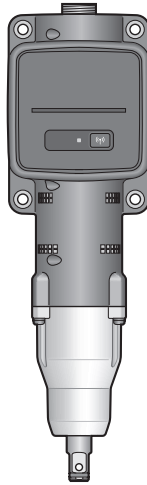


使用说明书
사용설명서
Operating Instructions

Panasonic®

机械脉冲拧紧单元
로보틱스 임팩트
Mechanical Pulse Endeffector

Model No.: EYFCA1WC



重要信息

使用本产品前，请认真阅读并遵守安全须知和使用说明书。
请在购买国以外控制使用无线功能。
否则会与各国的法令及规定等发生冲突。

중요

본 제품을 사용하기 전에 안전 및 사용설명서를 읽고 이를 준수하십시오.
제품을 구입한 국가 밖에서 무선 기능을 사용해서는 안 됩니다.
사용하면 현지 법률 및 규정을 위반할 수 있습니다.

IMPORTANT

Read and follow the safety and operating instructions before using this product.
Do not use the wireless function outside the country where you purchased the product.
Doing so may violate the local laws and regulations.



使用本产品前，请务必确认施工说明书。施工说明书请从以下网站下载。

본 제품을 사용하기 전에 설치설명서를 읽어 주십시오.
설치설명서는 웹사이트에서 다운로드할 수 있습니다.

Read the installation instructions before using this product.

The installation instructions are available for download from the website:

<https://panasonic.net/electricworks/ecm/powerelctrictools/download/>



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原版说明书:英文
原版说明书译本:其他语言

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红色字符表示使用说明书简版（印刷版）中未提及的内容。

安全注意事项

为了防止对人的危害和财产的损害，请必须遵守说明事项。

■针对错误使用时产生的危害和损害程度进行区分并说明。

 警告	可能造成死亡或重伤的内容。
 注意	注意可能造成轻伤或发生财产损失危险的内容。

■使用以下图片符号表示必须遵守的内容。（以下是图片符号的示例）

 绝对禁止的内容。
 必须执行的内容。

 警告	
 务必遵守	● 日常管理扭矩。 如不遵守，将会因扭矩变动而造成螺栓松动，引发事故。
	● 安装前确认机器人的可搬运重量。 否则可能会发生事故或故障。
	● 使用机器人动作时，使用协力模式。 否则可能会造成电源线或信号线损坏，工具主体发生故障，从而导致事故或故障。
	● 确认作业位置是否有电线管及自来水管、煤气管等埋设管线。 如果碰到埋设管线，可能会导致触电、漏电或煤气泄漏等事故。
	● 在声音嘈杂的作业环境中，要佩戴耳塞、帽扇（耳罩）等隔音防护用具。 如不遵守，可能会损伤听力。
	● 作业时要使用护目镜。此外，粉尘较多的作业要同时使用防尘口罩。 如不遵守，可能会损伤眼睛、喉咙。
	● 电源插头要切实插到底。 如未插到底，可能会因触电或发热而引起火灾。 请勿使用损伤的插头、松动的插座。

安全注意事项

警告



务必遵守

- **定期清除电源插头上的灰尘等。**
如果插头上积有灰尘等，就会因受潮等而造成绝缘不良，继而引发火灾。
请拔出电源插头，用干布擦拭。
- **使用指定的配件或附件。**
如不遵守，可能会造成人员受伤。
- **作业场所要足够明亮。**
昏暗会使视线变差，从而导致事故或人员受伤。
- **尖头工具（套筒、延长杆等）请务必使用动力工具。**
如使用手动工具用的尖头工具，可能造成破损、碎片飞溅等事故，因此本机中使用的尖头工具请务必使用动力工具。
- **请勿疏于尖头工具等的检查。**
尖头工具、本机的尖头工具插入部要始终检查有无磨损、损伤，如果需要，请更换或委托维修。特别是套筒和本机的套筒插入部晃动较大的，有可能会破损而造成人员受伤，因此切勿使用。
- **加工物要牢固固定。**
否则可能会发生意外移动，导致人员受伤。
使用夹钳或虎钳等固定，确保安全。
- **使用过程中，如果主体使用状况变差，或发出异音，请立即关闭触发器，关闭电源开关，停止使用。**
请咨询您所购买的销售店或 Panasonic 客户咨询中心。如果继续使用，将导致人员受伤。
- **请按照使用说明书牢固安装尖头工具类及配件。**
如未安装牢固，可能会因脱落而导致人员受伤。
- **拆除用于调节的键及扳手等工具类后再使用。**
如不遵守，可能会因意外脱落而导致人员受伤。
- **穿着整洁的衣物进行作业。**
 - 请勿穿着宽松的衣物及佩戴项链等饰品，否则可能会被卷入旋转部。
 - 请用帽子或发套等将长发包住。

安全注意事项

警告



- 切勿堵住主体的排气孔。
否则可能造成烫伤或因异常发热而着火。
- 切勿令主体排气孔吹出的热风直接对着皮肤。
- 作业刚结束后，切勿触摸套筒等尖头工具及螺丝、切屑。
否则会因高温而烫伤。
- 请勿用于非指定用途。
否则可能会造成人员受伤。
- 请勿将 LED 照明灯作为手电筒使用。
由于不能保证足够的亮度，如果使用该灯在阴暗处移动，可能会造成事故。
- 切勿将 LED 照明灯的光直接照射眼睛。
如果 LED 照明灯的光持续照射眼睛，会使眼睛受伤。
- 主体沾有油等异物时，请勿使用。
否则，主体可能会掉落从而引发事故。
此外，如果油等异物进入主体内部，可能会导致发热、起火、破裂。
- 使用过程中，身体或身体部位请勿靠近旋转部及切屑。
否则，可能会意外碰到脱落或破损的旋转部及切屑，从而造成人员受伤。请定期更换尖头工具。
- 请勿用于在金属上开孔。
由于扭矩较高，可能会造成金工钻头的钻尖缺损，导致人员受伤。
- 请勿在周边有石棉的环境下（包括清除作业）使用。
否则可能会损害健康。
石棉是一种会严重危害人体健康的物质，例如会导致肺癌等，请充分注意。
- 这是机器人用工具，请勿作为手动工具使用。
否则可能会导致人员受伤。

安全注意事项

 警告	
 禁止	● 不使用时，将电源插头从插座中拔出。 如不遵守，将会因绝缘老化而导致触电或漏电起火。
 禁止拆解	● 不得改装。且不可拆解或维修。 否则可能会引起火灾、触电、人员受伤。 维修事宜请咨询您所购买的销售店或本公司咨询窗口。
 禁止淋水	请勿进行以下操作。 ● 请勿在淋雨或潮湿场所使用或放置。 ● 使用时不要浸入水中。 否则可能会出现冒烟、起火、破裂。
 禁止湿手	● 请勿用湿手从插座中插拔电源插头。 否则可能会触电。

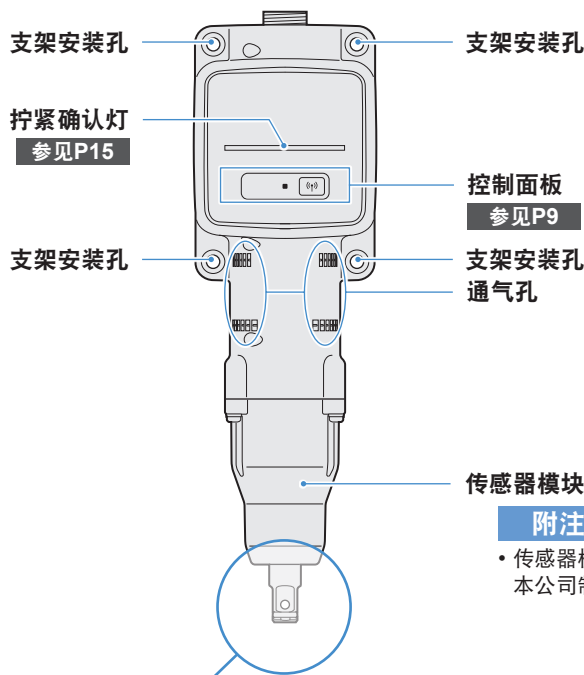
安全注意事项

 注意	
 禁止	● 请勿放置在儿童可以触及的场所。 否则可能会引发事故或故障。
	● 请勿将主体存放在温度为 50 ℃ 以上的场所。 否则可能导致动作异常。
	● 请勿在电机锁定时强行使用。 否则可能会出现冒烟、起火。 请用与性能适配的速度作业，以便安全高效地进行作业。
	● 疲劳时请勿使用。 否则可能会引发事故或人员受伤。
	● 请勿让儿童等非作业人员靠近车间或触碰工具。 否则可能会导致人员受伤。
 务必遵守	● 主体发烫时，应中断作业，待温度下降后再使用。 如不遵守，可能会造成烫伤。
	● 拔出电源插头时，请务必握住电源插头拔出，而不是拉扯电源线。 如果拉扯电源线拔出，将会导致触电、短路。
	● 使用前，请确认主体、尖头工具和其他零件有无损伤，是否能正常运转。 ● 使用前应确认工具主体有无损伤、开裂等。 如不遵守，可能会因破损等而造成人员受伤。
	● 请保持作业场所干净整齐。 场所和作业台散乱会引发事故。
	● 充分注意操作、作业方法及周围状况等，以常识进行作业。 如不遵守，可能会引发事故或导致人员受伤。

功能描述

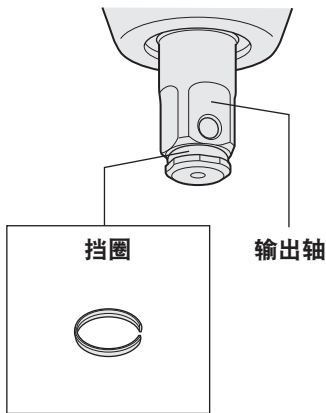
工具

■ 前面



附注

- 传感器模块下部的二维码为本公司制造识别标志。



伸缩套筒

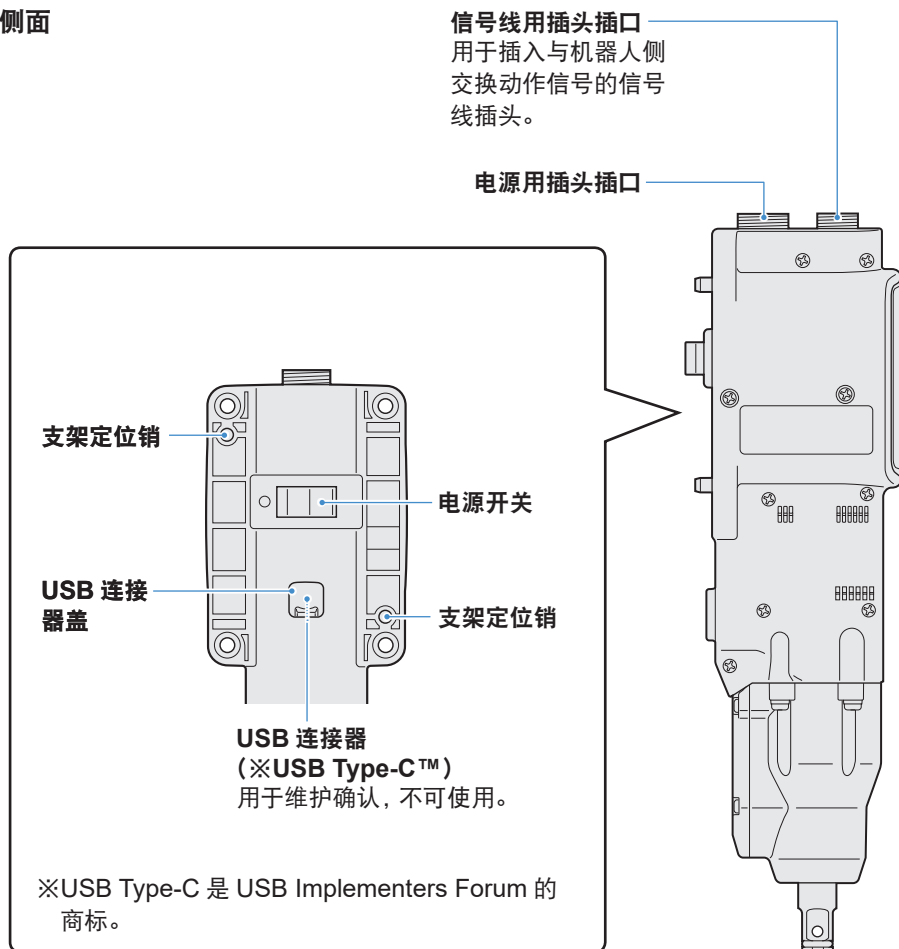
请安装附带的伸缩套筒，以缓解对机器人的冲击以及确保紧固扭矩精度。

※ 伸缩套筒的更换基准

请以紧固次数 25 万次为基准更换。根据使用环境不同，可能会在更短的时间内消耗、劣化。请定期进行检查。

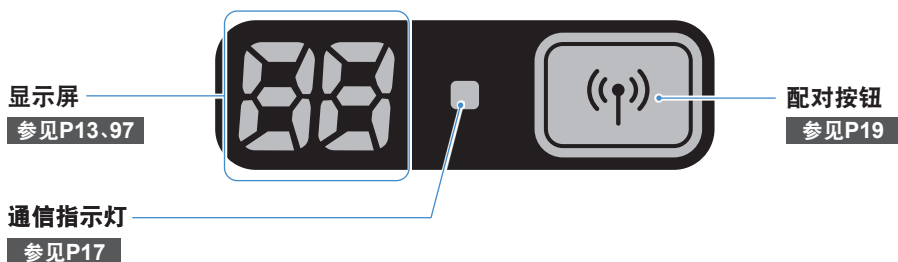
功能描述

■ 侧面



■ 控制面板

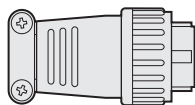
参见P8



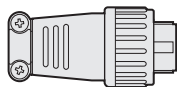
功能描述

附带品和另售件

电源线插头 (WEYFCA1WF711)



信号线插头 (WEYFCA1WF721)



伸缩套筒 (WEYFCA1WF701)



※ 附带品和另售件的详情请确认施工说明书。

※ 可作为维修零件购买。

开始使用前

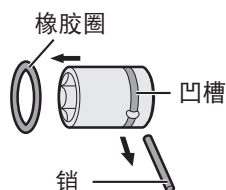
安装和使用场所

请在满足以下条件的场所使用本产品。

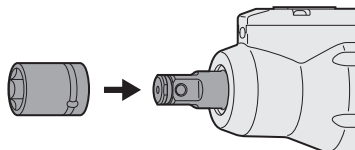
- (1) 室内
- (2) 无直射阳光、水滴或淋雨的场所
- (3) 无腐蚀性气体或易燃气体的场所
- (4) 无油雾、尘埃、水、盐分、铁粉、有机溶剂的场所
- (5) 环境温度：0℃～40℃

套筒的连接

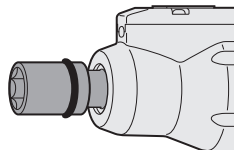
1 取下套筒上的橡胶圈和销。



2 将套筒插入工具。
对准其孔位。



3 按步骤 1 的相反顺序安装销和橡胶圈。
务必装好橡胶圈，使销不会露出。



- 挡圈（C 形环）用于临时固定。务必使用销和橡胶圈固定套筒。
- 如果使用的套筒磨损或变形，挡圈（C 形环）类型的铁砧无法插入。

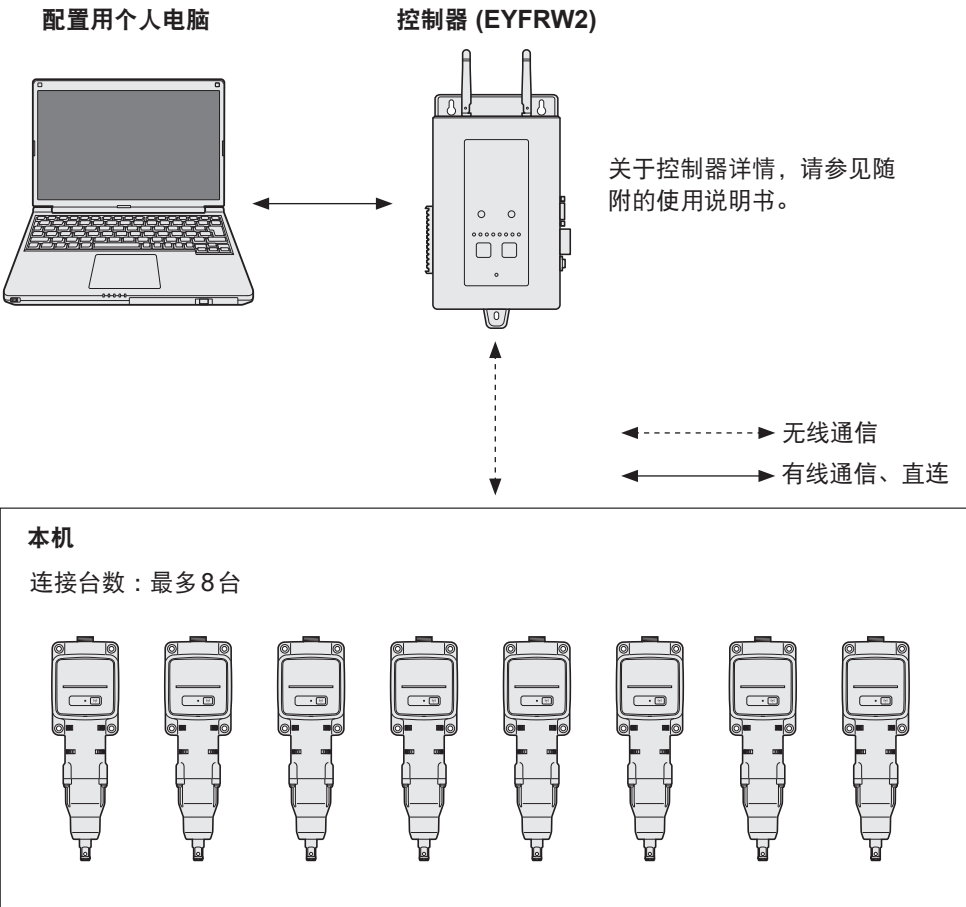
接线图

如以下连接图所示，工具可连接外部设备使用。

运行环境

支持操作系统	Windows 10 以上（支持以下浏览器的操作系统）
Web浏览	Microsoft Edge 版本 102 以上 或 Google Chrome 版本 102 以上

连接示例



※USB Type-C是USB Implementers Forum的商标。

基本操作

工具的基本操作模式

工具按以下模式之一操作。
控制面板上将显示工具当前使用的操作模式。



显示	模式名称	模式详情
	Wireless Communication Mode	通过无线通信控制工具操作的模式。 工具与控制器通讯，发送历史日志数据并接收配置参数。
	Operation Disable Mode	Wireless communication mode 下，工具已被控制器发出的禁止操作信号锁定。其将通过控制器发出的释放信号解锁。
	Pairing Mode	检查配对状态的模式。 也可在控制器上完成。 参见P19
	Minimum Output Mode	当目标扭矩较低时检查扭矩控制是否有效的模式。工具在最小脉冲数量上关闭。
	Offset Mode	根据实际扭矩校正工具的计算扭矩的模式。 参见P42
	Factory Default Mode	工具处于出厂默认状态的模式。 参见P27

基本操作

扭矩控制功能

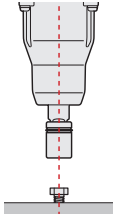
作业目标的拧紧扭矩通过工具的扭矩传感器计算。
当计算的扭矩值达到预设目标值时，工具应自动停止（关闭）。
(关于 Shut-Off Torque 的设置方法，请 **参见P49**)

⚠ 警告

完成扭矩性能的日常管理。
否则，螺栓可能因扭矩变化而松动，造成事故。

注意

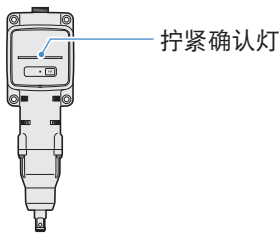
- 作业时，如果中途负载高于目标扭矩，螺栓可能无法拧紧，原因是中途负载被判定为目标扭矩。
- 作业时，如果构件各不相同，就算按相同的设置扭矩操作，拧紧扭矩也有可能不同。
- 同一螺栓如拧紧两次，可能导致过拧，造成螺栓断裂或栓接构件变形。
- 拧紧扭矩因作业条件不同而异。请在实际作业时调整拧紧扭矩。
- 螺栓拧紧扭矩可能受下列因素影响而异。

螺栓	螺栓直径（一般而言，拧紧扭矩随直径增大而增大），扭矩系数（由螺栓厂家给出）、等级、长度、是否使用垫圈和垫圈类型等
套筒	长度、材质、劣化程度、万向节的使用、套筒接头的使用、延长套筒的使用等
待拧紧构件的情况	材质、轴承表面处理等
作业方法	工具放上螺栓的方式、保持工具的力度、工具与螺栓轴心的对准等（以下插图） 

基本操作

拧紧确认灯

可通过观察工具上的 LED 指示灯检查拧紧结果。



指示灯显示

指示灯显示		显示含义	详情
绿色	点亮2秒 + 蜂鸣器（视具体 设置而定）	作业正常	拧紧作业成功达到设置的关闭扭矩。
红色	点亮2秒 + 蜂鸣器（视具体 设置而定）	作业不正常	拧紧作业未达到设置的关闭扭矩。 参见P99
		工具出错	如果控制面板显示屏上显示任何错误， 请根据错误描述采取对应措施。 参见P97
红色	常亮 + 蜂鸣器	电机高温	可能是电机发热。
		扭矩传感器异常 扭矩传感器保护	检测到扭矩传感器存在异常。
		维护间隔报警锁 定模式	工具因达到 [Maintenance Interval Alarm] 中设置的维护时间而被锁定。 还要检查设定值（1~99）和“0”在控 制面板显示屏上交替显示。 参见P25

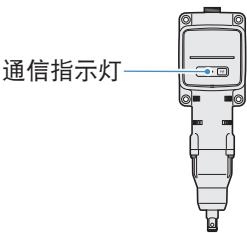
拧紧确认灯

指示灯显示		显示含义	详情
黄色	闪烁 (每秒1次) + 蜂鸣器	通信错误	无法与控制器进行通信。
		参数错误	检测到非法参数。
		存储器错误	存储器容量达到上限。
		电压不足	检测到输入电压比规定值低。
		过电压	检测到输入电压比规定值高。
		超时错误	连续动作5分钟以上。
		紧急停止错误	控制器发出了紧急停止指令。 (根据设置)

基本操作

通信指示灯

可通过观察工具上的 LED 指示灯检查通信状态。



指示灯显示

指示灯显示		显示含义	详情
蓝色	快速闪烁 (每 0.2 秒 1 次)	正在通信	正在与控制器通信。
蓝色	快速闪烁 (每 0.2 秒 1 次)	配对中	配对进行时，通信指示灯快速闪烁。
蓝色	缓慢闪烁 (每秒 1 次)	正在重新连接	重新连接时，通信指示灯缓慢闪烁。
蓝色	闪烁 (每 0.2 秒 1 次) + 蜂鸣器	配对完成	配对完成后，通信指示灯开始缓慢闪烁 (每 0.5 秒 1 次)。 配对完成后，工具根据控制器发出的指令进入“等待无线信号”或“无线操作禁止”状态。
蓝色	缓慢闪烁 (每秒 1 次)	等待无线信号	具处于无线通信模式时，通信指示灯缓慢闪烁。
—	熄灭	无线操作禁止	工具操作被来自控制器的禁止操作信号禁用。

基本操作

与控制器配对

启动配对

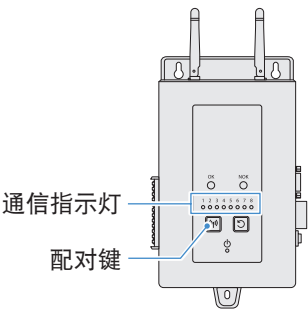
使用控制器 (EYFRW2) 上的配对键。

选择编号未注册的通信指示灯 (灯灭) 并按下配对键，进入配对模式。

在时长两分钟的配对模式期间，处于覆盖范围内的工具上开启配对模式，自动建立配对。

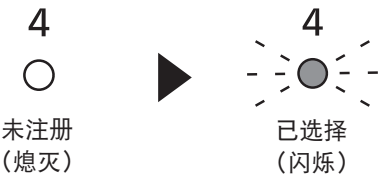
如果未在该时间内建立配对，配对模式将终止。

※ 尝试开始配对后，须等待片刻，控制器才能进入配对模式。

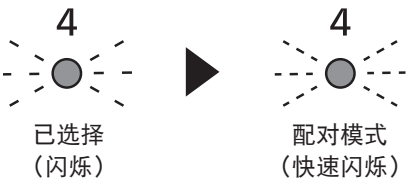


■ 注册工具 No. 4

1 按控制器上的配对键 4 次，选择工具 No. 4。
通信指示灯 No. 4 闪烁。



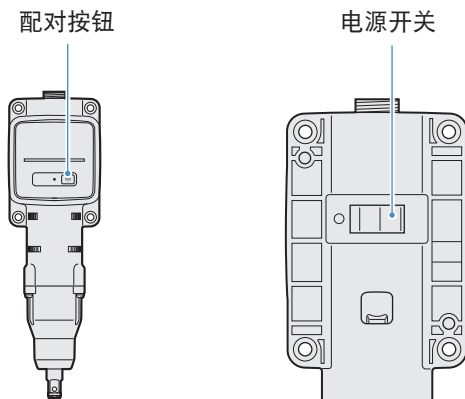
2 选择 No. 4 时，按下控制器上的配对键，进入工具 No. 4 的配对模式。
配对模式中，通信指示灯 No. 4 开始快速闪烁。



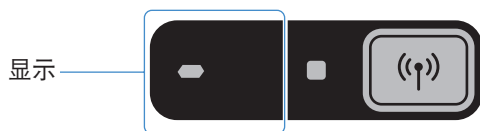
基本操作

与控制器配对

- 3** 按住工具（本机）上的配对按钮，打开电源开关。
工具进入配对模式。



工具进入配对模式时，控制面板上的显示屏指示配对模式。



无线通信自动建立，配对注册完成。

配对注册完成时，控制器上的通信指示灯 No.4 常亮。

※ 如果配对失败，请在控制器上取消配对，然后尝试重新配对。



附注

- 除了使用控制器上的配对键之外，您还可以通过在设置屏幕中进行设置来启动配对。
- 关于如何在设置屏幕上启动配对以及控制器的操作详情，请参见随控制器提供的使用说明书。

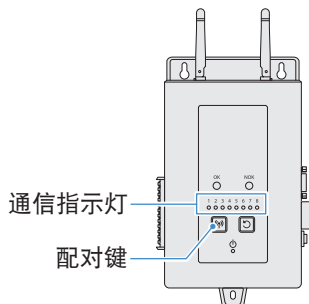
基本操作

与控制器配对

取消配对

使用控制器 (EYFRW2) 上的配对键。

选择想要取消注册的工具编号的通信指示灯 (灯亮) 并按下配对键, 取消配对注册。



■ 取消工具 No. 4

1 按控制器上的配对键4次, 选择工具 No. 4。

通信指示灯 No.4 闪烁。



2 选择 No.4 时, 按下控制器上的配对键, 取消工具 No.4 的配对注册。

配对取消时, 通信指示灯 No.4 停止闪烁并熄灭。



附注

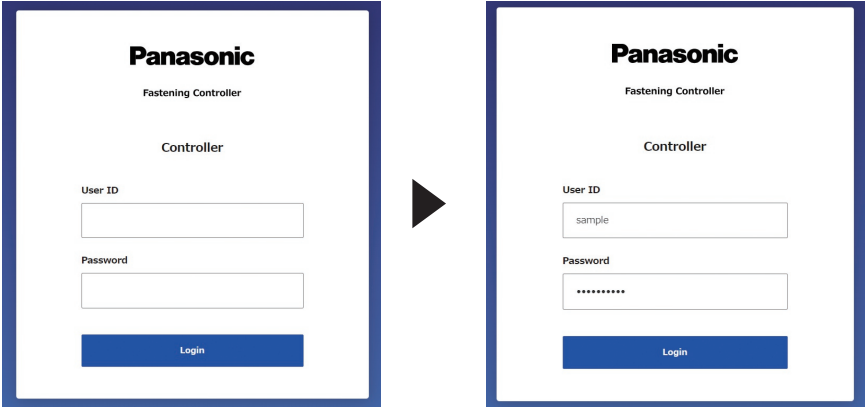
- 除了使用控制器上的配对键之外, 您还可以通过在设置屏幕中进行设置来取消配对。
- 关于如何在设置屏幕上取消配对以及控制器操作的详情, 请参见随控制器提供的使用说明书。

在 Web 浏览器中设置

显示设置画面

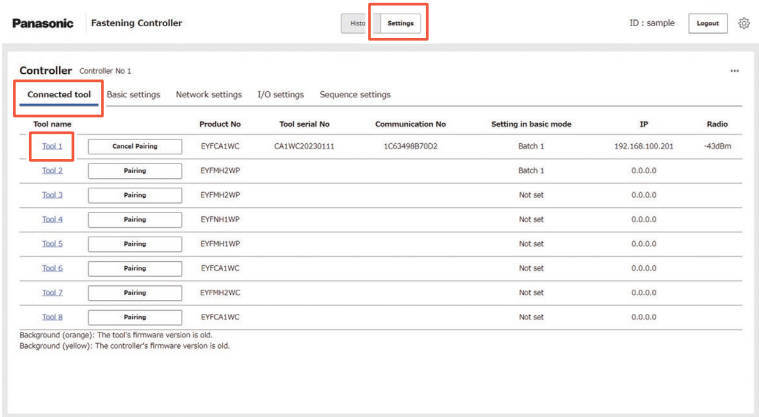
1 显示 Home 画面

请参见控制器 (EYFRW2) 使用说明书中“使用前的准备”内的“显示设置画面”～“经由网络的连接方法”后，在 Web 浏览器中设置后，显示 Home 画面。



2 显示工具画面

- ① 单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Connected tool”选项卡。
- ② 在“Connected tool”画面中单击对象工具 No.。
显示工具 No. 画面。



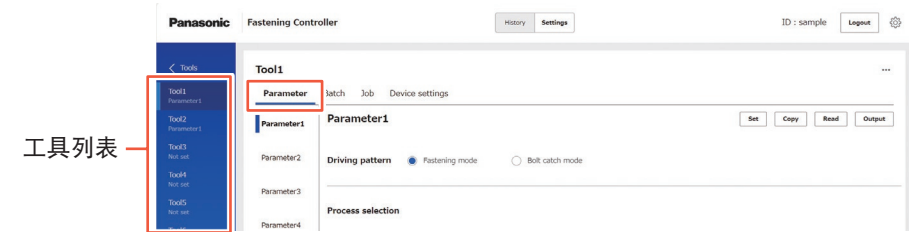
在 Web 浏览器中设置

显示设置画面

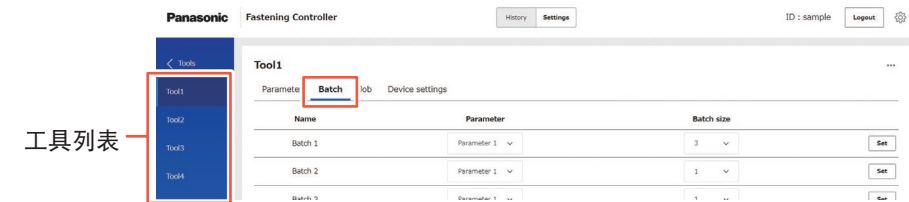
3 显示设置画面

可从工具 No. 画面的“Parameter”“Batch”“Job”“Device settings”选项卡进行参数设置、批处理设置、任务设置及工具的基本设置。
※ 切换工具时，也可以从工具列表选择。

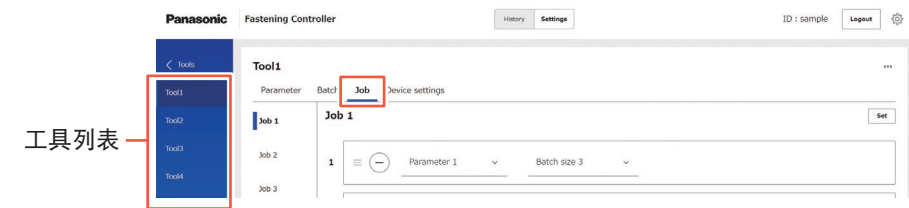
参数设置 参见P28



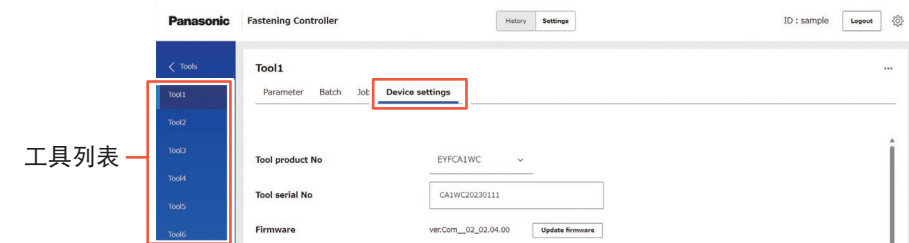
批处理设置 参见P73



任务设置 参见P74



工具设置 参见P23



设置工具

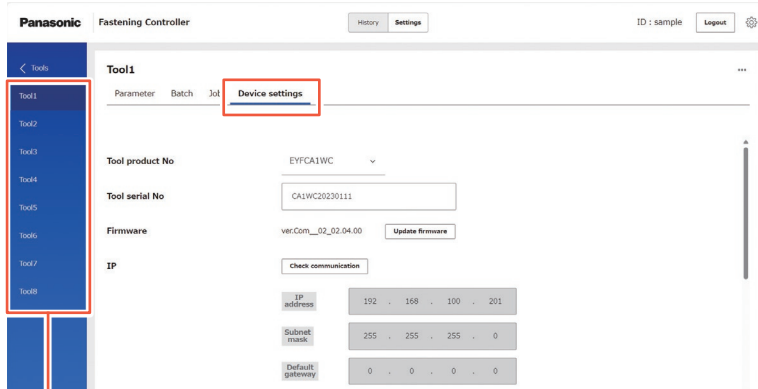
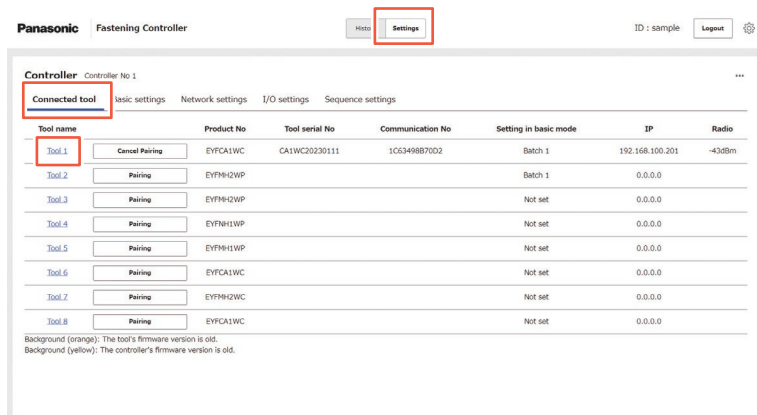
工具设置画面的显示

单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Connected tool”选项卡。

在“Connected tool”画面中单击对象工具 No.。

可以从工具 No. 画面的“Device settings”选项卡选择工具的基本设置及通用参数的设置。

※ 切换工具时，也可以从工具列表选择。



工具列表

设置工具

工具设置项目一览

Tool product No

选择工具型号。

[默认值] 未选择

[设置范围] 下拉选择

※ 先进行配对时自动选择。

※ 配对后不可更改型号。请先解除配对后再重新设置。

Tool serial No

显示 / 设置工具的个体识别信息。

[默认值] 型号识别5位 + 制造编号8位 (制造年份2位 + 月份2位 + 生产批次4位)

[设置范围] 13 ~ 16个英文数字字符

※ 如果更改，可能无法正确识别机型。

从管理规定上来讲，如非必要，使用时请勿更改。

Firmware

显示控制器 (EYFRW2) 的工具通信部固件版本。

单击 [Update firmware]，可更新固件。

更新步骤请参见控制器使用说明书中的“更新固件”。

Tool's clock

显示工具的时间。单击 [Adjust to controller] 可同步时间。

Timing to send waveform data

可以选择按每个作业发送或不发送波形数据。

[默认值] OFF

[设置范围] OFF、每个作业

工具设置项目一览

Maintenance Interval Alarm (Pulse Time)
[功能概述] 该报警计数自工具开始使用起的累积脉冲时间，用于提醒用户维护时间。 当到达设置时间之前仅剩不到 1 小时时，控制面板显示屏将向用户发出警告。 如果到达设置时间，控制面板显示屏将提醒用户，工具电机将被锁定（停止）。 工具初始化将使累积脉冲时间复位并同时解锁工具电机。 注意 工具初始化时，其他参数也将恢复为出厂默认值。 如果要初始化工具，务必在下次使用前重新配置参数。 警告显示（每 0.5 秒变化一次）：设定值（1~99）→ -1 → 操作模式（A 或 C） 停止显示（每 0.5 秒变化一次）：设定值（1~99）→ 0
[默认值] *0 小时
[设定值] *0~99 小时

输入带（*）的值将禁用此功能。

设置工具

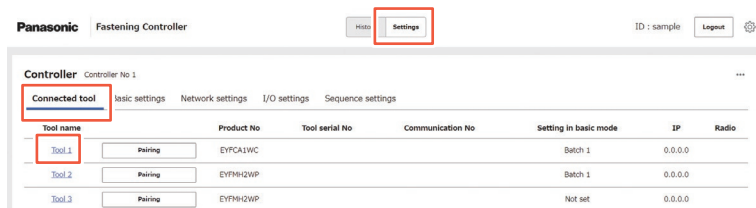
删除注册信息

停止使用该 No. 的工具时，或在配对使用其他型号的工具时，请删除注册信息。
※ 请解除配对后再进行。

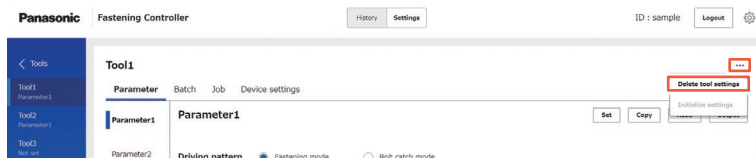
1 单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Connected tool”选项卡

显示“Connected tool”画面。

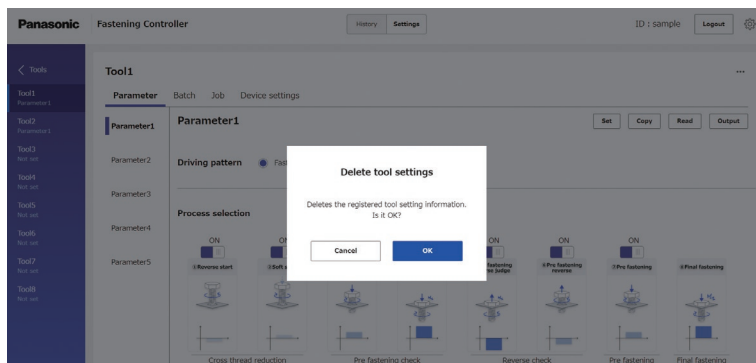
2 在“Connected tool”画面中单击对象工具 No.
显示工具 No. 画面。



3 从 ...（工具选项键）单击 [Delete tool settings]
显示“Delete tool settings”画面。



4 在“Delete tool settings”画面中单击 [OK]



设置工具

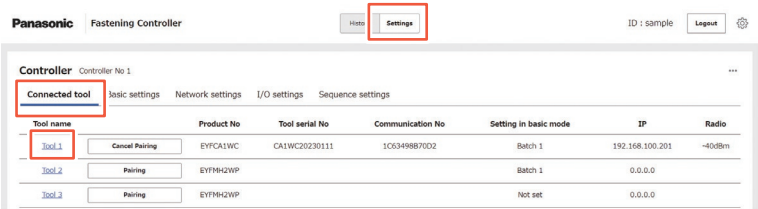
复位到出厂状态

可将工具的设置复位到出厂状态。
※ 复位后解除配对。

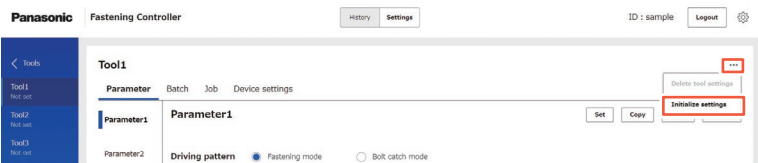
1 单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Connected tool”选项卡

显示“Connected tool”画面。

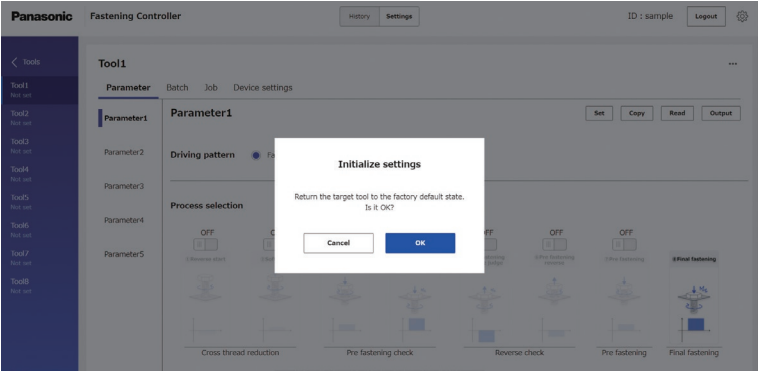
2 在“Connected tool”画面中单击对象工具 No.
显示工具 No. 画面。



3 从 ...（工具选项键）单击 [Initialize settings]
显示“Initialize settings”画面。

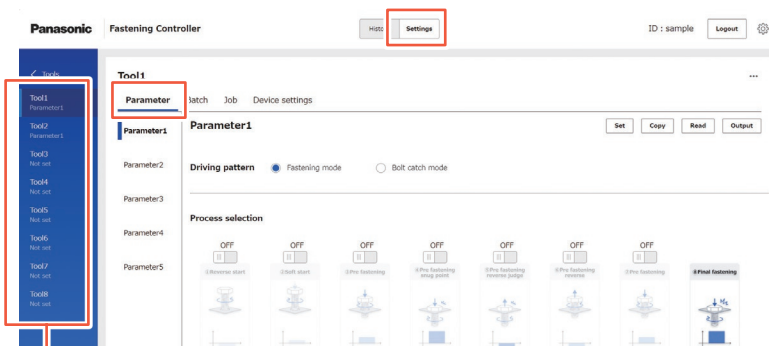


4 在“Initialize settings”画面中单击 [OK]



参数设置画面的显示

※ 切换工具时，也可从工具列表选择。



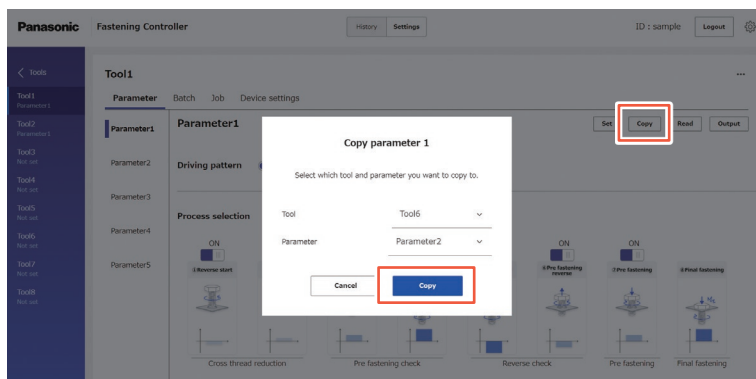
CN

设置紧固参数

复制参数

要根据已创建完成的参数创建新参数时，或者要在其他工具中使用同一参数时，可进行复制。从工具 NO. 画面的“Parameter”选项卡单击 [Copy] 后，会显示参数的复制画面，请选择复制路径，并单击参数复制画面中的 [Copy]。

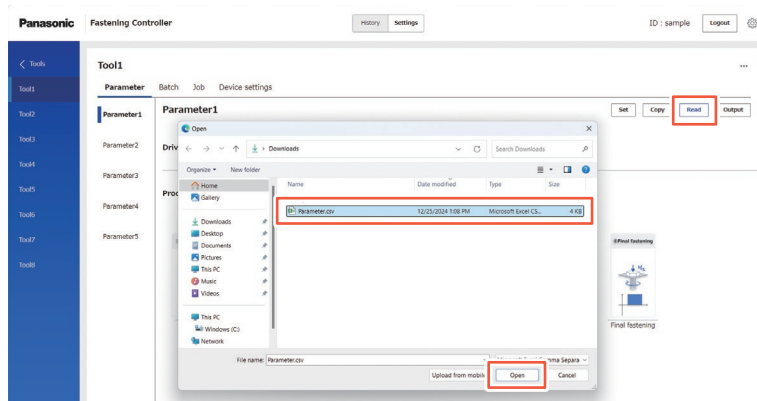
仅限相同型号的工具之间可以复制参数。



设置紧固参数

读取参数

可以将保存在设置用计算机中的参数文件读取到控制器进行注册。
请从工具 NO. 画面的“Parameter”选项卡单击 [Read]，打开参数文件。



设置紧固参数

输出参数

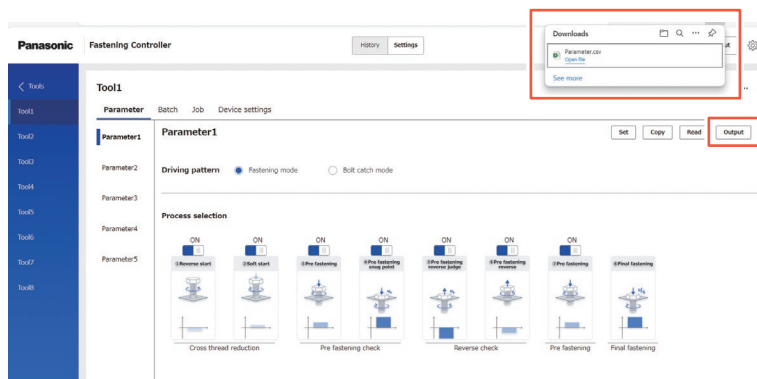
可将创建的参数输出到设置用计算机。

请用于备份用途或复制到其他控制器、移到其他设置用计算机等。

请从工具 NO. 画面的“Parameter”选项卡单击 [Output]，保存参数文件。

请勿对输出的参数文件进行编辑。

否则可能无法正常读取。



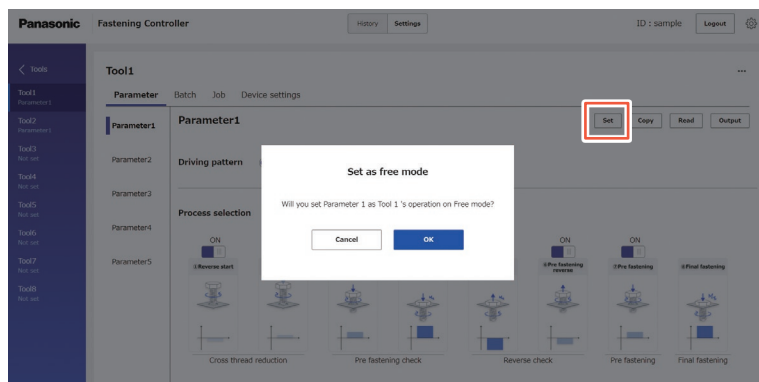
设置紧固参数

注册参数

利用控制器的动作模式“Free mode”进行控制时，进行注册以指定在工具中使用的参数。
※ 如果是“Repeat mode”、“External control mode”，则没有影响。

（有关“Free mode”、“Repeat mode”、“External control mode”的详细内容，请确认“设置控制器的动作模式”**参见P68**）

请从工具 NO. 画面的“Parameter”选项卡单击 [Set]。



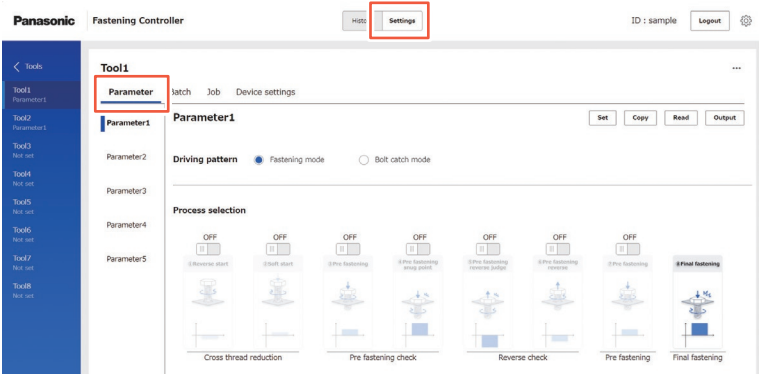
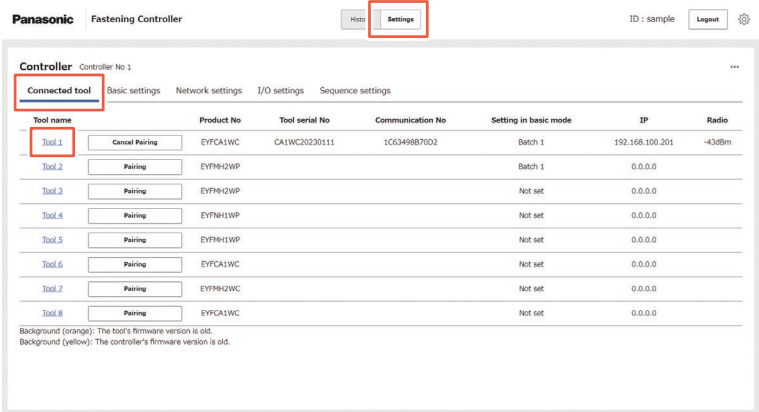
设置紧固参数

设置基本参数

单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Connected tool”选项卡。

在“Connected tool”画面中单击对象工具 No.。

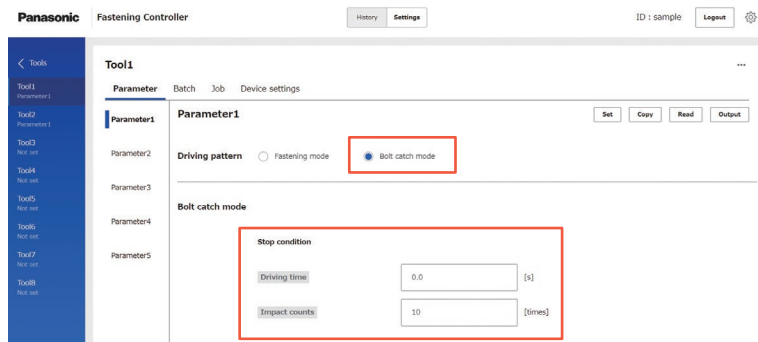
可从工具 NO. 画面中的“Parameter”选项卡进行设置。



设置紧固参数

套筒插入模式的设置

“Bolt catch mode”是一种通过低速驱动工具，使紧固用螺栓顺利插入套筒的模式。在驱动模式中选择“Bolt catch mode”后，可从显示的输入画面中设置“Stop condition”。



注意

- 本模式的设置将紧固模式各工序的设置作为专用设置模式动作。在本模式下设置的内容与紧固模式的设置联动，设置时请注意。
- 动作时间、停止条件均无效时，工具不会驱动。
- 以本模式作业时的结果履历不会被记录到控制器、工具主体中，也不会通知连接到控制器的外部设备等。
- 虽然也可将本模式登录到批处理设置，但不会因本模式的作业而产生进度变化，请注意。
- 本模式下的转速设置不可更改。
- 本模式下的最大动作时间为6秒。在未设置动作时间等情况下，以该时间停止动作。

设置紧固参数

套筒插入模式的设置

● 停止条件

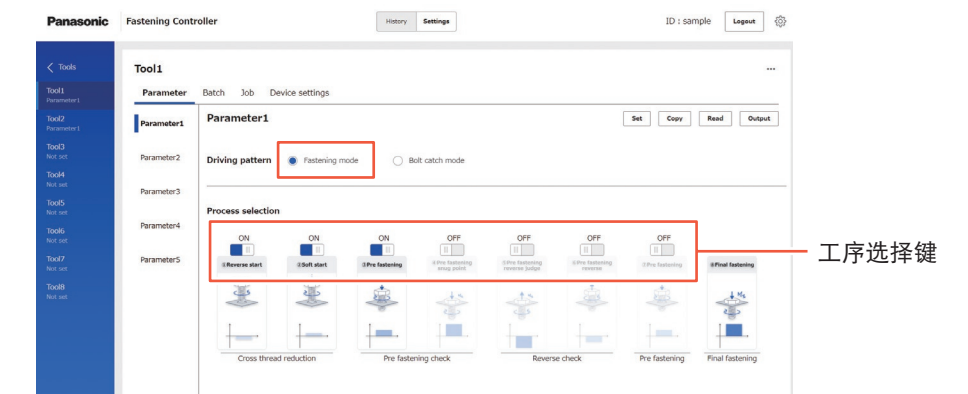
Driving time
[功能概要] 可设置在套筒插入模式下动作的时间。
[默认值] *0 s
[设置范围] *0.0 s ~ 5 s
Impact counts
[功能概要] 可设置在以套筒插入模式进行脉冲时停止的脉冲次数。
[默认值] *0 times
[设置范围] *0 ~ 20 times

输入带 (*) 的值将禁用此功能。

设置紧固参数

紧固模式的设置

“Fastening mode”是一种可通过设置暂时紧固确认、松动确认来抑制螺栓卡阻的模式。在驱动模式中选择“Fastening mode”后，即会显示输入画面。可使用工序选择键的 ON/OFF 切换工序。



工序一览

① Reverse start
[功能概要] 通过在螺栓进入时使其反转，减少螺牙的咬入。
② Soft start
[功能概要] 通过在螺栓进入时使其低速旋转，减少螺牙的咬入。
③ , ⑦ Pre fastening
[功能概要] 如果螺栓在到达拧紧点前的自由紧固期间咬入，则可按设置的脉冲次数检测咬入。

设置紧固参数

紧固模式的设置

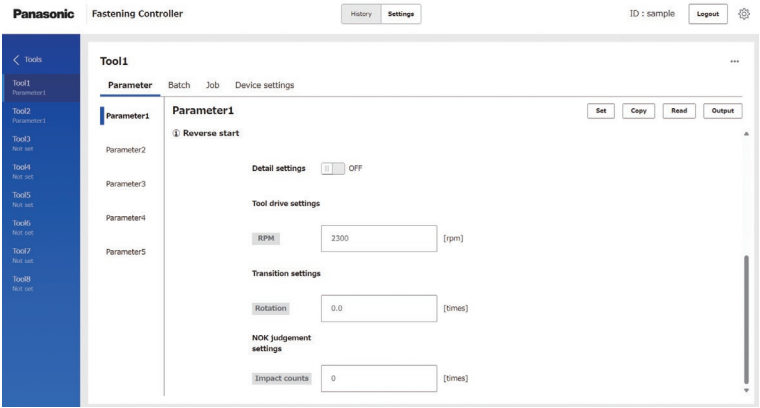
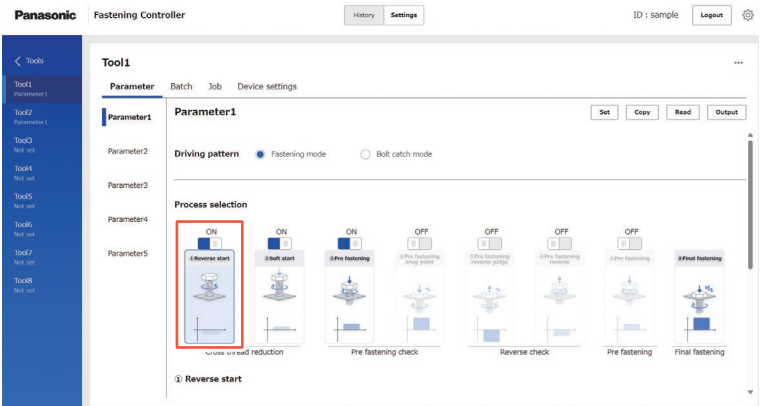
④ Pre fastening snug point
[功能概要] 当检测到伴有设置脉冲次数的作业时，视为已到达拧紧点，进入下一工序。
⑤ Pre fastening reverse judge
[功能概要] 如果从拧紧状态松开时脉冲持续高于设置值，视为已检测到螺栓咬入。
⑥ Pre fastening reverse
[功能概要] 如果松开时脉冲持续高于设置值，视为已检测到螺栓咬入。
⑧ Final fastening
[功能概要] 紧固至目标扭矩。

