Users' Manual of NcEditor V12 Laser Cutting CNC System

### NcEditor V12 激光切割控制系统 用户手册

(中英双语)

上海维宏电子科技股份有限公司

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前言

#### 如何使用本手册

本手册主要面向用户。如果您初次使用本系统,您需要仔细阅读本手册。如果您是一位有经验的用户,请通过目录快速查找相应信息。

本手册分为5部分,有4章节,具体如下:

- 前言部分,主要介绍在运输与储存、开箱检查、安装、接线、运行与调试、使用等方面的注意事 项,以及其他相关信息。用户在使用前须认真阅读,确保安全操作。
- 快速上手部分,参考第1章节。本章列出 NcEditor V12 的功能特性,并简要介绍界面构成以及 操作流程。
- 功能详解部分,参考第2章,主要介绍各功能点对应的软件界面及其操作,并列出涉及的参数信息和设定说明。该部分帮助用户熟悉操作单元和操作命令。
- 4) 机床调试部分,参考第3章,主要介绍硬件部分,包括安装,驱动器参数设置,机床相关参数设置等。
- 5) 附录部分,参考第4章,包括端子板接线,硬件设备安装尺寸,无线手柄介绍,参数一览,快捷 键一览,驱动器参数,驱动器接线图以及用户安装软件许可声明。

#### 我们的联系方式

您可以通过以下途径来获得我们的技术支持以及售前售后服务:

- 公司名称: 上海维宏电子科技股份有限公司
- 总部地址: 上海市奉贤区沪杭公路 1590 号

邮编: 201400

- 电话: **400-882-9188**
- 传真: 021-33587519
- 邮箱: weihong@weihong.com.cn
- 官网: http://www.weihong.com.cn

## Preface

#### About This Manual

This manual is intended for operators. If it's your first time to use Weihong CNC system, we suggest that you read through this manual. If not, you can search for the information you need through table of contents.

With 4 chapters, this manual can be divided into 5 parts as follows.

- 1) Part 1: The preface, introducing the precautions about transportation and storage, installation, wiring, debugging, usage and so on. You need to read them carefully before operating to ensure safe operations.
- 2) Part 2: The quick start part. Please refer to chapter 1. This chapter gives an introduction to functional characteristics, interfaces and operation flows of NcEditor V12.
- 3) Part 3: The function part. Please refer to chapter 2. This chapter gives an introduction to the interfaces, operations, parameters and settings related to each function. You will gain more knowledge of the operation units and operation commands.
- 4) Part 4: The machining debugging part. Please refer to chapter 2.6.6.This chapter gives an introduction to hardware, including installation, and parameter setting of the driver and the machine tool.
- 5) Part 5: The appendix. Please refer to chapter 4. This chapter includes an introduction about wiring of the terminal board and the wireless handwheel, the parameter list, the hot key list the software license agreement.

#### Contact Us

You can contact us by the following info for technical support and pre-sales / after-sales service:

01400

#### 修订历史记录

修订日期	手册版本	修订内容
2016.06	R5	<ol> <li>1) 增加 4.6 激光器接线图;</li> <li>2) 更新了 4.7.1、4.7.5、4.7.7 的驱动器参数信息。</li> </ol>
2016.04	R4	<ul> <li>3) 增加 2.1.4 炸开功能、2.1.5 桥接功能、2.1.6 微连功能、2.1.7 打断功能、2.1.15 清除功能;</li> <li>4) 更新了 2.2.2 引刀线功能、2.2.5 倒角功能、增加了 2.2.6 释放角功能;</li> <li>5) 更新了 2.6.6 系统与注册信息,增加了 APP 注册内容;</li> <li>6) 增加 3.1.3 基础环境包、3.1.4 软件安装步骤、3.1.7 更新驱动、3.1.8 卸载 NcEditor;</li> <li>7) 端子板安装尺寸图、手柄面贴以及报警信息更新;</li> <li>8) 增加了非金属标定等参数;</li> <li>9) 其他修改。</li> </ul>
2016.01	R3	<ol> <li>增加 2.1.1 多样化选择功能、2.1.14 阵列功能;</li> <li>增加 2.2.4 冷却点、2.2.5 倒角功能;</li> <li>端口信息以及参数信息更新;</li> <li>其他修改。</li> </ol>

#### 通过下表,您可以快速查询到本说明书各个版本的修订记录。

#### 注意事项

注意事项根据不遵守可能会造成危害的程度,分为注意和警告类型。



· 一般类型信息,包括但不限于补充说明、使用限制等提示性信息。如果不遵 守此类信息,可能会无法正常使用某功能。注意某些情况下不遵守此类信息也会造成人身伤害或机器损坏。



#### **Revision History**

Date	Edition	Revision
2016.06	DE	1) Section 4.6 Wiring Diagrams of Laser Devices added;
2010.00	КJ	2) Section 4.7.1, 4.7.5, and 4.7.7 updated.
		3) Section 2.1.4 Explosion, 2.1.5 Bridge, 2.1.6 Micro Joint, 2.1.7
		Break, and 2.1.15 Clear added;
		4) Section 2.2.2 Lead-in/out Line Setting, 2.2.5 Chamfer update, and
		2.2.6 Release Angle added;
		5) Section 2.6.6 System Info and Registration updated;
2016.05	P/	6) Section 3.1.3 Installation of Basic Environment Package, 3.1.4
2010.05	K4	Setup of NcEditor, 3.1.7 Update Device Driver and 3.1.8
		Uninstallation of NcEditor;
		7) Mounting dimension of terminal board, surface paste of handwheel,
		alarms updated;
		8) Parameters such as Nonmetal Sampling added;
		9) Other revisions.
		1) Section 2.1.1 Different Ways to Select Graphs and 2.1.14 Array
		added;
2016.01	R3	2) Section 2.2.4 Cooling Point and 2.2.5 Chamfer added;
		3) Port info and parameter info updated;
		4) Other revisions.

You can refer to the following table for the revision records of each edition.

#### Precautions

Precautions can be divided into caution and warning according to the degree of possible loss or injury in case of negligence or omission of precautions stipulated in this manual.

### CAUTION

: general info, mainly for informing, such as supplementary instructions and conditions to enable a function. In case of negligence or omission of this kind of precautions, you may not activate a function. Note that in some circumstances, negligence or omission of this kind of precautions could cause physical injury or machine damage.



: warning info requiring special attention. In case of negligence or omission of this kind of precautions, you may suffer physical injury, or even death, machine damage or other losses.



#### 1) Precautions Related to Storage and Transportation

The products should be transported properly in terms of the weight;

### ▲ 警告

- ▶ 堆放产品不可超过规定数量;
- ▶ 不可在产品上攀爬或站立,也不可在上面放置重物;
- ▶ 不可用与产品相连的电缆或器件对产品进行拖动或搬运;
- ▶ 储存和运输时应注意防潮。

#### 2) 安装相关事项

- ▶ 该装置必须安装在符合设计要求的电柜中才可使用,电柜的结构必须达到 IP54 防护等级;
- ▶ 在电柜门等接缝处应贴密封条,密封所有缝隙;
- ▶ 电缆入口应密封,在现场应容易再打开;
- > 采用风扇或热交换器等对电柜散热,对流空气;
- ▶ 若采用风扇散热,在进风或出风口必须使用空气过滤网;
- 灰尘或切削液可能从微小缝隙和风口进入数控装置,因而需注意通风孔侧的环境和空气流向,流 出气体应该朝向污染源;
- ▶ 在数控装置的背面与电柜壁之间留有 100mm 的间隙,以便插接与数控装置相连的电缆,便于电柜内空气流通和散热;
- ▶ 本产品与其他设备之间必须按规定留出间隙;
- 产品安装必须牢固,无振动。安装时,不可对产品进行抛掷或敲击,不能对产品有任何撞击或负载;
- ▶ 减少电磁干扰,使用 50V 以上直流或交流供电的部件,电缆应与数控装置保留 100mm 以上的距离;
- ▶ 应考虑将数控装置安装在易于调试维修的地方。

#### 3) 接线相关事项

- ▶ 参加接线与检查的人员,必须具有完成此项工作的能力;
- ▶ 数控装置必须可靠接地,接地电阻应小于4欧姆。切勿使用中性线代替地线。否则可能会因受干扰而不能正常地工作;
- ▶ 接线必须正确、牢固,否则可能产生误动作;
- ▶ 任何一个接线插头上的电压值和正负(+/-)极性,必须符合说明书的规定,否则可能发生短路或设备永久性损坏等故障;

#### WARNING

- > An excess of specified quantity of stacking products is prohibited;
- > Climbing, standing or placing heavy loads on the products is prohibited;
- > Dragging or carrying the products via cables or devices connected to them is prohibited;
- > Protect products from moisture when saving and transporting them.

#### 2) Precautions Related to Installation

- Only when this equipment installed in the qualified electricity cabinet can it be used. The construction of the cabinet must reach IP54 grade of protection;
- > Paste sealing strips on the joint of the cabinet to seal all the cracks;
- Cable entry should be sealed while easy-to-open on the spot;
- A fan or heat exchanger should be adopted for the heat dissipation and air convection of the cabinet;
- If a fan is adopted, air strainer is a must in air inlet or air outlet;
- Dust or cutting fluids may have access to the CNC device via the tiny cracks and tuyere. Therefore it is necessary to pay attention to the surroundings and air flow direction of the air vent to make sure that the outflow gas is towards pollution source;
- 100 mm space should be preserved between the back of the CNC device and the cabinet wall for plugging cable connected with the device and the ventilation & heat dissipation in the cabinet;
- Space between this device and other equipment should also be preserved according to the requirements;
- The product should be installed firmly and without vibration. During installing, casting, knocking, striking, or loading on the product is forbidden;
- To reduce electromagnetic interference, power-supply components used should be above AC or DC 50V and the space between cable and CNC device should be preserved above 100mm;
- > It will be better if CNC device is installed at a position facilitating debugging and maintenance.

#### 3) Precautions Related to Wiring

- > Only qualified people are allowed to participate in the wiring and checking;
- The CNC device should be grounded reliably and grounding resistance should be less than 4 ohm. Neutral line is absolutely not allowed to replace earth wire. Otherwise, it may result in malfunction of the device due to the interference;
- > Wiring should be firm and steady, or maloperation may occur;
- Voltage values and positive & negative polarity of any connection plug should be in accordance with specifications set forth in the manual, or it may result in breakdowns such as short circuit and permanent damage to the device;



- ▶ 在插拔插头或拨动开关前,手指应保持干燥,以防触电或损坏数控装置;
- ▶ 连接电线不能有破损,不能受挤压,否则可能发生漏电或短路;
- ▶ 不能带电插拔插头或打开数控装置机箱。

#### 4) 运行与调试注意事项

- ▶ 运行前,应先检查参数设置是否正确。错误设定会使机器发生意外动作;
- 参数的修改必须在参数设置允许的范围内,超过允许的范围可能会导致运转不稳定及损坏机器的 故障。

#### 5) 使用注意事项

- ▶ 插入电源前,确保开关在断电的位置上,避免偶然起动;
- > 为避免或减少电磁干扰对数控装置的影响,进行电气设计时,请确定电磁兼容性。系统附近如有 其他电子设备,则可能产生电磁干扰,应接入一个低通滤波器以削弱其影响;
- ▶ 不可对系统频繁通、断电。停电或断电后,若需重新通电,推荐的间隔时间至少为1分钟。

### ۇ注意

#### 1) 产品及手册相关事项

- "限制事项"及"能够使用的功能"等相关记载事项,由机床制造商发行的手册优先于本手册的内容;
- ▶ 本手册在编写时,假定所有选配功能均已附加。使用时请通过机床制造商发行的规格书加以确认;
- ▶ 各类机床的相关说明,请参阅由机床制造商发行的手册;
- ▶ 能够使用的画面及功能,因控制系统(或版本)而异。在使用前,请务必对规格加以确认。

#### 2) 开箱检查相关事项

- ▶ 确认是否是您所购买的产品;
- ▶ 检查产品在运输途中是否有损坏;
- > 对照清单,确认各部件、附件是否齐全,有无损伤;
- ▶ 如存在产品不符、缺少附件或运输损坏等情况,请及时与我公司联系。

#### WARNING

- To guard against electric shock or CNC device damage, fingers should keep dry before plugging or touching switch;
- The connecting wire should not be damaged and squeezed, or the leakage or short circuit may occur;
- > It is prohibited to plug or open the chassis of CNC device when power on.
- 4) Precautions Related to Running & Debugging
- Parameters setting should be checked before running, since wrong setting may lead to accidental movements;
- Modification to parameters should be within the allowable range, or such breakdowns as unsteady running and machine damage will occur.
- 5) Precautions in Use
- > Before power-on, please make sure that the switch is on blackout to avoid occasional start-up;
- Please check the electromagnetic compatibility during electrical design in order to avoid or reduce electromagnetic interference to the CNC device. A low pass filter should be employed to reduce electromagnetic interference if there are other electrical devices nearby;
- It is not allowed to frequently power on and power off. It is recommended to power up the machine again at least one (1) minute later after power failure or blackout.

#### 

#### 1) Precautions Related to Product and Manual

- Matters related to restrictions and functions available stipulated in the manuals issued by the machine manufacturer are prior to those in this manual;
- This manual assumes all the optional functions are available, which you must confirm through manuals issued by the machine manufacturer;
- Please refer to manuals issued by the machine manufacturer for the instructions of machine tools;
- Functions, and software interfaces vary with the system and the version of software. Before using the system, you must confirm the specifications.
- 2) Precautions When Opening the Package
- Please make sure that the products are what you have ordered;
- > Check if the products are damaged in transit;
- > Check if the components and accessories are damaged or missing in terms of the detailed list;
- Please contact us promptly if product discrepancy, accessory missing or transit damage occurs.

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# 1 快速上手

本章包括 NcEditor V12 功能特点描述,软件界面概览以及简要操作流程介绍。对于初次使用的用户, 建议详细阅读本章,从而对本系统有初步的认识,了解界面以便加工操作。对于熟悉该产品的使用者,可 跳过本章,直接通过目录获取其需要的内容。

### 1.1 功能特性

- O 设计主要面向二维切割,编辑二维图形,生成二维的加工对象数据;
- O 支持多种格式文件,包括g代码格式,nc格式,dxf格式,plt格式,eng格式等;
- O 导入图形时可进行自动优化,包括删除重复边,合并,删除小图形(点、小圆、小曲线)等;
- O 提供多种脉冲调制信号,可搭配不同激光器并根据切割速度动态调整占空比;
- O 支持图层功能,提供带膜切割、回旋过切、定高切割等多种工艺设置;
- 支持直接穿孔、渐进穿孔、分段穿孔、三级穿孔、预穿孔等多种穿孔方式,支持对穿孔过程和切割过程设置单独的激光功率、激光频率、气体类型、气压等;
- O 支持材料库功能,允许将全部工艺参数保存以供相同材料再次使用;
- O 支持自动及手动设置加工顺序功能;
- O 支持蛙跳功能, 摒弃传统矩形而采用抛物线形来控制切割轮廓之间的运动;
- O 支持速度功率调节功能,采用图形编辑方式,设置不同速度下的功率;
- O 自主研发随动控制功能,无缝整合于 NcEditor V12 激光切割系统;
- O 支持金属与非金属标定功能;
- O 支持无线手柄的远程控制, 直视无障碍传输距离为 60 米;
- O 新增扫描切割功能,支持对矩形和圆形的矩形阵列进行扫描切割。

# 1 Quick Start

This chapter gives a summary of functional characteristics of NcEditor V12, layout of the software interface and basic operational procedures. If you use the system for the first time, it is recommended to go over this chapter in details in order to obtain a primary knowledge of the system and get familiar with operations in real machining. If you have known the system well, it is recommended for you to skip this chapter and locate the target content.

### **1.1 Functional Characteristics**

- Designed for planar cutting, planar pictures editing and planar machining objects data generation;
- Various file formats are supported, including G-code file, NC file, DXF file, PLT file, ENG file, etc.;
- Supporting automatic optimization in loading objects, including deleting overlap, dots, mini curves and so on;
- Providing kinds of pulse modulation signals to mate with different laser machine and to adjust duty ratio according to cutting speed;
- Supporting layer function and providing cutting with film, corner loop, cutting at fixed height and so on;
- Supporting various piercing methods such as direct pierce, incremental pierce, segmented pierce, three segment pierce and pre-pierce; besides, you can set laser power, frequency, gas type and pressure separately in piercing and cutting;
- Supporting library function, and allowing all the technical parameters to be saved for next use on the same material;
- O Supporting set the machining sequence both automatically and manually;
- Supporting frog leap function, which controls the motion between objects by parabolic type instead of the classic rectangle type;
- Supporting speed power adjustment and adopting graphic method to set the power of different speeds;
- Developing follow-up function independently and integrating it into the NcEditor V12 laser cutting CNC system;
- Supporting function of marking metal and nonmetal;
- Supporting remote control of wireless handwheel whose direct-vision transmission free of barrier reaches 60 meter;
- **O** Scan cutting function newly added, supporting line scan and arc scan.

### 1.2 配置选择

NcEditor V12 软件提供单 Y 和双 Y 两种配置。

软件打开后默认配置为双Y配置。点击【机床】菜单下【配置】子菜单项,可进行配置选择。若无特别说明,本手册所有截图以及参数皆以双Y配置为主。

### 1.3 界面介绍

#### 1.3.1 用户界面



图 1-1 软件界面示意图

如上所示,软件界面从上至下依次为标题栏,菜单栏,工具栏,标尺,对象编辑区域和状态栏。界面 正中央白底部分为对象编辑区域,即对应的工作台行程范围,加工中加工对象须在该范围内。对象编辑区 域左侧为绘图工具栏,右侧为机床控制栏。该区域中的两个悬浮窗口为运行报告栏和错误警报栏。

**绘图工具栏:**包括视图变换区,绘图工具(点、直线、圆等),图形编辑区(阵列、测量距离等),工 艺设置区(图层、巡边、一键设置等),其中部分功能与【对象】菜单下的子菜单项相对应。

运行报告栏:显示运行加工对象的当前时间和总时间,系统当前状态以及当前加工速度和加工图层。

### **1.2 Configuration Selection**

NcEditor V12 offers two types of configurations, namely single Y axis and double Y axes configuration.

Double Y axes configuration is the default one. Click sub-menu item "Config" under "Mach" menu to switch between two configurations. Unless otherwise specified, all screenshots and parameters mentioned in this manual are under double Y axes configuration.

### **1.3 Software Interface**



#### **1.3.1 Holistic Interface**

Fig. 1-1 Example of Holistic Interface

As shown above, holistic interface of the software is divided into title bar, menu bar, toolbar, scale, object editing area as well as status bar, from upper part to lower part. Center part with white background is the object editing area, corresponding to worktable travel range, within which the objects to be machined should be. Left side of the object editing area is drawing toolbar, and the right side is machine control bar. Besides, two mini-windows which can be folded hangs over the area.

**Drawing Toolbar:** it includes view adjustment tools, tools for drawing (dot, line, circle, etc), object editing tools (array, distance measurement), and technic setting tools (layer, frame check, one-click setting, etc). You can find the counterparts of some functions under "Object" menu.

**Report Bar:** it shows current object machining time and total running time of the software, as well as current status and currently active feedrate and layer of the system.

状态栏:显示当前正在绘制图形信息等,如提示绘制图形操作的步骤及意义、当前操作成功与否等。

错误警报栏:点击"错误警报"字 样弹出报警提示信息如右所示,点击右上 角的下拉图标可选择查看报警类型。报警 信息框内显示报警名称、产生原因和解决 方法,用户可按照提示查找产生原因,并 根据相应的解决方法消除报警状态。

无线手柄连接异常		⇒ ×
无线手柄连接异常		限位报警
产生原因: 1.没有连接无线手柄信号接收器。		伺服报警 紧停端口报警 切割头异常报警 碰板报警
2. USD按口00焊。 3. 无线手柄信号接收器故障。	<ul> <li>Image: A start of the start of</li></ul>	无线手柄连接异常
解决方法: 1.连接无线手柄的信号接收器。 2.换一个好的USB接口。		无线手柄驱动冲突 端子板/EX30A连接异常 未进行双Y原点检则 随动仪未标定
3. 与厂商联系更换无线手柄信号接收器。		红色大字显示报警(P)

机床控制栏:包括坐标显示区、手动设置区、运行加工区、工艺控制区共四个区域。点击界面右上角 的【机床控制栏】按钮或者【机床】菜单下的【机床控制栏】子菜单可选择显示或隐藏机床控制栏。

▶ 坐标显示区

如右所示,显示当前各轴的工件坐标 或者 机械坐标,可通过 鼠标点击右侧小下拉标警或者双击坐标字样切换两者。

轴	工件坐标
х	0.000
Y	0.000
z	1.000

手动设置区  $\triangleright$ 



进给倍率条:通过调整当前进给倍率来控制进给速率。 计算公式为:当前进给速率=当前进给倍率\*额定进给值 调整进给倍率方法:用户可鼠标点击倍率标尺;也可点 标尺上的滑块进行拖曳操作;还可在点击进给倍率滑块 后敲击PageUp,PageDown。

包括连续、高速和增量步进,可通过鼠标单击该按钮进行模 ▶式切换。鼠标双击该按钮对数值进行更改。在连续点动方式 下,可通过小键盘上的数字0切换手动连续的高低速。

**Status Bar:** it shows information of currently being editing object, such as tips for drawing steps and effect, result of the ongoing operations, etc.

**Error & Alarm Bar:** Clicking "Warnings" will open a new window containing detailed alarm information, as shown in the figure on the right side. Alarm types can be known by clicking the drop-down icon upper right. Alarm information includes alarm titles, causes and solutions. You can find the causes and eliminate the alarm with the solutions.

WHB05S connection broken	⇒ x
Connection error of wireless handwheel	Limit
Cause: 1. Signal receiver of wireless handwheel is not 2. USB interface failure. 2. Signal receiver of wireless handwheel failur	Servo Estop alarm Cutting head alarm Touch part alarm WHBOSS connection broken
<ol> <li>Signal receiver of wireless handwheel handwheel</li> <li>Connect to signal receiver of wireless handwheel</li> <li>Change to a normal USB interface.</li> </ol>	WHB05S connection conflict Connecting/EX30A broken 2YDetection alarm Follow-up unmarked
<ol> <li>Contact with the manufacturer to change the handwheel.</li> </ol>	Post as Big Font

**Machine Control Bar:** it includes coordinate displaying area, manual setting area, machining operation area and process control area. You can make the machine control bar appear or disappear by clicking "MachController" button on the upper-right side or sub-menu item "Machine Control Bar" under "Mach" menu.

Coordinate displaying area

As shown right, workpiece coordinates (<u>WorkCoor</u>) or machine coordinates (<u>MachCoor</u>) of the active axis will be displayed in this area, which can be switched by clicking pull-down icon or double clicking the text.

Axes	WorkCoor
х	0.000
Y	0.000
z	1.000

Manual setting area



▶ 运行加工区



▶ 工艺控制区



按下激光按钮,系统将打开激光阀,松开该按钮则自动关闭激光闸。开始加工时,系统 会自动开启激光阀。



按下吹气按钮,系统将打开吹气阀。开始加工时,系统会自动开启吹气阀。



按下随动按钮,系统将打开随动阀。实时调整喷嘴和工件表面的距离以保持在一个固定 值上。开始加工时,系统会自动开启随动阀。



按下点射按钮,系统将打开激光阀,持续设定的点射时间后自动关闭端口。



按下光闸按钮,系统将打开光闸开关。必须先将光闸打开,再打开激光阀才会有激光出 来。须手动打开。



按下红光按钮,系统将打开红光开关。红光属于引导光,指示激光所打在板材的位置,须手动打开。

Machining operation area



Process control area



Laser button. With this button pressed, laser valve will be opened. Undo it, laser valve is turned off. The system will automatically turn on laser valve the moment machining begins.



Blow button. With this button pressed, blower valve will be opened. The system will automatically turn on blower valve the moment machining begins.



Follow button. With this button pressed, follow-up system will be activated, in order to instantly adjust the distance between laser nose and workpiece surface, maintaining the distance to a fixed value. The system will automatically turn on follow-up system valve the moment machining begins.



Burst button. With this button pressed, laser valve will be turned on and keep on for setting burst time before being turned off automatically.



Laser gate button. With this button pressed, laser gate switch will be turned on. The laser beam can be ejected out when laser valve is turned on based on condition that the laser gate switch has been turned on already. Note that the button should be manually enabled.



Lead light button. With the button pressed, red light switch will be turned on. Red light is a type of guiding light, which indicates the plate position. Note that the button should be manually enabled.

#### 1.3.2 菜单一览

文件	编辑	视图	绘图	对象	机床	帮助	
新建	撤销	视图平移	点	平移	机床控制栏	语言	
打开	重做	实时缩放	线段	旋转	系统参数	日志	
导入文件	全选	窗选放大	圆	对齐 ▶	端口设置	快捷键说明	
插入文件	反选	调整至最 适大小	圆弧	组合	统计信息	用户手册	
排版	取消选择	显示次序	椭圆	解散组合	循环加工信息	每日提示	
保存	选择不封闭图 形	显示起点	椭圆弧	合并	随动控制	维宏简介	
另存为	选择小图形	显示方向	矩形	炸开	配置 ▶	关于	
保存选中图形	按图层选择 ▶	显示引刀线	多义线	桥接	回机械原点▶		
最近打开的 NCE文件 ▶	按类型选择 ▶	轨迹显示 ▶	正多边形	1」町	回工件原点		
制作参数备	按嵌套关系 选择	清除轨迹	星形	自动设置	回固定点		
制作参数备份	选择相似图	显示当前点	文字	加工顺序 手动设置	标记点		
重启软件	删除	居中当前点	图库	加工顺序 ▶	巡边定位		
关闭系统	剪切	线框模式		测量距离	设置工件 原点		
重启系统	复制	普通绘图模式		图形预处理	开始		
显示桌面	粘贴	设置原点		刪除重复访	暂停		
退出	粘贴为组			删除小图形	停止		
	清除剪贴板			曲线光滑	加工选中 图形 ▶		
				改变加工方向	断点继续		
				设置加工方向	从邻近点开始		
				文字转换	仿真		
				成图形 引刀线起点	空运行		
				冷却点	走边框		
				扫描 ▶	视教编程		
				阳切	模拟量调节		
				阴切 白动沿置	丝杠误差 补偿向导		
				阴阳切	润滑		
				设置引刀线	显示功率		
				设置相贯线			
				设置割缝补偿			
				19月 			
				清除 ▶			
				捕捉			
				捕捉选项			
				极轴增量角			
				图层设置			
				圆管切割			
				一键设置			

Start for Near Point

Simulation

Dry Run Frame Check

Teaching

Screw-Err Compensation Guide

Lubricate

Show Power

►

Analog Ajust

**Reverse Direction** 

Set Direction Translate Text to Poylines

Start Cut Point

Stop Corner

Auto Set Fill

Chamfer Clear

Catch

Catch Options Polar IncAngle<30° >

Layer Parameters Pipe Cutting Instant Setting

Set Lead-in/out line Set Intersecting Line Set Kerf Comp

Scan

Fill

Unfill

#### 1.3.2 Overview of Menu

File	Edit	View	Draw	Object	Mach	Help
New	Undo	Pan	Dot	Translate	Machine Control Bar	Language
Open	Redo	Zoom	Line	Rotate	System	Log
Import File	Select All	Zoom by Rect	Circle	Align 🕨	Parameters Ports Setting	Shortcut Key Info
insert File	Select Invert	Fit to Window	Arc	Group	Show Statistics	User Manual
Nest	Clear Selected	Show Order	Ellipse	Break Group	Cyclical	Daily Tips
Save	Select Unclose	Show Start Point	EllipseArc	Combine	Follow Control	Weihong Introduction
Save As	Select Tiny	Show Direction	Rectangle	Explode	Configs 🕨	About NcEditor
Save Selected Objects As	Select By Color	Show Lead-in/out Line	Polyline	Add Bridge	Go Home	t
Recent Nce	Select By Type	Track	Polygon	Break	BackToWorkOrg	
Make Param	Outer	Clear Track	Star	Micro Joint	BackToFixedPoint	
Make Param	Select Similar	Show Current Point	Gallony	Auto Set Machining Order	Mark Position	
Backup	Delete	Middle Current Point	Gallery	Manual Set	WCS Adjust	
Resian Sonware	Cut	Wireframe		Shape Check		
Shutdown System	Conv	Ordinary Mode			Start	
Reboot System	Сору	Set Origin		Shapo Pro	Pauso	
Show Desktop	Paste			processing	Stop	
Exit	Paste as Group			Clip Overlaps	Stop Start for	
	Clear Clipboard			Delete Shorties	Selection	
				Smooth Curve	Resume	

### 1.4 操作流程



#### 1.4.1 回机械原点

回机械原点前需先设置轴方向、脉冲当量和粗定位方向,详情参见 3.4 节。

打开软件,系统默认弹出每日提示对话框(具体见第 2.6.5 节)。用户关闭提示对话框后,系统弹出对话框提示回机械原点操作,如下图 1-2 所示。

回机械原点	×
<u>.</u>	为了防止在加工过程中因意外情况,如断电,造成当前位置不准确。 请在程序启动或者发生紧停之后重新执行回机械原点。 注意:回机械原点前,请先抬起切割头!
	使用下列三种方法之一回机械原点:
	按左面按钮,则两个轴以X,Y的次序全部回机 械原点。
	直接设定 直接设定操作。你必须确保在此之前: ① · 机床没有关闭过 · 机床没有"紧停"发生过
	X轴(X) 按左列按钮,则对应轴回机械原点。
	Y抽() Z轴(Z)
注意: 使	用F2可以在不关闭对话框的情况下立刻停止运动!
☑ 软件启	动后自动弹出此对话框 关闭(C)

图 1-2 回机械原点对话框

### **1.4 Operation Procedure**



#### **1.4.1** Returning to the Machine Origin (Homing)

Axis direction, pulse equivalent and coarse positioning direction should be well set at first before returning axes to the machine origin. See section 3.4 for details.

The moment the software is started, dialog box of daily tips will pop out first by default (see section 2.6.5). After you close the tips, another dialog box as shown in Fig. 1-2 will pop up, prompting returning to the machine origin.

Go Home	In order to avoid position inaccuracy caused by accidents in machining, like power failure. Please go home after start-up or E-stop. Note: Before homing, please raise the cutting head. Use one of the 3 following methods to go home:
	All Axes
	Execute this function after ensuring the correctness of current machine coordinates, like:           Set Directly         • The machines is not powered off;           • No E-stop occurred.
	X Axis     Push the left buttons, then corresponding axis moves back to the mechanical reference points.       Y Axis     Z Axis
Note: You	can push F2 to stop go home!
This dia	alog pops up automatically when the software is started.

Fig. 1-2 "Go Home" Dialog Box

勾选【软件启动后自动弹出此对话框】即可在每次打开软件后自动弹出,否则需手动打开。点击【机 床】菜单下的【回机械原点】子菜单项,选择【回机械原点设置】将弹出如上所示对话框。

回机械原点包括全部回,直接设定和单轴回(X轴回、Y轴回、Z轴回)。选择全部轴回或单轴回时,系统将弹出对话框提示是否确认回机械原点。

确认回机械原点成功后,相应的轴前面出现机械原点标志

用户在保证当前位置的机械坐标与机床实际的机械坐标一致时,例如:机床未关闭过、未发生紧停等 异常情况,可点击【直接设定】按钮,直接设定当前机械坐标为准确的机械坐标。当完成该操作后,机床 控制栏上的轴前面也将出现回机械原点操作完成标识符



回机械原点的必要性:回机械原点之后方可使用软限位启用、设定固定点等功能。

#### 1.4.2 导入和绘制图形

◆ 加载文件

用户可选择【文件】菜单下的【打开】、【导入文件】、【插入文件】从本地加载刀路文件。

【打开】: 用于打开本系统软件生成的 nce 格式文件;

【导入文件】:用于打开系统支持的所有格式文件,例如.g、.nc、.dxf、.eng、.plt 格式文件。导入文件后,系统自动将该文件另存为.nce 格式并放置桌面的"NceFiles"文件夹内,若无此文件夹系统将自行创建。

【插入文件】: 用于打开系统支持的所有格式文件,例如.nce、.g、.nc、.dxf、.eng、.plt 格式文件。 该功能是在打开一个文件的基础上添加新的所支持格式的加工对象,而不会覆盖之前的文件。

此外,用户可选择【文件】菜单下的【最近打开的 nce 文件】子菜单项直接调出最近打开的 nce 格式 文件,共支持 9 组。

#### ◆ 绘制图形

用户可选择【绘图】菜单项下的子菜单项进行绘图,或直接点击绘图工具栏上对应的图标操作。

is checked, the dialog box will

When item

This dialog pops up automatically when the software is started.

automatically pop up the moment the software is started; otherwise, you need to click sub-menu item "Go Home  $\rightarrow$  Go home settting" under "Mach" menu to open this dialog box.

Go home consists of "set directly" and "single axis going home" (including X axis, Y axis and Z axis). When " all axes" and "single axis going home" are clicked, the system will eject a dialog box to confirm whether to go home.

When going home is confirmed, the mark 🗊 will appear before corresponding axes.

If you can ensure that the machine coordinate of the current position is same as the actual machine coordinate of the machine tool, i.e., the machine tool has not been turned off and abnormal situations such as E-stop has not happened, you can set current machine coordinates as correct and accurate by

clicking "Set Directly". When this operation is completed, the homing mark "Set" appears before corresponding axes in machine control bar.

# **CAUTION**

Only after homing can the following functions be enabled, like software limit, set fixed point, and tool change.

#### 1.4.2 Import and Draw Object

#### ♦ Load Files

You can load a tool path program file from the local into the software by clicking sub-menu "Open", "Import" or "Insert file" under "File" menu.

**Open:** open NCE format program files which have been generated by NcEditor;

**Import file:** open program files of all formats, e.g.: G-code file, NC file, DXF file, ENG file and PLT file, etc. After the file is imported, it will be automatically saved as .nce format file in folder "NceFiles" on the desktop. The folder will be automatically created if there is no such folder.

**Insert file:** open program files of all formats, e.g.: G-code file, NCE file, NC file, DXF file, ENG file and PLT file, etc. The function is used to add a new machining object with supported format on condition that a file has already been opened, without covering the previous one.

In addition, you can select sub-menu item "Recent Nce Files" under "File" menu to directly call up to 9 groups of NCE files which has been loaded recently.

#### Draw

You can select sub-menu items under "Draw" menu or directly click corresponding tool icons on the drawing toolbar to draw specific shapes.
▶ 操作步骤

1) 选择绘制类型,工具栏上自动显示图形属性(高度、宽度、角度、位置等)。

2) 左击鼠标开始绘图,然后根据状态栏上的提示进行操作。绘图过程中单击右键表示放弃当前绘图操作。

▶ 图库

此外,系统配有图库功能,保存了几十种用户常用的加工图形,用户可选择需要的图形,然后对该图 形设置相关参数后加入到加工文件中。用户可选择【文件】菜单下的【图库】子菜单项,或者点击绘图工

具栏上的 🔽 图库 操作。

◆ 保存文件

绘制图形或调用图库后,须先保存文件。用户亦可选择【文件】菜单下的【保存】、【另存为】、【保存 选中图形】进行操作。其中【保存选中图形】是指在含有多个加工对象的文件中,选取部分对象作为独立 的一个文件保存。



- 1) 对于已损坏的刀路文件,强制打开将出现"文件读写错误"的警告框。
- 在绘制多义线时,可点击鼠标右键选择多义线类型——直线段或相切弧。
   绘图结束后,点击鼠标右键,选择绘图结束类型(包括确定、取消、闭合), 如右图所示。

	确定
	取消
$\checkmark$	直线段
	相切弧
	闭合

 在绘制文字图形时,在文字框中输入文字。若需换行,按Ctrl+Enter组合 键换行;按Enter键完成文字绘制。

### 1.4.3 检查与编辑图形

该步骤主要涉及【对象】菜单中上半部分子菜单以及绘图工具栏第三部分图形编辑栏的操作,包括阵列与镜像,图形检测,图形预处理,组合与解散组合,设置加工顺序与加工方向,文字转换为图形等等。 具体见第 2.1 节。

#### 1.4.4 工艺设置

该步骤主要涉及【对象】菜单中下半部分子菜单以及绘图工具栏第四部分工艺设置栏的操作,包括图 层设置,引刀线设置,割缝补偿等。具体参见第 2.2 节。

- Operation steps:
  - 1) Select a drawing type, and object information including height, width, angle, position and so on will be displayed automatically on the toolbar;
  - 2) Left lick the mouse to begin drawing and operate as per the prompt on status bar. In drawing, a right click on mouse indicates canceling current drawing.
- ➢ Gallery

Besides, the system is equipped with gallery function. With tens of commonly used machining objects preset, you can select the need one, set related parameters and load it into machining file. You can

either choose "Gallery" submenu under "Draw" menu or directly click "<sup>1</sup> on the drawing toolbar for operation.

#### Save

After drawing objects or calling gallery, you need to save file by choosing "Save", "Save as" and "Save selected objects as" before next step. And "Save selected objects as" refers to selecting some objects and saving it as an independent file in a file containing multi-objects.

# CAUTION

- 1) Force opening the tool path files that has been damaged will eject prompt box to alarm;
- 2) During drawing, the user can right click to select the type of polyline, i.e. line or tangent arc. After drawing finishes, right click to select the type to finish drawing, as shown on the right side.
- During inputting, Ctrl + Enter can be used to make a line break. Press "Enter" to finish inputting.

	Confirm Cancel
✓	Line Tangent Arc
	Close

## 1.4.3 Check and Edit Object

This step mainly involves the operation of the sub-menus on the upper half of "Object" menu and the object editing area on the drawing toolbar, including array and mirror, shape check, shape pre-processing, group and break group, set machining order and direction, translate txt to polylines and so on. For more details, see section 2.1.

## 1.4.4 Technic Setting

This step mainly involves the operation of the sub-menus on the lower half of the "Object" menu and technic setting area on the drawing toolbar, including layer, lead in/out line, kerf compensation and so on. For more details, see section 2.2.

## 1.4.5 确定工件原点

工件坐标系的零点就是工件原点。加工之前,需首先确定工件原点的实际位置。步骤为:

- 1) 手动点击机床控制栏的 X 轴, Y 轴按钮,移动至需设置为原点的位置。
- 2) 点击机床控制栏上的 , 或者选择 【机床】菜单下的【设置工件原点】, 或者直接按下 F5, 可 将当前点设置为工件原点。

此外,系统还提供了将停靠点设置为工件原点的方法。选择绘图工具栏上的上,或者点击【视图】 菜单下的【设置原点】子菜单项,弹出如下图 1-3 对话框。勾选【自动应用停靠点】后,每次加载新加工 文件可直接使用机床操作栏下的【设置工件原点】而不必先选择工件原点,软件已默认选择加工文件的特 征点为工件原点。

设置坐标原点		×
停靠点		
◎ 左上	◎ 中上	◎ 右上
◎ 左中	◎ 中心	◎ 右中
<ul> <li>● 左下</li> </ul>	◎ 中下	◎ 右下
🔲 自动应用停靠点		
■ 鼠标拾取(M)	<b></b>	航空 取消 しんしょう 取消 しんしょう しょうしょう しょうしょう しょうしょう しょうしょう しんしょう しょう しんしょう しょ しょう しんしょ しょ しんしょ しん

图 1-3 设置坐标原点

用户还可使用【鼠标拾取】,该方式拾取工件坐标原点,软件自动加入捕捉支持功能,以便用户可精 确定位到想要的工件原点。

## 1.4.6 仿真模拟

#### ◆ 走边框

点击机床控制栏上的 按钮,或者选择【机床】菜单下的【走边框】子菜单项,或者直接按下 F7,系统将沿着加工文件外接矩形框走一圈,确定加工范围。走边框时,按钮呈绿色高显。

## 1.4.5 Set Workpiece Origin

Workpiece origin refers to the zero position of workpiece coordinate. Before machining, its actual position should be confirmed. The steps are as follows.

- 1) Manually click X axis or Y axis buttons in machine control bar to move the corresponding axis to the target position;
- 2) Click on the machine control bar or choose "Set WorkOrg" sub-menu under "Mach" menu, or just press F5 directly to set the current position as the workpiece origin.

Besides, the system also supports to set the berth point as workpiece origin. Select **I** on drawing toolbar or choose "Set origin" sub-menu under "View" menu to eject the dialog box as shown in Fig. 1-3. After "Auto apply berth point" is checked, you can directly execute "Set WorkOrg" in machine control bar without selecting workpiece origin first each time a new file is loaded since the system takes the feature point of the object as workpiece origin by default.

Set Origin		x
Berth point		
🔘 Top Left	Top Center	🔘 Top Right
🔘 Left Center	Center	Right Center
Bottom Left	Bottom Center	Bottom Right
Auto apply berth	point	
Set by mouse	ОК	Cancel

Fig. 1-3 Set Workpiece Origin

Also you can click "Set by mouse" to catch the workpiece origin and the system enables the catch support function automatically so that you can locate the position wherever they prefer.

## 1.4.6 Simulation Function

#### • Frame check

You can enable this function by clicking in machine control bar or choosing "Frame check" sub-menu under "Mach" menu, or just press F7 directly and the system will move around along the circumscribed rectangle of machining file to decide the machining range. During the operation, the button is highlighted in green.

仿真

◆ 仿真

如果某个加工程序已经保存,并且当前系统状态为"空闲",点击机床控制栏上按按按钮,或者选择 【机床】菜单下的【仿真】子菜单项,或者直接按下 F8,机床将自动地从加工程序第一段开始执行高速 仿真。仿真状态时,机床控制栏上的仿真按钮呈绿色高显。

仿真模式下,系统不驱动机床做相应的机械电气动作,而仅仅在对象编辑区域中高速显示加工路径。

◆ 空运行



点击机床控制栏上的 按钮,或者选择【机床】菜单下的【空运行】子菜单项,系统将自动进入 空运行。在空运行模式下,运行加工程序与机床实际加工一样,只是端口未打开。空运行时,机床控制栏 上的空运行按钮呈绿色高显。

### 1.4.7 加工控制

◆ 开始加工

点击机床控制栏下的 按钮(如果用户未保存加工文件或存在紧停报警时,该按钮处于不可点击

状态如**上**),或者选择【机床】菜单下的【开始】子菜单项,或者直接点击 **F9**,系统将从加工文件首行 命令自动开始加工。加工时【开始】按钮呈高显绿颜色,表示当前机床处于正加工状态。

此外,如果系统处于暂停状态时,点击开始按钮,系统将从暂停处继续执行自动加工,进入运行状态。

◆ 暂停加工

点击机床控制栏下的 按钮 按钮,或者选择【机床】菜单下的【暂停】子菜单项,或者直接按下 F10, 系统将暂停加工进入暂停状态。此时如要继续执行加工程序只需按下【开始】按钮或者选择相对应的菜单 选项。暂停时该按钮呈高显蓝色,表示当前机床处于暂停状态。

◆ 停止加工

在加工文件时,点击机床控制栏下的 按钮 按钮,或者选择【机床】菜单下的【停止】子菜单项,或 者直接按下 F11,机床将停止加工,然后终止整个加工任务,系统进入空闲状态。这是在加工过程中让系 统正常中断加工程序的方法。

#### Simulate

If a program is loaded and the system is in "Idle" state, after the button

in machine control bar is

Simu

clicked or "Simulate" sub-menu under "Mach" menu is selected or F8 is pressed, the system will start rapid simulation from the first line of program automatically. The button is highlighted in green in simulation.

In simulation mode, the system does not drive the machine tool to do mechanical and electrical movement, but machining path will be shown in object editing area at high speed.

Dry run

Click the button

DryRun

IN machine control bar, or select "Dry run" sub-menu under "Mach" menu, the

system entering dry run mode automatically. In dry run mode, except for not cutting workpiece, the machine tool will start working as in actual machining under the running of a machining program. The button is highlighted in green in dry run mode.

## 1.4.7 In-process Control

#### Start

Clicking the button **I** in machine control bar( it is disabled as **I** if machining files are not saved

or Estop alarm exists), or selecting "Start" sub-menu under "Mach" menu, or just pressing F9 directly, the system begins machining automatically from the first line of the machining files, During machining, the start button is highlighted in green indicating the running state of the machine.

If the system is in pause state, clicking the button will make the system resume machining from the suspended position automatically and enter into "Running" state.

#### Pause

Clicking the button in machine control bar, or selecting "Pause" sub-menu under "Mach" menu, or just pressing F10 directly, the system suspends the machining and enters into pause status. So as to continue machining, press "Start" button or select the relative menu item. When the button is highlighted in blue, it means the machine tool is in pausing state.

#### Stop

It is available for a program being machined. Clicking the button **LLM** in machine control bar, or selecting "Stop" sub-menu under "Mach" menu, or just pressing F11 directly, the system ends the machining and then enters into idle state. This is the normal way to stop an ongoing machining process.

◆ 断点继续

选择机床控制栏下的链接按钮,或者选择【机床】菜单下的【断点继续】子菜单项,或同时按下 Shift+F9,系统将自动从上次加工停止处继续加工。

如果用户在加工过程中按下【停止】按钮,或者出现断电、紧停等情况,在确定工件坐标准确性的情况下可选择此功能,使机床快速移动到断点处继续加工。如果无法保证工件坐标的准确性,请先进行回机械原点操作后再执行断点继续。



- 1) 参数"加工前是否必须回机械原点"选择为"是",但当前无回机械原点标识,【开始】按钮灰显。
- 2) 本软件系统设计是每隔5秒保存一次加工信息。若加工中在两次保存期间断电了,重新上电后再使用断点继续功能,软件就回到最后一次保存的地方开始加工。反映到路径上就是会回退一段距离再继续加工。
- 3) 若在加工过程中不是断电后使用断点继续,就可以精确找到断点位置继续加工。
- 4) 断电继续功能在修改了图层参数、系统参数后仍可使用。

### 1.4.8 加工信息

加工完成后,用户可查看加工信息。

◆ 统计信息

选择【机床】菜单下的【统计信息】子菜单项,或者直接点击运行报告栏上的运行报告 字样,可查 看加工统计信息,如下图 1-4 所示,可查看加工文件名,穿孔个数,切割长度,空程长度,切割用时,总 体用时,循环加工次数等。

若需对加工工件进行计费,只需勾选需要计费的加工信息,点击下方的【计费】按钮,然后输入穿孔 单价和切割单价后点击【计算】即自动计算总的切割费用。

点击对话框底部的【激光器时间】按钮,可查看当前激光器使用时间。

in

Resume

The system will resume machining from interrupted position automatically if you click the button

machine control bar, or select "Resume" sub-menu under "Mach", or press Shift and F9 simultaneously.

In case of E-stop, power failure, or clicking "Stop" button during machining, the user can press this button to make the machine tool rapidly resume machining from breakpoint if the accuracy of workpiece coordinate is ensured. If the accuracy of workpiece coordinate cannot be ensured, the user needs to home all axes before clicking this button to resume machining.



1) If parameter "Force Homing before Machining" is set as "YES", and there is no homing mark, button 'Start'

is disabled as

- 2) The software saves the machining info once every 5s. If power failure occurs before the software saves the machining info next time, after re-powered, the software will return to the last saved position after this function is used, i.e. the machine tool will retract a little distance before continuing machining.
- 3) If this function is used not after power failure in machining, machining will be continued from the exact breakpoint.
- 4) This function is still valid after modifying layer parameters and system parameters.

## 1.4.8 Machining Information

After machining tasks finish, you are entitled to look over all machining details.

#### Statistics

By clicking sub-menu item "Show Statistics" under "Mach" menu, or directly clicking Report, a dialog

box named "Statistics Information" will pop up, as shown in Fig. 1-4, where you can get such information as program file name, number of holes, cutting length, elapsed cutting time, total machining time, times of cycle machining, etc.

If charging is required, check the box in front of program files and click "Charging" button at the bottom of the dialog box. Cutting cost can be automatically calculated and offered when unit prices of hole perforation and cutting have been inputted.

Usage time of laser device can be checked by clicking "MPTime" button at the bottom of the dialog box.

统计	信息							×
	文件名	穿孔个数	切割长度 <mark>(m)</mark>	空程长度(m)	切割用时	总体用时	循环加工次数	开始时间
	123.nce	e 51	9.457	2.823	00:09:32	00:10:18	仿真	10:35:17 2015-10-10
	123.nce	e 51	9.457	2.823	00:09:32	00:10:18	仿真	10:35:54 2015-10-10
	123.nce	e 51	9.276	2.890	00:09:22	00:10:07	仿真	10:36:39 2015-10-10
	123.nce	e 53	10.046	3.183	00:10:08	00:10:56	仿真	10:37:26 2015-10-10
						8		
	显示全部		反达	"""	计资 激光者	2H1H	(痈)	正し、「「「「」」、「「」」、「「」」、「」「」、「」、「」、「」、「」、「」、「」

图 1-4 统计信息对话框

#### ◆ 循环加工信息

可设定循环加工的次数和间隔时间,以及可显示当前已加工的次数。

选择【机床】菜单下的【循环加工信息】子菜单项,弹出如下图 1-5 对话框:

循环加工信息	X
循环次数: 1	•
循环间隔: 1000	ms
完成次数: 0	清零
☑ 启用 确定	取消 应用(A)

图 1-5 循环加工信息对话框

使用前需先勾选【启用】,激活该功能,使该对话窗口可输入。

"完成次数"可即时显示当前加工次数。当加工完所设定次数后,需手动清零。若加工中没有到达所 设定循环次数,按下暂停或停止键,此时"完成次数"后的数字表示当前实际循环的次数,程序完整执行 一次算一次循环。空运行方式下也可进行循环加工。

Statisti	cs Information							×
	File name	Hole count	Cut len.(m)	G00 len.(m)	Cut time	Total time	Cycle times	Start time
	123.nce	48	7.671	2.383	00:08:00	00:08:27	Simu	14:49:04 2016-01-26
	123.nce	48	7.671	2.383	00:08:00	00:08:27	Simu	14:49:31 2016-01-26
📃 She	ow All	All	Invert C	Delete Cha	rging MPTi	me	0	K Cancel

Fig. 1-4 Statistics Information Dialog Box

#### • Cyclical machining Info

You can set the times, interval of the cycle machine. Besides, the number below shows how many times the cycle machining has been done.

Select the sub-menu "Cyclical Machining" under menu "Mach", and a dialog box as shown in Fig. 1-5 will pop up.

Cyclical Ma	chining		x
Times:	1	•	
Interval:	1000	ms	
Dones:	0	Clear	
🔽 Enable	ОК	Cancel	Apply

Fig. 1-5 Cyclical Machining Info Dialog Box

Only after the "Enable" is checked that the cycle machining function is activated and input to the dialog box is available.

"Dones" shows the current processed times in real time. After "Times" is finished, it needs to be cleared manually. If "Pause" or "Stop" is pressed before "Times" finished, the number behind "Dones" indicates the actual cycle times finished at present. "Cycle times" is counted once after one complete execution of the file. Cycle machining can also be executed in dry run mode.

## 2 功能详解

## 2.1 图形操作

## 2.1.1 多样化选择功能

#### ◆ 选择不封闭图形

选择【编辑】菜单下的【选择不封闭图形】子菜单项,则系统会将刀路文件内所有不封闭的图形选中。

#### ◆ 选择小图形

选择【编辑】菜单下的【选择小图形】子菜单项,弹出选择小图形对话框,如图 2-1 所示,用户只需将所需选择图形的 X、Y 尺寸范围输入,点击确定按钮后,则系统将按照用户的设置选中图形。

选择小图形	×
X尺寸小于	1 mm
Y尺寸小于	1 mm
	确定 取消

图 2-1 选择小图形

#### ◆ 按图层选择

选择【编辑】菜单下的【按图层选择】子菜单 项,按照子菜单项下的选项提示选择对应的图层, 则该图层内的图形将被选中。若该刀路文件在某一 图层上并不存在图形,则该图层不显示,如图 2-2 中未显示图层 5。

图层1
图层2
图层3
图层4
图层6
图层7

图 2-2 按图层选择

#### ◆ 按类型选择

选择【编辑】菜单下的【按类型选择】子菜单 项,按照子菜单项下的选项提示选择相应的类型, 则该刀路文件内的同一类型图形将被选中。选项如 图 2-3 所示:

圆
椭圆
矩形
多义线

图 2-3 按类型选择

# **2 Function Introduction**

## 2.1 Graphic Operation

## 2.1.1 Different Ways to Select Graphs

#### Select Unclose

Click submenu "Select Unclose" under menu "Edit", and you can select all the unclosed graphs in the tool path file.

#### • Select Tiny

Click submenu "Select Tiny" under menu "Edit" and a dialog box as shown Fig. 2-1 will pop up. After entering the ranges of X dimension and Y dimension of graphs and click "OK" in the dialog box, you can select all the graphs in the range.

	X
1	mm
1	mm
OK	Cancel
	1 1 0K

Fig. 2-1 Select Tiny

#### Select by Layer

Click submenu "Select By Layer" under menu "Edit", and then click on a layer, and you can select all the graphs in the layer. If there is no graph on a layer, the layer will not be displayed in the layer list. For example, layer 5 is not displayed, as shown in Fig. 2-2.

Layer 1
Layer 2
Layer 3
Layer 4
Layer 6
Layer 7

Fig. 2-2 Select by Layer

#### • Select by Type

Click submenu "Select By Type" under menu "Edit", and then click on a type, and you can select all the graphs of the type in a tool path file. The type list is as shown in Fig. 2-3

Circle
Ellipse
Rectangle
Polyline

Fig. 2-3 Select by Type

#### ◆ 按嵌套关系选择

里层图形: 被包含的图形;

外层图形:不被包含的图形。

选择【编辑】菜单下的【按嵌套关系选择】子菜 单项,按照子菜单项下的选项提示选择相应的嵌套关 系,则对应的图形将被选中。

里层图形
外层图形

图 2-4 按嵌套关系选择

#### ◆ 选择相似图形

相似图形:类型、尺寸相同,位置、旋转角度可不同。

首先选中一个图形,再选择【编辑】菜单下的【选择相似图形】子菜单项,则该刀路文件内与最先选 中的图形相似的所有图形将被选中。

### 2.1.2 平移/旋转/对齐

#### ♦ 平移

选中对象后,选择【对象】菜单下的【平移】子菜单项,或者直接鼠标点在选中对象后,按住鼠标左 键不放,拖动平移对象,也可通过键盘上下左右键进行微调。

#### ◆ 旋转

旋转不会影响图形的形状,只是位置和方向改变。对于旋转功能,有三种方式:

- 选择【对象】菜单下的【旋转】子菜单项进入旋转模式,然后鼠标左键点下的第一个点即为旋转 中心,点下的第二个点与第一点的连线与X轴正向的角度作为旋转的角度。
- 2) 选中图形后,按住 Ctrl 键,点击选中对象四角上的小矩形进入旋转功能。此方式下默认旋转中心 为外接矩形的中心,用户亦可自行拖动其来改变旋转中心的位置。
- 3) 选中图形,在工具栏上的【倾角】或者【R】直接输入旋转角度后按下回车键即可。

#### ◆ 对齐

用户在对象编辑区域内选择两个以上的对象时,【对象】菜单下的【对齐】的下级子菜单项变为可用。

左边对齐	所有被选中对象的左边缘将以图形选取后外接矩形框的左边框为基准对齐。
右边对齐	所有被选中对象的右边缘将以图形选取后外接矩形框的右边框为基准对齐。

#### Select by Inner-Outer

Inner graph: graphs included.

Outer graph: graphs not included.

Click submenu "Select By Inner-Outer" under menu "Edit", and then click on "Inner" or "Outer", and you can select the corresponding graphs.

Inner	
Outer	

Fig. 2-4 Select by Inner-Outer

#### • Select Similar

Similar graphs: graphs of the same type and dimensions, but with different position and rotation angle.

Select a graph and then click submenu "Select Similar" under menu "Edit", and you can select all the graphs similar to the graph you selected at first.

## 2.1.2 Translate/Rotate/Align

#### Translate

After the object is selected, click sub-menu item "Translate" under "Object" menu or directly click on the selected object with mouse, and drag the object while pressing the left mouse button. You can also make minor adjustment by pressing arrow keys.

#### Rotate

Rotation changes position and direction of an object, with no change to its shape. There are 3 methods to enable rotation function:

- After selection of an object, click the "Rotate" option under "Object" menu to activate rotation mode. The first click point is the center of rotation, and included angle between the positive X axis and the straight line connected by the second click point and first click point is the rotary angle.
- 2) After selection of an object, press Ctrl, click one of the small rectangles around the selected object to enter rotation mode. In this way, the rotation center is located in the center of the circumscribed rectangle of selected object by default. You can drag the small circle to change the position of the center point.
- 3) After selection of an object, click "Angle" or "R" on the toolbar, input rotating angle and press Enter key.

#### Align

When two or more objects have been selected, sub-menu "Align" under "Object" menu becomes available.

Align to Left	Left edges of selected objects are aligned on the basis of that of the general circumscribed rectangle of selected objects.
Align to Right	Right edges of selected objects are aligned on the basis of that of the general circumscribed rectangle of selected objects.

