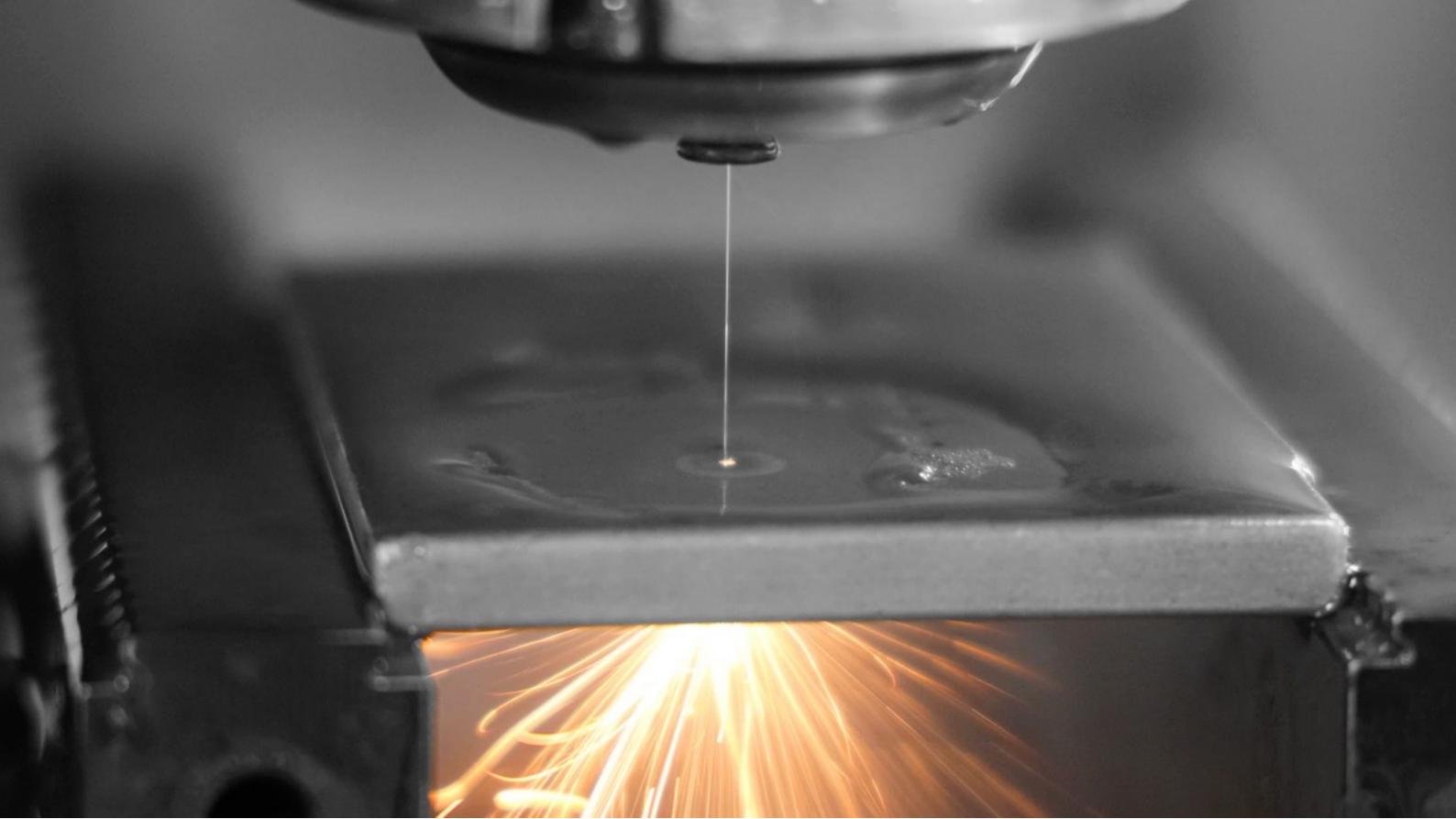
A black and white photograph showing a close-up of a precision engineering machine. The central component is a cylindrical lens assembly mounted on a white, octagonal base plate. The base plate has the brand name "Avonisys" printed on it. Above the base plate, there is a black cylindrical component with a ribbed surface and a small circular label that reads "NE20A". To the left of the base plate, a vertical metal frame features a date stamp "01/148985" and some smaller text. The background shows various mechanical parts, hoses, and a metal frame.

