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Analog Set Multifunction Timers  
In Slim 22.5 mm Design  
For Track Mounting

- Wide AC/DC power supply range (24 to 230 VAC/DC) minimizes inventory
- 12 VDC available in H3DE-M model
- Programmable contacts (available in -M2 and -S2 models) can enable and disable a self-holding relay circuit
- Eight operating modes in the H3DE-M (four in the H3DE-S) offer wide application flexibility
- Time setting range 0.10 sec to 120 hrs
- Finger protection terminal block



## Ordering Information

### ■ TIMER

Description		Part number	
Contact output	Supply voltage	Multifunctional	Standard
DPDT (time-limit output SPDT); and switchable SPDT (time-limit ↔ instantaneous)	12 VDC	<b>H3DE-M2 DC12</b>	—
	24 to 230 VAC/DC	<b>H3DE-M2 AC/DC24-230</b>	<b>H3DE-S2 AC/DC24-230</b>
SPDT (time-limit output SPDT)		<b>H3DE-M1 AC/DC24-230</b>	<b>H3DE-S1 AC/DC24-230</b>

### ■ MODEL NUMBER LEGEND

H3DE-□-□-□    1. M: Multifunction type    2. 1: SPDT    3. Supply voltage  
                  1 2 3                    S: Standard type                    2: DPDT

### ■ ACCESSORIES (ORDER SEPARATELY)

Item	Description	Part number
Mounting track	50 cm (l) x 7.3 mm (t)	<b>PFP-50N</b>
	1 m (l) x 7.3 mm (t)	<b>PFP-100N</b>
	1 m (l) x 16 mm (t)	<b>PFP-100N2</b>
End plate		<b>PFP-M</b>
Spacer		<b>PFP-S</b>

# Specifications

## ■ GENERAL

Item	H3DE-M2	H3DE-M1	H3DE-S2	H3DE-S1
Operating mode	A: ON-delay (Signal or Power) B: Repeat-cycle OFF start (Signal or Power) B2: Repeat-cycle ON start (Signal or Power) C: Signal ON-/OFF-delay D: Signal OFF-delay E: Interval (Signal or Power) G: Signal ON-/OFF-delay J: One-shot (Signal or Power)		A: ON-delay B2: Repeat-cycle ON start E: Interval J: One-shot	
Terminal block	Clamps two 2.5 mm <sup>2</sup> max. bar terminals without sleeves.			
Terminal screw tightening torque	0.98 N • m max. {approx. 10 kgf • cm max.}			
Input type	Voltage input		---	
Output type	Relay: DPDT	Relay: SPDT	Relay: DPDT	Relay: SPDT
Mounting method	DIN track mounting (See Note.)			
Attachment	Nameplate			
Approved standards	UL508, CSA 22.2 No.14 Conforms to EN61812-1, IEC60664-1 (VDE0110) 4 kV/2, VDE0106/P100 Output category according to IEC60947-5-1 (AC-13; 250 V 5A/AC-15; 250 V 3 A/DC-13; 30 V 0.1 A)			

Note: Can be mounted to 35-mm DIN track with a plate thickness of 1 to 2.5 mm.

## ■ TIME RANGES

Time scale display	Time unit display			
	seconds	min	hrs	10 h
x 0.1	0.1 to 1.2 s	0.1 to 1.2 min	0.1 to 1.2 h	1 to 12 h
x 1	1 to 12 s	1 to 12 min	1 to 12 h	10 to 120 h

Note: When the main dial is set to "0" for all settings, the output will operate instantaneously.

## ■ RATINGS

Rated supply voltage (See Notes 1 and 2.)		24 to 230 VAC/DC (50/60 Hz) 12 VDC (H3DE-M2 model only)
Operating voltage range		85% to 110% of rated supply voltage
Power reset		Minimum power-off time: 0.1 s
Reset voltage		2.4 VAC/DC max.
Power consumption (See Note 3.)	H3DE-M1	AC: approx. 4.3 VA (2.2 W) at 230 VAC DC: approx. 0.7 W at 24 VDC
	H3DE-M2	AC: approx. 4.8 VA (2.4 W) at 230 VAC DC: approx. 1.0 W at 24 VDC
	H3DE-S1	AC: approx. 2.7 VA (1.6 W) at 230 VAC DC: approx. 0.7 W at 24 VDC
	H3DE-S2	AC: approx. 3.2 VA (1.9 W) at 230 VAC DC: approx. 1.0 W at 24 VDC
Voltage input		Max. permissible capacitance between input lines (terminals B1 and A2) : 2000 pF Load connectable in parallel with inputs (terminals B1 and A2) H-level: 20.4 to 253 VAC/DC L-level: 0 to 2.4 VAC/DC
Control output		Contact output: 5 A at 250 VAC with resistive load (cosφ = 1); 5 A at 30 VDC with resistive load (cosφ = 1)
Ambient temperature		Operating: -10°C to 55°C (14 to 131°F) with no icing Storage: -25°C to 65°C (-13°F to 149°F) with no icing
Ambient humidity		Operating: 35% to 85%

Note: 1. DC ripple rate: 20% max.

