HANDHELD NUTRUNNER SYSTEM

X-PAQ™

PRECISION | ACCURACY | QUALITY

EH2 Series

OPERATION MANUAL

ASG™

Assembly · Industrial · Precision Fastening

— Table of Conents —

1. Before Use

Thank you for purchasing the **"X-PAQ EH2 Series"**.

For your safety, read this operation manual carefully before using the tool in order to familiarize yourself with its capability. Please keep this manual in a proper place for future reference.

1.1. Precautions

1) This operation manual is copyrighted. Note that it is prohibited to copy this manual in part or in whole without our permission.

2) The contents of this operation manual have been prepared with utmost care, but should there be any questions, errors or omissions, please inform us of them.

3) This operation manual is subject to change without notice.

4) As for the resultant influences of operating this product, we shall not bear any responsibility regardless of section 2. We appreciate your understanding on this point.

5) This product is manufactured and sold as a special tool for industrial use and its use at home is not allowed.

1.2. Precautions for Safety

In order to prevent the occurrence of harm or damage to the users and other persons or their property, be sure to thoroughly read this operation manual and all the appendices before the installation, operation, maintenance and inspection of the apparatus.

In this manual, the levels of risks and damages caused due to ignorance of the indications and improper use are classified into "Danger," "Warning," and "Caution." However, even a matter of "Caution" level may lead to a serious result. Since all the contents are very important, please be sure to strictly observe them.

◆ The indication marks and their meanings are described in the following.

⚠ **Danger**

If not observed, it will cause a severe wound or a risk of life. Also, it will result in a serious injury (loss of body part, etc.) or a risk of life.

⚠ **Warning**

If not observed, it can lead to a severe wound or a risk of life. Also, it can result in a serious injury (loss of body part, etc.) or a risk of life.

⚠ **Caution**

If not observed, it may lead to a slight wound (scratches, bruises, etc.). Also, material damage is regarded as a "Caution" level.

⚠ Danger

This product is not explosion-proof. It should not be used in the presence of combustible or explosive gas or anything involving the danger of explosion. Improper use may cause severe damage.

⚠ Warning

1) Be sure to ground this product. If not properly grounded, it may cause electric shock trouble.
2) Carry out the power protector grounding test of ELB (Electric Leak Breaker) by using the test button about once a month. *test button: located "Underside controller on the main power breaker unit."
3) Do not supply the controller with a power source not grounded. It will cause failure of normal operation of ELB (Electric Leak Breaker) and is very dangerous.
4) If ELB functioned to break the circuit of the system, be sure to check the cause of trouble before resuming the operation.
5) When opening this product for installation or maintenance, be sure to do so after disconnecting the plug from AC POWER connector which is bottomside controller.
6) This product includes no parts to be maintained or replaced by the users. The assembly and readjustment should be left to ASG or its designated dealer. It may otherwise cause abnormal operation or electric shock trouble.
7) While using high torque mode (10 Nm or more), please take measure to deal with reaction.
8) This product is a precision apparatus. Do not apply impact or vibration to the apparatus by falling nor use it near water or other liquid.
9) When installing this product, select a place away from heat or electric noise sources.
10) Do not touch the rotating spindle when operating. It may cause an operator to be entangled by it.
11) Do not handle cables such that they are scratched, excessively stressed or squeezed. Do not bend cables less than 100 mm radius.

⚠ Caution

1) Do not idle the tool excessively. It may cause the tool to overheat.
2) In case of a system error, check and eliminate the cause of trouble before resuming the system operation. It may cause malfunction or trouble.
3) Correctly make the connection of the control unit, tool and tool connection cables. Improper connection may cause electric shock or system malfunction.
4) When setting the parameter, be sure to set it to a low torque and gradually increase the torque while checking the reaction force. If it is set to a high torque carelessly, it may cause accidents such as a sprain, fracture, etc.

2. Product Specification

2.1. Unit Type

Control Unit

ASG - EH2-HT40-0 00 N N N

- EH2 Series
- Hardware type
- Driver output
  - 0: 50 W‑300 W
- Power source
  - 00: single phase 100-230 VAC
- OPTION I/O
  - N: none (standard spec.)
  - P: P I/O (option)
- FIELD BUS
  - N: none (standard spec.)
  - D: DeviceNet (option)
  - P: PROFIBUS (option)
  - C: CC-Link (option)
  - E: EtherNet/IP (option)
- REMOTE I/O
  - N: none (standard spec.)
  - R: REMOTE I/O (option)

Tool Unit

ASG - EH2 - R1 020 - A

- EH2 Series
- Tool type
  - R: normal tool
  - P: pulse tool
- Motor output
  - 0: 50 W
  - 1: 100 W
  - 2: 200 W
  - 3: 300 W
- Rated maximum torque
  - Torque value in N·m (three digits)
- Tool type
  - A: angled
  - S: straight
  - SL: straight lever type
  - SP: straight push type
  - SC: straight connector type
  - P: pistol
  - PH: pistol, Special shape for Reaction Support Attachment

2.2. General Specification

(1) Environmental Specification

Model	ASG-EH2-HT40-000*** (Control Unit)	ASG-EH2-R****-* (Tool Unit)
Environment	No corrosive gasses, dust or condensation	
Ambient Temperature	0–40°C (free from freezing)	
Ambient Humidity	No greater than 85% RH (free from condensation)	
Storage Temperature	-20–45°C (free from freezing)	
Storage Humidity	No greater than 85% RH (free from condensation)	
Altitude	No greater than 1000 m	

(2) Electrical Specification (Controller)

Model	ASG-EH2-HT40-000***			
Power Supply [*1]	Single Phase 100–230 VAC ±10% 50/60Hz[*3]			
Equipment Capacity	0.5 kVA/spindle	0.6 kVA/spindle	1.4 kVA/spindle	3.3 kVA/spindle
Rated Output	50 W	100 W	200 W	300 W
Power consumption [*2] (During operation)	40 W•h or less	40 W•h or less	75 W•h or less	100 W•h or less
Leakage Breaker	$\mathit{\Delta}I$ 30 mA maximum			

*1   It varies depending on the tool used.

*2   Values are measured from executing fastening process at maximum fastening torque for 10 sec. per cycle (fastening motion = 2.5 sec, unfastening motion = 2.5 sec, stand by motion = 5.5 sec)

*3   The power supply voltage should be 100–115 VAC±10% for 100 VAC power supply and be 200–230 VAC±10% for 200 VAC power supply.

2.3. Performance Specification

ITEM	FUNCTION
Display/Operation	Operation Keys (6 pieces), 7-segment LED, Display lamp, electronic buzzer
Control Input/output	RELAY/EXT IN, PIO (*Option) REMOTE I/O (*Option)
DC Output Power	24 VDC Max. 1 A
Max No. of Channel	99 channels
Max. No. of JOB	99 Jobs (up to Max 30 Step per Job is possible)
Communication Port	COM1 (X-PAQ management software connection, Barcode reader connection, RS-232C port for connection with serial printer/PC data output) ETHER (Ethernet connection port 10/100 BASE-T (RJ45)) NET (NET connection port for multi spindle) FIELDBUS (DeviceNet/Profibus/CC-Link/Ethernet/IP connection port (*option)) PANEL (RS-422 connection port for touch panel)
Memory	Program/system parameter, Allocation of I/O, Fastening Results, Fastening Result History, System Error History (FLASH-ROM Back-up) Torque Curve History (Battery Back-up) Parameter in USB flash drive, Fastening result storage (available in the future)
Record Data Capacity	Fastening Result: Approx. 33,000 (various from allocations) Torque Curve: 30 (Fastening OK Data: 20 / NG Data: 10) System Error: 50
Fastening Mode	Torque, Torque & Angle Monitor, Angle, Torque or Angle, and Torque & Angle Reverse Angle Control
Others	Free Allocation Function (I/O signal, Fastening Result Data), Error Proofing Function, Panel Setting Protest Function, Statistics Function (available in the future), Identifier Function
Monitor Output	Torque, Angle Pulse, Speed Control, Motor-Current , Motor-Speed
Protection Feature	T/T Zero-Point, Power Shortage, Motor Overcurrent, Motor Overload, Resolver break

Input/Output Specification

	ITEM	FUNCTION	
RELAY OUTPUT	Output Contact	2 points	
	COM Contact	2 points	
	Rated Point	125 VAC 0.4 A (resistance load) 125 VAC 0.2 A (induced load)	30 VDC 2 A (resistance load) 30 VDC 1 A (induced load)
	Output Delay	Under 5 ms (Operating& Recovery Time)	
	Initial Contact Resistance	Under 50 mΩ	
	Life time	Electrical life time: $\geq$ 100,000 times	Mechanical life time: $\geq$ 100 million times
EXT IN	Input	Non-voltage contact input	
	Number of Inputs	4 points	
PI/O	Input	Photo-Coupler Isolation 24 VDC 7 mA 16 points *the sink (- common), the source (+ common) either one is possible	
	Output	Photo MOS 24 VDC 50 mA 16points *the sink (- common), the source (+ common) either one is possible	
REMOTE I/O	Input	Link terminal, 16 point type, transmission delay time: Standard type (Model: B7A-T6D2, OMRON made)	
	Output	Link terminal, 16 point type, transmission delay time: Standard type (Model: B7A-R6A52, OMRON made)	
	Transmission Distance	Maximum 500 m (various with wiring configuration)	

2.4. Tool Unit Performance Chart

Form	TOOL Model	Motor Output (W)	Torque Range (N•m)	Free Speed (rpm)	Output Shaft Size (mm)	Weight (kgf)	Total length (mm)	Spindle Offset (Min. Pitch: mm)	Note
Angle	ASG-EH2-R1020-A	100	4–20	1027	9.5 sq	1.4	386	R 13.5	
	ASG-EH2-R1030-A		6–30	702	9.5 sq	1.5	393	R 17.2	
Straight	ASG-EH2-R0005-SL	50	1–5	1694	Hex. 6.35	1.2	296	R 26	
	ASG-EH2-R0005-SP			1694	Hex. 6.36	1.2	296	R 26	
	ASG-EH2-R0005-SC			1694	9.5 sq	1.1	228	R 26	
	ASG-EH2-R0010-SL		2–10	942	Hex. 6.35	1.2	296	R 26	
	ASG-EH2-R0010-SP			942	Hex. 6.36	1.2	296	R 26	
	ASG-EH2-R0010-SC			942	9.5 sq	1.1	228	R 26	
	ASG-EH2-R1016-S	100	3.2–16	1247	9.5 sq	1.3	344	R 23.5	
	ASG-EH2-R1020-S		4–20	1053	9.5 sq	1.3	344	R 23.5	
	ASG-EH2-R2035-S	200	7–35	1169	9.5 sq	2.0	406	R 24	
Pistol	ASG-EH2-R0005-P	50	1–5	1694	9.5 sq	1.1	202	R 26	
	ASG-EH2-R0010-P		2–10	942	9.5 sq	1.1	202	R 26	
	ASG-EH2-R1016-P	100	3.2–16	1247	9.5 sq	1.4	220	R 26	
	ASG-EH2-R1016-PH								
	ASG-EH2-R1020-P		4–20	1053	9.5 sq	1.4	220	R 26	
	ASG-EH2-R1020-PH								

Noise level

TOOL TYPE	Noise Level
ASG-EH2-R2120-S	59 dB(A)

Note: Used a representative model to measure the noise level when a tool unit executes fastening operation.

2.5. Handy2000 Lite System Layout
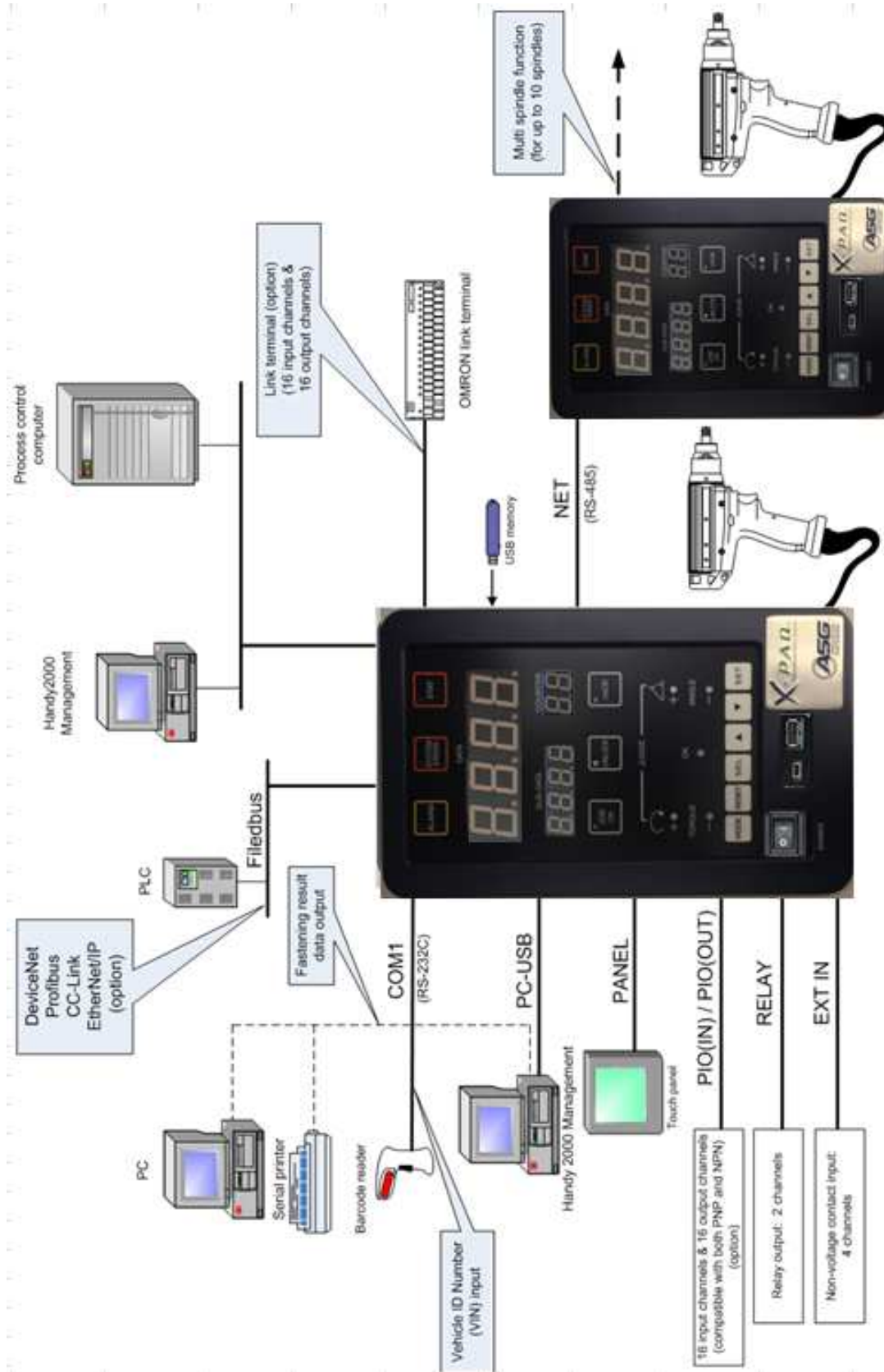
3. Unit Section Name & External Dimension

3.1. Controller Section
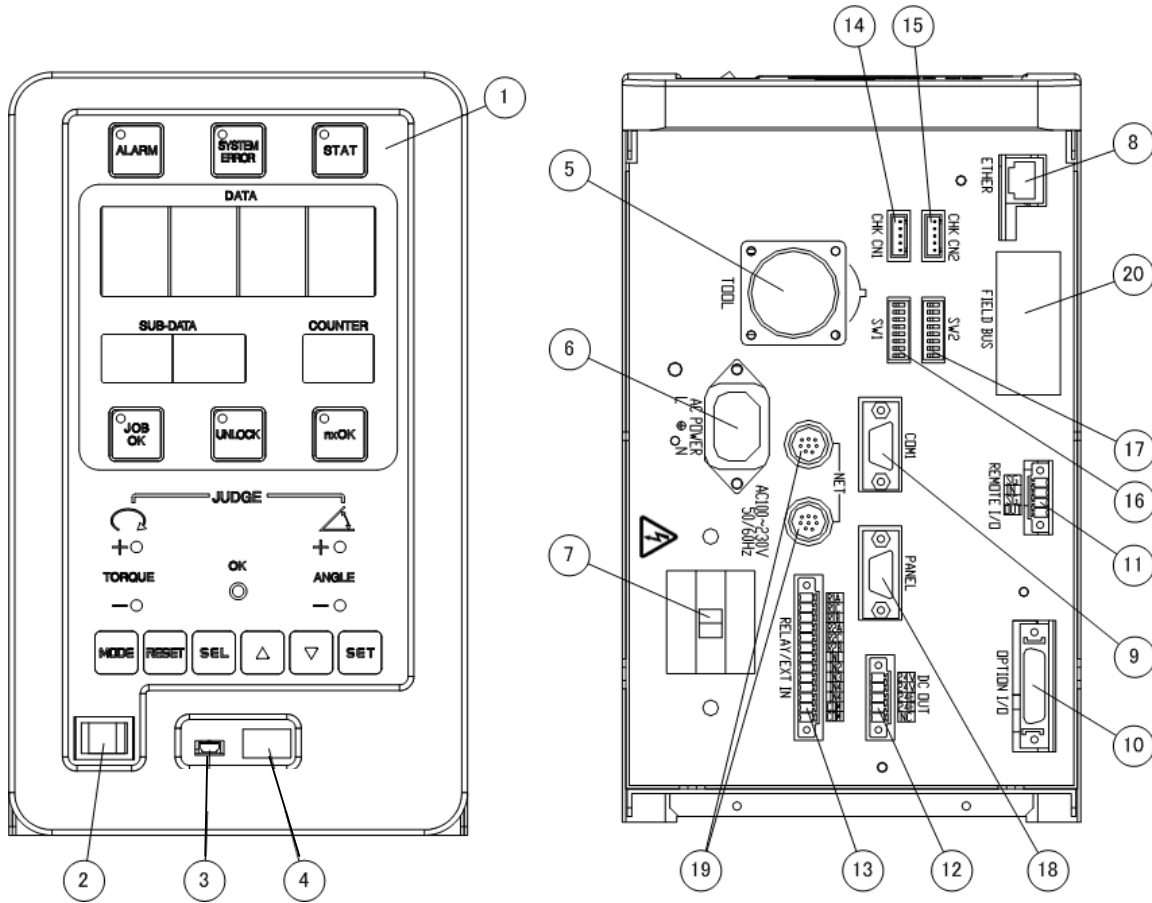
No.	Name	Function
1	Front Panel	Operation panel for various setting and display
2	Power Switch	System power switch (Power will not turn on unless the switch of the main power source breaker is ON)
3	PC-USB	USB connector (miniB type) to be connected with X-PAQ management software
4	USB FLASH DRIVE	Connector (A type) for USB flash drive
5	Tool	Tool cable connector
6	AC Power	AC power cable connector
7	Main Power Breaker	Centro-printer connection cable
8	ETHER	ETHERNET connector
9	COM1	RS-232C connector (used for connecting withX-PAQ management software or barcode reader or for transmitting serial data to external equipment)
10	PIO	(*option) Control I/O signal connector (parallel port)
11	REMOTE I/O	(*option) Remote I/O connector for control
12	DC OUT	24 VDC power source output connector
13	RELAY/EXT IN	Relay output for control, Connector for non voltage contact input
14	CHK CN1	Connector for monitor output
15	CHK CN2	Connector for monitor output
16	SW1	Dip-switch 1 for system setting
17	SW2	Dip-switch 2 for system setting
18	PANEL	Connector for touch panel connection
19	NET	Connector for network connection (at the time of using Multi Spindle function)
20	FIELD BUS	(*Option) Port for connecting field bus

3.2. Control Panel

No.	Name	Function
1	ALARM LED (Yellow)	• The lamp lights up during the power is on. → The Battery voltage drop • The lamp lights up when the data is transmitting. → Transmission is abnormal or the printer is alarming. • Recognizing, reading, writing status is displayed by blinking when USB flash drive is inserted
2	SYSTEM ERROR LED (Red)	This LED turns on solid when a system error occurs.
3	STAT ERROR LED (Red)	The lamp is on when a result value of Statistics Function is statistic NG. (available in the future)
4	DATA LED	• Fastening Judgment. Green light → OK. Red light → NG. The Result is displayed. • Fastening Mode. Torque mode: Torque mode data only. The other modes: Torque/Angle mode data.
5	SUB-DATA LED	• Selected channel No. is displayed while the channel function is on. • Selected JOB No. is displayed when JOB function is on. Channel No. is displayed while JOB is executed.
6	COUNTER LED	• Error Proofing Function is on. The setting value is displayed. • JOB Function is on. The total fastening time is displayed.
7	JOB OK LED (Seven colors)	This LED turns on solid when the JOB is used. This seven-color LED changes its color according to the operation.
8	UNLOCK LED (Blue)	This LED turns on solid when the tool is operable (unlocked, channel enabled, JOB enabled, etc.).
9	nxOK LED (Seven colors)	This LED turns on solid when the channel counter function is used. This seven-color LED changes its color according to the operation.
10	JUDGE LED	The light is on in response to the fastening Judgment result
11	OPERATION KEY	This key is used for panel operation. 　MODE : Mode selector key　　　RESET : Reset key 　SEL : Selection key　　　　　　▲ : Up key 　▼ : Down key　　　　　　　　SET : Setting key

* For the operation of the panel, please refer to "11 Description of Panel Operation"

3.3. Tool Unit

Angle Type
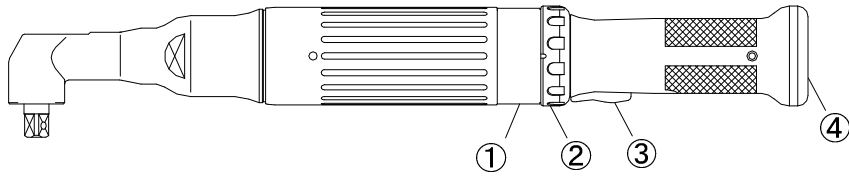
Straight Type
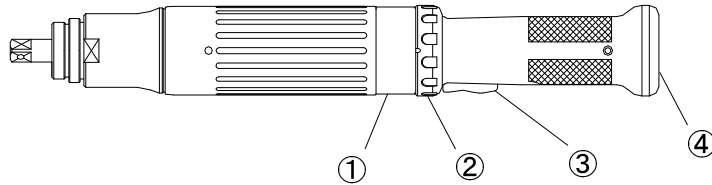
Straight Type (Connector Start Type)
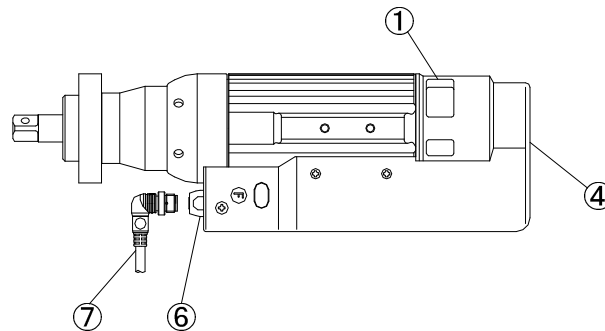
* There is no Start switch and Rotation direction selection switch on this tool.
This tool is ONLY operated by inputting Start/Reverse signal from external.

Pistol Type
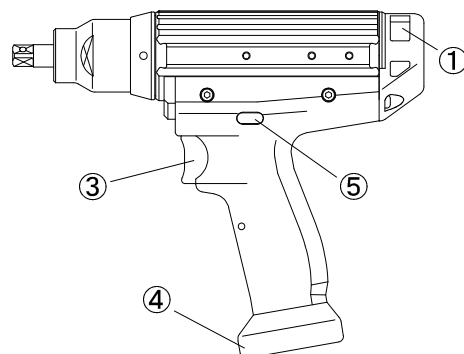
* Reaction supporting mechanism design/manufacture is possible. Please contact us for further information.

No.	Name	Function

1	LED display	To indicate Fastening Judgment Results and the state of system.
		(1) Fastening Judgment
		    High NG = Red OK = Green Low NG = Yellow
		(2) Rotation Direction
		    Forward = Blue Reverse = Red purple
		(3) System error = Sky blue (Blinking)
		(4) Reset = White (Blinking) (Use the tool unit switch)
		(5) Reject = Red (Blinking) (Use the tool unit switch)

2	Rotation direction selection/reset switch	The switch for selecting rotation direction, reset/Reject
		(1) Rotation direction
		    "F" = Forward, "R" = Reverse
		  * Program parameter "P11:DIRECTION" right screw/left screw rotation. Select "F", "R" to decide the direction
		(2) Adjust Switch to "<<" to reset [*1]
		(3) Adjust Switch to "<<" over 3 Sec. to Reject

3	Start switch	The trigger for start. Switch On to start.
4	Cable connector	The cable connector for Control and Tool Units.

5	Rotation direction selection switch (Pistol type)	A selection switch for switching operation rotation direction.
		    "F" = Forward rotation and "R" = Reverse rotation
		  * Program parameter "P11: DIRECTION" right/left screw rotation direction determines the rotation directions respectively at the time of selecting "F" or "R."
		  * when the switch is switched 4 times within 1 sec., the reset input is done. [*1]
		  * By turning ON dip switch SWI-8, rotating direction can be changed. Please refer to [5.8 DIP-SWITCH].

6	Switch Connector	The connector for external switch.
7	Switch Cable	The cable for connecting between external switch and switch connector. * See 5.11 Switch Connector

*1   Reset signal from tool is only applied for cancelling system error.

The function is different from internal "RESET" input signal

3.4. Controller External Dimension

This is the control unit for small and light-weight Hand Nut runners.

ASG-EH2-HT40-000*   Weight: Approx. 7.7 kg

Wall fittings (Accessory)
ASG-EH2-BRW02

Controller Base (Option)
ASG-EH2-CF02
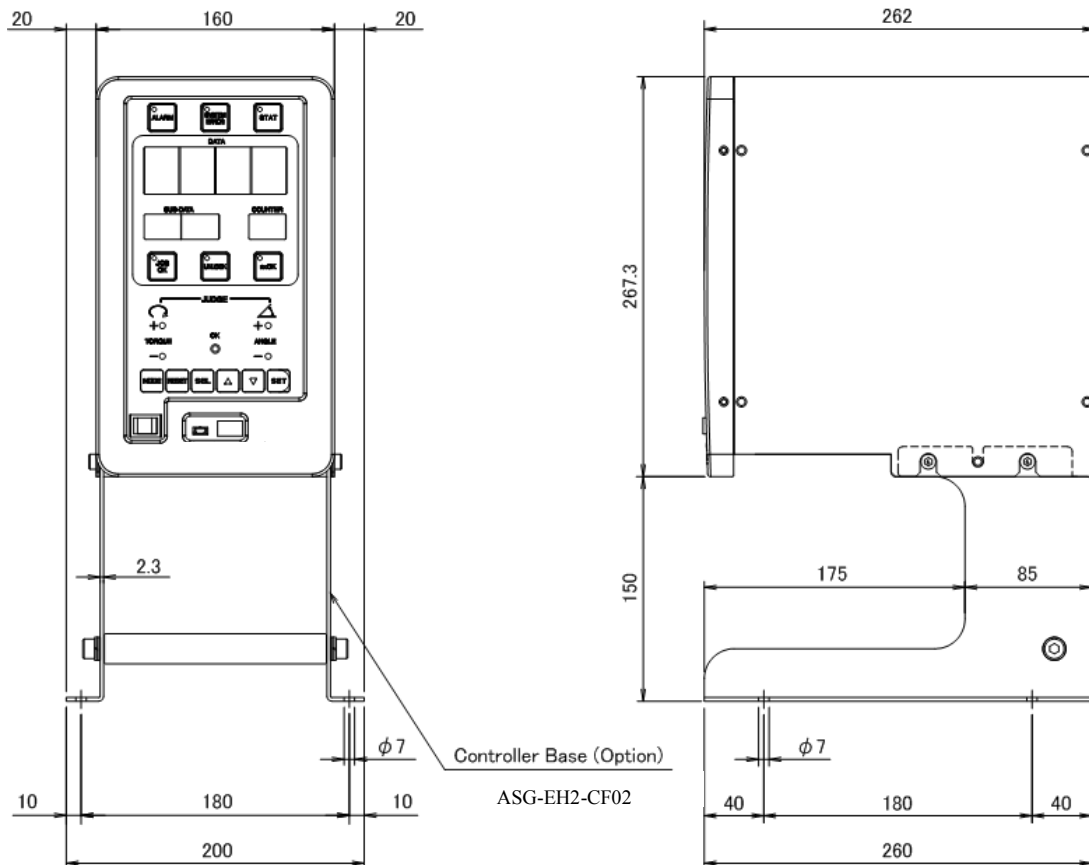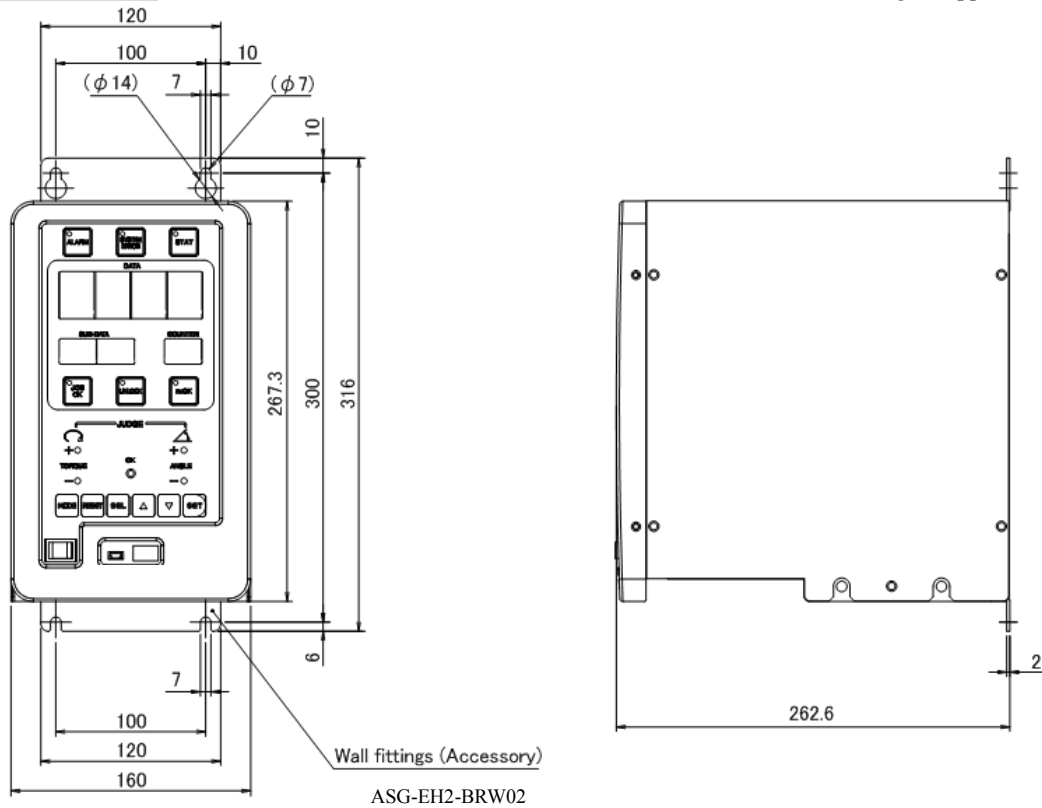
3.5. Tool Unit External Dimension

Angle Head Type

ASG-EH2-R1020-A, ASG-EH2-R1030-A

(mm)
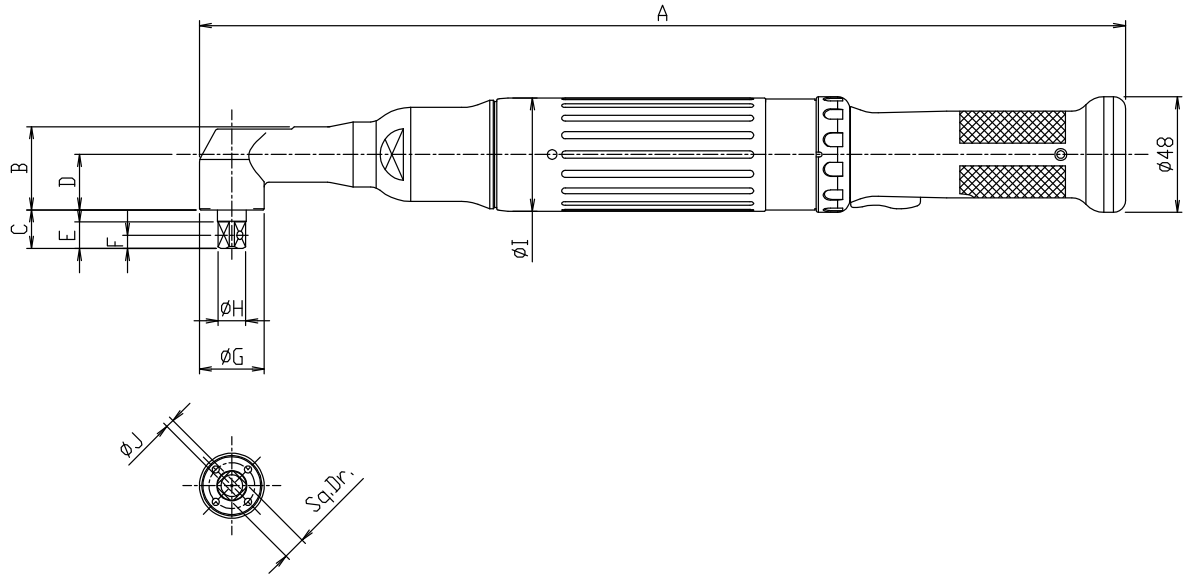
TOOL TYPE	A	B	C	D	E	F	G	H	I	J	Sq. Dr.
ASG-EH2-R1020-A	386	34.5	16	23	11	5.5	27	11.5	47	3.5	□9.5
ASG-EH2-R1030-A	393	39.5	16	27	11	5.5	34.4	11.5	47	3.5	□9.5

Straight Head Type

ASG-EH2-R0005-SL, ASG-EH2-R0010-SL
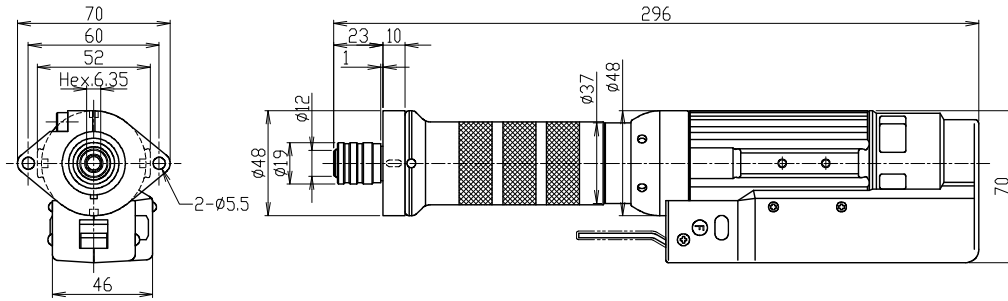
ASG-EH2-R0005-SP, ASG-EH2-R0010-SP
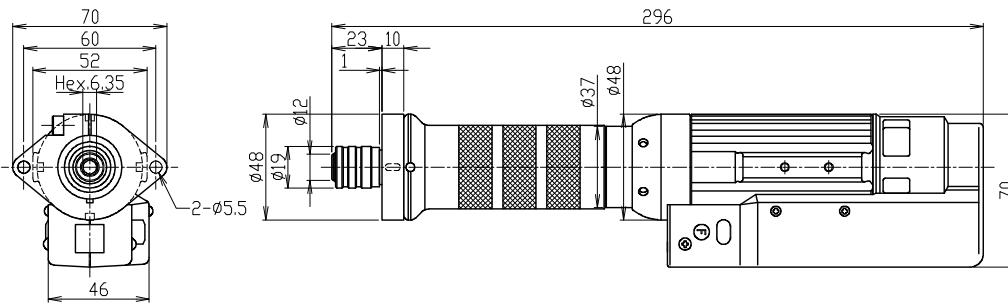
ASG-EH2-R0005-SC, ASG-EH2-R0010-SC
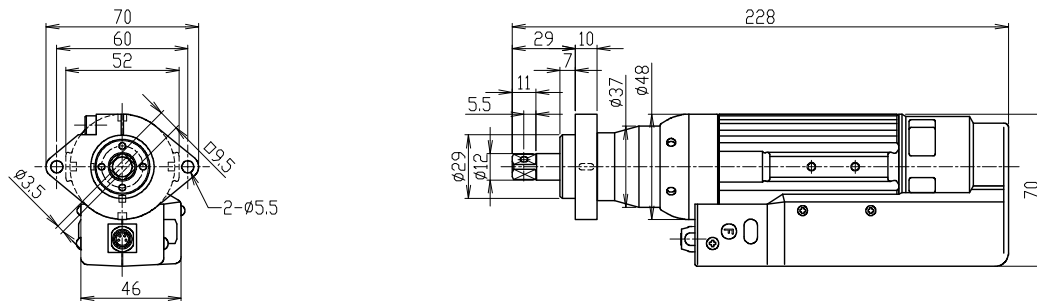
ASG-EH2-R1016-S, ASG-EH2-R1020-S

Involute Spline
34×32×1.0(20°)

M30×1

Ø12
Ø36
Ø48
Ø3.5
Ø9.5
Ø39
Ø47

5.5
9 8
11
22 17
344

ASG-EH2-R2035-S

4-M5 DRILL THRU

Ø12
Ø28
Ø48
Ø3.5
Ø50
PCD.40
Ø9.5
Ø45
Ø48
38

5.5
11
25 7
3
406
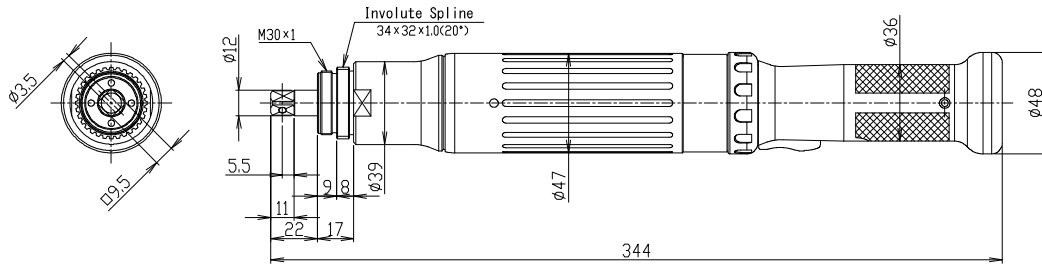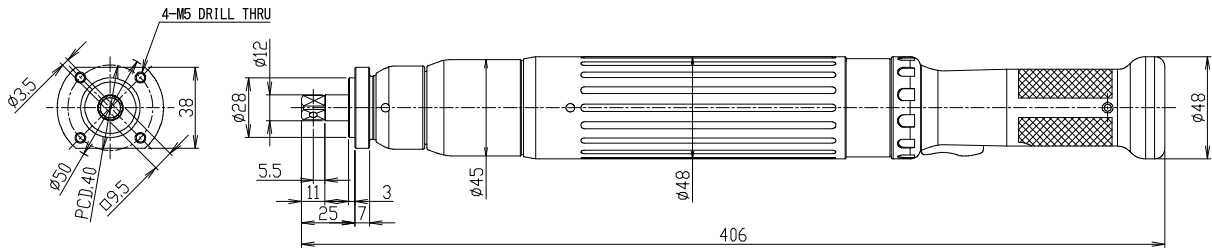
Pistol Type

ASG-EH2-R0005-P, ASG-EH2-R0010-P
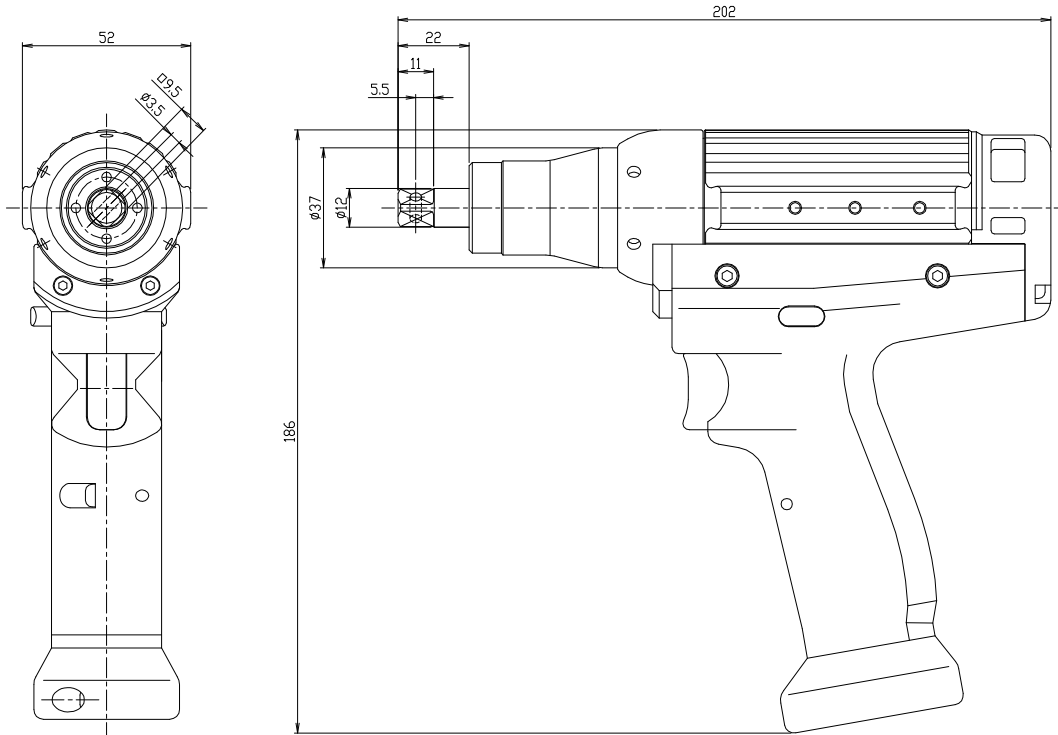
ASG-EH2-R1016-P & ASG-EH2-R1020-P

ASG-EH2-R1016-PH & ASG-EH2-R1020-PH

52

220

22

11

17

5.5

9 8

Ø9.5

Ø3.5

Ø39

Ø12

186

M30×1

Involute Spline
34×32×1.0(20°)
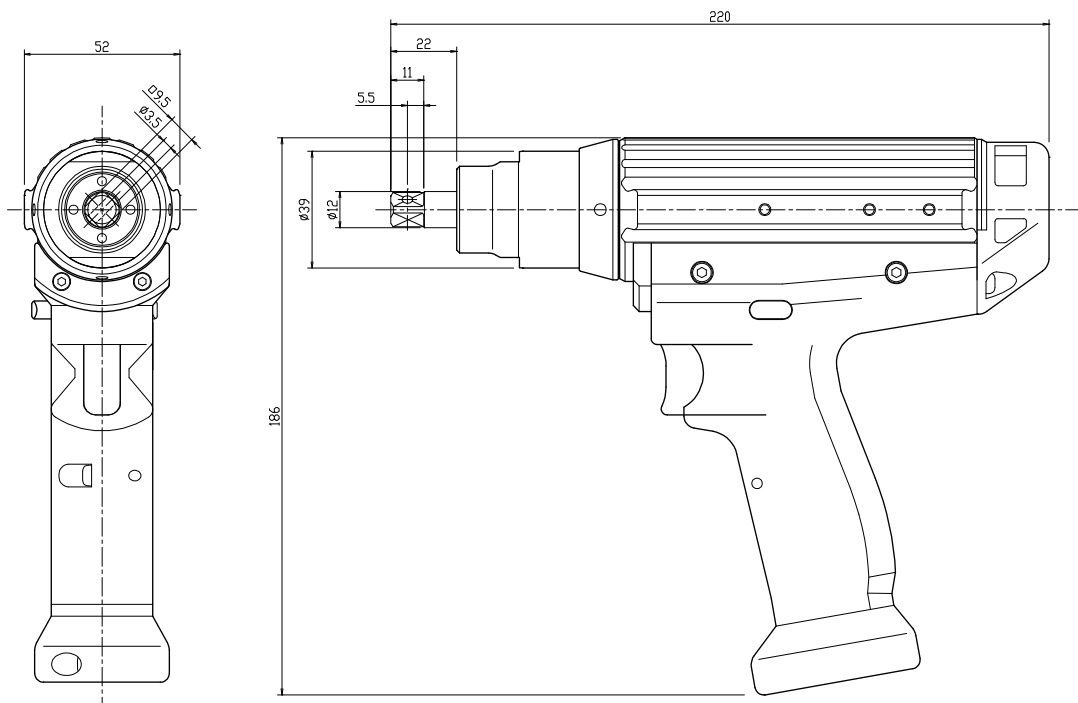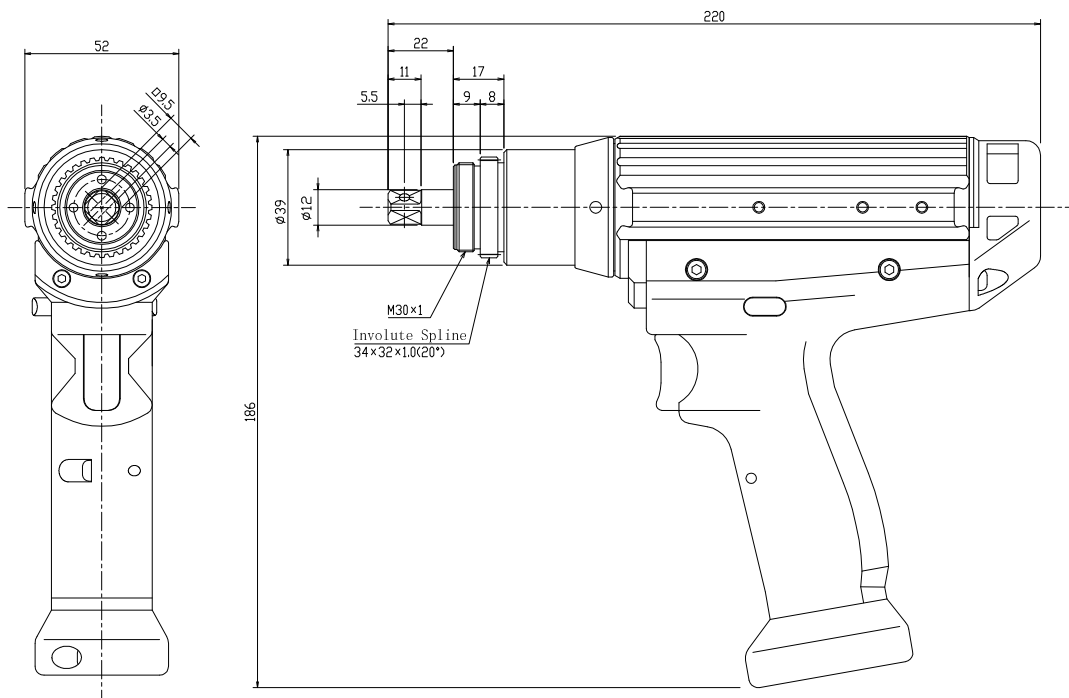
4. Installation

The handheld nutrunner system consists of independent units and can be installed very easily. Please keep the following points in mind to upgrade the system.

4.1. How to install

1) The controller is provided with various display lamps. So, set it up in a place where an operator is able to have a good view of it.

⚠ 2) When installing the controller, in order to prevent accidents such as dropping and overturning, be sure to fasten it using the controller mounting fixture.

3) Various connection ports for each cable are located on the bottom of the controller. Please keep a space of at least 200 mm open at the bottom.

4) Please keep a space of at least 10 mm from the left and right hand side of the controller.

5) The controller is protected by the cabinet, but it is necessary to avoid installing it in a place spattered by water, highly humid, affected by electric noise, or exposed to dust or mist.

4.2. Precaution for cable connection

⚠ 1) Be sure to ground the power connector.

2) Use the exclusive power cables (standard specification).

3) Do not supply the controller with insulation voltage through an insulating transformer or the like.

4) Make sure the main switch is "OFF" before connecting the power cable. After making the connection, completely secure the cable with a retainer.

5) When connected to TOOL cable, please make sure that the power switch is OFF and fully check that there is no foreign substance within the connector. Be sure that the connector is properly connected. In addition, use a pin spanner etc. to fasten the connector of the tool (diameter 35 mm, pin hole diameter 4 mm). The fastening torque should be around 20 N•m.
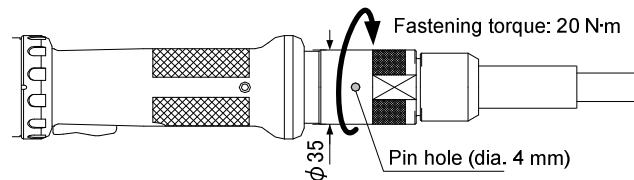
6) Please make sure the external P I/O and REMOTE I/O are exactly installed in accordance with the instructions which are provided seperately.

4.3. Precaution for Power ON

1) By turning the power ON to the controller, the controller activates a self-diagnosis (Lamps on the front panel blink), and then the system starts.

2) There may be cases where the system error "E111. TOOL MIS." (tool mismatch) occurs just after the controller is powered ON, which is not a failure. This is caused when a different type of tool from the previous one is connected to the controller. The above-mentioned system error may occur also when the product is purchased newly.
   If the connected tool is wrong, turn OFF the power and connect the proper tool. To use the connected tool as it is, cancel the system error with the RESET key on the front panel and make the new tool recognized. In this case, the set fastening parameters are cleared.

<Tool recognition method>

DATA

E111

↓ RESET key

1) Press the RESET on the front panel to cancel the system error.

DATA

init

SUB-DATA **nSEt**   COUNTER **in**
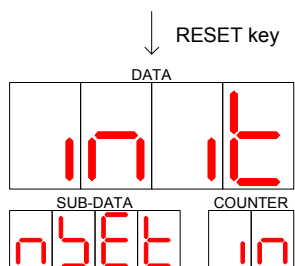
2) Change "NSET" on the SUB-DATA section to "SET" with the "▲" and "▼" keys and press the SET key to execute tool recognition.

↓ "▲" and "▼" keys

DATA

init

SUB-DATA **SEt**   COUNTER **in**

↓ SET key

DATA

— — — —

SUB-DATA **SEt**   COUNTER **in**
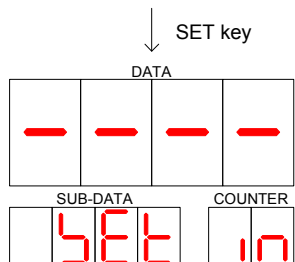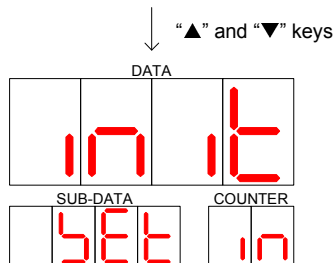
3) During the execution of tool recognition, "— — — —" is displayed on the SUB-DATA section.

↓

DATA

PoUr

SUB-DATA **oFF**   COUNTER
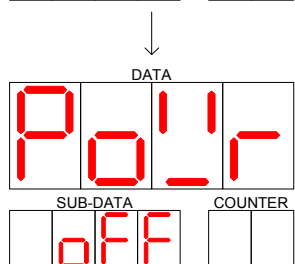
4) When the execution of tool recognition is completed, "POWER" is displayed on the DATA section and "OFF" is displayed on the SUB-DATA section. Then turn ON the power again.

↓ Turning ON the power again

5) Before turning ON the power again, wait for five seconds or more after the power is turned OFF.

5. Cable/Connector

5.1. Tool Cable

Tool cable is used to connect tool unit to controller.

