

# i<sup>3</sup>A Lite Intelligent Control Station

IMO

Technical Datasheet

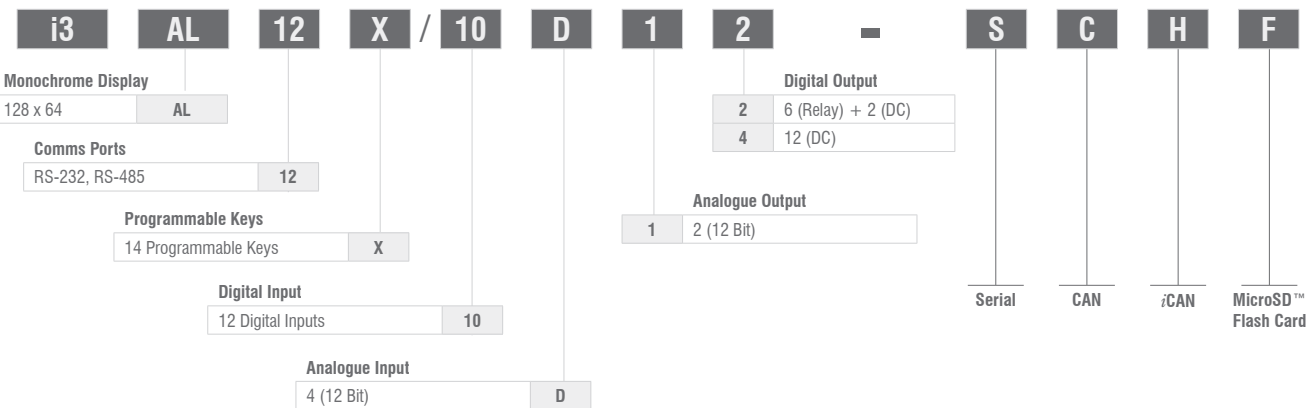
## Key Features

- 128 x 64 monochrome LCD display
- MicroSD™ data storage
- Real time clock
- 1 CAN Port, 1 RS-232, 1 RS-485
- Addressable function keys
- IP65 (NEMA 4X)
- Free configuration software



## Options & Ordering Codes

| Standard Options   | DI | DO          | AI | AO |
|--------------------|----|-------------|----|----|
| i3AL12X/10D12-SCHF | 12 | 6 Relay + 2 | 4  | 2  |
| i3AL12X/10D14-SCHF | 12 | 12          | 4  | 2  |



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## Technical Specifications

### General Specifications

|                               |                                 |
|-------------------------------|---------------------------------|
| Required Power (Steady State) | 64mA @ 24VDC                    |
| Primary Voltage Range         | 24VDC $\pm$ 20%                 |
| Inrush Current                | 30A for <1ms                    |
| Relative Humidity             | 5 to 95% Non-Condensing         |
| Clock Accuracy                | +/-90 seconds per month at 20°C |
| Operating Temperature         | -10°C to +60°C                  |
| Storage Temperature           | -20°C to +70°C                  |
| Weight                        | 0.340kg                         |

### Display Specifications

|                           |                                                                                   |
|---------------------------|-----------------------------------------------------------------------------------|
| Display Type              | 2.2" Monochrome LCD                                                               |
| Resolution                | 128 x 64 Pixels                                                                   |
| Keys                      | Membrane type switches w/metal dome - 20 numbers                                  |
| Screen Memory             | 256kB                                                                             |
| User-Programmable Screens | 250 (max. 15 objects per screen)                                                  |
| Backlight                 | LED - 50,000 hour life                                                            |
| Screen Update Rate        | User configurable within the scan time (perceived as instantaneous in many cases) |

