

IP1000 Conveyor Tracking Process Package User Manual

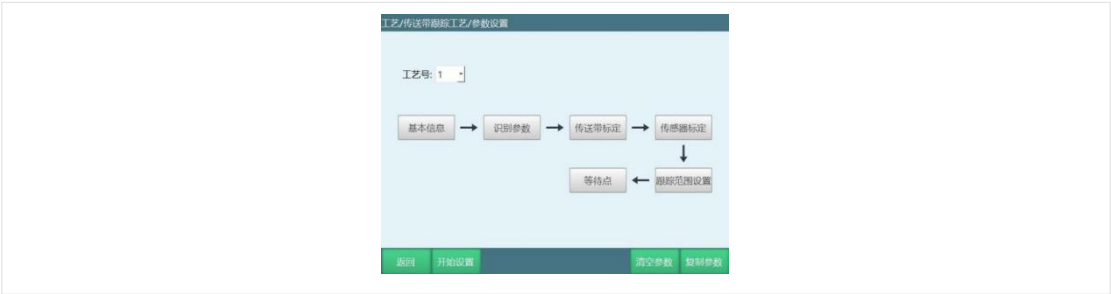
Table of Contents

1. Process Introduction	1
1.1. Basic Information	1
1.2. Parameter Identification	3
1.3. Conveyor Calibration	5
1.4. Sensor Calibration	7
1.5. Tracking Range Settings	8
1.6. Wait Point	10
2. Conveyor Instructions	11
2.1. CONVEYOR_ON - Conveyor Tracking Start	11
2.2. CONVEYOR_OFF - Conveyor Tracking End	12
2.3. CONVEYOR_POS - Get Conveyor Tracking Position	12
2.4. CONVEYOR_REMOVE - Delete Conveyor Tracking Target	13
2.5. CONVEYOR_CHECKEND - Conveyor Workpiece Detection End	14
2.6. CONVEYOR_CHECKPOS - Conveyor Workpiece Detection Start	15
3. Program Examples	15
3.1. Example 1: Sensor trigger, run trajectory on tracked workpiece	15
3.2. Example 2: Sensor trigger, use external point function for trajectory	16
3.3. Example 3: Vision + Conveyor Tracking	17
3.4. Example 4: Conveyor combined with palletizing	18
3.5. Example 5: Get tracking position additional data parameter description	18
4. DEMO Case Demonstration	20
4.1. Case Description	20
4.2. Hardware Installation	21
4.3. Teach Conveyor Tracking Process Package	24
4.3.1. Enter Conveyor Tracking Process	24
4.3.2. Enter Parameter Settings	24
4.3.3. Basic Information Settings	25
4.3.4. Parameter Identification Settings	26
4.3.5. Sensor Calibration	27
4.3.6. Tracking Range Settings	29
4.4. Program Description	31

1. Process Introduction

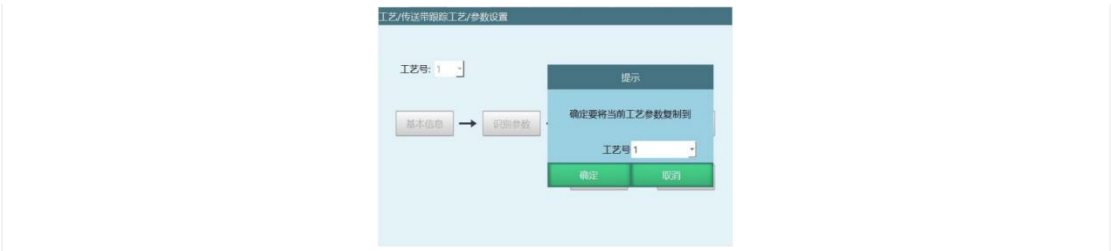
Conveyor tracking means the robot uses user-input workpiece positions and corresponding encoder values at those positions to calculate workpiece position in real-time, and tracks the workpiece through motion.

Click Process > Conveyor Tracking Process > Parameter Settings to enter the conveyor tracking parameter settings screen.



Clear Parameters: Clears parameters for the currently selected process number.

Copy Parameters: Copies all parameters from this process number to another process number.



1.1. Basic Information

Before setting all parameters, select a process number in the Parameter Settings screen. Each process number saves all parameters. Basic information provides basic conveyor parameter settings.



1. Encoder Value

After encoder connection is successful, the current encoder value is auto-detected. This value is read-only and cannot be modified.

When encoder value cannot be read, there are generally two causes: incorrect wiring of the encoder interface; or incorrect port position on the IO board.

Refer to the corresponding IO board definition diagram for port positions; refer to the encoder definition diagram for wiring.

2. Encoder Count Max/Min Values:

The maximum count of the encoder data processing module depends on the IO board used. Current ranges are:

Integrated controller version: 0-65535;

Nuodajia version: 0-1024;

R4C version: -2147483648 to 2147483647.

3. Encoder Resolution:

The unit pulse emitted by the encoder when the conveyor rotates 1mm. This value is a calibration result.

4. Encoder Direction:

Turn on the conveyor and observe whether the offset and speed increase with conveyor movement. If no change, encoder type or resolution setting does not match actual conditions. If it decreases with conveyor movement, select direction here.

5. Conveyor Position Mode:

Select Encoder: Normal sensor calibration.

Select Constant Speed: When set to constant speed, encoder is not used. Conveyor speed can be set manually (recalibrate sensor after manually changing speed).

Note: When set to constant speed, sensor position calibration has error; error factor: conveyor movement time interval during calibration is too large.

Solution: Stop the robot tool on the workpiece path, calibrate directly when workpiece passes the tool to reduce error.

6. Conveyor Speed

Current conveyor speed, read-only.

7. User Coordinate System

Can calibrate this user coordinate system based on actual conveyor movement direction. Tracking calculation and motion

are performed in this user coordinate system.

8. Gate Height: Maximum Z-axis height when robot performs gate-type motion.

9. Gate Linear Length: When robot lifts, Z moves this distance before X, Y coordinates move (this value cannot exceed gate height).

Note: Gate-type motion is used when robot receives picking coordinates and needs to move to workpiece position for picking.

10. Target Exceeds Limit Behavior at Tracking Start

- Wait for next target: When workpiece exceeds tracking range, teach pendant shows tracking exceeds limit, track next target.
- Jump to tracking end: When workpiece exceeds tracking range, instruction jumps to tracking end instruction position.

