

# Syncrocloser® Check Plus Relay M-0390



- **Panel-mounted direct upgrade for G.E. IJS and SLJ, and Westinghouse CVE relays**
- **Accurate, independent phase, time, voltage, and  $\Delta F$  functions**
- **Transducer and status outputs are standard features**
- **Modular construction allows cards to be removed while unit is installed**
- **Dead line/dead bus closure capability is standard**
- **Does not require a separate power source**
- **Complete test and checkout from front panel**
- **20 A output relay contacts open 0.9 A inductive at 125 V dc**
- **Temperature range of  $-40^{\circ}$  to  $+80^{\circ}$  C**

## M-0390 Specification

### Inputs

Line voltage, nominal 120 V ac, 150 V ac maximum continuous. Will withstand 200 V ac for 1 sec.

Bus voltage, nominal 120 V ac, 150 V ac maximum continuous. Will withstand 200 V ac for 1 sec.

Enable Sync-Check (by closing contact\*).

Open circuit voltage = 10 to 15 V dc; closed circuit current = 0.02 to 0.04 mA dc.

■ **NOTE:** One input must be greater than 100 V ac to ensure the Output Relay will close.

Enable Dead Closing (by closing contact\*).

■\***NOTE:** Requires use of gold-plated contacts located close to the unit or a permanent jumper on the back of the unit.

### Burden

Whichever input voltage is high, 4 VA; other input, 1 VA.

### Controls

**PHASE LIMIT:** 0 to  $\pm 45^\circ$  or 0 to  $\pm 90^\circ$  (switch selectable), dial accuracy  $\pm 5\%$  of full scale.

**TIME LIMIT to close after PHASE LIMIT OK:** 0 to 1.5 sec. or 0 to 15 sec. (switch selectable), dial accuracy  $\pm 10\%$  of full scale.

**$\Delta F$  LIMIT:** 0.01 to 0.5 Hz, dial accuracy  $\pm 5\%$  of full scale.

**UPPER VOLTAGE LIMIT, either input:** 110 to 140 V ac, dial accuracy  $\pm 5\%$  of full scale.

**LOWER VOLTAGE LIMIT, either input:** 90 to 120 V ac, dial accuracy  $\pm 5\%$  of full scale.

**DEAD LIMIT:** 10 to 90 V ac, dial accuracy  $\pm 10\%$  of full scale.

### Programmable Setpoints

Switches are provided on the Phase Verifier printed circuit board to modify the range of the **PHASE LIMIT** and **TIME LIMIT** controls. The **PHASE** range may be set in the **X1** or **X2** position. In the **X2** position, the front panel **PHASE LIMIT** control setpoint will be multiplied by 2, and the **X2** LED on the M-0390 front panel will light to indicate a 0 to  $\pm 90^\circ$  **PHASE LIMIT** control range. The **TIME** range may be set in the **X1** or **X10** position. In the **X10** position, the front panel **TIME LIMIT** control setpoint will be multiplied by 10, and the **X10** LED on the front panel will light indicating a 0 to 15 sec. **TIME LIMIT** range. Switches are provided on the Voltage Verifier printed circuit board to select dead line or dead bus closing.

### LED Indicators

**PHASE LIMIT OK:** Phase angle is within limit setting.

**PHASE X2:** **PHASE** setting is multiplied by 2.

**TIME X10:** **TIME** setting is multiplied by 10.

**OUTPUT CLOSED:** Output Relay Contacts have closed in the **OPERATE** mode.

**TEST CLOSE:** Conditions are correct to close the Output Relay Contacts in the **TEST** mode (although the Output Relay Contacts are disabled).

**$\Delta F$  LIMIT -  $\Delta F$  OK:**  $\Delta F$  is within the  **$\Delta F$  LIMIT** setting.

**UPPER VOLTAGE LIMIT - L OK:** Line voltage is below the **UPPER VOLTAGE LIMIT** setting.

**UPPER VOLTAGE LIMIT - B OK:** Bus voltage is below the **UPPER VOLTAGE LIMIT** setting.

**DEAD LINE/BUS DETECT - L HOT:** Line voltage is above the **DEAD LIMIT** setting.

**DEAD LINE/BUS DETECT - B HOT:** Bus voltage is above the **DEAD LIMIT** setting.

**LOWER VOLTAGE LIMIT - L OK:** Line voltage is above the **LOWER VOLTAGE LIMIT** setting.

**LOWER VOLTAGE LIMIT - B OK:** Bus voltage is above the **LOWER VOLTAGE LIMIT** setting.

## Breaker Close Relay

- Two form A output contacts rated to make 10 A at up to 250 V dc; interrupt 0.9 A, 125 V dc or 0.4 A at up to 250 V dc inductive load. Open contacts will withstand 1500 V ac for 1 minute. Contacts to ground will withstand 1500 V ac for 1 minute. Contacts may be paralleled to make 20 A at up to 250 V dc.
- One normally open output contact rated to make 10 A at up to 250 V dc; interrupt 0.9 A, 125 V dc or 0.4 A at up to 250 V dc inductive load. Open contacts will withstand 1500 V ac for 1 minute. Contacts to ground will withstand 1500 V ac for 1 minute. A normally closed light duty contact is provided that opens when either the line or bus is above 80 V ac  $\pm 10$  V. The contact closes when both the line and bus voltage drop below 50 V ac  $\pm 10$  V. The light duty contact is rated at 3 A at up to 240 V ac.

