Voltage/Frequency Relay

COOPER Power Systems

Electrical Apparatus

UM30 Three-Phase, Frequency and Universal Voltage Relay 150-22

The UM30 Three-Phase, Frequency and Universal Voltage relay is a member of Cooper Power Systems' Edison® line of micro-processor based protective relays. The UM30 relay offers the following functions:

- Two frequency levels each as either under (81<), over (81>), or under and over (81<>) elements.
- Two levels of overexcitation (24).
- Two voltage elements each configurable as either under (27), over (59), or under and over (27 and 59) elements.
- One positive (direct) sequence voltage level configurable as either an under (27pos) over (59pos) or under and over (27pos and 59pos).
- One negative sequence overvoltage element (59neg).
- Two zero sequence overvoltage levels (59zero), with indication of the faulted phase.

The UM30 also shares the following features common to all Edison® relays:

- Simple five button man machine interface (MMI) allows access to all functions, settings, and stored data without the need for a computer.
- Bright electroluminescent display easily visible even in brightly lit environments.
- Draw-out design permits relay testing without disturbing connections to case.
- Modbus communication protocol and RS485 terminal on rear.
- Modular design allows the draw-out module to be fitted to a variety of space saving cabinet styles.

Figure 1.
Front View of the UM30 Three-Phase, Frequency and Universal Voltage Relay

- Three programmable Form C (SPDT) output contacts and one Form A/B contact.
- Pick-up (start-time) elements.
- Programmable reset characteristics.
- Dedicated power supply/relay fail output contacts.
- Event records.
- Cumulative trip counters.
- Auto-ranging power supplies.

Applications

The UM30 is a general purpose voltage and frequency relay ideally suited for most voltage applications. Because of the many functions included in the UM30 relay, it can easily be used in many protection schemes:

- Automatic sectionalizing or deadline throw-over.
- Generator or motor bus under and overvoltage conditions.
- Single phasing of motors.
- Grounding of one phase on a delta or ungrounded system.

Additionally, the two levels of overexcitation (V/Hz) combined with the voltage functions makes the UM30 suitable as part of a generation protection package.

Targets

Eight bright LED targets are provided as follows:

- One red LED for the two frequency elements.
- One red LED for the two voltage control elements.
- One red LED for the positive sequence voltage control element.

- One red LED for the negative sequence voltage control element.
- One red LED for the two V/Hz ratio control elements.
- One red LED for the two zero sequence voltage control elements.

For all of the above, the LEDs flash when the element is picked up, and constantly illuminate upon trip. In addition, one yellow LED is provided which illuminates when either of the blocking inputs is active. A second yellow LED flashes when the relay is in programming mode, and illuminates constantly upon relay or power supply failure.

Blocking Inputs

Two blocking inputs are provided. One input is dedicated toward blocking all “under level” functions, and one dedicated to blocking all “over level” functions. While the blocking inputs are active, the tripping of any element associated with the blocking input(s) is prevented. For the “over level” functions, continued sensing of the input quantities and the countdown of their associated timers continues so that when the blocking is removed, any picked up elements will either trip instantaneously, or after any remaining time delay. For the “under level” functions, sensing of the input quantities are blocked and their associated timers are reset to their initial starting countdown time. Therefore, after the blocking input is removed for the “under level” functions, the “under level” elements must completely time out before producing a trip output signal.

Output Functions

The following list summarizes all of the output functions available which may be assigned to any or all of the programmable output contacts. Note that pick-up and time delayed elements may not be assigned to operate the same output contact(s).

- 1st Frequency Element Pick-up
- 1st Frequency Element Time Delayed Trip
- 2nd Frequency Element Pick-up
- 2nd Frequency Element Time Delayed Trip
- 1st Voltage Control Element Pick-up
- 1st Voltage Control Element Time Delayed Trip
- 2nd Voltage Control Element Pick-up
- 2nd Voltage Control Element Time Delayed Trip
- Low-Set Zero Sequence Voltage Control Element Pick-up
- Low-Set Zero Sequence Voltage Control Element Time Delayed Trip
- High-Set Zero Sequence Voltage Control Element Pick-up
- High-Set Zero Sequence Voltage Control Element Time Delayed Trip
- Positive Sequence Voltage Control Element Pick-up
- Positive Sequence Voltage Control Element Time Delayed Trip
- Negative Sequence Overvoltage Control Element Pick-up
- Negative Sequence Overvoltage Control Element Time Delayed Trip
- Volts/Hertz Elements Pick-up (either one or both)
- Volts/Hertz Elements Time Delayed Pick-up (either one or both)

Reset Characteristics

Each of the four programmable output relays may be programmed to reset in one of three manners.