顶边对齐	所有被选中对象的顶边缘将以图形选取后外接矩形框的上边框为基准对齐。
底边对齐	所有被选中对象的底边缘将以图形选取后外接矩形框的下边框为基准对齐。
中心点对齐	所有被选中对象的中心点将以图形选取后外接矩形框中心点为基准重合对齐。
水平中线对齐	所有被选中对象中心点的 Y 坐标将以图形选取后外接矩形框中心点的 Y 坐标为基准对齐。
垂直中线对齐	所有被选中对象的中心点的 X 坐标将以图形选取后外接矩形框中心点的 X 坐标为基准对齐。
水平分散对齐	水平分散对齐是以图形中心点的间距做分散依据,将处在水平边界的两个对象的 位置固定,各图形的中心点间距之间水平间距相等。选中的对象必须在三个或三 个以上。
垂直分散对齐	垂直分散对齐是以图形中心点的间距做分散依据,将处在垂直边界的两个对象的 位置固定,各图形的中心点间距之间垂直间距相等。选中的对象必须在三个或三 个以上。

## 2.1.3 组合与合并

◆ 组合

组合是对两个或两个以上的对象才能进行的操作,是把多个对象组合成一个群组。

选择需要组合的加工对象,点击【对象】菜单下的【组合】子菜单项,或者直接点击鼠标右键调出快捷菜单并选择【组合】,抑或点击工具栏上的【组合】按钮,选中的对象将组合成一个群组。

#### ◆ 解散组合

把已组合成的群组解散成多个对象。

选择已组合的对象,点击【对象】菜单下的【解散组合】子菜单项,或者直接点击鼠标右键调出快捷菜单并选择【解散组合】,抑或点击工具栏上的【解散】按钮,将解散已组合的对象。

◆ 合并

合并是把多个非闭合路径对象(直线、圆弧、椭圆弧和非闭合多义线)合并为单个路径对象,实现整体操作。使用对象合并之前推荐打开捕捉对象功能。

选中对象,点击【对象】菜单下的【合并】子菜单项,或者直接右击鼠标调出快捷菜单后选择【合并】 功能。在对象合并时,需依据一定的标准合并对象,这就要求设定一定的合并容差,即当对象之间相隔多 少以内就合并,所以系统提供了设定合并对象时容差的功能,容差范围为 1e-009~10。

Align to Top	Top edges of selected objects are aligned on the basis of that of the general circumscribed rectangle of selected objects.
Align to Bottom	Bottom edges of selected objects are aligned on the basis of that of the general circumscribed rectangle of selected objects.
Align Center Point	Centers of selected objects are aligned on the basis of that of the general circumscribed rectangle of selected objects.
Align Horizontal Midline	Y coordinates of selected objects centers are aligned on the basis of that of the general circumscribed rectangle of selected objects.
Align Vertical Midline	X coordinates of selected objects centers are aligned on the basis of that of the general circumscribed rectangle of selected objects.
Distribute Horizontally	With this menu item, the horizontal distances become equal between center points of selected objects, and the positions of the two objects next to the horizontal edge are fixed. Three or more objects must be selected.
Distribute Vertically	With this menu item, the vertical distances become equal between center points of selected objects, and the positions of the two objects next to the vertical edge are fixed. Three or more objects must be selected.

## 2.1.3 Group & Combine

#### ♦ Group

This option can bind two or more selected objects as a group.

Firstly select all objects which need to be bound as a group, click sub-menu item "Group" under "Object", or right click the right mouse button to open a shortcut menu and select "Group", or click corresponding button on the toolbar.

#### Break Group

This option dismisses a selected group into multiple objects.

After selected grouped objects, click sub-menu item "Break Group" under "Object" menu, or directly right click the mouse to open a shortcut menu and select "Break Group", or click corresponding button on the toolbar.

#### Combine

This option combines multiple unclosed objects (like lines, arcs, ellipse arcs and unclosed polylines), into one single-path object to realize integrated operations. It is recommended to open "Catch" before using "Combine".

First select the objects, click "Combine" sub-menu under "Objects" menu or right click mouse directly to eject the shortcut menu and select combine function.

In combination, the user needs to combine objects following a certain criterion, so combine tolerance is offered. When the distance between selected objects is within combine tolerance ranging from 1e-009 to 10, objects will be combined.

## 2.1.4 炸开

炸开图形,可删除多余线条,达到修剪刀路的目的。

- ▶ 对组合后的图形来说,炸开功能等同于解散组合功能;
- 炸开文字与将文字转换为图形效果相同。 炸开功能多用于多义线,配合使用合并功能,修正图形绘制发生的错误,保证加工质量。



图 2-5 炸开效果图

## 2.1.5 桥接

当一个工件由多个部分构成,但不希望切割之后散落,则可以通过"桥接"将它们连接起来。这一功 能还可减少穿孔次数。多次使用"桥接"功能,还可以实现对所有图形"一笔画"的效果。该功能多用于 文字笔画的连接。

点击【对象】菜单下的【桥接】子菜单,弹出桥接对话框,如图 2-6 所示。用户设置好"相邻曲线间 的最大距离"和"桥接宽度"参数后,点击确定,光标变为<sup>+</sup> <sup>+</sup> <sup>+</sup> <sup>+</sup> 后,即可在所需图形上进行操作。桥接效 果如图 2-7 所示。

## 2.1.4 Explosion

When exploding polylines or graphs, you can delete extra lines to change tool path.

- For combined graphs, to explode combinations equals to dissolve them.
- The result of exploding texts is the same as that of translating texts to graphs.

Explosion function is mostly used in polylines and graphs together with combination function. Combine correct graphs to ensure machining quality.



Fig. 2-5 Explosion Effect

## 2.1.5 Bridge

When a workpiece consists of many parts and you do not hope to scatter them after cutting, you can connect them through "Bridge". Besides, this function can also be used to reduce punch count. Multiple use of "Bridge" can achieve the effect of "One-stroke" for all the graphics. The function is mostly used in connecting strokes.

Click sub-menu item "Add Bridge" under "Object" menu, dialog box "Bridge" will pop out as shown in Fig. 2-6. After setting parameter "Max. Dis. Between adjacent curves" and "Bridge Width", click "OK". The

curser will change into <sup>H</sup>, and you can bridge graphs according to your needs. The effect of bridging is as shown in Fig. 2-7.



桥接前

图 2-7 桥接效果图

桥接后

#### 2.1.6 微连

进行激光切割加工时,板料被锯齿状的支撑条托住。被切割下来的零件,如果不能从支撑条的缝隙中 落下亦也不能被支撑条托住,则可能失去平衡,翘起。高速运动的切割头可能与之发生碰撞,轻则停机, 重则损坏切割头。利用微连功能可避免发生此种情况。微连将零件与周围材料连在一起,使得微连处理过 的材料不掉落,亦免去分拣的工作。

选择【对象】菜单下的【微连】子菜单,如图 2-8 所示。在【微连设置】中设置好微连长度后,在相 关图形中添加微连位置,若微连长度已设置好,再次进行微连操作时直接点击子菜单下的【微连】选项即 可。

删除微连有以下三种方法:

- ▶ 选中图形后,点击【微连】子菜单下的【清除微连】选项;
- ▶ 选中图形后,选择【对象】菜单下的【清除】子菜单中的【清除微连】选项;
- ▶ 选中图形后,点击右键,弹出快捷菜单,选择【清除】子菜单下的【清除微连】选项。



Fig. 2-6 Dialog Box "Bridge"





## 2.1.6 Micro Joint

During laser cutting, the material is held by zigzag supporting rods. If the part machined neither can fall from the gap of supporting rods nor can be held by the supporting rods, it will lose balance and become warped. The high-speed moving cutting head may collide with the warped part. The best result will be that the machine tool stops, and the worst will be that the cutting head be damaged. The situation can be avoided with micro joint function. With this function, the part can be joined with surrounding material and will not fall off, which will save sorting work.

Select submenu "Micro Joint" under menu "Object", the dropdown list is as shown in Fig. 2-8. Set the micro joint in "Set Micro Joint" dialog box, and then add micro joint position in the object you need to micro joint. If you have set the micro joint length, the next time you only need to click "Micro Joint" in the dropdown list.

There are three ways to clear micro joint:

- > After selecting the object, click "Clear Micro Joint" in the dropdown list.
- After selecting the object, click submenu "Clear" under menu "Object" and select "Clear Micro Joint" in the dropdown list.
- After selecting the object, right click and select "Clear Micro Joint" from dropdown list of menu "Clear" in the shortcut menu.

		微	£				
		郬	余微	车			
		炸开	干微	车			
		微	<b>主</b> 设i	置			
		图	2-8	微连			
說连	设置					x	
微	连长朋	度:	1			mm	
	确	È			[0]消		
							1

图 2-9 微连设置

本系统提供炸开微连功能,方便用户绘制复杂图形时,对多余图形进行裁剪。 微连操作效果如图 2-10 所示:



图 2-10 微连效果图

## 2.1.7 打断

打断与微连功能相似,通过打断处理,将切割后的零件与周围材料相连。用户亦可以在绘制图形阶段 通过打断功能对图形进行裁剪,便于切割出理想图形。点击【对象】菜单下的【打断】子菜单,弹出打断 对话框,如图 2-11 所示,用户可根据需要选择自动打断或手动打断。自动打断可同时对多个图形进行打 断处理,用户需同时设置打断数及打断长度;手动打断一次只能选择一个图形进行处理,但打断位置可自 行选择,用户只需设置打断长度。执行打断会改变图形属性。

Micro Joint
Clear Micro Joint
Explode MicroJoin
Set Micro Joint

Fig. 2-8 Dropdown List of Sub-menu Micro Joint

Micro Joint Setting	X
Joint length: 1	mm
ОК	Cancel

Fig. 2-9 Micro Joint Setting

This system provides explode micro joint function with which you can cut out redundant parts in drawing complicated graphs.

The effect of micro joint is as shown in Fig. 2-10.





## 2.1.7 Break

Break function is similar with micro joint function. With break, the part machined will be joint with surrounding material. You can also use break function to cut graphs during drawing graphs to get ideal graphs. Click submenu "Break" under menu "Object", a dialog box will pop out as shown in Fig. 2-11. You can select to break automatically or manually according to your needs, then set break counts and break length. In automatically break, you can break several graphs at the same time, and you need to set both break counts and break length. In manually break, you can only break one graph, and you can set break points and break length. The properties of graphs will be changed after a graph is broken.



图 2-11 打断

打断操作效果如图 2-12 所示:



图 2-12 打断效果图

## 2.1.8 文字转换成图形

选中需转换的文字,点击【对象】菜单下的【文字转换成图形】子菜单项或者右击鼠标调出快捷菜单 并选择【文字转换成图形】,操作完成后文字转换成多义线。

## 2.1.9 曲线光滑

曲线光滑指对曲线图形进行光滑处理,使处理后的图形更平滑,加工顺畅。



该功能只支持对多段多义线图形进行处理, 对其他规则图形不予处理。



Fig. 2-11 Dialog Box "Break"

The effect of break is as shown in Fig. 2-12.



Fig. 2-12 Break Effect

## 2.1.8 Translate Text to Polylines

After selected text which needs to be converted to graph, click sub-menu item "Translate Text to Polylines" under "Object" menu, or right click the mouse to open a shortcut menu and select the item, to convert text to polylines.

## 2.1.9 Curve Smoothing

This option makes curve smoother and easier to be processed.



This function is only effective for multiple polylines.

### 2.1.10 设置加工顺序

点击工具栏上的↓↓」或选择【视图】菜单下【显示次序】子菜单项,可显示加工对象的加工顺序。

#### ◆ 自动设置加工顺序

选中对象,点击【对象】菜单下的【自动设置加工顺序】子菜单项或右击鼠标调出快捷菜单后选择【自动设置加工顺序】,弹出如下图 2-13 对话框,可设置加工次序参数。

自动排序
排序策略 ◎ 最短路径 ◎ X方向 ◎ Y方向
<ul> <li>起始位置</li> <li>◎ 左上角</li> <li>◎ 左下角</li> <li>◎ 左下角</li> <li>○ 右下角</li> </ul>
高級 ② 技颜色排序 ③ 先内后外 ③ 先加工开口图形 ③ 双向排序
确定 取消

图 2-13 自动设置加工顺序

#### ◆ 手动设置加工顺序

▶ 设置加工顺序

点击【对象】菜单栏下的【手动设置加工顺序】,或者选中对象后调出 右键快捷菜单并选择【手动设置加工顺序】,将出现如右所示手动设置 加工顺序子菜单,即包括设置加工顺序,指定加工顺序和加工顺序列表。

设置加工顺序(M) 指定加工顺序(S) 加工顺序列表(L)

点击【设置加工顺序】,或者选择绘图工具栏上的<sup>1999</sup>按钮,或者直接在 NcEditor 编辑区域点击鼠标 右键调出快捷菜单然后选择【设置加工顺序】,此时鼠标会变成<sup>10</sup>,此时鼠标点击或框选任一图形,加 工顺序变为 1, 其余图形按照原来顺序依次变为 2、3……

## 2.1.10 Set Machining Order

Clicking on toolbar or selecting sub-menu item "Show Order" under "View" menu can show the machining sequence of all objects.

#### Automatic Machining Order Setting

After selection of objects, clicking sub-menu item "Auto Set Machining Order" under "Object" menu or selecting the item on pop-up shortcut menu list by right clicking the mouse will open a dialog box as shown in Fig. 2-13, where you can set relevant parameters.

Auto Sort	×
Sort Strategy MinDistance Horizontal Vertical	
Start Position TopLeft SottomLeft	<ul> <li>TopRight</li> <li>BottomRight</li> </ul>
Advanced Options Sort by color Inside objects Unclosed object Two-way Sort	first ts first
	OK Cancel

Fig. 2-13 Automatic Machining Order Setting

#### Manual Machining Order Setting

Clicking sub-menu item "Manual Set Machining Order" under "Object" menu, or selecting the item on the pop-up shortcut menu by right clicking on the selected object will open a sub-menu list as shown on the right part. You can set the machining order, specify the machining order or custom a machining order list.

Set Machining Order Specify Machining Order Machining Order List

Set Machining Order

After you click "Set Machining Order" or select the button in the drawing toolbar or select "Set Machining Order" on the pop-up shortcut menu by right clicking mouse in editing space, the mouse turns

into 1. At this time, click or frame select any object, and its machining order will turn into 1, while the order of left objects will change to 2, 3,... sequentially according to the original order.

▶ 指定加工顺序

点击【指定加工顺序】,出现手动设定对象加工序号对话框,可在此对话框中设置当前选中对象的加工顺序。使用此功能,只能选中一个对象,否则弹出对话框提示"选中的对象不是一个,手动设定加工顺序只能对一个选中对象进行操作!"

▶ 加工顺序列表

点击加工顺序列表将弹出对话框,在此对话框中可对加工对象进行【上移】、【下移】设置加工次序。

### 2.1.11 图形检测

导入或绘制好图形后,用户可选择图形检测功能,对刀路文件进行检查,以提示用户当前刀路是否有 异常以及有何异常。

选择需要检测的对象,点击【对象】菜单下的【图形检测】子菜单项,弹出图形检测对话框,勾选封闭检测、自交检测、相交检测、重叠检测任意检测,系统将对对象进行相关检测。

点击【确定】后,弹出图形检测结果对话框提示对当前刀路的检测结果。若选中刀路有符合勾选的检测类型,将显示异常类型。同时勾选图形检测中的【选中 XX 图形】,系统将自动选中该类型的对象,方便用户查看。

### 2.1.12 图形预处理

正式加工前,需对图形进行预处理,包括删除重复边、合并、删除点、删除小圆和删除小曲线等。

选择【对象】菜单下的【图形预处理】子菜单项,如下图 2-14 所示。选择预处理项并设定参数范围, 即可对图形进行该项预处理。选中对话框底部"导入文件时应用"即可在导入文件时自动处理图形。

图形预处理			×
☑ 删除重复边(O)			
☑ 合并(J)	合并容差 <mark>:</mark>	0.2	mm
☑ 删除点(D)			
✓ 刪除小圆(C)	直径 ≤	0.001	mm
📝 删除小曲线(U)	尺寸 ≤	0.001	mm
☑ 导入文件时应用(A)	确定		取消

图 2-14 图形预处理

此外,用户还可以直接选择【对象】菜单下的【删除重复边】、【删除小图形】对图形进行预处理。

Specify the machining order

Click "Specify the machining order", and set the machining order of the current selected objects in the dialog box popping out. You can Note that an error message "More than one object selected, manual set machining order is valid when only one object selected!" will be displayed if more than one object is selected.

Machining order list

Selecting "Machining order list" will eject a dialog box, where you can move down or up objects to set machining order.

## 2.1.11 Shape Check

After importing or drawing objects, you can select this function to check the selected objects in the currently loaded machining file to tell whether current path is normal or not, and where are the abnormalities.

Select the objects to be detected and click "Shape check" sub-menu under "Object" menu to eject the shape check dialog box. After the boxes before "Closed check", "Self-cross check", "Intersection check" and "Overlap check" are checked, the system will execute corresponding check on the objects.

"OK" clicked, a dialog box will pop up, showing the check result of the current tool path. In case of abnormalities, their abnormal type will be shown. You can select "Select XX Shape" at the same time to see the objects of the type you have selected.

## 2.1.12 Object Pre-processing

Before formal machining, there is a need to pre-process the objects in the machining file, including delete overlap, join (combine), delete dots, delete mini-circles, and delete mini-curves.

Select the "Pre-processing" sub-menu under "Object" menu to eject the dialog box as shown in Fig. 2-14, check the pre-processing items and set the parameter range to execute pre-processing on the objects. If "Apply when import" is checked, objects will be pre-processed automatically when a machining file is loaded.

Pre-Processing			×
📝 Delete Overlap			
🔽 Join	Tolerance:	0.2	mm
Delete Dots			
Delete Mini-Circles	Dia. ≤	0.001	mm
Delete Mini-Curves	Scale ≤	0.001	mm
Apply when import	ОК		Cancel



Besides, you can directly select sub-menu s including "Clip overlap" and "Delete shorties" under "Object" menu to pre-process the objects.

### 2.1.13 测量距离

该功能是用来测量某个特定的距离的。

选择【对象】菜单下的【测量距离】子菜单项,或者直接点击绘图工具栏上的 图标,或右击鼠标 调出快捷菜单后选择【测量距离】,然后鼠标左键点选需测量距离的起始点,拖动鼠标,在鼠标下方会显 示当前位置与起始点的距离、X/Y 偏移量及(当前点与起始点的连线)与 X 轴正向的角度。

再次点击鼠标左键,表示当前位置测量距离完毕,可继续下次测量。若要退出【测量距离】功能,直 接单击鼠标右键即可退出。

#### 2.1.14 阵列

该功能是对选中图形做阵列处理的。包括矩形阵列和圆周阵列。下面以矩形阵列为例介绍阵列功能。

选中图形后,直接点击绘图工具栏上的 **\*\*** 图标,弹出矩形阵列对话框,如图 2-15 所示。正确设置 阵列行数、列数、行间距/行偏移、列间距/列偏移、排列方式,点击确定,阵列完成后,生成的新加工程 序会自动加载到数控系统中。当用户勾选"间距为零自动共边"选项后,顾名思义在行/列间距为0时,对 图形做共边处理。



图 2-15 矩形阵列

### 2.1.15 清除

系统提供统一的清除功能,"清除引刀线"、"清除刀补"、"清除冷却点"、"清除倒角"、"清除微连" 以及"清除释放角"。

菜单方式:选择【对象】菜单下的【清除】子菜单,用户根据需要选择相应选项;

鼠标方式:选中对象,点击鼠标右键,弹出快捷菜单,选择【清除】子菜单下的相应选项即可。

## 2.1.13 Distance Measurement

This option is used to measure a certain distance.

Select "Measure" sub-menu under "Object" menu or click in drawing toolbar or choose "Measure"

in the shortcut menu by right clicking mouse, then left click to choose the start point of measurement, and then drag the mouse, in the lower part of the cursor displayed are the distance between current point and the start point, X/Y offset, and the included angle of the positive X axis and the line connected by the start point and current point.

Click again to finish current measurement. Then another measurement can be performed as the above-mentioned steps. To exit from "Measure", right click mouse.

## 2.1.14 Array

With function Array, graphs can be arrayed in circle or rectangle. Below is an introduction of rectangular array function.

After selecting graphs, click the icon *in*, and a dialog box will pop up as shown in Fig. 2-15. Set the rows, columns, Y Dist, X Dist and Order, and click "OK" to confirm. After array function is executed, the new tool path will be loaded automatically. When you check the box "Auto delete common side when gap is 0", common side will be deleted automatically when the gap is 0.



Fig. 2-15 Rectangular Array

## 2.1.15 Clear

The system provides clear function, including "Clear Lead-in/out Line", "Clear Crc", "Clear Stop Corner", "Clear Chamfer", "Clear Micro Joint", and "Clear Release Angle".

You can select a clear item from the dropdown list of submenu "Clear" under menu "Object", or select the object, right click and select a clear item from the dropdown list of "Clear" in shortcut menu.

清除引刀线
清除刀补
清除冷却点
清除倒角
清除微连
清除释放角

图 2-16 清除

## 2.2 图层与工艺

### 2.2.1 图层

图层功能为 NcEditor V12 系统核心功能,它将加工工艺与通用参数结合起来,用户无需在系统参数中 修改相关参数,便于用户使用。另外通过预设加工工艺,用户只需设置常用参数如激光功率、加工速度等 就可实现切割效果,提高效率。

选择【对象】菜单下的【图层设置】子菜单项,或点击工具栏上的 🗲 按钮,弹出如图 2-17 对话框。



图 2-17 图层设置对话框

Clear Lead-in/out Line
Clear Crc
Clear Stop Corner
Clear Chamfer
Clear Micro Joint
Clear Release Angle

Fig. 2-16 Dropdown List of Submenu "Clear"

## 2.2 Layer and Technic

## 2.2.1 Layer

As the core function of NcEditor V12, layer function integrates the machining technologies and general parameters together into one interface so that you do not need to turn to parameter dialog box to modify related parameters, bringing great convenience. Moreover, through presetting technologies, better cutting effects and higher efficiency can be achieved by simple setting on commonly used parameters such as laser power, machining speed and so on.

Select "Layer" under "Object" menu or click *in drawing toolbar to eject the dialog box as shown in Fig. 2-17.* 

Layer1	General Paramters	utfilm		Sub-interface			
Layer2	🖾 Import	🚽 Save					
Layer3	Technic Parameters						Power Curve
Layer4	Pierce Mode: 🔘 P	ierce Direc	) Inc	crement I 🔘 Pierce By	-se 🔘 T	hree Segm	Ê₽
Layer5	Pre-Laser Off	100	ms	Lifting Height:	1	mm	
Layer6	Pre-laser On	100	ms	Pre-Perforate Lift	2	mm	
Cutfilm	Cut Speed:	12000	mm/m	nin Pierce Speed:	300	mm/min	E
	Cut Current:	10	%	Pierce Current:	50	%	I E
	Cut Frequency:	5000	Hz	Pierce Frequency:	1000	Hz	
	Cut Power:	50	%	Pierce Power:	50	%	
	Cut Pressure:	100	%	Pierce Pressure:	100	%	Edit Adjust Power Au
	Cut Gas:	Air 👻		Pierce Gas:	Air	-	Remarks
	Follow Height:	10	mm	Pierce Height:	5	mm	
	Cut Focus:	15	mm	Punch Focus:	10	mm	
	Post-Laser On	150	ms	Pierce Delay:	200	ms	
ShowAll	Special Technic						
Unit Translation	Neglect This Lay	er [	Side	e Blow When Pierce	E 6	Enable Lead Spe	eed Circle Overcut
Speed mm/min 🔻	Not Close Gas		Side	e Blow When Mach		Lead-in 500	mm/min Bypass Angle: 120 de
Acc mm/s^2 💌	PrePerforate	[	Fixe	ed Heigh 📃 Outside C	a i	ead-out 500	mm/min Overcut Len: 2 m
Time ms 🔹	Cool Delay: 400	ms	Coo	ling Air 👻			

Fig. 2-17 Layer Setting Dialog Box

#### 2.2.1.1 图层选择框

NcEditor 系统提供8种颜色的图层,用户可以对每一个图层单独设置不同的工艺参数,包括切割速度, 跟随高度等。NcEditor软件默认同一颜色的加工对象具有相同的加工参数,如果需要改变某种颜色对应的 加工参数,具有该颜色的所有对象的加工参数都会随之改变。

对话框的左侧为图层选择框,用户可双击图层名称对其进行编辑。勾选图层选择栏底部的【显示全部】, 系统将显示所有图层,取消勾选则仅显示当前刀路所属的图层。

图层选择框下方为单位切换框。用户可根据需要对速度,加速度和时间的单位进行选择,其中速度默认单位为 mm/min,加速度默认单位为 mm/s<sup>2</sup>,时间默认单位为 ms。

#### 2.2.1.2 图层工艺设置

在此子页面下,用户可以对某一图层的工艺进行设置,如上所示为"Layer1"的工艺设置子页面。该 部分包括保存/导入工艺,工艺参数,特殊工艺,功率曲线和用户备注。

#### ◆ 保存/导入工艺

设置完工艺参数和特殊工艺后,点击工艺参数栏上方的【保存工艺】,可将用户自定义的工艺参数保 存至工艺库,作为备用。

若需调用已保存的工艺参数,用户可选择【导入工艺】进行操作。

#### ◆ 工艺参数

#### 穿孔方式

X 10/1 F 1	
直接穿孔	其流程为:开跟随,吹气→跟随至切割位置,持续时间为"吹气延时"→"开
	光前延时"→打开激光,持续时间为"开光后延时"→穿孔完成。
渐进穿孔	其流程为: 开跟随, 吹气→跟随到 "穿孔高度", 持续时间为 "吹气延时" →
	打开激光,持续时间为"穿孔延时"→不关闭激光,以"渐进速度"下降到
	跟随高度→穿孔完成。
分段穿孔	其流程为: 开跟随, 吹气→跟随到 "穿孔高度", 持续时间为 "吹气延时" →
	打开激光,持续时间为"穿孔延时"→穿孔完成。
三级穿孔	在上述穿孔的基础上,采用渐进或分段的方式从爆破高度采用爆破穿孔工艺
	下降到穿孔高度,具体操作见下方附录。

切割参数

切割速度	进给率为100%时,实际切割的目标速度。
切割电流	通过模拟量调节激光器,设置切割时的峰值电流,对应切割时的峰值功率。

#### 2.2.1.1 Layer Selection Box

There are altogether 8 numbered colors for selection in the color window, with each color corresponding to different values of such machining parameters as speed, power, etc. Machining objects with the same color shares the same values of machining parameters as default in NcEditor. Therefore, if value of a machining parameter corresponding to a color is changed, machining parameter value of all objects corresponding to the color will be changed accordingly.

At the left part of the dialog box is the layer selection box, in which you can double click the layer name to modify it. You can select "Show all" to unfold all the layers, otherwise only the layer of current tool path is displayed.

Unit translation box is located below the layer selection box. You can select the unit for speed, acceleration and time according to their needs, hereinto speed default unit "mm/min", acceleration default unit "mm/s<sup>2</sup>" and time default unit "ms".

#### 2.2.1.2 Layer Setting

In this sub-interface, you can set the machining technologies to certain layer, such as the "Layer 1" shown above. This part includes saving/importing, technic parameters, special technic, power curve and remark.

#### Save/Import

After the technic parameters and special technic are well set, clicking "Save" above technic parameters bar can save the custom parameters into the technic library for backup.

To call the saved technic parameters, click "Import" above technic parameters bar.

Pierce mode	
	Procedure: open follow and blow $\rightarrow$ follow to "Follow height", lasting
Pierce directly	"Blow delay" time $\rightarrow$ "Pre-laser on delay" time $\rightarrow$ open the laser, lasting
	"Post-laser on delay" time $\rightarrow$ pierce finishes.
	Procedure: open follow and blow $\rightarrow$ follow to "Pierce height", lasting
Increment	"Blow delay" time $\rightarrow$ open laser, lasting "Pierce delay" time $\rightarrow$ keep laser
	on and fall to the "follow height" in approaching speed $\rightarrow$ pierce finishes.
	Procedure: open follow and blow $\rightarrow$ follow to "Pierce height", lasting
Pierce by segment	"Blow delay" time $\rightarrow$ open laser, lasting "Pierce delay" time $\rightarrow$ pierce
	finishes.
	On the basis of the above pierce operations, this mode adopts increment
Three segment	and pierce technics from burst height to the pierce height incrementally or
	in segments. For more details, see the Appendix.
Cut parameters	
Cut speed	It specifies the actual target cutting speed when federate override is
	100%.
Cut current	It specifies the peak current corresponding to peak power in cutting
	setting when the laser device is adjusted by the analog quantity.

#### • Technic parameters

切割功率	通过 PWM 调节激光器,设置切割时的平均功率。
切割频率	切割时 PWM 调制信号的载波频率,也是一秒内的出光次数,该值越大代表出光越连续。
切割气压	切割时辅助气体的气压,需与比例阀或者多气阀配合使用。
切割气体	切割时所用的辅助气体的类型。
穿孔参数	
渐进速度	设置使用渐进穿孔时从穿孔高度下降到切割高度的速度。
穿孔电流	通过模拟量调节激光器,设置穿孔时的峰值电流,对应穿孔时的峰值功率。
穿孔功率	通过 PWM 调节激光器,设置穿孔时的平均功率。
穿孔高度	穿孔位距板材的高度。
穿孔频率	穿孔时 PWM 调制信号的载波频率,穿孔时一般采用较低的频率,用脉冲穿 孔来避免爆孔。
穿孔气压	穿孔时的辅助气体的气压,需与比例阀或者多气阀配合使用。
穿孔气体	穿孔时所用的辅助气体的类型。
穿孔延时	渐进穿孔时在穿孔高度开激光的时间;分段穿孔的持续时间。
延时	
关光前延时	关闭激光前延时。
开光前延时	开启激光前延时。
开光后延时	开启激光后持续"开光后延时"时间,再执行下一步骤。
其他	
上抬高度	切割完一段图形后,激光头上抬的高度。
预穿孔上抬高度	预穿孔过程中,每穿完一个孔,切割头上抬的高度。
跟随高度	切割时喷嘴距离板材的高度。

### <sup>③</sup> 附录:三级穿孔

三级穿孔常用于厚板穿孔,点击【三级穿孔】,图层新弹出三级穿孔参数子页面。

Cut power	It specifies the average power in cutting setting when the laser device is adjusted by PWM.
Cut frequency	It refers to the carrier frequency of PWM modulate signals in cutting, namely the light emission times in one second. The larger the value is, the more continuous the light emission will be.
Cut pressure	It specifies the auxiliary gas pressure in cutting and should be used together with proportional valve or multi-valve.
Cut gas	It specifies the type of auxiliary gas used in cutting.
Pierce parameters	
Increment speed	It specifies the speed used for falling from pierce height to the cutting height in incremental piercing.
Pierce current	It specifies the peak current corresponding to peak power in pierce setting when the laser is adjusted by the analog quantity.
Pierce power	It specifies the average power in pierce setting when the laser is adjusted by PWM.
Pierce height	It specifies the distance between the pierce position and the workpiece.
Pierce power	It specifies the laser power in piercing when laser machine is adjusted by analog quantity.
Pierce frequency	It specifies the carrier frequency of PWM modulate signals in piercing. In general it is set relatively lower and pulse is used to avoid bad piercing.
Pierce pressure	It specifies the auxiliary gas pressure in piercing and should be used together with proportional valve or multi-valve.
Pierce gas	It specifies the type of auxiliary gas used in piercing.
Pierce delay	It refers to the duration of laser on at pierce height in incremental piercing while the lasting time in segmented piercing.
Delay parameters	
Pre-laser off delay	It specifies the delay time before laser is closed.
Pre-laser on delay	It specifies the delay time before laser is opened.
Post-laser on delay	After laser on, the system will last this delay time before next step.
Others	·
Lifting height	The laser head will uplift this distance after cutting each object.
Pre-perforate lift	In pre-piercing, the cutting head will uplift this distance after piercing each hole.
Follow height	It specifies the distance between nozzle and workpiece in cutting.

### <sup>(37)</sup> Appendix: three segment piercing

Three segment piercing is usually used in thick plates. Clicking "Three-segm" will eject its parameter sub-interface.
图层设置								×
Layer1	通用参数 Layer1	Layer1-三级穿孔参数						
Layer2	Layer1-三级穿孔参	数						
Layer3								
Layer4		☑—级		☑ 二級			☑ 三级	
Layer5	一级电流:	100 %	二级电流:	100	%	三级电流:	100	%
Layer6	——级频率:	5000 Hz	二级频率:	5000	Hz	三级频率:	5000	Hz
Layer/ 切ま巨瞄		100 %	一個市家・	100	9/_		100	0/
		100 76	_3X9J¥•	100			100	70
	一级气压:	100 %	二级气压:	100	%	三级气压:	100	%
	——级气体:	空气 ▼	二级气体:	空气 ▼		三级气体:	空气 ▼	] []
	一级高度:	10 mm	二级高度:	5	mm	三级高度:	2	mm
	一级焦点:	0 mm	二级焦点:	5	mm	三级焦点:	10	mm
	一级延时:	200 ms	二级延时:	200	ms	三级延时:	200	ms
	用户备注							
▼ 泉示全部	J							
单位切换								
速度 mm/min 🔻								
加速度 mm/s^2 ▼	I							
时间 ms 🔻								
						C	确定	取消

图 2-18 三级穿孔参数子页面

如上所示,三级穿孔分为三级,用户可分别对一级,二级和三级的电流、频率、功率、气压、气体、 高度和延时进行设置。

执行三级穿孔时会顺次执行一级穿孔、二级穿孔、三级穿孔,若其中有未勾选的项,则该级穿孔跳过不执行。取消勾选一级、二级和三级前的小方框,其对应的参数灰显,用户不能对其进行设置。

下方的备注用于备注一些重要信息,方便用户操作。

◆ 特殊工艺

此图层不加工	勾选该选项,系统默认不加工当前图层下的所有加工对象。
此图层不关气	勾选该选项,系统默认加工本图层内图形期间不关吹气端口。
穿孔时侧吹气	勾选该选项,系统默认在穿孔时,打开侧吹气端口。
加工时侧吹气	勾选该选项,系统默认在切割加工时,打开侧吹气端口。
预穿孔	勾选该选项,当前图层下的所有加工对象启用预穿孔功能。预穿孔方式推荐采用 渐进穿孔或分段穿孔。
引刀线速度	勾选该选项,激活引刀线的引入速度和引出速度。
回旋过切	过切尖角然后回旋防止过烧。勾选该选项启用回旋过切,输入回旋角度(范围 0~150 deg)和过切长度(0.1~100 mm),点击【确定】即可。

Layer1	General Paramters L	ayer1	Layer1-Th	nree Segment Paramter	s				
Layer2	-Layer 1-Three Segme	nt Para	mters						
Layer3									
Layer4		First	t Se		Seco	nc		Third S	5
Layer5	Current:	100	9/2	Ourrent:	100	%	Ourrent	100	0/_
Layer6	Currenti	100	_ ^	current	100		current	100	/0
Layer7	Frequency:	5000	Hz	Frequency:	5000	Hz	Frequency:	5000	Hz
CutFilm	Power:	100	%	Power:	100	%	Power:	100	%
	Pressure:	100	%	Pressure:	100	%	Pressure	100	%
	Current:	Air	•	Current:	Air	•	Current	Air 🚽	•
	Height:	10	mm	Height:	5	mm	Height:	2	mm
	Focus:	0	mm	Focus:	5	mm	Focus	10	mm
	Delay:	200	ms	Delay:	200	ms	Delay	200	ms
	Remarks								
ShowAll									
hit Translation									
peed mm/min 🔻									
Acc mm/s^2 ▼	I								
Time ms 🔻									

Fig. 2-18 Three Segment Parameters

As shown above, it is divided into three segments and you can set such parameters as current, frequency, power, pressure, height and delay for each segment respectively.

The system will execute three-segment piercing from the first to the third. If the box before any of the three segments is unchecked, the system will skip this segment and the parameters below are disabled. The blank area at the bottom of the interface is for you to remark important information.

Neglect This Layer	With this item checked, the system will not machine all the object of current layer by default.				
Not Close Gas	With this item checked, the system will not close blow port when machining all the graphs of the current layer by default.				
Side Blow When Pierce	With this item checked, the system will open side blow port during piercing by default.				
Side Blow When Machining	With this item checked, the system will open side blow port during machining by default.				
PrePerforate	With this item checked, pre-piercing function is valid for all the objects of current layer. As to pierce mode, incremental piercing and segmented piercing are recommended.				
Enable Lead Speed	With this item checked, the lead speed is enabled.				
Circle Overcut	It refers to overcut the acute angle and loop around to avoid over burn. Check this item to enable this function and then enter the bypass angel (0~150 deg) and overcut length (0.1~100 mm), click "OK" to complete the setting.				

## Special Technic

定高切割	获取定高位置或者手动输入定高位置后,一直维持在此 Z 轴坐标进行切割。
冷却延时	加工到冷却点时,关闭激光的时间。
板外跟随	从板材外面不打孔直接切入板材,常用于厚板或者高精度要求的零件切割。
冷却气	可选择与切割气体不同的气体,包括空气、氮气、氧气三种选择。减少冷却时间, 提高加工效率。

### ◆ 功率曲线

针对激光切割中存在尖角过烧、厚度不同切割效果不一致等问题,系统提供速度功率调节,使速度变 化时激光功率也相应地调节达到匹配,以保证单位面积内吸收的热功率一致,达到理想切割效果。

点击功率曲线框左下方【编辑】按钮,弹出速度功率曲线编辑对话框如下所示。 \_\_\_\_\_\_



图 2-19 速度功率曲线编辑对话框

编辑对话框左侧为速度功率曲线图。横坐标为切割速度,纵坐标为切割功率,单位为百分比。右侧为 速度功率曲线列表,列表列出左侧曲线图各节点对应的速度与功率值。

系统提供两种调节功率曲线的方法:

▶ 方法一:直接在功率曲线图上调节。

在曲线框中按照提示的坐标值双击,即可选定该点,同时在右侧的速度功率列表中将出现对应的速度 值与功率值。如果需要删除某节点,将光标指向该节点,双击即可删除。

Fixed Height Cut	After you "get fixed position" or manually input the fixed position height, the system will remain this Z-axis coordinate in cutting.
Cool Delay	Laser off time at cooling point.
Outside Cutting	Commonly used in thick plate or the part cutting with high requirement of preciseness, it refers to cut the workpiece directly without piercing on it.
Cooling Gas	Different from cutting gas, including air, nitrogen and oxygen. It can reduce cooling time and improve machining efficiency.

#### Power curve

To solve problems like over-burning around the corner and difference of cutting result in terms of thickness, power curve is offered in our system. With it, the laser power will change with speed accordingly so as to ensure the consistency of thermal power absorbed in unit distance and achieve fine cutting result.

Click the "Edit" under the curve sketch to eject dialog box "Edit" as shown in Fig. 2-19.





The left part of the edit box is the speed power curve, with cutting speed as the X-axis coordinate, the cutting power as the Y-axis coordinate and percentage as the unit. Table of speed and power values are on the right side, displaying all the speed and power values of the corresponding nodes at left side.

The system provides two methods to adjust power curve:

> Method one: adjust directly on the curve

Double click on the curve box as per the prompt to confirm a node, with its corresponding speed and power values shown in the right-side table. To delete a node, move the cursor onto it and double click it.

▶ 方法二:通过速度功率列表调节。

点击列表上方的【添加】按钮,列表自动添加一组速度功率值,双击需要修改的值,然后输入,按下 Enter 确定。如果需要删除某组速度功率值,点击该组值后点击列表上方的【删除】即可。另外,用户还 可点击【清空】按钮,将曲线还原成默认曲线。

确定的节点越多,曲线越精确。绘制好曲线后,加工过程中就按照此曲线自动调节速度和功率匹配关 系,无需其他手动操作。

勾选【启用速度功率调节】后,切割时切割功率会随着切割速度变化而变化,具体数值由速度功率曲 线决定。取消勾选,切割时功率将保持不变。

#### ◆ 用户备注

用于备注加工信息,如板材类型、板材厚度、焦点、气体、气压等。

#### 2.2.1.3 通用参数设置

点击【通用参数】将切换到通用参数子页面,对话框如下图 2-20 所示。

图层设置						×
Laver1	通用参数 Layer1					
	机床运动参数					
	快速横移速度:	30000 mm/min	单轴加工加速度:	5000 mm/s	▶2 速度平滑时间:	0 ms
	单轴空运行加速度:	10000 mm/s^2	转弯加速度:	5000 mm/s	▶2 轨迹平滑时间:	20 ms
	走边框速度:	30000 mm/min	加工加加速度:	100000 mm/s	∿3 空程加加速度:	100000 mm/s^3
					🔽 参考圆最大速度:	5000 mm/min
	激光器参数					
	激光器类型:	IPG 👻	功率调整方式:	占空比 🔻	点射电流:	10 %
	额定功率:	不可用 w	激光功率:	10 V	点射频率:	5000 Hz
	通信方式:	-	最小脉冲宽度:	5 us	点射功率:	50 %
					点射时间:	500 ms
	随动控制		气压控制		加工后行为	
	☑ 蛙跳最小距离:	10 mm	默认吹气类型:	空气 ▼		
	灵敏等级:	10	气压空闲值:	5 V	Z轴停靠位置:	-10 mm
🔲 显示全部	获取定高位置	-10 mm	换气延时:	100 ms	XY轴附加行为:	不动 🔹
单位切换	直接跟随最大高度:	8 mm	吹气延时:	0 ms		
述反 mm/m1 ▼	高级					
加速度 mm/s 2 ▼ 时间 ms ▼	带膜切割: 不切	膜 ▼	板外跟随,板 外切割高度: 未保	存mm跟随至	版外高度并保存	PLC高级设置
					确定	取消

图 2-20 图层通用参数

在此子页面下,用户可对激光切割常用参数(包括快速横移速度,单轴空运行加速度等),激光器参数以及图层相关参数进行设置。在设置完参数后,点击【确定】完成。通用参数可分为六大块,包括机床运动参数,激光器参数,随动控制参数,气压控制参数,加工后行为参数以及高级参数。以下分别介绍。

> Method two: adjust by editing the table

By clicking on "Add" above the table, you can add a group of speed and power value in the table automatically. Double click the newly added, input the value and press Enter to confirm. If you want to delete a group of values, you can select the group and click "Delete" above. Besides, you can also click "Clear" to restore the curve to default.

The more the nodes are confirmed, the more precise the curve will be. After the curve is confirmed, the system will adjust the speed to the power automatically based on it without any other manual operation.

After the box before "Adjust power autom" is checked, the cutting power will vary with the cutting speed and its concrete value is determined by the curve. The power in cutting will remain the same if "Adjust power autom" is unchecked.

### Remarks

It is used to take notes of the machining information, including workpiece types, part thickness, focus, gas, pressure and so on.

## 2.2.1.3 General Parameter Setting

Click the "General parameters" to switch to the general parameters interface, as shown in Fig. 2-20.

Layer Parameters									×
Laver1	General Paramters La	yer1							
	Motion Control Parame	ters							
	G00 speed:	30000	mm/min Si	ngle axis acceleration	5000	mm/s^2	Speed smooth time:	0	ms
	Single axis acceleration	10000	mm/s^2	Cornering	5000	mm/s^2	Track smooth time:	20	ms
	Speed of simulate	30000	mm/min	Gxx Jerk:	100000	mm/s^3	G00 Jerk:	100000	mm/s^3
							Max. speed of	5000	mm/min
	Laser Device Paramete	rs							
	Laser Device:	IPG	•	Adjust Power Mode:	Duty Cyc	•	Burst Current:	10	%
	Rated Power:	Unavailat	]₩	LaserPower:	10	V	Burst Frequency:	5000	Hz
	Comm Mode:		-	Min Pulse Width:	5	us	Burst Power:	50	%
							Burst Time:	500	ms
	Follow Control			Pressure Control			Task End Motions		
	FrogLeaping	10	mm	Default blow type:	Air	•			
	Sensitivity:	10		Value of Pressure in	5	v	ZUP position:	-10	mm
ShowAll	Get Fixed-Pos	-10	mm	Switch Gas Delay:	100	ms	XY axes actions:	No Motio	n 🔻
Unit Translation Speed mm/min 💌	Direct follow height:	8	mm	Gas On Delay:	0	ms			
Acc mm/s^2 -	Advanced								
Time ms 🔻	Cut Film: No Fil	m Cut 🔻		The outside board height: Not Sa	ave mm	Set Out	side Height	PLC S	etting
							ОК		Cancel

Fig. 2-20 General Parameters Page

In this interface, you can set commonly used parameters (including G00 speed, single axis acceleration and so on), laser machine parameters and layer-related parameters. After setting, click "OK" to confirm. The general parameters are divided into six parts, i.e. motion control parameters, laser device parameters, follow control parameters, pressure control parameters, task end motions and advanced parameters, which will be introduced respectively as follows.

## ◆ 机床运动参数

在该部分下,用户可设置机床运动相关参数。

参数	设定范围	默认值	含义
快速横移速度	[0.06, 各轴最大速度最小 值]	30000 mm/min	机床定位时的默认速度(不是 加工时的速度)。
单轴空运行加速度	[100,100000]	10000 mm/s <sup>2</sup>	单轴空运行加速度。
走边框速度	[0,各轴最大速度最大值]	30000 mm/min	执行走边框时的速度。
单轴加工加速度	[100,100000]	5000 mm/s <sup>2</sup>	单轴加工加速度,见 3.5.1。
转弯加速度	[0.001, 100000]	5000 mm/s <sup>2</sup>	进给运动发生在相邻轴上的 最大加速度,见 3.5.2。
加工加加速度	[0.001, 9999999]	100000 mm/s <sup>3</sup>	加工时单轴加速度的变化率。
空程加加速度	[0.001, 9999999]	100000 mm/s <sup>3</sup>	空程时单轴加速度的变化率。
速度平滑时间	[0, 1]	0 s	时间越长速度越顺滑,不会影 响轨迹精度。
轨迹平滑时间	[0, 0.064]	0.02 s	时间越长工件表面越光滑,但 是有些细节可能会消弱。
尖角光滑精度	[0.001, 10]	0.02 mm	进行尖角光滑处理时的精度。
参考圆最大速度	[参考圆最小速度,各轴最 大速度最小值]	5000 mm/min	直径 10mm 圆对应的最大允 许速度,见 3.5.3。

## ◆ 激光器参数

在该部分下,用户可设置激光器相关参数。

海业盟米刑	用户可选择搭配的激光器类型,	支持主流激光器,	包括 SPI,	IPG,	锐科,	EO
<i> </i>	等。					

## Motion control parameters

Parameter	Setting Range	Default	Definition			
G00 speed	[0.06, Min. value of max.	30000	The default speed when			
OUD Speed	speed of each axis]	mm/min	positioning.			
Single axis acceleration	[100 100000]	10000	Single axis acceleration in			
in positioning.		mm/s <sup>2</sup>	positioning.			
Speed of simulate cut	[0, Max. value of max. speed of each axis]	30000 mm/min	Speed of simulate cut			
Single axis acceleration in machining	[100, 100000]	5000 mm/s <sup>2</sup>	Single axis acceleration in machining, see 3.5.1			
Cornering acceleration	[0.001, 100000]	1500 mm/s <sup>2</sup>	The maximum acceleration when feed motion is on adjacent two axes, see 3.5.2.			
Gxx Jerk	[0.001, 9999999]	100000 mm/s <sup>3</sup>	The rate of change of single axis acceleration when cutting.			
G00 Jerk	G00 Jerk [0.001, 9999999]		The rate of change of single axis acceleration when positioning.			
Speed smooth time	[0, 1]	0 s	The longer the time is, the smoother the speed will be without any effect on track accuracy.			
Track smooth time [0, 0.064]		0.02 s	The longer the time is, the smoother the workpiece surface will be. But some details may be weakened.			
Precision of arc transition [0.001, 10]		0.02 mm	The precision in smoothing the acute angles.			
Max. speed of reference circle [Min. speed of reference speeds of all axes]		5000 mm/min	The maximal permissible velocity of a circle with 10 mm diameter, see 3.5.3.			

In this part, you can set parameters related with motion control.

#### • Laser Device Parameters

In this part, you can set the parameters related with the laser device.

	You can select the mated laser machine and main stream laser types are
Laser Device	supported including SPI, IPG, EO and so on.

功率调整方式	分为占空比调节和模拟量调节。选择占空比调节,则速度功率曲线调节的是占空比;选择模拟量调节,则速度功率曲线调节的是峰值功率。
激光功率	激光功率 100%时对应的电压值。
最小脉冲宽度	指由占空比控制激光功率时所允许的最小脉冲宽度。当脉冲宽度小于此值时,则 使用此最小脉冲宽度;当脉冲宽度大于此最小脉冲宽度时,则使用的是占空比中 的脉冲宽度。
点射功率	对应点射时的峰值功率。
点射频率	点射时脉冲出光的频率。
点射占空比	点射时的占空比。
点射时间	执行点射时激光打开持续时间。

## ▶ 随动控制

蛙跳最小距离	当距离小于该值时,不进行蛙跳,切割头不上抬,直接横移到下一个图形起点。
灵敏等级	设定跟随浮头动态灵敏程度,数字越大越灵敏。
定高位置	既可以点击【获取定高位置】将当前的 Z 轴机械坐标设置为定高位置,也可直接 手动输入定高位置。
直接跟随最大高 度	当跟随高度、三级穿孔高度小于该值时,直接跟随到设定高度;当跟随高度、三级穿孔高度大于该值时,先跟随 1mm 再上升到设定高度。

## ◆ 气压控制

默认吹气类型	打开吹气端口默认使用气体,包括空气、氮气和氧气。
气压空闲值	机床空闲时的气压值。
换气延时	主要用于渐进穿孔和分段穿孔,若切割气体与穿孔气体不同,在穿孔完成后切换 气体的延时,过程中不关激光。
吹气延时	吹气端口从关闭状态切换到打开状态,将执行吹气延时。

## ◆ 加工后行为

Z轴停靠位置	设置加工完成后浮头上抬的目标位置。
--------	-------------------

Adjust Power Mode	It consists of duty ratio adjust and analog adjust. If duty ratio adjust is elected, the speed power curve adjusts the duty ratio; if analog adjust is selected, the speed power curve adjusts peak power.
Laser Power	It specifies the power value when laser power is 100%.
Min pulse width	It specifies the minimum allowable pulse width when laser power is controlled by duty ratio. When pulse width is smaller than this value, this value is used. When larger, pulse width in duty ratio is used.
Burst current	It corresponds to the peak power in burst.
Burst frequency	It refers to the frequency light output by pulse in burst.
Burst power	It refers to the duty ratio in burst.
Burst Time	It refers to the duration of laser during bursting.

## Follow control

Frogleaping Distance	Min.	When the distance is lower than this value, the system directly traverses to the start point of the next object without frog leaping and uplifting cutting head.
Sensitivity		It specifies the sensitivity of the cutting head. The larger the value is, the more sensitive it will be.
Get Fixed Pos		You can either click "Get fixed position" to set current Z-axis machine coordinate as the fixed position or directly input the height position manually.
Directly follow maximal height	the	If follow height and three segment piercing height are lower than this value, the system will directly follow to the set height. If larger, however, the system will follow 1 mm and rise to the set height.

### Pressure control

Default blow type	It specifies the default gas when blow port is open, including air, nitrogen and oxygen
Value of pressure in idle	It specifies the pressure in idle state.
Switch gas delay	Mainly used in incremental piercing and segmented piercing, it refers to the delay time for switching types of gas after piercing if cutting gas type is different from that in piercing, with laser remaining on.
Gas on Delay	When blow port is switched from off state to on state, the system will execute this delay time.

#### Task end motions

7LIP position	It specifies the target position to which the cutting head rises to after
	machining.

XY 轴附加行为	设置加工结束后 X 轴和 Y 轴的位置,	可选择不动,	回工件原点,	回固定点,	回标
	记点。				

## ◆ 高级

▶ 带膜切割

在切割表层贴膜的金属材料时,若不先把膜切掉,切割时膜融化挂丝,会污染切割头和板材。因此增加带膜切割功能,包括"不切膜","逐个切膜","分组切膜"以及"全局切膜"。

不切膜	指直接切割。
逐个切膜	指单个图形先切膜,切膜之后加工该图形。
分组切膜	指以组为单位,先对整个组的图形切膜,然后实际加工该组图形,其他组的图形 也依照这样的次序进行。
全局切膜	指当前文件所有图形切完膜后,再进行实际加工。

一般情况下,切膜的功率、切割高度等加工参数与实际切割参数不一样,故将第8图层设置为切膜图层,可在该图层上设置合适的切膜参数。

▶ 板外跟随

板外切割高度:板外引入时切割头距离板面的高度。设置完成后,点击【跟随至板外高度并保存】即可。

# 2.2.2 设置引刀线

点击工具栏上的└──或者选择【视图】菜单下【显示引刀线】子菜单项显示引刀线。

选中对象后,用户可直接点击绘图工具栏上的设置引刀线图标,或选择【对象】菜单下的【设置引刀线】子菜单项,或者直接点击鼠标右键调出快捷菜单中的【设置引刀线】,弹出对话框如图 2-21。

	You can set the X and Y position after machining. Available options are:
XY axes actions	no motion, back to workpiece origin, back to fixed position and back to
	mark point.

## Advanced

### Cut film

When coated metal material is being cut, if its film is not removed, it will be melted and stuck to the tool nose. So the combo box of cutting film is added at the bottom of the layer parameters dialog box, including "no film cut", "cut one by one", "cut by groups", "cut globally", as shown below.

No film cut	It refers to direct cutting.
Cut one by one	cut film before machining a single shape
Cut by groups	cut film before machining a group of shapes and then execute the same operation to the other groups.
Cut globally	cut the film of all the shapes with one shot before actual machining

Since the machining parameters like film cutting power and film cutting height are different from the actual cutting parameters, the eighth layer is designated as the film cutting layer for setting proper film cutting parameters.

### Follow outside

The outside part height: the distance between cut head and the workpiece surface in during leading in from outside part. After setting the height, click "Set outside height" to confirm.

# 2.2.2 Lead-in/out Line Setting

Click in the drawing toolbar or select "Show lead in/out line" under "View" menu to display the lead in/out line.

After selecting the objects, you can click in drawing toolbar, or selecting "Set lead in/out line" under "Object" menu or under the right-click menu. Its interface is as Fig. 2-21.

设置引刀线		×
- 引入线 类型①: 勾型 ▼	引出线 类型(): 无 ▼	E
半径(A): 1 mm	张角(N): 0 deg	
长度(L): 3 mm	长度(E): 2 mm	Š
✓引线起点添加小圆孔 圆孔半径:0.5 mm		
封闭图形	开口图形	
封口长度(S): 0 高级>> 段号(O): 0	<sup>mm</sup> 引入方式: ◎ 7 ○ 7	も の 左引刀 5引刀
位置比@: 0 手动设定	引出方式: ◎ ラ ◎ ヌ	단 ◎ 左引刀 5引刀
	C	确定 取消

图 2-21 设置引刀线

如上所示,对话框包括引入线,引出线,封闭图形和开口图形四个部分。

**引刀线类型:**包括直线引刀线、圆弧引刀线和勾型引刀线。勾型引刀线是由圆弧和直线构成的,且只有引入线。直线引刀线、圆弧引刀线和勾型引刀线在使用上并无明显的界限,可以相互替换。引刀线类型的选取完全由客户的切割工艺来决定;引刀线的引入是为了加工的精确。

如果用户只对封闭图形进行引刀线设置,开口图形框将禁用。如上所示为同时对封闭图形和开口图形 执行引刀线设置。引线起点添加小圆孔是为了解决在穿厚板时,熔渣堆积影响切割效果的问题。在引线起 点添加合适的小圆孔,即可将熔渣一并切除,从而保证切割质量。以下列出【设置引刀线】对话框中的名 词解释。

张角	直线张角是指引刀线与切线的夹角,圆弧张角是指圆心角。
半径	勾型半径是指引刀线圆弧部分半径。
长度	直线引刀线和圆弧引刀线的长度是指引入线与引出线的长度,勾型引刀线长度是指圆弧 部分半径与直线部分长度之和。
圆孔半径	引线起点小圆孔的半径。
封口长度	封口长度的范围为-500~500。根据封口长度的大小可设置开口引刀线和封口引刀线。长度是负值为缺口,即开口引刀线。长度是正值为过切,即封口引刀线。

Set Lead-in/out Lir	e	-	-		x
Lead-in Type: Hook Radius: Length: 3	mm	Lead-out Type Angle Length	: Line	eg _	S E
✓ Add tiny of Circle Radius 0.5 Closed Graphics	ircle at lead in : mm		UnClosed Gra	aphics	
Advanced>>	Seal Len: 0 SegNo,: 0	mm	Enter Side:	<ul> <li>None</li> <li>Right S</li> <li>None</li> </ul>	© Left Side ide
ManualSet	Poskado; U		LAR SIDE.	© Right S	Cancel

Fig. 2-21 Set Lead-in/out Line

As shown above, the interface can be divided into four parts, including lead in, lead out, closed graphics and unclosed graphics.

**Lead-in/out line type:** including line, arc and hook. Hook lead line is made up by arc and line and only supports lead in. There is no obvious limit among linear, arc and hook lead in/out lines in usage, so they can replace each other. The type of lead-in/out line is chosen in terms of cutting technique; besides, the use of lead-in/out line is for precise machining, and the user can decide whether to set it or not.

If you set lead in/out line to the closed objects, the unclosed graphic box is disabled and vice versa. The figure above shows the lead-in/out line setting on both closed and unclosed objects. Adding tiny circle at lead in can solve the problem that slag accumulated during piercing thick plate influences cutting effect. The following gives the explanation to the parameters in the dialog box.

Angle	It refers to the included angle between lead in/out line and tangent line in line type and the center angle in arc type.
Radius	Hook radius refers to the radius of arc part of the lead-in/out line.
Length	In line and arc type, it refers to the length of cut-in edge or cut-out edge of lead-in/out line while in hook type it sums the radius of arc and the length of line.
Circle Radius	The radius of tiny circle at the start point of lead-in line.
Seal len	It ranges from -500 to 500. Seal length decides whether lead-in/out line is cut-out or seal. In case of a negative value, under-cut will appear, i.e. this is a cut-out lead-in/out line. In case of a positive value, over-cut will appear, i.e. this is a seal lead-in/out line.

