



ZEF005350403

For Iron and Steel Industry

Abycoder[®]

ABSOCODER CONVERTER

NCV-220HSSIV1R

Specifications & Instruction Manual



Applicable sensor: VRE-P061

VRE-P074

VRE-P097

VRE-P101

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
ZEF005350400	4, Jun., 2013	1st Edition Japanese document: ZEF005350300
ZEF005350401	2, Mar., 2016	2nd Edition Japanese document: ZEF005350301
ZEF005350402	17, Jan., 2017	3rd Edition Japanese document: ZEF005350302
ZEF005350403	25, Dec., 2020	4th Edition Japanese document: ZEF005350303

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1. OVERVIEW

NCV-220HSSI is the ABSOCODER converter which is compatible with SSI (Synchronized Serial Interface). This converter can detect the machine position as the absolute value by combining the ABSOCODER sensor. The host controller can read this position data in SSI signals.

1-1. Features

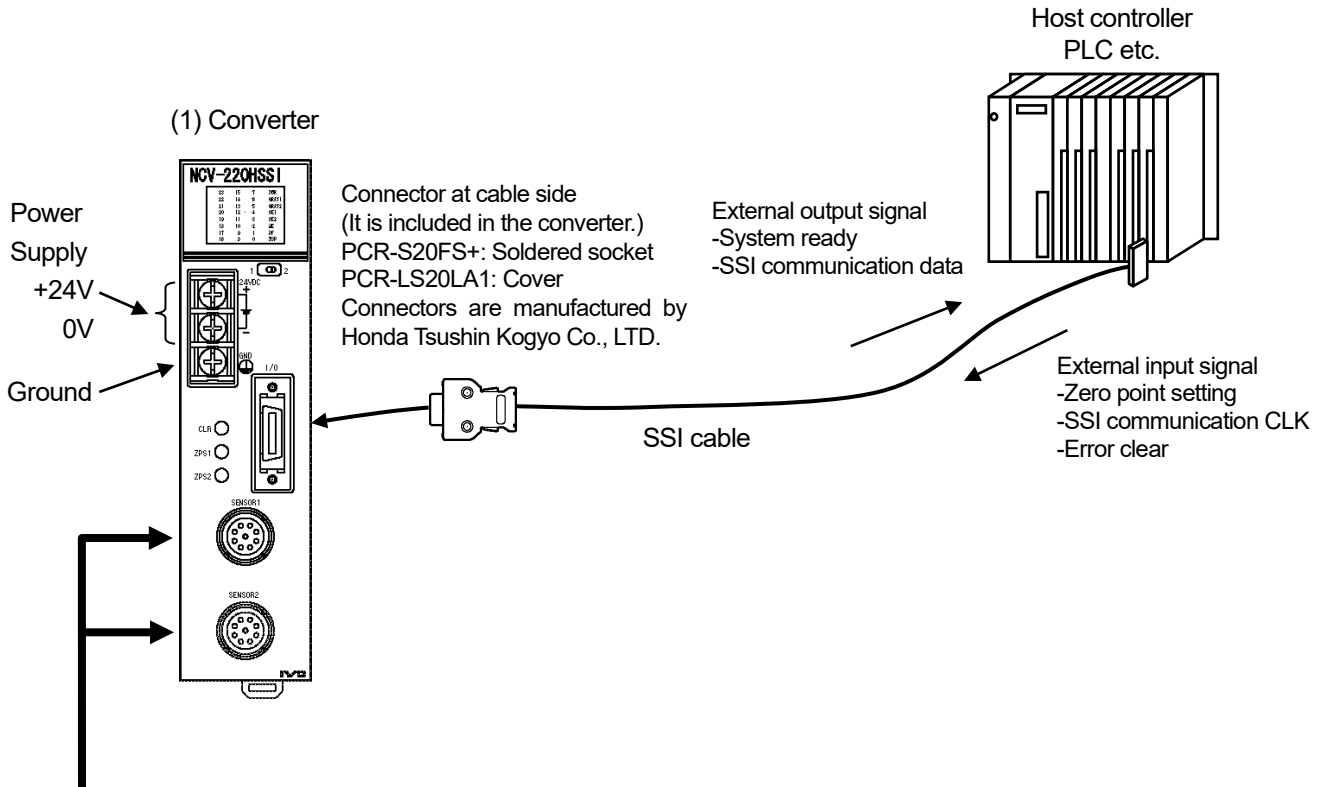
- High reliability
An absolute position detection format ensures accurate position detection even if a power interruption or unexpected noise condition occurs. An origin returning operation is not required.
- Superior durability
NSD's original ABSOCODER is used as the position sensor which features a no-contact construction for excellent durability. This sensor offers problem-free operation, even in environments where it is exposed to vibration, impact shocks, extreme temperatures, oil, and dust.
- Compact design
The unit's outside dimensions (39(W) x 155(H) x 93(D)) were miniaturized. DIN rail can be used, so mounting is much easier.
- Less wiring
The wiring can reduce by using the SSI communication.
- Two axes ABSOCODER sensor can connect
The machine positions for two axes can be detected by one converter. The space-saving in the control panel can be conducted.
- Rotating direction setting function
The increase direction of the position data can be set by changing the setting switch.
- Output code switch function
The converter can switch codes (gray / binary) by changing the setting switch.
- Zero point setting function
The zero point can set in desired machine position by pressing the zero point setting button on the panel or turning the zero point signal ON from external input. The converter has a setting button and input signal for two axes, so the zero point setting is available for each axis.
- Error detection function
An error status can be checked by the monitor LED of the converter when an error occurs. The PLC and host controller can also check the error, because the converter has a system ready signal.
- Applicable with JKPEV-S cable
A commercially available cable (JKPEV-S 1.25mm² x 5P) can be used between the converter and ABSOCODER sensor.
- Compliance with CE standards
The converter complies with CE (EMC Directive) standards.

2. MODEL SELECTION WHEN ORDERING

The following figure indicates the connection configuration of NCV-220HSSI.

Before ordering, refer to the connection configuration and model list. Please prepare by customer except 1 to 4 in the connection configuration.

● Connection configuration





(3) Extension sensor cable	(2) ABS CODER sensor	(4) Option
<p>-In the case of using the NSD special cable</p> <p>4P-S/RBT/URT-0144-[L]</p> <p>4P-S/RBT/URT-0144-[L] 4P-S/RBT/URT/HRT-4344-[L]</p> <p>4P-S/RBT/URT-0190-[L] 4P-S/RBT/URT/HRT-9090-[L]</p>	<p>Connector type</p> <p>B</p> <p>R</p>	<p>VRE-P061 VRE-P074 VRE-P097 VRE-P101</p> <p>RB-01 L type flange for VRE-P061</p>
<p>-In the case of using the commercially available cable</p> <p>4P-S/RBT/URT-0155-[L]</p> <p>JKPEV-S(1.25mm² X5P)</p> <p>NWPC-4012-Ad14 NWPC-4012-P14</p> <p>4P-S/RBT/URT-0190-[L]</p> <p>JKPEV-S(1.25mm² X5P)</p>	<p>P</p> <p>R</p>	

● Model List

◆ Converter

No.	Model	Description
(1)	NCV-220HSSIV1R	For single-turn type ABSOCODER sensor

◆ ABSOCODER sensor

No.	Model	Description
(2)	VRE-P061FK[2]	General environment type Mounting format: Flange-mount type With Interconnecting cable 2m
	VRE-P074[1]K[2][L][-G]	Compact size heavy duty type, SUS
	VRE-P097[1]K[2][L][-G]	Heavy duty type, spheroidal graphite iron castings
	VRE-P101[1]K[2][L][-G]	Heavy duty type, SUS
	<p>[1]: Mounting format F: Flange-mount type L: Base-mount type M: Face-mount type (Only available for MRE-SP074)</p>  <p>K: Input shaft (sunk key)</p>  <p>[2]: Connector type B: Standard connector for the NSD special cable (NJW-2012PM8, manufacturer: Nanaboshi Electric Mfg.Co,Ltd.) P: Large connector for JKPEV-S cable (NWPC-4012-Ad12, manufacturer: Nanaboshi Electric Mfg.Co,Ltd.) R: Crimping terminals for JKPEV-S cable and the NSD special cable (R1.25-4)</p> <p>[L]: Interconnecting sensor cable length (m) 2: 2m, 5: 5m, 10: 10m, 20: 20m</p> <p>[-G]: Silicon oil -G :Silicon oil injected no code: no oil injected</p>	

◆ Extension sensor cable

No.	Model	Description
(3)	4P-[1]-[2][3]-[L]	<p>[1]...Cable type S: Standard cable RBT: Robotic cable URT: Semi-heat-resistant robotic cable HRT: Heat-resistant robotic cable</p> <p>[2]...Connector (Converter side) 01: Connector for connecting to a converter (R04-PB9M8.0A) 43: Standard connector (NJW-2012-PM8) 90: Crimping terminals (R-1.25-4)</p> <p>[3]...Connector (Sensor side) 44: Standard connector (NJW-2012-AdF8) 55: Large connector (NWPC-4012-P12) 90: Crimping terminals (R-1.25-4)</p> <p>[L]...Cable length (m) Contact your NSD representative for the cable length.</p>
	JKPEV-S(1.25mm ² ×5P)	Commercially available cable

◆ Option

No.	Model	Description
(4)	RB-01	L-type flange for VRE-P061

3. SPECIFICATIONS

3-1. Converter Specifications

3-1-1. 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	-25 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

3-1-2. Performance specification

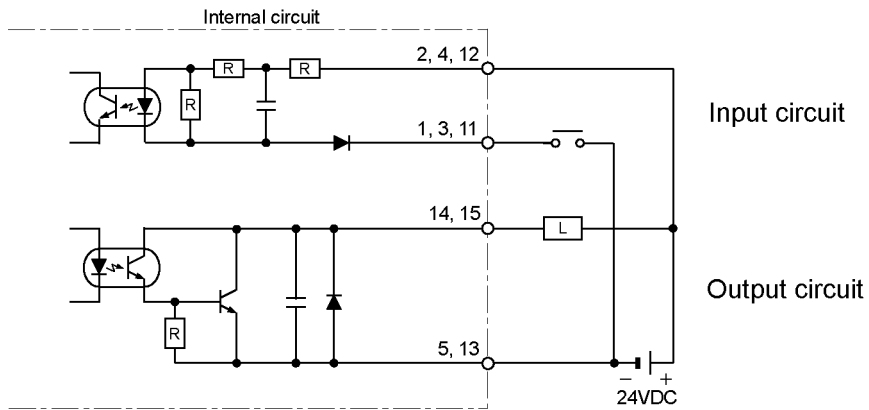
Items	Specifications
Applicable sensor	VRE-P061 VRE-P074 VRE-P097 VRE-P101
Total number of divisions	8192 (2 ¹³)
Position detection format	Absolute position format
Communication interface	SSI (Synchronized Serial Interface)
Number of communication channels	2ch
Output code	Binary or gray code (switchable)
Number of detection axes	2
Position data sampling time	0.2ms
Position data increase direction	CW or CCW (switchable)
Front panel function	Zero point setting, error clear
Switch (on rear face of product)	Position data increase direction setting (CW / CCW) Output code (binary /gray) Axis-2 error detection (enable / disable)
Monitor LED	Display of position data, power supply status, sensor disconnected error, low power supply error, memory error, converter error
Input signal	Axis-1 zero point setting: 1-point Axis-2 zero point setting: 1-point Error clear signal: 1-point
Output signal	Axis-1 system ready signal: 1-point Axis-2 system ready signal: 1-point
Applicable standard	CE Marking (EMC directive)

3-1-3. Input / output specification

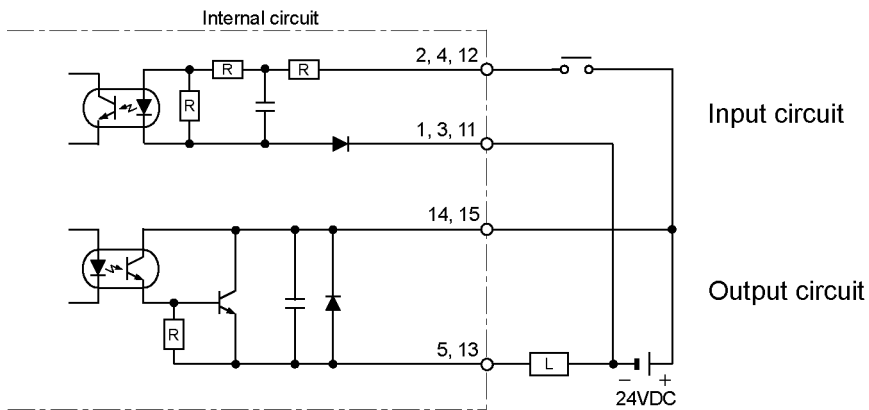
Input		Output	
Items	Specifications	Items	Specifications
Input signals	ZPS1 (axis-1 zero point setting): 1-point ZPS2 (axis-2 zero point setting): 1-point CLR (error clear): 1-point	Output signals	NOR1 (axis-1 system ready signal): 1-point NOR2 (axis-2 system ready signal): 1-point
Input circuit	DC input, photo-coupler isolation	Output circuit	Photo-coupler isolation
Input logic	Negative logic	Output logic	Negative logic
Rated input voltage	24VDC	Rated load voltage	24VDC (30VDC max)
Input current	10mA TYP (24VDC)	Max. load current	100 mA
		Max. voltage drop when ON	1.5V (100mA)

Circuit diagram

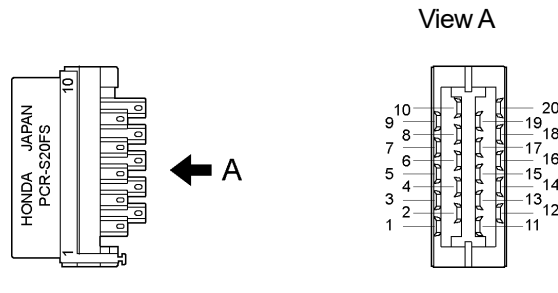
Sink connection



Source connection



3-1-4. SSI connector pin arrangement

Pin No.	Signal name	Pin No.	Signal name	Connector dimension
1	ZPS2-	11	ZPS1-	<p>Shows the pin arrangement as viewed from the soldering terminals side.</p> 
2	ZPS2+	12	ZPS1+	
3	CLR-	13	NOR1-	
4	CLR+	14	NOR1+	
5	NOR2-	15	NOR2+	
6	SG (0V)	16	SG (0V)	
7	CLK2-	17	DATA2-	
8	CLK2+	18	DATA2+	
9	CLK1-	19	DATA1-	
10	CLK1+	20	DATA1+	

● Accessory

Connector model: PCR-S20FS+ / PCR-LS20LA1 (Manufacturer: HONDA TSUSHIN KOGYO CO., LTD)

● Usage cable

Use the cable for RS-422 / RS-485 (twist-pair cable with shield).

