New ANZM Nut Runner Series

GSS/GSSW Torque Control System

Instruction Manual

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GIKEN INDUSTRIAL CO., LTD.

Before beginning operation:

⚠Caution

■Note

(1) Please read this instruction manual carefully in order to ensure that you use this product correctly.
(2) A part or all part of this instruction manual may not 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.

⚠Caution

■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

■Precautions to turn ON the power for the first time

1. Check the cable connection prior to turning ON the power. (Check by your eyes)

2. Set resistor(110.220Ω） on the connector part (COM port) of the arc net for communication of each axis. However, it is unnecessary when only one axis is used. Please refer to P109 page for details.

3. When the power is turned ON, input the SIO satellite station address setting of "Fn. 12 No. 3" of the GSS controller. If it is not input, the SIO communication will not be established. It is not necessary to set up in the case of PIO. (The contents mentioned above is M-net version only . CC-Link version don't need. it)

4. Make sure to set the axis setting of "Fn.01 No. 26" from the panel section in order to make the GSS controller driver recognize the axis number. If the axis number is not set, the communication from the setup personal computer is impossible.
(Please refer to P112 for details.)
*Axis number must be set up when the unit is replaced.

5. To confirm the wiring again after supplying power, check **[Fn.03 No.1]･[Fn.03 No.2].** (Electrical check)
(Please refer to P113～114 for details.)

6. Check the measurement value in "Fn. 03 No. 2" to confirm the zero point..
Using the setup software, it is also possible to adjust the zero point in respect of software.
(Please refer to P115 for details.)

7. Perform entering the setting or other operation after the contents mentioned above are finished.

Note) At CC-Link version IF , there is not the function of print about which the output can be done through RS422.

Contents

1. System outline

- New torque control system “GSS” is the torque control type nut runner system that enables the various tightening methods to many types of tightening objects.
- This system has the name specified as GSS (Giken Single system) and it can be divided into the controller section, AC nut runner section and IF unit section (Interface).

Controller section

- Tightening accuracy: 3σ±2%
- Compact design is provided by integrating the conventional GFC controller, power supply and driver amplifier for GSS Series.
- 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.
- Two setup methods are provided to setup the tightening program: the input method from the setup personal computer; and that from the controller front panel.
  (Please refer to P118 page for the items with setting- possible and items with setting- not- possible.)
- It is easy even for beginners to set up and input because the automatic setup and input function has been installed.

AC nut runner section

- Conventional ANZ series motor part and gear reduction part are improved to design miniaturization and improvement of durability.
  Motor part: The latest neo-magnet is used for magnet and the coil is changed to the mold type for miniaturization.
  Reduction gear part: 1.As the motor capacity is increased, the reduction mechanism is changed from 3 steps reduction to 2 steps reduction.
  (ANZM-250.350.500.850.1600)
  2.Due to increase of the motor capacity, the reduction ratio decreased.(reduction mechanism remains as 3 steps reduction.)
  (ANZM-2000.3000.5000.7000.9000)
- Rotation number can be freely set in a range from low-speed to high-speed rotation.
- Wide torque range from low torque to high torque with a variety range of types.

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.
- GSS 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(M-net ver. / CC-Link ver.).
  (M-net ver. IF and CC-Link ver.IF is not same model.)
- One IF unit is always required by set of controller.(2 units for 31 axes or more)

2. Specifications

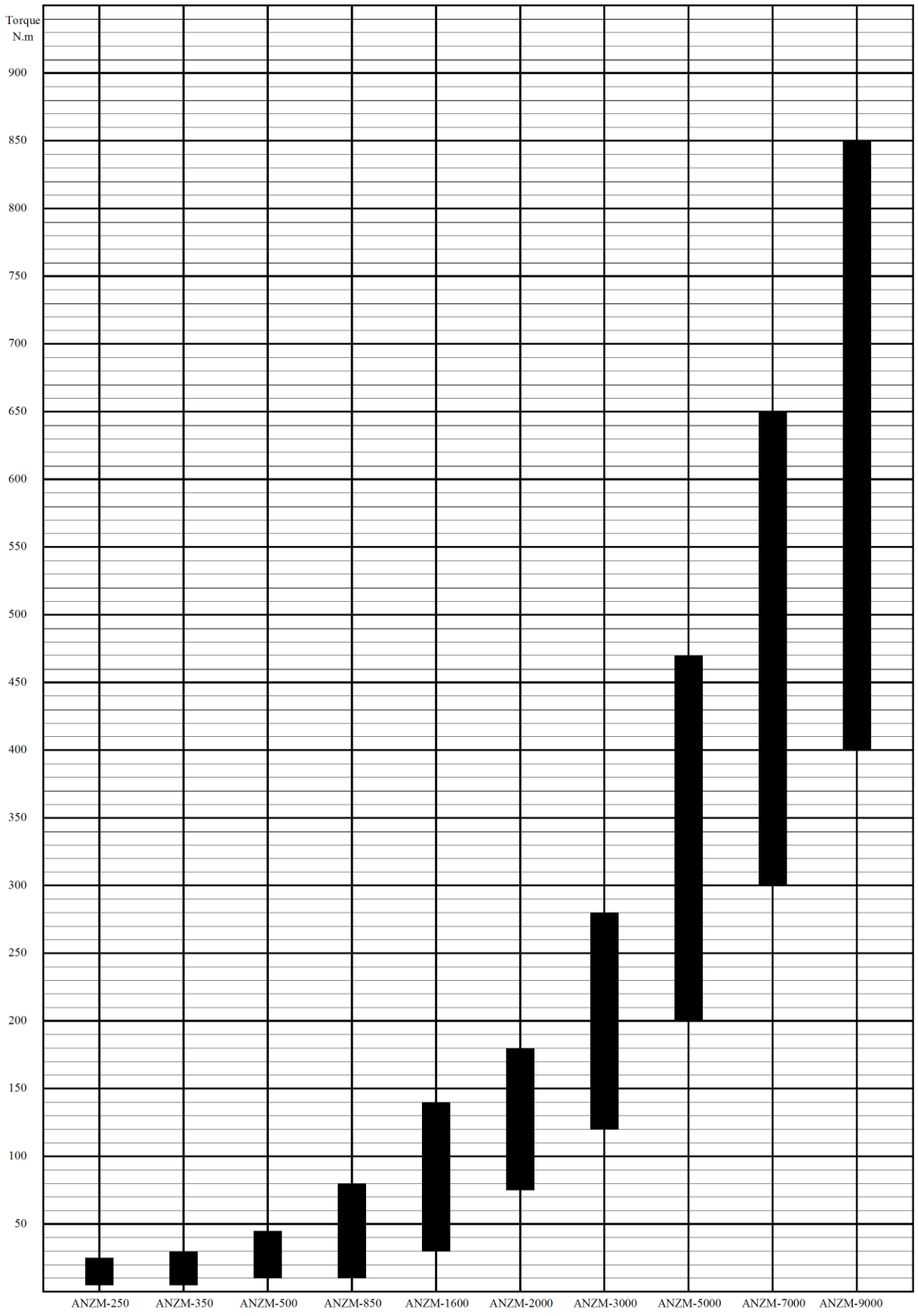
2-1 Specifications of nut runner and dimensions table

2-1-1 Specifications of nut runner

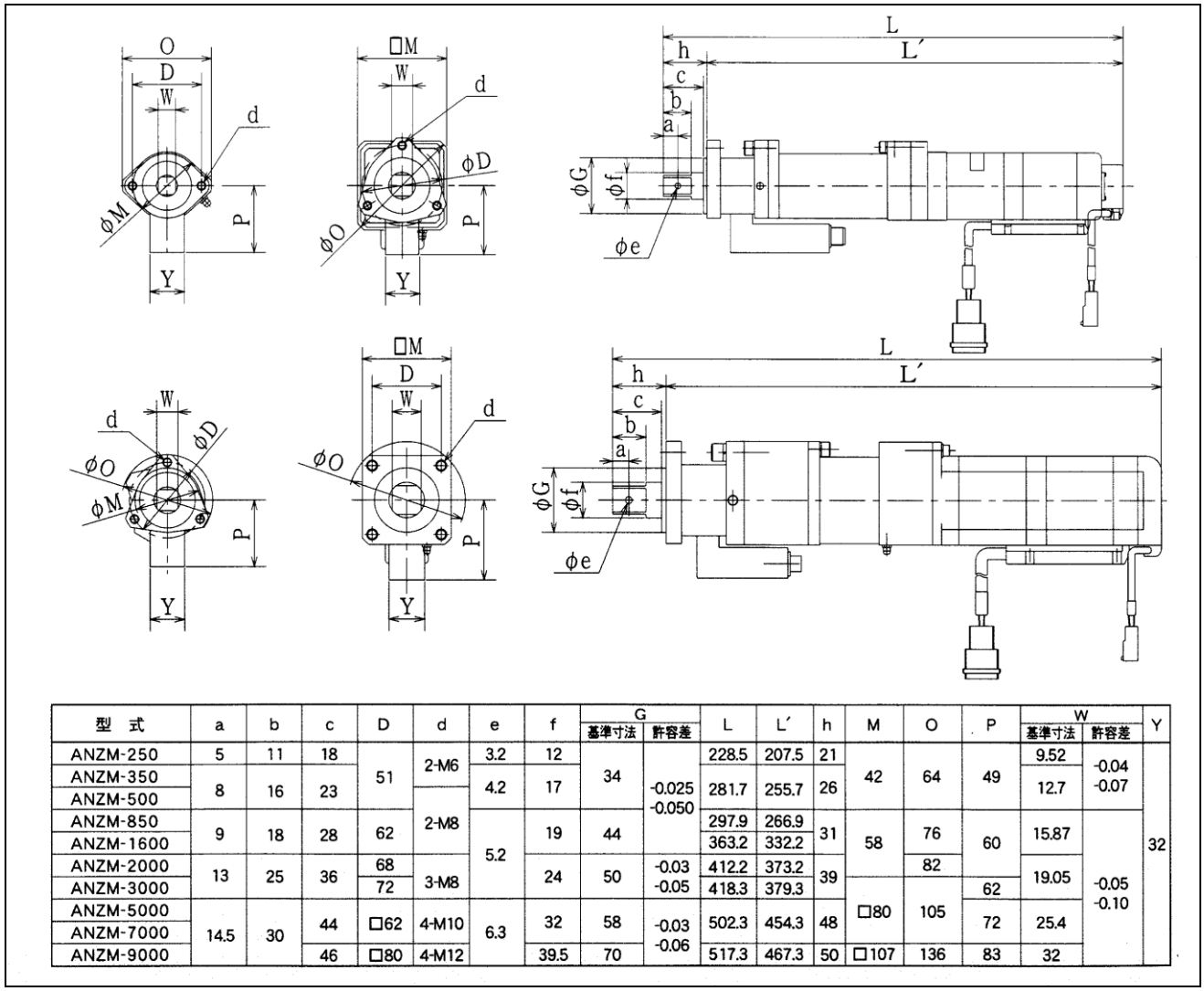
Nut runner model	Max.tightening torque (N/m)	Max. rotation number (rpm)	Power supply current (A rms)	Motor model	Weight (Approx.)Kg	Transducer model
ANZM-250	20	310	0.8	TS4603N1920E203	1.6	AZM-350
ANZM-350	30	430	1.5	TS4617N1920E203	1.9	AZM-350
ANZM-500	45	310	1.5	TS4617N1920E203	1.9	AZM-500
ANZM-850	80	420	2.8	TS4609N1920E203	3.9	AZM-850
ANZM-1600	140	420	4.0	TS4618N1920E203	5.0	AZM-1500
ANZM-2000	180	290	4.0	TS4618N1920E203	6.8	AZM-2500
ANZM-3000	280	235	6.0	TS4619N1920E203	9.0	AZM-4000
ANZM-5000	470	253	6.5	TS4619N1922E207	10.5	AZM-7500
ANZM-7000	650	176	6.5	TS4619N1922E207	10.5	AZM-7500
ANZM-9000	850	131	6.5	TS4619N1920E207	11.5	AZM-12000

*The maximum tightening torque is the output value based on the use at the speed, 20rpm.. When the speed is decreased extremely, it is difficult to get the torque output mentioned in the table.

2-1-2 Torque range graph of each nut runner

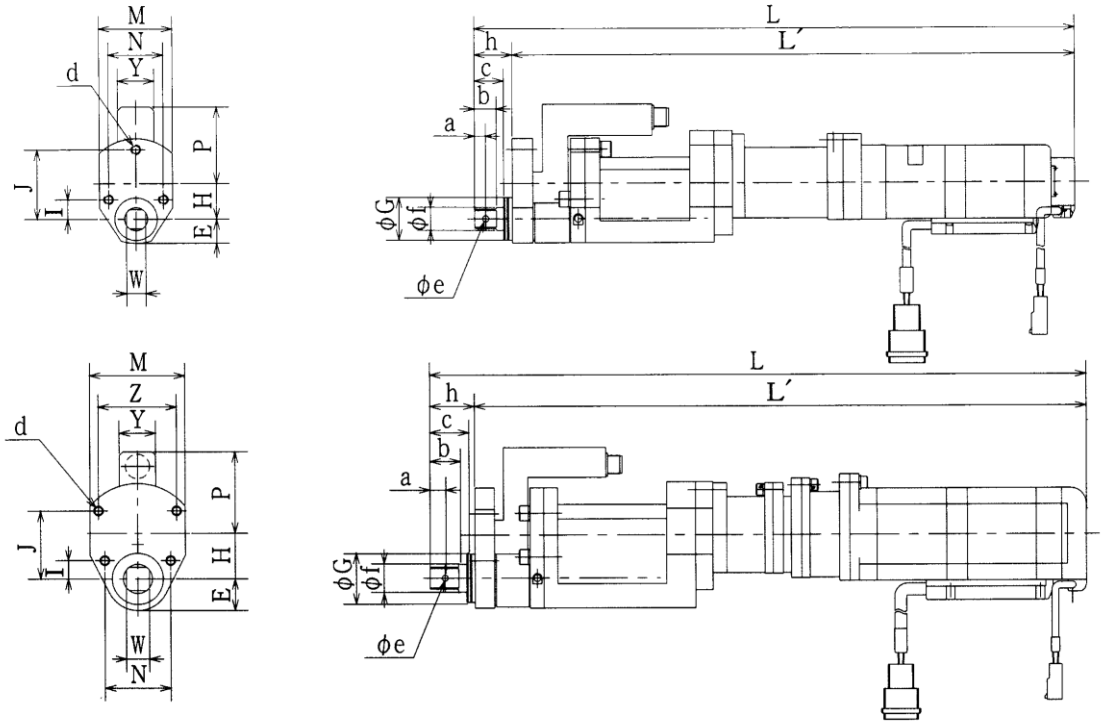


2-1-3 Dimensions table of nut runner（straight type）



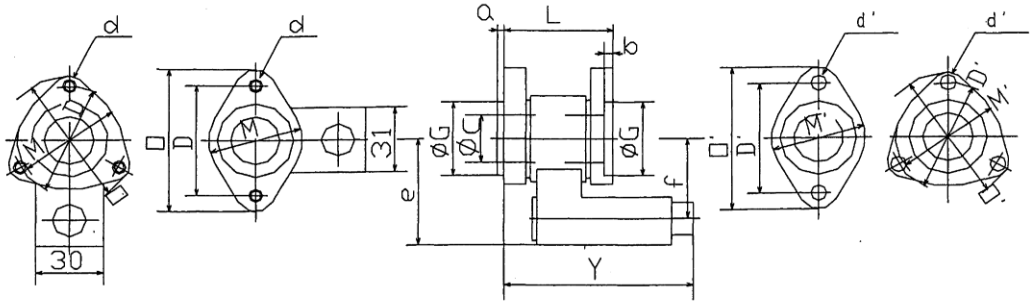
型 式	a	b	c	D	d	e	f	G 基準寸法	G 許容差	L	L′	h	M	O	P	W 基準寸法	W 許容差	Y
ANZM-250	5	11	18	51	2-M6	3.2	12	34	-0.025 -0.050	228.5	207.5	21	42	64	49	9.52	-0.04 -0.07	32
ANZM-350	8	16	23			4.2	17			281.7	255.7	26				12.7		
ANZM-500					2-M8													
ANZM-850	9	18	28	62		5.2	19	44		297.9	266.9	31	58	76	60	15.87	-0.05 -0.10	
ANZM-1600										363.2	332.2							
ANZM-2000	13	25	36	68	3-M8		24	50	-0.03 -0.05	412.2	373.2	39		82		19.05		
ANZM-3000				72						418.3	379.3				62			
ANZM-5000	14.5	30	44	□62	4-M10	6.3	32	58	-0.03 -0.06	502.3	454.3	48	□80	105	72	25.4		
ANZM-7000																		
ANZM-9000			46	□80	4-M12		39.5	70		517.3	467.3	50	□107	136	83	32		

2-1-4 Dimensions table of nut runner（offset type）



型　式	a	b	c	l	J	N	Z	d	e	f	G		L	L´	Y	P	h	M	W		E	H
											基準寸法	許容差							基準寸法	許容差		
ANZM-250SFFT	5	11	19	12	44.5	38	–	3-M6	3.2	12	28	-0.025 -0.050	312.5	290.5	32	55	22	50	9.52	-0.04 -0.07	15	22.5
ANZM-350SFFT	8	16	23					3-M8	4.2	17	30		364.7	338.7		56	26		12.7			
ANZM-500SFFT				13.5	49.5	42							376.7	350.7				54			17.5	25.5
ANZM-850SFFT	9	18	24	16	57	45			5.2	19	35		417.9	386.9		63	31	60	15.87	-0.05 -0.10	19.85	29.15
ANZM-1600SFFT													493.2	462.2								
ANZM-2000SFFT	13	25	32	15	55.8	54	64	4-M8		24	42		539.2	500.2		71	39	78	19.05		26	37.27
ANZM-3000SFFT													570.3	531.3		76						

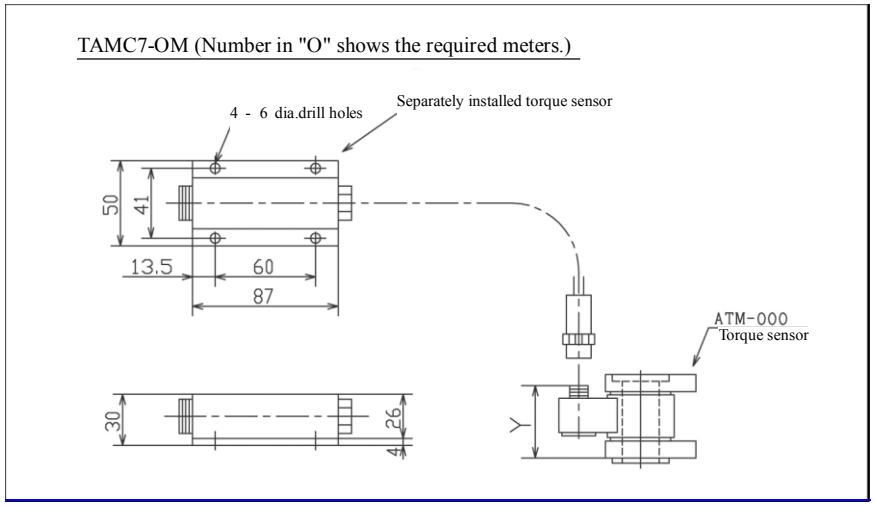
2-1-5 Dimensions table of torque sensor (straight type)



Model	a	b	c	D	D'	d	d'	e	f	G standard dimension	G Tolerance	L	M	M'	O	O'	Y
AZM-350	3	4	22	51	51	2-M6	2-7	52	37	34	-0.025 -0.050	49	42	42	64	64	114
AZM-500						2-M8	2-9								66	66	
AZM-850			30	62	62			60	45	44		51	58	58	76	76	119
AZM-1500																	
AZM-2500			28	68	68	3-M8	3-9	60	45	50		55	58	58	82	82	124
AZM-4000				72	72			65	50				66	66	86	86	

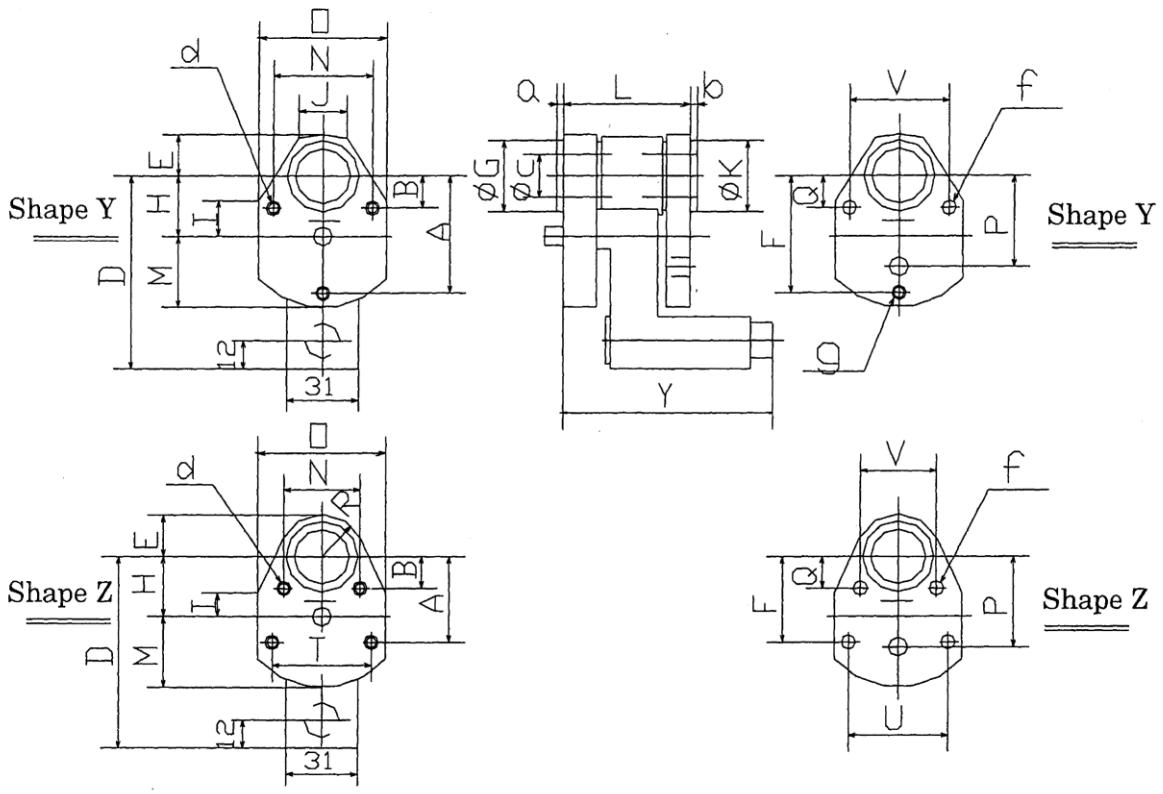
* When the amplifier is installed independently:

The torque sensor model is changed from AZM-OOO to ATM-OOO and only the dimension Y in the table is changed as shown in the following table.



Model	Dimension Y
ATM-350	50
ATM-500	
ATM-850	51
ATM-1500	
ATM-2500	53
ATM-4000	

2-1-6 Dimensions table of torque sensor (offset type)



Model		a	b	c	D	d	A	B	N	O	L	M	H	E
ZFT-350	Shape Y	3	2	18	81	3-M6	44.5	12	38	50	54	28.5	22.5	15
ZFT-500			3		85	3-M8	49.5	13.5	42	54		30	25.5	17.5
ZFT-850				20	96		57	16	45	60	60	37	29.15	19.85
ZFT-1500														
ZFT-2500	Shape Z			27	108	4-M8	55.8	15	54	78		41	37.27	26
ZFT-4000														

Model	G		K	V	Q	F	f	g	P	U	R	T	I	J	Y
	standard dimension	Tolerance													
ZFT-350	34	-0.02 -0.04	26	38	12	44.5	2-M6	M6	35.5				15	16	114
ZFT-500			30	42	13.5	49.5	2-7		38.5					20	
ZFT-850	44	-0.025 -0.050	35	45	16	57	3-9	M8	44.15				20	25	119
ZFT-1500															
ZFT-2500	50		45	58	17.3	55.8	4-9		56.27	64	26	64	18		124
ZFT-4000															

2-2 GSS controller specification

Composition	IF unit	1 type
	Controller unit	GSS Standard specification: 5 types, GSS T specification: 5 types GSSW Standard specification: 2 types, GSSW T specification: 2 types
Data	DATA communication function (PC)	RS232C conversion
	Other unit control	Arc-Net
	DATA control (PC)	RS422
	DATA saving	Tightening data: about 6000 items When IF is connected: Can be output from PC.
	Printer connection	Connected to IF unit or a personal computer (output to a commercial printer)
	Max. axis number for connection	30 axes control (60 axes as of software)
Display	DATA display	4-digit 7 SEG. LED
	Extraordinary display	Alarm code display + NG code display
Indicator	Display	OK/NG, axial arrangement, tightening setting (applicable to the 60 axes display)
Setting	Setting input method	Personal computer or the controller front panel
	Memory backup	EEPROM
	Setting value backup	PC =>FD,HD
Outside dimensions (See P17 to 39)	IF unit	25*220*170 (M-net ver.) 41*220*170 (CC-Link ver.)
	Controller unit (Standard specification) GSS-11-N04-M, GSS-13-N04-M	59(65)*238*170.5 Dimensions in parentheses show the dimension including the heatsink.
	GSS-14-N04-M, GSS-15-N04-M GSSW-11-N04-M, GSSW-13-N04-M	59(81)*238*170.5 Dimensions in parentheses show the dimension including the heatsink.
	GSS-17-N04-M	59(111)*238*170.5 Dimensions in parentheses show the dimension including the heatsink + fan.
	Controller unit (T specification)	65*243*171.5(220) Dimensions in parentheses show the dimension including the heatsink.
	Display GSS-D2	182.5*138.8*57.3 Install it taking account of the protrusion clearance of the connector.
	Display GS-D3	182.5*138.8*42.5
Tightening setting	Program number	24 programs
	Step number	77steps
	Block number	Maximum 19 blocks
	Setting items	T: Rating 30 types H: Final tightening, K: Pretightening, G: Reverse rotation, S: Rotation, Axial arrangement Each 24 types
Tightening method	Torque method, time and angle monitor	Zone monitoring YES
	Angle method, time monitor	Gradient determination YES
	Breakdown point method	Yield method (Tightening at the breakdown point)
Tightening control	Sequencing tightening (Block tightening)	Maximum 19 blocks (77 steps)
	Retry	Setting of Yes/No per program
	Baking determination	Reverse torque
	Reverse rotation for fixed quantity	Time, angle
	Speed switching	3 steps angle control
Accuracy	Torque waveform	Display, all axes display or a personal computer
	Angle stop accuracy	Within ±0.5°(30rpm or less)
	Angle display minimum unit	0.1°
	Tightening accuracy	3σ±2% or less
Connection	Connection cable	Standard specification: Terminal block type
		Standard specification: CN (Connector) type T specification: CN (Connector) type
Alarm ,extracts (See P96 and 97)	Motor overcurrent, (Driver over heating)	AL10
	Over load	AL20
	Over speed	AL30
	Encoder initial failure	AL40
	TOOL wrong connection	AL60, AL80
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	RS232C conversion
	Communication with PLC	SIO (M-NET) or SIO(CC-Link) or Parallel communication DC24V PIO
	Display connection	Connected to IF unit

2-3 Basic specification

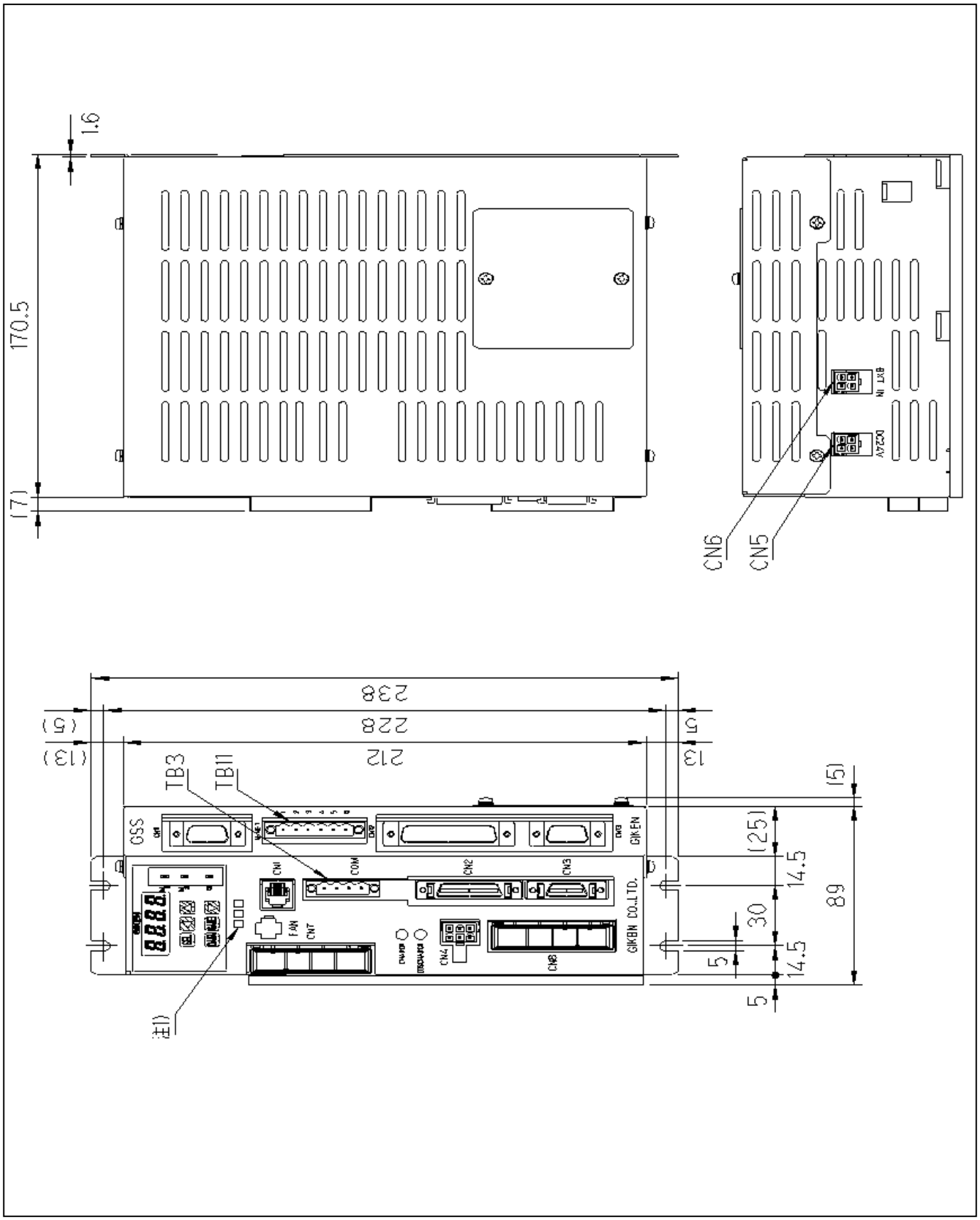
GSS Standard specification model	GSS-11-N04-M	GSS-13-N04-M	GSS-14-N04-M	GSS-15-N04-M	GSS-15-N041-M	GSS-17-N04-M
GSSW Standard specification model	GSSW-11-N04-M	GSSW-13-N04-M				
GSS T specification model	GSS-T1-N04-M	GSS-T3-N04-M	GSS-T4-N04-M	GSS-T5-N04-M	GSS-T5N041-M	GSS-T7-N04-M
GSSW T specification model	GSSW-T1-N04-M	GSSW-T3-N04-M				
I/F model (common)	GSS-IF-N2 (M-net ver.) / GSS-IF-CCN1 (CC-Link ver.)					
Control power input	Single phase, AC 100 to 220 V±10% 50/60 Hz (CC-Link ver. IF need power supply of DC 5V more than 2A)					
Drive power input	3-phase AC 200 to 220 V±10% 50/60 Hz					
Withstand voltage	AC 1500 V for 1 minute					
Insulation resistance	DC 500 V 10MΩor more					
Electric Capacity (per one axis of nut runner)	1A	2A	3A		5A	
Momentary power failure	No effect in the range less than 50 msec (excluding the driving time)					
Nut runner model	ANZM-250	ANZM-350 ANZM-500	ANZM-850	ANZM-1600 ANZM-2000	ANZM-3000	ANZM-5000 ANZM-7000 ANZM-9000
Applicable motor	TS4603N1920	TS4617N1920	TS4609N1920	TS4618N1920	TS4619N1920	TS4619N1922
Motor output (W)	75	150	300	600	1125	1125
Rotor inertia (kgm^2)	$0.04x10^{-4}$	$0.083x10^{-4}$	$0.38x10^{-4}$	$0.79x10^{-4}$	$2.62x10^{-4}$	$2.62x10^{-4}$
Rating output current (A rms)	1.0	1.9	3.6	6.8	7.1	11.0
Instantaneous maximum current (A rms)	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)					

2-4 Functions/Features

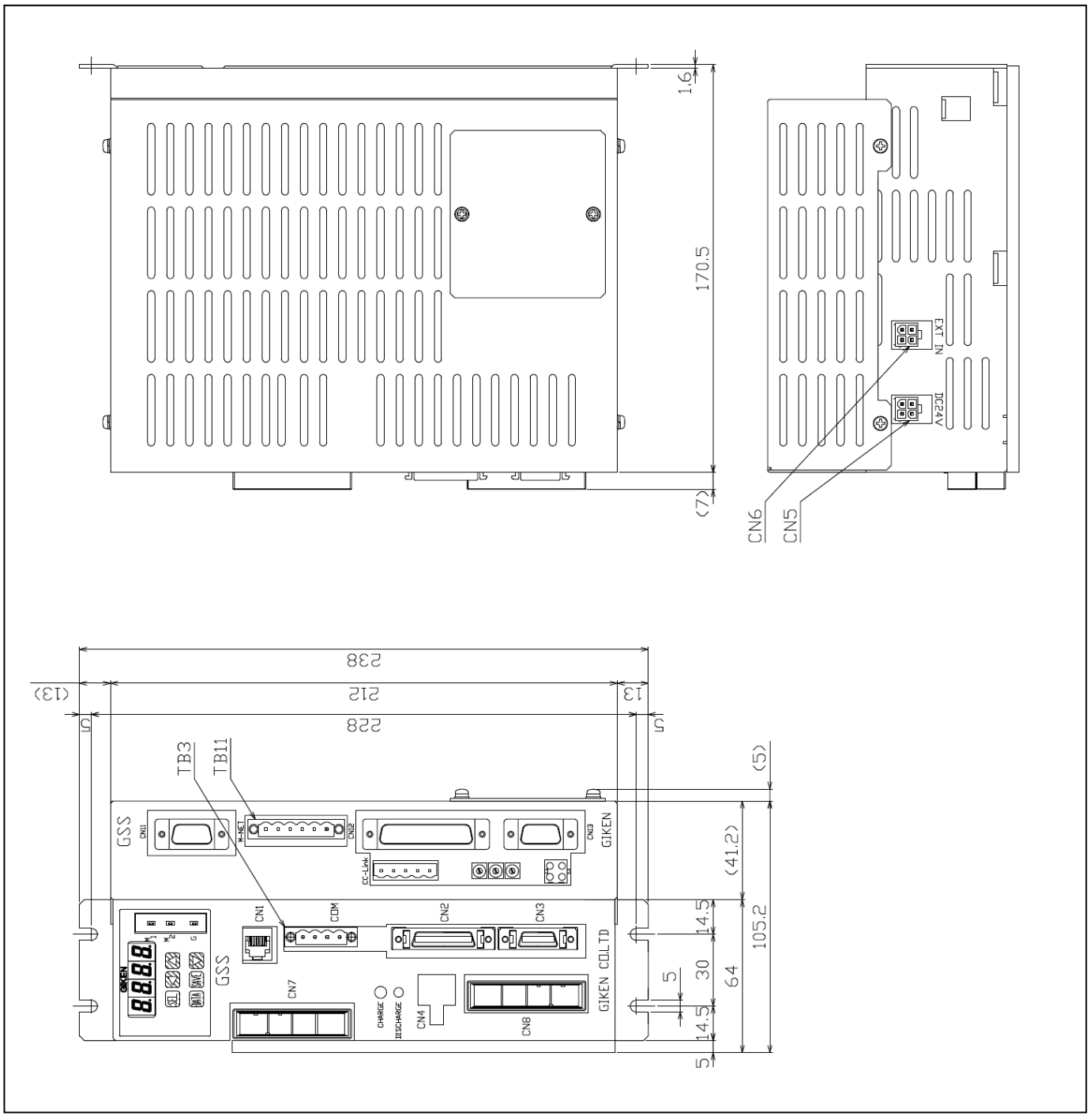
Protective function		Overcurrent, over load, over speed, encoder failure, drive power failure, EEPROM failure and CPU failure, etc.
Display function	7 SEGMENT LED	Alarm No., NG information Program No., block No. Operation monitor Tightening result (Torque, etc.)
Parameter setting		Set the following parameters by a personal computer and input them to the IF unit. • Program 24 types • Rating 30 types • Pretightening • Final tightening • Reverse rotation • Rotation } Each 24 types
Storing the tightening data		Tightening data: Stores about 6000 data. (When it exceeds over 6000, the older data are overwritten in order.) It is possible to confirm by the setup software when necessary.
Applicable to the multiaxial		It is possible to connect single controller 1～30 sets or double controller 1～15 sets per one IF unit. Max. 30 axes multiaxial control is available.
Communication with the sequencer (in serial or parallel)		Serial communication (SIO): Communication between IF unit and sequencer Parallel communication (PIO): Communication between each controller and sequencer
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 operation		Simulation operation is available by the personal computer operation (Sampling start for the seating angle by tightening)
Calendar function		Stores Year, Month, Day, Hour, Minute and Second per data.
Regenerative function (Over voltage detection)		Regenerative circuit is built in to make it consume by the internal resistor when the drive voltage exceeds a certain value.
Discharge function		Discharges the drive charge voltage by pressing the press button switch on the front panel.
Standard inertia (INERTIA)		$J_L \leqq 30J_M$
Rotating direction		Direction of CCW should be the forward rotation viewed from the motor shaft end.
Monitors (See P95)		Monitor signal output at the check pin on the front panel: M1 ••• Torque monitor M2 ••• Speed monitor G ••• Monitor GND

2-5 Dimensions

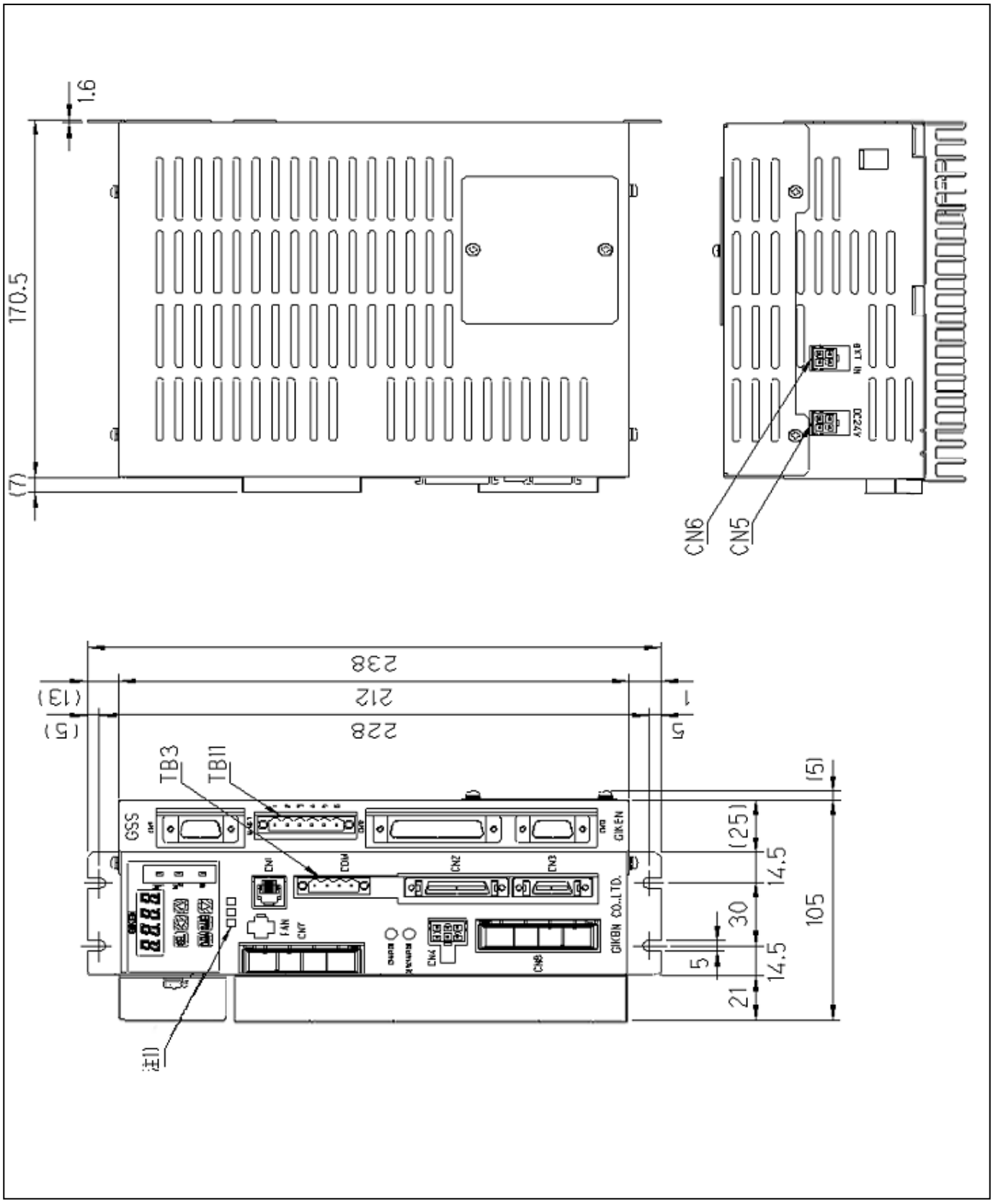
2-5-1-1 Dimensional drawing (with M-net ver. interface): Standard specification ••• GSS-11 (13)-N04-M



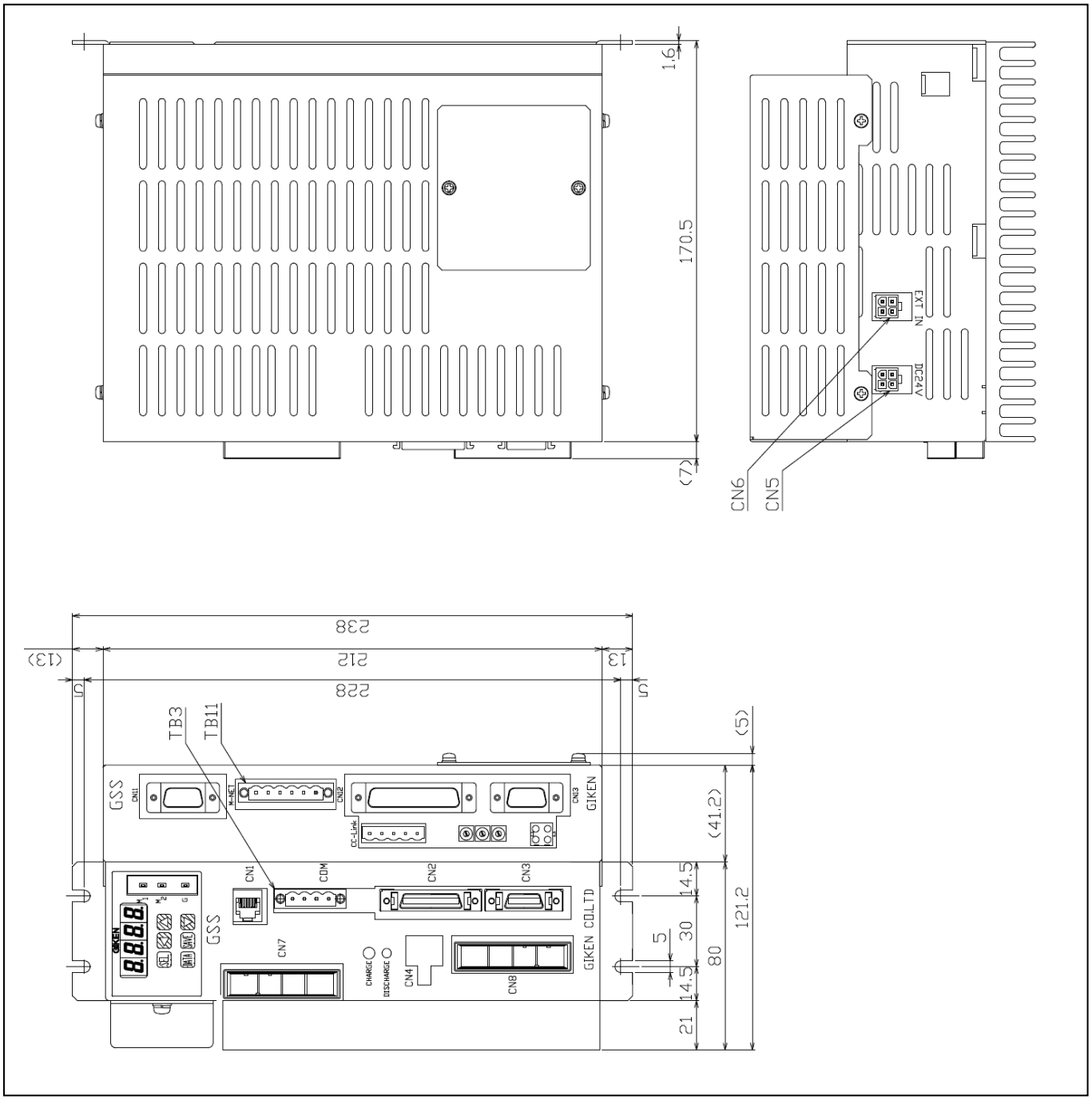
2-5-1-2 Dimensional drawing (with CC-Link ver. interface): Standard specification ••• GSS-11 (13)-N04-M



