

# Laser micromachining of interventional medical devices

## System solution

Changzhou Men-Luck Intelligent Technology Co., Ltd .

## 01 Laser Cutting Machine for Medical Stent

### ML-MDS300( 7.5)



#### Technical Parameters:

Maximum operating speed	300mm/s(X) ; 100mm/s(Y)for option ; 100mm/s (Z) ; 600rpm (θ);
Positioning accuracy	±1um (X) ; ±3um (Y) for option; ±3um (Z) ; ±15arcsec (θ) ;
Repetitive positioning accuracy	±0.2um (X) ; ±1um (Y) for option; ±1um (Z) ; ±3arcsec (θ);
Cutting seam width	15um~25um
Consistency of reinforcement width	<±5um;
Machining material	316L & Ni-Ti & L605 & Fe & Mg & Zn and other alloy materials
Tube blank length	<2.5m (customized support fixture)
Processing wall thickness	0~0.3±0.02mm;
Processing pipe diameter	Φ0.1~Φ7.5±0.02mm;
Single processing range	0~300mm (longer products will be machined by segmented splicing method);
Laser type	Fiber laser;
Laser wavelength	1030-1070±10nm;
laser power	100W&200W&300W for option;
Equipment power supply	220V±10%, 50Hz; AC 20A (main circuit breaker);
File format	DXF、DWG;
Equipment dimensions	2000mmx1000mmx1600mm;
Equipment weight	1500Kg;

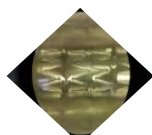
#### Sample Exhibition:



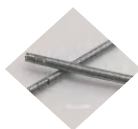
316L & L605 bare metal coronary stent



Ni-Ti- Φ 2.7mm-WT0.2mm coronary stent



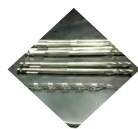
L605- Φ1.8mm-WT0.15mm drug coated coronary stent microstructure



Ni-Ti- Φ 2mm-L100mm-WT0.2mm coronary stent



Ni-Ti- Φ 3.4mm-WT0.2mm coronary stent



Ni-Ti- Φ2.03mm-WT0.2mm venous filter microstructure



2.0 Ni-Ti stent laser cutting

#### ● Application scope

- Laser micromachining of bare metal stent and drug coated stent such as coronary artery stent and vein filter

#### ● High precision machining

- Small cutting seam width: < 20um
- High machining accuracy:  $\leq \pm 5\mu m$
- Good quality of incision: no burr & smooth incision
- High machining efficiency: one-off cutting through one side pipe wall & continuous automatic feed machining

#### ● Strong adaptability

- Have the ability of laser dry cutting & wet cutting & drilling & blind slotting and other fine machining technology
- Support the centripetal, vertical and compound opening feature machining of equal diameter tube, variable diameter tube and plane instrument
- Can machine 316L & Ni-Ti & L605 & Fe & Mg & Zn and other alloy materials
- Compatible with precision D-type chuck & ER series chuck & three-jaw chuck and other precision thin-walled tube clamping system
- Adopt the combined precision thin-walled tube shaft sleeve support system with self-adaptive shape tolerance variation
- Provide the matching scheme of precision thin-walled tube continuous automatic feeding machining & dry / wet cutting and sealing material receiving
- Equipped with self-developed 2D & 2.5D & 3D CAM software system for laser micromachining

#### ● Flexible design

- Follow the design concept of ergonomics, delicate and concise
- Equipped with machine vision system to real time online monitor the laser dynamic machining process
- The software and hardware functions match flexibly, support personalized function configuration & intelligent production management
- Support forward innovative design from component level to system level
- Open type control & laser micromachining software system is easy to operate & intuitive interface

#### ● Technical certification

- CE
- ISO9001
- ISO13485

## 02 Laser Cutting Machine for Medical Big Stent

### ML-MDS300( 30)



#### Technical Parameters:

Maximum operating speed	300mm/s(X) ; 100mm/s(Y)for option ; 100mm/s (Z) ; 600rpm (θ);
Positioning accuracy	±1um (X) ; ±3um (Y) for option; ±3um (Z) ; ±15arcsec (θ) ;
Repetitive positioning accuracy	±0.2um (X) ; ±1um (Y) for option; ±1um (Z) ; ±3arcsec (θ);
Cutting seam width	15um~25um
Consistency of reinforcement width	<±5um;
Machining material	316L & Ni-Ti & L605 & Fe & Mg & Zn and other alloy materials
Tube blank length	<2.5m (customized support fixture)
Processing wall thickness	0~1.0±0.02 mm;
Processing pipe diameter	Φ 0.3~Φ 16.0& Φ 1.0~Φ 30.0±0.02 mm;
Single processing range	0~300mm (longer products will be machined by segmented splicing method);
Laser type	Fiber laser;
Laser wavelength	1030-1070±10nm;
laser power	200W&300W&500W for option;
Equipment power supply	220V± 10%, 50Hz; AC 20A (main circuit breaker);
File format	DXF、DWG;
Equipment dimensions	1600mmx950mmx1700mm;
Equipment weight	1500Kg;

