

§ Generator Digital **CONTROLLER** §

Automatic synchronizer ASY-96/ ASY-96-A□



■ APPLICATION

This product is an automatic synchronizer with synchronous validation display (LED) used when generators are connected in parallel. Smooth synchronizing can be performed with suppressed rush current, less system disturbance, less generator shock by accurate circuit breaker closing at synchronizing point after matching voltage / frequency of both generators.

■ FEATURES

▶ **Space saving is achieved with light-weight, small-size.**

Mounting area is reduced to approx. 1/6 compared with our conventional product (ASY-100).

▶ **Easy-to-see display / simple setting.**

Condition can be easily grasped as this product can be used as analog indicator and appropriate measure can be taken easily. Operation setting is easily performed from front with cover being open.

▶ **With automatic manual control changeover function.**

Automatic synchronizing start / manual synchronizing start can be selected freely.

▶ **With reverse power prevention function at receiving.**

Reverse power at receiving can be prevented by SLOW side closing designation (FB>FG).

▶ **Reduction of wiring work is achieved.**

Input of generator side takes in three phase voltage with V connection so far. Same function can be achieved with equivalent voltage input to single phase

▶ **Separate specification for Aux. power**

Separates the specification between bus side input and Aux. power (AC/DC80-143V)

ASY-96-A1: Synchronizing acceleration function: $\pm 0.05\text{Hz}$

ASY-96-A2: Synchronizing acceleration function: $\pm 0.02\text{Hz}$

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■ STANDARD SPECIFICATION

ITEM	CONTENTS	SPECIFICATION
AC input	Bus side input (single phase)	AC110V, 50/60Hz 5VA (*1)
	Generator side input (single phase)	AC110V, 50/60Hz 0.5VA
Control signal input	Automatic synchronizing start (AUTO)	1a contact: Switching voltage / current: DC12V, 10mA
	Manual synchronizing start (MANUAL)	
	SLOW side synchronizing assignment (SLOW)	
Control output	Voltage increase signal (60R)	Photo MOS. FET relay DC100V, 50mA or DC24V, 100mA
	Voltage decrease signal (60L)	
	Governor rise signal (15R)	
	Governor decay signal (15L)	
	Alarm signal (ALARM)	Photo MOS. FET Relay (*2)
	Synchronizing check signal ($\pm 15^\circ$) (*3)	
	Breaker closing signal (25)	
Display LED	Power	Green
	Voltage increase signal (60R)	Red] 2-color LED
	Voltage decrease signal (60L)	
	Governor rise signal (15R)	Red] 2-color LED
	Governor decay signal (15L)	
	Breaker closing signal (25)	Green
	Synchronizing check signal ($\pm 15^\circ$)	Orange
	Signal for frequency within set value (ΔF)	Green
	Signal for voltage difference within set value (ΔV)	Green
	Alarm signal (ALARM)	Red
Measurement display	Phase difference	Orange LED (green at synchronizing point) Total 26 points / 360° display (24 points by 15° interval and 2 points at 7.5° before and after the synchronizing point)
	Voltage difference: $V_G - V_B / 110 \times 100$ (%)	Green 7 segment LED: -□□.□% (% display against AC110V)
	Frequency difference: $F_G - F_B$ (Hz)	Green 7 segment LED: -□□.□Hz
Aux. power (*4)	—	AC/ DC80-143V AC100V 50/60Hz 1.5VA DC110V 2.5W

*1) ASY-96-A1 & ASY-96-A2 is 0.5VA

*2) Relay used at outside is correspond to MM4X or LY-2N.

