**RMS Mors Smitt**
A Wabtec Company

Features

- Large graphics display panel
- Instantaneous voltage display
- 20 to 130V PU setting range
- 0.1V setting resolution
- Adjustable pick up & drop out
- Adjustable reset time delay
- 63.5/110V AC nominal inputs
- Four independent voltage stages & output trip contacts
- Independent definite time delay per voltage stage
- Timing & trip indication LED's
- Relay enable input
- CPU watchdog
- Undervoltage blocking function
- Wide auxiliary supply range with fail alarm contact
- Size 4M56-S draw out case
- Made in Australia

COMMUNICATION

- USB front programming port
- Non platform specific PC programming software: uMATRIXwin
- Optically isolated network communication ports
- MODBUS RTU compatible network protocol

Applications

UNDERVOLTAGE LOAD SHEDDING

MOTOR UNDERVOLTAGE PROTECTION

COGENERATION SCHEMES

AUTOMATIC TRANSFER SCHEMES

TRANSFORMER VOLTAGE SUPERVISION
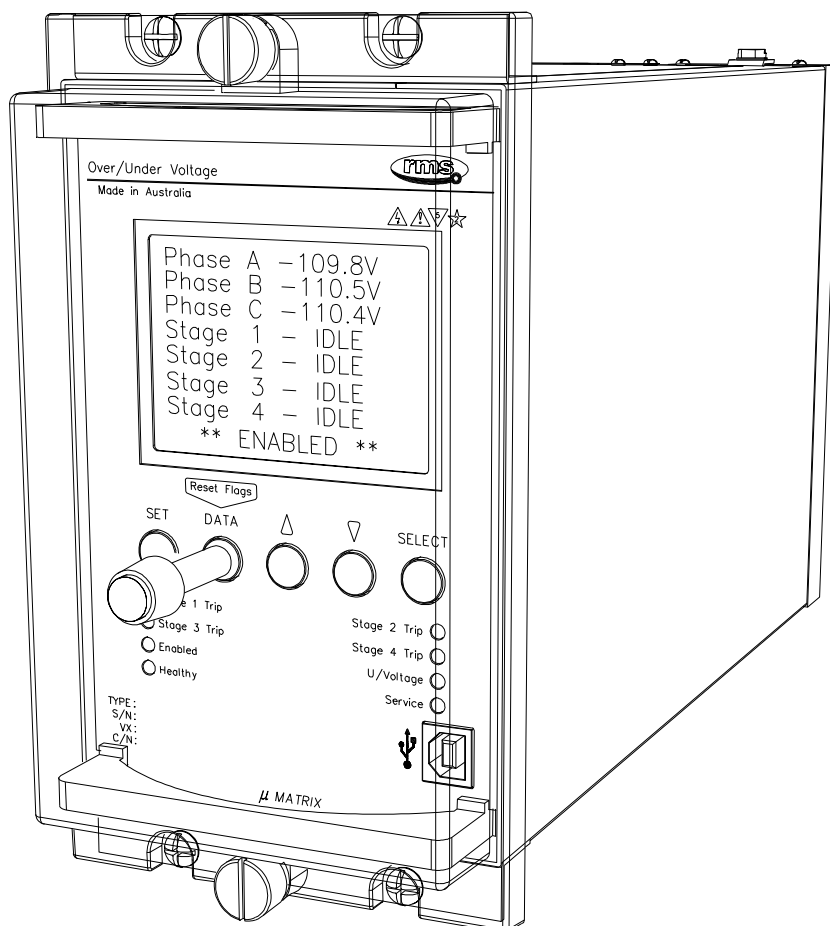
2V67-S depicted in a 4M56-S draw out case

Description

Made in Australia

The 2V67 Series relay is a three pole voltage monitoring relay with four stages of adjustable voltage pick up & drop out points. Each voltage set point can be set for under or overvoltage operation & has an independent time delay driving an output relay. An undervoltage lockout is used to disable the four voltage outputs when the voltage falls below a preset level. A single status input is used to enable the four voltage sensing stages.

