For Iron and Steel Industry

Absocoder®

ABSOCODER CONVERTER

NCV-20HBNV1R
NCV-20HGNV1R

Specifications & Instruction Manual

Applicable ABSOCODER:
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 ⚠CAUTION 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 case 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 exposed 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.

Document No.	Date	Revision Description
ZEF004479300	21, Dec., 2007	1st Edition Japanese document: ZEF004478701
ZEF004479301	28, Mar., 2008	2nd Edition Japanese document: ZEF004478702 Modification 6-2. Power Supply Connection 6-3. Input / Output Connector Connection
ZEF004479302	17, Jun., 2013	3rd Edition Japanese document: ZEF004478703
ZEF004479303	17, Sep., 2013	4th Edition Japanese document: ZEF004478704
ZEF004479304	19, Feb., 2016	5th Edition Japanese document: ZEF004478705

CONTENTS

1. SUMMARY

The NCV-20H Series converter can use with a position detection sensor "ABSOCODER" which has high environment resistance.　The durability and reliability is highly improved for iron and steel industry.　The position data that ABSOCODER detect by the absolute value is converted to binary or gray binary values for output.　NCV-20HB(G)NV1R converter is used with VRE (single-turn) type of ABSOCODER.

1-1. Features

(1) Optimum durability and high reliability for iron and steel industry

(2) Using VRE (single-turn) type ABSOCODER
   NCV-20HB(G)NV1R detects the position data that single turn of ABSOCODER divides into 8192 by the absolute format.

(3) Applicable with JKPEV-S cable
   A commercially available cable can be used between the converter and ABSOCODER.

(4) 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.

(5) 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.

(6) Compact design

   The unit's outside dimensions (39(W) x 155(H) x 93(D)) were miniaturized.　Moreover, it is possible to use DIN rail which is easy to mount the converter.

(7) Current position setting function

   The position data can be changed as desired by using the control panel's rotary switch.
   The current position setting is also quick and easy at installation.

(8) A full array of position data reading formats

   a) Latch pulse format
      Position data reading occurs by synchronizing with the latch pulse signal output from the converter. A position data update cycle (0.2ms, 0.4ms, 12.8ms, 25.6ms, 51.2ms) which is suitable for the host controller's reading speed can be selected.

   b) HOLD signal format
      A HOLD signal is input to the converter to stop position data output updates, with the position data then being read.
      This desired HOLD signal format can be selected from two types:
      - A transparent format in which data reading occurs while the HOLD signal is ON.
      - A PC synchro format in which position data updates occurs at the HOLD signal's leading or trailing edge.

(9) Error detection function

   A sensor disconnected error (SE) is indicated by a monitor "LED". A status output is also provided, enabling reading to a host controller (PLC, etc.).

(10) Compliance with UL and CE standards

   The NCV-20H Series complies with both UL (UL508) and CE (EMC Directive) standards, and therefore presents no problems when used in equipment which is to be exported abroad.

(11) Compliance with KC mark (Korea Certification Mark)

   The NCV-20H Series complies with KC mark. (It is only certified under the Radio Waves Act of South Korea.)
   KC mark is the same directives as CE marking. For more details, refer to "5-3. CE Marking".

2. MODEL SELECTION WHEN ORDERING

Indicates the configuration of NCV-20H.　Before ordering, refer to the connection configure and model list.
Please prepare by customer except 1 to 6 in the connection configuration.

●Connection configuration

(1) Converter
NCV-20HBNV1R
NCV-20HGNV1R

NCV-20H

Power
Supply
+24V
0V
Ground

Connector at cable side
(It is included in the converter.)
MR-25F : Soldered socket
MR-25L : Cover
Connectors are manufactured by Honda Tsushin Kogyo Co., LTD.

SENSOR

PLC

External output signal
-Position data
-Latch pulse
-Sensor disconnected

External input signal
-HOLD
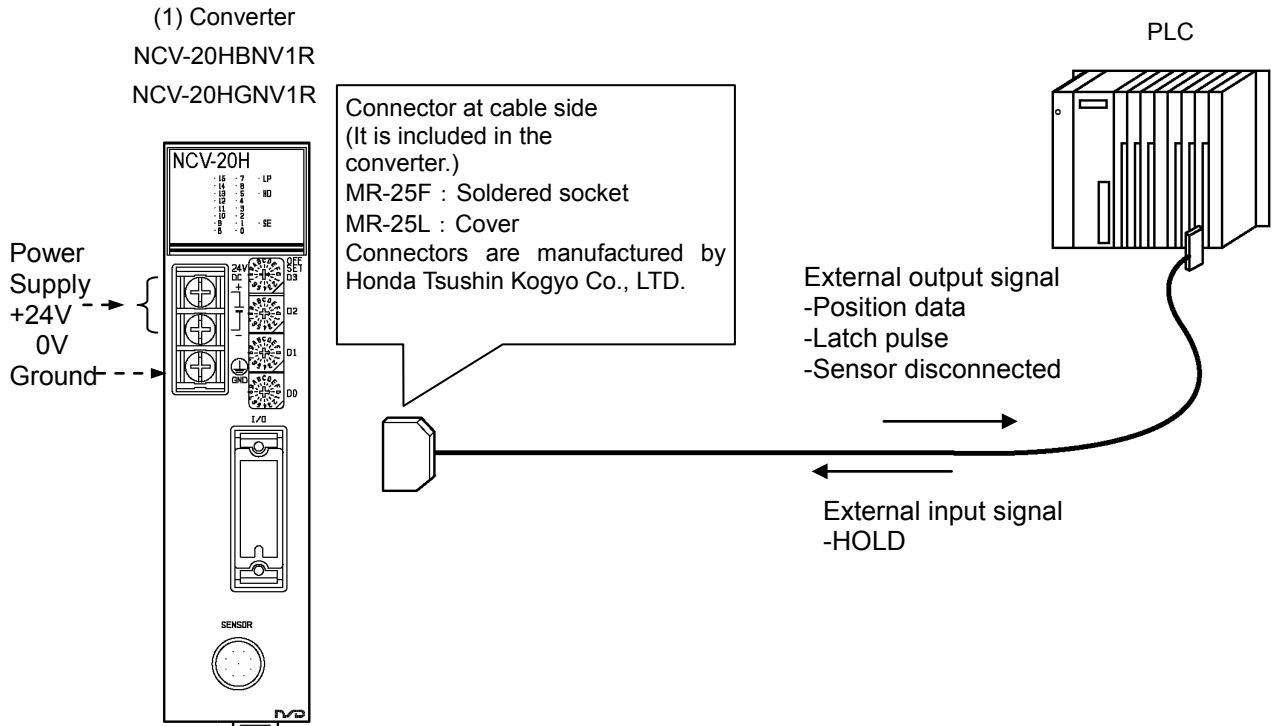
(3) to (6) Extension sensor cable		(2) ABSOCODER	
-In the case of using the dedicated cable		Connector type	
(3) 4P-S/RBT/URT-0144-[L] [01]　　　　　　　　　　　　　　　　[44]			VRE-P061 VRE-P074 VRE-P097 VRE-P101
(3) 4P-S/RBT/URT-0144-[L] [01]　　　　[44]	(4) 4P-S/RBT/URT/HRT-4344-[L] [43]　　　　[44]	B	
-In the case of using the commercially available cable			
(5) 4P-S/RBT/URT-0155-[L] [01]　　　　[55]	JKPEV-S(1.25mm^2×5P) NWPC-4012-Ad14　　NWPC-4012-P14 [27]　　　　　　[26]	P	
(6) 4P-S/RBT/URT-0190-[L] [01]　　　　[90]	JKPEV-S(1.25mm^2×5P)	R	

2-1. Model List

◆Converter

No.	Model	Descriptions
(1)	NCV-20HBNV1R	Position data binary code output (13bit)
	NCV-20HGNV1R	Position data gray code output (13bit)

◆ABSOCODER

No.	Model	Descriptions
(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

	[2]: Mounting format
	  F: Flange-mount type L: Base-mount type M: Face-mount type
	                                                                                                    (Only available for VRE-P074)
	
	K: Input shaft (sunk key)
	
	[3]: Connector type
	     B: Standard connector for the dedicated 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 dedicated cable (R1.25-4)
	
	[L]: Interconnecting sensor cable length (m): 2, 5,10, 20
	
	G: Silicon oil injected, no code: no oil injected	

◆ Extension sensor cable

No.	Models	Descriptions
(3)	4P-S-0144-[L]	Standard cable, standard connector
	4P-RBT-0144-[L]	Robotic cable, standard connector
	4P-URT-0144-[L]	Semi-heat-resistant robotic cable, standard connector
(4)	4P-S-4344-[L]	Standard cable, standard connector
	4P-RBT-4344-[L]	Robotic cable, standard connector
	4P-URT-4344-[L]	Semi-heat-resistant robotic cable, standard connector
	4P-HRT-4344-[L]	Heat-resistant robotic cable, standard connector
(5)	4P-S-0155-[L]	For JKPEV-S cable Standard cable, large connector
	4P-RBT-0155-[L]	For JKPEV-S cable Robotic cable, large connector
	4P-URT-0155-[L]	For JKPEV-S cable Semi-heat-resistant robotic cable, large connector
(6)	4P-S-0190-[L]	For JKPEV-S cable Standard cable, crimping terminal
	4P-RBT-0190-[L]	For JKPEV-S cable Robotic cable, crimping terminal
	4P-URT-0190-[L]	For JKPEV-S cable Semi-heat-resistant robotic cable, crimping terminal

3. SPECIFICATIONS

3-1. Converter Specifications

(1) General Specification

Items	Specifications
Power supply voltage	24VDCV±10% (including ripple)
Power consumption	7W 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 terminal 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) (Surrounding air temperature rating of 55°C maximum)
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	NCV-20HBNV1R		NCV-20HGNV1R	
Applicable ABSOCODER	VRE-P061 VRE-P074 VRE-P097 VRE-P101			
Total number of divisions	8192 (2^{13})			
Output code	Binary: 13-bit		Gray: 13-bit	
Number of detection axes	1			
Position data sampling time	0.2ms			
Status output signal	Latch pulse (Position data reading timing): 1 point Sensor disconnected error (Positive logic): 1 point Sensor disconnected error (Negative logic): 1 point			
Input signals	Position data HOLD signal: 1 point			
Control panel function	Current position setting			
Switch (on rear face of product)	Position data increase/decrease direction setting (CW / CCW) :1point			
	Position data update cycle	High-speed	0.2ms	
			0.4ms	
		Low-speed	12.8ms	
			25.6ms	
			51.2ms	
	HOLD signal format	Transparent format		
		PC synchro format		
Monitor LED	Display of sensor disconnected error, Display of position data, Display of latch pulse output, Display of HOLD signal format status			
Applicable standard	UL508 CSA C22.2 No.142 (Compliance with c-UL standard) CE marking (EMC directive) KC mark (Korea Certification Mark)			

(3) Input / Output Specification

	Items	Specifications
Input	Input signals	$\overline{\text{HD}}$ (Position data HOLD): 1 point
	Input circuit	DC input, photo-coupler isolation
	Input logic	Negative logic
	Rated input voltage	24VDC±10%
	Rated input current	10mA(24VDC)
	ON voltage	10VDC or more
	OFF voltage	4VDC or less
Output	Output signals	$\overline{\text{D0}}$ to $\overline{\text{D12}}$ (Position data): 13 points $\overline{\text{LP}}$ (Latch pulse: position data reading timing): 1 point $\overline{\text{SE}}$, SE(Sensor disconnected error): 2 points
	Output circuit	Isolation, photo-coupler open collector output
	Output logic	$\overline{\text{D0}}$ to $\overline{\text{D12}}$, $\overline{\text{LP}}$, $\overline{\text{SE}}$:negative logic SE:positive logic
	Rated load voltage	24VDC(30VDC max.)
	Max. load current	$\overline{\text{D0}}$ to $\overline{\text{D12}}$, $\overline{\text{LP}}$:10mA / point $\overline{\text{SE}}$, SE: 100mA / point
	Max. voltage drop when ON	0.8V

