



ZEF004630303



**ABSOCODER CONVERTER COMPATIBLE WITH DeviceNet  
NCV-20NDNVP**

**Specifications & Instruction Manual**

Applicable sensor: VRE-P028  
VRE-P062





# 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 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.

## Revision History

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

Document No.	Date	Revision Description
ZEF004630300	28, May, 2013	1st Edition Japanese document: ZEF004630102
ZEF004630301	16, Apr, 2014	2nd Edition Japanese document: ZEF004630103
ZEF004630302	14, Oct, 2015	3rd Edition Japanese document: ZEF004630104
ZEF004630303	29, Feb, 2016	4th Edition Japanese document: ZEF004630105

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# 1. OVERVIEW

NCV-20NDN Series is a converter which operates as the slave unit (group 2 only server) of the open field network "DeviceNet".

NCV-20NDN Series can be combined with a single-turn type (VRE) of ABSOCODER sensor to convert the detected absolute position data to binary code for output. The master unit can read the data by accessing IN data.

This manual explains how to use the NCV-20NDN.

For more details of the master unit, refer to your master unit manual.

For more details of "DeviceNet", refer to the DeviceNet Specification.

If the configuration tool is needed the NCV-20NDN definition file (EDS file), contact your NSD representative.

## ● Converter model code

NCV-20N DN VP

Converter series name

Compatible with "DeviceNet"

Applicable sensor

Single-turn type ABSOCODER sensor

VRE-P028

VRE-P062

## 1-1. Features

### (1) 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.

### (2) Superior durability

NSD's original ABSOCODER sensor 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.

### (3) Compact design

The unit's outside dimensions (39(W) x 155(H) x 93(D)) were miniaturized, and DIN rail mounting is also possible.

### (4) Current position setting function

The converter has the current position setting function that the position data can match the machine position.

The current position setting is also quick and easy at installation.

### (5) Error detection function

The converter has the error detection function.

The monitor LED of the converter or the master side of "DeviceNet" can indicate the error contents.

### (6) Less wiring

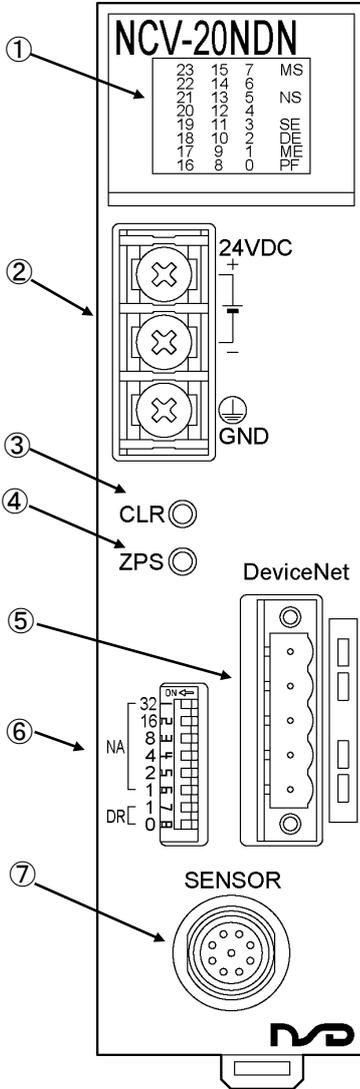
"DeviceNet" is not needed most I/O wirings, so the system can reduce the wire.

### (7) Compliance with CE standards

The converter complies with CE (EMC Directive) standards.

## 1-2. Parts Name and Functions of the Converter

Names and functions of the NCV-20NDN Series are indicated in the below.



### ① Monitor LED

DeviceNet monitor	MS: NS:	Indicate the device status. Indicate the network status. For more details, refer to "10-2".
Error monitor	SE: DE: ME: PF:	Light ON when the sensor disconnected error has occurred. Light ON when the sensor data error has occurred. Light ON when the memory error has occurred. Light ON when the low power error has occurred.
Position data monitor	0~23:	Indicate the position data by the binary code.

### ② Terminal block for the power supply connection

It is the input terminal of the external power supply. (M4 screw)  
Connect the 24VDC and grounding wires.

### ③ CLR button

Cancel the error by pressing the button.  
For more details, refer to "6-3".

### ④ ZPS button

The position data (D0-D23) can be set to 0 by pressing the ZPS button.  
For more details, refer to "6-2".

### ⑤ "DeviceNet" communication connector

Connector for connecting the network

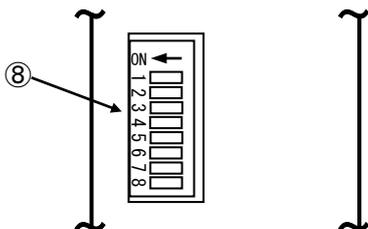
### ⑥ DeviceNet setting switch

Set the baud rate and node address.  
For more details, refer to the "6-1-1".

### ⑦ Sensor connector

Connect with the ABSOCODER sensor.

### ● Rear side of the converter



### ⑧ PLC selection switch

Set when using the master unit which is manufactured by the Rockwell Automation, Inc.  
For more details, refer to the "6-1-2".

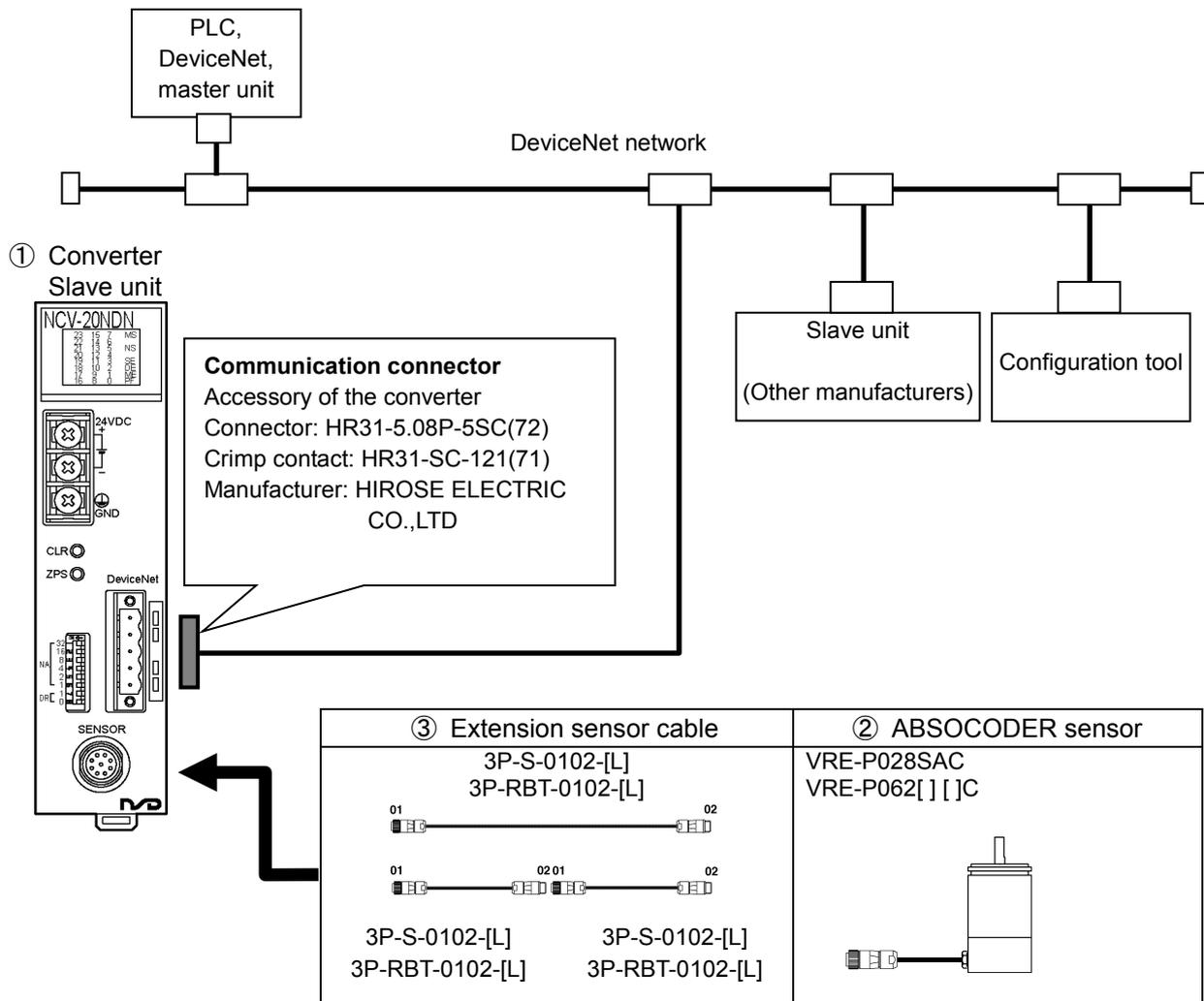
## 2. CONNECTION CONFIGURATION AND MODEL LIST

Following figure is indicated connection configuration of “NCV-20NDN Series”.

