Product specification

Product name

MC－200－7220□

Classification

MC driver

Product number

S50970,S50980,S51500

Specification document number

LA18B01-3

Technical number

L－18B01

Date of issue

November 27th 2019

Last update on (version number)

April 14th 2020 (Rev. 3)

Product overview

- AC servomotor driver
- Power source voltage: DC20－5% ～ 72V＋5%
- Encoder signal: Incremental (difference input, with CS signal)
  Absolute (BiSS-C communication) compliant
- Control method: Position control, speed control, current control compliant
- External connection interface: digital / analogue input / output, SPI communication compliant

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1. Common specification

Device type	Model	MC－200－7220□ └ (No mark): No external connection A: Digital / analogue input / output D: SPI communication
	Compliant motor	PM type 3 phase AC servo motor (1 drive with built-in encoder)
Rated	Rated output current	3.5Arms
	Maximum output current (less than 1 second)	20Arms (28Ap-p)
	Power source (common for main / control power) ・ Performance guaranteed voltage range ・ Working voltage range	DC20V－5%～DC72V＋5% DC15V～DC75V
	Main circuit (drive method)	Power MOSFET, sine wave PWM method (50kHz), 3 phase, reversible
	Control cycle	20kHZ (current PI control cycle)
	Dielectric strength voltage	Between the main circuit - FG: AC600V 1 minute Built-in DCDC converter ：DC1500V 1 minute AC1000V 1 minute
	Insulation resistance	Between the main circuit - FG: DC500V more than 10MΩ
Electricity	Control method	Position control, speed control, current control
	Encoder signal ・Incremental ・Absolute	Difference input, with CS signal (encoder resolution internal 4 multiplication) Serial communication BiSS-C
	Protection function (alarm)	See attachment
	Display lamp	LED1: Power ON (yellow) LED2: Positioning completed (green) LED3: Alarm (red) 7SEG: Servo ON / alarm content
	USB communication	Communication speed: 9600, 19200, 38400, 57600bps * Initial value: 38400bps bit length: 8bit Parity: None Stop bit: 1bit Flow control: None

1. Common specification

Environment	Ambient temperature Humidity	0℃～＋50℃ Equal or less than 80%RH(No condensation)
	Storage ambient temperature Humidity	－20℃～＋85℃ Equal or less than 80%RH(No condensation)
	Vibration resistance	50m/s² (around 5G), 10Hz ～ 400Hz , XYZ direction respectively 10min, 12 times
	Shock resistance	50m/s² (around 5G), 11ms, XYZ direction respectively 3 times
Other	Mass	MC-200-7220: 155g MC-200-7220A: 170g MC-200-7220D: 170g
	Outside drawing	See attachment
	Accessories	・For CN1 connection: Connector 1-1318120-3 (by TE Connectivity) Contact 1318105-1 (by TE Connectivity)
	Remarks	Following items will be described by specification ・External input / output specification ・Connector variety(CN4)

2. External input / output specification

① [MC－200－7220A] Digital / analogue input / output specification

Signal	Digital input signal	Command pulse (CW, /CW, CCW, /CCW), Servo ON (SVON), Alarm reset (RES), General input 4 (DIN1～DIN4)
	Digital output signal	Servo ready (RDY), Alarm (ALM), Positioning completed signal (INP), general output 1ch (DOUT), Encoder signal output (OUT_A, OUT_/A, OUT_B, OUT_/B, OUT_Z,OUT_/Z)
	Analogue input signal	Analogue command input (AREF)
	Analogue output signal	Analogue monitor 4ch (MON1～MON4)
Content	Command pulse input	1. Pulse / direction method 2. CW / CCW method 3. 2 phase pulse method (AB phase input)
	Analogue command input	DC-5V～DC5V (used in current control mode) Reference voltage 0-5V (command current 0A at reference voltage)
	Absolute position signal output ・ Communication specification	Communication speed: 9600, 19200, 38400, 57600bps * Initial value: 115200bps bit length: 8bit Parity: None Stop bit: 1bit Flow control: None

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2. External input / output specification

① [MC－200－7220A] Digital / analogue input / output specification (continued)

Content	Absolute position signal output Communication format	<ASCII code> STX ######### ## CR Checksum hexadecimal, 2 digit (Bottom 8bit of the total sum of STX and position data) Position data hexadecimal, 8 digit

エンコーダ位置 = 100 の時
位置データ ：「00000064」（64 =「100」の16進数の値）
チェックサム ：02H + (30H * 6) + 36H + 34H = 18CH → 「8C」

コード	STX	'0'	'0'	'0'	'0'	'0'	'0'	'6'	'4'	'8'	'C'	CR
16進	02H	30H	30H	30H	30H	30H	30H	36H	34H	38H	43H	0DH

位置データ　チェックサム

<Binary code>
： 8bit×7 data
Position data 32bit / Checksum
(Bottom 6bit of the total sum of 1st to 6th data)
No. Data 2bit
(1st data "00", 2nd to 6th data "10", 7th data "01")

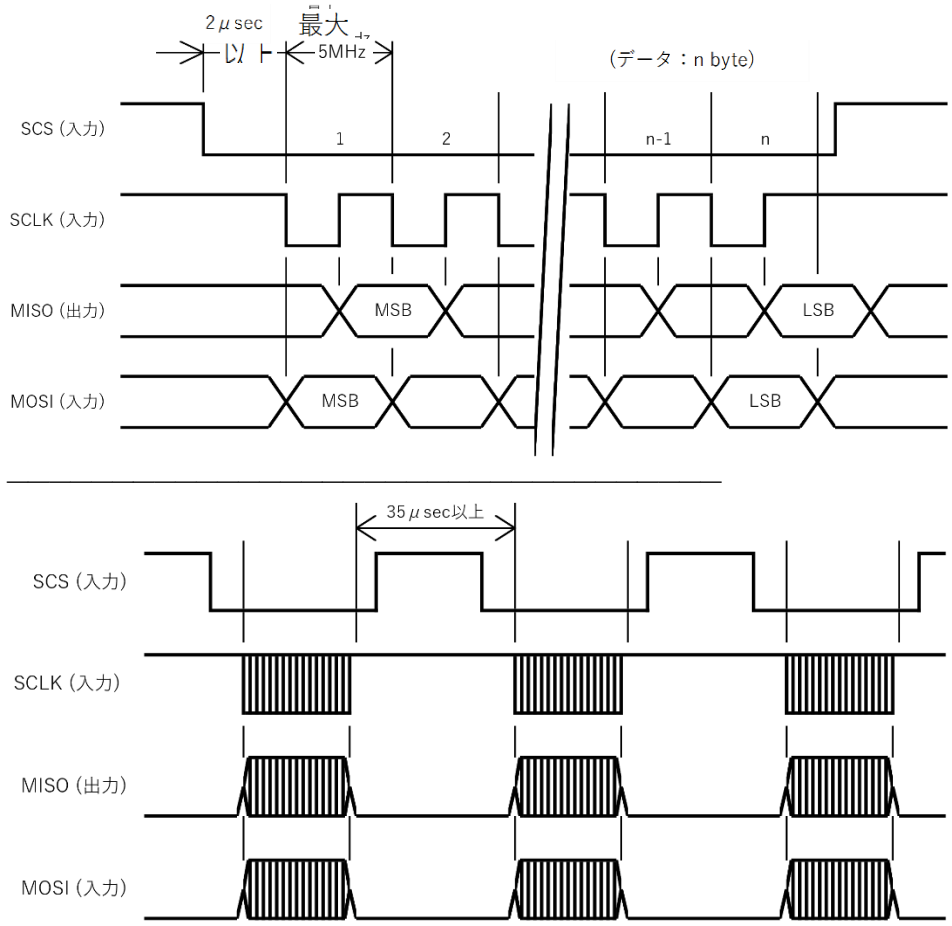
エンコーダ位置 = 100 の時
位置データ ：「0110_0100」（2進数）