3-2. ABSOCODER Specifications

(1) 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	5.5 + 0.1x cable length (m) kg
Linearity error		1° Max.	0.7° Max.
Moment of inertia $GD^2/4(J)$		6.4×10^{-6} kg-m^2 (6.5×10^{-5} kgf-cm-s^2)	3.3×10^{-5} kg-m^2 (3.4×10^{-4} kgf-cm-s^2)
Starting torque		4.9×10^{-2} N-m or less (0.5 kgf-cm or less)	9.8×10^{-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		5.5×10^4h (at 3600r/min)	8×10^4h (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		2.0×10^2 m/s^2 (20G) 2000Hz, up/down 4 h, forward/back 2 h,conforms to JIS D 1601 standard	2.0×10^2 m/s^2 (20G) 200Hz, up/down 4 h, forward/back 2 h,conforms to JIS D 1601 standard
Shock resistance		4.9×10^3 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
Max. sensor cable length	4P-S	500m	
	4P-RBT/URT /HRT	250m	
	JKPEV-S (1.25mm$^2 \times$5P)	300m	
Surface treatment		Electroless nickel plate	Not treated
Material		Steel	Stainless

(2) 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)		3.3×10^{-5}kg$\cdot$m^2 (3.4×10^{-4} kgf$\cdot$cm$\cdot$s^2)	
Permissible shaft load	Radial	1.5×10^2N (15kgf)	
	Thrust	78N (8kgf)	
Permissible mechanical speed		4000r/min	
Bearing life		8×10^4h (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	
Max. sensor cable length	4P-S	500m	
	4P-RBT/URT /HRT	250m	
	JKPEV-S (1.25mm^2 $\times$ 5P)	300m	
Surface treatment		Coated (epoxy resin)	Not treated
Material		Spheroidal graphite iron castings	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	Fluonlex
Construction	8-core, 2 pairs without shield + 2 pairs with shield			
Color of sheath	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

Units: mm

Mounting hole

2-M4

DIN rail
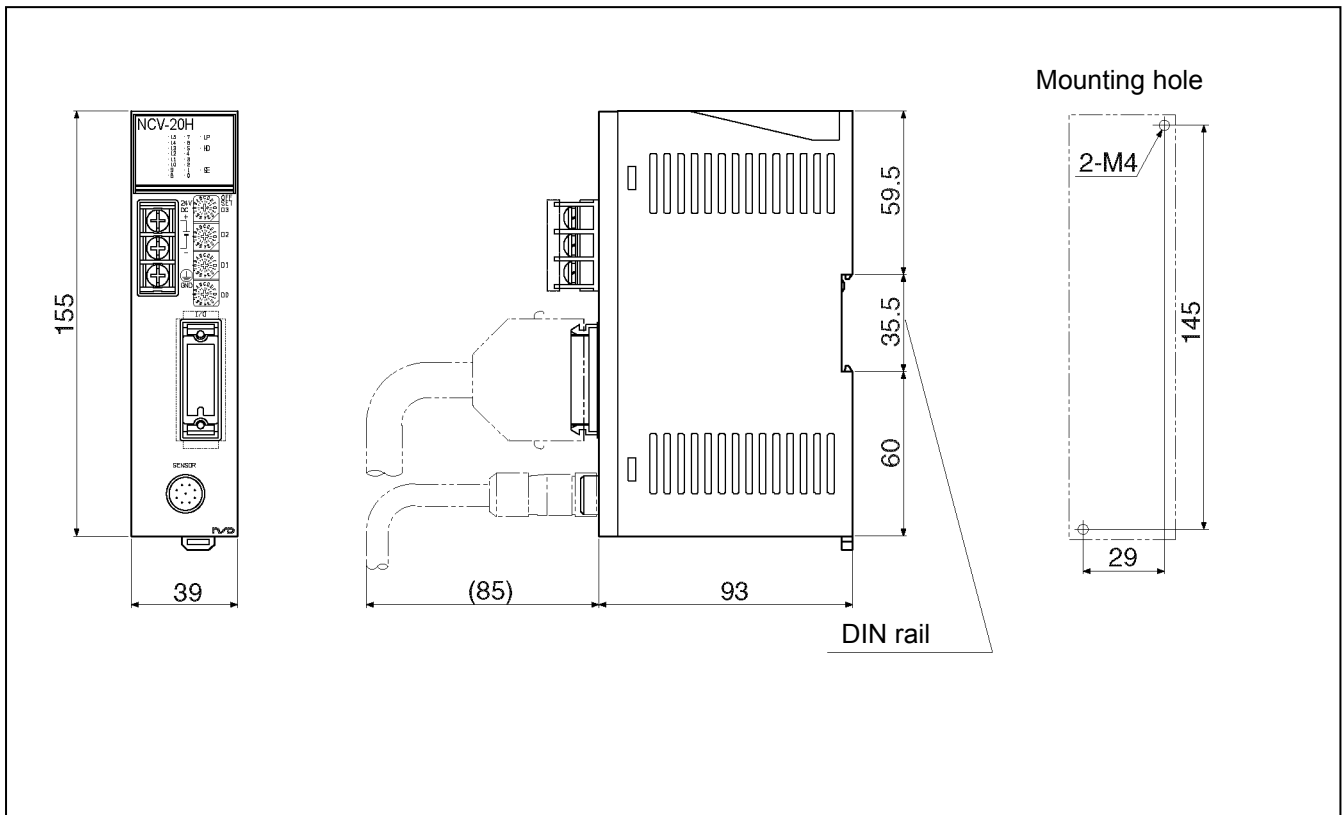
4-2. ABSOCODER

(1) VRE-P061FK[ ] (Flange-mount type)

Units: mm
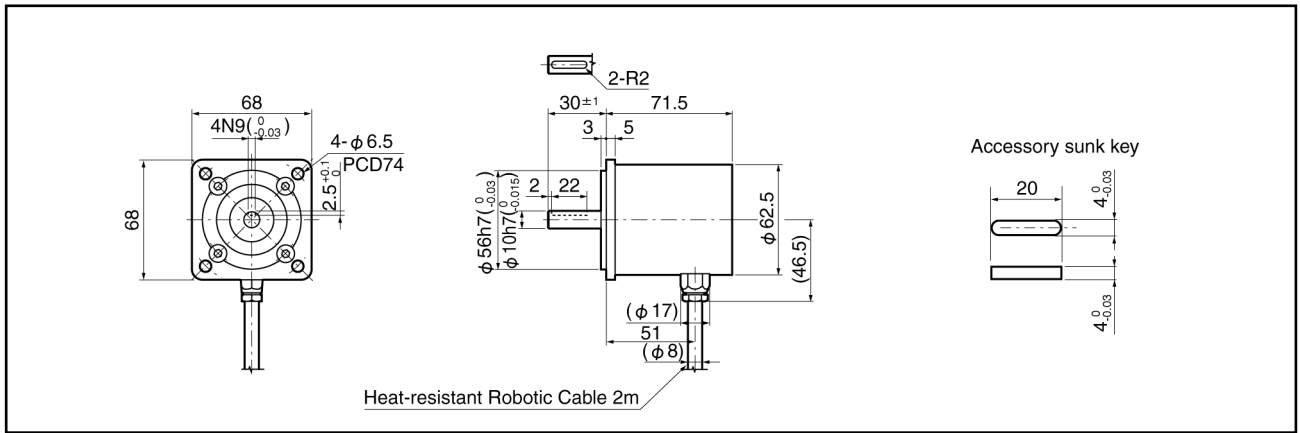
(2) VRE-P074FK[ ][ ]-G (Flange-mount type)
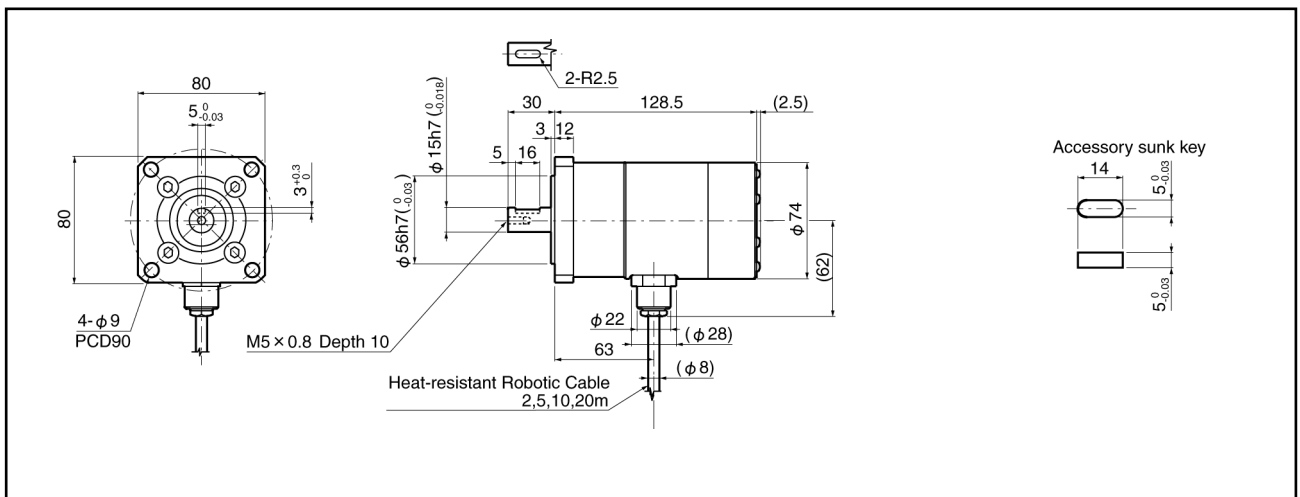
(3) VRE-P074LK[ ][ ]-G (Base-mount type)
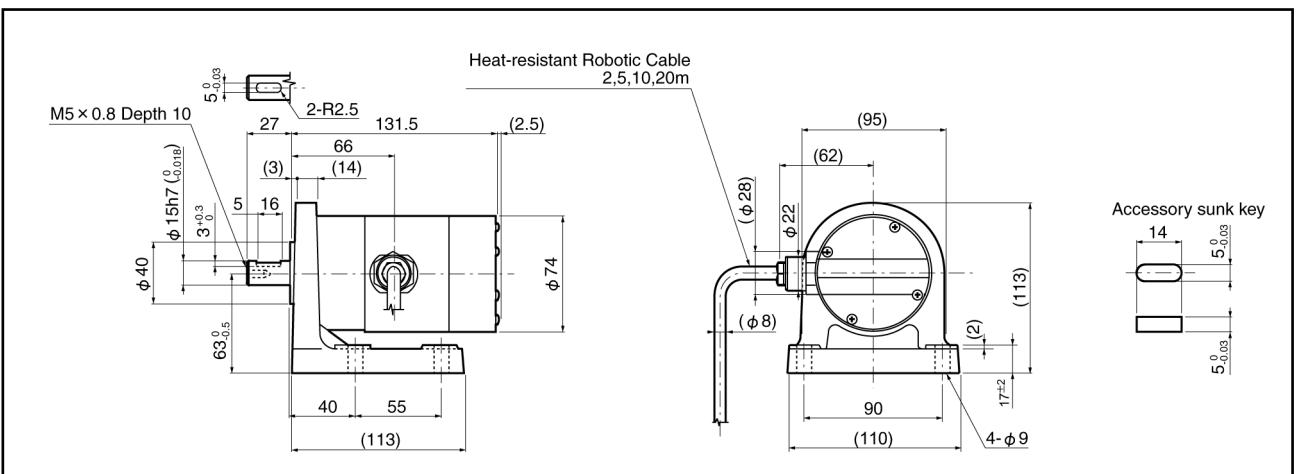
Units: mm

(4) VRE-P074MK[ ][ ]-G (Face-mount type)

4-M8×1.25 Depth 20
PCD61

$5^{\ 0}_{-0.03}$

$3^{+0.3}_{\ 0}$

2-R2.5

42 116.5 (2.5)

5 16 15

$\phi 15h7 \,(^{\ 0}_{-0.018})$

$\phi 40h7 \,(^{\ 0}_{-0.025})$

$\phi 74$

(62)

R1.5

M5×0.8 Depth 10

$\phi 22$

($\phi 28$)

51

($\phi 8$)

