Programming

编程手册

（B&R SYSTEM）

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CONTENTS 目录

1. 第一章 Introduction 引言

1.1 Symbols adopted 采用的符号

The following symbols are used herein:
以下符号将被使用

Symbol 符号	Description 描述
	**PROHIBITION** **禁止** Sections marked with this symbol contain instructions on incorrect behaviour and misuse that can result in hazards and, consequently, are prohibited. 在该图标标记的部分中包含：若不正确的行为或使用将导致危险，因此是被禁止的！
	**MANDATORY ACTION** Sections marked with this symbol contain instructions that you are required to follow. 强制行为 该图标标示的部分中包含：必须严格按照指令进行的操作。
	**WARNING** Sections marked with this symbol describe operations that can lead to hazardous situations if not carried out correctly. 警告 该图标标示的部分中表示：不恰当的操作将导致危险。

And the following conventions are adopted
如下的约定将会被使用

AUTO – TEACH
自动 – 示教

White writing on a black background refers to a control found on the Robot's control panel.
黑底白字表示机器人控制柜上的控制

Add
添加

LIST
列表

REC
记录

Writing on a grey, blue or red background refers to buttons to be pressed on the Robot pendant touch screen display.
以灰底、蓝底、红底表示的是需要摁下机器人示教盒中的按键

Speed
速度

Spraying distance
喷涂距离

Writing in bold refers to labels found on the Robot pendant display.
在机器人示教盒中可以找到以黑体表示的标签

Edit Out
编辑

White writing on a blue background refers to dialog boxes that appear on the Robot pendant display.
蓝底白字指机器人示教盒上出现的对话框

- Press the **STOP** button to stop the machine immediately.
- 按下**停止**按键可以立刻将设备停止

One or more arrows indicate an action or a series of actions that the operator is required to perform in order to follow a procedure.
一个或更多的箭头表示操作人员需要按顺序一个或一系列的操作程序

2. 第二章 Description of control and indicator devices 控制柜与指示设备简介

2.1 Description of Control Panel 控制柜简介

Figure 1
图 1

Figure 2
图 2

AUTO – TEACH Green illuminating two-position latching selector, used to select the operating mode: either teach or automatic(Note: When you select the mode, you must be consistent with the teaching pendant and panel, such as the election on the teacher automatically, the panel should also choose automatically, otherwise it will report Cabinet selector error). The green light incorporated in the selector lights to indicate that the robot is set to automatic mode, and goes off when in teach mode.

START : Green button, pressed to start the painting cycle in automatic mode provided all setup procedures described in section 1.2.3 自动循环

Automatic cycle starting procedure have been complied with.

HOLD – RUN – END : Black three-position latching selector. The selector is usually set to RUN; if it is turned to HOLD, the automatic cycle is stopped until the selector is turned back to RUN; when set to END, the robot finishes the program in progress and then stops altogether.

ALARMS : Red illuminating pushbutton. The incorporated light comes on to indicate that there is an alarm, as described in greater detail on the pendant display. Press the button to restart the alarm condition.

POWER ON : Green illuminating button, pressed to switch electric motor power on and off; the motors must be switched on to move the Robot, in both manual and automatic mode.

STOP : Red pushbutton, used to end the painting cycle.

GUN MAN – 0 – AUTO : Black three-position latching selector. Used to select the gun opening mode for spraying paint: when set to MAN, gun opening is unconditional; when set to the middle position, the gun is closed in both automatic and manual mode, but not in teach mode, in which case the gun will be controlled by the button on the programming stick. If turned to the right, the gun will open only in automatic mode and in accordance with the times programmed for the current cycle.

EMERGENCY : Twist-to-release mushroom-head pushbutton. The emergency stop button must be used whenever a situation is encountered that puts personnel or the actual Robot in danger. Pressing the button causes all Robot parts to stop immediately. To resume operation, you must deal with the cause of the emergency, release the mushroom-head pushbutton and switch on the motors. If you have a G version, use the relevant button to return the carousel to the correct work position if the emergency stop button was pressed while it was turning. The control panel is designed to accommodate additional emergency stop buttons on the outside of the Robot to as to deliver the utmost system safety.

自动 – 示教：绿色的两位选择开关，用于选择操作模式自动或手动（注：当选择模式时，必须示教器和面板保持一致，比如示教器上选自动，面板上也要选自动，否则就会报（Cabinet selector error）。绿灯亮表示机器人处于自动模式，绿灯熄灭表示机器人处于示教模式。

开始 :只要按 2.2.3 节中所描述的进行了设置，按下 Start 绿色按钮就可以在自动模式下实现喷涂循环。

暂停 – 运行 – 结束 : 黑色三位开关，该开关通常处于 RUN 运行状态，如果选择暂停状态，自动循环就会停止，直到开关拨至运行状态，当选择结束状态，机器人将会在运行完该程序后停止运行。

报警 :红色指示按钮，当有报警产生时，灯将亮起，同时面板中将显示详细的报警，按下按钮将清除报警。

上电 : 绿色指示按钮，按下后可以进行机器人的伺服上电和关闭。无论在自动还是手动模式下，若想操作机器人必须进行伺服上电。

停止 : 红色按钮，用于结束喷涂循环。

喷枪 手动 – 关闭 – 自动 :黑色三档开关，该开关用于喷枪打开模式的选择，当设置为手动时，喷枪将打开，当设置为中间关闭时，无论手动还是自动喷枪都将关闭，但在示教模式时，通过编程摇杆中的喷枪按键进行喷枪的控制。当旋转至右侧的自动模式下，将根据当前循环的编程指令进行喷枪的开关控制。

急停 :急停按钮，无论在任何情况下，当危机到人员安全或造成机器人损坏时，必须使用急停按钮停止机器人。当按下该按钮后机器人将立即停止，若要恢复运行，必须在处理急停后松开蘑菇头按钮，伺服上电，如果是 G 系列的机器人运行时，按下了急停，需要使用相应的按钮将转盘移动至合适的位置。在机器人的控制板上，也设计了急停按钮，用于保证整个设备的安全。

2.2 Description of Pendant 示教盒简介

The Robot has a pendant for programming.
机器人配有一个编程示教盒

Figura 3
图 3

Figure 4
图 4

The pendant features a 6.5" touchscreen display, a Joystick for moving the Robot manually, a mushroom-head Emergency stop pushbutton and two Enable or hold-to-run switches to enable movement.
示教盒上有一个 6.5 英寸的触摸屏，摇杆手柄用于手动模式下运动机器人，蘑菇头急停按钮以及两个使能（暂停-运行）按钮。

Igure 5
图 5

You must hold down the hold-to-run button to move the Robot in teach mode. The Robot's axes can also be moved individually using the - and + keys to the right of the display.

在示教模式下，只有按住使能按钮才能运行机器人，通过按显示屏右侧的“-”和“+”按钮就可以独立控制机器人的轴运动。

2.2.1 Movement keys 运动按键

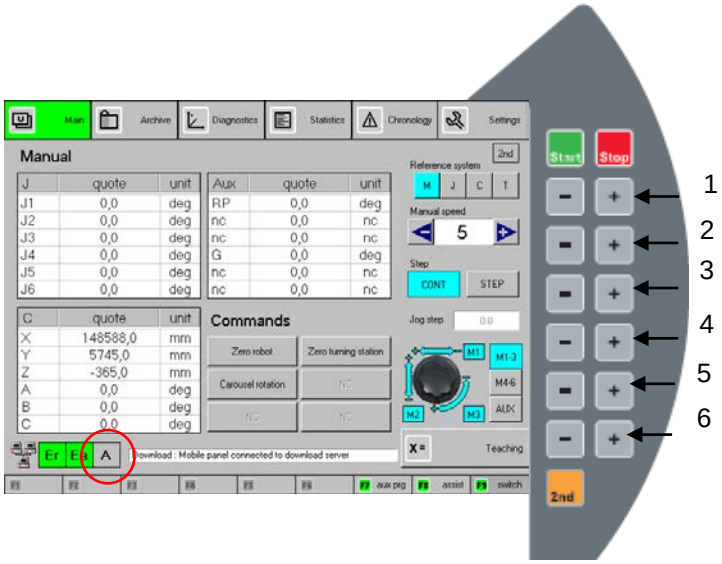


Figura 6
图 6

Key	Function
Start	Switches on motors 电机使能开
Stop	Switches off motors 电机使能关
-	Movement in negative direction 负方向运动
+	Movement in positive direction 正方向运动
2nd	Selects next 6 axes 选择另外的 6 个轴

Table 1: Key functions
表 2：功能键

To move the Robot's individual axes manually, proceed as follows:

- set the **AUTO – TEACH** selector on the control panel and teaching pendant to TEACH.
- switch on the motors with the **POWER ON** button
- press one of the hold-to-run (enable) buttons on the pendant's stick.

手动模式下控制机器人单轴运动的操作步骤如下：

- 将示教器和面板上的**自动 – 示教** 开关拨至示教模式
- 按下**上伺服**按钮给机器人的电机上伺服
- 按下示教盒上的任何一个使能按钮

The enable (hold-to-run) buttons on the underside of the pendant have three positions: fully depressed, intermediate and released. For Robot movement to be enabled, the hold-to-run button must be pressed to the intermediate position, which will cause the **Er** indicator to light (on green background).

- Then press the keys - , + to move the desired axis. The first pair of keys at the top is used to move axis 1, while the last pair moves axis 6.

示教盒上的使能按钮有三个档位，完全按下，中间档，松开
将机器人的使能按钮按至中间档 **Er** 灯点亮机器人才可以运动。

- 按下- 或 + 按钮就可以点动各轴，最上面的一对按键控制 1 轴，最下面的一对按键控制 6 轴。

To move the auxiliary axes of the G or C model Robots, press the 2nd key. The **2nd** indicator in the top right corner of the display lights. The first three pairs of keys control the interpolated axes, the second three pairs control the non-interpolated axes.

G models:

- the first pair of keys controls axis 7 (the rotate-piece device)
- the fourth pair controls axis 8 (the carousel).

C models

The first pair of keys is used to move the Robot along the traversing Y-axis.

The figure on the left illustrates whether axis movement is in the positive or negative direction.

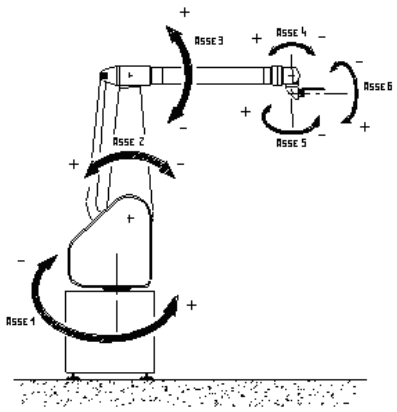


Figure 7
图 7

按下“2nd ”按键，可以点动 G 系列或 C 系列机器人的附加轴。2nd 指示灯位于显示器的右上角，前三组按钮控制插补轴，后三组控制非插补轴。

G 系列：

第一组按钮控制第 7 轴工件的旋转（转台）；

第四组控制第 8 轴转盘。

C 系列：

第一组按钮是控制机器人在 Y 行走轴方向的运动

左图显示了机器人轴运动的正、负方向

Before moving the Robot, always make sure there is enough clearance for the movement you plan on performing.
在机器人运动之前，请务必确保机器人的运动空间是安全的。

2.2.2 Display selection keys 显示按键

Key 按键	Function 功能
	Main page 主页面
	Configuration 配置
	Selects teach mode 示教模式选择
	File 文件
	Statistics 统计
	Diagnostics 诊断
	Error log 故障日志
	**Run** = painting cycle in progress **Run** = 喷涂循环中 **Error** = errors present **Error** = 故障 **Motion** = Motors on **Motion** = 电机使能开 **Process** = Joystick button interface active **Process** = 摇杆接口激活

Table 2: Display selection keys
表 3:选择按键显示

2.2.3 Function keys 功能键

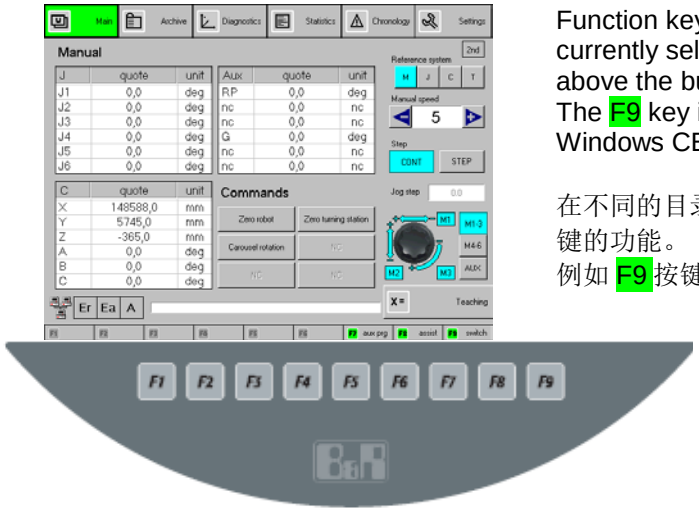


Figure 8
图 8

Function keys have different purposes depending on which menu is currently selected; the function performed is indicated on the line just above the buttons in question.
The F9 key is used to close the CMA application and return to Windows CE.

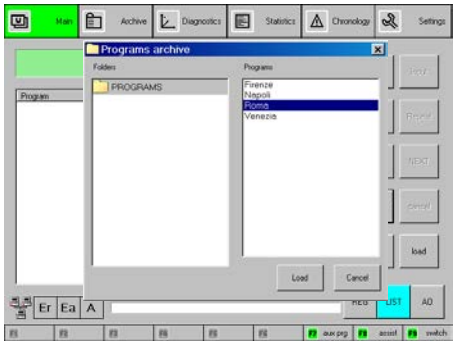
在不同的目录下，功能键的功能是不同的。在按键的上一行显示了按键的功能。
例如 F9 按键用于关闭 CMA 应用程序，返回 Windows CE。

2.3 AUTOMATIC CYCLE 自动循环

2.3.1 Automatic cycle starting procedure 自动循环启动步骤

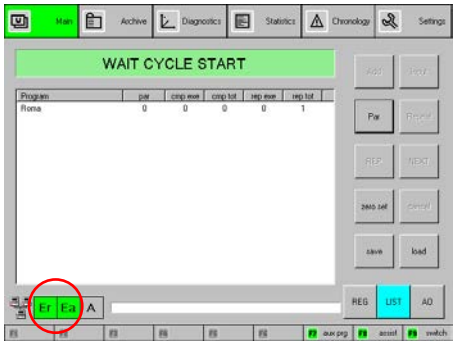
- Set the **AUTO – TEACH** selector to AUTO on the control panel and teaching pendan.
- 将示教器和控制面板上 **自动 – 示教** 开关旋转至自动模式

Figure 9
图 9



- On the display, select **LIST** followed by **Add** and select the program you want and confirm with **Load** .
- 在显示屏上选择**列表** 然后点击**增加** 选择想要的程序点击**加载**

Figure 10
图 10



- Press the **POWER ON** button on the control panel and then the **START** button to start the cycle.
- On ST versions, the **Er** (Robot axes) indicator will light
- On G versions, the **Ea** (auxiliary axes) indicator will light

- 按下控制柜上的**上伺服使能** 按钮，然后点击**开始** 按钮即可开始循环
- 在 ST 系列中，**Er** 机器人轴指示灯将会亮起
- 在 G 系列中，**Ea** 辅助轴指示灯将亮起

Figure 11
图 11

Figure 12
图 12

On ST versions, the Robot will start from the first point of the program and stands by for a remote start from the conveyor

在 ST 系列中，机器人将运动至第一点然后等待传送带的远程开始信号。

Figure 13
图 13

On G versions, the carousel turns, carrying the part in front of the Robot, at which point the painting cycle starts.

在 G 系列中，转台旋转将工件转至机器人的前方，在此位置机器人开始喷涂。

Before starting an automatic cycle, make sure nobody is inside the Robot's work area.

在开始自动循环前，请务必确保机器人工作空间中无人进入。

2.3.2 Automatic cycle stopping procedure. 自动循环停止步骤

Figure 14
图 14

- Press the **STOP** button to stop the machine immediately.
- To end the painting cycle in progress, set the **HOLD - RUN – END** selector to END. The **START** button's indicator will start flashing. The Robot finishes the painting cycle and then stops.
- To stop the Robot momentarily, set the **HOLD - RUN – END** selector to HOLD. The Robot stops immediately, but can be made to resume the cycle from where it left off by turning the selector back to RUN.
- Press the **EMERGENCY** button to stop the machine in hazardous situations.

- 按下**停止**按钮可以将设备立刻停止
- 将**暂停 - 运行 – 结束**开关旋转至结束，就可以结束喷涂循环。此时**启动**按钮的指示灯开始闪烁，在机器人结束当前喷涂循环后，将停止。
- 若想临时性的将机器人停止，将**暂停 - 运行 – 结束**按钮旋转至暂停状态，机器人将立即停止，当开关旋转至运行后，即可恢复运行状态。
- 在任何危险的情况下，都应立即按**急停**按钮停止机器人。

2.3.3 Adjustments during automatic cycle.自动模式下参数调整

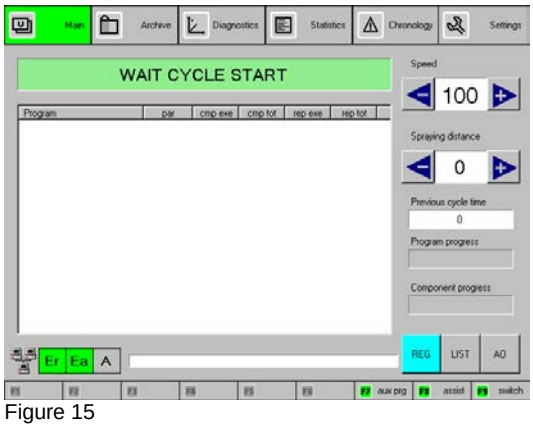


Figure 15
图 15

- Once you have performed the steps described in section 5.1 Automatic cycle starting procedure, you can make the following adjustments.
- Adjustments, press the **REG** key.

- 一旦按 5.1 中描述的自动循环步骤进行设置后，可以进行以下的调整。
- 参数调整，按 **REG** 按钮

When the **REG** key is selected, you can increase program execution speed compared to the original speed set in the **Speed** field. When set to 100%, the program will run at the same speed that it ran at during teaching. Any value higher than 100 will increase the execution speed, while a value lower than 100 will decrease execution speed. The change is saved in the program automatically, which means that when the program is next called up, it will be executed at the last speed set.

You can specify a value, in mm, in the **Spraying distance** field for the robot to approach the part to be painted.

The **Previous cycle time** field gives the time taken for the previous painting cycle to be completed.

当选择 **REG** 按钮后，可以在速度区域进行程序运行速度的增加。当设置为 100%，程序的运行速度与示教时的运行速度一致，任何大于 100%将增大运行速度，小于 100%的设置将降低运行速度。该修改设置将会被自动保存，这也就意味着当下一次程序被运行时，它的执行速度将与上一次一致。

在**喷涂距离**区域，可以对机器人与喷涂工件的距离进行设置，单位：mm。

在**前一次循环时间**区域，显示上一次喷涂循环完成的时间。

Execution list fields:
执行列表区域

Program: program name
程序: 程序名
Par: settable parameter associated with the program
参数: 关于程序的设定参数
Cmp exe: executed components of the program being executed
已被执行的程序组件:程序中已被执行的组件
Cmp tot: total number of components of the program being executed
程序的所有组件:程序中所有的组件数
Rep exe: number of repetitions of the program being executed
程序执行次数：程序已经执行的次数
Rep tot: total number of repetitions of the program being executed
程序总的执行次数：程序要执行的总次数

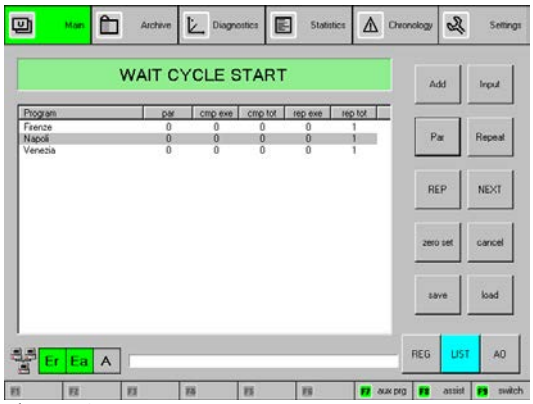


Figure 16
图 16

- Execution list, press the **LIST** key.
- You can add a program to the execution list using the **Add** key.
- Enter a program on the list using the **Input** key.
- Edit the list's parameter field using the **Par** key; the parameter field represents a numerical value that can be given a meaning, such as the selection of a colour.
- The **REP** and **NEXT** keys can be used to execute a sequence of programs a set number of times.
- **Zero set** resets the execution list.
- **Cancel** deletes the selected element.
- **Save** saves the list as a file.
- **Load** loads a previously saved list

- 执行列表，按下 **列表** 键.
- 点击 **添加**按键 就可以在执行列表中增加程序
- 使用 **Input** 按钮，就可以在执行列表中增加程序.
- 使用 **Par** 按钮，可以编辑列表参数。参数区域显示的数值代表一定的意义，例如颜色的选择。
- **REP** 与 **NEXT** 按键可以用于按已设置的次数运行一序列的程序
- **Zero set** 清除列表
- **Cancel** 删除选择的内容
- **Save** 将列表保存到文件
- **Load** 加载之前保存的列表

To adjust, analogue outputs, press the **AO** key.

If the accessory is fitted for controlling values such as colour pressure, atomizing air and spray gun fan, they can be changed during the painting cycle by adjusting the **analog outputs** fields. The last value set is stored in the properties of the program in group A.

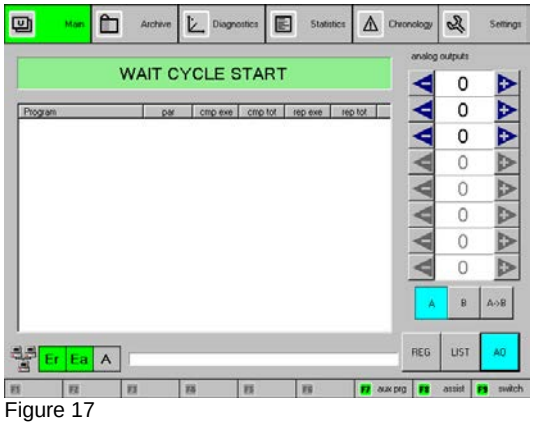


Figure 17
图 17

There are two groups of values for analogue outputs: group A and group B. Group A is normally selected.

需要调整模拟量输出，点击 **AO** 按钮.

如果配置了例如换色、雾化空气和成型空气等，在喷涂循环中可以这些控制值进行修改，例如修改**模拟量输出**区域的值。最后一次的设置值将会在 A 组的程序属性中保存。

模拟量输出的值有两组，A 组合 B 组，通常情况下选择 A 组

- Press **A** to select group A.
- Press **B** to select group B.
- Pressing the **A→B** key causes all values of the 8 available analogue outputs to be copied to group B.