									（10進数）
1データ目	0	0	1	0	0	1	0	0	→ 36 （位置データ 1~ 6bit目）
2データ目	1	0	0	0	0	0	0	1	→ 129 （位置データ 7~12bit目）
3データ目	1	0	0	0	0	0	0	0	→ 128 （位置データ13~18bit目）
4データ目	1	0	0	0	0	0	0	0	→ 128 （位置データ19~24bit目）
5データ目	1	0	0	0	0	0	0	0	→ 128 （位置データ25~30bit目）
6データ目	1	0	0	0	0	0	0	0	→ 128 （位置データ31~32bit目）
7データ目	0	1	1	0	0	1	0	1	→ 上記合計677 の2進数下位6bit（チェックサム）

	Accessories

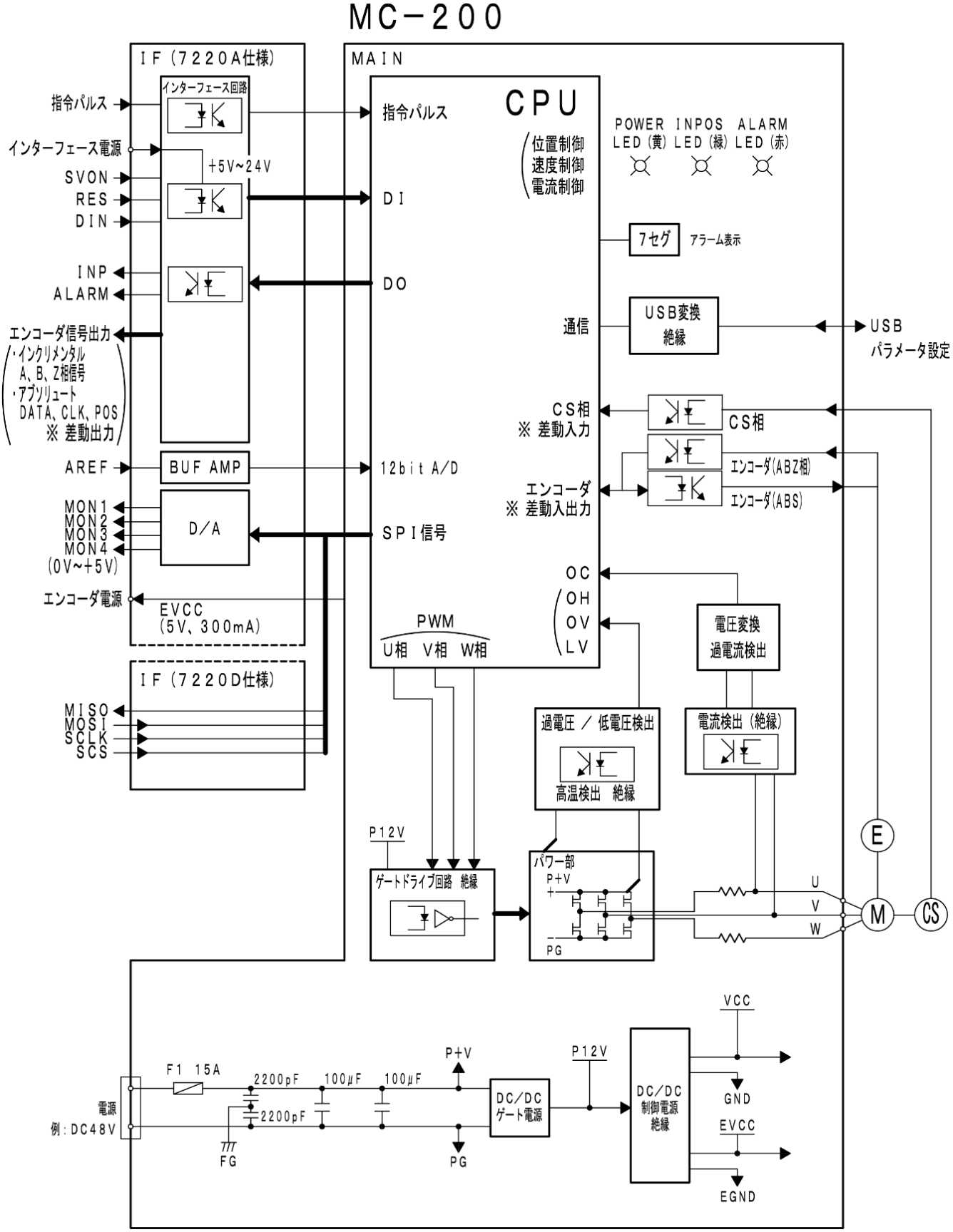
2. External input / output specification

