line sections. One specimen of the measuring set is permanently placed in the area of the Educational and Research Centre in Transport, Faculty of Transport Engineering, in Doubravice.

Economical parameters

Economical asset of the measuring set resides in the ability of continuous and discrete logging of the value of longitudinal deformation of rail, which enables prediction of continuous welded rail failures – rail breaks and track bucklings. Timely prediction of such failures can lead to a modification of operational loading of rail and minimize economical loss.

Description

The measuring set is in use at regular measurements of longitudinal deformations of continuous welded rail in operated railway lines. Its asset is a very precise determination of rail deformation in the location of track part installation. This accuracy ranges up to $\mu m \cdot m^{-1}$. Further assets are the lifetime of at least 1 year and no limitations for the use of track maintenance technology, except for ballast profiling and distributing machines. It is necessary to lift the brushes of the ballast profiling and distributing machine in order to save the track part of the measuring set while riding over the spot of installation.

Figures

Figure 1: Track part of the measuring set.

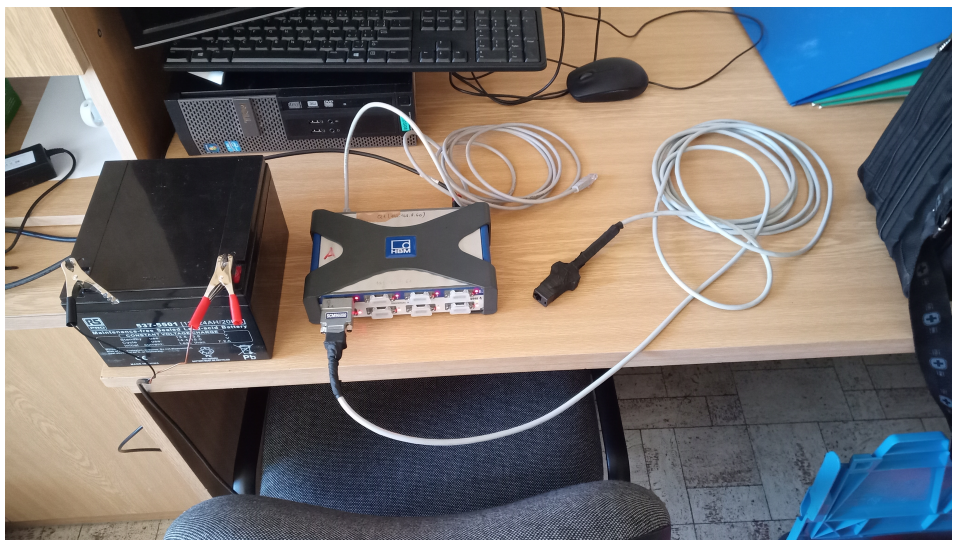

Figure 2: Mobile part of the measuring set.

Figure 3: Strain gauge attachment by 1-70 fast-acting superglue.

Figure 4: Connection of track and mobile part of the measuring set during measurement.