- Since an inrush current of 0.25 A will occur when using the power supply voltage at 24 VDC, pay careful attention when turning on or off the power supply to the Timer with a solid-state output such as a sensor.
- The power consumption is for mode A (ON-delay) after the Timer counts the time-up time and for the AC input at 50 Hz. The power consumption of the H3DE-M□ includes the input circuit with the B1 and A1 terminals short-circuited.

## ■ CHARACTERISTICS

Accuracy of operating time	±1% max. of FS (±1% ±10 ms max. at 1.2-s range) (See Note 1.)
Setting error	±10% ±50 ms max. of FS (See Note 1.)
Signal input time	50 ms min. (See Note 1.)
Voltage influence	±0.5% max. of FS (±0.5% ±10 ms max. at 1.2-s range)
Temperature influence	±2% max. of FS (±2% ±10 ms max. at 1.2-s range)
Insulation resistance	100 MΩ min. at 500 VDC
Dielectric strength	Between current-carrying metal parts and exposed non-current-carrying metal parts: 2,000 VAC for 1 min. Between control output terminals and operating circuit: 2,000 VAC for 1 min. Between contacts of different polarities: 2,000 VAC for 1 min. Between contacts not located next to each other: 1,000 VAC for 1 min.
Vibration resistance	Malfunction: 0.5-mm single amplitude at 10 to 55 Hz Destruction: 0.75-mm single amplitude at 10 to 55 Hz
Shock resistance	Malfunction: 100 m/s <sup>2</sup> (approximately 10G) Destruction: 1,000 m/s <sup>2</sup> (approximately 100G)
Contact material	AgNi+gold plating (Use the G6RN-1 at 12 VDC.)
Impulse withstand voltage	3 kV (between power terminals) 4.5 kV (between current-carrying metal parts and exposed non-current-carrying metal parts)
Noise immunity	Square-wave noise generated by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise) ±1.5 kV
Static immunity	Malfunction: 4 kV Destruction: 8 kV
Life expectancy	Mechanical: 10 million operations min. (under no load at 1,800 operations/h) Electrical: 100,000 operations min. (5 A at 250 VAC, resistive load at 360 operations/h) (See Note 2.)
EMC	<u>EMI</u> Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Harmonic Current: EN61000-3-2 Voltage Fluctuation and Flickering EN61000-3-3 <u>EMS</u> Immunity ESD: EN61000-4-2: 6 kV contact discharge (level 3); 8 kV air discharge (level 3) Immunity RF-interference from AM Radio Waves: EN61000-4-3: 10 V/m (80 MHz to 1 GHz) (level 3) Immunity Burst: EN61000-4-4: 2 kV power port and output port (level 3); 1 kV control port with capacitive clamp (level 3) Immunity Surge: EN61000-4-5: 2 kV common mode (level 3); 1 kV differential mode (level 3)
Enclosure rating	IP30 (Terminal block: IP20)
Weight	120 g

Note: 1. With the H3DE-M□, if the voltage exceeds 26.4 VAC/DC, the following hold at signal OFF for C, D, and G modes:

Accuracy of operating time: ±1% ±50 ms max. at 1.2-s range

Setting error: ±10% +100/-50 ms max.

Signal input time: 100 ms min.

2. For reference : A maximum current of 0.15 A can be switched at 125 VDC (cosφ=1).

A maximum current of 0.1 A can be switched if L/R is 7 ms.

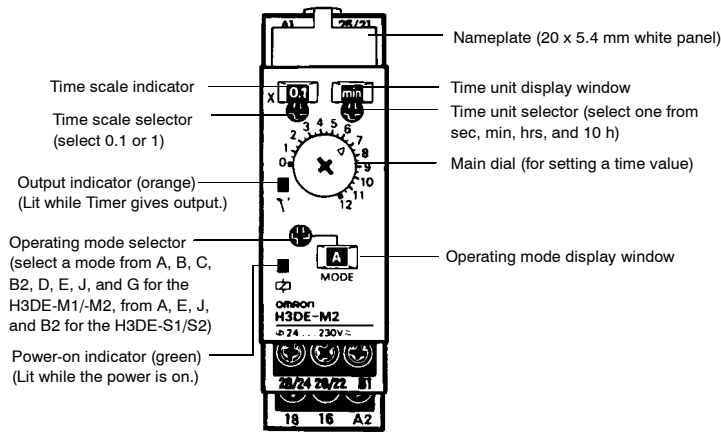
In both cases, a life of 100,000 operations can be expected.

