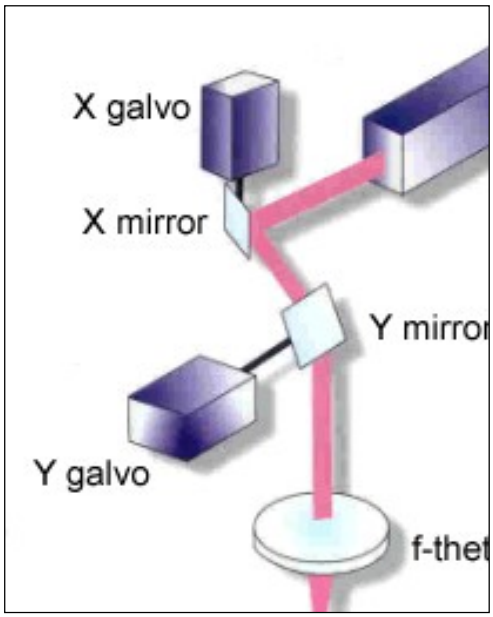
Laser Marking Heads (Laser Scanners, Scan Heads)

A whole laser marking head (or called laser scanner) consists of two scan mirrors, two galvanometers (or called galvo-scanner motor) & drive cards (or called driver), a XY mount, a scanning lens (f-theta lens), an interface card (or called D/A card), a set of marking software and a DC power supply.

Basics of 2-axis laser scanners

A laser beam is reflected from two scan mirrors in turn, and directed through a focusing lens. The mirrors are capable of high speed deflection about a rotation axis, being driven by a galvo-scanner motor. In most cases the maximum deflection angle of the mirror is ±12.5° (often ±10° is a safer limit) either side of the non-deflected incidence angle of 45°.

Note that, for best performance, the lens will appear to be 'the wrong way round' when compared with a standard meniscus lens used in conventional focusing of a laser beam.



Some of the design objectives in specification of 2-axis laser scanners are:

- Achievement of desired scanned field size
- Maximization of scan speeds
- Minimizing focused spot sizes
- Lowest cost solutions

Some of the limitations to be considered are:

- Quality factor **Q** (Q = M^2) of the laser beam
- Scan angle limitations
- Loss of power due to beam-clipping
- Physical aperture of the scanner head

Field of scan

The laser beam will be scanned over an angle θ, equal to twice the mirror deflection angle. So, the typical scanned field might be θ=±20° in both X and Y directions. (θ=±25° would be the usual maximum scanned field). The field size is then approximately 2F$\tan\theta$ in both X and Y.

The approximation arises because:

1) it is usually desirable to have a deliberate distortion characteristic in the scanner lens design so that the field position is proportional to θ, not $\tan\theta$.

2) scanning in two axes produces a geometrical distortion which is unrelated to the lens properties.

Focused spot size

The lower limit on spot size 'd' ($1/e^2$ intensity diameter) for a laser beam of diameter 'D' ($1/e^2$) is:

$d = 13.5QF/D\ \mu m$

Example: A TEM_{00} beam (Q=1) of 13.5mm ($1/e^2$) diameter, focused by a perfect lens of 100mm focal length, will form a focused spot of 100μm diameter. (Taking a more realistic value of Q=1.5, the spot size would be 150μm).

Beam clipping and optical aberrations can lead to focused spot sizes which are larger than the minimum diffraction limited value found from the equation above.

Large field sizes demand the use of lenses of long focal length. In turn, this leads to increased focused spot size unless the beam diameter, mirror sizes, and lens diameter are all increased.

Spot sizes are given in the form of an average spot size over the whole, maximum, field-of-scan. A second figure, the standard deviation from average spot size, gives a measure of variation of the spot size to be expected over the field.

Beam clipping

The physical aperture of a laser scanner is often limited by a circular aperture of the scanner head, of diameter 'A' mm, say.

Beam clipping can occur at a circular aperture, even for a well-centred beam, when the 'tails' of the beam energy distribution is blocked by the metalwork. The percentage power loss at a circular aperture, for a TEM_{00} beam (Q=1) is shown in the following table:

Table: Power Loss

A/D	0.8	1	1.2	1.4	1.6	1.8	2
Loss %	27.8	13.5	5.6	1.98	0.6	0.15	0.03

The table indicates that, where the physical aperture of the scanner is limited to A mm diameter, the laser beam diameter D ($1/e^2$) must be selected by a compromise between reduced spot size and power loss due to beam clipping. A value of D = A/1.4 would probably be acceptable for most laser scanner systems. Power loss due to beam clipping increases for de-centred beams.

Mirror design

Mirror (1) (or called Scan Mirror X)

The width of mirror (1) is determined by the beam diameter. It is easier to discuss this in terms of a 'full beam diameter' D_F, where the definition of full diameter is, to some extent, arbitrary.

For example, a system designer might define D_F as the measured diameter of a beam print in perspex [plexiglass]. Alternatively, D_F may be the measured 99% power points, or perhaps a value chosen in the range 1.4D to 1.6D.

The mirror width W1 is slightly larger than the selected value of D_F, sufficient to allow for minor misalignment. The length of mirror (1) is determined by the maximum angle of incidence i_{max} on the mirror. Let $\alpha = (90° - i_{max})$. Then the mirror length is L1, where $L1 = W1/\sin\alpha$. The large shape 'chamfers' on scanner mirrors are determined by the separation, S1, between mirrors (1) and (2); the scan angles, and the need that the mirrors should not collide during scanning.

Mirror (2) (or called Scan Mirror Y)

The width of mirror (2), W2, should be identical to the length of mirror (1). The length, L2, of mirror (2) is found from projection of the beam onto the second mirror at a distance of S1, and at maximum scan angle θ. These mirrors are built and coated *specifically for use with CO2 or YAG lasers*. They have a very high laser damage threshold, measured at 1000W/mm of $1/e^2$ beam diameter (D).

F-theta characteristic

Lenses described as being 'F-theta', or 'Fθ', type are designed so as to produce an off-axis spot at a location proportional to the scan angle. In turn, this may be directly proportional to a voltage applied to the galvo scanner motor. (A lens with zero distortion would form a spot at a field location of Ftanθ). No 2-axis galvo scanner can have a true F-theta characteristic, due to distortion from use of two mirrors. Single-element lenses are designed to be the best compromise between smallest spot size and F-theta characteristic. Errors in F-theta characteristic are usually 2% - 3% for these single element lenses. Multi-element lenses allow design freedom enabling a closer approach to F-theta performance. Fθ errors <0.36% are typical for this range, with only the 75mm FL type having a slightly greater value.

Lens design

All scanning lens designs are based on factors described above. For typical small scanner systems, limited to perhaps 10mm or 15mm full beam diameter, lenses of 48mm diameter have been found to be suitable. For 15mm beams, this lens size is only possible by minimizing the distances S1 and M2L. Each class of lens is designed for use with a specific range of beam diameters, and, more importantly, for a specific set of values S1 and M2L.

In each case the lens is designed to provide the best compromise performance for flat field, spot size and F-theta characteristic for the specified beam diameter and mirror locations, while avoiding beam-clipping at the lens mount.

For certain (longer focal length, single-element) lenses it is possible to obtain an improvement in performance by increasing the distance M2L. This necessitates the design/use of lenses of larger diameter (to avoid beam clipping).

Marking software

The Window-based marking software supports various fonts, pictures (PLT, DXF, BMP), automated series numbers, barcodes & DataMatrix. The users can easily use AutoCAD or CorelDraw to design their patterns. They also can scan photos or logos and then use marking software to mark.

How to Properly Select Marking Head, Beam Expander, Scan Mirror, F-theta Lens and Laser

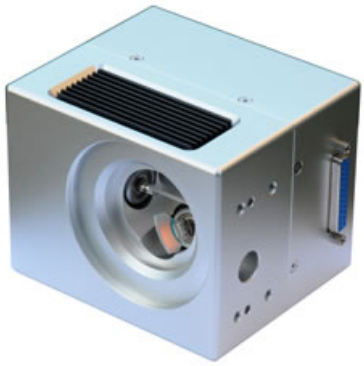
Here laser beam diameter is D1, beam diameter after beam expander is D2, beam expansion ratio is T, maximum allowed input beam diameter of scan mirrors is D3, maximum allowed input beam diameter of marking head is D4, Entrance pupil of f-theta lens is EP.

$D3 \geq D1 * T$ or $D4 \geq D1 * T$ or $EP \geq D1 * T$

Marking field is proportional to focal length (or working distance) and focused beam diameter is also proportional to focal length (or working distance).

Part Number Description of Marking Head

Description of Part Number: LSxx-xxxx-yy-AAAA
LSxx: laser scanner. xx means series marking heads such as CT, SL, LC, JC.
xxxx: laser wavelength.
yy: maximum input laser beam diameter.
AAAA: notes or remarks



LSJC-xxxx-10-2206

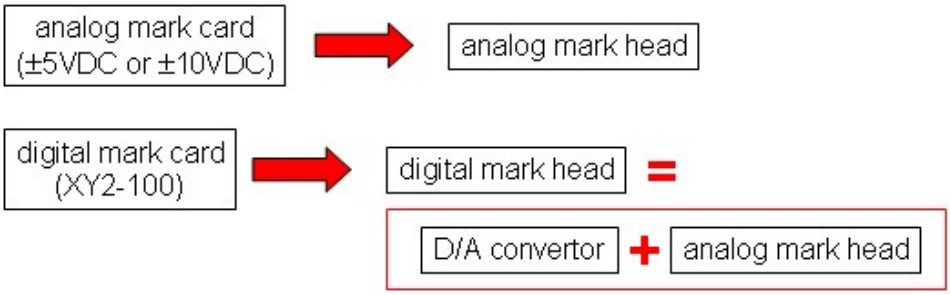
LSJC-xxxx-14-2208

Part number	Max entrance dia. mm	Model of galvo	Dimension LxWxH,mm	Control
LSCT-xxxx-12-6230	12	CTI-6230	165x125x125	Analog input
LSCT-xxxx-12-6231	12	CTI-6231	165x125x125	Analog input
LSSL-xxxx-7-XS	7	OSSL-XS	79x69x78	XY2-100
LSSL-xxxx-10-S	10	OSSL-S	115x97x94	XY2-100
LSSL-xxxx-10-BC10	10	OSSL-S	106x91x91	XY2-100
LSSL-xxxx-14-M	14	OSSL-M	134x100x106	XY2-100
LSLC-xxxx-10-DIGI	10		115x97x97	XY2-100
LSJC-xxxx-10-2206	10		119x97x94	XY2-100
LSJC-xxxx-14-2208	14		126x98x105	XY2-100

All above marking heads can operate at 1064nm, 532nm, 355nm or 10.6um wavelength. Other entrance diameters available upon request. Please contact us for more information.

Remark:

- The marking field of marking head depends on the f-theta lens. In general, it is 105x105mm (CO2 laser) or 110x110mm (Nd:YAG laser). Other mark fields are available upon request. In order to have best marking result, you may prepare a few f-theta lenses with different mark fields for your various applications.
- The focused beam diameter depends on the optical system such as beam expander and f-theta lens, laser beam parameter such as beam diameter and beam divergence angle, and marking parameters such as marking speed and material.
- All above analogue marking heads can be converted into digital marking heads via a D/A convertor.



LSSL Series Laser Marking Heads

Portable size, Fast speed, High accuracy

LSSL-7-XS, -10-S & -14-M

LSSL-10-BC10

Typical Fields of Application:
-> Marking in the packaging sector
-> Semiconductor industry
-> Electronics industry

LSSL series laser marking head is an ultra-compact one which delivers excellent dynamics and superior product quality in a minimum-size package. The solid performance of the marking heads is made possible by the new, miniaturized servo amplifiers and industry-proven OSSL series galvanometer optical scanners. Aperture of 7, 10 and 14mm are available.

Sealed against water and dust, the LSSL robust and exceptionally compact housing facilitates straightforward integration into production environments-even confined, difficult to-access locations. A wide variety of objectives can be used with these scan heads.

Versions with analog or digital interfaces are available. The digital version can be simply controlled via a PCI interface board or PC-independent standalone board. LSSL scan heads are ideally suited for solutions requiring very high marking speeds and integration in confined spaces. Applications include coding in the packaging industry or the marking of electronic components – areas traditionally served by inkjet systems.

Optics
We precisely optimize and tune all optical components to one another to ensure maximum focus quality and stable process parameters. Optical components offered by us include exceptionally compact objectives, as well as objective adapters for standard objectives. Optics for various wavelengths, power densities, focal lengths and image fields are available.

Control
LSSL marking heads are equipped with either an analog or a digital standard interface accessible via a 25-pin D-SUB connector. They are easily controlled via PC interface board or the PC-independent standalone board from us.

Quality
The high quality is the result of years of experience in the development and manufacture of galvanometer optical scanners and scan systems. In addition, every scan system must first pass the quality check burn-in test before it is released for shipment to the customer.

