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声明

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前言

版本说明

本手册版本为 2016 中文简体 A 版,对应产品 GH-P 系列激光切割机。本手册只适用于对应产品型号的标准配置,对于特殊定制的产品,请仔细阅读另附的说明资料。本手册对产品的工作原理、安装方法、操作使用、故障排除、运输储存、维护保养等进行说明。如果你是第一次使用该产品,请在安装使用之前仔细阅读此资料。请妥善保管此资料,以便将来查阅参考。

符号说明

为了预防可能对人体造成的伤害或设备损坏,本手册用以下安全标志加以提示,在使用设备时请注意标志提示的内容,以确保您和周围人员的安全。

第1章 序言

1.1 欢迎

欢迎并感谢您对光博士产品的青睐与厚爱，您购买的是东莞市光博士激光科技股份有限公司出品的 GH-P 系列激光切割机。如果您是第一次使用该产品，请在安装使用前务必仔细阅读此使用说明书。

1.2 公司简介

光博士激光坚持“创造顾客，服务顾客，企业与员工共赢！”的核心价值，秉承“团结、拼搏、求实、创新”的企业精神；全力打造全球激光行业第一品牌。

公司愿景：让世界知道光博士，让光博士人自豪！

核心价值：创造顾客，服务顾客，企业与员工共赢！

品牌理念：致力激光应用智能化

● 产品

光博士激光 ----- 致力激光应用智能化，为国内外客户提供一整套激光加工解决方案及相关配套方案，主要产品包括：激光雕刻机 | 激光切割机 | 激光打标机 | 全自动送料打标机 | 全自动送料切割机等多个系列一百余种工业激光设备及其配套产品。广泛应用于电子电路、集成电路、仪器仪表、印制电路、计算机制造、手机通讯、汽车配件、精密器械、建筑建材、服装服饰、城市灯光、金银首饰、工艺礼品、印刷制版、标识、包装、广告、食品等行业。

● 质量

光博士激光已通过 ISO9001: 2008 版国际质量体系认证，对产品的研发、采购、制造、检验等各个环节严格把关，确保出厂产品的性能和质量。






● 服务

光博士激光拥有阵容强大的营销管理中心，在全国设立多家分公司、多家办事处，同时在海外设立多个分支机构，常驻技术服务与销售人員，为客户提供全面的售前、售中、售后支持和服务。力争做到有光博士激光产品的地方，就有光博士人的服务。

1.3 保修条款

一、整机保修一年（即从购买机器验收合格之日起计）：公司负责为客户保修机械及电子部分的时间为一年；易损件不保修（易损件指聚焦镜、反射镜等），国产激光管保用三个月（因人为损坏不保），激光器保修壹年。

PS：因人为使用不当损坏的零件需收取人工、材料等费用（人为使用不当是指操

	警告
激光辐射注意内容，存在激光辐射的危险，请做好激光防护措施！	
	危险
电气安全注意内容，可能引起触电的危险，造成人身伤害！	
	警告
防火安全注意内容，可能引起火灾，注意防火！	
	注意
一般注意事项，如不遵循该提示内容操作，可能造成设备的损坏和故障	
	说明
对操作内容的描述进行补充和说明	

作不当或保养、清洁不到位导致的故障问题而损坏的零件)。如下:

如有以下情形之一的,不属于保修范围:

- 1、X、Y 轴未加机油导致轨道磨损的; X、Y 轴轨道未清洗干净导致走不动或马达烧毁的;
- 2、镜片未清洗干净或螺丝松动发生光路偏位或激光功率降低影响切割效果的;
- 3、人为使网板损坏或不平导致切割效果不好的;
- 4、网板及漏斗式吸风箱未清理干净使排气效果降低产生切割布料发黄的;
- 5、吸风机未清理干净使之堵塞导致电机烧坏或不运作的;
- 6、冷却机因水量不足烧坏或水质污染导致水垢在冷却管内形成,造成冷却水堵塞,使激光器输出功率降低或炸裂的;
- 7、外力导致激光器破损或由于冷却效果不好而产生的玻璃管炸裂的。
- 8、激光管在离保修期限一个月内,如出现输出功率降低属正常功率损耗,客户需调到合适功率使用,不予免费更换。
- 9、不按正常程序操作导致加密狗软件丢失或插错端口导致光博士软件不能使用的;
- 10、图形本身原因或人为操作不当导致电脑软件无法运行的;
- 11、电脑(含显示器)硬件出现故障的;

二、在保修期外:客户需负责维修更换的零配件费用、公司技术人员的维修费用及往返交通费用。

第 2 章 安全说明和预防措施

鉴于机器所使用的是不可见高能量激光,请务必按照操作规范由经过培训合格的人进行机器的日常操作和维护,并请不要加工高温易爆材料,在机器加工运行期间必须有专人看管。在切割过程中可能含产生有毒气体物质时请注意开启抽风系统,否则禁止开机。

2.1 综述



注意

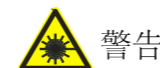
- a) 一定要确保此说明书保存在机器的最终使用者处。
- b) 机器的操作者和维护者须经我们公司人员或者是经我司授权的合格代理商进行培训后的合格人员。
- c) 确保使用者和维护者在机器的操作和维护过程中一定遵守相关要求,注意机器外部和内部的相关标识。



警告

- d) 正确放置机器与其附件。
 - e) 在给机器通电前,必须确保它已经良好接地。
 - f) 设备在不工作时,请勿给其接通电源。
 - g) 电源的保护地线要有良好的外部接地。
 - h) 必须是对本设备的性能和操作都很熟悉的人员才能进行电气操作。
 - i) 机器周围禁止堆放杂物。
 - j) 抽风机请另外单独接地
 - k) 工作时严禁将身体任何部位探入激光光路中,否则将会造成人身伤害。
 - l) 不得把易燃材料放置到光路上或激光束有可能照到的地方。若激光束照射到易燃材料上,将会引起火灾甚至爆炸。
 - m) 一定不能将激光电源输出端引线短路或接地
 - n) 在激光器开机过程中,严禁用眼睛直视出射激光或反射激光,以防损伤眼睛。
- 建议配戴激光防护眼镜

2.2 激光安全通告



警告

由于 GH-P 系列激光切割机采用部分封闭的激光光路设计,身体某部位进入切割区域的光路时会导致危险,必须规范操作。依照此说明书或培训内容操作。

2.2.1 眼和皮肤的保护



危险

请注意避免激光直射或者反射到眼和皮肤上,以免造成人身伤害,建议配戴防护眼镜。

2.2.2 防火保护



警告

避免加工易燃易爆产品,不得把易燃材料放置到光路上或激光束有可能照到的地方。若激光束照射到易燃易爆材料上时,将会引起火灾甚至爆炸。

建议在机器附近放置一台合格的灭火器。

2.2.3 电气安全

请依照要求提供符合当地要求的电源,且一定要保证机器接地良好。

检修机器请一定在断开电源的情况下进行。

对容易引起着火的易燃材料,进行加工时,应准备一个随时可拿取的灭火器。

2.2.4 材料安全通告

避免加工含硫，卤素等有毒元素的物品，在加工此类产品时请一定将抽风机打开，否则禁止开机工作。

2.2.5 机器的防护措施

本机器采取了一定的安全防护措施，具体如下：

- a) 电源短路 / 过载保护；
- b) 水流量信号保护；

2.2.6 使用人员常识

- a) 不可在没有使用抽气及辅助吹气设备的情况下操作此设备；
- b) 操作时严禁将身体任何部位探入激光光路中，否则将会造成人身伤害；
- c) 严禁将身体任何部位探入运动的结构中，否则将会造成人身伤害；



注意

对容易引起着火的易燃材料，进行加工时，应准备一个随时可拿取的灭火器。

第 3 章 产品的概述

3.1 产品的主要型号

GH-P 系列主要型号有：GH960-P、GH1260-P、GH1480-P、GH1610-P、GH1810-P 等。

3.2 产品特点及外观图

GH-P 系列机器具有长时间稳定可靠运行，操作简单，使用方便，标记清晰等特点。控制软件采用 Windows 工程界面，可兼容 Coreldraw, AutoCAD, Photoshop, Illustrator 等多种软件输出的文件。

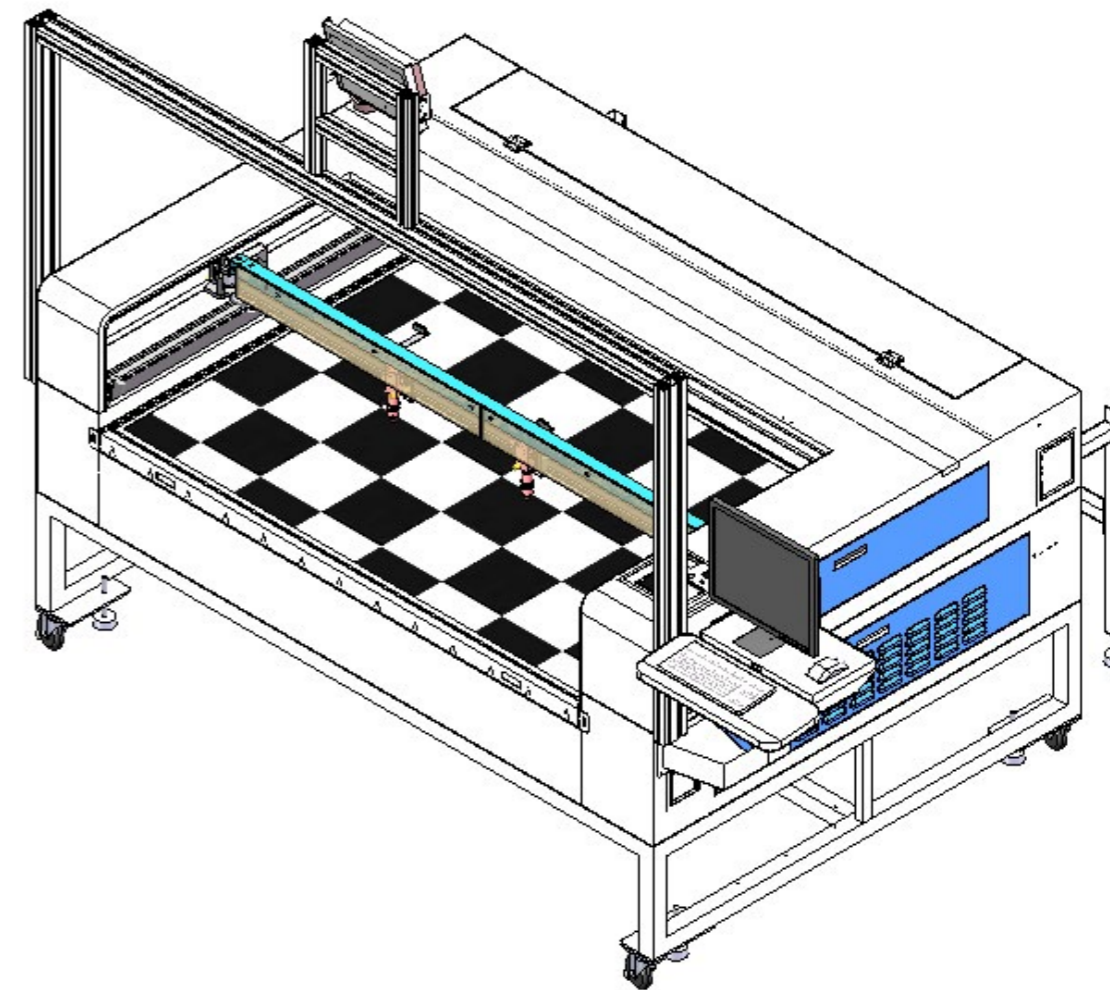
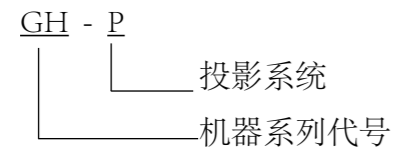


图 3-1 GH-P 系列整机外形图

3.3 型号定义说明

型号定义说明:



3.4 主要用途及适用范围

GH-P 系列机型属于 CO₂ 非金属激光切割雕刻机，可加工多种非金属材料。如：木制品、纸张、布料、皮革、环氧树脂、亚克力、不饱和树脂、塑料等非金属材料。

3.5 使用环境条件

该设备是按照有关工业环境规则设计的，东莞市光博士激光科技股份有限公司对因安装在其他环境（住宅和家庭等环境）所引起的任何影响概不负责。

请在符合建议环境条件下使用，否则可能会对机器造成伤害或者对机器使用寿命造成影响。

建议使用环境：

使用环境温度	15℃ ~ 35℃
运输包装环境温度 e	5℃ ~ 45℃
相对湿度	30% to 80%
电力需求	单相 220V AC, 50HZ/60HZ, 10A-20A
电网波动	< ± 5%
电网地线	符合机房国标要求
气源要求	0.4-0.5MP 无油无水干燥压缩空气

另外请避免安装在以下的场所使用：

- 垃圾、灰尘、油雾较多的场所；
- 震动以及冲击多的场所；
- 能触及药品和易燃易爆物的场所；
- 高频干扰源附近的场所；
- 易结露的场所；
- 在 CO₂、NO_x、SO_x 等浓度高的环境中。

3.6 对环境及能源的影响

本设备使用的是 CO₂ 激光源，属于非接触式加工，在加工进行过程中基本不会有噪音、化学、烟尘、废气的污染。但受加工材料本身的限制，某些材料加工时会产生烟尘、化学废气等，建议在排风系统中加装净化处理设备。

3.7 工作原理

GH-P 系列激光设备由控制系统、光学系统、XY 运动系统、工作台、投影系统、水冷系统等组成。CO₂ 激光器输出波长为 10.55 μm 到 10.63 μm 的激光，由反射镜折射后，通过聚焦镜聚焦，经过激光嘴，形成一个个细微的、高能量密度的光斑击穿工件表面，在工件表面形成一个细微的小孔，通过控制 XY 运动可使这些小孔排列成相应的形状，从而达到物体切割的目的

3.7.1 控制系统

1. GBOS 切割软件的操作有培训人员上门培训在此不作赘述。

2. 投影软件的使用

①. 使用支架将投影仪固定在机台的正上方，尽量使投影仪和工作台面保持垂直！在投影仪保持最佳分辨率的情况下，根据机台的工作幅面调整相对应的高度距离。

②. 安装好之后将投影仪链接计算机，并让机器复位到机械原点位置，首先确定激光头是否在投影仪所头投下来的有效幅面之内，然后将机算计和投影仪的分辨率设置成一样的。具体操作方法如下：