Sheath diameter: Max ϕ 10 or less Wire size: 0.2mm² (AWG24)

Reference

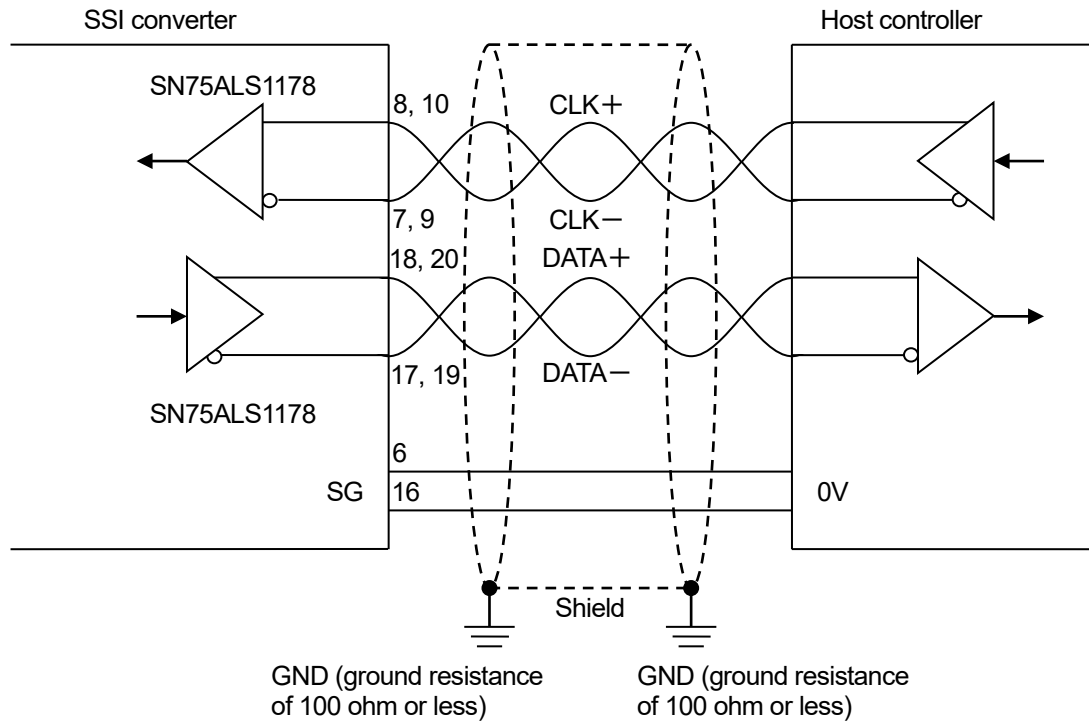
We conduct the operation check with using the following cable.

CO-SPEV-SB (A) 10P x 0.2SQ LF (Manufacturer: Hitachi Cable, Ltd.)

3-1-5. SSI communication specification

Items	Specifications
Interface	SSI (Synchronized Serial Interface)
Communication format	RS-422 standard
Numbers of channels	2 channels (per sensor axis)
Communication signal	DATA+, DATA-, CLK+, CLK-
Code	Gray / binary
Data length	13-bit
Monoflop time	20 μ s
Transmission speed: cable length	1MHz: 20m, 500kHz: 60m, 250kHz: 160m, 125kHz: 320m

3-1-6. SSI communication circuit diagram



*** Method of shield grounding**

The shield of the cable should be grounded (ground resistance of 100 ohm or less) at both sides of SSI converter and host controller.

3-2. ABSOCODER Sensor Specifications

● VRE-P061, VRE-P074

Items		Specifications	
Sensor model		VRE-P061	VRE-P074
Total number of turns		1	
Number of divisions		8192 (2 ¹³)	
Mass		1.3kg	Flange-mount type: 3.5+0.1 x cable length (m) kg Base-mount type: 5.5+0.1 x cable length (m) kg Face-mount type: 3.0+0.1 x cable length (m) kg
Linearity error		1° Max.	0.7° Max.
Moment of inertia GD ² /4(J)		6.4 x 10 ⁻⁶ kg·m ² (6.5 x 10 ⁻⁵ kgf·cm·s ²)	3.3 x 10 ⁻⁵ kg·m ² (3.4 x 10 ⁻⁴ kgf·cm·s ²)
Starting torque		4.9 x 10 ⁻² N·m or less (0.5 kgf·cm or less)	9.8 x 10 ⁻² N·m or less (1 kgf·cm or less)
Permissible shaft load	Radial	98N (10 kgf)	
	Thrust	49N (5 kgf)	
Permissible mechanical speed		3600r/min	4000r/min
Bearing life		5.5 x 10 ⁴ h (at 3600r/min)	8 x 10 ⁴ h (at 4000r/min)
Ambient temperature	Operating	-20 to +80°C	-20 to +120°C
	Storage	-30 to +90°C	-30 to +120°C
Vibration resistance		2.0 x 10 ² m/s ² (20G) 2000Hz, up/down 4 h, forward/back 2 h, conforms to JIS D 1601 standard	2.0 x 10 ² m/s ² (20G) 200Hz, up/down 4 h, forward/back 2 h, conforms to JIS D 1601 standard
Shock resistance		4.9 x 10 ³ m/s ² (500G) 0.5 ms, up/down/forward/back x 3 times each, conforms to JIS C 5026 standard	
Protection rating		IP65, conforms to JEM 1030 standard	IP67, conforms to JEM 1030 standard IP69K, conforms to ISO 20653 standard
Interconnecting cable		2m	2 · 5 · 10 · 20m
Max. sensor cable length	4P-S	500m	
	4P-RBT/URT /HRT	250m	
	JKPEV-S (1.25mm ² × 5P)	300m	
Surface treatment		Electroless nickel plate	Not treated
Material		Steel	Stainless

● VRE-P097, VRE-P101

Items		Specifications	
Sensor model		VRE-P097	VRE-P101
Total number of turns		1	
Number of divisions		8192 (2 ¹³)	
Mass		6.5+0.1 x cable length (m) kg	
Linearity error		0.7° Max.	
Moment of inertia GD ² /4(J)		3.3 x 10 ⁻⁵ kg·m ² (3.4 x 10 ⁻⁴ kgf·cm·s ²)	
Starting torque		9.8 x 10 ⁻² N·m or less (1 kgf·cm or less)	
Permissible shaft load	Radial	1.5 x 10 ² N (15kgf)	
	Thrust	78N (8kgf)	
Permissible mechanical speed		4000r/min	
Bearing life		8 x 10 ⁴ h (at 4000r/min)	
Ambient temperature	Operating	-20 to +120°C	
	Storage	-30 to +120°C	
Vibration resistance		2.0 x 10 ² m/s ² (20G) 200Hz, up/down 4 h, forward/back 2 h, conforms to JIS D 1601 standard	
Shock resistance		4.9 x 10 ³ m/s ² (500G) 0.5 ms, up/down/forward/back x 3 times each, conforms to JIS C 5026 standard	
Protection rating		IP67, conforms to JEM 1030 standard IP69K, conforms to ISO 20653 standard	
Interconnecting cable		2 · 5 · 10 · 20m	
Max. sensor cable length	4P-S	500m	
	4P-RBT/URT /HRT	250m	
	JKPEV-S (1.25mm ² × 5P)	300m	
Surface treatment		Coated (epoxy resin)	Not treated
Material		Cast iron	Stainless

3-3. Extension Sensor Cable Specification

Items	Specifications			
Model code	4P-S	4P-RBT	4P-URT	4P-HRT
Cable type	Standard cable	Robotic cable	Semi heat-resistant robotic cable	Heat-resistant robotic cable
Diameter	$\phi 8$			
Operating temperature range	-5 to +60°C		-5 to +105°C	0 to +150°C
Insulator	Irradiated cross linked foamed polyethylene	ETFE plastic		
Sheath	Polyvinyl chloride mixture		Heat-resistant polyvinyl chloride mixture	Fluoro-rubber
Construction	8-core, 2 pairs without shield + 2 pairs with shield			
Color	Gray	Black		
Advantage	Extensible for long distances	Superior flexibility; ideal for moving place		Heat treatment and flexible; ideal for moving place

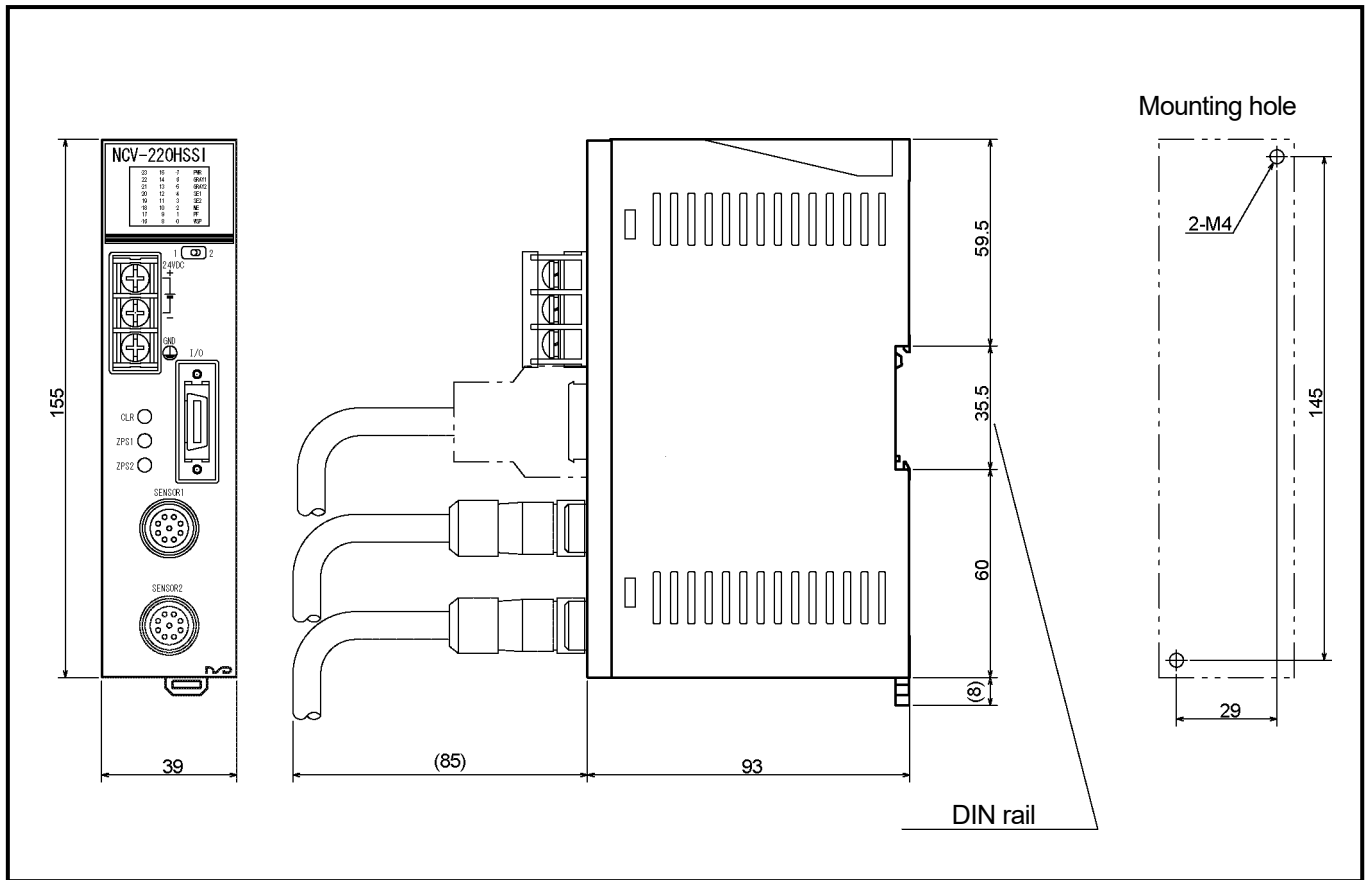
[Remark]

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

4. DIMENSIONS

4-1. Converter Dimension

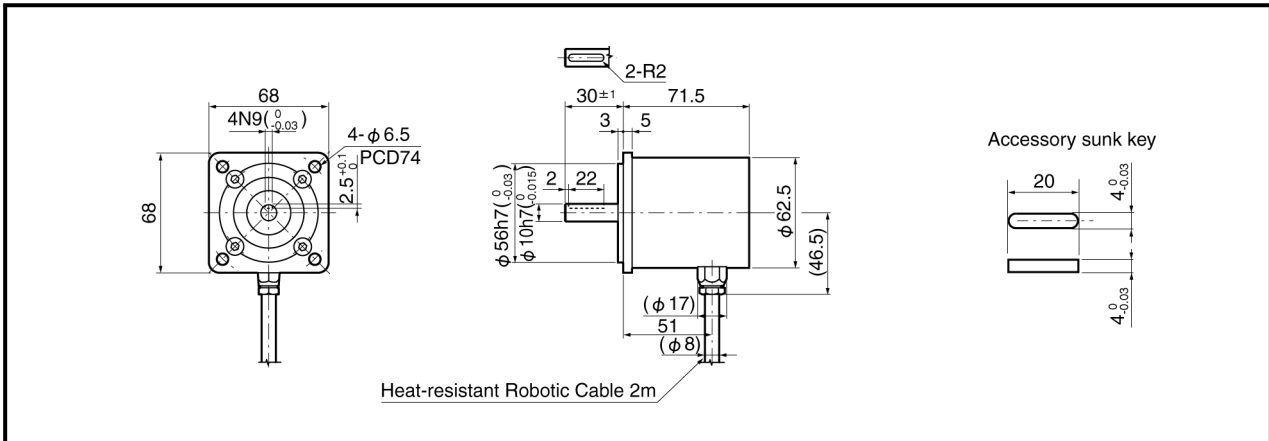
Units: mm



4-2. ABSOCODER Sensor Dimensions

- VRE-P061FK[] (Flange-mounting type)