The 2V67 relay is built on the Micro MATRIX digital platform. The standard Micro MATRIX human machine interface (HMI) is combined with fully solid-state voltage sensing & measuring circuitry to provide high accuracy, simple set up & flexible operation. Self-monitoring is carried out by hardware & software watchdogs. A CPU software watchdog records abnormal events & performs automatic periodic checks High speed, high contact rating output relays are used.

UNDER VOLTAGE LOAD SHEDDING

Under voltage may be caused by system over loading. The 2V67 may be used as an Under Voltage relay to provide load shedding of non-essential loads to aid in the restoration of nominal system voltage. The 2V67 is capable of providing up to four stages of progressive load shedding. Appropriate time delays are employed on load shedding schemes to prevent operation during transient system voltage excursions.

MOTOR UNDER VOLTAGE PROTECTION

Motors that are subjected to prolonged unbalanced supply voltages or single phasing will overheat. Motors that are subjected to balanced under voltages below about 80% may stall and lead to excessive winding currents. In both circumstances winding deterioration or failure may occur unless the motors are disconnected. The Under Voltage elements in the 2V67 may be used to trip out the motor or prevent attempted motor starts during these system voltage conditions. Appropriate time delays are employed to prevent operation during transient system voltage excursions.

If the system supply to a group of motors is lost, under voltage protection may be applied to ensure each of the motor circuit breakers or contactors are tripped so that on restoration of the main supply, it is not overloaded by the simultaneous starting of all the motors.

COGENERATION SCHEMES

At the interface between the utility and the cogenerator, under voltage relays are installed to provide an operating window for the cogenerator. During fault conditions where the generator may form an island and there are generation and load mismatches the associated system voltage may contravene code requirements and also lead to overloading of the generator. The under voltage elements in the 2V67 can be applied to detect these under voltage conditions and disconnect the generator. Appropriate time delays are employed to prevent operation during transient system voltage excursions and avoid unnecessary disconnection of the generator.

At the utility feeder circuit breaker to prevent the circuit breaker closing onto an islanded generator some form of voltage blocking is generally called for. A check for the presence of voltage on the load side of the utility feeder circuit breaker will confirm the presence of a generator island. The 2V67 can be applied to provide voltage blocking.

AUTOMATIC TRANSFER SCHEMES

Automatic transfer schemes can be applied to initiate changeover from a 'normal' to an 'alternate' power supply upon loss of the 'normal' supply. The 2V67 under voltage elements can initiate switching after a given time delay. Appropriate time delays should be employed to prevent operation during transient system voltage excursions.

TRANSFORMER VOLTAGE SUPERVISION

The 2V67 may be used to supervise tap changer control schemes and prevent tap changer run away events that may lead to either over voltage or under voltage conditions. Transformer voltage supervision schemes are usually employed with appropriate time delays to cater for tap changer delays and transient system voltage excursions.

TIMING CHARACTERISTICS

The pick up time due to a step change in voltage level is dependant on the start voltage & the applied over (or under), voltage step & the timer setting. Figure 2 & 3 show the relay operate time at the minimum 0.2s delay setting.

The total relay operate time is the combined Basic Timing Characteristic plus the time delay setting.

RESET TIME DELAY

An independent reset time setting (Treset), is provided for each of the four voltage stages which may be employed to emulate an induction disc reset characteristic. Treset may be adjustable between zero & 5s in 0.1s steps.

For instantaneous reset Treset should be set to zero.

When the voltage pick up & drop out points are set very close together it is advisable to set Treset with a small reset delay to avoid timer resetting due to transient voltage fluctuations.

The difference in timing performance is demonstrated in the following figure 1.

It should be noted that once the relay has timed out & the trip output initiated, the voltage element will reset instantaneously when the voltage pick up is reset irrespective of the Treset setting.
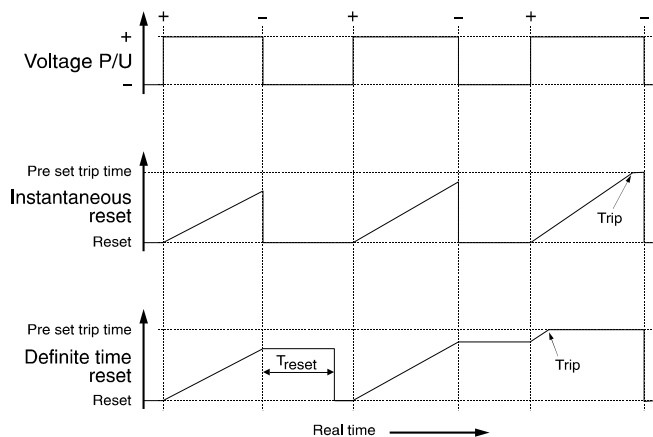

Figure 1

The reset characteristic for the undervoltage lockout function is instantaneous.