② [MC－200－7220D] SPI communication specification

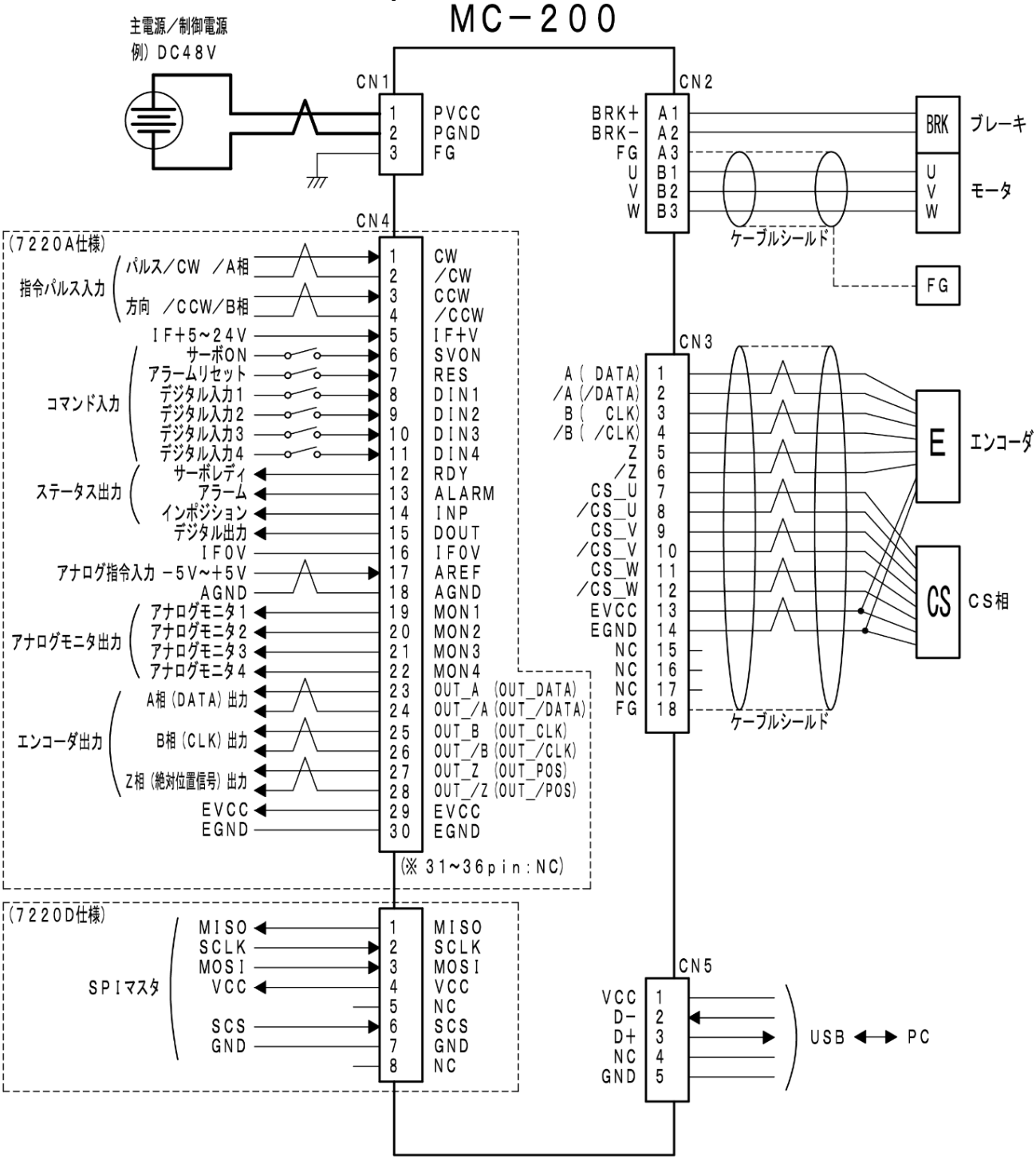
Signal	SCLK	Clock signal input
	SCS	Chip select signal input
	MISO	Data signal output (slave specification)
	MOSI	Data signal input (slave specification)
Content	Communication speed	Maximum 5MHz
	Communication specification ・1 packet ・Whole	
	Accessories	None

※ See attached “MTL_SPI communication format” for detail regarding communication format