Tool side   **Controller side**

Tool Cable Specification

ASG - EH2–CVS ＊ ＊ – S S

Cable length

05:05 m
10:10 m
15:15 m
20:20 m *
25:25 m *
30:30 m *

Shape of tool side
  S:Straight

Shape of controller side
  S:Straight

＊ Make-to-order item
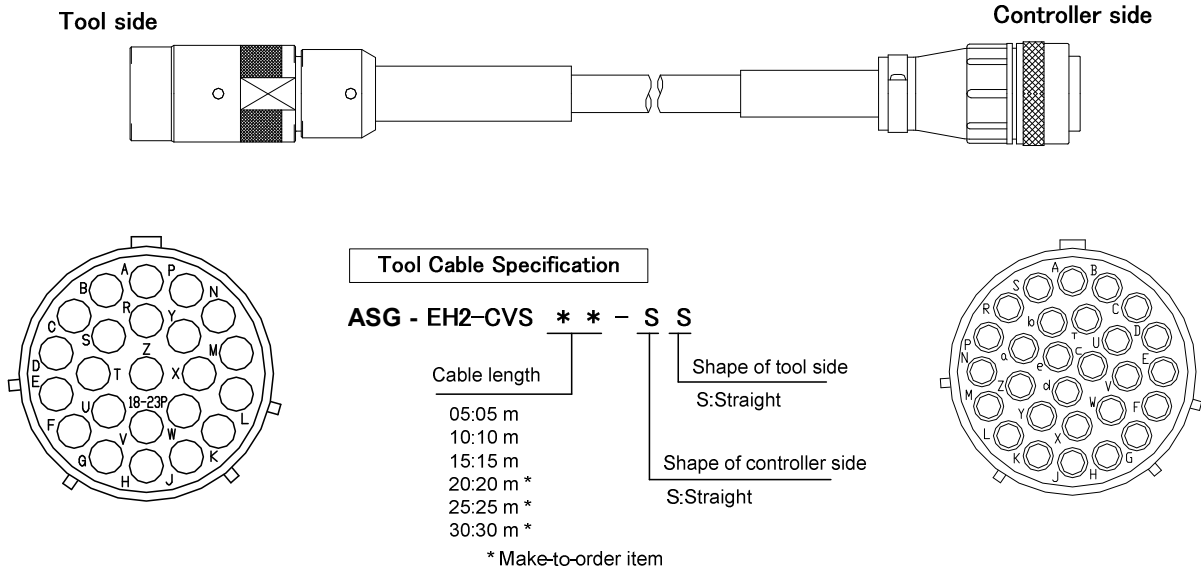
Tool side Pin No.	Signal Name	Controller side Pin No.
A	SIN+ (S1)	C
B	SIN- (S3)	D
N	COS+ (S2)	E
P	COS- (S4)	F
R	Excitation Current Power (R1)	G
Y	Excitation Current Power (R2)	H
X	FG	U
J	T/T IN+10V	J
K	T/T IN-10V	K
L	T/T OUT+	L
M	T/T OUT-	M
V•W	FG	N
C	RS-485 DATA+	V
T	RS-485 DATA-	W
U	START	X
D	(none)	Y
S	VCC	Z
Z	S.GND	d
F	U phase	A
G	V phase	b
H	W phase	R
E	Ground/Earth	c

⚠️ **Please make sure there is no foreign substance inside the cable before any connection. Tighten connection ring after cable is properly connected.**

5.2. RELAY/EXT IN Connector

This connector is for outputting relay for system controlling, and for non-voltage contact signal inputting.

The allocation of signals to the pin Nos. may be freely changed by using the management software. (Excluding some signals)

Adaptable Connector

ASG Type	: ASG-EH2-FCN13-RL
	* Type: Equivalent to MC1.5/13-STF-3.5 (Phoenix Contact)
Adaptable power cable size	: AWG28–16 (0.08–1.5 mm^2)

5.2.1 Replay Output

<Contact Specification>

Output point	: 2 points
Contact rating	: 125 VAC 0.4 A (resistance load) 30 VDC 2 A (resistance load)
	: 125 VAC 0.2 A (inductive load) 30 VDC 1 A (inductive load)
Output time delay	: 5 ms or less (operation time & return time)
Initial contact resistance	: 50 mΩ or less

Pin No.	Signal Name	Default setting	Changeable
R1A	Relay 1 normal open output		
R1C	Relay 1 COM	(none)	Yes
R1B	Relay 1 normal close output		
R2A	Relay 2 normal open output		
R2C	Relay 2 COM	(none)	Yes
R2B	Relay 2 normal close output		

<Wiring diagram>
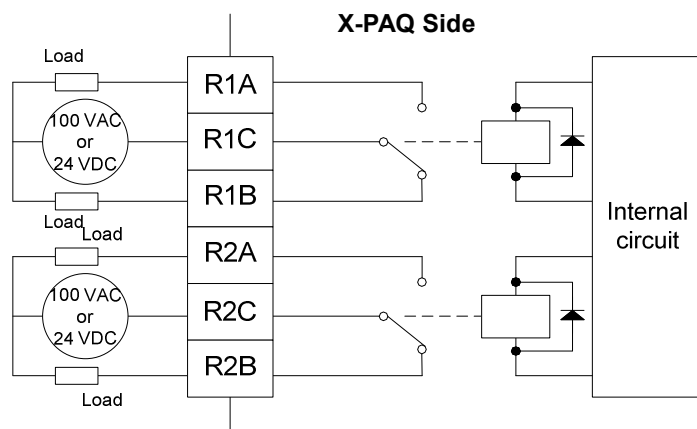
5.2.2. EXT IN Input

Specification

Number of input point   : 4 points

Contact type   : Non-voltage input contact

Pin No.	Signal Name	Default setting	Changeable
IN1	IN1	(none)	Yes
IN2	IN2	(none)	Yes
IN3	IN3	(none)	Yes
IN4	IN4	LOCK	No
IN4			
COM	INPUT COM		
COM			

Input current: 7 mA

Wiring diagram
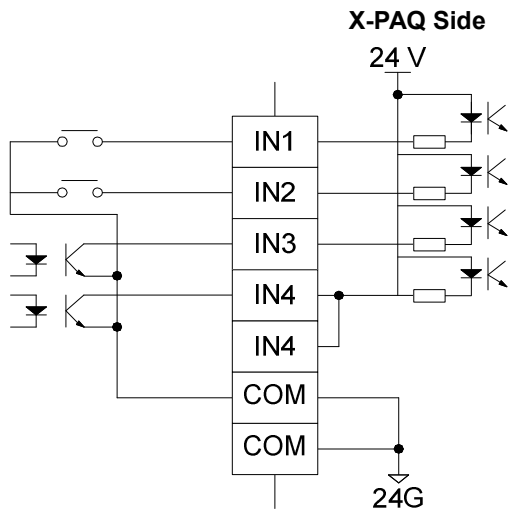
5.3. PIO Connector (Optional)

This is a parallel I/O connector used for controlling system. It may be connected from both sink (-COM) and source (+COM) power sides.

The allocation of signals to the pin Nos. may be freely changed by using the optional X-PAQ management software (hereinafter referred to as the management software).

Connector pin arrangement

Pin No.	Input signal	Pin No.	Output signal
1	IN1	19	OUT1
2	IN2	20	OUT2
3	IN3	21	OUT3
4	IN4	22	OUT4
5	IN5	23	OUT5
6	IN6	24	OUT6
7	IN7	25	OUT7
8	IN8	26	OUT8
9	IN9	27	OUT9
10	IN10	28	OUT10
11	IN11	29	OUT11
12	IN12	30	OUT12
13	IN13	31	OUT13
14	IN14	32	OUT14
15	IN15	33	OUT15
16	IN16	34	OUT16
17	Control signal power Input COM	35	Control signal power Output COM
18	FG	36	

Input specification… Input voltage : 24 VDC, Input current : 7 mA

Output specification… Output voltage : 24 VDC, Maximum current : 50 mA

Adaptable connector
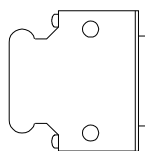
Manufactured by Sumitomo 3M: Plug   10136-3000PE
Shell   10336-52F0-008

ASG type
ASG - ENRZ－CN36－EX

Input signal wiring diagram
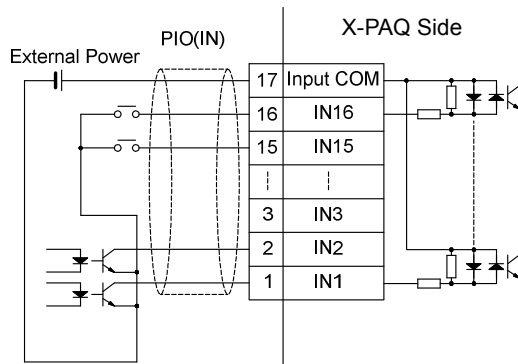
Sink (minus COM) connection   Source (plus COM) connection
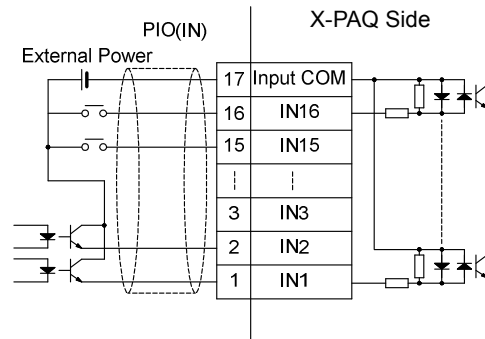
Output wiring diagram
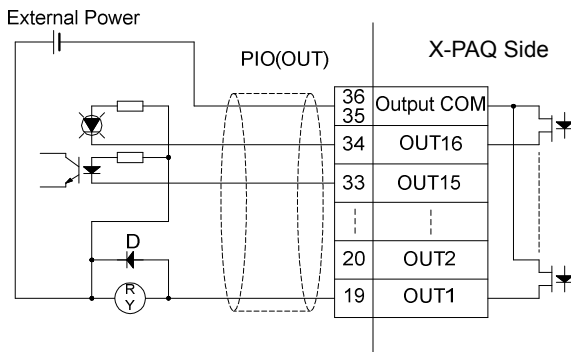
Sink (minus COM) connection   Source (plus COM) connection
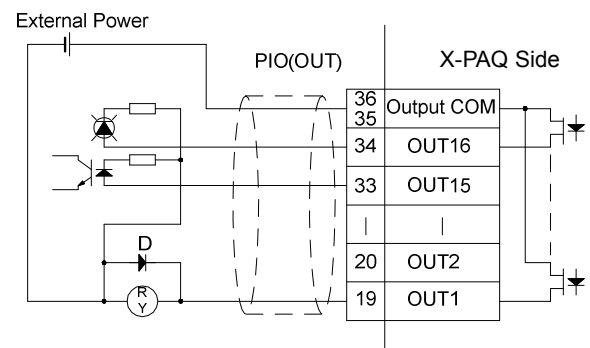
5.4. The connector for REMOTE I/O (option)

A remote I/O connector is used for system controlling.

(Please specify the type of connector that is compatible with REMOTE I/O while placing a controller order. Please refer to "2.1. Unit Type" for more details about connector types.)

There are 16-point controlling input signals and 16-point output signals for which 1 to 1 transmission is used for each point. This connector can be connected with an Omron link terminal. By comparing with connection through PIO connector, remote I/O connector is more economical in the way of wiring, and its correspondence delivery distance also expands to a maximum of 500 m. (Since deliverable distance may vary with wiring conditions, please refer to Omron link terminal catalog and user manuals.)

Allocation of signals in accordance with pin numbers may be freely changed by using optional management software.

Input specification: OMRON link terminal   16-point   Delivery delay time: standard
Output specification: OMRON link terminal   16-point   Delivery delay time: standard

Pin No.	Contents
OUT	Link terminal connects to transmission line terminal [SIG] of output unit.
SG	Link terminal connects to power terminal [-] of power unit.
IN	Link terminal connects to transmission line terminal [SIG] of input unit.
SG	Link terminal connects to power terminal [-] of power unit.

Adaptable Connector

ASG Type   : ASG-EH2-FCN4-RM
                                * Type: Equivalent to MC1.5/4-STF-3.5 (Phoenix Contact)
Adaptable power cable size   : AWG28–16 (0.08–1.5 mm^2)
                                (0.75 mm^2 or over is recommended)

5.5. DC OUT Connector

24 VDC Power outputting connector.

It can be used as a general purpose power supply. However, please do not use it to supply equipment that generates noise such as solenoids.

Pin No.	Signal Name	Contents
24V	DC+24 V output	
24V	DC+24 V output	Output current: Max 1 A
24E	GND	
24E	GND	
NC	(not used)	----

Adaptable Connector

ASG Type   : ASG-EH2-FCN5-DC
                                 * Type: Equivalent to MC1.5/5-STF-3.5 (Phoenix Contact)
Adaptable power cable size   : AWG28–16 (0.08–1.5 mm^2)

5.6. CHK CN Connector

This connector is for monitoring voltage output which is used to inspect torque, angle, spindle rotation speed and motor current.

Connector	Pin No.	Signal Name	Output contents
CN1	1	Torque monitor	Outputs loaded torque of T/T by voltage level. Outputs approx. 7.2 VDC when each tool type loaded with rated torque.
	2	Angular pulse	Outputs rotation angle with respect to output-axis of tool unit. [1]
	3	Pulse monitor	Output of encoder A-phase
	4	Analog input	Spare
	5	GND	
CN2	1	Current monitor	Outputs electric current level of motor by voltage level. Outputs approximately 9 VDC when motor outputs at maximum torque.
	2		----
	3		----
	4	Speed monitor	Outputs tool output spindle rotation speed by voltage level (Outputs rotation speed command to tool by voltage level.) [2]
	5	GND	Signal ground for each monitoring outputs.

Adaptable Connector

Connector type   : B5B-XH-A

Manufacturer   : Japan Solderless Terminal

ASG type   : ASG-ENRZ-CVCK-030 (3 m)

*1   When controller is measuring angle, it considers 1 (deg) as the pulse wave rising edge till the next pulse rising edge, and outputs voltage. (TTL signal)
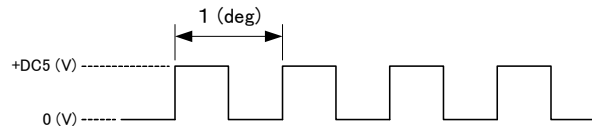
*2   It outputs rotation speed instruction by voltage level: maximum DC±10V. Number of rotations per monitor voltage 1 V depends on each tool type and as follows.

Tool Type	Speed Instruction Voltage	Tool Type	Speed Instruction Voltage	Tool Type	Speed Instruction Voltage
ASG-EH2-R1020-A	102.7 rpm/V	ASG-EH2-R0005-S	169.4 rpm/V	ASG-EH2-R0005-P	169.4 rpm/V
ASG-EH2-R1030-A	70.2 rpm/V	ASG-EH2-R0010-S	94.2 rpm/V	ASG-EH2-R0010-P	94.2 rpm/V
		ASG-EH2-R1016-S	124.7 rpm/V	ASG-EH2-R1016-P*	124.7 rpm/V
		ASG-EH2-R1020-S	105.3 rpm/V	ASG-EH2-R1020-P*	105.3 rpm/V
		ASG-EH2-R2035-S	116.9 rpm/V		

5.7. Communication Connector

5.7.1. ETHER Port

This is an Ethernet (LAN) connection port (RJ-45 connector) used when connecting to the management software.

Please use CAT.5E or better LAN cable when connecting to controller or when using a switching HUB.

We prepare protocols for data collection other than for connection with X-PAQ management software. Please ask a local sales office for details.

5.7.2. COM1 Port

This is a RS-232 connector for connection with the barcode reader, PC and serial printer connection. It can also be used for connection with the management software.

\<Connector Pin Allocation\>

No.	Signal
1	DCD
2	RXD
3	TXD
4	VCC (+5 V output Max. 200 mA)
5	GND
6	DSR
7	RTS
8	CTS
9	RI (not used)

```
   5    ◎    9

        ┌─┐
        │ │
        └─┘

   1    ◎    6
```

[Controller Side]
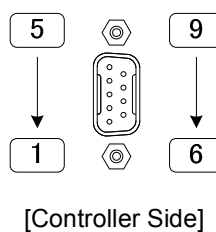
Adaptable Connector

Shape	: D-sub 9pin female connector (inch screw #4-40UNC)
Recommended connector type	: 17JE-13090-02 (D8C6)
	(straight pin with shield hood, solder type)
Manufacturer	: DDK Ltd.
Adaptable power cable	: AWG #22 and below (stranded)

Note1: Please use RS-232C cross-cable (with shielding) for connection with PC management software.

    Recommended cable   : ASG-ENRZ-CVSR-015 (1.5 m)

                                        : ASG-ENRZ-CVSR-050 (5 m)

                                        : ASG-ENRZ-CVSR-100 (10 m)

    Connector model   : D-sub 9-pin on both sides, female Connector

    Manufacturer   : ASG

Note 2: Please use RS-232C cross cable (with shielding) for connection with serial printer.

    Recommended cable   : ASG-ENRZ-CVSP-030 (3 m)

                                          : ASG-ENRZ-CVSP-050 (5 m)

                                        : ASG-ENRZ-CVSP-100 (10 m)

    Connector type   : D-sub 9-pin (female connector), and D-sub 25-pin (male connector)

    Manufacturer   : ASG

<Recommend Serial Printer>

    Printer model   : VP-700

    Manufacturer   : EPSON

5.7.3. PANEL Port

RS-422 connector is for connection with touch panel.

It can be connected to touch panel with the protocol of Modbus master. Please refer to Exhibit "Touch panel communication specifications" for details about connection.

<Connector Pin Allocation>

No.	Signals
1	RD+
2	RD-
3	TD+
4	TD-
5	GND
6	Connection check input
7	GND
8	DC+24 V Output (Max. 1.2 A)
9	24 VDC GND
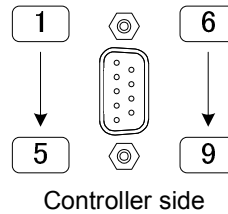
Service power   24 VDC MAX 1.2 A

Controller side

Adaptable connector

    Shape   : D-sub 9 pin male connector (attaching inch screw #4-40UNC)

    Recommended connector type : 17JE-23090-02 (D8C6)

                                                (straight pin type with shield hood, solder type)

    Manufacturer   : DDK LTD.

    Adaptable power cable   : AWG #22 and below (stranded)

5.7.4. PC-USB port

This is a port for connection with the PC (management software). The connector is of mini-B type. Connect with the PC using a cable of USB2.0 "A-mini-B" type.

⚠ In an electrically noisy environment, the PC side may malfunction to cause a communication error. In such a case, use as short a USB cable with ferrite core as possible. (U2C-MF15BK manufactured by ELECOM etc.)
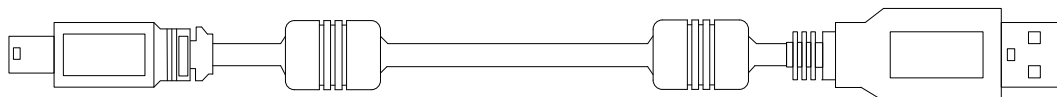
5.8. DIP-SWITCH

These are dip-switches used for system setting. Please be sure to turn OFF unused switches.

SW1

No.	Function Name	Function Purpose	Default
1	PC data out error	Set the procedure for communication error in PC data out if any. OFF: The ALARM lamp lights up in the front panel and [DATA OUT ERR] signal is output, but the next fastening is available. ON: The ALARM lamp lights up on the front panel and [SYSTEM ERR] and [DATA OUT ERR] signals are output. Unless any error is removed by inputting RUN or reset signals, the next fastening cannot be executed.	OFF
2	Used by the manufacturer	Not usable. Do not operate it.	OFF
3	Used by the manufacturer	Not usable. Do not operate it.	OFF
4	Used by the manufacturer	Not usable. Do not operate it.	OFF
5	Used by the manufacturer	Not usable. Do not operate it.	OFF
6	Used by the manufacturer	Not usable. Do not operate it.	OFF
7	Used by the manufacturer	Not usable. Do not operate it.	OFF
8	Rotating Direction	Change rotating direction for Pistol Type tools. OFF : [F] Forward rotating, [R] Reverse rotating ON : [F] Reverse rotating, [R] Forward rotating *Available Ver. HA1050 or later	OFF

SW2

No.	Function Name	Function Purpose	Default
1	Used by the manufacturer	Not usable. Do not operate it.	OFF
2	Used by the manufacturer	Not usable. Do not operate it.	OFF
3	Used by the manufacturer	Not usable. Do not operate it.	OFF
4	Used by the manufacturer	Not usable. Do not operate it.	OFF
5	Used by the manufacturer	Not usable. Do not operate it.	OFF
6	Battery Alarm	Select how to deal when alarm due to low battery is occurred. OFF: Turn on Alarm Lamp, and output [SYTEM ERR] [CLOCK ALARM] signals. Input of [RUN] or [RESET] signal cancels the error. ON: Turn on Alarm Lamp, and output [CLOCK ALARM], but operation can be continued as usual.	OFF
7	Used by the manufacturer	Not usable. Do not operate it.	OFF
8	Used by the manufacturer	Not usable. Do not operate it.	—

5.9. NET Cable

This cable is used to connect NET ports among controllers.

CONTROLLER SIDE	
PIN No.	SIGNAL
1	RS485 +TXD
2	RS485 −TXD
3	GND
4	GND
5	−−−
6	SYNC. I/O1
7	SYNC. I/O2
8	GND
Frame	

CONTROLLER SIDE	
PIN No.	SIGNAL
1	RS485 +TXD
2	RS485 −TXD
3	GND
4	GND
5	−−−
6	SYNC. I/O1
7	SYNC. I/O2
8	GND
Frame	
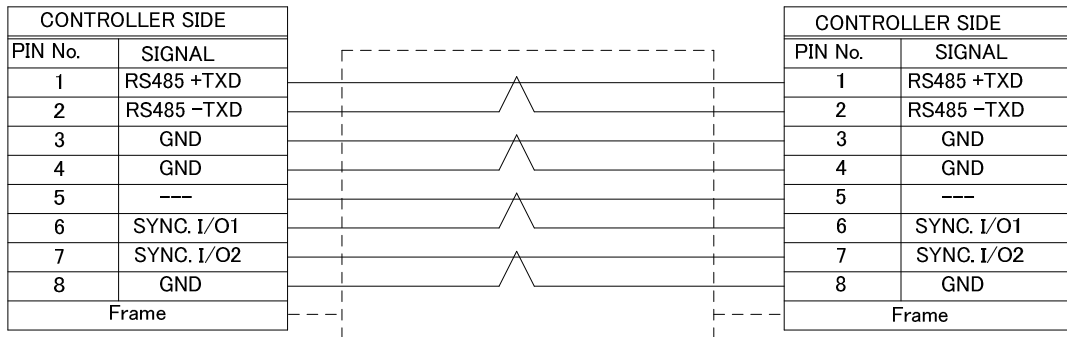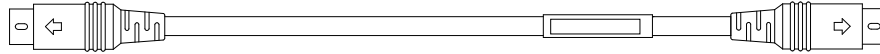
Adaptable Model	Cable Length	ASG Type
ASG-EH2-HT40-*	0.5 m	ASG-EH2-CVNK-005
	1.0 m	ASG-EH2-CVNK-010
	3.0 m	ASG-EH2-CVNK-030

5.10. NET End Resistor

In using Multi-Spindle function, NET end resistors must be installed into the NET port of the last controller in the chain, and NET port not-in-use on the MAS controller.
The NET end resistor is only needed when the Multi-Spindle function is being used.

Adaptable Models	ASG Type
ASG-EH2-HT40-*	ASG-EH2-CNST

5.11. Switch Connector

When tool unit with connector switch type is selected, connects switch connector on the tool unit and external switch with switch cable shown below.

5.11.1. Input Signal

Pin No	Color	Signal	Format	Description	Valid Condition
1	Brown	START	Continuous	Starts an operation on Signal ON, stops it on Signal OFF. Stops automatically on fastening completion.	• READY is ON. • LOCK of CONTROL I/O is OFF.
2	White	VCC	—	5 VDC (MAX 10 mA)	—
3	Blue	REVERSE	Continuous	Diverts to Reverse Mode on Signal ON, to Fasten Mode on Signal OFF. Disregards any inputs during operation.	• READY is ON. • START Signal Input is OFF.
4	Black	GND	—	Signal Ground	—

5.11.2. Switch Cable
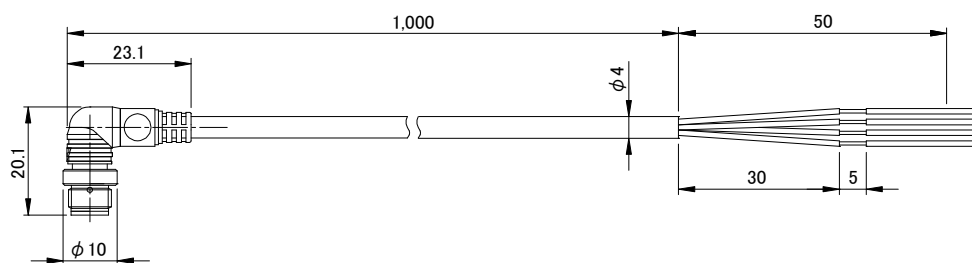
(mm)
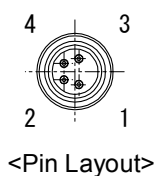
Model	:	Connector Plug with cable
Maker	:	OMRON
Type	:	XS3H-M421-401-R
Core	:	$0.2\ mm^2 \times 4$ lines

<Pin Layout>

5.11.3. Switch Connector Input Circuit
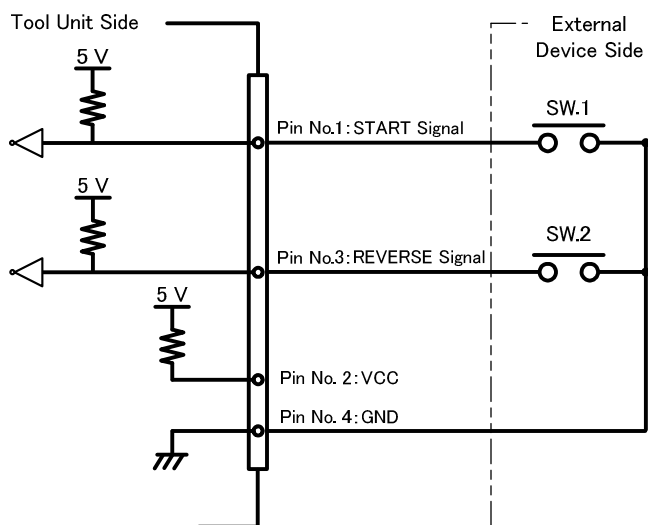
⚠ Caution

(1) Control Input Signal is driven by internal power. Do not impress external voltage on it, otherwise a malfunction may occur.

(2) Make this Switch Cable as short as possible and isolate it with other power line if possible, otherwise a failure may occur due to a noise effect.

(3) The switch cable must be connected only master station when Multi-spindle function is applied. Otherwise a malfunction may occur.

(4) VCC must be kept within allowable current (MAX10 mA). Otherwise, malfunction or failure may occur.

5.12. USB FLASH DRIVE port

This connection port is used when a USB flash drive is used as an external memory device.

<Specifications>

USB 2.0 supported
Connector: USB TYPE-A
Power supply voltage: 5 VDC ±5%
Output current: 500 mA (maximum)

As for the function of the file system, which becomes available by inserting a USB flash drive to this port,
Please refer to the "11.3.5 File system screen (FL)".

IMPORTANT

- **The USB flash drive connector is applicable to a USB flash drive only. Do not connect devices such as a barcode reader and printer other than a USB flash drive. Doing so will cause a failure.**

- **A USB flash drive of SSD type and a USB hard disk are not applicable.**

- **Use a USB flash drive formatted with the file system "FAT32". "FAT (FAT16)" is not applicable. ***

- **USB-HUB cannot be used. Connect a USB flash drive directly to the USB flash drive connector.**

- **If a USB flash drive is disconnected during USB flash drive accessing, the file may be corrupted. Therefore disconnect a USB flash drive after the access lamp on the USB flash drive goes out or five seconds or more after the completion of USB flash drive accessing.**

- **Do not power off a controller during USB flash drive reading/writing. Doing so may cause the file to be corrupted.**

- **If USB flash drive reading/writing cannot be performed or a USB flash drive cannot be recognized, format the USB flash drive with the file system "FAT32" again. Note that the data in the USB flash drive are entirely cleared when it is formatted again. There may be cases where a USB flash drive that can be recognized by Windows cannot be recognized by X-PAQ due to file system difference. In such a case, format the USB flash drive.**

- **The operation is confirmed using a commercially available USB flash drive. Should a USB flash drive not operate, use another USB flash drive to confirm the operation.**

---

* Please refer to the file system format of 18.1. USB flash drive and that of 18.2. USB flash drive.

6. Free Allocation Function

6.1. I/O Allocation

In the case of the control I/O ports (RELAY/EXT IN, PIO (optional) and REMOTE I/O (optional)), it is possible to freely allocate I/O signal to the pin Nos. I/O allocation setting can be made by using the management software.
I/O allocation is a function to designate internal I/O signals to external I/O signals. It establishes a link from internal I/O signal which carries various functions to physical external signal.
In addition, this I/O can be allocated to an optional Fieldbus as well as to a controlling I/O port.

<The case for I/O assign screen on management software >

Input

Output

6.1.1. Internal Input Signals

The following are inputting signals that make it possible to allocate to each input and output ports for control.

The "jobs" in this section include the trace job.

Signal Name	Input Type	Function Explanation	Active Conditions
START	Continuous	Start signal of fastening process. Fastening starts at signal ON and automatically terminates when reaching fastening target. If signal switches to OFF before fastening target, fastening process will terminate and judges as end of process.	• Operation mode is READY ON. • LOCK signal input is OFF.
REVERSE	Continuous	• When start signal is input from external I/O, normal fastening rotation if this signal is OFF, and reverse fastening rotation if this signal is ON. • When the reverse fastening rotation is being made by this signal input, "REVERSE ON" signal is output.	• Operation mode is READY ON. • Input side is active except during TOOL rotation operation.
RUN	Pulse	• It resets system error status. • It resets tool lock status due to Batch Counter and job end.	Except TOOL rotation operation.
LOCK	Continuous	• Fastening process block signal. While this signal is being inputted, signal inputs from START signal and trigger switch from TOOL START will be rejected. • If this signal is being input during fastening, operation will be forcibly stopped and judged. • When LOCK is ON, "LOCK ON" signal is output.	Operation mode is READY ON.
LOCK N.C	Continuous	It is a normal close signal to disable tool actions (LOCK). When this signal is OFF, tool actions are disabled.	Operation mode is READY ON.
REJECT	Pulse	• Executes the process of Batch Counter according to "S07: REJECT SEL". • Executes the process of JOB Counter according to "S07: REJECT SEL".	• REJECT setting is valid • Operation mode is READY ON • Except TOOL rotation operation.
RESET	Pulse	• Reset system error status. • Reset counter to 0 when Batch Counter function is being used. • Reset counter to 0 when JOB function is being used. • Reset the inputting of JOB START signal. • Reset tool lock status due to Batch Counter and job end.	Except TOOL rotation operation.
JOB START	Pulse	Starting signal of JOB. If setting of "5. LINE COUNT" is valid, JOB will not start to function if this signal is not inputted.	• Operation mode is READY ON. • Except TOOL rotation operation.
DATA OUT	Pulse	Output most recent fastening result data from COM1 port (RS-232C)	• Operation mode is READY ON. • Except TOOL rotation operation.
S.START	Pulse	Use this function to synchronize fastening without using Multi-Spindle function. This function is valid when "P05 SET TIME =>7. PAUSE.t" is set to other than 0. This signal enables seat synchronization. Don't use this signal when Multi-Spindle function is used.	• Valid only when START signal is input.
COUNTER RESET	Pulse	• Reset the value of Batch Counter to its default value. • Reset tool lock status due to batch counting end.	• The setting "P10: COUNT" is valid. • The operation mode is READY ON.
TOOL TIGHTENING DISABLE	Continuous	It is a signal to disable fastening operation. When this signal is ON, fastening is disabled, but loosing is not affected.	• The operation mode is READY ON • Except TOOL rotation operation.
TOOL LOOSING DISABLE	Continuous	It is a signal to disable tool loosing. When this signal is ON, loosing is disabled, but tightening is not affected.	• Operation mode is READY ON. • Except TOOL rotation operation.
START PULSE	Pulse	Pulse input executes rotation operation. Even when the signal is OFF, the rotation continues until the fastening process is completed (time out at the completion of fastening). To stop the process in the mid-course, input LOCK signal.	• Operation mode is READY ON. • When LOCK signal input is set OFF.
COUNT INCREMENT	Pulse	Increment one count of Batch Counter or Job Counter per input. A fastening result is 1OK count.	• Operation mode is READY ON. • Except TOOL rotation operation.

Signal Name	Input Type	Function Explanation	Active Conditions
COUNT DECREMENT	Pulse	Decrement one Batch Counter or Job Counter per input. A fastening result is not influenced.	• Operation mode is READY ON. • Except TOOL rotation operation.
RESTART JOB	Pulse	Restart the active job.	• Operation mode is READY ON. • Except TOOL rotation operation.
BYPASS CHANNEL	Pulse	Set Job Parameter "8. CONTINUE" to OFF and input this during execution of JOB to skip next CHANNEL (STEP) to be executed.	• Operation mode is READY ON. • Except TOOL rotation operation. • Job function is being used.
ABORT JOB	Pulse	This aborts the active job. A fastening result is JOB OK.	• Operation mode is READY ON. • Except TOOL rotation operation. • Job function is being used.
JOB OFF	Continuous	This turns off the job mode and turns on the channel switching from the panel. If the job is already active, it is cancelled. When the job is cancelled, the fastening result is JOB OK. Re-starting the job is below. 1. Input JOB START signal if JOB-INT or JOB-EXT is selected in S05.CH SELECT setting 2. Input VIN information if CH-ID is selected in S05.CH SELECT setting	• Operation mode is READY ON. • Except TOOL rotation operation. • Job mode
VIN STROBE	Pulse	This is a command signal when Identifier is set by Fieldbus. Please see Identifier function items.	
CH-INT SELECT	Continuous	The selecting signal of channel selection setting When all signals are OFF, the X-PAQ controller follows setting of "S05 CH SELECT".	Except TOOL rotation operation
CH-EXT SELECT	Continuous		
JOB-INT SELECT	Continuous		
JOB –EXT SELECT	Continuous		
ID SELECT	Continuous		
CH SELECT 1	Continuous	The selecting signal of CHANNEL. (binary form) Numbers from 1 to 99 are selectable. This becomes invalid if 0 (no input) or number that is larger than 99 is selected. • They cannot be used together with input signals "SET CH1–32."	CH-EXT (external channel) is valid under "S05: CH SELECT" setting.
CH SELECT 2	Continuous		
CH SELECT 4	Continuous		
CH SELECT 8	Continuous		
CH SELECT 16	Continuous		
CH SELECT 32	Continuous		
CH SELECT 64	Continuous		
JOB SELECT 1	Continuous	The selecting signal of JOB No. (binary form) Numbers from 1 to 99 are selectable. This becomes invalid if 0 (no input) or number that is larger than 99 is selected.	JOB-EXT (external job) is valid under "S05: CH SELECT" setting.
JOB SELECT 2	Continuous		
JOB SELECT 4	Continuous		
JOB SELECT 8	Continuous		
JOB SELECT 16	Continuous		
JOB SELECT 32	Continuous		
JOB SELECT 64	Continuous		
SET CH1	Continuous	Set as channel 1. Please be careful that it can not be used together with CH SELECT.	CH-EXT (external channel) is valid under "S05: CH SELECT" setting.
SET CH2	Continuous	Set as channel 2. Please be careful that it can not be used together with CH SELECT.	
SET CH3	Continuous	Set as channel 3. Please be careful that it can not be used together with CH SELECT.	
SET CH4	Continuous	Set as channel 4. Please be careful that it can not be used together with CH SELECT.	
SET CH5	Continuous	Set as channel 5. Please be careful that it can not be used together with CH SELECT.	
SET CH6	Continuous	Set as channel 6. Please be careful that it can not be used together with CH SELECT.	
SET CH7	Continuous	Set as channel 7. Please be careful that it can not be used together with CH SELECT.	
SET CH8	Continuous	Set as channel 8. Please be careful that it can not be used together with CH SELECT.	
SET CH9	Continuous	Set as channel 9. Please be careful that it can not be used together with CH SELECT.	
SET CH10	Continuous	Set as channel 10. Please be careful that it can not be used together with CH SELECT.	
SET CH11	Continuous	Set as channel 11. Please be careful that it can not be used together with CH SELECT.	
SET CH12	Continuous	Set as channel 12. Please be careful that it can not be used together with CH SELECT.	

Signal Name	Input Type	Function Explanation	Active Conditions
SET CH13	Continuous	Set as channel 13. Please be careful that it can not be used together with CH SELECT.	
SET CH14	Continuous	Set as channel 14. Please be careful that it can not be used together with CH SELECT.	
SET CH15	Continuous	Set as channel 15. Please be careful that it can not be used together with CH SELECT.	
SET CH16	Continuous	Set as channel 16. Please be careful that it can not be used together with CH SELECT.	
SET CH17	Continuous	Set as channel 17. Please be careful that it can not be used together with CH SELECT.	
SET CH18	Continuous	Set as channel 18. Please be careful that it can not be used together with CH SELECT.	
SET CH19	Continuous	Set as channel 19. Please be careful that it can not be used together with CH SELECT.	
SET CH20	Continuous	Set as channel 20. Please be careful that it can not be used together with CH SELECT.	
SET CH21	Continuous	Set as channel 21. Please be careful that it can not be used together with CH SELECT.	
SET CH22	Continuous	Set as channel 22. Please be careful that it can not be used together with CH SELECT.	
SET CH23	Continuous	Set as channel 23. Please be careful that it can not be used together with CH SELECT.	
SET CH24	Continuous	Set as channel 24. Please be careful that it can not be used together with CH SELECT.	
SET CH25	Continuous	Set as channel 25. Please be careful that it can not be used together with CH SELECT.	
SET CH26	Continuous	Set as channel 26. Please be careful that it can not be used together with CH SELECT.	
SET CH27	Continuous	Set as channel 27. Please be careful that it can not be used together with CH SELECT.	
SET CH28	Continuous	Set as channel 28. Please be careful that it can not be used together with CH SELECT.	
SET CH29	Continuous	Set as channel 29. Please be careful that it can not be used together with CH SELECT.	
SET CH30	Continuous	Set as channel 30. Please be careful that it can not be used together with CH SELECT.	
SET CH31	Continuous	Set as channel 31. Please be careful that it can not be used together with CH SELECT.	
SET CH32	Continuous	Set as channel 32. Please be careful that it can not be used together with CH SELECT.	
U01–U99		It is user coil used by the PLC function. It is possible to allocate it as an external output.	
TEACHING ALL	Continuous	Shift to trace job function all-position continuous teaching mode.	• Trace job mode • Except TOOL rotation operation • Panel is not operated.
TEACHING POINT	Continuous	Shift to trace job function specified-position teaching mode.	
POSITION SET	Pulse	Register the current position of tracer arm in the selected position list.	Trace job teaching mode
POSITION WRITE	Pulse	Enable the data registered in the position list. This becomes invalid if teaching is ended without inputting the signal.	Trace job teaching mode
ZERO RESET	Pulse	Set the current position to XY coordinate data 0. *Offset coordinate data acquired at input signal is stored in battry back-up area. Because of removing battery or low voltage, the data will be initialized. Please re- set the parameter when it happens.	Trace job mode
POSITION SELECT 1	Continuous		
POSITION SELECT 2	Continuous		
POSITION SELECT 4	Continuous	The position number selecting signal at the time of trace job function specified-position teaching. (binary form) Numbers from 1 to 63 are selectable. This becomes invalid if 0 (no input) or a number that is 64 or larger is selected.	Trace job specified-position teaching
POSITION SELECT 8	Continuous		
POSITION SELECT 16	Continuous		
POSITION SELECT 32	Continuous		

Note: If the input type is pulse, please set the pulse signal for more than 100 ms.

6.1.2. Internal Output Signals

The following output signals are possible to be allocated for each controlling input and output ports.

The "jobs" in this section include the trace job.

Signal Name	Output Type	Function Explanation	Signal OFF conditions
READY	Continuous	Output when operation is executable by input signal. For fastening process triggered by the external I/O START signal, make sure that Ready signal is ON before inputting.	• System error occurs. • Unset Channel or Job is selected. • Any Channel or Job is not selected.
BUSY	Continuous	Output during fastening process.	---
SYSTEM ERROR	Continuous	Output when system encounters abnormal status.	• RUN signal input • RESET signal input
COMP	Continuous	Output after fastening process is completed. (Note: Also output if fastening process is terminated due to system error.)	• Next START signal input • RUN signal input • RESET signal input.
OK[*1]	Continuous/Pulse	Output after fastening process is judged to be OK.	
NG[*1]	Continuous/Pulse	Output after fastening process is judged to be NG.	
nxOK[*1]	Continuous/Pulse	Output after Batch Counter is judged to be OK.	
nxNG[*1]	Continuous/Pulse	Output after Batch Counter is judged to be NG.	
SEAT	Continuous	Output after pre-fastening process is completed (seat torque is reached)	When fastening is completed (When COMP is output)
REVERSE ON	Continuous	Output when REVERSE switch of tool unit is input. However, for fastening process triggered by the external I/O START signal, it outputs the status of reverse signal of external I/O regardless of the input of reverse switch on a tool unit.	---
JOB COMP	Continuous	When JOB function is enabled, output if JOB is completed (all set STEPs are completed).	• When the next JOB starts • RUN signal input • RESET signal input
LOCK ON	Continuous	Output if LOCK signal is ON It will answer towards Lock signal input.	When LOCK signal is OFF
BATTERY EMPTY	Continuous	Output if the backup battery voltage drops down below the defined value.	Voltage of backup battery recovered
DATA OUT ERROR	Continuous	Output if abnormal status is detected when the data is output from COM1 port.	Data is normally output when the next DATA OUT is executed.
JOB STEP COMP	Continuous	When JOB function is enabled, output signal after completion of each step.	• When the next JOB starts • RUN signal input • RESET signal input
JOB RUNNING	Continuous	Output when the job is being executed.	When the job is completed.
JOB ABORT	Continuous	Output when the job is aborted.	• RUN signal input • RESET signal input
JOB OK	Continuous	Output when the JOB OK is completed.	• Next START signal input • RUN signal input • RESET signal input
JOB NG	Continuous	When COUNT TYPE on the JOB is set OK COUNT, output when REJECT signal is inputted. When COUNT TYPE on the JOB is set ALL COUNT, output after completion of the JOB if NG occurred during the JOB.	

*1   The signal output type can be switched to continuous/pulse by setting the system parameter "S13: JUDGE OUT."
Please see "SYSTEM (system parameter setting)" for details.

Signal Name	Output Type	Function Explanation	Signal OFF Conditions
TOOL LOCKED	Continuous	Output when the tool is locked, LOCK signal is ON, and Job or Channel count is completed.	Output when the tool is unlocked.
RECEIVE BARCODE	Continuous	• Output when a barcode has received data. • Output when Identifier has input from Fieldbus. • Output when Identifier has input from protocol only for PC.	• When the job is completed. • When the count is completed. • When fastening without Job and Count is completed • When identifier data is re-input (During 500 msec, it will be OFF)
VIN STROBE ANSWER	Pulse	Answer signal for VIN STROBE. When VIN STROBE is turned ON, VIN (vehicle number information) is acquired and this VIN STROBE ANSWER is turned ON. Then VIN STROBE is turned OFF, this is turned OFF.	• When VIN STROBE signal is OFF.
CH-ANS1	Continuous	Selected channel number confirmation signal. (binary form) Return operating channel number while JOB functions are being used.	• Either 0 (no input) or 100 and above are selected.
CH-ANS2	Continuous		
CH-ANS4	Continuous		
CH-ANS8	Continuous		
CH-ANS16	Continuous		
CH-ANS32	Continuous		
CH-ANS64	Continuous		
JOB-ANS1	Continuous	Selected JOB number confirmation signal. (binary form)	• The setting "S05: CH SELECT" is selected to CH-EXT or CH-INT. • Either 0 (no input) or 100 and above are selected.
JOB-ANS2	Continuous		
JOB-ANS4	Continuous		
JOB-ANS8	Continuous		
JOB-ANS16	Continuous		
JOB-ANS32	Continuous		
JOB-ANS64	Continuous		
SEAT TRQ HIGH NG	Continuous	Output if the value of seat torque exceeds its maximum setting value.	• Next START signal. • RUN signal input • RESET signal input
TRQ HIGH NG	Continuous	Output if the value of detected torque exceeds its maximum setting value.	
TRQ LOW NG	Continuous	Output if the value of detected torque falls below its minimum setting value.	
ANG HIGH NG	Continuous	Output if the value of detected angle exceeds its maximum setting value.	
ANG LOW NG	Continuous	Output if the value of detected angle falls below its minimum setting value.	
PRE SEAT TIME NG	Continuous	Output if the time required for detecting seat torque is within the "PRE SEAT.t" setting.	
FINAL MIN TIME NG	Continuous	Output if fastening completes within the time set in "FINAL MIN.t."	
FINAL MAX TIME NG	Continuous	Output if fastening completes within the time set in "FINAL MAX.t."	
TOTAL TIME NG	Continuous	Output if time interval between start to end of fastening process "TOTAL.t."	
MONITOR HIGH NG	Continuous	When S-MONITOR function is enabled, output if the inspected torque value exceeds its maximum setting value.	
MONITOR LOW NG	Continuous	When S-MONITOR function is enabled, output if the inspected torque value falls below its minimum setting value.	
S-CUR MON HIGH NG	Continuous	When S-CUR MONITOR function is enabled, output if the detected electric current value exceeds its maximum setting value.	
S-CUR MON LOW NG	Continuous	When S-CUR MONITOR function is enabled, output if the detected electric current value falls below its minimum setting value.	
F-CUR MON HIGH NG	Continuous	When F-CUR MONITOR function is enabled, output if the detected torque value exceeds its maximum setting value.	
F-CUR MON LOW NG	Continuous	When F-CUR MONITOR function is enabled, output if the detected electric current value falls below its minimum setting value.	

Signal Name	Output Type	Function Explanation	Signal OFF Conditions
MULTISPINDLE OK	Continuous	When multi-spindle function is enabled, output after TOTAL OK is judged. Function only for station number 1 (master station).	
MULTISPINDLE NG	Continuous	When multi-spindle function is enabled, output after TOTAL NG is judged. Function only for station number 1 (master station).	
PEAK TRQ HIGH NG	Continuous	Output if the value of detected peak torque exceeds its maximum setting value.	
PEAK TRQ LOW NG	Continuous	Output if the value of detected peak torque falls below its minimum setting value.	
RUNDOWN HIGH NG	Continuous	When rundown angle monitor function is enabled, output if the value of inspected angle exceeds it maximum setting value.	• Next START signal input • RUN signal input • RESET signal input
RUNDOWN LOW NG	Continuous	When rundown angle monitor function is enabled, output if the value of detected angle falls below its minimum setting value.	
SELF TAP TRQ HIGH NG	Continuous	Output if the detected torque exceeds the maximum torque during a self tap interval when Self Tap function is ON.	
SELF TAP TRQ LOW NG	Continuous	Output if the inspected torque falls below the minimum torque during a self tap interval when Self Tap function is ON.	
F-MON TRQ HIGH NG	Continuous	Output if the inspected torque exceeds the monitor maximum torque when the final monitor is ON.	
F-MON TRQ LOW NG	Continuous	Output if the detected torque falls below the monitor minimum torque when the final monitor is ON.	
MULTI-SPINDLE 1 OK	Continuous	This outputs fastening results of spindles when using the Multi-Spindle function.	• Next START signal input • RUN signal input • RESET signal input
MULTI-SPINDLE 1 NG			
MULTI-SPINDLE 2 OK			
MULTI-SPINDLE 2 NG			
MULTI-SPINDLE 3 OK			
MULTI-SPINDLE 3 NG			
MULTI-SPINDLE 4 OK			
MULTI-SPINDLE 4 NG			
MULTI-SPINDLE 5 OK			
MULTI-SPINDLE 5 NG			
MULTI-SPINDLE 6 OK			
MULTI-SPINDLE 6 NG			
MULTI-SPINDLE 7 OK			
MULTI-SPINDLE 7 NG			
MULTI-SPINDLE 8 OK			
MULTI-SPINDLE 8 NG			
MULTI-SPINDLE 9 OK			
MULTI-SPINDLE 9 NG			
MULTI-SPINDLE 10 OK			
MULTI-SPINDLE 10 NG			
STAT ALARM	Continuous	Output if strategy NG occurs when the statistical function is ON. (available in the future)	• The statistical function is OFF. • Strategy results become OK.
CURRENT LIMIT ON	Continuous	Output if the current limitation of a servo driver is effective during a fastening process.	• Except during current limit.
CH SELECT CH-INT	Continuous	Output if "S05 CH SELECT" is set to CH-INT.	Except when "CH-INT" is set.
CH SELECT CH-EXT	Continuous	Output if "S05 CH SELECT" is set to CH-EXT.	Except when "CH-EXT" is set.
CH SELECT JOB-INT	Continuous	Output if "S05 CH SELECT" is set to JOB-INT.	Except when "JOB-INT" is set.
CH SELECT JOB-EXT	Continuous	Output if "S05 CH SELECT" is set to JOB-EXT.	Except when "JOB-EXT" is set.
CH SELECT ID	Continuous	Output if "S05 CH SELECT" is set to ID.	Except when "ID" is set.
COUNT1	Continuous	This outputs current value of error proofing counter (binary form).	• When setting of "P10: COUNT" is selected to OFF
COUNT2	Continuous		
COUNT4	Continuous		
COUNT8	Continuous		
COUNT16	Continuous		
COUNT32	Continuous		
COUNT64	Continuous		

Signal Name	Output Type	Function Explanation	Signal OFF Conditions
DATA ACQT.ALIV	Continuous	It outputs while connecting with PC and dedicated protocol	• When communication time-out • When sending the communication stop command
MCH ABORT	Continuous	It outputs when Multi-Channel is aborted.	• Next START signal input • RUN signal input • RESET signal input
TOOL START	Continuous	It outputs when tool start switch is ON.	When tool start switch is OFF
TOOL REVERCE	Continuous	It outputs when rotation direction selection switch is selected reverse rotation.	When the direction switch is selected to Forward/Reset.
TOOL RESET	Continuous	It outputs when rotation direction selection switch is selected reset.	When the direction switch is selected to Forward/Reverse
JOB STEP No. 1	Continuous	It outputs current job step number by binary for.	When Job is not executed.
JOB STEP No. 2	Continuous		
JOB STEP No. 4	Continuous		
JOB STEP No. 8	Continuous		
JOB STEP No. 16	Continuous		
JOB STEP No. 32	Continuous		
U01–U99		It is user coil used by the PLC function. It is possible to allocate it as an external output.	
REVERCE COMP	Continuous	It outputs if start torque of operating channel is detected during reversing operation.	• Next START signal input • RUN signal input • RESET signal input
UNDER TARGET TORQUE	Continuous	It outputs if the operation is aborted before the the target torque is detected when ditecting under target torque function is valid.	
RELEASE START TRIGGER	Continuous	It outputs if the operation is aborted because of start trigger off when ditenting start trigger off function is enable.	
WATCH DOG	Pulse	Turn ON/Off every 0.5 sec It enables to judge whether the controller is normal thru device such as Field bus.	
1SEC CLOCK	Pulse	Turn On/Off every 1 sec	
TOOL CYCLE ALARM	Continuous	Output when tool cycle exceeded the value set on [S20. TOOL CYCLE COUNT MONITOR] (Available Ver. HA1050 or later)	
REVERSE ANGLE NG	Continuous	Output when NG occurred on REVERSE ANGLE control. (Available Ver. HA1050 or later)	• Next START signal input • RUN signal input • RESET signal input
CLOCK ALARM	Continuous	Output when abnormal value is set on internal clock IC. (Available Ver. HA1050 or later)	
TEACHING BUSY	Continuous	It outputs during teaching mode.	
TEACHING COMP	Continuous	It outputs when teaching is completed.	OFF at the end of teaching mode
TEACHING STEP COMP	Continuous	It outputs each time position data registration is completed.	POSITION SET input OFF and TOOL START OFF
TCU READY	Continuous	It displays trace controller READY status.	• Trace controller error occurred • Trace controller communication not established
POSITIONING NG	Continuous	It outputs if position data is out of tolerance when fastening is completed with trace job parameter "END POSITION" enabled.	• Next START signal input • RUN signal input • RESET signal input
ORIGIN SEARCH COMP	Continuous	It outputs when origin search is completed with "XY TBL" or "XYZ TBL" selected in "S18.1 TABLE SELECT".	