Before ordering, please refer to the connection configuration and model list.

Please prepare equipments by the customer except from ① to ⑥ in the connection configuration.

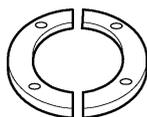
### ● Connection configuration



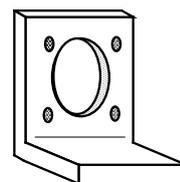
④ Servo-mount fixture  
Accessory of the VRE  
ABSOCODER sensor



⑤ Reinforced servo-mount fixture  
Option of the VRE  
ABSOCODER sensor



⑥ L type flange-mount fixture  
Option of the VRE  
ABSOCODER sensor



● Model list

No.	Items	Models	Descriptions
①	Converter	NCV-20NDNVP	Applicable sensor: VRE-P028, VRE-P062
②	ABSOCODER sensor	VRE-P062SAC	Servo-mount type, Flat shaft shape
		VRE-P062SBC	Servo-mount type, Key way shaft shape
		VRE-P062FAC	Flange-mount type, Flat shaft shape
		VRE-P062FBC	Flange-mount type, Key way shaft shape
		VRE-P028SAC	Servo-mount type, Flat shaft shape
③	Extension sensor cable	3P-S-0102-[L]	Standard cable [ ]: Cable length(m) 2, 3, 5, 8, 10, 15, 20, 25, 30, 35, 40, 45, 50 (If a cable length is 50m or more, it can be selected by each 10m.)
		3P-RBT-0102-[L]	Robotic cable [ ]: Cable length(m) 2, 3, 5, 8, 10, 15, 20, 25, 30, 35, 40, 45, 50 (If a cable length is 50m or more, it can be selected by each 10m.)
④	Servo-mount fixture	SB-01	Included with VRE-P062SAC, VRE-P062SBC
		SB-02	Included with VRE-P028SAC
⑤	Reinforced servo-mount fixture	SH-01	Option for VRE-P062SAC, VRE-P062SBC
⑥	L type flange	RB-01	Option for flange-mount and reinforced servo-mount fixture

### 3. SPECIFICATIONS

#### 3-1. Converter Specifications

##### (1) General Specification

Items	Specifications
Power supply voltage	24VDCV±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 terminal and ground
Vibration resistance	20m/s <sup>2</sup> 10 to 500Hz, 10cycles of 5 minutes in 3 directions, conforms to JIS C 0040 standard
Ambient operating temperature	0 to +55°C (No freezing)
Ambient operating humidity	20 to 90 %RH (No condensation)
Ambient operating environment	Free from corrosive gases and excessive dust
Ambient storage temperature	-10 to +70°C
Grounding	Must be securely grounded (ground resistance of 100 ohm or less)
Construction	Book-shelf type within enclosure, DIN rail mountable
Outside dimension (mm)	39(W) x 155(H) x 93(D) Refer to dimensions for details.
Mass	Approx. 0.4kg

##### (2) Performance Specification

Items	Specifications
Converter model	NCV-20NDNVP
Applicable sensor	VRE-P028 VRE-P062
Total number of divisions	8192(2 <sup>13</sup> )
Position detection format	Absolute
Number of detection axes	1
Position data sampling time	1ms
Monitor LED	Position data output status : D0-D23 Converter status : MS (Module Status) Network status : NS (Network Status) Sensor disconnected error : SE Sensor data error : DE Memory error : ME Low power error : PF
Operation function on the panel	Zero point setting press button : ZPS Error clear press button : CLR Node address setting switch : NA Baud rate setting switch : DR
Applicable standard	CE Marking (EMC directive)

**(3) DeviceNet specification**

Items	Specifications
DeviceNet specification	Volume1-Release2, Volume2-Release2
Vendor name	NSD Corporation (230)
Device profile name	Generic Device (0)
Product name	NCV-20NDN (3000)
Network current consumption	100mA or less
Connector type	Open-plug
Isolated physical layer	Yes
LEDs supported	MS (module), NS (network)
MAC ID setting	Dip switch
Communication baud rates setting	Dip switch
Communication baud rates supported	125kbps, 250kbps, 500kbps
Predefined master/ slave connection setting	Group 2 only server
UCMM supported	No
Fragmented explicit messaging supported	Yes
I/O message supported	POLD I/O

### 3-2. ABSOCODER Sensor Specification

VRE-P028, VRE-P062

Items		Specifications	
Sensor model		VRE-P028	VRE-P062
Total number of turns		1	
Number of divisions		8192 (2 <sup>13</sup> )	
Mass		0.25 kg	1.3 kg
Linearity error		1.5° Max.	1° Max.
Moment of inertia GD <sup>2</sup> /4(J)		9.3 × 10 <sup>-8</sup> kg·m <sup>2</sup> (9.5 × 10 <sup>-7</sup> kgf·cm·s <sup>2</sup> )	6.4 × 10 <sup>-6</sup> kg·m <sup>2</sup> (6.5 × 10 <sup>-5</sup> kgf·cm·s <sup>2</sup> )
Starting torque		1.5 × 10 <sup>-3</sup> N·m or less (0.015 kgf·cm or less)	4.9 × 10 <sup>-2</sup> N·m or less (0.5 kgf·cm or less)
Permissible shaft load	Radial	15 N (1.5 kgf)	98 N (10 kgf)
	Thrust	9.8 N (1.0 kgf)	49 N (5 kgf)
Permissible mechanical speed		6000 r/min	3600 r/min
Bearing life		8 × 10 <sup>4</sup> h (at 6000 r/min)	5.5 × 10 <sup>4</sup> h (at 3600 r/min)
Ambient temperature	Operating	-20 to +60°C	
	Storage	-30 to +90°C	
Vibration resistance		2.0 × 10 <sup>2</sup> m/s <sup>2</sup> (20G) 2000Hz, up/down 4h, forward/back 2h, conforms to JIS D 1601 standard	
Shock resistance		4.9 × 10 <sup>3</sup> m/s <sup>2</sup> (500G) 0.5 ms, up/down/forward/back x 3 times each, conforms to JIS C 5026 standard	
Protection rating		IP40, conforms to JEM 1030 standard	IP52f, conforms to JEM 1030 standard
Max. sensor cable length	Standard cable	100m (3P-S)	
	Robotic cable	100m (3P-RBT)	
Interconnecting sensor cable		2m	

