



ZEF005330304

For Iron and Steel Industry

byocoder®

Pulse Converter

NPG-220HZAL8

Specifications & Instruction Manual

Applicable sensor
VLS-8SM



GENERAL SAFETY RULES



(Please read this safety guide carefully before operation)

Thank you very much for purchasing our product. Before operating this product, be sure to carefully read this manual so that you may fully understand the product, safety instructions and precautions.

- Please submit this manual to the operators actually involved in operation.
- Please keep this manual in a handy place.



Signal Words

Safety precautions in this guide are classified into DANGER and CAUTION.

Symbol	Meaning
 DANGER	Incorrect handling may cause a hazardous situation that will result in death or serious injury.
 CAUTION	Incorrect handling may cause a hazardous situation that will result in moderate injury or physical damage.

Instructions accompanied by a symbol  may also result in serious damage or injury. Be sure to follow the all instructions accompanied by the symbol.

Graphic Symbols







Symbol	Meaning
	Indicates prohibited items.
	Indicates items that must be performed to.




Application Limitation

This product is not designed to be used under any situation affecting human life. When you are considering to use this product for special purposes such as medical equipment, aerospace equipment, nuclear power control systems, traffic systems, and etc., please consult with NSD.




This product is designed to be used under the industrial environments categorized in Class A device. The supplier and user may be required to take appropriate measures.

1. Handling Precautions



 DANGER	
	- Do not touch components inside of the controller; otherwise, it will cause electric shock.
	- Do not damage the cable by applying excessive load, placing heavy objects on it, or clamping; otherwise, it will cause electric shock or fire.
	- Turn the power supply OFF before wiring, transporting, and inspecting the controller; otherwise, it may cause electric shock.
	- Provide an external safety circuit so that the entire system functions safely even when the controller is faulty.
	- Connect the grounding terminal of the controller; otherwise, it may cause electric shock or malfunction.

 CAUTION	
	- Do not use the controller in the following places; water splashes, the atmosphere of the corrosion, the atmosphere of the flammable vapor, and the side of the combustibility. Doing so may result in fire or the controller may become faulty.
	- Be sure to use the controller and the ABSOCODER sensor in the environment designated by the general specifications in the manual. Failure to do so may result in electric shock, fire, malfunction or unit failure. - Be sure to use the specified combination of the ABSOCODER sensor, controller and sensor cable; otherwise, it may cause fire or controller malfunction.




2. Storage

 CAUTION	
	- Do not store the controller in a place exposed to water, or toxic gas and liquid.
	- Be sure to store the controller in designed temperature and humidity range, and do not expose to direct sunlight. - Be sure to consult with NSD when the controller is stored for long periods.



3. Transport



 CAUTION	
	- Do not hold the cable or shaft of ABSOCODER sensor during transport; otherwise, it will cause injury or controller malfunction.

4. Installation




 CAUTION	
	- Do not step on the ABSOCODER sensor or place heavy objects on the controller; otherwise, it will cause injury. - Do not block the exhaust port or allow any foreign matter to enter the controller; otherwise, it will cause fire or unit failure.
	- Be sure to secure the controller and ABSOCODER sensor with the provided brackets; otherwise, it may cause malfunction, injury, or drop. - Be sure to secure the specified distance between the main body and the control panel or other equipments; otherwise, it may cause malfunction.

5. Wiring




 DANGER	
	- Be sure to secure the terminal block firmly; otherwise, it may have risk of fire. - Be sure to mount the terminal cover provided with the controller, before supplying the power, starting operation after the installation, and wiring; otherwise, it may cause electric shock.

 CAUTION	
	- Be sure to keep the sensor cable, control cable, and communication cable at least 300 mm away from the main circuit and power line; otherwise it may cause injury or malfunction. - Be sure to connect all cables correctly; otherwise, it may cause injury or controller malfunction. - Be sure to firmly connect the external I/O connectors and sensor connectors; otherwise, it may cause incorrect inputs and outputs or injury.

6. Operation

 CAUTION	
	- Do not change the controller's function switch settings during the operation; otherwise, it will cause injury. - Do not approach the machine after instantaneous power failure has been recovered. Doing so may result in injury if the machine starts abruptly, it will cause injury.
	- Be sure to check that the power supply specifications are correct; otherwise, it may caused controller failure. - Be sure to provide an external emergency stop circuit so that operation can be stopped with power supply terminated immediately. - Be sure to conduct independent trial runs for the controller before mounting the controller to the machine; otherwise, it may cause injury. - When an error occur, be sure to eliminate the cause, ensure safety, and reset the error before restarting operation; otherwise, it may cause injury.

7. Maintenance And Inspection

 CAUTION	
	- Do not disassemble, remodel, or repair the unit; otherwise, it will cause electric shock, fire, and unit malfunction.
	- The capacitor of the power line deteriorates through prolonged use. We recommended that the capacitor be replaced every five years to prevent secondary damage.

8. Disposal

 CAUTION	
	- Be sure to handle the controller as industrial waste while disposing of it.

REVISION HISTORY

The Document No. appears at the upper right of this manual's cover page.

Document No.	Date	Revision Description
ZEF005330300	25, Oct., 2012	1st Edition Japanese document: ZEF005330100
ZEF005330301	11, Jun., 2013	2nd Edition Japanese document: ZEF005330101
ZEF005330302	21, Jul., 2015	3rd Edition Japanese document: ZEF005330102
ZEF005330303	14, Mar., 2016	4th Edition Japanese document: ZEF005330103
ZEF005330304	26, May, 2022	5th Edition Japanese document: ZEF005330104

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1. OVERVIEW

NPG-220HZAL8 converter is combined with the linear type of ABSOCODER sensor "VLS-8SM", and it can be connected to two of "VLS-8SM".

Detected positions are output as the up/down pulse or A/B pulse.

The converter outputs 1 pulse when the ABSOCODER sensor travels 1 μ m.

1-1. Features

(1) High resolution

The resolution is minimum 1 μ m per pulse by combining with VLS-8SM.

(2) Compact design

The unit's outside dimensions (39(W) x 155(H) x 93(D)) were miniaturized, and the shape of case is a bookshelf type. DIN rail mounting is also possible.

(3) Settable pulse division and width

The resolution per pulse can be selected from 4 settings by switching the function selector switch.

The up/down pulse can change the pulse width.

Settings of the pulse division and width can be selected for each axis.

(4) Error detection function

The error content can be checked by a converter monitor "LED" when an error occurs.

A status output is also provided, enabling reading to a host controller (PLC, etc.).

(5) Limit detection function for the sensor position

The external input of the converter has the limit error function (LE). The converter can read an error such as an over travel by inputting the signal of the limit switch which is mounted on the cylinder. This error is output as an integrated alarm signal (ALM) of the external output.

(6) Solution of the pulse missing

If the ABSOCODER sensor travel exceeds the pulse output permissive speed, pulses will not be output.

The pulses which aren't output during that time can be stored. Even though the pulse output error (PE) is output, stored pulses are output when the ABSOCODER sensor travel speed is back to the range of the pulse output permissive speed.

This motion is corresponding to both up/down pulse and A/B phase pulses.

(7) Compliance with CE standards

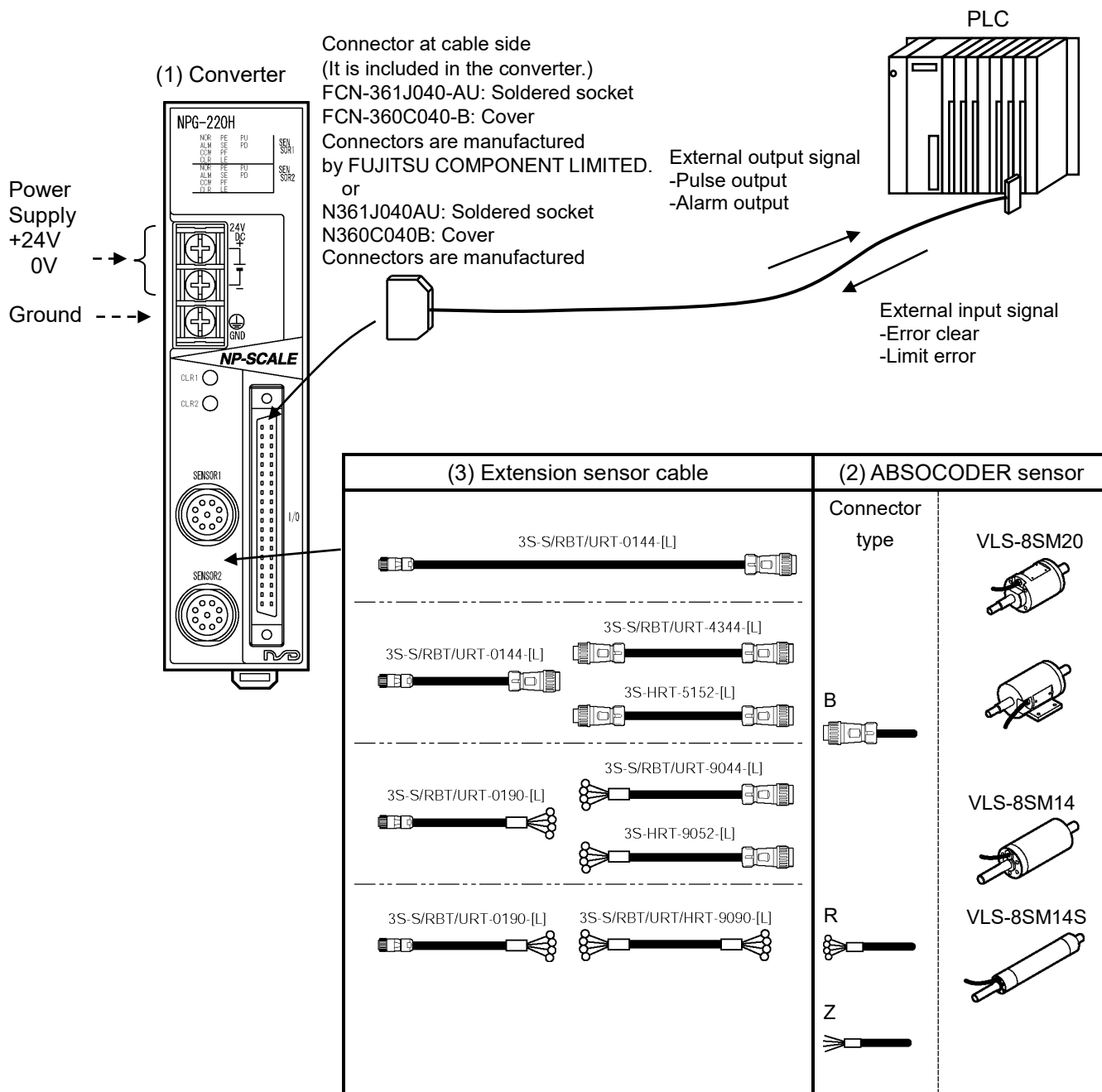
The converter complies with CE (EMC Directive) standards.

2. CONFIGURATION

Indicates the configuration of NPG-220HZAL8.

Contact your NSD representative for details of ABSOCODER sensor and the extension sensor cable.

● Connection configuration



● Model List

No.	Items	Models	Descriptions	
(1)	Converter	NPG-220HZAL8		
(2)	ABSOCODER sensor (Linear type)	VLS-8SM20-[1]FA[2][L]	Flange-mount type	[1]: Stroke VLS-8SM20: 50, 100, 150, 200, 250, 300, 350 VLS-8SM14(S): 50, 100, 150, 200 [2]: Connector type B: Standard connector (NJW-2012PM8, manufacturer: Nanaboshi Electric Mfg.Co.,Ltd.) Contact your NSD representative for VLS-8SM14 and VLS-8SM14S. R: Crimping terminals (R1.25-4) Z: No connector [L]: Interconnecting sensor cable length (m): 2, 5,10, 20
		VLS-8SM20-[1]LA[2][L]	Base-mount type	
		VLS-8SM14-[1]FB[2][L]	Flange-mount type	
		VLS-8SM14S-[1]FB[2][L]	Flange-mount type	
(3)	Extension sensor cable	3S-S-0144-[L]	Standard cable, standard connector	
		3S-RBT-0144-[L]	Robotic cable, standard connector	
		3S-URT-0144-[L]	Semi-heat-resistant robotic cable, standard connector	
		3S-S-4344-[L]	Standard cable, standard connector	
		3S-RBT-4344-[L]	Robotic cable, standard connector	
		3S-URT-4344-[L]	Semi-heat-resistant robotic cable, standard connector	
		3S-HRT-5152-[L]	Heat-resistant robotic cable, standard connector	
		3S-S-0190-[L]	Standard cable, crimping terminal	
		3S-RBT-0190-[L]	Robotic cable, crimping terminal	
		3S-URT-0190-[L]	Semi-heat-resistant robotic cable, crimping terminal	
		3S-S-9044-[L]	Standard cable, crimping terminal	
		3S-RBT-9044-[L]	Robotic cable, crimping terminal	
		3S-URT-9044-[L]	Semi-heat-resistant robotic cable, crimping terminal	
		3S-HRT-9052-[L]	Heat-resistant robotic cable, crimping terminal	
		3S-S-9090-[L]	Standard cable, crimping terminal	
		3S-RBT-9090-[L]	Robotic cable, crimping terminal	
		3S-URT-9090-[L]	Semi-heat-resistant robotic cable, crimping terminal	
3S-HRT-9090-[L]	Heat-resistant robotic cable, crimping terminal			

3. SPECIFICATIONS

3-1. Converter Specifications

(1) General Specification

Items	Specifications
Power supply voltage	24VDC±10% (including ripple)
Power consumption	10W or less
Insulation resistance	20 M-Ohms or more between external DC power terminals and ground (by 500 VDC insulation resistance tester)
Withstand voltage	500 VAC, 60Hz for 1 minute between external DC power terminals and ground
Vibration resistance	20m/s ² 10 to 500Hz, 10cycles of 5 minutes in 3 directions, conforms to JIS C 0040 standard
Ambient operating temperature	0 to +55°C (No freezing)
Ambient operating humidity	20 to 90 %RH (No condensation)
Ambient operating environment	Free from corrosive gases and excessive dust
Ambient storage temperature	-10 to +70°C
Grounding	Must be securely grounded (ground resistance of 100 ohm or less)
Construction	Book-shelf type within enclosure, DIN rail mountable
Outside dimension (mm)	39(W) x 155(H) x 93(D) Refer to dimensions for details.
Mass	Approx. 0.4kg

