

## ON/OFF Input Sensor Controller

NPS SERIES



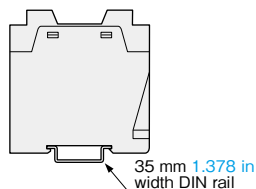
# NPS SERIES



## Multi-functional DIN rail mounting slim sensor controller

### DIN rail mounting

Mountable on 35 mm 1.378 in DIN rail by one-push. It reduces mounting space and mounting operations.

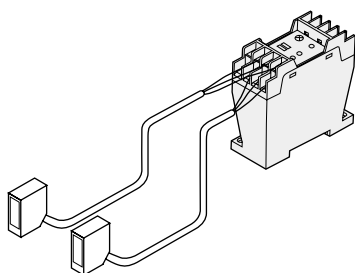


### Two outputs: contact and non-contact **NPS-C7, NPS-CT7**

Useful for various applications because the controller has two outputs, relay contact and NPN open-collector transistor output.

### Connects two sensors **NPS-C7W**

Two sensors can be connected, and two independent outputs are generated.



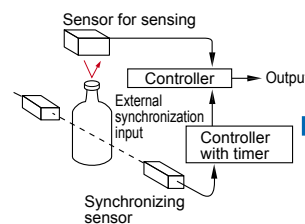
### Edge trigger

**NPS-CT7**

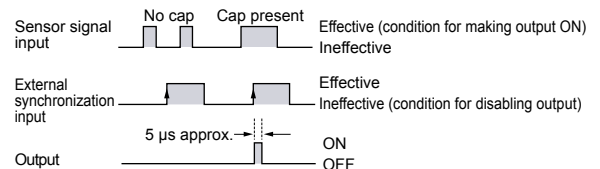
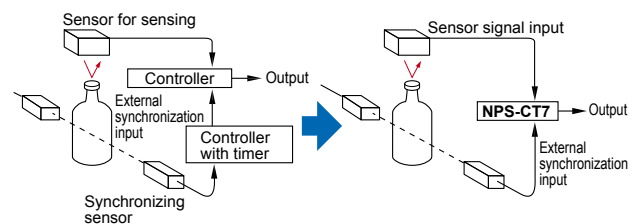
Synchronized input is possible at either the rising or the falling edge of the external synchronization signal. With this, now only one controller suffices where earlier two were required in applications, such as, detecting presence of bottle caps.

Example: Detecting presence of cap on bottle

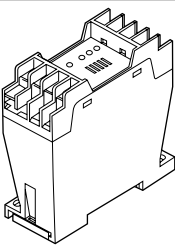
#### • Conventional method



#### • Using NPS-CT7

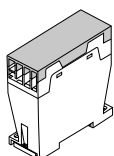


## ORDER GUIDE

Type	Appearance	Model No.	Supply voltage	Power supply for sensor	Output	External synchronization function	Timer function
General use		<b>NPS-C7</b>	100-240 V AC ±10 %	12 V DC ±10 % 150 mA max.	<ul style="list-style-type: none"> <li>Relay contact 1c</li> <li>NPN open-collector transistor</li> </ul>	Gate trigger	————
High-performance		<b>NPS-CT7</b>		12 V DC ±10 % 130 mA max.		Gate trigger and edge trigger	Three function selectable timer
Two sensor connection		<b>NPS-C7W</b>		12 V DC ±10 % 120 mA max.	Relay contact 1c ×2	————	————

### Accessory

- **NPS-CV** (Protection cover)