11. Tracking Compensation Time

Used to solve compensation lag; calculated from time and conveyor speed. Compensation lag is mainly caused by encoder data filtering and robot motion planning execution.

12. Tracking Compensation Encoder Value

Used to solve compensation lag; calculated from encoder value and resolution.

1.2. Parameter Identification

工艺/传送带跟踪工艺/参数设置/参数识别		
工艺号:1		
参数	值	注释
工件检测信号源	视觉	视觉/IO/全局变量
信号源参数	1	视觉工艺号/IO端口号/变量名
工件识别方式	视觉	视觉/传感器
视觉通讯方式	以太网	以太网/Modbus
视觉工艺号	1	
传感器触发方式	低电平触发	
视觉IO信号过滤	信号触发过滤	触发过滤/消失过滤
视觉锁存编码器值方式	触发锁存	触发锁存/收到数据锁存
修改	返回导航	上一页 下一页

1. Workpiece Detection Signal Source

Workpiece detection can be done via Vision, IO, or Global Variable.

2. Signal Source Parameters

If using IO for workpiece detection, signal source parameter can select IO port number;

If using global variable for workpiece detection, signal source parameter can select global boolean variable.

3. Workpiece Identification Method

Workpiece identification can be done via Vision or Sensor; when selecting sensor, visual communication method is not needed.

4. Visual Communication Method

If using vision for workpiece identification, can select Ethernet or Modbus communication.

5. Vision Process Number range 1-9.

6. Sensor Trigger Mode

Only when workpiece detection signal source is set to Digital IO, signal source parameter selects corresponding IO port, and workpiece identification method is Sensor, does sensor trigger mode take effect. Trigger modes: High level trigger (IO signal 1 triggers), Low level trigger (IO signal 0 triggers).

7. Vision IO Signal Filtering

- Vision Trigger Filtering:

When the first workpiece triggers sensor signal, and vision has not returned data when the second workpiece triggers sensor signal, discard the first workpiece sensor signal, record the second workpiece sensor signal. Robot does not pick the first workpiece.

When the first workpiece triggers sensor signal, and vision returns data when the second workpiece triggers, robot picks normally.

- Signal Disappearance Filtering:

When the first workpiece triggers sensor signal, and vision has not returned data when the second trigger signal disappears, discard the first workpiece sensor signal, record the second workpiece sensor signal. Robot does not pick the first workpiece.

When the first workpiece triggers sensor signal, and vision returns data when the second trigger signal disappears, robot picks normally.

8. Vision Latch Encoder Value Method: When robot is running using sensor and vision together for picking, a workpiece passes the sensor, vision captures image to calculate workpiece position. During instruction execution there are many uncertainties and camera processing is slow, so latch function is available.

- Trigger Latch: Latch current conveyor encoder value when vision triggers capture. Each time vision is triggered, if previous workpiece sensor trigger did not receive vision data, discard previous latched conveyor encoder data.

- Data Receive Latch: Latch encoder value when receiving camera data.

1.3. Conveyor Calibration

The user coordinate system is selected in Basic Information. User coordinate system needs to be calibrated in advance.

工艺/传送带跟踪工艺/参数设置/传送带标定

工艺号:1

传送带坐标系

用户坐标系:1

参数	值
X	282.06
Y	135.18
Z	114.47
U	-1.58

修改

开始标定

返回导航

上一页

下一页

Conveyor calibration calculates conveyor user coordinate system by calibrating 3 workpiece position points; click [Modify], [Start Calibration] to enter calibration screen.

工艺/传送带跟踪工艺/参数设置/传送带标定

工艺号:1

第1个工件位置: 移动传送带, 使工件移动到机器人的运动范围内, 移动机器人到工件处, 使机器人末梢的尖端对准工件的尖端, 点击标定

X mm

Y mm

编码器数值 线

工艺/传送带跟踪工艺/参数设置/传送带标定

工艺号:1

第2个工件位置: 继续移动传送带, 尽量远离上一点并在机器人的运动范围内, 移动机器人到工件处, 令机器人末梢尖端对准工件尖端, 点击标定按钮。

X mm

Y mm

编码器数值 线

工艺/传送带跟踪工艺/参数设置/传送带标定

工艺号:1

第3个工件位置: 移动工件使其相对上一点在传送带Y轴正方向有一定位移, 并在机器人的运动范围内, 移动机器人, 使机器人末梢尖端对准工件的尖端, 点击标定按钮。

X mm

Y mm

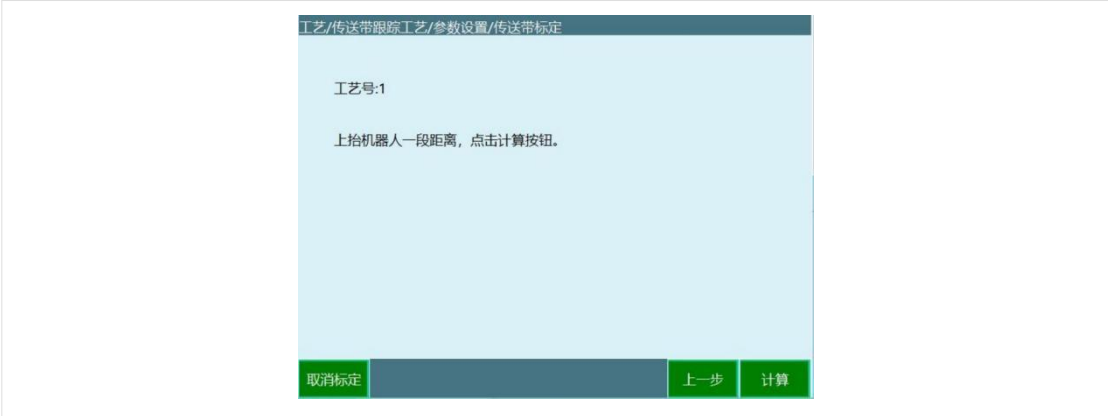
编码器数值 线

Step 1: Place a pointed calibration cone on the conveyor, move conveyor so cone enters robot motion range, turn off conveyor, move robot to workpiece, align tool tip with cone tip, click Calibrate.

Step 2: Slightly raise robot, continue moving conveyor away from previous point but within robot motion range, turn off conveyor, move robot to cone, align tool tip with cone tip, click Calibrate.

Step 3: Move cone to have displacement in conveyor Y-axis positive direction relative to previous point, within robot motion range, turn off conveyor, move robot to cone, align tool tip with cone tip, click Calibrate.

