



# 使用说明书\_力控功能-自由驱动

版本:v2

版本	时间	编辑	更新内容
v0	20230404	邵茂峰/王艳明	初稿发行
V1	20230523	王艳明	标定方法更新
V2	20231102	王艳明	增加针对焊接使用方法

# 目录

目录 .....	
1. 末端夹具装配 .....	
2. 负载识别 .....	
3.力传感器标定 .....	
4.开启自由驱动功能 .....	
5.1 针对焊接机器人 .....	
5.2 针对焊接机器人标定 .....	
(附属焊接专属机器人不同型号参数) .....	

# 1. 末端夹具装配

## 1.1 固定机械臂

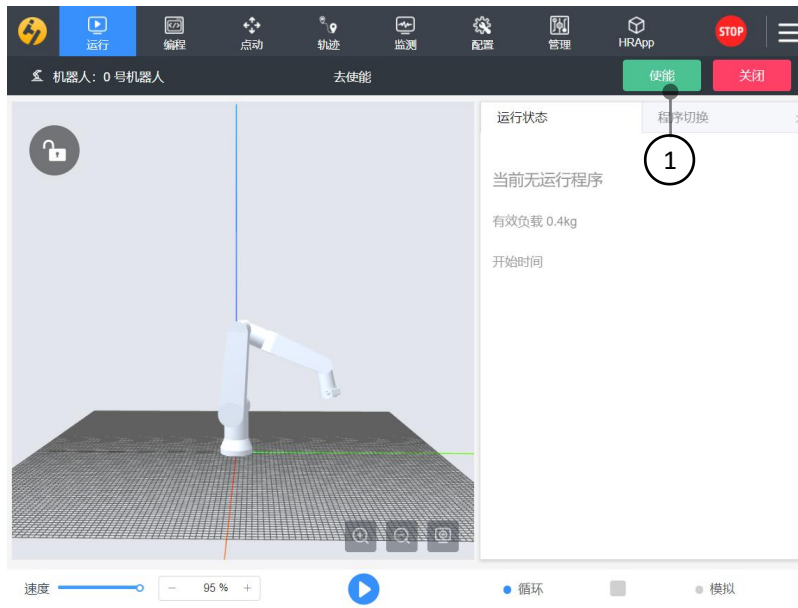


## 1.2 装配负载

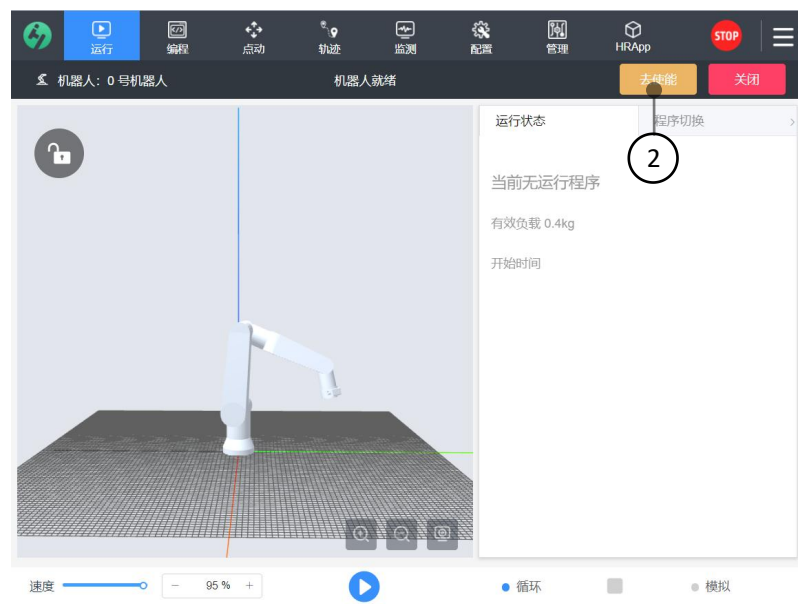


# 2. 负载识别

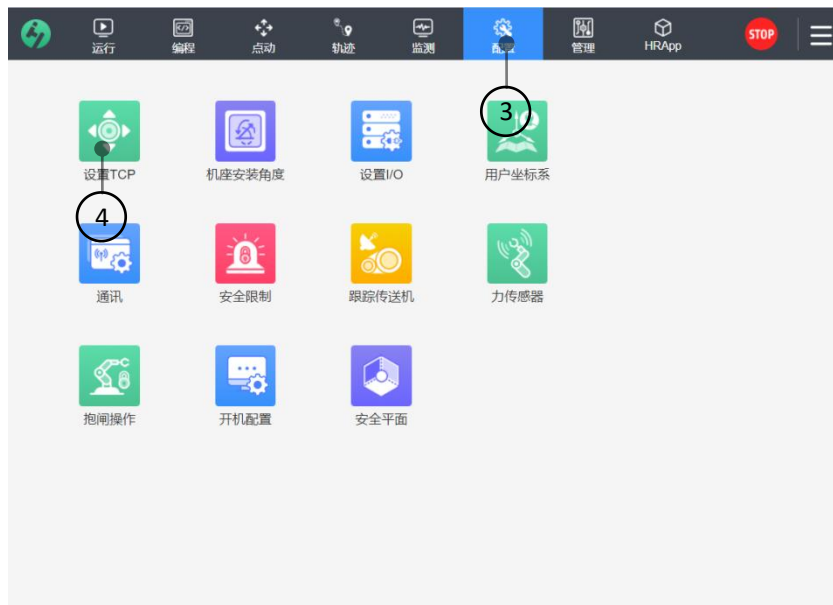
## 2.1 上电使能



步骤 1:上电使能

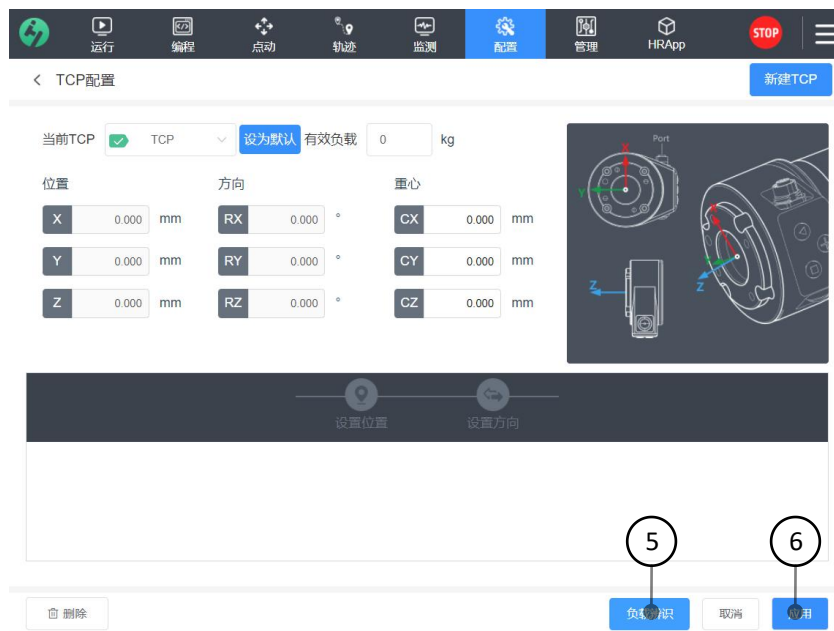


步骤 2:“使能”按钮变化成“去使能”



步骤 3: 点击“配置”

步骤 4: 点击“设置 TCP”