### 3-3. Extension Sensor Cable Specification

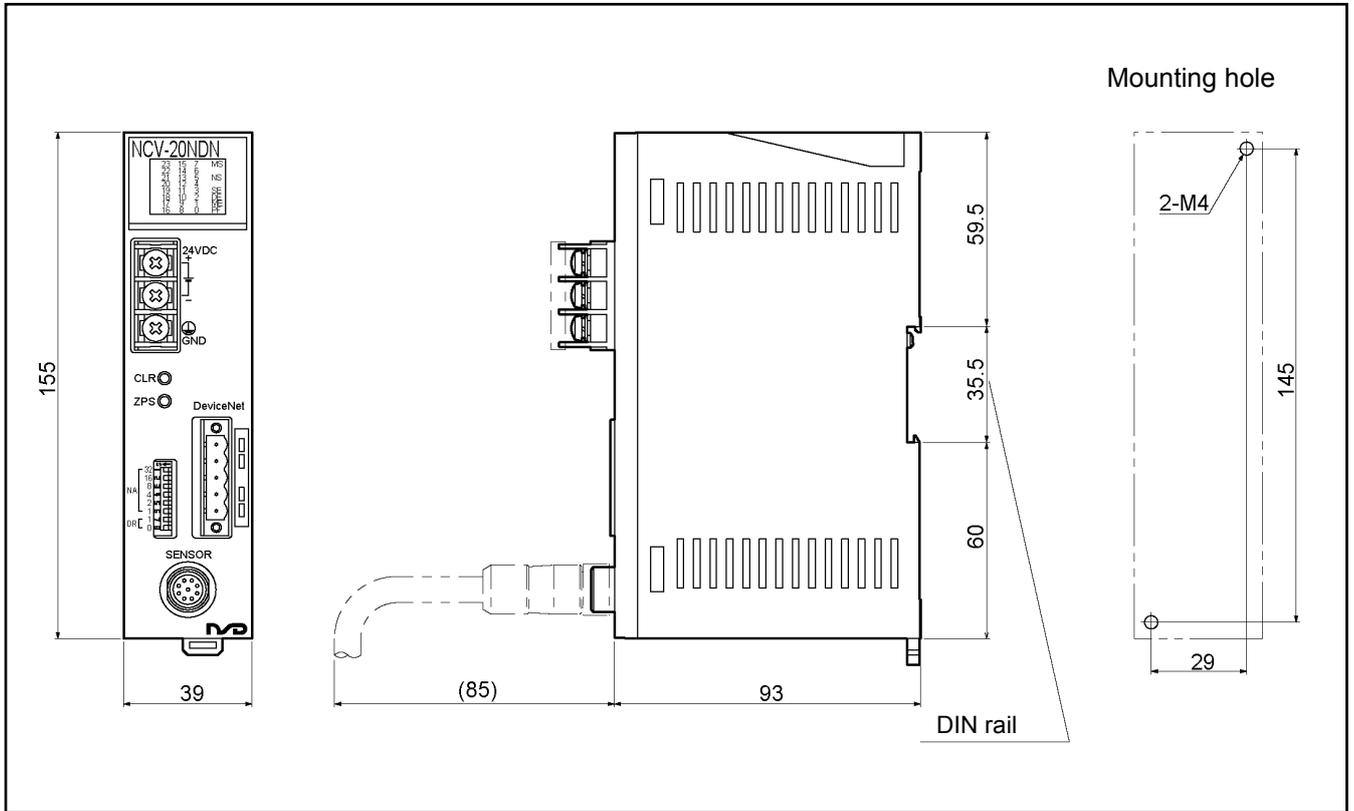
4P-S, 4P-RBT

Items		Specifications	
Model code		3P-S	3P-RBT
Cable type		Standard cable	Robotic cable
Diameter		φ 8	
Ambient temperature	Operating	-5 to +60°C	-5 to +60°C
	Storage	-5 to +60°C	-10 to +60°C
Insulator		Irradiated cross linked formed polyethylene	ETFE plastic
Sheath		Vinyl chloride mixture	
Color of sheath		Gray	Black
Advantage		Extensible for long distances	Superior flexibility; ideal for moving place

# 4. DIMENSIONS

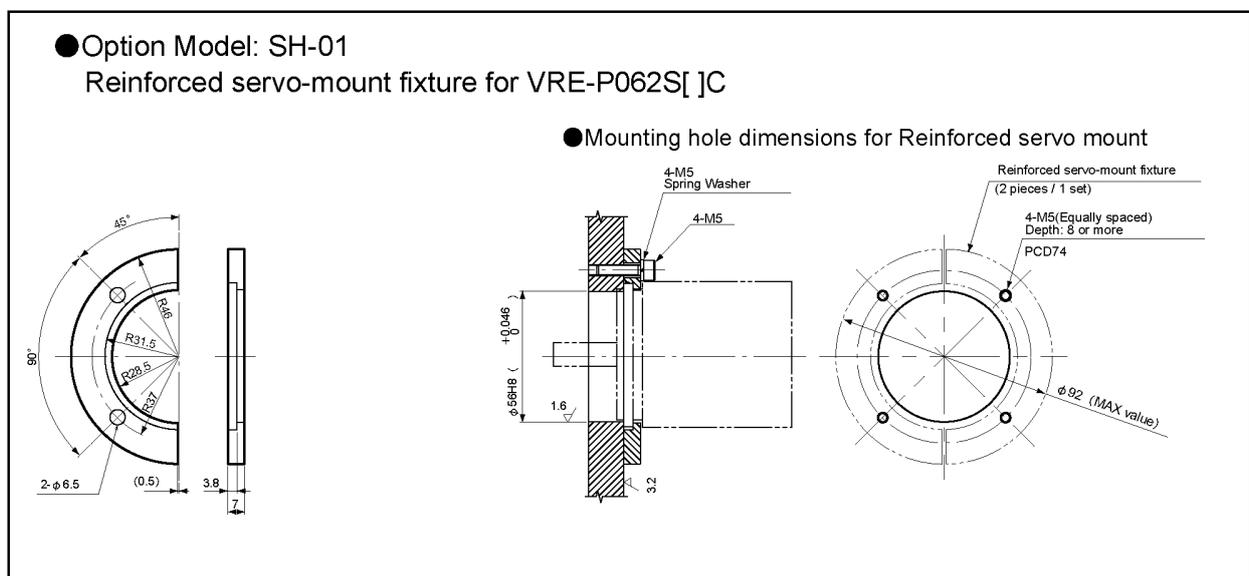
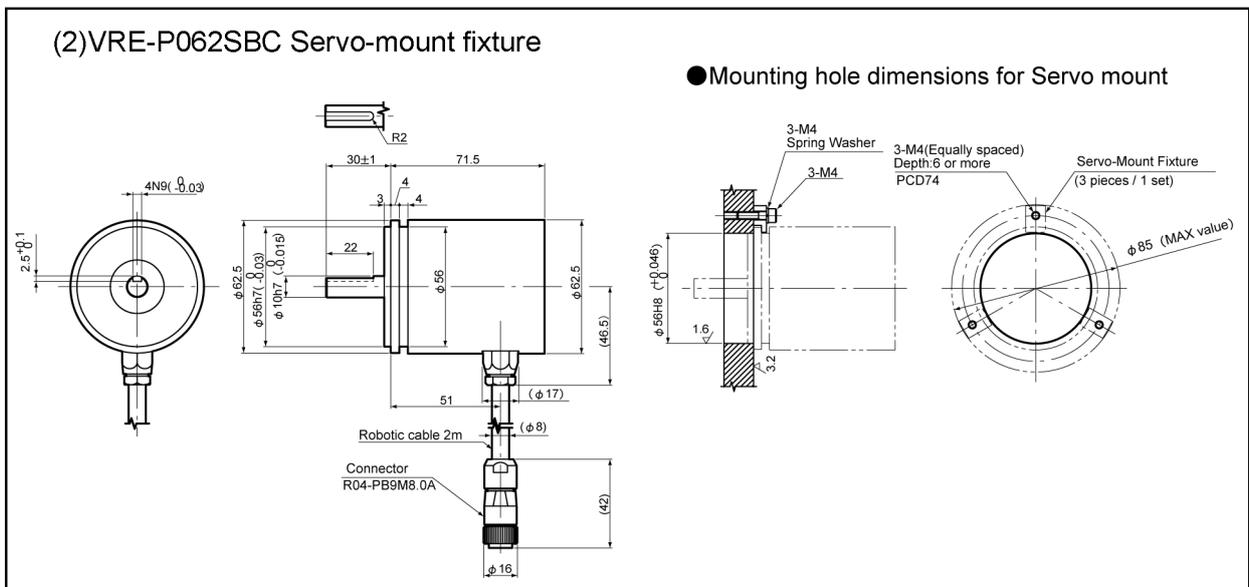
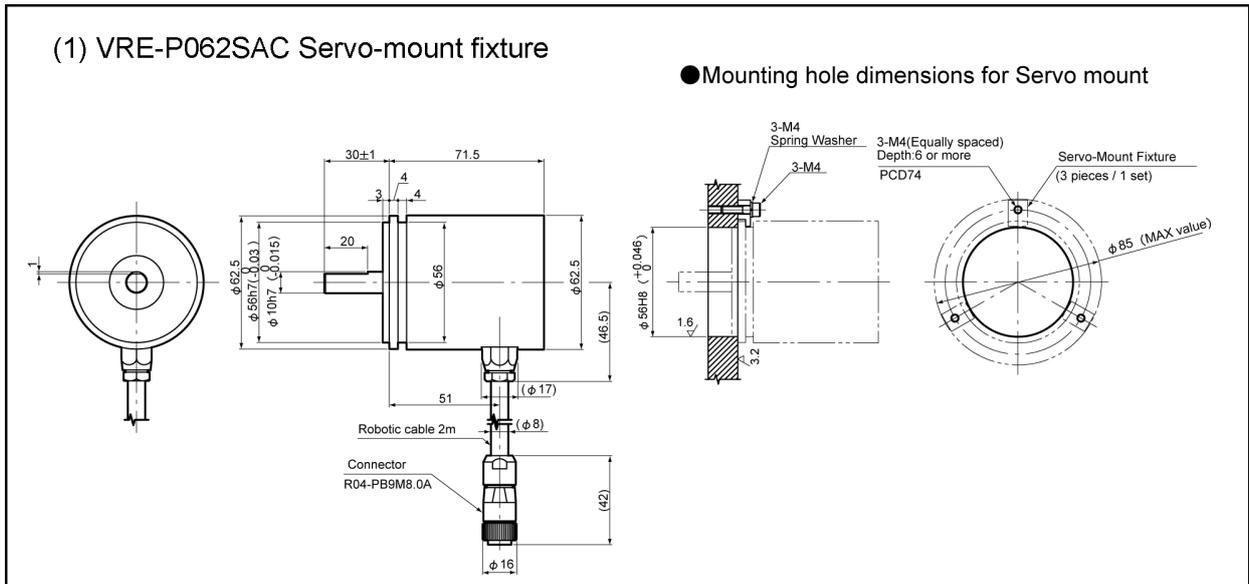
## 4-1. Converter

