Solutions for Laser Cutting Technology
Foreword

Dear Business Partner,

As a manufacturer of laser equipment or producer of manufacturing process parts, your corporate objective is to remain competitive and to design production processes intelligently. As specialists for complex system solutions in laser material processing, it is our pledged objective to provide you with products you can depend on. We back this pledge with our competent development and production team and our worldwide network of branch offices and partners. The fact that you’ll very often come across our products in the world of cutting and welding equipment is proof in itself that we only offer top-drawer products with consistent cutting-edge quality and a first-class service for providing solutions to customers’ problems – at a highly competitive price/performance level. We at Precitec are well aware of how much even the smallest component’s performance can contribute to your company’s success.

This is the newest version of our product catalog. We have included complete system solutions in this issue, as well as our time-tested products and associated accessories. We are also continuously expanding our global presence – this will enable us to meet you at your own site and to communicate with you in your own language. Together we will draft the best solution for successfully realizing your concepts with the help of our products.

We are your potential growth partners – so take advantage of our offer and get in touch with us anytime for a personal and non-binding discussion.

Maintain your competitive edge with Precitec!

We sincerely hope that this new catalog will help you pinpoint new success perspectives. Thank you for your time.

Your Precitec Management Board

Dr. Thilo Wersborg  Dr. Stephan Biermann  Dr. Uwe Zoske
Business Development - Milestones

• 1971 Precitec founded in Baden-Baden, Germany
• 1991 1,000 Laser Cutting Heads with distance sensor technology sold
• 1995 US subsidiary founded
• 1999 Precitec was granted its 100th patent
• 1999 Subsidiary in Japan founded
• 2000 Subsidiary in France founded
• 2000 Jurca Optoelektronik, trading as Precitec Optronik, incorporated into the Precitec Group
• 2003 Company’s new building was inaugurated in Gaggenau
• 2005 Subsidiary in PRC China founded
• 2007 Precitec was granted its 200th patent
• 2007 Subsidiary in Korea founded
• 2007 Soutec Soudronic “Vision” incorporated into the Precitec Group
• 2008 25,000 Laser Cutting Heads with distance sensor technology sold
We offer catalogs for the following segments:

- Cutting
- Welding
- Measuring Technology
Examples of use

One typical application for the fine-cutting head is the cutting of stents (sample illustration has been greatly magnified). A stent is an internal vascular expander in tubular form - it widens vasoconstrictions in coronary vessels.

Precise cutting, Nd:YAG robot application

Laser cutting of coated, honeycomb-shaped aluminum sheets

Laser cutting of contours in 3D area

2D high-pressure cutting of stainless steel
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Laser cutting of hollow bodies like profiles, tubes or hydro-formed parts with the YITC Inner Tube Cutting System

Laser cutting of profiles

Using the Form Cutter FC for precise and dynamic cutting of small contours in automotive manufacture
Precitec

Introduction

The wide range of applications in laser material processing makes great demands on the flexibility of the machines. This is why Precitec offers company-specific, CO₂ and solid-state laser system solutions for the laser cutting technology of today.

High-grade processing heads of unvarying quality reduce costs and increase plant productivity. Non-contact distance sensors are integrated into all our cutting heads - and when combined with other Precitec components, it can become part of an automated distance control loop.

Products for process monitoring, beam guidance and beam shaping round off our product range.

Application areas

Here is an overview of the application areas in which Precitec systems operate successfully.

2D applications

This section encompasses classic laser cutting equipment. This is the equipment type to which Precitec allocates machines that have X/Y linear drives and a linear Z drive for compensating for various workpiece thicknesses, cutting table heights and standoff distances. Combined machines which perform other processes (perforating, nibbling, etc.) are also included in this segment. CO₂ lasers are mainly used as beam sources at the present time. Precitec offers a large number of different systems which can be optimally integrated into a wide range of equipment concepts. Cutting heads with or without motorized lens adjustment, distance sensors, servos, process monitoring and many more products can be supplied. CO₂ and solid-state lasers can also be used. PLC connection is by means of I/O or field bus.

Cutting bevels

Various laser cutting equipment models are capable of bevel cutting. They work with additional rotation axes, which enable the laser beam to strike the workpiece surface at a defined angle. This process is mainly used to chamfer workpieces in preparation for welding processes or for pipework. The streamlined design of these Precitec cutting heads and nozzles enables the cutting of bevels up to an angle of 50°, depending on material and material thickness. The Precitec distance sensor signal can be smoothly transmitted by slip ring, which in turn opens up the option of working with endlessly rotating axes.
High-speed cutting

Some cutting machines work at very high speeds - this can either result in a very fast linear cut or the creation of many small contours. In most cases the basic machine is 2D equipment. The high speeds generate high acceleration and forces and these place special demands on mechanical and sensor components. Precitec components are designed for high acceleration values and possess the necessary mechanical robustness and a stable signal for the distance sensors.

Cutting thick metal

In response to today’s industrial requirements, metal sheets are getting thicker, but high-power lasers with high-quality beams are up to the task of cutting these. Machines for this segment are usually 2D types with high-power lasers, some of them with bevel cutting capabilities - and they can work on large areas. Machines with a working area of 6 x 30 m have already been designed and used for large-scale cutting operations. For these challenging thick sheet tasks, Precitec offers various cutting heads with long focal lengths and motorized lens adjustment. Such machines need high-power lasers - and that’s no problem for Precitec.

3D applications

For complex workpiece geometries, 5-axes equipment or robots are used. Robot applications are mainly equipped with fiber optical coupled lasers, which allow much freedom of movement. In robot systems where CO₂ lasers are used, the laser is usually co-guided by the robot. These cutting systems are often integral parts of entire finishing lines, like body-in-white, where high demands are placed upon design as regards interference resistance, maintenance and handling. Here Precitec offers a selection of different cutting heads, all of which enable adaptable and optimized laser operation. Distance control is taken over by an integrated linear Z drive – this means that the robot can retain its programmed path, even if workpiece tolerances occur. Precitec’s distance control is a self-contained control loop and is independent of the robot control system. It communicates with the primary controller using an I/O signal or field bus.