6.1.3. Input & Output Signal Timing

| < > : Input signal |
| [   ]: Output signal |

<<IMPORTANT>>
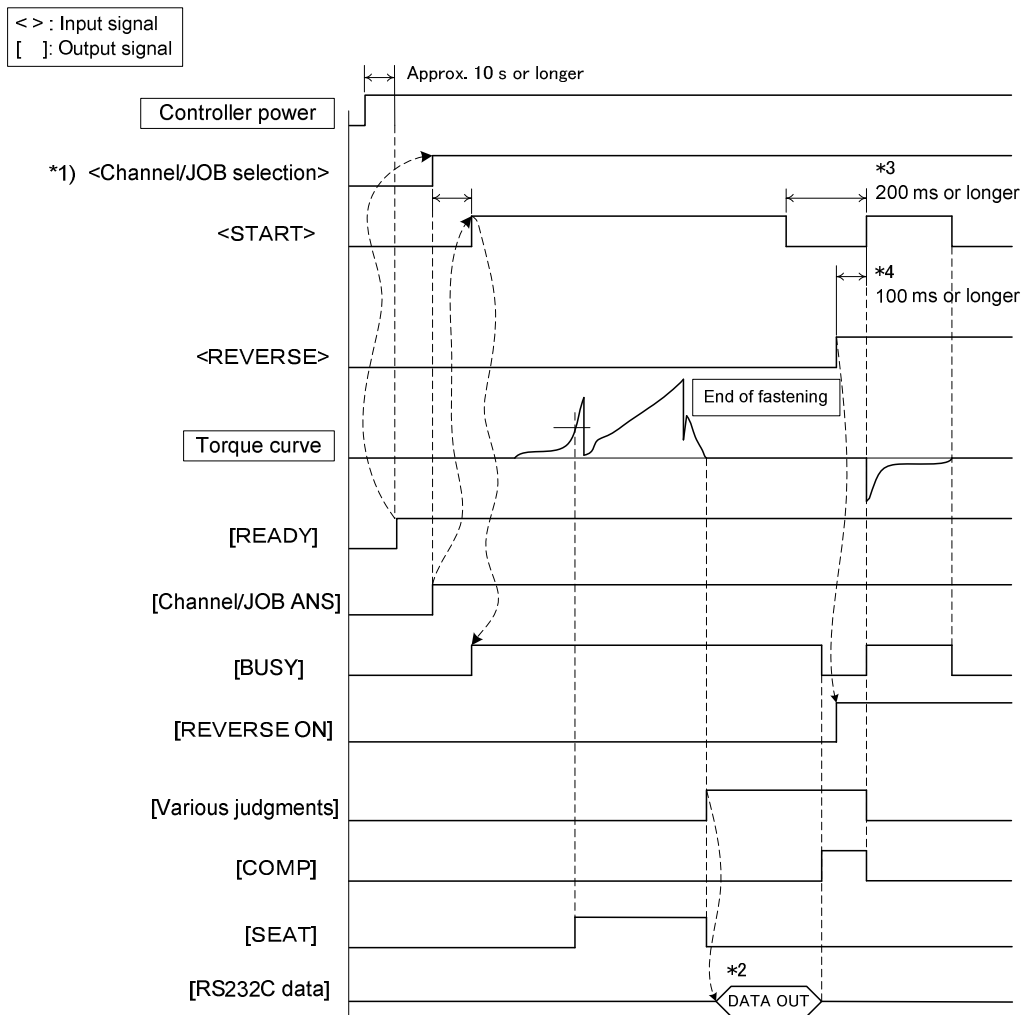
*1: When the system parameter "S05: CH SELECT" is set to the "external channel" and the "external JOB,"
READY signal output is not turned ON unless the channel/JOB selection signal is input in advance.

*2: Fastening (loosening) process is not executable during data output which sets as valid in "P13: DATA OUT".
(Data is output after completion of fastening process.) It is possible that fastening and loosening processes are
not functional for about 2 seconds after the completion of fastening process due to data retransmission if
communication abnormality occurs.

*3: After START signal is set OFF, please provide 200 msec or more before next START signal is inputted.
START signal may not be accepted if it is repeatedly inputted.

*4: When inputting REVERSE signal, please provide 100 msec or more response time before START signal is
inputted.

> **MEMO**
>
> COMP signal is outputted after each fastening judgment signal is outputted. (When setting of
> "P13: DATA OUT" is valid, COMP signal is outputted after DATA OUT.) If judgment output
> signal can not be received due to causes such as PLC scan time, please set a timer after
> receiving the COMP signal.

6.2. Fastening Result Data Allocation

Items of the result data which is saved in the controller after each tightening, and the result data which is output to the external device can be freely assigned.

Please use optional management software to modify allocation of the fastening process result data entries.

<The case for Fastening result item assign screen on management soft>
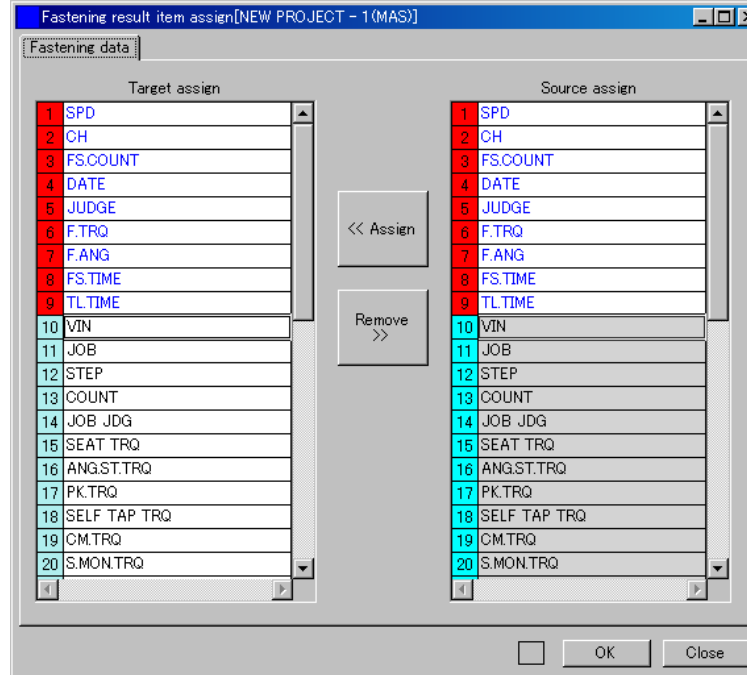
The following shows the fastening result data that can be allocated. Signals are pre assigned on default setting. Removing unnecessary signals creates more space on internal memory and more numbers of tightening results can be stored.The settings in shaded areas cannot be changed.

<Fastening Process Result Data Entry List>

Data Entry	Name	Content
SPD	Spindle number	Data of a Station Number of controller.
CH	Fastening channel number	Data of a channel number which executed fastening process.
FS.COUNT	Number of times of fastening	Data of number of times of fastening process.
DATE	Fastening completion time	Time data of fastening completion time. (yy/mm/dd/hh/mm/ss)
JUDGE	Fastening process judgment result	Data of fastening process judgment results.
F.TRQ	Final torque	Data of final torque.
F.ANG	Final angle	Data of final angle. (This is displayed when fastening process is performed other than Torque method.)
FS. TIME	Screw fastening time	Operation time data from starting fastening process to its completion (* D-END TIME function operation time is not included)
TL. TIME	Total fastening time	The operation time data from the start of fastening operation to the completion of D-END TIME function after the fastening process has been completed.
VIN	Vehicle number information	Data of inputted vehicle number information data. (currently unavailable)
JOB	JOB number	Data of executed JOB No. (display when using JOB function)
STEP	JOB STEP number	Data of executed JOB STEP No. (display when using JOB function)
COUNT	Number of counts	Fastening count data. (display when using JOB or Batch function)
JOB JDG	JOB judgment result	Result data of executed JOB operation judgment. (display when using JOB function) 0:Total OK, 1:Total NG, 2:Forced payment, 3:JOB incomplete, 4:JOB unsupported
ST. TRQ	Seat torque	Data of seat torque.

Data Entry	Name	Content
ANG. ST. TRQ	Angle measurement starting torque	Angle measurement starting torque data. (display when executing fastening process other than torque method.)
PK. TRQ	Peak torque	Data of peak torque.
SELF TAP TRQ	Self tap peak torque	Peak torque data in a self tap interval.
CM TRQ	Compensation torque	Compensation torque data in compensation torque function
S.MON. TRQ	Section monitor torque measured value	Measured torque data of Section Monitor function (This is set ON when using a section monitor.)
F.MON. TRQ	Final monitor torque	Measured torque data of final torque monitor function. (This is set ON when using a final monitor.)
RUNDOWN ANG	RUNDOWN angle	Rundown angle measurement data. (display when using rundown angle function)
FR. TIME	Screw pre-fastening time	Operation time data from measured starting torque inspected to completion of pre-fastening process (seat torque is inspected)
S.CUR.MON	Section current monitor measurement value	Measured current data of section current monitor function. (It is the last value at the time of OK, and is a value at the time of NG at the time of NG.).(The peak current monitor value of a Pre-fastening is stored at the time of section current monitor invalidity.)
F.CUR.MON	Final current monitor measurement value	Measured current data of final current monitor function. (It is the last value at the time of OK, and is a value at the time of NG at the time of NG.).(The peak current monitor value of a Final fastening is stored at the time of final current monitor invalidity.)
LO.ST. TRQ	Seat torque minimum value	Seat torque minimum setting data of fastening operation channel.
HI.ST. TRQ	Seat torque maximum value	Seat torque maximum setting data of fastening operation channel.
LO.ANG. TRQ	Angle measurement starting torque minimum value	Angle measurement starting torque minimum setting data of fastening channel
HI. ANG. TRQ	Angle measurement starting torque maximum value	Angle measurement starting torque maximum setting data of fastening channel
TG. TRQ	Target torque value setting	Target torque setting data of fastening operation channel.
LO. F. TRQ	Final torque minimum value setting	Final torque minimum setting data of fastening operation channel
HI. F. TRQ	Final torque maximum value setting	Final torque maximum setting data of fastening operation channel.
LO. PK. TRQ	Peak torque minimum value setting	Peak torque minimum setting data of fastening operation channel.
HI. PK. TRQ	Peak torque maximum setting value	Peak torque maximum setting data of fastening operation channel.
TG. ANG	Target angle value setting	Target angle setting data of fastening operation channel.
LO. ANG	Final angle minimum value setting	Final angle minimum setting data of fastening operation channel.
HI. ANG	Final angle maximum value setting	Final angle maximum setting data of fastening operation channel.
RT. TRQ	Tool unit rated torque	Rated torque data of connected tool unit.
TOOL TYPE	Tool unit type	Connected tool unit type data
SYS. ERR No.	System error number	Data of occurred system error number.
M-SPD. JDG	Multi-spindle overall judgment	Overall judgment for fastening result of multi-spindle system When all the spindles are judged as OK: OK. If even one spindle is judged as NG: NG.
POS.X	X-axis coordinate data	X-axis coordinate data at the completion of tightening
POS.Y	Y-axis coordinate data	Y-axis coordinate data at the completion of tightening
POS.Z	Z-axis coordinate data	Z-axis coordinate data at the completion of tightening

⚠ Caution: If allocation of fastening result entry changes, fastening result history data that was saved in controller will be deleted. When data backup is required, please use management software to load the data and backup.

7. FIELDBUS Communication Function (Optional)

This product enables connection with various Fieldbuses (DeviceNet/Profibus-DP/CC-link/EtherNet/IP). (Please specify a connector type for the appropriate Fieldbus. Please see "2.1 Unit Type" for details of types.)

Using Fieldbus communication function makes it possible to control from various types of I/O signals of X-PAQ and obtain fastening result data. The function mainly controls fastening operations and outputs results by I/O, sending word data such as torque/angle by allocating it to I/O, and does not send messages.
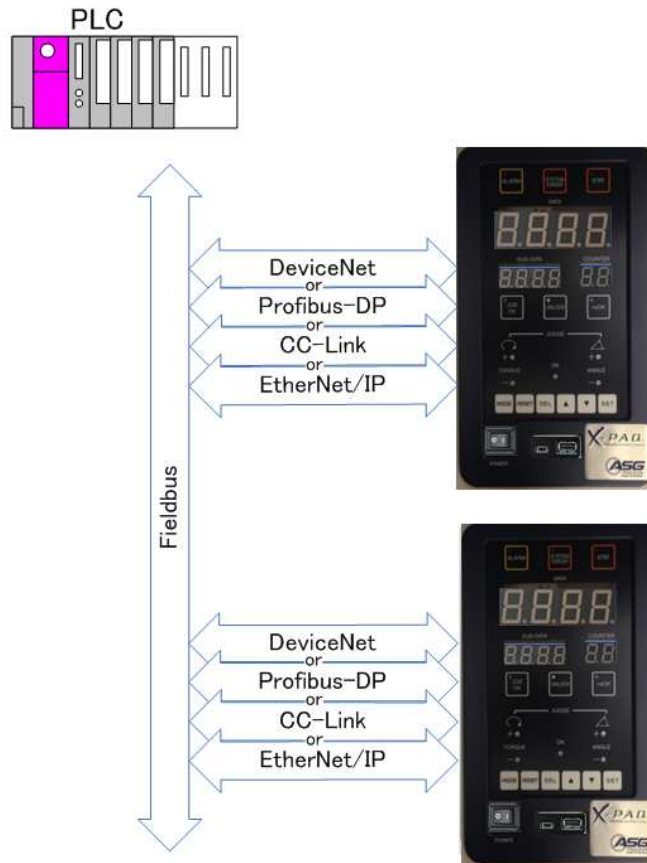
Because this product establishes connection with Fieldbuses through the interface module AnyBus-CC (CompactCom) of DeviceNet / Profibus-DP / CC-link / EtherNet / IP manufactured by HMC, it is not displayed as "X-PAQ Controller" but recognized as an I/F card when displayed on a monitor tool etc.

When the configuration software sets details, EDS/GSD file may be required. Please download it from the following web pages of companies:

HMS Japan   : http://www.anybus.jp/

(As of March 2011)

7.1. DeviceNet

7.1.1. Communication Specifications

Items	Specifications
Communication protocol	Under DeviceNet group 2.
Support connection	I/O connection
Communication speed	AUTO/500 k/250 k/125 k [bps]

7.1.2. Displays Status Lamp

The lamp displays the connection/communication status of Device Net.

LED (1) shows the module status.

LED (2) shows the network status.

LED (1) (Green/Red: Module status)

Status	Meaning	Content
Lamp off	No power supply	No power supply in the unit. Bad connection of embedded board
Green lamp	Normal status	DeviceNet running
Green blink	Setting error	The data size is bigger than the configuration.
Red on	Fatal abnormality	Hardware abnormality of the embedded board
Red blink	Warning	Minor abnormality
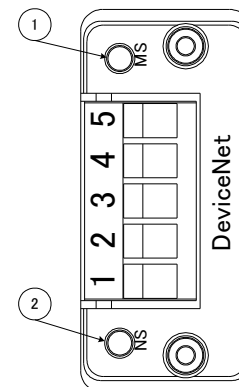
LED (2) (Green/Red: Network status)

Status	Meaning	Content
Lamp off	Power OFF/network unconnected	DeviceNet communication power OFF DeviceNet master waits for the completion of address duplication check.
Green lamp	Online/communication connection established	Network connection/communication established
Green blinking	Online/communication unconnected	Network is normal but communication is unestablished.
Red lamp	Fatal network abnormality	Communication abnormality (Abnormality that indicates the communication cannot be used is detected.) Node address duplication
Red blinking	Minor communication abnormality	Communication time out

7.1.3. Connection Connector

Use a screw connector to connect to DeviceNet.

Pin	Signal	Color
1	V-	Black
2	CAN_L	Blue
3	Drain (shield)	Bare wire
4	CAN_H	White
5	V+	Red
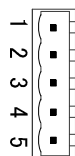
Controller-side connector (male)
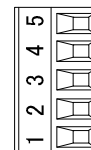
Network-side connector (female)

7.1.4. Communication Setting

There are two types of DeviceNet communication settings: "Node address setting" and "Communication speed setting".
They are set by means of the Fieldbus settings.
When the Fieldbus type is DeviceNet in the Fieldbus settings, the following settings can be made.

Node Address Setting

Set the node address. The setting range is 1–255.
If a node address is duplicated with another node, a node address duplication abnormality occurs and users cannot join communication.

Communication Speed Setting

Set the communication speed of DeviceNet.
Select AUTO, 125K, 250K or 500K. The default is AUTO.
The same communication speed must be set in all nodes (master and slave) on the network. Please note a slave at a communication speed different from the master cannot participate in the communication and may trigger a communication abnormality among node addresses which are correctly set.

7.2. Profibus-DP

7.2.1. Communication Specifications

Items	Specifications
Field Bus Type	PROFIBUS DP-V1
Communication speed	9.6 k[bps]–12 M[bps] (Automatic switching)

7.2.2. Displays Status Lamp

The lamp displays the connection/communication status of Profibus-DP.

LED (1) indicates the "Status".

LED (2) indicates the "Operation mode".
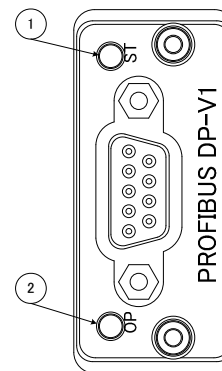
LED (1) (Green/Red: Status)

Status	Meaning	Content
Lamp off	• No power supply • Not initialized	No power is supplied to the unit. Before initialization
Green lamp on	Initialization completed	Data communication enabled.
Green lamp blinking	Diagnostic results existing	Diagnostic results exist after initialization.
Red lamp on	Exception error	AnyBus-CC setting error

LED (2) (Green/Red: Offline status)

Status	Meaning	Content
Lamp off	• Not online • No power supply	Offline No power supply in the unit.
Green lamp on	Online, Data exchange	Connected properly
Green lamp blinking	Online, Clear	
Red lamp blinking (Once)	Parameter error	Setting with PLC is not correctly determined.
Red lamp blinking (Twice)	Configuration error	Setting with PLC is not correctly determined.

7.2.3. Connection Connector

Use D-Sub 9 pin to connect to Profibus-DP.

Pin	Signal Name	Content
Housing	Shield	Shield
1	----	
2	----	
3	B-Line	Communication signal (+)
4	RTS	Communication request
5	GND BUS	Signal background
6	+5V BUS	Signal power source
7	----	
8	A-Line	Communication signal (-)
9	----	
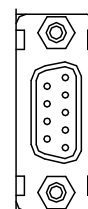
Controller-side
connector (male)

7.2.4. Communication Setting

There is "Node Address Setting" for Profibus-DP communication. It is set by means of the Fieldbus settings. Change the settings according to the system configuration.

When the Fieldbus type is Profibus in the Fieldbus settings, the following setting can be made.

Node Address Setting

Set the node address. The setting range is 1–125.

Caution: If a node address is duplicated with another node, a node address duplication abnormality occurs and users cannot join communication.

End resistor

The last node of the Profibus-DP network requires an end resistor in order to prevent reflection of the bus line.

Because no internal end resistor is provided on the X-PAQ side, install an end resistor on the wiring side (connector side).

7.3. CC-Link

7.3.1. Communication Specifications

Items	Specifications
Communication protocol	Under CC-Link Communication
Support connection	CC-Link remote device (I/O connection)
Communication speed	156K, 625K, 2.5M, 5M, and 10M
CC-Link Communication	CC-Link v.2

Note: X-PAQ uses only bit information. Caution that it does not use data.

7.3.2. Displays Status Lamp

The lamp displays the connection/communication status of CC-Link.
LED lighting and off show the following statuses:

LED (1) (Red: Error status)

Status	Meaning
Lamp off	Normal network status No power supply in the unit.
Lamp on	Abnormality in the station number setting or baud rate selection
Blinking	CRC error occurs. The station number or communication speed is changed.
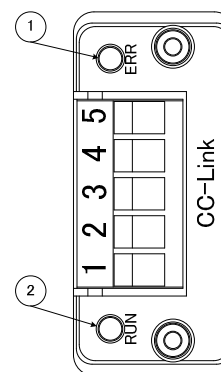
LED (2) (Green/Red: RUN status)

Status	Meaning
Lamp off	Network unconnected or communication time out No power supply in the unit.
Green lamp on	Normal network status
Red lamp on	Fatal error

7.3.3. Connection Connector

Use a screw connector to connect with CC-Link.

Pin	Signal
1	Communication line(DA)
2	Communication line(DB)
3	Digital GND(DG)
4	Shield
5	Frame Ground (FG/PE)

Controller-side connector (male)
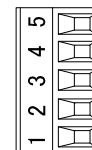
Network-side connector (female)

7.3.4. Communication Setting

There are two types of CC-Link communication settings: "Station Number Setting" and "Communication Speed Setting." They are set by means of the Fieldbus settings.
When the Fieldbus type is CC-Link in the Fieldbus settings, the following settings can be made.

Station Number Setting

Set the station number. The setting range is 1–64.
If the set station number duplicates the station number of other equipment, a station number error occurs and users cannot participate in the network.

Communication Speed Setting

Set the communication speed of CC-Link.
Select 156K, 635K, 2.5M, 5M or 10M. The default is 156K.
It is necessary to set the communication speed at the same value for all the station numbers (master and slave) on the network.

7.3.5. Cyclic extension and occupied station

Settings of cyclic extension and occupied station are determined by setting of IN Byte Length/OUT Byte Length in "Fieldbus I/O assignment" of X-PAQ controller. Refer below table to set for a PLC.
"L" is the larger of number of byte from IN Byte Length/OUT Byte in "Fieldbus I/O assignment" of X-PAQ controller.

	Cyclic extension	Occupied station	Remote I/O points
L <= 4	1 time	1 occupied station	32 points
L <= 8	1 time	2 occupied stations	64 points
L <= 12	1 time	3 occupied stations	96 points
L <= 16	1 time	4 occupied stations	128 points
L <= 28	2 times	4 occupied stations	224 points
L <= 56	4 times	4 occupied stations	448 points
L> 57	8 times	4 occupied stations	896 points

7.4. EtherNet/IP

7.4.1. Communication Specifications

Items	Specifications
Communication protocol	EtherNet/IP group 2 , 3 compliant
Support connection	I/O connection
Communication speed	10BASE/100BASE(Automatic switching)

7.4.2. Displays Status Lamp

The lamp displays the connection/communication status of EtherNet/IP

      LED (1) shows the "module" status

      LED (2) shows the "network" status

      LED (3) shows the "link" status
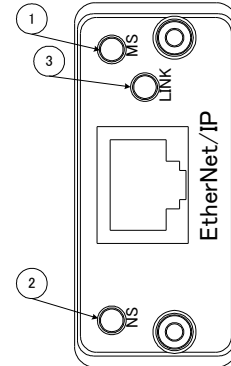
LED (1) (Green/Red: Module status)

Status	Meaning	Content
Lamp off	Not online	No power is supplied to the unit. The IP address is not set.
Green lamp on	Normal	Communication is operating properly.
Green lamp blinking	Connection not established.	Connection is not established.
Red lamp on	Minor glitch	A minor glitch occurs.
Red lamp blinking	Fatal glitch	An unrecoverable glitch occurs.

LED (3) (Green/Red: Network status)

Status	Meaning	Content
Lamp off	Not online IP address not set	No power supply in the unit or IP address has not been set.
Green lamp on	Online/Communication connected	Network connected, Communication established
Green lamp blinking	Online/Communication not established	Network is normal but Communication has not been established
Red lamp on	Fatal network error	Communication error—Unable to communicate on the Network Duplicated IP address
Red lamp blinking	Minor Communication error	Communication timed out

LED (1) (Green: Online status)

Status	Meaning	Content
Lamp off	Not linked	Network unconnected
Green lamp on	Linked	Network connected
Green lamp blinking	During operation	During network operation

7.4.3. Connected connector

Use standard connector RJ45 for EtherNet/IP

Pin	Signal
1	TD+
2	TD-
3	RD+
4	–
5	–
6	RD-
7	
8	
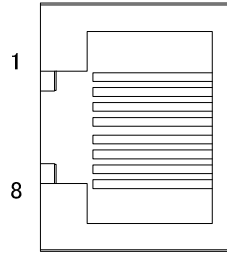
7.4.4. Communication setting

The setting of EtherNet/IP is only for IP address setting. It is set with the X-PAQ system parameters. Only the last digit of the IP address is set.

When the Fieldbus type is EtherNet/IP in the Fieldbus settings, the following settings can be made.

IP address configuration

Set the IP address. The setting range is 0–255 and the default is 0.

The IP address except for the last digit, the gate way and the subnet mask are of the same setting as that of the system parameter "S11 TCP/IP". It is necessary to set only the last digits ("X" shown below) of the IP address by means of the Fieldbus settings.

IP Address	192. 168. 0. x
Subnet	255. 255. 255. 0
Gateway	0. 0. 0. 0

7.5. Fieldbus Setting

To use the Fieldbus communication function, it is necessary to set the Fieldbus type, input byte count, output byte count, byte order, I/O input signal allocation and I/O output signal allocation. They are set by using the management software. After change below setting, please recycle the power. After the recycling, the setting will be valid.

Items	Description
Fieldbus Type	Select a Fieldbus type. Select one from None, DeviceNet, Profibus, CC-Link and EtherNet/IP.
In Byte Length [*1]	Set the number of input bytes. From PLC, they become output bytes. The range is 2–126 bytes, and only even numbers can be set.
Out Byte Length [*2]	Set the number of output bytes. From PLC, they become input bytes. The range is 2–126 bytes, and only even numbers can be set.
Byte Oder Select	Select whether high or low bytes should be allocated to the left.
I/O Input Allocation	Allocate internal inputs. In the range of input byte number, up to 64 points can be allocated.
I/O Output Allocation	Allocate internal outputs. In the range of output byte number, up to 64 points can be allocated.
Node address [*2]	The setting varies depending on the Fieldbus type.
Communication speed [*2]	The setting varies depending on the Fieldbus type.
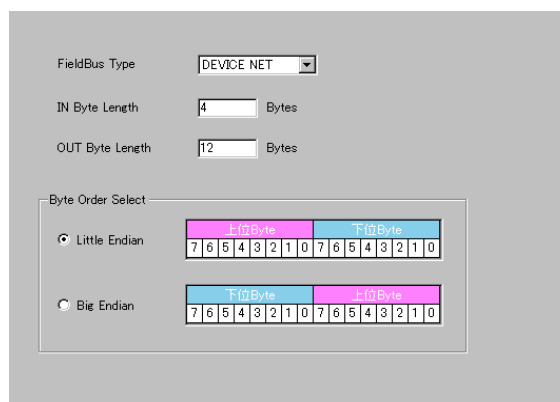
*1: The range of actual setting numbers may be narrower depending on Fieldbus types, PLC model, and the number of connections. Please refer to the manual of the PLC to be used for details.

*2: The node address and communication speed are added for X-PAQ.

The following is an explanation by using the setting screens of management. Please refer to Management Software Operation Manual for details.
(Screen may differ slightly depending on the version of Management.)

(1) This is the "Setting" Screen of Fieldbus I/O Allocation Menu. It is used to set Fieldbus Type, IN Byte Length, OUT Byte Length, Byte Order Select and DEVICENET (communication speed).

(2) This is the "Allocate to I/O Input" Screen of Fieldbus I/O Allocation Menu.

This setting screen allocates control signals from PLC such as START and REVERSE. The allocation of CH SELECT signals here enables users to switch channels from PLC (when using external channels).
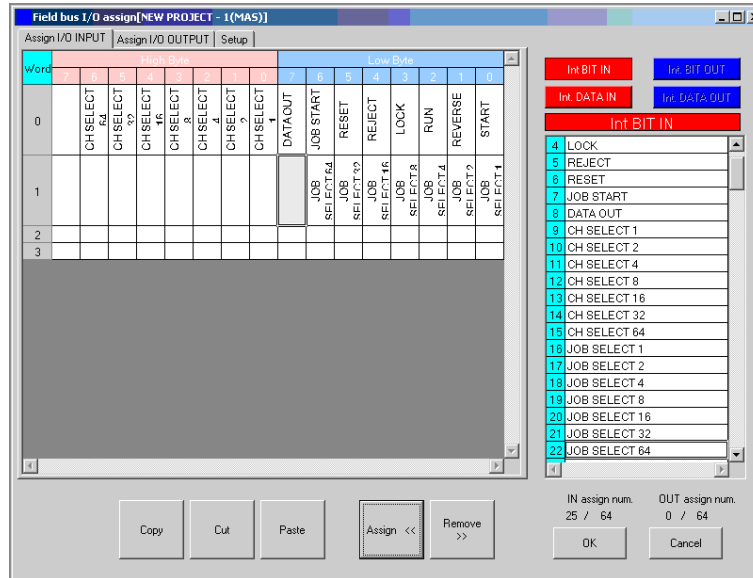
(3) This is the "Allocate to I/O Output" Screen of Fieldbus I/O Allocation Menu.

This screen enables users to allocate signals that show X-PAQ output status such as READY and BUSY and those that show fastening results such as OK, NG, TRQ, and HIGH NG. In addition, it enables users to allocate fastening result data such as F.TRQ (final torque) and F.ANG (final angle) as well as signals (BIT).
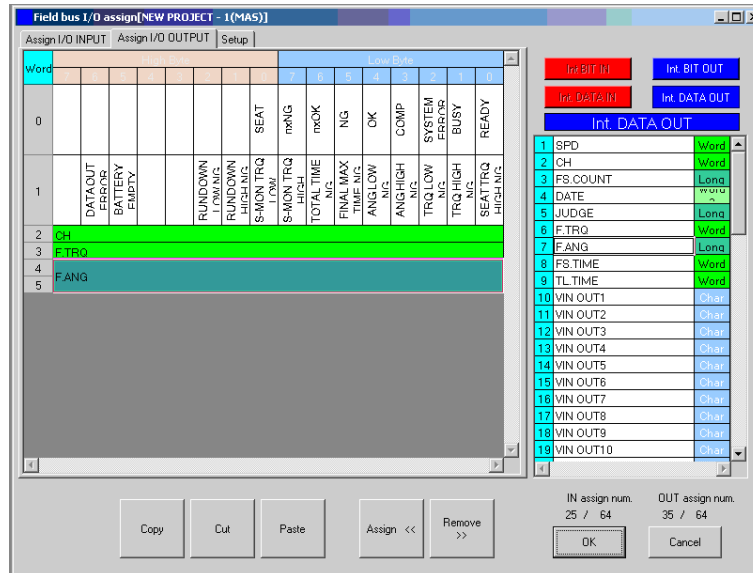
7.6. Fieldbus I/O Allocation Items

Input Allocation Items List
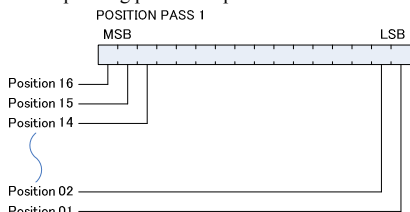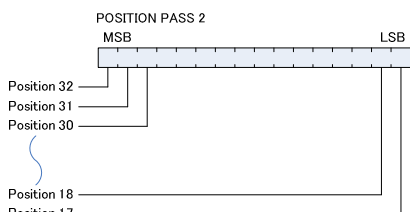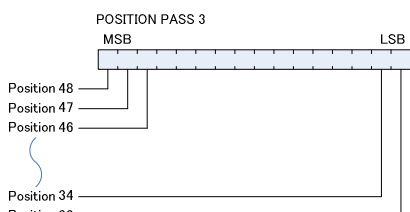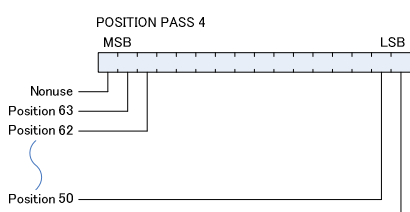
The following are signals that can be allocated to input ports:

The "jobs" in this section include the trace job.

Signal Name	Function Explanation	Data length
START	Start signal of fastening process. Fastening starts at signal ON and automatically terminates when reaching fastening target. If signal switches to OFF before fastening target, fastening process will terminate and judges as end of process.	Bit
REVERSE	• When start signal is input from external I/O, normal fastening rotation if this signal is OFF, and reverse fastening rotation if this signal is ON. • When the reverse fastening rotation is being made by this signal input, "REVERSE ON" signal is output.	Bit
RUN	• It resets system error status. • It resets tool lock status due to Batch Counter and job end.	Bit
LOCK	• Fastening process block signal. While this signal is being inputted, signal inputs from START signal and trigger switch from TOOL START will be rejected. • If this signal is being input during fastening, operation will be forcibly stopped and judged. • When LOCK is ON, "LOCK ON" signal is output.	Bit
LOCK N.C	It is a normal close signal to disable tool actions (LOCK). When this signal is OFF, tool actions are disabled.	Bit
REJECT	• Executes the process of Batch Counter according to "S07: REJECT SEL". • Executes the process of Job Counter according to "S07: REJECT SEL".	Bit
RESET	• Reset system error status. • Reset counter to 0 when Batch Counter function is being used. • Reset counter to 0 when JOB function is being used. • Reset the inputting of JOB START signal. • Reset tool lock status due to Batch Counter and job end.	Bit
JOB START	Starting signal of JOB. If setting of [LINE COUNT] is valid, JOB will not start to function if this signal is not inputted.	Bit
DATA OUT	Output most recent fastening result data from COM1 port (RS-232C)	Bit
S.START	Use this function to synchronize fastening without using Multi-Spindle function. This function is valid when "P05 SET TIME =>7. PAUSE.t" is set to other than 0. This signal enables seat synchronization. Don't use this signal when Multi-Spindle function is used.	Bit
COUNTER RESET	• Reset the value of Batch Counter to its default value. • Reset tool lock status due to batch counting end.	Bit
TOOL TIGHTENING DISABLE	It is a signal to disable fastening operation. When this signal is ON, fastening is disabled, but loosing is not affected.	Bit
TOOL LOOSING DISABLE	It is a signal to disable tool loosing. When this signal is ON, loosing is disabled, but tightening is not affected.	Bit
START PULSE	Pulse input executes rotation operation. Even when the signal is OFF, the rotation continues until the fastening process is completed (time out at the completion of fastening). To stop the process in the mid-course, input LOCK signal.	Bit
COUNT INCREMENT	Increment one count of Batch Counter or Job Counter per input. A fastening result is 1OK count.	Bit
COUNT DECREMENT	Decrement one Batch Counter or Job Counter per input. A fastening result is not influenced.	Bit
RESTART JOB	Restart the active job.	Bit
BYPASS CHANNEL	Set Job Parameter "8. CONTINUE" to OFF and input this during execution of JOB to skip next CHANNEL (STEP) to be executed.	Bit
ABORT JOB	This aborts the active job. A fastening result is JOB OK.	Bit
JOB OFF	This turns off the job mode and turns on the channel switching from the panel. If the job is already active, it is cancelled. When the job is cancelled, the fastening result is JOB OK. Re-starting the job is below. 1. Input JOB START signal if JOB-INT or JOB-EXT is selected in S05.CH SELECT setting 2. Input VIN information if CH-ID is selected in S05.CH SELECT setting	Bit
VIN STROBE	This is a command signal when Identifier is set by Fieldbus. Please see Identifier function items.	Bit
CH-INT SELECT		
CH-EXT SELECT		
JOB-INT SELECT	The selecting signal of channel selection setting	Bit
JOB –EXT SELECT	When all signals are OFF, the X-PAQ controller follows setting of "S05 CH SELECT".	
ID SELECT		

Signal Name	Function Explanation	Data length
CH SELECT 1	The selecting signal of CHANNEL. (binary form) Numbers from 1 to 99 are selectable. This becomes invalid if 0 (no input) or number that is larger than 99 is selected. *They cannot be used together with input signals "SET CH1-32."	Bit
CH SELECT 2		
CH SELECT 4		
CH SELECT 8		
CH SELECT 16		
CH SELECT 32		
CH SELECT 64		
JOB SELECT 1	The selecting signal of JOB. (binary form) Numbers from 1 to 99 are selectable. This becomes invalid if 0 (no input) or number that is larger than 99 is selected.	Bit
JOB SELECT 2		
JOB SELECT 4		
JOB SELECT 8		
JOB SELECT 16		
JOB SELECT 32		
JOB SELECT 64		
SET CH1	Set as channel 1. Please be careful that it can not be used together with CH SELECT.	Bit
SET CH2	Set as channel 2. Please be careful that it can not be used together with CH SELECT.	
SET CH3	Set as channel 3. Please be careful that it can not be used together with CH SELECT.	
SET CH4	Set as channel 4. Please be careful that it can not be used together with CH SELECT.	
SET CH5	Set as channel 5. Please be careful that it can not be used together with CH SELECT.	
SET CH6	Set as channel 6. Please be careful that it can not be used together with CH SELECT.	
SET CH7	Set as channel 7. Please be careful that it can not be used together with CH SELECT.	
SET CH8	Set as channel 8. Please be careful that it can not be used together with CH SELECT.	
SET CH9	Set as channel 9. Please be careful that it can not be used together with CH SELECT.	
SET CH10	Set as channel 10. Please be careful that it can not be used together with CH SELECT.	
SET CH11	Set as channel 11. Please be careful that it can not be used together with CH SELECT.	
SET CH12	Set as channel 12. Please be careful that it can not be used together with CH SELECT.	
SET CH13	Set as channel 13. Please be careful that it can not be used together with CH SELECT.	
SET CH14	Set as channel 14. Please be careful that it can not be used together with CH SELECT.	
SET CH15	Set as channel 15. Please be careful that it can not be used together with CH SELECT.	
SET CH16	Set as channel 16. Please be careful that it can not be used together with CH SELECT.	
SET CH17	Set as channel 17. Please be careful that it can not be used together with CH SELECT.	
SET CH18	Set as channel 18. Please be careful that it can not be used together with CH SELECT.	
SET CH19	Set as channel 19. Please be careful that it can not be used together with CH SELECT.	
SET CH20	Set as channel 20. Please be careful that it can not be used together with CH SELECT.	
SET CH21	Set as channel 21. Please be careful that it can not be used together with CH SELECT.	
SET CH22	Set as channel 22. Please be careful that it can not be used together with CH SELECT.	
SET CH23	Set as channel 23. Please be careful that it can not be used together with CH SELECT.	
SET CH24	Set as channel 24. Please be careful that it can not be used together with CH SELECT.	
SET CH25	Set as channel 25. Please be careful that it can not be used together with CH SELECT.	
SET CH26	Set as channel 26. Please be careful that it can not be used together with CH SELECT.	
SET CH27	Set as channel 27. Please be careful that it can not be used together with CH SELECT.	
SET CH28	Set as channel 28. Please be careful that it can not be used together with CH SELECT.	
SET CH29	Set as channel 29. Please be careful that it can not be used together with CH SELECT.	
SET CH30	Set as channel 30. Please be careful that it can not be used together with CH SELECT.	
SET CH31	Set as channel 31. Please be careful that it can not be used together with CH SELECT.	
SET CH32	Set as channel 32. Please be careful that it can not be used together with CH SELECT.	
U01–U99	It is user coil used by the PLC function. It is possible to allocate it as an external output.	

Signal Name	Function Explanation	Data length
TEACHING ALL	Shift to trace job function all-position continuous teaching mode.	Bit
TEACHING POINT	Shift to trace job function specified-position teaching mode.	
POSITION SET	Register the current position of tracer arm in the selected position list.	
POSITION WRITE	Enable the data registered in the position list. This becomes invalid if teaching is ended without inputting the signal.	
ZERO RESET	Set the current position to XY coordinate data 0. *Offset coordinate data acquired at input signal is stored in battry back-up area. Because of removing battery or low voltage, the data will be initialized. Please re- set the parameter when it happens.	
POSITION SELECT 1		
POSITION SELECT 2	The position number selecting signal at the time of trace job function specified-position teaching. (binary form) Numbers from 1 to 63 are selectable. This becomes invalid if 0 (no input) or a number that is 64 or larger is selected.	
POSITION SELECT 4		
POSITION SELECT 8		
POSITION SELECT 16		
POSITION SELECT 32		
CHANNEL NUMBER	The input area of Channel number (binary form) It is set to the input channel number. Numbers from 1 to 99 are selectable. This becomes invalid if 0 (no input) or number that is larger than 99 is selected.	Word
JOB NUMBER	The input area of Job number (binary form) It is set to the input Job number.	
CHANNEL BATCH SIZE	The count number setting area of Channel When the setting of program parameter 10.1.Count is "FIELDBUS", the content of this will be valid.	
VIN INPUT	VIN (vehicle number information) number. From 1 to 25characters are selectable.	Character
POSITION SELECT	The position number selecting signal. Numbers from 1 to 63 are selectable. This becomes invalid if 0 or a number that is larger than 63 is selected. It is enabled in trace teaching mode.	Word
POSITION PASS 1	Set passing of positions (steps) 1 to 63. The corresponding position is passed when the bit is ON. 	
POSITION PASS 2		
POSITION PASS 3		
POSITION PASS 4		

Output Allocation Items List

The following are signals that can be allocated to output ports.

The "jobs" in this section include the trace job.

Signal Name	Description	Data Length
READY	Output when operation is executable by input signal. For fastening process triggered by the external I/O START signal, make sure that Ready signal is ON before inputting.	Bit
BUSY	Output during fastening process.	Bit
SYSTEM ERROR	Output when system encounters abnormal status.	Bit
COMP	Output after fastening process is completed. (Note: Also output if fastening process is terminated due to system error.)	Bit
OK	Output after fastening process is judged to be OK.	Bit
NG	Output after fastening process is judged to be NG.	Bit
nxOK	Output after Batch Counter is judged to be OK.	Bit
nxNG	Output after Batch Counter is judged to be NG.	Bit
SEAT	Output after pre-fastening process is completed (seat torque is reached)	Bit
REVERSE ON	Output when REVERSE switch of tool unit is input. However, for fastening process triggered by the external I/O START signal, it outputs the status of reverse signal of external I/O regardless of the input of reverse switch on a tool unit.	Bit
JOB COMP	When JOB function is enabled, output if JOB is completed (all set STEPs are completed).	Bit
LOCK ON	Output if LOCK signal is ON It will answer towards Lock signal input.	Bit
BATTERY EMPTY	Output if the backup battery voltage drops down below the defined value.	Bit
DATA OUT ERROR	Output if abnormal status is detected when the data is output from COM1 port.	Bit
JOB STEP COMP	When JOB function is enabled, output signal after completion of each step.	Bit
JOB RUNNING	Output when the job is being executed.	Bit
JOB ABORT	Output when the job is aborted.	Bit
JOB OK	Output when the JOB OK is completed.	Bit
JOB NG	When COUNT TYPE on the JOB is set OK COUNT, output when REJECT signal is inputted. When COUNT TYPE on the JOB is set ALL COUNT, output after completion of the JOB if NG occurred during the JOB.	Bit
TOOL LOCKED	Output when the tool is locked, LOCK signal is ON, and Job or Channel count is completed.	Bit
RECEIVE BARCODE	• Output when a barcode has received data. • Output when Identifier has input from Fieldbus. • Output when Identifier has input from protocol only for PC.	Bit
VIN STROBE ANSWER	Answer signal for VIN STROBE. When VIN STROBE is turned ON, VIN (vehicle number information) is acquired and this VIN STROBE ANSWER is turned ON. Then VIN STROBE is turned OFF, this is turned OFF.	Bit
CH-ANS1		
CH-ANS2		
CH-ANS4		
CH-ANS8	Selected channel number confirmation signal. (binary form) Return operating channel number while JOB functions are being used.	Bit
CH-ANS16		
CH-ANS32		
CH-ANS64		
JOB-ANS1		
JOB-ANS2		
JOB-ANS4		
JOB-ANS8	Selected JOB number confirmation signal. (binary form)	Bit
JOB-ANS16		
JOB-ANS32		
JOB-ANS64		
SEAT TRQ HIGH NG	Output if the value of seat torque exceeds its maximum setting value.	Bit
TRQ HIGH NG	Output if the value of detected torque exceeds its maximum setting value.	Bit
TRQ LOW NG	Output if the value of detected torque falls below its minimum setting value.	Bit
ANG HIGH NG	Output if the value of detected angle exceeds its maximum setting value.	Bit
ANG LOW NG	Output if the value of detected angle falls below its minimum setting value.	Bit

Signal Name	Description	Data Length
PRE SEAT TIME NG	Output if the time required for detecting seat torque is within the "PRE SEAT.t" setting.	Bit
FINAL MIN TIME NG	Output if fastening completes within the time set in "FINAL MIN.t."	Bit
FINAL MAX TIME NG	Output if fastening did not complete within the time set in "FINAL MAX.t."	Bit
TOTAL TIME NG	Output if time interval between start to end of fastening process "TOTAL.t."	Bit
MONITOR HIGH NG	When S-MONITOR function is enabled, output if the inspected torque value exceeds its maximum setting value.	Bit
MONITOR LOW NG	When S-MONITOR function is enabled, output if the inspected torque value falls below its minimum setting value.	Bit
S-CUR MON HIGH NG	When S-CUR MONITOR function is enabled, output if the detected electric current value exceeds its maximum setting value.	Bit
S-CUR MON LOW NG	When S-CUR MONITOR function is enabled, output if the detected electric current value falls below its minimum setting value.	Bit
F-CUR MON HIGH NG	When F-CUR MONITOR function is enabled, output if the detected torque value exceeds its maximum setting value.	Bit
F-CUR MON LOW NG	When F-CUR MONITOR function is enabled, output if the detected electric current value falls below its minimum setting value.	Bit
MULTI-SPINDLE OK	When multi-spindle function is enabled, output after TOTAL OK is judged. Function only for station number 1 (master station).	Bit
MULTI-SPINDLE NG	When multi-spindle function is enabled, output after TOTAL NG is judged. Function only for station number 1 (master station).	Bit
PEAK TRQ HIGH NG	Output if the value of detected peak torque exceeds its maximum setting value.	Bit
PEAK TRQ LOW NG	Output if the value of detected peak torque falls below its minimum setting value.	Bit
RUNDOWN HIGH NG	When rundown angle monitor function is enabled, output if the value of inspected angle exceeds it maximum setting value.	Bit
RUNDOWN LOW NG	When rundown angle monitor function is enabled, output if the value of detected angle falls below its minimum setting value.	Bit
SELF TAP TRQ HIGH NG	Output if the detected torque exceeds the maximum torque during a self tap interval when Self Tap function is ON.	Bit
SELF TAP TRQ LOW NG	Output if the inspected torque falls below the minimum torque during a self tap interval when Self Tap function is ON.	Bit
F-MON TRQ HIGH NG	Output if the inspected torque exceeds the monitor maximum torque when the final monitor is ON.	Bit
F-MON TRQ LOW NG	Output if the detected torque falls below the monitor minimum torque when the final monitor is ON.	Bit
MULTI-SPINDLE 1 OK	This outputs fastening results of spindles when using the Multi-Spindle function.	Bit
MULTI-SPINDLE 1 NG		
MULTI-SPINDLE 2 OK		
MULTI-SPINDLE 2 NG		
MULTI-SPINDLE 3 OK		
MULTI-SPINDLE 3 NG		
MULTI-SPINDLE 4 OK		
MULTI-SPINDLE 4 NG		
MULTI-SPINDLE 5 OK		
MULTI-SPINDLE 5 NG		
MULTI-SPINDLE 6 OK		
MULTI-SPINDLE 6 NG		
MULTI-SPINDLE 7 OK		
MULTI-SPINDLE 7 NG		
MULTI-SPINDLE 8 OK		
MULTI-SPINDLE 8 NG		
MULTI-SPINDLE 9 OK		
MULTI-SPINDLE 9 NG		
MULTI-SPINDLE 10 OK		
MULTI-SPINDLE 10 NG		
STAT ALARM	Output if strategy NG occurs when the statistical function is ON. (available in the future)	Bit
CURRENT LIMIT ON	Output if the current limitation of a servo driver is effective during a fastening process.	Bit
CH SELECT CH-INT	Output if "S05 CH SELECT" is set to CH-INT.	Bit
CH SELECT CH-EXT	Output if "S05 CH SELECT" is set to CH-EXT.	Bit

Signal Name	Description	Data Length
CH SELECT JOB-INT	Output if "S05 CH SELECT" is set to JOB-INT.	Bit
CH SELECT JOB-EXT	Output if "S05 CH SELECT" is set to JOB-EXT.	Bit
CH SELECT ID	Output if "S05 CH SELECT" is set to ID.	Bit
COUNT1	This outputs current value of error proofing counter (binary form).	Bit
COUNT2		
COUNT4		
COUNT8		
COUNT16		
COUNT32		
COUNT64		
DATA ACQT.ALIV	It outputs while connecting with PC and dedicated protocol	Bit
MCH ABORT	It outputs when Multi-Channel is aborted.	Bit
TOOL START	It outputs when tool start switch is ON.	Bit
TOOL REVERCE	It outputs when rotation direction selection switch is selected reverse rotation.	Bit
TOOL RESET	It outputs when rotation direction selection switch is selected reset.	Bit
JOB STEP No. 1	It outputs current job step number by binary for.	Bit
JOB STEP No. 2		
JOB STEP No. 4		
JOB STEP No. 8		
JOB STEP No. 16		
JOB STEP No. 32		
U01–U99	It is user coil used by the PLC function. It is possible to allocate it as an external output.	Bit
REVERCE COMP	It outputs if start torque of operating channel is detected during reversing operation.	Bit
UNDER TARGET TORQUE	It outputs if the operation is aborted before the the target torque is detected when ditecting under target torque function is valid.	Bit
RELEASE START TRIGGER	It outputs if the operation is aborted because of start trigger off when ditenting start trigger off function is enable.	Bit
WATCH DOG	Turn ON/Off every 0.5 sec It enables to judge whether the controller is normal thru device such as Field bus.	Bit
1SEC CLOCK	Turn On/Off every 1 sec	Bit
TOOL CYCLE ALARM	Output when tool cycle exceeded the value set on [S20. TOOL CYCLE COUNT MONITOR] (Available Ver. HA1050 or later)	Bit
REVERSE ANGLE NG	Output when NG occurred on REVERSE ANGLE control. (Available Ver. HA1050 or later)	Bit
CLOCK ALARM	Output when abnormal value is set on internal clock IC. (Available Ver. HA1050 or later)	Bit
TEACHING BUSY	It outputs during teaching mode.	Bit
TEACHING COMP	It outputs when teaching is completed.	Bit
TEACHING STEP COMP	It outputs each time position data registration is completed.	Bit
TCU READY	It displays trace controller READY status.	Bit
POSITIONING NG	It outputs if position data is out of tolerance when fastening is completed with trace job parameter "END POSITION" enabled.	Bit
ORIGIN SEARCH COMP	It outputs when origin search is completed with "XY TBL" or "XYZ TBL" selected in "S18.1 TABLE SELECT".	Bit

Signal Name	Description	Data Length
SPD	Data of a Station Number of controller.	Word
CHANNEL	Number of channel which is fastened.	Word
FS. COUNT	Number of fastenings	Long word
DATE	Date and hour when fastening is completed. YY/MM/DD/hh/mm/ss (Only the last two digits are input.)	3 words (6 bytes)
F. TRQ	Final torque data	Word
F. ANG	Final angle data	Long word
VIN ANS1–VIN ANS25	Set VIN(vehicle ID number)data	Character
VIN OUT1–VIN OUT25	Input VIN (vehicle ID number) data	Character
JOB	Executed job number data.	Word
STEP	Executed job step number.	Word
COUNT	Fastening count data.	Word
JOB JDG	Total judgment result data of executed job.	Word
PK. TRQ	Peak torque data	Word
SEAT TRQ	Seat torque data	Word
S-MON. TRQ	Measured torque data of section torque monitor function	Word
ANG. ST. TRQ	Angle measurement starting torque data	Word
S. CUR. MON	Measured current data of section current monitor function.	Word
F. CUR. MON	Measured current data of fastening current monitor function.	Word
FR. TIME	Pre-fastening time data (Measured data shown in increments of 0.1 second. Output data is integer, multiplied by 10 folds)	Word
FS. TIME	Fastening time data (Measured data shown in increments of 0.1 second. Output data is integer, multiplied by 10 folds)	Word
TL. TIME	Total fastening time data (Measured data shown in increments of 0.1 second. Output data is integer, multiplied by 10 folds)	Word
RUNDOWN ANG	Rundown angle measurement data.	Long word
SELF TAP TRQ	Peak torque data between self tap sections.	Word
CM. TRQ	Compensation torque data of compensation torque function	Word
F. MON TRQ	Measured torque data of fastening torque monitor function.	Word
LO.ST. TRQ	Seat torque minimum setting data of fastening channel.	Word
HI.ST. TRQ	Seat torque maximum setting data of fastening channel.	Word
LO.ANG. TRQ	Angle measurement starting torque minimum setting data of fastening channel	Word
HI. ANG. TRQ	Angle measurement starting torque maximum setting data of fastening channel	Word
TG. TRQ	Target torque setting data of fastening channel.	Word
LO. F. TRQ	Final torque minimum setting data of fastening channel	Word
HI. F. TRQ	Final torque maximum setting data of fastening channel	Word
LO. PK. TRQ	Peak torque minimum setting data of fastening channel	Word
HI. PK. TRQ	Peak torque maximum setting data of fastening channel	Word
TG. ANG	Target angle setting data of fastening channel.	Word
LO. ANG	Angle minimum setting data of fastening channel.	Word
HI. ANG	Maximum angle setting data of fastening channel.	Word
SYS. ERR No.	Error number data of a system error occurring during fastening.	Word
F. BATCH SIZE	Fastening count setting data.	Word

Signal Name	Description	Data Length
X POSITION MONITOR	Current value of tracer arm X-axis coordinate data Signed data (0 to ±30000)	Word
Y POSITION MONITOR	Current value of tracer arm Y-axis coordinate data Signed data (0 to ±30000)	Word
Z POSITION MONITOR	Current value of tracer arm Z-axis coordinate data Signed data (0 to ±30000)	Word
POSITION OK STATUS 1 POSITION OK STATUS 2 POSITION OK STATUS 3 POSITION OK STATUS 4 POSITION NG STATUS 1 POSITION NG STATUS 2 POSITION NG STATUS 3 POSITION NG STATUS 4	It displays OK and NG status of positions (steps) 1 to 63. OK and NG status areas are provided. When a judgment of OK or NG is made, the bit corresponding to the position becomes 1 in each area. POSITION PASS 1 MSB LSB Position 16 Position 15 Position 14 Position 02 Position 01 POSITION PASS 2 MSB LSB Position 32 Position 31 Position 30 Position 18 Position 17 POSITION PASS 3 MSB LSB Position 48 Position 47 Position 46 Position 34 Position 33 POSITION PASS 4 MSB LSB Nonuse Position 63 Position 62 Position 50 Position 49	Word
NOW POSITION NUMBER	Point number of current position	Word

*   If the unit is set to "N•m" or "ft•lbs", torque data is output as integer multiplied by 100 folds. If the unit is set to "kgf•m", the data is output as integer multiplied by 1,000 folds. Angle value is output as integer multiplied by 10 folds.