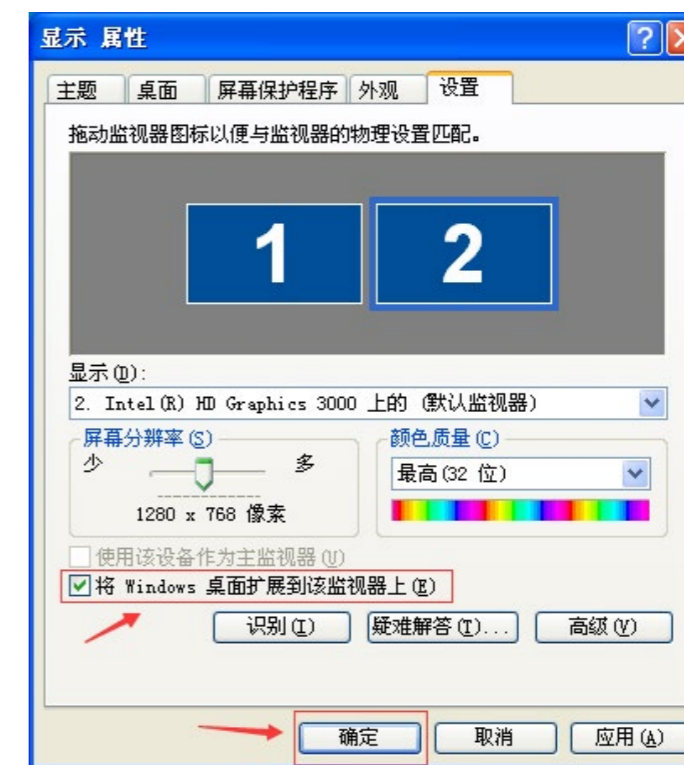
1) 在电脑桌面点击鼠标右键→属性→设置；如图：



2) 选择编号 1 并查看电脑的屏幕分辨率，然后选择编号 2 查看投影仪分辨率。并将投影仪的分辨率调整至最佳，再将电脑的屏幕分辨率设置成和投影仪一样的就可以了。如图所示：



3) 调整好计算机和投影仪分辨率之后并勾选将 Windows 桌面扩展到该监视器上(E) 选项；在点击“确定”。如下图：



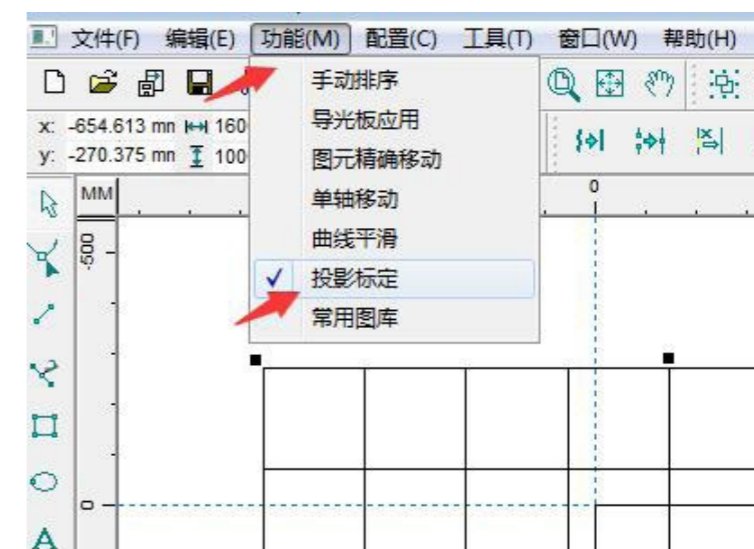
在调试过程中如果计算机和投影仪没有相同的分辨率，则选取两者最接近并且相同的分辨率即可。

1. 投影仪的标定

以下标定均在幅面为 1600mm*1000mm 的机器上完成。

1) 打开我们独立软件做一个 4 行 7 列尺寸为 200*200 的矩形 (尽量满幅面)，并让机器加工完成。

2) 在电脑上插入加密狗，点击软件上的“功能”选项选择“投影标定”如图：



3) 在右侧的功能设置区域会多出一个“投影仪”的菜单，点击后输入步骤一里的，区域宽 (X) 和 区域高 (Y)。

4) 再点击下方的步骤二“标定启用”然后输入密码 (tz0001) 确定，这时候下面的行·列·间隔输入框将会打开，在里面填写相对应的数值，如图：



5) 将投影仪投在工作幅面上的矩形用鼠标 (鼠标在电脑屏幕上一直往右边移动就可以移到激光机台面的投影区域上，对着交叉圆按住左键不放可以拉动交叉圆，对着交叉圆双击左键可以用键盘方向键精确移动) 拉着与之前激光机切割的矩形相互重叠在一起，最后在点击“投影仪标定”按钮。整个标定过程就完成了。

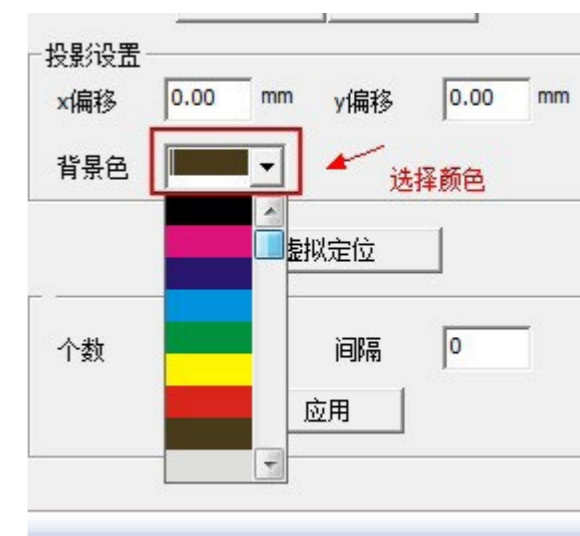
6) 以后打开软件就可以直接使用不用再次标定，同时你也可以使用导入参数和导出参数来保存你之前标定 OK 的参数，如果以后需要用到的时候在导入进来既可！

3. 投影设置

1) X.Y 偏移：是指投影仪在使用过程中，难免会有些偏动，投出来的图像位置和之前的有点差异，不在同一个地方！这时候我们就可以给他增加一个 X·Y 的偏移量

来校正投影仪投出来图形的准确性！当然这个偏移量是用户根据投影仪偏移程度的多少，用尺子测量出来的实际数值。

2) 背景色：是指改变投影仪投出来的实际颜色。当用户所需要切割的材料的颜色和投影所投出来的颜色相同时，两种颜色会混合到一起，会显示不出所需要切割的图形，这时候你只需要在背景色里选择一个其他的颜色就可以了。如图所示：



3) 虚拟定位：就是指用户可以在机器投影有效的幅面内暂时性的增加一个临时的定位点功能。使机器工作完成后激光投回到该虚拟定位的位置，大大缩短了激光头来回移动的空程距离，使激光机工作更加的方便快捷。设置方法应当先将机器的【归位点】设置为“无”激光头移动到用户需要设置为虚拟定位的位置，然后在软件上点击【虚拟定位】既可。

4) 个数和间隔：当用户需要用到普通双头切割同样的图形时可以使用此功能。只需要填写相对应的参数 (个数，间隔)，点击“应用”既可。就是将一个图形做一个 X 向的阵列，同时改变阵列出来的图形颜色，并禁止输出。这时投影仪投出来的图形就是两个图形，用于激光双头的对位。

常见问题：

1. 在勾选“标定启用”后发现下面的数值窗口没有打开，请检查控制卡与电脑是否连接正常！

2. 标定完成之后发现投影不能正常投在机器的工作台上，或是投下来的结果与之不符，请检查标定时激光头是否在投影仪所投的有效幅面之内！

3.7.2 主机模块

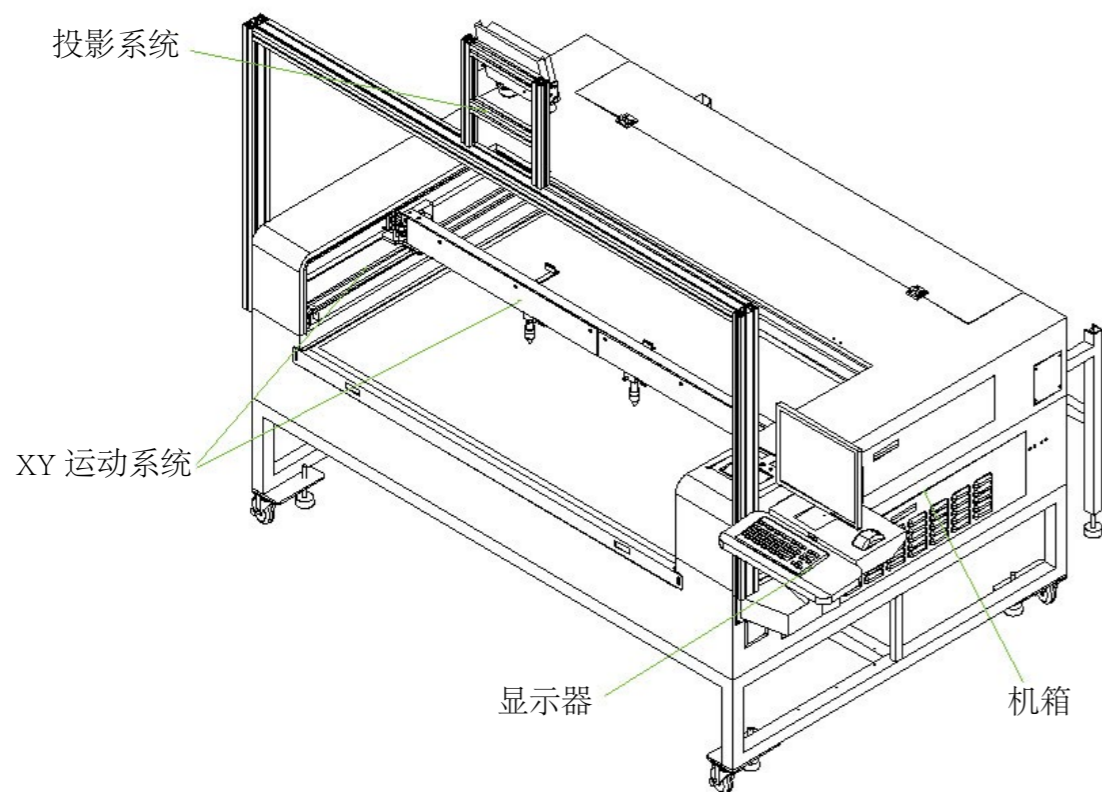


图 3-2 GH-P 系列

3.7.3 光学系统

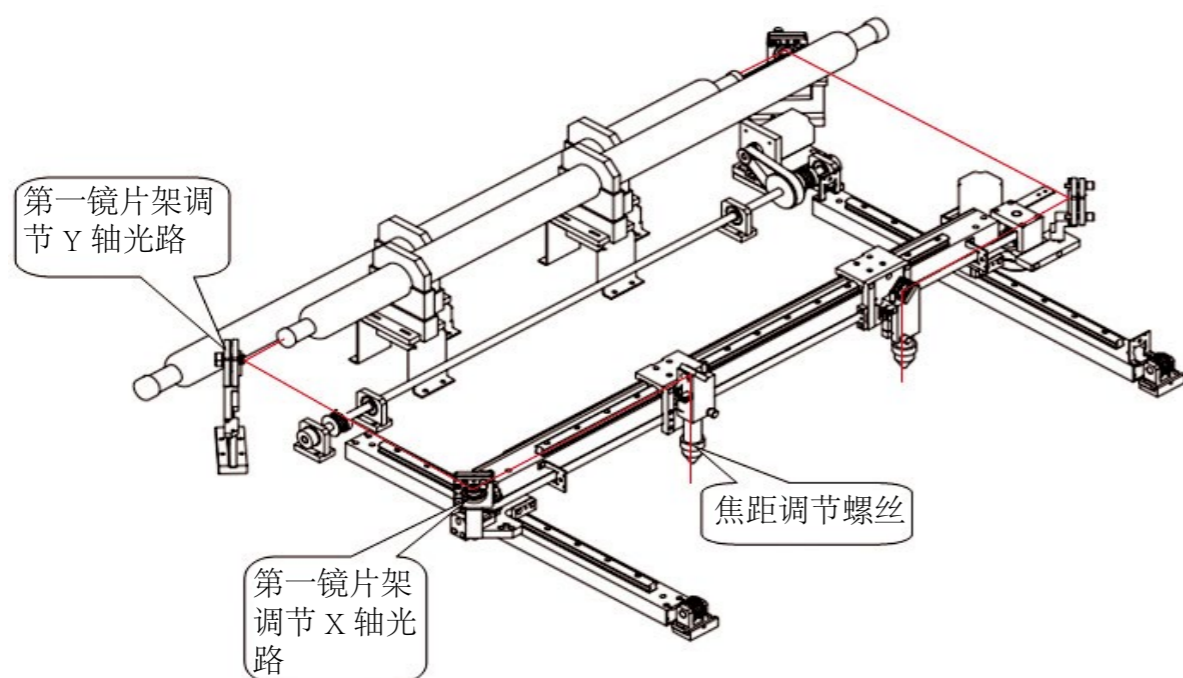


图 3-3 光路原理

3.7.4 工作台

标准配置蜂窝网板工作台，可选配刀条状工作台。

3.7.5 排风系统

主要部件为风机，如下图：

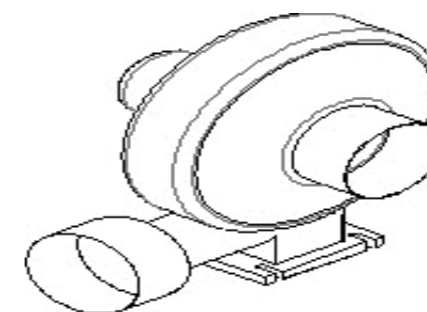


图 3-4 风机

在激光加工过程中，被加工材料表面会产生大量的烟尘或有害气体，必须利用风机及风管将烟尘或有害气体排出室外。

3.7.6 冷却系统：（如下图）

冷却水箱采用不锈钢多级离心式特种循环泵、PVC 连接管路，无生锈或腐蚀产生，可直接使用纯净水，配置耐高压纯水过滤装置，确保管路无脏堵，使激光设备运行更安全。

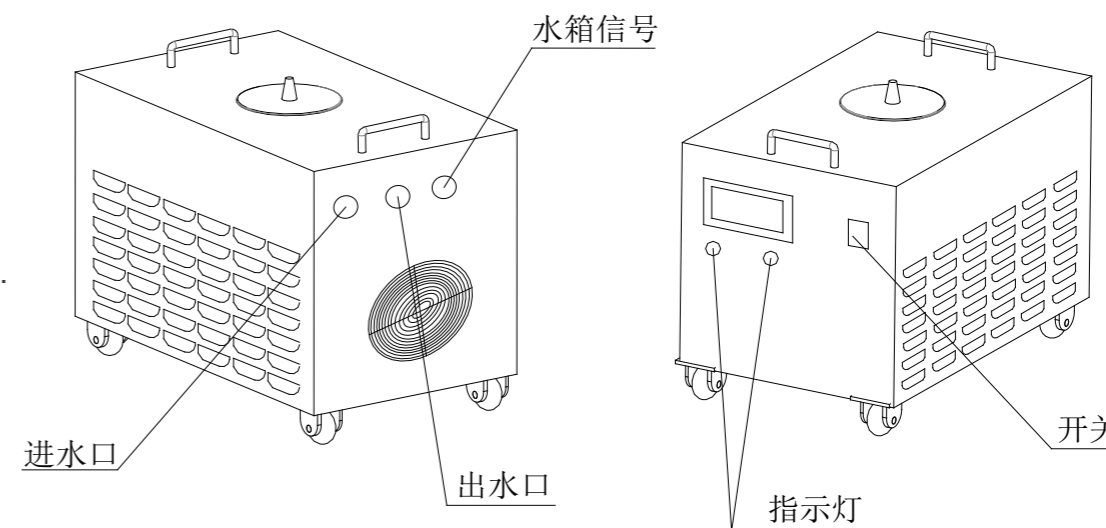


图 3-5 水箱

3.7.7 投影系统: (如下图)