**Avonisys**

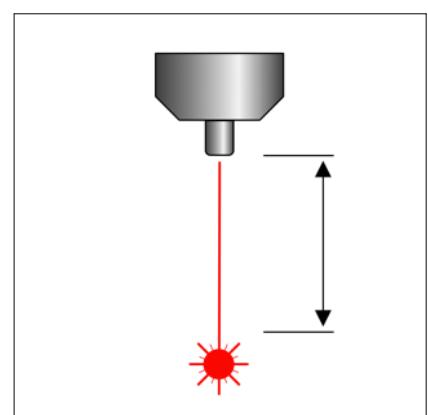
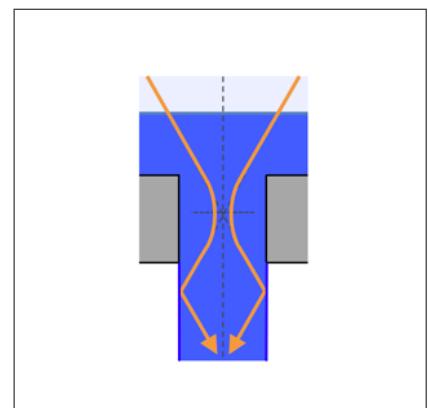
■ WATERJET LASER TECHNOLOGY PACKAGE



## Laser energy guided inside a jet of water

In 1986, the first laser beam guided by internal reflection inside a liquid column was unveiled (Aesculap-Werke AG, Germany). This working principle is an effective way to transport laser energy over a longer distance to a work piece, while maintaining a constant small “tool” diameter. Today, waterjets of as small as 0.03mm in diameter can be used. These are generated using waterjet nozzles similar to those applied in regular waterjet cutting systems. In a nutshell the main benefits of the waterjet guided laser are:

- **High quality cutting surfaces without burr**
- **Parallel cuts without heat impact (HAZ)**
- **No focus compensation required**
- **No process forces applied to the work piece**
- **High aspect ratio micro slot cutting**
- **Deep micro-hole drilling**
- **Broad process window**

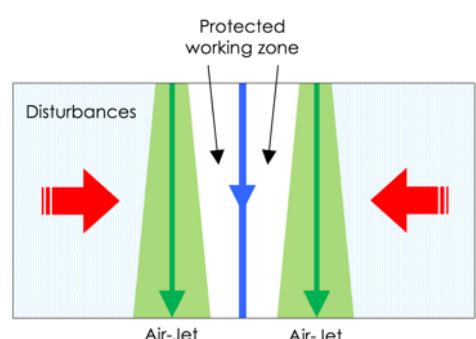
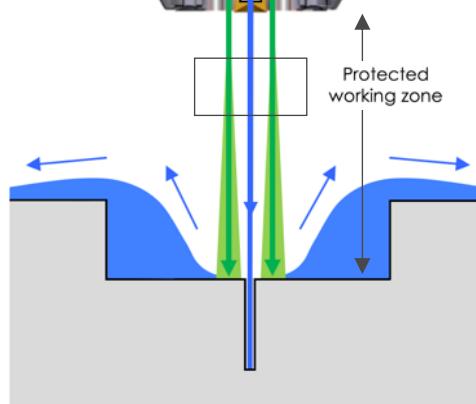
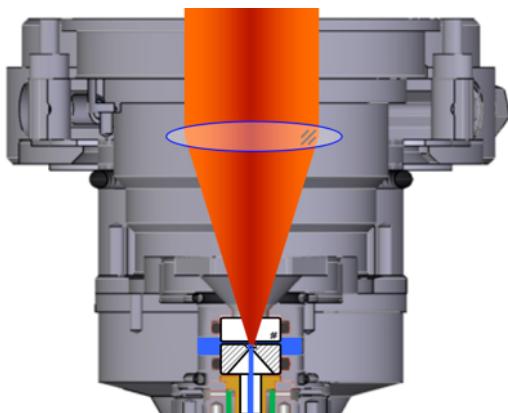
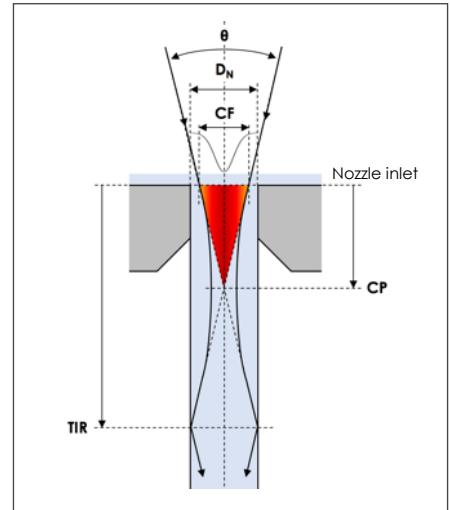


