

# Laser Cladding System



---

## CATALOGUE

0 Company Brief Introductions.....	3
1 System Introduction .....	3
1.1 System name, model and construction .....	3
1.2 Function and Processing capacity .....	4
2 Features .....	5
3 System Configuration .....	5
3.1 Diode laser, laser processing head, powder feeding system.....	7
3.2 Automation, tooling, control system.....	15
4 Auxiliary system .....	20
5 Spare parts list .....	23
6 Delivery, installation and commissioning of equipment .....	23
7 Training .....	24
8 After sales service .....	26

## **0. Company Brief Introductions**

Established on 8th, Sep, 2008, located at East Lake High-tech Development Zone, Optical valley in Wuhan China, QUESTT ASIA Technology Co., Ltd is devoted ourselves to research, develop laser technology, supply many different kinds of laser systems and prompt service and technology support all over the world.

We have wide experience developing laser machines using the best and latest technology as it becomes available. Our goals are to provide innovations and the best technology for laser applications in new fields and to create the best products at attractive prices as well as offering the highest possible level of customer service every step of the way. 90% of our laser systems are exported to Europe and US.

## **1. System Introduction**

### **1.1 System name, model and construction**

Name: Laser Cladding System

Model: QA-LCD3000

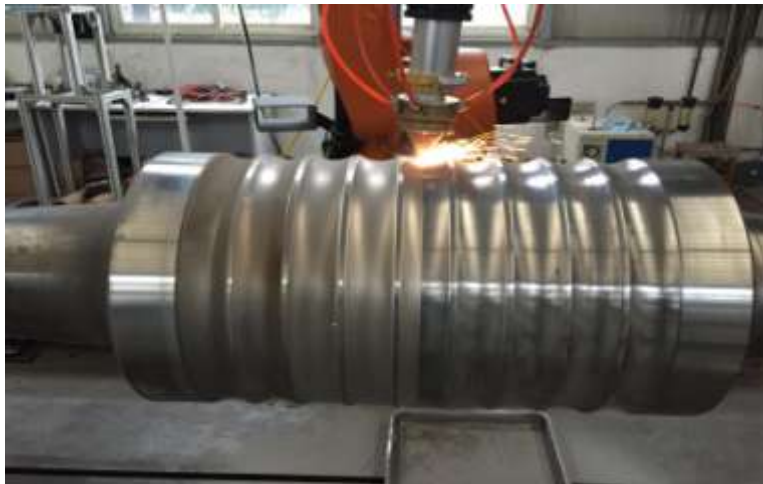
Construction: 3KW Laserline diode laser source、one and two time shutter, laser cladding head、Coax and side-shaft laser powder feeding nozzle、Air curtain and defensive equipment、Soot purification system、6+3 axis KUKA Robot、Linear slide for Robot、1 set Horizontal rotary worktable and tailstock tip、GTV double cylinder powder feeding machine 、Double temperature control water chiller、Stabilizer、Air compressor、Cold dryer machine etc. The following photo is for reference only, Subject to actual delivery:

### **1.2 Function and Processing capacity**

Function: The equipment is mainly used for laser processing (laser cladding ) on the surface of shafts, gears, discs, special-shaped parts, etc., to increase the hardness or corrosion resistance of the surface. The laser processing organization has metallurgical combination, small deformation, low interface dilution material, fine microstructure of the microstructure, and high surface fatigue life.

Processing capacity: Laser cladding, laser hardening

Chuck diameter 630mm, T-table length 6000mm, Clamping weight  $\leq 20T$ . The following photos are for reference only:



## 2. Features

- Imported Laserline laser device, high quality and stability, continuous operation in 48 hours;
- The quality of laser working lens, high uniformity of spot, good thermal stability, long focal length of lens, small lens pollution, long service life and low damage rate;
- Independent research and development of semiconductor laser control system with high integration, easy operation, space saving and convenient maintenance;
- Germany KUKA six-axis robot control robot slide rail and spindle realize 6+2 axis linkage, high precision machining and wide adaptability;

- Based on Siemens self-developed operation platform based on years of experience, the system integration operation is simple and one-button control, the machine tool adapts to a wide range and the equipment covers a small area;

### 3. System Configuration

NO.	Name	Model	Supplier	Qty	Remarks
1	Laser source	LDF3000	Laserline	1	Built-in beam splitter, dual optical output
2	Fiber cable	600um	Laserline	1	LLK-D connector
3	Laser head	OTS-5	Laserline	3	Uniform light, Sub-bin protection
4	Temperature measurement system	Pyrometer	Laserline	1	Inspection range 350-1500℃, built-in laser hardening head
5	Powder nozzle	PZSF-2/TZSF-2/K ZSF-2	Questt	4	
6	Powder feeder	PF 2/2 , high precision double cylinders	GTV	1	touch screen
7	Laser defensive equipment	Gas protection QL-2	Questt	1	The shielding gas is cooled and filtered (class 4) after
		Dust purification SE22			