Heat-resistant Robotic Cable
2,5,10,20m

Accessory sunk key

14

$5^{\ 0}_{-0.03}$

$5^{\ 0}_{-0.03}$
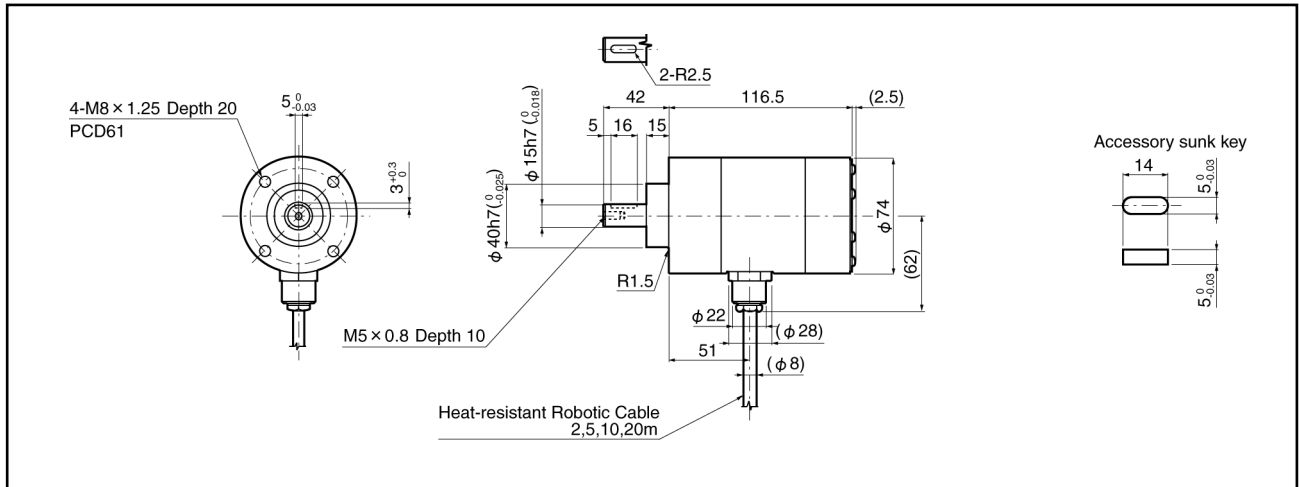
(5) VRE-P097FK[ ][ ]-G (Flange-mount type)

4-ϕ12
Backside Φ20 spot facing depth 1
PCD126

119

$5^{\ 0}_{-0.03}$

119

$3^{+0.3}_{\ 0}$

($\phi 156$)

2-R2.5

35 138

5 16

M5×0.8 Depth 10

5 16

$\phi 100h7 \,(^{\ 0}_{-0.035})$

$\phi 15h7 \,(^{\ 0}_{-0.018})$

Not painted

Not painted

$\phi 100$

(75)

R 1/2

65

($\phi 8$)

Heat-resistant Robotic Cable
2,5,10,20m

Accessory sunk key

14

$5^{\ 0}_{-0.03}$

$5^{\ 0}_{-0.03}$
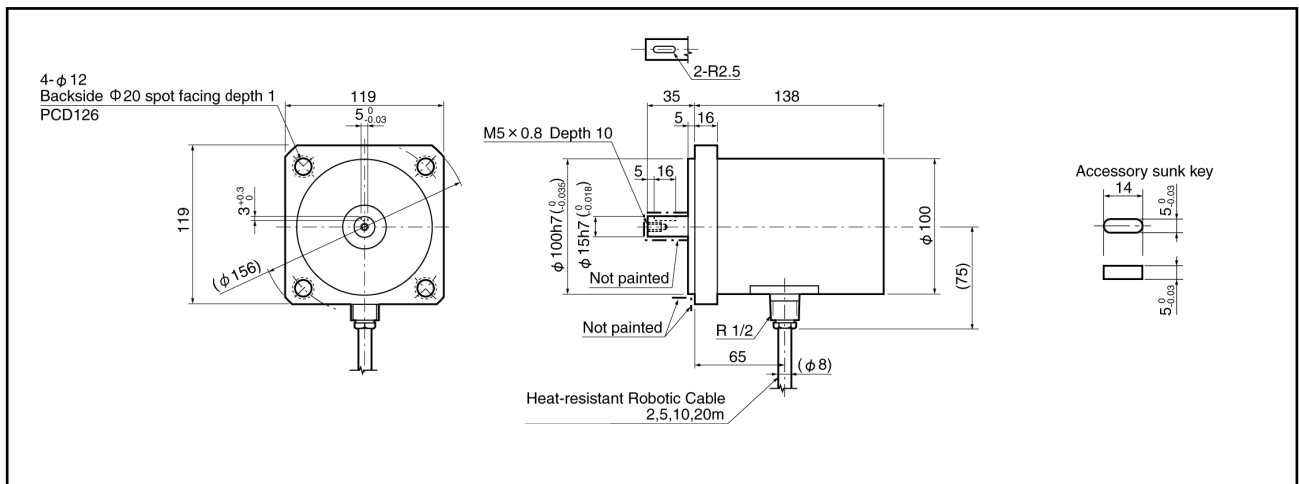
(6) VRE-P097LK[ ][ ]-G (Base-mount type)

4-ϕ12
Φ20 spot facing depth 0.5

Heat-resistant Robotic Cable
2,5,10,20m

$5^{\ 0}_{-0.03}$

(75)

$3^{+0.3}_{\ 0}$

113

$63^{\ 0}_{-0.5}$

13

($\phi 8$)

R 1/2

Not painted

56

120

140

Not painted

M5×0.8 Depth 10

2-R2.5

30 143

70

5 16 19.5

$\phi 15h7 \,(^{\ 0}_{-0.018})$

$\phi 50$

Not painted

$\phi 100$

40 60

5.5 90

Accessory sunk key

14

$5^{\ 0}_{-0.03}$

$5^{\ 0}_{-0.03}$

11
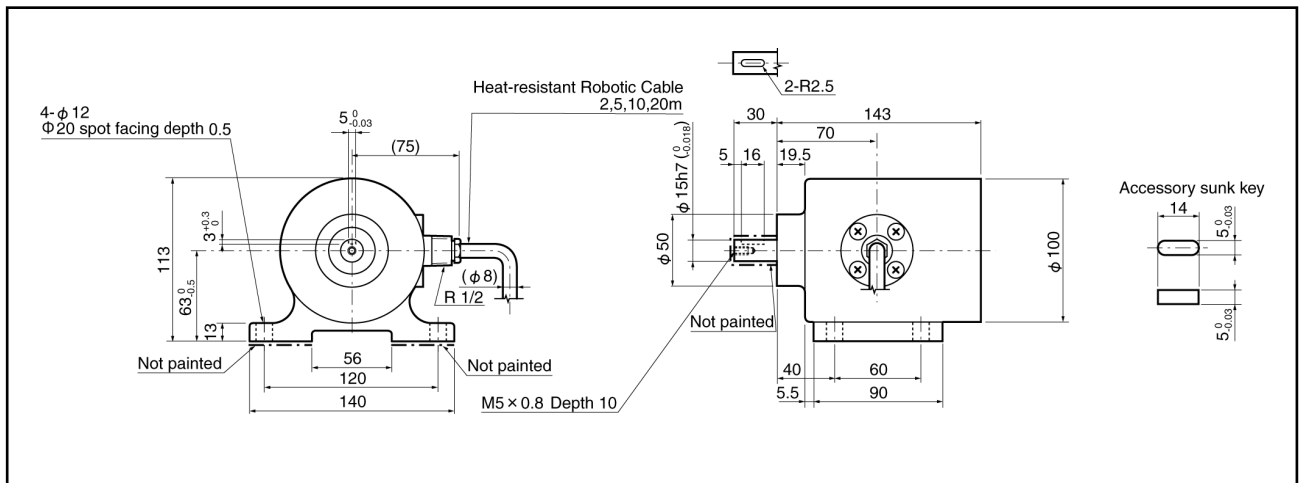
(7) VRE-P101FK[ ][ ]-G (Flange-mount type)

2-R2.5

4-φ12
PCD126

5 0/-0.03

3 +0.3/0

(φ156)

M5 × 0.8 Depth 10

35   138

5   16

5   16

φ100h7 (0/-0.035)
φ15h7 (0/-0.018)

φ100

(75)

R 1/2

65

(φ8)

Heat-resistant Robotic Cable
2,5,10,20m

Accessory sunk key

14

5 0/-0.03

5 0/-0.03
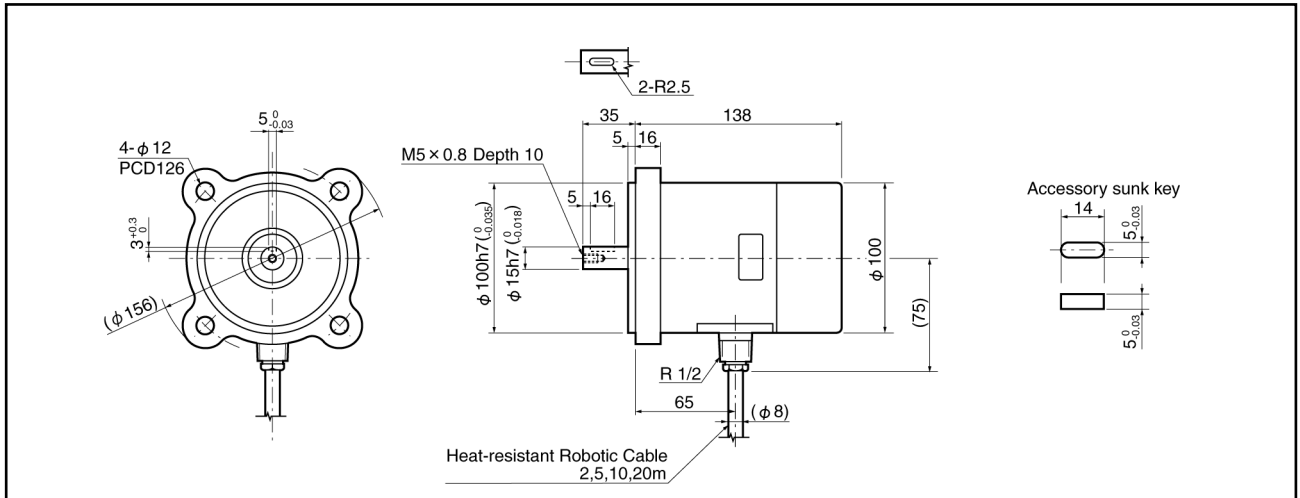
(8) VRE-P101LK[ ][ ]-G (Base-mount type)

Heat-resistant Robotic Cable
2,5,10,20m

2-R2.5

5 0/-0.03

(75)

113

3 +0.3/0

63 0/-0.5

13

56

120

140

4-φ12

(φ8)

R 1/2

M5 × 0.8 Depth 10

φ15h7 (0/-0.018)

30   143

70

5   16   19.5

φ50

40   60

5.5   90

φ100

Accessory sunk key

14

5 0/-0.03

5 0/-0.03

12
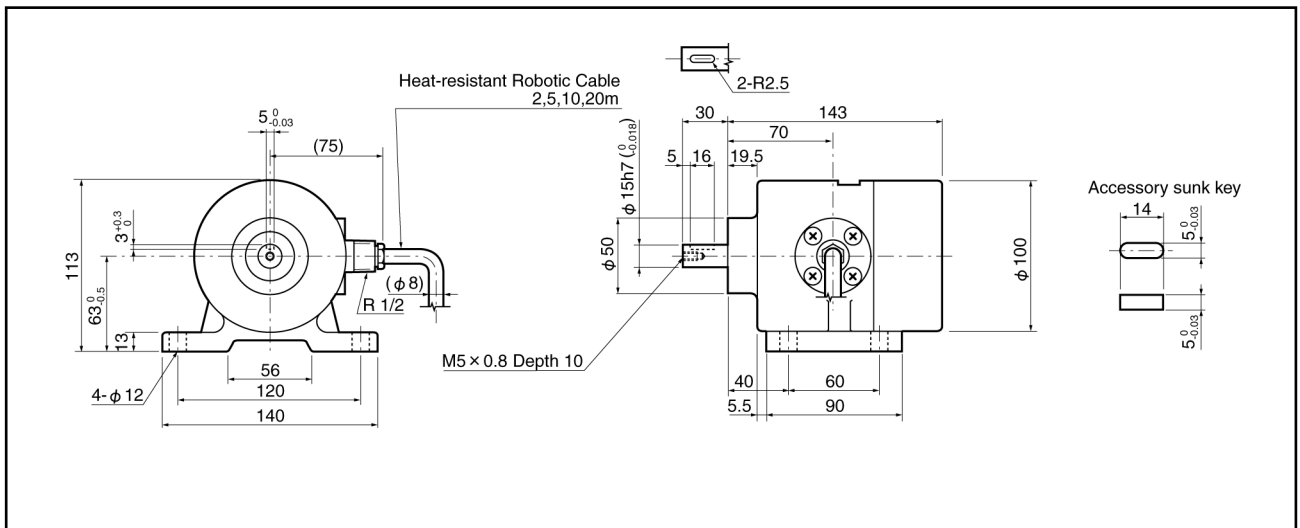
4-3. Extension Sensor Cable

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

R04-PB9M8.0A   NJW-2012-AdF8

φ16 φ11 φ8 M22×1 φ26

(42)   L   (60)

ATTN: [L] is given in terms of meter.

