



GIKEN

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GSK/GKL  
Controller Instruction Manual

GIKEN INDUSTRIAL CO., LTD.

Before beginning operation:



■Note

- ① Please read this instruction manual carefully in order to ensure that you use this product correctly.
- ② A part or no part of this instruction manual may be used or reproduced without the permission of GIKEN Industrial Co., LTD.
- ③ Regarding the handling process and operation that are not listed in this instruction manual, please think that they cannot be operated, and do not attempt to operate them. Any defect that would occur when the handling process or the operation that is not listed in this instruction manual is executed should be excluded in the scope of the warranty.
- ④ Matters listed in this instruction manual are subject to change for the improvement without notice.
- ⑤ For the product with special specifications, please consult us because it may not be pertinent to the use of this instruction manual
- ⑥ The personal computer for setup operation is an option. Please contact us if it is required.



■Measures in case of an emergency

If this product is in a dangerous condition, immediately turn OFF all power switches of the main unit or the connected equipment, or pull out all power cords from the plug outlets.

(「Dangerous condition」 means the condition when the fire break out or the danger to personal injury can be expected due to the excessive heat generation, smoking or ignition)



## Caution

### ■Notes of the first time the power is turned on

1. Please check the connection of cables before you turn on the power.
2. Please install the termination resistor(110Ω) to connection terminal of each axis for Arc net.  
But you don't need it when you use only one axis
3. Please set axis No. at one axis side on 『d00177』 and two axis side on 『d10177』 from the panel section to make GSK/GKL controller driver recognize axis Number.  
(You cannot communication from the PC when axis No. isn't set.)

\*You must set axis No. when you change controller driver.

4. For wiring reconfirmation after turning on the power, "d00210" "d10210" "d01003" "d11003" is confirmed.  
(Electrical check)
5. In order to confirm the zero point of the torque sensor, please check the measurement value of the zero-point of each axis in the "d00210" "d10210".  
It's possible to use setting software again to adjust zero by software.
6. Please set input, etc after the above content has been completed.

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## **1 System out line**

### **1-1 GSK System out line**

- “GSK” is the torque control type nut runner system what has the function necessary to tightening of the screw and locating.
- This system has the name specified as GSK and it can be divided into the controller section, IF unit section(Interface) and AC nut runner section.
- Torque is controlled by a torque sensor.

### **1-2 GSK Controller section**

- Tightening accuracy : $3\sigma\pm 2\%$
- GSK series improved a conventional GSS series, that was realized downsized, model integration and processing speed Improvement by the capacity rise of CPU and a memory
- Tightening program sets the rotation number and torque control, facilitating the wide variety of tightening patterns.
- High-speed and highly accurate tightening control is provided by combining the position control and the torque control.
- Self diagnosis function displays the program number/operating condition/alarm information on the front LED display.
- Three setup methods are provided to setup the tightening program: the input method from the setup personal computer, exclusive display and that from the controller front panel.
- It is easy even for beginners to set up and input because the automatic setup and input function has been installed.

### **1-3 GSK IF unit section**

- IF unit is the communication device to communicate with the external unit such as the sequencer/display/setup personal computer/printer or other equipment.
- GSK system allows you to check the information related to the tightening control such the setting data/tightening results by connecting a personal computer to the IF unit.
- It is possible to check the information by connecting to a printer without inputting the data such as the setting/tightening results into a personal computer.
- Communication setting is applicable to both specifications of PIO and SIO.
- One IF unit is always required by set of controller.(2 units for 31 axes or more).



#### 1-4 GSK AC nut runner section

•ANZM type nut runner can be continued to used like a conventional GSS series.

<Specification of nut runner >

Nutrunner model	MAX. tightening torque	MAX. rotational speed	Power supply current	Moter model	Weight	Transducer model
	(N.m)	(rpm)	(A rms)		(Kg)	
ANZM-50	4.5	1750	0.6	TS4603N1920E203	1.0	AZM-100
ANZM-250	20	310	0.6	TS4603N1920E203	1.6	AZM-350
ANZM-350	30	430	1.2	TS4617N1920E203	1.9	AZM-350
ANZM-500	45	310	1.2	TS4617N1920E203	1.9	AZM-500
ANZM-850	80	420	2.3	TS4609N1920E203	3.9	AZM-850
ANZM-1600	140	420	4.5	TS4618N1922E203 (TS4618N1920E203)	5.0	AZM-1500
ANZM-1800S	160	420	4.5	TS4618N1922E203 (TS4618N1920E203)	5.0	AZM-2000
ANZM-2000	180	290	4.5	TS4618N1922E203 (TS4618N1920E203)	6.8	AZM-2500
ANZM-3000	280	235	8.5	TS4619N1920E203	9.0	AZM-4000
ANZM-3500	330	200	4.5	TS4618N1922E203 (TS4618N1920E203)	10.0	AZM-4000
ANZM-5000	470	250	8.5	TS4619N1926E207 (TS4619N1922E207)	10.5	AZM-7500
ANZM-7000	650	175	8.5	TS4619N1926E207 (TS4619N1922E207)	10.5	AZM-7500
ANZM-9000	650	175	8.5	TS4619N1926E207 (TS4619N1922E207)	14.5	AZM-12000
ANZM-9000S	850	130	8.5	TS4619N1926E207 (TS4619N1922E207)	13.9	AZM-12000S

MAX tightening torque is an output value when the rotational speed is 20rpm.

When making the speed short exceedingly, torque output in a table becomes difficult.

(The sizes of the nut runner are indicated on catalogs, but please inquire about details).

## **1—5 GKL System out line**

- “GKL” is the torque control type nut runner system what has the function necessary to tightening of the screw and locating.
- This system has the name specified as GKL and it can be divided into the controller section, IF unit section(Interface) and AC nut runner section.
- Torque is controlled by a current sensor.

## **1—6 GKL Controller section**

- Tightening accuracy : Target torque  $\pm 15\%$
- GKL series improved a conventional GSL series, that was realized downsized, model integration and processing speed Improvement by the capacity rise of CPU and a memory
- Tightening program sets the rotation number and torque control, facilitating the wide variety of tightening patterns.
- High-speed and highly accurate tightening control is provided by combining the position control and the torque control.
- Self diagnosis function displays the program number/operating condition/alarm information on the front LED display.
- Three setup methods are provided to setup the tightening program: the input method from the setup personal computer, exclusive display and that from the controller front panel.
- It is easy even for beginners to set up and input because the automatic setup and input function has been installed.

## **1—7 GKL IF unit section**

- IF unit is the communication device to communicate with the external unit such as the sequencer/display/setup personal computer/printer or other equipment.
- GKL system allows you to check the information related to the tightening control such the setting data/tightening results by connecting a personal computer to the IF unit.
- It is possible to check the information by connecting to a printer without inputting the data such as the setting/tightening results into a personal computer.
- Communication setting is applicable to both specifications of PIO and SIO.
- One IF unit is always required by set of controller.(2 units for 31 axes or more).

## 1-8 GKL AC nut runner section

•ANM type nut runner can be continued to used like a conventional GSL series.

<Specification of nut runner >

Nut runner model	MAX. tightening torque	MAX. rotational speed	Power supply current	Moter model	Weight
	(N.m)	(rpm)	(A rms)		(Kg)
ANM-220	18	310	0.6	TS4603N1920E203	1.3
ANM-320	28	430	1.2	TS4617N1920E203	1.6
ANM-400	35	310	1.2	TS4617N1920E203	1.6
ANM-640	55	420	2.3	TS4609N1920E203	3.4
ANM-1200	110	420	4.5	TS4618N1922E203 (TS4618N1920E203)	4.2
ANM-1400	110	420	4.5	TS4618N1922E203 (TS4618N1920E203)	4.2
ANM-1800	170	285	4.5	TS4618N1922E203 (TS4618N1920E203)	5.2
ANM-2000	170	285	4.5	TS4618N1922E203 (TS4618N1920E203)	5.2
ANM-3000	265	235	8.5	TS4619N1920E203	8.5
ANM-3100	270	200	4.5	TS4618N1922E203 (TS4618N1920E203)	9.5
ANM-5000	450	250	8.5	TS4619N1926E207 (TS4619N1922E207)	10.0

MAX tightening torque is an output value when the rotational speed is 20rpm.

When making the speed short exceedingly, torque output in a table becomes difficult.

(The sizes of the nut runner are indicated on catalogs, but please inquire about details).

## 2 Specifications

### 2-1 Specifications of controller

Composition	IF unit	Standard type (M-NET) CC-link DeviceNet EtherNet/IP PROFINET I/O PROFINET IRT
	Controller unit	Single standard type (GSK/GKL) 3 kinds, Single T type (GSK/GKL) 3 kinds, 2 axis standard type (GSKW/GKLW) 2 kinds, 2 axis T type (GSKW/GKLW) 2 kinds
	Display	Tightening Result (Torque and time and angle and judge) Axial array Setting data Displays do not affect operation even if not used
Data	Setting PC	USB communication
	I/F ⇄ Controller Controller ⇄ Controller	Arc-Net
	DATA control (PC)	RS422, SD card
	DATA saving	Tightening data: about 5000 cases When IF is connected, It can output from a PC. SD card
	Printer connection	It connects a PC. (setting software is required for output)
	Max axis number for connection	30 axis control (software-based 60 axis)
Controller Display	DATA display	6-digit 7SEG.LED
	Extraordinary display	AL code indicate + NG code indicate
Setting	Setting input method	Personal computer and the controller front panel, display panel
	Memory backup	E2PROM, FRAM
	Setting value backup	PC⇒FD, HD
Outside dimensions	IF unit	44×226×91
	Controller unit GSK-14/GSKW-14 GSK-T4/GSKW-T4 GKL-14/GKLW-14 GKL-T4/GKLW-T4	44×226×91
	Controller unit GSK-15/GKL-15	86.5×226×171.6
	Controller unit GSK-17/GKL-17	116.5×226×171.6
	Controller unit GSKW-15/GKLW-15	160.5×226×171.6
	Controller unit GSK-T5/GKK-T7 GKL-T5/GKL-T7	65.5×226×211.6

	Controller unit GSKW-T5/GKLW-T5	109.5×226×211.6
	Display GSK-D2 GKL-D2	182.5×138.8×45.8 Please install by considering the projection of the connector
Tightening setting	Axis number	•30 axis × 16 program × 220 step
	Program number	•30 axis × 50 program × 70 step
	Step number	•8 axis × 50 program × 220 step Maximum values are different depending on the combination
	Setting items	T:Rating 30kinds H:REA.T SET, K:PRE.T SET, G:REV.T SET S:SCC.T SET,screw number setting Each 50kinds
Tightening method	Torque method, time and angle monitor	"Zone Monitoring" function exists
	Angle method, time monitor	"Gradient judgment" function exists
Tightening control	Sequencing tightening (Blocktightening)	MAX. 17blocks (70 steps) MAX. 55blocks (220 steps)
	Retry	Whether or not set for each program
	Baking determination	Reverse torque, judgement of area size
	Reverse rotation for fixed quantity	Time and angle
	Speed switching	4 stage, angle management and continuously variable transmission (smoothing) function
Accuracy	Torque waveform	Disply,all axis indication or personal computer
	Angle stop accuracy	within +0.5° (downward 30rpm)
	Angle display minimum unit	0.1°
	Tightening accuracy	downward 3σ±2%
Connection	Connection cable	Standard type and T-tyap: connectingmethod
Control power	Rated current	GSK-IF-N1/GKL-IF-N1 : 0.2A GSK-14 (T4)/GKL-14 (T4) : 0.2A GSKW-14 (T4)/GKLW-14 (T4) : 0.2A GSK-15 (T5)/GKL-15 (T5) : 0.3A GSKW-15 (T5)/GKLW-15 (T5) : 0.4A GSK-17 (T7)/GKL-17 (T7) : 0.3A
	Inrush current at startup	GSK-IF-N1/GKL-IF-N1 : 5.0A GSK-14 (T4)/GKL-14 (T4) : 5.0A GSKW-14 (T4)/GKLW-14 (T4) : 5.0A GSK-15 (T5)/GKL-15 (T5) : 5.0A GSKW-15 (T5)/GKLW-15 (T5) : 5.0A GSK-17 (T7)/GKL-17 (T7) : 5.0A
Others	Zero-point adjustment	Automatic correction (Tolerance range setting is provided.)
	Axis cutting function	Can be connected from a personal computer or the controller front panel.
	Communication with other unit	Arc-Net
	Setting input	USB Communication
	Communication with PLC	SIO (M-NET, CC-Link, and etc) or PIO
	Display connection	Connected to IF unit

## 2-2 Basic specification

### 2-2-1 GSK Basic specification

I/F model	GSK-IF-N1 : M-NET (Standard) GSK-IFCC-N1 : CC-Link GSK-IFDN-N1 : Devie-NET GSK-IFET-N1 : EtherNet/IP GSK-IFPNIO-N1 : PROFINET I/O GSK-IFPNIRT-N1 : PROFINET IRT GSK-IFSG-N1 : Parallel I/O (Input/output: 24 points each) GSK-IFSG2-N1 : Parallel I/O (Input/output: 48 points each)					
Standard specification model (GSK)	GSK-14-E-N2		GSK-15-E-N2		GSK-17-E-N2	
Standard specification model (GSKW)	GSKW-14-E-N2		GSKW-15-E-N2		/	
T specification model (GSK)	GSK-T4-E-N2		GSK-T5-E-N2		GSK-T7-E-2	
T specification model (GSKW)	GSKW-T4-E-N2		GSKW-T5-E-N2		/	
Control power input	DC24 V±10% (21.6~26.4V)					
Drive power input	3-phase AC220V±20% (176~264V) 50/60 Hz					
Withstand voltage	AC 1500 V for 1 minute					
Insulation resistance	DC 500 V 10M Ωmore					
Controller Calorific value	Controller 1 unit : 15W					
Momentary power failure	No effect in the range less than 50 msec (excluding the driving time)					
Nut runner model	ANZM-50 ANZM-250	ANZM-350 ANZM-500	ANZM-850	ANZM-1600 ANZM-1800S ANZM-2000 ANZM-3500	ANZM-3000	ANZM-5000 ANZM-7000 ANZM-9000 ANZM-9000S
Applicable motor	TS4603N1920 E203	TS4617N1920 E203	TS4609N1920 E230	TS4618N1922 E203	TS4619N1920 E203	TS4619N1926 E203
Motor output W	75	150	300	600	1125	1125
Rotor inertia kgm <sup>2</sup>	0.04x10 <sup>-4</sup>	0.083x10 <sup>-4</sup>	0.38x10 <sup>-4</sup>	0.79x10 <sup>-4</sup>	2.62x10 <sup>-4</sup>	2.62x10 <sup>-4</sup>
Driving power supply rated electrical capacity Arms	0.6	1.2	2.3	4.5	8.5	8.5
Rating output current Arms	1.0	1.9	3.6	6.8	7.1	11.0
Instantaneous maximum current Arms	5.4	10.7	19.6	38.6	40.2	62.9

Rating torque N.m	0.159	0.318	0.64	1.27	2.39	2.39
Instantaneous max. torque N.m	0.95	1.91	3.82	7.64	14.32	14.32
Maximum rotation number without loads rpm	12500				7500	12500
Motor drive system	Transistor PWM sine wave drive					
Angle sensor	Incremental encoder (With the zero magnification signal, line driver output, 256C/T)					
Operating temperature and humidity	0 to 50°C, Less than 90%RH (No condensation)					

### ※About combination of controllers and NRs other than ANZM series

The combination of each NR and controller is shown below.

#### •ANZM series

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZM-12000	8.5	GSK-17(T7)-E-N2
ANZM-15000	27.0	GSK-17(T7)-E1-N2
ANZM-20000		
ANZM-28000		

#### •ANZMC series

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZMC-50	0.6	GSK-14(T4)-E-N2 GSKW-14(T4)-E-N2
ANZMC-250		
ANZMC-350		
ANZMC-500	1.2	GSK-15(T5)-E-N2 GSKW-15(T5)-E-N2
ANZMC-850	2.3	
ANZMC-1600	4.5	
ANZMC-1800S		
ANZMC-2000		
ANZMC-3000	8.5	GSK-17(T7)-E-N2
ANZMC-3500	4.5	
ANZMC-5000	8.5	
ANZMC-7000		
ANZMC--9000		
ANZMC-9000S		
ANZMC-12000		
ANZMC-15000	27.0	GSK-17(T7)-E1-N2
ANZMC-20000		
ANZMC-28000		

• **ANZMH series**

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZMH-200	1.2	GSK-14(T4)-E-N2
ANZMH-450	2.3	GSKW-14(T4)-E-N2
ANZMH-900	4.5	GSK-15(T5)-E-N2 GSKW-15(T5)-E-N2
ANZMH-1500	8.5	GSK-17(T7)-E-N2
ANZMH-1550		
ANZMH-1850S		
ANZMH-2000		
ANZMH-2001		
ANZMH-9000	37.5	GSK-17(T7)-E1-N2

• **ANZMCH series**

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZMCH-200	1.2	GSK-14(T4)-E-N2
ANZMCH-450	2.3	GSKW-14(T4)-E-N2
ANZMCH-900	4.5	GSK-15(T5)-E-N2 GSKW-15(T5)-E-N2
ANZMCH-1500	8.5	GSK-17(T7)-E-N2
ANZMCH-1550		
ANZMCH-1850S		
ANZMCH-2000		
ANZMCH-2001		
ANZMCH-2500		

• **ANZMSH series**

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZMSH-120E2	1.2	GSK-14(T4)-E2-N2 GSKW-14(T4)-E2-N2
ANZMSH-130	2.3	GSK-14(T4)-E-N2 GSKW-14(T4)-E-N2
ANZMSH-150E2	1.2	GSK-14(T4)-E2-N2 GSKW-14(T4)-E2-N2
ANZMSH-500	2.3	GSK-14(T4)-E-N2 GSKW-14(T4)-E-N2
ANZMSH-700		
ANZMSH-2000	8.5	GSK-17(T7)-E-N2
ANZMSH-2001		

• **ANZMKH series**

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZKHM-400	4.5	GSK-15(T5)-E-N2 GSKW-15(T5)-E-N2
ANZKHM-700		



• **ANCKHM series**

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANCKHM-200	3.0	GSK-14(T4)-E1-N2 GSKW-14(T4)-E1-N2
ANCKHM-300	4.5	
ANCKHM-500	7.2	GSK-15(T5)-E1-N2 GSKW-15(T5)-E1-N2

• **ANZMCTH series**

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZMCTH-100E1	1.2	GSK-14(T4)-E1-N2 GSKW-14(T4)-E1-N2
ANZMCTH-150E1	2.3	
ANZMCTH-230E1		
ANZMCTH-450E1	4.5	GSK-15(T5)-E1-N2 GSKW-15(T5)-E1-N2
ANZMCTH-700E1		
ANZMCTH-900E1		

• **ANZMCXH series**

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZMCXH-100E1	1.2	GSK-14(T4)-E1-N2 GSKW-14(T4)-E1-N2
ANZMCXH-150E1	2.3	
ANZMCXH-230E1		
ANZMCXH-450E1	4.5	GSK-15(T5)-E1-N2 GSKW-15(T5)-E1-N2
ANZMCXH-700E1		
ANZMCXH-900E1		

• **ANZR series**

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZR-5000	8.5	GSK-17(T7)-R-N2
ANZR-7000		
ANZR-9000		
ANZR-9000S		
ANZR-12000		

• **ANZRC series**

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZRC-5000	8.5	GSK-17(T7)-R-N2
ANZRC-7000		
ANZRC-9000		
ANZRC-9000S		
ANZRC-12000		

•ANZMRCH series

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
ANZMRCH-2000	8.5	GSK-17(T7)-R-N2
ANZMRCH-2001		
ANZMECH-2500		

•LUR series

Nut runner model	Driving power supply rated electrical capacity Arms	Adaptive Controller
LUR-1000	5.7	GSK-15(T5)-E-L2

## 2-2-1 GKL Basic specification

I/F model	GKL-IF-N1 : M-NET (Standard) GKL-IFCC-N1 : CC-Link GKL-IFDN-N1 : Devie-NET GKL-IFET-N1 : EtherNet/IP GKL-IFPNIO-N1 : PROFINET I/O GKL-IFPNIRT-N1 : PROFINET IRT GKL-IFSG-N1 : Parallel I/O (Input/output: 24 points each) GKL-IFSG2-N1 : Parallel I/O (Input/output: 48 points each)					
Standard specification model (GKL)	GKL-14-E-N2		GKL-15-E-N2		GKL-17-E-N2	
Standard specification model (GKLW)	GKLW-14-E-N2		GKLW-15-E-N2		/	
T specification model (GKL)	GKL-T4-E-N2		GKL-T5-E-N2		GKL-T7-E-2	
T specification model (GKLW)	GKLW-T4-E-N2		GKLW-T5-E-N2		/	
Control power input	DC24 V $\pm$ 10% (21.6~26.4V)					
Drive power input	3-phase AC220V $\pm$ 20% (176~264V) 50/60 Hz					
Withstand voltage	AC 1500 V for 1 minute					
Insulation resistance	DC 500 V 10M $\Omega$ more					
Controller Calorific value	Controller 1 unit : 15W					
Momentary power failure	No effect in the range less than 50 msec (excluding the driving time)					
Nut runner model	ANM-220	ANM-320 ANM-400	ANM-640	ANM-1200 ANM-1400 ANM-1800 ANM-2000 ANM-3100	ANM-3000	ANM-5000
Applicable motor	TS4603N1920 E203	TS4617N1920 E203	TS4609N1920 E230	TS4618N1922 E203	TS4619N1920 E203	TS4619N1926 E203
Motor output W	75	150	300	600	1125	1125
Rotor inertia kgm <sup>2</sup>	0.04x10 <sup>-4</sup>	0.083x10 <sup>-4</sup>	0.38x10 <sup>-4</sup>	0.79x10 <sup>-4</sup>	2.62x10 <sup>-4</sup>	2.62x10 <sup>-4</sup>
Driving power supply rated electrical capacity Arms	0.6	1.2	2.3	4.5	8.5	8.5
Rating output current A rms	1.0	1.9	3.6	6.8	7.1	11.0
Instantaneous maximum current Arms	5.4	10.7	19.6	38.6	40.2	62.9

Rating torque N.m	0.159	0.318	0.64	1.27	2.39	2.39
Instantaneous max. torque N.m	0.95	1.91	3.82	7.64	14.32	14.32
Maximum rotation number without loads rpm	12500				7500	12500
Motor drive system	Transistor PWM sine wave drive					
Angle sensor	Incremental encoder (With the zero magnification signal, line driver output, 256C/T)					
Operating temperature and humidity	0 to 50°C, Less than 90%RH (No condensation)					

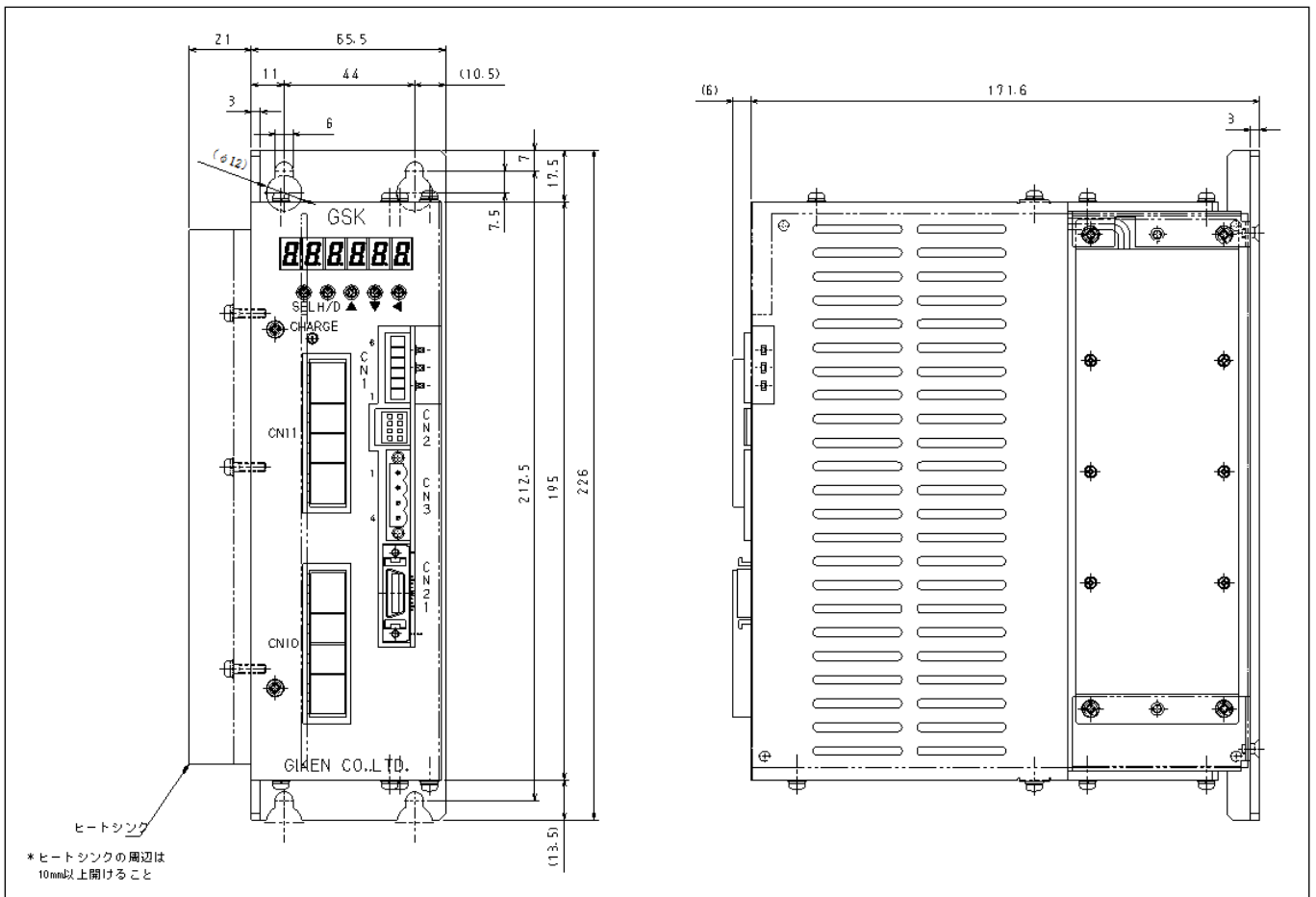
## 2-3 Functions/Features

Protective function		Over current, over load, over speed, encoder failure, drive power failure, E2PROM failure and CPU failure, etc.
Display function	7SEGMENT LED	Alarm No., NG information Program No., Block No. Operation monitor Tightening result (Torque, etc.)
Parameter setting		Set the following parameters by a personal computer and input them to the IF unit. . Program 16 or 50 . Rating 30 . PRE.T } . REA.T } Each 50 . REV.T } . SOC.T }
Storing the tightening data		Tightening data: About 5,000 per axis Alarm history: 16 per axis Tightening waveform: 1 per axis It is possible to check the data when needed from PC
Applicable to the multiaxial		1 to 30 units of controller or 1 to 15 units of double type controller can be connected to 1 Interface unit. Max. 30 axes multiaxial control is possible
Communication with the PLC (in serial or parallel)		Communication by multi-standard using the Anybus ※ Please refer to 2-2 in regard corresponding standard
Axis cutting function		Setting for axis cutting is possible by the PC setting or the operation from the front panel. (Used when the controller malfunctioned)
Zero magnification check function		Diagnosis function for the torque sensor malfunction (Performs per tightening operation)
Gear check function		Diagnosis function for biting of the gear and motor shaft (Selectable for Yes/No)
Simulation movement		Simulation movement is available by the personal computer operation (Sampling start for the seating angle by tightening)
Calendar function		It saves the Year, Month, Day, Hour, Minute and Second per data.
Regenerative function (Over voltage detection)		Regeneration circuit that visceral the driving voltage is consumed by the internal resistor when it exceeds a predetermined value.
Discharge function		Natural discharge by the LED
Standard inertia (INERTIA)		$J_L \leq 30JM$
Rotating direction		Direction of CCW should be the forward rotation viewed from motor shaft end.
Analog monitor (P81_reference)		Monitor signal output at the check pin on the front panel: M1 ... } The torque, an electric current and speed can be M2 ... } monitored every each controller in panel operation. G ... Monitor GND



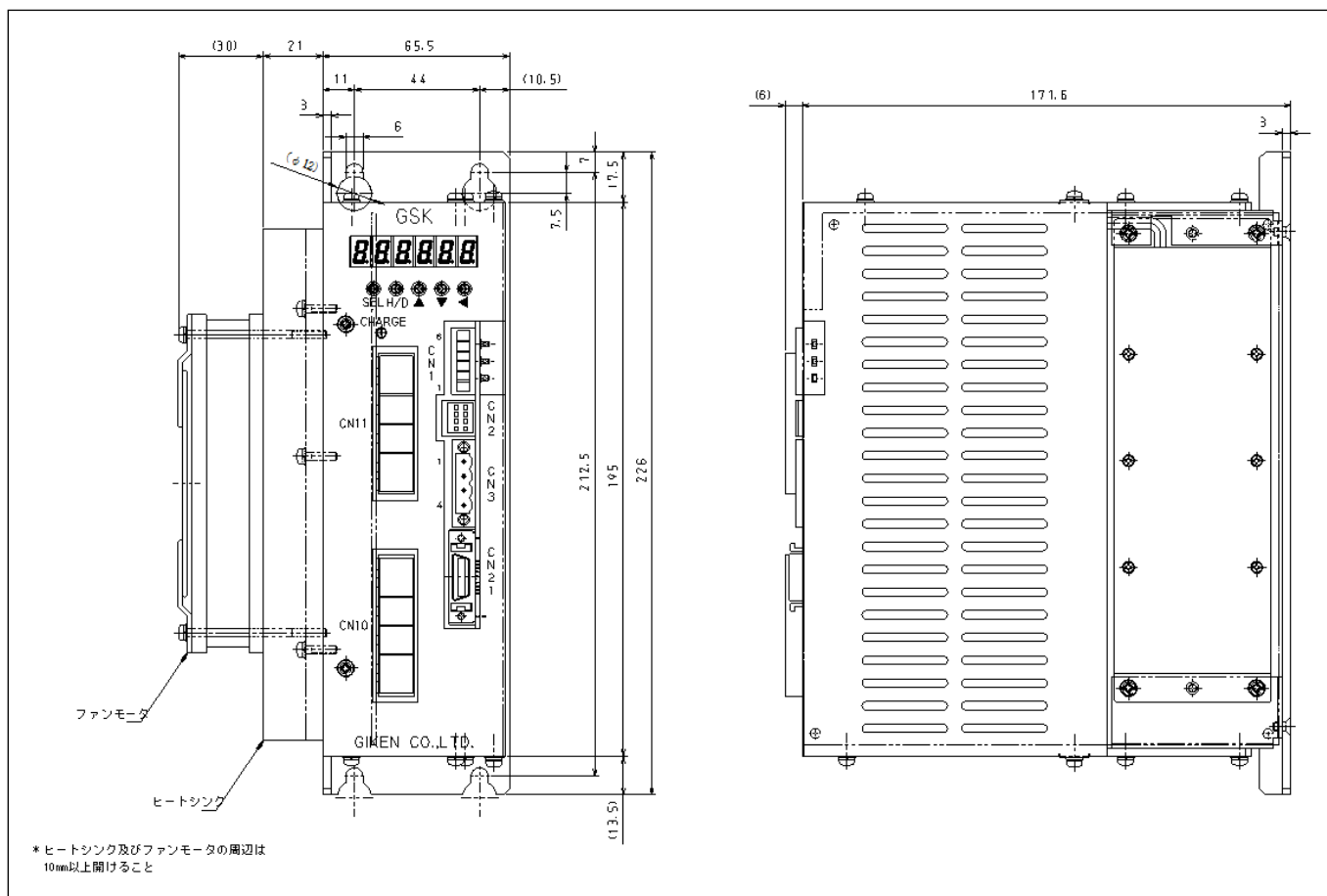


**2-4-3 Controller dimensions: Standard type ··· GSK-15/GKL-15**

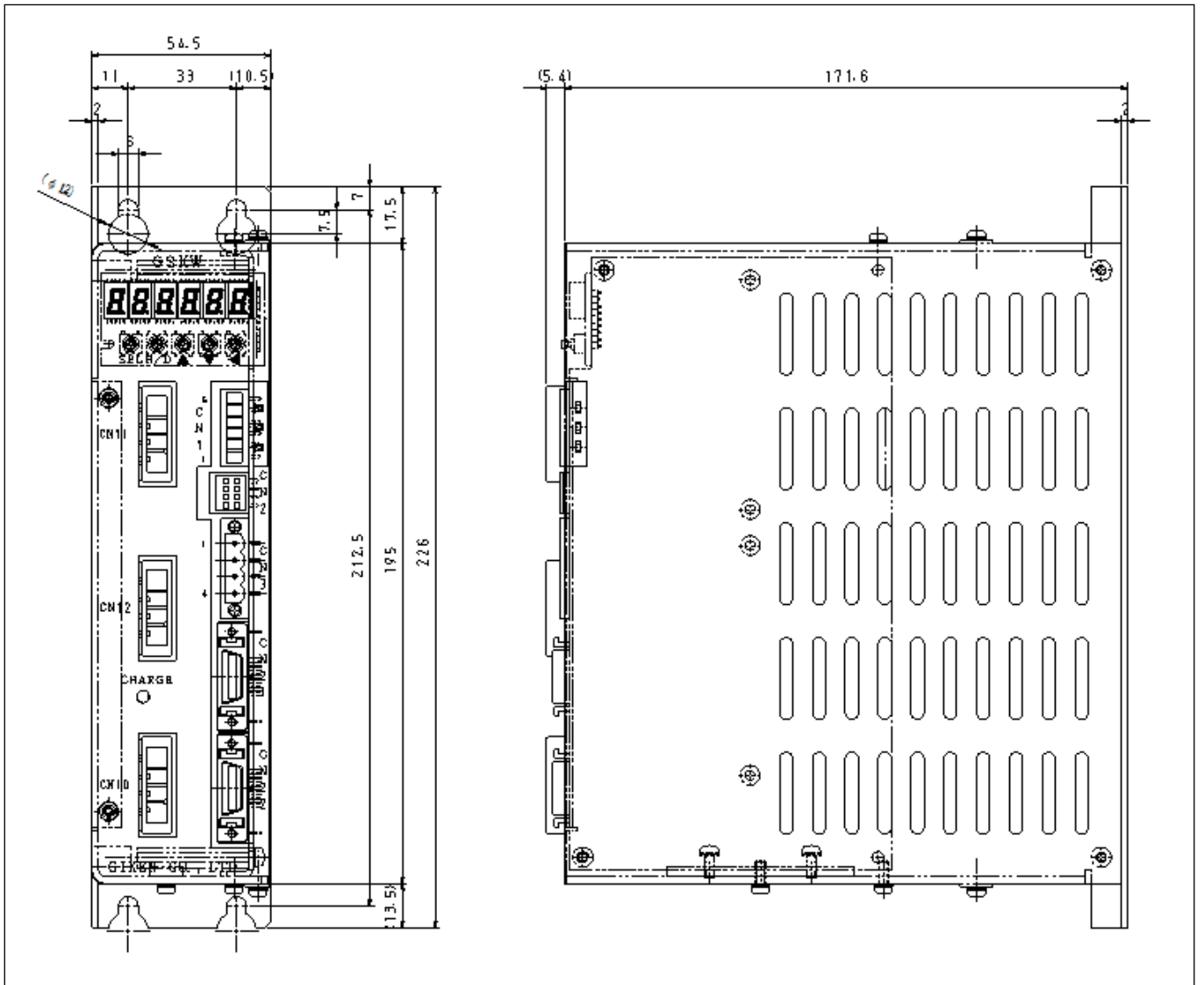




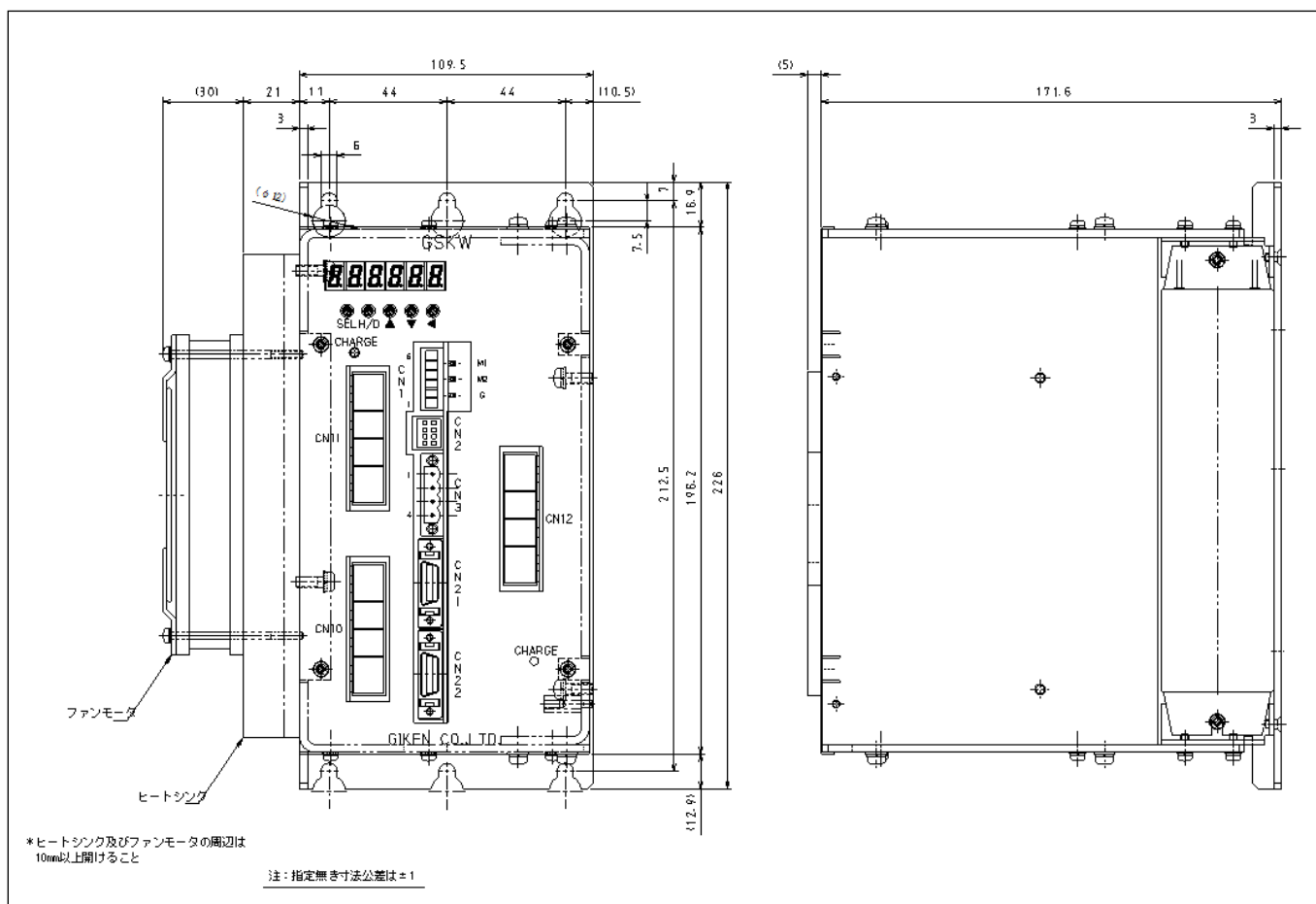
**2-4-4 Controller dimensions: Standard type GSK-17/GKL-17**