# NEW generation high-power waterjet laser

Nearly 3 decades after the first water guided laser was unveiled, Avonisys AG of Switzerland developed and industrialized a waterjet system for 24/7 heavy duty applications that require reliable micro-precise laser machining.

## Coupling of high-power IR fiber lasers

For many years it was believed and preached that a waterjet laser does not pair well with IR lasers when it comes to deep, high-aspect cutting. At Avonisys we challenged this paradigm and successfully developed a new and robust laser-to-waterjet coupling method that enables us to take advantage of todays high performance fiber lasers. Today our systems can reliably couple multi-kW IR laser beams without damaging the waterjet nozzle and for example cut micro gaps through more than 20mm of aluminum using a tiny 0.05mm nozzle.



## Dry working area = great cutting performance

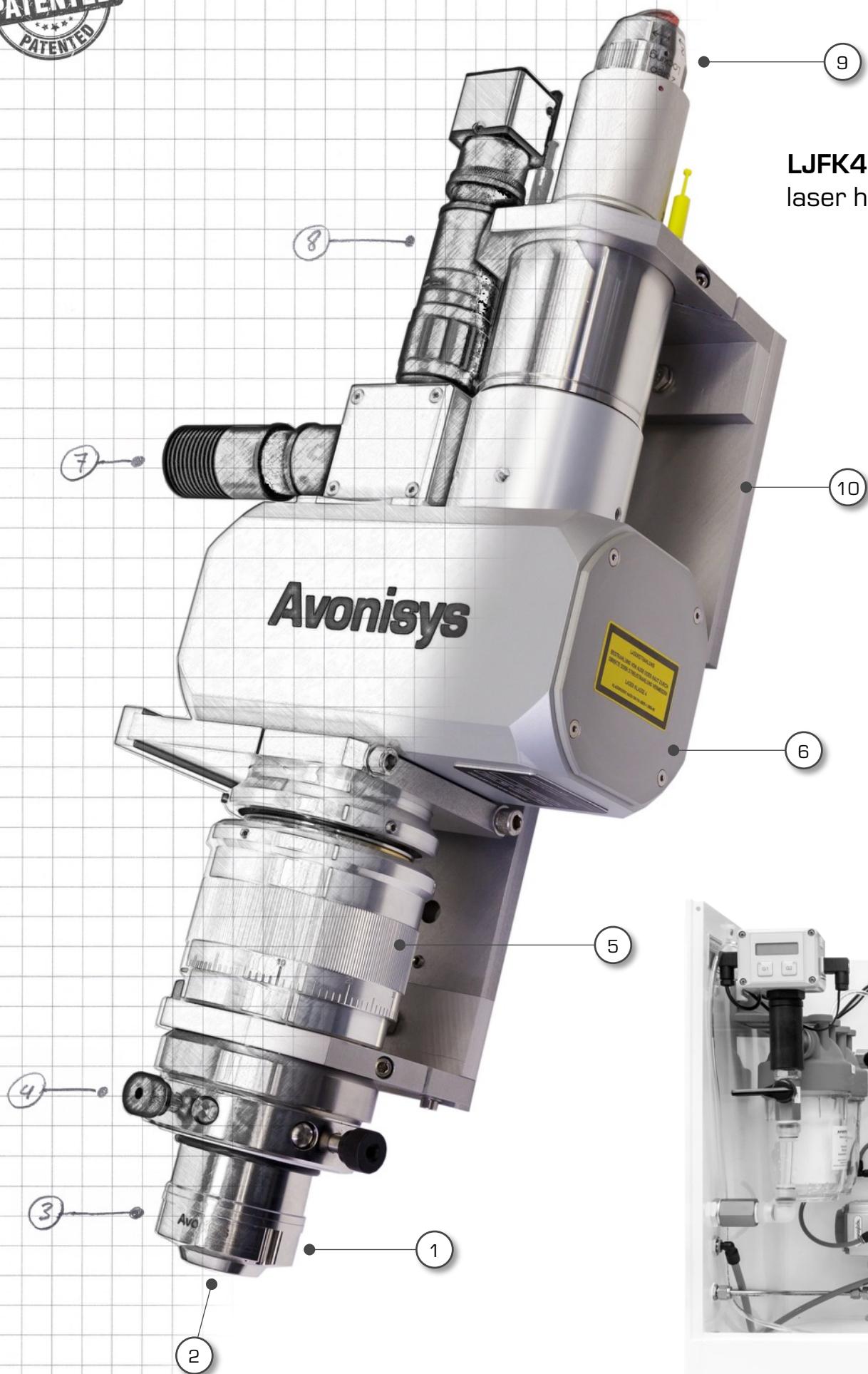
Air-Jet keeps the processing area on the work piece surface free from water accumulation to ensure best cutting performance. In addition Air-Jet efficiently shields the waterjet from disturbances such as water back spray and rapid movement drag. Air-Jet and the waterjet have two separate exit openings and thus a perfect Air-Jet control is possible without disturbing the waterjet itself.