Timing Characteristics

TIMING RESPONSE

The following calculation examples provide a guide to determine the actual operate times of the overvoltage, undervoltage & voltage lockout characteristics.

Overvoltage

Overvoltage Set Point	121 V
Start voltage:	110V
Over voltage step:	132 V

Applied Over Volts = $\dfrac{Overvoltage\ Step}{Overvoltage\ SetPoint} = \dfrac{132}{121}$ = **109 %**

Start Volts = $\dfrac{Start\ Voltage}{Overvoltage\ Set\ Point} = \dfrac{110}{121}$ = **91 %**

From Over Voltage characteristics curves – refer figure 2:

Timer setting	2V67 response time
0.2 s	0.235 s

The relay operate time for other time delay settings may be determined by the following calculation:

Timer Setting – 0.2s + 2V67 response time as per figure 2

e.g. For a 2s time delay setting: *2 – 0.2 + 0.235 = 2.035s*

Undervoltage

Undervoltage Set Point	105 V
Start voltage:	110V
Undervoltage step:	88 V

Applied Under Volts = $\dfrac{Undervoltage\ Step}{Undervoltage\ SetPoint} = \dfrac{88}{105}$ = **84 %**

Start Volts = $\dfrac{Start\ Voltage}{Undervoltage\ SetPoint} = \dfrac{110}{105}$ = **105 %**

From Under Voltage characteristics curves – refer figure 3:

Timer setting	2V67 response time
0.2 s	0.185 s

The relay operate time for other time delay settings may be determined by the following calculation:

Timer Setting – 0.2s + 2V67 response time as per figure 3

e.g. For a 2s time delay setting: *2 – 0.2 + 0.185 = 1.985s*

Undervoltage Lock Out

Lock Out Set Point	20 V
Start voltage:	110 V
Undervoltage step:	0 V

Applied Under Volts = $\dfrac{Undervoltage\ Step}{LockOut\ SetPoint} = \dfrac{0}{20}$ = **0 %**

Start Volts = $\dfrac{Start\ Voltage}{LockOut\ SetPoint} = \dfrac{110}{20}$ = **550 %**

From Undervoltage LockOut characteristics curves – refer figure 4:

