



Pass Guard System

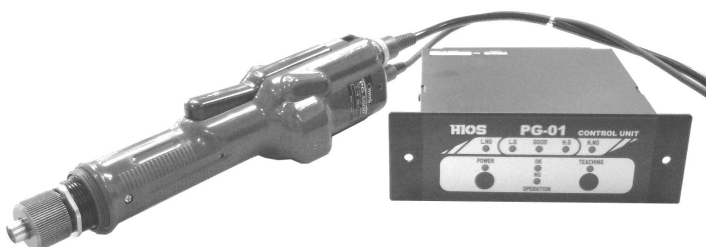
Brushless® Screwdriver with Built-in Torque Sensor

PG Series

Control Unit

PG-01

User's Manual



HIOS Inc.

1-35-1 Oshiage, Sumida-ku Tokyo, Japan 131-0045

Tel: 81-3-6661-8821

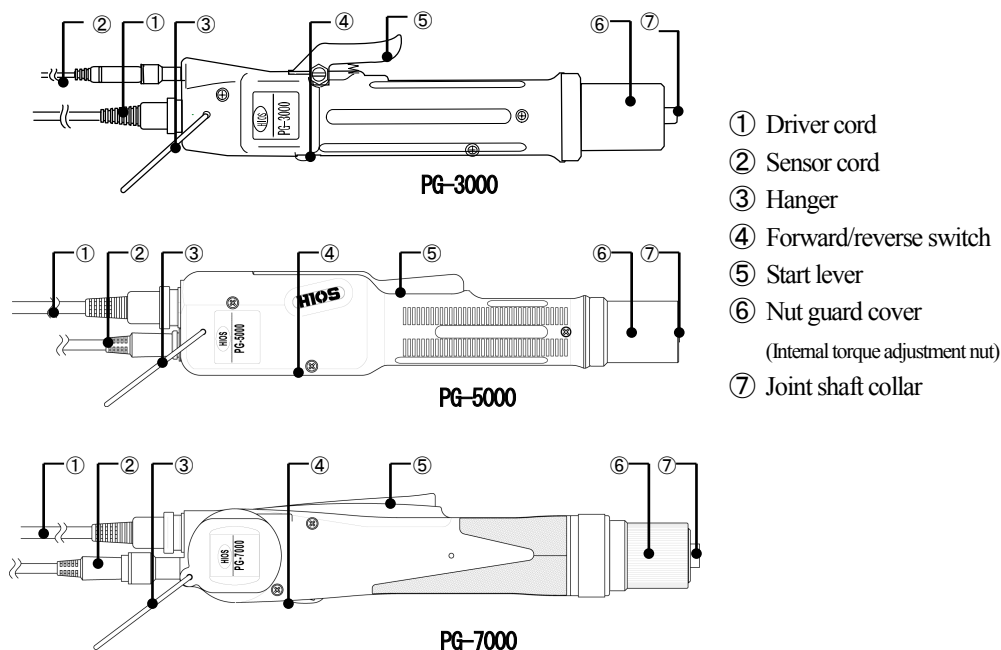
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■Introduction

The screw tightening process today entails adjusting a powered driver with a torque meter and assuming the tool will satisfactorily tighten screws. The inability to confirm screw tightness is a problem for users concerned with improving product quality. These powered drivers are equipped with torque sensors that enables them to function both as a work tools and as devices for fully testing screw tightness. We are confident that these drivers will improve your work efficiency and contribute to better product quality.

■PG Power Driver Parts



■Specifications

| Model Name | | PG-3000 | PG-5000 | PG-7000 |
|--------------------------------|---------------|---------------------|------------|-------------|
| Output Torque Range | N•m | 0.2-0.55 | 0.4-1.2 | 1.0-2.8 |
| | lbf•in | 1.7-4.8 | 3.5-10 | 8.8-24 |
| | (kgf•cm) | (2-5.5) | (4-12) | (10-28) |
| Torque Switching | | Stepless Adjustment | | |
| Unloaded Rotation Speed(r.p.m) | HI | 980 | 900 | 960 |
| | LOW | 680 | 590 | 630 |
| Screw Size (mm) | Machine Screw | 1.7-2.3 | 2.3-3.0 | 2.6-5.0 |
| | Tapping Screw | 2.0-2.3 | 2.0-2.3 | 2.6-4.0 |
| External Dimensions | Grip Diameter | φ 32.5 | φ 33 | φ 39 |
| | Length (mm) | 245 | 260 | 298 |
| Weight (g) | | 345 | 509 | 807 |
| Bit Drive | HIOS Shank | H4 | H4 | H5 and 5HEX |
| | HEX Shank | On request | On request | 1/4HEX |
| Power Supply | | T-70BL | | |
| Driver Cord | | 2m (6P) | | |
| Sensor Cord | | 1.7m (8P) | | |

■Precautions

To prevent malfunctions please take the following precautions:

1. Do not drop the driver or power supply. Do not subject the driver or power supply to sudden impacts.
2. Do not over-lubricate or expose the driver to oils.

■Preparing the Driver for Use

1. Make sure that the driver is paired with the appropriate power supply.
2. Plug the power supply into the AC power outlet and connect the driver power and sensor cord prior to turning the power supply ON.
3. Turn ON the power supply. The POWER LED will light up.
4. Refer to the section “Preparing the PG-01 for use.”
5. Torque adjustment

Torque is adjusted by varying the pressure on spring inside the torque adjustment nut.