## I/O Specifications

### Digital DC Inputs

|                         |                                                                 |                |
|-------------------------|-----------------------------------------------------------------|----------------|
| Inputs per Module       | 12 including 4 configurable HSC inputs                          |                |
| Commons per Module      | 1                                                               |                |
| Input Voltage Range     | 24 VDC                                                          |                |
| Absolute Max. Voltage   | 35 VDC Max                                                      |                |
| Input Impedance         | 10 k $\Omega$                                                   |                |
| Input Current           | Positive Logic                                                  | Negative Logic |
| Upper Threshold         | 0.8mA                                                           | -1.6mA         |
| Lower Threshold         | 0.3mA                                                           | -2.1mA         |
| Max. Upper Threshold    | 8 VDC                                                           |                |
| Max. Lower Threshold    | 3 VDC                                                           |                |
| OFF to ON Response      | 1 ms                                                            |                |
| ON to OFF Response      | 1 ms                                                            |                |
| HSC Max. Switching Rate | 10kHz - Totalize<br>2.5kHz - Quadrature<br>5kHz - Per Frequency |                |

### Digital DC Outputs - Sinking (PWM)

|                                    |                                         |
|------------------------------------|-----------------------------------------|
| Outputs per Module                 | 2 (PWM)                                 |
| Commons per Module                 | 1                                       |
| Type                               | Sinking w/optional 10k $\Omega$ pull-up |
| Absolute Max. Voltage              | 28VDC                                   |
| Output Protection                  | Short Circuit                           |
| Max. Output per Point: Sinking     | 500mA                                   |
| Max. Voltage Drop at Rated Current | 0.25VDC                                 |
| Max. Inrush                        | 650mA                                   |
| OFF to ON Time                     | 20 $\mu$ s                              |
| ON to OFF Time                     | 10 $\mu$ s                              |
| PWM Out                            | 65kHz                                   |
| Rise Time                          | 10 $\mu$ s                              |
| Fall Time                          | 20 $\mu$ s                              |

### Control & Logic Specifications

|                                      |                                                                                 |
|--------------------------------------|---------------------------------------------------------------------------------|
| Control Language Support             | Advanced Ladder Logic, Full IEC 61131-3                                         |
| Logic Program Size & Logic Scan Rate | 256kB Maximum, 1.2ms/kB                                                         |
| I/O Support                          | Digital Inputs - 1024                                                           |
|                                      | Digital Outputs - 1024                                                          |
|                                      | Analogue Inputs - 256                                                           |
|                                      | Analogue Outputs - 256                                                          |
| General Purpose Registers            | 5,000 (words) Retentive<br>1,024 (bits) Retentive<br>1,024 (bits) Non-retentive |
| Non-Retentive Memory                 | 128kB                                                                           |

### Connectivity

|                  |                                                                           |
|------------------|---------------------------------------------------------------------------|
| Serial Ports     | 1 RS-232, 1 RS-485                                                        |
| USB mini-B       | USB 2.0 (480MHz) Programming & Data Access                                |
| CAN              | Remote I/O, Peer-to-Peer Comms, i3 Configurator                           |
| Remote I/O       | IOS, Smart I/O, iSmart                                                    |
| Removable Memory | MicroSD™ (support for 32GB max)<br>Application updates, Datalogging, more |

### Digital Relay Outputs

|                                      |                                             |
|--------------------------------------|---------------------------------------------|
| Outputs per Module                   | 6 Relay                                     |
| Commons per Module                   | 6                                           |
| Max. Switching Current per Relay     | 3A @ 250 VAC, Resistive                     |
| Max. Total Output Current            | 5A Continuous                               |
| Max. Switching Voltage               | 275 VAC, 30 VDC                             |
| Max. Switched Power                  | 150W                                        |
| Contact Isolation to Ground          | 1000 VAC                                    |
| Max. Voltage Drop at Rated Current   | 0.5V                                        |
| Expected Life (see below for detail) | No Load: 5,000,000<br>100,000 at rated load |
| Max. Switching Rate                  | 300 CPM at no load<br>20 CPM at rated load  |
| Type                                 | Mechanical Contact                          |
| Response Time                        | One update per ladder scan plus 10ms        |