段号	被选取的对象上可能会有 N 条线段 (N 为自然数),引刀线所在的线段在该对象上所有 线段中的排序号称为"线段号"(用来确定引刀线设置在哪一条线段上)。段号设置为-1, 表示将整个图形看作一段,位置比就是引刀线到图形起点的距离相对于图形总长的比 值。
位置比	引刀线在其所在线段上的位置到该线段起点的距离与该线段总长度的比值,范围【0,0.999】。
简化/高级	此按钮是简化和高级设置的转换。简化模式下,段号和位置比灰显,不能使用。
手动设定	点击手动设定按钮后,光标变成 <sup>飞</sup> ,该按钮的功能等同于【对象】菜单下或者右键快捷 菜单下的【引刀线起点】子菜单项,可以手动确定引刀线的位置。
左 <b>/</b> 右引刀	针对开口图形设置引刀线。以加工方向为准,左引刀是指在加工方向的左侧进行引入或 引出,右引刀是指在加工方向的右侧进行引入或引出。

五种引刀线的效果如图 2-22 所示



图 2-22 引刀线示例

Seg No.	There are probable N straight lines (N is natural number) on the selected object. "Segment No." refers to the sequence number of the segment where the lead-in/out line is on among all the segments of the selected object (It is used to fix the location of lead-in/out line on a certain segment). When it is set as -1, "Pos Ratio" refers to the ratio of the distance between lead in/out and the object origin to the total length of the object.
Pos Ratio	It refers to the ratio of the distance between the position of lead-in/out line on a segment and the beginning of this segment to the whole length of the segment, and its range is "0, 0.999"
Simplified/Advanced	This button is to switch between simplified and advanced setting. Under simplified mode, segment No. and position ration are not available.
Manual set	After this button is clicked, the mouse cursor turns into <b>*</b> . It equals to the "Set start point" under "Object" menu or under the right-click menu, which can confirm the lead in/out position manually.
Left/right side	It mainly focuses on the unclosed objects. In the terms of machining direction, left side refers to leading in/out at the left side while right side means leading in/out at the right side.

The effect sketch of five types is as shown in Fig. 2-22:



Fig. 2-22 Lead-in/out Line Illustration

🐨 涉及参数

参数	设定范围	默认值	含义
启用引刀线速度	是: 启用; 否: 不启用	否	机床加工引刀线时是否启 用引刀线速度。
引入线速度	[0.06, 各轴最大速度最大值]	1200.000 mm/min	机床加工引入线的速度。
引出线速度	[0.06, 各轴最大速度最大值]	1200.000 mm/min	机床加工引出线的速度。



图形阴切时,会智能设置引刀线,即选择合适的位置并适当对引刀线进行剪裁,避免自交。

# 2.2.3 加工方向设置

◆ 改变加工方向

点击工具栏上的 按钮或选择【视图】菜单下【显示方向】,可显示加工方向。

选中对象,点击【对象】菜单下的【改变加工方向】子菜单,或者直接右击鼠标调出右键快捷菜单, 选中【改变加工方向】,则加工方向反向。

### ◆ 设置加工方向

选中对象,点击【对象】菜单下的【设置加工方向】子菜单,或者直接右击鼠标调出右键快捷菜单, 选中【设置加工方向】,弹出如下图 2-23 对话框,用户可智能设置加工方向。

设置加工方向
封闭图形 <ul> <li>顺时针</li> <li>逆时针</li> <li>阳切逆时针,阴切顺时针(留左边)</li> <li>即切顺时针,阴切逆时针(留右边)</li> <li>反向</li> </ul>
高级 副跳过组合对象
确定 取消

图 2-23 设置加工方向对话框

用户可设置顺时针, 逆时针, 或者根据阴切阳切来确定顺逆时针。

### Related parameters

Parameter	Setting Range	Default	Definition		
			It specifies whether to enable		
Enable Lead in/out speed	YES: Enable; NO: Disable	NO	the lead in/out speed in		
			machining lead in/out line.		
Loodin anod	[0.06, Max. value of the	1200.000	It specifies the speed in		
Lead in speed	max. speed of each axis]	mm/min	machining lead in ling.		
Lood out around	[0.06, Max. value of the	1200.000	It specifies the speed in		
Lead out speed	max. speed of each axis] mm/min		machining lead out line.		



If a selected object is under "Unfill" mode, the system will select appropriate position to set lead in/out line and cut the line properly to avoid overlapping.

# 2.2.3 Machining Direction Setting

### Reverse direction

Click in drawing toolbar or select "Show direction" under "View" menu to display the machining direction.

Select an object, then click "Reverse direction" under "Object" menu or under the right-click menu and to change the machining direction.

### • Set direction

Select an object, then click "Set direction" under "Object" menu or under the right-click menu to open the dialog box as shown in Fig. 2-23, in which you can set the direction as you need.

Set Direction
Closed objects
© cw
© ccw
CCW for Fill while CW for Unfill (Left reserved)
OW for Fill while CCW for Unfill (Right reserved)
Reverse
Advanced
Skip groups
OK Cancel

Fig. 2-23 Set Direction Dialog Box

You can set direction of CW or CCW and confirm the direction based on "Fill" or "Unfill" mode.

#### 冷却点 2.2.4

为改善切割厚板时拐点的切割效果,系统提供冷却点功能,用户可通过该功能在图形拐点处添加冷却 点,系统在加工到此处时会关闭激光,吹"冷却气",待"冷却延时"结束后,再打开激光继续加工,在 此期间吹气端口、随动均不关闭。

选中对象后,选择【对象】菜单下的【冷却点】子菜单项,当光标变成+,时,在图形拐点处点击即 可,设置冷却点后图形如图 2-24 所示:



添加冷却点前

## 图 2-24 添加冷却点

#### 2.2.5 倒角

为改善切割厚板时拐点的切割效果,除冷却点功能外,系统还提供圆弧倒角功能。该功能可对封闭图 形中所有小于 180 的角进行圆弧倒角处理。

选中对象后,选择【对象】菜单下的【倒角】子菜单项或右键下拉菜单中选择倒角,弹出倒角对话框, 如图 2-25 所示。用户设置合适的倒角范围和圆弧半径后,系统自动对选中的对象进行倒角处理,设置倒 角时需注意区分阴切和阳切;用户亦可通过设置指定的圆弧半径后,使用鼠标指定,选择合适的位置进行 倒角处理。

倒角				x
倒角类型:	圆弧	•		
倒角范围:	15	~	120	度
圆弧半径:	5	mm	鼠标指	<del>ک</del>
(	确定		取消	

图 2-25 倒角

# 2.2.4 Cooling Point

To improve the cutting at corners of thick parts, the system provides Cooling Point function. With this function, you can add cooling points at corners of the graphs. And laser will be closed when the machine tool machines to the point. After "Cool Delay" time, laser is reopened and machining starts again. In this process, blow port and follow up function keeps open.

After selecting objects, click the sub-menu "Cool Point" under menu "Object". And the cursor will

become +, click on the corners of graphs to add cool points as shown in Fig. 2-24.



Fig. 2-24 Add Cooling Points

# 2.2.5 Chamfer

To improve the cutting at corners of thick parts, the system also provides Chamfer function, besides Stop Corner function. With this function, you can chamfer angles less than 180 degree in closed graphs.

After selecting the objects, click the submenu Chamfer under menu Object, or right click and click on Chamfer in the shortcut menu. A dialog box as Fig. 2-25 will pop up. After you set the chamfer angle range and radius of the arc in the dialog box, the system will execute chamfer accordingly. Please note that settings can be different for negative chamfers and positive chamfers. You can also only set the arc radius and select a point to chamfer with the mouse.

Chamfer				x
Type:	Arc	•		
Angle:	15	~	120	Deg
ArcRadius:	5	mm	ByMous	se
	ОК		Cance	

Fig. 2-25 Chamfer

# 2.2.6 释放角

在切割之后的折弯工艺中,将板材折弯的连接处挖掉一块扇形区域,解决板材折弯后拐角处材料挤压 会鼓起的问题。点击【对象】菜单下的【释放角】子菜单,弹出如图 2-26 所示对话框,用户设置指定释 放角半径后,光标变为 后,在图形上相应位置点击即可。

释放角		X
请指定释放角半径:	1	mm
确定	_ 	肖

图 2-26 释放角



图 2-27 释放角操作前后对比图

## 2.2.7 割缝补偿

激光切割存在割缝,割缝是切割时损耗的部分,因此实际切割完成的零件尺寸与零件的理论尺寸存在 偏差。这种偏差造成实际零件尺寸外轮廓部分长度方向变小,内轮廓部分尺寸变大。本系统利用"割缝补 偿"对这种偏差进行几何尺寸补偿。

选中对象后,用户可直接点击绘图工具栏上的设置割缝补偿图标 ,或选择【对象】菜单下的【设置割缝补偿】子菜单项,或直接点击鼠标右键调出快捷菜单中的【设置割缝补偿】,弹出对话框如图 2-28。

# 2.2.6 Release Angle

During bending process after cutting, cut out a fan-shaped area at the bending corner of bent plate to solve the uplift of material at the bending corner. Click "Release Angle" under menu "Object", and a dialog box as shown in Fig. 2-26 will pop out. After you specify the radius of release angle and the cursor

turns

, click on the corresponding point to execute release angle.



Fig. 2-26 Dialog Box "Release Angle"





# 2.2.7 Kerf Compensation

Since kerf, the wearing part in cutting, exists in laser cutting, there is difference between the actually cut part size and the theoretical part size. This bias leads to a smaller size in outer contour and a larger size in inner contour. This system uses "kerf compensation" to compensate the geometry size.

After selecting objects, you can directly click the icon in drawing toolbar, or select "Set Kerf compensation" under "Object" menu or the right-click menu to open dialog box as shown in Fig. 2-28.



图 2-28 设置割缝补偿对话框

#### 补偿类型

内缩	保留零件外部的补偿。
外扩	保留零件内部的补偿。
内缩外扩	根据嵌套关系决定对加工对象进行内缩补偿或外扩补偿。
双向扩展	既保留零件内部,又保留零件外部的补偿。



若所选图形中含有文字, 需先将文字转化为图形才能进行补偿设置。

## 2.2.8 视教编程

为方便用户编辑异型图形的刀路,软件提供视教编程功能,使用户可根据工件的外形轮廓手动绘制加 工刀路。

选择【机床】菜单下的【视教编程】子菜单,或者直接点击绘图工具栏上的 <sup>1</sup> 视数</sup>按钮,弹出如下 图 2-29 对话框。

视教编程				×
段号:	0	开始新段	Y+	◎ 连续
□ 兄与:	终点	完成本稅	x- ~ x+	© 1 mm
◎ 相切弧	终点			◯ 10 mm ◯ 100 mm
◎ 三点弧	点2	点3	Y-	© 500 mm
◎ 三点圆	点2	点3	X: 0.000	停止
放弃本段	回退1节	回退1点	Y: 0.000	清除轨迹

图 2-29 视教编程对话框

**段号:**"开始新段"与"完成本段"的组合操作即可确定一段; **节点号:**点即曲线中的控制点,控制曲线的形状。



Fig. 2-28 Kerf Compensation Type

### **Compensation type**

Shrink	The compensation reserving the workpiece inner part.
Expand	The compensation reserving the workpiece outer part.
Expand or shrink	The system decides to execute shrink or expand compensation to the machining objects based on the nesting relation.
Expand and shrink	The compensation reserving both inner and outer part of the workpiece.



If text is contained in the selected objects, you need to transfer the text into graph before kerf compensation.

# 2.2.8 Teaching

For the convenience of editing special-shaped tool path, the software is equipped with teaching function so as to help you draw a machining path manually according to the shape and contour of workpiece.

Select the "Teaching" under "Mach" menu or click the icon , the dialog box as shown in Fig. 2-29 will pop out.

Teaching				X
Path No.: Node No.:	0	Start Path End Path	Y+	● Jog ◎ 0.1 mm
Line	End Point		X- ~ X+	<pre> 0 1 mm 0 10 mm </pre>
<ul> <li>Tangent Arc</li> <li>3-Points Arc</li> </ul>	Point 2	Point 3	Y-	© 100 mm ⊚ 500 mm
🔘 3-Points Circle	Point 2	Point 3	x: 0.000	Stop
Abandon Path	Back 1 Node	Back 1 Point	Y: 0.000	Clear Track

Fig. 2-29 Teaching Dialog Box

Path No.: a path is confirmed after started and ended.

Node No.: a control point of curve to control the shape of curve, including linear node and circular node.

可分为直线型节点和曲线形节点。画线段时点击一次【终点】按钮即可确定一个直线型节点; 画相切 弧或者三点弧时,点击一次【终点】或【点3】即确定一个曲线形节点。

线段:通过两个点确定一条线段。

相切弧:两个圆弧相切或圆弧与直线相切,有且只有一个交点。

三点弧:通过三个点确定一段圆弧。

**三点圆**:通过三个点确定一个圆。



段号和节点号是软件自动计算的,不能手动改变。

#### ◆ 操作步骤

下面以三点弧为例,说明具体操作与使用方法。

- 选中【三点弧】按钮,点击【开始新段】,即以当前的 XY 坐标位置为第一点。若当前点不是所需 的第一点,则先移动 XY 轴到目标位置再点击【开始新段】即可自主选择第一点位置。
- 2) 选定第一点后,移动坐标轴到下一个目标位置点击【点2】即确定了第二点。
- 再移动坐标轴到第三个目标位置点击【点 3】即确定了一个三点圆弧,此时【点 3】也作为下一 节的第一点即【点 1】。
- 4) 再移动坐标轴,点击【点 2】和【点 3】即可确定第二个圆弧,以此类推可连续画第三个第四个 第N个圆弧,直到点击【完成本段】。

若画图中需取消已选定的点 2,可点击【回退 1 点】。但是点击了【点 3】完成一节圆弧后如想取消当前第三点,则【回退 1 点】不能使用,只能使用【回退 1 节】(因为它已经是节点)。【回退 1 点】功能可 取消已选定的第三点和第二点,但不会取消第一点。若第一点坐标也需取消,只能点击【放弃本段】。

手动移动坐标时可选择连续和步进方式。连续方式下可通过数字键组合和只按数字键切换手动高低速。步进方式下可通过点击【停止】按钮来停止正在移动的坐标轴。



- 1) 点击【完成本段】后,【放弃本段】不再起作用。
- 2) 绘制完成后需点击【完成本段】, 否则所绘图形不予保留。
- 3) 【清除轨迹】可清除绘图中留下的红色多余轨迹,保留有用的蓝色刀路轨迹。

When drawing a line (i.e. a segment), each time clicking on "End Point" will confirm a linear node, while when drawing a tangent arc or a three-point arc, each time clicking on "End Point" or "Point 3" will confirm a circular node.

Line: two points to confirm a line.

Tangent arc: two arcs tangent to each other with only one point of intersection.

Three-point arc: confirming an arc through three points.

Three-point circle: confirming a circle through three points.

# **CAUTION**

Path number and node number are calculated automatically by the system and manual modification is forbidden.

### • Operation steps

Take "3 Points Arc" as an example to illustrate the concrete operation and usage:

- Select "3 Points Arc", and then click "Start Path" to set current XY coordinates as the first point. If the current point is not the desired one, move XY axes to the desired position before clicking "Start Path" in order to set the desired position as the first point.
- 2) After the first point is set, move XY axes to the next target position, then click "Point 2" to confirm the second point,
- 3) Move XY axes to the third target position, and then click "Point 3" to confirm a three-point arc, meanwhile, point 3 is also the first point of the next arc.
- 4) Then operate as the same to confirm the second and third point of second, third...nth arc as confirming the second and third point of the first arc and click "End Path" to complete this path at last.

During drawing, if you need to delete the selected point 2, you can click "Back 1 Point". But when an arc is confirmed after clicking "Point 3", you have to click "Back 1 Node" to delete the current third point because now the third point is a node and "Back 1 Point" is invalid. "Back 1 Node" cancels the drawn third and second point, with the first point remained. To cancel the first point, you have to click "Abandon Path".

Manually move coordinates in Jog or Incremental step mode. Number keys 4, 6, 2 and 8 on the keyboard are respectively corresponding to X-, X+, Y- and Y+. Combination key can also be used. For instance, when 0 and 4 are pressed simultaneously, the spindle moves towards the negative direction of X axis at rapid jogging speed. However, when only key "4" is pressed, the spindle moves toward the negative direction of X axis at jogging speed.



- 1) After "End path" is clicked, "Abandon path" will be disabled.
- 2) After drawing you should click "End path", otherwise the objects won't be saved.
- 3) "Clear track" function clears the redundant red traces and keeps the useful blue ones.

## 2.2.9 一键设置

为方便用户使用软件,减少操作步骤,故增加一键设置功能。

选中对象后,选择【对象】菜单下的【一键设置】子菜单项,或者直接点击绘图工具栏上的 **设置**, 或调出右键快捷菜单选择【一键设置】,弹出如下图 2-30 对话框。

一键设置				×
- 阴切/阳切 ◎ 不变	◎阳切	◎阴切	◎ 根据嵌套关系自动设	圕
加工方向 ◎ 顺时针 ◎ 逆时针	○ 阳切逆时针, ● 阳切顺时针,	阴切顺时针(留左边 阴切逆时针(留右边	D D	
引刀线 引入线: 类型: [ 张角: 0	<u>試</u> deg	引出线: 类型: <u>直线</u> 张角: <sup>0</sup>	封口长度: 0 m	m
长度: 2	mm 添加小圆孔 ).5  mm	长度: 2	mm S	
加工顺序 排序策略:	起始位置	<b>:</b>	高级:	
<ul> <li>○ 最短空</li> <li>◎ X方向</li> <li>○ Y方向</li> </ul>	程 ◎ 左]	上角 ◎ 右上角 下角 ◎ 右下角	<ul> <li>□ 技颜色排序</li> <li>▼ 先内后外</li> <li>□ 先加工开口图形</li> <li>▼ 双向排序</li> </ul>	
割缝补偿 补偿类型:	「内缩外扩 ▼		割缝宽度: 0.2	mm
				消

图 2-30 一键设置对话框

一键设置对话框中可同时对阴阳切、加工方向、引刀线、排序、割缝补偿功能进行设置。各参数功能 前已有介绍,该处只需按照需求修改参数后点击【确定】,即可一步完成几个功能的设置。

## 2.2.10 巡边定位

点击【机床】菜单下的【巡边定位】子菜单,或者选择绘图工具栏上的 经 巡边 按钮,弹出如下图 2-31 对话框,勾选对话框底端的【使用巡边功能】激活该功能。

# 2.2.9 Instant Setting

Instant setting function is added to simplify operation steps, bringing you covenience.

Select objects, and then click icon in drawing toolbar, or select "Instant setting" under "Object" menu or right-click menu, the dialog box as shown in Fig. 2-30 will pop out.

Instant Setting		x		
Fill/Unfill Changeless  Fill	🔘 Unfill	Auto Set Fill/Unfill     Auto Set Fill     Auto Set Fill     Auto Set Fill     Auto Set Fill     Auto Set Fill		
Direction	CW for Fill while CW for Unfill (Left	t reserved)		
○ ccw	V for Fill while CCW for Unfill (Righ	nt reserved)		
Lead-in/out Line				
Lead-in:	Lead-out:	Seal Len: 0 mm		
Type: Line 🔻	Type: Line			
Angle: 0	deg Angle: 0	deg		
Length: 2	mm Length: 2	mm s		
Add tiny circle at le	ad in			
Circle Radius 0.5	mm			
Maching Order				
Sort Strategy:	Start Position:	Advanced:		
MinDistance	🔘 TopLeft 🛛 🔘 TopRight	Sort by color		
<ul> <li>Horizontal</li> </ul>		Inside objects first		
Vertical	BottomLe1 O BottomRig	nt 🔽 Two-way Sort		
Kerf Compensation				
Compensation: Expand of	or : 💌	Kerfwidth: 0.2 mm		
		OK Cancel		

Fig. 2-30 Instant Setting Dialog Box

In the "Instant Setting" dialog box, as shown in Fig. 2-30, included settings are fill or unfill, machining direction, lead-in/out line, machining order, and kerf compensation, which are mentioned above. Set theses parameters according to actual needs and then click "OK" to confirm the settings.

# 2.2.10 Work Coordinate Adjustment

After you click the locating positioning mark in drawing toolbar, or select "WCS adjust" under "Mach" menu, a dialog box will pop out as shown in Fig. 2-31. Check "Use work coordinate adjust" to enable this function.

### 2.2.10.1 定位方式

巡边定位可分为两点定位、三点定位和自动定位。

两点定位方式: 在板材左下角取一点 O'作为新坐标系的原点,X 轴正方向上取一点 A, O'A 即可确定 新的 X 轴,软件自动过 O'点作垂直于 O'A 的直线确定新的 Y 轴。

三点定位方式:以板材左下角为原点,X轴正方向上取 A,B两点确定新的 X 轴,Y 正方向上取一点 C, 软件自动过 C 点做垂直于 AB 的直线确定新的 Y 轴, 垂足即为新坐标系的原点 O'。

自动定位方式:详见 2.2.10.3 节。



图 2-31 巡边定位对话框

## 2.2.10.2 定位操作

以两点定位方式操作为例。

- 确定定位方式后,手动移动 XY 轴到板材左下角取 O'点,点击【设置 O'】,即把当前 O'点位置作 为新工件坐标系的原点。
- 2) 再向 X 轴正方向移动坐标轴取 A 点, O'A 可确定新工件坐标系的 X 轴。此时软件可根据 O', A 两点自动确定新的工件坐标系。
- 3) 点击【计算定位结果】,软件即自动计算出当前板材相对于机械坐标系的旋转角度,加工时软件 会自动将刀路中的工件坐标系旋转相应角度。若旋转角度大于 15 度,表明板材偏移过多,需重 新放置板材再巡边定位。若 O'A 坐标选取不正确或需放弃当前点重新选取,可点击【重置 O'A】, 将当前 O'A 坐标恢复到软件默认值。

## 2.2.10.1 Adjusting Type

There are three adjust types available in this system, namely two-point adjust, three-point adjust and automatic adjust.

Two-point adjust: set a point O' at the lower left of workpiece as the origin of new workpiece coordinate system, and then a point A in the positive direction of X axis; thus, the new X axis O'A is confirmed, the software automatically confirming the new Y axis by constructing a line perpendicular to line O'A through O'.

Three-point adjust: take the left bottom of workpiece as the temporary origin of new WCS, set point A and B in the positive direction of X axis to confirm the new X axis, and then set a point C in Y axis, the software automatically confirming the new Y axis by constructing a line perpendicular to line AB through point C. The foot of perpendicular O' is the origin of new workpiece coordinate system.

Automatic adjust: see 2.2.10.3.



Fig. 2-31 Work Coordinate Adjust

## 2.2.10.2 Steps of Adjusting

Take two-point positioning as an example.

- 1) After selecting "Adjust Type" as "Two points", manually move X and Y axes to point O' at the lower left of workpiece, then click on the button "Set O'" to set O' as the origin of new WCS.
- 2) Move X axis towards positive direction to set point A, line O'A the X axis of new WCS. At this time, the software will confirm the new WCS automatically on the basis of point O' and A.
- 3) After you click on the button "Calculate=>", the software will automatically calculate the angle of rotation of current workpiece with respect to machine coordinate system, so that the software will automatically rotate the WCS in the tool path by the corresponding angle. If the rotation angle is larger than 15 degrees, it indicates that the workpiece is not put well, and the user needs to re-place the workpiece before edge finding again. If the selected coordinates of O' and A are not accurate or currently selected point needs to be deleted so as to choose a new point, clicking the button "Reset O'A" will restore the coordinates of O' and A to the default.

手动移动坐标可选择连续和步进方式。键盘上数字键 4、6、2、8 分别对应坐标轴 X-, X+, Y-,Y+。手动连续模式下使用快捷键组合,如同时按下 "0+4"表示主轴以手动高速向 X 轴负方向运动;只按下数字键 4 则表示主轴以手动低速向 X 轴负方向运动。



1) 取点时需先打开红光,以指引定位位置。

- 2) 三点定位时, A, B, C 三点均需在正半轴上, 且 A 点 X 轴坐标比 B 点的小, 否则轴方向反向。
- 正常加工结束后将自动清除定位结果,下次加工前若不重新定位则按旋转角度为零正常加工。自动清除定位结果并不清除界面中已定位的数据。若还需再使用此定位结果加工,可勾选【使用巡边功能】, 然后点击【确定】按钮即可。

#### 2.2.10.3 自动巡边



图 2-32 自动定位对话框

自动巡边步骤如下:

- 1) 设定巡边参数,包括X偏置,Y偏置,跟随高度和巡边速度;
- 2) 手动移动 X/Y 轴到目标位置的机械坐标。手动移动 X、Y 轴到板材左下角,在靠近板材下边界处 取两点,起点 A、起点 B,在靠近板材左边界处取一点,起点 C。起点 A、B、C 都要在板材内部。

Manually move coordinates in Jog or Incremental step mode. Number keys 4, 6, 2 and 8 on the keyboard are respectively corresponding to X-, X+, Y- and Y+. Combination key can also be used. For instance, when 0 and 4 are pressed simultaneously, the spindle moves towards the negative direction of X axis at rapid jogging speed. However, when only 4 is pressed, the spindle moves toward the negative direction of X axis at jogging speed.

# 

- 1) Before locating a point, you should open lead light first to guide the point position.
- 2) In three-point adjust, all the three points A/B/C should be in the positive half of X axis and the X-axis coordinate value of A should be smaller than that of B, or the axis direction will be reversed.
- 3) The result of edge finding will be cleared automatically after machining ends normally, so the rotation angle will be regarded as 0 degree if no edge finding executed before next machining. Note that the data of last edge finding will not be cleared in the software interface. To continue using these data for machining, select "Use work coordinate adjust" and then click "OK".

## 2.2.10.3 Auto Adjusting



Fig. 2-32 Automatic WCS Adjust

Its operation steps are as follows.

- 1) Set auto WCS adjust parameters, including X offset, Y offset, follow height and edge locating speed.
- 2) Manually move X and Y axes to the lower left of the workpiece and take two starting points A and B at the part lower edge. Then take another starting point C at the left edge. All the starting points (A/B/C) should be within the inner part of the workpiece.

- 3) 手动输入起点 A/B/C 的位置;
- 4) 点击【开始巡边】,执行自动巡边:先定位到起点 A,开跟随后以"巡边速度"往 Y-运动,直到 出边;然后定位到起点 B,开跟随后以"巡边速度"往 Y-运动,直到出边;最后定位到起点 C, 开跟随后以"巡边速度"往 X-运动,直到出边;
- 5) 自动巡边完成后,X、Y轴自动回到板材左下角,即O'点的位置。

# 2.2.11 标记点与固定点

◆ 标记点

此功能用于将目标位置的机械坐标设置为标记点的机械坐标,并在需要时操作机床回到该标记点。

选择【机床】菜单下的【标记点】子菜单项,或者直接点击绘图工具栏上的 + 标记,将弹出如下图 2-33 对话框:



图 2-33 标记点对话框

点击机床控制栏上的方向按钮或快捷键移动机床到目标位置,选择标记点 n(范围为 1~8),点击【标记坐标】,当前位置的机械坐标即被设置为标记点的机械坐标。

## ◆ 固定点

在加工结束后,可选择回到固定点位置。

点击【机床】菜单下的【系统参数】子菜单项,在参数页面下的【1.1 固定点】中可以设置固定点的 机械坐标。默认为 0。

设置完成后,点击【机床】菜单下的【回固定点】,系统将自动回到该固定点坐标处。

## 🐨 涉及参数

参数	设定范围	默认值	含义
X轴机械坐标	[-99999, 99999]	0.000 mm	固定点所在位置的X轴机械坐标。
Y轴机械坐标	[-99999, 99999]	0.000 mm	固定点所在位置的Y轴机械坐标。

- 3) Input the position of starting points A/B/C manually.
- 4) Click "Start" to execute auto WCS adjust: the system first positions the starting point A and keeps moving along negative direction of Y axis in "edge locating speed" after follow enabled until it goes beyond the workpiece edge → then the system first positions the starting point B and keeps moving along negative direction of Y axis in "edge locating speed" after follow enabled until it goes beyond the workpiece edge → finally the system first positions the starting point C and keeps moving along negative direction of X axis in "edge locating speed" after follow enabled until it goes beyond the workpiece edge → finally the system first positions the starting point C and keeps moving along negative direction of X axis in "edge locating speed" after follow enabled until it goes beyond the workpiece edge.
- 5) After auto adjusting is finished, X-axis and Y-axis return to point O' in the lower left of the part.

# 2.2.11 Mark Point and Fixed Point

## Mark point

This function is used to set the machine coordinates of target position as that of mark point so that the machine can return to this mark point in need.

Selecting "Mark point" under "Mach" directly clicking + in drawing toolbar will eject the dialog box as shown in Fig. 2-33.

MarkPoint		
MarkPoint1 -	SetMark	GoMark



After you click the direction buttons in machine toolbar or press the shortcuts keys to move the machine tool to the target position, select mark point number ranging from 1 to 8 and click "Setmark", the current machine coordinate will be set as mark point.

## • Fixed point

After machining ends, the machining can return to the fixed position.

Click "System parameters" under "Mach" menu and set the machine coordinate of fixed point in "1.1 FixedPoint" under this interface. It is zero by default.

After setting finishes, clicking "Backtofixedpoint" under "Mach" menu will drive the system to return to the fixed position.

### Related parameters

Parameter	Setting Range	Default	Definition
X machine coordinate		0.000 mm	X-axis machine coordinate of the fixed
	[-33333, 33333]		point.
V machina coordinata	machina acardinata		Y-axis machine coordinate of the fixed
T machine coordinate	[-99999, 99999]	0.000 mm	point.

# 2.2.12 扫描切割

系统支持对矩形和圆形的矩形阵列,以及圆环阵列进行扫描切割。

选中对象后,选择【对象】菜单下的【扫描】子菜单项,矩形选择直线扫描,圆形选择圆弧扫描,弹 出如下图 2-34 对话框(以直线扫描为例):

直线扫描	×
起刀位置:	⇒ L
	0 AL
◎ 左下	◎右下
最小扫描长度: 0	mm
确定	取消

图 2-34 扫描切割对话框

设置完成后,点击【确定】,开始加工。

### ③ 涉及参数

参数	设定范围	默认值	含义
扫描切割提前开光	[0, 10]	0	扫描切割提前开光参数,单位为半个控制周期。
扫描切割滞后关光	[0, 10]	0	扫描切割滞后关光参数,单位为半个控制周期。
扫描切割硬件缓冲数	[40,128]	95	扫描切割硬件缓冲数,缓冲 1 个相当于半个控制周期。
如果使用扫描切割开始和结束时出现板材没有切透的情况,可设置提前开光和滞后关光参数。			

## 2.2.13 功率显示

选择【视图】菜单下的【轨迹显示】子菜单项中的【显示反馈轨迹】,加工结束后选择【机床】菜单 \* 下的【显示功率】子菜单项,当光标变成 \* 时,将光标移到反馈轨迹处即可显示当前位置的功率 P,如 图 2-35 所示。

# 2.2.12 Scan Cutting

The system supports line scanning on rectangles and circles, and arc scanning on circles.

After choosing the objects, select "Scan" under "Object" menu and decide line scan or arc scan to eject a dialog box as shown in Fig. 2-34, taking line scan as an example.

Line Scan	x	
Start Corner:		
Op Left	🔘 Top Right	
🔘 Bottom Left	🔘 Bottom Right	
Min Scan Length: 0	mm	
ОК	Cancel	

Fig. 2-34 Scanning

After setting, click "OK" to begin scanning.

## Related parameters

Parameter	Setting Range	Default	Description
The time of open laser move	[0, 10]	0	The time of open laser move
forward			forward, 1 for a half control time.
The time of open laser move	[0, 10]	0	The time of open laser move
backward			backward, 1 for a half control time.
The buffer count for scan	[40, 128]	05	The buffer count for scan cutting, 1
cutting		95	for a half control time.
If part is not cut through when scan cutting begins and ends, you can set the above parameters.			

# 2.2.13 Show Power

After checking "Show feedback track" in "Track" under "View" menu, you can select "Show power" under

"Mach" menu to turn the cursor into And then move the cursor on the feedback track to display the power value of current position, Fig. 2-35.


图 2-35 功率显示

功率显示功能须配合反馈轨迹使用,可通过反馈轨迹上显示的功率来调节功率曲线从而得到一个正确 的功率曲线,改善拐角过烧现象,得到理想的加工效果。功率曲线编辑见 2.2.1.2 节。

### 2.2.14 圆管切割设置

#### 2.2.14.1 圆管相贯切割

目前,已有的相贯线切割设备功能相对单一,操作复杂,不能很好地实际加工工艺的要求,也不能满 足工业生产的需求。本系统根据以上特点开发出圆管切割满足管管相贯的精密要求。

选择【对象】菜单下的【圆管切割】子菜单项或直接点击绘图工具栏上的 <del>≓ 圆管</del>, 弹出圆管设置对 话框。圆管切割包括切割圆孔和方孔两种类型。

#### ◆ 圆孔切割

圆孔切割操作具体如下图 2-36 所示。



Fig. 2-35 Show Power

Power display function should be used together with the feedback trace. You can adjust the power curve through the displayed power in feedback trace to achieve a proper curve and ideal machining effect as well as better over-burning in corners. See 2.2.1.2 for how to edit power curve.

### 2.2.14 Pipe Cutting

#### 2.2.14.1 Circle cutting

Currently, existing intersectional cutting equipment, with simple functions, is complex to operate and cannot meet the demands of actual processing technic and industrial production. Therefore, our system provides pipe cutting (round tube cutting) to meet high-precision demand of intersection between pipe and pipe.

Select "Pipe cutting" under "Object" menu or clicking < in drawing toolbar to eject pipe cutting dialog box. Pipe cutting consists of circle cutting and rectangle cutting.

#### • Circle-hole type

Its operation is shown as Fig. 2-36.



图 2-36 圆孔切割

旋转轴	在转台配置下,此轴已被系统固定读取。
	即主圆管的直径,如图中"D"所示。在转台配置下选择单孔或对穿孔切割时,此
主管直径	时可修改,点击后面的即可修改直径,此处直径和参数中"转台直径"同步。
支管直径	即支圆管的直径,如图中"d"所示。切割主管时,需手动输入支管直径。主管直
	径需大于或等于支管直径。
	即主管中心线与支管中心线的偏距,如图 "e" 所示。
偏心距	偏心距最大值 = $\pm \frac{ \pm \hat{e} \hat{e} \hat{e} \hat{e} \hat{e} - \hat{z} \hat{e} \hat{e} \hat{e} \hat{e} \hat{e} \hat{e} \hat{e} e$
相贯角度	即主管与支管相贯时的倾斜角度,如图中"A"所示。相贯角度范围为[5,175]。

输入参数后,点击【生成刀路】,系统会根据输入数据自动生成主管切割运动轨迹。如下图 2-37 所示为主管圆孔的刀路轨迹:



Fig. 2-36 Circle Hole Cutting

Rev axis	Under rotary table configuration, rotary axis is fixed.
	The diameter of primary pipe, like "D" in the above picture. Under rotary table
Primary dia	configuration, its value can be changed by clicking 🛄 behind, synchronizing with
	the system parameter "Rotation Diameter".
	The diameter of auxiliary pipe, like "d" in the above picture. Manually enter the
Auxiliary dia	auxiliary diameter which must be less than or equal to primary diameter, when
	cutting the primary pipe.
	The offset between central line of primary pipe and auxiliary pipe, like "e" in the
Distance	above picture.
	Max, Offset Distance – + Primary Dia. – Auxiliary Dia.
	2
Angle	The tilt angle ([5, 175]) between intersected primary pipe and auxiliary pipe, like "A"
Angle	in the above picture.

After the above parameters are entered and "Create Curve" is clicked, the motion trajectory of cutting the primary tube will be generated automatically according to the data, as shown in Fig. 2-37.



图 2-38 切割主管对穿孔刀路轨迹

选择切割支管端面后,支管直径被固定读取(可修改),需手动输入主管直径。输入参数后点击【确 定】,系统自动生成支管端面的运动轨迹。如下图 2-39 所示:







Fig. 2-37 Trajectory of Cutting Single Primary Pipe



Fig. 2-38 Trajectory of Cutting Pair of Primary Pipe

If "Auxiliary" checked, as shown in Fig. 2-39, the value of auxiliary diameter can also be changed, synchronizing with the system parameter "Rotation Diameter", while the value of primary diameter needs to be entered manually.



Fig. 2-39 Trajectory of Cutting End Face of Auxiliary Pipe

使用"切割位置"可以实现在一根圆管上切割多个相贯孔的目的。如在 X 转台配置下, X 和 Y 分别指 第一个图形切割完后, X 旋转轴空运行旋转所设定的角, Y 轴空运行到所设定的长度后到达下一个切割位 置开始切割。圆孔一次多根切割刀路轨迹如下图 2-40 所示:



图 2-40 主管切割多个圆孔刀路轨迹

#### ◆ 方孔切割

方孔切割与圆孔切割类似,只是部分参数不同,如下图 2-41 所示:



图 2-41 方孔切割参数界面

K	切割的方孔平行于圆管的边为长边。				
宽	切割的方孔垂直于圆管的边为宽边。				
孔倾斜角度	指长边相对于圆管中心线的倾斜角度。此参数用来在圆管上切割多种不同角度位置的				
	方孔。倾斜角是正值,则按逆时针方向倾斜;倾斜角是负值,则按顺时针方向倾斜。				

"Cutting Pos" can be used to cut multiple circular holes on a round tube through "Create Curve". Under "RotaryX" configuration, value of X refers to the angle X axis rotates in rapid traverse with respect to the last cut hole, while value of Y means the length Y axis moves (i.e. to the next cut position) in rapid traverse with respect to the last cut hole. The trajectory is as shown in Fig. 2-40.



Fig. 2-40 The Trajectory to Cut Several Circular Holes on A Primary Tube

#### Rectangle-hole type

Pipe Cutting х Intersecting Tilted-cutting Intersecting Parameters Y Axis 🔻 Rev Axis: Circle Rect Types: 30 mm Primary Dia.: 10 mm Length: 10 Width: mm 0 deg Tilted Angle: h. 0 Distance: mm 45 deg Angle: Cutting Pos X: 0 mm Create Curve Y: 0 deg

It is similar with the circle-hole type, except for some different parameters, as shown in Fig. 2-41.

#### Fig. 2-41 Intersectional Cutting-rectangle Cutting

Length	The size of rectangle edge parallel to the edge of round tube.
Width	The size of rectangle edge perpendicular to the edge of round tube.
Tilted angle	Tilt angle of "Length" edge with respect to the central line of round tube, which can be used to cut multiple rectangle holes on different parts of round tube at different angles. If "Tilted Angle" is positive value, tilt goes CCW; if negative, title goes CW.

EIHONG

图 2-42 切割多个方孔刀路轨迹

#### 2.2.14.2 圆管截面切割

点击【圆管截断】弹出如下图 2-43 对话框:



#### 图 2-43 圆管截断对话框

旋转轴	己被固定读取当前转台轴。
圆管直径	己被固定读取当前旋转直径的参数值。
斜切角度	即切割面与圆管中心线所夹角度,如图中 "A" 所示,范围为[5,175]。

其他参数和圆孔相同,不赘述。如下图 2-42 所示为切割多个方孔的刀路轨迹。

Other parameters are the same as those of circle cutting. Fig. 2-42 is the trajectory to cut several rectangle holes on a primary tube.



Fig. 2-42 The Trajectory to Cut Several Rectangle Holes on A Primary Tube

#### 2.2.14.2 Tilted Cutting

Click "Tilted-cutting", a dialog box as shown in Fig. 2-43 will pop out.



Fig. 2	2-43 ]	Filted	Cutting	Dialog Box	
--------	--------	--------	---------	------------	--

Rev axis	The rotary axis under current rotary table configuration.
Tube dia	The value set in the system parameter "Rotation Diameter".
Angle	The angle ([5, 175]) included by cutting face and pipe central line, like "A" in Fig. 2-44.



图 2-44 圆管截断切割

#### 2.2.14.3 圆管多图切割

本系统支持在一个圆管上切割多种图形。具体操作步骤如下:

1) 在软件中画出或导入所切割的图形,如下图 2-45 所示:



图 2-45 绘制圆管多图切割图形

- 选中全部图形点击鼠标右键或是在【对象】菜单下选择【设置相贯线】(也可单独设置,这样比 较繁琐),弹出设置相贯线对话框。
- ▶ 旋转轴即与当前转台配置类型一致;
- > 圆管直径须大于所有图形的高度的最大值,否则将给出错误提示;
- ▶ 切割精度是实际切割路径与预计轨迹的重合度。切割精度越小切割误差越小。
- 3) 在对话框中输入相关数据后,点击确定,系统即可自动生成在非转台下的运动轨迹。

以上步骤操作完成后,系统将按照自动生成的运动轨迹在圆管上切割出所需的图形孔径。



Fig. 2-44 Motion Trajectory of Pipe Tilted Cutting

#### 2.2.14.3 Multi-cutting of Round Tube

Our software supports cutting multiple objects on a round tube, with the concrete methods as follows.

1) Draw or import the objects to be cut, as shown in Fig. 2-45.



Fig. 2-45 Draw Objects of Pipe Multi-cutting

- 2) Select all the objects and then select "Set Intersecting Line" under "Object" menu or under right-click menu. (Setting "Intersecting Line" for each object is also ok, but too cumbersome.)
- > Axis: consistent with current rotary table configuration.
- Pipe Dia.: the diameter of current pipe, which must be larger than the maximum height of all objects, or an error prompt will pop up.
- Precision: the contact ratio of actual cutting path and pre-estimated path; the smaller the Precision is, the smaller the error will be.
- 3) After setting the above parameters, click "OK" to generate the motion trajectory.

After all operations above are finished, the system will cut the required object holes on the round tube according to the above motion trajectory.

## 2.3 随动控制

2.3.1 硬件连接



图 2-46 随动控制连接示意图



图 2-47 前置放大器安装尺寸图

如上图所示,从左至右依次为前置放大器的长宽示意图、厚度示意图和安装孔位尺寸图。

## 2.3 Follow-up Control

### 2.3.1 Hardware Connection



Fig. 2-46 Connection Sketch of Follow-up System



Fig. 2-47 Dimensional Diagram of Preamplifier

As shown in Fig. 2-47, the three drawings illustrate the length and width, thickness and installation hole position of preamplifier from left to right respectively.



前置放大器的外壳用于屏蔽信号干扰,需保证放大器接触面的外围金属部分与机床有效安装,如下所示:



### 2.3.2 随动界面

点击【机床】菜单下的【随动控制】子菜单项,系统弹出随动控制界面如下图 2-48,包含系统子页 面和参数子页面。每个子页面都是由左侧相应的功能面板和右侧固定的操作面板构成。



#### 图 2-48 随动控制界面

#### ◆ 操作面板

操作面板由三个区域和一个紧停按钮组成,如上图所示:



Since the coat of preamplifier is used for shielding interfering signals, the outer metal part of preamplifier surface should be well installed on the machine, as shown below.



### 2.3.2 Follow-up Control Interface

After "Follow-up control" under "Mach" menu is clicked, the system will eject its interface as shown in Fig. 2-48. It includes system sub-interface and parameter sub-interface and both are made up by function panel on the left and the fixed operation panel on the right.



Fig. 2-48 Follow-up Control

#### Operation panel

It consists of three areas and one E-stop button.

▶ 紧停按钮:系统紧急停止。紧停后机械原点标识会取消,需要重新回机械原点。

▶ 坐标显示区:显示当前各轴的 工件坐标↔ 或 机械坐标↔,两者通过鼠标点击进行切换。

#### ▶ 手动设置区

X+/X-: 手动按钮,分别对应小键盘上的数字 6/4;
Y+/Y-: 手动按钮,分别对应小键盘上的数字 8/2;
Z+/Z-: 手动按钮,分别对应小键盘上的数字 9/3;





#### ▶ 功能设置区

#### 跟随开关

点击 → 按钮,在有标定数据情况下系统将运行自动跟随功能,此时按钮呈蓝色高显。在随动控制界 面下,再次点击该按钮,将停止跟随且 Z 轴回停靠位置;按下【停止】按钮,将停止自动跟随且 Z 轴停在 当前位置。

标定开关

点击 [1] 按钮,系统将运行自动标定功能,此时按钮呈黄色。再次点击该按钮或者按下【停止】按钮 将停止自动标定。

Z轴回原点

点击 ◆ 按钮, Z 轴将执行回机械原点,此时按钮呈绿色。再次点击该按钮或点击停止按钮,可停止回机械原点过程。回机械原点完成后,Z轴前出现 ◆标志。

#### 停止

点击──按钮,系统将停止当前运动进入空闲状态,是随动控制过程中让系统正常中断任务的方法。

E-stop button: System E-stop. After system e-stops, the homing mark will disappear and homing  $\triangleright$ again is needed.

WorkCoor #

- Coordinate display area: Displaying current  $\triangleright$ clicking mouse.
- Manual setting area ≻

X+/X-: Manual button, corresponding to the number key 6/4 respectively on mini keyboard;

Y+/Y-: Manual button, corresponding to the number key 8/2 respectively on mini keyboard;

Z+/Z-: Manual button, corresponding to the number key 9/3 respectively on mini keyboard;

Jog : The button for choosing between jogging mode and incremental mode. Click it to pop up the pull-down menu as shown right.

- Function setting area ≻

#### Follow switch

**1** clicked, the system will run follow-up function automatically at the presence of marking data, with this button highlighted in blue. Under the same interface, click this button again to stop follow-up and move Z to the up position. Click "Stop" to end follow-up with Z remained at current position.

#### Mark switch

₹C clicked, the system will execute marking function automatically, with this button highlighted in yellow.

Click it again or press "Stop" to end auto marking.

#### Z homing

0 clicked, Z-axis will go home automatically, with the button highlighted in green. Click the button

again or press "Stop" to terminate homing operation. After homing finishes, mark 🐨 will appear before Z-axis.

#### Stop

clicked, the system will cancel current motion and enter idle state. It is a method to bring the system to a normal stop in follow-up control.



switchable through

MachCoor 49

or

注意

若 Z 轴未回机械原点,关闭随动, Z 轴不回停靠位置, 而是上抬安全高度。

#### ◆ 功能面板区

功能面板区如上所示,包括主要参数区和示波器。

▶ 主要参数区

跟随使能	点击跟随按钮系统运行自动跟随功能后,跟随使能由关闭状态转为开启状态。
Z轴速度	显示当前 Z 轴运行速度。
Z轴位置	显示当前 Z 轴机械坐标。
当前电容	随动的原理是利用测量浮头与板材之间的电容值来动态调整距离。当切割头距离板材 越近时,显示的当前电容(实际指频率)越小。当切割头碰板时,电容值为 0(金属 板材)。
跟随高度	设定跟随的高度,用户也可在参数子页面下的【跟随设置】中进行修改。
最大速度	设定跟随的最大速度,也可在参数子页面下的【速度设置】中进行修改。
灵敏等级	设定跟随浮头动态灵敏程度,数字越大越灵敏,用户也可在参数子页面下的【跟随设 置】中修改。
停靠位置	设定加工完成后浮头上抬的目标位置,用户也可以在参数子页面下的【跟随设置】中 修改。

用户可以对上述后四个参数进行编辑。单击需要修改参数的当前值,弹出对话框,在对话框中输入输入需要修改的值,点击【确定】保存。此外,也可以将光标放在需要修改参数的右侧,会出现调整光标如

1.000 mm (以跟随高度为例),点击上下方向箭头调整参数值。

▶ 示波器

示波器显示【标定数据】、【实时电容】或【跟随误差】三种曲线。

#### 标定数据

如下图 2-49 所示,横坐标为电容值,纵坐标为浮头与板材的距离。自动标定即浮头标定,指测量切 割头与板材之间的电容与位置的对应关系。



If not going home, Z-axis will lift to safety height instead of returning to the up position after follow-up is turned off.

#### • Function panel

As shown above, it consists of main parameter area and oscilloscope.

Main parameter

	After follow switch is clicked and the system runs following, follow enable			
	is opened.			
Z Speed	Displaying current Z axis running speed.			
Z Position	Displaying current Z axis machine coordinate.			
Capacitance	The follow principle is to adjust the distance between cutting head and part dynamically by measuring their capacitance. The smaller the distance is, the smaller the displayed current capacitance (in actual frequency) will be. And when the cutting head touches the part, capacitance value turns zero for metal part.			
Follow height	It specifies the height in following and you can also modify it under "follow setting" under parameter sub-interface.			
Max speed	It specifies the maximum speed in following and you can also modify it in "speed setting" under parameter sub-interface.			
Sensitivity	It specifies the sensitivity of cutting head. Larger number mean more sensitive. You can also modify it under "follow setting" under parameter sub-interface			
Zup positionIt specifies the target position of cutting head upward motion af machining and you can also modify it under "follow setting" und parameter sub-interface.				

Only the latter four parameters can be modified. Clicking one will eject a dialog box, in which you input the value and click "OK" to save it. Besides, you can also move the cursor on the right of the parameter

to be modified and click the appearing adjust arrow **1.000 mm**, taking follow height as an example, to tune its value.

> Oscilloscope

The oscilloscope illustrates three kinds of curves, including mark data, real-time capacitance and follow error.

#### Mark data

As in Fig. 2-49, X-axis coordinate shows the capacitance while Y-axis coordinate is the distance between cutting head and part. Also called cutting head mark, automatic mark measures the correlation between the capacitance and the distance between cutting head and part.



图 2-49 标定数据

#### 实时电容

表示在一段时间内(横坐标所显示时间)的实时电容变化图。保持切割头和板材静止,观察左上角的 最大差值,反映在这段时间内最大电容与最小电容的差值,如下图 2-50 最大差值为 8,最大差值不超过 30 为理想值。因为该值越大,说明干扰越大,电容测量越不稳定。



图 2-50 实时电容

#### 跟随误差

如下图 2-51 所示,显示当前跟随高度与设置跟随高度之间的差值,反映跟随效果动态精度:



图 2-51 跟随误差



Fig. 2-49 Mark Data

#### **Real-time capacitance**

It displays the capacitance real-time change curve in certain time shown by X-axis coordinate. Keep the cutting head and part still and observe the "max.difference" reflecting the difference between the maximum capacitance and the minimum one during this time in upper left, as shown in Fig. 2-50. The ideal value is no less than 8 and no more than 30. If the value is larger, the interface will be more and capacitance measurement will be less stable.



Fig. 2-50 Real-time Capacitance

#### **Follow error**

As in Fig. 2-51, it shows the difference between actual follow height and specified follow height and reflects the follow dynamic precision.



Fig. 2-51 Follow Error

双击坐标内任意一点可暂停波形,纵坐标顶端的<sup>Auto</sup>样式会变成<sup>Auto</sup>
样式。

右键单击坐标内任意一点弹出标尺参数。勾选【自动设置刻度值】如下图 2-52 所示,此时不能编辑标尺最小值和单位刻度值。取消勾选【自动设置刻度值】,纵坐标顶端的 Auto 消失,此时可在标尺最小值(水平/竖直)和单位刻度值(水平/竖直)对应框内输入需要修改的值,单击鼠标或按回车键确认。

☑ 自动设置刻度值				
横标尺最小值:	0			
橫单位刻度值:	0			
竖标尺最小值:	-5			
竖单位刻度值:	0.2			

图 2-52 设置刻度值

### 2.3.3 调试步骤

准备阶段 电容检测 自动标定 检查随动

- ◆ 准备阶段
  - 1) 参数设置不当可能引起机器损坏。因此,在调试前,请仔细阅读参数说明;
  - 2) 请正确连接切割头、前置放大器与控制系统,详情见第 2.3.1 节;
  - 3) 软件打开无异常报警且当前电容有数值显示;
  - 4) 确定 Z 轴方向,手动点击 Z+/Z-查看 Z 轴运动方向,靠近工作台为负,远离工作台为正。如果不正确,更改参数【轴方向】的值;
  - 5) 判断 PG 分频比是否设置正确,正方向或负方向步进 Z 轴,观察 Z 轴坐标是否变化相应的步进长度,注意区分变化的正负。如果 Z 轴坐标变化与设置的步长不一致,则表明 PG 分频比设置不正确,需修改 PG 分频比,详情见第 2.3.4 节;
  - 6) 正确设置【系统设置】参数,确保基本运动正确以及坐标显示正确,Z轴能够正确回机械原点。

Click anywhere within the coordinate will pause the curve change and turn the Auto at the top of

Y-axis coordinate into

Right click anywhere within the coordinate, a scale parameter box will pop out. Check "Auto Set Scale" as shown in Fig. 2-42, and the input boxes for scale setting are disabled. Uncheck "Auto Set Scale",

Auto will disappear from the top of the vertical coordinate axis. And you can set the minimal and unit scales for horizontal and vertical scale. Click on the dialog box or press Enter to confirm the setting.



Fig. 2-52 Scale Setting

### 2.3.3 Debugging Steps



#### Preparation

- 1) Since improper setting of the parameters may lead to machine breakdown, so please read parameter specification thoroughly before operation.
- 2) Well connect the cutting head, preamplifier and CNC system, refer to section 2.3.1 for details.
- 3) Please ensure that no abnormal alarm prompts and current capacitance is displayed with value after opening the software.
- 4) Confirm the Z-axis direction by clicking Z+/Z- manually to watch it move. Moving toward stands for negative direction and the opposite is positive. If direction is incorrect, you can alter the value of parameter "axis direction".
- 5) To judge whether the dividing frequency ratio is set correctly, you can move Z axis in jogging mode along positive or negative direction, watch corresponding stepping length change of Z-axis coordinate and make a distinct between the increase and decrease of the changing value. If Z-axis coordinate change is inconsistent with the specified step length, which indicates the dividing frequency ratio is set wrong, you should modify its value. For more details, see section 2.3.4.
- 6) Correctly set the parameters in "system setting" to make sure basic motion and coordinate display is normal and Z axis can go home without any problem.

#### ◆ 电容检测

- 1) 用铁板靠近切割喷嘴,观察当前电容值是否实时变化;切割头向下碰触铁板,电容值应为0;
- 2) 正确设置参数界面里【跟随设置】下的【Z轴停靠位置】;
- 3) 移动切割头至板面 2 到 3mm 处静置,观察当前电容值是否稳定(电容变化在 30 以内为最佳), 如果低三位都有明显变化,则说明当前电气干扰严重,如何消除干扰详情见第 2.3.4 节。

#### ◆ 自动标定

系统提供金属标定与非金属标定两种类型,用户可在随动参数中将"非金属标定"设置为"是",则 可自动标定非金属,如木头、塑料等非金属材料。

- 每次系统重新启动后,需对放大器上电 10 分钟预热,确保其内部处于正常工作温度,在电容检测稳定后,标定前先把浮头点动移至靠近板面大约 5mm 处并始终保持板面静止。点击自动标定按钮,系统将自动运行标定过程,耗时 20s 左右,标定结束。整个标定过程分为以下四个步骤:
  - ◆ 切割头缓慢向下运动检测碰板;
  - ◆ 碰到板后,向上移动 5mm;
  - ◆ 浮头第二次缓慢向下运动检测碰板;
  - ◆ 碰到板后,向上缓慢移动设定的标定距离,采集标定数据,得出标定曲线,如下图 2-53 所示。



图 2-53 标定完成后的特征曲线

 标定时需时刻注意使用紧停按钮,防止碰板电容不正确时切割头继续下压造成机床损坏。若碰板 电容不为0,见第2.3.4节;

#### • Capacitance detect

- 1) Move the metal plate to approach to the nozzle and check whether current capacitance varies in real-time; when the cutting head moves downward and touches the metal plate, the capacitance is supposed to be zero.
- 2) Set the parameter "Z up position" value properly.
- 3) Move the cutting head to the position 2~3mm far from the part surface, and keep the cutting head still and observe whether the capacitance is stable (the ideal value is within 30). If the last three numbers of the value fluctuate obviously, the electric interference is serious. Refer to section 2.3.4 for detailed solution.

#### • Auto marking

The system provides metal marking and nonmetal marking. You can set follow-up parameter "Nonmetal Sample" as "Yes" to auto mark nonmetal material such as wood and plastic.

- 1) Power on and warm up the amplifier every time the system restarts to ensure the inside of amplifier is at normal working temperature. When the capacitance is detected stable, move the cutting head to the position about 5mm far from the part surface that should remain still. Click automatic marking button, and the system will run marking automatically for 20 second. The whole marking procedure can be divided into four steps:
  - ♦ Move the cutting head downward slowly to detect and touch part;
  - ♦ After it touches the part, lift it up 5mm;
  - ♦ Again, move the cutting head downward slowly to detect and touch part;
  - After touching the part, the cutting head rises slowly in specified marking distance.
     Meanwhile, the system collects the marking data and obtains the marking curve.



Fig. 2-53 Characteristic Curve after Marking

2) In marking, E-stop button is suggested for use at any time in case of machine breakdown caused by cutting head continuous moving downward if capacitance in touching part is incorrect, which can be handled by referring to section 2.3.4.

3) 标定结束后标定曲线将即时显示,并附有数据稳定度和平滑度的评定。稳定度是指下降 5mm 碰板和碰板上抬 5mm 这两段采集的数据差,差值越大稳定度越低。如果稳定度为"差",则可能是震动较大或者外部干扰较强,需要重新标定。平滑度是指曲线的平滑性,平滑度较差则说明曲线不平滑有起伏或者毛刺,可能需要重新标定。

◆ 检查随动

- 正确设置空移速度、随动最大速度、增益 KP、积分系数 KI、到位允差、零点限速(推荐值: Z 轴空移速度 15000mm/min,跟随最大速度 20000mm/min,增益 KP 200,积分系数 KI 50,到位 允差 0.1 mm,零点限速 0.05mm)。
- 2) 标定成功后开关随动,观察切割头是否抖动以及跟随距离是否正确。
- 3) 跟随后可使用螺丝刀或者小铁片在切割头下方来回移动,观察切割头是否会根据螺丝刀或小铁片的位置上下移动,以及观察是否会产生切割头抖动。
- 4) 根据需要,将"是否检测出边行为"设置为"是",并测试功能的正确性。
- 5) 绘制刀路,不开激光的情况下进行加工,并观察切割头在跟随过程中是否抖动。

- 1) 打开"是否检测出边行为"可有效提高安全性。
- 2) 如果在切割金属时,金属熔渣粘附喷嘴导致碰板报警可将系统参数中的碰板采样延时适当设大。
- 3) 切割材料为金属时,须将"非金属标定"设置为"否",否则会影响跟随精度。

### 2.3.4 常见问题

◆ PG 分频比设置不正确?

如 PG 分频比设置不正确, 需修改 PG 分频比的值, 其设置方法如下:

#### 维智系列伺服驱动器:

PG分频比 =	电机每旋转1圈的指令脉冲数		螺距/脉冲当量		Pr008
	电机每旋转1圈的输出脉冲数×4		编码器分频脉冲数×4	_	$Pr011 \times 4$

3) After marking finishes, the curve displays promptly, with data stability and curve smoothness. Stability is judged by the difference of the collected data between the segment of cutting head down 5mm before touching part and that of cutting head up 5mm after touching part. The larger the difference is, the smaller the stability will be. If the stability is judged "bad", the fluctuation may be relatively more unstable and the external interference may be relatively more serious. You need to mark again. Smoothness refers to the curve gliding property. "Bad" smoothness indicates the curve is not flat with ups and downs or the rags, so remarking is required.