设置紧固参数

紧固模式的设置

工序设置

单击将工序选择键设为 ON 的工序图像，可显示工序设置画面。
可进行工具的驱动设置以及设置进入下一工序的判定条件。

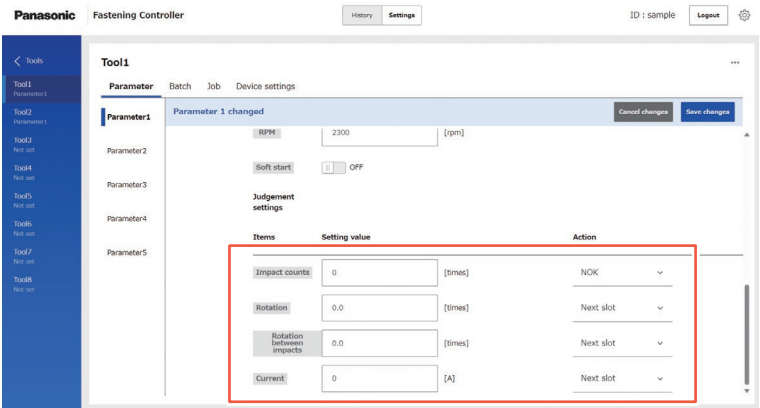
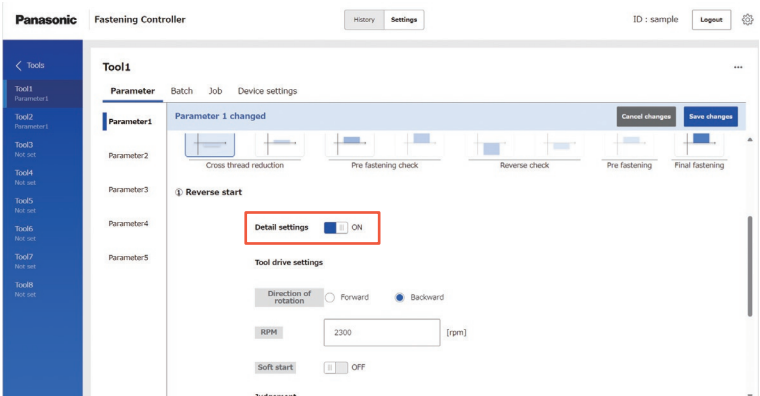


设置紧固参数

紧固模式的设置

■ 工序的详细设置

打开工序设置画面中的“Detail settings”，可以进行详细的驱动设置和设置进入下一工序的判定条件。



设置紧固参数

紧固模式的设置

● 工具驱动设置

Direction of rotation
[功能概要] 可以设置紧固方向。
[设置范围] Forward : 顺时针紧固 Reverse : 逆时针紧固
RPM
[功能概要] 可以设置每分钟的转速。
[设定值] 150 rpm~2300 rpm
Soft start
[功能概要] 可以设置每分钟的转速。
[设置范围] ON: 启用 OFF: 禁用

设置坚固参数

坚固模式的设置

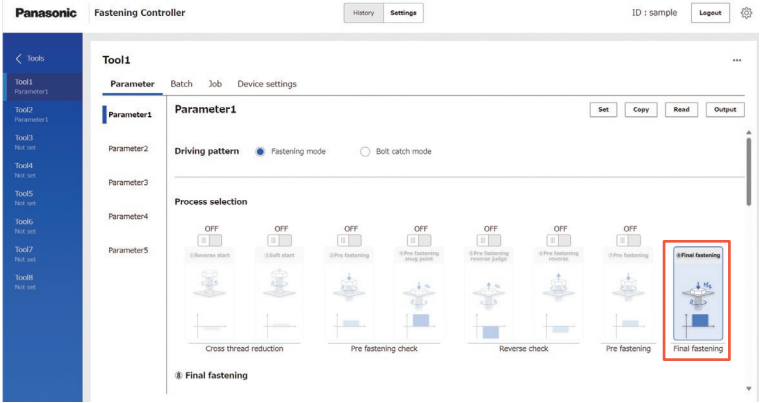
● 判定条件

Impact counts
[功能概要] 可以选择满足设置脉冲次数：时的动作。
[判定设定值] 0 times ~ 255 times [判定时动作] Next slot（动作连续） / NOK（动作停止）
Rotation
[功能概要] 可以选择满足设置转速时的动作。
[判定设定值] 0.0 times ~ 6553.5 times [判定时动作] Next slot（动作连续） / NOK（动作停止）
Rotation between impacts
[功能概要] 可以选择满足设置脉冲间旋转次数时的动作。
[判定设定值] 0.0 times ~ 655.3 times [判定时动作] Next slot（动作连续） / NOK（动作停止）
Current
[功能概要] 可以选择满足设置电流时的动作。
[判定设定值] 0.0 A ~ 25.5 A [判定时动作] Next slot（动作连续） / NOK（动作停止）

设置紧固参数

设置补偿

在“Fastening mode”的工序选择中单击“⑧ Final fastening”，显示最终紧固的工序设置画面。
可从工序设置画面的“Offset”进行设置。

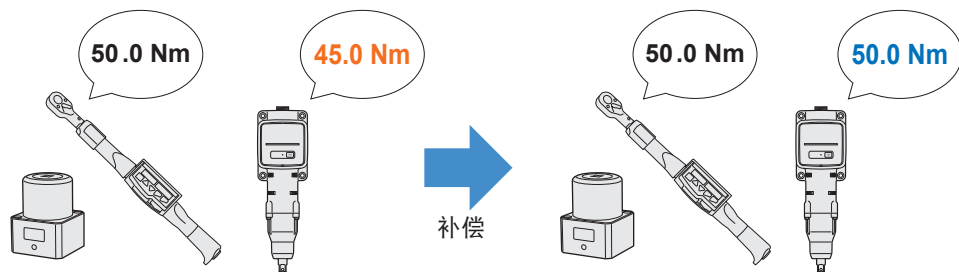


设置紧固参数

设置补偿

工具显示的扭矩值与紧固件上的实际扭矩值可能因套筒和 / 或接头条件造成的阻尼而存在差异。

这种情况下，可通过 Offset 设置调整工具显示的扭矩值。



- 第一次应用时，请在配置参数输入屏幕的 Offset 中选择 [Simulate] (①)，自动计算补偿值。
- 如已存在之前对作业用工具设置的补偿值，可对该工具设置相同的扭矩性能，方法是在配置参数输入屏幕的 [Slope] 和 [Intercept] (②) 中输入这些值。
(关于 [Slope] 和 [Intercept] 的详情，请 **参见P50**)

⑧ Final fastening

Shut-off Torque

Target 20.0 [Nm]

Upper torque limit 999.9 [Nm]

Lower torque limit 0.0 [Nm]

Offset

Simulate ①

Slope 25.00

Intercept 5.00 ②

设置紧固参数

设置补偿

选择 [Simulate]，补偿设置画面打开。
按以下步骤设置补偿。

注意

- 在补偿设置中，紧固模式工序①～⑦的动作将会失效，变为只有最终紧固的动作。

- 1 从下拉菜单中选择要使用的 [Socket length] (①)。
(如未找到与待用套筒匹配的长度，请选择最接近的长度。)
- 2 输入代表 [Shut-off Torque] (②) 的数值。
- 3 选择 [Apply(Continue)] (③)，将设置注册到工具中。

Offset

Torque result	Actual torque	%	Offset slope	Offset intercept	Delete
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① Socket length 40 mm ▾

Shut-off Torque 45 [Nm] ②

Torque result Get data Actual torque Input [Nm] Calculate

Minimum Output Mode OFF Offset slope 25.00 Offset intercept 5.00

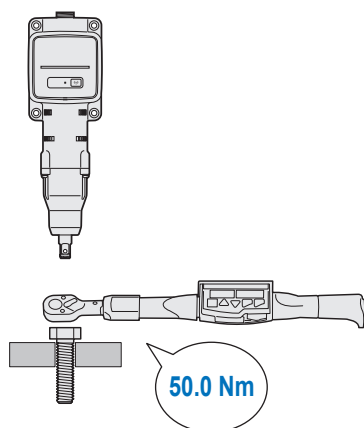
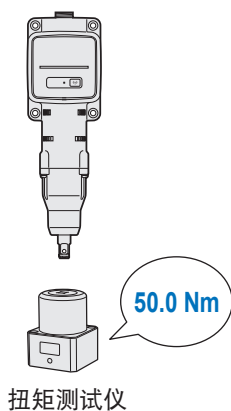
Close(End) Apply(Continue) ③

设置紧固参数

设置补偿

4 在扭矩测试仪或实际螺栓上完成一次拧紧作业

5 检查扭矩测试仪上或重新拧紧实际螺栓使用的扭矩扳手上显示的扭矩结果 (Audit Torque Value)。



设置紧固参数

设置补偿

- 6 选择 [Torque result] (④)，导入工具测量的扭矩值。
导入值显示在显示窗口上方的 [Torque result] 栏 (⑤) 中。
- 7 输入用扭矩测试仪或扭矩扳手校验过的 [Actual torque] (⑥)。
- 8 选择 [Calculate] (⑦)，计算新的补偿值。
(此时，刚刚计算的补偿值尚未注册到工具中。)
- 9 按 % (⑨) 检查工具测量的 [Torque result] (⑤) 与显示窗口上方 [Actual torque] (⑧) 之间的差值。
- 10 如果以上差值足够小，请选择 [Close(End)] (⑩)，结束补偿设置。
如果以上差值仍然较大，则选择 [Apply(Continue)] (⑪)，设置新的补偿值并重复步骤 4 ~ 10，直至差值降到足够小。

The screenshot shows a software interface for torque compensation. At the top, a table displays current values: Torque result (47.7), Actual torque (43.0), and % (90.2). Below this, there are input fields for Torque result (4), Actual torque (6), and a Calculate button (7). A % button (9) is also present. At the bottom, there are two buttons: Close(End) (10) and Apply(Continue) (11). The interface also includes fields for Socket length (40 mm), Shut-off Torque (45 [Nm]), Offset slope (22.60), and Offset intercept (5.00).

Offset				
Torque result	Actual torque	%	Offset slope	Offset intercept
47.7	43.0	90.2	25.00	5.00

Socket length 40 mm Shut-off Torque 45 [Nm]

④ Torque result ⑥ Actual torque Calculate ⑦ % ⑨

Minimum Output Mode OFF Offset slope 22.60 Offset intercept 5.00

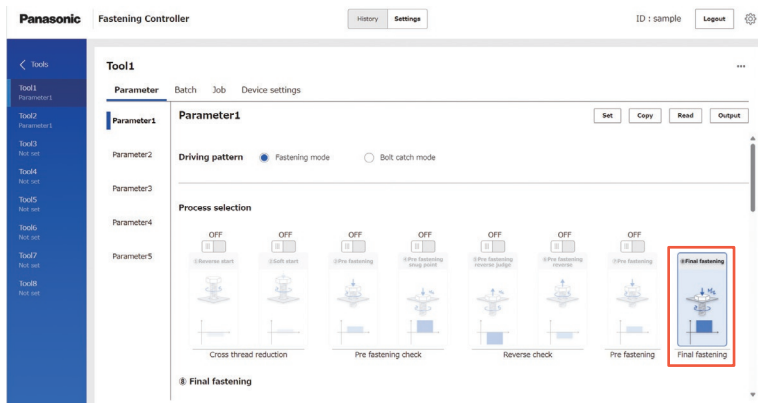
⑩ Close(End) Apply(Continue) ⑪

设置紧固参数

设定适配点检测水平

在“Fastening mode”的工序选择中单击“⑧ Final fastening”，显示最终紧固的工序设置画面。

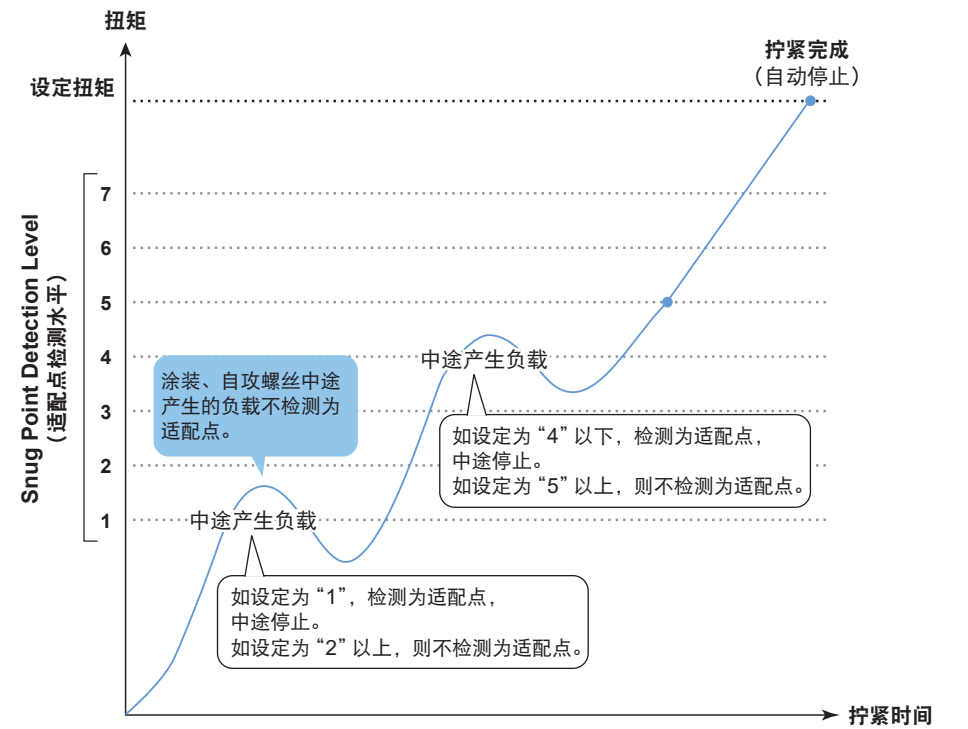
可从工序设置画面的“Snug point detection level”进行设置。



设置紧固参数

设定适配点检测水平

适配点检测水平在以下情况下使用。



可设定为 7 档	7：对中途产生负载较高的作业进行设定 ~ 1：对中途产生负载较低作业进行设定 0：适配点检测水平功能 OFF
----------	---

注意

- 从“1”开始设定 Snug Point Detection Level (适配点检测水平)。如从“2-7”开始设定 Snug Point Detection Level (适配点检测水平)，可能会因拧紧扭矩过高而导致目标材料断裂或变形。
- 如 Snug Point Detection Level (适配点检测水平) 设定为“1”的工具在适配点前停止，则将 Snug Point Detection Level (适配点检测水平) 设定为“2-7”。

设置紧固参数

参数列表

Shut-Off Torque
[功能概述] 当拧紧扭矩达到关闭扭矩的设定值时，工具将自动停止运行。 确认该值在范围内, Torque Upper Limit ≥ Shut-off Torque ≥ Torque Lower Limit。
[默认值] 20.0 Nm/177.0 In.lbs/14.7 Ft.lbs
[设定值] 10.0 Nm ~ 70.0 Nm/88.5 In.lbs ~ 619.5 In.lbs/7.4 Ft.lbs ~ 51.6 Ft.lbs 附注 该工具的建议使用范围如下： 20.0 Nm ~ 60.0 Nm/177.0 In.lbs ~ 531.0 In.lbs/14.7 Ft.lbs ~ 44.2 Ft.lbs
Torque Upper Limit
[功能概述] 设置判断作业 OK 还是 NOK 的扭矩上限。 确认该值在范围内, Torque Upper Limit ≥ Shut-off Torque ≥ Torque Lower Limit。
[默认值] *999.9 Nm/*8848.7 In.lbs/*737.4 Ft.lbs
[设定值] 10.0 Nm ~ *999.9 Nm/88.5 In.lbs ~ *8848.7 In.lbs/7.4 Ft.lbs ~ *737.4 Ft.lbs
Torque Lower Limit
[功能概述] 设置判断作业 OK 还是 NOK 的扭矩下限。 确认该值在范围内, Torque Upper Limit ≥ Shut-off Torque ≥ Torque Lower Limit。
[默认值] *0 Nm/*0 In.lbs/*0 Ft.lbs
[设定值] *0 Nm ~ 70.0 Nm/*0 In.lbs ~ 619.5 In.lbs/*0 Ft.lbs ~ 51.6 Ft.lbs

输入带（*）的值将禁用此功能。

设置紧固参数

参数列表

Offset_Slope
[功能概述] 该系数用于调整工具输出扭矩曲线对模拟真实工件上扭矩曲线的斜率。 建议利用自动补偿计算功能设置该系数。 (关于设置方法, 请 参见P42)。
[默认值] 25.00
[设定值] 0.10 ~ 500.00
Offset_Intercept
[功能概述] 该系数用于调整工具输出扭矩曲线对模拟真实工件上扭矩曲线的截距。 建议利用自动补偿计算功能设置该系数。 (关于设置方法, 请 参见P42)。 附注 • 补偿 (截距) 值是扭矩传感器能精确测量扭矩的下限。确认 “Shut-off Torque” 和 / 或 “Torque Lower Limit” 的设定值不小于补偿 (截距) 值。
[默认值] 5.00
[设定值] -1000.00 ~ 1000.00
Angle Before Snug Upper Limit
[功能概述] 设置判断作业 OK 还是 NOK 的累积角度上限 (从最终紧固工序开启到拧紧点)。拧紧点检测方法可从拧紧点设置中选择。
[默认值] *99999°
[设定值] 0°~*99999°

输入带 (*) 的值将禁用此功能。

设置紧固参数

参数列表

Angle Before Snug Lower Limit
[功能概述] 设置判断作业 OK 还是 NOK 的累积角度下限（从最终紧固工序开启到拧紧点）。 拧紧点检测方法可从拧紧点设置中选择。
[默认值] *0°
[设定值] *0°~99999°
Angle After Snug Upper Limit
[功能概述] 设置判断作业 OK 还是 NOK 的累积角度上限（从最终紧固工序的拧紧点到运行停止）。 拧紧点检测方法可从拧紧点设置中选择。
[默认值] *9999°
[设定值] 0°~*9999°
Angle After Snug Lower Limit
[功能概述] 设置判断作业 OK 还是 NOK 的累积角度下限（从最终紧固工序的拧紧点到运行停止）。 拧紧点检测方法可从拧紧点设置中选择。
[默认值] *0°
[设定值] *0°~9999°

输入带（*）的值将禁用此功能。

设置紧固参数

参数列表

Angle Error Shut-Off	
[功能概述] 当此功能为 ON 时，拧紧作业期间如果超出设置的上限角度，工具将自动停止操作。 想要使用此功能，必须设置上限角度。	
[默认值] OFF	
[设定值] ON、OFF	
No Load Speed	
[功能概述] 按 100 rpm 步长设置从最终紧固作业开启到进行工具脉冲的铁砧转速。	
[默认值] 2300 rpm	
[设定值] 1500 rpm ~ 2300 rpm	
Snug Point	
[功能概述] 选择拧紧点的检测方法。拧紧点是用作将角度测量结果划分为拧紧前角度和拧紧后角度的参考点。 When Pulsing Starts: 将工具开始脉冲的时刻视为拧紧点。 Snug Torque: 将拧紧扭矩达到设定值的时刻视为拧紧点。 Select From Graph: 从扭矩波形数据中选择想要的拧紧点。	
[默认值] When Pulsing Starts	
[设定值] When Pulsing Starts、Snug Torque、Select From Graph	

设置紧固参数

参数列表

Detection Threshold (Snug Torque)
[功能概述] 将拧紧扭矩达到该阈值的时间点判断为拧紧点。 仅当拧紧点设置为“Snug Torque”时，此参数有效。 附注 当“Offset_Intercept”的绝对值较高时，通过“Snug Torque”来检测拧紧点可能不够精确。
[默认值] 0.0 Nm
[设定值] 0.0 Nm ~ 999.9 Nm / 0.0 In.lbs ~ 8848.7 In.lbs / 0.0 Ft.lbs ~ 737.4 Ft.lbs
Detection Threshold (Select From Graph)
[功能概述] 将拧紧角度为 1° 的拧紧扭矩达到不小于该阈值时的时间点判断为拧紧点。 该值将通过选择图形上的一部分自动设置。 该参数仅当拧紧点设置为“Select From Graph”时有效。 附注 当该阈值设置较高时，视具体作业情况，拧紧点检测可能无法进行。
[默认值] 0.0 Nm/1°
[设定值] 0.0 Nm/1° ~ 999.9 Nm/1° / 0.0 In.lbs/1° ~ 8848.7 In.lbs/1° / 0.0 Ft.lbs/1° ~ 737.4 Ft.lbs/1°
Detection Start Angle (Select From Graph)
[功能概述] 除非累积拧紧角度达到该值，否则拧紧点检测不会开始。 该参数仅当拧紧点设置为“Select From Graph”时有效。
[默认值] 0°
[设定值] 0°~99999°

设置紧固参数

参数列表

Snug Point Detection Level
[功能概述] 该设定会更改螺栓适配点检测的负载水平。 由于拧紧中途的负载较高，因此提高 Snug Point Detection Level（适配点检测水平）可防止在螺栓到达适配点前工具停止。 （有些作业中，即使提高 Snug Point Detection Level（适配点检测水平），工具也可能会在适配点前停止。）
[默认值] *0
[设定值] *0~7
Rundown Error Detection
[功能概述] 从最终紧固工序开始起，如果工具在经过设置时间之前停止，将被判定为 NOK。
[默认值] *0.0 s
[设定值] *0.0 s~3.0 s
Ignore Rundown Result Before Snug
[功能概述] 此功能启用时，如果作业在拧紧点之前因触发器信号的操作而中断，将不会记录其历史日志。 从“Snug Point”参数中设置判断拧紧点的方法。
[默认值] OFF
[设定值] ON、OFF

输入带（*）的值将禁用此功能。

设置紧固参数

参数列表

Snug Torque Detection Delay
[功能概述] 从最终紧固工序开始起到设置时间经过前，即使中途产生的负载超过设置的关闭扭矩，工具也不会停止。
[默认值] *0.0 s
[设定值] *0.0 s~3.0 s
Buzzer
[功能概述] 为作业完成时蜂鸣器发出声音的条件选项。 OFF: 作业完成后不触发蜂鸣器。 Buzzer OK: 作业完成后，如果结果是 OK，则触发蜂鸣器。 Buzzer NOK: 作业完成后，如果结果是 NOK，则触发蜂鸣器。
[默认值] OFF
[设定值] OFF, Buzzer OK, Buzzer NOK
Bolt catch mode
[功能概述] 确保将紧固用螺栓插入套筒时能够顺利插入。
[默认值] Driving time: *0.0 s Impact counts: *0 times
[设定值] Driving time: *0.0 s~5.0 s Impact counts: *0 times~20 times

输入带(*)的值将禁用此功能。

设置紧固参数

参数列表

Reverse start
[功能概述] 通过在螺栓进入时使其反转，减少螺牙的咬入。
[默认值] No-load speed: 2300 rpm Number of rotations: *0.0 times Number of pulses: *0 times
[设定值] No-load speed: 500 rpm~2300 rpm
[进入判定条件] Number of rotations: *0.0 times~6553.5 times
[NOK 判定条件] Number of pulses: *0 times~255 times
Soft start
[功能概述] 通过在螺栓进入时使其低速旋转，减少螺牙的咬入。
[默认值] No-load speed: 350 rpm Number of rotations: *0.0 times Number of pulses: *0 times
[设定值] No-load speed: 150 rpm~350 rpm
[进入判定条件] Number of rotations: *0.0 times~6553.5 times
[NOK 判定条件] Number of pulses: *0 times~255 times

输入带(*)的值将禁用此功能。

设置紧固参数

参数列表

Pre fastening
[功能概述] 螺栓在拧紧前的自由紧固中咬入时，可按设置的脉冲次数检测咬入。
[默认值] No-load speed: 2300 rpm Number of rotations: *0.0 times Number of pulses: *0 times
[设定值] No-load speed: 500 rpm~2300 rpm
[进入判定条件] Number of rotations: *0.0 times~6553.5 times
[NOK 判定条件] Number of pulses: *0 times~255 times
Pre fastening snug point
[功能概述] 当检测到伴有设置脉冲次数的作业时，视为已拧紧，进入下一工序。
[默认值] No-load speed: 2300 rpm Number of pulses: *0 times Number of rotations: *0.0 times
[设定值] No-load speed: 500 rpm~2300 rpm
[进入判定条件] Number of pulses: *0 times~255 times
[NOK 判定条件] Number of rotations: *0.0 times~6553.5 times

输入带(*)的值将禁用此功能。

设置紧固参数

参数列表

Pre fastening reverse judge
[功能概述] 如果从拧紧状态松开时脉冲持续高于设置值，视为已检测到螺栓咬入。
[默认值] No-load speed: 2300 rpm Number of rotations between impacts: *0.0 times Number of pulses: *0 times
[设定值] No-load speed: 500 rpm~2300 rpm
[进入判定条件] Number of rotations between impacts: *0.0 times~655.3 times
[NOK 判定条件] Number of pulses: *0 times~255 times
Pre fastening reverse
[功能概述] 如果松开时脉冲持续高于设置值，视为已检测到螺栓咬入。
[默认值] No-load speed: 2300 rpm Number of rotations: *0.0 times Number of pulses: *0 times
[设定值] No-load speed: 500 rpm~2300 rpm
[进入判定条件] Number of rotations: *0.0 times~6553.5 times
[NOK 判定条件] Number of pulses: *0 times~255 times

输入带(*)的值将禁用此功能。

设置紧固参数

参数列表

以下是紧固模式工序①～⑦详细设置和判定条件的内容。

Tool drive settings	
[功能概述] 设置详细的驱动设置。	
[默认值] Direction of rotation: Forward (正转) RPM: 各工序的转速默认值 Soft start: Disable (禁用)	
[设定值] Direction of rotation: Forward (正转) / Reverse (反转) RPM: 150 rpm~2300 rpm Soft start: Enable (启用) / Disable (禁用)	
Judgement settings	
[功能概述] 根据设置的判定设置值决定判定时动作。	
[默认值] Number of pulses: *0 times Number of rotations: *0.0 times Number of rotations between impacts: *0.0 times Current: *0.0 A Resulting operation: Next slot (动作连续)	
[设定值] Number of pulses: *0 times~255 times Number of rotations: *0.0 times~6553.5 times Number of rotations between impacts: *0.0 times~655.3 times Current: *0.0 A~25.5 A Resulting operation: Next slot (动作连续), NOK (动作停止)	

输入带 (*) 的值将禁用此功能。

确认紧固履历数据

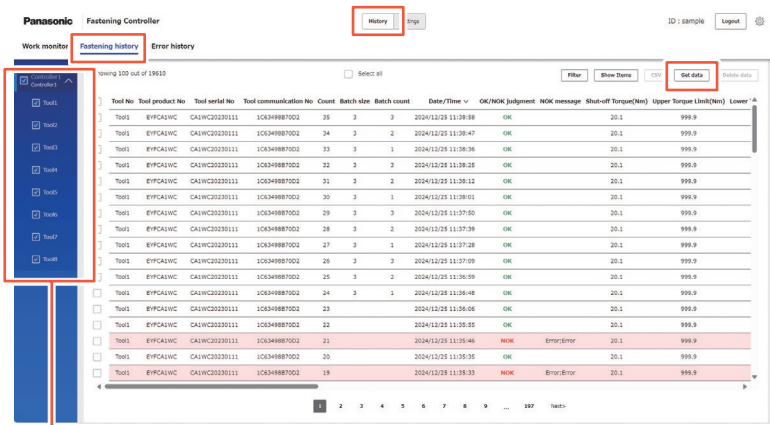
显示紧固履历数据

单击 Home 画面（设置画面初始页面）上部的 [History]，然后选择“Fastening history”选项卡。

可浏览从工具发送到控制器的紧固履历数据。

要显示数据时，请从左侧的工具列表选择显示对象控制器 / 工具，然后单击右上方的 [Get data]。

按新的顺序显示紧固履历数据。



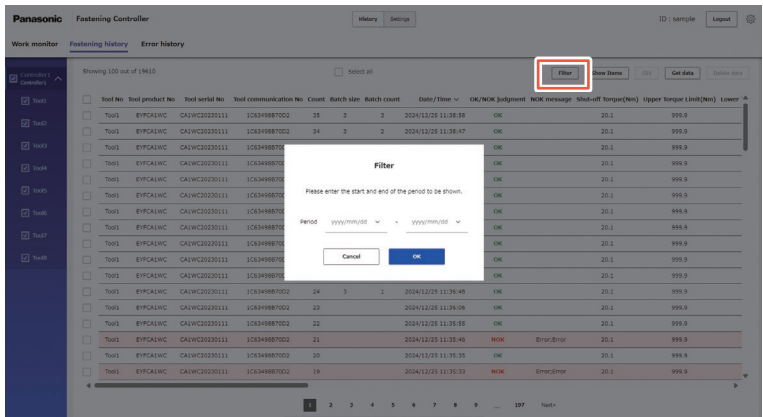
工具列表

确认紧固履历数据

显示紧固履历数据

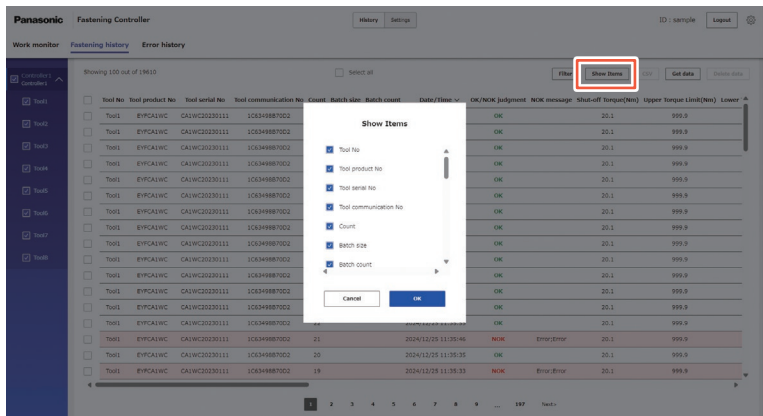
按照日期时间提取紧固履历

单击 [Filter]，输入日期时间，可筛选要显示的紧固履历。



设置显示项目

单击 [Show Items]，选择项目，可更改要显示的项目。



确认紧固履历数据

紧固履历数据项目

Count
[显示概述] 一个按作业完成顺序计数的数值。
Date
[显示概述] 显示作业完成的日期。
Time
[显示概述] 显示作业完成的时间。
Work Result
[显示概述] 判定作业结果是 OK 或 NOK。OK/NOK 判定标准如下。 OK：关闭停止顺利完成，未出错 NOK：关闭停止未完成，或出错
NOK Message
[显示概述] 当作业结果是 NOK 时,NOK 的理由显示在扭矩、角度或错误目录中。 如果 NOK 的理由确定为出错，详情将显示在紧固履历最后一行的错误消息中。
Shut-off Torque
[显示概述] 表示完成工具关闭的扭矩的配置参数。
Upper Torque Limit
[显示概述] 表示判定作业结果为 OK 的扭矩上限的配置参数。
Lower Torque Limit
[显示概述] 表示判定作业结果为 OK 的扭矩下限的配置参数。
Torque Result
[显示概述] 表示相关作业时工具输出扭矩的结果值。

确认紧固履历数据

紧固履历数据项目

Upper Angle Limit (Before Snug)
[显示概述] 表示判定作业结果为 OK 的拧紧前角度上限的配置参数。 拧紧前角度是通过拧紧点参数设置的从最后紧固工序开启到拧紧点的铁砧转动角度。
Lower Angle Limit (Before Snug)
[显示概述] 表示判定作业结果为 OK 的拧紧前角度下限的配置参数。 拧紧前角度是通过拧紧点参数设置的从最后紧固工序开启到拧紧点的铁砧转动角度。
Angle (Before Snug)
[显示概述] 表示相关作业拧紧前角度的结果值。 拧紧前角度是通过拧紧点参数设置的从最后紧固工序开启到拧紧点的铁砧转动角度。
Upper Angle Limit (After Snug)
[显示概述] 表示判定作业结果为 OK 的拧紧后角度上限的配置参数。 拧紧后角度是通过拧紧点参数设置的从拧紧点到作业结束的铁砧转动角度。
Lower Angle Limit (After Snug)
[显示概述] 表示判定作业结果为 OK 的拧紧后角度下限的配置参数。 拧紧后角度是通过拧紧点参数设置的从拧紧点到作业结束的铁砧转动角度。
Angle (After Snug)
[显示概述] 表示相关作业拧紧后角度的结果值。 拧紧后角度是通过拧紧点参数设置的从拧紧点到作业结束的铁砧转动角度。
Number of Pulse
[显示概述] 表示工具在相关作业中发出的脉冲次数。

确认紧固履历数据

紧固履历数据项目

Fastening Time
[显示概述] 显示从最后紧固工序开启到相关作业结束时所用的时间。
Battery Level
[显示概述] 本机不使用。为空栏。
Offset Slope
[显示概述] 表示扭矩传感器输出电压转换成扭矩的系数的配置参数。
Offset Intercept
[显示概述] 表示扭矩传感器输出电压转换成扭矩的系数的配置参数。
Snug Point Detection Level
[显示概述] 根据中途负荷的等级设置并显示适配点检测水平。
NOK Slot Information
[显示概述] 如在工序①～⑦的作业中发生错误,则显示该工序编号。
Error Message
[显示概述] 当 NOK 的理由、NOK 消息上显示的作业结果确定为出错时, 显示错误详情。 (关于错误消息详情, 请 参见P99)
External Input Information
[显示概述] 显示用条形码阅读器等输入到控制器的信息。

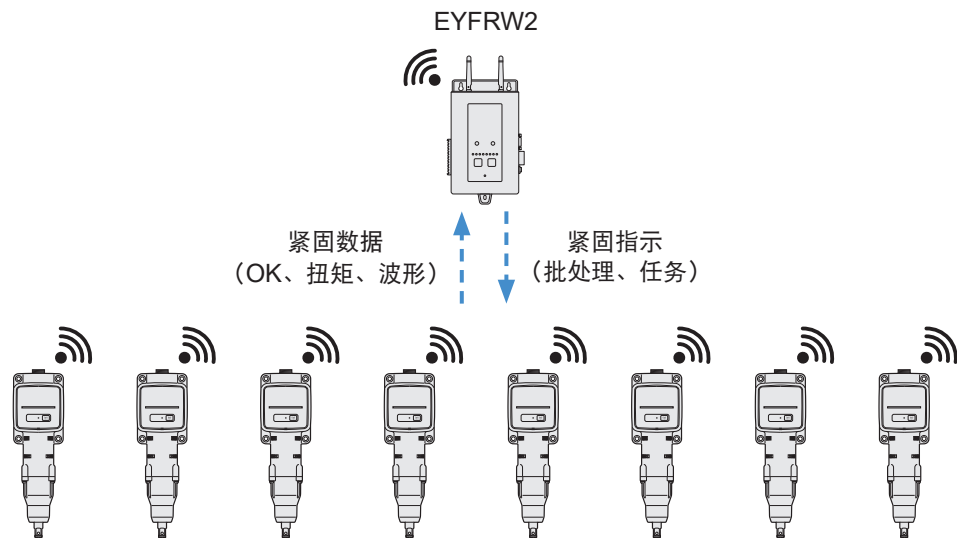
设置控制器的紧固控制模式

关于来自控制器的紧固控制

和控制器连接时，本产品最多可紧固控制8台。

另外，将按每个紧固作业接收紧固数据，对紧固数量进行计数。

连接台数：最多8台



设置控制器的紧固控制模式

控制器紧固控制模式的概要

紧固控制在多种模式下进行。各模式的概要请参见以下内容。

模式	[Free mode]	[Repeat mode]																								
		[Basic mode]	[Sequence mode]																							
OK 判定基准	— (无数量管理)	紧固数量完成	按指定的顺序, 多个工具分别完成紧固数量																							
[Batch] “单一设定值” (相同条件紧固) ※单一工件	A  OK <table><tr><th>设定值</th><th>紧固数量</th></tr><tr><td>10 Nm</td><td>∞</td></tr></table> Parameter <td> A  OK <table><tr><th>设定值</th><th>紧固数量</th></tr><tr><td>10 Nm</td><td>10 个</td></tr></table> Batch </td> <td> A ①  OK  B ②  OK <table><tr><th>设定值</th><th>紧固数量</th><th>设定值</th><th>紧固数量</th></tr><tr><td>10 Nm</td><td>10 个</td><td>20 Nm</td><td>5 个</td></tr></table> Batch×Sequence </td>	设定值	紧固数量	10 Nm	∞	A  OK <table><tr><th>设定值</th><th>紧固数量</th></tr><tr><td>10 Nm</td><td>10 个</td></tr></table> Batch	设定值	紧固数量	10 Nm	10 个	A ①  OK  B ②  OK <table><tr><th>设定值</th><th>紧固数量</th><th>设定值</th><th>紧固数量</th></tr><tr><td>10 Nm</td><td>10 个</td><td>20 Nm</td><td>5 个</td></tr></table> Batch×Sequence	设定值	紧固数量	设定值	紧固数量	10 Nm	10 个	20 Nm	5 个							
设定值	紧固数量																									
10 Nm	∞																									
设定值	紧固数量																									
10 Nm	10 个																									
设定值	紧固数量	设定值	紧固数量																							
10 Nm	10 个	20 Nm	5 个																							
[Job] “多个设定值” (不同条件紧固) ※多个工件	A  OK <table><tr><th>设定值</th><th>紧固数量</th></tr><tr><td>10 Nm</td><td>2 个</td></tr><tr><td>20 Nm</td><td>3 个</td></tr><tr><td>30 Nm</td><td>5 个</td></tr></table> Job	设定值	紧固数量	10 Nm	2 个	20 Nm	3 个	30 Nm	5 个	A ①  OK  B ②  OK <table><tr><th>设定值</th><th>紧固数量</th><th>设定值</th><th>紧固数量</th></tr><tr><td>10 Nm</td><td>2 个</td><td>20 Nm</td><td>5 个</td></tr><tr><td>20 Nm</td><td>3 个</td><td>30 Nm</td><td>10 个</td></tr><tr><td>30 Nm</td><td>5 个</td><td></td><td></td></tr></table> Job×Sequence	设定值	紧固数量	设定值	紧固数量	10 Nm	2 个	20 Nm	5 个	20 Nm	3 个	30 Nm	10 个	30 Nm	5 个		
设定值	紧固数量																									
10 Nm	2 个																									
20 Nm	3 个																									
30 Nm	5 个																									
设定值	紧固数量	设定值	紧固数量																							
10 Nm	2 个	20 Nm	5 个																							
20 Nm	3 个	30 Nm	10 个																							
30 Nm	5 个																									
备注	—	※ 任务最多到 10 个步骤	※ 时序最多可设置 10 步																							

设置控制器的紧固控制模式

控制器的控制模式可注册件数

控制器中可注册的控制模式数如下所示。

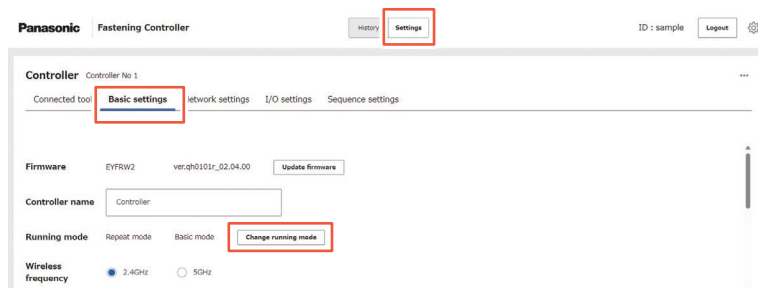
控制器模式		工具动作设置	可注册件数
Free mode		Parameter	○ 每台工具最多可注册5种
Repeat mode	Basic mode (独立控制)	Batch	○ 每台工具最多可注册5种
		Job	○ 每台工具最多可注册5种
	Sequence mode (顺序控制)	Batch/Job	○ 最多可注册5种
External control mode		—	○

设置控制器的紧固控制模式

设置控制器的动作模式

控制器的动作模式可按以下步骤设置。

- 1 单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Basic settings”选项卡
- 2 从“Basic settings”选项卡单击 [Change running mode] 显示“Change running mode”画面。

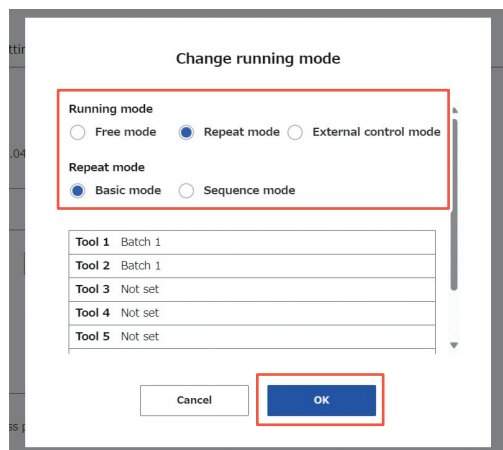


- 3 选择“Running mode”，单击 [OK]

设置动作模式。

动作模式可从“Free mode”“Repeat mode”“External control mode”中选择。另外，可在设置“Repeat mode”时选择“Basic mode”、“Sequence mode”。

参见P69~72



※ 设置为“Free mode”时，需要事先注册“Parameter”。

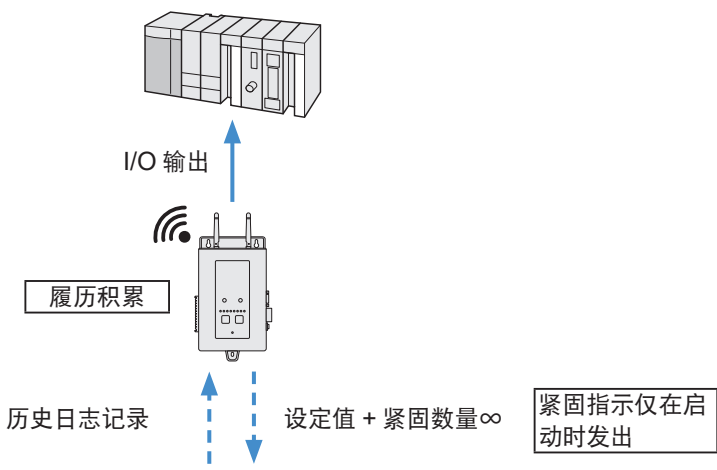
※ 设置为“Repeat mode”时，需要事先注册“Batch/Job”。

设置控制器的紧固控制模式

设置控制器的动作模式

Free Mode

无需管理紧固数量，可自由紧固的模式。
各工具按事先注册的“Parameter”进行紧固。
最多8台工具可单独紧固。
基于控制器 I/O 的输出设置启用。
※ 可在用外部设备对紧固数量进行计数时使用。



最多可同时使用8台

			
设定值 紧固数量	设定值 紧固数量	设定值 紧固数量	设定值 紧固数量
10 Nm ∞	20 Nm ∞	30 Nm ∞	40 Nm ∞

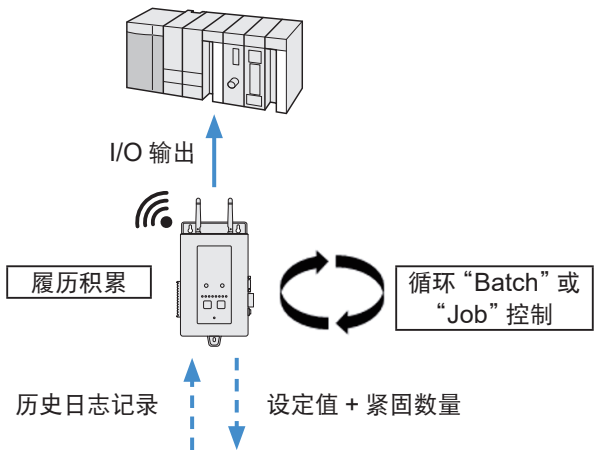
			
设定值 紧固数量	设定值 紧固数量	设定值 紧固数量	设定值 紧固数量
50 Nm ∞	60 Nm ∞	70 Nm ∞	80 Nm ∞

设置控制器的紧固控制模式

设置控制器的动作模式

Repeat Mode (Basic Mode)

重复控制“Batch”“Job”的模式。
各工具按照事先注册的“Batch”或“Job”进行紧固。
最多8台工具可单独紧固。
基于控制器 I/O 的输出设置启用。



最多可同时使用8台

			
设定值 紧固数量	设定值 紧固数量	设定值 紧固数量	设定值 紧固数量
10 Nm 10个	20 Nm 10个	30 Nm 10个	40 Nm 10个

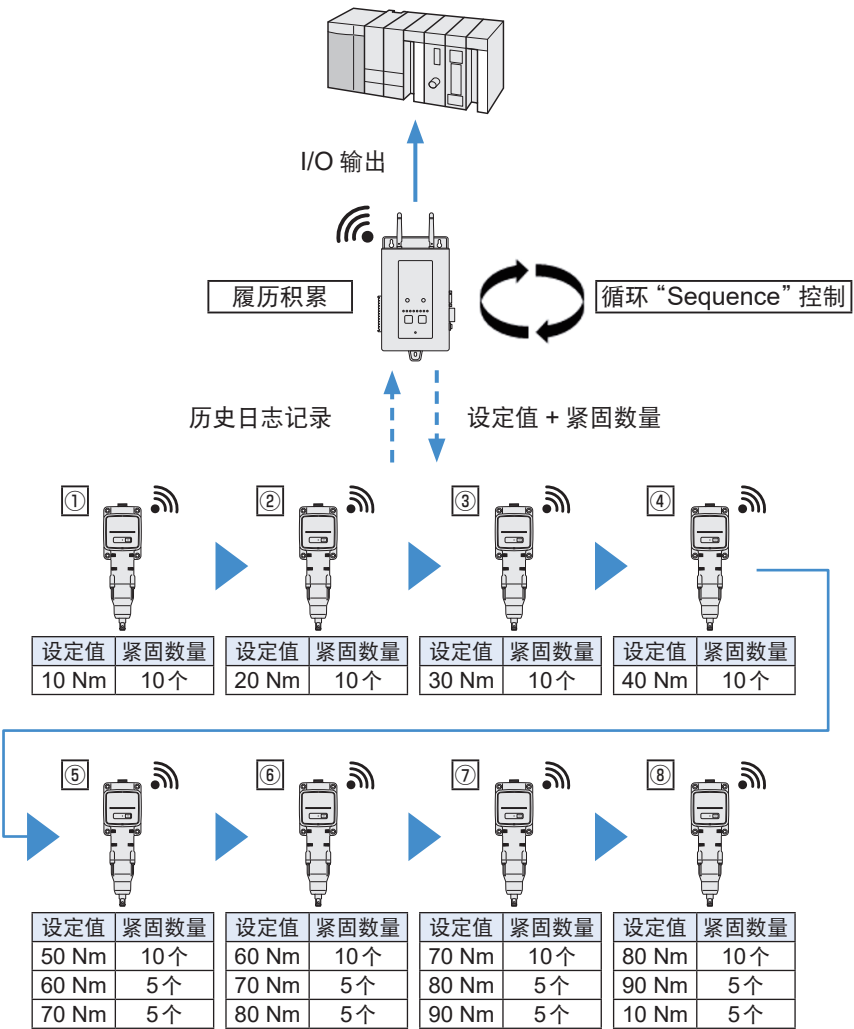
			
设定值 紧固数量	设定值 紧固数量	设定值 紧固数量	设定值 紧固数量
50 Nm 10个	60 Nm 10个	70 Nm 10个	80 Nm 10个
60 Nm 5个	70 Nm 5个	80 Nm 5个	90 Nm 5个
70 Nm 5个	80 Nm 5个	90 Nm 5个	10 Nm 5个

设置控制器的紧固控制模式

设置控制器的动作模式

Repeat Mode (Sequence Mode)

按顺序控制可使用的工具以重复“Sequence”的模式。
各工具根据事先注册的“Sequence”，按顺序进行紧固。
最多可设置10个步骤。时序内可使用的工具最多为8台，一次只能使用1台。
基于控制器 I/O 的输出设置启用。



设置控制器的紧固控制模式

设置控制器的动作模式

External Control Mode

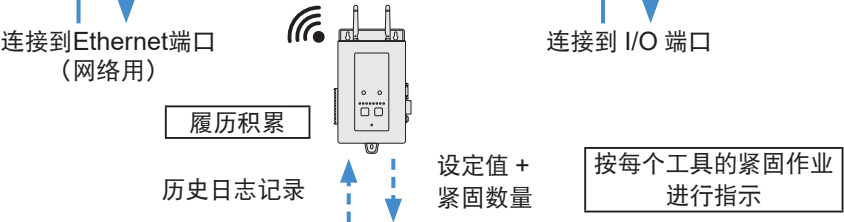
根据外部设备（上游系统）发出的指示来控制紧固的模式。
可在以下2种模式下控制。

● 利用 Open Protocol 进行控制
(Open Protocol 启用)

可根据上游系统发出的 Open Protocol 指示进行紧固控制。
最多可单独控制 8 台工具。
※ 不支持任务控制、时序控制。

● 通过 I/O 进行控制
(Open Protocol 禁用)

可根据来自外部设备的 I/O 输入指示进行紧固控制。
最多可单独或时序控制 8 台工具。



※可并行控制多台(不包括“Sequence”)

设定值	紧固数量
10 Nm	∞

Free mode

设定值	紧固数量
10 Nm	10 个

Batch

设定值	紧固数量
50 Nm	10 个
60 Nm	5 个
70 Nm	5 个

Job

①

设定值	紧固数量
10 Nm	10 个

②

设定值	紧固数量
20 Nm	10 个

Sequence mode

※ 如果在紧固作业中控制器电源关闭，重启后不会重新开始紧固。
要重新接受外部设备发出的指示后再开始作业。
※ 基于 I/O 的输出设置启用。

设置控制器的紧固控制模式

创建（设置）批处理

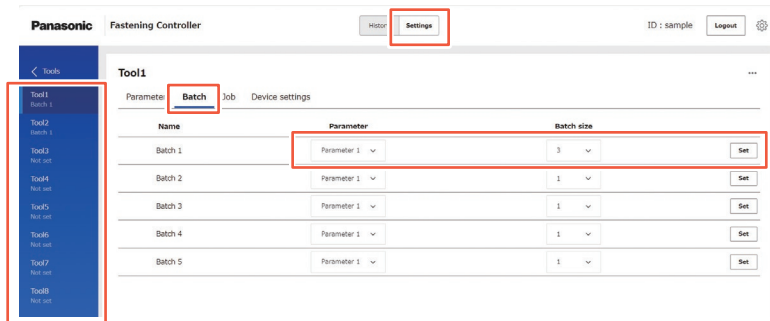
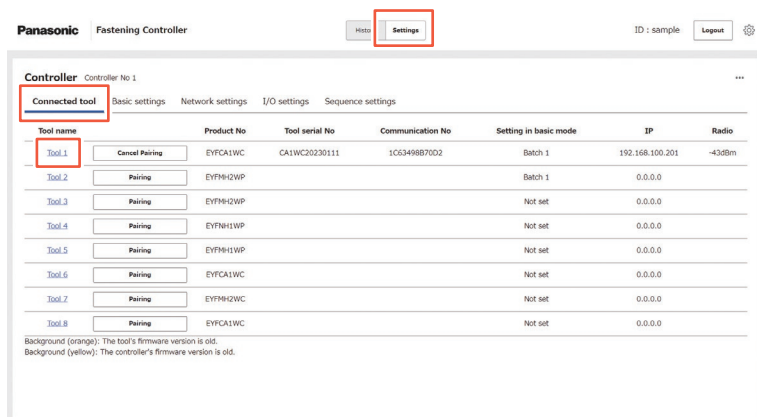
单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Connected tool”选项卡。在“Connected tool”画面中单击对象工具 No.。

可从工具 NO. 画面中的“Batch”选项卡进行设置。

下拉选择“Parameter”，然后设置“Batch size”（紧固数量。最多 99 个）。进行 [Set] 后，即可作为“Repeat mode (Basic mode)”时的动作设置。

※ 切换工具时，也可从工具列表选择。

※ 批处理最多可注册 5 种。



工具列表

设置控制器的紧固控制模式

创建（设置）任务

单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Connected tool”选项卡。在“Connected tool”画面中单击对象工具 No.。

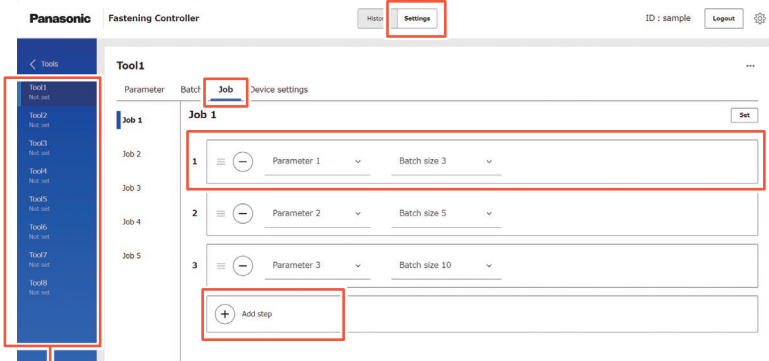
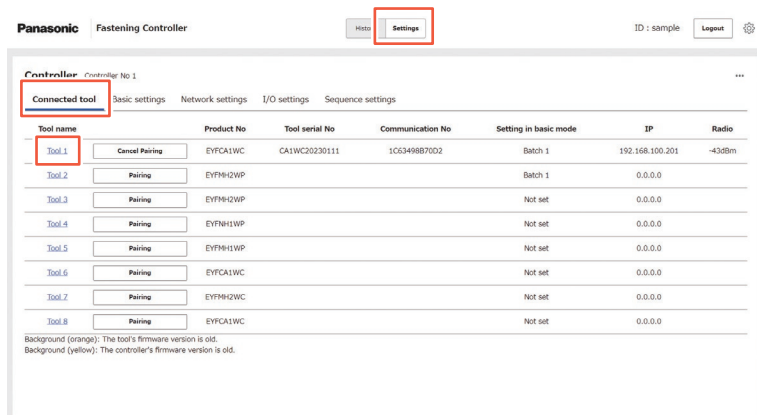
可从工具 NO. 画面中的“Job”选项卡进行设置。

下拉选择“Parameter”，然后设置“Batch size”（紧固数量。最多 99 个）。进行 [Set] 后，即可作为“Repeat mode（Basic mode）”时的动作设置。

※ 任务最多可注册 5 种。

※ 每个任务最多可注册 10 个步。

※ 切换工具时，也可以从工具列表选择。



工具列表

设置控制器的紧固控制模式

创建（设置）时序

单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Sequence settings”选项卡。

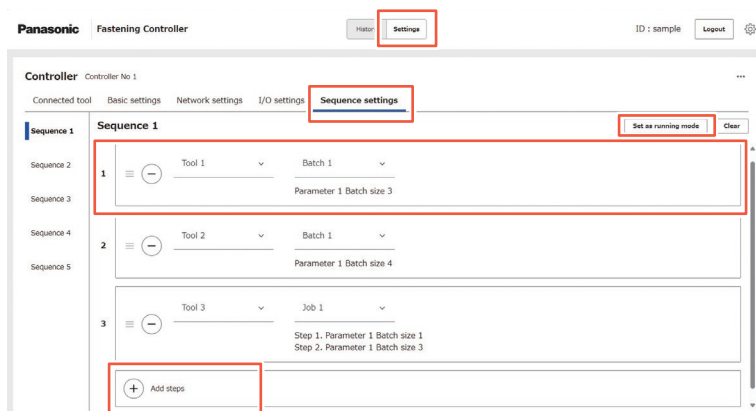
在“Sequence settings”画面中，下拉选择“Tool”后，设置“Batch”或“Job”。

设为[Set as running mode]后,即可作为“Repeat mode (Sequence mode)”时的动作设置。

※ 最多可注册5个时序。

※ 每个时序最多可注册10个步。

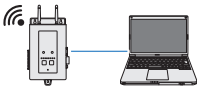
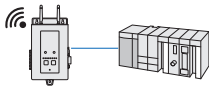
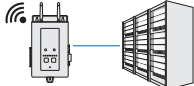
※ 在同一时序内也可设置使用多次工具。



连接控制器和外部设备

外部设备连接的概要

控制器可与以下外部设备连接。
详情请确认控制器 (EYFRW2) 的使用说明书。

对象	设置用计算机	PLC	客户上游系统
连接示意图			
通信方式	Ethernet	I/O	Ethernet
通信协议	http/https	— (仅 ON/OFF 信号)	Open Protocol
主要用途	• 浏览 / 保存历史日志 • 更改设置	• 输出 OK/NOK 信号 • 切换紧固指示	• 输出历史日志 • 切换紧固指示
可输出数据	• 工具串行 • 时间 • OK/NOK • 扭矩值、角度值、紧固时间 • 波形数据	• OK/NOK • Batch/job/sequence 完成 • Batch/job/sequence 选择中 • 工具运转中	• 工具串行 • 时间 • OK/NOK • 扭矩值、角度值、紧固时间
支持紧固指示切换	—	• Batch/job/sequence 选择中	• Parameter/batch 选择中
其他	显示使用 Web 浏览器 推荐 Microsoft Edge	输入 / 输出各 8 端口	关于对应命令, 请参见“Open Protocol 支持命令一览”。 参见P88 控制时序请单独确认。

连接控制器和外部设备

远程连接设置用计算机

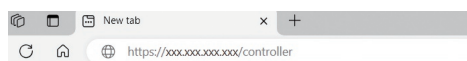
可从安装有证书的设置用计算机经由网络远程连接控制器。

但仅有 1 个访问可同时访问设置功能。

连接时，请在 Web 浏览器中用以下 URL 访问。

URL : <https://xxx.xxx.xxx.xxx/controller>

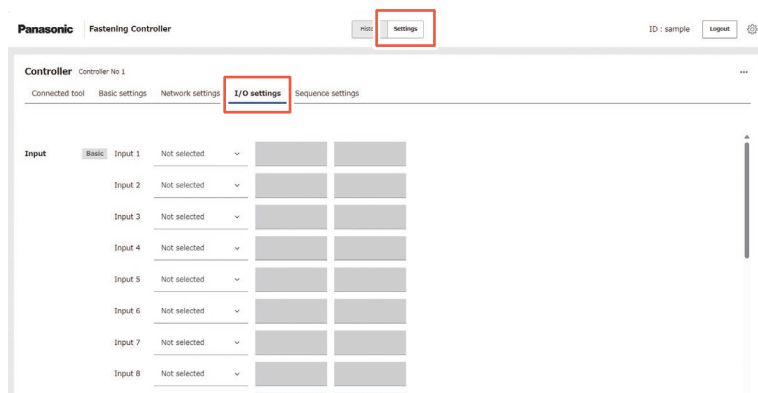
※xxx.xxx.xxx.xxx 是在控制器上的“IP”中设置的 IP 地址。

A screenshot of the Panasonic Fastening Controller login page. The page has a dark blue header with the "Panasonic" logo and "Fastening Controller" text. Below this, the word "Controller" is centered. The login form consists of two input fields: "User ID" and "Password". Below the password field is a blue "Login" button.