Micromachining

This type of material processing encompasses a very wide range of tasks, like cutting, welding, drilling, or stripping. One typical application here is the cutting of "stents", filigree contours for the medical industry. Here clearance widths of approx. 10 µm can be achieved. For this special sector, Precitec offers processing heads with high-grade optical components. Additional components for vertical adjustment, beam bending and camera observation with integrated lighting round off our range.
### Overview of system solutions and their application areas

<table>
<thead>
<tr>
<th>systems</th>
<th>beam sources</th>
<th>focal lengths</th>
<th>application areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2D</td>
</tr>
<tr>
<td>YRC</td>
<td>solid-state</td>
<td>73, 100 mm</td>
<td>X</td>
</tr>
<tr>
<td>YK52</td>
<td>solid-state</td>
<td>80 - 150 mm</td>
<td>X</td>
</tr>
<tr>
<td>FC</td>
<td>solid-state</td>
<td>73 - 150 mm</td>
<td>X</td>
</tr>
<tr>
<td>YITC</td>
<td>solid-state</td>
<td>100 mm</td>
<td>X</td>
</tr>
<tr>
<td>HP 1.5” (FL) on LD30N</td>
<td>solid-state</td>
<td>3.75” - 10”</td>
<td>X</td>
</tr>
<tr>
<td>fine cutting</td>
<td>CO₂</td>
<td>2”, 3”</td>
<td>X</td>
</tr>
<tr>
<td>fine cutting</td>
<td>solid-state</td>
<td>50, 80 mm</td>
<td>X</td>
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### Overview of processing heads and their application areas

#### Processing heads for CO₂ applications

<table>
<thead>
<tr>
<th>processing heads</th>
<th>beam sources</th>
<th>focal lengths</th>
<th>application areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2D</td>
</tr>
<tr>
<td>M1.5” S F2.5”</td>
<td>CO₂</td>
<td>2.5”</td>
<td>X</td>
</tr>
<tr>
<td>M1.5” S F3.75”</td>
<td>CO₂</td>
<td>3.75”</td>
<td>X</td>
</tr>
<tr>
<td>M1.5” C F2.5”</td>
<td>CO₂</td>
<td>2.5”</td>
<td>X</td>
</tr>
<tr>
<td>M1.5” KN</td>
<td>CO₂</td>
<td>5” 7.5”</td>
<td>X</td>
</tr>
<tr>
<td>M1.5” KS</td>
<td>CO₂</td>
<td>5” 7.5”</td>
<td>X</td>
</tr>
<tr>
<td>M1.5” DXN</td>
<td>CO₂</td>
<td>5” 7.5”</td>
<td>X</td>
</tr>
<tr>
<td>M1.5” DL</td>
<td>CO₂</td>
<td>5” 7.5”</td>
<td>X</td>
</tr>
<tr>
<td>M1.5” HNZ</td>
<td>CO₂</td>
<td>5” 7.5”</td>
<td>X</td>
</tr>
</tbody>
</table>
The market's choice

Processing heads for CO₂ applications with exchangeable lens cartridges precision cutting

<table>
<thead>
<tr>
<th>processing heads</th>
<th>beam sources</th>
<th>focal lengths</th>
<th>application areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM 2”</td>
<td>CO₂</td>
<td>5” 7.5”</td>
<td>2D X 3D X thin metal sheets X thick metal sheets X bevels X fast</td>
</tr>
<tr>
<td>HP 1.5”</td>
<td>CO₂</td>
<td>3.75” - 10”</td>
<td>2D X 3D X thin metal sheets X thick metal sheets X bevels X fast</td>
</tr>
<tr>
<td>HP 2”</td>
<td>CO₂</td>
<td>5” - 10”</td>
<td>2D X 3D X thin metal sheets X thick metal sheets X bevels X fast</td>
</tr>
<tr>
<td>HP 1.5” M *</td>
<td>CO₂</td>
<td>5” - 10”</td>
<td>2D X 3D X thin metal sheets X thick metal sheets X bevels X fast</td>
</tr>
<tr>
<td>HP 1.5” M CAN *</td>
<td>CO₂</td>
<td>5” - 10”</td>
<td>2D X 3D X thin metal sheets X thick metal sheets X bevels X fast</td>
</tr>
<tr>
<td>HP 2” M *</td>
<td>CO₂</td>
<td>5” - 10”</td>
<td>2D X 3D X thin metal sheets X thick metal sheets X bevels X fast</td>
</tr>
<tr>
<td>DS 1.5” *</td>
<td>CO₂</td>
<td>5” 7.5”</td>
<td>2D X 3D X thin metal sheets X thick metal sheets X bevels X fast</td>
</tr>
<tr>
<td>RS 20”</td>
<td>CO₂</td>
<td>7.5” 20”</td>
<td>2D X 3D X thin metal sheets X thick metal sheets X bevels X fast</td>
</tr>
</tbody>
</table>

* motorized adjustable lens position

Processing heads for applications with CO₂ and solid-state lasers

<table>
<thead>
<tr>
<th>systems</th>
<th>beam sources</th>
<th>focal lengths</th>
<th>application areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>fine cutting</td>
<td>CO₂</td>
<td>2”, 3”</td>
<td>2D X 3D X thin metal sheets X micro X</td>
</tr>
<tr>
<td>HP 1.5” FL</td>
<td>solid-state</td>
<td>50, 80 mm</td>
<td>2D X 3D X thin metal sheets X micro X</td>
</tr>
<tr>
<td>YR 30</td>
<td>solid-state</td>
<td>73, 100 mm</td>
<td>2D X 3D X thin metal sheets X micro X</td>
</tr>
<tr>
<td>YK 52</td>
<td>solid-state</td>
<td>80 - 150 mm</td>
<td>2D X 3D X thin metal sheets X micro X</td>
</tr>
</tbody>
</table>
Precitec Distance Sensors

Traverse paths of laser equipment are predetermined by means of programmed paths. However, component tolerances and thermal distortion cause irregular standoff distances between the workpiece and the cutting nozzle. Even minor differences of a few tenths of a millimeter lead to a deterioration in cutting quality. Constant, optimum cutting quality and speed can only be achieved if the cutting nozzle and the focus are positioned correctly in relation to the workpiece surface - an automatic distance control device is therefore advantageous.

