

## Timers

## Technical Information

## Glossary

**Accuracy of Operating Time**

Differences of operating times measured when the Timer repeats operation under the same condition with a given setting time.

Formula for calculation (with operating time measured more than 5 times):

Accuracy of operating time

$$= \pm \frac{1}{2} \times \frac{T_{\text{max.}} - T_{\text{min.}}}{TMs} \times 100 (\%)$$

where,

T max.:Maximum value of operating times measured at the same set time

T min.:Minimum value of operating times measured at the same set time

TMs: Maximum scale time (TMs is a set value in the case of a Digital Timer)

If there are setting changes in the H3CA or other types of Analog Timer while they are in time-limit operation, the following operation will result.

$$T = T_1 + T_2 \times \frac{T_3 - T_1}{T_3}$$

T: Final time-up time

T<sub>1</sub>: Time elapsed

T<sub>2</sub>: New setting

T<sub>3</sub>: Previous setting

**Ambient Humidity**

The ambient humidity at which a device can be used in the continuously operated state.

**Ambient Temperature (Operating)**

The ambient temperature at which a device can be used in the continuously operated state.

**Ambient Temperature (Storage)**

The ambient temperature at which a device, without power applied, may be stored safely.

**Dielectric Strength**

The maximum voltage a dielectric can withstand without rupturing.

**Electrical Life Expectancy**

The life expectancy of a Timer when the control output of the Timer is operated to switch the specified voltage/current load connected to the control output.

The electrical or mechanical life of the Timer is generally indicated by the operating times of control output. The electrical life is indicated by the operating time of the control output connected to a load and the mechanical life is indicated by the operating time of the control output with no load. The electrical life is shorter than the mechanical life. The lighter the load is, the longer the electrical life will be. Therefore, to prolong the electrical life of the Timer, use the Timer to switch heavy loads via relays instead of directly switching them with the control output.

**Electrical Reset**

To reset Timer by applying a required voltage to the reset circuit.

**Holding Time**

The period of time from the completion of the time-limit operation to the start of the reset operation.

**Impulse Withstand Voltage (AC)**

A voltage imposed between the operating power supply terminals or between a charged terminal and non-charged metal part to check the withstand surge voltage of the Timer. The impulse withstand voltage imposed between the operating power supply terminals is 3 kV and that imposed between a charged terminal and non-charged metal part is 4.5 kV with both using a  $\pm 1.2 \times 50\text{-}\mu\text{s}$  standard waveform.

**Influence of Temperature**

A change in operating time when the ambient temperature changes within a permissible range.

Formula for calculation (with operating time measured more than 5 time):

Variation due to temperature change

$$= \pm \frac{TMx_2 - TMs_2}{TMs} \times 100 (\%)$$

where,

TM<sub>2</sub>: Average value of operating times measured at 20° C

TMx<sub>2</sub>: Average value of operating times measured at a temperature which causes the maximum deviation from TM<sub>2</sub> within the specified ambient temperature range.

TMs: Maximum scale time (TMs is a set value in the case of the Digital Timer)

**Influence of Voltage**

A change in operating time when the voltage of the control power source changes within the permissible fluctuation range.

Formula for calculation:

Variation due to voltage change

$$= \pm \frac{TMx_1 - TM_1}{TMs} \times 100 (\%)$$

where,

TM<sub>1</sub>: Average value of operating times measured at rated voltage

TMx<sub>2</sub>: Average value of operating times measured at a voltage which causes the maximum deviation from TM<sub>1</sub> within the permissible fluctuation range.

TMs: Maximum scale time (TMs is a set value in the case of the Digital Timer.)

**Insulation Resistance**

The resistance offered by an insulating material to the flow of current resulting from an impressed DC voltage.

**Life Expectancy (Mechanical)**

The life expectancy of a Timer when the control output of the Timer is operated under no load condition.

**Manual Reset**

To mechanically reset the Timer by manual operation.

## Noise Immunity

The mechanical and physical resistance of the Timer against external noise.

The noise resistance of the Timer is checked with a noise simulator, a coil load, an oscillating relay, and static electric noise.

## OFF Time

The period of time between the moment that the Timer starts returning to its initial state and the moment that the operating voltage is applied to the operating circuit. Therefore, the OFF time of the Timer is larger than the resetting time.

### OFF Time Characteristics

A change in operating time when the operating time in a given OFF time and the OFF time are changed.

Formula for calculation:

OFF time characteristic

$$= \pm \frac{TM_{X3} - TM_3}{TM_s} \times 100 (\%)$$

TM<sub>3</sub>: Average value of operating times measured with a 1-second OFF time.

TM<sub>X3</sub>: Average value of operating times measured with an OFF time that causes the maximum deviation from TM<sub>X3</sub> within the specified OFF-time range of one hour from the specified resetting time.

TM<sub>s</sub>: Maximum scale time (TMs is a set value in the case of the Digital Timer.)