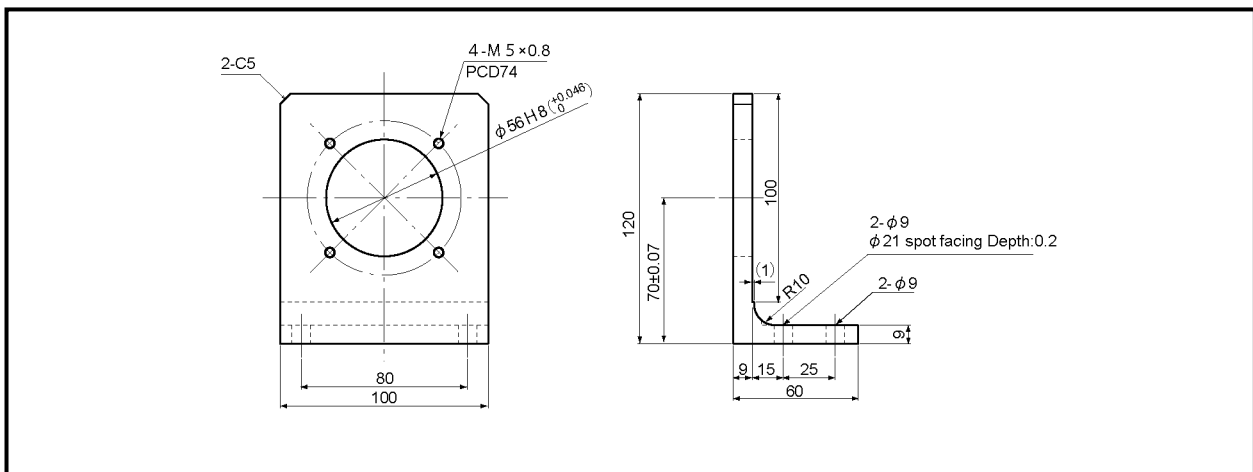
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- Option: RB-01

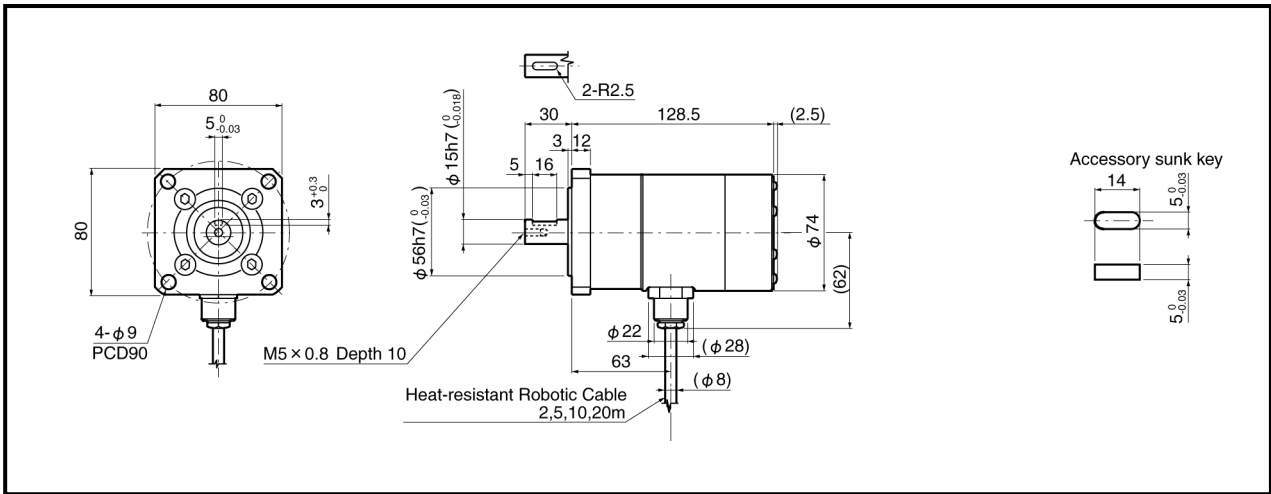
L-type flange for VRE-P061

Units: mm



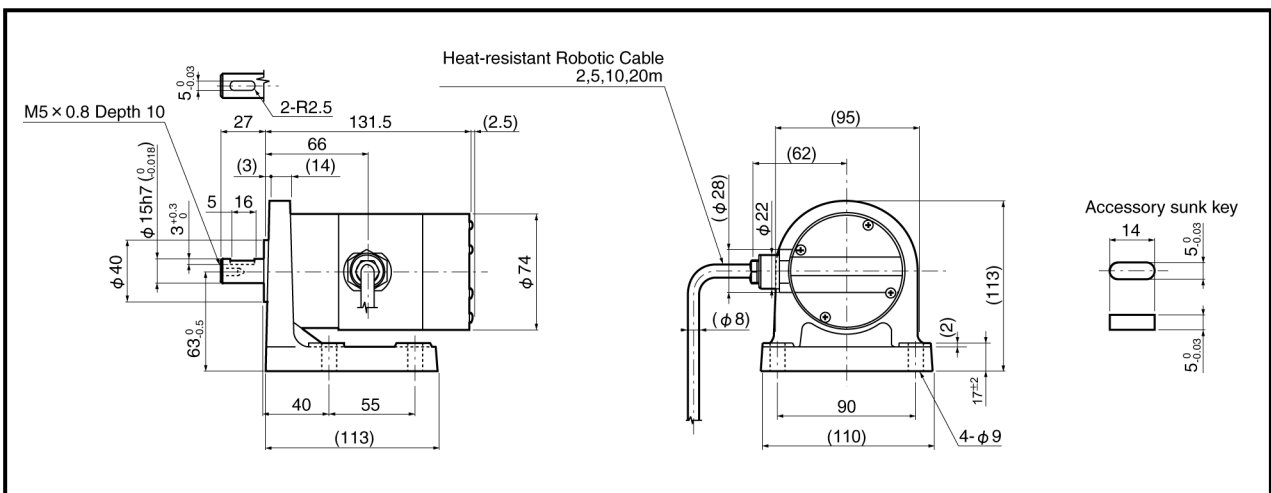
● VRE-P074FK[] (Flange-mount type)

Units: mm



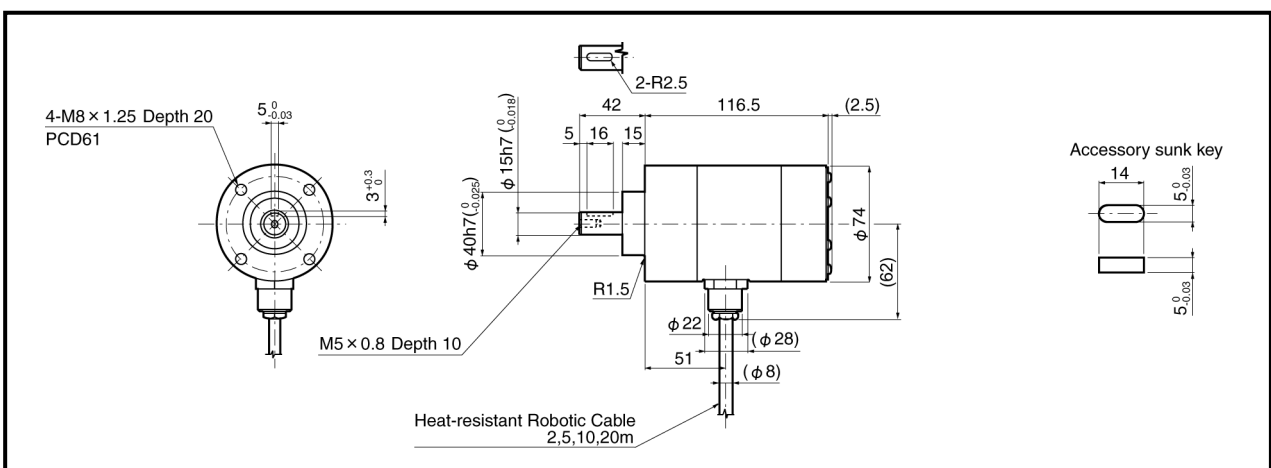
● VRE-P074LK[] (Base-mount type)

Units: mm



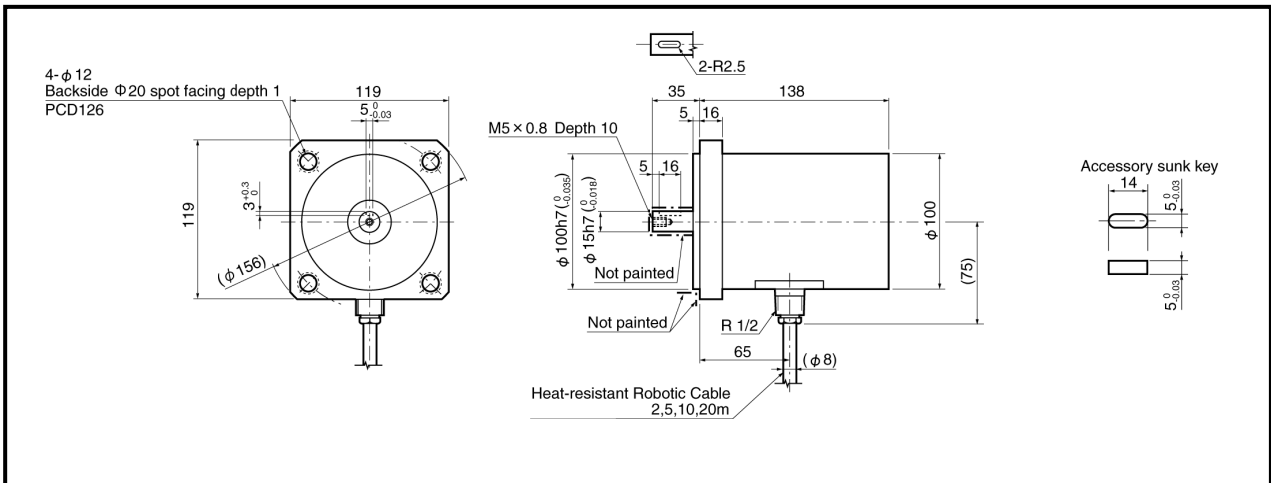
● VRE-P074MK[] (Face-mount type)

Units: mm



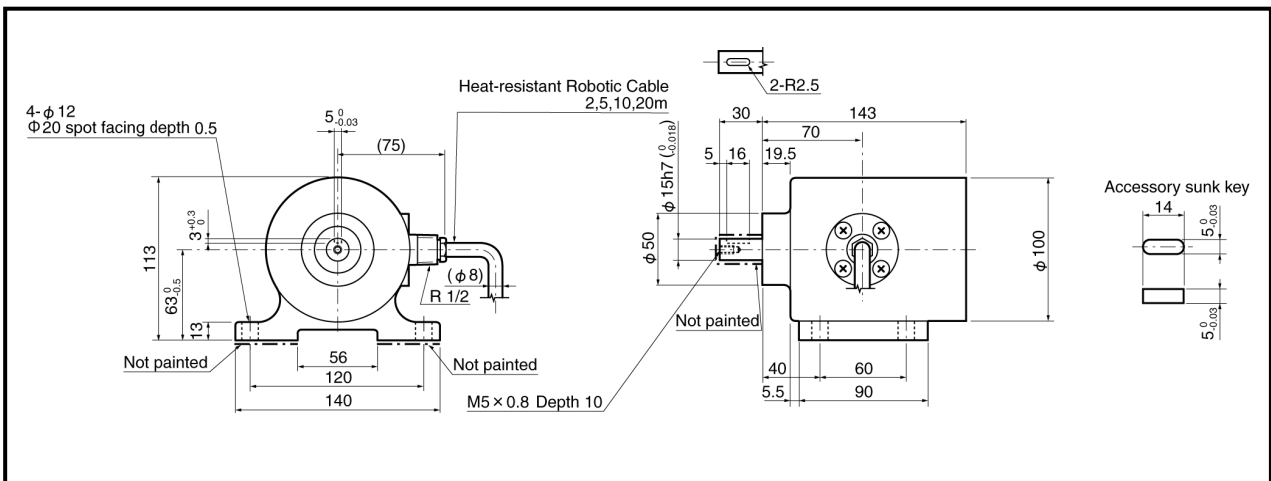
● VRE-P097FK[] (Flange-mount type)

Units: mm



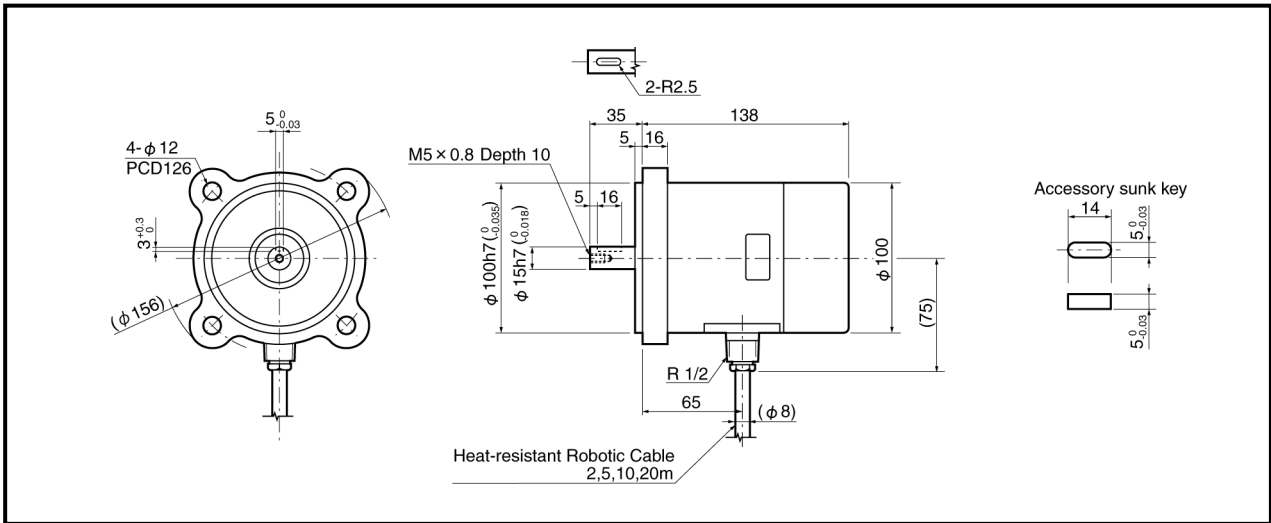
● VRE-P097LK[] (Base-mount type)