- 按 **A** 按钮选择 A 组.
- 按 **B** 旋转 B 组.
- 点击 **A→B** 按钮可以进 A 组的 8 个模拟量输出数据备份到 B 组.

2.4 TEACHING 示教

PROHIBITION
禁止

Do not perform teaching with the aid of paint. If you do, you must wear the PPE required by the safety data sheet for the paint being used.
请勿借助涂料进行示教，如果你这样做，你必须穿戴符合喷涂安全数据表中要求的 PPE 防护用品。

MANDATORY ACTION
强制行为

Make sure nobody is inside the danger zones before initiating movements.
在机器人运动前务必确保无人员进入工作区域。

Once you have made the adjustments/setup prescribed in the section above, you can put the partly completed machinery into operation.
一旦按照前一节中描述的进行了设置或调整，就可以让部分完好的设备进行工作。

2.4.1 Preliminary operations prior to teaching 示教操作前的准备步骤

Figure 18
图 18

- set the **AUTO – TEACH** selector on the control panel and teaching pendant to AUTO.(Note: Note: In the drag teaching mode, you must first control panel button to select automatically, otherwise it will read the brake exception or Cabinet selector error)
- 选择示教器和控制面板**自动 –示教**开关至自动（注：在拖动示教模式下，要先将控制面板的按钮选择自动，否则就会报抱闸异常或者 Cabinet selector error）。

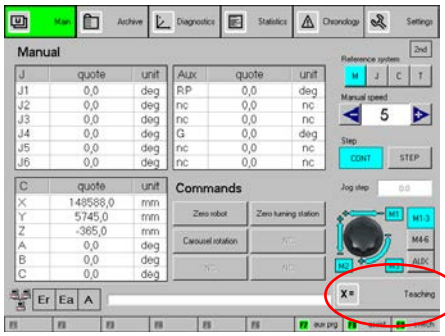


Figure 19
图 19

- Press the key to give the program you want to create a name.
- 选择 按钮进行程序的创建。

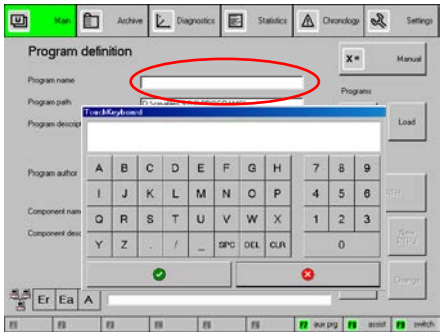


Figure 20
图 20

- Key in the program name
- 输入程序名。

3. 第三章 POINT-TO-POINT PROGRAMS (PTP) 点到点编程（PTP）

3.1 Point-to-point programming foreword 点到点编程前言

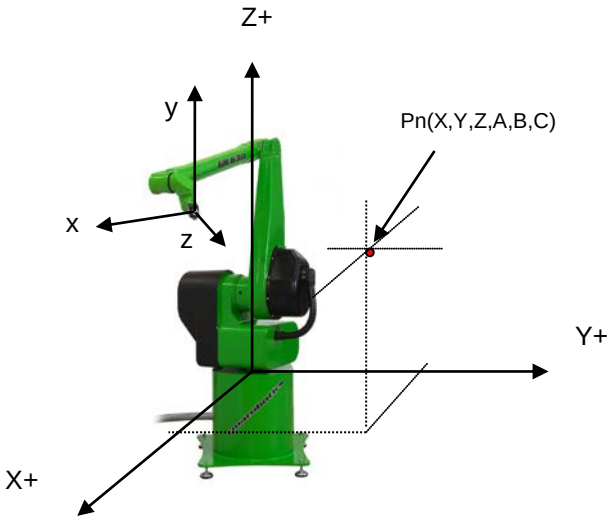
A point-to-point (PTP) program consists in a sequence of instructions that the Robot will execute during the automatic painting cycle. There are movement instructions (MOVE) and logic instructions (CYCLIC). The movement instructions cause the Robot to move and these are generally points taken in the field (Pn), while logic instructions change the last point acquired in the field, creating a new virtual one.
一个点到点程序（PTP）由一系列的指令组成，在自动模式下，机器人运行这些指令。指令可以分为运动指令和逻辑指令。运动指令的功能是让机器人运动至相应的位置（Pn）而逻辑指令是通过创建一个虚拟点实现对上一点进行修改的指令。

The available movement instructions are as follows:
可用的运动指令如下：

Movement Instructions 运动指令	Description 描述
Line 直线	Moves the Robot's gun along a line between two points 机器人点与点之间的直线运动
Circ 圆弧	Makes the Robot's gun describe an arc 机器人运行一个圆弧指令
Spline 样条	
Plane 平面指令	Covers a plane with S-shaped trajectories 覆盖平面的一个 S 型曲线轨迹
StartProfile 曲面开始	Covers a profile with S-shaped trajectories 覆盖曲面的 S 型轨迹
EndProfile 曲面结束	End of Profile instruction 曲面结束
Table 3: Movement instructions 表 4：运动指令	

The available logic instructions are as follows:
可用的逻辑指令如下：

Logic Instructions 逻辑指令	Description 描述
IncShift 相对偏移	Adds a shift to the current point Pn(X,Y,X,A,B,C) 在当前点 Pn(X,Y,X,A,B,C)增加一个偏移
AbsShift 绝对偏移	Sets a shift with respect to the current point Pn(X,Y,X,A,B,C) 对当前 Pn(X,Y,X,A,B,C)点设置一个偏移
WaitTime 延时	Waits for the time to elapse 延时一个给定的时间
WaitImput 等待输入	Waits for a change to occur in an input 等待一个输入信号的变化
Rep 循环	Repeats the instructions included between the Rep instruction and Next instruction 循环执行 Rep 和 Next 指令之间的指令
Next 循环结束	End of instructions to be repeated 循环结束指令
Table 4: Logic instructions 表 5：逻辑指令	



The Robot has a system of main coordinates X,Y,Z and a secondary system of coordinates x,y,z referred to the gun (tool).
The X,Y,Z coordinates of a Pn point in space refer to the main system of coordinates. In addition to the X,Y,Z coordinates, a point also has an orientation as defined by the angles A,B,C. Angle A is the rotation with respect to the X-axis, angle B is the rotation with respect to the Y-axis and angle C is the rotation with respect to the Z-axis.

机器人的坐标系可以分为基坐标系和工具坐标系。
Pn 点的 X,Y,Z 坐标是指在基坐标系下相对 X,Y,Z 轴的数值。点的姿态用 A,B,C 进行描述。A 是指相对 X 轴进行的旋转，B 是指相对 Y 轴进行的旋转，角度 C 是相对 Z 轴进行的旋转。

The secondary or Tool system of coordinates is used to make it easier to create the PTP program, allowing you to move, for example, in the direction the paint leaves the gun regardless of which way the gun is facing with respect to the main system of coordinates.
工具坐标是为了在创建 PTP 程序时更加的方便，可以实现在工具方向上的运动，而无需考虑其相对基坐标系下的运动。

3.2 Description of PTP program page 点到点编程界面描述

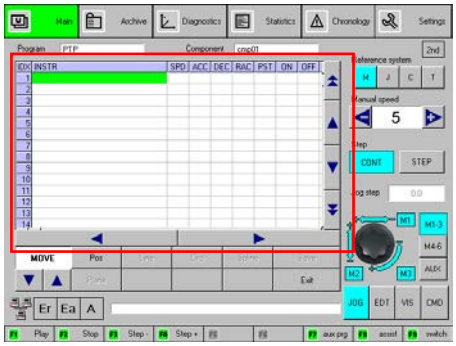


Figure 21
图 21

The PTP program creation page is divided into four main parts:
点到点编程界面主要可以分为 4 个部分：

1) The list of instructions making up the program
1）组成程序的指令

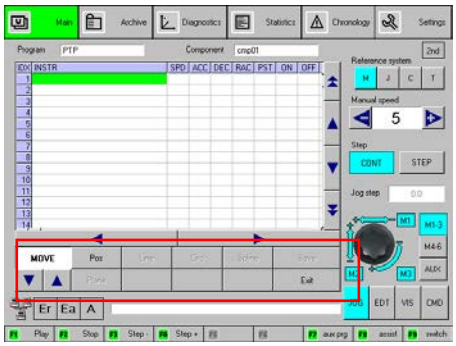


Figure 22
图 23

2) The selection of instructions to be inserted, divided into MOVE movement instructions and CYCLIC logic instructions.
2）插入指令的选择区域，指令可以分为运动指令和循环逻辑指令

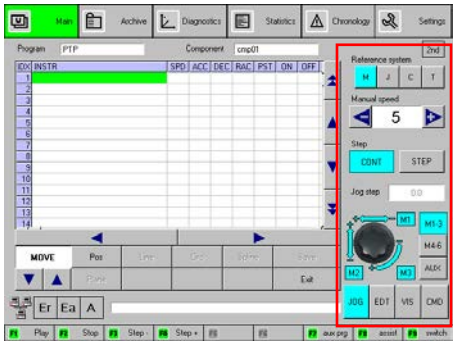
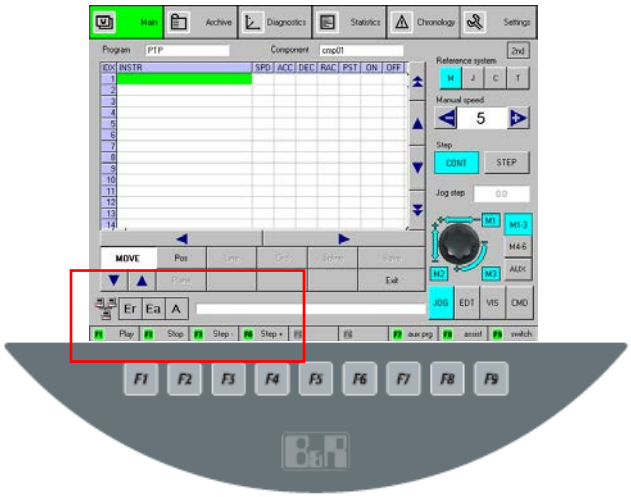


Figure 24
图 25

3) How the Robot is to move: speed, reference system of coordinates, type of movement - continuous or in step mode.
3）机器人运动参数设置：速度，参考坐标系，运动方式（连贯模式或单步模式）

4) Keys for trying out program instructions
4）试运行程序指令按键

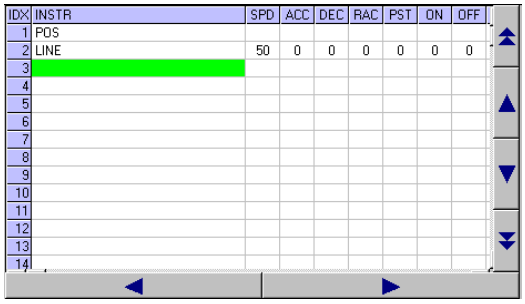


F1	Play - executes the program
F1	运行-执行程序
F2	Stop - stops the program's execution
F2	停止-停止程序的运行
F3	Executes the next program line
F3	执行程序的下一行
F4	Executes the previous program line
F4	执行程序的上一行

Figure26
图 26

Before executing the program lines, make sure the execution speed is suitable for the movement the Robot is required to perform.
在执行程序前请务必确认运行速度对机器人运动是合适的。

3.3 Fields of a PTP program instructions table PTP 编程指令表



IDX	INSTR	SPD	ACC	DEC	RAC	PST	ON	OFF
1	POS							
2	LINE	50	0	0	0	0	0	0
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								

INSTR	Instruction
SPD	Speed at which point is to be reached
ACC	Start acceleration from point
DEC	Deceleration on approaching point
RAC	Link with next point
PST	Gun status
ON	Gun open delay (in mm)
OFF	Gun early close (in mm)

INSTR	指令
SPD	指令运动速度
ACC	加速度
DEC	减速度
RAC	过渡半径
PST	喷枪状态
ON	喷枪打开延时 (单位 mm)
OFF	喷枪关闭延时(单位 mm)

Figure 27
图 27

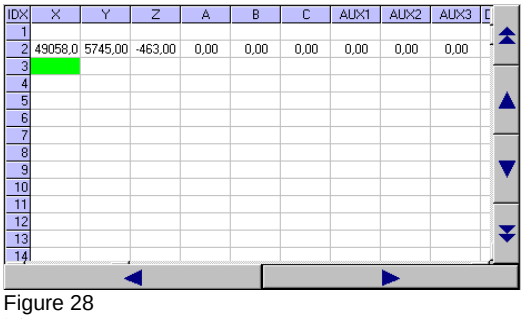


Figure 28
图 28

X	Point's X coordinate
Y	Point's Y coordinate
Z	Point's Z coordinate
A	Rotation with respect to X-axis
B	Rotation with respect to Y-axis
C	Rotation with respect to Z-axis
AUX1	Position of auxiliary axis 1
AUX2	Position of auxiliary axis 2
AUX3	Position of auxiliary axis 3

X	点的 X 坐标
Y	点的 Y 坐标
Z	点的 Z 坐标
A	相对于 X 轴的旋转
B	相对于 Y 轴的旋转
C	相对于 Z 轴的旋转
AUX1	附加轴 1 的位置
AUX2	附加轴 2 的位置
AUX3	附加轴 3 的位置

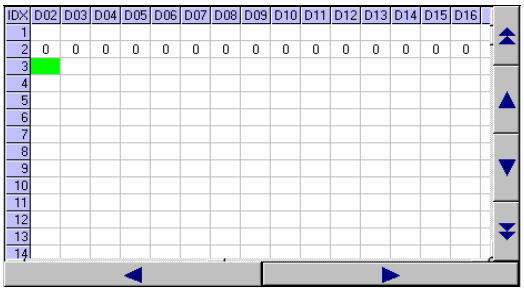


Figure 29
图 29

DO2..DO16	Value of digital outputs
DO2..DO16	数字量的输出值

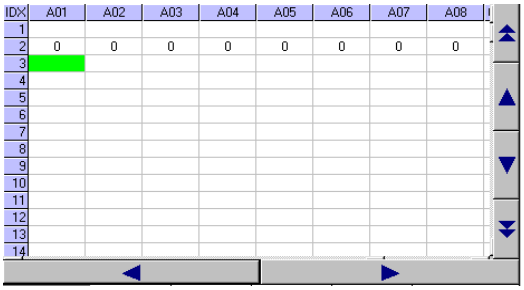


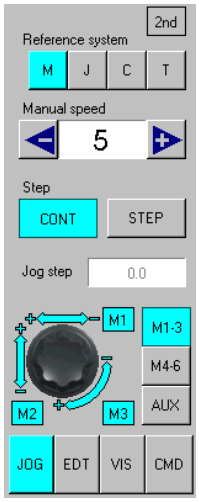
Figure30
图 30

AO1..AO8	Value of analogue outputs
AO1..AO8	模拟量的输出值

3.4 Robot movement settings 机器人运动设置

Reference system
参考坐标系

The following modes can be selected by selecting the buttons M, J, C and T respectively:
通过 M，J，C 和 T 按键可以进行以下模式的选择

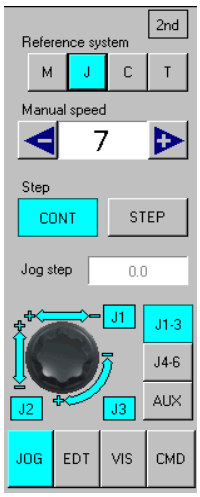


M	**Motor**, the Robot axes' individual motors are operated by pressing the - and + keys or by using the Joystick
M	电机模式，通过按 - 和 + 按键或摇杆手柄可以实现对机器人单个电机的操作。
J	**Joint**, the Robot axes' joints are operated by pressing the - and + keys or by using the Joystick
J	关节，通过按 - 和 + 按键或摇杆手柄可以实现对机器人关节的操作。
C	**Cartesian**, you can move the Robot along the main reference system's Cartesian axes X, Y, Z by using the Joystick.
C	笛卡尔，通过按摇杆手柄可以控制机器人在笛卡尔坐标系中的参考主轴 X, Y, Z 方向进行运动。
T	**Tool**, you can move the Robot's gun along the secondary reference system's Cartesian axes x, y, z by using the Joystick.
T	工具，通过按摇杆手柄可以控制机器人在工具参考坐标系下的 X, Y, Z 方向进行运动。

Figure 31
图 31

Manual Speed
手动速度

- Select the movement speed by setting the value in the range from 1 to 10 using the arrows
- 通过箭头，可以对机器人的运动速度进行设置，取值范围是 1 至 10



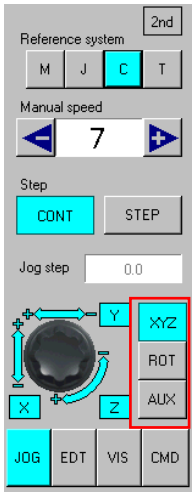
Step
单步

Type of movement, continuous or in step mode: continuous movement is controlled by the operator, i.e. the Robot starts or stops when the Joystick is operated or released. In step mode, you can set a distance in mm in the **Jog Step** box.
运动方式，可以分为连贯方式或单步模式：连贯模式由操作者进行控制，例如：当操作或松开摇杆手柄可以控制机器人的开始或停止。在单步模式下，可在单步电动对话框中设置单步的距离，单位是毫米。

- Press STEP to select step movement mode.
- 按 STEP 可以选择单步运动模式.

In step movement mode, when the Joystick is operated, the Robot will move by the distance given in the **Jog step** box, regardless of whether the Joystick is released or not. Always make sure there is enough clearance for the movement.
单步运动模式，操作摇杆手柄时，机器人将运行单步点动对话框中预先设定的一段距离，与摇杆手柄是否松开无关。请始终确保机器人有足够的安全运动空间。

Figure 32
图 32



The Joystick has three levels of freedom, meaning it can carry out three types of movement at a time. The keys highlighted by the red box have different meanings depending on which reference system is selected (M,J,C,T) and are used to change the Joystick-controlled movements.

摇杆手柄只有三个档位，这也就是说一次机器人最多只能控制三个方向的运动。在不同的参考坐标系下（M，J，C，T）红框中的高亮按键有不同的定义，可以通过这些按键切换摇杆所控制的运动。

The functions each of the three keys can have are summarized in the table below:

这三个按键的功能可以总结如下表：

Motor		Joint		Cartesian		Tool	
M1-3	Motors 1,2,3 电机 1，2，3	J1-3	Joints 1,2,3 关节 1，2，3	X,Y,Z	Axes X,Y,Z 轴 X，Y，Z	X,Y,Z	Gun axes X,Y,Z 喷枪的 X，Y，Z
M4-6	Motors 4,5,6 电机 4，5，6	J4-6	Joints 4,5,6 关节 4，5，6	ROT	Rotations 旋转	ROY	Gun rotations 喷枪的旋转
AUX	Auxiliary motors 附加轴电机	AUX	Auxiliary joints 附加轴关节	AUX		AUX	

Figure 33
图 33

Table 5: Joystick movement selection key function
表 6：点动功能选择键

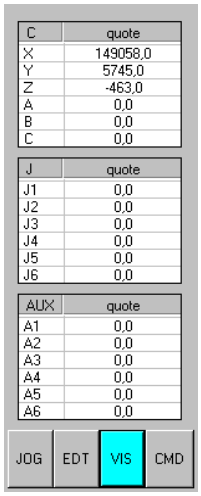


Figure34
图 34

- Pressing the VIS key allows you to view the gun's Cartesian position, the position of the individual axes and the position of the auxiliary axes, if any.
- 点击 VIS 按键可以查看喷枪的笛卡尔坐标值（X~C），机器人各个轴的值以及附加轴的值。

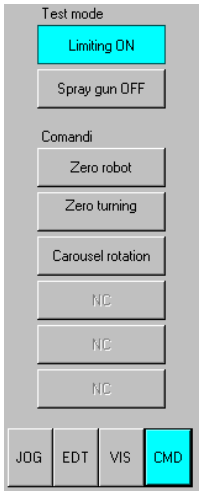


Figure 35
图 35

- Pressing the CMD key allows you to give the Robot special commands
- 点击 CMD 按键可以对机器人进行特殊命令的设置

Limiting ON **速度限位开启**	Robot speed limiting active 机器人的速度限位功能开启
Spray gun OFF **喷枪关闭**	Gun disabled during test cycle 测试阶段机器人的喷枪关闭
Zero Robot **机器人回零位**	Sends the Robot to home 机器人快速回零位命令
Zero Turning station **转台快速回零位**	Sends the rotate-piece device to home 转台快速回零位命令
Carousel rotation **旋转托盘**	Makes the carousel rotation axis perform one turn in automatic mode 在自动模式中，让选装托盘进行一次旋转

3.5 Setting PTP instructions PTP 指令设置

3.5.1 Pos instruction Pos 指令

The first instruction of a program is always the POS instruction. This is the instruction in which the first point of the program is stored.

机器人程序中，第一条指令始终是 Pos 指令。
机器人程序的第一点就是存储在这个指令中。

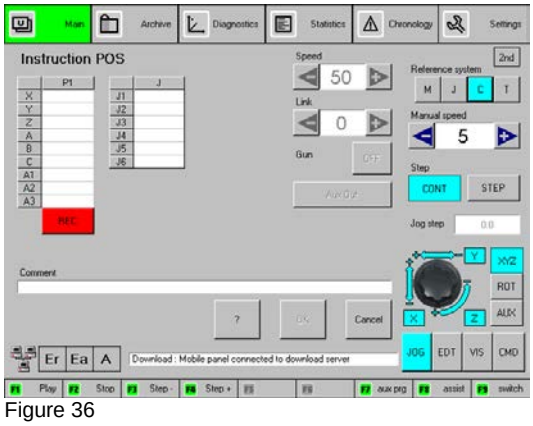


Figure 36
图 36

Choose the first point of the program at a sufficient distance from the part so that if the part has to move to reach the painting position, it will not hit the Robot already in position waiting for the part.
请务必选择足够远离工件的一点作为第一点，以保证机器人在到达该喷涂位置时不会与等待喷涂的工件发生碰撞。

- Press the **REC** key to store the point
- Press **OK** to confirm the instruction

- 点击 **REC** 按键可以记录该点
- 点击 **OK** 按键进行该指令的确认

3.5.2 Line instruction 直线指令

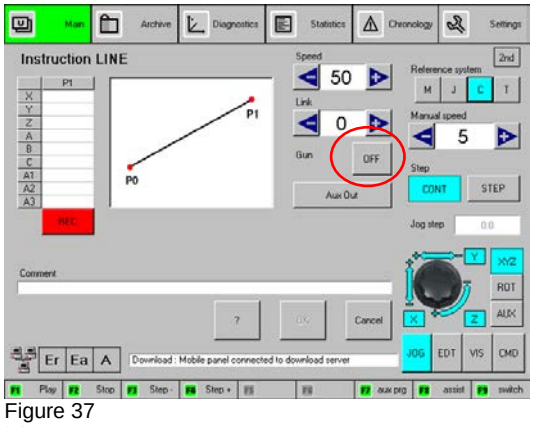


Figure 37
图 37

The LINE instruction joins the previously stored point (P0) with the current point (P1).