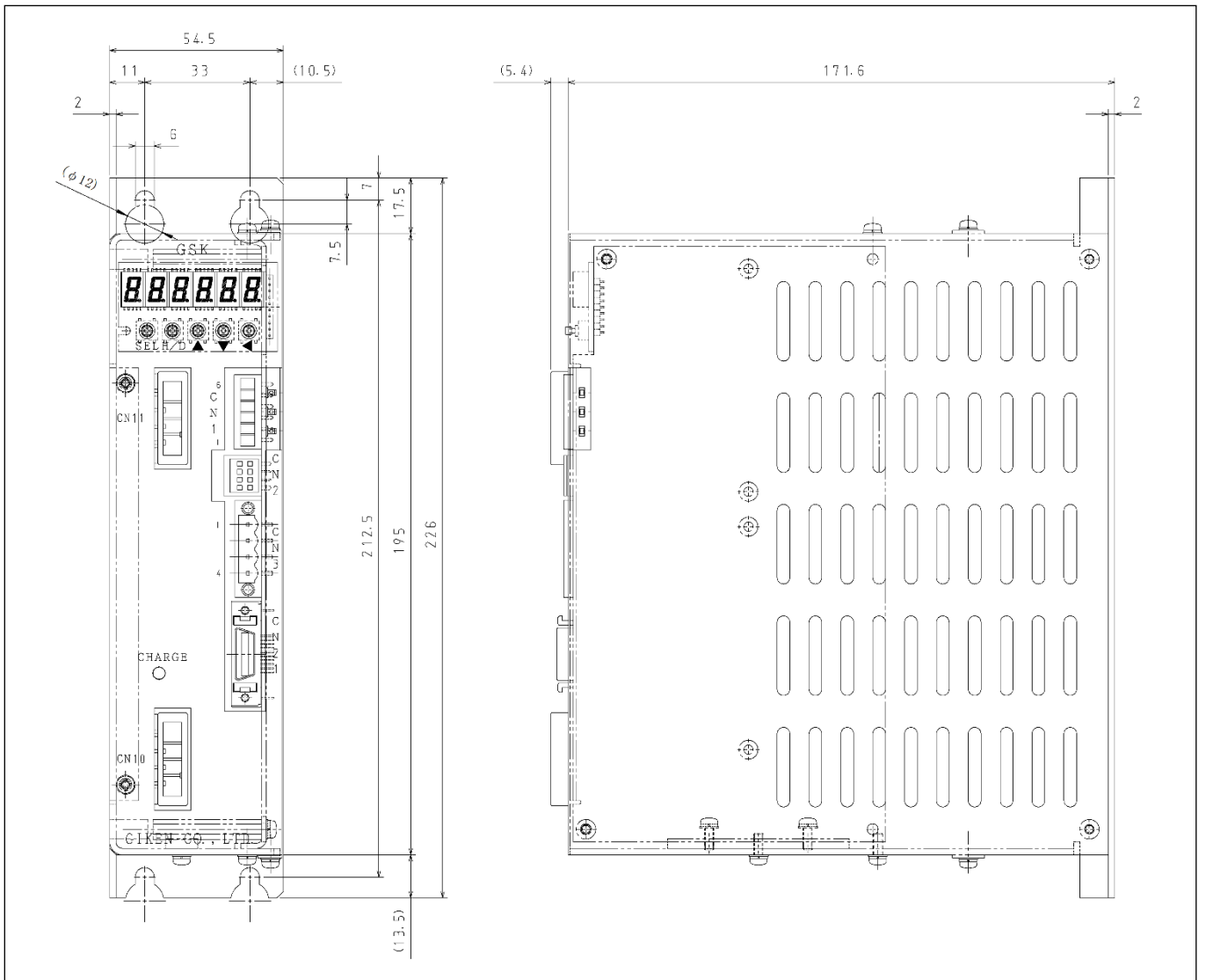
**2-4-5 Controller dimensions: Standard type ···GSKW-14/GKLW-14**



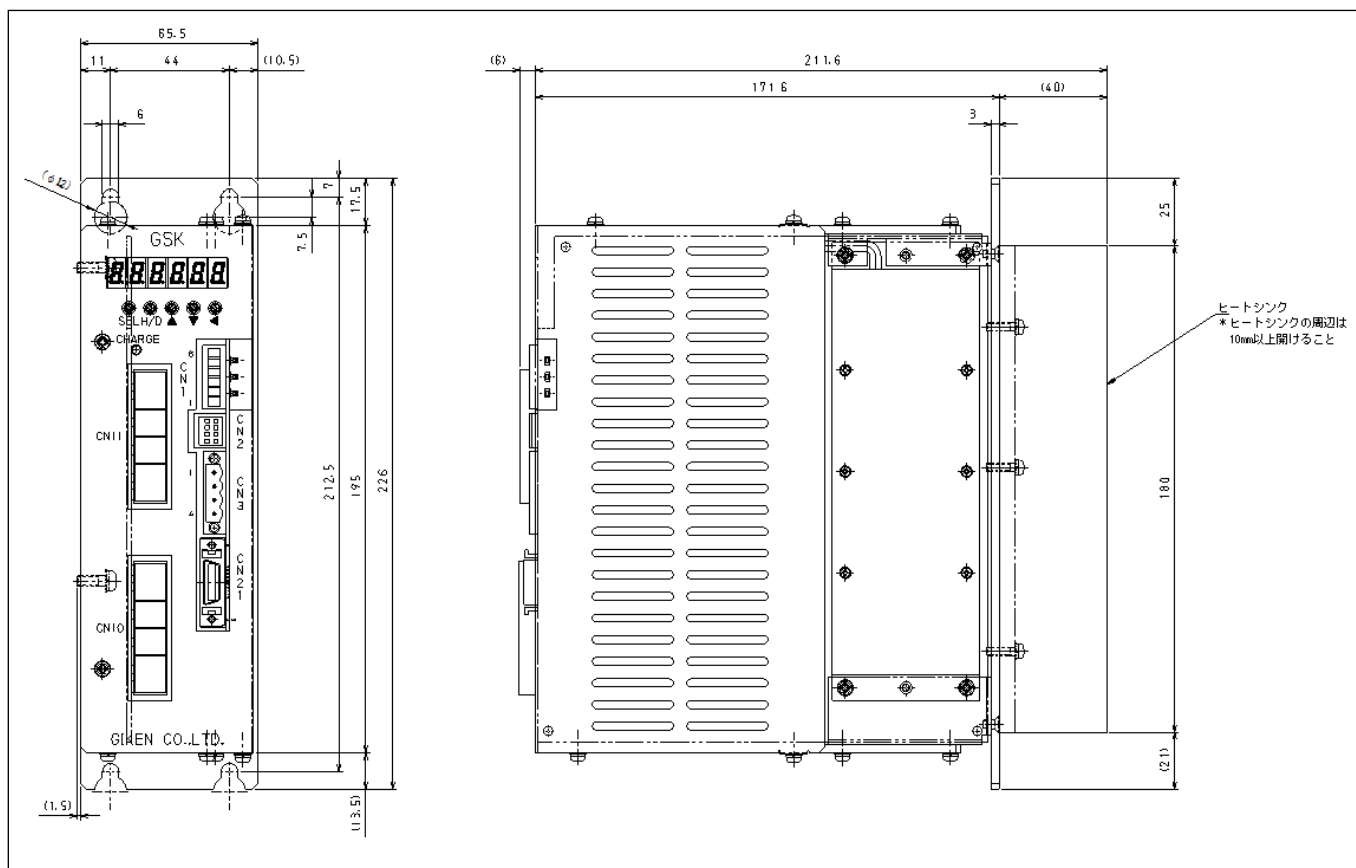
**2-4-6 Controller dimensions: Standard type ··· GSKW-15/GKLW-15**



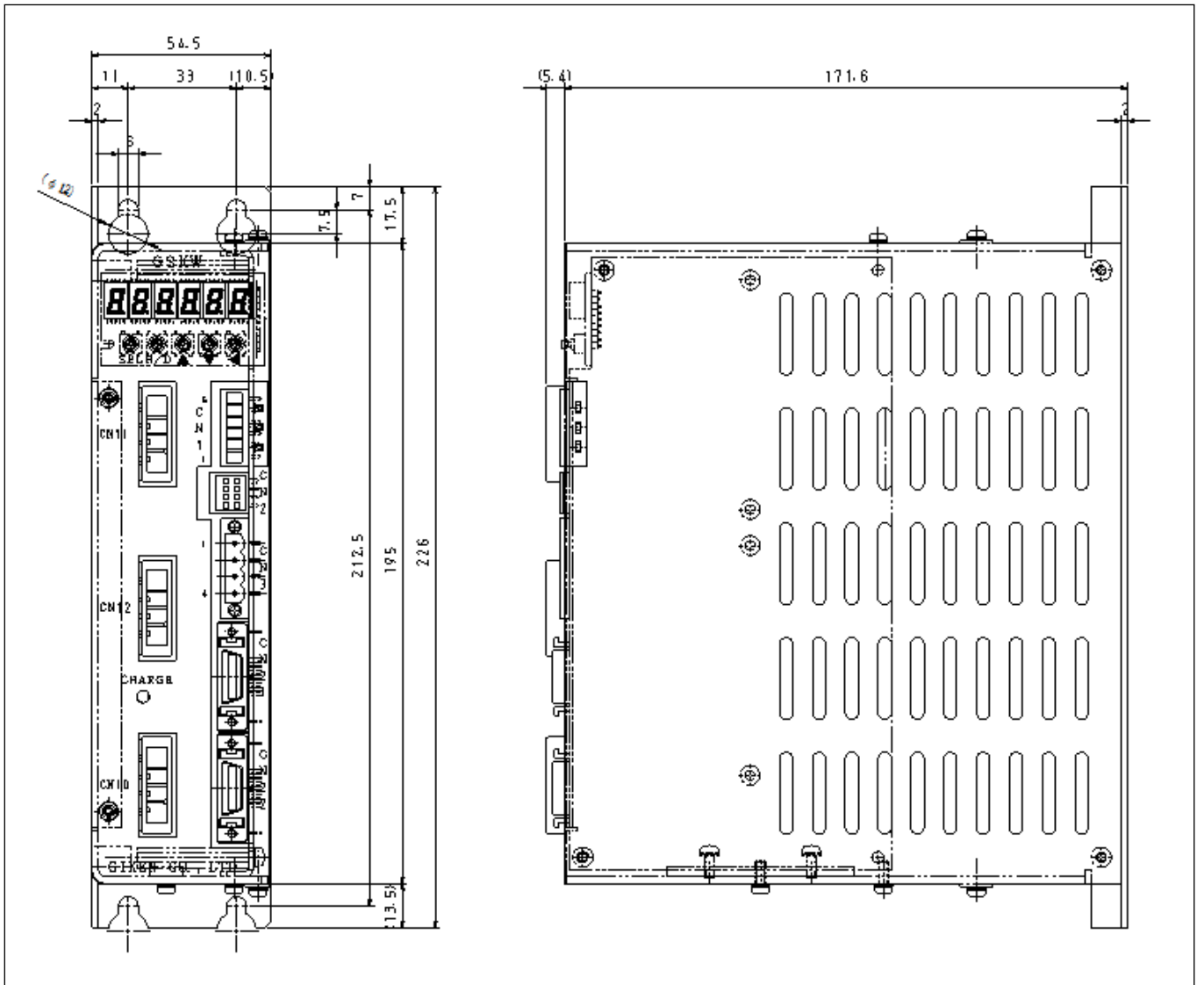
**2-4-7 Controller dimensions: T type ··· GSK-T4/GKL-T4**



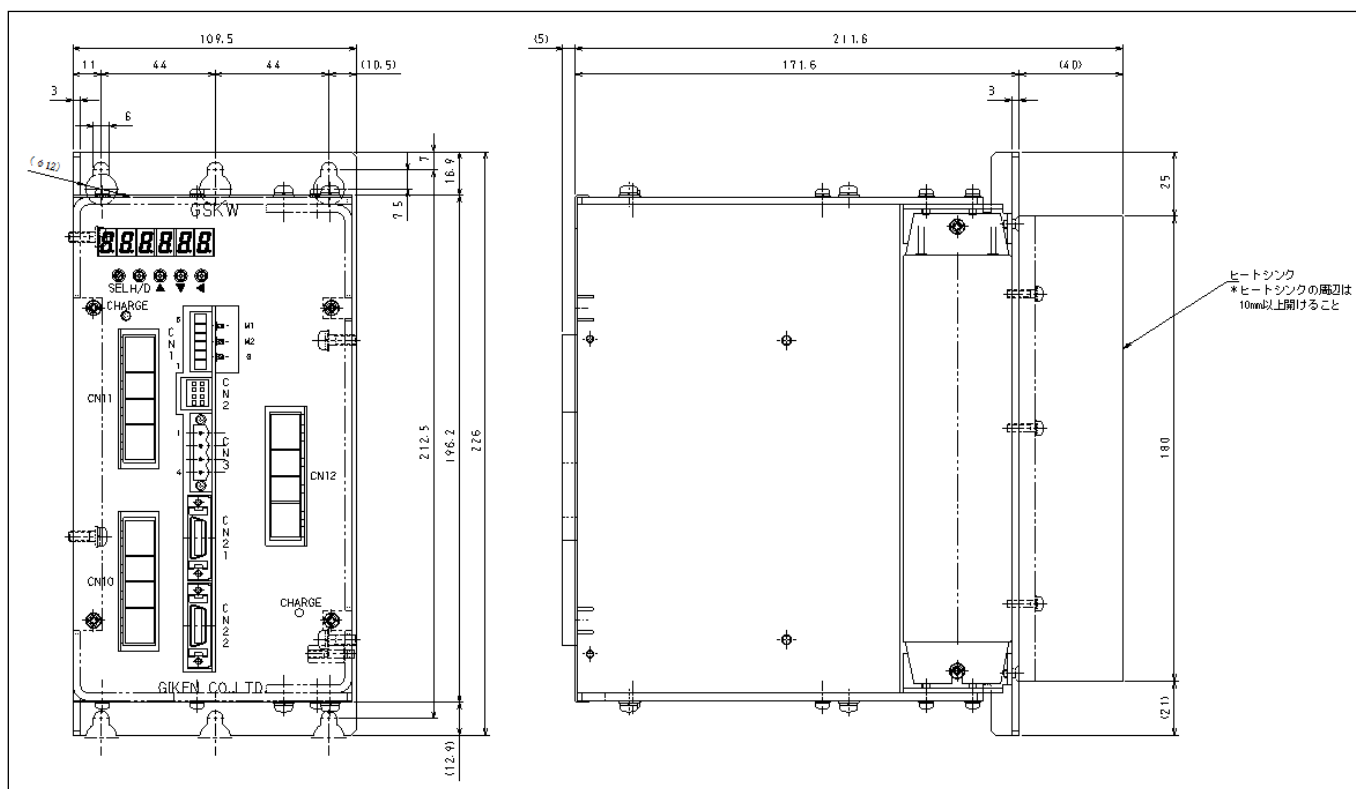
**2-4-8 Controller dimensions: T type...GSK-T5(T7)/GKL-T5(T7)**



**2-4-9 Controller dimensions: T type ··· GSKW-T4/GKLW-T4**



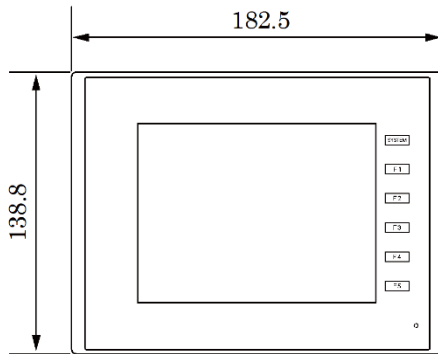
**2-4-10 Controller dimensions:T type···GSKW-T5/GKLW-T5**



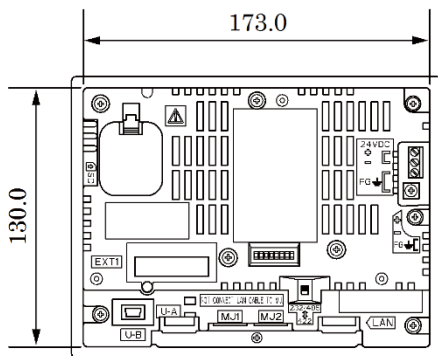
**2-4-11 Dimensions(display) : Model ...GSK-D2/GKL-D2**

(単位: mm)

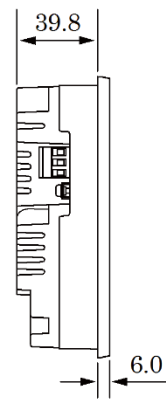
• 正面図



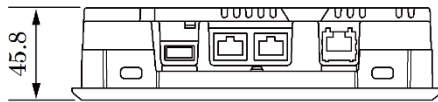
• 背面図



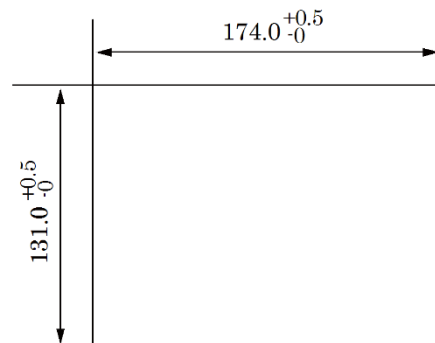
• 側面図



• 下面図



• パネルカット寸法

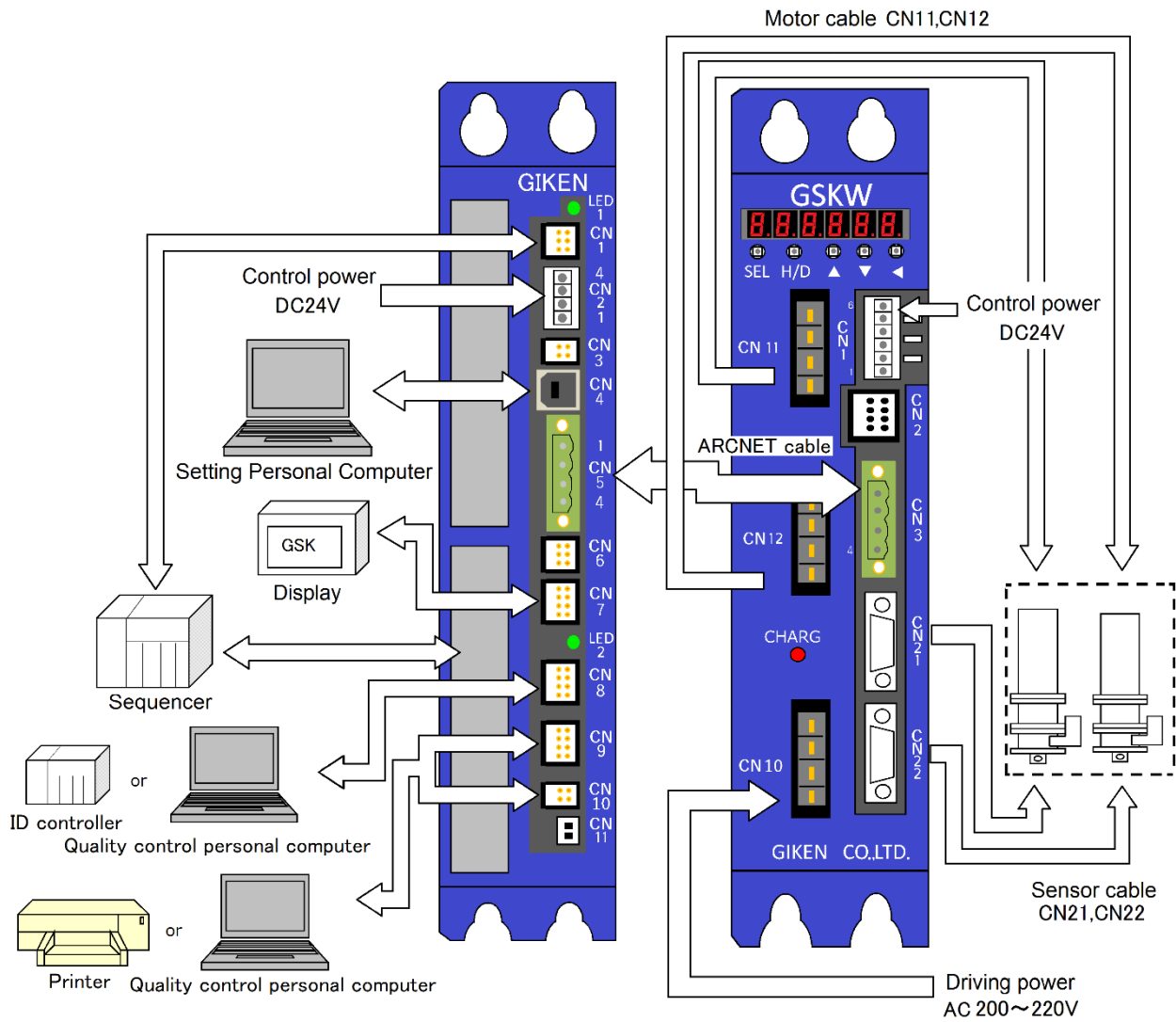




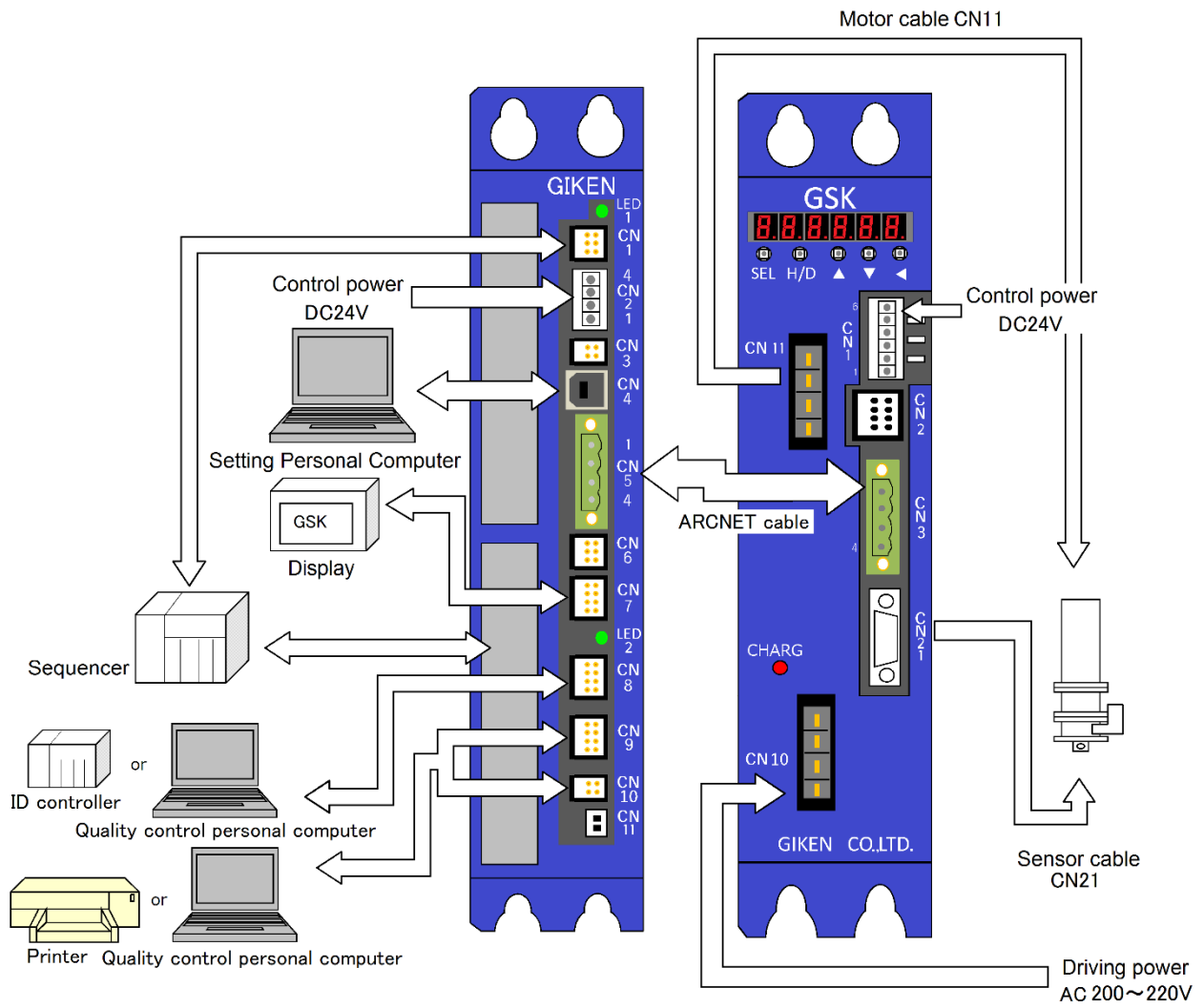
### 3 Wire connection

#### 3-1 Wiring reference diagram

##### 3-1-1 GSKW/GKLW Controller system wiring reference diagram



**3-1-2 GSK/GKL Controller system wiring reference diagram**



### 3-2 Used connector and mating connector

#### 3-2-1 GSK/GKL Used connector and mating connector

GSK/GSKW/GKL/GKLW connector unit (14/T4)

Port No.	Use/Matter	Used model	Matching model	Matching model pin	annexed
CN1	For the control power supply connection	734-166 (WAGO)	734-106 (WAGO)	—	○
CN2	Not used	1-1827864-4 (TYCO)	1-1827864-4 (TYCO)	1827570-2 (TYCO)	—
CN3	For communication among controllers at ARCNET	MSTB2,5/6-STF-5,08 (PHOENIX CONTACT)	MSTB2,5/6-STF-5,08 (PHOENIX CONTACT)	—	○
CN10	For the driving power supply connection	2-179277-2 (TYCO)	2-178128-4 (TYCO)	1-353717-2 (TYCO)	○
CN11	For power line of nutrunner 1	1-179277-2 (TYCO)	1-178128-4 (TYCO)	1-175218-2 (TYCO)	—
CN12	For power line of nutrunner 2	1-179277-2 (TYCO)	1-178128-4 (TYCO)	1-175218-2 (TYCO)	—
CN21	For sensor line of nutrunner1	10220-52A2PL (3MJapan)	10320-52A0-008 (3MJapan)	10120-3000VE (3MJapan)	—
CN22	For sensor line of nutrunner2	10220-52A2PL (3MJapan)	10320-52A0-008 (3MJapan)	10120-3000VE (3MJapan)	—

CN12/CN22 exists only for GSKW/GKLW controllers

GSK/GSKW/GKL/GKLW connector unit (15/T5,17/T7)

Port No.	Use/Matter	Used model	Matching model	Matching model pin	annexed
CN1	For the control power supply connection	734-166 (WAGO)	734-106 (WAGO)	—	○
CN2	Not used	1-1827876-4 (TYCO)	1-1827864-4 (TYCO)	1827570-2 (TYCO)	—
CN3	For communication among controllers at ARCNET	MSTB2,5/6-STF-5,08 (PHOENIX CONTACT)	MSTB2,5/6-STF-5,08 (PHOENIX CONTACT)	—	○
CN10	For the driving power supply connection	1-917541-2 (TYCO)	1-179958-4 (TYCO)	316040-2 (TYCO)	○
CN11	For power line of nutrunner 1	2-917541-2 (TYCO)	2-179958-4 (TYCO)	316040-2 (TYCO)	—
CN12	For power line of nutrunner 2	2-917541-2 (TYCO)	2-179958-4 (TYCO)	316040-2 (TYCO)	—
CN21	For sensor line of nutrunner1	10220-52A2PL (3MJapan)	10320-52A0-008 (3MJapan)	10120-3000VE (3MJapan)	—
CN22	For sensor line of nutrunner2	10220-52A2PL (3MJapan)	10320-52A0-008 (3MJapan)	10120-3000VE (3MJapan)	—

CN12/CN22 exists only for GSKW/GKLW controllers

### Interface unit

Port No.	Use/Matter	Used model	Matching model	Matching model pin	Annexed
CN1	PLC connection port	1-1827876-3 (TYCO)	1-1827864-3 (TYCO)	1827570-2 (TYCO)	—
CN2	Control power supply input port	734-144 (WAGO)	734-104 (WAGO)	—	○
CN3	Not used	1-1827876-2 (TYCO)	1-1827864-2 (TYCO)	1827570-2 (TYCO)	—
CN4	Port for setting PC connection	UBB-4R-D14T-4D (JST)	USB Type B	—	—
CN5	For communication among controllers at ARCNET	MSTB2.5/4-GF-5.08 (PHOENIX CONTACT)	MSTB2.5/4-STF-5.08 (PHOENIX CONTACT)	—	○
CN6	Port for CAN communication	1-1827876-3 (TYCO)	1-1827864-3 (TYCO)	1827570-2 (TYCO)	—
CN7	Display connection port	1-1827876-4 (TYCO)	1-1827864-4 (TYCO)	1827570-2 (TYCO)	—
CN8	Port for ID controller connection	1-1827876-4 (TYCO)	1-1827864-4 (TYCO)	1827570-2 (TYCO)	—
CN10	Printer connecting port	1-1827876-2 (TYCO)	1-1827864-2 (TYCO)	1827570-2 (TYCO)	—

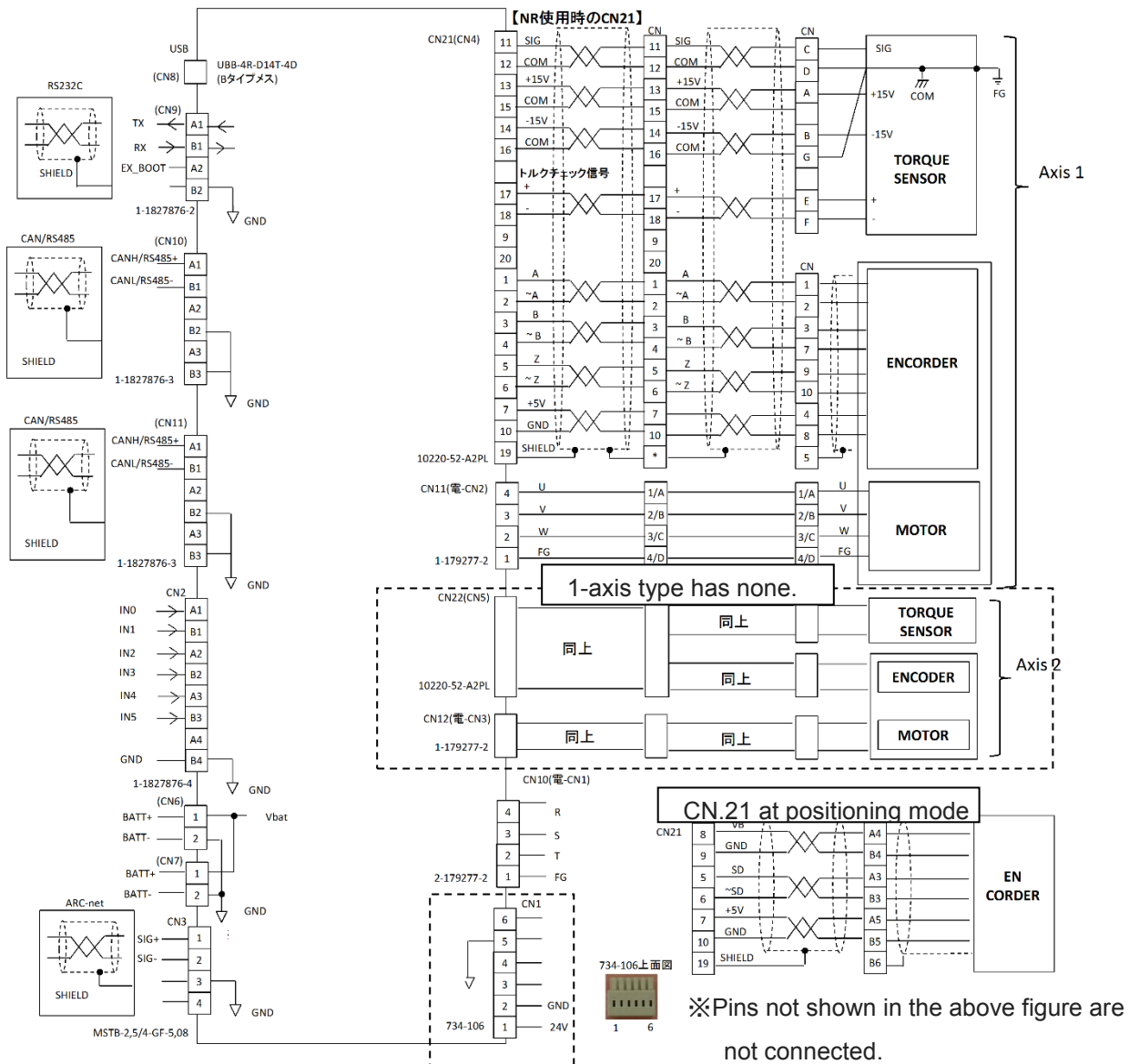
### 3-2-2 Interface communication port details

#### GSK/GKL interface unit

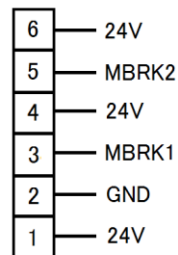
Number	Name	Explanation
CN1	PLC (M-NET)	Connected by corresponding standard in the 2-2 table that is used.
CN2	Power / READY notification(SW)	4-core connector Left 2 core power supply (24V) Right two-wire start notification for relay
CN3	Unused	Unused
CN4	A setting personal computer (USB)	Use to rewrite or read the data using the setting software.
CN5	Driver(ARCNET)	If you want to connect a plurality of GSK/GKL driver, it connects the driver to each other in the ARCNET.
CN6	CAN communication connector	Unused
CN7	External display (RS422)	It will be used to connect to an external display.
CN8	ID controller or quality control PC (RS422)	ID controller and a printer are selected either by the setting of a personal computer. It can not be connected at the same time. The connection partner of quality control personal computer depends on the setting. ID controller when using ⇒ ⑨ ⑩ · Printer when using ⇒ ⑧ <b>【Caution】</b> Please do not connect the equipment at the same time in two connectors of CN9 and CN10. <b>【In the case of the previous firmware than Rev1721-160】</b> · CN8 = quality control PC · CN9 / 10 = Printer or ID controller
CN9	Printer or personal computer for quality control (CN9: RS422)	
CN10	Printer or personal computer for quality control (CN10: RS232C)	
CN11	Battery backup	Connect the clock backup battery.