(2) Performance Specification

Items	Specifications		
Converter model	NPG-220HZAL8		
Applicable sensor	VLS-8SM20	VLS-8SM14	VLS-8SM14S
Minimum resolution	1 μ m(8.192mm/8192 divisions)		
Position detection format	Semi-absolute format		
Pulse output format	Up/down or A/B phase pulse		
Min. pulse width/Max. repetition frequency (up/down)	0.1 μ s/5MHz (Following values are also settable: 0.2 μ s/2.5MHz, 0.4 μ s/1.25MHz, 0.8 μ s/0.625MHz)		
Pulse output permissible speed	4.5m/s (Resolution: 1 μ m, pulse frequency:5MHz)		
Number of detection axes	2		
Position data sampling time	0.2ms		
Status output signal	Integrated alarm: ALM pulse output error: PE sensor disconnected error: SE low power error: PF		
Input signal	Error clear: CLR limit error: LE		
Front panel function	Error clear		
Function selector switch (on rear face of product)	Pulse division	Up/down pulse	A/B phase pulse
		1/1, 1/2, 1/5, 1/10	1/1, 1/2, 1/4, 1/8
	Pulse width (up/down)	1 time, 2 times, 4 times, 8 times	
	Alarm setting when turning ON the power supply		
	Sensor travel direction setting		
Pulse output format setting (up/down pulse or A/B phase pulse)			
Monitor LED	System state monitor	System ready: NOR, integrated alarm: ALM, pulse output error: PE, sensor disconnected error: SE, low power error: PF, limit error: LE	
	Setting state monitor	Travel direction: CCW	
	Input state monitor	Error clear input: CLR	
	Output state monitor	Pulse output: PU, PD	
Applicable standard	CE Marking (EMC directive)		

(3) Input / Output Specification

Items		Specifications
Input	Input signals	1_CLR, 2_CLR (Error clear) 1_LE, 2_LE (Limmit error)
	Input circuit	DC input, photo-coupler isolation
	Input logic	Negative logic
	Rated input voltage	5VDC
	Rated input current	10mA (5VDC)
	ON voltage	3.5VDC or more
	OFF voltage	1VDC or less
Output	Output signals	1_ALM, 1_PE, 1_SE, 1_PF (Axis-1 error output) 2_ALM, 2_PE, 2_SE, 2_PF (Axis-2 error output)
	Output circuit	Photo-coupler isolation, transistor open collector output
	Output logic	Positive logic
	Rated load voltage	12/24VDC (10 to 30VDC)
	Max. load current	10mA / point
	Max. voltage drop when ON	0.8V
Pulse output	Signal name	1_PU+, 1_PU-, 1_PD+, 1_PD-, 1_B+, 1_B- (Axis-1 pulse output) 2_PU+, 2_PU-, 2_PD+, 2_PD-, 2_B+, 2_B- (Axis-2 pulse output)
	Output circuit	Photo-coupler isolation, line driver (AM26C31:T.I.)output
I/O circuit	<p>Axis-1 and Axis-2 are the same circuit configuration. The power supply of the Axis-1 is isolated from Axis-2.</p>	

3-2. ABSOCODER Sensor Specifications

(1) VLS-8SM20

Items		Specifications
Model		VLS-8SM20
Max. detection stroke		350 mm
Absolute detection range		8.192 mm
Resolution		1 μ m(8.192mm/8192)
Linearity error		Customer's Special Specifications
Mass	Head	4.5+0.15 x [cable length(m)] kg
	Rod	0.4+0.0025 x [stroke (mm)] kg
Sliding resistance		69 N or less (7kgf or less)
Permissible mechanical speed		1000 mm/s
Ambient temperature	Operating	-10 to +80°C
	Storage	-10 to +80°C
Ambient operating humidity		—
Vibration resistance		2.0 x 10 ² m/s ² (20G) 200Hz up/down 4h, forward/back/left/right 2h each, conforms to JIS D 1601 standard
Shock resistance		4.9 x 10 ³ m/s ² (500G) 0.5ms, up/down x 3 times, conforms to JIS C 5026 standard
Protection rating		IP67, conforms to JEM1030 standard
Interconnecting cable		2 · 5 · 10 · 20m
Max. sensor cable length	Standard cable	3S-S 200m
	Robotic cable	3S-RBT 100m
Surface	Head	Electroless nickel plated
	Rod	Hard chromium electro plated
Material	Head	Steel
	Rod	Steel

(2) VLS-8SM14, VLS-8SM14S

Items		Specifications	
Model		VLS-8SM14	VLS-8SM14S
Max. detection stroke		200 mm	
Absolute detection range		8.192 mm	
Resolution		1 μ m(8.192mm/8192)	
Linearity error		Customer's Special Specifications	
Mass	Head	1.1+0.07 x [cable length(m)] kg	0.8+0.07 x [cable length(m)] kg
	Rod	0.0012 x ([rod length (mm)]) kg	
Sliding resistance		15 N or less (1.5kgf or less)	
Permissible mechanical speed		1000 mm/s	
Ambient temperature	Operating	-10 to +80°C	
	Storage	-10 to +80°C	
Ambient operating humidity		—	
Vibration resistance		2.0 x 10 ² m/s ² (20G) 200Hz up/down 4h, forward/back 2h, conforms to JIS D 1601 standard	
Shock resistance		4.9 x 10 ³ m/s ² (500G) 0.5ms, up/down x 3 times, conforms to JIS C 5026 standard	
Protection rating		IP67, conforms to JEM1030 standard	
Interconnecting cable		2 · 5 · 10 · 20m	
Max. sensor cable length	Standard cable	3S-S 200m	
	Robotic cable	3S-RBT 100m	
Surface	Head	Electroless nickel plated	
	Rod	Hard chromium electro plated	
Material	Head	Steel	
	Rod	Steel	

3-3. Extension Sensor Cable Specification

Items	Specifications			
Model code	3S-S	3S-RBT	3S-URT	3S-HRT
Cable type	Standard cable	Robotic cable	Semi-heat-resistant robotic cable	Heat-resistant robotic cable
Diameter	$\phi 8$			$\phi 9.5$
Operating temperature range	-5~+60°C		-5~+105°C	0~+150°C
Insulator	Irradiated cross linked formed polyethylene	ETFE plastic (resin)		
Sheath	Polyvinyl chloride mixture		Heat-resistant polyvinyl chloride mixture	Fluonlex
Construction	7-core, 1 triple with shield + 2 pairs with shield			
Color of sheath	Dark brown	Blue		Black
Advantage	Extensible for long distances	Superior flexibility; ideal for moving place		Heat treatment and flexible; ideal for moving place

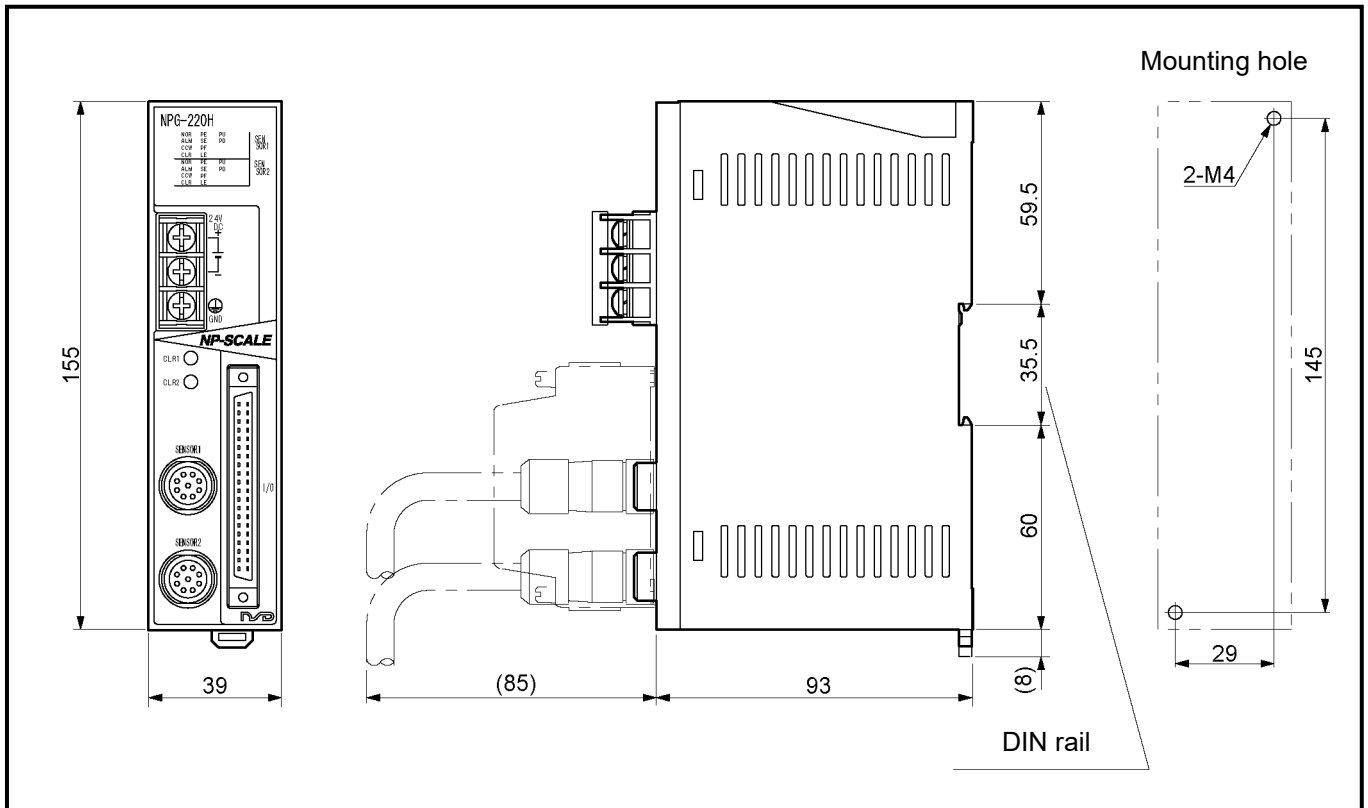
[Remark]

Contact your NSD representative when the extension cable combines different types of cables.

4. DIMENSIONS

4-1. Converter

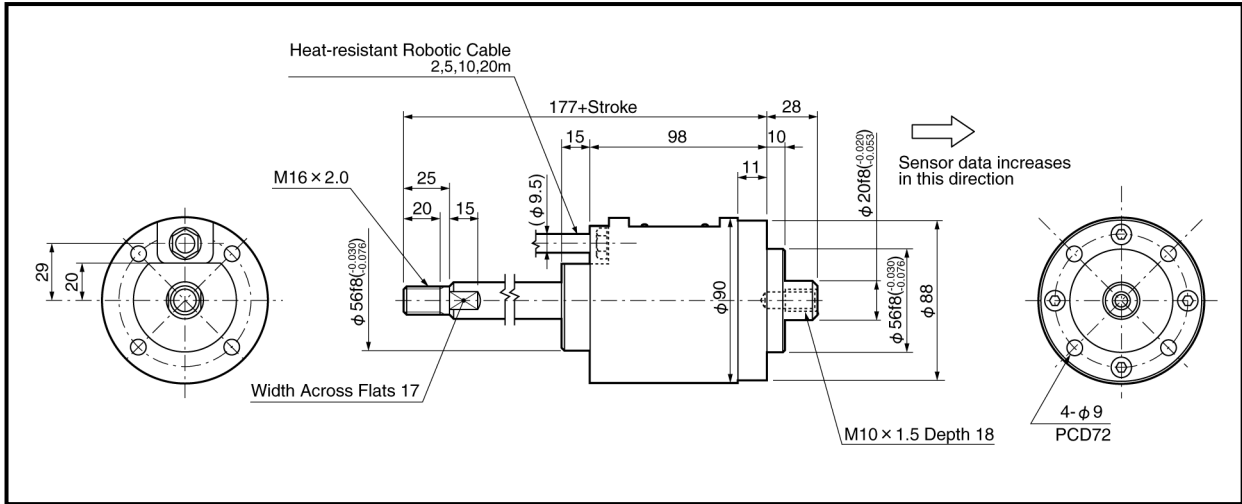
Units: mm



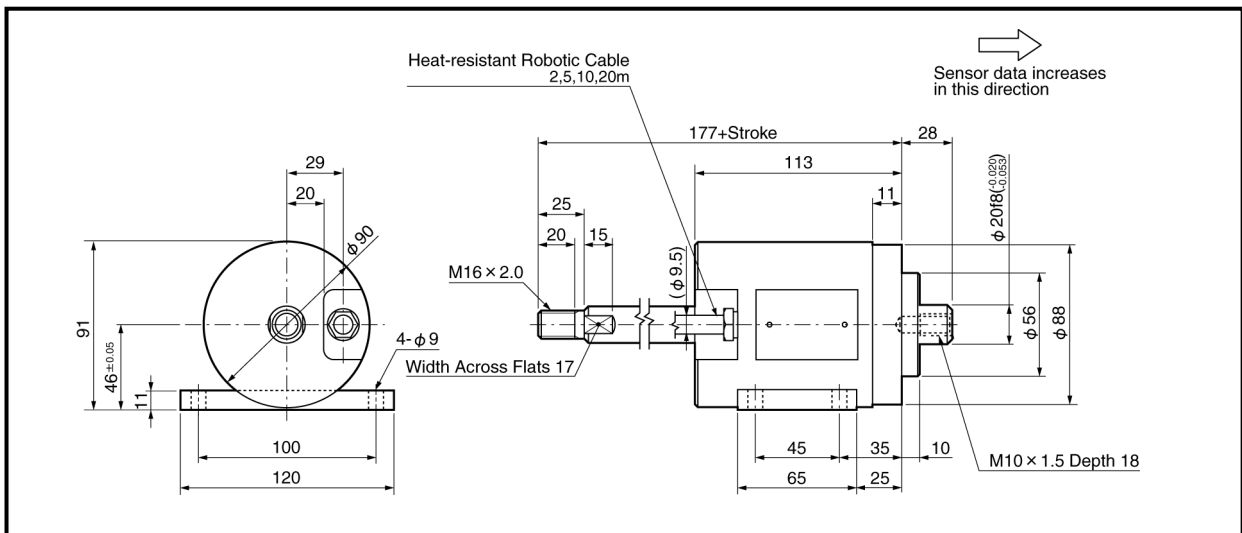
4-2. ABSOCODER Sensor

(1) VLS-8SM20-[]FA[] (Flange-mount type)