Tightening the torque adjustment nut increases torque while loosening the adjustment nut reduces torque

- The torque gradations on the driver do not represent output torque values. The lines should be used only as a rough guide of the output torque.

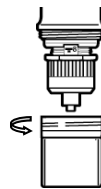
6. Adjusting torque

- Torque should be adjusted with a HIOS torque meter and Fidaptor
- If screw torque is low, tighten the torque adjustment nut upward. If screw torque is high, loosen the adjustment nut. Repeat this process until the appropriate amount of torque is reached

■Screw tightening

1. Complete the procedures explained in PG-01 “Preparing the PG-01 for use”.
2. Attach a bit to the driver.
 - Remove the torque adjustment nut cover.
 - Press the joint shaft collar and mount the bit
3. Perform a screw tightening procedure.

Place the bit on a screw and tighten the screw.
4. The internal clutch will disengage at the set torque value and rotation will stop. Release the start lever.
 - Repeat this procedure for subsequent screws.
 - We have a variety of replacement bit types available. Please visit our Website for a complete list: <http://www.hios.com/>
 - When using HIOS shank-type $\phi 4$ (H4), $\phi 5$ (H5) bits, be sure to use genuine HIOS products.



Caution

When changing bits, turn OFF the power supply or remove the power cord from the driver. Changing bits on a powered driver is dangerous as an unexpected rotation of the bit may cause serious injury. Use sufficient caution when changing bits.

HIOS torque meters are recommended for checking torque.

- HP series for setting torque on electric drivers.
- HDP series for measuring slack torque and top-off torque.

■After-sales Service

The PG Series is equipped with an axial force sensor. We recommend overhauling and inspecting the axial force sensor about once a year depending on usage conditions.

■Overview

1. PG driver adjustment

Locks the torque adjustment nut at the tightness value.

2. Teaching

The driver records the reactive force detected during the tightening process into memory.

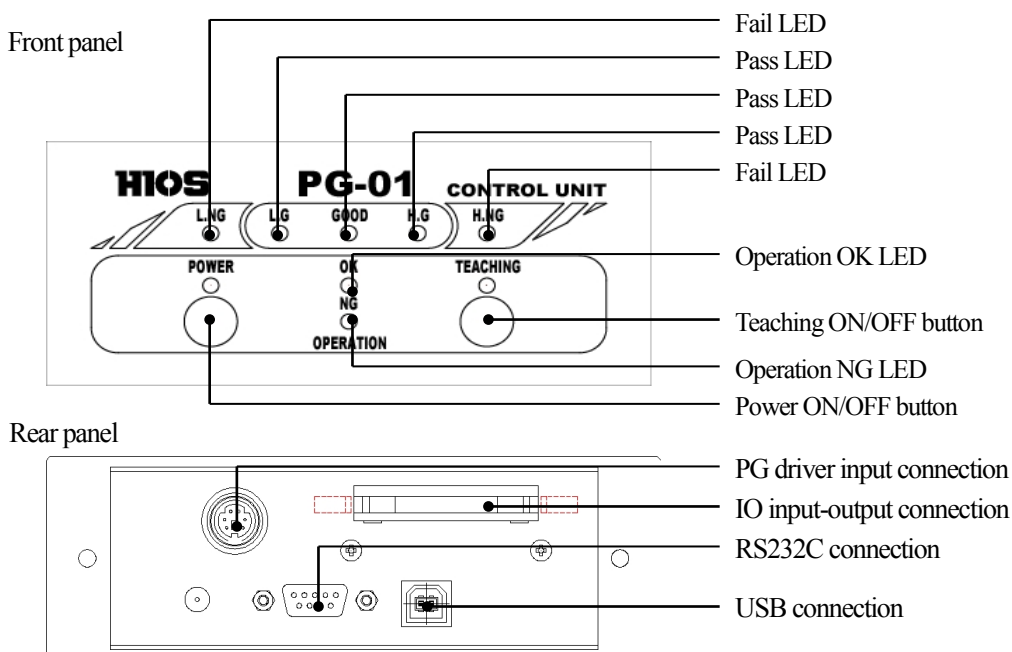
3. Percentage setting

Sets the acceptable range for maximum and minimum recorded values.

4. Tightening

Fully tests all screws against the values recorded in the memory. The results can be displayed and output.

■Parts names and functions



| Name | Operation and function |
|--------------|--|
| POWER | Turns the control unit ON and OFF. Press for 2 seconds to switch OFF. There is no auto OFF function. The Power lamp lights up when ON. |
| TEACHING | Turns the Teaching function ON and OFF. Press for 2 seconds to switch ON and OFF. The Teaching lamp lights up when ON |
| OPERATION OK | The OPERATION OK LED lights up during a tightening operation and turns off when on standby. |
| OPERATION NG | The OPERATION NG LED lights up during a tightening operation. |
| L.NG | This LED lights up when torque is below the L.G value. |
| L.G | This LED lights up when torque is within the specified percentage of the lower limit of GOOD. |
| GOOD | This LED lights up when torque is within the GOOD upper and lower limits. |
| H.G | This LED lights up when torque is within the specified percentage for the GOOD upper limit. |
| H.NG | This LED lights up when torque is above the H.G value. |

For a description of the rear panel, refer to Connection procedure.