Lockout response time = 0.18 seconds

2V67-S TIMING - OVERVOLTAGE CHARACTERISTICS - 0.2sec Delay Timer - Figure 2

2V067-S TIMING - UNDERVOLTAGE CHARACTERISTICS - 0.2sec Delay Timer - Figure 3

2V067-S - UNDERVOLTAGE LOCKOUT CHARACTERISTICS - Figure 4
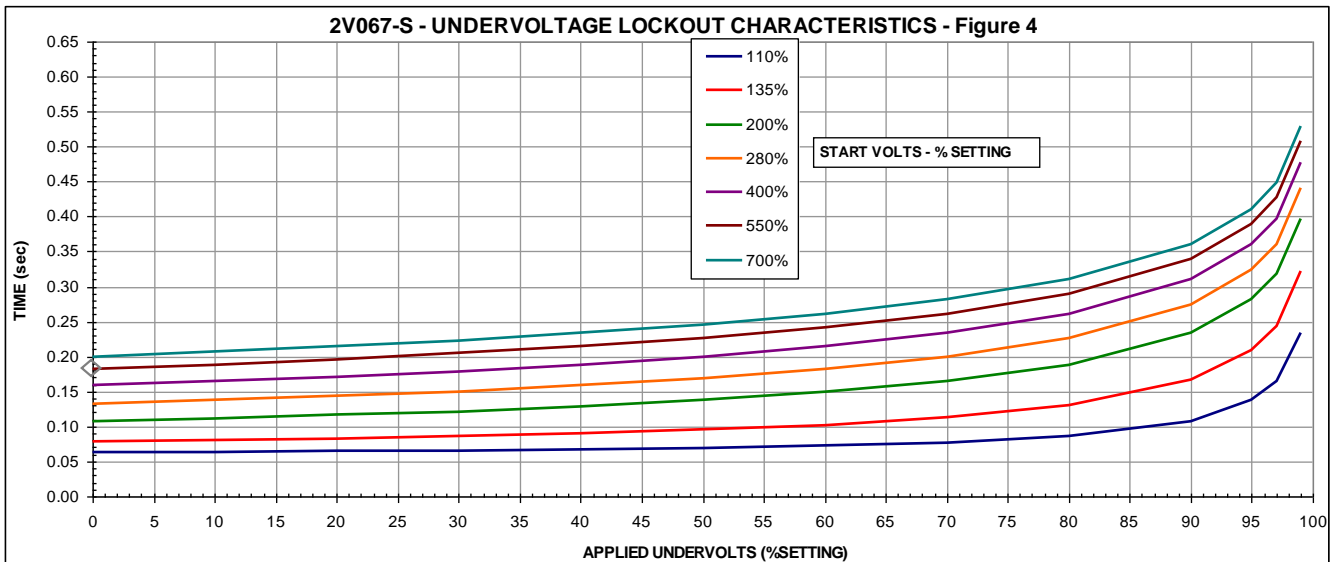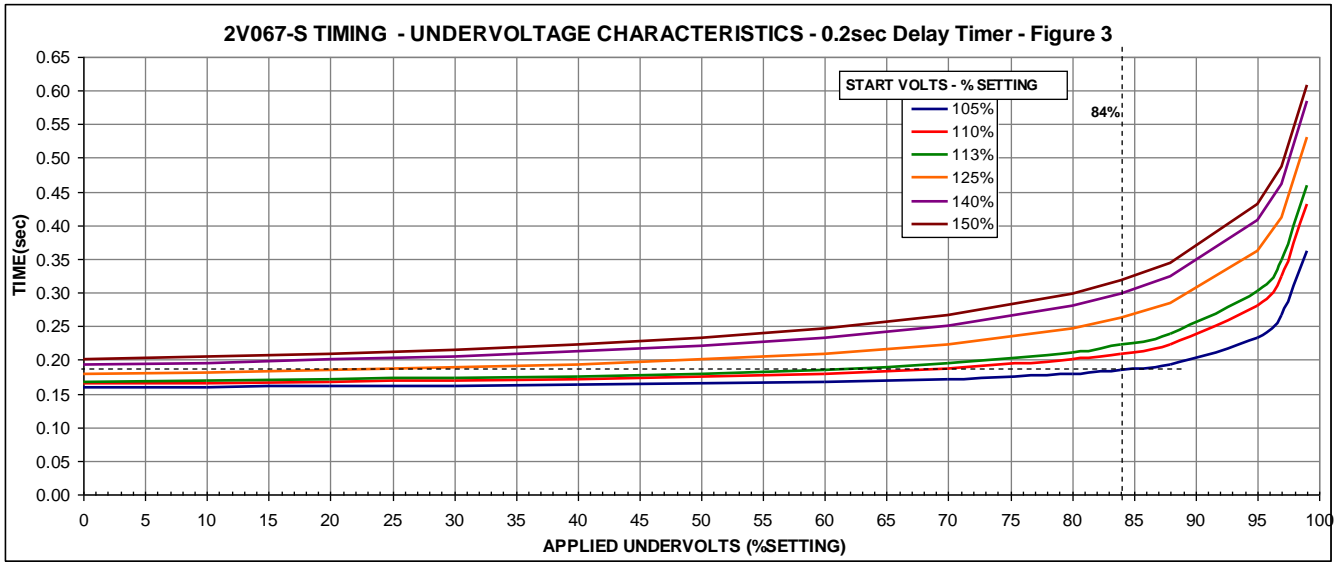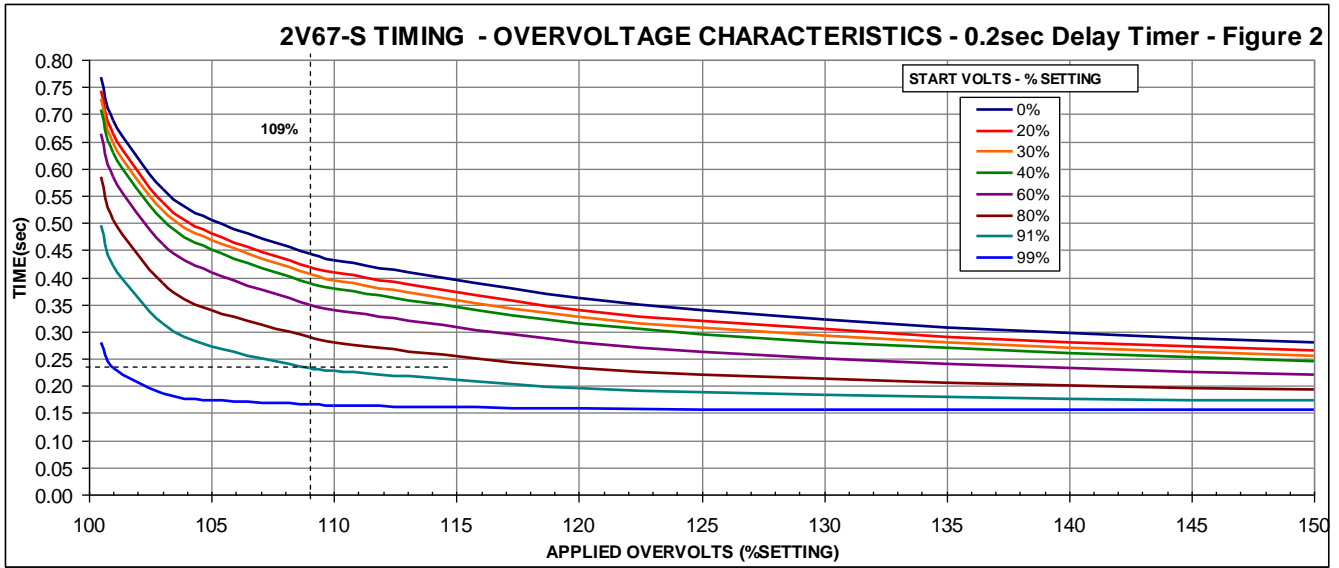
SENSING INPUT