Step 4: Raise robot some distance, click [Calculate] button, calibration complete.



Note: The selected user coordinate system direction must match the conveyor calibration direction.

1.4. Sensor Calibration

When workpiece identification method is Sensor, calibrate sensor on this screen; click [Modify] – [Start Calibration] to enter calibration screen, as shown below.

Note: When using vision for identification, no calibration needed, skip directly.



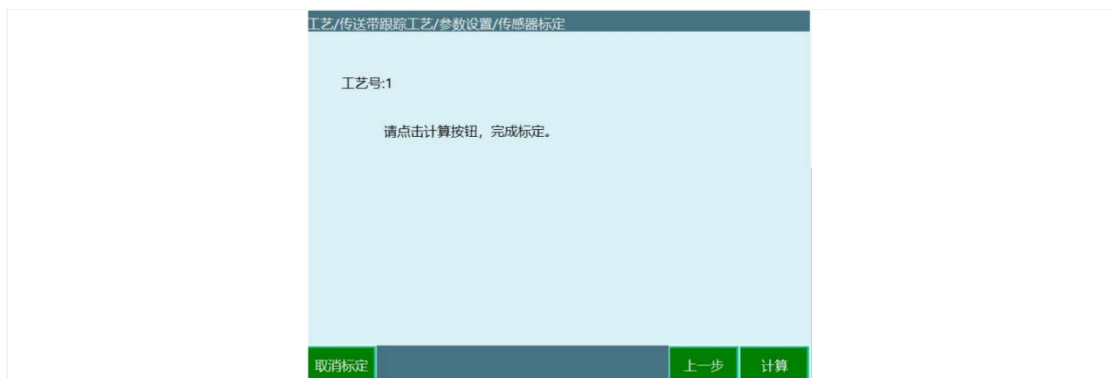
Step 1: Prepare a workpiece with a tip, place at conveyor working width, install a pointed cone on robot flange; move conveyor so workpiece passes sensor position, triggers IO, continue moving conveyor to move workpiece to calibration point within robot motion range, stop conveyor, move robot to workpiece, align tip to tip; click [Calibrate].



Step 2: Remove calibration cone and robot pointed tool, replace with actual workpiece and gripper; move robot to actual picking height and posture, click [Calibrate].



Step 3: Click [Calculate], calibration parameters are saved, see figure below.



1.5. Tracking Range Settings

This screen sets key positions and tracking ranges during robot tracking, as shown below. Note: Use user coordinate system calibrated with conveyor calibration.

工艺/传送带跟踪工艺/参数设置/跟踪范围设置

工艺号:1

位置	值	标定	移动
跟踪开始X点	0.000	标记	至此
最迟接收位置	0.000	标记	至此
跟踪范围X最大	0.000	标记	至此
跟踪范围Y最小	0.000	标记	至此
跟踪范围Y最大	0.000	标记	至此
跟踪范围Z最小	0.000	标记	至此
跟踪范围Z最大	0.000	标记	至此

修改

返回导航

上一页

下一页

- Tracking Start X Point

This parameter only records conveyor coordinate X-axis (conveyor movement direction) value. During each tracking, robot only tracks when workpiece exceeds this position.

When robot is in previous tracking process and next workpiece has exceeded tracking start X point, robot will directly track this workpiece after completing previous tracking.

If robot is not in tracking process and workpiece has not reached tracking start X point, robot will wait at this position.

- Tracking Range X Maximum

Maximum position of tracking range on conveyor X-axis (conveyor movement direction). Regardless of whether workpiece is being tracked, once it exceeds this position, robot abandons tracking and warns.

- Tracking Range Y Minimum

Minimum position of tracking range on conveyor Y-axis (perpendicular to conveyor movement). Workpiece below this position, robot does not track.

- Tracking Range Y Maximum

Maximum position of tracking range on conveyor Y-axis (perpendicular to conveyor movement). Workpiece above this position, robot does not track.

- Tracking Range Z Minimum

Minimum height during robot tracking.

- Tracking Range Z Maximum

Maximum height during robot tracking.

- Latest Acceptance Position

Latest acceptance position of workpiece on conveyor X-axis (conveyor movement direction). If workpiece exceeds this position before being tracked, robot does not track it.

Note: If calibrated range is unreasonable, reconfirm user coordinate system calibration and check if selected direction is correct.

1.6. Wait Point

等待点	值
X值	0.000
Y值	0.000
Z值	0.000
A值	0.000
B值	0.000
C值	0.000

1. Motion Method: After picking workpiece, robot returns to safe point. If no workpiece needs picking within set time, robot moves to wait point with set motion method.

Option Description:

Joint: After tracking ends, robot returns to wait point with joint motion.

Gate: After tracking ends, robot returns to wait point with gate-type motion.

Gate Height: Maximum Z height for gate-type motion.

Gate Linear Length: When robot lifts, Z moves this distance before X,Y move (cannot exceed gate height).

2. Wait Delay

Determines if workpiece exists based on set time. E.g., if set to 0.5s, if workpiece arrives within 0.5s continue tracking, if not, robot goes to wait point.

3. Wait at Specified Point When No Workpiece

Yes: Robot stays at wait point when no workpiece, waits until workpiece signal detected. No: Robot does not go to wait point, waits at current tracking end position for next workpiece signal.

4. Calibrate This Point

Regardless of which coordinate system is used for marking, saved position is in user coordinate system.

5. Move to Wait Point

Move to marked wait point.

2. Conveyor Instructions

2.1. CONVEYOR_ON - Conveyor Tracking Start



Format: CONVEYOR_ON [Command] P/GP/Workpiece [Position];
V [Tracking Speed] ACC
[Acceleration]. Function: Start tracking
when workpiece enters tracking range.
Parameters:

Position	Reference Position data (P 、 GP 、 : Position) Workpiece point: When camera sends a trajectory, first point is used as workpiece point P/GP:User can select existing position variable or create new one。 This point is the reference point during conveyor tracking, Also determines tracking height。 Recommend setting this point as middle of workpiece to track, in on , in No.
ID	Conveyor tracking process number
V	Speed during conveyor tracking
ACC	Acceleration during conveyor tracking

2.2. CONVEYOR_OFF - Conveyor Tracking End

参数	值	注释
ID	1	工艺号

示例: CONVEYOR_OFF ID = 1

Format: CONVEYOR_OFF [Command] ID [Tracking End Process No.] GP [] I001 [].

Function: End conveyor tracking.