### 3-3 Connection to the outside

#### 3-3-1 External connection diagram(Controller~NR):standard and T type

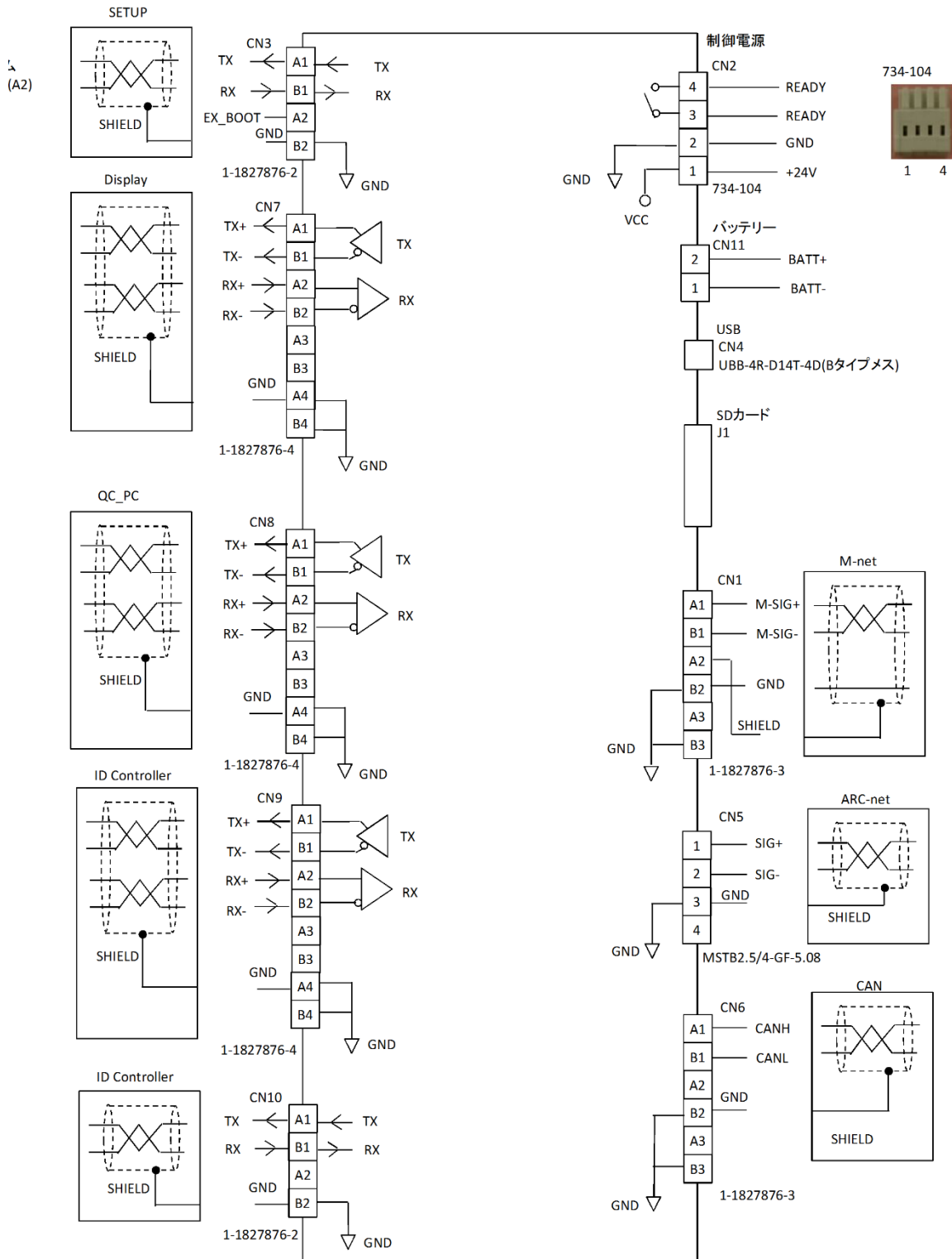


When you use motor with brake.



If you wire the above figure with "motor not using brake", the wired controller will fail.

### 3-3-2 External connection diagram(I/F unit~Connected equipment): standard and T type



### 3-4 Cable model list

#### 3-4-1 GSK Cable model list

(Please be sure to read the following notes.)

Cable name	Use nut runner	Cable model
Integrated power cable (Nut runner ~ Controller)	ANZM-50~ANZM-850 etc.	K8M5DW-4R-□M
	ANZM-1600~ANZM-3500 etc.	K8M30D-4R-□M
	ANZM-5000~ANZM-9000 etc.	K8M90D-4R-□M
Movable relay power cable (Nut runner ~Relay part)	ANZM-50~ANZM-850 etc.	K8M5TW-4R-□M
	ANZM-1600~ANZM-3500 etc.	K8M30T-4R-□M
	ANZM-5000~ANZM-9000 etc.	K8M90T-4R-□M
Unmovable relay power cable (Relay part ~ Controller)	ANZM-50~ANZM-850 etc.	K8M5TW-4A-□M
	ANZM-1600~ANZM-3500 etc.	K8M30T-4A-□M
	ANZM-5000~ANZM-9000 etc.	K8M90T-4A-□M
Integrated encoder sensor cable (Nut runner ~ Controller)	ANZM-50~ANZM-9000 etc.	8E*S*D-16R-□M
	ANZMC, ANZMCH, ANZMSH etc. Small torque sensor series	8E*S*DC-16R-□M
Integrated resolver sensor cable (Nut runner ~ Controller)	ANZR series	8R*S*D-16R-□M
	ANZRC series	8R*S*DC-16R-□M
Movable relay encoder sensor cable (Nut runner ~Relay part)	ANZM-50~ANZM-9000 etc.	8E*S*T-16R-□M
	ANZMC, ANZMCH, ANZMSH etc. Small torque sensor series	8E*S*TC-16R-□M
Movable relay resolver sensor cable (Nut runner ~Relay part)	ANZR series etc.	8R*S*T-16R-□M
	ANZRC series etc.	8R*S*TC-16R-□M
Unmovable relay encoder sensor cable (Relay part ~ Controller)	ANZM-50~ANZM-9000 etc.	8E*S*T-16A-□M
	ANZMC, ANZMCH, ANZMSH etc. Small torque sensor series	8E*S*TC-16A-□M
Unmovable relay resolver sensor cable (Relay part ~ Controller)	ANZR series etc.	8R*S*T-16A-□M
	ANZRC series etc.	8R*S*TC-16A-□M
Encoder sensor extension cable (Relay part~Relay part)	—	8EST-16EX-□M
Resolver sensor extension cable (Relay part~Relay part)	—	8RST-16EX-□M

### 3-4-2 GSKW Cable model list

Cable name	Use nut runner	Cable model
Integrated power cable (Nut runner ~ Controller)	ANZM-50~ANZM-850 etc.	K8M5DW-4R-□M
	ANZM-1600~ANZM-3500 etc.	K8M30D-4R-□M
Movable relay power cable (Nut runner ~Relay part)	ANZM-50~ANZM-850 etc.	K8M5TW-4R-□M
	ANZM-1600~ANZM-3500 etc.	K8M30T-4R-□M
Unmovable relay power cable (Relay part ~ Controller)	ANZM-50~ANZM-850 etc.	K8M5TW-4A-□M
	ANZM-1600~ANZM-3500 etc.	K8M30T-4A-□M
Integrated encoder sensor cable (Nut runner ~ Controller)	ANZM-50~ANZM-3500 etc.	8E*S*D-16R-□M
	ANZMC, ANZMCH, ANZMSH etc. Small torque sensor series	8E*S*DC-16R-□M
Integrated resolver sensor cable (Nut runner ~ Controller)	ANZR series	8R*S*D-16R-□M
	ANZRC series	8R*S*DC-16R-□M
Movable relay encoder sensor cable (Nut runner ~Relay part)	ANZM-50~ANZM-3500 etc.	8E*S*T-16R-□M
	ANZMC, ANZMCH, ANZMSH etc. Small torque sensor series	8E*S*TC-16R-□M
Movable relay resolver sensor cable (Nut runner ~Relay part)	ANZR series etc.	8R*S*T-16R-□M
	ANZRC series etc.	8R*S*TC-16R-□M
Unmovable relay encoder sensor cable (Relay part ~ Controller)	ANZM-50~ANZM-3500 etc.	8E*S*T-16A-□M
	ANZMC, ANZMCH, ANZMSH etc. Small torque sensor series	8E*S*TC-16A-□M
Unmovable relay resolver sensor cable (Relay part ~ Controller)	ANZR series etc.	8R*S*T-16A-□M
	ANZRC series etc.	8R*S*TC-16A-□M

#### Caution 1 (Cable General)

In parentheses represents the length of the cable. The unit is meters.  
Please select from the numeric value that is designated.  
You can also create other types of cables, but it takes time for delivery.

#### Caution 2 (Angle and Torque sensor cable)

Please write the length the respective sensor cables are wishing on cable model \* when you buy it.

E\*: The length of the encoder (angle sensor) from a parting.

If you're blank, the length will be 0.3m.

S\*: The length of the torque sensor from a parting.

If you're blank, the length will be 1.5m.

#### Caution 3 (GKL cable)

In GKL, only the sensor cable is replaced with the following.

Integrated encoder sensor cable:8ED-8R-□M

Movable(Unmovable) relay encoder sensor cable:8ET-8R(A)-□M



## 4 Signal

### 4-1 Signal type

#### Parallel I / O

I/O	Points	Signal name	Specification	Contents
Parallel input signal	48	IN1~IN48	DC24V 11mA	GSK-IFSG-N1 : Input/output: 24 points each GSK-IFSG2-N1 : Input/output: 48 points each GKL-IFSG-N1 : Input/output: 24 points each GKL-IFSG2-N1 : Input/output: 48 points each
Parallel output signal	48	OUT1~OUT48	DC24V 30mA max	

#### Serial I/O

I/O	Note	Management
ARC-NET	Installation of terminating resistor 110 Ω is required	Inter-controller communication during multi-axis control (to be crossed by COM)
CC-LINK	Model: GSK-IFCC-N1/GKL-IFCC-N1	Communication of tightening management with PLC
Devise-NET	Model: GSK-IFDN-N1/GKL-IFDN-N1	Communication of tightening management with PLC
EtherNetI/P	Model: GSK-IFET-N1/GKL-IFET-N1	Communication of tightening management with PLC
PROFINET I/O	Model: GSK-IFPNIO-N1/GKL-IFPNIO-N1	Communication of tightening management with PLC
PROFINET IRT	Model: GSK-IFPMIRT-N1/GKL-IFPNIRT-N1	Communication of tightening management with PLC

#### Analog monitor

Output item	Matter
M1	Output the date of torque, speed and current by the panel operation Monitoring of the torque sensor (≒5V/sensor rate) 、Scaling of the current(10A/10V) Monitoring of the motor rotation speed (Output plus value when it rotates to the right)
M2	

※You can change the above in the operation of the setting panel. (See PageNo..81)

#### I/F unit

I/O	Points	Matter
USB	1	Parameters and various data inputs and outputs data from the connection PC
Centronics or RS422	1 or 2	Connecction the printer or ID controller and Quality control PC (You cannot connect connect the printer when ID controller and Quality control PC are connected)
RS422	1	Connection the display.
RS485	1	The interface is connected at [Serial Input/Output]to a sequencer , etc.

## 4-2 Input and output signals

### 4-2-1 Input and output signals

Input("PLC"→"GSK/GKL")

No.	Bit	Name	Matter												
0	0	Operation ready	<p>This is the operation ready command</p> <p>0: Stop(Operation prohibition.The GSK/GKL Interface doesn't run.)</p> <ul style="list-style-type: none"> <li>Start signal cannot be accepted.</li> <li>It stops the motor at emergency stop if it becomes 0 operation.</li> </ul> <p>1: This operation enabled state.</p> <ul style="list-style-type: none"> <li>The output signal[Operation ready] becomes 1 operation when the GSK/GKL can operate.</li> </ul>												
0	1	Automatic/Manual	<p>Choose Automatic or manual operation</p> <p>0: The manual actions can be operated</p> <table border="1"> <thead> <tr> <th>Input signal</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>Inching start</td> <td>Nut runner does inching action</td> </tr> <tr> <td>JOG start</td> <td>The nut runner move to the specified position</td> </tr> <tr> <td>XJOG/YJOG</td> <td>JOG motion Xaxis/Yaxis</td> </tr> </tbody> </table> <p>【on Positioning mode】</p> <p>Other than the above, automatic operation is possible.</p> <p>1: The automatic operation is possible to start</p> <table border="1"> <thead> <tr> <th>Input signal</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>start</td> <td> <p>【On multi-axis mode】</p> <p>It actions only 1 block.</p> <p>When it exit,it waits for the next start.</p> <p>【on Positioning mode】</p> <p>Some set blocks are performed continuously</p> </td> </tr> </tbody> </table>	Input signal	Action	Inching start	Nut runner does inching action	JOG start	The nut runner move to the specified position	XJOG/YJOG	JOG motion Xaxis/Yaxis	Input signal	Action	start	<p>【On multi-axis mode】</p> <p>It actions only 1 block.</p> <p>When it exit,it waits for the next start.</p> <p>【on Positioning mode】</p> <p>Some set blocks are performed continuously</p>
Input signal	Action														
Inching start	Nut runner does inching action														
JOG start	The nut runner move to the specified position														
XJOG/YJOG	JOG motion Xaxis/Yaxis														
Input signal	Action														
start	<p>【On multi-axis mode】</p> <p>It actions only 1 block.</p> <p>When it exit,it waits for the next start.</p> <p>【on Positioning mode】</p> <p>Some set blocks are performed continuously</p>														
0	2	Start	<p>GSK/GKL will start the program execution at the rising edge of the start bit (start bit: 0⇒1).</p> <p>You also need to maintain the 1 at start bit during operation.</p> <p>If 1 become 0 to suspend, the automatic operation becomes a cycle stop state during the operation.</p>												
0	3	Inching start	<p>GSK/GKL will start the inching action at the rising edge of the inching start bit (inching start bit: 0⇒1).</p>												
0	4	Determination reset	<p>GSK/GKL will reset the determination result at the rising edge of the determination reset bit (determination reset bit: 0⇒1).</p> <p>Only when it receives the output signal of the program operation end (Total OK bit or Total NG bit : 0⇒1)GSK/GKL will accept this reset signal</p>												
0	5	Alarm reset	<p>GSK/GKL will reset the alarm condition at the rising edge of the Alarm reset bit (Alarm reset bit: 0⇒1).</p> <p>If successful Alarm reset (if driving preparation signal is ON) operation ready signal will return to ON.</p>												
0	6	QL signal	<p>QL signal is input at the rising edge of the i QL signal bit (QL signal bit: 0⇒1).</p>												
0	7	QL mode	<p>GSK/GKL Indicates whether to accept the QL signal。</p> <p>0: unavailable 1: Effectiveness</p> <p>This_signal_bit must become 1 when it does QL operation.</p>												

No.	Bit	Name	Matter
1	0-5	Program select 1 ~ Program select 6	This signal indicates the program number at the automatic operation. (The program number represented by a six-digit binary number data. (Program select 1→Bit0)) Program No. specify from among the up to the value of provisions.
1	6	Input ENABLE	It tells the program number acquisition time.
1	7	GSK reset GKL reset	GSK/GKL will reset to the start condition at the rising edge of the GSK/GKL reset bit (GSK/GKL reset bit: 0⇒1).
2	0-3	XJOG+ XJOG- YJOG+ YJOG-	【Only positioning mode】 GSK/GKL does the JOG operation each of the X-axis/Y-axis.
2	4-5	INX① INX②	【Only positioning mode】 This signal is used to hold the X-axis movement in automatic operation.
2	6-7	INY① INY②	【Only positioning mode】 This signal is used to hold the Y-axis movement in automatic operation.
3	0-1	Cylinder return end Cylinder motion end	【Only positioning mode】 This signal is used to check the vertical position of the nut runner.
3	2-3	X-axis return order Y-axis return order	【Only positioning mode】 Return the axis of the command to the specified position. When in operation such as automatic operation, it will begin to move after interrupting the operation.
3	4-5	WAIT① WAIT②	【Only positioning mode】 This signal is used when you temporarily suspend the execution of the program step.
3	6	SPW	【Only positioning mode】 This signal is used when moving in synchronization among multi-units.
3	7	JOG start	【Only positioning mode】 X-axis and Y- axis move to the specified position at the rising edge of the JOG start bit ( JOG start bit: 0⇒1).
4	0-7	Positon No.	【Only positioning mode】 This is a position No. of the destination when JOG start bit become one (The program number represented by a eight-digit binary number data.) This number specifies the range of 1 to 255.
5	0	IN	This signal is the input signal. GSK/GKL will hold a step execution until this signal becomes ON when this step has the attribute of "IN waiting". This signal is used in conjunction with the output signal "OUT".
5	7	Tightening angle sample start	It will start measuring the tightening angle at the rising edge of the tightening angle sample start bit (tightening angle sample start bit: 0⇒1).

## 4-2-2 Output signal

Output (“GSK/GKL”→“PLC”)

No.	Bit	Name	Matter
0	0	Completion of operation preparation	GSK/GKL will notify the PLC that it is possible operations 0: Incompletion of operation preparation GSK/GKL cannot operate. 1: Completion of operation preparation. It accepts the signal to perform an operation such as a start. ※It outputs 0 always in the following cases. •An alarm occurs at the GSK/GKL(interface or driver). •The input signal “operation ready” is 0
0	1	System OK	It will notify that GSK/GKL system is normal 0: Operation error (An alarm occurs at the GSK/GKL (interface or driver). 1: Operation normal
0	2	BatteryOK	0: Battery voltage drop(2.5V or less). Determined only when the control power supply is turned on. 1: battery normal
0	3-4	Total OK Total NG	It displays the result of automatic operation. •When automatic operation starts ,OK bit and NG bit are 0 •When all blocks on the selected program completes, OK bit or NG bit becomes 1. ※Sometimes Total NG change into Total OK by the QL processing ※OK and NG bits don't become 1 when the process stops on the selected program
0	5	Nut runner running	0: Motor is stopped. (Servo motors are tuned off on all axes.) 1: Motor is running.(Either axis is controlled with motor.)
0	6	Completion of QL processing	This signal becomes 1when you complete QL process.
0	7	During program execution	This signal indicates that the program of automatic operation is running. 1: running 0: stopped (program doesn't start or all blocks are completed. )
1	0-5	Program select OK 1 ~ Program select OK 6	To notify the number of the program that has been selected. (The program number represented by a six-digit binary number data (Program select OK 1→Bit0)).
1	6	Output ENABLE	0: Initial value 1: This signal become 1 when to input a program number complete and it lost signal at the falling edge of the input ENABLE bit
2	0-1	Tightening total OK Tightening total NG	<b>【on Multi-axis mode】</b> It's always 0. <b>【on positioning mode】</b> It displays the tightening result of automatic operation. •When automatic operation starts ,OK bit and NG bit are 0 •When all blocks on the selected program completes, OK bit or NG bit becomes 1.
2	2-3	Complete X-axis origin return Complete Y-axis origin return	0: Incomplete the return the origin position 1: Complete to return the origin position When this signal is 0 GSK/GKL cannot use the program operation and JOG start.
2	4-5	Zero point and magnification check OK	It notices zero point and magnification check result at the GSK/GKL driver. This OK signal is 1.: Zero point and magnification check is

		Zero point and magnification check NG	successful at all axes. This NG signal is 1 : there are zero point and magnification check NG axis one or more.
2	6	Cycle stop	This signal bit becomes 1 when the "cycle stop" occurred
2	7	OUT	OUT signal This signal is used in the synchronization with the PLC in automatic operation. • This signal is 0 at the start. • If the program of the command is the OUT attribute, it outputs 1 at the time of the command of the process completed. This signal is used in conjunction with the input signal "IN".
3	6	Block OK Block NG	GSK/GKL notify the tightening result each blocks. The signal is 0 at the start. Block OK ⇒ 1 : Program advanced to the final step in the unit and tightening in the block is correctly completed. Block NG ⇒ 1 : Program advanced to the final step and error occurred with either of tightening in the block ※ This signal doesn't change when X-axis/Y-axis complete the block.
4	0-5	Block end 1 ~ Block end 32	GSK/GKL notify the block number what the work is completed in the automatic operation. The block number represented by a six-digit binary number data (Block end 1 → Bit0). This signal is 0 at the automatic operation start.
4	6	Positioning mode boot in	【Only positioning mode】 0 : X-axis and Y-axis aren't used. 1 : X-axis or Y-axis alternatively both in operation.
5	0-7	Position No.1 ~ Position No.128	【Only positioning mode】 GSK/GKL notify the position number at present. The position is undecided when this signal is 0. The position number represented by a eight-digit binary number data (Position No.1 bit → Bit0).
6	0-1	X-axis within the range 1 X-axis within the range 2	【Only positioning mode】 It will turn ON when the X-axis is within a certain range. Range of coordinates is determined by the range output upper limit value of "X Jikuteikaku setting".
6	2-3	Y-axis within the range 1 Y-axis within the range 2	【Only positioning mode】 It will turn ON when the Y-axis is within a certain range. Range of coordinates is determined by the range output upper limit value of "Y Jikuteikaku setting".
6	4	Interference error	【Only positioning mode】 This signal will be 1 if it has occurred the interference between units.
6	5	Position error	【Only positioning mode】 This signal will be 1 when each axis has failed to move to the position specified by the position number.
6	6-7	Cylinder return Cylinder motion	【Only positioning mode】 This signal is located in order to lower the nut runner.
7 ~ 14	0-7 ~ 0-3	Bolt 1 OK ~ Bolt t60 OK	Those signals output which signals are bolt numbers at the tightening successful.
14	4	Result transfer in progress	Turns ON when transferring result data using FTP communication.
14	5	Unused	—
14	6	Protection warning	Please refer to the preventive maintenance section.
14	7	Life warning	Please refer to the preventive maintenance section.

### 4-3 Input & output signal map

Communication input (PLC ⇒ GSK/GKL)

NO.	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
0	Operation ready	Automatic/Manual	Start	Inching start	Determination reset	Alarm reset	QL signal	QL mode
1	Program select 1	Program select 2	Program select 3	Program select 4	Program select 5	Program select 6	Input ENABLE	GSK/GKL reset
2	XJOG+	XJOG-	YJOG+	YJOG-	INX①	INX②	INY①	INY②
3	Cylinder return end	Cylinder motion end	X-axis return order	Y-axis return order	WAIT①	WAIT②	SPW	JOG start
4	Positon No.1	Positon No.2	Positon No.4	Positon No.8	Positon No.16	Positon No.32	Positon No.64	Positon No.128
5	IN	—	—	—	—	Z JOG Up	Z JOG Down	Tightening angle sample start

Communication output (GSK/GKL ⇒ PLC)

NO.	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
0	Completion of operation preparation	System OK	Battery OK	Total OK	Total NG	Nut runner running	Completion of QL processing	During program execution
1	Program select OK 1	Program select OK 2	Program select OK 3	Program select OK 4	Program select OK 5	Program select OK 6	Output ENABLE	Complete Z-axis origin return
2	Tightening total OK	Tightening total NG	Complete X-axis origin return	Complete Y-axis origin return	Zero point and magnification check OK	Zero point and magnification check NG	Cycle stop	OUT
3	—	—	—	—	Z axis position 1	Z axis position 2	Block OK	Block NG
4	Block end 1	Block end 2	Block end 4	Block end 8	Block end 16	Block end 32	Positioning mode boot in	Z axis moving
5	Position No.1	Position No.2	Position No.4	Position No.8	Position No.16	Position No.32	Position No.64	Position No.128
6	X-axis within the range 1	X-axis within the range 2	Y-axis within the range 1	Y-axis within the range 2	Interference error	Position error	Cylinder motion	Cylinder return
7	Bolt 1 OK	Bolt 2 OK	Bolt 3 OK	Bolt 4 OK	Bolt 5 OK	Bolt 6 OK	Bolt 7 OK	Bolt 8 OK
8	Bolt 9 OK	Bolt10 OK	Bolt11 OK	Bolt12 OK	Bolt13 OK	Bolt14 OK	Bolt15 OK	Bolt16 OK
9	Bolt17 OK	Bolt18 OK	Bolt19 OK	Bolt20 OK	Bolt21 OK	Bolt22 OK	Bolt23 OK	Bolt24 OK
10	Bolt25 OK	Bolt26 OK	Bolt27 OK	Bolt28 OK	Bolt29 OK	Bolt30 OK	Bolt31 OK	Bolt32 OK
11	Bolt33 OK	Bolt34 OK	Bolt35 OK	Bolt36 OK	Bolt37 OK	Bolt38 OK	Bolt39 OK	Bolt40 OK
12	Bolt41 OK	Bolt42 OK	Bolt43 OK	Bolt44 OK	Bolt45 OK	Bolt46 OK	Bolt47 OK	Bolt48 OK
13	Bolt49 OK	Bolt50 OK	Bolt51 OK	Bolt52 OK	Bolt53 OK	Bolt54 OK	Bolt55 OK	Bolt56 OK
14	Bolt57 OK	Bolt58 OK	Bolt59 OK	Bolt60 OK	Result transfer in progress	—	Protection warning	Life warning

Each signal of No.7~No.4 output If you specify the unit 1 only

#### **4-4 Sequencerselected**

M-NET communication is standard communication which can connect between GSK/GKLIF and PLC.

But it can be connected with the sequencer in other communications by setting the expansion board.

GSK/GKLIF reads the ID according to the board in the time of power supply on and moves according to the respective communication, so there is no setting change in the communication.

※※※※Caution※※※※

Reading a different ID board, to carry out the switching is Ver 1721-143 or later.

There is also equipment with an exclusive program (DeviceNet=1722. CCLINK=1723) by equipment before that.

#### **4-4-1 Extender board setting method**

Please set the following expansion board to connector J2 at under GSK/GKLIF of cover.

Communication Method	model
M-NET	GSK-IF-N1/GKL-IF-N1
DeviceNet	GSK-IFFN-N1/GKL-IFDN-N1
CC-LINK	GSK-IFCC-N1/GKL-IFCC-N1
EtherNet I/P	GSK-IFET-N1/GKL-IFET-N1
PROFINET IO	GSK-IFPNIO-N1/GKL-IFPNIO-N1
PROFINET IRT	GSK-IFPNIRT-N1/GKL-IFPNIRT-N1

#### **Functional differences**

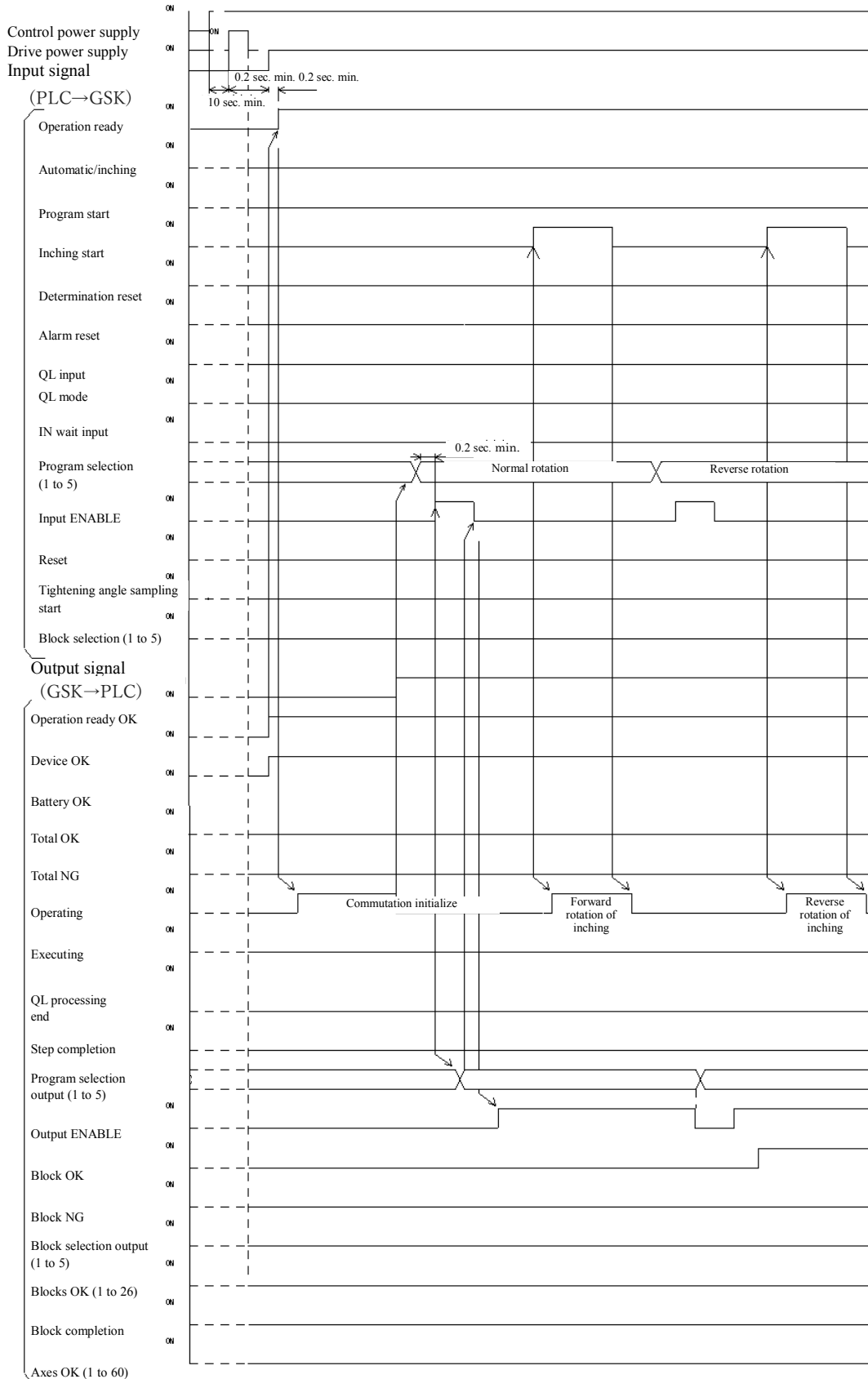
IO signal map does not change even changed communication method, but the functional has the following differences.

Communication method	Axis switching information	Tightening result notification
M-NET	N	N
DeviceNet	Y	Y
CC-LINK	Y	Y
EtherNet I/P	Y	Y
PROFINET IO	Y	Y
PROFINET IRT	Y	Y

## 5 Operation timing chart

### 5-1 Power ON and inching operation

(It will work at the speed and direction setting of rotation and inching that has been selected (1 to 24) by the program selection signal (1 to 5))

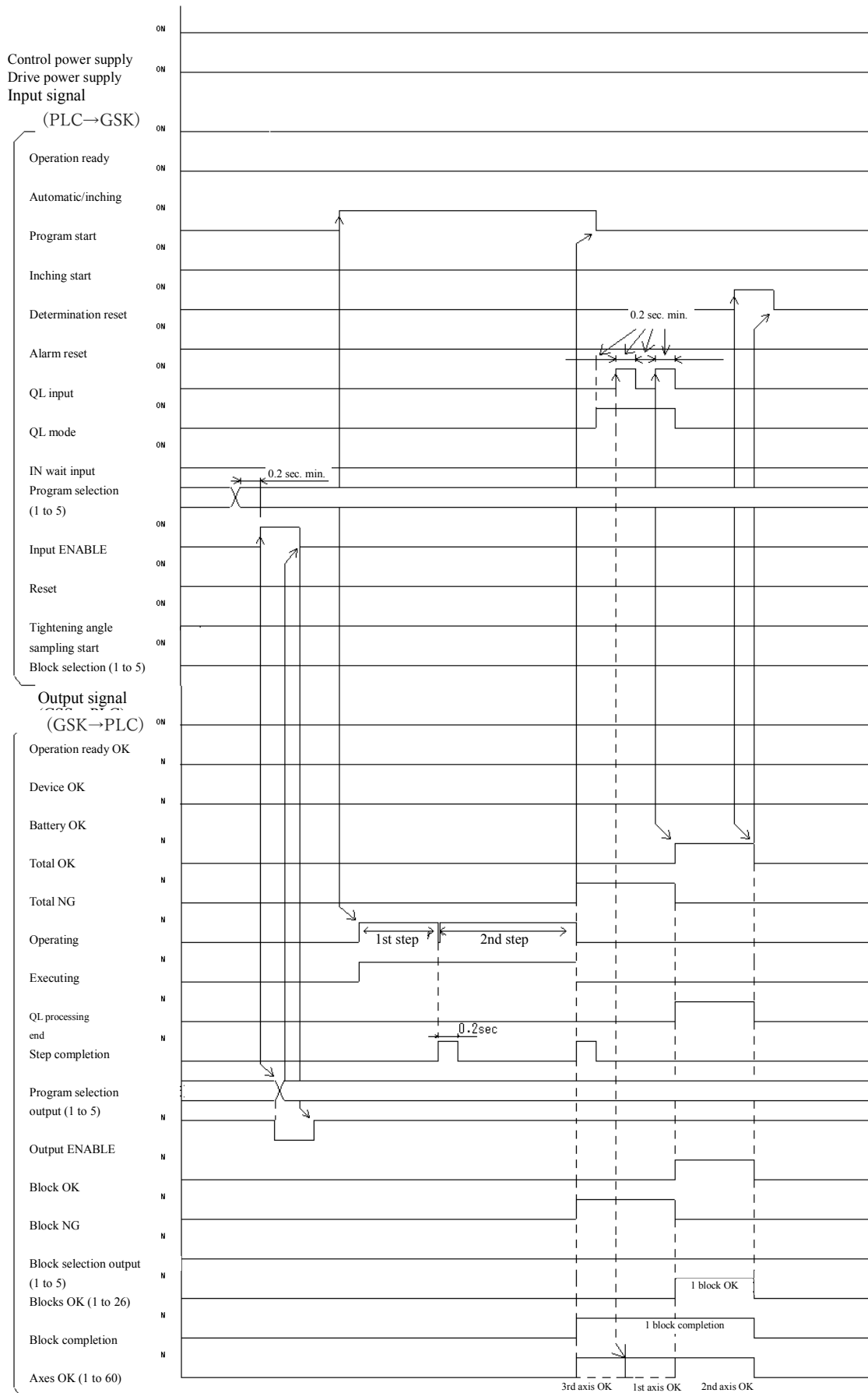






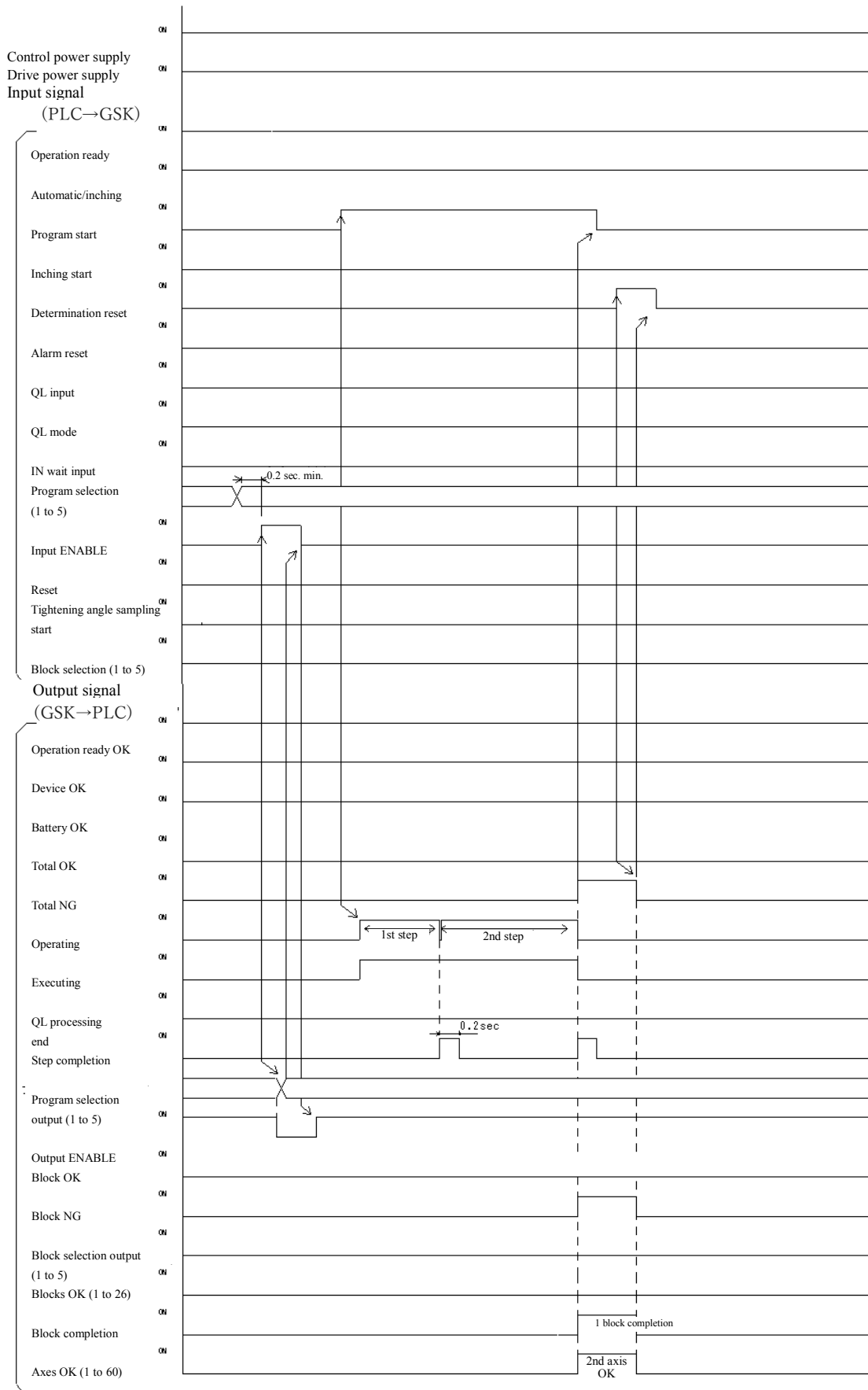
### 5-3 program operation -2 step operation ②

(When 1 block has settings of the 3 axis, first and second axis become NG at first step, third Axis is OK up to a two-step: there is QL process)