- Instantaneously upon the input or calculated quantities dropping below the pickup value.
- Automatically, but with a time delay adjustable between 0.1 and 9.9 seconds in 0.1 second steps.
- Manual reset (by front panel or computer command) only.

Measurements

System frequency, phase-to-phase voltages, and phase-to-neutral voltages are available for display on the relay and are accessible by software.

Last Trip Record

The following parameters are stored in non-volatile memory, providing details of the last trip event:

- Which element was the cause of the last trip, including identification of the faulted phase in the case of ground faults.
- Values of the following quantities at the time of trip: frequency, phase-to-phase voltages, positive sequence voltage, negative sequence voltage, and zero sequence voltage.

Diagnostics

Complete memory and circuit diagnostics are run upon powering the relay. The revision level of the firmware is displayed at this time.

During normal operation the relay suspends operation every 15 minutes for 10 msec and runs a comprehensive set of diagnostics that includes memory checksum, test of the A/D converters by injection of an internally generated reference voltage, and a check of the ALU.

The relay provides two manual test routines which may be run at any time. The first routine performs the same 15 minute test and in addition checks the target LEDs and the control circuitry to the output relays without operating the output relays. The second test is identical but also operates the output relays.

Dimensional and Electrical specifications

See Catalog Section 150-05 for electrical specifications and dimensional information on all Edison® relays.

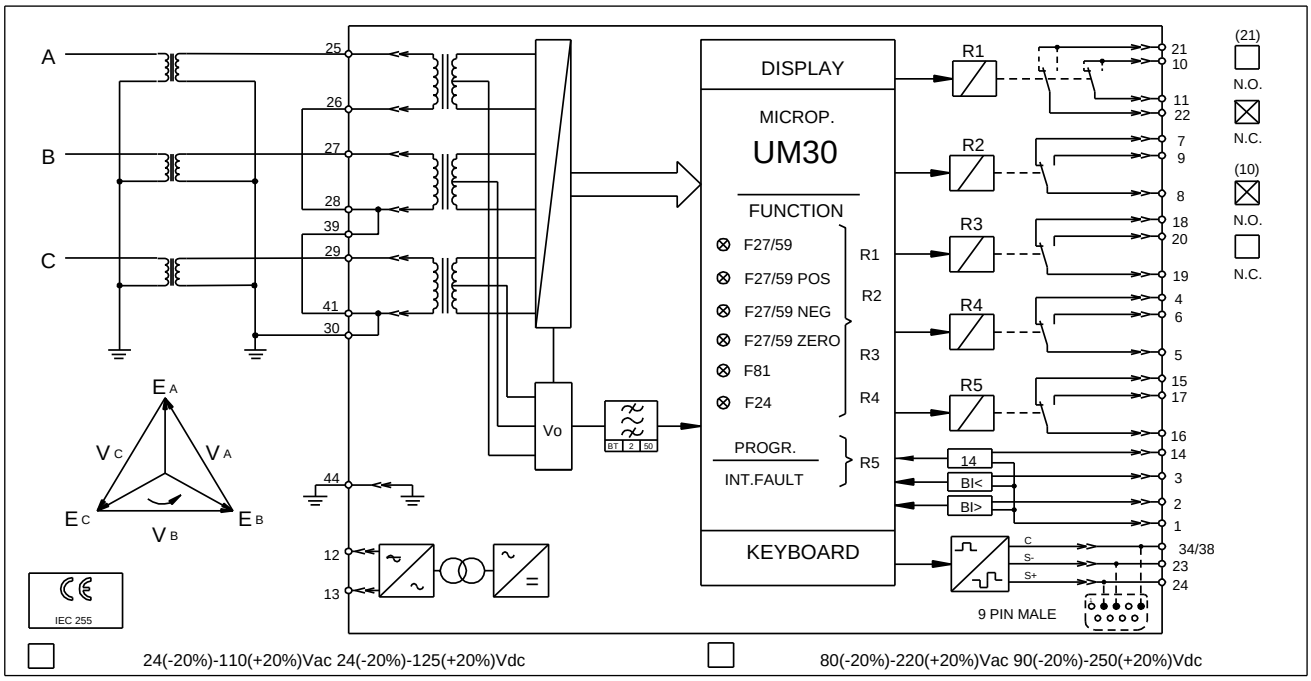

Figure 2.
Wiring Diagram for the UM30 Three-Phase, Frequency and Universal Voltage Relay.