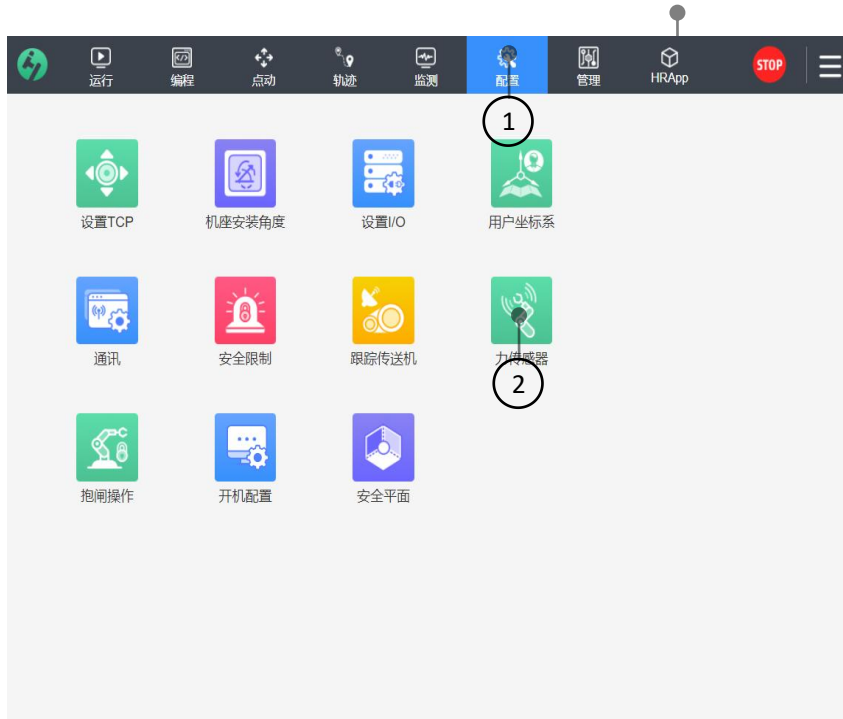


步骤 5: 点击“负载识别”, 点击后, 会有 3-5 分钟的负载辨识过程.

步骤 6: 识别成功后点击“应用”

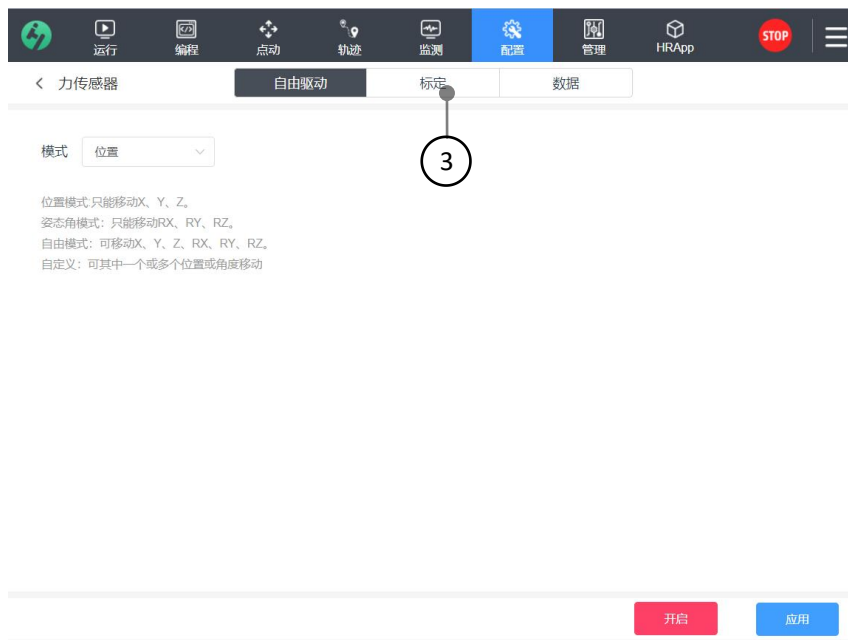
**特别注意: 负载识别过程会按照几条轨迹运行, 确保机器人周边无干扰物.**

### 3.力传感器标定

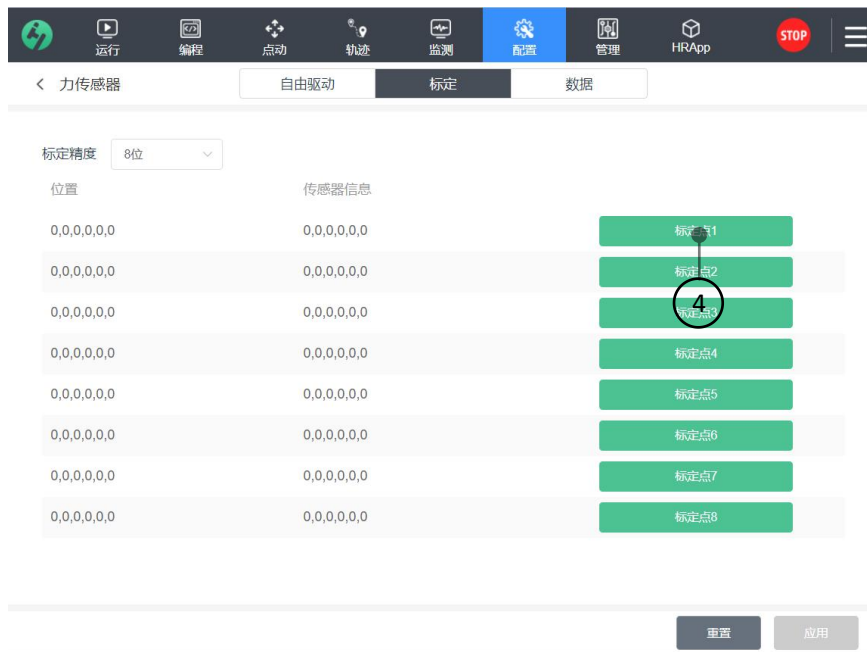


步骤 1:点击“配置”