- **Application scope**
  - Laser micromachining of bare metal stents and drug coated stents for heart valve, mitral valve, peripheral and lower limbs
- **High precision machining**
  - Small cutting seam width: < 20um
  - High machining accuracy:  $\leq \pm 5\mu m$
  - Good quality of incision: no burr & smooth incision
  - High machining efficiency: one-off cutting through one side pipe wall & continuous automatic feed machining

- **Strong adaptability**
  - Have the ability of laser dry cutting & wet cutting & drilling & blind slotting and other fine machining technology for big diameter & big wall thickness precision thin-walled tube
  - Support the centripetal, vertical and compound opening feature machining of equal diameter tube, variable diameter tube and plane instrument
  - Can machine 316L & Ni-Ti & L605 & Fe & Mg & Zn and other alloy materials
  - Compatible with precision D-type chuck & ER series chuck & three-jaw chuck and other precision thin-walled tube clamping system
  - Adopt the combined precision thin-walled tube shaft sleeve support system with self-adaptive shape tolerance variation
  - Provide the matching scheme of precision thin-walled tube continuous automatic feeding machining & dry / wet cutting and sealing material receiving
  - Equipped with self-developed 2D & 2.5D & 3D CAM software system for laser micromachining

- **Flexible design**
  - Follow the design concept of ergonomics, delicate and concise
  - Equipped with machine vision system to real time online monitor the laser dynamic machining process
  - The software and hardware functions match flexibly, support personalized function configuration & intelligent production management
  - Support forward innovative design from component level to system level
  - Open type control & laser micromachining software system is easy to operate & intuitive interface

- **Technical certification**

- CE
- ISO9001
- ISO13485

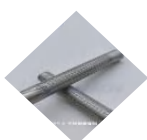
#### Sample Exhibition:



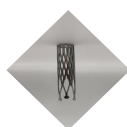
Ni-Ti- Φ7mm-WT0.4mm  
microstructure of valve stent



Ni-Ti&L605- Φ 23mm-WT0.5mm  
valve stent



Φ 9.5mm stainless steel  
tube blind engraving



Ni-Ti- Φ 9.5mm-WT0.5mm  
valve stent



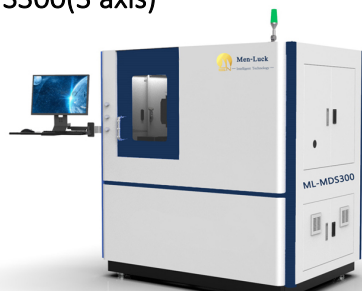
Ni-Ti- Φ 5.5mm-WT0.3mm  
mitral valve stent



Ni-Ti- Φ 5.5mm-WT0.3mm  
mitral valve stent

## 03 Laser Cutting Machine for Ultra Fast Femtosecond Stent (three axis & infrared & green light)

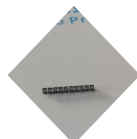
### ML-MDFS300(3 axis)



#### Technical Parameters:

Maximum operating speed	500mm/s (X) ; 100mm/s (Z) ; 600rpm (θ) ;
Positioning accuracy	±1um (X) ; ±3um (Z) ; ±15arcsec (θ) ;
Repetitive positioning accuracy	±0.2um (X) ; ±1um (Z) ; ±3arcsec (θ) ;
Cutting seam width	15um~25um
Consistency of reinforcement width	≤±5um;
Machining material	316L & Ni -Ti & L605 & Fe & Mg & Zn & PLA & PLLA & PI & Nylon & glass, metal & nonmetal materials
Tube blank length	<2.5m (customized support fixture)
Processing wall thickness	0~0.5±0.02 mm;
Processing pipe diameter	Φ0.1~Φ7.5±0.02 mm&Φ0.3~Φ16.0±0.02 mm&Φ1.0~Φ30.0±0.02;
Single processing range	0~300mm (longer products will be machined by segmented splicing method);
Laser type	Infrared green femtosecond laser
Laser wavelength	1030nm~1070nm±10nm&532nm±10nm
laser power	10W&16W&20W for option;
Equipment power supply	220V±10%, 50Hz; AC 25A (main circuit breaker);
File format	DXF、DWG;
Equipment dimensions	2100mmx1250mm (1000mm) x1750mm;
Equipment weight	1800Kg;

