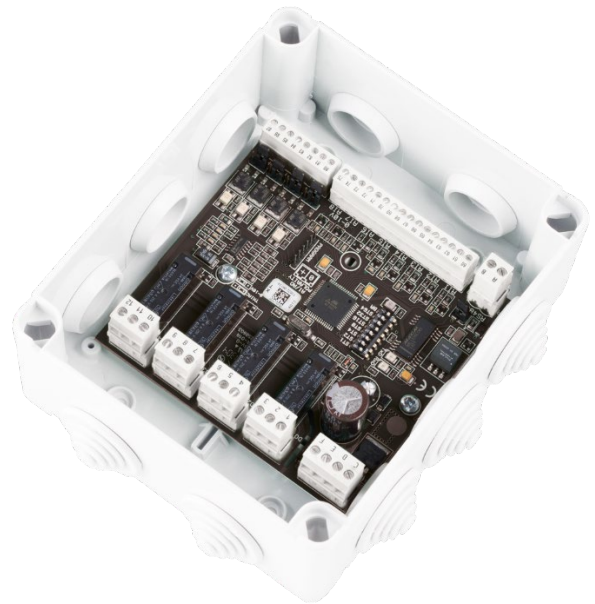
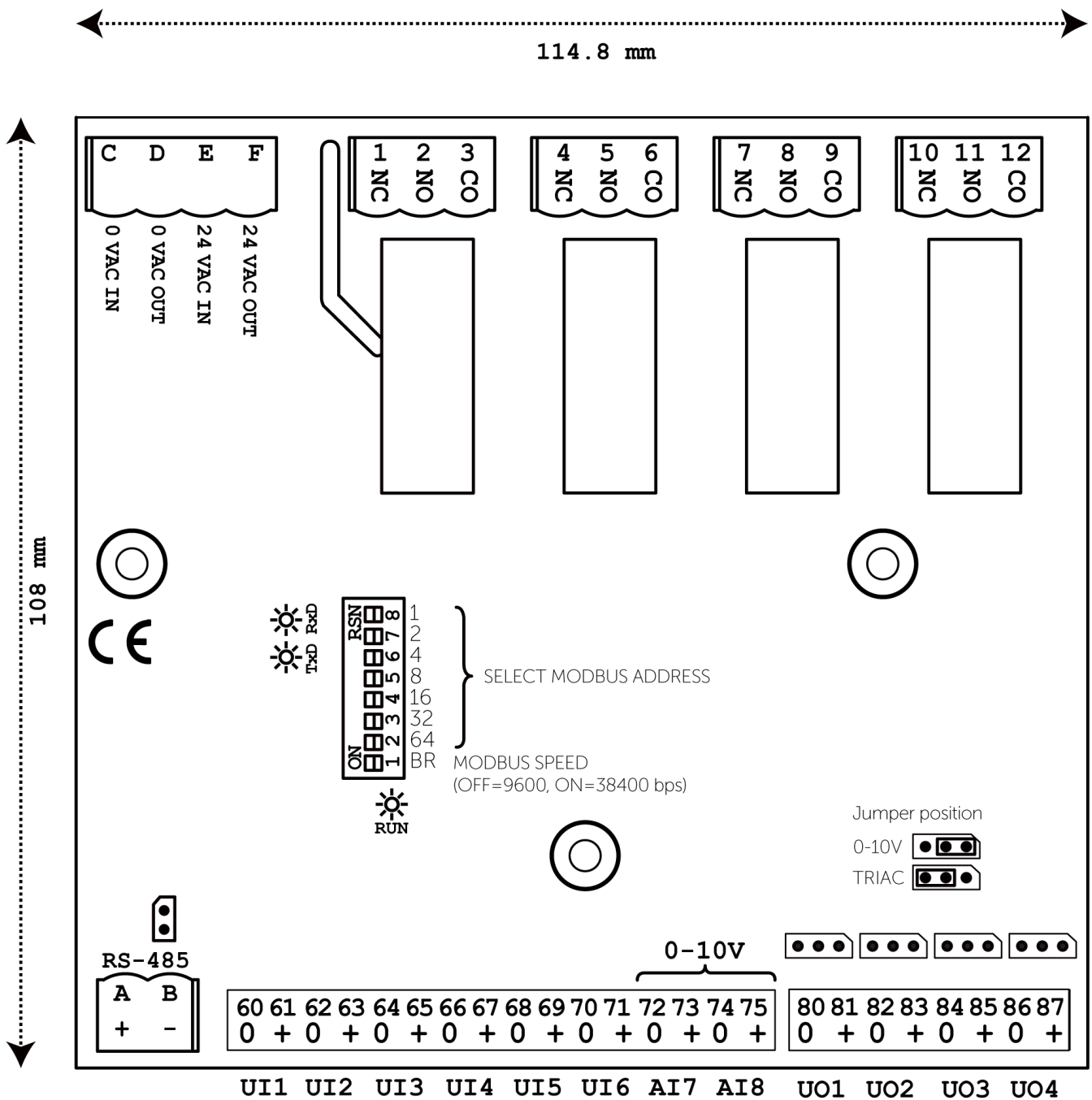