Due to the wide range of applications, the analysis of the measured distance signals is carried out with the help of the Lasermatic® or Lasermatic® Z system.

**Lasermatic® - system**

The differences between these are that the Lasermatic® system is extremely robust and when cutting materials, attains a level of plasma disturbance suppression which is unusually high in the field of capacitive measuring technology. This system is also suitable for reliable signal transfer via rotary slip rings on robot equipment.

**Lasermatic® Z - system**

The Lasermatic® Z - System is particularly suitable for use with solid-state laser robot applications. Precitec supplies very slim nozzle electrodes for this type of technology. The nozzles have minimum sensitivity to the lateral disrupting effects of capacitive measurement. Compared to other capacitive distance measuring systems, both of these measurement techniques possess very short reaction times, a very low temperature drift and an exceptionally wide capacitive measuring range in relation to the spot to be measured.
Cutting System YRC

3D cutting with fiber optical coupled lasers

Applications:
- 3D cutting
- robot
- multiple linear drive laser equipment
- cutting of thin metal sheets
- cutting of metals

System types/Lasers:
- for all solid-state lasers like Nd:YAG, disk, fiber optical and diode lasers

Features:
- complete system consisting of linear drive, cutting system, controller and collimation unit
- integrated, non-contact, patented distance sensors
- error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
- symmetrical design
- easy access to all connections (top)
- integrated collision detection
- water cooling system for optical components and fiber sockets
- all water-conducting parts made of stainless steel
- integrated collimation unit

Technical Specifications

<table>
<thead>
<tr>
<th>max. laser power</th>
<th>4 kW</th>
<th>max. clear aperture</th>
<th>26 mm</th>
</tr>
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<tbody>
<tr>
<td>electronics</td>
<td>Lasermatic® Z</td>
<td>axial lengths</td>
<td>350 mm / 380 mm</td>
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<tr>
<td>focal lengths focusing</td>
<td>73 mm, 100 mm</td>
<td>dimensions (W x H)</td>
<td>163 x 132 mm</td>
</tr>
<tr>
<td>focal lengths collimation</td>
<td>73 mm, 100 mm</td>
<td>mass of complete system</td>
<td>about 5 kg</td>
</tr>
</tbody>
</table>
Cutting System YK52

3D cutting with fiber optical coupled lasers

Applications:
- 3D cutting
- robot
- multiple linear drive laser equipment
- cutting of thin metal sheets
- cutting of metals

System types/Lasers:
- for all solid-state lasers like Nd:YAG, disk, fiber optical and diode lasers

Features:
- complete system consisting of linear drive (LD30C, LD30 N), cutting system, controller and collimation unit
- integrated, non-contact, patented distance sensors
- ultra-slim design
- minimal weight
- no TCP change after vertical and horizontal lens adjustment
- error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
- magnetic safe break coupling*
- air cooling of the lens by means of cutting gas
- air cooling of sensor inserts possible
- quartz optics with optimized imaging characteristics

*optional

Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th>max. laser power 5.5 kW(1)</th>
<th>max. clear aperture 48 mm</th>
<th>axial lengths 138.5 mm - 205.3 mm</th>
<th>mass of complete system 3.1 kg(2)</th>
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</thead>
<tbody>
<tr>
<td>electronics</td>
<td>Lasermatic® Z</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>focal lengths</td>
<td>80, 120, 150 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) for wavelengths 1064 - 1080 nm  (2) and for use with 120 mm focal lengths and LD 30C D50 linear drive
FC Form Cutter Cutting System

Precise cutting of preprogrammed contours

Applications:
- 3D cutting
- contour welding
- robot
- multiple linear drive laser equipment
- cutting of thin metal sheets
- cutting of metals

System types/Lasers:
- for all solid-state lasers like Nd:YAG, disk, fiber optical and diode lasers

Features:
- complete system consisting of cutting system, linear Z drive, X/Y positioning mechanism, controller and collimation unit
- integrated, non-contact, patented distance sensors
- contour movement carried out from FC
- significantly higher path accuracy
- external offset presetting to compensate for tolerances
- high degree of precision with high-level dynamics
- time savings through Teach-In
- stand-alone system or robot applications
- error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
- electrically monitored safe break coupling
- water cooling system for housing
- air cooling of the lens by means of cutting gas
- ethernet interface
- field bus-capable

Technical Specifications

<table>
<thead>
<tr>
<th>max. laser power</th>
<th>5.5 kW¹, ²</th>
<th>mass of complete system</th>
<th>9 kg³</th>
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<tbody>
<tr>
<td>electronics</td>
<td>Lasermatic® Z</td>
<td>power supply</td>
<td>110, 220 V AC</td>
</tr>
<tr>
<td>focal lengths</td>
<td>73, 80, 120, 150 mm⁴</td>
<td>recommended working area</td>
<td>approx. 30 x 30 mm</td>
</tr>
<tr>
<td>max. clear aperture</td>
<td>48 mm⁵</td>
<td>(1) for wavelengths 1064 - 1080 nm</td>
<td>(2) or 26 mm, depending on the cutting head used, (YR30 / YK52), see comparisons on pages 31 / 32</td>
</tr>
</tbody>
</table>
YITC Inner Tube Cutting System

Cutting system for "inside-to-out cutting"

Applications:
• 3D cutting
• robot
• multiple linear drive laser equipment
• cutting of thin metal sheets
• cutting of hydro-formed parts
• cutting of metals

System types/Lasers:
• for all solid-state lasers like Nd:YAG, disk, fiber optical and diode lasers

Features:
• complete system consisting of cutting system, linear drive, controller and collimation unit
• deep penetration of long hollow workpieces
• work also possible in areas that are difficult to access
• workpiece interior remains free of incidental cutting spatters and waste substances
• the cutting edge on the inner surface also remains completely burr-free
• two-sided linear drive arrangement possible
• magnetic protection if collision occurs
• integrated, non-contact, patented distance sensors
• air cooling of the lens by means of cutting gas
• error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded

Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
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<td>max. laser power</td>
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<tr>
<td>electronics</td>
<td>Lasermatic® Z</td>
</tr>
<tr>
<td>focal length</td>
<td>100 mm</td>
</tr>
<tr>
<td>axial length</td>
<td>381 mm(^{(1)})</td>
</tr>
<tr>
<td>clear aperture</td>
<td>22 mm</td>
</tr>
<tr>
<td>mass of complete system</td>
<td>4.3 kg(^{(2)})</td>
</tr>
</tbody>
</table>

\(^{(1)}\) without collimation unit  \(^{(2)}\) consists of cutting head and linear drive
Cutting System
HP1.5" (FL) on LD30N

Cutting system for flat bed systems

Applications:
• 2D cutting
• cutting of thin metal sheets
• cutting of metals
• capable of cutting various workpiece thicknesses
• cutting of non-metal materials like plastic and wood

System types/Lasers:
• CO₂ laser
• for all solid-state laser like Nd:YAG, disk, fiber optic and diode lasers
• flat bed systems
• pipe cutting systems

Features:
• complete system consisting of cutting head, linear drive, controller and collimation unit
• with integrated non-contact distance sensors
• faster changing of focal lengths thanks to preadjustable cartridges
• easy access to media connections (top)
• error signals in cases of collision, cable breakage or malfunction of the linear drive
• magnetic protection if collision occurs*
• water cooling system for housing
• all water-conducting parts made of stainless steel
• air cooling of the lens by means of cutting gas and additional gas
• air cooling of the sensor insert possible

*optional

Technical Specifications

| max. laser power | 6 kW(1) / 8 kW(2) |
| electronics | Lasermatic® |
| focal lengths | 3.75" - 10" (1) / 127 - 254 mm(2) |
| lens diameter | 1.5" (1) / 38.1 mm(2) |
| axial length | 236 mm |
| max. clear aperture | 33 mm(1)(2) |
| mass of complete system | about 7.5 kg |

(1) CO₂ laser (2) solid-state lasers
Fine Cutting System

Cutting of very small clearances widths of approx. 10 µm

Applications:
• 2D cutting
• cutting of thin metal sheets
• cutting of filigree contours for the medicine industry, e.g.
  • stents
  • surgical instruments
• minimal laser power cutting
• cutting of stainless steel, cobalt-chrome materials, memory effect alloys

System types/Lasers:
• Nd:YAG lasers
• disk lasers
• fiber optical lasers
• CO₂ lasers

Features:
• capable of working with very small clearances widths of approx. 10 µm
• monitoring via camera and integrated lighting for Nd:YAG, disk and fiber optical lasers
• integrated vertical adjustment and mirror beam bender
• integrated, non-contact, patented distance sensors*
• compact design

* optional

Technical Specifications

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>max. laser power</td>
<td>500 W⁽¹⁾</td>
<td>max. clear aperture</td>
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<td>electronics</td>
<td>Lasermatic® Z</td>
<td>axial length</td>
</tr>
<tr>
<td>focal lengths Nd:YAG</td>
<td>50 mm, 80 mm</td>
<td>axial lengths</td>
</tr>
<tr>
<td>focal lengths CO₂</td>
<td>2”, 3”</td>
<td>mass</td>
</tr>
</tbody>
</table>

⁽¹⁾ for wavelengths 1030 - 1090 nm (Nd:YAG, disk and fiber optical lasers) and 10.6 mm (CO₂ laser)  
⁽²⁾ with fine cutting head, camera monitoring, beam expander and vertical adjustment, see illustration  
⁽³⁾ F = 50 mm, 2”  
⁽⁴⁾ F = 80 mm, 3”  
⁽⁵⁾  
⁽⁶⁾  
⁽⁷⁾
Connection Head M1.5"

Basic module for connecting various sensor inserts

Applications:
• 2D and 3D cutting
• cutting of thin and thick metal sheets
• various workpiece thicknesses and designs
• cutting of non-metal materials like plastic and wood

System types/Lasers:
• CO₂ lasers
• flat bed systems
• systems with 5 linear drives

Features:
• exchangeable sensors for different cutting tasks
• integrated, non-contact, patented distance sensors
• modular system
• error signal if a collision or a cable break occurs or if measuring area tolerances are exceeded
• mechanical protection if collision occurs*
• air cooling of the lens by means of cutting gas
• magnetic protection if collision occurs*
• water cooling system*

*optional

2D and 3D cutting of various workpiece thicknesses and shapes

2D thin metal sheet cutting with short focal lengths
Cutting Heads M1.5" S F2.5", C F2.5", S F3.75"

Processing heads for CO₂ cutting of thin metal sheets

Applications:
• 2D cutting
• cutting of thin metal sheets
• cutting of metals
• cutting of non-metal materials like plastic and wood

System types/Lasers:
• CO₂ lasers
• flat bed systems

Features:
• integrated, non-contact, patented distance sensors
• modular system
• error signal if a collision occurs or if measuring area tolerances are exceeded
• patented cable break detection
• magnetic protection if collision occurs*
• air cooling of the lens by means of cutting gas

*optional

Technical Specifications

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</thead>
<tbody>
<tr>
<td>max. laser power</td>
<td>3 kW</td>
<td>axial lengths</td>
</tr>
<tr>
<td>electronics</td>
<td>Lasermatic®, Lasermatic® Z</td>
<td>135 mm(1), 166 mm(3)</td>
</tr>
<tr>
<td>focal lengths</td>
<td>2.5&quot; and 3.75&quot;</td>
<td>mass</td>
</tr>
<tr>
<td>lens diameters</td>
<td>1.1&quot; and 1.5&quot;</td>
<td>max. diameter</td>
</tr>
<tr>
<td>max. clear apertures</td>
<td>23 mm(1) and 33 mm(3)</td>
<td>vertical adjustment range</td>
</tr>
</tbody>
</table>