3. Outline block diagram

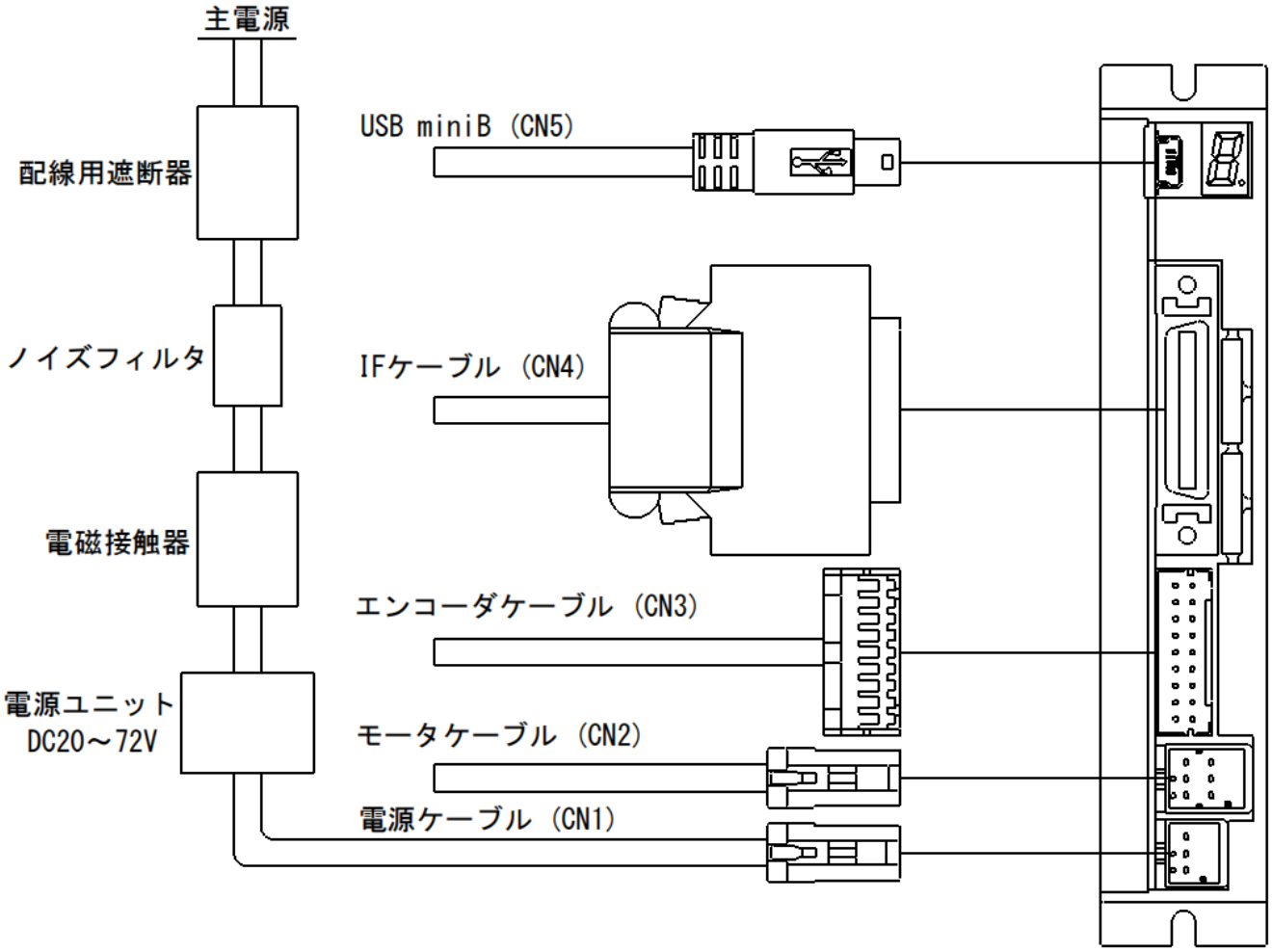


4. Connection example



1．パルス指令やコマンド入力は、通信機能を使用しても操作が可能。そのため、配線の省略が可能。
　パルス指令は＋５Ｖ専用。コマンド入力は、＋５Ｖ～２４Ｖにて使用可能。また、パルス指令は差動入力にて駆動可能。
　ＣＮ４の１ピン、２ピンに信号のペア（CW+、CW−など）にて接続のこと。
2．信号線は、ツイストケーブル及びシールドケーブルを使用のこと。
3．モータ線はノイズ軽減の為、必ず３芯シールドケーブルを使用し、シールドはモータのケース側とモータドライバの
　ＦＧ（ＣＮ２の４ピン）と接続のこと。この配線により、PWMスイッチングノイズがドライバへ帰還され、外部に漏れるノイズが少なくなる。

5. Composition example of peripherical device



Molded case circuit breaker (MCCB)

It will be used for power source line protection.
It will interrupt power source at overcurrent.

Noise filter

It will be used to prevent external noise from power source line.

Electromagnetic contactor

It will be used to switch power ON / OFF.

6. Connector variety

CN1 power source

Model: 1376135-1 (by TE Connectivity)

(Compatible connector model:1-1318120-3 (by TE Connectivity))

Pin No.	Signal name	In / Out	Remarks
1	PVCC	In	Main power source / control power source (DC20V-5%～72V＋5%)
2	PGND	－	0V
3	FG	－	Frame ground

CN2 motor

Model: 1376136-1 (by TE Connectivity)

(Compatible connector model:1-1318119-3 (by MOLEX))

Pin No.	Signal name	In / Out	Remarks
B1	U	Out	Motor U phase
B2	V	Out	Motor V phase
B3	W	Out	Motor W phase
A1	BRK＋	Out	Break release power source + (output voltage amount parameter switch)
A2	BRK－	Out	Break release power source - (output voltage amount parameter switch)
A3	FG	－	Motor frame ground connection

CN5 USB communication

Model: Ux60SC-MB-5ST(80) (HIROSE ELECTRIC CO., LTD.)

(Compatible connector mini-B connector-male)

Pin No.	Signal name	In / Out	Remarks
1	VCC	In	DC5V
2	D－	In / Out	Data (-)
3	D＋	In / Out	Data (+)
4	NC	－	(Not connected)
5	GND	－	0V

6. Connector variety

CN3 Encoder input signal

Model: DF1BZ-18DP-2.5DS (by HIROSE ELECTRIC CO., LTD.)

(Compatible connector model: DF1B-18DS-2.5RC (by HIROSE ELECTRIC CO., LTD.))

Pin No.	Signal name	In / Out	Remarks
1	A (DATA)	In (In)	Incremental encoder A phase (Absolute encoder DATA)
2	/A (/DATA)	In (Out)	Incremental encoder /A phase (Absolute encoder /DATA)
3	B (CLK)	In (Out)	Incremental encoder B phase (Absolute encoder CLK)
4	/B (/CLK)	In (Out)	Incremental encoder /B phase (Absolute encoder /CLK)
5	Z	In	Incremental encoder Z phase
6	/Z	In	Incremental encoder /Z phase
7	U	In	CS signal U phase
8	/U	In	CS signal /U phase
9	V	In	CS signal V phase
10	/V	In	CS signal /V phase
11	W	In	CS signal W phase
12	/W	In	CS signal /W phase
13	EVCC	Out	DC5V±5% (max. 500mA)
14	EGND	－	0V
15	NC	－	(Not connected)
16	NC	－	(Not connected)
17	NC	－	(Not connected)
18	FG	－	Frame ground

6. Connector variety

CN4 External connection

① [MC－200－7220A] Digital / analogue input / output specification

Model: 10236-5212PL (by 3M)

(Compatible connector model: 10136-3000PE (by 3M) or equivalent)

Pin No.	Signal name	In / Out	Remarks
1	CW	In	CW command pulse input +
2	/CW	In	CW command pulse input -
3	CCW	In	CCW command pulse input +
4	/CCW	In	CCW command pulse input -
5	IF＋V	In	For interface DC 5V～24V
6	SVON	In	Servo ON (Active Low)
7	RES	In	Alarm reset (Active Low)
8	DIN1	In	General input 1 (Active Low, content parameter switch)
9	DIN2	In	General input 2 (Active Low, content parameter switch)
10	DIN3	In	General input 3 (Active Low, content parameter switch)
11	DIN4	In	General input 4 (Active Low, content parameter switch)
12	RDY	Out	Servo ready (Active Low)
13	ALM	Out	Alarm (Active Low)
14	INP	Out	Positioning completed (Active Low)
15	DOUT	Out	General output (Active Low, content parameter switch)
16	IF0V	－	For interface GND
17	AREF	In	For analogue command input DC－5V～5V
18	AGND	－	For analogue command input, analogue monitor GND
19	MON1	Out	Analogue monitor 1 (content parameter switch)
20	MON2	Out	Analogue monitor 2 (content parameter switch)
21	MON3	Out	Analogue monitor 3 (content parameter switch)
22	MON4	Out	Analogue monitor 4 (content parameter switch)

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6. Connector variety

① [MC－200－7220A] Digital / analogue input / output specification (continued)

Pin No.	Signal name	In / Out	Remarks
23	OUT_A	Out	Encoder signal output Incremental-A phase+
24	OUT_/A	Out	Encoder signal output Incremental-A phase-
25	OUT_B	Out	Encoder signal output Incremental-B phase+
26	OUT_/B	Out	Encoder signal output Incremental-B phase-
27	OUT_Z	Out	Encoder signal output Incremental-Z phase+ or Absolute-position information signal+
28	OUT_/Z	Out	Encoder signal output Incremental-Z phase- or Absolute-position information signal-
29	EVCC	Out	For encoder signal DC5V±5%
30	EGND	－	For encoder signal GND
31	NC	－	(Not connected)
32	NC	－	(Not connected)
33	NC	－	(Not connected)
34	NC	－	(Not connected)
35	NC	－	(Not connected)
36	NC	－	(Not connected)