### Digital DC Outputs - Sourcing

|                                    |                                         |
|------------------------------------|-----------------------------------------|
| Outputs per Module                 | 12 Including 2 Configurable PWM Outputs |
| Commons per Module                 | 2                                       |
| Type                               | Sourcing / 10k $\Omega$ pull-down       |
| Absolute Max. Voltage              | 28VDC                                   |
| Output Protection                  | Short Circuit                           |
| Max. Voltage Drop at Rated Current | 0.25VDC                                 |
| Max. Inrush                        | 650mA                                   |
| Max. Output per Point: Sourcing    | 2.4mA @ 24VDC                           |
| OFF to ON Time                     | 1 $\mu$ s                               |
| ON to OFF Time                     | 1 $\mu$ s                               |
| PWM Out                            | 65kHz                                   |
| Rise Time                          | 150ns                                   |
| Fall Time                          | 150ns                                   |

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### Technical Specifications continued

#### Analogue Inputs

|                                                                        |              |
|------------------------------------------------------------------------|--------------|
| Number of Channels                                                     | 4            |
| Safe Input Voltage Range                                               | -0.5V to 12V |
| Nominal Resolution                                                     | 12 Bits      |
| Max. Over Current                                                      | 35 mA        |
| Max. Error at 25°C (excluding zero)<br>Adjusting filtering may tighten | <1.50% of FS |

|                                                 |                                                                         |
|-------------------------------------------------|-------------------------------------------------------------------------|
| Input Ranges                                    | 0-20 mA, 4-20 mA                                                        |
| Input Impedance<br>(clamped @ -0.5VDC to 12VDC) | Current Mode:<br>100 Ω                                                  |
| %AI Full Scale                                  | 32,000                                                                  |
| Conversion Speed                                | Once per Ladder Scan                                                    |
| Filtering                                       | 160 Hz hash (noise) filter<br>1-128 scan digital running average filter |

#### Analogue Outputs

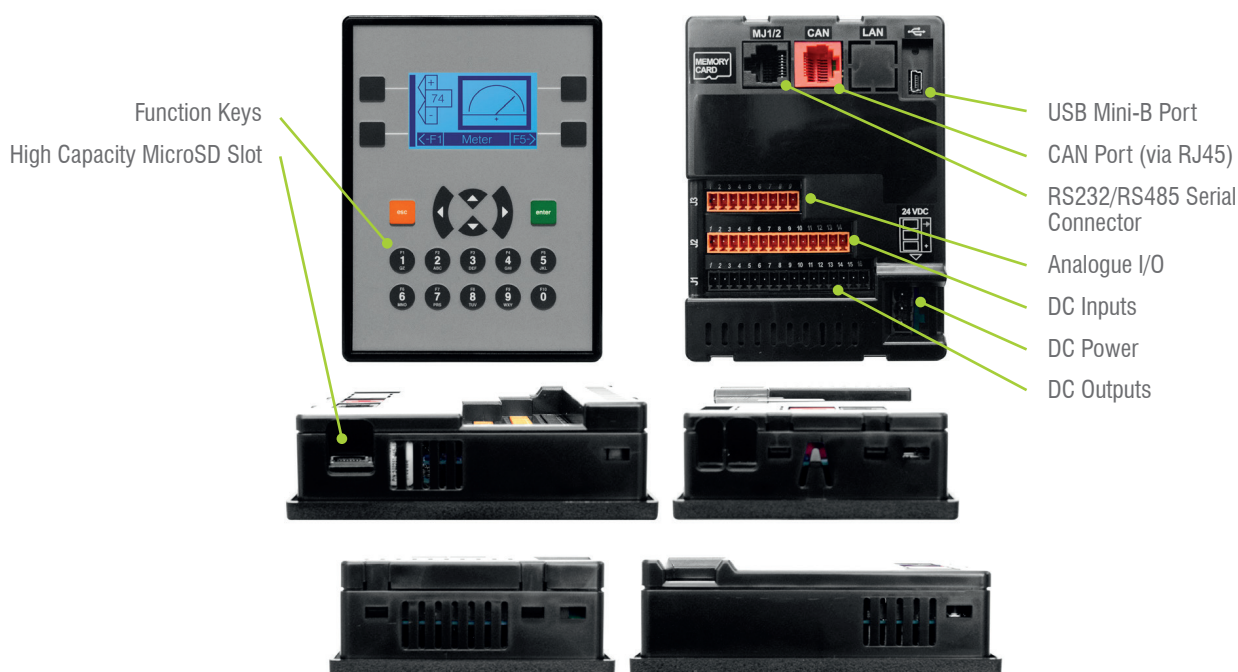
|                    |                            |
|--------------------|----------------------------|
| Number of Channels | 2                          |
| Output Ranges      | 4-20mA                     |
| Nominal Resolution | 12 Bits                    |
| Response Time      | One update per ladder scan |