(1) with lens diameter of 1.1"  (2) with lens diameter of 1.5"  (3) with focal length of 2.5"  (4) with focal length of 3.75"
Cutting Heads M1.5" KN, KS, HN Z, DXN, DL

Processing heads for CO₂ cutting of thin and thick metal sheets

Applications:
• 2D and 3D cutting
• cutting of thin and thick metal sheets
• cutting of metals
• cutting of non-metal materials like plastic and wood

System types/Lasers:
• CO₂ lasers
• flat bed systems (DXN, DL)
• system with 5 linear drives (KN, KS, HN Z)

Features:
• integrated, non-contact, patented distance sensors
• modular system
• error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
• mechanical protection if collision occurs*
• magnetic protection if collision occurs*
• water cooling system*
• air cooling of the lens by means of cutting gas
• air cooling of the sensor insert (DXN, DL, HN Z)

*optional

Technical Specifications

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td>max. laser power</td>
<td>3 kW</td>
</tr>
<tr>
<td>electronics</td>
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</tr>
<tr>
<td>focal lengths</td>
<td>5&quot; and 7.5&quot;</td>
</tr>
<tr>
<td>lens diameters</td>
<td>1.1&quot; and 1.5&quot;</td>
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<tr>
<td>max. clear apertures</td>
<td>23 mm(1) and 33 mm(2)</td>
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<td>axial length</td>
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<tr>
<td>mass</td>
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<td>max. diameter</td>
<td>82 mm</td>
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<td>vertical adjustment range</td>
<td>+3 / -2.5 mm</td>
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</tbody>
</table>

(1) with lens diameter of 1.1" (2) with lens diameter of 1.5" (3) with focal length of 5"
Cutting Head CM2" (Z)

Processing head for flat bed systems

Applications:
• 2D cutting
• cutting of thin and thick metal sheets
• cutting of metals
• cutting of non-metal materials like plastic and wood

System types/Lasers:
• CO₂ lasers
• flat bed systems

Features:
• integrated, non-contact, patented distance sensors
• faster changing of focal lengths thanks to exchangeable cartridges
• error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
• magnetic protection if collision occurs*
• water cooling system for housing
• all water-conducting parts made of stainless steel
• air cooling of the lens by means of cutting gas and additional gas
• air cooling of the sensor insert possible

* optional

Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>max. laser power</td>
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<tr>
<td>electronics</td>
<td>Lasermatic®, Lasermatic® Z</td>
</tr>
<tr>
<td>focal lengths</td>
<td>5&quot; and 7.5&quot;</td>
</tr>
<tr>
<td>lens diameters</td>
<td>2&quot;</td>
</tr>
<tr>
<td>max. clear aperture</td>
<td>46 mm</td>
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<tr>
<td>axial length</td>
<td>165 mm&lt;sup&gt;(1)&lt;/sup&gt;</td>
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<tr>
<td>mass</td>
<td>2.1 kg&lt;sup&gt;(1)&lt;/sup&gt;/ 2.9 kg&lt;sup&gt;(2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>max. diameter</td>
<td>95 mm</td>
</tr>
<tr>
<td>vertical adjustment range</td>
<td>+2 / -8 mm</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> with focal length of 5" <sup>(2)</sup> with focal length of 7.5"
Cutting Heads HP1.5" and HP2"

Processing heads with cartridge changing system

Applications:
• 2D cutting
• pipe cutting systems
• ideal for job & shop operation
• cutting of metals
• capable of cutting various workpiece thicknesses and types of material
• cutting of non-metal materials like plastic and wood

System types/Lasers:
• CO₂ lasers
• flat bed systems
• pipe cutting systems

Features:
• with integrated non-contact distance sensors
• faster changing of focal lengths thanks to exchangeable cartridges
• prepadjustable focusing optics
• easy access to all connections (top)
• error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
• water cooling system for housing
• all water-conducting parts made of stainless steel
• air cooling of the lens by means of cutting gas and additional gas
• air cooling of the sensor insert possible
• integrated piercing sensors and lens fault sensor* (with HP2" optional, compare pages 36-38)
• 10" focal length*

* optional

Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th>HP1.5&quot;</th>
<th>HP2&quot;</th>
<th></th>
<th>HP1.5&quot;</th>
<th>HP2&quot;</th>
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<tbody>
<tr>
<td>max. laser power</td>
<td>6 kW</td>
<td>8 kW</td>
<td>axial lengths</td>
<td>236 mm</td>
<td>241 mm</td>
</tr>
<tr>
<td>electronics</td>
<td>Lasermatic®</td>
<td>Lasermatic®</td>
<td>mass</td>
<td>4.2 kg</td>
<td>5.3 kg</td>
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<tr>
<td>focal lengths</td>
<td>3.75&quot; / 5&quot; / 7.5&quot;</td>
<td>5&quot; / 7.5&quot;</td>
<td>dimensions (W x H)</td>
<td>152 x 115.5 mm</td>
<td>172.6 x 132 mm</td>
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<tr>
<td>lens diameters</td>
<td>1.5&quot;</td>
<td>2&quot;</td>
<td>vertical adjustment range</td>
<td>+10 / -20 mm(1)</td>
<td>+10 / -18 mm(2)</td>
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<td>max. clear aperture</td>
<td>33 mm</td>
<td>46 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

(1) with focal length of 3.75": +10 / -6 mm (2) with focal length of 5": +10 / -10 mm
Cutting Heads
HP1.5" M and HP2" M

Processing heads with cartridge changing system and adjustable lens position via CNC

Applications:
• 2D cutting
• cutting of thin and thick metal sheets
• cutting of metals
• cutting of non-metal materials like plastic and wood
• capable of cutting various workpiece thicknesses and types of material

System types/Lasers:
• CO₂ lasers
• flat bed systems
• pipe cutting systems

Features:
• with integrated non-contact distance sensors
• motorized adjustable lens position
• faster changing of focal lengths thanks to exchangeable cartridges
• preadjustable focusing optics
• error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
• easy access to all media connections (top)
• air cooling of the lens by means of cutting gas and additional gas
• air cooling of the sensor insert possible
• water cooling system for housing
• all water-conducting parts made of stainless steel
• integrated piercing sensors and lens fault sensor (with HP2" M optional, compare pages 36-38)
• 10" focal length*