## SPECIFICATIONS

Type		DIN rail mounting		
		General use	High-performance	Two sensor connection
Item	Model No.	<b>NPS-C7</b>	<b>NPS-CT7</b>	<b>NPS-C7W</b>
Applicable sensors		Photoelectric sensor, inductive proximity sensor, etc., with NPN transistor output or relay output		
Supply voltage		100-240 V AC ±10 %		
Power consumption		6 VA or less		
Power supply for sensor	Voltage	12 V DC ±10 % (incorporated with short-circuit protection)		
	Current	150 mA max.	130 mA max.	120 mA max.
Output	Output operation	Relay contact 1c <ul style="list-style-type: none"> <li>Switching capacity: 250 V 3 A AC (resistive load)</li> <li>Electrical life: 100,000 switching operations or more (rated load)(at 1,800 operations/hour)</li> <li>Mechanical life: 10 million switching operations or more (at 36,000 operations/hour)</li> </ul>	NPN open-collector transistor <ul style="list-style-type: none"> <li>Maximum sink current: 100 mA or less</li> <li>Applied voltage: 30 V DC or less (between output and 0 V)</li> <li>Residual voltage: 1 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)</li> </ul>	Relay contact 1c ×2 <ul style="list-style-type: none"> <li>Switching capacity: 250 V 3 A AC (resistive load)</li> <li>Electrical life: 100,000 switching operations or more (rated load)(at 1,800 operations/hour)</li> <li>Mechanical life: 10 million switching operations or more (at 36,000 operations/hour)</li> </ul>
	Output operation	Switchable normal operation or inverse operation		
Response time		Relay contact: 10 ms approx., NPN open-collector transistor: 5 μs or less		10 ms approx.
Indicators	Power	Red LED (lights up when the power is ON)		
	Output (Note 2)	Red LED (lights up when the output is ON)		
	Sensor signal input	————	Red LED (lights up when the sensor signal input is effective)	————
	External synchronization input	————	Red LED (lights up when the external synchronization input is effective)	————
External synchronization function		Gate trigger	Gate trigger and edge trigger	————
Timer function		————	Three function selectable timer (Timer period: switchable either 40 ms to 1 sec. or 0.4 sec. to 10 sec.)	————
Environmental resistance	Ambient temperature	-10 to +50 °C <b>+14 to +122 °F</b> (No dew condensation or icing allowed), Storage: -30 to +70 °C <b>-22 to +158 °F</b>		
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH		
	Voltage withstandability	1,500 V AC for one min. between the power and the output terminals		
	Insulation resistance	10 MΩ, or more, with 500 V DC megger between the power and the output terminals		
	Vibration resistance	10 to 55 Hz frequency, 0.75 mm <b>0.030 in</b> double amplitude in X, Y and Z directions for two hours each		
Shock resistance	100 m/s <sup>2</sup> acceleration (10 G approx.) in X, Y and Z directions two times each			
Material		Enclosure: ABS, Terminal block: PBT (Glass fiber reinforced)		
Connecting method		Terminal block		
Weight		Net weight: 160 g approx.		
Accessories		Short bar: 1 pc., <b>NPS-CV</b> (Protection cover): 1 pc., Short-circuit protection plate: 1 pc., Adjusting screwdriver: 1 pc. ( <b>NPS-CT7</b> only)		

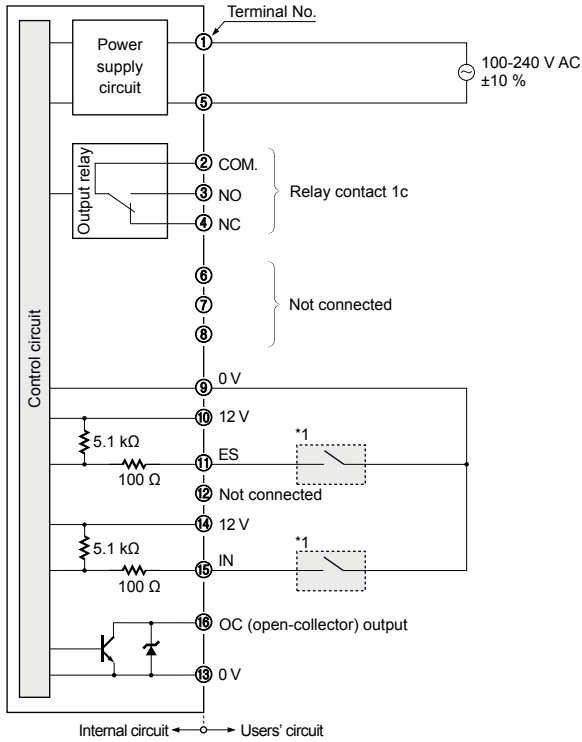
Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C **+68 °F**.

2) In **NPS-C7W**, two output indicators, Sensor 1 output indicator and Sensor 2 output indicator, have been incorporated.