#### Sample Exhibition:



Φ 2.0 mm zinc alloy stent



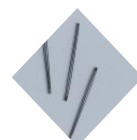
Plastic tube cutting



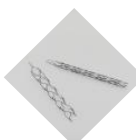
Φ 1.0 mm-Ni-Ti nerve interventional stent



Φ 1.9mm-Ni-Ti bolt removal bracket



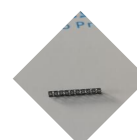
Φ 0.45mm-Ni-Ti stone basket



Φ 2.0 mm-Ni-Ti bolt removal bracket



Φ 3.0 mm poly-lactic acid stent



Φ 2.0 mm zinc alloy stent

#### ● Application scope

- o Laser micromachining of metallic and non-metallic stents such as intracranial & embolectomy & neural intervention & peripheral & reticular basket

#### ● High precision machining

- o Small cutting seam width: < 20um
- o High machining accuracy:  $\leq \pm 5\mu m$
- o Good quality of incision: infrared & green light processing mode for option, no burr & smooth incision & minimal heat affected zone
- o High machining efficiency: one-off cutting through one side tube wall & continuous automatic feed machining

#### ● Strong adaptability

- o Have the fine machining ability of laser dry cutting & wet cutting & drilling & blind slotting etc. for precision thin-walled tube
- o Can machine metal & nonmetal materials, such as 316L & Ni -Ti & L605 & Fe & Mg & Zn & PLA & PLLA & PI & Nylon & glass
- o Compatible with precision D-type chuck & ER series chuck & three-jaw chuck and other precision thin-walled tube clamping system
- o Adopt the combined precision thin-walled tube shaft sleeve support system with self-adaptive shape tolerance variation
- o Provide the matching scheme of precision thin-walled tube continuous automatic feeding machining & dry / wet cutting and sealing material receiving
- o Equipped with self-developed 2D & 2.5D & 3D CAM software system for laser micromachining

#### ● Flexible design

- o Follow the design concept of ergonomics, delicate and concise
- o Equipped with machine vision system to real time online monitor the laser dynamic machining process
- o Closed optical system & fine laser cutting head design, stable and reliable
- o The software and hardware functions match flexibly, support personalized function configuration & intelligent production management
- o Support forward innovative design from component level to system level
- o Open type control & laser micromachining software system is easy to operate & intuitive interface

#### ● Technical certification

- o CE
- o ISO9001
- o ISO13485

## 04 Laser Cutting Machine for Ultra Fast Femtosecond Stent (four axis & infrared & green light)

### ML-MDFS500(4 axis)



#### Technical Parameters:

Maximum operating speed	500mm/s (X) ; 100mm/s (Y) ; 100mm/s (Z) ; 600rpm (θ) ;
Positioning accuracy	±1um (X) ; ±3um (Y) ; ±3um (Z) ; ±15arcsec (θ) ;
Repetitive positioning accuracy	±0.2um (X) ; ±1um (Y) ; ±1um (Z) ; ±3arcsec (θ) ;
Cutting seam width	15um~25um;
Consistency of reinforcement width	≤±5um;
Machining material	316L & Ni-Ti & L605 & Fe & Mg & Zn & PLA & PLLA & PI & Nylon & glass, metal & nonmetal materials
Tube blank length	<2.5m (customized support fixture)
Processing wall thickness	0~0.5±0.02 mm;
Processing pipe diameter	Φ0.1~Φ7.5±0.02 mm& Φ0.3~Φ16.0±0.02 mm& Φ1.0~Φ30.0±0.02;
Single processing range	0~500mm (longer products will be machined by segmented splicing method);
Laser type	Infrared green femtosecond laser
Laser wavelength	1030nm~1070nm±10nm&532nm±10nm;
laser power	10W&16W&20W for option;
Equipment power supply	220V±10%, 50Hz; AC 25A (main circuit breaker);
File format	DXF、DWG;
Equipment dimensions	2100mmx1350mmx1750mm;
Equipment weight	1800Kg;

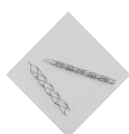
#### Sample Exhibition:



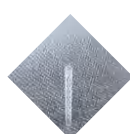
Zinc sheet



Φ 6.5mm magnesium alloy filter



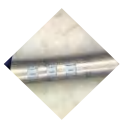
Φ 7.0mm Ni-Ti bolt stent



PLA degradation stent



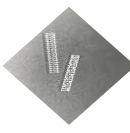
Plastic tube cutting



Slotting & cutting of nylon tube



Φ 0.36mm-0.254mm Variable diameter wave tube



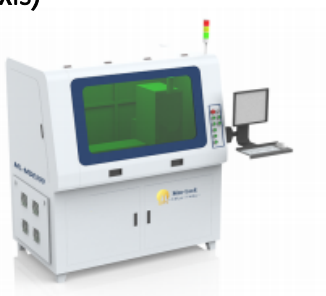
Φ 3.2mm magnesium alloy stent

- **Application scope**
  - Laser micromachining of metallic and non-metallic stents such as intracranial & embolectomy & neural intervention & peripheral & reticular basket
- **High precision machining**
  - Small cutting seam width: < 20um
  - High machining accuracy: ≤ ± 5um
  - Good quality of incision: infrared & green light processing mode for option, no burr & smooth incision & minimal heat affected zone
  - High machining efficiency: one-off cutting through one side tube wall & continuous automatic feed machining
- **Strong adaptability**
  - Have the fine machining ability of laser dry cutting & wet cutting & drilling & blind slotting etc.
  - Support the centripetal, vertical and compound opening feature machining of equal diameter tube, variable diameter tube and plane instrument
  - Can machine metal & nonmetal materials, such as 316L & Ni-Ti & L605 & Fe & Mg & Zn & PLA & PLLA & PI & Nylon & glass
  - Compatible with precision D-type chuck & ER series chuck & three-jaw chuck and other precision thin-walled tube clamping system
  - Adopt the combined precision thin-walled tube shaft sleeve support system with self-adaptive shape tolerance variation
  - Provide the matching scheme of precision thin-walled tube continuous automatic feeding machining & dry / wet cutting and sealing material receiving
  - Equipped with self-developed 2D & 2.5D & 3D CAM software system for laser micromachining
- **Flexible design**
  - Follow the design concept of ergonomics, delicate and concise
  - Equipped with machine vision system to real time online monitor the laser dynamic machining process
  - Closed optical system & fine laser cutting head design, stable and reliable
  - The software and hardware functions match flexibly, support personalized function configuration & intelligent production management
  - Support forward innovative design from component level to system level
  - Open type control & laser micromachining software system is easy to operate & intuitive interface
- **Technical certification**
  - CE
  - ISO9001
  - ISO13485



## 05 Laser Cutting Machine for Medical Hypo Tube & Spiral tube

### ML-MDE300(3 axis)



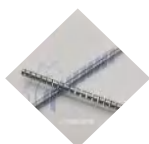
#### Technical Parameters:

Maximum operating speed	300mm/s (X) ; 600rpm (θ) ; 100mm/s (Z) ;
Positioning accuracy	±2um (X) ; ±15arcsec (θ) ; ±3um (Z) ;
Repetitive positioning accuracy	±0.5um (X) ; ±3arcsec (θ) ; ±1um (Z) ;
Cutting seam width	15um~30um;
Machining material	304 & 316L & Ni Ti & L605 and other alloy materials
Tube blank length	<2.5m (customized support fixture)
Processing wall thickness	0~0.5±0.02 mm;
Processing pipe diameter	Φ0.1~Φ7.5±0.02 mm& Φ0.3~Φ16.0±0.02 mm
Single processing range	0~300mm (longer products will be machined by segmented splicing method);
Laser type	Fiber laser
Laser wavelength	1030nm~1070nm±10nm
laser power	100W&200W&250W&500W for option;
Equipment power supply	220V±10%, 50Hz; AC 20A (main circuit breaker);
File format	DXF、DWG;
Equipment dimensions	1600mmx950mmx1750mm;
Equipment weight	1500Kg;

#### Sample Exhibition:



Φ 2.5mm stainless steel tube cutting



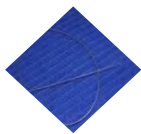
Φ 3.0mm stainless steel tube cutting



Φ 0.15mm stainless steel tube cutting



Φ 6.8mm stainless steel tube cutting



Φ 0.65mm Hypo tube spiral and tongue structure



Φ 1.6mm stainless steel tube cutting

#### ● Application scope

- Laser micromachining of precision thin-walled metal tubes such as medical flexible Hypo tube, spiral tube and spring tube