|                                     |                                        |
|-------------------------------------|----------------------------------------|
| Minimum Current Load                | 500Ω                                   |
| Protection                          | Protection against miswire up to 24VDC |
| Conversion Speed                    | Min. all channels once per scan        |
| Max. Error at 25°C (excluding zero) | 0-20mA < 1.5% of FS                    |

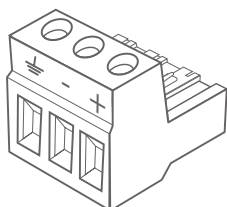
#### Approvals

|                      |                  |
|----------------------|------------------|
| Certifications       | CE, UL, cUL, FCC |
| Shock Tested         | IEC 60068-2-27   |
| Vibration Tested     | IEC 60068-2-6    |
| IP Protection Degree | IP65 (NEMA 4X)   |

### Port Connectors



### Power Wiring



#### Primary Power Port Pins

| Pin | Signal | Description          |
|-----|--------|----------------------|
| 1   | Ground | Frame Ground         |
| 2   | DC -   | Power Supply Common  |
| 3   | DC +   | Power Supply Voltage |

#### DC Input / Frame

Solid/Stranded wire; 12-24AWG (2.5-0.2mm). Strip length - 0.28" (7mm)  
Torque rating: 4.5-7.0 in/lbs (0.50-0.78Nm)  
DC- is internally connected to I/O 0V  
Class 2 power supply must be used to meet UL requirements

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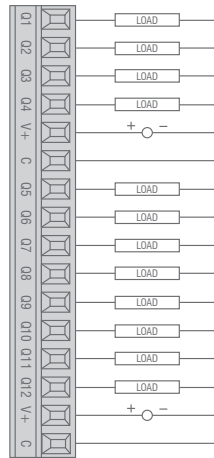


## Technical Datasheet

### Wiring Connectors

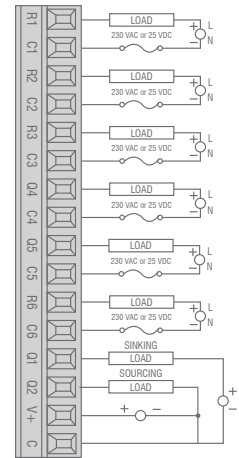
#### Model -10D14 Digital Out

| Position / Pin | Digital Model     |
|----------------|-------------------|
| 1              | Q1 Output 1 (PWM) |
| 2              | Q2 Output 2 (PWM) |
| 3              | Q3 Output 3       |
| 4              | Q4 Output 4       |
| 5              | V+ External V+    |
| 6              | C Common          |
| 7              | Q5 Output 5       |
| 8              | Q6 Output 6       |
| 9              | Q7 Output 7       |
| 10             | Q8 Output 8       |
| 11             | Q9 Output 9       |
| 12             | Q10 Output 10     |
| 13             | Q11 Output 11     |
| 14             | Q12 Output 12     |
| 15             | V+ External V 2+  |
| 16             | C Common          |



