

5. Typical Application Diagram

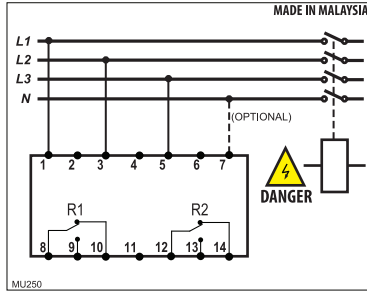


Figure 5

Neutral connection is optional when Phase option is set to L-L. Neutral connection is required when Phase option is set to L-N. (refer to *Setting b - Phase*)

6. Case Dimensions

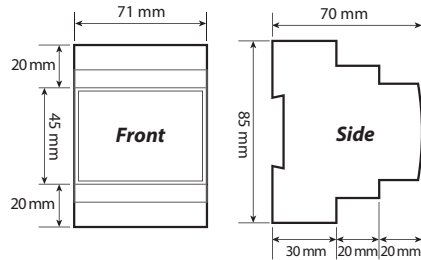


Figure 6: Case Dimensions

7. Technical Data

Setting Ranges

| | |
|---|-----------------------------|
| Undervoltage | : Off, 1% – 25% |
| Time delay for undervoltage | : 0.1s – 30s |
| Overvoltage | : Off, 1% – 20% |
| Time delay for overvoltage | : 0.1s – 30s |
| Unbalance | : Off, 3% – 20% |
| Time delay for unbalance | : 0.5s – 30s |
| Phase loss | : off, on, Fixed time <0.5s |
| Phase sequence | : off, on, Fixed time <0.5s |
| Start time delay | : 0s – 999s |
| Auto reset level (undervoltage and overvoltage) | : 1% – 10% |

Power Supply Input

| | |
|------------------------|-------------------------------|
| Phase to phase voltage | : 380V(-25%) to 415V(+20%) AC |
| MU250-415V | |
| MU250-220V | : 220V(-25%) to 240V(+20%) AC |
| MU250-110V | : 100V(-25%) to 120V(+20%) AC |

| | |
|---------------------------|----------------|
| Supply frequency | : 45Hz to 65Hz |
| Maximum power consumption | : 3VA |

Contacts

| | |
|--------------------------|---------------------------------------|
| Contact arrangement | : Change-over |
| Contact rating | : 5A, 250V AC (cos φ=1) |
| Expected electrical life | : 100,000 operations at rated current |
| Expected mechanical life | : 5 x 10 ⁶ operations |

Indicators

| | |
|------------------|--|
| Auxiliary supply | : Green LED indicator |
| Pickup indicator | : Red LED indicator |
| Trip | : 7-segment display and red LED indicators |

Mechanical

| | |
|--------------------|-------------------------|
| Mounting | : Din rail mounted |
| Dimension (mm) | : 71(w) x 85(h) x 70(d) |
| Approximate weight | : 0.31kg |

Accuracy

| | |
|-----------------------|--|
| Protection thresholds | : ± 3% |
| Time delay | : 0–0.5s, ± 15% with a minimum of 40ms |
| | : 0.6s and above, ± 3% |
| Measurements | : ± 3% |

Environmental Conditions

| | |
|-------------|----------------------------|
| Temperature | : -10°C to 55°C |
| Humidity | : 5% to 95% non-condensing |

MU250 3-Phase Voltage Relay User's Guide V3.0

R1

Brief Overview

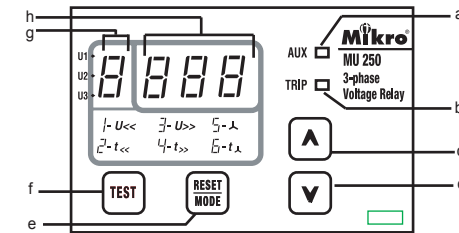


Figure 1: Front panel overview

| | |
|--------------------------------|-------------------------------|
| a – Auxiliary power supply LED | Symbols |
| b – Trip/Pickup LED | U<< - Undervoltage |
| c – Up key | t<< - Undervoltage time delay |
| d – Down key | U>> - Overvoltage |
| e – Reset/Mode key | t>> - Overvoltage time delay |
| f – Test key | ⏏ - Unbalance/phase |
| g – Function LED | ⏏ - Unbalance time delay |
| h – Data LED | |

1. General Description

MU250 is a voltage relay that combines overvoltage, undervoltage, unbalance, phase loss, phase sequence and delay start functions. It can be connected with or without neutral wire.

MU250 incorporates a 4-digit LED display which allows direct numerical readout of set values, actual measured value and system indication.