* optional

Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th>HP1.5&quot; M</th>
<th>HP2&quot; M</th>
<th>HP1.5&quot; M</th>
<th>HP2&quot; M</th>
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</thead>
<tbody>
<tr>
<td>max. laser power</td>
<td>6 kW</td>
<td>8 kW</td>
<td>294 mm</td>
<td>300 mm</td>
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<td>electronics</td>
<td>Lasermatic®</td>
<td>Lasermatic®</td>
<td>4.9 kg</td>
<td>9.0 kg</td>
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<td>focal lengths</td>
<td>5&quot; / 7.5&quot;</td>
<td>5&quot; / 7.5&quot;</td>
<td>134.1 x 137.2 mm</td>
<td>180 x 162 mm</td>
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<td>lens diameters</td>
<td>1.5&quot;</td>
<td>2&quot;</td>
<td>+6 / -14 mm</td>
<td>+5 / -10 mm</td>
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<tr>
<td>max. clear aperture</td>
<td>33 mm</td>
<td>45.5 mm</td>
<td></td>
<td></td>
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</tbody>
</table>
Cutting Head HP 1.5\" M CAN

Processing head with cartridge changing system, adjustable lens position via CNC

Applications:
• 2D cutting
• cutting of thin and thick metal sheets
• cutting of metals
• cutting of non-metal materials like plastic and wood
• capable of cutting various workpiece thicknesses and types of material

System types/Lasers:
• CO\textsubscript{2} lasers
• flat bed systems
• pipe cutting systems

Features:
• with integrated non-contact distance sensors
• motorized adjustable lens position
• faster changing of focal lengths thanks to exchangeable cartridges preadjustable focusing optics
• error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
• electronic cartridge detection (presence, focal length)
• temperature monitoring of housing, cartridge and sensor insert
• cutting gas pressure sensor
• easy access to all media connections (top)
• air cooling of the lens by means of cutting gas and additional gas
• air cooling of the sensor insert possible
• water cooling system for housing
• all water-conducting parts made of stainless steel
• integrated piercing sensors and lens fault sensor* (pages 36-38)
• 10" focal length*

Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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<tr>
<td>max. laser power</td>
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<tr>
<td>electronics</td>
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</tr>
<tr>
<td>focal lengths</td>
<td>5&quot; / 7.5&quot;</td>
</tr>
<tr>
<td>lens diameters</td>
<td>1.5&quot;</td>
</tr>
<tr>
<td>max. clear aperture</td>
<td>33 mm</td>
</tr>
<tr>
<td>axial length</td>
<td>294 mm</td>
</tr>
<tr>
<td>mass</td>
<td>4.9 kg</td>
</tr>
<tr>
<td>dimensions (W x H)</td>
<td>134.1 mm x 137.2 mm</td>
</tr>
<tr>
<td>vertical adjustment range</td>
<td>+6 / -14 mm</td>
</tr>
</tbody>
</table>
Cutting Head DS1.5"

Processing head for bevel cutting and for 3D applications

Applications:
- bevel cutting
- 3D cutting

System types/Lasers:
- CO₂ lasers
- pipe cutting systems
- systems with 5 linear drives

Features:
- with integrated non-contact distance sensors
- faster changing of focal lengths thanks to exchangeable cartridges
- preadjustable focusing optics
- error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
- easy access to all media connections (top)
- water cooling system for housing
- air cooling of the lens by means of cutting gas and additional gas
- concentric nozzle cooling
- temperature detector on sensor insert

Technical Specifications

<table>
<thead>
<tr>
<th>Max. laser power</th>
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<tbody>
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<td>Electronics</td>
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<tr>
<td>Focal lengths</td>
<td>5&quot; and 7.5&quot;</td>
</tr>
<tr>
<td>Lens diameters</td>
<td>1.5&quot;</td>
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<tr>
<td>Max. clear aperture</td>
<td>34 mm</td>
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<tr>
<td>Axial lengths</td>
<td>187 mm⁽¹⁾ / 251 mm⁽²⁾</td>
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<tr>
<td>Mass</td>
<td>3.0 kg⁽¹⁾ / 4.1 kg⁽²⁾</td>
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<tr>
<td>Max. diameter</td>
<td>110 mm</td>
</tr>
<tr>
<td>Vertical adjustment range</td>
<td>+2 / -8 mm⁽³⁾</td>
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<tr>
<td>Vertical adjustment range (optional)</td>
<td>-6 / -16 mm</td>
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</table>

⁽¹⁾ with focal length of 5"  (²) with focal length of 7.5"  (³) with focal lengths of 7.5": +2 / -16 mm
Cutting Head RS20"

Processing head for applications with long focal lengths

Applications:
- flat bed systems
- cutting of thick materials
- capable of cutting various workpiece thicknesses and types of material

System types/Lasers:
- CO₂ lasers
- flat bed systems

Features:
- with integrated non-contact distance sensors
- motorized adjustable lens position
- changing of focal lengths thanks to exchangeable cartridges
- preadjustable focusing optics
- compact design thanks to internal beam bending
- error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
- water cooling system for mirror
- mirror presence check
- integrated piercing sensors and lens fault sensor

Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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<tbody>
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<td>electronics</td>
<td>Lasermatic®</td>
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<tr>
<td>focal lengths</td>
<td>7.5&quot; and 20&quot;</td>
</tr>
<tr>
<td>lens diameters</td>
<td>1.5&quot; and 2&quot;</td>
</tr>
<tr>
<td>max. clear apertures</td>
<td>34 mm and 46 mm</td>
</tr>
<tr>
<td>axial length</td>
<td>330 mm</td>
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<tr>
<td>mass</td>
<td>about 12 kg</td>
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<tr>
<td>dimensions (W x H)</td>
<td>241 x 211 mm</td>
</tr>
<tr>
<td>vertical adjustment range</td>
<td>+10 / -20 mm</td>
</tr>
</tbody>
</table>