Nominal VT sensing input:	3 phase 63.5 & 110V AC
Sensing supply burden:	Less than 0.2VA
Thermal rating:	300V continuous

VOLTAGE SET POINTS

Setting stages:	4 independent stages
Setting range:	20 to 130V in 0.1V steps
Hysteresis:	0.2 to 5V in 0.1V steps
Overvoltage function:	PU at set point
	DO at set point – hysteresis
Undervoltage function:	PU at set point
	DO at set point + hysteresis
Undervoltage lockout:	11 to 90V in 0.1V steps

VOLTAGE MEASUREMENT ACCURACY

Precision of voltage setting:	0.1V steps
Voltage pick up repeatability:	+/-0.15V from 90 to 120V
Voltage display:	4 digits from 10 to 145V
Resolution of voltage display:	0.1V
Accuracy of displayed voltage:	+/-0.15V

TIME SETTING RANGE

Separate time range for each of the four voltage stage set points. Tset from 0.2s to 320s in 0.1s steps.

RELAY ENABLE STATUS INPUT

The status input on the 2V67 is used to enable the four voltage monitoring stages of the relay. The relay must be "enabled" in order for the time delay stages to operate. A front panel LED is illuminated red when the relay is disabled.

STATUS INPUT FUNCTION

The status input function is factory set for the relay to be enabled on the application of a control voltage. It is also possible for the status input to operate on the removal of a control voltage by simply changing a software flag in the PC setup program.

STATUS INPUT MINIMUM OPERATING CURRENT

10 mA P/U for 1 ms then reducing to1.5 mA after 4 ms.

STATUS INPUT OPERATING TIME

Initiate input	Parameter	Delay
DC	P/U	<4 ms
	D/O	<16 ms
AC	P/U	<23 ms
	D/O	<33 ms

Table 1

AUXILIARY SUPPLY

20-70V DC switchmode supply or
40-275V AC / 40-300V DC switchmode supply
Burden: Less than 7 watts at during timing

Inputs:
A high efficiency switchmode power supply is incorporated which provides a low burden to the auxiliary supply.