使用支架将投影仪固定在机台的正上方, 尽量使投影仪和工作台面保持垂直! 在投影仪保持最佳分辨率的情况下, 根据机台的工作幅面调整相对应的高度距离。

安装好之后将投影仪链接计算机, 并让机器复位到机械原点位置, 首先确定激光头是否在投影仪所头投下来的有效幅面之内, 然后将计算机和投影仪的分辨率设置成一样的。

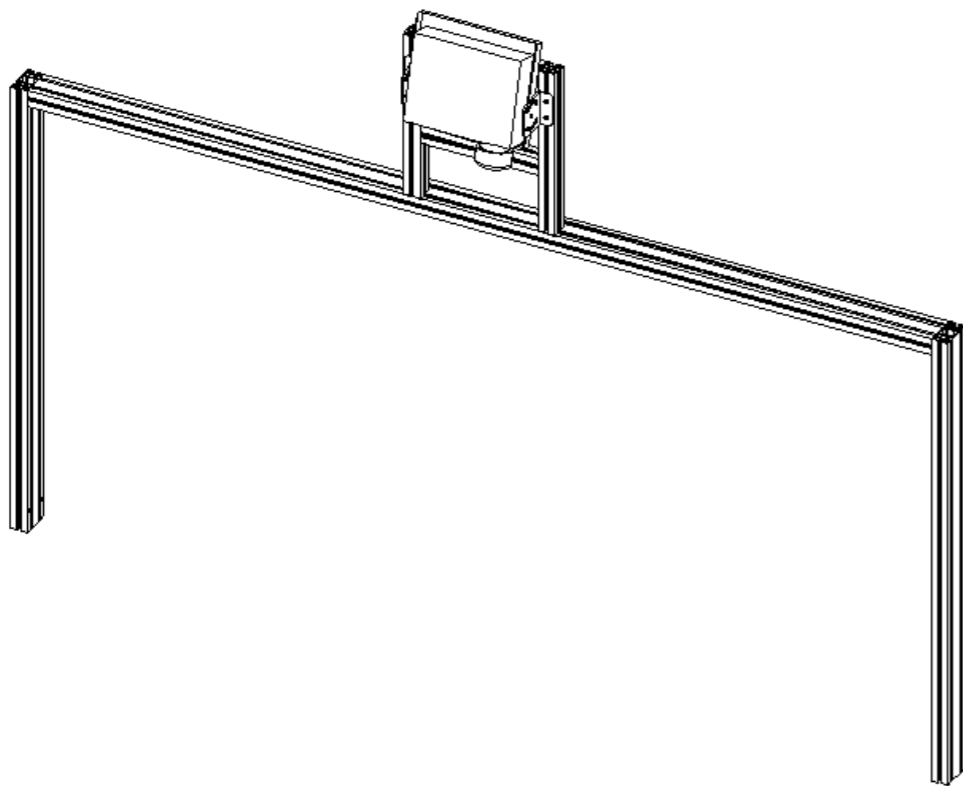


图 3-6 投影仪

第 4 章 安装、调试

4.1 交货检查

4.1.1 开箱注意事项

我们尽力为客户着想, 但由于各种原因造成客户收到机器时有不尽人意的地方, 请客户收到机器后依据装箱单进行逐项检查, 确认机器各部分与附件在装箱与运输过程中没有缺失和损坏, 如有异常, 请及时与我司 (含我司授权代理) 联系, 以便我们尽快处理, 谢谢!

如果装箱单器件没有缺失并状态良好, 请准确填写保修单并尽快传真给我司或者我们的授权代理商, 以便我们建立客户档案, 为我们以后的服务和更进一步工作准备。

4.1.2 检查内容

具体请依据装箱单, 仔细检查确认机器各部分与附件外观, 性能是否良好

4.2 安装环境要求

请在周围无急剧温度变化的场所使用, 另外请避免安装在以下的场所使用:

垃圾、灰尘、油雾多的场所;

震动以及冲击多的场所;

能触及药品和易燃易爆物的场所;

高频干扰源附近的场所;

易结露的场所;

在 CO_2 、 NO_x 、 SO_x 等浓度高的环境中。

在温度急剧变化的场合, 光学镜头上会结露, 出现污迹和雾斑, 务必防止环境温度的急剧变化, 若难以避免, 则请在确保无结露后使用该设备。

请将机器安装在水平无外界震动的环境条件下, 且确保有一定的工作空间。为方便起见, 请将机器安装在有压缩空气且易排风排烟的位置。

4.3 安装方法及注意事项

● 4.3.1 校水平

将机器放置于平整的地面, 找到合适的安装位置, 锁紧脚轮, 使脚轮不再转动, 升起脚杯。注意各脚杯要全部接触安装平面, 通过 4 个脚杯调整机器的水平, 并用水平仪检测。