Select the desired **Speed** and **Link** for reaching the point. The speed parameter can be set in the range from 1 to 100%, while link values range from 0 to 10. If the link value is 0, the Robot will stop at point P1 and will then set off for the next point. With link set to 10, the Robot will pass as near as possible to point P1 before continuing towards the next point.
Use the arrows ◀ ▶ to edit the values.

直线指令是将上一点存储的 P0 与当前点 P1 以直线运动指令连接。
可以设置到达该点时所需要的速度和过渡半径。其中速度的取值范围是 1%~100%，而直线的圆弧过渡取值范围是 0~10。如果圆弧过渡的值设为 0，那么机器人到达 P1 时将会停顿然后运动至下一点。当圆弧过渡的值设为 10 时，机器人将在运动至下一点前尽可能的逼近 P1 点，以实现速度的连贯。

- If you select the **Gun** **ON** button, the gun will be switched on during the journey from P0 to P1.
- 如果选择 **Gun** **ON** **按钮**，在从 P0 运动至 P1 的过程中机器人的喷枪将打开。

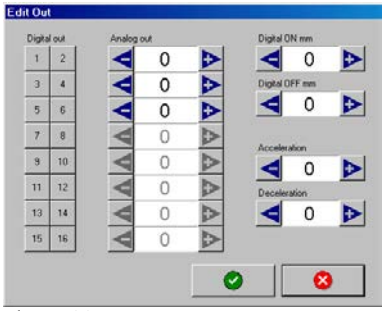


Figure 38
图 38

Pressing the **Aux Out** key calls up the Edit Out menu via which you can select:

- the state of 16 outputs (n°1 is the gun)
- the value of 8 analogue outputs
- the delay with which the gun comes on, in mm,from the line start point
- how early the gun is switched off, in mm, from the line end point
- Acceleration and deceleration during movement; the value 0 indicates that the parameter is calculated automatically so that

acceleration and deceleration spaces are the same; if the value is anything other than zero, then the acceleration and deceleration values are set.

点击 **Aux Out** 按键可以弹出 Edit Out 菜单进行相应的选择：

- 16 个输出的状态 (n°1 是喷枪)
- 8 个模拟量的输出值
- 直线运动中从起始点到喷枪打开的延时，单位 mm
- 直线运动中从结束点到喷枪提前关闭的位置，单位 mm
- 运动中的加速度、减速度；若该值是 0 表示加速度、减速度进行自动的计算

加速度和减速度是一样的。如果该值不等于 0，加速度、减速度将采用设定的值。

The **Digital ON mm** and **Digital OFF mm** parameters can prove useful in the event. you want to wait for the robot to move at constant speed before spraying, for a more even result on the sprayed product.

- Press the REC key to store the point
- Press OK to confirm the instruction

当希望机器人在喷涂前达到匀速运动时，**Digital ON mm** and **Digital OFF mm** 是很有用的，在已喷过的工件上可以获得更好的效果。

- 点击 REC 按键可以记录该点
- 点击 **OK** 按键进行该指令的确认

3.5.3 Circle instruction 圆弧指令

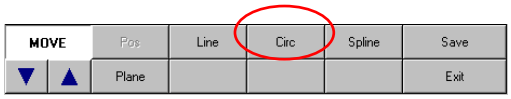


Figure 39
图 39

The CIRCLE instruction comprises two semi-instructions called CIRC1 and CIRC2.
The circle arc the Robot will execute will be the arc passing through three points.
The first point (P0) is the end point of the instruction before the CIRCLE instruction; the other two points are defined with two subsequent CIRC instructions.

圆弧指令由两个指令组成，称为 CIRC1 and CIRC2。
机器人运动中执行的圆弧指令由通过的三点组成。
第一点是圆弧指点前的一个指令结束点，另外两点由两个子圆弧构成指令构成。

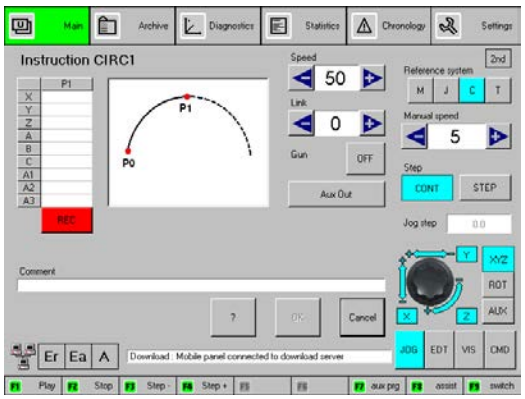


Figure 40
图 40

- When you press the **Circ** button on the MOVE menu the first time, the first part of the circle arc is inserted, going from P0 (the previous instruction's point) to P1 (second point defining the circle arc).
- Press REC to store the point.

- 当第一次点击 MOVE 菜单中的 **Circ** 指令时，第一个子圆弧将被插入。从上一点 P0（指令中的前一点）至 P1（决定圆弧的第二点）。
- 点击 REC 按键可以记录该点

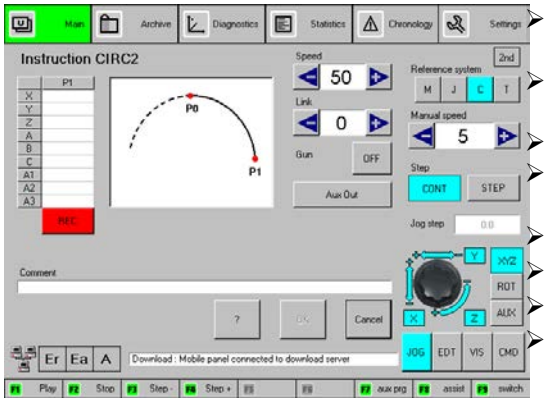


Figure 41
图 41

- Press **Circ** again to enter another CIRC instruction, which will automatically be called CIRC2.
- Pressing the REC key enters a new point P1 (third point defining the circle arc).
- CIRC instructions are required for a complete circle
- Press OK to confirm the instruction

- 再次点击 **Circ**，将插入另一个圆弧指令，称为 CIRC2.。
- 点击 REC 按键可以记录新的 P1 点（决定圆弧的第三点）
- 对于整圆，可以使用圆弧指令
- 点击 **OK** 按键进行该指令的确认

3.5.4 Spline instruction 样条指令

Not available 不可用

3.5.5 Plane instruction 平面指令

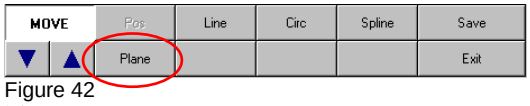


Figure 42
图 42

The PLANE instruction is used to get the Robot to paint flat surfaces, defining them with just four points and a step. The surface can be vertical or horizontal or tilted; the surface to be painted is actually defined as the plane that intersects the four points defined. The first point (P0) is the point defined with the instruction before the PLANE instruction; the other three points (P1, P2 and P3) are stored by pressing the REC key on the PLANE instruction page in three consecutive PLANE instructions, PLANE1, PLANE2 and PLANE3.
PLANE 指令是用于机器人喷涂平坦表面的指令，通过四个定义四个点和一个步长即可以实现该指令的定义。喷涂的面可以使水平的、垂直的、或倾斜的。喷涂的平面即为四个点所定义的平面。第一点是 P0 点该点是 PLANE 指令前的结束点。另外的 3 个点可以通过在平面指令页面中连续三次输入平面指令，并按 REC 进行记录即可插入 PLANE1，PLANE2，PLANE3 指令。

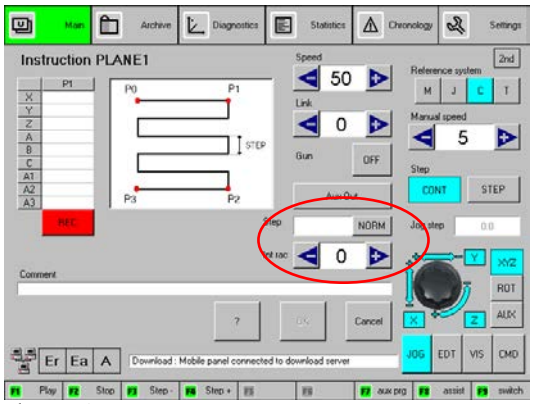


Figure 43
图 43

- Enter the **Step** parameter to specify the desired step, the Plane Step (mm) dialogue box is called up.
- In the case of the C model robot with traversing axis, pressing the NORM key executes the PLANE instruction with the aid of the Robot's traversing axis moving at constant speed.
- Enter a value for the **Int. Rac** parameter to specify a link between the changes in direction: 0 no link (the Robot stops); 10 maximum link.
- Press OK to confirm the instruction

- 输入 **Step** 参数用于设置需要的步长，并弹出 Plane Step (mm) 对话框。
- 如果使用的是 C 型号具有行走轴的机器人，按 NORM 键可以实现机器人的行走轴在常速下辅助喷涂平面。
- 输入 **Int. Rac** 值可以设置机器人在转接处不同运动方向的过渡，取值范围是 0~10。0：无过渡，机器人将停顿；10：最大的过渡。
- 点击 **OK** 按键进行该指令的确认

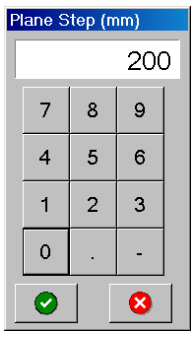


Figure 44
图 44

Plane Step (mm) dialogue box for entering the step
输入步长的 Plane Step (mm) 对话框

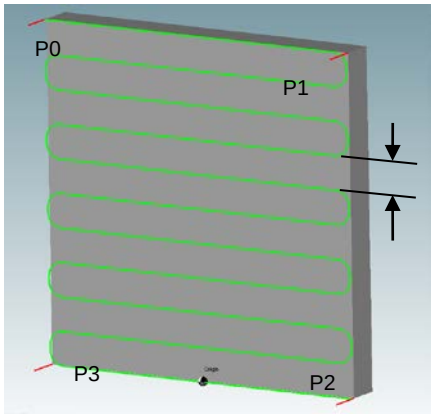


Figure 45
图 45

The figure on the left gives an example of a trajectory that the Robot would execute
左图给出了机器人执行的轨迹示例。

3.5.6 Profile instruction 轮廓指令

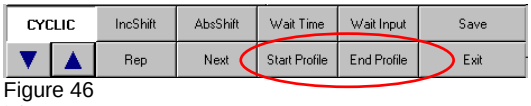


Figure 46
图 46

The PROFILE instruction comprises a number of instructions between the key START PROFILE and END PROFILE instructions.
The object is to describe a profile using LINE and CIRCLE instructions and repeating it a number of times by setting the Step parameter in the same way as the PLANE instruction.

轮廓指令由 START PROFILE 与 END PROFILE 之间很多的指令组成。
目标是采用直线和圆弧来描述一个这样的轮廓，然后采用与平面指令中类似的步长参数来实现一定次数的重复。

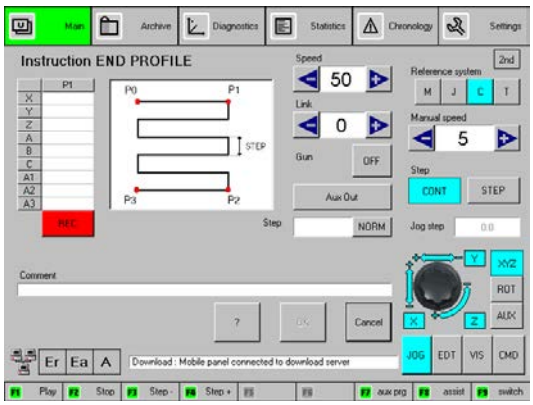


Figure47
图 47

- Pressing the REC key stores point P1, which represents the depth of the part.
- In the case of the C model robot with traversing axis, pressing the NORM key executes the PLANE instruction with the aid of the Robot's traversing axis moving at constant speed.

- 点击 REC 按键存储 P1 点，代表工件的深度。
- 如果使用的是 C 型号具有行走轴的机器人，按 NORM 键可以实现机器人的行走轴在匀速下辅助喷涂轮廓。

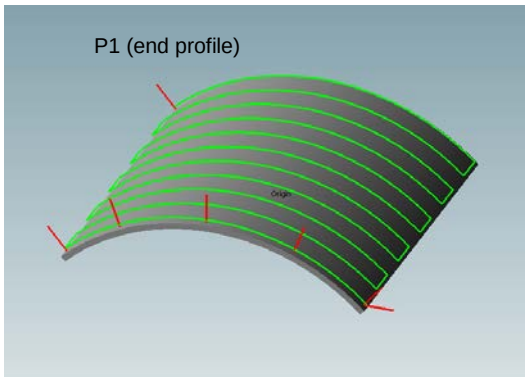


Figure 48
图 48

The figure on the left gives an example of a trajectory that the Robot would execute
左图给出了机器人执行的轨迹示例。

3.5.7 IncShift instruction 相对偏移指令

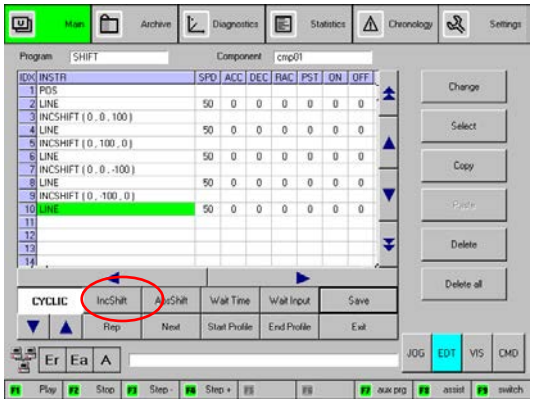


Figure 49
图 49

The INCSHIFT instruction can be used to add values, given in mm, to the X,Y,Z coordinates of a previously stored point, effectively creating a new point without necessarily having to acquire it in the field by moving the Robot.
In the instruction table on the left, the program represents a square on the Y,Z plane.

相对偏移指令可以用于相对于上一个存储点增加一个 X,Y,Z 坐标值（单位：mm），从而实现在不移动机器人的情况下来创建一个新的点。
左边指令表中的程序表示的是一个在 YZ 平面内的正方形。

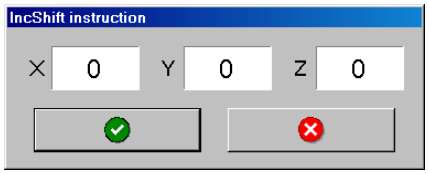


Figure 50
图 50

- Pressing the **IncShift** key calls up the IncShift instruction dialogue box for entering the X,Y,Z coordinates.
- 点击 **IncShift** 按键可以弹出 IncShift instruction 对话框用于输入 X,Y,Z 坐标。

3.5.8 AbsShift instruction 绝对偏移指令

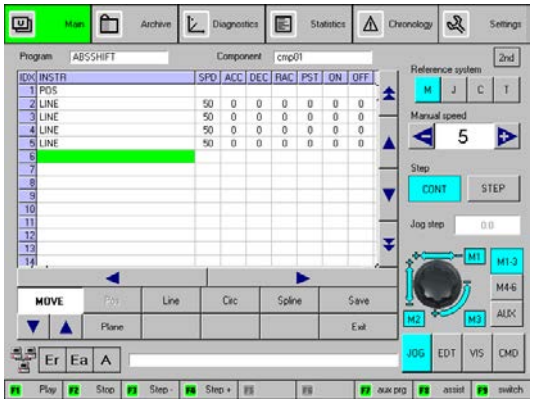


Figure 51
图 51

The ABSSHIFT instruction allows you to introduce a shift applied to all points following the instruction in question.
绝对偏移指令可以实现对指令后所有的点增加一个偏移值。

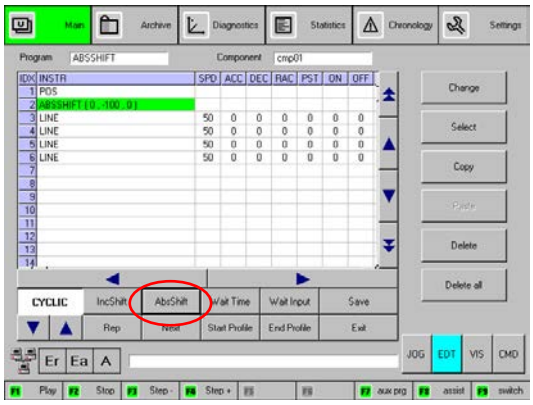


Figure 52
图 52

For example, if the program on the left represents a square on the Y,Z plane, entering the ABSSHIFT instruction (0,-100,0) between the POS instruction and the first LINE instruction moves the square 100 mm to the Robot's right.
例如，如果左边的程序表示一个在 YZ 平面中的正方形，在 POS 指令和第一个 LINE 指令之间输入 ABSSHIFT 指令(0,-100,0)，将在机器人的右边 100mm 处运动一个正方形。

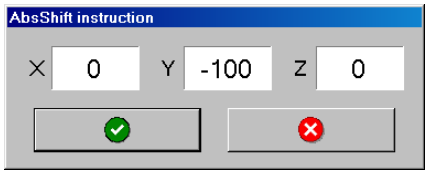


Figure53
图 53

- Pressing the **AbsShift** key calls up the AbsShift instruction dialogue box for entering the absolute coordinates the points are to be moved by.
- 点击 **AbsShift** 按键可以弹出 AbsShift instruction 对话框，在对话框中可以输入想要偏移的绝对坐标值。

3.5.9 Rep - Next instructions 循环指令

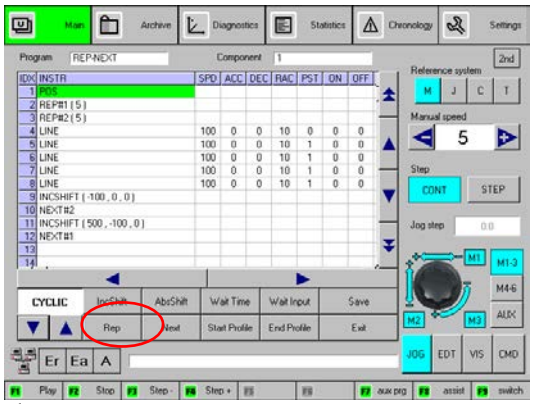


Figure 54
图 54

The REP and NEXT instructions can be used to repeat a sequence of instructions included between the REP instruction and NEXT instruction.
REP-NEXT cycles can be nested; the # indicator after the instruction specifies the number of the REP instruction inserted，The maximum number of nested REP-NEXT cycles is 16.
In the instruction table on the left, the square described by the instructions from line 4 to line 7 is repeated 25 times.
You can specify the number of times you want to repeat the sequence of instructions: pressing the **Rep** key calls up the numerical keypad below for this very purpose

REP 与 NEXT 指令可以用于重复执行 REP 和 NEXT 之间的指令。
REP-NEXT 循环可以嵌套；指令后的#标识符表示 REP-NEXT 循环的次数，最大嵌套层数是 16。
在左边的指令表中,从第 4 行到第 7 行的指令表示的是一个正方形，重复的次数是 25 次。
可以指定想要的次数重复序列的指令:按代表键调用下面的数字键盘为这个目的可以设定想要执行的指令循环次数:按 **Rep** 键将弹出下面的数值按键。

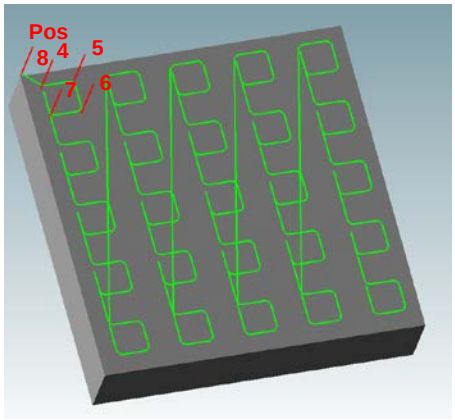


Figure 55
图 55

The figure on the left gives an example of a trajectory that the Robot would execute
左图给出了机器人执行的轨迹示例。

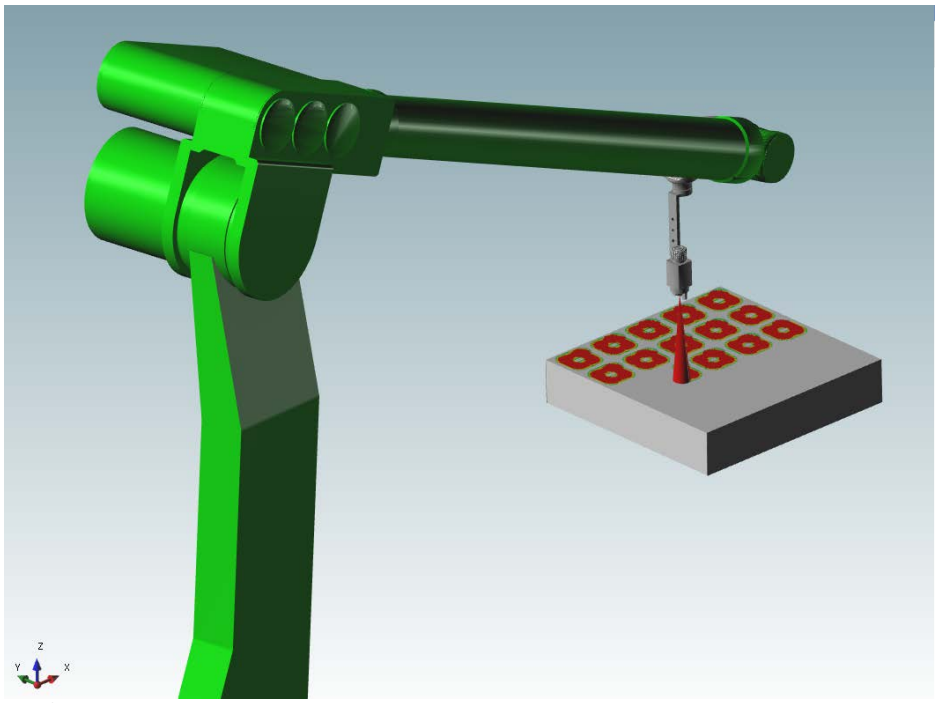


Figure 56
图 56

3.5.10 WaitTime instruction 延时指令

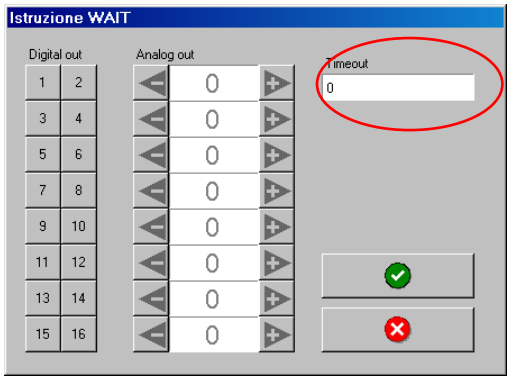


Figure 57
图 57

Enter an instruction by pressing the **Wait Time** key to create a pause in the program's execution. Specify the pause time in seconds in the **Timeout** field.
During the pause, you can set the state that the 16 digital outputs and 8 analogue outputs must be in.
Button 1 represents the spray gun

可以通过按 **WaitTime** 键来设置程序执行中的一个暂停时间。在 **Timeout** 区域中设置暂停时间。
在暂停时，可以对 16 个数字输出和 8 个模拟输出进行设置。
按钮表示 1 的是喷枪。

3.5.11 WaitInput instruction 等待输入指令

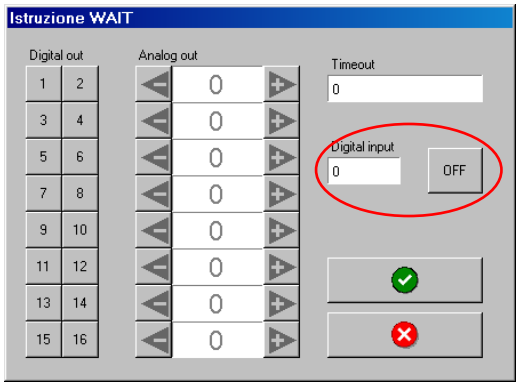


Figure 58
图 58

- Enter an instruction by pressing the **Wait Input** key to create a pause in the program's execution that will end when the input specified in the **Digital input** field changes state.
- 可以通过选择 **Wait Input** 键来写入该指令，只有当对应的信号状态发生改变后，该命令才会执行结束，否则一直等待输入信号满足条件。

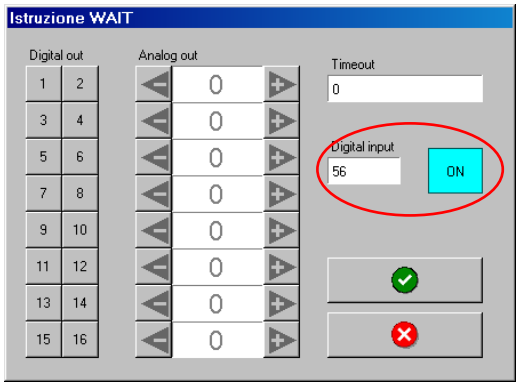


Figure 59
图 59

3.6 Creating and trying out a PTP program 创建和测试 PTP 程序

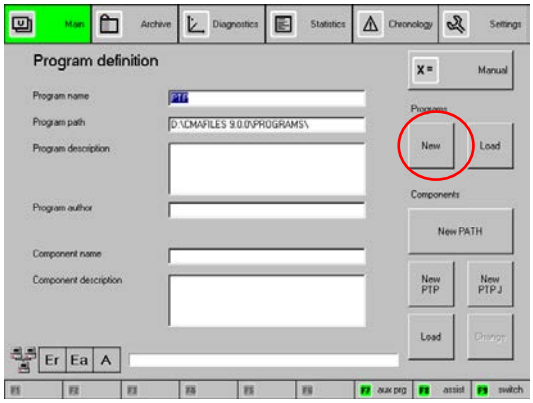


Figure 60
图 60

- Follow the instructions given in section 6.1 Preliminary operations prior to teaching.
- Then press the **New PTP** key and the PTP program Instruction table appears.