The minimum applicable load is 10 mA at 5 VDC (failure level: P).

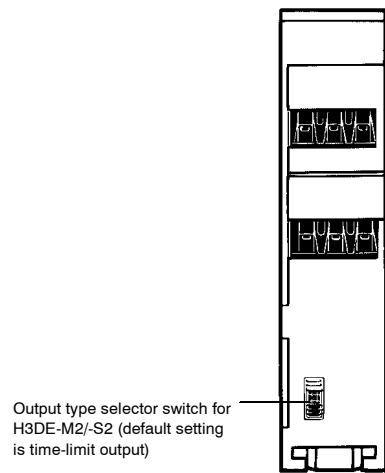
# Nomenclature

## ■ H3DE-F

### Front View



### Bottom View



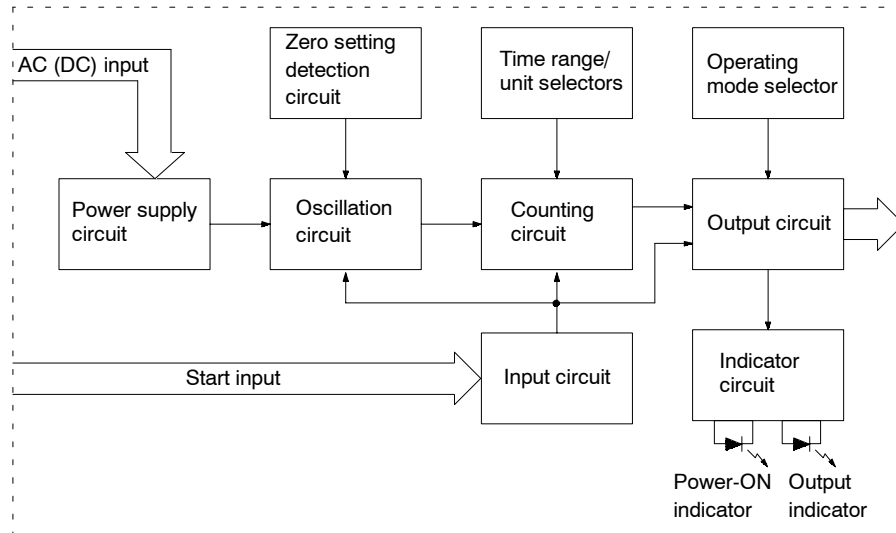
Output Type Selector Switch Settings

Setting	Output type
	Time-limit output (terminal numbers 25, 26 and 28) (default setting)
	Instantaneous output (terminal numbers 21, 22 and 24)

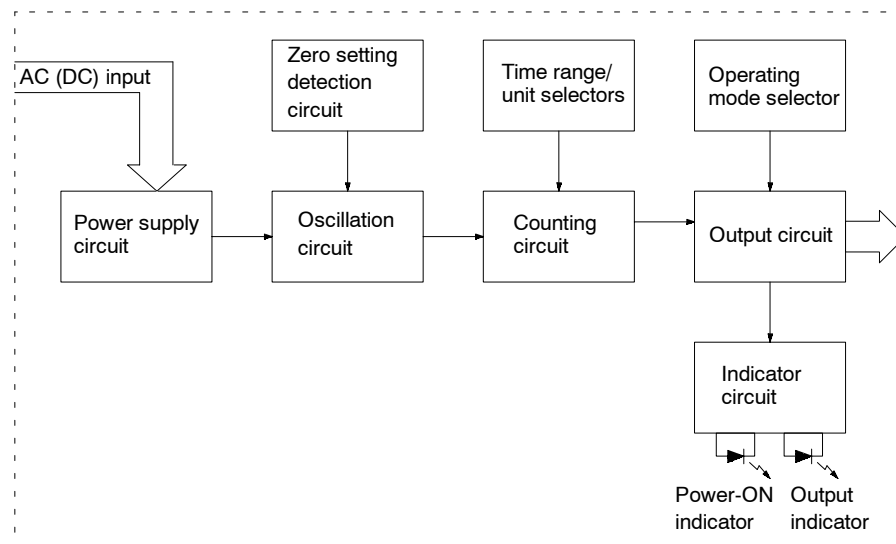
# Operation

## ■ BLOCK DIAGRAM

### H3DE-M1/-M2



### H3DE-S1/-S2



## ■ I/O FUNCTIONS

Item		H3DE-M1/-M2	H3DE-S1/-S2
Input	Start	Starts operation.	No input is available.
Output	Control output	Outputs are turned ON according to designated output mode when preset value is reached. (See Note.)	