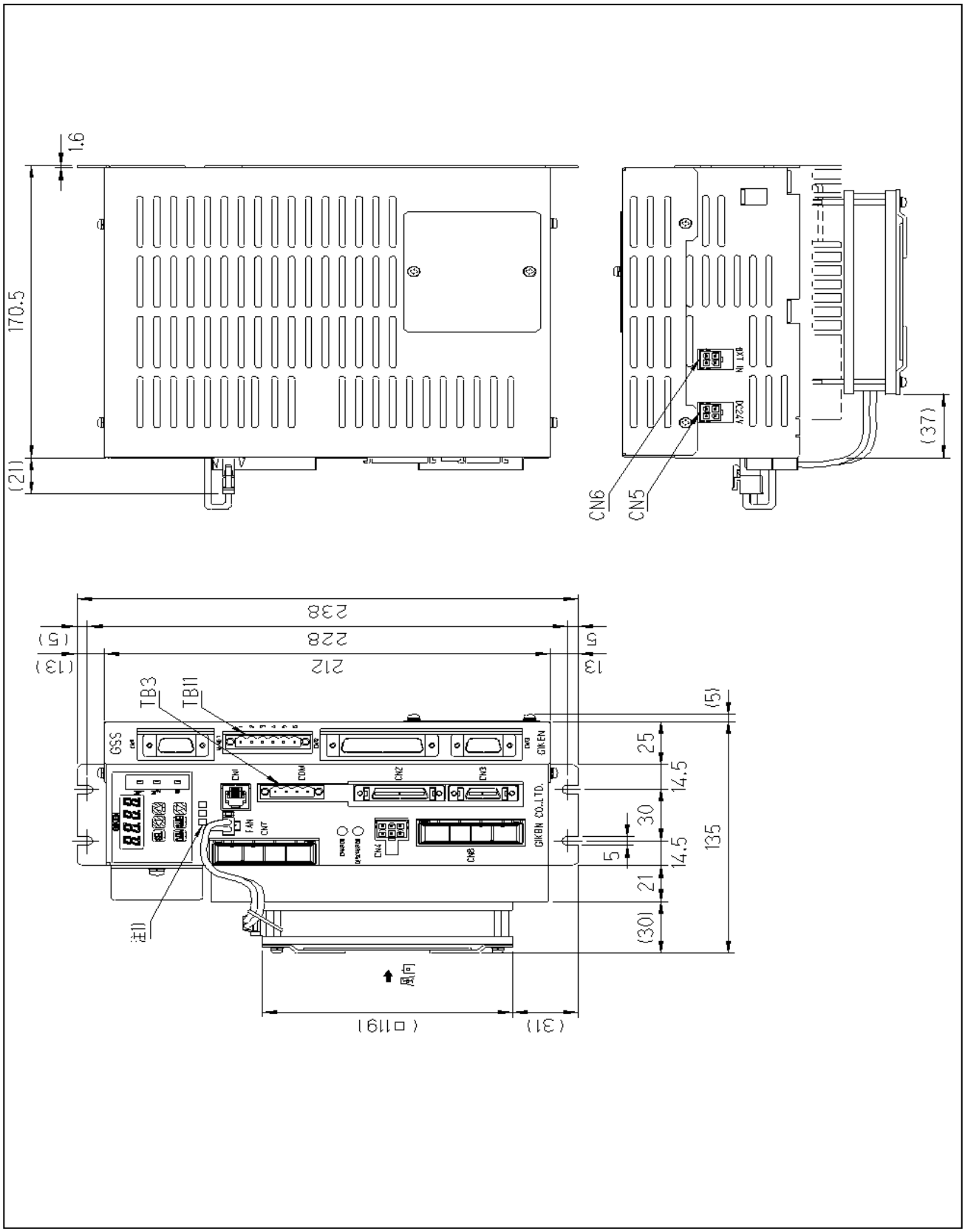
2-5-2-1 Dimensional drawing (with M-net ver. interface): Standard specification ••• GSS-14 (15)-N04-M



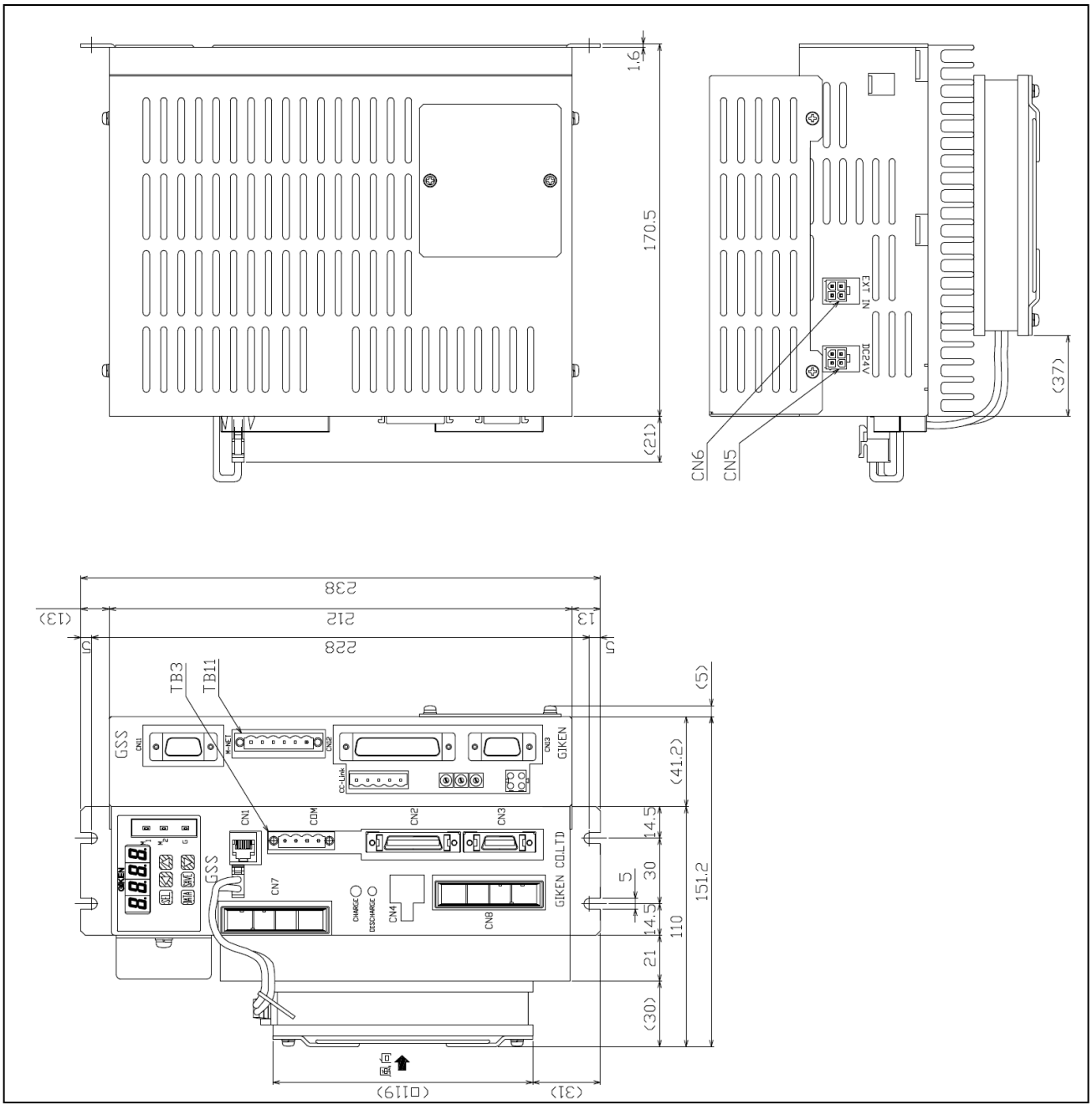
2-5-2-2 Dimensional drawing (with CC-Link ver. interface): Standard specification ••• GSS-14 (15)-N04-M



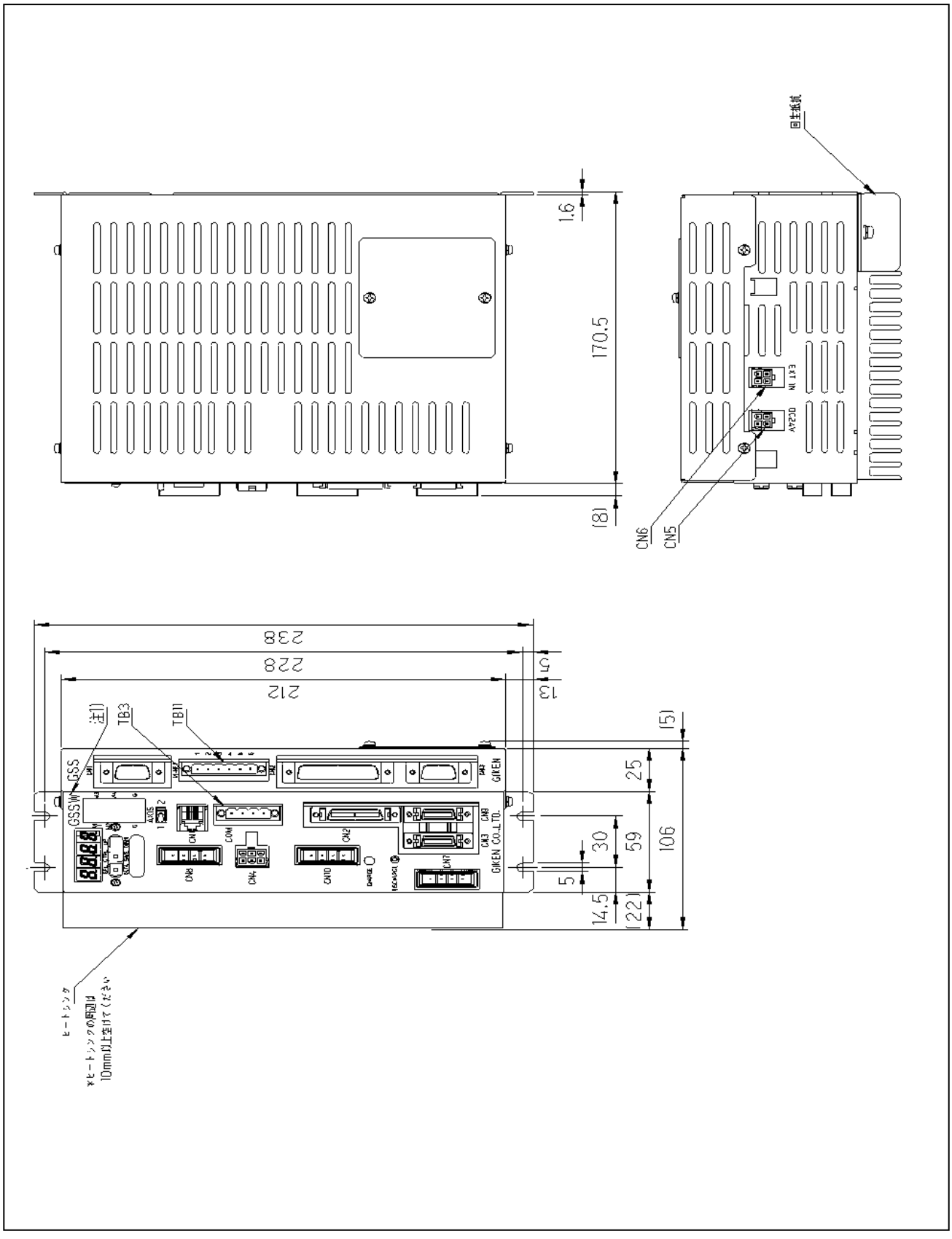
2-5-3-1 Dimensional drawing (with M-net ver. interface): Standard specification ••• GSS-17-N04-M



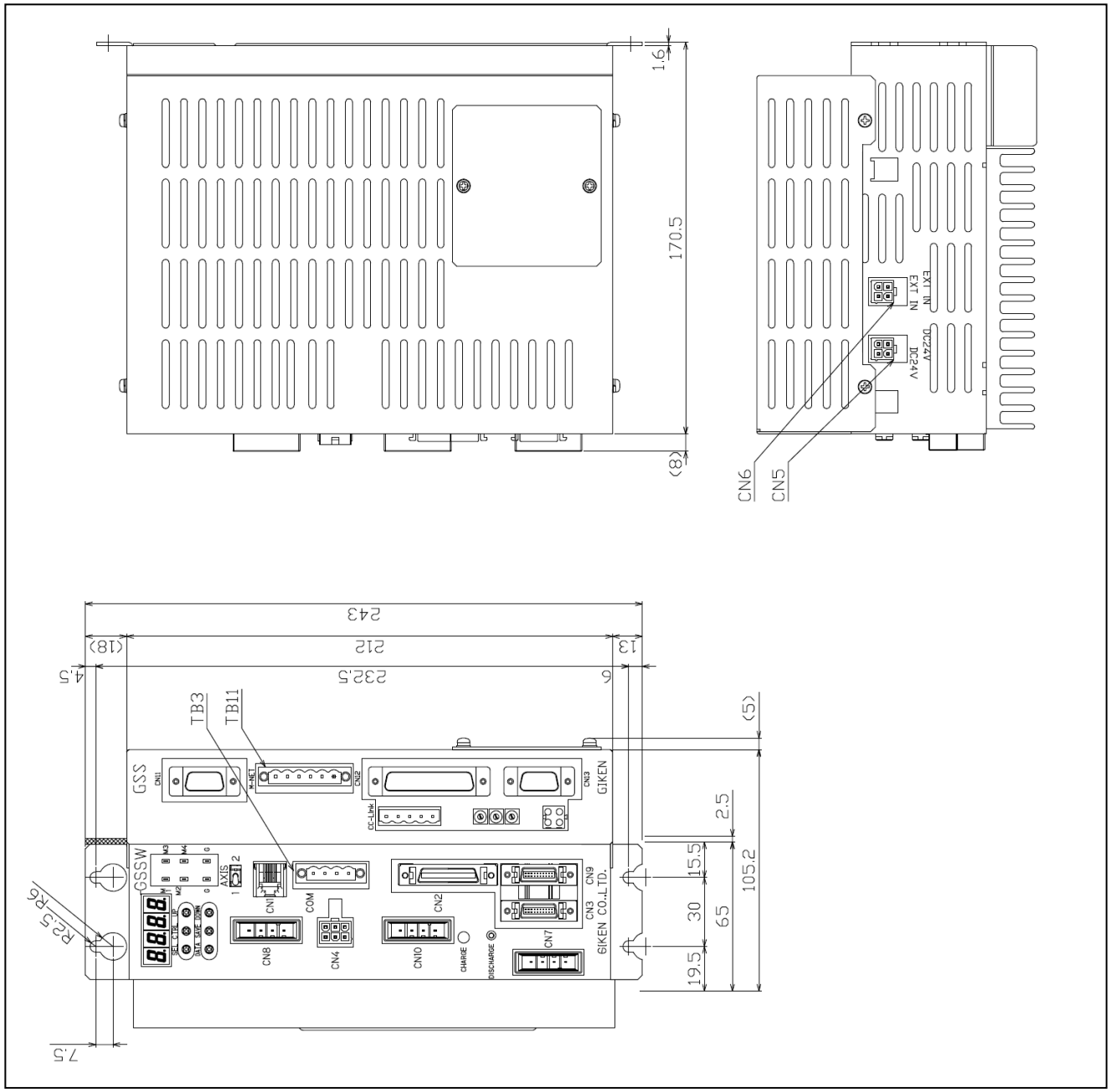
2-5-3-2 Dimensional drawing (with CC-Link ver. interface): Standard specification ••• GSS-17-N04-M



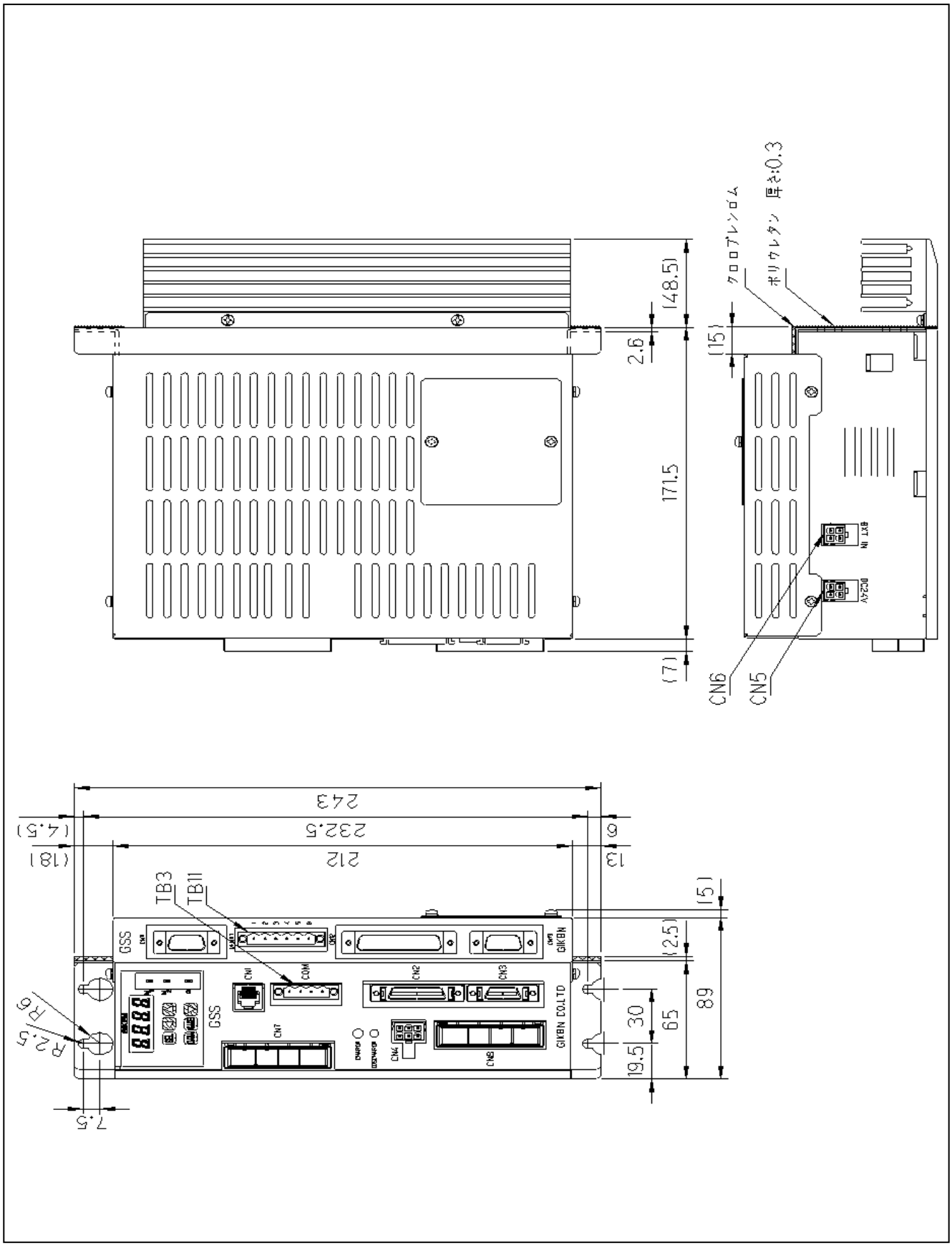
2-5-4 Dimensional drawing (with M-net interface): Standard specification ••• GSSW-11(13)-N04-M



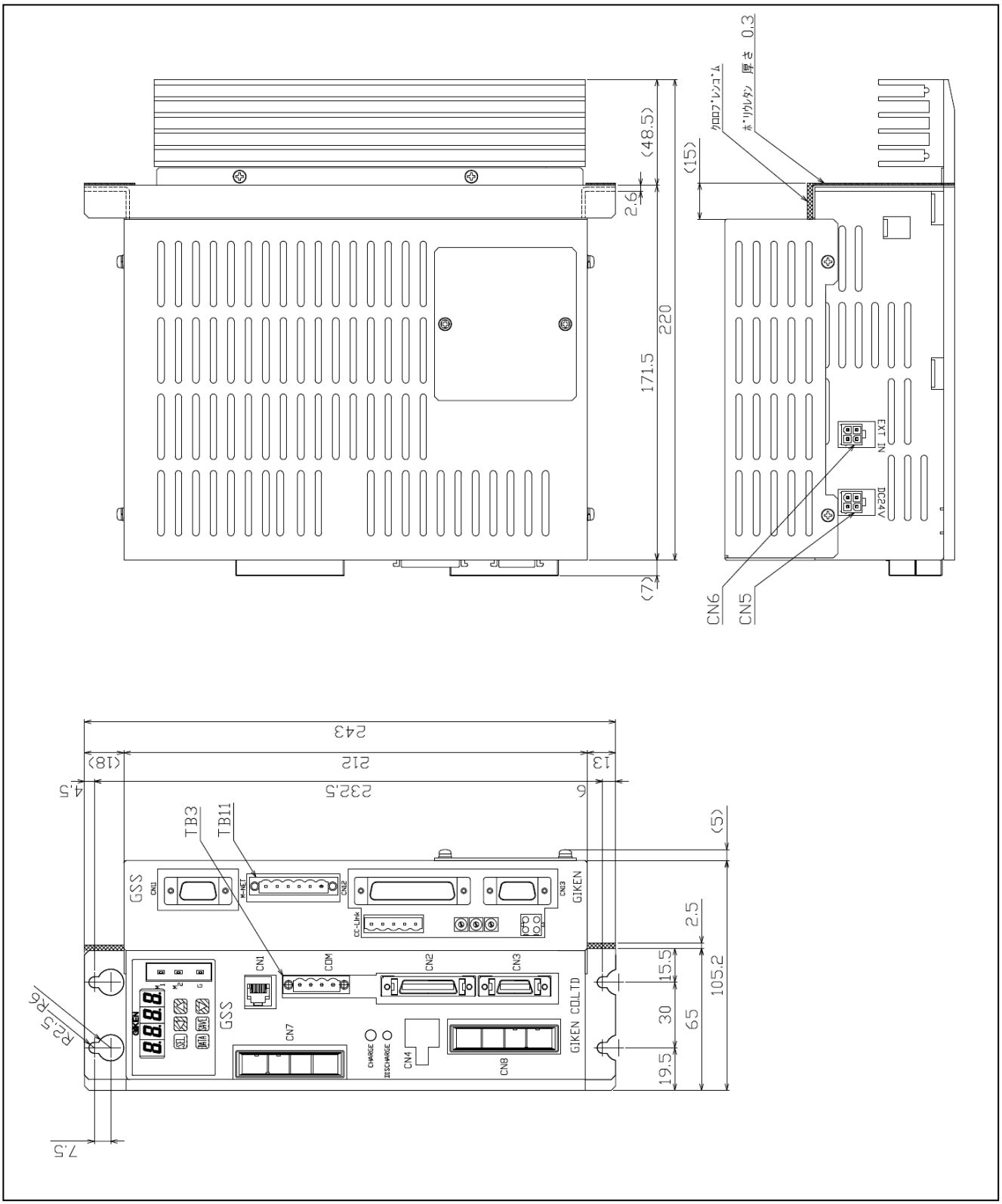
2-5-4-2 Dimensional drawing (with CC-Link interface): Standard specification ••• GSSW-11(13)-N04-M



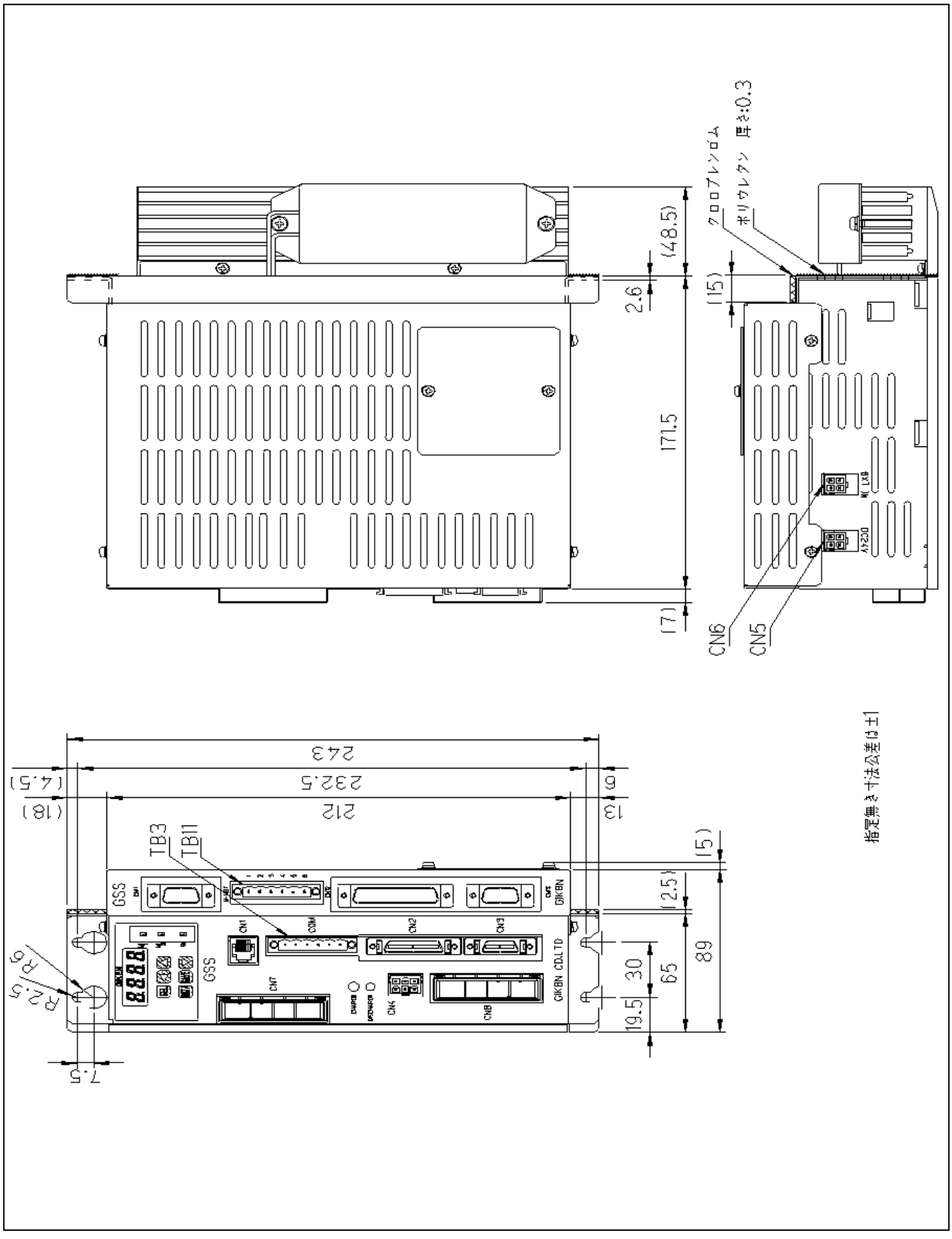
2-5-5-1 Dimensional drawing (with M-net interface): T specification ••• GSS-T1(T3)-N04-M



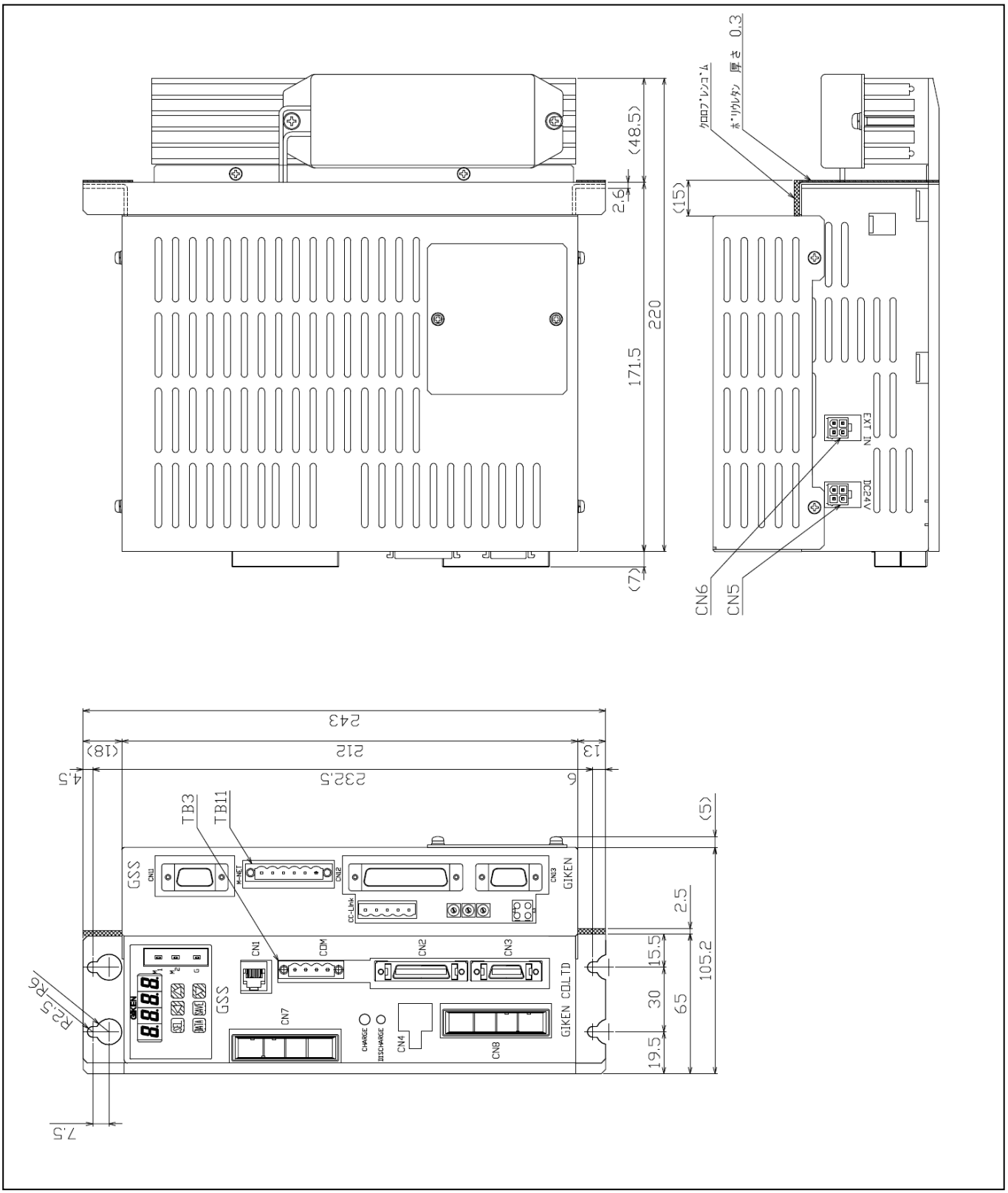
2-5-5-2 Dimensional drawing (with CC-Link interface): T specification ••• GSS-T1(T3)-N04-M



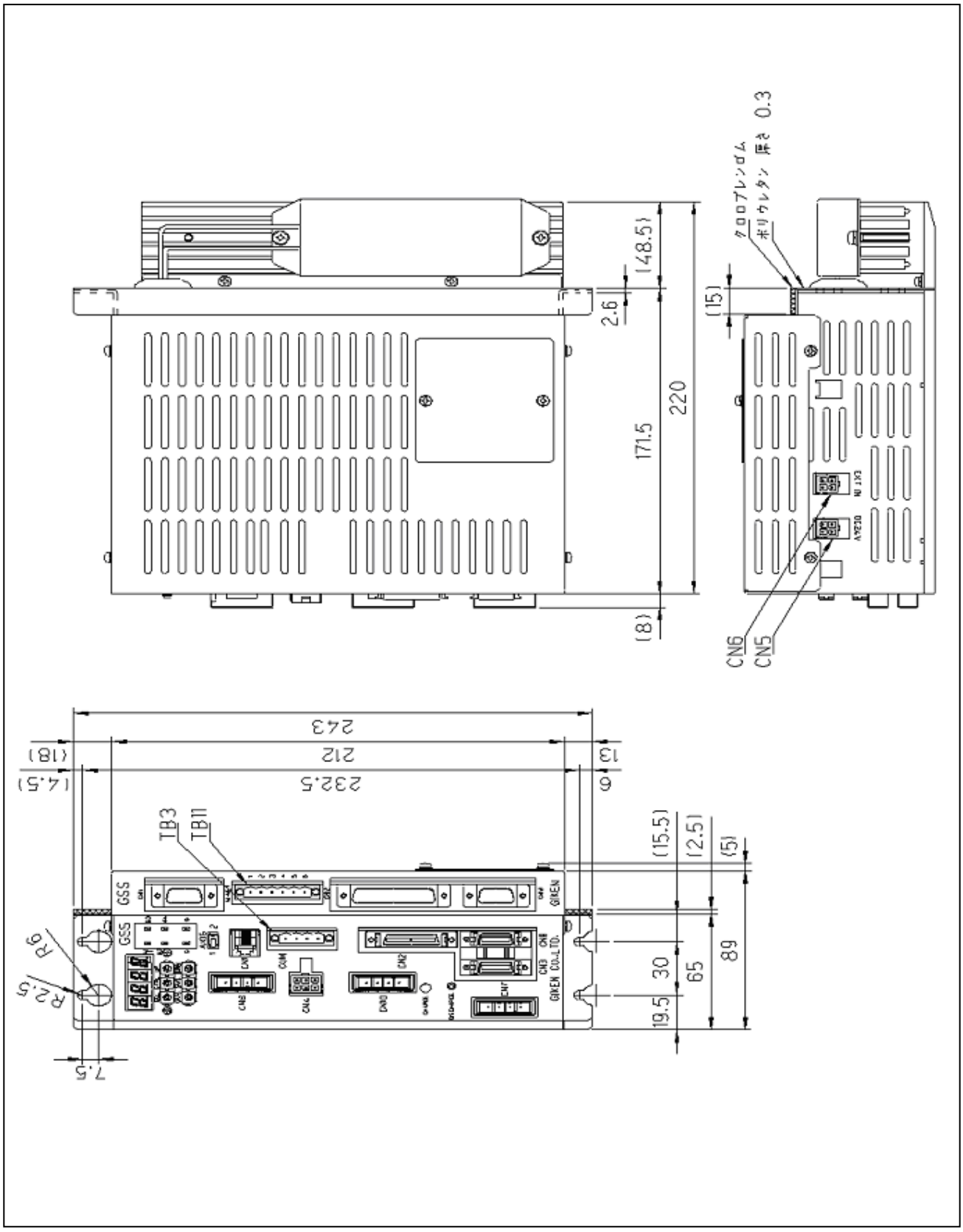
2-5-6-1 Dimensional drawing (with M-net interface): T specification ••• GSS-T4(T5, T7)-N04-M



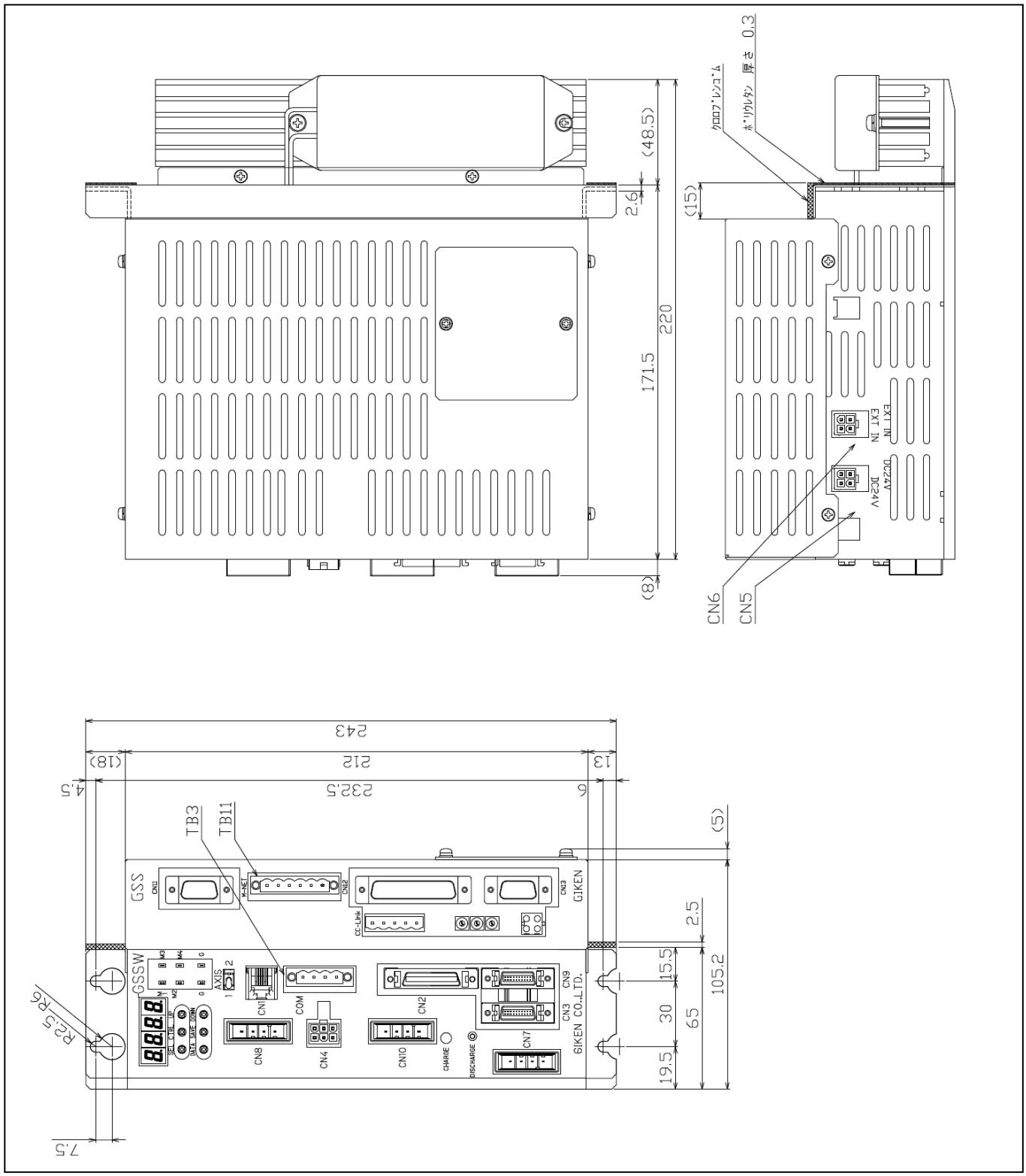
2-5-6-2 Dimensional drawing (with CC-Link interface): T specification ••• GSS-T4(T5, T7)-N04-M



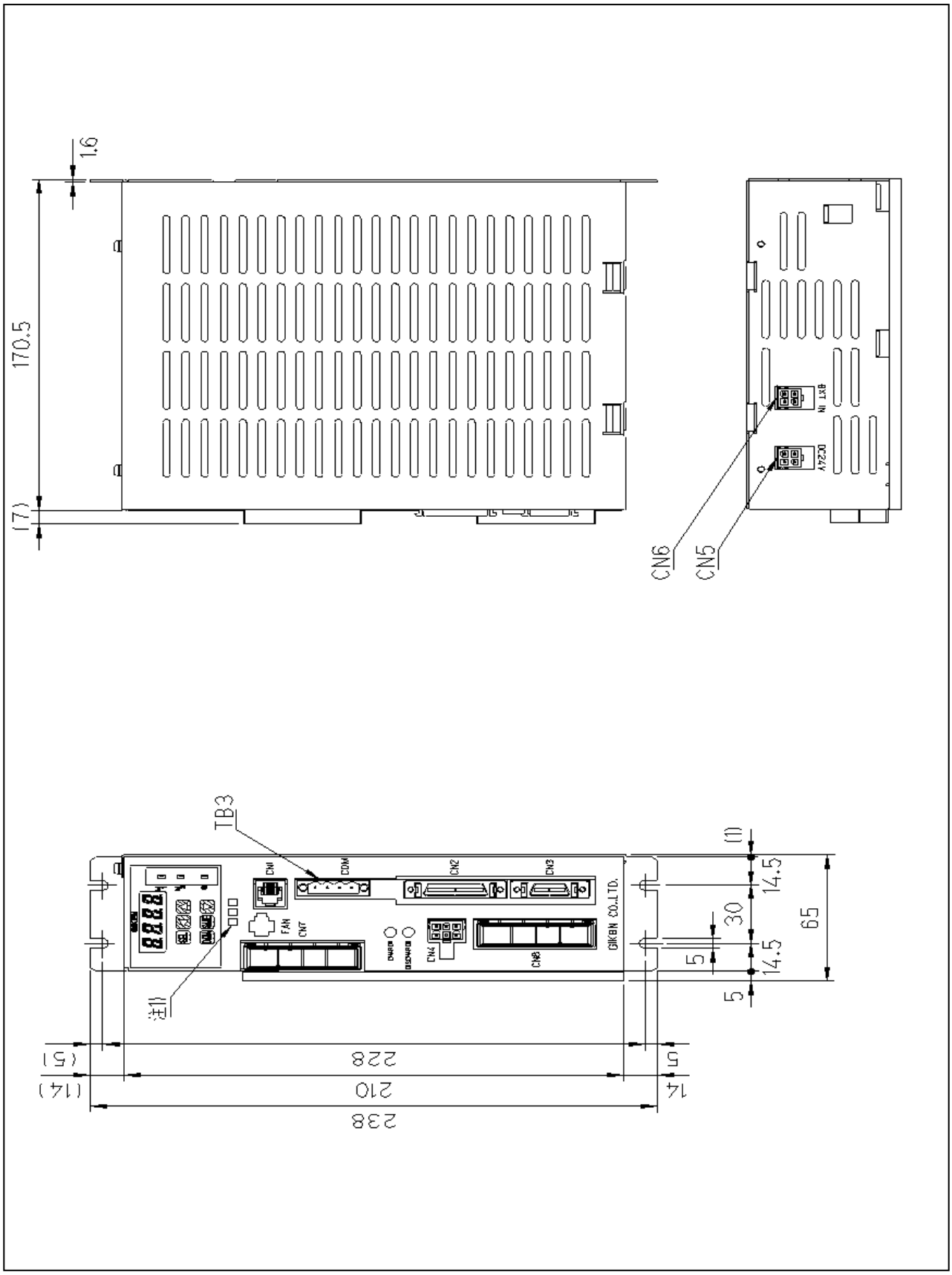
2-5-7-1 Dimensional drawing (with M-net interface): T specification ••• GSSW-T1(T3)-N04-M