Units: mm

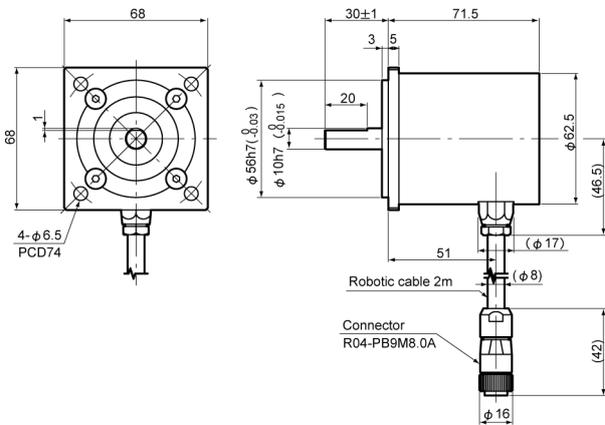


## 4-2. ABSOCODER Sensor

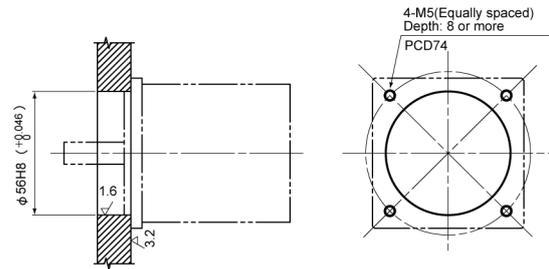
Units: mm



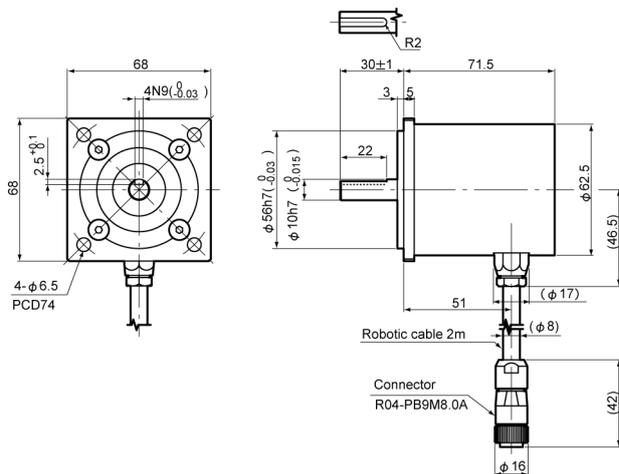
(4) VRE-P062FAC Flange-mount fixture



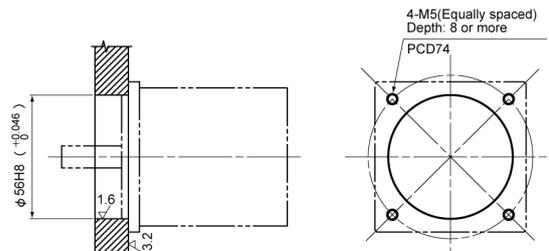
● Mounting hole dimensions for Flange



(5) VRE-P062FBC Flange-mount fixture

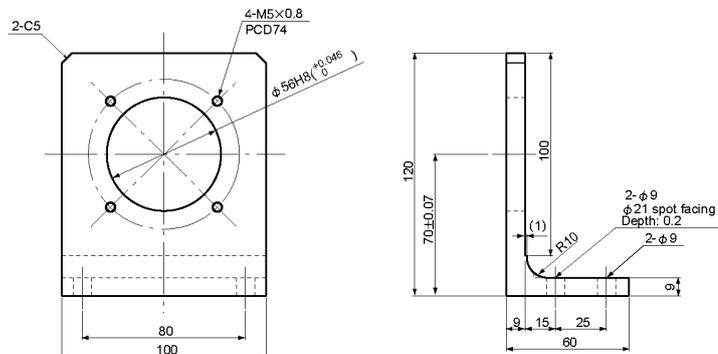


● Mounting hole dimensions for Flange



(6) Option Model: RB-01

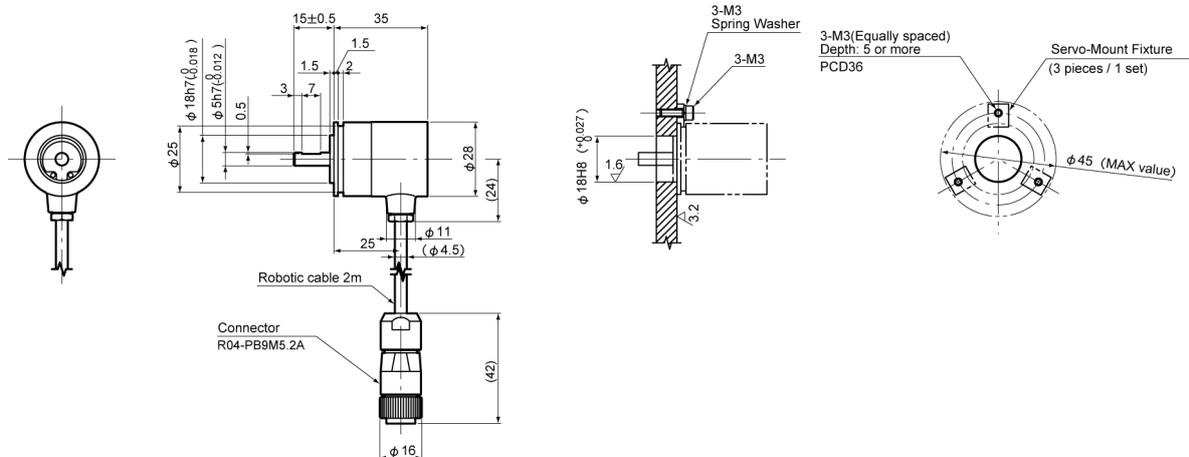
L type of flange-mount for VRE-P062



Units: mm

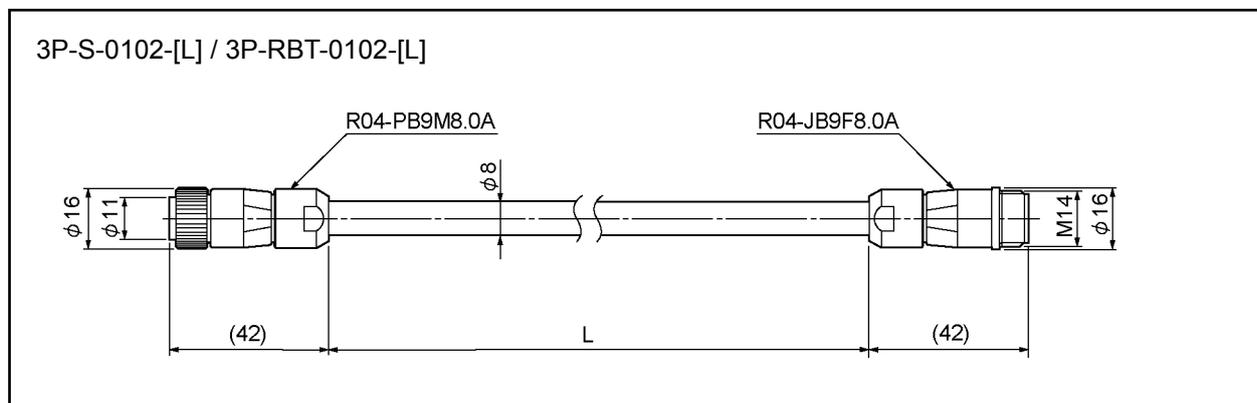
(7) VRE-P028SAC Servo-mount fixture

● Mounting hole dimensions for Servo mount

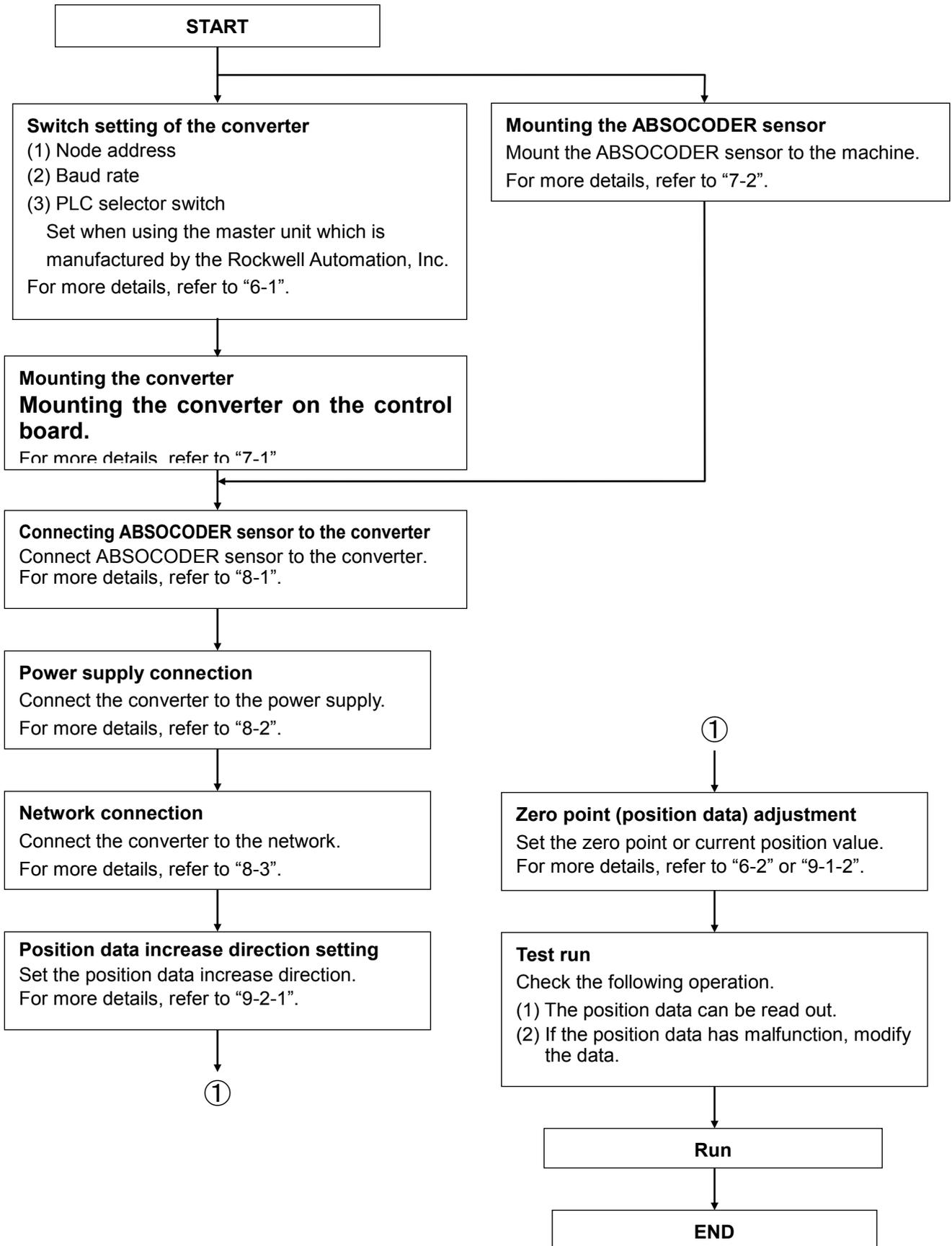


4-3. Extension Sensor Cable

Units: mm



## 5. PROCEDURE (FROM MOUNTING TO OPERATING)



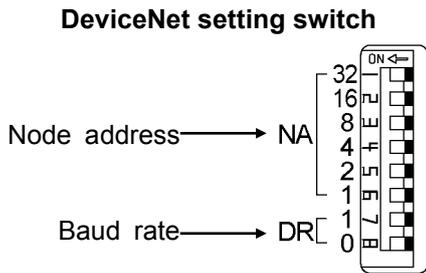
## 6. SWITCH SETTING OF THE CONVERTER

Explains each switch of the NCV-20NDN.

### 6-1. DeviceNet Setting

#### 6-1-1. Node address and baud rate setting

Set the node address and baud rate by the DeviceNet setting switch on the panel.



All setting is OFF when shipping from the factory.

- Node address (NA)

Setting range: 0-63

Setting method: 1-32 ( $2^0$ - $2^5$ ) is set by the binary.

Setting example: Turn ON "1 (SW6)" "4 (SW4)" when setting the node address 5.

Panel display	NA					
	32	16	8	4	2	1
Numeric value significance	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$

**Note**

The node address should not duplicate with the master or slave unit.

- Baud rate (DR)

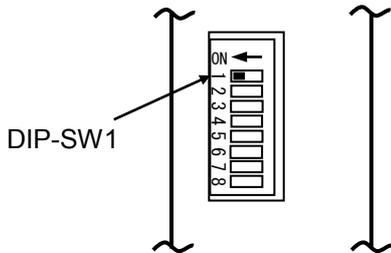
The setting range is the following three.

Panel display	DR	
	1	0
Baud rate		
125 kbps	OFF	OFF
250 kbps	OFF	ON
500 kbps	ON	OFF
Setting is prohibited	ON	ON

### 6-1-2. Setting the PLC selector switch

PLC selector switch is set when using the master unit which is manufactured by the Rockwell Automation, Inc.  