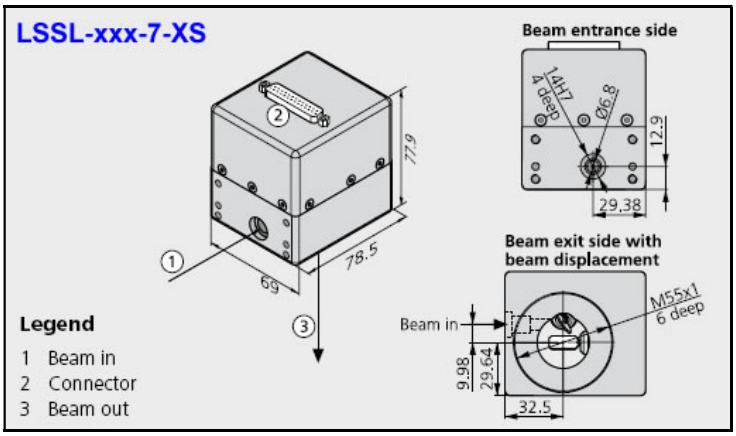
Common Specifications (all angles are in optical degrees)

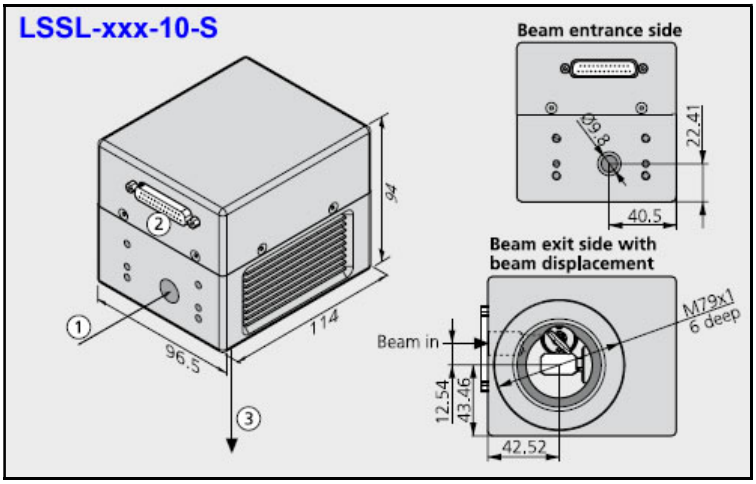
Dynamic Performance	Repeatability	< 22µrad
	Offset drift	30µrad/K
	Gain drift	80ppm/K

	Long-term drift over 8 hours	< 0.3mrad, plus temperature induced gain and offset drift
Optical Performance	Typical scan angle	±0.35rad
	Gain error	< 5mrad
	Zero offset	< 5mrad
	Nonlinearity	< 3.5mrad
Interface	Analog version	±4.8 V
	Digital version	XY2-100 standard
Operating Temperature		25 °C ± 10 °C

Product-Dependent Specifications (all angles are in optical degrees)

Part number	LSSL-xxx-7-XS	LSSL-xxx-10-S	LSSL-xxx-10-BC10	LSSL-xxx-14-M
Aperture	7mm	10mm	10mm	14mm
Beam displacement	9.98mm	12.54mm	12.54	16.42mm
Dynamic Performance Tracking error	0.14ms	0.18ms	0.14ms	0.30ms
Step Response Time (settling to 1/1000 of full scale) 1% of full scale 10% of full scale	0.30ms 0.70ms	0.40ms 1.2ms	0.35ms 1.0ms	0.65ms 1.6ms
Typical speeds Marking speed Positioning speed Writing speed with good writing quality Writing speed with high writing quality	2.5m/s 12.0m/s 900cps 600cps	2.0m/s 7.0m/s 640cps 400cps	2.5m/s 12m/s 800cps 570cps	1.0m/s 7.0m/s 410cps 280cps
Power Requirements	±15VDC max. 2A each	±15VDC max. 3A each	±15VDC max. 3A each	±15VDC max. 3A each
Weight (without objective)	650g	1.9kg	1.5kg	2.3kg

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Beam entrance side
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Beam exit side with
beam displacement
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Beam in
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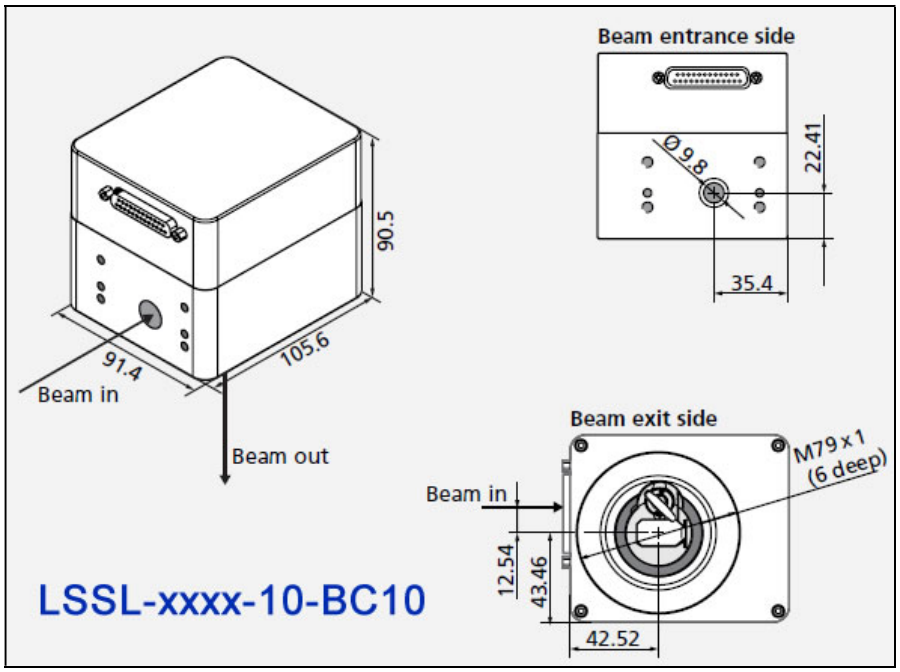
Beam entrance side
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Beam in
Beam out
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Beam in
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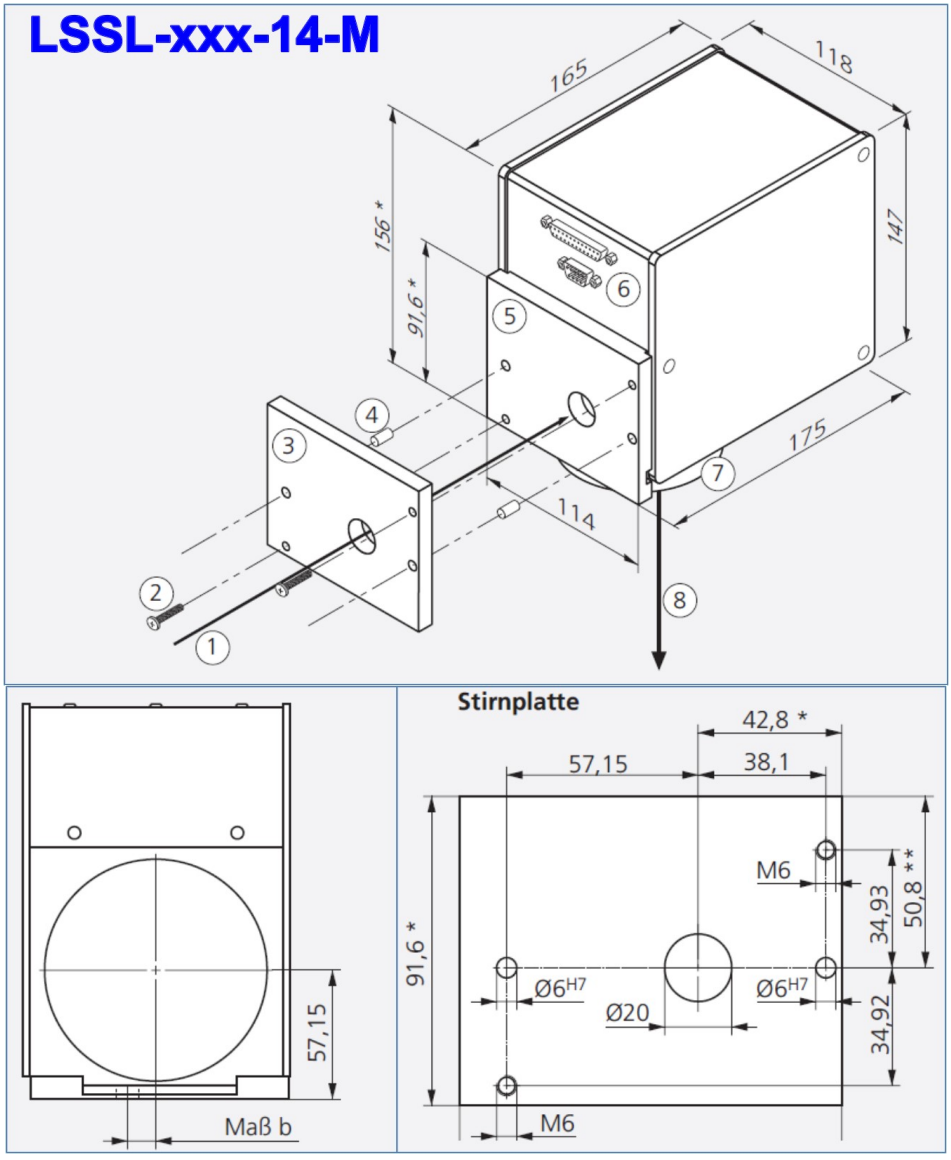
LSSL-xxxx-10-BC10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118
156 *
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Stirnplatte
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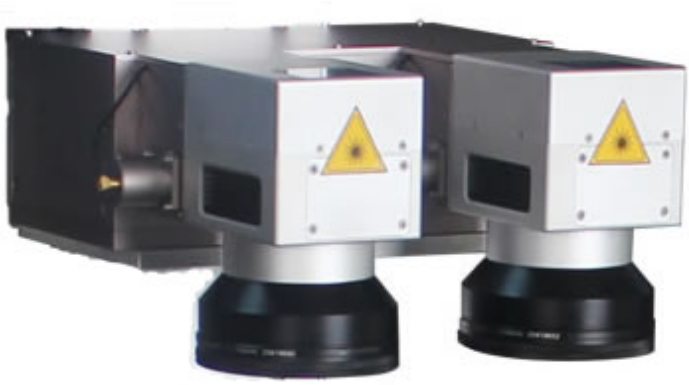
Laser Marking Dual-Heads

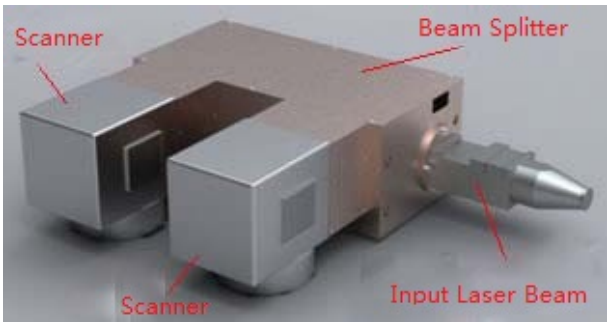


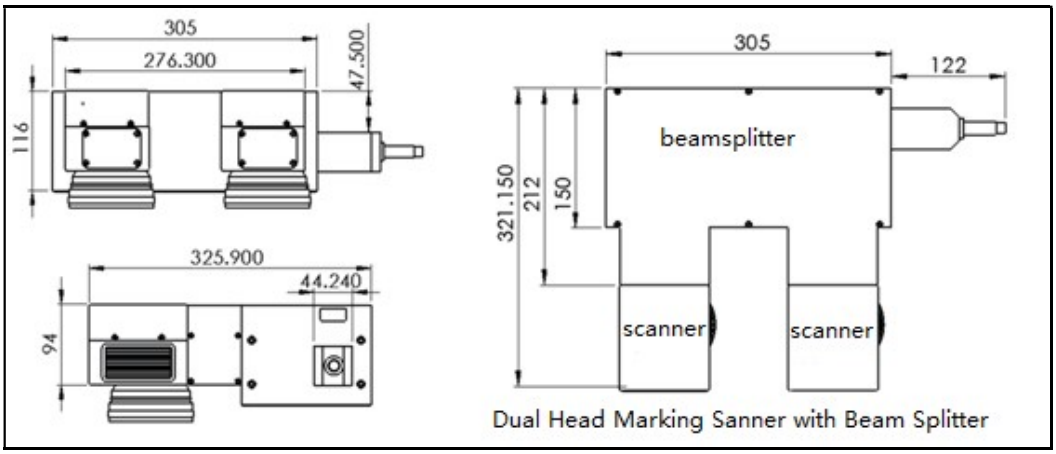
Dual-head using 2pcs single LSSL marking heads

Dual-head laser marking head consists of two individual single marking heads and a beam splitter. A laser beam enters the dual-head laser head and then is divided into two laser beams via an optics system. Then the two laser beams will enter the two individual single marking heads, respectively. The dual-head marking head is controlled by a specific software and the two single heads can be operated synchronously or independently. The dual-head marking heads are suitable to the applications which require high speed and large marking field.