Units: mm



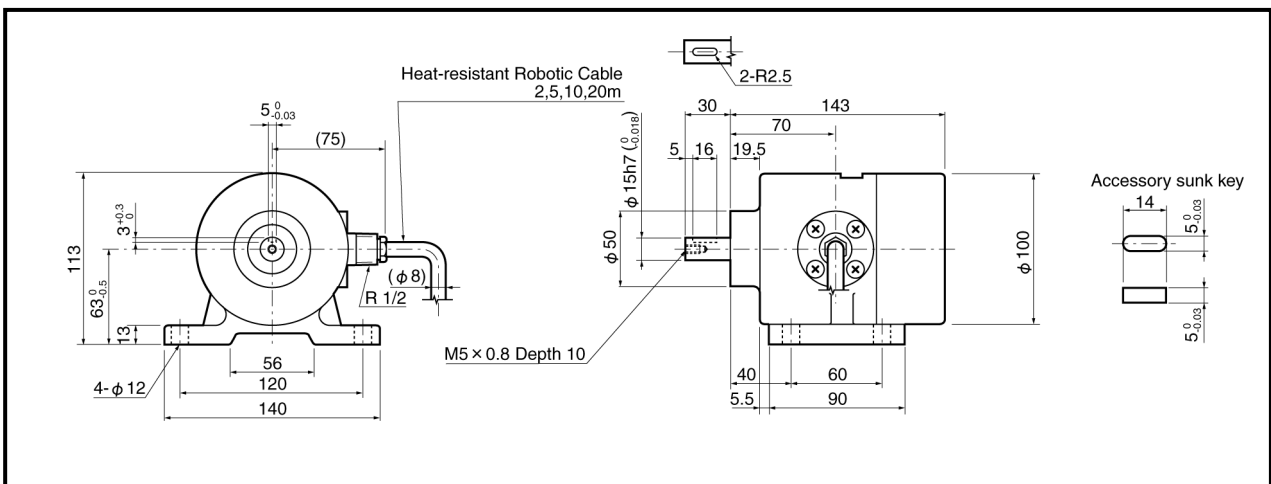
● VRE-P101FK[] (Flange-mount type)

Units: mm



● VRE-P101LK[] (Base-mount type)

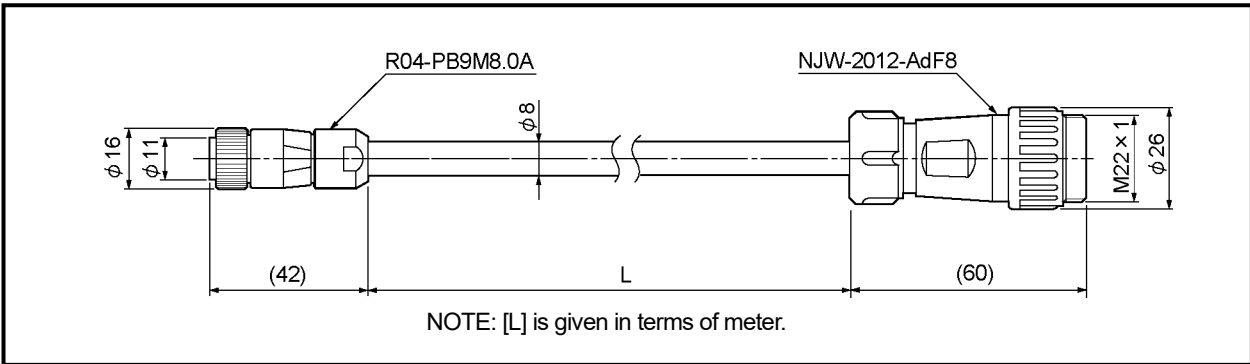
Units: mm



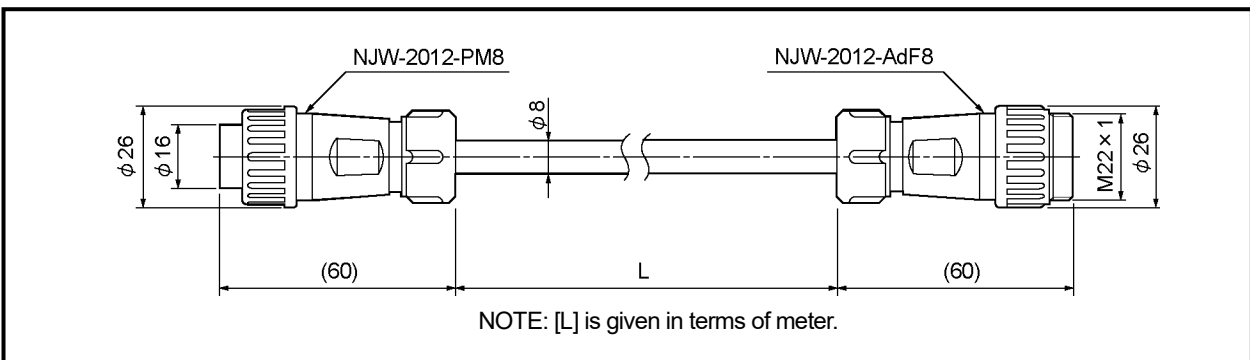
4-3. Extension Sensor Cable Dimensions

(1) 4P-S-0144-[L] / 4P-RBT-0144-[L] / 4P-URT-0144-[L]

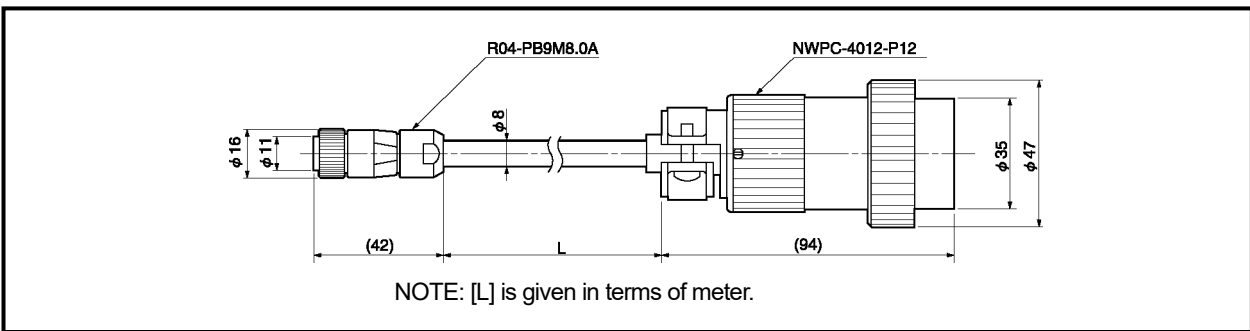
Units: mm



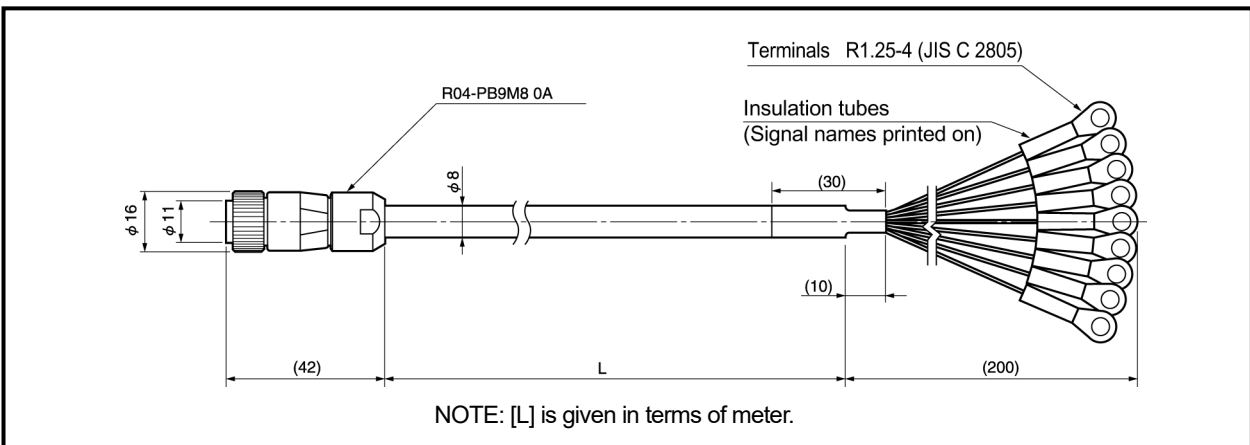
(2) 4P-S-4344-[L] / 4P-RBT-4344-[L] / 4P-URT-4344-[L] / 4P-HRT-4344-[L]



(3) 4P-S-0155-[L] / 4P-RBT-0155-[L] / 4P-URT-0155-[L]

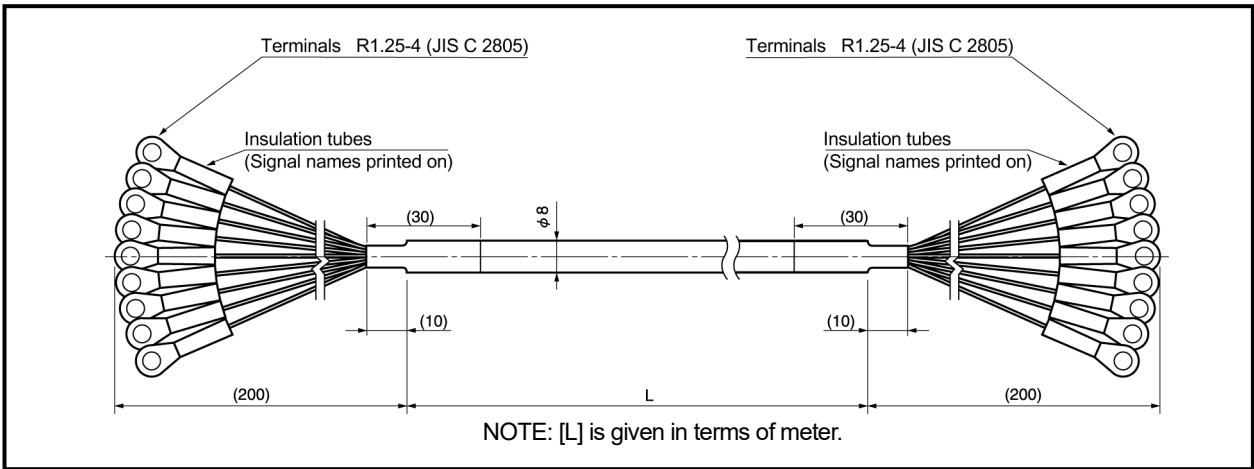


(4) 4P-S-0190-[L] / 4P-RBT-0190-[L] / 4P-URT-0190-[L]



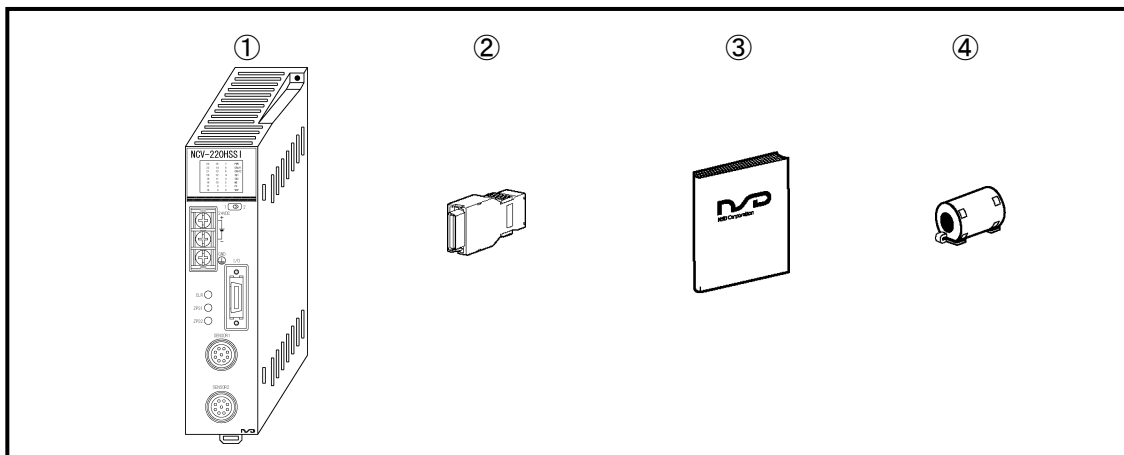
(5) 4P-S-9090-[L] / 4P-RBT-9090-[L] / 4P-URT-9090-[L] / 4P-HRT-9090-[L]

Units: mm



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 SSI connector..... 1 piece
Connector: PCR-S20FS+
Cover: PCR-LS20LA1
Manufactured by Honda Tsushin Kogyo Co., LTD.

- ③ Manual..... 1 piece

- ④ Clamp filter..... 1 piece
Model: ZCAT3035-1330
Manufactured by TDK Corporation.

6. INSTALLATION

6-1. Converter Installation Conditions and Precautions

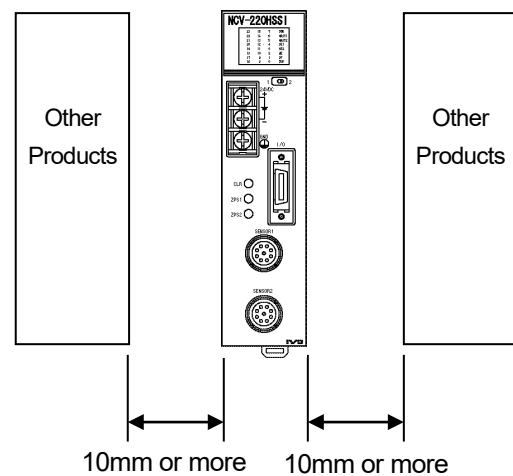
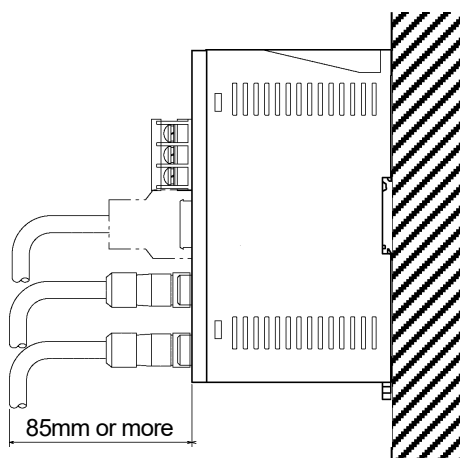
When installing the converter, the following conditions and precautions should be observed.