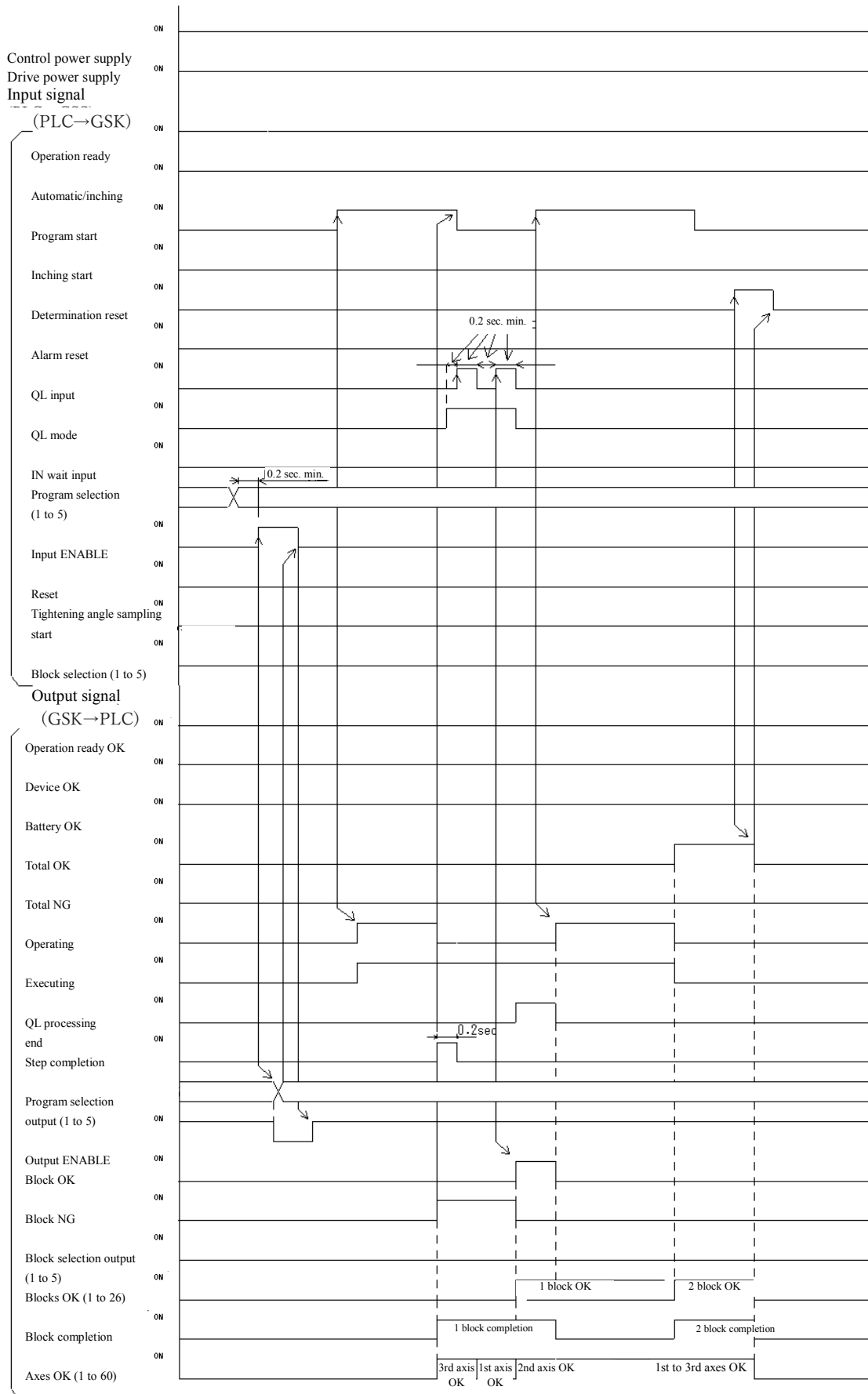
### 5-4 program operation -2 step operation③

(When 1 set block has the 2 axis, first axis become NG at first step, second axis is OK up to a two-step  
: QL process is nothing)



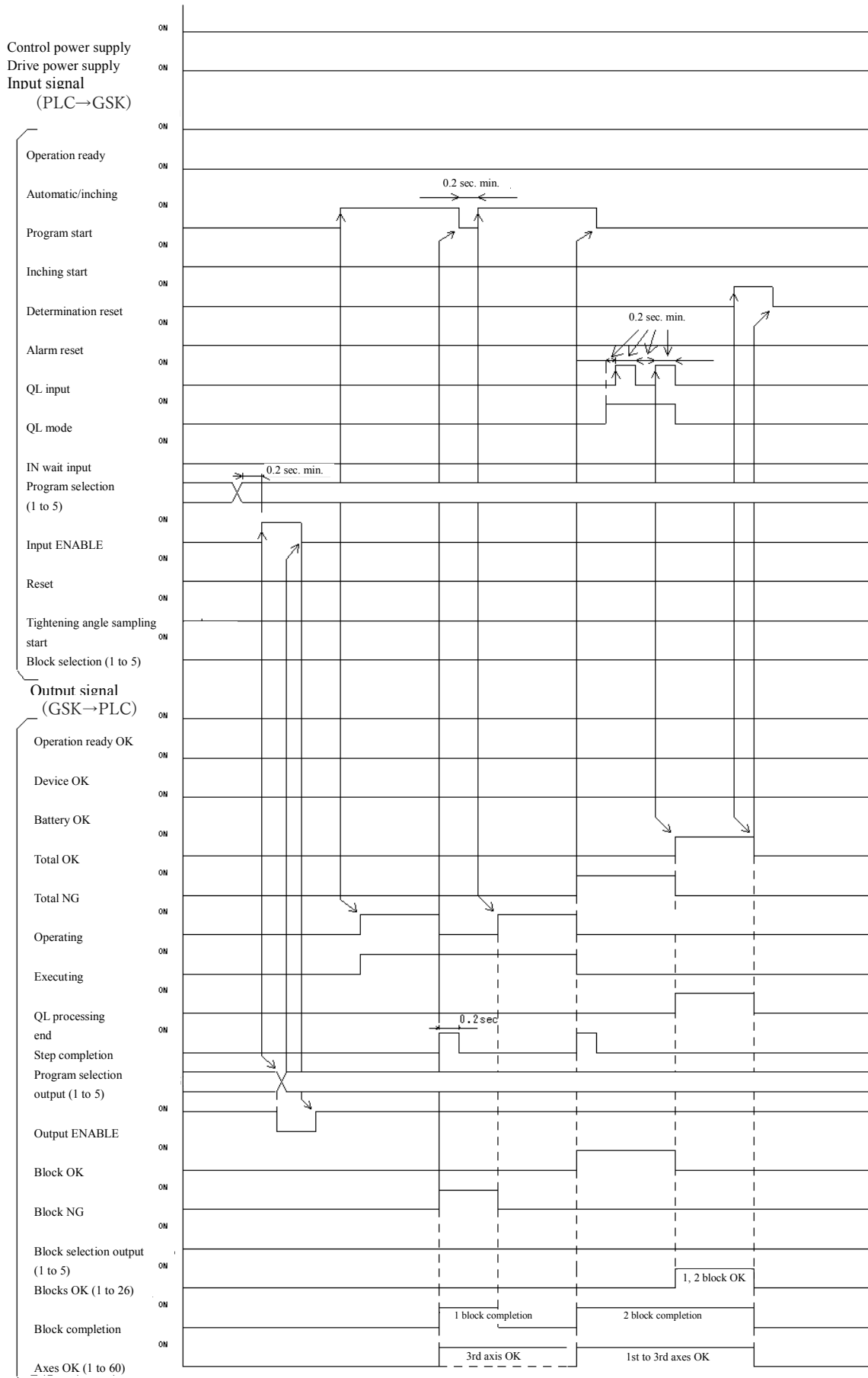
## 5-5 program operation -1step operation①

(2 block setting of, among the three axes, 1 and 2-axis is the first block NG, 3 Axis OK, 2 th block all axes OK : 1 block after QL)



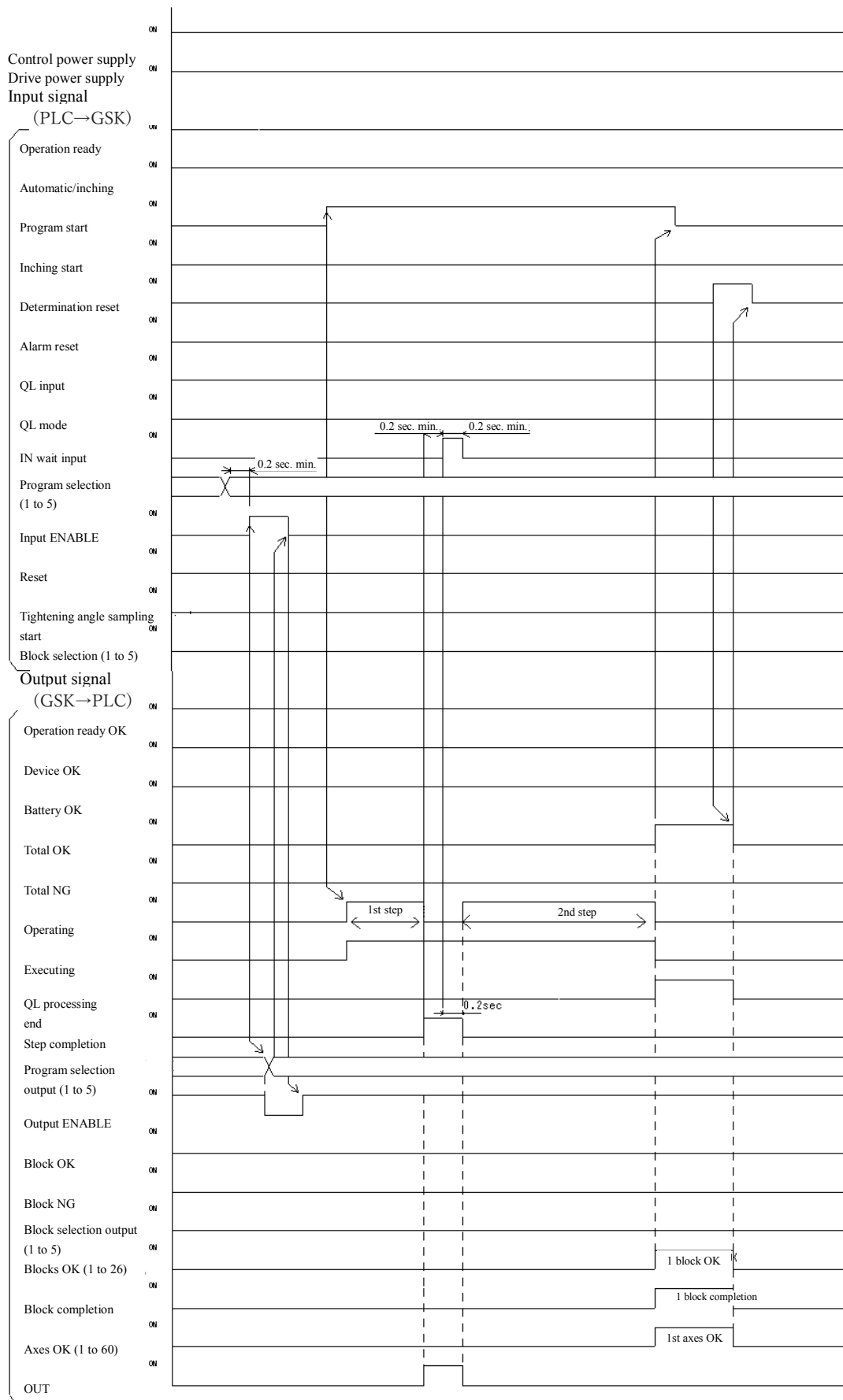
## 5-6 program operation -1step operation②

(2 block setting of, among the three axes, 1 and 2-axis is the first block NG, 3 Axis OK, 2 th block all axes OK: at the end of the program collectively QL)



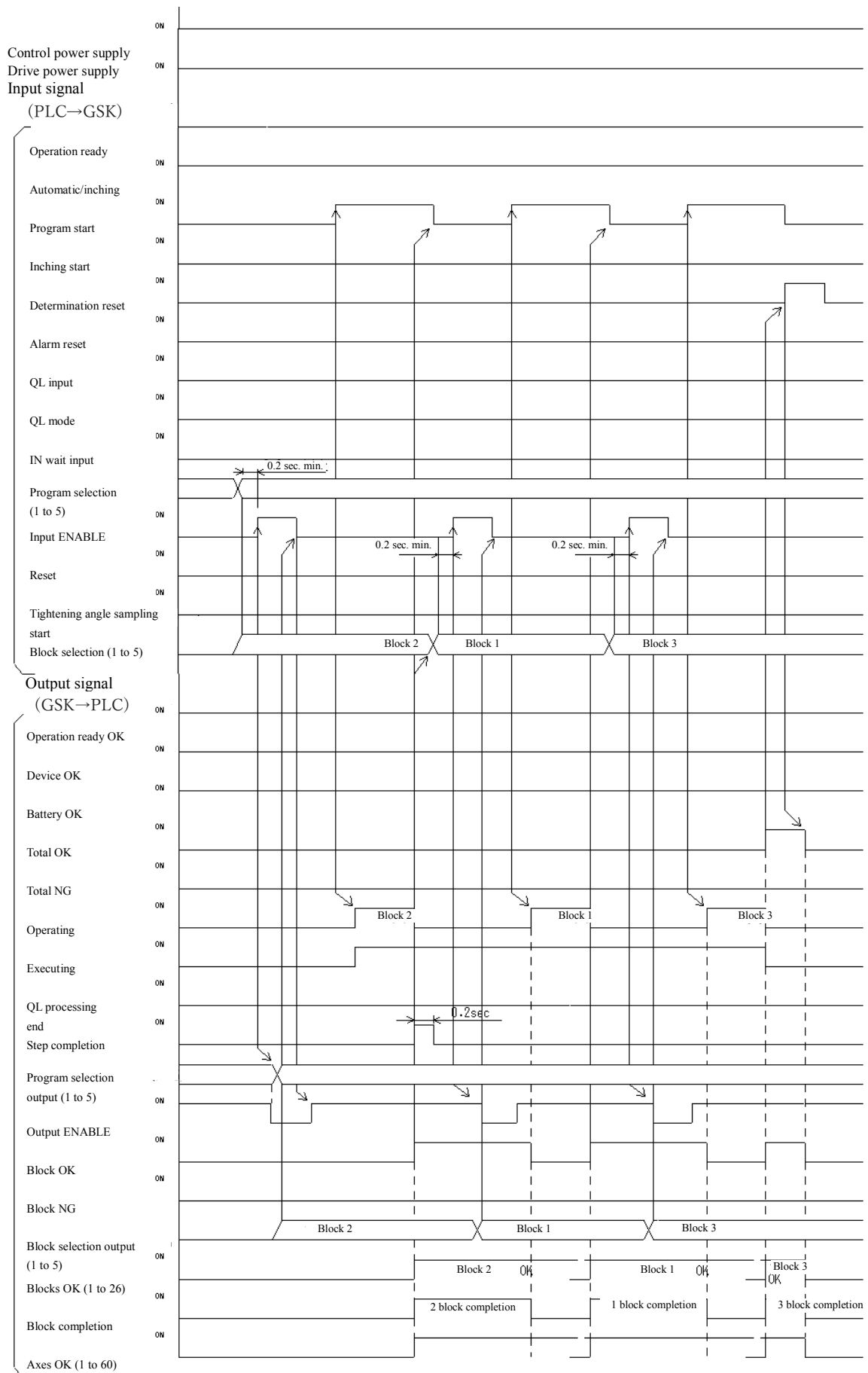
## 5-7 program operation --2 step operation④

(1 block, there is IN set ting to the second step)



## 5-8 program operation -1step operation③

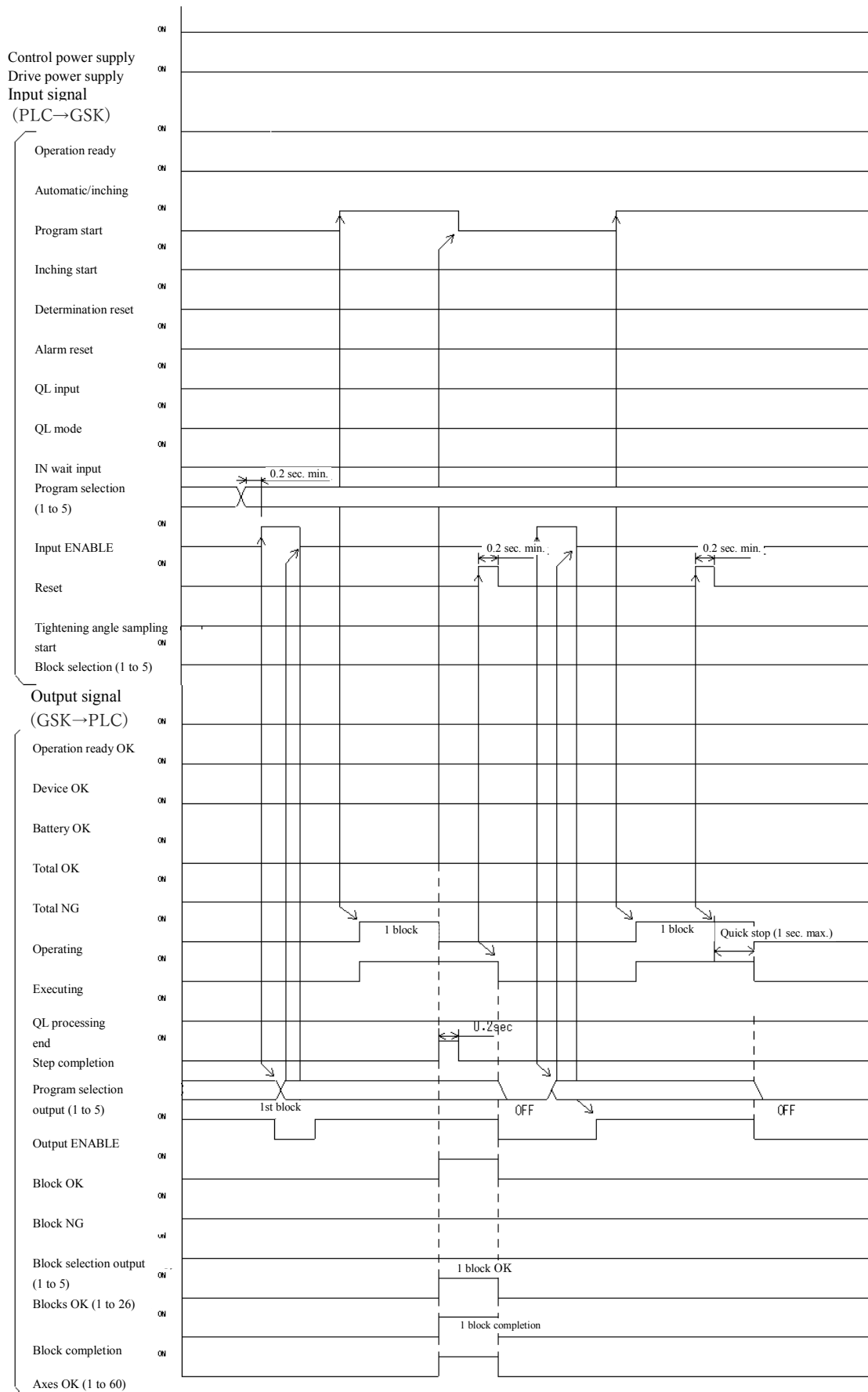
(3 blocks, if allowed to operate in the block order specified by the block selection signal: When the block select 1 to 5 are all OFF will operate from the block 1 in the order)



## 5-9 Interruption of program operation (reset)

(And if one block after the end of reset in one step × 2 blocks operation is turned ON

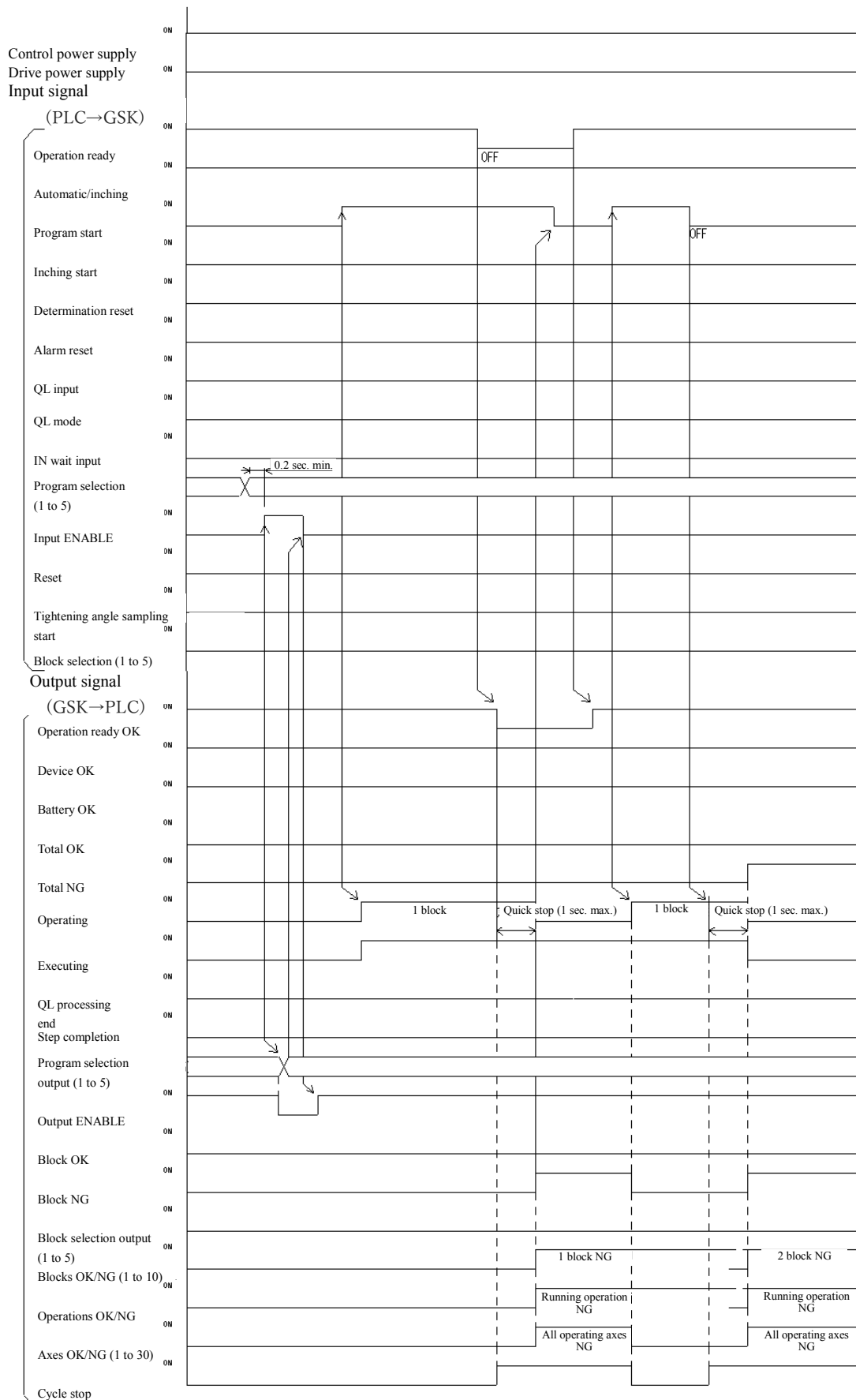
If it became a reset or ON in the first block of the operation)





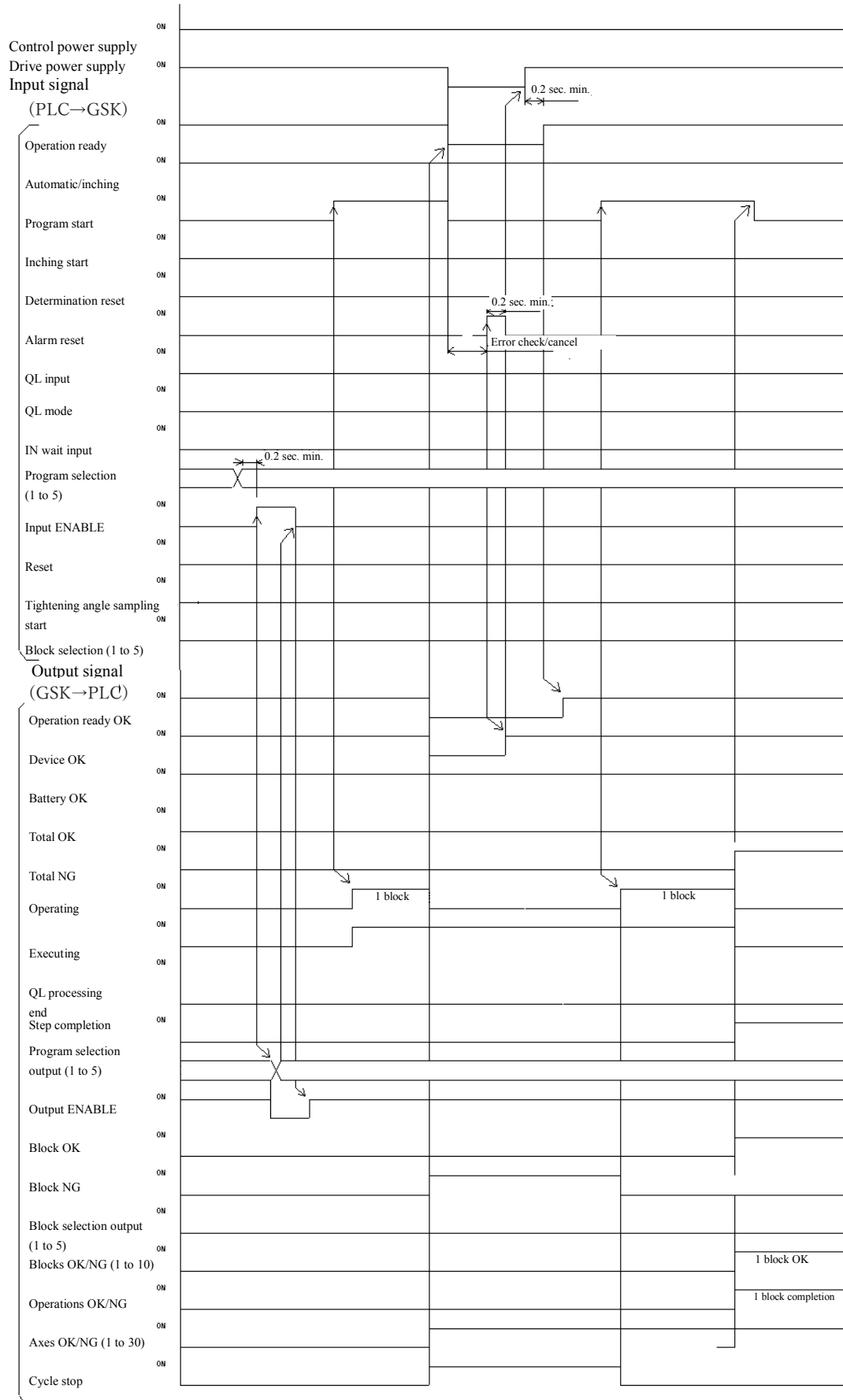
## 5-10 Operation preparation OFF and program start OFF in the program operation

(At the 1 step × 2 blocks program , “Operation preparation OFF” occur in the first block and “program start off” occur the 2nd block.)



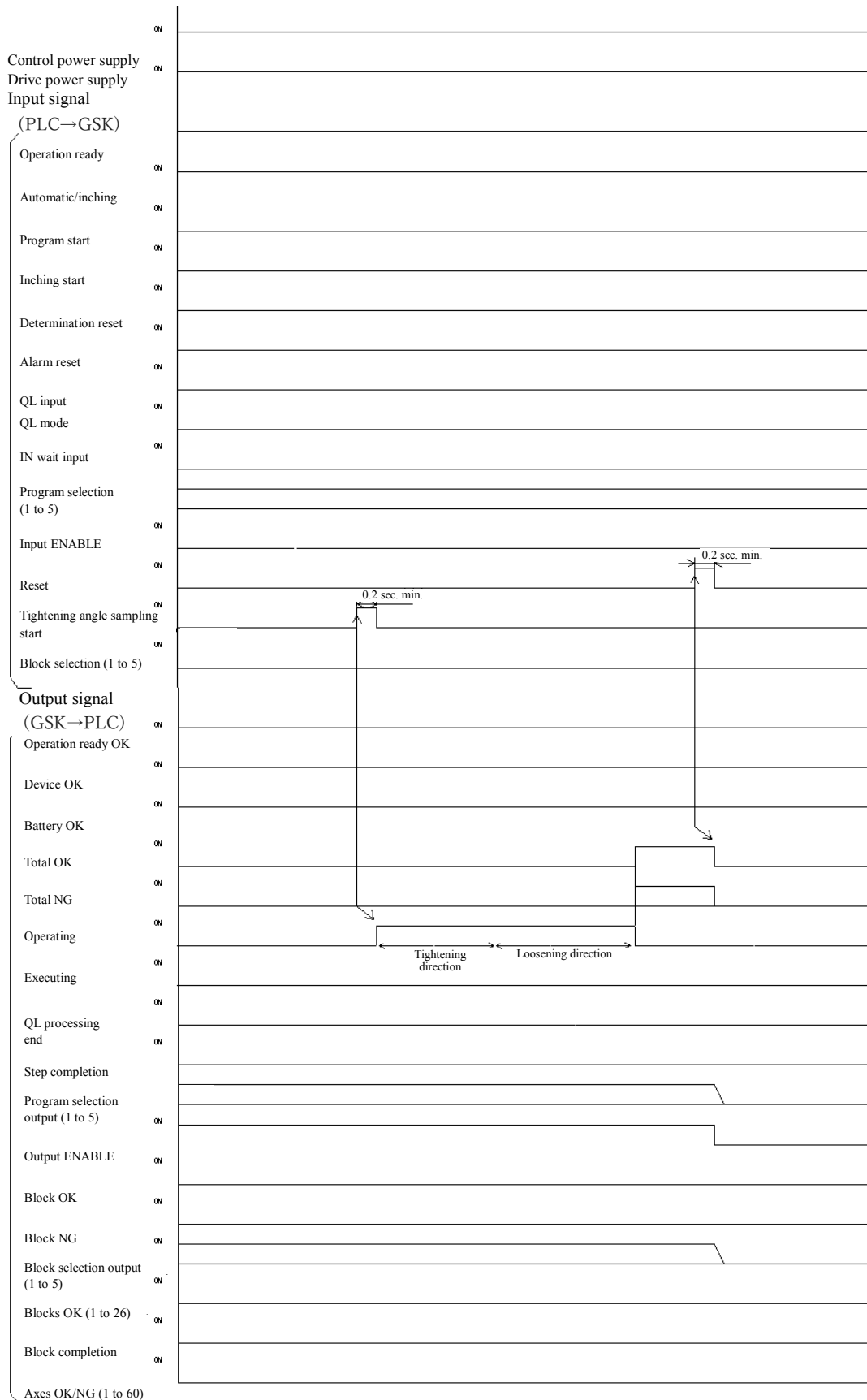
## 5-11 Alarm and alarm reset in the program operation

(At the 1 step × 2 blocks program, the alarm occurs in the middle of first block, if that was allowed to restart after the alarm reset)



## 5-12 Tightening angle sampling operation

(It will start the operation at the tightening angle sampling start signal turn ON in the state of Completion of operation preparation.)



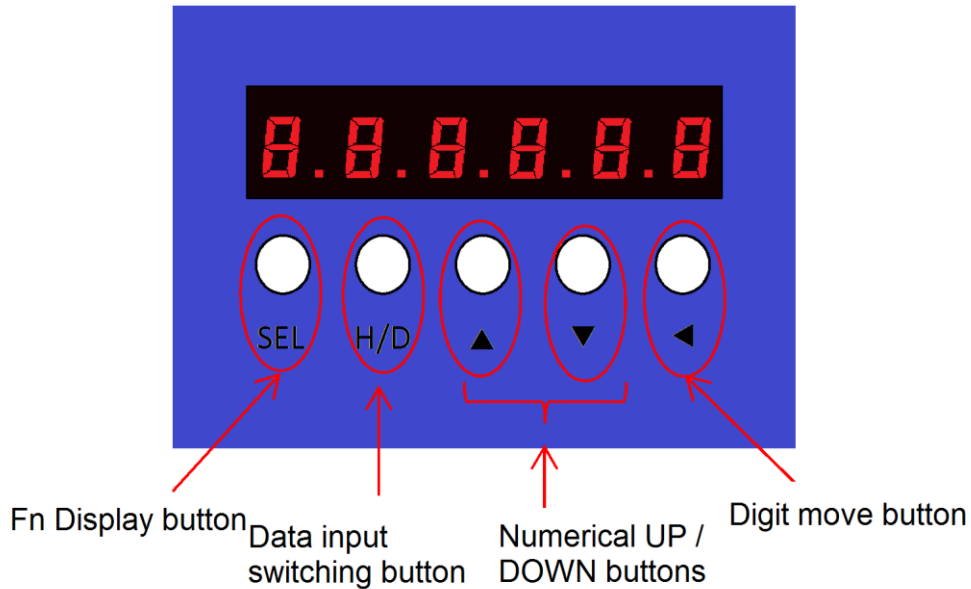
## 6 Setting

### 6-1 Display / setting function

It will display the each kinds fata, parameters and condition by the 7SEG.LED 6-digit.

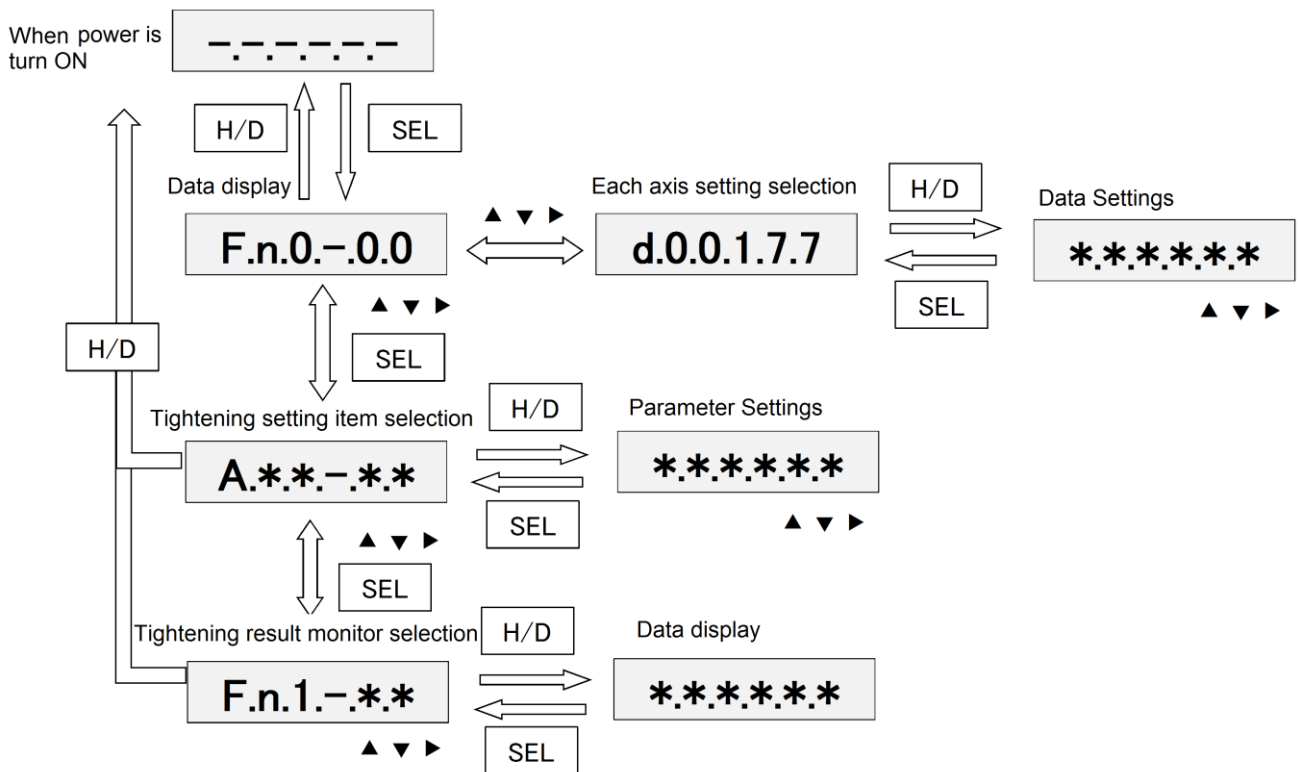
You can change the settings in the push-button operation.

