



ENGINEERING SPECIFICATION

SYMCOM MODEL 601 3-Phase Voltage Monitor Relay

PART 1 GENERAL

1.1 REFERENCES

- A. UL 508 Industrial Control Equipment – Underwriters Laboratories
- B. IEC 60947 Low Voltage Switchgear and Controlgear – International Electrotechnical Commission
- C. CSA C22.2 No. 14 Industrial Control Equipment – Canadian Standards Association
- D. ANSI/IEEE C62.41 – American National Standards Institute/Institute of Electrical & Electronics Engineers
- E. MODBUS over Serial Line Specification and Implementation Guide V1.02
- F. UL 1053 Ground-Fault Sensing and Relaying Equipment – Underwriters Laboratories

1.2 WARRANTY

- A. Manufacturer Warranty: The manufacturer shall guarantee the overload relay to be free from material and workmanship defects for a period of five years from the date of manufacture when installed and operated according to the manufacturer's requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

The equipment specified shall be the Model 601, manufactured by SymCom, Inc.

2.2 DESCRIPTION

- A. Regulatory Requirements:
 1. The equipment shall be UL Listed as type NKCR—Industrial Control Equipment-Motor Controllers-Auxiliary Devices.
 2. The equipment shall be ULC Listed as type NKCR7—Industrial Control Equipment-Motor Controllers-Auxiliary Devices Certified for Canada.
 3. The equipment shall be CE marked for use in the European Union and evaluated against IEC 60947 Low Voltage Switchgear and Controlgear.
 4. The equipment shall be CSA certified as class 3211-03—Industrial Control Equipment-Motor Controllers-Auxiliary Devices.

2.3 PERFORMANCE/DESIGN CRITERIA: 3-PHASE VOLTAGE MONITOR RELAY

- A. Protective Relay Functions
 1. The equipment shall provide protection against the following conditions:
 - a. voltage single phase/phase loss
 - b. phase reversal
 - c. low voltage
 - d. high voltage
 - e. voltage unbalance
 - f. low frequency
 - g. high frequency
- B. Communication Capabilities
 1. The equipment shall provide Modbus RTU communications capabilities when combined with the appropriate SymCom network communications modules. Visit www.symcom.com for the current list of communication modules.
 2. The equipment interface shall have the capability of connecting to the following systems:
 - a. HMI (Human Machine Interface)
 - b. SCADA (Supervisory Control and Data Acquisition) programs.
 - c. DCS (Distributed Control System)
 - d. PLC (Programmable Logic Controllers)
 3. The equipment shall support 9600 baud, Even parity, and 1 stop bit.
 4. The equipment shall provide set points that are readable and writable via the Modbus interface.
 5. The equipment shall provide the ability to energize and de-energize the motor via the Modbus interface.
 6. The equipment shall provide a 10-second Modbus network watchdog to trip the relay when Modbus communication is lost.
- C. Network Capabilities
 1. The equipment shall provide registers to read the following real-time values:
 - a. L1-L2 line voltage
 - b. L2-L3 line voltage
 - c. L3-L1 line voltage
 - d. Average line voltage
 - e. Voltage unbalance



- f. Restart Delay 1 (RD1) Time Remaining
 - g. Restart Delay 2 (RD2) Time Remaining
 - h. Low frequency
 - i. High frequency
 - j. Trip status of the following:
 - 1) Manual reset status
 - 2) Network off command status
 - 3) Low voltage trip
 - 4) High voltage trip
 - 5) Low frequency trip
 - 6) High frequency trip
 - 7) Voltage unbalance
 - 8) Voltage single-phase trip
 - k. Status of the following:
 - 1) Low voltage pending
 - 2) High voltage pending
 - 3) Voltage unbalance pending
 - 4) High frequency pending
 - 5) Reverse phase pending
 - 6) Low frequency pending
 - 7) Voltage single phase pending
 - 8) RD1 and RD2
 - l. Last fault 1
 - m. Last fault 2
 - n. Last fault 3
 - o. Last fault 4
 - p. Unit ID
 - q. Model code
2. The equipment shall provide the following readable/writable setpoints:
- a. Low voltage trip point
 - b. High voltage trip point
 - c. Voltage unbalance trip point
 - d. Low frequency
 - e. High frequency
 - f. Trip delay 1
 - g. Trip delay 2
 - h. Restart delay 1
 - i. Restart delay 2
 - j. Number of restarts after a fault (#RF) setpoint
 - k. Modbus address setpoint
 - l. Trip enable setpoint to enable the voltage unbalance (VUB) trip
 - m. Command line to respond to the following commands:
 - 1) Network program enable
 - 2) Network program disable
 - 3) Clear fault history
 - 4) Enable network watchdog
 - 5) Disable network watchdog
 - 6) Start the motor
 - 7) Stop the motor

D. Capabilities and Features

- 1. Inputs
 - a. The equipment shall require a 3-phase input voltage of 200-480VAC.
 - b. The equipment shall require a 3-phase 50/60Hz input voltage (see setpoints for trip range).
 - c. The equipment shall provide connection to an external remote reset switch.
- 2. Outputs
 - a. The equipment shall include one Form C (SPDT) output relay. Contacts pilot duty rated 480VA@240VAC. Contacts general purpose rated 10A@240VAC.
- 3. Functional Specifications
 - a. The equipment shall include the following front panel setpoint ranges:
 - 1) an adjustable low voltage (LV) setpoint range of 170-524VAC
 - 2) an adjustable high voltage (HV) setpoint range of 172-528VAC
 - 3) an adjustable voltage unbalance (VUB) setpoint range of 2-15% or 999 (disabled)
 - 4) an adjustable low frequency (LF) setpoint range of 35-73Hz
 - 5) an adjustable high frequency (HF) setpoint range of 37-75Hz
 - 6) an adjustable voltage/frequency trip delay (TD1) of 1-50 seconds
 - 7) an adjustable single-phase fault trip delay (TD2) of 1-50 seconds
 - 8) an adjustable power-up delay timer (RD1) of 0, 2-500 seconds
 - 9) an adjustable motor cool-down timer (RD2) of 2-500 seconds