#### Model -10D12 Relay & Digital Out

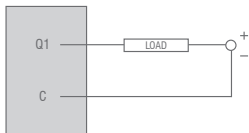
| Position / Pin | Digital Model     |
|----------------|-------------------|
| 1              | R1 Relay 1 NO     |
| 2              | C1 Relay 1 C      |
| 3              | R2 Relay 2 NO     |
| 4              | C2 Relay 2 C      |
| 5              | R3 Relay 3 NO     |
| 6              | C3 Relay 3 C      |
| 7              | R4 Relay 4 NO     |
| 8              | C4 Relay 4 C      |
| 9              | R5 Relay 5 NO     |
| 10             | C5 Relay 5 C      |
| 11             | R6 Relay 6 NO     |
| 12             | C6 Relay 6 C      |
| 13             | Q1 Output 1 (PWM) |
| 14             | Q2 Output 2 (PWM) |
| 15             | V+ External V+    |
| 16             | C Common          |



NOTE: Internal 10kΩ resistors between: V+ and Q1; V+ and Q2

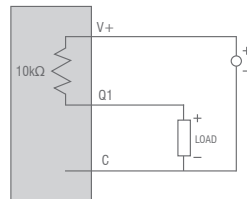
#### Model -10D14 Sinking & Sourcing Outputs

##### Sinking Outputs



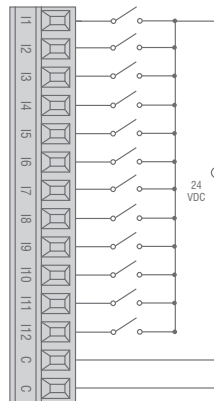
**Sinking:** Outputs can sink 500mA  
**Sourcing:** 2.4mA sourcing @ 24mA

##### Sourcing Outputs



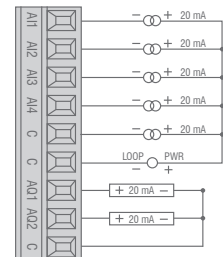
#### Digital Input

| Position / Pin | Digital Model    |
|----------------|------------------|
| 1              | I1 Input 1 (HSC) |
| 2              | I2 Input 2 (HSC) |
| 3              | I3 Input 3 (HSC) |
| 4              | I4 Input 4 (HSC) |
| 5              | I5 Input 5       |
| 6              | I6 Input 6       |
| 7              | I7 Input 7       |
| 8              | I8 Input 8       |
| 9              | I9 Input 9       |
| 10             | I10 Input 10     |
| 11             | I11 Input 11     |
| 12             | I12 Input 12     |
| 13             | C Common         |
| 14             | C Common         |



#### Analogue Input & Output

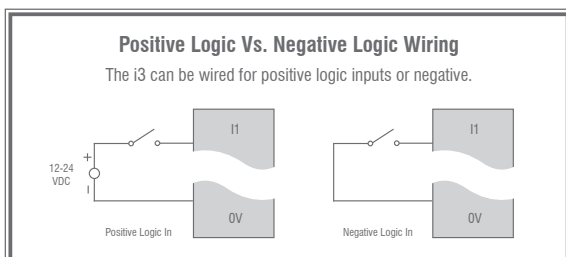
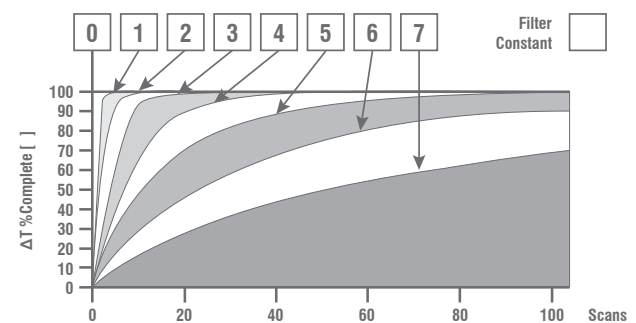
| Position / Pin | Digital Model         |
|----------------|-----------------------|
| 1              | AI1 Analogue Input 1  |
| 2              | AI2 Analogue Input 2  |
| 3              | AI3 Analogue Input 3  |
| 4              | AI4 Analogue Input 4  |
| 5              | C Common              |
| 6              | C Common              |
| 7              | AQ1 Analogue Output 1 |
| 8              | AQ2 Analogue Output 2 |
| 9              | C Common              |