		Reflective baffle GZT060			compressed air or nitrogen, the baffle is cooled by water.
8	Robot	KR60	KUKA	1	6+3 axis system
9	Linear slide	RRW50-2, 2500mm	Questt	1	Linkage with robot
10	Horizontal rotary table	RRW50 Chuck diameter 630mm, Center height 1000mm , table 6000mm*1200mm	Questt	1	Tailstock tip Rotate diameter <2000mm,loadi ng 20T
11	Rotating drag chain	TC.56	Igus Germany	1	
12	Central control system	RRW8060-89	Questt	1	Siemens PLC controller
13	Water chiller	HL-8000	Hanli China	1	Standard model for 8KW laser
14	Air Compressor	W-0.97/8/12.5		1	
15	Voltage regulation Power supply	SBW-100kVA	Wenfeng China	1	
16	Spare parts		Questt	1	See the parts list
17	Accessories	Air Dryer, filter, air compressor, laser air-conditioned room (user-made).			

### 3.1 LDF3000 Diode laser, laser processing head, powder feeding system

#### 1、 Basic Equipment, Fiber-Coupled Diode Laser, Type LDF

Semiconductor lasers using imported German LASERLINE company LDF3000-60 type laser .LASERLINE laser by the optical module, semiconductor modules, power modules, water cooling module and control components. External work by an optical fiber connected to the optical head. Typical efficiency is  $\geq 35\%$ . LASERLINE laser fiber-coupled semiconductor laser leader, its products are known for stable and reliable.

Laser beam mode is suitable for surface hardening process of multi-mode laser. Time band division road beamswitch two, with two 600 micron core diameter fiber connection 3D printing and laser cladding bald head.



<b>Supply unit</b>	Compact, modular and mobile laser housing(VG64) Easy access to all sub-components due to a sliding cover for service, repair and exchange. Consisting of: Diode laser head, control and operation unit, system status notification field, power supply for diode laser head.	
<b>Diode laser</b>	Water cooled diode laser stacks, beam shaping and	



<b>head</b>	<p>enclosure.</p> <p>Secondary housing for further protection of the diode laser head against dust.</p> <p>Integrated visible pilot laser.</p> <p>Integrated safety shutter/beam switch with beam dump.</p> <p>Horizontal fiber-coupling unit, vertical fiber exit.</p>	
<b>Control unit</b>	<p>Central control unit with EtherCat bus system based on a high performance industrial PC.</p> <p>System and operation parameters are continuously monitored with-sensors. Any deviations of the parameters are lagged.</p> <p>Integrated stack management (redumdancy concept):</p> <p>Automatic detection of the failure of a diode laser stack.</p> <p>Failed stack is deactivated allowing continued operation of the system.</p> <p>Prepared for teleservice connection to the diode laser for trouble diagnosis and software updates.</p>	
User panel interface	<p>Easy, user friendly operation of the diode laser system via either the hot pluggable mobile control panel with touch screen or a standard PC through an ethernet connection (without additional software).</p> <p>Several different modes of laser operation can be selected: Continuous wave (cw), pulse mode, programmable power mode or external remote operation.</p> <p>Two level warning/failure indication: Warning alert generated first</p> <p>- system still active. At the failure level the laser system shuts down.</p>	
<b>Laser Safety</b>	<p>The diode laser is a Class 1 laser system according to EN 60825-1. The end of the optical fiber (optics side) or the processing optics, if mounted, is a Class 4 laser system according to EN 60825-1.</p> <p>Concerning functional safety, the laser is conform to EN 13849 and achieves the safety category 3 and performance level D. Dust and humidity protection for the closed laser cabinet according to IP54.</p>	
<b>Servies</b>	<p>Documentation in the form of a detailed operating manual as a print-out and a pdf-file on CD-Rom in English.</p>	

## 2、Fiber-Coupled Diode Lasers,Type LDF,Basic Equipment

<b>LDF 3000</b>	Power: 3,000 W cw (fiber tip)	
-----------------	-------------------------------	--

Wuhan Questt Asia Technology Co., Ltd Address: A7-101, Hangyu building, Wuhan University Sci & Tech Park, East Lake High-tech Dev. Zone, Wuhan, Hubei, China Tel: 00862787611146 Fax: 00862759908808 <http://www.questtlaser.com>