(1) with focal length 7.5" lens diameter 1.5", with focal length 20" lens diameter 2"
Fine Cutting Head

Cutting head for minimum clearance widths of approx. 10 µm

Applications:
• 2D cutting
• cutting of thin metal sheets
• cutting of filigree contours for the medicine sector
  • stents
  • surgical instruments
• cutting with minimal laser power
• cutting of stainless steel, cobalt-chrome materials
• memory effect alloys

System types/Lasers:
• Nd:YAG lasers
• disk lasers
• fiber optical lasers
• CO₂ lasers

Features:
• capable of working with very small clearance widths of approx. 10 µm
• compact design
• highly precise vertical adjustment
• extremely short focal lengths
• integrated, non-contact, patented distance sensors*
• high quality optical components

*optional

Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th>max. laser power</th>
<th>max. clear aperture</th>
<th>electronics</th>
<th>axial lengths</th>
<th>mass</th>
<th>diameter</th>
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<tbody>
<tr>
<td>max. laser power</td>
<td>500 W(1)</td>
<td>16 mm</td>
<td>Lasermatic® Z</td>
<td>94 mm(2) / 116 mm(3)</td>
<td>1.1 kg</td>
<td>67 mm</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>focal lengths Nd:YAG</td>
<td>50 mm and 80 mm</td>
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<td></td>
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<tr>
<td>focal lengths CO₂</td>
<td>2&quot; and 3&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) for wavelengths 1030 - 1090 nm (Nd:YAG, disk and fiber optical lasers) and 10.6 mm (CO₂, lasers)  
(2) F = 50 mm, 2"  
(3) F = 80 mm, 3"
Cutting Head HP1.5" FL

Processing head for cutting with fiber optical coupled lasers

Applications:
- 2D and 2.5D cutting
- cutting of thin metal sheets
- cutting of metals

System types/Lasers:
- for all solid-state lasers like Nd:YAG, disk, fiber optical and diode lasers
- flat bed systems

Features:
- with integrated non-contact distance sensors
- faster changing of focal lengths thanks to exchangeable cartridges
- preadjustable focusing optics
- ideal for job-shop operation
- error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
- easy access to all connections (top)
- water cooling system for housing
- additional cooling system for nozzle
- quartz optics with optimized imaging characteristics

Technical Specifications

<table>
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<tr>
<th>Parameter</th>
<th>Specification</th>
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<tbody>
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<td>8 kW&lt;sup&gt;(1)&lt;/sup&gt;</td>
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<td>electronics</td>
<td>Lasermatic&lt;sup&gt;®&lt;/sup&gt;</td>
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<tr>
<td>focal lengths</td>
<td>127 mm to 254 mm</td>
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<tr>
<td>focal lengths collimation</td>
<td>70 mm, 100 mm</td>
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<tr>
<td>max. clear aperture</td>
<td>33 mm</td>
</tr>
<tr>
<td>axial lengths</td>
<td>447 mm&lt;sup&gt;(2)&lt;/sup&gt; / 510.5 mm&lt;sup&gt;(3)&lt;/sup&gt;</td>
</tr>
<tr>
<td>mass</td>
<td>5.1 kg&lt;sup&gt;(2)&lt;/sup&gt; / 6.6 kg&lt;sup&gt;(3)&lt;/sup&gt;</td>
</tr>
<tr>
<td>dimensions (B x H)</td>
<td>152 mm x 115.5 mm</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> for wavelengths 1064 - 1080 nm  
<sup>(2)</sup> with focal lengths 127.0 mm and 190.5 mm with collimator  
<sup>(3)</sup> with focal length 254.0 mm with collimator
Cutting Head YR30

Processing head for cutting with fiber optical coupled lasers

Applications:
• 3D cutting
• cutting of thin and thick metal sheets
• cutting of metals

System types/Lasers:
• for all solid-state lasers like Nd:YAG, disk, fiber optical and diode lasers
• systems with 5 linear drives

Features:
• integrated, non-contact, patented distance sensors
• preadjustable focusing optics
• ultra-slim design
• small measuring spot
• error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
• water cooling system for housing
• air cooling of the lens by means of cutting gas
• electrically monitored safe break coupling

Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th>max. laser power</th>
<th>max. clear aperture</th>
<th>26 mm</th>
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<tbody>
<tr>
<td>electronics</td>
<td>Lasermatic® Z</td>
<td>axial lengths</td>
<td>120 mm(2) / 150 mm(3)</td>
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<tr>
<td>focal lengths</td>
<td>73 mm, 100 mm</td>
<td>mass</td>
<td>1.1 kg(4)</td>
</tr>
</tbody>
</table>

(1) at wavelengths of 1064 - 1080 nm  (2) with focal length of 73 mm  (3) with focal length of 100 mm  (4) incl. lens holder, excl. lens
Cutting Head YK52

Processing head for cutting with fiber optical coupled lasers

Applications:
- 3D cutting
- cutting of thin metal sheets
- cutting of metals

System types/Lasers:
- for all solid-state lasers like Nd:YAG, disk, fiber optical and diode lasers
- systems with 5 linear drives

Features:
- integrated, non-contact, patented distance sensors
- ultra-slim design
- minimal weight
- vertical and horizontal lens adjustment causes no TCP change
- small measuring spot
- error signals if collision or cable breakage occurs or if measuring area tolerances are exceeded
- air cooling of the lens by means of cutting gas
- air cooling of sensor inserts possible
- (only with focal lengths of 120 mm and 150 mm)
- magnetic safe break coupling*

* optional

Technical Specifications

<p>| | | | |</p>
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<tr>
<th></th>
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<tbody>
<tr>
<td>max. laser power</td>
<td>5.5 kW</td>
<td>max. clear aperture</td>
<td>48 mm</td>
</tr>
<tr>
<td>electronics</td>
<td>Lasermatic® Z</td>
<td>axial lengths</td>
<td>138.5 mm to 205.3 mm</td>
</tr>
<tr>
<td>focal lengths</td>
<td>80 mm, 120 mm, 150 mm</td>
<td>mass</td>
<td>0.9 kg to 1.1 kg</td>
</tr>
</tbody>
</table>