*3) ASY-96-A1 & ASY-96-A2 without control output synchronizing check signal ($\pm 15^\circ$) Only LED display

*4) Specification for ASY-96-A1 & ASY-96-A2

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ITEM		SPECIFICATION
Tolerance	Voltage difference	±0.5%
	Frequency difference	±0.03Hz ±0.02Hz (ASY-96-A1 & ASY-96-A2)
	Pulse width	±50ms
	Voltage adjustment pulse period	±10%+(10~200ms)
	Phase difference detection	±1°
	Phase accuracy of synchronizing relay	±5°
Operating temperature / humidity limit		0~50°C, 5~90%.RH (no condensation)
Storage temperature range		-10°C~+70°C
Appearance color / Weight		Munsell N.1. 5 (black) / ≤1kg

■ **SETTING**

SETTING ITEM	MARK	DEFAULT VALUE	SETTING RANGE
Voltage difference AC110V = 100% (Rotary code switch 1)	ΔV	5%	1, 2, 3, 4, 5, 7, 10 (%)
Voltage adjustment pulse width (Rotary code switch 2)	Vpw	0.5S	0.1, 0.2, 0.3, 0.4, 0.5, 0.7, 1.0 (S)
Voltage adjustment pulse period (Rotary code switch 3)	Vpint	2S	1, 2, 3, 4, 5 (S)
Frequency difference (Rotary code switch 4)	ΔF	0.1Hz	0.1, 0.15, 0.2, 0.25, 0.3 (Hz) (*5)
Governor pulse width (Rotary code switch 5)	Fpw	0.5S	0.1, 0.2, 0.3, 0.4, 0.5, 0.7, 1.0 (S)
Breaker progressive time 5 bit DIP switch	25T	50ms	10~310ms (per 10ms) (cancels if beyond the range)

SW No.	ELAPSED TIME	The sum of the elapsed time that switched turned ON becomes progressive time. (*5) For example, when SW1, SW2, SW3 turned ON, 10ms + 20ms + 40ms = 70ms
SW1	10ms	
SW2	20ms	
SW3	40ms	
SW4	80ms	
SW5	160ms	

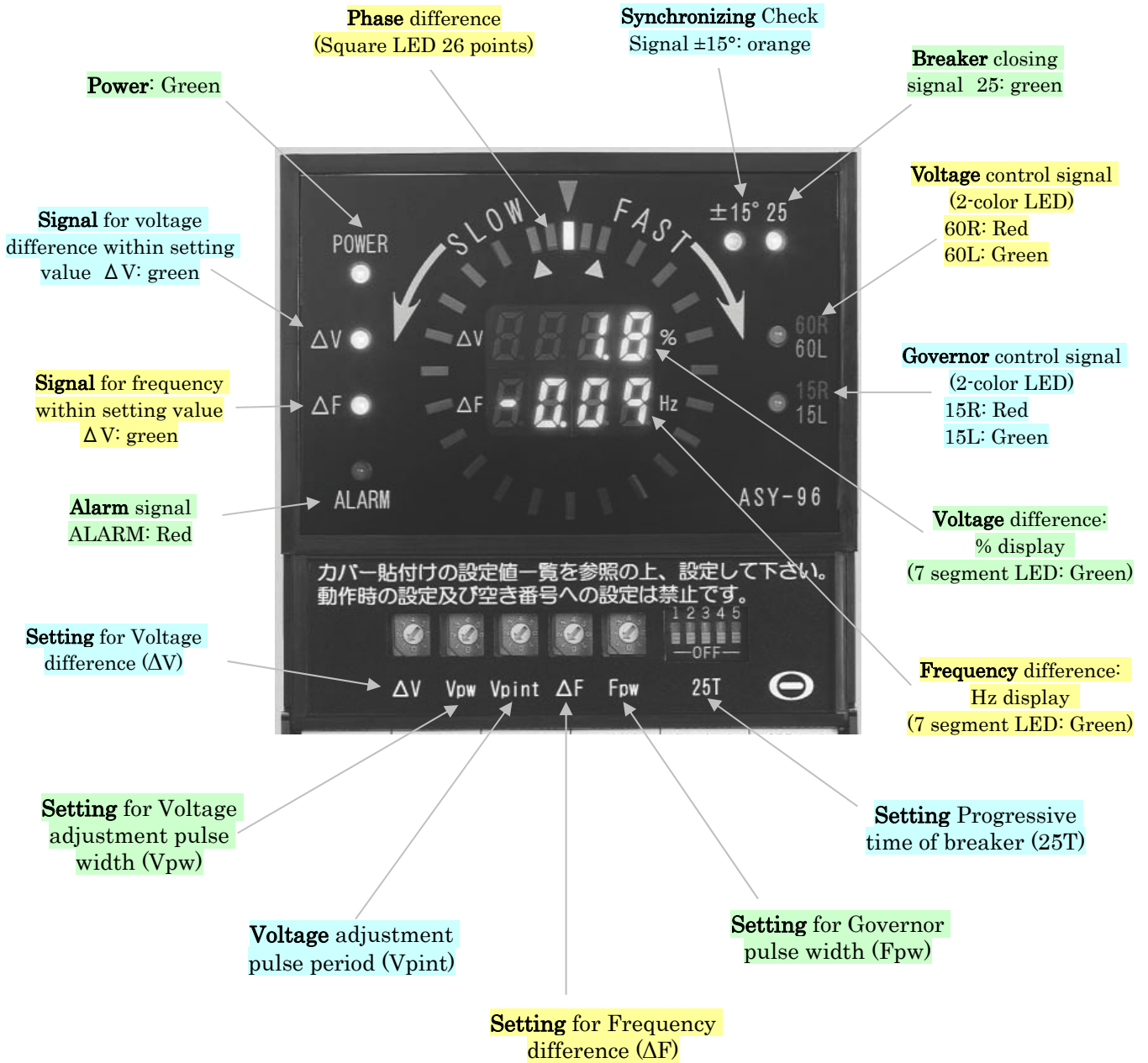
If a time beyond the setting range is set, the control stops and an error will be displayed.