	Beam quality/beam parameter product: 66 mm mrad. Suitable for an optical fiber with core diameter $\geq 600\mu\text{m}$ , 1000 $\mu\text{m}$ Built-in dual laser light path	
--	--	--

### 3、Laserline Cooling Unit

<b>Integrated in VG64 /</b>	Laserline Cooling unit for laser operation necessary. Cooling system with water/water-heat exchanger for cooling with tap water (optional also with compressor unit). Closed loop cooling system with conditioned and monitored water full integrated in the Laserline LDF laser control system including visualization.	
<b>Cooling unit CHW40 + OC integrated in VG64</b>	Water/water-heat-exchanger in VG64 housing with integrated hydraulically separated optic cooling unit for cooling of the processing optics. Max. overall cooling power of 15 kW. Suitable for diode lasers up to approx. 10 - 12 kW laser power depending on the beam quality. Ambient temperature min. 5 °C, max. 45 °C. 50 Hz or 60 Hz. Max. cooling water input temperature of the external circuit 15°C. Optic circuit : Max. cooling power 2000W, 1-2 l/min at 3,5 bar. Integrated control of the water temperature and the volume flow, displayed at the laser control system. Temperature range from 25°C to 30 °C, +/- 3 K.	

### 4、Extensions of The Control System and Integrated Options for Fiber-Coupled Diode Lasers, Type LDF

Enhanced dust and humidity protection	19" rack mount unit with drying module and filters. The unit provides controlled, positive pressure inside the laser head to avoid dust contamination in a dusty environment and condensation due to high humidity. Customer supplies clean, oil-free air according to ISO 8573-1: Particle content (dust): Class 1, Oil content: Class 1. Remaining water content/humidity: Classes 1-4, pressure 5 to 7 bar, temperature: 15 to	
---------------------------------------	--	--



	35°C. Air amount: approx. 30 l/min.	
Mobile control panel LL T200	Hot pluggable mobile touch screen control panel with graphical user interface for laser controlling, including 3 m cable, automatic software synchronization with the laser	
Field bus interface	INTERBUS-Safety (optical or electrical), PROFIBUS DP, PROFINET, Device Net, Ether Cat or Ether Net/IP. Extended diagnostics and status information. Program selection and start.	
Optical switch	Optical path switch for two fibers. Time-sharing: Laser power is only available at each fiber exit. A fieldbus interface is required (see above). Each beam exit includes a fieldbus gateway. Switch the time between programs that opt out of <200 ms. The total switching time also depends on the speed of the external bus. maximum. Switching frequency: 1.7 Hz (long term) or 2.8 Hz (short term). Integrated safety features and fault signals. Comprehensive monitoring of fiber optics. Mechatronics is the power supply unit.	Beam switch




## 5、Fiber cable


Fiber core diameter	600 μm	
Fiber optic interface	LLK-B	
Numerical aperture	NA 0.22	
length	20m	
Bending radius	min 250mm	
Operating temperature	10-40°C	
Suitable for robot and gantry operation, with inherent anti-reflection and misalignment protection, integrated temperature sensor, connection and fiber break. Water cooling is suitable for diode lasers if necessary.		


## 6、Optical Head

OTS5	Spot size Ø1.6-2mm (fast cladding), F1 (collimation)	The four optical
------	--	------------------

	<p>distance) = 105mm, F2 (focus distance) = 300mm, optical lens diameter 2 inches, room temperature water cooling module, positive pressure gas protection module, collimation module The focusing module, the protection module and the cooling module are both sealed and dustproof, and the coaxial powder feeding nozzle can be connected under the protective mirror.</p> <p>The built-in CCD vision module is integrated into the laser lens and the processing laser through the conversion module, and the cross cursor is used for the weld bead alignment after welding.</p>	<p>heads are connected to the fiber by LLF-D fiber interface, 0° coupling unit, unreflected beam, and LLK-D dust cap</p> 
OTS5	<p>Ø3.5-4mm (conventional cladding), F1 (collimation distance) = 105mm, F2 (focus distance) = 400mm, optical lens diameter 2 inches, room temperature water cooling module, positive pressure gas protection module, collimation module, focusing The module, the protection module and the cooling module are both sealed and dustproof, and the coaxial powder feeding nozzle and the side nozzle can be connected under the protective mirror.</p> <p>The built-in CCD vision module is integrated into the laser lens and the processing laser through the conversion module, and the cross cursor is used for the weld bead alignment after welding.</p>	
OTS5	<p>17*3.5mm (wide cladding, hardening), F1 (collimation distance) = 105mm, F2 (focus distance) = 400mm, optical lens diameter 2 inches, room temperature water cooling module, positive pressure gas protection module, collimation module The focusing module, the protection module and the cooling module are both sealed and dustproof, and the side nozzle can be connected under the protective mirror.</p> <p>Integrated German Mergenthaler two-color infrared pyrometer, detection range 450-1500 ° C, accuracy ± 0.1% or ± 1 ° C (whichever is higher), resolution 0.1 ° C, response time 0.2 ms. The detection light source is integrated into the laser lens and the processing laser through the light conversion module, and has real-time display and feedback control functions, waveform display and record storage, and realizes temperature-laser power closed-loop control.</p>	