■Preparation

1. PG driver adjustment (output torque adjustment)

(Refer to Diagram 1)

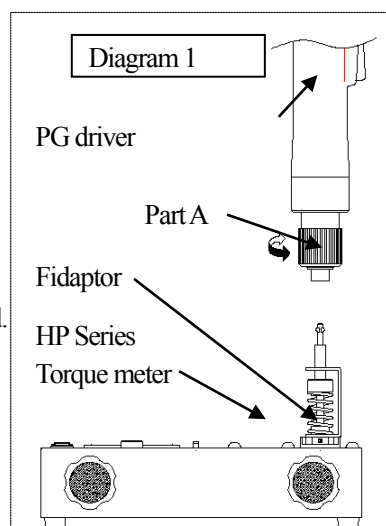
Example » (torque setting) When adjusting torque to $1\text{N} \cdot \text{m}$

1-1. Connect the HP-100 and PG screwdriver with a

Fidaptor.

1-2. Confirm the value displayed by the torque meter and then adjust the torque adjustment nut (part A) until $1\text{N} \cdot \text{m}$ is achieved. This sets PG driver output torque.

1-3. When the driver torque value is set, go to the next step. If the a rough torque setting was made with the values on the adjustment nut, measurements can be made without any prior preparation.



2. TEACHING (measurement standards, learning value, setup mode)

2-1. Press the Teaching button (SW2) for 2 seconds. The LED2 lights up.

2-2. This activates setup mode.

2-3. Tighten a screw as you would normally.

- Depress the PG driver start lever. The driver will begin to rotate.
- The buzzer sounds once. The peak value is recorded into memory.
- Release the start lever switch. The PG screwdriver is in standby mode as described in 2-4.

2-4. Perform the measurement process described above in 2-3 a minimum of 3 times.

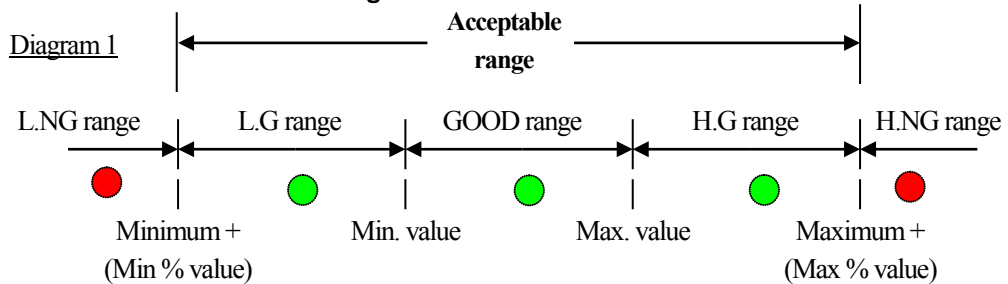
2-5. To exit Teaching, press button 2 for 2 seconds.

2-6. The recorded minimum and maximum values become the driver's standard values for evaluating whether or not a measurement is acceptable. Turning off the screwdriver does not erase these values.

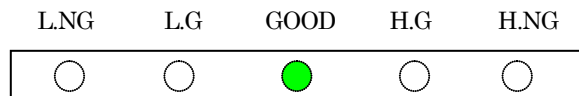
Teaching values

Teaching values record measurement values and minimum and maximum values for a work procedure. This functions records at least 3 and up to 10 data samples. The driver will indicate an error if less than 3 samples are recorded. When more than 10 data samples are input, the 11th sample is recorded and the 1st sample is deleted. If there is existing data in memory, it will be completely erased when setup mode is activated and the first new sample measurement is taken. Variation in the recorded values are the total sum of variations from the actual driver, screw and joined object combination.

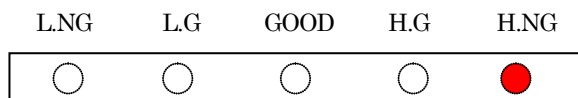
L. NG • L. G • GOOD • H. G • H. NG Range



Example of evaluation LEDs when an evaluation is in the GOOD range:



Example of evaluation LEDs when an evaluation is in the H. G range:



※Note: Teaching values can be modified with the supplementary EXCEL software.
(Refer to the software manual for details.)

3. Setting the percentage range

Percentage is set using the supplementary software. (Refer to the software manual for details.)

4. Screw tightening

A technician can use the evaluation LEDs to tighten screws with precision. A computer can be used for additional management capabilities.

■Error procedures

1. PG driver idle rotation (OPERATION NG)

Solution: Inactivated due to no torque-up signal.

2. PG driver reverses rotation

Solution: Ignore reverse direction.

4. No Teaching values

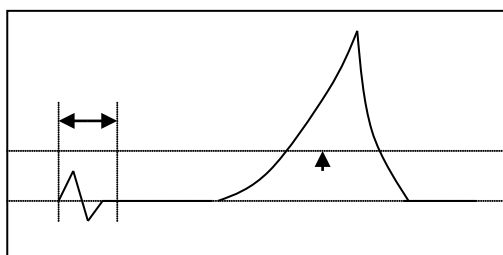
Solution: Blinking L.NG and H.G LEDs. Perform Teaching a second time.