Units: mm

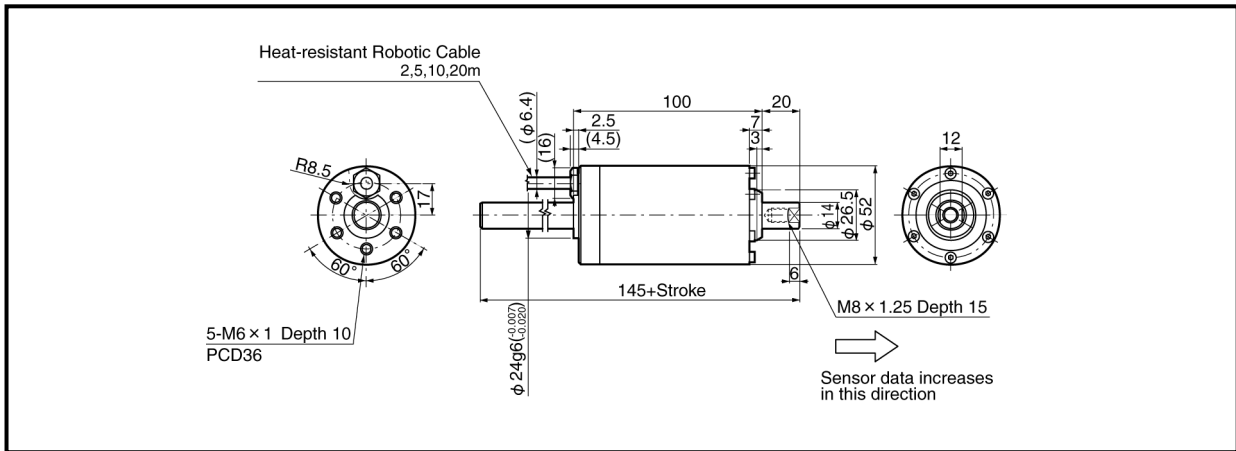


(2) VLS-8SM20-[]LA[] (Base-mount type)

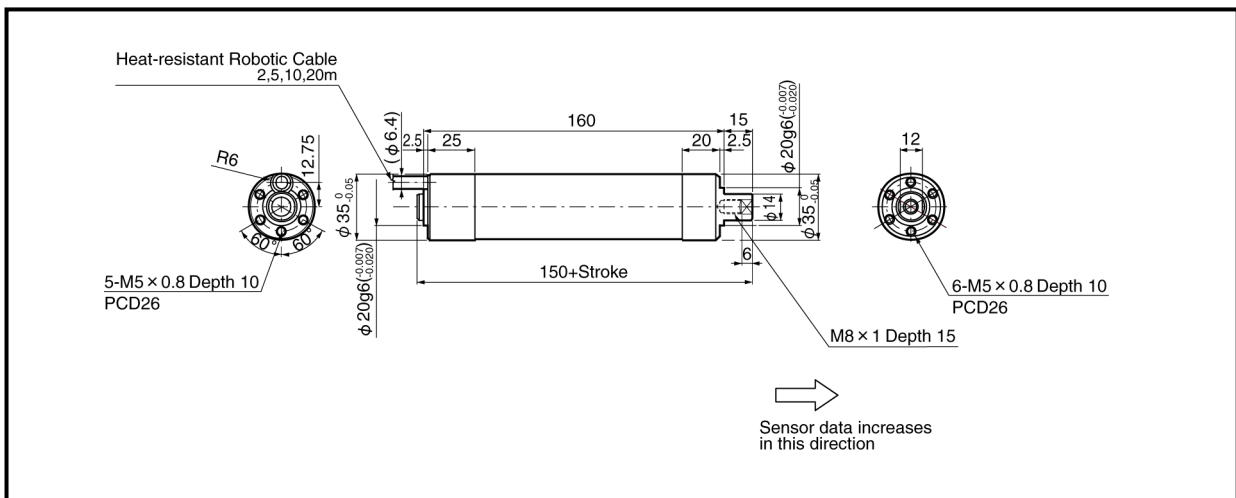


(3) VLS-8SM14-[]FB[] (Flange-mount type)

Units: mm



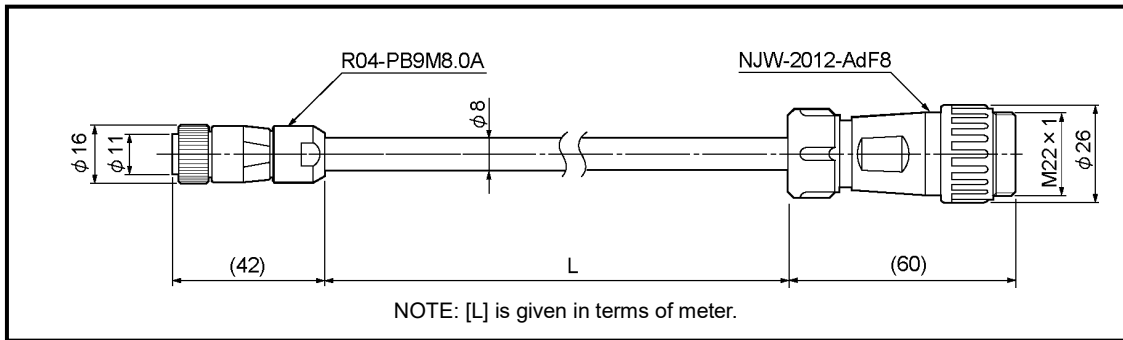
(4) VLS-8SM14S-[]FB[] (Flange-mount type)



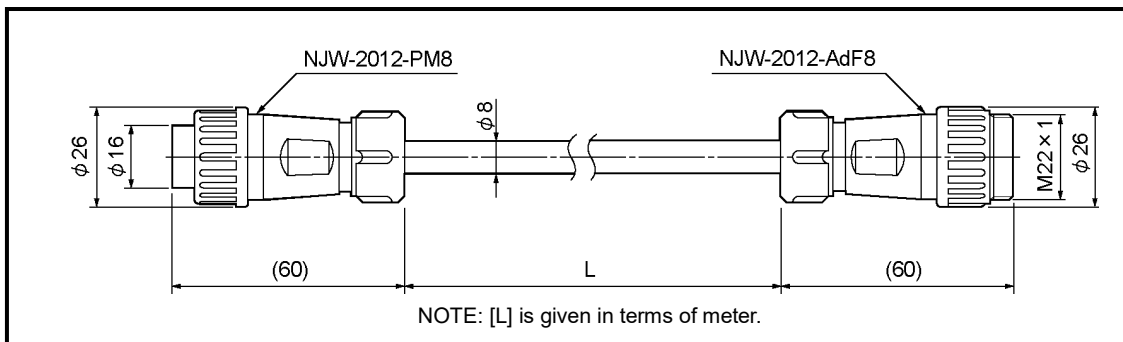
4-3. Extension Sensor Cable

(1) 3S-S-0144-[L] / 3S-RBT-0144-[L] / 3S-URT-0144-[L]

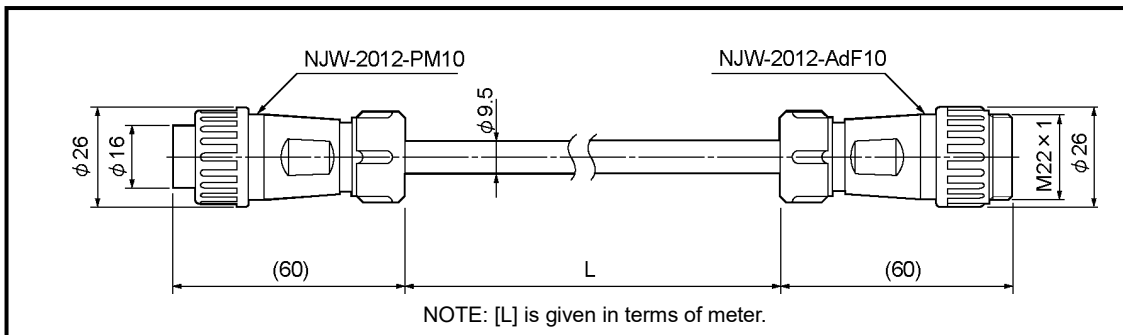
Units: mm



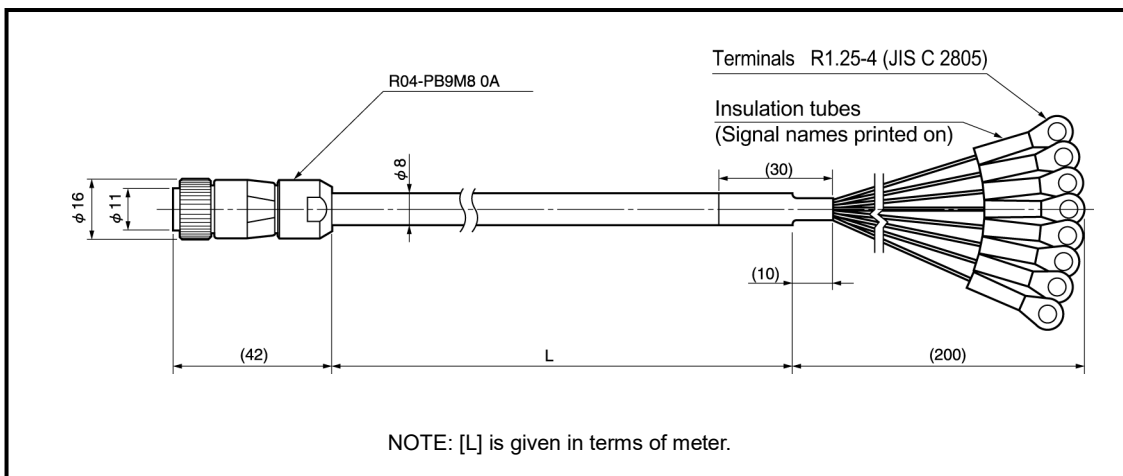
(2) 3S-S-4344-[L] / 3S-RBT-4344-[L] / 3S-URT-4344-[L]



(3) 3S-HRT-5152-[L]

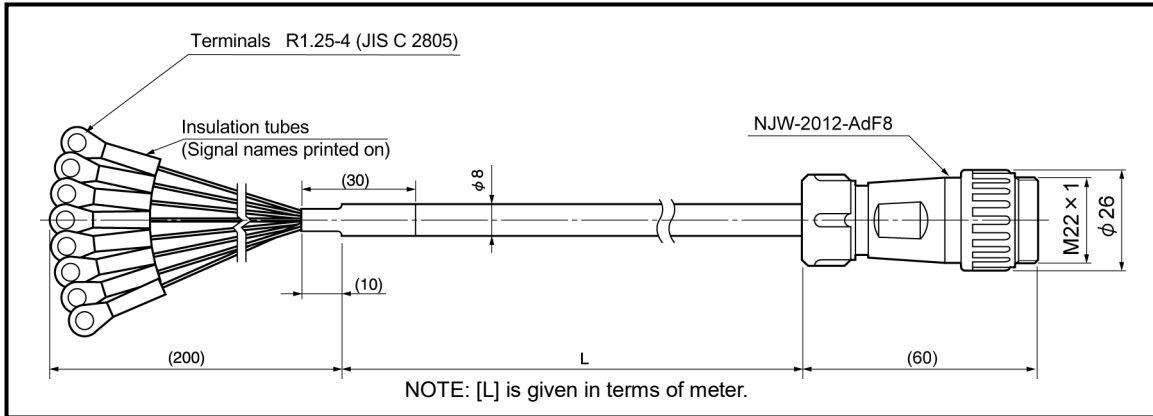


(4) 3S-S-0190-[L] / 3S-RBT-0190-[L] / 3S-URT-0190-[L]

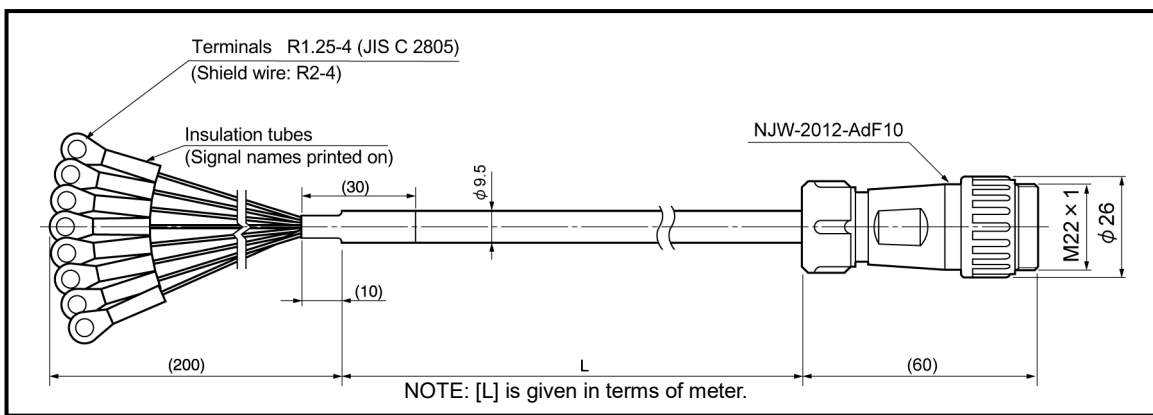


(5) 3S-S-9044-[L] / 3S-RBT-9044-[L] / 3S-URT-9044-[L]

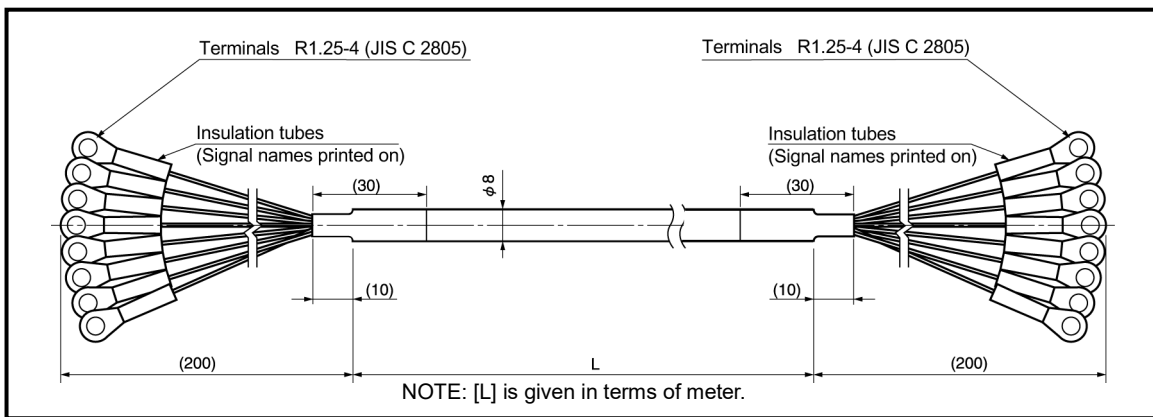
Units: mm



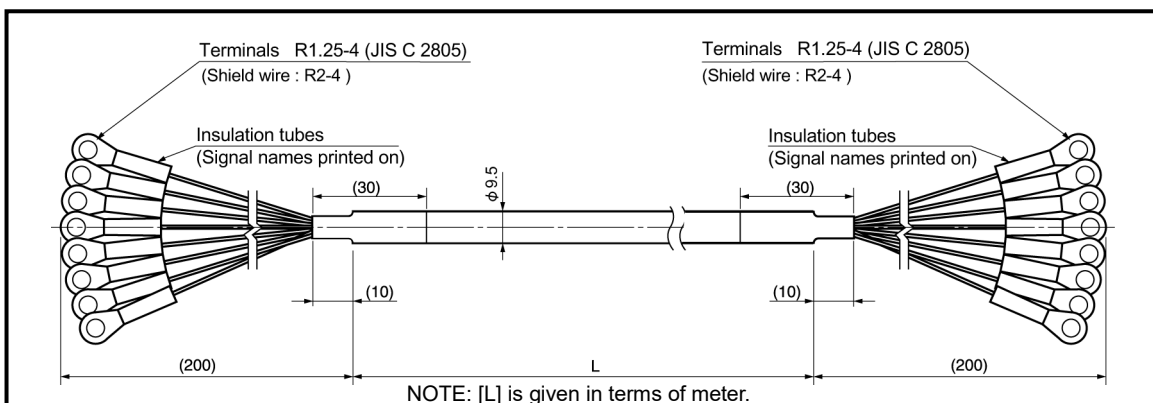
(6) 3S-HRT-9052-[L]