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

NJW-2012-PM8   NJW-2012-AdF8

φ26 φ16 φ8 M22×1 φ26

(60)   L   (60)

ATTN: [L] is given in terms of meter.

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

R04-PB9M8.0A   NWPC-4012-P12

φ16 φ11 φ8 φ35 φ47

(42)   L   (94)

ATTN: [L] is given in terms of meter.

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

Terminals   R1.25-4 (JIS C 2805)

R04-PB9M8 0A

Insulation tubes
(Signal names printed on)

φ16 φ11 φ8 (30)

(10)

(42)   L   (200)

ATTN: [L] is given in terms of meter.
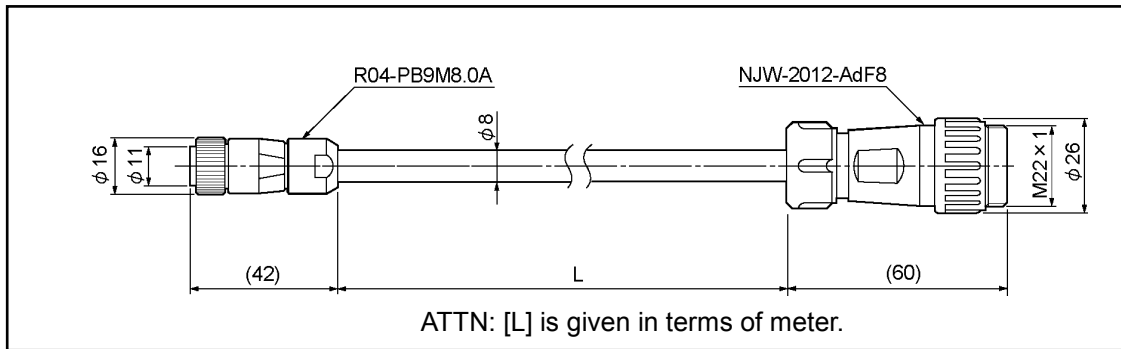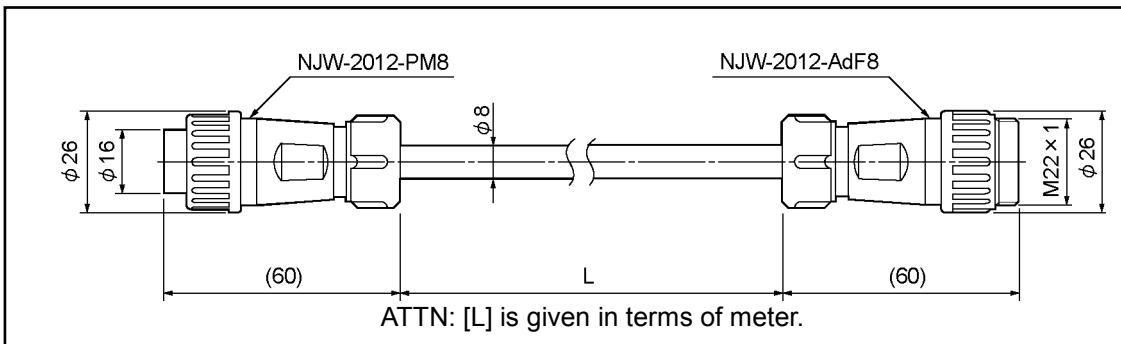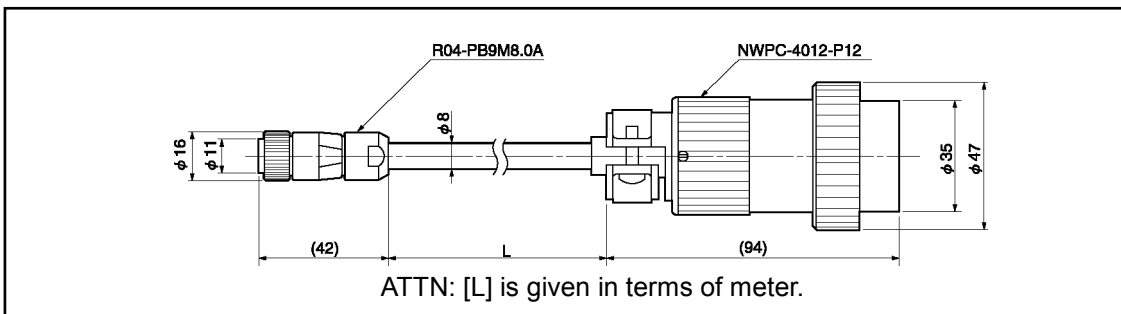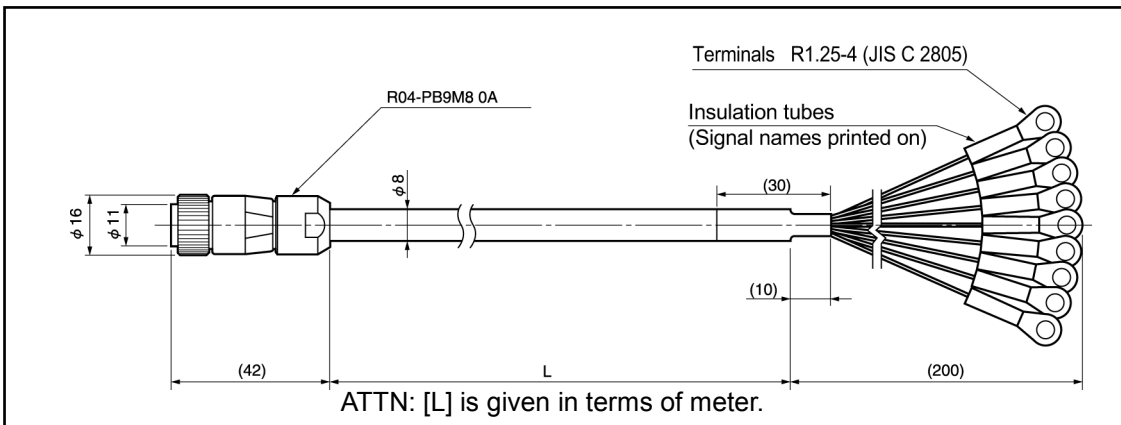
5. INSTALLATION

The installation conditions and precautions for each of the system components are described in this section.

5-1. Converter Installation Conditions and Precautions

-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
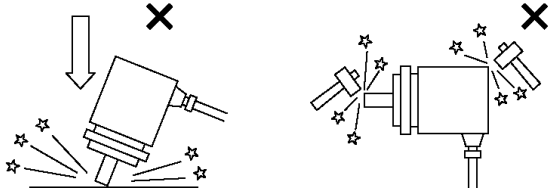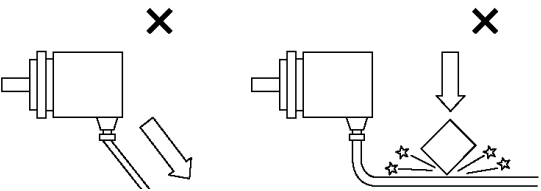
(1) Install inside the control cabinet.
(2) Install in a vertical direction so that the characters are visible.
(3) If a DIN rail mounting format is used, insert until the latch mechanism catches with an audible click.
   Secure between end plates at both sides.
(4) In high vibration areas, secure tightly 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) Peripheral components should be arranged so as not to obstruct the converter's heat dissipation.

85mm or more
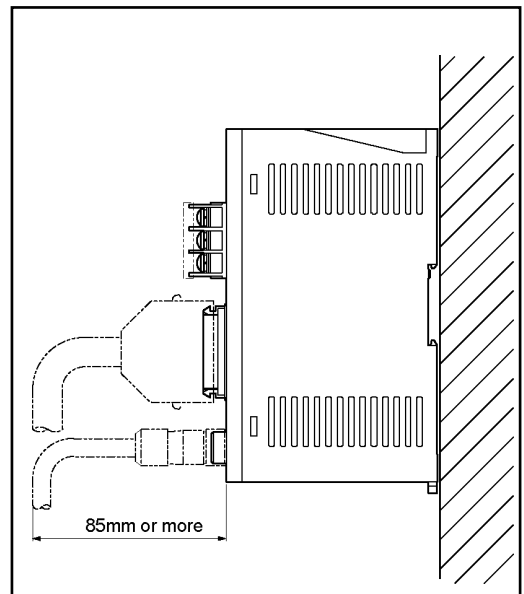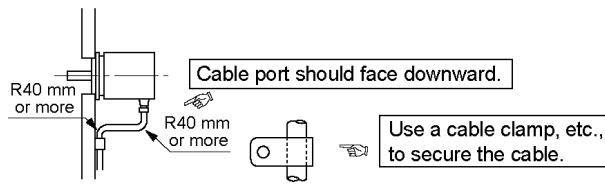
5-2. ABSOCODER Installation Conditions and Precautions

The installation conditions and precautions for ABSOCODER are described in this section.
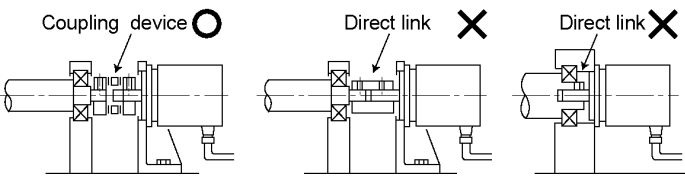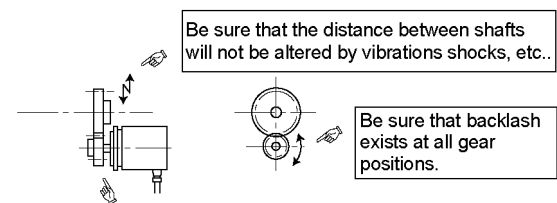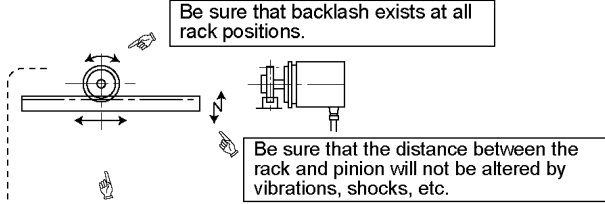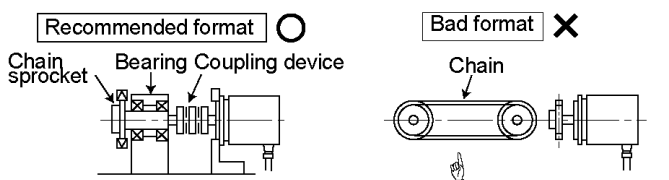
-Handling of Turn-type ABSOCODER

Item	Explanation
1) Main unit	Never drop the Sensor, or subject it to excessive forces or shocks.
2) Cable	Avoid stepping on, or applying excessive stress to the cable.
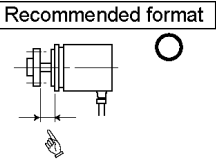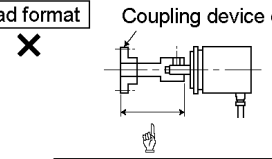
-Mounting of Turn-type ABSOCODER

Item	Explanation	Precaution
1) Mounting	For details regarding mounting dimensions, refer to each sensor dimensions.	
2) Cable port	Cable port should face downward.	

