



D3  
53mm  
DIN rail mount



D4  
72mm  
DIN rail mount



P44  
48mmx48mm  
panel mount



P49  
48mmx96mm  
panel mount

## 3 PHASE VOLTAGE MONITOR

**D3- VM3 0/1/2(N)** (software select.NEUTRAL monitoring)

**P44-VM3 0/1/2(N)** (software select.NEUTRAL monitoring)

**D4- VM3 0/1/2 + D4- VM3 0/1/2N**

**P49-VM3 0/1/2 + P49-VM3 0/1/2N**

EXAMPLE: D3-VM30(N) = 0 RELAY

Operating instructions and Guarantee Certificate  
[www.iconelectronics.co.za](http://www.iconelectronics.co.za)

### **Description:**

In addition to providing OVER and / or UNDER voltage protection, this device will monitor phase failure, phase reversal and phase imbalance (neutral failure on "N" devices).

It incorporates upper and lower voltage set-points, a programmable start-up delay, trigger delay, recovery delay, hysteresis, phase imbalance limit and phase imbalance hysteresis.

By changing the calibration setting, the readings may be adjusted from 90 to 110%.

The individual phase-to-phase voltages are monitored and can be viewed by pressing the "+" button.

Every key-press cycles the display in the following order: the voltage between phase 1 and 2, then 1 and 3, then 2 and 3, line frequency and the average of all three phases.

Under normal conditions the average of all 3 phases is displayed.

Under fault conditions, the display indicates the offending phases using the left hand character, and the message "Hi" or "Lo".

A phase imbalance or reversal is indicated by "PH.ib" or "Ph.Er".

If the start-up or trigger delay holds the relay energised during a fault condition, the display indicates "-r1-" as a warning.

The same message is displayed when the relay is held in the de-energised state by the recovery delay.

A latch facility is also incorporated.

### **0 RELAY**

This device measures 3 phase voltage signals and the line frequency. A phase imbalance of more than 50V or phase reversal is indicated by "PH.ib" and "Ph.Er" respectively.

By changing the calibration setting, the readings may be adjusted from 90 – 110%.

### **1 RELAY**

Even though the average of the 3 phases is being displayed, the individual phase to phase voltages are monitored.

If all phases are in the correct order, and no phase imbalance exists, AND all 3 phase to phase voltages are ABOVE the "LO" parameter AND below the "HI" parameter, the relay is energised.

If the voltage goes out of limits (eg above the "HI" parameter), the relay is de-energised until the voltage drops below the "HI" parameter by the "HYST" amount of volts. Eg: "HI"=410V & "HYST"=5V.

The relay is energised while the voltage is BELOW 410V. Once this setpoint is reached, the relay de-energises until the voltage drops to below 405V (410V-5V).

If the latch is used, the relay remains de-energised until the latch is removed.

### **2 RELAY**

This device incorporates independent voltage and frequency monitors. Each function controls a separate relay. In addition to providing OVER and / or UNDER voltage and frequency protection, this device will monitor phase failure, phase reversal and phase imbalance (neutral failure on "N" devices).

The voltage and frequency is monitored independently with separate upper and lower set-points.

A programmable start-up delay, reaction delay, hysteresis, phase imbalance limit and phase imbalance hysteresis is also included.

By changing the calibration setting, the readings may be adjusted from 90 – 110%.

A latch facility is also incorporated.

**START-UP delay:**

The relay is energised at startup for the pre-set time. Monitoring starts after the delay has lapsed.

**TRIGGER delay:**

Fault conditions (NOT phase fail or reversal) are tolerated for this period of time before the relay is de-energised. If a fault condition is detected for longer, the relay is de-energised.

**RECOVERY delay:**

When the relay is de-energised, it will not re-energise before this amount of time, even if all fault conditions are removed. This delay is active at start-up if the START UP delay parameter is set to ZERO.

**ADJUSTABLE PARAMETERS:**

*Please note: Depending on the model of the device purchased, some of the parameters listed below may not be available*

- **Upper voltage limit ("Hi") (default: Disabled)**  
If the input voltage on any phase exceeds this value, the relay de-energises.  
To disable this feature, set is to maximum (501V). "diSA" is displayed.
- **Lower voltage limit ("Lo") (default: Disabled)**  
If the input voltage on any phase drops below this value, the relay de-energises.  
To disable this feature, set is to minimum (249V). "diSA" is displayed.
- **Voltage Hysteresis ("HySt")**  
If the input voltage has exceeded the "Hi" setting, or dropped below the "Lo" setting, the voltage must drop, or rise above the applicable limit by this amount before the relay re-energises.  
This setting is limited to the difference between the "Hi" and "Lo" settings.
- **Phase imbalance ("Ph.ib") (default: 20V)**  
If the difference between any 2 phases exceeds this amount, the relay is de-energised.
- **Phase imbalance hysteresis ("Ph. H")**  
If a phase imbalance has been detected, the voltage difference between the 2 phases that caused the imbalance must reduce by this amount before the relay will re-energise.
- **Upper Frequency limit ("Fr.Hi") (default: Disabled)**  
If the line frequency exceeds this value, the frequency relay de-energises.  
To disable this feature, set is to maximum (55.1 Hz). "diSA" is displayed.
- **Lower Frequency limit ("Fr.Lo") (default: Disabled)**  
If the line frequency drops below this value, the relay de-energises.  
To disable this feature, set is to minimum (44.9 Hz). "diSA" is displayed.
- **Frequency Hysteresis ("Fr.Hy")**  
If the frequency has exceeded the "Fr.Hi" setting, or dropped below the "Fr.Lo" setting, the frequency must drop, or rise above the applicable limit by this amount before the relay re-energises.  
This setting is limited to the difference between the "Fr.Hi" and "Fr.Lo" settings.
- **Startup delay ("St d") (default: 1 Second)**  
If all 3 phases are present, and NOT reversed, the relay is energised upon start-up.  
The device does NOT monitor voltage errors until the start-up delay has lapsed.  
This feature is used to allow for over/under-voltage conditions following a power-up.  
During this time, the display alternates between the actual voltage, and whether it is Hi or Low.
- **Reaction delay ("rE d") (Default: 0 seconds)**  
This function is similar to the start-up delay.  
The device will tolerate voltage errors for this period of time once monitoring has commenced.
- **Calibration ("CAL") (Default: 100%)**  
This function may be used re-calibrate the device. The readings may be adjusted from 90% to 110%.
- **Neutral monitoring("nEUt") DUAL DISPLAY DEVICES ONLY (Default: "off")**  
Enable / Disable neutral monitoring.
- **Reset ("rESt)**  
By selecting this option, all values are reset to default.

