



### Name of the organization

Karlsruher Institut für Technologie (KIT)

### Name of the infrastructure / laboratory

HYKA-A8 Facility (a High Pressure Test Vessel)

### 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

Dr. Mike KUZNETSOV

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### Main field of activity of the infrastructure / laboratory

► Hydrogen safety, refueling, hydrogen storages

### Short description of the infrastructure / laboratory

The safety vessel A8 has main dimensions of 1.8 m id and 3.7 m length with a volume of 8.8 m<sup>3</sup>. It was certified at maximum static pressure of 120 bar. The vessel may be used as a safety vessel or filled itself with a hydrogen-air mixture at different pressures from several 10 mbar to 120 bar of absolute pressure. It has a semi-spherical cover to open/close whole cross-section of the vessel. Different installations and specimens as pipelines, valves and high-pressure hydrogen tanks can be put inside the vessel for testing. The vessel is equipped with measuring ports and windows for visual observations. The existing gas-filling system allows creating either inert atmosphere or hydrogen-air mixtures at different concentrations and pressures. Hydrogen injection into the evacuated or pressurized vessel may also be investigated. The measuring system consists of thermocouples array (gas temperature, flame arrival time), piezoelectric and piezoresistive gauges (initial pressure, explosion pressure), gas analyzer and mass spectrometer (to control mixture composition), photodiodes and ion probes (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 hydrogen jet injection and combustion at sub-atmospheric pressure of 200 mbar. Another testing was for 350 bar hydrogen tanks rupture under external mechanical pressure load.

### Main research areas) of the infrastructure / laboratory

Turbulent hydrogen combustion in uniform and nonuniform gas mixtures at different pressures; effect of venting on flame propagation regimes; high pressure hydrogen releases, experiments on hydrogen distribution, hydrogen jet combustion, structural response of piping structures to internal pressure loads, integrity of high pressure tanks under external and internal pressure loads, to use as a safety vessel for small hydrogen inventory facilities (as explosion tubes and chambers, hydrogen fuel cells).

### Instruments and tools available for the above mentioned research

Vacuum pump, Hydro-press (up to 50 ton), Hydrogen (or other gas) injection system, high speed imaging system combined with BOS technique.