(*5) ΔF Setting & Settable progressive time

ΔF SETTING	SETTABLE PROGRESSIVE TIME
0.1Hz	10~310ms
0.15Hz	10~210ms
0.2Hz	10~150ms
0.25Hz	10~100ms
0.3Hz	10~ 80ms

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■ **NAME of EACH PART**



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■ **FUNCTION**

▶ **Voltage balancing function**

It outputs control pulse to keep the difference between bus voltage and generator voltage within regulated range.

▶ **Speed matching function**

It outputs control pulse to keep the difference between bus frequency and generator frequency within regulated range.

▶ **Synchronizing check signal ($\pm 15^\circ$)**

While keeping the voltage difference ΔV and frequency difference ΔF between bus and generator within regulated range, it outputs contact a signal when the phase difference becomes $\pm 15^\circ$. In the case of automatic synchronizing, a safer synchronizing can be achieved by using a series connected breaker closing signal (25).

▶ **Synchronizing function**

While keeping the voltage difference ΔV and frequency difference ΔF between bus and generator within regulated range, in order to open the breaker at synchronizing point, it estimates the progressive time of closing breaker and outputs breaker closing signal (25) right before the synchronizing point.

ON time of synchronizing signal equals progressive time + 200ms.

▶ **Setting function**

Setting of Voltage difference, frequency difference, progressive time of breaker, and each control signal of pulse width, pulse period is possible.

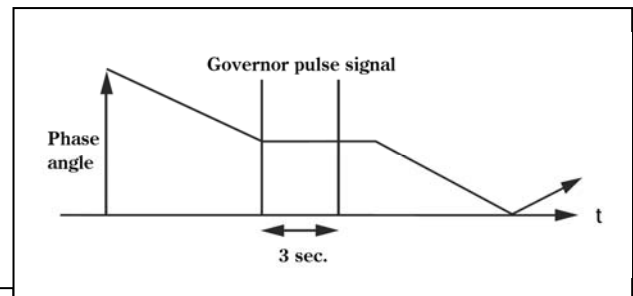
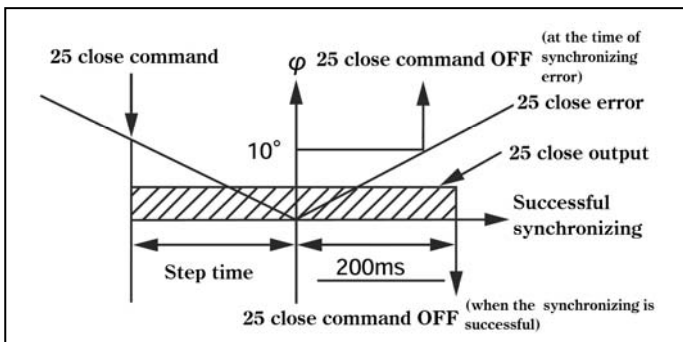
▶ **Synchronization error (alarm) signal**