Parameters:

ID	Conveyor tracking process number
----	----------------------------------

2.3. CONVEYOR_POS - Get Conveyor Tracking Position

参数	值	注释
ID	1	工艺号
全局位置变量	GP0001	1-9999整数
视觉附加数据首个变量	GD001	将附加数据保存到变量

示例: CONVEYOR_POS ID = 1 GP0001 GD001

确定 取消

Format: CONVEYOR_POS [Command] ID [Process No.].

Function: Sensor calibration result stored into selected position variable, additional data values stored into numeric variable.

Parameters:

ID	Conveyor tracking process number
Global position variable	Store sensor calibration result into GP point when sensor triggers Store vision capture position into GP point when vision triggers
First additional data variable	Additional data values saved to variable. Variable type (int, float, string)

	Vision Process > Vision Parameter Settings: Set additional data count, Get Conveyor Tracking Position: Set first additional data variable, This instruction stores additional data values into variables. User can use conditional logic not , etc. : First additional data variable is GD001, Additional data count is 2 , This instruction stores user-defined additional data values sequentially into GD001,GD002 If user needs to pick different colored workpieces from conveyor and place at different positions, We can represent different colored workpieces with different variable values, Then use IF conditional logic to select corresponding variable for picking different colored workpieces. GD001=1, to is when ifGD001=1 ,
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2.4. CONVEYOR_REMOVE - Delete Conveyor Tracking Target



Format: CONVEYOR_REMOVE [Command] ID=1 [Tracking Process No.] 0/1 [Delete range: "0" all targets, "1" current target].

Function: Delete tracking signal based on selected delete range.

Parameters:

ID	Conveyor tracking process number, range [1, 9]
Delete range	All targets: When conveyor tracking start signal is given multiple times during program execution, all signals except the first are deleted
	Current target: When conveyor tracking start signal is given multiple times, each cycle deletes the previous signal Assume there are 5 workpieces, No. 1 workpieces, No. 2 workpiecestracking signal deleted, not tracked, No. 3workpieces, No. 4 workpiecestracking signal deleted, not tracked, No. 5 workpieces

文件名称: 传送带工艺01		页码: 1 /2	当前次数: 0/1
0	开始		
> 1	视觉开始 工艺号:1		
2	传送带工件检测开始 工艺号 1		
3	循环 当(I001 == 0)时		
4	删除传送带跟踪目标 工艺号 1 本次目标		
5	传送带跟踪开始 P0001 工艺号 1 速度10毫米/秒 加速度20		
6	直线 P0002 速度10毫米/秒 平滑0 加速度1 减速度1 0		
7	传送带跟踪结束 工艺号 1		
8	结束循环		
9	传送带工件检测结束 工艺号 1		
10	视觉结束 工艺号:1		

2.5. CONVEYOR_CHECKEND - Conveyor Workpiece Detection End

CONVEYOR_CHECKEND

参数	值	注释
ID	1	工艺号

示例: CONVEYOR_CHECKEND ID = 1

确定

取消

Format: CONVEYOR_CHECKEND [Command] ID [Tracking Process No.].

Function: Stop detecting workpieces. After this instruction, workpieces passing sensor do not participate in queue calculation.

Parameters: Omitted.

2.6. CONVEYOR_CHECKPOS - Conveyor Workpiece Detection Start



参数	值	注释
ID	1	工艺号

示例: CONVEYOR_CHECKPOS ID = 1

确定 取消

Format: CONVEYOR_CHECKPOS [Command] ID [Tracking Process No.].

Function: Execute this instruction, workpieces passing sensor participate in queue calculation.

Parameters:

ID:	Conveyor tracking process number
-----	----------------------------------

3. Program Examples

3.1. Example 1: Sensor trigger, run trajectory on tracked workpiece



文件名称: 传送带1 页码: 1 / 2 当前次数: 1/1

0	开始
> 1	直线 P0001 速度10毫米/秒 平滑0 加速度1 减速度1 0
2	传送带工件检测开始 工艺号 1
3	循环 当(0001 == 0)时
4	传送带跟踪开始 P0002 工艺号 1 速度10毫米/秒 加速度20
5	延时1秒
6	直线 GP0001 速度10毫米/秒 平滑0 加速度1 减速度1 0
7	直线 GP0002 速度10毫米/秒 平滑0 加速度1 减速度1 0
8	传送带跟踪结束 工艺号 1
9	结束循环
10	传送带工件检测结束 工艺号 1

Example Description:

1. Robot safe position;
2. Start workpiece detection, workpieces passing sensor participate in queue calculation;
3. Loop start, workpiece loop tracking;

4. Start tracking workpiece;
5. Delay 1 second;
6. Run linear trajectory on tracked workpiece (GP0001-GP0002);
7. End workpiece tracking;
8. Workpiece loop tracking end;
9. Stop detection, workpieces passing conveyor again do not participate in queue calculation.

3.2. Example 2: Sensor trigger, use external point function for trajectory

文件名称: 传送带2		页码: 1 / 2	当前次数: 1 / 1
0	开始		
1	直线 P0001 速度10毫米/秒 平滑0 加速度1 减速度1 0		
2	传送带工件检测开始 工艺号 1		
3	循环 当(001 == 0)时		
4	传送带跟踪开始 P0002 工艺号 1 速度10毫米/秒 加速度20		
5	延时1秒		
6	外部点 关节 速度10% 平滑0 加速度20 减速度20 0		
7	传送带跟踪结束 工艺号 1		
8	结束循环		
9	传送带工件检测结束 工艺号 1		
10	结束		

Example Description:

1. Robot safe position;
2. Start workpiece detection, workpieces passing sensor participate in queue calculation;
3. Loop start, workpiece loop tracking;
4. Start tracking workpiece;
5. Delay 1 second;
6. Use external point function to send positions for trajectory;
7. End workpiece tracking;
8. Workpiece loop tracking end;
9. Stop detection, workpieces passing conveyor again do not participate in queue calculation.

3.3. Example 3: Vision + Conveyor Tracking

Track workpiece via vision. Set workpiece detection signal source to Vision.