5. After finishing a tightening operation, the driver performs ON/OFF operations and tightens a second and third time.

Solution: Evaluation is NG

In this case the driver clutch disengages once (completes tightening) and a second impact further tightens a screw already in place. This results in the screw being tightened to a value greater than the value specified by the driver. To ensure that screws are tightened to their appropriate values, be sure that the driver performs the operation only once.

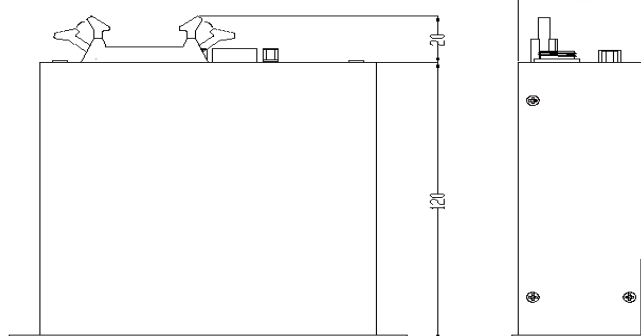
■Actual screw tightening procedure



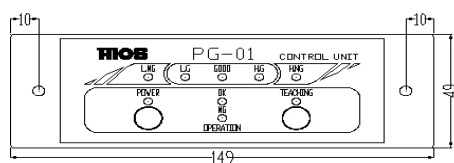
There is a 100ms interval between when the start lever is depressed and when the measurement and evaluation actually begin.

■Dimensions

PG-01



■Connection procedure



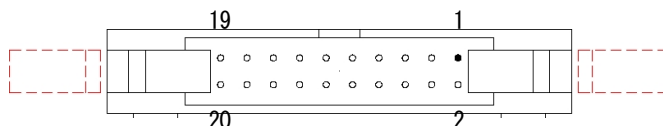
1. PG driver input connector

Connect the PG driver before turning on the power supply (PG-01 connector).

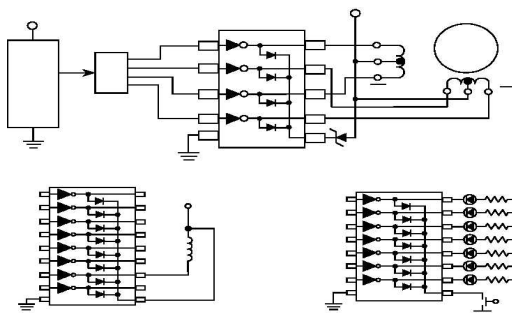
2. IO input/output connector Output (open collector)

| Pin No. | Output signal | Description |
|---------|---------------|--|
| 12 | COM GND | - |
| 13 | L.NG (Fail) | Output when below L.G value |
| 14 | L.G (Pass) | Output when within percentage set for GOOD lower limit |
| 15 | GOOD (Pass) | Output when within GOOD lower and upper limit |
| 16 | H.G (Pass) | Output when within percentage set for GOOD upper limit |
| 17 | H.NG (Fail) | Output when above L.G value |

IO connector



Example of external connection

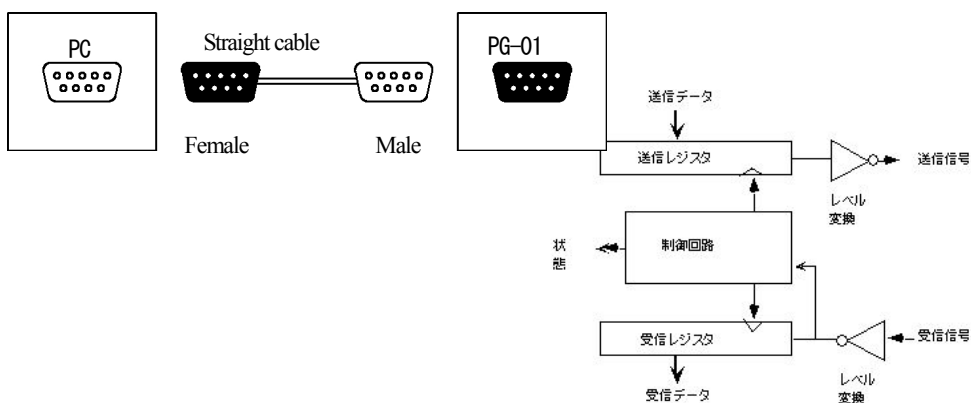


3. RS232C connector

Pin assign (blank terminals are unconnected)

| Pin no. | Signal name | IO |
|-----------|-------------|-----|
| 2 | RXD | OUT |
| 3 | TXD | IN |
| 5 | GND | |
| 1,4,7,8,9 | | |

PC/AT compatible with RS232C cable



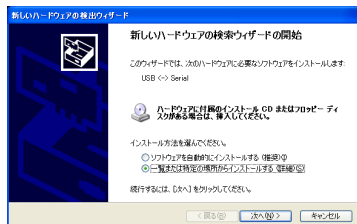
4. USB connector

Initial setup (Check basic settings with Windows.)