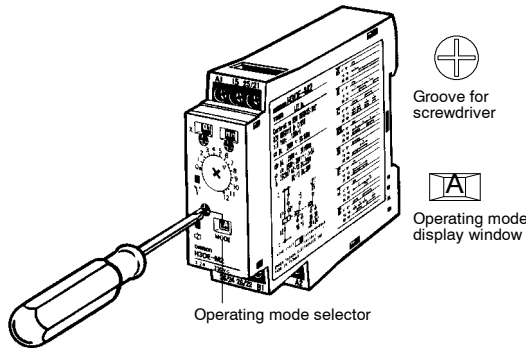
Note: When the output type selector switch on the bottom of the Timer is set to the instantaneous side, the relay R2 (terminal numbers 21/25, 22/26, and 24/28) becomes an instantaneous contact and turns ON/OFF in synchronization with the changes in the power supply.

## ■ BASIC OPERATION

### Selector Setting

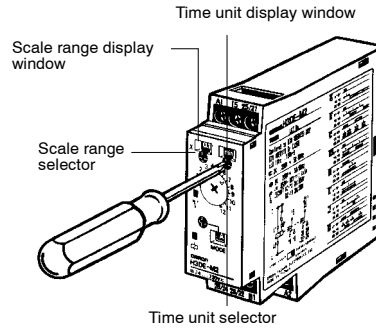
The selectors can be turned clockwise and counterclockwise to select the desired time unit, time scale, or operating mode.

Each selector has a snap mechanism that secures the selector at a given position. Set the selector at a position at which it is secured. Do not set it midway between two securing positions or a malfunction could result from improper setting.



### Time Unit and Time Scale Selection

The desired time unit (sec, min, hrs, or 10h) can be displayed in the time unit display window above the time setting dial by turning the time unit selector located at the upper right corner of the front panel. The time scale (0.1 or 1) is selected with the time scale selector at the upper left corner of the front panel. It appears in the scale range display window above the selector.



### Operating Mode Selection

The H3DE-M/-S can be set to any one of the operating modes A to J. Turn the operating mode selector with a screwdriver until the desired operating mode (A, B, B2, C, D, E, G, or J for the H3DE-M and A, B2, E, or J for the H3DE-S) appears in the operating mode display window located below the selector.

## ■ TIMING CHART

- Note: 1. The minimum power reset time is 0.1 s and the minimum signal input time is 0.05 s.  
 2. The letter "t" in the timing charts stands for the set time and "t-a" means that the period is less than the time set.

Operating mode	Timing chart
A: ON-delay	

(This table continues on the next page.)