通过 I/O 连接控制器和外部设备

设置 I/O

单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“I/O settings”选项卡。



※ 未设置的动作及现象也可自行分配（不包括任务选择、时序选择）

通过 I/O 连接控制器和外部设备

可分配到输入的命令

可分配到输入 (Input 端口) 的命令如下。

如果外部设备已向各端口输入信号，将根据分配的命令进行紧固控制

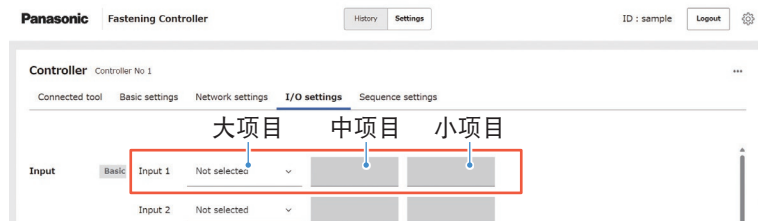
大项目 (动作)	中项目 (对象工具)	小项目 (批处理 No. 等)
Batch	工具 1-8	1-5
Job	工具 1-8	1-5
Sequence	—	1-5
Suspend tool ^{※1}	工具 1-8	—
Suspend controller ^{※1}	—	—
Batch reset	工具 1-8	—
Reset	—	—
Emergency stop ^{※1}	工具 1-8	—

※1 仅在输入信号维持中启用。

“Suspend tool” 或 “Suspend controller” 命令输入中的注意事项

- 不接收 “Suspend controller” 输入中的紧固指示。
- 不接收和 “Suspend tool” 输入中工具 No. 相同的工具 No. 的 “Batch” 或 “Job” 的紧固指示。
- 接收和 “Suspend tool” 输入中工具 No. 不同的工具 No. 的 “Batch” 或 “Job” 的紧固指示。
- 接收 “Suspend tool” 输入中的 “Sequence” 的紧固指示。
此时，会一直进行控制，直至 “Suspend tool” 输入中的工具符合为止。
- “Batch reset” 和 “Reset” 也和紧固指示一样处理。
- “Emergency stop” 是不依赖控制器的动作模式即可实施的 “Suspend tool” 指示。

在大项目中选择动作后，选择对象工具，如果还需要，选择 No. (批处理 No. 等)。



※ 如果输入未注册的信号，将不反应。(不出现错误)

通过 I/O 连接控制器和外部设备

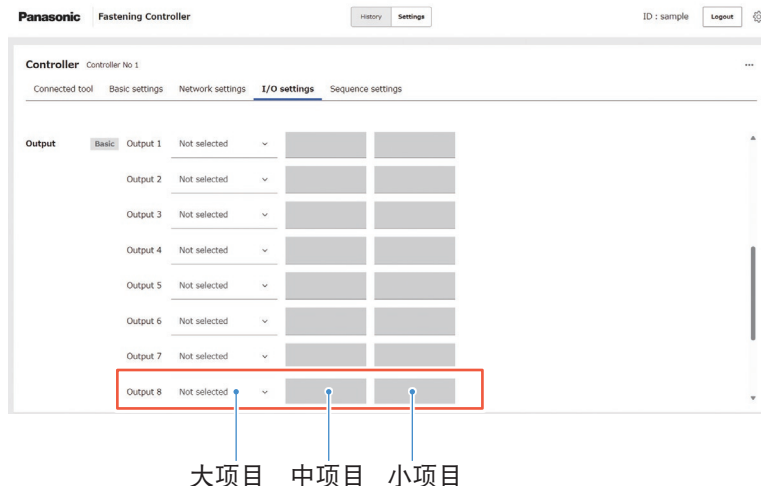
可分配到输出的命令

可分配到输出（Output 端口）的命令如下。

发生对象现象时，按分配的命令，从各端口将输出信号输出到外部设备。

大项目（现象）	中项目（对象工具）	小项目（批处理 No. 等）
OK	工具 1-8	—
NOK	工具 1-8	—
Batch complete	工具 1-8	1-5
Job complete	工具 1-8	1-5
Sequence complete	—	1-5
Tool active	工具 1-8	—
Batch selected	工具 1-8	1-5
Job selected	工具 1-8	1-5
Sequence selected	—	1-5

在大项目中选择现象后，选择对象工具，如果还需要，选择 No.（批处理 No. 等）。

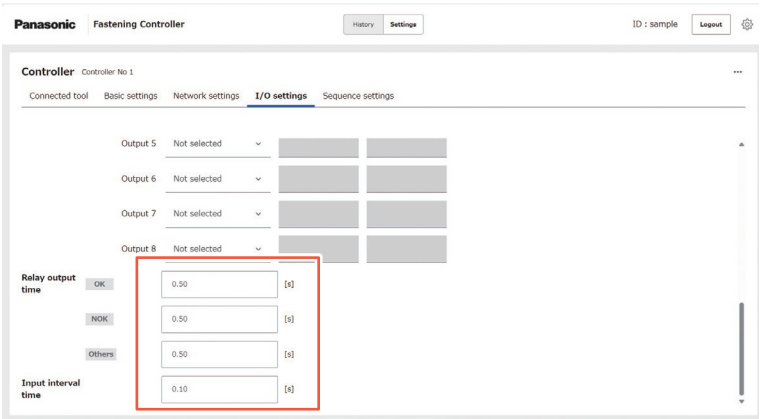


※ 如果在输出命令中切断控制器的电源，在恢复供电后将不能从中途重新开始。

通过 I/O 连接控制器和外部设备

其他设置

其他与 I/O 相关的设置可按以下设置。



Relay output time (OK)
选择从继电器输出紧固 OK 信号的时间（期间）。 [默认值] 0.5 s [设置范围] 0.01 s~10 s
Relay output time (NOK)
选择从继电器输出紧固 NOK 信号的时间（期间）。 [默认值] 0.5 s [设置范围] 0.01 s~10 s

通过 I/O 连接控制器和外部设备

其他设置

Relay output time (Others)
选择从继电器输出紧固 OK/NOK 以外信号的时间（期间）。 [默认值] 0.5 s [设置范围] 0.01 s ~ 10 s
Input interval time
选择不对连续的输入信号进行计数（不受理）的时间。 用于防止因干扰等造成重复计数的设置。 [默认值] 0.1 s [设置范围] 0.01 s ~ 10 s

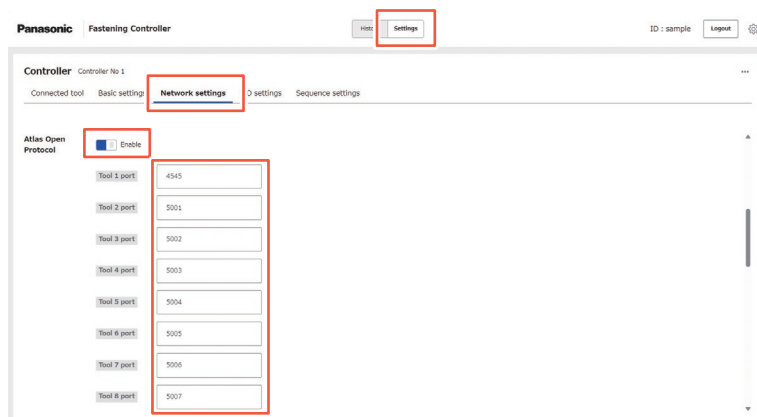
通过 Open Protocol 连接控制器和外部设备

通过 Open Protocol 通信连接

单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Network settings”选项卡。

将“Atlas Open Protocol”设为“Enable”。

对要使用的工具分别设置端口 No.。



Tool port

将通过 Open Protocol 进行通信的端口 No. 按工具进行分配。

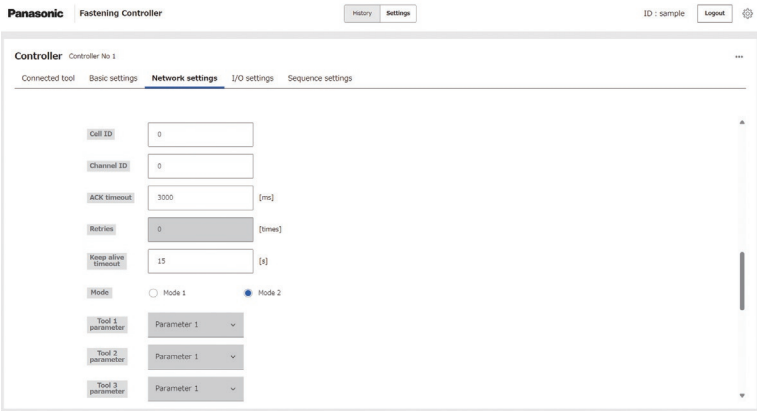
[默认值] (Tool 1) 4545
 (tool 2-8) 5001 – 5007

[设置范围] (Tool 1-8) 1024 ~ 49151

通过 Open Protocol 连接控制器和外部设备

其他设置项目

根据需要设置其他的设置项目。



Cell ID
设置单元格 ID。 [默认值] 0 [设置范围] 0 ～ 9999
Channel ID
设置通道 ID。 [默认值] 0 [设置范围] 0 ～ 99
ACK timeout
设置对来自控制器发出的请求信息发送的响应等待超时时间。 [默认值] 3000 ms [设置范围] 100 ms ～ 30000 ms

通过 Open Protocol 连接控制器和外部设备

其他设置项目

Retries
设置重新发送来自控制器的请求信息的次数。 [默认值] 0 times [设置范围] 不可更改 (固定)
Keep alive timeout
设置与上游系统的最后通信起至判断通信中断的时间。 [默认值] 15 s [设置范围] 1 s ~ 60 s
Mode
设置动作模式。 Mode 1 : 按照预先注册的紧固参数进行自由紧固的模式 Mode 2 : 按照上游指示的紧固参数进行紧固的模式 [默认值] Mode 1 [设置范围] Mode 1 / Mode 2

通过 Open Protocol 连接控制器和外部设备

分配紧固参数 (Mode 1 时)

以“Mode 1”(无参数指示)使用时，需要预先针对各工具注册紧固参数。
请从下方中选择以下拉方式使用的参数。

Panasonic Fastening Controller

History Settings

ID : sample Logout

Controller Controller No. 1

Connected tool Basic settings **Network settings** I/O settings Sequence settings

Cell ID 0

Channel ID 0

ACK timeout 3000 [ms]

Retries 0 [times]

Keep alive timeout 15 [s]

Mode ☒ Mode 1 ☐ Mode 2

Tool 1 parameter Parameter 1

Tool 2 parameter Parameter 1

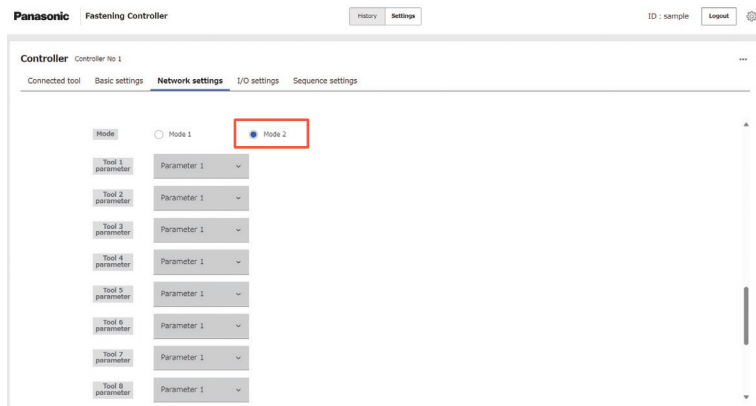
Tool 3 parameter Parameter 1

通过 Open Protocol 连接控制器和外部设备

分配紧固参数 (Mode 2 时)

可利用 MID 0018 命令从外部设备进行紧固指示。

紧固指示中可分配“Parameter”或“Batch”。



在紧固指示中指定“Parameter”时

请将 ID 的第 100 位设为 0。

10 位和 1 位表示参数编号。

示例：参数 1 的 ID 为“001”

参数 5 的 ID 为“005”

在紧固指示中指定“Batch”时

请将 ID 的第 100 位设为 1。

10 位和 1 位表示批处理编号。

示例：批处理 1 的 ID 为“101”

批处理 5 的 ID 为“105”

※ “Job”和“Sequence”不可分配。

通过 Open Protocol 连接控制器和外部设备

分配紧固参数 (Mode 2时)

Open Protocol 支持命令一览

本产品支持以下命令。
有关各命令的详情，请参见 Open Protocol 规格书 (Open Protocol Specification)。

MID 0001 Application communication start
支持 Revision1。 [内容] 通信开始
MID 0002 Application communication start acknowledge
支持 Revision1。 [内容] 通信响应
MID 0004 Application command error
支持 Revision1。 [内容] 命令错误
MID 0005 Application command accepted
支持 Revision1。 [内容] 命令接收
MID 0018 Select parameter set, Dynamic Job included
支持 Revision1。 分配方法请参见“分配紧固参数 (Mode 2时)”。 参见P87 [内容] 参数集指示
MID 0042 Disable tool
支持 Revision1。 [内容] 不可使用工具

通过 Open Protocol 连接控制器和外部设备

分配紧固参数 (Mode 2时)

MID 0043 Enable tool
支持 Revision1。 [内容] 可使用工具
MID 0050 Vehicle ID number download request
支持 Revision1。 [内容] 车辆 ID 获取请求
MID 0060 Last tightening result data subscribe
支持 Revision1-2。 [内容] 最终紧固结果数据注册
MID 0061 Last tightening result data
支持 Revision1-2。 [内容] 紧固结果上传
MID 0062 Last tightening result data acknowledge
支持 Revision1-2。 [内容] 紧固结果上传响应
MID 9999 Keep alive message
支持 Revision1。 [内容] 生存确认

经由外部接入点连接

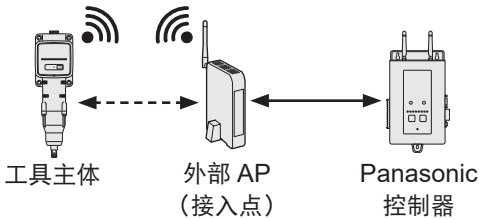
操作

可不使用控制器内置的接入点，而使用外部接入点和工具进行无线通信。

可不受控制器安装场所的限制使用工具。

接入点和控制器请用有线 LAN 连接。

※ 无线通信距离、通信性能根据使用的接入点而异。

连接方法	通信方式	详情
 工具主体 外部 AP (接入点) Panasonic 控制器	Ethernet	• 通过模式切换选择内置 AP (接入点)/ 外部 AP (接入点) • 最多可连接 8 台工具 ※ 内置 AP (接入点)/ 外部 AP (接入点) 一样

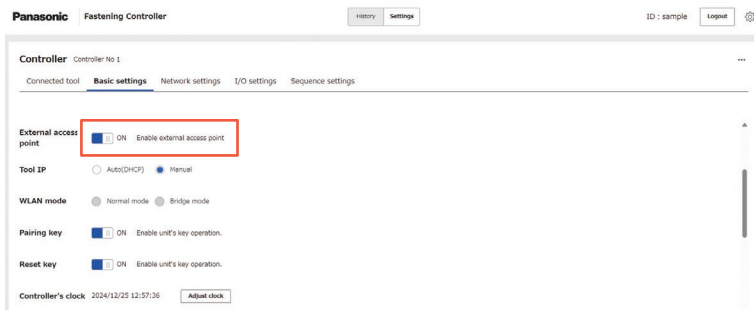
※ 将工具 IP 设置设为“Auto (DHCP)”时，可创建不管理工具 IP 地址的网络构成。详情请确认控制器 (EYFRW2) 的使用说明书。

经由外部接入点连接

设置方法

1 单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Basic settings”选项卡，将“External access point”设为“ON”

※ “WLAN mode”设置中“External access point”设置为 ON 时不在范围内。



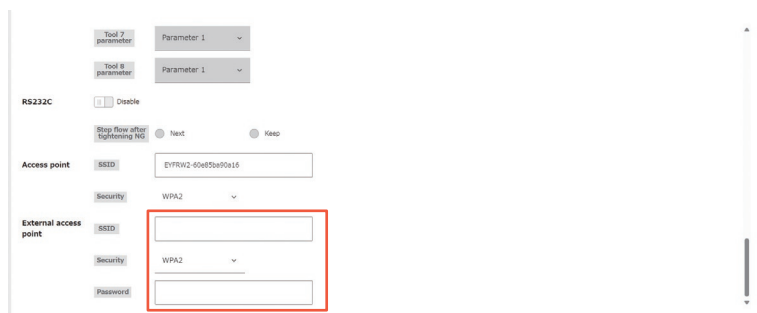
2 单击 Home 画面（设置画面初始页面）上部的 [Settings]，然后选择“Network Settings”选项卡，设置“Network Settings”画面中“External access point”的“SSID”、“Security”、“Password”

※ 可在控制器中注册的 SSID 仅有 1 种。（无法对每个工具进行设置）

※ 请参见使用的外部 AP（接入点）使用说明书。

※ 请务必在与工具进行配对注册前设置。

※ 请在配对注册前设置工具 IP 地址。



工具的性能和技术规格

工具的性能

型号	EYFCA1WC
建议作业 (螺栓强度)	M8 (高强度螺栓) M10 (普通螺栓)
扭矩控制作用范围	约 20.0 Nm~60.0 Nm / 177.0 In.lbs~531.0 In.lbs / 14.7 Ft.lbs~44.2 Ft.lbs (可设置范围：约 10~70 Nm / 88.6 In.lbs~620.0 In.lbs / 7.4 Ft.lbs~51.7 Ft.lbs)
紧固扭矩精度 (※1)	± 15 %
作业速度	<M8: 23 Nm / 204 In.lbs / 17 Ft.lbs> 约 0.5 秒 / 螺栓 <M10: 43 Nm / 380.8 In.lbs / 31.7 Ft.lbs> 约 0.7 秒 / 螺栓

<测量条件> 按本公司规定的测量条件。

※1 紧固扭矩、紧固扭矩精度会因作业情况而发生变化。使用前请务必通过实际作业进行确认。

工具的性能和技术规格

工具技术规格

型号		EYFCA1WC
扳手尺寸		□ 12.7 mm
电源电压		15 V DC
无负荷转速		0 ~ 约 2300 转 / 分钟 (最大转速可设为约 500 ~ 2300 转 / 分钟)
软启动转速		约 150 ~ 350 转 / 分钟 (最大转速可设为约 150 ~ 350 转 / 分钟)
脉冲数量		0 ~ 约 2700 转 / 分钟
外形尺寸	全长	约 306 mm (安装伸缩套筒时：约 408 mm)
	全高	约 89 mm
	全宽	约 91 mm
质量 (重量)		约 1.65 kg (安装伸缩套筒时：约 1.95 kg)
无线通信标准 (※1)		无线 LAN (IEEE802.11 a/b/g/n) ※n: 仅 HT20
频带		2.412-2.462 GHz / 5.180-5.240 GHz
通道数		2.4 GHz 频带：1 ch-11 ch / 5 GHz 频带：36、40、44、48 ch
可保存的工具历史日志数		约 45000 个螺栓 (按 1.2 秒工作)
可保有的工具参数数		1 个参数
对应机器人的可搬运重量		3 kg ~ (※2)

※1 关于 5 GHz(36、40、44、48 ch)：除与 5.2 GHz 带宽高功率数据通信系统的基站或陆上移动中继站进行通信的情形外，该无线设备仅限于在室内传送数据。

※2 3 kg 可搬运机器人使用 M8 高强度螺栓。

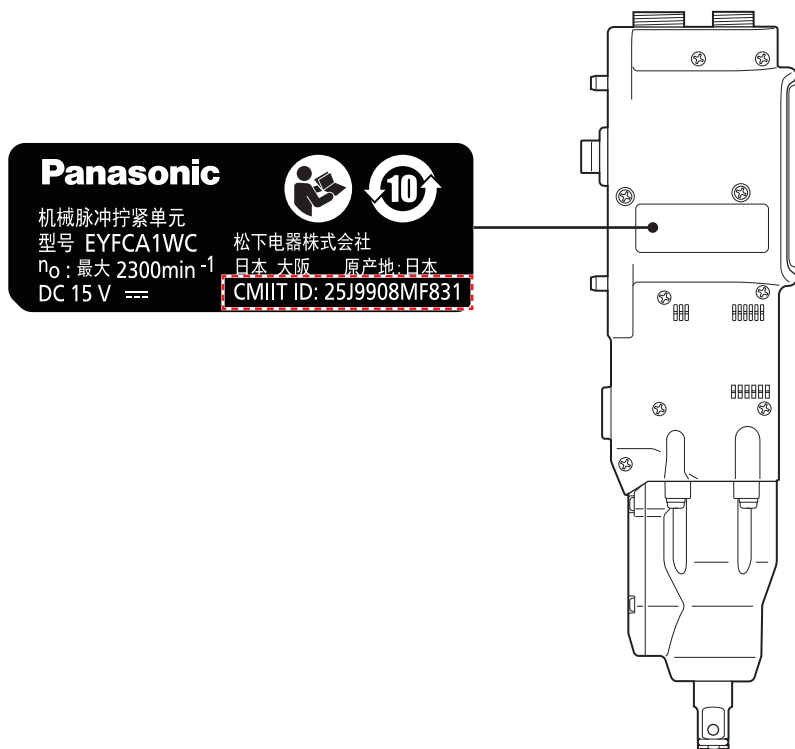
无线通信注意事项

■ 以下环境条件下可能产生噪声、无线电覆盖范围缩短或故障。

- 存在阻碍电波在无线工具单元与控制器之间正常传播的障碍物（如金属物体、钢筋混凝土物体）。
- 控制器天线被金属覆盖。
- 操作人员的身体干扰操作器（无线工具单元）与控制器之间的无线电传播。
- 附近存在导致噪声的微波炉、PC 或任何其他设备。
- 无线工具单元和控制器附近有人使用手机或个人手持电话。

- (一) 符合“微功率短距离无线电发射设备目录和技术要求”的具体条款和使用场景，采用的天线类型和性能，控制、调整及开关等使用方法；
- (二) 不得擅自改变使用场景或使用条件、扩大发射频率范围、加大发射功率（包括额外加装射频功率放大器），不得擅自更改发射天线；
- (三) 不得对其他合法的无线电台（站）产生有害干扰，也不得提出免受有害干扰保护；
- (四) 应当承受辐射射频能量的工业、科学及医疗（ISM）应用设备的干扰或其他合法的无线电台（站）干扰；
- (五) 如对其他合法的无线电台（站）产生有害干扰时，应立即停止使用，并采取措施消除干扰后方可继续使用；
- (六) 在航空器内和依据法律法规、国家有关规定、标准划设的射电天文台、气象雷达站、卫星地球站（含测控、测距、接收、导航站）等军民用无线电台（站）、机场等的电磁环境保护区域内使用微功率设备，应当遵守电磁环境保护及相关行业主管部门的规定；
- (七) 禁止在以机场跑道中心点为圆心、半径 5000 米的区域内使用各类模型遥控器；
- (八) 微功率设备使用时温度和电压的环境条件。

■ CMIIT ID 表显示位置



■ 无线功能作用：

在工具 and 控制器间进行无线通信的配对及数据双向通信（工具的设置信息、紧固作业结果等）

清洁和储存

清洁方法

■ 用软布擦拭

请勿使用湿布、稀释剂、酒精、汽油或其他挥发性液体。
(会导致褪色、变形或开裂)



■ 延长使用寿命

定期请经销商进行维护或向本公司提出咨询服务。

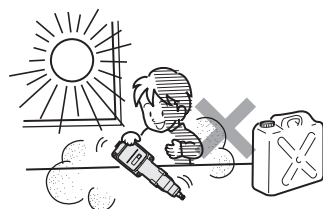
■ 定期实施检查

请定期确认电源线插头、信号线插头是否有松动、破损。

储存方法

储存期间，务必规避下列情况。

- 汽车驾驶室或其他高温场所
- 阳光直射的场所
- 淋雨或潮湿的场所
- 存在大量异物或灰尘的场所
- 儿童可能触及的场所
- 存在汽油或其他易燃物的场所
- 有掉落危险的场所



错误代码

控制面板上的错误代码

本产品出现异常时，控制面板上会出现闪烁的错误代码。
请求维修前，请采取以下措施。采取下列措施后，如果仍未改善，请联系经销商进行维修。

显示	可能原因	措施
	工具的内部存储器或通信线路、无线通信等存在异常。	重新接通电源并重新启动工具。 如果问题仍然存在，请执行初始化。 （“E1”显示时，按住配对按钮持续约10秒） 无线通信模式下，还会检查控制器的状态。
	工具的电机发热。	中断作业，待电机温度降低后，方可继续使用。
	主体内部的传感器类异常。	重新接通电源并重新启动工具。
	电机等过载、失效。	检查工具性能是否适合作业任务。

注意

- 拧紧或拧松已经上紧的螺栓时，过载保护（E5）可能起作用。

错误代码

控制面板上的错误代码

显示	可能原因	措施
	工具电路中存在异常、故障等。	重新接通电源并重新启动工具。
	与控制器的无线连接断开。 参见P94	- 在无线通信范围内重新接通电源再使用。 - 如果重新接通电源后仍有异常，请确认控制器及周边设备。
	① 扭矩传感器存在异常、故障等 ② 作业时间过长（测量数据过多） ③ 判定 NOK	①：重新接通电源并重新启动工具。 ②③：根据控制器的历史日志确认错误内容。 修改设置参数。
	工具中的纽扣电池耗尽。	—
	[Wireless Communication Mode] 下批量作业负荷过大(超过临时存储通信数据的存储器容量)。	重新考虑一个批次的作业负荷。 设置 [Graph Sending/Storing Timing] 时，请选择 [After Batch Complete] 之外的设置。
	输入电压低。	确认输入电压，重新接通电源并重新启动工具。
	工具主体的输入电压高。	确认输入电压，重新接通电源并重新启动工具。
	驱动中，工具主体的输入电压低。	重新接通电源并重新启动工具。
	连续驱动时间超过5分钟。	重新接通电源并重新启动工具。
	在系统端按下紧急停止按钮。	消除包括机器人在内的系统紧急停止原因，解除紧急停止。

错误代码

紧固履历的错误消息

如果拧紧作业没有成功完成，可查看紧固履历中的错误描述。（关于如何浏览紧固履历，参见P60。）

分类	错误消息	原因	措施（针对意外原因）
Torque	Torque exceeded	- 工具的测量扭矩超过扭矩设置上限。 - 构件条件不适合此工具。	- 检查设置。 - 重新考虑构件条件。 - 禁用扭矩设置上限。
Torque	Torque insufficient	- 作业停止时工具的测量扭矩小于扭矩下限。 - 构件条件不适合此工具。	- 检查设置。 - 重新考虑构件条件。 - 禁用扭矩设置下限。
Angle	Before snug angle exceeded	作业中途的拧紧前角度超过设置上限。	- 检查设置（包括拧紧点设置）。 - 重新考虑构件条件。 - 禁用设置上限。
Angle	Before snug angle insufficient	作业停止时的拧紧前角度小于设置下限。	- 检查设置（包括拧紧点设置）。 - 重新考虑构件条件。 - 禁用设置下限。
Angle	After snug angle exceeded	作业中途的拧紧后角度超过设置上限。	- 检查设置（包括拧紧点设置）。 - 重新考虑构件条件。 - 禁用设置上限。
Angle	After snug angle insufficient	作业停止时的拧紧后角度小于设置下限。	- 检查设置（包括拧紧点设置）。 - 重新考虑构件条件。 - 禁用下限设置。
Error	Rundown error	下旋错误时间以内实施关闭停止。	- 检查设置（关闭扭矩和下旋错误时间设置）。 - 重新考虑构件条件（造成停止的原因可能是负载异常）。 - 禁用下旋错误设置。
Error	Stop before shut off	- 作业在关闭前结束。 - 用户关闭触发器。 - 停止由另一个错误引起。	< 如果实施了手动停止 > - 重新考虑作业环境。 - 检查构件条件。 < 如果出现另一个错误 > - 检查错误描述并采取相应措施。

错误代码

紧固履历的错误消息

分类	错误消息	原因	措施（针对意外原因）
Error	Shut off incomplete	• 作业因“关闭前停止”和“存在脉冲”而结束。 - 关闭前停止 - 作业开始。	• 请参见关闭前停止的部分。 • 重新考虑作业程序。
Error	Overcurrent	• 保护因工具中发现异常电流而停止。 - 与作业环境有关 - 与电源系统或工具有关	• 重新考虑作业环境（是否存在异常负载、工人使用工具的方式）。
Error	Low voltage	• 保护因检测到工具主体的供电电压低而停止。 - 与作业环境有关 - 与电源系统有关	• 清洁连接器（检查连接器上的灰尘和磨损情况）。
Error	Motor high temperature	• 保护因工具电机发热而停止。	• 使用前，等待电机冷却（无冷凝）。 < 如果存在连续异常负载 > • 重新考虑作业环境。 • 检查构件条件。
Error	Motor sensor error	• 电机的温度传感器检出低温错误。 - 判断标准：-30℃以下	• 重新考虑作业环境。 - 该判断仅基于温度，如果该情况频繁出现，说明存在故障。
Error	Torque sensor error	• 扭矩传感器周围检出断路或短路。	• 检查频率。 - 如果该情况频繁出现，请求维修。
Error	Torque sensor protection	单一作业任务中，以下项目之一超过可测量上限。 - 脉冲次数（=511次） - 作业时间（=13秒） - 累积角度（=131071°）	• 重新考虑作业环境（包括作业任务和程序）。 • 检查构件条件。

错误代码

紧固履历的错误消息

分类	错误消息	原因	措施（针对意外原因）
Error	Tool locked	- 检测到驱动中的电机处于锁定状态。 - 硬件故障、负载异常等。	- 重新考虑作业环境。 - 检查频率。 - 如果该情况频繁出现，请求维修。
Error	Circuit identification error	电路 ID 开关设置异常。	- 检查频率。 - 如果该情况频繁出现，请求维修。（电路故障或制造、维修中出错）
Error	Parameter error	工具中设置的参数超出设置范围。	- 检查参数设置。 - 重新设置工具参数。
Error	Data limit exceeded	达到单个作业任务的可记录数据总量。	- 重新考虑作业环境（包括作业任务和程序）。 - 检查构件条件。
Error	Maintenance warning	提醒时间设置前，累积脉冲时间还剩 1 小时。	- 检查设置。 - 重新设置（如延长、初始化或禁用该设置）。
Error	Maintenance protection	累积脉冲时间超过提醒时间设置。	- 检查设置。 - 重新设置（如延长、初始化或禁用该设置）。
External input	Emergency stop	从连接控制器的系统执行了紧急停止操作。	确认并消除造成紧急停止操作的原因
Error	Pre fastening NOK	工序①～⑦下存在 NOK 条件。在工序①～⑦中，中断作业。	修改 NOK 的工序和设置条件，修改材料条件

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产品中有害物质的名称及含有的信息表

部件名称	有害物质									
	Pb	Hg	Cd	Cr(VI)	PBBs	PBDEs	DBP	DIBP	BBP	DEHP
外壳	○	○	○	○	○	○	○	○	○	○
控制面板	○	○	○	○	○	○	○	○	○	○
回路基板	×	○	○	○	○	○	○	○	○	○
开关	○	○	○	○	○	○	○	○	○	○
马达	○	○	○	○	○	○	○	○	○	○
机构部	○	○	○	○	○	○	○	○	○	○
USB 连接器盖	○	○	○	○	○	○	○	○	○	○
插头插口	○	○	○	○	○	○	○	○	○	○
插头	○	○	○	○	○	○	○	○	○	○
伸缩套筒	○	○	○	○	○	○	○	○	○	○
注1) ○:表示该有害物质在该部件所有均质材料中的含量均不超出电器电子产品有害物质限制使用国家标准要求。 ×:表示该有害物质至少在该部件的某一均质材料中的含量超出电器电子产品有害物质限制使用国家标准要求。 注2) 以上未列出的部件,表明其有害物质含量均不超出电器电子产品有害物质限制使用国家标准要求。										

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빨간색 텍스트는 사용설명서의 간편 (출력본) 버전에 언급되지 않은 부분을 나타냅니다.

안전 예방 조치

다음은 인명 피해 및 재산 피해를 방지하기 위해 항상 준수해야 하는 지침입니다.

■ 잘못된 사용으로 인한 피해 및 피해의 심각도는 다음과 같습니다.

 경고	사망하거나 중상을 입을 수 있습니다.
 주의	경상을 입거나 재산 피해가 발생할 수 있습니다.

■ 준수해야 할 내용은 다음 기호로 표시됩니다. (다음은 예시임)

	금지되는 행동입니다 .
	따라야 하는 행동입니다 .

 경고	
 필수	● 토크를 일별로 관리합니다. 이를 준수하지 않으면 토크 변동으로 인해 볼트가 헐거워져 사고가 발생할 수 있습니다.
	● 설치하기 전에 로봇의 중량 용량을 확인하십시오. 이를 준수하지 않으면 사고를 당하거나 문제가 발생할 수 있습니다.
	● 로봇을 사용할 때는 협동 모드를 사용하십시오. 이를 준수하지 않으면 전원선 또는 신호선이 손상되거나 도구 고장이 발생하여 사고를 당하거나 문제가 발생할 수 있습니다.
	● 작업 영역에 전선, 수도관, 가스관 등 매설된 물체가 없는지 확인하십시오. 매설된 물체와 접촉하면 감전, 누전, 화재 등 사고가 발생할 수 있습니다.
	● 소음이 심한 작업 환경에서는 귀마개 또는 귀덮개와 같은 귀 보호구를 착용하십시오. 이를 준수하지 않으면 청력에 악영향을 미칠 수 있습니다.
	● 작업 중에는 보호 안경을 사용하십시오. 또한, 먼지가 많은 곳에서 작업할 때는 방진 마스크를 착용하십시오. 이를 준수하지 않으면 눈이나 목에 부상을 입을 수 있습니다.
	● 전원 플러그를 끝까지 꽂으십시오. 제대로 삽입하지 않으면 감전이나 발열로 인해 화재가 발생할 수 있습니다 . 손상된 플러그나 느슨한 소켓을 사용하지 마십시오.

안전 예방 조치

⚠ 경고



필수

- **전원 플러그의 먼지를 정기적으로 청소하십시오.**
플러그에 먼지가 쌓이면 수분을 흡수하므로 절연 불량으로 인해 화재가 발생할 수 있습니다.
전원 플러그를 뽑고 마른 천으로 닦으십시오.
- **지정된 액세서리 및 부착물을 사용하십시오.**
이를 준수하지 않으면 부상을 입을 수 있습니다.
- **작업장을 충분히 밝게 유지하십시오.**
어두운 작업장에서는 시야가 제대로 확보되지 않아 사고나 부상을 입을 수 있습니다.
- **뿔촉한 도구(소켓, 연장 바 등)는 동력 도구 전용으로 사용하십시오.**
뿔촉한 도구를 수동 도구에 사용할 경우 파손되어 튀어나가 사고가 발생할 수 있습니다. 본 제품과 함께 동력 도구용 뿔촉한 도구를 사용해야 합니다.
- **뿔촉한 도구 등을 점검해야 합니다.**
뿔촉한 도구와 제품의 뿔촉한 도구 삽입 부분이 마모되거나 손상되었는지 항상 점검하십시오. 필요한 경우 교체 또는 수리를 요청하십시오. 소켓과 소켓 삽입부 사이에 큰 유격이 있는 경우에는 특히 사용하지 마십시오.
파손되어 부상을 입을 수 있습니다.
- **작업물을 단단히 고정하십시오.**
이를 준수하지 않으면 예기치 않은 움직임이 발생하여 부상을 입을 수 있습니다.
안전을 위해 클램프나 바이스를 사용하여 고정하십시오.
- **사용 중에 도구가 오작동하거나 비정상적인 소음이 발생하면 즉시 트리거 신호를 끈 다음 전원 스위치를 끄고 사용을 중단하십시오.**
대리점 또는 Panasonic 고객 지원 센터에 문의하십시오. 현재 상태로 계속 사용하면 부상을 입을 수 있습니다.
- **사용설명서에 따라 뿔촉한 도구 및 액세서리를 포함한 도구를 단단히 부착하십시오.**
단단히 부착하지 않으면 분리되어 부상을 입을 수 있습니다.
- **사용하기 전에 조정에 사용된 키, 렌치 및 기타 도구를 제거하십시오.**
이를 준수하지 않으면 예기치 않게 분리되어 부상을 입을 수 있습니다.
- **적절한 복장을 착용하고 작업하십시오.**
 - 헐렁한 의류나 목걸이와 같은 액세서리를 착용하지 마십시오. 회전하는 부품에 걸릴 수 있습니다.
 - 긴 머리는 모자나 헤어 커버로 가리십시오.

안전 예방 조치

⚠ 경고



금지

- **도구의 환기구를 막지 마십시오.**
막으면 비정상적인 열로 인해 화상이나 화재가 발생할 수 있습니다.
- **도구의 환기구에서 나오는 뜨거운 공기에 피부를 직접 노출하지 마십시오.**
● **작업 직후에는 소켓, 나사 또는 칩과 같은 뾰족한 도구를 만지지 마십시오.**
뜨거워서 화상을 입을 수 있습니다.
- **의도된 용도 외의 다른 목적으로 도구를 사용하지 마십시오.**
이를 준수하지 않으면 부상을 입을 수 있습니다.
- **LED 라이트를 손전등으로 사용하지 마십시오.**
어두울 때 이동할 수 있을 정도로 라이트가 충분히 밝지 못하기 때문에 사고가 일어날 수 있습니다.
- **LED 라이트가 눈에 직접 노출되지 않도록 하십시오.**
눈이 LED 라이트에 계속 노출되면 눈에 손상을 줄 수 있습니다.
- **도구에 오일 또는 기타 이물질이 묻어있는 경우 사용하지 마십시오.**
그렇지 않으면 도구를 떨어뜨려 사고가 발생할 수 있습니다.
또한, 이러한 오일 또는 기타 이물질이 내부로 유입되어 열 발생, 화재 또는 파열을 유발할 수 있습니다.
- **제품을 사용하는 동안 신체와 신체 일부가 회전 부품이나 칩에 닿지 않도록 하십시오.**
예기치 않게 이탈되거나 손상된 회전 부품 또는 칩이 부딪혀 부상을 입을 수 있습니다. 뾰족한 도구를 주기적으로 교체하십시오.
- **금속 물체에 구멍을 뚫는 용도로 제품을 사용하지 마십시오.**
높은 토크로 인해 금속 가공용 드릴 비트가 부러져 부상을 입을 수 있습니다.
- **석면이 근처에 존재하는 환경(석면 제거 중인 환경 포함)에서 도구를 사용하지 마십시오.**
건강에 악영향을 미칠 수 있습니다.
본 물질은 폐암 또는 기타 심각한 건강 손상을 유발하므로 석면에 극도의 주의를 기울여야 합니다.
- **본 제품은 로봇과 함께 사용하도록 되어 있습니다. 수동으로 작동하는 도구로 사용하지 마십시오.**
그렇게 하면 부상을 입을 수 있습니다.

안전 예방 조치

 경고	
 금지	● 사용이 끝나면 전원 플러그를 분리하십시오. 이를 준수하지 않으면 절연 불량으로 인해 감전이나 누전으로 인한 화재가 발생할 수 있습니다.
 분해 금지	● 도구를 개조하지 마십시오. 도구를 분해하거나 수리하지 마십시오. 그렇게 하면 화재, 감전, 부상의 원인이 됩니다. 수리하려면 대리점이나 고객 지원 팀에 문의하십시오.
 건조한 상태 유지	도구를 다음과 같이 사용하지 마십시오. ● 비나 습기에 노출된 상태로 두거나 사용하지 마십시오. ● 물에 잠긴 상태에서 사용하지 마십시오. 이를 준수하지 않으면 연기, 화재, 폭발의 원인이 됩니다.
 젖은 손 접촉 금지	● 젖은 손으로 전원 플러그를 콘센트에 연결하거나 분리하지 마십시오. 이를 준수하지 않으면 감전될 수 있습니다.

안전 예방 조치

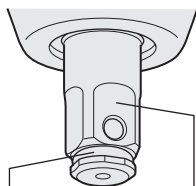
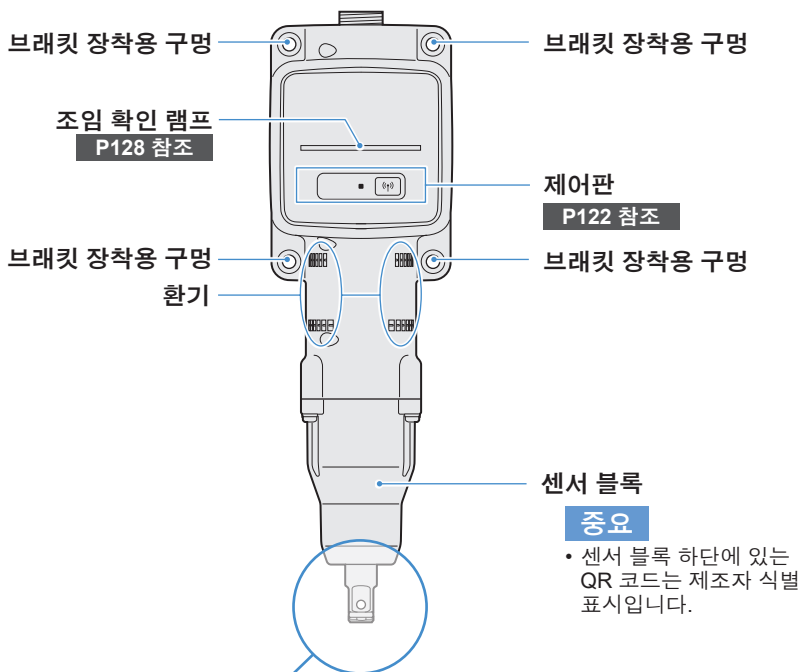
⚠ 주의

 금지	● 어린이가 접근할 수 있는 곳에 도구를 두지 마십시오. 이를 준수하지 않으면 사고를 당하거나 문제가 발생할 수 있습니다.
	● 온도가 50 °C 이상으로 올라갈 수 있는 장소에 본체를 보관하지 마십시오. 이를 준수하지 않으면 오작동의 원인이 됩니다.
	● 모터가 잠길 정도로 과도한 힘으로 도구를 사용하지 마십시오. 이를 준수하지 않으면 연기 또는 화재가 발생할 수 있습니다. 안전하고 효율적으로 작업하려면 능력에 맞는 속도로 작업하십시오.
	● 피곤할 때는 도구를 사용하지 마십시오. 이를 준수하지 않으면 사고를 당하거나 부상을 입을 수 있습니다.
	● 어린이나 작업자가 아닌 사람이 작업장에 접근하거나 도구를 만지지 않도록 하십시오. 그렇게 하면 부상을 입을 수 있습니다.
 필수	● 도구가 뜨거워지면 작업을 중단하고 사용하기 전에 냉각될 때까지 기다리십시오. 이를 준수하지 않으면 화상을 입을 수 있습니다.
	● 전원 플러그를 뽑을 때는 코드를 당기지 말고 항상 전원 플러그를 잡으십시오. 코드를 잡아당기면 감전 또는 단락이 발생할 수 있습니다.
	● 사용하기 전에 도구, 뿔족한 도구 및 기타 부품에 손상이 없는지 검사하고 정상적인 작동을 확인하십시오.
	● 사용하기 전에 도구에 흠집이나 균열이 없는지 확인하십시오. 이를 준수하지 않으면 손상이 발생하여 부상을 입을 수 있습니다.
	● 작업장을 청결하게 유지하십시오. 정리되지 않은 작업장이나 작업대는 사고로 이어질 수 있습니다.
	● 취급 및 작업 방법을 잘 고려하고, 주변 환경에 주의를 기울이며, 상식적인 수준에서 작업하십시오. 이를 준수하지 않으면 사고를 당하거나 부상을 입을 수 있습니다.

기능 설명

도구

■ 전면



리테이너 링

핀 멈춤쇠



확장 가능 소켓

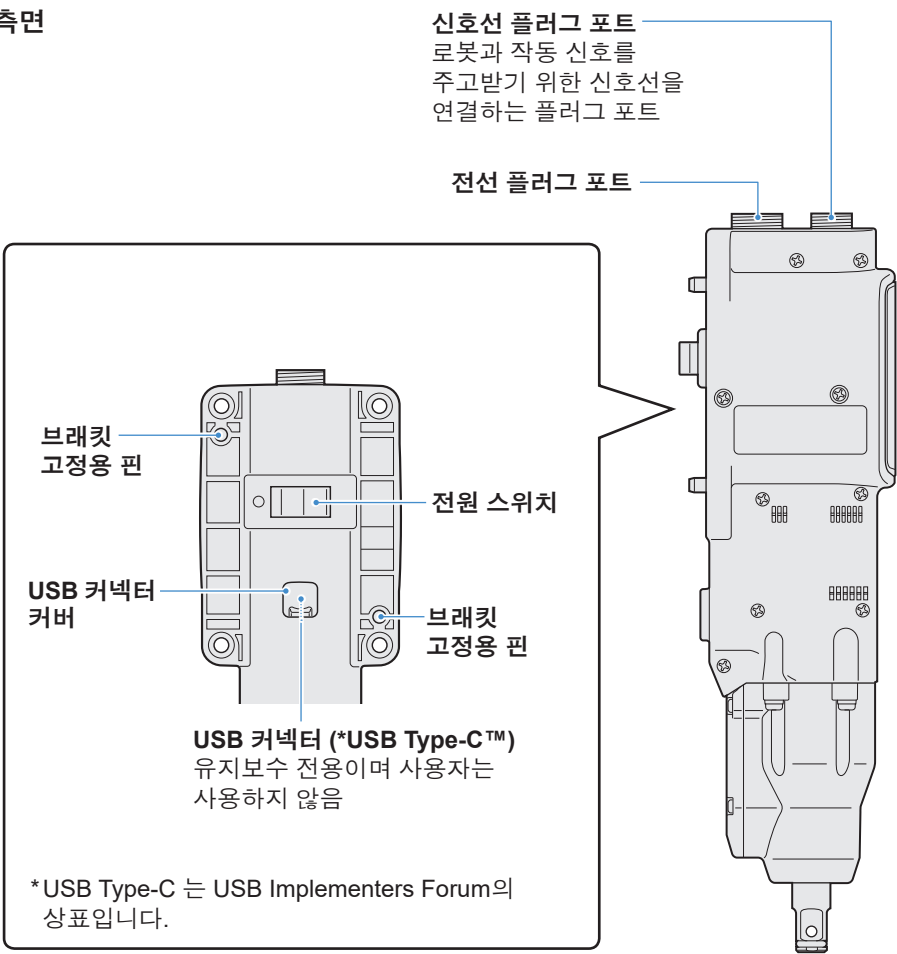
확장 가능 소켓을 사용하여 로봇에 미치는 충격을 줄이면서 체결 토크 정확도를 보장합니다.

* 확장 가능 소켓 교체 권장 시기

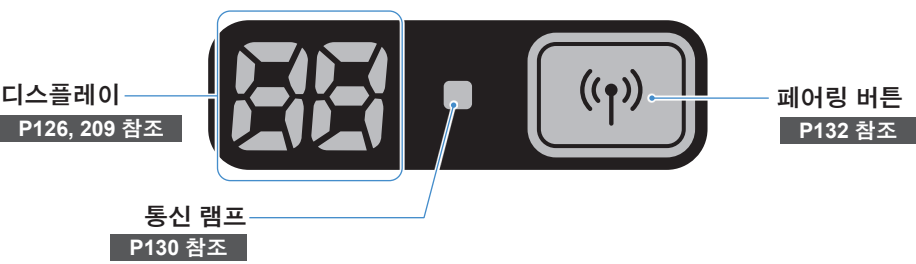
총 체결 횟수가 약 250,000 회에 도달하면 확장 가능 소켓을 교체하십시오.
사용 조건에 따라 더 빨리 마모되고 열화될 수 있습니다.
주기적으로 점검하십시오.

기능 설명

측면



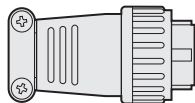
제어판 P121 참조



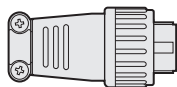
기능 설명

액세서리 및 별매품

전원선 플러그 (WEYFCA1WF711)



신호선 플러그 (WEYFCA1WF721)



확장 가능 소켓 (WEYFCA1WF701)



* 액세서리 및 별매품에 대한 자세한 내용은 설치설명서를 참조하십시오.

* 교체 부품으로 구매할 수 있습니다.

시작하기 전에

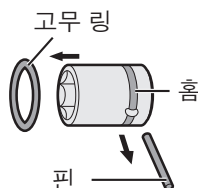
설치 및 사용 위치

다음 조건을 충족하는 장소에서 제품을 사용하십시오.

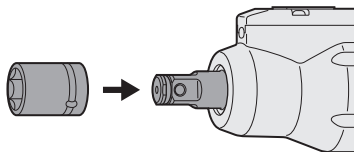
- (1) 실내
- (2) 직사광선 또는 물이나 비가 닿지 않는 곳
- (3) 부식성 또는 가연성 가스가 없는 곳
- (4) 오일 미스트, 먼지, 물, 염분, 철분 또는 유기 용제가 없는 곳
- (5) 주변 온도: 0 °C ~ 40 °C

소켓 부착

- 1** 소켓에서 고무 링과 핀을 제거합니다.

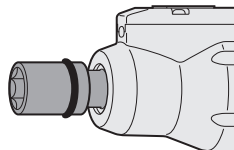


- 2** 소켓을 도구에 삽입합니다.
구멍 위치를 정렬합니다.



- 3** 1의 절차를 반대로 하여 핀과 고무 링을 부착합니다.

고무 링을 넣어 핀이 나오지 않도록 하십시오.



- 리테이너 링 (C-링) 은 임시 고정용입니다. 소켓 고정에는 핀과 고무 링을 사용하도록 하십시오.
- 마모되거나 변형된 소켓을 사용하는 경우, 리테이너 링 (C-링) 유형의 모루가 삽입되지 않을 수도 있습니다.

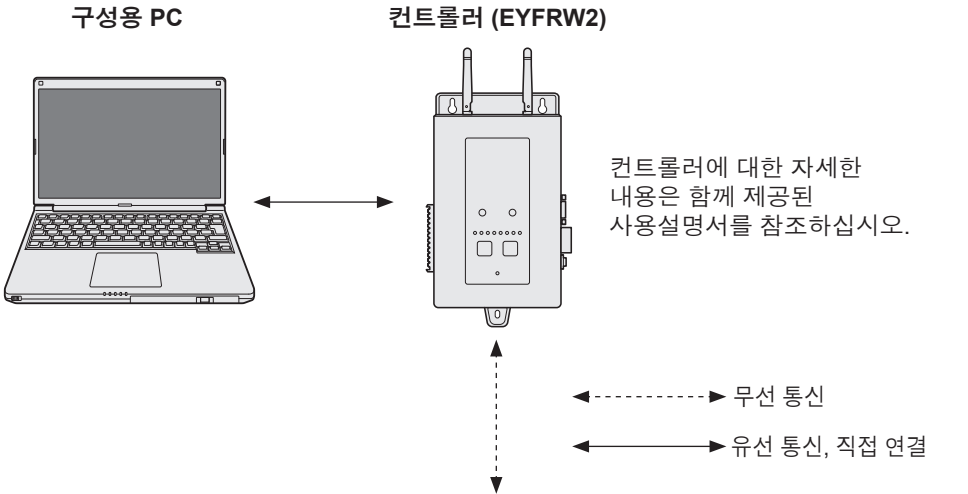
배선도

이 도구는 아래의 결선도에 나온 것과 같이 외부 장치를 연결하여 사용할 수 있습니다.

■ 작동 환경

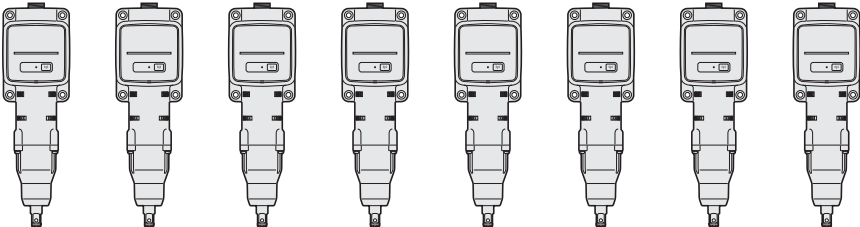
호환 OS	Windows 10 이상(아래 웹 브라우저 지원)
웹 브라우저	Microsoft Edge 버전 102 이상 또는 Google Chrome 버전 102 이상

■ 연결 예



본 기기

최대 연결 장치 수: 8



*USB Type-C 는 USB Implementers Forum 의 상표입니다.

기본 작동

도구의 사용 모드

도구는 다음 모드 중 하나로 작동합니다.
현재 사용 중인 모드가 제어판의 디스플레이에 표시됩니다.



디스플레이	모드 이름	모드 내용
	Wireless Communication Mode	이 모드에서는 도구가 무선 통신을 통해 제어됩니다. 도구는 컨트롤러와 통신하여 기록 로그 데이터를 전송하고, 구성된 매개 변수를 수신합니다.
	Operation Disable Mode	도구는 wireless communication mode 에 있는 컨트롤러에서 작동 금지 신호를 받아 잠깁니다. 컨트롤러에서 해제 신호를 받아 잠금 해제됩니다.
	Pairing Mode	이 모드는 페어링 상태를 점검합니다. 컨트롤러에서도 수행할 수 있습니다. P132 참조
	Minimum Output Mode	이 모드에서는 대상 토크가 낮을 경우, 토크 제어가 가능한지 여부를 확인합니다. 이 도구는 펄스가 최소 숫자일 때 작동 중단됩니다.
	Offset Mode	이 모드는 도구의 계산된 토크를 실제 토크에 맞춰 수정합니다. P155 참조
	Factory Default Mode	이 모드에서는 도구가 공장 기본 상태입니다. P140 참조

기본 작동

토크 제어 기능

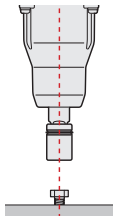
작업 목표의 조임 토크는 도구의 토크 센서로 계산됩니다.
계산된 토크 값이 사전 설정된 목표 값에 도달하면, 도구는 자동으로 중단(작동 중단)됩니다.
(Shut-Off Torque 설정 방법은, **P162 참조**)

⚠ 경고

토크 성능에 대한 일일 관리를 수행하십시오.
그렇지 않은 경우, 토크 변경으로 볼트가 느슨해져서 사고가 발생할 수 있습니다.