7、Powder feeding nozzle		
TZSF-2	<p>Made of copper metal as material, modular design, compact structure, threaded connection with lens, <math>\pm 5\text{mm}</math> adjustment in X, Y and Z directions, dustproof and anti-splash on coaxial air curtain, <math>\Phi 6</math> cooling interface and powder pipe, 4-way powder inlet, coaxial The annular powder feeding head (the powder is coaxially fed into the molten pool along the laser beam, and the crack resistance is good).</p> <p>Suitable for <math>\text{Ø}1.6\text{-}2\text{mm}</math> spot cladding for powder particles of <math>20\text{-}150\mu\text{m}</math>, powder spraying rate <math>2 - 100\text{g} / \text{min}</math> (depending on process data such as laser power, speed and thickness), can spray Fe, Ni, Co Base alloy (taking Fe-based alloy as an example, the cladding efficiency is <math>3.5\text{kg} / \text{h}</math> for <math>8\text{kW}</math> laser, <math>1.8\text{kg} / \text{h}</math> for <math>4\text{kW}</math> laser), coaxial positive pressure gas protection, nitrogen or argon gas, air pressure <math>0.2\text{-}0.4 \text{ MPa}</math> (depending on the degree of spatter of the alloy material).</p>	
TZSF-2	<p>Made of copper metal as material, modular design, compact structure, threaded connection with lens, <math>\pm 5\text{mm}</math> adjustment in X, Y and Z directions, dustproof and anti-splash on coaxial air curtain, <math>\Phi 6</math> cooling interface and powder pipe, 4-way powder inlet, coaxial The annular powder feeding head (the powder is coaxially fed into the molten pool along the laser beam, and the crack resistance is good).</p> <p>Suitable for <math>\text{Ø}3.5\text{-}4\text{mm}</math> spot cladding for powder particles of <math>20\text{-}200\mu\text{m}</math>, powder spraying rate <math>10 - 150\text{g} / \text{min}</math> (depending on process data such as laser power, speed and thickness), can spray Fe, Ni, Co Base alloy (taking Fe-based alloy as an example, the cladding efficiency is <math>5.5\text{kg} / \text{h}</math> at <math>8\text{kW}</math> laser, <math>2.5\text{kg} / \text{h}</math> at <math>4\text{kW}</math> laser), coaxial positive pressure gas protection, nitrogen or argon can be used, air pressure is <math>0.2\text{-}0.4 \text{ MPa}</math> (depending on the degree of spatter of the alloy material).</p>	
PZSF-2	<p>The copper metal is used as the material, and the powder tube and the nozzle are respectively modularized and screwed.</p> <p>Suitable for <math>\text{Ø}3.5\text{-}4\text{mm}</math> spot cladding for powder particles of <math>20\text{-}200\mu\text{m}</math>, powder spraying rate <math>10 - 200\text{g} / \text{min}</math> (depending on process data such as laser power, speed</p>	

	and thickness), can spray Fe, Ni, Co Base alloy (taking Fe-based alloy as an example, the cladding efficiency is 6.5 kg / h for 8 kW laser and 3.5 kg / h for 4 kW laser).	
KZSF-2	<p>It adopts copper metal as the material integrated design, with <math>\Phi 6\text{mm}</math> water cooling at room temperature, and the opening size of the bypass wide-band powder feeding nozzle is 15*1.5mm.</p> <p>Suitable for 17*3.5mm spot cladding for powder particles of 20-200<math>\mu\text{m}</math>, powder spraying rate 20 - 300g / min (depending on process data such as laser power, speed and thickness), can spray Fe, Ni, Co based Alloy (taking Fe-based alloy as an example, the cladding efficiency is 7.5 kg / h for 8 kW laser and 5.5 kg / h for 6 kW laser).</p>	

8、Powder feeder		
<b>Powder Feeding Unit, HGSF-2A</b>	<p>HGSF-2A type binoculars powder feeder is by quantitative powder feeding tray carrier gas transports the powder powder feeder. Powder Feeding height repeatability of <math>\pm 2\%</math>, capable of delivering a variety of particle size to meet the domestic generic cladding alloy powder. Powder feed tray speed setting range 0-100g, powder feed rate is continuously adjustable.</p> <p>Features:</p> <ol style="list-style-type: none"> <li>1) Siemens S7-200PLC do electrical control, stable performance, low failure rate;</li> <li>2) touch screen operation, simple and clear;</li> <li>3) powder feed stable (<math>\pm 2\%</math>), precision (see diagram), the amount of feed powder and powder carrier gas flow continuously adjustable (0-100g);</li> <li>4) Remote control / control system</li> </ol>	