MU250 has 2 relay outputs (R1 and R2). R1 is energized under normal operating condition. R2 can be configured as normally energized or de-energized. Both R1 and R2 can be assigned to operate separately by various tripping elements.

2. Voltage and Frequency Display

During power up, when the relay is not under tripping condition, the display will show voltage and frequency reading. The Function LED indicates which line/phase of voltage is being displayed or shows 'F' when frequency is being displayed.

The Data LED showing value. Press "UP" or "DOWN" to scroll through the parameters as shown in Figure 2 and 3 (depends on L-L or L-N setting).

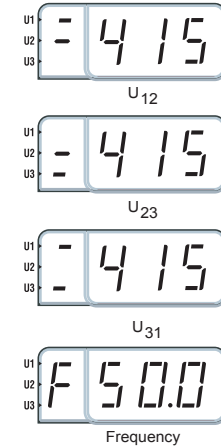


Figure 2: Display for L-L setting. 415V and 50.0Hz shown as example

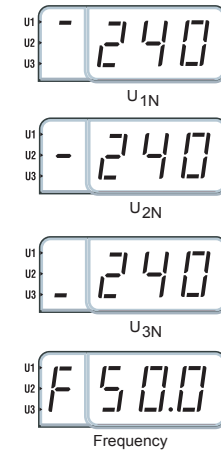


Figure 3: Display for L-N setting. 240V and 50.0Hz shown as example

a) Auto Scroll

Auto scroll let the display to scroll to the next available parameter every 10 seconds. To toggle auto scroll mode, press "UP" and "DOWN" simultaneously.

3. Settings

a) Setting Display

When the relay is not under tripping condition, pressing "RESET/MODE" can scroll through various settings. Function LED shows number or alphabet to indicate which setting is being view as shown in Figure 4. Table 1 gives description of each setting.

Tip: To quickly jump back to voltage display during setting display, press and hold "RESET/MODE" for more than 1.5 seconds.

b) Programming Setting

Step 1: Press "RESET/MODE" until the Function LED shows the required setting.

Step 2: Press "UP" and "DOWN" simultaneously to enter programming mode.

The Function LED blinks to indicate that the relay is in programming mode.

Step 3: Press "UP" or "DOWN" to select the desired value.

Step 4: To save the selected value, press "UP" and "DOWN" simultaneously again. It will exit the programming mode with the Data LED displaying the newly set value.

To exit programming mode without saving the selected setting, press "RESET/MODE" once.

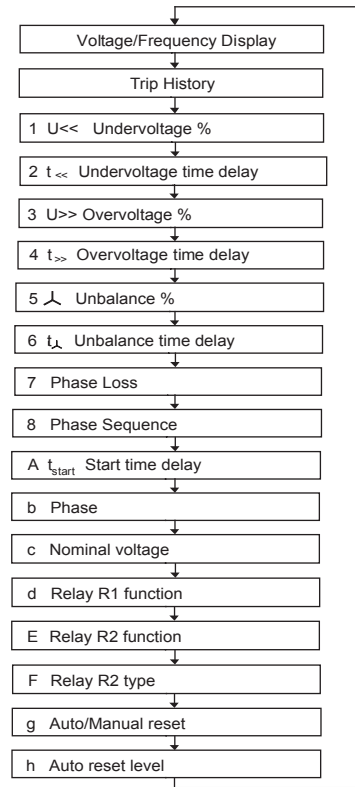


Figure 4: Display mode when pressing Reset/Mode

| Setting | Function | Setting Range | Description |
|---------|------------------------|---|---|
| 1 | U<< Undervoltage | off, 1-25 % | Undervoltage % from nominal voltage |
| 2 | t<< Undervoltage delay | 0.1-30 s | Time delay for undervoltage |
| 3 | U>> Overvoltage | off, 1-20 % | Overvoltage % from nominal voltage |
| 4 | t>> Overvoltage delay | 0.1-30 s | Time delay for overvoltage |
| 5 | Unbalance | off, 3-20% | Unbalance % |
| 6 | tUnbalance delay | 0.5-30 s | Unbalance time delay |
| 7 | Phase loss | off, on | Phase loss disable/enable |
| 8 | Phase sequence | off, on | Phase sequence disable/enable |
| A | t_start Starting delay | 0-999 s | On time delay of R1 during power up |
| b | Phase | L-L, L-N | L-L: Display and uses Line to Line voltage L-N: Display and uses Line to Neutral voltage |
| c | Nominal Voltage | 415V: 380,400,415V or 220,230,240V 220V: 220,230,240V or 127,133,139V 110V: 100,110,120V or 58,64,69V | Nominal voltage. Value depends on model and L-L or L-N setting |
| d | Relay R1 function | 0 - 7 | *Refer to Table 2 |
| E | Relay R2 function | 0 - 7 | *Refer to Table 2 |
| F | Relay R2 type | 0 - 1 | 0: Normally de-energized 1: Normally energized |
| g | Auto/Manual reset | 0=auto, 1=manual | auto: auto reset when trip condition clear manual: press "RESET/MODE" to reset |
| h | Auto reset level | 1-10 % | Auto reset level for U<< and U>> |