# multi-16 generic I/O software (16/32 bits)



|                          |  |   |
|--------------------------|--|---|
| Module:                  | multi-16   |   |
| Software:                | Universal I/O  |   |
| Name:                    | Universal I/O  |   |
| Version:                 | 1.36   |   |
| Built:                   | 2022-03-22   |   |
| Communication:           |  |   |
| Protocol and parameters: | Serial Modbus RTU over RS485, 8 databits, no parity, 1 stop-bit  |   |
| Speed:                   | 9600 or 38400 bps  |   |
|                          | <i>Dip-switch #1 (marked "BR") on the PCB ON = 38400 bps</i>   |   |
|                          | <i>Dip-switch #1 (marked "BR") on the PCB OFF = 9600 bps</i>   |   |
| Wiring:                  | Screw-connectors marked "A" (+) and "B" (-)  |   |
|                          | Communication channel is not galvanically isolated   |   |
| Address:                 | Modbus address is set using DIP-switches 2..8. They each represent a binary value as indicated on the schedule on the next page. The address range is from 1 to 127. |   |
| Power supply:            | 24 Volt DC or AC (16-26 VAC)   |   |
| Connections:             | Screw-terminal connectors C or D = 0 V   |   |
|                          | Screw-terminal connectors E or F = 24 V  |   |
|                          | Dual screw-terminals to enable easy daisy-chaining of the power supply.  |   |
| I/O connections:         |  |   |
| Inputs:                  | 60,61  | DI / Temperature (NTC10) / Resistance / 10k Potentiometer |
|                          | 62,63  | DI / Temperature (NTC10) / Resistance / 10k Potentiometer |
|                          | 64,65  | DI / Temperature (NTC10) / Resistance / 10k Potentiometer |
|                          | 66,67  | DI / Temperature (NTC10) / Resistance / 10k Potentiometer |
|                          | 68,69  | DI / Temperature (NTC10) / Resistance / 10k Potentiometer |
|                          | 70,71  | DI / Temperature (NTC10) / Resistance / 10k Potentiometer |
|                          | 72,73  | Voltage measurement (0..10V)                              |
|                          | 74,75  | Voltage measurement (0..10V)                              |
| Analogue outputs:        | 80,81  | AO1 output (0..10V or TRIAC, selectable with jumper)      |
|                          | 82,83  | AO2 output (0..10V or TRIAC, selectable with jumper)      |
|                          | 84,85  | AO3 output (0..10V or TRIAC, selectable with jumper)      |
|                          | 86,87  | AO4 output (0..10V or TRIAC, selectable with jumper)      |
| Relays:                  | 1,2,3  | Relay 1 / DO1 (NC, NO, COMMON)                            |
|                          | 4,5,6  | Relay 2 / DO2 (NC, NO, COMMON)                            |
|                          | 7,8,9  | Relay 3 / DO3 (NC, NO, COMMON)                            |
|                          | 10,11,12   | Relay 4 / DO4 (NC, NO, COMMON)                            |



Input channels 1..6 (60..71) can measure resistance, or be used as digital indication inputs.