	<p>software can be adjusted in real time to set the amount of feed powder.</p> <p>After adjusting the flow rate control valve and set the parameters to obtain a suitable carrier gas flow rate and powder feed can start cladding process. The table below (for reference only):</p>	
--	---	--



9、Laser Line Service term		
<b>Maintenance and availability, LDF</b>	<p>Laserline recommends an annual preventive maintenance with change of all consumables for its LDF series diode lasers. We also recommend the customer to purchase a spare optical fiber to be able to react rapidly in case of a fiber failure. Optimized operation of the laser in combination with stack management results in typically &gt; 99.5 % availability of our diode lasers in production. Further arrangements that can further reduce production downtime should be discussed. This may include backup components or backup lasers on the customer's site.</p>	
<b>Accessory</b>	<p>1 DI-water filter  1 water filter for main circuit  1 water filter optic circuit  1 set of drying capsules for laser head  1 filter element for main line filter  1 filter element for sub micro filter  1 set of tool kit (including inner hexagon, lens paper, special wrench for lens, special wrench for filter, etc.)</p>	
<b>Service</b>	<p>For its diode lasers, Laserline offers tailored service and maintenance agreements. Maintenance requirements and production downtime can be kept to a minimum with Laserline's diode lasers rendering them even more cost- effective.</p>	
<b>Annual preventive maintenance for LDF</b>	<p>Detailed check of laser head, supply unit, optical fibers, optics and further system components.  Replacement of consumables if required: Water filters, DI filters, desiccant capsules and cover slides.  Cleaning and alignment of mirrors and lenses inside laser head, if required.</p>	



	<p>Measurement of output power and current/voltage ratio.</p> <p>Check of diode status and cooling water flow.</p> <p>Final check of laser system.</p>
<b>Warranty</b>	<p>Warranty on the diode laser system is 2 years. Warranty on diode laser elements is 5 years in agreed operation conditions. "Agreed operation conditions" requires regular preventive maintenance as above and information/teleservice at any major failure within 48 hours. The operation mode (power, cycles, usage of shutter) has to be discussed once the laser runs in production.</p> <p>The warranty excludes consumables and damage due to improper usage of the laser, but includes parts and labor. Warranty starts at date of shipment. Defects will be repaired free of charge at the original place of delivery only; otherwise, additional costs will be charged to the customer.</p>

### 3.2 Automation, tooling, control system

Kuka robot, linear slide, rotary machine, positioner, rotary towline, robot flexible pipe.

1、 KUKA KR60 Robot		
Robot	<p>KR60</p> <p>Connection cable set X20 compl.;15m</p>	
Control cabinet KR C4	<p>Interface 2 external axis x7.1/.2</p> <p>KPP600-20 2*40 UL down right</p>	1
Rail motor	<p>MG_110_130_40_S0</p> <p>Resolver cable QUANTEC add.axis,flexible;8m</p> <p>Single motor cable 2,5mm<sup>2</sup>;H-I1;15m</p>	1
External shaft motor	<p>MG_260_180_30_S0</p> <p>Resolver cable QUANTEC add.axis,flexible 15m</p> <p>Single motor cable 2,5 mm<sup>2</sup>;H-I1;10m</p>	2
Control function	<p>In addition to all joint axes of the robot body, the robot also has the ability to control up to three external axes. The rotary axis of the positioner and the rotary axis of the light rotary platform share a kuka drive.</p>	
Teach Pendant Control	<p>1.Laser on and off control.</p> <p>2.Simulated laser processing operations for pre-processing of the machining process.</p> <p>3.Fault diagnosis function: Display clear alarm information when the fault occurs, the software comes with fault diagnosis and troubleshooting instructions or written fault diagnosis and repair instruction manual.</p>	





	<p>4.The teaching programmer adopts the human-machine interface of the teaching programmer, which can conveniently teach the robot and its external coordination axis posture and position, and can adjust parameters such as parameters online during laser processing.</p> <p>5.KUKA original medium-load robot, suitable for laser processing with laser working head, equipped with communication interface, digital/analog signal interface for easy communication with laser control system and deep integration. Comes with a Smartpad touch screen teach pendant.</p>	
--	---	--