## Fiber laser POWER unleashed !

Up to **3000 W** of a modern high-power IR fiber laser, reliably coupled into a tiny **0.05 mm** waterjet.



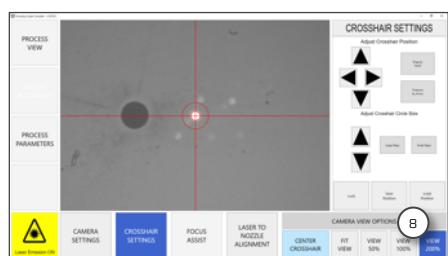
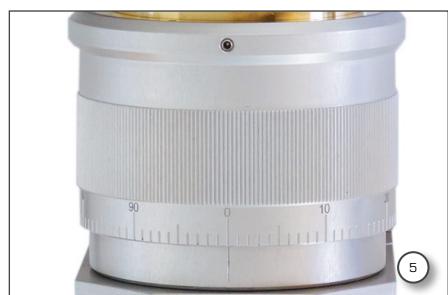
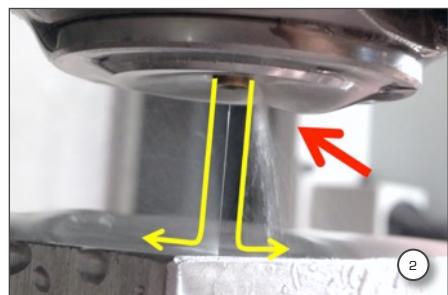
24mm thick aluminum cube processed with Avonisys waterjet laser



# Designed to deliver robust performance

Simple handling. System configuration in just minutes. Reliable and repeatable laser coupling. Easy access to consumables, as well as short maintenance cycles. In other words: designed in a way that is appreciated by operators that work with the technology on a daily basis.