15
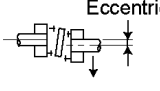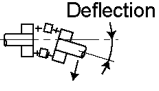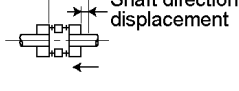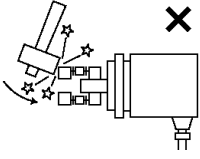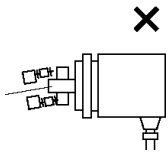
-Mounting of Turn-type ABSOCODER

Item	Explanation	Precaution
1) Coupling of machine shaft and sensor shaft	Be sure to use a coupling device to link the 2 shafts. Coupling device ⭕　　Direct link ✖　　Direct link ✖	A "direct-link" format will result in shaft fatigue and / or breakage after long periods. Therefore, be sure to use a coupling device to link the shafts.
2) For gear-type linkage	If a gear linkage is used, be sure that some backlash exists. Be sure that the distance between shafts will not be altered by vibrations shocks, etc.. Be sure that backlash exists at all gear positions. The sensor shaft pinion should be as light (small) as possible. This is especially true for environments where vibration / shock are likely.	Incorrect gear mounting can result in shaft bending or breakage.
3) For rack and pinion type linkage	Be sure that backlash exists at all rack positions. Be sure that backlash exists at all rack positions. Be sure that the distance between the rack and pinion will not be altered by vibrations, shocks, etc. Be sure that the distance between the rack and pinion is not altered when horizontal motion of the rack occurs. The sensor shaft pinion should be as light (small) as possible. This is especially true for environments where vibration / shocks are likely.	Incorrect rack and pinion mounting can result in shaft bending or breakage.
4) Chain or timing belt linkage	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. Recommended format ⭕　　　Bad format ✖ Chain sprocket　Bearing Coupling device　　Chain This linkage format is also applicable to the "rack-and-pinion" and "gear" methods shown above.　　Even a small amount of tension can produce a considerable load on the shaft.	

Mounting of Turn-type ABSOCODER

Item	Explanation	Precaution
5) Shaft mounting position	The shaft should be attached to the coupling device or gear at a point which is as near to the sensor body as possible. Recommended format ○　　Bad format ✕　Coupling device or **This distance should be as short as possible. When this distance is short, the load placed on the beaning by vibrations / shocks is slight.**　　**Never use an extended shaft format.**	

-Coupling of Turn-type ABSOCODER

Item	Explanation	Precaution
1) Coupling device selection precaution	1. When selecting a coupling, consider factors such as the design mounting error, the coupling tolerance error, and the sensor's permissible shaft load. $\text{Mounting error} < \text{Coupling tolerance error}$　$\text{Coupling shaft permissible load} < \text{Sensor shaft load}$ Prescribed dimension Eccentric　Deflection　Shaft direction displacement Load produced by eccentric condition.　Load produced by deflection.　Force produced by shaft direction displacement. Radial load　　　Thrust load 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. 3. Be sure to select a coupling device with an adequate transmission torque surplus relative to the sensor shaft's torque.	The selection of a larger coupling than necessary will increase the shaft load which is caused by the mounting error amount. Excessive force applied to the shaft can deform the coupling and reduce durability.
2) Coupling device installation precaution	Avoid bending or damaging the coupling. ✕　　　　✕	

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5-3. CE Marking

NCV-20H series conforms to CE Marking (EMC directive), but stands outside scope of the low voltage directive because it is 24 VDC power apparatus.

5-3-1. 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.

5-3-2. EMC Directive and Standards

EMC Directive consists of immunity and emission items.
It conforms to Table 01(see below) of EMC standards and Testing.

Table 01 EMC Standard and Testing

Class	Standard No.	Name
EMI (Emission)	EN61000-6-4	Generic standards. Emission standard for industrial environments
	EN55011　Class A	Electromagnetic radiation disturbance
EMS (Immunity)	EN61000-6-2	Generic standards. Immunity standard for industrial environments
	EN61000-4-2	Electrostatic discharge
	EN61000-4-3	Radiated, radio frequency, electromagetic 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

5-3-3. Measures for EMC Compliance

The I / O cable must be under 30m from the host controller to the converter. The wiring should be surely secured.

[Reference]

It may be improved when clamp ferrite core is added to the power supply cable, sensor cable, and I/O cable when it operates faultily by the influence from the peripheral device.

Recommendation Clamp Ferrite Core (Product name: Clamp filters for cable)

Mounting location	Clamp ferrite core model	Manufacturer
Power supply cable, sensor cable	ZCAT2032-0930 (Inner dimensions:ϕ 9)	TDK
I / O cable	ZCAT3035-1330 (Inner dimensions: ϕ 13)	TDK

6. WIRING

6-1. Connection between Converter and ABSOCODER

The maximum extension sensor cable length varies according to the ABSOCODER sensor and cable model being used. Please refer to the 3-2 for details.

-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.

Cable clamp

(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.

R75 or more

6-1-1. Connection configure of the sensor cable

Indicates the connection figure when using the dedicated cable and commercially available cable.

(1) In the case of using the dedicated cable

NCV-20H

Extension sensor cable

ABSOCODER sensor

4P-S/RBT/URT-0144-[L]

[01]   [44]

4P-S/RBT/URT-0144-[L]   4P-S/RBT/URT/HRT-4344-[L]

[01]   [44]   [43]   [44]

(2) In the case of using the commercially available cable (JKPEV-S 1.25mm^2 × 5P) and connecting with crimping terminals

Converter

NCV-20H

Please install the crimping terminals by customers

JKPEV-S Cable cross section

ABSOCODER sensor

Dedicated cable

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

[01]   [90]

Crimping terminal (R1.25-4)

Commercially available cable

JKPEV-S(1.25mm^2 ×5P)

Crimping terminal (R1.25-4)

Crimping terminal (R1.25-4)

Dedicated cable wire color

Wire color	Signal name
Brown	SIN＋
Red	SIN－
Orange	－COS＋
Yellow	－COS－
Green	OUT1＋
Blue	OUT1－
Violet	－
Gray	－
－	－
－	－
Shield	Shield

JKPEV-S cable wire No. and wire color

Wire No.(pair)	Wire color	Signal name
1	White	SIN＋
	Black	SIN－
2	White	－COS＋
	Black	－COS－
3	White	OUT1＋
	Black	OUT1－
4 (Not used)	White	－
	Black	－
5 (Not used)	White	－
	Black	－
	Shield	Shield

ABSOCODER sensor wire color

Wire color	Signal name
Brown	SIN＋
Red	SIN－
Orange	－COS＋
Yellow	－COS－
Green	OUT1＋
Blue	OUT1－
Violet	－
Gray	－
－	－
－	－
Shield	Shield

Cautions for the connection by the crimping terminal

1: The wire No. of JKPEV-S cable is printed on the surface of the white wire.

2: Unused wires of JKPEV-S cable should be severed at both ends.

3: Twist the signal wire for preventing noises.

   Combinations of the twist is following:

   SIN＋and SIN－, －COS＋and－COS－, OUT1＋and OUT1－

4: The shield wire shouldn't be grounded.

(3) In the case of using the commercially available cable (JKPEV-S 1.25mm^2 × 5P) and connecting with a connector

Converter

NCV-20H

Please install the connector by customers.

JKPEV-S Cable cross

ABSOCODER sensor

Dedicated cable
4P-S/RBT/URT-0155-[L]

[01]   [55]

Commercially available cable
JKPEV-S(1.25mm^2 ×5P)

NWPC-4012-Ad14   NWPC-4012-P14
[27]   [26]

NWPC-4012-Ad12

Dedicated cable connector pin arrangement and wire color

Pin No.	Wire color	Signal name
1	Brown	SIN＋
2	Red	SIN－
3	Orange	－COS＋
4	Yellow	－COS－
5	Green	OUT1＋
6	Blue	OUT1－
7	Violet	－
8	Gray	－
9	－	－
10	－	－
11	Shield	Shield
12	－	－

JKPEV-S cable connector pin arrangement and wire color

Pin No.	Wire No.(pair)	Wire color	Signal name
1	1	White	SIN＋
2		Black	SIN－
3	2	White	－COS＋
4		Black	－COS－
5	3	White	OUT1＋
6		Black	OUT1－
7	4	White	－
8	(Not used)	Black	－
9	5	White	－
10	(Not used)	Black	－
11		Shield	Shield
12	－	－	－

ABSOCODER sensor connector pin arrangement and wire color

Pin No.	Wire color	Signal name
1	Brown	SIN＋
2	Red	SIN－
3	Orange	－COS＋
4	Yellow	－COS－
5	Green	OUT1＋
6	Blue	OUT1－
7	Violet	－
8	Gray	－
9	－	－
10	－	－
11	Shield	Shield
12	－	－

Cautions for the connection by the connector

1: The wire No. of JKPEV-S cable is printed on the surface of the white wire.

2: Unused wires of JKPEV-S cable should be severed at both ends.

6-2. Power Supply Connection

The power supply should be connected as described below:

(1) Power Supply

-The rush current is 10A(rush time of 20ms), so
select the power supply after due consideration.
Choose the capacity of the power supply over
double of power consumption of converter.

-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.

-Use a Class 2 power supply.
-Use AWG 12 to 22 electrical wires which conform to the UL1015 or UL1007 standard.
-Use field installed conductors with a temperature rating of 75°C or higher.
-Use electrical wires of copper or copper strand.
-The terminal block tightening torque is 1.8 N·m (16 lb·in).
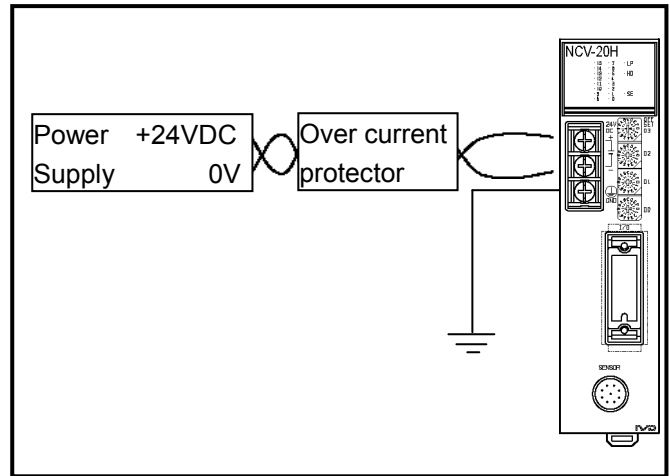
(2) Ground

-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.
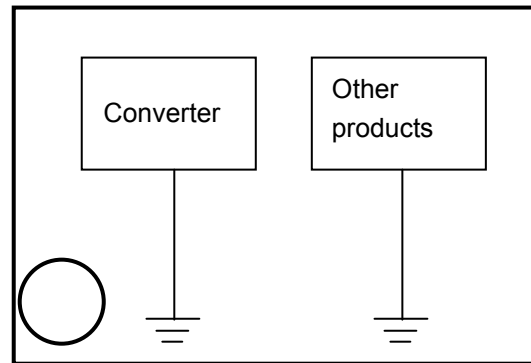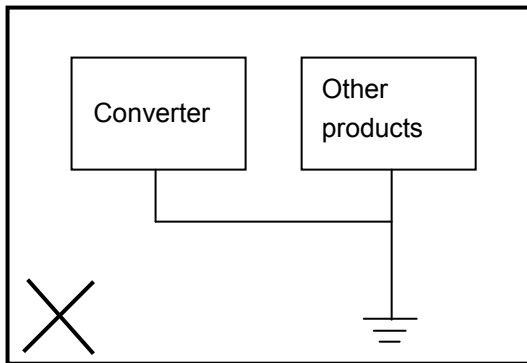
-Use AWG 12 to 14 electrical wires which conform to the UL1015 or UL1007 standard.
-Use field installed conductors with a temperature rating of 75°C or higher.
-Use electrical wires of copper or copper strand.
-The terminal block tightening torque is 1.8 N·m (16 lb·in).