### KR60 Main specifications:

Model		6 axis Robot
Axis		6
Mas speed	J1 Axis rotation	128°/sec
	J2 Axis rotation	102°/sec
	J3 Axis rotation	128°/sec
	J4 Axis arm rotation	260°/sec
	J5 Axis wrist rotation	245°/sec
	J6 Axis wrist rotation	322°/sec
Max range	J1 Axis rotation	-185 — +185°
	J2 Axis rotation	-135 — +35°
	J3 Axis rotation	-120 — +158°
	J4 Axis arm rotation	-350 — +350°
	J5 Axis wrist rotation	-119 — +119°
	J6 Axis wrist rotation	-350 — +350°
Max reach		2033mm
Max payload		≥ 60 kg
Drive mode		AC Servo motor
Repeating accuracy		±0.06mm

## 2、Machine Construction System

1) RRW50-2 Robot linear axis		
Robot linear slide range	2500mm	
Robot linear slide speed	0-5000mm/min	
Robot linear slide transmission mechanism	Rack and pinion	
Robot linear axis motor and	KUKA Servo motor and driver	

driver		
Repeat accuracy	±0.05mm	
<b>2) RRW50 Big Rotate axis、T worktable and Tailstock</b>		
Rotary axis head box placement	Horizontal	
Horizontal rotary load	5T (Chuck pins loading) , 20T (Roller loading)	
Vertical rotary load	1T	
Rotary axis box center height	1000mm	
Rotary axis Chuck and tips	Φ630mm 4-Jaw chuck, standard double tips	
Rotary axis rotate speed	0-15rpm, Enter the robot program, continuously adjustable	
Machine worktable size	6000*1200mm, table is Integral casting	
Tailstock and tips	Tips Taper=60°C, Mechanical expansion200mm	
Tips Sleeve diameter	Φ200mm	
Roller	2pcs, copper surface roller	
Rotary axis motor and driver	KUKA Servo motor and driver	
<b>3) TRC Rotating drag chain、TC Robot flexible pipe</b>		
Rotating drag chain	The drag chain dedicated to the rotary motion of the robot is placed at the bottom of the robot. The fiber, cable and air pipe are built into the drag chain, which facilitates fast switching between the laser bilateral stations, smooth inner cavity, better protection of cables	

	and optical fibers, and highest rotation speed. Up to 1m / s, the rotation angle is up to 5400, the bending radius is 300mm, and the outer ring radius is up to 850mm.	
Flexible pipe	The optical fiber, cable, air pipe, etc. from the towline to the laser processing head process pass through the fully enclosed, anti-debris pipeline, and follow the multi-dimensional movement of the robot, which is convenient for the robot to perform multi-dimensional movements freely, using the ball slot connection, and exerting tensile strength. High torsion resistance, each link has a rotation angle of $\pm 10$ degrees, a pipe diameter of 85 mm, a bending radius of 250 mm, with a strain relief joint and a swivel joint.	

3、Central Control System		
Siemens S7-1200 PLC	This system uses Siemens PLC as the main control unit, laser, KUKA robot, powder feeder, vertical and horizontal rotary machine, man-machine interface and so on.	
	The central control system integrates the	


	<p>relevant information of the robot and the laser, can control the start and stop of the robot, can control the start and stop of the laser, can set the power of the laser and display the actual power of the laser in real time, and can control the start of the powder feeder and the machine tool. stop. The robot is connected with the rotary machine tool and the traverse guide 6+3, and the system is highly integrated. After the robot machining program is programmed, after setting the laser power on the central control system, the machining can be completed in one click. The design has a chain warning protection or a soft and hard limit</p>	
	<p>Control principle: cabinet and the digital/analog signal are connected to the PLC module. The configuration software of the central control system communicates with the PLC to monitor the program preparation, stop, pause, program selection, fault alarm light and The laser is turned on to indicate laser, laser enable, start, stop, power display, fault display and remote/body control, as well as the powder feeder of the powder feeder, pause, fault, powder feeding speed, etc. Laser, powder feeder, etc.</p>	



#### 4. Auxiliary system

1. Water Chiller			
Model		HL-3000-QG2/2	
Voltage		AC 380V/50HZ	
The refrigerant		R22	
Total Currency (A)		25	
Low	Power (W)	2200	

temperature circulation pump	Maximum lift (m)	68
	Rated flow (L/min)	130
Normal temperature circulation pump	Power (W)	750
	Maximum lift (m)	57.5
	Rated flow (L/min)	33
Water tank volume (L)		175
Using environment	Temperature (°C)	0~40
	Humidity	0~80%
Temperature range (°C)		10~40
Accuracy		±1.5°C
Temperature display resolution		0.1°C
Flow switch		Low temperature
		Work flow>5L/min , stop flow<5L/min
Passive alarm output		Over temperature and flow, normally closed signal output
Other security protection		Press heat protection, press delay protection, high and low voltage protection, phase sequence protection, water level, leakage protection, safety ground protection, etc.
Dimension		1350*830*1910mm (L*D*H)