##### Analogue Inputs

Raw input values are found in the registers as Integer-type data with a range from 0 - 32000.

Analogue input may be filtered digitally with the filter constant found in the i3 Configurator Hardware Configuration for Analogue Inputs. Valid filter values are 0-7 and act according to the following chart.

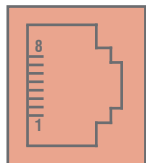


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## CAN Communication



Modular jack (8 posn RJ45)

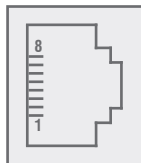
### CAN Pin Assignments

| Pin | Signal        |
|-----|---------------|
| 8   | No Connection |
| 7   | Ground        |
| 6   | Shield        |
| 5   | No Connection |
| 4   | No Connection |
| 3   | Ground        |
| 2   | CAN Data Low  |
| 1   | CAN Data High |

The CAN port is provided via the single 8-position modular jack labelled "CAN". It may be used to communicate with other i3 modules using *i*CAN protocol. Additionally, remote expansion I/O such as Smart I/O may be implemented using the *i*CAN protocol.

Termination for the CAN port may be enabled from the System Menu or System Register. This should only occur if the i3AL is at one end of the CAN network or the other. Only the two devices on either end of the CAN network should be terminated.

## Serial Communication



Modular jack (8 posn RJ45)

MJ1: RS-232 w/full handshaking

MJ2: RS-485 half-duplex

RS-485 termination and biasing via System Menu or System Register

### MJ1 Pin

| Pin | Signal       | Direction | Signal         | Direction |
|-----|--------------|-----------|----------------|-----------|
| 8   | TXD          | OUT       | --             |           |
| 7   | RXD          | IN        | --             |           |
| 6   | 0V           | Common    | 0V             |           |
| 5   | +5VDC @ 60mA | OUT       | +5VDC @ ± 60mA | OUT       |
| 4   | RTS          | OUT       | --             | --        |
| 3   | CTS          | IN        | --             | --        |
| 2   | --           | --        | RX- / TX-      | IN / OUT  |
| 1   | --           | --        | RX+ / TX+      | IN / OUT  |

### MJ2 Pin

## Built-in I/O

Both i3AL models feature built-in I/O. The I/O is mapped into i3 register space, in three separate areas – Digital/Analogue I/O, High-Speed Counter I/O, and High-speed Output I/O. Digital/Analogue I/O location is fixed starting at 1, but the high-speed counter and high-speed output references may be mapped to any open register location. For more details on using the high-speed counter and high-speed outputs, see the i3AL User Manual.

| Fixed Address | Digital/Analogue I/O Function | 10D12 | 10D14 |
|---------------|-------------------------------|-------|-------|
| %I            | Digital Inputs                | 1-12  | 1-12  |
|               | Reserved                      | 13-23 | 13-32 |
| %Q            | Digital Outputs               | 1-6   | 1-12  |
|               | Reserved                      | 7-16  | 13-16 |
| %AI           | Analogue Inputs               | 1-4   | 1-4   |
|               | Reserved                      | 5-12  | 5-12  |
| %AQ           | Analogue Outputs              | 1-2   | 1-2   |
|               | Reserved                      | 3-6   | 3-6   |

Reserved areas maintain backward compatibility with other models

## Installation Dimensions