Input channels 7 and 8 (72..75) can measure voltage input signals.

Analogue outputs 1..4 can send out 0..10V voltage signals, or PWM signals (TRIAC only available when the module is powered with AC current). The selection of the output signal is done by setting the corresponding jumper of each channel to the right position as indicated on the schedule above, right above connectors 80..87 (left position=TRIAC, right position=0..10V).

#### Measurements:

The multi-16 will provide all available measurement values at the same time (see register description). This means that you have to select the right registers to read from, while ignoring the "faulty" values in the other registers linked to the same input.

#### Modbus registers:

All registers are Holding registers and can be polled / written to using Modbus commands 3 (read), 6 (write single), or 16 (write multiple).

|       |  |
|-------|--|
| Reg8  | Potentiometer AI1 (-100%..100%)                                  |
| Reg9  | Potentiometer AI2 (-100%..100%)                                  |
| Reg10 | Potentiometer AI3 (-100%..100%)                                  |
| Reg11 | Potentiometer AI4 (-100%..100%)                                  |
| Reg12 | Potentiometer AI5 (-100%..100%)                                  |
| Reg13 | Potentiometer AI6 (-100%..100%)                                  |
| Reg14 | Resistance AI1 (Ohm)   |
| Reg15 | Resistance AI2 (Ohm)   |
| Reg16 | Resistance AI3 (Ohm)   |
| Reg17 | Resistance AI4 (Ohm)   |
| Reg18 | Resistance AI5 (Ohm)   |
| Reg19 | Resistance AI6 (Ohm)   |
| Reg20 | Temperature AI1 (NTC10 - °C * 100)                               |
| Reg21 | Temperature AI2 (NTC10 - °C * 100)                               |
| Reg22 | Temperature AI3 (NTC10 - °C * 100)                               |
| Reg23 | Temperature AI4 (NTC10 - °C * 100)                               |
| Reg24 | Temperature AI5 (NTC10 - °C * 100)                               |
| Reg25 | Temperature AI6 (NTC10 - °C * 100)                               |
| Reg26 | Voltage measurement AI7 (0..10V * 100)                           |
| Reg27 | Voltage measurement AI8 (0..10V * 100)                           |
| Reg28 | AO-output 1 (Register value 0..10 000 → 0..10V or 0..100%)       |
| Reg29 | AO-output 2 (Register value 0..10 000 → 0..10V or 0..100%)       |
| Reg30 | AO-output 3 (Register value 0..10 000 → 0..10V or 0..100%)       |
| Reg31 | AO-output 4 (Register value 0..10 000 → 0..10V or 0..100%)       |
| Reg32 | Digital Input 1 (0/1)  |
| Reg33 | Digital Input 2 (0/1)  |
| Reg34 | Digital Input 3 (0/1)  |
| Reg35 | Digital Input 4 (0/1)  |
| Reg36 | Digital Input 5 (0/1)  |
| Reg37 | Digital Input 6 (0/1)  |
| Reg38 | Digital Input off-delay in seconds (used for all digital inputs) |
| Reg39 | Relay 1 control (0/1)  |
| Reg40 | Relay 2 control (0/1)  |
| Reg41 | Relay 3 control (0/1)  |
| Reg42 | Relay 4 control (0/1)  |
| Reg43 | DI-point that controls relay 1 (1..6, 0=n/a)                     |
| Reg44 | DI-point that controls relay 2 (1..6, 0=n/a)                     |
| Reg45 | DI-point that controls relay 3 (1..6, 0=n/a)                     |
| Reg46 | DI-point that controls relay 4 (1..6, 0=n/a)                     |

