



Name of the organization

Karlsruher Institut für Technologie (KIT)

Name of the infrastructure / laboratory

HYKA-ST (a Set of Shock Tubes)

Address and country of the infrastructure / laboratory

Karlsruher Institut für Technologie (KIT), Campus Nord, Hermann-von-Helmholtz-Platz 1 - 76344 Eggenstein-Leopoldshafen, Germany

Person responsible of the access / Contact person

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Main field of activity of the infrastructure / laboratory

Hydrogen safety, transportation, refueling

Short description of the infrastructure / laboratory

Several explosion tubes available at the hydrogen test site HYKA: a detonation tube with a length of 12 m and 350 mm id, a tube with a length of 8 m and 50 mm id, a tube with a length of 4 m and 25 mm id, a tube with a length of 12.2 m and 520 mm id. The 12 m detonation tube, for instance, has an internal diameter of 350 mm and is designed for an internal pressure of 100 bar. It is equipped with a gas filling system and a large number of sensor ports. Furthermore it can be equipped with ring shaped obstacles of different blockage ratios (BR: 0.3, 0.45, 0.6, 0.75, 0.9), spaced by the tube diameter. The HYKA explosion tubes allow basic combustion experiments on flame acceleration and detonation transition with uniform mixtures at different initial pressures up to 1500 bar and temperatures up to 300 °C. Pipeline specimens may also be fabricated and tested with respect to integrity of pipelines under internal detonation pressure loads. The tubes in this case may be additionally equipped with strain gauges to monitor a mechanical response of the tube. The measuring system consists of thermocouples array (gas temperature, flame arrival time), piezoelectric and piezoresistive gauges (initial pressure, explosion pressure), gas analyzer and mass flow rate controller (to control mixture composition), photodiodes (flame arrival time, flame speed), strain gauges (deformations). The data acquisition system is based on multi-channel (64) ADC with a sampling rate of 1 MHz. The vessel was successfully tested for pipeline rupture at 1500 bar of explosion pressure.

Main research area(s) of the infrastructure / laboratory

Hydrogen combustion and detonation, critical conditions for flame acceleration and detonation initiation in a tube geometry, mechanical response of pipelines under internal pressure loads

Instruments and tools available for the above mentioned research

Gas filling system, heating system