주의

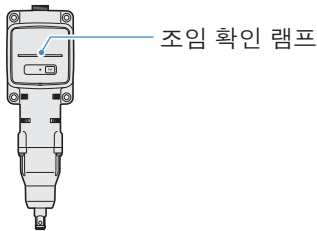
- 작업에서 작업 중 부하가 목표 토크보다 높으면, 작업 중 부하가 목표 토크에 따라 판단되기 때문에 볼트가 충분히 조여지지 않을 수 있습니다.
- 작업에서 구성이 다양한 경우, 조임 토크가 동일 설정 토크에서도 다를 수 있습니다.
- 동일한 볼트를 두 번 조인 경우, 과도하게 조여져 볼트가 부러지거나 볼트로 조인 구성이 변형될 수 있습니다.
- 조임 토크는 작업 조건에 따라 다양합니다. 실제 작업에 맞게 조절하십시오.
- 볼트 조임 토크는 다음 요인에 따라 변경될 수 있습니다.

볼트	볼트 지름 (일반적으로 지름이 크면, 조임 토크가 증가), 토크 계수 (볼트 제조사에서 제공), 등급, 길이, 와셔 여부 및 유형 등.
소켓	길이, 자재 품질, 열화도, 자재 연결기 사용, 소켓 어댑터 사용, 연장 소켓 사용 등
조일 구성 조건	자재 품질, 베어링 표면 마감 등
작업 방법	도구를 볼트에 놓는 방법, 도구의 강도, 도구와 볼트의 중심선을 정렬하는 방법 등(아래 그림 참조) 

기본 작동

조임 확인 램프

도구의 LED 램프를 보고 조임 결과를 확인할 수 있습니다.



램프 디스플레이

램프 디스플레이		램프 디스플레이	내용
초록색	2초간 켜짐 + 버저 (설정에 따름)	작업 OK 로 판단됨	조임 작업이 설정된 작동 중단 토크에 성공적으로 도달했습니다.
빨간색	2초간 켜짐 + 버저 (설정에 따름)	작업 NOK 로 판단됨	조임 작업이 설정된 작동 중단 토크에 도달하지 않았습니다. P211 참조
		도구 오류	제어판 디스플레이에 어떤 오류가 표시되는 경우, 오류 설명에 따른 조치를 취하십시오. P209 참조
빨간색	계속 켜짐 + 버저	높은 모터 온도	도구의 모터가 뜨거울 수 있습니다.
		토크 센서 오류 토크 센서 보호	토크 센서에서 이상, 고장 등이 감지되었습니다.
		유지관리 간격 알림 잠금 모드	[Maintenance Interval Alarm] 에 설정되어 있는 유지보수 시기에 도달했기 때문에 도구가 잠깁니다. 또한 제어판 디스플레이에 설정값 (1~99) 과 "0" 이 번갈아가며 보이는지 확인하십시오. P138 참조

기본 작동

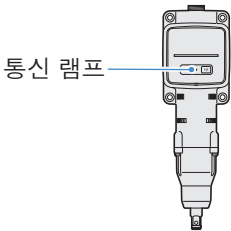
조임 확인 램프

램프 디스플레이		램프 디스플레이	내용
노란색	깜박임(1초 주기) + 버저	통신 오류	컨트롤러와 통신할 수 없습니다.
		매개 변수 오류	유효하지 않은 매개 변수가 감지되었습니다.
		메모리 오류	메모리 사용량이 상한에 도달했습니다.
		저전압	지정된 값보다 낮은 입력 전압이 감지되었습니다.
		과전압	지정된 값보다 높은 입력 전압이 감지되었습니다.
		시간 초과 오류	5분 이상 작업이 계속되었습니다.
		비상 정지 오류	컨트롤러가 비상 정지 명령을 발행했습니다(설정에 지정된 대로).

기본 작동

통신 램프

도구의 LED 램프를 보고 통신 상태를 확인할 수 있습니다.



램프 디스플레이

램프 디스플레이		디스플레이의 의미	내용
파란색	빠르게 깜빡임 (0.2초 주기)	통신 중	컨트롤러와 통신 중입니다.
파란색	빠르게 깜빡임 (0.2초 주기)	페어링 진행 중	페어링이 진행 중인 동안 통신 램프가 빠르게 깜빡입니다.
파란색	느리게 깜빡임 (1초 주기)	재연결 진행 중	재연결이 진행 중인 동안 통신 램프가 느리게 깜빡입니다.
파란색	깜빡임 (0.2초 주기) + 버저	페어링 완료됨	페어링이 완료된 후 통신 램프가 느리게 깜빡이기 시작합니다 (0.5초 주기). 페어링이 완료된 후, 도구는 컨트롤러의 명령에 따라 “무선 신호 대기 중” 또는 “무선 작동 금지됨” 상태로 들어갑니다.
파란색	느리게 깜빡임 (1초 주기)	무선 신호 대기 중	도구가 무선 통신 모드에 있는 동안 통신 램프가 느리게 깜빡입니다.
—	OFF	무선 작동 금지됨	컨트롤러에서 나온 작동 금지 신호에 따라 도구의 작동이 비활성화됩니다.

기본 작동

컨트롤러와 페어링

페어링 활성화하기

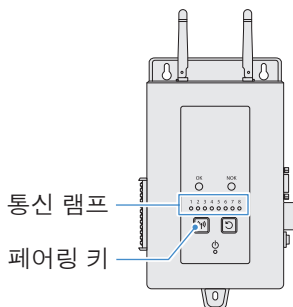
컨트롤러 장치에 있는 페어링 키를 사용하십시오 (EYFRW2).

등록되지 않은 숫자의 통신 램프를 선택(램프 꺼짐)하고 페어링 키를 눌러 페어링 모드로 들어갑니다.

페어링 모드에 들어간 지 2분 이내에 통신 범위 내에 있는 도구의 페어링 모드가 시작되어 페어링이 작동으로 구성됩니다.

이 시간 내에 페어링이 구축되지 않으면 페어링 모드가 종료됩니다.

- 페어링 시작을 시도한 이후, 컨트롤러가 페어링 모드에 들어갈 때까지는 약간의 시간이 소요될 수 있습니다.



■ 툴 No. 4 등록

- 1** 컨트롤러에 있는 페어링 키를 4 번 눌러 툴 No. 4 를 선택하십시오.
통신 램프 No. 4 가 깜빡거립니다.



- 2** No. 4 가 선택된 상황에서, 컨트롤러에 있는 페어링 키를 누르고 있으면 툴 No. 4 가 페어링 모드에 들어갑니다.

페어링 모드에서 통신 램프 No. 4 가 빠르게 깜빡이기 시작합니다.



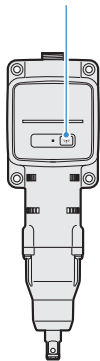
기본 작동

컨트롤러와 페어링

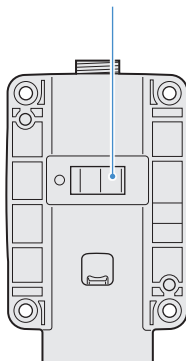
3 도구(본 제품)의 페어링 버튼을 누른 상태에서 전원 스위치를 켜십시오.

도구가 페어링 모드에 들어갑니다.

페어링 버튼



전원 스위치



도구가 페어링 모드에 들어가면, 제어판의 디스플레이가 페어링 모드를 보여줍니다.

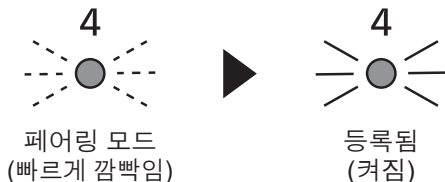
디스플레이



무선 통신은 자동으로 구축되며, 페어링 등록이 완료됩니다.

페어링 등록이 완료되면, 컨트롤러의 통신 램프 No. 4 가 계속 켜져 있습니다.

- 페어링에 실패하면, 컨트롤러의 페어링을 취소하고 다시 시도하십시오.



중요

- 기기의 키를 사용하는 것 외에도 설정 화면에서 설정하여 페어링을 할 수 있습니다.
- 설정 화면의 페어링 방법과 컨트롤러의 작동 세부 내용에 대해서는 컨트롤러와 함께 제공된 사용설명서를 참조하십시오.

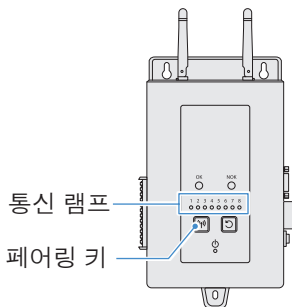
기본 작동

컨트롤러와 페어링

페어링 취소하기

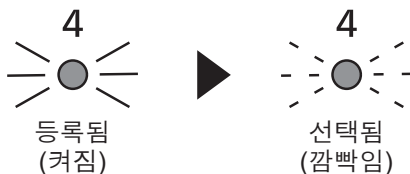
컨트롤러 장치에 있는 페어링 키를 사용하십시오 (EYFRW2).

등록 취소하고 싶은 숫자의 통신 램프를 선택(램프 켜짐)하고 페어링 키를 눌러 페어링 등록을 취소합니다.



■ 톨 No. 4 취소

- 1 컨트롤러에 있는 페어링 키를 4 번 눌러 톨 No. 4 를 선택하십시오.
통신 램프 No. 4 가 깜빡거립니다.



- 2 No. 4 가 선택된 상태에서, 컨트롤러에 있는 페어링 키를 누르고 있으면 톨 No. 4 의 페어링 등록이 취소됩니다.

페어링이 취소되면, 통신 램프 No. 4 의 깜빡임이 중단되고 꺼집니다.



중요

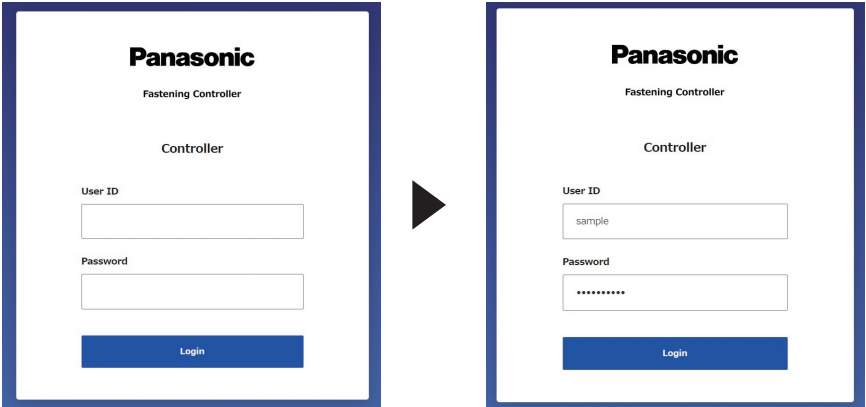
- 기기의 키를 사용하는 것 외에도 설정 화면에서 설정하여 페어링을 취소할 수 있습니다.
- 설정 화면의 페어링 취소 방법과 컨트롤러의 작동 세부 내용에 대해서는 컨트롤러와 함께 제공된 사용설명서를 참조하십시오.

웹 브라우저를 통한 설정

설정 화면 표시

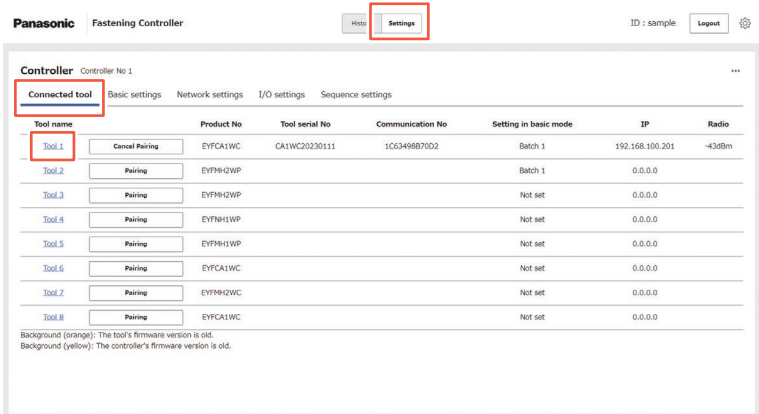
1 상단 페이지 표시

컨트롤러(EYFRW2)의 사용설명서에 있는 “사용 전 준비 사항”의 “설정 화면 표시”부터 “네트워크를 통해 연결”까지를 참조하여 웹 브라우저를 통해 설정하고 상단 페이지를 표시하십시오.



2 도구 화면 표시

- ① 상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Connected tool” 탭을 선택합니다.
- ② “Connected tool” 화면에서 원하는 도구 번호를 클릭합니다.도구 번호에 대한 화면이 표시됩니다.



웹 브라우저를 통한 설정

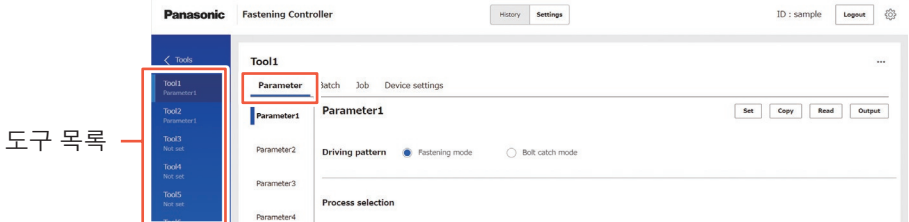
설정 화면 표시

3 설정 화면 표시

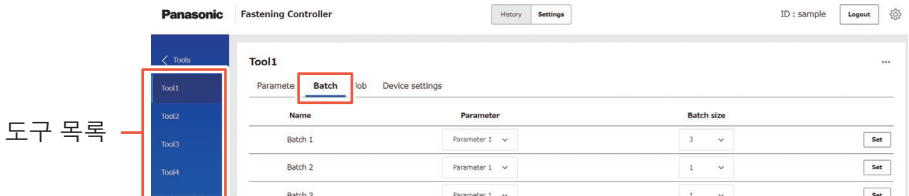
도구 번호 화면의 “Parameter”, “Batch”, “Job” 및 “Device settings” 탭에서 매개 변수, 배치, 작업 및 장치 설정을 수행하십시오.

* 도구를 전환하려면 도구 목록에서 원하는 도구를 선택합니다.

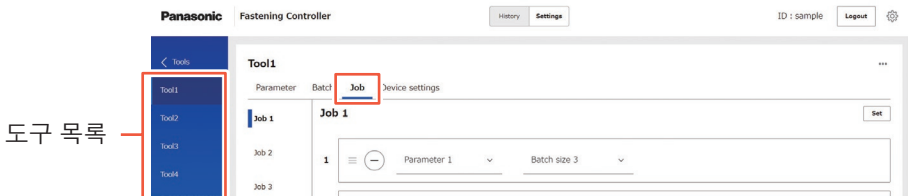
매개 변수 설정 P141 참조



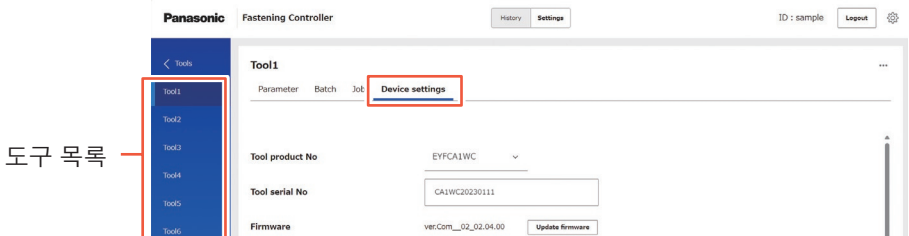
배치 설정 P186 참조



작업 설정 P187 참조



도구 설정 P136 참조



도구 구성

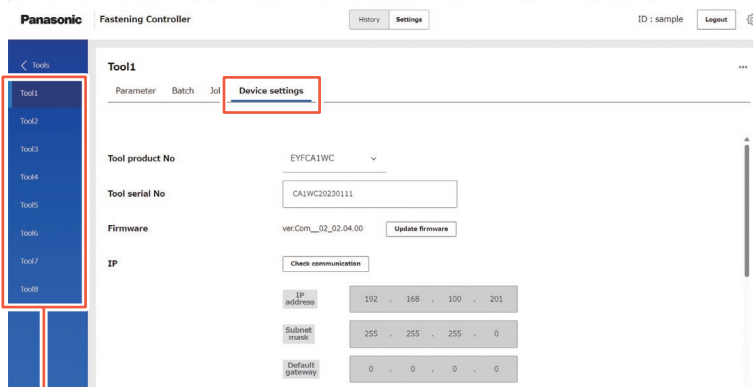
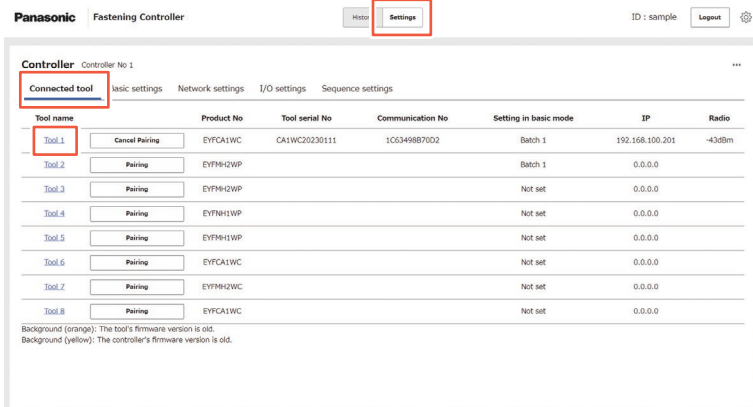
도구 설정 화면 표시

상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Connected tool” 탭을 선택합니다.

“Connected tool” 화면에서 원하는 도구 번호를 클릭합니다.

도구 번호에 대한 화면의 “Device settings” 탭에서 도구의 기본 설정을 지정하고 공통 매개 변수를 입력할 수 있습니다.

* 도구를 전환하려면 도구 목록에서 원하는 도구를 선택합니다.



도구 목록

도구 구성

도구 설정 항목 목록

Tool product No

도구 제품 번호를 선택합니다.

[기본] 비어 있음

[설정 범위] 폴다운 메뉴에서 선택 가능

* 사전에 페어링을 설정하면 자동으로 선택됩니다.

* 페어링 후에는 도구 제품 번호를 변경할 수 없습니다. 페어링을 취소한 다음 변경하십시오.

Tool serial No

도구의 장치 식별을 설정하고 표시할 수 있습니다.

[기본] 모델ID 5자리 + 일련 번호 8자리(제조연도 2자리 + 월 2자리 + 생산 로트 4자리)

[설정 범위] 영숫자 13~16자

* 정보가 변경되면 모델 번호가 올바르게 인식되지 않을 수 있습니다.

관리 규칙에 따라 필요하지 않는 한 변경하지 마십시오.

Firmware

컨트롤러(EYFRW2)에서 도구 통신 부분의 펌웨어 버전이 표시됩니다.

펌웨어를 업데이트하려면 [Update firmware] 를 클릭합니다.

업데이트 방법은 컨트롤러 사용설명서의 “펌웨어 업데이트”를 참조하십시오.

Tool's clock

도구의 시계가 표시됩니다. 시계를 조정하려면 [Adjust to controller] 를 클릭합니다.

Timing to send waveform data

작업별로 파형 데이터를 전송할지 여부를 설정할 수 있습니다.

[기본] OFF

[설정 범위] OFF 또는 작업별

도구 구성

도구 설정 항목 목록

Maintenance Interval Alarm (Pulse Time)
[기능 개요] 도구 사용을 시작한 이후로 축적된 펄싱 시간을 계산한 알람으로, 유지보수 시간을 알려줍니다. 설정 시간까지 1시간 이하가 남은 경우, 제어판 디스플레이에서 경고를 합니다. 설정 시간에 도달하면, 제어판 디스플레이로 이를 알려주며, 도구의 모터가 잠깁니다 (중단됨). 도구를 초기화하면 축적된 펄싱 시간이 재설정되고, 도구의 모터 잠금이 해제됩니다.
주의 • 도구를 초기화하면, 다른 매개 변수 역시 공장 기본값으로 돌아갑니다. • 도구를 초기화할 때는 다시 사용하기 전에 매개 변수를 재구성하십시오. 경고 디스플레이(0.5초마다 변경): 설정값 (1 ~ 99) → -1 → 작동 모드 (A 또는 C) 중단 디스플레이 (0.5초마다 변경): 설정값 (1 ~ 99) → 0
[기본값] *0 시간
[설정값] *0 시간 ~ 99 시간

값에 (*) 를 입력하면 기능이 비활성화됩니다.

도구 구성

등록 정보 삭제

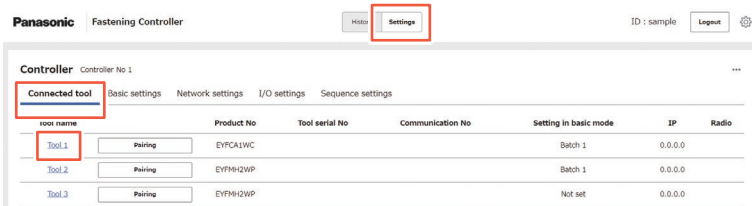
도구 사용을 중지하거나 제품 번호가 다른 도구를 페어링하려면 페어링 정보를 삭제하십시오.

* 사전에 페어링을 취소하십시오.

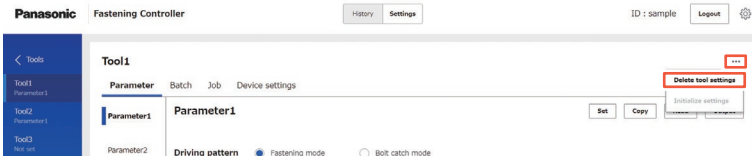
1 상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 **[Settings]** 를 클릭하고 **“Connected tool”** 탭을 선택합니다.

“Connected tool” 화면이 표시됩니다.

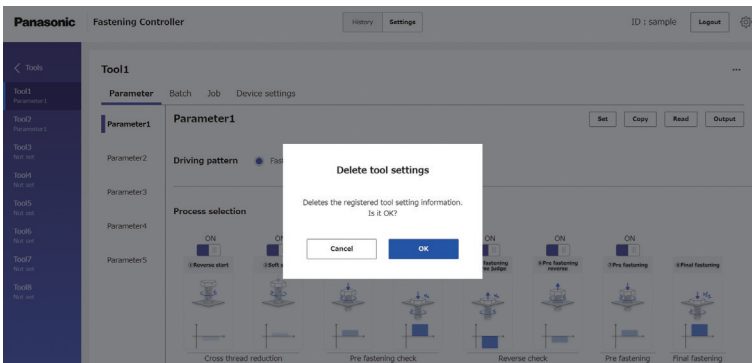
2 **“Connected tool”** 화면에서 원하는 도구 번호를 클릭합니다.
도구 번호에 대한 화면이 표시됩니다.



3 ... (도구 옵션 키)를 클릭한 다음 **[Delete tool settings]** 를 클릭합니다.
“Delete tool settings” 화면이 표시됩니다.



4 **“Delete tool settings”** 화면에서 **[OK]** 를 클릭합니다.



도구 구성

공장 설정으로 재설정

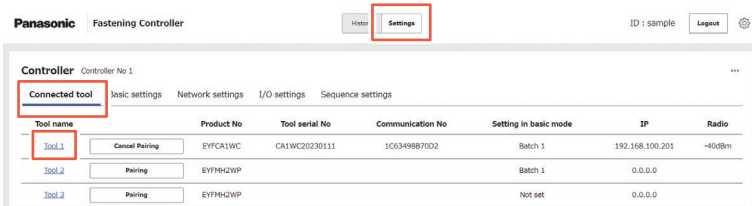
도구를 공장 설정으로 재설정할 수 있습니다.

* 재설정하면 페어링이 취소됩니다.

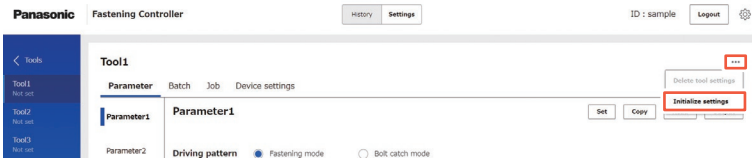
- 1 상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Connected tool” 탭을 선택합니다.

“Connected tool” 화면이 표시됩니다.

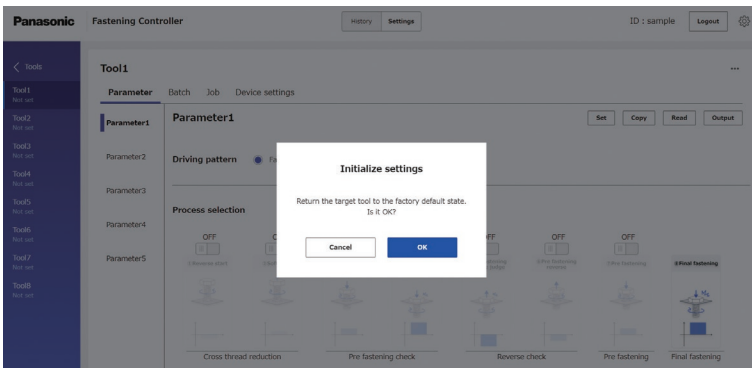
- 2 “Connected tool” 화면에서 원하는 도구 번호를 클릭합니다.
도구 번호에 대한 화면이 표시됩니다.



- 3 ... (도구 옵션 키)를 클릭한 다음 [Initialize settings] 를 클릭합니다.
“Initialize settings” 화면이 표시됩니다.



- 4 “Initialize settings” 화면에서 [OK] 를 클릭합니다.



체결 매개 변수 설정

매개 변수 설정 화면 표시

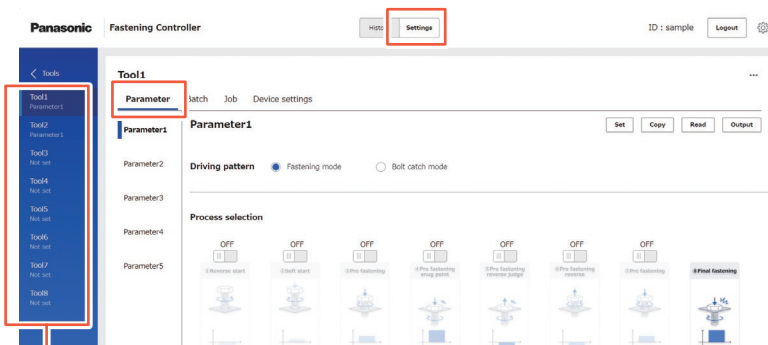
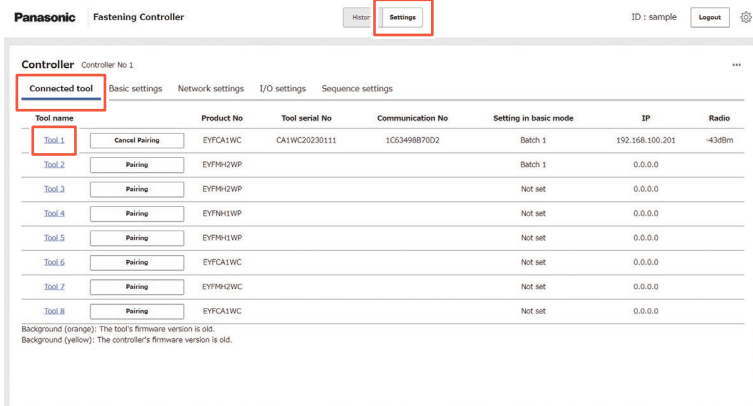
상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Connected tool” 탭을 선택합니다.

“Connected tool” 화면에서 원하는 도구 번호를 클릭합니다.

도구 번호에 대한 화면에서 “Parameter” 탭을 선택하여 설정합니다.

각 도구에 대해 5개의 매개 변수(매개 변수 1~5)를 설정할 수 있습니다.

* 도구를 전환하려면 도구 목록에서 원하는 도구를 선택합니다.



도구 목록

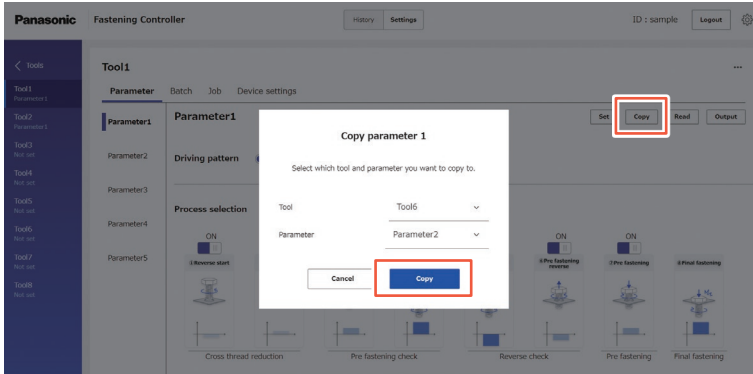
체결 매개 변수 설정

매개 변수 복사

설정된 매개 변수를 복사하여 새 매개 변수를 생성하거나 다른 도구에서 사용할 수 있습니다.

도구 번호에 대한 화면의 “Parameter” 탭에서 [Copy] 를 클릭하여 매개 변수 복사 화면을 표시합니다. 화면에서 대상을 선택하고 [Copy] 를 클릭합니다.

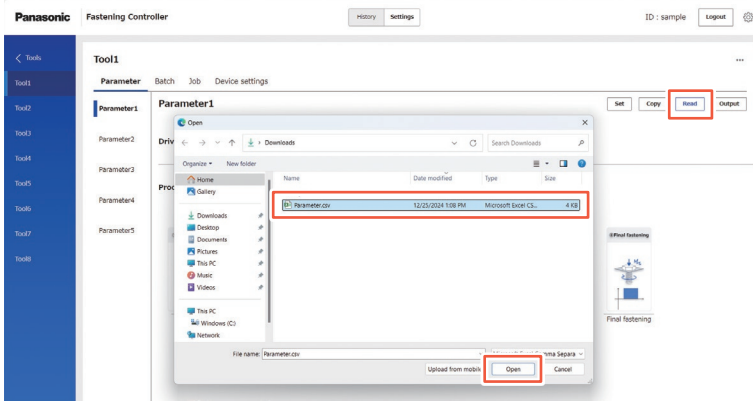
매개 변수 복사는 동일한 제품 번호의 도구 간에만 허용됩니다.



체결 매개 변수 설정

매개 변수 로드

구성용 PC에 저장된 매개 변수 파일을 컨트롤러에 불러와 매개 변수를 등록할 수 있습니다. 도구 번호에 대한 화면의 “Parameter” 탭에서 [Read] 를 클릭하여 매개 변수 파일을 엽니다.



체결 매개 변수 설정

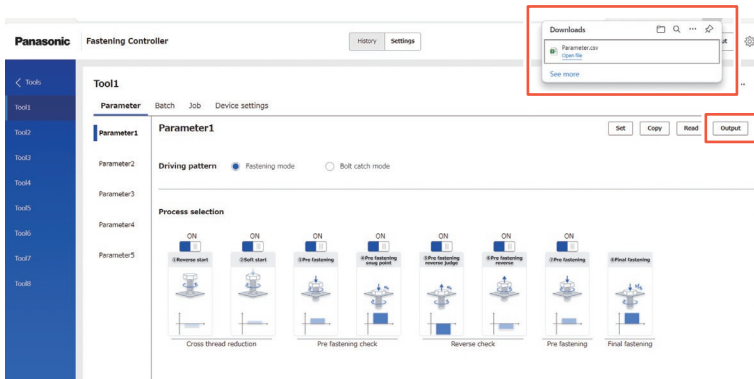
매개 변수 내보내기

생성된 매개 변수를 구성용 PC 로 내보낼 수 있습니다.

내보낸 파일을 백업으로 사용하여 다른 컨트롤러에 복사하거나 다른 구성용 PC로 옮길 수 있습니다.

도구 번호에 대한 화면의 “Parameter” 탭에서 [Output] 을 클릭해 매개 변수 파일을 저장합니다.

내보낸 매개 변수 파일을 편집하지 마십시오.
편집하면 올바르게 읽지 못할 수 있습니다.



체결 매개 변수 설정

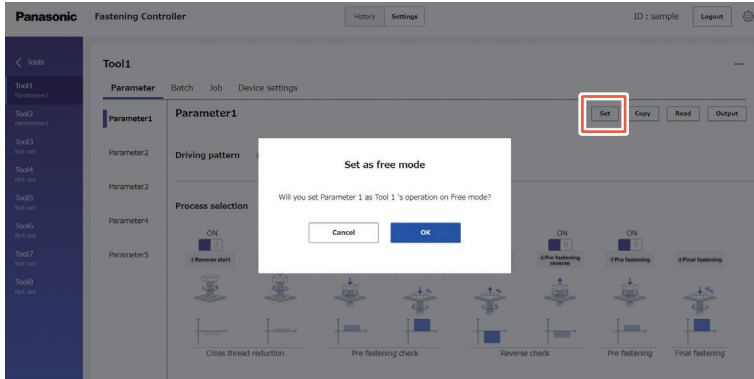
매개 변수 등록

컨트롤러 실행 모드 중 “Free mode” 에서 도구를 제어하는 데 사용하기 위해 매개 변수를 등록합니다.

* “Repeat mode” 와 “External control mode” 에서는 사용되지 않습니다.

(“Free mode”, “Repeat mode”, “External control mode”는 “컨트롤러의 실행 모드 설정”을 참조하십시오.) **P181 참조**)

도구 번호에 대한 화면의 “Parameter” 탭에서 [Set] 을 클릭합니다.



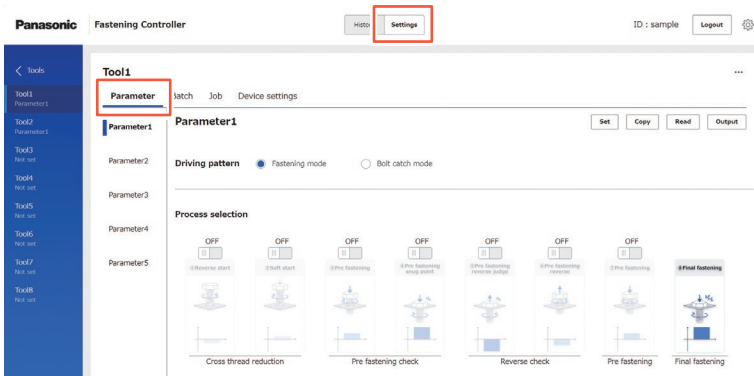
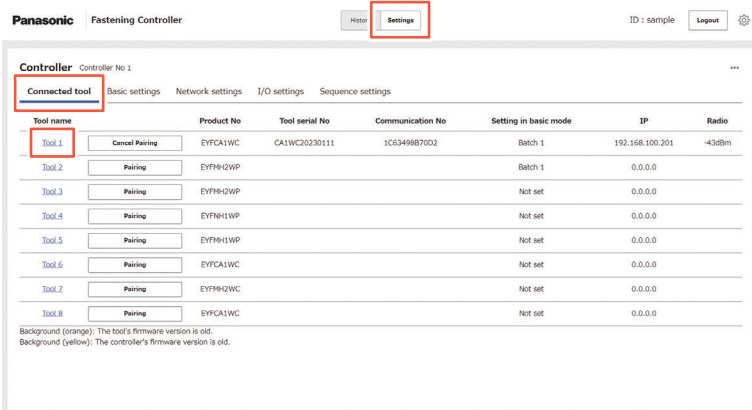
체결 매개 변수 설정

기본 매개 변수 설정

상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “연결된 도구” 탭을 선택합니다.

“Connected tool” 화면에서 원하는 도구 번호를 클릭합니다.

도구 번호에 대한 화면에서 “Parameter” 탭을 선택하여 설정합니다.

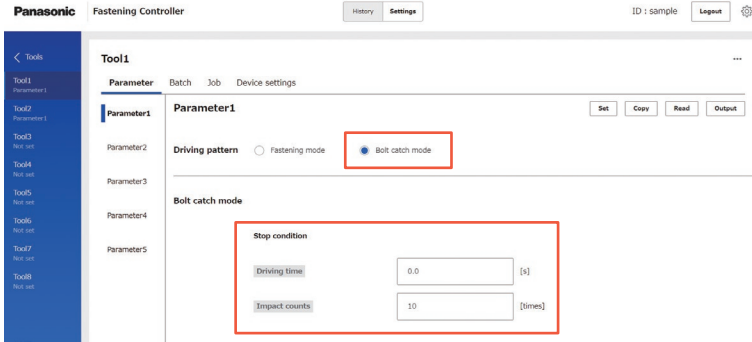


체결 매개 변수 설정

볼트 캐치 모드 설정

“Bolt catch mode”는 소켓이 조여질 볼트를 부드럽게 잡을 수 있도록 도구를 저속으로 구동합니다.

구동 패턴에서 “Bolt catch mode”를 선택하면 “Stop condition”을 설정하는 입력 화면이 표시됩니다.



주의

- 이 설정은 체결 모드에서 설정된 개별 공정 설정과 함께 작동합니다. 이 모드의 내용은 체결 모드 설정과 동기화됩니다.
- 작동 시간 및 정지 조건이 유효하지 않으면 도구가 작동하지 않습니다.
- 이 모드의 체결 이력은 컨트롤러나 도구에 기록되지 않으며 외부 장치와 통신하지 않습니다.
- 이 모드는 배치 설정에 포함될 수 있지만, 이 모드에서의 체결은 진행 상황의 일부로 간주되지 않습니다.
- 이 모드에서는 속도를 변경할 수 없습니다.
- 이 모드의 최대 작동 시간은 6초입니다. 작동 시간이 공백이면 해당 시간에 작동이 중지됩니다.

체결 매개 변수 설정

볼트 캐치 모드 설정

● 정지 조건

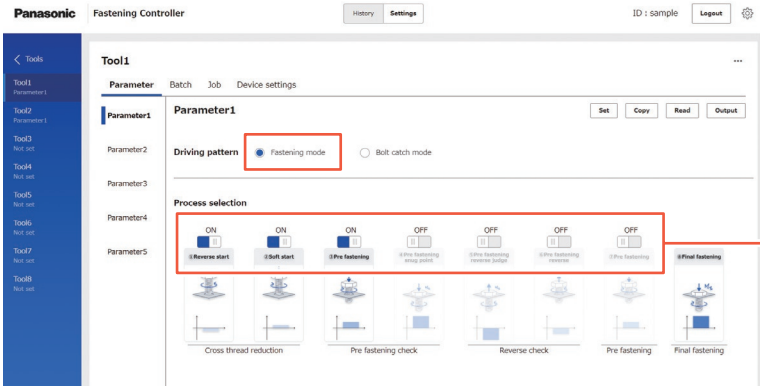
Driving time
[설명] 볼트 캐치 모드에서 도구를 작동할 시간을 설정합니다.
[기본] *0 s
[설정 범위] *0.0 s ~ 5 s
Impact counts
[설명] 볼트 캐치 모드로 작동하는 도구의 펄스 수를 설정합니다.
[기본] *0 times
[설정 범위] *0 times ~ 20 times

값에 (*) 를 입력하면 기능이 비활성화됩니다.

체결 매개 변수 설정

체결 모드 설정

“Fastening mode”는 볼트 고착을 줄이고 사전 체결 및 사전 체결 역회전을 수행하는 설정을 제공합니다. 구동 패턴에서 “Fastening mode”를 선택하면 입력 화면이 표시됩니다. 공정 선택 키를 ON 또는 OFF로 설정하여 공정을 켜거나 끄십시오.



공정 목록

① Reverse start
[설명] 도구는 나사 고착을 줄이기 위해 역회전으로 볼트 삽입을 시작합니다.
② Soft start
[설명] 도구는 나사 고착을 줄이기 위해 저속으로 볼트 삽입을 시작합니다.
③, ⑦ Pre fastening
[설명] 볼트가 무조건 스너그 타이트로 체결되기 전에 설정된 펄스 수에 도달하면 고착이 감지됩니다.

체결 매개 변수 설정

체결 모드 설정

④ Pre fastening snug point

[설명]

설정된 펄스 수에 도달하면 볼트가 스너그 타이트로 체결된 것으로 간주되고 다음 공정이 시작됩니다.

⑤ Pre fastening reverse judge

[설명]

스너그 타이트로 체결된 볼트가 역회전하는 동안 설정된 펄스 수를 초과하면 고착이 감지됩니다.

⑥ Pre fastening reverse

[설명]

볼트가 역회전하는 동안 설정된 펄스 수를 초과하면 고착이 감지됩니다.

⑧ Final fastening

[설명]

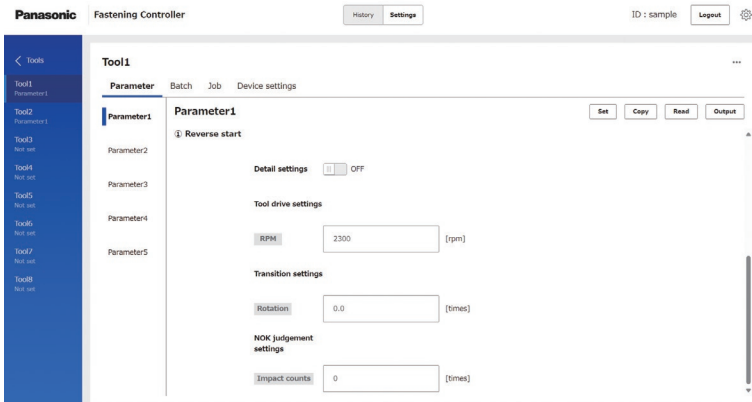
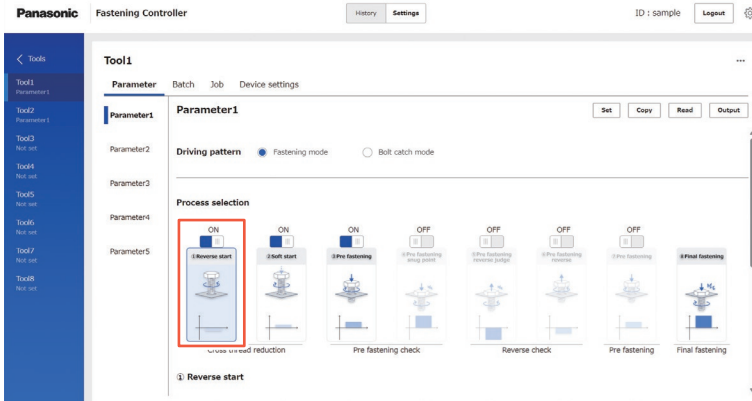
볼트는 목표 토크에 도달할 때까지 체결됩니다.

체결 매개 변수 설정

체결 모드 설정

공정 설정

공정 선택 키로 공정을 켜고 공정 이미지를 클릭하면 공정 설정 화면이 표시됩니다.
도구 구동 및 다음 공정으로 전환할 조건을 설정합니다.

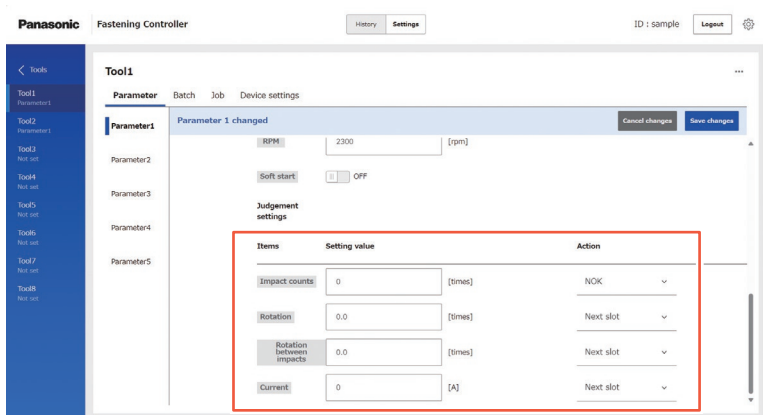
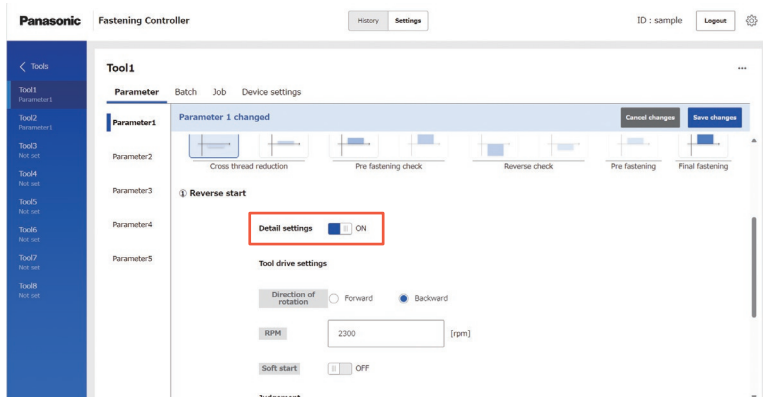


체결 매개 변수 설정

체결 모드 설정

■ 공정 세부 설정

공정 설정 화면에서 “Detail settings”를 켜면 다음 공정으로 전환하기 위한 구동 및 판단 조건의 자세한 내용을 설정할 수 있습니다.



체결 매개 변수 설정

체결 모드 설정

● 도구 구동 설정

Direction of rotation
[설명] 체결 방향을 설정합니다.
[설정 범위] 정방향: 시계 방향 역방향: 시계 반대 방향
RPM
[설명] 분당 회전수를 설정합니다.
[설정값] 150 rpm~2300 rpm
Soft start
[설명] 분당 회전수를 설정합니다.
[설정 범위] ON: 활성화됨 OFF: 비활성화됨

체결 매개 변수 설정

체결 모드 설정

● 판단 설정

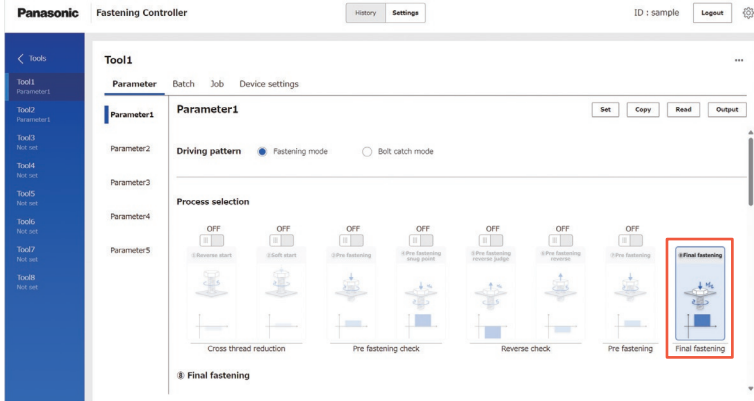
Impact counts
[설명] 설정된 충격 횟수에 도달했을 때의 동작을 선택합니다.
[판단 설정 값] 0 times ~ 255 times [결과 동작] Next slot (동작 계속) / NOK (동작 중지)
Rotation
[설명] 설정된 회전 수에 도달했을 때의 동작을 선택합니다.
[판단 설정 값] 0.0 times ~ 6553.5 times [결과 동작] Next slot (동작 계속) / NOK (동작 중지)
Rotation between impacts
[설명] 설정된 충격 간 회전 수에 도달했을 때의 동작을 선택합니다.
[판단 설정 값] 0.0 times ~ 655.3 times [결과 동작] Next slot (동작 계속) / NOK (동작 중지)
Current
[설명] 설정된 전류에 도달했을 때의 동작을 선택합니다.
[판단 설정 값] 0.0 A ~ 25.5 A [결과 동작] Next slot (동작 계속) / NOK (동작 중지)

체결 매개 변수 설정

Offset 설정

“Fastening mode”를 선택하고 공정 선택에서 “⑧Final fastening”을 클릭하면 최종 체결 공정 설정 화면이 표시됩니다.

공정 설정 화면에서 “Offset”을 설정합니다.

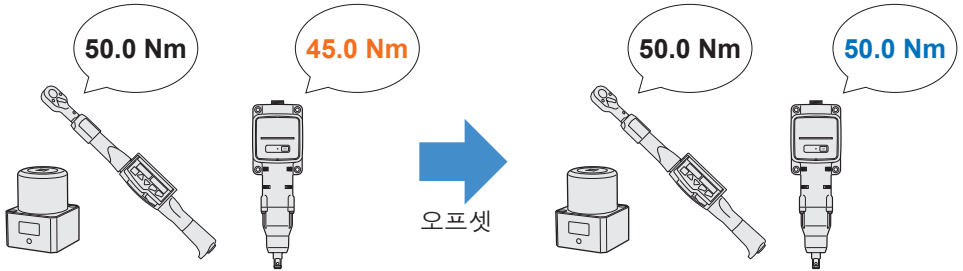


체결 매개 변수 설정

Offset 설정

도구에서 표시하는 코트 값과 조임쇠의 실제 토크는 소켓 및/또는 연결 부위 조건에 의해 초래된 감폭에 의해 달라질 수 있습니다.

그런 경우, 도구에서 보여지는 토크 값은 오프셋 설정에 의해 조절될 수 있습니다.



- 첫 번째 애플리케이션의 경우, 오프셋 값을 자동으로 계산하기 위해 구성된 매개 변수 입력 화면에서 오프셋 에 있는 [Simulate] (①) 을 선택하십시오.
- 작업에 사용한 도구에 이미 설정된 오프셋 값이 있는 경우, 구성된 매개 변수 입력 화면에 있는 [Slope] 및 [Intercept] (②) 에 이 값을 입력하여 도구가 동일한 토크 성능을 보이도록 설정할 수 있습니다.

([Slope] 및 [Intercept] 의 자세한 내용에 대해서는 **P163 참조**)

⑧ Final fastening

Shut-off Torque

Target: 20.0 [Nm]

Upper torque limit: 999.9 [Nm]

Lower torque limit: 0.0 [Nm]

Offset

Simulate ①

Slope: 25.00

Intercept: 5.00 ②

체결 매개 변수 설정

Offset 설정

[Simulate]을 선택하면 오프셋 설정 화면이 표시됩니다.
오프셋을 설정하려면 다음 절차를 수행하십시오.

주의

- 오프셋이 설정되면 체결 모드 공정 ① ~ ⑦은 비활성화되고 최종 체결 모드만 활성화됩니다.

1 풀다운 메뉴에서 [Socket length] (①) 를 선택하여 사용하십시오.
(사용할 소켓과 일치하는 길이를 찾을 수 없는 경우에는 가장 비슷한 길이를 선택하십시오.)

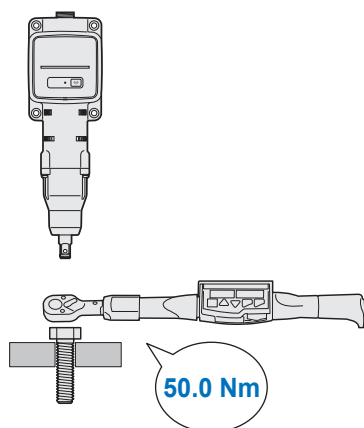
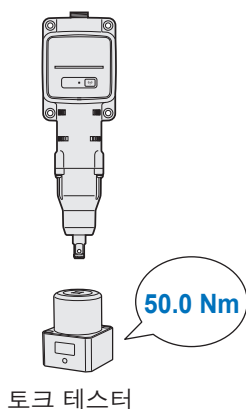
2 [Shut-off Torque] (②) 를 나타내는 숫자로 된 값을 입력하십시오.

3 [Apply(Continue)] (③) 을 선택하여 도구에 설정을 등록하십시오.

체결 매개 변수 설정

Offset 설정

- 4 토크 테스터 또는 체결에 사용되는 실제 볼트에서 한 번 체결합니다.
- 5 토크 테스터나 실제 볼트를 조인 토크 렌치에서 보여진 토크 결과를 확인하십시오 (Audit Torque Value).



체결 매개 변수 설정

Offset 설정

- 6 [Torque result] (④) 를 선택하여 도구로 측정된 토크 값을 불러 들입니다.
불러 들인 값이 상단 디스플레이에 있는 [Torque Result] 컬럼 (⑤) 에 보여집니다.
- 7 토크 테스터 또는 토크 렌치로 확인된 [Actual torque] (⑥) 을 입력하십시오.
- 8 [Calculate] (⑦) 를 선택하여 새 오프셋 값을 계산합니다.
(이 때, 새로 계산된 오프셋 값은 아직 도구에 등록되지 않았습니다.)
- 9 도구로 측정한 [Torque Result] (⑤) 와 상단 디스플레이 창의 [Actual torque] (⑧) 의 차이를 % (⑨) 로 확인하십시오.
- 10 위의 차이가 충분히 작다면, [Close(End)] (⑩) 를 선택하여 오프셋 설정을 종료합니다.
위에 나온 차이가 아직도 크다면, [Apply(Continue)] (⑪) 을 설정하여 도구에 새 오프셋 값을 설정하고 이 차이가 충분히 작아질 때까지 4 ~ 10 단계를 반복하십시오.

Offset				
Torque result	Actual torque	%	Offset slope	Offset intercept
47.7 (⑤)	43.0 (⑧)	90.2 (⑨)	25.00	5.00

Socket length 40 mm Shut-off Torque 45 [Nm]

(④) Torque result (⑥) Actual torque 43 [Nm] Calculate (⑦)

Minimum Output Mode OFF Offset slope 22.60 Offset intercept 5.00

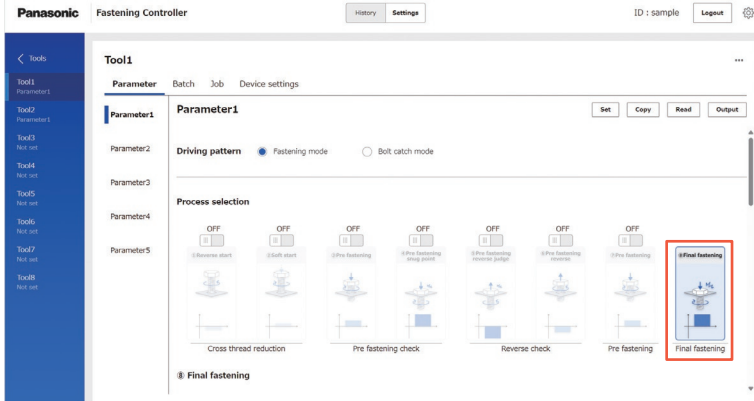
(⑩) Close(End) Apply(Continue) (⑪)

체결 매개 변수 설정

Snug Point Detection Level (스너그 포인트 감지 레벨) 설정

“Fastening mode”를 선택하고 공정 선택에서 “⑧Final fastening”을 클릭하면 최종 체결 공정 설정 화면이 표시됩니다.

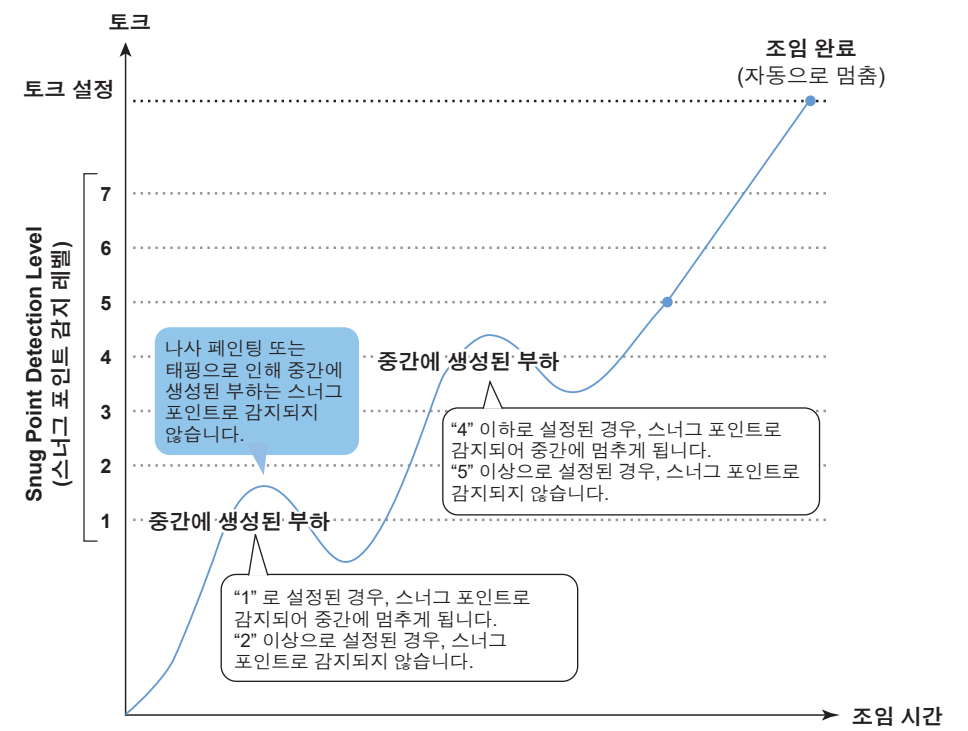
공정 설정 화면에서 “Snug point detection level”을 설정합니다.