文件名称: 视觉加传送带		页码: 1 / 2	当前次数: 1 / 1
0	开始		
1	直线 P0001 速度10毫米/秒 平滑0 加速度1 减速度1 0		
2	视觉开始 工艺号:1		
3	传送带工件检测开始 工艺号 1		
4	循环 当(i001 == 0)时		
5	视觉触发 工艺号:1		
6	传送带跟踪开始 P0002 工艺号 1 速度10毫米/秒 加速度20		
7	直线 P0003 速度10毫米/秒 平滑0 加速度1 减速度1 0		
8	直线 P0004 速度10毫米/秒 平滑0 加速度1 减速度1 0		
9	传送带跟踪结束 工艺号 1		
10	结束循环		
11	传送带工件检测结束 工艺号 1		
12	视觉结束 工艺号:1		
13	结束		

Example Description:

1. Robot safe position;
2. Open vision;
3. Conveyor workpiece detection start;
4. Loop start, workpiece loop tracking;
5. Camera captures once, vision triggers once (when trigger condition is continuous in vision software, one trigger allows normal tracking; when single, camera captures once per trigger);
6. Start tracking workpiece;
7. Tracking trajectory (P0003-P0004);
8. End workpiece tracking;
9. Workpiece loop tracking end;
10. Stop detection, workpieces passing conveyor again do not participate in queue calculation;
11. Close vision.

3.4. Example 4: Conveyor combined with palletizing

Combine vision tracking with palletizing to palletize picked workpieces.

文件名称: 视觉传送带码垛		页码: 1 / 2	当前次数: 1 / 1
0	开始		
> 1	码垛复位 工艺号1		
2	循环 当(0001 == 0)时		
3	直线 P0001 速度10毫米/秒 平滑0 加速度1 减速度1 0		
4	视觉开始 工艺号:1		
5	传送带工件检测开始 工艺号 1		
6	视觉触发 工艺号:1		
7	传送带跟踪开始 P0002 工艺号 1 速度10毫米/秒 加速度20		
8	传送带跟踪结束 工艺号 1		
9	码垛开始 工艺号1 码垛 正序 1001 1001 1001		
10	码垛入口点 工艺号1 关节 速度10% 平滑0 加速度20 减速度20 OFF OFF 0 0		
11	码垛辅助点 工艺号1 关节 速度10% 平滑0 加速度20 减速度20 0		
12	码垛工件点 工艺号1 关节 速度10% 平滑0 加速度20 减速度20 0		
13	码垛结束判断 ID:1 B001		
14	结束循环		
15	传送带工件检测结束 工艺号 1		
16	视觉结束 工艺号:1		
17	结束		

3.5. Example 5: Get tracking position additional data parameter description

1. Vision Process > Vision Parameter Settings: Set additional data count, max 10 supported.

工艺/视觉工艺/视觉参数设置	
相机选择 工艺号: 1 类型: 自定义	用户坐标系 手眼标定用户坐标系 无
网络参数 控制器IP: 192.168.0.233 相机: 客户组 端口数: 1 相机数据: 机器人坐标 端口1: 5050 端口2: 0	触发方式 Ethernet TRG 单次 触发周期: 35 ms
连接参数 触头: @ 成功发送标志符: OK 分隔符: , 失败发送标志符: NG 结束符: \$ 超时时间: 30 s 单目标: 类型: 2D 附加数据个数 2	接收坐标系 工具 用户 弧度/角度 弧度/角度转换 角度制

2. Click Vision Position Parameters to view example format. udataN represents additional data.

工艺/视觉工艺/视觉位置参数设置

工艺号 1

机器人抓取时的姿态 (坐标系都是直角坐标系)

基准点	值
X值	0.00
Y值	0.00
Z值	0.00
A值	3.14
B值	0.00
C值	0.00

高度可手动填写

相机坐标	值
X	0.00
Y	0.00
高度	0.00
角度	0.00

偏移补偿

X方向偏移 0.000 mm

Y方向偏移 0.000 mm

Z方向偏移 0.000 mm

角度偏移 0.000

接受位置类型 点

角度方向 正方向

比例系数 1.000

示例格式: @.x,y,Rz,data ..., \$

接收数据:

返回 修改

3. External device: Network debugging tool sends positions according to example format in Vision Position Parameters.

网络调试助手

NetAssist V5.0.8

网络设置

(1) 协议类型 TCP Client

(2) 远程主机地址 192.168.0.233

(3) 远程主机端口 2020

连接

接收设置

ASCII HEX

按日志模式显示

接收后自动换行

接收数据不显示

接收保存到文件...

自动换行 清除接收

发送设置

ASCII HEX

转义符指令前缀

自动发送附加数据

打开文件数据源...

循环周期 1000 ms

继续接收 历史发送

数据日志

[2024-01-01 10:19:31.727]# Reconnecting to the server...

[2024-01-01 10:19:33.789]# Server connected from local 192.168.0.19:12401

[2024-01-01 10:19:33.789]# RCV ASCII:

T00

[2024-01-01 10:19:34.923]# SEND ASCII:

M 1030,-120,3.14,1,2,\$

[2024-01-01 10:19:34.923]# RCV ASCII:

OK

[2024-01-01 10:19:34.930]# Server disconnected and a reconnection is scheduled in 5 seconds.

[2024-01-01 10:19:36.720]# Reconnecting to the server...

数据发送

M 1030,-120,3.14,1,2,\$

清除 清除

发送

4. Click Test Capture. After network tool sends positions, "1,2" in received data represents additional data. Additional data defaults to GS001, incrementing based on defined count.

工艺号 1

机器人抓取时的姿态 (坐标系都是直角坐标系)

基准点	值
X值	0.00
Y值	0.00
Z值	0.00
A值	3.14
B值	0.00
C值	0.00

高度可手动填写

相机坐标	值
X	1030.00
Y	-120.00
高度	0.00
角度	3.14

偏移补偿

X方向偏移 0.000 mm

Y方向偏移 0.000 mm

Z方向偏移 0.000 mm

角度偏移 0.000

接受位置类型 点

角度方向 正方向

比例系数 1.000

示例格式: @.x,y,Rz,data ..., \$

接收数据: @.1030,-120,3.14,1,2,\$

返回 修改

5. If Get Conveyor Tracking Position instruction is inserted, execution stores additional data values into user-selected variables (int, float, string). Users can represent workpiece shape/color with values (e.g. GD001=1 for red, GD002=2 for green), then use conditional logic to track and pick different colored workpieces.