Timing Chart — continued from previous page

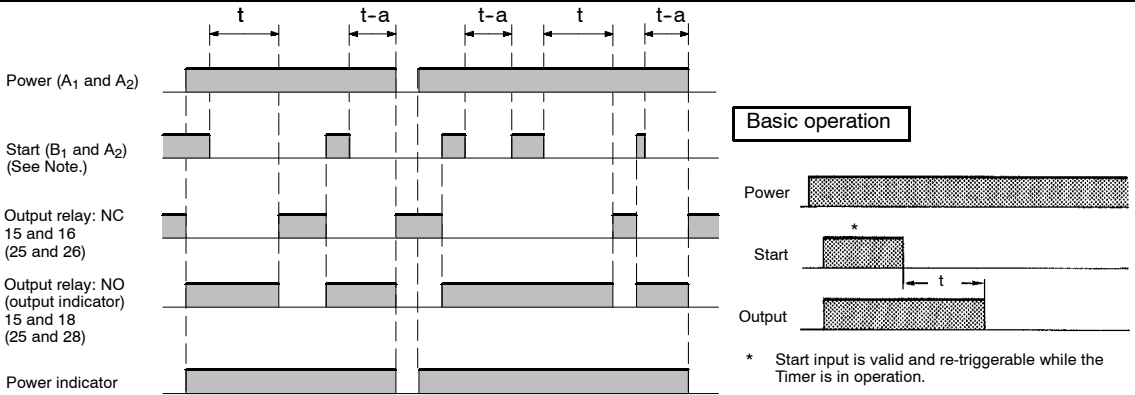
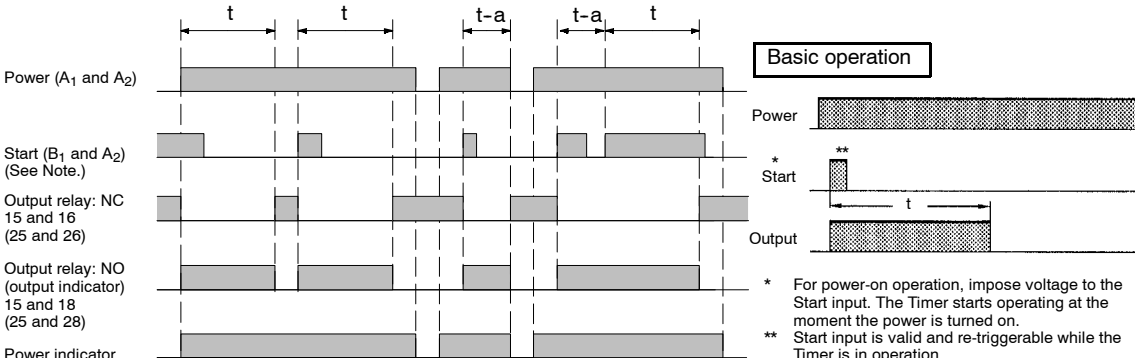
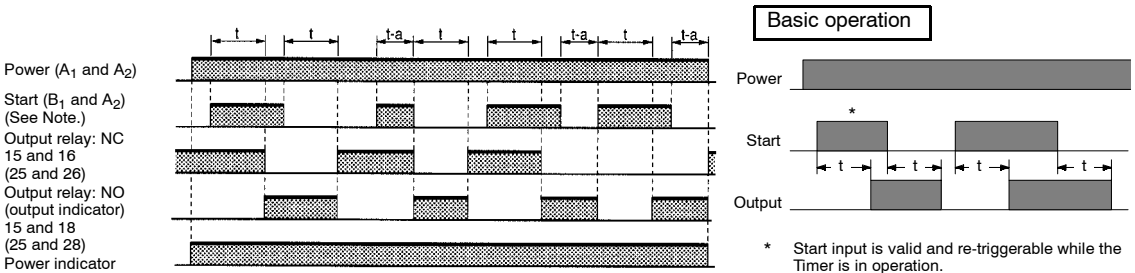
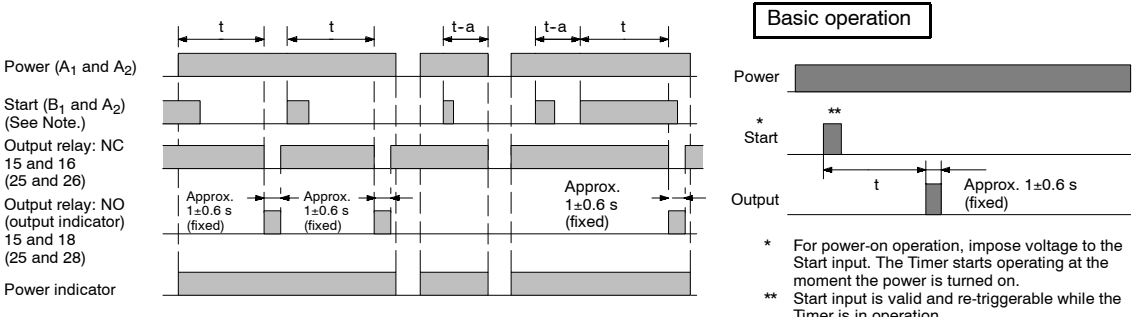
Operating mode	Timing chart	
<b>B:</b> Repeat-cycle OFF start		<div style="border: 1px solid black; padding: 5px; width: fit-content;">Basic operation</div> <p>* For power-on operation, impose voltage to the Start input. The Timer starts operating at the moment the power is turned on.</p> <p>** Start input is invalid while the Timer is in operation.</p>
<b>B2:</b> Repeat-cycle ON start		<div style="border: 1px solid black; padding: 5px; width: fit-content;">Basic operation</div> <p>* For power-on operation, impose voltage to the Start input. The Timer starts operating at the moment the power is turned on.</p> <p>** Start input is invalid while the Timer is in operation.</p>
<b>C:</b> Signal ON/OFF-delay		<div style="border: 1px solid black; padding: 5px; width: fit-content;">Basic operation</div> <p>* Start input is invalid while the Timer is in operation.</p>

Note: The start input of the H3DE-M1 or H3DE-M2 model is activated by applying a voltage to B1 and A2 terminals. The voltage can be applied by turning on the contact between B1 and A1 (Refer to *Terminal Arrangement*).

(This table continues on the next page.)