If synchronization error occurred continuously 3 times, alarm LED will lights up and contact signal will output after 1 sec.

Synchronization error is the case that in spite of the output of breaker closing signal (25), the phase difference between bus side and generator side exceeds 10 degree. The alarm can be released by no-voltage input or by OFF of synchronizing start (both manual and automatic).

▶ **Synchronizing acceleration function**

When frequency difference is within $\pm 0.05\text{Hz}$ and the change of phase difference becomes flat, in order to accelerate the synchronizing, after 3 sec. it outputs governor pulse signal automatically. The governor pulse signal is 15L signal at the time of SLOW side closing designation, 15R at the time of no SLOW side closing designation.



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■ CONTROL RANGE

▶ INPUT RANGE

- Bus voltage: 90~125V
- Generator voltage: $\geq 80V$
- System frequency: $50 \pm 3Hz, 60 \pm 3Hz$
- Frequency difference: within $\pm 4Hz$
- Other than those above: control stops, displays become error.

▶ CONTROL INPUT (1a contact switching voltage / current DC12V, 10mA)

(1) Automatic synchronizing start and manual synchronizing start

START INPUT		OUTPUT
Automatic synchronizing	Manual synchronizing	
ON	OFF	60RL, 15RL, Synchronizing check signal ($\pm 15^\circ$), 25
OFF	ON	Synchronizing check signal ($\pm 15^\circ$) only
OFF	OFF	Lighting up POWER LED only
ON	ON	E8 display (double ON designation in START INPUT)

ON: terminal short; OFF: terminal open

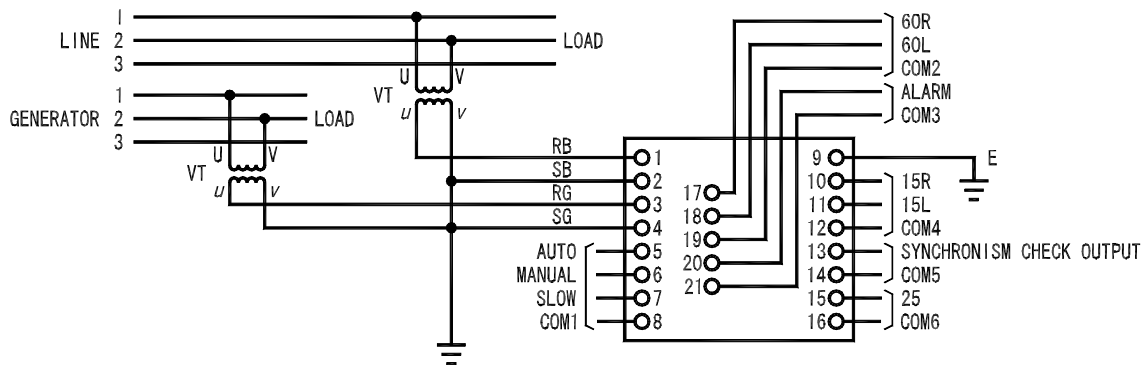
(2) Specify of generator SLOW side closing.