6. Connector variety

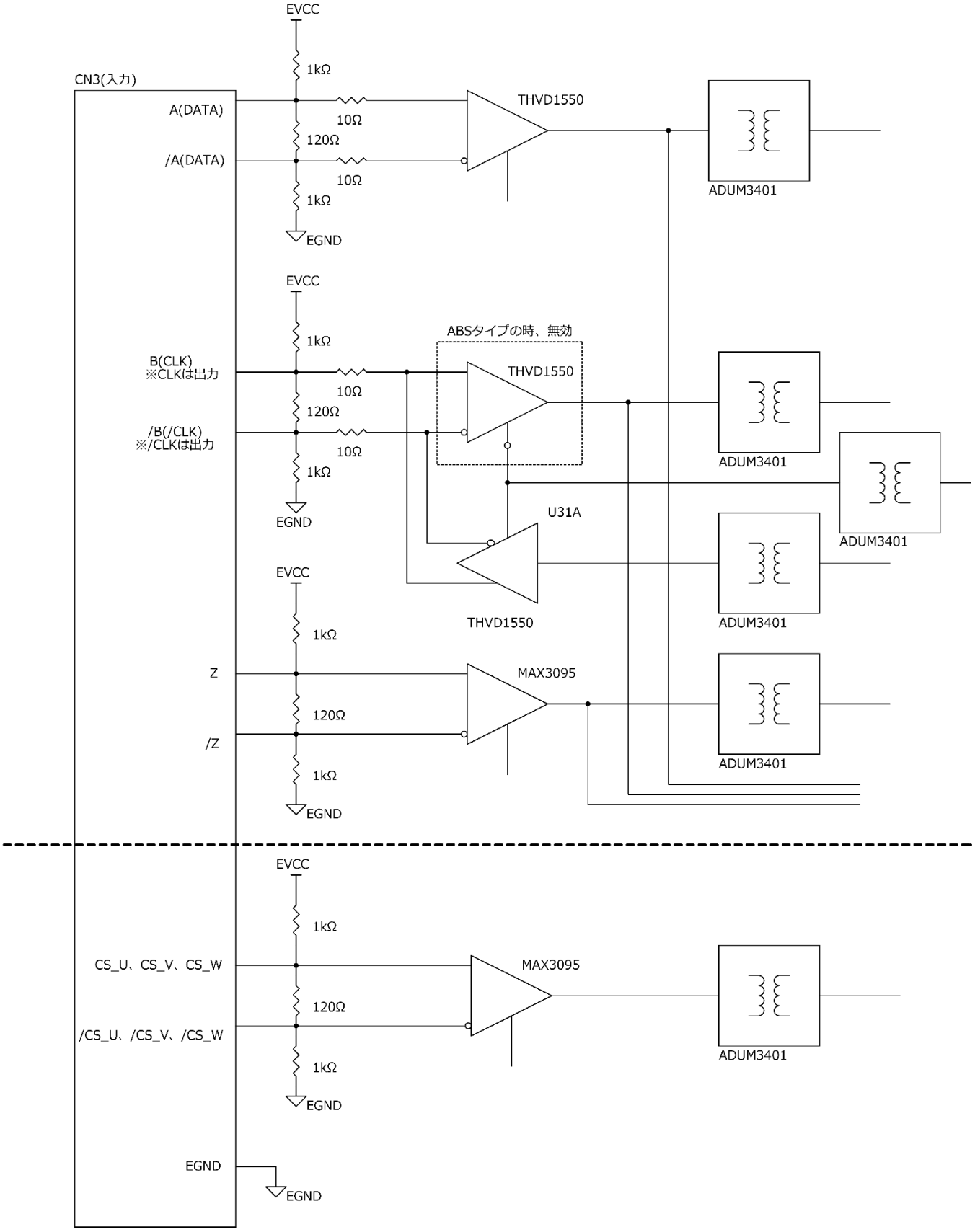
② [MC－200－7220D] SPI communication specification

Model: RJ-45 jack

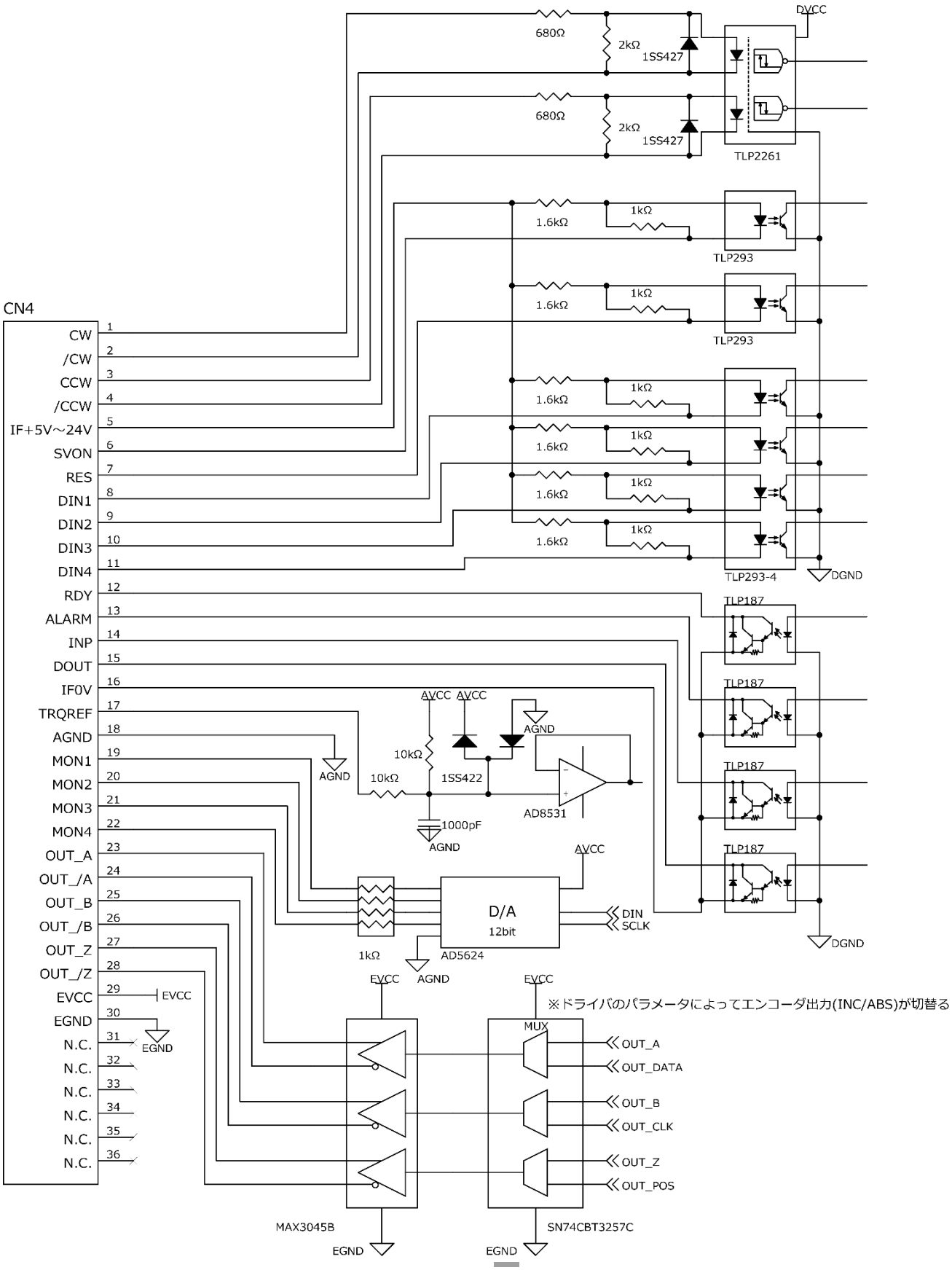
(Compatible connector model: RJ-45 plug)