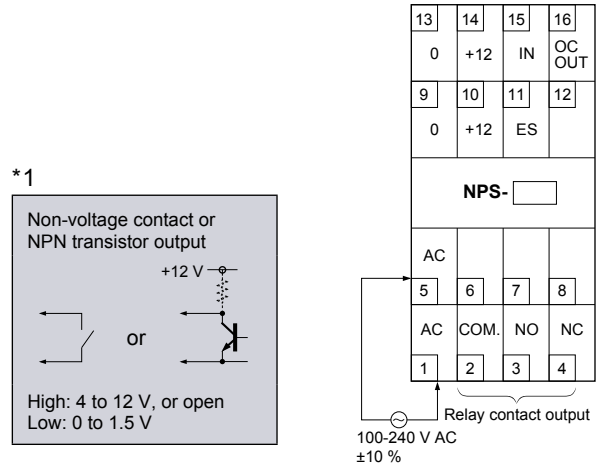
**I/O CIRCUIT AND WIRING DIAGRAMS**

**NPS-C7 NPS-CT7**

**I/O circuit diagram**



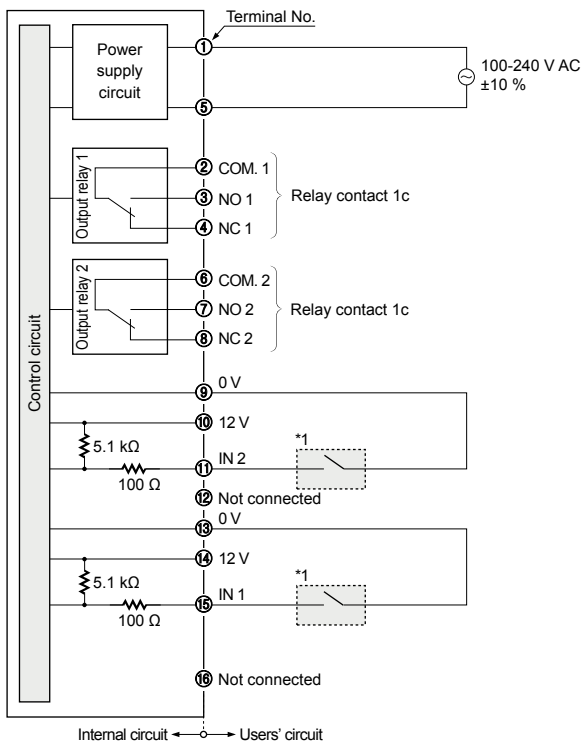
**Terminal arrangement diagram**



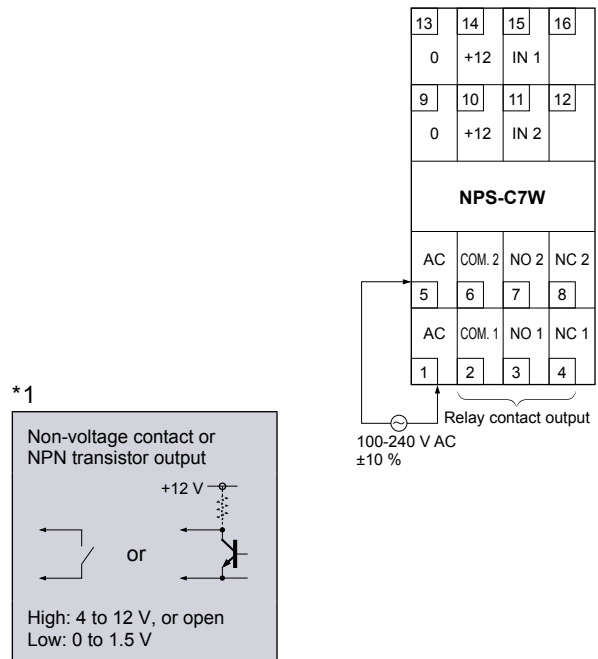
Note: Response time of the NPN open-collector transistor output of **NPS-C7** and **NPS-CT7** is 5  $\mu$ s. If a relay or a micro-switch (mechanical contact) is connected, its bounce may result in output chattering. Take care of this aspect, especially when the timer function is used.