 DIP-SW1 on the rear side of the converter should be ON.

Rear side of the converter



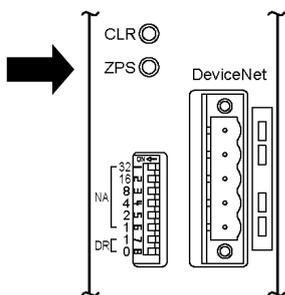
All setting is OFF when shipping from the factory.

**Note**

DIP-SW2 to 8 is must be OFF.  
 Do not change the switch.

### 6-2. Zero Point Setting (ZPS Button)

Designating the position data (D0-D23) at "0" is "zero point setting". The zero point setting is that pressing the zero point setting button "ZPS" on the panel after the moving the sensor to the zero point position.

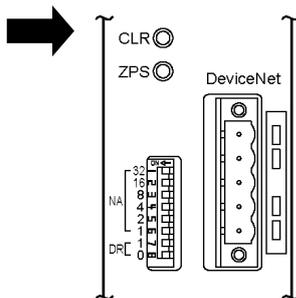


Zero point setting procedure

- (1) Move the machine to the zero point position.
- (2) Check the converter is normal status.  
 In the normal status, light OFF the each SE, DE, ME, and PF on the front panel.
- (3) Press the zero point setting button "ZPS" on the panel.
- (4) Position data is set to the "0".

### 6-3. Error Clear (CLR Button)

If an error has occurred, clear the error by pressing "CLR" button on the panel after remove an error cause.  
 For more error details, refer to "10-2. Troubleshooting".



**Point**

The error clear can be done by "error reset" on the out data.  
 Fore more details, refer to "9-1-2. OUT data format".

## 7. INSTALLATION

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

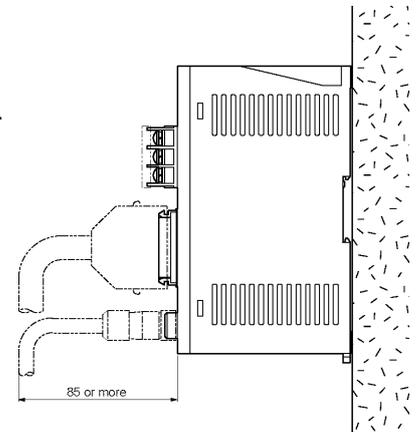
### 7-1. Converter Installation Conditions and Precautions

#### ● 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

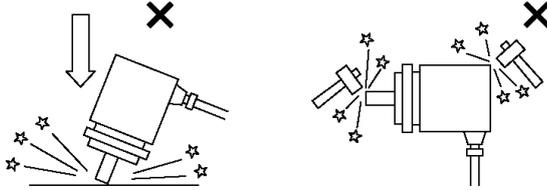
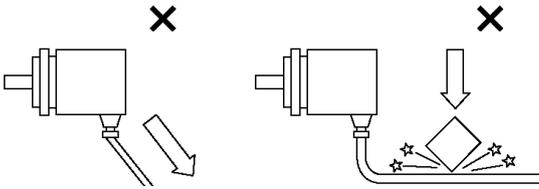
- (1) Install inside the control cabinet.
- (2) Install in a vertical direction so that the characters are visible.
- (3) If a DIN rail mounting format is used, insert until the latch mechanism catches with an audible click. Secure between end plates at both sides.
- (4) In high vibration areas, secure 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.



