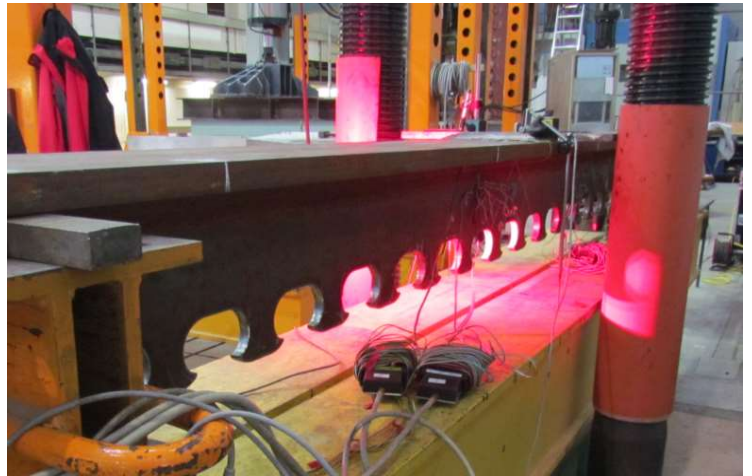


# Steel girders during mechanical load tests: elastic and plastic strains



## *Nerve-Sensors: Case Study*

A number of steel girders designed for bridge applications were investigated in laboratory conditions during mechanical tests. The research includes MCL girders as well as I- and H-beams. The challenge in this project was to measure extremely high strains, exceeding the range of elastic behaviour significantly. Thanks to DFOS strain sensors, it was possible to analyse the yielding process up to 20 000  $\mu\epsilon$  in tension and 10 000  $\mu\epsilon$  in compression.







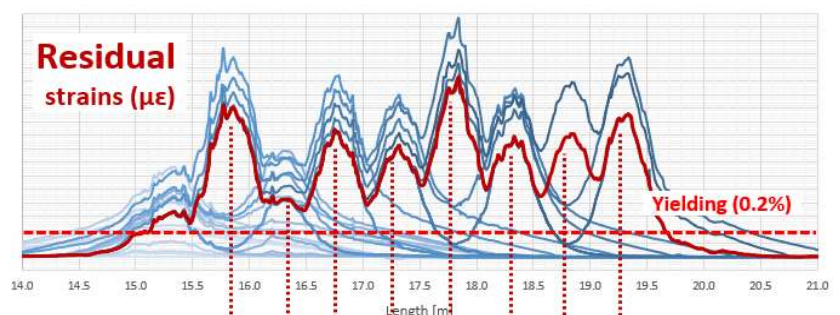
## Benefits of application

- Strain measurements **during elastic and plastic behaviour** of steel (20 000  $\mu\epsilon$ )
- Knowledge about **residual strains, both in compression and tension zones**
- Thousands of measurement points **over freely shape traces**
- Unique data for **scientific analysis, FEM calibration and PhD thesis**

## Example results

One of the research goals was to monitor the yielding process of steel girders, both in their compression and tension zones. The network of DFOS strain sensors installed within the structural elements allowed us to obtain a comprehensive picture of strains for different load schemes and force values. The figure below shows the example result of strain distributions for selected girder. The red line corresponds to residual strains, which remained after tests were completed.

-  **28 800** measurement points
-  **288 m** of sensing path
-  **26 x** strain sensor
-  **short-term** (load tests)



project **partner:**



Wrocław University  
of Science and Technology