Input Transients:
Withstands multiple high-energy transients & ring waves in accordance with IEEE28 - ANSI C26.1 Cat. II, accordingly:
- 0.5uS 100kHz   6kV O/C, 500A S/C, 4J
- 1.2/50uS   6kV O/C
- 8/20uS   3kA S/C, 80J clamped at 1,000V

Mains conducted EMI within limits specified by AS 3548 Class B.

Isolation:
The inputs are isolated from the outputs in accordance with AS3260 Class II Limited Current Circuitry, accordingly:
- Withstand voltage of 2.5kV RMS 50Hz for one minute
- Creepage & clearance distance greater than 4mm
- Output leakage current less than 0.25A to earth

Output Protection:
Outputs will withstand continuous short circuit. Output regulators & switching control regulator are thermally protected.

OUTPUT CONTACTS

4 C/O self reset: 1 for each time delayed voltage output stage
1 C/O self reset: Undervoltage blocking alarm
1 C/O self reset: Relay enabled indication
1 C/C self reset: Power supply fail / CPU watchdog alarm

OUTPUT CONTACT RATINGS   IEC60255-0-2

Carry continuously	5A AC or DC	
Make & carry	0.5 s 20 A AC or DC	
L/R ≤ 40ms & V ≤ 300V	0.2 s 30 A AC or DC	
	AC resistive	1,250 VA
Break capacity	AC inductive	250 VA @ PF ≤ 0.4
I ≤ 5A & V ≤ 300V	DC resistive	75 W
	DC inductive	30 W @ L/R ≤ 40 ms
		50 W @ L/R ≤ 10 ms
Minimum number of operations	10^6 at maximum load	
Minimum recommended load	0.5W limit 10mA / 5 V	

RELAY FAIL ALARM

A C/O alarm contact is maintained in the energized state when all of the following conditions are met:

- The auxiliary supply is applied
- The internal 24V DC rail is within acceptable limits
- The CPU hardware watchdog maintains a pulsing output

A CPU software watchdog records "suspect" events to an assert register and if necessary performs a soft restart.

CASE

4M56-S   Size 4 draw out with 56 M4 screw terminals
Mounting   Flush panel or 4U high 1/4 width 19 inch rack mount

ACCESSORIES SUPPLIED

1 x M4 self threading mounting screw kit	P/N 290-406-151
2 x M4 terminal screw kit (28 per kit)	P/N 290-407-153

1 x uMATRIX User Guide per order
1 x CD - uMATRIXwin software, setting files & applications per order

TRANSIENT OVERVOLTAGE   IEC60255-5 CLASS III

Between all terminals & earth	5 kV 1.2/50 us 0.5 J
Between independent circuits without damage or flashover	5 kV 1.2/50 us 0.5 J

INSULATION COORDINATION   IEC60255-5 CLASS III

Between all terminals & earth	2.0 kV rms for 1 min.
Between independent circuits	2.0 kV rms for 1 min.
Across normally open contacts	1.0 kV rms for 1 min.

AUXILIARY SUPPLY   IEC60255-11

Allowable breaks / dips in supply Collapse to zero from nominal voltage	≤ 20 ms

HIGH FREQUENCY DISTURBANCE   IEC60255-22-1 CLASS III

2.5 kV 1MHz common mode 1.0 kV 1MHz differential mode	≤ 3% variation

ELECTROSTATIC DISCHARGE   IEC60255-22-2 CLASS III

6 kV contact discharge	≤ 5% variation

FAST TRANSIENT   IEC60255-22-4

4 kV, 5/50 ns, 100 KHz repetitive	≤ 3% variation

TEMPERATURE RANGE

Operating:	-5 to +55°C
Storage:	-25 to +75°C

HUMIDITY   IEC68-2-1/2

40 °C & 95% RH non condensing

RELAY CONFIGURATION USING μMATRIXwin

The purpose of the μMATRIXwin application is to provide display, configuration and diagnostic facilities required to support the entire family of μMATRIX digital relays. The prime functions of the application are:

Create a setting file off line
To create & view relay setting files at your PC without the need for a relay;

Relay setting
To down load a setting file (UMP) into a relay connected to a PC;

To display & change settings in a connected relay;

Relay status
To display the Status of nominated inputs and outputs of a connected relay;

Commissioning
To export reports of setting parameters & status screen to confirm correct functionality during commissioning;

Upgrade relay software
To configure a μMATRIX relay for a specific customer application;

To upgrade the operational software (UMX) of a μMATRIX relay;

All current UMX software applications may be downloaded from:

https://www.morssmitt.com/product-categories/400833/umatrix-platform-downloads-page

Maintenance
To provide utility and diagnostic facilities at a technical level.

COMMUNICATION PORTS

Two (2) communications ports are available. The front USB programming port is provided as standard while the rear RS485 network port is available as an option.

Programming port
The programming port is accessible from the front panel of the relay via a USB physical link & PC configuration program supplied with the relay. The μMATRIXwin configuration program is designed to operate with all relays from the μMATRIX range & with all installed firmware version.

Network port
The network port is intended for applications where permanent connection to a master control system is required. An optically isolated RS485 physical layer is provided for this function.

The RS485 connection is intended for applications where multiple μMATRIX relays are to be connected on a common communications bus.

Network Port Terminating Resistor
Where multiple relays are connected in a multi-drop configuration the RS485 comms. bus must have a 120 ohm terminating resistor fitted at each end. If the μMATRX-S relay is at one end of the transmission line a terminating resistor can be added by placing SW100-3 and SW100-4 in the ON position as depicted in the wiring diagram.

Network Port BIAS Resistors
Where a single relay is connected to the network, or where the relay is a long distance from other devices on the comms. bus, BIAS resistors may need to be fitted to ensure reliable operation. To simplify this configuration, BIAS resistors are fitted to each μMATRIX-S relay and may be selected IN by setting switches SW100-1 and SW100-2 to the ON position as depicted in the wiring diagram. This bank of four switches can be accessed by withdrawing the relay module from it's case, turning upside down and looking at the centre PCB near the rear terminal blocks.

PC TO μMATRIX USB CONNECTION
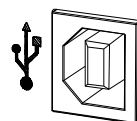
2V164-S front panel USB programming port

USB DRIVERS

The uMATRIX-S USB port is configured as a Virtual Communications Port (VCP) & is operated through a PC COM port. USB drivers must be installed on the PC to enable correct communication. A ZIP file containing the driver files needed for this process may be downloaded from:

https://www.morssmitt.com/product-categories/400833/umatrix-platform-downloads-page

Size 4M56-S
draw out case
Drawing units: mm

Suits flush panel mounting &
4U high 19 inch rack frame

| Front view | Side view | Terminal layout | Panel cut out |

Case Earth

4M56 Case terminations (REAR VIEW)

Ordering Information

Generate the required ordering code as follows: e.g. 2V67-S-BDDAA

General Type	Order Code				
	1	**2**	**3**	**4**	**5**
2V67-S -					

1 AUXILIARY SUPPLY RANGE

A 20-70V DC   B 40-275V AC (300V DC)

2 RELAY INITIATE INPUT

A 24-80V AC/DC   B 80-150V AC/DC
C 150-275V AC (300V DC) D 18-275V AC (300V DC)

3 REMOTE FLAG RESET INPUT

A 24-80V AC/DC   B 80-150V AC/DC
C 150-275V AC (300V DC) D 18-275V AC (300V DC)

! VOLTAGE INPUTS

A 3 Pole Version   B 1 Pole Version

5 REAR COMMUNICATIONS PORT

A Not required
B Required – Modbus protocol

REQUEST DEFAULT APPLICATION SOFTWARE

A UMX2V067A 3 phase 4 stage under / over voltage
H UMX2V067H 1 phase 4 stage under / over voltage

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*Note: The status inputs & some relay outputs are assigned by the software (UMX) loaded on the relay.

Shown here are the standard assignments of the A UMX. Other UMX versions may differ. Consult the UMX data sheets for specific I/O assignments.

2V67 wiring diagram - Relay shown in de-energised condition

Visit www.morssmitt.com/rms for the latest product information.

www.morssmitt.com/rms