MK231A Earth-fault Relay User's Guide

A BRIEF OVERVIEW

Symbols

- $l_0$ - Earth-fault current
- $l>$ - Low-set
- $t>$ - Low-set delay time
- $l>>$ - High-set
- $t>>$ - High-set delay time
- SW - Soft switches

1. DESCRIPTION

The MK231A is a microprocessor based numerical earth-fault relay. It uses fundamental frequency current measurement for excellent harmonic current rejection. The relay provides two-element (low-set and high-set) earth-fault protection with definite time characteristic. The 4-digit panel display on the MK231A allows the display of present load current; recorded fault current for last tripping; and all setting of the relay.
2. LIGHT INDICATORS
The indicators display the status of the system as follow:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aux:::FUNC:DT</td>
<td>No Auxiliary power supply.</td>
</tr>
<tr>
<td>0 0 0 0 0</td>
<td>Normal condition, no tripping.</td>
</tr>
<tr>
<td>1 1 0 0 X X</td>
<td>Low-set overcurrent triggered, time delay countdown started.</td>
</tr>
<tr>
<td>1 0 1 X X</td>
<td>High-set overcurrent triggered, time delay countdown started.</td>
</tr>
<tr>
<td>1 B 0 B B</td>
<td>Low-set tripped, DT LEDs show tripped value.</td>
</tr>
<tr>
<td>1 0 B B B</td>
<td>High-set tripped, DT LEDs show tripped value.</td>
</tr>
<tr>
<td>1 X X B 1</td>
<td>Programming mode.</td>
</tr>
</tbody>
</table>

Table 1: System Status

1 = ON 0 = OFF X= don’t care, not blinking
B = blinking DT = DATA FUNC = FUNCTION

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>DP</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>. 0</td>
<td>off</td>
<td>Earth fault current.</td>
</tr>
<tr>
<td>0</td>
<td>blink</td>
<td>Previous tripped current.</td>
</tr>
<tr>
<td>4</td>
<td>off</td>
<td>Low-set current setting.</td>
</tr>
<tr>
<td>5</td>
<td>off</td>
<td>Low-set delay time setting.</td>
</tr>
<tr>
<td>6</td>
<td>off</td>
<td>High-set delay time setting.</td>
</tr>
<tr>
<td>7</td>
<td>off</td>
<td>High-set delay time setting.</td>
</tr>
<tr>
<td>8</td>
<td>off</td>
<td>Soft switch setting.</td>
</tr>
</tbody>
</table>

Table 2: FUNCTION Code

Note: Under normal operating condition, The 4-digit display is off. When the RESET key is pressed, the 4-digit display will light up. The display will switch off automatically after 6 minutes if no further key is pressed.

3. PUSH-BUTTONS OPERATION

a) Trip test
   Press the “TEST” button to simulate a trip

b) Trip reset
   Press the “RESET” button to reset the relay when tripped.

c) View setting
   When the relay is not under tripped condition, pressing the “RESET” button will scroll through the various functions.

```
     0  6
  0 4  5
```

Figure 1: Scroll sequence

d) Program setting
   Only function codes from 4 to 8 can be programmed.

Step 1: Press the RESET key until the function digit shows required function.

Step 2: Press the UP and DOWN key simultaneously to enter programming mode. The function digit will blink to indicates the relay is in programming mode.

Step 3: Use the UP or DOWN key to select the desired value.

Step 4: To save the selected value, press the UP and DOWN key simultaneously again. It will exit the programming mode with the data digits displaying new setting.
To exit programming mode without saving the selected setting, press the RESET key once.

4. OUTPUT CONTACTS
The MK231A has two set of output contact:
(i) CONTACT R1 - linked to trip signal.
(ii) CONTACT R2 - linked to trip or start signal.
The output contact can be programmed to be either auto reset type or manual reset type.
For auto reset type, the contact remain activated until the fault current is removed.
For manual reset type, the contact remain activated.

5. SOFT SWITCHES
The MK231A incorporates 3 soft switches for system configuration. When the function digit shows “8”, the relay is in soft switch setting mode.

<table>
<thead>
<tr>
<th>SW</th>
<th>SVL</th>
<th>System configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>00</td>
<td>Contact R1 linked to trip signal auto reset type.</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>Contact R1 linked to trip signal manual reset type.</td>
</tr>
<tr>
<td>2</td>
<td>00</td>
<td>Contact R2 linked to trip signal auto reset type.</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>Contact R2 linked to trip signal manual reset type.</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Contact R2 linked to signal auto reset type.</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Contact R2 linked to signal manual reset type.</td>
</tr>
<tr>
<td>3</td>
<td>00</td>
<td>High-set disabled.</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>High-set enabled.</td>
</tr>
</tbody>
</table>

Table 3: Soft switch setting
6. TECHNICAL DATA

**Ratings**
- Rated current $I_n$ ............... 5 A
- Frequency .......................... 50 Hz or 60 Hz
- Burden .................................. < 0.3 VA at $I_n$

**Auxiliary Supply**
- MK231A-240A(6) ............... 198–265 VAC
- MK231A-110A(6) ............... 94–127 VAC
- Supply frequency .............. 50 Hz or 60 Hz
- VA rating ......................... 3 VA typical

**Setting Ranges**
- Low-set setting $I>$ ................... 0.10 - 5.00 A (2%-100%)
- Low-set definite time $t>$ ........0.05 - 99 sec
- High-set setting $I>>$ ............. 0.10 - 50.0 A (2%-1000%)
- High-set definite time $t>>$ ....... 0.05 - 2.5 sec

**Indicators**
- Auxiliary supply .................. Green LED indicator
- Pick up .............................. Red LED indicator
- Trip .................................. 7 segment LED and red LED indicators

**Mechanical**
- Mounting ......................... Panel mounting
- Front panel ....................... Standard DIN 96x96 mm
- Approximate weight .......... 0.6 kg

**Outputs**
- Trip Contact:
  - Rated voltage .............. 250 VAC
  - Continuous carry .......... 5A (cos $\phi = 1.0$)
  - Make and carry for 0.2 s .... 30A

**Contact specification**
- Expected electrical life ....... $10^5$ operations
- Expected mechanical life ...... $5 \times 10^6$ operations

7. CONNECTION DIAGRAMS

Earth Fault Relay

![Connection Diagram](attachment:connection_diagram.png)
8. CASE DIMENSION

Figure 2: Case Dimension