OFF-time characteristics are determined by the charging and discharging of a capacitor and resistor used in combination as an Electronic Timer. The characteristics vary by  $\pm 1.5\%$  to  $\pm 5\%$ .

Operating time accuracy, setting error, influence of voltage, influence of temperature, and OFF-time characteristics are items used to express the precision of the Timer. Any of these items may be ignored depending on the particular specifications of the model.

The Motor Timer and Electronic Timer indicate these items by percentage values. The Count Timer indicates these items by differential time values because the differential range of the Timer's operating time is almost definite due to the operating principle of the Timer. Furthermore, the Count Timer total setting error can be indicated to express all these items in the case of the Count Timer.

## ON Time

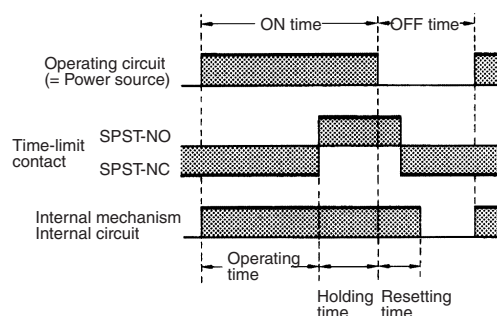
The period of time during which a required voltage is being applied to the operating circuit.

### Operating Time

The period of time from the application of a required voltage to the operating circuit until the completion of the time-limit contact operation.

### Resetting Time

The period of time from the interruption of the voltage supplied to the operating circuit during or after the time-limit operation until the return of the Timer to its initial state.



The resetting time of the Timer is the period of time during which all the internal components including the contacts, pointer, and the circuit components, such as the capacitor, of the Timer are reset.

If the Timer is in operation with an insufficient OFF time (i.e., the OFF time is less than the rated resetting time), the normal operation of the Timer cannot be expected. In such cases, the Timer may operate with insufficient operating time, operate instantaneously, or not operate at all. Be sure that the OFF time of the Timer is the same as or more than the rated resetting time.

### Self-reset

To automatically reset the Timer by interrupting the voltage being supplied to the operating circuit.

### Setting Error

A difference between the actual operating time and scale time.

Formula for calculation (measurement position can be any scale position as long as it is set to 1/3 min. of the maximum scale time):

Setting error

$$= \frac{TM - Ts}{TM_s} \times 100 (\%)$$

where,

TM: Average value of measured operating times

Ts: Set time

TM<sub>s</sub>: Maximum scale time (TMs is a set value in the case of the Digital Timer)

### Shock Resistance (Destruction)

The threshold of shock beyond which an abnormality is expected to occur in the appearance or function of a device.

### Shock Resistance (Malfunction)

The threshold of shock beyond which a device can no longer operate properly by satisfying the prescribed ratings.

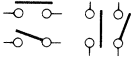
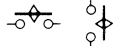


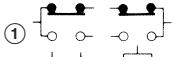
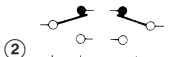
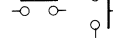
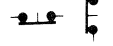
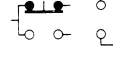
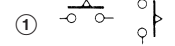
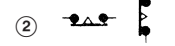

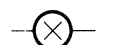
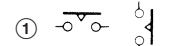



### Vibration Resistance (Destruction)

The threshold of vibration beyond which an abnormality is expected to occur in the appearance or function of a device.

### Vibration Resistance (Malfunction)

The threshold of vibration beyond which a device can no longer operate properly by satisfying the prescribed ratings.

# ■ Symbols Used in Internal Connection Diagram of Timers

Name and symbol	Description	Name and symbol	Description
<b>NO contacts</b> 	Normally open contacts (A pair of contacts which are normally open when no relay input is applied.)	<b>Time-limit operation, time-limit resetting contacts</b> ①  ② 	① NO contacts ② NC contacts
<b>NC contacts</b> 	Normally closed contacts (A pair of contacts which are normally closed when no relay input is applied.)		
<b>Transfer contacts</b> ①  ② 	Transfer contacts (NO and NC contacts which have a common contact terminal are collectively called "transfer contacts.") A variety of contacts shown in ① and ② are all transfer contacts with NC contact arranged either on the right side or on the upper side.	<b>Manually operated, automatic resetting contact</b> ①  ②  ③ 	Contacts which reset upon release of the hand, and used as the contacts to operate pushbutton switches. ① NO contacts ② NC contacts ③ Transfer contacts
<b>Time-limit operating contacts</b> ①  ② 	① NO contacts ② NC contacts	<b>Synchronous motor</b> 	A miniature motor which operates in synchronization with power frequency.
		<b>Relay</b> 	An electromagnetic relay
<b>Time-limit resetting contacts</b> ①  ② 	① NO contacts ② NC contacts	<b>LED</b> 	Used to indicate the operating state of the Timer.
		<b>Neon lamp</b> 	Used to indicate the operating state of the Timer.