-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.
- (8) Space out 10mm or more between the converter and peripheral components in order not to obstruct the converter's heat dissipation.



6-2. ABSOCODER Sensor Installation Conditions and Precautions

The ABSOCODER installation procedures and precautions are described in this section.

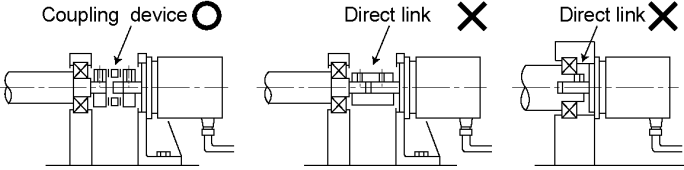
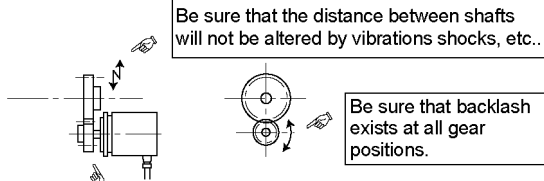
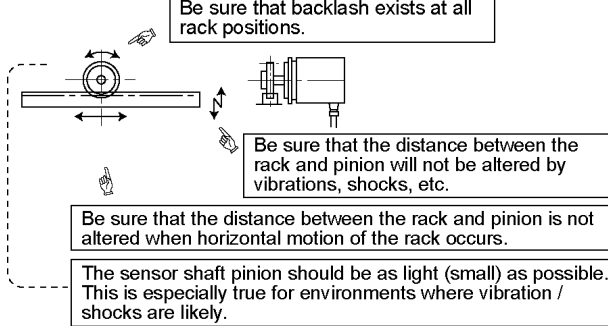
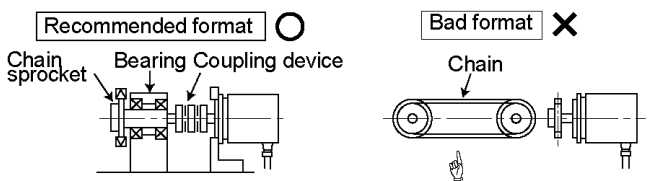

● Handling of Turn-type ABSOCODER Sensor

Item	Explanation
(1) Main unit	<p>Never drop the Sensor, or subject it to excessive forces or shocks.</p>
(2) Cable	<p>Avoid stepping on, or applying excessive stress to the cable.</p>

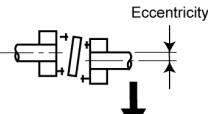
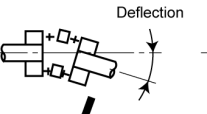
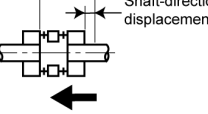
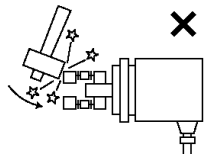
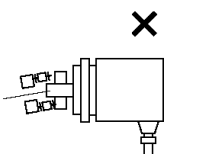
● Mounting of Turn-type ABSOCODER Sensor

Item	Explanation	Precaution
(1) Mounting	For details regarding mounting dimensions, refer to each ABSOCODER dimensions.	
(2) Cable port	<p>Cable port should face downward.</p>	
(3) Cable	<p>The bend radius for movable parts should never be less than 75 mm (ϕ 150) (robotic cable).</p>	Do not use the standard cable for movable parts. (Use robotic cable.)
(4) Wiring	<p>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>	

● **Mounting of Turn-type ABSOCODER Sensor**

Item	Explanation	Precaution
(1) Coupling of machine shaft and sensor shaft	<p>Be sure to use a coupling device to link the 2 shafts.</p>  <p>Coupling device ○ Direct link ✕ Direct link ✕</p>	<p>A “direct-link” format will result in shaft fatigue and / or breakage after long periods.</p> <p>Therefore, be sure to use a coupling device to link the shafts.</p>
(2) For gear-type linkage	<p>If a gear linkage is used, be sure that some backlash exists.</p>  <p>Be sure that the distance between shafts will not be altered by vibrations shocks, etc..</p> <p>Be sure that backlash exists at all gear positions.</p> <p>The sensor shaft pinion should be as light (small) as possible. This is especially true for environments where vibration / shock are likely.</p>	<p>Incorrect gear mounting can result in shaft bending or breakage.</p>
(3) For rack and pinion type linkage	<p>Be sure that backlash exists at all rack positions.</p>  <p>Be sure that backlash exists at all rack positions.</p> <p>Be sure that the distance between the rack and pinion will not be altered by vibrations, shocks, etc.</p> <p>Be sure that the distance between the rack and pinion is not altered when horizontal motion of the rack occurs.</p> <p>The sensor shaft pinion should be as light (small) as possible. This is especially true for environments where vibration / shocks are likely.</p>	<p>Incorrect rack and pinion mounting can result in shaft bending or breakage.</p>
(4) Chain or timing belt linkage	<p>When a chain or timing belt linkage format is used, there is an inherent risk of the shaft's load being increased by the resulting tension. Therefore, a bearing should be used, with the shafts being linked by a coupling device immediately behind the bearing.</p>  <p>Recommended format ○ Bad format ✕</p> <p>Chain sprocket Bearing Coupling device Chain</p> <p>This linkage format is also applicable to the "rack-and-pinion" and "gear" methods shown above.</p> <p>Even a small amount of tension can produce a considerable load on the shaft.</p>	
(5) Shaft mounting position	<p>The shaft should be attached to the coupling device or gear at a point which is as near to the sensor body as possible.</p>  <p>Recommended format ○ Bad format ✕ Coupling device or</p> <p>This distance should be as short as possible. When this distance is short, the load placed on the bearing by vibrations / shocks is slight.</p> <p>Never use an extended shaft format.</p>	

● Coupling of Turn-type ABSOCODER Sensor

Item	Explanation	Precaution
<p>(1) Coupling device selection precaution</p>	<p>1. Selection of the coupling device should be based on the following factors;</p> <ul style="list-style-type: none"> - The amount of a mounting error caused by the machine design. - The permissible error of coupling device. - Reaction force of coupling device. - Permissible shaft load of the sensor. <div style="display: flex; justify-content: space-around; align-items: center; margin: 10px 0;"> <div style="border: 1px solid black; padding: 2px; font-size: 8px;">The amount of a mounting error caused by the machine design</div> <div style="font-size: 24px;"><</div> <div style="border: 1px solid black; padding: 2px; font-size: 8px;">The permissible error of the coupling device</div> </div> <hr style="width: 100%;"/> <p>Mounting error</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Eccentricity</p> <p>↓</p> <div style="border: 1px solid black; padding: 2px; font-size: 8px;">Load generated by the eccentricity</div> </div> <div style="text-align: center;">  <p>Deflection</p> <p>↓</p> <div style="border: 1px solid black; padding: 2px; font-size: 8px;">Load generated by the deflection</div> </div> <div style="text-align: center;">  <p>Prescribed dimension</p> <p>Shaft-direction displacement</p> <p>←</p> <div style="border: 1px solid black; padding: 2px; font-size: 8px;">Load generated by the shaft direction displacement</div> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; font-size: 8px;">Radial load</div> <div style="border: 1px solid black; padding: 2px; font-size: 8px;">Thrust load</div> </div> <p>2. If the selected coupling device is larger than necessary (When used in high vibration/shock environments), the load which is applied to the shaft by the vibrations/shocks will be increased by the weight of the coupling device.</p> <p>3. Be sure to select a coupling device with an adequate transmission torque surplus relative to the sensor shaft's torque.</p>	<p>The selection of a larger coupling than necessary will increase the shaft load which is caused by the mounting error amount.</p> <p>Excessive force applied to the shaft can deform the coupling and reduce durability.</p>
<p>(2) Coupling device installation precaution</p>	<p>Avoid bending or damaging the coupling.</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="text-align: center;">  <p>×</p> </div> <div style="text-align: center;">  <p>×</p> </div> </div>	

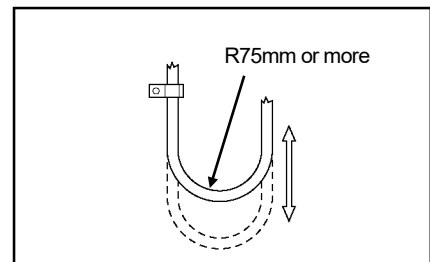
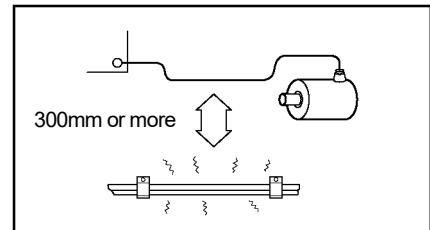
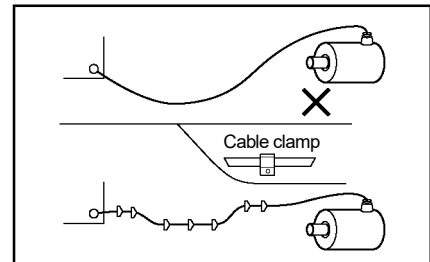
7. WIRING

7-1. Connection between Converter and ABSOCODER Sensor

The maximum extension sensor cable length varies according to the ABSOCODER sensor and cable model being used. For more details refer to "3-2. ABSOCODER Sensor Specifications".

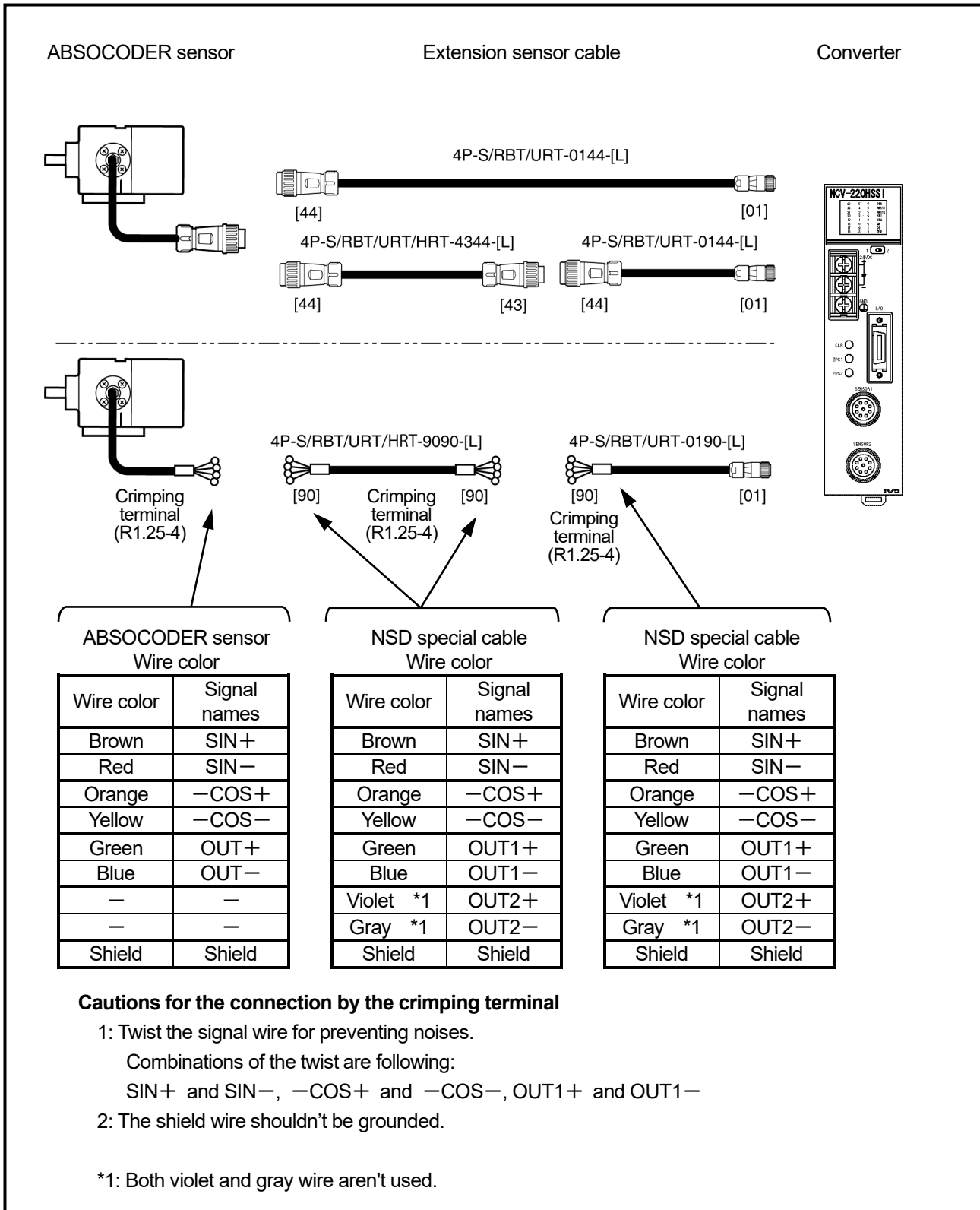
-Wiring Precautions

- (1) The sensor cable should be clamped as shown in the right figure to prevent excessive tension from being applied to the cable connectors.
- (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.
- (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.