(7) 3S-S-9090-[L] / 3S-RBT-9090-[L] / 3S-URT-9090-[L]



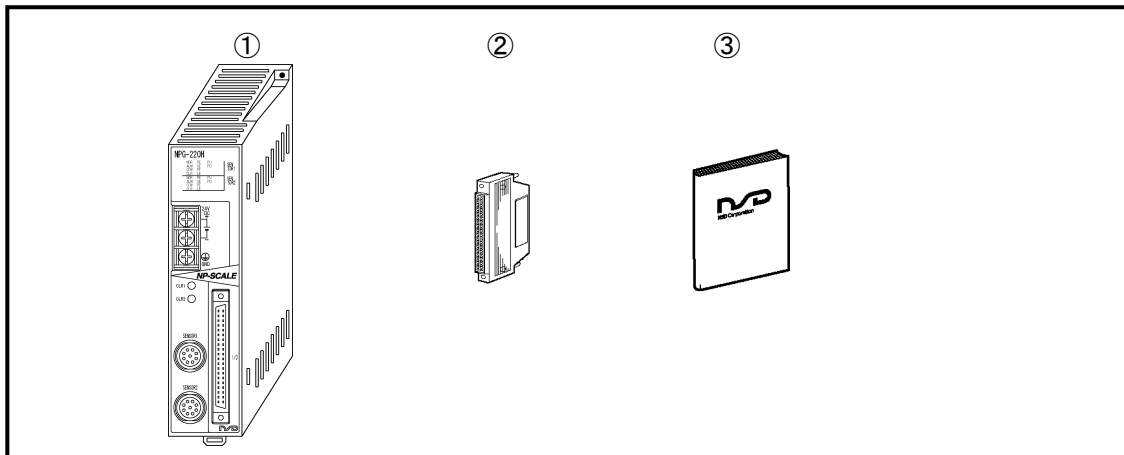
(8) 3S-HRT-9090-[L]



5. CHECKING THE CONTENTS OF THE SHIPPING CASE

Open the packing case, and verify that all items are present.

When extension sensor cables are ordered, they are packed separately.



① Converter 1 unit

② I/O connector 1 piece

Connector: FCN-361J040-AU / N361J040AU

Cover: FCN-360C040-B / N360C040B

Manufacturer: FUJITSU COMPONENT LIMITED / OTAX CO.,LTD.

③ Manual 1 piece

6. INSTALLATION

6-1. Converter Installation Conditions and Precautions

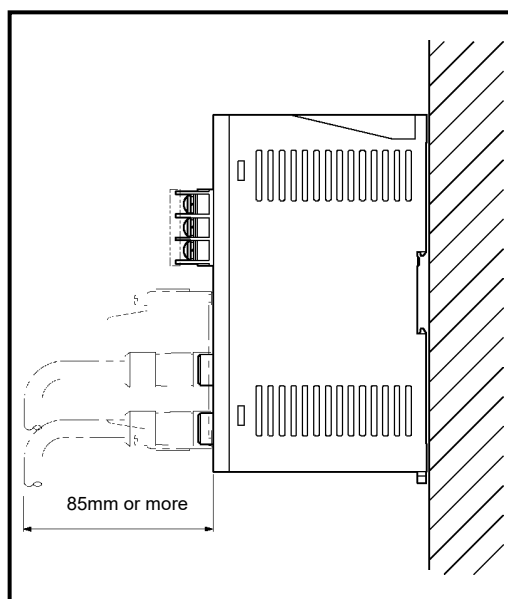
When installing the converter, the following conditions and precautions should be observed.

-Installation Site

- (1) Avoid sites where the unit is exposed to direct sunlight.
- (2) The ambient temperature should never exceed a 0 to 55°C range.
- (3) The ambient humidity should never exceed a 20 to 90% RH range.
- (4) Do not install the unit in areas where condensation is likely to occur (high humidity with extreme temperature changes).
- (5) Avoid sites where dust is excessive.
- (6) Do not install in areas with an excessive amount of salt and/or metal chips.
- (7) Do not install in areas where flammable and / or corrosive gases are present.
- (8) Avoid areas where splashing water, oil or chemicals are likely to occur.
- (9) Avoid areas where vibration and shocks are excessive.

-Installation cautions

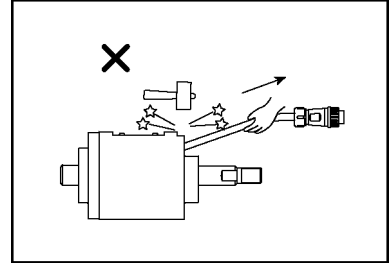
- (1) Install inside the control cabinet.
- (2) Install in a vertical direction so that the characters are visible.
- (3) If a DIN rail mounting format is used, insert until the latch mechanism catches with an audible click.
Secure between end plates at both sides.
- (4) In high vibration areas, secure tightly with 2 M4 screws.
- (5) Install as far from high voltage lines and power lines as possible in order to minimize noise influences.
- (6) Allow 85mm or more space at the converter's front side for plugging in and unplugging the connector.
- (7) Peripheral components should be arranged so as not to obstruct converter installation, removal, and connector plugging/unplugging.



6-2. ABSOCODER Sensor Installation Conditions and Precautions

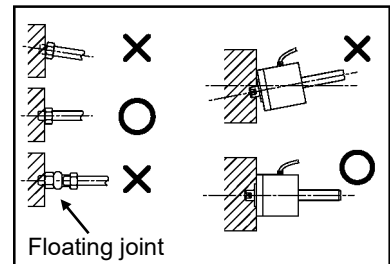
The installation conditions and precautions for ABSOCODER sensor are described in this section.

- (1) Do not apply excessive forces to the cable port, and avoid damaging the cable.

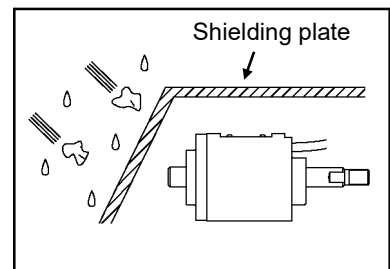


- (2) The part of a machine mounted the sensor rod must travel in the same direction as the sensor rod extends and contracts.

Do not use a floating joint.



- (3) When the cable port is exposed, a shielding plate should be installed as shown in the right figure.



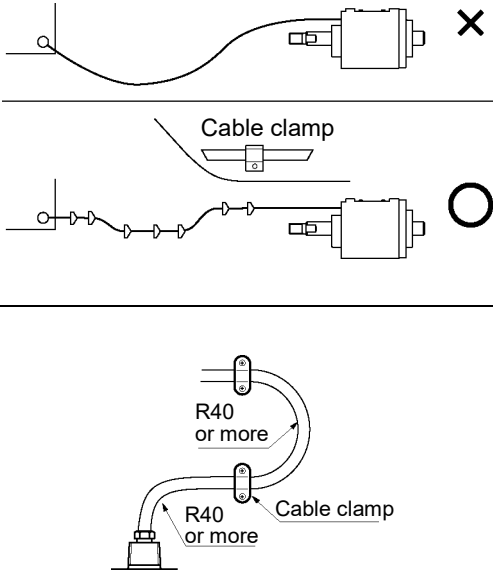
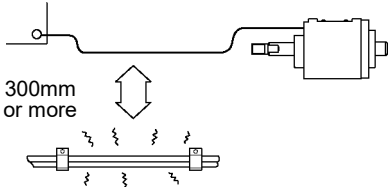
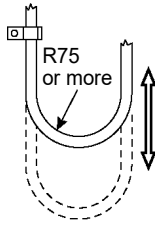
Contact your NSD representative for details of the installation conditions and precautions for ABSOCODER sensor.

7. WIRING

7-1. Connection between Converter and ABSOCODER Sensor

The length of the extendable cable has a limitation depending on the models of ABSOCODER sensor and sensor cable. For more details, refer to "3-2. ABSOCODER Sensor Specifications".

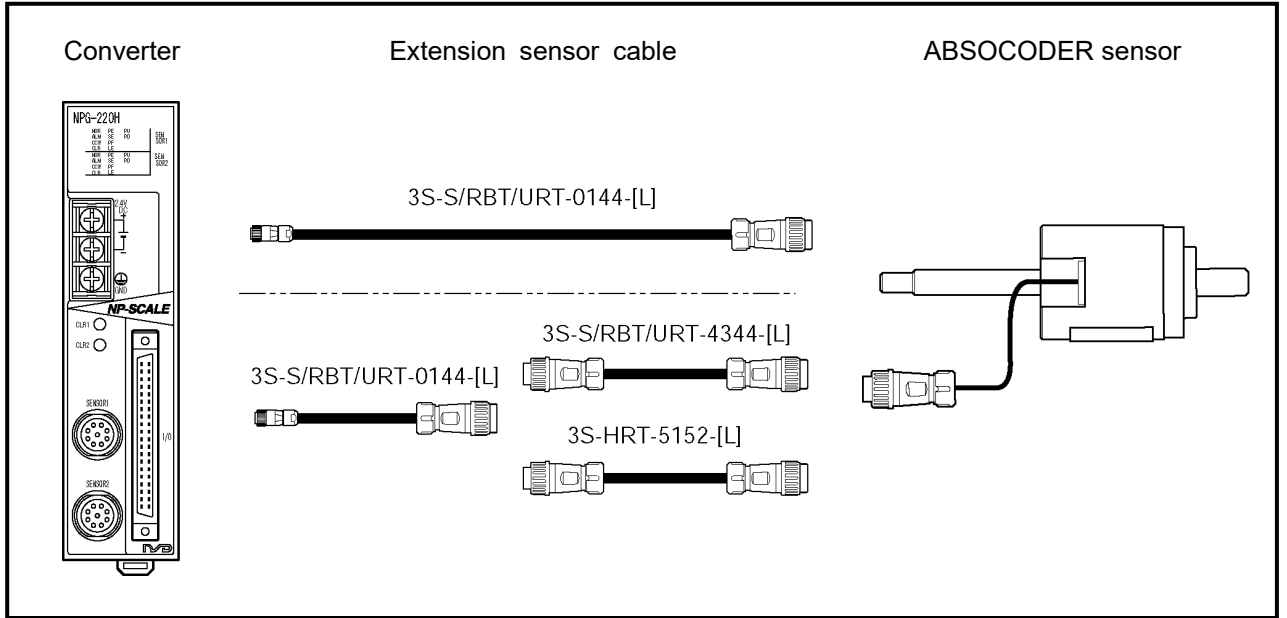
●Wiring precautions

<p>(1) The sensor cable should be clamped as shown in the right figure to prevent excessive tension from being applied to the cable connectors.</p>	
<p>(2) The sensor cable should be located at least 300mm away from power lines and other lines which generate a high level of electrical noise.</p>	
<p>(3) If the cable is moved under the state of bending like a horseshoe, a robotic cable should be used. The bend radius should never be less than 75 mm.</p>	

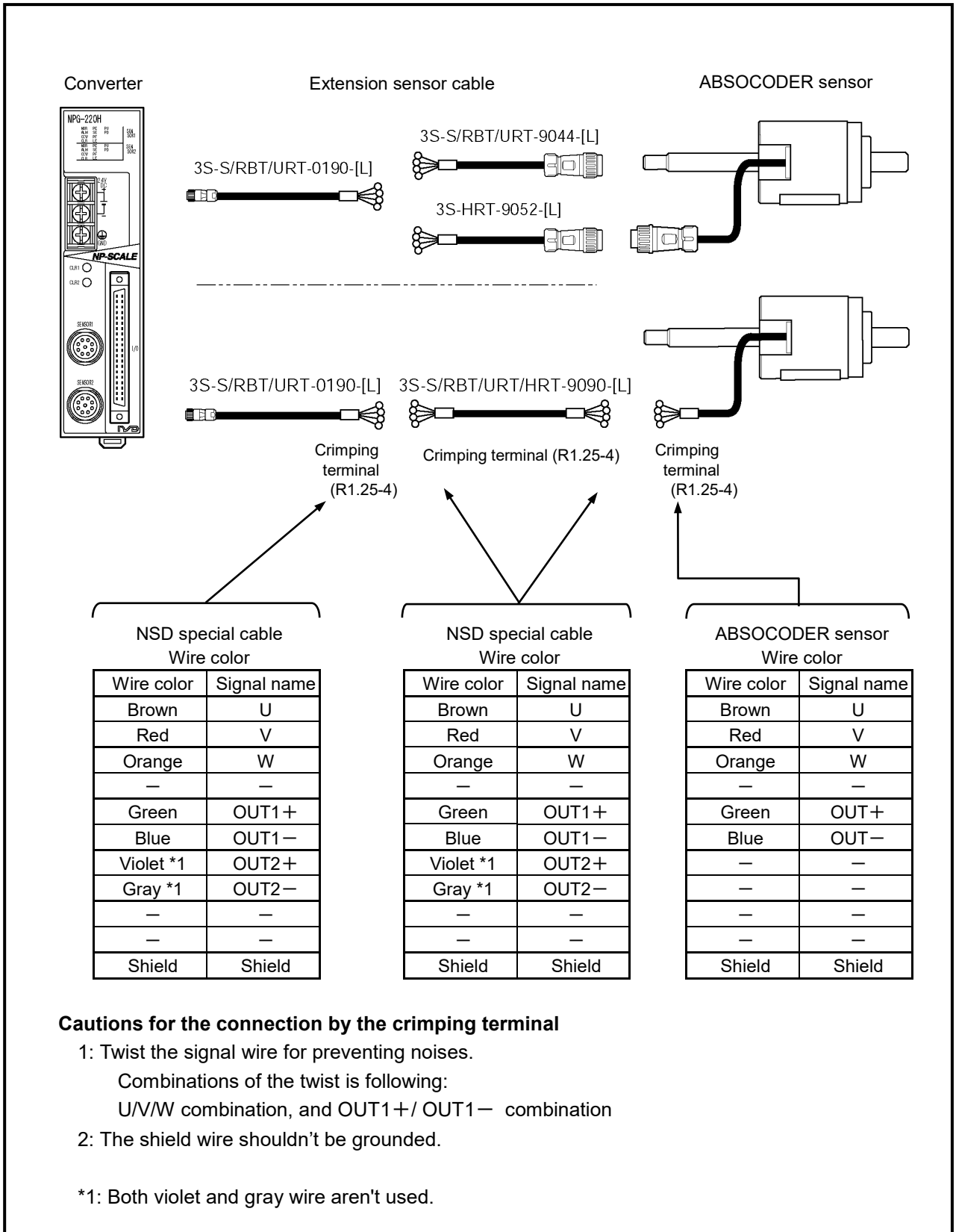
7-1-1. Connection configure example of the sensor cable

Indicates the connection configure example when using the standard connector and the crimping terminals.