|             |   |
|-------------|---|
| Reg47       | Relay 1 current status (0/1)                                    |
| Reg48       | Relay 2 current status (0/1)                                    |
| Reg49       | Relay 3 current status (0/1)                                    |
| Reg50       | Relay 4 current status (0/1)                                    |
| Reg51       | DI 1 open/closed selection (0=normally open, 1=normally closed) |
| Reg52       | DI 2 open/closed selection (0=normally open, 1=normally closed) |
| Reg53       | DI 3 open/closed selection (0=normally open, 1=normally closed) |
| Reg54       | DI 4 open/closed selection (0=normally open, 1=normally closed) |
| Reg55       | DI 5 open/closed selection (0=normally open, 1=normally closed) |
| Reg56       | DI 6 open/closed selection (0=normally open, 1=normally closed) |
| Reg64+Reg65 | Resistance AI1 (Ohm - 32 bit - 64=MSB, 65=LSB)                  |
| Reg66+Reg67 | Resistance AI2 (Ohm - 32 bit - 66=MSB, 67=LSB)                  |
| Reg68+Reg69 | Resistance AI3 (Ohm - 32 bit - 68=MSB, 69=LSB)                  |
| Reg70+Reg71 | Resistance AI4 (Ohm - 32 bit - 70=MSB, 71=LSB)                  |
| Reg72+Reg73 | Resistance AI5 (Ohm - 32 bit - 72=MSB, 73=LSB)                  |
| Reg74+Reg75 | Resistance AI6 (Ohm - 32 bit - 74=MSB, 75=LSB)                  |

Arranged per I/O, this same register table looks like this:

#### Input Channel 1:

|             |   |
|-------------|---|
| Reg8        | Channel 1 Potentiometer (-100%..100%)                                       |
| Reg14       | Channel 1 Resistance (Ohm)  |
| Reg20       | Channel 1 Temperature (NTC10 - °C * 100)                                    |
| Reg32       | Channel 1 Digital Input Status (0/1)  |
| Reg51       | Channel 1 Digital Input type selection (0=normally open, 1=normally closed) |
| Reg64+Reg65 | Channel 1 Resistance (Ohm - 32 bit - 64=MSB, 65=LSB)                        |

Connection: Resistance is measured between 60 and 61

#### Input Channel 2:

|             |   |
|-------------|---|
| Reg9        | Channel 2 Potentiometer (-100%..100%)                                       |
| Reg15       | Channel 2 Resistance (Ohm)  |
| Reg21       | Channel 2 Temperature (NTC10 - °C * 100)                                    |
| Reg33       | Channel 2 Digital Input Status (0/1)  |
| Reg52       | Channel 2 Digital Input type selection (0=normally open, 1=normally closed) |
| Reg66+Reg67 | Channel 2 Resistance (Ohm - 32 bit - 66=MSB, 67=LSB)                        |

Connection: Resistance is measured between 62 and 63

#### Input Channel 3:

|             |   |
|-------------|---|
| Reg10       | Channel 3 Potentiometer (-100%..100%)                                       |
| Reg16       | Channel 3 Resistance (Ohm)  |
| Reg22       | Channel 3 Temperature (NTC10 - °C * 100)                                    |
| Reg34       | Channel 3 Digital Input Status (0/1)  |
| Reg53       | Channel 3 Digital Input type selection (0=normally open, 1=normally closed) |
| Reg68+Reg69 | Channel 3 Resistance (Ohm - 32 bit - 68=MSB, 69=LSB)                        |

Connection: Resistance is measured between 64 and 65

**Input Channel 4:**

|             |   |
|-------------|---|
| Reg11       | Channel 4 Potentiometer (-100%..100%)                                       |
| Reg17       | Channel 4 Resistance (Ohm)  |
| Reg23       | Channel 4 Temperature (NTC10 - °C * 100)                                    |
| Reg35       | Channel 4 Digital Input Status (0/1)  |
| Reg54       | Channel 4 Digital Input type selection (0=normally open, 1=normally closed) |
| Reg70+Reg71 | Channel 4 Resistance (Ohm - 32 bit - 70=MSB, 71=LSB)                        |

Connection: Resistance is measured between 66 and 67

**Input Channel 5:**

|             |   |
|-------------|---|
| Reg12       | Channel 5 Potentiometer (-100%..100%)                                       |
| Reg18       | Channel 5 Resistance (Ohm)  |
| Reg24       | Channel 5 Temperature (NTC10 - °C * 100)                                    |
| Reg36       | Channel 5 Digital Input Status (0/1)  |
| Reg55       | Channel 5 Digital Input type selection (0=normally open, 1=normally closed) |
| Reg72+Reg73 | Channel 5 Resistance (Ohm - 32 bit - 72=MSB, 73=LSB)                        |

