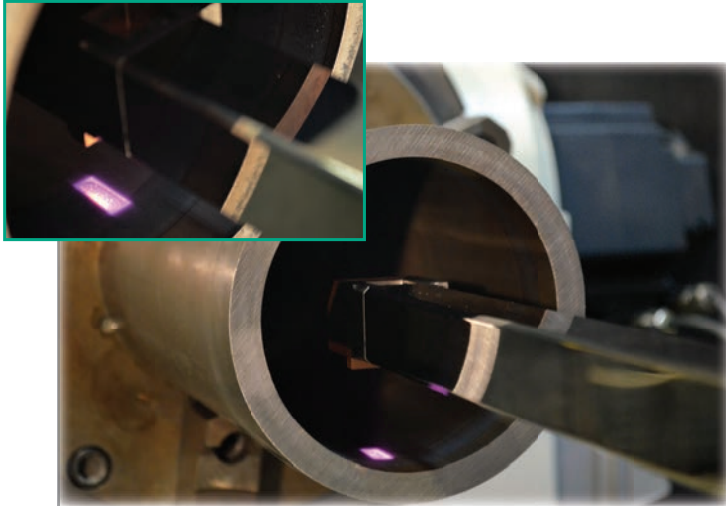


Internal Diameter (ID)

Laser Hardening

Center for Coatings and Laser Applications

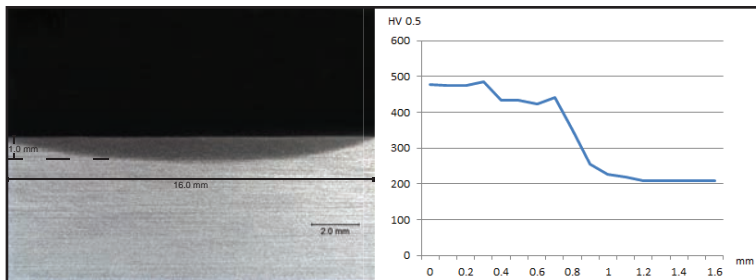
ID-H Laser Hardening Head



Laser Heat Treatment of Sample Tube with ID-H Head (20 mm x 8 mm laser spot size shown)

The new Fraunhofer CCL ID-H Hardening head can be used to carry out laser beam hardening of hardenable steels and cast iron materials in confined spaces, typically inside rotating cylinders or tubes. The overall arm construction is similar to our ID Cladding head design featuring integrated water cooling and beam delivery. The head can operate at up to 3 kW maximum laser power, and the initial prototype head has been tested using both disk and fiber laser (a diode laser version is also planned). Our ID-H head is available as a standard ID hardening head or as a retrofit to our ID 1 or ID 2 cladding systems.

The current 20 mm x 8 mm spot size can produce a 0.629" (16 mm) wide hardened track with an effective case depth of approximately 1 mm. (See figure with results of hardness measurement below)

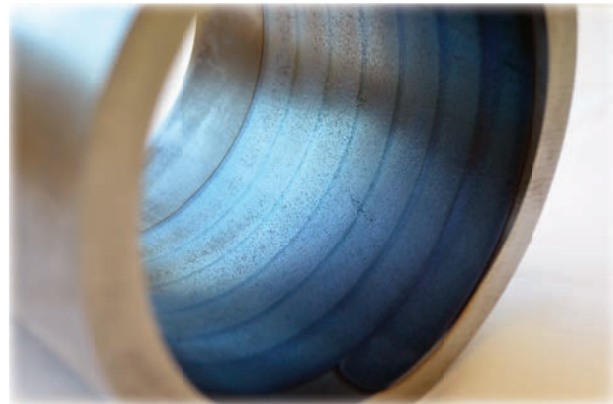


Cross Section (left) and Hardness Depth Profile (right) of Laser Heat treated Steel Pipe

The ID-H head allows large area heat treatment up to 1 m (39") deep inside tubes, bores, and hard to reach areas. The processing arm features integrated optics in order to produce a homogenous energy density across a large spot size of up to 1" x 1" (25 mm x 25 mm), although other square and rectangular spot sizes are also possible using different optical configurations.

Specifications

- Laser Power: up to 3 kW
- Hardening/Softening Track Width: up to max. 1" (25 mm)
- Spot Size: 0.787" x 0.314" (20 mm x 8 mm)
- Minimum Internal Diameter: 3.0" (76 mm)
- Maximum Reach: 39.3" (1000 mm)



ID hardened Sample Tube

Current research work includes extending the capabilities of both the ID Cladding and ID Hardening heads to be able to work in smaller spaces and at greater depths and also integrate process monitoring and control systems.

Applications

- Oil drilling components
- Pipes, Valves and Bearing bushings
- Plastic extrusion barrels
- Heavy machinery components

Making innovation a reality