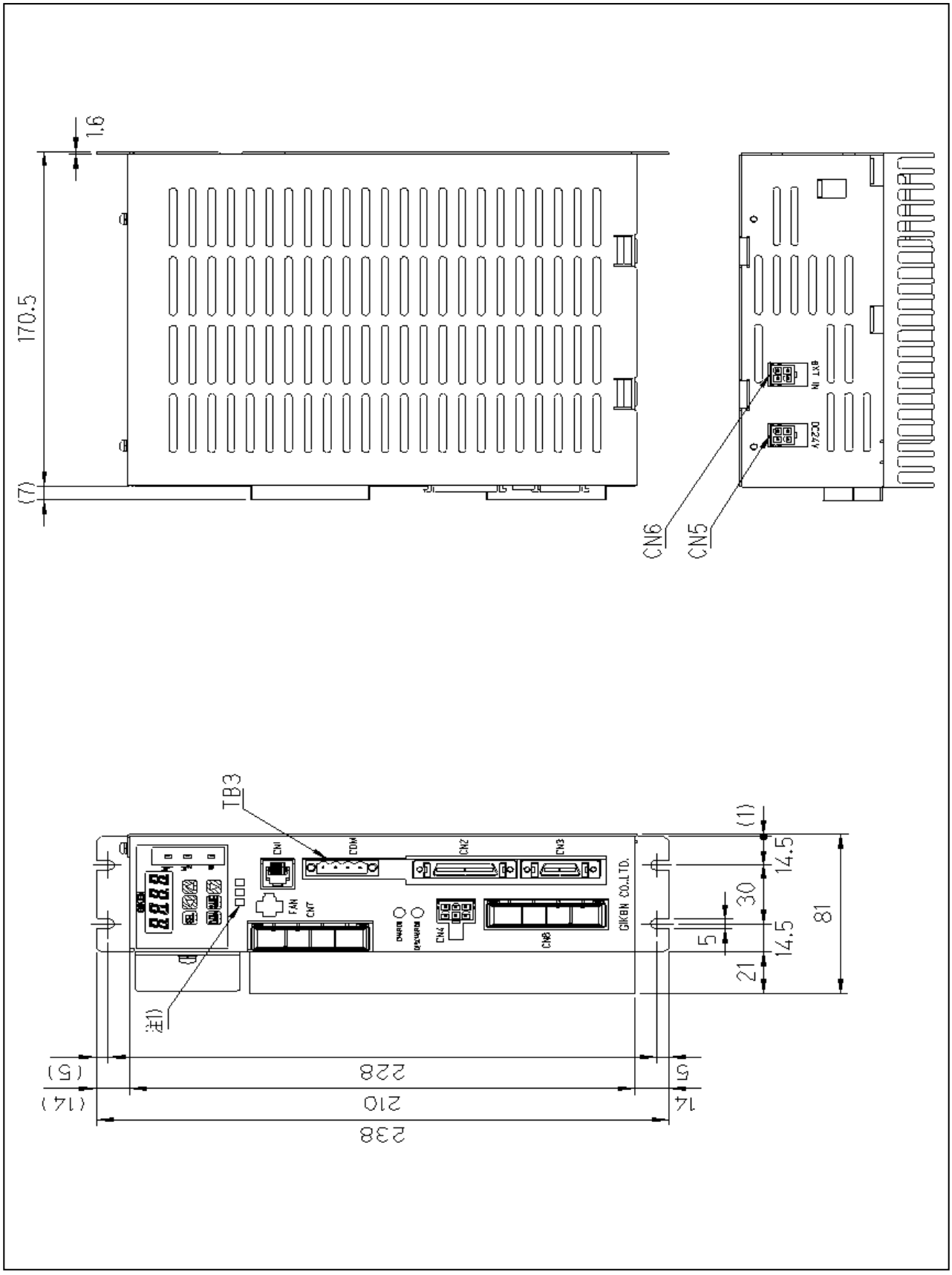
2-5-7-2 Dimensional drawing (with CC-Link interface): T specification ••• GSSW-T1(T3)-N04-M



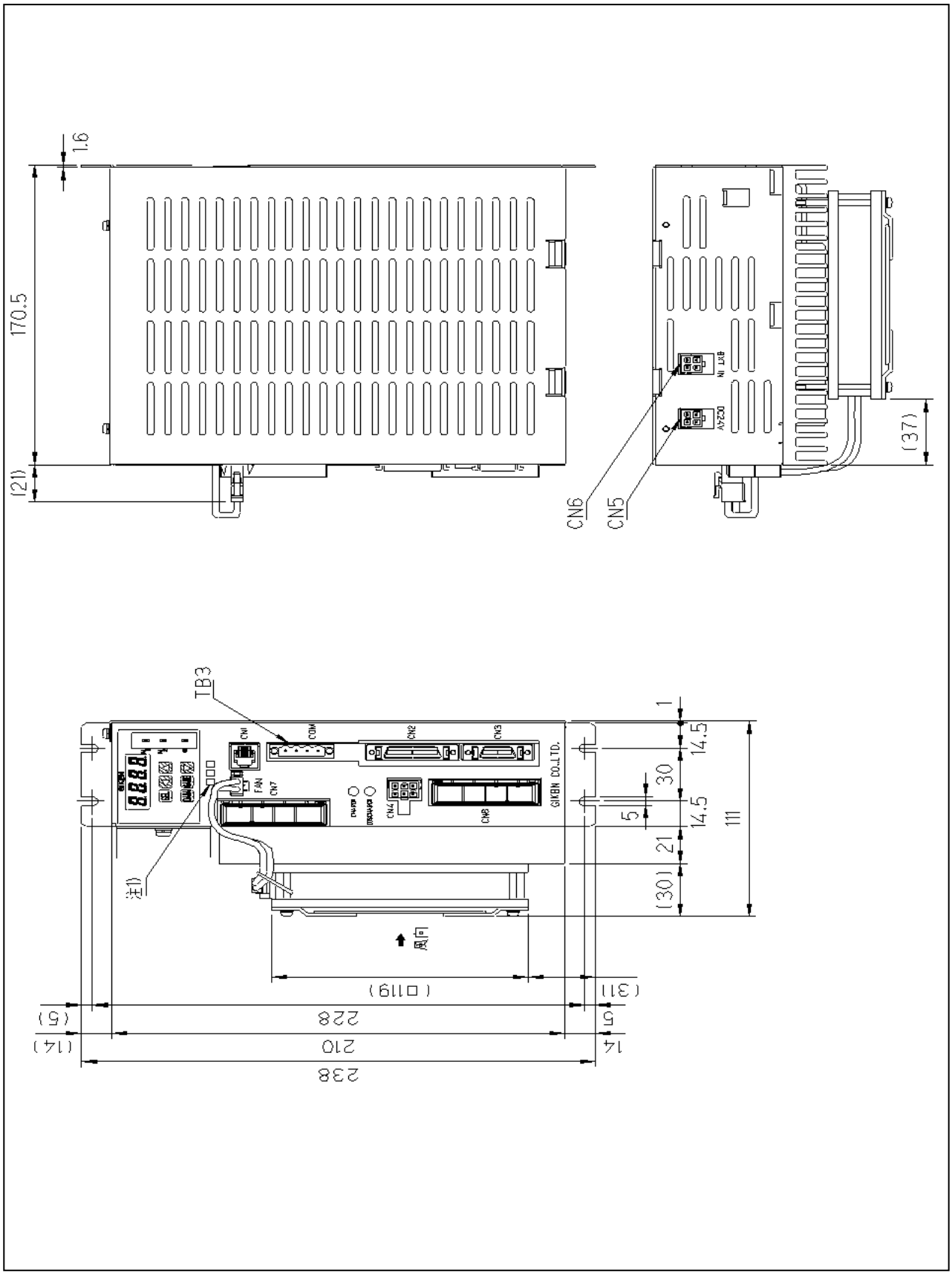
2-5-8 Dimensional drawing: Standard specification ••• GSS-11 (13)-N04-M



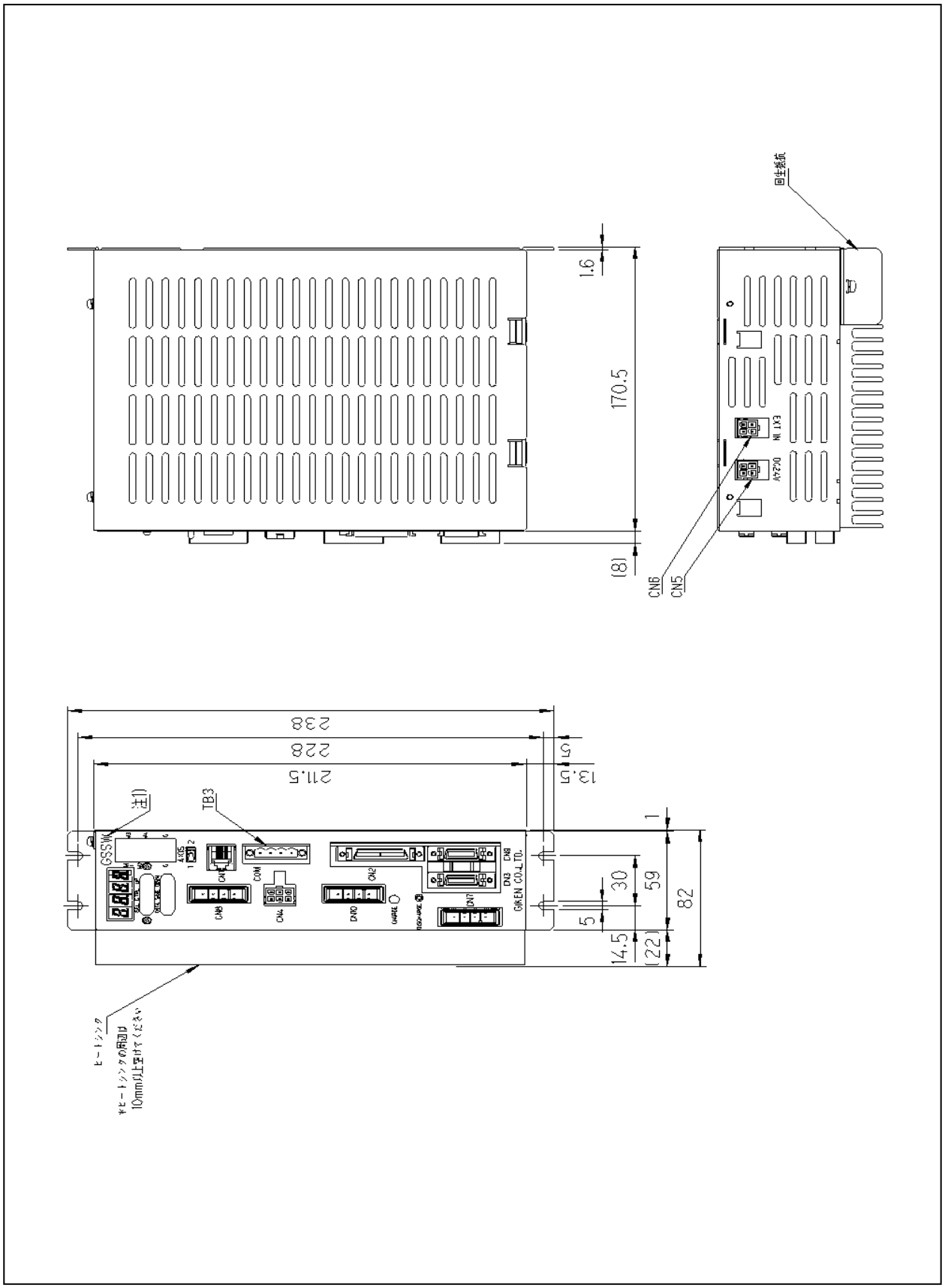
2-5-9 Dimensional drawing: Standard specification ••• GSS-14 (15)-N04-M



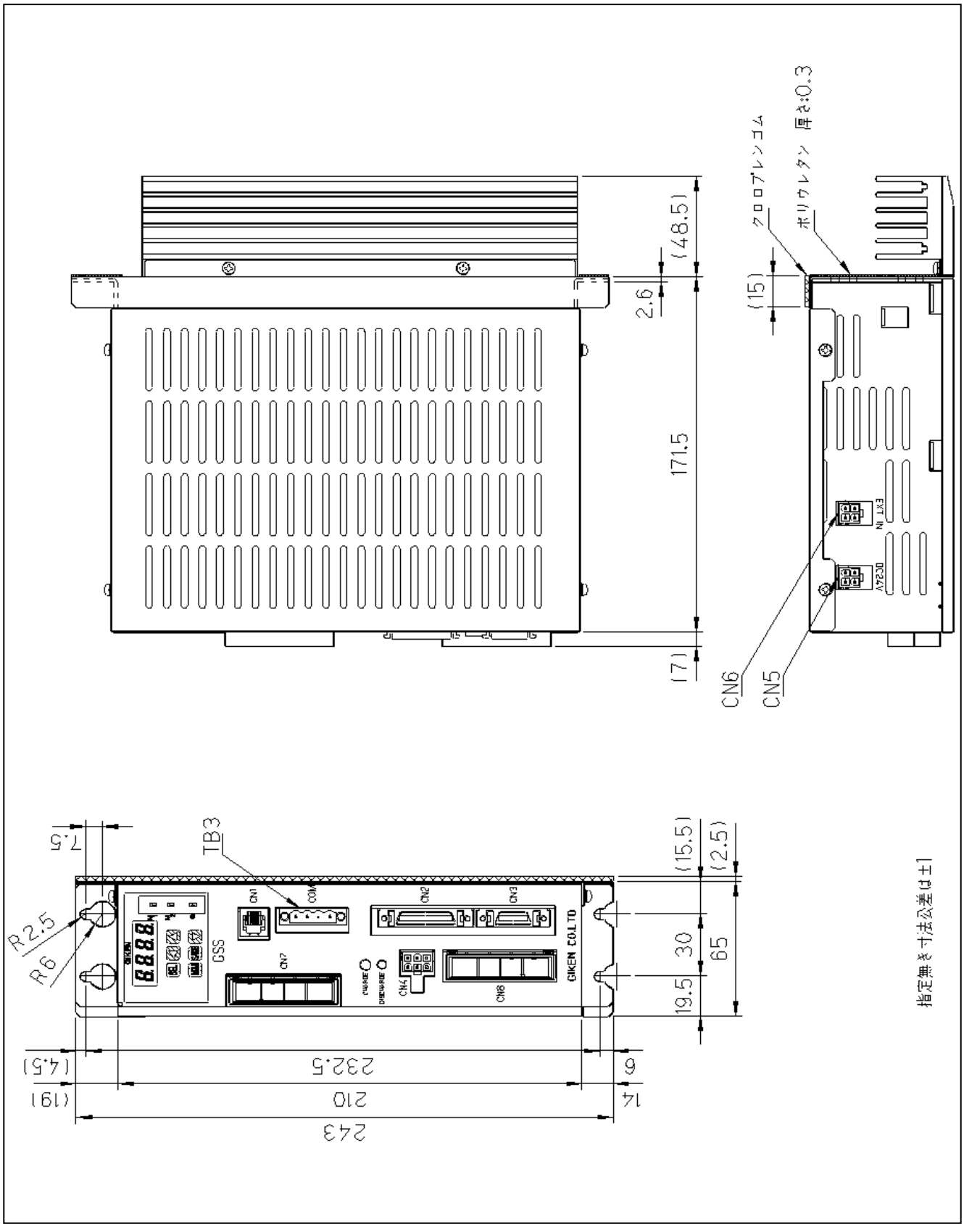
2-5-10 Dimensional drawing: Standard specification ••• GSS-17 (15)-N04-M



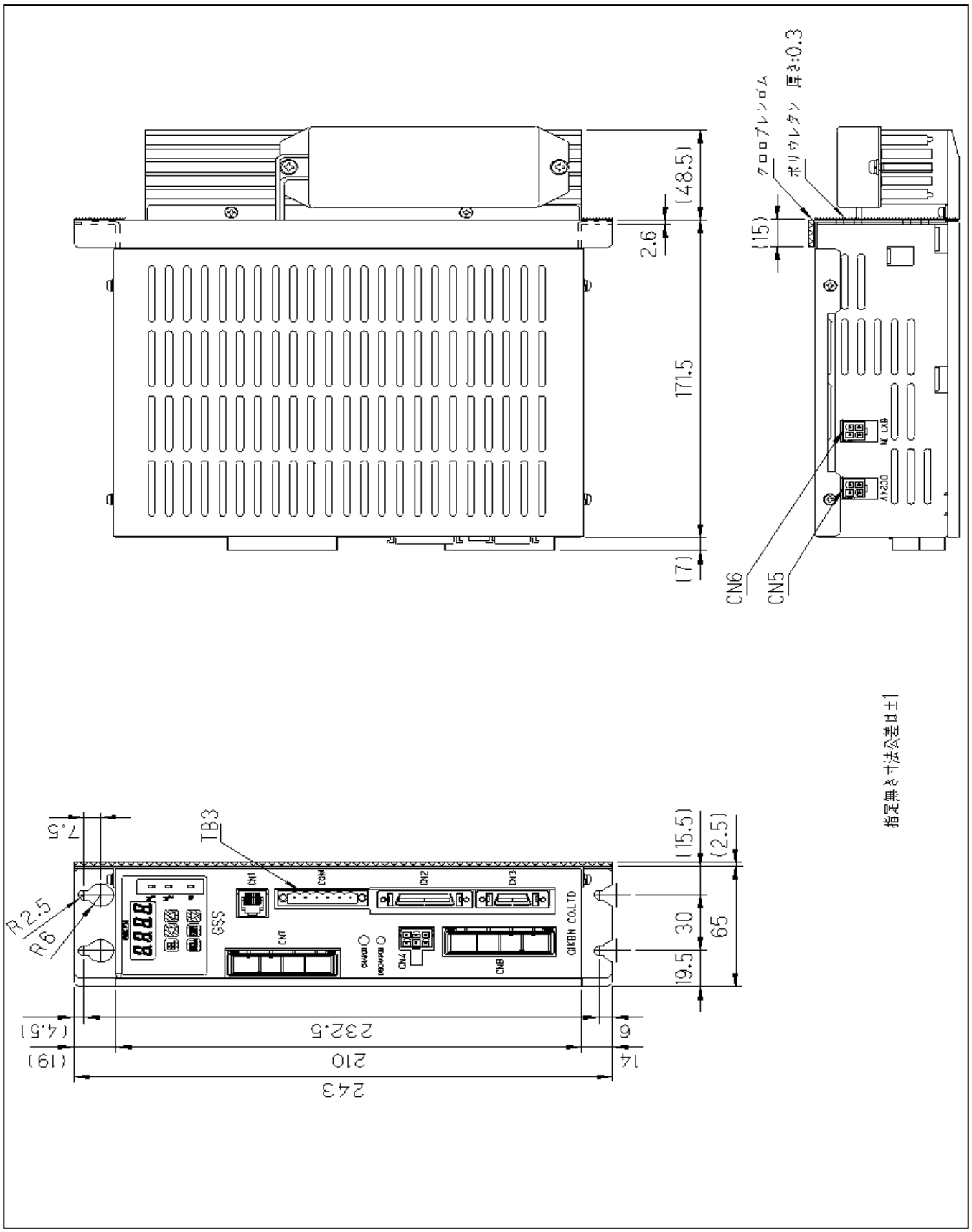
2-5-11 Dimensional drawing: Standard specification ••• GSSW-11 (13)-N04-M



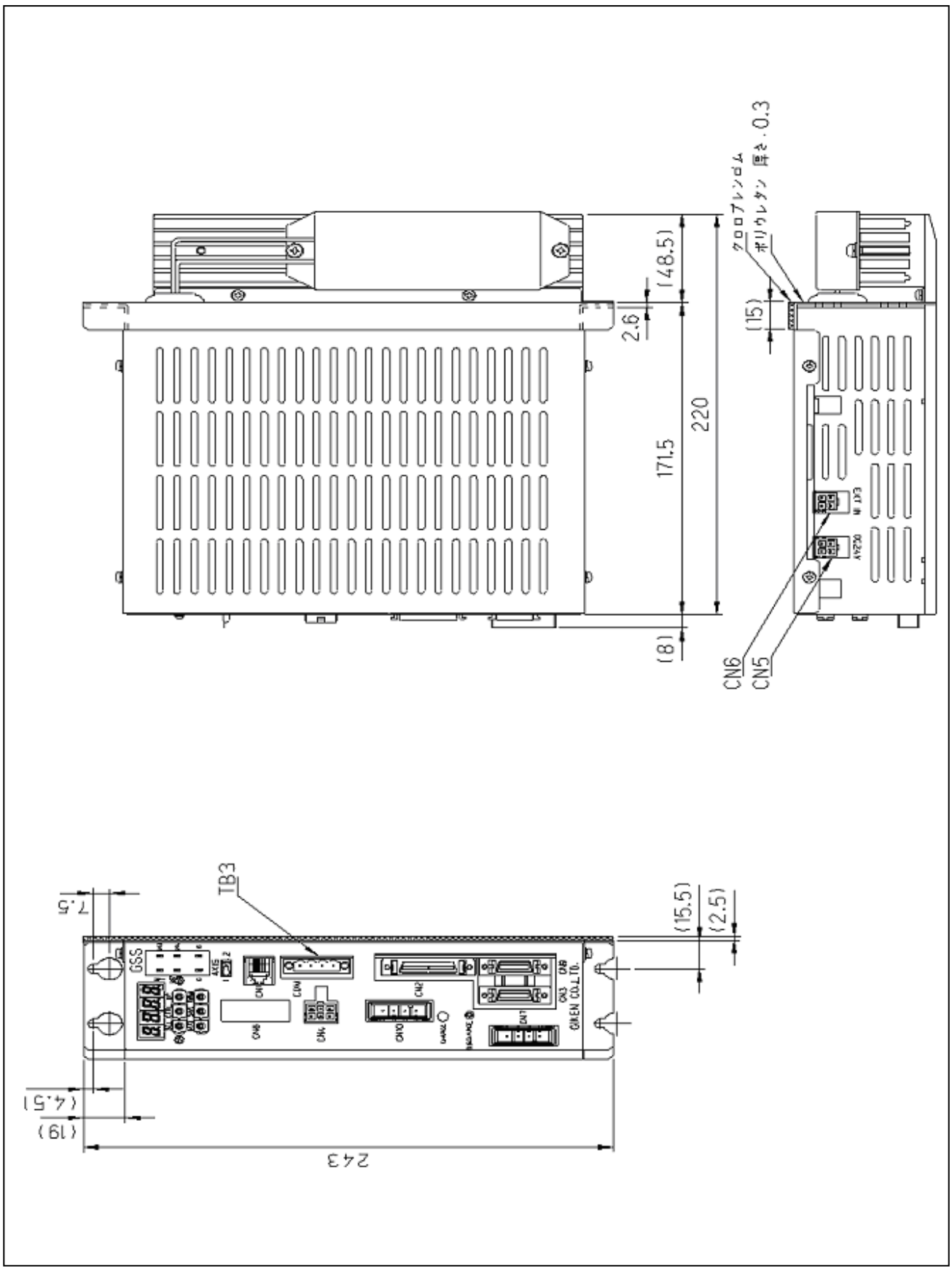
2-5-12 Dimensional drawing: T specification ••• GSS-T1 (T3)-N04-M



2-5-13 Dimensional drawing: T specification ••• GSS-T4 (T5,T7)-N04-M



2-5-14 Dimensional drawing: T specification ••• GSSW-T1 (T3)-N04-M

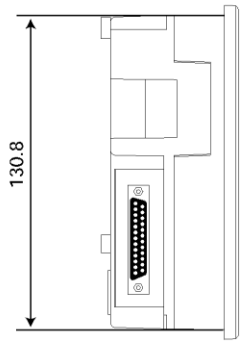


2-5-15 Dimensional drawing (Display)

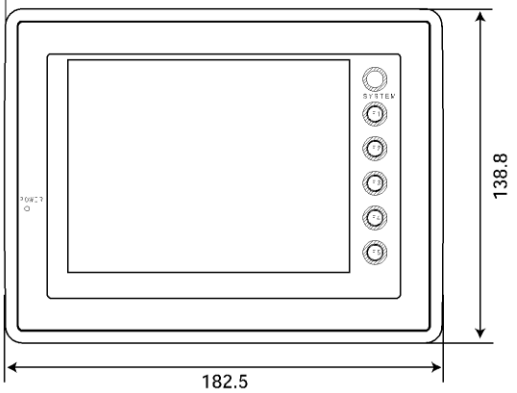
Model: GSS-D2

単位：mm

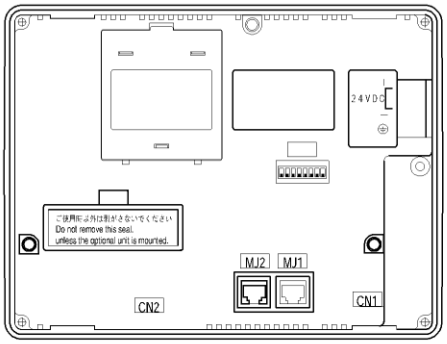
○側面図



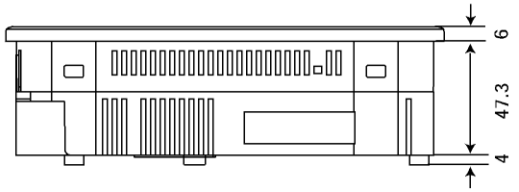
○正面図



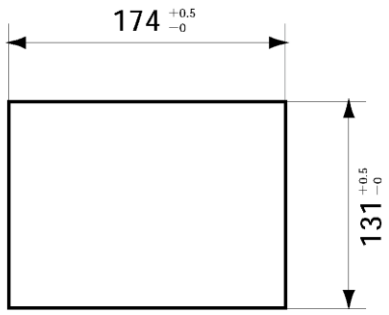
○背面図



○下面図



・パネルカット寸法

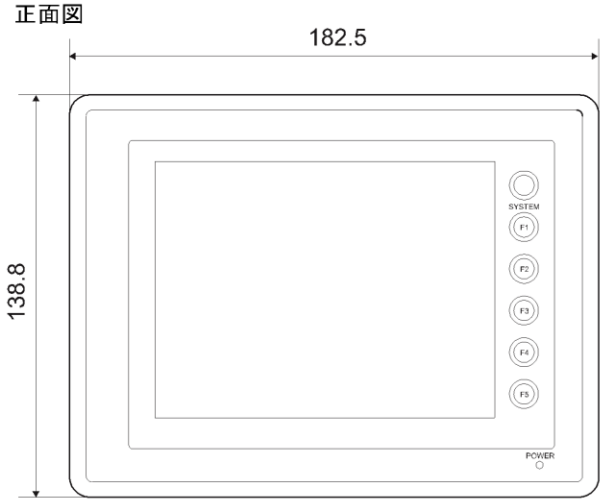


2-5-15 Dimensional drawing (Display)

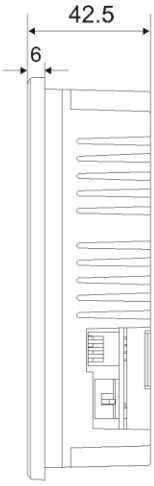
Model: GS-D3

（単位：mm）

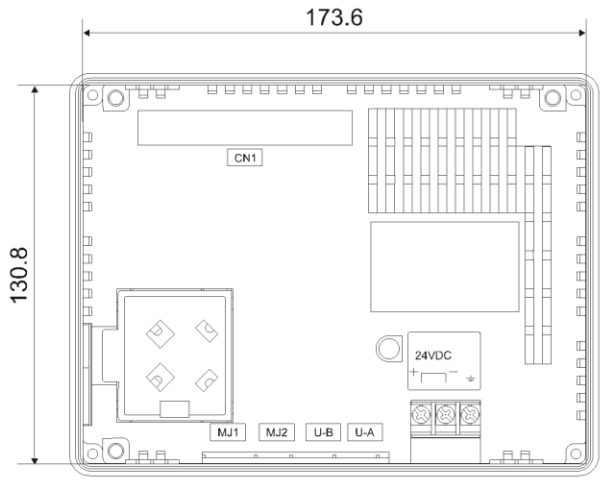
• 正面図



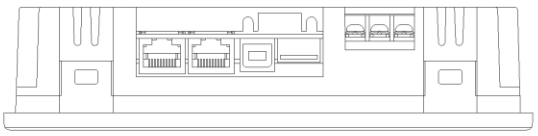
• 側面図



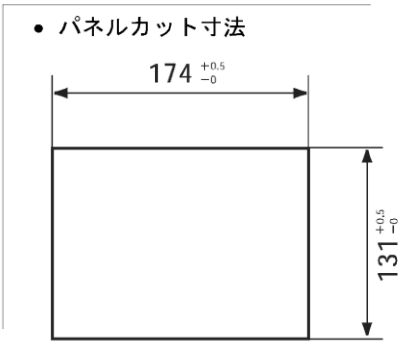
• 背面図



• 下面図



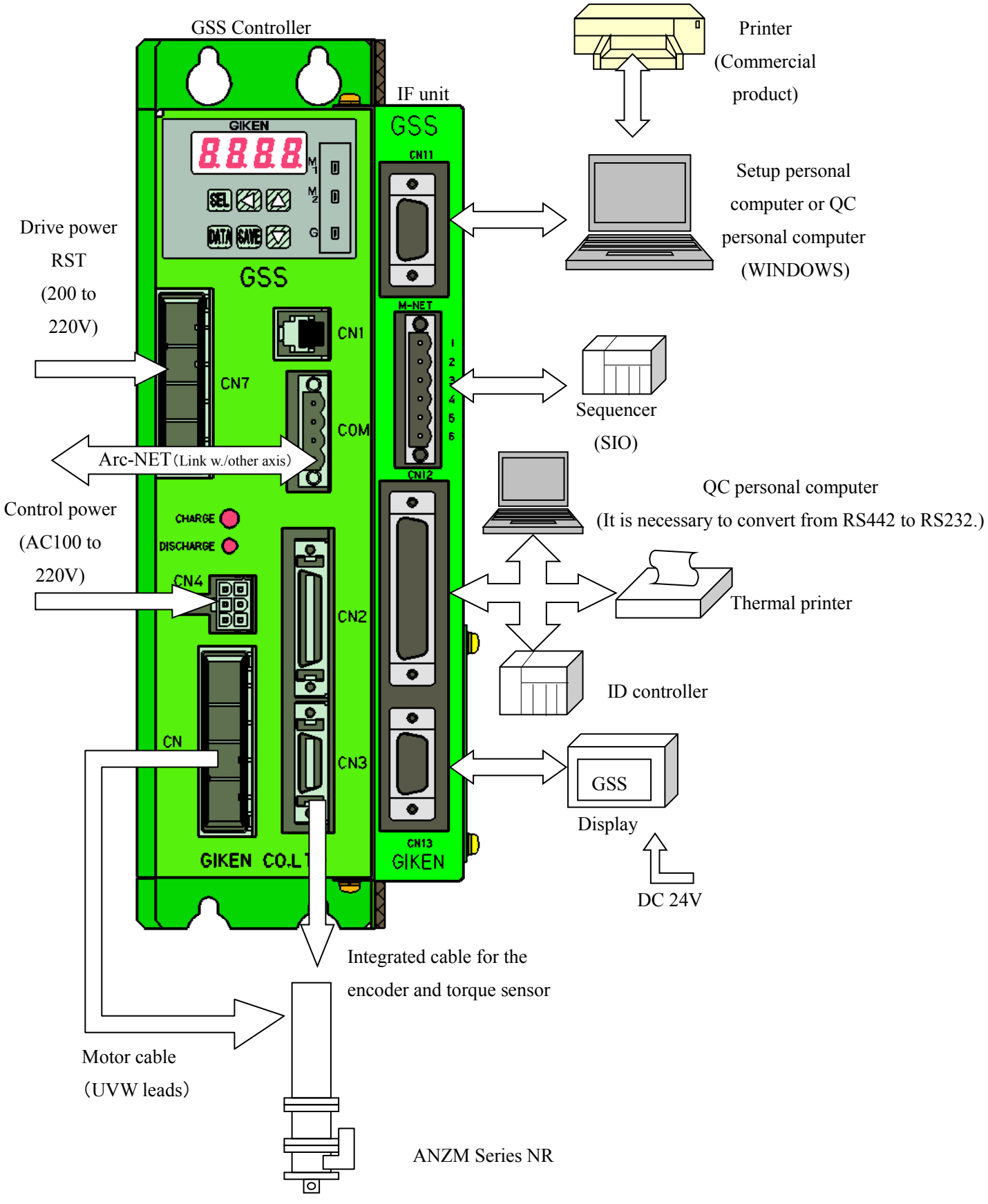
• パネルカット寸法



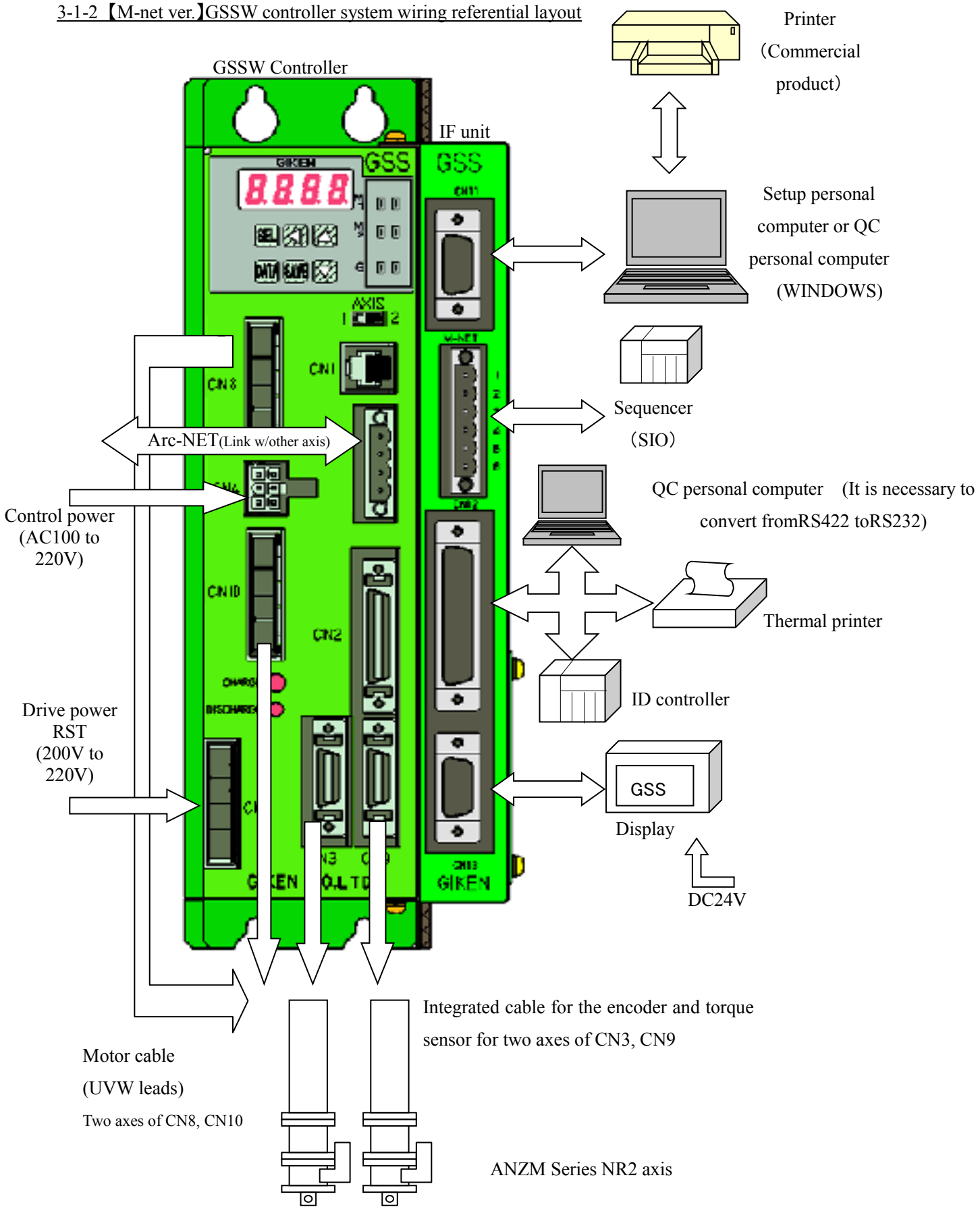
3. Wiring connection

3-1 Wiring referential layout

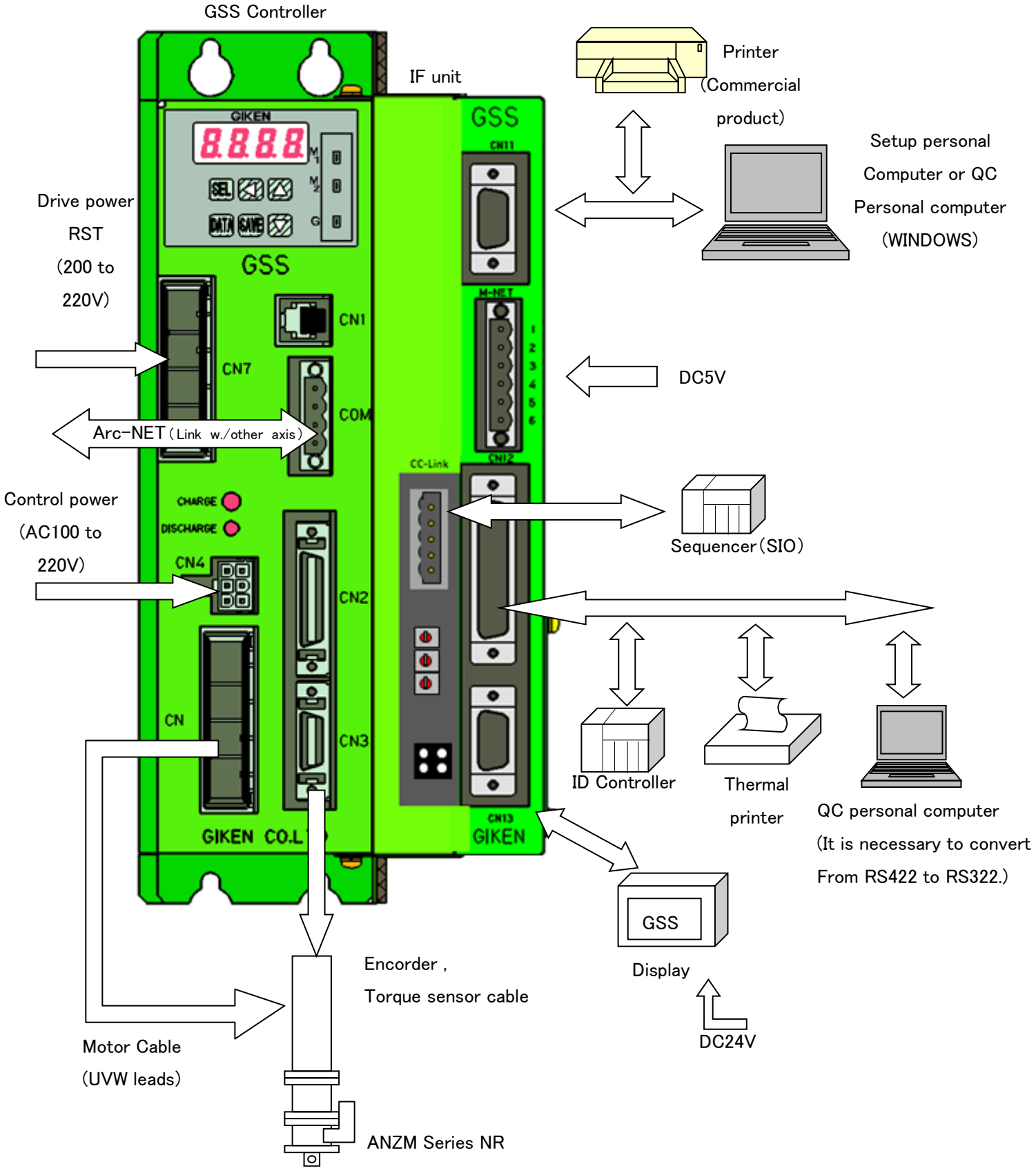
3-1-1 【M-net ver.】GSS controller system wiring referential layout



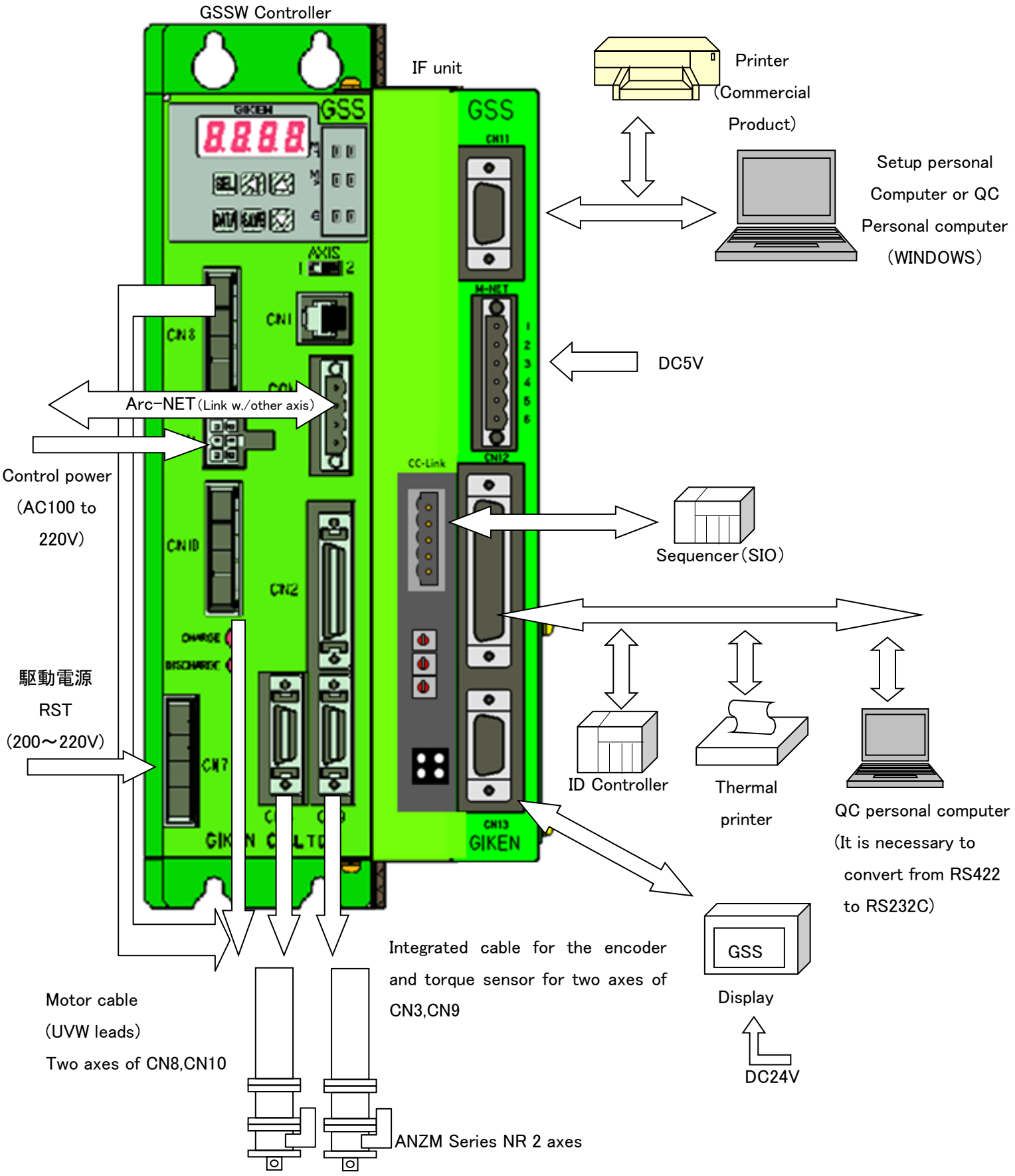
3-1-2【M-net ver.】GSSW controller system wiring referential layout



3-1-3【CC-Link ver.】GSS controller system wiring referential layout



3-1-4【CC-Link ver.】GSSW controller system wiring referential layout



3-2 Connector to be used and the other side connector

3-2-1 GSS connector and the other side connection

Driver unit

Code	Application/contents	Applicable type	Counter side type	Counter attachment
CN1	Manufacturer use RS232C connection	3MJ66HOPLP-N3(OKI WIRE) or equivalent	Modular jack 6 pin (Each manufacturer)	
CN2	For the parallel interface	10236-52A2JL(SUMITOMO 3M) or equivalent	Plug: 10136-3000VE (SUMITOMO 3M) Shell: 10336-52A0-008 (SUMITOMO 3M)	
CN3	For the connection with the encoder	10220-52A2JL(SUMITOMO 3M) or equivalent	Plug: 10120-3000VE (SUMITOMO 3M) Shell: 10320-52A0-008 (SUMITOMO 3M)	
CN4	For the connection of control power supply	5569-6A1(MOLEX) or equivalent	Connector: 5557-06R (MOLEX) Terminal: 5556TL (MOLEX)	○
CN5	Power supply for I/O For the connection of (DC24V)	5569-4A1(MOLEX) or equivalent	Connector: 5557-04R (MOLEX) Terminal:5556TL (MOLEX)	
CN6	Unused	5569-4A1(MOLEX) or equivalent	Connector: 5557-04R (MOLEX) Terminal: 5556TL (MOLEX)	
CN7	For the connection of drive power supply	1-917541-2 (Tyco electronics amplifier) X key Or equivalent	Housing: 1-179958-4 (Tyco electronics amplifier) X key Contact: 316041-2 (Tyco electronics amplifier) for AWG10,AWG12	○
CN8	For the connection to a motor	2-917541-2 (Tyco electronics amplifier) Y key or equivalent	Housing:2-179958-4 (Tyco electronics amplifier) Y key Contact: 316041-2 (Tyco electronics amplifier) for AWG10,AWG12	
COM	For communication among Controllers	MSTB 2,5/4-FG-5,08 (POHENIX CONTACT)	MSTB 2,5/4-STF-5,08 (POHENIX CONTACT) Wire directly installed type applicable wire;AWG24～AWG12	○ (Resistor to be attached)