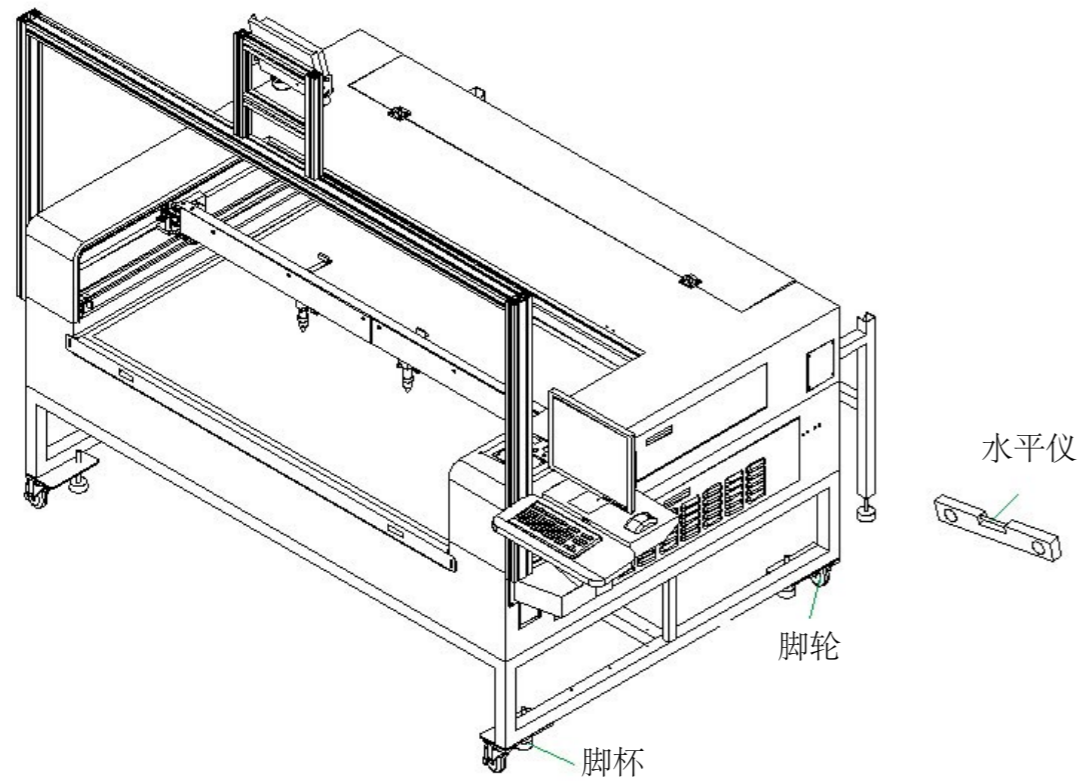


图 4-1 校水平

● 4.3.2 水箱连接

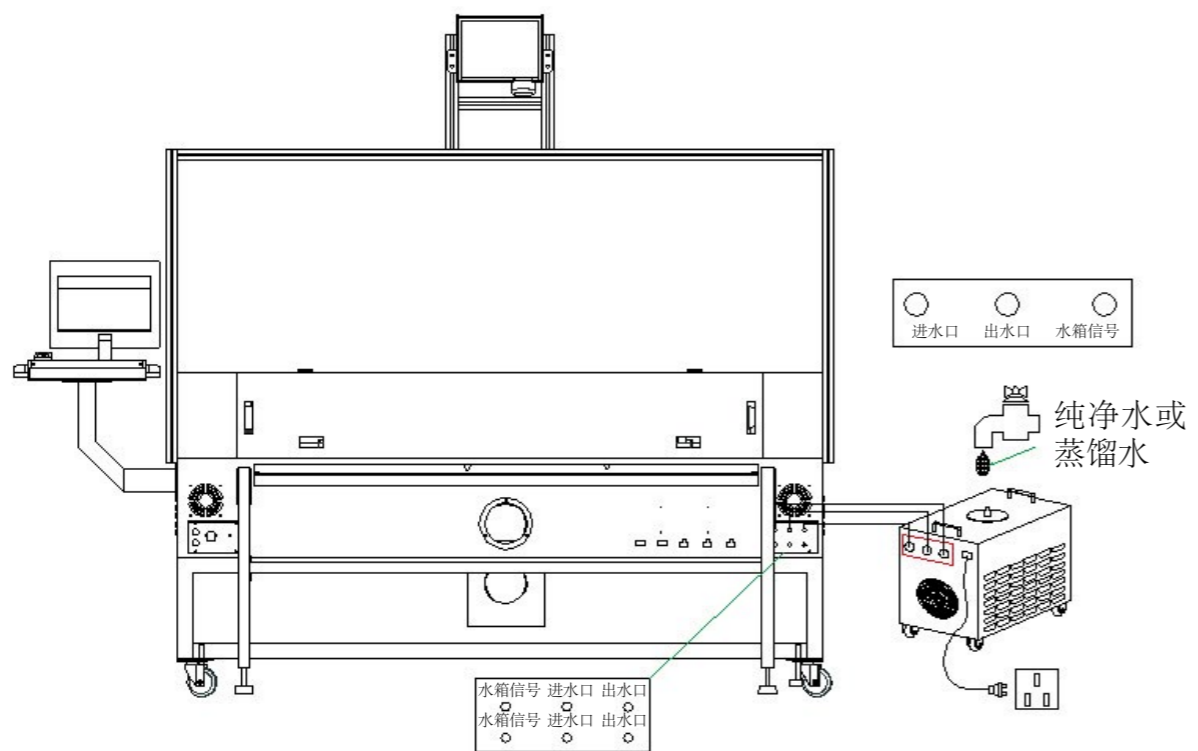


图 4-2 水箱连接

● 4.3.3 风机连接

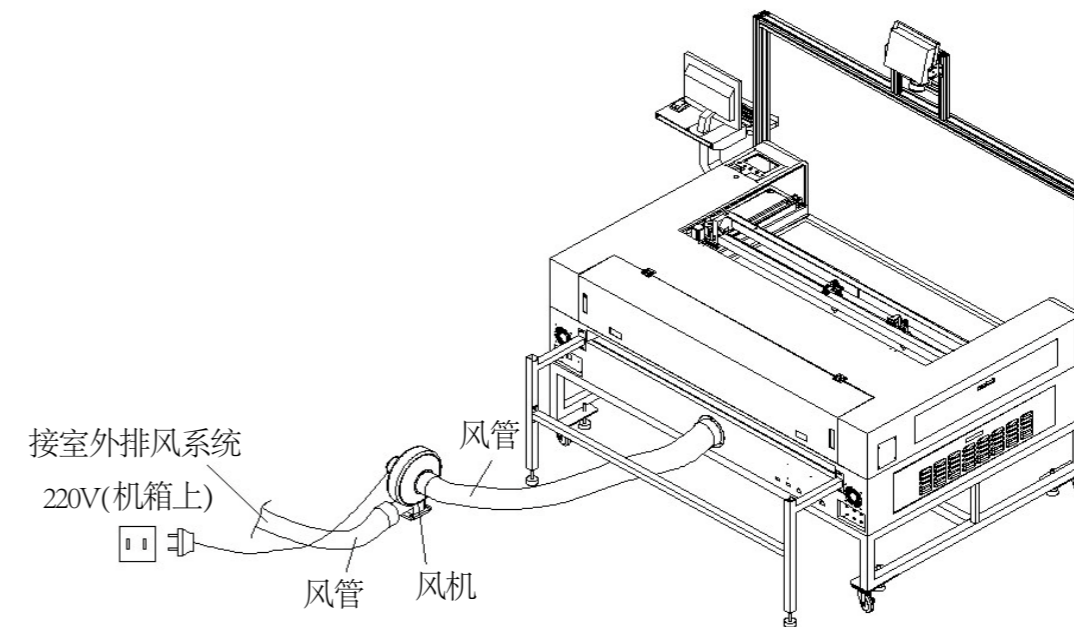


图 4-3 风机连接

● 4.3.4 吹风机 / 电源线连接

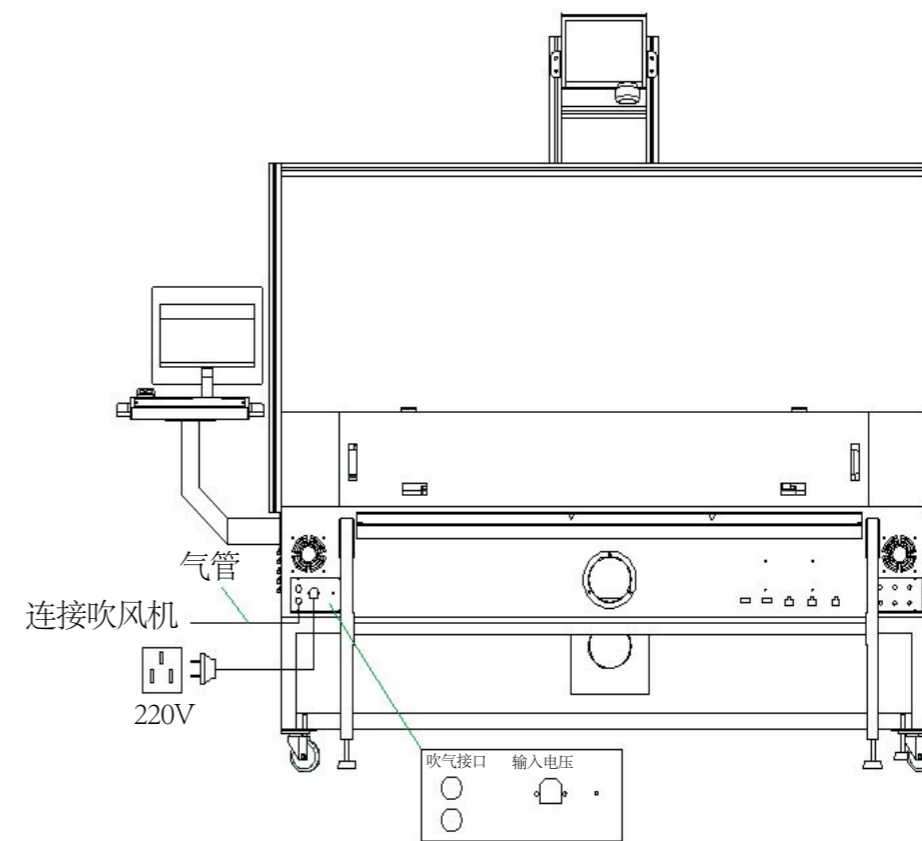


图 4-4 吹风机 / 电源线连接

4.4 调试方法及注意事项

将一张白纸平放在工作台上，然后根据其与激光嘴的距离初步调整高度，之后按下操作面板上的测试按钮，激光会在材料上打下一个痕迹，然后手动调节激光头高度，再次按下按钮开关，再次在材料上打下一个痕迹，比较两者的痕迹大小，重复上述的调节切割头高度和打点步骤，直到痕迹最小，则此时为焦点位置。

工具：公制内六角扳手一套



注意

调试之前必须检查，辅助气体，聚焦镜片等是否正常。

测试按钮开关用于触发激光，不可长时间按下按钮

第 5 章 使用须知

5.1 使用前的准备和检查

- 1、水冷系统：用户自行将水箱加满纯净水（推荐用蒸馏水）检查水箱及连接水管无漏水。
- 2、电源：确认是否接入 220V 工业电源，接口是否松动。
- 3、气源：将气泵 / 压缩空气的气管接入机器。
- 4、排风系统：确认风机、风管是否连接正确，保证烟尘能够排到室外。确认无误后，方可开机调试。

5.2 整机开机程序

- 1、确保安全接通设备电源
- 2、开总电源
- 3、开水箱电源
- 4、开气泵和风机
- 5、点击开机按钮
- 6、开投影遥控电源按钮

5.3 整机关机程序

- 1、点击关机按钮
- 2、关投影遥控电源按钮
- 3、关闭气泵和风机
- 4、关闭水箱电源
- 5、关闭总电源

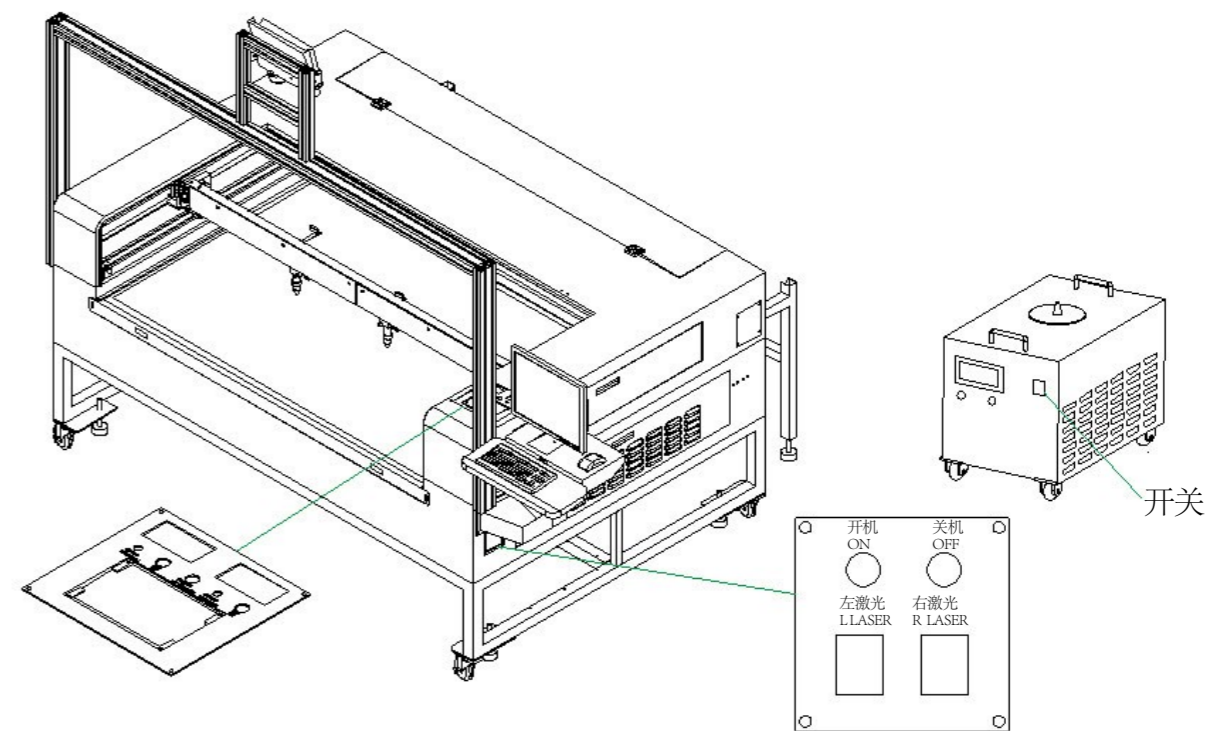


图 5-1 开关机程序

第 6 章 维护、保养和故障排除

为确保和延长机器的使用寿命，一定的日常和定期维护保养检查是不可缺少的，请依据具体情况制定日常维护保养计划。

6.1 综述

维护保养主要指机器的外观保养，抽风机，光学系统，冷却系统，激光保护装置，电器系统等定期和不定期检查维护和保养。

6.2 日常维护、保养

每班工作完之后，首先清洁机器周围的环境，使地面无尘、洁净。然后做好设备的清洁，包括主控柜的外表面、光学系统罩壳、工作台面等要无杂物、无尘、洁净。

6.2.1 风机检查和维护

每次开机前，请清理机器抽风口、风机及风管内部的杂物（每周清理一次），检查抽风机的风管有无折住，保证风机排风效果良好。

6.2.2 光学系统检查和清洁

光学镜片存放及安装时应注意使镜片免于受损和污染。使用中的镜片应定期进行清洁（**每周定期检查必要时须清洗**）。未定期进行清洁保养的镜片则会降低使用寿命。

在激光工作时，当激光对材料进行切割、焊接、热处理时，工件表面会释放大量的气体和飞溅物，这些气体和飞溅物将会对镜片造成伤害。当污染物落在镜片表面，将会从激光束吸收能量，导致热透镜效应而损伤镜片。应时刻检查镜片是否被污染，做到及时清洁。

正确的清洗方法

清洗镜片的过程中，唯一的目的是将镜片的污染物去除，并且不要对镜片造成进一步的污染和损坏。

第一步：用空气球将表面的浮物及微小颗粒吹掉。



注意

不能使用压缩空气，因为这些空气中含有油物和水滴，会加深对镜片的污染。

第二步：应用无水乙醇对镜片作轻微清洗。使用棉签或擦镜纸蘸上无水乙醇在光照下清洗镜片，并做环状移动。

如果无水乙醇不能将所有的污物去除，请使用酸醋清洗。酸醋清洗是利用酸对污染物的溶解来达到清除污物的，但不会对光学镜片造成伤害。这种酸醋可以是实验级别的（稀释到 50% 强度），或者家庭用的 6% 乙酸的白醋亦可。清洗的程序与无水乙醇清洗一样，然后再用无水乙醇来去除酸醋和擦干镜片。



注意

如果污染物和镜片损伤无法通过清洗去除，特别是因金属飞溅和污垢引起的膜层烧坏，要想恢复良好的性能，唯一的办法就是更换镜片。

6.2.3 水箱的检查和维护

开机前检查：

- 1、电源插座接触是否良好，工作电压是否稳定、正常
- 2、检查水箱水位：查看水箱中的水是否充足
- 3、进 / 出水口连接是否正常，有无松动、漏水现象，水流是否畅通，有无堵塞
- 4、检查水温设定是否过高，正常为 20-30℃

维护及保养：

- 1、定期换水（使用纯净水或蒸馏水）
- 2、每天清理入风口 / 出风口的过滤网



注意

- 1、严禁无水运行，机器工作前一定要保证激光管内充满循环水
- 2、水箱散热时在达到一定的温度风扇才会转动
- 3、确保水箱入风、出风通道顺畅（水箱后面的出风口 / 入风口距离障碍物要留有 30CM 以上的距离）
- 4、当水温低于环境温度，产生冷凝水的情况时，建议调高水温设定或将水温加高到 10℃ 左右。

6.2.4 电气检查

请定期清洁电控制柜中的灰尘，检查线路有无松动、脱落、鼠啮等，检查各排风扇的工作情况。

6.2.5 激光保护装置的检查

请定期检查机器的激光使能开关，气压保护开关，流量保护开关是否正常。

6.2.6 检修周期

请依照实际情况制订检修计划进行相应检修。

6.3 故障分析及排除方法

6.3.1 激光能量弱；

原因：

- a、光路偏移；
- b、镜片上有污物；
- c、镜片有损伤；
- d、激光器老化。

检查方法：

- a、查看各个镜片的入射光是否在镜片的中心位置
- b、镜片（聚焦镜、反射镜、合束镜）是否洁净；
- c、镜片（聚焦镜、反射镜、合束镜）是否损伤；
- d、直接在激光器的激光出口测试激光的功率。

处理方法：

- a、调整光路（方法参见 4.4 调整方法）；
- b、用棉签或擦镜纸、无水乙醇擦拭镜片；
- c、更换损坏镜片；
- d、更换激光器。

6.3.2 运行不出光，测试出光正常；

原因：

加工参数不正确。

检查方法：

检查加工功率设置。

处理方法：

重新设置加工参数。

6.3.3 机器无论测试或加工均不出光

原因：

- a、光路偏移；
- b、激光开关没有打开；
- c、激光开关损坏或连线接触不良；
- d、激光器或激光电源损坏。

检查方法：

- a、查看各个镜片的入射光是否在镜片的中心位置
- b、检查激光使能开关：使能指示灯
- c、检查控制卡的输入信号、输出信号、激光器连接的连接线是否正常，激光电源

与激光器连接是否正常；

- d、激光电源的指示灯是否点亮

处理方法：

- a、调整光路
- b、打开激光使能开关；
- c、重新连接好连线；
- d、更换激光电源的保险，更换激光电源。

6.3.4 机器一个或多个方向不能动作

原因：

- a、伺服电机报警；
- b、限位开关连接线接触不良；
- c、限位开关被污物遮挡或损坏；
- d、控制卡、驱动器、电机线路故障；

检查方法：

- a、检查相应的报警代号
- b、检查相应限位开关与控制卡之间的连接线；
- c、检查限位开关是否有污物遮挡或限位开关被遮挡与无遮挡时是否有相应的变化；
- d、检查控制卡、电机、驱动器的连线；

处理方法：

- a、对相应代号故障针对性处理
- b、重新连接限位开关与控制卡的连接线；
- c、清理污物或更换限位开关；
- d、重新连接控制卡、电机、驱动器的连线；

6.3.5 机器不通电

原因：

- a、电源线接触不良；
- b、急停开关被锁定；
- c、启动按钮与接触器之间的连接线故障；
- d、启动按钮或接触器故障。

检查方法：

- a、检查电源供电情况和电源连接线；
- b、检查急停开关的状态；
- c、检查启动按钮与接触器之间的连接线故障；
- d、检查启动按钮与接触器。

处理方法：

- a、重新连接电源线；
- b、打开急停开关；
- c、重新连接启动按钮与接触器之间的连接线；
- d、更换启动按钮与接触器。

6.3.6 机器运行时轨迹有明显锯齿

原因：

- a、运行速度、加速度设置设置过大；
- b、驱动器与电机线连接故障；
- c、电机损坏；
- d、运动部分有固定螺丝松动；

检查方法：

- a、检查运动速度，加速度设置（切割速度 $\leq 9000\text{mm}/\text{min}$ ，加速度级别增大）；
- b、检查驱动器与电机线连接；
- c、检查电机；
- d、检查运动部分的螺丝是否固定；

处理方法：

- a、重新设置运动速度，加速度；
- b、重新连接驱动器与电机线连接；
- c、更换电机；
- d、固定各个导轨上的螺丝；

查找 / 排除线路故障时请一定断电作业，在机器故障排除以前请不要作业。

第 7 章 技术规范

本章列出了产品的主要功能规格和参数等

一、GH-P 系列激光设备的技术参数具体如下：

型号	GH-P 系列
激光器类型	国产激光管（玻璃）
冷却方式	水冷
加工方式	平面
激光功率	70W-180W 可选
激光波长	10.6um
最小线宽	0.15mm
加工线速	≤ 300mm/s
重复定位精确度	± 0.05mm
雕刻深度	≤ 5mm
最小字符	1mm

二、GH-P 系列机型基本参数

型号	加工范围 (mm)	外形尺寸 (mm)	重量 (Kg)	供电电源
GH960-P	900*600	1460*1000*970	190	220V 50Hz/60Hz 10Amax
GH1260-P	1200*600	1790*1150*1006	280	220V 50Hz/60Hz 10Amax
GH1280-P	1200*800	1900*1420*1006	300	220V 50Hz/60Hz 10Amax
GH1480-P	1400*800	2100*1300*1006	325	220V 50Hz/60Hz 10Amax
GH1610-P	1600*1000	2300*1530*1007	380	220V 50Hz/60Hz 10Amax
GH1810-P	1800*1000	2420*1530*1006	400	220V 50Hz/60Hz 10Amax


以上参数仅供参考，光博士激光有最终解释权

Statement

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Any organization or individual is not allowed to copy or duplicate this Manual or transform it in any form without the permission of GBOS.