Timing Chart — continued from previous page

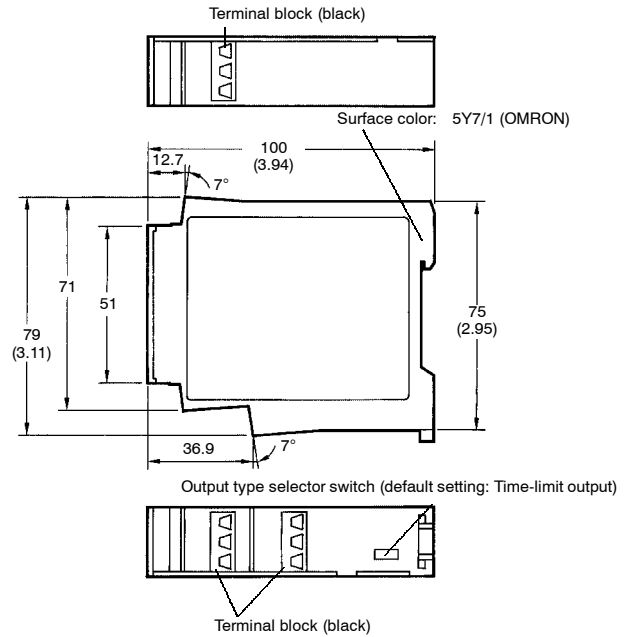
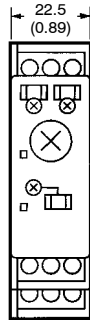
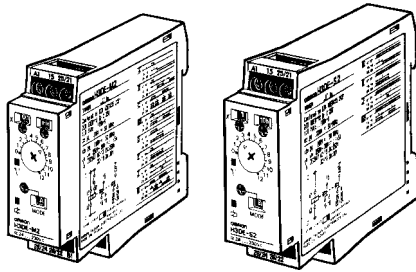
Operating mode	Timing chart
<p><b>D:</b> Signal OFF-delay</p>	
<p><b>E:</b> Interval</p>	
<p><b>G:</b> Signal ON/OFF-delay</p>	
<p><b>J:</b> One-shot output (ON delay)</p>	

Note: The start input of the H3DE-M1 or H3DE-M2 model is activated by applying a voltage to B1 and A2 terminals. The voltage can be applied by turning on the contact between B1 and A1 (Refer to *Terminal Arrangement*).

# Dimensions


Unit: mm (inch)

## H3DE-M H3DE-S

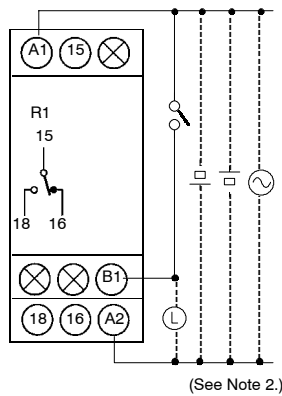


# Installation

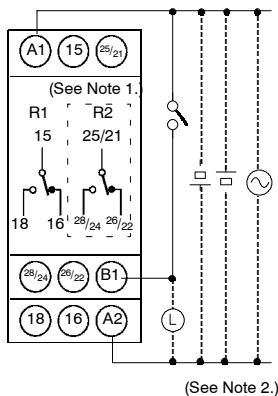
## TERMINAL ARRANGEMENT

- Note: 1. The contact symbol for the H3DE is indicated with  because it offers multiple operating modes and is different from the delayed contact for conventional timers.
2. DC supply voltage does not require the designation of polarity.
3. The relay R2 can be set to either instantaneous or time-limit contact using the switch located on the bottom of the Timer.

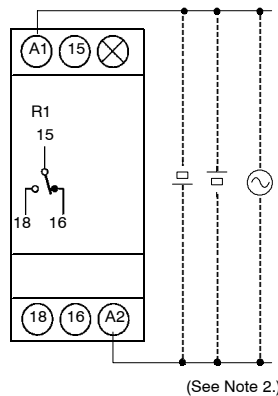
H3DE-M1



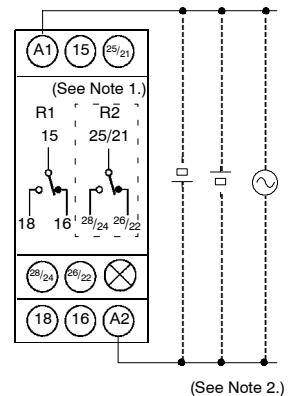
H3DE-M2



H3DE-S1



H3DE-S2

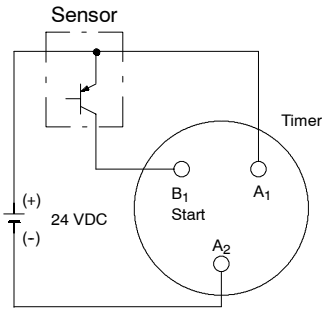


### INPUT CONNECTIONS

The inputs of the H3DE-M1/-M2 are voltage (voltage imposition or open) inputs.