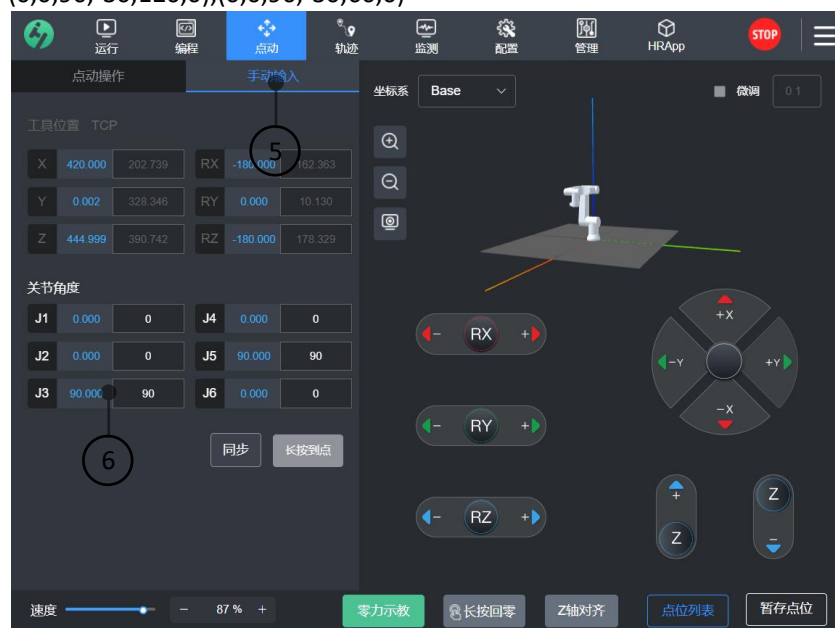
步骤 2:点击“力传感器”



步骤 3:点击标定,界面如下,设置机器人标定 8 个姿势点位,让力控在空间上受力均匀.



步骤 4: 点击“标定点 1”进行标定, 分别标定 8 个点位. 推荐点位 (0,0,90,0,90,0), (0,0,90,0,60,0), (0,0,90,0,120,0), (0,0,90,30,90,0), (0,0,90,30,60,0), (0,0,90,-30,90,0), (0,0,90,-30,120,0), (0,0,90,-30,60,0)