**Latch facility:**

If the latch pins are shorted, the relay will not re-energise until the short is removed, even if the input voltage is within the pre-set limits.

**Please Note:**

- The latch pins **MUST BE ISOLATED FROM THE INPUT**.
- As a power saving feature, the display dims if settings are not being made.
- We recommend that all relay connections be disconnected while making adjustments and the unit be reset by disconnecting the power after settings have been changed.
- Certain settings are reset to default when the device is re-configured. Before commissioning, re-check all settings to ensure they are correct.
- Even though the device seems to operate correctly, the relay will not energise if the input voltage is below the operating voltage.
- If one phase should fail while an inductive load is connected, the device may indicate the fault as a low phase (not phase failure). The load may be generating a voltage on the 3rd phase.

**DUAL DISPLAY Programming Example : *Configure the device to monitor the NEUTRAL***

Press “⏏” repeatedly until the display indicates “nEUt”.  
Use the “▼” and “▲” buttons to change the value to “on”.  
Press and hold “⏏” for 3 seconds to exit the menu.

**SINGLE DISPLAY Programming Example : *Set device to energise the relay if the input voltage is between 350V and 400V.***

Press “MENU” to display “Hi”.  
Press “SELECT”.  
Use the “+” and “-” buttons to change the value to “400”.  
Press “ENTER” to return to the menu. “Lo” is displayed.  
Press “SELECT”. Use “+” and “-” to change the value to “350”. Press “ENTER”.  
Press “BACK”.

**Specifications:**

Accuracy:	Voltage: $\pm 0.5\%$ at 25 °C
	Frequency*: $\pm 0.05\%$
Display Resolution:	Voltage: 1 Volt
	Frequency*: 0.1 Hz
Input voltage:	$\pm 15\%$ of rated voltage
Led indication:	Relay status
Response time:	Phase failure /reversal: <1 Sec
	Over / Under voltage: <2 Sec
	Phase imbalance: <2 sec
	Frequency* <1 Sec
Start-up delay:	0 to 125 sec
Trigger delay:	0 to 125 sec
Recovery delay:	0 to 250 sec

*\*for 2 RELAY DEVICES only*

**Menu operation (single display device):**

All adjustments are made via the three front mounted buttons.

Press the "MENU" button repeatedly until the desired setting is reached, press "SELECT" to display the current value of the selected parameter, or sub menu (if applicable).

The "+" and "-" buttons are used to change the value.

"ENTER" will return the device to the menu.

The "BACK" button will exit the menu.

**Menu operation (dual display device):**

Press the menu "⌂" button repeatedly until the desired setting is reached.

The "▲" and "▼" buttons are used to change the value.

"⌂" will display the next menu item.

To exit the menu hold "⌂" button for 3 seconds.

**Menu options:**

Exit the menu before making the following adjustments.

**Lock / unlock parameters:****(default: unlocked)**

Press "BACK" ("▼"), then "ENTER" ("⌂") and hold the 2 buttons until the desired option is displayed.

The display cycles between "Loc" (no changes allowed) & "u.Loc" (parameters may be adjusted)

**Full / reduced menu (default: Full)**

Press "SELECT" ("▲"), then "ENTER" ("⌂") and hold the 2 buttons until the desired option is displayed.

The display cycles between "rEdu" (limited menu) & "Full" (all parameters are accessible)

**Access Code: (default: no code)**

Once the above options have been set as required, Press "BACK" and "SELECT" ("▼" and "▲") simultaneously until "CODE" is displayed.

Now use the "+" & "-" ("▲" and "▼") to enter a code.

Once a code is entered, access to the options above is not permitted.

To clear the code, re-enter the same code again.

If the code is forgotten. Press and hold "+" & "-" ("▲" and "▼") until "CODE" is displayed while re-applying power to the device.

**Please Note ( for 1 and 2 relay devices ONLY):**

- As a power saving feature, the display dims if settings are not being made.
- Even though the device seems to operate correctly, the relay(s) will not energise if the input voltage is below the operating voltage.

**12 Month guarantee:**

Our product is guaranteed for a 12 (twelve) month period from date of purchase. This guarantee is valid for defects arising from failure during specified conditions. This guarantee does not cover damage due to abuse, tampering or improper installation. Our company does not accept liability for any consequential damage or loss arising from product malfunction. Should this product prove to be defective, kindly return for inspection or repair.

**Relay specifications:**

Contact rating: 10A 250 VAC 2500VA

Mechanical life: 30 million operations

Electrical life: 250 000 operations (at maximum load)