**NPS-C7W**

**I/O circuit diagram**



**Terminal arrangement diagram**



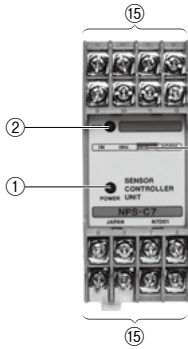
**PRECAUTIONS FOR PROPER USE**



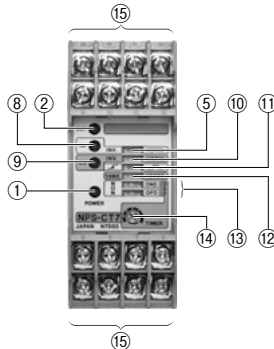
- Never use this product in a device for personnel protection.
- In case of using devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

**Functional description**

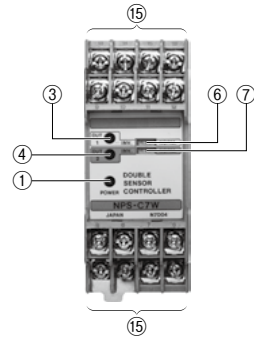
**NPS-C7**



**NPS-CT7**



**NPS-C7W**

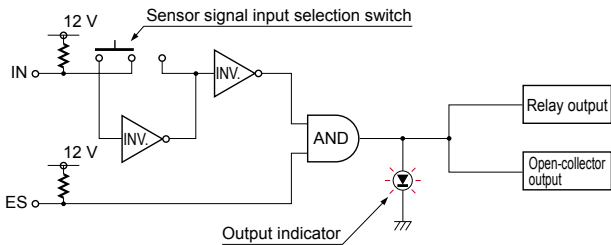


	Description	Function
①	Power indicator (Red LED)	Lights up when the power is ON.
②	Output indicator (Red LED)	
③	Sensor 1 output indicator (Red LED)	Lights up when the output is ON.
④	Sensor 2 output indicator (Red LED)	
⑤	Sensor signal input selection switch	Selects the output operation. INV. ( ) NORM. INV.: The output is ON when the sensor signal input is High. NORM.: The output is ON when the sensor signal input is Low.
⑥	Sensor 1 output operation mode switch	Selects the output operation. INV. ( ) NORM.
⑦	Sensor 2 output operation mode switch	INV.: The output is ON when the sensor signal input is High. NORM.: The output is ON when the sensor signal input is Low.
⑧	Sensor signal input indicator (Red LED)	Indicates the state of the sensor signal input. The operation differs according to the mode set with ⑤ Sensor signal input selection switch. INV.: Lights up when the sensor signal input is High. NORM.: Lights up when the sensor signal input is Low.
⑨	External synchronization input indicator (Red LED)	Indicates the state of the external synchronization input. Lights up when the external synchronization input does not disable the output.

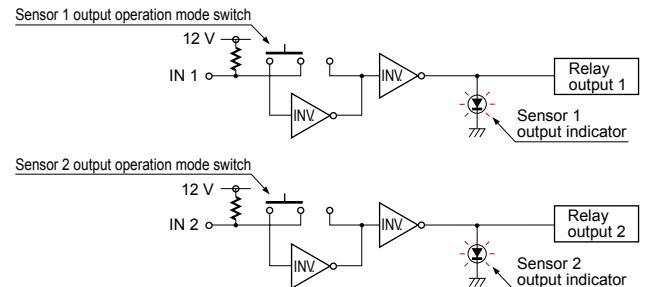
	Description	Function
⑩	External synchronization operation mode switch	Selects the operation of external synchronization. INV. ( ) NORM. INV.: The output is neglected when the external synchronization input is High. NORM.: The output is neglected when the external synchronization input is Low.
⑪	Gate/Edge trigger operation mode switch	Selects Gate trigger or Edge trigger. [Symbol: square pulse] : Effective at the instant the external synchronization input is applied. [Symbol: horizontal line] : Effective over the period for which the external synchronization input is applied.
⑫	Timer period selection switch	Selects the timer period. 1sec. ( ) 10sec. 1 sec.: Variable from 40 ms approx. to 1 sec. approx. 10 sec.: Variable from 0.4 sec. approx. to 10 sec. approx.
⑬	Timer operation mode switch	Selects the timer operation. (A) Ineffective (B) ON-delay (C) OFF-delay (D) ONE SHOT [Symbol A] [Symbol B] [Symbol C] [Symbol D] [Symbol A] [Symbol B] [Symbol C] [Symbol D]
⑭	Timer adjuster	Set the timer period.
⑮	Terminal block	