#### 6-1-1 View of the display unit



7SEG Display	Matter												
<p>2-axis side    1-axis side</p>	<p>When the program unselected</p> <p>State from 1 to 3 digit 1 axis side State from 4 to 6 digit 2 axis side</p>												
	<p>When the servo OFF</p>												
<p>: Operation Number</p>	<p>When the servo ON</p> <p>Under 1 digit operation number</p> <table border="0"> <tr> <td>1 : SOC.T</td> <td>7 : Stop</td> </tr> <tr> <td>2 : PRE.T</td> <td>8 : Angle measurement tightening</td> </tr> <tr> <td>3 : REV.T</td> <td>C : PRE.T end synchronization</td> </tr> <tr> <td>4 : REA.T</td> <td>E : REA.T end synchronization</td> </tr> <tr> <td>5 : Inching</td> <td></td> </tr> <tr> <td>6 : Zero times check</td> <td></td> </tr> </table>	1 : SOC.T	7 : Stop	2 : PRE.T	8 : Angle measurement tightening	3 : REV.T	C : PRE.T end synchronization	4 : REA.T	E : REA.T end synchronization	5 : Inching		6 : Zero times check	
1 : SOC.T	7 : Stop												
2 : PRE.T	8 : Angle measurement tightening												
3 : REV.T	C : PRE.T end synchronization												
4 : REA.T	E : REA.T end synchronization												
5 : Inching													
6 : Zero times check													
<p>: Alarm code</p>	<p>Alarm “ * * ” occurs</p> <p>The last two digits are the alarm code .</p>												

## 6-1-2 Operation the display unit



### ※important※

GSK/GKL driver you need to set the the axis number (1 to 30 decimal) in order to identify each axis.

If you use the driver in two or more axes, please set the axis number in the following way by operating the panel.

In the case of Axis 1: You set the axis number to d00177 and write the number data.

(1-axis type of driver the same)

In the case of Axis 2: You set the axis number to d10177 and write the number data.

Please set so as not to overlap with the axis number of the driver.

If you use the two-axis type of driver, and you don't connect the motor, please set the axis number to 0

(not used).






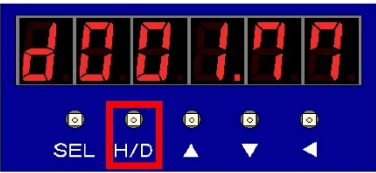
### 6-1-3 Setting example

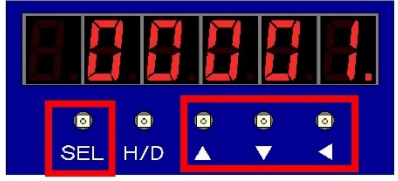

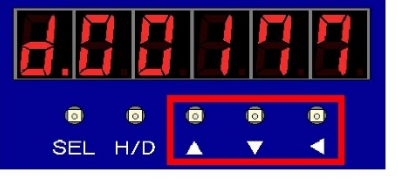
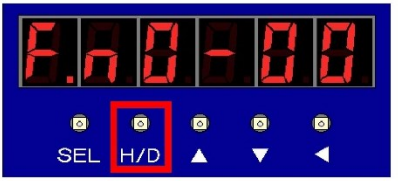
For GSK/GKL · GSKW/GKLW, each parameter can be changed by using the bottom button of 7 SEG display part. Here, we will explain the setting of representative parameters using 7 SEG display by using several examples. For the setting place etc. of each parameter, please refer to paragraph 7.

### 6-1-4 Procedure for setting axis number

When assembling equipment with GSK/GKL, you have to recognize each axis to number of each axis's own number.

Here, the setting procedure is shown below.

StepNo.	Image	Description
1		The screen on the left is the normal screen. Please press the SEL button to change the parameter.
2		When you press the SEL button in step 1, you will see the screen on the left. A digit with a blinking dot can become operable by ▲, ▼ buttons. Please move the dot position to F by pressing the most right button.
3		Dot came at F. In this state, press ▲ or ▼ to select the function you want to set or monitor. For the item, please refer to 7-1. It will take an axis setting as an example this time. Please select d for that. Please change F to d with ▲ or ▼.
4		You complete the selection d on the left screen. Please change the displayed value to "d00177" to change the address. When setting the second axis using the W type controller, please set the display value to "d10177".
5		The screen on the left is the screen where you enter the address. Change the numerical value with ▲ and ▼ buttons, and when you complete, you move to the next digit with the left direction button.
6		You finished entering the address "d00177". Press the H / D button to display the setting in the address.

7		<p>Enter the axis number.</p> <p>Use the left button to change the number of digits and change the numerical value with ▲ or ▼ buttons.</p> <p>When setting of the axis number is completed, please push the SEL button.</p> <p>You will return to the address setting screen.</p>
8		<p>Save the installed axis number.</p> <p>When you press and hold the left triangle button for about 2 seconds on the address setting screen, the screen of 7-SEG flashes twice.</p> <p>After this blinking is completed, the set data is saved.</p>
9		<p>When saving of data is completed, it returns to the operation screen from the parameter setting screen.</p> <p>Please move the position of the dot to d with the left button and set it to F with the ▲ or ▼ button.</p>
10		<p>When the leftmost 7-SEG becomes F, the screen on the left is displayed.</p> <p>Press the H / D button to return to the operation screen.</p> <p>At this time, if the number of Fn is other than "Fn 0 - 00", please note that even if you press the H / D button you can not return.</p>

※Please set so that controller axis numbers do not overlap.

### 6-1-5 Procedure to erase the 7 segment display of W type unused axis

There are circumstances such as using only one axis when using W type.

If you don't set the axis number, you can use W type as it is.

However, 7 SEG on the unused axis continues to discharge the sensor unconnected alarm.

(In this case, you can ignore the alarm and tighten the screw.)

Here is the procedure for setting to erase the indication of the unused axis which discharges the alarm.

StepNo.	Image	Description
1		We change the parameters to erase the second axis display of GSKW. Please press the "SEL" button to open the function screen.
2		It moves from function screen to driver data change screen. Please move to "d00000" to use "△", "▽", "◀" buttons. "." is the selected digit. You can move to the target screen by pressing "▽" twice in accordance with "F".
3		The driver data screen is now displayed. Please change the display to "d10181" using the "△", "▽", "◀" buttons.
4		The display becomes "d10181". This shows the parameter address for ON / OFF of the second axis display in the GSKW controller. Please press the "H / D" button to display the data inside the address.
5		"D10181" data was displayed. In this example, turn off the display on the 2nd axis side, so press the "△" button once to set it to "00001".
6		It was changed to "00001". Please press "SEL" button to return to the address setting screen.
7		When it comes to the display on the left figure, it returns to the address setting screen. Please hold "◀" for 2 seconds. When the blinking is completed, the previous change is saved. Please temporarily turn off the control power supply of this driver and turn on the power again.
8		After turning on the power again, if the right three digits are displayed as shown in the left figure, the parameter rewriting is successful.

※This setting procedure is available only after GSK/GKL version "1851-2.18".

Please note that the display on the 2 axes side will not disappear even if this setting is made in earlier versions.





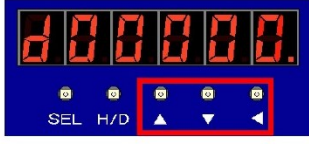




### 6-1-6 Procedure of changed tightening sampling stop torque

It setting When you set the tightening method from the PC,  
there is a sampling setting as a method for making that setting.

Here, we show how to set the target torque of the sampling operation to automatically collect  
the tightening information with the setting method.

(The tightening sampling stop torque has an initial value of 0.

For that reason, sampling setting can not be used unless that it sets the torque by this procedure.)

工程No.	Image	説明
1		It sets the tightening sampling stop torque which is necessary for the sampling setting of the auto setting. Please press the "SEL" button to open the function screen.
2		It moves from function screen to driver data change screen. Please move to "d00000" to use "△", "▽", "◀" buttons . "." is the selected digit. You can move to the target screen by pressing "▽" twice in accordance with "F".
3		The driver data screen is now displayed. Please change the display to "d00174" using the "△", "▽", "◀" buttons.
4		The display becomes "d00174" now. This shows the tightening sampling stop torque for each axis of GSK. Please press the "H / D" button to display the data inside the address.
5		"d00174" data will be displayed. Please enter the torque you want to set here in units of [Nm]. For this example, please change it to "00010" to set 10 [Nm].
6		It was changed to "00010". Please press "SEL" button to return to the address setting screen.
7		When it comes to the display on the left figure, it returns to the address setting screen. Please hold "◀" for 2 seconds. When the blinking is completed, the previous change is saved. You turn on the power again, after it turns off the control power of this driver once. Since then, please start sampling setup.

## 6-2 Program

Unit numbr(MAX : 7)

Program step

Axis number(MAX : 30)

STEP	IN	OUT	PRINT	Unit : 1			Unit : 1			Unit : N		
				NR: AXIS 1			NR: AXIS 1			NR: AXIS N		
				ZERO	SYNC					ZERO	SYNC	
					S	E					S	E
1				RATE : 1	REV .T1							
2				BLOCK : 1	REA .T1							
3				SCREW : 1	END							
4				RATE : 1	REV .T1							
5				BLOCK : 1	REA .T1							
6				SCREW : 2	END							
7												
8												
9												
10												
11												
.												
.												
220												

Unit : 1			
NR: AXIS 1			
		ZERO	SYNC
			S E
※2	RATE : 1	※1	REV.T1
	BLOCK : 1		REA.T1
	SCREW : 1		END
	RATE : 1		REV.T1
	BLOCK : 2		REA.T1
	SCREW : 2		END

※1: The established movement content in the block of ※2

※2: You will set the following items by the "Tightening block operation select" in the "PROGRAM SET"

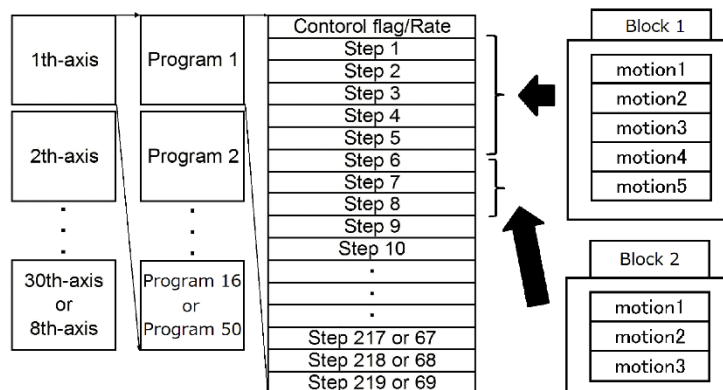
Rate : Rated setting of the nut runner to be used

Block: Operation content which is set by the block control  
You will set the contents of the block from the tightening parameter settings for the following.

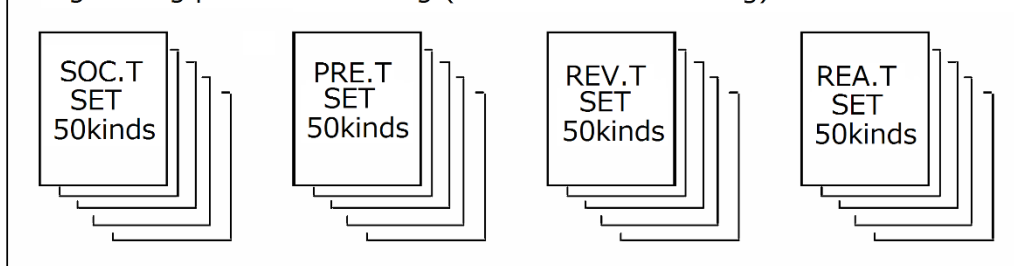
Screw: This represents the screw number of the tightening target.

### User program data structure

Programrate	Number of axes	Number of programs	Number of blocks	Number of steps
1	30	16	256	220
2	30	50	256	70
3	8	50	256	220



Tightening parameter setting (Use the motion setting)



## 7 Setting function details

### 7-1 Fn. \*\* Display setting function list

It can set internal data and modify and monitor at the panel surface of the GSK/GKL controller.

Select data	Matter of display data	Remarks
Fn0-00	status of 2-axis motion	Special display
Fn 0-01	I / O status	Display in the code the state of the DI and DO
Fn 0-02	Product Model	"021.0xx" xx is No. N upper two digits
Fn 0-03	Firm-ware program number	—
Fn 0-04	Firm-ware version number	—
Fn 0-05	At the time, minutes, and seconds	It displays the current time
Fn 0-06	date	It displays the date
Fn 1-00~42	The first axis of the screw tightening result monitor	—
Fn 2-00~42	The second axis of the screw tightening result monitor	—
Fn 3-00~19	M-Net input / output monitor	—
Fn 4-00~01	Printer output settings	(Note 1)
Fn 5-01~30	Setting the unit number	(Note 1)
Fn 6-00~19	Setting of the I / F parameter	(Note 1)
Fn 7-00~03	Setting the ID controller	(Note 1)
Axx-yy	Parameter of the "SOC.T" operation	xx < 50 , yy < 16: (Note 1)
Lxx-yy	Parameter of the "PRET" operation	xx < 50 , yy < 32: (Note 1)
Gxx-yy	Parameter of the "REV.T" operation	xx < 50 , yy < 16: (Note 1)
Hxx-yy	Parameter of the "REA.T" operation	xx < 50 , yy < 48: (Note 1)
Uxx-yy	Parameter of the "RATE" operation	xx < 30 , yy < 10: (Note 1)
Xxx-yy	Parameter of the "X-axis RATE" operation	xx < 30, yy < 16: (Note 1)
Yxx-yy	Parameter of the "Y-axis RATE" operation	xx < 30, yy < 16: (Note 1)
Pu.xxx.y	XY position movement point coordinates	u:1~4, xxx < 288, y < 2 (Note 2)
d0xxxx	Any data monitor of the 1th-axis	3 < xxxx ≤ 200: Can be changed (Note 3)
d1xxxx	Any data monitor of the 2th-axis	3 < xxxx ≤ 200: Can be changed (Note 3)
r0xxxx	The 1th axis of history data monitor	Address of FRAM , Data of 0xxxxh
r1xxxx	The 2th axis of history data monitor	Address of FRAM , Data of 1xxxxh

※ Note 1: When the data selection mode, the data sent to the controller in the long press "←".

※ Note 2: u is the unit number, xxx is point number, X coordinate in the y = 0, Y coordinate in the y = 1.

xxx > = 255 data limit coordinate data

※ Note 3: At time of data selection mode, it save the data of xxxx < 200 in the long press of the "←"

Setting the axis number (d0xxxx)

GSK/GKL driver you need to set the the axis number (1 to 30 decimal) in order to identify each axis.

Please set the following parameters to manipulate the case of a two-axis for the driver panel.

In the case of Axis 1: Write to set the axis number to d00177. (Same as 1-axis type driver)

In the case of Axis 2: Write to set the axis number to d10177.

Please set so as not to overlap with the driver axis number.

Please set the axis number to 0 (not used) or, if you do not want to connect the motor in the two-axis type of driver.

**7-2 (d-00\*\*\*, d-10\*\*\*)Each-axis setting, driver parameter setting**

Address	Name	Matter	unit
036	Speed limit	This sets the maximum value of the rotational speed.	rpm
064	method of return to origin	0: If you are detected using the LSW and the sensor 1: butting formula	—
065	Set position data after the return to origin	Abutment formula: return amount homing (LSW formula: set position after homing)	—
066	Homing start direction	Starting rotary direction of homing operation 0: positive direction 1: negative direction	—
068	Homing speed	Speed to start the homing	rpm
069	Creep rate	Origin detection rate	rpm
070	Collision time	Butting time in the origin detection of abutment type	msec
071	Collision torque	Butting torque in the origin detection of abutment type Please set as a percentage of the motor rated current	%
084	ID of the monitor 1	Data of the set ID is converted into an analog signal that it 's outputted from the M1 terminal.	—
085	Scale of the monitor 1	Output scaling of the monitor 1	—
086	ID of the monitor 2	Data of the set ID is converted into an analog signal that it 's outputted from the M2 terminal.	—
087	Scale of the monitor 2	Output scaling of the monitor 2	—
104	Detection current of overload alarm	The alarm becomes overloaded when the average value of the motor current exceeds the set value. Setting value is set as a percentage of the motor rated current.	%
105	Detection rate of Acceleration alarm	The number of revolutions of the motor	rpm
112	Origin return overtime	Set the cycle timeout time during origin return.	msec
140	Sensor type	GSK(W)-OO-E-N2: 2 GSK(W)-OO-E1-N2: 2 GSK(W)-OO-E2-N2: 2 GSK(W)-OO-R-N2: 8 GSK(W)-OO-E-P2: 6 GSK(W)-OO-E-P3: 7 GKL(W)-OO-E-N2: 2	—
141	Sensor resolution	GSK(W)-OO-E-N2: 256 GSK(W)-OO-E1-N2: 1024 GSK(W)-OO-E2-N2: 2048 GSK(W)-OO-R-N2: 8192 GSK(W)-OO-E-P2: 16384 GSK(W)-OO-E-P3: 16384 GKL(W)-OO-E-N2: 256	—

Address	Name	Matter	unit
142	Sensor resolution magnification	GSK(W)-OO-E-N2: 4 GSK(W)-OO-E1-N2: 4 GSK(W)-OO-E2-N2: 4 GSK(W)-OO-R-N2: 1 GSK(W)-OO-E-P2: 4 GSK(W)-OO-E-P3: 4 GKL(W)-OO-E-N2: 4	—
142	Magnification of the sensor resolution	It sets the resolution magnification of the sensor. NR, positioning encoder, positioning resolver: 4	—
160	Gear abnormality determination count (continuous)	When the gear failure is detected, it will set the number of times determined to the alarm.	—
161	Gear abnormality determination count (cumulative)	It sets the resolution of the sensor NR: 256, Positioning resolver: 8192 Positioning encoder: 16384 NR2: 1024	—
163	Temporary tightening torque-free monitoring time	This sets the torque-free monitoring time of the pre-tightening.	msec
165	Minimum gradient determination value	It is judged to be abnormal when the gradient is less than the value obtained by multiplying the value of -1 to be set here. Here you set the rapid torque change rate that it is generated by a bolt breakage at the time of this tightening end.	% %
166	Bolt fracture criterion value		
168	Polarity of tightening waveform	This reverses the output polarity of the entire waveform by selecting 1. ※ Please use when you select a left rotation	—
169	Torque-free monitoring time	This sets the torque-free monitoring time in the case of the operation other than the real tightening or pre-tightening.	msec
170	Zero times check wait time	This sets the waiting time until the beginning the acceptance of the torque signal from the output of the zero-magnification check signal.	msec
174	Seating detection torque	This sets the torque value of the starting point, when it starts the measurement at the tightening angle measurement operation.	Nm
177	Axis number	You enter the axis number of each corresponding to the driver. ※Please set immediately after the driver mounting when installing the driver.	—
178	Axis type	You are the axis of the driver nut runner - or for use as, sets whether to use as a positioning motor. 1: Nutrunner 2:X-axis motor 3: Y-axis motor ※ Please set immediately after the same driver installation and axis number. It can be set in the PC configuration software unlike the axis number.	—
179	Socket torque limit	You set the current limit at the time of the socket Remove operations (inching operation) in what percentage of the rated current of the motor	%
1003	Angle sensor current position	Displays the current position of the motor's angle sensor.	—

※ Important items

- 177      ... You will need the settings when you install the driver to the equipment.  
Be sure to set this when installing the drivers to exchange and new.

### 7-3 Socket-fittings setting

It is the setting for performing screw tightening before the preparation operation. (Numbers 1 to 50)

Bolt picked up, it performs a gear check, fitting, etc., and then to state that can be screw-tightening.

Number is the number of the case to be set from GSK/GKL driver panel (Axx-yy)

Number (yy)	Matter	increments
No.00	Rotation angle To set the rotation end angle.	1 degree
No.01	Speed Setting the rotation speed.	1rpm
No.02	Rotate / inching direction, fitting, gear check 00 * □  L -----Rotation / inching direction specified              0: rotation to the tightening direction              1: Rotation Loosen the direction + --- Torque judgment / fitting / gear check 0: No torque judgment 1: One-shot reversal 2: Fitting 3: Gear Check	—
No.03	Detection torque During the rotation, it reaches the set value, and exit the rotation. If you do not reach even beyond the cut angle will be the "fitting angle over".	0.1Nm
No.04	Before time From rotating operation start, after a set time, we actually begin to operate.	1msec
No.05	Over time When "setting time" elapsed from the rotation start, it completes the operation if in operation. (Not including before time)	1sec
No.06 ~ No.15	Unused	—

## 7-4 Pre-tightenings setting

Rotating at high speed until the seating position is set for moving the screw. (Numbers 1 to 50)

Number is the number of the case to be set from GSK/GKL driver panel (Lxx-yy)

★ : This is a GSK-only setting. Set to 0 since it is not used in GKL.

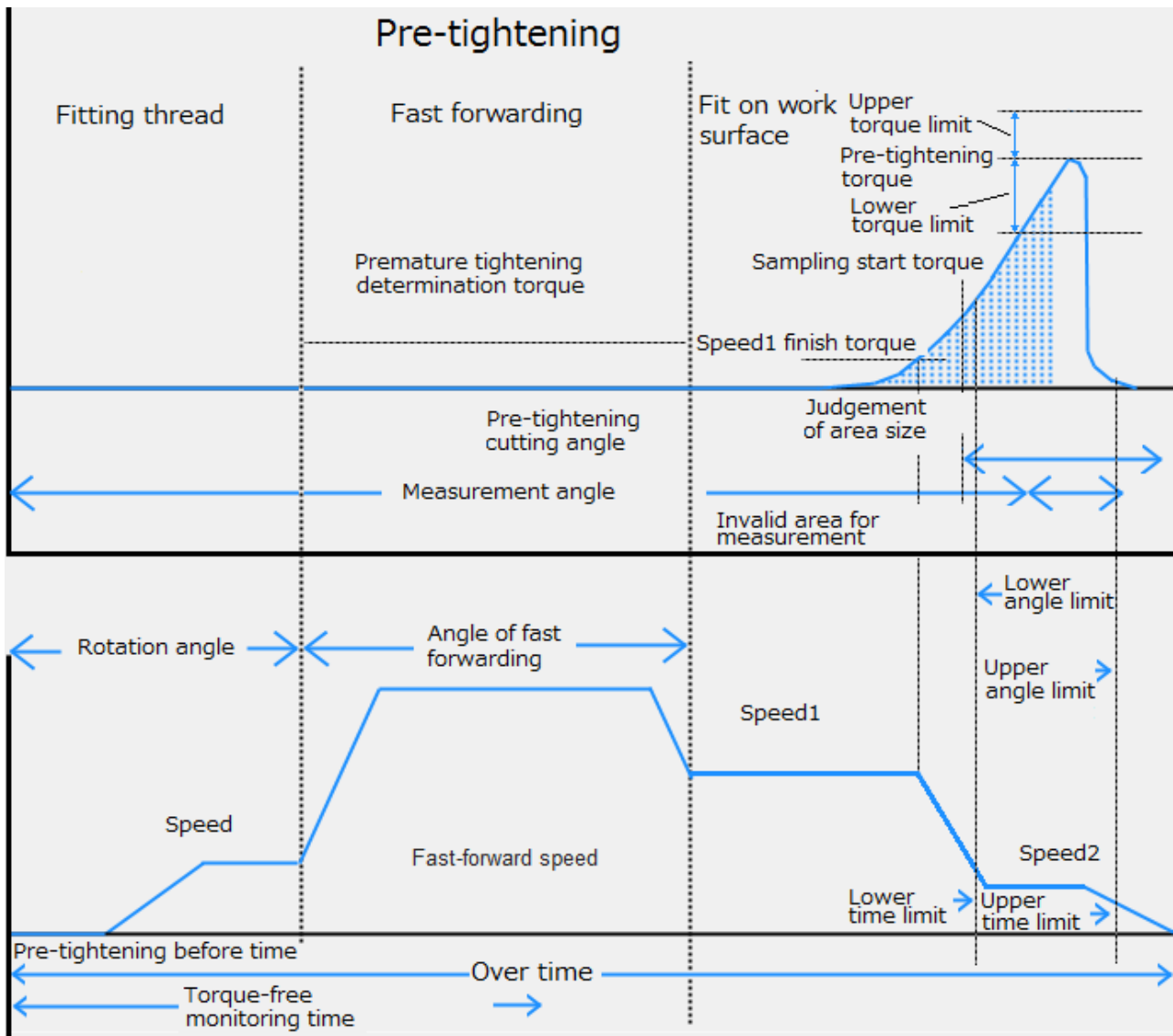
☆ : This is a GKL-only setting. Set to 0 since it is not used in GSK.

Number (yy)	Matter	increments	
No.00	Rotation angle It sets the angle to rotate at the screw adjustment speed.	1 degree	
No.01	Screw adjustment speed It sets the rotation speed while turning at rotation angle.	1rpm	
No.02	Fast-forward angle It sets the rotation angle at the Fast-forward speed.	1 degree	
No.03	Fast-forward speed It sets the rotation speed during the fast forward.	01rpm	
No.04	Closed fast decision torque If this torque is reached between the start and the end of the fast-forward angle, the fast-tightening judgment becomes invalid.	0.1Nm	
No.05	Pre-tightening torque It is the target torque of the pre-tightening.	0.1Nm	
No.06	Torque upper limit	If you have not entered torque value is in the range at the time of arrest, it will be "Pre-tightening torque over" "Pre-tightening torque under".	0.1Nm
No.07	Torque lower limit		0.1Nm
No.08	End torque of 1th speed (upper byte) This torque switches to the 2th speed.	0.1Nm	
No.09	1th speed It is the speed before the screw is fastened after fast forward.	1rpm	
No.10	2th speed It is the final fastening speed of this process.	1rpm	
No.11	Over time If the pre-tightening torque is not reached from the start of this process until this set value, the rotation stops when this set time is reached and "over time" NG is output. This time setting prevents mistakes.	1sec	
No.12	Judgment area ★ Judgment area in the graph of angle and torque, is the integral value of the torque waveform.	1N ·degree	
No.13	Measurement invalid range ★ This sets the range to disable the area measurement. The corresponding area will be from the pre-tightening start to this setting angle.	1 degree	
No.14	Measurement angle ★ The area is judged from the measurement start point to the set value.	1 degree	
No.15	Before time It starts to operate after the set time has elapsed from the start of the temporary tightening process.	1msec	
No.16	Time upper limit ★	If the time of the stop found in the range of the set value will be "Pre-tightening time over" "Pre-tightening time under". (Measurement fromTQ1)	1msec
No.17	Time lower limit ★		1msec
No.18	Angle upper limit	If no angle at the time of arrest comes in the range of the set value will be "temporary tightening angle over" "temporary tightening angle over". (Measurement from TQ1)	0.1 degree
No.19	Angle lower limit		0.1 degree
No.20	Torque-free monitoring time This sets the time from the start of the pre-tightening until the start of torque monitoring. It does not measure the torque from the pre-tightening start until this set time. It is a setting to prevent misjudgment by picking up torque fluctuation at the start of rotation.	1msec	
No.21	Sampling start torque Measurement of tightening time and tightening angle starts after detection of the arrival at this set torque.	0.1Nm	

Number (yy)	Matter	increments
No.22	Pre- tightening cut angle ★ It stops when it reaches this set angle from measurement starting torque. This setting uses angles to prevent mistakes.	1 degree
No23	Stall time ☆ When using a sensorless type nut runner, in order to stabilize the tightening torque, the torque must be held for a certain time after reaching the cut torque. This sets the holding time.	1msec
No.24	Total angle upper limit This is the upper limit setting for total angle determination. If the angle from the start of temporary tightening to the end of temporary tightening exceeds the set value, the total angle over NG. This function can be used with I/F version: 1721-2.78 or higher and controller version 1851-2.44 or higher.	1 degree
No.25	Total Angle Lower Limit This is the setting of the lower limit of the total angle determination. If the angle from the start of temporary tightening to the end of temporary tightening does not reach the set value, the total angle under NG is set. This function can be used with I/F version: 1721-2.78 or higher and controller version 1851-2.44 or higher.	1 degree
No.26 ~ No31	Unused	—



Pre-tightening reference waveform



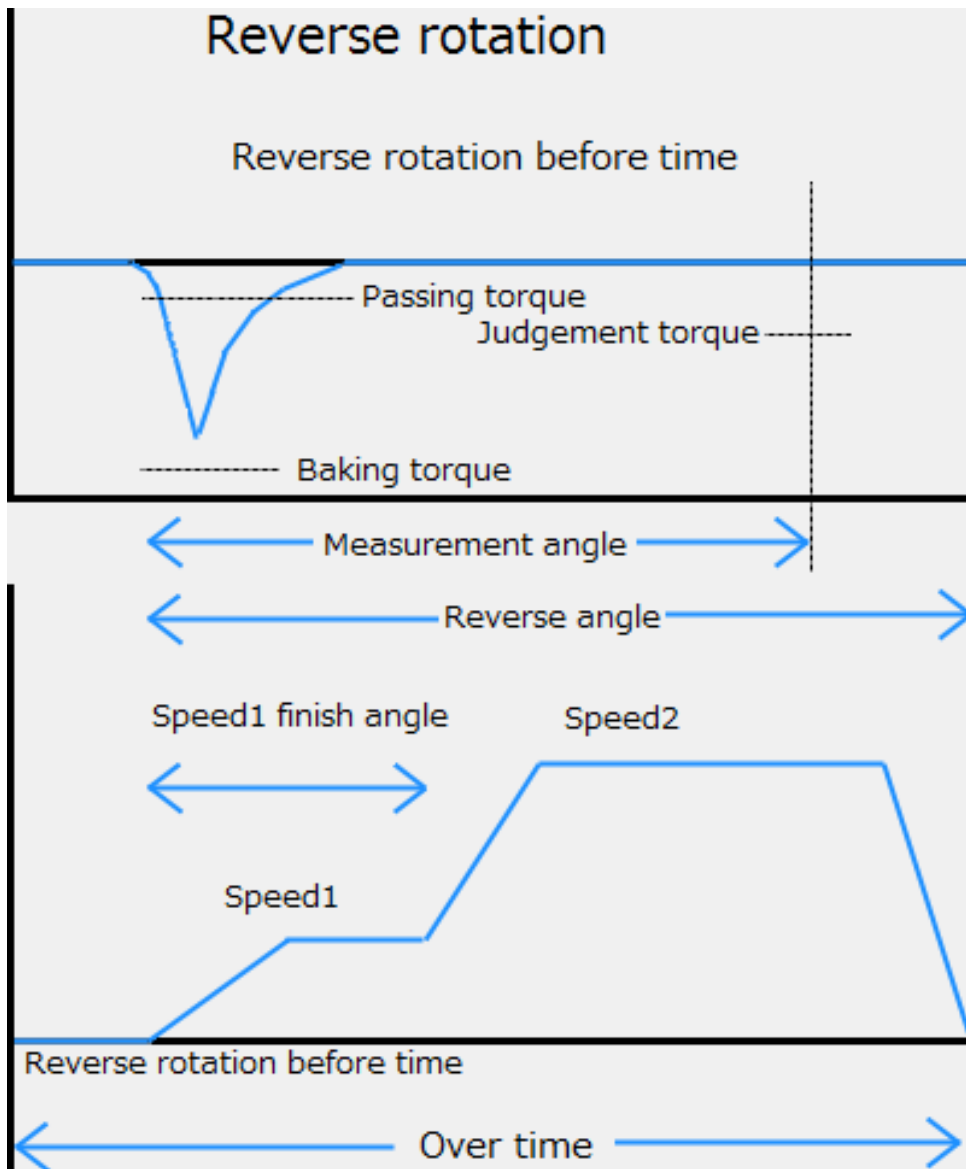
## 7-5 Reverse tightening setting

You use the seating detection determined that the burning decision.

Number is the number of the case to be set from GSK/GKL driver panel (Gxx-yy)

Number (yy)	Matter	Increments
No.00	Reversal torque If this torque is exceeded when reaching the measurement angle, NG is output.	0.1Nm
No.01	Reverse angle This sets the angle to rotate in the reverse rotation.	1 degree
No.02	The 1th speed This sets the 1th speed of reverse rotation. (Usually to a smaller value than the 2th speed)	1rpm
No.03	Measurement angle Before the end of the reverse rotation operation, torque judgment is performed when this set angle is reached. Set the angle from the start of reverse rotation operation. Please set so that it becomes smaller than reverse rotation angle.	1 degree
No.04	Passing torque If there is no condition beyond this set value during reverse rotation operation, "reverse rotation passing torque NG" will be obtained. (It becomes NG when tightening an unclamped bolt etc.)	0.1Nm
No.05	Baking torque When the torque reaches the set value during the reverse rotation process, it becomes "reverse seizing torque NG". It becomes NG when the pre-tightening torque is too large or when the screws are seized to not loosen.	0.1Nm
No.06	Overtime When this set time has elapsed from the start of reverse rotation, if it is in operation, it outputs NG and ends the operation. (Excluding before time)	1sec
No.07	Speed 1 End angle When this set angle is reached, the speed is switched from the first speed to the second speed.	1 degree
No.08	The 2th speed It sets the reverse rotation second speed after removing the torque. (It is usually set to a value larger than the first speed)	1rpm
No.09	Before time When this set time has elapsed since entering the reverse rotation process, it will start operation.	1msec
No.10 ~ nO.15	Unused	—

Reverse tightening reference waveform



## 7-6 Real tightening setting

It is set for a final tightening of the screws. (Numbers 1 to 50)

This tightening will choose from two types of torque method / angle method.

However, in the case of GKL, the No. 00 setting is ignored.

Method	Exit conditions	Judgment items	
Torque method	Until it reaches the cut torque, to rotate at a specified speed. Angle from the snug torque, to determine the time result.	Zone judgment	Torque upper/lower limit Time upper/lower limit Angle upper/lower limit Over time
Angle method	From the snug torque, it will rotate at the specified speed until it reaches the cut angle. Torque, time, torque gradient also determined.	Gradient decision	
No torque sensor (GKL)	Do tighten similar to the torque method. Calculate the torque to use the current value of the motor.	—	—

Number is the number of the case to be set from GSK/GKL driver panel (Uxx-yy).

★: This is a GSK-only setting. Set to 0 since it is not used in GKL.

☆: This is a GKL-only setting. Set to 0 since it is not used in GSK.