6-3. Input / Output Connector Connection

Lead wires should be soldered to pins of the connector according to the I/O chart below.

Pin No.	Signal Names		Input / Output	Descriptions
1	$\overline{D0}$			
2	$\overline{D1}$			
3	$\overline{D2}$			
4	$\overline{D3}$			NCV-20HBNV1R:
5	$\overline{D4}$			Output the position data by 13 bit of binary code.
6	$\overline{D5}$	Position data		
7	$\overline{D6}$		Output	NCV-20HGNV1R:
8	$\overline{D7}$			Output the position data by 13 bit of gray binary code.
9	$\overline{D8}$			
10	$\overline{D9}$			$\overline{D0}$: LSB（Least Significant Bit）
11	$\overline{D10}$			$\overline{D12}$: MSB（Most Significant Bit）
12	$\overline{D11}$			
13	$\overline{D12}$			
14				
15	NC			Do not connect anything.
16				
17				
18	SE	Sensor disconnected error	Output	Switches OFF when sensor or connector is disconnected or loose.
19	$\overline{SE}$			Switches ON when sensor or connector is disconnected or loose.
20	Z24	Ground for SE		Ground for sensor disconnected error output signal
21	P24	24V	Input	This is a power supply for the sensor disconnected error output and HOLD input signals.
22	$\overline{HD}$	HOLD		The HOLD input signal is used to HOLD position data outputs from the host controller.
23	$\overline{LP}$	Latch pulse	Output	Outputs the position data reading timing signal.
24	SG	Signal ground	Input	Ground for $\overline{D0}$ to $\overline{D12}$, and $\overline{LP}$ signals
25	SG	Signal ground		

Connector at cable side (It is included in the converter.)   Soldered socket: MR-25F
                                     Cover: MR-25L

Connectors are manufactured by Honda Tsushin Kogyo Co., LTD.

Pin arrangement

Connector model :
  MR-25F

```
        ○
   ⑨     ㉕
   ⑧  ⑯  ㉔
   ⑦  ⑮  ㉓
   ⑥  ⑭  ㉒
   ⑤  ⑬  ㉑
   ④  ⑫  ⑳
   ③  ⑪  ⑲
   ②  ⑩  ⑱
   ①  ⑩  ⑰
        ○
```
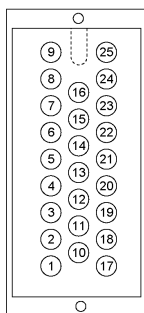
Viewed from the soldered
terminals on the rear side of
the connector.

●I/O Circuit

Converter internal circuit
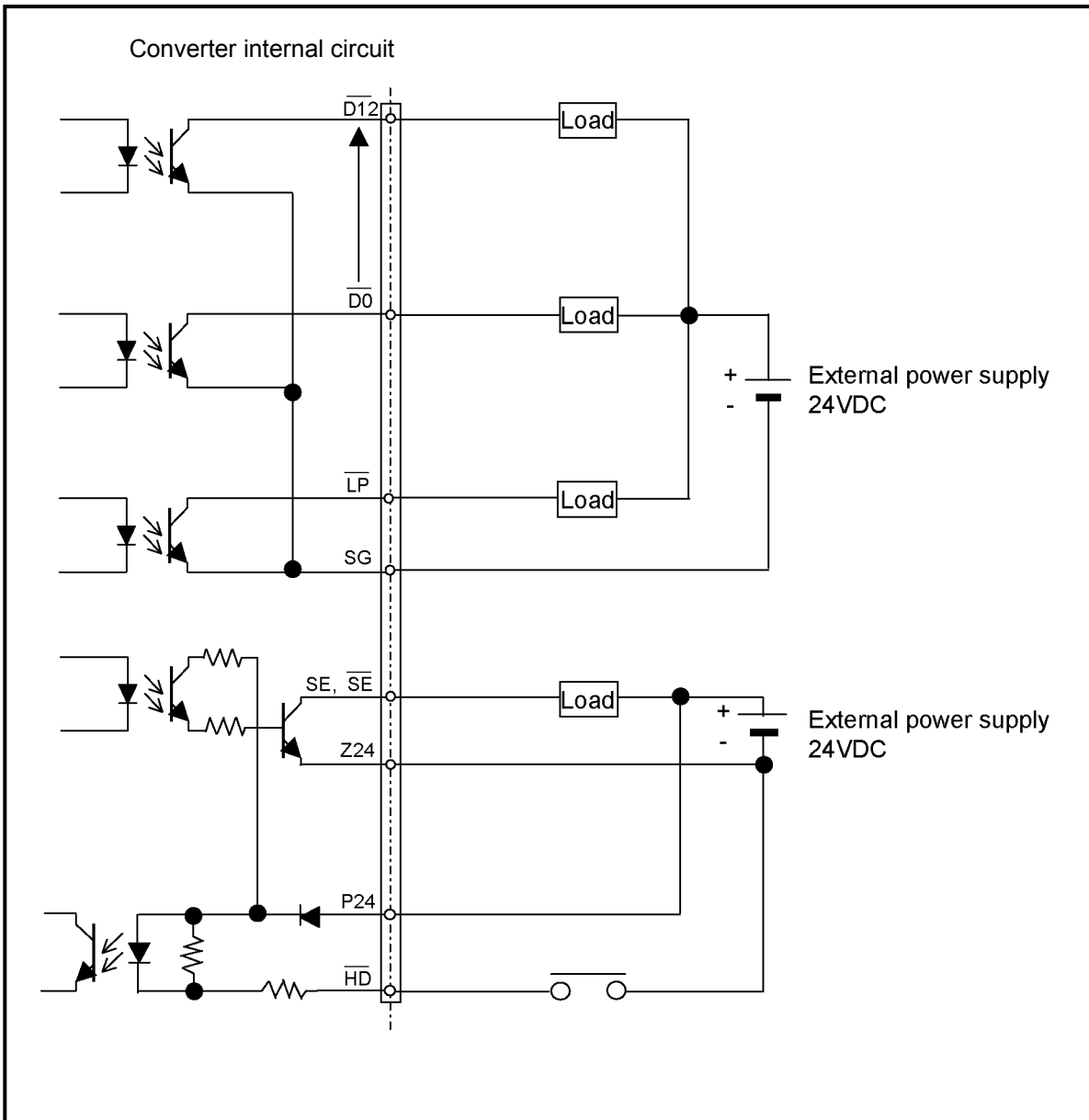
*[1] Input/output circuit is isolated from power supply and internal circuitry by photo-coupler.
*[2] Use a Class 2 power supply for the input/output external power supply.

7. NOMENCLATURE

7-1. Part Identification

Monitor LEDs
- Position data output indicator
- Sensor disconnection indicator
- Latch pulse indicator
- HOLD input indicator

Power terminal block
- M4 screw

Current position value setting switch

I/O connector

Sensor connector
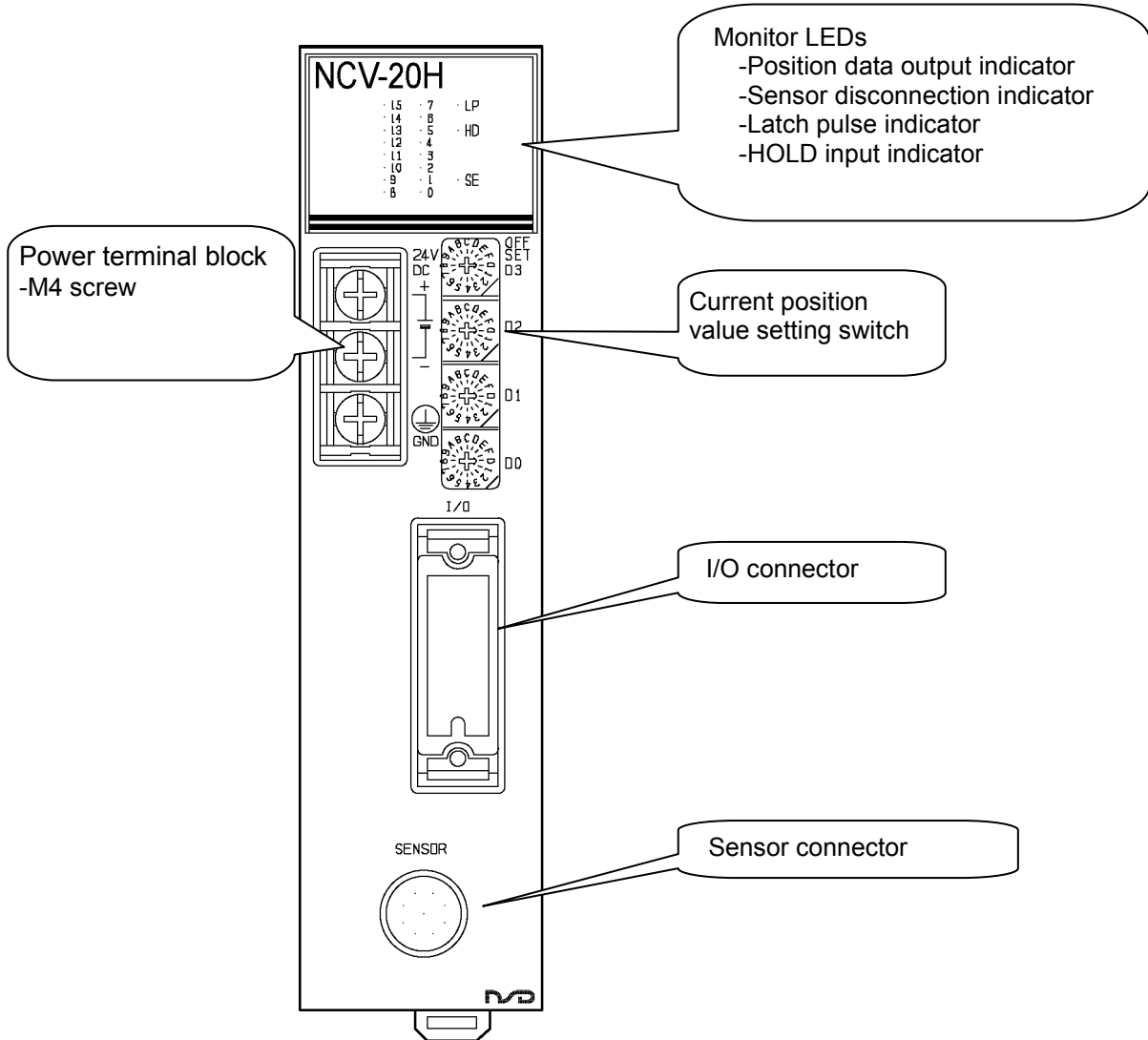
7-2. Function and Name of Display and Setting Area

Rear face

Switch
- Position data increase direction setting:
  - Switch DOWN: CW direction
  - Switch UP: CCW direction

LED function for monitor

Function setting switches:
See section 8.3 (Position Data Reading Setting)

0 to12: Displays position data as binary or gray binary.

LP: Lights when latch pulse output is ON (LOW).
HD: Lights at HOLD input.
SE: Lights at sensor disconnection.