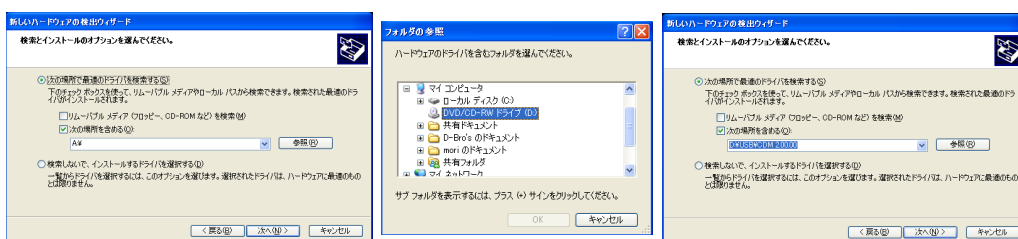
4-1. Turn ON PG-01.

4-2. Connect PG-01 to the PC with a USB cable.

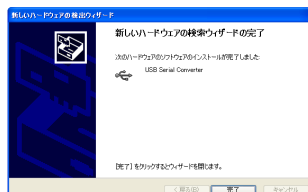
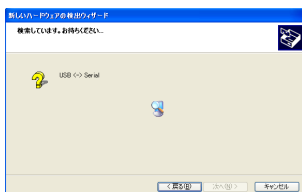
4-3. The following screen appears. Check “select from a list or install in a specified location” and then proceed to the next step.



4-4. Click **Browse**, from the attached CD **select USB-CDM 2.00.00**, click **OK**, and then proceed to the next step.



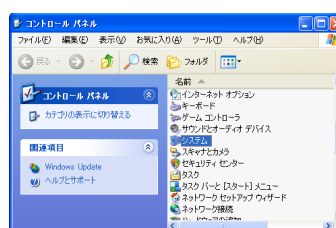
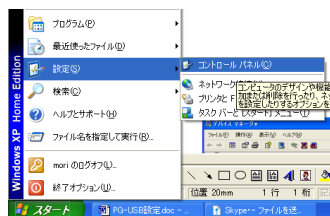
4-5. Installation begins. After installation is completed close the Wizard. This completes the initial setup.



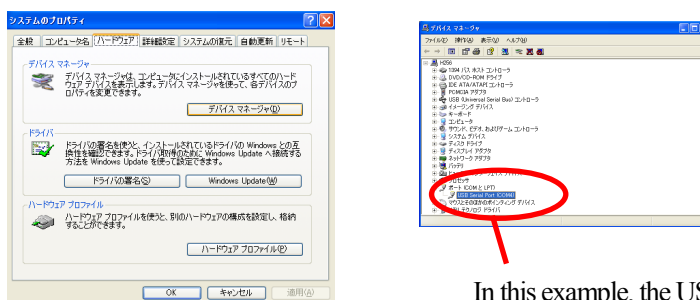
Confirm ports

This step confirms which ports the USB is connected to before starting an application (EXCEL or some other application used for recording measurement data). Use the Device Manager to confirm the port location.

- Select Start, Settings, and then open the Control Panel to start the system.



- From system hardware, open the Device Manager and confirm the COM and LPT1 port numbers.



In this example, the USB port is COM4.

■Data output formats

1. Measurement data output

Evaluation data is output for each measurement in three formats in the order shown below.

1-1. Measurement data

D 1 0 □□□□ □□□□end of line

→ Measurement time - 5 digits (unit 100mS)

→ Torque value – 4 digits

1-2. Recorded learning value

D 0 0 □□□□ □□□□ □□□□ □□□□ □□□□end of line

↓

Displays learning measurement time maximum

Displays learning measurement time minimum

Displays learning maximum value

Displays learning minimum value

Displays learning number

1-3. Evaluation base values

D 2 0 □□ □□□□ □□□□ □□□□ □□□□end of line

↓

Evaluation measurement time maximum value

Evaluation measurement time minimum value

Evaluation maximum value

Evaluation minimum value

Evaluation error rate

2. Error related output

2-1. Measurement value detected in zero domain error E 9 0

2-2. Measurement time malfunction E 9 1

2-3. Learning insufficient, ended without measurement E 9 2

2-4. Measurement L NG E 9 3

2-5. Measurement H NG E 9 4

3. Measurement evaluation output

3-1. Measurement GOOD E 0 0

3-2. Measurement LOW OK E 0 1

3-3. Measurement HIGH OK E 0 2

■Communication settings

PG-01-PC communication settings

- Communication speed 4 8 0 0 B P S
- Start Bit 1 Bit
- Stop Bit 1 Bit
- Data length 8 Bit
- Data format ASCII

■Computer input

1. Using Windows HyperTerminal

1-1. After turning on the computer and displaying version information, performs autozero correction. The following messages output during this process are debugging messages not directly involved in measurement.