Trademark statement

 Both patterns and words are the registered trademark of GBOS which shall have such legitimate rights such as exclusively using, allowing using, transferring or renewing them. Without the permission of GBOS, any organization or individual is not allowed to use identical or similar trademark.

Attention

GBOS will perform warranty service committed within the scope of warranty specified. We bear no warranty service if exceeding the scope of warranty. We bear no any liability for any loss or losses that may happen by using this product. Any dispute shall be resolved as per the relevant laws of the People’s Republic of China.

GBOS may, from time to time, upgrade software or hardware or update the contents of this Manual. We will bring all these updates into the new version of this manual without sending prior notice.

Preface

Version

This Manual is 2016 simplified Chinese version A of Series GH-P laser cutting machine. This Manual is applicable to the standard configuration of the product in the corresponding model. For the customized products, please read through the instruction data attached carefully.

This Manual has set down the working principle, installation method, operation, troubleshooting, transportation & storage, maintenance, etc. of this product. For the users that use this product for the very first time, please read these data carefully prior to use.

Please save these data properly for further reference.

Symbols

The safety marks contained in this Manual will remind users of personal injury or equipment damage that may happen. Please pay attention to the contents prompted by marks while using this equipment to ensure the safety of the operator and personnel nearby.



Warning

Laser radiation attention: danger of laser radiation may happen so please take laser protective measures!

**Danger**

Electric safety attentions: danger of electric shock which leads to personal injury may happen!

**Warning**

Fire safety attentions: danger of fire disaster may happen so please pay attention to fire resistance!

**Attention**

General attentions; failure in operating according to the prompt may lead to equipment damage and failure.

**Instruction**

Supplemental instruction of operation details.

Chapter 1 Foreword

1.1 Welcome

Thanks and welcome to use GBOS products. Here is the GH-P Series laser cutting engraving machine produced by GBOS. For the users that use this product for the very first time, please read these data carefully prior to use.

1.2 Company Profile

By insisting on the core value of “create customer, serve customer ,Companies and employees win-win” and the enterprise spirit of “being united, diligent, practical-minded and innovative”, we try to become the first brand in laser industry worldwide.

Company vision: All GBOS people will be proud of the well-known GBOS.

Core value: create customer, serve customer, Companies and employees win-win.

Brand concept: dedicated to smart laser application .

- **Product**

GBOS laser- is dedicated to laser application automation by providing clients both at home and abroad with one whole set of laser processing solution and relevant supporting schemes; the main products include several series of industrial laser equipment and supporting products in more than 100 kinds, such as laser engraving machine | laser cutting machine | laser marking machine | full automatic marking machine. Our products have been widely used in such industries as electronic circuit, integrated circuit, instrument, printed circuit, computer manufacturing, mobile communications, auto accessories, precise machinery, construction and building materials, costume, city lights, gold & silver jewellery, craft gift, printing platemaking, mark, packaging, ads and food.

- **Quality**

GBOS has passed ISO9001: 2008 international quality system certification. We are strict on all links such as product R & D, purchasing, manufacturing and inspection so as to ensure the performance and quality of final products.

- **Service**

We have established a large and powerful marketing management center and many branches and offices all over China. We also have established many overseas branches where we designate our permanent technical service and sales personnel to provide all-dimensional pre-sales, sales and after-sales support and service. We endeavor to enable all our customers to get access to our considerate service.

1.3 Warranty Terms

I. We provide one-year warranty period for the whole machine (subject to the nameplate date): we are liable for the warranty of mechanical and electronic parts for one year; we do not provide warranty service to quick-wear parts (refer to focus lens and reflector). The warranty period we provide for

domestic laser tube and laser is three months (excluding artificial damage) and one year respectively.

PS: For the parts that are damaged by improper use, we will charge man costs and materials costs (improper artificial use refers to the parts damaged by improper operation or faults caused by lack of maintenance and cleaning). They are illustrated as follows:

We do not provide warranty service for any of the following circumstances:

1. The track is worn due to the failure in lubricating Axis X and Y; the track can not move or motor is burnt by the failure in cleaning Axis X and Y;
2. Cutting effect is affected by the failure in cleaning lens thoroughly or light path deviation by loosen screw or a reduced laser power.
3. The cutting effect becomes inferior due to artificial damage or uneven screen;
4. The cloth cut becomes yellow by the reduced exhaust affect due to the failure in cleaning screen and funneling air draft box;
5. The motor is burnt or does not operate as suction ventilator is not cleaned thoroughly and blocked;
6. Cooling water is blocked as the cooler is burnt due to insufficient water or incrustation forms inside cooling tube by water quality pollution, reducing laser output power or causing burst;
7. Laser is damaged by external force or glass tube is broken due to poor cooling effect;
8. If the output power of laser tube is reduced within one month prior to the expiration of warranty period, it is quite normal power consumption; should the circumstance happen, user can tackle with it by adjusting proper power and we do not exchange it for this reason;
9. Softdog is lost due to the failure in operating according to normal procedure or GBOS software can be no longer used by inserting port by mistakes;
10. Computer software can not be operated due to pattern or improper artificial operation;
11. Faults happen to computer hardware (including display).

II. For the repairing beyond warranty period, user should be liable for the fees of the parts and accessories maintained or changed and maintenance fees and round-trip travel expenses of our technicians.

Chapter 2 Safety Instructions and Preventive Measures

As this equipment is provided with sightless high-energy laser, please operate and maintain it by the personnel that have passed training as per operation specifications in usual time and never process high-temperature and explosive materials; designate special person for the processing and operation of this equipment. This equipment may generate toxic gas during the cutting process so please start extract system; otherwise, never start it.

2.1 Overview



Attention

- a) Do make sure this Manual is saved by the final user of this equipment.
- b) This equipment shall be operated by the operators that pass the training organized by our staffs or qualified agents authorized by us.
- c) Always make sure the personnel in charge of operation and maintenance of this equipment abide by relevant requirements and pay attention to the relevant marks at external and internal side of this equipment while operating and maintaining it.



Warning

- d) Please place this equipment and relevant accessories correctly;
- e) Ensure this equipment has been connected to the ground well prior to power-on;
- f) Never power this equipment on when it is not occupied;
- g) Ensure good external earthing of power protective ground wire;
- h) Only those that are quite familiar with the performance and operation of this equipment can be allowed for electrical operation;
 - i) Never stack foreign matters near this equipment;
 - j) Make extract system connect the ground individually;
 - k) Never extend body to laser light path during the operation process to avoid personal injury;
- i) Never place inflammables on light path or place that laser beam can reach; Fire and even explosion may happen if laser beam reaches inflammable and explosive materials.
- m) Never short circuit or connect the lead of laser power output end to the ground;
- n) Never see emergency light or reflecting laser with eyes directly when the laser is started to avoid injuring eyes; Laser goggles is strongly recommended.

2.2 Laser Safety Notification



Warning

In light series GH-P laser cutting machine is designed with some sealed laser light path, danger may happen if body enters the light path of cutting area; so it is a MUST to operate as per regulations. Please DO operate according to this Manual or training contents.

2.2.1 Eye and skin protection



Danger

Please avoid laser from directly shooting at or reflecting eye and skin to avoid personal injury; goggles are strongly recommended.

2.2.2 Fire protection



Warning

Avoid processing inflammable and explosive products or putting inflammable materials on light path or where laser beam may reach. Fire and even explosion may happen if laser beam reaches inflammable and explosive materials.

One set of conforming fire extinguisher is strongly recommended near this equipment.

2.2.3 Electrical safety

Please provide power that meets local requirements as per the requirements and ensure good earthing of this equipment.

Always ensure to power off before repairing this equipment.

- a) Ensure the supply voltage of this equipment meets the requirements;
- b) Ensure this equipment has been connected to the ground well prior to power-on;
- c) Never power this equipment on when it is not occupied;
- d) Never short circuit or connect the lead of laser power output end to the ground;
- e) Ensure good external earthing of power protective ground wire;
- f) Only those that are quite familiar with the performance and operation of this equipment can be allowed for electrical operation;
- g) The test of control system of this equipment entails some special measurement technique. The reference ground should be selected and determined by the technicians familiar with operation of this system and relevant equipment;

2.2.4 Material safety notification

Try to avoid processing toxic elements such as those containing sulfur and halogen; do remember to start exhaust fan before processing such kind of products; otherwise, operation is prohibited.

2.2.5 Protective measures for this equipment

This equipment has been provided with the following safety protective measures:

- a) Power short circuit/overload protection
- b) Water flow signal protection

2.2.6 Common knowledge for users

- a) Never operate this equipment if there is no air exhaust and auxiliary blowing equipment;
- b) Never extend body to laser light path during the operation process to avoid personal injury;
- c) Never extend body to motion structure during the operation process to avoid personal injury;



Attention

Prepare one fire extinguisher within reach prior to processing combustible materials that easily catch fire.

Chapter 3 Product Overview

3.1 Main Models of Product

Series GH-P products include the following models: GH960-P, GH1260-P, GH1480-P, GH1610-P, GH1810-P, etc.

3.2 Product Features and Outside View

Series GH-P series machines are featured by long-time stable and reliable operation, simple operation, convenient use and clear marking. The control software is Windows engineering interface and can be compatible with several output documents such as Coreldraw, AutoCAD, Photoshop, Illustrator, etc.

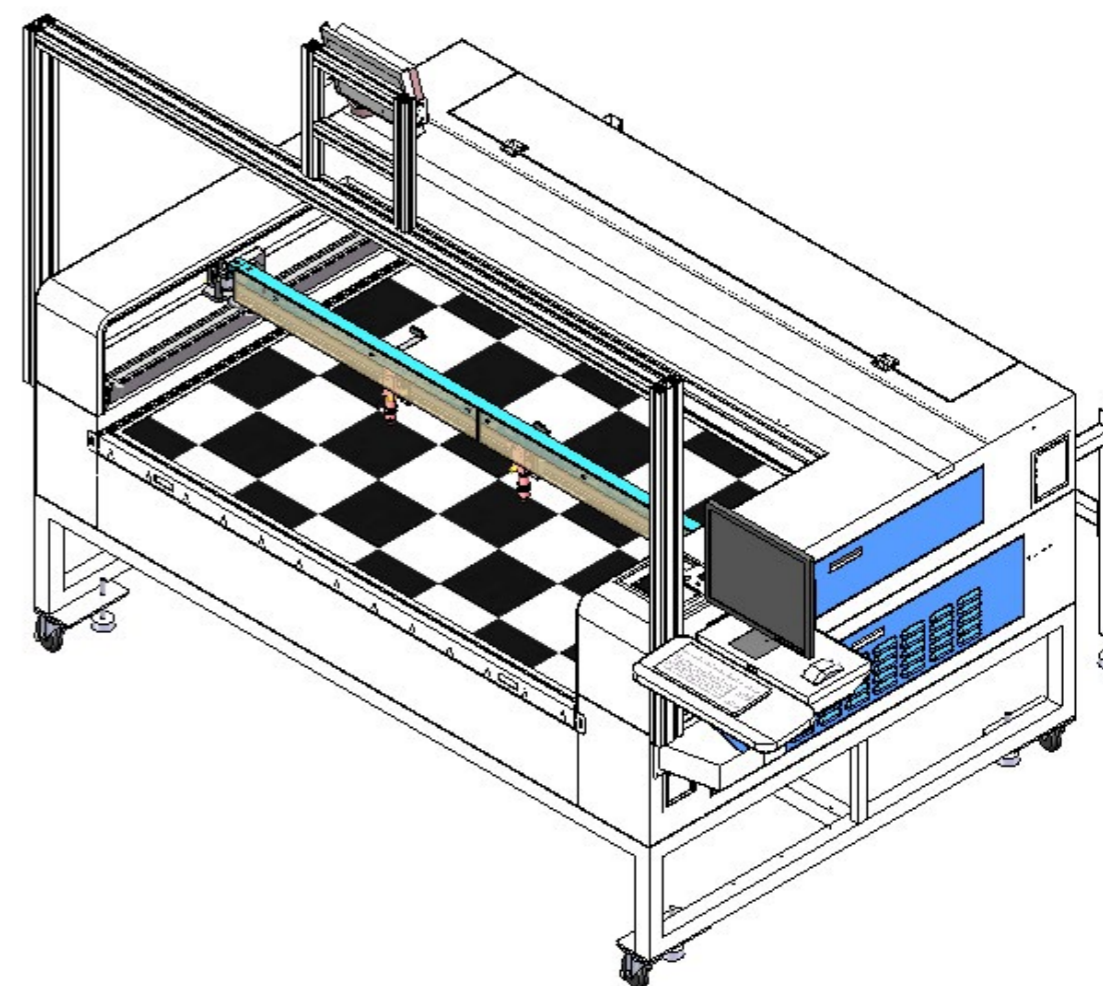
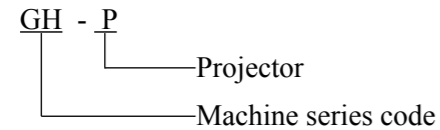


Fig. 3-1 Outside View of Series GH-P Equipment

3.3 Model Definition

Model definition:



3.4 Main Usage and Scope of Application

Series GH-P machines belong to CO₂ non-metal laser cutting engraving machine which can be used for processing different kinds of non-metal materials, such as wooden products, paper, cloth, leather, epoxy resin, acrylic material, unsaturated polyester resin and plastic.

3.5 Conditions of Use Environment

This equipment is designed according to the relevant industrial environment rules. We bear no liabilities for any influence caused by the installation of it in other environment (such as residential buildings, homes, etc.).

Please use this equipment under the environment which meets the suggested conditions; otherwise, it may lead to mechanical injury or influence on the service life of this equipment.