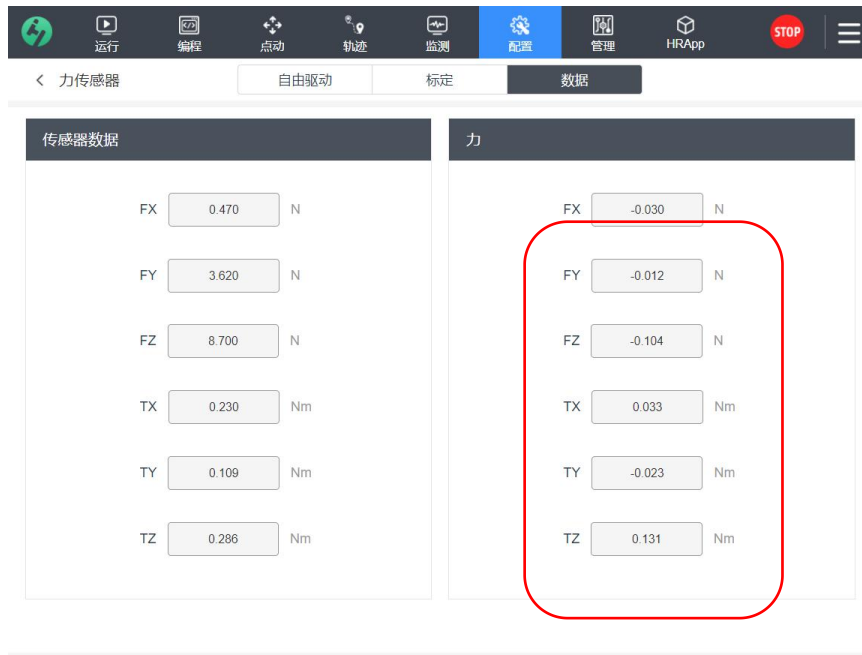


步骤 5: 点击“手动输入”。

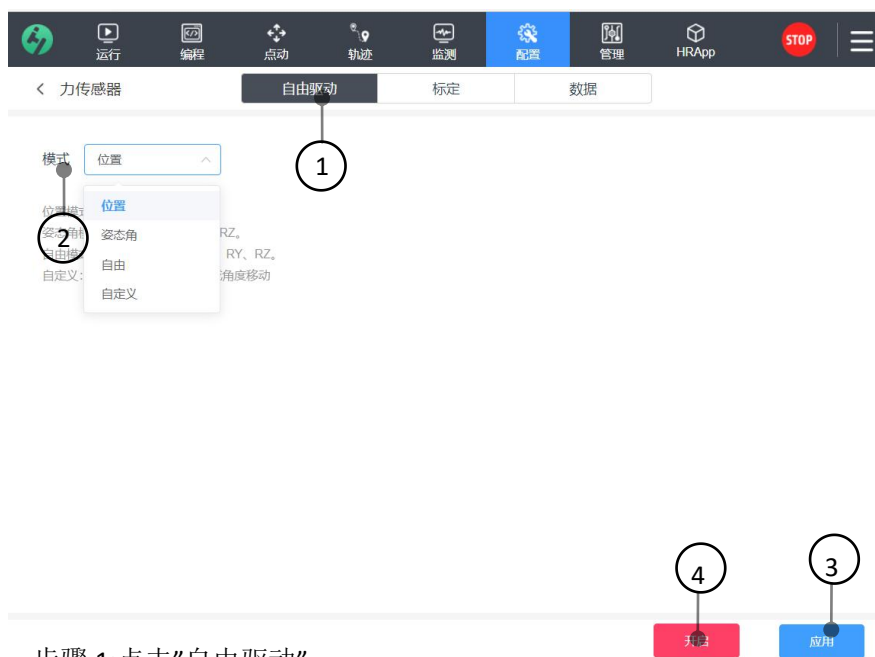
步骤 6: 点击“关节角度”输入上面的推荐点位。

标定成功后, 下图右半部分 6 个数值会在“0”附近晃动。





## 4.开启自由驱动功能



步骤 1: 点击“自由驱动”。

步骤 2: 点击“模式”, 选择所需求模式, 控制不同姿态。

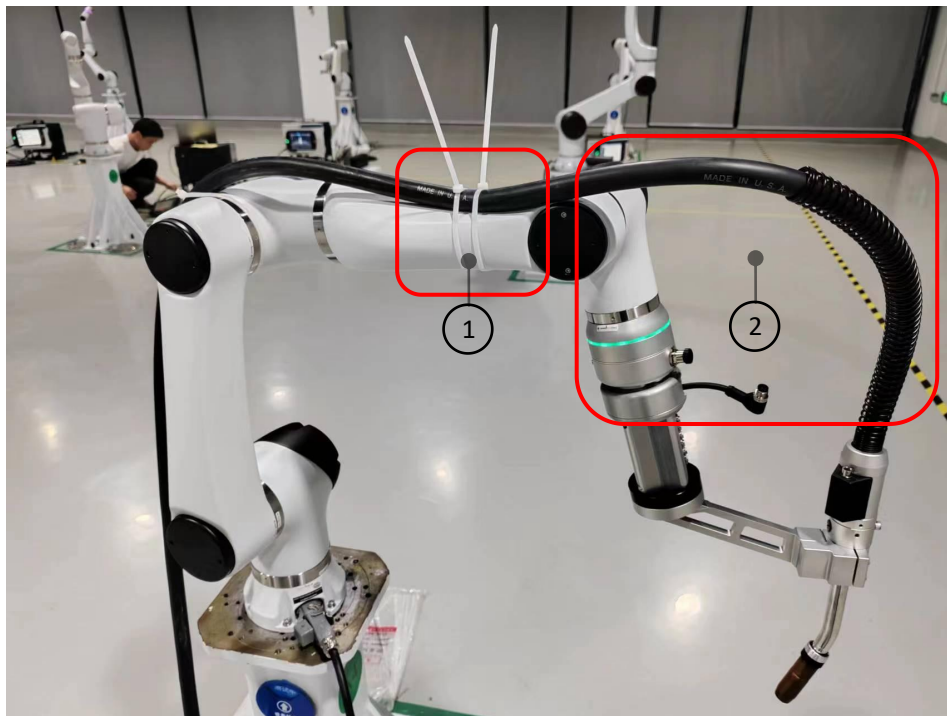
步骤 3: 点击“应用”。

步骤 4: 点击“开启”。

-end-

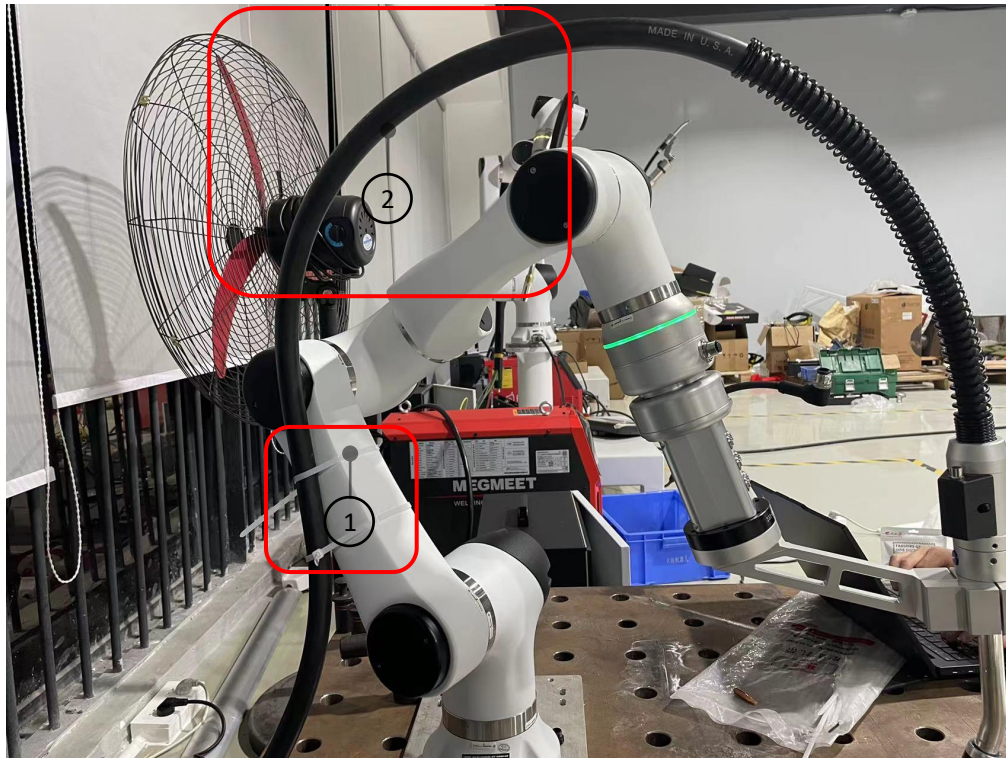
## 5.1 针对焊接机器人.

### 5.1.1.针对 5kg 及以上机器人装配方法.



针对 5kg 及以上焊接机器人搭配在①处要固定焊接枪管,以减少焊接枪的干扰.在②处要留出焊接枪余量,保证焊接时工作全覆盖.但是也不能太长,导致晃动厉害,增加力控干扰负担.

### 5.2 针对 3kg 机器人装配方法.



针对 3kg 小型焊接机器人搭配在①处要固定焊接枪管,以减少焊接枪的干扰.在②处要留出焊接枪余量,保证焊接时工作全覆盖.但是也不能太长,导致晃动厉害,增加力控干扰负担.且②处不可以固定.

装配一旦设计固定后,要用尼龙带或者其他固定方式固定,不可标定后晃动.

## 5.2 针对焊接机器人标定.

在标定前观察焊接机器人工作范围,以及焊接时焊枪在工作时给机器人造成的扭力动作.可将以上做为标定点.例:



标定时,在①范围内标定点.可更换机器人姿态,更换机器人位置,将焊接枪所造成的影响标定进入标定点内.即可.

