

DO4

Digital Output Module (4 intrinsically safe relay outputs)

Summary

The iMAC DO4 module is an Intrinsically Safe (Ex ia I Ma) Digital Output module that provides four (4) general purpose relay outputs.

The relay outputs can be operated directly from the iMAC controller or by programming an input module such as a DI4 module to the same address as the DO4 module, in which case each relay output will respond to the respective input of the DI4 input module.

Multiple DO4 modules can be programmed to the same address, allowing distributed simultaneous control in multiple locations.

Data Register(s)

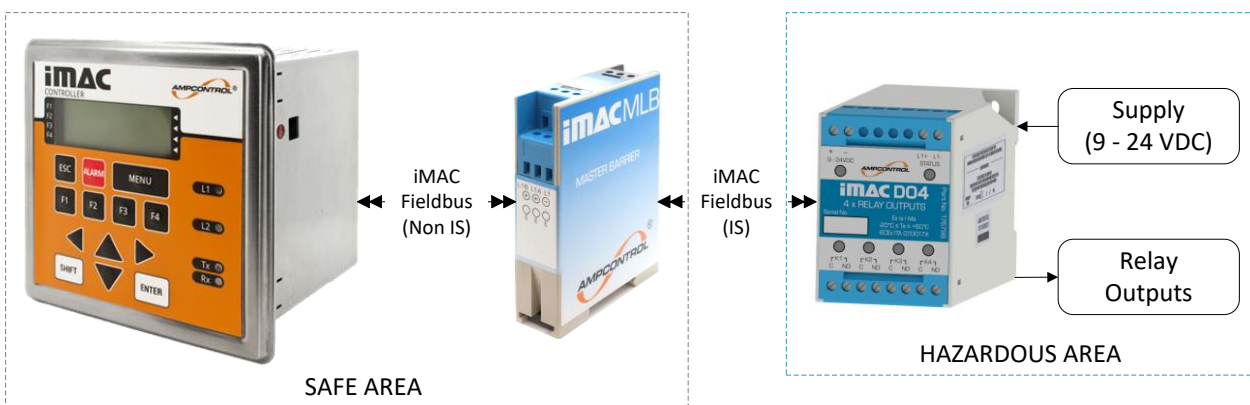
1 (Output)

Features

- Intrinsically Safe Ex ia Group 1 Ma
- 4 normally open relay outputs
- Standard DIN rail mounting
- iMAC Fieldbus electrically isolated
- Power healthy LED
- Multifunction diagnostic status LED
- Individual relay output LEDs
- Remotely configured via the iMAC Controller
- Configurable relay state on loss of fieldbus communications
- Wide power supply operating range