- 在示教程序前将介绍如下 6.1 节中的指令
- 按 **New PTP** 按键 PTP 程序指令表将弹出

The program is formed by moving the Robot with the Joystick, entering the instructions line by line and storing the points in the instructions.

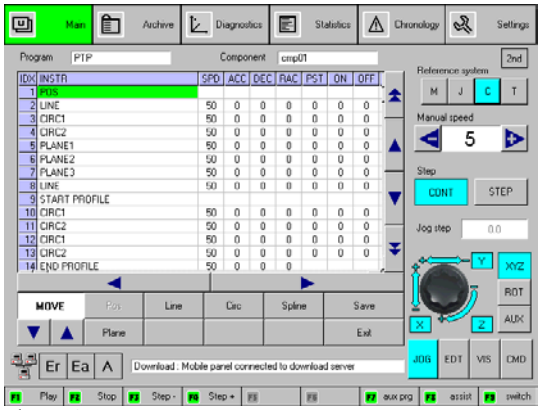
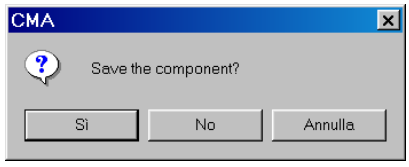


Figure 61
图 61

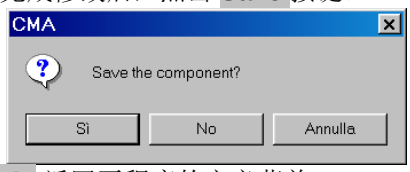
- The program can be tried out one line at a time by pressing the **F3 Step -** and **F4 Step +** keys, or can be tried out in full by pressing the **F1 Play** key.
- Once you have finished making changes, press the **Save** button.



- Press **Exit** to return to the program definition menu

可以通过机器人的摇杆手柄运动机器人，一行一行的输入并保存指令的点。

- 可以通过按 **F3 Step –** 和 **F4 Step +**按键实现一次只执行一行命令，或按 **F1 Play** 键一次执行整个程序。
- 一旦当完成修改后，点击 **Save** 按键。



- 点击 **Exit** 返回至程序的定义菜单

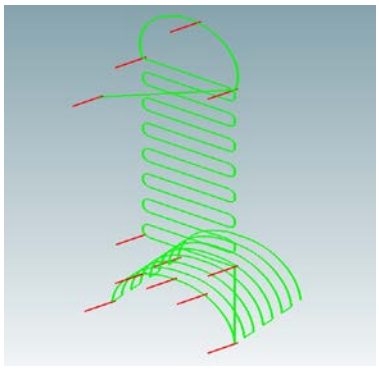
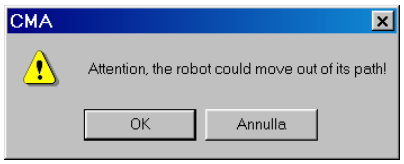


Figure 62
图 62

The figure on the left shows the trajectory that the Robot would execute based on the instructions given above

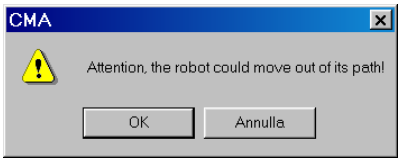
You can move from one line of the program to the next by simply touching the desired line to move the cursor

If program lines are not executed in sequence, pressing the F1 **Play** or F3 **Step +** key and F4 **Step –** results in the following message appearing (the robot might follow a trajectory not prescribed by the program).



左图给出了机器人执行的轨迹示例，该轨迹由上面的指令生成。

可以通过光标就可以实现从程序的一行跳至想要的另一行。
如果按 F1 **Play** 按键，或 F3 **Step –** 和 F4 **Step +**按键将会弹出下面的的对话框（机器人运行的轨迹可能不是程序所描述的轨迹）。



Confirm the action if you are sure the movement is not hazardous.
请务必确定程序是无危险的才可以确认运动。

3.7 Editing the instructions of a PTP program 编辑 PTP 程序的指令

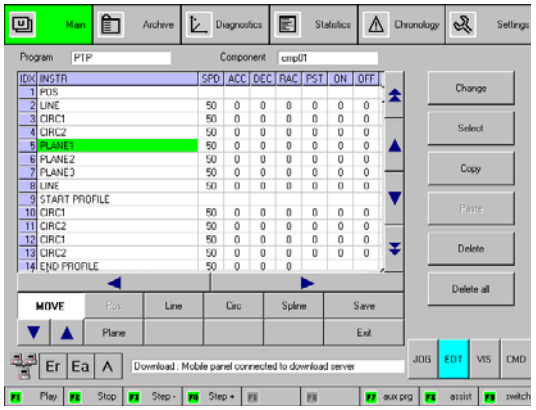


Figure63
图 63

- To edit an instruction that has already been stored, press the **EDIT** key to select the instruction and press **Change** . The standard page for the selected instruction is called up.
- To copy one or more instructions, select them, press **Copy**, move onto the line you want to copy the instructions to and press **Paste** . The sequence of instructions can be copied mirrored

- 若想编辑已经存储的指令，点击 **EDIT** 按键，选择想编辑的指令，点击 **Change** 按键，将弹出选择指令的标准界面。
- 若想复制一行或多行指令，选中他们，点击 **Copy** 然后移动至想要拷贝至的指令行，点击 **Paste** 按键，相应的指令就会被复制黏贴。

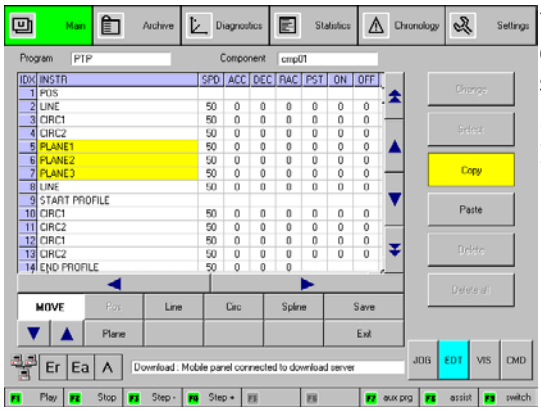


Figure 64
图 64

You will also be asked whether to delete the instructions with the original points; if you answer YES to this question, the instructions selected for copying will basically by moved.
系统将会询问是否将原始点删除，若选择“是”，那么所被选中的原始复制指令将会被删除。

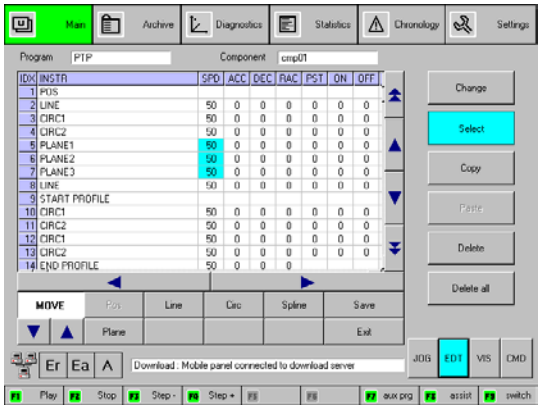
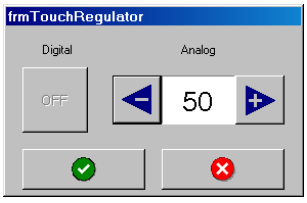
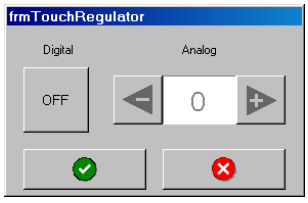


Figure65
图 65

- For instance, to edit the speed of a number of instructions at the same time, select them on the touchscreen display and then press **Change** ; this calls up the frmTouchRegulator dialogue box via which you can set both analogue values such as speed (SPD) or acceleration (ACC) and digital values like gun status (PST)
- 例如，若同时编辑一定数量指令的速度大小，在屏幕中选中它们，然后点击 **Change** 按键，将弹出一个 frmTouchRegulator 对话框，通过该对话框可以设置模拟量，例如速度或加速度同时也可以设置数字量例如喷枪的状态。





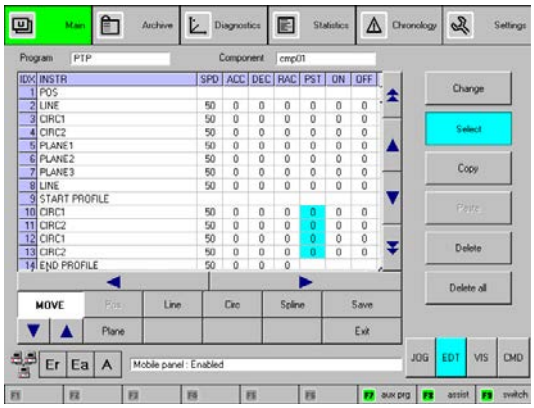


Figure 66
图 66

- The **Delete** button deletes the selected line
- The **Delete all** button deletes all the component's lines
- Once you have finished making changes, press the **Save** button to save the changes made

- **Delete** 删除按钮用于删除选中的组件行
- **Delete all** 用于删除所用的指令行
- 一旦完成相应的修改，点击 **Save** 按键进行设置的保存

3.8 Editing a PTP program 编辑一个 PTP 程序

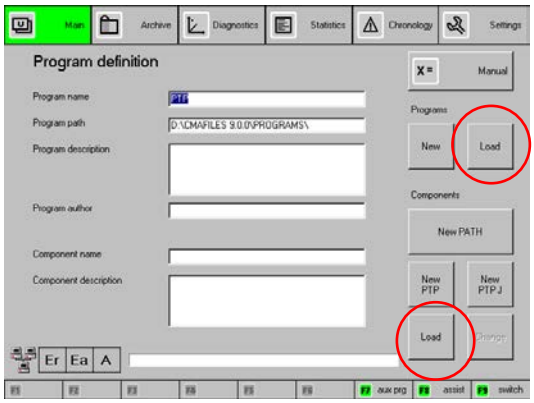
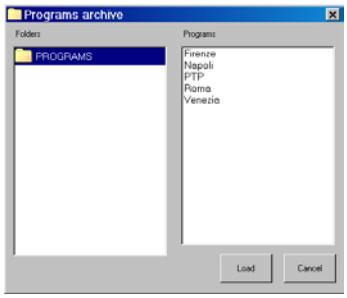


Figure 67
图 67

- To edit a previously stored program, press the **Load** key and select the program from the list provided by Programs archive
- Then press the second **Load** key relating to the program components and select the component you want to edit from the Load component list.
- Then follow the procedure given in the above section 0
- Editing the instructions of a PTP program

- 编辑一个之前存储的程序，点击 **Load** 按键在程序列表中选中所要编辑的程序名
- 点击第二个 **Load** 按键，该按键是关于程序组件，在 Load component 列表中选中相应的程序组件。
- 参考 8.3.7 节中介绍的编辑 PTP 程序的指令方法，进行步骤操作。



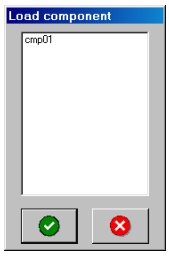


Figure 68
图 68
Figure 69
图 69

4. 第四章 UTILITIES 实用工具

4.1 File 文件

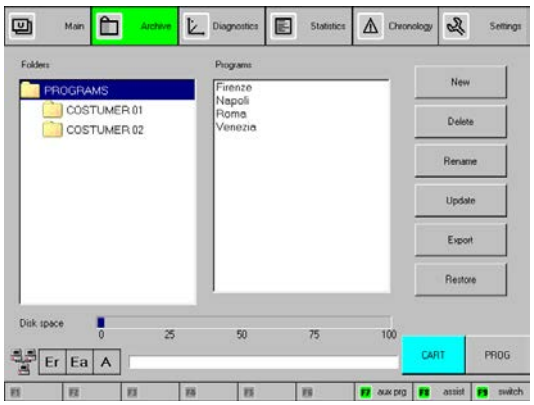


Figure 70
图 70

You can press the key to the left of the display or on the actual display itself to call up the programs file.

- If you press the CART key, operations are carried out on the folders. The available operations are as follows:

点击按键可以在左边显示文件右边显示文件夹中的程序。

- 如果点击 CART 按键, 可以实现对文件夹的操作，操作命令有：

- **New** to create a new folder
- **New** 创建一个新文件夹
- **Delete** to delete an existing folder
- **Delete** 删除一个存在的文件夹
- **Rename** to give a folder a new name
- **Rename** 对文件夹进行重命名
- **Update** to update the list of folders
- **Update** 对文件夹进行刷新
- **Export** to create a backup of the Robot's full configuration, including the painting programs
- **Export** 对机器人的全部配置进行一个备份，包括喷涂程序

- **Restore** to load a previously saved configuration
- **Restore** 加载一个先前保存的配置

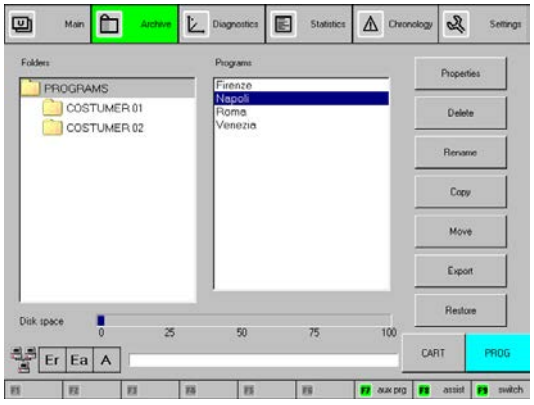


Figure 71
图 71

- If you press the PROG key, operations are carried out on the painting programs. The available operations are as follows:
- 如果点击 PROG 按键，可以对喷涂程序进行操作。操作命令如下：

- **Properties** to call up the properties of a program
- **Properties** 显示程序的属性

- **Delete** to delete a program
- **Delete** 删除程序

- **Rename** to give a program a new name
- **Rename** 对程序进行重命名

Figure 72
图 72

- **Copy** to copy a program
- **Copy** 复制一个程序

- **Move** to move a program to a different folder
- **Move** 将程序移动至其他文件夹

- **Export** to copy a program to an external storage device
- **Export** 拷贝程序至外部设备

- **Restore** to copy a program from an external storage device
- **Restore** 将程序从外部设备拷贝至机器人

When copying or loading to a USB storage device, use the port on the right side of the electrical cabinet.
在使用 USB 设备进行文件的拷贝和加载时，可以使用电控柜上右侧 USB 接口。

4.1.1 Program properties 程序属性

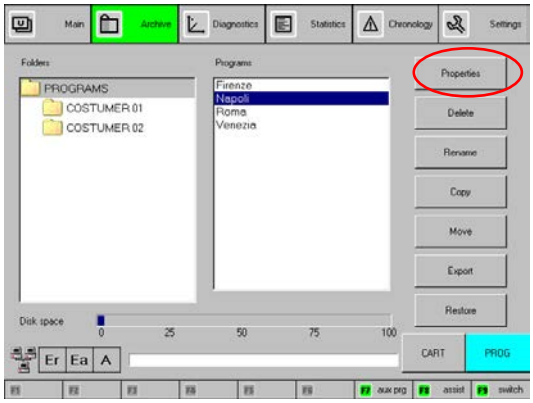


Figure 73
图 73

- Pressing the **Properties** key calls up the properties of the painting program
- 点击 **Properties** 按键可以显示喷涂程序的属性

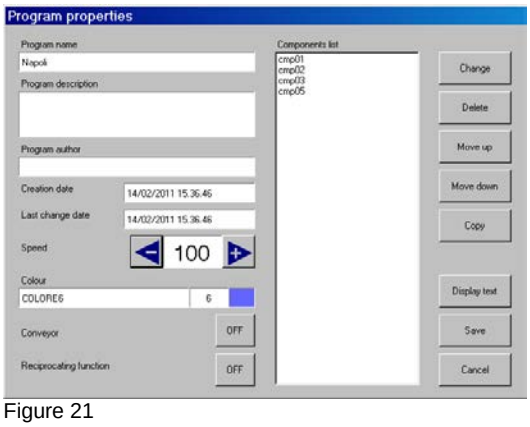


Figure 21
图 74

On the program's properties page, you can:

- View the list of its components
- Write a description of the program and indicate its compiler.
- View and change the setting of the last program execution speed (**Speed**) using the arrows
- In the event the program has been created with the conveyor moving, you can test the program with the conveyor stationary by selecting **Conveyor OFF**. See section 8.2.4.3 PATH program teaching with conveyor moving

在程序的属性页面中，可以进行如下的操作:

- 查看程序的组成组件；
- 可以对程序进行功能的描述，并增加程序的编程人员。
- 查看程序的执行速度，通过箭头按键可以进行程序的速度设置(**Speed**)。
- 若程序示教时，传送带是运动的。在测试时，可以通过选择 **Conveyor OFF** 按键将传送带保持静止。可以参阅 8.2.4.3节中的输送链运动中的路径编程。

The **Reciprocating function** key is not enabled.
Reciprocating function 按键不可用。

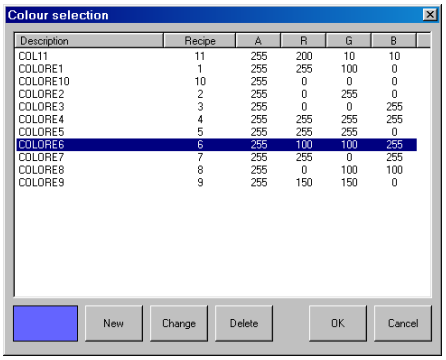


Figure 75
图 75

- You can assign a colour (**Colour**) to the program. To do this, simply touch the field under the colour caption and the **Colour selection** window is called up: press OK to confirm your selection.
- 可以对程序喷涂的颜色进行设置，进行该项设置时，只需要点击颜色属性区域，一个 **Colour selection** 对话框将弹出，点击 OK 进行颜色的确定。

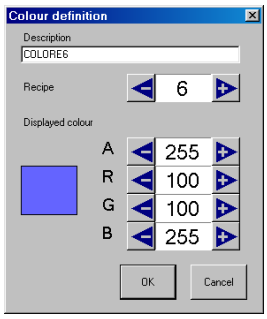


Figure 76
图 76

- You can define new colours by pressing the **New** key. A colour is defined by the numerical value **Recipe**, and four values that correspond to the colours' ARGB code.
- 可以使用 **New** 按键定义一个新的颜色，颜色是由这个参数 **Recipe** 的数值决定的，四个数值对应的是 ARGB 的数值。

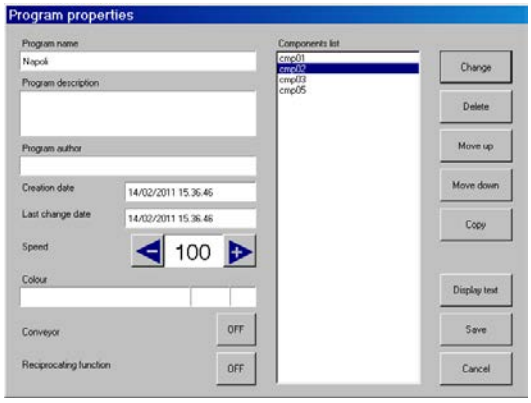


Figure 77
图 77

- Pressing the **Delete** key deletes the component.
- You can press the **Move up** and **Move Down** keys to alter the order of the components.
- Pressing the **Copy** key copies the component.
- Pressing the **Display text** key displays the component in text format.