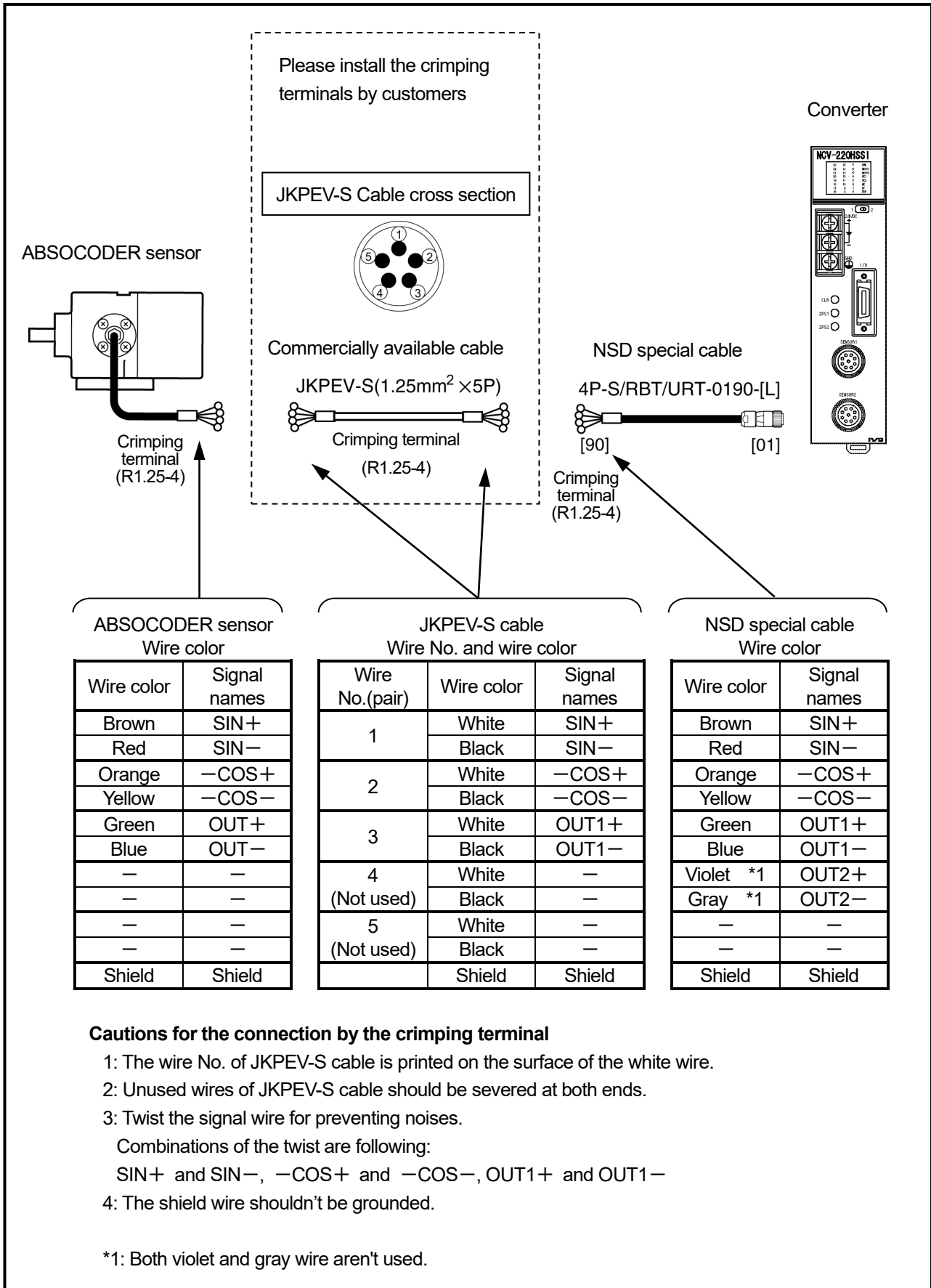


7-1-1. Connection configure example of the sensor cable

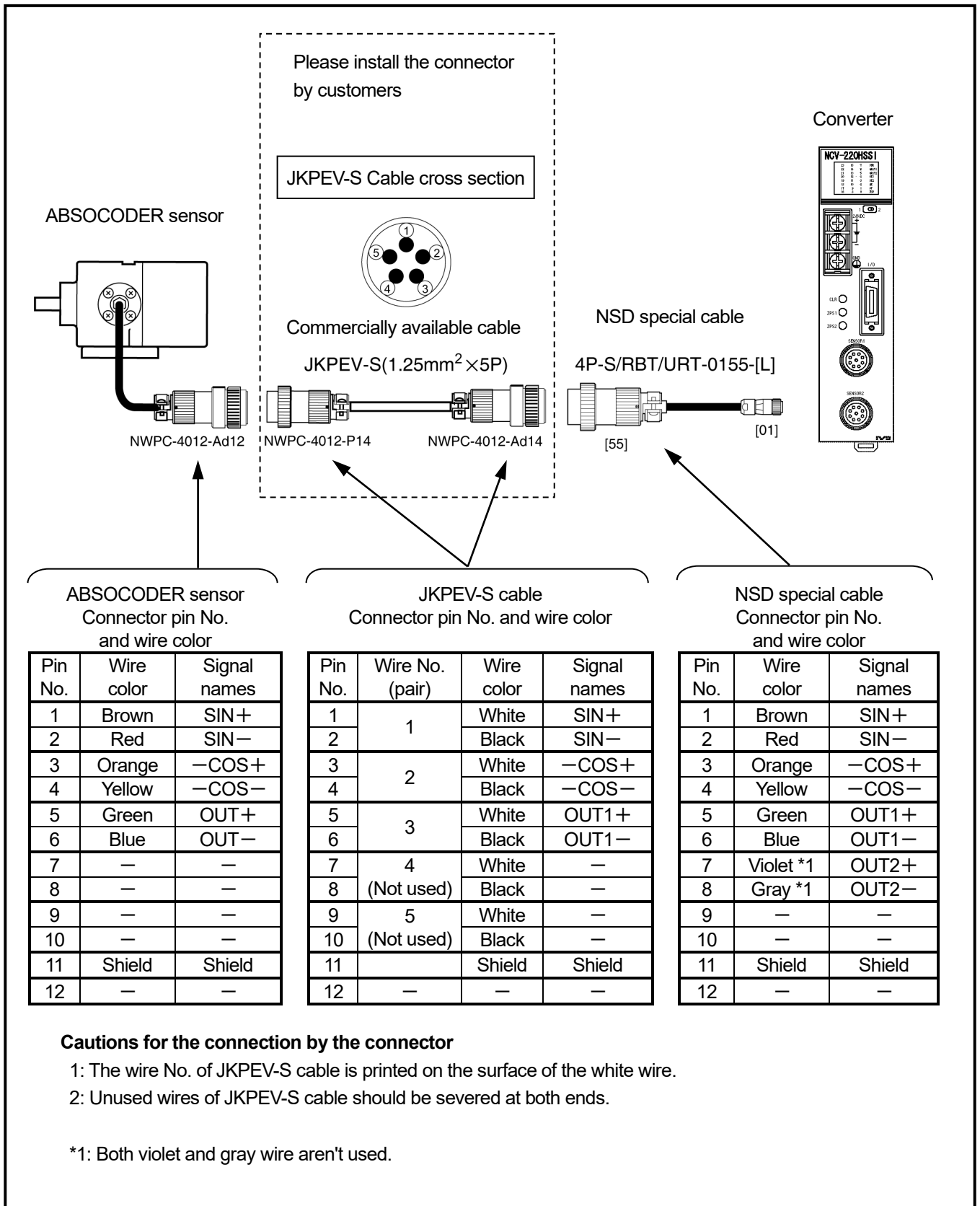
● In the case of using the NSD special cable



- In the case of using the commercially available cable (JKPEV-S 1.25mm² × 5P) and connecting with crimping terminals



- In the case of using the commercially available cable (JKPEV-S 1.25mm²×5P) and connecting with a connector

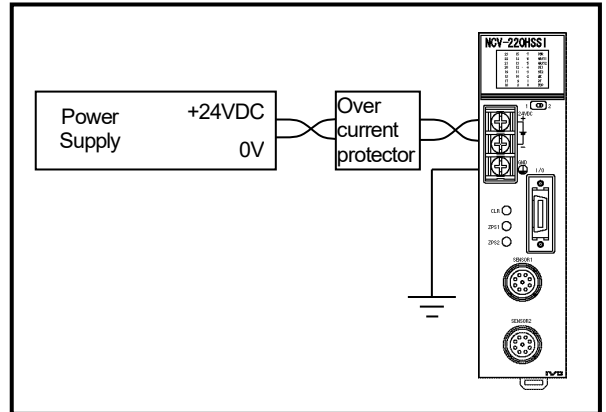


7-2. Power Supply Connection

The power supply should be connected as described below:

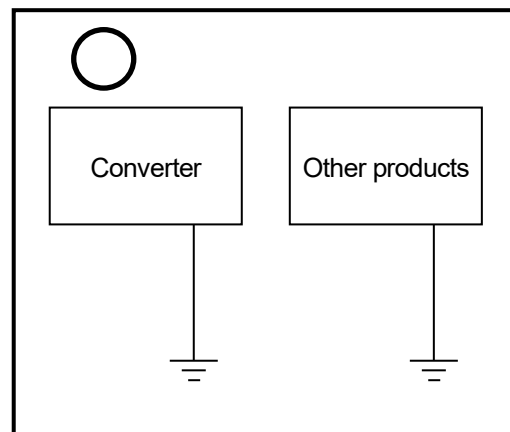
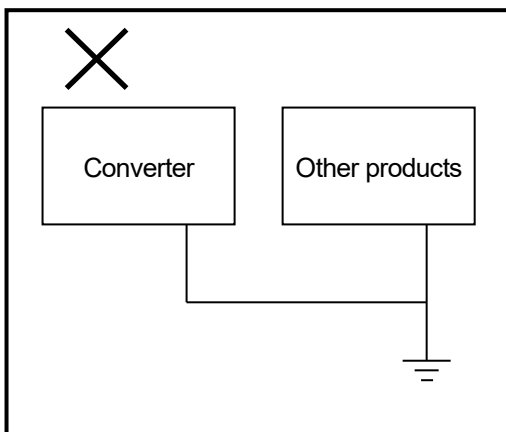
●Power Supply

- Choose the power supply capacity which is more than twice the power consumption of the converter.
The power consumption of the converter is 10W or less.
- The input power supply should be isolated from the commercial power supply.
- The power cable should be as thick as possible to minimize voltage drops.
- 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 terminal block tightening torque is 1.8 N·m (16 lb·in).



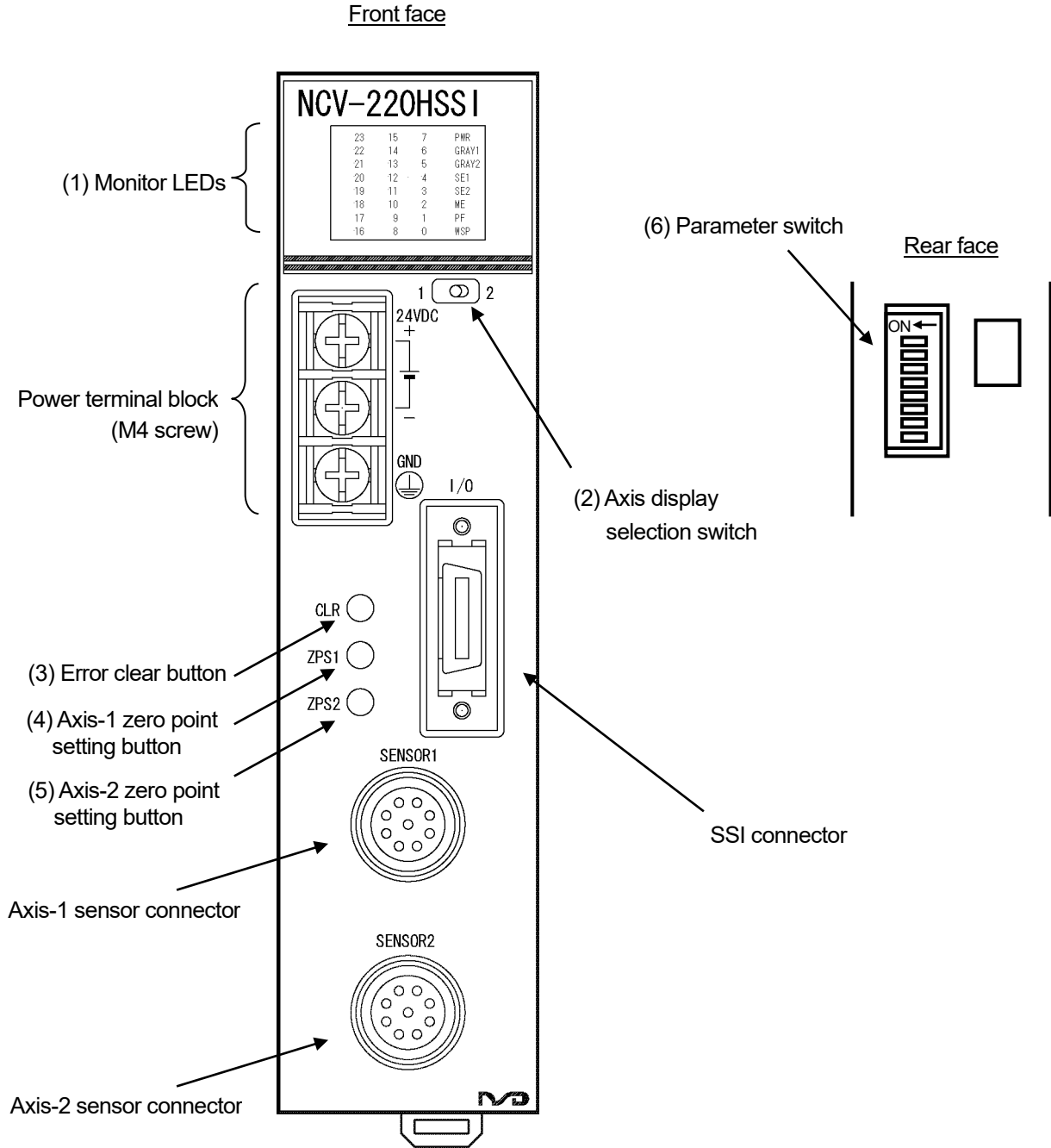
●Ground

- 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).