Ver2.19aE 2010/10/21

[Zero adjusting A/D=FFF Gain=1D8]

[Zero adjusting A/D=803 Gain=1D9]

[Zero adjusting A/D=7FF Gain=1DA]

[Zero Adjustment end A/D=7FB Gain=1DA]

1-2. Example of a measurement OK message

In general, messages are either test messages or measurement data.

| | | |
|---------------------------|-------|--------------------------|
| [Job Num = 4] | _____ | A debugging test message |
| S00 | _____ | |
| [Lever SW ON] | _____ | |
| [Job Num = 6] | _____ | |
| S02 | _____ | |
| [Torque up ON] | _____ | Measurement data |
| D10026900668 | _____ | |
| D000005026903150033701891 | _____ | |
| D2002026303210033001928 | _____ | A debugging test message |
| M21 [Judgment=LOW OK] | _____ | |
| E01 | _____ | |
| [Judgment end] | _____ | |

1-3. Unsatisfactory result - display when evaluation results are abnormal

| | | |
|--|-------|--------------------------|
| [Job Num = 4] | _____ | A debugging test message |
| S00 | _____ | |
| [Lever SW ON] | _____ | |
| [Job Num = 6] | _____ | |
| S02 | _____ | |
| [Torque up ON] | _____ | Measurement data |
| D10028600590 | _____ | |
| D000006009600010000101894 | _____ | |
| D2002140513090131201931 | _____ | A debugging test message |
| [Abnormal termination at measurement time] | _____ | |
| E91 | _____ | |

2. Using included EXCEL data

Operating Environment

HIOS The driver data taking-in sheet can be carried out by:

- Microsoft Windows XP
- Microsoft Excel 2003

In case of not functioning, select application type "Driver Data Collection".

Please be aware that maintenance and support services are unavailable since this is a sample software.

Processing measurement settings

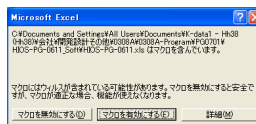
| | |
|-------|---|
| "S00" | [Lever switch On] |
| "S01" | [Lever switch Off(no torque up)] |
| "S02" | [Torque up On] |
| "S10" | [Work On] |
| "S11" | [Work Off] |
| "E00" | [Judgment = Good] |
| "E01" | [Judgment = Low OK] |
| "E02" | [Judgment = High OK] |
| "E90" | [Zero area detection/Impossible judgment ending] |
| "E91" | [The abnormally end at the measurement time] |
| "E92" | [The ending about which it is impossible to judge by the learning lack] |
| "E93" | [Judgment = Low NG] |
| "E94" | [Judgment = High NG] |

2-1. Start EXCEL with the included CD.

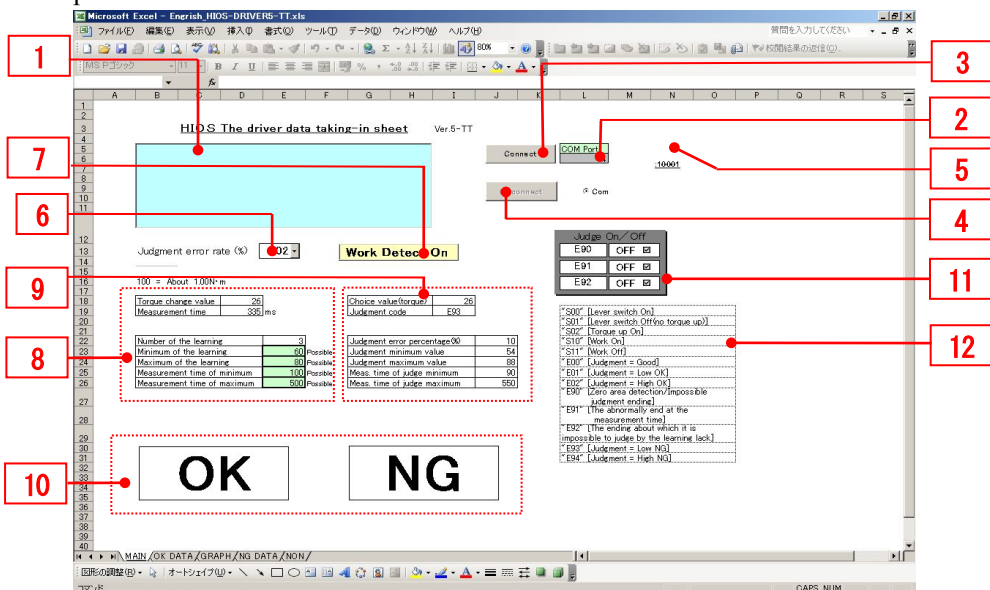
Note: When you want to launch two different types of data, start by creating two different EXCEL files. For example, test1.xls and test2.xls.

Be sure to have both EXCEL files open in separate windows when launching the data. When launching data with a direct link, the data for the second EXCEL file will launch in the first EXCEL window. You will not be able to handle the data if this occurs.

2-2. Be sure to Enable macros (E).



Data upload sheet screen



Perform all settings after turning on the PG-01 power supply and connecting it to the computer. When using a USB connection, the computer may automatically turn off the power supply under certain conditions. If this occurs, disconnect and then reconnect the driver. There is no response if the PG driver is reversed.