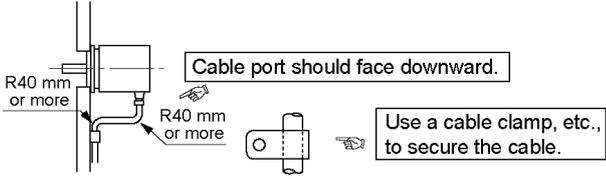
## 7-2. ABSOCODER Sensor Installation Conditions and Precautions

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

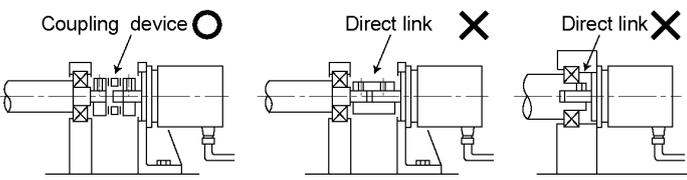
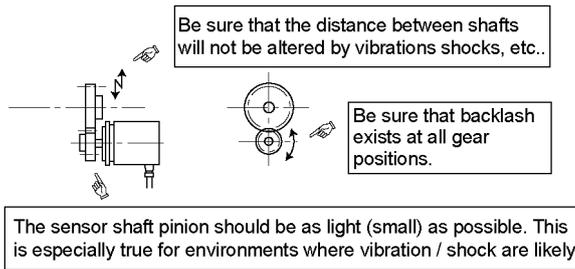
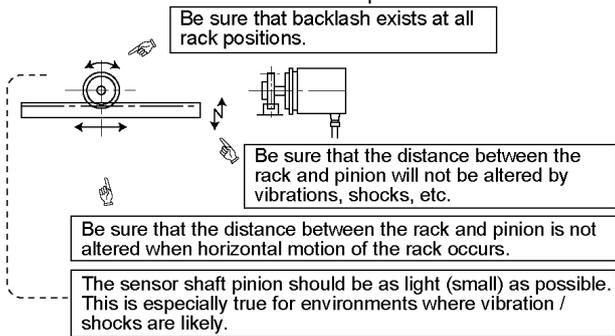
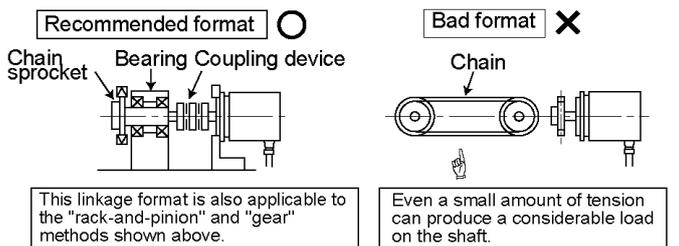
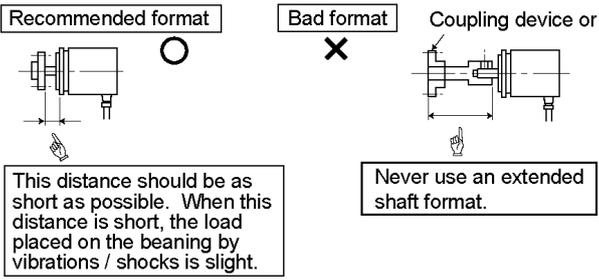
### ● Handling of Turn-type ABSOCODER sensor

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> 

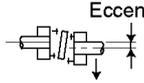
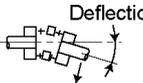
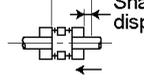
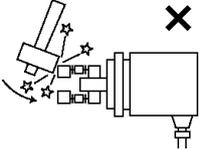
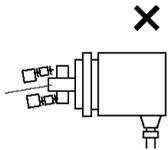
### ● Mounting of Turn-type ABSOCODER sensor

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

● Coupling of Turn-type ABSOCODER sensor

Item	Explanation	Precaution
<p>(1) Coupling device selection precaution</p>	<p>1. When selecting a coupling, consider factors such as the design mounting error, the coupling tolerance error, and the sensor's permissible shaft load.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Mounting error &lt; Coupling tolerance error</p>  <p>Eccentric</p> <p>Load produced by eccentric condition.</p> </div> <div style="text-align: center;"> <p>Coupling shaft permissible load &lt; Sensor shaft load</p>  <p>Deflection</p> <p>Load produced by deflection.</p> </div> <div style="text-align: center;"> <p>Prescribed dimension</p>  <p>Shaft direction displacement</p> <p>Force produced by shaft direction displacement.</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>Radial load</p> </div> <div style="text-align: center;"> <p>Thrust load</p> </div> </div>	<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. 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>(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;">   </div>	

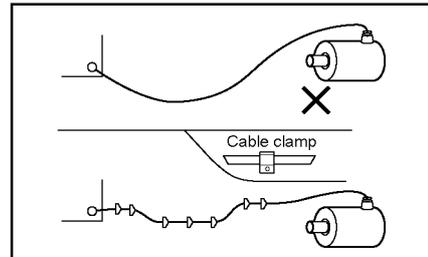
## 8. WIRING

### 8-1. Connection between Converter and ABSOCODER Sensor

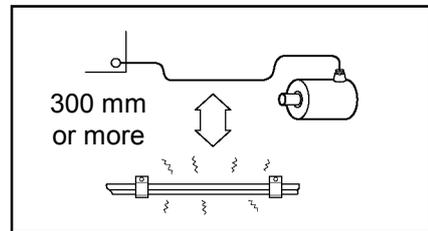
The maximum extension sensor cable length varies according to the ABSOCODER sensor and cable model being used. For more details refer to "3-2. ABSOCODER Sensor Specification".

#### ● Wiring Precautions

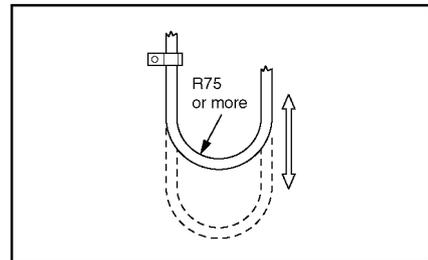
- (1) The sensor cable should be clamped as shown in the right figure to prevent excessive tension from being applied to the cable connectors.



- (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.



## 8-2. Power Supply Connection

The power supply should be connected as described below:

### (1) 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.

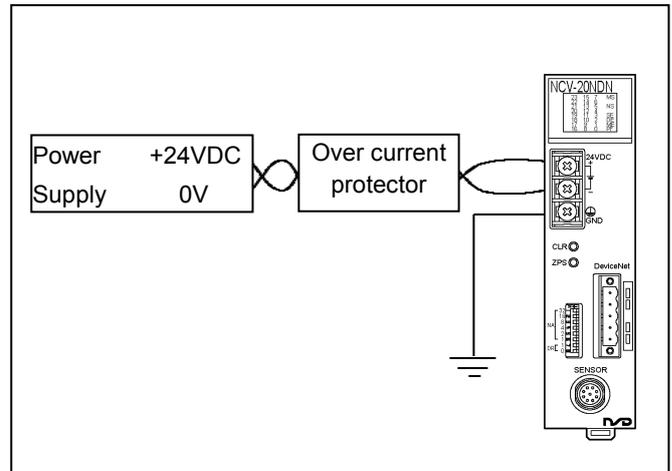
-The input power supply should be isolated from the commercial power supply.

-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)

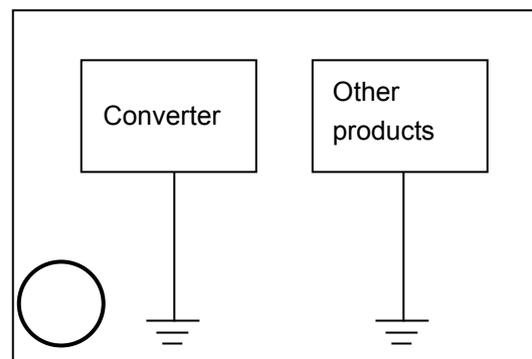
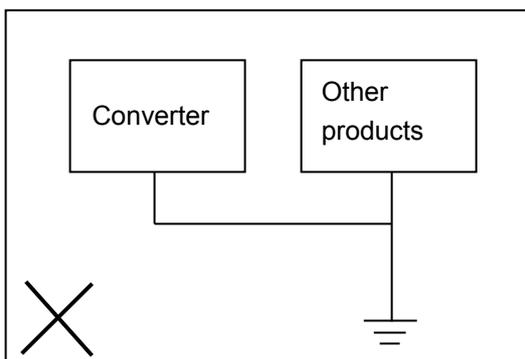