Connection: Resistance is measured between 68 and 69

**Input Channel 6:**

|             |   |
|-------------|---|
| Reg13       | Channel 6 Potentiometer (-100%..100%)                                       |
| Reg19       | Channel 6 Resistance (Ohm)  |
| Reg25       | Channel 6 Temperature (NTC10 - °C * 100)                                    |
| Reg37       | Channel 6 Digital Input Status (0/1)  |
| Reg56       | Channel 6 Digital Input type selection (0=normally open, 1=normally closed) |
| Reg74+Reg75 | Channel 6 Resistance (Ohm - 32 bit - 74=MSB, 75=LSB)                        |

Connection: Resistance is measured between 70 and 71

**Input Channel 7:**

|       |  |
|-------|--|
| Reg26 | Channel 7 Voltage measurement (0..10V * 100) |
|-------|--|

Connection: Voltage signal input to 73 (GND to 72)

**Input Channel 8:**

|       |  |
|-------|--|
| Reg27 | Channel 8 Voltage measurement (0..10V * 100) |
|-------|--|

Connection: Voltage signal input to 75 (GND to 74)

**Common settings:**

|       |  |
|-------|--|
| Reg38 | Digital Input off-delay in seconds (used for all digital inputs) |
|-------|--|

**Analogue Output 1:**

Reg28 AO-output 1 (Register value 0..10 000 → 0..10V or 0..100%)

Connections: 0..10 Volt signal output from 81 (GND from 80)  
 TRIAC: 24VAC PWM (sink) with 24VAC from 81 and 0VAC from 80  
 TRIAC only available when the module is powered with 24 VAC

**Analogue Output 2:**

Reg29 AO-output 2 (Register value 0..10 000 → 0..10V or 0..100%)

Connections: 0..10 Volt signal output from 83 (GND from 82)  
 TRIAC: 24VAC PWM (sink) with 24VAC from 83 and 0VAC from 82  
 TRIAC only available when the module is powered with 24 VAC

**Analogue Output 3:**

Reg30 AO-output 3 (Register value 0..10 000 → 0..10V or 0..100%)

Connections: 0..10 Volt signal output from 85 (GND from 84)  
 TRIAC: 24VAC PWM (sink) with 24VAC from 85 and 0VAC from 84  
 TRIAC only available when the module is powered with 24 VAC

**Analogue Output 4:**

Reg31 AO-output 4 (Register value 0..10 000 → 0..10V or 0..100%)

Connections: 0..10 Volt signal output from 87 (GND from 86)  
 TRIAC: 24VAC PWM (sink) with 24VAC from 87 and 0VAC from 86  
 TRIAC only available when the module is powered with 24 VAC

**Digital Output / Relay 1:**

Reg39 Relay 1 control (0/1)  
 Reg43 DI-point that controls relay 1 (1..6, 0=n/a)  
 Reg47 Relay 1 current status (0/1)

Connections: Common=3, Normally Open=2, Normally Closed=1

**Digital Output / Relay 2:**

Reg40 Relay 2 control (0/1)  
 Reg44 DI-point that controls relay 2 (1..6, 0=n/a)  
 Reg48 Relay 2 current status (0/1)

Connections: Common=6, Normally Open=5, Normally Closed=4

**Digital Output / Relay 3:**

Reg41 Relay 3 control (0/1)  
 Reg45 DI-point that controls relay 3 (1..6, 0=n/a)  
 Reg49 Relay 3 current status (0/1)

Connections: Common=9, Normally Open=8, Normally Closed=7

**Digital Output / Relay 4:**

Reg42 Relay 4 control (0/1)  
 Reg46 DI-point that controls relay 4 (1..6, 0=n/a)  
 Reg50 Relay 4 current status (0/1)

Connections: Common=12, Normally Open=11, Normally Closed=10