- 1 Connection confirmation window
No action necessary.
- 2 COM port
After confirming the port being used, enter the port number.
- 3 Connect driver
Click to start data input standby status. If previously input data needs to be retained, save the data before performing this operation. (Establishing a connection clears data.)
- 4 Disconnect driver
Click to finish data upload.
- 5 LAN settings
optional use
- 6 Evaluation error rate settings (%)
Sets the acceptable evaluation range before a screw tightening operation. Switching to this screen transmits the values to the PG-01 memory. The PG-01 will use these values to evaluate measurements even when not connected to the computer.
Setting selection values (2% • 5% • 10% • 15% • 20%) 02=2%
- 7 Work detection ON
Normally turns on automatically when performing a process.
- 8 Output data

| | |
|----------------------------------|---|
| Torque value | Indicates actual work value. |
| Measurement time | Indicates time elapsed from the start of screw tightening to torque up. |
| Learning number | Indicates number of teaching operations performed. |
| Learning minimum value | Indicates minimum teaching value. (modifiable) |
| Learning maximum value | Indicates teaching maximum value. (modifiable) |
| Learning minimum evaluation time | Indicates teaching minimum time. (modifiable) |
| Learning maximum evaluation time | Indicated teaching maximum time. (modifiable) |
- 9 Evaluation comparison data

| | |
|-------------------------------------|---|
| Torque value | Indicates value output on the graph sheet. |
| Minimum evaluation value | Indicates the amount minus the % setting for the learning minimum value. |
| Maximum evaluation value | Indicates the amount plus the % setting for the learning maximum value. |
| Evaluation minimum measurement time | Indicates the amount of time minus the % setting for the learning minimum measurement time. |
| Evaluation maximum measurement time | Indicates the amount of time plus the % setting for the maximum minimum measurement time. |

10 Evaluation

Indicates whether the screw tightening procedure has passed or failed.

11 Evaluation ON/OFF

Error E90, E91, E92 ON/OFF switch possible.

ON Indicates the measurement value in the data sheet.

OFF Indicates the measurement value in the irregular sheet.

12 Measurement settings processing table

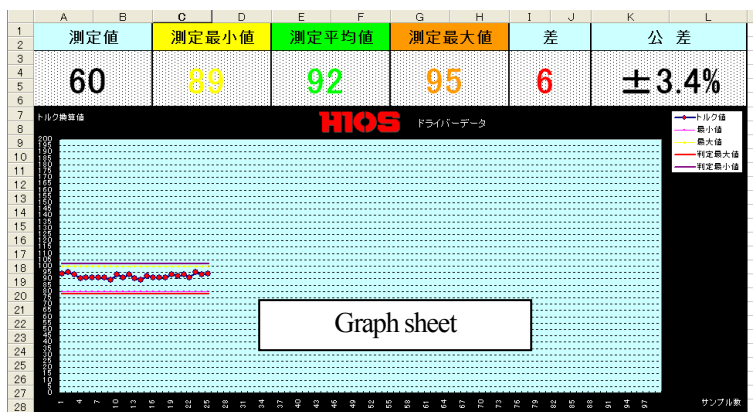
Other sheets

Microsoft Excel - HIOS-PG-0611a.xls

ファイル(F) 編集(E) 表示(V) 挿入(I) 書式(O) ツール(T) データ(D) ウィンドウ(W) ヘルプ(H)