- In the case of connecting by using the standard connector



● In the case of connecting by using crimping terminals



7-2. Power Supply Connection

The power supply should be connected as described below.

(1) Power Supply

- Choose the capacity of the power supply over double of power consumption of converter.
The power consumption of the converter is 10W or less.

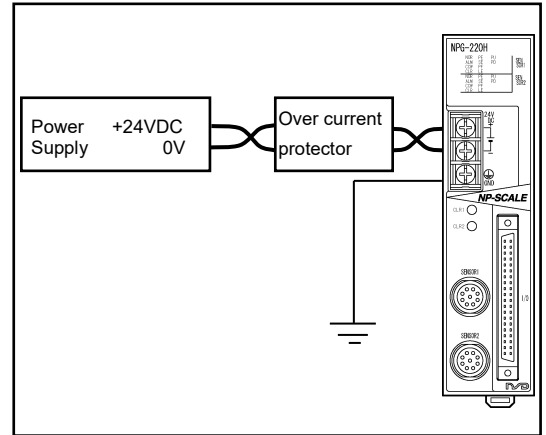
- The input power supply should be isolated from the commercial power supply.

- Twist the power cable for preventing noises.

- Use the M4 size crimp lug terminals with insulating sleeves in order to prevent short circuit caused by loose screws.

- The power cable should be as thick as possible to minimize voltage drops.

- The terminal block tightening torque is 1.8 N·m (16 lb·in).

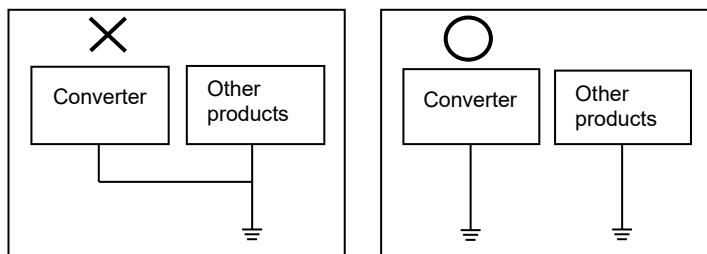


(2) Ground

- The unit should be securely grounded (ground resistance of 100ohm or less) to prevent electrical shocks.

- The ground wire should be connected to the ground terminal directly.

- The terminal block tightening torque is 1.8 N·m (16 lb·in).

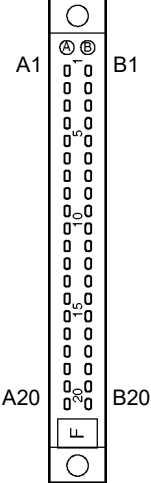


7-3. Input / Output Connector Connection

7-3-1. Pin arrangement of the I/O Connector

Connector model: FCN-361J040-AU / FCN-360C040-B (FUJITSU COMPONENT LIMITED)
 or N361J040AU / N360C040B (OTAX CO.,LTD.)

Compatible wire size: 0.3mm²

Pin No.	Signal name	Pin No.	Signal name	Pin arrangement
A1	1_SG	B1	1_+COM	Shows the pin arrangement as viewed from the soldering terminals side. 
A2	1_SG	B2	1_+COM	
A3	1_LE	B3	1_CLR	
A4	1_B+	B4	1_B-	
A5	1_PU+	B5	1_PU-	
A6	1_PD+	B6	1_PD-	
A7	1_ALM	B7	1_-COM	
A8	1_PE	B8	1_-COM	
A9	1_SE	B9	1_-COM	
A10	1_PF	B10	NC	
A11	NC	B11	2_PF	
A12	2_-COM	B12	2_SE	
A13	2_-COM	B13	2_PE	
A14	2_-COM	B14	2_ALM	
A15	2_PD-	B15	2_PD+	
A16	2_PU-	B16	2_PU+	
A17	2_B-	B17	2_B+	
A18	2_CLR	B18	2_LE	
A19	2_+COM	B19	2_SG	
A20	2_+COM	B20	2_SG	

[Note] Do not connect any cord to spare pins.

7-3-2. Signal names and descriptions

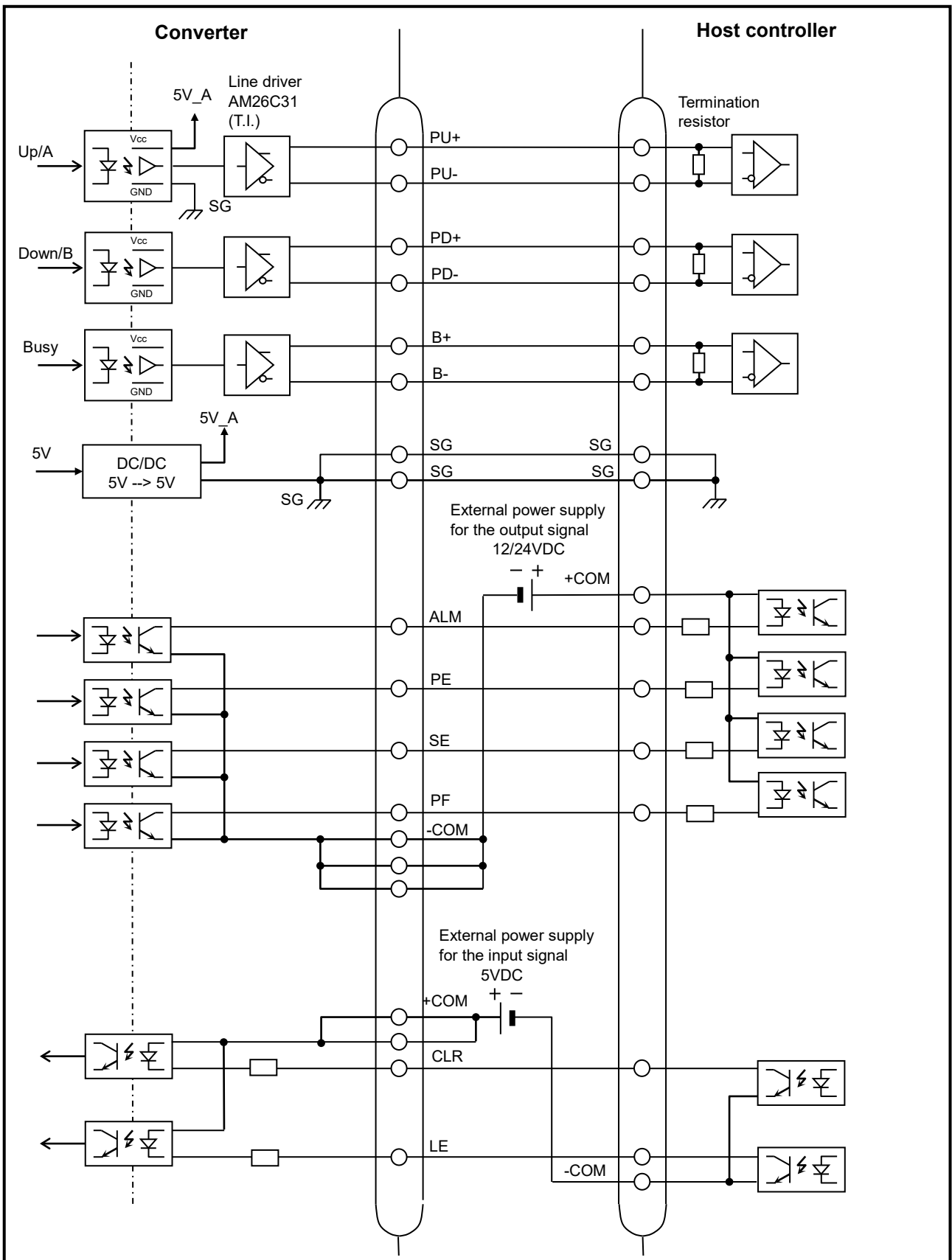
Input/ Output	Signal name		Descriptions	
Pulse output	1_PU+	Axis-1	Up/ A phase pulse	Outputs either Up or A phase pulse
	2_PU+	Axis-2		
	1_PU-	Axis-1		
	2_PU-	Axis-2		
	1_PD+	Axis-1	Down/ B phase pulse	Outputs either Down or B phase pulse.
	2_PD+	Axis-2		
	1_PD-	Axis-1		
	2_PD-	Axis-2		
	1_B+	Axis-1	Busy	Outputs the synchronous signal when outputting the up/down pulse. (The Busy signal doesn't change when outputting the A/B phase pulse.)
	2_B+	Axis-2		
	1_B-	Axis-1		
	2_B-	Axis-2		
1_SG	Axis-1	Signal ground	This is the signal ground (0V) for the pulse output signal.	
2_SG	Axis-2			
Output	1_ALM	Axis-1	Integrated alarm	The signal is output when one of the following errors occurs. - Sensor disconnected error - Low power error - In the case of inputting the limit error (LE) of I/O connector Outputs the low level in the normal operation, and outputs the high level when an error occurs. The signal is HIGH level at turning ON the power supply when "Alarm setting when turning on the power supply" of the function selector switch is set to "ON: alarm output".
	2_ALM	Axis-2		
	1_PE	Axis-1	Pulse output error	The signal turns ON when the sensor travel exceeds the pulse output permissible speed. Outputs the low level in the normal operation, and outputs the high level when an error occurs.
	2_PE	Axis-2		
	1_SE	Axis-1	Sensor disconnected error	Outputs when detecting that the sensor is disconnected. Outputs the low level in the normal operation, and outputs the high level when an error occurs.
	2_SE	Axis-2		
	1_PF	Axis-1	Low power error	Outputs when detecting low power at the internal converter or 24VDC at the external power supply. Outputs the LOW level in the normal operation, and outputs the HIGH level when an error occurs.
	2_PF	Axis-2		
	1_-COM	Axis-1	Output signal common	Connects this signal to 0V of the external power supply for the output signal.
	2_-COM	Axis-2		
Input	1_CLR	Axis-1	Error clear	Inputs the LOW level when clearing an error.
	2_CLR	Axis-2		
	1_LE	Axis-1	Limit error	Inputs the LOW level when inputting the limit error signal from external.
	2_LE	Axis-2		
	1_+COM	Axis-1	Input signal common	Connects to + side of the external power supply for the input signal.
	2_+COM	Axis-2		

*: The power supply line for Axis-1 is isolated from Axis-2. Supply the power to each axis.

Important

The pulse is output even while outputting the integrated alarm, but the reliability is low. For your safety, read out the pulse when the integrated alarm is "LOW level".

7-3-3. I/O Circuit



*: The I/O circuit is isolated from the power supply and internal circuit by the photocoupler. The line driver "AM26C31" which is manufactured by Texas Instruments Incorporated. is used for the pulse output. Proper terminal resistance should be placed when "AM26C31" is connected with the line receiver.

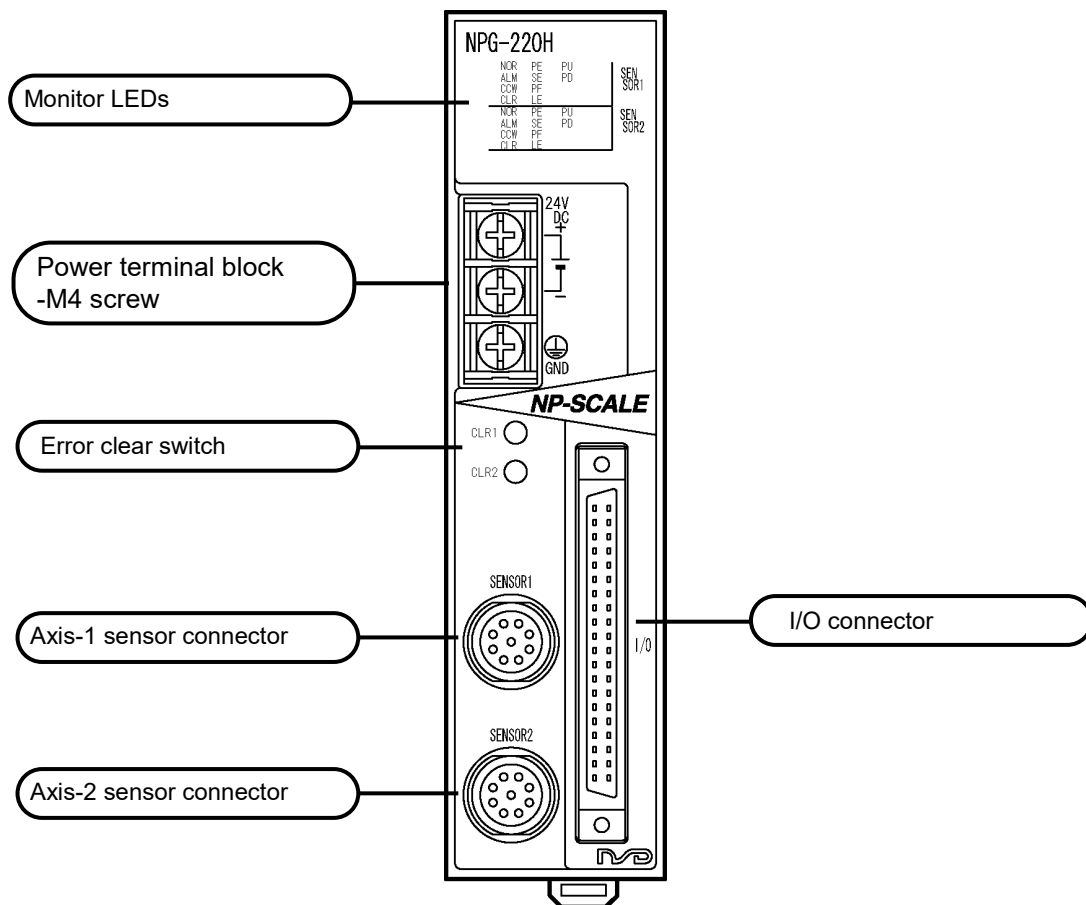
● Logic explanation

Signal name	Logic	Term in the timing chart	Input / Output voltage
ALM PE SE PF	"LOW" / "HIGH" (ON / OFF)	"L" / "H"	"L" = 0V
CLR LE	"LOW" / "HIGH" (ON / OFF)	"L" / "H"	"L" = 0V