Table 1: Description of functions

c) Undervoltage

Undervoltage pickup occurs when any line to line or line to neutral voltage is less than [nominal voltage - U<< %], relay trips when delay time is elapsed.

d) Overvoltage

Overvoltage pickup occurs when any line to line or line to neutral voltage is more than [nominal voltage + U>> %], relay trips when delay time is elapsed.

e) Unbalance

Unbalance is calculated as:

$$(V_{max}-V_{min})/V_{min} \times 100\%$$

Where Vmax is the maximum voltage among the 3 voltages. Vmin is the minimum voltage among the 3 voltages.

Unbalance pickup occurs when unbalance is more than setting %, relay trips when delay time is elapsed.

Phase Sequence trip occurs when the phase sequence in any 2 or all of the lines are reversed.

Phase Loss trip occurs when any voltage is less than 70% of nominal.

f) Starting Delay

Starting delay is the delay time for R1 to energized during power up under normal condition.

g) Relay Function Selection

During tripping, output contact relay R1 or R2 will be de-energized/energized if the related tripping element is activated.

The setting is shown below:

| Code | Phase | OV | UV | |
|------|-------|----|----|---|
| 0 | 0 | 0 | 0 | Code : Displays on Data LED |
| 1 | 0 | 0 | 1 | Phase: Unbalance, Phase Loss and Phase Sequence |
| 2 | 0 | 1 | 0 | OV : Overvoltage |
| 3 | 0 | 1 | 1 | UV : Undervoltage |
| 4 | 1 | 0 | 0 | |
| 5 | 1 | 0 | 1 | |
| 6 | 1 | 1 | 0 | |
| 7 | 1 | 1 | 1 | |

Table 2: Relay function selection

4. Trip

a) Trip Display

During pickup, Trip/Pickup LED blinks. During tripping condition, Trip/Pickup LED on. Function LED and Data LED blinks with trip source as shown:

| Function LED | Data LED | Description |
|--------------|--------------|---------------------|
| 1 | trip voltage | Undervoltage trip |
| 3 | trip voltage | Overvoltage trip |
| 5 | Ub | Unbalance trip |
| 5 | PL | Phase loss trip |
| 5 | PS | Phase sequence trip |
| t | EST | Test |

Table 3: Trip display

b) Trip Reset

During tripping condition, press "RESET/MODE" to reset the relay, the relay will reset if lower than threshold. Manual reset threshold for U>> / U<< and Unbalance is: Setting % - 1%.

Auto/Manual reset setting applies to U<<, U>>, Unbalance tripping. Phase Sequence and Phase loss is always auto reset.

c) Auto reset level

This sets the U<< and U>> auto reset level. Unbalance auto reset is fix to 2%.

Eg1. if U>> is set to 10% and Auto reset level is set to 2%, U>> trips when voltage >110%, U>> reset when voltage <108%

Eg2. if U<< is set to 20% and Auto reset level is set to 5%, U<< trips when voltage <80%, U<< reset when voltage >85%

If Auto reset % is equal or larger than U<< / U>> %, it will be automatically set to U<< / U>> % - 1%.

d) Trip Test

Trip test is used to simulate a tripping condition. Press "TEST" button and hold for 1.5s, trip LED blinks. After 3.5 seconds, "tEST" will blink, R1 de-energized and R2 will operate dependent on *relay R2 type*. Press "RESET/MODE" to reset.

e) Trip History Display

During Voltage and frequency display, Press "RESET/MODE" button to jump to Trip History Display. Display shows the previous trip status with a 'dot' blinking at Function LED. To clear trip history, press "UP" and "DOWN" simultaneously.

f) Trip Bypass Mode

To disable tripping due to incorrect setting, press "RESET/MODE" and "TEST" simultaneously during power up. The Trip LED slow blink to indicate Trip Bypass Mode. Go into programming mode to correct the setting. Power off and on to reset the relay. The relay will return to normal if no button is pressed for longer than 2 minutes.

MU250 / 150



MU250 3-phase



MU150 Single-phase

Product Description

MU150 and MU250 are voltage relays that combine various protections and starting delay.

MU150 is used for single-phase monitoring while MU250 is used for 3-phase monitoring.