- 点击 **Delete** 按键可以删除该组件。
- 点击 **Move up** 和 **Move Down** 按键可以修改组件执行的顺序。
- 点击 **Copy** 按键可以拷贝相应的组件
- 点击 **Display text** 按键将以文本形式显示程序组件。

4.1.2 Component properties 组件属性

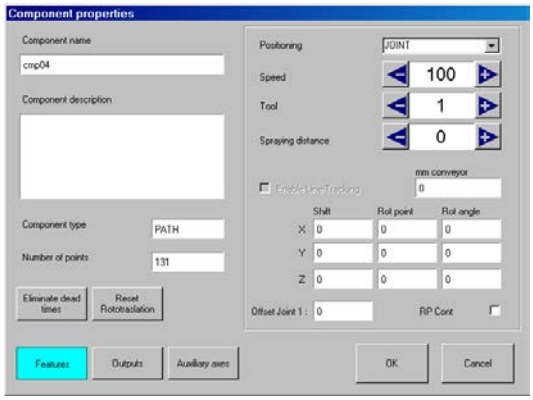


Figure 78
图 78

- By selecting a program component from the **Component List** and pressing the **Change** key, you can call up the properties of the individual component.
- For PATH programs, there is a function to eliminate idle time, i.e. pauses that the operator took during teaching. To apply the idle time reduction function, press the **Eliminate dead times** button.
- To permanently apply the set rotation-translation data to all program points, press **Reset Rototraslation**; the currently set **Shift**, **Rot Point** and **Rot angle** values will be reset.
- In addition to the name and description, you can also change:
- (by pressing the **Features** button):

-
- 在**组件列表**中选择程序的组件，点击修改按键，可以弹出这个组件的属性对话窗口。
- 对于路径程序，可以使用 **Eliminate dead times** 按键将轨迹示教时可以消除产生的空闲时间（例如示教时的暂停）。
- 若想将旋转平移数据应用至所有的程序点，点击 **Reset Rototraslation** 按键即可，程序将使用 **Shift**, **Rot Point** 和 **Rot angle** 这几个参数当前输入的数值也将会被重置。
- 此外还可以修改名称和组件的描述。
- (点击 **Features** 按键):

- The type of first point positioning, choosing from JOINT,LINE and MIX (**Positioning**).
- The speed of the individual component (**Speed**).
- The gun (**Tool**) reference coordinate system x,y,z
- The spraying distance from the part (**Spraying distance**)
- The position with respect to the conveyor (**mm conveyor**)
- The position of the program in space (**Shift**)
- Rotation-translation (**Rot angle**) with respect to a rotation point (**Rot point**)
- The offset on Robot axis 1 only (**Offset Joint 1**)
- **RP Cont** parameter referring specifically to programs generated with the CMA Offline Painting program.

- 第一个定位点的类型，例如：关节，直线和混合的（**定位**）
- 组件的运行速度 (**速度**)
- 工具坐标系的 x,y,z 值。
- 喷枪与工件之间的距离(**喷涂距离**)
- 相对于传送带之间的距离(**mm 传送带**)
- 程序在机器人坐标系中的位置 (**偏移**)
- 旋转-平移 (**旋转角**) 相对于旋转点(**旋转点**)
- 第一个关节轴的偏移 (关节 1 的偏移)
- **RP Cont** 参数特指程序是 CMA 离线编程生成的喷涂程序。

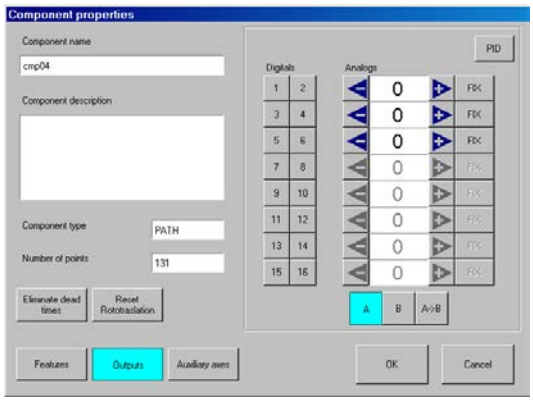


Figure 79
图 79

- By pressing the **Outputs** key, you can change:
- The state of 16 digital outputs, the first 1 of which is the spray gun (**Digitals**).
- The value of 8 analogue outputs (**Analogs**); the first three normally control the pressure of the paint pump, the atomization air and the spray gun fan. To use these outputs, you must have the Proportioning valves (CAPV) accessory

- 点击 **Outputs** 按键, 可以进行如下的修改：
- 在 16 个数字输出中，第一个输出时喷枪(**数字**).
- 在 8 个模拟量输出中 (**模拟**); 前三个用于控制喷涂压力，雾化空气和扇形。若要使用这三个输出，需要配备比例阀组件（CAPV）。

Figure 80
图 80

CAPV accessory

- You can control two groups of values for the analogue outputs: group A and group B. Selecting button **A**, allows you to work on group A, Selecting button **A**, allows you to work on group A, selecting button **B**, allows you to work on group B, while pressing the **A →B** button causes the values from group A to be copied to group B.
- The **FIX** button is used to set the value of the analogue output for the full duration of the component, otherwise it is stored during teaching or specified in the PTP instructions.
- The PID button is used to enable Proportional Integral Derivative control of the output selected: pressing this button calls up the PID parameters setting dialogue box. The function requires additional hardware, which is available as an optional extra.

- 可以使用两组值进行模拟量的控制：组 A 和组 B。当选择组 **A** 时，使用的是组 A 中的值控制模拟输；选择组 **B** 时，使用的是组 B 中的值对模拟量进行控制。当选择 **A →B** 按键时，将会把组 A 中的值复制至组 B 中。

- **FIX** 按键用于设置组件运行全程中的模拟输出值。在示教中进行存储的或在 PTP 指令中进行设定的。
- PID 按键是用于启用对选择的输出进行比例-积分-微分控制:按下这个按键将弹出 PID 参数的设置对话框。该功能需要额外的硬件（一个额外选配件）。

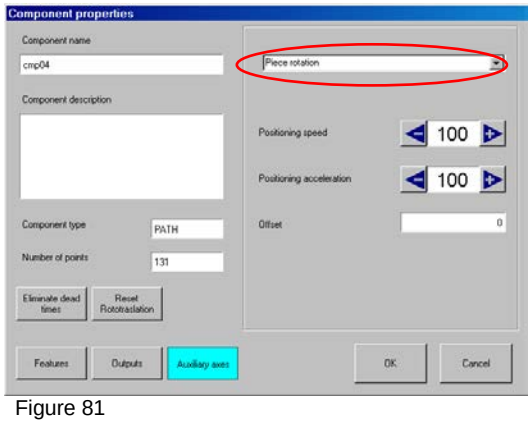


Figure 81
图 82

- By pressing the **Auxiliary axes** button, you can change:
- Selection of the auxiliary axis whose basic parameters you want to edit.
- The first point positioning speed of the auxiliary axis (**Positioning speed**)
- The first point positioning acceleration of the auxiliary axis (**Positioning acceleration**)
- An **Offset**, if any, with respect to the original position stored during the program's creation.

- 点击 **Auxiliary axes** 按键, 可以进行如下的修改：
- 选中基本参数所要修改的辅助轴
- 辅助轴运动至定位点时的速度(**定位速度**)
- 辅助轴运动至定位点时的加速度 （**定位加速度**)
- 偏移，如果存在的话，相对于程序创建时的原始点。

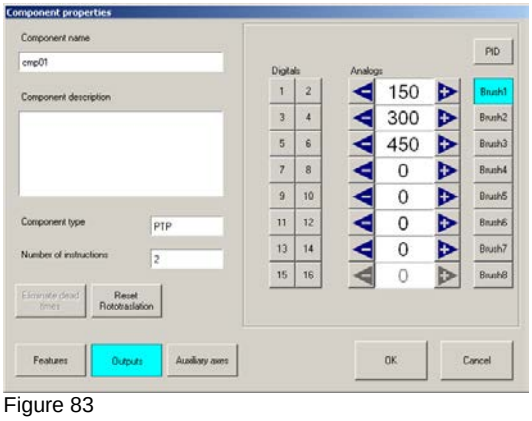


Figure 83
图 83

When the **Outputs** key is pressed, the properties of the component may even be displayed as illustrated on the left in the event brush mode was chosen for the analogue outputs' control in the machine's configuration.
This mode allows you to create up to 8 groups called brushes, each with 8 analogue values that can be given different settings.By pressing the **Brush** button, you can change the brush selected for the component

当点击 **Outputs** 按键时，在机器人的配置中若对模拟输出选择了项目刷模式，将会像左边图片中那样显示组件的属性。
在这个模式中，可以创建 8 组，称为刷组，每一个包含 8 个模拟量可以有不同的设置。点击 **Brush** 按键可以对选中的刷进行修改。

4.2 Diagnostics 诊断

4.2.1 in axes 主轴

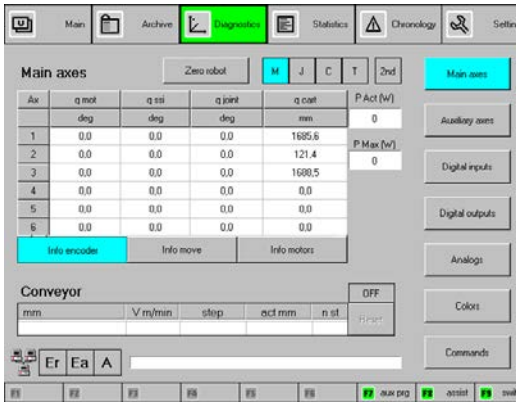


Figure 84
图 84

Pressing the key calls up the diagnostics menu, which shows the status of the Robot's main axes The information is arranged in three tables that can be selected with the following keys:

点击 按键将弹出诊断对话框，在此对话框中将显示机器人主轴的状态。信息分为三个表格，通过下面的按键可以进行切换：

- **Info encoder** information on the position sensors
- **Info encoder** 位置传感器的信息

- **Zero robot** Robot movement button: it turns red when pressed once and, when pressed again, sends the Robot will all its joints to home position. Enable the motors to perform movement. **Er** indicator lights.
- **Zero robot** 机器人运动命令：连续点击此按键两次即可。第一次点击后按键将变红第二次点击后机器人的各个关节将开始向零位运动。需要将机器人上伺服，同时指示灯 **Er** 将被点亮。

q mot = motor position
q ssi = absolute encoder position
q joint = Joint position
q cart = Cartesian position

q mot = 电机位置
q ssi = 绝对编码器的位置
q joint = 关节位置
q cart = 笛卡尔位置

- **Info move** movement information
- **Info move** 运动信息

e act = current error
e max = maximum error
v act = current speed
v max = maximum speed

e act = 当前误差
e max = 最大误差
v act = 当前速度
v max = 最大速度

- **Info motors** information on motors
- **Info motors** 电机信息

i act = motor current demand
i max = maximum current demand
T act = current motor temperature
T max = maximum temperature reached by motor

i act = 电机运行电流
i max = 最大运行电流
T act = 当前电机温度
T max = 电机的最大允许温度

The following values are displayed for the conveyor, if there is one:
如果有输送链，下列参数将显示输送链的信息：

mm = current conveyor position
V m/min = speed in metres per minute
step = last step performed in mm
act mm = position of step
n st = number of start signals received

mm = 当前输送链的位置
V m/min = 速度（米/分钟）
step = 运行的上一步（mm）
act mm = 当前步的位置 （mm）
n st = 收到的启动信号数量

For all motors, including auxiliary motors, the display shows:
对所有的电机，包含辅助轴，显示如下：:

P Act(W) = Power demand in watts
P Max(W) = Maximum power demand in watts

P Act(W) = 当前的功率(W)
P Max(W) = 最大允许的功率（W）

The diagnostics menu provides access to other submenus, which are described in greater detail below, namely:
诊断菜单还可以显示如下的子菜单,下面将进行详细的介绍：

- **Auxiliary axes** The auxiliary axes menu
- **Auxiliary axes** 辅助轴菜单

- **Digital inputs** to view inputs
- **Digital inputs** 输入状态显示

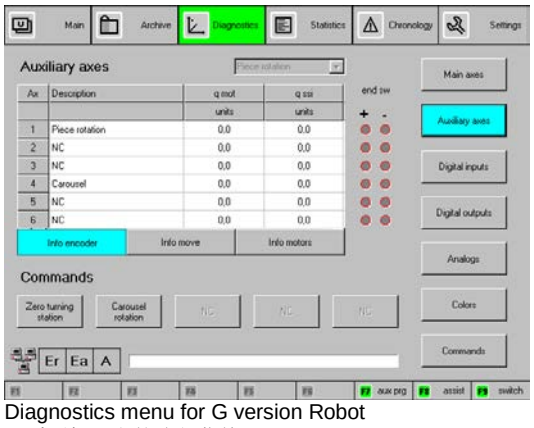
- **Digital outputs** to view outputs
- **Digital outputs** 输出状态显示

- **Analog** to view analogue outputs
- **Analog** 模拟量输出显示

- **Color** to select the colour or pump
- **Color** 选择颜色或泵

- **Commands** for special operations
- **Commands** 特殊操作

4.2.2 Auxiliary axes 辅助轴



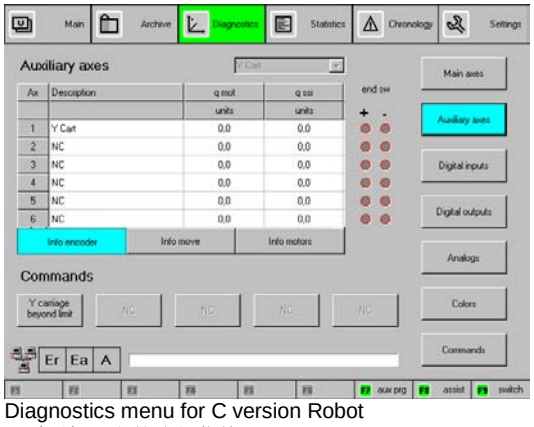
Diagnostics menu for G version Robot
G 系列机器人的诊断菜单

Figure 85
图 85

Pressing the **Auxiliary axes** button calls up the menu. In this menu, the three tables – **info encoder**, **info move** and **info motors** – feature the same information already covered for the main axes.
To the right of the table, under the heading **end sw**, the state of the limit switches featured on the C versions is given as either positive or negative. The red indicator comes on to show that the limit switch has tripped.

点击**辅助轴**按钮，可以弹出一个菜单，该菜单包含编码器、运动、电机三个表格，该信息内容与机器人轴的信息相同。
在右表中，**软限位**下面显示的是 C 类型的正负限位状态。红灯点亮表示限位被触发。

The **Zero turning station** key can be used to send the part rotation axis to the zero position quickly. To do this, the auxiliary axis motors must be on, hence with the **Ea** indicator lit. Press the key twice in a row: the first time it is pressed, it turns red and the second time it performs the movement.
The **Carousel rotation** key is used to move the carousel on by one station. To do this, the auxiliary axis motors must be on, hence with the **Ea** indicator lit. Press the key twice in a row: the first time it is pressed, it turns red and the second time it performs the movement.



Diagnostics menu for C version Robot
C 系列机器人的诊断菜单
Figure86
图 86

旋转回零按钮可以用于让旋转轴快速回零。在动作之前将电机使能，**Ea** 灯将被点亮。连续点击该按键两次：第一次点击后，该按键将变红，第二次点击后将开始运动。
点击 **Carousel rotation** 按键可以实现将转盘移动一个转位。在操作转盘前，需要将辅助上伺服，同时指示灯 **Ea** 将被点亮。连续点击此按键两次即可。第一次点击后按键将变红第二次点击后转盘将开始运动。

When an **end sw** indicator lights – to show that the Robot's traversing axis has overrun – you must use the 'release from limit switch' function: it is actually no longer possible to move the axis with normal manual movements in this situation, and you will need proceed as follows instead:

- set the machine to **TEACH** mode
- switch on the motors; the **Ea** indicator lights
- press the **Y carriage beyond limit** button.

The traversing axis will start to move and keep moving until it clears the tripped limit switch and the **end sw** indicator goes off.

当 **end sw** 指示灯亮起表示机器人的行走轴超出了限位。此时必须是使用限位开关功能中的松开功能。此刻，已经不能再手动模式下正常运行这个轴，需要采用如下的操作步骤：

- 将机器人旋至 **TEACH** 模式
- 给电机上伺服使能; **Ea** 指示灯亮起
- 点击 **Y carriage beyond limit** 按键.

行走轴将开始运动，直至运动至无限位报警处，同时 **end sw** 指示灯将熄灭。

4.2.3 Digital Inputs and Outputs 数字输入输出

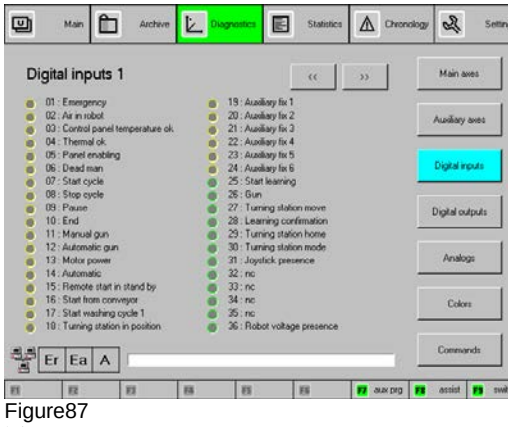


Figure87
图 87

Pressing the Digital inputs and Digital outputs key calls up the menu. This menu gives the state of the Robot's inputs and outputs. They are divided up according to zone and identified by colour, as detailed in the table below:
点击 Digital inputs 和 Digital outputs 按键将弹出菜单，此菜单中将显示机器人的输入和输出状态。不同的区域用不同颜色进行标示，可以分为：

Colour 颜色	I/O	Zone 区域
YELLOW 黄	1-24 37-48	Electrical cabinet 电控柜
GREEN 绿	25-36	Robot 机器人
LIGHT BLUE 浅蓝	49-60	Proportioning valves (CAPV) 比例阀 (CAPV)
PURPLE 紫色	61-72	Colour change system (CCO) 换色系统 (CCO)
RED 红	73-144	Other location 其他功能

Table 6: I/O zone colour coding
表 7：I/O 区域颜色代码

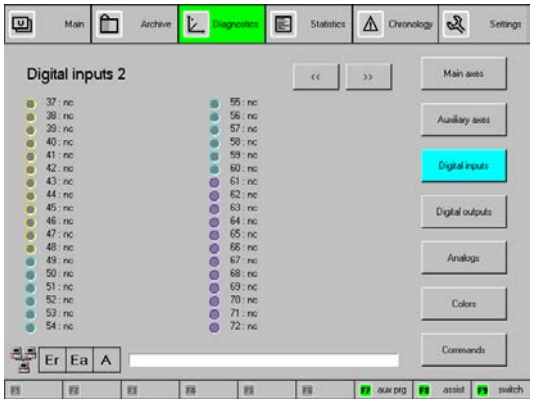


Figure 88
图 88

Press the **<<** and **>>** keys to view the next and previous page respectively.
点击 **<<** 和 **>>** 按键可以显示上一页和下一页

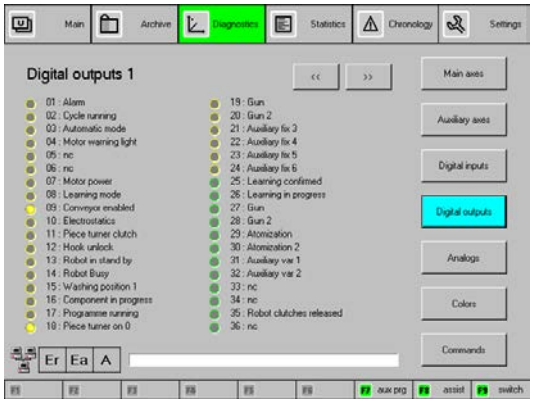


Figure 89
图 89

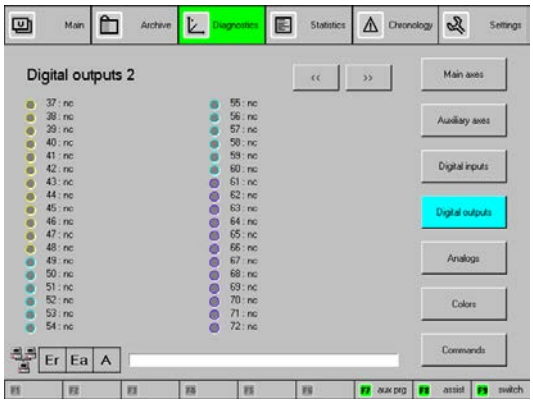


Figure 90
图 90

4.2.4 Analogue outputs (CAPV accessory) 模拟量输出（CAPV 附件）

CAPV accessory

Figure 91
图 91

In the event the Robot features the proportioning valves accessory, you can press the Analogs key on this menu to adjust their opening. The valves usually have the job of controlling pump pressure, atomization air and the gun fan.
You can select values in the range from 0 to 1000 units. Based on the fact that the valves' input pressure is usually 6 bar, one unit is equal to 0.006 bar.

若机器人配备了比例阀组件，可以点击菜单中的 Analogs 按键进行打开的调整。阀通常是用于控制泵压、雾化空气和扇形。可以在 0~1000 单位范围内进行设置，由于阀体的输入气压通常是 6bar，因此每一个单位表示 0.006bar。

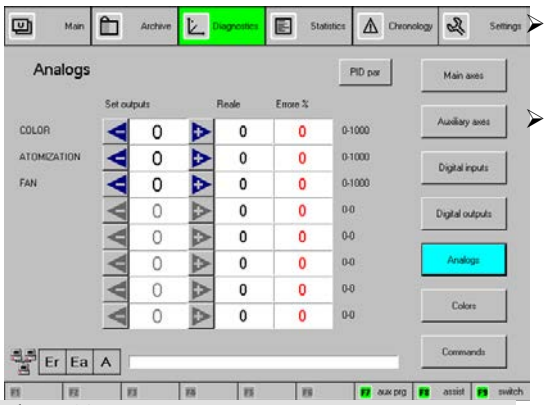


Figure 92
图 92

- Press the ◀ ▶ arrows to change the value or key in the value directly using the TochNum keypad that appears when you touch the **Set outputs** fields
- 点击 ◀ ▶箭头进行值的修改，或当点击 **Set outputs** 区域时将弹出 TochNum 键盘，使用键盘直接输入。

Instead of proceeding as described above, you can control the three proportioning valves as though they were brushes.
There are 8 available brushes and each brush is associated with a set of three values for the proportioning valves.

- You can change the brush inside a PATH component.
- In the case of point-to-point programs, you can change the brush at each program instruction.

You can choose the analogue output operating mode via the machine's configuration menu: once selected, it cannot be changed.

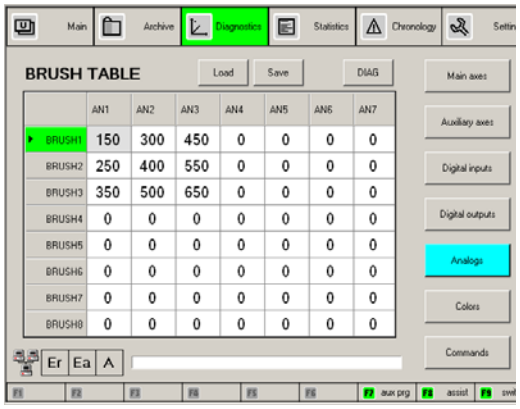


Figure 93
图 93

除了使用上述的方法进行修改外，还可以通过刷组进行三个比例阀的控制。可以有 8 个刷组，每一个刷组都可以对此三个比例阀进行输出值的独立设置。

- 可以修改路径组件中的刷组参数.
- 在点到点的程序中，可以在程序的每一个指令中进行刷组数值的修改

通过机器的配置菜单你可以选择模拟输出操作模式：一旦选定,就不能改变了

4.2.5 Colour change system (CCO accessory) 换色系统（CCO 组件）

CCO accessory

Figure 94
图 94

If the Robot has a colour change system, pressing the Colors key calls up a page for performing washing and loading the colour or desired pump manually

- To load a colour, press the button featuring the colour you want before starting a teaching procedure, and then press the **Loading** button.