- (1) **Coupling unit** with bayonet quick-release for easy access to laser protection window
- (2) **Air-Jet technology** that clears the work piece from excess liquid and protects the waterjet against disturbances
- (3) **High-pressure water**, ultra-pure and free from pulsations
- (4) **XY micro-adjustment** system for precise concentric alignment of the waterjet nozzle to the laser beam
- (5) **Focus Z-drive** with 6mm travel and 10 micron increments for reliable and repeatable high-power laser coupling
- (6) **Moisture sealed laser head housing**
- (7) **LED illumination** for crystal clear nozzle illumination
- (8) **Vision system** for precise laser-to-nozzle alignment
- (9) **QBH fiber connector** for reliable laser beam delivery
- (10) **3-point bracket** for easy fixation into a CNC machine



## AVHPP600 pump system



- Patented **laser-to-waterjet coupling** method, well suited to utilize modern high power IR-fiber lasers
- Patented **Air-Jet** technology for enhanced waterjet stability and robust machining, even inside cavities
- Patented **coupling unit** with quick-release bayonet and easy maintenance features

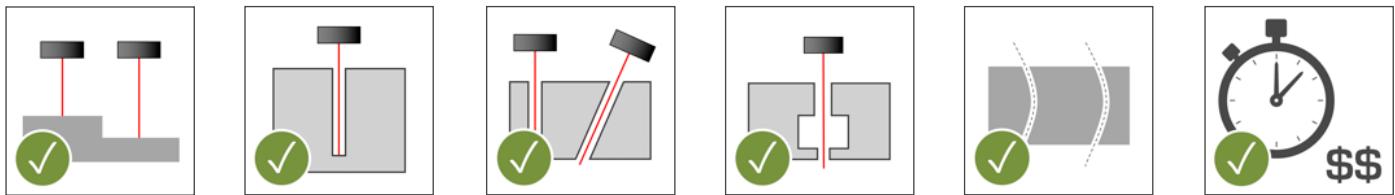
# From ultra-thin up to ultra high-aspect cutting



Suitable for a variety of conductive, semi-conductive and non-conductive work piece materials, such as:  
Aluminum (also Anodized), Silicon, Silicon Carbide, Nickel, Inconel, Tungsten, Tungsten Carbide, Stainless Steel, Carbon Steel, Ceramics, Carbon Fiber & more.

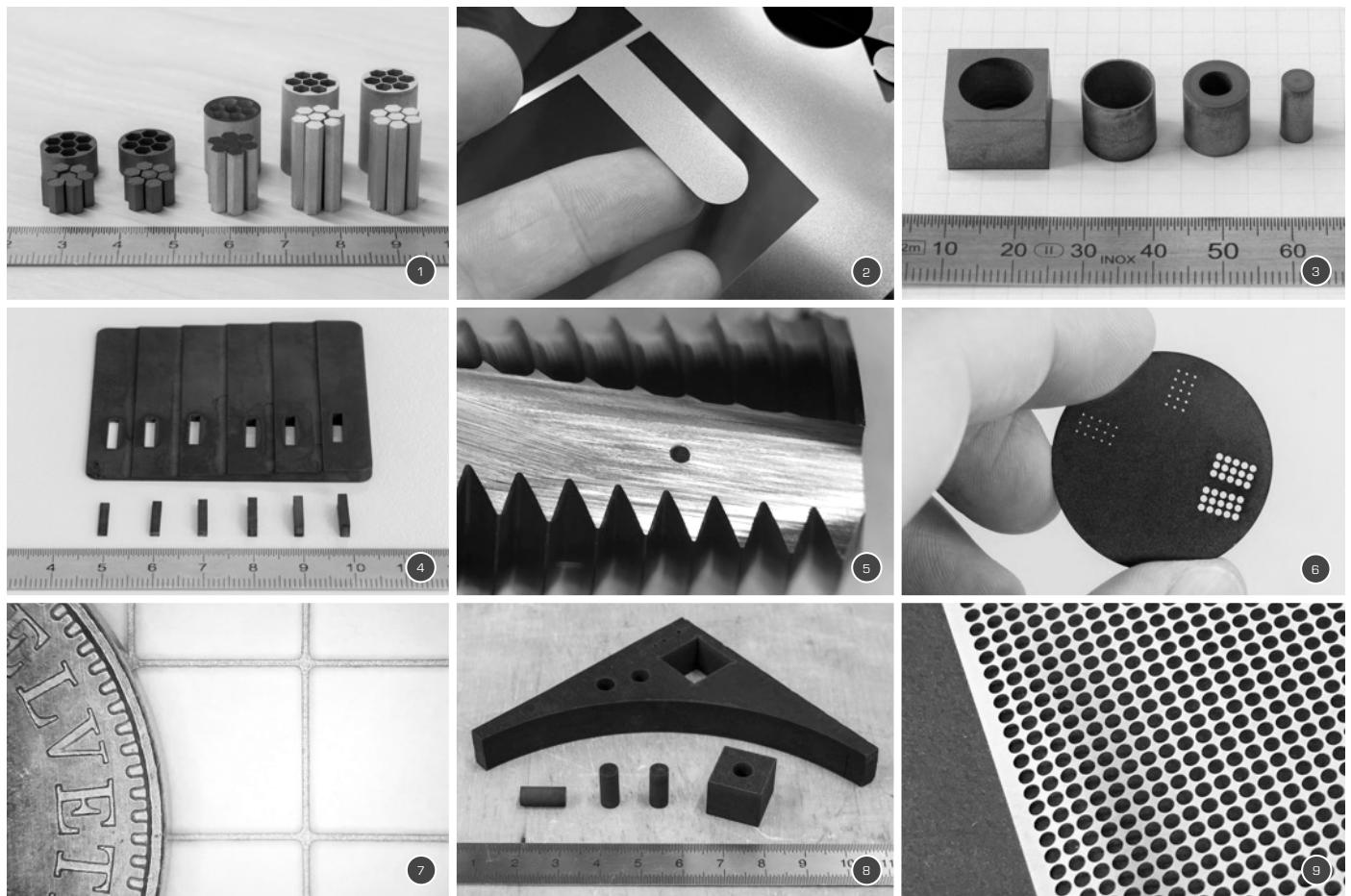
Avonysis waterjet guided laser systems can serve a broad range of applications, work piece materials as well as material thicknesses. Key highlights are:

- Deep micro cutting [aspect of up to 400:1]\*
- Micro hole drilling [aspect of up to 20:1]\*
- Burr free cutting of ultra thin sheet metal
- Cutting inside cavities and pockets
- Inclined micro cutting and micro-drilling
- Freeform cutting
- EDM alike surfaces with flexibility of laser
- No tooling cost & quick setting



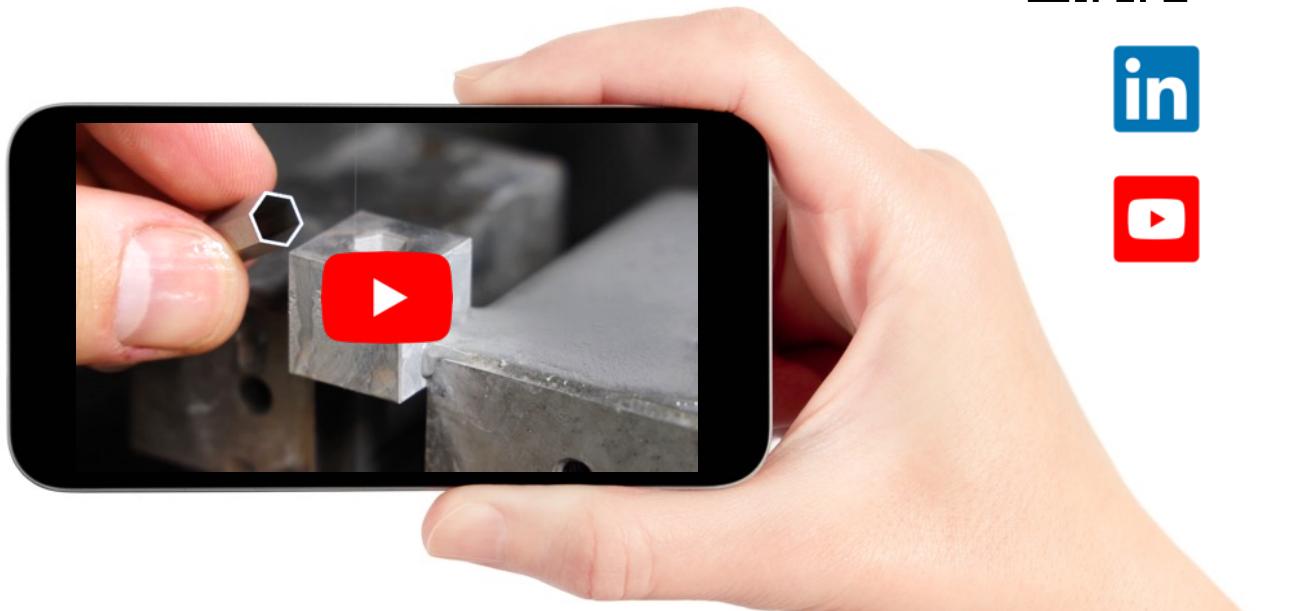
\* Achievable cutting & drilling depth as well as aspect ratios are subject to work piece material and required cutting surface quality