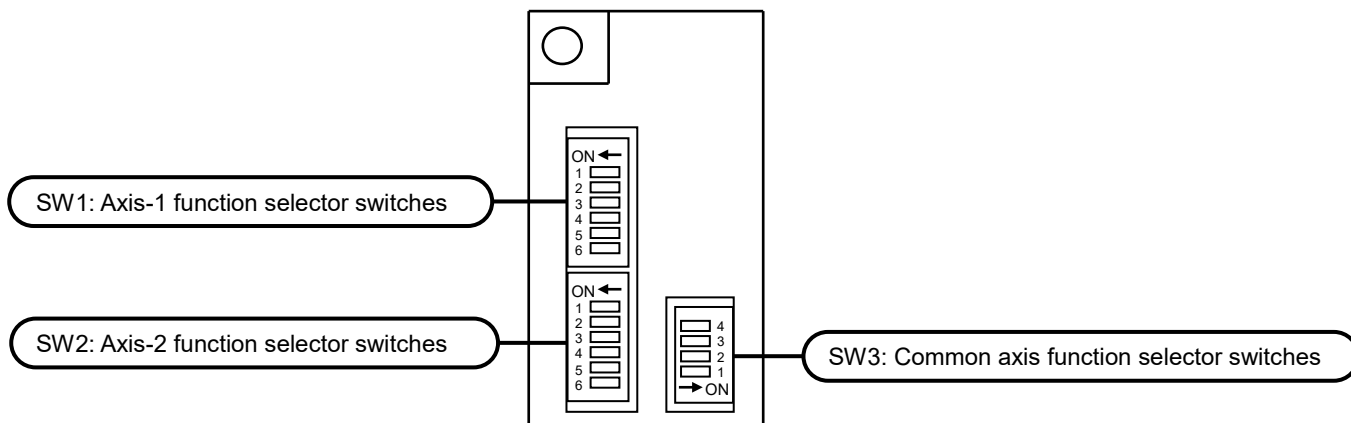
8. NOMENCLATURE

8-1. Part Identification

Front face



Rear face

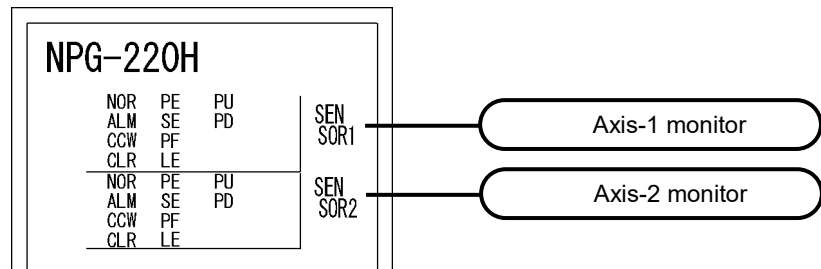


8-2. Monitor LED

The monitor display for Axis-1 is isolated from Axis-2 one.

For example, the monitor LEDs indicate following when detecting the sensor disconnected error (SE) for Axis-1.

- Axis-1 system ready (NOR): OFF
- Axis-1 Integrated alarm (ALM): ON
- Axis-1 sensor disconnected error (SE): ON

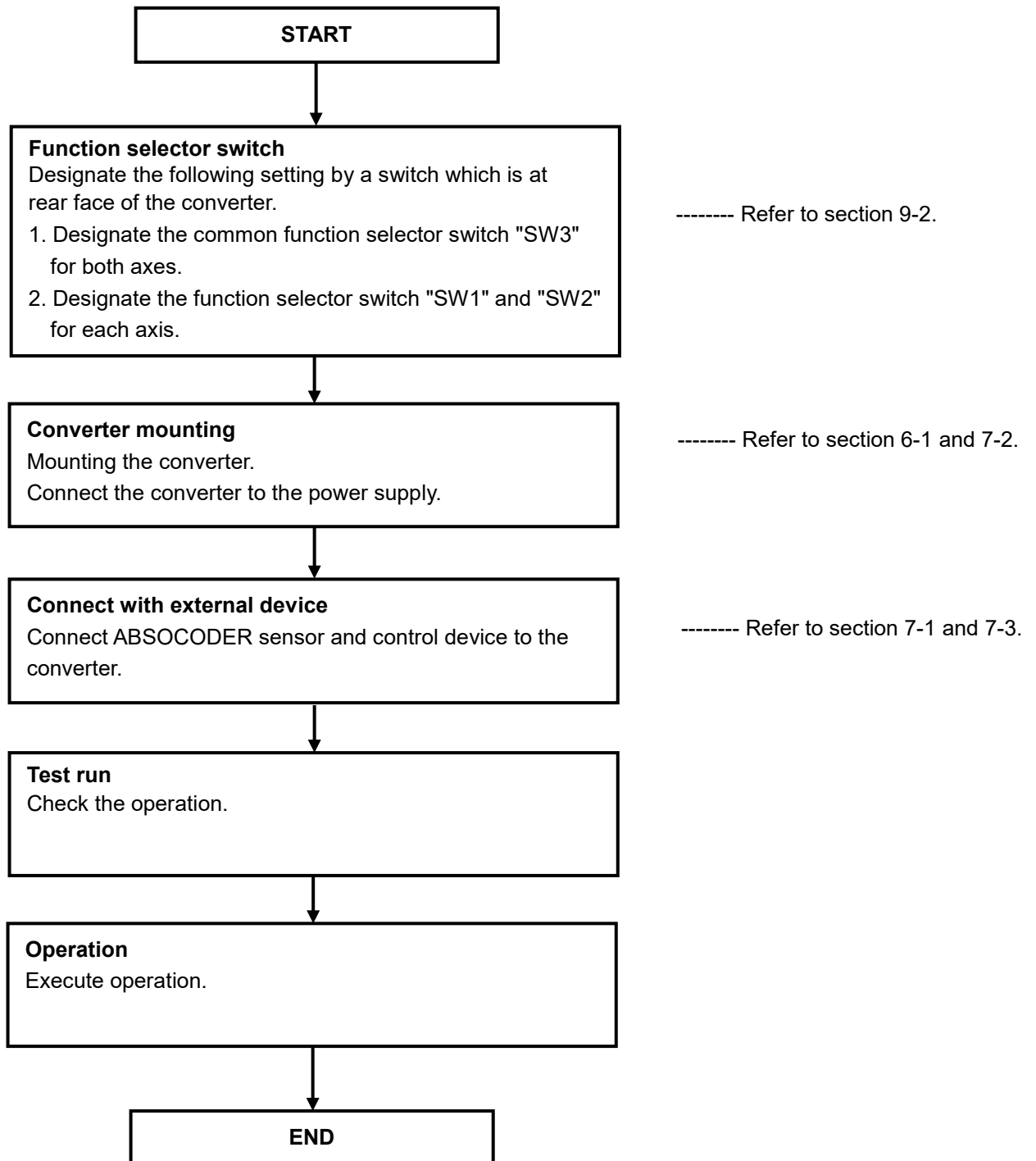


Display	Name	Color	Description
NOR	System ready	Green	LED turns ON when the pulse output is normal status.
ALM	Integrated alarm *1	Red	LED turns ON when one of the following errors occur. - Sensor disconnected error - Low power error - In the case of inputting the limit error (LE) of I/O connector LED will turn ON when the power supply is ON if "Alarm setting when turning on the power supply" of the function selector switch is set to "ON: alarm output".
CCW	Travel direction setting	Green	LED turns ON when "sensor travel direction setting" of the function selector switch is ON.
CLR	Error clear	Green	LED turns ON while the error clear signal is ON or error clear button is pressed.
PE	Pulse output error	Green	LED turns ON when the sensor travel exceeds the pulse output permissible speed.
SE	Sensor disconnected error	Green	LED turns ON when detecting the sensor disconnected error.
PF	Low power error	Green	LED turns ON when detecting the low power at the internal converter or 24VDC at the external power supply.
LE	Limit error	Green	LED turns ON when the limit error input is ON.
PU	State of pulse output	Green	LED turns ON when Up or A phase pulse output is ON.
PD	State of pulse output	Green	LED turns ON when Down or B phase pulse output is ON.

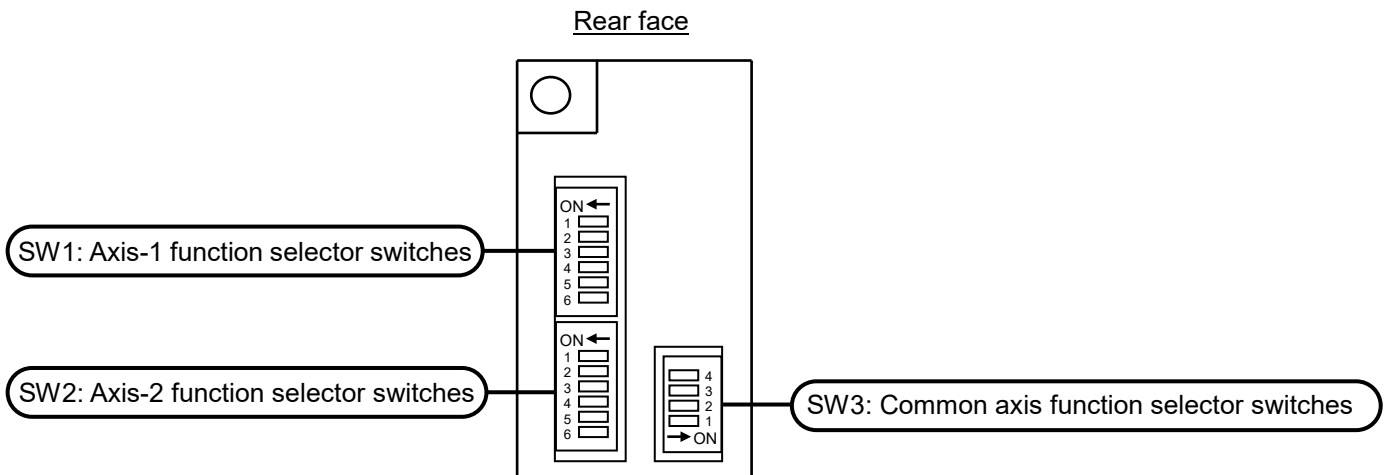
*1: The pulse is output even while outputting the integrated alarm, but the reliability is low.

9. OPERATION

9-1. Operation Sequence



9-2. Function Selector Switch



(1) Function selector switches of each axis SW1, SW2

Name	Description	SW1_*, SW2_* setting (<input type="checkbox"/> : Factory setting)		
		SW1	SW2	Setting
Pulse division	Sets the resolution per pulse.	<input type="checkbox"/> :OFF	<input type="checkbox"/> :OFF	1/1 = 1 μ m *
		<input type="checkbox"/> :ON	<input type="checkbox"/> :OFF	1/2 = 2 μ m *
		<input type="checkbox"/> :OFF	<input type="checkbox"/> :ON	1/5 = 5 μ m * (A/B phase pulse: 1/4 = 4 μ m)
		<input type="checkbox"/> :ON	<input type="checkbox"/> :ON	1/10 = 10 μ m * (A/B phase pulse: 1/8 = 8 μ m)
Pulse width	Sets the pulse width per pulse. (Only settable for the up/down pulse)	<input type="checkbox"/> :OFF	<input type="checkbox"/> :OFF	1 time *
		<input type="checkbox"/> :ON	<input type="checkbox"/> :OFF	2 times *
		<input type="checkbox"/> :OFF	<input type="checkbox"/> :ON	4 times *
		<input type="checkbox"/> :ON	<input type="checkbox"/> :ON	8 times *
Alarm settings when the power supply turns ON *1	Sets the switch if the integrated alarm signal is output when the power supply turns ON.	<input type="checkbox"/> :OFF		Alarm clear
		<input type="checkbox"/> :ON		Alarm output
Travel direction setting of sensor	Sets the pulse output when the sensor travels to the sensor data increase direction which is indicated on the outer dimensions.	<input type="checkbox"/> :OFF		Outputs Up pulse. A phase is faster than B phase.
		<input type="checkbox"/> :ON		Outputs Down pulse. B phase is faster than A phase.

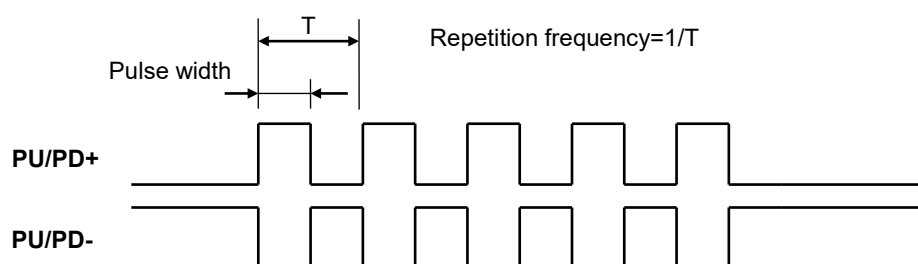
Note

*1: In the case of turning ON "alarm setting when turning ON the power supply"

The integrated alarm signal (ALM) will be output when turning ON the power supply if this switch is set to ON. In this case, the alarm cannot be cleared even though the converter power supply is restarted.