MS Pゴシック 11 B I U

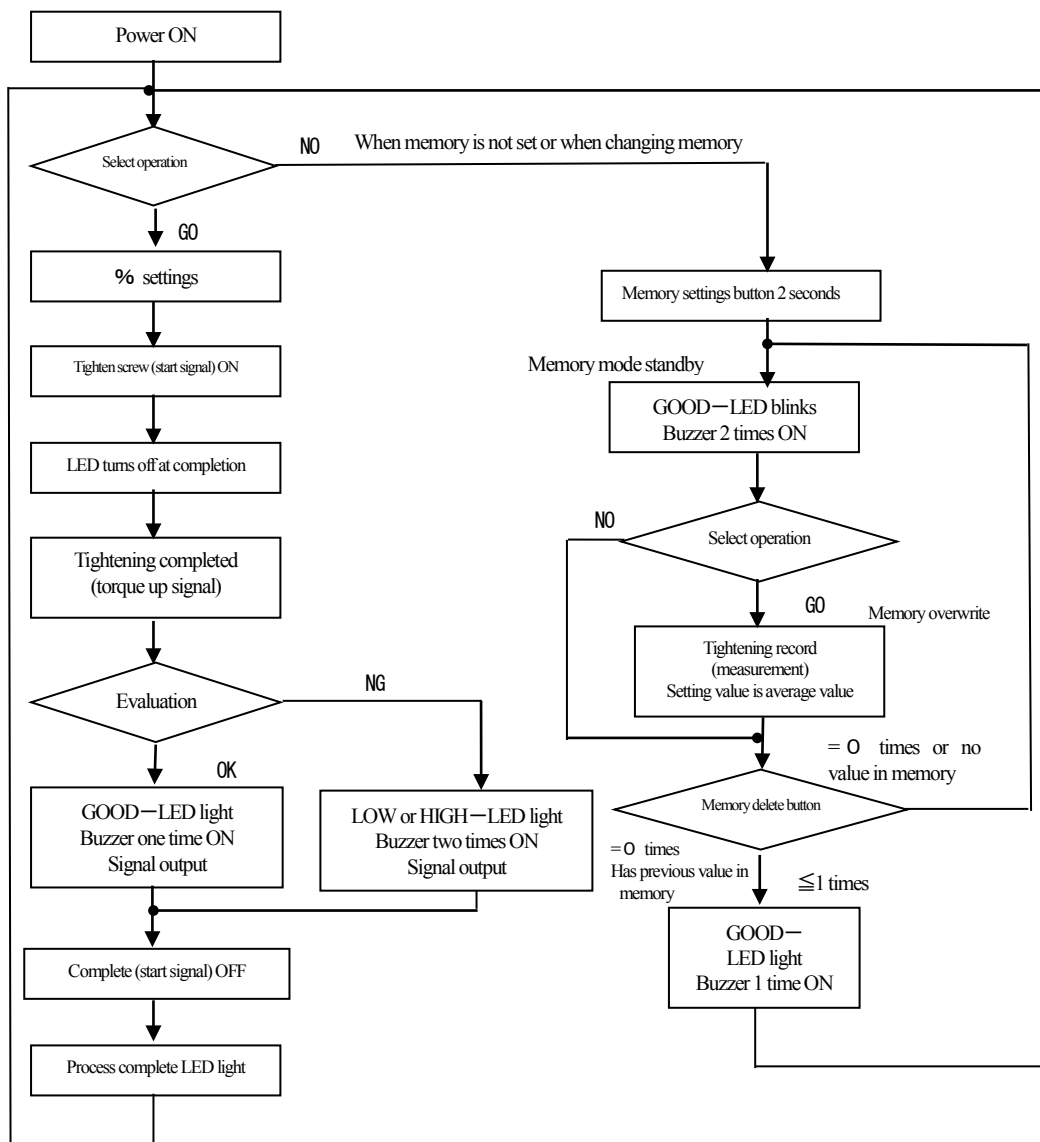
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|----|-----------|------------|------------|------|-----|-----------|-----------|--------------|--------------|-----|-----------|-----------|--------------|--------------|-----|
| 1 | 日付 | 時間 | トルク 換算値 | 測定時間 | 学習数 | 学習 最小値 | 学習 最大値 | 学習最小 測定時間 | 学習最大 測定時間 | 誤差率 | 判定 最小値 | 判定 最大値 | 判定最小 測定時間 | 判定最大 測定時間 | 判定 |
| 2 | 2007/1/16 | 1:20:19 PM | 94 | 255 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 3 | 2007/1/16 | 1:20:22 PM | 95 | 283 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 4 | 2007/1/16 | 1:20:25 PM | 93 | 286 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 5 | 2007/1/16 | 1:20:28 PM | 90 | 290 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 6 | 2007/1/16 | 1:20:35 PM | 91 | 248 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 7 | 2007/1/16 | 1:20:38 PM | 91 | 276 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 8 | 2007/1/16 | 1:20:40 PM | 91 | 315 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 9 | 2007/1/16 | 1:20:42 PM | 91 | 289 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 10 | 2007/1/16 | 1:20:57 PM | 89 | 1 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 11 | 2007/1/16 | 1:21:00 PM | 93 | 3 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 12 | 2007/1/16 | 1:21:04 PM | 91 | 3 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 13 | 2007/1/16 | 1:21:07 PM | 93 | 3 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 14 | 2007/1/16 | 1:21:10 PM | 90 | 308 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 15 | 2007/1/16 | 1:21:13 PM | 89 | 294 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 16 | 2007/1/16 | 1:21:16 PM | 92 | 281 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 17 | 2007/1/16 | 1:21:19 PM | 91 | 280 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |
| 18 | 2007/1/16 | 1:21:22 PM | 91 | 304 | 3 | 80 | 100 | 100 | 600 | 2 | 78 | 102 | 98 | 612 | E00 |



| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|----|----|----|------------|------|-----|-----------|-----------|--------------|--------------|-----|-----------|-----------|--------------|--------------|----|
| 1 | 日付 | 時間 | トルク 換算値 | 測定時間 | 学習数 | 学習 最小値 | 学習 最大値 | 学習最小 測定時間 | 学習最大 測定時間 | 誤差率 | 判定 最小値 | 判定 最大値 | 判定最小 測定時間 | 判定最大 測定時間 | 判定 |
| 2 | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | |

Irregular sheet

■Operation chart



■China RoHS2 Table

If you export to China by yourselves, below is the table of China RoHS2.

| 有害物质名称及含量标识格式 | | | | | | |
|---------------|-------|-------|-------|-----------------|---------------|-----------------|
| 产品中有害物质的名称及含量 | | | | | | |
| 部件名称 | 有害物質 | | | | | |
| | 铅(pb) | 汞(Hg) | 镉(Cd) | 六价铬 (CR(VI)) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| 电路板总成 | × | ○ | ○ | ○ | ○ | ○ |
| 电机单品 | × | ○ | ○ | ○ | ○ | ○ |
| 齿轮 | × | ○ | ○ | ○ | ○ | ○ |
| 外壳 | ○ | ○ | ○ | ○ | ○ | ○ |
| 螺丝刀线 | × | ○ | ○ | ○ | ○ | ○ |
| 电源适配器 | × | ○ | ○ | ○ | ○ | ○ |
| - | | | | | | |
| - | | | | | | |

本表格依据 SJ/T 11364 的规定编制。
 ○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
 ×：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 GB/T 26572 规定的限量要求。

In addition, if the following mark cannot be found at the rear side of the product and/or Product box, cut off a mark and stick a mark to the product and/or product box.