8. Multi-Spindle Function

8.1. System Outline

Multi-spindle functionality is that the operation control can be aggregated into a master unit and the synchronous tightening to the seat, when carrying out a tightening in the multi-axis system.

By connecting controllers with NET cable, connections with multi-spindles (2 through 10 spindles) can be established.
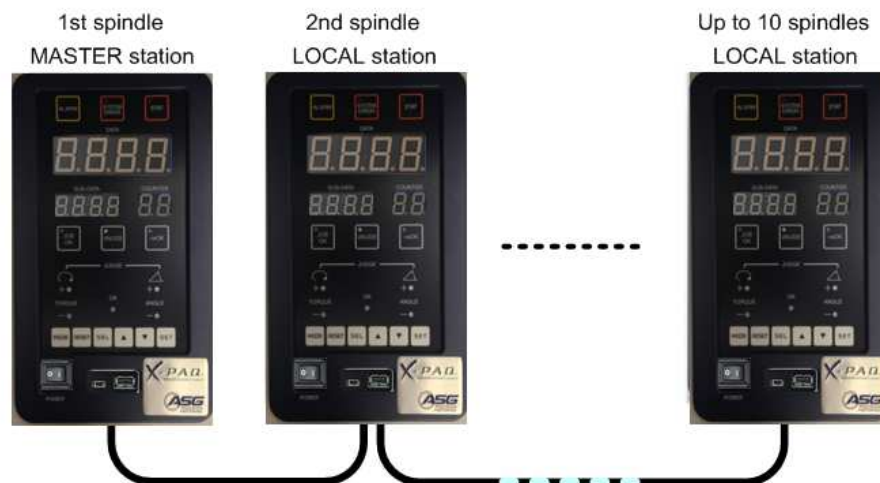
Multi-spindles have the following features and conditions.

(1) Connection with the same tool type

All tool types connected to a master and local stations must be same. If one or more controller(s) is/are connected with different tool types, multi-spindle operation cannot be executed.

(2) Control command such as fastening START is only for a master station.

Control commands such as fastening START signal can be given only to a master station. Fastening does not start with START signal of a local station ON. Even if REVERSE signal is input to a local station, whether the rotation of the local station is normal/reverse depends on the master station. The local station uses the same rotation as the master's.

(3) Fastening parameter is set only for the master station.

Fastening parameter must be set only for the master station. (Same as channel/job related settings.)
As a local station is fastened with the parameter set by the master, fastening can be conducted even by a default fastening parameter. On the other hand, editing a fastening parameter for a local station is not reflected in a fastening operation.

(4) Fastening result data is stored in stations.

The master station can output only fastening OK/NG judgment of local stations.
As stations output fastening result data and various result judgments (I/O output such as TRQ HIGH NG), use Ethernet, RS-232C serial data output, Fieldbus, etc. to collect result data of individual fastenings.

8.2. Setup Procedure

(1) Wiring

Carry out required wirings as shown below for power, TOOL, and NET cables when power switch is off.　No sequence is specified to connect NET cables. There is no problem in connecting them in random order if all stations are connected. Be sure, however, to connect NET end resistor at both ends of controllers.

| End resistor | 1st spindle Master station | NET cable | 2nd spindle Local station | NET cable | 3rd spindle Local station | NET cable | 4th spindle Local station | End resistor |

| End resistor | 4th spindle Local station | NET cable | 1st spindle Master station | NET cable | 3rd spindle Local station | NET cable | 2nd spindle Local station | End resistor |
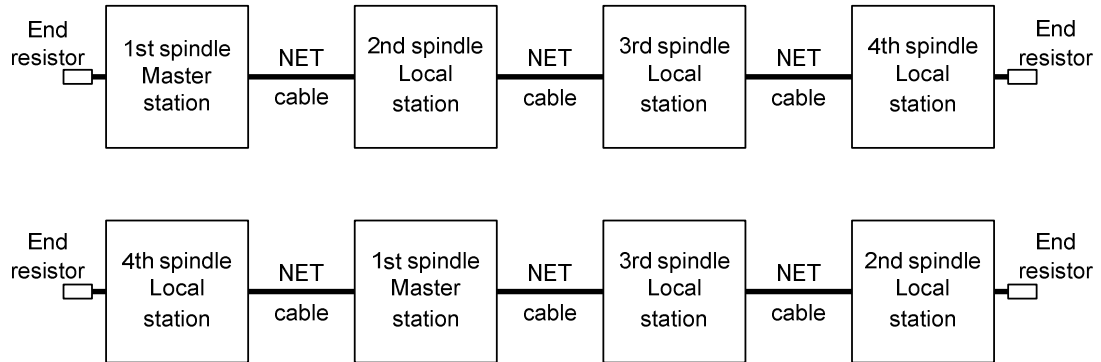
(2) Set a master station

Power on the 1st spindle controller, this will be the master station.

Using the code address setting on the system parameter setting screen, change the setting value to "1". (The factory default is set to "1.")

<Setting method—Code address>

MODE key

SUB-DATA　　COUNTER
`Cont　SY`
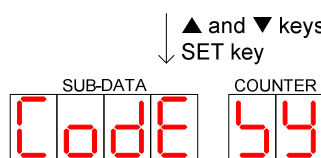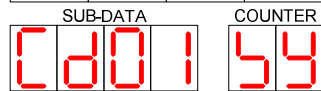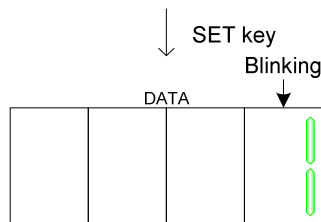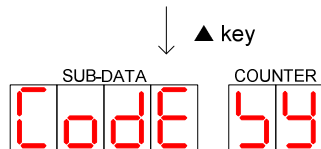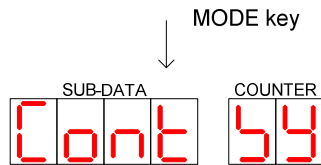
1) Press the MODE key on the front panel until system parameter setting screen. "SY" is displayed in the COUNTER section and then press the SET key.

▲ key

SUB-DATA　　COUNTER
`CodE　SY`

2)Press "▲" and then "CODE" is displayed in the SUB-DATA section. Press the SET key to go to the code address setting screen.

SET key
Blinking

DATA

3) The value blinks in the DATA section.
Set the code address with the "▲" and "▼" keys and SEL key and confirm it with the SET key.

SUB-DATA　　COUNTER
`Cd01　SY`

▲ and ▼ keys, SEL key
SET key

SUB-DATA　　COUNTER
`CodE　SY`

4) Return to the menu screen.

Using the multi-spindle setting on the system parameter setting screen, enter the total number of spindles connected to the setting value. In the case of four spindles, for example, enter "4".

<Setting method—Total number of spindles>
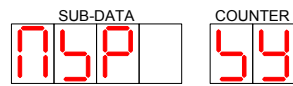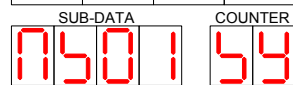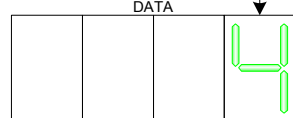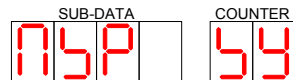
1) On the system parameter setting screen, operate the "▲" and "▼" keys until "MSP" is displayed in the SUB-DATA section. Then press the SET key to go to the multi-spindle setting

2) The value blinks in the DATA section. Set the total number of spindles with the "▲" and "▼" keys and SEL key and confirm it with the SET key.

3) Return to the menu screen.

(3) Set a local station (2nd spindle)

Power on the 2nd spindle, this will be the first local station.

Using the code address setting on the system parameter setting screen, enter the spindle number in the setting value. In this case, change the number to "2" because it is the 2nd spindle.

For the setting method, refer to "Setting method—Code address" under "(2) Set a master station".

(4) Set all local stations

If the 3rd and subsequent spindles are connected, power on them sequentially and set the setting content to the corresponding spindle number using the code address setting on the system parameter setting screen.

On this occasion, be careful not to duplicate or omit a spindle number. Any duplication or omission will cause a system error or a controller malfunction.

For the setting method, refer to "Setting method—Code address" under "(2) Set a master station".

(5) Set by the Management Software

This section explains how to set up management software for performing at "(4) Set all local stations" from "(2) Set a master station "

Management software can be done in the setting of (2) ~ (4) at once by creating a new project file of using multi-spindle and by writing setting data to the controller.

1) Create a new project file. Click on the command switch or pull-down menu　[New] → [File] to start the management software.
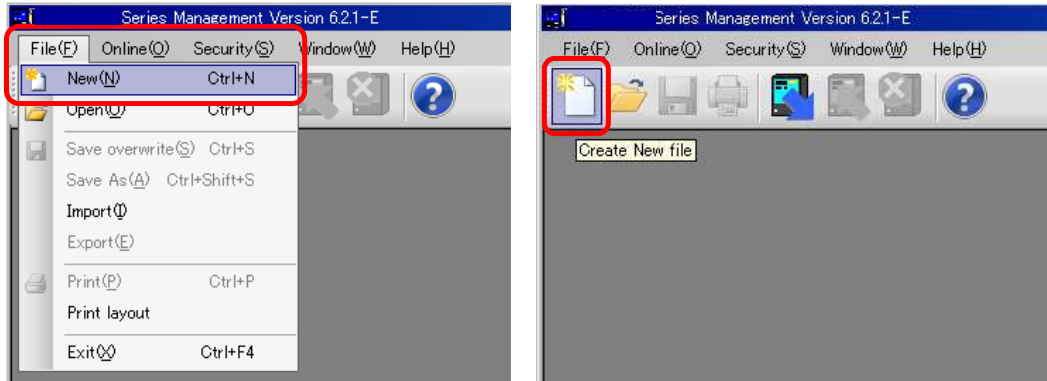
2) Window "Creating New" will be displayed.
Set the necessary items when creating a new project file and make the settings for use in multi-spindle at SPINDLE SETUP.
#1 Select the M-SPINDLE in 1. SPINDLE TYPE. #2Enter the total number of axes to SPINDLE NUMBER.
Click OK by setting the Controller Name, if necessary.
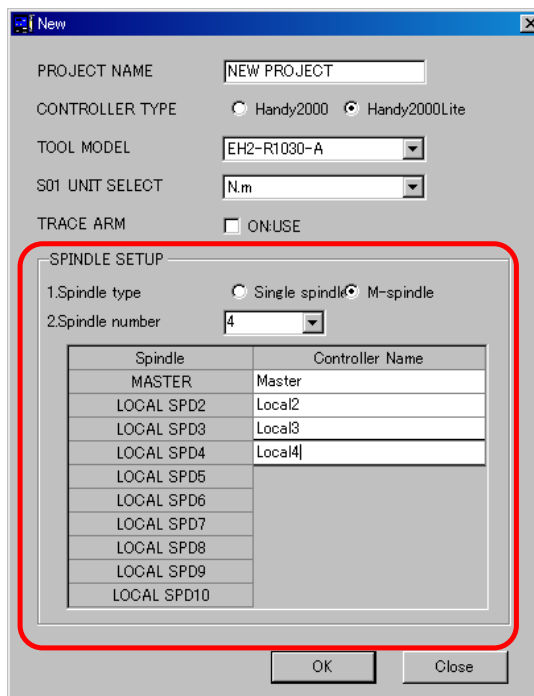
3) Project file that you set the multi-spindle function is created and then Projects tab nd a tree view is displayed as follows.
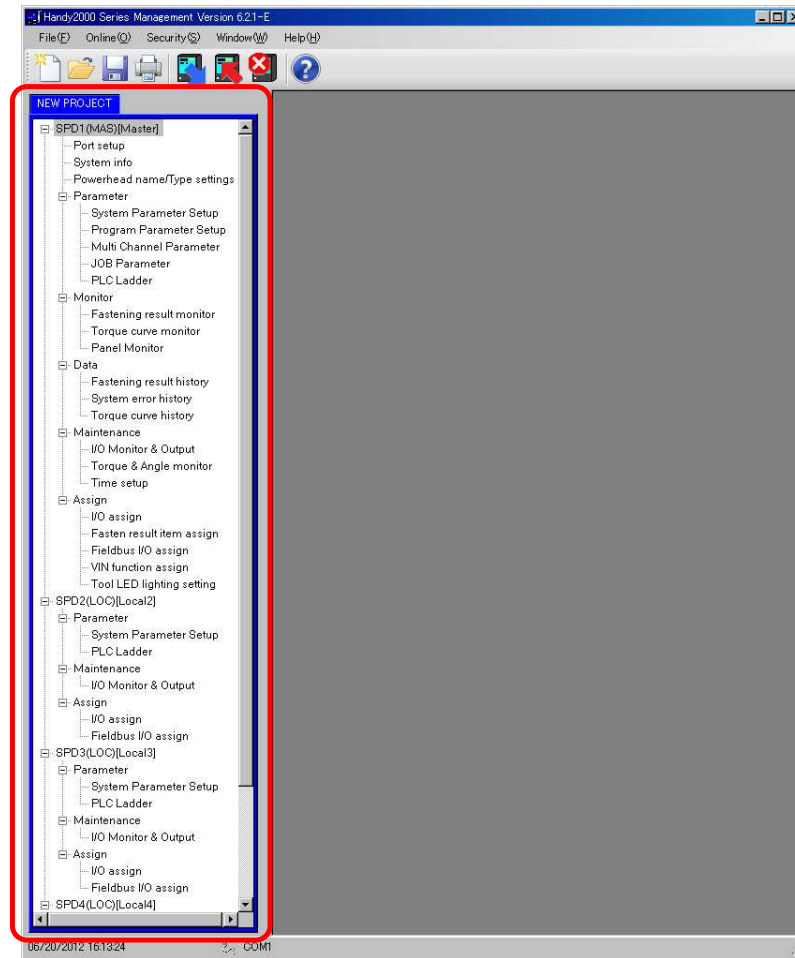
4) Power up the controller of all stations are connected, and Write the setting data to the master station controller.
When you click a command switch or pull-down menu [online] →[write and upload (PC to HNR)] , Window [write and upload] will be displayed.
Select "Selectable item" and check to System parameters, and then click "OK" to carry out writing.
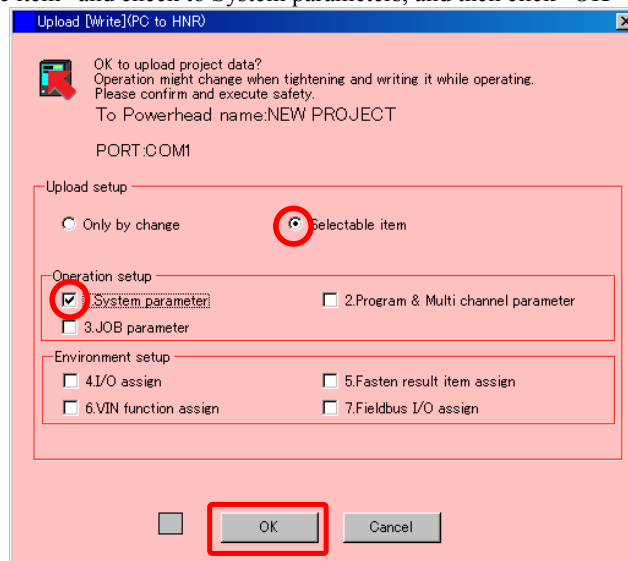
(6) Check NET connection status

When all the spindles have been powered on and all the spindle numbers have been set, select the station number check screen in the master station on the 1st spindle and check the connection status.

Press the MODE key on the front panel until "ST" is displayed in the COUNTER section and then press the SET key. The station number check screen will appear. This screen is displayed only for a multi-spindle master station.
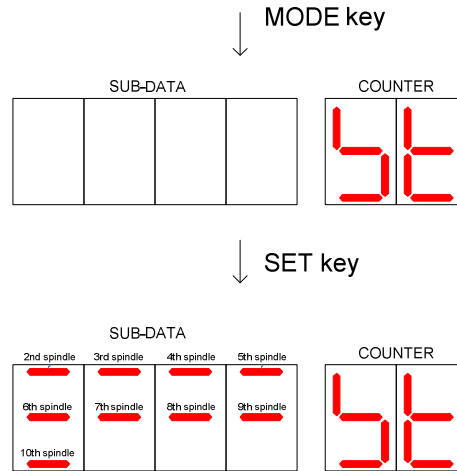
When communications for the total number of set spindles cannot be carried out or the type does not match, only the spindles for which communications can be carried out and the type matches are displayed and "ST" blinks in the COUNTER section.

The screen below shows that the total number of spindles is 10. It indicates that 1st to 5th spindles are recognized but 6th to 10th spindles are not.
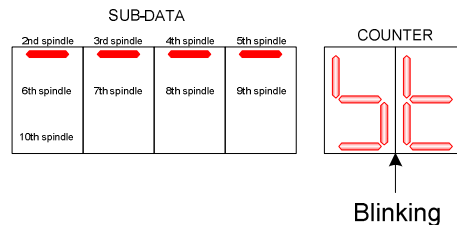
(7) Setting of seat synchronous fastening

Set a synchronizing method etc. from the setting items of the system setting "S12 M-SPINDLE => 2. SYNC TIGHT", etc. For further details, see the explanation in SYSTEM (System parameter setting) "S-12 M-SPINDLE".

(8) Conditions for start of fastening operation

When a fastening parameter of the master station has been set and all spindles are operable, fastening can be started by inputting START signal into the master station. If a system error occurs, please see "Troubleshooting" in this document.

(9) Inputting IDENTIFIER

When IDENTIFIER (VIN) is inputted to only master station, the information will be transferred to local stations. Moreover, it is also possible to input IDENTIFIER to local station. When the IDENTIFIER is inputted to local station, the IDENTIFIER obtained from master station will not be transferred to the local station.

8.3. Cautions in Multi-Spindle Function

Please take extra care in the following points, which cause system malfunctions.

(1) Don't use duplicate spindle numbers (S02 SYS SETUP => 1.CODE ADR.) in one multi-spindle system.

(2) Don't connect more/less spindles than the number of spindles set in the master station: (S12 M-SPINDLE => 1.M-SPINDLE).

(3) Don't set more than one master station in one multi-spindle system.

9. IDENTIFIER Function

Identifier function takes in a vehicle information number (VIN) and codes to identify fastening works such as an engine number (Identifier) to X-PAQ.

X-PAQ can reflect obtained codes in fastening result data and output the data. In addition, it can switch channels and jobs based on an input code.

Codes can be obtained from a bar-code reader, Fieldbus, and Ethernet. This document explains how to obtain codes from a bar-code reader or Fieldbus. Please ask our nearest business site for details on how to obtain from Ethernet.

9.1. Connection of Bar-Code Reader

(1) Check the bar-code reader wiring specifications and the pin configuration of COM1 port (see the explanations in "5.7.2. COM1 Port"). COM1 port provides DC+5 V power output and the max current capacity is 200 mA. Please use it as required after checking the consumption current of the bar-code reader to be used.

(2) If there is no problem in connection specifications, connect the bar-code reader to COM1 port.

(3) Next, select barcode reader at "1.SELECT DEVICE", then change "2.SPEED", "3.PARITY", "4.DATA BIT" and "5.STOP BIT" of the system setting "S10 RS-COMMU" to agree with bar-code reader settings or set the communications of a bar-code reader in accordance with X-PAQ.

(4) Lastly, please configure the Bar-code reader to transmit codes as: HEADER → DATA → TERMINATOR HEADER is STX, DATA is the data scanned and TERMINATOR is ETX.
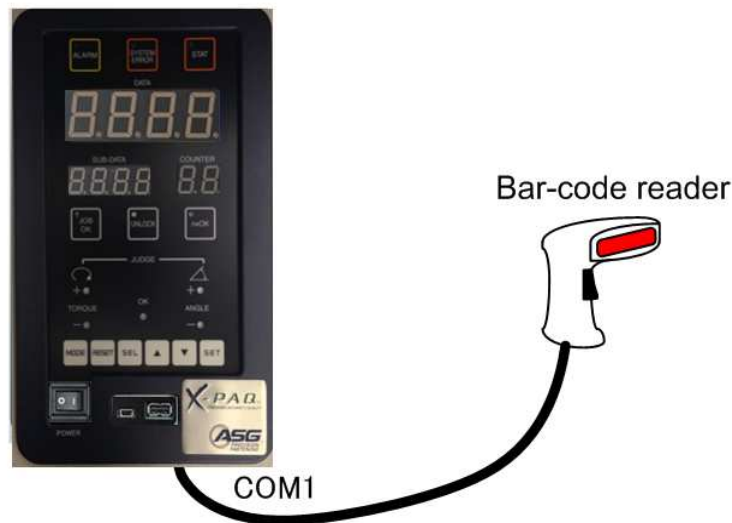
9.2. Input IDENTIFIER from FIELDBUS

In inputting a code (Identifier) from FIELDBUS, please see "7. FIELDBUS Communication Function (Option)." In addition, it is necessary to use Management Software to allocate "VIN INPUT" of internal data input and "VIN STROBE" signals of the internal BIT input and "VIN STROBE ANSWER" signals of the internal BIT output.

"VIN STROBE" and "VIN STROBE ANSWER" signals set "VIN INPUT" code (Identifier) in X-PAQ. The set timing is as the diagram below indicates.
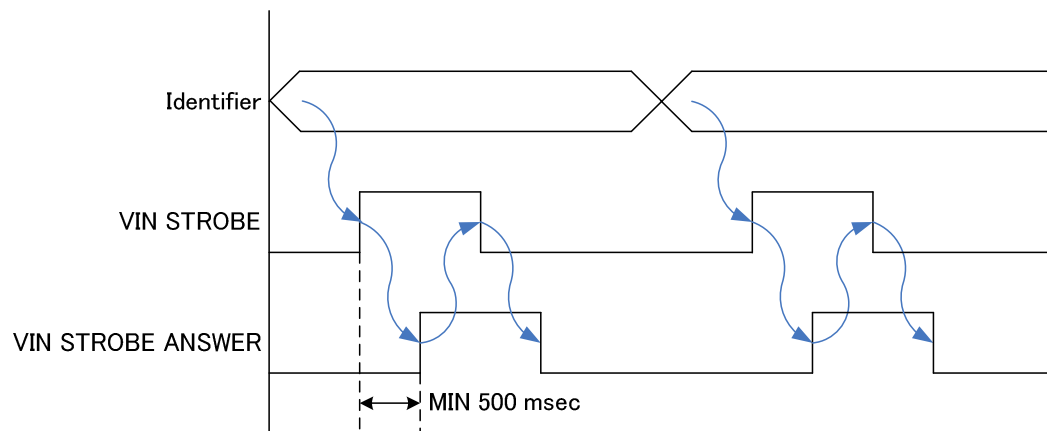
(1) Set a code from Fieldbus destination (PLC) and turn "VIN STROBE" signal ON.

(2) Turn "VIN STROBE ANSWER" signal ON from X-PAQ and get a code.

(3) Turn "VIN STROBE" signal OFF from PLC and turn "VIN STROBE ANSWER" signal OFF from X-PAQ.

(4) Set the waiting time from turning "VIN STROBE" signal ON to turning "VIN STROBE ANSWER" signal ON to 500 msec or longer. (Generally, a response is made within 100 msec.) Other timings are pursuant to this provision.

9.3. Set Valid Characters of IDENTIFIER

By setting the system setting "S06 ID SELECT => 1.ID POSITION", users can determine which characters in the character string of the input code (Identifier) are used. The maximum number of characters in the code is 25. Users can choose which of these 25 characters are to be used as identifiers.

The management software is used to make setting. The screen is as follows.

S06 ID SELECT				
1.ID POSITION	1	⊙ USE	○ NO USE	
	2	⊙ USE	○ NO USE	
	3	○ USE	⊙ NO USE	
	4	○ USE	⊙ NO USE	
	5	⊙ USE	○ NO USE	
	6	⊙ USE	○ NO USE	
	7	⊙ USE	○ NO USE	
	8	⊙ USE	○ NO USE	
	9	○ USE	⊙ NO USE	
	10	○ USE	⊙ NO USE	
	11	○ USE	⊙ NO USE	
	12	○ USE	⊙ NO USE	
	13	○ USE	⊙ NO USE	
	14	○ USE	⊙ NO USE	
	15	○ USE	⊙ NO USE	
	16	○ USE	⊙ NO USE	
	17	○ USE	⊙ NO USE	
	18	○ USE	⊙ NO USE	
	19	○ USE	⊙ NO USE	
	20	○ USE	⊙ NO USE	
	21	○ USE	⊙ NO USE	
	22	○ USE	⊙ NO USE	
	23	○ USE	⊙ NO USE	
	24	○ USE	⊙ NO USE	
	25	○ USE	⊙ NO USE	

For the setup shown above, (USE) is actually used in the Identifier code read by a scanner.

For example, in the case of code "ASGPFX123456," the first, the second, and the fifth to eighth characters from the beginning are used, and "ASFX12" code is used as the example above shows.

A	S	G	P	F	X	1	2	3	4	5	6
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
1	1	0	0	1	1	1	1	0	0	0	0
↓	↓			↓	↓	↓	↓				
A	S			F	X	1	2				
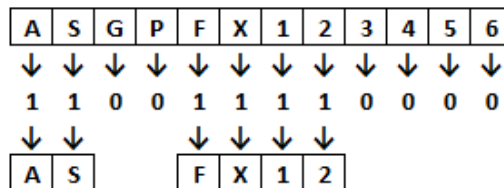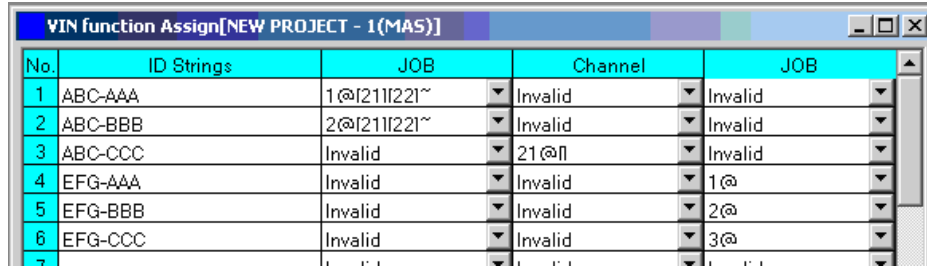
9.4. Switching Channels and Job by IDENTIFIER

X-PAQ has a function to switch channels or jobs according to an input code (Identifier) and users can configure this using Management software.

(1) Change the system setting "S05 CH SELECT => 1.CH SELECT" to "ID."

(2) Next, allocate channels and jobs corresponding to the contents of a code (Identifier) from VIN Information Function Allocation Menu.
In the following example, if a code is "ABC-AAA," carry out fastening in Channel "1" and if it is "EFG-AAA," do it in Job "1."

No.	ID Strings	JOB	Channel	JOB
1	ABC-AAA	1@[21][22]~	Invalid	Invalid
2	ABC-BBB	2@[21][22]~	Invalid	Invalid
3	ABC-CCC	Invalid	21@[1]	Invalid
4	EFG-AAA	Invalid	Invalid	1@
5	EFG-BBB	Invalid	Invalid	2@
6	EFG-CCC	Invalid	Invalid	3@

VIN function Assign[NEW PROJECT - 1(MAS)]

Please refer to Management Software Manual for details of other settings.

10. PLC Function

10.1. Specifications

PLC function of X-PAQ provides a simplified program logic control (PLC) function by A or B Contact, AND, OR, or a timer. The specifications of X-PAQ PLC function are as follows:

Items	Content
Language	Ladder language (ladder drawing)
Control Method	Stored program method
I/O Control Method	Use the cyclic scan method and the as-needed method.
Scan Time	About 20 msec
Program Capacity	200 steps
User Relay	99 points
Timer	16 points
Input Point	Actual I/O input, actual I/O output, internal input signal, internal output signal, user relay, and timer
Output Point	Actual I/O output, internal output signal, and user relay

Note: Actual I/O means PI/O (optional), RELAY/EXT IN, or REMOTE I/O (option) port.

10.2. Operation

X-PAQ PLC function can be programmed and monitored in X-PAQ management software. Please refer to X-PAQ Management Software Manual for details.
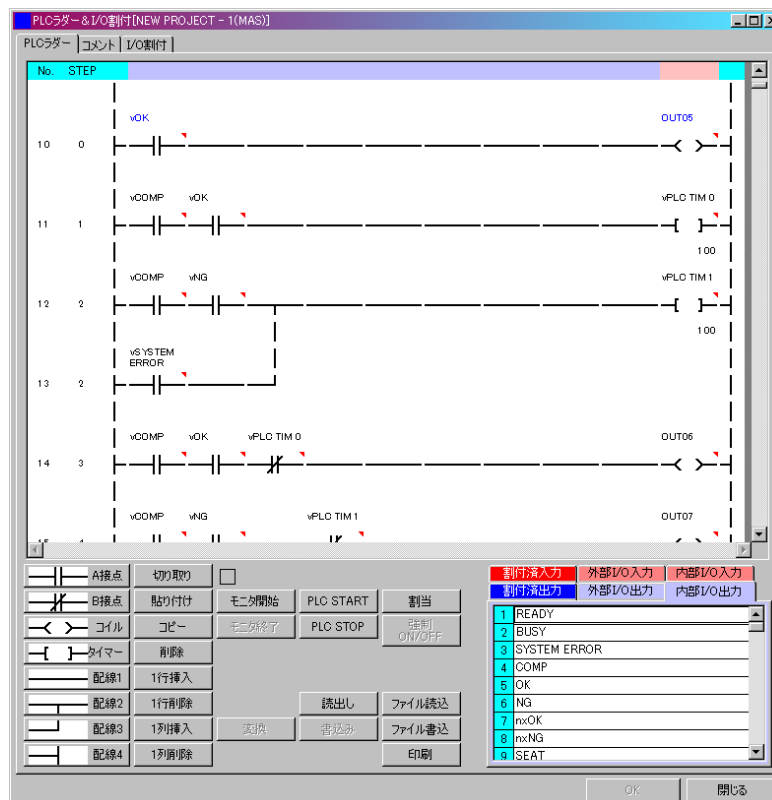
11. Description of Panel Operation

The front panel operation, display screen configuration and display data are described below.

11.1. Functions of panel

11.1.1. LED

The status indicating LEDs on the front panel are described below.

ALARM   Yellow

This LED turns on solid when the battery voltage is insufficient at power-on or when a communication error occurs at PC data transmitting, and also when a communication error occurs with PFCS.

It goes off when RUN and RESET input is done or when next PC data transmitting is performed.

While USB flash drive is insterted, recognizing, reading and writing status is indicated by blinking ALARM LED.

SYSTEM ERROR   Red

This LED turns on solid when a system error occurs.

It goes off when the system error is cancelled by doing RUN and RESET input.

STAT   Red

This LED turns on solid when the result value of the statistic function is statistic NG.

It goes off when RUN and RESET input is done or when the statistic NG is cancelled.

(available in the future)

JOB OK   7 colors

This LED turns on solid according to the JOB status as shown below. It is off when JOB is not selected.

- JOB selection   : Blue
- JOB execution   : Purple
- JOB OK   : Green
- JOB NG   : Red

| UNLOCK | Blue |

This LED turns on solid when the tool can rotate (when the lock is released and the channel or JOB is enabled).

| nxOK | 7 colors |

This LED turns on solid according to the status as shown below when the counter of the channel is enabled. It is off when the counter is disabled.

- Counter enabled : Blue
- Counter operating : Purple
- nx OK : Green
- nx NG : Red

| JUDGE | TRQUE+−, ANGLE+−, OK |

This LED turns on solid according to the fastening result as shown below.

NG No.	Fastening judgment entry	Contents of NG	Related Setting Item		Judging lamp Display
01	SEAT TRQ HI NG	Exceeded the upper limit in seat. (Pre-fastening NG)	P03-5.	SEAT HI TRQ	+TRQ
02	TRQ LOW NG	Fastening torque less than lower limit.	P03-9.	F MIN TRQ	−TRQ
03	TRQ HIGH NG	Fastening torque exceeded upper limit.	P03-11.	F MAX TRQ	+TRQ
04	PEAK TRQ LOW NG	Peak hold torque is below lower limit.	P03-12.	P MIN TRQ	−TRQ
05	PEAK TRQ HIGH NG	Peak hold torque exceeded upper limit.	P03-13.	P MAX TRQ	+TRQ
06	RUNDOWN LOW NG	Measured Rundown angle is below lower limit	P04-1.1.	RUNDOWN MIN	−ANG
07	RUNDOWN HIGH NG	Measured Rundown angle exceeded upper limit.	P04-1.2.	RUNDOWN MAX	+ANG
08	ANG LOW NG	Fastening angle is below lower limit.	P04-2.	MIN ANG	−ANG
09	ANG HIGH NG	Fastening angle exceeded upper limit.	P04-4.	MAX ANG	+ANG
10	PRE SEAT.t NG	Seat time is less than the set time during pre-fastening. (Double fastening)	P05-2.	PRE SEAT.t	−TRQ
11	FINAL MIN TIME NG	Reaching the target earlier than set time in final fastening.	P05-3.	FINAL MIN.t	−TRQ
12	FINAL MAX TIME NG	Exceeded the upper limit of set time in final fastening.	P05-4.	FINAL MAX.t	−TRQ
13	TOTAL TIME NG	Exceeded the upper limit of operation time.	P05-5.	TOTAL.t	−TRQ
14	F-MONITOR LOW NG	Final monitor torque is below lower limit.	P09-3.1. P09-3.3.	F-START MIN F-END MIN	−TRQ
15	F-MONITOR HIGH NG	Final monitor torque exceeded upper limit.	P09-3.2. P09-3.4.	F-START MAX F-END MAX	+TRQ
16	MONITOR LOW NG	Below "section monitor torque"	P09-2.3.	S-TRQ MIN	−TRQ
17	MONITOR HIGH NG	Over "section monitor torque	P09-2.9.	S-TRQ MAX	+TRQ
18	SELF TAP LOW NG	Self tap monitor torque is below lower limit.	P09-1.2.	TRQ MIN	−TRQ
19	SELF TAP HIGH NG	Self tap monitor torque exceeded upper limit.	P09-1.3	TRQ MAX	+TRQ
20	S-CUR LOW NG	Below "section current monitor value"	P09-5.3.	CURRENT MIN	−TRQ, −ANG
21	S-CUR HIGH NG	Over "section current monitor value"	P09-5.4.	CURRENT MAX	+TRQ, +ANG
22	F-CUR LOW NG	Below "final current monitor value"	P09-6.1.	CURRENT MIN	−TRQ, −ANG
23	F-CUR HIGH NG	Over "final current monitor value"	P09-6.2.	CURRENT MAX	+TRQ, +ANG
24	CURRENT LIMIT ON	Current limit functions.			−TRQ, −ANG
25	MCH ABORT	Multi-channel is interrupted.	P07-9.	PRE CUR LMT	−TRQ, −ANG
26	POSITIONING NG	Fastening end position is out of allowable range.	Trace job parameter END POSITION		−TRQ, −ANG
	Fastening OK Judged		−		OK

11.1.2. 7-segment LED

The status indicating 7-segment LEDs on the front panel are described below.

DATA   Red and Green, 4 digits

This 7-segment LED mainly displays the fastening results (torque and angle) and a system error.

The data is displayed in green when a fastening OK judgment is made and displayed in red when a fastening NG judgment is made. When a system error occurs, the ERROR No. is displayed in red in a blinking condition.

When the "Torque method" is selected, only the torque data is displayed. When a method other than the torque method is selected, the torque data and angle data are displayed alternately.

SUB-DATA   Red, 4 digits

This 7-segment LED mainly displays the channel No. and JOB No.

When the channel function is used, the selected channel No. is displayed.

When the JOB function is used, the selected JOB No. is displayed. When JOB operation is executed, the channel No. is displayed.

COUNTER   Red, 2 digits

This 7-segment LED mainly displays the counter of the channel and JOB.

When the error proofing function is used, the count value in accordance with the setting is displayed.

When the JOB function is used, the total count value of the number of times of fastening is displayed.

11.1.3 Operation key

The operation keys on the front panel are described below.

| MODE | Mode selector key

This key is used to change the display mode.

| RESET | Reset key

This key is used to return the display to the initial mode. When a system error occurs, it is used to reset the system error. However the tool is not stopped.

| SEL | | ▲ | | ▼ | Cursor move (select, up, down) keys

These keys are used to move the display cursor.

| SET | Setting key

This key is used to confirm the setting.

11.1.4 7-segment display

The 7-segment LED displays alphabetic characters as shown below.
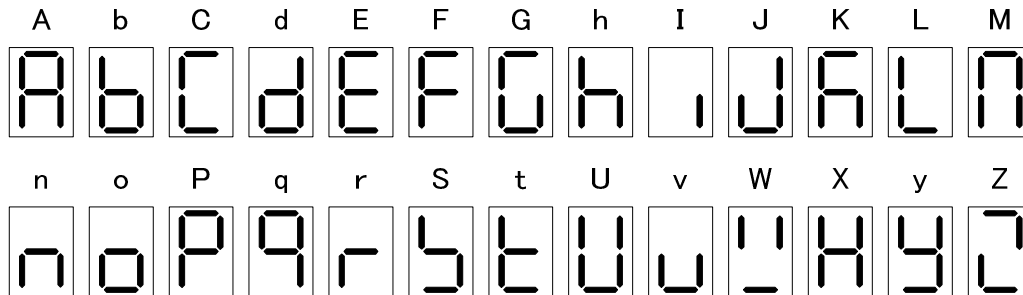
11.2. Screen transition

When the MODE key is pressed, the menu is changed. When the SET key is pressed, the corresponding setting screen appears. The menu is displayed in the COUNTER section (7-segment LED). When the monitor screen is selected, the COUNTER section (7-segment LED) displays the counter.

Transition by means of MODE key	SUB-DATA display	COUNTER display		
Fastening monitor screen	C 01		SET key →	NG display screen
System parameter setting screen (SY)	Cont	SY	SET key →	System parameter setting
Program parameter setting screen (PR)		Pr	SET key →	Program parameter setting
System check screen (SC)	ChK	SC	SET key →	System check execution
File system screen (FL)	PSUS	FL	SET key →	File system
Station number check screen (ST)		St	SET key →	Station number check execution
Initialization screen (IN)	nSEt	in	SET key →	Initialization execution
Maintenance log screen (LG)	SuEr	LG	SET key →	Maintenance log
Tracer arm setting screen (TC)	tEAC	tC	SET key →	Fastening position teaching execution

* To return to the monitor screen, press the RESET key.

11.3. Screen operation

11.3.1 Monitor screen

The monitor screen is displayed first at power-on.

11.3.1.1 Fastening monitor

Example of display

Channel 2: when the counter function is enabled and when the job is set
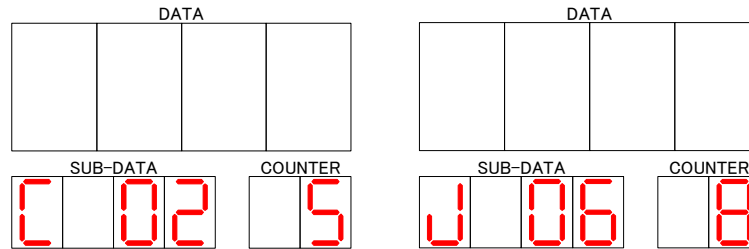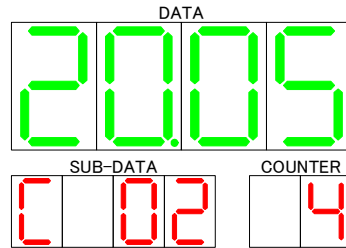
Fastening OK   Fastening NG
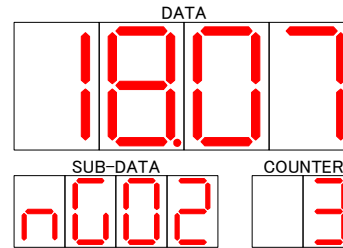
In the case of fastening NG, the channel or job No. and NG No. are displayed alternately in the SUB-DATA section. When there are two or more NGs, they are displayed sequentially. For the NG No., refer to "14.2. List of Fastening NG Judgments and Judging Lamps".

11.3.1.2 Display of fastening disabled status

In the case of starting in fastening disabled status such as fastening prohibition, "VOID" is displayed in the DATA section and the following are displayed in the SUB-DATA section and COUNTER section as shown below.

SUB-DATA	COUNTER	Status	Description
LOCK	1	Tool lock status	LOCK signal is ON.
	2		LOCK N.C. signal is OFF.
	3		Batch count is completed.
	4		Job is completed.
	5		Out of tracer arm position range
	6		Tool lock from touch panel
	7		Disable Tool command from Ethernet
	8		Tool lock by time up of Job / Trace job function (START TIME)
	9		Tool lock by time up of Job / Trace job function (END TIME)
CH	1	Parameter disabled	Out of channel setting range
	2		Channel not created
	3		Batch size not set
JOB	4		Out of job setting range
	5		Job parameter not proper
	6		Job line control not entered
	7		Job repeat prohibited
ID	8		ID is not set.
FTN	1	Fastening prohibited	TOOL TIGHTENING DISABLE signal is ON.
LOOS	1	Loosening prohibited	TOOL LOOSENING DISABLE signal is ON.
	2		Job function (LOOSENING) reverse disabled
	3		When fastening is OK with loosening setting only at occurrence of fastening NG of job function (LOOSENING)
	4		Trace job function (LOOSENING) reverse disabled
	5		When fastening is OK with loosening setting only at occurrence of fastening NG of trace job function (LOOSENING)

11.3.2 System parameter setting screen (SY)

X-PAQ allows you to set the following system parameters from the front panel. To set all the items, use the management software or external touch panel.

• Channel selection setting (S05 CH SELECT)
• Code address setting (S02 SYS SETUP => 1.CODE ADR.)
• IP address setting: IP address, Subnet mask, Default gateway
　　　　　　　　　(S11 TCP/IP=> 1. IP ADDRESS, 2. SUBNET MASK, 3. GATE WAY)
• COM1 Port communication setting (S10. RS-COMMU.)
• Multi-spindle setting (S12 M-SPINDLE => 1.M-SPINDLE)
• Software dip SW setting （S16. SYS DIP SW.）
•Buzzer setting (S14. BUZZER SEL.)

When the system parameter setting screen is selected with the MODE key, "SY" is displayed in the COUNTER section and "CONT" (channel selection) is displayed in the SUB-DATA section. The submenu items can be selected with the ▲ and ▼ keys and are displayed in the following order.
When the MODE key is pressed, you are taken back to the menu screen from any screen. When the RESET key is pressed, you are taken back to the monitor screen from any screen.

SUB-DATA	COUNTER	
Cont	SY	Channel selection

▼key ↑ ↓ ▲key

SUB-DATA	COUNTER	
CodE	SY	Code address

↑ ↓

SUB-DATA	COUNTER	
iP	SY	IP address

↑ ↓

SUB-DATA	COUNTER	
Sub	SY	Subnet mask

↑ ↓

SUB-DATA	COUNTER	
dG	SY	Default gateway

↑ ↓

SUB-DATA	COUNTER	
CoN	SY	COM1 Port communication setting

↑ ↓

SUB-DATA	COUNTER	
NSP	SY	Multi-spindle

↑ ↓

SUB-DATA	COUNTER	
SdiP	SY	Software dip SW

↑ ↓

SUB-DATA	COUNTER	
bUZZ	SY	Buzzer

<Setting method>
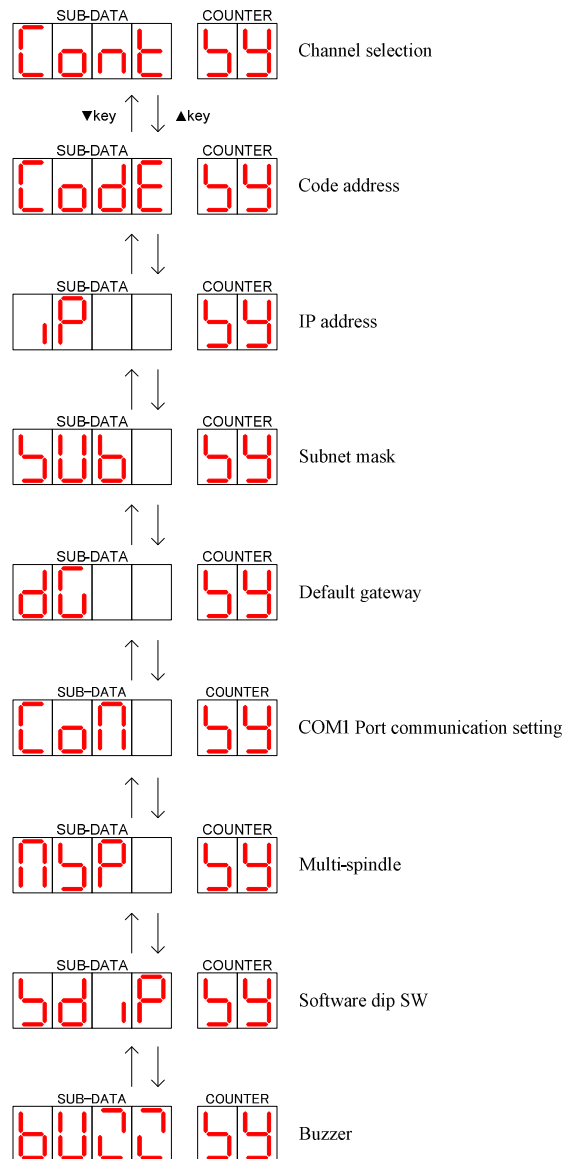
(1) Channel selection setting

When the SET key is pressed with "CONT" displayed, the following display is produced.

DATA
Ch in

SUB-DATA COUNTER
Cont 54
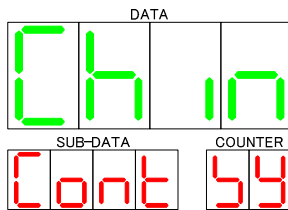
The channel selection methods can be selected with the ▲ and ▼ keys and are displayed in the following order. When the SET key is pressed after a selection is made, the selection is confirmed and you are taken back to the menu screen.

For further details on the channel selection method, refer to System "S05: CH SELECT".

DATA
Ch in   CH-INT (Channel internal control)

▼ key ↑ ↓ ▲ key

DATA
ChEn   CH-EXT (Channel external control)

↑ ↓

DATA
J- in   JOB-INT (JOB internal control)

↑ ↓

DATA
J-En   JOB-EXT (JOB external control)

↑ ↓

DATA
id   ID (Identifier function)
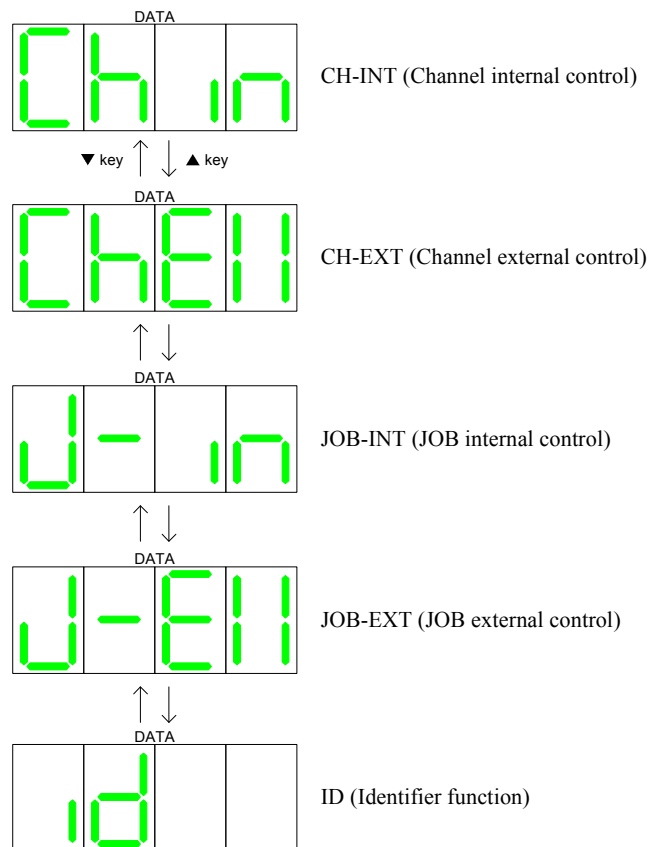
(2) Code address

When the SET key is pressed with "CODE" displayed, the following display is produced.
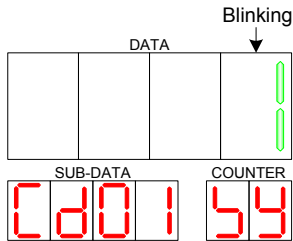
Blinking

DATA

SUB-DATA COUNTER

```
Cd01  5Y
```

When the code address is set with the ▲ and ▼ keys and the SET key is pressed for the confirmation, you are taken back to the menu screen.

Please refer "S02.1. CODE ADR." For more detail.

(3) IP address

When the SET key is pressed with "IP" displayed, the following display is produced.