#### Check follow

- Set related parameters properly, including G00 speed, max.speed in follow, follow gain, Integral coefficient, INposition tolerance and zero limit speed range (recommended value: Z G00 speed 9000mm/min, max.speed in follow 20000mm/min, follow gain 200, integral coefficient 1, INposition tolerance 0.1mm and zero limit speed range 0.05mm).
- 2) After marking succeeds, switch on and off the follow to observe whether the cutting head shakes and whether the follow distance is correct;
- 3) After following ends, you can move the bolt driver or tiny metal plate back and forth under the cutting head and see if it moves up and down along with position of bolt driver or the metal plate and if cutting head shakes.
- 4) According to actual need, you can set the "out margin check" as "Yes" and test if the function works;
- 5) Draw a tool path and machine it without enabling laser, and see if the cutting head shakes in follow-up process.



- 1) Enable "out margin check" can improve safety effectively;
- 2) In cutting metal part, it is suggested to set the system parameter "collecting sample delay in touching part" relatively larger if touching part alarm occurs due to metal slag sticking to the nozzle.
- 3) You should set parameter "Nonmetal Sample" as "No" when cutting metal, otherwise follow-up precision will be influenced.

### 2.3.4 FAQ

#### Incorrect PG dividing frequency setting?

If PG dividing frequency ratio is set improperly, you need to modify its value. The setting method is as follows.

#### WISE series servo driver:

 $\label{eq:Dividing Frequency Ratio} \text{Dividing Frequency Ratio} = \frac{\text{Command Pulse No. per Motor Circle}}{\text{Output Pulse No. per Motor Circle} \times 4} = \frac{\text{Screw / Pulse Equivalence}}{\text{Encoder Dividing Frequency Pulse No.} \times 4} = \frac{\text{Pr 008}}{\text{Pr 011} \times 4}$ 

#### 松下 MINAS A5 系列伺服驱动器:

<b>PG</b> 分频比 =	电机每旋转1次的指令脉冲数		螺距/脉冲当量	 Pr0.08
	电机每旋转1次的输出脉冲数×4		编码器分频脉冲数×4	 $\overline{Pr0.11 \times 4}$
安川Σ-V/Σ-7 系列伺服驱动器:				

$$PG$$
分频比 =  $\frac{ 螺距 / 脉冲当量}{ 编码器分频脉冲数 \times 4} = \frac{ 螺距 / 脉冲当量}{ Pn212 \times 4}$ 

台达伺服驱动器:

$$PG$$
分频比 =  $\frac{$ 螺距 / 脉冲当量}{编码器分频脉冲数 × 4} = \frac{螺距 / 脉冲当量}(P1 - 46) × 4

用户可通过调整驱动器参数的值来修改 PG 分频比的值。

◆ 电气干扰严重?

#### 消除干扰方法

- 检查驱动器、朗达控制器 5S 以及扩展端子板 EX30A 与大地是否良好接触。(驱动器的位置对电 气干扰有影响,理论上将驱动器与机床紧密连接较好)。
- 2) 检查电缆线屏蔽层处理是否完好(查看屏蔽层处理需注意屏蔽层是否完好,屏蔽网是否缠绕到外部铁框上)。
- 检查 M16 四芯航空插头拖链电缆线的 4 号脚与放大器之间是否导通,两者之间的电阻值需非常小(如 0.01 Ω),最好为零。
- 4) 检查放大器与机床是否紧密完全接触(在安装放大器前将贴面用砂纸打磨去除氧化层)。
- 5) 通过万用表测试射频电缆线是否完好。
- 6) 机床与大地接触良好。

#### 软件调整方法

- 1) 适当调低 KP 值;
- 2) 适当提高到位允差和零点限速的值。

降低 KP 值将造成跟随精度降低,提高到位允差和零点限速的值可能使切割精度降低,请谨慎操作。

◆ 碰板电容有时不为0?

- ▶ 原因
  - 1) 板材与机床不导通或导通性不好;
  - 2) 标定位置的板材存在锈迹或油漆等绝缘物。

#### Panasonic MINAS A5 series servo driver:

Dividing Frequency Ratio =	Command Pulse No. per Motor Circle	Screw / Pulse Equivalence	Pr 0.08
	Output Pulse No. per Motor Circle $\times$ 4	Encoder Dividing Frequency Pulse $No. \times 4$	$=$ $\frac{1}{\text{Pr } 0.11 \times 4}$
YASKAWA $\Sigma$ -V/ $\Sigma$ -7	series servo driver:		
Dividing Frequency Ratio =	Screw / Pulse Equivalence	_ Screw / Pulse Equivalence	
	Encoder Dividing Frequency Pulse No.×4	$\frac{1}{4} = \frac{1}{1}$ Pn212×4	
DELTA servo driver			
Dividing Frequency Ratio =	Screw / Pulse Equivalence	_ Screw / Pulse Equivalence	
	Encoder Dividing Frequency Pulse No.×4	4 (P1-46)×4	

You can modify PG dividing frequency ratio by adjusting driver parameter values.

#### • Serious electric interference?

#### Approaches to eliminate interference:

- Check whether driver, lambda controller and external board EX30A are well grounded.(since the driver position has influence on the electric interference, it should be connected tight with the machine technically.
- 2) Check whether the cable shielding layer treatment is complete and right, including shielding layer is not broken and shielding nest is not wired to the outer metal frame.
- 3) Check the No.4 pin of M16 tow cable with 4-core air plug and preamplifier is connected. The resistance value between the two should be very small (like 0.01Ω), 0 best.
- 4) Check whether the preamplifier and the machine are connected tight and complete (it is suggested to polish and remove the oxide coating of the touching side by abrasive paper before installing preamplifier).
- 5) Test whether the cable work through multimeter.
- 6) The machine is well grounded.

#### Adjust in software:

- 1) Turn down the KP value slightly;
- 2) Turn up the "in position tolerance" and "Zero limit speed range" slightly.



Turning down the KP value may lead to lower precision and turning up the "in position tolerance" and "Zero limit speed range" may give rise to cutting inaccuracy, so please operate carefully.

#### Capacitance value is not zero in touching part?

- Cause
- 1) The part and the machine are not connected or not well connected;
- 2) Insulator such as rust and paint exists on the part at marking position.

- ▶ 解决方案
  - 1) 下移切割头靠近板材;
  - 2) 手动运动调步进,使用小步长如 0.1 缓慢向下移动直到碰板,查看此时的电容值;
  - 3) 设置参数【碰板电容】为比当前显示电容值更大的值。
- ◆ 电容实际跟随高度与标定跟随高度发生偏差?
- ▶ 原因
  - 1) 系统重新启动后,放大器未预热,其内部尚未达到正常工作温度,此时电容标定曲线尚未稳定;
  - 2) 环境温度变化较大,导致电容曲线产生一定偏移。
- ▶ 解决方案

重新标定即可。

#### ◆ 标定时切割头一直向下运动?

标定时若切割头一直向下运动,有以下几种可能:

- 1) 碰板电容不为0, 解决方案如上;
- 2) 朗达 5S 或 EX30 端子板程序错误, 需联系厂商更换设备;

判断方法:用铁片触碰切割头喷嘴,电容不为0则说明 EX30A 程序错误,电容为0却无碰板报警,则说明朗达 5S 程序错误。

3) 软件安装过程出现问题。

解决方案:将 C:\Program Files\Weihong 下的 NcEditor 文件夹删除,重新安装。若安装时选择将参数分开放置,则还需删除 D 盘下的 Weihong 文件夹(若有需要保留的打包软件、工艺库等,请先将它们备份)。

### 2.3.5 随动参数

下面列出随动控制系统所有参数,供用户参考。

参数名称	设定范围	默认值	生效时间
系统设置			
轴方向	正: 1; 负: -1	1	重启生效
	设置轴方向。		
轴的脉冲当量	[1E-08, 1000]	0.001 mm/p	重启生效
	每个控制脉冲在对应的进给轴上产生的位移或者角度。		
工作台行程下 限	[-999999,限位上限)	-3000 mm	重启生效

- Solution
- 1) Move the cutting head downward and toward the part, and then jiggle the step length manually;
- 2) Use small step length such as 0.1 to drive the cutting head downward until it touches the part and check current capacitance;
- 3) Set the parameter "Touch part capacitance" larger than current capacitance.

• The actual follow height is different from the marked follow height?

- Cause
  - 1) After system restarts, the amplifier is not warmed up to make the inside temperature reach normal working temperature. Therefore, the marking curve of capacitance is unstable;
  - 2) The environment temperature changes enormously, which cause the deviation of marking curve of capacitance.
- Solution

Re-mark.

#### Cutting head keeps moving downward during marking?

The reasons may be as follows.

- 1) The capacitance in touching part is not zero and refers to solutions mentioned above;
- 2) There exist program errors in Lambda 5S or the terminal board EX30A. You need to contact the manufacturers to change another one.

Judging method: move the metal plate to touch the nozzle. If the capacitance is not zero, there exist program errors in EX30A. If the capacitance is zero without any touching part alarm, program errors occur in Lambda 5S.

3) Installation problem

Solution: delete file folder "NcEditor" under C:\Program Files\Weihong and reinstall. If you choose to put the parameters separately in previous installing, it is also required to delete the Weihong folder under D disk (first back up what needs to be saved including software package, technic library and so on).

### 2.3.5 Follow-up Control Parameters

Below are the follow-up control parameters for your reference.

Parameter	Setting Range	Value	Effect Time
System Setting			
Axis direction	Position: 1; Negative: -1	1	After restart
	[1E-08, 1000]	0.001 mm/p	After restart
Pulse equivalent	The displacement and angle of one control pulse in the corresponding		
	feeding axis.		
Lower limit of		3000 mm	Aftor rostart
worktable stroke		-3000 mm	Aller Testan

参数名称	设定范围	默认值	生效时间	
工作台行程上 限	(限位下限, 999999]	0 mm	重启生效	
	-	-1	重启生效	
PG 分频比	Z 轴发送脉冲与反馈脉冲的比值,正数表示轴编码器 0 表示不启用编码器反馈。	器正向,负数表示轴编	码器负向,	
Z 轴粗定位方	正: 1; 负: -1	1	立即生效	
向	在回机械原点过程中,Z 轴粗定位阶段的运动方向。			
Z 轴粗定位阶	[0.06, 9000]	1800 mm/min	立即生效	
段速度	在回机械原点过程中,Z轴粗定位阶段的进给速度。			
	[-100,1000]	2 mm	立即生效	
Z 轴回退距离 回机械原点精定位阶段结束后,Z 轴的调整距离。取正值表示往里回退, 往外出去。			负值表示	
随动仪				
	[0, 65535]	200	立即生效	
配置的 Kp	控制跟随过程的快慢(即增益),值越大越灵敏。但是数值过大将会引起跟随的抖动, 数值过小会使跟随无法运行。建议将该值设为 200。			
<b>町里的レ</b> :	[0, 65535]	50	立即生效	
能直的 <b>N</b>	用作下行 Kp,控制跟随的下行速度。			
前罢滤油店	[0, 999999999]	0.1 ms	立即生效	
刊 <b>旦</b> /応 /汉 国	控制电容值的跳变,值越大,控制跳变的能力越强,但是电容的灵敏度降低。			
户田动太防划	是: 启用; 否: 不启用	是	立即生效	
<b>                                    </b>	是否启用动态防抖,用以抑制诸如吹气伴随的跟随抖动。			
到位分差	[0, 655]	0.1 mm	立即生效	
到位兀差	检测到高度为"跟随高度±到位允差值"时,认为随动到位。			
雪占阳油	[0, 0.1]	0.05 mm	立即生效	
令只限还	在零点限速范围内跟随不再调整。			
标定设置				
北人同七中	是:使用非金属标定;否:不使用非金属标定	否	立即生效	
<b>北</b> 立,两你儿	是否使用非金属标定			
碰板电容	-	0 Hz	立即生效	
	碰板时以频率标识的电容值。			



Parameter	Setting Range	Value	Effect Time	
Upper limit of worktable stroke	(Lower limit, 999999]	0 mm	After restart	
	-	-1	After restart	
Frequency dividing	The ratio between the sending pulses and	d feedback pulse	es of Z axis.	
ratio of Z	Positive value stands for forward direction of	of axis encoder w	hile negative	
	value for backward direction. Note that this va	alue cannot be se	et as "0".	
7 direction in occrea	Position: 1; Negative:-1	1	Immediately	
	The moving direction of Z axis in coarse pos	itioning stage wh	en backing to	
positioning	the reference point.			
7 apart in coorce	[0.06, 9000]	1800 mm/min	Immediately	
z speed in coarse	The feeding speed of Z axis in coarse position	ning stage when l	backing to the	
positioning	reference point.			
	[-100, 1000]	2 mm	Immediately	
Pook appage of 7	The additional displacement of Z after precision	on positioning wh	en backing to	
Back space of Z	the reference point. Positive value represents	s backing inside,	and negative	
	value represents backing outside.			
Follow-up				
	[0, 65535]	200	Immediately	
	The parameter controls the time or gain of fol	low process. If th	e value of the	
Кр	parameter is greater, the follow process will	be more sensiti	ve. Too great	
	value will cause shake in follow process. Ar	nd too small valu	e will disable	
	follow process. Suggested value is 200.			
	[0, 65535]	50	Immediately	
Γ.I	An integral coefficient which can reduce follow	w balance.		
	[0, 99999999]	0.1 ms	Immediately	
<b>Profiltor</b> volue	The parameter controls the jumping of capac	itance. The value	e is larger, the	
Freniller value	ability to control jumping of capacitance will be stronger. But the sensitivity			
	of capacitance will be lower.			
Enable dynamic	Yes: Enable; No: Disable	Yes	Immediately	
anti-shake	Whether to enable dynamic anti-shake in order to control follow shake			
	caused by operations such as blowing.			
	[0, 655]	0.1 mm	Immediately	
INposition tolerance	When detected height is equal to "Follow height $\pm$ INposition tolerance",			
	follow is in position.			
Zero limit speed	[0, 0.1]	0.05 mm	Immediately	
range	Within this range, following motion will not be	adjusted.		
Mark Setting				
Nonmetal Sample	Yes: Enable; No: Disable	No	Immediately	
	Enable nonmetal sample			
Touch part	-	0 Hz	Immediately	
capacitance	It specifies the capacitance in MHz when touching the parts.			

参数名称	设定范围	默认值	生效时间	
长空长舟	[0, 25]	15 mm	立即生效	
你走下度	标定时记录该范围内的电容数据,当 Z 轴行程较短时,可将此参数值适当设低。			
<b>神花</b> 声 庄	[0, 1000000]	100 mm/min	立即生效	
<b>朏似述</b> 反	标定时,碰板运动的速度。			
标定速度	[0, 1000000]	100 mm/min	立即生效	
跟随设置				
Z 轴停靠的位	-	-10	立即生效	
置	回机械原点后关闭跟随或加工结束时,Z轴停靠的标	几械坐标位置。		
它人宣産	[0, 100]	10mm	立即生效	
女王向皮	Z轴未回机械原点时,上抬的安全高度。			
跟随高度	[0, 30]	1 mm	立即生效	
	-	10	立即生效	
灭戰寺级	控制跟随的灵敏度,数值越高灵敏度越高,但是越高	高越容易产生过调。		
实时状态检测				
是否检测出边	是:检测;否:不检测	是	立即生效	
行为	跟随时是否开启出边行为的检测,遇到出边就停止运动。			
山边宏差	[0, 20]	2 mm		
出边谷左	与跟随高度处的位置比较,当前位置在容差范围外时认为出边了。			
山边目御庭	[1, 10]	5	立即生效	
出辺灵敏度	灵敏度值越高越容易判断成出边。			
速度设置				
	[0,轴最大速度]	15000 mm/min	立即生效	
Z轴空移速度	浮头下行和上行运动的速度。当空移速度设置得比较大时,需要相应增加标定长度,			
	这样跟随下行时有足够的减速区,以免撞板。			
跟随最大速度	[0,Z轴支持的最大速度]	20000 mm/min	立即生效	
<u> </u>	跟随时,不能超过的最大速度。			
Z 轴支持的最	[60, 3932100]	20000 mm/min	立即生效	
大速度	跟随速度和空移速度不能超过这个速度。			
跟随加速度	-	10000 mm/s <sup>2</sup>	立即生效	
Z手动速度				
<b>Z</b> 的手动加速 度	[0, 1000000]	800 mm/s <sup>2</sup>	立即生效	



Parameter	Setting Range	Value	Effect Time			
Mark length	[0, 25]	15 mm	Immediately			
	Record the capacitance data in this range.	Set the value sn	nall when the			
	travel of Z axis is short.					
Touch part speed	[0, 1000000]	100 mm/min	Immediately			
	It specifies the speed in touching part during marking.					
Mark speed	[0, 1000000]	100 mm/min	Immediately			
Follow Setting		·				
	-	-10	Immediately			
ZUP position	It specifies the machine coordinate of Z up position after following is disables or homing finishes.					
Sofaty baight	[0,100]	10mm	Immediately			
Salety height	Safety height when Z axis is not back to mec	hanical origin.				
Follow height	[0, 30]	1 mm	Immediately			
	-	10	Immediately			
Sensitivity	It controls the sensitivity of following. The la sensitivity and the more the possibility of the	arger the value, the value, the over-tune will be.	he higher the			
Real-time state checl	ĸ					
	-	Yes	Immediately			
Out margin check	It specifies whether to enable the check for moving out of range in following. If out of range, the machine stops,					
	[0, 20]	2 mm				
Out margin tolerance	If current position is out of tolerance range compared to the follow height					
-	position, the system considers it beyond margin.					
Out margin	[1, 10]	5	Immediately			
sensitivity	A larger value may lead to higher tendency for	or judging out ma	rgin.			
Speed Setting			-			
	[0] man and at 7]	15000	las as a lista ba			
	[0, max. speed of 2]	mm/min	Immediately			
Z G00 speed	Cutting head speed in moving up and down. When G00 speed is too great,					
	you need to add mark length accordingly for cutting head to slow down,					
	avoiding bumping into part.					
Max speed in follow	[0, Max Speed of Z axis]	20000 mm/min	Immediately			
	Max speed in follow should not exceed the maximal speed of Z axis.					
Max speed supported by Z	[60, 3932100]	20000 mm/min	Immediately			
	Note that the follow speed and G00 speed sh	ould not exceed	this value.			
Follow acceleration	-	10000 mm/s <sup>2</sup>	Immediately			
Manual Speed(Z)						
Manual acceleration of Z	[0, 1000000]	800 mm/s <sup>2</sup>	Immediately			
参数名称	设定范围	默认值	生效时间			
--------	---	-------------	-------	--	--	--
手动连续高速	[手动连续低速,轴最大速度与 9000 的最小值]	1800 mm/min	立即生效			
手动连续低速	[0.06,手动连续高速]	1200 mm/min	立即生效			
板外跟随						
板外跟随最大	[0, 65535]	100	立即生效			
Kp 值	板外跟随时 Kp 值限定在此参数范围以内,避免出达	2时跟随太快,下扎过	深。			
	[0, 5]	0mm	立即生效			
最大下扎深度	切割头相对于板材平面允许的最大下扎深度,当切 参数时认为踩空了,切割头上抬。	割头相对于板面下降;	距离超过此			
)边会昭宣帝	[0.01,出边参照高度]	1.5 mm	立即生效			
八边参照同度	当前电容值小于入边参照高度对应的电容值就认为已经入边,打开随动。					
入计成应证时	[1, 500]	10 ms	立即生效			
八辺恐应延时	感应入边所需延时,这个值过大,则跟随滞后,过小则反映过于灵敏。					
	[入边参照高度, 20]	5 mm	立即生效			
出边参照高度	当前电容值在出边感应延时内一直大于出边参照高度对应的电容值,则判断已出边,关闭随动上抬至板外高度。					
	[1, 500]	50 ms	立即生效			
出边感应延时	感应是否出边所需延时,这个值不能太大,否则会 过深。	导致感应出边迟钝,	切割头下扎			

## 2.4 排版

该功能用于图形排版,点击【文件】菜单下的【排版】子菜单项,弹出如下图 2-54 所示对话框:



Parameter	Setting Range	Value	Effect Time			
Depid logging apood	[Jogging speed, the min between Max Z	1900 mm/min	Immodiately			
Rapid jogging speed	axis speed and 9000]	1800 mm/min	immediately			
Jogging speed	[0.06, Rapid jogging speed]	1200 mm/min	Immediately			
Follow Outside Part						
Max Kn in follow	[0, 65535]	100	Immediately			
outsido part	In outside follow, Kp value is limited within	this parameter ra	ange to avoid			
outside part	following too fast and plunging too deep.					
	[0, 5]	0mm	Immediately			
Max plugging depth	The Max. allowable plugging depth of the cu	utting head relati	ve to the part			
max. progging doput	surface. If the actual plugging depth exceeds	setting value of t	he parameter,			
	the cutting head will be outside the part and it should be lifted.					
	[0.01, Reference height out margin]	1.5 mm	Immediately			
Reference height in	If current capacitance stays smaller than that corresponding to this					
margin	parameter value during the sense delay, the system considers it within					
	margin and enables follow.					
	[1, 500]	10 ms	Immediately			
Sense delay in	It specifies the needed delay time for dete	ecting whether v	vithin margin.			
margin	Excessively large value leads to lag in follow while the contrary will make					
	response too sensitive.	r				
	[Reference height in margin, 20]	5 mm	Immediately			
Reference height out	If current capacitance stays larger than that corresponding to this parameter					
margin	value during the sense delay, the system considers it beyond margin and					
	disables follow.					
	[1, 500]	50 ms	Immediately			
Sense delay out	It specifies the needed delay time for detectir	ng whether beyor	nd margin. Do			
margin	not set a too large value for this parameter, otherwise out margin detect will					
	be insensitive, leading the cutting nose to plu	nging too deep.				

## 2.4 Nest

This function is used to nest objects. Click "Nest" under "File" menu, a dialog box as Fig. 2-54 will pop out.

<ul> <li>各称 优先级 排版数量 旋转角度 外框封闭 零件反</li> <li>数加 编辑 删除余</li> <li>牙排版的材料</li> <li>● 名称 类型 宽度 高度 可用数</li> </ul>	待排版的	零件					
Am 编辑 删除	序号	名称	优先级	排版数量	旋转角度	外框封闭	零件尺寸
【編辑 删除     【集辑 删除     【集辑 】     【集辑 】     【集辑 】     【集辑 】     【集辑 】     【「編辑 】     【「編辑 】     【「編辑 】     【「編辑 】     【「「編辑 】     【「「編辑 】     【「「編辑 】     【「「編辑 】     【「「編辑 】     【「「「編辑 】     【」     【」     【」     【」     【」     【     】     【     】     【     】     【     】     【     】     】     【     】     】     【     】     【     】     】     【     】     】     【     】							
Share and a second							
茶加 编辑 删除       茶加 编辑 删除       子排版的材料       号 名称 类型 宽度 高度 可用数							
조加 编辑 删除       子排版的材料       号 名称 类型 宽度 高度 可用数							
<ul> <li>法加 编辑 删除</li> <li>于排版的材料</li> <li>号 各称 类型 宽度 高度 可用数</li> </ul>							
F排版的材料 弓 名称 类型 宽度 高度 可用数 □ - 編輯 删除 → □ - 編輯 ■ ■	添加	编辑	刪除				
	用于排版的	的材料					
	序号	名称	类型	!	宽度	高度	可用数量
	添加 ▼	编辑	刪除				
·····································						H. 4=	

图 2-54 【套料】对话框

#### ◆ 待排版的零件

点击待排版零件框下的【添加】,用户可以选择需要排版的零件,系统支持 nce 格式、dxf 格式以及 dwg 格式。添加完成后,右侧的黑色框会出现待排版零件示意图。

在选择需要编辑的待排版零件后,点击【编辑】或双击所需编辑的零件,弹出如下图 2-55 对话框, 此时用户可对零件的优先级、旋转角度和排版数量进行编辑。

零件信息		×
优先级:	10	<b>-</b>
旋转角度:	随机旋转	•
排版数量:	10	
	确定	取消

图 2-55 零件信息对话框



用户在点击编辑之前,首先要选择需要编辑的零件,否则系统将弹出对话框提示。

- 优先级:设置排版的优先级,数字越大优先级越高。在材料不足的情况下,系统会优先排版级数高的零件;
- ▶ 旋转角度:设置零件的旋转角度;
- ▶ 排版数量:设置提交零件的排版数量。

Parts whic	ch will be nested					
Num	Name	Priority	Nest Count	Rotate Angle	Closed Boundary	Part Size
Add Materials Num	Edit which will be con Name	Delete sumed	2	Width	Height	Available Count
Add Materials Num	Edit which will be con Name	Delete sumed Type	e	Width	Height	Available Count
Add Materials Num	Edit which will be con Name	Delete sumed Type	e	Width	Height	Available Count
Add Materials Num	Edit ( which will be con Name	Delete sumed	2	Width	Height	Available Count
Add Materials Num	Edit ( which will be con Name	Delete sumed	8	Width	Height	Available Count
Add Materials Num	Edit ( which will be con Name	Delete sumed Type	e	Width	Height	Available Count
Add Materials Num	Edit ( which will be con Name	Delete sumed Type	2	Width	Height	Available Count
Add Materials Num	Edit ( which will be con Name	Delete sumed		Width	Height	Available Count
Add Materials Num	Edit ( which will be con Name	Delete sumed Type		Width	Height	Available Cour

Fig. 2-54 Nest Dialog Box

#### Parts which will be nested

You can click "Add" in the "Parts which will be nested" section to select the parts to be nested. The system supports .nce, .dxf and .dwg formats. After parts are loaded, the parts nesting illustration will be displayed in the black area on the right.

And you can click "Edit" to edit priority, rotate angle and nest count in dialog box as shown in Fig. 2-55.

Part Info	×
Priority	10 💌
Rotate Angle	Free Rotate 💌
Nest Count	10
[	OK Cancel

Fig. 2-55 Part Info



You need to select the part to be edited before click "Edit", otherwise a prompt will pop out.

- Priority: set the priority of the parts arrangement. The smaller the number is, the higher the priority will be. In case of insufficient materials, the system will nest those parts that have higher priority first.
- > Rotate angle: set the parts rotary angle.
- Nest count: set the number of parts to be nested.

#### ◆ 用于排版的材料

关于添加用于排版的材料,系统提供了两种方式,即新建材料和导入材料。

点击【新建材料】将弹出对话框,用户可自定义名称、宽度、高度以及数量。用户在设置好后,点击 【确定】,右侧黑色方框会出现排版材料示意图。

点击【导入材料】,用户可从本地导入材料,系统支持 dxf 格式和 dwg 格式。

#### ◆ 排版算法

排版的算法包括快速排版和异形排版。快速排版主要用于排版规则图形如矩形正方形,异形排版主要 用于不规则图形的排版。

#### ◆ 参数设置

点击参数会弹出如下图 2-56 对话框,用户可以设置排版边距,零件间距,起始角和排版方向。

参数设置	×
│ 排版边距及零件间距	
¥	顶部: 10.0 mm
Тор	底部: 10.0 mm
Right +	左边: 10.0 mm
	右边: 10.0 mm
Bottom	间距: 0.100 mm
	排版方向
	$\Leftrightarrow$
	Ĵ
	确定 取消

图 2-56 套料参数设置

设置好参数后,按下【确定】生效。点击【执行】会弹出如下图 2-57 对话框。

点击【查看板材】,出现板材排版示意图如下图 2-58 所示。

点击【保存板材】,把排版后的板材保存为 dxf 格式 (零件均为 dxf 格式) 或者 nce 格式到本地文件夹。

点击【生成余料】, 弹出对话框如下所示, 剩下的部分即为图 2-59 余料, 用户还可点击【另存为 dxf 文件】保存余料。

#### • Materials which will be consumed

As to adding materials, the system provides two methods, including making new materials and importing materials. You can click "New", and customize the name, width, height and number of the material. And through "Import", you can load .dxf and .dwg format material from local.

#### • Nesting algorithm

Nest algorithm consists of "Remnant Rectangle" and "True Shape". "Remnant rectangle" is mainly used in nesting regular figures such as rectangle while "true shape" focuses on irregular figures and applies to special parts with small number.

#### • Parameter setting

After "Config" is clicked, a dialog box as shown in Fig. 2-56 will pop up. You can set nest border, part space, start corner and nest direction here.



Fig. 2-56 Nesting Parameters Setting

After the parameters are set, click "OK" and then click "Execute" to enable the function.

Click "View sheet", and a nest sketch will appear as shown in Fig. 2-58.

Click "Save sheet" to save the nested parts to the local file folder in .dxf or .nce format;

Click "Remnant", and a dialog box as Fig. 2-59 will pop out. Remnant refers to the remaining part of the nested materials and you can click "Save As Dxf" to save it.

排版结果			
─零件排崩 i	反统计 已提交数: 200      已挂	非版数: 120	
序号	名称	提交数量	已排版数量
1	无标题	200	120
	目统计 已提交数: 1 i	2消耗数: 1	总利用率: 72.2
序号	名称	提交数量	已消耗数量
	新建材料	1	1
──生成的机	反材		
序号	名称	数里	材料名称
	sheet1	1	新建材料
生成	板材总数: 1	查看板材	保存板材 生成余料

图 2-57 排版结果



#### 图 2-58 查看板材

Nest Result			×		
Nested Part Statistics Submitted Count 200 Nested Count 120					
Num	Name	Submitted Cour	nt Nested Count		
1	Untitled	200	120		
Material Us Submi	age Statistics	umed Count: 1	Total Utilization(%): 72.2		
Num	Name Naw Matarial				
Generated	Sheet List				
Num	Name	Count	Material Name		
1	sheet1	1	New Material		
Total S	heet Count: 1	View Sheet	Save Sheet Remnant		

Fig. 2-57 Nesting Result



Fig. 2-58 View Sheet



图 2-59 生成余料

## 2.5 视图变换

### 2.5.1 视图平移

用户可打开【视图】菜单下的【视图平移】子菜单项,或者选择绘图工具栏上的 ※ 按钮,然后在对 象编辑区域中按下鼠标左键并拖动鼠标到相应的位置后释放鼠标,或者按住鼠标中间键拖动。 此时不会改变对象在坐标中的位置或比例,只改变视图。

### 2.5.2 实时缩放

用户可打开【视图】菜单下的【实时缩放】子菜单项,或者选择绘图工具栏上的<sup>全</sup>,或选择小键盘 上的+键/-键,实现跟踪轨迹图形的放大缩小,但是只是视图上的缩放,并未改变实际图形的大小。 此外,用户还可滑动鼠标滚轮,对图形进行实时缩放。向前滚动滑轮进行放大,向后则进行缩小。 图形最大可放大 200 倍。

Remnant Material Info	×
Polygons In Remnant Material	Remnant Material Preview Current Cursor Coordinate: x= 0.8387, y= -7.1613
	Re-generate Remnant Material Merge Distance: 10 Re-generate
	SaveAs Dxf Close

Fig. 2-59 Save Sheet

## 2.5 View Transformation

### 2.5.1 Pan

You can select "Pan" under "View" menu or click in drawing toolbar, and then hold down the left button of the mouse in the editing space and move the cursor to the aimed position and release the mouse or just hold down the mouse wheel and drag it.

This command will not change the position or ratio of the figure in the coordinate system, only the view.

## 2.5.2 Zoom

You can select "Zoom" under "View" menu or choose in drawing toolbar, or press the +/- key in mini key board to achieve the zooming in and out of the objects. Note that the actual size of the figure won't change; only the view will be enlarged or minified.

You can also slide the mouse wheel in the "Object Editor Space" to zoom objects. Sliding forward zooms in the object while sliding backward zooms out it.

Graphs can be magnified at most 200 times with zoom function.

#### 2.5.3 窗选放大

用户可打开【视图】菜单下的【窗选放大】子菜单项,或者选择绘图工具栏上的<sup>Q</sup>,可将图形的局 部放大到视图窗口大小,并不会改变对象在坐标中的位置。

### 2.5.4 调整至最适大小

用户可打开【视图】菜单下的【调整至最适大小】子菜单项,或者选择绘图工具栏上的 . ,或者按下小键盘上的\*键,可将跟踪视图自适应大小地在窗口中全部显示,用户无需滚动窗口就能看到跟踪图全貌。

### 2.5.5 视图模式

#### ◆ 绘图模式

系统默认的画图模式,所有的图形都以线框模式显示。

#### ◆ 普通绘图模式

即为填充模式,在阳切模式下,图形显示被填充。

#### 2.5.6 捕捉选项

捕捉对象是为了在绘制对象是更加精确得定位到某些图形的特征点上而设置的一种功能,当鼠标接近特征点时就能轻松捕捉到。用户可选择【对象】菜单下的【捕捉】子菜单项或点击工具栏上的逐按钮, 打开或关闭捕捉选项。

用户可选择【对象】菜单下的【捕捉选项】或者工具栏上的图标,启用捕捉选项功能,弹出对话框如 下图 2-60 所示。

勾选文字前的方框,其对应项将在对象编辑区域中显示,否则将被隐藏。

## 2.5.3 Zoom by Rect

To enable the function, click "Zoom by rect" under "View" menu or click  $\square$  in drawing toolbar. This command can enlarge part of an object to window size without changing its coordinates.

## 2.5.4 Fit to Window

After zooming and translating, if you want to fit the view to window, this menu item can be used to make you get a general view without sliding the wheel, since this function can make track view fit to window.

You can select "Fit to window" under "View" menu or choose in drawing toolbar, or just press \* key in mini keyboard.

## 2.5.5 View Mode

#### • Wireframe Mode

It is the default drawing mode, under which all objects are displayed in wireframe.

#### Ordinary Mode

Also called fill mode, ordinary mode shows objects in "Fill" mode (under "Object" menu) filled with a color.

## 2.5.6 Catch Options

Catch function is used to better position a feature point of objects during drawing, so that a feature point can be easily caught when approached.

Select "Catch Options" under "Object" menu or click the button 🛄 in the drawing toolbar, and "Catch

Options" dialog box will pop out, as shown in Fig. 2-60.

Check the items to display it in the editing space, otherwise hidden.

捕捉选项			×
对象 ☑ 图形	☑ 构造线	ī <b>☑</b> 极轴辅机	助线
- 特征点 ☑ ☑	中心点 象限点	<ul><li>✓ 中点</li><li>✓ 端点</li></ul>	
○极轴 <b>I</b> 【】	正交极轴	🗌 自定义极轴	
网格	直角坐标网格	□极坐标网格	
其他 ■ ☑ □	交点 切点 自动吸附距离: <sup>8</sup>	<ul> <li>☑ 最近点</li> <li>☑ 垂足</li> <li>像素</li> </ul>	
网格精密度 捕捉灵敏度	低 低 (低) (一 <b>0</b>	<u>全部选择</u> 高 高 确定	都清除 取消

图 2-60 捕捉选项对话框

▶ 各种图形的特征点

图形	特征点	图形	特征点
点	点	直线	两个端点和一个中点
多义线	各个节点以及中心	矩形	四个顶点和中点
员	四个象限点和圆心	椭圆	四个象限点和中心点
圆弧	起点,终点,中点,圆心和 象限点		

▶ 捕捉对象的优点

可迅速定位到如上所示图形的特征点,便于图形之间的准确连接。前文已介绍的【对象合并】已用到 此功能。

▶ 精密度

精密度越高,网格越细密,特征点越多。

▶ 灵敏度

灵敏度越高,越容易自动捕捉到特征点。

◆ 极轴增量角

增量角指以一定角度捕捉,例如:选择 45°,勾选【启用自定义极轴】,画直线时,确定第一点后,移动鼠标,以水平正方向为起始方向,逆时针旋转,每转到一个 45°,就出现红色极轴提示,软件本身对水平和竖直方向进行提示。

Catch Options	x
Object Graphics  Ref Lin	nes 🛛 Polar RefLines
Feature Point Center Point Quadrant Point	<ul><li>✓ Midpoint</li><li>✓ Endpoint</li></ul>
Polar Axis V Orthogonal	Custom
Grid 📝 Cartesian Grid	Polar Grid
Other	<ul> <li>✓ Nearest Point</li> <li>✓ Foot Point</li> <li>pixel</li> </ul>
Low GridPrecision Low CatchSensitivity	Select All Clear All High High OK Cancel

Fig. 2-60 Dialog Box "Catch Options"

Feature points of each shape

Shape	Feature point	Shape	Feature point
Point	Point	Line	Endpoints and midpoint
Polyline	Node and circle center	Rectangle	Vertexes and center
Circle	Quadrant points and center	Ellipse	Quadrant points and center
Arc	Start point, end point, midpoint		
	and center.		

#### > Advantages of executing "Catch Options"

You can directly use cursor to precisely position a feature point, which is convenient for the accurate connection of objects. This function is always used together with "Combine" function.

Precision

The higher the precision, the denser the grid and the more feature points.

Sensitivity

The higher the intensity is, the easier it is to catch feature points.

#### Polar IncAngle

You can catch a certain angle after checking "Custom" in dialog box "Catch Options". For instance, choose "45"; in drawing a straight line, after the first point is clicked, a red polar axis will be caught when the straight line to be drawn moves anticlockwise near 45 degree each time with the positive X-axis as the start direction.

## 2.6 系统管理

### 2.6.1 制作参数备份安装包

此功能可一键快速打包软件到默认路径下(D:\Weihong\Setup),直接生成.zip 格式文件。对保存已 调好的参数等非常有用。用户可点击【文件】菜单下的【制作参数备份安装包】子菜单项进行选择。

### 2.6.2 语言切换

目前,软件支持中文和英文两种语言。除了在软件安装的时候,可以选择软件运行的语言之外,还可 以在软件打开后进行语言的切换。选择【帮助】菜单下的【语言】子菜单,然后进行中英文切换。

### 2.6.3 日志

【帮助】菜单下的【日志】子菜单记录了用户重要的操作及系统时间,如下图 2-61 所示。在此子页 面下,用户不仅可以浏览系统本次启动后的日志信息,而且可以查看历史日志。

日志			×
	时间	描述	
3	2015-10-12 10:35:55	加载文件123.nce(23856bytes)	
8	2015-10-12 08:39:59	随动仪未标定	
8	2015-10-12 08:39:59	未进行双Y原点检测	
10	2015-10-12 08:39:59	加载文件123.nce(932871bytes)	
8	2015-10-10 16:59:50	随动仪未标定	
8	2015-10-10 16:59:50	未进行双Y原点检测	
10	2015-10-10 16:59:50	加载文件123.nce(932871bytes)	
9	2015-10-10 10:37:26	加载文件123.nce(932871bytes)	
9	2015-10-10 10:36:39	加载文件123.nce(929365bytes)	
9	2015-10-10 10:35:01	加载文件123.nce(929202bytes)	
8	2015-10-10 10:34:37	请先进行XXY原点检测	
8	2015-10-10 09:58:01	随动仪未标定	
8	2015-10-10 09:58:01	未进行双Y原点检测	=
1	2015-10-10 09:58:00	LoadParameters failed, object is 'CChecker'	
1	2015-10-10 09:58:00	LoadParameters failed, object is 'CSetSpeedDlg'	
1	2015-10-10 09:58:00	LoadParameters failed, object is 'CMarkPointTarget'	
1	2015-10-10 09:58:00	LoadParameters failed, object is 'CCycMachiningTarget'	
1	2015-10-10 09:58:00	LoadParameters failed, object is 'CCadPreProcessingTarget'	
1	2015-10-10 09:58:00	LoadParameters failed, object is 'CWCSAdjustTarget'	
1	2015-10-10 09:58:00	LoadParameters failed, object is 'CManualTarget'	
	2015-10-10 09:58:00	LoadParameters failed, object is 'CControlTarget'	
	2015-10-10 09:58:00	LoadParameters failed, object is 'CHelpTarget'	
	2015-10-10 09:58:00	LoadParameters failed, object is 'CJoinTarget'	
1	2015-10-10 09:58:00	LoadParameters failed, object is 'CCatchNearestTarget'	
57	2015-10-10 09:58:00	LoadParameters failed, object is 'CCatchFeatureTarget'	
	2015-10-10 09:58:00	LoadParameters failed, object is 'CCatchPerpendicularTarget'	
	2015-10-10 09:58:00	LoadParameters failed, object is 'CCatchTangentTarget'	
	2015-10-10 09:58:00	LoadParameters failed, object is 'CCatchIntersectTarget'	
	2015-10-10 09:58:00	LoadParameters failed, object is 'CCatchParallelTarget'	-
2%	2015-10-10 09:58:00	LoadParameters tailed, object is 'CCatchPolarAxisTarget'	
	🔇 🗹 错误项	🚹 🗹 警告项 🔹 💽 信息项 💦 🐼 系统项	刷新(R)

图 2-61 【日志】对话框

## 2.6 System Management

## 2.6.1 Generate Parameter Backup Installation Package

With this function, the software can be backed up into .zip format file to the default path (D:\Weihong\Setup), which is very helpful for saving adjusted parameters. You can find the sub-menu "Make Param Backup Installer" under menu "File".

## 2.6.2 Language Setting

At present, the system supports Chinese and English. You can switch the languages either at software installation or after the software is started. For the latter situation, you can choose "Language" under "Help" menu.

## 2.6.3 Log

"Log" sub-menu under "Help" menu records important operation and system time, as shown in. In this interface, you can not only view the log information after current startup, but also check the history log before.

Log			×
	Time	Description	<u>^</u>
•	2016-01-18 15:45:49	Load file: Untitled.nce(712406bytes)	
0	2016-01-18 15:43:45	5 2YDetect alarm	
0	2016-01-18 15:43:35	5 2YDetect alarm	
0	2016-01-18 10:43:27	7 Follow-up unmarked	
0	2016-01-18 10:43:27	7 2YDetect alarm	
100	2016-01-13 19:22:13	3 Follow-up unmarked	
0	2016-01-13 19:22:13	3 2YDetect alarm	
100	2016-01-13 19:20:50	) Follow-up unmarked	
I 🕹	2016-01-13 19:20:50	2YDetect alarm	
<b>Q</b>	2016-01-13 18:52:32	2 Follow-up unmarked	
100	2016-01-13 18:52:32	2 2YDetect alarm	
100	2016-01-13 18:48:30	) Follow-up unmarked	E
100	2016-01-13 18:48:30	2YDetect alarm	
<b>W</b>	2016-01-13 18:45:38	3 Follow-up unmarked	
<b>W</b>	2016-01-13 18:45:38	3 2YDetect alarm	
<b>W</b>	2016-01-13 18:44:41	Follow-up unmarked	
<b>N</b>	2016-01-13 18:44:41	2YDetect alarm	
1 Sector	2016-01-13 18:44:10	) Follow-up unmarked	
1 Q	2016-01-13 18:44:10	2YDetect alarm	
<b>W</b>	2016-01-13 18:43:28	3 Follow-up unmarked	
<b>W</b>	2016-01-13 18:43:28	3 2YDetect alarm	
<b>W</b>	2016-01-13 18:38:25	5 Follow-up unmarked	
19	2016-01-13 18:38:25	5 2YDetect alarm	
1 Sector	2016-01-13 18:37:33	3 Follow-up unmarked	
1 Q	2016-01-13 18:37:33	3 2YDetect alarm	
<b>W</b>	2016-01-13 18:00:49	Follow-up unmarked	
<b>W</b>	2016-01-13 18:00:49	2YDetect alarm	
<b>W</b>	2016-01-13 18:00:14	Follow-up unmarked	
I 🔮	2016-01-13 18:00:14	2YDetect alarm	-
	2016-01-13 17:56:05	Follow-up unmarked	
	😣 📝 Error	🔥 🗹 Warning 🛛 🖓 🖉 Information 🛛 🛠 🔲 System 🛛 🛛 Refrest	

Fig. 2-61 Dialog Box "Log"

日志信息包括:系统报警信息;其他一些系统信息。点击【刷新】可刷新当前界面,进行日志与系统的同步工作。信息日志的前面带有图标<sup>3,</sup>系统日志的前面带有图标<sup>3,</sup>\*;警告日志的前面带有图标<sup>3,</sup>;错误日志的前面带有图标<sup>3,</sup>。请注意区别。

### 2.6.4 在线文档

选择【帮助】菜单下的【用户手册】,可查看用户手册。

选择【帮助】菜单下的【快捷键说明】,可查看本系统快捷键操作按钮表。

选择【帮助】菜单下的【维宏简介】,可查看我司相关信息。

### 2.6.5 每日提示

软件启动后,系统自动弹出【每日提示】对话框,此功能按照软件操作顺序简单地介绍了各功能和使 用方法。点击【上一条】或【下一条】可以顺序查看。勾选【启动时显示每日提示】可以在每次打开软件 时自动显示此提示框,否则需手动打开。

此外,如果用户在操作时需要查看每日提示,可以点击【帮助】菜单下的【每日提示】子菜单项。

### 2.6.6 系统信息与注册

用户可在软件中查看版本号,控制卡,制造商等相关信息。

选择【帮助】菜单下的【关于】子菜单项,弹出对话框,用户在如图 2-62 所示中查看相关信息。

点击【设备信息】,用户可以查看当前机床设备的运行时间和运行长度,以便更好地对机床进行维护管理。【注册】功能用于板卡注册从而规定系统的使用时间,其中注册码由上海维宏电子科技股份有限公司自主研发的手机客户端"NcStudio 注册机"生成。以下详细介绍该 APP 的使用流程。

Log information includes system alarm information and other information. Click "Refresh" to refresh

current interface and synchronize the log and the system. Mark 😨 stands for information log, 🧚 for

system log, 🔔 for alarm log while 🥸 for error log. Please mind their difference.

### 2.6.4 Online Documents

Click "User manual" under "Help" menu to view users' manual online.

Click "Shortcut Key Information" under "Help" menu to view the shortcut key list.

Click "Weihong Introduction" under "Help" menu to learn about Weihong.

### 2.6.5 Daily Tips

After system boot, daily tips dialog box pops out automatically. This function lists various operations and functions in terms of software operation sequence. "Prev" and "Next" are used to check previous and next tip. If "Show daily tips on start-up" is checked, this dialog will pop up automatically each time the software is opened. Otherwise, it needs to be opened manually.

Besides, if you need to check daily tips in operation, it is also suggested to select "Daily tips" sub-menu under "Help" menu.

## 2.6.6 System Info and Registration

You can view software version number, control card and manufacturer information in the software.

Click "About" under "Help" menu, and a dialog box will pop out, where related information is provided as shown in Fig. 2-62.

Click "Device...", to see running time and running length of the machine tool to facilitate machine management and maintenance. "Register" function is used for limiting the system usage time by registering the control card. Registration code is generated in APP "NcStudio Generator" launched by Weihong Electronic Technology Co. Ltd.. Registration steps with the APP are as follows.

关于 NcEditor		×
维宏数控系统		设备信息
版本: 12.607		注册
上海维宏电子和	斗技股份有限公司	http://www.weihong.com.cn
版权所有(C)20	008-2012,上海维宏电子科技股份有	酮限公司
系统信息		
控制卡:	硬件描述: WH-PCIMC85A.SIMU.SY	S
	设备号码: WHINC-OL5S-GNGN-0001	-000
	自检信息: S2-0.S5-0.IC-3.HS-0 [ADAPTER:SIM_LAMBDA5-1.0.1-N7	.IN-1.PB-1. -0x31A].
	注册信息:无限期	

图 2-62 【关于】对话框

#### 2.6.6.1 "NcStudio 注册机" APP 注册流程

机床厂家在苹果手机 APP Store 中搜索"维宏",找到并下载安装 APP"NcStudio 注册机"。在正式 使用该 APP 之前,机床厂家应确保已正确填写了来自维宏公司的传真文件《APP 注册信息确认函》,并盖 章传回给维宏公司。维宏公司将依据上述确认函进行信息备案。

#### ◆ 绑定手机号

APP 成功安装后,使用前须绑定手机号。初次打开,提示如图 2-63 所示的对话框,点击"确定"后, 关闭该对话框。点击下方"绑定",出现如图 2-64 所示的界面,进行手机号绑定操作。

About NcEditor
Weihong CNC System
Register
Weihong Electronic Technology <u>http://www.weihong.com.cn</u>
Copyright(C)2008-2012, Shanghai WeiHong Electronic Technology Co., Ltd.
System Info
Control Card: Hardware: WH-PCIMC85A. SIMU. SYS
DeviceNO: WHNC-OL5S-GNGN-0001-000
Self-chk: S2-0.S5-0.IC-2.HS-0.IN-1.PB-1. [ADAPTER:SIM_LAMBDA5-1.0.1-N7-0x31A].
Registration: Without Expiration

Fig. 2-62 Dialog Box "About NcEditor"

#### 2.6.6.1 Get Registration Code with APP "NcStudio Generator"

You can search Apple APP Store for "Weihong", find and install APP "NcStudio Generator". Make sure you have already filled and stamped the fax file *APP Registration Info Confirmation Letter* sent rom Weihong and have returned it to Weihong before using the APP. Weihong will record the information in the confirmation letter you have returned.

#### • Bind your mobile phone number to the APP

You must bind your mobile phone number to the APP before using it. A dialog box shown as Fig. 2-63 will pop up when you launch the APP for the first time. Click on "OK" to close the box. Then click on "Bind" in the lower left of the interface. Fill in the information to bind your number to the APP in the interface as shown in Fig. 2-64.



图 2-63 绑定手机号 (一)

●●●●● 中国移动	(:-	09:04	0 .
$\leftarrow$	NcSti	udio注册机	
公司名称			
用户姓名			
手机号码			
验证码			
		获取	2验证码
设置密码			
说明: 绑定手材	し前请対	c联系上海维统	宏电子科技有限
公司进行相关信	言息备紧	8。详情请拨	丁官网客服电话
400-002-91884	,		



- 1) 公司名称、用户姓名、手机号码等信息必须与备案信息一致,否则不能注册。
- 2) 设置密码必须是由字母和数字组成的6位数。输入密码后需在下一行重复确认输入密码,否则不能提 交。

#### ◆ 登录

成功绑定手机号后,可进行登录。在如图 2-65 所示界面点击"获取验证码",通过短信向手机用户发送验证码,"验证"随即切换成倒计时,从 59 秒到 0 秒,到达 0 秒后切换成"重发"。获取验证码后,在如图 2-66 所示界面输入验证码即可登录。

图 2-64 绑定手机号 (二)





●●○○○ 中国移动 4G	9:15 AM	۵ 🏵 79% 🔳
← NcSti	udio Gene	rator
Company Name	)	
User Name		
Cell phone num	ber	
Verfication code		
	Get ve	erification code
Set password		
Note: Before bind, p WeiHong Electronics	lease contac	ot Shanghai ster first. Please
call service number	400-882-918	38 for details.

Fig. 2-63 Bind (1)





- 1) Your company name, user name, cellphone number must be the same as recorded by Weihong. Otherwise, you can't register successfully.
- 2) The "set password" must be 6 digits or characters. Repeat the password in the next line, otherwise the password cannot be set successfully

#### Login

You can login with the phone number you have bound to the APP. Click "Verification code" in the interface as shown in Fig. 2-65. The APP will send a short message containing a verification code to you. And a countdown from 59 to 0 is shown in the interface. The prompt info "Please input verification code" will turn into "Time out, please request code again". After receiving the code, input the code and then the password in the interface, as shown in Fig. 2-66, to login.

••••• 中国

中国移动 🗢 09:24 🛛 🗨 💽	••••••中国移动 🗢 09:24 🛛 💽
15021610727	52 15021610727
获取验证码	请输入验证码
情输入密码 登录	请输入密码登录
忘记密码	忘记密码
图 2-65 登录(一)	图 2-66 登录(二)
中国移动 夺 13:19 0 • • • •	
忘记密码	若忘记密码,请联系上海维宏电子科技股份
如果您不慎忘记密码,请尽快拨打维宏官 方服务电话400-882-9188,我们将妥善 为您解决。	有限公可。 点击 忘记密码 , 将提示维太公可联系电话。如右图 2-67 所示。
确定	

图 2-67 忘记密码

### ◆ 功能页

登录成功后进入如下图 2-68 所示的功能页面,导航下方自动显示厂商名称。

忘记密码

●●○○○ 中国移动 4G	11:29 AM	֎ ወ 68% ■♪
15	021610727	
	Verific	ation code
Please input pa	ssword	
	Login	
		forget
Fig.	2-65 Login	-1
●●○○○ 中国移动 4G	11:16 AM	Time To The
Fam	N	rd

●○○○ 中国移动 4G	11:20 AM	● Ø 70% ■●
	54	
15	02161072	7
Please input ve	erification co	ode
	Verifi	cation code
Please input pa	assword	
	Login	
		forget



If you forget your password, please contact with Weihong Electronic Technology Co. Ltd. Click on "forget", and a prompt message containing the official service number of Weihong will appear on the screen, as shown in

Fig. 2-67.



If you forgot your password, please call our official service number

400-882-9188 and we will help you get it back.

OK

forget

#### Function Page

After login, you will enter the function page as shown in Fig. 2-68. Your company name will be shown under the navigation bar automatically.



图 2-68 功能页面

设备号码:可直接输入板卡号,也可通过点击"相机控件"开启摄像头进行扫描(此功能暂不支持)。 注册类型:选择按天注册后,可直接点击"时间期限"后面的"选择",选择常用时间:1星期、1个 月、6个月、12个月、永久;或点击"日历控件",选择具体天数。注册时间从当天算起。选择按小时注 册,直接在"时间限制"下方的输入框输入时间即可。

**获取注册码:**点击"获取注册码",下方灰色框开始加载(三个连续出现的动态原点重复加载),直到 写号码自动生成出现在框中。

**短信转发:**向下滑动,点击"短信转发",跳转至编辑短信的界面,短信内容中自动添加获取到的写 号码。



系统支持按小时注册或按天注册两种方式,若选择按天注册,无论系统断电与否,都会按照系统内部时钟 计算剩余使用时间;若选择按小时注册,系统内部计算剩余使用时间,在系统断电后,剩余使用时间不会 减少直到系统上电。

#### ◆ 个人信息

点击功能页面导航栏左侧的"头像控件",可打开个人信息页面。如图 2-69 所示:

Portrait Widget	●●○○○ 中国移动 4G 11:21 ●●	AM © 70% Generator C		Clock Widget
	Device number	Ó	-	Camera Widget
	Register type			
	By day	By hour	]	
	Time limit	曲		Calendar Widget
	Input number of days	Select		
	Start:	End:		
	Client information	2		
	Input client name			
	Input client cell numbe			
	Get Regist	er Code		Slide up

Fig. 2-68 Function Page

**Device number:** you can enter the device number here directly, or click the camera icon to open the camera on the phone and scan the device number on the device. However, the scanning function is not supported by now.

**Register type:** If you select "By day" as registration type, you can click on "Select" under "Time limit" to choose a time limit from range "1 week, 1 month, 6months, 12 months, permanent; or you can click on the calendar icon to choose specific days. Register time is calculated from the day you register. If you choose registering by hour, you can enter the time in the input box under "Time limit".

**Get Registration Code:** click on "Get Registration Code", and the grey box under "Get Registration Code" will load until the writing code appear in the box automatically. When the grey box is loading, three continuously dynamic dots load repeatedly.

**Send SMS:** click on "Send SMS", and the interface will jump to interface "Edit SMS". The writing code you have received will be added to the SMS automatically.



The system supports registering by hour or by day. If you choose to register by day, service time will be counted according to system internal clocking, no matter the system is power off or not. And if you choose to register by hour, service time will be counted according to system internal clocking. However, after the system is power off, the service time will not get less until the system is power on.

#### User Information

Click the head icon in the upper left of the navigation bar in function page to open user information page, as shown in Fig. 2-69.

#### ◆ 历史记录

点击功能页面导航栏右侧的"时钟控件",选择要查询的时间区间后即可打开历史记录页面。如图 2-70 所示:



图 2-69 个人信息页面

图 2-70 历史记录页面

#### 2.6.6.2 利用注册码注册

通过手机客户端 APP 注册获取注册码后,客户可在 NcEditor 软件界面进行系统使用时间的注册。 当机床处于非加工状态(即空闲或紧停状态),可按照以下步骤进行注册。注意,当机床处于加工状态(即加工或暂停状态),不能进行注册,否则,软件会提示黄色报警"当前加工状态,不能执行该操作!" 软件注册的操作步骤如下:

点击【帮助】菜单下的【关于】子菜单,弹出关于对话框,可在该对话框内查看软件当前板卡号码;亦可在点击注册按钮后,弹出注册对话框内查看设备号码,如图 2-71 所示。

#### History

Click the clock icon in the upper right of the navigation bar in function page to open user information page, as shown in Fig. 2-70.

●●○○○ 中国移动 4G 11:13 AM ④ ④ 71% ■
$\leftarrow \qquad \text{User Information} \qquad (?)$
Company Name
weihong
User Name
weihong
Trader short name
gn
Change password
Logout





Fig. 2-70 History Page

#### 2.6.6.2 Register with Registration Code

After getting a registration code in "NcStudio Generator", you can register the use time in NcEditor.

When the machine tool is in not machining in idle or E-stop state, you can register according to the following steps. Do not register when the machine tool is running or in pause. Otherwise, the software will warn you that "Machining. Unable to execute the operation!".

Registration steps with registration code are as follows.

1) Click "About" under "Help" menu, and check the device number in dialog box "About NcEditor". Or you can click on the button "Register..." to check the device number, as shown in Fig. 2-71.