8. OPERATION

8-1. Operation Sequence

```
                    ┌─────────────────────────────────┐
                    │             START               │
                    └─────────────────────────────────┘
                                    │
                                    ▼
        ┌─────────────────────────────────────────┐
        │ Function selector switch setting         │
        │ Designate the following setting by a     │
        │ switch which is at                       │ ------- Refer to section 8-2, 8-3.
        │ rear face of the converter.              │
        │                                          │
        │ (1) Position data "increase direction"   │
        │     setting                              │
        │ (2) Position data reading setting        │
        └─────────────────────────────────────────┘
                                    │
                                    ▼
        ┌─────────────────────────────────────────┐
        │ Converter mounting                       │
        │ Mounting the converter.                  │ ------- Refer to section 5-1.
        └─────────────────────────────────────────┘
                                    │
                                    ▼
        ┌─────────────────────────────────────────┐
        │ Connect with external device             │
        │ Connect ABSOCODER sensor and control     │ ------- Refer to section 6-1to 6-3.
        │ devise to the converter.                 │
        └─────────────────────────────────────────┘
                                    │
                                    ▼
        ┌─────────────────────────────────────────┐
        │ Origin (position data) adjustment        │
        │ Sets the current position value.         │ ------- Refer to section 8-4.
        └─────────────────────────────────────────┘
                                    │
                                    ▼
        ┌─────────────────────────────────────────┐
        │ Test run                                 │
        │ Check the operation.  Make corrections   │
        │ if problems exist                        │
        │ with position data readings or current   │
        │ position value.                          │
        └─────────────────────────────────────────┘
                                    │
                                    ▼
        ┌─────────────────────────────────────────┐
        │ Operation                                │
        │ Execute operation.                       │
        └─────────────────────────────────────────┘
                                    │
                                    ▼
                    ┌─────────────────────────────────┐
                    │              END                │
                    └─────────────────────────────────┘
```

8-2. Position Data "Increase Direction" Setting

The position data increases or decreases according to the ABSOCODER sensor's rotative direction. The direction in which the position data increases is specified by a switch on the converter's rear face.

Switch setting

Switch setting	Increase direction	Alteration of the position data
Switch DOWN position ("CW" side) Factory setting	CW	Position data Absolute position detection range CW direction
Switch UP position ("CCW" side)	CCW	Position data Absolute position detection range CW direction

Rotative direction of the shaft

CW
CCW
MRE
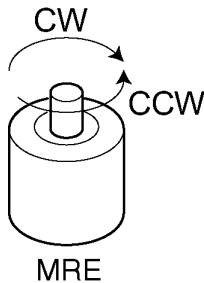
Important	Position data "increase direction" setting caution
	Do not change the position data "increase direction" switch setting while the power is ON, as this could cause an accident.

8-3. Position Data Reading Setting

(1) Function setting switch list

The following two position data reading formats are available:
1) Latch pulse (LP) format…Reads position data which is updated regularly in synchronization with a latch pulse output signal from the converter.
2) HOLD (HD) format…Reads position data while position data updates are stopped by a HOLD input signal.
When the LP output signal reading format is used, a position data update period (cycle) can be selected which is appropriate for the host controller being used.
When the HD input signal reading format is used, either a transparent format or a PC synchro format can be selected.
The desired position data reading format can be specified by the DIP switches on the rear face of the converter. The DIP switch settings are shown below.

Reading by LP output

High speed reading — Position data update cycle
0.2ms (Factory setting) → ON 1 2 3 4 5 6 7 8 — Refer to the page 29.

Low speed reading
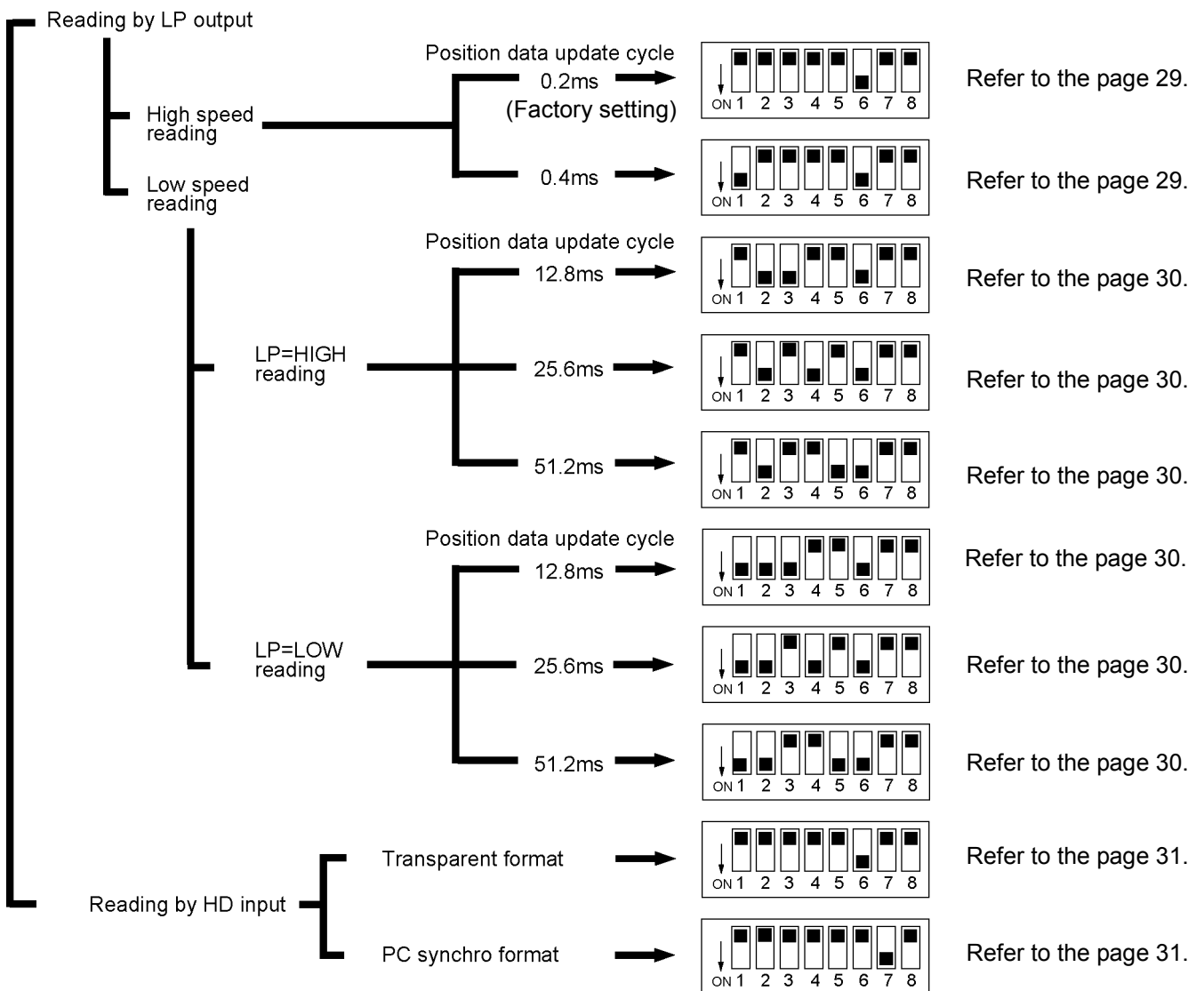0.4ms → ON 1 2 3 4 5 6 7 8 — Refer to the page 29.

LP=HIGH reading — Position data update cycle
12.8ms → ON 1 2 3 4 5 6 7 8 — Refer to the page 30.
25.6ms → ON 1 2 3 4 5 6 7 8 — Refer to the page 30.
51.2ms → ON 1 2 3 4 5 6 7 8 — Refer to the page 30.

LP=LOW reading — Position data update cycle
12.8ms → ON 1 2 3 4 5 6 7 8 — Refer to the page 30.
25.6ms → ON 1 2 3 4 5 6 7 8 — Refer to the page 30.
51.2ms → ON 1 2 3 4 5 6 7 8 — Refer to the page 30.

Reading by HD input
Transparent format → ON 1 2 3 4 5 6 7 8 — Refer to the page 31.
PC synchro format → ON 1 2 3 4 5 6 7 8 — Refer to the page 31.

Important	Cautions when using the function setting switches
	-Always verify the function setting switch settings before beginning operation. -Never use function switch settings which are not indicated in the specifications. -Do not change function switch settings during operation, as this could result in injury.

(2) Position data reading by LP output

Position data reading is synchronized with the LP output signal from the converter. Either high-speed or low-speed reading can be selected.

●High-speed reading

When high-speed reading is selected, the position data output stabilizes at the trailing edge of the LP output signal. The position data should be read at that time.
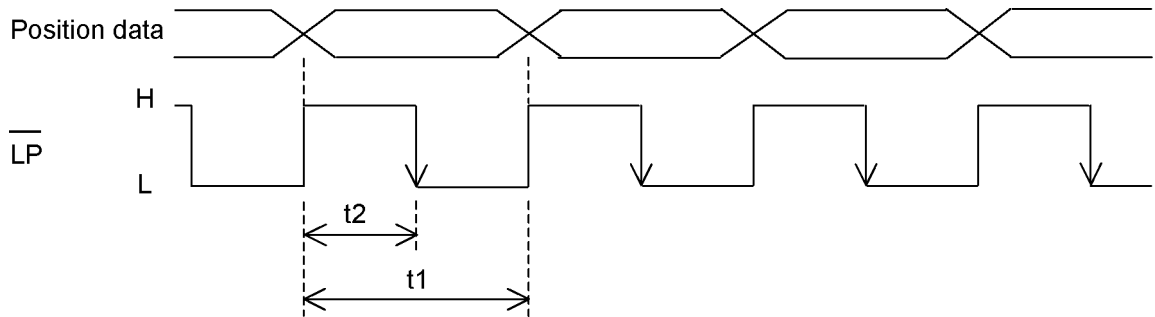
LP cycle	Switch setting	t1	t2
0.2ms	ON 1 2 3 4 5 6 7 8	200µs	70 to 100µs
0.4ms	ON 1 2 3 4 5 6 7 8	400µs	170 to 200µs

●Low-speed reading (at LP=HIGH)

When low-speed reading (at LP=HIGH) is selected, the position data output stabilizes when the LP output signal is HIGH. The position data should be read at that time.
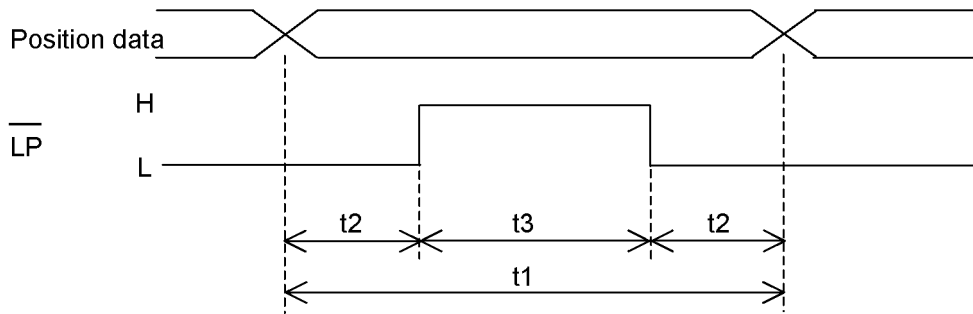
Position data update cycle	Switch setting	t1	t2	t3
12.8ms		12.8ms	3.2ms	6.4ms
25.6ms		25.6ms	6.4ms	12.8ms
51.2ms		51.2ms	12.8ms	25.6ms

●Low-speed reading (at LP=LOW)
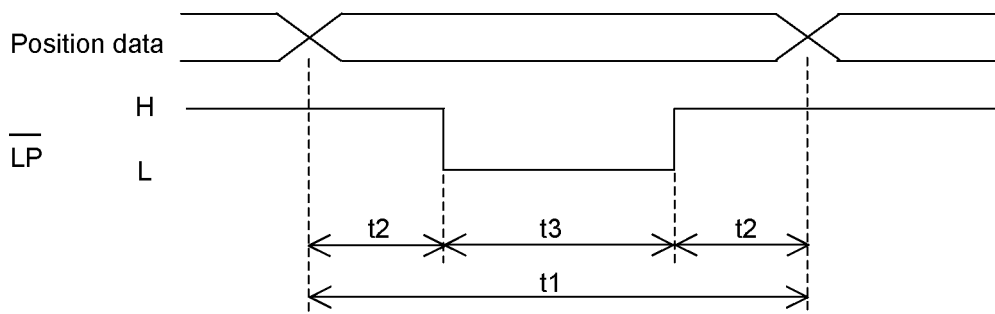
When low-speed reading (at LP=LOW) is selected, the position data output stabilizes when the LP output signal is LOW. The position data should be read at that time.

Position data update cycle	Switch setting	t1	t2	t3
12.8ms		12.8ms	3.2ms	6.4ms
25.6ms		25.6ms	6.4ms	12.8ms
51.2ms		51.2ms	12.8ms	25.6ms

(3) Position data reading by HOLD (HD) input

The HD input signal is used to HOLD position data outputs from the host controller. Either of the following 2 position data HOLD formats can be selected.