Example:

文件名称: 传送带1		页码: 1 / 2	当前次数: 1 / 1
0	开始		
1	直线 P0001 速度10毫米/秒 平滑0 加速度1 减速度1 0		
2	传送带工件检测开始 工艺号 1		
3	循环 当(001 == 0)时		
4	传送带跟踪开始 P0002 工艺号 1 速度10毫米/秒 加速度20		
5	获取传送带跟踪位置 工艺号 1 GP0001 GD001		
6	如果 (GD001 == 1)		
7	直线 P0005 速度10毫米/秒 平滑0 加速度1 减速度1 0		
8	直线 P0006 速度10毫米/秒 平滑0 加速度1 减速度1 0		
9	结束如果		
10	如果 (GD001 == 2)		
11	直线 P0007 速度10毫米/秒 平滑0 加速度1 减速度1 0		
12	直线 P0008 速度10毫米/秒 平滑0 加速度1 减速度1 0		
13	结束如果		
14	延时1秒		
15	传送带跟踪结束 工艺号 1		
16	结束循环		
17	传送带工件检测结束 工艺号 1		
18	结束		

4. DEMO Case Demonstration

4.1. Case Description

This case uses sensor trigger method to demonstrate the complete process of conveyor dynamic tracking, picking and placing.

Case Objective: Robot uses conveyor tracking to dynamically pick workpieces from conveyor and accurately place them at specified release points.

Application Scenarios: Suitable for production lines requiring dynamic picking of moving workpieces, such as sorting and handling in food, packaging, electronics industries. Dynamic tracking technology eliminates frequent conveyor start/stop, greatly improving production efficiency.



4.2. Hardware Installation

1. Install robot end-effector suction cup and solenoid valve wiring

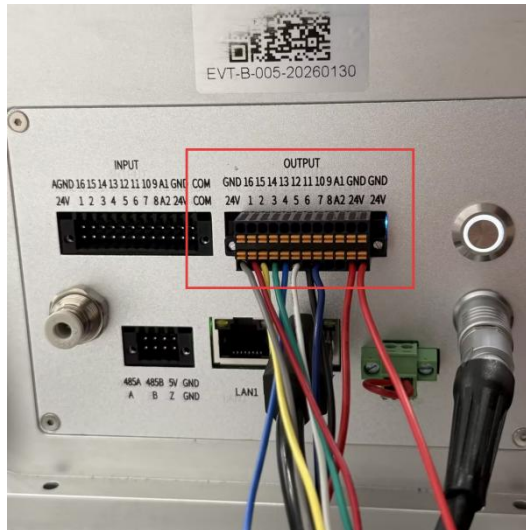
Install end-effector (suction cup or gripper) on robot flange for picking workpieces. After installation, confirm tool coordinate system is correctly calibrated. Connect solenoid valve control signal wires to corresponding ports on robot IO board.



2. Connect conveyor IO board signals

Connect conveyor control signal wires to corresponding ports on robot IO board

Confirm IO signal type (input/output) matches conveyor control requirements



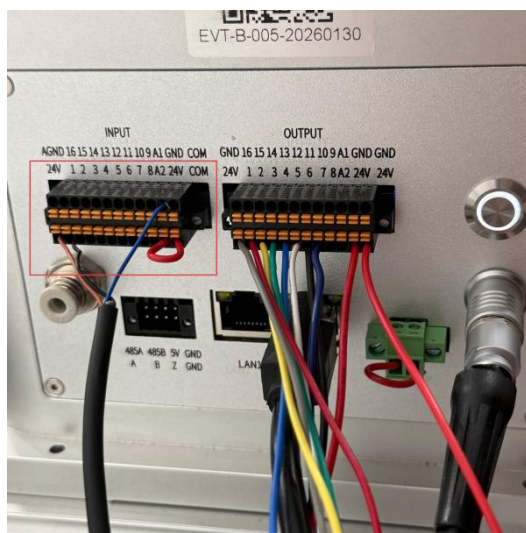
3. Connect sensor I/O board signals

Connect sensor signal wires to digital input ports on I/O board

Record I/O port number connected to sensor (assumed DIN2-1 in this example), needed for parameter settings later

Confirm sensor trigger method (high level or low level trigger)

Sensor function: When workpiece passes sensor position, sensor sends I/O signal to trigger system to record workpiece initial position.



4. Connect encoder signals (ABZ)

Connect encoder ABZ signal wires to encoder input port on I/O board

Refer to I/O board definition diagram and encoder definition for wiring

Encoder data processing module count range depends on hardware version:

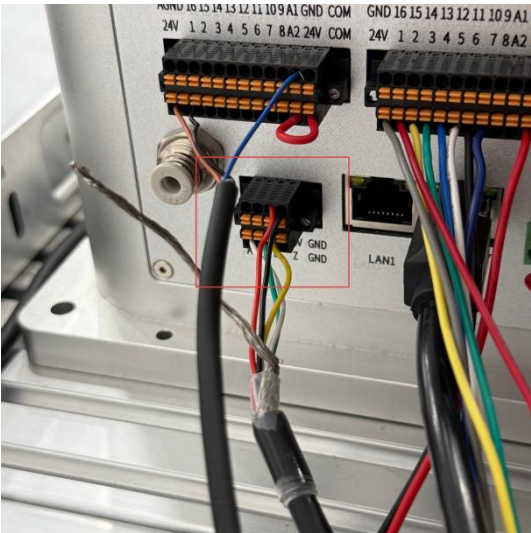
Integrated controller version: 0-65535

Nuodajia version: 0-1024

R4C version: -2147483648 to 2147483647

Confirm encoder power (5V) is correctly connected

Encoder function: Real-time monitoring of conveyor position and speed, enabling precise dynamic tracking of workpieces.



5. Hardware Wiring Completion Check

After completing hardware installation, perform the following checks:

Conveyor can start and stop normally

Sensor signal can detect workpieces normally

Encoder value can be read normally (check in parameter settings screen)

IO 状态			
数字输入		数字输出	
IO板1		IO板2	
2-1	☐	2-9	☐
2-2	☐	2-10	☐
2-3	☐	2-11	☐
2-4	☐	2-12	☐
2-5	☐	2-13	☐
2-6	☒	2-14	☐
2-7	☒	2-15	☐
2-8	☐	2-16	☐

IO 状态			
数字输入		数字输出	
IO板1		IO板2	
2-1	0	2-9	0
2-2	0	2-10	0
2-3	0	2-11	0
2-4	0	2-12	0
2-5	0	2-13	0
2-6	0	2-14	0
2-7	0	2-15	0
2-8	0	2-16	0