#### 图 2-71 查看设备号码

- 2) 将手机客户端 APP 注册获取的注册码填入步骤 1 注册窗口中"注册码"输入框,点击确定。
- 系统提示"注册成功。请重新启动计算机!",按提示重启系统即可。重启后,在【帮助】菜单下的【关于】子菜单可查看当前的注册信息。



板卡号码是随着注册次数的改变而改变,可以通过板卡最后三位数字的改变体现出来,当注册次数为0的时候,最后三位数字为000,当注册次数为1的时候,最后三位数字为001。

软件成功注册后,即开始限制系统正常使用时间。当注册时间将要过期或已经用完时,软件会依据当 前状态及剩余时长,给出不同提示信息,请特别注意。

#### ◆ 注册时间已用完

软件打开时,不显示软件界面,直接显示注册对话框,提醒用户"该软件已过期,注册后才能继续使用",如图 2-72 所示。

About NcEditor	
Weihong CNC System	REGISTER
Version: 12.608	DeviceNO: WHNC-OL5S-GNGN-0001-000
Copyright (C)2008-2012, Shanghai WeiHong Electronic Technology Co., Ltd.	Self-chk: S2-0.S5-0.IC-3.HS-0.IN-1.PB-1. [ADAPTER:SIM_LAMBDA5-1.0.1-N7-0x31A].
System Info Control Card: Hardware: WH-PCIMC85A.SIMU.SYS	Please enter the OK
DeviceNO: WHNC-015S-GNGN-0001-000 Self-chk: S2-0.S5-0.IC-2.HS-0.IN-1.PB-1.	RegCode: Cancel
[ADAPTER:SIM_LAMEDA5-1.0.1-N7-0x31A]. Registration: Without Expiration	

Fig. 2-71 Check Device Number

- 2) Enter the registration code you have got into the input box of "RegCode" as shown in Fig. 2-71, and then click "OK".
- 3) The system will prompt "Register successfully. Please restart your computer!" Restart your computer. After restarting the computer, open NcEditor and check the current registration information.



Card NO. changes with registered times, reflected in the last three numbers of Card No.. When registered times is 0, the last three numbers are 000; when registered times is 1, the last three numbers 001.

After successful registration, system use time will be limited. When the registered time is to be overdue or already overdue, the software will prompt different information according to your current state and lasted hours.

#### • Registration Overdue

If your registration is overdue, register dialog box instead of software interface will pop out when you try to open the software. And as shown in Fig. 2-72, it warns you "The software is overdue. Please register!"



图 2-72 注册过期



客户收到的控制卡均在出厂前完成写号,如遇到写号未成功的产品,如图 2-73 所示,显示"控制卡类型 不匹配"的信息,请及时与厂商联系。

注 <del>肋</del>		×
控制卡类别	不匹配,注册后才能继续使用。	
设备号码:	WHNC-085A-CDGN-01A8-000	
自检信息: S2-0.S5-0.IC-14.HS-0.IN-0.PB-1.BC- 4344.FI-65535.RT-0.WT-0.FR-1.ME- 0090.BD-01A8.ATR-10.DC-1KKMHL. [ADAPTER:PM85A(3.1.0)-NO-PXPM85A].		
请输入您的	注册信息	确定
注册码:		

图 2-73 写号不匹配

REGISTER		83
The softwa register! DeviceNO:	ure is overdue. Please WHNC-085A-LHGN-01A8-002	
Self-chk:	S2-0.S5-0.IC-0.HS-0.IN-0.PB 4C48.FI-0.RT-0.WT-0.FR-1.ME 01A8.ATR-10.DC-J894UY.[ADAP (3.1.0)-N0-PXPM85A].[MC:LD5	-1.BC- -0090.BD- TER:PM85A S-04(1.4.8)-
Please ent	er the	OK
RegCode:		Cancel

Fig. 2-72 Registration Overdue



The control card number has been written before you receive it. Please contact with the manufacturer if you failed to register with the control card. As shown in Fig. 2-73, error will prompt if you filed to register.

REGISTER	×
Board class error. Please register!	
DeviceNO: WHNC-085A-LKGN-01A8-000	
Self-chk: S2-0.S5-0.IC-5.HS-0.IN-0.PB- 4C4B.FI-65535.RT-0.WT-0.FR-1 0090.BD-01A8.ATR-10.DC-711FM [ADAPTER:PM85A(3.1.0)-N0-PXP	1.BC- .ME- B. M85A].
Please enter the	OK
RegCode:	Cancel

Fig. 2-73 Board Class Error

## 3 机床调试

## 3.1 控制系统安装

### 3.1.1 计算机主机配置要求

CPU:	主频 1G 或以上
内存:	1G 以上
硬盘:	<b>20G</b> 以上
显示卡:	最低支持 1024*864 分辨率(纵向分辨率最少为 864)
显示器:	14" VGA 以上
光驱:	4 倍速或更高(可选配)
主板扩展槽:	PCI 槽/PCIE 槽 1 个以上

### 3.1.2 控制系统配置

PM85A 运动控制卡是由上海维宏电子科技股份有限公司自主研发的运动控制卡,它与 NcEditor 运动 控制软件配套使用,可完成激光切割运动控制。

PM85A 控制系统标配包括:

- ▶ PM85A 伺服型控制卡一张
- > NcEditor 运动控制软件光盘1张(厂商已定制则无需)
- ▶ DB9M/F 通讯线 2 根
- ▶ I/O 板: 朗达 5S 控制器+EX30A5 扩展端子板

### 3.1.3 基础环境包安装

客户首次安装软件前需安装基础环境包。建议客户从小到大安装。

名称	大小
🕮 dotNetFx40_Full_x86_x64.exe	49,268 KB
避 vcredist_x86.exe	4,879 KB
避 vcredist_x86_2005.exe	2,620 KB

图 3-1 基础环境包

# 3 Machining Debugging

## 3.1 Installation of CNC System

## 3.1.1 Basic Configuration for Host Computer

CPU:	basic frequency 1G or above
Memory:	above 1G
Hard disk:	above 20G
Display adapter:	1024*864 at least(Longitudinal resolution $\geq$ 864)
Display:	above VGA 14"
CD-ROM:	4X or higher (optional)
Main board extension slot:	1 or more PCI/PCIE slot

## 3.1.2 Configuration for CNC System

Independently developed by Weihong Electronic Technology Co., Ltd., PM85A motion control card, mating with NcEditor motion control software, is applied to the motion control of laser cutting.

The standard configuration for a PM85A control system is as follows.

- One PM85A servo control card;
- A CD of NcEditor motion control software (unnecessary if the manufacturer has already customized one.);
- Two DB9M/F communication cables;
- > I/O board: Lambda 5S control box + EX30A5 extended terminal board.

## 3.1.3 Installation of Basic Environment Package

If it is the first time you install NcEditor, you should install the basic environment package before installing NcEditor. It is suggested to install the three files in the package from small to large.

Name	Size
🔀 dotNetFx40_Full_x86_x64.exe	49,268 KB
避 vcredist_x86.exe	4,879 KB
避 vcredist_x86_2005.exe	2,620 KB

Fig. 3-1 Basic Environment Package

### 3.1.4 软件安装步骤

软件安装过程分为以下几个步骤:

- 1) 将 NcEditor 系统安装光盘放入光驱。打开【我的电脑】,双击光驱盘符,在 NcEditor 系统安装光盘找到图标 ,双击后,弹出安装语言选择对话框。如果点选【选择中文界面】,安装向导和操作界面为中文显示;如果点选【ENGLISH】,安装向导和操作界面为英文显示。用户亦可在系统中进行语言切换。
- 用户选择合适的语言后,界面提示是否更新系统。点击【是】开始更新系统。若您为首次安装软件,请直接跳转至第6)步。
- 若安装程序一直处于"等待 NcEditor 关闭",这是由于 V12 NcEditor 软件在运行过程中,需要将 其关闭才能继续安装。
- 为避免计算机上老版本的 NcEditor 文件干扰新版本软件的安装,系统会提示警告,是否删除 (C:\Program Files\Weihong\NcEditor\)中的所有文件。点击【确定】。
- 5) 若 PC 机之前安装过 V12 NcEditor 软件,系统会提示用户是否要保存之前软件配置的参数。这一步骤方便用户将之前配置的参数设置直接迁移到新软件,省去重新设置参数的麻烦。用户视自身需要选择【是】或【否】,继续下一步的安装。
- 6) 安装开始, NcEditor 系统将被默认安装到 C:\Program Files\Weihong\NcEditor 目录下。安装完毕,界面提示生成文件和可执行文件是否分开放置,推荐操作为【否】。
- 7) 系统提示是否关闭计算机(方便用户安装控制卡),推荐操作为【是】。重启计算机后,软件安装 完成。



用户计算机必须配有 D 盘, 否则安装失败!

#### 3.1.5 控制卡安装步骤

- 1) 将软件光盘插入计算机光驱,然后运行 setup 安装软件,直到软件成功安装完成;
- 2) 关闭计算机电源,打开计算机主机箱,将控制卡插入 PCI/PCIE 插槽,用螺丝固定好,盖好计算 机主机机箱;
- 3) 打开计算机电源,计算机会自动找到设备并安装驱动程序,首次需手动安装驱动,详见3.1.7;
- 运行计算机桌面上的 NcEditor,正确运行则安装完毕,(若不能正常运行,请关闭计算机后检查 金手指是否干净)。

## 3.1.4 Setup of NcEditor

The setup of NcEditor can be divided into the following steps:

1) Put the setup CD of NcEditor into the CD-ROM. Double click Computer icon, then double click the

CD-ROM icon. Find and double click the icon *icon*. A language selection dialog box will pop out. If you select "选择中文界面", the setup wizard and software interface will be in Chinese. And if you select "ENGLISH", the setup wizard and software interface will be in English. Besides, you can switch interface language in the software.

- 2) Select a language according to your needs. And another dialog box will pop out asking whether to update the software. Click "Yes" to start updating. If it is your first time to setup NcEditor in your computer, please skip from here to step 6).
- 3) If the wizard shows and stays at "Waiting for closing NcEditor", V12 NcEditor must be running. You should close the running NcEditor to proceed with updating.
- 4) To avoid the old version software interferences the setup of the current software, the system will warn that the files in directory (C:\Program Files\Weihong\NcEditor\)". Click "OK".
- 5) Then the system will ask whether to save the configuration parameters set before. You can select "Yes" or "No" according to your needs.
- 6) Installation begins. The software will be installed under the default directory, C:\Program Files\Weihong\NcEditor. During installation, a dialog box will pop up asking whether to put generated files and executive files separately. "No" is recommended.
- 7) A dialog box will pop up asking whether to shut down the computer. "OK" is recommended. After the computer is restarted, setup is completed.



There must be a D disk in your computer, otherwise installation of NcEditor fails.

## 3.1.5 Control Card Setup Steps

- 1) Insert the software CD into the CD driver of computer, and then double click "setup. exe" for installation of the software until finished;
- 2) Power off the computer, then open the computer chassis, and then insert the control card into a PCI/PCIE slot and fasten the screw of rail block, and then lid the computer case;
- 3) Power on the computer. The computer will find the new hardware-device and install its driver automatically;
- 4) Double click the shortcut icon of NcEditor on the desktop; if it runs normally, installation is over. If not, please check whether the control card is well inserted and the gold finger is clean.
### 3.1.6 控制卡安装检测

检查端子板输入信号指示 LED: 比如用户接的原点开关是常闭的,此时 X0,Y0 两个 LED 应该是亮的,可以人为模拟撞原点开关,(如果是行程开关,可通过人为按压的方法观察信号能否拿到;如果是光电开关,可通过人为遮挡光路的办法来观察信号能否拿到;如果是金属接近开关,可人为用金属块接近该 开关。)若相应 LED 熄灭,说明原点信号已送到端子板上;若接的原点开关为常开,平时 LED 应是灭的, 人为触碰原点开关,LED 应变亮,说明原点信号能送到端子板。用同样方法检查其他输入端子,确保从端 子板到机床间接线正确,能大大缩短调试时间。

#### 3.1.7 更新驱动

#### 3.1.7.1 自动更新驱动

控制卡安装完成后,在软件安装过程中系统将自动更新驱动,win7系统将弹出 Windows 安全对话框,如图 3-2 所示,用户选择【始终安装此驱动程序软件(I)】即可,软件安装完成后,重启系统,则驱动安装成功。



图 3-2 Windows 安全对话框

#### 3.1.7.2 手动更新驱动

软件和控制卡安装完成后,若软件无法打开,系统弹出如图 3-3 或图 3-4 所示对话框时,则自动更新 驱动可能失败,在排除了控制卡未插紧等其他因素后,用户可执行手动更新硬件驱动程序来解决问题,更 新步骤以 win7 系统为例介绍。

## 3.1.6 Control Card Setup Detection

Examine the input signal LEDs of the terminal board: for example, if the origin switch connected is normally closed, at this time, three LEDs of X0 and Y0 are on; trigger the origin switch through artificial imitation. (For travel switch, artificial press can be used to observe whether the signals can be received. For photoelectrical switch, artificially obstruct the light to see if the signals can be received. For metal proximity switch, artificially approach it with a metal block to see if the signals can be received.) If the corresponding LED is out, it indicates the origin signals have been sent to the terminal board. If the origin switch connected is normally open, LEDs should be usually out, and by artificially touching the switch, LEDs should become light, which shows the origin signals have been sent to the terminal board. The same method can be taken to test other input ports to ensure the correctness of the wiring between the terminal board and the machine tool, greatly shortening the debugging time.

### 3.1.7 Update Device Driver

#### 3.1.7.1 Auto Update Device Driver

After control card is installed, the system will auto update the driver for it when NcEditor is installed. A dialog box as shown in Fig. 3-2 will pop out. Click "Install the driver software anyway" to start installing the driver. After software installation is completed, restart the computer.



Fig. 3-2 Windows Security Dialog Box

#### 3.1.7.2 Manually Update Device Driver

If the NcEditor can't open after NcEditor software and control card is installed, it indicates that auto update driver may have failed. And if you can exclude other factors such as loose control card, you can update the device driver manually. The updating steps in Win7 are shown as follows.



图 3-3 板卡信息读取失败提示

NcEditor		x
<u>^</u>	文件 C:\Windows\System32\Drivers\WHNC85A.sys 已经被修改(或 损坏) 请重新 <del>安装</del> 软件!	
	确定	

图 3-4 重新安装软件提示

鼠标右键点击"我的电脑"选择"属性",在"系统属性"页面下选择"硬件"下的"设备管理器",在设备管理器下找到"数控适配器",选中数控适配器下的选项,点击鼠标右键,选择"更新驱动程序",即可开始更新硬件驱动。



图 3-5 更新驱动-设备管理器界面



Fig. 3-3 Read Board Information Error



Fig. 3-4 Reinstall Software

 Right click "Computer", select "Properties", and then click "Device Manager". Click CNC Adapters" and select "Weihong CNC Adapter(PCIMC-85A)", right click on it and select "Update Driver Software…" to start updating driver software.

🛛 🕂 💇 CNC Adapters	
💽 Weihong Ch	
Computer	Update Driver Software
Disk drives	Disable
🔈 騙 Display adapter	Uninstall
🔈 🥼 Human Interfac	
D IDE ATA/ATAPI	Scan for hardware changes
Keyboards	Properties
Mice and other	Toperaes
Monitors	

Fig. 3-5 Device Manager--Update Device Driver



图 3-6 开始更新硬件驱动程序

2) 选择【浏览计算机以查找驱动程序软件(R)】,出现如图 3-7 所示对话框:

	×
④ 更新驱动程序软件 - 维宏数控适配卡 PCIMC-85A 型	
浏览计算机上的驱动程序文件	
在以下位置搜索驱动程序软件: Ct\Program Files\Weihong\NcEditor\Addins	
☑ 包括子文件夹①	
→ 从计算机的设备驱动程序列表中选择(L) 此列表将显示与该设备兼容的已安装的驱动程序软件,以及与该设备处于同一类别下的 所有驱动程序软件。	
下一步(N) 取消	<b>H</b>

图 3-7 选择更新驱动方式

3) 选择【从计算机的设备驱动程序列表中选择(L)】,点击"下一步",出现界面如图 3-8 所示:



Fig. 3-6 Search for Driver Software

2) Select "Browse my computer for driver software", a dialog box as shown in Fig. 3-7 will pop out.

		x
<b>G</b>	Jpdate Driver Software - Weihong CNC Adapter(PCIMC-85A)	
Bro	wse for driver software on your computer	
Sear	ch for driver software in this location:	
C:\	Program Files\Weihong\NcEditor\Addins    Browse	
V I	nclude subfolders	
•	Let me pick from a list of device drivers on my computer This list will show installed driver software compatible with the device, and all driver software in the same category as the device.	
	Next	ancel

Fig. 3-7 Browse for Driver Software

3) Select "Let me pick from a list of device drivers on my computer" and click "Next". A dialog box as shown in Fig. 3-8 will pop out.

						×
0	圓更	新驱动程序软件 - 维宏数	姓运配卡 PCIMC	C-85A 型		
	选择	要为此硬件安装的	设备驱动程序	5		
	<u>.</u>	请选定硬件设备的厂 盘,请单击"从磁盘	商和型号,然后单 安装"。	鮭"下一步"。	如果手头有包	含要安装的驱动程序的磁
	<b>∨</b> ₽	示兼容硬件(C)				
	型号					
		凯数控适配卡 PCIMC-6	5A 型			
	8	E宏数控适配卡 Lambda	型			
	1	該数控适配卡 PCIMC-8	35A 型			
	ŝ	È宏运动控制器(PM系列	))			
	<u> </u>	这个驱动程序没有经过数	字签名!			从磁盘安装(出)
	1	告诉我为什么驱动程序签	名很重要			
						下一步(N) 取消

图 3-8 选择设备类型

4) 点击【从磁盘安装(H)】按钮,出现如图 3-9 所示:

从磁盘安	ż.	×
<b>V</b>	插入制造商的安装盘,然后确定已在下面选定正 确的驱动器。	<u>确定</u> 取消
	制造商文件复制来源 C):	
	×	浏览 (B)

图 3-9 选择选择硬件驱动程序存放位置(二)

5) 点击【浏览】按钮,在新出现的对话框里选择所使用的驱动程序,路径: C:\Program Files\Weihong\NcEditor\Addins,如图 3-10 所示:

		×
$\bigcirc$	Update Driver Software - Weihong CNC Adapter(PCIMC-85A)	
	Select the device driver you want to install for this hardware. Select the manufacturer and model of your hardware device and then disk that contains the driver you want to install, click Have Disk.	click Next. If you have a
	Show compatible hardware	
	Model	A
	Naiky CNC Adaptor PCIMC-6A WeiHong CNC Adaptor PCIMC-6A 奈凯数控适配卡 PCIMC-6A 型 Version: 6.0.1.0 [2004/2/2] 奈凯数控适配卡 PCIMC-6A 型 Version: 9.0.0.0 [2006/12/8]	The second se
	This driver is not digitally signed! <u>Tell me why driver signing is important</u>	Have Disk
		Next Cancel

Fig. 3-8 Select the Path of Driver Software (1)

4) Click "Have Disk". A dialog box as shown in Fig. 3-9 will pop out.

Install From	n Disk	×
~	Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.	OK Cancel
	Copy manufacturer's files from:	Browse

Fig. 3-9 Select the Path of Driver Software (2)

5) Click "Browse", and select the device driver you need under path "C:\Program Files\Weihong\NcEditor\Addins", as shown in Fig. 3-10.

🚔 查找文件		×
查找范围(I):	🌗 Addins 👻	G 🏚 📂 🖽 •
Ca.	名称	修改日期
最近访问的位置	] gallery	2016/4/18 19:51 3
_	layer	2016/4/18 19:52 3
-	preview	2016/4/21 17:25
桌面	🍌 res	2016/4/18 19:51
	퉬 warninginfo	2016/4/18 19:51
	NcadptPci(PCIMC-85A).inf	2016/4/18 19:52 🚦
[1] 库	NcadptPcie(NC65A).inf	2016/4/18 19:52 5
17		
计算机		
	4	-
网络		
	文件名(M): NcadptPci(PCIMC-85A).inf	▼ 打开(0)
	<b>文件类型 ①</b> : 安装信息 (*.inf)	- 取消

图 3-10 选择所需硬件驱动程序

6) 正确选择所需驱动程序后,点击【打开】,返回磁盘安装界面,"制造商文件复制来源"将显示文件存放位置,如图 3-11 所示:

从磁盘安装	ž.
4	插入制造商的安装盘,然后确定已在下面选定正 确定 确的驱动器。 取消 取消
	制造商文件复制来源 (2):
	C:\Program Files\Weihong\NcEditor\Addins 👻 [測览 @)

图 3-11 确认驱动程序文件路径

- 7) 点击【确定】,界面返回到上一级对话框,如图 3-8 所示,点击【下一步】。
- 8) 系统弹出如图 3-2 所示对话框,点击【始终安装此驱动程序软件(I)】即开始更新硬件驱动程序。
- 9) 硬件驱动程序更新完成后,即可正常打开软件。



首次安装驱动时:

 点击"设备管理器"工具栏的 (扫描检测硬件改动)按钮,或右击"其他设备"选择"扫描检测 硬件改动"更新设备列表后,如图 3-12 所示,右键"网络和计算机机密/解密控制器"选择更新驱动 程序软件 (P),即可开始更新驱动。

📇 Locate File		-	-	×
Look in:	Addins	-	G 🤌 📂 🛄 -	
<b>C</b> a	Name	*	Date modified	Туре
	퉬 gallery		2016/4/18 19:51	File folder
Recent Places	퉬 layer		2016/4/18 19:52	File folder
	鷆 preview		2016/4/21 11:07	File folder
	🌗 res		2016/4/18 19:51	File folder
Desktop	📗 warninginfo	D	2016/4/18 19:51	File folder
<b>F</b>	NcadptPci(	PCIMC-85A).inf	2016/4/18 19:52	Setup Infc
	NcadptPcie	(NC65A).inf	2016/4/18 19:52	Setup Infc
Libraries				
Computer				
	· · · · · · · · · · · · · · · · · · ·			•
Network	5			
	File name:	NcadptPci(PCIMC-85A).inf	• L	Open
	Files of type:	Setup Information (*.inf)	<b>_</b>	Cancel

Fig. 3-10 Select the Device Driver

6) After select the correct driver, click "Open" to go back to install interface. The file path will be shown under "Copy manufacture's files from:", as shown in Fig. 3-11.

Install From	m Disk	×
~	Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.	OK Cancel
	Copy manufacturer's files from: C:\Program Files\Weihong\NcEditor\Addins -	Browse

Fig. 3-11 Confirm the Path of Device Driver

- 7) Click "OK" to go back to the previous dialog box as shown in Fig. 3-8.Click "Next", a dialog box shown as Fig. 3-2.
- 8) Click "Install the driver software anyway" to start installing the driver.



When you install the device driver for the first time,

1) Click we button in the toolbar of "Device Manager" or right click on "Other devices" and select "Scan for hardware changes" to update device list. Then right click on "Network and Computing Encryption/Decryption Controller" and select "Update Driver Software" to start updating.



图 3-12 首次更新驱动-设备管理器界面

2) 第3)步,选择【从计算机的设备驱动程序列表中选择(L)】后,系统弹出如图 3-13 所示对话框, 直接点击"下一步",则弹出如图 3-8 所示对话框,用户按照以上步骤继续安装即可。

		×
④ 更新驱动	)程序软件 - 网络和计算机加密/解密控制器	
从以下列	表选择设备的类型。	
常见硬件类型	뮡(H):	
显示所有	自设备	*
9 61883	设备类	=
🔮 AVC 设	备	
🚯 Bluetoo	oth 无线电收发器	
A DVD/C	D-ROM 驱动器	
Gaide at	A/ATAPI 控制器	
EEE 12	284.4 兼容打印机	
EEE 12	284.4 设备	
EEE 13	394 和 SCSI 打印机	
🖗 IEEE 13	394 总线主控制器	
Sedia 🔜	Center Extender	
🕼 Micros	oft Windows 类公共控制器	
	rk Service	<b>T</b>
	▶ 下一步(N)	取消

图 3-13 首次更新驱动-选择设备类型

## 3.1.8 卸载 NcEditor 系统

NcEditor 属于绿色软件。所以删除 NcEditor 软件, 仅需要删除 C:\Program\Weihong\路径下的 NcEditor 文件夹, 然后删除【开始】->【程序】里的 NcEditor 项以及桌面上的快捷方式即可。

⊳ 📲 Computer		
Disk drives		
🗼 🖳 Display adapte	rs	
DVD/CD-ROM	drives	
🕟 🕼 Human Interfa	ce Devices	
IDE ATA/ATAP	I controllers	
Keyboards		
Mice and other	r pointing devices	
Monitors		
🗼 🔮 Network adapt	ers	
Other devices		
🖟 Netwo		Controller
D Portable I	Update Driver Software	
Ports (CO	Disable	
Processor	Uninstall	
🖥 📲 Sound, vi		
👂 🖳 System d	Scan for hardware changes	
🗟 📲 Universal	Properties	

Fig. 3-12 Device Manager--First-time Update Driver

2) After selecting "Let me pick from a list of device drivers on my computer" in the step 3 above, a dialog box as shown in Fig. 3-13 will pop out. Click "Next". And then follow the steps above from step 4.

G I Update Driver Software - Network and Computing Encryption/Decryption Controller	x
Select your device's type from the list below.	
Common hardware types:	
Show All Devices Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gamma Gam	
Floppy disk drives	Ŧ
Next	Cancel

Fig. 3-13 Select Device Type-- First-time Update Driver

## 3.1.8 Uninstallation of NcEditor

NcStudio is green software. To uninstall it, all you need to do is to delete the folder "NcEditor" under directory C:\Program Files\Weihong, and the shortcut icons on the desktop as well as in the Start menu.

## 3.2 端口接线说明

#### 3.2.1 软件端口诊断

- 点击【机床】菜单下的【端口设置】窗口,用户可以看到许多输入输出信号,前面的实心圆点表 示输入信号,空心圆点表示输出信号。
- 2) 圆点为红色时表示该信号此时无效(没有输入或输出),圆点为绿色时表示该信号此时有效。【端口设置】菜单项下内容如下图 3-14 所示,(仅供参考,硬件端口窗口内所显示的端口因软件版本、硬件板卡型号的不同而不尽相同,请以最终出货为准)。

3称	引脚号	极性	PLC地址	输入采样	描述	
输入端口 ——						
CONNECT0		N	00001	E,F:16ms S:4ms	端子板连接状态	
XALM		N	00008	E,F:16ms S:4ms	X轴伺服报警	
Y1ALM		N	00009	E,F:16ms S:4ms	Y1轴伺服报警	
Y2ALM		N	00010	E,F:16ms S:4ms	Y2轴伺服报警	
ZALM		N	00011	E,F:16ms S:4ms	Z轴伺服报警	
XC		N	00016	E,F:16ms S:4ms	X轴编码器零点	
Y1C		N	00017	E,F:16ms S:4ms	Y1轴编码器零点	
Y2C		N	00018	E,F:16ms S:4ms	Y2轴编码器零点	
ZC		N	00019	E,F:16ms S:4ms	Z轴编码器零点	
X00		N	00024	E,F:16ms S:4ms	X轴正向限位	
X01		N	00025	E,F:16ms S:4ms	X轴负向限位	
X02		N	00026	E,F:16ms S:4ms	Y轴正向限位	
X03		N	00027	E,F:16ms S:4ms	Y轴负向限位	
X04		N	00028	E,F:16ms S:4ms	Z轴正向限位	
X05		N	00029	E,F:16ms S:4ms	Z轴负向限位	
			00020	E E 1Cma C Ama	感色描述	

图 3-14 硬件端口窗口

3) 根据用户选择的原点开关、紧停等按钮的类型修改软件中输入端口的极性:常开输入端口极性为N,常闭输入点极性为 P。

极性修改方法:选中需要修改的端口,直接点击下方操作按钮【修改极性】即可,修改极性的密码为: ncstudio。当所有要修改的极性已修改完,关闭 NcEditor 软件,然后重新运行,此时极性修改生效。

#### 3.2.2 端子板端口诊断

接通电气箱电源。此时两个轴的零点端口、紧停端口、程序开始、程序停止等输入端口的前面显示红色圆点,表明处于无输入状态。否则应检查电气线路是否连接正确,端口极性是否正确。

## 3.2 Wiring of I/O Ports

## 3.2.1 Diagnosis of Software Ports

- 1) Power on the computer, run NcEditor software, and then open "IOPort" window displaying many input and output signals by "Ports Setting" under "Mach" menu. Solid dots represent input signals, while hollow dots represent output signals.
- 2) Dots in red indicate the signals are invalid at the time (with no input or output), while dots in green indicate the signals are valid at the time. The "IOPort" window is as shown in Fig. 3-14. (It is for reference only. Ports displayed in "IOPort" window will vary with different software versions and hardware board card types. The actual situation is in line with shipment).

ay	Pin	Polarity	PLC Addr	Input Sample	Description	
In						
	го	N	00001	E,F:16ms S:4ms	Connecting State	
XALM		N	00008	E,F:16ms S:4ms	Servo Alarm of Axis X	
Y1ALM		N	00009	E,F:16ms S:4ms	Servo Alarm of Axis Y1	
Y2ALM		N	00010	E,F:16ms S:4ms	Servo Alarm of Axis Y2	
ZALM		N	00011	E,F:16ms S:4ms	Servo Alarm of Axis Z	
XC		N	00016	E,F:16ms S:4ms	Axis X Encoder Zero	
Y1C		N	00017	E,F:16ms S:4ms	Axis Y1 Encoder Zero	
Y2C		N	00018	E,F:16ms S:4ms	Axis Y2 Encoder Zero	
ZC		N	00019	E,F:16ms S:4ms	Axis Z Encoder Zero	
x00		N	00024	E,F:16ms S:4ms	Positive Limit of Axis X	
X01		N	00025	E,F:16ms S:4ms	Negative Limit of Axis X	
X02		N	00026	E,F:16ms S:4ms	Positive Limit of Axis Y	
X03		N	00027	E,F:16ms S:4ms	Negative Limit of Axis Y	
X04		N	00028	E,F:16ms S:4ms	Positive Limit of Axis Z	
X05		N	00029	E,F:16ms S:4ms	Negative Limit of Axis Z	
_		N	00030	E.F: 16ms S: 4ms	Estop	

Fig. 3-14 IO Ports Interface

 Alter the input port polarity in the software in terms of such buttons selected as origin switch and E-STOP button: the polarity of NO input ports is N; the polarity of NC input ports is P.

To alter polarity in the laser cutting software NcEditor, select the port to be modified its polarity, and then click the manipulation button "ConvertPol". The password to modify polarity is "ncstudio". After all the polarity modification has been finished, shut down and restart NcEditor to validate polarity modification.

### 3.2.2 Diagnosis of Terminal Board Ports

 Electrify the electrical box. At this time, the dots in front of such input signals as zero signals of the two axes, E-STOP signal and program start/stop signals should be in red, indicating that there are no inputs. Otherwise, it is necessary to check the correctness of electrical circuitry and signals polarity. If electrical circuitry is correct, alter the corresponding signal polarity to ensure the dots in front of the above-mentioned signals shown in red.

- 2) 按下程序开始按钮,观察【程序开始】端口前面的圆点颜色是否变化。按下时,圆点颜色应该为 绿色,松开时圆点颜色应为红色。如果圆点颜色没有变化,根据第 3.1.6 节检查按钮按下时端子 板上的 LED 有没有正常反应,若端子板上正常,说明软件没有采集到端子板上的信号,检查朗 达控制器与扩展端子板是否用 DB9M/F 连接好。程序停止、紧停信号的测试方法类似。
- 3) 按照上述方法,打开【端口设置】中 I/O 窗口,模拟触发原点信号,观察软件中零点信号前圆点 应在触发原点开关时变绿,确保 X,Y 轴原点都能接收到信号。



用户在做端子板端口诊断时,请勿连接驱动器,否则可能会发生危险!

## 3.3 驱动器参数设置

#### 3.3.1 伺服驱动器接口

伺服驱动器接头插座为 DB15 三排孔,引脚定义如下图 3-15 所示:



图 3-15 驱动器接口定义

信号名	定义	输入输出	说明
A+、A-	编码器A相反馈信号	输入,差分信号传输方式	接受来自驱动分频器(等效于
B+、B-	编码器B相反馈信号	输入,差分信号传输方式	RS422)的编码器信号(A、B、
C+、C-	编码器C相反馈信号	输入,差分信号传输方式	<b>C</b> 相)的差分输出。
ALM	驱动器报警信号	输入	当驱动器检测到故障时,此输出 (晶体管)切断。

- 2) Press the button "Start", and observe whether the dot color of "program start" signal changes. When the button is being pressed, the dot color should show in green, and in red after released. If there is no change to the dot color, please turn to section 3.1.6 above to check whether the LED on the terminal board works normally when being pressed. If the terminal board works normally, it indicates that the software has not collected the signals from the terminal board. Examine the connection between the control card and the terminal board via DB9M/F. Similar method can be taken to examine program stop signal and emergency stop signal.
- 3) In accordance with the above method, open "IOPort" window and simulate to trigger the zero signals, observing whether the dot in front of the zero signal turns into green when an origin button is being triggered. Make sure that both the origin signals of X-axis and Y -axis can be received.



Do not connect terminal board with any driver when you are diagnosing the I/O ports of the terminal board. Otherwise danger may occur.

## 3.3 Driver Parameter Setting

## 3.3.1 Pin Definition of the Servo Driver

The socket of servo driver joint is three-row DB15 holes. Its pins definition is shown in Fig. 3-15.



Fig. 3-15 Pin Definition of the Driver

Signal	Definition	Output/Input	Remark
Feedback signal of		Input, differential signal	
A+, A-	encoder phase A	transmission mode	Receive the differential output of
Feedback signal of Input, differential		Input, differential signal	encoder signal (phase A, B, C) from
D+, D-	encoder phase B	transmission mode	driver frequency divider (equal to
Feedback signal of		Input, differential signal	RS422).
0+, 0-	encoder phase C	transmission mode	
			When breakdown occurs in driver,
ALM	Driver alarm signal	Input	this output (transistor) switch will be
			closed or disconnected.

信号名	定义	输入输出	说明
SON	伺服 ON 信号	输出	此信号用于开启(通电状态)及 关闭(非通电状态)伺服马达。 当此信号连接到 COM-时,动态 制动器将释放,驱动器允许工作 (伺服使能)。
CLR	驱动器报警清除信号	输出	此信号为解除报警状态/警告状态。本信号只能解除有可解除属性的报警。
PUL+、PUL-	脉冲输出	输出,差分信号传输方式	
DIR+、DIR-	方向输出	输出,差分信号传输方式	
+24V、GND	DC24V 电源	输出	与驱动器连接。

具体每种驱动器的接线图详见 4.8。

#### 3.3.2 常用驱动器参数设置

维智,安川,松下,三菱,台达,富士,日立,三洋,开通伺服驱动器的参数设置表参见4.6。

#### 3.3.3 其他品牌驱动器驱动器参数设置

注意以下事项:

- 首先确定选择的伺服驱动器 SON 信号的类型,是否低电平有效(即与 24V 电源的 GND 导通时 为 ON)。
- 确定伺服驱动器报警输出端在没有报警时的电平,若正常时为低电平,软件中【端口设置】下的 驱动器报警输入端口极性应设为 P,若报警时才为低电平,极性应设为 N(极性设定方法见 3.2.1 节)。
- 确定伺服驱动器的参数设定为:接收的脉冲信号类型是"脉冲+方向"。伺服驱动器输入端子中有 无外部紧停信号输入,及该信号的逻辑。
- 4) 驱动器试运转前,必须先给端子板供 24V 电源,因为驱动器所需 24V 电源是通过端子板转供的。 如果驱动器还不能运转,确定驱动器参数设定为不使用"正反转输入禁止"。

Signal	Definition	Out	out/Input	Remark
SON	Servo ON signal	Output		This signal used for opening (power on) and closing (power off) servo motor. When it is connected to COM-, dynamic brake will be released and the driver is allowed to work (servo enabled).
CLR	Driver alarm clear signal	Output		The alarm state will be cleared when this signal keeps closed with COM- for above 120ms.
PUL+; PUL-	Pulse output	Output, signal mode	differential transmission	
DIR+; DIR-	Direction output	Output, signal mode	differential transmission	
+24V; GND	DC 24V power	Output		Connected to driver

For wiring diagrams of any specific drivers, see section 4.8.

## 3.3.2 Frequently Used Servo Drivers

Regarding parameter setting of such servo drivers as YASKAWA, PANASONIC, MITSUBISHI, DELTA, FUJI, HITACHI, SANYO and KT, please refer to section 4.6.

### 3.3.3 Parameter Setting of other Servo Drivers

Note:

- 1) Firstly confirm the SON signal type of selected servo driver to see whether it is active low (i.e. servo is ON when SON and GND of 24V power is conducted);
- 2) Then make clear the level of servo driver alarm output port when there is no alarm. If it is normally low-level, the input port polarity of servo alarm should be "P" in "IOPort" window of software; if it is low-level when alarm occurs, the port polarity should be "N"; for polarity setting, refer to section 3.2.1;
- Make sure the type of pulse signal received in parameters setting of servo driver is "pulse + direction"; make clear whether there is external emergency stop signal input in the input terminal of servo driver, and the logic of this signal;
- 4) Before the trial run of the driver, 24V power supply must be provided for the terminal board, because the 24V power for the driver is indirectly provided through the terminal board; if the driver can't rotate, make sure the driver parameter "forward and reverse rotation input prohibited" is set invalid.

## 3.4 系统参数设置

#### 3.4.1 脉冲当量设置

**脉冲当量 (p)**:数控系统发出一个脉冲时,丝杠移动的直线距离或旋转轴转动的度数,也是数控系统 所能控制的最小距离。该值越小,机床加工精度和工件表面质量越高;值越大,机床最大进给速度越大。 因此,在进给速度满足要求的情况下,建议设定较小的脉冲当量。机床所能达到的最大进给速度与脉冲当 量间关系为:

最大进给速度=脉冲当量×60×频率

例如: 朗达 4S 的硬件频率为 1MHz, 假设脉冲当量为 0.001mm/p, 则:

#### 最大进给速度=0.001×60×1000000=60m/min

机械减速比(m/n):减速器输入减速与输出转速的比值,也等于从动轮齿数与主动轮齿数的比值。在数控机床上为电机轴转速与丝杠转速之比。即:

机械减速比= 减速器输入转速 = 从动轮齿数 = 电机轴转速 减速器输出转速 主动轮齿数 = 丝杠转速

螺距 (d): 螺纹上相邻两牙对应点之间的轴距离。

对于不同的电机系统,脉冲当量相关计算不同。

◆ 步进电机

一般情况下,先设定细分数,再计算脉冲当量。也可先设定脉冲当量,再计算细分数。其关系为:

$$\frac{d}{p} = \frac{360}{\theta} \times x \times \frac{m}{n}$$

其中: p 代表脉冲当量, x 代表步进驱动器细分数, θ 表示步进电机步距角。 从而得出:

脉冲当量 = 
$$\frac{丝杠螺距}{\frac{360}{$$
步距角} × 细分数 × 机械减速比

例如: 某型号机床 X 轴选用的丝杠导程为 5 毫米,步进电机的步距角为 1.8 度,工作在 10 细分模式。 电机和丝杠采用连轴节直连。那么,X 轴的脉冲当量为:

脉冲当量 = 
$$\frac{5mm}{\frac{360}{1.8} \times 10 \times 1}$$
 = 0.0025mm/p

## 3.4 System Parameter Setting

## 3.4.1 Pulse Equivalent Setting

**Pulse equivalent (p):** the moving distance of workbench or rotation degree of rotary axis corresponding to one pulse sent by CNC device, the minimum available distance controlled by CNC system as well.

The smaller the pulse equivalent is, the higher the machining precision and surface quality will be. The larger, the faster feedrate will be. Therefore, lower pulse equivalent should be set under the condition of meeting the demand of feedrate. The relationship between Max. feedrate and pulse equivalent is as follows.

Max. Feedrate= pulse equivalent X 60 X frequency

For example, the hardware frequency of Lambda 4S is1 MHz and provided the pulse equivalent is 0.001 mm/p, then:

Max. Feedrate=0.001 X 60 X 1000000= 60m/min

**Mechanical deceleration (m/n):** the ratio of reducer input speed to output speed, equal to the ratio of the teeth number of driven wheel to that of driving wheel. When applied in CNC machines, it specifies the ratio of motor speed to screw speed.

 $Mechanical \ deceleration \ ratio = \frac{reducer \ input \ speed}{reducer \ output \ speed} = \frac{teeth \ number \ of \ driven \ wheel}{teeth \ number \ of \ driving \ wheel} = \frac{motor \ speed}{screw \ speed}$ 

**Pitch (d):** The axial distance between the corresponding points of two adjacent teeth on the threads. The calculation of pulse equivalent varies with different motor systems.

#### Stepping Motor

In general, firstly set the subdivision and then calculate the pulse equivalent. You can set the pulse equivalent before calculating subdivision. Their relationship can be shown as:

$$\frac{d}{p} = \frac{360}{\theta} \times \mathbf{x} \times \frac{m}{n}$$

Hereinto, p stands for pulse equivalent, x represents subdivision of stepping motor while  $\theta$  stands for stepping angle. Therefore,

 $\label{eq:pulse equivalent} \mbox{Pulse equivalent} = \frac{\mbox{screw pitch}}{\frac{360}{\mbox{stepping angle}} \times \mbox{subdivision} \times \mbox{mechanical deceleration ratio}}$ 

For instance, the selected screw lead of X-axis for a certain type of machine tool is 5mm, and the stepping angle of stepping motor is 1.8 degree, with "10" subdivision and motor directly connected with screw by coupling. Thus, the pulse equivalent of X-axis is:

Pulse equivalent = 
$$\frac{5mm}{\frac{360}{1.8} \times 10 \times 1} = 0.0025mm/p$$

#### ◆ 伺服电机

一般情况下,设定脉冲当量(p)为默认值 0.001mm/p,计算电子齿轮比(B/A),其关系为:

电子齿轮比  $(\frac{B}{A}) = \frac{编码器分辨率×脉冲当量}{螺距} × 机械减速比 <math>(\frac{m}{n})$ 即:  $\frac{B}{A} = \frac{F \times p}{d} \times \frac{m}{n}$ 

电子齿轮比(B/A):为伺服驱动器参数(例:安川驱动器,B为PN202,A为PN203),是伺服对接收到上位机的脉冲频率进行放大或缩小,B/A的值大于1为放大,值小于1为缩小。例如:上位机输入频率100HZ,电子齿轮比分子设为1,分母设为2,那么伺服实际运行速度按照50HZ的脉冲进行。上位机输入频率100HZ,电子齿轮比分子设为2,分母设为1,那么伺服实际运行速度按照200HZ的脉冲进行。

**编码器分辨率 (F)**:编码器轴转一圈所输出的位置数。查看伺服电机的铭牌,并对应驱动器说明书即可确定编码器分辨率,如图 3-16 所示为安川 SGMSH 型号电机铭牌,其中电机型号中第四位是序列编码器规格,该电机分辨率为 2<sup>17</sup>,即 131072。

AC SERVO	) MOTOR		.]			
TYPE SGMSH-10ACA21           W         N • m         A           1000         3.18         5.7			━━━━━━ TYPE SGMSH-1 0 ACA 2 1 第4位			
r/min 30 S/N V71	000 007-1 (AWA ELECTR	<u>9707</u> 001	- 第四位:序列编码器规格			格
7		JAPAN	J	记号	规格	备注
				2	17位绝对值	标准
				С	<b>17</b> 位增量值	标准

图 3-16 伺服电机铭牌-编码器分辨率

例如:某型号机床(配安川驱动器)的丝杠螺距为5毫米,编码器分辨率为17bit,脉冲当量为0.001mm/p, 机械减速比1:1。

电子齿轮比=
$$\frac{PN202}{PN203} = \frac{2^{17}}{5/0.0001} \times 1 = \frac{8192}{3125}$$

#### ◆ 旋转轴

旋转轴脉冲当量:每个脉冲对应装夹工件的轴转动的度数。其与直线运动轴的区别在于:旋转轴的螺 距值为 360 度。因此,计算旋转轴脉冲当量时,其他计算相同,只需将螺距值换成 360。

从而得出:

#### Servo Motor

In general, set the default value of pulse equivalent as 0.001mm/p and calculate electronic gear ratio (B/A). Their relationship can be shown as:

$$\label{eq:Electronic gear ratio} \begin{split} \text{Electronic gear ratio} & \frac{B}{A} = \frac{\text{encoder resolution}}{\frac{\text{screw pitch}}{\text{pulse equivalent}}} \times \text{mechanical deceleration ratio} \end{split}$$

Namely,  $\frac{B}{A} = \frac{F \times p}{d} \times \frac{m}{n}$ 

**Electronic gear ratio (B/A):** the parameter of servo driver (take YASKAWA driver as an example, B is PN202 while A PN203). This ratio represents servo scales up or down the pulse frequency sent by CNC system. When B is larger than A, it means scaling up and vice versa. For example, provided the pulse frequency sent by CNC system is 100HZ, if the numerator of electronic gear ratio (B) is set as 1 while the denominator 2, the actual running speed of servo is 50HZ. On the contrary, if the numerator is set as 2 while denominator 1, the actual running speed turns to 200HZ.

**Encoder Resolution (F):** needed pulse number for one circle of servo motor. Please see the servo motor label plate and then refer to the corresponding manual to confirm its encoder resolution. A label plate of YASKAWA SGMSH type motor is as follows, and the 4th character in motor type is the serial encoder specification, so the resolution of this motor is 2<sup>17</sup>, i.e. 131072.



Fig. 3-16 Name Plate of Servo Motor-encoder Resolution

For instance: (an example of YASKAWA servo) screw pitch of a certain type of machine is 5mm, with 17 bit encoder resolution, "0.0001mm/p" pulse equivalent and "1:1" deceleration ratio.

Electronic gear ratio =  $\frac{PN202}{PN203} = \frac{2^{17}}{5/0.0001} \times 1 = \frac{8192}{3125}$ 

#### Rotary Axis

The pulse equivalent of rotary axis refers to the rotation degree of the axis clamping the workpiece corresponding to each pulse. The difference of rotary axis movement from linear axis movement lies in that the screw pitch of rotary axis is 360 degrees. Therefore, in calculating rotary axis pulse equivalent, you just need to replace screw pitch with 360.

▶ 步进电机:

脉冲当量 =  $\frac{360}{\frac{360}{\overline{5}$  步距角 × 细分数 × 机械减速比

▶ 伺服电机

电子齿轮比
$$\frac{B}{A} = \frac{编码器分辨率 \times 脉冲当量}{360} \times 机械减速比$$

<sup>(3)</sup> 涉及参数(制造商参数)

参数	设定范围	默认值	含义
轴的脉冲当量X	[1E-08,1000]	0.002 mm/p	华气入坊制脉冲左对应的进始轴上立
轴的脉冲当量Y	[1E-08,1000]	0.002 mm/p	相 <b>夺</b> [
轴的脉冲当量Z	[1E-08,1000]	0.001 mm/p	工时世梦或有用反。



脉冲当量的设定值必须与伺服驱动器的电子齿轮比或步进驱动器的细分数设定值匹配。

#### 3.4.2 轴方向设置

首先需要根据右手法则的坐标系来确定各轴的正方向,右手法则的坐标系统如下图 3-17 所示。



图 3-17 右手法则坐标系

在切割类机床中,机床坐标轴的方向取决于机床的类型和各组成部分的布局。对机床而言,基本坐标 轴为 X, Y, Z:

——Z轴远离工件表面的方向为正方向(+Z);

——X 轴垂直于 Z 轴,并平行于工件的装卡面,如果为单立柱铣床,面对刀具向立柱方向看,其右运动的方向为 X 轴正方向(+X);

#### For Stepping Motor

 $Pulse equivalent = \frac{360}{\frac{360}{stepping angle} \times subdivision \times mechanical deceleration ratio}}$ 

For Servo Motor

Electronic gear ratio  $\frac{B}{A} = \frac{\text{encoder resolution} \times \text{pulse equivalent}}{360} \times \text{mechanical deceleration ratio}$ 

#### Related Parameters

Parameter	Setting Range	Default	Definition
Pulse equivalent of X-axis	[1E-08,1000]	0.002 mm/p	It refers to the displacement or
Pulse equivalent of Y-axis	[1E-08,1000]	0.002 mm/p	angle generated on the relative
Pulse equivalent of Z-axis	[1E-08,1000]	0.001 mm/p	feed axis per control pulse.

## 

The setting value of pulse equivalent must match that of the electronic gear ratio of servo driver or that of subdivision of stepping driver.

### 3.4.2 Axis Direction Setting

You should ensure the positive direction of each axis through the standard coordinate system following right-hand rule, as illustrated in Fig. 3-17.



Fig. 3-17 Coordinate System Following Right-hand Rule

For a cutting machine, the direction of machine axes is decided by both machine tool type and the layout of each component. The basic coordinate axes of a machine are X-axis, Y-axis, and Z-axis:

Z-axis: the direction of the cutting head moving away from workpiece is its positive direction (+Z).

X-axis is perpendicular to Z-axis and parallel to the clamped surface of workpiece. For a single column vertical milling machine, if the user faces the spindle and looks in the column direction, right moving direction is the positive direction of X-axis (+X).

——Y轴与X轴和Z轴一起构成遵循右手定则的坐标系统。

在根据右手法则确定各轴的正方向后,在手动模式下,用户可通过操作面板或数字键盘上相应的操作 键对机床进行手动移动,检查各轴方向是否正确。用户通过手动移动机床,来观察手动按钮方向与机床实 际运动方向是否一致。

#### 🐨 涉及参数

参数	设定范围	默认值	含义
轴方向 X	1、-1	1	
轴方向 Y	1、-1	1	指定 X/Y/Z 轴的运动方向
轴方向 Z	1、-1	1	

用户通过手动移动机床,来观察手动按钮方向与机床实际运动方向是否一致。如果不一致,比如按下 X+方向按钮,机床却向 X 轴负方向移动,此时用户可更改相应的值,比如此时若参数【N21】 "轴方向 (X)"的值为"1",用户应将其改为"-1"。

#### 3.4.3 机械原点设置

- 1) 回参考点是控制系统同步其自身坐标系与外部机床真实坐标系的过程。具体的说:当控制系统启动后,它并不知道目前机床各个轴处在什么位置,于是系统驱动各个轴运功,并且在运动的过程中检测事先安装在各个轴的开关信号。所以,一旦检测到这些开关信号,控制系统就知道机床运动到事先指定的位置,于是控制系统就把自己的坐标也设为该位置,也就是说,此时控制系统内部坐标系统和机床真实的位置同步了。
- 2) 粗定位是为了让轴(X/Y)回到机械原点的附近。粗定位开关可以采用接近开关、机械开关、光电开关等。由于这些开关在定位精度、重复性方面的局限性,所以粗定位的精度不高,通过粗定位并不能让轴精确地回到机械原点,因此需要进行精定位。
- 3) 精定位是为了让轴精确地回到机械原点。精定位采用的方法各不相同,该版本采用编码器零点作为精定位开关,即轴在运动过程中通过检测编码器零点来寻找机械原点。由于编码器转动一圈, 才能出现一个零点信号,所以精定位信号具有周期性。
- 4) 根据两个轴零点传感器的安装位置,设置【制造商】参数中的回机械原点参数。当设置正确后, 可运行【机床】菜单中的【回机械原点】子菜单项。

X-axis, Y-axis and Z-axis together constitute the coordinate system following right-hand rule.

After ensuring the positive direction of each axis based on right-hand rule, you can manually move the machine through operation panel or the shortcut keys to check whether the direction is correct or not. Through this process, you can watch and judge whether the direction indicated by manual button and actual moving direction is consistent.

#### Related Parameters

Parameter	Setting Range	Default	Definition	
Axis direction(X)	1; -1	1	It specifies the feeding	
Axis direction(Y)	1; -1	1		
Axis direction(Z)	1; -1	1		

You can judge whether the direction indicated by manual button and actual moving direction is consistent by manually moving the machine. If not (for example, pressing X+ button only to find machine moves along the negative direction), you can modify the corresponding value. For example, if the value of parameter N21 is "1", you should change it into "-1".

### 3.4.3 Homing Setting

- 1) Homing is a procedure to synchronize local coordinate system with actual external coordinate system via control system. Specifically, since the concrete position of each axis is not detected in the system, after system start-up, it will control the motion of each axis and detect the switch signal pre-installed on each axis during the motion (the control system has already known the installation position of these switches). Thus, once these switch signals are found, the system will acquire pre-specified position of the machine tool and then set the coordinate of this position as current coordinate, namely, the local coordinate system is synchronous with the actual one.
- 2) Coarse positioning is used to drive X/Y axis around the machine origin. And the following switches can be adopted in coarse positioning, involving proximity switch, mechanical switch, photoelectric switch, etc. Due to the limit of these switches on precision and repetition in positioning, the X/Y axis is unable to return to machine origin exactly in coarse positioning, thus, fine positioning is compulsory.
- 3) Fine positioning, with various methods, is used to make each axis return to machine origin exactly by regarding encoder origin as fine positioning switch, i.e. the axis is searching for machine origin in the motion via detecting encoder origin. Due to one origin signal sent per revolution of encoder, fine positioning signal is periodic.
- 4) Set manufacturer parameter "Bkref" in the software according to the installation positions of zero sensors of the two axes. When the setting is correct, run "Go Home" under "Mach" menu.

## 3.4.4 工作台行程设置

确定各轴的运动方向和机械原点后,根据机床实际尺寸在【制造商】参数中设定工作台的行程上限、 工作台行程下限和检查工作台行程范围是否有效,以使软件中的软限位功能有效。

🐨 涉及参数

参数	设定范围	默认值	含义
工作台行程下限 X	[-999999,限位上限)	0 mm	在工作台行程范围检查
工作台行程上限 X	<b>(</b> 限位下限,999999]	1500 mm	有效的情况下,允许的工 作台行程下限的机械坐
工作台行程下限 Y	[-999999, 限位上限)	0 mm	标值
工作台行程上限Y	(限位下限,999999]	3000 mm	在工作台行程范围检查
工作台行程下限 Z	[-999999,限位上限)	-3000 mm	有效的情况下,允许的工 作台行程上限的机械坐
工作台行程上限 Z	<b>(</b> 限位下限,999999]	0 mm	标值
检查工作台行程范围有效 (X/Y/Z)	是,否	是	是否启用工作台行程检 查

## 3.5 速度参数设置

#### 3.5.1 单轴加工加速度

用以描述单个进给轴的加减速能力,单位是毫米/秒<sup>2</sup>。这个指标由机床的物理特性决定,如运动部分的质量、进给电机的扭矩、阻力、切削负载等。这个值越大,运动过程中用于加减速的时间越小,效率越高。在设置过程中,开始设置小一点,运行一段时间,重复做各种典型运动,注意观察,如果没有异常情况,然后逐步增加。如果发现异常情况,则降低该值,并留 50%~100%的保险余量。

## 3.4.4 Travel Limit Setting

After confirming machine origin and moving direction of each axis, set the manufacturer parameters "Lower & Upper limit of worktable stroke" and "Check worktable stroke" according to the actual size of machine tool, so as to enable software limit function.

#### Related parameters

Parameter	Setting Range	Default	Definition
Lower limit of worktable stroke(X)	[-999999, upper limit)	0 mm	The machine coordinate of the allowable upper limit or worktable stroke.
Upper limit of worktable stroke(X)	(lower limit, 999999]	1500 mm	
Lower limit of worktable stroke(Y)	[-999999, upper limit)	0 mm	
Upper limit of worktable stroke(Y)	(lower limit, 999999]	3000 mm	The machine
Lower limit of worktable stroke(Z)	[-999999, upper limit)	-3000 mm	coordinate of the allowable lower limit or worktable stroke.
Upper limit of worktable stroke(Z)	(lower limit, 999999]	0 mm	
Check worktable stroke(X/Y/Z)	YES; NO	YES	Whether to enable worktable stroke check.

## 3.5 Speed Parameter Setting

### 3.5.1 Single Axis Machining Acceleration

It is used to describe the acceleration / deceleration ability of a single axis, with unit mm/s<sup>2</sup>. The value is determined by the physical characteristic of machine tool, such as quality of movement part, torque, resistance, cutting load of feed-motor, and so on. The larger the value is, the less time spent in the process of acceleration / deceleration will be, and the higher the efficiency will be. Set the value smaller at the beginning; make the machine tool perform various typical movements for a period of time, and carefully observe it; if there is no abnormal situation, increase the value gradually; otherwise, decrease the value and reserve 50%~100% insurance allowance.

#### 3.5.2 转弯加速度

用以描述多个进给轴联动时的加减速能力,单位是毫米/秒<sup>2</sup>。它决定了机床在做圆弧运动时的最高速 度。这个值越大,机床在做圆弧运动时的最大允许速度越大。通常,对于伺服电机系统,可以设置在 1000~5000之间。如果是重型机床,该值要小一写。在设置过程中,开始设置小一点,运行一段时间,重 复做各种典型联动运动,注意观察,如果没有异常情况,然后逐步增加。如果发现异常情况,则降低该值, 并留 50%~100%的保险余量。

#### 3.5.3 参考圆最大速度

对应于圆弧限速功能。当加工一个圆弧时,由于机床做圆弧运动时的向心力的存在,会导致机床抖动,为了减少这种抖动,加工圆弧时,软件对加工速度做了限制,限速依据要以向心加速度为依据。以默认设置为例,默认设置为是,参考圆直径为10mm,最大线速度为1800mm/min;

按照向心加速度计算公式:

$$a = \frac{v^2}{r}$$

 $\pm \pm \pm$ ; r = (10/2)mm; v = 1800mm/min

可计算出向心加速度<sup>*a*</sup>;当加工其他圆弧时,就以这个相信加速度为最大允许的向心加速度。如果其他圆弧速度过大,导致向心加速度大于本计算公式计算出来的加速度,就会对该圆进行限速。

#### 3.5.4 参考圆最小速度

对应于圆弧限速功能;按照上述计算公式,计算出来的向心加速度 a 不是唯一的判断标准。 根据公式

$$a = \frac{v^2}{r}$$

可以得知,如果圆弧太小时,线速度会被圆弧线速限制得很小,这就导致加工小圆时,会浪费时间, 于是系统提供圆弧运动最小速度这个参数。无论圆弧半径多小,加工速度都不会小于圆弧运动最小速度所 限定的下限。

通常考虑到伺服电机的驱动能力、机械装配的摩擦、机械部件的承受能力,可以在厂商参数中修改各 个轴的最大速度,对机床实际使用时的两个轴最大速度予以限制。

## 3.5.2 Cornering Acceleration

It is used to describe the acceleration/deceleration ability in synchronized motion of multi-feed-axis, with unit mm/s<sup>2</sup>. The value limits the maximum speed of machine tool in circular movement. The larger this value is, the higher the maximum allowable speed on circular movement of machine tool will be. Generally, for servo motor systems, the value is between 1000 and 5000; for heavy machine tools, the value should be smaller. Set the value smaller at the beginning; make the machine tool perform various typical movements for a period of time, and carefully observe it; if there is no abnormal situation, increase the value gradually; otherwise, decrease the value and reserve 50%~100% insurance allowance.