Blinking

DATA

```
192
```

SUB-DATA COUNTER

```
iP01  5Y
```
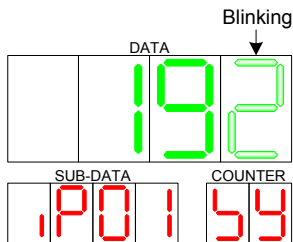
When a numeric value is entered with the ▲ and ▼ keys and SEL key and the SET key is pressed, the next digit is displayed.

Blinking

DATA

```
5
```

SUB-DATA COUNTER

```
iP02  5Y
```
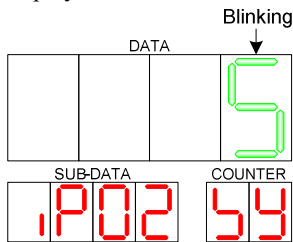
Enter numeric values with the ▲ and ▼ keys, SEL key and SET key until IP04 is obtained. When setting of IP04 is completed, you are taken back to the submenu screen.

Set the subnet mask and default gateway in the same manner.

Please refer "S11. TCP/IP." For more detail.

(4) COM1 Port communication setting

When the SET key is pressed with "COM" displayed, the following display is produced.

Setting Status

DATA

```
nAnC
```

Blinking

SUB-DATA COUNTER

```
SEL   5Y
```

Setting Item

1.SEL.DEVICE

SUB-DATA

SEL ———— **NAnc**   Management software connection

▼ key ↑ ↓ ▲ key

DATA

br   Barcode reader

↑ ↓

DATA

oP   Serial open protocol

↑ ↓

SET key

DATA

Pri   output by printer.

↑ ↓

DATA

PC   output by PC data

2.SPEED

SUB-DATA

bAUd ———— **9600**   9.6 kbps

▼ key ↑ ↓ ▲ key

DATA

192   19.2 kbps

↑ ↓

DATA

384   38.4 kbps

↑ ↓

SET key

DATA

576   57.6 kbps

↑ ↓

DATA

115   115.2 kbps

3.PARITY

SUB—DATA

PArⁱ

DATA

nonE No parity

▼ key ↑ ↓ ▲key

DATA

odd Odd parity

↑ ↓

DATA

EuEn Even parity

SET key

4.DATA BIT

SUB—DATA

LEnG

DATA

7 7bit

▼ key ↑ ↓ ▲ key

DATA

8 8bit

SET key

5.STOP BIT

SUB—DATA

Sbit

DATA

1 1bit

▼ key ↑ ↓ ▲ key

DATA

2 2bit

SET key

6.DATA OUT

SUB—DATA

doUt

DATA

ALL ALL

▼ key ↑ ↓ ▲ key

DATA

nG NG

SET key

When the SET key is pressed for the confirmation after setting of 6.DATA OUT, you are taken back to the menu screen.

Please refer "S10. RS-COMMU." For more detail.

(5) Multi-spindle
When the SET key is pressed with "MSP" displayed, the following display is produced.

Blinking
DATA
SUB-DATA   COUNTER
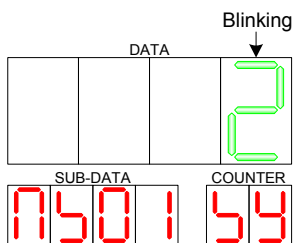
When the total number of spindles is set with the ▲ and ▼ keys and the SET key is pressed, you are taken back to the menu screen.
Please refer "S12.1. M-SPINDLE." For more detail.

(6) Software dip SW
Two software dip SWs are available: software dip SW1 (SD01) and software dip SW1 (SD02). 16 SWs are assigned to each software dip SW.
When the SET key is pressed with "SDIP" displayed, the following display is produced.

This indicates the status (ON/OFF) of the SW.
DATA
SUB-DATA   COUNTER
"1" indicates SD01; "2" indicates SD02.
This indicates the SWs (1–16) of each software dip SW.
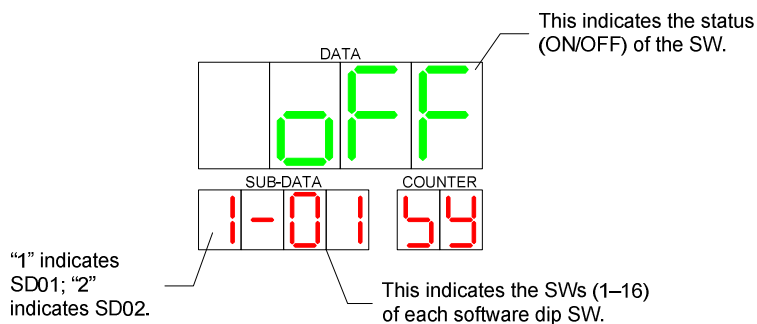
Select a SW No. (1–16) with the ▲ and ▼ keys and switch between ON and OFF with the SEL key.
When the SET key is pressed, the display for setting of SD02 is produced. When the SET key is pressed again, "SDIP" is displayed again.
Please refer "S16. SYS DIP SW." for more detail.

(7) Buzzer
When the SET key is pressed with "BUZZ" displayed, the following display is produced.
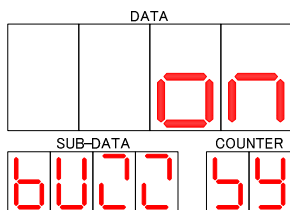
DATA
SUB–DATA   COUNTER

When the code address is set with the ▲ and ▼ keys and the SET key is pressed for the confirmation, you are taken back to the menu screen.
Please refer "S14. BUZZER SEL." For more detail.

11.3.3 Program (fastening) parameter setting screen (PR)

This screen is used to create a channel and set the various fastening parameters.

For more detail about the channel and the tightening of the parameters, Please refer to "12.2.1 Channel Function " and "12.1.1 Fastening Parameters ".

11.3.3.1 New channel creation

Immediately after purchase or if a fastening parameter is initialized as a result of data initialization or tool type changing, it is necessary to create a new channel for a fastening parameter.
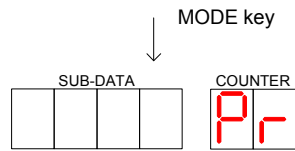
<Setting method>

MODE key

SUB-DATA | COUNTER

1) Press the MODE key on the front panel until "PR" is displayed in the COUNTER section and then press the SET key.

SET key

DATA

SUB-DATA | COUNTER
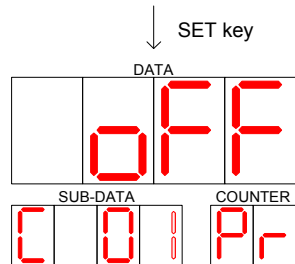
2) The channel No. blinks in the SUB-DATA section. Enter the No. of a channel to be created with the ▲ and ▼ keys and SEL key and then press the SET key.

▲ and ▼ keys, SEL key
SET key

DATA

SUB-DATA | COUNTER

3) "OFF" blinks in the DATA section.

SEL key

DATA

SUB-DATA | COUNTER
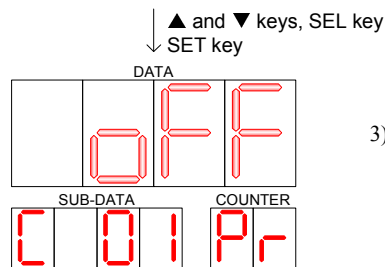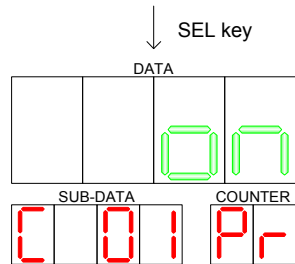
4) Change "OFF" to "ON" with the SET key and press the SET key to confirm this.

SET key

SUB-DATA | COUNTER

5) The No. of the created channel is displayed in the COUNTER section and you are taken back to the program parameter setting screen.

11.3.3.2 Program parameter setting

Each type of tool is provided with a program of default values. The user is able to change the settings in accordance with the condition such as the state of work, workability, etc.
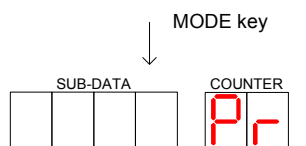
<Setting method>

MODE key

1) Press the MODE key on the front panel until "PR" is displayed in the COUNTER section and then press the SET key.
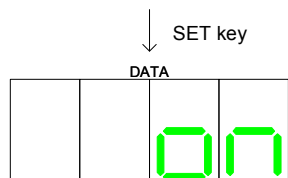
SET key

2) The channel No. blinks in the SUB-DATA section
Select the intended channel No. with the ▲ and ▼ keys and SEL key and then press the SET key.
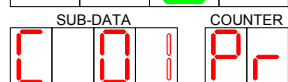
SET key

3) The program parameter No. blinks in the SUB-DATA section.
The selected channel No. is displayed in the COUNTER section.
Enter the No. of a program parameter to be changed with the ▲ and ▼ keys and SEL key and then press the SET key.

▲ and ▼ keys, SEL key

Example: Changing FIRST SPEED from 519 r.p.m to 350 r.p.m
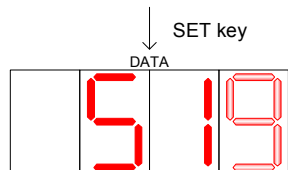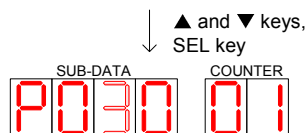
SET key

4) The setting blinks in the DATA section.

▲ and ▼ keys, SEL key

5) Change the setting with the ▲ and ▼ keys and SEL key.
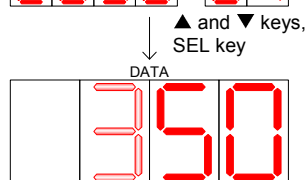
SET key

6) Press the SET key to confirm the change.
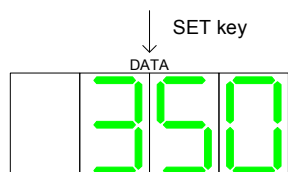
SET key

7) Press the SET key to return to the program parameter selection screen.
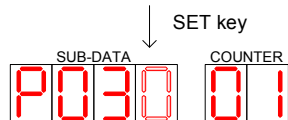
- 93 -

\<Program parameter\>

P01 CH SPAN

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. CH SPAN	P0	
2. ANGLE SPAN	P1	

P02 F.METHOD

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. F.METHOD	P2	

P03 SET TORQUE

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. START TRQ	P3	
2. P.START TRQ	P4	
3. SEAT LO TRQ	P5	
4. SEAT TRQ	P6	
5. SEAT HI TRQ	P7	
6. A.START LO TRQ	P8	
7. A.START TRQ	P9	
8. A.START HI TRQ	P10	
9. F.MIN TRQ	P11	
10. TARGET TRQ	P12	
11. F.MAX TRQ	P13	
12. P.MIN TRQ	P14	
13. P.MAX TRQ	P15	

P04 SET ANGLE

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. RUNDOWN ANG	P16	
1. RUNDOWN MIN	P17	
2. RUNDOWN MAX	P18	
2. MIN ANG	P19	
3. TARGET ANG	P20	
4. MAX ANG	P21	

P05 SET TIME

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. SOCKET IN.t	P22	
2. PRE SEAT.t	P23	
3. FINAL MIN.t	P24	
4. FINAL MAX.t	P25	
5. TOTAL.t	P26	
6. IDLE.t	P27	
7. PAUSE.t	P28	

P06 SET SPEED

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. SOCKET SPD	P29	
2. FIRST SPD	P30	
3. FINAL SPD	P31	
4. SP.HIGH SPD	P32	
1. SPEED	P33	
2. REVOLUTION	P34	
5. SP.LOW SPD	P35	
1. SPEED	P36	
2. CHANGE TRQ	P37	
6. SP.SEAT PT	P38	
7. SP.SEAT SL	P39	

P07 DRIVE CONT

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. MODE	P40	
1. STOP TIME	P41	
2. RUN TIME	P42	
3. PULSE LEVEL	P43	
4. PULSE COUNT	P44	
2. D-CONTROL	P45	
3. FIRST SLOPE	P46	

P07 DRIVE CONT

Parameter contents	Handy2000 Lite program parameter No.	Setting
4. D-SLOPE	P47	
5. D-END TRQ	P48	
6. D-END TIME	P49	
7. MICRO PULSE	P50	
1. PULSE LEVEL	P51	
2. CHANGE TRQ	P52	
3. SLOPE	P53	
4. PULSE END LEVEL	P54	
8. REVERSE PLS	P55	
1. STOP TIME	P56	
2. RUN TIME	P57	
3. PULSE LEVEL	P58	
9. PRE CUR LMT	P59	

P08 REV. ANGLE

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. ANG ST. TRQ	P60	
2. F. MIN TRQ	P61	
3. F. MAX TRQ	P62	
4. P. MIN TRQ	P63	
5. P. MAX TRQ	P64	
6. F. MIN ANG	P65	
7. TARGET ANG	P66	
8. F. MAX ANG	P67	
9. SPEED	P68	
10. SLOPE	P69	

P09 OPTION

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. SELF TAP	P70	
1. INTERVAL	P71	
2. TRQ MIN	P72	
3. TRQ MAX	P73	
2. S-MONITOR	P74	
1. S-START ANG	P75	
2. S-MON. ANG	P76	
3. S-TRQ MIN	P77	
4. S-TRQ MAX	P78	
3. F-MONITOR	P79	
1. F-START MIN	P80	
2. F-START MAX	P81	
3. F-END MIN	P82	
4. F-END MAX	P83	
5. F-START ANG	P84	
6. F-END ANG	P85	
4. COMPENSATE	P86	
1. POINT	P87	
5. S-CUR MON	P88	
1. START ANG	P89	
2. MON.ANG	P90	
3. CURRENT MIN	P91	
4. CURRENT MAX	P92	
6. F-CUR MON	P93	
1. CURRENT MIN	P94	
2. CURRENT MAX	P95	
7. UNDR TG.TRQ	P114	
8. REL S.TRIGR	P115	

P10 COUNT

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. COUNT	P96	
1. COUNT No.	P97	
2. COUNT METH	P98	
3. TOOL LOCK	P99	

P11 DIRECTION

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. DIRECTION	P100	

P13 DATA OUT

Parameter contents	Handy2000 Lite program parameter No.	Setting
1. DATA OUT	P113	

11.3.4 System check screen (SC)

This menu is used for system status monitoring and for function checking at the time of system installation etc.

11.3.4.1 Manual system check

The system check is performed manually. The INITIAL (reference) value is updated by reading new CAL and ZERO values.

⚠️ When performing the manual system check, do not apply any load to the TOOL output spindle.
Not doing so will cause an error at the time of reading of the INITIAL value of CAL/ZERO.

<Setting method>

MODE key

SUB-DATA — ChK   COUNTER — SC

SET key

— — — —

SUB-DATA — EXEC   COUNTER — SC

DATA — Good

SUB-DATA — CoMP   COUNTER — SC
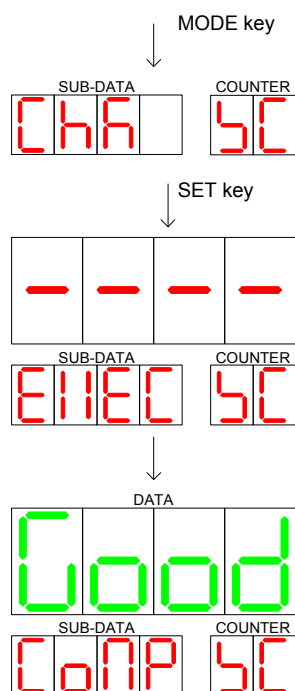
1) Press the MODE key on the front panel until "CHK" is displayed in the SUB-DATA section and "SC" is displayed in the COUNTER section.

When the SET key is pressed, the system check is executed.

2) "— — — —" is displayed in the DATA section while the system check is being executed.

3) When the system check is completed normally, "GOOD" is displayed in the DATA section and "COMP" is displayed in the SUB-DATA section.

When an error occurs, the system error is displayed.

11.3.4.2 Maintenance system monitor

The system monitor is effective at the time of maintenance to check the status of the hand tool system.

The monitor functions can be selected with the ▲ and ▼ keys and are displayed in the following order.

SUB-DATA	COUNTER	
`ChA`	`5C`	Manual system check

▼ key ↑ ↓ ▲ key

SUB-DATA	COUNTER	
`ttr9`	`5C`	Torque track display

↑ ↓

SUB-DATA	COUNTER	
`Ptr9`	`5C`	Torque peak display

↑ ↓

SUB-DATA	COUNTER	
`AnG`	`5C`	Angle display

↑ ↓

SUB-DATA	COUNTER	
`uoLt`	`5C`	Voltage display

↑ ↓

SUB-DATA	COUNTER	
`in i0`	`5C`	Offset zero value

<Monitoring method>
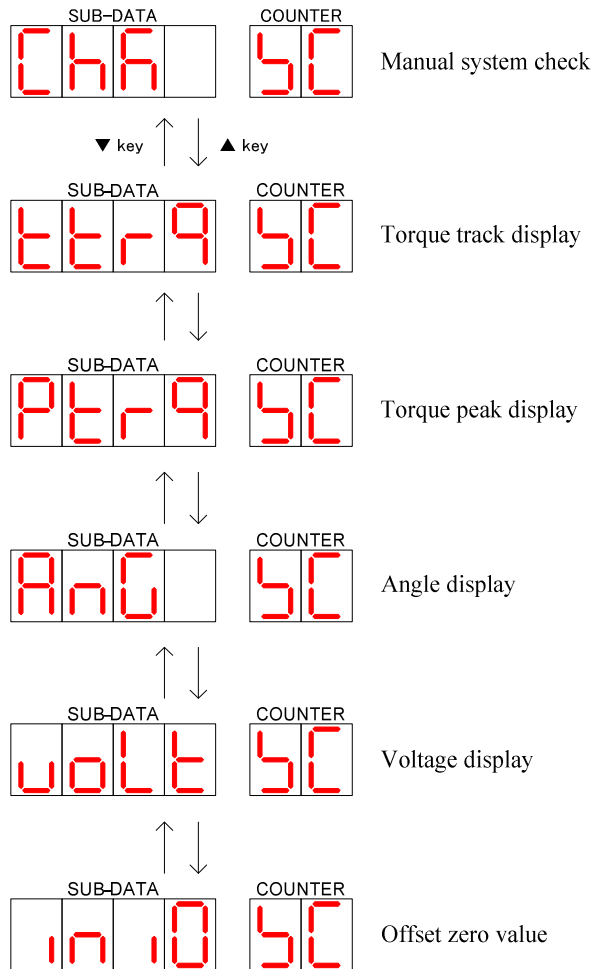
(1) Torque track display

When the SET key is pressed with "TTRQ" displayed, the torque value is displayed in real time while the torque is being applied to the output spindle.

SUB-DATA   COUNTER
ttrq   SC

↓ SET key

DATA
0.55

SUB-DATA   COUNTER
ttrq   SC
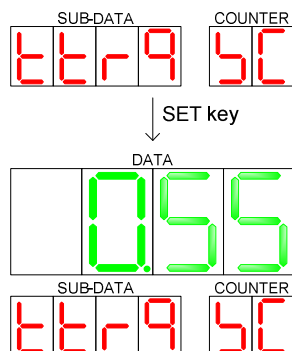
(2) Torque peak display

When the SET key is pressed with "PTRQ" displayed, the maximum torque value applied to the output spindle is held. The held torque value is cleared to zero by pressing the SET key.

SUB-DATA   COUNTER
Ptrq   SC

↓ SET key

DATA
0.85

SUB-DATA   COUNTER
Ptrq   SC

↓ SET key

DATA
0.00

SUB-DATA   COUNTER
Ptrq   SC
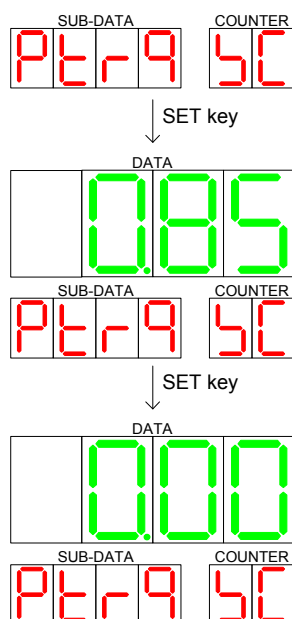
(3) Angle display

When the SET key is pressed with "ANG" displayed, the angle value is displayed. The value is added when the output spindle is turned in the fastening direction; the value is subtracted when the output spindle is turned reversely. The angle value is cleared to zero by pressing SET key.
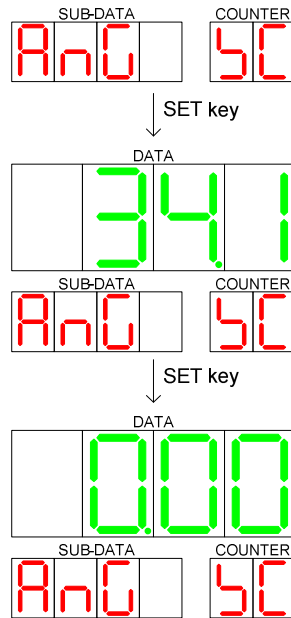
* When the start trigger switch is turned ON with the screen of (1) or (2) displayed, the servo lock status (position holding) is produced. When the switch is turned OFF, the servo lock is released.

⚠ In the servo lock status, the input torque should be about 30% of the rated torque and should be applied for 5 seconds or less. If the load is applied for a long time, D-O.L will be caused.

(4) Voltage display

When the SET key is pressed with "VOLT" displayed, simulation is performed using the built-in standard resistor and the current CAL voltage is measured and displayed.

The SEL key is used to switch between ON and OFF of CAL. The current CAL voltage is measured and displayed when CAL is OFF.

SUB-DATA   COUNTER

uoLt   5C

↓ SET key

DATA

0.688

SUB-DATA   COUNTER

uoLt   5C

↓ SEL key

DATA

8.068

SUB-DATA   COUNTER

uoLt   5C
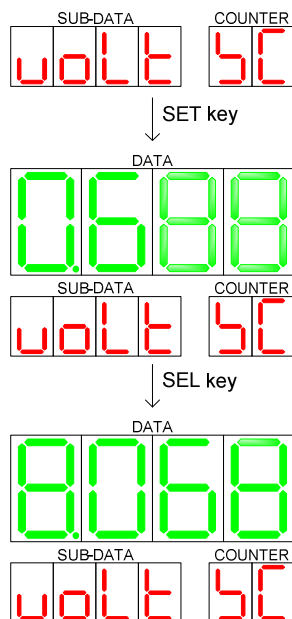
(5) Offset zero value

When the SET key is pressed with "INI0" displayed, the INITIAL (reference) value stored in each tool unit is displayed.

The INITIAL value is updated when new tool information is obtained and when the manual system check on the system check screen (SC) is executed.

SUB-DATA   COUNTER

in i0   5C

↓ SET key

DATA

664

SUB-DATA   COUNTER

in i0   5C
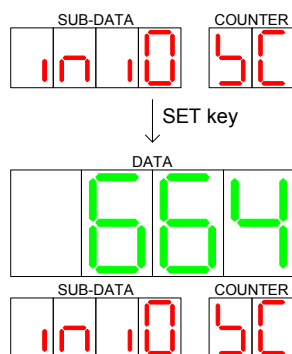
11.3.5 File system screen (FL)

This section explains about the function can be used by inserting a USB flash drive to USB port (A Type) of front panel by using file system. (Available Ver. HA1050 or later)

You can pass the project data mainly between the controller and management software by using USB flash drive.
*Project data: all setting data, Fastening result history data, System error history data and Torque curve result data.

11.3.5.1. Export / Import Function

1. **Export Function**

   Export Project Data, Tightening results file from the controller to the USB flash drive.
   This function enables to create backup file easily.
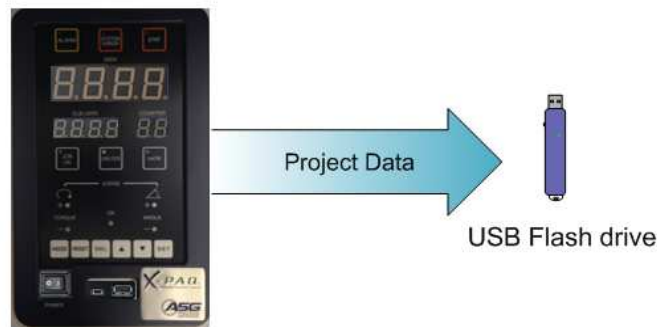
2. **Import Function**

   Import Project Data from the USB flash drive to the controller and overwrite the programs.
   Power switch must be turned OFF, and ON after import.Tightening results cannot be imported.

3. **Edit Project Data by Management Software**

   Project Data and Tightening results file in the USB flash drive can be exported and imported to/from Management Software. Obtaining data and editing data is possible without connecting by cable between the controller and Management Software. Please refer to Management Software Manual for the details.
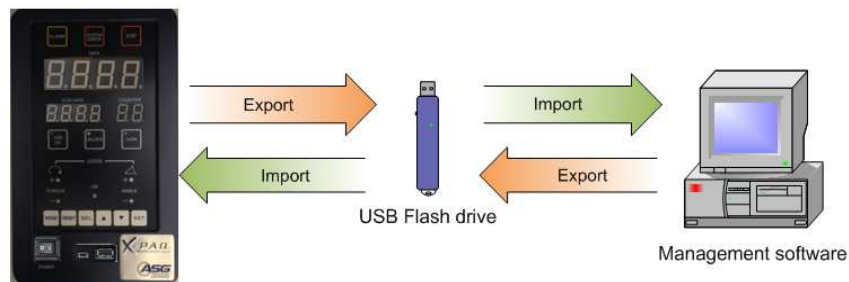
4. **Folder Structure**

When a Project Data is imported/exported to/from the USB Falsh drive, a DATA is stored in BANK.
Importing/Exporting is executed by selecting BANK number which stores the Data you want to use.
BANK numbers are created 0 to 99, and upto 100 Data can be stored in 1 USB flash drive.
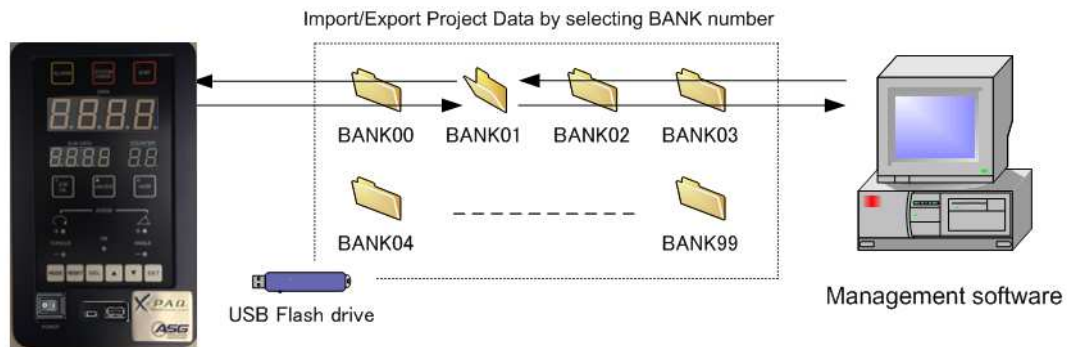
⚠ Exporting to the USB flash drive overwites data, if the same BANK number is selected for several times.
Only the last data exported will be stored as a result.

Folder name with "CD" added on the spindle number set at S02.1.CODE ADDRESS is created in BANK folder.
Project Data and Results Data file for correspoinding spindle are stored in it.

Project Data folder name : C D 0 1

Defined by setup on
S02.1. CODE ADDRESS

Complete data for all spindles are required to be stored in the same BANK folder in order to edit Project Data by
Management Software for Multi Spindles use.

Single Spindle

Project Data folder name

Multi Spindles ex) 4 soindles

Storage folder
for Master spindle

Storage folder
for 2nd to 4th spindles

<Folder Structure>

```
EH2L
  BANK00  ←───────────────  A folder in which Project Data is stored when
    CD01                     BANK number "0" is selected for export
      CHNAME.HPM
      CHPRM.HPM
      FIELDBUS.HPM
      HOLDING_REG.HPM
      IDENTFIRE.HPM
      INPUT_REG.HPM
      IOALLOC.HPM
      JOBNAME.HPM
      JOBPRM.HPM
      MANAGEMENT.HPM
      MANAGEMENT2.HPM        Project Data
      MCHPRM.HPM             Consisted of each settings data file,
      MODEL.HPM          ←   Tightening results data file, System error
      NGCURVEINF01～10.HPM    results data file,Torque curve history data file.
      NGCURVEINF1～3.HPM
      OKCURVE01～20.HPM
      OKCURVEINF1～3.HPM
      PLC.HPM
      RESULT.HPM
      RESULTALLOC.HPM
      SYSERROR.HPM
      SYSPRM.HPM
      SYSTEMINFO.TXT.txt
      TJOBNAME.HPM
      TJOBPOS.HPM
      TJOBPRM.HPM
  BANK01  ←───────────────  A folder in which Project Data is tored when BANK
    CD01                     number "1" is selected.
    CD02    ←──────────────  Same numbers of folders as numbers of spindles are created when
    CD03                     Multi Splndles is in use. Folder name correspond to the spindle
  BANK99                     number set on S2.1.CODE ADDRESS.
  RESULT                     (This is a sample when 3 spindles are used as multi spindles.)
    20111018115014.csv
    20111018124325.csv  ←    Tightening results history in CSV format exported
    20111018153402.csv       from the controller is stored here.
```

5. Procedure

∼ Export ∼

MODE key

SUB−DATA   COUNTER

[P⊃U5] [FL]

1. Press MODE key on the front panel till [P>US] on SUB-DATA and [FL] on COUNTER are shown, then press

SET key

DATA [02]

SUB−DATA   COUNTER

[bAnk] [FL]
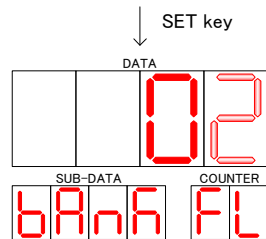
2. BANK number is displayed blinking on DATA. Press UP/DOWN key and SEL key to select the BANK number, then press SET key.
* LED Color on DATA identify if selected BANK number has data or not.

    Red -> No Data   Green -> Data existing

▲▼ key
SEL key

DATA [02]

SUB−DATA   COUNTER

[nSEt] [FL]

3. SUB-DATA shows [NO SET/SET]

▲▼ key

DATA [02]

SUB−DATA   COUNTER

[SEt] [FL]

4. Press UP/DOWN key to select [SET] and press SET key to start export.

SET key

DATA [- - - -]

SUB−DATA   COUNTER

[ ] [FL]

5. [- - - -] is displayd on DATA during execution.

DATA [CoNP]

SUB−DATA   COUNTER

[ ] [FL]
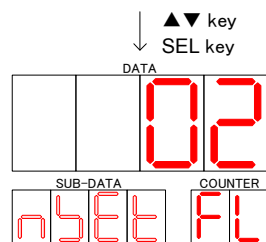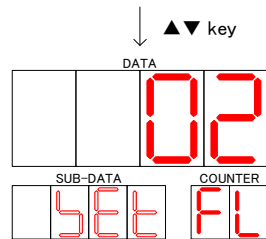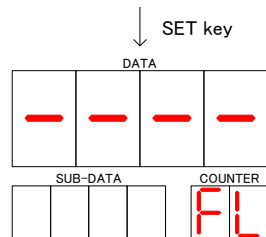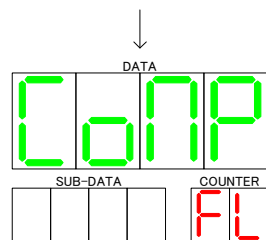
6. When [COMP] is displayed on DATA, export is completed.
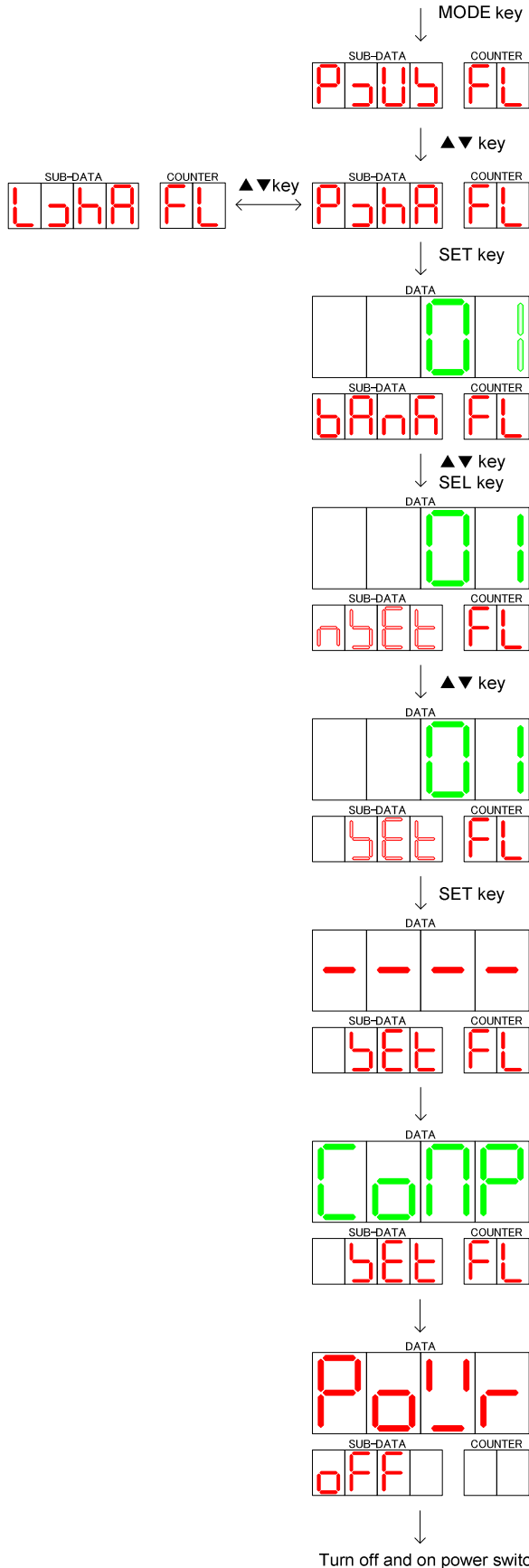
~ Import ~

MODE key

SUB-DATA: `PsUS` COUNTER: `FL`

1. Press MODE key on the front panel till [P>US] on SUB-DATA and [FL] on COUNTER are shown.

▲▼ key

SUB-DATA: `LshA` COUNTER: `FL` ←**▲▼key**→ SUB-DATA: `PshA` COUNTER: `FL`

2. By the key ▲▼, switching to「P>HA」or「L>HA」, Press SET key.

> 「P > HA」：The program which is created by use of PLC function is not imported.
> This is only at use for importing Setting data.
>
> 「L > HA」：This is to import all project data, except fastening result data.

SET key

DATA: `01`
SUB-DATA: `bAnk` COUNTER: `FL`

3. BANK number is displayed on DATA. Press UP/DOWN key and SEL key to select the BANK number you want to use, then press SET key.
* LED Color on DATA identify if selected BANK number has data or not.

　　　　Red -> No Data　　Green -> Data existing

▲▼ key
SEL key

DATA: `01`
SUB-DATA: `nSEt` COUNTER: `FL`

4. SUB-DATA shows [NO SET/SET]

▲▼ key

DATA: `01`
SUB-DATA: `SEt` COUNTER: `FL`

5. Press UP/DOWN key to select [SET] and press SET key to start inport.

SET key

DATA: `- - - -`
SUB-DATA: `SEt` COUNTER: `FL`

6. [- - - -] is displayd on DATA during execution.

DATA: `CoNP`
SUB-DATA: `SEt` COUNTER: `FL`

7. On completion of import, [COMP] is displayed on DATA. [POWER OFF] is displayed, then please turn OFF and ON the power switch.

DATA: `PoUr`
SUB-DATA: `oFF` COUNTER:

Turn off and on power switch

11.3.5.2. Save Tightening results data in CSV format

Fastening result data can be saved only as CVS format to USB flash drive.

Select numbers of tightening results from [20/100/500/1000/2000/3000/ALL], then export to the USB flash drive.

Tightening results data will be stored in a folder (folder name: RESULT) which will be created automatically, as file name with the date and the time executed when export is executed.

Fastening result history data saved by CSV format can not be read at management software.

(If you want to load such datain the management software, please use the export function.)

This is used for the case to display and edit by using the other programs.

<Procedure>

MODE key
SUB-DATA COUNTER
P∍U∍ FL

1. Press MODE key on the front panel till [P>US] on SUB-DATA and [FL] on COUNTER are shown.

▲▼ key
SUB-DATA COUNTER
r∍U∍ FL

2. Press UP/DOWN key to select [r >US] and press SET key.

SET key
SUB-DATA COUNTER
20 FL

3. Numbers of tightening results is diaplayed on SUB-DATA. Press UP/DOWN key to select and press SET key to start export.

▲▼ key
SUB-DATA COUNTER
100 FL

SET key
DATA
CoNP
SUB-DATA COUNTER
100 FL

4. When export is completed, [COMP] is displayed on DATA.

<CSV format data>

	A	B	C	D	E	F	G	H	I	J	
1											
2	SERIAL:HHHHHH										
3	SPD	CH	FS.COUNT	DATE	JUDGE1	JUDGE2	F.TRQ	F.ANG	FS.TIME	T.L.TIME	
4	2	1	25	2010/2/27 5:40	0	0	0.76	0	0	1.5	
5	2	1	24	2010/2/27 5:40	0	0	0.77	0	0	1.6	
6	2	1	23	2010/2/27 5:40	0	0	0.73	0	0	1.6	
7	2	1	22	2010/2/27 5:40	0	0	0.74	0	0	1.6	
8	2	1	21	2010/2/27 5:39	4	0	0	0	0	1.4	
9	2	1	20	2010/2/27 5:39	4	0	0	0	0	1.4	
10	2	1	19	2010/2/27 5:30	4	0	0	0	0	1.3	
11	2	1	18	2010/2/27 5:30	4	0	0	0	0	1.1	
12	2	1	17	2010/2/27 5:30	4	0	0	0	0	0.9	
13	2	1	16	2010/2/27 5:30	4	0	0	0	0	1.7	
14	2	1	15	2010/2/27 5:30	4	0	0	0	0	3.5	
15	2	1	14	2010/2/27 5:30	4	0	0	0	0	2.8	
16	2	1	13	2010/2/27 5:30	4	0	0	0	0	1.3	
17	2	1	12	2010/2/27 5:30	4	0	0	0	0	2.1	
18	2	1	11	2010/2/27 5:29	0	0	0.73	0	0	1.8	
19	2	1	10	2010/2/27 5:29	0	0	0.74	0	0	2.2	
20	2	1	9	2010/2/27 5:29	4	0	0	0	0	1.2	
21	2	1	8	2010/2/27 5:29	4	0	0	0	0	2.2	
22	2	1	7	2010/2/27 5:28	0	0	0.75	0	0	2.3	
23	2	1	6	2010/2/27 5:28	4	0	0	0	0	2	
24											

11.3.5.3. Error message

If writing to or reading from the USB flash drive results in failure, the error indication is displayed in the DATA section. The error indication and error contents are as shown below.

DATA
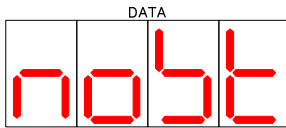
USB flash drive not recognized or connection improper

DATA
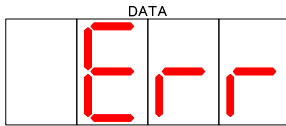
Write or read error

Error Number is displayed when error occurred during writing or reading.
Each error is explained as below.

Err.No	FUNCTION	CAUSE
01	Reading to USB flash drive was failed	・USB flash drive does not have enough space ・USB flash drive is broken
02	Import is prohibited	・Tried to import during tightening is executed 　Import is not allowed during tightening
03	Import from USB flash drive was failed	・Tried to import the project data for unmatched tool ・Project data is broken ・USB flash drive is broken

11.3.6 Station number check screen (ST)

When the SET key is pressed with "ST" displayed, the station number check screen appears. This is effective only in the case of the multi-spindle setting and master station. In the case of the single spindle and local station, pressing the SET key is ignored.

The station number check screen appears. The actual number of displayed spindles is up to the number of set spindles. When communications for the number of set spindles cannot be carried out or the type does not match, only the spindles for which communications can be carried out and the type matches are displayed and "ST" blinks in the COUNTER section.
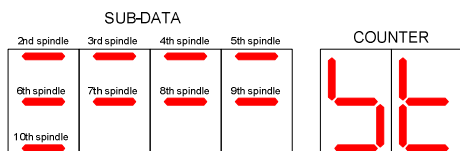
11.3.7 Initialization screen (IN)

When the SET key is pressed with "IN" displayed, the initialization screen appears. On the initialization screen, the "NO SET/SET" selector display is produced. When "SET" is selected with the SEL key and the SET key is pressed and held for three seconds or more, initialization is executed. While initialization is being executed, fastening is not allowed and "————" is displayed in the DATA section.
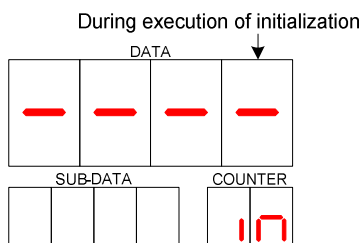
11.3.8 Maintenance log screen (LG)

It shows current controller version, MAC address used by Ethernet, and etc.
Change displayed items using ▲▼ key. It displays contents of the item when SET key is pressed.
Pressing MODE key enable to return MENUE screen from any screen and RESET key enable to return MONITOR screen.

Controller Version

Servo amplifier version

Controller
Ethernet IP MAC address

Fieldbus
Ethernet MAC address

① Controller Version

SUB–DATA   COUNTER

buEr   LG

↓ SET key

DATA

0100

SUB–DATA   COUNTER

buEr   LG

② Servo amplifier version

SUB–DATA   COUNTER

duEr   LG

↓ SET key

DATA

6005

SUB–DATA   COUNTER

duEr   LG
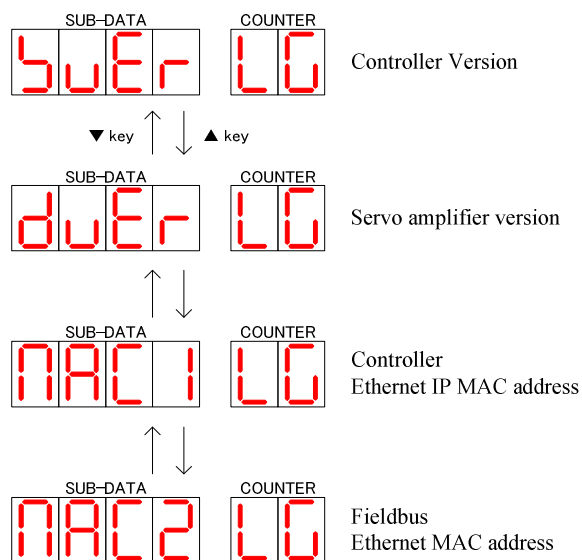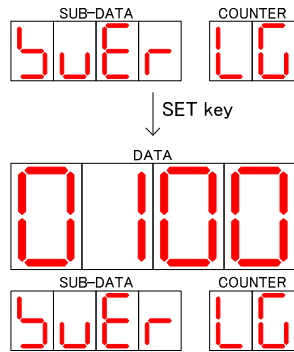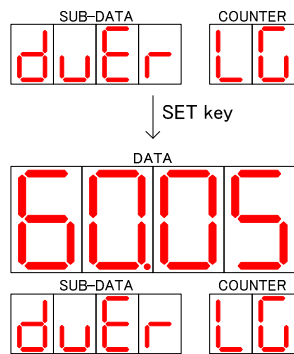
③　Controller Ethernet MAC address

（Example：MAC Address：00.19.84.05.20.00）
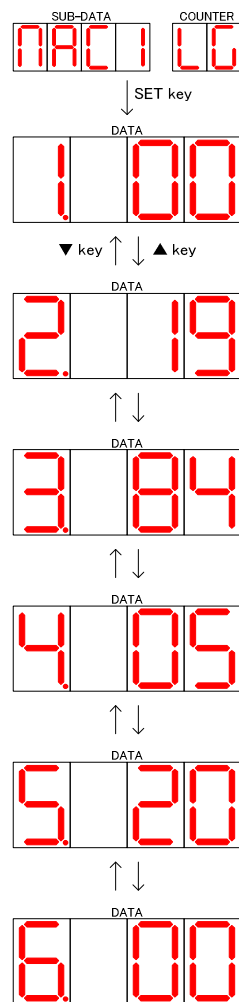
④　Fieldbus Ethernet IP MAC address

Confirm with the same procedure as　③　Controller Ethernet MAC address.

11.3.9 Tracer arm setting（TC）

This setting is used for Trace Job function setting.
For the detail, "X-PAQ Trace Control Unit Trace Arm Manual"

11.4. Channel No. and JOB No. change

When CH-INT (channel internal control) is selected by setting "S05: CH SELECT", the channel No. can be changed from the front panel. When JOB-INT (JOB internal control) is selected, the JOB No. can be changed.

<Changing method>
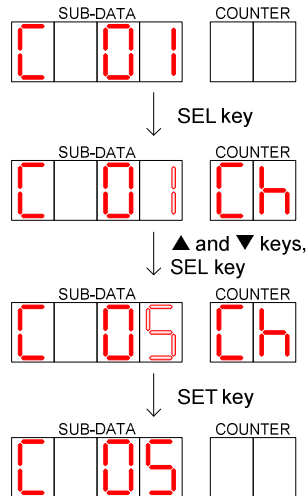
1) Press the SEL key on the fastening monitor screen.

↓ SEL key

2) The channel No. blinks in the SUB-DATA section, which is changeable.

Change the channel No. with the ▲ and ▼ keys and SEL key.

▲ and ▼ keys,
↓ SEL key

↓ SET key

3) Press the SET key to confirm the change.

The JOB No. can be changed in the same manner.

12. Description of Function and Setup

12.1. Fastening Parameter Setup

The fastening parameters are set on the program parameter setting screen on the front panel or using the management software or external touch panel.

<The case for Program parameter setting screen on management soft>

12.1.1. Fastening Parameters

P01 CH SPAN (Torque correction span)

1. CH SPAN

   This function is active only if CHANNEL is selected under "S03: CAL SPAN => 2. CH SPAN" of system parameter, and it calibrates inspected torque by each unit channel. Torque calibration function is not active if the setting value is 100%.

   (Range: 75.0–125.0%   Default: 100.0%)

   Note: SYSTEM SPAN must be used for Multi-Spindles, but not CH SPAN.

2. ANGLE SPAN

   This function is active only if CHANNEL is selected under "S03: CAL SPAN => 4. CH ANG SPAN" of system parameter, and it calibrates inspected angle by each unit channel. Angle calibration function is not active if the setting value is 100%.

   (Range: 75.0–125.0%   Default: 100.0%)

P02 F.METHOD (Fastening method selection setting)

1. F.METHOD

   This function enables users to select and use fastening methods: (1) Torque method, (2) Torque method with angle monitor, (3) Angle method, (4) Torque or angle method, (5) Torque and angle method, (6) Reverse angle control. For acquiring the best performance of each feature, it is suggested that the user become familiar with the operation flow and make correct settings.

(1) TRQ	: Torque method/Time monitor (default)
(2) TRQMANG	: Torque method/Angle and time monitor
(3) ANG	: Angle method/Torque and time monitor
(4) TRQorANG	: Torque or angle method
(5) TRQandANG	: Torque and angle method
(6) RVS-ANG	: Reverse angle control

1) F. METHOD: TRQ (Torque method/Time monitor)

This method is widely employed in general. In this method, fastening continues up to the predetermined target torque and stopped there, and then it is judged whether the peak torque is within the upper and lower limit range of torque. In this system, the judgment is made on the final fastening time and total time as well as the upper and lower limits of torque.

〈Area relevant to judgment〉

control setting

TOTAL TIME
PRETRQ TIME
FINAL MAX TIME
SOCKET IN TIME
FINAL MIN TIME
END TIME
Final fastening
OK range
(TRQ)
SAFETY LEVEL
TRQ HIGH
TARGET TRQ
TRQ LOW
SEAT TRQ HI
PRE CURRENT LIMIT
SEAT TRQ
START TRQ
END TRQ
(TIME)
0
START
SYSTEM START
Pre-fastening
OK range
SYSTEM COMP

〈Operation Flow〉

(TRQ)
TARGET TRQ
CHANGE TRQ
SEAT TRQ
END TRQ
START TRQ
(TIME)
0
(REVOLUTION)
SOCKET IN TIME
FIRST SLOPE
DRIVE SLOPE
(SPEED)
SP.HIGH SPEED
FIRST SPEED
FINAL SPEED
SP.LOW SPEED
SOCKET SPEED
(TIME)
0
START
SYSTEM START
SYSTEM COMP

2) F. METHOD: TRQMANG (Torque method/Angle and Time Monitor)

Fastening is basically performed by the torque method, and the judgment is made on the upper and lower limits of angle in addition to the upper and lower limits of torque and time.

⟨Area relevant to judgment⟩

control setting

TOTAL TIME

PRETRQ TIME

FINAL MAX TIME

SOCKET IN TIME

FINAL MIN TIME

END TIME

Angle measurement starting point

Final fastening OK range

(TRQ)

SAFETY LEVEL
TRQ HIGH

TARGET TRQ

TRQ LOW

A.START TRQ

SEAT TRQ HI
PRE CURRENT LIMIT

SEAT TRQ

START TRQ

END TRQ

(TIME)
(ANGLE)

0

START

SYSTEM START

SYSTEM COMP

Pre-fastening OK range

LOW ANG

HIGH ANG

Fastening angle

⟨Operation Flow⟩

(TRQ)

TARGET TRQ

CHANGE TRQ

A.START TRQ

SEAT TRQ

START TRQ

END TRQ

(TIME)

0

(REVOLUTION)

SOCKET IN TIME

FIRST SLOPE

DRIVE SLOPE

(SPEED)

SP.HIGH SPEED

FIRST SPEED

FINAL SPEED

SP.LOW SPEED

SOCKET SPEED

(TIME)

0

START

SYSTEM START

SYSTEM COMP

3) F. METHOD: ANG (Angle Method/Torque and Time monitor)

In this method, fastening continues from angle measurement starting point (A.START TRQ) up to the predetermined target angle and stops there. It is then judged whether the peak torque is within the upper and lower limit range of torque. It is necessary to set up fixing bracket for high precision fastening.