체결 매개 변수 설정

Snug Point Detection Level (스너그 포인트 감지 레벨) 설정

Snug Point Detection Level (스너그 포인트 감지 레벨) 설정은 다음과 같은 경우에 사용됩니다.



7레벨로 설정 가능	7 : 높게 설정된 중간에 생성된 부하와 협력하도록 설정
	~
	1 : 낮게 설정된 중간에 생성된 부하와 협력하도록 설정
	0 : Snug Point Detection Level (스너그 포인트 감지 레벨) 기능 끄기

주의

- Snug Point Detection Level (스너그 포인트 감지 레벨) 은 “1” 상태에서 설정해야 합니다. Snug Point Detection Level (스너그 포인트 감지 레벨) 을 “2-7” 상태에서 설정하면, 대상 재질이 손상되거나 변형될 수 있습니다.
- Snug Point Detection Level (스너그 포인트 감지 레벨) 이 “1” 일 때 스너그 포인트에 도달하기 전에 기기가 멈추면, Snug Point Detection Level (스너그 포인트 감지 레벨) 을 “2-7” 로 설정하십시오.

체결 매개 변수 설정

매개 변수 목록

Shut-Off Torque
[기능 개요] 조임 토크가 작동 중단 토크의 설정값에 도달하면, 도구가 자동으로 작동 중단합니다. $\text{Torque Upper Limit} \geq \text{Shut-Off Torque} \geq \text{Torque Lower Limit}$ 범위에 있도록 하십시오.
[기본값] 20.0 Nm/177.0 In.lbs/14.7 Ft.lbs
[설정값] 10.0 Nm ~ 70.0 Nm/88.5 In.lbs ~ 619.5 In.lbs/7.4 Ft.lbs ~ 51.6 Ft.lbs
중요 이 도구의 권장 사용 범위는 다음과 같습니다. 20.0 Nm ~ 60.0 Nm/177.0 In.lbs ~ 531.0 In.lbs/14.7 Ft.lbs ~ 44.2 Ft.lbs
Torque Upper Limit
[기능 개요] 작업이 OK 인지 NOK 인지 판단하기 위한 토크 상한을 설정합니다. $\text{Torque Upper Limit} \geq \text{Shut-Off Torque} \geq \text{Torque Lower Limit}$ 범위에 있도록 하십시오.
[기본값] *999.9 Nm/*8,848.7 In.lbs/*737.4 Ft.lbs
[설정값] 10.0 Nm ~ *999.9 Nm/88.5 In.lbs ~ *8848.7 In.lbs/7.4 Ft.lbs ~ *737.4 Ft.lbs
Torque Lower Limit
[기능 개요] 작업이 OK 인지 NOK 인지 판단하기 위한 토크 하한을 설정합니다. $\text{Torque Upper Limit} \geq \text{Shut-Off Torque} \geq \text{Torque Lower Limit}$ 범위에 있도록 하십시오.
[기본값] *0 Nm/*0 In.lbs/*0 Ft.lbs
[설정값] *0 Nm ~ 70.0 Nm/*0 In.lbs ~ 619.5 In.lbs/*0 Ft.lbs ~ 51.6 Ft.lbs

값에 (*) 를 입력하면 기능이 비활성화됩니다.

체결 매개 변수 설정

매개 변수 목록

Offset_Slope
[기능 개요] 도구의 출력 토크 곡선의 기울기를 모의의 실제 제품의 토크 곡선에 따라 조절하는 계수입니다. 설정을 위해, 자동 오프셋 계산 기능을 사용하도록 권장합니다. (설정 방법은 P155 참조)
[기본값] 25.00
[설정값] 0.10 ~ 500.00
Offset_Intercept
[기능 개요] 도구의 출력 토크 곡선의 인터셉트를 모의의 실제 제품의 토크 곡선에 따라 조절하는 계수입니다. 설정을 위해, 자동 오프셋 계산 기능을 사용하도록 권장합니다. (설정 방법은 P155 참조) 중요 오프셋의 값(인터셉트)은 토크 센서가 정확하게 측정할 수 있는 하한입니다. “Shut-Off Torque” 및/또는 “Torque Lower Limit”의 설정값이 오프셋의 값 (인터셉트) 보다 적지 않도록 하십시오.
[기본값] 5.00
[설정값] -1000.00 ~ 1000.00
Angle Before Snug Upper Limit
[기능 개요] 작업이 OK인지 NOK인지 판단하기 위해 최종 체결 시작 지점부터 착좌점까지 축적된 각도의 상한을 설정합니다.
[기본값] *99999°
[설정값] 0° ~ *99999°

값에 (*)를 입력하면 기능이 비활성화됩니다.

체결 매개 변수 설정

매개 변수 목록

Angle Before Snug Lower Limit
[기능 개요] 작업이 OK인지 NOK인지 판단하기 위해 최종 체결 시작 지점부터 착좌점까지 축적된 각도의 하한을 설정합니다. 착좌점 탐지 방법은 착좌점 설정에서 선택할 수 있습니다.
[기본값] *0°
[설정값] *0° ~ 99999°
Angle After Snug Upper Limit
[기능 개요] 작업이 OK인지 NOK인지 판단하기 위해 최종 체결 중 착좌점부터 작동 중단 지점까지 축적된 각도의 상한을 설정합니다. 착좌점 탐지 방법은 착좌점 설정에서 선택할 수 있습니다.
[기본값] *9999°
[설정값] 0° ~ *9999°
Angle After Snug Lower Limit
[기능 개요] 작업이 OK인지 NOK인지 판단하기 위해 최종 체결 중 착좌점부터 작동 중단 지점까지 축적된 각도의 하한을 설정합니다. 착좌점 탐지 방법은 착좌점 설정에서 선택할 수 있습니다.
[기본값] *0°
[설정값] *0° ~ 9999°

값에 (*)를 입력하면 기능이 비활성화됩니다.

체결 매개 변수 설정

매개 변수 목록

Angle Error Shut-Off
[기능 개요] 이 기능이 ON 인 상태에서, 조임 작업 중 설정 상한 각도를 초과하면 도구는 자동으로 작동을 중단합니다. 이 기능을 사용하려면 상한 각도를 설정해야 합니다.
[기본값] OFF
[설정값] ON, OFF
No Load Speed
[기능 개요] 엔빌 회전 속도를 100 rpm 단계부터 시작해서 최종 체결 시작부터 도구 펄싱까지 설정합니다.
[기본값] 2300 rpm
[설정값] 1500 rpm ~ 2300 rpm
Snug Point
[기능 개요] 착좌점의 탐지 방법을 선택하십시오. 착좌점을 참조 지점으로 사용하여 각도 결과를 한번 조임 이전과 한 번 조임 이후로 나눕니다. When Pulsing Starts: 도구가 펄싱을 시작하는 시점을 착좌점으로 간주합니다. Snug Torque: 조임이 설정한 토크에 도달하는 시점을 착좌점으로 간주합니다. Select From Graph: 토크 파형 데이터에서 원하는 착좌점을 선택합니다.
[기본값] When Pulsing Starts
[설정값] When Pulsing Starts, Snug Torque, Select From Graph

체결 매개 변수 설정

매개 변수 목록

Detection Threshold (Snug Torque)
[기능 개요] 조임 토크가 이 임계점에 도달한 시점이 착좌점으로 판단됩니다. 이 매개 변수는 착좌점 설정이 "Snug Torque"인 경우에만 활성화됩니다. 중요 "Snug Torque"에 따른 착좌점 탐지는 "Offset Intercept"의 절대값이 높은 경우에는 덜 정확할 수 있습니다.
[기본값] 0.0 Nm
[설정값] 0.0 Nm ~ 999.9 Nm / 0.0 In.lbs ~ 8848.7 In.lbs / 0.0 Ft.lbs ~ 737.4 Ft.lbs
Detection Threshold (Select From Graph)
[기능 개요] 조임 각도 1°의 조임 토크가 이 임계점에 근접한 시점이 착좌점으로 판단됩니다. 이 값은 그래프에서 한 섹션을 선택하여 자동 설정됩니다. 이 매개 변수는 착좌점 설정이 "Select From Graph"인 경우에만 활성화됩니다. 중요 이 임계점이 너무 높게 설정되어 있으면, 착좌점 탐지는 작업에 따라 이루어지지 않을 수 있습니다.
[기본값] 0.0 Nm/1°
[설정값] 0.0 Nm/1° ~ 999.9 Nm/1° / 0.0 In.lbs/1° ~ 8848.7 In.lbs/1° / 0.0 Ft.lbs/1° ~ 737.4 Ft.lbs/1°
Detection Start Angle (Select From Graph)
[기능 개요] 축적된 조임 각도가 이 값에 도달하지 않으면, 착좌점 탐지가 시작되지 않습니다. 이 매개 변수는 착좌점 설정이 "Select From Graph"인 경우에만 활성화됩니다.
[기본값] 0°
[설정값] 0° ~ 99999°

체결 매개 변수 설정

매개 변수 목록

Snug Point Detection Level
[기능 개요] 이 설정은 볼트 스너그 포인트 감지를 위한 부하 수준을 변경합니다. Snug Point Detection Level (스너그 포인트 감지 레벨) 을 증가시키면 조임 중 높은 부하로 인해 볼트가 스너그 포인트에 도달하기 전에 도구가 멈추지 않도록 방지할 수 있습니다. (작업에 따라서는 Snug Point Detection Level (스너그 포인트 감지 레벨) 을 증가시킨다고 하더라도 도구가 스너그 포인트 도달 이전에 중단될 수 있습니다.)
[기본값] *0
[설정값] *0 ~ 7
Rundown Error Detection
[기능 개요] 도구가 최종 체결 시작 이후 설정 시간에 도달하기 전에 꺼지는 경우, NOK로 판단됩니다.
[기본값] *0.0 s
[설정값] *0.0 s ~ 3.0 s
Ignore Rundown Result Before Snug
[기능 개요] 이 기능이 ON인 경우, 착좌점에 도달하기 전에 트리거 신호가 꺼져 체결이 중단되면, 이에 대한 기록 로고는 기록되지 않습니다. “Snug Point” 매개 변수에서 착좌점 결정 방법을 설정합니다.
[기본값] OFF
[설정값] ON, OFF

값에 (*) 를 입력하면 기능이 비활성화됩니다.

체결 매개 변수 설정

매개 변수 목록

Snug Torque Detection Delay	
[기능 개요]	작업을 시작한 이후 설정한 시간이 지나기 전에 설정한 작동 중단 토크를 일시적으로 초과하는 부하가 발생하더라도 도구가 작동 중단되지 않습니다.
[기본값]	*0.0 s
[설정값]	*0.0 s ~ 3.0 s
Buzzer	
[기능 개요]	작업이 완료됐을 때 버저가 울리는 조건 옵션입니다. OFF: 작업이 완료된 이후에 버저가 울리지 않습니다. Buzzer OK: 작업이 완료된 후, 결과가 OK 이면 버저가 울립니다. Buzzer NOK: 작업이 완료된 후, 결과가 NOK 이면 버저가 울리지 않습니다.
[기본값]	OFF
[설정값]	OFF, Buzzer OK, Buzzer NOK
Bolt catch mode	
[기능 개요]	소켓이 체결될 볼트를 부드럽게 잡는 모드입니다.
[기본값]	Driving time: *0.0 s Impact counts: *0 times
[설정값]	Driving time: *0.0 s ~ 5.0 s Impact counts: *0 times ~ 20 times

값에 (*)를 입력하면 기능이 비활성화됩니다.

체결 매개 변수 설정

매개 변수 목록

Reverse start	
[기능 개요]	도구는 나사 고착을 줄이기 위해 역회전으로 볼트 삽입을 시작합니다.
[기본값]	No-load speed: 2300 rpm Number of rotations: *0.0 times Number of pulses: *0 times
[설정값]	No-load speed: 500 rpm ~ 2300 rpm
[전달 판단 조건]	Number of rotations: *0.0 times ~ 6553.5 times
[NOK 판단 조건]	Number of pulses: *0 times ~ 255 times
Soft start	
[기능 개요]	도구는 나사 고착을 줄이기 위해 저속으로 볼트 삽입을 시작합니다.
[기본값]	No-load speed: 350 rpm Number of rotations: *0.0 times Number of pulses: *0 times
[설정값]	No-load speed: 150 rpm ~ 350 rpm
[전달 판단 조건]	Number of rotations: *0.0 times ~ 6553.5 times
[NOK 판단 조건]	Number of pulses: *0 times ~ 255 times

값에 (*) 를 입력하면 기능이 비활성화됩니다.

체결 매개 변수 설정

매개 변수 목록

Pre fastening	
[기능 개요] 볼트가 무조건 스너그 타이트로 체결되기 전에 설정된 펄스 수에 도달하면 고착이 감지됩니다.	
[기본값] No-load speed: 2300 rpm Number of rotations: *0.0 times Number of pulses: *0 times	
[설정값] No-load speed: 500 rpm ~ 2300 rpm	
[전달 판단 조건] Number of rotations: *0.0 times ~ 6553.5 times	
[NOK 판단 조건] Number of pulses: *0 times ~ 255 times	
Pre fastening snug point	
[기능 개요] 설정된 펄스 수에 도달하면 볼트가 스너그 타이트로 체결된 것으로 간주되고 다음 공정이 시작됩니다.	
[기본값] No-load speed: 2300 rpm Number of pulses: *0 times Number of rotations: *0.0 times	
[설정값] No-load speed: 500 rpm ~ 2300 rpm	
[전달 판단 조건] Number of pulses: *0 times ~ 255 times	
[NOK 판단 조건] Number of rotations: *0.0 times ~ 6553.5 times	

값에 (*) 를 입력하면 기능이 비활성화됩니다.

체결 매개 변수 설정

매개 변수 목록

Pre fastening reverse judge	
[기능 개요] 스너그 타이트로 체결된 볼트가 역회전하는 동안 설정된 펄스 수를 초과하면 고착이 감지됩니다.	
[기본값] No-load speed: 2300 rpm Number of rotations between impacts: *0.0 times Number of pulses: *0 times	
[설정값] No-load speed: 500 rpm ~ 2300 rpm	
[전달 판단 조건] Number of rotations between impacts: *0.0 times ~ 655.3 times	
[NOK 판단 조건] Number of pulses: *0 times ~ 255 times	
Pre fastening reverse	
[기능 개요] 볼트가 역회전하는 동안 설정된 펄스 수를 초과하면 고착이 감지됩니다.	
[기본값] No-load speed: 2300 rpm Number of rotations: *0.0 times Number of pulses: *0 times	
[설정값] No-load speed: 500 rpm ~ 2300 rpm	
[전달 판단 조건] Number of rotations: *0.0 times ~ 6553.5 times	
[NOK 판단 조건] Number of pulses: *0 times ~ 255 times	

값에 (*) 를 입력하면 기능이 비활성화됩니다.

체결 매개 변수 설정

매개 변수 목록

아래는 체결 모드 공정 ① ~ ⑦의 세부 설정 및 판단 조건입니다.

Tool drive settings	
[기능 개요] 자세한 구동 설정을 수행할 수 있습니다.	
[기본값] Direction of rotation: Forward (정방향) RPM: 각 공정의 기본 속도 Soft start: Disable (비활성화)	
[설정값] Direction of rotation: Forward (정방향) /Reverse (역방향) RPM: 150 rpm ~ 2300 rpm Soft start: Enable (활성화) /Disable (비활성화)	
Judgement settings	
[기능 개요] 설정된 판단 설정값에 따라 결과 동작이 결정됩니다.	
[기본값] Number of pulses: *0 times Number of rotations: *0.0 times Number of rotations between impacts: *0.0 times Current: *0.0 A Resulting operation: Next slot (다음 슬롯)	
[설정값] Number of pulses: *0 times ~ 255 times Number of rotations: *0.0 times ~ 6553.5 times Number of rotations between impacts: *0.0 times ~ 655.3 times Current: *0.0 A ~ 25.5 A Resulting operation: Next slot (다음 슬롯) , NOK	

값에 (*)를 입력하면 기능이 비활성화됩니다.

체결 이력 데이터 확인

체결 기록 데이터 표시

상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [History] 를 클릭하고 “Fastening history” 탭을 선택합니다.

도구에서 컨트롤러로 전송된 체결 기록 데이터를 볼 수 있습니다.

데이터를 표시하려면 왼쪽의 도구 목록에서 원하는 컨트롤러 및 도구를 선택하고 오른쪽 상단에서 [Get data] 를 클릭합니다.

체결 기록 로그는 최신에서 가장 오래된 순으로 표시됩니다.

The screenshot displays the 'Panasonic Fastening Controller' interface. At the top, there are tabs for 'Work monitor', 'Fastening history', and 'Error history'. The 'Fastening history' tab is active. On the left, a 'Tool list' is visible with a search bar and a list of tools (Tool1 to Tool8). The main area shows a table of fastening records. The table has columns for Tool No, Tool product No, Tool serial No, Tool communication No, Count, Batch size, Batch count, Date/Time, OK/NGK Judgment, NGK message, Shut-off Torque(Nm), Upper Torque Limit(Nm), and Lower Torque Limit(Nm). The table is sorted by Date/Time in descending order. The 'Get data' button is highlighted in the top right corner. The 'Tool list' on the left is also highlighted.

Tool No	Tool product No	Tool serial No	Tool communication No	Count	Batch size	Batch count	Date/Time	OK/NGK Judgment	NGK message	Shut-off Torque(Nm)	Upper Torque Limit(Nm)	Lower Torque Limit(Nm)
Tool1	EYPCALWC	CA1WC20220111	10634H887002	25	3	3	2024/12/25 11:28:58	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	24	3	2	2024/12/25 11:28:47	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	33	3	1	2024/12/25 11:28:36	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	32	3	3	2024/12/25 11:28:25	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	31	3	2	2024/12/25 11:28:12	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	30	3	1	2024/12/25 11:28:01	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	29	3	3	2024/12/25 11:27:50	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	28	3	2	2024/12/25 11:27:39	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	27	3	1	2024/12/25 11:27:28	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	26	3	3	2024/12/25 11:27:09	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	25	3	2	2024/12/25 11:26:59	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	24	3	1	2024/12/25 11:26:48	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	23			2024/12/25 11:26:06	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	22			2024/12/25 11:25:55	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	21			2024/12/25 11:25:46	NGK	error:Error	20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	20			2024/12/25 11:25:35	OK		20.1	999.9	
Tool1	EYPCALWC	CA1WC20220111	10634H887002	19			2024/12/25 11:25:33	NGK	error:Error	20.1	999.9	

도구 목록

체결 이력 데이터 확인

체결 기록 데이터 표시

기간별 체결 기록 로그 추출

[Filter] 를 클릭하고 표시할 체결 기록 로그의 범위를 좁히기 위해 기간을 지정합니다.

The screenshot shows the Panasonic Fastening Controller interface. The 'Filter' dialog box is open, prompting the user to enter a start and end date. The dialog has a 'Period' field with a date range selector and 'Cancel' and 'OK' buttons. The background shows a table of fastening records with columns for Tool No., Tool product No., Tool serial No., Tool communication No., Count, Batch size, Batch count, Date/Time, OK/NG judgment, NGK message, Start-off Torque(Nm), Upper Torque Limit(Nm), and Lower Torque Limit(Nm).

표시할 항목 설정

표시된 항목을 변경하려면 [Show Items] 를 클릭하고 원하는 항목을 선택합니다.

The screenshot shows the Panasonic Fastening Controller interface. The 'Show Items' dialog box is open, allowing the user to select which items to display. The dialog has a list of items with checkboxes: Tool No., Tool product No., Tool serial No., Tool communication No., Count, Batch size, Batch count, and Error message. The background shows the same table of fastening records as in the previous screenshot.

체결 이력 데이터 확인

체결 이력 데이터 항목

Count
[디스플레이 개요] 작업 완료 순서로 계상된 숫자입니다.
Date
[디스플레이 개요] 작업이 완료된 날짜를 보여줍니다.
Time
[디스플레이 개요] 작업이 완료된 시간을 보여줍니다.
Work Result
[디스플레이 개요] 작업의 결과가 OK 또는 NOK 로 판단됩니다. OK/NOK 판단 기준은 다음과 같습니다. OK: 오류 없이 작동 중단이 이루어졌습니다, NOK: 작동 중단이 불완전하거나 오류가 발생했습니다
NOK Message
[디스플레이 개요] 작업 결과가 NOK 인 경우, NOK 가 된 이유가 토크, 각도 또는 오류 범주로 표시됩니다. NOK라는 이유가 오류로 분류된 경우, 체결 이력 로그의 마지막 줄에 있는 오류 메시지에 오류 세부 사항이 표시됩니다.
Shut-off Torque
[디스플레이 개요] 도구가 작동 중단되게 하는 토크의 구성된 매개 변수를 보여줍니다.
Upper Torque Limit
[디스플레이 개요] 작업 결과를 OK 로 판단하기 위한 토크 상한의 구성된 매개 변수를 보여줍니다.
Lower Torque Limit
[디스플레이 개요] 작업 결과를 OK 로 판단하기 위한 토크 하한의 구성된 매개 변수를 보여줍니다.
Torque Result
[디스플레이 개요] 관련 작업의 도구 출력에 대한 토크 결과값을 보여줍니다.

체결 이력 데이터 확인

체결 이력 데이터 항목

Upper Angle Limit (Before Snug)
[디스플레이 개요] 작업 결과를 OK 로 판단하기 위한 조임 전 상한 각도의 구성된 매개 변수를 보여줍니다. 조임 전 각도는 착좌점 매개 변수에 따라 설정된 최종 체결의 시작 지점부터 착좌점까지 앤빌 반전각입니다.
Lower Angle Limit (Before Snug)
[디스플레이 개요] 작업 결과를 OK 로 판단하기 위한 조임 이전 각도 하한의 구성된 매개 변수를 보여줍니다. 조임 전 각도는 착좌점 매개 변수에 따라 설정된 최종 체결의 시작 지점부터 착좌점까지 앤빌 반전각입니다.
Angle (Before Snug)
[디스플레이 개요] 관련 작업의 조임 이전 각도의 결과값을 보여줍니다. 조임 전 각도는 착좌점 매개 변수에 따라 설정된 최종 체결의 시작 지점부터 착좌점까지 앤빌 반전각입니다.
Upper Angle Limit (After Snug)
[디스플레이 개요] 작업 결과를 OK 로 판단하기 위한 조임 이후 각도 상한의 구성된 매개 변수를 보여줍니다. 조임 후 각도는 착좌점 매개 변수에 따라 설정된 착좌점부터 작업 완료 시까지의 앤빌 반전각입니다.
Lower Angle Limit (After Snug)
[디스플레이 개요] 작업 결과를 OK 로 판단하기 위한 조임 이후 각도 하한의 구성된 매개 변수를 보여줍니다. 조임 후 각도는 착좌점 매개 변수에 따라 설정된 착좌점부터 작업 완료 시까지의 앤빌 반전각입니다.
Angle (After Snug)
[디스플레이 개요] 관련 작업의 조임 이후 각도의 결과값을 보여줍니다. 조임 후 각도는 착좌점 매개 변수에 따라 설정된 착좌점부터 작업 완료 시까지의 앤빌 반전각입니다.
Number of Pulse
[디스플레이 개요] 관련 작업에서 도구가 방출하는 펄스의 수를 보여줍니다.

체결 이력 데이터 확인

체결 이력 데이터 항목

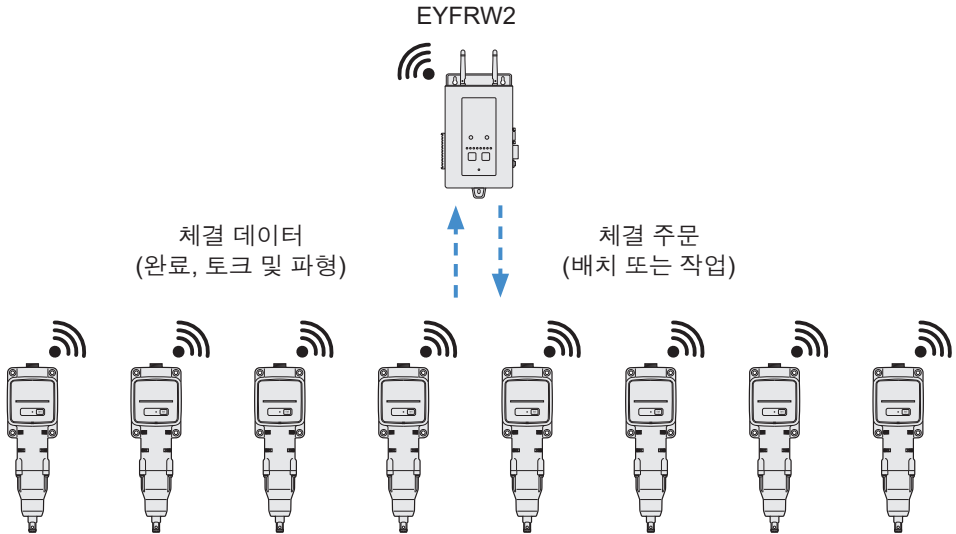
Fastening Time
[디스플레이 개요] 최종 체결의 시작부터 끝까지 걸린 시간을 보여줍니다.
Battery Level
[디스플레이 개요] 사용하지 않습니다. 빈 칸으로 둡니다.
Offset Slope
[디스플레이 개요] 토크 센서의 출력 전압을 토크로 변환하기 위한 계수의 구성된 매개 변수를 보여줍니다.
Offset Intercept
[디스플레이 개요] 토크 센서의 출력 전압을 토크로 변환하기 위한 계수의 구성된 매개 변수를 보여줍니다.
Snug Point Detection Level
[디스플레이 개요] 이것은 과도 부하 수준에서 설정된 착좌점 감지 수준을 보여줍니다.
NOK Slot Information
[디스플레이 개요] 공정 ① ~ ⑦에서 오류가 발생하면 오류가 있는 공정 번호를 보여줍니다.
Error Message
[디스플레이 개요] NOK 메시지에 표시되는 작업 결과인 NOK 의 이유가 오류로 분류된 경우, 오류 내용이 표시됩니다. (오류 메시지의 세부 내용은 P211 참조)
External Input Information
[디스플레이 개요] 바코드 리더 등을 통해 컨트롤러에 입력된 정보를 보여줍니다.

컨트롤러에서 체결 제어 모드 설정

컨트롤러에서 체결 제어

컨트롤러에 연결하면 최대 8개 유닛을 체결하여 제어할 수 있습니다.
컨트롤러는 체결된 볼트를 계산하기 위해 작업당 체결 데이터를 수신합니다.

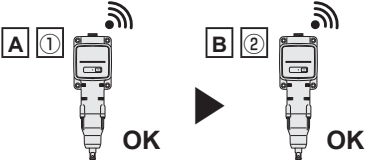
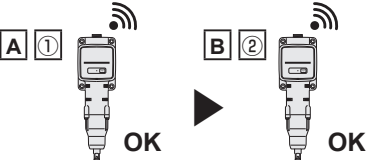
최대 연결 장치 수: 8



컨트롤러에서 체결 제어 모드 설정

컨트롤러의 일반적인 체결 제어 조합

다양한 체결 제어 설정 조합을 생성할 수 있습니다. 아래와 같은 일반적인 조합을 참조하십시오.

모드	[Free mode]	[Repeat mode]	
		[Basic mode]	[Sequence mode]
통과 기준	— (수량은 지정되지 않음)	목표 수량 체결이 완료됨	도구는 지정된 주문으로 각각의 목표 수량 체결 완료
[Batch] “단일 설정 값” (동일한 조건에서 체결) * 단일 유형의 공작물	 설정 값 목표 수량 10 Nm ∞ Parameter	 설정 값 목표 수량 10 Nm 10 Batch	 설정 값 목표 수량 설정 값 목표 수량 10 Nm 10 20 Nm 5 Batch×Sequence
[Job] 다중 설정 값 (다른 조건에서 체결) * 여러 유형의 공작물		 설정 값 목표 수량 10 Nm 2 20 Nm 3 30 Nm 5 Job	 설정 값 목표 수량 설정 값 목표 수량 10 Nm 2 20 Nm 5 20 Nm 3 30 Nm 10 30 Nm 5 Job×Sequence
주의	—	* 작업에는 최대 10단계가 포함될 수 있습니다.	* 시퀀스에는 최대 10단계가 포함될 수 있습니다.

컨트롤러에서 체결 제어 모드 설정

컨트롤러에 등록 가능한 조합 수

컨트롤러에 등록할 수 있는 조합의 수는 아래와 같습니다.

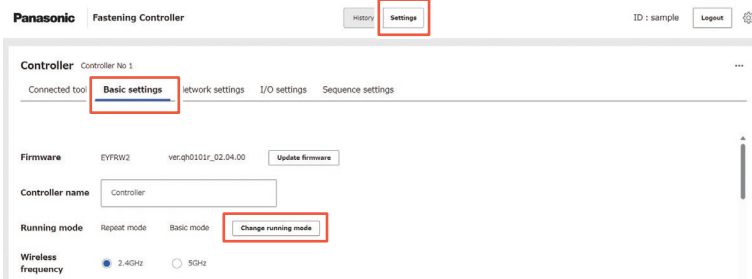
컨트롤러의 모드		도구의 설정	등록 가능한 조합 수
Free mode		Parameter	○ 도구당 5개의 조합
Repeat mode	Basic mode (독립 제어)	Batch	○ 도구당 5개의 조합
		Job	○ 도구당 5개의 조합
	Sequence mode (순차 제어)	Batch/Job	○ 5개의 조합
External control mode		—	○

컨트롤러에서 체결 제어 모드 설정

컨트롤러의 실행 모드 설정

컨트롤러의 실행 모드를 아래와 같이 설정합니다.

- 1 상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Basic settings” 탭을 선택합니다.
- 2 “Basic settings” 탭에서 [Change running mode] 를 클릭합니다.
“Change running mode” 화면이 표시됩니다.



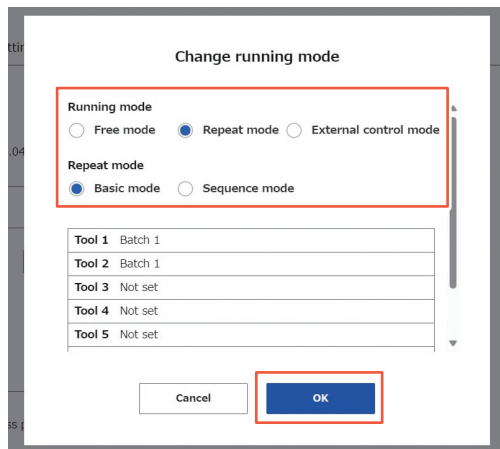
- 3 “Running mode” 를 선택하고 [OK] 를 클릭합니다.

실행 모드가 설정됩니다.

“Free mode”, “Repeat mode”, “External control mode” 중에서 실행 모드를 선택합니다.

“Repeat mode”의 경우, “Basic mode” 또는 “Sequence mode”를 선택합니다.

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* “Free mode”로 설정하기 전에 “Parameter”를 등록합니다.

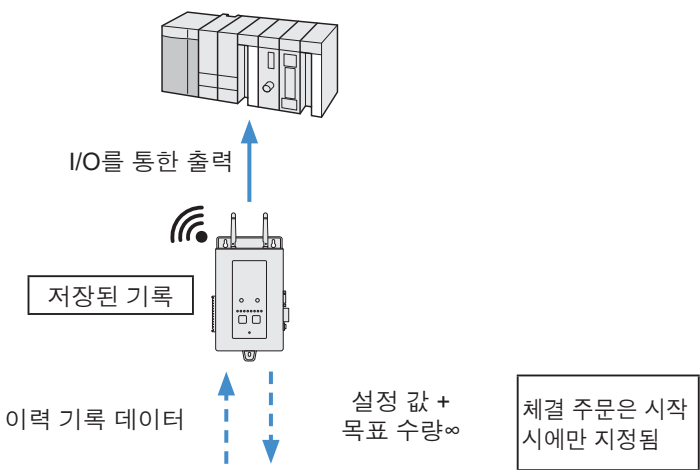
* “Repeat mode”로 설정하기 전에 “Batch/Job”을 등록합니다.

컨트롤러에서 체결 제어 모드 설정

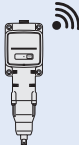
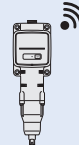
컨트롤러의 실행 모드 설정

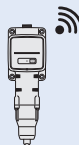
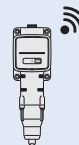
Free Mode

이 모드에서는 체결 수량 지정 없이 무조건 체결할 수 있습니다.
도구는 체결을 위해 미리 등록된 매개 변수를 사용합니다.
최대 8개의 도구가 독립적으로 작동할 수 있습니다.
컨트롤러의 I/O를 통한 출력 설정이 활성화됩니다.
* 외부 장치에서 체결 수량을 카운트할 때 사용하는 모드입니다.



최대 8개의 도구를 동시에 제어할 수 있음

			
설정 값 목표 수량	설정 값 목표 수량	설정 값 목표 수량	설정 값 목표 수량
10 Nm ∞	20 Nm ∞	30 Nm ∞	40 Nm ∞

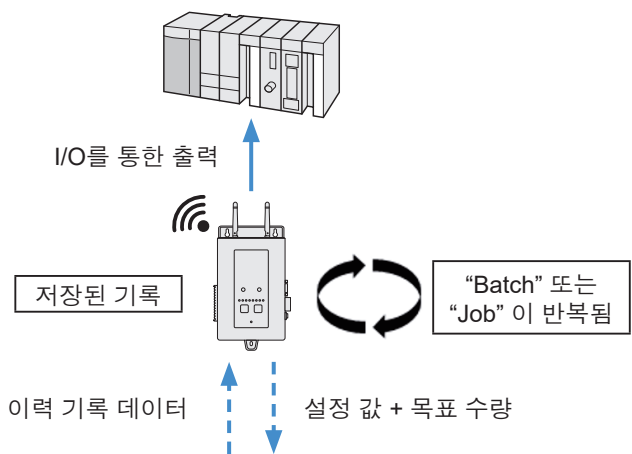
			
설정 값 목표 수량	설정 값 목표 수량	설정 값 목표 수량	설정 값 목표 수량
50 Nm ∞	60 Nm ∞	70 Nm ∞	80 Nm ∞

컨트롤러에서 체결 제어 모드 설정

컨트롤러의 실행 모드 설정

Repeat Mode (Basic Mode)

이 모드는 “Batch” 또는 “Job” 프로세스를 반복합니다.
도구는 체결을 위해 미리 등록된 “Batch” 또는 “Job” 설정을 사용합니다.
최대 8개의 도구가 독립적으로 작동할 수 있습니다.
컨트롤러의 I/O를 통한 출력 설정이 활성화됩니다.



최대 8개의 도구를 동시에 제어할 수 있음

설정 값	목표 수량
10 Nm	10

설정 값	목표 수량
20 Nm	10

설정 값	목표 수량
30 Nm	10

설정 값	목표 수량
40 Nm	10

설정 값	목표 수량
50 Nm	10
60 Nm	5
70 Nm	5

설정 값	목표 수량
60 Nm	10
70 Nm	5
80 Nm	5

설정 값	목표 수량
70 Nm	10
80 Nm	5
90 Nm	5

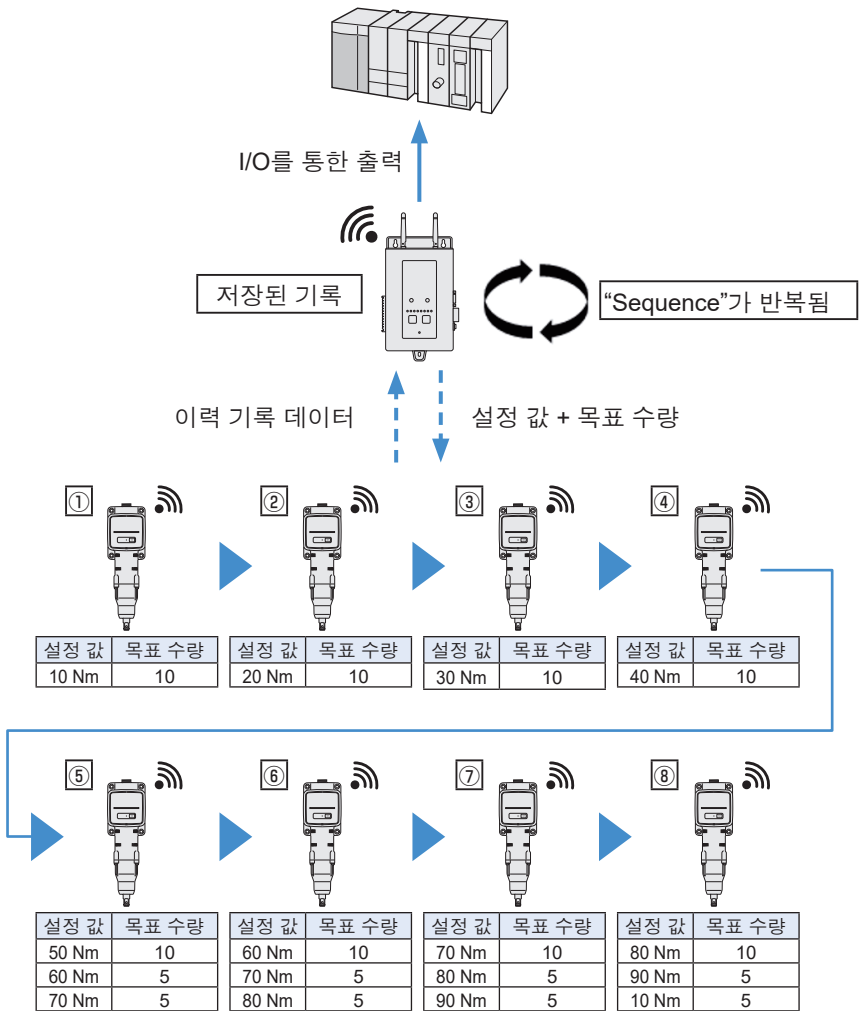
설정 값	목표 수량
80 Nm	10
90 Nm	5
10 Nm	5

컨트롤러에서 체결 제어 모드 설정

컨트롤러의 실행 모드 설정

Repeat Mode (Sequence Mode)

이 모드는 사용 가능한 도구가 주문대로 제어되는 “Sequence” 프로세스를 반복합니다. 도구는 순차 체결을 위해 미리 등록된 “Sequence” 설정을 사용합니다. 최대 10단계까지 설정할 수 있습니다. 시퀀스는 최대 8개의 도구를 지원하지만 한 번에 하나의 도구만 작동시킬 수 있습니다. 컨트롤러의 I/O를 통한 출력 설정이 활성화됩니다.



컨트롤러에서 체결 제어 모드 설정

컨트롤러의 실행 모드 설정

External Control Mode

이 모드에서는 외부 장치(호스트 시스템)의 주문에 따라 체결 제어가 가능합니다.
다음 2가지 유형의 제어가 지원됩니다.

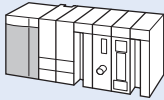
● 개방형 프로토콜을 통한 제어
(개방형 프로토콜 활성화)

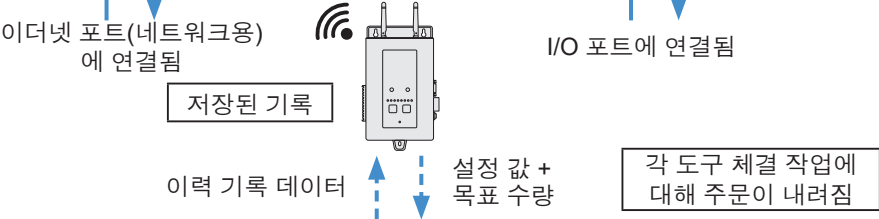
호스트 시스템이 개방형 프로토콜을 통해 체결을 제어합니다.
최대 8개의 도구를 독립적으로 제어할 수 있습니다.
* 작업 및 시퀀스 제어는 지원되지 않습니다.



● I/O를 통한 제어
(개방형 프로토콜 비활성화)

외부 장치의 I/O 포트를 통한 입력으로 체결을 제어합니다.
최대 8개의 도구를 독립적으로 제어하거나 순차적으로 제어할 수 있습니다.





* 하나 이상의 도구를 동시에 제어할 수 있습니다(“Sequence” 제외).



설정 값	목표 수량
10 Nm	∞

Free mode



설정 값	목표 수량
10 Nm	10

Batch



설정 값	목표 수량
50 Nm	10
60 Nm	5
70 Nm	5

Job



설정 값	목표 수량
10 Nm	10



설정 값	목표 수량
20 Nm	10

Sequence mode

* 체결 도중 컨트롤러가 꺼지면 컨트롤러가 켜진 후 체결이 재개되지 않습니다. 외부 장치에서 주문하면 체결이 다시 시작됩니다.
* I/O 출력 설정이 활성화됩니다.

컨트롤러에서 체결 제어 모드 설정

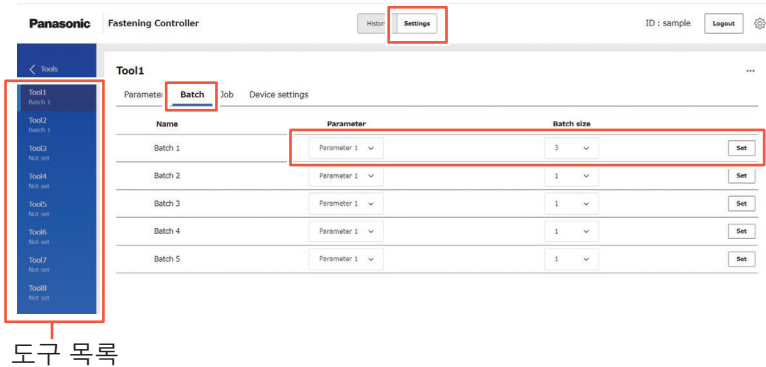
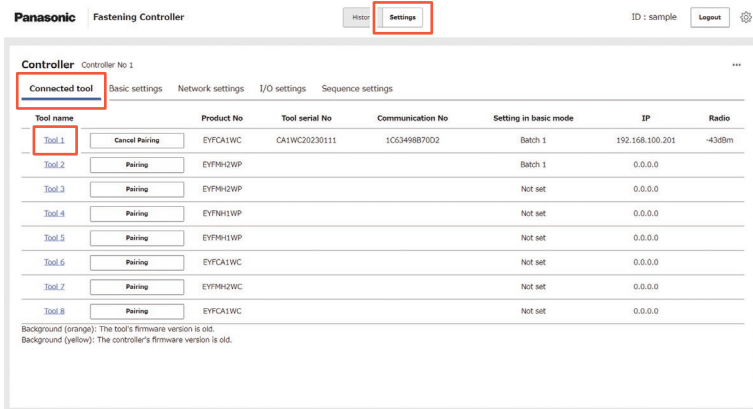
배치 생성(설정)

상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Connected tool” 탭을 선택합니다. “Connected tool” 화면에서 원하는 도구 번호를 클릭합니다. 도구 번호에 대한 화면에서 “Batch” 탭을 선택하여 설정합니다.

“Parameter” 폴다운 메뉴에서 매개 변수를 선택하고 “Batch size” (체결 수량, 최대 99개)를 설정합니다. [Set] 을 클릭하여 “Repeat mode (Basic mode)” 의 값을 설정합니다.

* 도구를 전환하려면 도구 목록에서 원하는 도구를 선택합니다.

* 최대 5개의 배치를 등록할 수 있습니다.



도구 목록

컨트롤러에서 체결 제어 모드 설정

작업 생성(설정)

상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Connected tool” 탭을 선택합니다. “Connected tool” 화면에서 원하는 도구 번호를 클릭합니다.

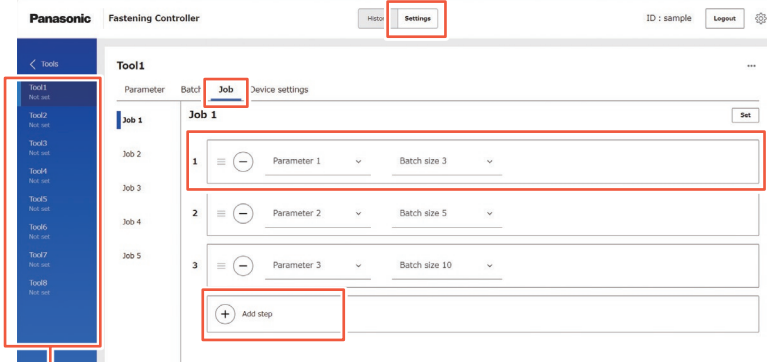
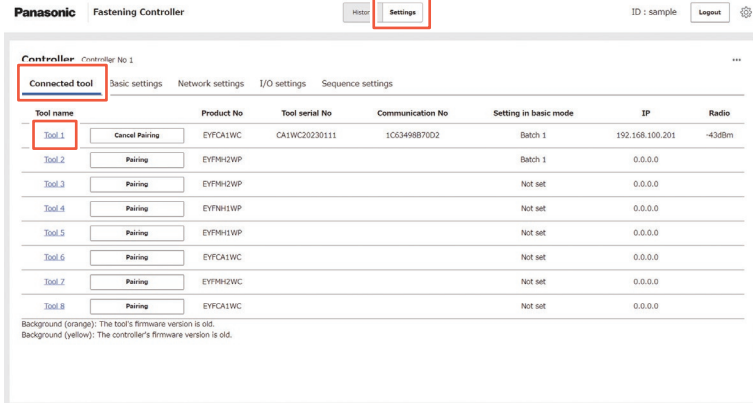
도구 번호에 대한 화면에서 “Job” 탭을 선택하여 설정합니다.

“Parameter” 폴다운 메뉴에서 매개 변수를 선택하고 “Batch size” (체결 수량, 최대 99개)를 설정합니다. [Set] 을 클릭하여 “Repeat mode (Basic mode)” 의 값을 설정합니다.

* 최대 5개의 작업을 등록할 수 있습니다.

* 작업당 최대 10단계를 등록할 수 있습니다.

* 도구를 전환하려면 도구 목록에서 원하는 도구를 선택합니다.



도구 목록

컨트롤러에서 체결 제어 모드 설정

시퀀스 생성(설정)

상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings]를 클릭하고 “Sequence settings” 탭을 선택합니다.

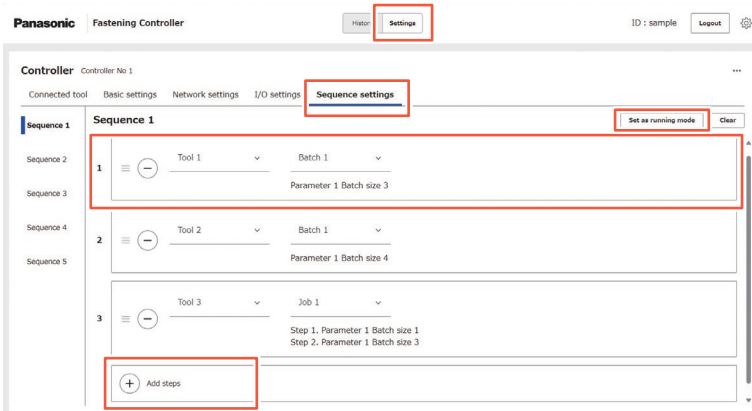
“Sequence settings” 화면의 “Tool” 폴다운 메뉴에서 도구를 선택하고 “Batch” 또는 “Job” 을 설정합니다.

[Set as running mode] 를 클릭하여 “Repeat mode (Sequence mode)” 에 대한 값을 설정합니다.

* 최대 5개의 시퀀스를 등록할 수 있습니다.

* 시퀀스당 최대 10단계를 등록할 수 있습니다.

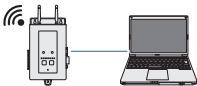
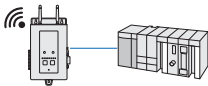
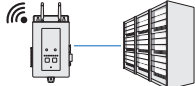
* 동일한 도구를 시퀀스에서 두 번 이상 사용할 수 있습니다.



컨트롤러를 외부 장치에 연결

지원되는 외부 장치 유형

컨트롤러는 다음 유형의 외부 장치를 지원합니다.
 자세한 내용은 컨트롤러(EYFRW2)의 사용설명서를 참조하십시오.

기능	구성용 PC	PLC	고객의 호스트 시스템
그림			
통신 방법	Ethernet	I/O	Ethernet
통신 프로토콜	http/https	— (ON/OFF 신호만)	Open Protocol
주 용도	- 이력 기록 보기 및 저장 - 설정 변경	- 완료 및 실패 신호 출력 - 체결 주문 전환	- 이력 기록 내보내기 - 체결 주문 전환
내보낼 수 있는 데이터	- 도구의 일련 번호 - 시간 - 완료 및 실패 결과 - 토크 값, 각도, 체결 시간 길이 - 파형 데이터	- 완료 및 실패 결과 - Batch/job/sequence 완료 - Batch/job/sequence 선택됨 - 도구 활성화	- 도구의 일련 번호 - 시간 - 완료 및 실패 결과 - 토크 값, 각도, 체결 시간 길이
체결 주문 전환	—	Batch/job/sequence 선택됨	Parameter/batch 선택됨
기타	웹 브라우저에 표시됩니다. Microsoft Edge 가 권장됩니다.	각 입력 및 출력용 포트 8개	지원되는 명령은 “개방형 프로토콜과 호환되는 명령”을 참조하십시오. P201 참조 제어 순서는 각각 검토해야 합니다.

컨트롤러를 외부 장치에 연결

원격 위치에서 구성용 PC에 연결

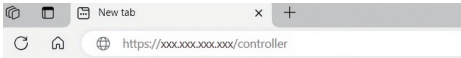
인증서가 설치된 구성용 PC는 컨트롤러에 원격으로 연결할 수 있습니다.

한 번에 하나의 구성 기능 액세스만 허용됩니다.

연결하려면 웹 브라우저에서 아래 URL에 접속합니다.

URL : <https://xxx.xxx.xxx.xxx/controller>

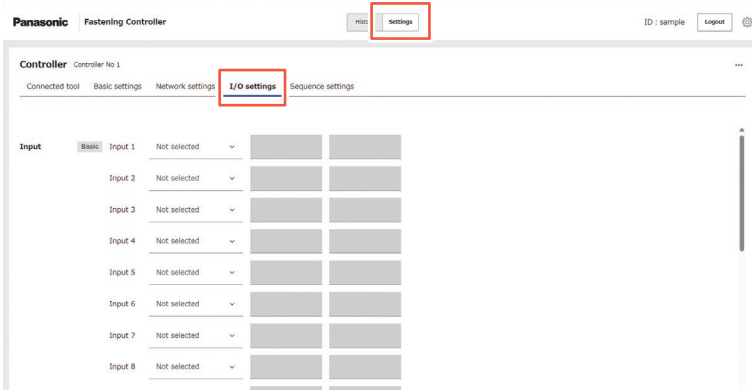
* xxx.xxx.xxx.xxx에는 컨트롤러의 “IP”에 설정된 IP 주소를 삽입합니다.

A screenshot of the Panasonic Fastening Controller login page. The page has a white background with a blue border. At the top, it says "Panasonic" in bold, followed by "Fastening Controller" in a smaller font. Below that, it says "Controller". There are two input fields: "User ID" and "Password". At the bottom, there is a blue "Login" button.

I/O를 통해 컨트롤러를 외부 장치에 연결

I/O 설정

상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “I/O settings” 탭을 선택합니다.



* 아직 등록되지 않은 동작이나 이벤트를 지정할 수 있습니다. (직업 선택 및 시퀀스 선택 제외)

I/O를 통해 컨트롤러를 외부 장치에 연결

입력 포트에 할당된 명령

입력 포트에 할당할 수 있는 명령은 다음과 같습니다.

외부 장치의 신호가 포트 중 하나에 입력되면 할당된 명령이 실행됩니다.

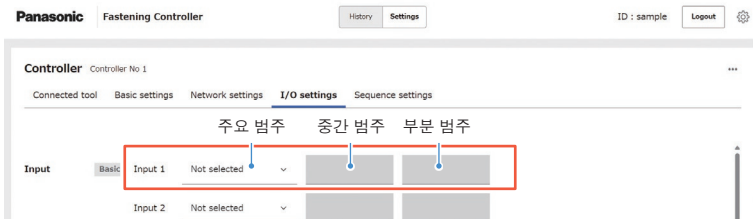
주요 범주(동작)	중간 범주(도구)	부분 범주(배치 번호 등)
Batch	도구 1~8	1-5
Job	도구 1~8	1-5
Sequence	—	1-5
Suspend tool ^{*1}	도구 1~8	—
Suspend controller ^{*1}	—	—
Batch reset	도구 1~8	—
Reset	—	—
Emergency stop ^{*1}	도구 1~8	—

^{*1} 입력 신호가 유지되는 동안에만 활성화됩니다.

“Suspend tool” 또는 “Suspend controller” 명령이 입력인 경우

- “Suspend controller” 가 활성 상태인 경우 체결 주문이 허용되지 않습니다.
- “Suspend tool” 이 활성화된 도구 번호의 경우 “Batch” 또는 “Job” 체결 주문이 허용되지 않습니다.
- “Suspend tool” 이 활성화된 도구 번호 이외의 도구 번호에서는 “Batch” 또는 “Job” 체결 주문이 허용됩니다.
- “Suspend tool” 이 활성 상태인 경우 “Sequence” 체결 주문이 허용되지 않습니다. 이때 “Suspend tool” 이 활성화된 도구에 도달할 때까지 프로세스가 계속됩니다.
- “Batch reset” 및 “Reset” 은 체결 주문과 동일한 방식으로 취급됩니다.
- “Emergency stop”은 컨트롤러의 실행 모드와 관계없이 실행할 수 있는 “Suspend tool” 명령입니다.

주요 범주에서 동작을 선택하고 도구를 선택한 다음 필요에 따라 번호(예: 배치 번호)를 선택합니다.



* 할당되지 않은 신호가 입력되면 아무 조치도 취하지 않습니다. (발생 오류 없음)

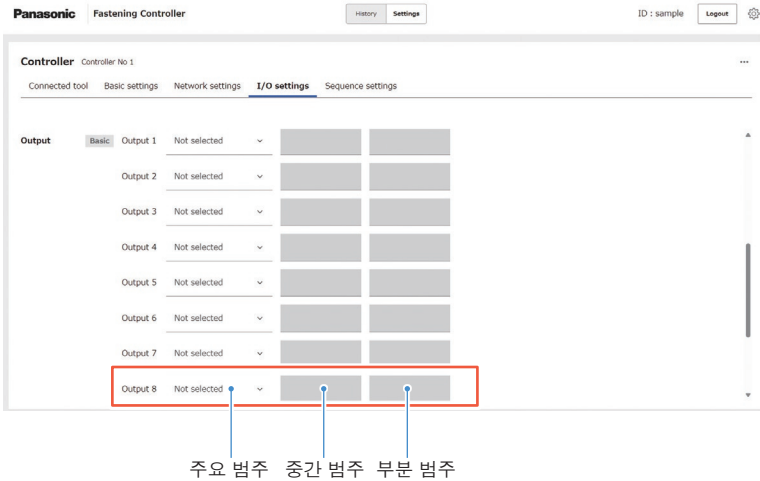
I/O를 통해 컨트롤러를 외부 장치에 연결

출력 포트에 할당된 명령

출력 포트에 할당할 수 있는 명령은 다음과 같습니다.
해당 이벤트가 발생하면 컨트롤러는 할당된 명령에 지정된 대로 해당 포트에서 외부 장치로 신호를 출력합니다.

주요 범주(이벤트)	중간 범주(도구)	부분 범주(배치 번호 등)
OK	도구 1~8	—
NOK	도구 1~8	—
Batch complete	도구 1~8	1-5
Job complete	도구 1~8	1-5
Sequence complete	—	1-5
Tool active	도구 1~8	—
Batch selected	도구 1~8	1-5
Job selected	도구 1~8	1-5
Sequence selected	—	1-5

주요 범주에서 이벤트를 선택하고 도구를 선택한 다음 필요에 따라 번호(예: 배치 번호)를 선택합니다.

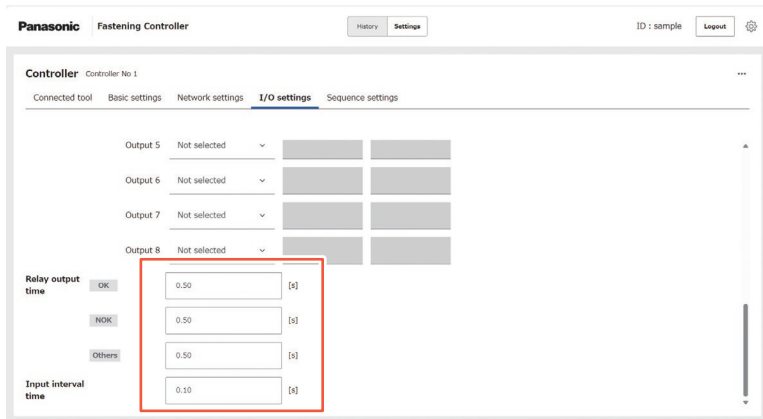


* 출력 명령을 실행하는 동안 컨트롤러가 꺼지면 컨트롤러가 켜진 후 프로세스가 다시 시작되지 않습니다. (이력 기록 데이터가 저장됩니다.)