Applicable wire： AWG24～AWG12

I/F unit

Code	Application/contents	Applicable type	Counter side type	Counter attachment
CN11	Inputs/outputs the related data to tightening from the personal computer with RS232C port.	D-SUB 9 pins　Male	D-SUB 9 pins　Female (Each manufacturer)	
CN12	For the connection with a printer, ID controller or QC personal computers	D-SUB 25 pins　Female	D-SUB 25 pins　Male (Each manufacturer)	
CN13	For the connection with a indicator (RS422 interface)	D-SUB 9 pins　Female	D-SUB 9 pins　Male (Each manufacturer)	
M-NET	For M-NET communication (CC-Link ver. IF need 5V power supply)	MSTB 2,5/6-FG-5,08 (POHENIX CONTACT)	MSTB 2,5/6-STF-5,08 (POHENIX CONTACT) Wire directly installed type Applicable wire：AWG24～AWG12	○
CC-Link (only for CC-Link ver. IF)	For CC-Link communication	MSTB 2,5/5-FG-5,08-AU (POHENIX CONTACT)	MSTB 2,5/5-ST-5,08 (POHENIX CONTACT)	○

3-2-2 GSSW connector and the other side connection

Driver unit

Code	Application/contents	Applicable type	Counter side type	Counter attachment
CN1	Manufacturer use RS232C connection	3MJ66HOPLP-N3(OKI WIRE) or equivalent	Modular jack 6 pin (Each manufacturer)	
CN2	For the parallel interface	10236-52A2JL(SUMITOMO 3M) or equivalent	Plug: 10136-3000VE (SUMITOMO 3M) Shell: 10336-52A0-008 (SUMITOMO 3M)	
CN3 CN9	For the connection with the encoder	10220-52A2JL(SUMITOMO 3M) or equivalent	Plug: 10120-3000VE (SUMITOMO 3M) Shell: 10320-52A0-008 (SUMITOMO 3M)	
CN4	For the connection of control power supply	5569-6A1(MOLEX) or equivalent	Connector: 5557-06R (MOLEX) Terminal: 5556TL (MOLEX)	○
CN5	Power supply for I/O For the connection of (DC24V)	5569-4A1(MOLEX) or equivalent	Connector: 5557-04R (MOLEX) Terminal:5556TL (MOLEX)	
CN6	Unused	5569-4A1(MOLEX) or equivalent	Connector: 5557-04R (MOLEX) Terminal: 5556TL (MOLEX)	
CN7	For the connection of drive power supply	2-179277-2 (Tyco electronics amplifier) X key Or equivalent	Housing: 2-178128-4 (Tyco electronics amplifier) X key Contact: 1-353717-2 (Tyco electronics amplifier) for AWG10,AWG12	○
CN8 CN10	For the connection to a motor	1-179277-2 (Tyco electronics amplifier) Y key or equivalent	Housing:1-178128-4 (Tyco electronics amplifier) Y key Contact: 1-353717-2 (Tyco electronics amplifier) for AWG10,AWG12	
COM	For communication among Controllers	MSTB 2,5/4-FG-5,08 (POHENIX CONTACT)	MSTB 2,5/4-STF-5,08 (POHENIX CONTACT) Wire directly installed type Applicable wire: : AWG24～AWG12	○ (Resistor to be attached)

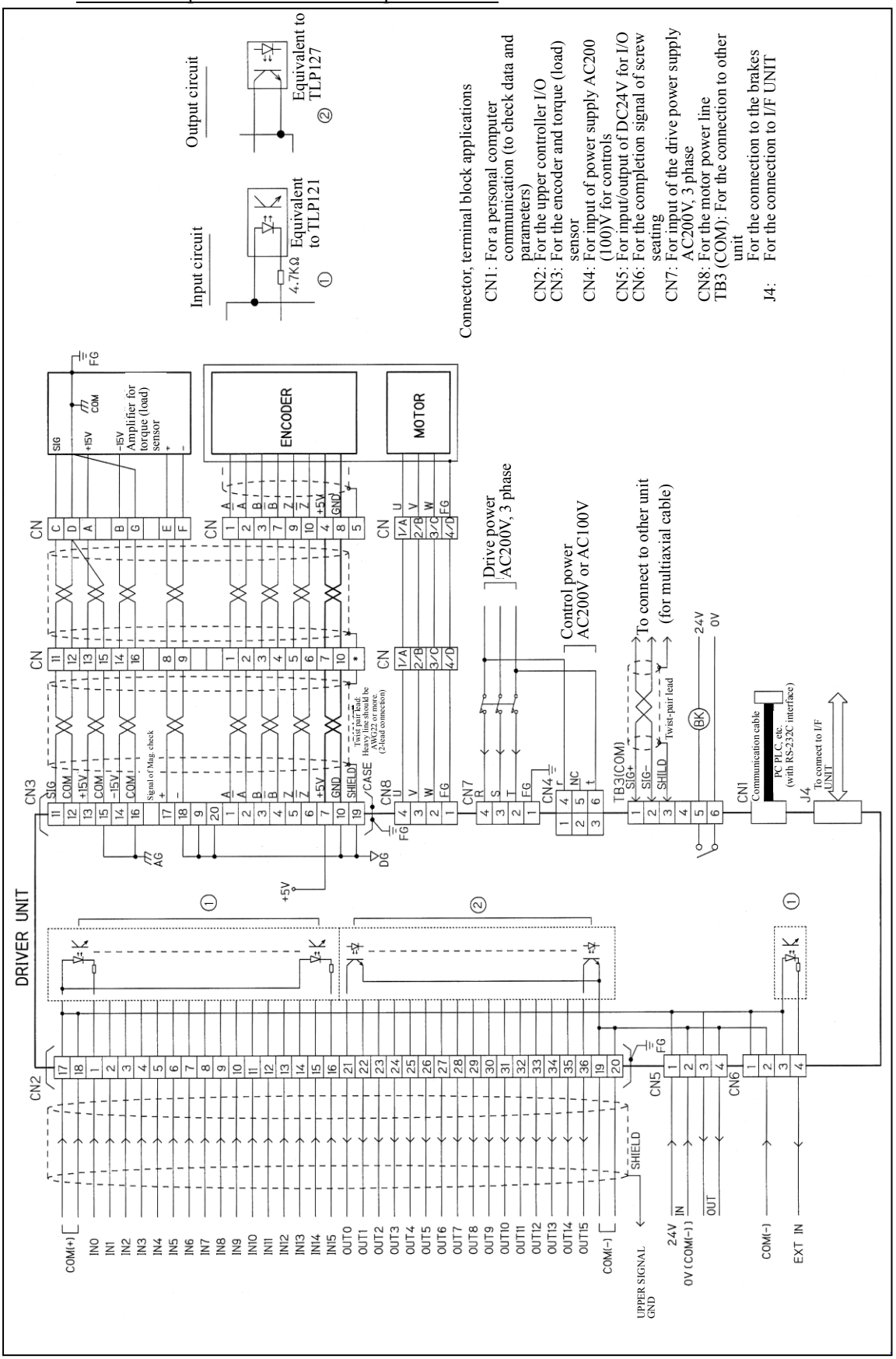
I/F unit

Code	Application/contents	Applicable type	Counter side type	Counter attachment
CN11	Inputs/outputs the related data to tightening from the personal computer with RS232C port.	D-SUB 9 pins Male	D-SUB 9 pins Female (Each manufacturer)	
CN12	For the connection with a printer, ID controller or QC personal computers	D-SUB 25 pins Female	D-SUB 25 pins Male (Each manufacturer)	
CN13	For the connection with a indicator (RS422 interface)	D-SUB 9 pins Female	D-SUB 9 pins Male (Each manufacturer)	
M-NET	For M-NET communication (CC-Link ver. IF need 5V power supply)	MSTB 2,5/6-FG-5,08 (POHENIX CONTACT)	MSTB 2,5/6-STF-5,08 (POHENIX CONTACT) Wire directly installed type Applicable wire: AWG24～AWG12	○
CC-Link (only for CC-Link ver. IF)	For CC-Link communication	MSTB 2,5/5-FG-5,08-AU (POHENIX CONTACT)	MSTB 2,5/5-ST-5,08 (POHENIX CONTACT)	○

3-3 External connection

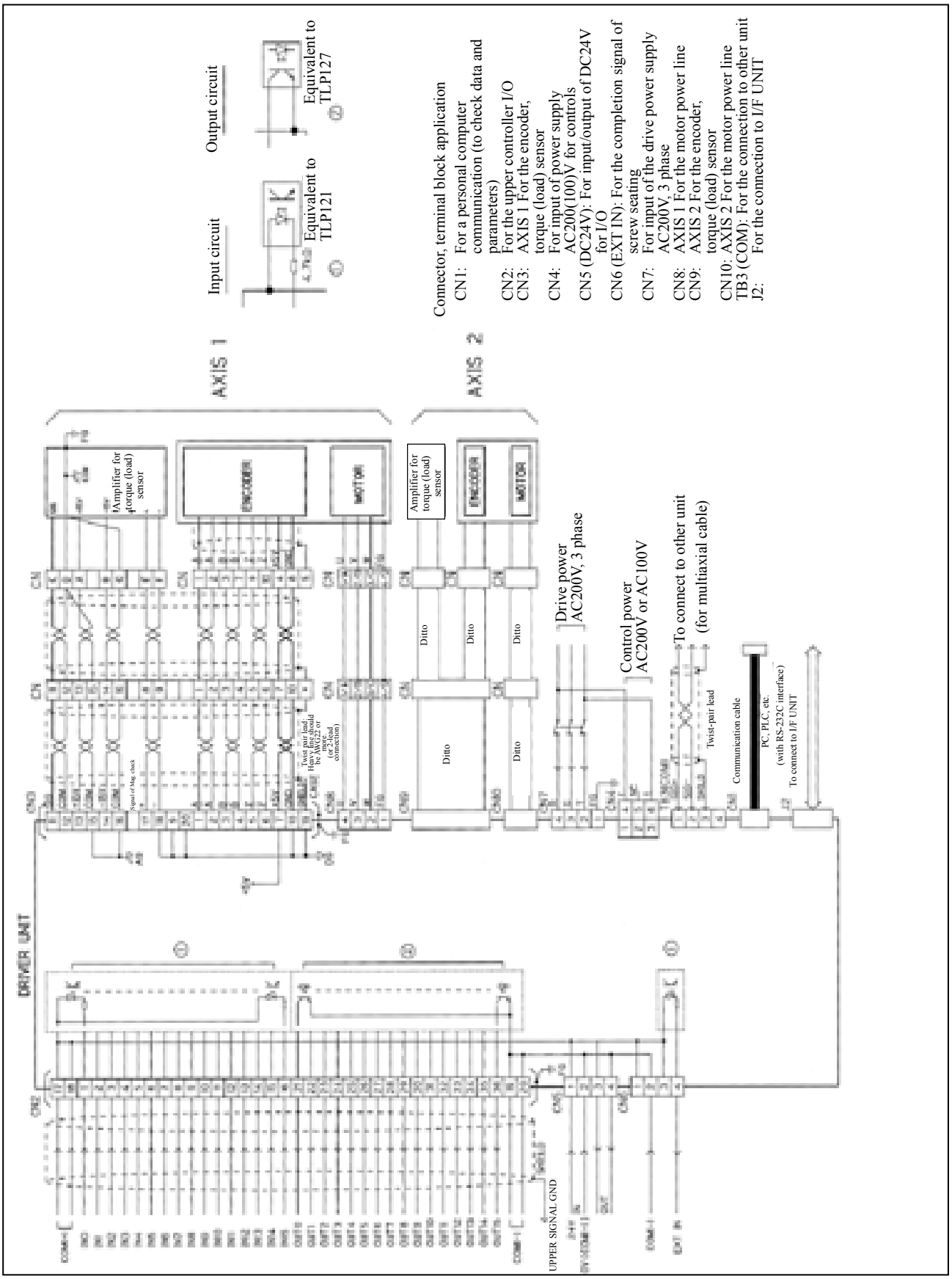
3-3-1 External connection diagram(between the GSS controller and NR):

Standard specification and T specification



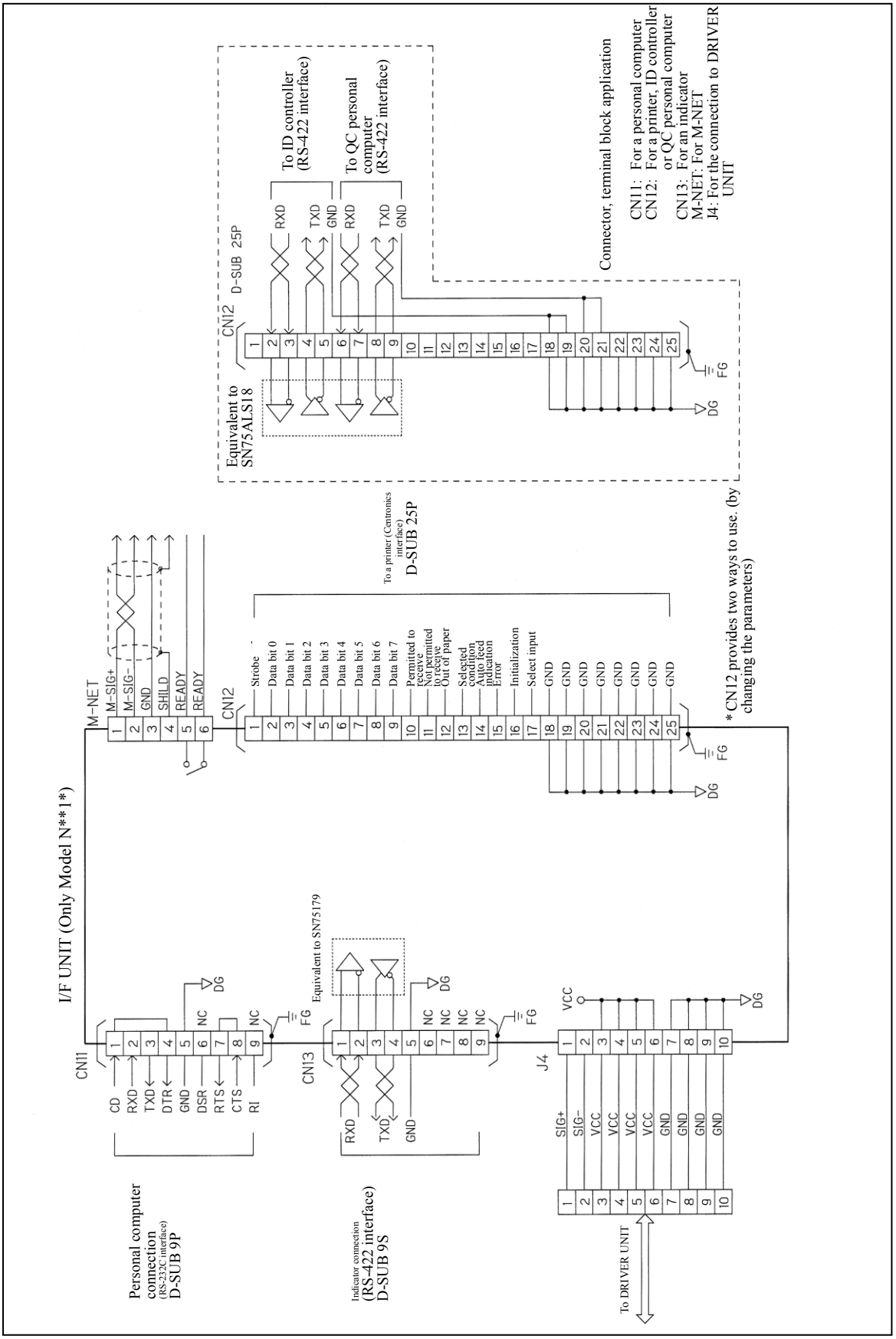
3-3-2 External connection diagram(between the GSSW controller and NR):

Standard specification and T specification



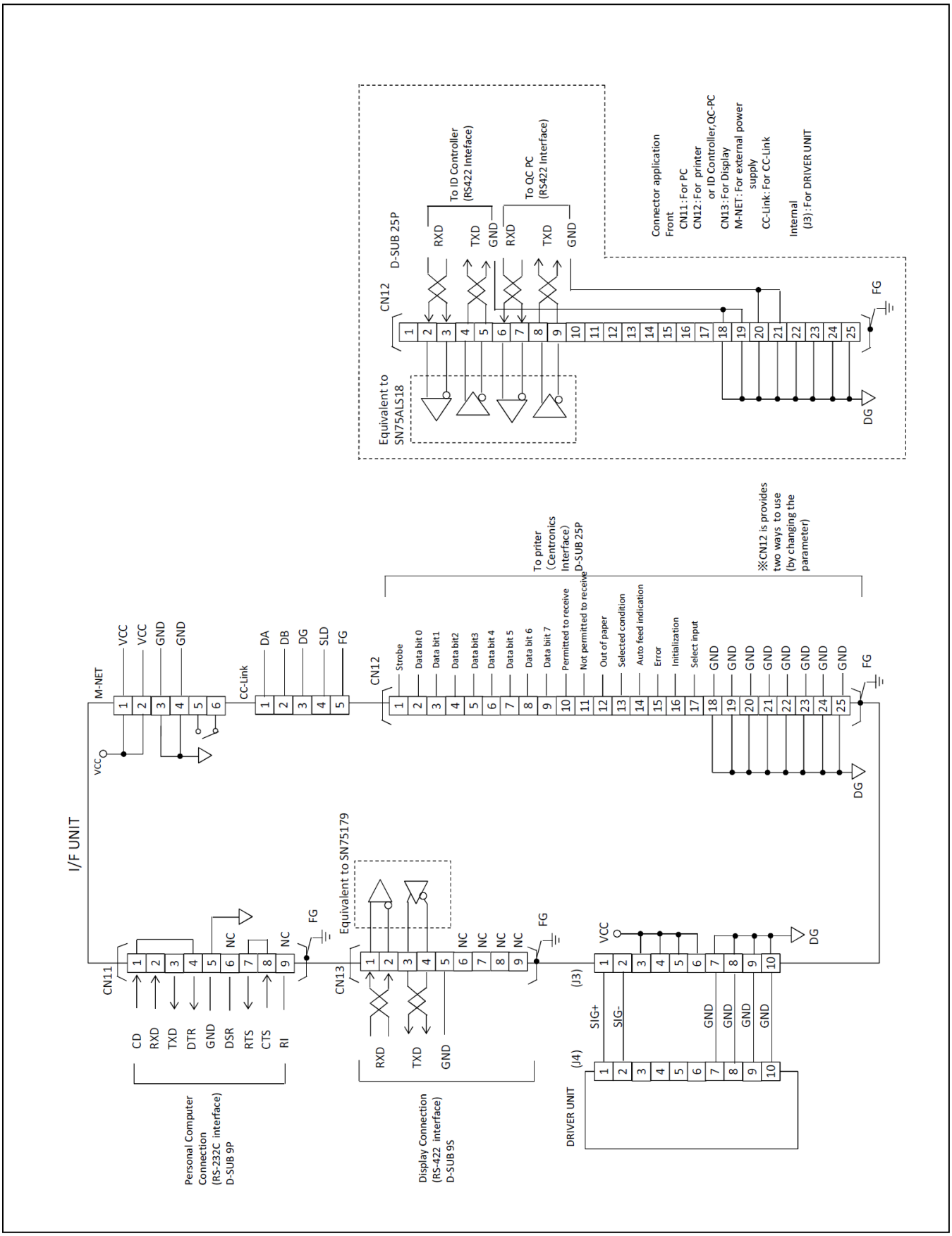
3-3-3 【M-net ver.】External connection diagram (between the interface and equipment to connect):

Standard specification and T specification



3-3-4 【CC-Link】External connection diagram (between the interface and equipment to connect):

Standard specification and T specification



3-4 Table of Cable model

3-4-1 Table of GSS Cable model

〔Please be sure to read the following points to notice.〕

Cable name	NR to be used	Cable model
Motor integrated cable 〔NR ～ Controller〕	ANZM-250～ANZM-500	8M5D-4R(5.10.15.20)M
	ANZM-850～ANZM-3000	8M30D-4R(5.10.15.20)M
	ANZM-5000～ANZM-9000	8M90D-4R(5.10.15.20)M
Motor relay movable (NR ～Relay part)	ANZM-250～ANZM-500	8M5T-4R(2.3.5.7)M
	ANZM-850～ANZM-3000	8M30T-4R(2.3.5.7)M
	ANZM-5000～ANZM-9000	8M90T-4R(2.3.5.7)M
Motor relay fixed cable (Relay part ～ Controller)	ANZM-250～ANZM-500	8M5T-4A(5.10.15.20)M
	ANZM-850～ANZM-3000	8M30T-4A(5.10.15.20)M
	ANZM-5000～ANZM-9000	8M90T-4A(5.10.15.20)M
Encoder･sensor integrated cable (NR～Controller)	ANZM-250～ANZM-9000	8E*S*D-16R(5.10.15.20)M
Encoder ･sensor relay movable cable (NR～Relay part)	ANZM-250～ANZM-9000	8E*S*T-16R(2.3.5.7)M
Encoder ･sensor relay fixed cable (Relay part～Controller)	ANZM-250～ANZM-9000	8E*S*T-16A(5.10.15.20)M

3-4-2 Table of GSSW Cable model

Cable name	NR to be used	Cable model
Motor integrated cable (NR～Controller)	ANZM-250～ANZM-500	8M5DW-4R（5.10.15.20）M
Motor relay movable cable (NR～Relay part)	ANZM-250～ANZM-500	8M5TW-4R（2.3.5.7）M
Motor relay fixed cable (Relay part～Controller)	ANZM-250～ANZM-500	8M5TW-4A（5.10.15.20）M
Encoder･sensor integrated cable (NR～Controller)	ANZM-250～ANZM-500	8E*S*D-16R（5.10.15.20）M
Encoder･sensor relay movable cable (NR～Relay part)	ANZM-250～ANZM-500	8E*S*T-16R（2.3.5.7）M
Encoder･sensor relay fixed cable （Relay part～Controller）	ANZM-250～ANZM-500	8E*S*T-16A（5.10.15.20）M

Notice 1 (Cable overall)

Figures in ( ) are cable length in meter. Please select from the figures indicated.

Cables other than indicated in ( ) are also available with some delivery time.

Notice 2 (Encoder ･Sensor cable)

E*: Encoder cable length from a diverging point Standard (0.3m) in case of no indication.

S*:Sensor cable length from a diverging point Standard (1.5m) in case of no indication.

4. Signal

4-1 Input/Output signal

Parallel I/O

I/O	Points	Name	Specification	Contents
Parallel input signal	16 points	IN0 to IN15	DC24V 11mA	See P53-54
Parallel output signal	16 points	OUT0 to OUT15	DC24V 30mA max	See P53-54

Serial I/O

I/O	Points	Application
RS232C	1 point	Manufacturer use (Should not be used by a customer)
ARC net	1 point	Communication among controllers at multi-axial control (Provide jumping at COM)

Analog monitor

	Output item	Description
M1	TORQUE	Torque (load) sensor monitor (≒5V/sensor rating)
M2	SPEED	Motor rotation speed monitor (Note 5: In the case of CW rotation +)

*The above data can be changed at setting before shipment. (See P95)

I/F unit

I/O	Points	Application
RS232C	1 point	Inputs/outputs parameters and various data by the personal computer connection
Centronics or RS422	1 point 2 points	Parallel printer connection, ID controller and QC personal computer connection (Simultaneous use with the printer is not permitted.)
RS422	1 point	Connection with an indicator
RS485	1 point	Connection via SIO interface with a sequencer and other devices (Option)
CC-Link (only for CC-Link ver.)	1 point	Connection via SIO interface with a sequencer and other devices (Option)

4-2 Input/Output signal (PIO)

4-2-1 Input signal (PIO)

PIO input (“PLC→”GSS”)

Input contents to the first axis in the unit

Note: The action which is enabled when Automatic/Inching is selected is marked with ○.

I/O	Name	Contents	Auto-matic	Inch-ing
IN 0	Operation ready	Signal to start the motor operation (Level determination) 0: Stop (Motor does not run. It stops immediately during operation.) “0” during operation results in cycle stop output. 1: Condition in which the operation can start.	○	○
IN 1	Automatic/ Manual	Motor operating method selection (Level determination) 0: Inching motion Motor rotates in the specified direction according to the inching start signal. Using parameter depends on the rotating direction. 1: Automatic operation Motor operates according to the program selected by the program selection input.	○	○
IN 2	Program start	Signal to start the automatic operation (Processed at the rising edge) 0: Automatic operation stops. 1: Automatic operation starts. (Only a specified block operates. If no block is specified, operation starts from the block 1.) When it becomes “O”/”1” during operation, it will run from the first step of block which stopped at “0”.	○	
IN 3	Inching start	Signal to start inching motion (Processed at the rising edge) 0: Inching operation stops. 1: Inching motion starts.		○
IN 4	Determination reset	Signal to reset the tightening determination output (Processed at the rising edge) 1: All determination signals (Determination data on OUT 3, OUT 4 and M-NET) are turned OFF. No object while inching.	○	
IN 5	Alarm reset	Signal to reset the GSS alarm (Processed at the rising edge) 1: Resets only GSS alarm.	○	○
IN 6	QL input	QL processing input signal (Processed at the rising edge) 1: QL processing input(It is limited when QL mode is 1.)	○	
IN 7	QL mode	Signal that enables the QL input signal according to the signal input (Level determination) 1: QL input valid 2: QL input invalid	○	
IN 8 to IN 12	Program selection input	Program selection input (Level determination) Inputs the operation program number. Inputs the number with ON state of the photocoupler power supply = "1" and OFF state = "0" by accounting as 5-bit information with IN 12 set to MSB side and IN 8 set to LSB side.	○	○
IN 13	Input ENABLE	Program selection importing timing signal (Level determination) 1: Imports the program selection input. Monitor the program selection input/output on the higher rank and make it "0" when they match. Output ENABLE will be "1" at the signal rising edge.	○	○
IN 14	Reset	Reset input (Level determination) 1: Reset to the state when the drive power supply is turned ON. All determinations are OFF and the stop servo of motor is OFF.	○	○
IN 15	IN delay input	IN signal (Level determination) If the step in the program has “IN delay” attribution, “the step” will not be executed until this signal becomes “1”. 1: IN delay start	○	

(“1”: Photocoupler power supply on, “0”: Photocoupler power supply off)

Input contents to the second axis in the unit

I/O	Name	Contents	Auto-matic	Inch-Ing
IN 0 to IN 15	Axis cutting for 1st axis to 16th axis	Set the axis cutting of the corresponding axis by setting IN 0=1st axis, IN 1=2nd axis, … IN 15=16th axis. After changing the setting, the changed contents will be valid by turning the control power supply OFF/ON. At "0": Normal At "1": Axis cutting	○	○

("1": Photocoupler power supply on, "0": Photocoupler power supply off)

Input contents to the third axis in the unit

I/O	Name	Contents	Auto-matic	Inch-Ing
IN 0 to IN 13	Axis cutting for 17th axis to 30th axis	Set the axis cutting of the corresponding axis by setting IN 0=17th axis, IN 1=18th axis, … IN 13=30th axis. After changing the setting, the changed contents will be valid by turning the control power supply OFF/ON. At "0": Normal At "1": Axis cutting	○	○

("1": Photocoupler power supply on, "0": Photocoupler power supply off)

* Axis cutting is not possible with the controller (1st axis) which is connected to the interface unit.

4-2-2 Output signal (PIO)

PIO output ("GSS"→"PLC")

Output contents from the first axis in the unit

I/O	Name	Contents	Auto-matic	Inch-Ing
OUT 0	Ready complete	0: Operation ready incomplete This is the state that the controller cannot operate. (GSS alarm, drive power supply disconnected, motor not initialized yet or operation ready signal OFF) 1: Operation ready complete	○	○
OUT 1	System OK	0: Operation error (GSS alarm) 1: Operation normal	○	○
OUT 2	Battery OK	0: Battery voltage drop (2.7 V or less). Determined only when the control power supply is turned on. 1: Battery normal	○	○
OUT 3	Total OK	0: 1: All axes programs in the unit advanced to the final step and tightening of all blocks is correctly completed.	○	
OUT 4	Total NG	0: 1: Program advanced to the final step (all blocks operation) and error occurred with either of tightening.	○	
OUT 5	NR running	0: Motor is stopped. (Servo motors are turned off on all axes) 1: Motor is running. (Either axis is controlled with motor)	○	○
OUT 6	QL complete	It is "1" when the QL input of NG times in the unit entered in the state of block NG/total NG. It will be Block OK/total OK.	○	
OUT 7	Program running	Outputs while the program is running.	○	
OUT 8 to OUT 12	Program selection output	Outputs the currently selected program number Outputs the number with ON state of the photocoupler power = "1" and OFF state = "0" by accounting as 5-bit information with OUT 12 set to MSB side and OUT 8 set to LSB side.	○	○
OUT 13	Output ENABLE	0: Initial value 1: It is "1" when the program selection completion signal is confirmed and "0" at rising of the input ENABLE.	○	○
OUT 14	Block OK	0: 1: Program advanced to the final step in the unit and tightening in the block is correctly completed.	○	

I/O	Name	Contents	Auto-matic	Inch-Ing
OUT 15	Block NG	0: 1: Program advanced to the final step and error occurred with either of tightening in the block.	○	

("1": Photocoupler ON, 0: Photocoupler OFF)

Output contents from the second axis in the unit

I/O	Name	Contents	Auto-matic	Inch-Ing
OUT 0 to OUT 15	1st axis OK to 16th axis OK	Outputs the block OK "1" of the corresponding axis setting OUT 0=1st axis, OUT 1=2nd axis, … OUT 15=16th axis. The corresponding axis advanced to the block end step and final tightening is correctly completed.	○	

("1": Photocoupler ON, 0: Photocoupler OFF)

Output contents from the third axis in the unit

I/O	Name	Contents	Auto-matic	Inch-Ing
OUT 0 to OUT 15	17th axis OK to 32th axis OK	Outputs the block OK "1" of the corresponding axis setting OUT 0=17th axis, OUT 1=18th axis, … OUT 15=32th axis. The corresponding axis advanced to the block end step and final tightening is correctly completed.	○	

("1": Photocoupler ON, 0: Photocoupler OFF)

Items to save

Items to save	Description	Remarks
Screw No.	Screw number attached to each tightening screw. (Can be specified as the format by xx-th axis and xx-th block)	Personal computer communication function is used to set up.
Tightening result	Torque (Determination time point) Angle (from sample start or snag torque) Time (from sample start or snap torque)	
Work data No.	Data sent from ID controller "0" when ID controller is not used.	

4-3 Function of I/F unit

Connection function for the SIO communication, setup personal computer communication, external display connection, printer connection, QC personal computer and ID controller connection

4-4 input/output signal (SIO)

4-4-1 Input signal (SIO)

※M-net version

	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
0	Operation ready	Auto/Each (Manual)	Start	Inching start	Determination reset	Alarm reset	QL signal input	QL mode
1	Program bit 1 selection	Program bit 2 selection	Program bit 3 selection	Program bit 4 selection	Program bit 5 selection	Input ENABLE	GSS reset (ALL reset)	IN delay input
2	Block bit selection 1	Block bit selection 2	Block bit selection 3	Block bit selection 4	Block bit selection 5			Tightening angle sampling start

※CC-Link version

Address : RYm ～RYm+DFh　m:Initial I/O Number　αConstant value of Unit（Note1）

Address	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
RYm+α ～ RYm+α+Fh	Operation ready	Auto/Each (Manual)	Start	Inching start	Determination reset	Alarm reset	QL signal input	QL mode
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	Program bit 1 selection	Program bit 2 selection	Program bit 3 selection	Program bit 4 selection	Program bit 5 selection	Input ENABLE	GSS reset (ALL reset)	IN delay input
RYm+α+10h ～ RYm+α+1Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	Block bit selection 1	Block bit selection 2	Block bit selection 3	Block bit selection 4	Block bit selection 5			Tightening angle sampling start
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F

（Note1） α ＝ Unit1 : 00h
Unit2 : 20h
Unit3 : 40h
Unit4 : 60h
Unit5 : 80h
Unit6 : A0h
Unit7 : C0h

Address : RYm+E0h ～ RYm+FFh

	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
RYm+E0h ～ RYm+EFh	Axis 1 Cutting	Axis 2 Cutting	Axis 3 Cutting	Axis 4 Cutting	Axis 5 Cutting	Axis 6 Cutting	Axis 7 Cutting	Axis 8 Cutting
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	Axis 9 Cutting	Axis 10 Cutting	Axis 11 Cutting	Axis 12 Cutting	Axis 13 Cutting	Axis 14 Cutting	Axis 15 Cutting	Axis 16 Cutting
RYm+F0h ～ RYm+FFh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	Axis 17 Cutting	Axis 18 Cutting	Axis 19 Cutting	Axis 20 Cutting	Axis 21 Cutting	Axis 22 Cutting	Axis 23 Cutting	Axis 24 Cutting
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	Axis 25 Cutting	Axis 26 Cutting	Axis 27 Cutting	Axis 28 Cutting	Axis 29 Cutting	Axis 30 Cutting		

※No Axis Cutting in case of the value of "0" / Axis Cutting in case of the value of "1"

Application	Address
Unit1	RYm ～RYm+1Fh
Unit2	RYm+20h～RYm+3Fh
Unit3	RYm+40h～RYm+5Fh
Unit4	RYm+60h～RYm+7Fh
Unit5	RYm+80h～RYm+9Fh
Unit6	RYm+A0h～RYm+BFh
Unit7	RYm+C0h～RYm+DFh
The signal of axis cutting	RYm+E0h～RYm+FFh
Not use	RYm+100h～RYm+37Fh

※The non using bit data must be value of "0" .

Following signals cannot be input from PIO.

I/O	Name	Contents	Auto-matic	Inch-Ing
SIO	Block selection 1 to 5	Input the operation block number "0": Operates from block 1 in order. "1 to 19": Operates the specified block. Input the signal accounting as 5-bit information with the block selection 5 set to MSB side and the block selection 1 set to LSB side.	○	
	Tightening angle sampling start	Tightening angle sampling movement start When it is not on the way of block movement but operation ready completion output is ON, the sampling movement starts at standing point of "1".	○	

4-4-2 Output signal (SIO)

※M-net version

	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
0	Ready complete	System OK	Battery OK	Total OK	Total NG	NR running	Completion of QL treatment	Program running
1	Completion of program bit 1 selection	Completion of program bit 2 selection	Completion of program bit 3 selection	Completion of program bit 4 selection	Completion of program bit 5 selection	Output ENABLE	Block determination OK	Block determination NG
2	Completion of block bit 1 selection	Completion of block bit 2 selection	Completion of block bit 3 selection	Completion of block bit 4 selection	Completion of block bit 5 selection	Step finished	Cycle stop	OUT
3	Block 1 OK	Block 2 OK	Block 3 OK	Block 4 OK	Block 5 OK	Block 6 OK	Block 7 OK	Block 8 OK
4	Block 9 OK	Block 10 OK	Block 11 OK	Block 12 OK	Block 13 OK	Block 14 OK	Block 15OK	Block 16 OK
5	Block 17 OK	Block 18 OK	Block 19 OK	Block 20 OK	Block 21 OK	Block 22 OK	Block 23 OK	Block 24 OK
6	Block 25 OK	Block 26 OK	Block 1 finished	Block 2 finished	Block 3 finished	Block 4 finished	Block 5 finished	Block 6 Finished
7	Torque over	Time over	Angle over	Zone NG	Snag NG	Passing torque	Zero/Mag.OK	Gear OK
8	Torque under	Time under	Angle under	Gradient NG	NR failure precognition	Baking	Zero/Mag. NG	Gear NG
9	1st axis OK	2nd axis OK	3rd axis OK	4th axis OK	5th axis OK	6th axis OK	7th axis OK	8th axis OK
10	9th axis OK	10th axis OK	11th axis OK	12th axis OK	13th axis OK	14th axis OK	15th axis OK	16th axis OK
11	17th axis OK	18th axis OK	19th axis OK	20th axis OK	21st axis OK	22nd axis OK	23rd axis OK	24th axis OK
12	25th axis OK	26th axis OK	27th axis OK	28th axis OK	29th axis OK	30th axis OK	31st axis OK	32nd axis OK
13	33rd axis OK	34th axis OK	35th axis OK	36th axis OK	37th axis OK	38th axis OK	39th axis OK	40th axis OK
14	41st axis OK	42nd axis OK	43rd axis OK	44th axis OK	45th axis OK	46th axis OK	47th axis OK	48th axis OK
15	49th axis OK	50th axis OK	51st axis OK	52nd axis OK	53rd axis OK	54th axis OK	55th axis OK	56th axis OK
16	57th axis OK	58th axis OK	59th axis OK	60th axis OK				

*Each signal of No.9～16 is only output to the Unit 1.

※CC-Link version

Address : RXm ~RXm+26Fh　　m: Initial I/O Number　　β: Constant value of Unit(Note2)

RXm+β ～ RXm+β+Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	Ready complete	System OK	Battery OK	Total OK	Total NG	NR running	Completion of QL treatment	Program running
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	Completion of program bit 1 selection	Completion of program bit 2 selection	Completion of program bit 3 selection	Completion of program bit 4 selection	Completion of program bit 5 selection	Output ENABLE	Block determination OK	Block determination NG
RXm+β+10h ～ RXm+β+1Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	Completion of block bit 1 selection	Completion of block bit 2 selection	Completion of block bit 3 selection	Completion of block bit 4 selection	Completion of block bit 5 selection	Step finished	Cycle stop	OUT
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	Block 1 OK	Block 2 OK	Block 3 OK	Block 4 OK	Block 5 OK	Block 6 OK	Block 7 OK	Block 8 OK
RXm+β+20h ～ RXm+β+2Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	Block 9 OK	Block 10 OK	Block 11 OK	Block 12 OK	Block 13 OK	Block 14 OK	Block 15OK	Block 16 OK
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	Block 17 OK	Block 18 OK	Block 19 OK	Block 20 OK	Block 21 OK	Block 22 OK	Block 23 OK	Block 24 OK
RXm+β+30h ～ RXm+β+3Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	Block 25 OK	Block 26 OK	Block 1 finished	Block 2 finished	Block 3 finished	Block 4 finished	Block 5 finished	Block 6 Finished
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	Torque over	Time over	Angle over	Zone NG	Snag NG	Passing torque	Zero/Mag.OK	Gear OK
RXm+β+40h ～ RXm+β+4Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	Torque under	Time under	Angle under	Gradient NG	NR failure precognition	Baking	Zero/Mag. NG	Gear NG
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	1st axis OK	2nd axis OK	3rd axis OK	4th axis OK	5th axis OK	6th axis OK	7th axis OK	8th axis OK
RXm+50h ～ RXm+5Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	9th axis OK	10th axis OK	11th axis OK	12th axis OK	13th axis OK	14th axis OK	15th axis OK	16th axis OK
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	17th axis OK	18th axis OK	19th axis OK	20th axis OK	21st axis OK	22nd axis OK	23rd axis OK	24th axis OK
RXm+60h ～ RXm+6Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	25th axis OK	26th axis OK	27th axis OK	28th axis OK	29th axis OK	30th axis OK	31st axis OK	32nd axis OK
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	33rd axis OK	34th axis OK	35th axis OK	36th axis OK	37th axis OK	38th axis OK	39th axis OK	40th axis OK
RXm+70h ～ RXm+7Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	41st axis OK	42nd axis OK	43rd axis OK	44th axis OK	45th axis OK	46th axis OK	47th axis OK	48th axis OK
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F
	49th axis OK	50th axis OK	51st axis OK	52nd axis OK	53rd axis OK	54th axis OK	55th axis OK	56th axis OK
RXm+80h ～ RXm+8Fh	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
	57th axis OK	58th axis OK	59th axis OK	60th axis OK				
	bit 8	bit 9	bit A	bit B	bit C	bit D	bit E	bit F

(Note2)　β　＝ Unit1 :　00h
Unit2 :　90h
Unit3 :　E0h
Unit4 : 130h
Unit5 : 180h
Unit6 : 1D0h
Unit7 : 220h

Unit	Address	Not use bit
Unit1	RXm ～RXm+ 8Fh	-
Unit 2	RXm+ 90h～RXm+ DFh	RXm+ D8h ～ RXm+ DFh
Unit 3	RXm+ E0h～RXm+12Fh	RXm+ 128h ～ RXm+ 12Fh
Unit 4	RXm+130h～RXm+17Fh	RXm+ 178h ～ RXm+ 17Fh
Unit 5	RXm+180h～RXm+1CFh	RXm+ 1C8h ～ RXm+ 1CFh
Unit 6	RXm+1D0h～RXm+21Fh	RXm+ 218h ～ RXm+ 21Fh
Unit 7	RXm+220h～RXm+26Fh	RXm+ 268h ～ RXm+ 26Fh
Not use	RXm+270h～RXm+37Fh	-

※The non using bit data is the value of "0" .

Result Word

Use WordData

GSS→PLC

Address : RWrm ～ RWrm+7Fh m: sation number

Address	Contents
RWrm	Bolt1 NG code
RWrm + 1h	Bolt1 Time (Unit: 1ms)
RWrm + 2h	Bolt1 Angle (Unit: 0.1 degree)
RWrm + 3h	Bolt1 Torque (Unit: 0.1Nm)
RWrm + 4h	Bolt2 NG code
RWrm + 5h	Bolt2 Time (Unit: 1ms)
RWrm + 6h	Bolt2 Angle (Unit: 0.1 degree)
RWrm + 7h	Bolt2 Torque (Unit: 0.1Nm)
RWrm + 8h	Bolt3 NG code
RWrm + 9h	Bolt3 Time (Unit: 1ms)
RWrm + Ah	Bolt3 Angle (Unit: 0.1 degree)
RWrm + Bh	Bolt3 Torque (Unit: 0.1Nm)
RWrm + Ch	Bolt4 NG code
RWrm + Dh	Bolt4 Time (Unit: 1ms)
RWrm + Eh	Bolt4 Angle (Unit: 0.1 degree)
RWrm + Fh	Bolt4 Torque (Unit: 0.1Nm)
・	・
・	・
RWrm + 78h	Bolt31 NG code
RWrm + 79h	Bolt31 Time (Unit: 1ms)
RWrm + 7Ah	Bolt31 Angle (Unit: 0.1 degree)
RWrm + 7Bh	Bolt31 Torque (Unit: 0.1Nm)
RWrm + 7Ch	Bolt32 NG code
RWrm + 7Dh	Bolt32 Time (Unit: 1ms)
RWrm + 7Eh	Bolt32 Angle (Unit: 0.1 degree)
RWrm + 7Fh	Bolt32 Torque (Unit: 0.1Nm)

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

Regarding 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 rotation
3. Pretightening
(Low) 4. Rotation

About ResultWord:

NG code: 0000～FFFF(h)

(example) When NG code is 0412 , The value of 0x0412(h)[1042(d)] is input.

ResultWord except NG code: 0000～270F(h)【0000～9999(d)】not decimal

(example) When Tightening Torque is 21Nm , D2(h)[210(d)] is input.

ResultWord is set at the timing of Block OK(NG).

0000 is set at the timing of [Determination reset] or [GSS reset].

Note)ResultWord don't be outputted as soon as Block OK(NG) is outputted.

Please take enough wait .

ResultWord (NG code, Final Tightening Time, Angle, Torque) of Bolt number except 1-32 is not outputted.

When there is not tightening ResultWord of bolt number 1-32, the value of it is 0000.

Precautions to replace the unit

* Make sure to set the axis setting (Fn. 01 to No. 26 axis ID) from the setup section of the controller when the GSS controller driver is replaced. (If the axis number is not set, the communication from the setup personal computer is impossible.)

Following signals are not output from PIO.