The specifications of the dual-head marking heads are same as the specifications of the single marking head except the doubled marking fields. For example, the marking field will be 200x100mm if the single head's marking field is 100x100mm.

We can supply the dual-head marking heads operating with CO2 lasers, Nd:YAG lasers and fiber lasers.





LSLC Series Scan Heads & Software

Digi-Cube II is the new intelligent, self tuning digital Laser Scan Head with the technologically advanced digital processor

Digi-Cube II has been designed for easy OEM design integration and plug-and-play replacement for existing analogue scan heads with industry standard mechanical bolt patterns, industry standard power and communication pinouts as well as a range of popular apertures, mirror coatings and lenses. The Digi-Cube II uses XY2-100 Communication Protocol as standard.

Other digital scan heads available on the market, which are many times more expensive, cannot begin to the match price and performance of the Digi-Cube II. In fact this new Laser Scan Head costs less than most analogue models and it's also IP55 rated.

The Digi-Cube II operating system uses DSP technology to rapidly compute and predict the exact drive impulses required to achieve small mirror movements with the fastest possible acceleration.

In fact the only thing that restricts the speed of the galvanometer (an impressive 1K impressions per second) are the laws of physics. Once the Digi-Cube II is switched on, it performs a detailed self diagnosis and system check to determine the operating parameters of the individual galvos. This ensures the accuracy and positioning of the laser marking is precise and error free – something that cannot be guaranteed with analogue models which often have to undergo complicated manual recalibration procedures after prolonged use. This is particularly important in the marking of components in the semi-conductor industry where positional accuracy is paramount. If speed, accuracy, cost-effectiveness and long term reliability are your requirements — *the Digi-Cube II is the intelligent choice.*

Improved Performance
Where marking time is limited by galvo performance, rather than laser power, a 50% to 100% speed improvement could be expected.

Benefits
- Increased productivity with significantly faster scan speeds
- Fits easily into any new or existing production line
- 'Plug-and-Play' system simplifies installation and compatibility
- Much lower heat generation than other DSP scan heads, the Digi-Cube runs as cool as a typical analogue scan head
- Improved dynamic performance
- Fast 'On the Fly' processing

- Small mirror moves without waiting for feedback
- Simpler and faster set-up
- Scale & offset pot only
- Most cost-effective and unbeatable method of increasing performance of your scan heads
- Automatic tuning checks when powered up
- Compatible with analogue scan heads using the XY2-100 protocol
- Reduced temperature drift
- Robust IP55 rated case for protection against particle ingress and a good level of protection against water

Improved Field Serviceability

As the Digi-Cube has self tuning technology it is now possible to replace just the scanners or the mirrors. This eliminates the expense of either calling out a service technician to tune in replacements or the need to return the scan head to base.

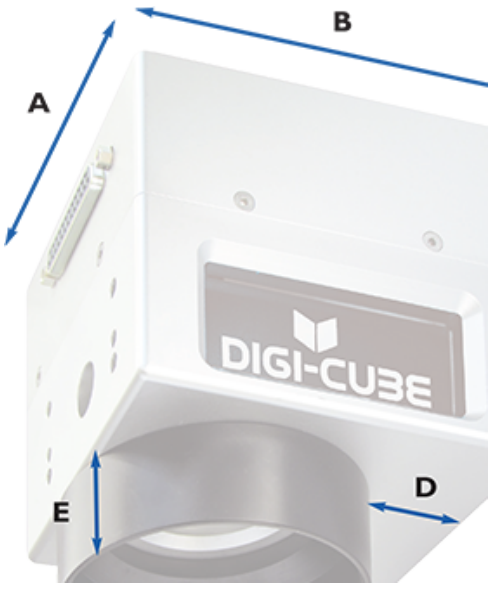
This saves both time and money – and enhances your system's reputation and decreases downtime for your customers.

Typical applications

- High Accuracy Laser Marking
- Scribing / Engraving
- Welding
- Photovoltaic Production
- Trimming
- Rapid Prototyping
- On the Fly Processing
- Laser 3D Printing
- Scanner Control Systems in medical equipment

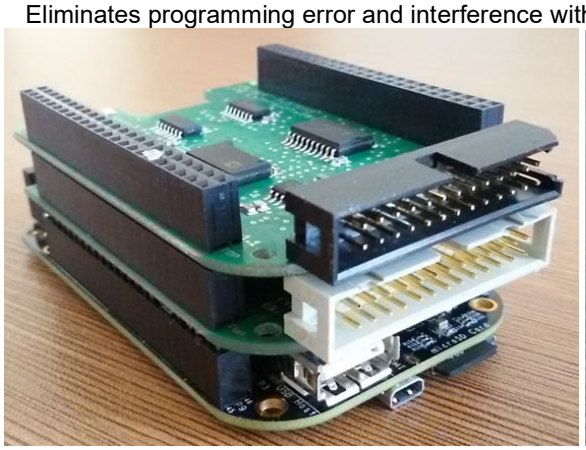
DigiCube II Specifications (DSP controlled 10mm XY Scan Head)

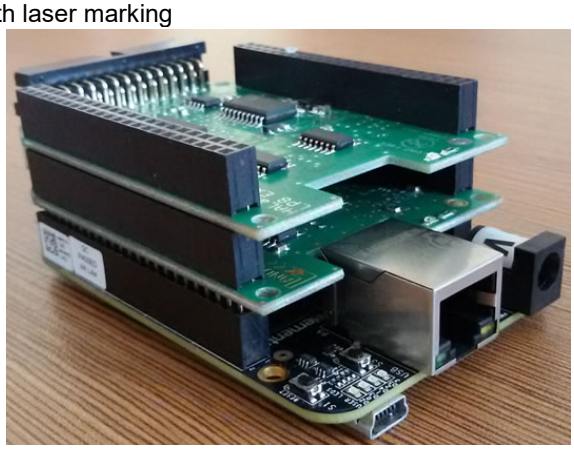
Laser wavelength	1064nm
Beam entrance diameter	10mm
Power supply requirement	+24/-24V 4A
Maximum current drive to galvo	10A
Quiescent power draw (no marking)	<10W
Positioning speed m/s	10 - 20
Marking speed m/s	3 - 6
Precision writing cps	500
High quality writing cps	1000
Resolution urad	10urad
1% step response setting to 0.1% fs	0.28ms
Scale drift ppm/C	<40
Zero drift urad/C	<10
Linearity %	99.9
Short term repeatability urad	<8
Dither RMS	<10urad
Weight	2.2kg
Dimensions	A97MM, B115mm, C97mm, D15mm, E30mm, F90mm



DIGI-STRUCT Laser Marking Controller

- Increases productivity & flexibility
- Saves time & material
- Easier to customise
- Minimises downtime
- Eliminates programming error and interference with laser marking

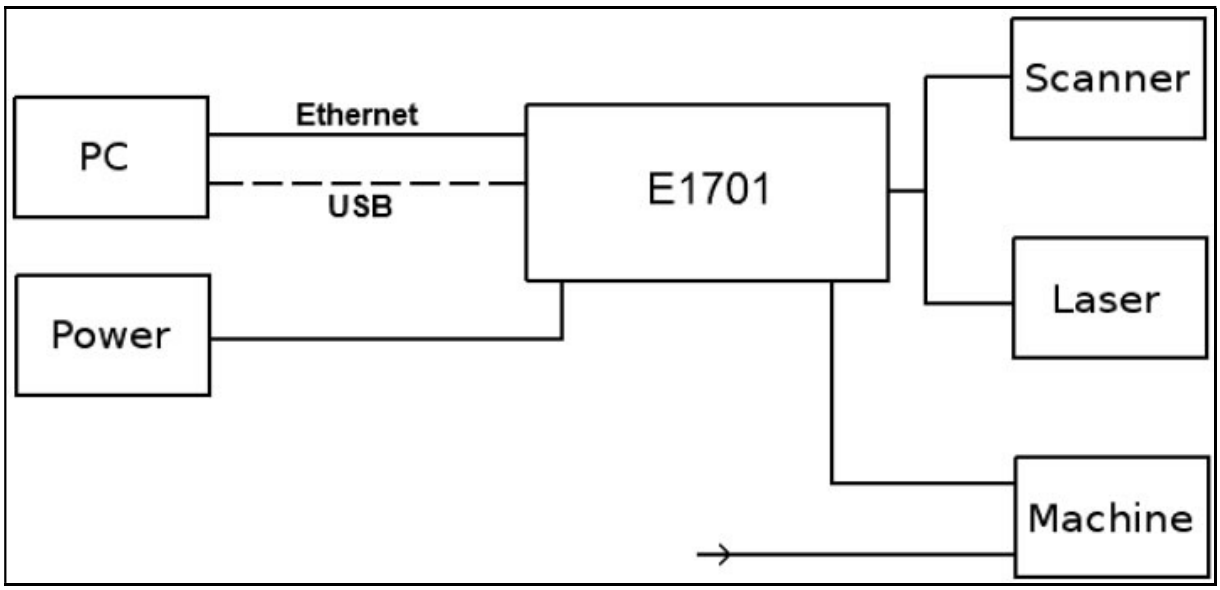




The laser marking controller consists of E1701D scanner controller baseboard plus optional extension boards. The E1701 scanner controller boards are designed for controlling galvanometric scanner systems with two or three axes. Depending on the used extension boards (which are optional) they also supply extensive signals for laser and external control. The communication between the host system and the controller boards is done via Ethernet or USB.

When using E1701 scanner controller boards, there is always one baseboard required for proper operation.
This baseboard can be used together with different extension boards that provide additional signals for
controlling the laser marking process. These extension boards are optional and have to be used only in
environments where the additional signals processed by these boards are required. So depending on used type of laser and requirements, the minimal solution to control a laser marking system may consist of the baseboard only.

Normally extension boards can be combined with any baseboard and all other extension boards freely, there are no restrictions for usage. In case some specific extension board types can't be operated with other boards, Normally an E1701 baseboard can be combined with several extension boards of different types but not with more than one board of same type. In case of special extension boards where more than one board of the same type can be used, this is stated in description of the related boards below.



E1701D XY2/100 Digital Laser Scanner Controller Baseboard
This baseboard can be used to control 2D or 3D scanheads that come with a XY2/100 interface. It can be combined with extension boards without any restrictions. E1701D offers following features:

- XY2/100 interface to scanhead with X, Y and Z channel
- 100 Mbit Ethernet connection
- USB 2.0 connection
- online XYZ grid correction with support for several correction table file formats (like SCAPS(tm) .ucf,
- Scanlab(tm) .ctb and .ct5, Raylase(tm) .gcd)
- switching between up to 16 grid correction tables during marking process
- high-definition online XYZ grid correction with BeamConstruct HD correction files (.bco)
- 10 microseconds vector cycle time and resolution (microstep period)
- command execution time down to 0,5 microseconds
- realtime processing of laser and scanner signals
- 26 bit internal resolution (for better quality also with 16 bit hardware output)
- can control nearly every laser type (this may require extension boards as described below)
- two laser CMOS digital outputs for usage with YAG, CO2, IPG(tm), SPI(tm) and compatible laser types
- (outputs can provide PWM frequency, Q-Switch, FPK-pulse, CW/continuously running frequency,
- stand-by frequency) running with frequencies of up to 20 MHz
- 512 MByte DDR3 RAM
- 1 GHz CPU clock
- support for Micro-SD and Micro-SDHC cards
- internal command and vector data list with more than 20 million entries
- continuous list concept, no need to swap between lists
- BeamConstruct PRO license included
- open source compatibility library that emulates existing programming interface for fast and easy usage
- with existing software (contains e.g. Scanlab, RTC4), SCAPS, USC/SCI and other compatible interfaces)

E1701 LP8 Extension Board
This board can be used to provide signals for controlling a wide range of laser types. It offers following features:

- LP8 8 bit CMOS level parallel digital output e.g. for controlling laser power
- LP8 latch CMOS level digital output for usage with IPG(tm) and compatible laser types
- Master Oscillator CMOS level digital output for usage with IPG(tm) and compatible laser types
- 8 bit 0..5V analogue output e.g. for controlling laser power (this output is a slave of LP8 outputs)
- two laser CMOS level digital outputs for usage with YAG, CO2, IPG(tm), SPI(tm) and compatible laser
- types (outputs can provide PWM frequency, Q-Switch, FPK-pulse, CW/continuously running
- frequency, stand-by frequency) running with frequencies of up to 20 MHz

E1701 Digi I/O Extension Board
This board provides additional digital in- and outputs for synchronisation and communication with external equipment. It offers following features:

- 8 freely usable digital outputs providing either CMOS level or electrically insulated outputs via
- external power supply
- 8 freely usable digital inputs expecting either CMOS level or electrically insulated inputs via external
- power supply
- 2 digital inputs usable for quadrature encoder signals for marking on-the-fly applications

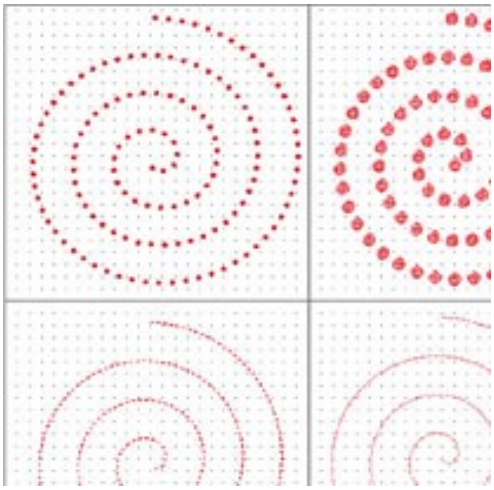
E1701 Secondary Head Extension Board
Using boards of this type additional heads can be connected which then work in parallel to the first scanhead of E1701D baseboard. So as only output it provides an additional XY2/100 connection.