I/O를 통해 컨트롤러를 외부 장치에 연결

기타 설정

아래와 같이 기타 I/O 관련 설정을 지정할 수 있습니다.



Relay output time (OK)
체결 완료 신호가 릴레이로 출력될 때까지의 시간을 선택합니다. [기본] 0.5 s [설정 범위] 0.01 s~10 s
Relay output time (NOK)
체결 실패 신호가 릴레이로 출력될 때까지의 시간을 선택합니다. [기본] 0.5 s [설정 범위] 0.01 s~10 s

I/O를 통해 컨트롤러를 외부 장치에 연결

기타 설정

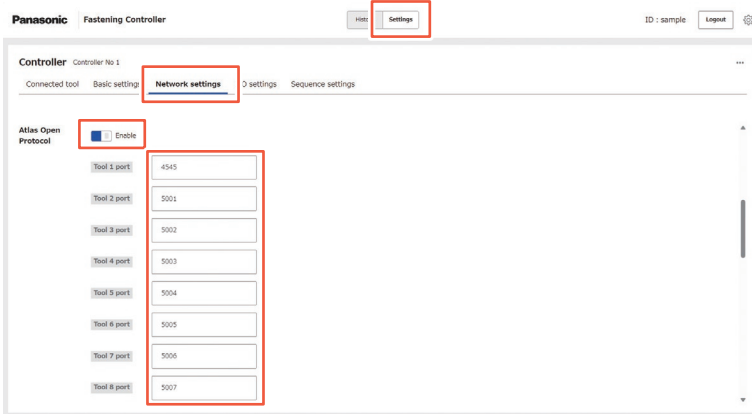
Relay output time (Others)
체결 완료 및 실패 신호 이외의 신호가 릴레이에서 출력될 때까지의 시간을 선택합니다. [기본] 0.5 s [설정 범위] 0.01 s~10 s
Input interval time
연속 입력 신호를 카운트(수락)하지 않는 시간을 선택합니다. 노이즈 등에 의한 중복 카운트를 방지하기 위해 설정합니다. [기본] 0.5 s [설정 범위] 0.01 s~10 s

개방형 프로토콜을 통해 컨트롤러를 외부 장치에 연결

개방형 프로토콜 통신을 통한 연결

상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Network settings” 탭을 선택합니다.

“Atlas Open Protocol” 을 활성화합니다.
각각 사용하는 도구에 포트 번호를 설정합니다.



Tool port

개방형 프로토콜 통신을 위한 포트 번호를 각 도구에 할당합니다.

[기본] 도구 1 - 4545,
 도구 2~8 - 5001~5007

[설정 범위] 도구 1~8 - 1024~49151

개방형 프로토콜을 통해 컨트롤러를 외부 장치에 연결

기타 설정

필요에 따라 다른 항목을 설정합니다.

The screenshot shows the 'Panasonic Fastening Controller' settings page. At the top, there are tabs for 'History' and 'Settings'. Below this, the 'Controller' section is visible, showing 'Controller No. 1'. The 'Network settings' tab is active, displaying various configuration fields: 'Cell ID' (0), 'Channel ID' (0), 'ACK timeout' (3000 [ms]), 'Retries' (0 [times]), 'Keep alive timeout' (15 [s]), 'Mode' (Mode 1 and Mode 2, with Mode 2 selected), and three 'Tool' parameters (Tool 1, Tool 2, Tool 3), each set to 'Parameter 1'.

Cell ID

셀 ID를 설정합니다.

[기본] 0

[설정 범위] 0~9999

Channel ID

채널 ID를 설정합니다.

[기본] 0

[설정 범위] 0~99

ACK timeout

컨트롤러의 요청 메시지에 대한 응답을 기다리는 시간을 설정합니다.

[기본] 3000 ms

[설정 범위] 100 ms~30000 ms

개방형 프로토콜을 통해 컨트롤러를 외부 장치에 연결

기타 설정

Retries

컨트롤러에서 요청 메시지 전송을 반복할 횟수를 설정합니다.

[기본] 0 times

[설정 범위] 선택할 수 없음(고정됨)

Keep alive timeout

호스트 시스템과의 마지막 통신 후 연결이 끊어진 경우를 판단하는 시간을 설정합니다.

[기본] 15 s

[설정 범위] 1 s~60 s

Mode

실행 모드를 설정합니다.

Mode 1: 미리 등록된 매개 변수로 무조건 체결

Mode 2: 호스트 시스템에서 주문한 매개 변수로 체결

[기본] Mode 1

[설정 범위] Mode 1 / Mode 2

개방형 프로토콜을 통해 컨트롤러를 외부 장치에 연결

체결 매개 변수 할당(Mode 1)

“Mode 1”(주문한 매개 변수 없음)에는 도구에 미리 등록된 체결 매개 변수가 필요합니다. 아래와 같이 풀다운 메뉴에서 매개 변수를 선택합니다.

Panasonic Fastening Controller MODIFY Settings ID : sample Logout

Controller Controller No 1 ...

Connected tool Basic settings **Network settings** I/O settings Sequence settings

Call ID:

Channel ID:

ACK timeout: [ms]

Retries: [times]

Keep alive timeout: [s]

Mode: ☒ Mode 1 ☐ Mode 2

Tool 1 parameter:

Parameter 1 ▼

Tool 2 parameter:

Parameter 1 ▼

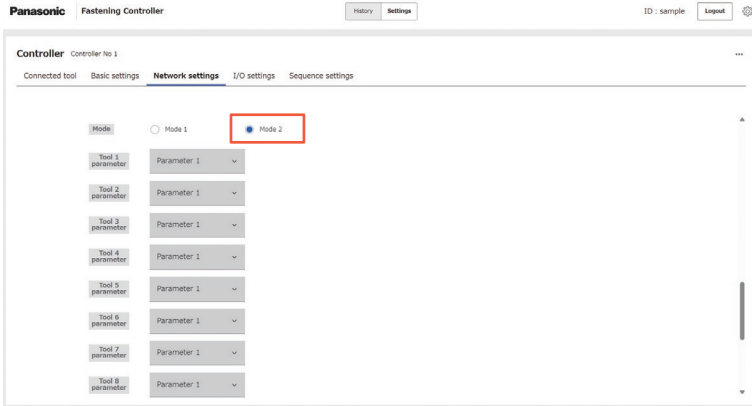
Tool 3 parameter:

Parameter 1 ▼

개방형 프로토콜을 통해 컨트롤러를 외부 장치에 연결

체결 매개 변수 할당(Mode 2)

체결은 외부 장치에서 MID 0018 주문을 통해 명령할 수 있습니다.
체결 주문에 “Parameter” 또는 “Batch” 를 지정할 수 있습니다.



체결 주문에 “Parameter” 를 지정하려면

ID 의 백 자리에 “0” 을 입력합니다.
십의 자리와 일의 자리는 매개 변수 번호를 나타냅니다.
예: 매개 변수 1의 ID: 001
매개 변수 5의 ID: 005

체결 주문에 “Batch” 를 지정하려면

ID 의 백 자리에 “1” 을 입력합니다.
십의 자리와 일의 자리는 배치 번호를 나타냅니다.
예: 배치 1의 ID: 101
배치 5의 ID: 105

* “Job” 및 “Sequence” 제어는 지원되지 않습니다.

개방형 프로토콜을 통해 컨트롤러를 외부 장치에 연결

체결 매개 변수 할당(Mode 2)

개방형 프로토콜과 호환되는 명령

컨트롤러는 다음 명령을 지원합니다.

명령에 대한 자세한 내용은 개방형 프로토콜 사양을 참조하십시오.

MID 0001 Application communication start
개정 1이 지원됩니다. [내용] 통신 시작
MID 0002 Application communication start acknowledge
개정 1이 지원됩니다. [내용] 통신 확인
MID 0004 Application command error
개정 1이 지원됩니다. [내용] 명령 오류
MID 0005 Application command accepted
개정 1이 지원됩니다. [내용] 명령 수락
MID 0018 Select parameter set, Dynamic Job included
개정 1이 지원됩니다. 할당 방법은 “체결 매개 변수 할당(Mode 2)” 을 참조하십시오. P200 참조 [내용] 매개 변수 설정 주문
MID 0042 Disable tool
개정 1이 지원됩니다. [내용] 도구 비활성화됨

개방형 프로토콜을 통해 컨트롤러를 외부 장치에 연결

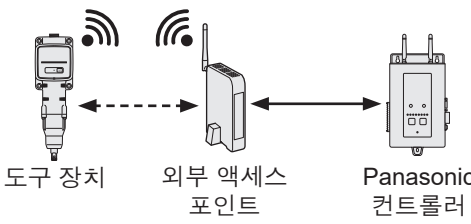
체결 매개 변수 할당(Mode 2)

MID 0043 Enable tool
개정 1이 지원됩니다. [내용] 도구 활성화됨
MID 0050 Vehicle ID number download request
개정 1이 지원됩니다. [내용] 차량 ID 취득 요청
MID 0060 Last tightening result data subscribe
개정 1과 2가 지원됩니다. [내용] 최종 체결 결과 데이터 등록
MID 0061 Last tightening result data
개정 1과 2가 지원됩니다. [내용] 체결 결과 업로드
MID 0062 Last tightening result data acknowledge
개정 1과 2가 지원됩니다. [내용] 체결 결과 업로드 승인
MID 9999 Keep alive message
개정 1이 지원됩니다. [내용] 가용성 확인

외부 액세스 포인트를 통해 연결

설정

컨트롤러는 내장된 액세스 포인트 대신 외부 액세스 포인트를 사용하여 무선 통신을 통해 도구에 연결할 수 있습니다.
컨트롤러는 설치된 위치에 관계없이 도구를 제어할 수 있습니다.
액세스 포인트와 컨트롤러를 유선 LAN 에 연결합니다.
* 무선 범위와 성능은 사용하는 액세스 포인트에 따라 달라집니다.

연결	통신 방법	중요
 도구 장치 외부 액세스 포인트 Panasonic 컨트롤러	Ethernet	• 모드 선택에서 내부 액세스 포인트 또는 외부 액세스 포인트를 선택합니다. • 최대 연결 도구 수: 8 * 내부 액세스 포인트 또는 외부 액세스 포인트 모두

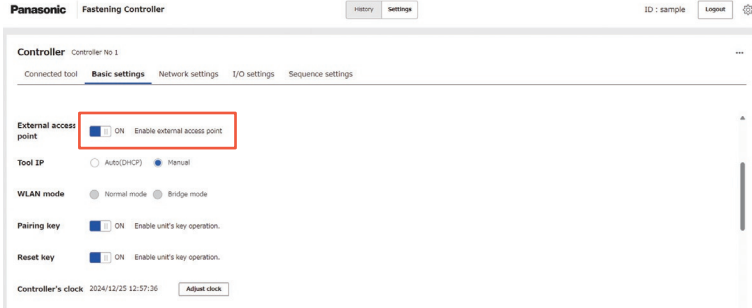
* 도구의 IP를 “Auto (DHCP)”로 설정하면 도구의 IP 주소를 관리하지 않고도 네트워크를 구성할 수 있습니다. 자세한 내용은 컨트롤러(EYFRW2)의 사용설명서를 참조하십시오.

외부 액세스 포인트를 통해 연결

설정 절차

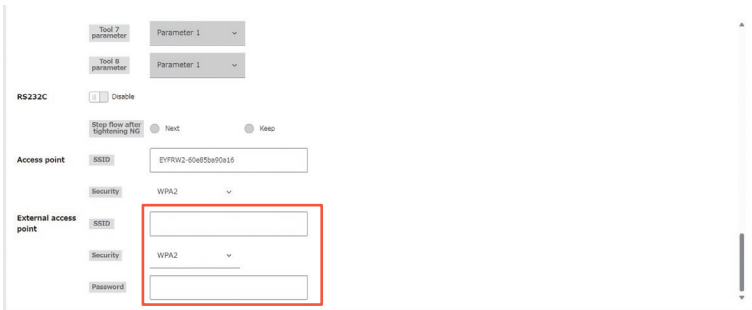
1 상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Basic settings” 탭을 선택한 다음 “External access point” 를 “ON” 으로 설정합니다.

* “External access point” 가 활성화되면 “WLAN mode” 가 비활성화됩니다.



2 상단 페이지(설정 화면의 초기 페이지)에서 위에 있는 [Settings] 를 클릭하고 “Network settings” 탭을 선택합니다. “External access point” 에서 “SSID”, “Security”, “Password” 를 설정합니다.

- * 컨트롤러에는 하나의 SSID 만 등록할 수 있습니다. (도구마다 다른 SSID 를 등록할 수 없음)
- * 외부 액세스 포인트의 사용설명서를 참조하십시오.
- * 도구와 페어링 등록을 시작하기 전에 이 설정을 지정합니다.
- * 페어링 등록을 시작하기 전에 도구의 IP 주소를 설정합니다.



도구의 용량 및 사양

도구의 용량

모델 번호	EYFCA1WC
권장 작업 (볼트 강도)	M8 (볼트 강도 높음) M10 (일반 볼트)
토크 제어 기능 범위	약 20.0 Nm ~ 60.0 Nm / 177.0 In.lbs ~ 531.0 In.lbs / 14.7 Ft.lbs ~ 44.2 Ft.lbs (설정 범위: 약 10~70Nm / 88.6 In.lbs~620.0 In.lbs / 7.4 Ft.lbs~51.7 Ft.lbs)
체결 토크 정확도(*1)	±15%
작업 속도	<M8: 23 Nm / 204 In.lbs / 17 Ft.lbs> 약 0.5 s/bolt <M10: 43 Nm / 380.8 In.lbs / 31.7 Ft.lbs> 약 0.7 s/bolt

<측정 조건> 당사 지정 측정 조건 기준입니다.
 *1 체결 토크 및 체결 토크 정확도는 작업에 따라 다릅니다. 실제로 미리 테스트해야 합니다.

도구의 용량 및 사양

도구 사양

모델 번호		EYFCA1WC
렌치 크기		□12.7 mm
전원 공급 전압		15 V DC
무부하 속도		0 ~ 2300 회전/분 (최대 속도는 약 1500 ~ 2300 회전/분으로 설정할 수 있습니다.)
소프트 시작 속도		약 150 ~ 350회전/분 (최대 속도는 약 150 ~ 350회전/분으로 설정할 수 있습니다.)
펄스 숫자		0 ~ 2700 회전/분
크기	전체 길이	약 306 mm (확장 소켓 포함: 약 408 mm)
	전체 높이	약 89 mm
	전체 너비	약 91 mm
질량 (무게)		약 1.65 kg (확장 소켓 포함: 약 1.95 kg)
무선 통신 표준 (*1)		무선 LAN (IEEE802.11a/b/g/n) *n: HT20 에만 해당
주파수 대역		2.412-2.462 GHz / 5.180-5.240 GHz
채널 수		2.4 GHz: 1 ~ 11 채널 / 5 GHz: 36, 40, 44, 48 채널
저장 가능한 도구 이력 기록의 개수		약 45000볼트 (1.2초 작업 시)
보유 가능한 매개 변수의 개수		1-매개변수
호환 로봇의 부하 용량		3 kg 이상 (*2)

*1 약 5GHz(36, 40, 44, 48ch) 지원: 무선 장비는 5.2GHz 대역 고전력 데이터 통신 시스템의 기지국 또는 육상 이동 중계국과 통신하는 경우를 제외하고 실내 전용 전송을 지원합니다.

*2 최대 3 kg 용량 로봇용 M8 고강도 볼트.

무선 통신 유의 사항

■ 다음과 같은 환경 조건에서는 노이즈, 짧은 전파 도달 거리 또는 고장이 발생할 수 있습니다.

- 무선 운용 가능 도구 유닛 및 컨트롤러 간의 원활한 무선 전파를 방해하는 방해물(예: 금속 또는 강화 콘크리트 구조물)이 있습니다.
- 컨트롤러의 안테나는 금속으로 마감되어 있습니다.
- 오퍼레이터의 바디가 오퍼레이터(무선 운용 가능 도구 유닛)와 컨트롤러 사이의 무선 전파를 방해합니다.
- 부근에 마이크로웨이브, PC 또는 기타 기기 등 노이즈를 초래하는 장치가 있습니다.
- 무선 운용이 가능한 도구 유닛과 컨트롤러 주변에서 휴대폰이나 PHS 폰을 사용합니다.

청소 및 보관

청소 방법

■ 부드러운 천으로 닦아주기

젖은 천, 시너, 알코올, 벤진 또는 그 외의 휘발성 액체를 사용하지 마십시오.
(변색, 변형 또는 갈라짐 유발)



■ 수명 단축 방지

대리점 또는 상담 서비스를 통해 주기적인 유지보수를 요청하십시오.

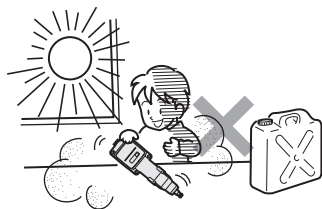
■ 정기 점검 실시

느슨하거나 파손된 전원선 플러그 또는 신호선 플러그가 있는지 주기적으로 확인하십시오.

보관 방법

보관 중에는 다음 상황을 피하십시오.

- 차량 캐빈 또는 그 외의 뜨거운 장소
- 직사광선에 노출된 장소
- 물 또는 습기에 노출된 장소
- 이물질 또는 먼지가 많은 장소
- 아이들이 만질 수 있는 장소
- 가솔린이나 그 외의 가연성 물질이 있는 장소
- 넘어질 위험이 있는 장소



오류 코드

제어판의 오류 코드

제품에 오류가 발생하면 제어판 디스플레이의 오류 코드가 깜빡입니다. 수리를 요청하기 전에 다음 조치를 취해 보십시오. 다음 조치를 취한 이후에도 향상되지 않는 경우에는 대리점에 문의하십시오.

디스플레이	가능한 원인	조치
	도구의 내부 메모리 또는 통신 라인, 무선 통신 등 이상	전원을 껐다가 켜서 도구를 재시작하십시오. 문제가 지속될 경우, 초기화를 수행하십시오. (“E1”이 표시된 상태에서 페어링 버튼을 약 10초 동안 누르고 있습니다.) Wireless Communication Mode 에서도 컨트롤러의 상태를 확인하십시오.
	도구의 모터가 뜨겁습니다.	작업 중단 후, 모터 온도가 사용하기 전으로 내려갈 때까지 기다리십시오.
	도구 내부 센서 시스템 이상	전원을 껐다가 켜서 도구를 재시작하십시오.
	과부하, 모터 고장 등	작업이 도구의 용량에 적합한지의 여부를 확인하십시오.

주의

- 이미 조여 놓은 볼트를 조이거나 풀면 과부하 보호 (E5) 가 기능할 수 있습니다.

오류 코드

제어판의 오류 코드

디스플레이	가능한 원인	조치
	도구 회로의 이상, 고장 등	전원을 껐다가 켜서 도구를 재시작하십시오.
	컨트롤러와 무선 통신이 끊겼습니다. P207 참조	- 무선 통신 범위 내에서 전원을 껐다가 켜서 도구를 사용하십시오. - 전원을 껐다가 켜는데도 문제가 계속되면 컨트롤러 및 주변 장치를 확인하십시오.
	① 토크 센서의 이상, 고장 등 ② 과도한 작업 시간 (과도한 측정 데이터) ③ NOK로 판단됨	① :전원을 껐다가 켜서 도구를 재시작하십시오. ②③:오류 세부 정보는 컨트롤러의 이력 기록을 확인하십시오. 설정된 매개 변수를 검토합니다.
	도구 내에 있는 버튼의 배터리가 다 닳았습니다.	—
	[Wireless Communication Mode]에서 과도한 배치 작업 부하 (통신 데이터에 임시 저장되는 메모리 용량 초과)	배치에 있는 작업 부하를 재검토하십시오. [Graph Sending/Storing Timing] 설정에 대해 [After Batch Complete] 이외의 설정을 선택하십시오.
	낮은 입력 전압	입력 전압을 확인하고 전원을 껐다가 켜서 도구를 다시 시작하십시오.
	도구에 고전압이 입력됩니다.	입력 전압을 확인하고 전원을 껐다가 켜서 도구를 다시 시작하십시오.
	작동 중 도구에 대한 입력 전압이 떨어졌습니다.	전원을 껐다가 켜서 도구를 재시작하십시오.
	도구가 5분 이상 계속 작동했습니다.	전원을 껐다가 켜서 도구를 재시작하십시오.
	시스템이 비상 정지 버튼을 활성화했습니다.	로봇을 포함한 시스템의 비상 정지 원인을 제거한 다음 비상 정지를 취소하십시오.

체결 이력 오류 메시지

체결 작업이 성공적으로 완료되지 않은 경우 체결 이력에서 오류 세부 정보를 확인할 수 있습니다.

(체결 이력 검색 방법에 대해서는 **P173 참조** .)

카테고리	오류 메시지	원인	조치 (의도하지 않은 원인의 경우)
Torque	Torque exceeded	- 작업 중단 시 도구의 측정된 토크가 토크 하한 이하입니다. - 멤버 조건이 도구에 맞지 않습니다.	- 설정을 확인하십시오. - 멤버 조건을 재확인하십시오. - 토크 설정 하한 비활성화.
Torque	Torque insufficient	- 작업 중단 시 도구의 측정된 토크가 토크 하한 이하입니다. - 멤버 조건이 도구에 맞지 않습니다.	- 설정을 확인하십시오. - 멤버 조건을 재확인하십시오. - 토크 설정 하한 비활성화.
Angle	Before snug angle exceeded	작업 중 조임 전 각도가 설정 상한을 초과했습니다.	- 설정을 확인하십시오 (착좌점 설정 포함). - 멤버 조건을 재확인하십시오. - 설정 상한 비활성화.
Angle	Before snug angle insufficient	작업 중단 시 조임 전 각도가 설정 하한보다 작습니다.	- 설정을 확인하십시오 (착좌점 설정 포함). - 멤버 조건을 재확인하십시오. - 설정 하한 비활성화.
Angle	After snug angle exceeded	작업 중 조임 후 각도가 설정 상한을 초과했습니다.	- 설정을 확인하십시오 (착좌점 설정 포함). - 멤버 조건을 재확인하십시오. - 설정 상한 비활성화.
Angle	After snug angle insufficient	작업 중단 시 조임 후 각도가 설정 하한보다 작습니다.	- 설정을 확인하십시오 (착좌점 설정 포함). - 멤버 조건을 재확인하십시오. - 설정 하한 비활성화.
Error	Rundown error	작동 중단이 런다운 오류 시간 설정 이내에 이루어졌습니다.	- 설정 (토크 차단 및 런다운 오류 시간 설정) 을 확인하십시오. - 멤버 조건을 재확인하십시오. (비정상적 부하로 인해 중단될 수 있습니다.) - 런다운 오류 설정 비활성화.
Error	Stop before shut off	- 작업이 작동 중단 전에 종료되었습니다. - 사용자가 트리거를 꺾습니다. - 다른 오류로 인해 중단되었습니다.	<수동으로 중단시킨 경우> - 작업 환경을 재검토하십시오. - 멤버 조건을 확인하십시오. <다른 오류가 나타난 경우> - 오류 설명을 확인하고 조치를 취하십시오.

체결 이력 오류 메시지

카테고리	오류 메시지	원인	조치 (의도하지 않은 원인의 경우)
Error	Shut off incomplete	• 작동 중단 전에 정지" 및 "필싱 발생" 으로 인해 작업이 중단되었습니다. - 작동 중단 전에 정지 - 작업이 시작되었습니다.	• 작동 중단 전에 정지 섹션을 참조하십시오. • 작업 절차를 재검토하십시오.
Error	Overcurrent	• 도구에서 비정상적인 전류가 관찰되어 보호가 중단되었습니다. - 작업 환경 의존적 - 전원 시스템 또는 도구로 인해 발생	• 작업 환경(비정상 부하가 있는지의 여부 및 작업자가 도구를 사용한 방법)을 재검토하십시오.
Error	Low voltage	• 도구로 공급되는 전압 강하가 감지되어 도구 보호를 위해 작동이 중지되었습니다. - 작업 환경 의존적 - 전원 시스템으로 인해 발생	• 커넥터를 청소하십시오 (커넥터의 먼지 및 마모도 확인).
Error	Motor high temperature	• 도구의 모터가 뜨겁기 때문에 보호가 중단되었습니다.	• 사용하기 전에 온도가 내려가도록 기다리십시오 (응결 없음). <비정상적 부하가 지속되는 경우> • 작업 환경을 재검토하십시오. • 멤버 조건을 확인하십시오.
Error	Motor sensor error	• 모터의 온도 센서가 저온 오류를 감지했습니다. - 기준: -30 °C 이하	• 작업 환경을 재검토하십시오. - 온도만으로 판단하기 때문에 자주 발생하는 고장입니다.
Error	Torque sensor error	• 토크 센서와 관련하여 회로 고장이나 단락이 감지되었습니다.	• 빈도수 확인. - 자주 발생하는 경우, 수리를 요청하십시오
Error	Torque sensor protection	• 단일 작업에서, 다음 항목 중 하나가 측정 가능한 상한을 초과했습니다. - 펄스 횟수 (= 511회) - 작업 시간 (= 13초) - 축적된 각도 (= 131071°)	• 작업 환경을 재검토하십시오 (작업 및 절차 포함). • 멤버 조건을 확인하십시오.

체결 이력 오류 메시지

카테고리	오류 메시지	원인	조치 (의도하지 않은 원인의 경우)
Error	Tool locked	- 구동 모터가 잠겼습니다. -하드웨어 고장, 비정상적 부하 등	- 작업 환경을 재검토하십시오. - 빈도수 확인. - 자주 발생하는 경우, 수리를 요청하십시오.
Error	Circuit identification error	도구의 회로 인지 스위치의 설정이 수용 가능하지 않습니다.	- 빈도수 확인. - 자주 발생하는 경우, 수리를 요청하십시오. (회로 고장 또는 제조, 수리 실수)
Error	Parameter error	도구의 매개 변수 설정이 설정 범위를 벗어났습니다.	- 매개 변수 설정을 확인하십시오. - 도구에 대한 매개 변수를 다시 설정하십시오.
Error	Data limit exceeded	작업당 기록 가능한 데이터의 양에 도달했습니다.	- 작업 환경을 재검토하십시오 (작업 및 절차 포함). - 멤버 조건을 확인하십시오.
Error	Maintenance warning	경고 설정 이전에 축적된 펄싱 시간이 1시간 남았습니다.	- 설정을 확인하십시오. - 다시 설정하십시오 (연장, 초기화 또는 설정 비활성화).
Error	Maintenance protection	축적된 펄싱 시간이 경고 시간 설정을 초과했습니다.	- 설정을 확인하십시오. - 다시 설정하십시오(연장, 초기화 또는 설정 비활성화).
External input	Emergency stop	컨트롤러에 연결된 시스템이 비상 정지를 활성화했습니다.	비상 정지 원인을 확인하고 제거하십시오.
Error	Pre fastening NOK	공정 ① ~ ⑦에서 NOK 조건이 충족되었습니다. 공정 ① ~ ⑦ 중에 작업이 중단되었습니다.	NOK 원인이 된 공정과 설정을 검토하십시오. 구성원 조건을 검토하십시오.

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Original instructions: English

Translation of the original instructions: Other languages

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Characters written in red show those that are not mentioned in a brief (printed) version of Operating Instructions.

SAFETY PRECAUTIONS

Below are the instructions you should always adhere to, to prevent human harm and property damage.

■The severity of harm and damage caused by incorrect use is presented with the following.

 WARNING	May cause death or serious injury.
 CAUTION	May cause minor injury or property damage.

■The content that should be observed is presented with the following symbols.
(The following are examples)

	You MUST NOT do the action.
	You MUST do the action.

 WARNING	
 Mandatory	● Perform daily management of torque. Failure to observe this may cause loose bolts due to torque fluctuations, resulting in an accident.
	● Confirm the weight capacity of the robot before installation. Failure to observe this may cause an accident or trouble.
	● Use a collaborative mode when using a robot. Failure to observe this may cause a damaged power wire or signal wire or a tool failure, resulting in an accident or trouble.
	● Confirm that no buried object exists in the operating area, such as a power, water, or gas pipe. Contact with a buried object may cause an accident such as an electric shock, electric leakage, or fire.
	● Wear ear protectors such as earplugs or earmuffs in noisy work environments. Failure to observe this may adversely affect hearing.
	● Use protective glasses during work. In addition, wear a dust mask during dusty work. Failure to observe this may cause injury to the eyes or throat.
	● Insert the power plug all the way seated. Incomplete insertion may cause electric shock or heat generation resulting in fire. Do not use a damaged plug or loose socket.

SAFETY PRECAUTIONS

WARNING



Mandatory

- **Clean dust off the power plug routinely.**
Accumulated dust on the plug may absorb moisture and cause poor insulation resulting in fire.
Disconnect the power plug and wipe it with dry cloth.
- **Use the specified accessories and attachments.**
Failure to observe this may cause injury.
- **Keep the workplace sufficiently bright.**
Poor visibility in a dark workplace may lead to an accident or injury.
- **Use a pointed tool (socket, extension bar, etc.) for power tools only.**
Using a pointed tool for manually operated tools may cause it to break and fly, resulting in an accident. Be sure to use a pointed tool for power tools with this product.
- **Avoid failing to inspect the pointed tool, etc.**
Always inspect the pointed tool and the pointed tool insertion part of the product to check for wear and damage. Request replacement or repair if necessary. Do not use them particularly if a large backlash exists between the socket and the socket insertion part, as this may cause breakage resulting in injury.
- **Fix the workpiece firmly.**
Failure to observe this may cause unexpected movement, resulting in injury. For safety, use clamps or vices for fixing it.
- **If the tool malfunctions or makes abnormal noises during use, immediately turn the trigger signal off, turn the power switch off, and stop using it.**
Consult your dealer or Panasonic Customer Support Centre. Using it as is may result in injury.
- **Following the Operating Instructions, attach tools including a pointed tool and accessories securely.**
Failure to securely attach them may cause detachment, resulting in injury.
- **Before use, remove a key, wrench, and other tools used for adjustment.**
Failure to observe this may cause unexpected detachment, resulting in injury.
- **Work in proper attire.**
 - Do not wear baggy clothing or accessories such as a necklace, because they may get caught in rotating parts.
 - Cover long hair with a cap or a hair cover.

SAFETY PRECAUTIONS

WARNING



Prohibited

- **Do not block the vent of the tool.**
Doing so may cause burns or fire due to abnormal heat.
- **Do not expose your skin directly to hot air from the vent of the tool.**
- **Immediately after work, do not touch the pointed tool such as a socket, screws, or chips.**
They are hot and may cause burns.
- **Do not use the tool for any other purpose than intended.**
Failure to observe this may cause injury.
- **Do not use the LED light as a torch.**
Doing so may cause an accident since the light is not bright enough to move in the dark.
- **Do not expose your eyes to the LED light directly.**
Keeping your eyes exposed to the LED light may damage them.
- **Do not use the tool with oil or other foreign material attached to it.**
Otherwise an accident may occur if the tool falls.
Also, such oil or other foreign material may enter the inside, resulting in generation of heat, fire, or burst.
- **While using the product, keep your body and a part of your body away from the rotating parts and chips.**
You may be injured when unexpectedly detached or damaged rotating parts or chips hit you. Replace the pointed tool periodically.
- **Do not use the product to drill a hole in a metal object.**
The metalworking drill bit may become chipped due to high torque, resulting in injury.
- **Do not use the tool in an environment where asbestos exists nearby (including an environment where asbestos is being removed).**
Doing so may adversely affect health.
Great care should be given to asbestos, because this substance causes lung cancer or other serious health damage.
- **The product is intended for use with a robot. Do not use it as a manually operated tool.**
Doing so may cause injury.

SAFETY PRECAUTIONS

WARNING

 Prohibited	● Disconnect the power plug between uses. Failure to observe this may cause poor insulation resulting in electric shock or fire from electric leakage.
 No disassembly	● Do not modify the tool. Do not disassemble or repair the tool. Doing so may cause fire, electric shock, or injury. For repair, consult your dealer or our customer support team.
 Keep dry	Avoid the following use of tools. ● Do not use or leave them exposed to rain or moisture. ● Do not use them immersed under water. Failure to observe this may cause smoke, fire, or burst.
 No wet hand	● Do not use a wet hand to connect or disconnect the power plug to or from the outlet. Failure to observe this may cause electric shock.

SAFETY PRECAUTIONS

CAUTION



Prohibited

- **Do not put the tool in a place accessible by a child.**
Failure to observe this may cause an accident or trouble.
- **Do not store the main body in a place where the temperature may rise to 50 °C or higher.**
Failure to observe this may lead to abnormal operation.
- **Do not use the tool in such a forceful manner that causes the motor to lock.**
Failure to observe this may cause smoke or fire.
In order to work safely and efficiently, work at a speed that matches the ability.
- **Do not use the tool when you are tired.**
Failure to observe this may cause an accident or injury.
- **Do not allow a child or any other person who is not an operator to come near the workplace or touch the tool.**
Doing so may cause injury.



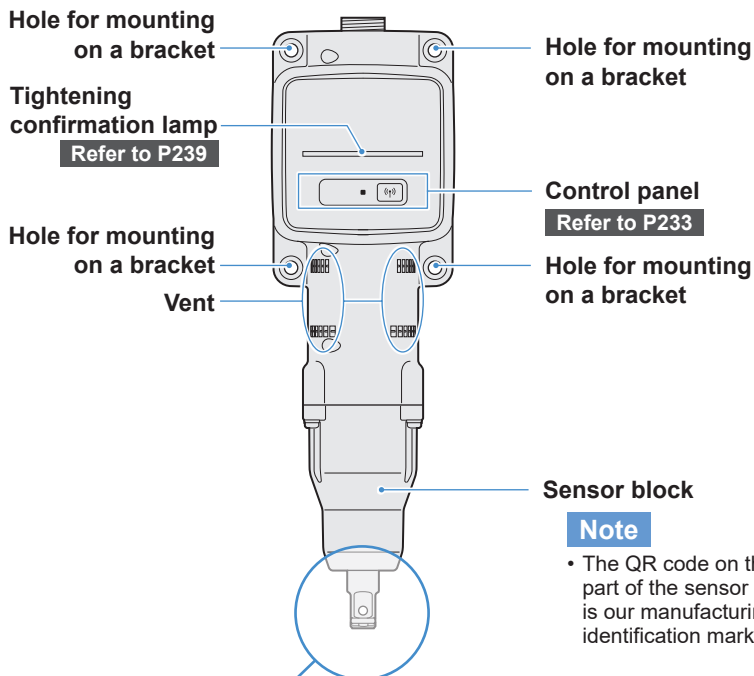
Mandatory

- **If the tool becomes hot, interrupt the work and wait for it to cool down before use.**
Failure to observe this may cause burns.
- **To disconnect the power plug, always hold the power plug without pulling the cord.**
Pulling the cord may cause electric shock or short circuit.
- **Before use, check the tool, pointed tool, and other parts for any damage and confirm their normal operation.**
- **Before use, confirm that no flaw or crack exists on the tool.**
Failure to observe this may cause damage, resulting in injury.
- **Keep the workplace clean.**
A disordered workplace or work table may lead to an accident.
- **Consider well how to handle and work, pay attention to the surrounding environment, and use common sense during work.**
Failure to observe this may cause an accident or injury.

FUNCTIONAL DESCRIPTION

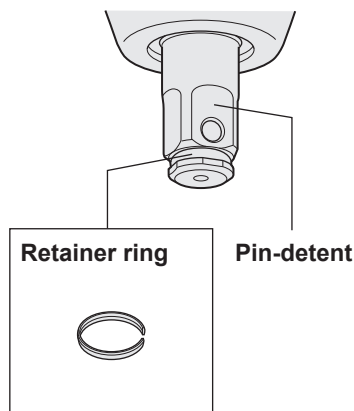
Tool

■ Front



Note

- The QR code on the lower part of the sensor block is our manufacturing identification mark.



Extendable socket

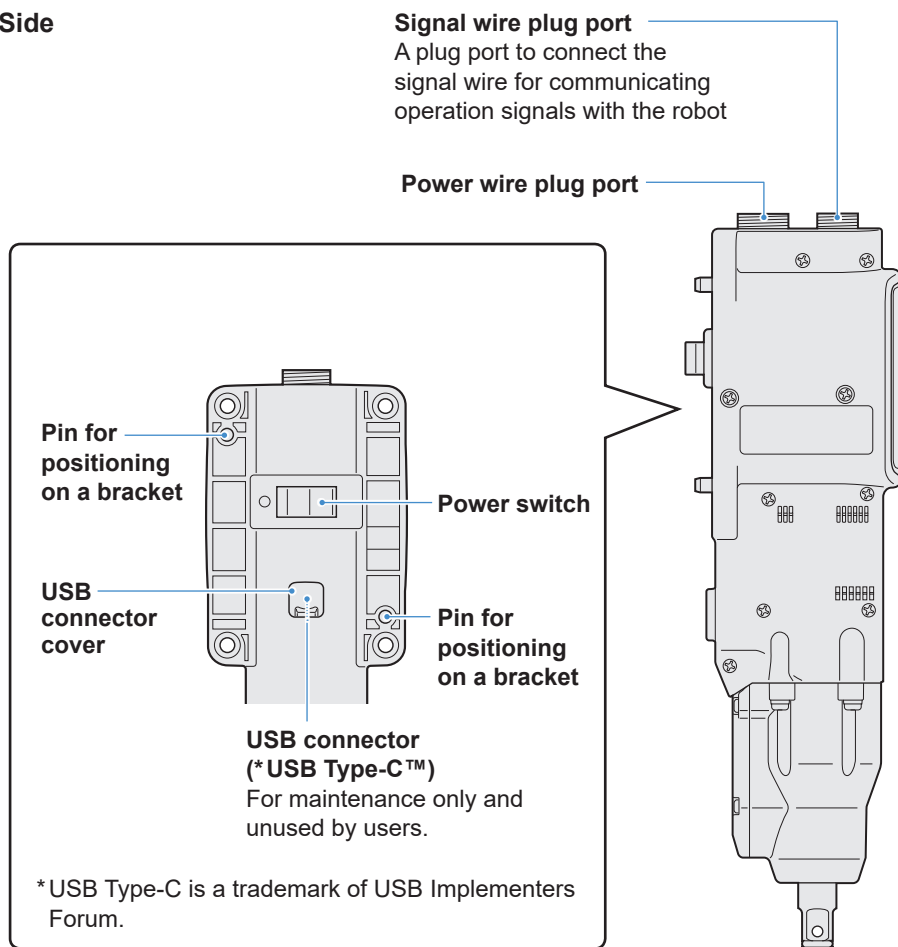
Use the supplied extendable socket to mitigate the impact on the robot while ensuring the fastening torque accuracy.

* Recommended time to replace the extendable socket

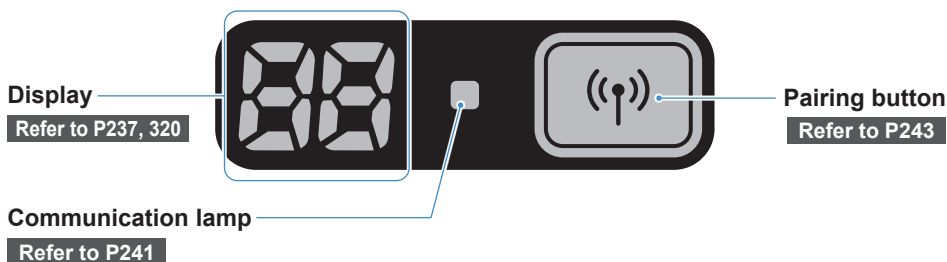
Replace the extendable socket when the total number of fastenings has reached approximately 250,000. It may wear and deteriorate earlier depending on the use conditions. Perform periodical inspections.

FUNCTIONAL DESCRIPTION

■ Side



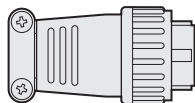
■ Control panel Refer to P232



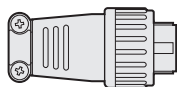
FUNCTIONAL DESCRIPTION

Accessories and Separately Sold Items

Power wire plug (WEYFCA1WF711)



Signal wire plug (WEYFCA1WF721)



Extendable socket (WEYFCA1WF701)



* Refer to the Installation Instructions for details on the accessories and separately sold items.

* They are available as replacement parts.

BEFORE GETTING STARTED

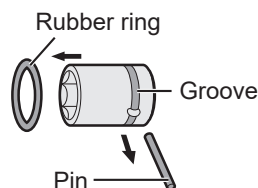
Installation and Use Location

Use the product in a location meeting the following conditions:

- (1) Indoors
- (2) No direct sunlight or spill of water or rain
- (3) No corrosive or flammable gas
- (4) No oil mist, dust, water, salt, iron powder, or organic solvent
- (5) Ambient temperature: 0 °C to 40 °C

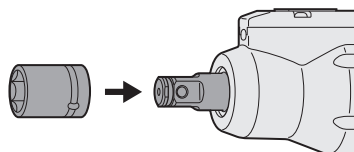
Attaching a Socket

- 1 Remove a rubber ring and a pin from the socket.**



- 2 Insert the socket into the tool.**

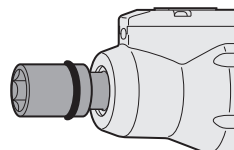
Align their hole positions.



- 3 Reversing the procedure 1, attach the pin and the rubber ring.**

Be sure to put the rubber ring so that the pin will not come out.

- The retainer ring (C-ring) is for temporary fixing. Be sure to use the pin and the rubber ring to fix the socket.
- If you use a socket that is worn or deformed, an anvil of the retainer ring (C-ring) type may not be inserted.



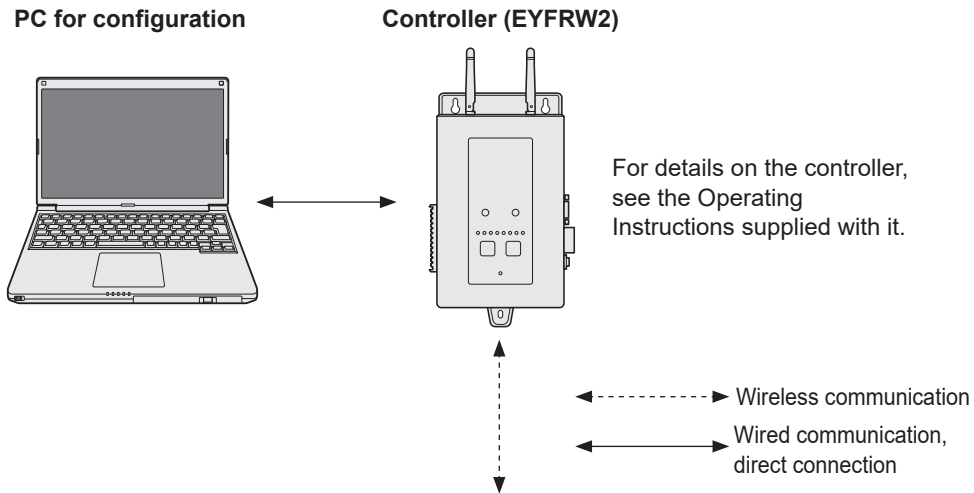
WIRING DIAGRAM

The tool can be used by being connected to external devices as shown in the connection diagram below.

Operating environment

Compatible OS	Windows 10 or later (supporting any of the web browsers below)
Web browser	Microsoft Edge version 102 or later or Google Chrome version 102 or later

Connection example



This unit

Maximum number of connected devices: 8

*USB Type-C is a trademark of USB Implementers Forum.

BASIC OPERATION

OPERATION MODE OF THE TOOL

The tool operates in one of the following modes.
The mode in which it is used now is shown on the display of the control panel.



Display	Mode name	Mode details
	Wireless Communication Mode	This is a mode in which the tool is controlled via wireless communication. The tool communicates with the controller to send the history log data and receive the configured parameters.
	Operation Disable Mode	The tool has been locked by an operation prohibition signal from the controller in the wireless communication mode. It will be unlocked by a release signal from the controller.
	Pairing Mode	This is a mode to check the pairing status. It can also be done on the controller. Refer to P243
	Minimum Output Mode	This is a mode in which to check whether torque control is available when the target torque is low. The tool is shut off at the minimum number of pulses.
	Offset Mode	This is a mode in which to correct the calculated torque of the tool for the actual torque. Refer to P266
	Factory Default Mode	This is a mode in which the tool is in the factory default status. Refer to P251

BASIC OPERATION

TORQUE CONTROL FUNCTION

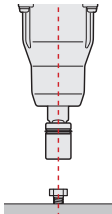
The tightening torque for the work target is calculated by the torque sensor of the tool. When the calculated torque value reaches the preset target value, the tool is supposed to stop (shut off) automatically.
(For how to set the Shut-Off Torque, **Refer to P273**)

**WARNING**

Make a daily management of torque performance.
Otherwise, bolts will be loosened by torque change, causing an accident.

CAUTION

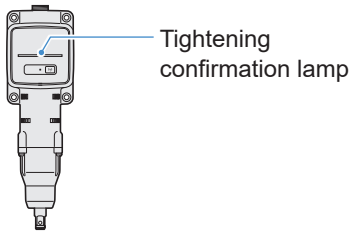
- At work where a load on the way is higher than the target torque, bolts may not be tightened up because the load on the way is judged to be the target torque.
- At work where members vary, the tightening torque may vary even at the same set torque.
- If you tighten the same bolt twice, overtightening may cause the bolt to break or the bolted member to deform.
- The tightening torque varies with the work conditions. Adjust it in the actual work.
- The bolt tightening torque might change according to the following factors.

Bolt	Bolt diameter (generally, as the diameter becomes large, the tightening torque will increase), torque coefficient (shown by the bolt manufacturer), grade, length, washer presence and type, etc.
Socket	Length, quality of material, deterioration degree, use of universal joint, use of socket adapter, use of extension socket, etc.
Condition of member to tighten	Quality of material, bearing surface finish, etc.
Working method	How you put the tool to a bolt, force that holds the tool, how you align the centre lines of the tool and the bolt, etc. (see the figure below) 

BASIC OPERATION

TIGHTENING CONFIRMATION LAMP

You can check the tightening result by seeing the LED lamp on the tool.



Lamp display

Lamp display		Meaning of display	Details
Green	Lit for 2 s + Buzzer (depending on the setting)	Work judged OK	The tightening work reached the set shut-off torque successfully.
Red	Lit for 2 s + Buzzer (depending on the setting)	Work judged NOK	The tightening work did not reach the set shut-off torque. Refer to P322
		Tool error	If any error is shown on the control panel display, take action according to the error description. Refer to P320
Red	Lit continuously + Buzzer	Motor high temperature	The motor of the tool may be hot.
		Torque sensor error Torque sensor protection	Abnormality, failure, etc. was detected in the torque sensor.
		Maintenance Interval Alarm Lock Mode	The tool is locked because it reached the maintenance timing that was set in [Maintenance Interval Alarm]. Also check that the setting value (1 to 99) and “0” are shown alternately on the control panel display. Refer to P249

BASIC OPERATION

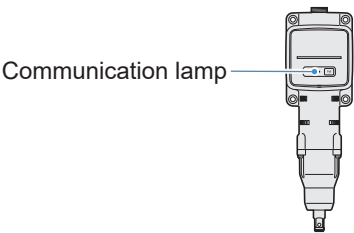
TIGHTENING CONFIRMATION LAMP

Lamp display		Meaning of display	Details
Yellow	Blinking (1 s cycle) + buzzer	Communication error	Cannot communicate with the controller.
		Parameter error	An invalid parameter was detected.
		Memory error	The memory usage has reached the upper limit.
		Undervoltage	An input voltage lower than specified was detected.
		Overvoltage	An input voltage higher than specified was detected.
		Time-out error	Operation continued for more than 5 minutes.
		Emergency stop error	The controller issued an emergency stop command (as specified in the setting).

BASIC OPERATION

COMMUNICATION LAMP

You can check the communication status by seeing the LED lamp on the tool.



Lamp display

Lamp display		Meaning of display	Details
Blue	Blinking fast (0.2 s cycle)	Communicating	Communicating with the controller.
Blue	Blinking fast (0.2 s cycle)	Pairing in progress	The communication lamp blinks fast while pairing is in progress.
Blue	Blinking slowly (1 s cycle)	Reconnection in progress	The communication lamp blinks slowly while reconnection is in progress.
Blue	Blinking (0.2 s cycle) + buzzer	Pairing completed	The communication lamp starts blinking slowly (0.5 s cycle) after pairing is completed. After pairing is completed, the tool enters a "Waiting for a wireless signal" or a "Wireless operation prohibited" state at a command from the controller.
Blue	Blinking slowly (1 s cycle)	Waiting for a wireless signal	The communication lamp blinks slowly while the tool is in the wireless communication mode.
—	Off	Wireless operation prohibited	The tool's operation is disabled by an operation prohibition signal from the controller.

BASIC OPERATION

PAIRING WITH THE CONTROLLER

Enabling Pairing

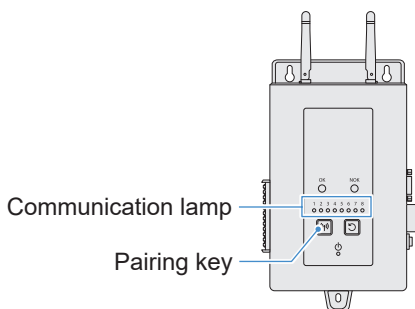
Use the Pairing key on the controller unit (EYFRW2).

Select the communication lamp of the number with no registration (lamp off) and hold the Pairing key down to enter the pairing mode.

During 2 minutes of the pairing mode, start the pairing mode on a tool within the coverage to automatically establish pairing.

If pairing is not established within the time, the pairing mode will end.

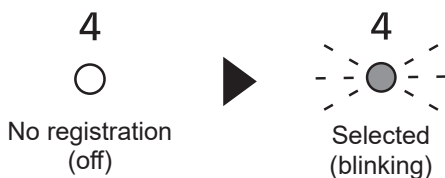
- After you attempt to start pairing, it may take some time until the controller enters the pairing mode.



■ To register Tool No. 4

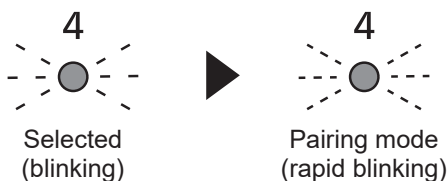
1 Press the Pairing key on the controller 4 times to select Tool No. 4.

Communication lamp No. 4 blinks.



2 While No. 4 is selected, hold down the Pairing key on the controller to enter the pairing mode of Tool No. 4.

In the pairing mode, Communication lamp No. 4 starts blinking rapidly.



BASIC OPERATION

PAIRING WITH THE CONTROLLER

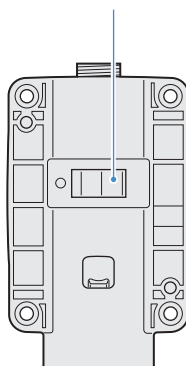
- 3** On the tool (this product), while holding down the Pairing button, turn ON the power switch.

The tool enters the pairing mode.

Pairing button

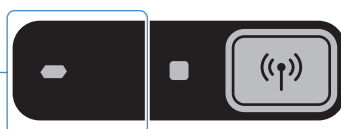


Power switch



When the tool enters pairing mode, Display on Control panel indicates the pairing mode.

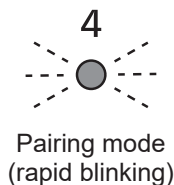
Display



Wireless communication is automatically established and pairing registration is completed.

When pairing registration is completed, Communication lamp No. 4 on the controller stays lit.

- If pairing fails, cancel pairing on the controller and then try again.



Note

- You can enable pairing by setting in the setting screen in addition to using the key on the unit.
- For how to enable pairing in the setting screen and details on operation of the controller, see the Operating Instructions supplied with the controller.

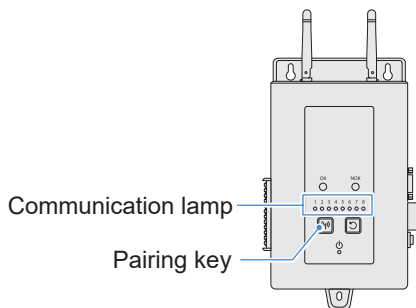
BASIC OPERATION

PAIRING WITH THE CONTROLLER

Cancelling Pairing

Use the Pairing key on the controller unit (EYFRW2).

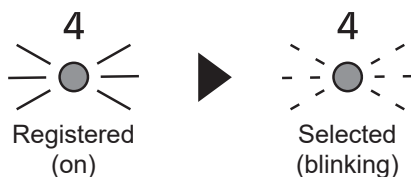
Select the communication lamp of the tool number you want to cancel registration (lamp on) and hold the pairing key down to cancel pairing registration.



■ To cancel Tool No. 4

1 Press the Pairing key on the controller 4 times to select Tool No. 4.

Communication lamp No. 4 blinks.



2 While No. 4 is selected, hold down the Pairing key on the controller to cancel pairing registration of Tool No. 4.

When pairing is cancelled, Communication lamp No. 4 stops blinking and turns off.



Note

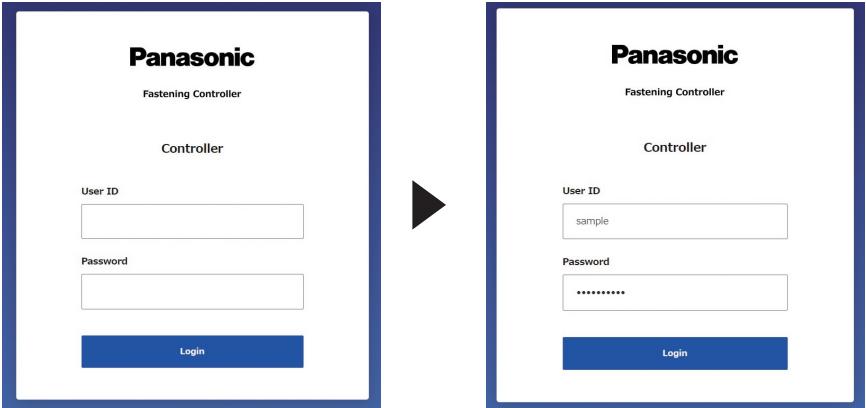
- You can cancel pairing by setting in the setting screen in addition to using the key on the unit.
- For how to cancel pairing in the setting screen and details on operation of the controller, see the Operating Instructions supplied with the controller.

SETTING VIA A WEB BROWSER

DISPLAYING THE SETTING SCREEN

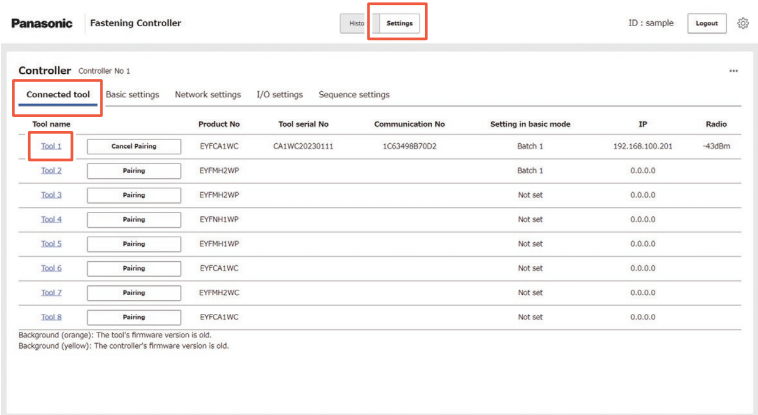
1 Displaying the Top Page

Refer to “Displaying the Setting Screen” to “Connecting via Network” in “PREPARATION BEFORE USE” of the Operating Instructions of the controller (EYFRW2) and make settings via a web browser to display the top page.



2 Displaying the Tool Screen

- ① In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Connected tool” tab.
- ② In the “Connected tool” screen, click the desired tool number. The screen for the tool number is displayed.