Use environment suggested:

Ambient temperature for operation	15 °C ~35 °C
Transportation and packaging ambient temperature e	5 °C ~ 45 °C
Relative humidity	30% to 80%
Electric demand	Single-phase 220VAC,50HZ/60HZ,10A-20A
Fluctuations in power system	<±5%
Power grid grounding line	Meet international machine room requirements
Air source requirements	0.4-0.5MPoil and water-free dry compressed air

Never use this equipment in the following places:

- Places with wastes, dust or excessive oils;
- Places with significant vibration and impacts;
- Places getting access to drugs, inflammables and explosives;
- Places near high-frequency s interference source;
- Places where moisture condensation easily happens;
- Environment where the concentration of CO₂, NO_x, SO_x is high.

3.6 Impact on Environment and Energy

As this equipment is provided with CO₂ laser source, it belongs to non-contact processing during which, no such pollutions as noise, chemistry and chemical waste gas will be caused. Restricted by the processed materials, some materials may generate smoke and chemical waste gas when processed; it is suggested to install purification treatment equipment in air exhaust system.

3.7 Working Principle

Series GH-P laser equipment is composed of controlling system, optical system, XY motion system, working platform, projection system and water cooling system. CO₂ laser is able to output the laser, the wave length of which ranges from 10.55μm to 10.63μm and the laser will be reflected to focus lens through reflector. Finally, the laser will form several tiny and high-energy density facula breaking down the surface of workpiece after focus of focus lens and laser nozzle; one tiny hole will be formed on the surface of workpiece; all these holes can be arranged in the corresponding shapes though controlling the motion of Axis X and Y so as to cut the object.

3.7.1 Controlling system

1. The door-to-door training service provided by our trainer regarding the operation of GBOS cutting software will not be illustrated in detail here.

2. Use of projection software

① .Please fix the projector right above the machine using a bracket and try to keep the projector vertical to the table of working platform! Keep the optimum resolution and then adjust the height in accordance with the working range of machine.

② .After installation is done, connect the projector to computer and reset the machine to the original point of machinery, check if the laser head is within the effective breadth projected by projector and then set the resolution of computer to be the same with that of projector. The detailed operation is as follows:

1) Right click on computer desktop → property → setting; it is as shown in figure below:



2) Choose No. 1 and check the screen resolution of your computer, then choose No. 2 to check the resolution of projector. Adjust the resolution of projector to be optimal and then set the computer screen resolution to be the same as shown in figure below:



3) Adjust the resolution of computer and projector and tick “Expand Window desktop to this monitor (E)” and click “OK” as shown in figure below:



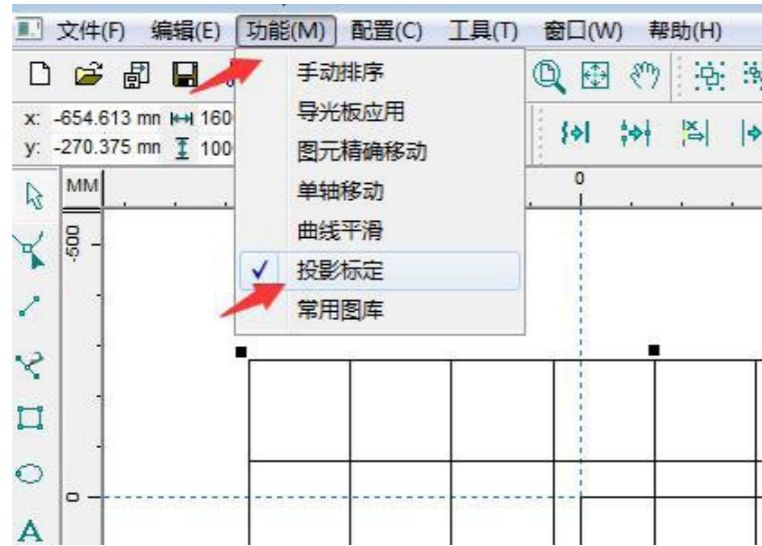
If there's no identical resolution between the computer and projector during debugging process, it is required to select the most close and identical resolution between them.

2. Calibration of projector

The following calibrations should be completed on the machine with breadth of 1600mm*1000mm.

1) Open the software to complete a 4-row 7-column rectangle with dimension of 200*200 (be of full breadth ASAP) and complete processing by machine.

2) Insert softdog in computer and click “Function” option and “Projection calibration” of software as shown in figure below:



3) The “Projector” menu will appear at the right function setting area, click it and input the area width (X) and area height (Y) in Step 1.

4) Click Step 2 “Calibration enable” below and input password (tz0001) and click OK to pop up the row · column · interval input box and fill out the corresponding number as shown in figure below:



5) Pull the rectangle projected on the working area by projector (keep moving the mouse to the

right side of computer screen to move it to the projection area on laser table, holding the left key on cross circle to pull it, or double click the left key to the cross circle to precisely move it using direction key on keyboard) to overlap with the rectangle which is previously cut by laser, then click “Projector calibrate” to complete entire calibration process.

6) If the software is further opened, you may directly use it without repeating the calibration process and, you may also import or export parameters to save the parameters which were calibrated by you. You may import the parameters as needed!

3. Projection setting

1) X.Y displacement: it refers to the deviation which is inevitable in the operation process of projector and as a result, the position of projected image is different from the previous one! So, we can input an X·Y displacement to it to calibrate the projected image and ensure accuracy! Surely, this displacement is the actual value measured by a ruler in accordance with the deviation level of projector.

2) Background color: it refers to the actual color projected by the projector. If the color of to-be-cut materials is the same with the projected color, they will be mixed to display the image which doesn't need cutting and in such case, you need to select another color in the background color as shown in figure below:



3) Virtual locating: it refers to the function by which the user may temporarily add a locating point in the effective projection breadth of projector. It can help the laser return to the virtual locating position, thus greatly shortening the idle stroke of laser head and making it easier and faster. The virtual locating point can be set by firstly setting the [Home position] of machine to be “None”, moving the laser head to the virtual locating position needed and clicking the [Virtual locating] of software to complete the setting.

4) Counts and interval: this function may be helpful if the users need to cut the same images using common two-head laser. The user needs to fill out the corresponding parameters (count and interval)

and click “Apply” to complete the setting. It means an image is prepared into an array at X direction and the color of image from array is changed and output is forbidden. In such case, two images will be projected by the projector for alignment of two laser heads.

Common problems:

1. If the number window as shown below is not opened after ticking “Calibration enable”, please check if the control card is normally connected to the computer!
2. If the projector fails to project on the working platform of machine after calibration is done, or the projected image is inconsistent, please check if the laser head is within the effective breadth of projector during calibration!

3.7.2 Host Module

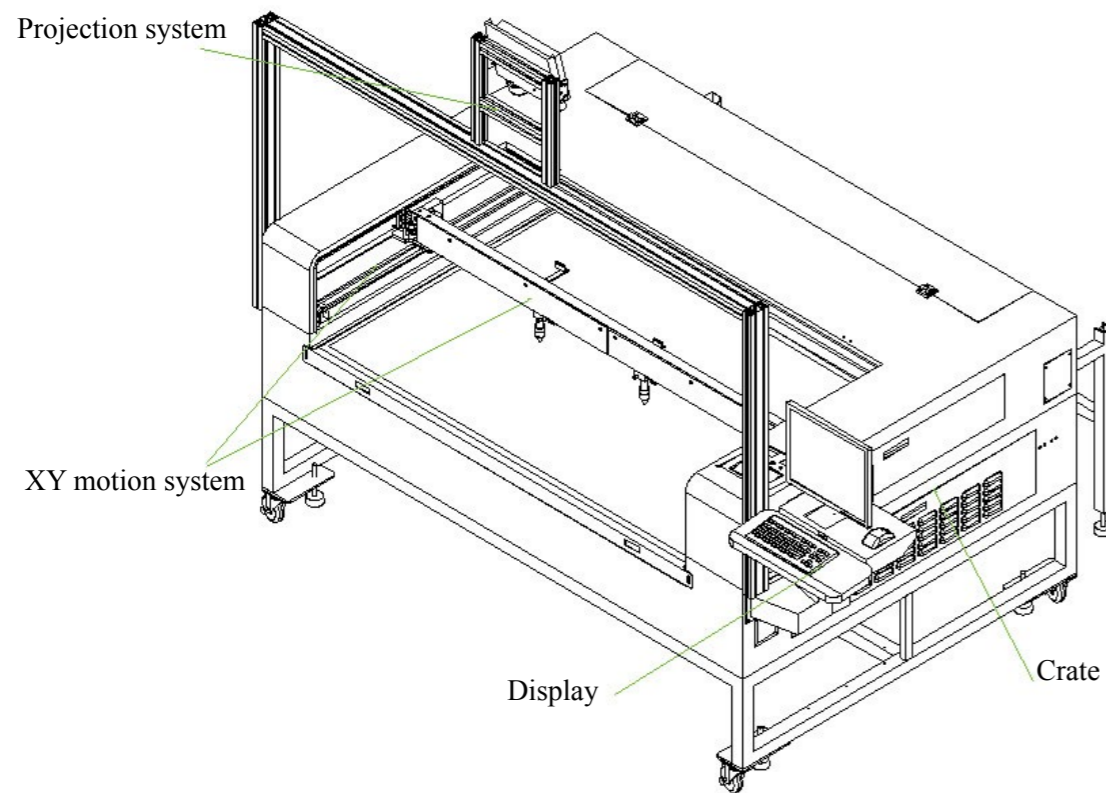


Fig. 3-2 Series GH-P

3.7.3 Optical system

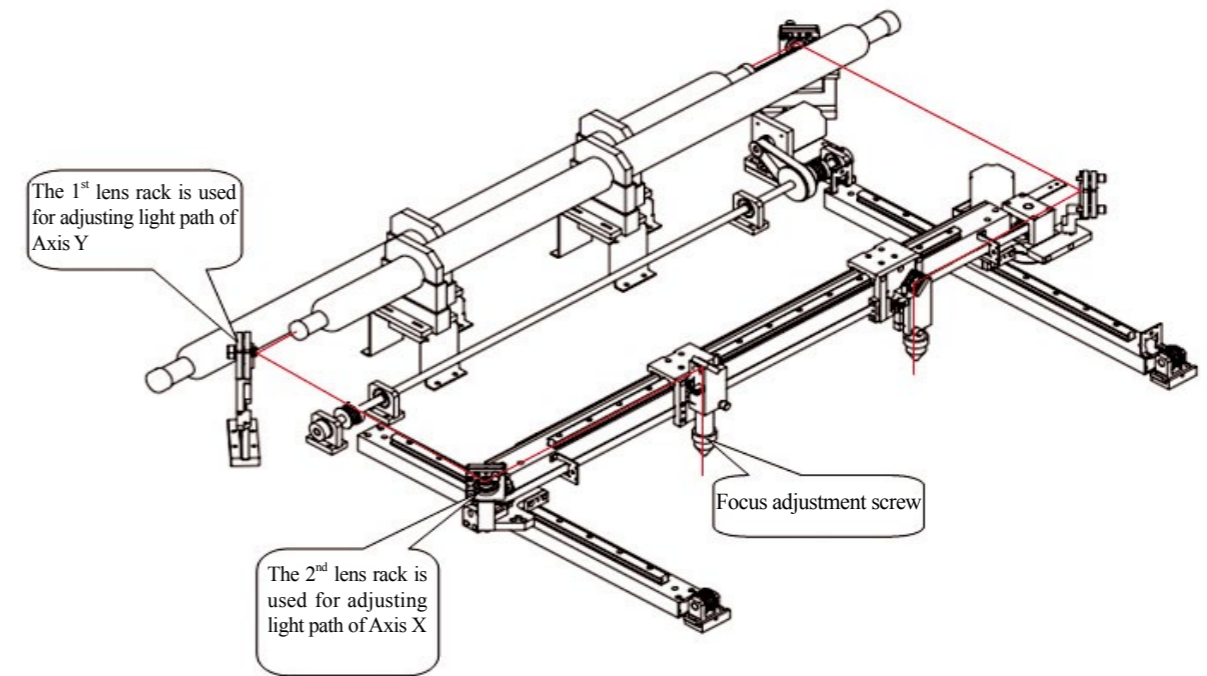


Fig. 3-3 Light Path Principle

3.7.4 Working platform

Honeycomb screen working platform is provided and bar cutter working platform is also optional.

3.7.5 Exhaust system

The main part refers to exhauster, which is shown in the figure below:

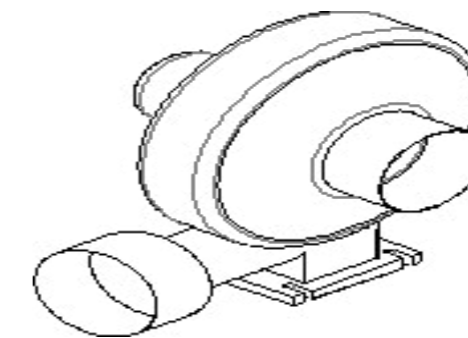


Fig. 3-4 exhauster

Considerable dusts or harmful gas will be generated on the surface of the material processed during laser processing and they should be removed outdoors by exhauster and air tube.

3.7.6 Cooling system (as shown in the figure below)

The cooling water tank is provided with stainless steel multi-level special centrifugal circulating pump and PVC connection pipeline so no dust or corrosion will happen. Pure water can be used

directly; high-pressure resistant pure water filtration device is provided to prevent pipelines from being blocked and make laser equipment operate safer.

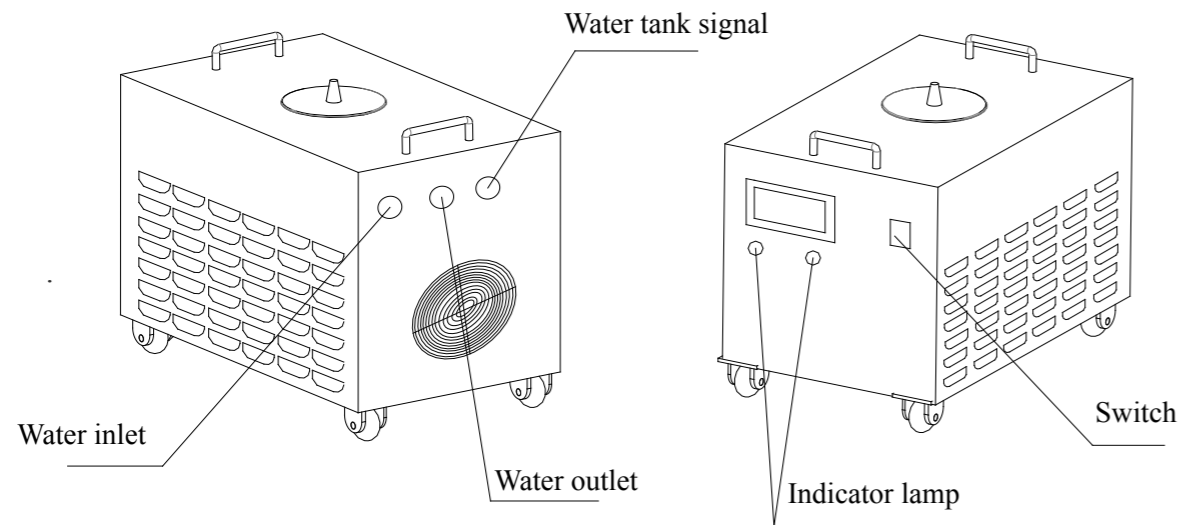


Fig. 3-5 Water Tank

3.7.7 Projection system (as shown in the figure below)

Fix the projector below drilling crew by rack and make the projector vertical with working platform surface as much as possible! Adjust the corresponding height and distance according to the working area of the machine on the basis that the projector is under the best resolution.