Pin No.	Signal name	In / Out	Remarks
1	MISO	Out	Data transmission signal (slave specification)
2	SCLK	In	Clock signal
3	MOSI	In	Data reception signal (slave specification)
4	VCC	Out	DC5V
5	NC	－	(Not connected)
6	SCS	In	Chip select signal
7	GND	－	0V
8	NC	－	(Not connected)

7. Interface circuit



7. Interface circuit



8. Protection function (alarm)

Content	7SEG Display	Parameter Driver status	Remarks
Overload error	1 (flashing)	1st bit = 1	Alarm Maximum current output time exceeds parameter-designated time (What to do: Re-adjust)
Encoder error	2 (flashing)	2nd bit = 1	Alarm Encoder disconnection detection (What to do: Check encoder and wiring)
(Reserved)		3rd bit = 1	
Access error	4 (flashing)	4th bit = 1	Alarm Read-write defect of EEPROM (What to do: Repair circuit board)
Overspeed	5 (flashing)	5th bit = 1	Alarm Motor speed exceeds parameter-designated speed (need: verify parameter setting)
Overcurrent error	6 (flashing)	6th bit = 1	Alarm Abnormal maximum rated current of driver output current (What to do: Inspect overload current)
Excessive position error	7 (flashing)	7th bit = 1	Alarm Position error exceeds parameter-designated value (What to do: Re-adjust)
CS signal error	8 (flashing)	8th bit = 1	Alarm Magnetic pole detection failure (What to do: Inspect encoder and wiring / adjust parameter / verify load status)
(Reserved)		9th bit = 1	
Overvoltage error	A (flashing)	10th bit = 1	Alarm More than 76 V power source voltage (What to do: Reset to restore)
Low voltage error	B (flashing)	11th bit = 1	Alarm More than 10 V power source voltage (What to do: Reset to restore)
Communication error	C (flashing)	12th bit = 1	Alarm Unable to communicate with exterior (What to do: Reset to restore)
Electric thermal error	D (flashing)	13th bit = 1	Alarm Driver's output current exceeds parameter-designated value (What to do: Inspect overload current)
Emergency stop	E (flashing)	14th bit = 1	Alarm External input HardStop = ON (What to do: Turn HardStop=OFF and then restore with alarm reset)

8. Protection function (alarm)

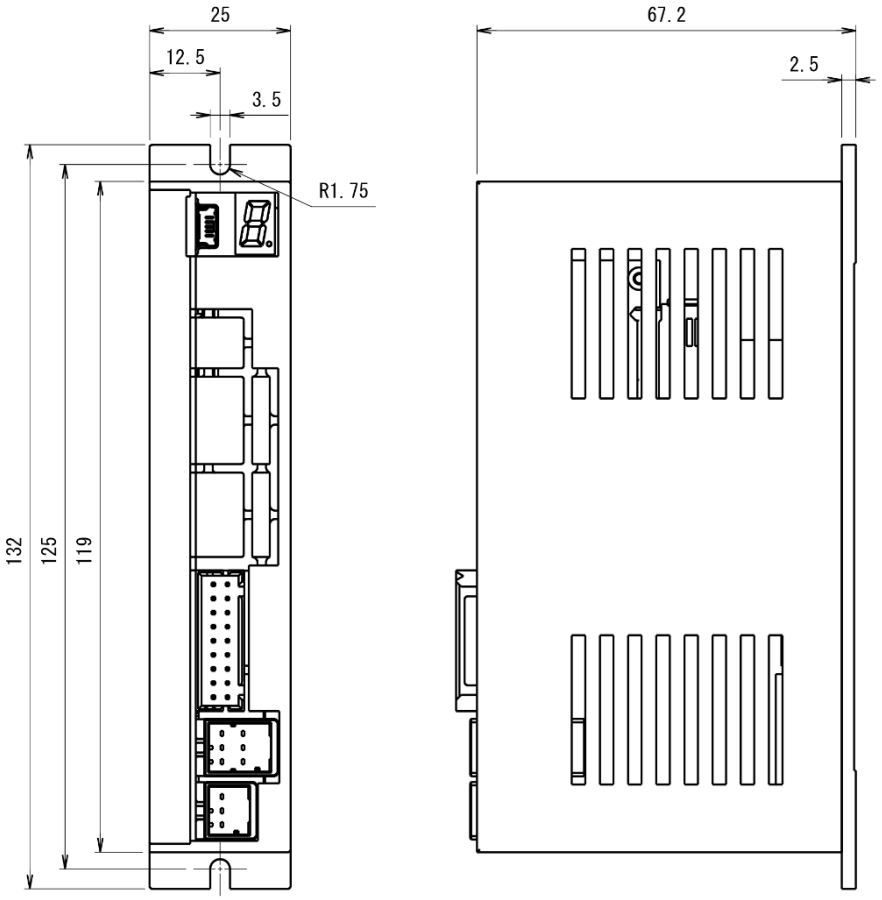
Content	7SEG Display	Parameter Driver status	Remarks
ABS setting error	F (flashing)	15th bit = 1	Alarm There is a variance between the data length by parameter setting and actual data length (What to do: Verify encoder setting)
(Reserved)		16th bit = 1	
+ side limit	1	17th bit = 1	Limit alarm Command position CW side Software limit out of range
- side limit	2	18th bit = 1	Limit alarm Command position CCW side Software limit out of range
Counter overflow	3	19th bit = 1	Limit alarm Count accumulated value ±32bit out of range
Return-to-origin error	4	20th bit = 1	Limit alarm Return-to-origin failure / unable to execute return-to-origin
No reception of ABS valid data	5	21st bit = 1	Limit alarm Absolute encoder signal reception failure
(Reserved)		22nd bit = 1	
(Reserved)		23rd bit = 1	
(Reserved)		24th bit = 1	
(Reserved)		25th bit = 1	
(Reserved)		26th bit = 1	
(Reserved)		27th bit = 1	
(Reserved)		28th bit = 1	
(Reserved)		29th bit = 1	
(Reserved)		30th bit = 1	
Positioning completion error	G (flashing) G	31st bit = 1	Alarm Limit alarm Switch alarm / limit alarm at parameter #400
Oscillation error	H (flashing) H	32nd bit = 1	Alarm Limit alarm Switch alarm / limit alarm at parameter #400