如果机器人具有换色系统，点击 Colors 按键可以调用喷枪清洗和手动加载颜色或换泵

- 加载颜色的操作是：在开始示教前，选中需要喷涂的颜色，点击**加载**按键。

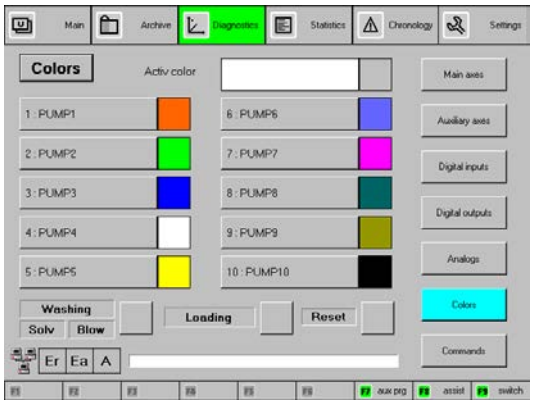


Figure 95
图 95

If the Robot's motors are on, with **Er** lit, the machine will move to the washing position and will start spraying the selected colour; whereas if the motors are off, the machine will spray the colour from wherever it is positioned at that given moment.

- To run a wash cycle, press the **Washing** key and a wash cycle will be carried out as described in greater detail in section 8.4.5.4 Wash Cycles.
- This pane features ten buttons for selecting the colour. You can select additional colours by touching the tenth button's colour field: this calls up the Colour selection window via which you can select a different colour and press **OK**.

如果机器人的电机伺服是打开的，**Er** 指示灯将点亮,机器人将运动至洗枪位置，然后开始进行选定颜色的喷射，如果电机的伺服是未打开，机器人将在给定的运动位置处进行颜色喷射。

- 为了运行清洗循环，点击 **Washing** 按键，清洗循环将会像 8.4.5.4节中描述的那样进行清洗
- 此菜单中有 10 个颜色选择按键，在按键的颜色区域点击，可以进行其他颜色的选择：将弹出一个 Colour selection 窗口，通过该窗口可以进行颜色的选择点击 **OK** 即可。

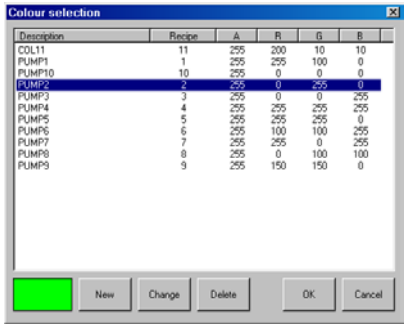
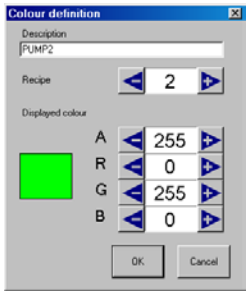


Figure 96
图 96

- Press the **Colors** button in the top left corner to create new colours: the Colour selection window is called up
- press **New** to create a new colour in the Colour definition window; **Change** to edit an existing colour; or **Delete** to delete it.

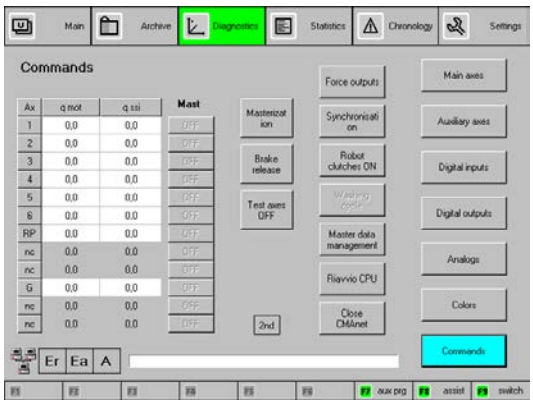
- 点击左上角的 **Colors** 按键可以创建一个新的颜色：将弹出一个 Colour selection 窗口。
- 在 Colour definition 窗口点击 **New** 按键可以创建一个新的颜色、点击 **Change** 按键编辑已存在的颜色或点击 **Delete** 按键删除该颜色。



You can create colours in the Colour selection window using classic ARGB code
可以在 Colour selection 窗口使用 ARGB 代码创建一个新的颜色

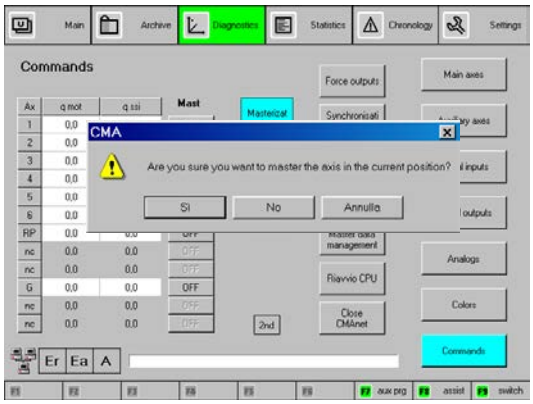
Figure 97
图 97

4.2.6 Commands 命令



Press the Commands key to call up the advanced commands page, which is password protected and gives you access to the machine's more advanced diagnostic functions.
点击命令按键，可以调用高级设置页面，此页面是进行密码保护的，可以进行设备的更多高级诊断功能的设置。

Figure 98
图 98



- Press the **Masterization** button to enable the individual axis zeroing commands. To zero the axis, press the **OFF** key to the right of the table to view the position. When prompted to confirm the command, answer **Yes** and, once you have confirmed, the position will be set to the value zero. Use this function when replacing one of the axis's position sensors.
- 点击 **Masterization** 按键可以对轴的清零操作进行使能。在轴清零前，点击表右侧的 **OFF** 按键可以查看位置。当确定要清零操作时，点击 **OFF** 按键，一旦点击该按键后机器人的位置值将被清零。在更换电机的编码器时，需使用该功能。

Figure 99
图 99

- Press the **Brake release** button to enable the motor brake release commands. Press the **OFF** button to the right of the table corresponding to the selected button
- 点击 **Brake release** 按键可以松开电机的抱闸，然后点击表中右侧对 应的 **OFF** 按键。

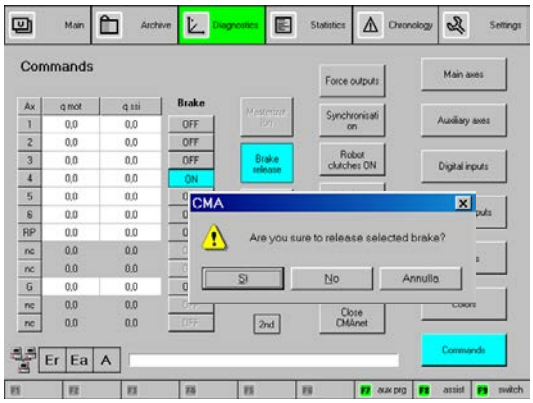


Figure 2200
图 101

Before pressing the brake release button for axes 2 and 3, make sure the axis is resting on a support and will not fall under its own weight.
在松开机器人的 2、3 轴抱闸前请务必确认该轴已有支撑，以防机器人在重力作用下下落造成伤害！！！

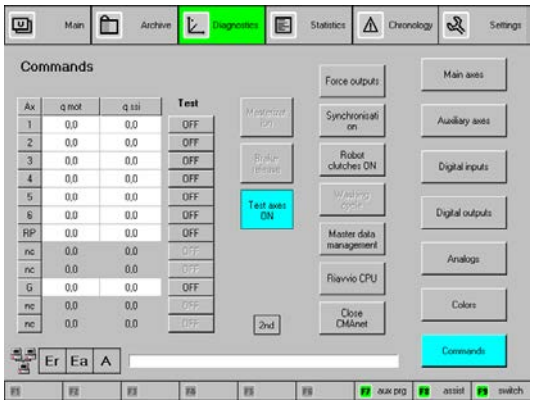


Figure 2302
图 102

- Press the **Test axes ON** button to enable the individual axis switch-on mode for the set of drives.
- Select the desired axis by pressing the **OFF** key to the right of the table
- Switch on the motors by pressing the **POWER ON** key on the Control panel and press the pendant's enable (hold-to-run) button. The **Er** indicator lights. This mode allows you to isolate an individual axis to locate possible problems.

- 点击 **Test axes ON** 按键可以对选中轴的伺服驱动使能
- 选中相应的轴点击表中右侧的 **OFF** 按键
- 点击电控柜中 **POWER ON** 按键并按下示教盒中的使能（暂停-运行）按键即可对电机上伺服，此时指示灯 **Er** 将被点亮。此模式是用于独立操作单独的轴，以便于查找可能的问题。

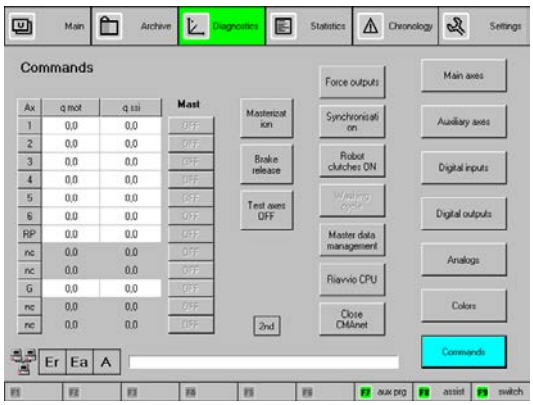


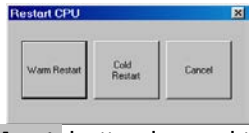
Figure 103
图 103

- Press the **Force outputs** button to call up the Force outputs window via which you can press the relevant OFF key to check whether a certain Robot control output is working.
- The **Robot clutches ON** button is used to force the clutches to release and hence disengage motors 1, 2 and 3 from their respective Robot axes (models GR630 and GR650only).

- 点击 **Force outputs** 按键可以弹出 Force outputs 窗口，通过该窗口，点击相应的 OFF 按键测试机器人控制输出的是否正常。
- **Robot clutches ON** 按键是用于强制松开 1、2、3 轴的离合器，使电机与机器人轴之间脱离。 (只针对 GR630 和 GR650 型号).

Figure 104
图 104

- Restart CPU



- The **Close CMAnet** button is used to exit the application. The Force outputs window for forcing outputs is shown on the left.

- 按键是用于重启 CPU

- **Close CMAnet** 按键用于退出应用
- 左边显示的强制窗口是用于输出的强制

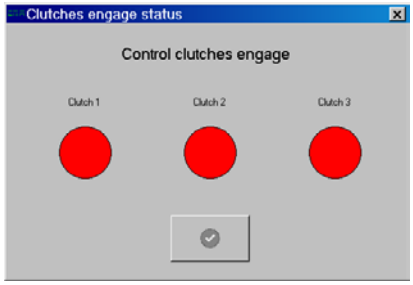


Figure 105
图 105

Pressing the **Synchronisation** button calls up the Clutches engage status window showing clutch engagement status with the motor of the Robot's main axes (models GR630 and GR650 only). The Robot's axes are pushed manually to synchronize the motor position and position sensor position. Once synchronization is complete, all the circles turn green.

- 点击 **Synchronisation** 按键将弹出 Clutches engage status 窗口，将显示电机与机器人的离合器啮合状态(只针对 GR630 和 GR650 型号)。需要用手推动关节以将电机位置与传感器位置相同步，一旦完成同步，所有的圆将变绿。

Figure 106
图 106

- The **Master data management** button is used to manage the Robot's master data. Every time a Zeroing operation is performed, as described above, the master data file is updated. Where needed, this file can be transferred to the PLC (**FILE → PLC** key), imported from an external storage device (**Import** key) or saved to an external storage device (**Export** key).

- **Master data management** 按键是用于操作机器人的零位数据，每一次对如上所述机器人进行零点标定操作后，该数据将被更新，若有需要，可以将此文件传至 PLC（**FILE → PLC** 按键)，或从外部设备导入（**Import** 按键），或保存至其他的外部设备(**Export** 按键)。

4.3 Statistics 统计

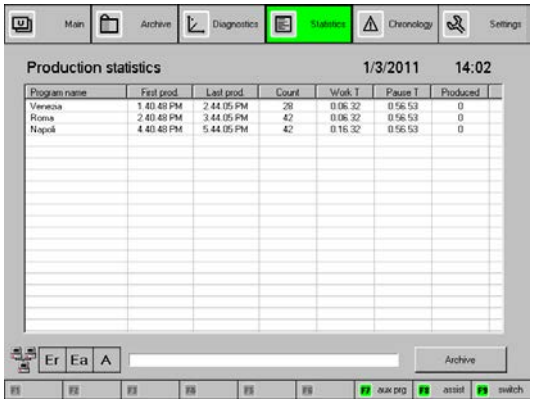


Figure 2407
图 107

Pressing the key calls up the statistics menu featuring a table giving the following information:
点击 按键可以弹出统计菜单，菜单的图表中将显示如下的信息：

Program name	=	Name of the program
Program name	=	程序名
First prod.	=	Production start time
First prod	=	生产开始时间
Last prod.	=	Production end time
Last prod	=	生产结束时间
Count	=	Number of parts processed
Count	=	处理完成的工件数
Work T	=	Work time (number of parts x work cycle length)
Work T	=	工作时间 (工件数 x 每次工作循环时长)
Pause T	=	Pause time (Time elapsed between production start and end – Work time)
Pause T	=	暂停时间(从生产启动到生产停止的时间 – 工作时间)
Product	=	Amount of product (paint) used (optional)
Product	=	总的产量 (喷涂) (选用 l)

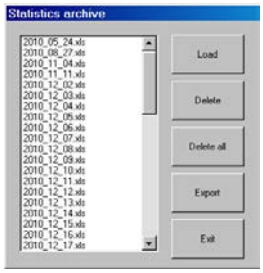


Figure 108
图 108

- Pressing the **Archive** key calls up the Statistics archive dialogue box listing the previous days' statistics.
- Press **Load** to load a previous statistics file

- 点击 **Archive** 按键弹出 Statistics archive 对话框，将显示以前的统计信息。
- 点击 **Load** 加载以前的统计文件。

4.4 Log

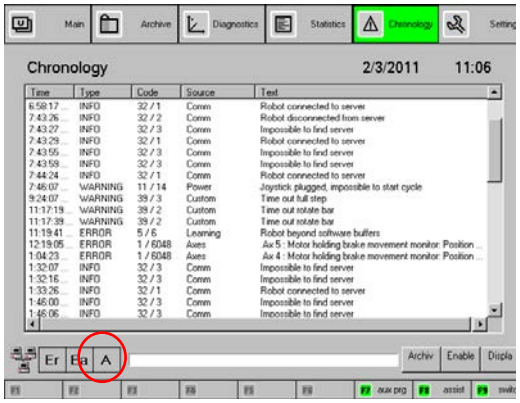


Figure 109
图 109

Pressing the ⚠ key calls up the log menu featuring a table containing a list of events that have occurred. Events are split into three types:

INFO information
WARNING message advising caution (A indicator on yellow background); operation in progress is not stopped.
ERROR error message (A indicator on red background); operation in progress is stopped.

The table features the following information:

Time = Time the event occurred.
Type = Type of event (INFO, WARNING, ERROR).
Code = Event's numerical ID code.
Source = Source of event

- Press the A box to reset the current event

点击 ⚠ 按键将弹出日志菜单，在日志菜单中图表将包含发生的一系列事件。事件分为以下三类：

信息 信息
警告 建议注意的消息 (A 指示灯将被显示黄底，不会将进程中的操作停止。
故障 错误信息 (A 指示灯将被显示红底，操作将会停止。

同时图表中还将显示如下的信息：

时间 = 事件发生的时间
类型 = 事件类型 (信息，警告，故障)
故障代码 = 事件的数字 ID 号
故障源 = 事件的源头

- 点击 A 按键可以将当前结果复位

4.4.1 Axis messages (code 01) 轴消息（代码 01）

40	A	*Value of parameter higher than maximum value*	The parameter you are trying to set is higher than the maximum limit	This error can only occur during axis parameter setup
54	A	*Value of parameter lower than maximum value*	The parameter you are trying to set is lower than the minimum limit	This error can only occur during axis parameter setup
1002	A	*Parameter Outside the valid range*	The parameter has not been accepted	This error can only occur during axis parameter setup
1003	A	*Parameter cannot be written while loop control is active*	The parameter has not been accepted	Switch off the Robot's motors before saving new parameters
Table 8: Axis error messages				

40	A	*当前值比最大值大*	你设置的参数值比最大限制值大	这个故障只会在轴参数设置中出现
54	A	*当前值比最小值小*	你设置的参数值比最小限制值小	这个故障只会在轴参数设置中出现
1002	A	*参数超出有效值范围*	该参数不会被接收	这个故障只会在轴参数设置中出现
1003	A	*控制环激活状态下无法写该参数*	该参数不会被接收	在保存参数前将电机使能关闭
表 8: 轴故障信息				

Other errors identified with code 01 concerning possible axis hardware malfunctions are specified in more detail in the Electrical Unit Manual (Section 3).
其他有关轴硬件失灵的代码 01 故障请参阅电气手册中 (第三节)。

4.4.2 Trajectory messages (code 02) 轨迹信息（代码 02）

01	A	Axis # maximum speed exceeded	The speed requested is higher than the top speed for axis #.	
02	A	Axis # maximum speed exceeded	The speed requested is more than 50% higher than the top speed for axis #.	Decrease execution speed
03		Maximum acceleration exceeded	Not used	
04	A	Robot outside Cartesian work area		Redo program, keeping inside the Cartesian work area
05	A	Robot outside axis range	A software limit is set for each axis and this limit has been exceeded	Redo program, keeping inside the axis range
Table 9: Trajectory error messages				

01	A	超出了轴#的最大速度	需要的速度比轴#的最大运行速度还大	
02	A	超出了轴#的最大速度	需要的速度比轴#的最大运行速度还大 50%	降低运行速度
03		超出了最大加速度	未使用	
04	A	机器人超出了笛卡尔工作区域		重新示教程序，保证机器人笛卡尔工作空间中运行
05	A	超出了机器人的轴运动范围	机器人的每一个轴设置了一个软限位，这个限位被超出了。	重新示教程序，保证机器人笛卡尔工作空间中运行
表 9:轨迹故障信息				

4.4.3 Model messages (code 03) 模型信息（代码 03）

01	A	Entry position error	The gun's maximum traversing speed (X,Y,Z) has been exceeded	In the case of PATH programs, decrease execution speed.
02	A	Entry orientation error	The gun's maximum rotation speed (A,B,C) has been exceeded	In the case of PATH programs, decrease execution speed.
03	A	Exit position error	Error due to Robot singularity	Change the Robot's path
04	A	Exit orientation error	Error due to Robot singularity	Change the Robot's path
05	A	Determinant below threshold	Error due to Robot singularity	Change the Robot's path
06	A	Model not initialized	Not used	

Table 10: Model messages

01	A	进入位置错误	超出了喷枪的(X,Y,Z)最大运行速度	对于路径程序，减小运行的速度
02	A	进入姿态错误	超出了喷枪的姿态(X,Y,Z)最大运行速度	对于路径程序，减小运行的速度
03	A	退出位置错误	机器人奇异	修改机器人的路径
04	A	退出姿态错误	机器人奇异	修改机器人的路径
05	A	行列式的值小于阈值	机器人奇异	修改机器人的路径
06	A	模型为初始化	未使用	

表 10: 模型信息

4.4.4 Transfer messages (code 04) 传输信息（代码 04）

01	A	Component header empty	Program file corrupted	Delete the program and redo it
02	A	Ptp program empty	Program file corrupted	Delete the program and redo it
03	A	Path program empty	Program file corrupted	Delete the program and redo it
04	A	Component header transfer timeout	Communication error between Ethernet and PLC	Call customer support
05	A	Path block transfer timeout	Communication error between Ethernet and PLC	Call customer support
06	A	Ptp block transfer timeout	Communication error between Ethernet and PLC	Call customer support

Table 11: Transfer messages

01	A	组件头文件为空	程序文件损坏	删除程序重新示教
02	A	PTP 程序为空	程序文件损坏	删除程序重新示教
03	A	路径 程序为空	程序文件损坏	删除程序重新示教
04	A	组件的头文件传输超时	以太网与 PLC 通讯故障	启用客户远程支持系统
05	A	路径块传输超时	以太网与 PLC 通讯故障	启用客户远程支持系统
06	A	PTP 块传输超时	以太网与 PLC 通讯故障	启用客户远程支持系统

表 11: 传输信息

4.4.5 Teaching messages (code 05) 示教信息（代码 05）

01	A	Transfer buffer empty	Communication error between Ethernet and PLC	Call customer support
02	A	Indexing not consistent	Communication error between Ethernet and PLC	Call customer support
03	A	Conveyor not active	No part present in working space	See sections 8.2.4.3 PATH program teaching with conveyor moving and 8.2.4.4 PATH program teaching with conveyor stationary (LTR option)
04	A	Tracking with conveyor stationary	The conveyor has stopped during teaching of a program with conveyor in non-stationary mode	See section 8.2.4.3 PATH program teaching with conveyor moving
05	A	Line tracking with conveyor moving	The conveyor has moved during teaching of a program with conveyor in stationary mode	See section 8.2.4.4 PATH program teaching with conveyor stationary (LTR option)
06	A	Robot outside software limits	You are teaching trajectories outside the machine's software limits	Keep within limits
07	A	Carousel not in position	The carousel is not in the correct position	Rotate the carousel one turn

08	A	Rotate-piece device not powered	The motors must be switched on in order to use the rotate-piece device	Switch on the motors
Table 12: Teaching messages				

01	A	传输缓冲区为空	以太网与 PLC 通讯故障	启用客户远程支持系统
02	A	索引不一致	以太网与 PLC 通讯故障	启用客户远程支持系统
03	A	输送链未激活	工作区域内无工件	参阅 8.2.4 节中的输送链运行时的轨迹编程与 82.4.4 节中输送链静止的轨迹编程（LTR 选项）
04	A	跟踪时输送链静止	在输送链非静止模式中示教程序时，输送链停止	参阅 8.2.4.3 节中的输送链运动中的路径示教
05	A	直线跟踪时输送链运行	在输送链禁止模式下示教时出现了输送链运行的情况	参阅 8.2.4.4 节中输送链静止时的路径示教（LTR 选项）
06	A	机器人超出软限位	正在示教的轨迹超出了设备的软限位	保持在限位以内
07	A	转盘不在正确的位置	转盘不在正确的位置	将转盘旋转一个转位
08	A	旋转设备未上使能	为了使用旋转设备必须将电机使能	打开电机使能
表 12: 示教信息				