#### No-Contact Input

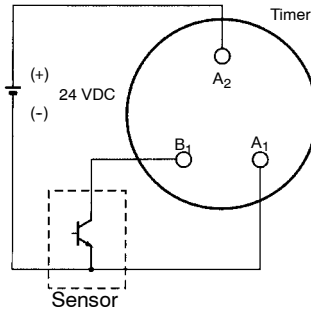
Connection to PNP output sensor.



Operates with PNP transistor ON

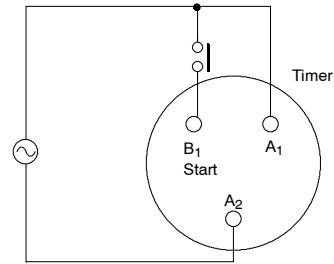
#### No-Contact Input

Connection to NPN output sensor.



Operates with NPN transistor ON

#### Contact Input



Operates with relay ON

#### Voltage Input Signal Levels

No-contact input	1. Transistor ON Residual voltage: 1 V max.; voltage between terminals B <sub>1</sub> and A <sub>2</sub> must be more than the rated "H-level" voltage (20.4 VDC min.)
	2. Transistor OFF Leakage current: 0.01 mA max.; voltage between terminals B <sub>1</sub> and A <sub>2</sub> must be less than the rated "L-level" voltage (2.4 VDC max.)
Contact input	Use contacts that can adequately switch 0.1 mA at each voltage to be imposed. When the contacts are ON or OFF, voltage between terminals B <sub>1</sub> and A <sub>2</sub> must be within the following ranges. When contacts are ON: 20.4 to 253 VAC/DC. When contacts are OFF: 0 to 2.4 VAC/DC



**POWER SUPPLIES**

The H3DE Series is provided with a transformerless power supply system. An electric shock may be received if the input terminal or the output type selector switch is touched while power is being supplied.

Use the bar terminal for wiring the H3DE. Using a stranded-wire terminal may cause a short-circuit due to a stray wire entering into the Timer.

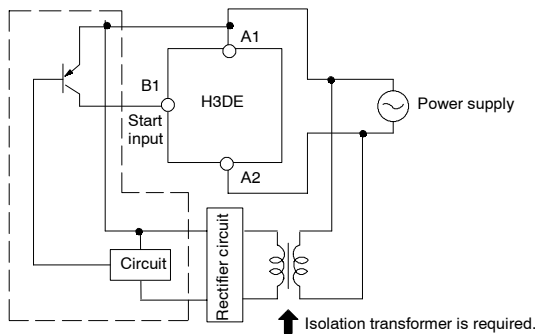
Both AC and DC power supplies can be connected to the power input terminals without regarding polarity.

With the H3DE only, a DC power supply must be connected to the power input terminals as designated according to the polarity of the terminals.

A DC power supply can be connected if its ripple factor is 20% or less and the mean voltage is within the rated operating voltage range of the Timer.

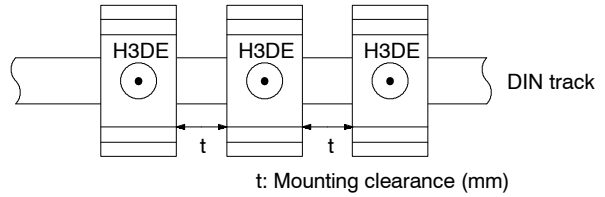
Connect the power supply voltage through a relay or switch in such a way that the voltage reaches a fixed value at once or the Timer may not be reset or a timer error could result.

For the power supply of an input device, use an isolating transformer, of which the primary and secondary windings are mutually isolated and the secondary winding is not grounded.

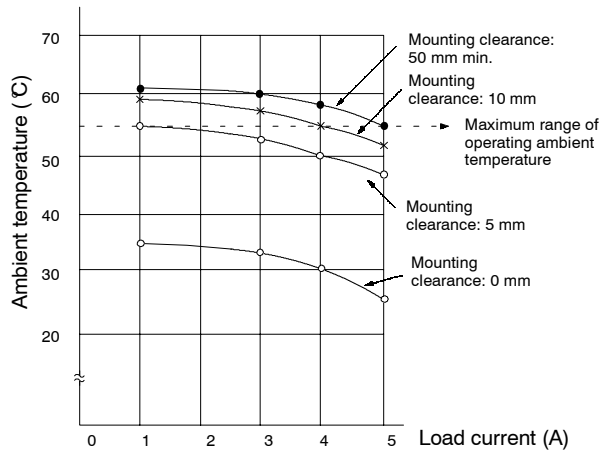


**MOUNTING CLEARANCE**

If the load current is continuously being supplied to the Timer for a long period of time, be sure to provide the mounting clearance as shown in the figure below. If used under the conditions other than those specified below, the life of internal components may be shortened due to an excessive rise in the internal temperature.