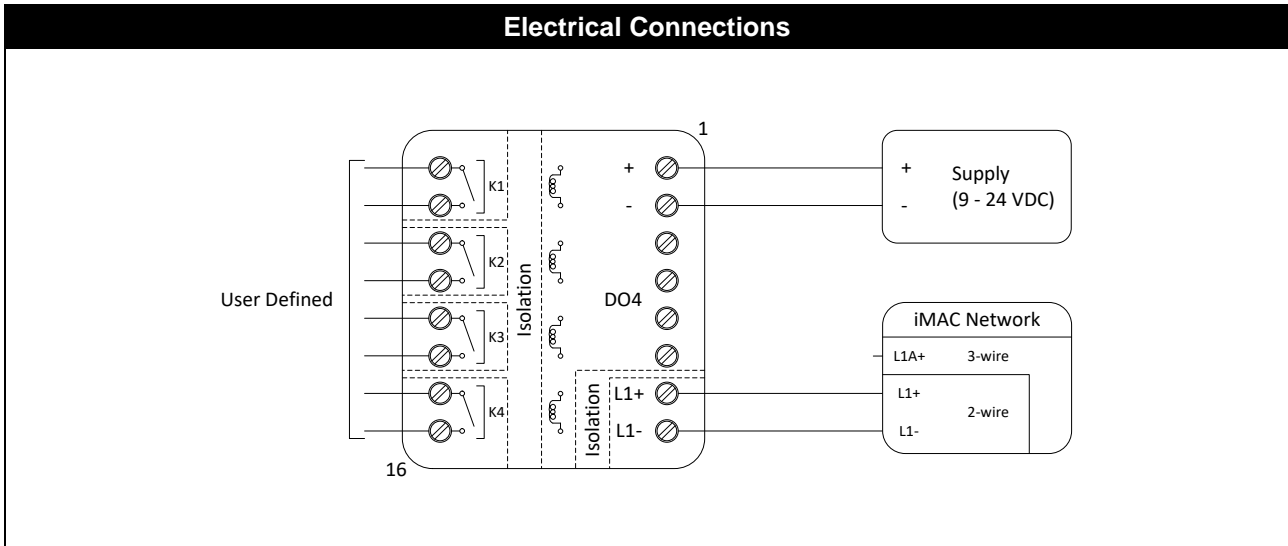
System Overview



CAUTION!



All relays will open (de-energise) on failure of DC power supply, regardless of configuration parameters.



| Terminal | Label | Description | |
|------------|-------|---------------------------------------|--------|
| 1 | DC+ | DC Power Supply Input (9 – 24VDC) | |
| 2 | DC- | | |
| 3, 4, 5, 6 | - | - | |
| 7 | L1+ | iMAC Fieldbus L1 connections (2-wire) | |
| 8 | L1- | | |
| 9 | K1 | Relay Output 1 | Common |
| 10 | | | N/O |
| 11 | K2 | Relay Output 2 | Common |
| 12 | | | N/O |
| 13 | K3 | Relay Output 3 | Common |
| 14 | | | N/O |
| 15 | K4 | Relay Output 4 | Common |
| 16 | | | N/O |

Data Register(s)

| Output Register | | | | |
|-----------------|--------------|-----------|-------|------------|
| Bit | Description | Bit Value | R / W | Invert Bit |
| 15 | - | X | W | - |
| 14 | - | X | W | - |
| 13 | - | X | W | - |
| 12 | - | X | W | - |
| 11 | - | X | W | - |
| 10 | - | X | W | - |
| 9 | - | X | W | - |
| 8 | - | X | W | - |
| 7 | - | X | W | - |
| 6 | - | X | W | - |
| 5 | - | X | W | - |
| 4 | - | X | W | - |
| 3 | K4 (Relay 4) | 0 / 1 | W | 3 (0008h) |
| 2 | K3 (Relay 3) | 0 / 1 | W | 2 (0004h) |
| 1 | K2 (Relay 2) | 0 / 1 | W | 1 (0002h) |
| 0 | K1 (Relay 1) | 0 / 1 | W | 0 (0001h) |

Configuration Parameters

| Output Register Parameters (roll-call name: DO4 Module) | | | | |
|---|---|---------------|---------|-----------|
| No | Description | Range | Default | Notes |
| 1 | Output register address | 1 - 255 | 255 | |
| 2 | Output register invert bits | 0000h – 000Fh | 0000h | See below |
| 3 | De-energize relays on loss of iMAC Fieldbus comms | 0000h – FF0Fh | 0A0Fh | See below |
| 4 | Energize relays on loss of iMAC Fieldbus comms | 0000h – FF0Fh | 0000h | See below |

Parameter Details

Parameter 2: Invert bits - specify whether received output data bits energise or de-energise relay outputs. If invert bit is 0, then corresponding relay output energises when received data bit is a 1 and de-energises when a 0. If invert bit is 1, then corresponding relay output energises when received data bit is a 0 and de-energises when a 1.

| Output Bits Kx (x = 1 to 4) Truth Table | | |
|---|--|--------------|
| Output register – Kx bit value | Output register parameter – Invert bit value | Relay output |
| 0 | 0 (N/O) | De-energised |
| 1 | 0 (N/O) | Energised |
| 0 | 1 (N/C) | Energised |
| 1 | 1 (N/C) | De-energised |

Parameters 3 & 4: specify the time delay and relay output state (energised or de-energised) on loss of iMAC Fieldbus comms.