The Digi-Struct is feature rich software platform that provides a user-friendly layout with an easy-to-use and powerful toolset for the creation of laser marking programmes and control of Digi-Cube laser scan heads to further maximise productivity and reduce production costs

DIGI-STRUCT Features
A vast array of different one dimensional and two dimensional codes are available from installation including QR codes, Datamatrix UPC and EAN.

Supports TrueType fonts, including Unicode, and a variety of different script styles.
Fulfils the demands of an ever more globalised identification and labelling market. Digi-Struct also

comes with 11 different laser vector fonts providing legible characters in the fastest possible timeframe.



A large number of different date and time options are available.
Provides the ultimate flexibility of date and time coding while remaining simple to use through a date/time wizard. Customisable date/time strings can also be made using a list of easily entered commands with minimal syntax.

Provides a variety of line styles, giving you full control of the laser marking process.
Perforation of pieces can be achieved by a few clicks of a mouse and custom line styles are available to perform specific tasks.

Supports images and artwork in a variety of standard formats including .dxf and .svg.
Makes adding logos and images to products quick and easy. With no tooling to consider, brands and logos can be changed,

The automated test matrix makes the fine tuning of your marks faster and easier.
This gives you the best possible contrast using the shortest amount of time and using as little material as possible.

By utilising the automated test matrix tool, a number of different effects created by the laser source can be marked on to a single swatch of sample material and can easily be identified and refined using the grid within the automated test matrix.

3D capabilities allows for subtractive 3D printing(removing material instead of adding).
Utilises a versatile 'Slicing' system, breaking down a complex 3D project into easy-to-handle 2 dimensional layers.

DIGI-CARD **Scan Head Controller – Software Board & Extension Boards**
Combines a powerful 1GHz processor on a compact platform with a scalable architecture and low thermal output. This allows laser OEM's to integrate the software into their current design pipeline easily and efficiently.

YAG and CO2 lasers are supported out of the box, whilst the easy-to-connect extension boards can be added to interface with fibre laser sources such as IPG®, SPI®, iLuma®, Raycus and all other commercially available laser sources.

The Digi-Card sports a 100Mb Ethernet connection allowing for the rapid transfer of data between a PC and the laser control software which is stored on the 4GB micro SD card containing all the laser marking programmes. The programmes can then be selected by software commands or by utilising the I/O expansion board.

DIGI-LINK **Control Box**
An easy-to-use feature of the Digi-Struct Software allows up to 254 different laser marking programmes to be created on a Laptop or Desktop computer.

These programmes can then be downloaded on to a micro SD card and inserted into the Digi-Link Control Box.

When the Digi-Card Scan Head Controller Board is connected to the Digi-Link it allows the user to select the appropriate programme and externally control laser stop/start functions, removing the need for a Laptop/Desktop on the shop floor -saving time, eliminating programming error and preventing any unauthorised access or interference with the laser marking.

The Digi-Link control box can also receive instructions via an Ethernet connection allowing full factory integration.

Marking Card and Marking Software

Our marking software has been designed to meet the needs of all types of users of laser marking systems. The software was developed to be a retrofit package for existing systems, or as original software on new systems. The package provides significant advancements over previous laser marking control systems, while remaining extremely user-friendly. It's an object oriented, graphically interactive, PC control system providing a user the ability define and execute laser marking jobs. Multiple hardware interfaces are supported giving the software the ability to control most Nd:YAG and CO_2 laser marking systems.

Unlike some marking software, the operator never has to remember what fonts and logo's need to be loaded for a particular job. The software automatically performs all required graphic loading. The software does not require users to learn any programming languages or special codes, and yet the software provides all of the flexible, graphic control users are accustomed to, including radial marking, aspect control, character spacing, angular rotations, and full justification. Text to be marked can be fixed or variable. Variable text can be retrieved at runtime from a variety of sources including, the keyboard, a bar code reader, and disk files. Automatic date coding and alphanumeric serialization are included as variable text types. Fonts include laser engraving fonts and Window's True Type fonts. True Type fonts can be vector filled using user specified density, angle and kerf. Graphics (sometimes called "logo's" on other systems) can be imported from a large variety of common vector formats. All graphic features are either menu controlled or graphically controlled via the mouse and keyboard.

The software can create various objects such as barcode, DataMatrix, text, simple geometrical objects (such as line, rectangle, round-corner rectangle, polygon, circle, ellipse etc), complex graphic objects (such as PLT & BMP files), automatic date coding and alphanumeric serialization.

There are three types of marking cards (interface cards) and relevant software: LMX series, LMM series and LMC series. LMC can operate with Windows7 but others can not.

1. LMX Series Cards and Software

LMX Marking Control Card is especially developed for scan head and laser control in real time with a PCI bus interface. It is used with corresponding software to control laser marking.

- 2 analog output ports (for scan head);
- 1 laser switch signal(TTL);
- 1 PWM signal(TTL);
- 9 digit input signals;
- 4 output signals(relay output);
- 2 differential mode axes control for step/servo motor;
- 1 single ended mode axe control for stop/servo motor;

DB37: Pin Assignments

No.	Name	Description	Characteristics
1	CP1+	1st pulse+ signal	
2	DIR1+	1st direction+ signal	
3	AGND	Analog GND	Analog
4	X-OUT	Scanning mirror X output	Analog
5	CP2+	2nd pulse+ signal	
6	CP2-	2nd pulse- signal	
7	CP1-	1st pulse- signal	
8	IN0	0 input signal	
9	12V GND	Power 12V GND	
10	5V GND	Power 5V GND	
11	Input 5V	Input 5V	
12	COM1	Relay1 COM	

13	COM3	Relay3 COM	
14	NO4	Relay4 normal open port	
15	NO2	Relay 2 normal open port	
16	IN2	2 input signal	
17	IN6	6 input signal	
18	IN3	3 input signal	
19	IN4	4 input signal	
20	CP3	3rd pulse signal	
21	DIR3	3rd pulse signal	
22	PWM	PWM signal	TTL
23	Y-OUT	Scanning mirror Y output	Analog
24	DIR2-	2nd direction- signal	
25	DIR2+	2nd direction+ signal	
26	DIR1-	1st direction- signal	
27	GATE	Laser output signal in YAG laser	TTL
28	5V	Power 5V	
29	12V	Power 12V	
30	IN1	1 input signal	
31	NO1	Relay1 normal open port	
32	NO3	Relay3 normal open port	
33	COM4	Relay4 COM	
34	COM2	Relay2 COM	
35	IN5	5 input signal	
36	IN7	7 input signal	
37	IN8	8 input signal	

Model and description:

Model	Main function
LMX-1	2D marking to control X galvo and Y galvo
LMX-1A	2D marking to control X galvo and Y galvo plus rotation table
LMX-1AB	2D marking to control X galvo and Y galvo plus XY table

2. LMM Series Cards and Software

LMM Marking Control Card is especially developed for scan head and fiber laser control in real time with a PCI bus interface. It is used with corresponding software to control laser marking. The suitable fiber lasers are IPG, Manlight and SPI lasers via 8-bit laser power adjustment.

- 2 analog output ports (for scan head);
- 11 digital output signals, TTL/CMOS compatible;
- 7 digital input signals TTL/CMOS compatible;
- 1 PWM signal output (TTL).

There are following main functions of LMM marking software:

- Operation under WINXP / 2000
- Acceptable for PLT and BMP
- Support drawing such as circle, rectangle, line etc.
- Support the edit of SHX and TTF fonts
- Barcode, 2D DataMatrix, series numbers, date, time
- Support the layers up to 8
- Save of all system parameters
- Support copy, delete, replace, move etc
- Support mirror, hatch, group
- Set pulse repetition rate, pulse duty factor
- Control ON/OFF, laser power of CO2 lasers from Synrad, Coherent, Universal Lasers, Manlight and IPG etc.

DB37: Pin Assignments

No.	Name	Description	Characteristics

1	CP1+	1st pulse+ signal	
2	DIR1+	1st direction+ signal	
3	AGND	Analog GND	Analog
4	X-OUT	Scanning mirror X output	Analog
5	CP2+	2nd pulse+ signal	
6	CP2-	2nd pulse- signal	
7	CP1-	1st pulse- signal	
8	IN0	0 input signal	
9	COM	Relay Comm	
10	GND	GND	
11	NO	Relay NO	
12	D0		
13	D2		
14	D4		
15	D6		
16	NC	Relay NC	
17	Temp	Alarm Temperature	
18	Alarm MO	Alarm MO	
19	Frequency	Alarm Frequency	
20	CP3	3rd pulse signal	
21	DIR3	3rd pulse signal	
22	Pulse Repet	Pulse Repe	TTL
23	Y-OUT	Scanning mirror Y output	Analog
24	DIR2-	2nd direction- signal	
25	DIR2+	2nd direction+ signal	
26	DIR1-	1st direction- signal	
27	PA	Power Amplifier(PA)	TTL
28	5V	5V	
29	Red Light	Red Light	TTL
30	IN1	1 input signal	
31	D1		
32	D3		
33	D5		
34	D7		
35	Back Ref	Alarm back reflection	
36	MO	Master Oscillator(MO)	TTL
37	ES	Emergency Stop	TTL

Model and description:

Model	Main function
LMM-1	2D marking to control X galvo and Y galvo
LMM-1A	2D marking to control X galvo and Y galvo plus rotation table
LMM-1AB	2D marking to control X galvo and Y galvo plus XY table

3. ETH6608 Series Cards and Software

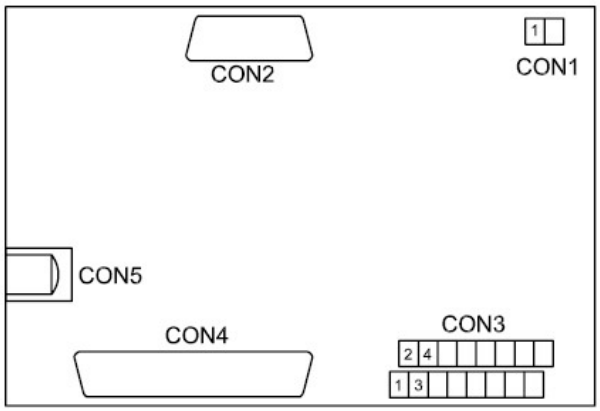
The ETH6608 card, which is designed to provide a standalone platform with Ethernet communication to PC, allows the capability of more devices configuration, and is more compatible solution in laser marking or engraving applications. Marking data can be downloaded by using a RJ45 interface with default IP address 192.168.1.55, and the PC to be set under 192.168.1.X.

Due to the configuration flexibility, there are four models available to different requirements:
ETH6608A1_5/10, to control 1 analog scanner via ±5/10VDC
ETH6608A2_5/10, to control 2 analog scanners via ±5/10VDC
ETH6608A1D1_5/10, to control 1 analog scanner via ±5/10VDC, and 1 digital scanner
ETH6608A2D1_5/10, to control 2 analog scanners via ±5/10VDC, and 1 digital scanner

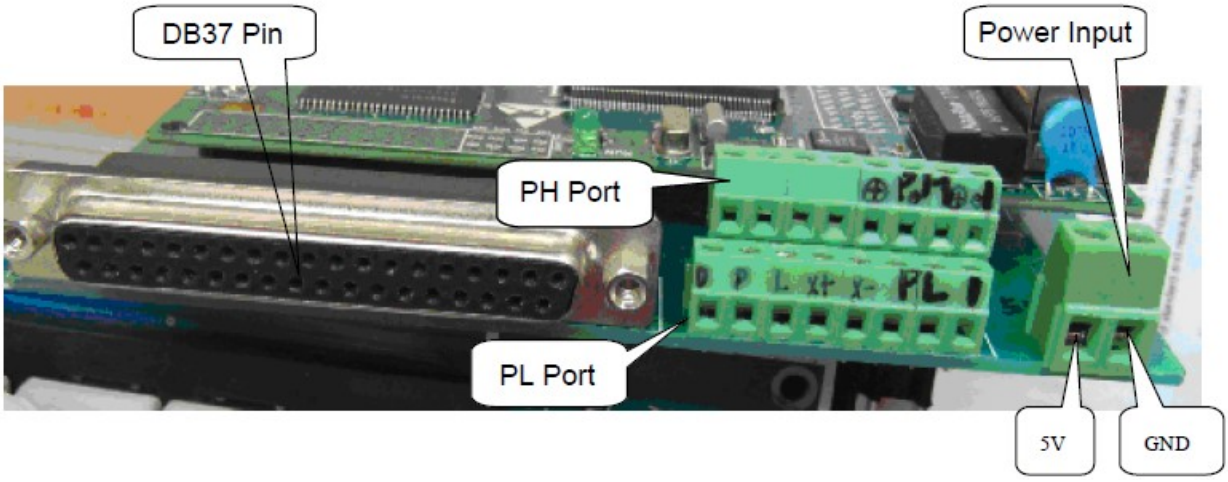
In its standard configuration, the ETH6608 consists of a base board with the following features:

- 100MBits Ethernet connection
- Compatible with digital scanner head
- Four 16-bit DAC output, selectable voltage output to control analog scanner
- 16 channels TTL compatible digital input
- 21 channels TTL compatible digital output
- 6 channels hardware limit inputs, to control motion
- Special instruction for pulse number
- 1 differential PWM output, minimum 10ns pulse width

The board dimensions and layout



Legend:
CON1: Power 5VDC 3A, 2Pin socket
CON2: Digital scanner head, XY2-100
CON3: Analog scanner head
CON4: Laser IO & PWM output
CON5: Ethernet, RJ45 connecter



Electrical connections

1 Power supply

The power source is connected to a 2-pin “CON1” header on the board, 5VDC 3A power source is required to operate this unit.