2 Dust purification system	<p>Mobile single-arm type dust purifier (picture is for reference only), equipped with 3 m universal suction arm, 360° free hover; imported polyester fiber filter, filtering accuracy of 0.3um soot particles up to 99% Professional electronic control design, all-round protection such as overheating and phase sequence; drawer type dust bucket design, easy to clean; patented technology quiet noise reduction design, reduce wind noise and mechanical noise; industrial grade mute anti-skid wheel, easy to move It can be easily moved in the complex ground/work area of the workshop to purify the smoke generated by the laser equipment.</p> <table><tr><td>Model</td><td>SE-22</td></tr><tr><td>Power (KW)</td><td>2.2</td></tr><tr><td>Voltage (V/HZ)</td><td>220/50</td></tr><tr><td>Max flow (M<sup>2</sup>/H)</td><td>2800</td></tr><tr><td>Filtration area (M<sup>2</sup>)</td><td>11.0</td></tr><tr><td>Noise (DB)</td><td>74±2</td></tr><tr><td>Inhalation diameter (mm)</td><td>150/200</td></tr><tr><td>Dimension (mm)</td><td>700*750*1280</td></tr><tr><td>Weight (kg)</td><td>140</td></tr></table>	Model	SE-22	Power (KW)	2.2	Voltage (V/HZ)	220/50	Max flow (M <sup>2</sup> /H)	2800	Filtration area (M <sup>2</sup> )	11.0	Noise (DB)	74±2	Inhalation diameter (mm)	150/200	Dimension (mm)	700*750*1280	Weight (kg)	140	
Model	SE-22																			
Power (KW)	2.2																			
Voltage (V/HZ)	220/50																			
Max flow (M <sup>2</sup> /H)	2800																			
Filtration area (M <sup>2</sup> )	11.0																			
Noise (DB)	74±2																			
Inhalation diameter (mm)	150/200																			
Dimension (mm)	700*750*1280																			
Weight (kg)	140																			
3.Air Compressor	Model: W-0.97/8/12.5 Power: 7.5kW Exhaust pressure: 0.8mpa/12.5mpa																			
4.Stabilizer	Model: SBW-100kVA Input Voltage: 304~456V Output Voltage: 380V±3% adjustable Insulation resistance (MΩ) ≥2 effectiveness ≥98% Waveform distortion ≤0.1% Working frequency (Hz) 50~60 Voltage regulation accuracy ±(1~5) % adjustable When the input voltage jumps a stable schedule ative to the rated value, the set is less than 1.0s.																			



## 5. Spare parts

No.	name	Model	Qty	Supplier	Remarks
1	Toolkit		1 set	Questt	
2	Laser protection glasses		2 pcs		
3	Protective mirrors	D50*2	5 pcs		Must be replaced by a professionally trained and approved staff member
4	Deionized ink drum		1set	Germany	
5	Water filter		1 pc		
6	Desiccant		1 bag		Must be replaced by the original factory or replaced by qualified personnel
7	Gas, water pipe		few	Questt	

## 6. Delivery, installation and commissioning of equipment

### 1. Delivery

The delivery method is motor transportation. The delivery contract can be delivered within 3 months after the contract is signed. The contract is guaranteed.

### 2. Installation and commissioning

The seller will install and debug the buyer's designated place free of charge. The buyer must provide the factory and supporting facilities that meet the conditions for the installation and commissioning of the goods. The seller shall complete the complete installation of each cargo. When the equipment needs to change the position in the future, the seller has no obligation to re-install, but the two parties can negotiate friendly.

3. The equipment installation and commissioning conditions that the buyer should have (the following are the water, electricity and gas requirements of each equipment)

- (1) Water: 200L of pure water.
- (2) Electricity: Three-phase five-wire system 50HZ Three-phase 380V, single-phase 220V,

electric cabinet grounding wire is not more than 4 ohms, voltage fluctuation is less than 10%, and nearby high-power high-current equipment meets the requirements of electromagnetic compatibility standard IEC61000-6-2.

- (3) Gas: Laser lens protection gas: dry compressed air / dry nitrogen (air compressor + cold dryer, filter); powder feeding gas: dry nitrogen / dry argon.
- (4) Ground: Standard factory floor. If the equipment needs to be rebuilt, the seller will provide the standard foundation map to the buyer 20 days before delivery. The buyer will make the foundation before the equipment arrives according to the requirements of the foundation map.
- (5) Lifting: Lifting device with lifting weight greater than 15 tons.
- (6) Ambient temperature, humidity: 5 ° C ~ 40 ° C, humidity: 20% - 75%, no condensation, laser operating temperature is 18 ° C ~ 26 ° C environment.