工艺/传送带跟踪工艺/参数设置/基本参数

工艺号:1

参数	值	注释
传送带位置模式	编码器值	
传送带速度	18.592	mm/s

工件抓取参数

抓取点直线高度	50	mm
门型UZ轴最大值	60	mm

修改 说明 返回导航 上一页 下一页

4.3. Teach Conveyor Tracking Process Package

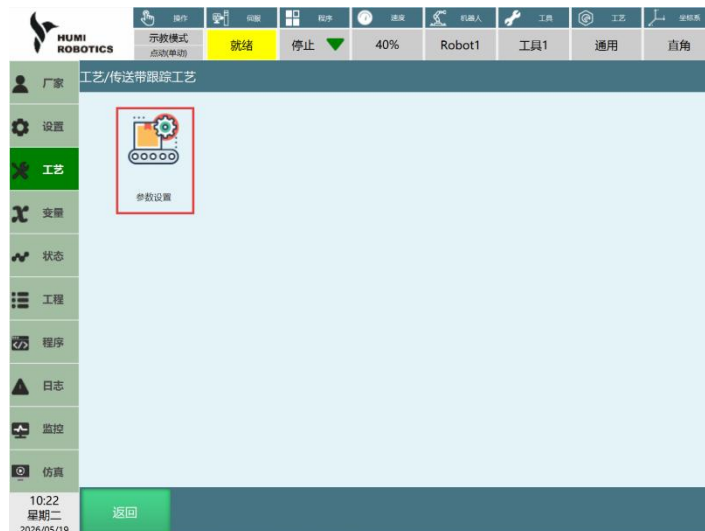
4.3.1. Enter Conveyor Tracking Process

1. Click [Process] button at bottom of system main screen
2. Find [Conveyor Tracking Process] in process list
3. Click [Conveyor Tracking Process] to add to current screen



4.3.2. Enter Parameter Settings

1. Click [Parameter Settings] button to enter conveyor tracking parameter settings screen
2. Tip: Parameter settings screen contains Basic Information, Parameter Identification, Conveyor Calibration, Sensor Calibration, Tracking Range Settings, Wait Point Settings and other tabs. Configure in order.



4.3.3. Basic Information Settings

1. Select a process number (range 1-9). All parameters saved under this process number.
2. Confirm encoder value is read normally



Basic parameter screen:

3. Set conveyor position mode: Encoder value
4. Workpiece picking parameters:

Pick point linear height: Maximum Z-axis lift height during gate-type motion

Gate UZ maximum: Robot moves this distance along Z-axis before X, Y axes start moving (cannot exceed pick point linear height)

- Settings complete, click Next



参数	值	注释
传送带位置模式	编码器值	
传送带速度	0.000	mm/s
工件抓取参数		
抓取点直线高度	50	mm
门型UZ轴最大值	60	mm

- Set encoder port: 1
- Set encoder minimum: 0
- Set encoder maximum: 65535
- Set encoder resolution: Auto-detect
- Set encoder direction: Forward, based on conveyor direction
- After completing above settings, click [Next]



参数	值	注释
编码器端口	1	编码器接入端口
编码器值	53595	p
编码器计数最小值	0	p
编码器计数最大值	65535	p
编码器分辨率	4.423	p/r
编码器方向	正向	

4.3.4. Parameter Identification Settings

- Tracking method: Select "Sensor".
- Signal source parameter: Select sensor IO port number (e. g. DIN2-2).

3. Sensor trigger method: Select "Rising Edge Trigger" or "Falling Edge Trigger" based on actual sensor type
4. IO trigger safety time interval: Set to 2 seconds, used to filter duplicate trigger signals from same workpiece
5. Click [Next]



4.3.5. Sensor Calibration

1. Click [Start Calibration] button in Sensor Calibration tab



2. Calibrate trigger point:
 - Run conveyor, move workpiece past sensor to trigger IO signal
 - Continue moving conveyor, send workpiece near robot tracking start position
 - Stop conveyor, manually move robot to align tool end with workpiece tip, click [Calibrate] to record first point.



3. Click [Next]

4. Calibrate movement direction:

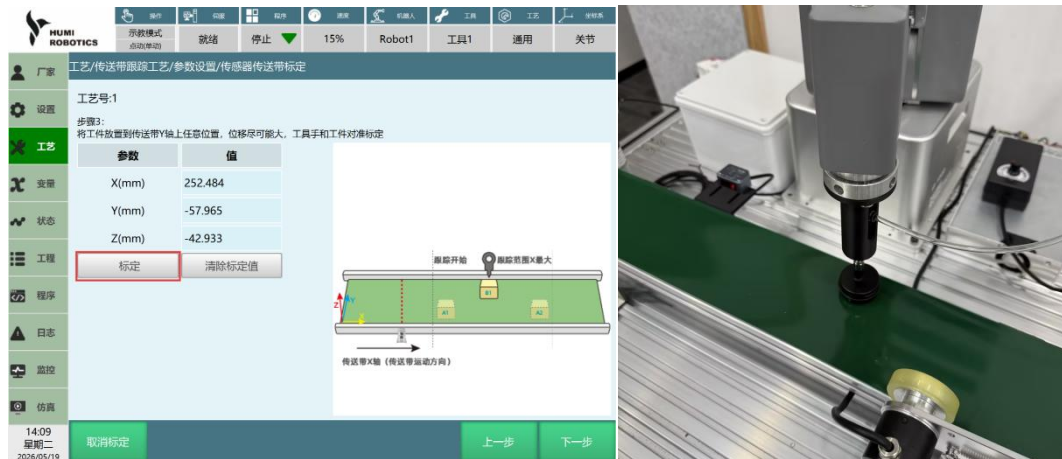
- Start conveyor again, move workpiece some distance (away from first point, but within robot motion range)
- Stop conveyor, realign with workpiece tip, click [Calibrate] to record second point



5. Click [Next]

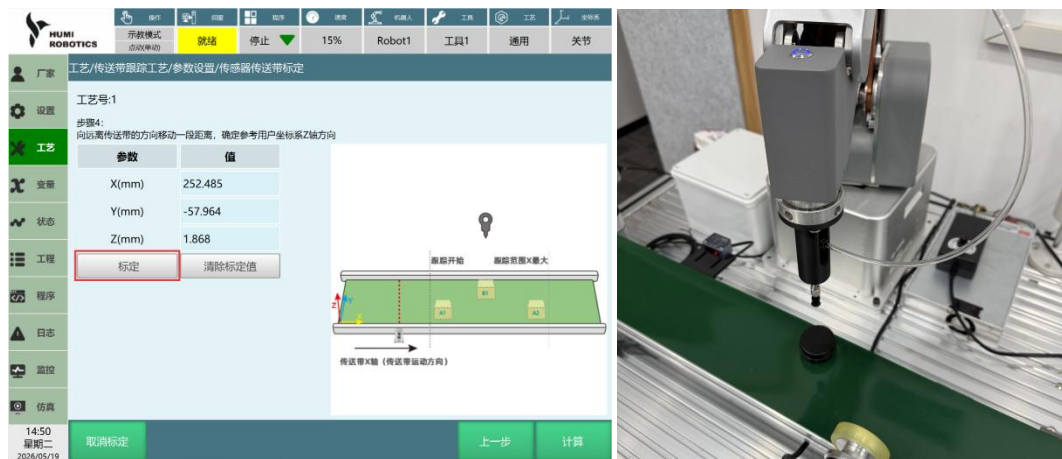
6. Calibrate Y-axis direction:

- Place workpiece at another position on conveyor Y-axis (perpendicular to movement direction), with maximum displacement
- Stop conveyor, align with workpiece tip, click [Calibrate] to record third point
- Click [Next]



7. Calibrate Z-axis direction:

- Move some distance away from conveyor, confirm reference user coordinate Z-axis direction
- Click [Calibrate] to record fourth point
- Click [Calculate], system automatically saves calibration parameters



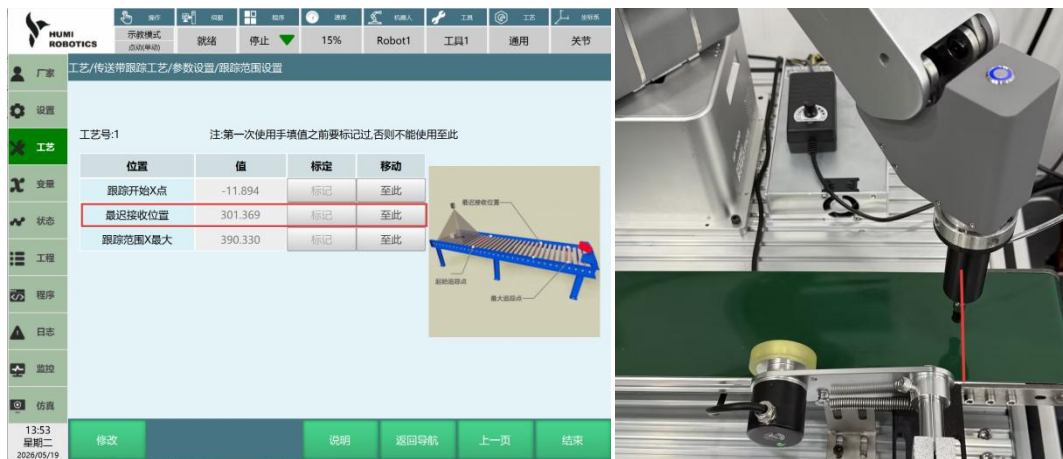
4.3.6. Tracking Range Settings

1. Enter [Tracking Range Settings] tab
2. Calibrate key positions (using conveyor user coordinate system):

Tracking Start X Point: Move robot to desired X coordinate for tracking start, click [Calibrate]



Latest Acceptance Position: Move robot to maximum X coordinate for accepting workpieces, click [Calibrate]



Tracking Range X Maximum: Move robot to X-axis limit for tracking, click [Calibrate]



3. After recording above positions, click [Finish]

Complete: Conveyor tracking process calibration is fully complete. Recommend clicking [Move to Wait Point] to verify wait point position.

4.4. Program Description

Example program description:

1. Robot safe position;
2. Start conveyor;
3. Start workpiece detection, workpieces passing sensor participate in queue calculation;
4. Loop start, workpiece loop tracking;
5. Robot safe picking position;
6. Conveyor wait for material;
7. Start tracking workpiece top point;
8. Workpiece pick point;
9. Vacuum suction cup activate;
10. Delay 0.5 seconds;
11. Workpiece escape point;
12. End workpiece tracking, workpiece loop tracking end;
13. Workpiece place top point;
14. Workpiece place point;
15. Vacuum suction cup release;
16. Delay 0.5 seconds;
17. Workpiece place escape point;
18. End loop;
19. Stop detection, workpieces passing conveyor again do not participate in queue calculation.

示教模式

点动(单动)

就绪

停止

20%

Robot1

工具1

通用

直角

工程预览/程序指令

总共19行指令

文件名称: CONV_MIAN

当前次数: 0/1

0 开始

> 1 直线 P0002 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

2 IO输出 OT#(DOUT2-7) 1 时间 0 输出值保持

3 传送带工件检测开始 工艺号 1

4 循环 当(i001 == 0)时

5 直线 P0002 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

6 传送带等料 工艺号 1 超时时间 999 来料结果 GI001 来料位置 GP0001

7 直线 P0004 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

8 传送带跟踪开始 P0001 工艺号 1 速度1000毫米/秒 加速度100 提前时间0

9 IO输出 OT#(DOUT2-6) 1 时间 0 输出值保持

15:25 星期二 2026/05/19

插入 修改 删除 操作 变量

1 / 3

示教模式

点动(单动)

就绪

停止

20%

Robot1

工具1

通用

直角

工程预览/程序指令

总共19行指令

文件名称: CONV_MIAN

当前次数: 0/1

9 IO输出 OT#(DOUT2-6) 1 时间 0 输出值保持

10 延时0.5秒

11 直线 P0003 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

12 传送带跟踪结束 工艺号 1

13 直线 P0007 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

14 直线 P0006 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

15 IO输出 OT#(DOUT2-6) 0 时间 0 输出值保持

16 延时0.5秒

17 直线 P0007 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

18 结束循环

15:25 星期二 2026/05/19

插入 修改 删除 操作 变量

2 / 3

示教模式

点动(单动)

就绪

停止

20%

Robot1

工具1

通用

直角

工程预览/程序指令

总共19行指令

文件名称: CONV_MIAN

当前次数: 0/1

11 直线 P0003 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

12 传送带跟踪结束 工艺号 1

13 直线 P0007 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

14 直线 P0006 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

15 IO输出 OT#(DOUT2-6) 0 时间 0 输出值保持

16 延时0.5秒

17 直线 P0007 速度1000毫米/秒 平滑0 加速度100 减速度100 提前时间0

18 结束循环

19 传送带工件检测结束 工艺号 1

20 结束

15:25 星期二 2026/05/19

插入 修改 删除 操作 变量

2 / 3

32