I/O	Name	Contents	Auto-matic	Inch-ing
SIO	Block selection output 1 to 5	When the block selection input is O, it does not output. When the block selection input is set except 0, the currently selected block number is output.	○	
SIO	Step finish	It outputs "1" for 200msec at each finish of 1 step.	○	
SIO	Cycle stop	It becomes "1" in case of the cycle stop (operation ready signal during movement OFF or start signal OFF).	○	
SIO	OUT	When the step set as OUT in program finishes, it becomes "1".	○	
SIO	Block 1 to 26 OK/NG	When the block movement finishes as OK, it becomes "1".	○	
SIO	Torque over/under	"1" when torque over/under is NG.	○	
SIO	Time over/under	"1" when time over/under is NG.	○	
SIO	Angle over/under	"1" when angle over/under is NG.	○	
SIO	Zone NG	"1" when zone is NG.	○	
SIO	Gradient NG	"1" when gradient is NG.	○	
SIO	Snag NG	"1" when snag over/under is NG.	○	
SIO	NR failure forecast	When the gear check NG occurs plural times (internal setting times), it becomes "1". At continuous occurrence When the continuous times of the gear check NG exceed the setting value of Fn.01 PA10, it becomes "1". Integration When the gear check NG times from power ON exceed the setting value of Fn.01 PA11, it becomes "1".	○	
SIO	Passing torque NG	"1" when passing torque is NG.	○	
SIO	Baking NG	"1" when baking is NG.	○	
SIO	Zero magnification OK/NG	"1" when zero magnification check is normal/abnormal.	○	
SIO	Gear OK/NG	"1" when gear check ends normally/abnormally.	○	
SIO	1st to 60th axes OK	"1" when operation of screws from No.1 to 60 is OK.	○	

Note 4.1) Program selection input and selection output signal

(Relation of program numbers corresponding to the status of IN8(OUT8) to IN12(OUT12))

	Program number																							
Signal name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
IN 8 / OUT 8	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
IN 9 / OUT 9	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
IN 10 / OUT 10	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0
IN 11 / OUT 11	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1
IN 12 / OUT 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1

("1": Photocoupler ON, "0": Photocoupler OFF)

4-5 Multiaxial operation function

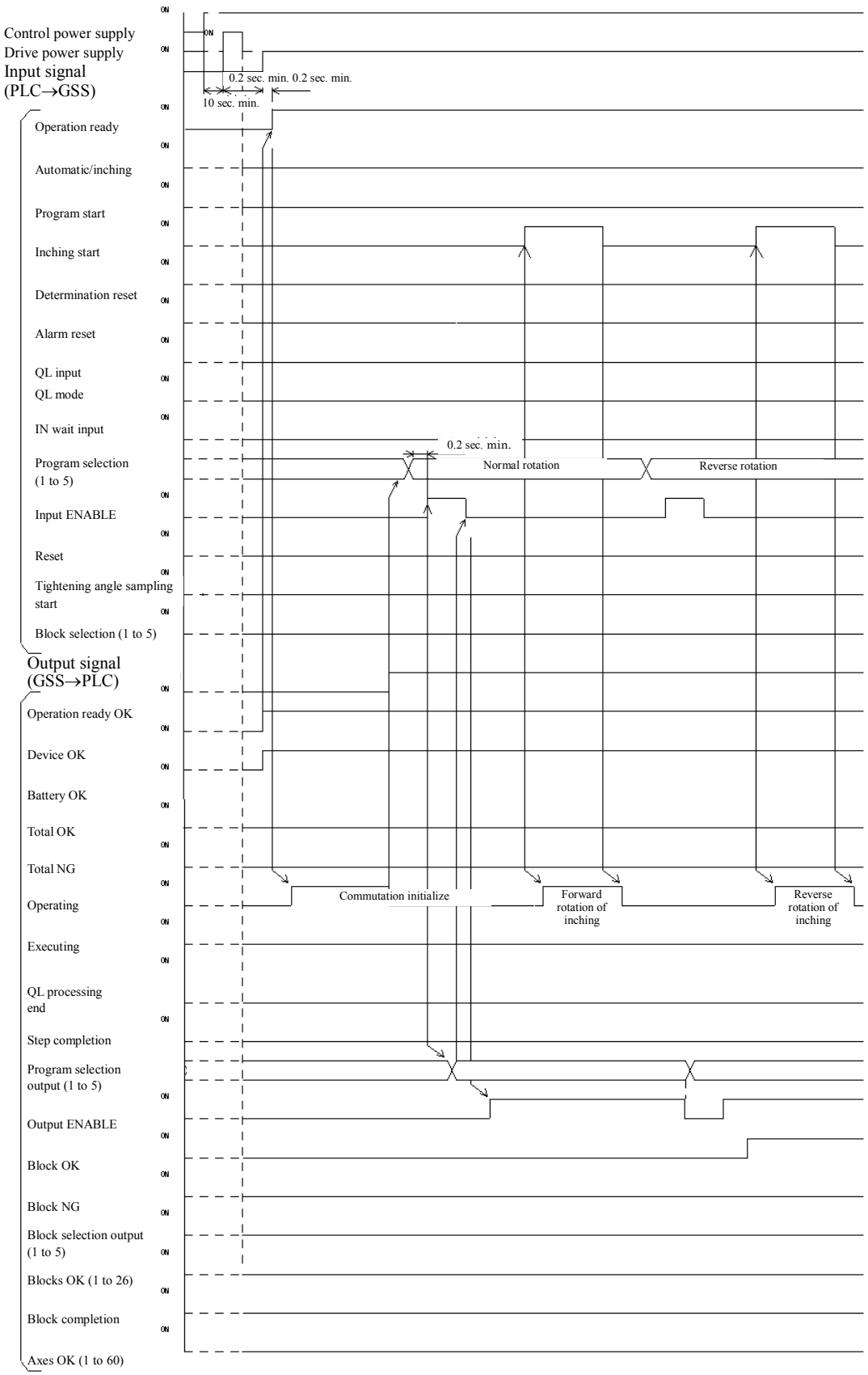
Multiaxial control is possible up to 30 axes for one I/F unit (60 axes on the software)

Axis cutting function: Axis cutting (edge cutting) setting is possible by the push button operation on the panel.

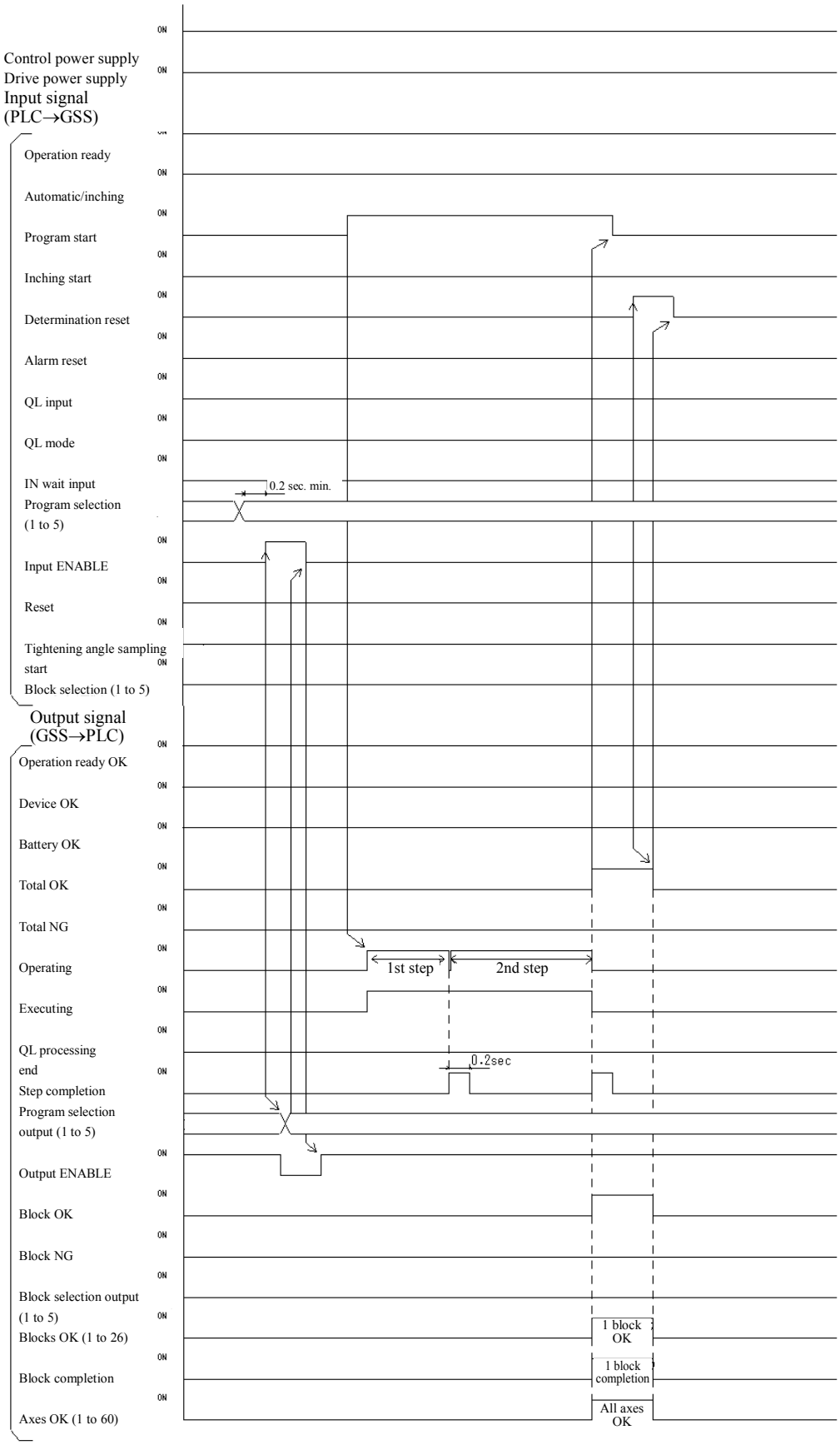
(Fn. 11 SAVE no.** DATA **** Axis cutting with the unit number "-")

5. Operation timing chart

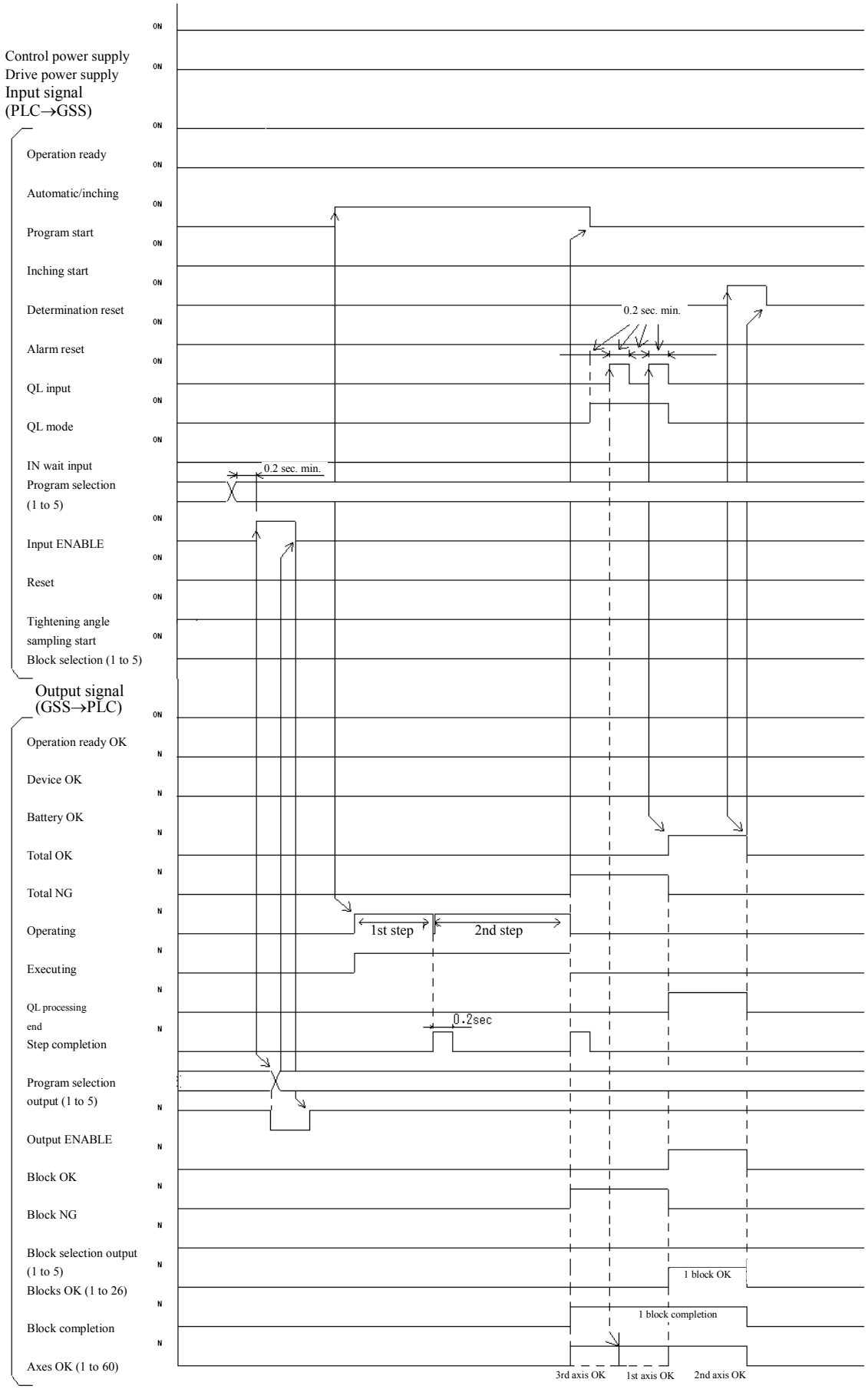
5-1 Power ON and inching operation (Operates by the speed/direction setting of the rotation/inching (1 to 24) selected by the program selection signals (1 to 5))



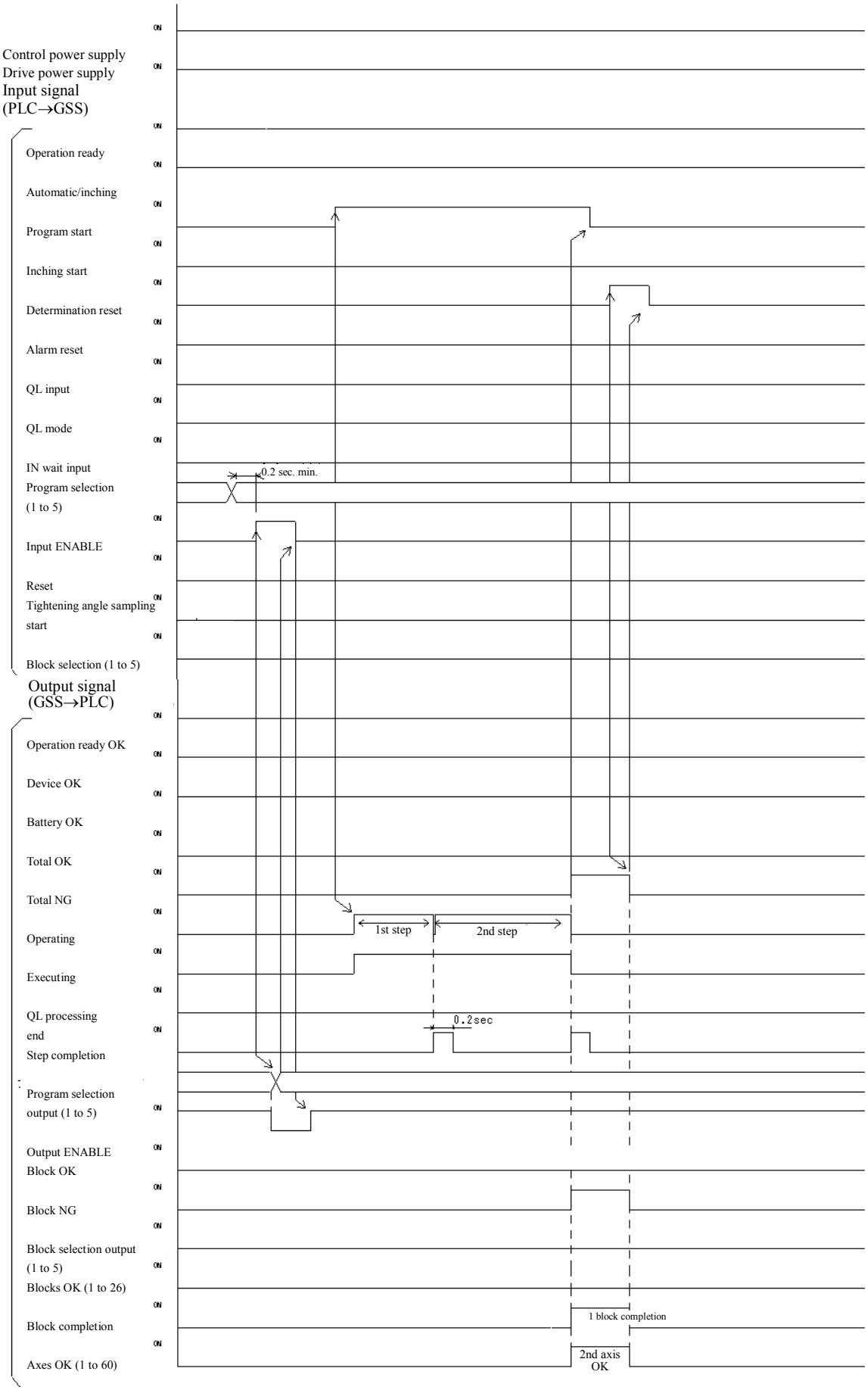
5-2 Program operation - When the determination is OK for 2 step operation x 1 block



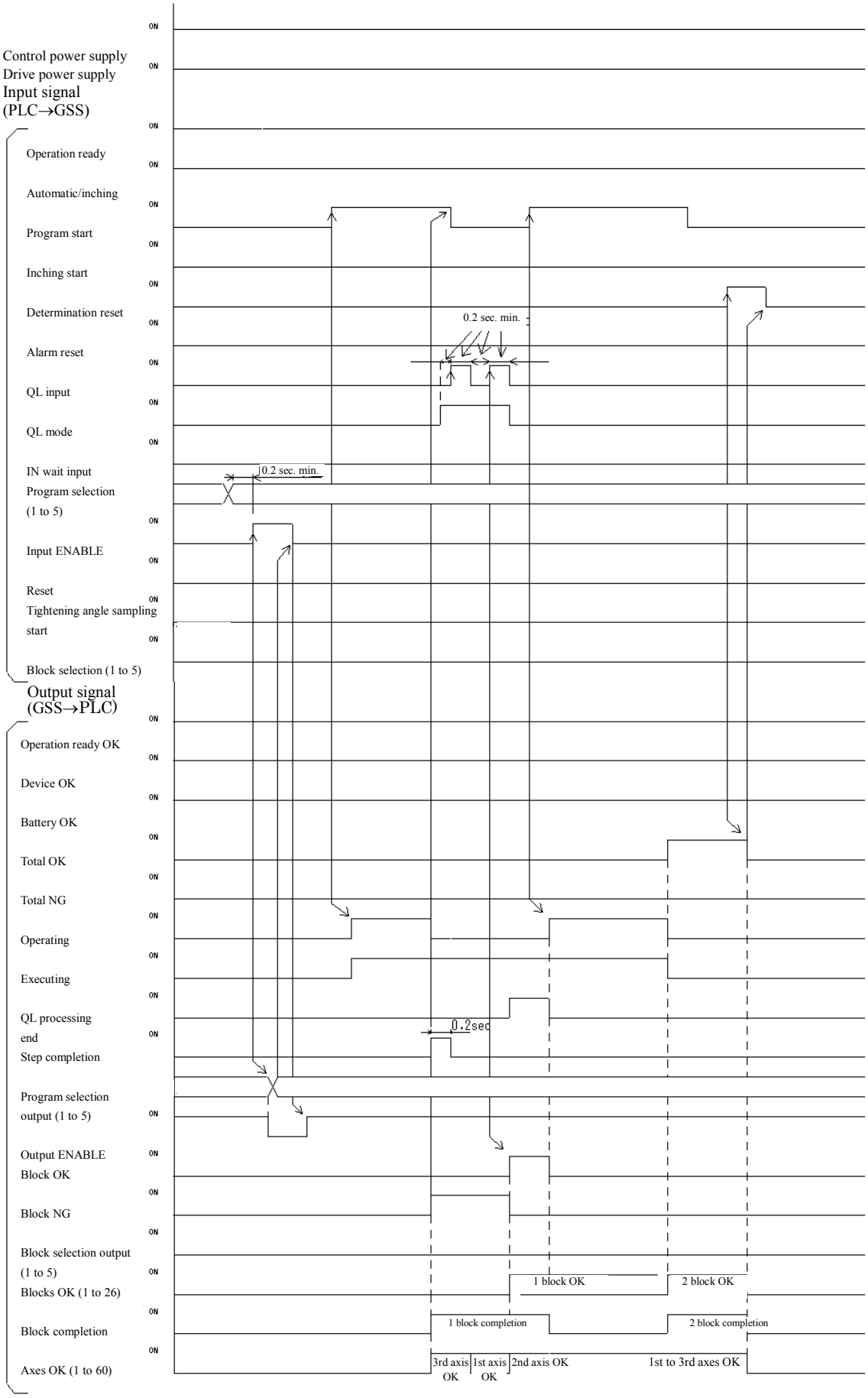
5-3 Program operation - Setting for 2 step operation x 1 block, when 1st/2nd axis is NG on the first step and the 3rd axis is OK until the second step in three axes (with QL)



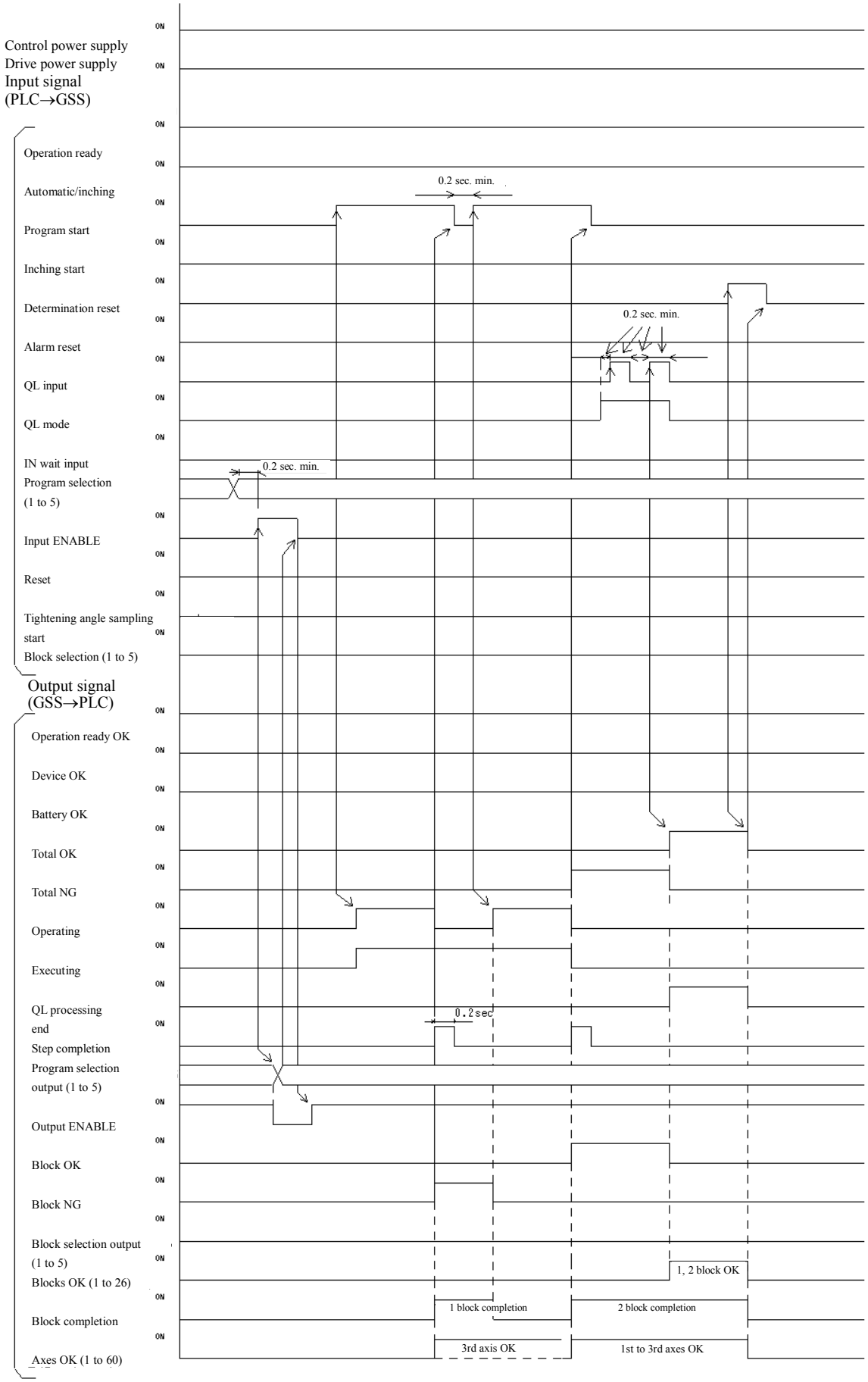
5-4 Program operation - Setting for 2 step operation x 1 block, when 1st axis is NG on the first step and the 2nd axis is OK until the second step in two axes (without QL)



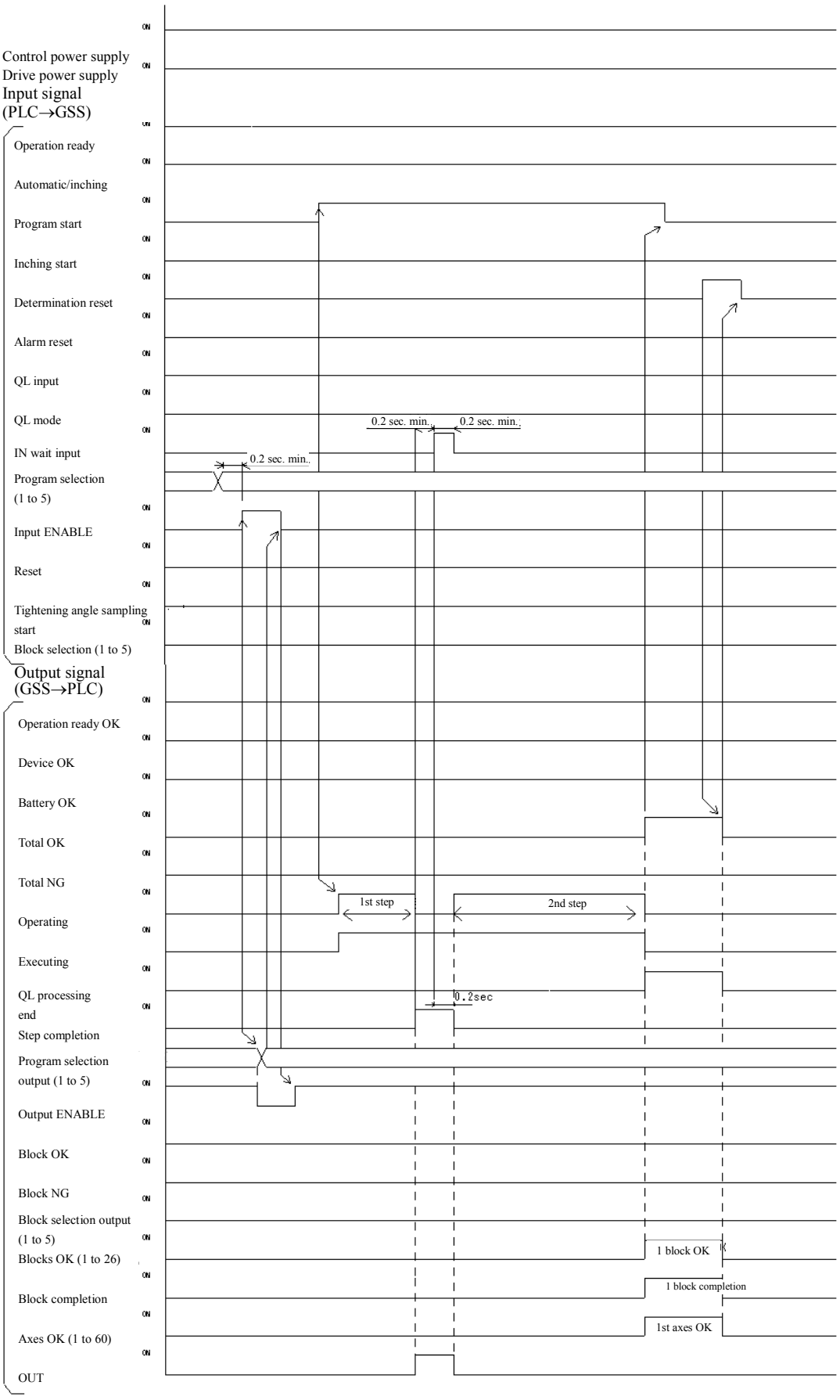
5-5 Program operation - Setting for 1 step operation x 2 blocks, when 1st/2nd axis is NG and 3rd axis is OK on the first block and the all axes are OK on the second block in three axes (with QL after 1 block)



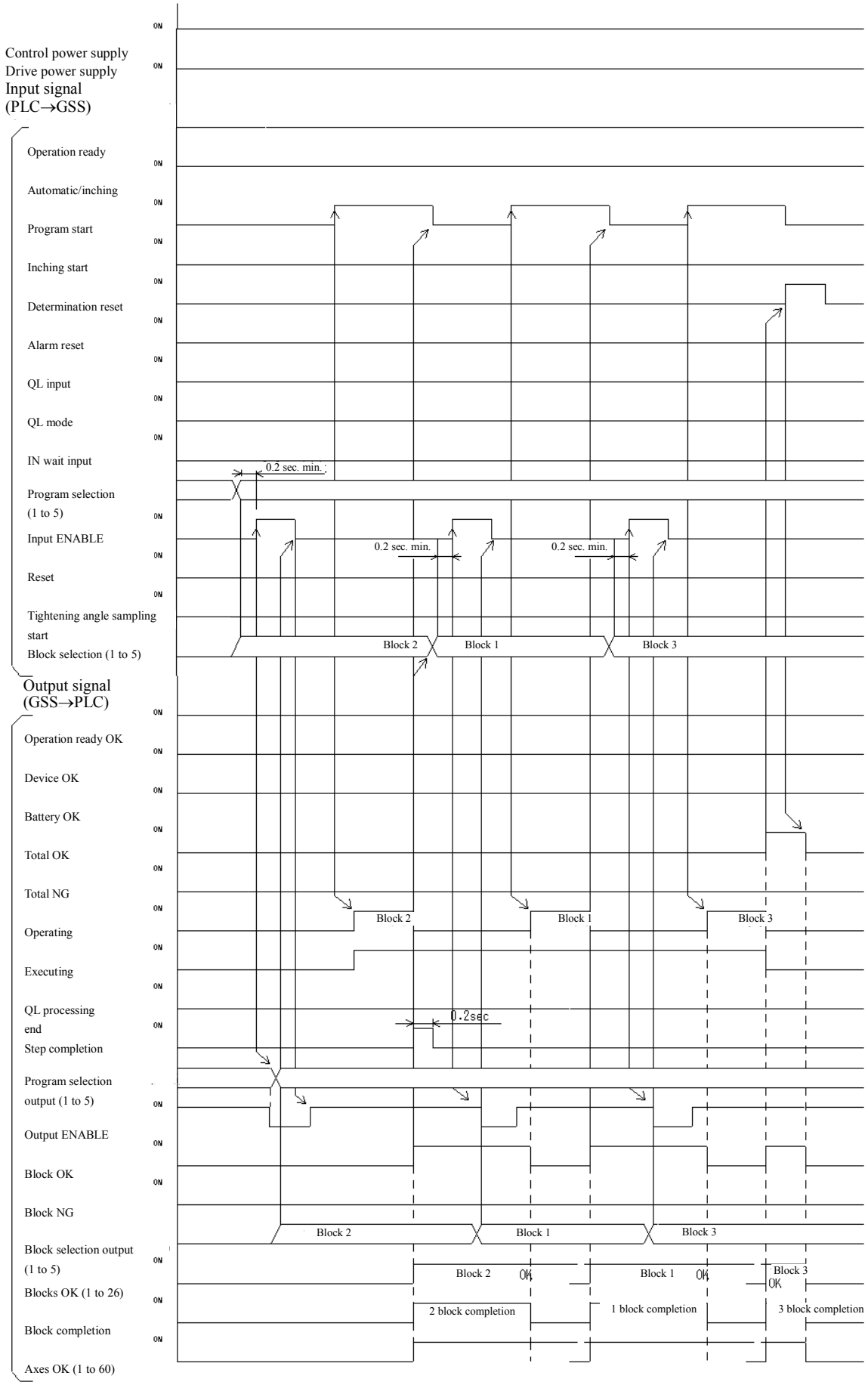
5-6 Program operation - Setting for 1 step operation x 2 blocks, when 1st/2nd axis is NG and 3rd axis is OK on the first block and the all axes are OK on the 2nd block in three axes (with batch QL after the program end)



5-7 Program operation - Setting for 2 steps operation x 1 block, when there is IN setting on the 2nd step

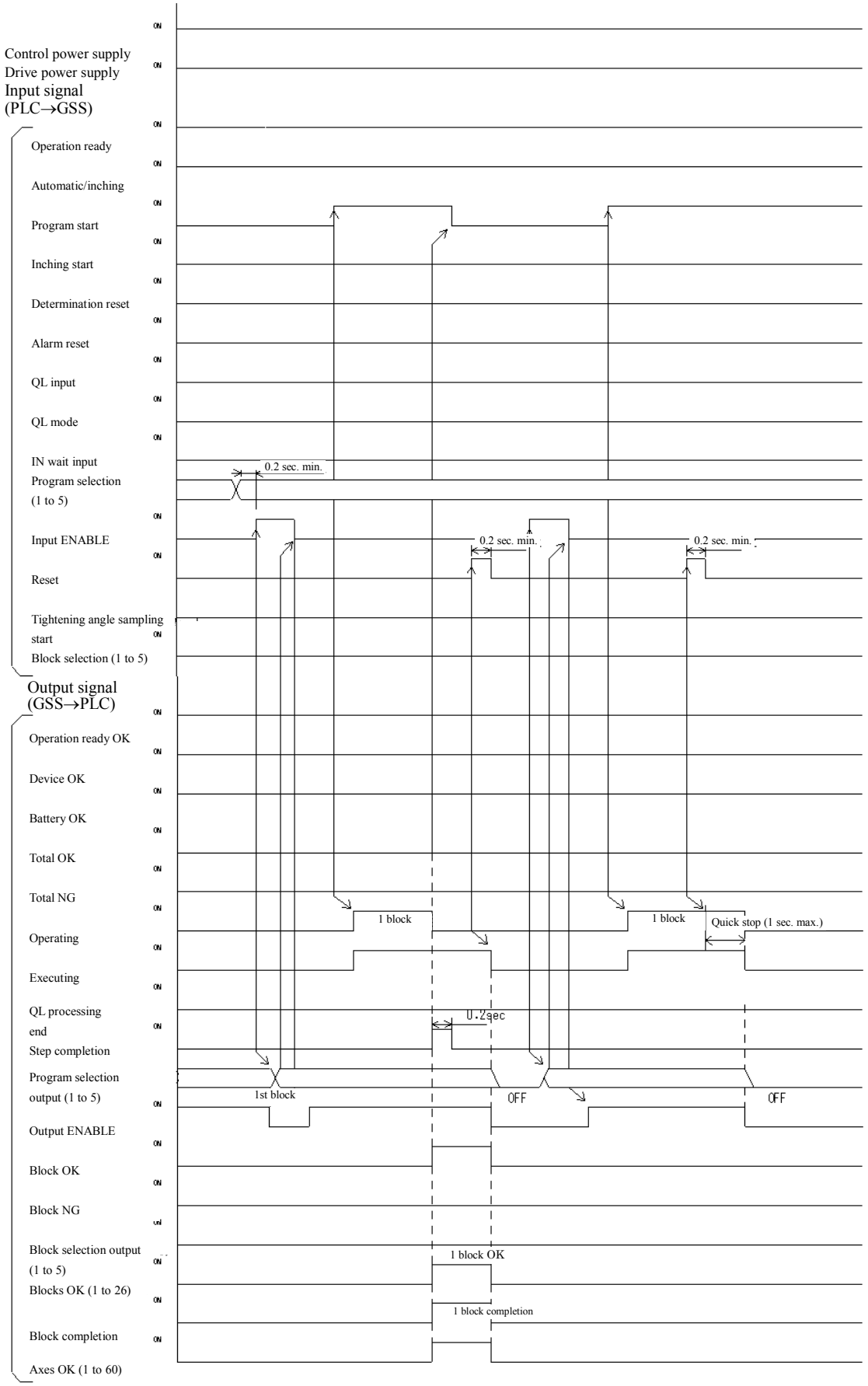


5-8 Program operation - 1 step operation x 3 blocks, when the unit is operated in sequence specified by the block selection signal (It operates in order from the block 1 when the block selection is OFF for 1 to 5)



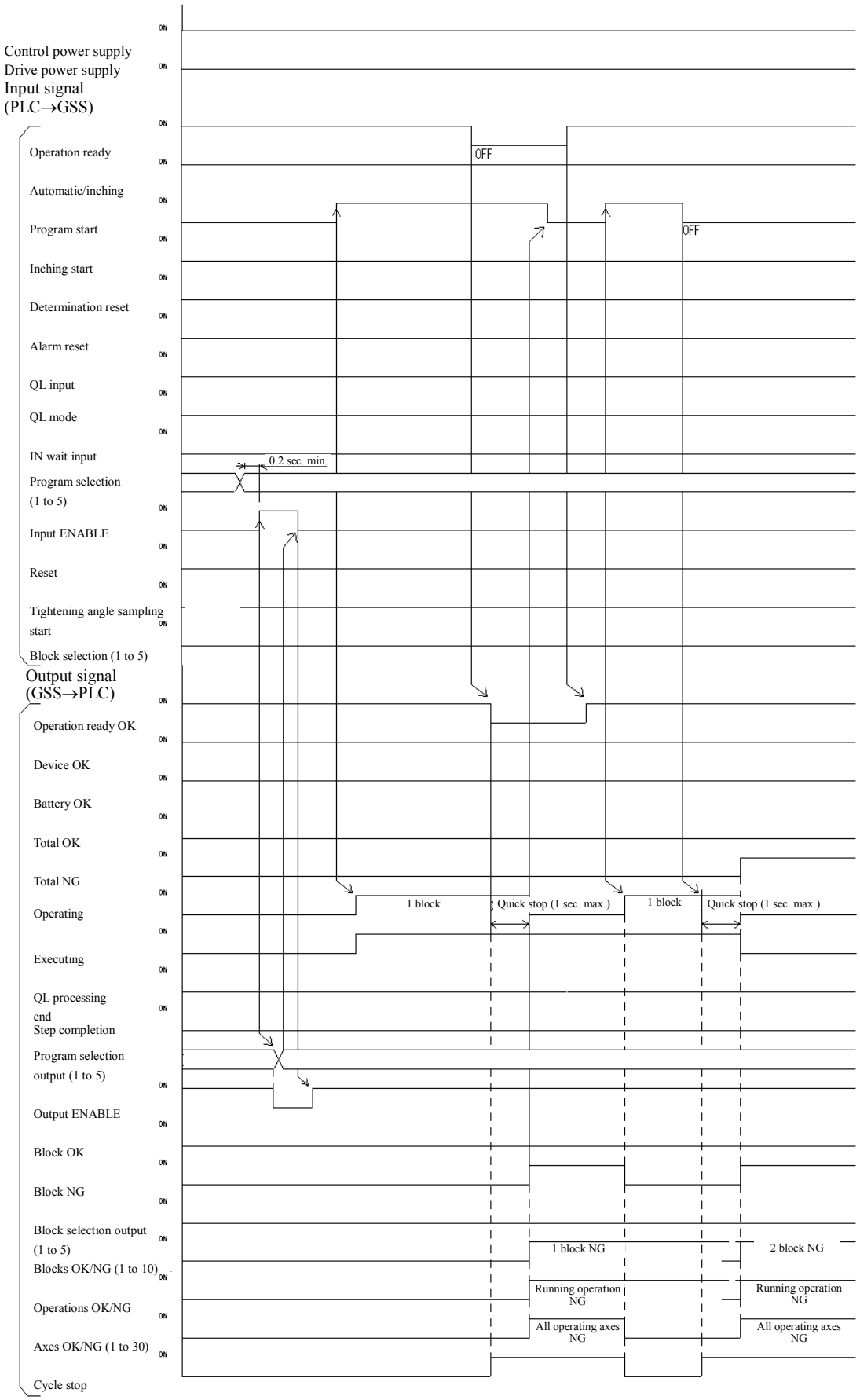
5-9 Interruption of the program operation (Reset)

(When the reset is turned ON after 1 block is finished and the reset is turned ON during the 1st block operation in the 1 step x 2 blocks operation)



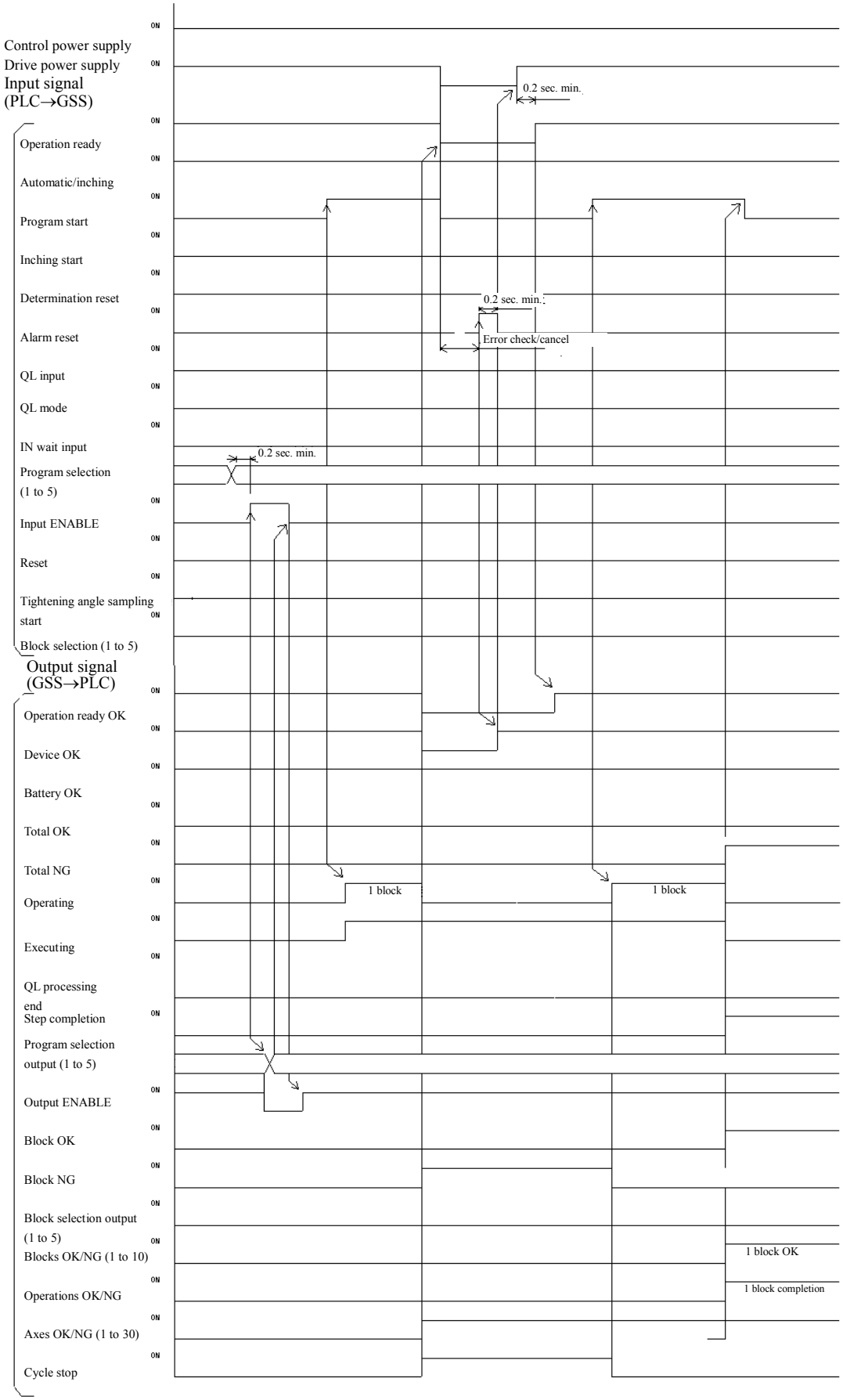
5-10 Operation ready OFF and program start OFF during the program operation