## (附属焊接专属机器人不同型号参数)

(更改参数参照<工程文件\_20230413\_王艳明\_力控自由驱动参数调试>)

### 1. 3kg:

```
{
  "FTwrenchThresholds": {
    "ForceThreshold": "16",
    "TorqueThreshold": "3.5"
  },
  "FreeDriveMaxVelocity": {
    "MaxLinearVelocity": "220",
    "MaxAngularVelocity": "20"
  },
  "FreeDriveDampLimit": {
    "Max_X": "450",
    "Max_Y": "450",
    "Max_Z": "450",
    "Max_Rx": "40",
    "Max_Ry": "40",
    "Max_Rz": "30",
    "Min_X": "380",
    "Min_Y": "380",
    "Min_Z": "380",
    "Min_Rx": "25",
    "Min_Ry": "25",
    "Min_Rz": "13"
  },
  "FreeDriveMassAndDamp": {
    "Mass_X": "0.8",
    "Mass_Y": "0.8",
    "Mass_Z": "0.8",
    "Mass_Rx": "0.8",
    "Mass_Ry": "0.8",
    "Mass_Rz": "1.5",
    "Damp_X": "7",
    "Damp_Y": "7",
    "Damp_Z": "7",
    "Damp_Rx": "3",
    "Damp_Ry": "3",
    "Damp_Rz": "4"
  }
}
```



2. 5kg:

```

"FTWrenchThresholds": {
  "ForceThreshold": "16",
  "TorqueThreshold": "4",
},
"FreeDriveMaxVelocity": {
  "MaxLinearVelocity": "220",
  "MaxAngularVelocity": "20",
},
"FreeDriveDampLimit": {
  "Max_X": "400",
  "Max_Y": "400",
  "Max_Z": "400",
  "Max_Rx": "50",
  "Max_Ry": "50",
  "Max_Rz": "40",
  "Min_X": "350",
  "Min_Y": "350",
  "Min_Z": "350",
  "Min_Rx": "25",
  "Min_Ry": "25",
  "Min_Rz": "13",
},
"FreeDriveMassAndDamp": {
  "Mass_X": "0.8",
  "Mass_Y": "0.8",
  "Mass_Z": "0.8",
  "Mass_Rx": "0.8",
  "Mass_Ry": "0.8",
  "Mass_Rz": "1.5",
  "Damp_X": "4",
  "Damp_Y": "4",
  "Damp_Z": "4",
  "Damp_Rx": "3",
  "Damp_Ry": "3",
  "Damp_Rz": "6",
}

```

### 3. 8kg:

```

"FTWrenchThresholds": {
    "ForceThreshold": "16",
    "TorqueThreshold": "4",
},
"FreeDriveMaxVelocity": {
    "MaxLinearVelocity": "300",
    "MaxAngularVelocity": "20",
},
"FreeDriveDampLimit": {
    "Max_X": "400",
    "Max_Y": "400",
    "Max_Z": "400",
    "Max_Rx": "50",
    "Max_Ry": "50",
    "Max_Rz": "40",
    "Min_X": "250",
    "Min_Y": "250",
    "Min_Z": "250",
    "Min_Rx": "50",
    "Min_Ry": "50",
    "Min_Rz": "8",
},
"FreeDriveMassAndDamp": {
    "Mass_X": "0.8",
    "Mass_Y": "0.8",
    "Mass_Z": "0.8",
    "Mass_Rx": "0.8",
    "Mass_Ry": "0.8",
    "Mass_Rz": "1.2",
    "Damp_X": "7",
    "Damp_Y": "7",
    "Damp_Z": "7",
    "Damp_Rx": "7",
    "Damp_Ry": "7",
    "Damp_Rz": "4",
}

```

#### 4. 10kg

```

"FTWrenchThresholds": {
  "ForceThreshold": "16",
  "TorqueThreshold": "4",
},
"FreeDriveMaxVelocity": {
  "MaxLinearVelocity": "300",
  "MaxAngularVelocity": "20",
},
"FreeDriveDampLimit": {
  "Max_X": "400",
  "Max_Y": "400",
  "Max_Z": "400",
  "Max_Rx": "50",
  "Max_Ry": "50",
  "Max_Rz": "40",
  "Min_X": "350",
  "Min_Y": "350",
  "Min_Z": "350",
  "Min_Rx": "25",
  "Min_Ry": "25",
  "Min_Rz": "8",
},
"FreeDriveMassAndDamp": {
  "Mass_X": "0.8",
  "Mass_Y": "0.8",
  "Mass_Z": "0.8",
  "Mass_Rx": "0.8",
  "Mass_Ry": "0.8",
  "Mass_Rz": "4",
  "Damp_X": "7",
  "Damp_Y": "7",
  "Damp_Z": "7",
  "Damp_Rx": "3",
  "Damp_Ry": "3",
  "Damp_Rz": "6",
}

```