The high byte of parameter's 3 & 4 specify the time delay following a loss of iMAC Fieldbus comms, from 0 to 51 seconds, in 0.2 second increments.

| Parameter 3 and 4 high byte examples | | |
|--------------------------------------|-----|----------------|
| Hex | Dec | Time Delay (s) |
| 00h | 0 | Instantaneous |
| 01h | 1 | 0.2 s |
| 0Ah | 10 | 2 s |
| 32h | 50 | 10 s |
| FFh | 255 | 51 s |

The low byte of parameter's 3 & 4 specify which relays will be affected following the time delay.

| Parameter 3 and 4 low byte examples | | |
|-------------------------------------|-----|---|
| Hex | Dec | Relays (s) |
| 00h | 0 | No effect (relays remain at last fieldbus communicated state) |
| 01h | 1 | K1 |
| 02h | 2 | K2 |
| 03h | 3 | K2, K1 |
| 04h | 4 | K3 |
| 05h | 5 | K3, K1 |
| 06h | 6 | K3, K2 |
| 07h | 7 | K3, K2, K1 |
| 08h | 8 | K4 |
| 09h | 9 | K4, K1 |
| 0Ah | 10 | K4, K2 |
| 0Bh | 11 | K4, K2, K1 |
| 0Ch | 12 | K4, K3 |
| 0Dh | 13 | K4, K3, K1 |
| 0Eh | 14 | K4, K3, K2 |
| 0Fh | 15 | K4, K3, K2, K1 |

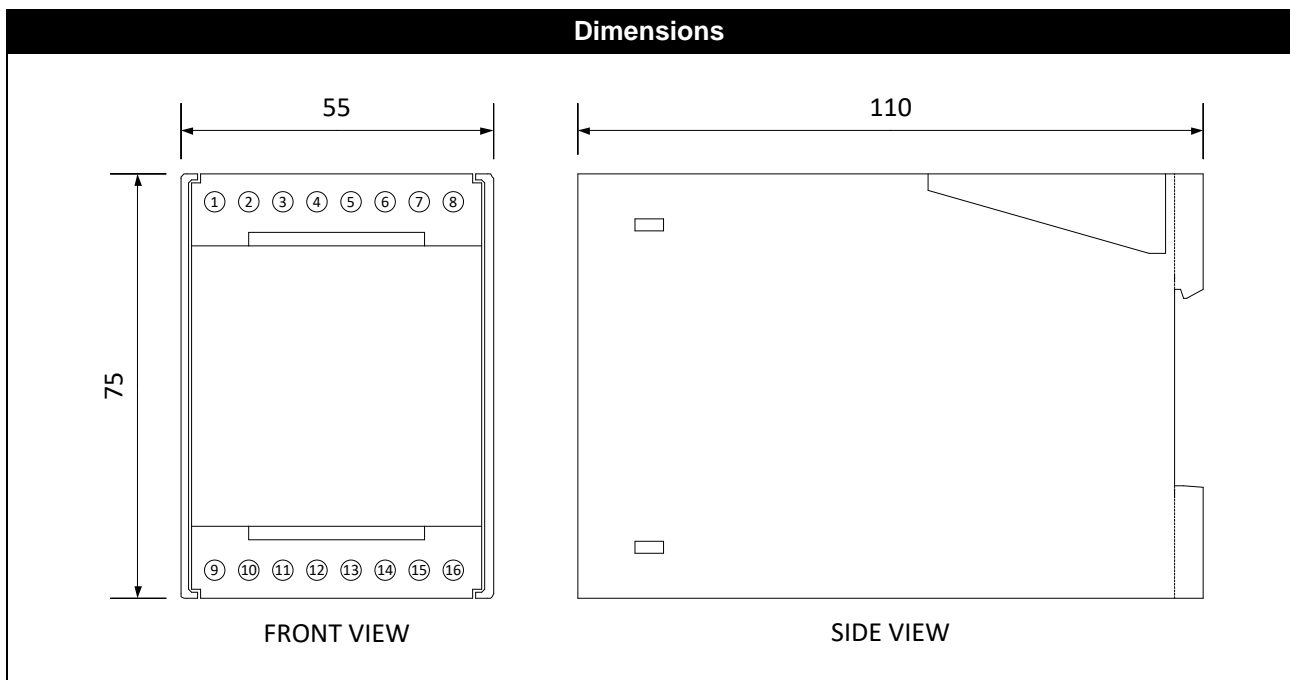
Parameter 3 specifies which relays will de-energise (open contacts) while Parameter 4 specifies which relays will energise (close contacts).

| Parameter 3 examples | | |
|----------------------|----------------|---------------------------|
| Hex | Time Delay (s) | Relays open (De-energise) |
| 0A03h | 2 s | K2, K1 |
| 3201h | 10 s | K1 |
| 010Fh | 0.2 s | K4, K3, K2, K1 |
| Parameter 4 examples | | |
| Hex | Time Delay (s) | Relays close (Energise) |
| 0A01h | 2 s | K1 |
| 320Ch | 10 s | K4, K3 |
| 010Fh | 0.2 s | K4, K3, K2, K1 |

If parameters 3 & 4 are both set to 0000h, then relay outputs will remain at last communicated state on loss of iMAC Fieldbus comms.