### (2) Ground

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

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

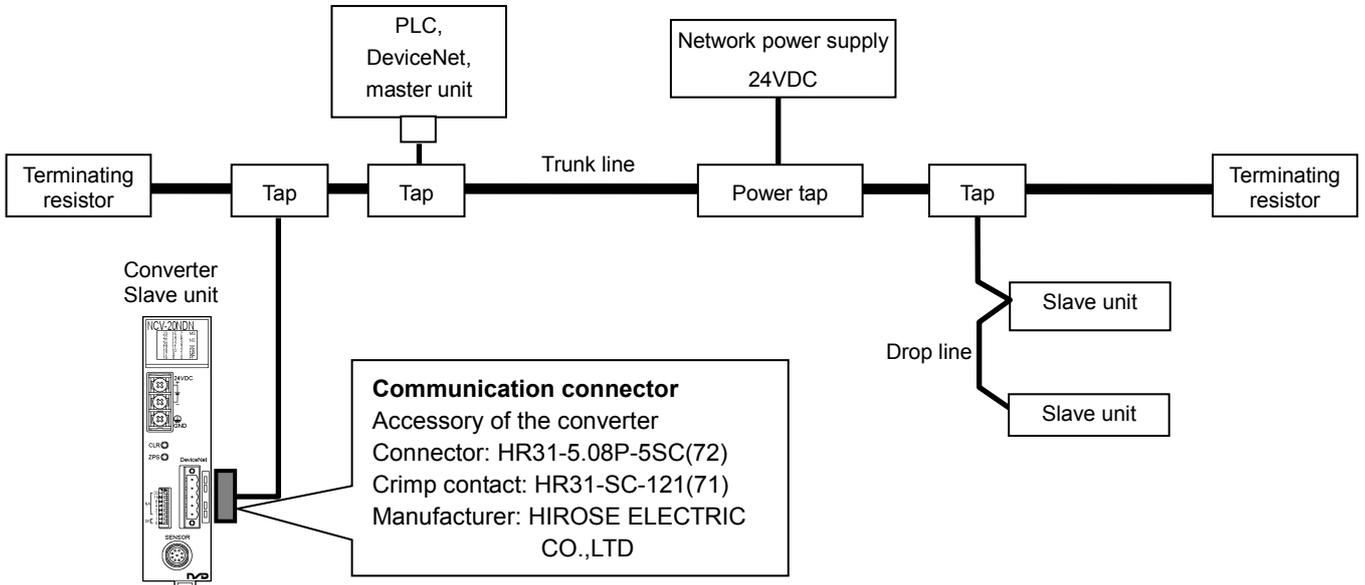
-The terminal block tightening torque is 1.8 N·m (16 lb·in).



### 8-3. DeviceNet Network Connection

Explains the DeviceNet network connection in this section.

● Example of the network connection



● Attention

- (1) Connect the terminating resistor at both ends of the trunk line.
- (2) The length of the communication cable is different depending on the baud rate and cable kinds. Lay the cables by referring to the following table.

Baud rate	Maximum distance		Drop line length	Cumulative drop line length
	Thick cable	Thin cable		
500 kbps	100m or less	100m or less	6m or less	39m or less
250 kbps	250m or less			78m or less
125 kbps	500m or less			156m or less

(3) Network ground

- Connect a shield wire of the power tap and an earth terminal of the network power supply, and ground (ground resistance of 100ohm or less) the wires.
- Ground at one place in order to prevent the ground loops.

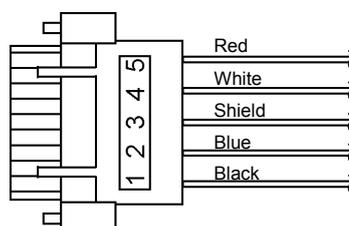
● Communication connector wiring

- (1) The connector and crimping terminal should be use the accessory of the converter.
- (2) The connector wiring should be matched the pin number and wire color by referring to the following table.

Crimping terminal size: 1.25 mm<sup>2</sup>  
 Crimp tool: Conforming to JIS C 9711 standard  
 Applicable wire size: 0.25-1.65 mm<sup>2</sup>

For more details, refer to the manufacture reference.

Connector pin No.	Wire Color	Wire identity
5	Red	V+
4	White	CAN_H
3	—	Shield
2	Blue	CAN_L
1	Black	V-



## 9. DeviceNet

### 9-1. IN/OUT Data

The master unit should be read or written by using the IN/OUT data.

The notation of IN/OUT is based on the master unit side in this manual.

IN data: The master unit reads out from NCV-20NDN.

OUT data: The master unit writes to the NCV-20NDN.

#### 9-1-1. IN data format

IN data format is used 5-byte.

IN data can read out the position data and error contents.

Bit Byte	7	6	5	4	3	2	1	0
0	D7	D6	D5	D4	D3	D2	D1	D0 (LSB)
	Position data 0 (D13-D15 should be fixed at 0.)							
1	D15	D14	D13	D12	D11	D10	D9	D8
	Position data 1							
2	D23 (MSB)	D22	D21	D20	D19	D18	D17	D16
	Position data 2 (D16-D23 should be fixed at 0.)							
3	Fixed at 0							
4	Fixed at 0			N5PF	PF	ME	DE	SE

#### (1) Position data (byte 0-2)

The position data which is detected by the ABSOCODER sensor can read out as the binary code.

This position data value will be changed, if the OUT data format is done the current position setting.

The position data range which can be read out is determined depending on the total number of divisions.

VRE-P028 : 0-8191 (0-0x1FFF)

VRE-P062 : 0-8191 (0-0x1FFF)

#### (2) Error detection (byte 4)

The bit which is corresponding to the error is changed "0 to 1" when an error has occurred.

Bit	Name	Error contents
0	SE	Sensor disconnected error
1	DE	Sensor data error
2	ME	Low power error
3	PF	Memory error
4	N5PF	-5V power supply error
5-7	Reserve	Fixed at 0

For more details, refer to "10-2. Troubleshooting".

## 9-1-2. OUT data format

OUT data format is used 5-byte.

OUT data can do the current position setting and the error clear.

Byte \ Bit	7	6	5	4	3	2	1	0
0	PRD7	PRD6	PRD5	PRD4	PRD3	PRD2	PRD1	PRD0 (LSB)
	Current position setting data 0							
1	PRD15	PRD14	PRD13	PRD12	PRD11	PRD10	PRD9	PRD8
	Current position setting data 1 (PRD13-PRD15 should be fixed at 0.)							
2	PRD23 (MSB)	PRD22	PRD21	PRD20	PRD19	PRD18	PRD17	PRD16
	Current position setting data 2 (PRD16-PRD23 should be fixed at 0.)							
3	Fixed at 0							
4	Fixed at 0						Current position setting command	Error clear

### (1) Current position setting

The current position setting is a function which change the position data of the IN data format to the value which is matched the current position of the machine. If the extension sensor cable is used, set it with connecting the cable.

#### Procedures

##### 1. Current position setting data (byte 0-2)

Write the matched value as the current position of the machine.

The setting range is determined by the total number of the division.

VRE-P028 : 0-8191 (0-0x1FFF)

VRE-P062 : 0-8191 (0-0x1FFF)

##### 2. Current position setting command (bit 1 of the byte-4)

The position data is changed when this bit is switched "0 to 1".

#### Note

If a value which is out of the setting range is written to the current position setting data, the only data which is in the setting range will be written.

### (2) Error clear (bit 0 of the byte-4)

The position is changed when this bit switch "0 to 1", and the error is cleared.

For more details, refer to "10-2. Troubleshooting".

#### Point

The error also can be cleared by "CLR button" on the panel.

For more details, refer to "6-3. Error Clear (CLR Button)".

## 9-2. Application Object

The application object can be accessed by using Explicit Messaging.

- Type and class ID of the application object

Type: Position Sensor object

Class ID: 135 (0x87)

- Service list of the Position Sensor object

Service code	Service name	Descriptions
14 (0x0E)	Get Attribute Single	Read out the contents of the specified attribute.
16 (0x10)	Set Attribute Single	Change the contents of the specified attribute.
5 (0x05)	Reset	Initialize contents of the objects. Option 0: Error clear 1: Factory setting

- Attribute list of the Position Sensor object

Instance ID	Attribute ID	Name	Descriptions	Access rule	Data type
0 (0x00)	1 (0x01)	Revision	Revision	Get	UINT
1 (0x01)	10 (0x0A)	Position data	Position data which is detected by the ABSOCODER sensor. This is the same function as the position data of IN data format.	Get	DINT
	12 (0x0C)	Position data increase direction	Set the position data increase direction. 0: CW, 1: CCW For more details, refer to "9-2-1".	Get/Set	BOOL
	19 (0x13)	Current position setting value	Change the position data value to the value which is set in this ID. This is the same function as the current position setting of OUT data format.	Get/Set	DINT
	41 (0x29)	Setting status	The setting status of the converter can be read out. For more details, refer to "9-2-2".	Get	BYTE
	44 (0x2C)	Error information	Read out error information. For more details, refer to "9-2-3".	Get	WORD
	45 (0x2D)	Error detection item	Support information of the error detection item can be read out. For more details, refer to "9-2-3".	Get	WORD
	46 (0x2E)	Error detection	0: None 1: Error is detected	Get	BOOL
	51 (0x33)	Offset value	Difference between an absolute position value which is detected by the ABSOCODER sensor and a current position setting value.	Get	DINT

● Basic format of the Explicit message

Request message

Bit	7	6	5	4	3	2	1	0
Byte								
0	Flag	XID	MAC ID					
1	R/R	Service code						
2	Class ID							
3	Instance ID							
4	Service data							
:	*: The contents will be changed by the service code.							