### 3.5.3 Maximal Speed of Reference Circle

Maximal speed of reference circle corresponds to arc speed limit function. When a machine tool processes an arc, it will vibrate due to centripetal force. To reduce this kind of vibration, the software limits machining speed during machining an arc in terms of centripetal acceleration. Take default setting as an example, the maximal line velocity of the reference circle (Diameter: 10mm) is 1800mm/min.

The formula to calculate centripetal acceleration is as follows.

$$a = \frac{v^2}{r}$$

Among the formula, r = (10/2)mm; v = 1800mm/min.

Thus centripetal acceleration a can be calculated; when other arcs are processed, this centripetal acceleration is the maximum allowable centripetal acceleration. Arc speed will be limited, if it is too large causing centripetal acceleration larger than a calculated in this formula.

### 3.5.4 Minimal Speed of Reference Circle

Minimal speed of reference circle also corresponds to arc speed limit function. a calculated in the above formula is not the only criterion for arc speed limit function.

$$a = \frac{v^2}{r}$$

According to the above formula, in processing an arc with small radius, the line speed will be limited quite low caused by arc speed limit, which will be a waste of time. Therefore, the software provides the parameter "Min. speed of reference circle", which is the minimum speed for circular motion. However small the arc radius is, the machining speed will not be smaller than the value of this parameter.

Usually, given the drive ability of servo motor, frication of machine assembly, and endurance capacity of mechanical components, the maximum speed of the two axes in actual using can be limited by modifying the manufacturer parameters "Max. speed" of each axis.

## 3.6 补偿参数设置

#### 3.6.1 丝杠误差补偿的原因

丝杠误差包括螺距误差和由于反向间隙的存在所带来的误差。一般情况下这两种误差不需要补偿,但 是精度要求较高的场合需要对反向间隙进行补偿,如果在精度要求更加严格的场合,则同时需要对螺距误 差进行补偿。

#### ◆ 螺距误差

由于丝杠生产工艺上的缺陷和长期使用导致的磨损等种种原因造成了螺距误差。为了提高进给精度, 就需要对螺距进行补偿,以满足要求。丝杠的简图如下图 3-18 A 所示,将丝杠上的 0 点设为参考点,建 立以名义值和实际值为横坐标和纵坐标的坐标系,那么理想的移动曲线应为如下图 3-18 B 所示的曲线 1, 但实际上由于螺距误差的存在,可能是移动曲线变为如下图 3-18 B 所示的曲线 2。也就是说在同一个名 义值下所对应的实际值发生了变化,偏离了理想的移动曲线,它们之间的差值就是误差,即:

误差值=名义机械坐标-实际机械坐标



图 3-18 螺距误差原理分析图

#### ◆ 反向间隙

由于正反向间隙的存在,产生了回滞特征。假设主动轴顺时针方向转动时为反向运动,带动从动轴进 行反向运动,当主动轴突然改为逆时针方向旋转也就是正向运动时,由于机械传动链齿隙的存在,会引起 伺服电机的空走,而无工作台的移动,工作台停留在某个位置一定的时间,然后才随主动轴一起进行反向 的运动,当主动轴再次改变运动方向时,情况相同,这种现象就是回滞现象。在螺距不存在误差,即理想 状态下工作台移动曲线如下图 3-19 中 A 所示,其中水平段曲线就是伺服电机空走时,工作台无移动的曲 线。实际情况下的工作台移动曲线如图 3-19 图 B 所示。

## **3.6 Compensation Parameter Setting**

### **3.6.1** Causes for Screw Error Compensation

Screw error consists of screw pitch error and errors caused by backlash. Generally, these two errors don't need compensation, but backlash compensation is needed in high precision required situation, if higher precision is required, both the two compensations are needed.

#### • Pitch Compensation:

Pitch error is caused by defect in manufacturing of screw and long-term wear, etc. In order to improve precision, pitch compensation is needed. The sketch of screw is shown in Fig. 3-18(A). Coordinate system is established, based on "0" point on the screw as the reference point, nominal value as X-coordinate, and actual value as Y-coordinate. Then ideal moving curve is as curve "1" in Fig. 3-18(B), however, actual curve will be curve "2" due to pitch error. That is to say, the Actual value is not the same as its corresponding Nominal value, actual moving curve deviating from the ideal one, and their difference is called error, i.e.:





Fig. 3-18 Analysis of Pitch Error

#### Backlash Compensation:

Hysteresis feature is caused by forward and reverse clearance. Assumed that CW rotation of driving shaft is negative motion, leading the driven shaft to counter motion, servo motor will be idling without moving worktable because of mechanical driving chain backlash when the driving shaft suddenly begins CCW rotation (positive motion). After staying at a certain position for some time, worktable will move along the negative direction with the driving shaft; when the direction of the driving shaft changes again, the situation is the same, which is called Hysteresis. If there were no pitch error under ideal condition, the moving curve of worktable is shown in Fig. 3-19(A), and the curve of horizontal section is during the idling of servo motor without worktable movement. The actual moving curve of worktable is shown in Fig. 3-19(B).



图 3-19 反向间隙原理分析图

通俗的解释是:通常滑块固定在丝杠上,丝杠外丝与附在其上的内丝不可能完全吻合,滑块在往一方移动,在突然往反方向移动时必须要走完上一方向丝杠间的间隙,我们对这点误差的补偿,称之为反向间隙补偿。

#### 3.6.2 丝杠误差补偿的方法

当【丝杠补偿方式】参数选择"2"时,则表示系统使用丝杠误差补偿功能,若参数值不为"2",则 该功能不生效。丝杠误差补偿功能将螺距误差和反向间隙误差合并在一起进行补偿处理。

将各坐标轴上相对应的名义坐标的反向误差和正向误差列入到丝杠误差补偿文件中,系统会根据这个 文件中的误差数据自动进行误差补偿。

▶ 丝杠误差补偿文件

丝 杠 误 差 补 偿 文 件 名 称 为 axeserr.dat, 该 文 件 可 以 在 安 装 目 录 ( C:\Program Files\WeiHong\NcEditor\config)里的 Data 文件夹下找到。如果对丝杠误差补偿文件中的数据进行了修改, 需要重新启动软件,才能使修改后的误差补偿文件起作用。

丝杠误差补偿文件格式为:

- 1) 指定补偿的轴数,比如: < Compensation Count ="3"> 表示补偿 3 个轴;
- 2) 指定各个轴的误差序列,该序列中内容必须按照名义机械坐标值从小到大的顺序进行排列,否则 不能正常工作。

[轴.<轴名称>]

<位置>, <正向实测值>, <反向实测值>

<位置>, <正向实测值>, <反向实测值>

<位置>, <正向实测值>, <反向实测值>

其中:

<轴名称>: X, Y, Y2, ... (大小写不区分)

位置:即名义值,即没有补偿时系统发脉冲想要走到的理论位置;



Fig. 3-19 Analysis of Backlash

The popular explanation is: because the slider is generally fixed on the screw whose outer wire and the inner wire on the outer wire cannot be completely matched, backlash compensation compensates the clearance between the screw of last direction that the slider needs to finish after reversing its moving direction.

### 3.6.2 Screw Error Compensation Method

When Parameter "Lead screw compensation mode is set as "2", screw error compensation function will be enabled; otherwise, the function will be disabled. With this function, the system will compensate both screw error and backlash error together.

After you list the forward and backward errors of nominal coordinate on each axis in the screw error compensation file, the system will compensate automatically according to the data you have listed. In the file

Screw error compensation file

The name of lead screw error compensation file is *axeserr.dat*, which can be found under folder Data of installation directory (C:\Program Files\WeiHong\NcEditor\config). Modification to the data in the lead screw error compensation file will become valid after the software is restarted.

The file format is:

- Firstly specify the number of axes to be compensated, for example, <Compensation Count = "3"> represents that 3 axes are to be compensated.
- 2) Then specify error sequence of each axis. To work properly, the contents in this sequence must be arranged in the ascending order of position value from small to large, as follows.

[Axis.<Axis Name>]

<Position>, <Forward Error>, <Backward Error>

<Position>, <Forward Error>, <Backward Error>

<Position>, <Forward Error>, <Backward Error>

Among them, <Axis Name> is X, Y, Y2... (Case-insensitive)

Position: nominal value, i.e. the theoretically arrived position driven by the pulses sent by the system when there is no compensation;

正向实测值:即没有补偿时系统发脉冲正向走,实际走到的位置;

反向实测值:即没有补偿时系统发脉冲反向走,实际走到的位置。

▶ 丝杠误差补偿工具

点击【机床】菜单下的【丝杠误差补偿向导】子菜单项,如下图 3-20 所示:



图 3-20 丝杠误差补偿向导对话框

如上所示,点击对话框底部的【加载工具】,弹出丝杠误差补偿的整体界面如图 3-21。

Measured Value (P): the actually arrived position driven by the pluses sent by the system to move forward when there is no compensation.

Measured Value (N): the actually arrived position driven by the pulses sent by the system to move reversely when there is no compensation.

Lead Screw Error Compensation Tool

Click "Screw-Err Compensation Guide" under "Mach" menu to eject the main interface of AxesErrEditor.exe as shown in Fig. 3-20.

Screw-Err Compensation Guide		x
Locate Axes	Machine Motion	Locate Program
Z © AxesX © AxesY	Y (Y+) (0) 30g (Y+) (0) 100mm 200mm	
	Y- 0 800 mm	
	A BackToOrigion	
Laser Dry StartPos: 0.000 mm PauseTime: 500	MachCoor 0 ms x3,137 mm	
EndPos: 3000.000 mm DotNum: Interval: 2.000 mm LoopNum:	5 Y: 17.568 mm	
No Start Interval     Generate GCode     Run GCode	Stop	
	LoadTools	OK Cancel

Fig. 3-20 Screw Error Compensation Guide

As above, click "LoadTools" at bottom to eject "AxesErrEditor" interface as Fig. 3-21.
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文件(E)	编辑(E)	视图(⊻)	语言(L) 设置(	<u>S</u> ) 帮助( <u>H</u> )						
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x sh	v seb	¥2 4ab								
	;  * 114	12 114							数据分析:	
编号	7 	位置	正向实测值	正向误差	反向实测值	反向误差	反向间隙	插入①	全程平均反向间隙:	
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图 3-21 丝杠误差补偿文件界面

一般丝杠误差补偿值通过激光干涉仪测量得出,有两种编写补偿文件的方法:

- 1) 导入文件补偿。在菜单栏【文件】中选择【导入文件】,在弹出对话框中选择需要导入的激光干涉仪记录的补偿数据,执行保存会自动保存到对应的配置文件中,系统在加工时即会按照文件中的值自动进行补偿。目前此工具支持.lin和.rtl文件。
- 2) 直接在丝杠误差补偿工具中输入补偿数据。在如上界面中输入【位置】、【正向实测值】和【反向 实测值】、【正向误差】与【反向误差】以及【反向间隙】都会根据输入数值自动计算得出,执行 保存会自动保存到对应的配置文件中,系统在加工时即会按照文件中的值自动进行补偿。

丝杠误差补偿工具会根据输入数据生成如下图形,根据此图形可以直观地看到路径图形,如下所示:

2	AxesErrE	ditor - axeserr.	dat					
File	Edit	View Langu	age Settings Help					
3	axis	Y axis Y2 ax	is					
	NO.	Position	Measured Value(P)	Positive Error	Measured Value(N)	Reverse Err	Insert	Data Analyse: Average Reverse
	*						Delete	0 mm
							Clear	ModifyReverseClearance
							MoveUp	
							MoveDown	
							MoveLast	
	•					•	Order	
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	+ 00							
	- 00							
	-0	0						+ 00
Read	ły							NUM

Fig. 3-21 Main Interface of AxesErrEditor.exe

Generally the value of lead screw error compensation can be measured by a laser interferometer, with two ways for compensation.

- 1) File compensation. Select "Import File" under "File" menu, choose the compensation data recorded by a laser interferometer to be imported in the pop-up dialog, and then save the data file to corresponding configuration folder. In this way, automatic compensation will be performed during machining in terms of the data in the file. Currently, only .lin and .rtl format files are supported.
- 2) Directly set compensation on the interface. Enter position, positive measured value and negative measured value in the interface, positive error, reverse error and reverse clearance calculated automatically. Then save the data file under the corresponding configuration folder. In this way, automatic compensation will be performed during machining according to the value in the file.

A visualized path graph, as shown in Fig. 3-22, will be generated according to the input data.

2	Axe	sErr	Editor - a	xeserr.	dat							
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	X 轴	3	Y 轴	12 轴								
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		3	40.0	00000	40.000000	0.000000	40.000000	0.000000	0.000000	清除 C)	调整全程反向间隙	敦( <u>R</u> )
		4	50.0	00000	50.005000	-0.005000	50.000000	0.000000	-0.005000			
		*								「上移し」		
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图 3-22 生成丝杠误差补偿界面

其中红色线条表示正向误差;蓝色线条表示反向误差;中间灰色线条代表误差为0时的基准线。

目前此编辑工具支持将丝杠误差补偿文件保存成 V9 和 V12 两个版本。可在菜单栏下的【设置】中选择所需要的版本。如上图所示,即为 V12 版本下的界面。

在双Y配置下,对Y轴、Y2轴进行丝杠误差补偿时需注意以下三点:

 使用丝杠误差补偿工具导入Y轴丝杠误差补偿参数时,需手动选择导入的数据为Y轴数据还是Y2轴 数据。界面如图 3-23 所示;

Dialog	×
请选择导入的数据	是Y轴还是Y2轴:
© Y轴	● Y2抽
	ОК

图 3-23 导入文件选择对话框

File Edit View Language Settings Help      Image: Settings Help    Descent analyse: Analyse: Average Reverse      NO.    Position    Measured Value (?)    Positive    Neasured V    Reverse C    Insert    Data Analyse: Average Reverse      1    0.00000    0.000000    0.000000    -0.001000    30.000000    -0.003000      2    30.000000    40.000000    0.000000    -0.001000    30.000000    -0.001000      3    40.000000    40.000000    0.000000    -0.001000    -0.001000    -0.001000      4    50.000000    50.000000    0.000000    -0.001000    -0.001000    -0.001000      *	🗹 Ax	kesErr	Editor - axe	serr.dat							×
NO.      Position      Measured Value (P)      Positive      Measured V.      Reverse C.      Insert      Average Reverse      Average Reverse      Omm        1      0.00000      0.000000	File	Edit	View La	anguage Settings H	lelp						
X axis    Y axis	D	Ê	8	?							
X axis    Y axis    Y2 axis      N0.    Position    Measured Value (P)    Positive    Measured V    Reverse C    Insert    Data Analyse:      1    0.000000    0.000000    0.000000    0.000000    0.000000    0.000000      3    40.000000    40.000000    0.000000    0.000000    0.000000    0.000000      3    40.000000    50.005000    50.000000    0.000000    0.000000    0.000000      4    50.000000    50.005000    50.005000    -0.005000    -0.005000    -0.005000      *         Movelly    Movelly      MovelLast        Order       0.0005            0.005             0.005               0	-			-							
N0.    Position    Measured Value (P)    Positive    Measured V    Reverse    C    Insert    Average Reverse      1    0.000000    0.000000    0.000000    0.000000    0.000000    0.000000      3    40.000000    40.000000    40.000000    0.000000    0.000000    0.000000      4    50.000000    50.005000    -0.005000    0.000000    0.000000    0.000000      *    -    -    -    -    -    ModifyReverseClearance      *    -    -    -    -    -    -    -      *    -    -    -    -    -    -    -    -      *    -	X	axis	Y axis Y	2 axis							
NO.    Position    Measured Value (P)    Positive    Measured V    Reverse    Insert    Average Reverse      1    0.000000    0.000000    0.000000    0.000000    0.000000    0.000000      2    30.000000    40.000000    0.000000    0.000000    0.000000    0.000000      3    40.000000    0.000000    40.000000    0.000000    0.000000    0.000000      4    50.000000    50.005000    -0.005000    0.000000    0.000000    0.000000      *										-Data Analyse:	
0.005-		NO.	Position	Measured Value(P)	Positive	Measured V	Rever	Reverse C	Insert	Average Reverse	
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4 50.000000 50.005000 -0.005000 0.000000 -0.005000 *		2	40,000000	30.001000	-0.001000	40,000000	0.000000	-0.001000	[]eer	ModifyReverseClearance	e
*  MoveUp    MoveDown  MoveFirst    MoveLast  Order		4	50.000000	50.005000	-0.005000	50.000000	0.000000	-0.005000			
0.005		*							MoveUp		
0.005									MoveDown		
0.005											
0.005-									moverirst		
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Ready	Ready	/								NU	м

Fig. 3-22 Lead Screw Error Compensation Generation Interface

In the above picture, the red line indicates the path of positive motion; the blue line the path of reverse motion; the middle gray line the ideal path.

Currently, this tool can save the lead screw error compensation file as two versions: V9 and V12, which can be switched under "Settings" menu. The figure above shows the interface under V12 version.



Under Double Y axes configuration, you should note the following 3 points during screw error compensation of Y axis or Y2 axis.

1) When you import the screw error compensation parameters with the load tool, you need to select whether the imported data is for Y axis or Y2 axis. The dialog box is as shown in Fig. 3-23.

Import [	Data	x
Please data:	select it as Y	axis data or Y2 axis
	🔘 Y axis	Y2 axis
		ОК

Fig. 3-23 Dialog Box "Select Whether the Data is for Y Axis or Y2 Axis"

- 2) 若直接在丝杠误差补偿工具中输入 Y 轴或 Y2 轴的补偿数据, 需选择相应的子页面进行输入;
- 3) 若在 axeserr.dat 文件中直接输入 Y2 轴的补偿数据, 指定补偿的轴数需加1, 补偿文件如图 3-24 所示。

图 3-24 Y2 轴补偿数据文件

### 3.6.3 丝杠误差补偿的效果

传统的补偿仅由单方向的误差修正量组成,在反向移动时为了提高移动位置精度,同时加上反向间隙 补偿。理论上,该补偿方式能够较好地提高半闭环数控机床的控制精度,但实验发现,补偿前定位精度很 好的点在补偿后精度并不能得到很好地保证。

本系统实现了双向螺距误差补偿功能,能够仅通过一次机床精度测量就确定正、反双向误差补偿的修 正量。相较于传统误差补偿方式(需先分别测量反向间隙值与螺距误差值,然后再作补偿表),双向误差 补偿方式能在提高定位精度的同时减少机床测量的工作量。

实践证明丝杠误差补偿能大大提高数控机床的定位精度和重复定位精度。

(j)	涉及参数
-----	------

参数	设定范围	默认值
丝杠补偿方式	0: 不补偿; 1: 反向间隙补偿; 2: 丝杠误差补偿	0
反向间隙X	[0,0.1] mm	0.000
反向间隙Y	[0,0.1] mm	0.000

- 2) If you directly enter the screw error compensation data in the load tool, you need to select the relevant interface for X axis, Y axis or Y2 axis.
- 3) If you enter directly the compensation data for Y2 axis in file axeserr.dat, the value of compensation data must be the result of 1+actual axis number. The compensation data in file axeserr.dat is shown as Fig. 3-24.

Fig. 3-24 Compensation Data for Y2 Axis

### 3.6.3 Effect of Screw Error Compensation

Composed of unidirectional error correction, traditional compensation adds backlash compensation simultaneously in reverse motion to improve moving precision. Although this kind of compensation can improve the control precision of a semi-closed machine tool to some extent, the precision after compensation of a point which is located precisely before compensation cannot be ensured according to experiments.

Weihong control system realizes bidirectional screw pitch error compensation and can confirm the correction of forward and backward direction by one measure of machine tool precision, which greatly reduce work load of machine tool measurement and improve positioning accuracy, while for traditional compensation, backlash value and screw pitch error value are measured separately with compensation table made afterwards.

It has been found that lead screw error compensation greatly improves positioning accuracy and repeated positioning accuracy of CNC machine tools.

Parameter	Setting Range	Default
	0: No compensation;	
Lead screw compensation mode	I screw compensation mode 1: Backlash compensation;	
	2: Screw error compensation	
Backlash X	[0, 0.1] mm	0.000
Backlash Y	[0, 0.1] mm	0.000

#### Related parameters

### 3.7 电子齿轮比设置

#### 3.7.1 电子齿轮

假设主控器发 5000 个脉冲指令伺服电机转一圈,现在想同样发 5000 个脉冲让伺服电机转两圈,可 以在电机轴与负载轴中间加机械齿轮实现,也可以通过设置伺服参数实现,用电路实现机械齿轮的功能,称为电子齿轮,即脉冲指令倍频功能。

#### 3.7.2 电子齿轮功能

所谓"电子齿轮"功能,是当输入一定量脉冲时对电机输出的位移量的一个比例控制系数。发出指令脉冲的"上级装置",在进行控制时,可以不用估计机械的减速比和编码器的脉冲数。

电子齿轮的功能: 使脉冲当量(主控器一个脉冲对应的丝杠移动距离)可自由设定; 倍频可以用来放 大主控器发出脉冲频率。

电子齿轮比=编码器分辨率\*脉冲当量\*机械减速比/螺距。编码器分辨率详见第 3.4.1 节。

例如:(以安川为例)某型号机床的丝杠螺距为5毫米,编码器分辨率为17Bit,脉冲当量为0.0001mm/p, 机械减速比为 1:1。

电子齿轮比=
$$\frac{PN202}{PN203} = \frac{2^{17}}{5/0.0001} \times 1 = \frac{8192}{3125}$$

电子齿轮比换算如下图 3-25 所示。

不使用电子齿轮

使用电子齿轮



#### 图 3-25 电子齿轮比换算示意图

## 3.7 Electronic Gear Ratio Setting

### 3.7.1 Electronic Gear

Electronic Gear: assume that the host controller sends 5000 pulses per revolution of servo motor. When doubling revolutions of servo motor driven by the same amount of pulses is needed, there are two methods available, "set servo parameters" and "addition of mechanical gear between motor spindle and load-spindle". Using circuit to realize the functions of mechanical gear is called electronic gear, i.e. pulse frequency multiplication function.

### 3.7.2 Electronic Gear Function

Regarding "Electronic Gear", it refers to a proportional control factor of output displacement to motor when a certain amount of pulses is input. For the "senior device" issuing pulses, it can be regardless of encoder pulse No. and mechanical deceleration ratio in controlling.

Functions of electronic gear: it can set the command unit freely (the displacement of screw corresponding to one pulse sent by host controller). Frequency reduplication can be used to amplify the frequency of pulse issued by mater controller.

Electronic gear ratio= encoder resolution × command unit × mechanical deceleration ratio / pitch. Please see section 3.4.1 for encoder resolution.

For instance: (an example of YASKAWA servo) screw pitch of a certain type of machine is 5mm, with 17 bit encoder resolution, "0.0001mm/p" pulse equivalent and "1:1" deceleration ratio.

Electronic gear ratio = 
$$\frac{PN202}{PN203} = \frac{2^{17}}{5/0.0001} \times 1 = \frac{8192}{3125}$$

The conversion of electronic gear ratio is as Fig. 3-25.



Fig. 3-25 Schematic Conversion of Electronic Gear Ratio

### 3.7.3 电子齿轮比换算示意图

电子齿轮比的设定:依照设备规格设定电子齿轮比。



### 3.7.4 电子齿轮比设定范例

◆ 范例一

丝杠螺距 6mm (负载轴丝杠每转一圈丝杠进动 6mm), 伺服电机所带来编码器为 13 位增量型编码器。 电机每转一圈产生的脉冲数: 2<sup>13</sup>/2<sup>2</sup>=2048

指令单位: 0.001mm, 主控器发一个脉冲丝杠进给 0.001mm。

负载轴旋转一圈的移动量: 6mm/0.001mm=6000

#### 滚珠丝杠



图 3-27 伺服电机与丝杠同轴 (无减速结构)

伺服电机与丝杠同轴练级,没有减速结构,电机每转一圈,丝杠也转一圈。 电子齿轮比 $\frac{B}{A} = \frac{2048 \times 4}{6000} \times \frac{1}{1} = \frac{8192}{6000} = \frac{Pn202}{Pn203}$ (注:安川伺服器分子乘4)

表格 1 参数设定值

参数	PN202	PN203
设定值	8192	6000

### 3.7.3 Computing method of Electronic Gear Ratio

The setting of electronic gear ratio should be in accordance with the specification of equipment.





Electronic Gear Ratio  $\frac{B}{A} = \frac{Pn202}{Pn203} = \frac{Encoder Pulses \times 4}{Amount of movement per revolution of bearing axle} \times \frac{m}{n}$ ; while  $\frac{m}{n}$  is mechanical deceleration ratio.

### 3.7.4 Samples of Electronic Gear Ratio

#### ♦ Sample One

As lead screw pitch= 6mm (lead screw travels 6mm per revolution of bearing axle), "2048"  $(2^{13}/2^2)$  pulses will be generated per revolution of servo motor with 13-bit incremental encoder.

Pulses generated per revolution of motor= $2^{13}/2^2$ =2048

Command unit= 0.001mm (lead screw moves 0.001mm per pulse generated by host controller)

Amount of movement per revolution of bearing axle= 6mm/0.001mm=6000

#### **Ball Screw**



Fig. 3-27 Servo Motor Sharing the Same Axle with Lead Screw (without reduction gearbox)

Servo motor and lead screw are sharing the same axle (without reduction gearbox), and one revolution of motor will lead to one rotation of lead screw.

Electronic Gear Ratio 
$$\frac{B}{A} = \frac{2048 \times 4}{6000} \times \frac{1}{1} = \frac{8192}{6000} = \frac{Pn202}{Pn203}$$

(Note: for YASKAWA servo, "4" should be multiplied by the numerator.)

Table 1 Parameters S	Setting Value
----------------------	---------------

Parameter	PN202	PN203
Setting Value	8192	6000

#### ◆ 范例二



图 3-28 圆台范例

电机每转一圈产生的脉冲数: 2<sup>13</sup>/2<sup>2</sup>=2048

1 圈的旋转角: 360°

一个指令单位: 0.1°

负载轴旋转 1 圈的移动量: 360°/0.1°=3600

电子齿轮比
$$\frac{B}{A} = \frac{2048 \times 4}{3600} \times \frac{3}{1} = \frac{Pn202}{Pn203}$$

表格 2 参数设定值

参数	PN202	PN203
设定值	24576	3600

◆ 范例三





图 3-29 皮带滑轮范例

电机每转一圈产生的脉冲数: 2<sup>16</sup>/2<sup>2</sup>=16384 滑轮直径: 100mm

一个指令单位: 0.02mm

#### Sample Two





Fig. 3-28 Sample of round table

Pulses generated per revolution of motor= $2^{13}/2^2$ =2048

Angle of rotation per revolution=360°

Command unit=0.1°

Amount of movement per revolution of bearing axle= 360°/ 0.1°=3600

$$ElectronicGearRatio \frac{B}{A} = \frac{2048 \times 4}{3600} \times \frac{3}{1} = \frac{Pn202}{Pn203}$$

Table 2 Parameters Setting Value

Parameter	PN202	PN203
Setting Value	24576	3600

• Sample Three

Belt + Pulley

Command Unit: 0.02mm



Fig. 3-29 Sample of Belt + Pulley

Pulses generated per revolution of motor= $2^{16}/2^2$ =16384

Pulley diameter=100mm

Command unit=0.02mm

负载轴旋转 1 圈的移动量:  $3.14 \times 100$ mm/0.02mm=15700 电子齿轮比  $\frac{B}{A} = \frac{16384 \times 4}{15700} \times \frac{2}{1} = \frac{Pn202}{Pn203}$ 



若计算结果未处在设定范围内,需对分子与分母进行约分。

表格 3 参数设定值

参数	PN202	PN203
设定值	131072	15700

### 3.8 机床设置检测

#### 3.8.1 校验电子齿轮比和脉冲当量

校验电子齿轮比和脉冲当量的设定值是否匹配。可以在机床的任意一根轴上做个标记,在软件中把该 点坐标设为工件零点,用直接输入指令、点动或手轮等工作方式使该轴走固定距离,用游标卡尺测量实际 距离与坐标系显示距离是否相符。

#### 3.8.2 测定有无丢脉冲

用户可以用直观的方法:用激光在工件表面上打一个点,把该点设为工作原点;反复运动后再回工件 原点,用激光在工件上再打一个点,看两点是否完全重合。对伺服系统可用更精确地方法::把伺服驱动 器设为"监视模式"中的"输入脉冲计数方式"(例如安川伺服的参数 UNOOC),调到显示数值(十六进 制)的低4位(计数值前与偶'L'),设定工作原点后记下此时的脉冲计数值,使机床反复空跑加工程序, 然后回工作原点,观察此时的脉冲计数值与原来的是否相符。对于安川伺服,只要脉冲计数值前后相差不 超过4个(伺服器内部对主控器所发的脉冲四倍频),说明主控器没有多发或少发超过一个脉冲,系统即 为正常。否则,请检查驱动器的脉冲信号类型,设定伺服器的接收方式与板卡所发脉冲类型一致。 Amount of movement per revolution of bearing axle= 3.14×100mm/ 0.02mm=15700

Electronic Gear Ratio 
$$\frac{B}{A} = \frac{16384 \times 4}{15700} \times \frac{2}{1} = \frac{Pn202}{Pn203}$$



If the calculation result is out of setting range, both the numerator and denominator should be divided by their common divisor.

Table 3 Parameter	s Setting Value
-------------------	-----------------

Parameter	PN202	PN203
Setting Value	131072	15700

### 3.8 Machine Setup Detection

### 3.8.1 Check Electronic Gear Ratio and Pulse Equivalent

To examine whether the value of electronic gear ratio matches with that of pulse equivalent, make a mark on any axis of the machine tool and set this marked point as the workpiece origin in the software. Drive this marked axis to move a fixed distance by direct command input, jog or handwheel, and so on. Measure the actual moving distance with a vernier caliper and compare whether the measured result is equal to the distance shown in the software.

### 3.8.2 Examine If Any Pulse Is Lost

Direct method: mark a little dot on the surface of a workpiece blank with laser; set this point as the workpiece origin; repeatedly move the two axes; and then back to the workpiece origin; mark a little dot again with laser to observe whether this dot completely coincides with the marked dot.

For servo systems, there is a more precise method: set servo driver mode as "input pulse count mode" of the "surveillance mode" (for example, the parameter of YASKAWA servo is UN00C); regulate the servo driver to display the lower 4 bits (with "L" before the count value) in count value (hexadecimal system); set workpiece origin and then write down the pulse count value at this time, then repeatedly run a procedure with laser off, then back to workpiece origin and see whether the pulse count value at this time is the same with the original value. For YASKAWA servo, as long as the value difference of pulse count value is no more than 4 (the frequency of host controller is 1/4 times the frequency of pulse sent by servo drive), indicating that the main controller sends pulses within the tolerance of 1 pulse, the control system runs normally; otherwise, please check the pulse signal type of servo driver, and make the pulse type received by servo in accordance with the pulse type sent by the card.

#### 3.8.3 激光工艺检测

激光工艺检测主要是检查激光,吹气,随动,点射各个控制端口是否和实际情况相对应,图层中的激 光工艺时序参数是否匹配。随动、吹气、激光之间的时序和延时控制设置是否合理,激光功率控制端口 AVC 电压变化与激光器功率变化是否一一对应。

### 3.9 PWM 脉冲控制调试

#### 3.9.1 多种脉冲调制信号

本系统提供多种脉冲调制信号,以配合多种激光器:

- 1) +24V 单端信号: MOD(24V) & COM, 输出+24V 单端信号。
- 2) +5V 单端信号: MOD(5V) & COM, 输出+5V 单端信号。
- 3) ±5V 差分信号: MOD(5V) & / MOD(5V), 输出±5V 差分信号。

#### 3.9.2 频率占空比控制

软件支持根据需要自行设置频率和占空比。

进入图层设置对话框,点击通用参数框,在激光器参数中的功率调整方式选择"占空比"。 频率取值范围: 0~100000Hz,占空比取值范围 0%~100%。

### 3.10 模拟量调节

点击【机床】菜单下的【模拟量调节】子菜单,弹出如下图 3-30 对话框:

模拟量调节	×
激光功率(AVC):	
气压(AVO1):	50%
备用模拟量1(AVO2):	50%
备用模拟量2(AVO3):	50%
□点动	激光 吹气 随动 Z浮

图 3-30 模拟量调节对话框

### 3.8.3 Laser Technic Detection

Laser technic detection is mainly to examine whether the state of such ports as laser, blow, follow, Z-up changes with the actual situations, and whether parameters of laser technic in "Layer Parameters" dialogue box are appropriate, like time sequence and delay of follow, blow and laser, and whether voltage change of the laser power control port AVC correlates with laser power change.

## 3.9 PWM (Pulse-Width Modulation)

### 3.9.1 Pulse Modulation Signals

Multiple pulse modulation signals are provided for compatibility with various lasers.

- 1) +24V single-ended signal: MOD(24V) & COM for outputting +24V single-ended signal.
- 2) +5V single-ended signal: MOD(5V) & COM for outputting +5V single-ended signal.
- 3) ±5 V differential signal: MOD(5V) & /MOD(5V) for outputting ±5V differential signal.

### 3.9.2 Frequency and Duty Cycle

Frequency and duty cycle can be set as required.

Enter the layer parameters dialog box, and then click "General parameters" and select "Duty cycle" in the "Adjust power mode" under laser device parameters.

Frequency should be within 0~100000Hz, while duty cycle within 0%~100%.

## 3.10 Analog Adjustment

Click "Analog Adjust" under "Mach" menu, and a dialog box as Fig. 3-30 will pop out.

Analog Adjust		×
Laser Power(AVC):	· · · · · · · · · · ·	100%
Pressure(AVO 1):		50%
Analog1(AVO2):		50%
Analog2(AVO3):		50%
DOC 🔲	Laser Blow Follow	Z Up

Fig. 3-30 Dialog Box "Analog Adjust"

拖动【激光功率】、【气压】、【备用模拟量1】、【备用模拟量2】滑动条可进行相应调节。 点击【激光】、【吹气】、【随动】、【Z浮】可选择开启或关闭对应端口。 勾选【点动】,再点击右侧四个按钮,输出方式为点动;取消勾选则为连续输出。

### 3.11 RS232 通信

**RS-232-C** 是美国电子工业协会联合贝尔系统、调制解调器厂家及计算机终端生产厂家共同制定的用于串行通讯的标准。它适合于数据传输速率在 0~20000b/s 范围内的通信。一般用于 20m 以内的通信。

V12 激光光纤切割软件支持通过 RS232 发送和接收指令实现激光器与软件之间的通讯以及随动仪与 软件之间的通信。

#### ◆ 接线说明

将激光器 RS232 接口与 EX30A 端子板上的 RS232 通过 DB9 电缆线连接,软件可与激光器通信。

Drag the sliders for "Laser Power", "Pressure", "Analog1" and "Analog2" to adjust the corresponding item.

Click "Laser", "Blow", "Follow" and "Z UP" to open or close corresponding ports.

After checking "JOG", click the four buttons on the right to output in jog mode; otherwise, output will be continuous.

## 3.11 RS232 Communication

RS-232-C is the standard for serial communication jointly made by EIA, AT&T (Bell System), modem manufacturers and computer terminal manufacturers, which is suitable for communication with transfer rate within the range of 0~20000b/s and generally adopted by communication within 20m.

V12 fiber laser cutting software can realize its communication with a laser and follow-up apparatus via RS232 sending and receiving instructions.

#### • Wiring specification

Connect the RS232 port on a laser to the RS232 LASER on the terminal board EX30A via a DB9 cable to read laser power.

## 4 附录

## 4.1 端子板接线图



图 4-1 激光切割系统 (双 Y) 中朗达控制器接线示意图

# 4 Appendix

## 4.1 Wiring of Terminal Board



Fig. 4-1 Wiring of Lambda Controller in Double Y Axis Configuration Laser Cutting

注意

- 本软件分单Y轴与双Y轴配置,上图所示为双Y轴配置,在单Y轴配置下朗达5S控制器上各轴伺服接口按控制器上丝印0,1,3依次接X、Y和Z轴伺服接口。
- 2) 在单Y轴配置下,X08 端口为Y轴零点,X09 端口为通用输入。
  激光切割使用扩展端子板 EX30A5,其尺寸为 195mm×118mm×56.5mm,接线图如图 4-2 所示:



图 4-2 激光切割系统中扩展端子板 EX30A5 接线示意图

注意

- 1) EX30A5 扩展端子板输出为达林顿管输出,负载电流不得大于 0.4 安培。
- 2) Y00~Y05 输出端口与继电器相连接。
- 3) 在有随动仪配置下, Y02 端口为吹气 (空气); 在无随动仪配置下, Y02 端口为随动控制切换。

[108] 附录



- The software consists of single Y configuration and double Y configuration. In single Y configuration, only X, Y and Z axes should be connected to axes driver interface 0, 1 and 3.
- 2) In single Y configuration, X08 is defined as Y-axis REF. point and X09 general input.

Extended terminal board EX30A5 ( $195mm \times 118mm \times 56.5mm$ ) is required in laser cutting, with wiring diagram as shown in Fig. 4-2.



Fig. 4-2 Wiring of Extended Terminal Board EX30A5 in Laser Cutting



- 1) The outputs of extended terminal board EX30A5 are Darlington outputs, and their load current should be  $\leq$  0.4A.
- 2) Outputs Y00~Y05 should be connected to relays.
- 3) Under the configuration with follow-up, Y02 is assigned as "Blow(Air)"; under the configuration without follow-up, Y02 is set as "follow control switching".

### 4.2 硬件设备安装尺寸图



图 4-3 朗达 5S 安装尺寸图



图 4-4 EX30A 安装尺寸图



图 4-5 前置放大器安装尺寸图

## 4.2 Dimensional Graphs



Fig. 4-3 Dimensional Graph of Lambda 5S Controller



Fig. 4-4 Dimensional Graph of Terminal Board EX30A5



Fig. 4-5 Dimensional Graph of Pre-amplifier

### 4.3 无线手柄远程控制

软件支持无线手柄远程控制,且须为成都新宏畅为我司定制的无线手柄。在 40 米空旷区域内可随意 移动,让用户不局限在电脑前操作,方便加工定位,提高操作效率和材料利用率。



## 4.3 Remote Control of Wireless Handwheel

The system supports remote control of wireless handwheel, which is customized by Xinhecheng company. In spacious areas, it can be replaced anywhere within 40 meters, freeing you from computers, facilitating machine positioning and improving operation efficiency and material usage rate.



Fig. 4-6 Wireless Handwheel

#### • Introduction of part of the buttons





2) 手动高速组合键,即在手动连续模式下,按住\_\_\_\_与任意一个方向键。

#### ◆ 优势特点

- 操作面板轻便简洁,操作按键根据系统软件定制化,可直接控制机床执行回工件原点、断点继续等功能,控制端口开闭(激光切割特色工艺如随动、吹气等端口);
- > 采用低功耗设计,无需电源开关,短时间无操作手柄将进入省电模式;
- ▶ 信号接收器外置,提升信号传输稳定性;
- ▶ 配备橡胶保护套,有效提高产品耐用性。



Combination keys for mark function: turn on mark function, press and then press ZI.
 Combination keys for manual high-speed: in manual mode, press and any other direction key.

#### Advantageous features

- With light and concise panel as well as custom buttons, it can be used to control function including backing to workpiece origin and breakpoint resume, and the opening of ports including follow and blow ports.
- Without power switch, it adopts low energy cost design and enters power saving mode if no operation is input in short time.
- > Signal receiver is installed outside, to improve the stability of signal transmission;
- > Its rubber protecting coat ensures the durability of the handwheel.

## 4.4 系统参数一览表

选择【机床】菜单下的【系统参数】子菜单项,弹出参数界面,以下列出制造商参数一览表。

参数	设定范围	默认值	生效时间	
1.0 手动				
	手动连续低速~各轴最大速度最小值(mm/min)	18000	立即生效	
手动连续高速	手动连续高速运行时的速度。当将此参数的值设置得比手动送统自动将手动连续低速的值设为该值。	连续低速还	要小时,系	
毛动连续任证	0.06~手动连续高速(mm/min)	6000	立即生效	
于幼廷续低还	手动连续默认速度,未回机械原点时在手动运动状态下均以	手动连续低	、速运行。	
手动步讲速度	0.06~各轴最大速度最小值(mm/min)	6000	立即生效	
	手动步进速度。			
1.1 固定点		[		
X轴机械坐标	-99999~99999 (mm)	0.000	立即生效	
	固定点所在位置的 X 轴机械坐标。	1		
	-99999~999999 (mm)	0.000	立即生效	
「抽机机效生物	固定点所在位置的 Y 轴机械坐标。			
1.2 参考点				
	是: 需要; 否: 不需要	否	立即生效	
加 工 前 是 否 必 须回机械原点	伺服系统使用增量型编码机床,而系统只知道此刻相对于以前的位置,为使机床上的任意位置为一固定坐标,需要选一个参考点,这个参考点就是机械原点。加工中发生紧急停止或机床断电后,重新启动机床继续加工时会出现偏位。通过重新回机械原点将找回机械坐标系,保证继续加工的精度。			
	是:复用;否:不复用	是	立即生效	
尿点限位复用	原点开关是否在接线上与限位开关复用。			
X 轴粗定位阶段	1: 正方向; -1: 负方向	-1	立即生效	
方向	在回机械原点过程中,X轴粗定位阶段的运动方向。			
Y 轴粗定位阶段	1: 正方向; -1: 负方向	-1	立即生效	
方向	在回机械原点过程中,Y 轴粗定位阶段的运动方向。			
Z 轴粗定位阶段	1: 正方向; -1: 负方向	1	立即生效	
方向	在回机械原点过程中,Z轴粗定位阶段的运动方向。			
X 轴粗定位阶段	0.06~9000 (mm/min)	6000	立即生效	
速度	在回机械原点过程中,X轴粗定位阶段的进给速度。			

## 4.4 Parameter List

Click "System Parameters" under "Mach" menu, and the parameter dialog box will pop out. Manufacturers' parameters are listed below for your reference.

Parameter	Setting Range	Default	Effect Time
1.0 Manu			
Popid jogging	1~Min. value of max. speed of all axes (mm/min)	18000	Immediately
speed	The speed in rapid jogging speed. When this value the system will set the jogging speed as it.	e is lower that	n jogging speed,
Jogging speed	1~Min. value of max. speed of all axes (mm/min)	6000	Immediately
Stepping speed	0.06~Max. value of all max. speeds of each axis (mm/min)	6000	Immediately
1.1 FixedPoint		•	
X machine	-99999~99999	0.000	Immediately
coordinate	X-axis machine coordinate of the fixed position.		
Y machine	-99999~99999	0.000	Immediately
coordinate	Y-axis machine coordinate of the fixed position.		
1.2 Bkref			
	Yes: Force; No: Not force	NO	Immediately
Force homing before machining	Our system, when used on an incremental machine tool with servo system, on knows current position with respect to previous position. To make any positio on the machine tool a fixed coordinate, it is necessary to select a reference point, which is machine origin in our system. In case of E-stop or power failur during machining, after restart, directly continuing machining may caus deviation, while resuming machining after homing to retrieve workpiec		
Limit owitch	Yes: Used; No: Not used	YES	Immediately
used as home switch	Whether the limit switch can be used as home switch as well. That is, exclusive home switch can be absent, and limit switch signal serves as home switch signal in homing		
X direction in	1: Positive; -1: Negative	-1	Immediately
coarse	The moving direction of X axis in coarse positionin	g stage durin	g the process of
positioning	backing to the reference point.		
Y direction in	1: Positive; -1: Negative	-1	Immediately
coarse	The moving direction of Y axis in coarse positionin	g stage durin	g the process of
positioning	backing to the reference point.		
Z direction in	1: Positive; -1: Negative	1	Immediately
coarse	The moving direction of Z axis in coarse positioning stage during the process of		
positioning	backing to the reference point.		
X speed in	0.06~9000(mm/min)	6000	Immediately
coarse positioning	The feeding speed of X axis in coarse positioning backing to the reference point.	stage during	g the process of

Y 轴粗定位阶段  0.06~9000 (mm/min)  6000  立即生效    速度  在回机械原点过程中,Y轴粗定位阶段的进给速度。  5000  5000			
速度 在回机械原点过程中,Y轴粗定位阶段的进给速度。			
Z 轴粗定位阶段 0.06~9000 (mm/min) 1800 立即生效			
速度 在回机械原点过程中, <b>Z</b> 轴粗定位阶段的进给速度。			
X 轴精定位阶段      0.06~6000 (mm/min)      600      立即生效			
速度 在回机械原点过程中,X轴精定位阶段的进给速度。			
Y 轴精定位阶段      0.06~6000 (mm/min)      600      立即生效			
速度 在回机械原点过程中,Y轴精定位阶段的进给速度。			
Z 轴精定位阶段  0.06~6000 (mm/min)  60  立即生效			
速度 在回机械原点过程中,Z轴精定位阶段的进给速度。			
-100~1000 (mm) 2 立即生效			
X 轴回退距离 在回机械原点精定位阶段结束后,X 轴附加的移动距离。取正值时表示往里回退, 负值表示往外出去。如果该值为0,则不移动。			
-100~1000 (mm) 2 立即生效			
Y 轴回退距离 在回机械原点精定位阶段结束后,Y 轴附加的移动距离。取正值时表示往里回退, 负值表示往外出去。如果该值为0,则不移动。			
-100~1000 (mm) 2 立即生效			
Z 轴回退距离 在回机械原点精定位阶段结束后, Z 轴附加的移动距离。取正值时表示往里回退, 负值表示往外出去。如果该值为 0,则不移动。			
0~10000 (mm)      2      立即生效			
XY 轴允差 允许XY 轴编码器原点偏差的范围。			
2.0 X 进给轴参数			
1:正方向;-1:负方向  1  重启生效			
指定 X 轴的机械坐标值增长的方向。在根据右手法则确定各轴的正方向后,手动			
轴方向 作机床运动,确定轴运动是否正确。若方向相反,则修改此参数。以X轴为例,号			
」 · · · · · · · · · · · · · · · · · · ·			



Parameter	Setting Range	Default	Effect Time	
Y speed in	0.06~9000(mm/min)	6000	Immediately	
coarse	The feeding speed of Y axis in coarse positioning	stage during	g the process of	
positioning	backing to the reference point.			
Z speed in	0.06~9000(mm/min)	1800	Immediately	
coarse	The feeding speed of Z axis in coarse positioning	stage during	g the process of	
positioning	backing to the reference point.			
X speed in	0.06~6000(mm/min)	600	Immediately	
precision	The feeding speed of X axis in fine positioning	stage during	the process of	
positioning	backing to the reference point.			
Y speed in	0.06~6000(mm/min)	600	Immediately	
precision	The feeding speed of Y axis in fine positioning	stage during	the process of	
positioning	backing to the reference point.		-	
Z speed in	0.06~6000(mm/min)	60	Immediately	
precision	The feeding speed of Z axis in fine positioning	stage during	the process of	
positioning	backing to the reference point.			
	-100~1000 (mm)	2	Immediately	
	The additional displacement of X after fine positioning during the process of			
Back space of X	backing to the reference point; plus value indicates positive direction while			
	minus value negative direction. If its value is "0", X	axis will not i	move.	
	-100~1000 (mm)	2	Immediately	
Book appage of V	The additional displacement of Y after fine positi	oning during	the process of	
Dack space of f	backing to the reference point; plus value indicates positive direction while			
	minus value negative direction.			
	-100~1000 (mm)	2	Immediately	
Back space of 7	The additional displacement of Z after fine positi	oning during	the process of	
Dack space of Z	backing to the reference point; plus value indic	ates positive	direction while	
	minus value negative direction.			
OV Error Dound	0~10000 (mm)	2	Immediately	
2Y Error Bound	The allowable difference range between the encod	er origins of	dual Y axes.	
2.0 XAxisParam				
	1: Positive ; -1: Negative	1	After restart	
	Indicates the moving direction of X axis. After the p	ositive direct	ion of each axis	
	is confirmed based on right-hand rule, manually move the machine tool to see if			
Axis direction	the direction of each axis is correct. If the direction is wrong, change the value of			
	this parameter. Take X axis as an example, manually move the machine tool			
	along X axis, only to find the direction of X axis is wrong; if the value of this			
	parameter is "1" now, change it to "-1".			

参数	设定范围	默认值	生效时间
	1E-08~1000 (mm/p)	0.002	重启生效
	脉冲当量指每个控制脉冲在对应的进给轴上产生的位移或者	角度。详细	地说,就是
<b></b> 田 的	指运动控制卡能够处理的最小位移量,在步进系统中,它一般	对应着一个	〉步进脉冲,
	再根据传动关系,把步进脉冲的角位移量转化为直线量。		
检查工作台行	是: 启用; 否: 不启用	是	重启生效
程范围有效	是否启用工作台行程范围检查。		
工作台行程下	-999999~限位上限(mm)	0.000	重启生效
限	设定工作台行程下限。		
工作台行程上	限位下限~999999(mm)	1500	重启生效
限	设定工作台行程上限。		
白斗净库	0~最大速度(mm/min)	480	立即生效
后功速度	设定启动速度。		
目上法应	0~硬件支持最大速度(mm/min)	60000	立即生效
取人迷皮	指定 X 轴允许的最大速度。		
目上加法由	$0 \sim 100000 \text{ (mm/s}^2)$	2000	立即生效
取人加迷皮	设定最大加速度。		
目上地和注意	$0 \sim 100000 \text{ (mm/s}^3)$	10000	立即生效
取入加加速度	设定最大加加速度。		
	-10000~10000	-1	重启生效
PG 分频比	X 轴发送脉冲与反馈脉冲的比值,正数表示轴编码器正向,负	数表示轴线	扁码器负向,
	0表示不启用编码器反馈。		
2.1 Y 进给轴参数			
	1: 正方向; -1: 负方向	1	重启生效
轴方向	指定 Y 轴的机械坐标值增长的方向。在根据右手法则确定各轴的正方向后,手动操		
	作机床运动,确定轴运动是否正确。若方向相反,则修改此参数。		
	1E-08~1000 (mm/p)	0.002	重启生效
	脉冲当量指每个控制脉冲在对应的进给轴上产生的位移或者	角度。详细	地说,就是
轴的脉冲当量	指运动控制卡能够处理的最小位移量,在步进系统中,它一般对应着一个步进脉冲,		
	再根据传动关系,把步进脉冲的角位移量转化为直线量。		
检查工作台行	是: 启用; 否: 不启用	是	重启生效
程范围有效	是否启用工作台行程范围检查。		
工作台行程下	-999999~限位上限(mm)	0	重启生效
限	设置工作台行程下限。		
工作台行程上	限位下限~999999(mm)	3000	重启生效
限	设置工作台行程上限。		
启动速度	0~最大速度(mm/min)	480	立即生效
	0~硬件支持最大速度(mm/min)	60000	立即生效
最大速度	指定 Y 轴允许的最大速度。		
最大加速度	$0 \sim 100000 \text{ (mm/s}^2)$	2000	立即生效

Parameter	Setting Range	Default	Effect Time		
	0.0000001~1000(mm/p)	0.002	After restart		
Pulse equivalent	Pulse equivalent refers to the displacement or angle generated on the corresponding axis per control pulse, i.e. the least displacement the motion control card can deal with. For stepping system, it is the linear value converted from angular displacement of a stepping pulse according to transmission relation, generally corresponding to a stepping pulse.				
Check worktable stroke	YES: Enable; NO: Disable	YES	After restart		
Lower limit of worktable stroke	-999999~Upper limit(mm)	0	After restart		
Upper limit of worktable stroke	Lower limit~999999(mm)	1500	After restart		
Starting speed	0~Max. speed(mm/min)	480	Immediately		
Max apod	0~Max. speed supported by hardware(mm/min)	60000	Immediately		
wax. speed	Specifies the max. allowable speed of X axis.				
Max. acceleration	0~100000(mm/s <sup>2</sup> )	2000	Immediately		
Max. jerk	0~100000(mm/s <sup>3</sup> )	10000	Immediately		
<b>F</b>	-10000~10000	-1	After restart		
Frequency	The ratio between the sending pulses and feedback pulses of X axis. Positive				
dividing ratio or	value stands for forward direction of axis encoder while negative value for				
^	backward direction. Note that this value cannot be set as "0".				
2.1 YAxisParam					
	1: Positive ;		After restart		
	-1: Negative	1			
Avia dina atian	Indicates the moving direction of Y axis. After the positive direction of each axis				
Axis direction	is confirmed based on right-hand rule, manually move the machine tool to see if				
	the direction of each axis is correct. If the direction is wrong, change the value of				
	this parameter.				
Pulse equivalent	0.0000001~1000(mm/p)	0.002	After restart		
Check worktable stroke	YES: Enable; NO: Disable	YES	After restart		
Lower limit of worktable stroke	-999999~Upper limit(mm)	0	After restart		
Upper limit of worktable stroke	Lower limit~999999(mm)	3000	After restart		
Starting speed	0~Max. speed(mm/min)	480	Immediately		
Max. speed	0~Max. speed supported by hardware(mm/min)	60000	Immediately		
Max. acceleration	0~100000(mm/s <sup>2</sup> )	2000	Immediately		

参数	设定范围	默认值	生效时间		
最大加加速度	$0 \sim 100000 \text{ (mm/s}^3)$	10000	立即生效		
	-10000~10000	-1	重启生效		
PG 分频比	Y 轴发送脉冲与反馈脉冲的比值,正数表示轴编码器正向,负数表示轴编码器负向,				
	0表示不启用编码器反馈。				
2.2 Z 进给轴参数	:				
	1: 正方向; -1: 负方向	1	重启生效		
轴方向	指定 Z 轴的机械坐标值增长的方向。在根据右手法则确定各轴的正方向后,手动操				
	作机床运动,确定轴运动是否正确。若方向相反,则修改此参数。				
	1E-08~1000 (mm/p)	0.001	重启生效		
轴的脉冲当量	脉冲当量指每个控制脉冲在对应的进给轴上产生的位移或者角度。详细地说,就是				
和印刷打力重	指运动控制卡能够处理的最小位移量,在步进系统中,它一般对应着一个步进脉冲,				
	再根据传动关系,把步进脉冲的角位移量转化为直线量。				
检查工作台行	是: 启用; 否: 不启用	是	重启生效		
程范围有效	是否启用工作台行程范围检查。				
工作台行程下	-999999~限位上限(mm)	-3000	重启生效		
限	设置工作台行程下限。				
工作台行程上	限位下限~999999(mm)	0	重启生效		
限	设置工作台行程上限。				
启动速度	<b>0</b> ~最大速度(mm/min)	480	立即生效		
最大速度	0~硬件支持最大速度(mm/min)	36000	立即生效		
最大加速度	$0 \sim 100000 \text{ (mm/s}^2)$	2000	立即生效		
最大加加速度	$0 \sim 100000 \text{ (mm/s}^3)$	10000	立即生效		
手动连续低速	0.06~手动连续高速(mm/min)	1200	立即生效		
手动连续高速	手动连续低速~各轴最大速度最小值(mm/min)	1800	立即生效		
手动步进速度	0.06~各轴最大速度最小值(mm/min)	1200	立即生效		
	-	-1	重启生效		
PG 分频比	Z 轴发送脉冲与反馈脉冲的比值,正数表示轴编码器正向,负数表示轴编码器负向,				
	0表示不启用编码器反馈。				
编码器反馈容	0~10000 (mm)	0.001	立即生效		
差	编码器反馈坐标与当前坐标的容差。				
	0.06~最大速度(mm/min)	15000	立即生效		
Z轴运动速度	加工时 Z 轴上抬、下降时的速度。				
2.3 补偿参数					
丝杠补偿方式	0: 不补偿; 1: 反向间隙补偿; 2: 丝杠误差补偿	0	重启生效		
	0: 不补偿; 1: 反向间隙补偿; 2: 丝杠误差补偿。				
反向间隙X	0~0.1 (mm)	0.000	重启生效		
	仅在"丝杠补偿方式"选择反向间隙补偿的情况下起作用。				



Parameter	Setting Range	Default	Effect Time		
Max. jerk	0~100000(mm/s <sup>3</sup> )	10000	Immediately		
Fraguanay	-10000~10000	-1	After restart		
dividing ratio of	The ratio between the sending pulses and feedback pulses of Y axis. Positive				
	value stands for forward direction of axis encoder while negative value for				
	backward direction. Note that this value cannot be set as "0".				
2.2 ZAxisParam					
	1: Positive ; -1: Negative	1	After restart		
	Indicates the moving direction of Z axis. After the positive direction of each axis				
Axis direction	is confirmed based on right-hand rule, manually move the machine tool to see if				
	the direction of each axis is correct. If the direction is wrong, change the value of				
	this parameter.				
Pulse equivalent	1E-08~1000(mm/p)	0.001	After restart		
Check worktable	YES: Enable: NO: Disable	YES	After restart		
stroke					
Lower limit of	-999999~Upper limit(mm)	-3000	After restart		
worktable stroke					
Upper limit of	Lower limit~999999(mm)	0	After restart		
worktable stroke		400			
Starting speed	0~Max. speed(mm/min)	480	Immediately		
Max. speed	0~Max. speed supported by hardware(mm/min)	36000	Immediately		
Max.	0~100000(mm/s <sup>2</sup> )	2000	Immediately		
Acceleration Max jerk	$0.10000(mm/s^3)$	10000	Immediately		
logging speed	0.06~rapid jogging speed(mm/min)	1200	Immediately		
Rapid jogging		1200	Inineciatery		
speed	axis(mm/min)	1800	Immediately		
Stepping speed	0.06~max.value of all max.speed of each axis.	1200	Immediately		
	-	-1	After restart		
Frequency	The ratio between the sending pulses and feedba	ack pulses of	Z axis. Positive		
dividing ratio of Z	value stands for forward direction of axis encod	der while ne	gative value for		
	backward direction. Note that this value cannot be	set as "0".	-		
Encoder					
feedback	0~10000(mm)	0.001	Immediately		
tolerance					
Speed of Z	0.06 - 36000 (mm/min)	15000	Immediately		
motion	0.00~30000(mmmm)	13000	Inineciately		
2.3 Compensation					
Lead screw	0: No compensation;				
compensation	1: Backlash compensation;	0	After restart		
mode	2: Screw error compensation				
Backlash X	0~0.1 mm	0	After restart		
参数	设定范围		生效时间		
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后向间附又	0~0.1 (mm)	0.000	重启生效		
<b>汉</b> 问间原 Y	仅在"丝杠补偿方式"选择反向间隙补偿的情况下起作用。				
3.0 轨迹控制					
最大前瞻路径	1~1000	300	立即生效		
数	单次规划最大路径数。				
	0~0.064 (s)	0.020	立即生效		
	平滑时间作用相当于后加减速。该值设置越大,工件的细节;	越模糊,即	越光滑。但		
	是在加工圆弧时,会引起圆弧半径的减少。同样在加工类似着	波纹的工件	的时候,会		
劫亦亚海时间	让波峰变矮如下图 4-7 所示:				
机建工得时间					
	图 4-7 轨迹平滑				
白田丹夕桂刘	1: 是; 0: 否	1	保存生效		
后用件余面作	是否启用样条插补算法。对于符合 B 样条曲线特性的段,启	用后会提高	高加工效率。		
3.1 速度控制					
进给速度确定	0: 使用文件中速度; 1: 使用默认速度	0	立即生效		
方式	设置进给速度确定方式。				
加油描移油由	0.06~各轴最大速度最小值(mm/min)	30000	立即生效		
伏坯蚀物坯皮	机床定位时(G00指令下)的默认速度(不是加工时的速度	)。			
₩11:#42:16 亩	0.06~各轴最大速度最小值(mm/min)	1800	立即生效		
款	机床加工时的默认速度(不是定位时的速度)。				
启用引刀线速	是: 启用; 否: 不启用	否	立即生效		
度	机床加工引刀线时是否启用引刀线速度。				
引入线速度	0.06~各轴最大速度最大值(mm/min)	1200	立即生效		
引出线速度	0.06~各轴最大速度最大值(mm/min)	1200	立即生效		
走边框速度	0~各轴最大速度最大值(mm/min)	30000	立即生效		
	$100 \sim 100000 \text{ (mm/s}^2)$	5000	立即生效		
	单轴加速度用以描述单个进给轴的加减速能力,单位是毫米	1秒 <sup>2</sup> 。这个	指标由机床		
单轴加工加速	的物理特性决定,如运动部分的质量、进给电机的扭矩、阻力等。这个值越大,在				
度	运动过程中花在加减速过程中的时间越小,效率越高。通常	在设置过程	中,开始设		
	置小一点,运行一段时间,重复做各轴典型运动,如果没有异常情况,可以逐步增				
	加。如果发现异常情况,则降低该值,并保留 50%~100%	的保险余量	0		
单轴空运行加	$100 \sim 100000 \text{ (mm/s}^2)$	10000	立即生效		
速度	用于机床定位时,各个进给轴的最大加速度。	I			



Parameter	Setting Range	Default	Effect Time		
Backlash Y	0~0.1 mm	0	After restart		
3.0 Track control	ol				
Max. look-ahead paths	1~1000	300	Immediately		
	0~1 (s)	0.02	Immediately		
Track smooth time	"Track smooth time" works as post-acceleration/ deceleration. The larger value is, the more ambiguous the details of workpiece are, i.e. the workpiece smoother. But it will lead to reduction of arc radius in machining an arc. An will also dwarf wave peak in machining workpiece resembling waves, as follow				
Enable B-spline	1. Yes:				
interpolation	0: No	1	After saving		
3.1 Speed/Acc					
Feeding speed options	0: file feed speed; 1: default feed speed.	0	Immediately		
G00 speed	0.06~Min. value of max. speed of all axes (mm/min)	30000	Immediately		
Default feed speed	0.06~Min. value of max. speed of all axes (mm/min)	1800	Immediately		
Enable lead in/out speed	YES: Enable; NO: Disable	NO	Immediately		
Lead in speed	0.06~Min. value of max. speed of each axis	1200	Immediately		
Lead out speed	0.06~Min. value of max. speed of each axis	1200	Immediately		
Speed of simulate cut	0~max.value of max. speed of each axis(mm/min)	30000	Immediately		
	100~100000(mm/s <sup>2</sup> )	5000	Immediately		
Single axis acceleration in machining	Single axis acceleration is used to describe the acceleration/ deceleration capability of each feed axis, with unit "mm/s <sup>2</sup> ", depending on the physical feature of machine, such as quality of motion part, torque, cutting load an resistance of the feed motor. The larger its value is, the less time the machin will spend in acceleration/ deceleration during motion process, the higher the efficiency is. Set a smaller value at first, and repeatedly execute typical motion for a period of time. If there is no abnormal situation, gradually increase the value. If abnormal condition occurs, reduce the value, with "50%~100% insurance allowance.				
Single axis	100~100000(mm/s <sup>2</sup> )	10000	Immediately		
acceleration in positioning	Max. acceleration of each feed axis during the positioning of a machine tool.				