**Block diagrams (The diagrams below explain NPS's operation in a simple manner. The actual circuits may differ slightly.)**

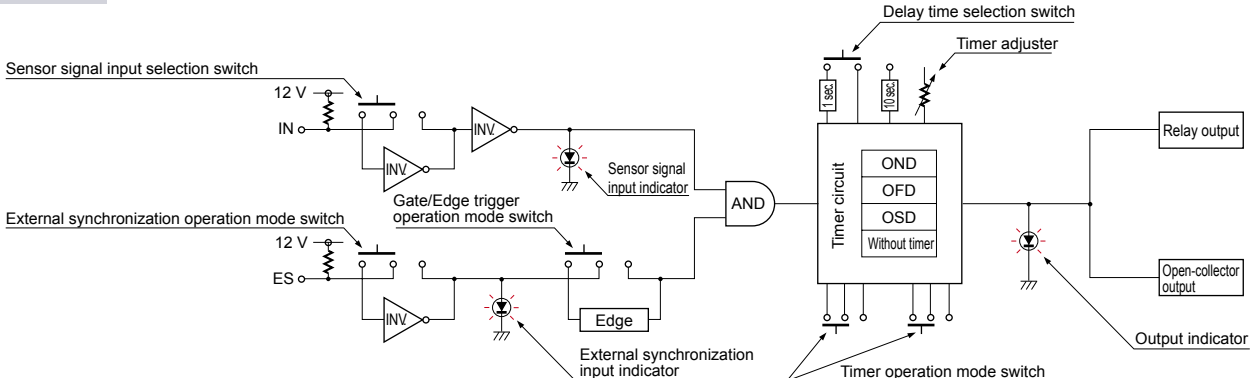
**NPS-C7**



**NPS-C7W**



**NPS-CT7**



## PRECAUTIONS FOR PROPER USE

### Timer functions (NPS-CT7 only)

- **NPS-CT7** has three types of convenient built-in timer functions.

#### • ON-delay (OND)

<Function>:

Neglects short output signals.

<Application>:

As only long signals are extracted, this function is useful for detecting if a line is choked or for sensing only objects taking a long time to travel.

#### • OFF-delay (OFD)

<Function>:

Extends the output signal for a fixed period of time.

<Application>:

This function is useful if the output signal is so short that the connected device cannot respond.

#### • ONE SHOT (OSD)

<Function>:

Outputs a fixed width signal upon sensing.

<Application>:

This function is useful when the input specifications of the connected device require a signal of fixed width. Of course, it is also useful for extending a short width signal to a desired width.

Various other applications are possible.