Response message

Bit	7	6	5	4	3	2	1	0
Byte								
0	Flag	XID	MAC ID					
1	R/R	Service code (If an error has occurred, 0x14 will be read out.)						
2	Service data *: The contents will be changed by the service code. (If an error has occurred, an error code will be read out.)							
3								
4								
:								



\*Flag: divide of the message, XID: transaction, R/R: request / response

● Request and response message formats for each service

① Get Attribute Single service

Request message

Bit	7	6	5	4	3	2	1	0
Byte								
0	Flag	XID	MAC ID					
1	0	Service code = 0x0E						
2	Class ID = 0x87							
3	Instance ID							
4	Attribute ID							

Response message

Bit	7	6	5	4	3	2	1	0
Byte								
0	Flag	XID	MAC ID					
1	1	Service code = 0x0E						
2	Attribute data							
3								
:								



\*: Refer to "Attribute list of the Position Sensor object" for the instance ID and attribute ID.

② Set Attribute Single service

Request message

Bit	7	6	5	4	3	2	1	0
Byte								
0	Flag	XID	MAC ID					
1	0	Service code = 0x10						
2	Class ID = 0x87							
3	Instance ID							
4	Attribute ID							
5	Attribute data							
:								

Response message

Bit	7	6	5	4	3	2	1	0
Byte								
0	Flag	XID	MAC ID					
1	1	Service code = 0x10						



\*: Refer to "Attribute list of the Position Sensor object" for the instance ID and attribute ID.

③ Reset service

Request message

Bit	7	6	5	4	3	2	1	0
Byte								
0	Flag	XID	MAC ID					
1	0	Service code = 0x05						
2	Class ID = 0x87							
3	Instance ID = 0x00							
4	Option							

Response message

Bit	7	6	5	4	3	2	1	0
Byte								
0	Flag	XID	MAC ID					
1	1	Service code = 0x05						



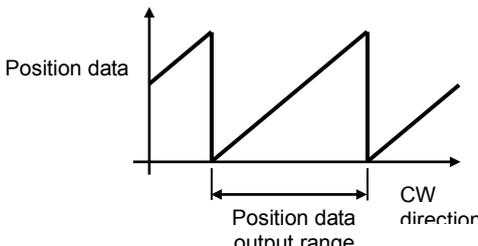
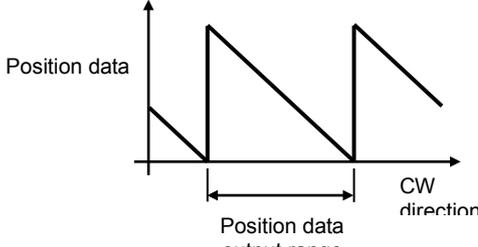
\*: Refer to "Service list of the Position Sensor object" for the option.

### 9-2-1. Position data increasing direction setting

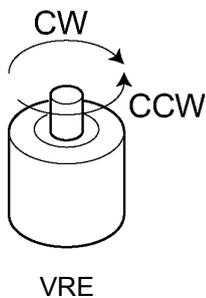
The position data increases or decreases depending on the ABSOCODER sensor's rotation direction (or on the rod travel direction when a linear-type ABSOCODER sensor is used).

This position data increase direction is specified by the attribute ID 12 (0x0C) of the Position Sensor object.

Contents of the attribute ID 12

Description	Position data change
<p style="text-align: center;">0: CW</p> <p>When ABSOCODER sensor rotates (travel) to CW direction, the position data will be increased.</p>	
<p style="text-align: center;">1: CCW</p> <p>When ABSOCODER sensor rotates (travel) to CW direction, the position data will be decrease.</p>	

Shaft rotation direction



### 9-2-2. Bit configuration of the setting status

The bit configuration of the Attribute ID41 (0x29) setting status for the Position Sensor object is indicated in this section.

Bit	Name	Description	Note
0	Position data increase direction	0: CW 1: CCW	
1-7	—	Fixed at 0	

### 9-2-3. Bit configuration of the error information

The bit configurations of the attribute ID44 (0x2C) error information and the attribute ID45 (0x2D) error detection item for the Position Sensor object are indicated in this section.

Bit	Name	Description of attribute ID44	Description of attribute ID45
0	Sensor data error (DE)	0: No error 1: Error is detected	Fixed at 1 (support)
1	Sensor disconnected error (SE)	0: No error 1: Error is detected	Fixed at 1 (support)
2-11	—	Fixed at 0	Fixed at 0
12	Low voltage error (PF)	0: No error 1: Error is detected	Fixed at 1 (support)
13	-5V power supply error (N5PF)	0: No error 1: Error is detected	Fixed at 1 (support)
14	Memory error (ME)	0: No error 1: Error is detected	Fixed at 1 (support)
15	—	Fixed at 0	Fixed at 0

## 10. 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.

### 10-1. Inspection

Inspection item	Inspection Description	Criteria	Remark
Power supply	Measure the voltage fluctuation at the power supply terminal block 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.	Sensor: -20 to +60°C Converter: 0 to +55°C	Thermometer
	There should be no accumulation of dust.	None	Visual Inspection
Mount Conditions	Verify that the sensor is securely mounted.	There should be no looseness.	
	Verify that the sensor 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 DeviceNet communication connector is plugged in all the way.	There should be no looseness.	

## 10-2. Troubleshooting

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

NCV-20NDN has LEDs for the DeviceNet monitor (MS and NS) and monitoring error. The operation status and error contents can be checked by LED light status. The error contents should be checked when an error has occurred. Clear the error by the recovering methods which corresponding to each error.

If the condition isn't improved, the ABSOCODER sensor or converter might have the malfunction.

### ● Contents of the DeviceNet monitor LED

Monitor LED		Error name	Probable cause	Error clear procedures	Recovering method
Name	Light status				
MS	Green	Normal	Operating in a normal condition		
	Flickering red	Minor error	- Recovery is possible. Either error SE, DE, or PF has occurred. - Baud rate setting error.	- Refer to the section "SE, DE, and PE" on the next page. - Correct the baud rate.	
	Red	Non-recovery error	Recovery is not possible. Either ME or PF has occurred.	Refer to the section "ME and PE" on the next page.	Replace the converter if an error has occurred again.
			The internal circuit or part might be broken down or degradation.	Restart the power supply for the converter.	
OFF	No power supply	The power is not supplied to the converter.	Check the wiring of the power supply.	Turn ON the power supply for the converter.	
NS	Green	Online/ connected	DeviceNet communication is normal.		
	Flickering green	Online/ disconnected	- The Communication connection is not established. - NCV-20NDN is not allocated to the master unit.		
	Flickering red	Connection time out	Communication timeout of the I/O connection has occurred.	Connect the terminating resistor.	
	Red	Critical error	A DeviceNet communications error was detected caused by node address duplication or Bus OFF.  These errors make communications impossible.	- Correct the node address duplication. - Correct the baud rate. - Correct communications cable connection problem. - Connect the terminating resistor.	After removing an error cause, restart the power supply for the converter.
OFF	Offline/ no power supply	- Online status is not established. - The network power is not supplied.	- Check whether the communication connector is unplugged. - Check whether the network power is supplied.		

● Contents of the error monitor LED

Monitor LED		Error name	Probable cause	Error clear procedures	Recovering method
Name	Light status				
SE	ON	Sensor disconnected error	Sensor connector is disconnected.	Secure the connector	After removing an error cause, clear the error by either way:  - Press CLR button. - Clear the error of the OUT data.
			Sensor connector is loose.		
			Sensor cable is severed.	Replace the cable.	
DE	ON	Sensor data error	Wiring has a noise source	- Check the GND terminal is grounded. - Check whether there is no power line around the sensor cable.	
			Sensor cable is severed.	Replace the cable.	
ME	ON	Memory error	The internal circuit or part is broken down or deteriorated.	Restart the power supply for the converter.	
PF	ON	Low power error	Voltage drop of 24VDC power supply	Check the power supply. 21.6 to 26.4VDC (including a ripple)	After removing an error cause, clear the error by either way:  - Press CLR button. - Clear the error of the OUT data.
			Instantaneous power failure of 24VDC power supply		
PF	Flickering	-5V power supply error	Wiring has a noise source	- Check the GND terminal is grounded. - Check whether there is no power line around the sensor cable.	After removing an error cause, restart the power supply for the converter.
			The internal circuit or part is broken down or deteriorated.	Restart the power supply for the converter.	

● Other error contents

Error contents	Probable cause	Error clear procedures	Recovering method
Zero point deviation	The coupling between the axis of the ABSOCOER sensor and the axis of the machine is loose.	Secure the coupling / mounting.	Set the zero point.
	ABSOCODER sensor mounting is loose.		

## 11. CE Marking

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

### 11-1. 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.

### 11-2. 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.	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

### 11-3. Measures for EMC Compliance

#### ● Sensor cable

If a 30m or longer sensor cable is to be used, pass the sensor cable through a metal duct or cover the sensor cable with the shielded zippertubing and ground the tube shield.

Zippertubing

Model	Manufacturer
MTFS 20 $\phi$	ZIPPERTUBING(JAPAN),LTD.

#### [Reference]

It may be improved when clamp ferrite core is added to the power supply or sensor 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: $\phi$ 9)	TDK





NSD Group

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