(When the operation ready is OFF on the 1st block and the program start is OFF on the 2nd block in 1 step x 2 block operation)



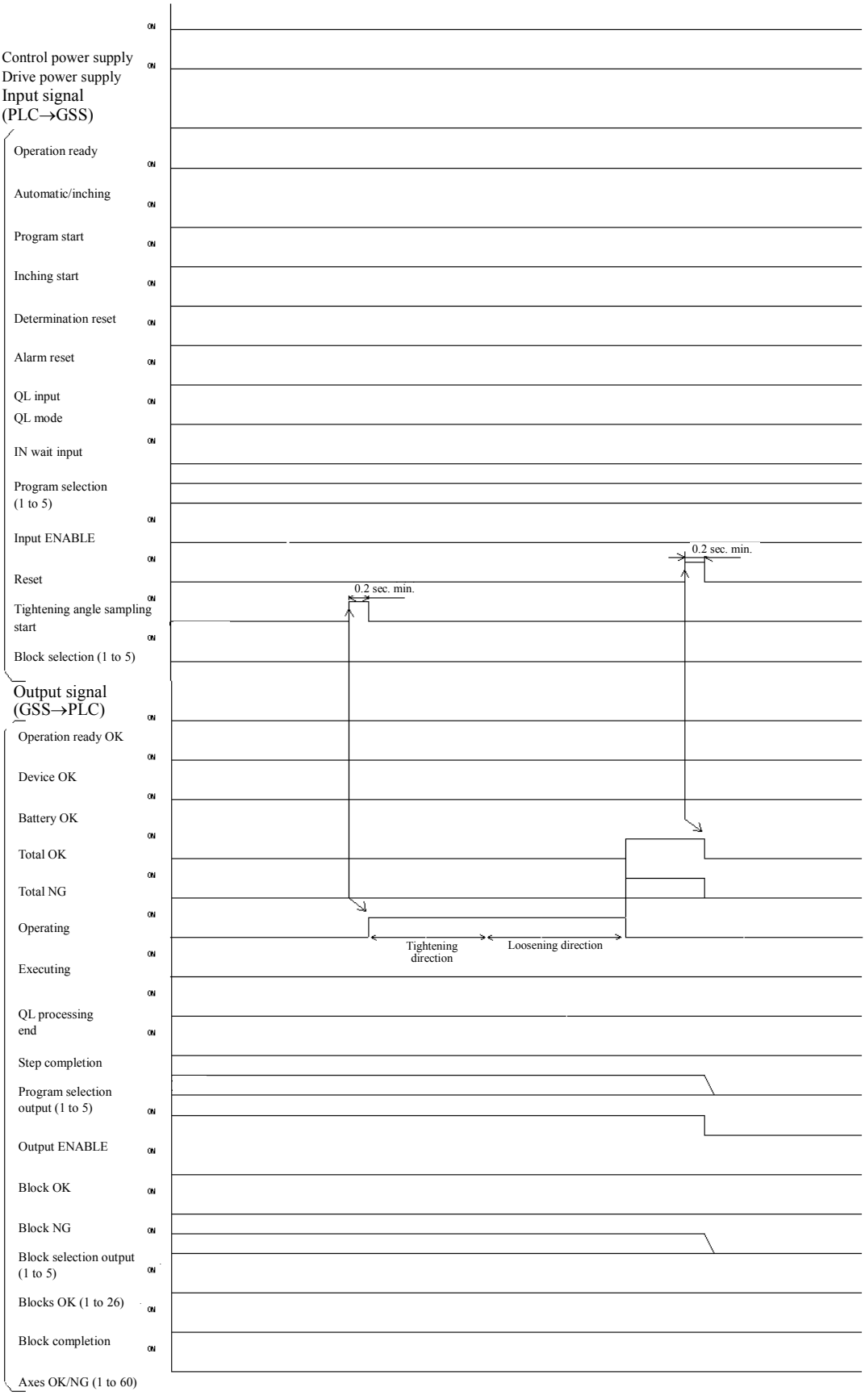
5-11 Alarm generation and alarm reset during the program operation

(When the alarm occurred on the way of 1st block and the unit is rebooted after the alarm is reset in 1 step x 2 block operation)



5-12 Tightening angle sampling operation

(When the tightening sampling start is turned ON with the preparation ready ON, the operation starts. When the program ends, Total OK or Total NG becomes ON. After this moment, the determination is cleared by ALL reset. The determination reset cannot be accepted)

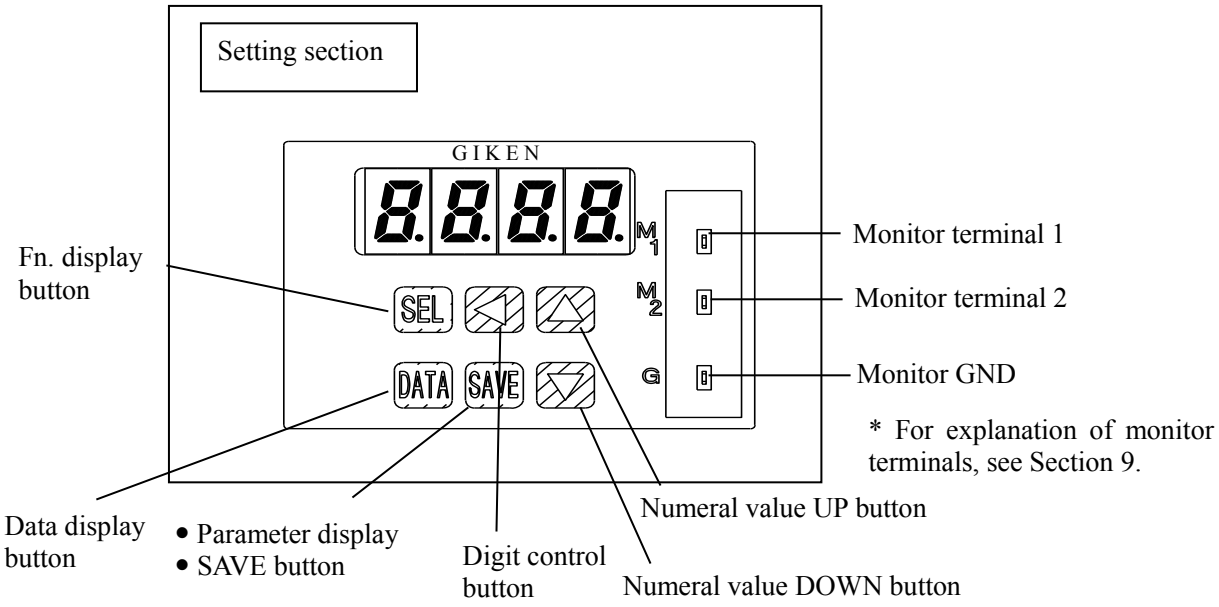


6. Setting

6-1 Display/setting function

Displays various data, parameters and conditions in 7 SEG. LED 4-digit. It is possible to set or change the parameters by the operation of push-button panel.

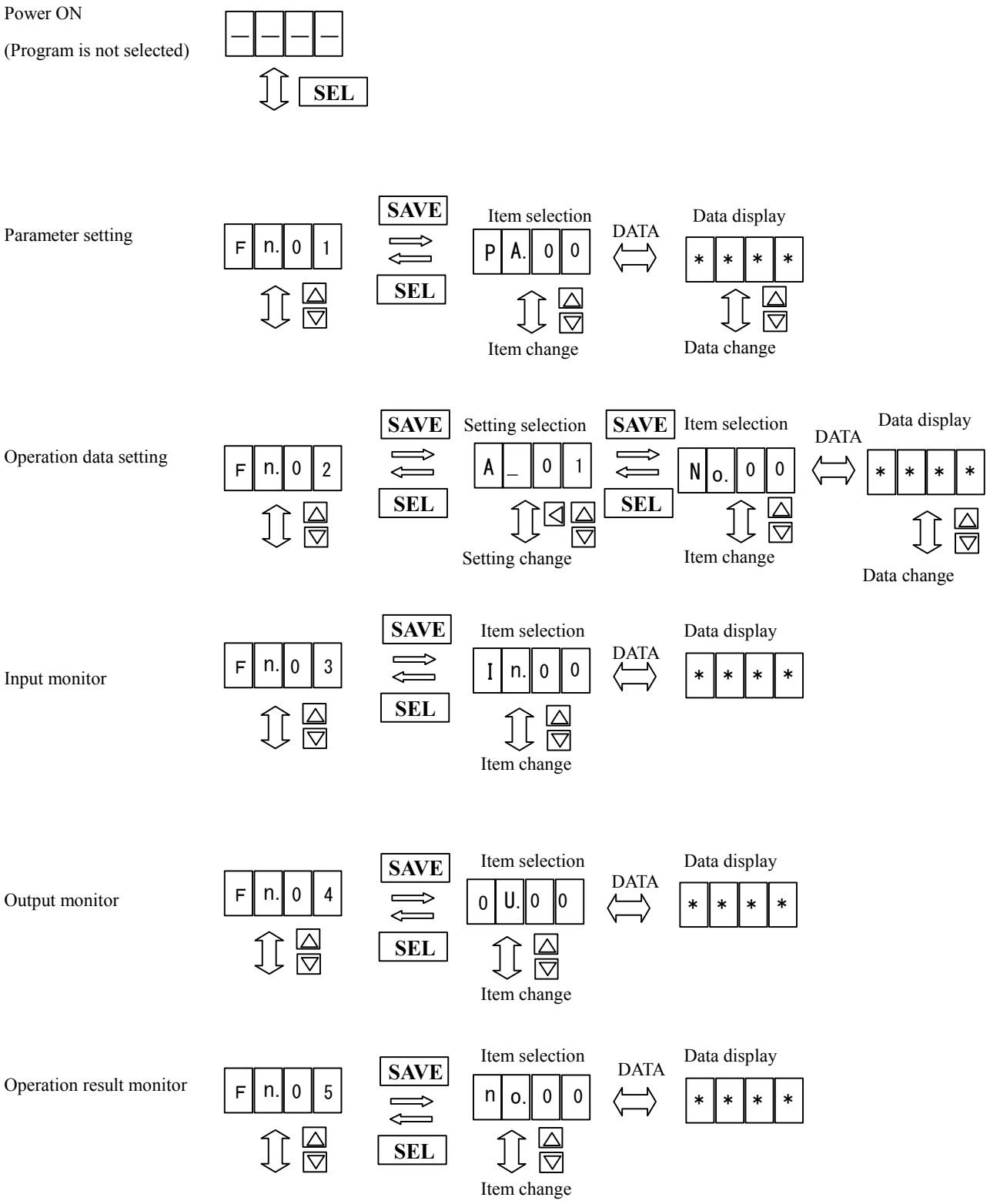
6-1-1 Display section layout



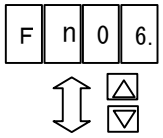
7-segment display	Contents
— — — —	Program is not selected.
0 1 0 — (A B C)	A: Program No. B: "0" C: State of driver -: Servo OFF 0: Commutation initialize 1: Rotation 2: Pretightening 3: Reverse rotation 4: Final tightening 5: Inching 6: Zero magnification condition 7: Stop
****	NG code "****" occurred
AL**	Alarm "**" being generated

6-1-2 Operation of the display section

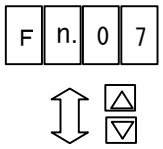
Display unit operation



(Reserved)



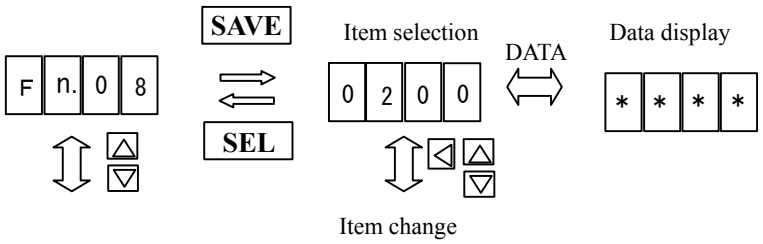
(Reserved)



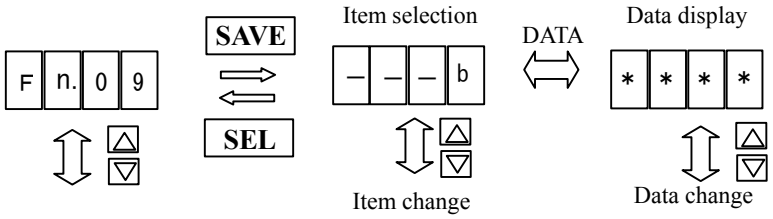
(Used by manufacturer)

*Not permitted

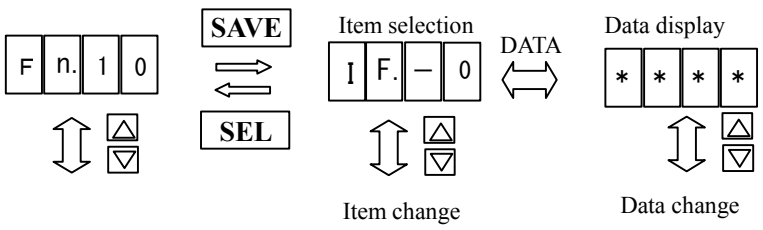
for the customer to use.



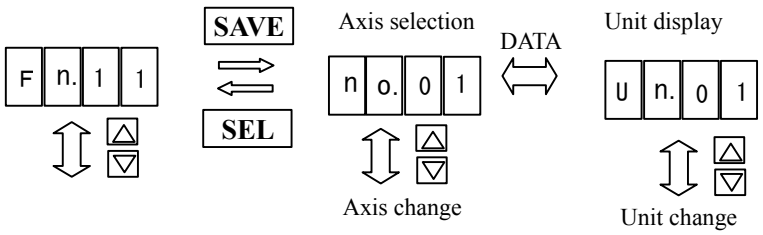
Calender setting



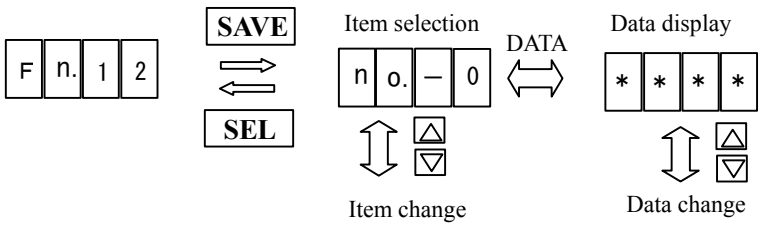
I/F unit setting



Unit setting

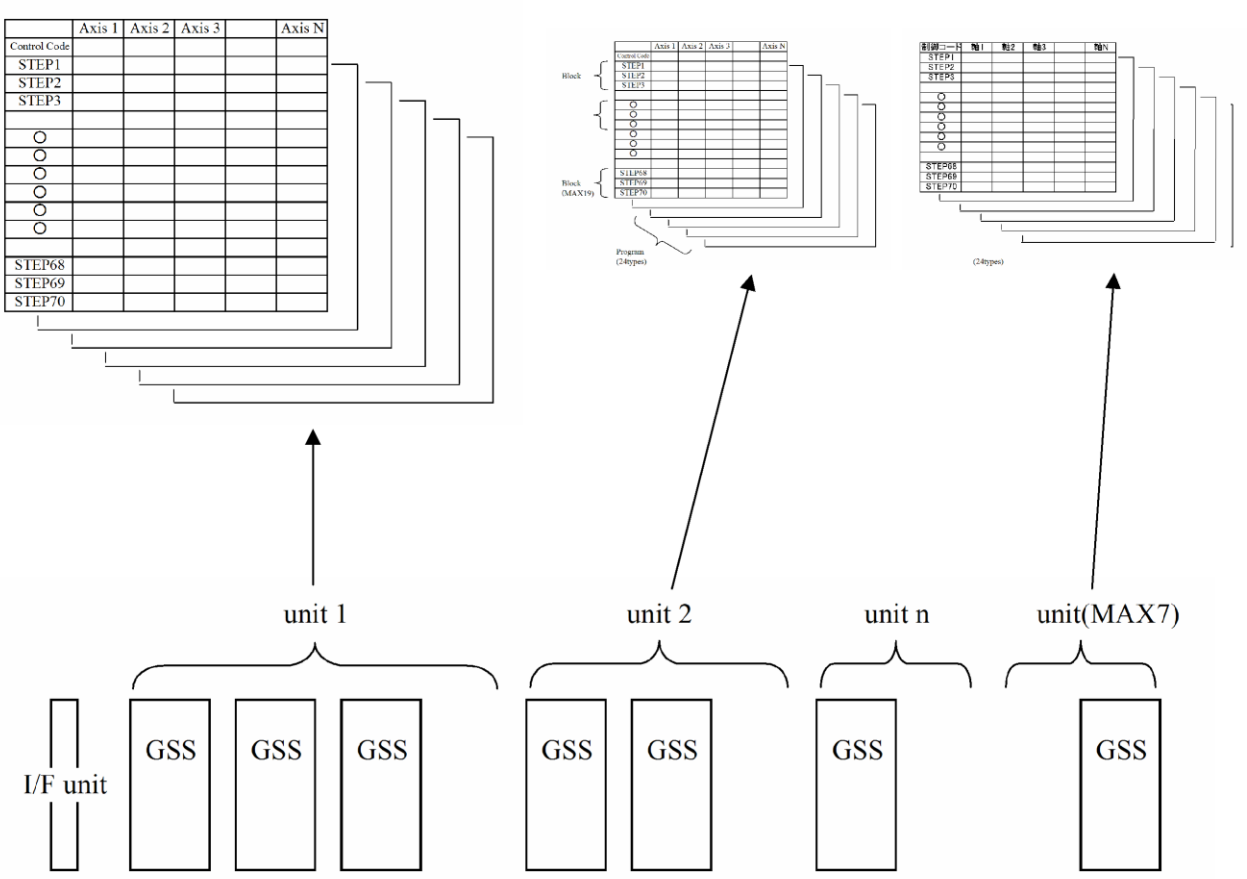


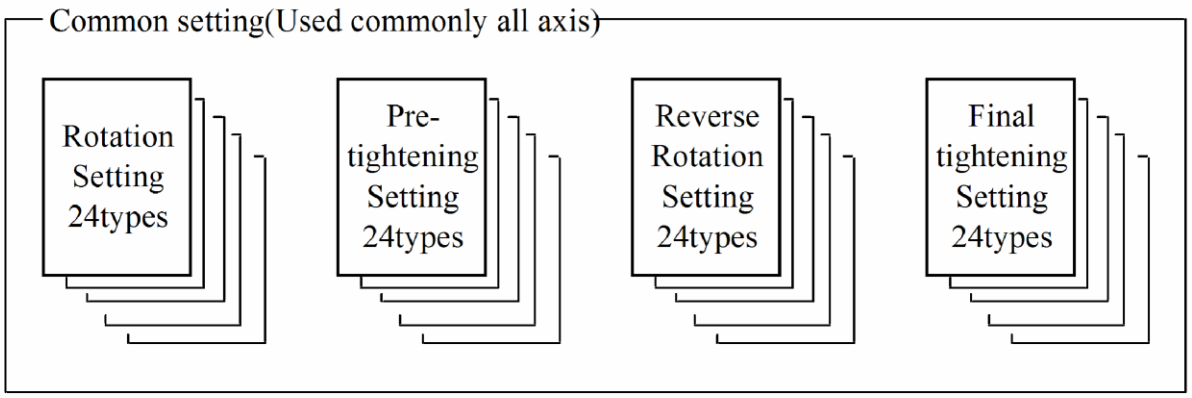
ID controller setting



6-2 Program

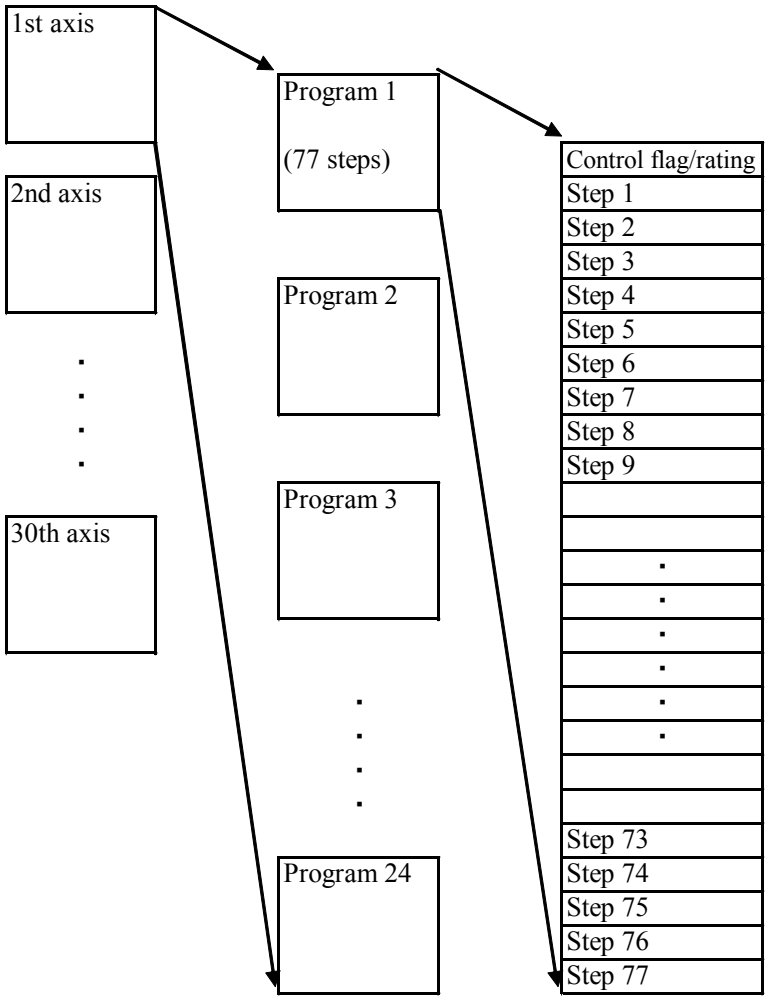
6-2-1 Tightening program





6-2-2 Program configuration

30 axis × 24 types of programs × 77 steps



Details of step setting (Example)

	Control flag	
Step 1	Rating 1	
Step 2	Screw 1	
Step 3		Rotation1
Step 4		Pretightening 1
Step 5		Reverse rotation 1
Step 6		Final tightening 1
Step 7		End
Step 8	Rating 1	
Step 9	Screw 2	
Step 10		Rotation 2
•		•
•		•
Step 77		

・The control flag (Zero magnification check, IN, with or without finish synchronize) is not included in the step.

・Rating (block start declaration),finish(block finish declaration),
screw number and each operation to be counted as 1 step.
It is possible to set maximum 77 steps.

7. Setting function list

7-1 Fn.** display setting function list

Internal data can be set, changed and monitored on the panel of each axis of GSS. Each function is classified by “Fn”.

Fn No.	Functions/Contents	Object to set
Fn. 01	Each axis setting Sets the driver parameter and axis number of each GSS axis.	Each axis
Fn. 02	Tightening setting Changes setting of parameters related to the operation. This setting value can be changed by GSS of each axis, but the changed value will be reflected to all axes. Setting value is used as the common operation setting at all axes. Available conditions are as follows: Rotation, inching condition (A_01 to A_24) Pretightening condition (b_01 to b_24) Reverse rotation condition (C_01 to C_24) Final tightening condition (d_01 to d_24) Rating condition (E_01 to E_30) 24 types (Rating 30 types) of operating conditions can be set respectively.	Common setting
Fn. 03	Input monitor Monitoring of input signal (PIO) is possible. This is effective only with the axis (1st axis) connected with PIO.	
Fn. 04	Output monitor Monitoring of output signal (PIO) is possible. This is effective only with the axes (1st, 2nd and 3rd axes) connected with PIO.	
Fn. 05	Operation result monitor Monitoring of tightening result performed just before is possible.	Each axis
Fn. 06	Printer operation Printing out operation is possible for tightening data, programs and various settings.	Common setting
Fn. 07	Unused	
Fn. 08	Used by manufacturer RAM monitor for debugging is performed.	Each axis
Fn. 09	Unused	
Fn. 10	I/F unit setting Changes settings of printer output timing, setup personal computer communication and external display	Common setting
Fn. 11	Unit setting Sets the unit	Common setting
Fn. 12	ID controller connection setting Sets the connection with ID controller	Common setting

Note: Common setting: Can be changed on the panel of each axis, but the changed value will be reflected to all axes.

When the settings of Fn.01・10・11・12 are changed, please operate after switching OFF/ON the power supply.

7-2 (Fn. 01) Each axis setting Driver parameter setting

Number	Contents	Setting range	Unit
PA.00	Position loop gain This is the responsive parameter of position control system. Setting at a large value increases rigidity and shortens the setting time, but the system becomes easy to oscillate.	0-9999	
PA.01	Speed loop gain This is the responsive parameter of speed control system. To set the higher position loop gain, it is needed to make this value larger. Usually increase it proportionate to the load inertia.	0-9999	
PA.02	Speed integral gain Sets the integral gain in the speed loop. When the value is set larger, the response becomes faster and the rigidity increases, but the system becomes easy to oscillate. This function works to drive a slight speed-deviation at the time of stop in zero.	0-9999	
PA.03	Resonance control filter Sets the response of the filter to be inserted to the current command. It may suppress the oscillation caused by torsional resonance in the mechanical system to increase the control gain. When the value is set smaller, the filter effect increases.	0-7FFF	
PA.04	Motor speed limit Sets the motor speed limit value.	0-9999	10 rpm
PA.05	Over speed error detecting level Sets the speed to detect the speed alarm “AL30”	0-9999	10 rpm
PA.06	Overload error detecting level Sets the current level to detect the overload alarm “AL20”.	0-9999	0.1 Arms
PA.07 PA.08	Sets the contents to output to Monitor terminal M1 (PA.07) and Monitor terminal M2 (PA.08), respectively. Changing parameters can change the contents to output to each terminal. (See P95) Setting at shipment M1: Torque sensor output M2: Speed feed back	0-FFFF	
PA.09	Clears the alarm history Clears it by SAVE after inputting 8089 setting.		
PA.10	NR deterioration forecast (series) When the number of continuously occurring times with gear check NG exceeds the set value, NR failure forecast becomes “ON”. (Refer to P57-59 table of output signal.) If the setting value is 0000, it does not work.	0-9999	
PA.11	NR deterioration forecast (integrated) When the integrated number of occurrence with gear check NG from power ON exceeds this setting value, the NG failure forecast becomes “ON”. (Refer to P57-59 table of output signal.) If the setting value is 0000, it does not work.	0-9999	
PA.12	Unused		
PA.13	No monitoring time for pretightening minimum torque. It does not monitor the torque during the preset time when reaching to speed 1 and reaching to speed 2. (It is set to prevent wrong judgment of torque due to the change of speed.)	0-9999	1ms
PA.13 to 17	Unused		
PA.18	Waveform output polarity Waveform data (Waveform sampling function output) may tighten in the negative direction depending on the configuration of mechanism (Torque sensor position). This setting allows the output polarity of waveform sampling function to reverse. Direct values such as a monitor are not changed. “0000”: (+) output as motor twists rightward “0002”: (-) output as motor twists leftward	0000/0002	
PA.19	No monitoring time for torque No determination related to torque is performed during this time after each operation start in the rotation and reverse rotation modes. Set the value in consideration of the transient torque fluctuation such as an acceleration time.	0-9999	1 ms
PA.20	Magnification check delay time Sets the data importing delay time after the torque sensor bridge short-circuit when the magnification check is performed.	0-9999	1 ms
PA.21	Motor acceleration speed control setting Can suppress the acceleration speed lower than the limit value when controlling the speed. Smooth acceleration and deceleration is possible against the acceleration command in step form.	0-9999	100 rpm/s
PA.22	Standard current limit Sets the maximum current of motor	0-9999	0.1 Arms

Number	Contents	Setting range	Unit
PA.23	Torque increase for the premature tightening NG detection Sets the torque increase for the premature tightening NG detection. (When it reaches to speed 3 select torque + torque increase for the premature tightening NG detection within the premature tightening determination angle, it outputs NG.)	0-9999	0.1 Nm
PA.24	Tightening sampling operation end torque Sets the torque value to end the tightening sampling operation	0-9999	0.1 Nm
PA.25	Unused		
PA.26	Axis number Set from “1” in serial numbers. Make sure to set “1” when I/F unit is provided.	1-0030	
PA.--	Press SAVE button to save all data of Fn. 01 in one lump.		

Storing data: When “PA. ---” is displayed, if “SAVE” button is pressed, all parameters of Fn. 01 will be saved in memory.

Note: Please do not change the item of this driver parameter items on the user side. However, the customer side should input for items of “PA.26” because they are inputs after the installation of the controller.

7-3 (Fn.02) Rotation and the inching setting (A_01 to 24: 24 types)

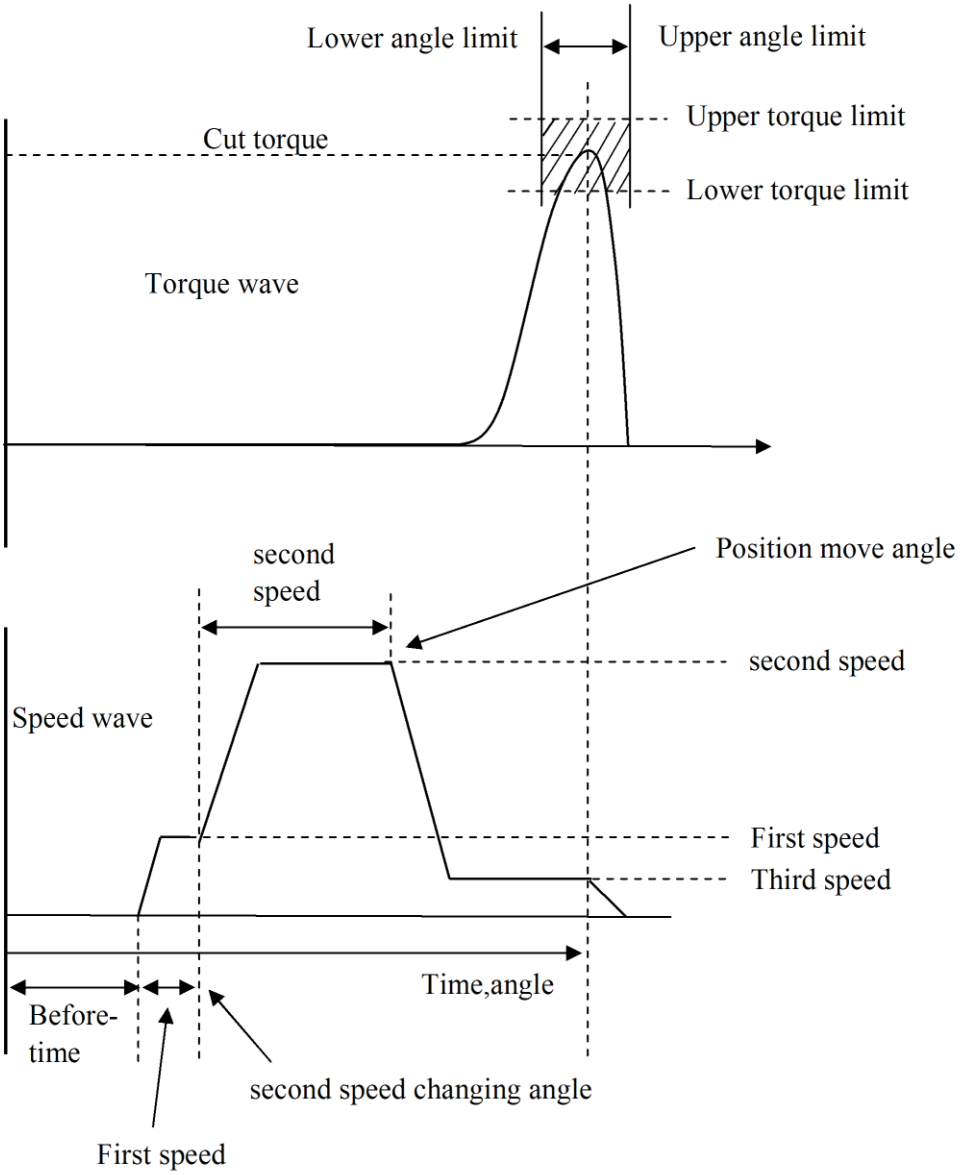
Number	Contents		Setting range	Unit
No.00	Rotation/ inching direction, rotation movement 00*□ |+—— Rotation/inching direction specified | 0: Rotate to tightening direction | 1: Rotate to loosening direction +——— Torque determination/fitting/gear check 0: No torque determination 1: Torque determination Determines normal/error by using torque upper limit/lower limit values. 2: Fitting end exists When rotation reaches the fitting torque, it stops rotation. Torque upper limit/lower limit determination is not performed. 3: Gear check is performed If the motor current while running exceeded the value equivalent to torque upper limit, it becomes “Gear Check NG”			
No.01	Overtime (only when rotating) If the rotation of cut angle is not performed within the preset time after rotation start, the rotation stops and the rotation is determined. (Excluding the before-time)		0-0065	1 s
No.02	Cut angle Set the rotation end angle.		0-9999	1 degree
No.03	Speed Set the rotation speed.		0-9999	1 rpm
No.04	Before-time Rotation control actually starts when the preset time has elapsed after the rotation start.		0-9999	1 ms
No.05	Torque upper limit	If the torque value is not within the present range when the product stops (When only the torque determination is provided.), it becomes “Rotation torque over or under”. If the motor current during rotation exceeds the equivalent value to the upper torque limit, it becomes “Gear check NG”. (Only when the gear check is provided.)	0-9999	0.1 Nm
No.06	Torque lower limit		0-9999	0.1 Nm
No.07	Fitting torque (Fig. 8.1) Rotation ends when it reaches the preset value while rotating. If it does not reach even if it passes over the cut angle, it becomes "Fitting Angle Over".		0-9999	0.1 Nm
No.08	Unused			
No.09	Unused			
No.—	Press SAVE button to save data. Save data on each one of 24 setting types.			

Storing data: When “NO. ---” is displayed, if "SAVE" button is pressed, all parameters of Fn. 01 will be saved in memory. Save data on each one of 24 setting types.

7-4 (Fn.02) Pretightening setting (b_01 to 24: 24 types)

Number	Contents		Setting range	Unit
No.00	Torque upper limit	If the torque value is not within the present range when the product stops, it becomes “Pretightening torque over or under”.	0-9999	0.1 Nm
No.01	Torque lower limit		0-9999	0.1 Nm
No.02	Time upper limit	If the time at stopping is not within the preset range, it becomes “Pretightening time over or under”. (Measure from TQ1)	0-9999	1 ms
No.03	Time lower limit		0-9999	1 ms
No.04	Angle upper limit	If the angle at stopping is not within the preset range, it becomes “Pretightening angle over or under”.	0-9999	0.1 degree
No.05	Angle lower limit		0-9999	0.1 degree
No.06	Overtime If pretightening does not end within the preset time, the rotation ends and the pretightening determination is performed. (Excluding the before-time.)		0-0065	1 s
No.07	First speed Set the pretightening first speed.		0-9999	1 rpm
No.08	Position move angle It will be unconditionally the third speed after the specified angle.		0-9999	1 degree
No.09	Third speed Set the pretightening third speed.		0-9999	1 rpm
No.10	Before-time Rotation control actually starts when the preset time has elapsed after the pretightening operation start.		0-9999	1 ms
No.11	Sample start torque (TQ1) Set the measurement standard torque of the time upper/lower limit, angle upper/lower limit.		0-9999	0.1 Nm
No.12	Cut torque Set the target torque for pretightening. (Pretightening stops when it reaches the target torque.)		0-9999	0.1 Nm
No.13	Second speed switching angle Specify the angle to change to the second speed.		0-9999	1 degree
No.14	Second speed Set the pretightening second speed.		0-9999	1 rpm
No.15	Third speed switching torque Set the torque to switch to third speed. (It is given priority over the second switching angle.)		0-9999	0.1 Nm
No.16	Premature tightening determination angle Specify the angle to determine premature tightening NG. If it reaches the cut torque on the way from pretightening start to this angle, it becomes premature tightening NG.		0-9999	1 degree
No.17	Cut angle: Set the target angle from TQ1. (Rotation stops when the angle reaches the target value.)		0-9999	0.1 degree
No.18	No monitoring time for torque Set the time from the pretightening start time to the start time of the torque monitoring.		0-9999	1 ms
No.—	Press SAVE button to save data. Save data on each one of 24 setting types..			

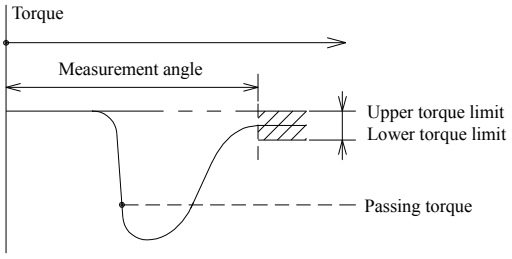
Pre-tightening reference wave

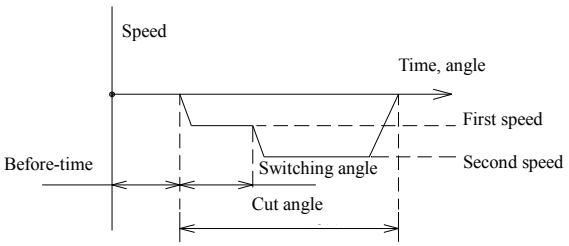


7-5 (Fn.02) Reverse rotation setting (C_01 to 24: 24 types)

(To be used for the lock determination and seating detection determination.)

Number	Contents		Setting range	Unit
No.00	Torque upper limit	If the torque value at the measurement angle is not within the preset range, it becomes “Reverse rotation torque over or under”. (Determined while stopping)	0-9999	0.1Nm
No.01	Torque lower limit		0-9999	0.1 Nm
No.02	Time upper limit	If the time at the stopping is not within the preset range, it becomes “Reverse rotation time over or under”. (Measured from the start.)	0-9999	1 ms
No.03	Time lower limit		0-0065	1 ms
No.04	Overtime If the rotation of cut angle is not performed within the preset time after rotation start, the rotation stops and the reverse rotation determination is performed. (Measured from the start, excluding the before-time.)		0-0065	1 s
No.05	Cut angle Set the angle of reverse rotation.		0-9999	1 degree
No.06	Second speed Set reverse rotation second speed.		0-9999	1 rpm
No.07	Measurement angle Angle to store the torque. Performs the torque upper/lower limit determination when the reverse rotation is finished. (Measured from the start.)		0-9999	1 degree
No.08	Before-time Rotation control actually starts when the preset time has elapsed after the reverse rotation start.		0-9999	1 ms
No.09	Speed switching angle Angle to change speed. (First speed → second speed)		0-9999	1 degree
No.10	First speed Set reverse rotation first speed.		0-9999	1 rpm
No.11	Passing torque If there is no condition more than the preset value during reverse rotation, it becomes the “Reverse rotation passing torque NG”.		0-9999	0.1 Nm
No.12	Seize torque If it reaches larger torque than the specified value during reverse rotation, it becomes the "Reverse Rotation Seizure Torque NG".		0-9999	0.1 Nm
No.13 To 19	Unused			
No.—	Press SAVE button to save data. Save data on each one of 24 setting types..			





G7-6 (Fn.02) Final tightening setting (d_01 to 24: 24 types)

The tightening method for final tightening can be selected from the following three methods.

However, if it has been set as no torque sensor in Fn.01, the selection of the tightening method will be ignored.