<Area relevant to judgment>

☐ control setting

<Operation Flow>
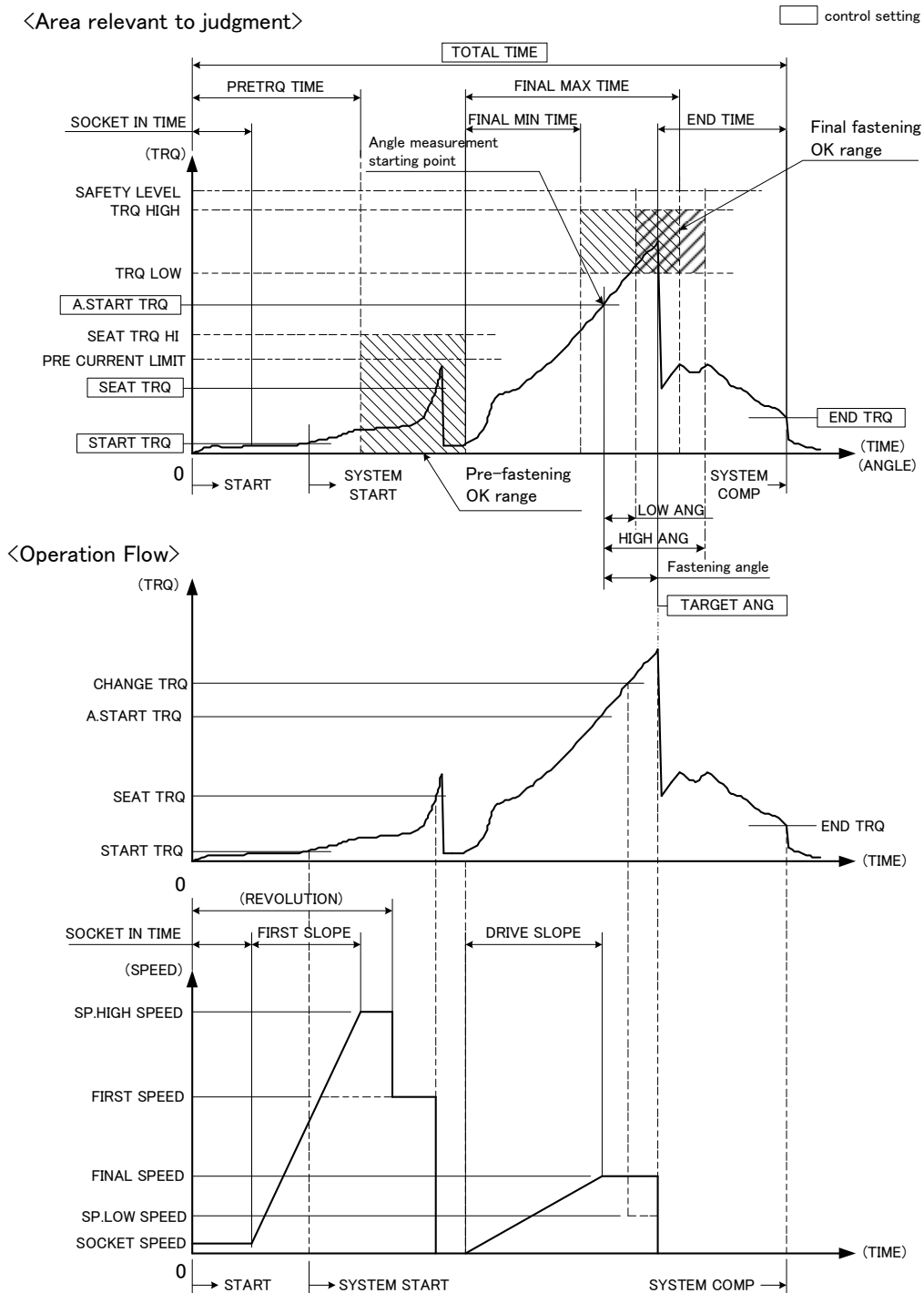
4) F.METHOD: TRQorANG (Torque or angle method/Time monitor)

This method monitors both torque and angle while controlling fastening. When either a target torque or angle is reached, fastening stops and the maximum or the minimum torque, time, and angle at the time is judged.

The difference from TRQ and ANG method is either a torque or an angle (or both) reach(es) its/their target(s).
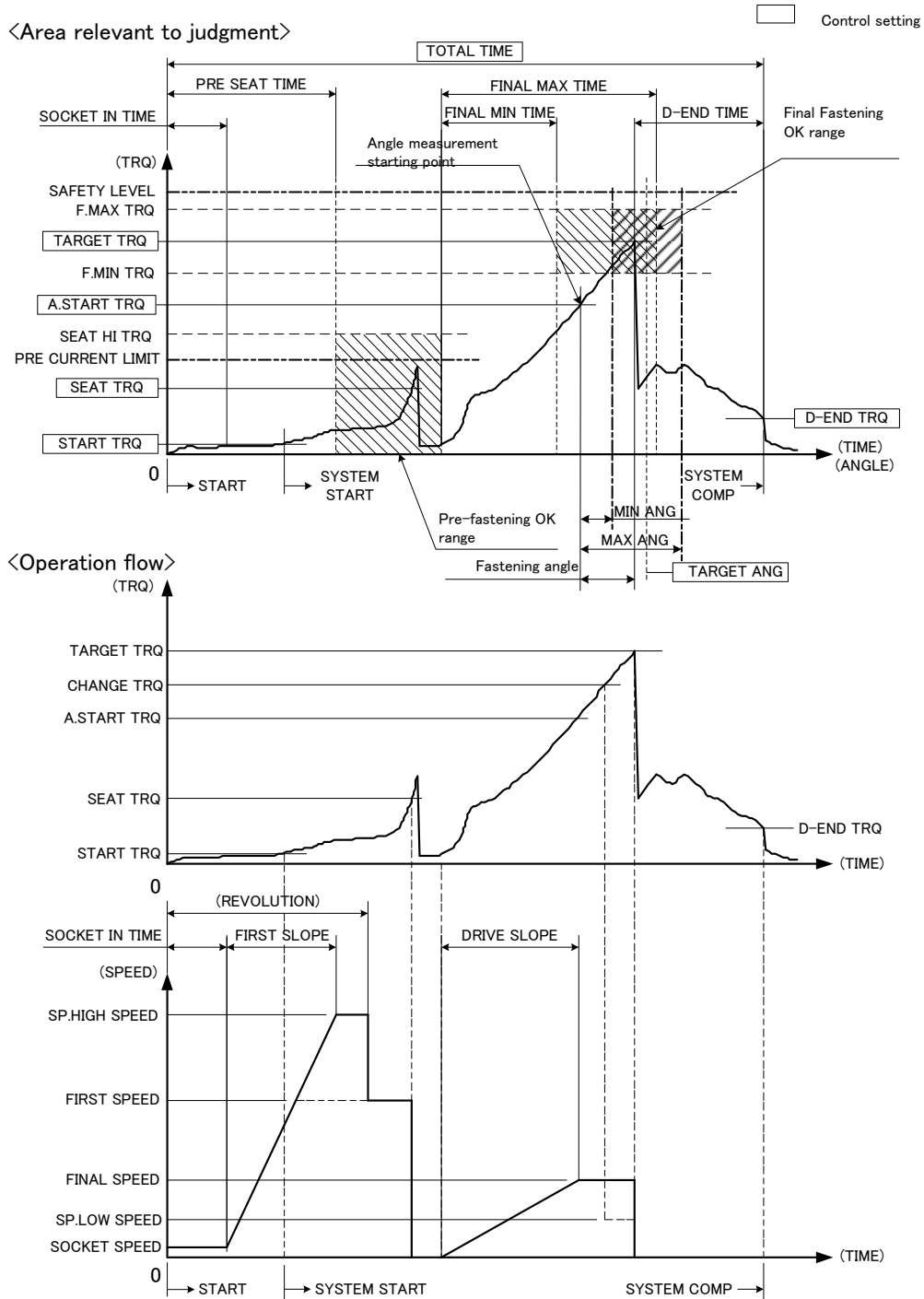
5) F.METHOD: TRQandANG (Torque and angle method/Time monitor)

This method monitors both torque and angle while controlling fastening. When both target torque and angle are reached, fastening stops and the maximum and the minimum torques, times, and angles at the time are judged.

The difference from TRQ or ANG method is both torque and angle reach their target(s).

Control setting

⟨Area relevant to judgment⟩

TOTAL TIME

PRE SEAT TIME

FINAL MAX TIME

SOCKET IN TIME

FINAL MIN TIME

D-END TIME

Final Fastening OK range

Angle measurement starting point

(TRQ)

SAFETY LEVEL
F.MAX TRQ
TARGET TRQ
F.MIN TRQ
A.START TRQ
SEAT HI TRQ
PRE CURRENT LIMIT
SEAT TRQ
START TRQ

D-END TRQ

(TIME)
(ANGLE)

0

START

SYSTEM START

SYSTEM COMP

MIN ANG

MAX ANG

Pre-fastening OK range

Fastening angle

TARGET ANG

⟨Operation flow⟩

(TRQ)

TARGET TRQ
CHANGE TRQ
A.START TRQ

SEAT TRQ

D-END TRQ

START TRQ

(TIME)

0

(REVOLUTION)

SOCKET IN TIME

FIRST SLOPE

DRIVE SLOPE

(SPEED)

SP.HIGH SPEED

FIRST SPEED

FINAL SPEED
SP.LOW SPEED
SOCKET SPEED

(TIME)

0

START

SYSTEM START

SYSTEM COMP

6) F.METHOD: RVS-ANG (Reverse angle method)

Fastening makes the loosening rotation in the direction reverse to the set screw fastening direction, stops when a target angle is detected, and judges the maximum and the minimum torques. When the torque exceeds the peak torque, it stops and the judgment completes.
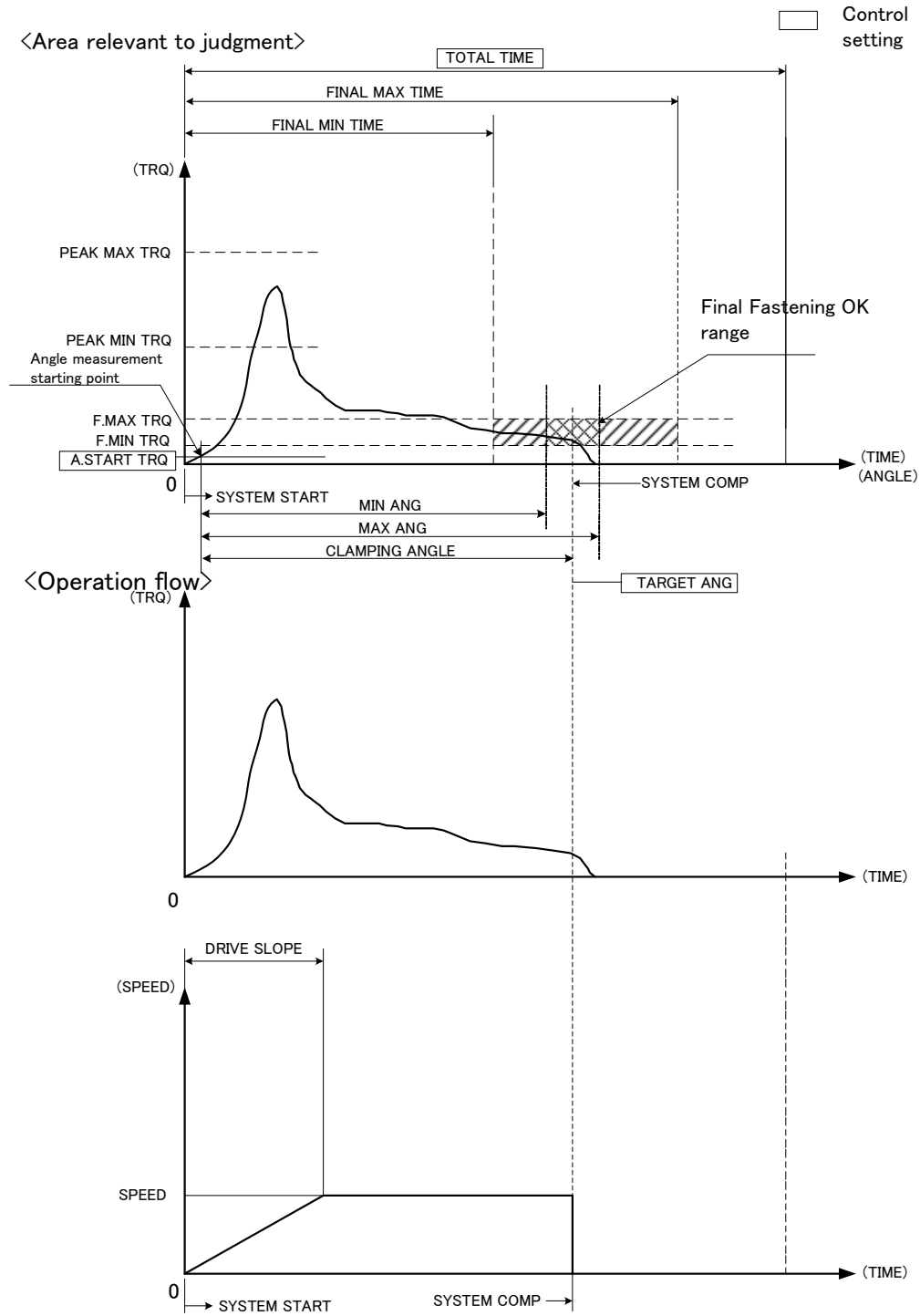
⚠ When using this function with intermittent operation (pulse) mode, Nutrunner ceases fastening motion at the target angle, but stop positions are not constant.

Program Setting Item List

This is a program setting item list indicating which settings are necessary in relation to each fastening method.

◉: This item is absolutely required to be set-up ○: Setting consideration is needed for normal usage.
△: To be set according to necessity of usage ×: Not required to be set in selected fastening method

Setting Entries / Fastening Method		TRQ	TRQMANG	ANG	TRQorANG	TRQandANG	R-ANG
P03 SET TORQUE	1. START TRQ	○	○	○	○	○	×
	2. P.START TRQ	△	△	△	△	△	×
	3. SEAT LO TRQ	△	△	△	△	△	×
	4. SEAT TRQ	◉	◉	◉	◉	◉	×
	5. SEAT HI TRQ	◉	◉	◉	◉	◉	×
	6. A.ST LO TRQ	△	△	△	△	△	×
	7. A.START TRQ	×	◉	◉	◉	◉	×
	8. A.ST HI TRQ	△	△	△	△	△	×
	9. F.MIN TRQ	◉	◉	◉	◉	◉	×
	10. TARGET TRQ	◉	◉	×	◉	◉	×
	11. F.MAX TRQ	◉	◉	◉	◉	◉	×
	12. P.MIN TRQ	×	×	◉	◉	◉	×
	13. P.MAX TRQ	×	×	◉	◉	◉	×
P04 SET ANGLE	1. RUNDOWN ANG	△	△	△	△	△	×
	2. MIN ANG	×	◉	◉	◉	◉	×
	3. TARGET ANG	×	×	◉	◉	◉	×
	4. MAX ANG	×	◉	◉	◉	◉	×
P05 SET TIME	1. SOCKET IN.t	△	△	△	△	△	×
	2. PRE SEAT.t	△	△	△	△	△	×
	3. FINAL MIN.t	△	△	△	△	△	△
	4. FINAL MAX.t	△	△	△	△	△	△
	5. TOTAL.t	△	△	△	△	△	△
	6. IDLE.t	△	△	△	△	△	△
P06 SET SPEED	1. SOCKET SPD	△	△	△	△	△	×
	2. FIRST SPD	△	△	△	△	△	×
	3. FINAL SPD	△	△	△	△	△	×
	4. SP.HIGH SPD	△	△	△	△	△	×
	5. SP.LOW SPD	△	△	△	△	△	×
	6. SP.SEAT PT	△	△	△	△	△	×
	7. SP.SEAT SL	△	△	△	△	△	×
P07 DRIVE CONT	1. MODE	○	○	○	○	○	○
	2. D-CONTROL	△	△	△	△	△	△
	3. FIRST SLOPE	△	△	△	△	△	△
	4. D-SLOPE	○	○	○	○	○	×
	5. D-END TRQ	△	△	△	△	△	△
	6. D-END TIME	△	△	△	△	△	△
	7. MICRO PULSE	△	△	△	△	△	△
	8. REVERSE PLS	△	△	△	△	△	△
	9. PRE CUR LIMIT	○	○	○	○	○	×

Setting Entries	Fastening Method	TRQ	TRQMANG	ANG	TRQorANG	TRQandANG	R-ANG
P08 REV ANG	1. ANG ST. TRQ	×	×	×	×	×	◉
	2. F.MIN TRQ	×	×	×	×	×	◉
	3. F.MAX TRQ	×	×	×	×	×	◉
	4. P.MIN TRQ	×	×	×	×	×	◉
	5. P.MAX TRQ	×	×	×	×	×	◉
	6. F.MIN ANG	×	×	×	×	×	◉
	7. TARGET ANG	×	×	×	×	×	◉
	8. F.MAX ANG	×	×	×	×	×	◉
	9. SPEED	×	×	×	×	×	○
	10. SLOPE	×	×	×	×	×	△
P09 OPTION	1. SELF TAP	△	△	△	△	△	×
	2. S-MONITOR	△	△	△	△	△	×
	3. F-MONITOR	△	△	△	△	△	△
	4. COMPENSATE	△	△	△	△	△	×
	5. S-CUR MON	△	△	△	△	△	×
	6. F-CUR MON	△	△	△	△	△	△
	7. UNDR TG.TRQ	△	△	△	△	△	×
	8. REL S.TRIGR	△	△	△	△	△	△
P10 COUNT	1. COUNT	△	△	△	△	△	△
P11 DIRECTION	1. DIRECTION	△	△	△	△	△	△
P13 DATA OUT	1. DATA OUT	△	△	△	△	△	△

Program parameter consistency check list.

While selecting and using each fastening method as well as each function, consistency between each parameter setting related to fastening methods and functions must be maintained. If the following conditions are not satisfied, "NG" is displayed on the screen and settings cannot be registered.

• Common setting conditions for all fastening methods.

START TRQ	≤	SEAT TRQ
SEAT TRQ	<	SEAT HI TRQ
FINAL MIN TRQ	<	FINAL MAX TRQ
FINAL MIN.t	<	FINAL MAX.t
FINAL MAX.t	<	TOTAL.t
PAUSE.t	<	TOTAL.t
PRE SEAT.t	<	TOTAL.t

• Setting conditions when fastening method "F.METHOD:TRQ" is selected.

SEAT TRQ	<	TARGET TRQ
FINAL MIN TRQ	≤	TARGET TRQ
TARGET TRQ	<	FINAL MAX TRQ

• Setting conditions when fastening method "F.METHOD:TRQ&ANG" is selected.

SEAT TRQ	<	TARGET TRQ
ANGLE START TRQ	<	TARGET TRQ
FINAL MIN TRQ	≤	TARGET TRQ
TARGET TRQ	<	FINAL MAX TRQ
MIN ANG	<	MAX ANG

• Settings conditions when fastening method "F.METHOD:ANG" is selected

SEAT TRQ	<	PEAK MAX TRQ
ANGLE START TRQ	<	PEAK MAX TRQ
PEAK MIN TRQ	<	PEAK MAX TRQ
MIN ANG	≤	TARGET ANG
TARGET ANG	<	MIN ANG
MIN ANG	<	MAX ANG

• Setting conditions when pulse mode function is used.

START TRQ	<	PULSE START TRQ

• Setting conditions when rundown angle monitor function is used.

RUNDOWN MIN	<	RUNDOWN MAX

• Setting conditions when section monitor function is used.

S-TRQ MIN	<	S-TRQ MAX

P03 SET TORQUE (Torque parameter setting)

1. START TRQ   : Measurement start torque   (START TRQ ≤ SEAT TRQ)

    The torque value that is measured initially when system started taking measurements.

    If "P04 SET ANGLE 1. RUNDOWN ANG" is set to be active, system starts to watch RUNDOWN ANGLE after first torque measurement has been taken.

    (Range: 0–50% of rated torque   Default: 3% of rated torque)

2. P.START TRQ   : Pulse start torque   (START TRQ ≤ P. START TRQ)

    This setting is valid only when "PULSE" selected under "P07 DRIVE CONT" =>"1.MODE", and this sets torque value when pulse operation starts.

    (Range: 0–50% of rated torque   Default: 6% of rated torque)

3. SEAT LO TRQ   : Seat minimum torque

    This sets the minimum torque for pre-fastening.

    *   This setting item is not a parameter reflected in judging fastening. This setting is used in an external statistical computing system etc. Use it by default under normal conditions.

    (Range: 0-rated torque   Default = 0)

4. SEAT TRQ   : Upper limit of Seat torque   (SEAT TRQ <SEAT HI TRQ)

    The torque value that when process transferring from screw placement to fastening.

    (Range: 0–rated torque   Default: 8% of rated torque)

5. SEAT HI TRQ   : Seat upper limit torque

    This sets upper limit torque for pre-fastening, and it prevents faulty detection of torque due to over-shoot etc. **(Normally please set it lower than the value of TARGET TRQ.)** If the torque is too high, it may become unable to detect generation of over-shoot, resulting in fastening with excessive torque higher than the displayed value due to impact.

    (Range: 0–rated torque   Default: 50% of rated torque)

6. A.ST LO TRQ   : Angle measurement starting torque minimum value

    This sets the lower limit torque when starting angle measurement.

    *   This setting item is not a parameter reflected in judging fastening. This setting is used in an external statistical computation system, etc. Use it by default under normal conditions.

    (Range: 0-rated torque   Default = 0)

7. A. START TRQ   : Angle measure start torque   (A. START TRQ <TARGET TRQ)

    This sets the angle measurement starting torque.

    (Range: 0–rated torque   Default: 20% of rated torque)

8. A.ST HI TRQ   : Angle measurement starting torque maximum value

This sets the maximum torque when starting angle measurement.

*   This setting item is not a parameter reflected in judging fastening. This setting is used in an external statistical computation system, etc. Use it by default under normal conditions.

(Range: 0–125% of rated torque   Default = 120% of rated torque)

9. F.MIN TRQ   : Final torque minimum value   (F.MIN TRQ ≤ TARGET TRQ)

This sets the minimum value of torque at the end of fastening process. After measurement starting torque is inspected, it judges even START input is set OFF and stopped before target point.

If the setting is "0," the minimum value is not judged.

(Range: 0–125% of rated torque   Default: 40% of rated torque)

10. ARGET TRQ   : Fastening target torque   (TARGET TRQ <HIGH TRQ)

Fastening target torque. Please set it in the range of 20%~100% of rated torque.

As the fastening process principle, because Nutrunner ceases controlling when it reaches target torque, it causes some overshoot due to response delay. Therefore, it is desirable to set the target torque to retract the overshoot amount from the actual the target value.

(Range: 0–125% of rated torque   Default: 50% of rated torque)

11. MAX TRQ   : Final torque maximum value   (F.MIN TRQ <F.MAX TRQ)

When using "F.METHOD:TRQ," "F.METHOD:TRQ&ANG,|" "TRQ or ANG," or "TRQ and ANG ," this sets the fastening torque upper limit.

If "F.METHOD: ANG" is being used, this sets torque upper limit at fastening completion point. Furthermore, it will not judge as NG and stop even if it exceeds fastening torque upper limit during fastening process, but judge as upper limit NG after the completion of fastening process.

(Range: 0–125% of rated torque   Default: 60% of rated torque)

12. P.MIN TRQ   : Peak hold minimum value   (P.MIN TRQ <P.MAX TRQ)

When "F.METHOD:ANG.," "TRQ or ANG," or "TRQ and ANG" method is used, this sets the peak hold torque minimum value. Peak hold is always performed during fastening process, and this minimum value is judged at the end of process. If the setting is "0," the minimum is not judged.

This value is invalid when "F.METHOD: TRQ" and "F.METHOD: TRQ&ANG" are used.

(Range: 0–125% of rated torque   Default: 0%)

13. P.MAX TRQ   : Peak hold maximum value   (A.START TRQ <P.MAX TRQ)

When "F.METHOD:ANG.," "TRQ or ANG," "TRQ and ANG" method is used, this sets the maximum torque of fastening. Fastening process will be terminated at the point where peak torque exceeds its maximum value, and it will be judged as NG.

This is invalid when "F.METHOD: TRQ" and "F.METHOD: TRQ&ANG" methods are used.

(Range: 0–125% of rated torque   Default: 120%)

P04 SET ANGLE (Angle parameter setting)

1. RUNDOWN ANG : Rundown angle   (RUNDOWN MIN <RUNDOWN MAX)

> Rundown angle monitor, a function that watches angles from measurement starting torque to the point where seat torque is inspected, judges the lower and maximum values of the angle.
> In order to activate rundown angle monitor function, rundown lower limit angle and upper limit angle must also to be set up.
> (Range: ON (valid)/OFF (invalid)   Default: OFF)

> 1. RUNDOWN MIN   : rundown angle lower limit
>
> > It sets up for permissible lower limit angle value. If the measured fastening angle is lower than this lower limit value, it terminates fastening process and judges it to be NG.
> > If the setting is "0," the minimum is not judged.
> > (Range: 0–65000 deg   Default: 0 deg)

> 2. RUNDOWM MAX: rundown angle upper limit
>
> > It sets up for permissible upper limit angle value. If the measured fastening angle is higher than this upper limit value, it terminates fastening process and judges it to be NG.
> > (Range: 0–65000 deg   Default: 360 deg)

2. MIN ANG   : Final angle lower limit value   (MIN ANG ≤ TARGET ANG)

> It sets up for lower limit minimum value for fastening.
> (Range: 0–6500.0 deg   Default: 0.0 deg)

3. TARGET ANG   : Targeted fastening angle   (TARGET ANG <MAX ANG)

> It sets up for the targeted fastening angle. It is valid in F.METHOD: ANG.
> (Range: 0–6500.0 deg   Default: 0.0 deg)

4. MAX ANG   : Final angle upper limit maximum value   (MIN ANG <MAX ANG)

> It sets up for upper limit maximum value for fastening.
> (Range: 0–6500.0 deg   Default: 90.0 deg)

P05 SET TIME (Time parameter setting)

1. SOCKET IN.t   : Initial low speed rotation time

The purpose of this function is to make it easier to get the socket onto the bolt or nut at the initial start point of fastening process, and it rotates at the set speed for the set length of time set by "PO6: SOCKET SPD => SOCKET SPD". After the time lapses or Seat Torque or Pulse Start Torque (on Pulse mode only) is inspected within initial low speed rotation time, it automatically changes to rotate at FIRST SPD or SP HIGH SPD. Also, the setting is effective in reversing mode.

(Range: 0.0–2.0 sec   Default: 0.5 sec)

2. PRE TRQ.t   : Pre-fastening lower limit time (double fastening prevention) (PRE SEAT.t <TOTAL.t)

This sets time internal required before seat torque is inspected. If seat torque is inspected during this time interval, it is judged to be NG and thus terminated. This can be used for double fastening prevention.

(Range: 0.0–9.9 sec   Default: 0.0 sec)

3. FINAL MIN.t   : Final fastening lower limit time   (FINAL MIN.t <FINAL MAX.t)

The lower limit minimum time is set for fastening. If the fastening is completed before the time set here, it will be judged NG. This can be used for clogging prevention and foreign substances elimination etc.

(Range: 0.0–9.9 sec   Default: 0.0 sec)

4. FINAL MAX.t   : Final fastening upper limit time   (FINAL MAX.t <TOTAL.t)

The upper limit maximum time is set for fastening. If the fastening is not completed within this maximum time interval, it will be judged NG. This can be used for preventing overload on motor, or detecting thread defects.

(Range: 0.0–9.9 sec   Default: 2.0 sec)

5. TOTAL.t   : Operation allowable time

This sets the maximum allowable operation time interval from the point that fastening START signal is inputted to end of fastening process. Operation is forcibly terminated and judged as NG if the total time exceeds this value. If START TRQ is not inspected and time exceeds its maximum allowable value, operation will stop but NG judgment will not be performed. This operation maximum allowable time is also effective for reverse rotation.

(Range: 0.0–30.0 sec   Default: 10.0 sec)

6. IDLE.t:Standby time between stages   (IDLE.t <TOTAL.t)

Standby time between stages in multi-channel function.

(Range: 0.0–30.0 sec   Default = 0.0 sec)

7. PAUSE.t:Seat Stop Time   (PAUSE.t <TOTAL.t)

This function is set when not using multi-spindle function of X-PAQ but S.START of I/O is used to conduct multi-spindle seat synchronization.

If this value is not 0, wait for the input of S.START for designated time after pre-fastening completes. If S.START is not input at that time, the judgment completes, and if S.START is input, fastening is executed.

If multi-spindle sync is executed by using the Multi-Spindle function, keep this value and default of 0. (Range: 0.0–9.9 sec   Default = 0.0 sec)

P06 SET SPEED (Speed parameter setting)

1. SOCKET SPD   : Initial low rotation speed

The purpose of this function is to make socket easier to get into bolt or nut at the initial start point of fastening process. It rotates at the set speed for the set length of time set by "P05: SET TIME => SOCKET IN.t". After lapse of the set time as well as measurement starting torque is inspected within initial low speed rotation time, it automatically changes to rotate at FIRST SPD or SP HIGH SPD. Also, the setting becomes effective in reversing mode.

(Range: 1–max. rotation speed   Default: 5% of max rotation speed)

2. FIRST SPD   : Pre-fastening speed

This is the free speed the spindle rotates at before seating the bolt to the work object. This also applies to reverse rotation.

(Range: 1–max rotation speed   Default: 50% of max rotation speed)

3. FINAL SPD   : Fastening rotation speed

This is the final rotation speed as the spindle applies the target torque or angle to the bolt.

(Range: 1–max rotation speed   Default: 5% of max rotation speed.)

⚠️ Although it reduces overshoot of torque along with the reduction of rotation speed, please set time interval within one second for fastening to end. Otherwise, it may cause overloading and overheating of motor.

4. SP.HIGH SPD   : Pre-fastening high speed feed setting

This is used in case rotation speed can not be increased due to large overshoot torque in seating even if FIRST SPD is increased to shorten pre-fastening time.

When using this function, it is possible to feed screws by the rotation speed set by "1.SPEED" and the number of threads set by "2.REVOLITION" from fastening start point. After high speed feeding motion, it switches to FIRST SPD.

(Range: ON (valid)/OFF (invalid)   Default: OFF)

    1. SPEED   : High speed feeding speed setting.

    (Range: 1–Max rotation speed   Default: 100% of max speed)

    2. REVOLUTION   : Operation revolution volume setting at high speed feeding.

    (Range: 1–99 rev   Default: 1 rev.)

> MEMO
>
> In order to effectively use this function, it is important to adjust the setting so that seating does not occur during high speed motion.

5. SP.LOW SPD   : Fastening super low speed setting

This function can effectively reduce overshoot and ease of relaxation by reducing rotation speed to the point where it is even slower than the fastening rotation speed (FINAL SPD).

(Range: ON (valid)/OFF (invalid)   Default: OFF)

    1. SPEED   : Sets super low rotation speed.

(Range: 1–max rotation speed   Default: 1% of max rotation speed.)

    2. CHANGE TRQ   : This sets a point for speed changeover with respect to targeted torque.

Point is set by percentage. Speed will not change at 100%.

(Range: 0–100%   Default: 80%)

⚠ Although it reduces overshoot of torque along with the reduction of rotation speed, please set time interval within 1 second for fastening completion. Otherwise, it may cause overloading and overheating of motor.

6. SP.SEAT PT   : Turning point for Pre-fastening low speed (Torque)

This function can reduce overshoot at the point of seating the bolt to the work object by reducing rotation speed before the seating torque.

This set a point for speed changeover with respect to seating torque.

Point is set by percentage. If 0 or 100% is selected, this function is invalid.

(Range: 0–100%   Default = 100%)

7. SP.SEAT SL   : Turning point for Pre-fastening low speed slope (UP slope)

After reducing rotation speed by SP.SEAT PT, and detecting lower torque rather than measured point at the turning point, rotation speed is set back as previous setting.

This parameter is used to set a speed slope at the point.

(Range: 0–100% (100% = 1 sec)   Default = 10%)

P07 DRIVE CONT (Operation control setting)

This is a unique setting of Handy nut runner. The setting for Control method of drive during fastening (after seated at FINAL SPEED) is described under this section.

1. MODE : Fastening operation setting
Please choose continuous operation (DIRECT) or intermittent operation (PULSE). This setting is also effective in reverse rotation mode. Default is DIRECT.

DIRECT : Continuous operation (direct) mode
Although fastening counterforce is directly received, fastening precision is same as nut runner.
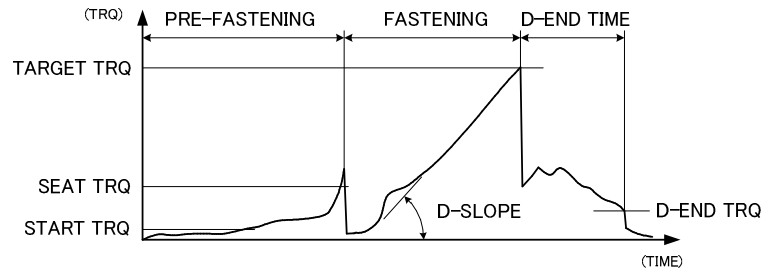
PULSE : Intermittent operation (pulse) mode
By using ASG special motor controlling feature, pulse characteristics, joint hardness of fastening work, work time, and the magnitude of fastening counterforce can be adjusted to optimize the user's needs.
Although quantity of overshoot is slightly increased compared to direct mode, it can greatly reduce fastening counterforce.
To use pulse mode, pulse operation time (RUN TIME), pulse pause time (STOP TIME), pulse output (pulse level) are required settings.

<Pulse: Intermittent operation (pulse) mode>
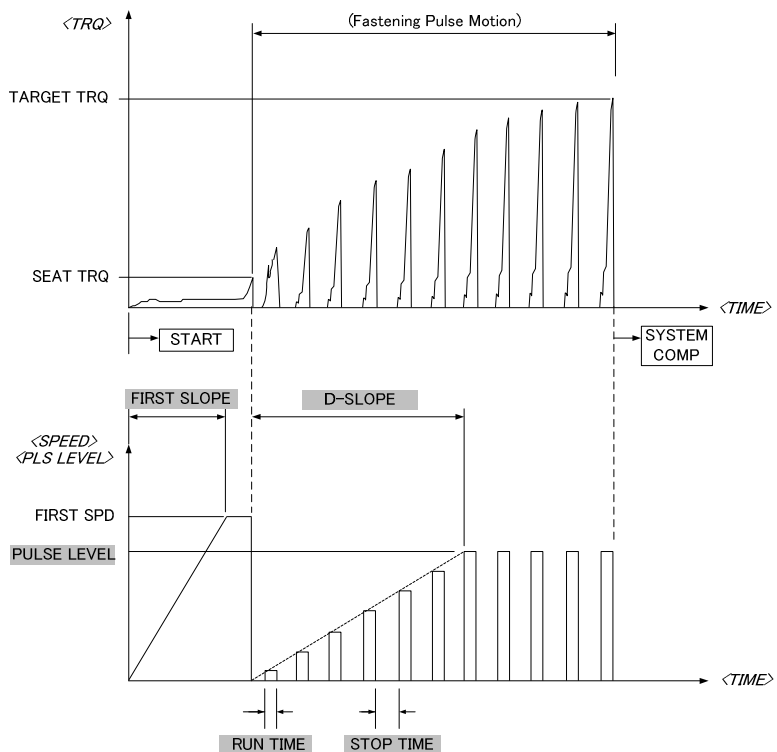
1. **STOP TIME** : Pulse pause time
    (Range: 0.001–0.100 sec   Default: 0.025 sec)
    * When pulse tool is connected, parameter can not be changed.

2. **RUN TIME** : Pulse operation time
    (Range: 0.001–0.018 sec   Default: 0.006 sec)
    * When pulse tool is connected, parameter can not be changed.

3. **PULSE LEVEL** : Pulse output adjustment
    This is the setting for pulse operation output level. Adjusting this setting will improve the precision of the fastening. A setting of 100% will provide maximum output power.
    (Range: 1–100%   Default: 50%)
    Please note that if the pulse level is set too low, the fastening process will hsmmer continuously until a timeout occurs. If this occurs, please increase the pulse level in order to reach the target torque. If the fastening time becomes too long, please take into consideration using the "MICRO PULSE" function.
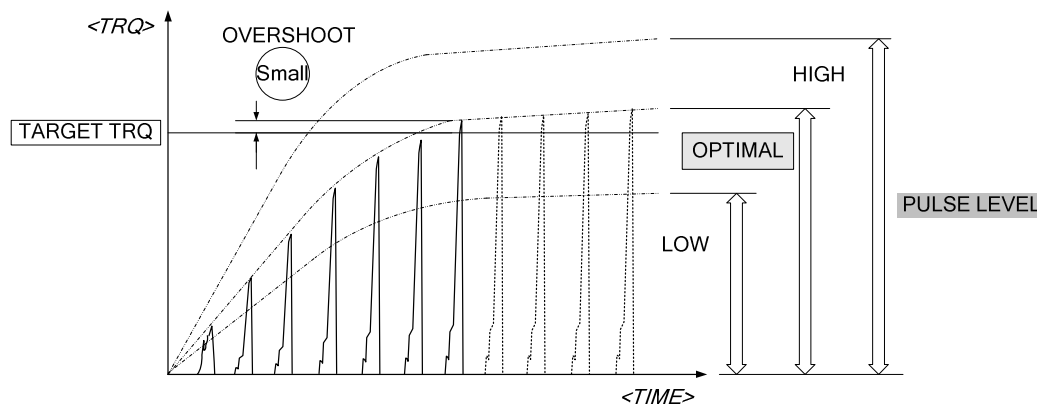
4. **PULSE COUNT** : Additional pulse setting
    Executes the set number of pulse operations after target torque is inspected.
    This is invalid when using "F.METHOD:ANG"
    (Range: 0–20   Default: 0)

    *   When using this function, fastening result torque is higher than set target torque because it executes the set number of pulse operations after target torque is inspected. Please use this function with caution and inspect the joint to ensure proper setting.

⚠️ **It is extremely dangerous to change setting values with sudden wild range due to change in operating motions. Please gradually change the setting values of "STOP TIME" and "RUN TIME" from their default values and search for the most suitable settings.**

2. D-CONTROL   : Fastening control setting

This is a function for selecting the motor control mode during fastening from speed control (SPEED) and current control (CURRENT).

(Range of setting: SPEED/CURRENT   Default = SPEED)

* When pulse tool is connected, parameter can not be changed from [SPEED] setting.

3. FIRST SLOPE   : Pre-fastening initial speed slope

This sets the acceleration slope of pre-fastening rotation speed. It will relieve the impact due to abrupt speed increase at START. (The higher the setting value the slower the rising speed)

(Range: 0–100% (100% = 1 sec)   Default: 10%)

4. D-SLOPE   : Fastening speed slope/pulse output slope

This sets rising slope of fastening rotation speed (DIRECT mode) and pulse output (PULSE mode). This is used to reduce the impact due to overshoot of torque and ease the impact (counterforce) due to sudden rising in torque. If slope value is set high, screws are fastened in a relatively slow motion; oppositely, if slope value is set low, screws are fastened in a sudden motion. Since it affects fastening precision and counterforce etc, please adjust slope values according to desired condition of use.

For general condition of use, please set slow (HIGH%) rising slope for hard joint and fast (LOW%) rising slope for soft joint.

(Range: 2–1000% (100% = 1 sec)   Default: 20%)

5. D-END TRQ   : Reaction relaxation termination torque

This is a function for easing the counter reaction caused by the sudden shutoff upon fastening completion. When D-END TRQ is reached, spindle reaction will be relaxed over the time set in the "D-END TIME" function.

This function is set in a percentage with respect to target torque setting.

* This is invalid when PULSE under "P07 DRIVE CONT => 1.MODE" is selected.

(Range: 0–100%   Default: 10%)

6. D-END TIME   : Reaction relaxation termination time

This sets the retentive attenuation time of counter reaction relaxation function (slope time of declining). Please adjust values according to condition of use.

(Range: 0.00–2.00 sec   Default: 0.50 sec)

7. MICRO PULSE   : Micro-pulse function

This function is usable while pulse mode is selected. PULSE LEVEL (pulse output) and SLOPE (pulse output slope) can be changed in the middle of fastening pulse operation. This is effective especially for wishing to reduce work time and to improve accuracy.

In order for micro pulse setting to be valid, settings of micro-pulse output adjustment, pulse change torque, and pulse output slope are also required.

(Range: ON (valid)/OFF (invalid)   Default: OFF)

<Reduction of the working time>

Soft joint fastening process takes longer time after SEAT TRQ because of its big fastening angle. For reducing this time, set the pulse level maximum, and make the high striking power per 1 pulse in the beginning of the fastening action. After the fastening action, to avoid degradation of the torque precision, set the "MICRO PLS LEVEL" and "MICRO PULSE END LEVEL" to the value which can achieve the TARGET TORQUE as it would with "PULSE LEVEL".
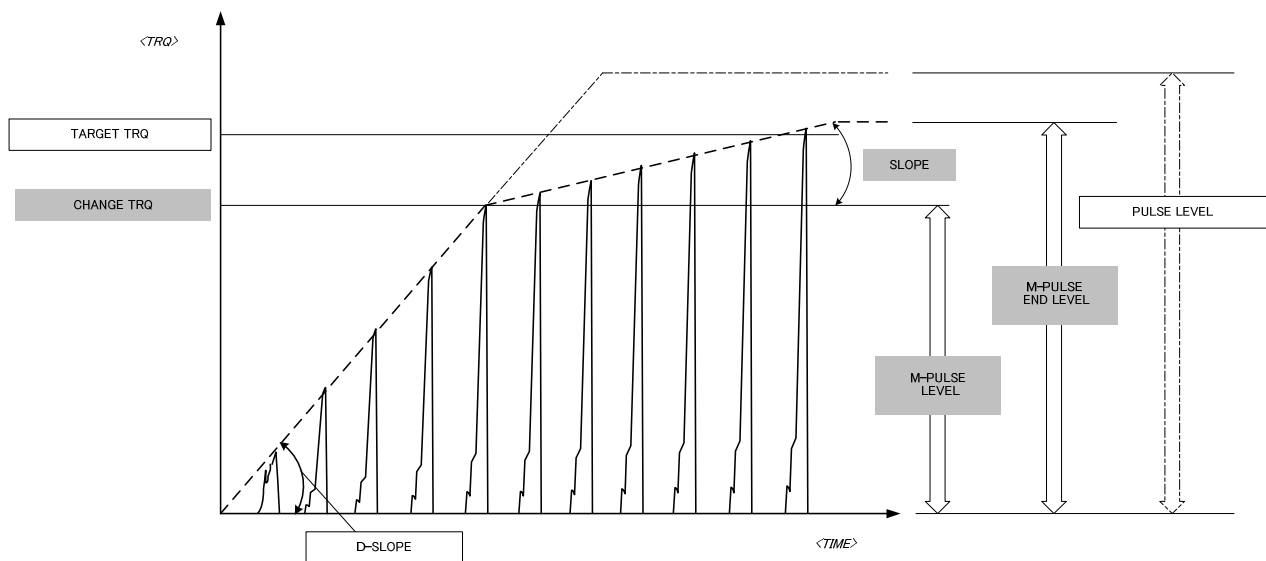
1. PULSE LEVEL   : Micro-pulse start output adjustment

Set output value when Micro-pulse operation starts after set torque at "CHANGE TRQ" is detected.

(Range: 1–100% (100% = Max. output)   Default: 50%)

2. CHANGE TRQ   : Micro-pulse transition torque

Micro-pulse transition torque is set in percentage with respect to target torque.

(Range: 1–100%   Default: 80%)

3. SLOPE   : Micro-pulse output slope

Set rising slope between MICRO PULSE LEVEL and MICRO PULSE END LEVEL after the set torque "CHANGE TRQ" is detected.

When the setting error between Micro pulse start output value and Micro pulse end output is large, the effect will be also large.

Although torque precision is increased if this Micro-pulse output slope setting value is increased, the time required to reach TARGET TRQ becomes longer due to the features of fastening application. For this kind of situation, time can be shortened if the SLOPE setting value is decreased.

(Range: 1–100% (100% = 10 sec)　　Default 20%)

4. PULSE END LEVEL : Micro-pulse end output adjustment

This sets Micro-pulse operational output. In general, little higher value than value of "MICRO PULSE LEVEL" is effective.

(Range: 1–100% (100% = Max. output)　　Default: 100%)

8. REVERSE PULSE : Reverse pulse

This function becomes usable when pulse mode is selected. Although pulse operation can function in reserve rotation based on the settings of normal rotation, pulse operation/stop time in reverse rotation can be modified by using this setting. After fastening, this is especially effective to the work when unfastening requires higher torque than the fastening process.

In order for reverse pulse setting to be valid, STOP TIME, RUN TIME, and PULSE LEVEL must be set within the REVERSE PULSE function.

1. STOP TIME : Reverse pulse resting time

(Range: 0.001–0.100 sec　　Default: 0.025 sec)

* When pulse tool is connected, parameter can not be changed.

2. RUN TIME : Reverse pulse operating time

(Range: 0.001–0.018 sec　　Default: 0.006 sec)

* When pulse tool is connected, parameter can not be changed.

3. PULSE LEVEL : Reverse pulse output adjustment

Adjusts reverse pulse operation output.

(Range: 1–100% (100% = Max. output)　　Default: 50%)

9. PRE CUR LMT : Electric current value limitation for pre-fastening

This is an electric current limitation setting of pre-fastening operation (from fastening operation start to the point where SEAT TRQ is reached)

The purpose of this function is for suppressing overshoot as well as sudden counterforce when bolt is seated (SEAT).

(Range: 0–100% (100% = Max. output)　　Default: 30%)

Basic setting standard = "section current monitor value (S)" + 5%

⚠ **It is possible that spindle will not rotate and be stalled (TOTAL TIME is over) during fastening if electric current limitation value is set too low. Please change current limitation value if this situation happens.**

P08 REV ANGLE (Reverse Angle Control Setting)

This is a parameter group that must be set when the reverse angle control is selected as a fastening method.

1. ANG ST. TRQ : Angle measurement starting torque
   This is a detected torque value whose angle measurement is started by the system.
   (Range: 0–100% of rated torque   Default = 0% of rated torque)

2. F.MIN TRQ : Final torque minimum value
   This sets the minimum torque when the action completes. After detecting starting torque, the judgment is performed even if Start input is turned OFF and the operation stops before reaching a target point.
   If the setting is "0," the minimum value is not judged.
   (Range: 0–125% of rated torque   Default = 0% of rated torque)

3. F.MAX TRQ : Final torque maximum value   (F.MIN TRQ <F.MAX TRQ)
   This is the maximum torque setting when the operation completes, and even if it exceeds the maximum torque during the fastening process, it will not be judged as NG and will not stop but will be judged as the maximum NG after the completion of fastening.
   (Range: 0–125% of rated torque   Default = 50% of rated torque)

4. P.MIN TRQ : Peak hold minimum value
   When "RVS-ANG," method is used, this sets the peak hold torque minimum value. Peak hold is always performed during the fastening process, and the minimum value is judged at the end of process. If the setting is "0," the minimum value is not judged.
   (Range: 0–125% of rated torque   Default = 0% of rated torque)

5. P.MAX TRQ : Peak hold maximum value   (P.MIN TRQ <P.MAX TRQ)
   When "RVS-ANG," method is used, this sets the maximum torque at the time of screw fastening. Fastening process will be terminated at the point where peak torque exceeds its maximum value, and fastening will be judged as NG.
   (Range: 0–125% of rated torque   Default = 120% of rated torque)

6. F.MIN ANG : Reverse Angle Minimum Value   (F.MIN ANG <TARGET ANG)
   This sets the minimum angle when rotating in the reverse angle.
   (Range: 0–6500.0 deg   Default = 0.0 deg)

7. TARGET ANG : Reverse Target Angle   (TARGET ANG <F.MAX ANG)
   This sets the target angle when rotating in the reverse angle.
   (Range: 0–6500.0 deg   Default = 180.0 deg)

8. F.MIN ANG : Maximum Reverse Angle Value   (F.MIN ANG <F.MAX ANG)
   This sets the maximum angle when rotating in the reverse angle.
   (Range: 0–6500.0 deg   Default = 360.0 deg)

9. SPEED   : Rotation speed

This sets the rotation speed when rotating in the reverse angle.

(Range; 1- maximum rotation speed   Default = 30% of maximum rotation speed)

10. SLOPE   : Speed slope

This sets the acceleration slope of rotation speed. It will relieve the impact due to abrupt rotation at START. The higher the setting value, the slower the rising speed.

(Range: 0–100% (100% = 1 sec)   Default = 20%)

P09 OPTION (Option Setting)

1. SELF TAP   : Self tap monitor

This option is used when a large torque occurs like with a tapping screw at the beginning of a fastening process and exceeds SEAT torque.

No seat torque is detected from START TRQ detection during INTERVAL. During the time, peak torque is held and if it exceeds the maximum self tap torque, this operation completes as NG. In addition, if the peak torque, which is held when the self-tap section completes, falls below the minimum self tap value, this operation completes as NG.

(Range: ON (valid)/OFF (invalid)   Default = OFF)
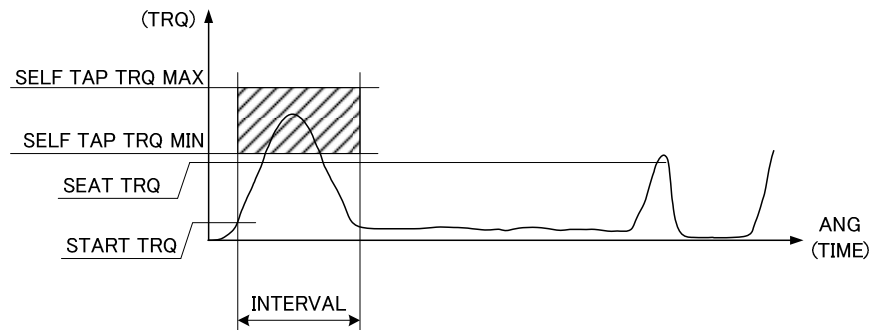
1. INTERVAL   : Self-tap interval

This function monitors until set angle value from the START TRQ point.

(Range: 0–65000 deg   Default = 10 deg)

2. TRQ MIN   : Self tap torque minimum value

It is the minimum torque in the monitor interval.

If a detected torque falls below the setting value, self-tap LOW NG judgment stops and is displayed and output.

(Range: 0.00–rated torque   Default = 0.00)

3. TRQ MAX   : Self tap torque maximum value (TRQ MIN <TRQ MAX)

It is the maximum torque in the monitor interval.

If a detected torque exceeds the setting value, self-tap HIGH NG judgment stops and is displayed and output.

(Range: 0.00–rated torque   Default = rated torque)

2. S-MONITOR   : Section monitor (section torque monitor)

This function judges the upper and lower limits of an inspected torque for any specified section. It also can be used to check the friction of the gears of the tool.

This function watches from START TRQ point as a starting point and begins monitoring after passing the angle set in "START ANG" to the angle range set in "S-MON.ANG". If the upper and lower limit torque values are exceeded within the specified section, it will be judged as NG and stop.

In order to turn ON (valid) this function, settings of monitor starting angle/range angle, monitor torque lower limit value and monitor torque upper limit value are also required.

(Range: ON (valid)/OFF (invalid)   Default: OFF)

* While using pulse mode, monitor function terminates after reaching the torque set under "P.START TRQ".

* Monitoring stopped when SEAT TRQ is tetected.
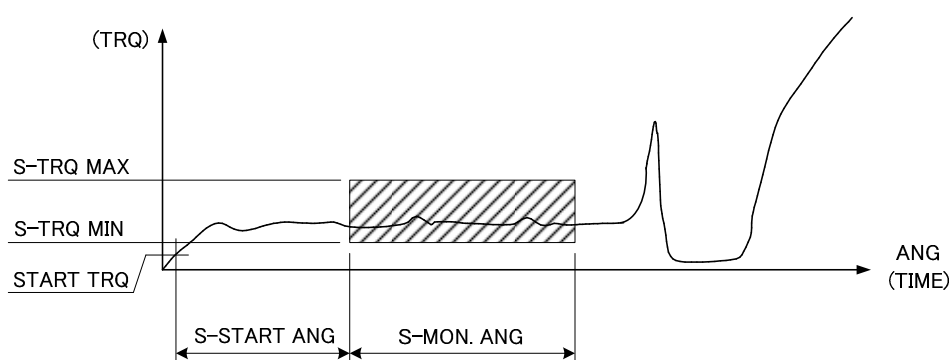
1. S-START ANG   : Monitor starting angle.

Use START TRQ point as starting point and begin monitoring at the set angle value.

(Range: 0–65000 deg   Default: 0 deg)

2. S-MN.ANG   : Monitor range angle.

Monitoring angle range setting

(Range: 1–65000 deg   Default: 360 deg)

3. S-TRQ-MIN   : Monitor torque lower limit value

Torque lower limit setting for monitoring section.

If inspected torque is below setting value, it judges as MONITOR LOW NG and then stops, display/output.

(Range: 0.00–rated torque   Default: 0.00)

4. S-TRQ-MAX   : Monitor torque upper limit value (S-TRQ MIN <S-TRQ MAX)

Torque upper limit setting for monitoring section.

If inspected torque exceeds setting value, it judges as MONITOR HIGH NG and then stops, display/output.

(Range: 0–rated torque   Default: 8% of rated torque)

3. F-MONITOR   : Final Monitor (Determine screw fastening zone)

This is a function that judges the maximum and the minimum values of detected torques in any specified interval and is used for early detection of bad works.

This function starts at the point where a set torque of "P03 SET TORQUE => 7. A.START TRQ" is detected, monitors the point with the angle set in "F-START ANG" passes through the angle range set in "F-END ANG." If a torque exceeds the upper/lower torque within the specified interval, this function will judge it as NG and stop.

In order to set this function ON (valid), it is required to set the monitor starting angle/range and monitor torque minimum/maximum value.