* 7SEG display: Normal time “0”, servo ON “0. ”

* With alarm, it will automatically turn servo OFF, with limit alarm, servo stays ON

9. Outside drawing

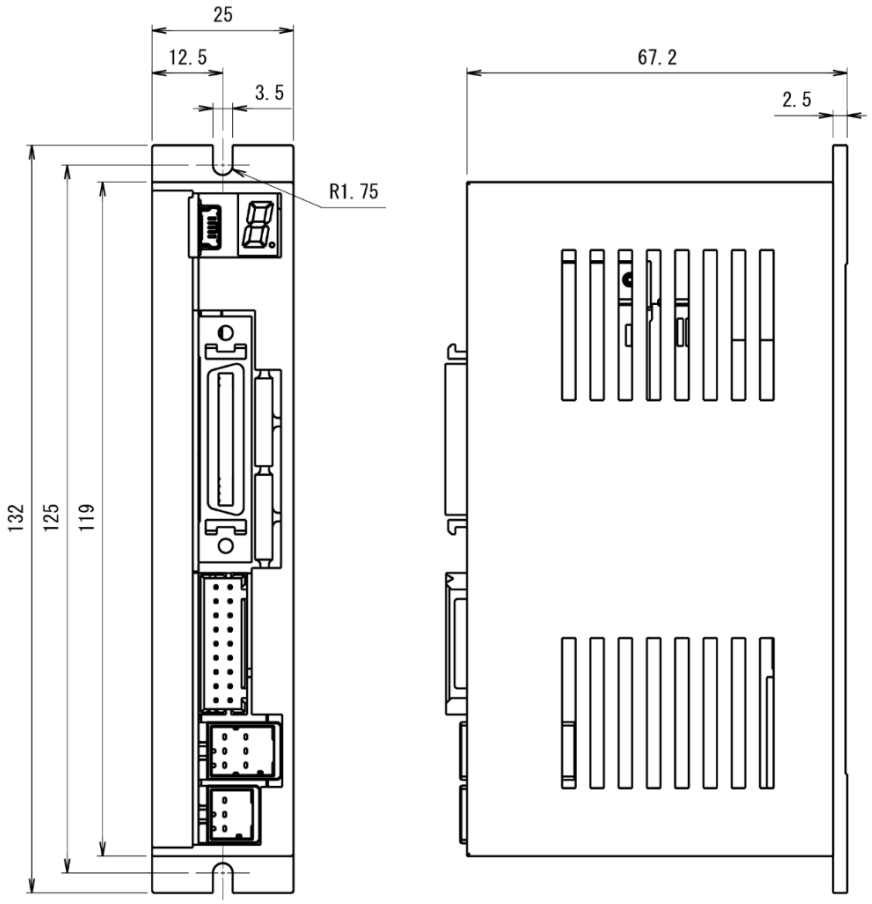
① [MC－200－7220] No external connection specification



・Faceplate display —	・Remarks * No. indicates our lot number 1) Alphabet (A-L) ..... production date A: January B: February | 2) Number (0-9) .....production year 0: 2020 1: 2021 | Example. A0. .....produced in January 2020 ↑ RoHS command mark ". "

9. Outside drawing

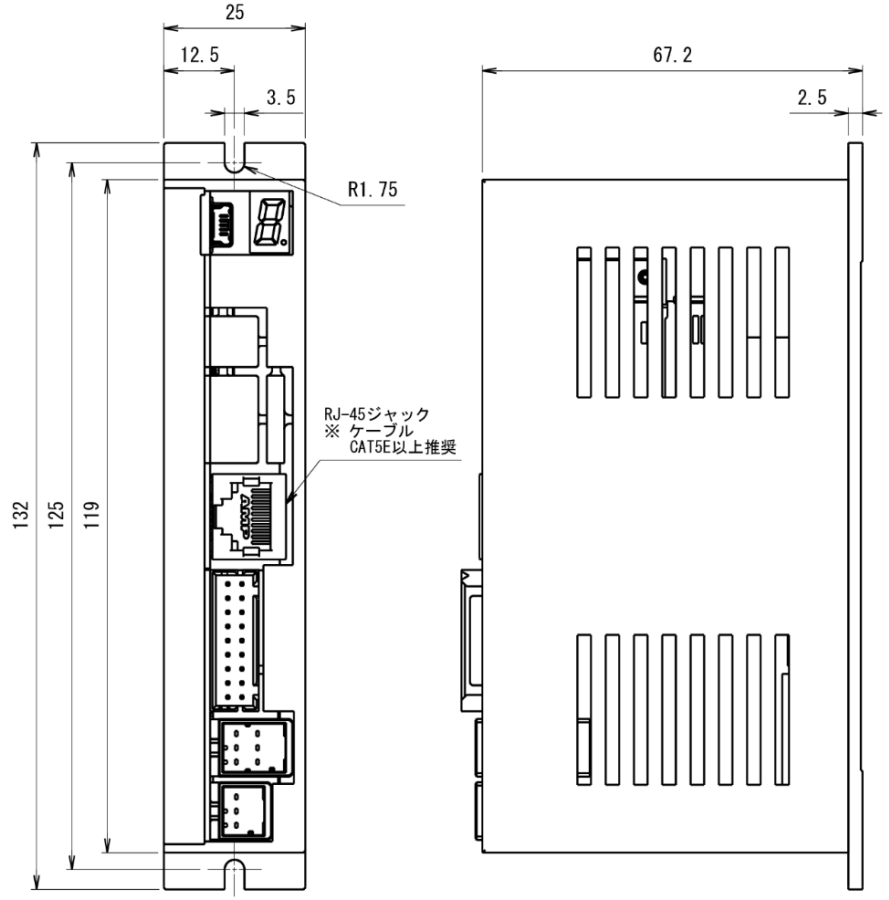
② [MC－200－7220A] Digital / analogue input / output specification



・Faceplate display —	・Remarks * No. indicates our lot number 1) Alphabet (A-L) ..... production date A: January B: February | 2) Number (0-9) .....production year 0: 2020 1: 2021 | Example. A0. .....produced in January 2020 ↑ RoHS command mark ". "