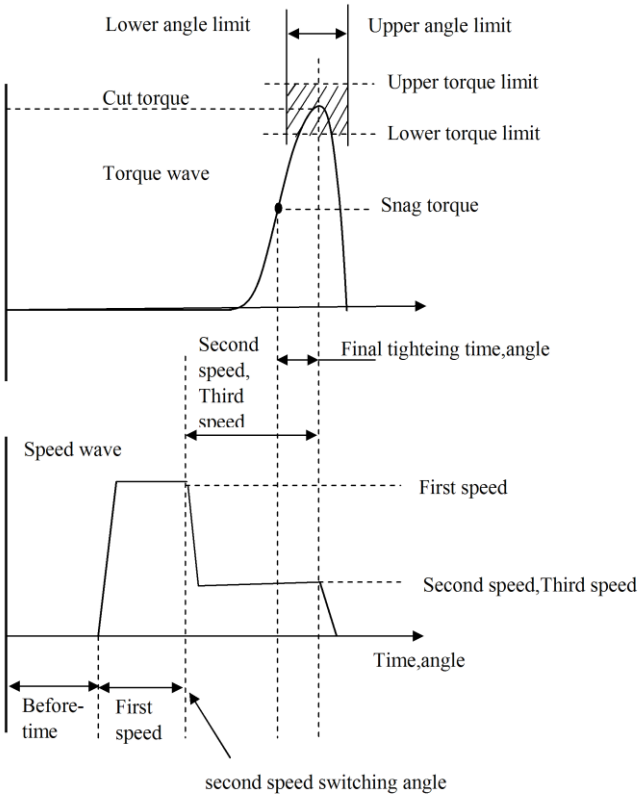
Method	End condition	Determination item	
Torque method	Reaching the cut torque	Zone determination	Torque upper limit/lower limit Time upper limit/lower limit Angle upper limit/lower limit Over time
Angle method	Reaching the cutting angle	Tilt determination	
Yield method	Stops when “Gradient” satisfies the Yield cut	Zone determination, tilt determination	

Number	Contents		Using parameters			Setting range	Unit
			Torque method	Angle method	Yield method		
No.00	Tightening Mode 0: Torque method 1: Angle method 2: Yield method		○	○	○		
No.01	Torque upper limit	Sets the regulated upper limit value of the tightening torque. If the torque is not in a range between the upper limit and lower limit when the product stops, it becomes “Final tightening torque over or under”.	○	○	○	0-9999	0.1 Nm
No.02	Torque lower limit		○	○	○	0-9999	0.1 Nm
No.03	Time upper limit	If the time at the stopping is not within the present range, it becomes “Final tightening time over or under”. (Measured from TQ2.)	○	○	○	0-9999	1 ms
No.04	Time lower limit		○	○	○	0-9999	1 ms
No.05	Angle upper limit	If the angle at the stopping is not within the present range, it becomes “Final tightening angle over or under”. (Measured from TQ2.)	○	○	○	0-9999	0.1 degree
No.06	Angle lower limit		○	○	○	0-9999	0.1 degree
No.07	Overtime If final tightening does not end within the preset time, the rotation ends and the final tightening determination is performed. (Excluding the before-time.)		○	○	○	0-0065	1 s
No.08	First speed Set the final tightening first speed.		○	○	○	0-9999	1 rpm
No.09	Speed switching angle Specify the angle to change the first speed to the second speed. (Measured from the start.)		○	○	○	0-9999	1 degree
No.10	Second speed Set the final tightening second speed.		○	○	○	0-9999	1 rpm
No.11	Before-time Rotation control actually starts when the preset time has elapsed after the final tightening operation start.		○	○	○	0-9999	1 ms
No.12	Cut torque (TS2) Set the target torque for final tightening. (Rotation ends when it reaches the preset torque.) Set the sufficient value in the case of Angle method.		○	○	○	0-9999	0.1 Nm
No.13	Cut angle: Set the target tightening angle for final tightening. (Rotation stops when the angle reaches the target value.) (Measured from TQ2) Set the enough large value when you use the Torque method.		○	○	○	0-9999	1 degree
No.14	snag torque, (TQ2) Set the upper/lower limit, the angle upper/lower, and the measurement standard torque for Yield method.		○	○	○	0-9999	0.1 Nm
No.15	TQ2 torque upper limit	Set the tolerance of TQ2. If the actually used TQ2 is not within the present range, it becomes “Final tightening snag torque over or under”. (Measured while stopping)		○	○	0-9999	0.1 Nm
No.16	TQ2 torque lower limit			○	○	0-9999	0.1 Nm
No.17	Washer slip detection torque Once the torque increases more than the preset value and then goes lower than this value during final tightening, it is taken as washer slip and all sampled gradient data will be disabled. (Set a larger value than the Yield sample start value.)				○	0-9999	0.1 Nm

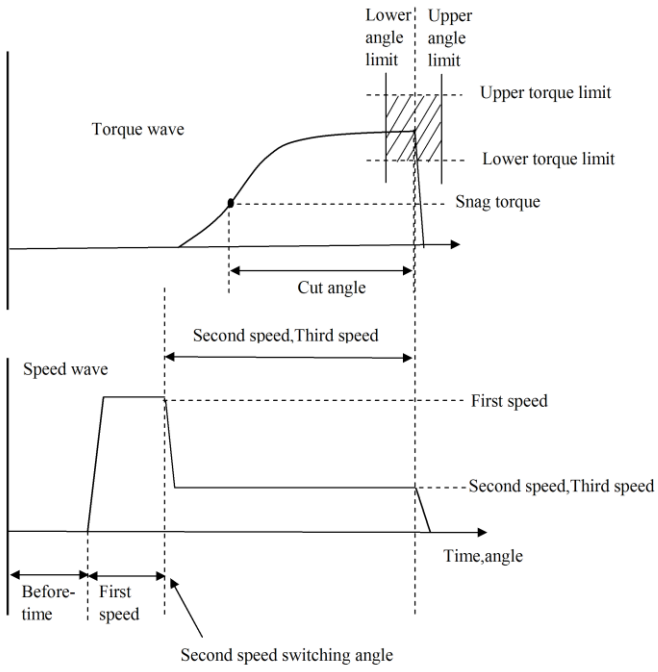
Number	Contents					Setting range	Unit
No.18	Yield restart torque After the determination of washer slip, if the torque that exceeds the preset value is detected, the sampling process for gradient data will be resumed. (Set a larger value than the Yield sample start value.)				○	0-9999	0.1Nm
No.19	Gradient sampling number (0.5 degree intervals)	Set the method to obtain the gradient data. (See P87)		○	○	1 to 128	2 degrees
No.20	Moving average quantity (0.5 degree intervals)			○	○	1 to 128	1
No.21	Zone determination start torque (Torque method)	(Torque method) Set the zone when the zone determination is performed. (Yield method) If the torque at stopping is not within the range of (QC check torque)±(Torque tolerance), it becomes "QC check torque NG". If the angle at stopping is not within the preset range, it becomes "QC check angle NG". (Measured from TQ2)	○			0-9999/ 0-9999	0.1 Nm/ 0.1 Nm
	QC check torque (Yield method)				○		
No.22	Zone determination torque tolerance (Torque method)		○			0-9999/ 0-9999	0.1 Nm/ 0.1 Nm
	QC check torque tolerance (Yield method)				○		
No.23	Zone determination end angle (Torque method) Zone determination start torque standard		○			0-9999/ 0-9999	0.1 degree/ 0.1 degree
	QC check angle (Yield method)				○		
No.24	Zone determination angle tolerance (Torque method)		○			0-9999/ 0-9999	0.1 degree/ 0.1 degree
	QC check angle tolerance (Yield method)				○		
No.25	Zone monitoring range (Torque method) Set to enable/disable the zone determination. 0:No zone monitoring 1: NG over the range 2:NG less than the range 3: NG except the range		○			0-9999	0.1 degree
	QC check cutting angle (Yield method) If the angle at stopping exceeds the preset value, it becomes "QC check angle NG". (Same as NG to be detected by No23, 24)(Measured from TQ2)				○		
No.26	Over cut angle Set the maximum rotation angle from the start of final tightening. If it exceeds this angle, the rotation ends and it becomes the "Final Tightening over cut angle NG".				○	0-9999	1 degree
No.27	Yield sample start Set the torque that starts obtaining the gradient data.				○	0-9999	0.1 Nm
No.28	Yield cut(Angle method) Performs the "Final tightening gradient NG" using the following formula. *Preset value≦Gradient at the end of final tightening/Gradient immediately after the Yield sample started x100 If "0 or 1" does not execute "Final tightening gradient NG" determination.			○		0-9999	1 %
	Yield cut(Yield method) The following formula terminates the tightening process. *Preset value≦Gradient at the end of final tightening/Gradient immediately after the Yield sample started x100				○	0-9999	1 %
No.29	Yield cut detection width				○	0-9999	1 %
No.30	Yield cut detection number				○	0-9999	1
No.31	Washer slip enabled Set Enable/Disable of washer slip detection 0: Disabled 1: Enabled				○		
No.32	No monitoring time for torque Set the time from the start of pretightening to the time to start torque monitoring.		○	○	○	0-9999	1 ms
No.33	Unused						
No.34	3rd speed Set speed 3 of the final tightening.		○	○	○	0-9999	1 rpm
No.35	Speed 3 select torque. Set the torque to change to 3rd speed. (It is given priority over Speed 2 select angle.)		○	○	○	0-9999	0.1Nm
No.36	Premature tightening determination angle Specify the angle to judge premature NG. Premature tightening NG is judged when it reaches to the cut torque between the final tightening start to this angle.		○	○	○	0-9999	1 degree

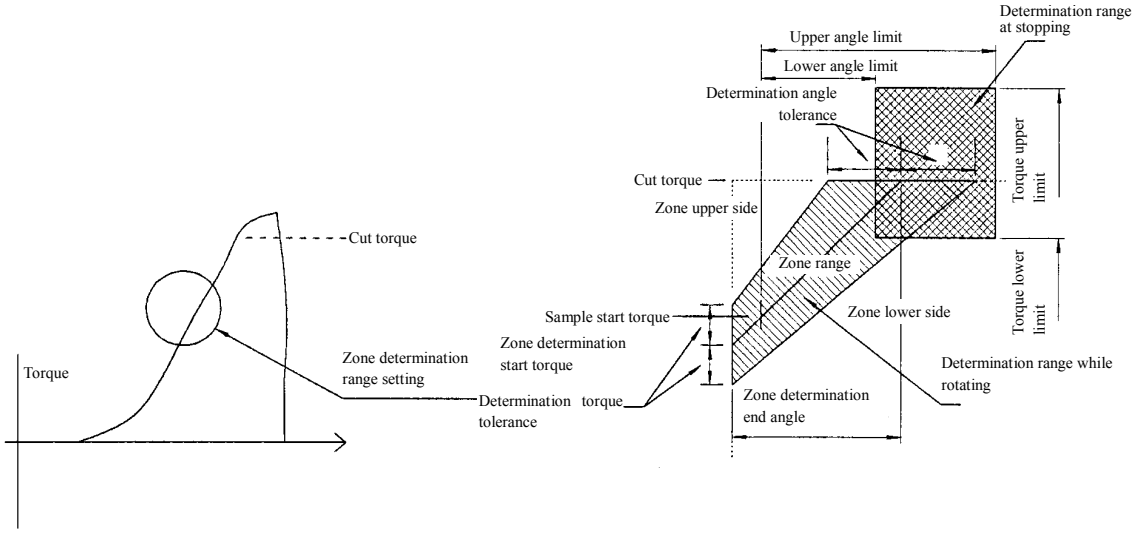
Number	Contents				Setting range	Unit
No.37 To 39	Unused					
No.—	Press SAVE button to save data. Save data on each one of 24 setting types..	○	○	○		

Final tightening reference wave(Torque method)

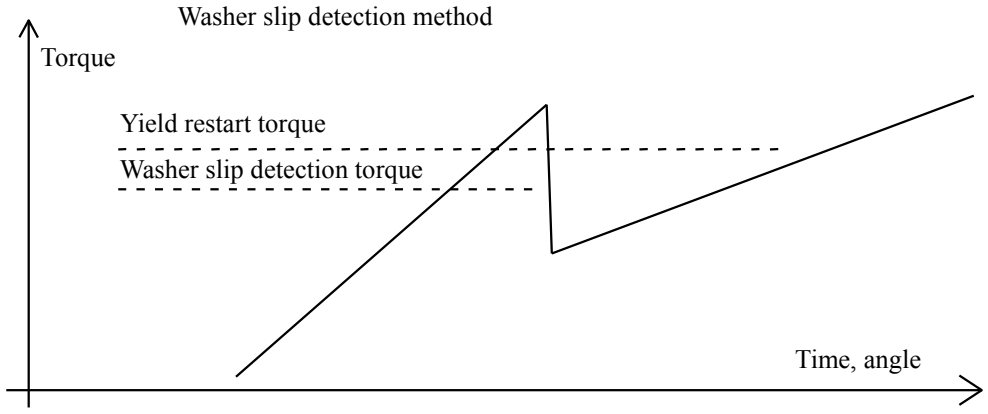


Final tightening reference wave(Angle method)





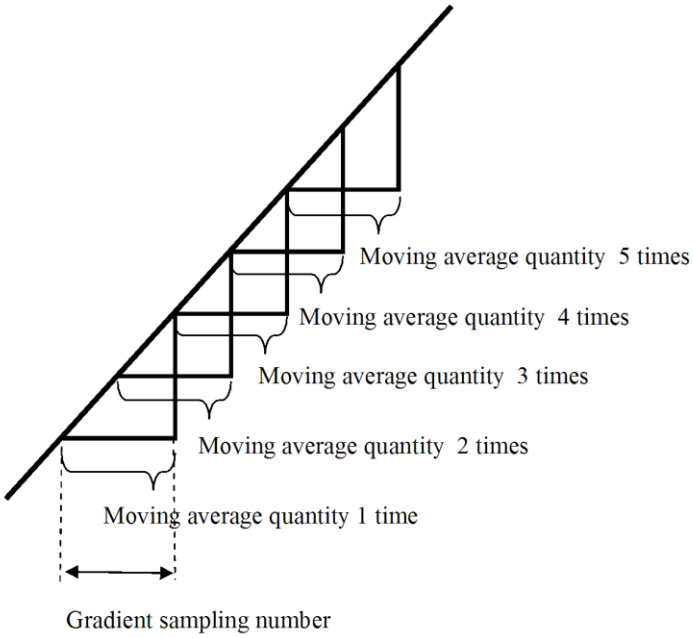
[Zone determination range setting]



About Gradient judgment

Setting items
① Gradient sampling number
② Moving average quantity
③ Gradient judgment value

Explanation of contents
①Gradient sampling number means
the width of sampling per 1time.
(Torque rising value at setting number x 0.5˚)
②Moving average quantity means the number
to get the data of width determined by the
gradient sampling number at 0.5˚interval.
③Calculation method of gradient judgment value.
Setting value≦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 ÷ 1.286 × 100 ＝ 14.46%

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 ÷ 2.5 × 100 ＝ 13.6%

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

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 (Fn.02) Rating setting (E_ 01 to 30: 30 types)

Number	Contents	Setting range	Unit
No.00	Torque sensor rating Set the torque when the torque sensor output is 10V.	0-9999	0.1 Nm
No.01	Tightening direction, Nut runner model **□□ ||+—— Specify the Nut runner type (See, P90) |+———— Existence of torque sensor | 0: Equipped 1: No +———— Tightening direction 0: Tighten the motor clockwise as viewed from the encoder side. (Tighten as the motor axis end turned CCW.) 4: Tighten the motor counterclockwise as viewed from the encoder side. (Tighten as the motor axis end turned CW.)		
No.02	Limit over Set the change tolerance of the value per zero magnification check. When the output value of the last time zero magnification check and the present output value are compared and the difference exceeded the preset value, it becomes “Zero offset error” and “Magnification error” respectively. (About 2% of torque sensor rating)	0-9999	0.1 Nm
No.03	Set over Set the tolerance of the value per zero output and magnification output in the case of zero magnification check. When it exceeds Zero point output=(zero point preset)±（set over） and Magnification output=(magnification preset)±（set over）, it becomes “Zero offset error” and “Magnification error”. (About 5% of torque sensor rating)	0-9999	0.1 Nm
No.04	Zero point preset Set t he output voltage without torque sensor load by the torque conversion. Usually set “0”.	0-9999	0.1 Nm
No.05	Magnification preset Set the output voltage by the torque conversion when the torque sensor magnification is checked. Usually set a half value of the “torque sensor rating”.	0-9999	0.1 Nm
No.06	Gain offset Use to correct the torque (current) sensor output (gradient). If gain offset is not performed, set a half value of the "sensor rating". Torque after offset is calculated by the following formula. $\text{Torque after offset} = \frac{\text{Sensor output voltage (V)}}{\text{10 (V)}} \times$ $\text{Torque sensor rating} \times \frac{\text{Gain offset}}{\text{Magnification preset}}$ If the torque after offset is set larger, it is qualified as the torque sensor with large rating.	0-9999	0.1 Nm
No.07	Deceleration ratio Input deceleration ratio of Nut runner gear. Set the motor axis rotation number required to rotate the tightening axis one turn.	0-9999	0.1 rev
No.08	Unused		
No.09	Unused		
No.—	Press SAVE button to save data. Perform saving operation on each 30 types of data.		

Saving the data: When the “SAVE” button is pressed at the “No. --“ display, the data will be saved. Perform the saving operation for each one of 30 types setting.

□□	Nut runner type	□□	Nut runner type
00	ANZ-200	1b	TS4204N31
01	ANZ-350	21	ANCKHM-200
02	ANZ-500	27	ANCKHM-500
03	ANZ-850	28	ANZM-1600-old
04	ANZ-1500	29	ANZM-3000-old
05	ANZ-2000	2A	ANCKHM-400
06	ANZ-3000	2B	ANZM-250
07	ANZ-3500	2C	TS4603N1920E203
08	ANZ-4500	2D	ANZM-350
09	ANZ-4500H	2E	TS4617N1920E203
0F	ANCKH-150	2F	ANZM-500
10	ANCKH-300	30	ANZM-850
11	ANCKH-600	31	TS4609N1920E203
12	ANCKH-1000	32	ANZM-1600-new
13	ANZ-6000	33	ANZM-2000
14	ANZ-8000	34	ANZKM-700
15	ANZ-12000	35	ANZM-3000-new
16	TS4200	36	TS4619N1922E207
17	TS4201	37	ANZM-5000
18	TS4202	38	ANZM-7000
19	TS4203	39	ANNZM-9000
1A	TS4204	63	Others

* Rating setting Fn.02 E_01～30 Refer to no.2

7-8 (Fn.03) Input monitor

Number	Contents	Display range
In.00	External input signal monitor Indicates the state of input signal input from CN1.	0-FFFF (bit)
In.01	Sensor importing value Displays the torque sensor output +10V in "7FFF".	0-±7FFF
In.02	Encoder counter Integration counter from the motor commutation initialize position (Motor one rotation at 400 hex)	0-FFFF
In.03	Time (hour. minute) (Only when connected with I/F unit) Display example: 07.30: 7:30 To change, perform by Fn. 09.	00.00 to 23.59
In.04	Date (month. day) (Only when connected with I/F unit) Display example: 04.01: April 1st To change, perform by Fn. 09.	01.01 to 12.31
In.05 to In.06	SIO input signal monitor It is possible to monitor SIO input signal. Select the unit to be monitored by Fn.10-IF. 5. It shows the state as follows: In.05 Upper 8 bit: SIO input "1" Lower 8 bit: SIO input "0" In.06 Upper 8 bit: Not decided Lower 8 bit: SIO input "2"	0-FFFF (bit)

Monitor display only. Contents cannot be changed.

7-9 (Fn.04) Output monitor

Number	Contents	Setting range
OU.00	External output signal monitor Indicates the state of output signal output from CN1.	0-FFFF (bit)
OU.01	Dummy output It can output the forced ON/OFF command for the external output signal. This output is to check connection with equipment at a higher rank. Internal status will not be changed with this value.	0-FFFF (bit)
OU.02 to OU.10 (Unconfirmed)	SIO output signal monitor It is possible to monitor SIO output signal. Select the unit to be monitored by Fn.10-IF._5. It shows the state as follows: OU.02 Upper 8 bit: SIO output "1" Lower 8 bit: SIO output "0" OU.03 Upper 8 bit: SIO output "3" Lower 8 bit: SIO output "2" OU.04 Upper 8 bit: SIO output "5" Lower 8 bit: SIO output "4" OU.05 Upper 8 bit: SIO output "7" Lower 8 bit: SIO output "6" OU.06 Upper 8 bit: SIO output "9" Lower 8 bit: SIO output "8" OU.07 Upper 8 bit: SIO output "11" Lower 8 bit: SIO output "10" OU.08 Upper 8 bit: SIO output "13" Lower 8 bit: SIO output "12" OU.09 Upper 8 bit: SIO output "15" Lower 8 bit: SIO output "14" OU.10 Upper 8 bit: Not decided Lower 8 bit: SIO output "16"	0-FFFF (bit)

*Points to notice

Indication is displayed in hexadecimal numeral. To convert to data of parallel I/O, carry out the following conversion:

Convert (indication contents of 4 digits) from hexadecimal to binary numeral.

Right end value after conversion (LSB) corresponds to IN 0/OUT 0. As it goes to the left side, it becomes 1,2…IN 15/OUT 15. If there is no corresponding digit, convert as "O".

1: Input/Output signal ON 0: Input/output signal OFF

(Simple example) IN/OUT15 ---------- 0

Indication "0007" → "0000000000111" IN/OUT 0～2:ON IN/OUT 3～15:OFF

Indication "E007" → "1110000000000" IN/OUT 0～2:OFF IN/OUT 3～15:ON

7-10 (Fn.05) Operation result monitor

Number	Contents	Setting range	Unit
No.00	Final tightening torque (Torque when final tightening is complete)	0-999.9	0.1 Nm
No.01	Final tightening angle (Angle from TQ2 torque to the completion)	0-999.9	0.1 degree
No.02	Final tightening time (Time from TQ2 torque to the completion)	0-9999	1 ms
No.03	Final tightening TQ2 torque (Actually used TQ2 torque)	0-999.9	0.1 Nm
No.04	Final tightening total angle (from start)	0-9999	1 degree
No.05	Final tightening total time (from start, including the before-time)	0-99.99	0.01s
No.06	Pretightening torque (Torque when pretightening is complete)	0-999.9	0.1 Nm
No.07	Pretightening angle (Angle from TQ1 torque to the completion)	0-999.9	0.1 degree
No.08	Pretightening time (Time from TQ1 torque to the completion)	0-9999	1 ms
No.09	Pretightening TQ1 torque (Actually used TQ1 torque)	0-999.9	0.1 Nm
No.10	Pretightening total angle (from start)	0-9999	1 degree
No.11	Pretightening total time (from start, including the before-time)	0-99.99	0.01 s
No.12	Reverse rotation torque (Torque at the measurement angle)	0-999.9	0.1 Nm
No.13	Reverse rotation angle (from start)	0-9999	1 degree
No.14	Reverse rotation measurement angle (Actually used measurement angle position)	0-9999	1 degree
No.15	Reverse rotation total time (from start, including the before-time)	0-99.99	0.01 s
No.16	Rotation torque (maximum value during rotation)	0-999.9	0.1 Nm
No.17	Rotation angle (from start)	0-9999	1 degree
No.18	Rotation time (from start, including the before-time)	0-99.99	0.01 s
No.19	Program total time (from start to block end, including the before-time)	0-99.99	0.01 s
No.20	Zero point (indicating the value just before)	0-999.9	0.1 Nm
No.21	Magnification (Displays the value immediately before)	0-999.9	0.1 Nm

[Following functions are valid only when the interface unit is connected.]

7-11 (Fn.06) Printer operation

Number	Contents		Setting range	Unit
Pr.00	Unused	Set data and press SAVE button to print the specified contents.		
Pr.01	Rotation setting print		1 to 24	
Pr.02	Reverse rotation setting print		1 to 24	
Pr.03	Pretightening setting print		1 to 24	
Pr.04	Final tightening setting print		1 to 24	
Pr.05	Rating setting print		1 to 30	
Pr.06	Program contents print		1 to 24	
Pr.07	Axes arrangement data print		1 to 24	
Pr.08	Final data print If there is no data, it does not print.		1 to 30	
Pr.09	Unused			
Pr.10	All data print		Unnecessary	

Set values cannot be saved.

7-12 (Fn.07) Unused

7-13 (Fn.08) RAM monitor for debugging (Used by the manufacturer)

Monitors the data of RAM in the CPU by designating the address.

Click on the SAVE button to change the address and DATA button to display the data.

RAM contents cannot be changed.

7-14 (Fn.09) Unused

7-14 (Fn.10) I/F unit setting

Number	Contents	Setting range	Unit
IF._0	Printer output setting 0: No print out 1: All printed out 2: Only NG printed out 3: Only first N units + NG are printed out. Printing is performed at the block end of each unit.	0 to 3	
IF._1	Print item: Bit 0: Rotation result 1: Print 0: No Bit 1: Pretightening result 1: Print 0: No Bit 2: Reverse rotation result 1: Print 0: No Bit 3: Final tightening result 1: Print 0: No Bit 4: Zero magnification result 1: Print 0: No	Bit unit	
IF._2	Number of final tightening for the initial time Set the number of final tightening to print out after the power is turned on when the print mode is set 3.	0 to 99	
IF._3	Set the personal computer communication speed to the digit of 1. 0: 9600 bps 1: 19200 bps 2: 38400 bps Set the display communication speed to the digit of 10. 0*:38400bps 1*:57600bps 2*:76800bps	0 to 22	
IF._4	External display 0: Disabled 1: Enabled 11: Language switching (Sends the language switching information to a printer.) (1: Japanese 11: English)	0, 1, 11	
IF._5	SIO signal monitor unit selection Select the unit to monitor the SIO signal by Fn. 03 and Fn. 04.	1 to 7	
IF._6	Resolution of the wave data to the display. Set the resolution of the wave data to transmit to the external display. (Set at the unit of 0.5 degree.) Example 0.5°:05 1.0°:10 1.5°:15 2.0°:20	5 to 20	0.1 degree
IF._-	Press SAVE button to save all data of Fn. 10 in one lump.		

7-15 (Fn.11) Unit setting

Number	Contents	Setting range
NO. □□	□□ is the axis number. For data, set the unit number that each axis belongs to in the form of Un-○○. Unit setting value will be the station number of SIO. Make sure to set "Un. 01" for the axis with I/F unit. For axes to axis cutting, set the unit number to "Un. _-".	Un. 01 to Un. 07 Un. _-
NO.——	Press SAVE button to save all data of Fn. 11 in one lump.	

7-16 (Fn.12) ID controller connection setting

Number	Contents
No._0	ID controller connection setting (Output contents setting)
No._1	ID controller connection setting (Output digit number setting)
No._2	I/F unit Selection of CH2 function
No._3	SIO start address setting Enter a number of "1" to "7".
No._-	Press SAVE button to save all data of Fn. 12 in one lump.

Please refer to Page 117-120 for the details of the F12 abovementioned.

8. Supplementary

8-1. Sub serving function for operation

(1) Checking the zero magnification per zero magnification check function tightening block

To check the existence of CHECK, give or remove the check mark in the check box on the program setting screen.

(2) History data saving function

Saves the history data to each driver by using the reset input as a trigger signal after the tightening total determination is output.

To check the data, read the data from the GSS_PC-Automatic measurement screen-Tightening history screen. (To read, load the history data to PC by specifying an axis or all axes. Cancel switch is provided.)

(3) Waveform sampling function

Saves two data types of waveform 1 and waveform 2 in the 2048 data each axis driver.

(Next time, data will be overwritten by tightening)

- Waveform 1:Save at 10ms. intervals from the block start to the block end.
- Waveform 2: Save at the angle 0.5 degree intervals from the final tightening snag TQ to the end of final tightening.
- It is possible to store waveform data 1 after tightening by the setting soft and to get waveform data 2 by the regular connection (online).

Automatic save selection function for waveform 1 or waveform 2 is provided by the GSS_PC ini file

- It is also possible to read and save the waveform from the start after tightening.

8-2. Driver function

Regenerative function: Regenerative circuit is built in order to consume the excessive drive voltage through the internal resistor when it exceeded the preset value.
(Regenerative resistor is externally attached.)

Discharge function: Discharges the drive charge voltage by pressing the puss button on the panel.

Analog monitor: Outputs the monitor signal by the check pins on the panel. (Can be selected by parameters)
Standard load inertia: $J_L \leqq 30\ J_M$

Parallel input/output: Processes the basic operation with input 16 points and output 16 points.
Any tightening is possible at the multiple timing by connecting the parallel leads to the top axis that is set by the unit when the multiple units is set.
1st axis: Parallel input/output (each 16 points)
2nd axis: 1 to 16 axes OK output, 1 to 16 axes - axes cutting set input
3rd axis: 17 to 30 axes OK output, 17 to 30 axes - axes cutting set input

(* However, the axis cutting input as mentioned above is enabled only when #1 to 3 axis has Unit no.1.)

Tightening history save: Saves about 6000 tightening data at the E2PROM of each axis. Setup software is used to read the history.

Alarm history function: GSSW stores 16 times of alarms. Setup software is used to read the alarm history.

9. Monitor output

Usually, the current sensor output and speed feedback values are output to the M1 and M2 terminals on the front of driver. It is possible to change the contents to output to each terminal by changing the parameters.

Fn.-01–PA.07 (MADRS1)	M1,M3 terminal output contents (Setting at shipment: 021F)
Fn.-01–PA.08 (MADRS2)	M2,M4 terminal output contents (Setting at shipment: 0222)

Contents	Setting value	Applicable type	Output scale
Torque sensor output	021F	Common	Max. torque of torque sensor/5V
Motor current command	0239	GSS-*1-N04-M	8.8 Arms/5 V
		GSSW-*1-N04-M	
		GSS-*3-N04-M	17.7 Arms/5 V
		GSSW-*3-N04-M	
		GSS-*4-N04-M	29.5 Arms/5 V
		GSS-*5-N04-M	44.3 Arms/5 V
		GSS-*7-N04-M	88.6 Arms/5 V
Speed feedback	0222	Common	16384 rpm/5 V "+" by rotating to the right (CCW)

* 1: Standard specification (connector type)

* T: T specification (with a heatsink + Connector type)

10. Code table

10-1 NG code list

Operation	Code display	Contents	Related parameters
	FFFF	Emergency stop Operation ready OFF during operation, or start OFF during program operation.	
Zero magnification and others	0001	Zero point offset error Zero point output exceeded the set over during the zero point check.	Fn02-E□-No03
	0002	Magnification error Magnification output exceeds the set over range when Zero/Magnification is checked.	Fn02-E□-No03
	0003	Zero point offset fluctuation error Output difference between this time and last time exceeded the limit over.	Fn02-E□-No02
	0004	Magnification change error Difference between outputs of last time and preset time exceed the limit over.	Fn02-E□-No02
	0033	Sampling angle over Rotated more than 9999 degrees during the tightening angle sampling operation.	Fn01-PA.24
Rotation	0106	Gear check NG1 It reached to the cut angle while monitoring no-torque	Fn02-A_□ -No02 Fn01-PA.19
	0107	Gear check NG2 Motor current exceeded the equivalent value to the upper torque limit while running.	Fn02-A_□ -No.05
	0108	Fitting angle over Does not reach the fitting torque even if it exceeds the cut angle.	Fn02-A_□ -No02 Fn02-A_□ -No07
	0111	Rotation torque over Torque at stopping exceeded the upper limit.	Fn02-A_□ -No05
	0112	Rotation torque under Torque at stopping does not reach the lower limit.	Fn02-A_□ -No06
Pretightening	0207	Premature pretightening NG Reached the cut torque switching torque while operating in the first speed.	Fn02-b_□ -No15 Fn02-b_□ -No16
	0208	Twice tightening of pretightening NG Torque reached the total of the 3rd speed switching torque + incremented torque (Fn01 -23) between the start and premature tightening determination angle. Deceleration NG Speed is not the 3rd speed when it reached the sample start torque or cut torque.	Fn02-b_□ -No15 Fn02-b_□ -No16 Fn01-PA.23
	0211	Pretightening torque over Torque value at stopping exceeded the upper limit.	Fn02-b_□ -No00
	0212	Pretightening torque under Torque value at stopping does not reach the lower limit.	Fn02-b_□ -No01
	0221	Pretightening time over Time at stopping exceeded the upper limit.	Fn02-b_□ -No02
	0222	Pretightening time under Time at stopping does not reach the lower limit.	Fn02-b_□ -No03
	0231	Pretightening angle over Angle at stopping exceeded the upper limit.	Fn02-b_□ -No04
	0232	Pretightening angle under Angle at stopping does not reach the lower limit.	Fn02-b_□ -No05
Reverse rotation	0306	Reverse rotation passing torque NG Did not reach torque more than the preset torque during operation.	Fn02-c_□ -No11
	0307	Reverse rotation seizure torque NG Reached torque more than the preset torque during operation.	Fn02-c_□ -No12
	0311	Reverse rotation torque over Torque value at the measurement angle exceeded the upper limit.	Fn02-c_□ -No00 Fn02-c_□ -No07
	0312	Reverse rotation torque under Torque value at the measurement angle does not reach the lower limit.	Fn02-c_□ -No01 Fn02-c_□ -No07
	0321	Reverse rotation time over Time at stopping exceeded the upper limit.	Fn02-c_□ -No02
	0322	Reverse rotation time under. Time at stopping doe not reach the lower limit.	Fn02-c_□ -No03

Operation	Code display	Contents	Related parameters
Final tightening	0403	Final tightening zone NG It became NG by the zone determination using Torque method	Fn02-d_□ -No21 to 24
	0404	Final tightening gradient NG Gradient exceeded the preset value by Gradient method. Action ended before obtaining the basic gradient.	Fn02-d_□ -No19 Fn02-d_□ -No20 Fn02-d_□ -No21
	0405	QC check torque NG Torque at stopping exceeded the range.	Fn02-d_□ -No21 Fn02-d_□ -No21
	0406	QC check angle NG Angle at stopping exceeded the range.	Fn02-d_□ -No23 Fn02-d_□ -No24 Fn02-d_□ -No25
	0407	Final tightening premature tightening NG Torque reached the cut torque switching torque between the start and premature tightening determination angle.	Fn02-d_□ -No35 Fn02-d_□ -No36
	0411	Final tightening torque over Torque value at stopping exceeded the upper limit.	Fn02-d_□ -No01
	0412	Final tightening torque under Torque value at stopping does not reach the lower limit.	Fn02-d_□ -No02
	0421	Final tightening time over Time at stopping exceed the upper limit.	Fn02-d_□ -No03
	0422	Final tightening time under Time at stopping does not reach the lower limit.	Fn02-d_□ -No04
	0431	Final tightening angle over Angle at stopping exceeds the upper limit.	Fn02-d_□ -No05
	0432	Final tightening angle under Angle at stopping does not reach the lower limit.	Fn02-d_□ -No06
	0441	Final tightening snag torque over Used TQ2 exceeded the range.	Fn02-d_□ -No14 Fn02-d_□ -No15
	0442	Final snag torque under Used TQ2 does not reach the range.	Fn02-d_□ -No14 Fn02-d_□ -No16

10-2 Alarm code table

Driver alarm display list

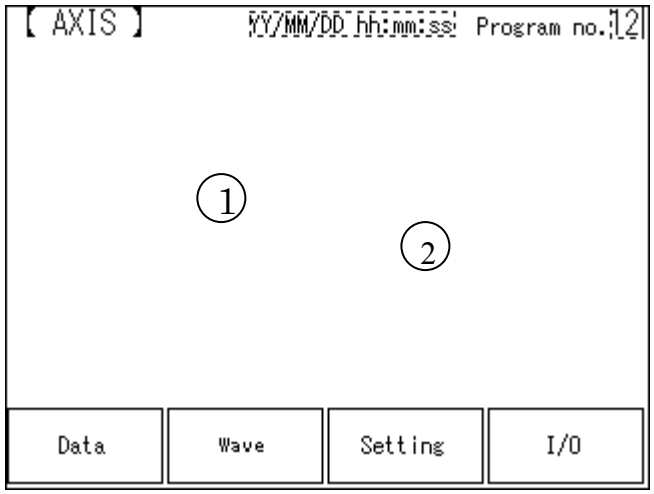
Code display contents	Detected cause	Situation	Cause	Measures
AL10 Power drive error	Power drive error is detected. Over current, over heat error, control power supply error	Occurs simply when power supply is turned on	GSS defect	Replace GSS
		Occurs when operated	Wire short-circuit of motor	Check wiring to motor Replace motor
			GSS defect	Replace GSS
		Occurs during acceleration and deceleration	GSS adjustment improper	Replace GSS
		Occurs during operation	Internal overheat	Improve heat radiating condition Ease operating condition
AL20 Overload alarm	Average value of motor current exceeded the detecting level (Fn.01-PA06)	Motor vibrates while running	Adjustment improper	Readjust gain (Fn.01-PA00 to PA03)
		Occurs during acceleration and deceleration Occurs during rotation at a constant speed	Too much acceleration/deceleration	Lower acceleration/ deceleration speed (Fn.01-PA21)
			Too much load torque	Increase motor size
		Occurs simply when operation starts	Motor wire wrong connection/not connected	Check wiring
			Locking of mechanical rotation part	Check mechanism
AL30 Speed alarm	Motor speed exceeded detection level (Fn01-PA05)	Occurs during operation	Speed overshoot	Readjust gain (Fn.01-PA00 to PA03)
			Encoder error	Replace motor
			Sensor signal receiver error	Replace GSS

AL40 Encoder initial error	Failed to initialize commutation	Motor does not rotate after drive power supply is turned on	Wrong wiring to motor	Check wiring to the motor
			Motor defect	Replace motor
			Mechanism is too heavy to operate	Improve mechanism section
		Motor rotates after drive power supply is turned on	Disconnection in sensor signal leads	Check wiring
			Motor defect	Replace motor
			Signal receiver defect	Replace GSS
AL48 Angle data reading error	Sensor position data cannot be read normally	Occurs during operation	Signal receiver defect	Replace GSS
AL60 Sensor signal error	Sensor is disconnected	Occurs when power supply is turned on	Sensor signal disconnection	Check wiring Loose connection Replace motor
AL71 Drive power supply over voltage	Drive voltage is high	Occurs during deceleration	Regenerative ability insufficient	Replace GSS Lower acceleration/ deceleration speed (Fn.01-PA21)
		Occurs simply when power supply is turned on	Drive voltage specification is wrong	Change GSS
			GSS defect	Replace GSS
AL72 Regeneration circuit error	Regeneration processing circuit malfunctioned	Occurs during deceleration	Regenerative resistor broken	Replace GSS
			Regenerative processing ability insufficient	Change GSS
		Occurs simply when power supply is turned on	Drive voltage specification is wrong	Change GSS Check power supply wiring
			Voltage detecting circuit malfunction	Replace GSS
AL80 Drive power supply interrupted	Drive voltage is too low Momentary power interruption (about 0.1 sec.) occurred	Occurs during operation	Voltage drop and power supply momentary interruption of input power supply	Check input power supply
		Occurs at a specific timing	Drive power supply was cut off during GSS operation	Check higher rank timing
AL90 Driver section E2PROM error	Data cannot be read/written from/to E2PROM	Occurs when power supply is turned on Occurs when parameters are saved	E2PROM defect/operating life	Replace GSS
ALC0 Program NO error	Program selection error/contents error	Occurs when program starts/while executing	Specified program number is 0, or more than 25	Check program selection signal
			There is no content of specified program	Reconfigure program
			Block number is not set from 1 in order Block numbers are doubled There are more than 15 block numbers. Block numbers of all axes in the unit do not match.	Reconfigure program
ALC1 Program step error	Undecipherable step has been set	Occurs when program starts	E2PROM defect/operating life	Replace I/F unit
ALC2 No operating axis error	Specified axis is not actually installed	Occurs when power supply is turned on	Unit setting mistake	Check unit setting axis
ALC3 I/F unit E2PROM failure	Data cannot be read/written from/to E2PROM	Occurs when power supply is turned on Occurs when parameters are saved	E2PROM defect/operating life	Replace I/F unit
ALC4 *M-NET Communication error (M-net version) *CC-Link Communication error (CC-Link version)	M-NET(CC-Link) communication stopped	Occurs within 10 seconds after control power supply is turned on	M-NET (CC-Link) connection wrong wiring	Check wiring
			Sequencer failure	Check sequencer setting
		Occurs during the operation	M-NET connecting leads shield treatment defect	Check wiring
= CPU error	CPU cannot operate normally	Becomes normal when the sensor cable/M-NET connection is disconnected	Sensor/M-NET signal wrong wiring	Check wiring
		Occurs when power supply is turned on	GSS defect	Replace GSS
LED OFF	CPU is not operating	Becomes normal when sensor cable/M-NET connection is disconnected	Sensor/M-NET signal wrong wiring	Check wiring Check/replace sensor
		Occurs when power supply is turned on	GSS defect	Replace GSS

11. Display layout

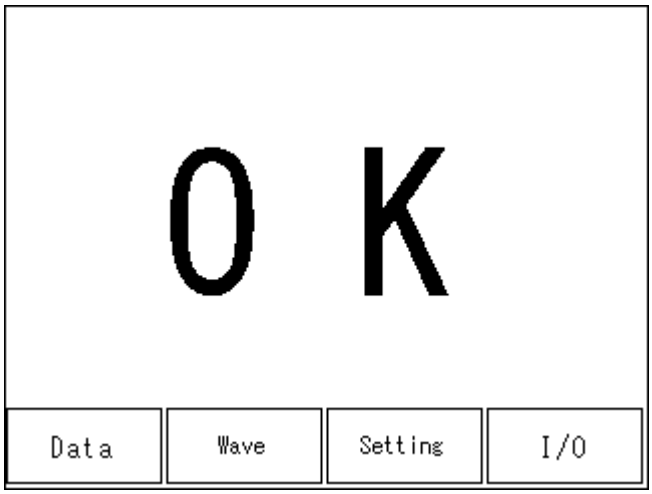
Displayed when the power is supplied.

Displays when the program is not selected.

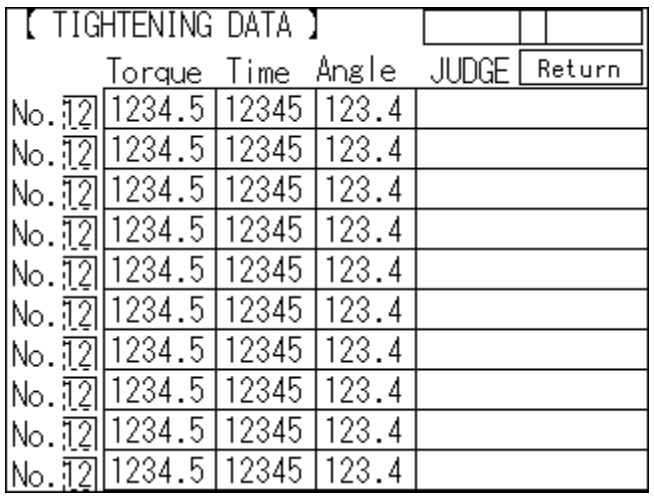


Displays the arrangement of axes.

Displays white display before tightening,
green when tightening is OK and red when tightening is NG.



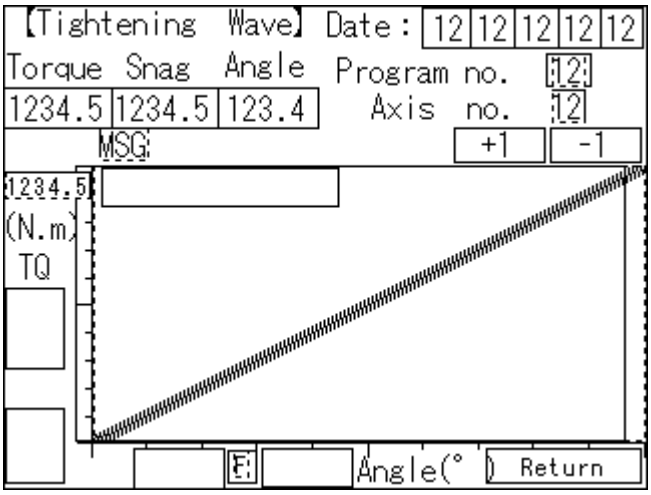
Displays the total OK when output after tightening



Displays the data of tightening result.

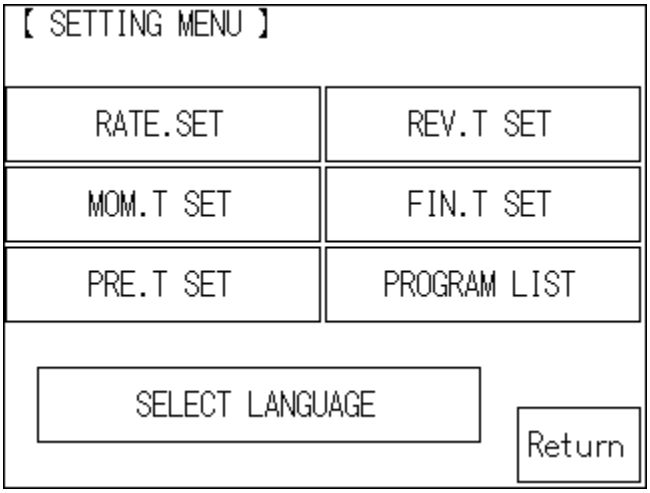
Tightening result message appears in the MSG section.

Example:	Tightening condition	Message display
	1. When tightening is OK	OK
	2. Final tightening torque over	Final tightening torque over
		etc.



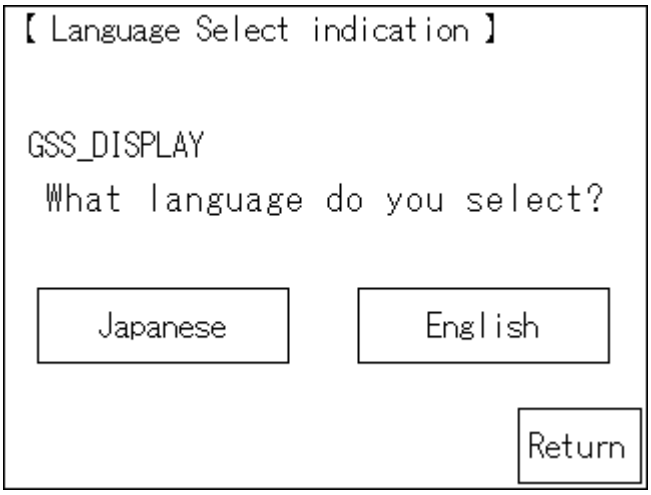
Waveform is displayed based on data obtained by the tightening results.
This is the waveform display from TQ2 value to the final torque of final tightening.

* It is not displayed in the case of pretightening NG or reverse rotation NG.
  Mostly used for tightening by Angle method.



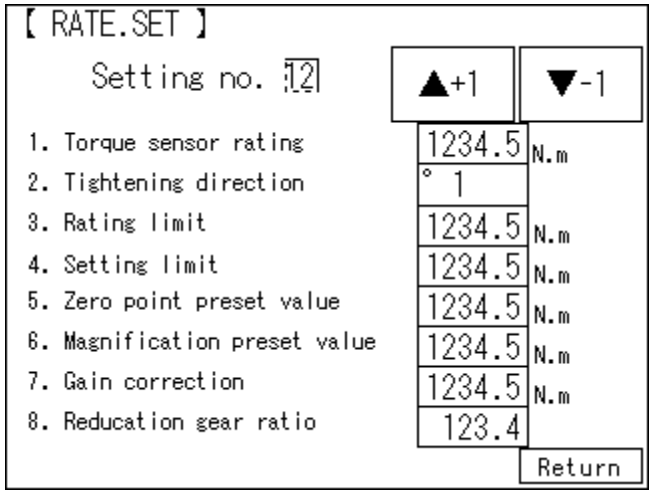
It is possible to check the details of parameters for tightening setting.

* It is impossible to change the setting value.



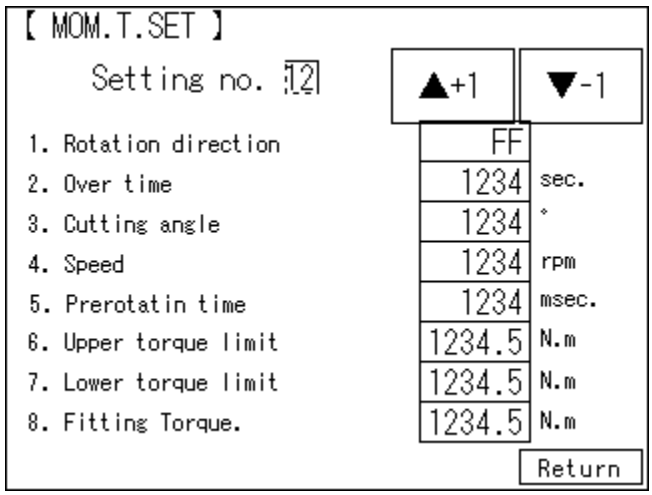
It is possible to change the language to be displayed on the display.

Available languages are Japanese and English.