* Relationship between pulse division and pulse width. (In the case of the up/down pulse)

Pulse division (resolution)	Pulse width (μs) / repetition frequency			
	1 time	2 times	4 times	8 times
1/1 ($1\mu\text{m}$)	0.1 μs / 5MHz	0.2 μs / 2.5MHz	0.4 μs / 1.25MHz	0.8 μs / 0.625MHz
1/2 ($2\mu\text{m}$)	0.2 μs / 2.5MHz	0.4 μs / 1.25MHz	0.8 μs / 0.625MHz	1.6 μs / 0.3125MHz
1/5 ($5\mu\text{m}$)	0.5 μs / 1MHz	1.0 μs / 0.5MHz	2.0 μs / 0.25MHz	4.0 μs / 0.125MHz
1/10 ($10\mu\text{m}$)	1.0 μs / 0.5MHz	2.0 μs / 0.25MHz	4.0 μs / 0.125MHz	8.0 μs / 0.0625MHz



(2) Common axis function selector switches SW3

SW3_*	Name	Setting (<input type="checkbox"/> : Factory setting)
1	Pulse output format	<input type="checkbox"/> OFF : Up/down pulse ON : A/B phase pulse
2	Reserved	<input type="checkbox"/> Fixed at OFF
3	Reserved	<input type="checkbox"/> Fixed at OFF
4	Reserved	<input type="checkbox"/> Fixed at OFF

Important

Cautions when using the function selector switches

- Do not turn ON the "reserved" switch.
- Turn the power OFF and then ON again after the function selector switches are changed.

9-3. Signal Timing Patterns

9-3-1. Integrated alarm

The integrated alarm signal indicates that the converter outputs normal pulses.
This signal is "LOW level" when the ABSOCODER sensor and converter are normal status.

Important
For your safety, read pulses when the Integrated alarm signal is " LOW level ".

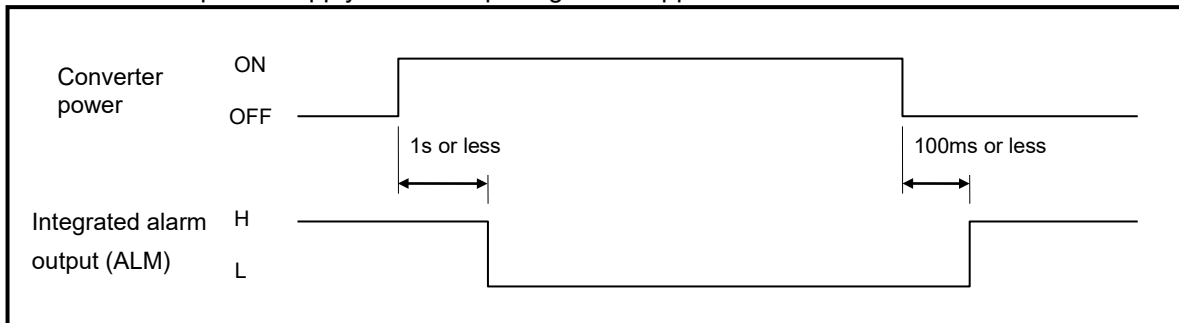
The integrated alarm is "**HIGH level**" in the following cases:

- The converter power is OFF. (In the case of the external power supply for the output signal is supplied to the output circuit)
- An error occurred.

For more details, refer to "11-2. Output State when Occurring an Error"

(1) Signal output timing at power ON/OFF

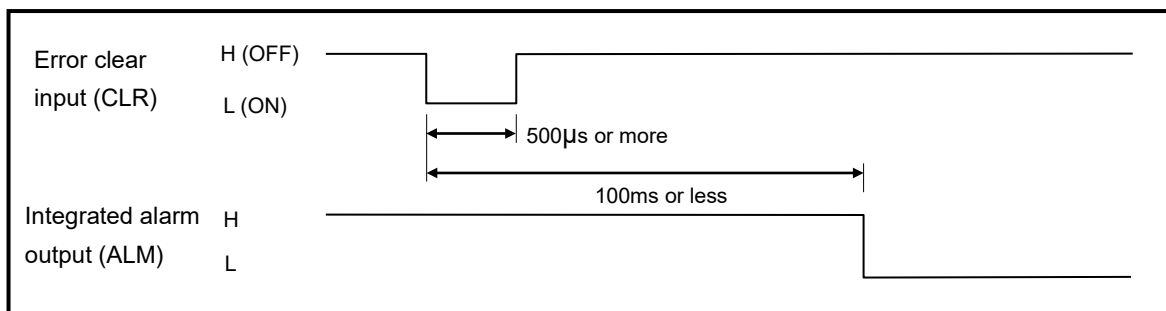
If the external power supply for the output signal is supplied.



(2) Timing of error clear

The error clear signal must be ON (LOW level) 500μs or more.

The error clear signal must be turned OFF (HIGH level) after clearing the error.



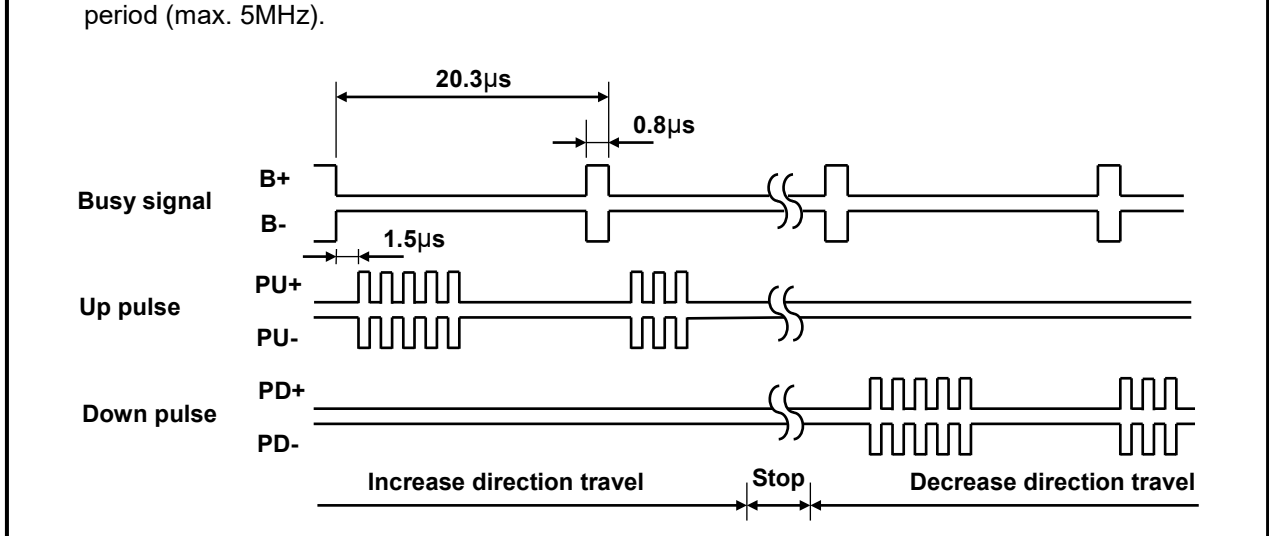
*: Pulse will not output while error clear signal is input.

9-3-2. Pulse output timing

The pulse is output which is corresponding to the travel distance of the ABSOCODER sensor. The output pulse signal is different by the function selector switch "sensor travel direction setting".

● Up/down pulse

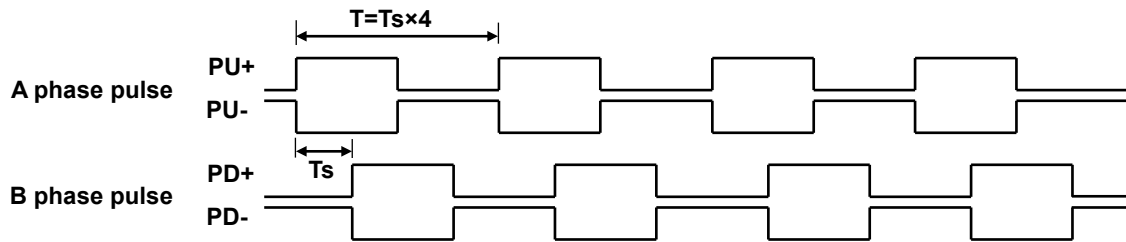
- If the sensor travel direction setting is OFF (Up pulse), PU side pulse will be output when the sensor rod travels to the sensor data increase direction indicated in the outer dimension.
- If the sensor travel direction setting is ON (Down pulse), PD pulse will be output when the sensor rod travels to the sensor data increase direction indicated in the outer dimension.
- The pulse which corresponding to the travel amount per $20.3\mu\text{s}$ is output in constant period (max. 5MHz).



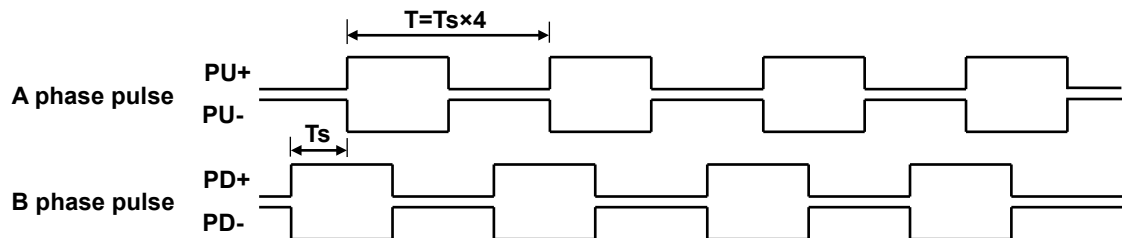
*: The waveform indicated in the figure is a waveform between "SG" and each signal.

● A/B phase pulse

If the sensor travel direction setting is OFF (up pulse), A phase will be faster than B phase when the sensor travels to the sensor data increase direction which is indicated in the outer dimension.



If the sensor travel direction setting is ON (down pulse), A phase will be slower than B phase when the sensor travels to the sensor data increase direction which is indicated in the outer dimension.



The Busy signal doesn't change when outputting A/B phase pulse.

T_s : depends on the speed (1m/s: approx. 1 μ s)

● Pulse missing

If the ABSOCODER sensor travel exceeds the pulse output permissive speed, pulses will not be output. The pulses which aren't output during that time can be stored. Even though the pulse output error (PE) is output, stored pulses are output when the ABSOCODER sensor travel speed is back to the range of the pulse output permissive speed. Hence, the pulse missing will be never occurred.

However, there is a time lag between actual ABSOCODER sensor position and pulse output because of stored pulses.

In this case, the pulse output error (PE) occurs only, the integrated alarm (ALM) doesn't.

This motion is corresponding to both up/down pulse and A/B phase pulses.

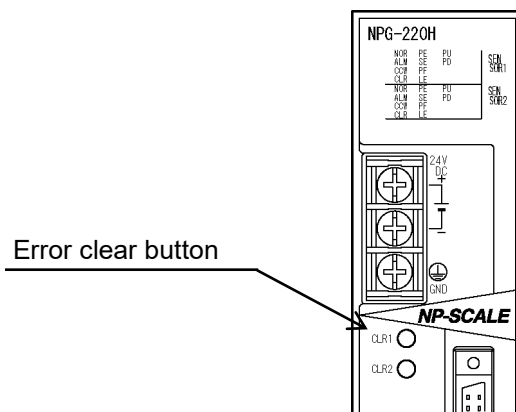
9-4. Error Clear

In the case of clearing an error, remove the cause, and then press the error clear button on the converter panel or input the error clear signal.

Each axis (Axis-1 and Axis-2) has the error clear button and error clear signal.

(1) Using the error clear button on the front face

Press the error clear button on the front face.

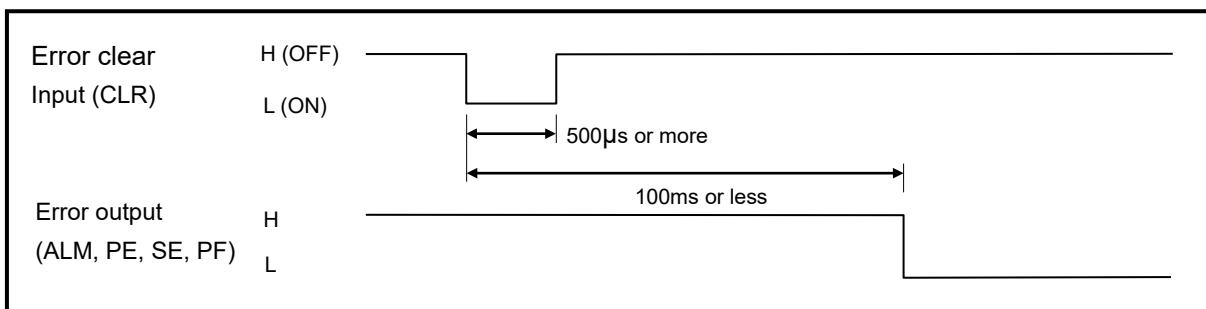


(2) Input the error clear signal

Input the error clear signal (CLR).

The error clear signal must be ON (LOW level) 500 μ s or more.

The error clear signal must be turned OFF (HIGH level) after clearing the error.



*: Pulses will not output while the error clear signal is input.

10. INSPECTIONS

The inspection should be conducted once every 6 months to a year.

Any inspected items which do not satisfy the criteria shown below should be repaired.

Inspection item	Inspection Description	Criteria	Remark
Power supply	Measure the voltage at the power supply terminal.	Within 21.6 to 26.4VDC	Tester
Ambient Conditions	Check the ambient temperature.	ABSOCODER sensor -10 to +80°C Converter 0 to +55°C	Thermometer
	There should be no accumulation of dust.	None	Visual Inspection
Mount Conditions	Verify that the sensor is securely mounted.	There should be no looseness.	
	Verify that the sensor rod is securely coupled to the machine shaft.	There should be no looseness.	
	Check for severed cables.	Cable should appear normal.	
	Verify that the sensor cable connector is plugged in all the way.	There should be no looseness.	
	Verify that the I/O connector is plugged in all the way.	There should be no looseness.	

11. TROUBLESHOOTING

The causes and corrective actions for errors that may occur during converter operation are described below.

11-1. Display and Countermeasure when an Error Occurred

Converter has LED for the error monitor. Error contents are checked by LED light.
Refer to the following list and implement appropriate countermeasures.