8. NOMENCLATURE

8-1. Part Identification



8-2. Function and Name of Display and Setting Area

(1) Monitor LEDs

Name	Description
PWR (green)	LED turns ON when the power supply is normal status.
GRAY1 (green)	LED turns ON when the axis-1 output code is gray.
GRAY2 (green)	LED turns ON when the axis-2 output code is gray.
SE1 (red)	LED turns ON when the axis-1 sensor is disconnected.
SE2 (red)	LED turns ON when the axis-2 sensor is disconnected.
ME (red)	LED turns ON when the memory has an error.
PF (red)	LED turns ON when the power supply voltage is low.
WSP (red)	LED blinks or ON when the converter has an error.
0 to 23 (green)	Indicates a position data in a binary code. The axis-1 position data is displayed when the axis display selection switch is "1". The axis-2 position data is displayed when the axis display selection switch is "2". Indicates in 0 to 12 (13-bit) 13 to 23 aren't used.

(2) Axis display selection switch

Selects the position data which is displayed on the monitor LED on the panel.

- The axis-1 current position data is displayed on monitor LED when the switch is "1".
 - The axis-2 current position data is displayed on monitor LED when the switch is "2".
- All LEDs from 0 to 23 blink when the axis-2 is not used.

(3) Error clear button [CLR]

The error display turns OFF by pressing this button [CLR] after removing an error cause. The system ready signal of the connector output turns ON.

(4) Axis-1 zero point setting button [ZPS1]

Axis-1 position data is set to "0" by pressing this button [ZPS1]. Do this procedure after moving the machine position to the zero point position (0 position).

(5) Axis-2 zero point setting button [ZPS2]

Axis-2 position data is set to "0" by pressing this button [ZPS2]. Do this procedure after moving the machine position to the zero point position (0 position).

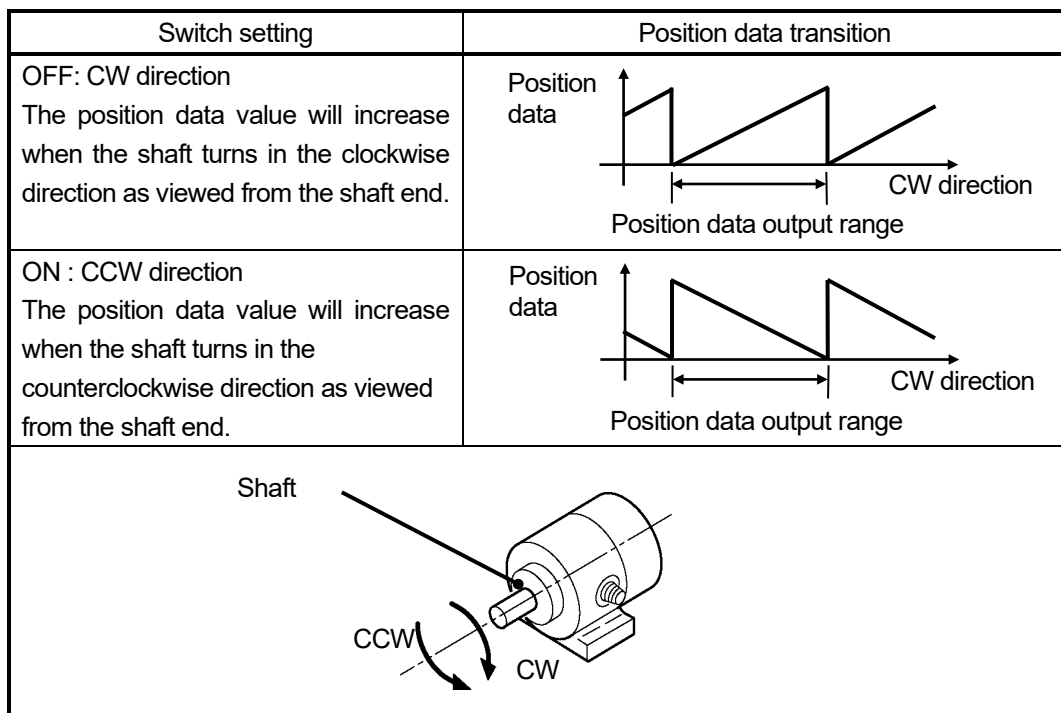
(6) Parameter switch (Rear face)

The switch status is set as the parameter when the power supply turns ON.

The operation isn't influenced even though the switch is changed during the operation.

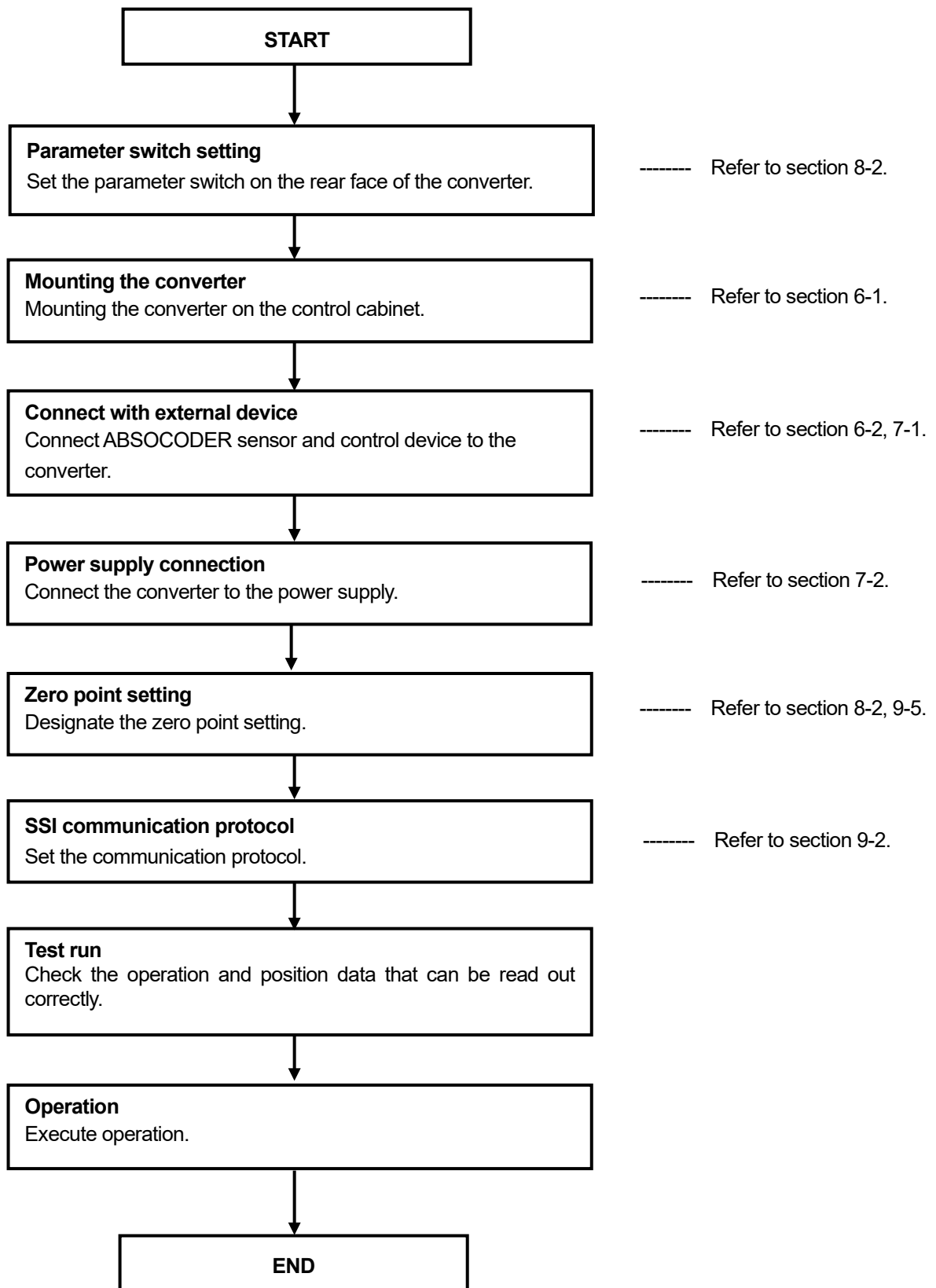
Switch No.	Parameter name	Switch setting	Description	Factory setting
1	Axis-1 position data increase direction	ON : CCW OFF: CW	Specify the direction in which the axis-1 position data should increase. *1	OFF
2	Axis-2 position data increase direction	ON : CCW OFF: CW	Specify the direction in which the axis-2 position data should increase. *1	OFF
3	Axis-1 output code	ON : Gray OFF: Binary	Outputs Axis-1 position data in the gray code when the setting is ON.	OFF
4	Axis-2 output code	ON : Gray OFF: Binary	Outputs Axis-2 position data in the gray code when the setting is ON.	OFF
5	Reserved	Fixed at OFF	Keep this switch in the OFF position. The correct operation cannot be guaranteed if this switch is set to the ON position.	OFF
6	Reserved	Fixed at OFF	Keep this switch in the OFF position. The correct operation cannot be guaranteed if this switch is set to the ON position.	OFF
7	Reserved	Fixed at OFF	Keep this switch in the OFF position. The correct operation cannot be guaranteed if this switch is set to the ON position.	OFF
8	Axis-2 (enabled / disabled)	ON : Disable OFF: Enable	When this switch is set to the ON position, error will not occur even if the axis-2 sensor is not connected. Axis-2 position data is "0", and monitor LEDs from 0 to 23 blink.	OFF

*1: The position data increases or decreases according to the ABSOCODER sensor's shaft rotative direction.



9. OPERATION

9-1. Operation Sequence



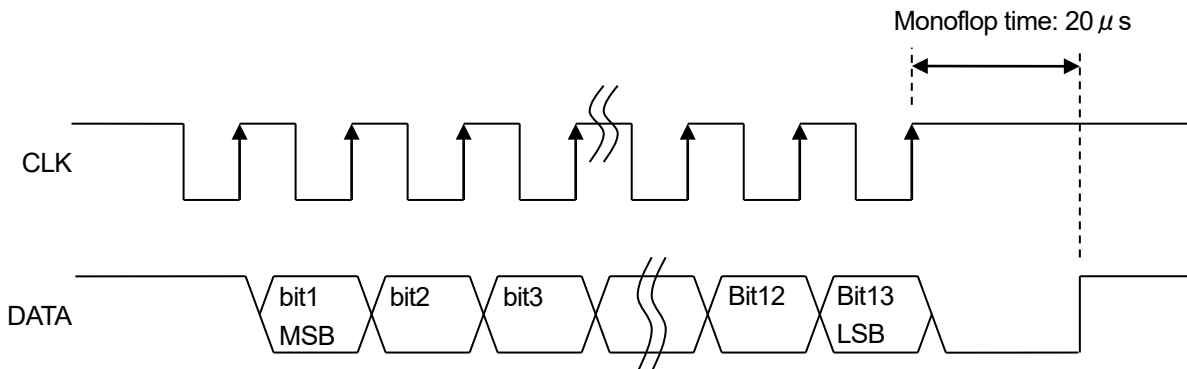
9-2. SSI Communication Protocol

bit	1	2	3	4	5	6	7	8	9	10	11	12	13
data	D	D	D	D	D	D	D	D	D	D	D	D	D
	12	11	10	9	8	7	6	5	4	3	2	1	0

- (1) Set the following of the host PLC side.
- Absolute Sensor *1 (the data length): 13-bit.
 - Steps/Revolutions *1: 8192.

*1 The items name is written when using SM338 manufactured by SIEMENS AG.

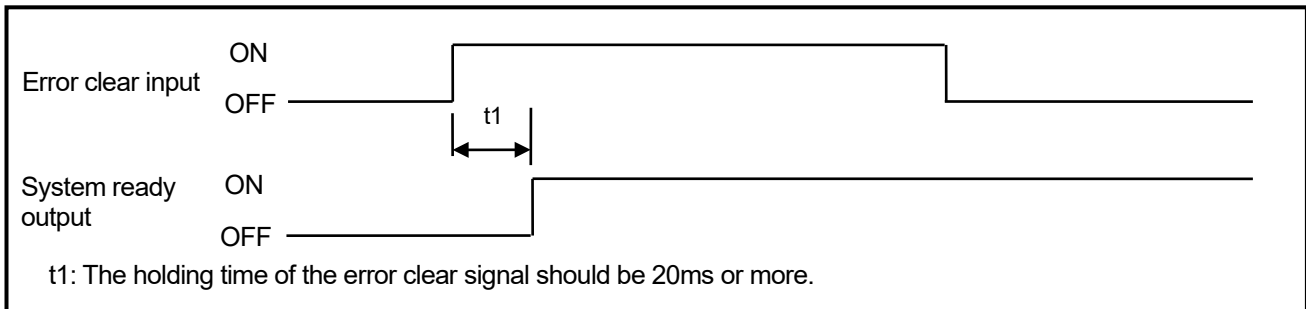
9-3. SSI Communication Timing Chart



- (1) The newest DATA is latched and MSB is sent to the DATA line when the first CLK rises.
 After that, the DATA is sent at each clock rising until LSB.
 The DATA will be "L" after DATA is sent until LSB. (monoflop time)
- (2) The same DATA will be sent from MSB again when the CLK is supplied newly within monoflop time.
 The DATA becomes "H" when the CLK isn't supplied newly within the monoflop time.
 After time passes more than monoflop time, the newest data will send from MSB again when CLK rises.

9-4. Error Clear Input (CLR)

The chart below indicates the error clear input timing.

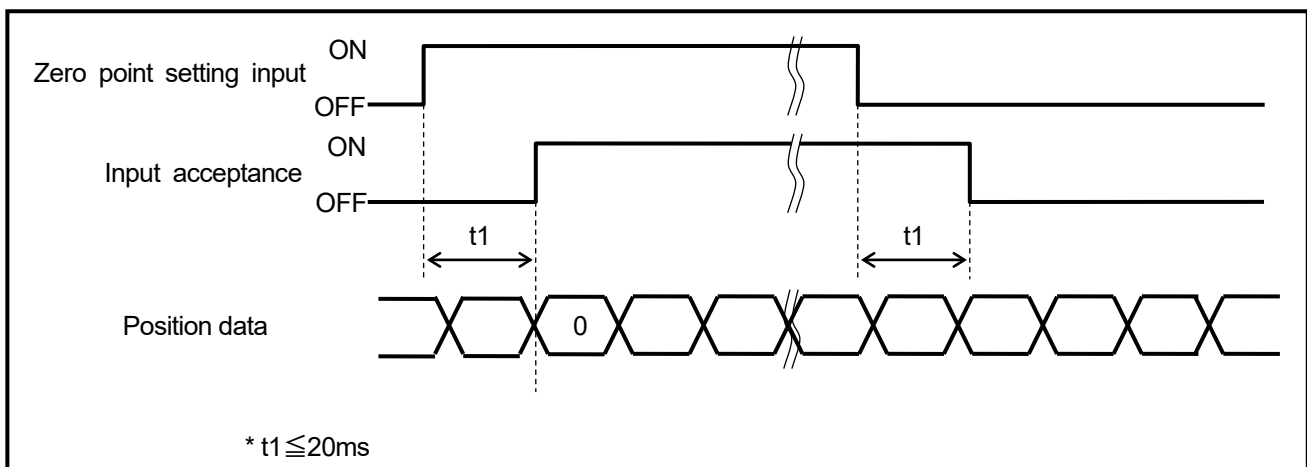


Important

The error clear input must be ON 20ms or more.
The error clear signal must be turned OFF after clearing the error.