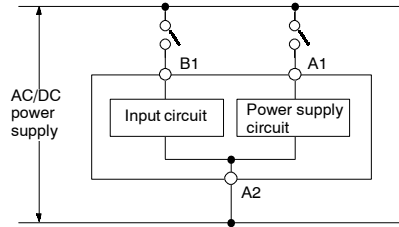
**SWITCHING CURRENT VS. AMBIENT TEMPERATURE (WHEN MOUNTING TWO OR MORE H3DE UNITS SIDE-BY-SIDE)**



Note: Measurement Condition: Input voltage of 230 VAC.

## INPUT/OUTPUT

### Relationship between Input and Power Supply Circuits



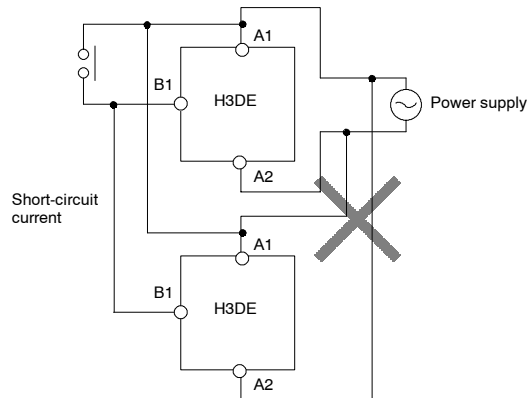
Since the input circuit and the power supply circuit are configured independently, the input circuit can be turned on or off irrespective of the on/off state of the power supply. It must be noted that a voltage equivalent to the power supply voltage is applied to the input circuit.

When connecting a relay or a transistor as an external signal input device, pay attention to the following points to prevent short-circuiting due to a sneak current to the transformerless power supply.

If a relay or transistor is connected to two or more Timers, the input terminals of those Timers must be wired properly so that they will not be different in phase or the terminals will be short-circuited to one another (refer to the figures below).

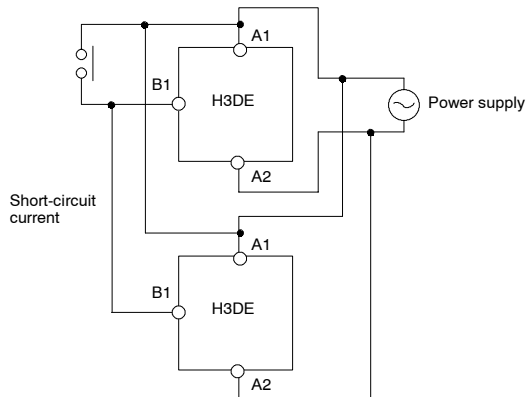
### Incorrect

Contact or transistor for external input signal



### Correct

Contact or transistor for external input signal



**Note:** The H3DE Series is provided with a transformerless power supply system.

## INPUT WIRES

The input wires must be as short as possible. If the floating capacity of wires exceeds 2,000 pF (approx. 17 m for cables with 120 pF/m), the operation will be affected. Pay particular attention when using shielded cables.

## VDE CONFORMANCE

The H3DE as a built-in timer conforms to VDE 0435/P2021 provided that the following conditions are satisfied:

The output section of the H3DE is provided only with basic isolation. To ensure reinforced isolation required by the VDE standards, provide supplementary basic isolation on the load side connected to the output.

The H3DE itself is designed according to the following:

- Overvoltage category III
- Pollution degree 2

The following facts are based on the above standards:

- Operation parts on the front and bottom: Reinforced isolation with clearance of 5.5 mm and creepage distance of 5.5 mm at 230 VAC
- Output: Basic isolation with clearance of 3 mm and creepage distance of 3 mm at 230 VAC

**■ ENVIRONMENT**

When using the Timer in an area with excess electronic noise, separate the Timer, wiring, and the equipment which generates the input signals as far as possible from the noise sources. To further prevent electronic interference, shield the input signal wiring.

Organic solvents (such as paint thinner), as well as very acidic or basic solutions can damage the outer casing of the Timer.

Do not use the Timer in places where it is exposed to dust, corrosive gas, or direct sunlight.

When storing the Timer, make sure that the ambient temperature and humidity are within the rated values. Leave the Timer at room temperature for at least three hours before using the Timer if it has been stored at an ambient temperature of  $-10^{\circ}\text{C}$  or below.

**■ RELAY LIFE EXPECTANCY**

Built-in relay for the H3DE: G6RN; 50,000 operations min.  
(8 A at 250 VAC, resistive load at 360 operations/h.)

**NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.**

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