● Lists of the error monitors, probable causes, and error cancel procedures

Error contents	Name	Probable cause	Error cancel procedures
SENSOR1 "PE" LED is ON	Axis-1 pulse output error	The sensor travel exceeds the pulse output permissible speed.	After removing an error cause, clear the error by either way: - Press the error clear button of the corresponding axis. - Turn on the error clear signal of the corresponding axis. - Turn the converter power OFF and then ON again.
SENSOR2 "PE" LED is ON	Axis-2 pulse output error		
SENSOR1 "ALM" and "SE" LED IS ON	Axis-1 sensor disconnected error	Sensor connector is disconnected or loose.	After removing an error cause, clear the error by either way: - Press the error clear button of the corresponding axis. - Turn ON the error clear signal of the corresponding axis. - Turn the converter power OFF and then ON again.
SENSOR2 "ALM" and "SE" LED IS ON	Axis-2 sensor disconnected error	Sensor cable is severed.	Replace the sensor cable.
		ABSOCODER sensor failure	Replace the ABSOCODER sensor.
		Converter failure	Replace the converter.
SENSOR1 SENSOR2 "ALM" and "PF" LED is ON	Low power error	Voltage drop of 24VDC power supply Instantaneous power failure of 24VDC power supply	After removing an error cause, clear the error by either way: - Press the error clear button of the corresponding axis. - Turn ON the error clear signal of the corresponding axis. - Turn the converter power OFF and then ON again.
SENSOR1 SENSOR2 "ALM" LED is ON, "PF" LED is blinking	Internal power supply error	The power supply inside of the converter is broken down.	Replace the converter.
SENSOR1 "ALM" and "LE" LED is ON	Axis-1 limit error	LED turns ON when the limit error input is ON.	Clear the error by one of the following ways after removing the cause why the limit error input was ON. - Press the error clear button of the corresponding axis. - Turn ON the error clear signal of the corresponding axis. - Turn the converter power OFF and then ON again.
SENSOR2 "ALM" and "LE" LED is ON	Axis-2 limit error		
SENSOR1 SENSOR2 "ALM" LED is ON	Alarm when turning ON the power supply	Turns ON the power supply when "Alarm setting while turning ON the power supply" of the function selector switch is set to "ON: Alarm output".	Clear the error by one of the following ways. - Press the error clear button of the corresponding axis. - Turn ON the error clear signal of the corresponding axis. - Restart the converter's power supply after "Alarm setting when turning ON the power supply" of the function selector switch is set to "OFF: Alarm clear".
All LED is OFF, all output is OFF	—	24VDC power supply is not input.	Input 24VDC power supply.
	—	Converter failure	Replace the converter.

● Other error contents

Error contents	Probable cause	Error cancel procedures
Pulse is not output.	The wiring of the I/O connector has problems.	Repair the wiring.
Incorrect pulse output.	The pulse division of the function selector switch is improper.	Set the correct pulse division.
	The pulse width of the function selector switch is improper. (Up/down pulse)	Set the correct pulse width.
	The sensor travel direction setting of the function selector switch is improper.	Set the correct travel direction.
	The pulse output format setting of the function selector switch is improper.	Set the correct pulse output setting.
	The wiring of the I/O connector has problems.	Repair the wiring.

11-2. Output State when Occurring an Error

Indicates the state of output signal when occurring an error.

Each error occurs each axis.

Items \ Output	Pulse output PU,PD,B *1	Integrated alarm ALM	Pulse output error PE	Sensor disconnected error SE	Low power error PF
"PE" LED is ON	Pulse output continues	LOW	HIGH	LOW	LOW
"ALM" and "SE" LED is ON Sensor disconnected error	Pulse output continues	HIGH	LOW	HIGH	LOW
"ALM" and "PF" is ON Low power error	Pulse output continues	HIGH	LOW	LOW	HIGH
"ALM" LED is ON, "PF" LED is blinking Power supply error inside of the converter	Pulse output continues	HIGH	LOW	LOW	HIGH
"ALM" and "LE" LED is ON Limit input error	Pulse output continues	HIGH	LOW	LOW	LOW
"ALM" LED is ON. Alarm when turning the power supply	Pulse output continues	HIGH	LOW	LOW	LOW

*1: The pulse is output even while outputting the integrated alarm, but the reliability is low.

11-3. Procedure Contents after Replacing

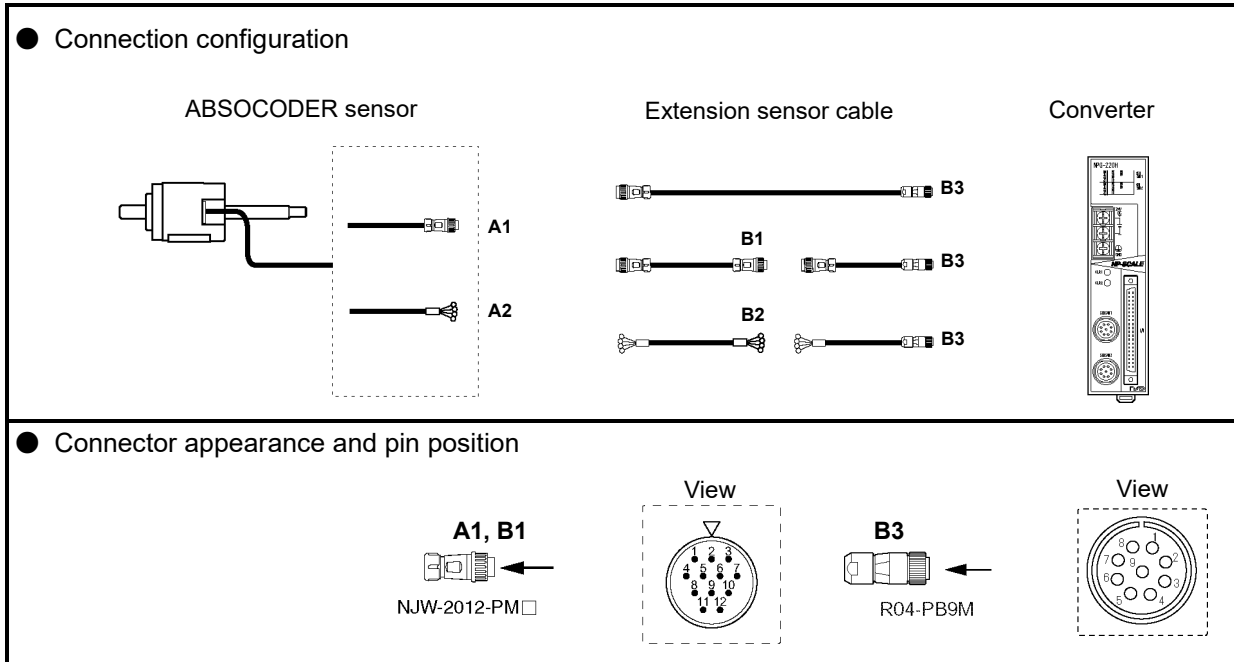
Implement the following measures after replacing the converter, ABSOCODER sensor, and sensor cable.

Replacing contents	Countermeasure
In the case of replacing ABOSOCODER sensor	After the replacement, clear the error by either way. - Press the error clear button of the corresponding axis on the front face. - Turn on the error clear signal of the corresponding axis. - Turn the converter power OFF and then ON again.
In the case of replacing the sensor cable	
In the case of replacing the converter	After the replacement, please set all function selector switches on the rear face.

—MEMO—

11-4. ABSOCODER Sensor Check Lists

- Applicable ABSOCODER sensor models
VLS-8SM20
VLS-8SM14
VLS-8SM14S



- Connector pin position and standard coil resistance ranges (at 25°C)

Check position				Signal names	Standard coil resistance [Ω]	
A1, A2, B1, B2		B3			VLS-8SM20	VLS-8SM14 VLS-8SM14S
Pin No.	Wiring color	Pin No.	Wiring color			
1	Brown	1	Brown	U	114 to 154	132 to 152
2	Red	2	Red	V		
3	Orange	3	Orange	W		
4	—	4	—	—	—	—
5	Green	5	Green	OUT+	162 to 202	150 to 180
6	Blue	6	Blue	OUT-		
7	—	7	—	—		
8	—	8	—	—		
9	—	9	Shield	Shield		
10	—	—	—	—		
11	Shield	—	—	—		
12	—	—	—	—		

The above standard coil resistance ranges are referential data to assist wiring disconnection diagnosis and are not product specification values. There may be no wiring disconnection even when the resistance measurement is out of the standard resistance range.

● Circuit resistance check

[Measurement method]

Measure resistance at Point A or B using a circuit tester or other appropriate device.
 Have Point A connected to measure at Point B.
 If the connector is off, identify the line by the wiring color.

[Check details]

Refer to the previous page for the connector pin number.

Check position	Criterion	Check position	Criterion
Between brown and red	The measured value should be in the range of the standard coil resistance. *1	Between brown and green	∞
Between brown and orange		Between brown and shield	
Between red and orange		Between green and shield	
Between green and blue			
		Between frame and each wire or shield	

*1: If checks are done at Point B, the measurement value is [Standard coil resistance + extension sensor cable resistance].

Extension sensor cable resistance value

The resistance value of the NSD special cable is 0.2Ω/m (loop resistance).

Consider resistance variations due to temperature, which, relative to the standard temperature (25°C), increases 0.4% when the temperature rises 1°C and decreases 0.4% when the temperature falls 1°C.

● Insulation check


[Measurement method]

Measure using a 500 VDC insulation tester.

[Check details]

Refer to the previous page for the connector pin number.

Check position	Criterion
Between brown and green	10MΩ or more
Between brown and shield	
Between green and shield	
Between frame and each wire or shield	

 NOTES
<ol style="list-style-type: none"> 1. Make sure to disconnect the ABSOCODER sensor from the converter before carrying out insulation checks. 2. If there is a risk that energization may cause damages to the electronic circuits in and around the machine, remove the ABSOCODER sensor from the machine. 3. After completing the checks, short-circuit between the pins to discharge remaining voltage before connecting the ABSOCODER sensor to the converter.

12. CE MARKING

This product conforms to the EMC Directive.

12-1. EMC Directives

It is necessary to do CE marking in the customer's responsibility in the state of a final product. Confirm EMC compliance of the machine and the entire device by customer because EMC changes configuration of the control panel, wiring, and layout.

12-2. EMC Directive and Standards

EMC consists of emission and immunity items.
It conforms to Table (see below) of EMC standards and Testing.

Class	Standard No.	Standard Name
Emission (EMI)	EN61000-6-4	Generic standards. Emission standard for industrial environments
Immunity (EMS)	EN61000-6-2	Generic standards. Immunity standard for industrial environments
	EN61000-4-2	Electrostatic Discharge
	EN61000-4-3	Radiated, Radio frequency, Electromagnetic Field
	EN61000-4-4	Electrical Fast Transient / Burst
	EN61000-4-5	Surge Immunity
	EN61000-4-6	Conducted Disturbances, Induced by Radio-Frequency Fields
	EN61000-4-8	Power Frequency Magnetic Field

12-3. Low Voltage Directive

This product doesn't apply to low-voltage directive for the equipment of 24VDC power supply.

12-4. Restrictions

In this section, restrictions are described for conforming to the EMC Directive.

- **Shielded pulse cable**

The cable with a shield should be used for pulse outputs.

The cable shield should be grounded.

- **I/O cable**

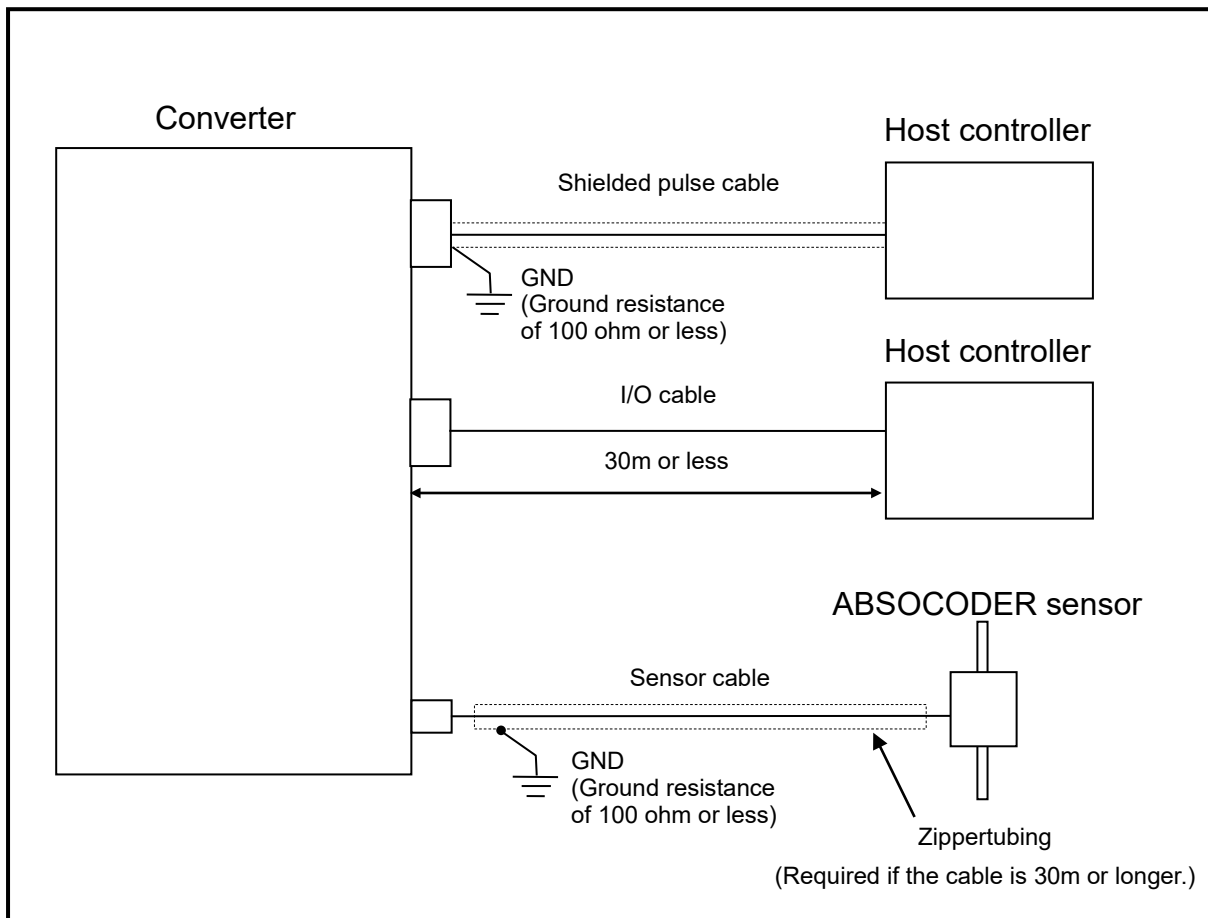
The I/O cable should be shorter than 30m.

- **Sensor cable**

If a 30m or longer sensor cable is to be used, cover the sensor cable with a shielded zippertubing, with the tube shield grounded.

Recommendation zippertubing

Model	Manufacturer
MTFS 20 ϕ	ZIPPERTUBING (JAPAN), LTD.





NSD Group

Manufacturer

NSD Corporation 3-31-28, OSU, NAKA-KU, NAGOYA, JAPAN 460-8302

Distributor

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