### Selection switch and timer operation

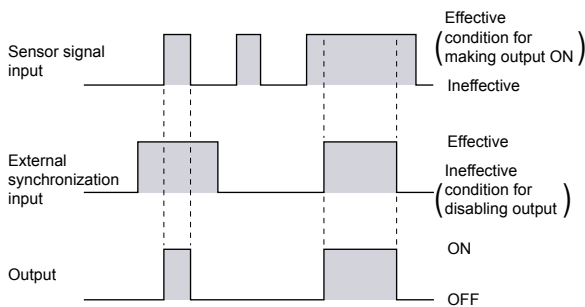
Switch setting		Sensor signal input	Output operation
Sensor signal input selection	Timer operation selection		
INV. <input type="checkbox"/> NORM. <input checked="" type="checkbox"/>	OND <input checked="" type="checkbox"/> OFD <input type="checkbox"/> OSD <input type="checkbox"/> OND <input type="checkbox"/> OFD <input checked="" type="checkbox"/> OSD <input type="checkbox"/>		Input not inverted normal operation
	OND <input checked="" type="checkbox"/> OFD <input type="checkbox"/> OSD <input type="checkbox"/> OND <input type="checkbox"/> OFD <input checked="" type="checkbox"/> OSD <input type="checkbox"/>		Input not inverted ON-delay
	OND <input checked="" type="checkbox"/> OFD <input type="checkbox"/> OSD <input type="checkbox"/> OND <input type="checkbox"/> OFD <input checked="" type="checkbox"/> OSD <input type="checkbox"/>		Input not inverted OFF-delay
	OND <input checked="" type="checkbox"/> OFD <input type="checkbox"/> OSD <input type="checkbox"/> OND <input type="checkbox"/> OFD <input checked="" type="checkbox"/> OSD <input type="checkbox"/>		Input not inverted ONE SHOT
	OND <input type="checkbox"/> OFD <input checked="" type="checkbox"/> OSD <input type="checkbox"/> OND <input checked="" type="checkbox"/> OFD <input type="checkbox"/> OSD <input type="checkbox"/>		Input inverted normal operation
	OND <input type="checkbox"/> OFD <input checked="" type="checkbox"/> OSD <input type="checkbox"/> OND <input checked="" type="checkbox"/> OFD <input type="checkbox"/> OSD <input type="checkbox"/>		Input inverted ON-delay
INV. <input checked="" type="checkbox"/> NORM. <input type="checkbox"/>	OND <input checked="" type="checkbox"/> OFD <input type="checkbox"/> OSD <input type="checkbox"/> OND <input type="checkbox"/> OFD <input checked="" type="checkbox"/> OSD <input type="checkbox"/>		Input inverted OFF-delay
	OND <input checked="" type="checkbox"/> OFD <input type="checkbox"/> OSD <input type="checkbox"/> OND <input type="checkbox"/> OFD <input checked="" type="checkbox"/> OSD <input type="checkbox"/>		Input inverted ONE SHOT
	OND <input type="checkbox"/> OFD <input checked="" type="checkbox"/> OSD <input type="checkbox"/> OND <input checked="" type="checkbox"/> OFD <input type="checkbox"/> OSD <input type="checkbox"/>		Input inverted normal operation

Timer period: T=Switchable, either 40 ms approx. to 1 sec. approx., or 0.4 sec. approx. to 10 sec. approx.

### External synchronization function (NPS-C7, NPS-CT7 only)

#### • Gate trigger

The output is disabled when the external synchronization input is Low [mode selection switch on NORM. (Note)] or is High [mode selection switch on INV. (Note)].

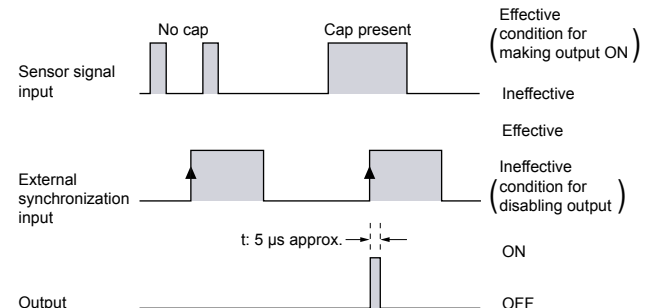
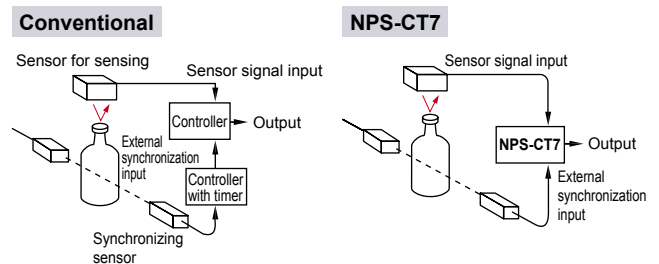


Note: Since **NPS-C7** is not incorporated with the selection switch, the output is disabled only when the external synchronization input is Low.

#### • Edge trigger (NPS-CT7 only)

The sensor signal is judged at the instant the external synchronization input rises up or falls down. This sensor is ideal for cap presence detection that would have required two controllers in the past.

#### Example: Detecting presence of cap on bottle



Note: As the output time 't' is only 5  $\mu$ s approx., extend it by using the OFF-delay timer or the ONE SHOT timer.

### Mounting

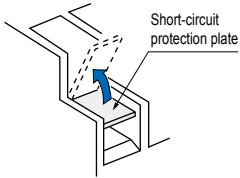
- To mount **NPS** with screws, use M4 screws. The tightening torque should be 0.78 N•m or less.