9-5. Zero Point Setting Input (ZPS1, ZPS2)

The chart below indicates the zero point setting input timing.



Important

The zero point setting input must be ON 20ms or more.
The zero point setting signal must be turned OFF after setting the zero point.

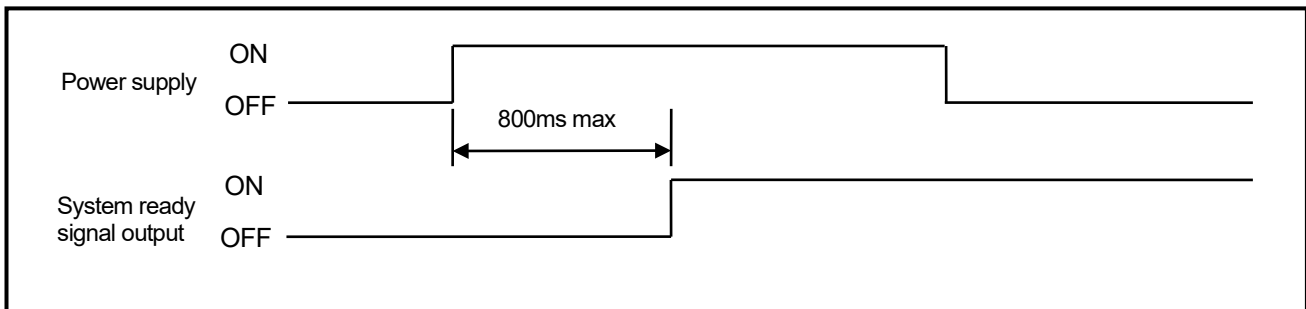
9-6. System Ready Signal Output (NOR1, NOR2)

The system ready signal indicates that the normal position data is output from the converter.

The signal is ON when ABSOCODER sensor and converter operate normally.

For your safety, read the position data when the system ready signal is ON.

The following figure indicates the timing from turning ON the power supply to outputting the system ready signal.



10. INSPECTION

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 fluctuation at the power supply terminal block of the converter to determine if it is within the prescribed range.	Within 21.6V to 26.4VDC range	Tester
Ambient Conditions	Check the ambient temperature.	ABSOCODER sensor VRE-P061: -20 to +80°C VRE-P074: -20 to +120°C VRE-P097: -20 to +120°C VRE-P101: -20 to +120°C Converter: 0 to +55°C	Thermometer
	There should be no accumulation of dust.	None	
Mount Conditions	Verify that the sensor is securely mounted.	There should be no looseness.	Visual Inspection
	Verify that the sensor shaft 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 SSI connector is plugged in all the way.	There should be no looseness.	

11. TROUBLESHOOTING

11-1. Display and Countermeasure when an Error Occurred

Error monitor	Name	Probable cause	Error cancel procedures
"SE 1" or "SE 2" LED is ON	Sensor disconnected error	Sensor connector is disconnected or loose.	After removing an error cause, clear the error by either way: - Press CLR button. - Turn ON the error clear input signal.
		Sensor cable is severed.	Replace the sensor cable.
		ABSOCODER sensor failure	Replace the ABSOCODER sensor.
		Converter failure	Replace the converter.
"PF" LED is ON	Low power supply error	Voltage drop of the power supply. Instantaneous power failure of the power supply.	After removing an error cause, clear the error by either way: - Press CLR button. - Turn ON the error clear input signal.
"ME" LED is ON	Memory error	Memory data has been changed due to external noise, etc.	After moving the machine to the zero point, press "ZPS1" and "ZPS2" buttons at same time in order to clear an error. NOTE The position data is changed to "0" when clearing the error. (The zero point setting is executed.)
"WSP" LED is ON	Converter error	Watchdog timer error occurs.	Replace the converter.
"WSP" LED blinks	Converter error	Converter failure	Replace the converter.

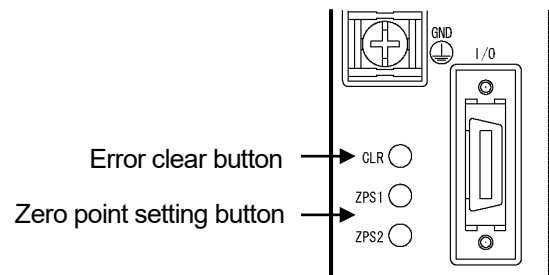
Note
The error wouldn't be cleared if a cause isn't removed.

11-2. Error Clear Method

The error clear is executed by following methods.

(1) In the case of clearing SE and PE

- Press the error clear button [CLR] on the front panel.
- Turn on the error clear input signal [CLR] in the I/O connector from PLC or host controller.



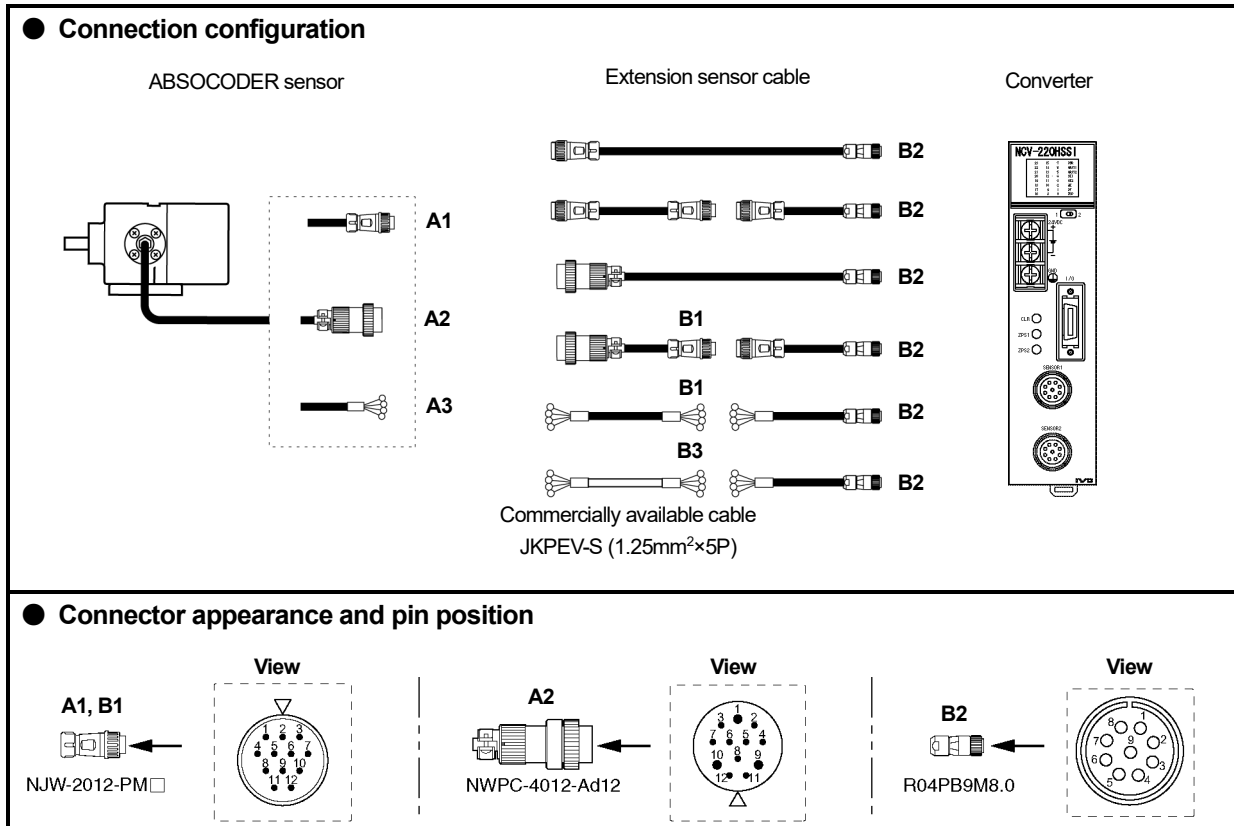
(2) In the case of clearing ME

- Press both zero point setting buttons [ZPS1 and ZPS2] on the front panel at the same time.

- MEMO -

11-3. ABSOCODER Sensor Check List

- **Applicable ABSOCODER sensor models**
VRE-P061, VRE-P074, VRE-P097, VRE-P101



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

Check position						Signal names	Standard coil resistance [Ω]	
A1, A2, A3, B1		B2		B3			VRE-P061	VRE-P074 VRE-P097 VRE-P101
Pin No.	Wiring color	Pin No.	Wiring color	Wire No. (pair)	Wiring color			
1	Brown	1	Brown	1	White	SIN+	219 to 229	227 to 243
2	Red	2	Red		Black	SIN-		
3	Orange	3	Orange	2	White	-COS+	219 to 229	227 to 243
4	Yellow	4	Yellow		Black	-COS-		
5	Green	5	Green	3	White	OUT+	3.5 to 5.5	28.5 to 40.5
6	Blue	6	Blue		Black	OUT-		
7	-	7	Violet	4	White	-		
8	-	8	Gray		Black	-		
9	-	-	-	5	White	-		
10	-	-	-		Black	-		
11	Shield	9	Shield	-	Shield	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 orange, green, shield	∞
Between orange and yellow		Between orange and green, shield	
Between green and blue		Between green and shield	
		Between frame and each wire or shield	

*1: If a check is done at Point B, the measurement value will be [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).

The resistance value of the JKPEV-S cable is 0.034Ω/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 orange, green, shield	10MΩ or more
Between orange and green, shield	
Between green and shield	
Between frame and each wire or shield	

 **Note**

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.

● SSI cable

Install the clamp filter (accessory) to the SSI cable.

The installation position was set within 300 mm of the host controller.

The shielded SSI cable should be connected to the ground of the converter's power terminal block.

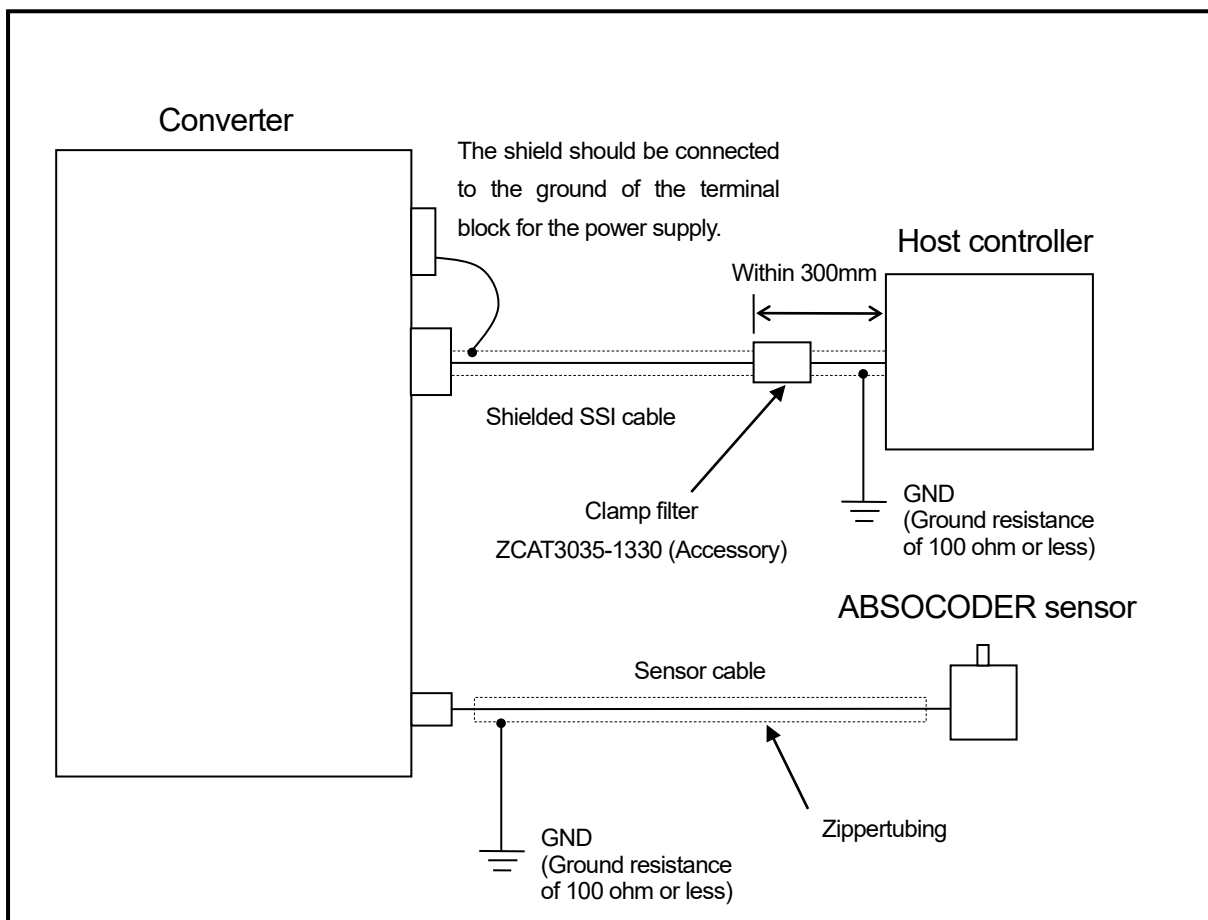
It close to the host controller should be connected to the ground.

● Sensor cable

The sensor cable should be covered with the zippertubing with a shield, and the shield should be grounded close to the converter.

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

NSD Trading Corporation 3-31-23, OSU, NAKA-KU, NAGOYA, JAPAN 460-8302

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