## Response Time

The M-0390 will close the breaker with proper phase angle only after the time set by the **TIME LIMIT** control, assuming the  $\Delta F$  is within limits. After the timer has timed out, the M-0390 will respond to correct voltage conditions in approximately 0.2 sec. In closing on dead line or dead bus, the phase and frequency conditions are ignored so that the unit will close upon a voltage below set threshold in approximately 1.5 sec.

## Status Relay Contacts

These are light duty, form C contacts rated for 3 A at 120 V ac noninductive load. They are intended primarily for status interrogation by supervisory and may be used to light local lights.

**Phase Status:** Phase angle is within the limit setting.

**Voltage Status:** Line and Bus voltages are within the limit settings.

**$\Delta F$  Status:**  $\Delta F$  is within the limit setting.

**Dead Line/Dead Bus Status Option:** See **BREAKER CLOSE RELAY** option 2 above.

## Analog Output Options

SCADA-compatible analog outputs are provided that can be connected for either voltage or current outputs, and may be used as transducer outputs or for interrogation of the unit while in operation.

### *Phase*

- 0 to 10 V dc = 0 to 180°, accuracy  $\pm 3^\circ$ . Load: 5 K or greater.
- 0 to 1.0 mA dc = 0 to 180°, accuracy  $\pm 3^\circ$ . Load: 10 K or less.

Other voltage/current ranges can be set by external precision resistors.

### *Line/Bus Voltage*

- 0 to 7.5 V dc = 0 to 150 V rms, accuracy  $\pm 5\%$  of full scale. Load: 3 K or greater.
- 0 to 1.0 mA dc = 0 to 150 V rms, accuracy  $\pm 5\%$  of full scale. Load: 10 K or less.

Other voltage/current ranges can be set by external precision resistors.

■ **NOTE:** The Analog Outputs are not isolated from each other. A common zero volt reference (Analog Common) is used for all analog outputs.

## M-0292 Test Cable Set Option

The M-0292 Test Cable Set allows the Power Supply, Phase Verifier, and Voltage Verifier / Synchronizer Boards of the M-0390 to be tested either in the field or in the laboratory. The cable set allows the boards to be physically removed from the case while remaining electrically connected for testing.

## Field Testing

Two **OPERATE/TEST** switches, located on the M-0390 front panel, internally disable the Output Relay and disconnect the Bus and Line V.T. inputs when in the **TEST** position. This isolates the V.T. inputs of the M-0390 from the external wiring and ensures that the Output Relay Contact will not close while the unit is being tested. The M-0390 can then be checked by applying 120 V ac nominal Line and Bus inputs at the respective jacks on the front panel.

## Calibration

No circuit calibration is required; complete, solid-state design has no circuit calibration controls.

## Reliability

The most advanced and stable solid-state components are used to achieve an accuracy and reliability of service not usually available for this class of relay. The reliability is enhanced by the basic stability of the circuits; no temperature compensation is used.

## Transient Protection

Input and output circuits are protected against system transients. The M-0390 will exhibit no component failure or false commands when subjected to the requirements of ANSI/IEEE C37.90.1-1989, which defines oscillatory and fast transient surge withstand capability. All inputs and outputs will withstand 1500 V ac to chassis or instrument ground for one minute. Voltage inputs are electrically isolated from each other, from other circuits, and from ground.

All faces of the relay, with the chassis solidly grounded, have been exposed to Radio Frequency Immunity testing and have successfully passed with a field intensity of 20 volts per meter at typical utility frequencies of 144 MHz, 148 MHz, 438 MHz, and at 450 MHz.

## Environmental

**Temperature Range:** Stated accuracies are maintained from  $-40^{\circ}$  to  $+80^{\circ}$  C; analog output signals to  $+60^{\circ}$  C.

**Humidity:** Stated accuracies are maintained at up to 85% relative humidity (non-condensing).

**Fungus Resistance:** A conformal printed circuit board coating inhibits fungus growth.

## Physical

**Size and Mounting:** The unit is designed for semiflush panel mounting, compatible with G.E. type S1 and Westinghouse type FT-21 drawout relay cases. Refer to the Application Guide for specific dimensions. A transparent cover is supplied with the unit.

**Approximate Weight:** 12 lb (5.5 kg).

**Approximate Shipping Weight:** 14 lb (6.4 kg).

## Patent

U.S. Patent 4,218,625.

## Warranty

The M-0390 Syncrocloser<sup>®</sup> Check Plus Relay is covered by a five year warranty from date of shipment.

*Specification is subject to change without notice.*



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