4.4.6 PTP messages (code 06) PTP 信息（代码 06）

01	A	Instruction transfer	Unexpected instruction during programming	Check the PTP program
02	A	Instruction compilation	Unexpected instruction during compilation	Check the PTP program
03	A	Instruction execution	Unexpected instruction during execution	Check the PTP program
04		Invalid joint instruction parameters	Not used	
05		Invalid line instruction parameters	Not used	
06	A	Invalid circ instruction parameters		Make sure there are no coinciding or aligned points
07	A	Invalid plane instruction parameters		Make sure there are no coinciding or aligned points
08	A	Plane cannot be executed backwards	The F3 **Step –** key cannot be used during the program test stage to test a PLANE instruction	
09	A	WAIT INPUT instruction timeout	The maximum set time has elapsed without the expected input being received	Check the expected input
10	A	Traversing axis speed too high	The C INT function cannot be used	Disable the C INT function
Table 13: PTP messages				

01	A	指令传输	编程中出现了未知指令	检查 PTP 程序
02	A	指令编辑	编辑中出现了未知指令	检查 PTP 程序
03	A	指令执行	执行中出现了未知指令	检查 PTP 程序
04		无效的关节指令参数	未使用	
05		无效的指令参数	未使用	
06	A	无效的圆弧指令参数		确保点不重合或共线
07	A	无效的平面指令参数		确保点不重合或共线
08	A	平面指令不能向后执行	F3 **Step –**指令不能用于测试阶段的平面指令	
09	A	等待输入指令超时	输入信号超出最大设定指令时间后还没有到来	检查输入信号
10	A	行走轴速度过高	C 初始函数不能被使用	不启用 C 初始功能
表 13: PTP 信息				

4.4.7 Automatic mode messages (code 07) 自动模式信息（代码 07）

01	A	Components number	Program designed for conveyor in non-stationary mode with more than one component	Redo program, see section 8.2.4.3 PATH program teaching with conveyor moving
02	A	Cycle start request with robot not powered		Switch on the motors
03		Robot paused	Not used	
04		Robot end	Not used	

05	A	Memory buffer full, cannot run program		Call customer support
06	A	Stop Cycle input triggered		Check input operation
07	A	Conveyor mode error	The program being run is not compatible with the conveyor operating mode	Change the conveyor's operating mode
08	A	Rotate-piece not synchronized with any hook	In the event of a conveyor in step mode with no hook lock-release, it means there is no hook in front of the Robot	Run on one step
09	A	Positioning outside software limits	The program's first point is outside the set software limits	Redo the program
10	A	Offline licence not found	You are trying to run a program generated by the CMAOfflinePainting software without the dongle	Insert the dongle in the PLC

Table14: Automatic mode messages

01	A	组件号	输送链非静止模式的程序多于一个组件	重新示教程序，参阅 8.2.4.3 节中的输送链运动中的路径编程。
02	A	Cycle start request with robot not powered 循环启动中机器人未上电		打开电机使能
03		机器人暂停	未使用	
04		机器人结束	未使用	
05	A	存储缓存已满，不能运行程序		启用远程客户支持系统
06	A	停止循环输入激活		检查输入操作
07	A	输送链模式错误	程序运行模式与输送链操作模式不匹配	修改输送链的操作模式
08	A	旋转设备与挂钩不同步	在输送链单步模式中，挂钩未松开，也就是说机器人前面无挂钩	在一个模式运行
09	A	位置超出软限位	程序的第一点已超出软限位	重新示教程序
10	A	离线仿真序列号未找到	未经授权，试图运行一个由离线仿真软件生成的程序，	在 PLC 中插入授权

表 14: 自动模式信息

4.4.8 Conveyor messages (code 08) 输送链信息（代码 08）

01	A	Negative speed	The conveyor is going backwards	Make sure the conveyor is actually going forwards
02		Maximum speed exceeded	Not used	Decrease conveyor speed
03	A	Missed start	Start request while the Robot is still carrying out a painting program	Decrease conveyor speed
04	A	Work behind	In Line Tracking mode, conveyor speed is too high; the Robot is getting behind with parts entering the booth	Decrease conveyor speed
05	A	Roller distance less than start distance	Parameter setting error	Warning during machine installation, parameters set incorrectly or part roller not suitable for conveyor
06	A	Chain pitch less than roller length	Work cannot be performed with a rotate-piece device that is longer than the conveyor pitch	Warning during machine installation, parameters set incorrectly or part roller not suitable for conveyor
07	A	Hook missed by roller		Warning during machine installation, parameters set incorrectly or part roller not suitable for conveyor
08	A	Hook outside roller, rotate-piece movement not allowed	There is no hook in front of the part roller	Move the hook in front of the part roller

Table 15: Conveyor messages

01	A	负速度	输送链往回运行	确保输送链是向前运行
02		超出最大速度	未使用	降低输送链速度
03	A	错过工件	开始请求，机器人仍然在运行喷涂程序在	降低输送链速度
04	A	无法跟上工件	在直线跟踪模式中，输送链速度太快，工件进入喷房时机器人在工件后面。	降低输送链速度
05	A	滚转机距离小于开始距离	参数设置错误	设备安装中的警告，参数设置不合理或工件滚转机与输送链不匹配
06	A	链节距小于滚子长度	滚子长度不能比链节距长	设备安装中的警告，参数设置不合理或工件滚转机与输送链不匹配

07	A	滚转机错过了挂钩		设备安装中的警告，参数设置不合理或工件滚转机与输送链不匹配
08	A	挂钩超出了滚转机，运动不被允许	滚转机前无挂钩	将挂钩运动至滚转机前
表 15: 输送链信息				

4.4.9 Parameter messages (code 09) 参数信息（代码 09）

01	A	Parameter download with motors at full torque		Switch off the motors before saving the parameters
Table 16: Parameter messages				

01	A	在电机工作时进行了参数下载		保存参数前将电机伺服关闭
表 16: 参数信息				

4.4.10 Allocation messages (code 10) 配置信息（代码 10）

01		Component header	Not used	
02		Path component	Not used	
03		Ptp component	Not used	
04		Conveyor	Not used	
Table17: Allocation messages				

01		组件头	未使用	
02		路径组件	未使用	
03		PTP 组件	未使用	
04		输送链	未使用	
表 17:配置信息				

4.4.11 Power messages (code 11) 动力消息（代码 11）

01	A	Robot not getting air	No compressed air supply to Robot	Check compressed air supply
02	A	No power to inputs		See electrical cabinet manual
03	A	Thermal cutouts tripped		See electrical cabinet manual
04	A	Proportioning valves not getting air	No compressed air supply to CAPV accessory	Check compressed air supply
05	A	Axes master data not set, cannot power up	The axis zeroing procedure must be carried out first.	Call customer support
06	A	Axes not zeroed, cannot power up	Position transducer reading problem	Call customer support
07	A	Axes not synchronized, cannot power up	Axis synchronization required following teaching has not been performed	Perform synchronization as described in section 8.4.2.6 Commands
08	A	Error powering up axis	Problem on axis drive	Call customer support
09	A	Cabinet temperature over limit	The temperature inside the cabinet has exceeded the maximum temperature of 40°C	Check that the forced ventilation, or air conditioning if fitted, is working properly
10	A	No booth ventilation	If the booth ventilation presence detection input is configured, lack of ventilation will trigger the alarm and disable the spray gun	Switch on ventilation in the spray booth
11	A	Auxiliary axes movement inhibited	Movement of the Rotate-piece device is inhibited	On ST versions featuring the rotate-piece device, check the hook release sensor
12	A	Robot powered timeout with axes stopped	The motors have been switched off due to the Robot being idle for too long	
13	A	Robot I/O not getting power	Auxiliary 24V power supply not reaching Robot	Call customer support
14	A	Joystick connected, cannot start cycle	The programming stick is connected to the base of the Robot	Disconnect the stick
15	A	Axis # overcurrent timeout	The rated current of the motor of axis # has been supplied for too long	Check for mechanical obstacles, such as the gun's hoses or covers
16	A	Limit switch tripped	On C versions, the limit switches located at the ends of the Robot's traversing axis have tripped	Proceed as described in section 8.4.2.2 Auxiliary axes

Table 18: Power messages				
01	A	机器人没有压缩空气	未给机器人提供压缩空气	检查压缩空气供给
02	A	输入无动力		参考电器柜手册
03	A	热保险熔断		参考电器柜手册
04	A	比例阀无空气	CAPV 附件无压缩空气	检查压缩空气供给
05	A	轴无零参考点数据，无法上伺服	第一次使用该轴时必须进行标零点	启用远程客户支持系统
06	A	轴未正常回零，无法上伺服	位置传感器读取错误	启用远程客户支持系统
07	A	轴未同步，无法上伺服	示教后未进行轴的同步工作	参考 8.4.2.6 节中的同步指令
08	A	轴上伺服错误	轴驱动器问题	启用远程客户支持系统
09	A	控制柜过温	控制柜中的温度超出了最大允许的 40°C	检查通风设备或空调（如果安装了）是否正常工作
10	A	无喷房通风设备	如果已进行了喷房通风设备的检测输入配置，若缺少该通风设备将触发报警并且无法进行喷涂	打开喷房中的通风设备
11	A	辅助轴的运动被禁止	转台设备的运动被禁止	在 ST 版本的机器人中配备了转台设备，检查挂钩的打开传感器
12	A	机器人长时间未运行，机器人伺服断电	机器人长时间不工作，电机的伺服断电（节能）	
13	A	机器人 I/O 未供电	辅助的 24V 电源达不到机器人需求	启用远程客户支持系统
14	A	摇杆连接在机器人上，无法开始循环启动	编程摇杆连接在机器人底座上，不能进行生产循环	接触编程摇杆
15	A	轴 # 长时间过流	轴#长时间处于额定电流工作状态	检查机械的故障，例如喷枪的软管
16	A	触发软限位	在 C 型号中，机器人的辅助轴限位开关被触发	8.4.2.2 节中的辅助轴描述进行操作
表 18: 动力信息				

4.4.1 PID controller messages (code 12) PID 控制器信息（代码 12）

01	A	Maximum percentage error exceeded	The PID controller associated with the analogue output is unable to hold the set value	Call customer support
Table 19: PID controller messages				

01	A	超出了最大的误差百分比	模拟量输出的 PID 控制器无法跟踪设定值	启用远程客户支持系统
表 19: PID 控制器信息				

4.4.12 Hardware messages (code 13) 硬件信息（代码 13）

01	A	Cannot find internal I/O module	I/O modules inside electrical cabinet are malfunctioning	Call customer support
02	A	Cannot find encoder I/O module	The module for synchronization with the conveyor is malfunctioning	Call customer support
03	A	Cannot find Robot I/O module	Robot internal I/O module is malfunctioning	Call customer support
04	A	Cannot find proportioning valve I/O module	The proportioning valve accessory (CAPV) I/O module is malfunctioning	Call customer support
05	A	CPU battery low		Replace CPU battery, see Electrical cabinet manual
06	A	Cannot find colour change I/O modules	The colour change system accessory (CCO) I/O module is malfunctioning	Call customer support
07	A	Cannot find scanner I/O modules	The scanner I/O module is malfunctioning (systems with AWPS only)	Call customer support
Table 20: Hardware messages				

01	A	无法找到内部 IO 模块	控制柜中的内部 I/O 模块失效	启用远程客户支持系统
02	A	无法找到编码器 I/O 模块	输送链的同步模块失效	启用远程客户支持系统
03	A	无法找到机器人的 I/O 模块	机器人内部的 I/O 模块失效	启用远程客户支持系统
04	A	无法找到比例阀 I/O 模块	比例阀附件(CAPV)的 I/O 模块失效	启用远程客户支持系统
05	A	CPU 电源过低		更换 CPU 的电池，参考电气柜手册
06	A	无法找到换色系统的 I/O 模块	换色系统的 I/O 失效	启用远程客户支持系统

07	A	无法找到扫描设备的 I/O 模块	扫描设备的 I/O 模块失效（只针对 AWPS ）	启用远程客户支持系统
表 20:硬件信息				

4.4.13 SSI messages (code 14) SSI 信息（代码 14）

01	A A	Encoder and resolver not synchronized	On models GR630 and GR650, the position indicated by the axis position transducers (Encoder) does not match that indicated by the Motors' resolver. Alarm when motors are switched on, warning message when motors are switched off.	Follow the synchronization procedure described in section 8.4.2.6 Commands to engage the main axes with the corresponding motors
Table 21: SSI messages				

01	A A	编码器与旋转变压器不同步	在 GR630 与 GR650 型机器人中，轴的编码器数值与电机的旋转变压器不匹配，机器人上伺服时将产生故障，不上伺服时将产生警告	参考 8.4.2.6 节中描述的主轴与电机命令将其进行同步
表 21: SSI 信息				

4.4.14 Jog messages (code 15) 点动信息（代码 15）

01	A	Limit reached	The message appears during manual movements when you reach the axis's software limit	
Table 22: Jog messages				

01	A	到达限位	当手动模式下操作时，轴到达限位将产生此警告	
表 22: 点动信息				

4.4.15 Deadman messages (code 16) 手压按下信息（代码 16）

01	A	Deadman pressed		Information purpose only
02	A	Deadman released		Information purpose only
Table 23: Deadman messages				

01	A	手压按下		仅仅是提示信息
02	A	手压松开		仅仅是提示信息
表 23: 手压信息				

4.4.16 EnDat auxiliary axes messages (code 17) EnDat 辅助轴信息（代码 17）

01	A	Axis moved with Robot off, check	On G versions, the carousel has been turned more than one turn with the electrical cabinet switched off	Check the position displayed: if it is not consistent, re-zero the carousel once you have positioned it correctly.
Table 24: EnDat auxiliary axes messages				

01	A	机器人未使能运动了该轴,检查	在 G 型号中，在电控柜未使能情况下，转盘旋转超出一个转位	检查位置显示，如果不一致，在定位正确后对该转盘重新清零
表 24: EnDat 辅助轴信息				

4.4.17 Wash Cycle messages (code 18) 喷枪清洗信息（代码 18）

01	A	Wash cycle not enabled	A request has been received to run a disabled wash cycle.	Enable the wash cycle. See wash cycle settings in section 8.4.5.4 Wash Cycles
02	A	Wash request with robot not powered	A request has been received to run a wash cycle while the motors are switched off	Switch on the motors
03	A	Wash request with robot in automatic mode		Set the Robot to Automatic mode

04	A	Wash cycle already active	A request has been received to run a wash cycle while the Robot is already running a wash cycle.	
05	A	Error loading the wash program	Ethernet communication error	Call customer support
06		Robot has not reached washing position	Not used	

Table 25: Wash Cycle messages

01	A	洗枪循环未使能	在喷枪清洗未使能的情况下，收到了一个清洗请求	使能洗枪循环，参阅 8.4.54 节中描述的清洗进行设置
02	A	机器人未使能，收到清洗请求	电机未使能时，收到了一个清洗请求	电机使能
03	A	自动模式下发送清洗请求		参考机器人自动模式
04	A	清洗循环已激活	机器人在清洗循环时，又接到一个清洗请求	
05	A	加载清洗程序错误	以太网通讯错误	启用远程客户支持系统
06		机器人未到达清洗位置	未使用	

表 25: 清洗循环信息

4.4.18 Rotate-Piece Device messages (code 21) 转台设备信息（代码 21）

01	A	Rotate-piece positioning timeout	The axis is unable to perform positioning within the set range.	Check for mechanical obstacles
02	A	Rotate-piece not set to zero	The axis is unable to perform zero positioning within the set range.	Check for mechanical obstacles
03	A	Rotate-piece locking timeout	On version GR630 G, the rotate-piece device locking-release pneumatic cylinder movement has not been performed within the set time.	Check the compressed air supply and make sure input 32 is working properly
04	A	Rotate-piece release timeout	On version GR630 G, the rotate-piece device locking-release pneumatic cylinder movement has not been performed within the set time.	Check the compressed air supply and make sure input 33 is working properly
05	A	Hook locking timeout	On ST versions with part roller featuring a conveyor hook release system, the hook locking-release cylinder movement has not been performed within the set time.	Check the compressed air supply and make sure input 23 is working properly
06	A	Hook release timeout	On ST versions with part roller featuring a conveyor hook release system, the hook locking-release cylinder movement has not been performed within the set time.	Check the compressed air supply and make sure input 24 is working properly

Table 26: Rotate-Piece Device messages

01	A	转台设备重定位超时	在设定时间内，该轴无法进行重定位	检查是否存在机械障碍
02	A	转台设备未回零	在设定时间内，该轴无法进行回零点	检查是否存在机械障碍
03	A	转台设备锁定超时	在 GR630 G 型机器人中，旋转设备锁定-松开气缸在给定时间内没有完成动作	检查压缩空气的供应及 32 号输入信号工作正常
04	A	转台设备松开超时	在 GR630 G 型机器人中，旋转设备锁定-松开气缸在给定时间内没有完成动作	检查压缩空气的供应及 33 号输入信号工作正常
05	A	挂钩锁定超时	在 ST 型号中，若配备了输送链挂钩系统，挂钩的锁定-松开气缸在规定时间内未完成动作	检查压缩空气的供应及 23 号输入信号工作正常
06	A	挂钩松开超时	在 ST 型号中，若配备了输送链挂钩系统，挂钩的锁定-松开气缸在规定时间内未完成动作	检查压缩空气的供应及 24 号输入信号工作正常

表 26: 转台设备信息

4.4.19 Carousel messages (code 20) 转盘信息（代码 20）

01	A	Carousel positioning timeout	The axis is unable to perform positioning within the set range	Check for mechanical obstacles
02		Carousel not set to zero	Not used	
03	A	Carousel not in position	The carousel is not in the position required by the selected mode	Rotate the carousel one turn
04	A	Carousel inhibited by input	The enabling input is off	Make sure input 18 is working properly

05	A	Carousel inhibited by Joystick being fitted		Remove the programming stick from the base of the Robot.
06		Carousel arm opening timeout	Not used	
07		Carousel arm closing timeout	Not used	
08		Rotate-piece jammed, cannot open carousel arm	Not used	
09		Rotate-piece not in position, cannot turn carousel	Not used	
10	A	Carousel not in position after zeroing	Carousel axis encoder reading error	Call customer support
Table 27: Carousel messages				

01	A	转盘重定位超时	在设定时间内，该轴无法进行重定位	检查是否存在机械障碍
02		转盘未设置回零	未使用	
03	A	转盘位置错误	在选定模式中，转盘不在要求的位置	旋转转盘一个转位
04	A	转盘被输入抑制	使能输入无信号	确认 18 号输入工作正常
05	A	安装了编程摇杆，转盘被抑制		将机器人底座的编程摇杆移除
06		转盘臂打开超时	未使用	
07		转盘臂关闭超时	未使用	
08		转台卡住，无法打开转盘臂	未使用	
09		转台位置异常，无法旋转转盘	未使用	
10	A	转盘回零后位置不对	转盘轴编码器读取异常	启用远程客户支持系统
表 27: 转盘信息				

4.4.20 Drag messages (code 23) 拖拽信息（代码 23）

01		Drag gripper timeout	Not used	
Table 28: Drag messages				

01		拖拽抓手超时	未使用	
表 28: 拖拽信息				

4.4.21 Shuttle messages (code 24) 输送机信息（代码 24）

01		Shuttle not in position	Not used	
02		Shuttle in position timeout	Not used	
03		Shuttle inhibited by input	Not used	
Table 29: Shuttle messages				

01		输送机位置异常	未使用	
02		输送机定位异常	未使用	
03		输送机被输入信号移植	未使用	
表 29: 输送机信息				

4.4.22 Ethernet Communication messages (code 32)以太网通讯信息（代码 32）

01		Robot connected to server	Information on connection status with a program management terminal, if any	
02		Robot disconnected from server	Information on connection status with a program management terminal, if any	
03		Cannot find server	Information on connection status with a program management terminal, if any	
04		Cannot connect to server	Information on connection status with a program management terminal, if any	
05		Addition not allowed during teaching	The program cannot be added to the list while the Robot is in teaching mode	

06		No such program	The program you want to add is not found in the Robot's files	
07		Program added	The program has been added correctly to the program execution list	
08		Error adding program		
09	A	Checksum error	Ethernet communication error	Call customer support
10		New string for list auto add	Information in program auto add to list mode	
Table 30: Ethernet messages				

01		机器人连接至服务器	如果存在的话，与程序管理终端的连接信息	
02		机器人与服务器断开	如果存在的话，与程序管理终端的连接信息	
03		无法找到服务器	如果存在的话，与程序管理终端的连接信息	
04		无法连接服务器	如果存在的话，与程序管理终端的连接信息	
05		示教时无法进行加入	在示教模式时，程序无法被加入至列表中	
06		无改程序	想要加载的程序在机器人文件夹中不存在	
07		程序被加入	程序已经被正确的加入至运行列表	
08		加载程序错误		
09	A	校验错误	以太网通讯错误	启用远程客户支持系统
10		自动加载时列表中的新字符	程序自动加载至列表的信息	
表 30:以太网信息				

4.4.23 Emergency messages (code 33) 急停信息（代码 33）

01		Robot in emergency mode		
02		Emergency cleared, reset		
Table 31: Emergency messages				

01		机器人处于急停模式		
02		急停已消除，请复位		
表 31: 急停信息				

4.4.24 Pendant messages (code 34) 示教盒信息（代码 34）

01		Enabled	Not used	
02		Disabled	Not used	
03		Cannot close CMAnet with motors at full torque		
Table 32: Pendant messages				

01		使能	未使用	
02		未使能	未使用	
03		在电机上伺服状态下，无法关闭 CMAnet		
表 32: 示教盒信息				

4.4.25 Server Download messages (code 35) 服务器下载信息（代码 35）

01		Pendant connected to download server	Information	
02	A	Error connecting to download server		Switch the electrical cabinet back on
03		Pendant disconnected from download server	Information	
Table33: Server Download messages				

01		示教盒与下载服务器已连接	信息	
02	A	与下载服务器已连接故障		重新将电柜断电、上电
03		示教盒与下载服务器已断开连接	信息	
表 33: 服务器下载信息				

4.5 Settings 设置

Pressing the key calls up the settings menu, which is, in turn, split into four submenus:
按下可以调出设置菜单，按顺序可以分为以下 4 个子菜单:

4.5.1 Gun (tool) coordinate system 枪（工具）坐标系

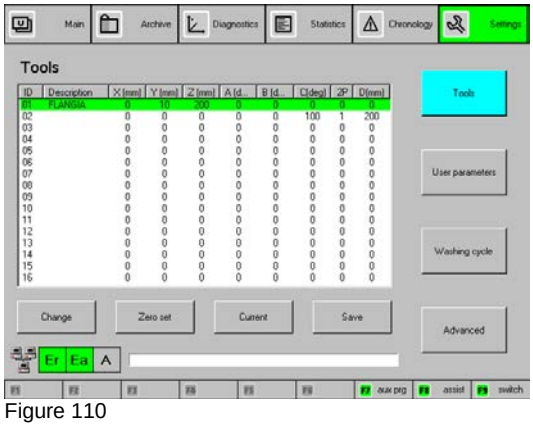


Figure 110
图 110

You can set up to 16 x,y,z coordinate systems referring to the gun mounted on the Robot. Also see section 8.3.1 Point-to-point programming foreword
The fields to be set are as follows:

可以为装在机器人上的喷枪设置多达 16 个 x,y,z 坐标系，可以参阅 8.3.1 点到点编程。
该内容分为以下几部分:

Description **描述**	description of secondary coordinate system 工具坐标系的描述
X(mm)	x offset value X 的偏移值
Y(mm)	y offset value Y 的偏移值
Z(mm)	z offset value Z 的偏移值
A(degrees)	value of rotation with respect to y-axis 相对于 Y 轴的旋转角度值
B(degrees)	value of rotation with respect to x-axis 相对于 X 轴的旋转角度值
C(degrees)	value of rotation with respect to z-axis 相对于 Z 轴的旋转角度值
2 Gun Mode	indicates the position of the fans of two guns set side by side, **None** indicates there is just one gun, **Align** indicates that the two guns have aligned fans, **Parallel** indicates that the two fans are parallel (see example 3)
2 Gun Distance	Distance between the nozzles of two guns (see example 3) 两个喷嘴之间的距离（参考示例 3）

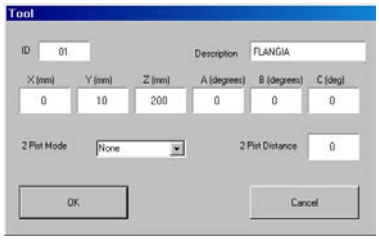
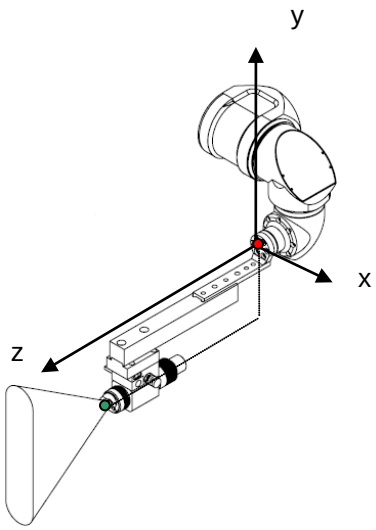


Figure 2511
图 111

- Press the **Change** key to edit the settings of the secondary coordinate system selected.The **Tool** dialogue box appears featuring the fields described above.
- Press **Zero set** to reset the coordinate system selected
- Press **Current** to use the coordinate system selected; the selected system will be stored in the program you are creating.
- Press **Save** to save the changes made

- 点击“修改”按钮可以对选择的工具进行编辑。同时将弹出上面描述的工具坐标系对话框。
- 点击清零可以实现对选择的坐标系进行清零功能。
- 点击当前可以将选定的坐标系用作当前工具坐标系，当创建程序时将储存此选中的坐标系。
- 点击保存可以对修改进行保存。

4.5.2 Sample gun (tool) coordinate system setup 喷枪（工具）坐标系的设置示例

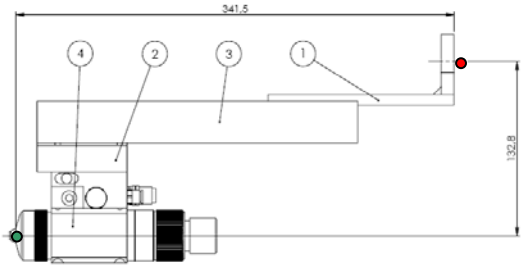


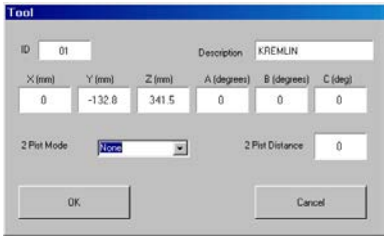
EXAMPLE 1:

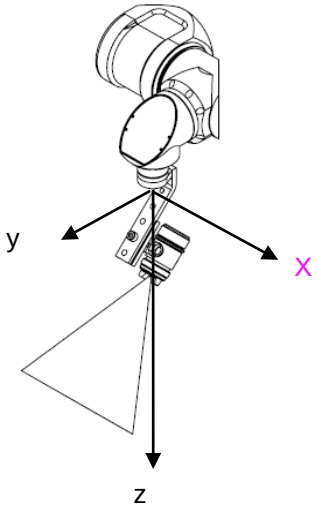
With gun mounted as illustrated on the left, set:
Y = - 132.8
Z = 341.5
Essentially, you need to describe numerically the path from the red dot to the green dot, which is the gun's nozzle.

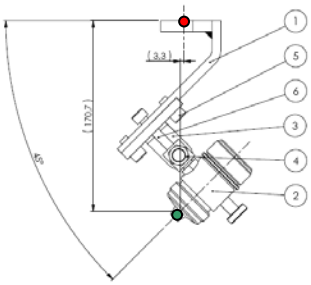
示例 1
当喷枪如左图中所示的安装时:
Y = - 132.8
Z = 341.5

本质上，需要描述红点到绿点（喷嘴）的数值距离



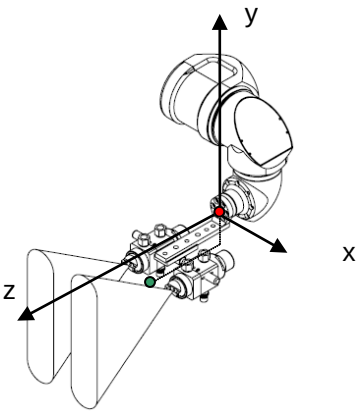


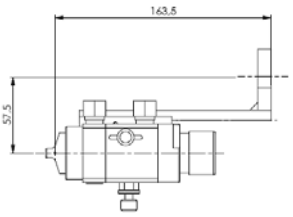




EXAMPLE 2:示例 2：
With gun mounted as illustrated on the left, set:
Z = 170.7
Y = 3.3
B = 45° (rotation with respect to x-axis)

当喷枪如左图中所示的安装时:
Z = 170.7
Y = 3.3
B = 45° (相对于 X 轴的旋转)





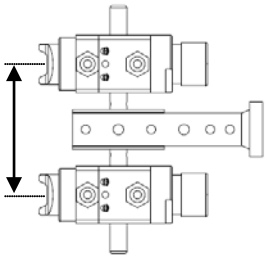
EXAMPLE 3:示例 3:

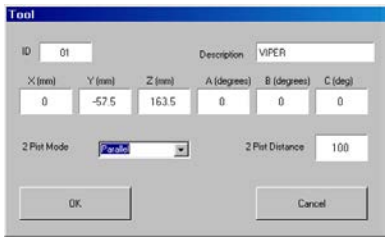
With two guns mounted as illustrated on the left, set:
Y = -57.5
Z = 163.5
2 Gun Mode = Parallel
2 Gun Distance = 100

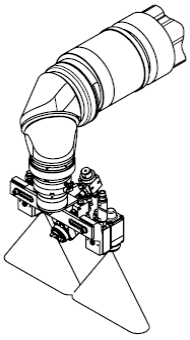
当喷枪如左图中所示的安装时:

Y = -57.5
Z = 163.5

2 Gun Mode = 平行
2 Gun Distance = 100







EXAMPLE 4:示例 4:

Guns with fan aligned, set **2 Gun mode** = Align
喷枪扇形对齐，设置 **2 Gun mode** =Align 对齐

4.5.3 User parameters 用户参数

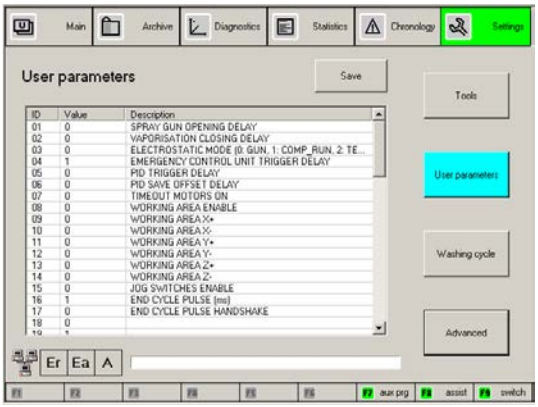


Figure 26112
图 112

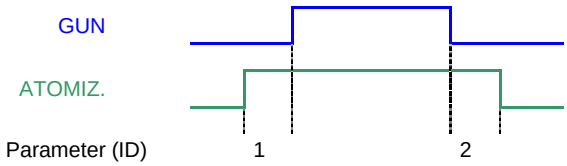


Figure 113
图 113

The following parameters can be edited by the user:
01 SPRAY GUN OPENING DELAY: gun needle opening delay with respect to atomization air. (marked in blue on the graph).
02 VAPORIZATION CLOSING DELAY: atomization air closing delay with respect to gun needle (marked in green on the graph).
03 ELECTROSTATIC MODE: operating mode of output controlling electrostatic generator, if any. Set to 0, the output works together with the gun control. Set to 1, the output stays on for the full duration of the program component. Set to 2, the output also comes on in teaching mode.
04 EMERGENCY CONTROL UNIT TRIGGER DELAY: For setting the time after which the emergency control unit cuts off power to the drives.
05 PID TRIGGER DELAY: PID controller alarm triggering delay.
06 PID SAVE OFFSET DELAY: Amount of space set aside in PLC memory for loading programs.
07 TIMEOUT MOTORS ON: Maximum time after which the motors switch off automatically if the Robot is still idle. (when set to 0, the function is disabled)
08 WORKING AREA ENABLE: Enabling of Robot work area limits control. The following parameters can be used to define a parallelepiped that the Robot is required to stay inside. If a program goes outside the set area, an alarm is generated and the Robot stops. (when set to 0, the function is disabled)
09 WORKING AREA X+: see parameter 08
10 WORKING AREA X-: see parameter 08

11 WORKING AREA Y+: see parameter 08
12 WORKING AREA Y-: see parameter 08
13 WORKING AREA Z+: see parameter 08
14 WORKING AREA Z-: see parameter 08
15 JOG SWITCHES ENABLE: Set to 1 to enable JOG inputs for moving the Robot's individual axes
16 END CYCLE PULSE: when set to any value other than zero, it gives the length of the Robot cycle end pulse in milliseconds.
17 END CYCLE PULSE HANDSHAKE: value indicating the maximum time waited for the end cycle pulse handshake, after which an alarm is generated.

用户可以对以下参数进行编辑：

01 喷枪打开延时功能：喷枪需要在雾化空气打开后延时一段时间打开。（图中蓝色曲线）

02 雾化空气关闭延时：雾化空气需要在喷枪关闭后延时一段时间关闭。（图中绿色曲线）

03 静电模式：静电发生器输出控制的操作模式，如果存在。设置为 0,输出与喷枪控制同步工作；设置为 1,在程序组件的持续时间中，一直输出。设置为 2，在示教模式下输出。

04 紧急控制单元触发延迟：紧急控制装置触发后到切断驱动的设定时间。

05 PID 触发延时：PID 控制器报警触发延时。

06 PID 保存偏移延迟：在 PLC 内存中用于加载程序预留空间。

07 电机运行超时：在机器人无生产停止达到一设定的最大时间后，将关闭电机。 (设置为 0 时，功能禁用)

08 工作区域使能：机器人工作区域控制使能，以下参数用于定义机器人必须在区域内工作的平行六面体。一旦某个程序导致机器人运动超出此设定的区域，将产生报警同时机器人停止运动。（当设置为 0 时，此功能被屏蔽）

09 工作区域 X+： 参阅参数 08

10 工作区域 X-：参阅参数 08

11 工作区域 Y+：参阅参数 08

12 工作区域 Y-：参阅参数 08

13 工作区域 Z+：参阅参数 08

14 工作区域 Z-：参阅参数 08

15 点动开关使能：将此参数设置为 1 可以使用点动输入用于控制机器人相应轴。

16 循环结束脉冲：设定任何非 0 的值可以在机器人循环结束后生成一个设定值的脉冲（单位 ms）。

17 循环结束脉冲握手：此参数用于设置循环结束脉冲后的握手等待时间，一旦超过此时间无握手信号将产生报警。

Figure 114
图 114

- The **TouchNum** numerical keypad appears when you touch the parameter you want to edit on the display
- Press **Save** to put the changes made into effect

- 当编辑某个参数时，点击此参数将在屏幕上显示此数字键盘对话框
- 点击**保存**可以使修改的参数生效

4.5.4 Wash Cycles 清洗循环

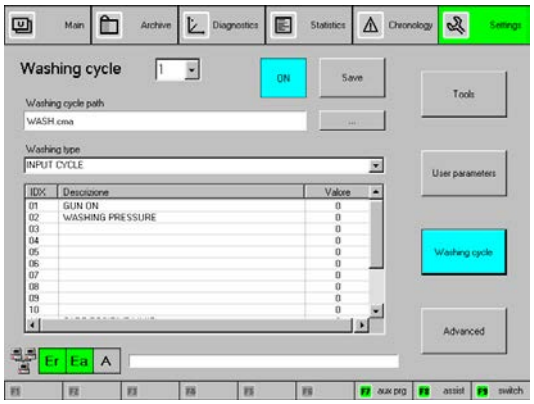


Figure 115
图 115

There are four available wash cycles, which are associated with a special program and attributed properties for the running of the cycle. The maximum number of instructions for the first two cycles is 16, and 8 for the second two.
Select the cycle to be configured (1, 2, 3, 4) in the box to the **Washing cycle** caption.
Enable the wash cycle by pressing the **ON** button.
Select the wash program by pressing the **....** key (the program must be the PTP type).

机器人有四个可用的清洗循环,每个清洗循环都被制定一个特定的程序和循环属性。前两个循环的最多可使用的指令数为 16，后两个的指令数为 8。
在**清洗循环**框中，选择相应了循环配置（1，2，3，4）
点击 **ON** 按钮可以将清洗循环使能。
点击 **....** 按钮可以进行清洗程序的选择（程序必须是 PTP 程序）。

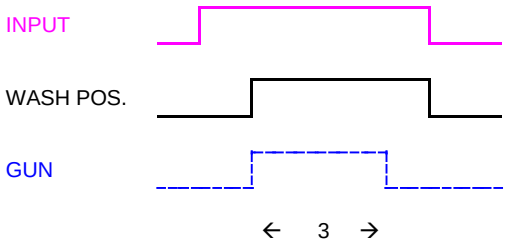


Figure 116
图 116

Select the wash cycle type and relevant parameters from the following options:

INPUT CYCLE
In the input-based wash cycle, a special Robot input generates a request to run the wash cycle, which will be run at the end of the painting program. In the event the Robot is not in automatic mode, the wash cycle is run immediately. The Robot stays in the washing position until the input is released.
01 GUN ON: If set to any value other than 0, the gun is activated once the washing position is reached.
02 WASHING PRESSURE: Value taken by the first analogue output during washing (normally used to determine pump pressure).
03 GUN MAX TIME: Maximum gun opening time regardless of washing request input.

从下面的选项中，选择清洗循环类型和相应的参数。

输入循环
在基于输入清洗循环中，需要机器人生成一个特殊的输入请求来启动清洗循环，清洗循环将在喷涂程序结束后运行清洗循环。若机器人处于非自动模式，清洗循环将立即运行。机器人将一直处于清洗位置，直到该输入信号被清除。

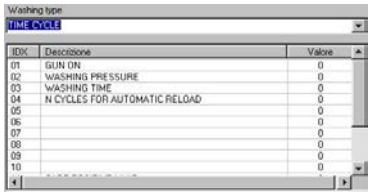


Figure 117
图 117

01 喷枪打开：如果设置了一个非 0 值，一旦机器人到达清洗位置，喷枪将打开。
02 清洗压力： 清洗时，第一个模拟量输出值（通常用于确定泵压）。
03 喷枪最大打开时间： 喷枪最大的打开时间，不考虑清洗请求输入。

The following parameters are the same for all wash cycle types
11 CART POSITIVE LIMIT
12 CART NEGATIVE LIMIT
13 CART DISABLE
14 BACK CYCLE: if set to any value other than zero, it enables execution of the PTP washing program in reverse at the end of the cycle in question.
15 STOP INSTRUCTION: In the washing program, it indicates the instruction from which the return path starts and the washing operation is carried out.

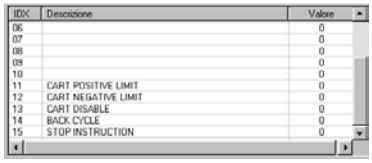


Figure 118
图 118

以下的参数对所有的清洗循环类型都是一样的：
11 笛卡尔空间正限位
12 笛卡尔空间负限位
13 笛卡尔空间未使能
14 返回循环: 如果设置任何非零值，在清洗循环结束后，将开启原来清洗程序运行的路径反方向功能。

15 停止指令: 在清洗程序中，它所指示的指令表示的是返回路径的开始以及清洗操作被执行。

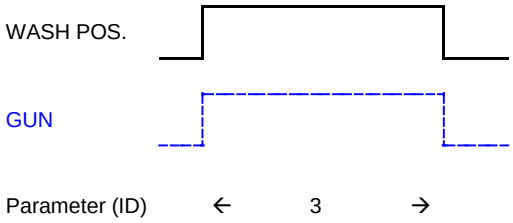


Figure 119
图 119

TIME CYCLE

In the time-based wash cycle, the cycle is activated automatically once the Robot has painted a certain number of parts. How long the Robot holds the washing position is determined on a time basis. Once the set Time has elapsed, the Robot resumes normal work.
03 WASHING TIME: Time during which the Robot stays in the washing position.
04 N CYCLES FOR AUTOMATIC RELOAD: Number of painting cycles the Robot must perform before running a wash cycle.

时间循环

在基于时间的清洗循环中，机器人在喷涂一定数量的工件后，该清洗循环将自动被激活。机器人在清洗位置的时间由一个时间参数决定，一旦设定的时间到达，机器人将恢复正常的工作。
03 清洗时间：机器人在清洗时待在清洗位置的时间。
04 自动加载前的循环次数：机器人在运行清洗循环前需要完成的喷涂循环次数。

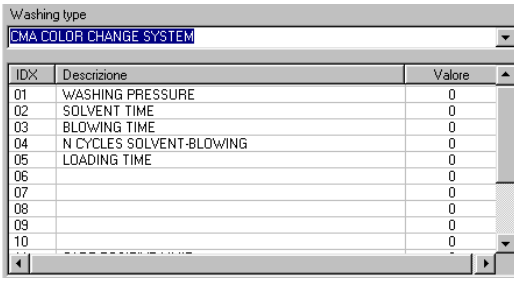


Figure 120
图 120

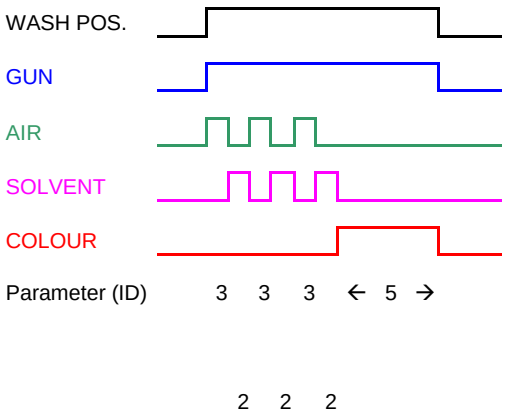


Figure 121
图 121

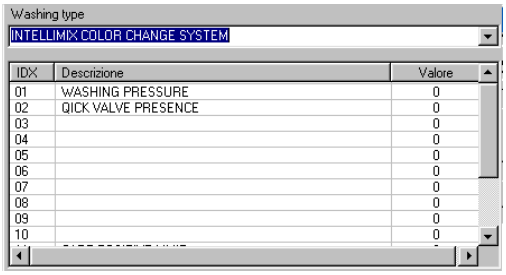


Figure122
图 122

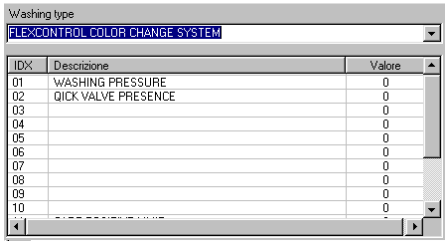


Figure 123
图 123

CMA COLOR CHANGE SYSTEM

In the CMA-type wash cycle, the cycle is activated automatically when a colour change is detected between two consecutive programs. Also refer to the meaning of the **par** field on the execution list in section 8.2.3.3 Adjustments during automatic cycle.. Once the washing position has been reached, the air valves and solvent valves of the CCO accessory are activated alternatively the number of times specified by the 04 N CYCLES SOLVENT-BLOWING parameter
02 SOLVENT TIME: Solvent valve opening time.
03 BLOWING TIME: Air valve opening time.
04 N CYCLES SOLVENT-BLOWING: Number of air-solvent cycles.
05 LOADING TIME: Colour loading time.

CMA 换色系统

在 CMA-类型的清洗循环中，在连续执行两个程序时，若中间出现了颜色的切换，清洗循环将自动被激活。可以参考 8.2.3.3 节中的自动循环时的参数调整进行。一旦机器人到达清洗位置，换色系统中的空气阀和溶剂阀将交替打开关闭一定的次数。该次数在 04 溶剂-吹气循环次数参数中设置。
02 溶剂时间： 溶剂阀打开的时间.
03 吹气时间： 空气阀打开的时间.
04 溶剂-吹气循环次数： 空气和溶剂的交替循环次数
05 加载时间： 颜色加载时间

INTELLIMIX COLOR CHANGE SYSTEM

This wash cycle is used in conjunction with the Wagner – Intellimix dosing system
02 QUICK VALVE PRESENCE: When set to a value other than zero, it indicates that the drain valve is present

INTELLIMIX 换色系统

该清洗循环是用于连接 Wagner – Intellimix 喷漆配量系统
02 快速阀存在设置:如果该值设置为非 0 的值，表示 存在排放阀。

Figure 124
图 124

FLEX CONTROL COLOR CHANGE SYSTEM
FLEX 控制换色系统

This wash cycle is used in conjunction with the Wagner – Flex Control dosing system
Once you have done, press the **Save** key to confirm the changes

该清洗循环是用于连接 Wagner –Flex 控制喷漆配量系统
一旦完成设置，点击 **Save** 键进行设置的保存。

4.5.1 Advanced settings 高级设置

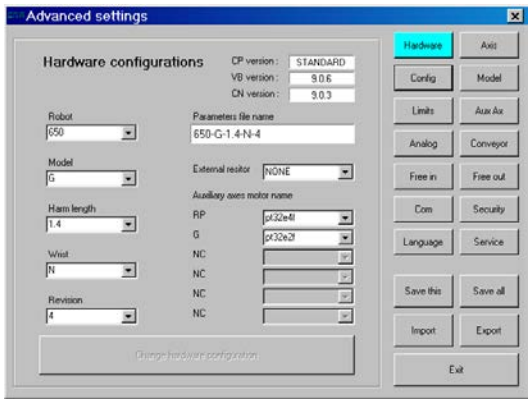


Figure 125
图 125

- If you press the **Advanced** key, you will be prompted to enter the password granting access to the Robot's advanced settings, which can be edited by CMA technical personnel only.
- 如果按下**高级**按键，需要输入密码才可以进行高级设置，此设置只供 CMA 技术人员进行修改。