Note: All relays will open (de-energise) on failure of DC power supply, regardless of configuration parameters

| LED Indicators | | |
|------------------------------------|--|--------------------------------|
| Status LED (RED) | | |
| Sequence | Module – iMAC Comms Status | |
| Off | Unknown (check connections) | |
| Slow Flash | | Healthy |
| 2 Flashes | | Healthy (has been roll-called) |
| 3 Flashes | | Error (address clash) |
| Fast Flash | | Error (general) |
| Power LED (GREEN) | | |
| Off | Power Supply Off/Failure | |
| On | Power Supply On/Healthy | |
| Relay LED's (RED - K1, K2, K3, K4) | | |
| Off | The corresponding relay output is de-energized | |
| On | The corresponding relay output is energized | |



Certification / Approvals

| | | | |
|--|--|---|--|
| Type | Ex ia I Ma (for use in zone 0, 1 or 2) | | |
| Certificate number | IECEX ITA 07.0017X | | |
| Certified module type | DO4 | | |
| IP rating | IP20 | | |
| Other | Must be installed in a suitable enclosure that provides a degree of protection not less than IP54. Must be connected in accordance with iMAC system drawing IMACZ032. L1+ L1- terminals must only connect to a single MLB (Master Line Barrier). | | |
| I/O parameters | iMAC Fieldbus terminals (L1+, L1-) | Ui = 21.5V Ii = 481.52mA Pi = 2.58W Ci = Negligible Li = Negligible | |
| | Power Supply terminals 9-24VDC (+, -) | Ui = 27.5V Ii = N/A Ci = Negligible Li = Negligible | |
| | Relay terminals K1 (C, NO) K2 (C, NO) K3 (C, NO) K4 (C, NO) Note: Parameter option 1 or 2 may be individually selected for each relay output. | Option 1 Ui = 30V Ii = 3A Pi = N/A Ci = Negligible Li = Negligible Ci = Negligible Uo = 0V | Option 2 Ui = 32.5V Ii = 280mA Pi = N/A Ci = Negligible Li = Negligible Ci = Negligible Uo = 0V |
| Ambient temperature (Ta) | -20°C to +60°C (refer to operating environment specifications) | | |
| This table is provided for quick reference purposes only: refer to latest issue of the Certificate of Conformity for all system designs. | | | |

Specifications

| | |
|---|--|
| Mechanical | |
| Dimensions | 110 mm (Height) x 55mm (Width) x 75mm (Depth) |
| Weight | 505g |
| IP Rating | IP20 |
| Mounting | Standard 35mm DIN rail (Top Hat Rail – EN50022) |
| Electrical Connections | ERNI screw terminals (maximum wire size of 4mm ² , maximum torque or 0.4 Nm) |
| Environmental | |
| Operating Temperature | -10°C to +60°C |
| Power Supply (external) | |
| Relay Interface | External power supply required |
| Voltage | 9 – 24VDC (Ui = 27.5VDC) |
| Current (max) | 90mA @ 9VDC, 35mA @ 24VDC |
| Relay Outputs | |
| Limits | 30V @ 3A or 32.5V @ 280mA |
| Isolation | 3kV RMS (coil – contacts) |
| Communications (iMAC L1) | |
| Hardware interface | 2 wire (+/-18VDC via intrinsically safe MLB barrier) |
| Line Speed | 300 – 1000 baud |
| Bit protocol | iMAC proprietary |
| L1 Isolation | 5.3kV RMS |
| L1 Line Loading (baud) | 1.32mA (300 – 1000 baud) |
| Find Out More | |
| For more information on this product, contact Ampcontrol Customer Service on +61 1300 267 373 or customerservice@ampcontrolgroup.com or visit the Ampcontrol website: www.ampcontrolgroup.com | |

| Equipment List | |
|-----------------------|--------------------|
| Part Number | Description |
| 176798 | MODULE IMAC DO4 |

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