[1] Honeycomb cutting in thick silicon, anodized aluminum and aluminum, [2] Stainless steel sheet cutting, [3] Thick silicon coring, [4] Silicon carbide cutting, [5] Micro hole drilling in tungsten carbide, [6] Micro hole drilling in silicon, [7] Thin frame cutting in tungsten, [8] Cutting of dark ceramic, [9] Hole drilling in stainless steel sheet

Head over to [www.avonisys.com](http://www.avonisys.com) and [follow us on social media](#) to see how some of the above samples were actually produced and to get access to the latest updates, articles and videos about waterjet guided laser cutting at Avonisys.



# Technical specifications

<b>LASER HEAD</b>	<b>Product name</b>	LJFK45IR
	<b>Description</b>	Waterjet guided laser head for accepting IR fiber lasers
	<b>Fiber connector</b>	QBH
	<b>Wavelength</b>	1064 - 1080 nm
	<b>Waterjet</b>	0.03 - 0.08 mm waterjet nozzles
	<b>Coupling unit</b>	Avonisys proprietary laser-to-waterjet coupling unit with bayonet quick release system
	<b>Air-Jet</b>	Avonisys proprietary module to protect the waterjet and clear work piece cavities from excess liquid
	<b>Nozzle alignment module</b>	High-resolution camera based optical alignment system with LED illumination of the waterjet nozzle
	<b>Dimensions</b>	173 mm x 90 mm x 485 mm
	<b>Weight</b>	7.5 kg (incl. mounting bracket)
<b>WATER PUMP</b>	<b>Product name</b>	AVHPP600
	<b>Description</b>	High pressure water pump for waterjet guided laser applications
	<b>Pressure range</b>	50 - 550 bar output pressure
	<b>Pressure stability</b>	Pulsation free waterjet ±1 bar
	<b>Water purification</b>	De-ionization & 3-step filtration
	<b>Monitoring</b>	Electronic sensor and display of water conductivity, Electronic sensor and display of pump output pressure, Electronic sensor for water pressure at laser head, Manometer for P1 & P2 pressure indication
	<b>Dimensions</b>	650 mm x 420 mm x 500 mm
	<b>Weight</b>	52 kg (without water)
<b>UTILITY REQUIREMENTS</b>	<b>Water</b>	Input to pump 2-5 bar city water Consumption by process approx. 1 liter/hour
	<b>CDA (air)</b>	Input 1: to laser head 0 - 50 Nl/min for Air-Jet Input 2: to laser head 0 - 2 bar for over-pressure of laser head Input 3: to water pump 4 - 5 bar
	<b>Power</b>	Line 1: to laser head 100 - 230 V 50/60Hz (or via 15 V DC) Line 2: to water pump 12 - 24 V DC

Avonisys AG reserves the right to change product and technical specifications without notice. Alterations of technical specifications and details in comparison to images, charts, and descriptions in this document can apply. "Avonisys" and the Avonisys logo are registered European trademarks. The products and the technology are protected by following patents: US8859988B1, US10022820B2, US10092980B1, US10272522B2, US10307864B2, EP1940579B1, CN107530828B, CN206925459U and patents pending.

# Avonisys

**Avonisys AG**  
General-Guisan-Str. 6  
6300 Zug, Switzerland

**Tel.** +41 41 229 48 73  
**fax** +41 41 229 48 74  
**web** [www.avonisys.com](http://www.avonisys.com)