(Range: ON (valid)/OFF (invalid)   Default = OFF)

*   This function is invalid when "Torque method" is selected as a fastening method.
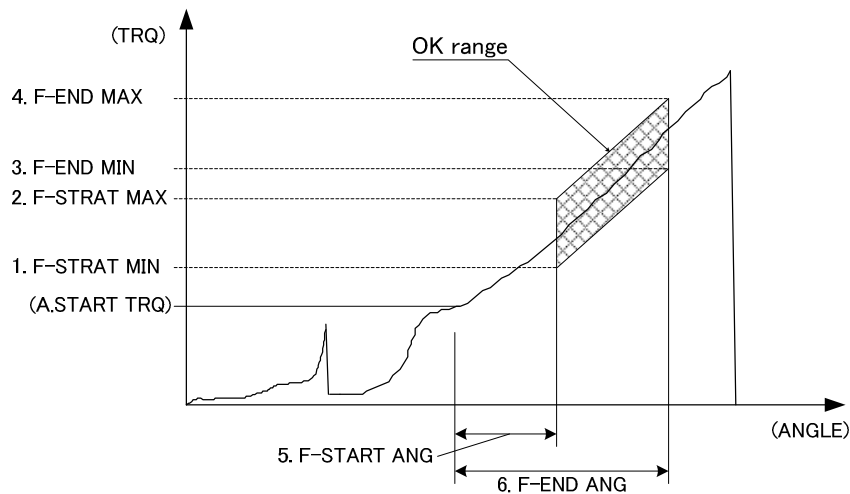
1. F-START MIN   : Start minimum torque value
It is the minimum torque setting at the starting point of the monitor interval.
If a detected torque falls below the setting value, this function judges it as F-MONITOR LOW NG and stops.
(Range: 0–125% of rated torque   Default = 0)

2. F-START MAX   : Start torque maximum value (F-START MIN <F-START MAX)
It is the maximum torque setting at the starting point of the monitor interval.
If a detected torque exceeds the setting value, this function judges it as F-MONITOR HIGH NG, stops, displays and outputs it.
(Range: 0–125% of rated torque   Default = rated torque)

3. F-END MIN   : Final torque minimum value
It is the minimum torque at the ending point of the monitor interval.
If a detected torque falls below the setting value, this function judges it as F-MONITOR LOW NG and stops.
(Range: 0–125% of rated torque   Default = 0)

4. F-END MAX   : Final torque maximum value (F-END MIN <F-END MAX)

It is the maximum torque setting at the ending point of the monitor interval.

If a detected torque exceeds the setting value, this function judges it as F-MONITOR HIGH NG, displays and outputs it.

(Range: 0–125% of rated torque   Default = rated torque)

5. F-START ANG   : Judgment start angle

This sets a detected point of "P03 SET TORQUE => 7. A.START TRQ" as a detection starting point and the judgment starts at the point where this set angle is passed.

(Range: 0–6500.0 deg   Default = 0.0 deg)

6. F-END ANG   : Judgment ending angle

It is the angle range setting to be monitored.

(Range: 1–6500.0 deg   Default = 10.0 deg)

4. COMPENSATE (Compensation)

This function is used when the friction torque is not included in the tightening torque.

This function starts at the point where the set torque of "P03 SET TORQUE => 4. SEAT TRQ" is detected and using the detected torque at the point where the angle set in "POINT" is returned as a reference, executes fastening by the torque with the reference deduced.

In order to set this function ON (valid), it is required to set the angle of the standard torque measurement point.

(Range: ON (valid)/OFF (invalid)   Default = OFF)

Note: This function is invalid when "Pulse mode" is selected on "P07 DRIVE CONT 1. MODE".

1. POINT   : Reference torque measurement point

Set the measurement point of the reference torque by the angle value returned from a detected point in "P03 SET TORQUE => 4. SEAT TRQ"

(Range: 0–9999 deg   Default = 10 deg)

- 137 -
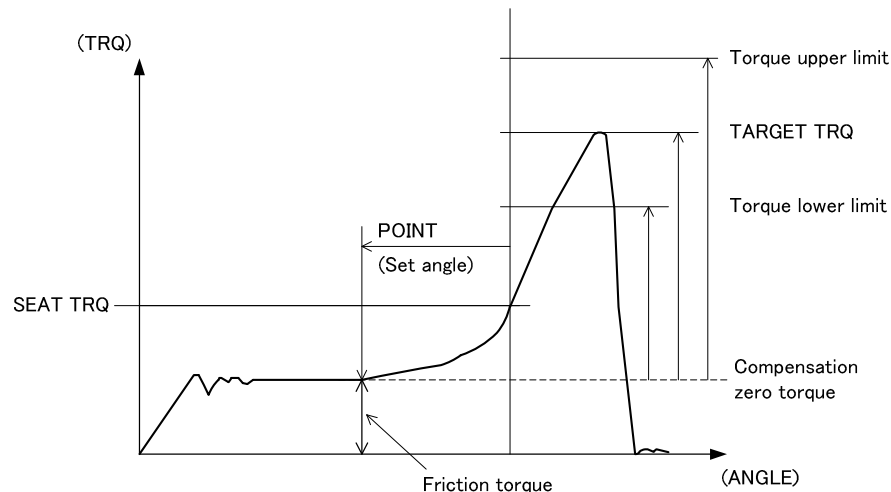
5. S-CUR MON   : Selection Current Monitor (Monitor current interval)

This is a function that judges the upper and lower limits of inspected current for any specified section. It also can be used to detect whether washer/packing exists or not, and perform inspections of defective works.

This function watches from START TRQ point as starting point and starts monitoring after passing the angle set in "S-START ANG" to the angle range set in "S-MON.ANG". If the upper and lower limit torque is exceeded within specified section, it will be judged as NG and stop.

In order to turn ON(valid) this function, settings of monitor starting angle/range, current monitor lower limit value, and current monitor upper limit value are also required.

(Range: ON (valid)/OFF (invalid)   Default: OFF)

* While using pulse mode, monitor function terminates after torque set under "P.START TRQ" is inspected.
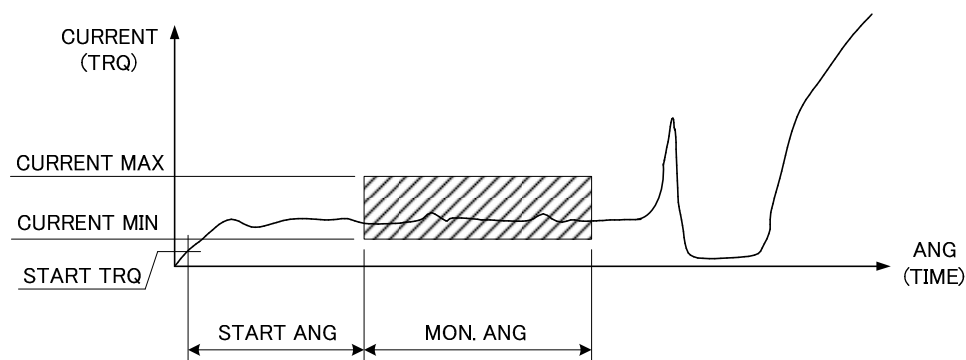
1. START ANG   : Monitor starting angle
Use START TRQ point as starting point and start monitoring right after passing the set angle value.
(Range: 0–65000 deg   Default: 0 deg)

2. MON.ANG   : Monitor range angle
Monitoring angle range setting
(Range: 1–65000 deg   Default: 360 deg)

3. CURRENT MIN   : Monitoring current lower limit value
This is the lower limit setting for the current monitoring section.
If inspected current value is below setting value, it judges as S-CUR LOW NG and then stop, display/output.
(Range: 0–100%   Default: 0%)

4. CURRENT MAX   : Monitoring current upper limit value
This is the upper limit setting for the current monitoring section.
If inspected current value exceeds setting value, it judges as S-CUR HIGH NG and then stop, display/output.
(Range: 0–100%   Default: 100%)

6. F-CUR MON   : Final Current Monitor (Final electric current monitor)

This function judges the upper and lower limit values of inspected electric currents during fastening operation. After SEAT TRQ is inspected, current monitor starts and peak holds monitor value. If value of current exceeds its upper limit value before target torque and angle are reached, it will be judged as NG and stop. The judgment for lower limit current value is performed after the completion of fastening process.

In order to set ON (valid) this function, settings monitor current lower limit and upper limit values are also necessarily required

(Range: ON (valid)/OFF (invalid)   Default: OFF)

    1. CURRENT MIN   : Monitoring current lower limit value

This is the lower limit setting for current monitoring.
If inspected current value is below setting value, it judges as F-CUR LOW NG and then stop, display/output.
(Range: 0–100%   Default: 0%)

    2. CURRENT MAX   : Monitoring current upper limit value

This is the upper limit setting for the final current monitoring section.
If inspected current value exceeds setting value, it judges as F-CUR HIGH NG and then stop, display/output.
(Range: 0–100%   Default: 100%)

7．UNDR TG.TRQ   : Under target torque

Select the operation is judged as OK or NG if the final torque is below setting value of "P03.10 TARGET TRQ" and exceeds "P03.9. F.MIN TRQ".
This value is invalid when "F.METHOD:ANG" and "F.METHOD: RVS-ANG " are used.
(Range: ON (fastening OK judgment)/OFF (fastening NG judgment)   Default: OFF)

8．REL S.TRIGR   : Release start trigger

This function detect the fastening operation is aborted by Start Trigger Off.
If a start trigger is come by off by completion of fastening, the judgment of torque and an angle will be performed at that time, but when this function is effective, even if a judgment is OK, it judges as NG of fastening.
(Range: ON (fastening OK judgment)/OFF (fastening NG judgment)   Default: OFF)

P10 COUNT (Batch Count function)

This sets the Batch Count function. After the set number of fastening completes, the "nxOK" lamp on the display panel lights up, and the "nxOK" signal allocated to I/O ports is output. This enables users to check that the set number of fastenings has been executed. The counting is conducted in the DOWN count method.

1. COUNT   : Batch Count setting

          OFF   : The count function is not used. (default)

          CHANNEL   : Set it from the parameter of a channel being used.

          FIELDBUS   : Set it from FieldBus.

          ETHERNET   : Set it from the open protocol.

          In order to set COUNT related functions, the following settings are required.

          1. COUNT NO.   : Count number

          This is valid when "CHANNEL" is selected. The number of counts set by this function is used.

          (Range: 1–99   Default = 1)

          2. COUNT METH   : Count method

          OK COUNT: This counts fastening OK judgments only (default).

          ALL COUNT: This counts all fastening judgments.

          (1)   When the set number is counted up and the fastening OK judgment is given every time, the nxOK lamp on the display panel turns on and the nxOK signal is turned ON and output from the I/O port.

          (2)   When the set number is counted up and the fastening NG judgment is made even once, the nxOK lamp on the display panel does not turn on and the nxNG signal is turned ON and output from the I/O port.

          3. TOOL LOCK   : Tool lock

          OFF: Invalid (default)

          ON: Locks the tool operation when the count is completed.

          Tool unlocking condition

          • "RUN" signal inputted or panel "RUN" button pressed

          • "RESET" signal inputted

          • "COUNTER RESET" signal inputted

          • Tool reset inputted (tool reset enabled)

          • Batch size changed

          • Channel changed

MEMO

(1) Counting number is to be reset to setting value on changing CH. The setting value shall be "0" in "UP COUNT" and value set in "1. Count No. " in "DOWN COUNT".

(2) Batch counter function is invalid if JOB function is being used.

P11 DIRECTION (Control direction setting)

This setting decides torque inspection direction/output spindle rotation direction during fastening operation.

1. DIRECTION

This sets the fastening rotation direction for the forward condition of the tool.

RIGHT SCREW : Right screw fastening rotation direction (default)

LEFT SCREW : Left screw fastening rotation direction

MEMO

For the operation of the selection switch on the tool, "F" means fastening rotation direction (P11: DIRECTION setting) and "R" means loosening reverse rotation direction and it operates based on (reverse of P11: DIRECTION setting).

P13 DATA OUT (RS-232C Data output setting)

This is a function that automatically outputs fastening result data from COM1 port after fastening process completed; validity of data outputting can be selected by unit channel.

For settings about data outputting, please go to system setting "S10: RS-COMMU".

1. DATA OUT

OFF : data output disabled (default)

ON : data output is enabled

12.2. Channel & JOB/TRACE JOB Setting

For this system, there is a CHANNEL function that operates a single fastening process. There is also a JOB function or trace job function that can operate multiple channels in a specified sequence for a set number of steps. A wide range of operating processes can be performed by one of the functions.

An explanation of the trace job function is given in the "Instruction manual for X-PAQ trace control unit tracer arm".

12.2.1. Channel Function

A CHANNEL is constructed by setting program parameters (P01: CH SPAN–P13: DATA OUT) into a single operative function. The maximum number of channels that can be set is 99; hence, it is capable of handling many types of fastening work from a single system.

Channel is to be selected by either Internal Control (CH-INT) which is operated by front panel pn the controller, or External Control (CH-EXT) which is input signal from external I/O port.

\<The case for Channel setting screen on management soft\>

12.2.2. Multi Channel Function

Channel (Program Parameter), which is the indivisual settings for each tightening motion, to the Stage in Multi Channel (up to 8 Channels), and enables to execute a chain of the Stages (assigned channel) set in Multi Channel.

And, tightening results is not saved/output on completion of each stage, but only the results of selected stages will be saved/output.

This function is used for a purpose such as acclimation of fastener by repeating "Tightening – Loosening – Tightening", or detecting seizing of thread by checking remaining torque on loosening after pre tightening.

Multi Channel is set in Channel as same as Program Parameter, therefore this can not be set if the Channel is already in use. If Multi Channel need to be created in the channel in use, please delete the settings first then set.

<The case for Mult-Channel parameter setting screen on management soft>
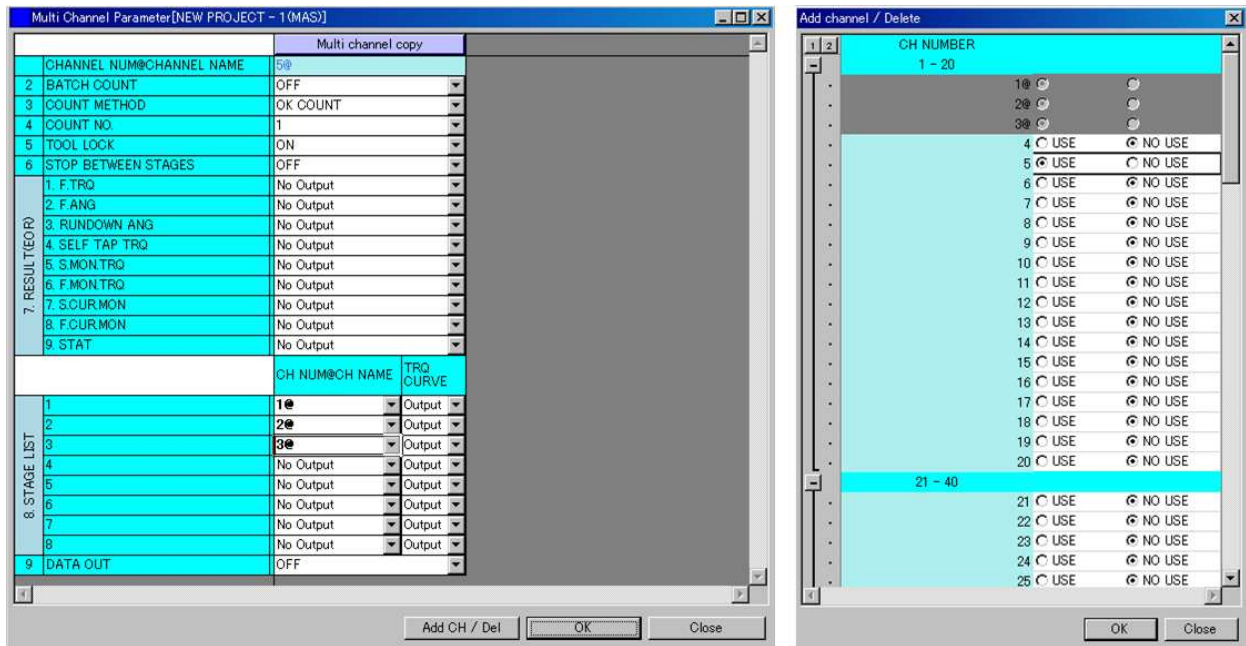
12.2.3. Multi Channel Parameter

1. CH LIST

   CH LIST is a function that sets channel number (CH) to be operated at each stage. The maximum number of stages to be set is eight and the setting is executed to the stage with the channel number set to "0".

2. COUNT

   This parameter specifies the input source of Batch Count.

OFF	: The Count function is not used. (Default)
CHANNEL	: Set it from the parameter of used channel.
FIELDBUS	: Set from FieldBus.
ETHERNET	: Set from the open protocol.

3. COUNT METH

Select a count method for the number of operations set in a step from OK COUNT/ALL COUNT.

      OK COUNT   : This counts fastening OK judgments only (Default).

      ALL COUNT   : This counts all fastening judgments.

          (1) When the predetermined number has been counted, in case of all fastening OK judgments, nxOK lamp on the display panel turns on, and nxOK signals are output from I/O port.

          (2) When the predetermined number has been counted, if fastening NG judgments are included, nxOK lamp on the display panel is not turned on, and nxNG signals are output from I/O port.

4. COUNT No.

This is valid when "CHANNEL" is selected in COUNT and the number determined in this setting is used.
(Range: 1-99   Default = 1)

5. TOOL LOCK

This parameter specifies whether to lock a tool in Multi Channel after the count has been completed.

      OFF   : Invalid (Default)

      ON   : Lock the tool operation when the count is completed.

6. STOP STAGE

This parameter sets whether to set idle time during stages.

      OFF   : Invalid (Default)

      ON   : During idle times in each channel (fastening parameter), the execution of the next stage is waited.

7. RESULT

This specifies which stage fastening results are recorded as fastening history data. If Stage 0 (default) is set, the fastening results of the last stage is recorded as history data.

1. TRQ

This sets a stage to be recorded as the last torque.

2. ANG

This sets a stage to be recorded as the last angle.

3. RUNDOWN

This sets a stage to be recorded as pre-fastening time and RUNDOWN angle.

4. SELF TAP

This sets a stage to be recorded as the measurement torque of the Self Tap function.

5. S-MONITOR

This sets a stage to be recorded as the measurement torque of the Monitor Interval function.

6. F-MONITOR

This sets a stage to be recorded as the measurement torque of the Final Monitor function.

7. S-CUR MON

This sets a stage to be recorded as the section current value.

8. F-CUR MON

This sets a stage to be recorded as the final current value.

8. TRQ CURVE

This sets a stage where a torque curve is obtained.

OFF   :A torque curve in the stage is not obtained.

ON   :A torque curve in the stage is obtained. (Default)

9. DATA OUT

This function automatically outputs fastening result data from COM1 port when a fastening completes. A user can select whether to set data output to valid/invalid by channel.

Output data is set in the system setting "S10: RS-COMMU."

OFF   : Data output is invalid (Default)

ON   : Data output is valid.

12.2.4. JOB Function

JOB is a function which can construct a sequence of fastening operations by specifying fastening operation channel/number of times of fastening operation without requiring any controlling from external commanding equipment (PLC etc).

Up to a maximum of 99 jobs can be set, and a maximum number of 30 steps can be composed per job.

The internal control (JOB-INT) to input from the front panel of the controller or the external control (JOB-EXT) to input from the external I/O port can be selected for changing the JOB No.

An explanation of the trace job function is given in the "Instruction manual for X-PAQ trace control unit tracer arm".

<The case for Job parameter setting screen on management soft>
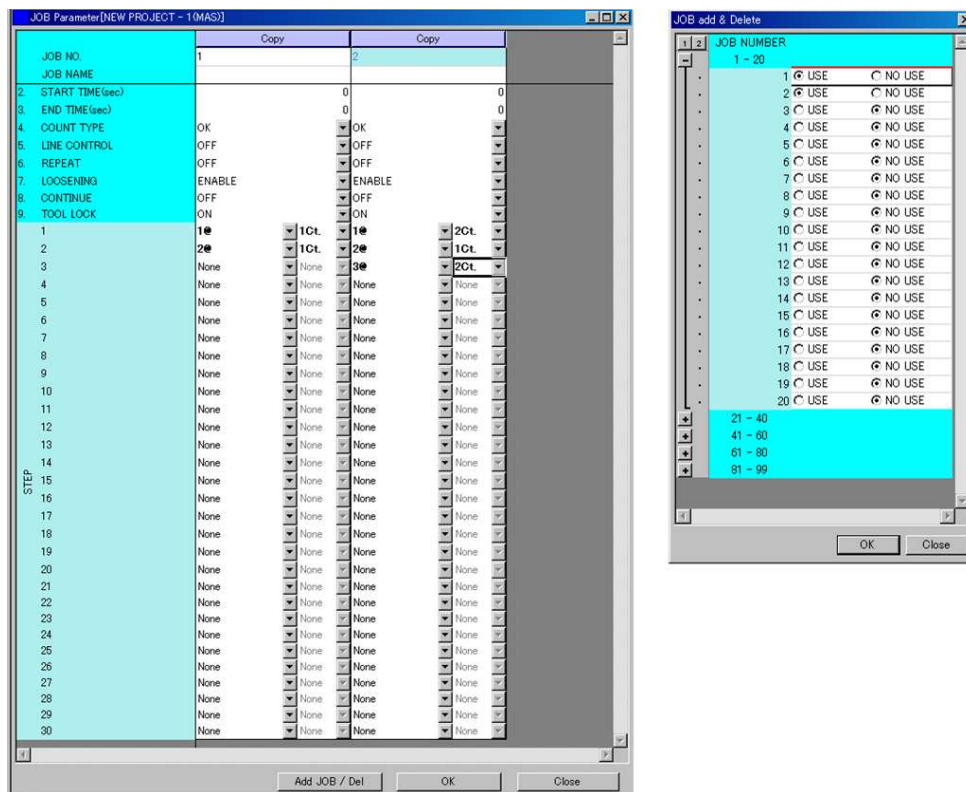
12.2.5. JOB Parameter

1. JOB LIST (STEP)

   This sets the operation channel number (CH) and the number of times to run an operation (CN) by each unit step.
   Steps are sequentially executed till the step which channel number "0" or number of times of operation "0" is set.
   (Range: 0–99)

2. START TIME

   This sets the maximum waiting time interval from the point where JOB number is selected to the point right before operation of initial step starts. If JOB operation does not start within this set time interval, selected JOB turns becomes invalid and terminates.
   Time watch will not be performed if "0" is set.
   (Range: 0–9999 sec   Default: 0 sec)

3. END TIME

   This sets the maximum allowed time interval for the period starting from the point where JOB number is selected to completion of job (all set steps are completed). If job is not completed within this time interval, operations of all remaining steps will all be blocked.
   Time watch will not be performed if "0" is set.
   (Range: 0–9999 sec   Default: 0 sec)

4. COUNT TYPE

   Select the counting method for the number of times to run an operation for each step between OK COUNT and ALL COUNT.

OK COUNT	: count only if fastening judgment is OK (default)
ALL COUNT	: count all fastening judgments.

5. LINE CONT

   This sets the condition of "JOB START" signal inputting from external I/O port when JOB starts.
   If this setting is set ON, JOB can not be initiated if "JOB START" signal is not inputted. When it is set OFF, JOB turns into standby mode after JOB number is selected.

OFF	: JOB START signal input is not required (Default)
ON	: JOB START signal input required.

6. REPEAT

   Set whether or not to repeat previous job process after it is completed.
   If it is set ON, repeated operation is possible. In contrast, it stops after job is completed if it is set OFF.

OFF	: Invalid (Default)
ON	: Valid

7. LOOSENING

Set the validity of reverse rotation operation.

When it is set to ENABLE, reverse rotation operation is possible by the REVERSE switch or input signal.

When it is set to DISABLE, reverse rotation operation can not be performed regardless of inputting of REVERSE switch/signal.

When it is set to NG-ENA, the following STEP operation cannot be done if the loosening operation is not executed once or more after fastening NG is occurred.

(Loosening operation can be executed any number of times until next fastening operation is started.)

ENABLE	: Reverse rotation operation valid (Default)
DISABLE	: Reverse rotation operation invalid
NG-ENA	: Loosening when fastening NG occurs

8. CONTINUE

If this setting is set ON, a sequenced continuous operation is carried out from the point where START signal is inputted once and JOB starts to completion of JOB (all set steps are completed).

If it is set OFF, inputting of START signal is required every time when previous STEP is completed and before next STEP starts.

This function cannot be used when Multi-spindle function is in use.

OFF	: Continuous operation is invalid (Default)
ON	: Continuous operation is valid

9. TOOL LOCK

This function is to lock the action of tool (to disable input of START signals) after completion of JOB.

Conditions to release the lock of action when this function is valid (ON) are as follows:

• When either one of signals "RUN", "RESET" or "JOB START" is input

• When JOB select number is changed

• When ID information (VIN) is input again while using Identifier function (system setting "S06: ID SELECT")

OFF	: TOOL LOCK is invalid
ON	: TOOL LOCK is valid (Default)

Tool unlocking condition

• "RUN" signal inputted or panel "RUN" button pressed

• "RESET" signal inputted

• "JOB START" signal inputted

• Tool reset inputted

• JOB changed

![ASG Precision Fastening logo]

12.2.6. JOB Function Flow Chart
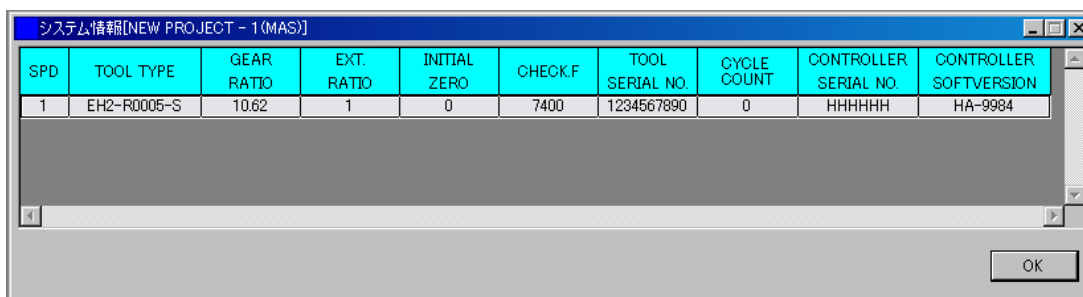
This is the flow chart for the case in which JOB LIST and CONTINUE are set to OFF

JOB LIST
1.CH 1 : CN 1
2.CH 2 : CN 1

```
LINE CONT.          NO     JOB starts with
Invalid?           ───►    JOB START signal input.    ───►   D

        │ YES
        ▼
D ───► Fastening
        JOB START
        │
        ▼
   JOB STEP 1
   EXECUTED
        │
        ▼
   JOB START is proceeded     NO    JOB motion stops by         JOB motion invalid
   within START TIME setting ───►   JOB TIME OUT.          ───► status is released with  ───► D
   time?                                                        RUN, RESET signal input.

        │ YES
        ▼
   JOB STEP 1 judgment   NO    A or B,          As for COUNT TYPE setting,
   OK?                  ───►   C is             If 「ALL COUNT」is selected,      ◄─── A
                               common.          it goes to COUNT UP and moves to
        │ YES                                   next step.
        ▼
   Fastening                           In terms of COUNT TYPE setting,
   JOB START                           if 「OK COUNT」is selected,
        │                              COUNT UP is not done and retry is   ◄─── B
        ▼                              given to JOB STEP while no NG
   JOB STEP 2                          occurred previously.
   EXECUTED
        │                              In LOOSENING setting,
        ▼                              「ENABLE」always makes operation possible.
   JOB STEP 2 judgment   NO    A or B,  「DISABLE」can not make a loosing operation.  ◄─── C
   OK?                  ───►   C is     「NG-ENA」can not fasten without loosing motion.
                               common.
        │ YES
        ▼
   JOB is completed within   NO    If it exceeds the time set at    RUN, RESET signal      A or B,
   END TIME setting time?   ───►   END TIME setting, it turns to   ───► input releases JOB ───► C is
                                   JOB TIME OUT at the              invalid status.        common.
        │ YES                     completion of fastening and
        ▼                         JOB motion is invalid.
   JOB complete
        │
        ▼
   REPEAT           NO    If REPEAT is valid, it
   Invalid?        ───►   returns to JOB STEP 1   ───►   D
                          and JOB START
        │ YES
        ▼
   JOB function is possible with
   RUN, RESET signal input.
   If 「LINE CONT.」is valid,
   JOB START signal input
   enables JOB fastening to
   pruceed.
```

12.3. System information

It shows the current system outline. It can be used to check the type when making an inquiry.

SPD	TOOL TYPE	GEAR RATIO	EXT. RATIO	INITIAL ZERO	CHECK.F	TOOL SERIAL NO.	CYCLE COUNT	CONTROLLER SERIAL NO.	CONTROLLER SOFTVERSION
1	EH2-R0005-S	10.62	1	0	7400	1234567890	0	HHHHHH	HA-9984

1. TOOL TYPE

   It shows the type of tool.

   * Please refer to section "2.1. Unit Type" for details.

2. GEAR RATIO (Tool built-in gear ratio)

   It shows the reduction ratio up to the torque sensor of the tool unit.

3. EXT RATIO (Tool output gear ratio)

   It shows the reduction ratio up to the torque sensor of the tool unit.

4. INITIAL ZERO

   It shows the zero point data in calibration.

5. CHECK.F (Check force)

   It shows the calibration data.

6. TOOL SERIAL NO.

   It shows the manufacturing serial number.

7. CYCLE COUNT (Total number of fastening)

   It shows the total number of fastening of the tool unit.

8. CONTROLLER SERIAL NO.

   It shows the manufacturing serial number of the controller.

9. CONTROLLER SOFTVERSION (Version number)

   It shows the version number of the controller.

12.4. System parameter setup

The system parameters are as shown below.

S02 SYS SETUP (System Setting)

Settings for code address, torque units, and use of additional gear ratio.

1. CODE ADR. (Code Address Setting)

    This sets a code address. Number "1" is a master address code. In the case of the local station of the
    multi-spindle, set it to other than "1". In the case of the master station and single spindle operation, set it to "1".
    (Range: 1–10   Default = 1)

2. CHANGE UNIT (Units Setting)

    Setting of system torque units.
    (Range: N•m/Kgf•m/ft.lbs/in.lbs   Default: N•m)

3. EX-GEAR SEL (Use of additional gear ratio setting)

    1. EXT GEAR

        In the event that a speed increaser/reducer gear is attached to the output spindle, this function must be set ON
        (valid) and gear ratio inputted. With these settings inputted, program parameter values can now be entered in
        the converted form that calculated by set gear ratio, and fastening result data is also outputted in the
        converted form of gear ratio.
        Speed decreases if the gear ratio is set greater than 1.00, and speed increases if the gear ratio is set smaller 1.00.
        (Range: ON (0.50–6.00)/OFF   Default: OFF)

        Note 1: When the gear ratio is set greater than values shown in the table below, the displayed value
        from the controller will be changed to 1/10th scale and the digit position will also be changed.
        Use of pulse mode will be prohibited from this point as well.

Form	Tool type	Rated torque (N•m)	Scale change point
Straight	ASG-EH2-R2035-S	35	6.00

        Note 2: When the gear ratio is set greater than the values shown in the table below, use of pulse mode
        will be prohibited from this point.

Form	Tool type	Rated torque (N•m)	Prohibition point of Pulse mode
Pistol	ASG-EH2-R0010-P	10	5.00
	ASG-EH2-R1016-P	16	3.00
	ASG-EH2-R1016-PH		
	ASG-EH2-R1020-P	20	2.50
	ASG-EH2-R1020-PH		

⚠ **Please be aware that all parameter settings will be initialized if the gear ratio setting is modified.**

S03 CAL SPAN (Calibration Span)

Controller fastening result values and display value from inspection equipments (such as torque wrench) may sometimes contain deviation errors due to characteristics of fastening work, joint tension from tool unit to work etc. For this kind of situation, controller fastening result values and results from inspection equipment can be calibrated by using "SPAN" which calibrates torque and "ANG SPAN" which calibrates angle.

There are two types of span available. SYSTEM SPAN applies calibration to all channels. CH SPAN applies calibration according to each channel.

1. SYSTEM SPAN : Torque calibration setting of SYSTEM SPAN
   (Range: 75.0–125.0%   Default: 100.0%)

2. CH SPAN : Select whether to use SYSTEM SPAN or CHANNEL SPAN.
   SYSTEM   : apply torque calibration to all channels (Default)
   CHANNEL : apply torque calibration according to each unit channel

3. ANGEL SPAN : Angle calibration setting of ANGLE SPAN
   (Range: 75.0–125.0%   Default: 100.0%)

4. CH ANG SPAN : Select whether to use SYSTEM ANGLE SPAN or CHANNEL ANGLE SPAN.
   SYSTEM   : apply angle calibration to all channels (Default)
   CHANNEL : apply angle calibration according to each unit channel

S04 CHECK SYS (System Check Setting)

- The allowable range of system check can be changed.
- System check is executed when shifting to operation with power ON and every starting operation.
- If an error is detected during system check, the system error lamp lights and I/O output is produced. In addition, the tool unit stops and the error No. is displayed on the 7-segment LED.

1. **RVS TRQ LIMIT** (Loosening torque limit)
   It is set when desired to limit the torque in reversing. When this torque is detected when reversing, the tool stops and R TRQ LIMIT Error will result. Set the maximum rating torque of the tool unit to 100%.
   (Range: 1–120%   Default: 120%)

2. **PRECAL CHK** (CAL value allowable range)
   The setting of PRE CAL check function allowable range. Normally, modification is not necessary.
   (Range: 1–10%   Default: 10%)
   - Purpose: This is used for the detection of partial disconnection or defective contact.
   - Operation: It judges whether the difference between the previous CAL check data and the present CAL check data is within the predetermined range.

3. **SAFETY LV.** (Safety current value upper limit)
   This setting is manipulated in combination with "4. SAFETY TIME". When safety current detection time is exceeded and outputs current value that exceeds set current value, system is forcibly terminated and considered as system error (E135: SAFETY ON). This setting is effective in both normal and reverse rotation operation.
   (Range: 0–100%   Default: 100%)
   Basic setting standard = "current monitor value (F)" + 5%

4. **SAFETY TIME** (Safety current inspection time)
   This setting is manipulated in combination with "3. SAFETY LV". When safety current detection time is exceeded and outputs current value that exceeds set current value, system is forcibly terminated and considered as system error (E135: SAFETY ON).
   (Range: 0.001–1.000 sec   Default: 0.020 sec)

⚠️ **If safety current value upper limit is set too low, system abnormal status could also happen even for normal fastening process. Please consider changing the values of safety current upper limit when this situation is encountered.**

S05 CH SELECT (Channel Selection Setting)

Select whether to use channel function or JOB function. In addition, while selecting each function, the way of selecting operation channel/JOB number may be chosen by using control panel (internal control) or input from external I/O port (external control).

1. **CH SELECT**
   Select from CH-INT/CH-EXT/JOB-INT/JOB-EXT
   - CH-INT (channel internal control)   : specify channel number from front panel. (Default)
   - CH-EXT (channel external control)   : specify channel number from external I/O port.
   - JOB-INT (JOB internal control)   : specify JOB number from front panel.
   - JOB-EXT (JOB external control)   : specify JOB number from external I/O port.
   - ID (Identifier function)   : Channels or JOB numbers are switched by Identifier.

> MEMO
> Selection of Channel change method can be executed from external.
> Inputting signal by assigning [CH-INT SELECT], [CH-EXT SELECT], [JOB-INT SELECT], [JOB-EXT SELECT], [ID SELECT] on external I/O or Fieldbus device enables to select Channel change method. By inputting this signal, the Channel change method initially set on System patamere is not changed, therefore original setting is activated while external input signal is OFF.

S06 ID SELECT (Identifier Function Setting)

1. ID POSITION

This determines which characters from an obtained code (Identifier) should be used for control. The maximum number of characters that can be used is 25. Users can select specific digits to use from a code: use (1)/nonuse (0).

S06 ID SELECT				
1.ID POSITION	1	● USE	○ NO USE
	2	● USE	○ NO USE
	3	○ USE	● NO USE
	4	○ USE	● NO USE
	5	● USE	○ NO USE
	6	● USE	○ NO USE
	7	● USE	○ NO USE
	8	● USE	○ NO USE
	9	○ USE	● NO USE
	10	○ USE	● NO USE
	11	○ USE	● NO USE
	12	○ USE	● NO USE
	13	○ USE	● NO USE
	14	○ USE	● NO USE
	15	○ USE	● NO USE
	16	○ USE	● NO USE
	17	○ USE	● NO USE
	18	○ USE	● NO USE
	19	○ USE	● NO USE
	20	○ USE	● NO USE
	21	○ USE	● NO USE
	22	○ USE	● NO USE
	23	○ USE	● NO USE
	24	○ USE	● NO USE
	25	○ USE	● NO USE
2.ID LOCK		OFF	

2. ID LOCK

This determines whether codes (Identifier) should be obtained or not during job or batch counting.

OFF : Codes (Identifier) is obtained. (Default)
ON : Invalid

When this setting is OFF, obtained code is valid during job or batch counting,
When this setting is ON, obtained code dring job or batch counting is ignored. Input code after completion of job or batch counting.

S07 REJECT SEL (Counter forced disposal setting)

1. REJECT SEL

This function is effective only when ID is selected in "S05: CH SELECT" and when "P10:COUNT" is enabled. The method for resetting counter input signal is selected here.

OFF : Ineffective. (Default)
1 OK COUNT : OK fastening counts one by each time the REJECT signal is inputted.
nxNG : When REJECT signal is inputted, nxNG of output I/O is emitted and the counter is cleared. (Forced NG disposal) Ejecting operation.

S08 REC DATA (Torque Curve data collection setting)

This determines sampling conditions of torque curve data.

1. RECORD SAMPLE

   This enables users to select loading/sampling speed of the torque curve data (torque/angle data).

   (Range: 0.5/1/2/5/10/20/50/100 msec   Default: 0.5 msec)

2. START.PT (Measure start point)

   This selects the loading start point of torque curve data (torque/angle data).

   Users can select START TRQ/SEAT/ANG START, and the default is START TRQ.

3. OVER SET (Treatment in data overflow)

   It selects the method of treatment in case of overflow of the internal memory during torque curve data collection.

   Select from STOP (stop recording)/RING (ring buffer). Default setting is RING.

   STOP   : Stop of Recording

   RING   : Ring Buffer (default)

MEMO

> Maximum memory volume to record torque curve data is 5,000 points. When "1. RECORD SAMPLE" set is 0.5 msec, the data can be measured for 2.5 sec. (Maximum 100 msec, for 500 sec.)

S10 RS-COMMU (Barcode reader communication setting)

Communication settings of COM1 port (RS-232C).

1. SEL DEVICE

   Select a communication destination. Select from among the management software, barcode reader, serial printer output, PC data outputting and serial open protocol.

PRINTER	: output by printer.
PC DATA OUT	: output by PC data
MANAGEMENT	: Management software connection (Default)
BARCODE READER	: Barcode reader connection
OPEN PROTOCOL	: Serial open protocol

2. SPEED

   This selects the communication speed.
   (Range: 9.6/19.2/38.4/57.6/115.2 kbps   Default = 9.6 kbps)

3. PARITY

   This selects a parity bit.
   (Range: NONE/ODD/EVEN   Default = NONE)

4. DATA BIT

   This selects data bit.
   (Range: 7/8 bit(s)   Default = 7 bit)

5. STOP BIT

   This selects stop bit.
   (Range: 1/2 bit(s)   Default = 1 bit)

6. DATA OUT

   When program setting "P13: DATA OUT" is set ON (valid), this enables data output execution in relation with fastening judgment.

ALL	: output data every time fastening in completed regardless of fastening judgment. (Default)
NG	: output data with fastening judgment NG only.

S11 TCP/IP

Settings for IP address when using ETHERNET.

1. IP address
   (Default: 000:000:000:000)

2. SUBNET MASK
   (Default: 255:255:255:000)

3. GATE WAY
   (Default: 000:000:000:000)

4. KEEP ALIVE
   Set time of keeping alive. Unlimited if 0 is set.
   (Range: 0–999 sec   Default: 15 sec)

S12 M-SPINDLE (Multi spindle function)

This function enables users to consolidate operation controls to a master station and exercise seat synchronization when fastening is exercised in multi spindle systems. The setting of this function is ignored when a local station is set.

1. M-SPINDLE
   This is a setting for each connected spindle in a multi spindle system. The setting value determines the total number of spindles including a master station.
   (Range: 1–10   Default = 1)

2. SYNC TIGHT
   This is a setting of seat sync fastening. With this is set to "ON (valid)," it stops output spindles after pre-fastening (SEAT torque detection) and starts screw fastening operations for all spindles after pre-fastening has been completed.
   (Range: OFF/ON   Default = OFF (invalid))

3. SYNC LOOSE
   This function sets Sync Loosening Reverse function.
   With this setting is set to "ON (valid)," it stops output spindles when detecting START torque after reverse operation starts, and resumes reverse operations all at once after all spindles detect START torque.
   (Range: OFF/ON   Default = OFF (invalid))

4. SYNC CONTINUE
   This is a continued process setting in the synchronizing functions "2.SYNC TIGHT" and "3. SYNC LOOSE."
   When this setting is "ON (continue)," and the "5. SYNC TIME" expires, then fastening continues and moves to screw fastening operation. With this setting "OFF (operation completed)," if "5. SYNC TIME" expires the fastening operation is completed.
   (Range: OFF/ON   Default = OFF (operation completed))

5. SYNC TIME
   This is the maximum setting of sync stand-by time. When the maximum time is exceeded in the sync stand-by time, a continued process operation is conducted according to the setting in "4. SYNC CONTINUE."
   (Range: 0.0–20.0 sec   Default = 2.0)

S13 JUDGE OUT (Judgment Output Time Setting)

1. TIME

Set output time for OK, NG, nxOK, nxNG, JOBOK*, JOBNG* outputting. Range is from 0.0 to 9.9 sec, and 0 for continuous outputting. Default setting is 0.0 second.

Even if time is already set, outputting is automatically turned off when next fastening process starts.

(Range: 0–9.9 sec   Default: 0.0 sec)

* JOBOK, JOBNG is available on Ver.H3130-S3120 or later

S14 BUZZER SEL (Buzzer Setting)

1. BUZZER SEL

Setting up the buzzer function. If this is set OFF, buzzer sound is muted when fastening judgment and system error occur.

    ON   : Effective (Default)

    OFF   : Ineffective

S15 TOOL SW

1. ROTATION SW: Rotation direction selection switch setting

Settings and operation of "Rotation direction/reset selection switch" on tool unit.

	Switch Input Content		
	F	**R**	**<<**
1	Fastening rotation	Reverse rotation	RESET
2	Fastening rotation	Reverse rotation	\<invalid\>
3	Fastening rotation	\<invalid\>	\<invalid\>
4	Fastening rotation	Reverse rotation	RESET/REJECT*

(Default) — for row 1

  *   If REJECT is required, please hold switch for 3 seconds or more.

  *   Pistol type and some straight type tools do not have "<<"position.

⚠

Be careful that the operation of rotation direction will be fastening rotation even though switch position is "R" if #3 is selected in this settiing.

2. TOOL SW SEL: Tool switch usage selection

This sets whether the start trigger and/or the rotation direction switch of a tool unit is valid/invalid.

If the switch is set to "invalid," fastening control by the switch input on a tool unit is invalid, and only the control from an external I/O is available.

(Range: OFF/ON   Default = ON (valid))

⚠ **If fastening operation does not start although the start trigger switch on the tool unit is input, check if this setting is "invalid."**

3. START OFF DELAY TIME: Set the time prohibited to input Start signal

Set the time from the previous tightening completion to the next tightening start input.

When this parameter is set [0], this function is invalid.

(Range: 0.0–10.0 sec   Default = 0.0sec)

* Available Ver.HA1050 or later

S16 SYS DIP SW (Software Dip Switch)

These are software dip switches which manufacturer uses for system setting.

As these switches are not used normally, do not change the default setting (all switches are OFF).

1. SYS DIP SW1

There is no available switch setting at present. Please ensure that all switches are set to OFF.

2. SYS DIP SW2

There is no available switch setting at present. Please ensure that all switches are set to OFF.

S18 TRACE CONT (Trace job function setting)

This is a parameter to make settings when the trace job function is used.

The details are described in the "Instruction manual for X-PAQ trace control unit tracer arm".

S20 TOOL CYCLE COUNT MONITOR (Tool cycle time monitor function)

(Available Ver. HA1050 or later)

This function monitors tool cycles in order to tell the maintenance timing set by this parameter.

When tool cycles reach the numbers set here, internal signal [TOOL CYCLE ALARM] will be ON, and [ALARM] LED on the controller panel slowly blinks. When this parameter is [0] this function is invalid.

(Range: 0～65000×1000   Default = 0)

12.5 Tool LED lighting setting

This is used to make tool LED lighting setting.

The setting items and the settable LED colors and lighting pattern are as shown below.

[TOOL LED allocation items list]

No.	Item	Default	Description
1	CW	B (Blue)	Tool tightening direction selection
2	CCW	P (Purple)	Tool loosening direction selection
3	SYS ERR	SF (Sky blue•Flashing)	System Error
4	RESET	W (White)	Reset
5	OK	G (Green)	Tightening OK
6	HIGH NG	R (Red)	Tightening + NG
7	LOW NG	Y (Yellow)	Tightening–NG
8	JOB OK	GF (Green•Flashing)	JOB OK
9	JOB NG	RF (Red•Flashing)	JOB NG
10	nx OK	GF (Green•Flashing)	nx OK
11	nx NG	RF (Red•Flashing)	nx NG
12	TOOL LOCK	W (White)	Tool locked
13	LOCKED	YF (Yellow•Flashing)	At the start of tightening TOOL LOCK warning
14	CHANNEL INVALID	YF (Yellow•Flashing)	At the start of tightening CHANNEL INVALID warning
15	JOB INVALID	YF (Yellow•Flashing)	At the start of tightening JOB INVALID warning
16	ID INVALID	YF (Yellow•Flashing)	At the start of tightening ID INVALID warning
17	TIG INVALID	YF (Yellow•Flashing)	At the start of tightening TIGHTEN INVALID warning
18	REV INVALID	YF (Yellow•Flashing)	At the start of tightening REVERSE INVALID warning
19	POSITION INVALID	YF (Yellow•Flashing)	At the start of tightening POSITION INVALID warning

[TOOL LED setting list]

No.	Lighting method	Panel display	Description
0	None	NON	
1	BLUE	B	Lighting in blue
2	BLUE FLASH	BF	Flashing in blue
3	GREEN	G	Lighting in green
4	GREEN FLASH	GF	Flashing in green
5	YELLOW	Y	Lighting in yellow
6	YELLOW FLASH	YF	Flashing in yellow
7	RED	R	Lighting in red
8	RED FLASH	RF	Flashing in red
9	WHITE	W	Lighting in white
10	WHITE FLASH	WF	Flashing in white
11	SKYBLUE	S	Lighting in sky blue
12	SKYBLUE FLASH	SF	Flashing in sky blue
13	PURPLE	P	Lighting in purple
14	PURPLE FLASH	PF	Flashing in purple

12.6. Span Setting

In order to calculate the percent error between nut runner fastening results and displayed values from inspector, about 5 to 10 times fastening processes are executed and the average of each displayed value is calculated. SPAN is calibrated from the average by following equations.

- Torque Correction –

$$\left(\frac{\text{AVG torque from inspector}}{\text{AVG torque from handy N/R}}\right) \times \begin{array}{c}\text{CURRENT SYSTEM SPAN} \\ \text{(CH SPAN)}\end{array} = \begin{array}{c}\text{CORRECTED SYSTEM SPAN} \\ \text{(CH SPAN)} \qquad (\%)\end{array}$$

- Angle Correction –

$$\left(\frac{\text{AVG angle from inspector}}{\text{AVG angle from handy N/R}}\right) \times \begin{array}{c}\text{CURRENT ANGLE SPAN} \\ \text{(CH ANG SPAN)}\end{array} = \begin{array}{c}\text{CORRECTED ANGLE SPAN} \\ \text{(CH ANG SPAN)} \qquad (\%)\end{array}$$

(1) Calculate each average value after displayed values of inspector and handy nut runner are recorded.

	INSPECTOR		NUT RUNNER	
TRIAL	Torque	Angle(deg)	Torque	Angle(deg)
1	19.95	20.1	21.24	23.4
2	19.97	20.8	21.24	23.6
3	19.96	20.4	21.23	23.5
4	19.95	20.2	21.24	23.3
5	19.97	20.9	21.25	23.7
AVG	19.96	20.48	21.24	23.5

(2) For above equations, calculations are derived according to each average values. Correction is completed after calculation results are set into span.

SYSTEM SPAN

$$\left(\frac{19.96}{21.24}\right) \times 100 \fallingdotseq 94.0 \quad (\%)$$

ANG SPAN

$$\left(\frac{20.48}{23.5}\right) \times 100 \fallingdotseq 87.1 \quad (\%)$$

⚠️ Please avoid narrow modification on SPAN. There exist uncertain factors for fastening process that requires wide modification on SPAN. In order to maintain high precision process, eliminates all uncertainties before any sudden changes on SPAN.

13. RS-232C Serial Data Output

13.1. Printer Output Format

This section explains the outputted data contents when PRINTER is set.

"S10:RS-COMMU => 1. SEL.DEVICE". Data is outputted by ASCII code format, and its contents are as follows.

(1) Print Format

The Case of the output when the default assign of fastening result items (All fastening result item assign) is.

SPD01 CH01 00000010 2008/04/03 10:58:44 O 120.63 Nm 24.2 deg 1.2 sec 3.5 sec

JOB00 STEP00 COUNT01 JOB-JUDGE04 20.50 Nm 12.04 Nm 120.63 Nm

30.51 Nm 0.00 Nm 10.06 Nm 80.03 Nm 780.5 deg 3.3 sec 15.1% 87.5%

0.00 Nm 80.00 Nm 0.00 Nm 24.00 Nm 110.00 Nm 130.00 Nm 0.00 Nm 140.00 Nm

0.0 deg 0.0 deg 90.0 deg 120.00 Nm EH2-R2120-S ERR:000

(2) Description of output data items

Data item	Size (characters)	Description	Data range	Example
SPD	6	Spindle number	SPD01–SPD04	"SPD01"
CH	5	Fastening channel number	CH01–CH99	"CH01"
FS.COUNT	9	Fastening count	00000001–99999999	"88888888"
DATE	20	Fastening completion date (year/month/day/hour/minute/second)	– 2099/12/31 23:59:59	"2007/06/01 17:07:30"
JUDGE	2	Fastening judgment	O: OK N: NG C = 1 COUNT CLEAR [2] A = ALL CLEAR [3]	"O"
F.TRQ	11	Final torque [1]	Depends on tool type and unit system.	"123.45 Nm" "12.345 Kgm" "123.45 fl"
F.ANG	11	Final angle [1]	0.0–9999.9 deg	"9999.9 deg"
FS.TIME	10	Fastening time after pre-fastening [1]	0.0–9.9 sec	"9.9 sec"
TL.TIME	10	Total fastening time [1]	0.0–30.0 sec	"30.0 sec"
VIN	26	Vehicle identification number (25 characters and spaces)		"12345678901234567890 12345"
JOB	6	Job number	JOB00–JOB99	"JOB99"
STEP	7	JOB STEP number	STEP00–STEP30	"STEP30"
COUNT	8	Count	COUNT00–COUNT99	"COUNT01"
JOB JDG	12	Job judgment	JOB-JUDGE00 = judged OK JOB-JUDGE01 = judged NG JOB-JUDGE02 = forcible rejection JOB-JUDGE03 = JOB incomplete JOB-JUDGE04 = JOB unused	"JOB-JUDGE04"
ST.TRQ	11	Seat torque [1]	Depends on tool type and unit system.	"123.45 Nm" "12.345 Kgm" "123.45 fl"
ANG.ST.TRQ	10	Angle measurement starting torque		
PK.TRQ	11	Peak torque [1]		
S.T.TRQ	11	Self-tapping peak torque [1]		
CM.TRQ	11	Compensation torque [1]		
S.M.TRQ	11	Section torque monitor [1]		
F.M.TRQ	11	Final monitoring torque [1]		

Data item	Size (characters)	Description	Data range	Example
RUNDOWN ANG	10	Rundown angle [1]	0.0–999.9 deg	"9999.9 deg"
FR.TIME	10	Pre-fastening time [1]	0.0–9.9 sec	"9.9 sec"
S.CUR.MON	8	Section current monitor [1]	0.0–100.0%	"100.0%"
F.CUR.MON	8	Final current monitor [1]	0.0–100.0%	"100.0%"
LO.ST.TRQ	10	Minimum seat torque	Depends on tool type and unit system.	"123.45 Nm" "12.345 Kgm" "123.45fl"
HI.ST.TRQ	10	Maximum seat torque		
LO.ANG.TRQ	10	Minimum angle measurement starting torque		
HI.ANG.TRQ	10	Maximum angle measurement starting torque		
TG.TRQ	10	Target torque		
LO.F.TRQ	10	Minimum final torque		
HI.F.TRQ	10	Maximum final torque		
LO.PK.TRQ	10	Minimum peak torque		
HI.PK.TRQ	10	Maximum peak torque		
TG.ANG	10	Target angle	0.0–6500.0 deg	"6500.0 deg"
LO.ANG	10	Minimum final angle	0.0–6500.0 deg	"6500.0 deg"
HI.ANG	10	Maximum final angle	0.0–6500.0 deg	"6500.0 deg"
RT.TRQ	10	Tool unit rated torque	Depends on tool type.	"30.00 Nm"
TOOL TYPE	16	Tool unit type	Depends on tool type.	"EH2-R2080-A"
SYS.ERR No.	8	System error number	ERR:000–ERR:999	"ERR:000"
POS.X	10	X-axis coordinate data (Designed for Ver. H2200-S2200 or later)	0–±30000 mm	"-30000 mm"
POS.Y	10	Y-axis coordinate data (Designed for Ver. H2200-S2200 or later)	0–±30000 mm	"-30000 mm"
POS.Z	10	Z-axis coordinate data (Designed for Ver. H2200-S2200 or later)	0–±30000 mm	"-30000 mm"

Caution: Allocation of data entries with background shading can not be changed. Please refer to section "6.2. Fastening Result Data Entries Allocation" for more details about settings of each result data entry allocation.