Features

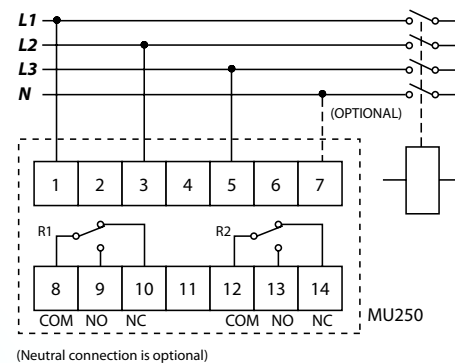
- Microprocessor based numerical relay
- Undervoltage
- Overvoltage
- Delay-on
- 2 voltage-free output contacts
- Voltage and frequency display

Features For MU250 only

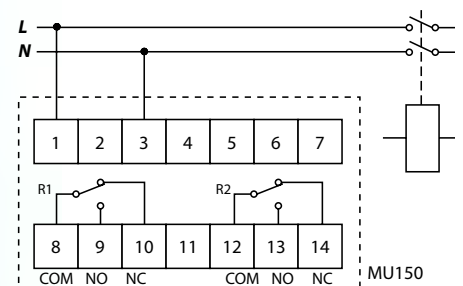
- 3-Phase
- Unbalance
- Phase loss
- Phase sequence
- With or without neutral connection
- Phase to phase or phase to neutral monitoring

TYPICAL APPLICATION DIAGRAMS

MU250



MU150



Technical Data

SETTING RANGES

| | |
|-----------------------------|---------------|
| Undervoltage | : 1% to 25% |
| Time delay for undervoltage | : 0.1s to 30s |
| Overvoltage | : 1% to 20% |
| Time delay for overvoltage | : 0.1s to 30s |
| Start time delay | : 0s to 999s |

For MU250 only:

| | |
|--------------------------|--------------------|
| Unbalance | : 3% to 20% |
| Time delay for unbalance | : 0.1s to 30s |
| Phase loss | : Fixed time <0.1s |
| Phase sequence | : Fixed time <0.1s |

POWER SUPPLY INPUT

| | |
|---------------------------|--|
| Input voltage | : MU150: 220V(-25%) to 240V(+20%) AC (Phase-Neutral) : MU250: 380V(-25%) to 415V(+20%) AC (Phase-Phase) |
| Supply frequency | : 45Hz to 65Hz |
| Maximum power consumption | : MU250: 3VA : MU150: 2.5VA |

CONTACTS

| | |
|--------------------------|---------------------------------------|
| Contact arrangement | : Change-over |
| Contact rating | : 5A, 250V AC (cos $\varphi=1$) |
| Contact material | : Silver alloy |
| Expected electrical life | : 100,000 operations at rated current |
| Expected mechanical life | : 5×10^6 operations |

INDICATORS

| | |
|------------------|--|
| Auxiliary supply | : Green LED indicator |
| Pickup indicator | : Red LED indicator |
| Trip | : 7-segment display and red LED indicators |

MECHANICAL

| | |
|--------------------|------------------------------------|
| Mounting | : Din rail mounted |
| Approximate weight | : MU150: 0.27kg : MU250: 0.31kg |

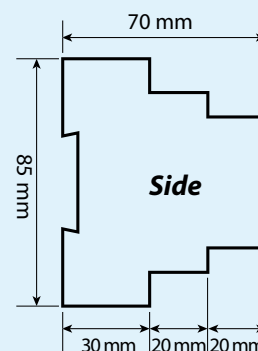
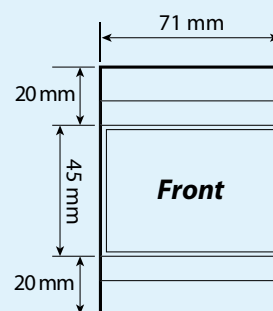
ACCURACY

| | |
|-----------------------|--|
| Protection thresholds | : $\pm 3\%$ |
| Time delay | : 0 to 0.5s, $\pm 15\%$ with minimum 40ms : 0.6s and above, $\pm 3\%$ |
| Measurements | : $\pm 3\%$ |

ENVIRONMENTAL CONDITIONS

| | |
|-------------|---|
| Temperature | : -5 C to +55 C |
| Humidity | : 56 days at 93% RH and 40 C non-condensing |

CASE DIMENSIONS



Ordering Information

| MODEL | DESCRIPTION |
|------------|---|
| MU150-240V | Single-Phase, 220/230/240 V AC, 45-65 Hz power supply |
| MU250-415V | 3-Phase, 380/400/415 V AC, 45-65 Hz power supply |