Port	Description	Remark
1	+5V	+5VDC
2	GND	Return

2 Digital scanner

A male D-Sub 15pins connector headed with “CON2”, digital scanner head can connect to this port with protocol of XY2-100, while an analogue scanner works with external DAC by connecting to this port.

Pin	Description	Pin	Description
1	CLK-	9	CLK+
2	SYNC-	10	SYNC+
3	XCH-	11	XCH+
4	YCH-	12	YCH+
5	ZCH-	13	ZCH+
6	NC	14	NC
7	NC	15	GND
8	GND		

* 3 axis digital scanner works only ZCH-/ZCH+ are connected. Twisted cable is strongly recommended.

3 Analog scanner CON3

This port can control either one or two 2-axis scanners, or one 2-axis scanner plus Z-axis. DAC1 & 2 assigned for Scanner1, while DAC3 & 4 for Scanner2. DAC output voltage to be decided upon ordering.

Pin	Description	Pin	Description
1	DOUT3	2	DAC4
3	DOUT2	4	AGND
5	DOUT1	6	DAC3
7	DIN1	8	AGND
9	DIN2	10	DAC2
11	GND	12	AGND
13	VCC+5V	14	DAC1
15	NC	16	AGND

4 Laser control

Header mark “CON4”, provides predefined or general IOs for laser and peripheral devices. Total 14 DIs, 18 DOs and 2 PWM outputs are available located on a female DB37 connector. 1 PWM is configured as differential output.

No.	General	Defined For Fibre Laser	Remark
1	VCC+5V	VCC+5V	+5V output
2	PWM3-	PRR RETURN	Return of PWM3+
3	PWM2		
4	DOUT7	ES	Emergency stop
5	DOUT9	RED ON	Red beam
6	DOUT11	D0	Power setting LSB
7	DOUT13	D2	Power setting
8	DOUT15	D4	Power setting
9	DOUT17	D6	Power setting
10	DOUT19		
11	DOUT21		
12	GND	GND	Return of signal
13	DIN4		
14	DIN6		
15	DIN8	MO ALM	Master oscillator alarm
16	DIN10	BK ALM	Back reflection alarm
17	DIN11		
18	DIN12		
19	DIN16		
20	DOUT4		

21	DOUT5		
22	PWM3+	PRR	Pulse repetition output
23	DOUT6	GATE	Laser ON
24	DOUT8	MO	Master Oscillator
25	DOUT10	PA	Power Amplifier
26	DOUT12	D1	Power setting
27	DOUT14	D3	Power setting
28	DOUT16	D5	Power setting
29	DOUT18	D7	Power setting MSB
30	DOUT20		
31	DIN3		
32	DIN5		
33	DIN7	TEMP ALM	Temperature alarm input
34	DIN13		
35	DIN9	FREQ ALM	Frequency alarm input
36	DIN15		
37	DIN14		

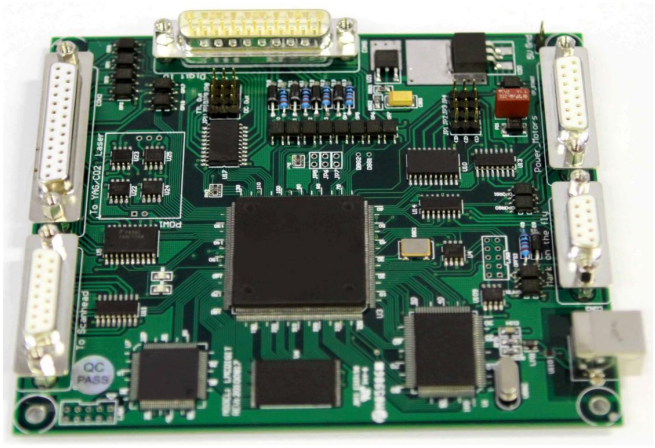
4. LMC Series Cards and Software

Our marking software has been designed to meet the needs of all types of users of laser marking systems. The software was developed to be a retrofit package for existing systems, or as original software on new systems. The package provides significant advancements over previous laser marking control systems, while remaining extremely user-friendly. It's an object oriented, graphically interactive, PC control system providing a user the ability define and execute laser marking jobs. Multiple hardware interfaces are supported giving the software the ability to control most Nd:YAG, CO_2 and fiber laser marking systems such as adjusting currents, frequency, duty ratio . and red light indication.

Unlike some marking software, the operator never has to remember what fonts and logo's need to be loaded for a particular job. The software automatically performs all required graphic loading. The software does not require users to learn any programming languages or special codes, and yet the software provides all of the flexible, graphic control users are accustomed to, including radial marking, aspect control, character spacing, angular rotations, and full justification. Text to be marked can be fixed or variable. Variable text can be retrieved at runtime from a variety of sources including, the keyboard, a bar code reader, and disk files. Automatic date coding and alphanumeric serialization are included as variable text types. Fonts include laser engraving fonts and Window's True Type fonts. True Type fonts can be vector filled using user specified density, angle and kerf. Graphics (sometimes called "logo's" on other systems) can be imported from a large variety of common vector formats. All graphic features are either menu controlled or graphically controlled via the mouse and keyboard.

The software can create various objects such as barcode, DataMatrix, text, simple geometrical objects (such as line, rectangle, round-corner rectangle, polygon, circle, ellipse etc), complex graphic objects (such as PLT & BMP files), automatic date coding and alphanumeric serialization.

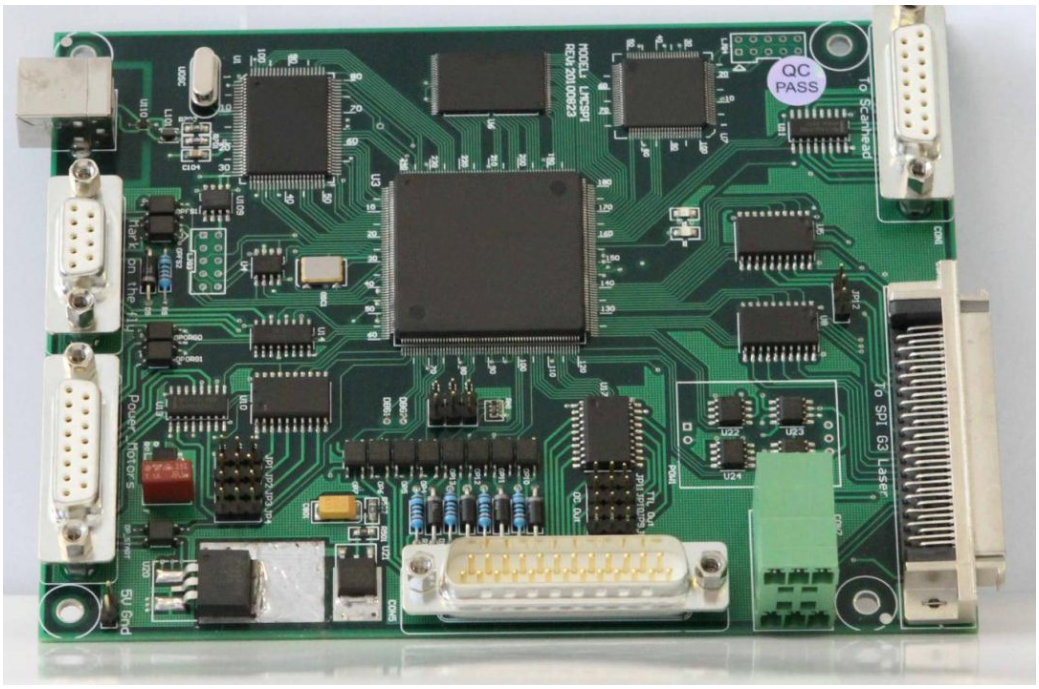
Digital card (control CO2 laser, YAG laser)



- Data transfer:usb2.0 interface
- Digital output used for scan head
- Support FPK with three ways [optional]
- Support high-speed fly marking with rotary encoder
- Eight digital input and seven digital output used for other controlled equipment
- 25 routes general digital signals(TTL compatible), 4 of the IO ports can be OC IO, can connect with relay.
- LASER Signal: TTL, used for laser On/Laser Off .
- PWM Signal: TTL, used to adjust the frequency and duty ratio.
- Tow Direction/Pulse signals, used to control

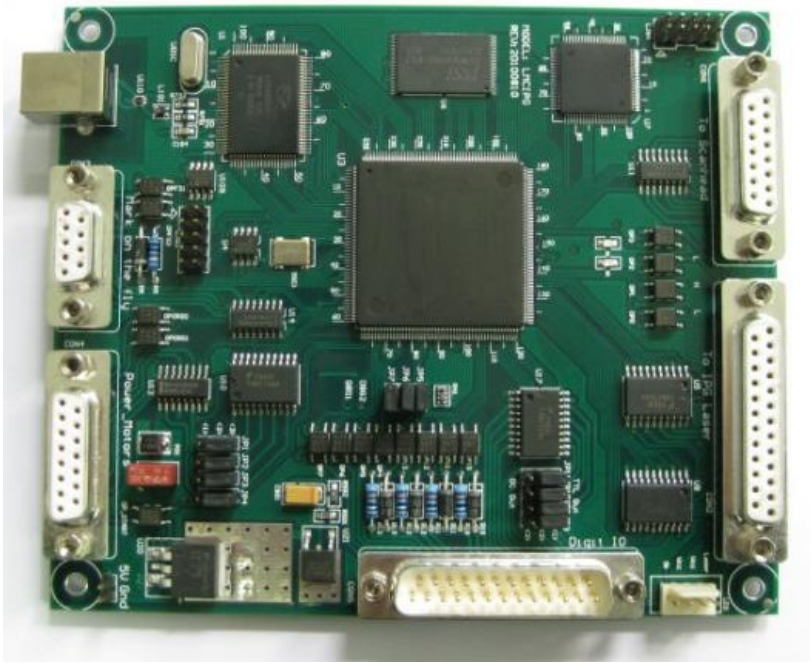
stepping motor.
- START Signal: used to connect foot switch

SPI G3.0 card (control SPI laser)



- Use 68-pins SCSI 3 socket, connect SPI G3 laser module via 68-pin cable directly
- Adjustable digital/analog output used for scan head
- Mark-on-fly function with an encoder connected
- Extend axes output: Two Direction/pulse signals, used to control stepping motor or servomotor
- 25 routes general digital signals(TTL compatible), 4 of the IO ports can be OC IO, can connect with relay
- Original start signal: Used when marking contents are the same and high speed is required
- Compatible with USB2.0

IPG CARD (**control IPG-YLP laser and IPG-YLPM laser**)



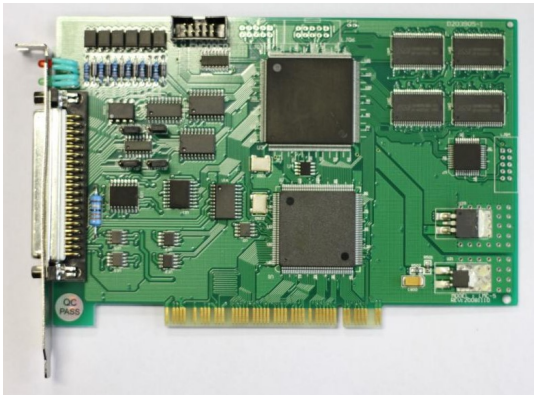
- Use 25-pins DB25 socket, connect IPG YLP and YLPM laser module via 25-pin cable directly
- Adjustable digital/analog output used for scan head

- Mark-on-fly function with an encoder connected
- Extend axes output: Direction/pulse signals, used to control stepping motor or servomotor
- 25 routes general digital signals(TTL compatible), 4 of the IO ports can be OC IO, can connect with relay
- Original start signal: used when marking contents are the same and high speed is required.
- Compatible with USB2.0

Dynamic focus board

- Dynamic focus .three digital output for scan head
- Support FPK with two ways (optional)
- 6 routes digital input and 6 routes digital output
- LASER signal : TTL, used for laser on/laser off
- PWM signal: TTL ,used to adjust the frequency and duty ratio
- Direction/pulse signals ,used to control stepping motor or servomotor
- DB25 connector used for IPG YLP laser directly (optional)
- Compatible with USB2.0

PCI Board (control CO2 and YAG laser)



PCI-7F board (control fiber laser)

5. DA Converter Board

DA converter is an integrated product for digital to analogue single conversion, to enable higher marking accuracy and long distance signal transmission which is less susceptible to electrical noise.