#### ● High precision machining

- Small cutting seam width: < 15~30um
- High machining accuracy:  $\leq \pm 5\mu m$
- Good quality of incision: no burr & smooth incision
- High machining efficiency: one-off cutting through one side tube wall & continuous automatic feed machining

#### ● Strong adaptability

- Have the fine machining ability of laser cutting & drilling & slotting for equal diameter tube with concentric opening characteristics
- Can machine 304 & 316L & Ni-Ti & L605 and other alloy materials
- Compatible with precision D-type chuck & ER series chuck & three-jaw chuck and other precision thin-walled tube clamping system
- Adopt the combined precision thin-walled tube shaft sleeve support system with self-adaptive shape tolerance variation
- Provide the matching scheme of precision thin-walled tube continuous automatic feeding machining & automatic loading and unloading
- Equipped with self-developed 2D & 2.5D & 3D CAM software system for laser micromachining

#### ● Flexible design

- Follow the design concept of ergonomics, delicate and concise
- Provide the optional function of machine vision system to real time online monitor the laser dynamic machining process
- The software and hardware functions match flexibly, support personalized function configuration & intelligent production management
- Support forward innovative design from component level to system level
- Open type control & laser micromachining software system is easy to operate & intuitive interface

#### ● Technical certification

- CE
- ISO9001
- ISO13485

## 06 Laser Cutting Machine for Medical Hypo Tube & Spiral tube

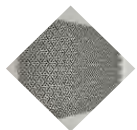
### ML-MD6045(4 axis)



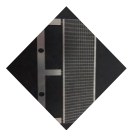
#### Technical Parameters:

Maximum operating speed	500mm/s (X) ; 500mm/s (Y1&Y2) ; 50mm/s (Z) ;
Positioning accuracy	±3um (X) ±3um (Y1&Y2) ; ±5um (Z) ;
Repetitive positioning accuracy	±1um (X) ; ±1um (Y1&Y2) ; ±3um (Z) ;
Machining material	304&316L&Ni-Ti&L605&Li&Mg&Al&Cu&Fe&Ceramic
Material wall thickness	0~2.0±0.02 mm;
Plane processing range	450mm*600mm;
Laser type	Fiber laser
Laser wavelength	1030nm~1070nm±10nm
laser power	100W&200W&250W&300W&500W&1000W&QCW150W for option;
Equipment power supply	220V± 10%, 50Hz; AC 25A (main circuit breaker);
File format	DXF、DWG;
Equipment dimensions	1280mmx1320mmx1600mm;
Equipment weight	1500Kg;

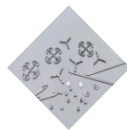
#### Sample Exhibition:



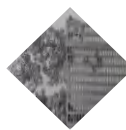
WT0.8mm titanium alloy  
cranial fix piece



CT tungsten steel electrode



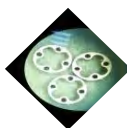
Endoscope reducer ring



Nickel titanium electrode



Ceramic microhole machining



Endoscope clip



Endoscope pierced earrings



Endoscope pierced earrings

- **Application scope**
  - Laser micromachining of plane and curved surface medical instruments such as brain fixed piece, connecting piece and electrode piece
- **High precision machining**
  - Small cutting seam width: < 15~30um
  - High machining accuracy:  $\leq \pm 10\mu m$
  - Good quality of incision: no burr & smooth incision
  - High machining efficiency: direct-drive mobile dual-drive system, one-off cutting through single layer material
- **Strong adaptability**
  - Have the fine machining ability of laser cutting & drilling & slotting & scribing
  - Can machine 304 & 316L & Ni-Ti & L605&Li&Mg&Al&Cu&Fe&Ceramic
  - Can machine plane and curved surface instruments
  - Provide double position & machine vision positioning & receiving and closed blanking & automatic loading and unloading system & machining dynamic monitoring and other optional functions
  - Equipped with self-developed long & short focal length fine laser cutting head with sharp & flat nozzle & compatible with commercially available laser cutting head
  - Equipped with self-developed 2D & 2.5D & 3D CAM software system for laser micromachining
- **Flexible design**
  - Follow the design concept of ergonomics, delicate and concise
  - The software and hardware functions match flexibly, support personalized function configuration & intelligent production management
  - Support forward innovative design from component level to system level
  - Open type control & laser micromachining software system is easy to operate & intuitive interface
- **Technical certification**
  - CE
  - ISO9001
  - ISO13485

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Do what you say and keep your promise



**Men-Luck**

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