参数	设定范围	默认值	生效时间		
杜亦加诸帝	$0.001 \sim 100000 \text{ (mm/s}^2)$		立即生效		
将弓加述度	进给运动发生在相邻轴上的最大加速度,推荐值为1~2倍单	单轴加速度	0		
	0.001~9999999 (mm/s <sup>3</sup> )	100000	立即生效		
加工加加速度	加工时单轴加速度的变化率。				
应和抽油注意	0.001~9999999 (mm/s <sup>3</sup> )	100000	立即生效		
全柱加加速度	空程时单轴加速度的变化率。				
新启设出中国	0.001~10 (s)	0.5	立即生效		
習佇碱速时间	系统从运行到暂停或者停止状态所需要的时间,该数值太小	会造成冲击	Î o		
	0~180 (deg)	120	立即生效		
高速衔接最大 角度	加工过程中如果相邻两条线段的角度大于"高速衔接最大角度",则加工过程中连接处的速度为起跳速度,如果相邻两条线段的角度小于"高速衔接最大角度",则 会根据连接角度计算一个合适的连接速度。				
	是: 启用; 否: 不启用	是	立即生效		
圆弧限速有效	圆弧限有效时,参数 N59 最大前瞻路径数、N76 参考圆最大速度和 N77 参考圆最 小速度才起作用。				
	参考圆最小速度~各轴最大速度最小值(mm/min)	5000	立即生效		
参考圆最大速 度	当加工一个圆弧时,由于机床做圆弧运动时的向心力的存在,会导致机床抖动,为 了减小这种抖动,加工圆弧时,软件对加工速度做了限制,限速依据要以向心加速 度为依据。以默认设置为例,默认设置是,参考圆直径为 10mm,最大线速度为 1800mm/min;按照向心加速度计算公式: $a = \frac{v^2}{r}$ ;其中: $r = (10/2)mm$ ;				
	v=1800mm/min;可计算出向心加速度 <sup>a</sup> ;当加工其他圆弧时,就以这个向心加速 度为最大允许的向心加速度。如果其他圆弧速度过大,导致向心加速度大于本计算 公式计算出来的加速度,就会对该圆进行限速。				
4.0 其他					
XY 轴附加行为	0: 不动; 1: 回固定点; 2: 回工件原点; 3~10: 回标记点	0	立即生效		
	每次加工程序正常结束后的 XY 轴附加行为。				
重复边只加工	0:不使用该功能;1:使用该功能	0	保存生效		
一次	图形中重复边只加工一次。				
加工结束后红	0:不提示; 1: 红灯亮 3 秒; 2: 红灯一直亮,直到用户有 鼠标或键盘输入	0	立即生效		
灯提示	加工结束后红灯提示。				



Parameter	Setting Range	Default	Effect Time		
Corporing	0.001~100000(mm/s <sup>2</sup> )	5000	Immediately		
	The maximum acceleration when feed motion is on two adjacent axes;				
acceleration	recommended value is 1~2 times of single axis acc	celeration.			
Gyy Jork	0.001~99999999(mm/s <sup>3</sup> )	100000	Immediately		
GXX JEIK	The rate of change of single axis acceleration whe	n cutting.			
G00 lork	0.001~9999999(mm/s <sup>3</sup> )	100000	Immediately		
GOO JEIK	The rate of change of single axis acceleration whe	n positioning.			
Pause deceleration time	0.001~10(s)	0.5	Immediately		
	0~180(deg)	120	Immediately		
Max. angle of	During machining, if the angle of two adjacent see	gments are la	rger than "Max.		
high-speed	angle of high-speed connection", the speed of ma	chining joint	is "0"; if smaller		
connection	than "Max. angle of high-speed connection", an a	ppropriate co	onnection speed		
	will be calculated according to the connection angle	e.			
	YES: Enable; NO: Disable	YES	Immediately		
Circular speed limit	Only when "Circular speed limit" is enabled can parameters "Max. look-ahead paths", "Max. speed of reference circle", and "Min. speed of reference circle" work.				
	Min. speed of reference circle~Min. value of max.	5000	Immediately		
	speed of all axes (mm/min)				
Max. speed of	When a machine tool processes an arc, it will vibrate due to centripetal force. To reduce this kind of vibration, the software limits machining speed during machining an arc in terms of centripetal acceleration. Take default setting as an example, the maximum line velocity of the reference circle (Diameter: 10mm) is				
reference circle	1800mm/min. The formula to calculate centripetal acceleration is $a = \frac{v}{r}$ ; among				
	it, $r = (10/2)mm$ , $v = 1800mm/min$ . Thus centripetal acceleration $a$ can be				
	calculated; when other arcs are processed, this centripetal acceleration is the				
	maximum allowable centripetal acceleration. Arc speed will be limited if it is too				
	large causing centripetal acceleration larger than	a calculated	in this formula.		
4.0 Others					
XX aves actions	0~2	0	Immediately		
AT axes actions	0: None; 1: Back to fixed point; 2: Back to workpiece origin.				
Process once	0:Disable; 1: Enable	0	After saving		
when figure overlaps	Machine line, arc or dot only once if it overlaps with	n others.			
Dromot time	0~2	0	Immediately		
when task end	The prompt after machining ends. 0: no prompt; 1:	red light on fo	or 3s; 2: red light		
	always on until there is input from the mouse or keyboard.				

参数	设定范围	默认值	生效时间	
сэ гл.њац	是: 启用; 否: 不启用		立即生效	
后用蛙跳	图层中"蛙跳"和此处是同步修改。	•		
	0.01~100 (mm)	10	立即生效	
蛙跳最小距离	此参数用来设当起点和到点的距离小于此值时,不进行蛙跳	,直接跳到	山加工点。	
白田小女小河	是: 启用; 否: 不启用	否	保存生效	
后用矢用尤淯	拐角大于此角度的刀路处才进行光滑处理。	•		
尖角光滑最小	0~尖角光滑最大角(deg)	5	保存生效	
角	拐角大于此角度的刀路处才进行尖角光滑处理。			
尖角光滑最大	尖叫光滑最小角~180(deg)	175	保存生效	
角	拐角小于此角度的刀路处才进行尖角光滑处理。			
	0.001~10 (mm)	0.02	保存生效	
尖角光滑精度	度打关用尤相处理时的相度。即图 4-8 中ODI的长度,此值设值的越大,则可以倒更大的角,此时误差更大。反之设置的越小,可以倒的角越小,误差也越小。 C			
尖角光滑最小	0.001~1000 (mm)	0.001	保存生效	
长度	相关段长度大于该值时才进行尖角光滑处理。	1		
尖角光滑最大	0.2~10 (mm)	10	保存生效	
光滑长度	进行尖角光滑处理时最多会在此长度上修剪光滑。如上图所示,如果尖角光滑最大 光滑长度为 OE ,则 AO 的长度不会超过 OE 。			
海业市家	0~10 (v)	10	立即生效	
<b> </b>	激光功率为100%时对应的电压值。			



Parameter	Setting Range	Default	Effect Time			
Enable	YES: Enable; NO: Disable	YES	Immediately			
Erroal eaning	Whether to enable frog leaping function, synchronizing with "FrogLeaping					
TrogLeaping	" <sup>g</sup> "Layer".					
	0.01~100 (mm)	10	Immediately			
FrogLeaping	If the distance between start point and end pint s	maller than t	he value of this			
min-length	parameter, processing point (end point) will be ju	mped to dire	ctly without frog			
	leaping.	Γ				
Enable arc	YES: Enable: NO: Disable NO After saving					
transition						
Min angle of are	0~Max. angle of arc transition (deg)	5	After saving			
transition	The position where the corner is smaller than the value	alue of this pa	arameter will not			
	be performed closed-angle smoothing.					
May angle of	Min. angle of arc transition~180 (deg)	175	After saving			
Max. angle of	The position where the corner is larger than the va	alue of this pa	arameter will not			
	be performed closed-angle smoothing.					
	0.001~10(mm)	0.02	After saving			
	The precision for closed-angle smoothing, i.e. the length of  OD  shown in Fig.					
	4-8. The larger the value is, the larger the angle of round-fillet is, the larger the					
	error will be, while the smaller the value is, the sm	naller the ang	le of round-fillet			
	is, the smaller the error will be.					
Precision of arc transition	E = A = O					
	Fig. 4-8 Precision of Arc Transition					
Min longth when	0.001~1000(mm)	0.001	After saving			
arc transition	The position where the length is smaller than the value of this parameter will not					
	be performed closed-angle smoothing.					
Max cut length	0.2~10(mm)	10	After saving			
when arc	This length is the max. length for closed-angle smoothing. As shown above, if					
transition	the max. smoothing length is  OE , the length of  AO  should be smaller than					
	that of IOEI.					
Laser power	0~10(v)	10	Immediately			
	The voltage relative to 100% laser power.					

参数	设定范围		生效时间	
	0~1000 (ms)	0	立即生效	
功率增长速率	功率从 0%增长到 100%所需要的时间。使用此参数可以解决	や 起点 过烧	问题。	
润滑方式	0:不启用润滑; 1: 自动润滑; 2: 手动润滑	0	立即生效	
润滑距离间隔	1~999999 (m)	100	立即生效	
自动润滑持续	1~100 (s)	5	立即生效	
时间	自动润滑时开一次润滑的持续时间			
与正	0~10 (v)	10	立即生效	
	气压为 100%时对应的电压值。			
气压空闲值	0~10 (v)	5	立即生效	
<b>冬田樟拟</b> 量 1	0~10 (v)	10	立即生效	
	备用模拟量1为100%时对应的电压值。	r		
备用模拟量1空 闲值	0~10 (v)	5	立即生效	
な田母が見る	0~10 (v)	10	立即生效	
备用 楔 拟 重 2	备用模拟量2为100%时对应的电压值。			
备用模拟量2空 闲值	<sup>3</sup> 0~10 (v)		立即生效	
	0~100000 (µs)	5	立即生效	
最小脉冲宽度 指由占空比控制激光功率时所允许的最小脉冲宽度。当脉冲宽度小于此值 用此最小脉冲宽度;当脉冲宽度大于此最小脉冲宽度时,则使用的是占空 冲宽度。				
	0:模拟量调节; 1:占空比调节	1	立即生效	
功率调整方式	方式 模拟量调节时,AVC 输出= 激光功率*切割功率*速度功率曲线,占空比= PWM 空比;占空比调节时,AVC 输出= 激光功率*切割功率,占空比= PWM 占空比*; 度功率曲线。			
默认吹气类型	0: 空气; 1: 氮气; 2: 氧气	0	立即生效	
	手动点击吹气时所吹的气体类型, 0-空气, 1-氮气, 2-氧气。			
启用双 <b>Y</b> 误差检 测	是: 启用; 否: 禁用		立即生效	
	是: 同向; 否: 反向	否	立即生效	
Y1Y2 定百回问	Y1Y2 轴电机旋转方向是否相同,是表示相同,否表示反向。			
V4V2	0~100 (mm)	5	立即生效	
┃     ∠ 惚心''   左	Y1Y2 在静止时,偏差反馈值与输出值的误差大于该值,则打	<b>尽警</b> 。		
V4V2 动太伯关	0~100 (mm)	5	立即生效	
Y1Y2 动态偏差	Y1Y2 在运动过程中,偏差反馈值与输出值的误差大于该值,	则报警。		



Parameter	Setting Range	Default	Effect Time	
Power	0~1000(ms)	0	Immediately	
Increasing	Time (in ms) for power to increase from 0% to 100%, which can be used to			
Speed	solve the problem of over-burn at the start point.			
Enable lubricate	0: No; 1: Yes; 2: Manual	0	Immediately	
Lubricate Length	1~999999(m)	100	Immediately	
Lubricate Time	1~100(s)	5	Immediately	
Pressure	0~10(v)	10	Immediately	
Value of pressure in idle	0~10(v)	5	Immediately	
Reserved analog 1	0~10(v)	10	Immediately	
Value of reserved analog 1 in idle	0~10(v)	5	Immediately	
Reserved analog 2	0~10(v)	10	Immediately	
Value of reserved analog 2 in idle	0~10(v)	5	Immediately	
	0~100000(µs)	5	Immediately	
Min pulse width	It specifies the allowable minimum pulse width. When the pulse width is smaller than this value, use this value; when larger, however, use the pulse width in duty cycle.			
	0: svc; 1: duty cycle	1	Immediately	
Adjust power mode	When svc,SVC1 = MaxPower * Layer Power,DutyCycles = PW DutyCycles;When dutycycle,SVC1 = MaxPower ,DutyCycles = Layer Power PWM DutyCycles			
Default blow type	0: Air; 1: Nitrogen; 2: Oxygen.	0	Immediately	
Enable double Y error detect	YES: Enable; NO: Disable	YES	Immediately	
Y1Y2 axis is the same direction	YES: Consistent; NO: Inconsistent	NO	Immediately	
	0~100(mm)	5	Immediately	
tolerance	When Y1 Y2 axes are steady, if the difference between the feedback value and output value is bigger than this value, alarm will occur.			
V1V2 dynamic	0~100(mm)	5	Immediately	
tolerance	When Y1 Y2 axes are dynamic, if the difference between the feedback value and output value is bigger than this value, alarm will occur.			

参数	设定范围		生效时间
自动清零工件	0: 否; 1: 是	0	立即生效
坐标	是否在开始加工、走边框、空运行时自动清零工件坐标。		
扫描切割提前	0~10	0	立即生效
开光	扫描切割提前开光参数,单位为半个控制周期。		
扫描切割滞后	0~10		立即生效
关光	扫描切割滞后关光参数,单位为半个控制周期。		
扫描切割硬件	40~128		立即生效
缓冲数	扫描切割硬件缓冲数,缓冲1个相当于半个控制周期。		
举毛可长江叶	1~10000 (ms)	200	立即生效
<b>唑</b>	控制碰板信号的灵敏度,值越大越不灵敏。		

Parameter	Setting Range	Default	Effect Time
Auto clear	0: No: 1: Yes	0	Immediately
workcoor		0	
The time of open			
laser move	0~10	0	Immediately
forward			
The time of open			
laser move	0~10	0	Immediately
backward			
The buffer count	40, 129	05	Immediately
for scan cutting	40~128	95	minediatory
Collido	1~10000(ms)	200	Immediately
Collide	It controls the sensitivity of touching the workpiece. The larger the value is, the		
Sellouvity	less sensitivity the motion will be.		

## 4.5 快捷键操作按键表

快捷键	功能	快捷键	功能
F1	帮助,显示快捷键说明	Ctrl+ N	新建文件
F2	紧停	Ctrl+ O	打开文件
F3	后退	Ctrl+ S	文件保存
F4	前进	Ctrl+ I	导入保存
F5	设置工件原点	Ctrl+ A	选择全部
F6	回工件原点	Ctrl+ Shift+ A	反向选择
F7	走边框	Shift+ A	清除选择
F8	仿真	Ctrl+ X	剪切
F9	开始	Ctrl+ C	复制
F10	暂停	Ctrl+ V	粘贴
F11	停止	Delete	删除
F12	清除轨迹	Ctrl+ Z	撤销
Shift+F9	断点继续	Ctrl+ Y	重做
Ctrl+F9	选择加工	Ctrl+ G	图库
Alt+0	显示端口窗口	Ctrl+ T	图形检测
Alt+1	激光	Ctrl+1	一键设置
Alt+2	吹气	Ctrl+2	图层设置
Alt+3	随动	Ctrl+ J	合并
Alt+4	点射	Ctrl+ W	设置引刀线
Num0	手动高速	Ctrl+ Q	引刀线起点
Num+	放大视图	Ctrl+ P	系统参数
Num-	缩小视图	Ctrl+ Home	回机械原点
Num*	调整至窗口大小	Ctrl+ BackSpace	显示速度/加速度
Num2	Y轴负向手动	Ctrl+ D	设置加工方向
Num4	X轴负向手动	Ctrl+ E	自动设置加工顺序
Num6	X轴正向手动	Ctrl+ R	设置割缝补偿
Num8	Y轴正向手动	End	居中当前点

## 4.5 Shortcut Key List

Shortcut Key	Function	Shortcut Key	Function
F1	Help, show shortcut key	Ctrl+ N	New
F2	E-stop	Ctrl+ O	Open file
F3	Go backward	Ctrl+ S	Save file
F4	Go forward	Ctrl+ I	Import file
F5	Set workpiece origin	Ctrl+ A	Select all
F6	Back to workpiece origin	Ctrl+ Shift+ A	Select invert
F7	Frame check	Shift+ A	Clear selection
F8	Simulation	Ctrl+ X	Cut
F9	Start	Ctrl+ C	Сору
F10	Pause	Ctrl+ V	Paste
F11	Stop	Delete	Delete
F12	Clear Track	Ctrl+ Z	Undo
Shift+F9	Resume breakpoint	Ctrl+ Y	Redo
Ctrl+F9	Start for selection	Ctrl+ G	Gallery
Alt+0	Show Ports window	Ctrl+ T	Shape check
Alt+1	Arc striking	Ctrl+1	One key setting
Alt+2	Auto high	Ctrl+2	Layer setting
Alt+3	Fall	Ctrl+ J	Combine
Alt+4	Rise	Ctrl+ W	Set lead-in/out line
Num0	Rapid jogging speed	Ctrl+ Q	Set origin of lead-in/out line
Num+	Zoom in	Ctrl+ P	System parameters
Num-	Zoom out	Ctrl+ Home	Back to machine origin (Go home)
Num*	Fit to window	Ctrl+ Backspace	Show speed/acceleration
Num2	Manu in negative Y axis	Ctrl+ D	Set machining direction
Num4	Manu in negative X axis	Ctrl+ E	Auto set machining order
Num6	Manu in positive Y axis	Ctrl+ R	Set kerf compensation
Num8	Manu in positive X axis	End	Middle current point

4.6 激光器接线图

### 4.6.1 IPG-YLR 系列激光器接线图



## 4.6.2 飞博 MARS-500W 激光器接线图



## 4.6 Wiring Diagrams of Laser Devices

## 4.6.1 Wiring Diagram of IPG YLR Series Laser Device



## 4.6.2 Wiring Diagram of FEIBO MARS 500W Laser Device



### 4.6.3 锐科 Raycus 光纤激光器接线图



## 4.6.4 JK/GSI-500W-FL 激光器接线图



#### Wiring Diagram of Raycus Laser Device 4.6.3



## 4.6.4 Wiring Diagram of JK 500FL Laser Device



## JK 500FL Laser Device

## 4.6.5 创鑫 Max 光纤激光器接线图

#### 创鑫Max光纤激光器

	InterLock
1	冷水机安全锁
19	冷水机安全锁

Lambda 5S控制器

#### 创鑫激光器接口

	<b>措</b> 扒 - 是 给 山	AVC			12	0~10V
	很以里相山	GND			- 5	AGND
	14/ Nr	C02	1			
	激光	Y02			- 16	出光使能+
				0\/	21	出光使能-
	光闸	C03	+24V	01		
		Y04	 J			
	EX30A5端	子板				
	PWM输出	MOD			- 15	激光调制+
		COM			- 3	激光调制-

## 4.6.6 SPI-500W-R4 激光器接线图



## 4.6.5 Wiring Diagram of Maxphotonics Laser Device

						Μ	axphc	otonics Laser Device
								InterLock
							· 1 · 19	Chiller Safety Interlock Chiller Safety Interlock
La	ambda 5S Cont	roller						Interface
	Anolog Output	AVC					12	0~10V
	Analog Output	GND					5	AGND
		C02		1				
	Laser	Y02					16	Laser Emit Enable +
		C03			0V	0V	21	Laser Emit Enable -
	Shutter	Y04		724	v			
E	(30A5 Terminal	Board						
	PWM Output	MOD					15	Laser Modulate +
		COM					3	Laser Modulate -

## 4.6.6 Wiring Diagram of SPI-500W-R4 Laser Device

**EX30A5** Terminal Board

PWM Output

MOD

COM



()注意

- 1) EX30A4 端子板的 DB9 接口(母头)与 EX30A5 端子板的 DB9 接口(公头)2、3 引脚相反,接线时 无需交叉。
- 2) 本部分接线图中所涉及的端子板 EX30A5 的 MOD 引脚均为 MOD (24V)。

## 4.7 驱动器参数设定

#### 4.7.1 维智系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明			
Pr528	LED 初始状态	6	通过设置此参数来监测脉冲数的收发是否正确。在维宏 控制系统里面,通过脉冲监测,来检测通讯卡发出脉冲 是否正确,从而可判断出是否存在电气干扰问题。			
Pr008	电机每旋转 1 次 的指令脉冲数	0	本设定值为0时,参数Pr009与Pr010有效。			
Pr009	第 1 指令分倍频 分子	需计算	范围: 0~2 <sup>30</sup> 。 典型值: 螺距 5mm,编码器分辨率 10000,连轴器直			
Pr010	指令脉冲分倍频 的分母	需计算	连,脉冲当量 0.001mm 时,Pr009=10000, Pr010=螺距 5mm/脉冲当量 0.001mm=5000, 即:Pr009/Pr010=10000/5000=2/1。			
Pr011	电机每旋转 1 圈 的输出脉冲	2500(默认值)	典型值:脉冲当量为 0.001,且没有减速机的情况下, 螺距为 10mm 时,此参数设置为 2500; 螺距为 5mm 时,此参数设置为 1250。			
Pr100	第1位置环增益	480 (默认值)	单位 0.1/s,具体数值请根据机床实际运行情况设定。			
Pr101	第1速度环增益	270(默认值)	单位 0.1Hz,具体数值请根据机床实际运行情况设定。			
Pr102	第1速度环积分 时间常数	210(默认值)	单位 0.1ms,具体数值请根据机床实际运行情况设定。			
也可设置	也可设置 Pr008 的值不为零,根据下面公式计算 Pr008 设置的值。					
电机每旋转1圈的指令脉冲数= $\frac{螺距}{脉冲当量×机械减速比}=\frac{5mm}{0.001mm/p}=5000$ ,						
当螺距 5	mm,脉冲当量 0.0	001 时,Pr008 设	置为 5000。			



- 1) Pin 2 and 3 of DB9 interface female head on EX30A4 Terminal Board is opposite to that of male head on EX30A5 terminal board, so the wiring need not be overlapped.
- 2) The MOD pin of EX30A5 terminal board in wiring diagrams of this section is MOD (24V).

## 4.7 Parameter Setting for Drives

## 4.7.1 Parameter Setting for WISE Servo Driver

Para.	Function	Value	Description	
No.	Function	value	Description	
Pr528	LED initial status	6	Monitor if the number of sent and received pulses is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.	
Pr008	Command pulse No. per motor circle	0	When it is set to "0", parameters Pr009 and Pr010 are valid.	
Pr009	1st numerator of command pulse frequency division/ multiplication	To be calculated 0~2 <sup>30</sup>	Typical value: pitch 5 mm, encoder resolution 10000, deceleration ratio 1:1, pulse equivalent 0.001 mm:	
Pr010	Denominator of command pulse frequency division/multiplica- tion	To be calculated 0~2 <sup>30</sup>	Pr009=10000 Pr010=pitch 5mm/ pulse equivalent 0.001mm=5000 Pr009/Pr010=10000/5000=2/1	
Pr100	1st position loop gain	480 (default)	Unit: 0.1/s. Set it according to the actual situation.	
Pr101	1st velocity loop gain	270 (default)	Unit: 0.1Hz. Set it according to the actual situation.	
Pr102	1st velocity loop integrated time constant	210 (default)	Unit: 0.1ms. Set it according to the actual situation.	
When th	ne value of Pr008 is no	ot "0", it should	d be calculated according to the following formula:	
Command pulse No.per motor circle= $\frac{\text{Screw pitch}}{\text{Pulse equivalent } \times \text{Mechanical deceleration ratio}} = \frac{5\text{mm}}{0.001\text{mm}/\text{p}}$				
That is t	o say, when screw pit	ch is 5mm and	d pulse equivalent is 0.001, the value of Pr008 is 5000.	

◆ 参数 Pr008、Pr009、Pr010 三者关系

Pr008	Pr009	Pr010	设定值说明
1~2 <sup>20</sup>	 (无影响)	 (无影响)	<u>指令脉冲输入</u> <u>编码器分辨率</u> <u>位置指令</u> 【Pr008设定值】 不受 Pr009、Pr010 设定的影响,根据 Pr008 的设定值进行处理。
0	0	1~2 <sup>30</sup>	指令脉冲输入       编码器分辨率       位置指令         【Pr010设定值】          Pr008、Pr009 都为0时,根据 Pr010的设定值进行上图的处理。
	1~2 <sup>30</sup>	1~2 <sup>30</sup>	指令脉冲输入       【Pr009设定值】       位置指令         【Pr010设定值】          Pr008 为 0、且 Pr009 不为 0,根据 Pr009、Pr010 设定值进行上         图的处理。

## 4.7.2 安川 Σ- ΙΙ 系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明
Fn010	密码设定(防止任 意修改参数)	0000	设为"0000"允许修改用户参数 PnXXX 和部分辅助功能 参数 FnXXX;设为"0001"禁止修改用户参数 PnXXX 和部分辅助功能参数 FnXXX。
Un00C	输入指令脉冲计 数器	十六进制 计数值 L 低四位	通过设置此参数来监测脉冲数的接发是否正确。在维宏控制系统里面,通过脉冲监测,来检测通讯卡发出脉冲是否 正确,从而可判断出是否存在电气干扰问题。
Pn000	选择旋转方向 选择控制模式	0010	位 0: 设"0",正转从负载端(丝杠)看为逆时针旋转; 设为 1 反向。 位 1: 设"1"为位置控制方式。永远计算脉冲指令。

• Attached list: the relationship among parameters Pr008, Pr009 and Pr010.

Pr008	Pr009	Pr010	Description
1~2 <sup>20</sup>	– (no influence)	– (no influence)	Command Pulse Input As shown above, the process is undergone in terms of the setting value of Pr008, not affected by the settings of Pr009 and Pr010.
0	0	1~2 <sup>30</sup>	Command Pulse Input When the values of Pr008 and Pr009 are both set to "0", as shown above, the process is undergone in terms of the setting value of Pr010.
	1~2 <sup>30</sup>	1~2 <sup>30</sup>	Command Pulse Input Setting Value of Pr009 Setting Value of Pr010 When the value of Pr008 is "0", but the value of Pr009 is not "0", as shown above, the process is undergone in terms of the setting values of Pr009 and Pr010.

## 4.7.2 Parameter Setting for YASKAWA $\Sigma$ – $\rm II~$ Servo Driver

Para. No.	Function	Value	Description
Fn010	Set password (to prevent arbitrary modification to parameters)	0000	Set "0000": modification to user parameters "PnXXX" and part of auxiliary function parameters "FnXXX" permitted; Set "0001": modification to user parameters "PnXXX" and part of auxiliary function parameters "FnXXX" prohibited.
Un00C	Surveillance mode	LXXXX (Hexadeci- mal system)	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
Pn000	Direction selection Control mode selection	0010	Bit 0: Set 0, "CCW" rotation is forward rotation (viewed from the load end of screw ball); Set 1, the rotation direction of the motor is reversed. Bit 1: Set 1, position control mode (calculate pulse instruction all the time).

参数号	参数功能	设定值	设定值说明
Pn200	选择脉冲指令方 式	0005	位 0: 设为 "5",选择指令方式为脉冲加方向、负逻辑。 位 3: 设 "0",差分信号输入滤波器。
Pn50A	选择功能	8100	位 1: 设 "0", 启用/S-ON 信号, 从 40 脚输入; 设为 "7" 伺服器永远为 ON。 位 3: 设 "8",不使用正转禁止输入信号 P-OT。
Pn50B	选择功能	6548	位 0:设 "8"不使用反转禁止输入信号 N-OT。
Pn50F	选择功能	0300	伺服电机带制动器时设置; 位 2: 设为 "3", 从 CN1-29、 30 输出刹车互锁信号/BK, 控制刹车用的 24V 继电器。
Pn50E	选择功能	0211	伺服电机带刹车时设置,四位数中不能有"3",防止 CN1-29、CN1-30 脚复用为其它功能,以致刹车失效。
Pn506	伺服关,电机停止 情况下,刹车延时 时间	视具体情 况定	电机带刹车时设置。 出厂设定为"0",设定值单位为10ms。
Pn201	PG 分频比设定	需计算	范围: 16~2 <sup>14</sup> , 具体数值根据 PG 分频比(维宏系统)设定。 典型值: 脉冲当量为 0.001, 且没有减速机的情况下, 螺 距为 10mm 时, 此参数设置为 2500; 螺距为 5mm 时, 此参数设置为 1250。
Pn202	电子齿轮比分子	需计算	Pn202=编码器每转脉冲数×4×机械减速比。 Pn203=(丝杠螺距/脉冲当量)。 典型值:螺距 5mm,编码器 17 位,连轴器直拖,脉冲当
Pn203	电子齿轮比分母	需计算	量 0.001mm 时, Pn202=16384; Pn203=625。 螺距 5mm,编码器 17 位,连轴器直拖,脉冲当量 0.0005mm 时, Pn202=8192; Pn203=625。



Para. No.	Function	Value	Description
Pn200	Select pulse instruction mode	0005	Bit 0: Set 5, select the instruction input mode as "pulse + direction", negative logic. Bit3: Set 0, input differential signal into filter.
Pn50A	Selection function	8100	Bit 1: Set 0, Servo ON /S-ON, input from the 40th pin; Set 7, Servo ON all the time. Bit 3: Set 8, forward rotation not used and signal input (P-OT) prohibited.
Pn50B	Selection function	6548	Bit 0: Set 8, reverse rotation not used and signal input (N-OT) prohibited.
Pn50F	Selection function	0300	Set it when servo motor with brakes. Bit 2: Set 3, brake interlock signal "/BK" is output from CN1-29, CN1-30 to control 24V relay for brake.
Pn50E	Selection function	0211	Set it when servo motor with brakes. To avoid of CN1-29 and CN1-30 being used for other function and leading to brake ineffective, "3" is not allowed to appear in the 4 digits.
Pn506	Servo off, time delay of brake when motor stops	Depended	Set it when motor with brakes. Default setting is "0", setting unit is 10ms.
Pn201	PG divider ratio	To be calculated	Range: 16~2 <sup>14</sup> . Concrete value is decided by PG divider ratio (Weihong system). Typical value: when pulse equivalent is 0.001, pitch 10mm, without reducer, sets the parameter to 2500; when pitch 5mm, sets it to 1250.
Pn202	Electronic gear ratio (numerator)	To be calculated	Pn202 = pulse No. of each encoder circle x 4 x mechanical deceleration ratio. Pn203 = (screw pitch/ pulse equivalent). Typical value: pitch 5mm encoder 17-bit coaxial
Pn203	Electronic gear ratio (denominato r)	Need Calculation	connection between motor and screw, pulse equiva 0.001mm, Pn202=16384; Pn203=625. Pitch 5mm, encoder 17-bit, coaxial connection betw motor and screw, pulse equivalent 0.0005mm, Pn2 8192; Pn203=625.

## 4.7.3 安川 Σ- V /Σ-7 系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明
Fn010	参数写入禁止设 定	0000	设定值为"0000"时写入许可,允许修改用户参数 PnXXX 和部分辅助功能参数 FnXXX。 设定值为"0001"时写入禁止,禁止修改用户参数 PnXXX 和部分辅助功能参数 FnXXX。
Pn000	功能选择基本开 关 0	0010	0位:设"0",正转指令时正转。 1位:设"1"为位置控制方式(脉冲序列指令)。
Pn200	位 置控制指令形 态选择开关	0005	0位:设为"5",选择指令方式为脉冲 + 方向、负逻辑。
Pn50A	输入信号选择1	8100	1 位:设"0",启用/S-ON 信号,从 40 脚输入;设为"7" 伺服器永远为 ON。 3 位:设"8",不使用正转禁止输入信号 P-OT。
Pn50B	输入信号选择2	6548	0位:设"8"不使用反转禁止输入信号 N-OT。
Pn50F	输出信号选择2	0300	伺服电机带制动器时设置; 2位:设为"3",从 CN1-29、 30 输出刹车互锁信号/BK,控制刹车用的 24V 继电器。
Pn50E	输出信号选择1	0211	伺服电机带刹车时设置,四位数中不能有"3",防止 CN1-29、CN1-30 脚复用为其它功能,以致刹车失效。
Pn506	制动器指令-伺服 OFF 延迟时间	视具体情 况定	电机带刹车时设置。 出厂设定为"0",设定值单位为ms。

## 4.7.3 Parameter Setting for YASKAWA $\Sigma\text{-}\mathrm{V}/\Sigma\text{-}7$ Servo Driver

Para. No.	Function	Value	Description
Fn010	Parameter input prohibition setting	0000	Set "0000": modification to user parameters "PnXXX" and part of auxiliary function parameters "FnXXX" permitted. Set "0001": modification to user parameters "PnXXX" and part of auxiliary function parameters "FnXXX" prohibited.
Pn000	Function selection basic switch 0	0010	Bit 0: Set 0, positive rotation at positive rotation command; Bit 1: Set 1, position control mode (pulse sequence command)
Pn200	Format selection switch of position control command	0005	Bit 0: Set 5, select the instruction mode as "pulse + direction", negative logic.
Pn50A	Input signal selection 1	8100	Bit 1: Set 0, Servo ON /S-ON, input from the 40 <sup>th</sup> pin; Set 7, Servo ON all the time. Bit 3: Set 8, positive rotation not used and signal input (P-OT) prohibited.
Pn50B	Input signal selection 2	6548	Bit 0: Set 8, negative rotation not used and signal input (N-OT) prohibited.
Pn50F	Output signal selection 2	0300	Set it when servo motor with brakes. Bit 2: Set 3, brake interlock signal "/BK" is output from CN1-29, CN1-30 to control 24V relay used for brake.
Pn50E	Output signal selection 1	0211	Set it when servo motor with brakes. To avoid of CN1-29 and CN1-30 being used for other function and leading to brake ineffective, 3 is not allowed to appear in the 4 digits.
Pn506	Brake instruction- servo OFF time delay	Depended	Set it when motor with brakes Default setting is "0", setting unit is ms.

参数号	参数功能	设定值	设定值说明
Pn20E	电子齿轮比 (分子)	需计算	$\frac{Pn20E}{Pn210} = \frac{编码器分辨率 \times 脉冲当量 \times 减速比螺距例如: 螺距 5mm,编码器 20 位,联轴器直拖,脉冲当量0.001mm 时,Pn20E _ 2^{20} \times 0.001_ 1048576 _ 131072$
Pn210	电子齿轮比 (分母)	需计算	$\frac{1}{Pn210} = \frac{1}{5} = \frac{1}{5000} = \frac{1}{625}$ $\text{gp 10mm b},  \frac{Pn20E}{Pn210} = \frac{1048576}{10000} = \frac{65536}{625}$ $\text{yp RE}旋转轴, 编码器 13 位, 减速比为 60$ $\frac{Pn20E}{Pn210} = \frac{2^{13} \times 0.001 \times 60}{360} = \frac{8192}{6000} = \frac{512}{375}$
Pn212	编码器分配脉冲 数	需计算	范围: 16~2 <sup>30</sup> , 具体数值根据 PG 分频比设定。 脉冲当量为0.001,且没有减速机的情况下,螺距为10mm 时,此参数设置为 2500; 螺距为 5mm 时,此参数设置 为 1250。



Para. No.	Function	Value	Description
Pn20E	Electronic gear ratio (numerator)	To be calculated	$\frac{Pn20E}{Pn210} = \frac{Encoder resolution \times Pulse equiv \times Deceleration ratio}{Screw pitch}$ For example, screw pitch 5mm, 20-bit encoder, coupling direct drag, pulse equivalent 0.001mm,
Pn210	Electronic gear ratio (denominator)	Need Calculation	$\frac{Pn20E}{Pn210} = \frac{2^{20} \times 0.001}{5} = \frac{1048576}{5000} = \frac{131072}{625}$ When screw pitch is 10mm, $\frac{Pn20E}{Pn210} = \frac{1048576}{10000} = \frac{65536}{625}$ For a rotary axis with 13-bit encoder and deceleration ratio as 60, $\frac{Pn20E}{Pn210} = \frac{2^{13} \times 0.001 \times 60}{360} = \frac{8192}{6000} = \frac{512}{375}$
Pn212	Pulse No. allocated by encoder	To be calculated	Range: 16~2 <sup>30</sup> . Concrete value is decided by PG divider ratio. When pulse equivalent is 0.001, pitch 10mm, without reducer, sets this parameter to 2500; when pitch 5mm, sets it to 1250.

## 4.7.4 松下 MINAS A4 系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明
Pr01	LED 初始状 态	12	通过设置此参数来监测脉冲数的收发是否正确。在维宏控制系 统里面,通过脉冲监测,来检测通讯卡发出脉冲是否正确,从 而可判断出是否存在电气干扰问题。
Pr02	控制方式选择	0	0: 位置控制。 1: 速度控制。 2: 转矩控制。
Pr40	指令脉冲输入 选择	1	1: 通过差分专用电路输入。
Pr42	指令脉冲输入 方式选择	3	设定脉冲指令输入方式为指令脉冲+指令方向,负逻辑。
Pr44	反馈脉冲分倍 频分子	需计算	范围: 1~32767,具体数值根据 PG 分频比设定。 脉冲当量为 0.001,且没有减速机的情况下,螺距为 10mm 时, 此参数设置为 2500;螺距为 5mm 时,此参数设置为 1250。
Pr48	指令脉冲分倍 频第1分子	需计算 1 ~ 10000	典型值:螺距 5mm,编码器分辨率 10000,连轴器直拖,脉冲 当量 0.001mm 时,
Pr4B	指令脉冲分倍 频的分母	需计算 1 ~ 10000	Pr48=10000, Pr4B=螺距 5mm/脉冲当量 0.001mm=5000, 即: Pr48/Pr4B=10000/5000=2/1。

## 4.7.4 Parameter Setting for PANASONIC MINAS A4 Servo

### Driver

Para. No.	Function	Value	Description
Pr01	LED initial status	12	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
Pr02	Select control mode	0	0: position mode 1: velocity mode 2: torque mode
Pr40	Selection of command pulse input	1	1: input by differential exclusive circuit
Pr42	Select command pulse input mode	3	Set command pulse input mode: pulse + direction, negative logic
Pr44	Numerator of feedback pulse frequency multiplication	To be calculated	Range: 1~32762. Concrete value is decided by PG divider ratio. When pulse equivalent is 0.001, pitch 10mm, without reducer, sets this parameter to 2500; when pitch 5mm, sets it to 1250.
Pr48	1st numerator of command pulse frequency multiplication	To be calculated Range: 1~10000	Typical value: pitch 5 mm, encoder resolution 10000, shaft coupling direct drag, pulse equivalent 0.001 mm:
Pr4B	Denominator of command pulse frequency multiplication	To be calculated Range: 1~10000	Pr4B = pitch 5mm / pulse equivalent 0.001mm = 5000 Pr48/Pr4B=10000/5000=2/1

## 4.7.5 松下 MINAS A5 系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明				
Pr5.28	LED 初始状态	6	通过设置此参数来监测脉冲数的收发是否正确。在维宏控制系 统里面,通过脉冲监测,来检测通讯卡发出脉冲是否正确,从 而可判断出是否存在电气干扰问题。				
Pr0.01	控制模式设定	0	<ul><li>0:位置控制。</li><li>1:速度控制。</li><li>2:转矩控制。</li></ul>				
Pr0.05	指令脉冲输入 选择	хх	<ul> <li>0: 光电耦合器输入(PULS1, PULS2, SIGN1, SIGN2)。</li> <li>1: 长线驱动器专用输入(PULSH1, PULSH2, SIGNH1, SIGNH2)。</li> <li>注: 一般情况,将此参数设置为1。</li> </ul>				
Pr0.07	指令脉冲输入 模式设置	3	设定脉冲指令输入方式为指令脉冲+指令方向,负逻辑。				
Pr0.08	电机每旋转 <b>1</b> 次的指令脉冲 数	0	本设定值为 0 时,参数 Pr0.09 与 Pr0.10 有效。				
Pr0.09	第 1 指令分倍 频分子	需计算 0~2 <sup>30</sup>	典型值:螺距 5mm,编码器分辨率 10000,连轴器直拖,脉冲 当量 0.001mm 时,				
Pr0.10	指令脉冲分倍 频的分母	需计算 0~2 <sup>30</sup>	Pr0.09=10000, Pr0.10=螺距 5mm/脉冲当量 0.001mm= 5000,即: Pr0.09/Pr0.10=10000/5000=2/1。				
Pr0.11	电机每转 1 圈 的输出脉冲数	2500	范围: 1~262144,具体数值根据 PG 分频比设定。脉冲当量 为 0.001,且没有减速机的情况下,螺距为 10mm 时,此参数 设置为 2500;螺距为 5mm 时,此参数设置为 1250。				
也可设置	也可设置 Pr0.08 的值不为零,根据下面公式计算 Pr0.08 设置的值。						
电机每	电机每旋转1圈的指令脉冲数= $\frac{螺距}{脉冲当量×机械减速比}=\frac{5mm}{0.001mm/p}=5000$						
当螺距 5	当螺距 5mm,脉冲当量 0.001 时,Pr0.08 设置为 5000。						

## 4.7.5 Parameter Setting for PANASONIC MINAS A5 Servo

#### Driver

Para. No.	Function	Value	Description				
Pr5.28	LED initial status	6	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.				
Pr0.01	Select control mode	0	0: position mode 1: velocity mode 2: torque mode				
Pr0.05	Selection of command pulse input	ХХ	<ul> <li>0: Photo-coupler input (PULS1, PULS2, SIGN1, SIGN2)</li> <li>1: Exclusive input for line driver (PULSH1, PULSH2, SIGNH1, SIGNH2)</li> <li>Note: generally, "1" is selected for this parameter.</li> </ul>				
Pr0.07	Command pulse input mode setup	3	Set command pulse input mode: pulse + direction, negative logic.				
Pr0.08	Command pulse counts per one motor revolution	0	When it is set as "0", parameters Pr0.09 and Pr0.10 are valid.				
Pr0.09	1st numerator of command pulse frequency multiplication	To be calculated Range: 0~2 <sup>30</sup>	Typical value: pitch 5 mm, encoder resolution 10000, shaft coupling direct drag, pulse equivalent 0.001 mm:				
Pr0.10	Denominator of command pulse frequency multiplication	To be calculated Range: 0~2 <sup>30</sup>	Pr0.10=pitch 5mm/ pulse equivalent 0.001mm= 5000 Pr0.09/Pr0.10=10000/5000=2/1				
Pr0.11	Output pulse No. per one motor revolution	2500	Range: 1~262144. Concrete value is decided by PG divider ratio. When pulse equivalent is 0.001, pitch 10mm, without reducer, sets this parameter to 2500; when pitch 5mm, sets it to 1250.				
When the va	alue of Pr0.08 is no	t "0", it can be	calculated in terms of the following formula:				
Command p	Command pulse No.per motor circle= $\frac{\text{Screw pitch}}{\text{Pulse equivalent } \times \text{Mechanical deceleration ratio}} = \frac{5\text{mm}}{0.001\text{mm}/\text{p}}$						
= 5000 When scrow pitch is 5mm and pulse equivalent 0.001mm/s, the value of Pr0.08 is "5000"							
= 5000 When screw pitch is 5mm and pulse equivalent 0.001mm/p, the value of Pr0.08 is "5000".							

◆ 参数 Pr0.08、Pr0.09、Pr0.10 三者关系

Pr0.08	Pr0.09	Pr0.10	设定值说明
1~2 <sup>20</sup>	 (无影响)	 (无影响)	<u>指令脉冲输入</u> <u>编码器分辨率</u> <u>位置指令</u> 【Pr0.08设定值】 不受 Pr0.09、Pr0.10 设定的影响,根据 Pr0.08 的设定值进行上 图的处理。
0	0	1~2 <sup>30</sup>	<u>指令脉冲输入</u> 编码器分辨率 位置指令 【Pr0.10设定值】 ↓ <b>□</b> 【Pr0.10设定值】 ↓ <b>□</b> Pr0.08、Pr0.09 都为0时,根据 Pr0.10 的设定值进行上图的处 理。
	1~2 <sup>30</sup>	1~2 <sup>30</sup>	指令脉冲输入 【Pr0.09设定值】 位置指令 【Pr0.10设定值】 】

## 4.7.6 三菱 MR-JE 系列伺服驱动器参数设定

参数号	简称	参数功能	设定值	设定值说明
PA01	*STY	运行模式	XXX0	X:选择位置控制模式。
PD24	MBR	CN1-23 引脚输出 信号配置	XX05	xx:选择 MBR (电磁制动器互锁信号)。

• Attached List: the relationship among parameters Pr0.08, Pr0.09 and Pr0.10.

Pr0.08	Pr0.09 Pr0.10		Description
1~2 <sup>20</sup>	— (no influence)	— (no influence)	Command Pulse Input Setting Value of Pr0.08 The process shown above is undergone in terms of the setting value of Pr0.08, not affected by the settings of Pr0.09 and Pr0.10.
0	0	1~2 <sup>30</sup>	Command Pulse Input Setting Value of Pr0.10 When the values of Pr0.08 and Pr0.09 are both set as "0", as shown above, the process is undergone in terms of the setting value of Pr0.10.
	1~2 <sup>30</sup>	1~2 <sup>30</sup>	Command Pulse Input Setting Value of Pr0.09 Setting Value of Pr0.10 When the value of Pr0.08 is "0", but the value of Pr0.09 is not "0", as shown above, the process is underdone in terms of the setting values of Pr0.09 and Pr0.10.

## 4.7.6 Parameter Setting for MITSUBISHI MR-JE Servo Driver

Para. No.	Code	Function	Value	Description
PA01	*STY	Operation mode	XXX0	x: select position control mode.
PD24	MBR	Output assignation to CN1-23 pin	XX05	xx: select MBR (electromagnetic brake interlock).

参数号	简称	参数功能	设定值	设定值说明
PA06	СМХ	电子齿轮分子	需计算	CMX/CDV=指令单位×伺服电机分辨率×机械减速 比/丝杠螺距。 典型值:螺距 5mm,编码器分辨率 10000,连轴
PA07	CDV	电子齿轮分母	需计算	<ul> <li>础 1 元, 亦, 平 当 重 0.001mm 时,</li> <li>CMX/CDV=10000×0.001/5=2/1;</li> <li>脉冲当量 0.0005mm 时, CMX/CDV=1/1。</li> <li>电子齿轮比设定范围 1/50~500。</li> </ul>
PC36	*DMD	状态显示选择	00XX	<ul> <li>xx:接通电源时状态显示的选择,对接通电源时显示的状态显示进行选择。</li> <li>00:反馈脉冲累积;</li> <li>01:伺服电机转速;</li> <li>02:滞留脉冲;</li> <li>03:指令脉冲累积;</li> <li>04:指令脉冲频率。</li> </ul>
PA13	*PLSS	指令脉冲输入形 态	0011	设定脉冲指令输入方式为脉冲串加符号,负逻辑。
PA15	*ENR	编码器反馈脉冲	需计算	设置范围: 1~65535, 具体数值根据 PG 分频比设定。 脉冲当量为 0.001, 且没有减速机的情况下, 螺距为 10mm 时,此参数设置为 2500; 螺距为 5mm 时, 此参数设置为 1250。
PD03	*DI1L	可以将任意的输 入设备分配到 CN1-15针上。	XX02	xx: 位置控制模式下选择 SON。

## 4.7.7 三菱 MR-E 系列伺服驱动器参数设定

参数号	简称	参数功能	设定值	设定值说明
0	*STY	选择控制模式和 再生用选购件	X0X0	位 0: 设为 "0",选择位置控制方式。 位 1: 电机序列选择, 0: HC-KFE; 1: HC-SFE。 位 3: 再生用选购件选择, 0: 不用。 位 4: 电机功率选择。

Para. No.	Code	Function	Value	Description	
PA06	СМХ	Electronic gear numerator	To be calculated	CMX/CDV=command unit × servo motor resolution × mechanical deceleration ratio pitch of screw. E.G., pitch 5 mm, encoder	
PA07	CDV	Electronic gear denominator	To be calculated	resolution 10000, deceleration ratio 1:1, pulse equivalent 0.001 mm, $CMX/CDV=10000\times0.001/5 = 2/1$ ; When pulse equivalent = 0.0005mm CMX/CDV = 1/1. Electronic gear ratio range: 1/50~500	
PC36	*DMD	Status display selection	00XX	<ul> <li>xx: status display selection at power-on.</li> <li>This is used to select a status display shown at power-on.</li> <li>00: cumulative feedback pulses</li> <li>01: servo motor speed</li> <li>02: droop pulses</li> <li>03: cumulative command pulses</li> <li>04: command pulse frequency</li> </ul>	
PA13	*PLSS	Command pulse input form	0011	Set command pulse input form: pulse train+ sign, negative logic.	
PA15	*ENR	Encoder feedback pulse	To be calculated	Range: 1~65535. Concrete value is decided by PG divider ratio. When pulse equivalent is 0.001, pitch 10mm, without reducer, sets the parameter to 2500; when pitch 5mm, sets it to 1250.	
PD03	*DI1L	Input assignation to CN1-15 pin	XX02	xx: select SON under position control mode.	

## 4.7.7 Parameter Setting for MITSUBISHI MR-E Servo Driver

Para.No.	Code	Function	Value	Description
0	*STY	Control mode selection and regenerative fittings	X0X0	<ul> <li>Bit 0: set 0: select position control mode.</li> <li>Bit 1, select motor series: 0: HC-KFE;</li> <li>1:HC-SFE;</li> <li>Bit 3, select regenerative apparatus, set 0: not use.</li> <li>Bit 4, select motor power.</li> </ul>
参数号	简称	参数功能	设定值	设定值说明
-----	------	----------------------------------	--	--
1	MBR	功能选择 1	001X	位 0: 输入滤波器,外部输入信号如果因为噪声等 原因发生震荡,使用输入滤波器进行抑制。 位 1: 设为"1",CN1-12引脚的功能选择。 0: 零速度检测信号; 1: 电磁制动器互锁信号。
3	СМХ	电子齿轮分子	需计算	CMX/CDV=指令单位×伺服电机分辨率×机械减 速比/丝杠螺距。 典型值:螺距 5mm,编码器分辨率 10000,连轴 器直拖 脉冲当量 0.001mm 时 CMX/CDV=10000
4	CDV	电子齿轮分母	<ul> <li>需计算</li> <li>器 正泡, 脉冲 当 重 0.001/mm 时, CMX/CDV</li> <li>× 0.001/5=2/1; 脉冲 当 量 0.0005mm</li> <li>CMX/CDV=1/1。</li> <li>电子齿轮比设定范围 1/50~500。</li> </ul>	<ul> <li>※ 0.001/5=2/1; 脉冲当量 0.0005mm 时,</li> <li>CMX/CDV=1/1。</li> <li>电子齿轮比设定范围 1/50~500。</li> </ul>
18	*DMD	状态显示选择	00XX	3: 指令脉冲积累; E: 负载转动惯量。 当参数设置为3时,通过设置此参数来进行脉冲数 的接发是否正确。在维宏控制系统里面,通过脉冲 监测,来检测通讯卡发出脉冲是否正确,从而可判 断出是否存在电气干扰问题。
21	*OP3	功能选择3(指令 脉冲波形选择)	0001	设定脉冲指令输入方式为脉冲串加符号,负逻辑。
27	*ENR	编码器输出脉冲	需计算	范围: 1~65535, 具体数值根据 PG 分频比设定。 脉冲当量为 0.001, 且没有减速机的情况下, 螺距 为 10mm 时,此参数设置为 2500; 螺距为 5mm 时, 此参数设置为 1250。
41	*DIA	输入信号 SON、 LSP、LSN 自动 ON 选择	0110	位 0: 伺服 ON 选择。设"0",由外部输入使伺服 ON,设"1",伺服器内部一直 ON。 位 1: 正转行程终点(LSP)输入选择,设"1", 伺服器内部自动 ON,不需外部配线。 位 3: 反转行程终点(LSN)输入选择,设"1", 伺服器内部自动 ON,不需外部配线。

Para.No.	Code	Function	Value	Description
1	MBR	Function selection 1	001X	Bit 0: input signal filter. If external input signal causes chattering due to noises, etc., input filter is used to suppress it. Bit 1: CN1-12 function selection, set "1": electromagnetic brake interlock (MBR); set "0": zero speed detection signal.
3	СМХ	Electronic gear numerator	To be calculated	resolution × mechanical deceleration ratio / screw pitch. E.G., pitch 5 mm, encoder resolution 10000, shaft coupling direct drag, pulse equivalent
4	CDV	Electronic gear denominator	To be calculated	0.001 mm, $CMX/CDV=10000\times0.001/5 = 2/1;$ When pulse equivalent = 0.0005mm, CMX/CDV = 1/1. Electronic gear ratio range: 1/50~500
18	*DMD	Status display selection	00XX	3: cumulative command pulses E: load inertia When the parameter is set "3", monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection to determine if there is electrical interference.
21	*OP3	Function selection 3 (command pulse format selection)	0001	Set pulse command input form: pulse train+ sign, negative logic
27	*ENR	Encoder output pulse	To be calculated	Range: 1~65535. Concrete value is decided by PG divider ratio. When pulse equivalent is 0.001, pitch 10mm, without reducer, sets this parameter to 2500; when pitch is 5mm, sets it to 1250.
41	*DIA	Signal input SON-ON, LSP-ON and LSN-ON automaticall y selection	0110	<ul> <li>Bit 0: Servo-ON selection. "0": servo on by external input;</li> <li>"1": servo on all the time inside.</li> <li>Bit 1: last signal of positive rotation range (LSP):</li> <li>"1": auto servo on inside, without external wiring.</li> <li>Bit 3: last signal of negative rotation range (LSN):</li> <li>"1": auto servo on inside and no need of external wiring.</li> </ul>

🔔 注意

- 1) 三菱 MR-E-A 系列支持位置控制模式和速度控制模式;
- 2) 三菱 MR-E-AG 系列仅模拟量输入的速度控制模式。

#### 4.7.8 台达 ASDA-A 系列伺服参数设定

参数号	参数功能	格式 范围	设定值	设定值说明
P0-02	驱动器状态显示		02	通过设置此参数来进行脉冲数的接发是否正确。 在维宏控制系统里面,通过脉冲监测,来检测通 讯卡发出脉冲是否正确,从而可判断出是否存在 电气干扰问题。
P1-00	设定外部脉冲输 入形式	ZYX	102	X=2:设定外部脉冲输入形式为脉冲+方向。 Z=1:负逻辑。
P1-01	控制模式设定	ZYX1X0	0000	Z=0: 控制模式切换时 DIO 保持原设定值。因为 没有使用模式切换,故Z=0。 Y=0: 从负载方向看,逆时针正转,设为1反向。 X1X0=00: 设定控制模式为位置控制。
P1-32	电机停止模式	YX	00	Y=0: 伺服使能没有时,电机动态刹车。设为 1 电机自由。 X=0: 电机瞬间停止,设1减速停止。
P1-44	电子齿轮比分子 N1	1~32767	需计算	N1/M=编码器脉冲数×4×脉冲当量×机械减速 比/螺距; 典型值: 编码器脉冲数 2500, 脉冲当量
P1-45	电子齿轮比分母 M	1~32767	需计算	N1/M=2500×4×0.001/5=2/1, N1 设 2, M 设 1。 未使用多段电子齿轮比,不用设 P2-60~P2-62。



- 1) MITSUBISHI MR-E-A series servo drivers support position control mode and speed control mode;
- 2) MITSUBISHI MR-E-AG series servo drivers only supports speed control mode with analog input.