There are two types:
->2 channel: supports 2 channels output, and the digital protocol has not extended coding, which is labeled as “20071012-V101”;

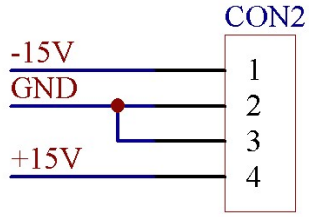
->3 channel: supports 3 channels output, and the digital protocol has the extended coding, which is labeled as “20080107-V103”.

Connector’s description:
CON1 (DB15):

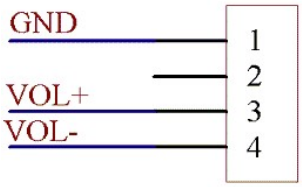
Pin No.	Signal name	Illustrations
1，9	CLK-/CLK+	Clock signal. Differential output
2，10	SYNC-/ SYNC+	Synchronized signal. Differential output
3，11	XChannel-/ XChannel+	Digital signal of X axis galvo. Differential output
4，12	YChannel-/ YChannel+	Digital signal of Y axis galvo. Differential output
5，13	ZChannel-/ ZChannel+	Digital signal of Z axis galvo. Differential output
6，14	Status-/ Status+	The state feedback signal of Galvo. Differential input
8，15	Gnd	The reference ground of control card.

For usual three-dimension Galvo, only connecting CLK, SYNC XChannel, Ychannel, Zchannel with ten signal lines is enough. A twisted-pair cable for connecting for digital signal is strongly recommended.

CON2: Power socket



CON4—CON6: Analog Voltage signal



The default range of output voltage is ±5V. For single interface drive, connect pin 1&3, the voltage is ±5V. For differential output drive, please connect pin 3&4, between which the voltage is ±10V.

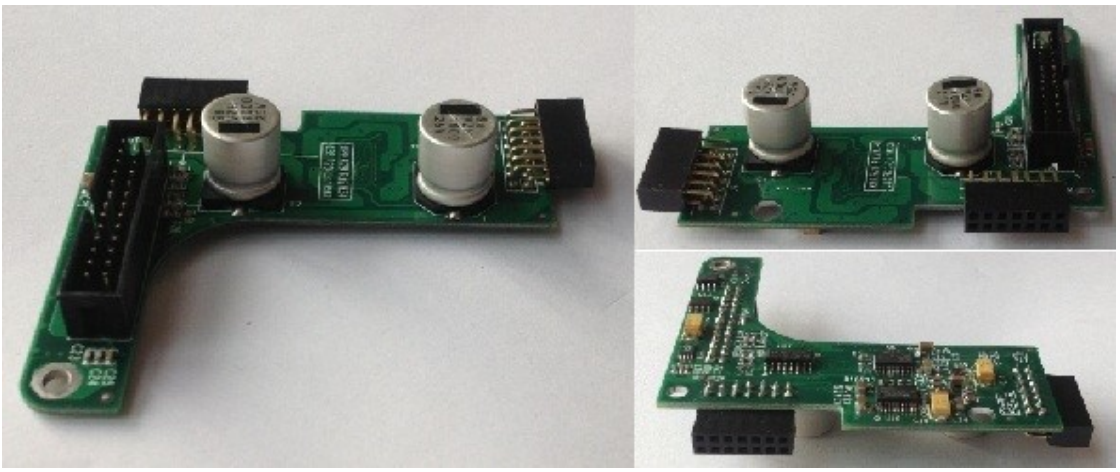
Model and description for LMC boards:

Model	Main function
LMC-PCI-7	2D marking to 2D analog galvos plus 2 axes (rotary stage, on-fly, Z-axis or XY-axis) to control CO2 or YAG laser.
LMC-PCI-7F	2D marking to 2D digital galvos plus 1 axis (rotary stage or Z-axis) to control fiber laser.
LMC-USB-DIGIT	Digital card, to control 2D digital galvos plus 2 axes (rotary stage, on-fly, Z-axis or XY-axis) to control CO2 or YAG laser.
LMC-USB-IPG	Fiber digital card, to IPG fiber lasers, 2D marking to control 2D digital galvos plus 2 axes (rotary stage, on-fly, Z-axis or XY-axis)
LMC-USB-SPI	Fiber digital card, to SPI fiber lasers, 2D marking to control 2D digital galvos plus 2 axes (rotary stage, on-fly, Z-axis or XY-axis)
LMC-D/A	D/A conversion card, to convert 2 input digital signals into 2 output analog signals , which are used to drive analog galvos.

Remark:
The boards always come with 2D marking to control 2D galvos plus one axis (rotary or Z-axis). On-fly and XY-axis are available upon request at additional cost.

ST-DAC-XY2-CD DA Converter

ST-DAC-XY2-CD series DA converter is an integrated product for digital to analogue single conversion, to enable higher marking accuracy and long distance signal transmission which is less susceptible to electrical noise.

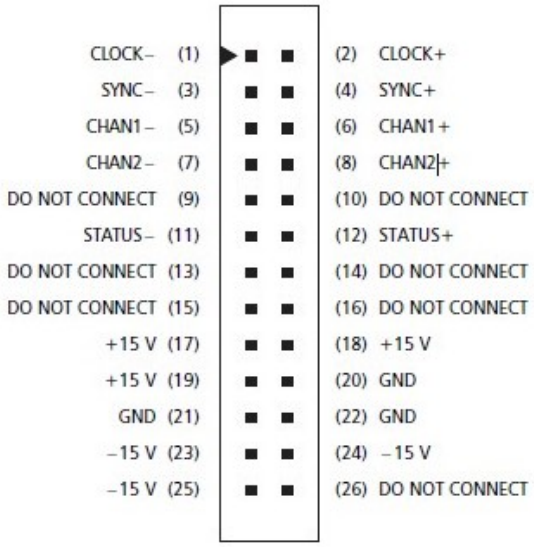


Interface: Digital Singal Input

This series DIGITAL SIGNAL INPUT connector is used for digital signal input according to the XY2-100 standard. The pin-out of this is shown right.

The DIGITAL SIGNAL INPUT connector is also used for connecting the converter board to a power supply with balanced power source of DC+/-15V.

This board draws approximately 50mA from pins 17, 18, 19 and approx. 20mA from pins 23, 24, 25. However, when driver board and scanners are connected and operating, then 1.5A is required for each of X and Y axes.

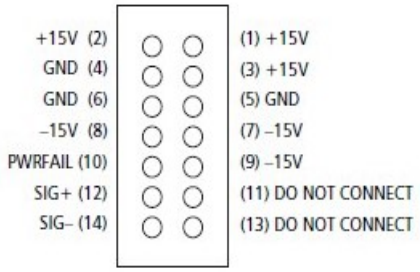


Digital Singal Input

Interface: Power Output

DC+/-15V power to the two driver board is provided by ANALOG POWER output connectors. The pin-out of these connector is shown as right figure.

The ANALOG POWER OF X&Y axis output connectors provide analog output signal in the range of -5V to +5V for controlling the scanners via driver board.

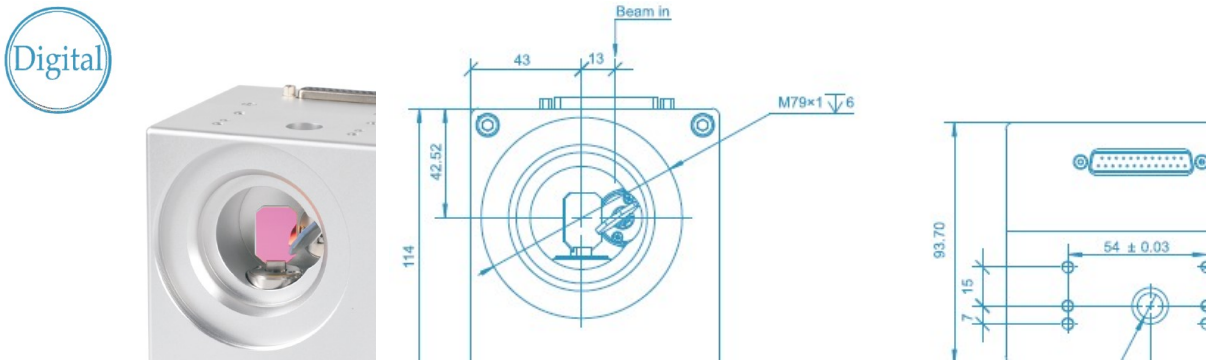


Power Output

STRM series precision optical scanning system

2D scanheads

STRM-A10



STRM-A Series is a totally digital 2D galvanometer system. Embedded control system guaranteed the servo loop operation. It is compact, stable and cost-efficiency. It is the basic version of STRM series scanheads. Mirrors of general wavelength is available, like 1064nm, 532nm 355nm, 10.6um.Suitable for laser marking, microscope, drilling, trimming and cutting etc.

STRM-A10 Specifications
(All angles are in optical degrees)

Aperture	10mm
Beam displacement	13mm
Tracking error time	220us
Offset drift	75urad/K
Gain drift	200ppm/K
Step response time	
1% of full scale	0.3ms
10% of full scale	0.8ms
Marking speed (1)	2m/s
Positioning speed	12m/s
Writting speed (2)	
Good quality	500cps
High quality	450cps
Repeatability	< 22urad
Drift over 8 hours (After 30min warm-up)	< 0.3mrad
Typical scan angle	40 degrees
Interface (3)	XY2-100 Enhanced
Operating temperature	25°C±10°
Power requirements	±15V DC, 150W
Driver mode	Digital
Resolution	16Bit
Max laser power (4)	100W
(1)with F-Theta objective, f=160mm (2)single-stroke characters of 1mm height (3)XY2-100 Enhanced with status feedback (4)The mirror of 1064nm can stand max laser power	

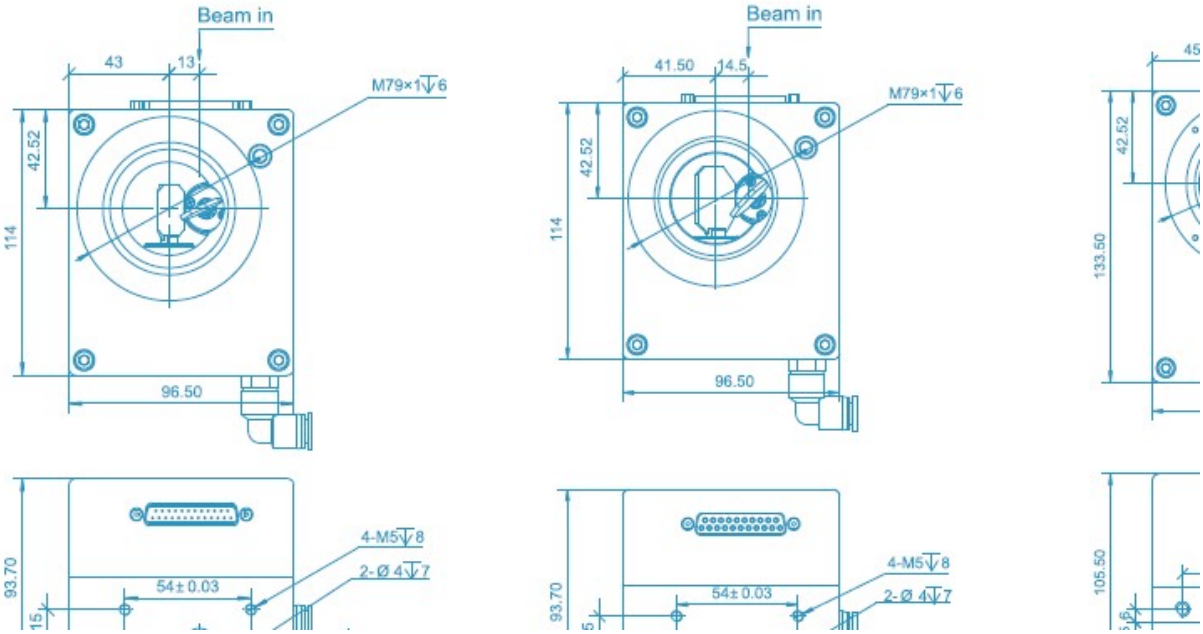
STRM-Q 10/12/14

Digital

STRM-QUANTUM series is totally digital 2D galvanometer system. System operate based on the embedded platform. It is compact, stable and high quality. More fast and accuracy. The offset drift and gain drift are very low. Mirrors of typical laser wavelength is available and optimized for inertial and stiffness. Suitable for high end application like ITO scratching, laser micro processing etc.