Connect projector with computer after installation and reset the machine to the original position of machine; firstly, determine if the laser head is within the effective area projected by projector and set the same resolution for computer and projector.

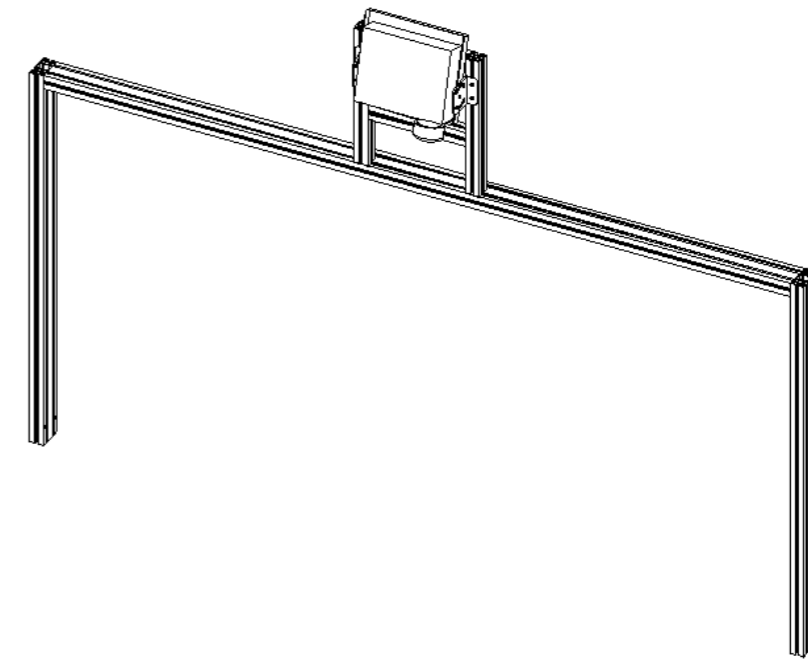


Fig. 3-6 Projector

Chapter 4 Installation and Debugging

4.1 Delivery inspection

4.1.1 Unpacking attentions

We try to consider our customers with the greatest efforts but we can not ensure customers are totally satisfied with the equipment received; please check the equipment item by item according to packing list upon receiving it to confirm if all parts and accessories of this equipment are lost or damaged when they are packaged or conveyed; if any abnormality, please contact us (including our authorized agents) as soon as possible so that we can remove all these problems for you, thank you!

If all parts contained in packing list are not lost but under complete status, please fill in warranty card accurately and then fax it to us or our authorized agent so that we can establish client's files to get prepared further for our service and work.

4.1.2 Contents checked

Please check if the appearance and performance of all parts and accessories of this equipment are complete carefully according to packing list.

4.2 Requirements for installation environment

Please use this equipment in the places to which sudden temperature change of surrounding environment will never occur rather than the following places:

Places with wastes, dust or excessive oils;

- Places with significant vibration and impacts;
- Places getting access to drugs, inflammables and explosives;
- Places near high-frequency s interference source;
- Places where moisture condensation easily happens;
- Environment where the concentration of CO₂, NO_x, SO_x is high.

Splodge and fog marking will happen if optical lens is dewed in the occasions with sudden temperature change. Please avoid using this equipment in the place with sudden ambient temperature change or at least make sure no moisture condensation will happen.

Please install this equipment in the environment in horizontal place with no external vibration and ensure certain working space. For the sake of convenience, please install this equipment in the places which are provided with compressed air and easy to exhaust air and smoke.

4.3 Installation Method and Attentions

● 4.3.1 Level calibration

Place this equipment in even ground and find a proper installation place; lock caster to avoid rotating and enhance machine leg. All machine legs should contact installation plane totally and adjust the level of machine by four machine legs; make detection by gradienter.