SETTING VIA A WEB BROWSER

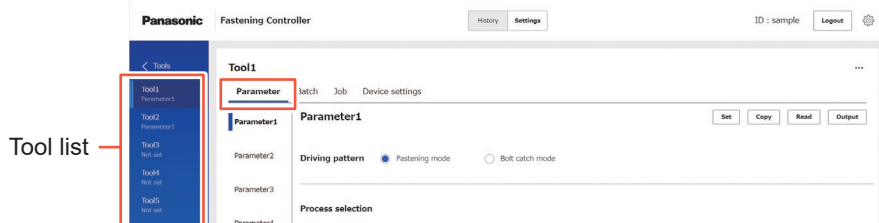
DISPLAYING THE SETTING SCREEN

3 Displaying the Setting Screen

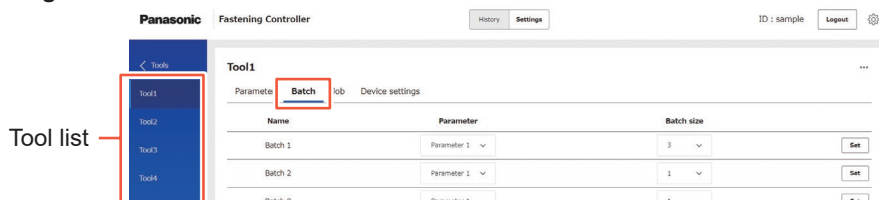
From the “Parameter”, “Batch”, “Job”, and “Device settings” tabs in the screen for the tool number, make settings of Parameter, Batch, Job, and Device settings.

* To switch the tool, select the desired one from the tool list.

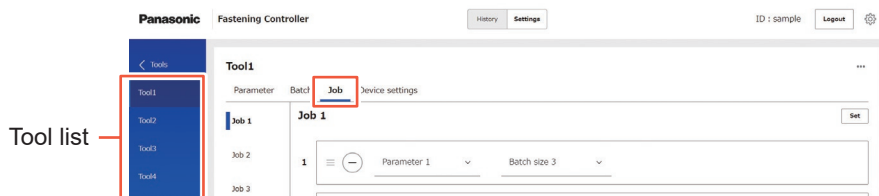
Setting Parameters **Refer to P252**



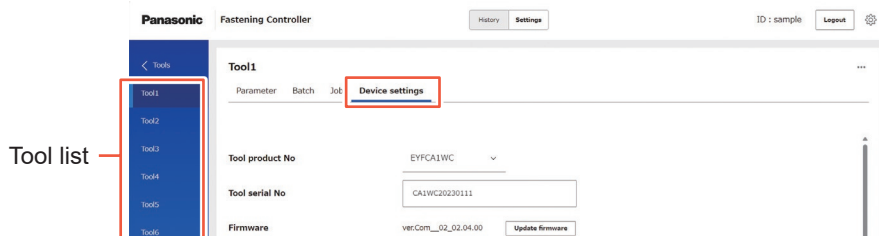
Setting a Batch **Refer to P297**



Setting a Job **Refer to P298**



Setting a Tool **Refer to P247**



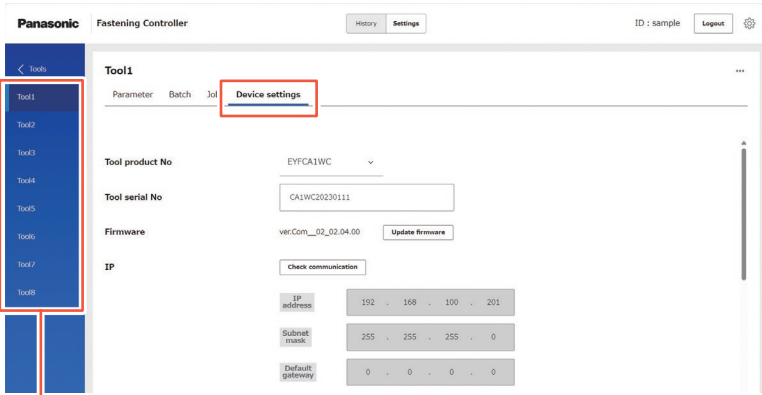
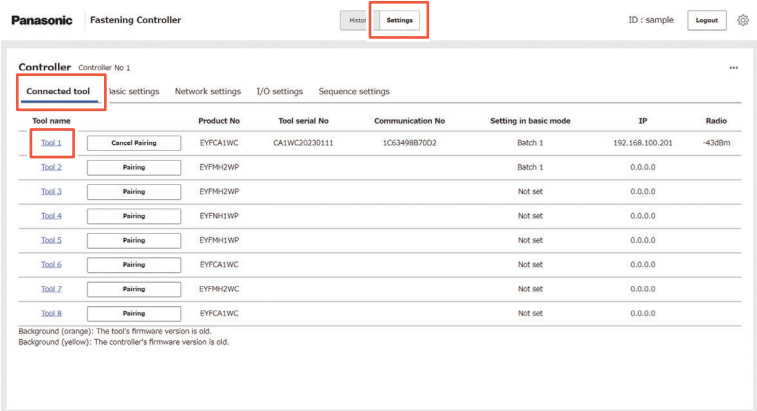
CONFIGURING A TOOL

DISPLAYING THE TOOL SETTING SCREEN

In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Connected tool” tab.

In the “Connected tool” screen, click the desired tool number.
From the “Device settings” tab in the screen for the tool number, you can make basic settings of the tool and enter common parameters.

* To switch the tool, select the desired one from the tool list.



Tool list

CONFIGURING A TOOL

TOOL SETTING ITEMS LIST

Tool product No

Select the tool product number.

[Default] Blank

[Setting range] Selectable from the pull-down menu

* Automatically selected if you establish pairing beforehand.

* The tool product number cannot be changed after pairing. Cancel pairing and then change it.

Tool serial No

You can set and display the tool's unit identification.

[Default] 5-digit model ID + 8-digit serial number (2-digit manufacturing year + 2-digit month + 4-digit production lot)

[Setting range] 13 to 16 alphanumeric characters

* The model number may not be recognised correctly if the information is changed. Do not change it unless required by the management rule.

Firmware

The firmware version of the tool communication part on the controller (EYFRW2) is displayed.

Click [Update firmware] to update the firmware.

For how to update, see "Updating the Firmware" in the Operating Instructions of the controller.

Tool's clock

The tool's clock is displayed. Click [Adjust to controller] to adjust the time.

Timing to send waveform data

You can set whether to send the waveform data per task.

[Default] OFF

[Setting range] OFF or per task

CONFIGURING A TOOL

TOOL SETTING ITEMS LIST

Maintenance Interval Alarm (Pulse Time)
[Functional overview] This is an alarm that counts the pulsing time that has been accumulated since the tool started to be used, and reminds you of maintenance timing. When you have 1 hour or less to go before the set time, the control panel display will give you a warning. If the set time is reached, the control panel display will remind you of that, and the tool's motor will be locked (stopped). Initializing the tool will reset the accumulated pulsing time, and also unlock the tool's motor.
CAUTION When the tool is initialized, the other parameters will also return to the factory defaults. If you initialize the tool, be sure to reconfigure parameters before using it again. Warning display (changing every 0.5 seconds): Setting value (1 to 99) → -1 → Operation mode (A or C) Stop display (changing every 0.5 seconds): Setting value (1 to 99) → 0
[Default] *0 hours
[Setting value] *0 hours to 99 hours

Entering the value with (*) will disable the function.

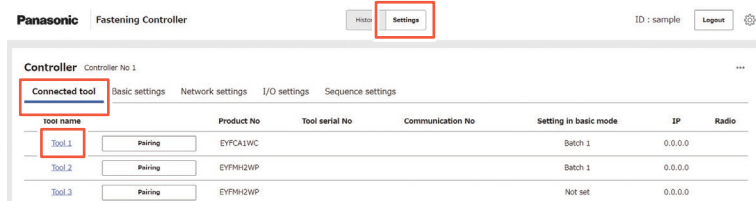
CONFIGURING A TOOL

DELETING THE REGISTRATION INFORMATION

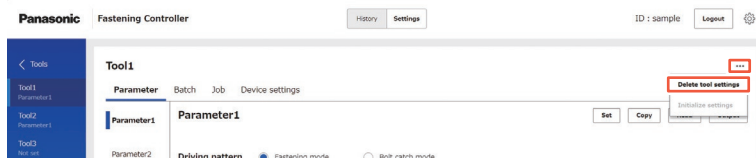
To stop use of a tool or pair a tool with a different product number, delete the pairing information.

* Cancel pairing beforehand.

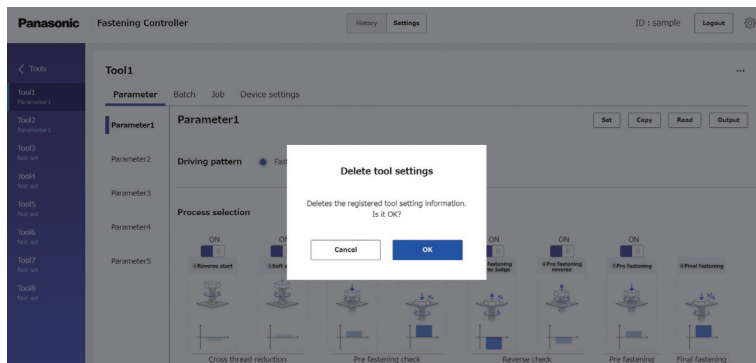
- 1 In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Connected tool” tab.**
The “Connected tool” screen is displayed.
- 2 In the “Connected tool” screen, click the desired tool number.**
The screen for the tool number is displayed.



- 3 Click ... (tool option key) and then [Delete tool settings].**
The “Delete tool settings” screen is displayed.



- 4 In the “Delete tool settings” screen, click [OK].**



CONFIGURING A TOOL

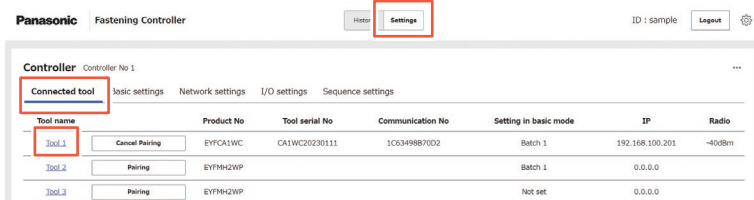
RESETTING TO FACTORY SETTINGS

You can reset a tool to its factory settings.

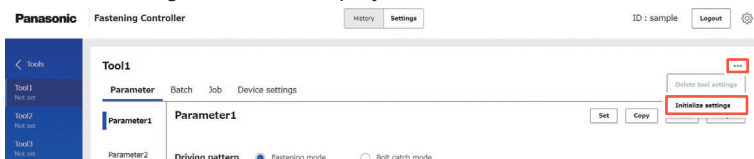
* Resetting cancels pairing.

1 In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Connected tool” tab. The “Connected tool” screen is displayed.

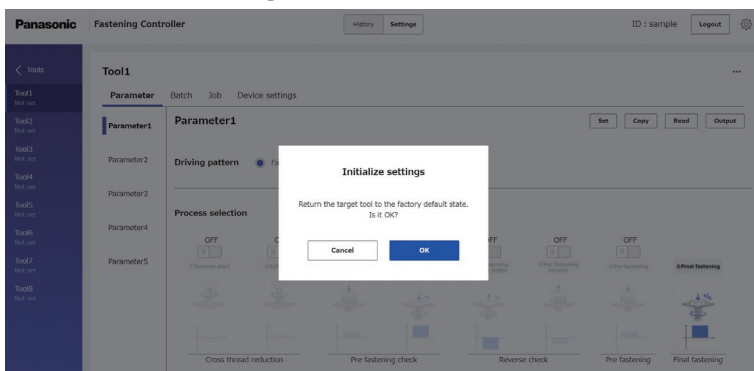
2 In the “Connected tool” screen, click the desired tool number. The screen for the tool number is displayed.



3 Click ... (tool option key) and then [Initialize settings]. The “Initialize settings” screen is displayed.



4 In the “Initialize settings” screen, click [OK].



SETTING FASTENING PARAMETERS

DISPLAYING THE PARAMETER SETTING SCREEN

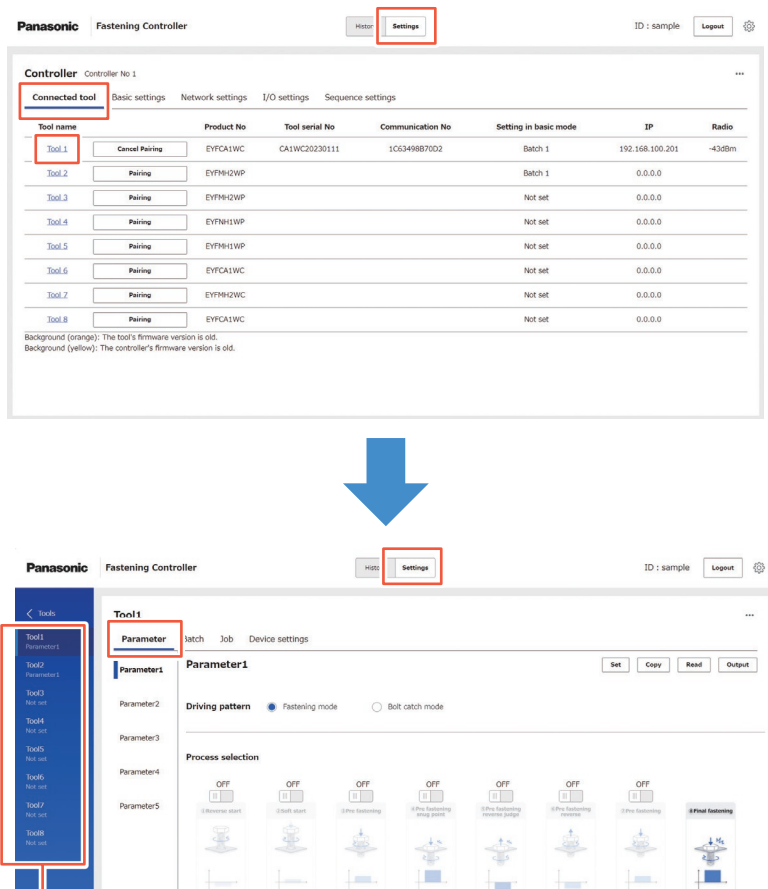
In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Connected tool” tab.

In the “Connected tool” screen, click the desired tool number.

In the screen for the tool number, select the “Parameter” tab to make settings.

You can set five parameters (Parameter 1 to 5) for each tool.

* To switch the tool, select the desired one from the tool list.

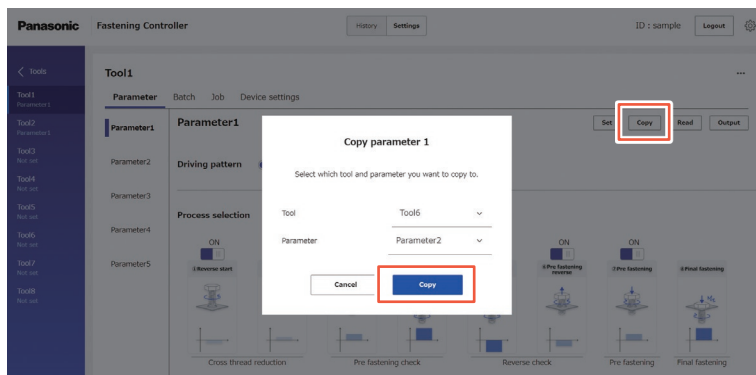


Tool list

SETTING FASTENING PARAMETERS

COPYING PARAMETERS

You can copy the set parameter to create a new parameter from it or use it on another tool. In the "Parameter" tab in the screen for the tool number, click [Copy] to display the screen for copying the parameter. In the screen, select the destination and click [Copy]. Copying parameters is allowed only between tools of the same product number.

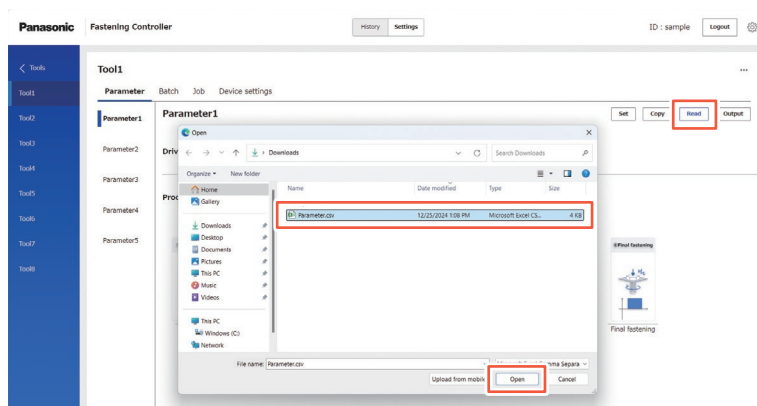


SETTING FASTENING PARAMETERS

LOADING PARAMETERS

You can register a parameter by loading a parameter file saved in the PC for configuration into the controller.

From the “Parameter” tab in the screen for the tool number, click [Read] and open the parameter file.



SETTING FASTENING PARAMETERS

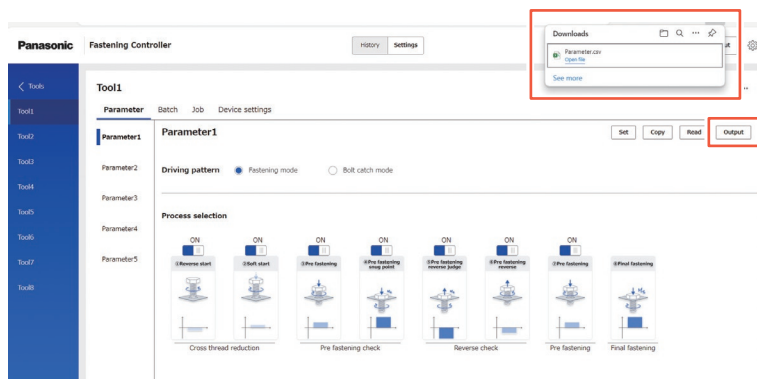
EXPORTING PARAMETERS

You can export the created parameter to the PC for configuration.

You can use the exported file as a backup, to copy it to another controller, or to move it to another PC for configuration.

From the “Parameter” tab in the screen for the tool number, click [Output] and save the parameter file.

**Do not edit the exported parameter file.
Otherwise it may not be read correctly.**



SETTING FASTENING PARAMETERS

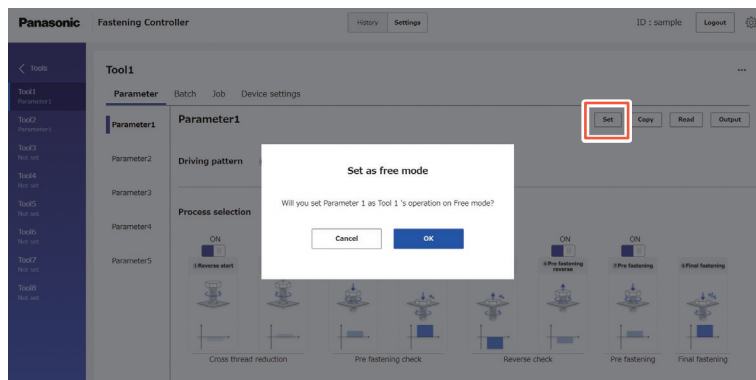
REGISTERING PARAMETERS

Register a parameter to use it to control a tool in “Free mode” of the controller’s running mode.

* It is not used in “Repeat mode” and “External control mode”.

(For “Free mode”, “Repeat mode”, and “External control mode”, see “SETTING THE RUNNING MODE ON THE CONTROLLER”. **Refer to P292**)

From the “Parameter” tab in the screen for the tool number, click [Set].



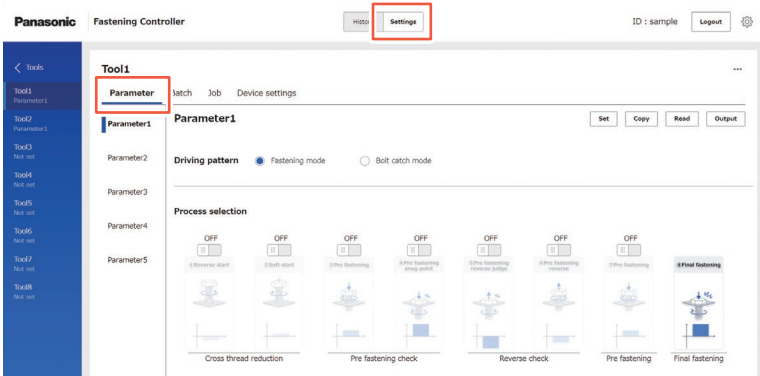
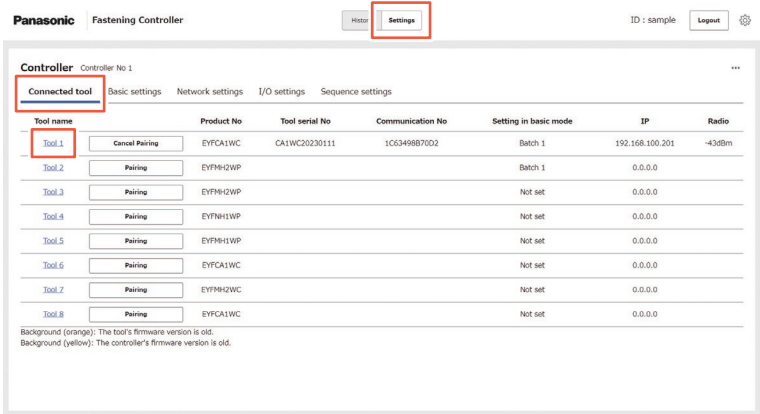
SETTING FASTENING PARAMETERS

SETTING BASIC PARAMETERS

In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Connected tool” tab.

In the “Connected tool” screen, click the desired tool number.

In the screen for the tool number, select the “Parameter” tab to make settings.

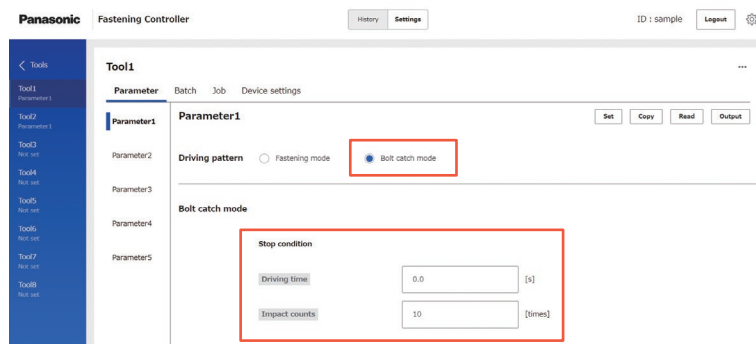


SETTING FASTENING PARAMETERS

SETTING THE BOLT CATCH MODE

The “Bolt catch mode” drives the tool at a low speed to allow the socket to smoothly catch a bolt to be fastened.

Selecting “Bolt catch mode” in the driving pattern displays the input screen to set “Stop condition”.



CAUTION

- This setting works with individual process settings set in the fastening mode. Note that the content of this mode is synchronized with the fastening mode setting.
- The tool does not operate if the operating time and stop conditions are invalid.
- The fastening history in this mode is not recorded in the controller or tool or communicated to an external device.
- This mode can be included in a batch setting but the fastening in this mode is not taken into account as part of the progress.
- The speed cannot be changed in this mode.
- The maximum operating time in this mode is 6 seconds. If the operating time is blank, operation stops in the time.

SETTING FASTENING PARAMETERS

SETTING THE BOLT CATCH MODE

● Stop condition

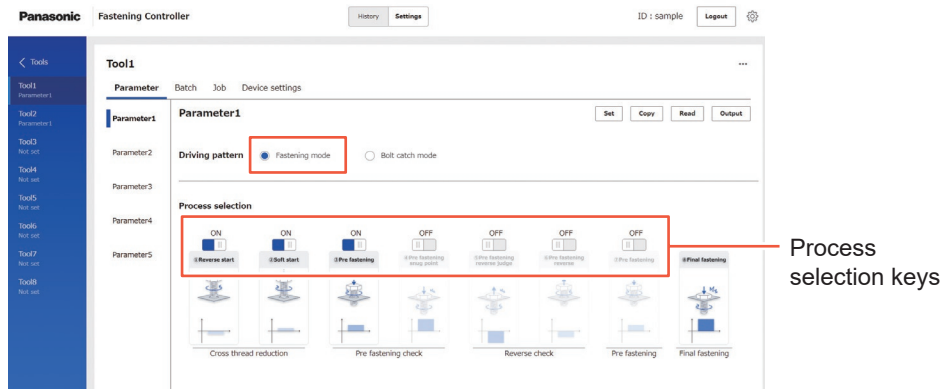
Driving time
[Description] Set the time to operate the tool in the Bolt catch mode.
[Default] *0 s
[Setting range] *0.0 s to 5 s
Impact counts
[Description] Set the number of pulses before stopping the tool operated in the Bolt catch mode.
[Default] *0 times
[Setting range] *0 times to 20 times

Entering the value with (*) will disable the function.

SETTING FASTENING PARAMETERS

SETTING THE FASTENING MODE

The “Fastening mode” provides the settings to reduce bolt galling and conduct pre fastening and pre fastening reverse. Selecting the “Fastening mode” in the driving pattern displays the input screen. Set the process selection keys to ON or OFF to turn the processes on or off.



Processes List

① Reverse start
[Description] The tool starts inserting a bolt with reverse rotation to reduce thread galling.
② Soft start
[Description] The tool starts inserting a bolt at a low speed to reduce thread galling.
③, ⑦ Pre fastening
[Description] Galling is detected when the set number of pulses is reached before the bolt is unconditionally fastened snug-tight.

SETTING FASTENING PARAMETERS

SETTING THE FASTENING MODE

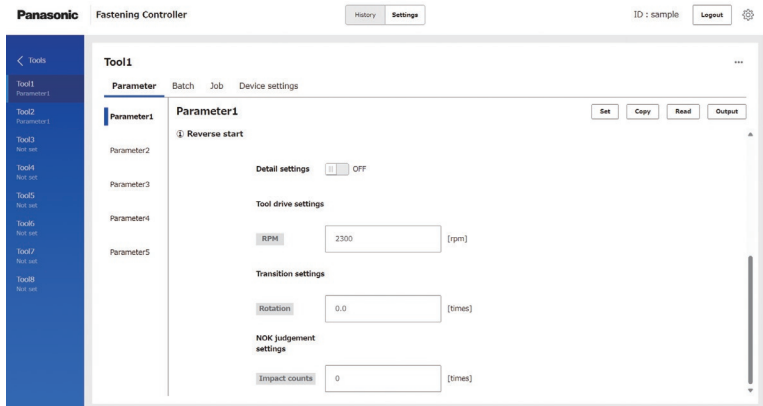
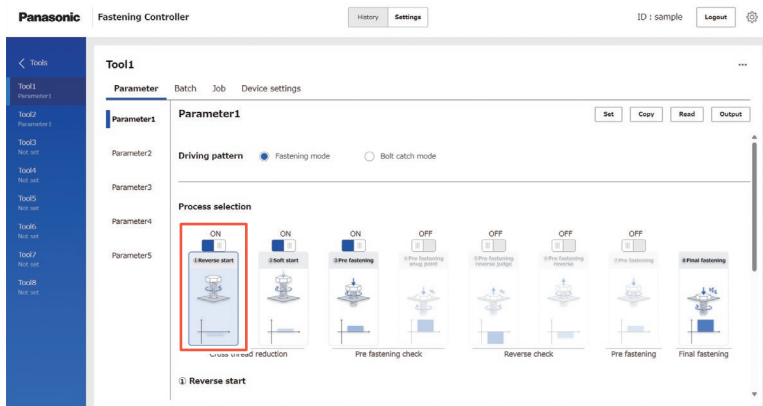
④ Pre fastening snug point
[Description] The bolt is considered to be fastened snug-tight when the set number of pulses is reached, and the next process starts.
⑤ Pre fastening reverse judge
[Description] Galling is detected when the set number of pulses is exceeded while the bolt fastened snug-tight is reverse-rotated.
⑥ Pre fastening reverse
[Description] Galling is detected when the set number of pulses is exceeded while the bolt is reverse-rotated.
⑧ Final fastening
[Description] The bolt is fastened until the target torque is reached.

SETTING FASTENING PARAMETERS

SETTING THE FASTENING MODE

Process Setting

Turning the process on with the process selection key and clicking the process image displays the process setting screen.
Set the tool driving and the condition to transfer to the next process.

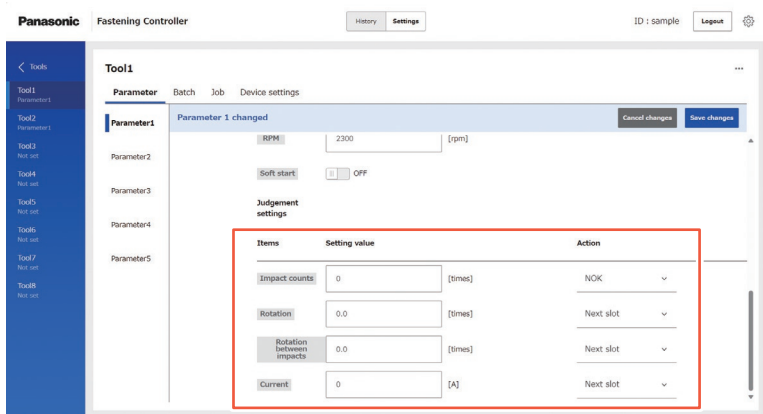
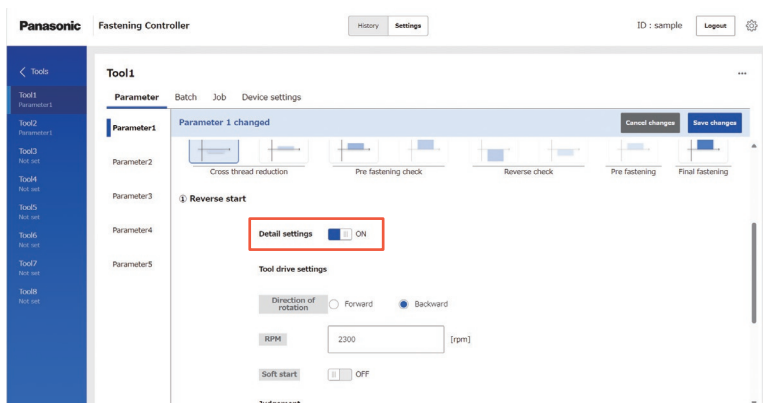


SETTING FASTENING PARAMETERS

SETTING THE FASTENING MODE

■ Process Details Setting

Turning “Detail settings” on in the process setting screen allows setting more details of the driving and the judgement condition to transfer to the next process.



SETTING FASTENING PARAMETERS

SETTING THE FASTENING MODE

● Tool drive settings

Direction of rotation
[Description] Set the fastening direction.
[Setting range] Forward: Clockwise Reverse: Anticlockwise
RPM
[Description] Set the number of rotations per minute.
[Setting value] 150 rpm to 2300 rpm
Soft start
[Description] Set the number of rotations per minute.
[Setting range] ON: Enabled OFF: Disabled

SETTING FASTENING PARAMETERS

SETTING THE FASTENING MODE

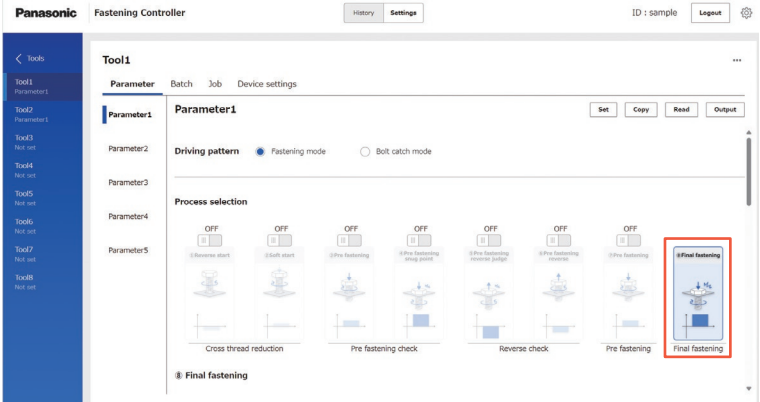
● Judgement settings

Impact counts
[Description] Select the operation when the set number of impact counts is reached.
[Judgement setting value] 0 times to 255 times [Resulting operation] Next slot (Operation continues) / NOK (Operation stops)
Rotation
[Description] Select the operation when the set number of rotations is reached.
[Judgement setting value] 0.0 times to 6553.5 times [Resulting operation] Next slot (Operation continues) / NOK (Operation stops)
Rotation between impacts
[Description] Select the operation when the set number of rotations between impacts is reached.
[Judgement setting value] 0.0 times to 655.3 times [Resulting operation] Next slot (Operation continues) / NOK (Operation stops)
Current
[Description] Select the operation when the set current is reached.
[Judgement setting value] 0.0 A to 25.5 A [Resulting operation] Next slot (Operation continues) / NOK (Operation stops)

SETTING FASTENING PARAMETERS

SET OFFSETS

Selecting “Fastening mode” and clicking “⑧Final fastening” in the process selection displays the final fastening process setting screen.
Make the setting from “Offset” in the process setting screen.

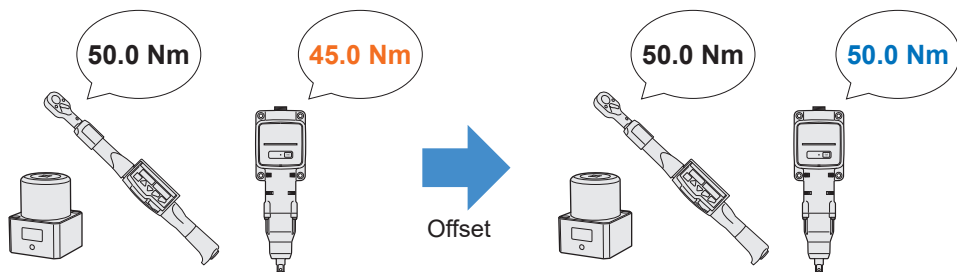


SETTING FASTENING PARAMETERS

SET OFFSETS

The torque value shown by the tool and the actual torque on the fastener may differ depending on the damping caused by the socket and/or the joint condition.

In that case, the torque value shown by the tool can be adjusted by Offset setting.



- For the first application, select [Simulate] (①) in Offset on the configured parameter input screen to calculate offset values automatically.
- If the offset values that were previously set for the tool used for work already exist, you can set the same torque performance to the tool by entering those values in [Slope] and [Intercept] (②) on the configured parameter input screen.
(For details of [Slope] and [Intercept], **Refer to P274**)

⑧ Final fastening

Shut-off Torque

☒ ON

☒ ON

Target 20.0 [Nm]

Upper torque limit 999.9 [Nm]

Lower torque limit 0.0 [Nm]

Offset

☒ Simulate ①

Slope 25.00

Intercept 5.00 ②

SETTING FASTENING PARAMETERS

SET OFFSETS

Selecting [Simulate] displays the offset setting screen.
Perform the following procedure to set offsets.

CAUTION

- With offsets set, the fastening mode processes ① to ⑦ are inactive and only the final fastening mode is active.

- 1 Select a [Socket length] (①) to use from the pulldown menu.**
(If the length that matches the socket to use is not found, select the nearest length.)
- 2 Enter a numerical value that represents [Shut-off Torque] (②).**
- 3 Select [Apply(Continue)] (③) to register the settings to the tool.**

The screenshot shows the 'Offset' settings screen. At the top, there is a table with columns: Torque result, Actual torque, %, Offset slope, Offset intercept, and a Delete button. Below the table, there are input fields for 'Socket length' (40 mm) and 'Shut-off Torque' (45 [Nm]). The 'Socket length' field is annotated with ① and the 'Shut-off Torque' field with ②. Below these fields, there are buttons for 'Torque result' (Get data), 'Actual torque' (Input), and 'Calculate'. At the bottom, there is a 'Minimum Output Mode' (OFF) and 'Offset slope' (25.00) and 'Offset intercept' (5.00) fields. The 'Apply(Continue)' button is annotated with ③.

Torque result	Actual torque	%	Offset slope	Offset intercept	Delete
---------------	---------------	---	--------------	------------------	--------

① Socket length 40 mm ▾

Shut-off Torque 45 [Nm] ②

Torque result Get data Actual torque Input [Nm] Calculate

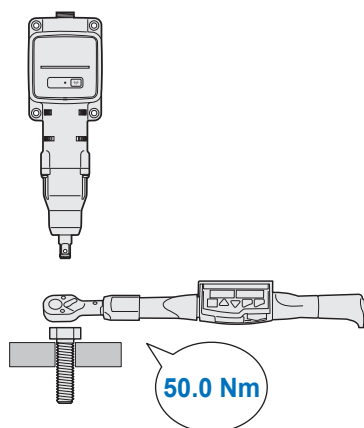
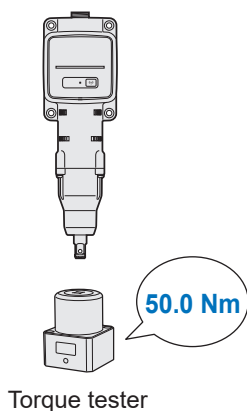
Minimum Output Mode OFF Offset slope 25.00 Offset intercept 5.00

Close(End) Apply(Continue) ③

SETTING FASTENING PARAMETERS

SET OFFSETS

- 4** Using a torque tester or a bolt actually used for tightening, do tightening once.
- 5** Check the torque result shown by the torque tester or the torque wrench which retightened the actual bolt (Audit Torque Value).



SETTING FASTENING PARAMETERS

SET OFFSETS

- 6** Select [Torque result] (④) to import the torque value measured by the tool.

The imported value is shown in the [Torque result] column (⑤) in the upper display window.

- 7** Enter the [Actual torque] (⑥) checked with the torque tester or the torque wrench.

- 8** Select [Calculate] (⑦) to calculate new offset values.

(At this point, the newly calculated offset values have not been registered in the tool yet.)

- 9** Check by % (⑨) the difference between the [Torque result] (⑤) measured by the tool and the [Actual torque] (⑧) in the upper display window.

- 10** If the above difference is small enough, select [Close(End)] (⑩) to end the offset setting.

If the above difference is still large, select [Apply(Continue)] (⑪) to set the new offset values to the tool and repeat steps 4 to 10 until the difference becomes small enough.

The screenshot shows the 'Offset' setting screen of a tool. At the top, there is a table with columns: Torque result, Actual torque, %, Offset slope, and Offset intercept. The values are 47.7, 43.0, 90.2, 25.00, and 5.00 respectively. Below the table, there are fields for 'Socket length' (40 mm) and 'Shut-off Torque' (45 [Nm]). Further down, there are fields for 'Torque result' (4), 'Actual torque' (6), and a 'Calculate' button (7). Below these, there are fields for 'Minimum Output Mode' (OFF), 'Offset slope' (22.60), and 'Offset intercept' (5.00). At the bottom, there are two buttons: 'Close(End)' (10) and 'Apply(Continue)' (11). The 'Apply(Continue)' button is highlighted in blue.

Torque result	Actual torque	%	Offset slope	Offset intercept
47.7	43.0	90.2	25.00	5.00

Socket length: 40 mm Shut-off Torque: 45 [Nm]

Torque result (4) Actual torque (6) Calculate (7)

Minimum Output Mode: OFF Offset slope: 22.60 Offset intercept: 5.00

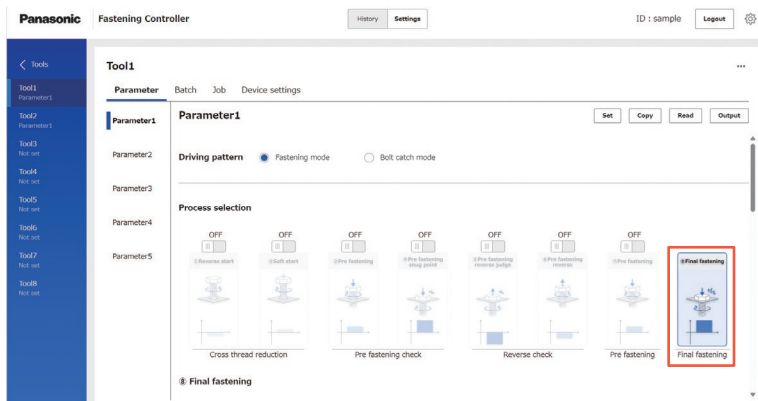
Close(End) (10) Apply(Continue) (11)

SETTING FASTENING PARAMETERS

SET A SNUG POINT DETECTION LEVEL

Selecting “Fastening mode” and clicking “⑧Final fastening” in the process selection displays the final fastening process setting screen.

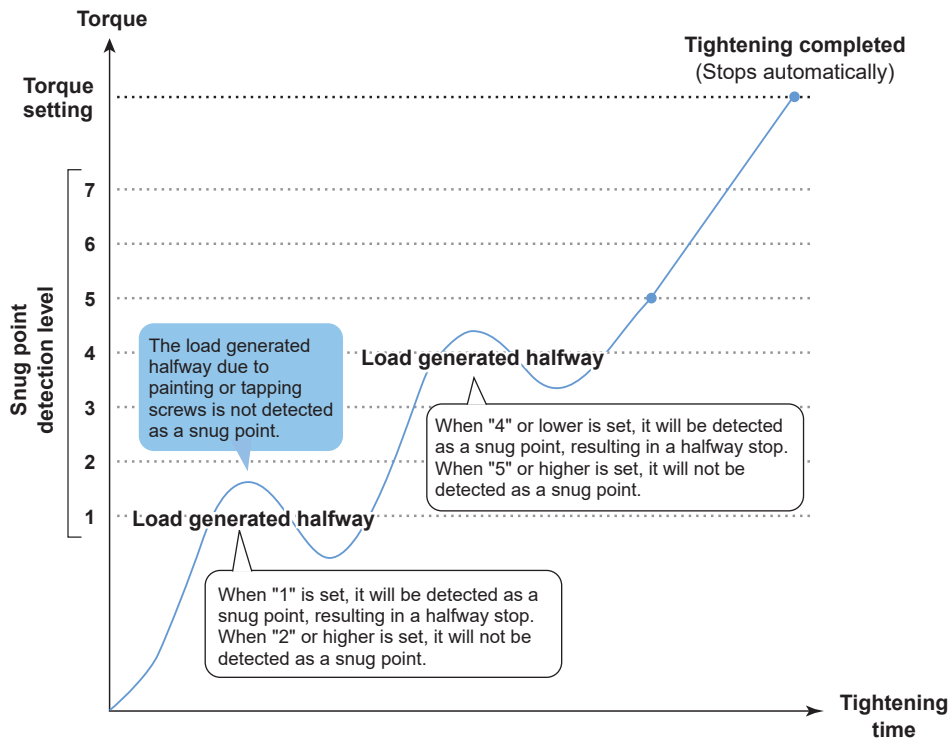
Make the setting from “Snug point detection level” in the process setting screen.



SETTING FASTENING PARAMETERS

SET A SNUG POINT DETECTION LEVEL

The snug point detection level setting is used in the following cases.



Can be set in 7 levels	7: Set for the work with a high load generated halfway ~ 1: Set for the work with a low load generated halfway 0: Snug point detection level function OFF
-------------------------------	---

CAUTION

- Set a snug point detection level from "1". Setting a snug point detection level from "2-7" may result in cracking or deformation of the target material because of high tightening torque.
- If the tool stops before the snug point at a snug point detection level of "1", set the snug point detection level to "2-7".

SETTING FASTENING PARAMETERS

PARAMETER LIST

Shut-Off Torque [Functional overview] When the tightening torque reaches the set value of shut-off torque, the tool will stop running automatically. Ensure that it is in the range, Torque Upper Limit $\geq$ Shut-Off Torque $\geq$ Torque Lower Limit. [Default value] 20.0 Nm/177.0 In.lbs/14.7 Ft.lbs [Setting value] 10.0 Nm to 70.0 Nm/88.5 In.lbs to 619.5 In.lbs/7.4 Ft.lbs to 51.6 Ft.lbs Note The range where this tool usage is recommended is as follows: 20.0 Nm to 60.0 Nm/177.0 In.lbs to 531.0 In.lbs/14.7 Ft.lbs to 44.2 Ft.lbs
Torque Upper Limit [Functional overview] Set the upper limit of torque for judging work OK or NOK. Ensure that it is in the range, Torque Upper Limit $\geq$ Shut-Off Torque $\geq$ Torque Lower Limit. [Default value] *999.9 Nm/*8848.7 In.lbs/*737.4 Ft.lbs [Setting value] 10.0 Nm to *999.9 Nm/88.5 In.lbs to *8848.7 In.lbs/7.4 Ft.lbs to *737.4 Ft.lbs
Torque Lower Limit [Functional overview] Set the lower limit of torque for judging work OK or NOK. Ensure that it is in the range, Torque Upper Limit $\geq$ Shut-Off Torque $\geq$ Torque Lower Limit. [Default value] *0 Nm/*0 In.lbs/*0 Ft.lbs [Setting value] *0 Nm to 70.0 Nm/*0 In.lbs to 619.5 In.lbs/*0 Ft.lbs to 51.6 Ft.lbs

Entering the value with (*) will disable the function.

SETTING FASTENING PARAMETERS

PARAMETER LIST

Offset_Slope
[Functional overview] This is a coefficient that adjusts the slope of the output torque curve of the tool to the torque curve on the simulated actual workpiece. For setting, you are recommended to use the automatic offset calculation function. (How to set, Refer to P266)
[Default value] 25.00
[Setting value] 0.10 to 500.00
Offset_Intercept
[Functional overview] This is a coefficient that adjusts the intercept of the output torque curve of the tool to the torque curve on the simulated actual workpiece. For setting, you are recommended to use the automatic offset calculation function. (How to set, Refer to P266) Note • The value of offset (intercept) is the lower limit that the torque sensor can measure with accuracy. Ensure that the set value of “Shut-Off Torque” and/or “Torque Lower Limit” is not less than the value of offset (intercept).
[Default value] 5.00
[Setting value] -1000.00 to 1000.00
Angle Before Snug Upper Limit
[Functional overview] Set the upper limit of the accumulated angle from the start point of the final fastening to a snug point, for judging work OK or NOK. The snug point detection method can be selected from snug point setting.
[Default value] *99999°
[Setting value] 0° to *99999°

Entering the value with (*) will disable the function.

SETTING FASTENING PARAMETERS

PARAMETER LIST

Angle Before Snug Lower Limit
[Functional overview] Set the lower limit of the accumulated angle from the start point of the final fastening to a snug point, for judging work OK or NOK. The snug point detection method can be selected from snug point setting.
[Default value] *0°
[Setting value] *0° to 99999°
Angle After Snug Upper Limit
[Functional overview] Set the upper limit of the accumulated angle from a snug point during the final fastening to the running stop point, for judging work OK or NOK. The snug point detection method can be selected from snug point setting.
[Default value] *9999°
[Setting value] 0° to *9999°
Angle After Snug Lower Limit
[Functional overview] Set the lower limit of the accumulated angle from a snug point during the final fastening to the running stop point, for judging work OK or NOK. The snug point detection method can be selected from snug point setting.
[Default value] *0°
[Setting value] *0° to 9999°

Entering the value with (*) will disable the function.

SETTING FASTENING PARAMETERS

PARAMETER LIST

Angle Error Shut-Off	
[Functional overview] With this function ON, if the set upper-limit angle is exceeded during tightening work, the tool will stop operating automatically. To use this function, you need to set the upper-limit angle.	
[Default value] OFF	
[Setting value] ON, OFF	
No Load Speed	
[Functional overview] Set the anvil rotation speed from the start of the final fastening to the tool pulsing start in 100 rpm steps.	
[Default value] 2300 rpm	
[Setting value] 1500 rpm to 2300 rpm	
Snug Point	
[Functional overview] Select a detection method for the snug point. The snug point is used as a reference point to divide angle results into the one before snug and the one after snug. When Pulsing Starts: The point in time when the tool started pulsing is regarded as a snug point. Snug Torque: The point in time when tightening reached the set torque is regarded as a snug point. Select From Graph: Select a desired snug point from the torque waveform data.	
[Default value] When Pulsing Starts	
[Setting value] When Pulsing Starts, Snug Torque, Select From Graph	

SETTING FASTENING PARAMETERS

PARAMETER LIST

Detection Threshold (Snug Torque)

[Functional overview]

The point in time when the tightening torque reached this threshold is judged to be the snug point.

This parameter is enabled only when the snug point setting is "Snug Torque."

Note

- Snug point detection by "Snug Torque" may be less accurate if the absolute value of "Offset_Intercept" is high.

[Default value]

0.0 Nm

[Setting value]

0.0 Nm to 999.9 Nm / 0.0 In.lbs to 8848.7 In.lbs / 0.0 Ft.lbs to 737.4 Ft.lbs

Detection Threshold (Select From Graph)

[Functional overview]

The point in time when the tightening torque for a tightening angle of 1° reached not less than this threshold is judged to be the snug point.

The value is automatically set by selecting one section on the graph.

This parameter is enabled only when the snug point setting is "Select From Graph."

Note

- If this threshold is set too high, snug point detection might not be made depending on work.

[Default value]

0.0 Nm/1°

[Setting value]

0.0 Nm/1° to 999.9 Nm/1° / 0.0 In.lbs/1° to 8848.7 In.lbs/1° / 0.0 Ft.lbs/1° to 737.4 Ft.lbs/1°

Detection Start Angle (Select From Graph)

[Functional overview]

Unless the accumulated tightening angle reaches this value, snug point detection does not start.

This parameter is enabled only when the snug point setting is "Select From Graph."

[Default value]

0°

[Setting value]

0° to 99999°

SETTING FASTENING PARAMETERS

PARAMETER LIST

Snug Point Detection Level
[Functional overview] This setting changes the load level for bolt snug point detection. Increasing the snug point detection level can prevent the tool from stopping before a bolt reaches the snug point because of a high load during tightening. (Depending on the work, even if the snug point detection level is increased, the tool might stop before the snug point.)
[Default value] *0
[Setting value] *0 to 7
Rundown Error Detection
[Functional overview] If the tool shuts off before the set time passes from the start of the final fastening, the fastening will be judged as NOK.
[Default value] *0.0 s
[Setting value] *0.0 s to 3.0 s
Ignore Rundown Result Before Snug
[Functional overview] When this function is ON, if the fastening is interrupted with the trigger signal turned off before the snug point, the history log will not be recorded. From the "Snug Point" parameter, set the method for determining the snug point.
[Default value] OFF
[Setting value] ON, OFF

Entering the value with (*) will disable the function.

SETTING FASTENING PARAMETERS

PARAMETER LIST

Snug Torque Detection Delay
[Functional overview] The tool will not shut off even if a load temporarily exceeds the set shut-off torque before the set time passes from the start of the final fastening.
[Default value] *0.0 s
[Setting value] *0.0 s to 3.0 s
Buzzer
[Functional overview] This is a condition option for sounding a buzzer when work is complete. OFF: A buzzer is not set off after work is complete. Buzzer OK: After work is complete, a buzzer is set off when the result is OK. Buzzer NOK: After work is complete, a buzzer is set off when the result is NOK.
[Default value] OFF
[Setting value] OFF, Buzzer OK, Buzzer NOK
Bolt catch mode
[Functional overview] The mode allows the socket to smoothly catch a bolt to be fastened.
[Default value] Driving time: *0.0 s Impact counts: *0 times
[Setting value] Driving time: *0.0 s to 5.0 s Impact counts: *0 times to 20 times

Entering the value with (*) will disable the function.

SETTING FASTENING PARAMETERS

PARAMETER LIST

Reverse start
[Functional overview] The tool starts inserting a bolt with reverse rotation to reduce thread galling.
[Default value] No-load speed: 2300 rpm Number of rotations: *0.0 times Number of pulses: *0 times
[Setting value] No-load speed: 500 rpm to 2300 rpm
[Transfer judgement condition] Number of rotations: *0.0 times to 6553.5 times
[NOK judgement condition] Number of pulses: *0 times to 255 times
Soft start
[Functional overview] The tool starts inserting a bolt at a low speed to reduce thread galling.
[Default value] No-load speed: 350 rpm Number of rotations: *0.0 times Number of pulses: *0 times
[Setting value] No-load speed: 150 rpm to 350 rpm
[Transfer judgement condition] Number of rotations: *0.0 times to 6553.5 times
[NOK judgement condition] Number of pulses: *0 times to 255 times

Entering the value with (*) will disable the function.

SETTING FASTENING PARAMETERS

PARAMETER LIST

Pre fastening
[Functional overview] Galling is detected when the set number of pulses is reached before the bolt is unconditionally fastened snug-tight.
[Default value] No-load speed: 2300 rpm Number of rotations: *0.0 times Number of pulses: *0 times
[Setting value] No-load speed: 500 rpm to 2300 rpm
[Transfer judgement condition] Number of rotations: *0.0 times to 6553.5 times
[NOK judgement condition] Number of pulses: *0 times to 255 times
Pre fastening snug point
[Functional overview] The bolt is considered to be fastened snug-tight when the set number of pulses is reached, and the next process starts.
[Default value] No-load speed: 2300 rpm Number of pulses: *0 times Number of rotations: *0.0 times
[Setting value] No-load speed: 500 rpm to 2300 rpm
[Transfer judgement condition] Number of pulses: *0 times to 255 times
[NOK judgement condition] Number of rotations: *0.0 times to 6553.5 times

Entering the value with (*) will disable the function.

SETTING FASTENING PARAMETERS

PARAMETER LIST

Pre fastening reverse judge	
[Functional overview] Galling is detected when the set number of pulses is exceeded while the bolt fastened snug-tight is reverse-rotated.	
[Default value] No-load speed: 2300 rpm Number of rotations between impacts: *0.0 times Number of pulses: *0 times	
[Setting value] No-load speed: 500 rpm to 2300 rpm	
[Transfer judgement condition] Number of rotations between impacts: *0.0 times to 655.3 times	
[NOK judgement condition] Number of pulses: *0 times to 255 times	
Pre fastening reverse	
[Functional overview] Galling is detected when the set number of pulses is exceeded while the bolt is reverse-rotated.	
[Default value] No-load speed: 2300 rpm Number of rotations: *0.0 times Number of pulses: *0 times	
[Setting value] No-load speed: 500 rpm to 2300 rpm	
[Transfer judgement condition] Number of rotations: *0.0 times to 6553.5 times	
[NOK judgement condition] Number of pulses: *0 times to 255 times	

Entering the value with (*) will disable the function.

SETTING FASTENING PARAMETERS

PARAMETER LIST

Below are the detailed settings and judgement conditions of the fastening mode processes ① to ⑦.

Tool drive settings	
[Functional overview] Detailed driving settings can be set.	
[Default value] Direction of rotation: Forward RPM: Default speed of each process Soft start: Disable	
[Setting value] Direction of rotation: Forward/Reverse RPM: 150 rpm to 2300 rpm Soft start: Enable/Disable	
Judgement settings	
[Functional overview] Resulting operation is decided based on the set judgement setting values.	
[Default value] Number of pulses: *0 times Number of rotations: *0.0 times Number of rotations between impacts: *0.0 times Current: *0.0 A Resulting operation: Next slot	
[Setting value] Number of pulses: *0 times to 255 times Number of rotations: *0.0 times to 6553.5 times Number of rotations between impacts: *0.0 times to 655.3 times Current: *0.0 A to 25.5 A Resulting operation: Next slot, NOK	

Entering the value with (*) will disable the function.

CHECKING THE FASTENING HISTORY DATA

DISPLAYING THE FASTENING HISTORY DATA

In the top page (the initial page of the setting screen), click [History] on the top and select the “Fastening history” tab.

You can view the fastening history data sent from tools to the controller.

To display the data, select the desired controller and tools from the tool list on the left and click [Get data] on the upper right.

The fastening history logs are displayed from newest to oldest.