(All angles are in optical degrees)

	STRM-Q 10	STRM-Q 12	STRM-Q 14
Aperture	10mm	12mm	14mm
Beam displacement	13mm	14.5mm	18.1mm
Tracking error time	130us	160us	160us
Offset drift	30urad/K	30urad/K	30urad/K
Gain drift	50ppm/K	50ppm/K	50ppm/K
Step response time			
1% of full scale	0.3ms	0.3ms	0.5ms
10% of full scale	0.8ms	0.8ms	1ms
Marking speed (1)	2.5m/s	2m/s	2m/s
Positioning speed	15m/s	11m/s	8m/s
Writting speed (2)			
Good quality	800cps	660cps	660cps
High quality	500cps	410cps	410cps
Repeatability	< 15urad	< 15urad	< 15urad
Drift over 8 hours (After 30min warm-up)	< 0.1mrad	< 0.1mrad	< 0.1mrad
Typical scan angle	40 degrees	40 degrees	40 degrees
Interface (3)	XY2-100 Enhanced	XY2-100 Enhanced	XY2-100 Enhanced
Operating temperature	25°C±10°	25°C±10°	25°C±10°
Power requirements	±15V DC, 150W	±15V DC, 150W	±15V DC, 150W
Driver mode	Digital	Digital	Digital
Resolution	16Bit	16Bit	16Bit
Max laser power (4)	100W	100W	100W
(1)with F-Theta objective, f=160mm (2)single-stroke characters of 1mm height (3)XY2-100 Enhanced with status feedback (4)The mirror of 1064nm can stand max laser power			

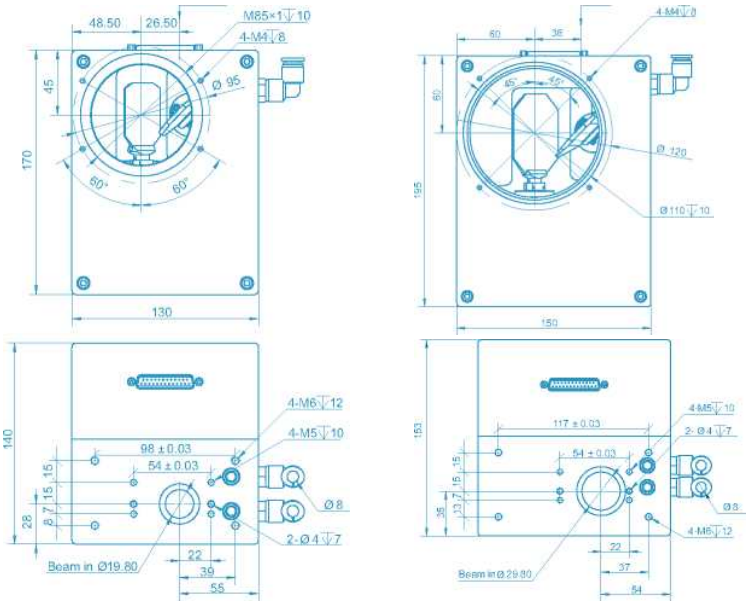

Beam in
43
13
M79×1 6
42.52
114
96.50
93.70
54± 0.03
4-M5 8
2- Ø 4 7
Beam in
41.50
14.5
M79×1 6
42.52
114
96.50
93.70
54± 0.03
4-M5 8
2- Ø 4 7
42.52
133.50
105.50

STRM-Q 20/30

Digital

STRM-QUANTUM series is totally digital 2D galvanometer system. System operate based on the embedded platform. I t is compact, stable and high quality. More fast and accuracy. The offset drift and gain drift are very low. Mirrors of typical laser wavelength is available and optimized for inertial and stiffness. Suitable for high end application like I TO scratching, laser micro processing etc. Added water and air cooling function to improve the stability of the system.
(All angles are in optical degrees)

	STRM-Q20	STRM-Q30
Aperture	20mm	30mm
Beam displacement	26.5mm	36.5mm
Tracking error time	360us	550us
Offset drift	30urad/K	30urad/K
Gain drift	50ppm/K	50ppm/K
Marking speed	1m/s	0.7m/s
Positioning speed	6m/s	3m/s
Writing speed		
Good quality (1)	320cps	220cps
High quality (2)	210cps	150cps
Repeatability	<15urad	< 15urad
Drift over 8 hours	< 0.1mrad	< 0.1mrad
(After 30min warm-up) Typical scan angle	40 degrees	40 degrees
Interface	XY2-100 Enhanced	XY2-100 Enhanced
Operating temperature	25°±10°	25°±10°
Power requirements	±15V DC, 150W	±15V DC, 150W
Driver mode	Digital	Digital
Resolution	16Bit	16Bit
Max laser power (3)	1000W	5000W
(1) with F-Theta objective, f=160mm (2) single-stroke characters of 1mm height (3) The mirror of 1064nm can stand max laser power in air cooling		


48.50
26.50
M85×1 ↓10
4-M4 ↓8
Ø 95
45
170
80°
80°
130
4-M6 ↓12
4-M5 ↓10
98 ± 0.03
54 ± 0.03
15
15
8.7
28
140
Ø 8
2-Ø 4 ↓7
22
39
55
Beam in Ø19.80
60
36
4-M4 ↓8
45°
45°
60
Ø 120
Ø110 ↓10
195
150
153
4-M5 ↓10
117 ± 0.03
2-Ø 4 ↓7
54 ± 0.03
15
15
13.7
35
Ø 8
4-M6 ↓12
22
37
54
Beam in Ø 29.80

3D scanheads

STRM-QPT: 3D Post-Scanning Solution

(Refer to STRM-Q Quantum datasheet for 2D galvo.)

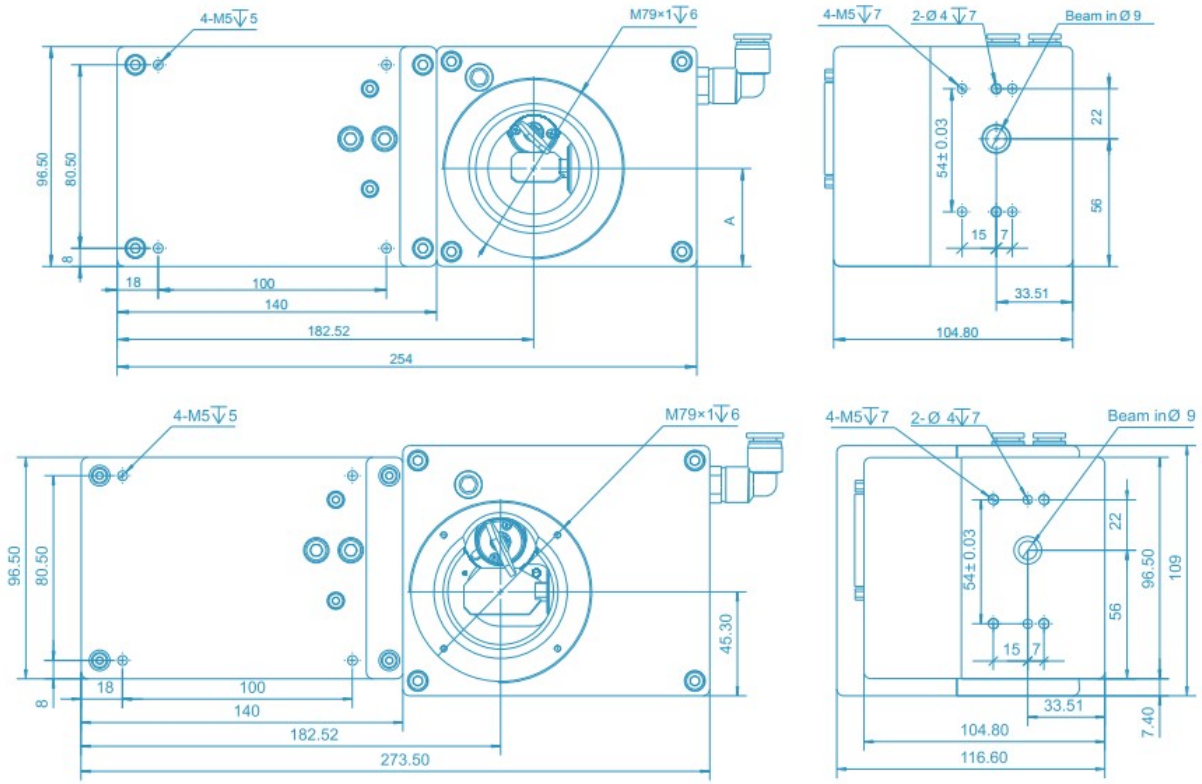
This solution includes a 2D galvoscanner system STRM-Q Series, a dynamic focus unit Proton Series, F-theta lens and a galvo system controller STRM-UMC4. It uses the Post-Objective Scanning technology, the working volume is about 150*150*45(with the 210mm F-theta lens). The advantage of this system: marking fast, small focal spot, small loss.

Laser type	**Nd:YAG**	**Nd:YAG doubled**
Wavelength	1064nm	532nm
Beam expansion factor	1.67	3
Input aperture	6mm 7.2mm 8.4mm	3.3mm 4mm 4.6mm
Scan head apertures	10 12 14	10 12 14
Focus range in Z-direction	±22.5mm (1)	±2.5mm (2)
Tracking error time	700us	700us

A:(1) F-Theta f=210mm. (with F-Theta objective ,f=210mm)
(2) F-Theta f=100mm. (with F-Theta objective ,f=100mm)

All of the above parameters are theoretical values.

Scan head apertures	10mm	12mm
A	43	41.5



STRM-QP 20/30: 3D Pre-Scanning Solution includes a 2D galvoscanner system STRM-Q, a dynamic focus unit Proton series, and a galvo system controller STRM-UMC4. It uses the Pre-Objective Scanning technology to realize the large field and 3D laser application. The advantage of this system: fast, small focal spot, small power loss.

CO2 laser configuration example: STRM-QP 30

Working dimension	600x600mm	600x600mm
Spot diameter	364um	487um
Working distance	502mm	777mm
Resolution	9um	12um

Nd:YAG laser configuration example: (λ=1064nm) STRM-QP20/ 30

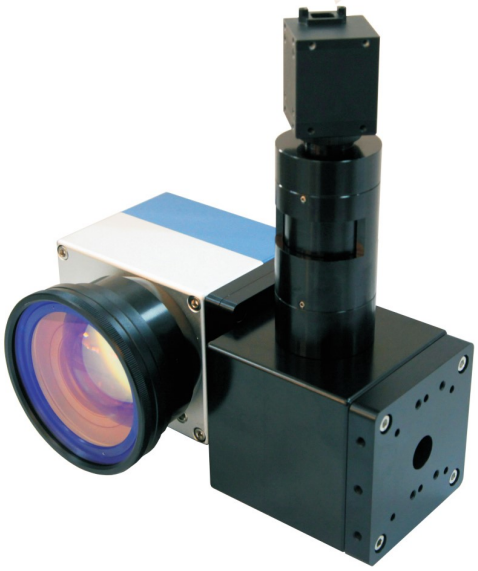
Working dimension	400x400mm	600x600mm	800x800mm
Spot diameter			
QP-20	34um	52um	—
QP-30	-	36um	48um
Working distance			
QP-20	502mm	777mm	—
QP-30	-	777mm	1051mm
Resolution	6um	9um	12um

UV laser configuration example: STRM-Q14 + Proton

Working dimension	400x400mm	600x600mm
Spot diameter	17um	26um
Working distance	520mm	795mm
Resolution	6um	9um

1. All of the above parameters are theoretical values.
2. Distance between edge of deflection unit and working surface. This distance is dependent on the product model and will vary with laser divergence and objective tolerance.
3. Actual spot size and writing speed are dependent on material and application.

STRM-CA: CCD Adapter



Traditional galvo scanner correction method is given priority to with the manual measurement, accuracy is difficult to be guaranteed, thus affecting the processing quality. Galvo scanner with a Camera adapter vision module can greatly improve the accuracy of the calibration, and facilitate monitoring of work surfaces and screening at the first time.

Installation:
The camera adapter is mounted between the scan head's beam entrance and the laser flange. (see Fig 1).