#### 4.7.8 Parameter Setting for DELTA ASDA-A Servo Driver

Para. No.	Function	Format & Range	Value	Description
P0-02	Driver status display		02	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection to determine if there is electrical interference.
P1-00	External pulse input type	ZYX	002	X=2: pulse + direction; Z=0: positive logic
P1-01	Control mode setup	ZYX1X0	0000	Z=0: during control mode switching, DIO is maintaining the set value. Since switching control mode is not used, Z=0 Y=0: forward rotation (CCW) (in terms of load); Y=1: the rotation direction is reversed. X1X0=00: position control mode
P1-32	Motor stop mode selection	YX	00	<ul><li>Y=0: when there is no servo enabled, motor dynamic brake occurs; Y=1: motor is free.</li><li>X=0: motor stops instantly, X=1: motor stops with deceleration.</li></ul>
P1-44	Electronic Gear Ratio (Numerator)(N1)	1~32767	To be calculated	N1/M= encoder pulses x 4x pulse equivalentx mechanical deceleration ratio/ pitch Representative value: encoder pulses=2500, pitch=5mm, pulse equivalent=0.001 deceleration ratio=1
P1-45	Electronic Gear Ratio (Denominator) (M)	1~32767	To be calculated	calculation as follows. $N1/M= 2500 \times 4 \times 0.001/5 = 2 / 1, N1=2,$ M=1; When the multi-electronic gear ratio is not used, P2-60~P2-62 are not required.

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参数号	参数功能	格式 范围	设定值	设定值说明
P2-10	数字输入脚 DI1 功能设定	X2X1X0	101	X1X0=01:设定数字输入 DI1 为 SON,对应 CN1 的 9 脚。X2=1:设定输入 DI1 为常开 a 接点。
P2-15	数字输入脚 DI6 功能设定	X2X1X0	100	驱动器出厂默认设置 DI6、DI7 为常闭限位信号输入,未接 CN1 的 32、31 脚时驱动器无法运转。
P2-16	数字输入脚 DI7 功能设定	X2X1X0	100	X2=1,设定输入 DI6、DI7 为常开 a 接点。 X1X0=00,不使用驱动器的限位输入。
P2-17	数字输入脚 DI8 功能设定	X2X1X0	100	不使用外部 EMG 紧停输入。
P2-21	数字输出脚 DO4 功能设定	X2X1X0	108	DO4 对应的引脚为 1、26,在 Z 轴用做钳位刹车 信号。 X2=1 设定 DO4 输出为 a 常开接点,设为 0 为 b 常闭接点。 X1X0=08:设定 1、26 脚分别为 BK+、BK-。
P2-22	数字输出脚 DO5 功能设定	X2X1X0	007	DO5 对应的引脚为 28、27,伺服报警信号。 X2=0 设定 DO5 输出为 b 常闭接点。 X1X0=07:设定 28、27 脚分别为 ALRM+、ALRM-。
P2-51	伺服使能 SON 设定		0	0: 伺服 ON 须由数字输入信号触发。 1: 伺服上电后,若无报警自动 ON。 没有 SON 信号线时设为 1。

Para. No.	Function	Format & Range	Value	Description
P2-10	Digital Input Pin DI1	X2X1X0	101	X1X0=01: digital input (DI1=SON) corresponds to 9th pin of CN1. X2 = 1: set DI1 input as NO (normally open) a-contact point.
P2-15	Digital Input pin DI6	X2X1X0	100	Default factory setting of DI6 and DI7 are NC (normally closed) limit signal input pins; driver can't run without being connected to pin 32 and pin 31 of CN1.
P2-16	Digital Input Pin DI7	X2X1X0	100	X2=1: set DI6 and DI7 inputs as NC (normally open) a-contact points X1X0=00, limit signal input of the drive is not used.
P2-17	Function setting for digital input pin DI8	X2X1X0	100	External EMG stop input is not used.
P2-21	Function setting for digital output pin DO4	X2X1X0	108	DO4 corresponds to pin 1 & pin 26, used as clamping-position brake signal of Z-axis; X2=1: set DO4 output as NO (normally open) a-contact point; X2=0: set DO4 output as NC (normally closed) b-contact point; X1X0=08: set pin 1 and pin 26 as BK+ and BK- respectively.
P2-22	Function setting for digital output pin DO5	X2X1X0	007	DO5 corresponds to pin 28 & pin 27, used as servo alarm signal. X2=0: set DO5 output as NC (normally closed) b-contact point. X1X0=07: set pin 28 and pin 27 as ALRM+ and ALRM- respectively.
P2-51	Servo ON (SON) setup		0	<ul><li>0: Servo ON must be triggered by numerical input signal.</li><li>1: when servo is powered, if there is no alarm signal, servo will be automatically on. Set 1 when there is no SON signal wire.</li></ul>

#### 4.7.9 台达 ASDA-A2 系列驱动器参数设定

参数号	参数功能	格式 范围	设定值	设定值说明
P0-02	驱动器状态显 示		02	通过设置此参数来进行脉冲数的接发是否正确。在维 宏控制系统里面,通过脉冲监测,来检测通讯卡发出 脉冲是否正确,从而可判断出是否存在电气干扰问 题。
P1-00	设定外部脉冲 输入形式	ZYX	102	X=2: 设定外部脉冲输入形式为脉冲+方向。 Z=1: 负逻辑。
P1-01	控制模式设定	ZYX1X0	0000	<ul> <li>Z=0:控制模式切换时 DIO 保持原设定值。因为没有使用模式切换,故 Z=0。</li> <li>Y=0:从负载方向看,逆时针正转,设为1反向;</li> <li>X1X0=00:设定控制模式为位置控制。</li> </ul>
P1-44	电子齿轮比分 子 <b>N1</b>	1 ~ 32767	需计算	P1-44 P1-45 = 编码器分辨率×脉冲当量×减速比 螺距 编码器分辨为 1280000, 螺距 5mm, 脉冲当量 0.001,
P1-45	电子齿轮比分 母 M	1 ~ 32767	需计算	且定 $\frac{P1-44}{P1-45} = \frac{1280000 \times 0.001}{5} = \frac{256}{1}$ 未使用多段电子齿轮比,不用设 P2-60~P2-62。
P1-46	检出器输出脉 冲数设定	20 ~ 320000	需计算	回转单项脉冲数设定,具体数值根据 PG 分频比设定。 脉冲当量为 0.001,且没有减速机的情况下,螺距为 10mm 时,此参数设置为 10000;螺距为 5mm 时,此参数设置为 5000。
P2-10	数 字 输 入 脚 DI1 功能设定	X2X1X0	101	X1X0=01:设定数字输入 DI1 为 SON,对应 CN1 的 9 脚。 X2=1:设定输入 DI1 为常开 a 接点。

#### 4.7.9 Parameter Setting for DELTA ASDA-A2 Servo Driver

Para. No.	Function	Format & Range	Value	Description
P0-02	Driver status display		02	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
P1-00	External pulse train input type	ZYX	002	X=2: pulse + direction; Z=0: positive logic
P1-01	Set control mode	ZYX1X0	0000	Z=0: during control mode switching, DIO is maintaining the set value. Since switching control mode is not used, Z=0; Y=0: positive rotation (CCW) (from the view of load); Y=1: negative rotation (CCW) X1X0=00: position control mode
P1-44	Electronic Gear Ratio ( Numerator) (N1)	1~32767	To be calculated	$\frac{P1-44}{P1-45} = \frac{Encoder resolution \times Pulse equiv \times Decelerat. ratio}{Pitch}$ Assuming encoder resolution is 1280000, pitch 5mm, pulse equivalent
P1-45	Electronic Gear Ratio (Denominator) (M)	1~32767	To be calculated	then: $\frac{P1-44}{P1-45} = \frac{1280000*0.001}{5} = \frac{256}{1}$ When the multi-electronic gear ratio is not used, P2-60~P2-62 are not required.
P1-46	Detector output pulse No. setting	20~ 320000	To be calculated	Concrete value is decided by PG divider ratio. Assuming encoder resolution is 0.001, pitch 10mm, without reducer, then set this parameter to 10000; when pitch is 5mm, set it to 5000.
P2-10	Digital Input Pin 1 (DI1)	X2X1X0	101	X1X0=01: digital input (DI1 = SON) corresponds to 9th pin of CN1. X2=1: set DI1 input as NO (normally open) a-contact point.

参数号	参数功能	格式 范围	设定值	设定值说明
P2-15	数 字 输 入 脚 DI6 功能设定	X2X1X 0	100	驱动器出厂默认设置 DI6、DI7 为常闭限位信号输入, 未接 CN1 的 32、31 脚时驱动器无法运转。
P2-16	数 字 输 入 脚 DI7 功能设定	X2X1X 0	100	X2=1,设定输入 DI6、DI7 为常开 a 接点。 X1X0=00,不使用驱动器的限位输入。
P2-17	数 字 输 入 脚 DI8 功能设定	X2X1X 0	100	不使用外部 EMG 紧停输入。
P2-21	数字输出脚 DO4 功能设 定	X2X1X 0	108	DO4 对应的引脚为 1、26, 在 Z 轴用做钳位刹车信号。 X2=1 设定 DO4 输出为 a 常开接点, 设为 0 为 b 常闭 接点。 X1X0=08: 设定 1、26 脚分别为 BK+、BK-。
P2-22	数字输出脚 DO5 功能设 定	X2X1X 0	007	DO5 对应的引脚为 28、27,伺服报警信号。 X2=0 设定 DO5 输出为 b 常闭接点。 X1X0=07:设定 28、27 脚分别为 ALRM+、ALRM-。

### 4.7.10 台达 ASDA-B 系列驱动器参数设定

参数号	参数功能	格式 范围	设定值	设定值说明
P0-02	驱动器状态显示		02	通过设置此参数来进行脉冲数的接发是否正确。 在维宏控制系统里面,通过脉冲监测,来检测通 讯卡发出脉冲是否正确,从而可判断出是否存在 电气干扰问题。
P1-00	设定外部脉冲列 输入形式	ZYX	102	X=2: 设定外部脉冲输入形式为脉冲+方向。 Z=1: 负逻辑。

Para. No.	Function	Format & Range	Value	Description
P2-15	Function setting for digital input pin DI6	X2X1X0	100	Default factory setting of DI6 and DI7 is NC (normally closed) limit signal input; driver can't run without being connected
P2-16	Function setting for digital input pin DI7	X2X1X0	100	X2=1: set DI6 and DI7 input as NO a-contact points. X1X0=00, limit input of driver is not used.
P2-17	Function setting for digital input pin DI8	X2X1X0	100	External EMG stop input is not used.
P2-21	Function setting for digital output pin DO4	X2X1X0	108	DO4 corresponds to pin 1 & pin 26, used as clamping-position brake signal of Z-axis; X2=1: set DO4 output as NO (normally open) a-contact point; X2=0: set DO4 output as NC (normally closed) b-contact point; X1X0=08: set pin 1 and pin 26 as BK+ and BK- respectively.
P2-22	Function setting for digital output pin DO5	X2X1X0	007	DO5 corresponds to pin 28 & pin 27, used as servo alarm signal. X2=0: set DO5 output as NC b-contact point. X1X0=07: set pin 28 and pin 27 as ALRM+ and ALRM- respectively.

### 4.7.10 Parameter Setting for DELTA ASDA-B Servo Driver

Para. No.	Function	Format & Range	Value	Description
P0-02	Driver status display		02	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
P1-00	External pulse train input type	ZYX	002	X=2: pulse + direction; Z=0: positive logic

参数号	参数功能	格式 范围	设定值	设定值说明
P1-01	控制模式设定	YX1X0	000	Y=0:从负载方向看,逆时针正转,设为1反向。 X1X0=00:设定控制模式为位置控制。
P1-32	电机停止模式	YX	00	Y=0:伺服使能没有时,电机动态刹车。设为 1 电机自由。 X=0:电机瞬间停止,设1减速停止。
P1-44	电子齿轮比分子 N1	1~32767	需计算	N1/M=编码器脉冲数×4×脉冲当量×机械减速 比/螺距。 典型值:编码器脉冲数 2500,脉冲当量
P1-45	电子齿轮比分母 M	1~32767	需计算	0.001mm/p, 螺距 5mm,机械减速比 1。 N1/M=2500×4×0.001/5=2/1, N1 设 2, M 设 1。 未使用多段电子齿轮比,不用设 P2-60~P2-62。
P2-10	数字输入脚 DI1 功能设定	X2X1X0	101	X1X0=01: 设定数字输入 DI1 为 SON, 对应 CN1 的 17 脚。 X2=1: 设定输入 DI1 为常开 a 接点。
P2-15	数字输入脚 DI6 功能设定	X2X1X0	100	驱动器出厂默认设置 DI6 为常闭限位信号输入, 未接 CN1 的 32、31 脚时驱动器无法运转。 X2=1,设定输入 DI6 为常开 a 接点。 X1X0=00,不使用驱动器的限位输入。
P2-18	数 字 输 出 脚 DO1 功能设定	X2X1X0	108	DO1 对应引脚为 16,在 Z 轴用做钳位刹车信号。 X2=1 设定 DO1 输出为 a 常开接点,设为 0 为 b 常闭接点。 X1X0=08:设定 16 脚为 BK+。
P2-20	数 字 输 出 脚 DO3 功能设定	X2X1X0	007	DO3 对应的引脚为 1, 伺服报警信号。 X2=0 设定 DO3 输出为 b 常闭接点。 X1X0=07:设定 1 脚为 ALRM+。

Para. No.	Function	Format & Range	Value	Description
P1-01	Set control mode	YX1X0	000	<ul><li>Y=0: forward rotation (CCW) (from the view of load)</li><li>Y=1: the rotation direction is reversed.</li><li>X1X0=00: position control mode</li></ul>
P1-32	Motor stop mode	YX	00	<ul> <li>Y=0: when there is no servo enabled, motor dynamic brake occurs; Y=1: motor is free.</li> <li>X=0: motor stops instantly;</li> <li>X=1: motor stops with deceleration.</li> </ul>
P1-44	Electronic Gear Ratio (Numerator) (N1)	1~32767	To be calculated	N1/M= mechanical deceleration ratio × 4 × encoder pulses × pulse equivalent / pitch. Representative value: encoder pulses=2500, pitch =5mm, pulse equivalent=0.001 mm/p, deceleration ratio
P1-45	Electronic Gear Ratio (Denominator) (M)	1~32767	To be calculated	<ul> <li>= 1, calculation as follows.</li> <li>N1 / M = 2500×4×0.001/5 = 2/1, N1=2</li> <li>M=1;</li> <li>When the multi-electronic gear ratio is not used, P2-60~P2-62 are not required.</li> </ul>
P2-10	Digital Input Pin 1 (DI1)	X2X1X0	101	X1X0=01: digital input (DI1 = SON) corresponds to 17th pin of CN1. X2=1: set DI1 input as NO (normally open) a-contact point.
P2-15	Function setting for digital input pin DI6	X2X1X0	100	Default factory setting of DI6 is NC (normally closed) limit signal input; driver can't run without being connected to pin 32 and pin 31 of CN1. X2=1: set DI6 input as NO a-contact point. X1X0=00, limit input of driver is not used.
P2-18	Function setting for digital output pin DO1	X2X1X0	108	DO1 corresponds to the 16th pin, as clamping-position brake signal of Z-axis; X2=1: set DO1 output as NO a-contact point; X2=0: set DO1 output as NC b-contact point; X1X0=08: set the 16th pin as BK+.
P2-20	Function setting for digital output pin DO3	X2X1X0	007	DO3 corresponds to pin 1, used as servo alarm signal. X2=0: set DO3 output as NC b-contact point; X1X0=07: set pin 1 as ALRM+.

### 4.7.11 台达 ASDA-B2 系列驱动器参数设定

参数号	参数功能	格式 范围	设定值	设定值说明
P0-02	驱动器状态显 示		02	通过设置此参数来进行脉冲数的接发是否正确。在 维宏控制系统里面,通过脉冲监测,来检测通讯卡 发出脉冲是否正确,从而可判断出是否存在电气干 扰问题。
P1-00	设 定 外 部 脉 冲 输入形式	ZYX	102	X=2: 设定外部脉冲输入形式为脉冲+方向。 Z=1: 负逻辑。
P1-01	控制模式设定	ZYX1X0	0000	Z=0: 控制模式切换时 DIO 保持原设定值。因为没 有使用模式切换,故 Z=0。 Y=0: 从负载方向看,逆时针正转,设为1反向。 X1X0=00: 设定控制模式为位置控制。
P1-44	电子齿轮比分 子 N1	1 ~ 32767	需计算	N1/M=编码器脉冲数×4×脉冲当量×机械减速比/ 螺距。 典型值:编码器脉冲数 40000,脉冲当量 0.001,
P1-45	电子齿轮比分 母 M	1 ~ 32767	需计算	Shift, 机械减速比1。 N1/M=40000×4×0.001/5=32/1, N1 设 32, M 设 1。 未使用多段电子齿轮比,不用设 P2-60~P2-62。
P1-46	检 出 器 输 出 脉 冲数设定	20 ~ 40000	需计算	回转单项脉冲数设定,具体数值根据 PG 分频比设定。 脉冲当量为 0.001,且没有减速机的情况下,螺距为 10mm 时,此参数设置为 10000;螺距为 5mm 时,此参数设置为 5000。

### 4.7.11 Parameter Setting for DELTA ASDA-B2 Servo Driver

Para. No.	Function	Format & Range	Value	Description
P0-02	Driver status display		02	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
P1-00	External pulse train input type	ZYX	002	X=2: pulse + direction; Z=1: positive logic
P1-01	Set control mode	ZYX1X0	0000	Z=0: during control mode switching, DIO is maintaining the set value. Since switching control mode is not used, Z=0; Y=0: forward rotation (CCW) (from the view of load); Y=1: the rotation direction is reversed. X1X0=00: position control mode
P1-44	Electronic Gear Ratio (Numerator) (N1)	1~32767	To be calculated	N1/M= mechanical deceleration ratio x 4 x encoder pulses x pulse equivalent / pitch. Representative value: encoder pulses=40000, pitch =5mm, pulse equivalent=0.001, deceleration ratio = 1,
P1-45	Electronic Gear Ratio (Denominator) (M)	1~32767	To be calculated	calculation as follows. N1 / M = $40000 \times 4 \times 0.001/5 = 32/1$ , N1=32, M=1; When the multi-electronic gear ratio is not used, P2-60~P2-62 are not required.
P1-46	Detector output pulse No. setting	20~40000	To be calculated	It sets detector output pulse number, whose concrete value is decided by PG divide ratio. When pulse equivalent = 0.001mm/p, pitch=10mm, without reducer, sets this parameter to 10000; when pitch=5mm, sets it to 5000.

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参数号	参数功能	格式范围	设定值	设定值说明	
P2-10	数字输入脚 DI1 功能设定	X2X1X0	101	X1X0=01:设定数字输入 DI1 为 SON,对应 CN1 的 9 脚。 X2=1:设定输入 DI1 为常开 a 接点。	
P2-15	数字输入脚 DI6 功能设定	X2X1X0	000	驱动器出厂默认设置 DI6、DI7 为常闭限位信号输入,未接 CN1 的 32、31 脚时驱动器无法运转。	
P2-16	数字输入脚 DI7 功能设定	X2X1X0	000	X2=0,设定输入 DI6、DI7 为 b 常闭接点。 X1X0=00,不使用驱动器的限位输入。	
P2-17	数字输入脚 DI8 功能设定	X2X1X0	000	不使用外部 EMG 紧停输入。	
P2-18	数 字 输 出 脚 DO1 功能设定	X2X1X0	108	DO1 对应的引脚为 6、7,在 Z 轴用做钳位刹车信号。 X2=1 设定 DO1 输出为 a 常开接点,设为 0 为 b 常闭接点。 X1X0=08:设定 6、7 脚分别为 BK-、BK+。	
P2-22	数 字 输 出 脚 DO5 功能设定	X2X1X0	007	DO5 对应的引脚为 28、27,伺服报警信号。 X2=0 设定 DO5 输出为 b 常闭接点。 X1X0=07:设定 28、27 脚分别为 ALRM+、ALRM-。	

Para. No.	Function	Format & Range	Value	Description	
P2-10	Digital Input Pin DI1	X2X1X0	101	X1X0=01: digital input (DI1 = SON) corresponds to 9th pin of CN1. X2=1: set DI1 input as NO (normally open) a-contact point.	
P2-15	Function setting for digital input pin DI6	X2X1X0	000	Default factory setting of DI6 and DI7 is NC (normally closed) limit signal input; driver can't run without being connected	
P2-16	Function setting for digital input pin DI7	X2X1X0	000	<ul> <li>to pin 32 and pin 31 of CN1.</li> <li>X2=0: set DI6 and DI7 inputs as N b-contact point.</li> <li>X1X0=00, limit input of driver is not use</li> </ul>	
P2-17	Function setting for digital input pin DI8	X2X1X0	000	External EMG stop input is not used.	
P2-18	Function setting for digital output pin DO1	X2X1X0	108	DO1 corresponds to pin 6 & pin 7, used as clamping-position brake signal of Z-axis; X2=1: set DO1 output as NO (normally open) a-contact point; X2=0: set DO1 output as NC (normally closed) b-contact point; X1X0=08: set pin 6 and pin 7 as BK- and BK+ respectively.	
P2-22	Function setting for digital output pin DO5	X2X1X0	007	DO5 corresponds to pin 28 & pin 27, used as servo alarm signal. X2=0: set DO5 output as NC b-contact point. X1X0=07: set pin 28 and pin 27 as ALRM+ and ALRM- respectively.	

#### 4.7.12 三洋 PY 系列伺服驱动器参数设定

参数号	简称	参数功能	标准值	设定范围	单位	设定值说明
1-2	EGER	电子齿轮比	4/1	1/32767~ 32767/1		视具体编码器分辨率而定。 伺服驱动器电子齿轮比公 式如下:电子齿轮比分子= 编码器每圈脉冲数×4×机 械减速比; 电子齿轮比分母=(丝杠螺 距/脉冲当量)。 例如:维宏系统默认的脉冲 当量为 0.001mm/p,螺距 为5mm 编码器每圈的脉冲 数为2000 连轴器直拖,此 时的电子齿轮比分子为8, 电子齿轮比分母 5。(编码 器选用增量型)
1-16	MENP	电机编码器脉冲数 1、设置电机所用编码器的 脉冲数 2、下列所示的编码器脉冲 数为标准配置:省配线增 量式编码器2000P/R 绝对式编码器2048P/R		$500 \sim 65535$	P/R	

### 4.7.12 Parameter Setting for SANYO PY Servo Driver

Para.	Abbr	Nome	Standard	Setting	L Incit	Domork
No.	Abbr.	Name	Value	Range	Unit	Remark
1-2	EGER	Electronic gear ratio	4/1	1/32767 to 32767/1		Depends on the specific encoder resolution. The formula of electronic gear ratio of servo driver is as follows. Electronic gear ratio numerator =mechanical deceleration ratio × 4× pulse No. per encoder circle; Electronic gear ratio denominator = (screw pitch / pulse equivalent) E.G. In Weihong system, the default pulse equivalent is 0.001mm/p, screw pitch is 5mm, pulse number per encoder circle is 2000 shaft coupling direct drag, currently the numerator of the electronic gear ratio is 8, and the denominator is 5. (Select incremental type encoder)
1-16	MENP	Pulse amount of the motor encoder 1. Set the pulse amount of the motor encoder; 2. Standard configuration of the encoder pulse No. is as follows. Incremental encoder omitting wiring: 2000P/R Absolute encoder:2048P/R		500 to 65535	P/R	

参数号	简称	参数功能	标准值	设定范围	单位	设	定值说明
2-0	PMOD	位置指令脉冲形 本系统选择: 方 PMOD 7 6	式 向+脉冲形 5 4 3 ———————————————————————————————————	式,参数如下          2       1       0         2       1       0         Bit       Bit       Bit         1       0       0         0       1       1         Bit       Bit       Bit         1       0       0         0       1       1         Bit5       指令脉;       0         0       方向+         字滤波器的切換       高速         低速(1/4)       1/4)	图所示: 当bit 7=0时 指令脉冲输 最小朋 0.3 0.4 1.0 当bit 7=1时 指令脉冲输 最小朋 3.3 0.3 0.4 1.0 4 小朋	入 <u>数字滤波器</u> 3μs 2μs 4μs 6μs 入数字滤波器 3μs 3μs 6μs 4μs	
4-3	TYPE	控制模式 *从位 其中一种控制模 选择项 Position Velocity Torque Velo↔To Posi↔To Posi↔To Posi↔Ve 对于切换类型,可 需要的控制模式 Func3, bit7为0 1:35 管脚使能 \$\$\$:标准值	五置、速度 式。	和转矩控制模 内容 2置控制方式 速度控制方式 5矩控制方式 5年短切换方: ↔转矩切换方: ↔转矩切换方:	式之中选择 式式式 一一式式式 一一一式式式可能。	6	本 系 统 选 择 Position 位置 控制方式。



Para. No.	Abbr.	Name	tandard Value	Setting Range	Unit	Rema	ark
2-0	PMOD	Pulse format of Our system use	position co es: direction	2 1   0   0   1   0   1   0   1   1   0   1   1   0   1   1   0   1   1   0   1   1   0   1   1   0   0   1   1   0   0   1   1   0   0   1   1   0   0   1   1   1   0   0   1	rmat, the         Whe         Bit       Comm.         0       0         1       0         0       0         1       0         0       0         1       0         0       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0         1       0	e parameters are sh en bit 7=0 and Pulse Input Digital Filte Min. Pulse Width 0.8µs 0.2µs 0.4µs 1.6µs bit 7=1 and Pulse Input Digital Filte Min. Pulse Width 3.2µs 0.8µs 1.6µs 6.4µs Format Ilse	er
4-3	TYPE	Control mode: *Select one co and torque mod Selection Item Position Velocity Torque Velo ↔Torq Posi ↔Velo Referring to th mode can be se Func3, set Bit7 \$ \$ \$ : standa (leave factory set S	ontrol mode des. Posit Veloc Velocity↔ Position↔ Position↔ e switch ty elected fror as 0: pin 3 f as 1: pin 3 f as 1: pin 3 f as 1: pin 3	e from pos Content ion control m city control m ue control m Torque swit Torque swit Torque swit Velocity swi (pe, the re- n pin 36 or 5 6 is enable 35 is enable aries with th	ode ode ode ode tch mode tch mode tch mode tch mode d. 35 of the d. d. ne reset	elocity, 6 types control c CN1. setup	Our system selects position control mode.

#### 4.7.13 三洋 R 系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明
Group0,	调谐模式参数设定		
00	调谐模式设定	00	设置为自动调谐模式。
Group8,	控制参数设定		
00	位置输入极性	00	位置指令模式:正转有效。
11	输入指令方式	02	脉冲+负逻辑。
15	电子齿轮设定	8/5	视具体编码器分辨率而定。例如增量型编码器 2000,电 机转动一圈时所需要脉冲为 2000×4=8000,而维宏通讯 卡脉冲当量为 0.001mm/p 时,即每线动 1mm 时所需脉冲 1000 个,假设螺距为 5。则线动 5mm 所需脉冲数为 5000, 所以 F=8000/5000=8/5。
Group9,	功能有效设置		
05	伺服 on 选择	02	伺服选择 on 状态。
02	伺服报警清除	10	伺服报警功能有效。
系统参数	设定		
02	编码器选择	00	标准增量型编码器。此参数视具体情况而定,这里为典型 设定。
03	编码器分辨率	2000	500~65535,人为设定编码器分辨率操作。
08	控制方式选择	02	选择位置控制方式。

### 4.7.13 Parameter Setting for SANYO R Servo Driver

Para.	Deremeter Nome	Set	Domorko
No.	Parameter Name	Value	Remarks
Group 0,	parameter setting of tunin	g mode	
00	Setting of tuning mode	00	Set as auto tuning mode
Group 8,	setting of the control para	meters	
00	Polarity of position input	Polarity of position 00 Position command mode: positive rotatio	
11	Input command mode	02	Pulse train + negative logic, negative logic
15	Setting of electronic gear	8/5	It depends on the resolution of the specific encoder. E.G.: incremental encoder 2000, motor needs 2000 x4=8000 pulses per circle. And pulse equivalent of Weihong control card is 0.001mm/p, it needs 1000 pulses to move 1mm along line, in other words, if the screw pitch is 5, so, to move 5mm along line needs 5000 pulses, so F=8000/5000=8/5.
Group 9,	setting of function effectiv	е	
05	Servo ON selection	02	Select servo ON state.
02	Servo alarm elimination	10	Make the function of servo alarm effective
Setting of	f the system parameters		
02 Encoder selection		00	Standard incremental encoder. The parameter depends on the specific situation, what we list is only the representative one.
03	Encoder resolution	2000	500-65535, set the encoder resolution manually.
08	Control mode selection	02	Select position control mode.

### 4.7.14 三洋 Q 系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明		
第1组参数	第1组参数				
GER1	电子齿轮比 1	1/1	为位置指令脉冲设置电子齿轮比。例如增量型编码器 2000,电机转动一圈时所需要脉冲为2000×4=8000,而 维宏通讯卡脉冲当量为0.001mm/p时,即每线动1mm时 所需脉冲1000个,假设螺距为5。则线动5mm所需脉冲 数为5000,所以F=8000/5000=8/5。		
GER2	电子齿轮比 2	1/1	该设置和电子齿轮比1相同,在电子齿轮切换期间该功能 激活。		
第4组参数					
PA400	指令脉冲选择	00H	选择位置指令脉冲为:脉冲+方向。		
第 <b>8</b> 组参数	<u></u>				
S-ON	伺服 on 功能	02H	伺服选择 on 状态。		
AL-RST	报警复位功能	10H	伺服报警功能有效。		
系统参数设	<b></b>				
01	电机编码器类型	00	标准增量型编码器。此参数视具体情况而定,这里给出典 型。		
03	增量编码器分辨率	2000	500~65535,人为设定编码器分辨率操作。		
08	控制方式选择	02	选择位置控制模式。		

### 4.7.14 Parameter Setting for SANYO Q Servo Driver

Deve No	Devery star Name	Set	Demerke	
Para. No.	Parameter Name	Value	Remarks	
Group 1				
GER1	Electronic gear ratio 1	1/1	Set electronic gear ratio for position command pulse E.G., incremental encoder 2000, motor needs 2000 ×4=8000 pulses per circle. And pulse equivalent o Weihong control card is 0.001mm/p, it needs 1000 pulses to move 1mm along line, in other words, if the screw pitch is 5, so, to move 5mm along line needs	
GER2	Electronic gear ratio	1/1	This setting is the same as that of electronic gear ratio	
Group 4				
PA400	Command pulse 00H Set position command pulse as "puls		Set position command pulse as "pulse + direction".	
Group 8				
S-ON	Servo ON	02H	Select servo ON state.	
AL-RST	Alarm reset	10H	Make the function of servo alarm effective	
Setting of th	e system parameters			
01	Encoder selection	00	Standard incremental encoder. The parameter depends on the specific situation, what we list is only the representative one.	
03	Incremental encoder resolution	2000	500-65535, set the encoder resolution manually.	
08	Control mode selection	02	Select position control mode	

#### 4.7.15 开通 270 系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明
PA4	控制模式选择	0	<ul> <li>通过此参数可设置驱动器的控制模式:</li> <li>0:位置控制模式; 1:速度控制模式;</li> <li>2:试运行控制模式; 3:JOG运行控制模式。</li> </ul>
PA12	位置指令脉冲 倍率分子	2	设置位置指令脉冲的倍率(电子齿轮)。 在位置控制模式下,通过对参数 PA12,参数 PA13 的设置, 可以很方便地与各种脉冲源相匹配,以达到用户理想的控制分 辨率(即角度/脉冲)。 公式: P×G=N×C×4 P: 输入指令的脉冲数; G: 电子齿轮比; G=倍率分子/倍率分母 N: 电机旋转圈数; C: 光电编码器每转线数,本系统 C=2500。 〖例〗输入指令脉冲为 6000 时,伺服电机旋转 1 圈 $G = \frac{N \times C \times 4}{P} = \frac{1 \times 2500 \times 4}{6000} = \frac{5}{3}$ 则参数 PA12 设为 5,参数 PA13 设为 3。 电子齿轮比推荐范围为 $\frac{1}{50} \le G \le 50$ 。
PA13	位置指令脉冲 倍率分母	1	见参数 PA12。
PA14	位置指令脉冲 输入方式	0	设置位置指令脉冲的输入形式,通过参数可选择3种输入方式 之一: 0:脉冲+符号; 1:正转脉冲/反转脉冲; 2:两相正交脉冲输入。 设定0:脉冲+符号。

#### 4.7.15 Parameter Setting for KT270 Servo Driver

Para. No.	Parameter Name	Value	Description
PA4	Control mode selection	0	<ul><li>The control mode of the driver can be set through this parameter:</li><li>0: position control mode; 1: speed control mode;</li><li>2: trial run control mode; 3: JOG control mode.</li></ul>
PA12	Numerator of position command pulse ratio	2	Set the ratio of the position command pulse (electronic gear). Under position control mode, with the setting of the PA12 and PA13, it is convenient to match with pulse source of each type, which can reach users' perfect control resolution (that is angle/pulse) Expression: $P \times G = N \times C \times 4$ P: pulse amount of the input command; G: electronic gear ratio, G=ratio numerator / ratio denominator. N: circle number that the motor rotates; C: each circle line number of photo electricity encoder, C of our system =2500. E.G.: input 6000 command pulses to make the servo motor rotate one circle, $G = \frac{N \times C \times 4}{P} = \frac{1 \times 2500 \times 4}{6000} = \frac{5}{3}$ So set PA12 as 5 and PA13 as 3. We recommend the range of electronic gear ratio as: $\frac{1}{50} \le G \le 50$
PA13	Denominator of the position command pulse ratio	1	Refer to parameter PA12.
PA14	Input mode of the position command pulse	0	Set the input mode of the position command pulse; there are following three modes can be selected by setting the parameter: 0: pulse + symbol; 1: positive rotation pulse/ negative rotation pulse; 2: two orthogonal pulses inputs Default setting is 0: pulse + symbol, negative logic.

参数号	参数功能	设定值	设定值说明
PA20	行程末端输入 无效	1	<ul> <li>0: LSP、LSN 正转、反转行程末端有效。</li> <li>当 LSP 开关闭合时,允许正转驱动;当 LSP 开关断开时,禁止正转驱动(正转方向转矩保持为 0);LSN 同理。如果 LSP、LSN 都断开,则会产生驱动禁止异常报警(NO.7)。</li> <li>1: LSP、LSN 正转、反转行程末端无效。</li> <li>不管 LSP、LSN 开关状态如何,正转、反转驱动都允许。同时,如果 LSP、LSN 都断开,也不会产生驱动禁止异常报警(NO.7)。</li> <li>2: LSP、LSN 正转、反转行程末端无效,且 SON 强制有效。</li> <li>注: SON 强制有效仅用于电机调试,在正常使用中,建议由输入端口来控制 SON 的状态。</li> <li>3: LSP、LSN 正转、反转行程末端有效。</li> <li>当 LSP 开关闭合时,允许正转驱动;当 LSP 开关断开时,禁止正转驱动(正转方向速度保持为 0,转矩不为 0);LSN 同理。如果 LSP、LSN 都断开,不会产生驱动禁止异常报警(NO.7)。</li> </ul>

Para. No.	Parameter Name	Value	Description
PA20	Invalid input on the end of the stroke	1	<ul> <li>0: Valid stroke end of LSP, LSN positive rotation, negative rotation.</li> <li>When switch LSP is connected, driving of the positive rotation is allowed; When switch LSP is disconnected, driving of the positive rotation is prohibited (torque of the positive direction is 0). LSN is the same as LSP. If LSP and LSN are all disconnected, the abnormal alarming of driving prohibited will occur (NO.7).</li> <li>1: Invalid stroke end of LSP, LSN positive rotation, negative rotation.</li> <li>No matter which state of the switch LSP and LSN is in, driving of positive rotation and negative rotation are all allowed. Simultaneously, even if LSP and LSN are all disconnected, abnormal alarming of driving prohibited will not occur (NO.7).</li> <li>2: Invalid stroke end of LSP, LSN positive rotation, negative rotation, and SON is forced to be effective. (Note: SON forcedly effective is only used for motor debugging. In normal use, we suggest controlling the state of SON by input port.)</li> <li>3: Valid stroke end of LSP, LSN positive rotation, negative rotation.</li> <li>When switch LSP is connected, driving of the positive rotation is allowed; When switch LSP is disconnected, driving of the positive rotation is prohibited (the speed of positive direction is 0, but the torque is not 0). LSN is the same as LSP. When LSP and LSN are all disconnected, abnormal alarming of driving prohibited will not occur (NO.7).</li> </ul>

### **4.7.16** 富士 FALDIC-β 系列伺服参数设定

参数号	参数功能	设定值	设定值说明
01	指令脉冲分子 α	需计算 1∼32767	指令脉冲分子、分母即通常意义上的电子齿轮比分子 分母。 α/β=编码器分辨率×脉冲当量×机械减速比/丝杠螺
02	指令脉冲分母β	需计算 1∼32767	<ul> <li>典型值:编码器分辨率 65536,脉冲当量 0.001,螺</li> <li>距 5mm,机械减速比 1, α / β =65536 × 0.001/5=8192/625,故α =8192,β =625。</li> </ul>
03	脉冲串输入形态	0	设定脉冲串输入形态为指令加指令符号,即脉冲+方向。
04	旋转方向	0或1	设为0,从负载方向看,逆时针方向正转。 设为1,从负载方向看,顺时针方向反转。
10	CONT1 信号分配	1	CONT1 分配为 RUN(即 SON),不分配时,上电无报 警即自动 ON。
11	CONT2 信号分配	2	CONT2 分配为 RST(即伺服报警清除 CLR)。 12、13、14 号参数设为 0,即 CONT3、CONT4、CONT5 不能分配为 OT 超程,或 EMG 外部紧停。
15	OUT1 信号分配	1	设为1,OUT1分配为报警输出a接点。 设为2,分配为报警检出b接点。
27	是否禁止更改参数	0或1	设 0,可以更改驱动器参数。 设 1,禁止更改参数。
74	CONT 一直有效 1	1	初始值为0,设置为1,伺服启动(RUN)。

### 4.7.17 四通 GS 系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明
F0f	电子齿轮比分子	2	位置方式电子齿轮比: 4×电机编码器反馈脉冲频率=指令脉
F10	电子齿轮比分母	1	间(以螺距为 10mm 来计算设定值)。

#### 4.7.16 Parameter Setting for FUJI FALDIC-β Servo Driver

Para. No.	Name	Value	Description
01	Command pulse numerator α	To be calculated 1~32767	Command pulse numerator and denominator are equal to those of the electronic gear ratio. α/ β=encoder resolution× pulse equivalent×
02	Command pulse denominator β	To be calculated 1~32767	mechanical deceleration ratio / screw pitch. Typical value: encoder resolution 65536, pitch 5mm, pulse equivalent 0.001, mechanical deceleration ratio 1, $\alpha$ / $\beta$ =65536×0.001 / 5=8192 / 625, So $\alpha$ =8192, $\beta$ =625.
03	Pulse string input form	0	Set the input mode of pulse string as: instruction + symbol, that is 'pulse + direction'.
04	Direction of rotation switch	0 or 1	Set 0: Positive direction: Forward rotation (CCW) Set1: Positive direction: Reverse rotation (CW)
10	CONT1 signal distribution	1	CONT1 is distributed as RUN (i.e. SON); if not distributed, CONT1 will be auto ON if there is no alarming when powered.
11	CONT2 signal distribution	2	CONT2 is distributed as RST (i.e. servo alarming clearance CLR). When 12, 13, 14 are 0, that is CONT3, CONT4 and CONT5 can't be distributed as OT over-travel or EMG (external emergency stop).
15	OUT1 signal distribution	1	Set 1, OUT1 is distributed as a-contact point of alarming output; Set 2, OUT1 is distributed as b-contact point of alarming detection.
27	Parameter write-protection	0 or 1	Set 0, write-enable. Set 1, write-protected.
74	CONT always ON 1	1	Initial value: 0. when set "1", servo is activated (RUN).

#### 4.7.17 Parameter Setting for STONE GS Servo Driver

Para. No.	Para. Name	Value	Description
F0f	Electronic gear ratio numerator	2	Electronic gear ratio of position mode: 4× pulse frequency fed back by servo encoder = command pulse frequency×
F10	Electronic gear ratio denominator	1	F0f / F10; value of F0f / F10 must be within 1/100~100. (calculation with pitch 10mm)

参数号	参数功能	设定值	设定值说明		
F00	选择控制模式	2	<ul> <li>0:外部速度运行模式,根据 CN2-16、17 的外部模拟量给定 -10V~+10V 信号确定电机运转速度的大小和方向。</li> <li>1:内部速度运行模式,根据参数 F33、F35、F37、F39 设置 和 CN2-9, CN2-25 端口状态确定电机运转速度、方向。</li> <li>2:位置脉冲运行模式,接收外部位置指令脉冲和方向电平信号输入。</li> <li>3: JOG 运行模式,通过参数 F3b 的设置确定电机运转速度, 在键盘上按▼和▲控制电机运转方向。</li> <li>4:转矩控制运行模式,CN2-43、1 输入的外部模拟量给定- 10V~+10V 信号确定电机运转转矩的大小和方向。</li> <li>5~10:混合控制运行模式,根据 CN2-24 输入端口状态选择:</li> </ul> <b>F00</b> CN2-24接口状态 值 断开(第一模式)闭合(第二模式) <ul> <li>5 位置脉冲模式 外部速度运行模式</li> <li>6 位置脉冲模式 内部速度运行模式</li> <li>7 位置脉冲模式 外部速度运行模式</li> <li>8 内部速度运行模式 外部速度运行模式</li> <li>9 内部速度运行模式 转矩控制运行模式</li> <li>10 外部速度运行模式 转矩控制运行模式</li> </ul>		
F2e	脉冲输入方式选 择	2	位置方式指令脉冲串方式选择:         1 - 单脉冲串正逻辑       脉冲       12       27		

Para. No.	Para. Name	Value	Description		
F00	Control mode selection	2	External speed running mode; ma ection of motor speed according $DV \sim +10V$ signal of CN2-16, 17; Internal speed running mode; ma ection of motor speed accord rameter F33, F35, F37, F39 a J2-9, CN2-25; Position pulse running mode; ternal position pulse and direction Jog mode; make sure the mot rameter setting of F3b, and contra- the direction keystroke $\blacksquare$ and $\blacktriangle$ Torque mode; make sure the mot rameter setting of F3b, and contra- the direction keystroke $\blacksquare$ and $\blacktriangle$ Torque mode; make sure the mot rameter setting of F3b, and contra- the direction keystroke $\blacksquare$ and $\blacktriangle$ Torque mode; make sure the mot rameter setting of F3b, and contra- the direction keystroke $\blacksquare$ and $\clubsuit$ Torque mode; select mode according to the extern pal of CN2-43, 1; 10: Mixed mode; select mode according to the cN2-24: DO DFF (Mode One) 5 Position Pulse Mode 8 Internal Speed Running Mode 10 External Speed Running Mode	Ing to the external analog ling to the external analog l7; ; make sure the value and cording to the setting of 9 and the port status of ode; accept the input of ction level signal; motor speed in terms of ontrol the rotation direction d $▲$ ; he value and direction of cternal analog -10V ~ +10V according to the port input rface Status ON (Mode Two) External Speed Running Mode Internal Speed Running Mode External Speed Running Mode External Speed Running Mode	
F2e	Pulse input mode selection	2	Pulse12271- Single pulse train positive logicPulse12272- Single pulse rain negative logicPulse12273- Double pulse train positive logicDirection13284- Double pulse train negative logicCCW12275- Orthogonal ulse positive logicPulse12276- Orthogonal ulse negative logicPhase A12276- Orthogonal ulse negative logicPhase B13286- Orthogonal ulse negative logicPhase A12276- Orthogonal ulse negative logicPhase B1328		

### 4.7.18 东元 TSDA 系列伺服驱动器参数设定

参数号	参数功能	设定值	设定值说明				
Pn010-1	设定控制模式	1	设定值	控制模式			
				CN1 Pin12 开路	CN1 Pin12 导通		
			0	速度控制	速度控制		
			1	位置控制	位置控制		
			2	扭力控制	扭力控制		
			3	速度控制	速度控制		
			4	位置控制	位置控制		
			5	扭力控制	扭力控制		
			设定值	输入脉波形式			
Pn010-2	设定位置控制时 输入脉波形式	0	0	脉冲+方向			
			1	双脉冲			
			2	A/B 相位差			
Pn010-3	设定马达旋转方 向	1	设定值	功能			
			0	输入正命令马达反时针旋转			
			1	输入正命令马达顺时针旋转			
Pn021	电子齿轮比之分 子	5	输入脉波数将被乘以此数后输出。参数 <b>21</b> 及参数 <b>22</b> 的比				
Pn022	电子齿轮比之分 母	1	值范围为: 1/127<参数 21/参数 22<127。				
Pn011-4	设定 CN1 Pin20 接脚的功能	1	设定值	功能			
			0	零速度信号输出			
			1	刹车信号输出			
Pn013-1	设定位置控制时 的驱动器的脉波 最大接受频率	7	此参数可以改善走位现象。将接受频率由 500Kpps-200Kpps区分成8段频率。0表示500Kpps,7 表示200Kpps。				

### 4.7.18 Parameter Setting for TECO TSDA Servo Driver

Para. No.	Function	Value	Description			
Pn010-1	Set control mode	1	Value	Control mode CN1 Pin12 open circuit	CN1 Pin12 closed circuit	
			0	Speed control	Speed control	
			1	Position control	Position control	
			2	Torque control	Torque control	
			3	Speed control	Speed control	
			4	Position control	Position control	
			5	Torque control	Torque control	
Pn010-2	Set the pulse input format under position control mode	0	Value	The format of pulse input		
			0	Pulse + direction		
			1	Bi-pulse		
			2	A/B phase difference		
Pn010-3	Set rotation direction of motor	1	Value	Function		
			0	Input positive order, motor rotates CCW.		
			1	Input positive order, motor rotates CW.		
Pn021	Electronic gear ratio numerator	To be	The input pulse amount will be multiplied with this number before output. Ratio range of parameter 21 to 22: 1/127 <parameter 21="" 22<127<="" parameter="" td=""></parameter>			
Pn022	Electronic gear ratio denominator	calculated	The input pulse amount will be multiplied with this			
			number before output. Ratio range of parameter 21			
			to 22:			
			Value Function			
Pn011-4	Set the value of Pin20 of CN1	1		Output of "0" speed signal		
			1	Output of brake signal		
Pn013-1	Set the maximum pulse frequency received by the driver under position control mode	7	It can correct the phenomenon of unauthorized over-travel. Received frequency is divided into 8 segments from 500Kpps to 200Kpps. "0" indicates 500Kpps while "7" 200Kpps.			

### 4.8 驱动器接线图

#### 4.8.1 维智系列伺服接线图

上海维宏DB15驱动器接口

维智(50P高密插头)CN2接口



上海维宏DB15驱动器接口

维智(50P高密插头)CN2接口



### 4.8 Wiring Diagrams of Drivers

#### 4.8.1 Wiring Diagram of WISE Servo Driver




### **4.8.2** 安川 Σ-ΙΙ/Σ-V/Σ-7 交流伺服接线图



### 4.8.2 Wiring Diagram of YASKAWA AC Servo Driver



Figure 2

### 4.8.3 松下交流伺服接线图



### 4.8.4 三菱 MR-JE 型伺服接线图



[153] 附录

#### Wiring Diagram of PANASONIC AC Servo Driver 4.8.3

Weihon	g DB15 Di	river Inte	erface	Panas	onic MI	NAS-A5 Se	ervo 50F	P HD Plug
	Signal	Pin	] .		Pin	Signal		
	A+	1	1—————————————————————————————————————		21	0A+		
	A-	2	└──╯.`	\	22	0A-		
	B+	3	1—————————————————————————————————————		48	0B+		
	B-	4	└──∕ .`	\	49	0B-		
	C+	5	<u> </u>		23	0Z+		
	C-	7	<u> </u>	\	24	0Z-		
	PUL+	11	$\vdash$		44	PULS1		
	PUL-	12	└──∕`,`	\	45	PULS2		
	DIR+	13			46	SIGN1		
	DIR-	14		\	47	SIGN2		
	+24V	6	<u> </u>		7	COM+		
	ALM	8			37	ALM+		
	SON	9			29	SRV-ON		
	CLR	10			31	A-CLR		
	GND	15		•	41	COM-		
			_	Ļ	36	ALM-		
	Re			d	11	BRKOFF+		
	Z axis brake lin		brake line	ine	10	BRKOFF-		
	DIGCH			ж	50	FG		
				•				]

#### Wiring Diagram of MITSUBISHI MR-JE Servo Driver 4.8.4

Weihong D	0B15 Drive	r interfa	ace	Mitsubish	i MR-JE C	N1 50
	Signal	Pin	]	Pin	Signal	
	A+	1	1—————————————————————————————————————	4	LA	
	A-	2	╞──╯.╰──	5	LAR	
	B+	3	1—————————————————————————————————————	6	LB	
	B-	4	┤───╯、╰──	- 7	LBR	
	C+	5		- 8	LZ	
	C-	7	]/ \	9	LZR	
	PUL+	11	μ	10	PP	
	PUL-	12	┨───╱╷╰──	11	PG	
	DIR+	13	1—————————————————————————————————————	35	NP	
	DIR-	14	]/ \	- 36	NG	
	+24V	6	]	20	DICOM	
	ALM	8	]	- 48	ALM	
	SON	9	]	15	SON	
	CLR	10		19	RES	
	GND	15	<u>├</u> •	- 46	DOCOM	
				42	EMG	
				43	LSP	
				- 44	LSN	
				47	DOCOM	l
		Figur	e 1 without bral	ke lines		
	- Not	e: twiste	ed pair for differe	ential signal	ls.	

Mitsubishi MR-JE CN1 50P HD Plug



### 4.8.5 三菱 MR-E 型伺服接线图



# **WEIHONG**



#### Weihong DB15 Driver Interface



#### Wiring Diagram of MITSUBISHI MR-E Servo Driver 4.8.5

Weihong DB15 Driver Interface					ubishi N	/IR-E-A 26	PHD
				[	Pin	Signal	
	Signal	Pin	] г		2	OPC	1
	+24V	6			1	VIN	
	ALM	8			9	ALM	
	SON	9			4	SON	
	CLR	10			3	RES	
	GND	15	•		13	SG	
			L		8	EMG	]
	A+	1	<u>├</u>		15	LA	
	A-	2	╞──╯.└─		16	LAR	1
	B+	3	├A		17	LB	
	B-	4	╞──╯.└─		18	LBR	
	C+	5	├A		19	LZ	
	C-	7	<u>}∕∖∖_</u>	[	20	LZR	]
	PUL+	11	<u>├</u>		23	PP	
	PUL-	12	╞──╯.└─		22	PG	
	DIR+	13	<u>├</u> ∧		25	NP	
	DIR-	14			24	NG	
		Zovio	Red		12	MBR	
			Black		13	SG	]
			Black				
	$\perp$					$\perp$	

Plug

#### 4.8.6 台达伺服接线图

台达 ASDA-A、ASDA-A2、ASDA-AB 所用电缆线相同,其中 ASDA-A2 与 ASDA-AB 接线管脚完全 相同,ASDA-A 只是位置指令脉冲信号管脚相反,PULSE 为 43,/PULSE 为 41。具体参数设置参见 0、 4.7.9 节。



#### 4.8.6 Wiring Diagram of DELTA Servo Driver

DELTA ASDA-A, ASDA-A2, ASDA-AB share the same wire. Among them, ASDA-A2 and ASDA-AB have the same wiring pin while ASDA-A has the contrary pulse pin, with PULSE 41, /PULSE 43. For detailed parameter setting, refer to section 0 and section 4.7.9.





## **WEIHONG**



DELTA ASDA-B2 DB25(Two-line Pinholes)



### 4.8.7 富士伺服接线图



#### 4.8.8 日立伺服接线图

上海维宏DB15驱动器接口

日立ADA系列



#### Wiring Diagram of FUJI Servo Driver 4.8.7



### 4.8.8 Wiring Diagram of HITACHI Servo Driver

#### Weihong DB15 Driver Interface

#### HITACHI ADA Servo Driver

Signal	Pin		Pin	Signal
+24V	6		2	PLC
ALM	8		11	ALM
SON	9		26	SON
CLR	10		27	RS
GND	15	•	30	CM1
			34	CM2
			33	PEN
PUL+	11		15	PLSP
PUL-	12		16	PLSN
DIR+	13	<u> </u>	40	SIGP
DIR-	14	/ \	41	SIGN
A+	1	<u>├───</u>	21	OAP
A-	2		22	OAN
B+	3		46	OBP
B-	4		47	OBN
C+	5		23	OZP
C-	7		24	OZN
		—	13	BRK
		s Brake Line		

### 4.8.9 三洋 PY 系列伺服接线图



#### 4.8.10 三洋 R 系列伺服接线图



### 4.8.9 Wiring Diagram of SANYO PY Servo Driver



#### 4.8.10 Wiring Diagram of SANYO R Servo Driver



### 4.8.11 开通 KT270 系列伺服接线图



### 4.8.12 四通 GS 系列伺服接线图

上海维宏DB15驱动器接口

四通GS系列伺服(DB44针3排)

信号名	引脚		引脚	信号名
+24V	6	-	7	输入信号共阳公共端
ALM	8	-	22	故障信号输出+
SON	9	-	23	伺服使能输入
CLR	10	-	8	报警清除信号输入
GND	15	-	6	故障信号输出-
	11		12	臣汝也也太信已於),
	10			脉冲拍令信亏制八+
PUL-	12		21	脉冲指令信亏输入-
DIR+	13	/ \	13	方向/脉冲指令输入+
DIR-	14	J/ \	- 28	方向/脉冲指令输入-
A+	1	μ	33	信号美分输出+
A-	2	·/ \	34	信号差分输出-
B+	3	μ	35	信号差分输出+
B-	4	·/ _ `	36	信号差分输出-
C+	5	1A	31	信号差分输出+
C-	7		32	信号差动输出-
	75-1-14	<u>红巴</u>	21	BRAKE+
	▲ 十曲 11	3円1世纪 四 A	5	BRAKE-
	」	—————————————————————————————————————		
	//T 14A	11 2		
$\perp$				$\perp$

### 4.8.11 Wiring Diagram of KT270 Servo Driver



### 4.8.12 Wiring Diagram of STONE GS Servo Driver

Weiho	ng DB15 Drive	r Interfa	ce	STONE	GS Series Servo (3-line DB44 F	ins
	Signal	Pin		Pin	Signal	1
	+24V	6		- 7	Input signal anode common port	1
	ALM	8		22	Fault signal output+	1
	SON	9		- 23	Servo enable input	1
	CLR	10		- 8	Alarm clear signal input	I
	GND	15		6	Fault signal output-	I
	PUL+	11	⊢ <u>_</u>	12	Pulse command signal input+	1
	PUL-	12	└──/ <u>`</u> └──	27	Pulse command signal input-	1
	DIR+	13	<u>├</u>	13	Direction/pulse command input +	1
	DIR-	14	└───/ \	- 28	Direction/pulse command input-	I
	A+	1	μ	33	Signal differential output +	1
	A-	2	└───/ . \	34	Signal differential output -	1
	B+	3	Α	35	Signal differential output +	1
	В-	4	└───∕ . └───	- 36	Signal differential output -	1
	C+	5	μ	31	Signal differential output +	1
	C-	7	/_ \	32	Signal differential output -	1
	Z-axis Brak		Red 21		BRAKE+	
				- 5	BRAKE-	
l		]	Black			
	<u> </u>				<u> </u>	

### 4.8.13 东元 TSDA 系列伺服接线图



### 4.8.14 东元 ESDA 系列伺服接线图

上海维宏DB15驱动器接口

东元ESDA系列伺服



### 4.8.13 Wiring Diagram of TECO TSDA Servo Driver



### 4.8.14 Wiring Diagram of TECO ESDA Servo Driver



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