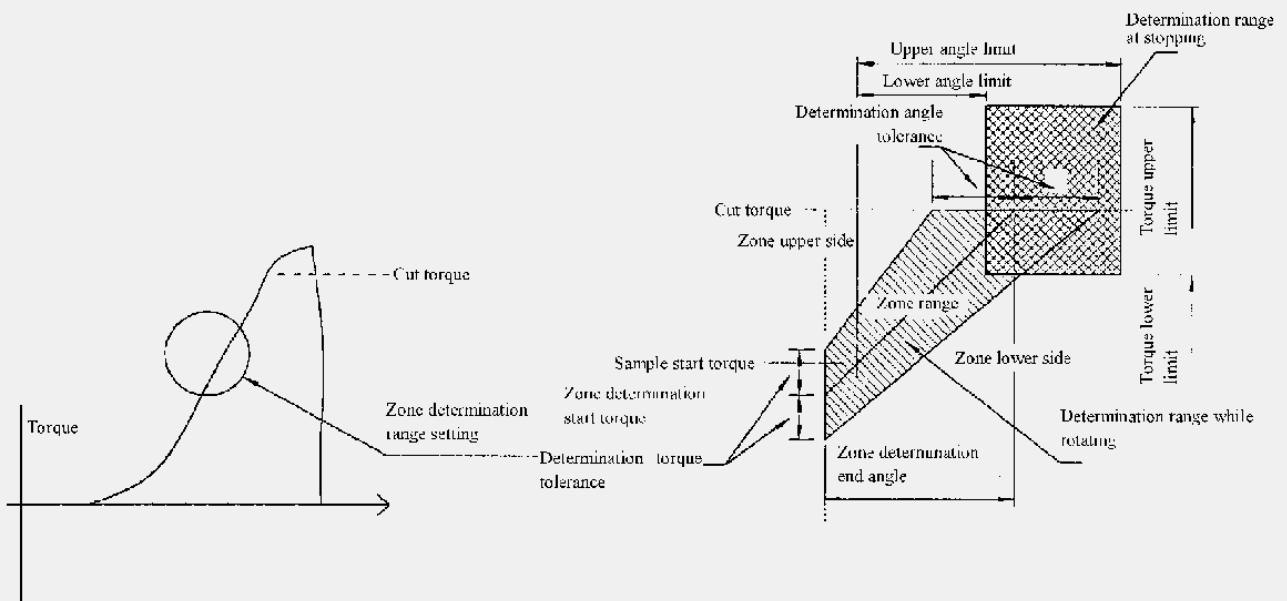
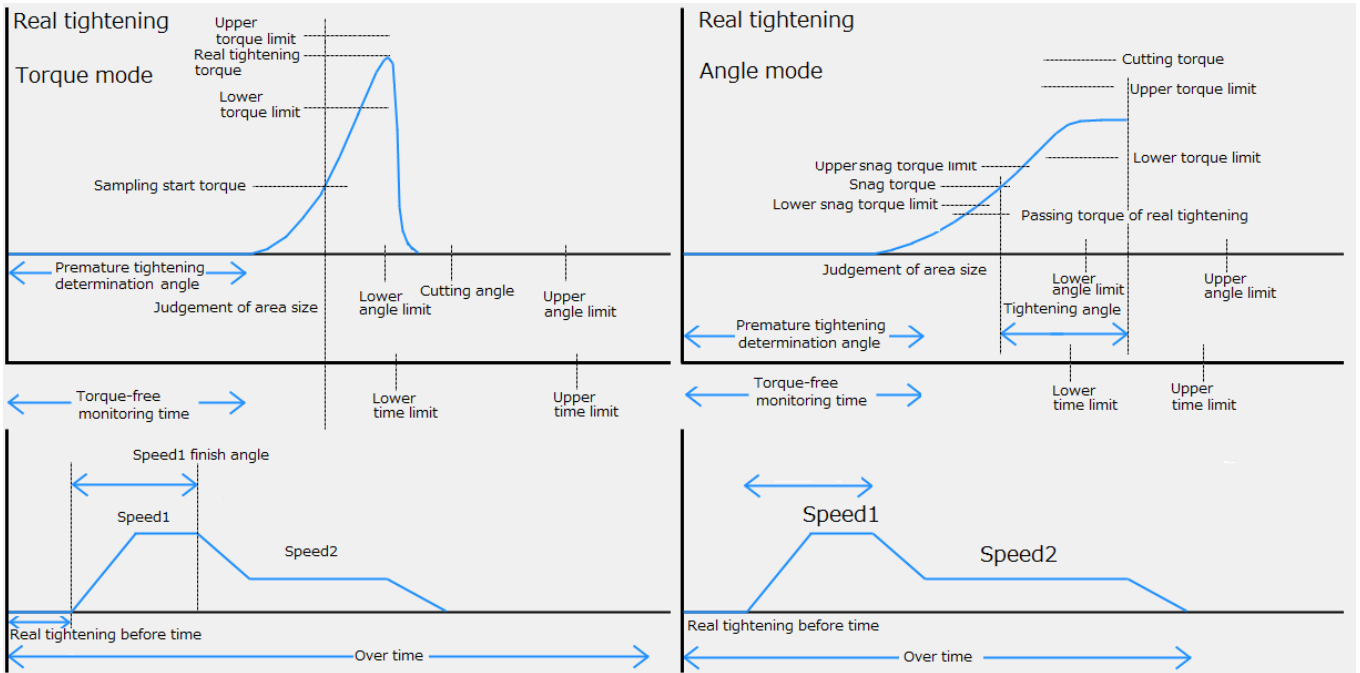
Number (yy)	Matter		Increments
No.00	Mode ★ (In GKL angle method can not be used) 0: Torque method 1: Angle method		—
No.01	Torque method	Real tightening torque: This torque is the target of this tightening.	0.1Nm
	Angle method	Stop torque: It is a stop torque to prevent the bolt from twisting.	0.1Nm
No.02.	Torque method	Sampling start torque : With this setting it begins measuring angle and time.	0.1Nm
	Angle method	Snag torque: It starts clamping plastic zone from this torque. It also starts measuring angle and time	0.1Nm
No.03	Speed 1: It is the speed at the start in this process. Normally set about 50 to 80 rpm. The tightening angle is also shown when tightening with only this process.		1rpm
No.04	Speed 1 End angle: It rotates at speed 1 until this set angle is reached. When it reaches this angle, it switches to speed 2.		1 degree
No.05	Speed 2: This is the tightening speed in this process. 20 - 50 rpm is recommended.		1rpm
No.06	Over time: When this set time elapses from the start of the process, the process is terminated. It outputs overtime NG when it ends. (It is excluded from time).		1sec
No.07	Torque upper limit: It sets the allowable upper limit of cut torque or stop torque.		0.1Nm
No.08	Torque lower limit: It sets the allowable lower limit of cut torque or stop torque.		0.1Nm
No.09	Torque method	Stop angle★: This is a setting to interrupt this process. It functions to not break the machine when the torque does not reach the target value due to some trouble.	1 degree
	Angle method	Tightening angle: This is the rotation angle from the snug torque. This sets the target angle.	1 degree
No.10	Before time: It delays the start of this process by the set value of time.		1msec
No.11	Time upper limit★: It sets the allowable upper limit of the time. Unlike Overtime, this time is measured from the "measurement starting torque" or "Snag torque".		1msec
No.12	Time lower limit★: It sets the allowable lower limit of the time. Unlike Overtime, this time is measured from the "Measurement starting torque" or "Snag torque".		1msec

Number (yy)	Matter		Increments
No.13	Angle upper limit: It sets the allowable upper limit of the angle. Unlike Overtime, this time is measured from the "Measurement starting torque" or "Snag torque".		0.1 degree
No.14	Angle lower limit: It sets the allowable upper limit of the angle. Unlike Overtime, this time is measured from the "Measurement starting torque" or "Snag torque".		0.1 degree
No.15	Closed fast decision angle: If the measurement start torque is detected earlier than this set angle, "fast-tightening NG" is output. In this case, fast-tightening refers to a state in which the screw hole is crushed and the screw is not tightened.		1 degree
No.16	Torque-free monitoring time: It will not monitor the torque for the set time from the start of the process.		1msec
No.17	Judgment area ★: Judgment area is in the graph of angle and torque. It is a setting for judging screw failure, and if it exceeds this value, it will be "screw failure". Please refer to the measured value in the online etc of the automatic measurement for the setting.		X 10
No.18	Torque method	Unused	—
	Angle method	Snag torque upper limit: It is the upper limit value of snug torque. If this value is exceeded, "snug torque over NG" is output.	0.1Nm
No.19	Torque method	Zone judgment★: It sets whether to perform the zone judgment.	—
	Angle method	Snag torque lower limit: It is the lower limit value of snug torque. If this value is exceeded, "snug torque under NG" is output.	0.1Nm
No.20	Torque method	Zone judgment range ★: It is one of the screw judgment. We select the range of zone judgment from the following. "No zone monitoring" ⇒ Zone judgment is not performed. "Zone lower limit ignored" ⇒ The lower limit value is not judged at zone judgment. "Zone upper limit ignored" ⇒ The upper limit value is not judged when zone judgment is made. "Zone normal monitoring" ⇒ Judge by the upper limit value and the lower limit value when judging the zone.	—
	Angle method	Real tightening torque passing: It is a torque to judge whether abnormality occurred during tightening. It is judged below this value after passing the snug torque.	0.1Nm
No.21	Torque method	Zone starting point ★: We set the torque value at the start of zone judgment.	0.1Nm
	Angle method	Gradient decision: It sets whether to make gradient judgment. 0: None 1: Execution	—
No.22	Torque method	Zone starting point tolerance ★: We set the range of start torque for executing the zone judgment.	0.1Nm
	Angle method	Gradient sampling number: The width of one sampling is represented by this set value X 0.5 °.	1 times
No.23	Torque method	Zone end point ★: It sets the angle of judgment range at zone judgment.	0.1 degree
	Angle method	Moving average number: It sets how many times sampling is done in increments of 0.5 °. (Please refer the page number 65.)	1 times

Number (yy)	Matter		Increments
No.24	Torque method	Zone end point tolerance ★: It sets the intersection angle of the end point for the zone judgment.	0.1 degree
	Angle method	Gradient decision upper limit: It sets the upper limit value for gradient judgment.	1%
No.25	smoothing tightening ★: It sets whether to perform smoothing tightening. 0:None 1: Execution		—
No.26	Initial speed ★: It sets the speed at the start of smoothing tightening. .		1rpm
No.27	Torque method	Cut torque at the speed ★: It sets the speed at which the cut torque is reached during smoothing tightening.	1rpm
	Angle method	Snug torque speed: It sets the speed at which the snag torque is reached during smoothing tightening.	1rpm
No.28	Speed 3, 4 additional mode: It sets whether to use Speed 3 and 4. 0:None 1: Execution		—
No.29	Speed 3 switching angle: When this angle is reached, speed 3 is switched.		1 degree
No.30	Speed 3: It will be the speed when you are seated in Speed 3, 4 mode.		1rpm
No.31	Speed 4 switching torque: When this torque is reached it switches from Speed 3 to Speed 4.		0.1Nm
No.32	Speed 4: It is the final tightening speed in speed 3, 4 mode.		1rpm
No.33	Torque method	Stall time ☆: When the torque sensor is not used, it sets the time to hold the tightening torque in order to fix the torque.	1msec
	Angle method	Gradient decision lower limit: It sets the lower limit value for gradient judgment.	1%
No.34	Torque method	Over cut time ☆: If tightening is not completed before exceeding this angle, NG will be output.	1msec
	Angle method	Reserve	—
No.35	Total angle upper limit This is the upper limit setting for total angle determination. If the angle from the start of real tightening to the end of real tightening exceeds the set value, the total angle over NG. This function can be used with I/F version: 1721-2.78 or higher and controller version 1851-2.44 or higher.		1 degree
No.36	Total Angle Lower Limit This is the setting of the lower limit of the total angle determination. If the angle from the start of temporary tightening to the end of temporary tightening does not reach the set value, the total angle under NG is set. This function can be used with I/F version: 1721-2.78 or higher and controller version 1851-2.44 or higher.		1 degree
No.37 ~ No.47	Unused		—

※ Priorities of behavior is "with smoothing tightening"> "Speed 3, 4, additional mode".

# Real tightening reference waveform (Torque method)



[Zone determination range setting]

## Gradient calculation method

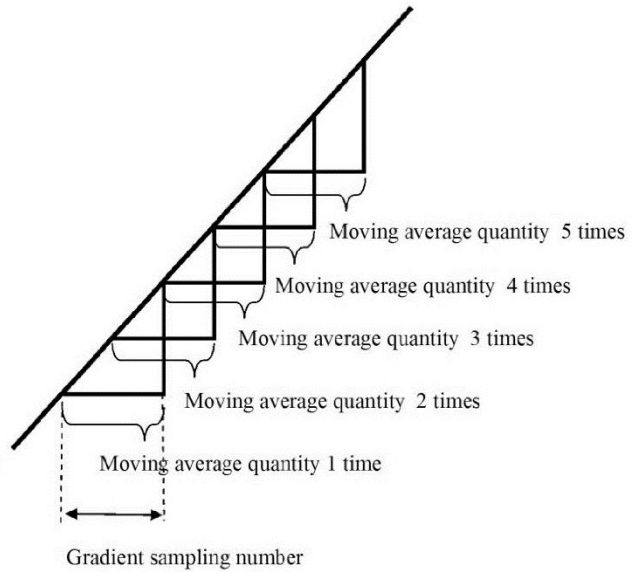
### About Gradient judgment

Setting items

- ① Gradient sampling number
- ② Moving average quantity
- ③ Gradient judgment value

Explanation of contents

- ① Gradient sampling number means the width of sampling per 1time.  
(Torque rising value at setting number x 0.5°)
- ② Moving average quantity means the number to get the data of width determined by the gradient sampling number at 0.5° interval.
- ③ Calculation method of gradient judgment value.  
Setting value  $\leq$  gradient at completion of real tightening /gradient right after snag torque x 100



#### Example 1

(Based on tightening result said on right)

- Gradient sampling number (1)  
Moving average quantity (7)  
Gradient judgment value (70)

Gradient right after snag torque  
(Initial gradient)

Q'ty	Angle	Torque rising value
1	0.0~0.5	1
2	0.5~1.0	1
3	1.0~1.5	1
4	1.5~2.0	1.5
5	2.0~2.5	1.5
6	2.5~3.0	1.5
7	3.0~3.5	1.5
Average value		1.285714286

Gradient at the completion of final tightening  
(Completion gradient)

Q'ty	Angle	Torque rising value
1	12.5~13.0	0.3
2	13.0~13.5	0.2
3	13.5~14.0	0.2
4	14.0~14.5	0.2
5	14.5~15.0	0.2
6	15.0~15.5	0.1
7	15.5~16.0	0.1
Average value		0.185714286

Gradient value

$$0.186 \div 1.286 \times 100 = 14.46\%$$

Judgment becomes OK because of less than 70% of setting value in case of example 1 and example 2.

#### Example 2

(Based on tightening result said on right)

- Gradient sampling number (2)  
Moving average quantity (5)  
Gradient judgment value (70)

Gradient right after snag torque  
(Initial gradient)

Q'ty	Angle	Torque rising value
1	0.0~1.0	2
2	0.5~1.5	2
3	1.0~2.0	2.5
4	1.5~2.5	3
5	2.0~3.0	3
Average value		2.5

Gradient at the completion of final tightening  
(Completion gradient)

Q'ty	Angle	Torque rising value
1	13.0~14.0	0.4
2	13.5~14.5	0.4
3	14.0~15.0	0.4
4	14.5~15.5	0.3
5	15.0~16.0	0.2
Average value		0.34

Gradient value

$$0.34 \div 2.5 \times 100 = 13.6\%$$

#### Tightening result

Angle	Torque
0.0	40.0
0.5	41.0
1.0	42.0
1.5	43.0
2.0	44.5
2.5	46.0
3.0	47.5
3.5	49.0
4.0	50.5
4.5	51.5
5.0	52.5
5.5	53.5
6.0	55.0
6.5	56.5
7.0	58.0
7.5	59.0
8.0	60.0
8.5	60.5
9.0	61.0
9.5	61.5
10.0	62.0
10.5	62.5
11.0	63.0
11.5	63.3
12.0	63.6
12.5	63.9
13.0	64.2
13.5	64.4
14.0	64.6
14.5	64.8
15.0	65.0
15.5	65.1
16.0	65.2



## 7-7 Rate setting

It is the basic settings for the nut runner axis. (Number 1 to 30)

Please set a value corresponding to the motor and sensors to be used in the nut runner.

Number is the number of the case to be set from GSK/GKL driver panel (Uxx-yy).

Number	Matter	Increments								
No.00	Torque sensor rate/Current sensor rate • Torque sensor exist: Set the torque at the time of the torque sensor output 10V. • Torque sensor none: Set the nut runner shaft end torque of that which causes a momentary maximum current to the motor.	0.1Nm								
No.01	Tightening direction/Nut runner format The following Bit allocation in hexadecimal data <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 10%;">F</td> <td style="width: 20%;">E</td> <td style="width: 20%;">D~8</td> <td style="width: 20%;">7~0</td> </tr> <tr> <td>0</td> <td>Tightening_direction</td> <td>Sensor type (Note 2)</td> <td>Nut runner type (Note 1)</td> </tr> </table> Tightening_direction 0: Tightening in the right rotation looking at the motor from the encoder side (tightening in the motor shaft end CCW rotation) 1: Tightening in the left rotation looking at the motor from the encoder side (tightening in the motor shaft end CW rotation)	F	E	D~8	7~0	0	Tightening_direction	Sensor type (Note 2)	Nut runner type (Note 1)	—
F	E	D~8	7~0							
0	Tightening_direction	Sensor type (Note 2)	Nut runner type (Note 1)							
No.02	Limit over When the zero-fold check it set the tolerance of magnification output value and zero output. Zero-point output = (zero point preset) ± (limit over) Magnification output = (magnification preset) ± (limit over) If it exceeds the above, respectively, "zero offset anomaly", it will be "magnification abnormal". (Torque senso:about 5% at rating、current sensor:about 10% at rating)	0.1Nm								
No.03	Set over Set the fluctuation tolerance value every zero times check. It compares the current output value and the output value in the previous zero times check, , respectively When the difference exceeds the set value each will be "zero offset fluctuation abnormal" and "magnification change abnormal". (About 2% of the torque sensor rating)	0.1Nm								
No.04	Zero point preset The output voltage at no-load of the torque sensor, set in the torque conversion. Usually set to "0".	0.1Nm								
No.05	Magnification preset To set the output voltage at the time of the torque sensor magnification check with a torque conversion. Usually set the 1/2 of the value of the "torque sensor rating".	0.1Nm								
No.06	Gain correction It is used to perform a correction of output of the torque (current) sensor (slope). If not corrected, set the half of the value of the "sensor rating". Torque value after correction (T) is calculated by the following equation. $T = \frac{\text{Sensor output voltae (V)}}{10(V)} \times \text{Torque sensor rate} \times \frac{\text{Magnification preset}}{\text{Gain correction}}$ The smaller the gain correction value, the actual torque will be higher.	0.1Nm								
No.07	Reduction ratio To set the gear ratio of the nut runner gear. Please set as mechanism when the motor shaft rotates the set value is one rotation.	0.1rev								
No.08	Moter model (Note 3)	—								
N.09	Unused	—								

Note 1: About value of nut runner type.

Value	GSK Nut runner type	GKL Nut runner type	remarks
0	OTHER	—	
1~10	—	—	
11	ANZMT-350UW	—	
12	ANZMT-500UW	—	
13	ANZMT-1600UW	ANMH-2000	
14	ANZMCH-200	ANMH-2001	
15	ANZMCH-450	—	
16	ANZMCH-900	—	
17	ANZMCH-1550	—	
18	ANZMCH-1850S	—	
19	ANZMCH-2001	—	
20	ANZR(C)-5000	—	
21	ANZR(C)-7000	—	
22	ANZR(C)-9000	—	
23	ANZR(C)-12000	—	
24	ANZM(C)-50E2	—	This setting can be used with controller version 1851-2.38 or higher.
25	ANZMCTH-450	—	
26	ANZMCXH-100E1	—	
27	ANZMCXH-150E1	—	
28	ANZMCXH-230E1	—	
29	ANZMCXH-450E1	—	
30	ANZMCXH-700E1	—	
31	ANZMCXH-900E1	—	
32	ANZM(C)-4800	—	
33	ANCKHM-200	—	
34	ANCKHM-300	—	
35	ANZM(C)-9001	—	
36	ANZM(C)-20000	—	
37	ANZM(C)-30	—	
38	ANZMH-200SFFT	—	
39	ANCKHM-500	—	
40~41	—	—	
42	ANZMKH-400	—	
43	ANZM(C)-250	ANM-220	
44	ANZM(C)-50	ANM-50	
45	ANZM(C)-350	ANM-320	
46	ANZMH-200	—	
47	ANZM(C)-500	ANM-400	
48	ANZM(C)-850	ANM-640	
49	ANZMH-450	ANM-1800	
50	ANZM(C)-1600	ANM-1200	
51	ANZM(C)-2000	ANMH-400	
52	ANZMKH-700	ANM-2000	
53	ANZM(C)-3000	ANM-3000	
54	ANZMH-1500	ANM-3100	
55	ANZM(C)-5000	ANM-5000	
56	ANZM(C)-7000	—	
57	ANZM(C)-9000	ANM-9000	
58	ANZM(C)-9000S	—	

Value	GSK Nut runner type	GKL Nut runner type	remarks
59	ANZM(C)-4500	—	
60	ANZM(C)-15000	—	
61	ANZMH-1500	—	
62	ANZMH-900	ANM-1400	
63	ANZM(C)-3500	ANM-1700	
64	ANZMSH-700	—	
65	ANZMH-9000	—	
66	ANZMSH120E1	—	
67	ANZMH-2001	—	
68	ANZMSH-130	—	
69	ANZMSH-420	—	
70	ANZMH-1800S	—	
71	ANZMSH-2000	—	
72	AMZMH-2000	—	
73	ANZMSH-500	—	
74	ANZM(C)-1800S	—	
75	ANZM(C)-12000	—	
76~79	—	—	
80	ANZMKSH-40	—	
81	—	—	
82	—	ANM-10	
83	ANZMSH-150		
84	LUR-1000	LUR-1000	
85	ANZMCTH-100E1	—	
86	ANZMCTH-150E1	—	
87	ANZMCTH-230E1	—	
88	ANZMCTH-450E1	—	
89	ANZMCTH-700E1	—	
90	ANZMCTH-900E1	—	
91~92	—	—	
93	ANZMCH-2500	—	
94	ANZMSH-2001	—	
95	ANZMCTW-3500	—	
96	ANZMCH-2100	—	
98	ANZRCH-2500	—	
99	OTHER	OTHER	

Note 2: About value of sensor type. (GSK only)

Value	Sensor type	remarks
0	Nothing	
1	100S	
2	200	
3	250	
4	350	
5	500	
6	850	
7	1500	
8	2500	
9	4000	
10	5000	
11	7000	
12	7500	
13	8000	
14	1200	
15	15000	
16	20000	
17	ANMSH-13	
18	AZM-40SH	
19	ANZMSH-70	
20	AZMT-150	
21	OTHER	
22	1850	
23	5500	
24	AZMC-51	

Note 3: About value of motor model

Value	Motor type	remarks
0	TS4129N2820E230	
1~6	—	
7	TS4509N2825E203	
8	TS4515N2820E202	
9	TS4603N1920E203	
10	TS4603N1925E203	
11	TS4609N1920E203	
12	TS4612N6920E601	
13	TS4614N6920E102	
14	TS4617N1520E203	
15	TS4617N1920E203	
16	TS4618N1920E203	
17	TS4619N1920E203	
18	TS4619N1922E207	
19	TS4839N2820E235	
20	TS4617N1925E203	
21	TS4609N1925E203	
22	TS4618N1927E203	
23	TS4610N1625E206	
24	TS4619N1926E207	
25	TS4619N3326E207	
26	TS4603N1520E203	This setting can be used with controller version 1851-2.38 or higher.
27	TS4618N1922E203	This setting can be used with controller version 1851-2.39 or higher.

## 7-8 X-axis rate setting

It is the basic settings for the X-axis. (Number 1 to 30)

Please set the motor and the moving speed, and the like to be used in the X-axis.

X-axis rate number 28 to 30, number 28 is X/Y-axis Inching. - No. 29 is specified point movement.

- No. 30 is used in the back X.

Number is the number of the case to be set from GSK/GKL driver panel (= xx-yy).

Number (yy)	Matter	Setting range	Increments	
No.00	Acceleration time constant The acceleration time constant at the time of position movement set in the rotation angle unit of the motor.	0000-7FFF	10 rpm/s	
No.01	Deceleration time constant The deceleration time constant at the time of position movement set in the rotation angle unit of the motor.	0000-7FFF	10 rpm/s	
No.02	Moving Speed It set the movement speed at the time of position movement.	0000-9999	1mm/s	
No.03	Point ± detection range When the current coordinate is within the range "X-coordinate ± the set value of the points", GSK/GKL driver determines that the move to the specified point has been completed.	0000-9999	0.1mm	
No.04	Range output ① lower limit	When the current Y-axis coordinate is within the range of this setting, the output signal "X range output ①" will turn ON.※	0000-9999	1mm
No.05	Range output ① upper limit			
No.06	Range output ② lower limit	When the current Y-axis coordinate is within the range of this setting, the output signal "X range output ②" will turn ON.※	0000-9999	1mm
No.07	Range output ② upper limit			
No.08	Motor revolution amount of movement It is set something to mili meters move when the motor is rotated 1.	0000-9999	0.001 mm/rev	
No.09	Motor model It is set the model of motor. (Note 1)	0000-7FFF	—	
No.10	Source direction of rotation When the position is increased in the positive direction, and set whether the motor is turning in any direction. 0000: CW direction as viewed from the rear of the motor 0001: CCW direction as viewed from the rear of the motor	0000 / 0001	—	

Note 1: About value of motor model

Value	Motor type	remarks
0~2	—	
3	TS4603	
4	TS4604	
5	TS4607N2088	
6	TS4609	
7	TS4607N3222	
8	—	
9	TS4612	
10	TS4610	
11	TS4606	
12	TS4612N3222	
13	TS4613N3222	
14	TS4614N6920	
15	TSM4104N2820	
16	TSM4104N7820	
17	TSMB	
18	TSM	
19	TS4602N7032E200	
20	TS4602N8000E200	
21	TS4603N8000E200	
22	TSM4204N7820E205	This setting can be used with controller version 1851-2.37 or higher.
23	TSM4354N2802E200	This setting can be used with controller version 1851-2.48 or higher.
24	TSM4354N7802E200	This setting can be used with controller version 1851-2.48 or higher.
25	TSM4254N2820E200	This setting can be used with controller version 1851-2.49 or higher.

## 7-9 Y-axis rate setting

It is the basic settings for the Y-axis. (Number 1 to 30)

Number is the number of the case to be set from GSK/GKL driver panel (= xx-yy).

Number (yy)	Matter	Setting range	increments	
No.00	Acceleration and deceleration time constant The acceleration time constant at the time of position movement set in the rotation angle unit of the motor.	0000-7FFF	10 rpm/s	
No.01	Deceleration time constant The deceleration time constant at the time of position movement set in the rotation angle unit of the motor.	0000-7FFF	10 rpm/s	
No.02	Moving Speed It set the movement speed at the time of position movement.	0000-9999	1mm/s	
No.03	Point $\pm$ detection range When the current coordinate is within the range "Y-coordinate $\pm$ the set value of the points", GSK/GKL driver determines that the move to the specified point has been completed.	0000-9999	0.1mm	
No.04	Range output ① lower limit	When the current Y-axis coordinate is within the range of this setting, the output signal "Y range output ①" will turn ON.※	0000-9999	1mm
No.05	Range output ① upper limit			
No.06	Range output ② lower limit	When the current Y-axis coordinate is within the range of this setting, the output signal "Y range output ②" will turn ON.※	0000-9999	1mm
No.07	Range output ② upper limit			
No.08	Motor revolution amount of movement It is set something to mili meters move when the motor is rotated 1.	0000-9999	0.001 mm/rev	
No.09	Motor model It is set the model of motor. (same as X-axis rate)	0000-7FFF	—	
No.10	Source direction of rotation When the position is increased in the positive direction, and set whether the motor is turning in any direction. 0000: CW direction as viewed from the rear of the motor 0001: CCW direction as viewed from the rear of the motor	0000 / 0001	—	

※ The setting value of the range output will be the range output that Y Jikuteikaku numbers 1 to 4 are each units 1 to 4.

Please beware that the settings for the unit rather than the axis.



## 7-10 Point setting

It will remember the XY coordinates of each unit in the form of a point number.

If GSK/GKLIF instructs the move to GSK/GKL driver, specify the point number, not the coordinate value.

Number is the number of the case to be set from GSK/GKL driver panel (= x-yyy-z).

The x is the unit number (1 ~ 4), yyy is point number (1 ~ 255), z indicates the axis type.

Number (yy)	Matter	Setting range	Increments																							
No.000 ~ No.254	Point coordinate value (Point number1~255) Set the coordinate values of the point of the X-axis. ※ Axis type (z):0 is the X-axis, 1 is the Y-axis.	0000-9999	0.1mm																							
No.255	Reserve	—	—																							
No256	Set the adjacent interference distance 1 to 8. The combination of the unit number (x) and the shaft type (z) shows the following value.	—	—																							
	<table border="1"> <thead> <tr> <th>Unit number(x)</th> <th>Axis type(z)</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td rowspan="2">1</td> <td>0</td> <td>Adjacent interference distance 1</td> </tr> <tr> <td>1</td> <td>Adjacent interference distance 2</td> </tr> <tr> <td rowspan="2">2</td> <td>0</td> <td>Adjacent interference distance 3</td> </tr> <tr> <td>1</td> <td>Adjacent interference distance 4</td> </tr> <tr> <td rowspan="2">3</td> <td>0</td> <td>Adjacent interference distance 5</td> </tr> <tr> <td>1</td> <td>Adjacent interference distance 6</td> </tr> <tr> <td rowspan="2">4</td> <td>0</td> <td>Adjacent interference distance 7</td> </tr> <tr> <td>1</td> <td>Adjacent interference distance 8</td> </tr> </tbody> </table>			Unit number(x)	Axis type(z)	Meaning	1	0	Adjacent interference distance 1	1	Adjacent interference distance 2	2	0	Adjacent interference distance 3	1	Adjacent interference distance 4	3	0	Adjacent interference distance 5	1	Adjacent interference distance 6	4	0	Adjacent interference distance 7	1	Adjacent interference distance 8
	Unit number(x)			Axis type(z)	Meaning																					
	1			0	Adjacent interference distance 1																					
				1	Adjacent interference distance 2																					
	2			0	Adjacent interference distance 3																					
1		Adjacent interference distance 4																								
3	0	Adjacent interference distance 5																								
	1	Adjacent interference distance 6																								
4	0	Adjacent interference distance 7																								
	1	Adjacent interference distance 8																								
1	0	Adjacent interference distance 9																								
		Adjacent interference distance 10																								
2	0	Adjacent interference distance 11																								
		Adjacent interference distance 12																								
3	0	Adjacent interference distance 13																								
		Adjacent interference distance 14																								
4	0	Adjacent interference distance 15																								
		Adjacent interference distance 16																								

No257 Set the soft limit (+ direction).  
Set the upper operating limit coordinate value according to the unit number (x) and the shaft type (z).

—

—

No258 Set the adjacent interference distance 9 to16.  
The combination of the unit number (x) and the shaft type (z) shows the following value.

Unit number(x)	Axis type(z)	Meaning
1	0	Adjacent interference distance 9
	1	Adjacent interference distance 10
2	0	Adjacent interference distance 11
	1	Adjacent interference distance 12
3	0	Adjacent interference distance 13
	1	Adjacent interference distance 14
4	0	Adjacent interference distance 15
	1	Adjacent interference distance 16

—

—

No.259 ~ No.266 Each individual operation interlock setting  
(GSK/GKL is not used because it has no function.)

—

—

No267 Adjacent interference check invalid setting  
BIT1 0:check 1:not check  
※ Note that the check "to" 0

—

—

No268 Set the soft limit (- direction).  
Set the lower operating limit coordinate value according to the unit number (x) and the shaft type (z).

—

—

No269 ~ No.287 Reserve

—

—

### 7-11 (Fn.01) Tightening result monitor of the 1th axis

Number	Content
Fn.1- 00 to 42	This displays the result of 1th axis.

Monitor only. You cannot change the content.

### 7-12 (Fn.02) Tightening result monitor of the 2th axis

Number	Content
Fn.2- 00 to 42	This displays the result of 2th axis.

Monitor only. You cannot change the content.

### ※The display contents of the Fn.1 and Fn.2

In data selection mode, when they are the Fn1-xx and Fn2-xx, you can monitor the data of screw tightening each CH1 and CH2. Its contents are as in the following table.

Number	Contents
00	Screw number
01	Program number
02	The torque results of socket alignment operating
03	The time results of socket alignment operating
04	The angle results of socket alignment operating
05	The torque results of pre-tightening operation
06	The time results of pre-tightening operation
07	The angle results of pre-tightening operation
08	The torque results of final tightening operation
09	The time results of final tightening operation
10	The angle results of final tightening operation
11	The sample point torque of final tightening operation
12	The final slope ratio of final tightening operation
13	Unused
14	The torque results of reverse operation
15	The time results of reverse operation
16	The angle results of reverse operation
17	Result number
18	The fast-forward torque result of pre-tightening
19	The fast-forward time result of pre-tightening
20	The fast-forward angle result of pre-tightening
21	The area result of pre-tightening
22	The area result of final tightening
23	The initial slope of the final tightening
24	The final slope of the final tightening
25	The gradient ratio of t final tightening $((23) / (24) \times 100)$
26	The sample point torque result of pre-tightening
27	The total operating time result of the pre-tightening operation
28	The total rotation angle result of the pre-tightening operation
29	The total operating time result of the final tightening operation
30	The total rotation angle result of the final tightening operation
31	The sample point angle result of the reverse rotation
32	The execution time of the program operation
33	Unused
34	Unused
35	The offset torque result of zero magnification check operation
36	Zero preset value of the "rate" parameter
37	The test of the zero magnification check operation
38	The gain correction value of the "rate" parameter
39	The number of running the program operation
40	Position data of the motor [2048/rev]
41	The A / D input value of the torque sensor [2048/10V]
42	(Parameter)typical value of torque sensor preset

You can update the display data by long press of the "←" button.

### 7-13 (Fn.03) Input and output monitor

Number	Unit number	Matter	Setting range
Fn3-00 to 19	Un.0	Display the internal state of the GSK/GKL-IF	[No.0 ~ No.12]: check the network status [No.14, No.15]: GSK/GKL-IF alarm display [Other than those described above]: Preliminary
	Un.1 to 7	Display the input and output signals of communication with the PLC	[No.0-No.5]: the contents of the input signal 0 to 5 [No.6-No.19]: the contents of the output signal 0 to 13

※ Attention point of the input-output monitor

The signal monitor display is a hexadecimal display.

Please do the following change to convert it to parallel I/O data.

- 4 digits of displayed contents are changed from a hexadecimal number to a binary number.

Right end of the value after a change (LSB) is equivalent to IN 0/OUT 0.

It is incremented by one in accordance as the advance on the left side, it will be the IN 15 / OUT 15.

If the corresponding digit isn't calculated as "0".

### 7-14 (Fn.04) Operation instruction from GSK/GKL drive

The write operation of Fn4 will be the operating instructions for the GSK/GKL interface.  
Set the operation type to Fn4-00 and the data number to Fn4-01, and it will execute the following operations by the long press the left arrow button.

Number	Matter	Description
Fn4-.00	Operation type	1: The final tightening result print start 2: Special Operation
Fn4-.01	Data number	This becomes a different meaning by the operation type. [In the case of operation type = 1] Unit number (1 to 7). [In the case of operation type = 2] Special operation for debugging 1: It will allow the special operation ★1 2~7: Unused 8:Communication port exchange of debugging and PC communication (RS232C → USB).★2

- ★1 Only just after writing in "1" for wrong operation prevention, after 2 moves.  
For example, when you want to save the SETTING.BIN file, please do in the 1 → 2 of the order.  
You need to do from writing again "1" If you perform another operation.
- ★2: After the end of a read, please cut the powersupply and turn on the power of GSK/GKL interface after that.

### 7-15 (Fn.5) unit setting

Number	Matter	Setting range
NO.□□	The □□ is axis number. Please set each axis belongs the unit number to Un- □□. The set value of the unit will be the station number of SIO. Please be sure to set "Un.01" as an axis with the interface unit. To the axis of the shaft cut is set to "Un._-" the unit number.	Un.01~Un.07 Un.—
No.-	Save at once all of the data of Fn.11 at the SAVE button.	—

#### 【Caution】

Please the power of always GSK/GKLIF after changing the unit set to the OFF / ON.  
GSK/GKL system does not correspond to change the unit configuration while the power is ON.

## 7-16 (Fn.6) Interface unit setting

Number	Matter	Setting range	Increments
No.00	To select equipment type: Here you select the type of equipment. This setting is used in the adjacent interference check in the positioning mode. 0000:Standard coordinate 0001: Special coordinate1 0002: Special coordinate2	0000/0002	—
No.01	The maximum waiting time of waveform read in quality management PC <b>【Multi axis mode】</b> This setting is not used in this mode. <b>【Positioning mode】</b> It sets the maximum time to wait when it reads the waveform to the quality control personal computer. The quality control personal computer will read the waveform at the end of a block, but the reading of the waveform is needs the many time. This setting is a timer in order to hold between the read. 1~9:Waiting time 0:Quality management PC is invald  [Set 1 or more] It is pending the execution of the next block until it finishes reading waveform of all the units by the personal computer at the end of a block. If the waveform reading finished earlier than the setting time, it will start the next block as soon as reading is over. ⇒When the reading of the wave pattern of all units is not finished even if it reaches in waiting time, I start the next blocking. ※This setting is the setting for the quality control personal computer, but the behavior is the same if you have connected the setting personal computer. Please be sure to set a 0 if you do not want to connect the quality management PC.	0000-0009	sec
No.02	Screw number for ID output It sets the maximum number of for a single work.	0000-0099	—
No.03	This sets the communication speed of the personal computer (1 byte data of hexadecimal) communication speed of setting personal computer (bps) * 0:9600 * 1:19200 * 2:38400 communication speed of quality control personal computer (bps) * 0: 19200 * 1: 38400	0000-0012	—
No.04	Setting of the external display (Decimal data) 1th digit: Display valid (0: Invalid 1: Valid) 2th digit: Language switching (0: Japanese 1: English) ※Language will be changed by sending the information of the language switching to an external display.	0000-0011	—
No.05	M-NET signal monitor unit selection This select the unit number (1 to 7) to be displayed in GSK/GKL driver panel according to the M-NET signal monitor (Fn03). If set to 0 will be the state monitoring of GSK/GKL interface.	0001-0007	—
No.06	Waveform resolution to an external display The resolution of the waveform data when transmitted to an external display in 0.5-degree increments. (For example, 0.5 degrees: 05, 1.0 degrees: 10, 1.5 degrees: 15, 2.0 degrees: 20)	0005-0095	0. 1degree

Number	Matter	Setting range	Increments
No.07	<p>Communication speed of the external display (bps)  0:38400 1:57600 2:76800 3:115200  【Note: the operation of the later version 1721-141】  When the power is ON it will connect at the optimal speed to check the communication speed of the display.  This setting is the default communication speed in the case of the connection between the power is turned ON display it could not be confirmed.  Please combine this setting with the communication speed of display as possible.</p>	0-3	—
No.08	<p>Print Settings (hexadecimal data)  This sets the conditions relating to the printer output.  BIT7: new line code specified (0: LF 1: CR + LF)  BIT6-3: unused  BIT1-0: Auto Print selection (00: N / 01: every time 10: NG at the time / 11: First N stand + when NG)</p>	—	—
No.09	<p>Online print mode  BIT5: print format (0: Standard 1: Jamco specification)  BIT4: zero times result print presence or absence  BIT3: Print the presence or absence of this tightening results  BIT2: Print the presence or absence of the reverse result  BIT1: temporary tightening result print presence or absence  BIT0: socket alignment prints presence or absence</p>	—	—
No.10	<p>Initial number  (N at the time of the "automatic printing selected first N stand" of No08 Print Settings)</p>	—	—
No.11	<p>QL setting ※ This feature is enabled by Version1721-170 below.</p>	—	—
No.12	<p>PLC setting  This sets the such as IO size of the PLC to be connected to the Anybus board. Please set the parameters according to the PLC to be connected. Meaning of the value depends on the Anybus board.</p>	—	—
No.13 ~ No.19	<p>Unused</p>	—	—

## 7-17 (Fn.7) ID controller connection setting

Number	Matter
No.0	ID controller output content setting
No.1	ID controller output content setting
No.2	Function selection of the Interface unit CH12
No.3	SIO start address setting " set at the 1-7 "
No.-	Save at once all of the data of Fn.12 at the SAVE button.

Please refer to the following about the details of the above-mentioned Fn.7.