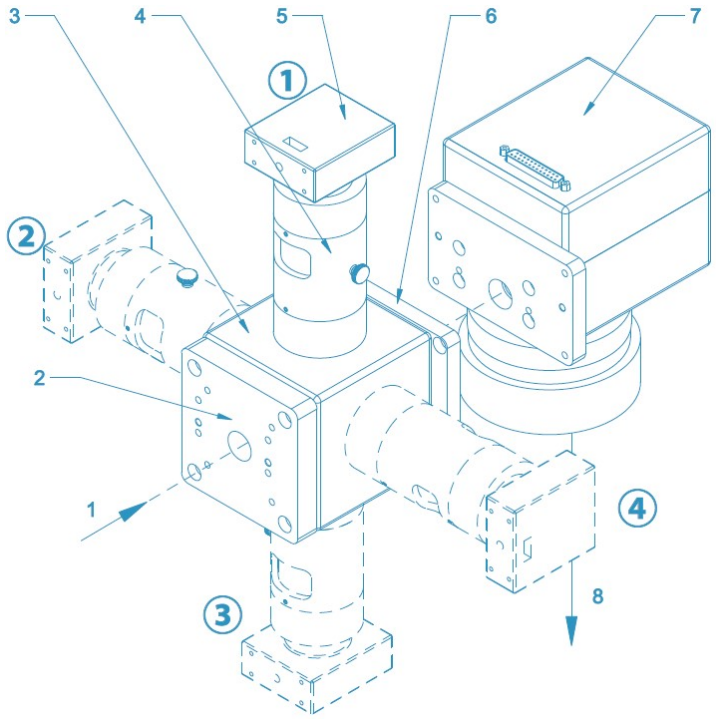
Working Principle:
Illumination light reflected from the surface of the workpiece pass through achromatic F-theta, galvo scanner, beam splitter, CCD lens to reach the CCD sensor. Adjust beam splitter position to compensate the error of machining and assembly to ensure the optical path of the laser and reflected light coaxial. Make the laser coincides with the CCD image detection point.

FOV:
Field of view is decided by the lens focal length, CCD camera, CCD camera photosensitive element size together. For example, 160mm lens, CCD target surface size of ½ ", the field of view is 10.4mm * 8.3mm (see table)

Laser wavelength	1064nm			532nm
Pilot laser wavelength	635nm			635nm
Diameter of entering beam	14mm			10mm
Scan head mirror coating	1064nm + 635nm			532nm + 635nm
Processing field size	100 x 10 0mm			100 x 100mm
Observation wavelength	1064nm / 635nm			532nm / 635nm
Focal length camera objective	102mm			102mm
Flat field objective	160mm	210mm	254mm	163mm
Observation field size	10.4x8.3mm	13.7x10.9mm	16.6x13.3mm	10.6 x 8.5mm

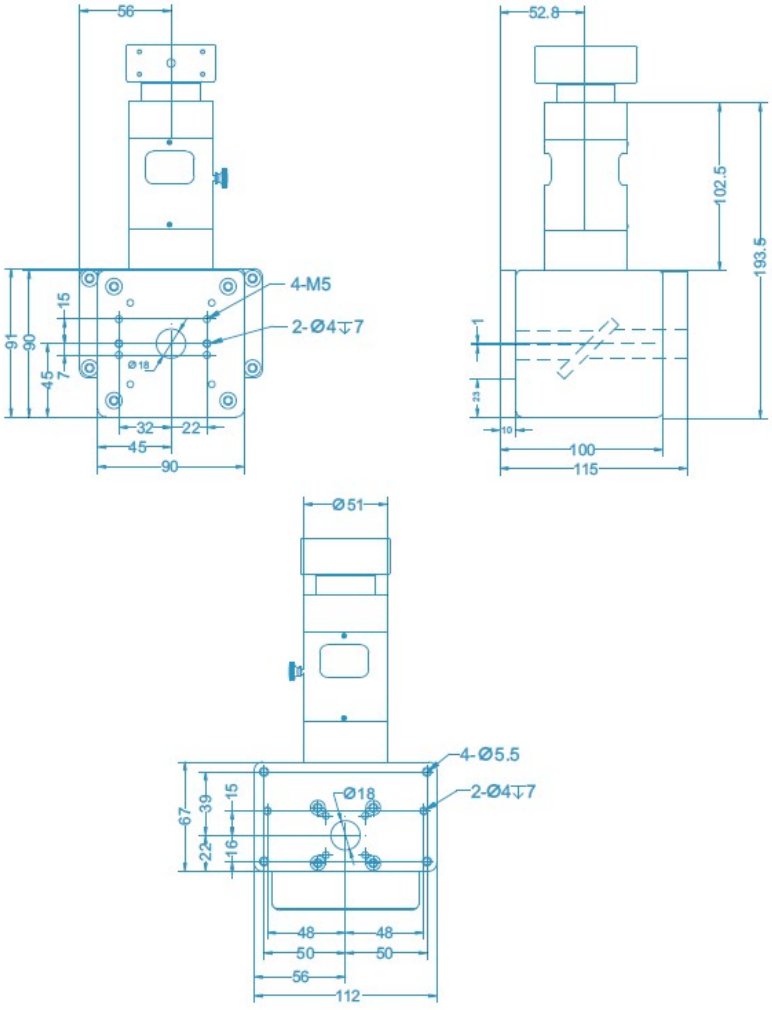
Other Parameters:

Diameter of entering beam	14mm
Operating temperature	25℃ ±10℃
Max. Chip size	95 %
Camera Connection type	≥1/2″
Weight(without camera)	C-mount
Laser transmissivity	≈2.6 K g

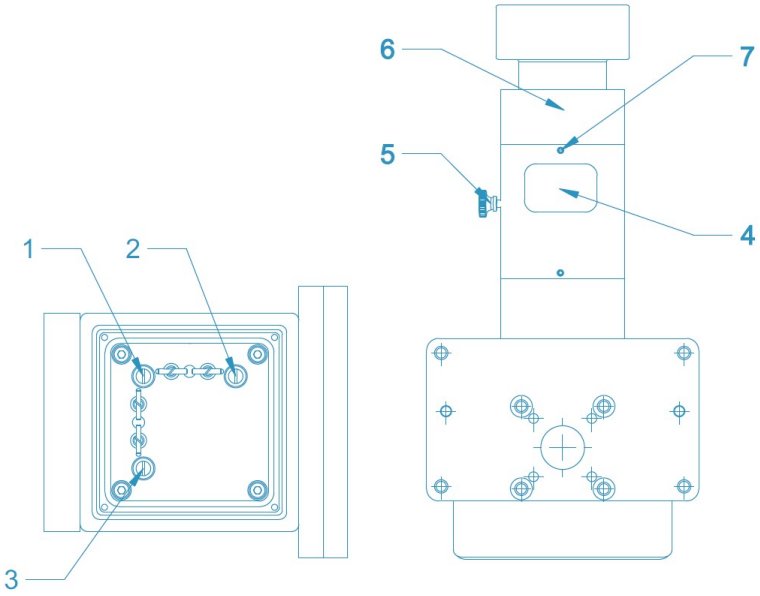


1. Entering beam
2. Beam-entrance side camera adapter
3. Camera adapter
4. CCD objective
5. CCD camera
6. Beam-exit side camera adapter
7. Scan head
8. Exit beam

Mechanical Parameters:
All Dimension in mm



Coaxial CCD adapter tuning method and steps
1. Adjust the galvanometer height, find the galvanometer focus position.
2. Mark the crosshair.
3. Adjust the focus ring 4 (CW or CCW), to the camera showing a clear image.
4. Locking screw 5 to lock the focus ring 4.
5. Loosen screw 7, CW or CCW adjusting ring 6, to make the orientation of the image the same as the crosshairs.
6. Lock screw 7.
7. Observe the CCD image crosshair and the marked crosshair position. If the two crosshair does not coincide with each other need to open the protective cover, tuning the knob 2 and knob 3. Take ② (see Figure 1) as an example, when the knob 2 is adjusted, the centre of the image will move left and right diagonally. When the knob 3 is adjusted, the centre of the image will move up and down diagonally .Tuning knob 2 and 3 to make the image crosshair coincide with the marked crosshair.
8. After tuning restore the cover.



Scan Controller & Software

STRM-PMC2

- Support digital scanners by XY2-1 00 protocol.
- For analog scanners, signals converted by the DA2-1 6 daughter board.
- Built-in DSP, marking computing do not occupy computer CPU time.
- 1 0μs galvo-motor-position updating rate.
- FPK, PPK, R05 first pulse suppression.
- Two 1 2-bits analog control signals.
- Support 3-axis encoder inputs, can be used to detect the object position of fly-marking and XY table.
- PWM maximum output frequency is 1 0MHz, minimum pulse width is 0.1 μs.
- 4-axis pulse/direction digital control signals, the maximum output frequency is 2MHz.
- General purpose 1 6-bits digital outputs, 1 6-bits digital inputs.
- Specific 1 6-bits laser control digital outputs.
- Up to 4 cards installed simultaneously.
- Support for Windows XP/Vista/Windows7/Windows8.

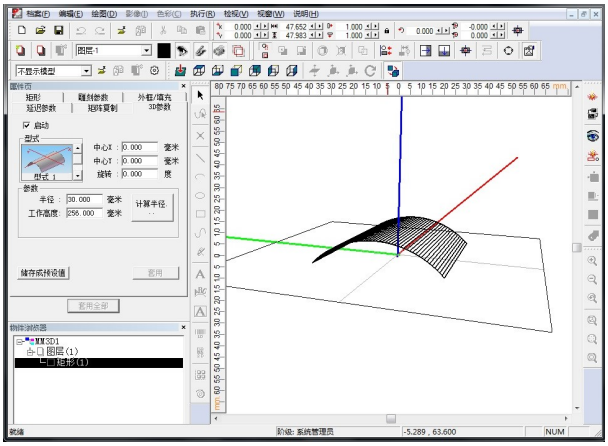
STRM-PMC2 is a PCI bus advanced laser marking card, support digital galvo motor, compatible with XY2-100 protocol, and through DA-1 6 daughter board can control analog galvo motor precisely.

STRM-UMC4

- Built-in DSP, marking computing do not occupy computer CPU time.
- Support one XY2-100 digital control signal output, 10μs cycle update galvo motor position.
- FPK, PPK, R05 first pulse suppression.
- Two 12-bits analog control signals.
- PWM maximum output frequency is 10MHz, minimum pulse width is 0.1μs.
- Support offline marking, could access 16 files each contains 8 sets auto-text and 8 kinds of fonts.
- One RS232 Communication Port for PLC communication.
- Support one encoder input for mark-on-fly function.
- Support one pulse/direction digital control signal output, the maximum output frequency is 2MHz.
- Contain expansion connectors for connecting with a variety of daughter boards.
- Support for Windows XP/Vista/Windows7/Windows8.

STRM-UMC4 is a USB bus advanced laser marking card,support digital galvo motor,compatible with XY2-100 protocol.STRM-UMC4 built-in full offline marking functions,could access up to 16 files.

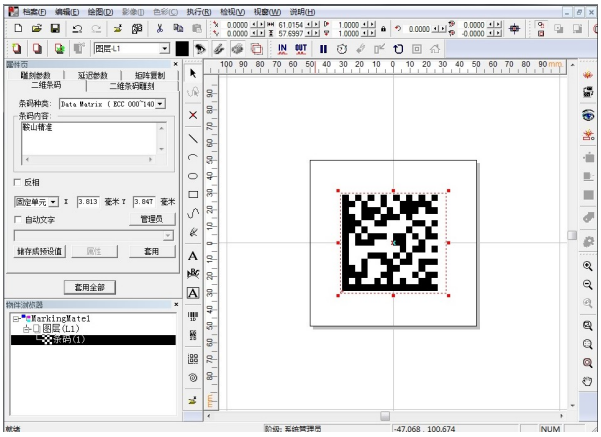
STRM-MM3D



- Support STL 3D model
- Draw in 2D graphic
- Built in several frequently used models
- Support import 3D DXF as marking path
- Graphic Coated or projection mapping to curved surface
- Real-time preview, what you see is what you get
- Automated process control
- Support X,Y,or Z axis motion

MM3D marking software has combined the third marking axis(focal shifter) control ability, which could help user marking on unregular curve surface. After user import the 3D model in STL format, MM3D will paste the drawed graphic on the model surface. At this time, user could put the working-piece on the proper marking position to complete marking task.Not only MM3D allowed user import 3D model in STL format, but built in several most frequently used curve surface; or user could import 3D DXF file as marking path.

STRM-MM: MarkingMate



- Support many kinds of language,such as Chinese,English,Japanese,Deutsch
- Support Win XP,Vista,Win7,Win8
- Provide Draw Menu:Vertex,Line,Arc,Circle,Text,Barcode
- A multiplicity of Auto Text: Serial No, Date, Keyboard, File
- The best compatibility, can import variety of image formats
- Provide Object-Related Property Table, has being selected, the Property
- Mark Parameter List shows all the marking parameters users set themselves.
- Control Object-Related Property: Digital In, Digital out, Stop, Delay Time, Motion,Reset and Homing.
- Support RS-232,TCP OP Parameters
- Layer-Related Property Table
- Matrix Property
- Compensation for all lens distortion
- Provide 3user levels
- Users can set the deviation compensation between align light and laser
- Support many kinds of Laser Marking Card,such as PMC2,MC3,RTC3,4,5
- Support many kinds of Laser,such as CO2,YAG,Fiber,Green,UV

STRM-MM MarkingMate is window-based laser marking software developed which is easy and friendly to use powerful tool. Support variety vector and bitmap graphic, and provide library and OCX component for marking solution provider. Easily to mark on plane or non-plane surface, also support variety PCI or USB marking controller, able to control almost all kinds of laser.