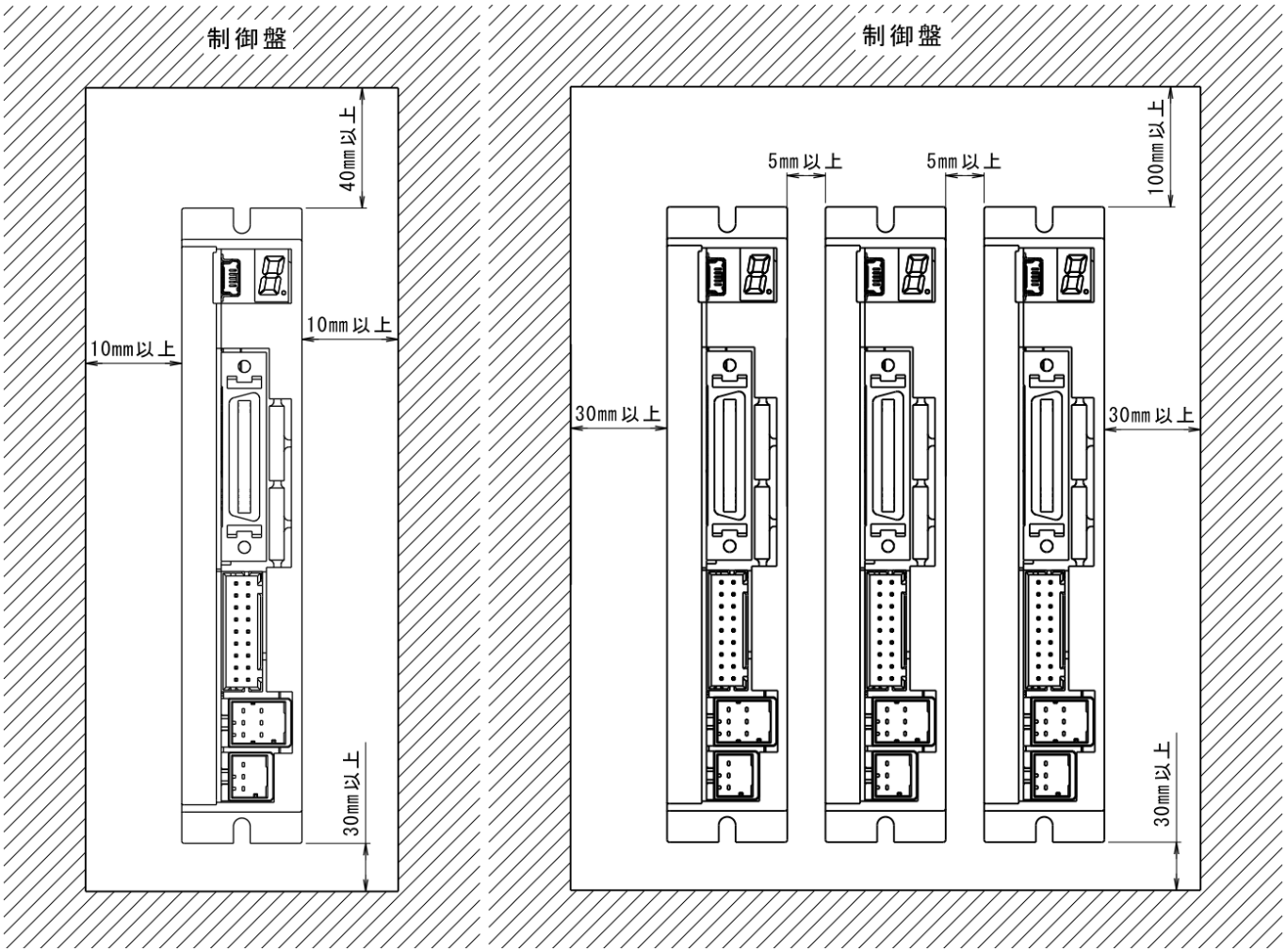
9. Outside drawing

③ [MC－200－7220D] SPI communication specification



・Faceplate display —	・Remarks * No. indicates our lot number 1) Alphabet (A-L) ..... production date A: January B: February | 2) Number (0-9) .....production year 0: 2020 1: 2021 | Example. A0. .....produced in January 2020 ↑ RoHS command mark “. “

10. Installment



① In case of installing 1 device

② In case of installing several devices

・Please install with the distance between driver and the inner face of control panel as described in the figure.

・Please be careful that temperature inside control panel won't get too high and take measure such as to install cooling fan in control panel.

・In case you install driver in standing position like in this figure, please install in position that CN1 connector will be at the bottom.

11. Remarks and precautions at usage

(1)Some part of the contents of these specifications are subject to change without notice for performance improvement etc.

(2)Please contact us in advance if the product is to be used outside the scope of the specifications.

(3)Completed equipment's compliance with the standards, laws and regulations must be verified by your company.

(4)In the event of a defect, it shall be resolved and implemented after consultation with both parties based on the items listed in this specification.

(5)Although every effort has been made to ensure the quality of this product, malfunctions of your company's completed equipment may occur due to malfunctions of our products (e.g., signal breakage, signal loss phase, etc.) or unexpected external noise or static electricity application that may cause abnormal operation. We ask for your consideration for fail-safe design and safety within the operational envelope of your company's operation site.

(6)This product is not equipped with a protective device. Provide appropriate protection by using an overcurrent protection / a circuit breaker / a temperature rise prevention device / an emergency stop device etc.

(7)Noise-proof property may be affected by wiring conditions (grounding method, cable length, signal line shielding, etc.). Please check the noise-proof property of your completed equipment.

(8)Never use this product in a place where it is exposed to water, grinding oil or other liquids, oil mist, chips or other foreign objects, or in an atmosphere of corrosive gas (H2S, SO2, NO2, C12, etc.) or flammable gas, or near flammable materials.

(9)Despite our best efforts to ensure the quality of this product, there is a possibility that it may operate out of specification due to unexpected external noise (including radiation) / static electricity application / abnormalities in the input power supply, wiring or parts etc. Please ensure sufficient safety against unexpected operations.

(10)When using this product in combination with other products, please check the specifications of the corresponding product before use.

(11)When connecting the motor lead wires, encoder lead wires, driver connections, etc., and adjusting the servo gain, have a full-time person perform the wiring and adjust the servo gain to prevent

miswiring.

(12) This product is designed for general industrial applications. Please note that these products are not designed for use in life-threatening equipment or special environments, such as nuclear control, aerospace equipment, transportation, medical equipment, various safety devices, or equipment requiring cleanliness.

(13) For more information on the product's warranty period and coverage, please refer to the enclosed instruction manual. On the condition that the product is used in accordance with each item in the instruction manual, our warranty covers 18 months after delivery (one year after the start of use) or 2000 hours of operation time for the product in question, whichever comes first. If the product fails due to a manufacturing defect during the above warranty period, our company will repair or replace the product at its own risk. We will not be responsible for any damage caused by the failure of the product in question, or the man-hours and costs associated with removal and installation of the product from the actual machine.

(14) Please contact us at the following address, as we will respond in good faith to any malfunction or failure to diagnose the problem, including products beyond the warranty period.

Contact: Microtech Laboratory Inc. Sales department
TEL:042-746-0123　e-mail:mtl@mtl.co.jp