No.	Digit	Setting value	Transmission timing
No._0	1 <sup>st</sup> digit	0	Data transmission at block judgement output
		1	Data transmission at start of next block and input of judgement reset input
		2	Data transmission from command from the upper device
		Min.3	Not used
	2 <sup>nd</sup> digit	0 to 7	Set the digit no. of engine no. transmission (digit no-1)
No._1	1 <sup>st</sup> digit	Refer to the undermentioned data	Setting of with or w/o transmission eith axis no. 0: not to be transmitted      1: to be transmitted
	2 <sup>nd</sup> digit		Setting yes or no with transmission of each axis judgement 0: not to be transmitted      1: to be transmitted
	3 <sup>rd</sup> digit		Set the digit no. of transmission with torque
	4 <sup>th</sup> digit		Set the digit no. of transmission with gradient
No._2	1 <sup>st</sup> digit	0 to 4	I/F unit selection of ch2 function 0: Operation as printer port 1: Connection of ID controller of standard specification 2: Output of T spec. torque and judgement 3: Output of T spec. judgement 4: Connection with J spec. ID controller Quality control PC This port is possible with operation if the number is order than zero.
	2 <sup>nd</sup> digit	0/1	Set Yes or No with transmission of date and time 0: not to be transmitted      1: to be transmitted
	3 <sup>rd</sup> digit	0/1	Set Yes or No with transmission of program no. 0: not to be transmitted      1: to be transmitted
	4 <sup>th</sup> digit	0/1	Set Yes or No with transmission of unit no. 0: No/select gradient      1: Yes/select gradient 2: No/select snag.      3: Yes/select snag
No._3	—	1 to 7	Set address of M-Net station Set station address of unit 1. Address after 2 is the serial number following to setting value *1.
No._—	Save the whole data of Fn.12 in a lump by the SAVE button		

Setting value	Torque, angle, gradient	Time	Remark
0	It doesn't transmit.		
2	* . *	* . *	2 <sup>nd</sup> digit with decimal point
3	* * . *	* . * * *	3 <sup>rd</sup> digit with decimal point
4	* * * . *	* . * * * *	4 <sup>th</sup> digit with decimal point
5	* * * * . *	* * . * * * *	5 <sup>th</sup> digit with decimal point
6	* * * * * . *	* * * . * * * *	6 <sup>th</sup> digit with decimal point
A	* *	* *	2 <sup>nd</sup> digit without decimal point
b	* * *	* * *	3 <sup>rd</sup> digit without decimal point
C	* * * *	* * * *	4 <sup>th</sup> digit without decimal point
d	* * * * *	* * * * *	5 <sup>th</sup> digit without decimal point
E	* * * * * *	* * * * * *	6 <sup>th</sup> digit without decimal point

In case of setting value not provided, the operation is same as zero.



## **8 Supplementary explanation**

### **8-1 Operation auxiliary function**

①Zero times check function: Zero times checked every block tightening.

Carried out in the presence or absence check by the program setting screen check Box for checking the presence or absence.

②History data storage function

After tightening comprehensive judgment outputs, make the history data stored in each driver at the reset input as a trigger.

When the data is confirmed the data was read from GSK/GKL\_PC- automatic measurement screen. -

(The history data is read to PC by the all or Specified axis when the read switch on setting software. There is the cancel SW.)

③Waveform sampling function

It can save 2048 the 2 kinds of waveform data in the each driver. 2 kinds of waveform data are waveform data1 and waveform data2.

When the number of data is over 2048, next tightening data will be overwritten.

Waveform data1: save in 10msec Interval from the block start to block end.

Waveform data2: save in 0.5degree Interval from the real tightening snag torque to real tightening finished

It is possible at the setting software that it saves the waveform data 1 after tightening and it can get waveform data 2 by the always-on connection (online).

### **8-2 Driver function**

Regeneration capability: If the drive voltage exceeds a certain value, it has a built-in regenerative circuit to be consumed by the internal resistance. (Regenerative resistor is external.)

Discharge function: The driver spontaneously discharges by the LED.

Analog monitor: Monitor signal output from the panel surface check pin (can be selected by parameter)

Standard load inertia :  $J_L(\text{Standard load inertia}) \leq 30J_M(30 \text{ times of the moter inertia})$

Tightening history storage: The data about 5,000 has been saved in the E2PROM of each axis.  
The call of history, you can use the setting software.

Alarm history function: GSK/GKL has 16 times the storage of the alarm.  
The call of alarm history, you can use the setting software.

## 9 Monitor output

Any internal signal of this driver is converted into an analog signal of  $-8V \sim +8V$ , it can be monitored.

The output voltage is scaled so that the setting value of the monitor output scale become 8V.

The analog monitor signal is output to M1.M2 pin on the panel surface of the driver.

The setting about an analog monitor is indicated below.

Please input the address in d\_00XXX.

There are the pins of M1, M2 only on CH1 side in case of GSKW/GKLW.

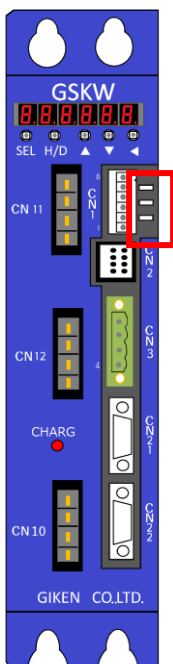
When seeing CH2 side, please change the input ID.

address	Item name	Matter
084	Output-ID of the Monitor1	It sets the ID of the data which is output to the analog monitor 1. initial value: 45(The ID of the input value from the torque sensor)
085	Output-scale of the Monitor1	The analog monitor 1 is scaled so that the set value of this parameter becomes 8V output. initial value: 2048
086	Output-ID of the Monitor2	It sets the ID of the data which is output to the analog monitor 2. initial value: 41(Current speed ID)
087	Output-scale of the Monitor2	The analog monitor 1 is scaled so that the set value of this parameter becomes 8V output. initial value: 1500

The output ID set above and its contents are shown below.

IDNumber	Display contents
41 ※(10041)	It represents the current speed [rpm]. It is initialized to analog monitor 2. The initial scale is 1500 [rpm / 8 V].
42 ※(10042)	It represents the motor current value for monitoring [0.01 Arms]. Please set it in torque sensor unused mode.
45 ※(10045)	It represents the output current value of the torque sensor. It is initialized to analog monitor 1. The initial scale is 2048 [Arms / 8 V].

※When using the W type controller and checking CH 2,  
please set the value which added 10000 to the number of CH 1.



※ For GSK-T4-E-N2 and GSKW-T4-E-N2 there is no analog monitor pin notation.

Pins for analog monitor in these controller types are within the red frame in the left figure.

These show the following from the top of the figure.

TP6: M1 pin

TP7: M2 pin

TP 8: GND

When connecting, please connect to pin and GND respectively.

## 10 Code table

### 10-1 NG Code List

Operation	Code display	Matter
Basic NG	FFF F00	Emergency stop Preparation for operation off during operation or START OFF in the running program.
Before starting check, etc.	001	Zero offset error During the zero / magnification check, zero point output exceeds the set over range.
	002	Magnification error During the zero / magnification check, magnification output exceeds the set over the range.
	003	Zero offset fluctuation error Difference in the previous and current output value exceeds the limit over.
	004	Magnification fluctuation error Difference in the previous and current output value exceeds the limit over.
	033	1.On Nut runner Tightening sampling error
		2.On Positioning mode Return to origin point over time error
034	Home to return operation at the time of incomplete. Positioning movement command of the X/Y-axis has been issued in the state of that origin return is not yet completed.	
SOC.T	106	Gear checkNG1 In the torque-free monitoring time, angle tightening has reached the cut angle.
	107	Gear checkNG2 Motor current during rotation exceeds the torque upper limit equivalent. ※The torque limit is a current value.
	108	Fitting angle over It does not reach the fitting torque when it exceeds the cut angle.
	133	SOC.T over time The time of this operation has exceeded the set value.
PRE.T	207	Pre tightening early tightening NG It reaches the second speed switching torque between the closed fast decision angle from the start.
	211	Pre tightening torque over The torque value at the time of the end has exceeded the upper limit.
	212	Pre tightening torque under The torque value at the time of stopping does not reach the lower limit.
	221	Pre tightening time over The time exceeds the upper limit when this operation is completed.
	222	Pre tightening time under It does not reach the lower limit when this operation is completed.
	231	Pre tightening angle over The angle exceeds the upper limit when this operation is completed.
	232	Pre tightening angle under It does not reach the lower limit when this operation is completed.
	233	Pre tightening over time The time of this operation has exceeded the set value.
	240	Pre tightening area over The size of the judgment area exceeds the set value.
	271	Pre tightening total angle exceeded The angle from the start of Pre tightening to the end of tightening exceeds the total angle upper limit. This function can be used with I/F version: 1721-2.78 or higher and controller version 1851-2.44 or higher.
	272	Pre tightening total angle under The angle from the start of Pre tightening to the end of tightening does not reach the total angle lower limit. This function can be used with I/F version: 1721-2.78 or higher and controller version 1851-2.44 or higher.

Operation	Code display	Matter
REV.T	306	Reverse tightening pass torque NG During operation, the torque did not reach the set value.
	307	Reverse tightening sticking judgment NG During operation, the torque exceeds the set value.
	311	Reverse tightening torque over The torque at the measurement angle exceeded the judgment torque.
	333	Reverse tightening over time The time of this operation has exceeded the set value.
REA.T	403	Real tightening zone NG Out of the zone determination range at torque method.
	404	Real tightening gradient NG Gradient at an angle method exceeds the set value. It has ended operation before the acquisition of basic gradient.
	407	Real tightening early tightening NG The tightening torque reached the cut torque between the start and the early tightening judgment angle.
	411	Real tightening torque over The torque value at stop has exceeded the upper limit.
	412	Real tightening torque under The torque value at stop does not reach the lower limit.
	421	Real tightening time over The time exceeds the upper limit when this operation is completed.
	422	Real tightening time under It does not reach the lower limit when this operation is completed.
	431	Real tightening angle over The angle exceeds the upper limit when this operation is completed.
	432	Real tightening angle under It does not reach the lower limit when this operation is completed.
	433	Real tightening over time The time of this operation has exceeded the set value.
	434	Real tightening over cut angle Angle from the start was over. (No torque sensor only)
	440	Real tightening_area over The size of the judgment area exceeds the set value.
	441	Real tightening snag torque over The snug torque exceeded the upper limit by the angle method.
	442	Real tightening snag torque under The snug torque does not reach the lower limit by the angle method.
	451	Real tightening torque decrease NG The tightening torque becomes lower than the setting value of the real tightening passing torque after passing the snug torque.
	471	Real tightening total angle exceeded The angle from the start of Real tightening to the end of tightening exceeds the total angle upper limit. This function can be used with I/F version: 1721-2.78 or higher and controller version 1851-2.44 or higher.
	472	Real tightening total angle under The angle from the start of Real tightening to the end of tightening does not reach the total angle lower limit. This function can be used with I/F version: 1721-2.78 or higher and controller version 1851-2.44 or higher.

## 10-2 Alarm Code List

Alarm generated in the GSK/GKL IF (EC\*)

Code display Matter	Detection factor	Cause	Counterplan
EC0 Program Number error	Selected program error /Details of the problem	It is Outside the range specified program No.	Confirmation of program selection signal
		Program data GSK/GKLIF remember is illegal state. (Check SUM)	Readjustment of a program
		There are no nut runners by multi axis mode.	Confirmation of the unit setting
EC1 Operation details of the error	Deciphering impossible operation is set.	Program data GSK/GKLIF remember is illegal state. (You found an unknown command)	Readjustment of a program
EC2 No action-axis error ※Reset is impossible.	The specified axis has not been implemented. /the axis number is mapped twice.	Unit misconfiguration	Confirmation of the unit setting
		ARC-NET communication failure	Confirmation of the connection between GSK/GKL interface and GSK driver
			Confirmation of the connection among GSK/GKL drivers
			Check whether the axis number of GSK/GKL driver saide and unit setting is matching
EC3 FRAM error ※Reset is impossible.	Anomaly detection by self-check of GSK/GKLIF farm	Ensure shortage of backup area	Review the GSK/GKLIF of firmware
EC4 External communication error ※Reset is impossible.	M-NET communication has stopped.	M-NET connection faulty wiring	Confirmation of the wiring
		Station address of the PLC side, the number of bytes sent and received abnormal	Confirmation of the sequence settings
		M-NET station address misconfiguration	Confirmation of the N-NET stations
		Shield processing defects of the M-NET connection line	Confirmation of the wiring
EC5 Rate number setting error	NR/X/Y axis rate number error	NR/X/Y axis rate assignment other than 1 to 30	Confirmation of the program setting

Code display Matter	Detection factor	Cause	Counterplan
EC6 Position select error	Position select error at the time of JOG operation	Selected positions at the time of JOG operation are other than 1 to 255.	Confirmation of the input and output signals
EC7 CAN communication error	Communication error with Z axis driver	CAN cable connection problem	Change the cable
		Fogging or mismatch of Z axis driver ID	Review the driver settings
		Z axis driver turns off	Reboot the master
EC9 Arcnet communication error	It occurs, when turning on the power.	ARC-NET communication failure	Same as EC2
		Without replies from GSK/GKL driver	It's checked whether index of an axis on the driver side is parallel with index of an axis of unit setting.

Alarm generated in the GSK/GKL driver (E\*\*)

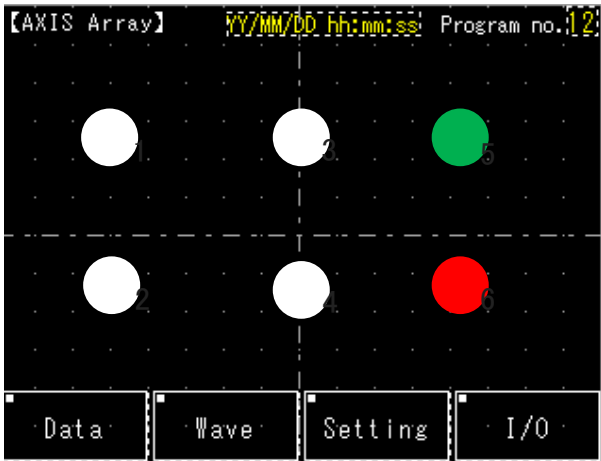
Code	Alarm names and detection contents / Cause of generation and treatment
E11	[IPM error] Power drive signal error (overcurrent / overheat / power supply error) 1. Short circuit between motor windings : Replace motor 2. Short circuit of motor connection cable : Replace cable 3. Controller drive circuit failure : Replace controller 4. Overheating due to overload 5. The ambient temperature of the controller is abnormally high : Review the installation environment 6. Fan does not work : Replace controller
E21	[Overload] The motor average current exceeded the "overload alarm detection value" (see * 6-1) 1. Excessive load torque : Reduced load 2. Acceleration / deceleration frequency of operation is too high : Change of operation pattern 3. Overload alarm set value is too small : "d00104" parameter change 4. Sensor setting error : Review parameters of "d00141"
E22	[Current control error] The average deviation of the current control loop exceeded the "current control error value" 1. Motor disconnection : Replace motor 2. Broken motor connection cable : Replace cable 3. Occurrence of abnormal vibration : Readjustment of servo gain 4. Resolver NR is used : "d00114" parameter review
E31	[Overspeed] The motor speed exceeded the "overspeed alarm detection value". 1. Excessive command speed : Review of command speed 2. Overspeed detection set value is too small : "d00105" parameter change * * There is a difference in initial value between NR and positioning. Representative value NR : 15000 Positioning : 7500 Since the value varies depending on the model, please contact the manufacturer for details. 3. Overshoot during control : Servo gain readjustment 4. After resetting the absolute position detection sensor: Reset the alarm again.
E41	[Position control counter overflow] Position data exceeds $\pm 68000000h$ 1. Rotated in a certain direction for a long time: Review of operation pattern 2. Does not move due to cable disconnection or wiring mistake: Cable replacement
E42	[Excessive deviation] Position deviation exceeded "deviation error detection value" 1. A large position command has been added in steps: Review of the position command 2. Motor disconnection: Motor replacement 3. Disconnection of motor connection cable: Encoder / resolver cable replacement 4. Abnormal vibration occurs: Servo gain readjustment 5. Setting error of angle sensor resolution: "d00141" parameter review
E61	[Sensor error] Encoder signal cannot be detected (disconnected) 1. Broken motor angle sensor connection cable : Replace the cable 2. Sensor setting error : Review parameters of "d00140" 3. Abnormal sensor attached to motor : Replace motor
E62	[Sensor abnormality] Abnormal sensor signal from resolver backup unit 1. After an error occurred, the power was turned off without resetting: Reset the R / D_board. 2. Resolver backup unit error : R / D_board replacement 3. Motor sensor magnetic pole signal error : Replace motor
E63	[Sensor error] Communication error with SmartInc or SmartABS encoder / resolver 1. Connection cable error: Replace cable 2. Resolver backup unit error: R / D_board replacement 3. Abnormal motor angle sensor: Replace motor
E64	[Sensor error] SmartInc or SmartABS encoder detected an error 1. Overflow count value overflow : Reset of multi-turn position data by alarm reset 2. Battery voltage drop : Replace battery after error reset 3. Cable breakage between resolver backup unit and resolver : cable replacement 4. Abnormal motor angle sensor : Replace motor 5. Malfunction of backup unit due to noise : Review cable connection and ground connection, and install ferrite core on motor connection line 6. Uncertain origin : Return to origin
E65	[Sensor abnormality] There is no HZ state when the power saving encoder power is ON 1. Sensor setting error : Review parameters of "d00140" 2. Abnormal motor angle sensor: Replace motor

E66	[Abnormal sensor] Excessive amplitude of resolver signal 1. Unresolvable resolver : Please contact us 2. Sensor setting error : Review parameters of “d00114” and “d00142” 3. Resolver reception circuit error : Replace controller 4. A value exceeding the motor speed upper limit was set : Review of settings 5. Disconnection between resolver backup unit and resolver : cable replacement
E67	[Sensor abnormality] Sensor signal abnormality Multi-turn overflow of resolver backup unit
E69	[Sensor abnormality] Sensor signal abnormality 1. Resolver backup unit error
E71	[Overvoltage] Excessive drive power supply voltage 1. Drive power supply voltage exceeded 800V: Review of drive power supply 2. Drive voltage detection circuit malfunction: Controller replacement
E72	[Voltage drop] Drive power supply voltage drop 1. The drive power was turned off while the servo was on: Controller replacement
E73	[Regeneration abnormality] Voltage does not decrease due to regeneration 1. Regenerative resistance is too large : Replace the controller because the regenerative resistance cannot be replaced.
E74	[Regenerative abnormality] Regenerative resistance overload 1. Insufficient capacity of regenerative resistor : Since the regenerative resistor cannot be replaced, replace the controller.
E81	[Abnormal control power] Decrease of control 24V voltage 1. Control 24V voltage dropped : Review of external power supply unit 2. Abnormal voltage detection circuit : Replace controller
E82	[Bus failure] Cannot read / write data between CPU and peripheral device normally 1. CPU peripheral circuit error : Controller replacement
E83	[Current offset error] The offset value of the current sensing circuit is abnormally large 1. Abnormal current detection circuit : If the alarm cannot be reset after turning the drive power off, replace the controller.
E91	[Non-volatile memory error] Data cannot be read normally 1. Non-volatile memory malfunction or memory data destroyed : Parameter initialization and resetting or controller replacement
E92 E93 E94	[Non-volatile memory error] Data cannot be written normally (E92) Data cannot be erased normally (E93) Write check failure (E94) 1. Malfunction of nonvolatile memory : If the parameter is saved again and the alarm cannot be reset, replace the controller.
E95	[Non-volatile memory error] Abnormality of the data to be written 1. There is a parameter setting value exceeds the allowable range : Review of the parameters
EA0	[Nutrunner operation parameter error] 1. Abnormal parameter sent from IF to controller : Review of setting values
EA1 EA2 EA3	[ARC-Net initialization failure] 1. ARC-Net IC error : Controller replacement
EA4 EA5	[ARC-Net communication error] 1. Communication is not possible due to noise, etc. : Cable inspection, terminal processing inspection, shield processing inspection



## 11 Indication on the display

### 【Axis arrangement】



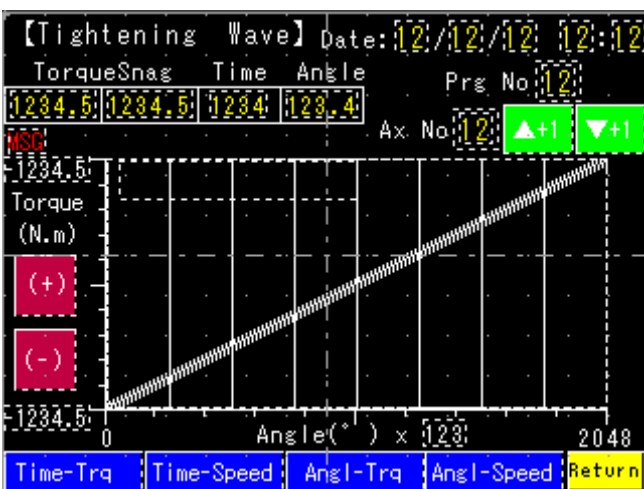
### 【Tightening result data】

【TIGHTENING DATA】					
	Torque	Time	Angle	Snag	Judge
No. 12	1234.5	12345	123.4	1234.5	MSG
No. 12	1234.5	12345	123.4	1234.5	MSG
No. 12	1234.5	12345	123.4	1234.5	MSG
No. 12	1234.5	12345	123.4	1234.5	MSG
No. 12	1234.5	12345	123.4	1234.5	MSG
No. 12	1234.5	12345	123.4	1234.5	MSG
No. 12	1234.5	12345	123.4	1234.5	MSG
No. 12	1234.5	12345	123.4	1234.5	MSG
No. 12	1234.5	12345	123.4	1234.5	MSG
No. 12	1234.5	12345	123.4	1234.5	MSG

Data of a tightening result is indicated.

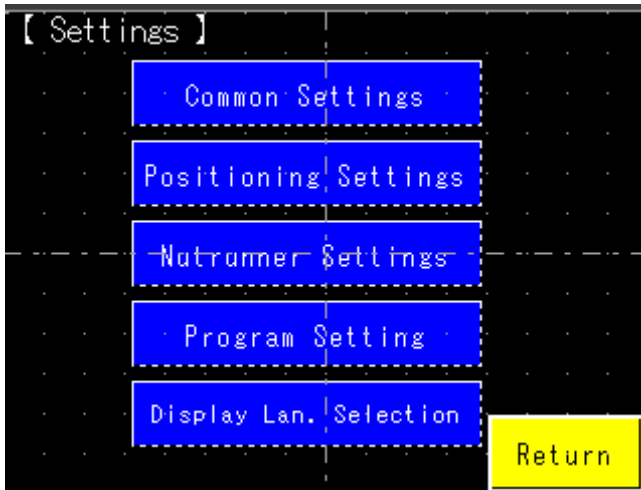
A message of a tightening result is shown to MSG part.

### 【tightening torque curve】



A tightening corrugation can be seen "transverse: Time - vertical axis: torque", "transverse: Time - vertical axis: speed" and "transverse: The angle - vertical line: The torque", "transverse: The angle - vertical axis: speed".

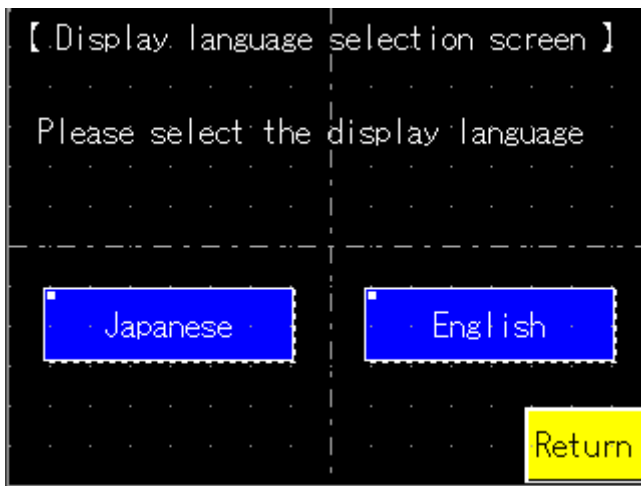
【Setting menu】



It's possible to confirm the parameter of setting variously.

Setting parameter change is possible by input PIN code.

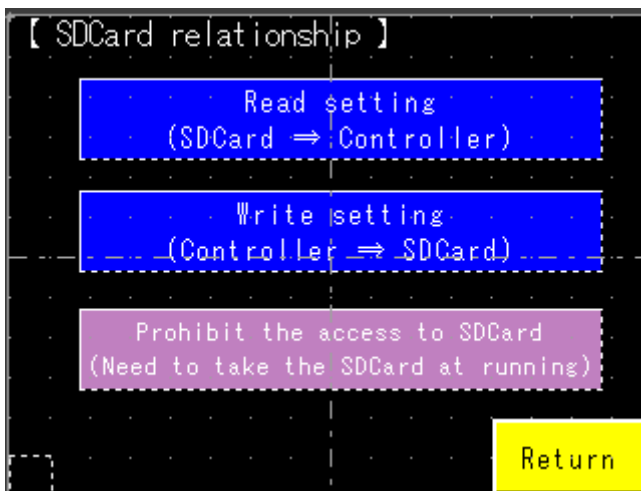
【Selevt language】



It's possible to change the language shown to a display.

The language which can be indicated is two, Japanese and English.

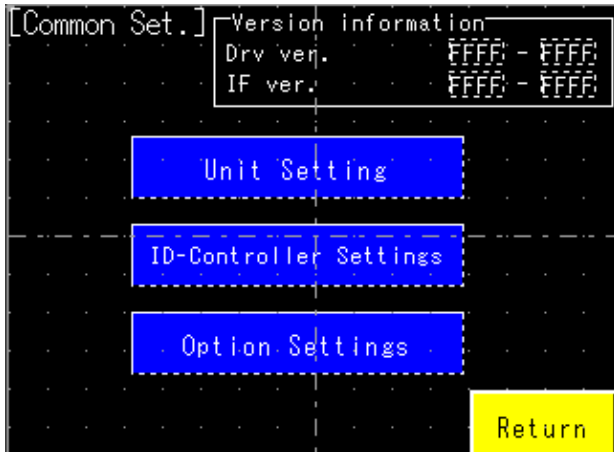
【SD card setting read/write】



The reading of the setting and writing in can do by a SD card.

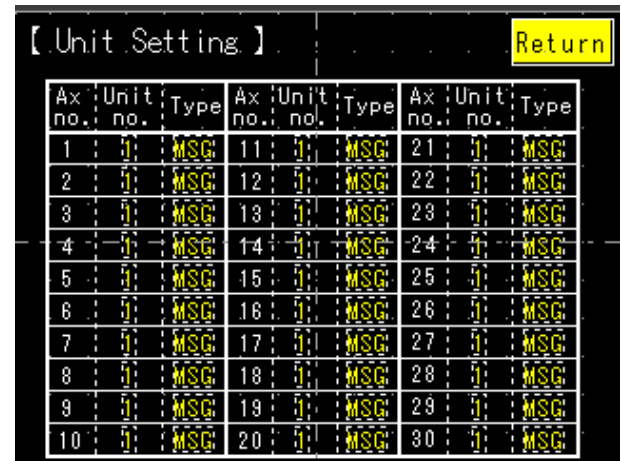
Input of PIN is needed in case of writing in.

**【common setting】**



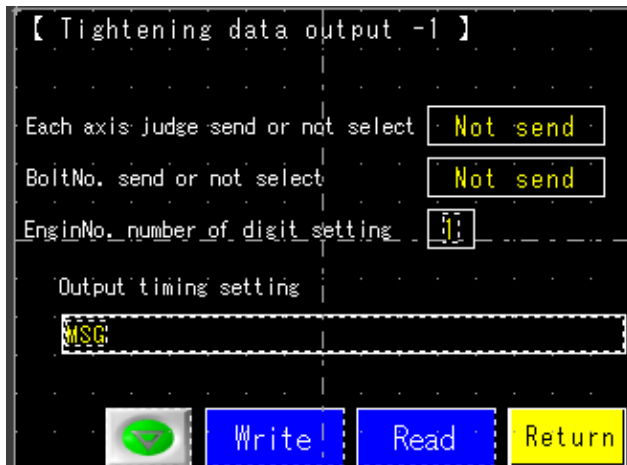
There is [unit setting] [tightening data output] [option setting] in common setting.

**【unit setting】**



It's indicating which unit an axis is.

**【output of tightening data】**



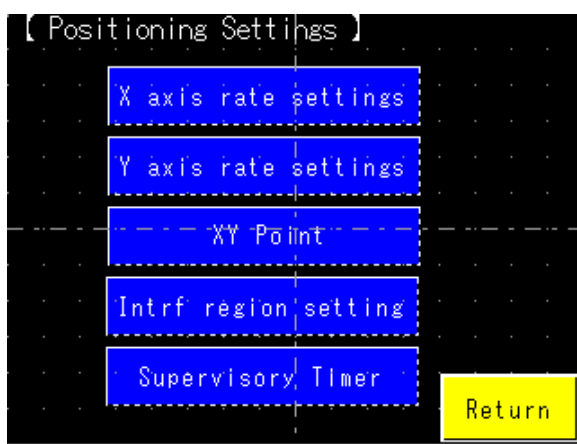
The tightening data output output from a controller is established.

**【option setting】**



The setting contents by the option item are being indicated.

**【position setting】**



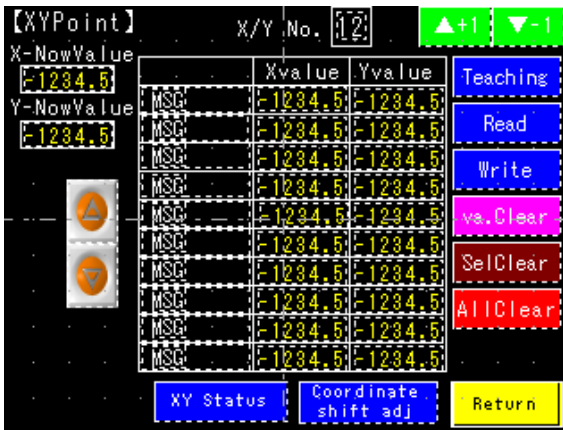
When using positioning control, X and a Y axis are established.

**【X axis rate】**



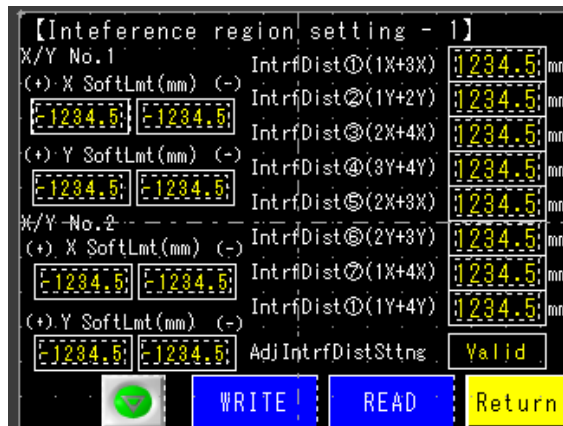
Each parameter details of rated value setting of an X axis motor are indicated.

**【XY point teaching】**



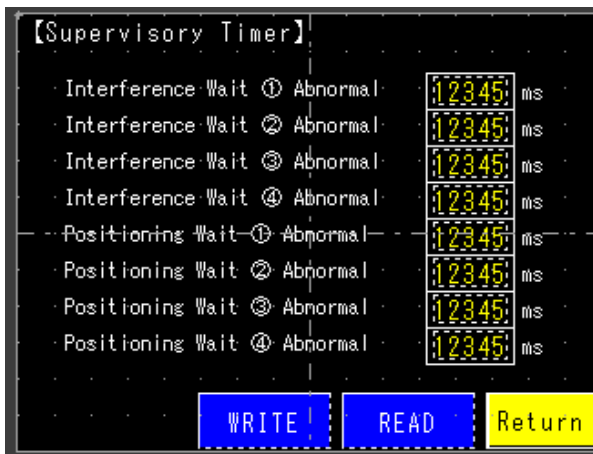
Details of each parameter in the set coordinate location are indicated by each axis of XY.

**【Buffering territory setting】**



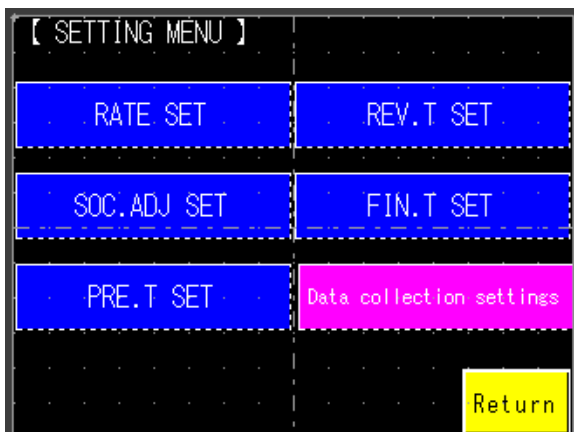
Each parameter details in a set interaction region are indicated by each XY axis.

**【Monitor timer】**



The restriction time details established as the intervention waiting time with the other units are indicated.

**【Nutrunner setting】**



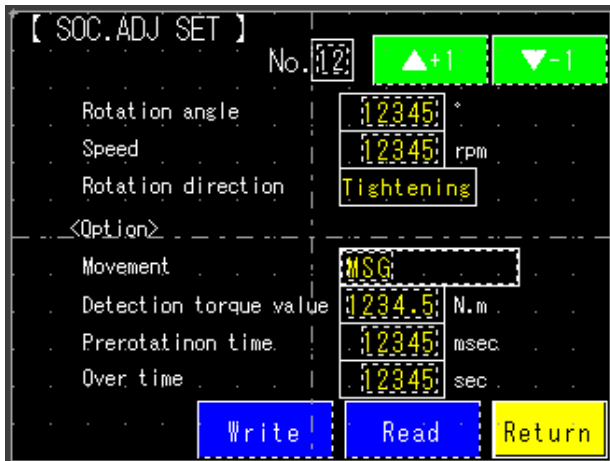
There is [rated setting] [socket adjustment] [reverse] [pre-tightening] [real-tightening] [data collection] as nut runner setting.

**【Rated setting】**



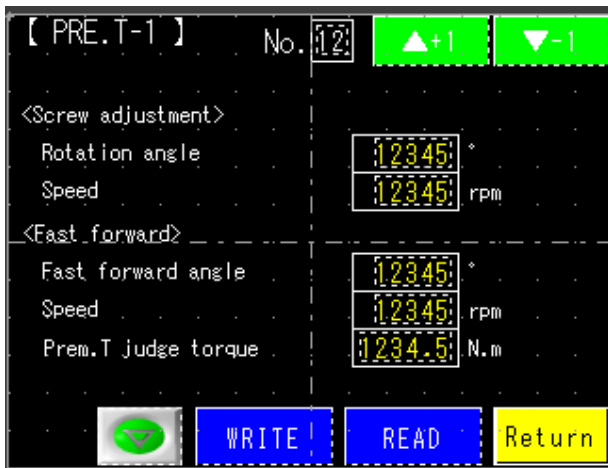
Each parameter of rated setting of used nut runner is indicated.

### 【Socket adjustment】



Each parameter of socket adjustment is indicated.

### 【Pre-tightening】



A parameter of pre-tightening set value is indicated. It's possible to do smaller control and judgment by option setting.

### 【Reverse】



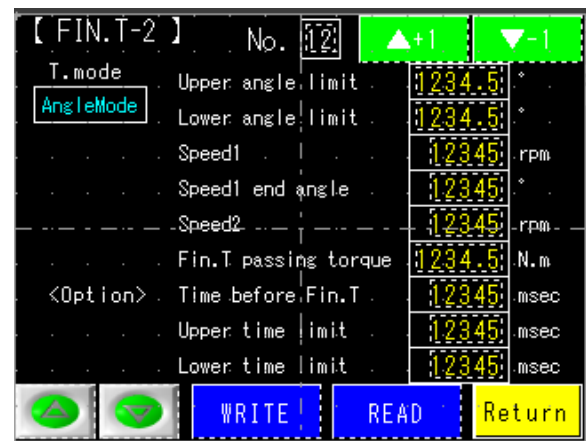
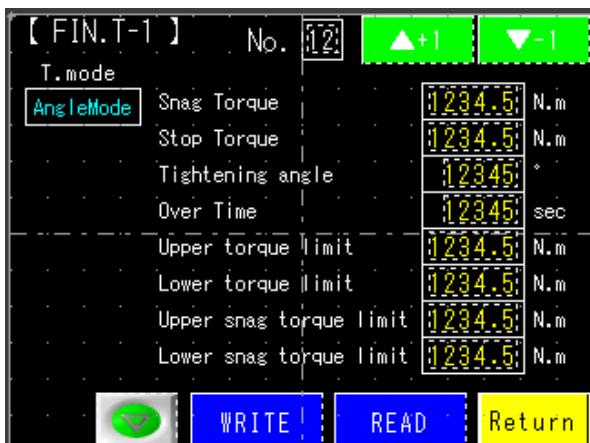
A parameter of reverse set value is indicated.