●Transparent format

Position data output updating is stopped by an HD input signal from the host controller (PLC, etc.). The position data should be read at that time.

Updating of the position data is stopped while the HD input signal is ON (L). Position data reading should be performed after waiting period "t1" following the HD input signal ON.

When the HD input signal switches OFF (H), position data updates are synchronized with the LP output signal.
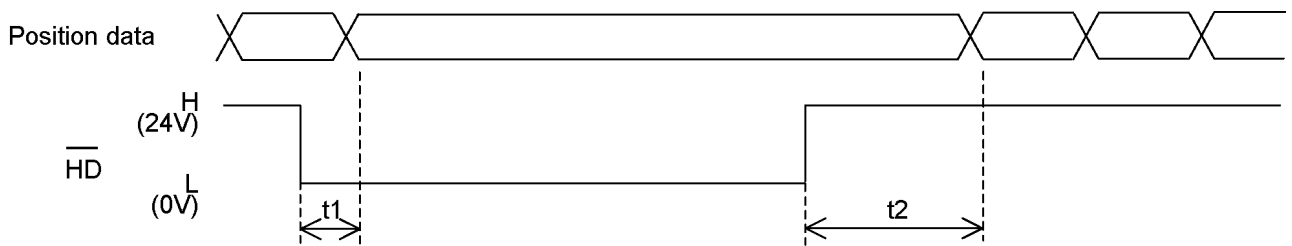
	Switch setting	t1	t2
Transparent format	ON 1 2 3 4 5 6 7 8	90µs	340µs

●PC synchro format

Position data output updating occurs when the HD input signal status changes (leading edge or trailing edge), and is not synchronized with the LP output signal.

Position data reading should be performed following waiting period "t1" after the HD input signal status is changed by the host controller (PLC, etc.).
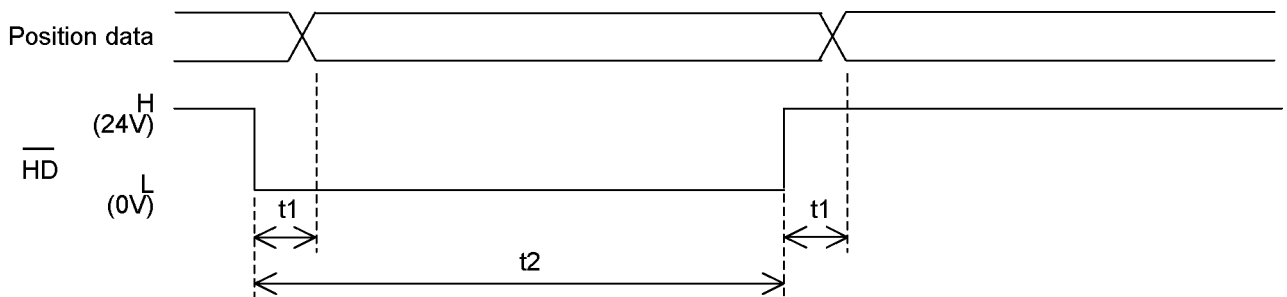
	Switch setting	t1	t2
PC synchro format	ON 1 2 3 4 5 6 7 8	230µs	200µs or more

8-4. Current Position Setting

The current position setting function changes the converter's position data output to a value that corresponds to the machine's current position. The position data can be changed to any desired value by using the rotary switch on the control panel.

If an extension sensor cable is being used, the cable must be connected when performing the current position setting function.

(1) For binary code output

<Current position setting procedure>
1) Secure the sensor to the machine, then move the machine to the desired position.
2) Obtain the position data that corresponds to the machine's current position.
3) Use the control panel's rotary switches (in the D0 to D3 order) to specify monitor LED values that match the position data obtained at step 2) above.

[Ex] Setting a "0000H" current position value   □: Light ON ■: Light OFF

Procedure	Position data monitor LED	Rotary switch	Explanation
—	0BD7ᴴ	0 D3 / 0 D2 / 0 D1 / 0 D0	When the rotary switch is at "0000" position, the output LED indicators read "0BD7ᴴ".
1	0BE0ᴴ	0 D3 / 0 D2 / 0 D1 / 9 D0	Turn D0 rotary switch until the all D0 output LED indicators are OFF.
2	0C00ᴴ	0 D3 / 0 D2 / 2 D1 / 9 D0	Turn D1 rotary switch until the all D1 output LED indicators are OFF.
3	1000ᴴ	0 D3 / 4 D2 / 2 D1 / 9 D0	Turn D2 rotary switch until the all D2 output LED indicators are OFF.
4	0000ᴴ	1 D3 / 4 D2 / 2 D1 / 9 D0	Turn D3 rotary switch until the all D3 output LED indicators are OFF.

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(2) For gray binary code output

<Current position setting procedure>
1) Secure the sensor to the machine, then move the machine to the desired position.
2) Obtain the position data that corresponds to the machine's current position.
3) Convert the position data obtained at step 2) above to gray binary code.
4) Use the control panel's rotary switches (in the D0 to D3 order) to specify monitor LED values that match the value converted at step 3) above.

    *Each digit (D0 to D3) of gray binary code may not be adjusted to target values.
    If it is not able to adjust, set the value by following methods:
1. Add "8H" to the setting value of each digit when setting the digit of D0 to D2. One upper digit is specified when one lower digit is also set up.
2. Add "1000H" to the current position data (it is the confirmed value in step 3) when setting the digit of D3, then set the digit of the D0 again.

[Ex] Setting a "0000H" current position value   □: Light ON   ■: Light OFF

Procedure	Position data monitor LED	Rotary switch	Explanation
—	0C1B^H	D3: 0, D2: 0, D1: 0, D0: 0	When the rotary switch is at "0000^H" position, the output LED indicators read "0C1B^H".
1	0C10^H	D3: 0, D2: 0, D1: 0, D0: D	Turn D0 rotary switch until the output D0 LED indicators read "0^H".
2	0C80^H	D3: 0, D2: 0, D1: E, D0: D	Turn D1 rotary switch until the output D1 LED indicators read "8^H".
3	0800^H	D3: 0, D2: 7, D1: E, D0: D	Turn D2 rotary switch until the output D2 LED indicators read "8^H". At this time, D1 LED indicators read "0^H".
4	1000^H	D3: 1, D2: 7, D1: E, D0: D	Turn D3 rotary switch until the output D3 LED indicators read "1^H".
5	0000^H	D3: 1, D2: 7, D1: E, D1: E	Turn D0 rotary switch to the right one time so that D3 output LED indicators read "0^H"

9. MAINTENANCE and 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.

9-1. Inspection

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.	Power supply voltage fluctuation must be within 21.6V to 26.4VDC range	Tester
Ambient Conditions	Check the ambient temperature.	ABSOCODER VRE-P061: −20 to +80℃ VRE-P074: −20 to +120℃ VRE-P097: −20 to +120℃ VRE-P101: −20 to +120℃ 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.	
	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.	Visual Inspection
	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.	

9-2. Troubleshooting

The causes and corrective actions for errors that may occur during NCV-20H operation are described below.

| Error item	Cause	Countermeasure
Sensor disconnected LED (SE) is ON.	Sensor connector is disconnected.	Secure the connector
	Sensor connector is loose.	
	Sensor cable is severed.	Replace the sensor cable
Deviation in origin point position.	Coupling of sensor shaft and machine shaft is loose.	Secure the coupling or mounting.
	Sensor mounting is loose.	
Incorrect position data output	Latch pulse output signal and position data reading timing is improper.	Correct the reading timing.
	HOLD input signal and position data reading timing is improper.	
	The wiring of the output signal has problems.	Repair the wiring.
Position data HOLD doesn't occur.	The function setting switch is incorrect.	Change the setting.
	The voltage of the power supply for input and output is out of prescribed range.	Supply the correct power voltage. 21.6V to 26.4VDC
	The wiring of the input signal has problems.	Repair the wiring.
No position data output	The function setting switch is incorrect.	Change the setting.
	The voltage of the power supply for input and output is out of prescribed range.	Supply the correct power voltage. 21.6V to 26.4VDC
	"HD"(the external input signal) is ON.	Check the signal.
	The wiring of the output signal has problems.	Repair the wiring.

If the troubleshooting procedures described above fail to solve the problem, the sensor or converter may be defective.　In this case, please contact your NSD representative.

- MEMO -

10. ABSOCODER SENSOR CHECK LIST

● **Applicable ABSOCODER sensor models**

VRE-P061, VRE-P074, VRE-P097, VRE-P101

● **Connection configuration**

● **Connector appearance and pin position**
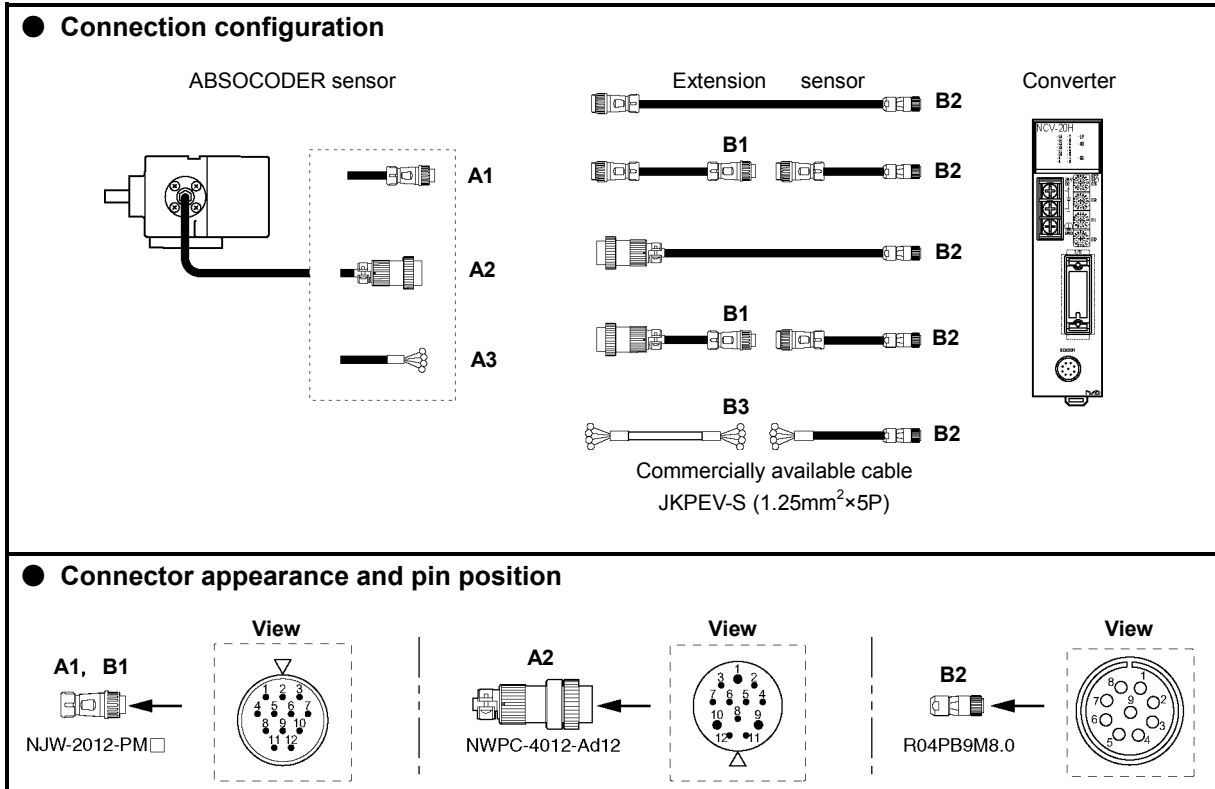
● **Connector pin position and standard coil resistance ranges (at 25℃)**

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	OUT1＋	3.5 to 5.5	28.5 to 40.5
6	Blue	6	Blue		Black	OUT1－		
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 Point at 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^oC), increases 0.4% when the temperature rises 1^oC and decreases 0.4% when the temperature falls 1^oC.

● **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.

NSD Group

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