[1]   If fastening NG occurs, "H (High)" or "L (Low)" is attached to the entry with NG status respectively.

[2]   For the situation that "1 OK COUNT" is set under S07:REJECT SEL setting and this setting is used to boost up counting by one, the display becomes 1 COUNT CLEAR = "C" and torque, angle, time of fastening data is outputted as "0".

[3]   For the situation that "nxNG" is set under S07:REJECT SEL setting and this setting is used to execute forced count clear, the display becomes ALL CLEAR = "A" and torque, angle, time of fastening data is outputted as "0".

13.1.1. Alarm at printer output

Before outputting data to a printer, the controller monitors DCD signal (Pin number 1) and DSR signal (Pin number 6) on COM1 port. DCD and DSR signals on the controller side connect to RTS and DTR signals of printer.

RTS signal and DTR signal of VP-700 (EPSON) have below functions.

Pin No.	Signal Name	Function
4	RTS	Transfer Request Signal. When the power of the printer is ON, it always shows high level. The pull-up resistor is 4.7 kΩ and it pulls high to +12 V.
20	DTR	It shows whether the printer is possible to communicate or not.

When the controller detects one of these signals is OFF, it judges the printer as not connected or one of the alarm statuses such as no paper, lights ALARM lamp on the front panel and outputs DATA OUT ERROR signal. Outputting to the printer will proceed when the alarm occurs.
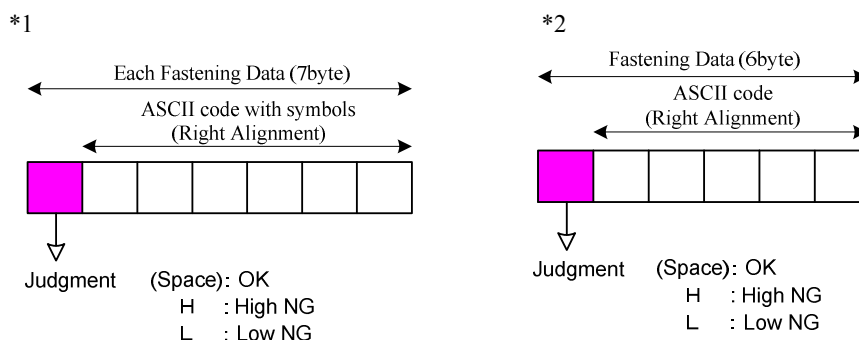
13.2. PC Serial Output Format

This section explains the outputted data contents when PC output is set.

"S10:RS-COMMU => 1.SEL.DEVICE". Data is outputted by ASCII code format, and its contents are as follows.

	Data item	Size (byte)	Description	Data range	Example
	STX	1	Data transmission start code	02_H (control code)	-
Various data on fastening results	SPD	2	Spindle number	01–04	"01"
	CH	2	Fastening channel number	01–99	"01"
	FS.COUNT	8	Fastening count	00000001–99999999	"88888888"
	DATE	12	Fastening completion date (year/month/day/hour/minute/second)	– 991231235959	"070601170730"
	JUDGE	1	Fastening judgment	O: OK N: NG C = 1 COUNT CLEAR [3] A = ALL CLEAR [4]	"O"
	F.TRQ	7	Final torque [1]	Depends on tool type and unit system.	With Nm or ft lbs specified: "123.45" With kgfm specified: "12.345"
	F.ANG	7	Final angle [1]	0.0–9999.9	"9999.9"
	FS.TIME	6	Fastening time after pre-fastening [2]	0.0–9.9	"9.9"
	TL.TIME	6	Total fastening time [2]	0.0–30.0	"30.0"
	VIN	25	Vehicle identification number (25 characters and spaces)		"1234567890123456789 012345 "
	JOB	2	Job number	00–99	"99"
	STEP	2	JOB STEP number	00–30	"30"
	COUNT	2	Count	00–99	"01"
	JOB JDG	2	Job judgment	00 = judged OK 01 = judged NG 02 = forcible rejection 03 = JOB incomplete 04 = JOB unused	"04"
	ST.TRQ	7	Seat torque [1]	Depends on tool type and unit system.	With Nm or ft lbs specified: "123.45" With kgfm specified: "12.345"
	ANG.ST.TRQ	7	Angle measurement starting torque [1]		
	PK.TRQ	7	Peak torque [1]		
	SELF TAP TRQ	7	Self-tapping torque [1]		
	CM TRQ	7	Compensation torque [1]		
	S.MON.TRQ	7	Section torque monitor [1]		
	F.MON.TRQ	7	Final monitoring torque [1]		
	RUNDOWN ANG	7	Rundown torque [1]	0.0–9999.9	"9999.9"
	FR.TIME	6	Pre-fastening time [2]	0.0–9.9	"9.9"
	S.CUR.MON	6	Section current monitor [2]	0.0–100.0	"100.0"
	F.CUR.MON	6	Final current monitor [2]	0.0–100.0	"100.0"

	Data item	Size (byte)	Description	Data range	Example
Various data on fastening results	LO.ST.TRQ	7	Minimum seat torque	Depends on tool type and unit system.	With Nm or ft lbs specified: "123.45" With kgfm specified: "12.345"
	HI.ST.TRQ	7	Maximum seat torque		
	LO.ANG.TRQ	7	Minimum angle measurement starting torque		
	HI.ANG.TRQ	7	Maximum angle measurement starting torque		
	TG.TRQ	7	Target torque		
	LO.F.TRQ	7	Minimum final torque		
	HI.F.TRQ	7	Maximum final torque		
	LO.PK.TRQ	7	Minimum peak torque		
	HI.PK.TRQ	7	Maximum peak torque		
	TG.ANG	6	Target angle	0.0–6500.0	"6500.0"
	LO.ANG	6	Minimum final angle	0.0–6500.0	"6500.0"
	HI.ANG	6	Maximum final angle	0.0–6500.0	"6500.0"
	RT.TRQ	6	Tool unit rated torque	Depends on tool type	"30.00"
	TOOL TYPE	16	Tool unit type	Depends on tool type	"EH2-R2080-A"
	SYS.ERR No.	4	System error number	E000–E999	"E000"
	POS.X	6	X-axis coordinate data	0–±30000 mm	"-30000"
	POS.Y	6	Y-axis coordinate data	0–±30000 mm	"-30000"
	POS.Z	6	Z-axis coordinate data	0–±30000 mm	"-30000"
	ETX	1	Data transmission completion code	03H (control code)	–
	Check sum	1	Error check method	*5	*5

Caution: Allocation of data entries with background shading can not be changed. Please refer to section "6.2. Fastening Result Data Entries Allocation" for more details about settings of each result data entry allocation.

*1

Each Fastening Data (7byte)
ASCII code with symbols (Right Alignment)

Judgment   (Space)： OK
         H   ： High NG
         L   ： Low NG

*2

Fastening Data (6byte)
ASCII code (Right Alignment)

Judgment   (Space)： OK
         H   ： High NG
         L   ： Low NG

*3   For the situation that "1 OK COUNT" is set under S07:REJECT SEL setting and this setting is used to boost up counting by one, the display becomes 1 COUNT CLEAR = "C" and torque, angle, time of fastening data is outputted as "0".

*4   For the situation that "nxNG" is set under S07:REJECT SEL setting and this setting is used to execute forced count clear, the display becomes ALL CLEAR = "A" and torque, angle, time of fastening data is outputted as "0".

(*5)   Checksum is a calculation result that by adding up the checking data in its binary form and then converting its last digit of byte (8 bit).

Checksum varies depend on contents of fastening result entry allocation.

<Check sum range and calculation example>

Checksum Range

Spd.No.		Each Result Data										System Error				E T X
O	1	…	…	…	…	…	…	…	…	…	…	E	O	O	O	
30_H	31_H	…	…	…	…	…	…	…	…	…	…	45_H	30_H	30_H	30_H	03_H

Checksum Range

Sample Calculation

$30_H + 31_H$ .... $+45_H + 30_H + 30_H + 30_H + 03_H$

$= 1F5_H$

⟶ Last one byte of data is checksum figure.
Hence, it is "$F5_H$"
"It becomes '75H' when the data length is seven bits."

13.2.1. Transmission Flow Specification
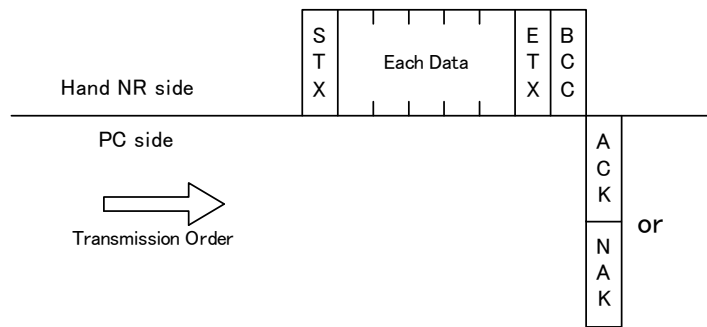
(1) The above fastening result is transmitted every time the Hand Nutrunner completes a cycle after reaching the START TRQ value.

(2) When a fastening cycle judgment completes, each fastening data is transmitted as ASCII Code. When the data transmission is completed, the COMP signal will be outputted.

(3) Signals such as a system error and communication error are cleared by inputting the RUN (RESET) signal, but the Batch Count value is kept. The Batch Count value may be cleared by the REJECT signal (forced termination). For REJECT settings, please refer to section "S07: REJECT SEL" in "12.4: SYSTEM (system parameter setup)".

(4) When a system error occurs for settings without data, "0" is outputted.
Note 1: A system error is outputted only after START (triggered ON).
Note 2: Data is not transmitted if any error occurs shortly after power is supplied into system.

(5) Any communication error, by default, will be handled as a DATA OUT ERROR and the ALARM indicator on the front panel will light up. If the No. 1 contact in the dip switch SW1 is set to ON, any communication error will be handled as a system error.

13.2.2. Transmission Sequence

Protocol

1) Data is transmitted from Controller to PC after every fastening process.

2) Set to return Control code "ACK (06$_H$)"or "NAK (15$_H$)"signal within 500 msec after receipt of the data.

3) If Control code "ACK" or "NAK" signal is not received from PC within 500 msec, controller re-transmits data again.

4) Data is re-transmitted twice every 500 msec. If Control code "NAK" or "ACK" signal is not received by controller within this period, it is considered as NO PC RESPONSE and displays and outputs as follows:

   • ALARM lamp on front panel lights up.
   • Outputs DATA OUT ERROR signal.
   Note: During PC communication, fastening operation is not executable. (Fastening process stops)

5) Fastening Data is transmitted as variable length data from Control code "STX (02$_H$)" to "ETX (03$_H$)" and "Checksum", then completes. In PC side, set to compare a Check SUM calculated in PC with a Check SUM in transmitted data after receipt of "ETX". Then, returns ACK if they are consistent, returns NAK if they are inconsistent.

Operation Flow

- 168 -
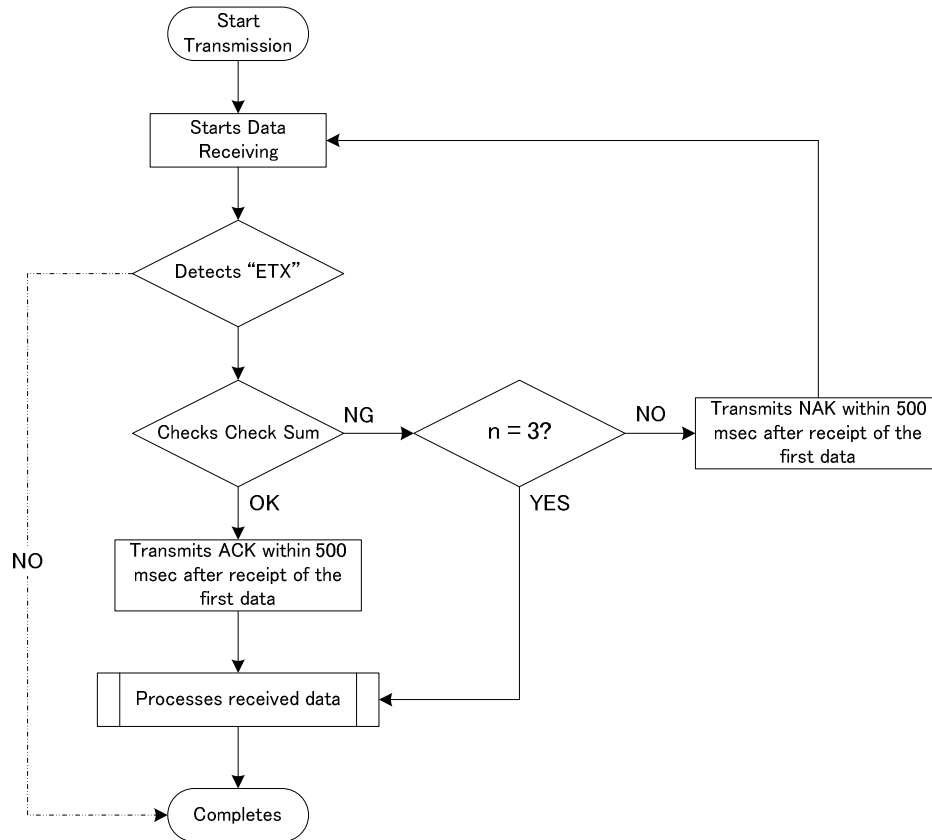
13.2.3. ASCII Code Table

	MSD	0	1	2	3	4	5	6	7
LSD		0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
0	0 0 0 0	NUL	DLE	SP	0	@	P	`	p
1	0 0 0 1	SOH	DC1	!	1	A	Q	a	q
2	0 0 1 0	STX	DC2	"	2	B	R	b	r
3	0 0 1 1	ETX	DC3	#	3	C	S	c	s
4	0 1 0 0	EOT	DC4	$	4	D	T	d	t
5	0 1 0 1	ENQ	NAK	%	5	E	U	e	u
6	0 1 1 0	ACK	SYN	&	6	F	V	f	v
7	0 1 1 1	BEL	ETB	/	7	G	W	g	w
8	1 0 0 0	BS	CAN	(	8	H	X	h	x
9	1 0 0 1	HT	EM	)	9	I	Y	i	y
A	1 0 1 0	LF	SUB	*	:	J	Z	j	z
B	1 0 1 1	VT	ESC	+	;	K	[	k	{
C	1 1 0 0	FF	FS	,	<	L	\	l		
D	1 1 0 1	CR	GS	-	=	M	]	m	}
E	1 1 1 0	SO	RS	.	>	N	↑	n	–
F	1 1 1 1	SI	US	/	?	O	←	o	DEL

Note 1: ☐ Background shaded codes are not usable for identifier such as VIN.
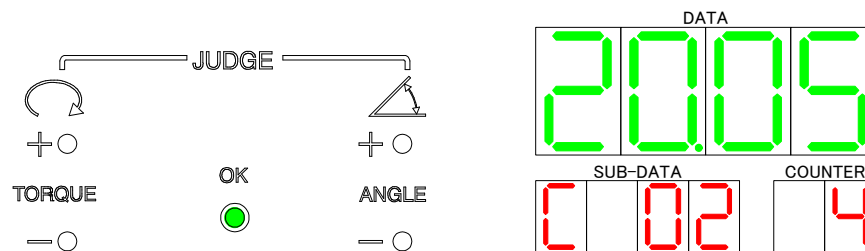
14. Fastening Judgment

14.1. Fastening Judgment Result

The measured torque is displayed in the DATA section when the fastening process starts and START TRQ (measurement starting torque) is reached. A fastening Judgment is made at the completion of the set program. The judgment results are indicated by the OK, +NG and –NG lamps (JUDGE LED) on the front panel and the various fastening judgment signals are outputted from each controlling I/O port.

14.1.1. Fastening OK Judgment Display

The OK lamp (JUDGE LED) on the front panel lights and the fastening result value is displayed in green in the DATA section. In the case of the torque control, the torque is displayed. In the case of other than the torque control, the torque and angle are displayed alternately.
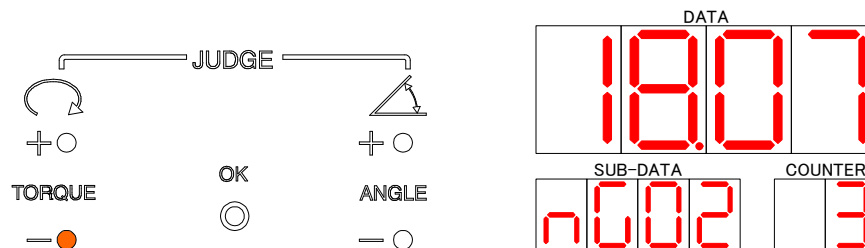
14.1.2. Fastening NG Judgment Display

The +NG or –NG lamp (JUDGE LED) on the front panel lights and the fastening result value is displayed in red in the DATA section. The corresponding NG No. shown in "14.2. List of Fastening NG Judgments and Judging Lamps" and the channel or job No. are displayed alternately in the SUB-DATA section.

14.2. List of Fastening NG Judgments and Judging Lamps

At the occurrence of NG, the corresponding NG No. shown below and the channel No. or job No. are displayed alternatively.

When two or more NGs occur, the NG No. is displayed for the number of occurred NGs and then the channel No. or job No. is displayed.

NG Judgment Entry	Contents of NG	Related Setting Item		Judging lamp Display	Tool Lamp Display
NG01	Exceeded the upper limit in seat. (Pre-fastening NG)	P03-5.	SEAT HI TRQ	+TRQ	Red
NG02	Fastening torque less than lower limit.	P03-9.	F MIN TRQ	−TRQ	Yellow
NG03	Fastening torque exceeded upper limit.	P03-11.	F MAX TRQ	+TRQ	Red
NG04	Peak hold torque is below lower limit.	P03-12.	P MIN TRQ	−TRQ	Yellow
NG05	Peak hold torque exceeded upper limit.	P03-13.	P MAX TRQ	+TRQ	Red
NG06	Measured Rundown angle is below lower limit	P04-1.1.	RUNDOWN MIN	−ANG	Yellow
NG07	Measured Rundown angle exceeded upper limit.	P04-1.2.	RUNDOWN MAX	+ANG	Red
NG08	Fastening angle is below lower limit.	P04-2.	MIN ANG	−ANG	Yellow
NG09	Fastening angle exceeded upper limit.	P04-4.	MAX ANG	+ANG	Red
NG10	Seat time is less than the set time during pre-fastening. (Double fastening)	P05-2.	PRE SEAT.t	−TRQ	Yellow
NG11	Reaching the target earlier than set time in final fastening.	P05-3.	FINAL MIN.t	−TRQ	Yellow
NG12	Exceeded the upper limit of set time in final fastening.	P05-4.	FINAL MAX.t	−TRQ	Red
NG13	Exceeded the upper limit of operation time.	P05-5.	TOTAL.t	−TRQ	Red
NG14	Final monitor torque is below lower limit.	P09-3.1. P09-3.3.	F-START MIN F-END MIN	−TRQ	Yellow
NG15	Final monitor torque exceeded upper limit.	P09-3.2. P09-3.4.	F-START MAX F-END MAX	+TRQ	Red
NG16	Below "section monitor torque"	P09-2.3.	S-TRQ MIN	−TRQ	Yellow
NG17	Over "section monitor torque	P09-2.9.	S-TRQ MAX	+TRQ	Red
NG18	Self tap monitor torque is below lower limit.	P09-1.2.	TRQ MIN	−TRQ	Yellow
NG19	Self tap monitor torque exceeded upper limit.	P09-1.3	TRQ MAX	+TRQ	Red
NG20	Below "section current monitor value"	P09-5.3.	CURRENT MIN	−TRQ, -ANG	Yellow
NG21	Over "section current monitor value"	P09-5.4.	CURRENT MAX	+TRQ, +ANG	Red
NG22	Below "final current monitor value"	P09-6.1.	CURRENT MIN	−-TRQ, −ANG	Yellow
NG23	Over "final current monitor value"	P09-6.2.	CURRENT MAX	+TRQ, +ANG	Red
NG24	Current limit functions.			−TRQ, −ANG	Yellow
NG25	Multi-channel is interrupted.	P07-9.	PRE CUR LMT	−TRQ, −ANG	Yellow
NG26	Fastening end position is out of allowable range.	Trace job parameter END POSITION		−TRQ, −ANG	Yellow
NG27	Fainal torque is larger than lower limit, but it does not reach the target.	P09-7.	UNDR TG.TRQ	−TRQ	Yellow
NG28	The fastening operation is aborted because of start trigger off.	P09-8.	REL S.TRIGR	−TRQ, −ANG	Yellow
NG30	Torque exceeds upper limit during reverse rotation.	P04-1.	RVS TRQ LMT	+TRQ	Red
Fastening OK Judged		−		OK	Green
At occurrence of system error		−		SYSTEM ERROR	Sky-blue (Blinking)

15. System Error

This system has an automatic self-diagnosis function. If a system error occurs at power-on or during use, the error No. is displayed in the DATA section of the 7-segment LED. Fastening cannot be performed until the occurred system error is reset. For the countermeasure to be taken against each error, refer to "16. Troubleshooting".

	Err. No	Contents	Description
	E011	D-CL.V	Power supply is insufficient due to instant stopping or insufficient power capacity.
	E012	D-O.V	Driver converter voltage is abnormally high due to regenerative energy.
	E013	D-L.V	The fall of input power supply voltage.
	E014	D-O.C	Output current value of build-in driver exceeded allowable value.
	E015	D-O.H	Build-in driver power element is abnormally heated.
*1	E016	D-O.L	Motor has been used for long period of time with current value exceeding the rated current value. (Motor overloaded)
	E018	D-O.R	Regenerative energy voltage is exceeding the allowable value.
	E026	D-O.S	Motor rotating speed is exceeding the upper limit.
	E036	D-ROM1	Built-in driver unit is in EEP-ROM data trouble.
	E037	D-ROM2	Built-in driver unit is in EEP-ROM data trouble.
	E067	RESOLVER1	Resolver (angle sensor) signal voltage error occurred due to disconnection etc.
	E068	RESOLVER2	Resolver (angle sensor) signal voltage error occurred due to disconnection etc.
	E070	D-CDOH	The charging resistor for preventing rush current has overheated.
	E071	D-RELV	The voltage of the resolver signal has dropped less than the allowable value.
	E072	D-POWFAIL	Version of built-in driver is different from unit configuration.
	E073	D-RGST	The reverse-current absorption transistor has turned on for more than 100 msec.
	E074	D-BAOL	Effective load rate for overload-protection exceeds allowable value.
	E077	D-OCS	The motor current value exceeds allowable value.
	E078	D-VAS	Speed amplifier of built-in driver is saturated and exceeds allowable value.
	E079	D-MOL	Temparature rise value of monitor exceeds allowable value.
	E080	D-FESERR	Abnormal status occurred within resolver counter value.
	E095	D-CERR	Built-in driver unit is in parameter trouble/.
	E099	D-REST	Other abnormal status occurred within built –in driver.
	E100	F-ROM	F-ROM date error occurred.
	E101	SYSTEM-P	Abnormal status occurred within memory stored system parameter.
	E102	PROGRAM-P	Abnormal status occurred within memory stored program parameter.
	E103	MEMORY	Abnormal status occurred within the data stored in backup battery RAM.
	E104	D.POWER	The power of internal driver is not established.
	E105	D-COM	A communication error occurred between the internal drive and CPU port.
	E106	DIFFR-D	Abnormal status occurred during build-in driver type checking.
	E107	TOOLID-C	TOOL ID board connection error occurred.
	E108	TOOLID	TOOL ID error occurred. (Located on the board)
	E109	NOT CONNECT	TOOL is not connected.
	E110	WRONG TOOL	Controller type (wattage) and connected tool are incompatible.
	E111	TOOL MIS.	Tool type is different from previously connected tool type. Additional external gear ratio is different from system parameter setting.
	E112	COM. ERROR	With the No. 1 contact of the dip switch (SW1) set to ON, a communication error took place during the output of data to a PC.
	E113	FIELDBUS	The specified Fieldbus type does not match the real hardware type.
	E114	CLOCK	An abnormal value is set to the internal clock IC.
	E115	DIFFR-DP	Error occurred by parameter check of built-in driver. Wattage setting is different from connected tool.
	E120	ZERO POINT	Zero point of torque sensor is out of allowable range. (Exceeded auto-zero calibration allowable range)
	E121	OFFSET 0	Zero point is shifted by ±10% due to zero point data from execution of "D02: SYSTEM CHK" when tool starts.

Err. No	Contents	Description
E122	CAL	CAL data is out of allowable range.
E123	PRE CAL	CAL data fluctuated out of range set in "S04: CHECK SYS =>2.PRECAL CHK" due to CAL data from execution of "D02: SYSTEM CHK" when tool starts.
E124	PLS CHECK	Angle pulse signal reading abnormal status occurred within built-in driver.
E125	TEMP	Tool temperature is too high for an extended length of time.
E130	SERVO ON	Built-in driver does not operate according to servo on operation command.
E131	SAFETY	Abnormal status occurred in safety and protection device.
E132	S.LOCK	System is stopped by safety and protection device.
E133	SPD D/A	Operation is halted because speed command output error occurred.
E134	SERVO IM	Error occurred in circuitry of current monitor.
E135	SAFETY ON	System is stopped by safety and protection device.
E140	LOCAL COM	Fastening was executed while the communication link with the local station was unestablished or disrupted.
E141	LOCAL SYNC	An error was detected with the signal used for synchronization with the local station.
E142	LOCAL NOT-R	A fastening start signal was input to the master station while the local station could not start the fastening operation because it was locked or because torque monitoring was instructed from the panel.
E143	LOCAL MISS	The connected tool type differs between the master and local stations.
E150	TCU COM	Fastening was executed while the communication link with the trace controller was not established or disrupted.
E151	TCU RDC1	Error occurred in trace controller resolver 1.
E152	TCU RDC2	Error occurred in trace controller resolver 2.
E153	TCU RDC3	Error occurred in trace controller resolver 3.
E154	TCU ENC1	Error occurred in trace controller encoder 1.
E155	TCU ENC2	Error occurred in trace controller encoder 2.
E156	TCU ENC3	Error occurred in trace controller encoder 3.

*1   The alarm can be cleared by inputting RUN/RESET signal but it is possible only after lapse of at least 10 seconds.

16. Troubleshooting

16.1. System error

In case of system error, take proper countermeasure with reference to the methods shown in the following.

> MEMO
>
> When replacing each unit to cope with a system error, be sure to turn off the power beforehand. Turn on the power after completing the replacement.

System error abbreviations	Inspection & Checking Methods	Countermeasure
E011 D-CL.V.	(1) Please check supplying power voltage is within the following ranges [100 V: 100–115 VAC±10%] or [200 V: 200–230 VAC±10%] (2) Power supply capacity is not enough, please check if voltage drops or not due inrush current when power is supplied.	If using shared power, please change to a single power supply and secure the power capacity for the exclusive use of Hand N/R only.
E012 D-O.V.	Please check that is there any attachment that enhance great rotation moment of inertia is being installed on TOOL output spindle	Reduce moment of inertia Reduce rotation speed.
E013 D-L.V.	(1) Please check supplying power voltage is within the following ranges [100 V: 100–115 VAC±10%] or [200 V: 200–230 VAC±10%] (2) Power supply capacity is not enough, please check if voltage drops or not due inrush current when power is supplied.	If using shared power, please change to a single power supply and secure the power capacity for the exclusive use of Hand N/R only.
E014 D-O.C.	Shut down the power of controller and check winding resistance values between motor coiled lines. Please refer to "5.1.Tool Cable" for details about pin numbers. * Please refer to "17.1 Tool Inspections" for inspection methods.	Change tool if resistance values of winding lines are abnormal. Change cable if values are normal
E015 D-O.H.	Please check temperature around controller and cooling conditions.	Review cooling methods and condition of controller.
E016 D-O.L.	(1) Fastening time (time interval of high torque output for motor) may be too long. Please reset program to finish fastening process at least within 1 second. (2) Please check that is the set current limitation values are too low with respect to seat torque settings in PROG "P07: DRIVE CONT =>9.PRE CUR LMT" (3) Please make sure the winding resistance values of U phase, V phase, and W phase on both ends of tool cable connector are lower than 0.0269 Ω/m. Please refer to "5.1.Tool Cable" for details about pin numbers. **<Attention>** Generally, D-O.L (overload) occurs due to motor overloading. It is possible to clear this error; however, D-O.C (motor burn out) may occur if continue using this system. When D-O.L occurs, perform operations only after cause factor is solved.	(1) Reduce loading time by changing values of parameter (2) Please review setting value and make proper changes. (3) Please change tool cable if winding resistances are out of range.
E018 D-O.R.	Please make sure the tool output spindle does not rotate in very high speed due external forces. (This will not occur under normal usage.)	Please review the way of operating.
E026 D-O.S.	Please review and reset rotation speed and slope setting. (especially operates during pulse mode)	Please change parameter settings.
E036 D-ROM1 E037 D-ROM2	Please turn off power for more than 5 seconds and then turn on again.	Please change controller if problem still occurs after power restart.
E067 RESOLVER1 E068 RESOLVER2	Abnormality occurs among the connection with resolver sensor (angle sensor) of tool. (1) Please check that are both ends of connector of tool cable are proper connected, and check that are fitting rings fastened tightly enough. (2) Please perform continuity check on tool cable to make sure there is no half connection. Please change cable if resistance value is higher than conductor resistance value by using continuity check. Please refer to Inspection section of "17.2 Tool Cable Inspection" for conductor resistance value.	If problem still occurs after cable is changed, please change tool.
E070 D-CROH	Please turn off power for more than 5 seconds and then turn on again.	Please change controller if this happens after power restart.

System error abbreviations	Inspection & Checking Methods	Countermeasure
E071 D-RELV	Abnormality occurs among the connection with resolver sensor (angle sensor) of tool. (1) Please check that are both ends of connector of tool cable are proper connected, and check that are fitting rings fastened tightly enough. (2) Please perform continuity check on tool cable to make sure there is no half connection. Please change cable if resistance value is higher than conductor resistance value by using continuity check. Please refer to Inspection section of "17.2 Tool Cable Inspection" for conductor resistance value.	If problem still occurs after cable is changed, please change tool.
E072 D-POWFAIL	Please turn off power for more than 5 seconds and then turn on again.	Please change controller if this happens after power restart.
E073 D-RGST	Please turn off power for more than 5 seconds and then turn on again.	Please change controller if this happens after power restart.
E074 D-BAOL	(1) Fastening time (time interval of high torque output for motor) may be too long. Please reset program to finish fastening process at least within 1 second. (2) Fastening cycle (time interval of high torque output for motor) may be too short.	(1) educe loading time by changing values of parameter (2) Make the time interval of high torque output longer.
E077 D-OCS	(1) Please check that is there any stress put on tool output spindle. (2) Please make sure the winding resistance values of U phase, V phase, and W phase on both ends of tool cable connector are lower than $0.0269\ \Omega/m$, and do not have short circuit or ground fault. Please refer to "5.1.Tool Cable" for details about pin numbers.	If no problem is found after checking (1) and (2), please change tool. Please change cable if problem is found after checking (2)
E078 D-VAS	(1) Please check that is there any stress put on tool output spindle. (2) Please review and reset rotation speed and slope setting.	Please change parameter after no problem is found at (1)
E079 D-MOL	(1) Fastening time (time interval of high torque output for motor) may be too long. Please reset program to finish fastening process at least within 1 second. (2) Fastening cycle (time interval of high torque output for motor) may be too short.	(1) Reduce loading time by changing values of parameter (2) Make the time interval of high torque output longer.
E080 D-FESERR	Abnormality occurs among the connection with resolver sensor (angle sensor) of tool. (1) Please check that are both ends of connector of tool cable are proper connected, and check that are fitting rings fastened tightly enough. (2) Please perform continuity check on tool cable to make sure there is no half connection. Please change cable if resistance value is higher than conductor resistance value by using continuity check. Please refer to Inspection section of "17.2 Tool Cable Inspection" for conductor resistance value.	If problem still occurs after cable is changed, please change tool.
E095 D-CERR E099 D-REST	Please turn off power for more than 5 seconds and then turn on again.	Please change controller if this happens after power restart.
E100 F-ROM	Please turn off power for more than 5 seconds and then turn on again.	Please change controller if this happens after power restart.
E101 SYSTEM-P E102 PROGRAM-P	There exists incompatible data in the contents of stored memory parameter setting. Please follow the instructions on panel LCD screen to initialize parameter.	Please change controller if this happens again after parameter initialization.
E103 MEMORY	Backup battery voltage is too low inside controller. * Please be aware that operation will carry on after system error is cleared, but calendar setting and torque curve history data will be deleted.	Please change controller.
E104 D-POWER	Please make sure there is no sudden change or stop on power supply ranges. Ranges are 100–115 VAC±10% and 200–230 VAC±10%.	If no problem is found, change controller and check its operation.
E105 D-COM	Please turn off power for more than 5 seconds and then turn on again.	If it happens again, please change controller.
E106 DIFFR-D	Please follow the procedure indicated on the front panel for the re-setting of driver parameter.	If it happens again, please change controller.

System error abbreviations	Inspection & Checking Methods	Countermeasure
E107 TOOLID-C	(1) Please check that both ends of connector of tool cable are properly connected, and check that the fitting rings fastened tightly enough. (2) It may be influenced by electrical noise in the background. Please check routing of connection cable. If source of electrical noise can be detected, please take proper countermeasure of it.	If this problem occurs again, please change cable, tool, and controller in order and check their operations.
E108 TOOL ID	Please turn off power for more than 5 seconds and turn on again	If this happens again, please either change tool or controller.
E109 NOT CONNECT	(1) If tool is not connected, please connect tool. (2) Make sure both ends of connector are properly connected and tighten ring is fastened till the end. (3) Please perform continuity check to see if there is any disconnection on tool cable. Please change cable if there exists resistance that is higher than conductor resistance by continuity check. Please refer to (2) of "17.2. Tool Cable Inspection" for conductor resistance detail.	If this happens again after cable is replaced, please change tool.
E110 WRONG TOOL	Output capacity is different between connected tool and controller. Operation is not possible.	Please operate with correct combination.
E111 TOOL MISMATCH	(1) Tool type is different from previous usage, or additional external gear ratio is different from setting of "S02:SYS SETUP => EX-GEAR". In order to start the operation, please clear previous system settings and programs and setup new parameters for the new type of tool. (2) To start the operation, press the RESET key on the front panel, change "NSET" in the SUB-DATA section to "SET" with the ▲ and ▼ keys and press the SET key. "————" is displayed in the DATA section. When this is completed, "POFF" is displayed in the DATA section and "END" is displayed in SUB-DATA section. Turn on the power again to make the new tool recognized. Because the set fastening parameters are cleared, set the parameters newly.	If different type of tool is connected by mistake, please change back to previous tool type, and perform system power restart.
E112 COM.ERROR	Refer to "5-8.DIP Switch".	For more detail on communication, refer top "13.2. PC Serial Output Format".
E113 FIELDBUS	Check the Fieldbus type by referring to "11.FIELDBUS" of "S01 SYS INFO." Change the Fieldbus type for compatibility with the Management Software.	Changing the Fieldbus type requires that the controller be returned to manufacturer temporarily.
E114 CLOCK	Repeat the time setting procedure.	Replace the controller if the problem persists.
E115 DIFFR-DP	Take a same measure as E111,then restart the power.	Replace the controller if the problem persists.
E120 ZERO POINT	(1) Is there any stress put on tool output spindle? Please do not add any load on torque direction except fastening process. (2) Please make sure continuity resistance for each pin number "J, K, L, M" is lower than 0.138Ω/m on both ends of connection. (3) Please make sure resistances of tool connector pin between "J–K" and "L–M" are both within the range of 700Ω±1%. Furthermore, make sure the resistances between pins are not varied. (4) Please use system monitor function to check zero-voltage.	Please change cable if continuity resistance is out of range at (2). Please change tool if resistance is out of range at (3).
E121 OFFSET ZERO	(1) Is there any load added when inputting RUN signal? Please do not add any load on torque direction except during fastening process. (2) Executes "D02 SYSTEM CHK" under system setting and set CAL/ZERO again when there tool is not loaded. * There is no problem in system operation if system comes back to normal by above procedure; however, it is possible that "E120 ZERO POINT" could happen again. Please perform cable and tool maintenance as soon as possible. Maintenance method is same as "E120 ZERO POINT"	If this happens again, please change cable.
E122 CAL	Tool cable might be broken or partially connected. Please perform tool cable inspection. Please refer to "17.2. Tool Cable Inspection"	If this happens again even after cable is changed, please change controller.

System error abbreviations	Inspection & Checking Methods	Countermeasure

E123 PRE CAL	(1) Is the value of PRECAL CHK, which can be found under system setting "S04 CHECK SYS => 2.PRECAL CHK", set lower than necessary?
	(2) Execute the system check (SC) from the front panel to set the CAL/ZERO again.
	(3) Monitor the CAL data with "Torque and angle monitor" of the management software and check the following.
	  • Is there any big change in percentage of set CAL data when shaking tool cable?
	  • If displayed voltage(%) varies without doing anything, it is probably being affected by background noise. Please change cable routing.
		Please change setting. MAX±10%
		
		Please change cable if value varies widely.
		
		Please change controller if this happens again even after cable routing is changed.

E124 PLS CHECK	It may be influenced by electrical noise on background. Please check routing of connection cable. If source of electrical noise can be detected, please take proper countermeasure for it.	If this problem happens again after the cable routing is changed, please change controller.
E125 TEMP	Stop operating the tool until its temperature falls below 65°C.	Operative under 65°C
E130 SERVO ON E131 SAFETY E132 S.LOCK E133 SPD D/A E134 SERVO IM	Please turn off power and wait for about 5 seconds and then turn it on again.	If system does not recover, check operation of controller and tool in order and change them. *Please contact manufacturer if problems still occur after each unit is changed.
E135 SAFETY ON	(1) Monitoring current level is exceeding the set value under SYSTEM "S04: CHECK SYS => 3. SAFETY LEVEL" during fastening process. (2) If system error occurs at the time of initial adjustment, please compare the setting contents between monitoring current level during fastening process and "S04:CHECK SYS => 3.SAFETY LEVEL, 4.SAFETY TIME" and then adjust setting value 5–10% higher than monitoring current level.	Please check operations of cable and tool in order, and then change them.
E140 LOCAL COM	Check the connection referring to descriptions about the multiple channel feature. Check the spindle numbers for omissions and duplications. Check the controller's power and cable connections.	If the problem persists, try replacing the NET cable and then the controller.
E141 LOCAL SYNC	Check cable connections.	
E142 LOCAL NOT-R	If the local station is locked by the lock signal, turn the signal off. If torque monitoring has been performed on the panel, press the RESET key to display the initial screen.	
E143 LOCAL MISS	Match the tool type between the master and local stations.	
E150 TCU COM	(1) Check that the trace controller is powered. (2) Check that the NET cable is connected properly.	If the problem persists, try replacing the NET cable, trace controller and controller in this order.
E151 TCU RDC1 E152 TCU RDC2 E153 TCU RDC3 E154 TCU ENC1 E155 TCU ENC2 E156 TCU ENC3	Check that the position detection sensor cable of the trace controller is connected properly.	If the problem persists, try replacing the position detection sensor cable, tracer arm, trace controller and controller in this order.

- In troubleshooting, if a spare tool and spare cable are available, the problem can be checked by carrying out the replacement and test. Also, the system down time can be minimized and therefore it is advisable to prepare spares whenever possible.
- Tool cable connection occupies more than 50% of all system trouble. So, it is important to prepare spare cables considering that tool cables are consumable.
- In case of controller trouble, it is necessary to input the parameters again. It is recommended to back up the parameters at the start of system operation and regularly using the management software. Thus the recovery time will be minimized in case of trouble.

16.2. Battery alarm

When the battery voltage decrease, ALARM LED on the panel lights up and BATTERY EMPTY signal is on after turning on the controller. Tightening control is no problem even if the battery voltage is low, but the time data can be initialized or torque curve history can be lost. Please ask for reparing.

16.3. Fieldbus Communication Error

If an error happens at Fieldbus communication or communication fails, please check the wiring of cable, setting items of I/O assign menu to find out inconsistency with PLC setting.

Also, recycling the X-PAQ power has to be done after changing the setting. Recycling power makes the setting is valid.

17. Maintenance and Inspections

Carry out periodical maintenance and inspections in order to keep X-PAQ System in the best condition at all times. Also, check the following points once a month or as needed.

17.1. Tool Inspections

(1) Appearance

- Check for loosening of each screw.
- Check for loosening of cable connectors and connecting rings.
- Check the start switch and reverse switch operation.

(2) Inspection

1. Torque Sensor
- Check the strain gauge status of torque sensor. Check that the resistance across "J–K" and "L–M" of the tool connector is within 700Ω +/-1% and there is no deviation between them.
- Test by dynamic torque checker
  (Rotating torque transducer and peak indicator)
  Set the dynamic torque checker to the test piece or work to carry out the fastening test. After the test, if calibration is needed, do it with System "S03: CAL SPAN".
- Simplified test by static torque
  The above-mentioned torque checking method is best for torque checking, but it is also possible to test the torque sensor by a simplified method.
  With the use of the peak torque display on the system check screen (SC), compare it with the indication of the torque monitor using a needle type torque wrench or peak hold torque wrench.

2. RESOLVER
- With the use of the angle display on the system check screen (SC), put a mark at one point on the output shaft and then confirm that 720 degrees is displayed when the shaft is turned two turns.

3. Motor
- Check the motor coil winding resistance between U, V, W phases.
  Measure the winding resistance between tool connector pin number "F–G", "G–H", "F–H" and check there is no wide variation between each winding resistance.
  Please refer to "5.1.Tool Cable" for details about pin number.
  Do not try to check the insulation resistance because there is a fear of pin contacting.

Motor	Resistance at 20°C
50 W Motor	Approx. 2 Ω
100 W Motor	Approx. 1 Ω
200 W Motor	Approx. 0.5 Ω

4. Reducer (gear section)
- Remove the tool connector and make sure that the output shaft smoothly rotates when turned by hand.

17.2. Tool Cable Inspection

(1) Appearance

- Check the cables for cracks or scratches.
- Check the cable connector for loosening at the base.
- Check for excessive tension or stresses applied to the cables.
  (The bend radius should be greater than 100 mm)
- Check for squeezing or bruising of the cables.

(2) Tests

- Carry out an end-to-end conduction resistance test between the ends of table connector. Make sure that the resistance is less than the values indicated at the list below. Please refer to "5.1.Tool Cable" for more details about pin number.

Tool side Pin No.	Conductor Resistance (Ω/m) <at Temp. 20℃>	Controller side Pin No.
A・B・C・D・J・K・L・M N・P・R・T・U・Y	0.138	C・D・E・F・G・H・J・K L・M・V・W・X・Y
S・Z	0.111	Z・d
F・G・H・E	0.0269	A・b・R・c

- Connect the cable between the controller and tool and monitor the "Torque and angle monitor" torque of the management software. Vigorously shake the cable and check to see that the value does not change significantly.

17.3. Controller Inspection

(1) Appearance

- Are all connectors connected properly?
- Check for sticking of water or oil?
- Check that ALARM is not lighted with power turned on?

(2) Tests

- Press the test button beside the breaker switch of ELB (leak breaker), and check that the power is cut off and the power protection grounding function is operating correctly.

- The internal check is automatically performed at power-up and in fastening operation, so there are no particular items to be checked by the user. Make sure that no system error is caused at power-on.

> MEMO
>
> In case that trouble occurs, it is recommended to periodically back up the parameter settings using the management software.

18. Appendix

18.1. File system of USB flash drive

There are 4 kinds of type such as FAT (FAT16), FAT32, NTFS and exFAT as file system of USB flash drive can be used connecting to Windows PC.

Most of USB flash drive can be initialized (formatted) to be ready to use right after the purchase.

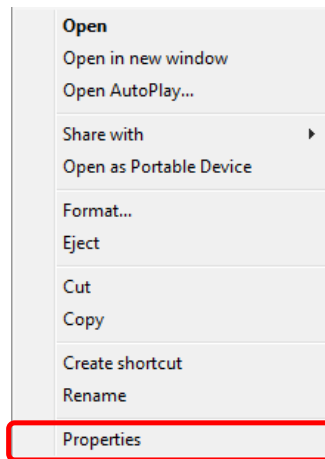The following steps are showing by which file system USB flash drive is formatted.

【How to check file system】 example) Windows 7
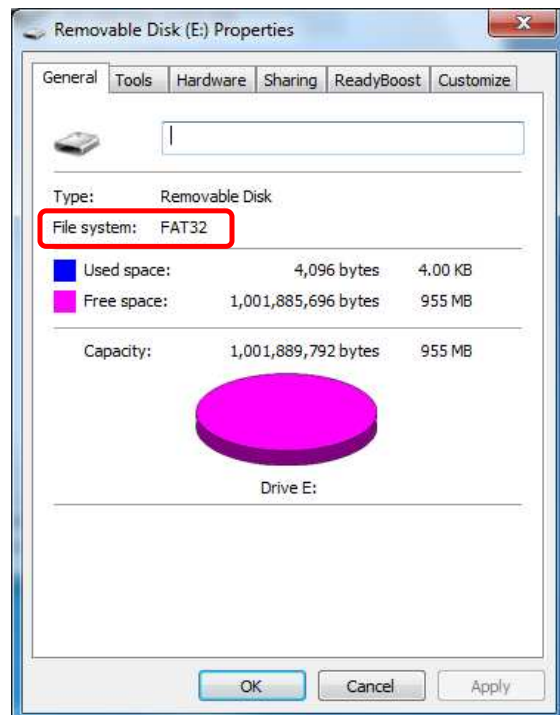
1. Connect USB flash drive to the PC.

2. Open up 「My Computer」 and, Do Right-Click the drive corresponding to USB flash drive among 「Removable Disk」 .

3. Select "Properties" from the appeared menu and click it.

4. Make sure the item "File System" on tab "General" where the dialog box will appear.

18.2. Format of the USB flash drive

If the file system was a non-FAT32, Please format USB flash drive at FAT32.

Data in the USB flash drive will be erased by formatting.

If significant data has been saved, please copy the data to the other USB flash drive and the hard disk and then do format.

【How to format】Example) Windows 7

1. Connect USB flash drive to the PC.

2. Open up 「My Computer」 and, Do Right-Click the drive corresponding to USB flash drive among 「Removable Disk」.

3. Select "Format…" from the appeared menu and click it.
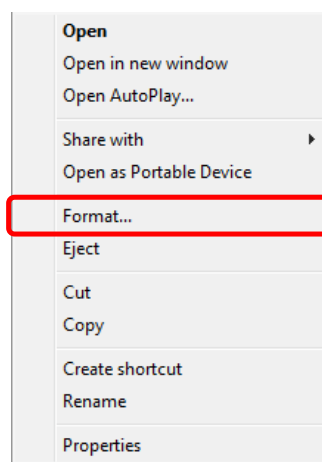
4. The dialog box will appear.
   Select "FAT32" on File System. Check to "Quick format"and Click "Start".
   * Format will end soon by checking to "Quick Format". However, Format can be done without checking to that.
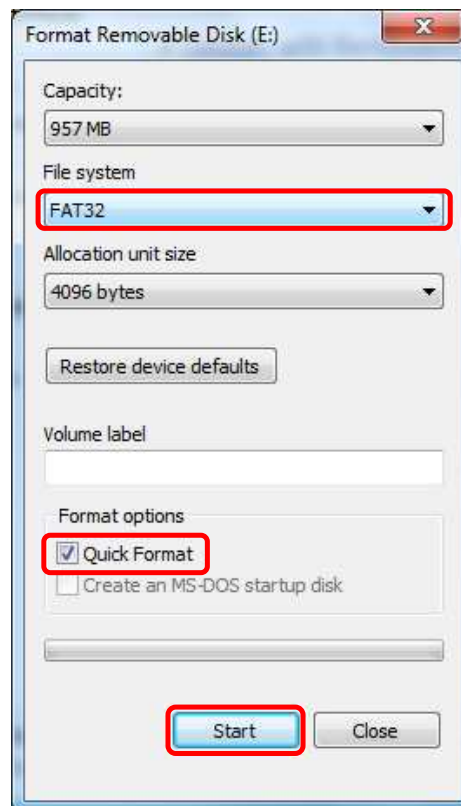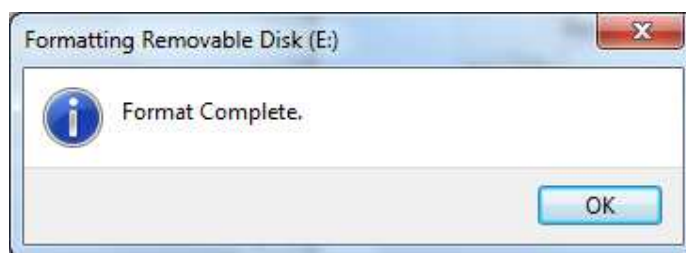
5. WARNING message will appear.
   Click "OK", or Click "OK" after backup data, if backup data is nessary.
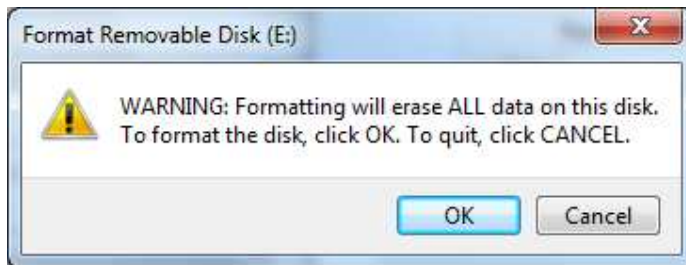
6. After formatted is completed, following message will appear.
   Then, Click "OK".

The format is completed.

Revision History

Operation manual revision number is printed on the lower right side of cover.

Revision	Date	Revision Note
1.05	Oct.2012	◇ [5.3. PIO Connector (Optional)] ・Pin No. 17 and 18 in Connector pin arrangement are revised.

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