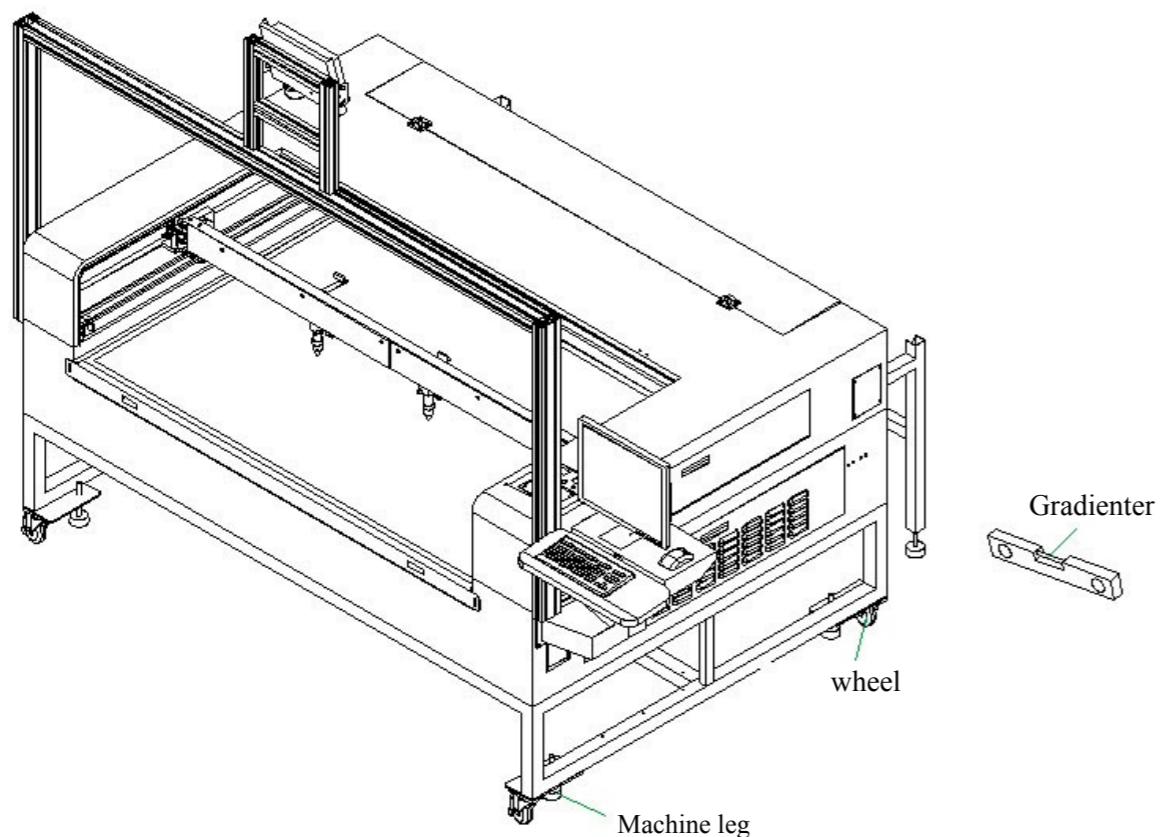


Fig. 4-1 Level Calibration

● 4.3.2 Water tank connection

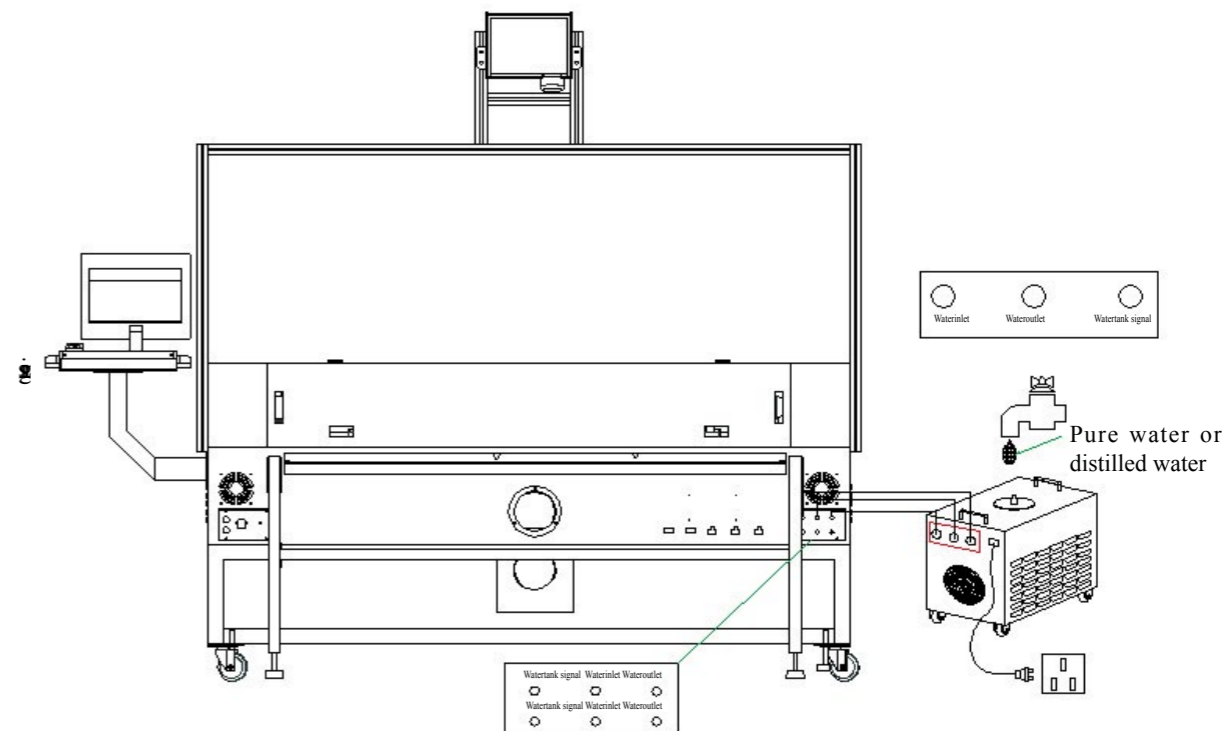


Fig. 4-2 Water Tank Connection

● 4.3.3 exhauster connection

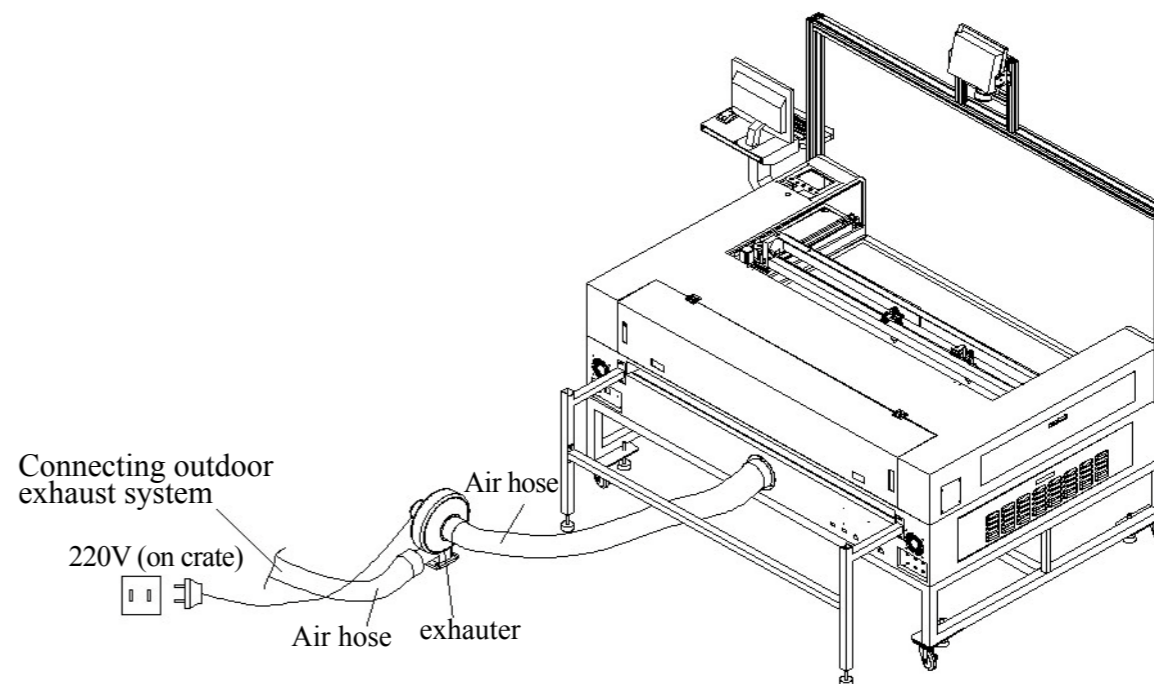


Fig. 4-3 exhauster Connection

● 4.3.4 Blower/power connection

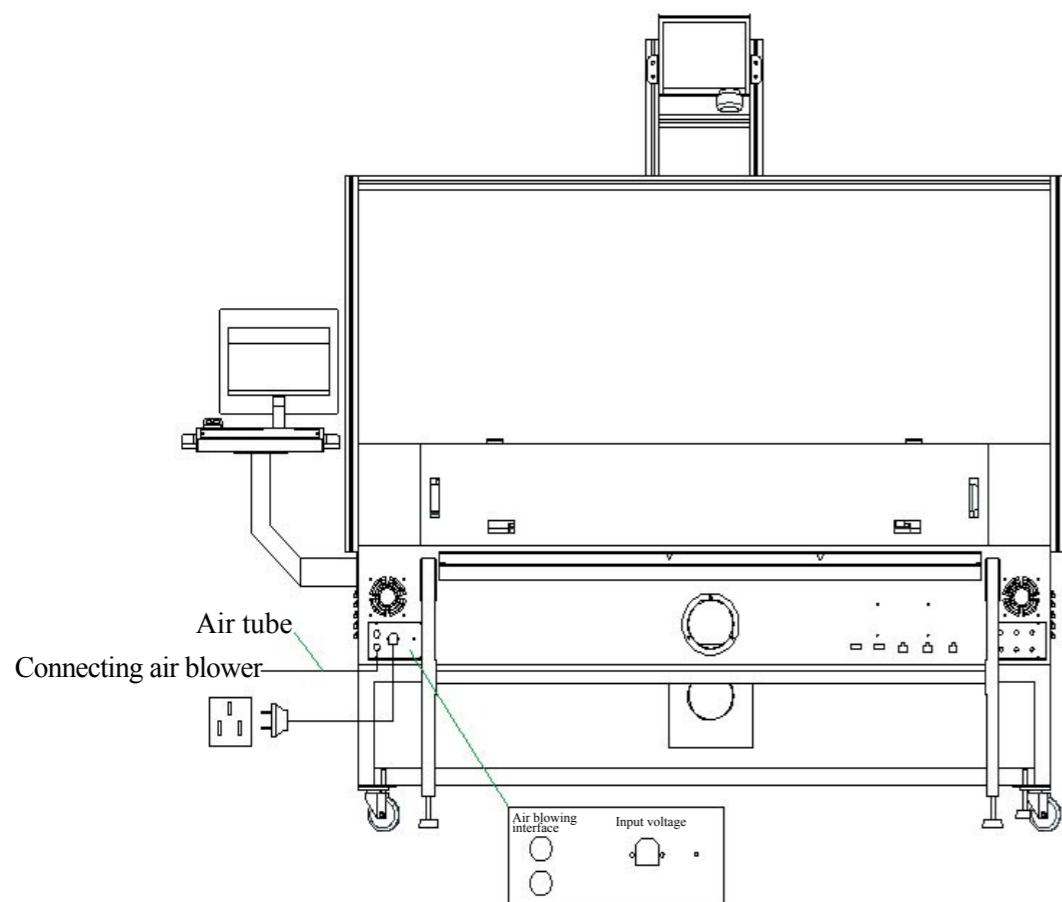


Fig. 4-4 Blower/Power Line Connection

4.4 Debugging Method and Attentions

Put one white paper on working platform horizontally and adjust height preliminarily according to the distance of it from laser nozzle; then press test button on operation panel and the laser will leave a trace on material; then adjust the height of scanner head manually and press button switch again to set a trace on material; compare the size of the two traces, repeat the steps above of adjusting height and setting trace until the trace becomes minimum. This is where the focus lies.

Tools required: one set of metric socket head wrench



Attention

Check if auxiliary gas and focus lens are normal prior to debugging.

Test button switch is used for triggering laser so never keep pressing it for a long time.

Chapter 5 Use Instructions

5.1 Preparation and Inspection Prior to Use

1. Water cooling system: user needs to fill in water tank with pure water (distilled water recommended) to check if water tank and connecting pipe leak water.
2. Power: confirm if 220V power is connected and if interface becomes loose.
3. Air source: connect air pipe of air pump/compressed air with machine.
4. Air exhaust system: confirm if exhauster/air tube is connected correctly and ensure dust can be exhausted to the outside

Start this equipment for debugging after the above is confirmed

5.2 Integral Startup Procedure

1. Ensure to connect equipment power safely;
2. Turn on main power supply
3. Turn on water tank power supply
4. Start air pump and exhauster
5. Click startup button
6. Press projector remote power button

5.3 Integral Shutdown Procedure

1. Click shutdown button
2. Press projector remote power button
3. Shut down air pump and exhauster
4. Turn off water tank power supply
5. Turn off main power supply

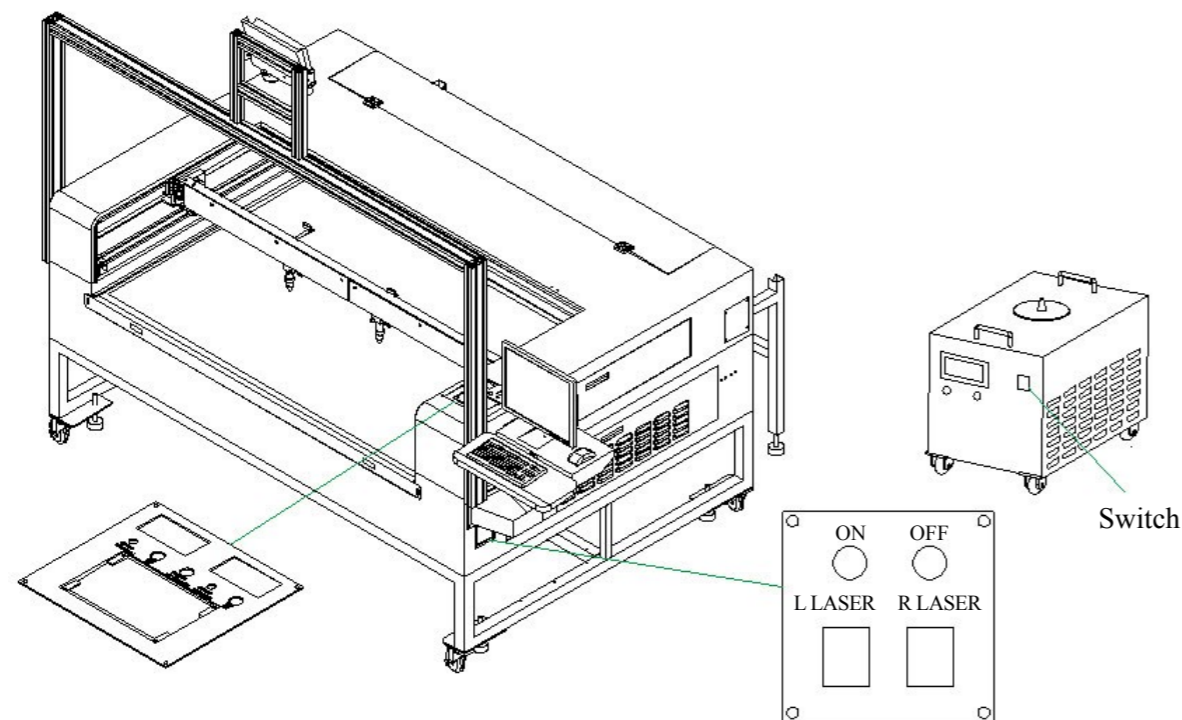


Fig. 5-1 Startup and Shutdown Procedure

Chapter 6 Maintenance and Troubleshooting

To ensure and prolong the service life of this equipment, it is a MUST to maintain this equipment on a daily basis and regularly. Please prepare daily maintenance plan according to the actual situations.

6.1 Overview

Maintenance mainly refers to both regular and irregular maintenance of machine appearance, suction fan, optical system, cooling system, laser protection device and electric system.

6.2 Daily Maintenance

After work is finished per shift, clean the surrounding environment of this equipment to make the ground dustless and clean. Clean this equipment, including the external surface of main control cabinet, enclosure of optical system and working platform, all of which shall be free from sundries and dust and clean and tidy.

6.2.1 Inspection and maintenance of exhauster

Prior to startup each time, clean suction port, exhauster of this equipment and sundries inside air tube (cleaning once a week) and check if the air tube of exhaust fan is folded in order to ensure normal exhausting.

6.2.2 Inspection and cleaning of optical system

Save and install optical lens by avoiding damaging or polluting it. The lens used should be cleaned regularly (**cleaning it while checking it each week**). Failure in cleaning and maintaining it regularly may lead to a shorter service life.

When material is processed with laser, the surface of workpiece may release considerable gas and splashed matters, all of which do harm to lens. If the pollutant falls on the surface of lens, it will absorb energy from laser beam, damaging lens by thermal lens effect. Check if the lens is polluted always and clean it in time.

The right way to clean it

Lens is cleaned thoroughly in order to remove lens pollutant and avoid polluting and damaging lens further.

Step 1: Blow away floating matter and tiny particles on surface with air ball;

 Attention

Never use compressed air which contains oil and water drop in air and thus pollutes lens more seriously.

Step 2: Clean lens by moistening cotton bud or lens wiping paper softly with absolute ethyl alcohol softly under sunshine and move circularly.

Use vinegar if absolute ethyl alcohol can not remove all pollutants. Vinegar cleaning means removing pollutants by dissolving them and it does not damage optical lens. Such vinegar is experimental level (diluted to 50% strength) or household 6% acetic acid white vinegar can also be used. Cleaning procedure is the same as that of absolute ethyl alcohol; then use ethyl alcohol to remove vinegar and wipe lens.

 Attention

If pollutant can not be removed by cleaning lens damaged, particularly for the film damaged by splashed metal and dirt, change lens to recover performance.

6.2.3 Inspection and maintenance of water tank

Inspection prior to startup:

1. Check if power socket is in good contact and if working voltage is stable and normal;
2. Inspect water level of water tank: check if the water in water tank is sufficient
3. Check if water inlet/outlet is normal, loose or leaks water and if water is smooth or blocked
4. Check if water temperature is set too high (20-30°C normally)

Maintenance:

1. Change water regularly (using pure water or distilled water)
2. Clean strainer of air inlet/outlet on a daily basis

 Attention

1. Operation with no water is prohibited; ensure the laser tube is filled with circulating water before starting this equipment.

2. Fan will not rotate until reaching certain temperature when water tank releases heat.

3. Make sure the air inlet and outlet channel of water tank is smooth (the air inlet/outlet beside water tank shall be above 30cm far away from obstacle).

4. If water temperature is lower than ambient temperature, generating condensation water, increase water temperature setting or heat water to 10℃ .

6.2.4 Electric inspection

Clean dust inside electric control cabinet and check if line is loose, fall or damaged by rat and the working conditions of all exhaust fans regularly.

6.2.5 Inspection of laser protection device

Check if laser enable switch and flow protection switch of this equipment are normal regularly.

6.2.6 Repairing cycle

Repair this equipment by preparing repairing plan according to the actual situations.

6.3 Fault Analysis and Troubleshooting

6.3.1 Weak laser energy:

Cause:

a. Deviation of light path; b. Lens contains dirt; c. Lens is damaged; d. Aged laser

Inspection method:

- Check if incident light of all lens is in the central position of lens;
- Check if lens (focus lens, reflector and beam combiner) is clean;
- Check if lens (focus lens, reflector and beam combiner) is damaged;
- Test laser power at laser outlet of laser directly.

Troubleshooting:

- Adjust light path (see 4.4 Adjustment Method for method);
- Wipe lens by moistening cotton bud or lens wiping paper softly with absolute ethyl alcohol;
- Change the lens damaged;
- Change laser.

6.3.2 Laser is abnormal in operation but normal in test;

Cause:

Incorrect processing parameters.

Inspection method:

Check how processing power is set

Troubleshooting:

Set processing parameter again

6.3.3 Laser is abnormal for both test and processing

Cause:

- Deviation of light path;
- Laser switch is not turned on;

c. Laser switch damage or poor contact of wires;

d. Damage of laser or laser power.

Inspection method:

- Check if incident light of all lens is in the central position of lens;
- Check laser enable switch: enable indicator lamp
- Check if the input and output signal of control card and connecting wire connected with laser are normal and if laser power is connected with laser normally;
- Check if laser power indicator lamp is on.

Troubleshooting:

- Adjust light path;
- Turn on laser enable switch;
- Connect wire again;
- Change laser power fuse and laser power.

6.3.4 Action failure in one or several directions;

Cause:

- Stepping/servo motor alarming;
- Poor contact of limit switch connecting wire;
- Limit switch is covered or damaged by pollutant;
- Fault of control card, actuator, motor line;

Inspection method:

- Check the corresponding alarming code;
- Check the connecting wire between the corresponding limit switch and control card;
- Check if limit switch is covered by pollutant or if there is any change when it is covered or not covered;
- Check the connecting wire of control card, motor and actuator.

Troubleshooting:

- Treat the corresponding code fault;
- Connect the connecting line between limit switch and control card again;
- Remove dirt or change limit switch;
- Connect the connecting wire of control card, motor and actuator again.

6.3.5 This equipment can not be electrified

Cause:

- Poor contact of power line;
- Emergency switch is locked;
- Failure of connecting wire between startup button and contactor;
- Fault of startup button or contactor.

Inspection method:

- a. Check power supply and power connecting wire;
- b. Check the status of emergency stop switch;
- c. Check the failure of connecting wire between startup button and contactor;
- d. Check startup button and contactor.

Troubleshooting:

- a. Connect power line again;
- b. Turn on emergency stop switch;
- c. Connect the connecting line between startup button and contactor again;
- d. Change startup button and contactor.

6.3.6 Obvious sawtooth trace when this equipment works

Cause:

- a. Excessive operation speed and acceleration;
- b. Connection failure between actuator and motor wire;
- c. Motor damage;
- d. Loose fixed screw in motion part.

Inspection method:

- a. Check motion speed and acceleration setting (cutting speed ≤ 9000 mm/ min, increase of acceleration grade);
- b. Check the connection of actuator and motor wire;
- c. Check motor;
- d. Check if the fixed screw in motion part becomes loose.

Troubleshooting:

- a. Set motion speed and acceleration again;
- b. Connect actuator and motor wire again;
- c. Change motor;
- d. Fix all screws of all guide rails.

Power off before trying to discover/eliminate wire fault; never use this equipment before fault is eliminated.

Chapter 7 Technical Specification

This chapter has set down the main functions, specifications and parameters of this equipment.

I. The technical parameters of Series GH-P laser equipment are as follows:

Model	Series GH-P
Laser type	Domestic laser (glass)
Cooling mode	Water cooling
Processing mode	Plane
Laser power	70W-180W optional
Wave length of laser	10.6um
Min. line width	0.15mm
Processing line speed	≤ 300 mm/s
Repetitive positioning accuracy	± 0.05 mm
Engraving depth	≤ 5 mm
Min. character	1mm

II. Basic parameters of Series GH-P machines

Model	Processing scope (mm)	Overall dimension (mm)	Weight (Kg)	Power supply
GH960-P	900*600	1460*1000*970	190	220V 50Hz/60Hz 10Amax
GH1260-P	1200*600	1790*1150*1006	280	220V 50Hz/60Hz 10Amax
GH1280-P	1200*800	1900*1420*1006	300	220V 50Hz/60Hz 10Amax
GH1480-P	1400*800	2100*1300*1006	325	220V 50Hz/60Hz 10Amax
GH1610-P	1600*1000	2300*1530*1007	380	220V 50Hz/60Hz 10Amax
GH1810-P	1800*1000	2420*1530*1006	400	220V 50Hz/60Hz 10Amax

The parameters above are for reference only; we reserve the right of final interpretation.