【Real-tightening –torque control mode】



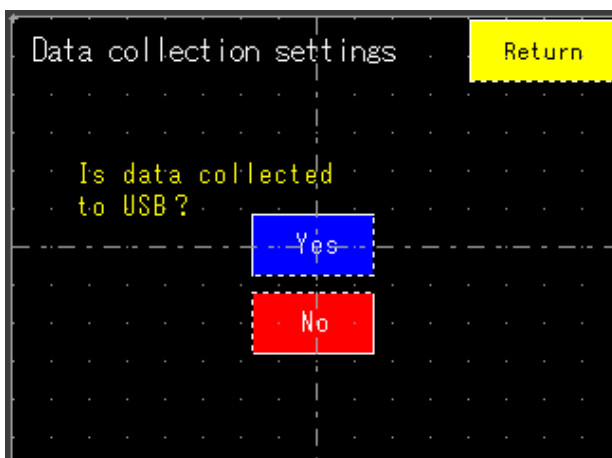
A parameter of real-tightening is set value by the torque control mode is indicated. It's possible to do smaller control and judgment by option setting.

【Real-tightening –angle control mode】



A parameter of real-tightening is set value by the angle control mode is indicated. It's possible to do smaller control and judgment by option setting.

【Data collection setting】



When USB is inserted in a display when "use" is chosen from a data collection setting, a tightening result is preserved by a USB memory by a CSV format.

【Program setting】



The program setting can be confirmed.

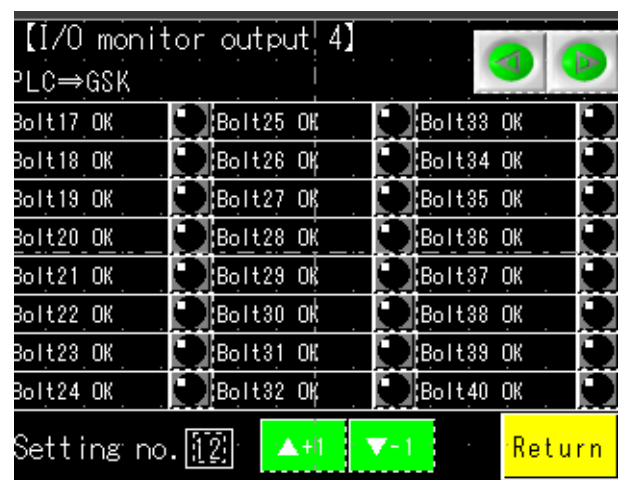
【IO monitor input】



It's possible to do input confirmation of I/O monitor.

A screen is changed by an arrow button.

【IO monitor output】



It's possible to do output confirmation of I/O monitor.

A screen is changed by an arrow button.

## **12 Maintenance and check**

### **12-1 Precautions**

#### **12-1-1 Precautions for maintenance and check**

- Before removing the unit, make sure to cut off the power supply, and discharge the voltage by operating DISCHARGE, and detect the voltage.
- Do not operate when your hands are wet, Doing so may cause electric shock.
- Do not attempt the insulation resistance test of the driver with a Megger tester. Doing so may damage the driver
- Do not disassemble or repair the product at the customer end.

General operating condition:

Ambient temperature should be at the annual average 30°C and the load ratio be less than 80% and operation be less than 20 hours a day.

#### **12-1-2 Check items**

Daily check

- Check for unusual vibration or sound.
- Check for abnormal odor.
- Check the wire for flaw and cracks. Special care should be taken to inspect the movable cables.
- Check the driver ventiration hole for foreign matters attached. Periodical check (1 year)
- Check the screws at tightening point for loosened condition.
- Check the tightening section for alignment failure.
- Check the cooling fan for any damage.

#### **12-1-3 Operating life**

Changes depending on the environmental condition and usage. It is required to replace the component if the abnormal condition is detected.

To replace the parts, please return it to the manufacturer for repair.

Products	Component	Standard replacement interval	Remarks
Driver	Capacitor	About 5 year	Standard replacement interval is only for your reference. It is required to replace when the defective condition is found even if it has not reached the standard replacement interval.
	Relay	100,000 times operation	
	Cooling fan	10,000 to 30,000 hours	
	Battery	10,000 to 50,000 hours	
	E2PROM	10,000 times of overwriting operatio	



#### **12-1-4 Capacitor**

• A smoothing capacitor deteriorates its characteristic under the effect of ripple current. The operating life of capacitor varies depending on the ambient temperature and using conditions but it lasts about 5 years under the general operating condition.

#### **12-1-5 Relay**

• Contacts wear due to the open/close current. Relay reaches the life limit by about 100,000 times of operation

#### **12-1-6 Cooling fan**

• Due to the bearing's operating life, the cooling fan has the life of 10,000 to 30,000 hours under continuous operation.

#### **12-1-7 Battery**

• Battery life is basically about 5 years. But it varies depending on the application to use.

#### **12-1-8 E2PROM**

• E2PROM for parameters storing has the limit of overwriting frequency. Data holding time is about 10 years.

### **12-2 Guarantee**

The overwriting frequency under the guaranteed condition is as follows as an outline. It is restricted by the shortest condition in the following terms.

Parameter overwrite (Fn01 to Fn12)	Each 10,000 times/total
Program overwrite	10,000 times/each axis
Tightening history data	Tightening of about 10,000,000 times/axis
Engine number data	About 59,520,000 units
Alarm history	Alarm 10,000 times occurrence/each axis

### **12-3 Tightening operation glossary**

UNIT:

Multiple axes control up to 30 axes can be treated as each axis to independently operate or as a group of several axes (a unit) to operate together. One interface unit can control the maximum 7 units. At least one controller belongs to one unit (maximum 30 axes control to one unit), and one input command is assigned to one unit and then all belonging axes start operation simultaneously. In SIO, different station numbers assigned to each unit.

PROGRAM:

Screw tightening program can form the program from 1 to 24 on each axis. One program begins with the control flag (Zero magnification check is performed or not, etc.) and rating setting, and it is possible to set operation to maximum 77 steps. However, the rating block number, screw number and end is handled as 1 step. At least one block should have been set in the program.

#### BLOCK:

A set of operations in tightening program. Block start begins from rating step and shows the set of steps to the end declaration. In automatic operation, one-time program start executes one block. It is also possible to start from the block on the way by designating the block number. The determination (Block OK/NG) against the operated block is output on the step in the block end declaration. If "NG" is determined on either step in the block, it becomes the "block NG" (excluding the case when there is a retry); the next step will not be executed. After determination output, the program start initiates the next block.

#### STEP:

Each operation (Rotation, pretightening, reverse rotation and final tightening), block start declaration, screw number, block end declaration, and retry are called steps respectively. Step 1 will be always the block start declaration and the step 2 will be always the screw number because more than one program is needed in a program. Program is executed from the step 1 and finished by the end declaration at the final block. On the step of the final block end declaration, the total determination (Total OK/NG) is output. Each axis in the unit operates by step synchronization and the axis in which step has been complete turns OFF the servo motor and waits for the step completion of other axes. When steps of all axes are complete, the next step will be operated.

#### QL INPUT:

In the block where the tightening operation is in progress, if the tightening operation is not within the OK range, "NG" determination is output in this block. Operator looks at this "NG" determination and needs to retighten the screw manually. At this time, it is possible to change the determination "NG" to "OK" by inputting the tightening output of the manual torque wrench to the controller. This input is called a QL input.

#### RETRY:

It is possible to retry (try again) operation if NG occurred in set on the step, if NG occurred on the way from the block start declaration till the previous step of retry, the operation following the retry will be executed. If NG did not occur, the operation following the retry will not be executed.

#### ROTATION:

Used for screw pick up (a socket picks up a screw head) operation before tightening or preventive operation against socket-engagement after tightening.

#### PRETIGHTENING:

Operation to perform temporary tightening until a screw seats.

#### REVERSE ROTATION:

Operation to unfasten the seated screw by several turns in order to transit to final tightening. (Baking inspection of the screw by pretightening)

#### FINAL TIGHTENING:

Final tightening operation of screws.

#### ZERO MAGNIFICATION CHECK:

Inspects the torque sensor zero point and magnification (Output voltage at 1/8 momentary maximum current).

※When the zero magnification check is set on the program, the zero point of the torque sensor becomes zero automatically. However, the value exceeding the one of the rating setting becomes "Zero magnification NG".

#### APPLICABLE TO QC PERSONAL COMPUTER:

Automatic gain of the tightening data and tightening waveform (Simultaneous use with a printer is not possible.)

※Tightening data: "Machine No.", "Axis No.", "Screw No.", "Date", "Time", "Program No.", Pretightning torque, Pretightening angle, Reverse time, Reverse angle, Final tightening torque, Final tightening time, Final tightening angle, Final tightening snag torque, Gradient, Rotation torque judgement, Unit No., Engine No.

※Tightening waveform: Waveform from the final tightening snag torque to the finish,

#### APPLICABLE TO ID CONTROLLER:

It is possible to transfer the engine number, set the calendar and transmit the result data by connecting the interface unit and ID controller via serial communication. (Exclusive use with a printer.)

#### APPLICABLE TO PRINTERS:

Connects with a printer through Centronics interface. Setting data and tightening result can be printed .

(Exclusive use with a QC personal computer and ID controller)

#### TIGHTENING ANGLE SAMPLING OPERATION:

Operation to rotate the screw in the tightening direction at a constant speed and then stop when it reaches the preset torque, in order to measure the screw length. The angle from the start to stop is read through the personal computer communication. This is not the operation on the program. (Executable only from the personal computer and SIO)

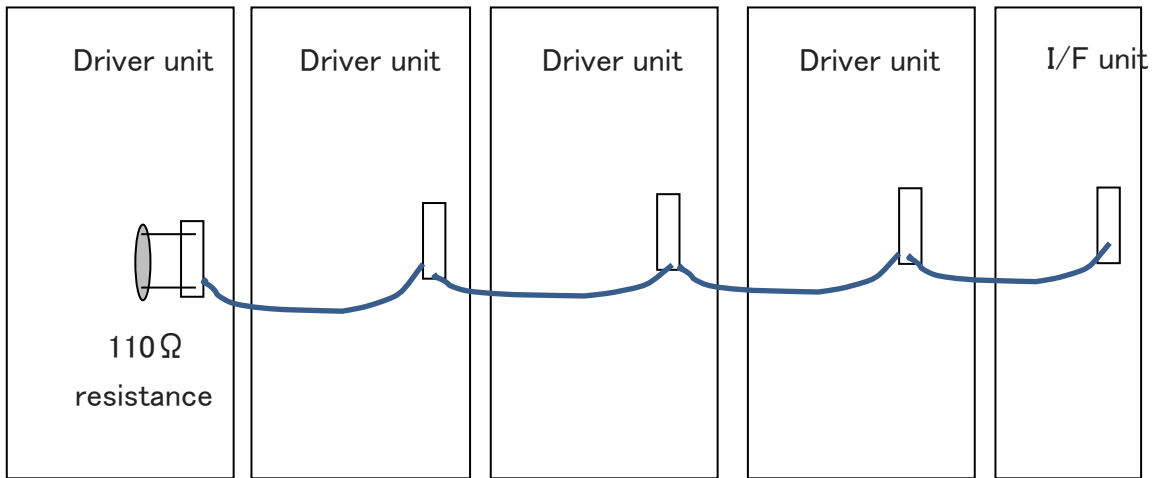
#### END, STOP:

During tightening operation (rotation, pretightening, reverse tightening and final tightening), the operation may be finished to stop when the condition is matched. This point that the condition matches (during the motor running) is defined as "End" and the point actually the motor stopped is defined as "Stop". Most NG determination is executed after "Stop" is established.

### 13 Supplemental explanation

#### 13-1 Precautions for wiring the arc net.

Please use the following drawing for the arc net wiring.



Set 110Ω resistor to (+)(-) on the arc net connector of the end unit driver .

#### Precautions to use M-net communication

Make sure to set the SIO start address setting "Fn12 No.13" from the controller panel when SIO is selected for the communication with PLC. (If the PLC address does not match the GSK/GKL controller SIO start address, the communication between PLC and GSS cannot be established.)

Password to write the setting data to GSK/GKL PC

Password when the setting is written: 2014

## **13-2 About GSK/GKL tightening setting additional items**

### **13-2-1 Judgment area**

You set the area value to be used for judging screw defects.

Calculation of area value is obtained by integral calculation on torque and angle curve during Pre-tightening cycle (option setting item in case of Real tightening).

With the tightening waveform of the automatic measurement item in the setting software, you can check the waveform used for this calculation.

To see this waveform, you select "Extended waveform".

### **13-2-2 Smooth tightening**

This tightening controls the rotational speed steplessly.

You can set this tightening method by the option of the final tightening cycle.

By setting initial speed and the speed at the cutting torque, the rotation speed changes steplessly according to the change of torque.

### 13-3 SD card

In GSK/GKL, several functions can be used by inserting the SD card memory into the SD card slot at the top of the I / F.

The available functions are shown below.

- ① Automatic storage of tightening result

**※Caution※**

**The SD card that GSK/GKL supports is up to "SDHC".**

**Please note that it does not correspond to "SDXC" type.**

The LED lighting status and SD card status are shown in the table below.

	State	Explanation
LED2	Lights off	No SD card inserted
	Lit green	SD card inserted (idle)
	Blinking green	SD card inserted (accessing)
	Lit red	Access prohibited
	Blinking red	SD card access error occurred or Wait for SD card insertion / removal after conservation. (GSK/GKL-IF ⇒ SDCard)

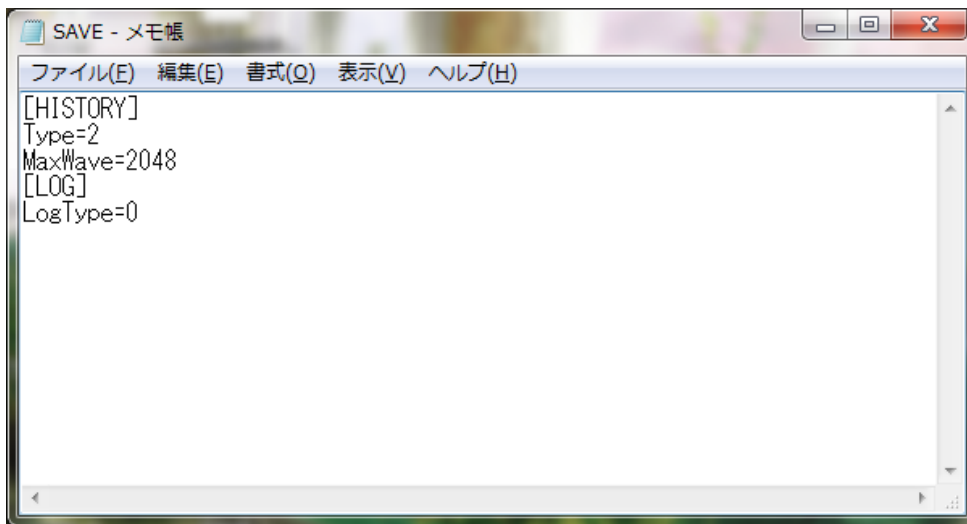
### 13-3-1 Automatic storage of tightening result

The tightening result when operating automatically, is received at any time from GSK/GKL – IF and the data is preserved in a "HISTORY.CSV" file.

#### •SAVE.INI file

When this automatic preservation is performed with multi-axis tightening, it may take too much time to store all the waveform data.

In that case, setting "SAVE.INI" file in the SD card makes it possible to shorten the writing time by reducing the amount of data to be written to the "HISTORY.CSV" file.



The following table shows the setting in this configuration file.

Items		Explanation	Setting contents
[HISTORY]	Type	It sets the saving pattern of the tightening history. Please select the setting contents from the right column.	0: Don't save 1: Save only the tightening result 2: Save tightening result + save waveform 3: Save the tightening result + save waveform when NG
	MaxWave	It sets the number of sampling in one waveform. It takes 0.01 seconds per sampling. Therefore, the maximum time of the waveform to be saved with this setting is determined. Waveforms exceeding this setting are not saved.	Please specify a value in the range from 1 to 2048. ※ The smaller the value, that is the shorter the write time.
[LOG]	LogType	It sets whether to write the operation record of the program.	0: Don't write 1: Write

If the "SAVE.INI" file does not exist in the SD card, it will be saved with the following settings.

TYPE = 2

MaxWave = 2048

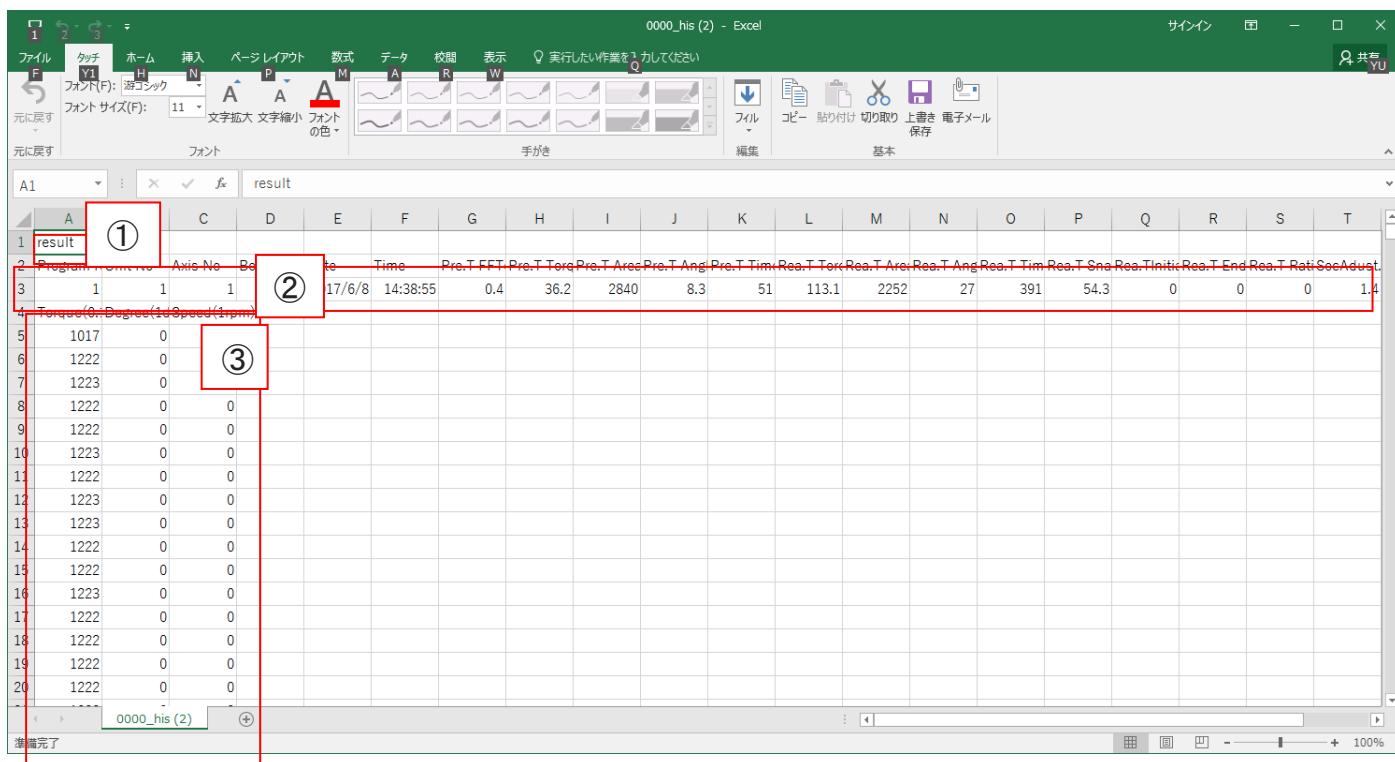
LogType = 0

・HISTORY.CSV file

When the SD card is inserted into the slot of the GSK/GKL-IF, the tightening result is written to the SD card.

"HISTORY.CSV" is the file which the tightening result is written at this time.

The file name actually saved is "0000\_his.CSV".



Below is a description of the number in the above figure.

- ①: This is the title of the history. "Result" is fixed.  
The data etc. read by the support system are not shown in this notation, please use it to distinguish.
- ②: The details of the tightening result are shown.  
The result data is saved in the same format as "Online" of the setting software.
- ③: Sampling data which used for waveform image creation is recorded.  
It records torque, angle, rotation speed every 10 msec.

About 1000 items can be saved in this file (※).

If it is over, it names the current history file by date and time and it saves the result to a new history file.

Please refer to the table below for name change.

Order	Contents	String
1 <sup>st</sup> and 2 <sup>nd</sup> Character	Renamed date	01~31
3 <sup>rd</sup> and 4 <sup>th</sup> Character	Renamed hours	00~23
5 <sup>th</sup> and 6 <sup>th</sup> Character	Renamed minutes	00~59
7 <sup>th</sup> Character	Renamed second (10 of digits)	0~5
8 <sup>th</sup> Character	Renamed month	1~9,A(October),B(1November),C(December)

(Example: When splitting at 23:50:35 on October 3 ⇒ "0323503 A. CVS")

If a file with the same name already exists, it delete the existing file and it rename the current file.



## **13-4 Predictive maintenance function**

※This function can be used with I/F version 1721-2.76 or higher.

This function is available with GSK setting software version 0.0.119 or higher.

This function is available with GKL setting software version 0.0.17 or higher.

### **13-4-1 Outline of Predictive Maintenance**

The predictive maintenance function is a function to urge early exchange and maintenance by notifying before the GSK/GKL Nutrunner system fails.

This function prevents occurrence of breakdown on the manufacturing line.

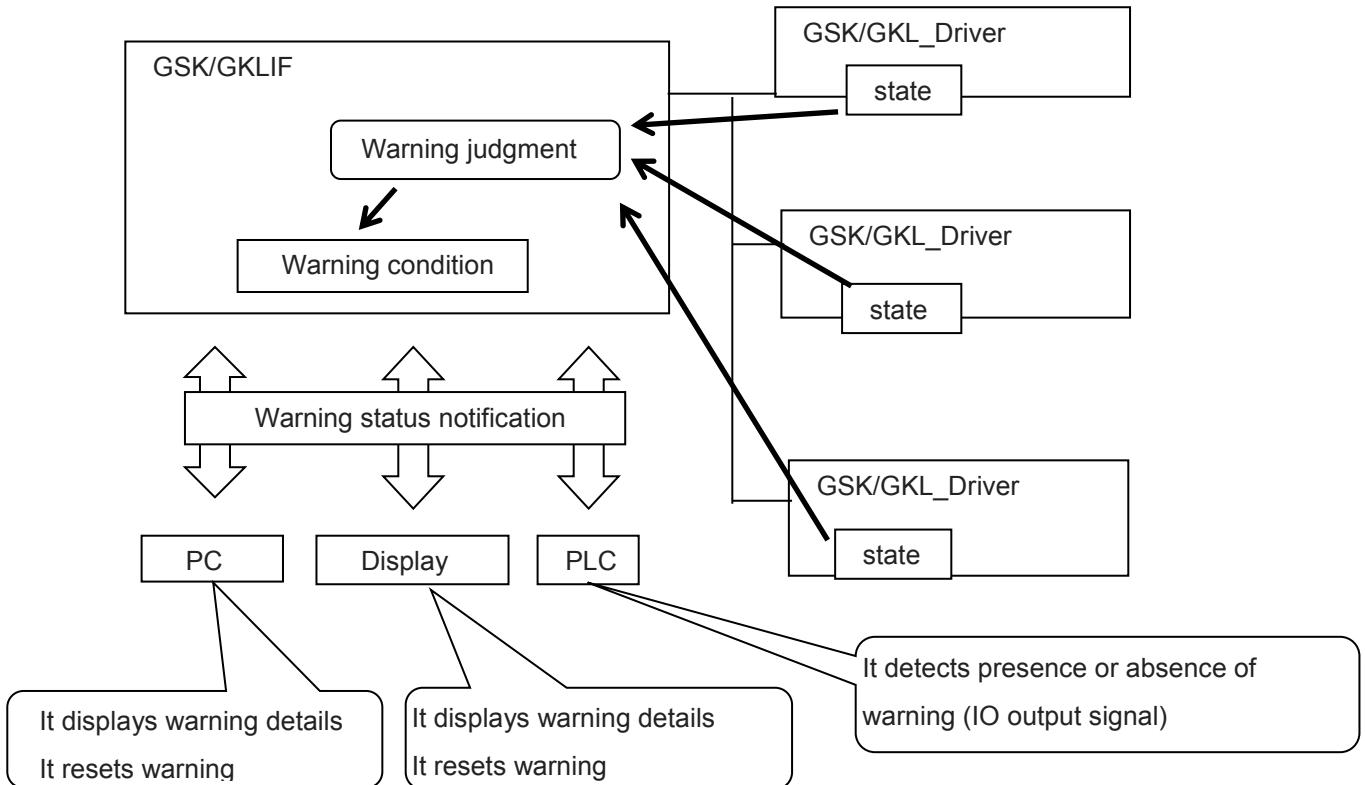
Controller electronic component life warning	This function warns the parts life of the GSK/GKL system (GSK/GKLIF and GSK/GKL driver). Warning will be issued when parts life comes close, such as electrolytic capacitors and relays. Warnings can not be reset without replacement work.
Nutrunner failure prediction warning	This function is a warning that occurs according to the state of the nut runner, such as overload. Warnings are cleared by turning off the power or resetting.

### 13-4-2 Flow to alarm notification

The GSK/GKL system possesses a predictive maintenance function for warning of electrical parts life warning and protection warning.

The following shows the flow until a warning is notified.

1. Each driver notifies the current state to the GSK/GKL I / F
2. When the GSK/GKL I/F judges that a warning has occurred, it turns on the warning bit of the IO output signal.
3. Confirm warning details by using a PC or external display (currently being created)



※At the stage of warning comes out, the lifetime of each consumable item of GSK/GKL is not much left.  
We recommend exchanging it promptly.

### 13-4-3 GSK/GKL controller Electronic component lifetime warning

If even one of the following warning conditions occurs, the output signal to the PLC "warning of electrical component life warning" turns ON.

The warning level in the table is the initial value and so it is possible to change from 7 segment monitor.

If warning level is set to 0, warning judgment is not performed.

#### Driver's electrolytic capacitor lifetime warning

Warning content	Lifetime warning of electrolytic capacitor mounted on GSK/GKL drive
Warning level	4 years (lifespan: 5 years)
Determination method	We write the date of manufacture when manufacturing the GSK/GKL driver. The GSK/GKL I / F compares the manufacture date of each driver with the current date and It judges whether it exceeds the warning level or not. ※However, if the date of manufacture is all 0, it will not be checked.
Warning Reset	That is impossible.

### Driver's relay lifetime warning

Warning content	Lifetime warning of the drive power-on relay mounted on the GSK/GKL drive
Warning level	80 thousand times (lifespan 100 thousand times)
Determination method	It clears the relay operation count to 0 when manufacturing the GSK/GKL driver. The GSK/GKL controller increments this count by 1 each time the relay is moved. The GSK/GKL I / F checks the number of relay operations of each driver and it judges whether it exceeds the warning level or not.
Warning Reset	That is impossible.

### Driver's EEPROM lifetime warning

Warning content	Lifetime warning of EEPROM rewriting installed in the GSK/GKL drive
Warning level	800 thousand times (lifespan 1 million times)
Determination method	It clears the EEPROM write count to 0 when manufacturing the GSK/GKL driver. The GSK/GKL driver increments this number by 1 each time EEPROM rewrite is performed. GSK/GKLIF checks the EEPROM write count of each driver and it judges whether it exceeds the warning level or not.
Warning Reset	That is impossible.

### **13-4-4 Nut runner failure prediction warning**

When the following warning condition occurs, the output signal "protection warning" turns ON.

The warning level in the table is the initial value and can be changed by the personal computer.

When the warning level is 0, warning judgment is not performed.

### Driver overload warning

Warning content	The load current of the GSK/GKL driver exceeds a certain value.
Judgment target	Overload alarm level (percentage of alarm level)
Warning level	80%
Determination method	The GSK/GKL driver notifies the GSK/GKL I/F of the overload alarm level of the motor. GSK/GKL I/F checks whether the judgment value has exceeded the warning level and exceeded.
Warning Reset	Warnings can be reset by computer operation. It resets when turning off the power of GSK/GKL I/F.

## 13—5 Precautions for Input/Output communication

### 1. Program selection

Make sure to select the program No.1 to No.24 for the program bit when the program selected.  
When the program number is 0 or more than 25, it becomes ALC0 (Program not selected NG)

### 2. Input ENABLE

Please always input "Input ENABLE" after the program bit is selected.

If ENABLE is not input, the program cannot be changed or selected, After the program selection is changed, check that the output of program selection completion and the program number is security changed.

### 3. Determination reset

Determination reset is not accepted except the total determination output after the program is finished.

(To prevent the double tightening, it is always required to input the determination reset after the program is finished. (Total determination output))

### 4. Inching start

Select the program number by selecting the program bit at the inching start.

Rotating speed and direction are decided during rotation by selecting the program.

(Rotation setting number is selected by the selected program number and the speed and rotating direction by this setting controls the inching movement.)

If the program is not selected, inching start is not accepted. Please be careful of it.

Do not input the inching start during the program operation. It may cause malfunction.

### 5. Alarm reset

Input for the alarm reset input is enabled only when the alarm occurred.

### 6. IN input

Effective only when IN is set in the program setting.

If IN setting is performed in the program, make sure to enter IN because the program waits for the input of IN after the program execution until the previous step before the IN is set.

Do not input the inching start and alarm reset. It may cause malfunction.

### 7. Auto/Each selection

Auto selection: Only the start input is accepted. Do not turn OFF the start signal input until the total determination is output. Doing so causes "FFFF" NG. This is the interruption NG of the program while running.

Each selection: Only the inching start input is accepted. When the input signal is turned OFF after inching started, it becomes to wait for the inching start and only operates when the inching star is turned ON.

### 8. GSK/GKL reset(ALL reset)

When GSK/GKL reset is input, make sure to input from the program selection because all steps return to the initial status.

### 9. Program bit selection

Program bit selection allows you to select the program number by combining the program bit.

### 10. Program setting

Rating setting and axis number setting is possible by each block and axis unit in the program.

### **13—6 Precautions to read history**

Make sure to give sufficient reading time to read the history data.

(In the case of communication speed at 38400 Bps, about 1 minutes of reading time is needed per axis.)

### **13—7 Items of setting possible and setting not possible**

Item	Manual input	Input from setup soft
Driver parameter internal	○	×
RATE. SET	○	○
SOC. T. SET	○	○
PRE. T. SET	○	○
REV. T. SET	○	○
REA. T. SET	○	○
AXIS ARRANGE SET	×	○
PROGRAM SET	×	○
AXIS CUT INPUT	○	○
ID OUTPUT SET	○	○
M-NETSTARTED ADDRESS	○	○

## **13-8 About connection setting of ID controller**

### **13-8-1 Outline**

Connecting the interface unit with ID controller by serial communication (RS422), transfer of engine number, setting of the calendar and transmission of result data become possible.

### **13-8-2 Specification of communication**

Communication method : RS422

Communication speed : 9600bps

Start bit : 1

Stop bit : 1

Parity : non

Transmission start character : '#' (23H)

Transmission finish character : CR (0DH)

Transmission character : ASCII code

### **13-8-3 Resive format (PLC → Interface unit)**

Resive of engine number.

# [Engine number] CR      Engine number should be maximum 7 figures by decimal numeral.

Data transmit demand or Specify of unit to send the data.

# U [n] CR              Unit No. specified (n=1 to 6)

Setting of callendar

# C [Callendar] CR      Callendar setting (year, month, date, hour, minute each 2 figures)

### **13-8-4 Transmission format (Interface unit → PLC)**

① Standard specification setting (1<sup>st</sup> figure = 1 of fn12 no.2)

# [Date and time] [Judge] [Axis No.] [Program No.] [Unit No.] [Torque] [Time] [Angle ] [Gradient] [Engine No.]  
CR

[Date and time] = 01 / 12 / 29 Δ 15 : 59      (14 letters) Δ means blank (20H)

[Each axis judgement] = 0000 (OK) or NG code (4 letters)

[Axis no.] = 01 to 30      (2 letters)

[Program no.] = 01 to 24      (2 letters)

[Unit no.] = 1 to 6      (1 letter)

[Torque] = 123.4      (Number of letters is according to the parameter)

[Time] = 12.34      (Number of letters is according to the parameter)

[Gradient] = 99.9      (Number of letters is according to the parameter)

[Engine no.] = 1234567      (Number of letters is according to the parameter)

②T specification with Torque (1<sup>st</sup> figure = 1 of fn12 no.2)

# [1<sup>st</sup> axis torque] [1<sup>st</sup> axis judgement] [2<sup>nd</sup> axis torque] [2<sup>nd</sup> axis judgement] ... [n axis torque]  
[n axis judgement] CR

[Each axis torque] = 123.4 (Number of letters is according to the parameter)

[Each axis judgement] = 2 (1=NG 2=OK)

③T specification without torque (fn1<sup>st</sup> figure = 3 of fn12 no.2)

# [1<sup>st</sup> axis torque] [1<sup>st</sup> axis judgement] [2<sup>nd</sup> axis torque] [2<sup>nd</sup> axis judgement] ... [n axis torque]  
[n axis judgement] CR

[Each axis torque] =  $\Delta\Delta\Delta$  (Number of letters is according to the parameter)  $\Delta$  means blank (20H)

[Each axis judgement] = 2 (1=NG 2=OK)

Part of torque data always outputs zero.

④J specifications (fn1<sup>st</sup> figure = 4 of fn12 no.2)

# [Date and time] [Program no.] [Unit no.] [Engine no.]

[Axis no.(01)] [1<sup>st</sup> axis torque] [1<sup>st</sup> axis time] [1<sup>st</sup> axis angle] [1<sup>st</sup> angle gradient] [1<sup>st</sup> axis judgement]

[Axis no.(02)] [2<sup>nd</sup> axis torque] [2<sup>nd</sup> axis time] ... [n axis gradient] [n axis judgement] CR

[Date and time] = 01 / 12 / 29  $\Delta$  15 : 59 (14 letters)  $\Delta$  means blank (20H)

[Program no.] = 01 to 24 (2 letters)

[Unit no.] = 1 to 6 (1 letter)

[Engine no.] = 1234567 (Number of letters is according to the parameter)

[Axis no.] = 01 to 30 (2 letters)

[Torque] = 123.4 (Number of letters is according to the parameter)

[Time] = 12.34 (Number of letters is according to the parameter)

[Gradient] = 99.9 (Number of letters is according to the parameter)

[Each axis judgement] = 0000 (OK) or NG code (4 letters)

### **13-8-5 Select with condition of starting transmission**

It is possible to set timing of the transmission from the interface unit by the parameter.

Timing is able to be selected from one of follows;

- Data transmission at the time of the block judgement output
- Data transmission at the time of starting next block and judgement reset input.
- Data transmission according to the request of data transmission from the upper

### **13-8-6 Selecting transmission data**

It is possible to set each data to be transmitted or not to be transmitted, specifying figure number, with or without decimal point to the parameter if necessary. If there are some items which are not transmitted, the following items are transmitted shortening the items not to be transmitted.

Transmission of torque, time, angle data based on the kinds of operation

Transmission of torque data,time data and angle data, data of only one kind of operation is transmitted even if many kinds of operation such as pretightening, real tightening, etc. are carried out within the same block. Selection with kinds of operation is effected automatically basing on the following order of priority. When the operation with higher priority is not carried out, it select the operation of following order of priority. In case of carrying out same kind of operation more than two times within the same block, the last operation is selected.

Order of priority (high) 1 : Real tightening  
                                  2 : Reverse tightening  
                                  3 : Pretightening  
                                  ↓  
                                  (low) 4 : Socket fitting



## **13—9 About installation**

### **13—9—1 About installation**

GSK-14., GSKW-14, GSK-T4., GSKW-T4, GKL-14, GKLW-14, GKL-T4, and GKLW-T4 have no difference between the standard and T specifications.

Unlike other controllers, no additional installation procedures are required.

When installing all GSK and GKL units, please make sure that the temperature inside the panel where the GSK and GKL units (I/F, controller) will be installed is cooler than 50°C (122°F).

When installing all GSK/GKL units (I/F, controller), please install a cooler or fan so that the temperature inside the panel where the unit will be installed will be kept below 50°C.

### **13—9—2 standard specification**

The standard controllers GSK-15, GSK-17, GSKW-15, GKL-15, GKL-17, and GKLW-15 have fins or fans on the sides for heat exhaust,

The GSK-15, GSK-17, GSKW-15, GKL-15, GKL-17, and GKLW-15 controllers have fins or fans on their sides to exhaust heat.

To exhaust heat from these fins or fans, please install the controllers at least 10mm apart from each other.

### **13—9—3 T specification**

The GSK-T5, GSK-T7, GSKW-T5, GKL-T5, GKL-T7, and GKLW-T5 of the T-specification controllers have fins at the rear for heat exhaust.

The fins are attached to the rear of the unit for heat dissipation.

A fan must be installed to dissipate the heat from these fins.

Please confirm the following information before installation.

Air volume of heat dissipation fan

Install a fan with an airflow rate of at least 0.6 m<sup>3</sup>/min per controller.

When installing one fan for two controllers, install a fan with at least twice the airflow.

Also, we do not recommend installing one fan for three controllers, because the airflow will be dispersed.

Fans should be installed within 150 mm of the bottom of the controller and should blow from the bottom to the top.

If the fan is more than 150 mm away from the controller, increase the airflow or take other measures to prevent the air from escaping.

**Update log**

Version	Date	Update contents
001	May .2016	—
002	Jun .2017	Added correspondence table of nut runner and controller Etc.
003	Nov.2017	Added the commentary about Additional functions Added setting procedure Etc.
004	Mar.2020	Alarm list modified Contact email address has been updated.
005	Aug.2020	Added description of GKL type
006	Nov.2024	GKL specifications added Overall Review



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