ON (terminal short): closing from SLOW side (FB>FG)

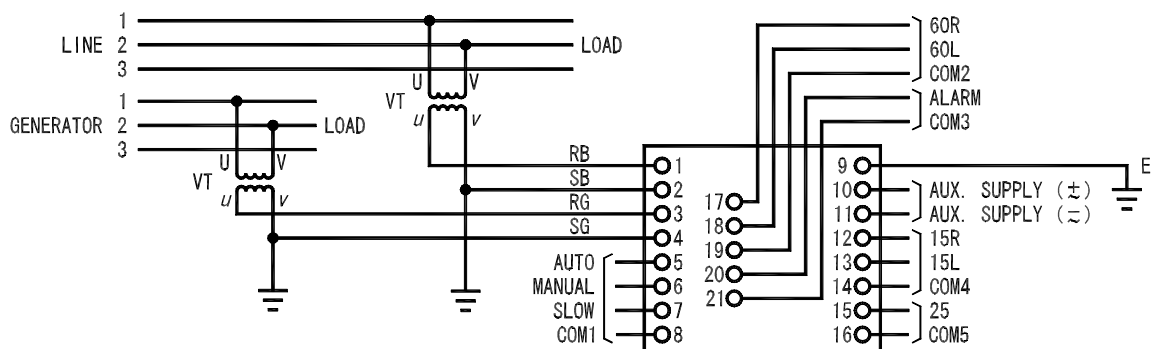
OFF (terminal open): random closing direction (FB>FG or FB<FG)

■ CONNECTION DIAGRAM

(ASY-96)

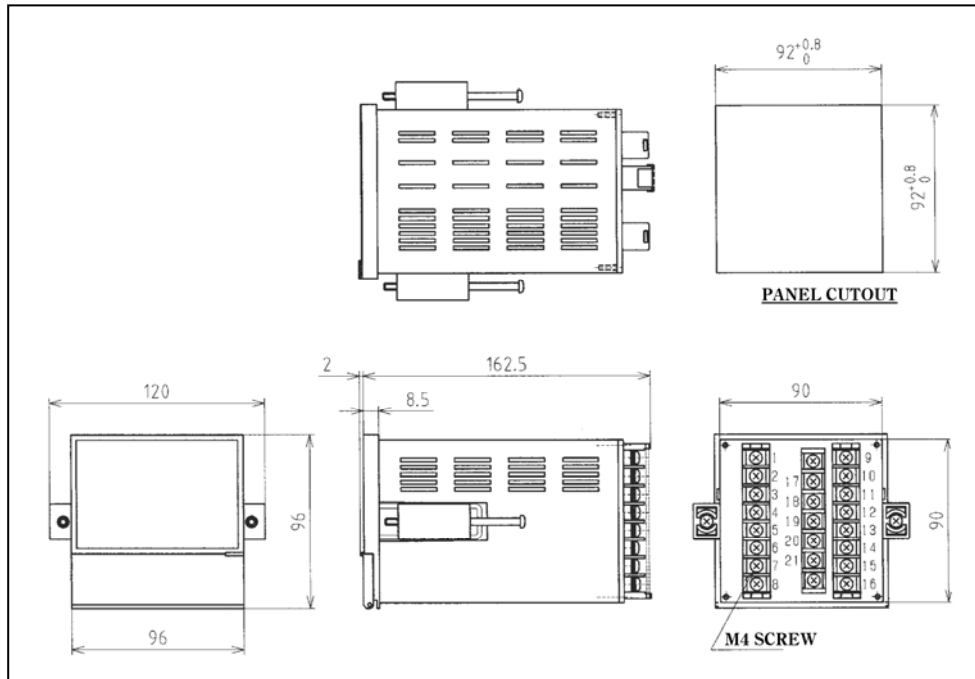


(ASY-96-A□)



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■ **DIMENSIONS (ASY-96 / ASY-96-A□)**



■ **PURCHASE SPECIFICATIONS**

ASY-96

- (1) Type
- (2) Input Voltage

Note: Product and the test report are ship in default setting.
Change to your request settings according to the manual instruction before use.

ASY-96-A□

- (1) Type
 - ASY-96-A1: Synchronizing acceleration function: $\pm 0.05\text{Hz}$
 - ASY-96-A2: Synchronizing acceleration function: $\pm 0.02\text{Hz}$
- (2) Input Voltage
- (3) Aux. Power (AC/ DC80-143V)