Ordering Information

The only ordering options for the UM30 relate to the power supply range desired and the mounting cabinet.

Construct catalog number from the following table.

Example: UM30LJS is an UM30 with low range power supply in a single relay case.

If ordering two or more relays to be fit in a common case, the first relay ordered should indicate the case style desired. This relay will be located in the leftmost bay of the case. Subsequent relays should use the C2, C3, or C4 suffixes to denote their position in the case using the leftmost bay as a C1 reference.

Example: An UM30xJN and an IM30AExxJC2 consists of an UM30 relay in the leftmost bay of a 19" rack case, with an IM30AE relay in the second bay from the left. The third and fourth bays will be empty and will be covered with blank faceplates.

TABLE 1
Catalog Numbers

Description	Catalog Number
Base Relay	UM30
To the above add one each of the following applicable suffixes	
Power Supply[1]	
24-110V AC/DC	L
90-220V AC/DC	H
Modbus Protocol	J
Case Style[2]	
Draw out relay only, no cabinet supplied	D
Single relay case	S
Double relay case	T
19" Rack mount cabinet	N
Mounting Position	
Denotes mounting position in either a double case or 19" Rack along with other relays ordered at the same time.	C2 C3 C4

[1] The power supplies are user replaceable and interchangeable. See Catalog section 150-99.

[2] The relay itself may be drawn out of any of the listed cases and plugged into any of the other case styles. The catalog number specified during ordering denotes the type of cabinet in which the relay will be shipped.

TABLE 2
Functional Specifications

Nominal frequency setting range.....50 or 60Hz
Programmable Φ-Φ primary voltage.....0.10 - 1.00 kV in 0.01kV steps
.....1.1 - 9.9 kV in 0.1 kV steps
.....1 - 655 kV in 1 kV steps
Programmable secondary voltage.....100-125V in 1V steps
Overexcitation Elements
Quantity.....2
V/Hz setting.....1-2 in 0.1 steps or Disable
Time Delay.....0.1-60 in 0.1second steps
Frequency Elements
Quantity.....2
Characteristic.....Selectable between Under (81<)
.....Over (81>), Under/Over (81< >), or Disable
ΔFrequency setting (change).....0.05 - 9.99 Hz in 0.01 Hz steps
Time Delay.....0.1 - 9.9 seconds in 0.1 sec. steps
Voltage Control Elements
Quantity.....2
Characteristic.....Selectable between Under (27)
.....Over (59), Under/Over (27/59), or Disable
ΔVoltage setting.....5 - 90% of system voltage in 1% steps
Time Delay.....0.1 - 60.0 seconds in 0.1 sec. steps
Direct Sequence Voltage Control Element
Quantity.....1
Characteristic.....Selectable between Under (27pos)
.....Over (59pos), Under/Over (27pos/59pos)
.....or Disable
ΔVoltage setting[3].....5 - 90% of system voltage in 1% steps or Disable
Time Delay.....0.1 - 60.0 seconds in 0.1 sec. steps
Negative Sequence Overvoltage Control Element
Quantity.....1
Voltage setting.....1 - 99% of system voltage in 1% steps or Disable
Time Delay.....0.1 - 60.0 seconds in 0.1 sec. steps
Low-Set Zero Sequence Voltage Control Element
Quantity.....1
Voltage setting.....1 - 99 Volts in 1V steps or Disable
Time Delay.....0.05 - 9.9 seconds in 0.05 second steps
.....10 - 60 seconds in 0.1 second steps
High-Set Zero Sequence Voltage Control Element
Quantity.....1
Voltage setting.....1 - 99 Volts in 1V steps or Disable
Time Delay.....0.05 - 9.9 seconds in 0.05 second steps

[3] The setting is made based upon the change from the programmed system base frequency. Whether a positive, negative, or absolute value change is acted upon is dependent upon the over, under, or over/under setting selected.

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