## PRECAUTIONS FOR PROPER USE

### Wiring

- Make sure that the power supply is off while wiring.
- Verify that the supply voltage variation is within the rating.

#### • Short-circuit protection plate



The short-circuit protection plate is attached to terminal No. 1 to prevent AC short-circuit. Flip the plate up, connect the wire to terminal No. 1, and then flip it down.

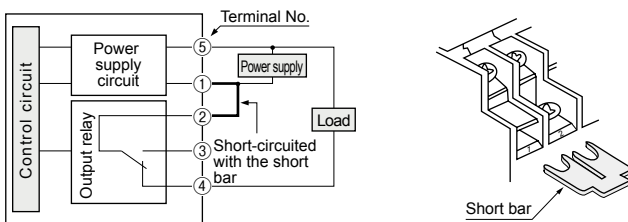
(The short-circuit protection plate is attached at the time of shipment from our factory.)

#### • Short bar

The short bar saves wiring when a common power supply is used for the AC supply terminal and the load supply of the relay contact output.

(The short bar is attached between the terminal Nos. 1 and 2 at the time of shipment from our factory. To use a separate power supply for the output relay, make sure to remove it.)

#### Typical wiring diagram



#### • Dimensions of suitable crimp terminals

(Unit: mm in)

Y-shaped type	Round type

Note: Use crimp terminals having insulation sleeves.

Recommended crimp terminal: Nominal size 1.25-3.0

- **NPS-C7** and **NPS-CT7** do not incorporate a short-circuit protection at the NPN open-collector transistor output. Do not connect them directly to a power supply or a capacitive load.
- The response time of the NPN open-collector transistor output of **NPS-C7** or **NPS-CT7** is 5  $\mu$ s. If a relay or a micro-switch (mechanical contact) is connected, take care since its bounce may result in output chattering.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.

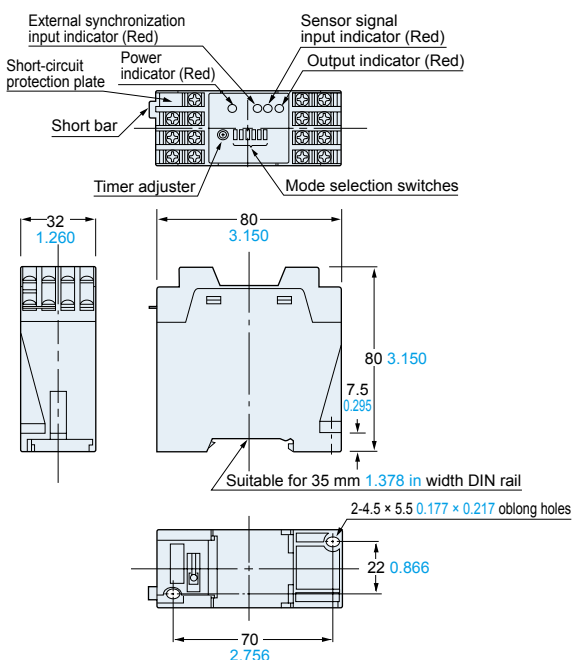
#### Others

- Do not use during the initial transient time (0.5 sec.) after the power supply is switched on.
- Avoid dust, dirt, and steam.
- Take care that the controller does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.

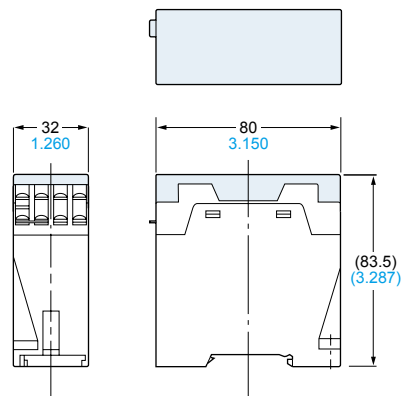
## DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from our website.

### NPS-□



#### Assembly dimensions with attached protection cover



- Notes: 1) The above drawing illustrates the dimensions of **NPS-CT7**. The dimensions of **NPS-C7** and **NPS-C7W** are identical to those given above.
- 2) The front panel of each model is different. Refer to p.5 for more details of the front panels.

## Disclaimer

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