## 7. Training

### General rules for training

- ❖ The seller has the responsibility and obligation to train the buyer's technical staff. The seller trains the buyer's technicians in terms of operation and maintenance so that the buyer's technicians are familiar with the equipment and control system and understand it.
- ❖ The training costs of the buyer's technical staff are included in the total contract price and are not listed separately.
- ❖ The seller's training of the buyer's technical personnel shall be high-quality, experienced senior technical personnel. Knowledge and skills can be passed on to the buyer's technicians, both in the classroom and in the workshop.
- ❖ The buyer's technical staff trained must be a professionally educated, technically competent technician who will work in the factory and prepare to strengthen the training.
- ❖ The seller shall provide the buyer with a preliminary training manual. If the buyer has any comments, he may submit an opinion to the seller within one month after receiving the manual. The seller will submit the final version to the buyer after making the corresponding

modifications.

### **Technical training**

#### Training instructions

- ❖ The seller is responsible for the free technical training of the buyer for the complete set of machinery, CNC, electrical, laser and laser processing technology, equipment operation and maintenance to ensure that the buyer can independently carry out the general processing operations.
- ❖ Basic technical training is conducted in 3 sessions, and the total training time is no less than 3 weeks (time).
- ❖ Seller training content is systematic, extensive, targeted and practical

#### **Training content** (training tutorials are compiled according to the content of this contract)

- ❖ Laser principle and safety protection
- ❖ How the laser works
- ❖ Laser operation and routine maintenance
- ❖ Maintenance of external light path
- ❖ CNC system operation and programming
- ❖ Daily maintenance of machine tools and management of spare parts

Note: The buyer has the right to make final changes to the number of trainers and the training period.

- ❖ Training purposes
- ❖ The participating trainers have a certain understanding of the laser technology and various parts of the machine tool, and can skillfully use the equipment for processing and routine maintenance.

### **Requirements for students**

- ❖ Have a higher education level or above, and more than 2 years of relevant work experience in the factory.
- ❖ After the training, the trainees will conduct written examinations and on-site operation

assessments under the supervision of the seller. Only qualified for the exam can be put on the job.

- ❖ Number of trainees: 2 to 5 people in machine tools, CNC/Electrical, laser and laser processing technicians.

## **8. After sales service**

1. After the equipment is inspected at the buyer's site, the quality assurance period of the equipment is one year (including the overall warranty of the laser for 3 years, counting from the date of shipment from the laser manufacturer). Free replacement of parts and services (excluding consumables such as optical fibers, lenses, nozzles, and other consumables) during the warranty period, and within 24 hours after receiving the buyer's fault information, the maintenance personnel will arrive at the scene if needed
2. The seller has a professional after-sales service team. After the equipment leaves the factory, the seller establishes a "buyer file card" to track and record the relevant information of the buyer.
3. During the warranty period of the equipment: The seller is responsible for free replacement parts and services due to any damage or damage caused by the quality of the equipment itself, except for the conventional consumable parts and the accidents that the buyer's site conditions do not meet the normal operation or illegal operation of the equipment. The seller is obliged to replace the damaged parts free of charge for damage caused by equipment.
4. After the equipment maintenance service is completed, the seller shall report the cause of the fault, the remedial measures, the time and date of completion of the repair and return to normal to the buyer. The report signed by the buyer, in duplicate, for review.
5. The Seller Customer Service Center provides lifetime maintenance services for the products provided, and provides daily consultation and guidance related to the equipment.
6. The seller has sufficient spare parts and accessories to provide technical services and spare parts services to the buyer in time to meet the maintenance needs of the equipment.
7. The seller holds the buyer's technology and market exchange meeting every year to enhance the exchange of experience between the buyers and introduce the buyer to the latest



technological progress of the seller in the field of laser application.

8. After the expiration of the equipment warranty, the seller still guarantees a wide range of preferential spare parts supply and technical support.

Wuhan QUESTT ASIA Technology Co., Ltd

Address: A7-101, Hangyu, WuDa Sci & Tech Park, East Lake Dev. Zone, Wuhan, Hubei, China

Zip: 430223

Tel: 0086 27 87611146

Fax: 0086 27 59908808

Email: [info@questtlaser.com](mailto:info@questtlaser.com)

Mobile: 0086 13294168619

QQ: 2696898824

[Http://www.questt.com.cn](http://www.questt.com.cn)

[Http://www.questtlaser.com](http://www.questtlaser.com)