(1) on wavelengths 1064 - 1080 nm
Adjust Boxes
EG 8010 / 8110

Electronics for precise distance measuring at high cutting speeds

Applications:
• for all laser cutting applications with capacitive Lasermatic® (EG8010) and Lasermatic® Z (EG8110) distance sensor technology

System types/Lasers:
• CO₂ lasers
• for all solid-state lasers like Nd:YAG, fiber optic and disk lasers

Features:
• multifaceted possibilities for user-defined parameterization
• acquisition of sensor temperature or monitoring of plasma activity
• error signal if collision with nozzle body occurs
• generation of signals like malfunction, operation, collision, nozzle lost, cable break, position attained, measuring area tolerances exceeded
• setting of user-defined parameters like collision delay, control dynamics, set point value range
• saving and tracing of parameters possible
• I/O interface acts as interface with the primary controller or CAN Open

Technical Specifications

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>24 V DC ± / max. 6W</th>
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<tbody>
<tr>
<td>Measuring Range</td>
<td>0.1 mm to 20 mm(1)</td>
</tr>
</tbody>
</table>

| Mass | 0.8 kg |

(1) sensor-dependent
Motor Controllers
MC 8510 / 8610

Controllers for capacitive distance control loop

Applications:
• all laser cutting applications with capacitive distance sensors
  • Lasermatic® (MC8510)
  • Lasermatic® Z (MC8610)

System types/Lasers:
• CO₂ lasers
• for all solid-state lasers like Nd:YAG, fiber optic and disk lasers

Features:
• completes the capacitive distance control loop
• parameterization via remote control, front panel
• control via I/O or field bus (CAN open, Profibus, DeviceNet)
• multifaceted possibilities for user-defined parameterization
• acquisition of sensor temperature or monitoring of plasma activity
• error signal if collision with nozzle body or a cable break occurs
• saving and tracing of parameters

Technical Specifications

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>supply voltage</td>
<td>230 VAC / 115 VAC</td>
<td>mass</td>
</tr>
<tr>
<td></td>
<td>±10%, 50 / 60 Hz</td>
<td>about 19 kg</td>
</tr>
<tr>
<td>dimensions (B x H)</td>
<td>230 x 400 x 430 mm</td>
<td></td>
</tr>
</tbody>
</table>
Piercing Sensor PS130

Monitoring of the piercing and cutting process

System types/Lasers:
• CO₂ lasers

Features:
• monitoring takes place online
• working with actual piercing times
• detection of cutting breaks
• retrofittable to all Precitec CO₂ cutting heads
• sensor systems consisting of sensors, analysis unit and preamplifier

1. evaluating unit
2. preamplifier
3. sensors

Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th>0.8 kg</th>
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<tr>
<td>mass</td>
<td></td>
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</tbody>
</table>
Lens Break Sensor
Detection of damage to the lens during the process

System types/Lasers:
• CO₂ lasers

Features:
• detection of damage to the lens (burn penetration) and larger areas of burned-in spatter
• prevention of further damage, e.g. soiling of the processing system caused by the destruction of the lens
• sensors supplied in two geometries

Technical Specifications

<table>
<thead>
<tr>
<th>mass</th>
<th>about 30 g</th>
<th>dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>square form</td>
<td>35 x 45 x 18 mm</td>
<td></td>
</tr>
<tr>
<td>cylindrical form</td>
<td>length 60 mm ø 20 mm</td>
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</tr>
</tbody>
</table>
Process Adapters
PA HP1.5" / HP2" / HP2" M

Process monitoring as combination of piercing and lens fault sensor

System types/Lasers:
• CO₂ laser

Features:
• monitoring takes place online
• monitoring of the piercing and cutting process
• detection of damage to the lens (burn penetration) and larger areas of burned-in spatter
• working with actual piercing times
• detection of cutting breaks
• suitable for use with HP1.5" / HP2" / HP2" M cutting heads

**Technical Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>mass PA HP1.5&quot;</td>
<td>0.5 kg</td>
</tr>
<tr>
<td>mass PA HP2&quot; / HP2&quot; M</td>
<td>0.7 kg</td>
</tr>
<tr>
<td>dimensions PA HP1.5&quot;</td>
<td>112 x 88.5 x 24 mm</td>
</tr>
<tr>
<td>dimensions PA HP2&quot; / HP2&quot; M</td>
<td>140 x 104 x 22 mm</td>
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</tbody>
</table>
Collimators

Laser beam collimation

**System types/Lasers:**
- for all solid-state laser like Nd:YAG, disk, fiber optic and diode lasers
- optimized for Precitec Cutting Heads

**Features:**
- various focal lengths for adjusting optical imaging ratios
- cooling circuits in stainless steel

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**Technical Specifications**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>available fiber sockets</th>
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</thead>
<tbody>
<tr>
<td>max. laser power</td>
<td>8 kW</td>
<td>QBH, B, D</td>
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<tr>
<td>focal lengths</td>
<td>73, 100, 125, 150 mm</td>
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</tr>
</tbody>
</table>
Beam Bender SU50 NJ

Applications:
• laser cutting
• laser beam welding

System types/Lasers:
• gantry systems
• CO₂ lasers

Features:
• simple setting of beam position by means of independent X/Y adjustments
• presence check and temperature monitoring of the mirror
• no adjustment or tools necessary during mirror change
• mirror in standard sizes, therefore more economical spare part costs
• many different possibilities for customizing beam guiding systems
• directly-cooled or indirectly-cooled mirror

Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>max. laser power</td>
<td>8 kW</td>
</tr>
<tr>
<td>max. clear aperture</td>
<td>50 mm</td>
</tr>
<tr>
<td>mass</td>
<td>2.5 to 3.3 kg</td>
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<tr>
<td>mirror diameter</td>
<td>3”</td>
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Technical alterations reserved for all products in this catalog.