Fastening Controller

History

Work monitor

Fastening history

Error history

Tool list

Get data

Tool No.	Tool product No.	Tool serial No.	Tool communication No.	Count	Batch size	Batch count	Date/Time	OK/NGOK judgment	NGOK message	Shut-off Torque(Nm)	Upper Torque Limit(Nm)	Lower Torque Limit(Nm)
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	25	3	3	2024/12/25 11:28:39	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	24	3	2	2024/12/25 11:28:47	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	23	3	1	2024/12/25 11:28:36	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	22	3	3	2024/12/25 11:28:25	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	21	3	2	2024/12/25 11:28:12	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	20	3	1	2024/12/25 11:28:01	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	29	3	3	2024/12/25 11:27:50	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	28	3	2	2024/12/25 11:27:39	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	27	3	1	2024/12/25 11:27:28	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	26	3	3	2024/12/25 11:27:09	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	25	3	2	2024/12/25 11:26:59	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	24	3	1	2024/12/25 11:26:48	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	23			2024/12/25 11:26:06	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	22			2024/12/25 11:25:25	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	21			2024/12/25 11:25:46	NGOK	Error:Error	20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	20			2024/12/25 11:25:35	OK		20.1	999.9	
T001	EYFCA1WC	CA1WC20220111	10S3498B7002	19			2024/12/25 11:25:33	NGOK	Error:Error	20.1	999.9	

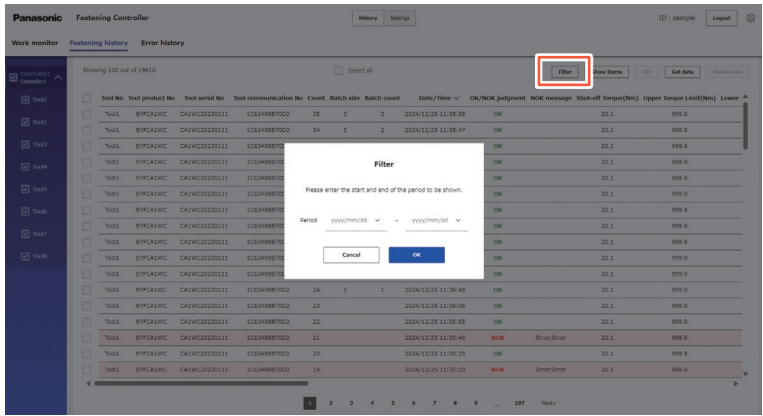
Tool list

CHECKING THE FASTENING HISTORY DATA

DISPLAYING THE FASTENING HISTORY DATA

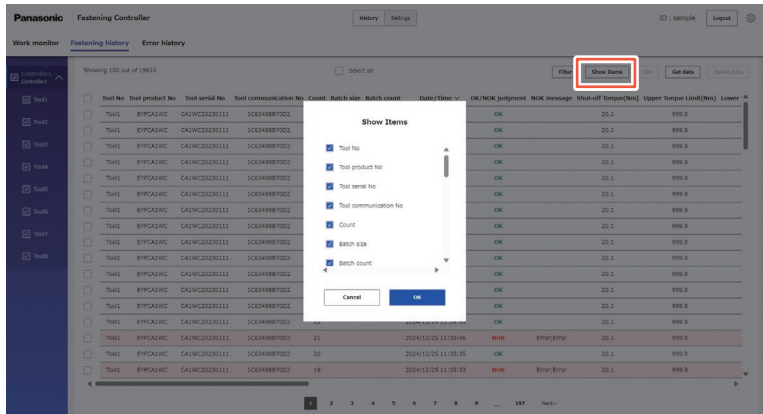
Extracting the Fastening History Logs by Time Period

Click [Filter] and specify the time period to narrow down the fastening history logs to display.



Setting Items to Display

To change the displayed items, click [Show Items] and select the desired items.



CHECKING THE FASTENING HISTORY DATA

FASTENING HISTORY DATA ITEMS

Count
[Display overview] A number counts up in the order that work was done.
Date
[Display overview] This shows the date when work was done.
Time
[Display overview] This shows the time when work was done.
Work Result
[Display overview] The result of work is judged OK or NOK. The OK/NOK judgment criteria are as follows. OK: A shut-off stop made successfully without any error, NOK: A shut-off stop incomplete, or made with an error
NOK Message
[Display overview] When the work result is NOK, the reason for NOK is displayed in the Torque, Angle, or Error category. If the reason for NOK is classified as Error, the error details will be displayed in the error message on the last line of the fastening history log.
Shut-off Torque
[Display overview] This shows the configured parameter of torque that makes the tool shut off.
Upper Torque Limit
[Display overview] This shows the configured parameter of the upper limit of torque for judging the work result OK.
Lower Torque Limit
[Display overview] This shows the configured parameter of the lower limit of torque for judging the work result OK.
Torque Result
[Display overview] This shows the result value of torque that the tool output at the work concerned.

CHECKING THE FASTENING HISTORY DATA

FASTENING HISTORY DATA ITEMS

Upper Angle Limit (Before Snug)
[Display overview] This shows the configured parameter of the upper limit of angle before snug for judging the work result OK. The angle before snug is an anvil turning angle from the start point of the final fastening to the snug point set by the snug point parameter.
Lower Angle Limit (Before Snug)
[Display overview] This shows the configured parameter of the lower limit of angle before snug for judging the work result OK. The angle before snug is an anvil turning angle from the start point of the final fastening to the snug point set by the snug point parameter.
Angle (Before Snug)
[Display overview] This shows the result value of the angle before snug of the work concerned. The angle before snug is an anvil turning angle from the start point of the final fastening to the snug point set by the snug point parameter.
Upper Angle Limit (After Snug)
[Display overview] This shows the configured parameter of the upper limit of angle after snug for judging the work result OK. The angle after snug is an anvil turning angle from the snug point set by the snug point parameter to the end of work.
Lower Angle Limit (After Snug)
[Display overview] This shows the configured parameter of the lower limit of angle after snug for judging the work result OK. The angle after snug is an anvil turning angle from the snug point set by the snug point parameter to the end of work.
Angle (After Snug)
[Display overview] This shows the result value of the angle after snug of the work concerned. The angle after snug is an anvil turning angle from the snug point set by the snug point parameter to the end of work.
Number of Pulse
[Display overview] This shows the number of pulses that the tool emitted at the work concerned.

CHECKING THE FASTENING HISTORY DATA

FASTENING HISTORY DATA ITEMS

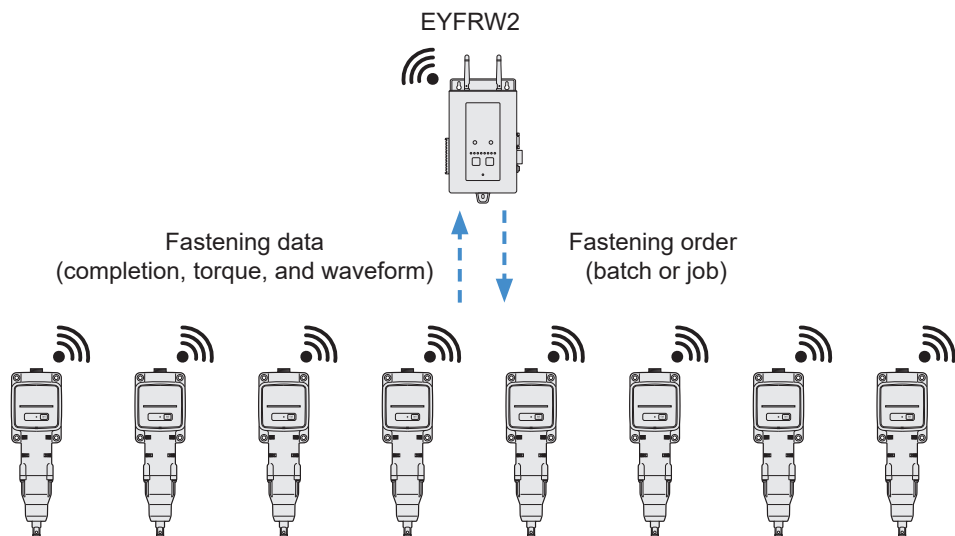
Fastening Time
[Display overview] This shows the time from the start to the end of the final fastening.
Battery Level
[Display overview] Not used. This is left blank.
Offset Slope
[Display overview] This shows the configured parameter of the coefficient for converting the output voltage of the torque sensor into torque.
Offset Intercept
[Display overview] This shows the configured parameter of the coefficient for converting the output voltage of the torque sensor into torque.
Snug Point Detection Level
[Display overview] This shows the snug point detection level set from the transient load level.
NOK Slot Information
[Display overview] This shows the process number with an error if an error occurs in the processes ① to ⑦.
Error Message
[Display overview] When the reason for NOK, the work result displayed on the NOK message, is classified as Error, details of the error are displayed. (For details of error messages, Refer to P322)
External Input Information
[Display overview] This shows the information input to the controller by a barcode reader, etc.

SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

FASTENING CONTROL FROM THE CONTROLLER

Fastening with up to 8 units can be controlled by connecting them to the controller. The controller receives the fastening data per task to count the fastened bolts.

Maximum number of connected devices: 8



SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

TYPICAL FASTENING CONTROL COMBINATIONS ON THE CONTROLLER

You can create different combinations of fastening control settings. See typical combinations as below.

Mode	[Free mode]	[Repeat mode]																						
		[Basic mode]	[Sequence mode]																					
Pass criterion	— (The quantity is not specified)	Fastening the target quantity is completed	Tools complete fastening the respective target quantities in the specified order																					
[Batch] “Single set value” (Fastening in the same condition) * Single type of workpiece	A  OK <table><tr><th>Set value</th><th>Target quantity</th></tr><tr><td>10 Nm</td><td>∞</td></tr></table> Parameter	Set value	Target quantity	10 Nm	∞	A  OK <table><tr><th>Set value</th><th>Target quantity</th></tr><tr><td>10 Nm</td><td>10</td></tr></table> Batch	Set value	Target quantity	10 Nm	10	A ①  OK B ②  OK <table><tr><th>Set value</th><th>Target quantity</th></tr><tr><td>10 Nm</td><td>10</td></tr></table><table><tr><th>Set value</th><th>Target quantity</th></tr><tr><td>20 Nm</td><td>5</td></tr></table> Batch and Sequence	Set value	Target quantity	10 Nm	10	Set value	Target quantity	20 Nm	5					
Set value	Target quantity																							
10 Nm	∞																							
Set value	Target quantity																							
10 Nm	10																							
Set value	Target quantity																							
10 Nm	10																							
Set value	Target quantity																							
20 Nm	5																							
[Job] Multiple set values (Fastening in different conditions) * Multiple types of workpiece	A  OK <table><tr><th>Set value</th><th>Target quantity</th></tr><tr><td>10 Nm</td><td>2</td></tr><tr><td>20 Nm</td><td>3</td></tr><tr><td>30 Nm</td><td>5</td></tr></table> Job	Set value	Target quantity	10 Nm	2	20 Nm	3	30 Nm	5	A ①  OK B ②  OK <table><tr><th>Set value</th><th>Target quantity</th></tr><tr><td>10 Nm</td><td>2</td></tr><tr><td>20 Nm</td><td>3</td></tr><tr><td>30 Nm</td><td>5</td></tr></table><table><tr><th>Set value</th><th>Target quantity</th></tr><tr><td>20 Nm</td><td>5</td></tr><tr><td>30 Nm</td><td>10</td></tr></table> Job and Sequence	Set value	Target quantity	10 Nm	2	20 Nm	3	30 Nm	5	Set value	Target quantity	20 Nm	5	30 Nm	10
Set value	Target quantity																							
10 Nm	2																							
20 Nm	3																							
30 Nm	5																							
Set value	Target quantity																							
10 Nm	2																							
20 Nm	3																							
30 Nm	5																							
Set value	Target quantity																							
20 Nm	5																							
30 Nm	10																							
Remark	—	* A job can contain up to 10 steps.	* A sequence can contain up to 10 steps.																					

SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

NUMBER OF COMBINATIONS THAT CAN BE REGISTERED ON THE CONTROLLER

See the number of combinations that can be registered in the controller as below.

Controller's mode		Tool's setting	Number of combinations that can be registered
Free mode		Parameter	○ 5 combinations per tool
Repeat mode	Basic mode (Independent control)	Batch	○ 5 combinations per tool
		Job	○ 5 combinations per tool
	Sequence mode (Sequential control)	Batch/Job	○ 5 combinations
External control mode		—	○

SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

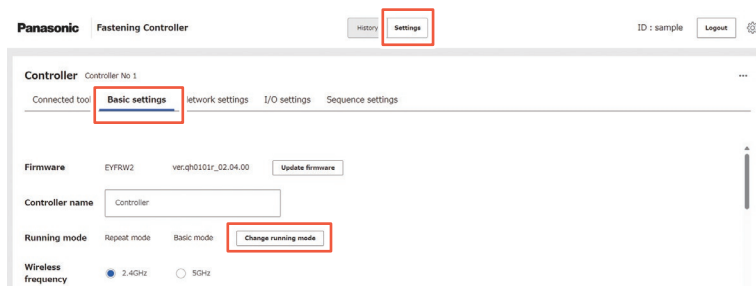
SETTING THE RUNNING MODE ON THE CONTROLLER

Set the running mode of the controller as below.

1 In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Basic settings” tab.

2 In the “Basic settings” tab, click [Change running mode].

The “Change running mode” screen is displayed.



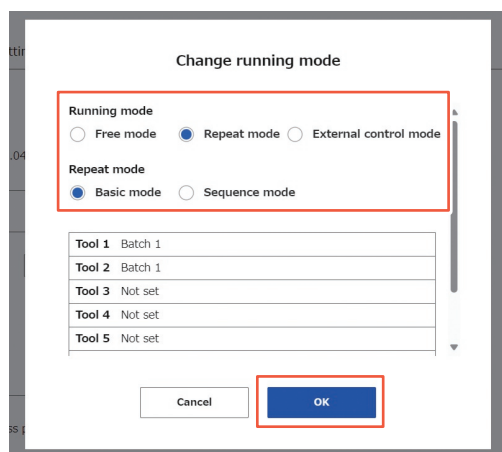
3 Select a “Running mode” and click [OK].

The running mode is set.

Select a running mode from “Free mode”, “Repeat mode”, and “External control mode”.

For “Repeat mode”, select “Basic mode” or “Sequence mode”.

Refer to P293 to 296



* Register “Parameter” before setting to “Free mode”.

* Register a “Batch/Job” before setting to “Repeat mode”.

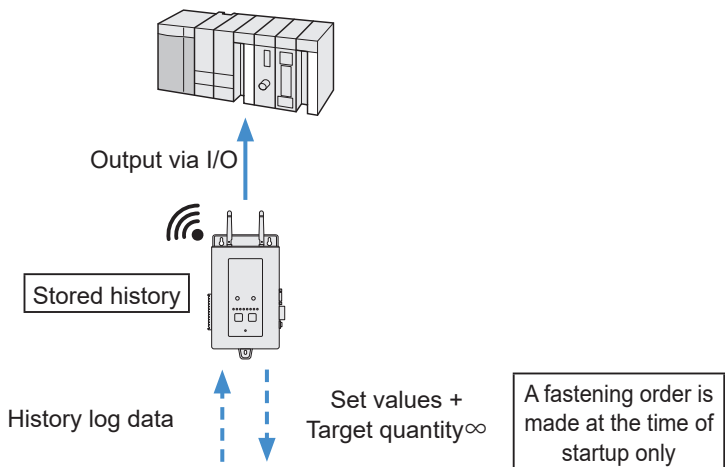
SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

SETTING THE RUNNING MODE ON THE CONTROLLER

Free Mode

This mode allows for unconditional fastening without specifying the quantity to fasten. Tools use pre-registered parameters for fastening. Up to 8 tools can conduct independent operation. The output settings via I/O on the controller are enabled.

* Use the mode when the fastened quantity is counted by an external device.



Up to 8 tools can be controlled at the same time



Set value	Target quantity
10 Nm	∞



Set value	Target quantity
20 Nm	∞



Set value	Target quantity
30 Nm	∞



Set value	Target quantity
40 Nm	∞



Set value	Target quantity
50 Nm	∞



Set value	Target quantity
60 Nm	∞



Set value	Target quantity
70 Nm	∞



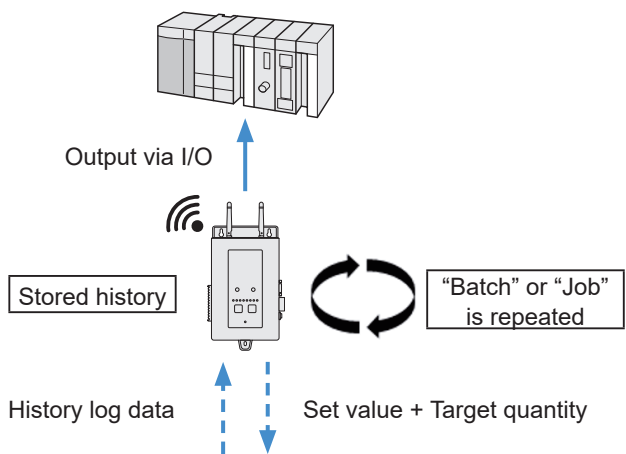
Set value	Target quantity
80 Nm	∞

SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

SETTING THE RUNNING MODE ON THE CONTROLLER

Repeat Mode (Basic Mode)

This mode repeats a “Batch” or “Job” process.
Tools use pre-registered “Batch” or “Job” settings for fastening.
Up to 8 tools can conduct independent operation.
The output settings via I/O on the controller are enabled.



Up to 8 tools can be controlled at the same time






Set value	Target quantity
10 Nm	10

Set value	Target quantity
20 Nm	10

Set value	Target quantity
30 Nm	10

Set value	Target quantity
40 Nm	10






Set value	Target quantity
50 Nm	10
60 Nm	5
70 Nm	5

Set value	Target quantity
60 Nm	10
70 Nm	5
80 Nm	5

Set value	Target quantity
70 Nm	10
80 Nm	5
90 Nm	5

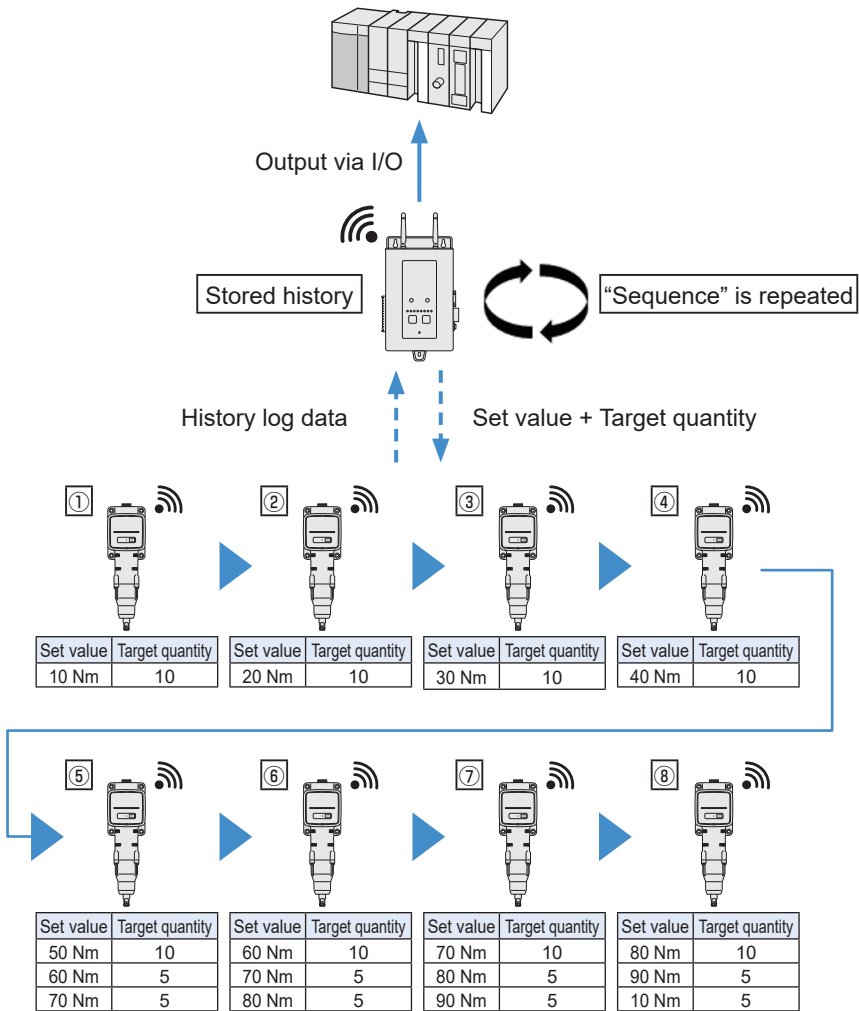
Set value	Target quantity
80 Nm	10
90 Nm	5
10 Nm	5

SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

SETTING THE RUNNING MODE ON THE CONTROLLER

Repeat Mode (Sequence Mode)

This mode repeats a “Sequence” process where available tools are controlled in order. Tools use pre-registered “Sequence” settings for sequential fastening. Up to 10 steps can be set. A sequence supports up to 8 tools but allows only one tool to operate at a time. The output settings via I/O on the controller are enabled.



SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

SETTING THE RUNNING MODE ON THE CONTROLLER

External Control Mode

This mode allows for fastening control as ordered by an external device (host system). The following 2 types of control are supported.

● Control via Open Protocol (with Open Protocol enabled)

Fastening is controlled via Open Protocol by a host system.

Up to 8 tools can be controlled independently.

* Job and sequence controls are not supported.



Output via
Open Protocol

Input via
Open Protocol

Connected to the
Ethernet port (for network)

Stored history

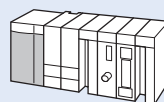


History log data

● Control via I/O (with Open Protocol disabled)

Fastening is controlled by inputs via the I/O port from an external device.

Up to 8 tools can be controlled independently or sequentially.



Output via I/O

Input via I/O

Connected to the
I/O port

Set value +
Target quantity

Ordered for each
fastening job of tools

* More than one tool can be controlled at the same time (except for “Sequence”)



Set value	Target quantity
10 Nm	∞

Free mode



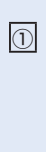
Set value	Target quantity
10 Nm	10

Batch

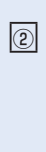


Set value	Target quantity
50 Nm	10
60 Nm	5
70 Nm	5

Job



Set value	Target quantity
10 Nm	10



Set value	Target quantity
20 Nm	10

Sequence mode

* If the controller turns off during fastening, fastening does not resume after the controller turns on. Fastening starts again when ordered by an external device.

* The I/O output settings are enabled.

SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

CREATING (SETTING) A BATCH

In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Connected tool” tab. In the “Connected tool” screen, click the desired tool number. In the screen for the tool number, select the “Batch” tab and make settings. Select a parameter from the “Parameter” pull-down menu and set “Batch size” (quantity to fasten, up to 99). Click [Set] to set the values for “Repeat mode (Basic mode)”.

- * To switch the tool, select the desired one from the tool list.
- * Up to 5 batches can be registered.

Panasonic

Fastening Controller

HistorySettings

ID : sampleLogout

Controller Controller No.1

Connected toolBasic settingsNetwork settingsI/O settingsSequence settings

Tool name		Product No	Tool serial No	Communication No	Setting in basic mode	IP	Radio
Tool 1	Cancel Pairing	EYFCA1WC	CA1WC20230111	1CG3498B70D2	Batch 1	192.168.100.201	-43dBm
Tool 2	Pairing	EYFHH2WP			Batch 1	0.0.0.0	
Tool 3	Pairing	EYFHH2WP			Not set	0.0.0.0	
Tool 4	Pairing	EYFHH1WP			Not set	0.0.0.0	
Tool 5	Pairing	EYFHH1WP			Not set	0.0.0.0	
Tool 6	Pairing	EYFCA1WC			Not set	0.0.0.0	
Tool 7	Pairing	EYFHH2WC			Not set	0.0.0.0	
Tool 8	Pairing	EYFCA1WC			Not set	0.0.0.0	

Background (orange): The tool's firmware version is old.

Background (yellow): The controller's firmware version is old.

Tool list

Tool1Batch 1

Tool2Batch 2Not set

Tool3Not set

Tool4Not set

Tool5Not set

Tool6Not set

Tool7Not set

Tool8Not set

Tool1

ParameterBatchJobDevice settings

Name	Parameter	Batch size	
Batch 1	Parameter 1	3	Set
Batch 2	Parameter 1	1	Set
Batch 3	Parameter 1	1	Set
Batch 4	Parameter 1	1	Set
Batch 5	Parameter 1	1	Set

Tool list

SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

CREATING (SETTING) A JOB

In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Connected tool” tab. In the “Connected tool” screen, click the desired tool number.

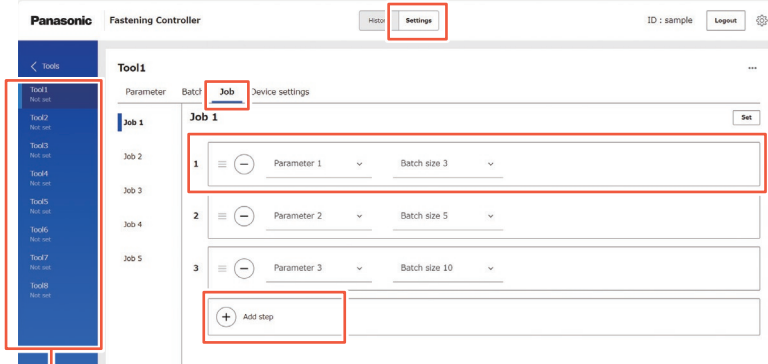
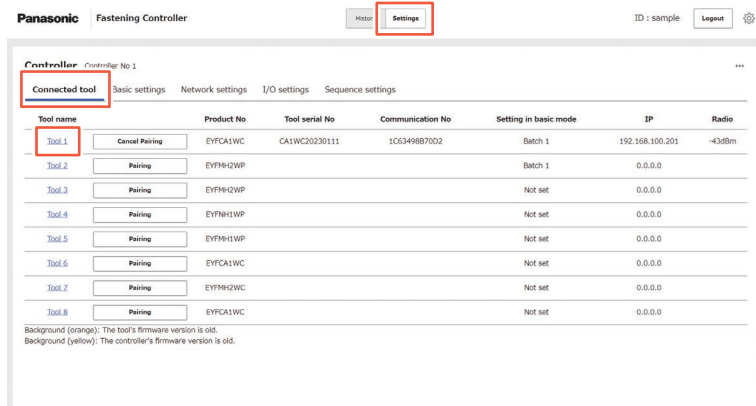
In the screen for the tool number, select the “Job” tab and make settings.

Select a parameter from the “Parameter” pull-down menu and set “Batch size” (quantity to fasten, up to 99). Click [Set] to set the values for “Repeat mode (Basic mode)”.

* Up to 5 jobs can be registered.

* Up to 10 steps can be registered per job.

* To switch the tool, select the desired one from the tool list.



Tool list

SETTING THE FASTENING CONTROL MODE ON THE CONTROLLER

CREATING (SETTING) A SEQUENCE

In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Sequence settings” tab.

In the “Sequence settings” screen, select a tool from the “Tool” pull-down menu and set “Batch” or “Job”.

Click [Set as running mode] to set the values for “Repeat mode (Sequence mode)”.

* Up to 5 sequences can be registered.

* Up to 10 steps can be registered per sequence.

* The same tool can be used more than once in a sequence.

Panasonic Fastening Controller

Settings

ID : sample Logout

Controller Controller No 1

Connected tool Basic settings Network settings I/O settings **Sequence settings**

Sequence 1 **Sequence 1** Set as running mode Clear

Sequence 2 1 Tool 1 Batch 1 Parameter 1 Batch size 3

Sequence 3 2 Tool 2 Batch 1 Parameter 1 Batch size 4

Sequence 4 3 Tool 3 Job 1 Step 1, Parameter 1 Batch size 1 Step 2, Parameter 1 Batch size 3

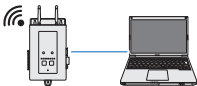
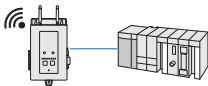
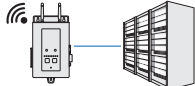
Sequence 5 + Add steps

CONNECTING THE CONTROLLER TO AN EXTERNAL DEVICE

SUPPORTED TYPES OF EXTERNAL DEVICES

The controller supports the following types of external devices.

For details, refer to the Operating Instructions of the controller (EYFRW2).

Feature	PC for Configuration	PLC	Customer's Host System
Illustration			
Communication method	Ethernet	I/O	Ethernet
Communication protocol	http/https	— (ON/OFF signal only)	Open Protocol
Main use	• Viewing and storing the history log • Changing the settings	• Outputting completion and failure signals • Switching the fastening order	• Exporting the history log • Switching the fastening order
Data that can be exported	• Serial numbers of tools • Time • Completion and failure results • Torque values, angles, fastening time lengths • Waveform data	• Completion and failure results • Batch/job/sequence complete • Batch/job/sequence selected • Tool active	• Serial numbers of tools • Time • Completion and failure results • Torque values, angles, fastening time lengths
Switching the fastening order	—	• Batch/job/sequence selected	• Parameter/batch selected
Other	Displayed in a web browser. Microsoft Edge is recommended.	8 ports each for input and output	For supported commands, see “Commands Compatible with Open Protocol”. Refer to P312 Control sequences should be reviewed respectively.

CONNECTING THE CONTROLLER TO AN EXTERNAL DEVICE

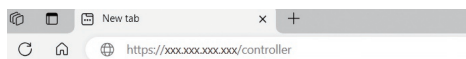
CONNECTING TO THE PC FOR CONFIGURATION IN A REMOTE LOCATION

The PC for configuration with the certificate installed can remotely connect to controllers. Note that only one access to the configuration function is accepted at a time.

To connect, access the URL below on a web browser.

URL : <https://xxx.xxx.xxx.xxx/controller>

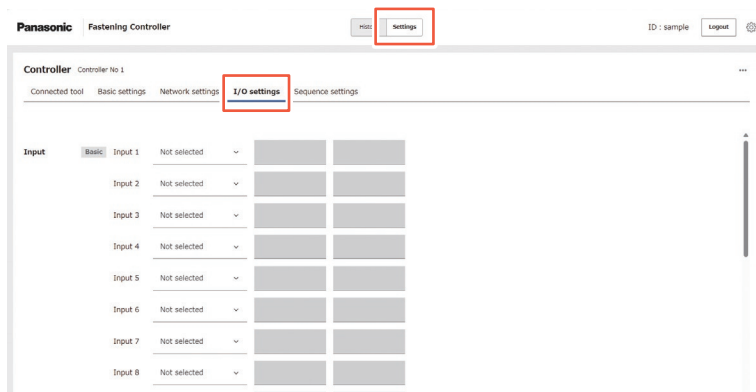
* For xxx.xxx.xxx.xxx, insert the IP address set in "IP" on the controller.

A screenshot of the Panasonic Fastening Controller login page. The page has a white background with a blue border. At the top, the 'Panasonic' logo is displayed in bold. Below it, the text 'Fastening Controller' is centered. Further down, the word 'Controller' is centered. The login form consists of two input fields: 'User ID' and 'Password'. Below these fields is a blue 'Login' button.

CONNECTING THE CONTROLLER TO AN EXTERNAL DEVICE VIA I/O

SETTING I/O

In the top page (the initial page of the setting screen), click [Settings] on the top and select the “I/O settings” tab.



* It is possible to assign a behaviour or event not registered yet. (Except for job selection and sequence selection)

CONNECTING THE CONTROLLER TO AN EXTERNAL DEVICE VIA I/O

COMMANDS ASSIGNED TO INPUT PORTS

Below are the commands that can be assigned to the input ports.

When a signal from an external device is input to one of the ports, the assigned command is executed.

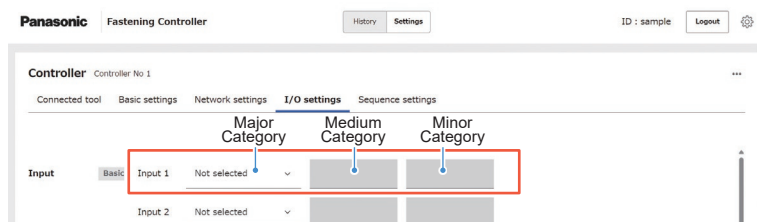
Major Category (Behaviour)	Medium Category (Tool)	Minor Category (Batch No., Etc.)
Batch	Tool 1 to 8	1-5
Job	Tool 1 to 8	1-5
Sequence	—	1-5
Suspend tool ^{*1}	Tool 1 to 8	—
Suspend controller ^{*1}	—	—
Batch reset	Tool 1 to 8	—
Reset	—	—
Emergency stop ^{*1}	Tool 1 to 8	—

^{*1} Enabled only while the input signal is held.

Notes when the “Suspend tool” or “Suspend controller” command is input

- While “Suspend controller” is active, no fastening order is accepted.
- For the tool number with “Suspend tool” active, no “Batch” or “Job” fastening order is accepted.
- For other tool numbers than that with “Suspend tool” active, a “Batch” or “Job” fastening order is accepted.
- While “Suspend tool” is active, no “Sequence” fastening order is accepted.
At the time, the process continues until it reaches the tool with “Suspend tool” active.
- “Batch reset” and “Reset” are treated in the same manner as a fastening order.
- “Emergency stop” is a “Suspend tool” command that can be executed regardless of the controller’s running mode.

After selecting a behaviour in the major category, select a tool and then a number (e.g., batch number) as necessary.



* No action is conducted if an unassigned signal is input. (No error occurs)

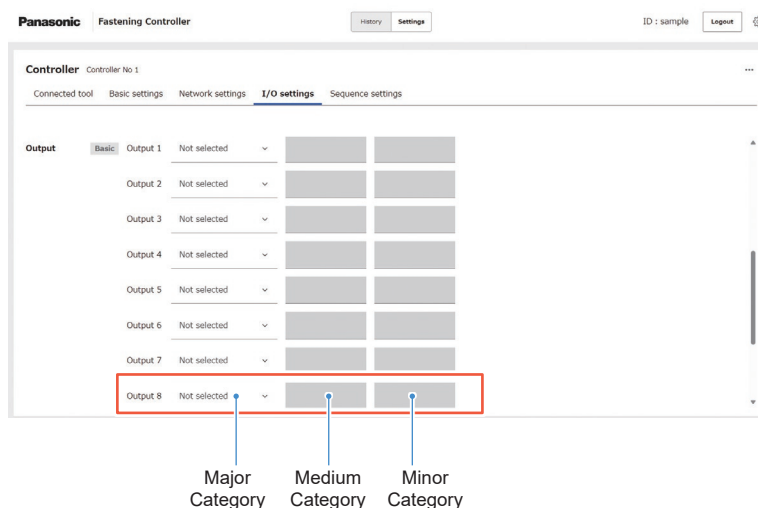
CONNECTING THE CONTROLLER TO AN EXTERNAL DEVICE VIA I/O

COMMANDS ASSIGNED TO OUTPUT PORTS

Below are the commands that can be assigned to the output ports.
When a relevant event has occurred, the controller outputs a signal from the corresponding port to an external device as specified by the assigned command.

Major Category (Event)	Medium Category (Tool)	Minor Category (Batch No., Etc.)
OK	Tool 1 to 8	—
NOK	Tool 1 to 8	—
Batch complete	Tool 1 to 8	1-5
Job complete	Tool 1 to 8	1-5
Sequence complete	—	1-5
Tool active	Tool 1 to 8	—
Batch selected	Tool 1 to 8	1-5
Job selected	Tool 1 to 8	1-5
Sequence selected	—	1-5

After selecting an event in the major category, select a tool and then a number (e.g., batch number) as necessary.



* If the controller turns off while executing an output command, the process does not resume after the controller turns on. (Note that history log data are saved.)

CONNECTING THE CONTROLLER TO AN EXTERNAL DEVICE VIA I/O

OTHER SETTINGS

You can set other I/O related settings as below.

PanasonicFastening Controller

HistorySettings

ID : sampleLogout

ControllerController No. 1

...

Connected tool

Basic settings

Network settings

I/O settings

Sequence settings

Output 5

Not selected

Output 6

Not selected

Output 7

Not selected

Output 8

Not selected

Relay output time

OK

NOK

Others

Input interval time

0.50

[s]

0.50

[s]

0.50

[s]

0.10

[s]

Relay output time (OK)
Select the time length until a fastening completion signal is output by the relay. [Default] 0.5 s [Setting range] 0.01 s to 10 s
Relay output time (NOK)
Select the time length until a fastening failure signal is output by the relay. [Default] 0.5 s [Setting range] 0.01 s to 10 s

OTHER SETTINGS

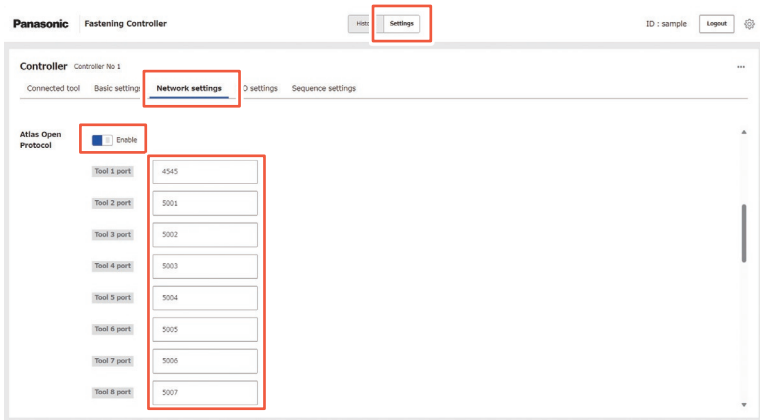
Relay output time (Others)
Select the time length until any other signal than fastening completion and failure signals is output by the relay. [Default] 0.5 s [Setting range] 0.01 s to 10 s
Input interval time
Select the time length when the successive input signals are not counted (accepted). Set it to prevent double-counting caused by noise, etc. [Default] 0.1 s [Setting range] 0.01 s to 10 s

CONNECTING THE CONTROLLER TO AN EXTERNAL DEVICE VIA OPEN PROTOCOL

CONNECTING VIA OPEN PROTOCOL COMMUNICATION

In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Network settings” tab.

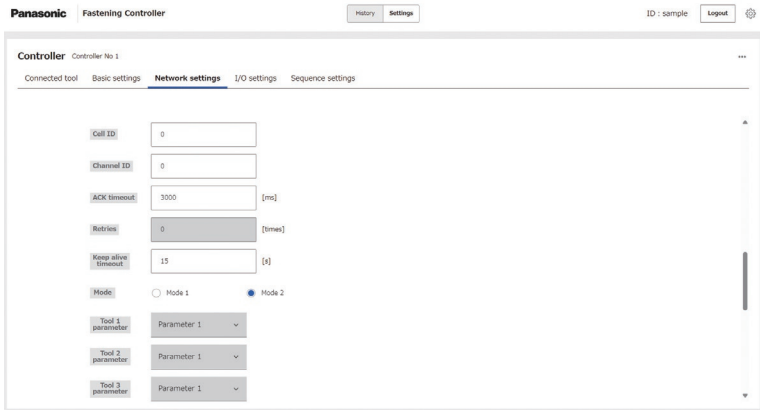
Enable “Atlas Open Protocol”.
Set port numbers to the tools used respectively.



Tool port	
Assign a port number for Open Protocol communication to each tool.	
[Default]	Tool 1 - 4545, Tool 2 to 8 - 5001 to 5007
[Setting range]	Tool 1 to 8 - 1024 to 49151

OTHER SETTINGS

Set other items as necessary.



Cell ID
Set the cell ID. [Default] 0 [Setting range] 0 to 9999
Channel ID
Set the channel ID. [Default] 0 [Setting range] 0 to 99
ACK timeout
Set the time length to wait for a response to a request message from the controller. [Default] 3000 ms [Setting range] 100 ms to 30000 ms

OTHER SETTINGS

Retries
Set the number of times to repeat sending a request message from the controller. [Default] 0 times [Setting range] Not selectable (Fixed)
Keep alive timeout
Set the time length to determine occurrence of disconnection after the last communication with a host system. [Default] 15 s [Setting range] 1 s to 60 s
Mode
Set the running mode. Mode 1: Unconditional fastening with pre-registered parameters Mode 2: Fastening with parameters ordered by a host system [Default] Mode 1 [Setting range] Mode 1 / Mode 2

ASSIGNING FASTENING PARAMETERS (MODE 1)

“Mode 1” (without parameters ordered) requires fastening parameters pre-registered to tools.

Select a parameter from the pull-down menu as below.

PanasonicFastening Controller

HistorySettings

ID : sampleLogout

ControllerController No. 1

Connected toolBasic settingsNetwork settingsI/O settingsSequence settings

Cell ID0

Channel ID0

ACK timeout3000[ms]

Retries0[times]

Keep alive timeout15[s]

Mode

Mode 1

Mode 2

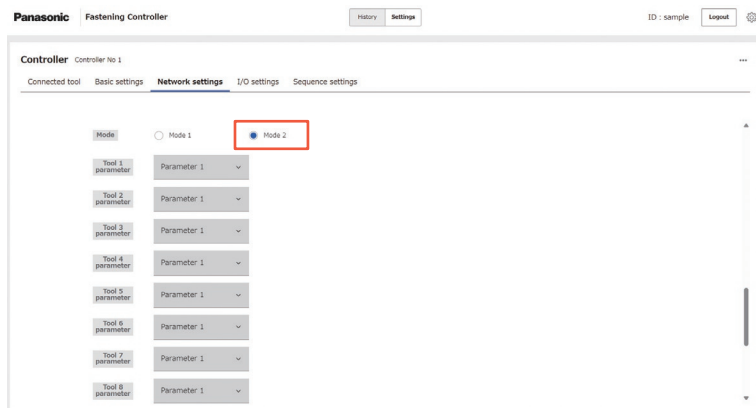
Tool 1 parameterParameter 1

Tool 2 parameterParameter 1

Tool 3 parameterParameter 1

ASSIGNING FASTENING PARAMETERS (MODE 2)

Fastening can be ordered with a MID 0018 command by an external device. You can specify “Parameter” or “Batch” in a fastening order.



To Specify “Parameter” in a Fastening Order

Put “0” in the hundreds digit of ID.

The tens and ones digits show a parameter number.

Example: Parameter 1's ID: 001
Parameter 5's ID: 005

To Specify “Batch” in a Fastening Order

Put “1” in the hundreds digit of ID.

The tens and ones digits show a batch number.

Example: Batch 1's ID: 101
Batch 5's ID: 105

* “Job” and “Sequence” are not supported.

ASSIGNING FASTENING PARAMETERS (MODE 2)

Commands Compatible with Open Protocol

The controller supports the following commands.

For details of commands, see the Open Protocol Specification.

MID 0001 Application communication start
Revision 1 is supported. [Content] Communication start
MID 0002 Application communication start acknowledge
Revision 1 is supported. [Content] Communication acknowledgement
MID 0004 Application command error
Revision 1 is supported. [Content] Command error
MID 0005 Application command accepted
Revision 1 is supported. [Content] Command acceptance
MID 0018 Select parameter set, Dynamic Job included
Revision 1 is supported. For how to assign, see "ASSIGNING FASTENING PARAMETERS (MODE 2)". Refer to P311 [Content] Parameter set order
MID 0042 Disable tool
Revision 1 is supported. [Content] Tool disabled

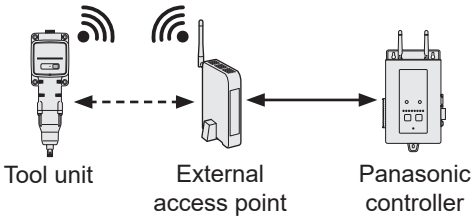
ASSIGNING FASTENING PARAMETERS (MODE 2)

MID 0043 Enable tool
Revision 1 is supported. [Content] Tool enabled
MID 0050 Vehicle ID number download request
Revision 1 is supported. [Content] Vehicle ID acquisition request
MID 0060 Last tightening result data subscribe
Revision 1 and 2 are supported. [Content] Final fastening result data registration
MID 0061 Last tightening result data
Revision 1 and 2 are supported. [Content] Fastening result upload
MID 0062 Last tightening result data acknowledge
Revision 1 and 2 are supported. [Content] Fastening result upload acknowledgement
MID 9999 Keep alive message
Revision 1 is supported. [Content] Availability check

CONNECTING VIA AN EXTERNAL ACCESS POINT

SETUP

The controller can connect to tools via wireless communication using an external access point instead of the built-in access point.
The controller can control tools wherever it is installed.
Connect the access point and the controller to wired LAN.
* The wireless coverage and performance change depending on the access point used.

Connection	Communication Method	Note
 Tool unit External access point Panasonic controller	Ethernet	• In the mode selection, select the internal access point or external access point. • Maximum number of connected tools: 8 * For both the internal access point or external access point

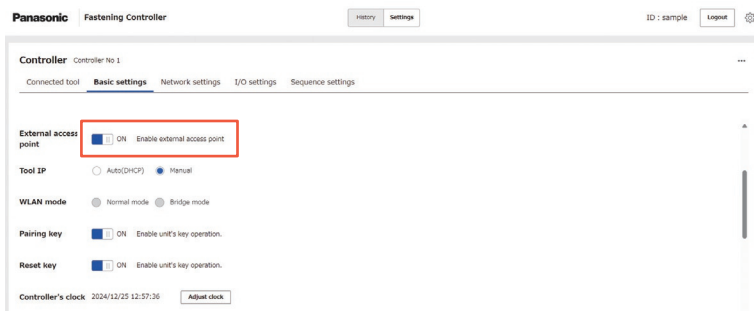
* Setting the tool's IP to "Auto (DHCP)" allows the network configuration without the tool's IP address being managed. For details, refer to the Operating Instructions of the controller (EYFRW2).

CONNECTING VIA AN EXTERNAL ACCESS POINT

SETTING PROCEDURE

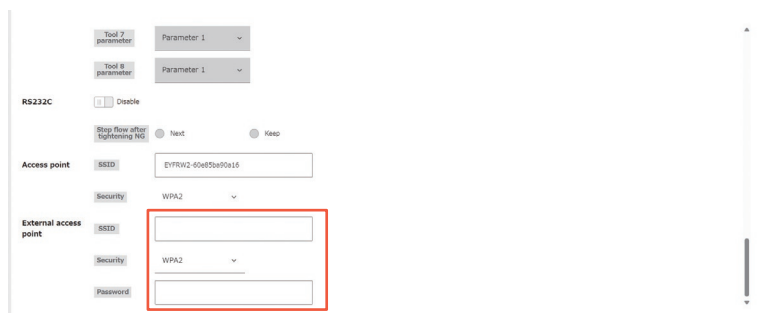
- 1 In the top page (the initial page of the setting screen), click [Settings] on the top, select the “Basic settings” tab, and set “External access point” to “ON”.

* “WLAN mode” is disabled when “External access point” is enabled.



- 2 In the top page (the initial page of the setting screen), click [Settings] on the top and select the “Network settings” tab. In “External access point”, set “SSID”, “Security”, and “Password”.

- * You can register only one SSID in the controller. (You cannot register different SSIDs for different tools)
- * See the Operating Instructions of your external access point.
- * Make this setting before starting pairing registration with tools.
- * Set the tool's IP address before starting pairing registration.



CAPACITY AND SPECIFICATIONS OF THE TOOL

Capacity of the Tool

Model No.	EYFCA1WC
Recommended work (Bolt strength)	M8 (high-strength bolt) M10 (ordinary bolt)
Torque control functioning range	About 20.0 Nm to 60.0 Nm / 177.0 In.lbs to 531.0 In.lbs / 14.7 Ft.lbs to 44.2 Ft.lbs (Setting range: About 10 to 70 Nm / 88.6 In.lbs to 620.0 In.lbs / 7.4 Ft.lbs to 51.7 Ft.lbs)
Fastening torque accuracy (*1)	±15%
Work speed	<M8: 23 Nm / 204 In.lbs / 17 Ft.lbs> About 0.5 s/bolt <M10: 43 Nm / 380.8 In.lbs / 31.7 Ft.lbs> About 0.7 s/bolt

<Measurement conditions> Based on our specified measurement conditions.

*1 Fastening torque and fastening torque accuracy vary depending on the task. Be sure to test them in practice beforehand.

CAPACITY AND SPECIFICATIONS OF THE TOOL

Specifications of the Tool

Model No.		EYFCA1WC
Wrench size		□12.7 mm
Power supply voltage		15 V DC
No-load speed		0 to about 2300 rotations/minute (The maximum speed can be set from about 500 to 2300 rotations/minute.)
Soft start speed		About 150 to 350 rotations/minute (The maximum speed can be set from about 150 to 350 rotations/minute.)
Number of pulses		0 to about 2700 rotations/minute
Dimensions	Overall length	About 306 mm (With the extendable socket: About 408 mm)
	Overall height	About 89 mm
	Overall width	About 91 mm
Mass (Weight)		About 1.65 kg (With the extendable socket: About 1.95 kg)
Wireless Communication Standard (*1)		Wireless LAN (IEEE802.11a/b/g/n) *n: HT20 only
Frequency band		2.412-2.462 GHz / 5.180-5.240 GHz
Number of channels		2.4 GHz: 1 to 11 channels / 5 GHz: 36, 40, 44, 48 channels
Number of tool history logs that can be saved		About 45000 bolts (at 1.2 s work)
Number of tool parameters that can be held		1 parameter
Load capacity of compatible robot		3 kg or more (*2)

*1 About 5 GHz (36, 40, 44, 48 ch) support: The radio equipment supports transmission for indoor use only, except when it communicates with a base station of 5.2 GHz band high power data communication system or a land mobile relay station.

*2 Up to M8 high-strength bolt for a 3 kg capacity robot.

PRECAUTIONS FOR WIRELESS COMMUNICATION

■ There may be noise, shorter radio coverage, or malfunction occurring in the following environmental conditions.

- There is an obstruction (e.g., a metal or reinforced concrete object) that prevents smooth radio propagation between the wireless-enabled tool unit and the controller.
- The antennas of the controller are covered with metal.
- An operator's body is interfering with radio propagation between an operator (the wireless-enabled tool unit) and the controller.
- There is a microwave, PC, or any other device causing noise in the vicinity.
- A cell-phone or PHS phone is used near the wireless-enabled tool unit and the controller.

CLEANING AND STORAGE

How to Clean

■ Wiping with Soft Cloth

Do not use wet cloth, thinner, alcohol, benzine, or other volatile liquids.
(Cause of discoloration, deformation, or crack)



■ For Long Life

Request maintenance from the dealer or our consultation service periodically.

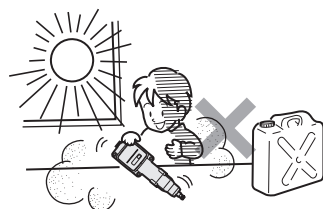
■ Conducting Periodic Inspection

Periodically check for a loose or broken power wire plug or signal wire plug.

How to Store

Avoid the following conditions during storage.

- Car cabin or other hot places
- Places exposed to direct sunlight
- Places exposed to water or dampness
- Places with a lot of foreign bodies or dust
- Places within reach of children
- Places with gasoline or other flammables
- Places with risk of fall



ERROR CODES

ERROR CODES ON CONTROL PANEL

If the product has an error, an error code blinks on the display of the control panel. Before requesting repair, take the following action. Contact your dealer if there is no improvement even after the following action.

Display	Possible cause	Action
	Abnormality in the tool's internal memory or the communication line, wireless communication, etc.	Turn the power off and on to restart the tool. If the problem persists, perform the initialization. (With "E1" displayed, press and hold the Pairing button for about 10 seconds.) In Wireless Communication Mode, also check the condition of the controller.
	The motor of the tool is hot.	Interrupt work, and wait for the motor temperature to fall before use.
	Abnormality in the tool's internal sensor system	Turn the power off and on to restart the tool.
	Overload, failure in the motor, etc.	Check whether the job suits the capacity of the tool.

CAUTION

- Overload protection (E5) may function if you tighten or loosen the bolt that has been tightened up.

ERROR CODES

ERROR CODES ON CONTROL PANEL

Display	Possible cause	Action
	Abnormality, failure, etc. in the tool's circuit	Turn the power off and on to restart the tool.
	Wireless communication with the controller is disconnected. Refer to P318	• Turn the power off and on within the wireless coverage area to use the tool. • If the problem persists after the power is turned off and on, check the controller and peripheral devices.
	① Abnormality, failure, etc. in the torque sensor ② Excessive work time (Excessive measurement data) ③ Judged NOK	① : Turn the power off and on to restart the tool. ②③ : Check the history log on the controller for the error details. Review the set parameters.
	The button battery inside the tool has run out.	—
	Excessive batch workload in [Wireless Communication Mode] (Excess of the capacity of memory temporarily storing communication data)	Reconsider the workload in a batch. Select a setting other than [After Batch Complete] for Set [Graph Sending/Storing Timing].
	Low input voltage	Check the input voltage and turn the power off and on to restart the tool.
	High voltage is input to the tool.	Check the input voltage and turn the power off and on to restart the tool.
	The input voltage to the tool has dropped during operation.	Turn the power off and on to restart the tool.
	The tool continuously operated for 5 minutes or more.	Turn the power off and on to restart the tool.
	The system activated the emergency stop button.	Remove the cause of the emergency stop on the system including robots and then cancel the emergency stop.

ERROR CODES

FASTENING HISTORY ERROR MESSAGES

If fastening work is not completed successfully, you can check the fastening history for the error details.

(For how to browse the fastening history, [Refer to P284](#).)

Category	Error message	Cause	Action (for unintended cause)
Torque	Torque exceeded	- The measured torque of the tool exceeded the upper-limit torque setting. - The member conditions do not suit the tool.	- Check the settings. - Reconsider the member conditions. - Disable the upper-limit torque setting.
Torque	Torque insufficient	- The measured torque of the tool at the time of work stop is less than the lower-limit torque. - The member conditions do not suit the tool.	- Check the settings. - Reconsider the member conditions. - Disable the lower-limit torque setting.
Angle	Before snug angle exceeded	The angle before snug in the middle of work exceeded the upper-limit setting.	- Check the settings (including the snug point setting). - Reconsider the member conditions. - Disable the upper-limit setting.
Angle	Before snug angle insufficient	The angle before snug at the time of work stop is less than the lower-limit setting.	- Check the settings (including the snug point setting). - Reconsider the member conditions. - Disable the lower-limit setting.
Angle	After snug angle exceeded	The angle after snug in the middle of work exceeded the upper-limit setting.	- Check the settings (including the snug point setting). - Reconsider the member conditions. - Disable the upper-limit setting.
Angle	After snug angle insufficient	The angle after snug at the time of work stop is less than the lower-limit setting.	- Check the settings (including the snug point setting). - Reconsider the member conditions. - Disable the lower-limit setting.
Error	Rundown error	A shut-off stop was made within the rundown error time setting.	- Check the settings (shut-off torque and rundown error time setting). - Reconsider the member conditions. (The stop might be caused by an abnormal load.) - Disable the rundown error setting.
Error	Stop before shut off	- Work ended before shut-off. - The user turned off the trigger. - The stop was made by another error.	<If a manual stop was made> - Reconsider the work environment. - Check the member conditions. <If another error appears> - Check the error description and take action.

ERROR CODES

FASTENING HISTORY ERROR MESSAGES

Category	Error message	Cause	Action (for unintended cause)
Error	Shut off incomplete	• Work ended by both "stop before shut-off" and "occurrence of pulsing." - Stop before shut-off - Work was started.	• Refer to the section of a stop before shut-off. • Reconsider the work procedure.
Error	Overcurrent	• Protection stopped because abnormal current was observed in the tool. - Dependence on the work environment - Caused by the power system or the tool	• Reconsider the work environment (whether there is an abnormal load, and how workers use the tool).
Error	Low voltage	• Operation stopped to protect the tool because a drop in the power voltage to the tool was detected. - Dependence on the work environment - Caused by the power system	• Clean the connectors (check for dust and wear in the connectors).
Error	Motor high temperature	• Protection stopped because the motor of the tool is hot.	• Wait for it to cool down before use (no condensation). <If there are continuous abnormal loads> • Reconsider the work environment. • Check the member conditions.
Error	Motor sensor error	• The motor's temperature sensor detected a low temperature error. - Criterion: -30 °C or below	• Reconsider the work environment. - There is a failure if it occurs frequently, because judgment is based on the temperature only.
Error	Torque sensor error	• A break or a short circuit was detected around the torque sensor.	• Check for frequency. - Request repair if it occurs frequently.
Error	Torque sensor protection	• In a single job, one of the following items has exceeded the measurable upper limit. - Number of pulses (= 511 times) - Work time (= 13 seconds) - Accumulated angle (= 131071°)	• Reconsider the work environment (including the job and the procedure). • Check the member conditions.

ERROR CODES

FASTENING HISTORY ERROR MESSAGES

Category	Error message	Cause	Action (for unintended cause)
Error	Tool locked	- The driving motor has been locked. - Hardware failure, abnormal load, etc.	- Reconsider the work environment. - Check for frequency. - Request repair if it occurs frequently.
Error	Circuit identification error	The circuit identification switch of the tool has an unacceptable setting.	- Check for frequency. - Request repair if it occurs frequently. (Circuit failure, or mistake in manufacture or repair)
Error	Parameter error	Parameters set in the tool are out of the setting range.	- Check the parameter settings. - Set the parameters again to the tool.
Error	Data limit exceeded	The recordable data amount per job was reached.	- Reconsider the work environment (including the job and the procedure). - Check the member conditions.
Error	Maintenance warning	The accumulated pulsing time has 1 hour to go before the reminder setting.	- Check the setting. - Make the setting again (such as extending, initializing, or disabling the setting).
Error	Maintenance protection	The accumulated pulsing time exceeded the reminder time setting.	- Check the setting. - Make the setting again (such as extending, initializing, or disabling the setting).
External input	Emergency stop	The system connected to the controller activated the emergency stop.	Check and remove the cause of the emergency stop.
Error	Pre fastening NOK	An NOK condition has been met in the processes ① to ⑦. Operation was interrupted during the processes ① to ⑦.	Review the process and setting that caused NOK. Review the member conditions.

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제 조 국 가 : 일본

인증받은자의상호 : 파나소닉코리아주식회사

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