- 10) an adjustable number of restarts after faults (#RF) of 0 (manual reset) or A (automatic)
 - 11) an adjustable device communication address (ADDR) setpoint range of A01-A99
 - b. The equipment shall provide two independent adjustable restart delays, one for power up and one after faults.
 - c. The equipment shall allow manual or automatic restart after a fault.
 - d. The equipment shall have the ability to display the last fault that caused the relay to trip off.
 - e. The equipment shall provide a front panel tamper guard, to prevent accidental setpoint changes.
 - f. The equipment shall provide the ability to clear the last fault using the front panel.
- E. Timing Requirements
- 1. The equipment shall provide a voltage/frequency trip delay that follows an inverse time curve.
 - 2. The equipment shall provide a single-phase fault trip delay that follows an inverse time curve.
- F. Accuracy Requirements
- 1. The equipment shall provide a timing accuracy on all timers of 5% \pm 1 second.
 - 2. The equipment shall provide a voltage measurement accuracy of \pm 1%.
- G. Human Interface Features
- 1. The equipment shall provide an adjustment dial to set the following setpoints:
 - a. Low Voltage (LV)
 - b. High Voltage (HV)
 - c. Voltage Unbalance (VUB)
 - d. Low Frequency (LF)
 - e. High Frequency (HF)
 - f. Trip Delay 1 (TD1)
 - g. Trip Delay 2 (TD2)
 - h. Power-Up Delay Timer (RD1)
 - i. Restart Delay After a Trip / Motor Cool-down Timer (RD2)
 - j. Number Of Restarts After a Fault (#RF)
 - k. Device Communication Address (ADDR)
 - 2. The equipment shall provide an adjustment dial to view the following runtime information:
 - a. L1-L2 line voltage
 - b. L2-L3 line voltage
 - c. L3-L1 line voltage
 - d. Average line voltage
 - e. Voltage unbalance
 - f. Frequency
 - 3. The equipment shall provide a 3-digit 7-segment display for viewing operating parameters of the device.
 - 4. The equipment shall provide a push button switch for the following functions:
 - a. Programming the device
 - b. Viewing the last fault
 - c. Resetting the device after a fault
 - d. Resetting the device during a restart delay
- H. Electromagnetic Compatibility
- 1. The equipment shall be immune to electrostatic discharge per IEC 61000-4-2, Level 3, 6kV contact discharge and 8kV air discharge.
 - 2. The equipment shall be immune to electrical fast transient bursts exceeding IEC 61000-4-4, Level 3. Specified limits shall be 3.5kV input power.
 - 3. The equipment shall be immune to electrical surges per IEC 61000-4-5, Level 3. Specified limits shall be 2kV line-to-line; Level 4, 4kV line-to-ground.
 - 4. The equipment shall be immune to surge and ring wave per ANSI/IEEE C62.41. Specified limits shall be 6kV line-to-line.
 - 5. The equipment shall be immune to radiated radio frequency emissions per IEC 61000-4-3, Level 3. Specified limits shall be 10V/m.
 - 6. The equipment shall be immune to conducted radio frequency emissions per IEC 61000-4-6, Level 3. Specified limits shall be 10V.
- I. Vibration/Shock Requirements
- 1. The equipment shall withstand vibrations per IEC 68-2-6. Specified limits shall be 10-55Hz, 1mm peak-to-peak, 2 hours, 3 axis.
 - 2. The equipment shall withstand shocks per IEC 68-2-27. Specified limits shall be 30g, 3 axis, 11ms duration, half-sine pulse.



- J. Dielectric Isolation: Equipment withstands an alternating current potential of 1000V plus twice the rated voltage of the equipment for 1 minute without breakdown between uninsulated live parts and the enclosure with the contacts open and closed; between terminals of opposite polarity with the contacts closed; and between uninsulated live parts of different circuits.
- K. Enclosure Class of Protection: The equipment shall provide IEC IP20 (finger safe) protection.
- L. Environmental Requirements
 - 1. The equipment shall operate continuously without de-rating in ambient temperatures of -20° to 70°C (-4° to 158°F).
 - 2. The equipment shall operate continuously without de-rating in relative humidity of up to 95% non-condensing per IEC 68-2-3.
 - 3. The equipment shall operate properly after storage in ambient temperatures of -40° to 80°C (-40° to 176°F).
- M. Dimensions: The equipment dimensions shall not exceed 3.0" in height X 3.6" in width X 5.1" in depth.
- N. Mounting:
 - 1. The equipment shall be mountable on standard 35 mm DIN rail.
 - 2. The equipment shall be surface mountable on a backplane.
- O. Conformal coating:
 - 1. The equipment shall contain harsh environment conformal coating to help extend product life and to protect from hostile environments including moisture, temperature variations, salt spray, organic attack (fungus), and aggressive chemicals and vapors.

End of Section