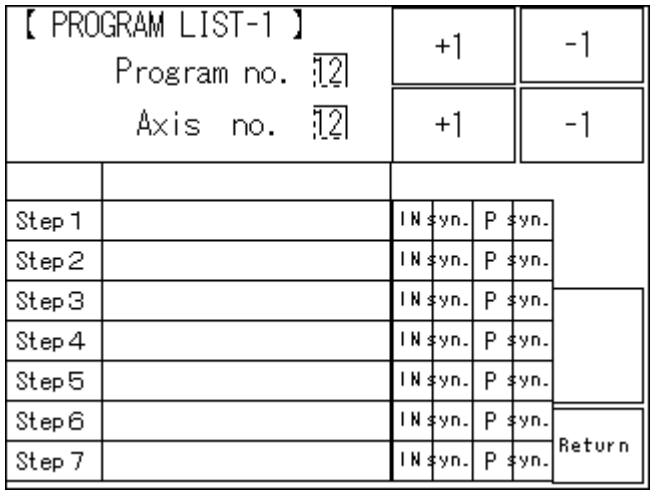
It is possible to check the parameter for rating setting of each axis.

Display axis can be switched by “+1” and “-1” buttons.



It is possible to check the parameter of the rotation setting.

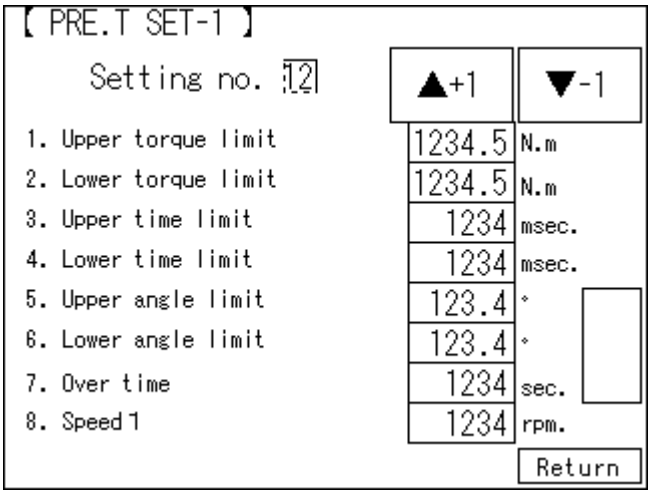
Setting No. can be switched by “+1” and “-1” buttons.

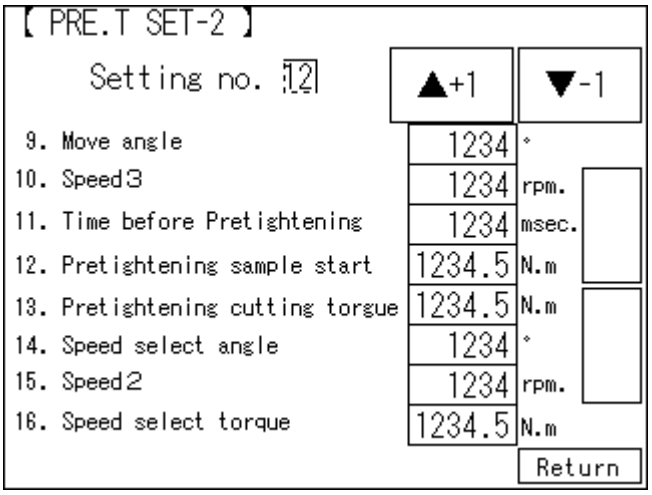


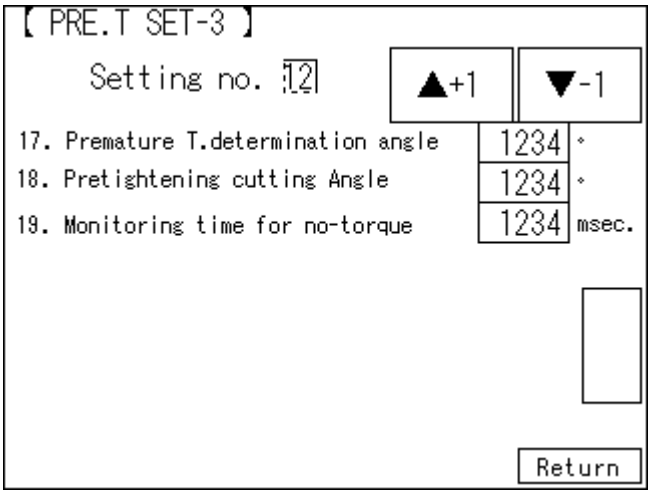
It is possible to check the details of program list.

Program number and axis number can be switched by “+1” and “-1” buttons.

Up/down arrow buttons switch the list number.

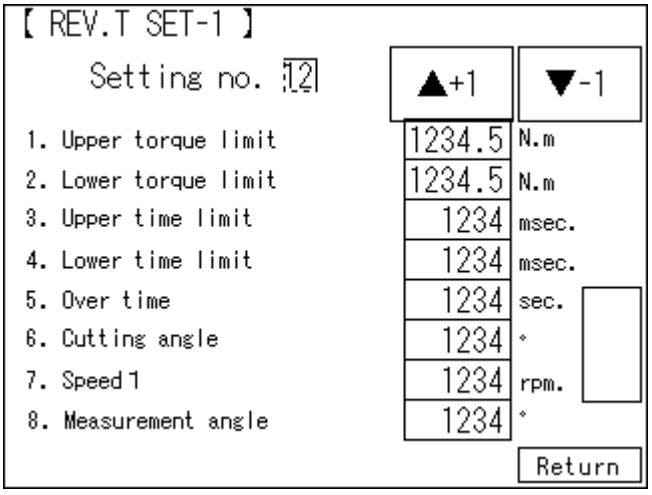


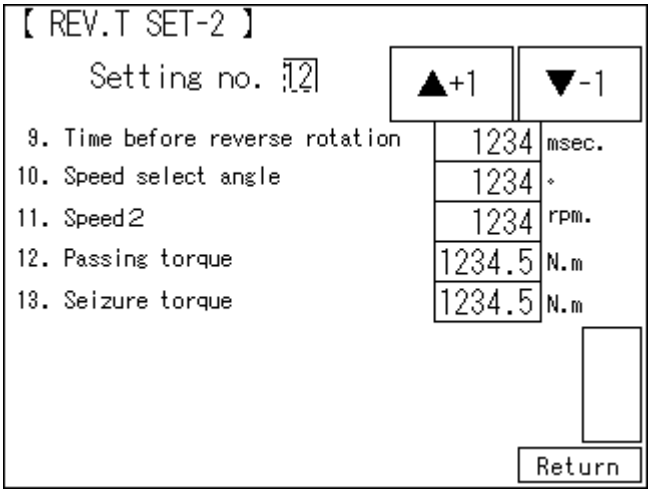




It is possible to check the parameter for pretightening.

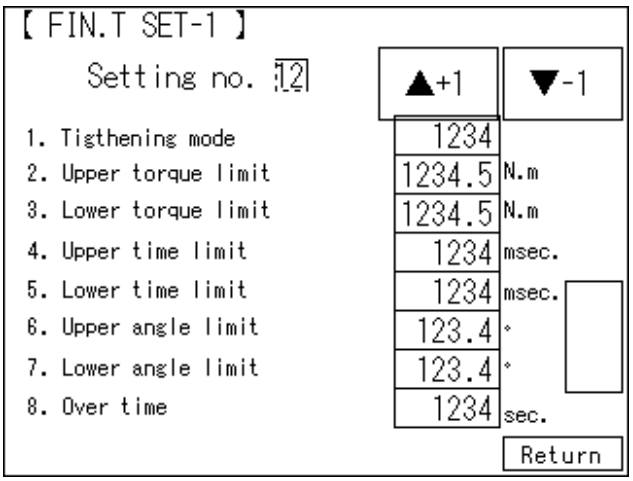
Setting No. can be switched by “+1” and “-1” buttons.

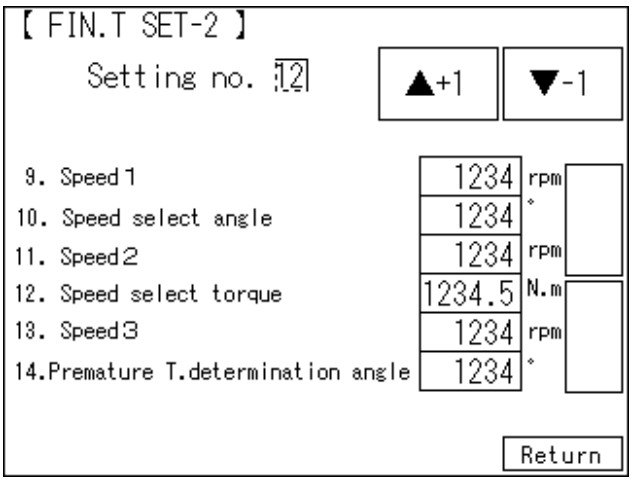


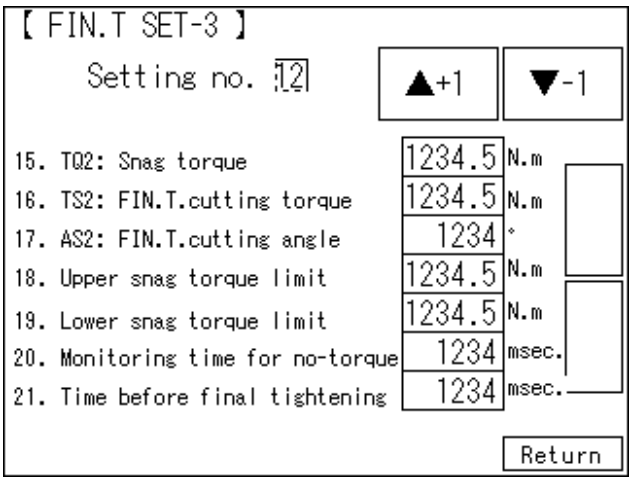


It is possible to check the parameter for reverse rotation setting.

Setting No. can be switched by “+1” and “-1” buttons.

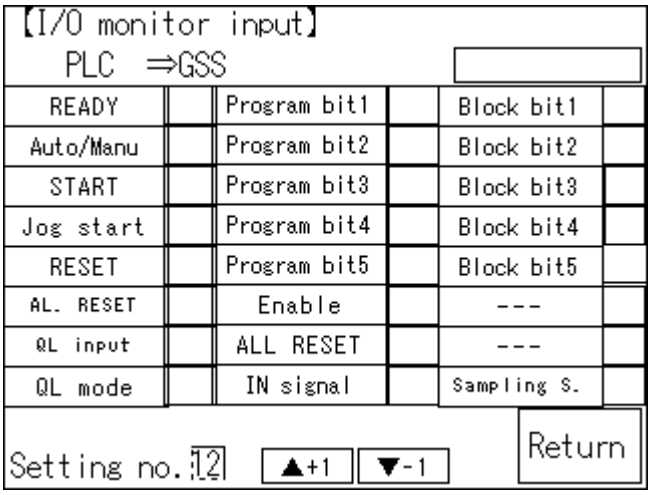


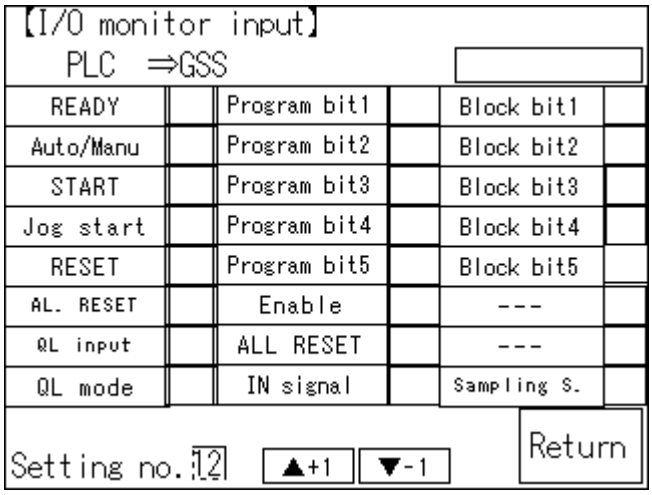


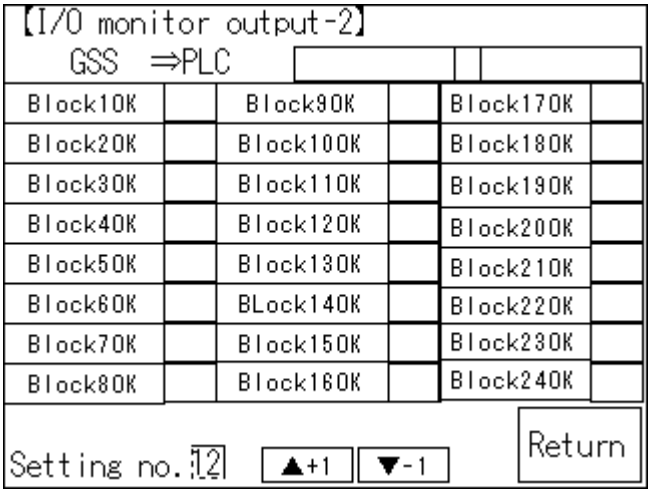


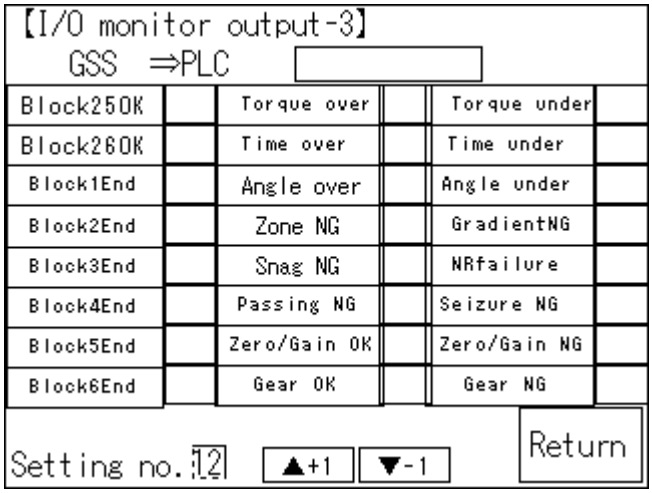
It is possible to check the parameter for final tightening setting.

Setting No. can be switched by "+1" and "-1" buttons.









It is possible to check the input/output of I/O monitor.

Clicking on the arrow button switches the screen number.

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 ventilation 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.

Product	Component	Standard replacement interval	Remarks
Driver	Capacitor	About 5 years	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 operation	

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/each 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 are 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" determination (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 each operation (rotation, pretightening, reverse rotation or final tightening) in the block. When the retry operation is 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 set over 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., Pretightening torque, Pretightening angle, Reverse torque, Reverse time, Reverse angle, Final tightening torque, Final tightening time, Final tightening angle, Final tightening snag torque, Gradient, Rotation torque judgment, Unit No., Engine No.

*Tightening waveform: Waveform from the final tightening snag torque to the finish.

APPLICABLE TO ID CONTROLLERS:

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 the stop is read through the personal computer communication. This is not the operation on the program. (Executable only from the personal computer and SIO.)

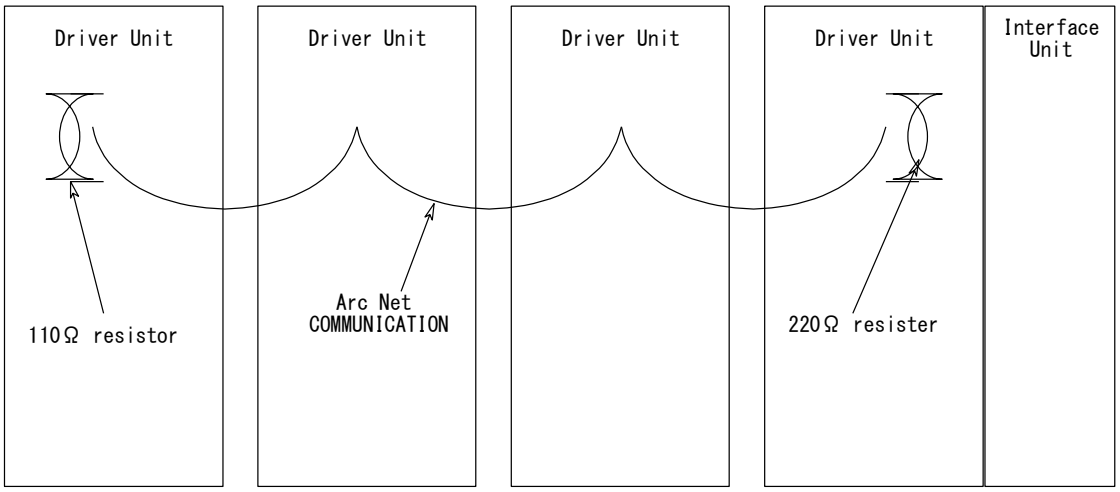
END, STOP:

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.

Supplemental explanation

☆Precautions for wiring the arc net.

Please use the following drawing for the arc net wiring.



*Set 220Ωresistor to (+)(-) on the arc net connector of the driver (1st axis) which is the closest to the Interface unit and set 110Ωresistor to (+)(-) of the end unit for the arc net connection.

*The arc net wiring is unnecessary when the driver unit to be used is one.

☆**Precautions to use M-net communication**

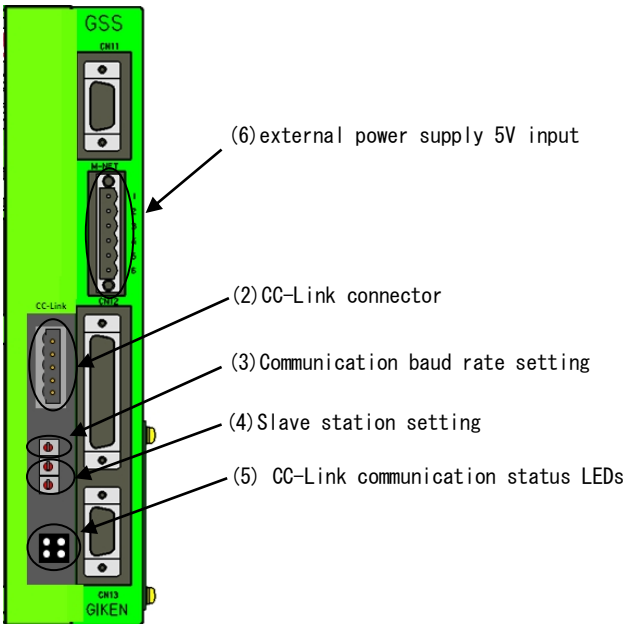
Make sure to set the SIO start address setting "Fn.12 No.03" from the controller panel when SIO is selected for the communication with PLC. (If the PLC SIO address does not match the GSS controller SIO start address, the communication between PLC and GSS cannot be established.)

☆**Precautions to use CC-Link communication**

The CC-Link system to use with GSS,GSSW system is below (1).
I/F unit can set below (3) communication baud rate and below (4) slave station number.
PLC also must set below (1) system and match the PLC setting of (3)communication baud rate,(4)slave staition number to CC-Link I/F setting of the same.

(1)CC-Link System Summary
- ・Version: CC-Link Ver.2.00
  (Can not connect to Ver.1.00 Maseter terminal)
- ・Terminal type: Remote Device station(Slave station)
- ・Number of occupied stations 4
- ・Number of extention Cycles: 8
- ・Input Output size: at each input points and output points, bit:896, word:128

CC-Link ver. IF outside drawing



(2)CC-Link connector

Connector Pin Number	Signal Name
1 (Up)	DA
2	DB
3	DG
4	SLD
5 (Down)	FG

(3)Communication baud rate setting

I/F unit can set communication baud rate with uppest rotary switch of I/F unit panel .

switch setting	Communication speed
0	156kbps
1	625kbps
2	2.5Mbps
3	5.0Mbps
4	10.0Mbps
5～8	–
9	Reserve

(4)Slave station number setting

I/F unit can set station number with rotary swich at middle and downest(LEDs side).

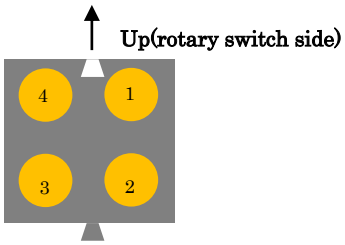
The middle rotary switch is 10x and the down rotary switch 1x.

The setting range is from 1to 64(decimal number). 99 is reserve.

(5)CC-Link communication status LEDs

There is the LEDs which can display CC-Link communication status.

The meaning is following.



Number	Name	Status	Meaning
1	RUN (Green)	On	Anybus Normal Operation
		Off	Anybus Stanby
2	ERROR(Red)	On	Anybus CRC error detected (illegal station number or illegal baud rate selected)
		Off	Anybus Nomal Operation
3	RD(Green)	On	CC-Link Data being received
		Off	CC-Link No data reception
4	SD (Green)	On	CC-Link Data being transmitted
		Off	CC-Link No data transmission

(6) External power supply 5V input

CC-Link IF need to input external power supply 5V at M-net connector

Please see the below table.

Pin	Input voltage
1	5V
2	5V
3	GND
4	GND

Pin1,2 and Pin 3,4 is connected inside

☆**Password to write the setting data to GSS PC**

Password when the setting is written: 2003.

☆**Difference between GSS-D-2 and GS-D3**

GSS-D2: Tightening result (OK.NG), tightening data (torque･time･angle), tightening waveform, indication of setting values

GS-D3: The above mentioned functions of GSS-D2 in addition to the use as a versatile operation board.

☆**Precautions to replace the unit**

Make sure to set the axis setting of "Fn.01 No.26" from the panel when the GSS controller driver is replaced.

If the axis number is not set, the communication from the setup personal computer cannot be established.

(Setting is required for each driver.)

☆**How to set axis No.**

To set axis No., manual input by the operation of the following push button from the 7 segment indication on the front of the controller. is required.

Manual input operation shows [ ] and 7 segment indication shows [ ].

(Confirming the control power being supplied, set the axis no. at the condition that the machine is not operated.)

[----] or [010.0] → [SEL] → [Fn.01] →

Initial screen indication　Program 1 selected　SEL button　Function No.1

(Program bit 1 is being selected from the sequencer or PC software.)

→ [SAVE] → [PA.00] → [↑] → [PA.26] →

SAVE button　Parameter No0　Up butt (Raise up to PA.26)

→ [DATA] → [××××] → [↑] [↓] [←] → [0001] [0002] →

DATA button　(x) Numeral 1~9　(1st axis) (2nd axis)

Set axis no. using Up, Down and CTRL button.

Notice (Set the driver with I/F unit as 1st axis and go on 2nd axis, 3rd axis, etc.setting as much as the number of the nut runners. Please do not double the number.)

→ [DATA] → [PA.26] → [↑] → [PA.--] → [SAVE] →

DATA button　Parameter No.　Push Up button once.　Parameter No.　SAVE button It turns on and off.

→ To establish the setting, save it and then carry out "On/ Off" of the power supply.

☆Order of checking wiring of the sensor cable

To check the wiring of the sensor cable, it is necessary to carry out manual input by the following push button operation from the 7 segment indication of the front of the controller and twist the nut runner (sensor) manually.

Manual input operations shows [ ], and 7 segment indication shows [ ].

(Confirming the control power being supplied, set the axis no. at the condition that the machine is not operated.)

[----] or [010.0] → [SEL] → [Fn.01] →

Initial screen indication　Program 1 selected　SEL button　Function No.1

(Program bit 1 is selected from the sequencer or PC software.)

→ [↑] → [Fn.03] → [SAVE] → [In.00] →

Up button　Function No.3　SAVE button　Input No0

(Raise up to Fn.03)

→ [↑] → [In.01] → [DATA] → [××××]

Up button　Input No1　DATA button　Sensor reading value

(Raise up to In.01)　(×)numeral 1~9

After completion of operation, twist the nut runner (sensor) manually.

If the value of the controller same as the axis twisted changes, the wiring is done correctly.

（If it does not correspond, please check the wiring.）

☆Order of the wiring check with the encoder cable

To check the wiring of the encoder cable, it is necessary to input manually by the following push button operation from the 7 segment indication of the front of the controller and turn the nut runner (the socket of the machine) manually.

Manual input operation shows [ ], and 7 segment indication shows [ ].

(Confirming the control power being supplied, check the wiring at the condition when the machine is not operated.)

[----] or [010.0] → [SEL] → [Fn.01] →

Initial screen indication　Program 1 selected　SEL button　Function No1

(Program bit 1 is being selected from the sequencer or PC software.)

→ [⇑] → [Fn.03] → [SAVE] → [In.00] →

Up button　Function No3　SAVE button　Input No0

(Raise up to Fn.03)

→ [⇑] → [In.02] → [DATA] → [××××]

Up button　Input No2　DATA button　Encoder counter

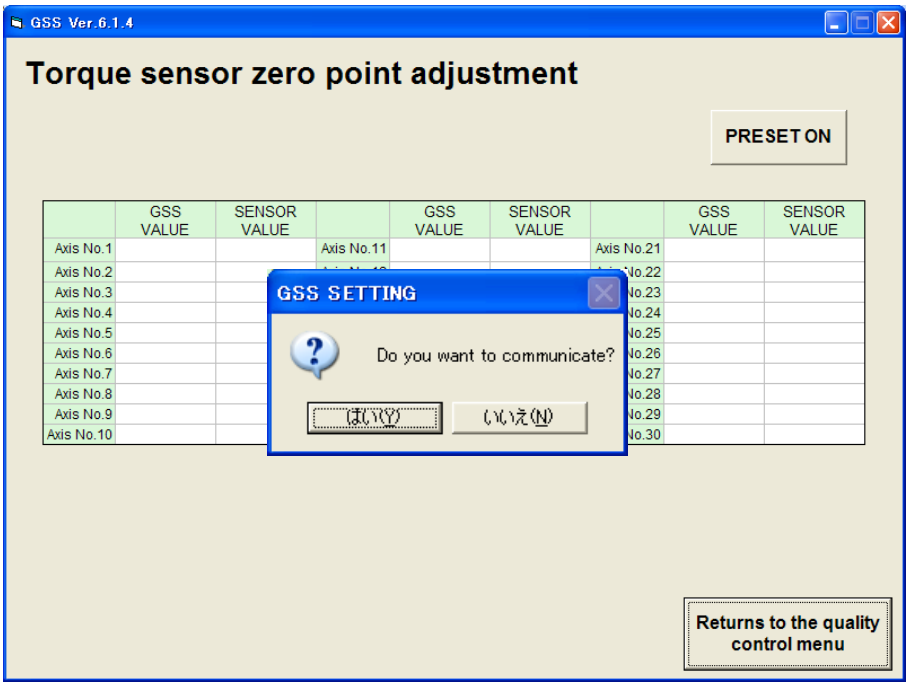
(Raise up to In.02)　(×) Numeral 1～9

After completion of the operation, please turn the nut runner (the socket of the machine) Manually. If the value of the controller same as the axis turned changes, the wiring is correct. (If it does not correspond, please check the wiring.)

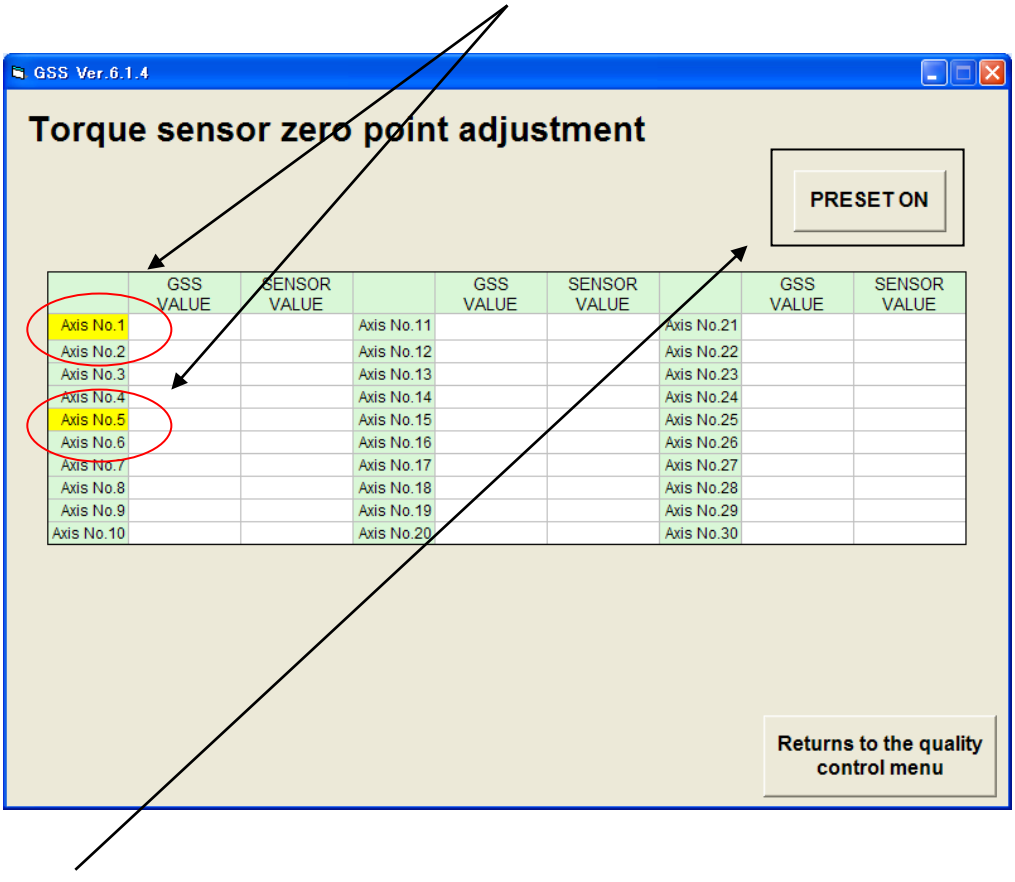
☆Order of sensor zero point adjustment (Personal computer software)

Starting the setup software, select in order of Main menu →Quality control →Torque sensor zero point adjustment

According to the indication of "Do you want to communicate?", please select "Yes".



Click the axis which you want to adjust. (It turn to the yellow indication after your selection.)



Push the zero point adjust button. (Although the sensor output value does not change, the GSS indication value changes to zero.)

☆Explanation of additional items for GSS tightening setting

1. Pretightening setting

1）**Speed switching torque**： Torque to switch the speed to the pretightening speed 3

When the torque reaches this preset torque, it can be switched from Speed 1 to 2 to Speed 3.

2）**Premature tightening determination angle**： Set angle in the range for premature tightening NG determination

When the torque reaches the speed switching torque until the preset angle since the pretightening start, the premature tightening NG (NG code 207) occurs.

3）**Cut angle:** Restricted angle until the torque reaches the cut torque since the sample start during pretightening.

4）**No monitoring time for torque**： Time setting to ignore the acceleration reactive force at the pretightening start

It ignores the torque determination during the preset time after the pretightening start.

2. Final tightening

1）**Speed 3 switching torque**：Torque to switch the speed to the final tightening speed 3

When the torque reaches this preset torque, it can be switched from Speed 1 to 2 to Speed 3.

2）**Premature determination angle**： Set angle in the range for premature tightening NG determination

When the torque reaches the speed switching torque until the preset angle since the pretightening start, the premature tightening NG (NG code 407) occurs.

3）**Speed 3**： Final tightening No.3 speed setting

4）**No monitoring time for torque**：Time setting to ignore the acceleration reactive force at the final tightening start

It ignores the torque determination during the preset time after the final tightening start.

☆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 is 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 securely 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 start is turned ON.

8. GSS reset(ALL reset)

When GSS 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.

☆**Precautions to read the history**

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

(In the case of communication speed at 19200 Bps, about 4 minutes of reading time is needed per axis.)

☆ Items of setting possible and setting not possible

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

☆About connection setting of ID controller

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.

2.Specification of communication

Communication method: RS422

Communication speed: 9600 bps

Start bit : 1

Stop bit : 1

Parity; non

Transmission start character: "#"（23H）

Transmission finish character: CR(0DH)

Transmission character: ASCII code

3.Receive format (ID controller →Interface unit)

Receive of engine no.

#(engine no.) 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 calendar

#C(Calendar) CR Calendar setting (year, month, date, hour, minute each 2 figures)

4.Transmission format (Interface unit →ID controller)

(1) Standard specification setting (1st 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△15:59	(14 letters) △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 letter is according to the parameter.)
[Time]=12.34	(Number of letter is according to the parameter.)
[Angle]=12.3	(Number of letter is according to the parameter.)
[Gradient]=99.9	(Number of letter is according to the parameter.)
[Engine No.]=1234567	(Number of letter is according to the parameter.)

(2)T specification with Torque (1st figure =2 of fn12 no.2)

#[1st axis torque][1st axis judgment][2nd axis torque][2nd axis judgment]･･･

[n axis torque][n axis judgment]CR

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

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

(3)T specification without torque (1st fingure=3 of fn12 no.2)

#[1st axis torque][1st axis judgment][2nd axis torque][2nd axis judgment]

[n axis torque][n axis judgment]CR

[Each axis torque =△△△ （Number of letter is according to the parameter.）△means blank(20H)

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

Part of torque data always outputs zero.

(4)J specification (1st figure=4 of fn12 no.2)

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

[Axis No.(01)][1st axis torque][1st axis time][1st axis angle][1st axis gradient][1st axis judgment]

[Axis No.(02)][2nd axis torque][2nd axis time]･･･[n axis gradient][n axis judgment]CR

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

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

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

[Engine No.]= 1234567 (Number of letter is according to the parameter.)

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

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

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

[Angle]= 12.3 (Number of letter is according to the parameter.)

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

[Each axis judgment] = 0000(K) or NG code (4 letters)

Select with condition of starting transmission

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

Timing is able to be selected from one of followings;

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

5.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.

6.

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

Regarding 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 rotation
	3. Pretightening
（Low）	4. Rotation

Parameter setting related to the ID controller

Fn.12

No.	Digit	Setting value	Transmission timing
No._0	1st digit	0	Data transmission at block judgment output
		1	Data transmission at start of next block and input of judgment reset input
		2	Data transmission from command from the upper device.
		Min. 3	not used.
	2nd digit	0 to 7	Set the digit no. of engine no. transmission (digit no.-1) In case of the set value ;0, it does not transmit.
	3rd digit	0／1	Setting of with or w/o transmission with axis no. 0:not to be transmitted. 1; to be transmitted.
	4th digit	0／1	Setting yes or no with transmission of each axis judgment. 0:not to be transmitted. 1: to be transmitted.
No._1	1stdigit	Refer to the undermentioned data.	Set the digit no. of transmission with torque.
	2nd digit		Set the digit no. of transmission with time.
	3rd digit		Set the digit no. of transmission with angle.
	4th digit		Set the digit no. of transmission with gradient.
No._2	1st 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 judgment 3:Output of T spec. judgment 4:Connection with J spec.ID controller Quality control PC port is possible with operation if the no. is other than zero.
	2nddigit	0／1	Set Yes or No with transmission of date and time. 0:not to be transmitted. 1:to be transmitted.
	3rd digit	0／1	Set Yes or No with transmission of program no. 0:not to be transmitted. 1:to be transmitted.
	4th 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 does not transmit.		
2	＊. ＊	＊. ＊	2 digit with decimal point
3	＊＊. ＊	＊. ＊＊	3 digit with decimal point
4	＊＊＊. ＊	＊. ＊＊＊	4 digit with decimal point
5	＊＊＊＊. ＊	＊＊. ＊＊＊	5 digit with decimal point
6	＊＊＊＊＊. ＊	＊＊＊. ＊＊＊	6 digit with decimal point
A	＊＊	＊＊	2 digit without decimal point
B	＊＊＊	＊＊＊	3 digit without decimal point
C	＊＊＊＊	＊＊＊＊	4 digit without decimal point
D	＊＊＊＊＊	＊＊＊＊＊	5 digit without decimal point
E	＊＊＊＊＊＊	＊＊＊＊＊＊	6 digit without decimal point

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

☆**Heat release fan**

1. Standard specification

GSS-1*-N04-M(Standard specification). GSSW-1*-No4-M(Standard specification) should be equipped with a fan or a cooler which cools throughout the controller.

Make sure to provide the interval more than 10 mm between the controllers.

2-1 T specification

GSS-T*-No4-M(T specification). GSS-T*-No4-M(T specification) is required to equip the fan to radiate heat with the fin of the back of the controller. Please check the following contents and then equip it.

* Depending on the nut runner type, the figure from 1 to 7 will be entered. (For details, see P15.)

2-2 Airflow of the heat release fan

Install the fan, which has the airflow of 0.6 m^3/min. or more per driver.

If one fan is installed for two drivers, make sure to install the fan with the airflow of twice or more. However, it is not recommended to install one fan for three drivers because the wind will be dispersed.

2-3 Installation method

As the installation method, make sure to install the fan within the downward area of 150 mm from the driver and orient the air flow from the bottom up. If the installation place is 150 mm or further from the driver(s), make sure to take measures so that the airflow is increased or the wind does not escape from the flow line.

☆Precations to set the cable (about antinoise measures and noise influence)

1.Method of set

Please wire separetellly the encorder cable (communication line) and the motor cable (power line).

Please take antinoise measures of using the noise protected hook tube for the encorder cable (communication line) and etc when there is it near the noise source.

2.About phenomenon of output noise

If the signal is not in order because of the noise , Gss (GSSW) Controller show AL20(over loaded).

If the above mentioned phenomenon occurs frequently , please take the antinoise measures grounded on [1.Method of installation].

NR setting operation list

F No.	Category	No.	Item	Remarks
1	Driver	0	Position loop gain	
		1	Speed loop gain	
		2	Speed loop integral gain	
		3	Resonance control filter	
		4	Motor Speed limit	
		5	Acceleration error detection level	
		6	Over load error detection level	
		7	Monitor terminal 1	
		8	Monitor terminal 2	
	Others	18	Waveform output polarity	
		19	No monitoring time for torque	
		20	Magnification check delay time	
		21	Motor acceleration limit	
		22	Standard current limit	
		23	Premature tightening NG detection torque	
		24	Tightening sampling operation finish torque	
		25	Not used	
		26	Axis number	1 to 63
		-	Data saving by clicking on the SAVE button	

F No.	Category	No.	Item	Remarks
2	A 1 to 24 Rotation	0	Rotation direction, rotation operation	
		1	Over time	
		2	Cut angle	
		3	Speed	
		4	Before-time	
		5	Upper torque limit	
		6	Lower torque limit	
		7	Fitting torque	
		8	Preliminary 8 to 9	
		-	Data saving by clicking on the SAVE button	
	B 1 to 24 Pretightening	0	Upper torque limit	
		1	Lower torque limit	
		2	Upper time limit	
		3	Lower time limit	
		4	Upper angle limit	
		5	Lower angle limit	
		6	Over time	
		7	First speed	
		8	Position moving angle	
		9	Third speed	
		10	Before-time	
		11	Sample start torque	
		12	Cut torque	
		13	Second speed switching angle	
		14	Second speed	
		15	Third speed switching torque	
		16	Premature tightening determination angle	
		17	Cut angle	
		18	No monitoring time for torque	
		-	Data saving by clicking on the SAVE button	
	C 1 to 24 Reverse rotation	0	Upper torque limit	
		1	Lower torque limit	
		2	Upper time limit	
		3	Lower time limit	
		4	Over time	
		5	Cut angle	
		6	Second speed	
		7	Measurement angle	
		8	Before-time	
		9	Speed Switching angle	
		10	First speed	
		11	Passing torque	
		12	Baking torque	
		13	Preliminary 13 to 19	
		-	Data saving by clicking on the SAVE button	
	D 1 to 24 Final tightening	0	Tightening mode	
		1	Upper torque limit	
		2	Lower torque limit	
		3	Upper time limit	
		4	Lower time limit	
		5	Upper angle limit	
		6	Lower angle limit	
		7	Over time	
		8	First speed	
		9	Speed switching angle	
		10	Second speed	
		11	Before-time	
		12	Cut torque	
		13	Cut angle	
		14	Sample start torque	
		15	TQ2 torque determination upper limit	
		16	TQ2 torque determination lower limit	
		17	Washer slip detection torque	
		18	Yield restart torque	
		19	Gradient sampling number	
		20	Moving average quantity	
		21	Zone determination start/QC check torque	
		22	Zone determination start/QC check torque	
		23	Zone determination end/QC check angle	
		24	Zone determination end/QC check angle	
		25	Zone monitoring range	
		26	Overcut angle	
		27	Yield sample start	
		28	Yield cutting	
		29	Yield cutting detention width	
		30	Yield cutting detection number	
		31	Washer slip enabled	
		32	No monitoring time for torque	
		33	Not used	
		34	Third speed	
		35	Preliminary 35 to 39	
		-	Data saving by clicking on the SAVE button	

F No.	Category	No.	Item	Remarks
2	E 1 to 30 rating	0	Torque sensor rating	
		1	Tightening direction, nut runner type	
		2	Limit over	
		3	Set over	
		4	Zero point preset	
		5	Magnification preset	
		6	Gain correction value	
		7	Reduction ratio	
		8	Preliminary 8 to 9	
		-	Data saving by clicking on the SAVE button	

F No.	Category	No.	Item	Remarks
3	Input monitor	0	External input signal monitor	
		1	Sensor import value	
		2	Encoder counter	
		3	Time	
		4	Date	
		5	M-NET input 1	
		6	M-NET input 2	

F No.	Category	No.	Item	Remarks
4	Output monitor	0	External output signal monitor	
		1	Dummy output	
		2	M-NET output 0	
		3	M-NET output 1	
		4	M-NET output 2	
		5	M-NET output 3	
		6	M-NET output 4	
		7	M-NET output 5	
		8	M-NET output 6	
		9	M-NET output 7	
		10	M-NET output 8	

F No.	Category	No.	Item	Remarks
5	Operation result monitor	0	Final tightening torque	
		1	Final tightening angle	
		2	Final tightening time	
		3	Final tightening TQ2 torque	
		4	Final tightening total angle	
		5	Final tightening total time	
		6	Pretightening torque	
		7	Pretightening angle	
		8	Pretightening time	
		9	Pretightening TQ1 torque	
		10	Pretightening total angle	
		11	Pretightening total time	
		12	Reverse rotation torque	
		13	Reverse rotation angle	
		14	Reverse rotation measurement angle	
		15	Reverse rotation total time	
		16	Rotation torque	
		17	Rotation angle	
		18	Rotation time	
		19	Program total time	
		20	Zero point	
		21	Magnification	

F No.	Category	No.	Item	Remarks
6	Printer operation	0	Not used	
		1	Rotation setting data print	1 to 24
		2	Reverse rotation setting data print	1 to 24
		3	Pretightening setting data print	1 to 24
		4	Final tightening setting data print	1 to 24
		5	Rating setting data print	1 to 30
		6	Program contents print	1 to 24
		7	Axial arrangement data print	1 to 24
		8	Final data print	1 to 30
		9	Not used	
		10	Total data print	Setting value is unnecessary.

F No.	Category	No.	Item	Remarks
7	Program editing			Program for the

F No.	Category	No.	Item	Remarks
8	RAM monitor	no.60 version check		For debugging
		no.61 version check		

F No.	Category	No.	Item	Remarks
9	Calendar setting	b	Set a second	
		F	Set a minute	
		H	Set an hour	
		d	Set a day	
		n	Set a month	
		y	Set a year	

F No.	Category	No.	Item	Remarks
10	I/F unit setting	0	Printer output setting	
		1	Number of print items	
		2	Initial prints number	
		3	PC communication speed	0: 9.6K 1: 19.2K 2:
		4	External display	1: Enabled 11:
		5	SIO signal monitor unit selection	
		6	Resolution of wave data	

F No.	Category	No.	Item	Remarks
11	Unit axis setting		No.: Axis number 1 to 30	
			Un.: Unit number 1 to 7	Axis cutting by "-"

F No.	Category	No.	Item	Remarks
12	ID setting	0	Output setting	
		1	Output digit number setting	
		2	Printer/ID and QC PC switching	0: Printer 1: ID and
		3	M-NET start address	1 to 7

Revised Contents

Revised Date	Revised Contents
Dec. 2006(first edition)	–
July 2009(second edition)	Add the contents of the setting about ID Controller connecting.
Nov. 2013(third edition)	Add the detailed item of supplemental explanation Add HomePageAddress Add precautions of the cable installation Rectify the wrong description of NG code table(at NG code 207,407) Rectify the wrong description of the premature tightening determination angle (at PreTightening setting, Tightening setting) Add the description of CC-Link version IF.
Jan. 2014(fourth edition)	Change the item at the area of ResultWord in CC-Link . (Final Tightening Time -> Time, Final Tightening Angle -> Angle, Final Tightening Torque -> Torque) Change [Real tightening > Pretightening > Reverse rotation > Rotation] to [Real tightening > Pretightening > Reverse rotation > Rotation] at the priority of the data (torque,angle,time) of ID-Controller output .
Mar. 2020(fifth edition)	Change of an e-mail address and the homepage address

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