$i^{3}$ CX Intelligent Control Station

- $640 \times 480$ colour touch display
- High resolution resistive touch screen
- Addressable function keys
- Real time clock
- Built-in Ethernet
- $3 \times$ communications ports (RS 232 / RS 485)
- $1 \times$ USB A, $1 \times$ USB mini B
- 10-30 VDC power supply
- 1MB RAM (program), 27MB (Graphical)
- Free configuration software
- IP65 (NEMA4)
- Remote I/O communication
- Optional: MicroSD (up to 32GB)

Modem (SMS, GSM, GPRS)
USB drive up to 2TB

## ( $\in$ (IL) , (IL)

Options \& Ordering Codes

| Standard Options | DI | D0 | AI | A0 |
| :--- | :---: | :---: | :---: | :---: |
| i3CX12Z/10D03-SEHF | 12 | 6 Relay | 4 | - |
| i3CX12Z/13C14-SEHF | 12 | 12 | $2^{*}$ | 2 |
| i3CX12C/20B05-SEHF | 24 | 16 | 4 | - |
| i3CX12Z/10B04-SEHF | 12 | 12 | 2 | - |
| i3CX12Z/10E24-SEHF | 12 | 12 | $6^{*}$ | 4 |
| i3CX12Z/00000-SEHF | - | - | - | - |

* Universal Analog Inputs



## Technical Specifications

| General Specifications |  |
| :--- | :---: |
| Required Power (Steady State) | $420 \mathrm{~mA} @ 12 \mathrm{VDC} /$ <br> $230 \mathrm{~mA} @ 24 \mathrm{VDC}$ |
| Required Power (Inrush) | 25 A for $<1 \mathrm{~ms}$ @ 24VDC <br> DC Switched |
| Primary Power Range | $10-30 \mathrm{VDC}$ |
| Relative Humidity | 5 to $95 \%$ Non-Condensing |
| Clock Accuracy | $+/-20 \mathrm{ppm}$ Maximum at $25^{\circ} \mathrm{C}$ <br> $(+/-1$ Minute per month) |
| Operating Air Temperature | $-10^{\circ} \mathrm{C}$ to $+60^{\circ} \mathrm{C}$ |
| Storage Temperature | $-40^{\circ} \mathrm{C}$ to $+60^{\circ} \mathrm{C}$ |
| Weight | $1.98 \mathrm{~kg} / 4.375 \mathrm{Ibs} \mathrm{(without} \mathrm{I/O)}$ |
| Approvals | $\mathrm{UL}, \mathrm{CE}$ |


| Display Specifications |  |
| :--- | :---: |
| Display Type | $5.7 "$ VGA TFT <br> $(450$ nit typical) |
| Resolution | $640 \times 480$ |
| Colour | 16-bit (65,536) |
| Screen Memory | 27 MB |
| User-Programmable Screens | 1023 |
| Backlight | User configurable within the scan time. <br> (perceived as instantaneous in many <br> cases) |
| Screen Update Rate |  |


| Control \& Logic Specifications |  |
| :--- | :---: |
| Control Language Support | Advanced Ladder Logic |
|  | Full IEC 61131-3 |
| Logic Program Size | 1 MB Maximum |
| \& Logic Scan Rate | $0.013 \mathrm{~ms} / \mathrm{k}$ |
| Online Programming Changes | Supported in Advanced Ladder |
|  | Digital Inputs - 2048 |
| I/O Support | Digital Outputs - 2048 |
|  | Analog Inputs -512 |
|  | Analog Outputs -512 |
| General Purpose Registers | 50,000 (words) Retentive |
|  | 16,384 (bits) Retentive |


| Connectivity |  |
| :--- | :---: |
| Serial Ports | 1 RS-232 \& 1 RS-485 on first modular jack (MJ1/2) <br> 1 RS-232 or 1 RS-485 on second Modular Jack (MJ3) |
| USB mini-B | USB 2.0 (480MHz) Programming \& Data Access |
| USB A | USB 2.0 (480MHz) for USB FLASH Drives (up to 2TB) |
| CAN | Remote I/0, Peer-to-Peer Comms, i3 Configurator |
| Ethernet | $10 / 100 \mathrm{MB}$ (Auto-MDX), Modbus TCP, HTTP, FTP, <br> SMTP, i3 Configurator, Ethernet IP |
| Remote I/O | IOS, Smart IO, iSmart |
| Removable <br> Memory | MicroSD (support for 32GB max) <br> Application updates, Datalogging, more |

Input / Output Specifications

| Model | DC In | DC Out | Relays | HS In | HS Out | $\mathrm{mA} / \mathrm{V}$ In | mA/V <br> RTD/TC | mA/V Out | High Spe | nters |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 10D03 | 12 |  | 6 | 4 |  | 4 |  |  | Number of Counters | 2 |
| 10B04 | 12 | 12 |  | 4 | 2 | 2 |  |  | Maximum Frequency | 500 kHz each |
| 20B05 | 24 | 16 |  | 4 | 2 | 2 |  |  | Accumulator Size | 32-bits each |
| 13 C 14 | 12 | 12 |  | 4 | 2 |  | 2 | 2 | Modes Supported |  |
| 10E24 | 12 | 12 |  | 4 | 2 |  | 6* | 4* | Totalizer | Quadrature |
| There are 4 high-speed inputs of the total DC inputs. There are 2 high-speed outputs of the total DC outputs. Model 10D03, 10B04, 20B05 feature 12 -bit analog I/O. Model $13 C 14$ features $14 / 16$-bit analog I/ 0 . High-speed outputs |  |  |  |  |  |  |  |  | Pulse Measurement | Frequency Measurement |

(imited to $<65 \mathrm{kHz}$. Model 10E14 features a 14/17 bit analog I/O
*Up to six mA/V In, RTD/TC, and mA/V Out

2 Position Controlled Outputs
1 ON/OFF Setpoint per Output

## Dimensions \& Panel Cutout



## Ports \& Connectors



## DC Input / Frame

Torque rating: 4.5-7 Lb-in ( $0.50-0.78 \mathrm{Nm}$ )
DC- is internally connected to I/O V-, but is isolated from CAN V-
A Class 2 power supply must be used

| Primary Power Port Pins |  |  |
| :---: | :---: | :---: |
| Pin | Signal | Signal Description |
| 1 | Ground | Frame Ground |
| 2 | DC- | Input Power Supply Ground |
| 3 | DC + | Input Power Supply Voltage |



## MJ1/2 Independent Serial Ports

MJ1: RS-232 w/Full Handshaking MJ2: RS-485 Half-Duplex

| PIN | MJ1 PINS |  | MJ2 PINS |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Signal | Direction | Signal | Direction |
| 8 | TXD | OUT | - | - |
| 7 | RXD | IN | - | - |
| 6 | 0 V | Ground | 0 V | Ground |
| 5 | $+5 \mathrm{~V} @ 60 \mathrm{~mA}$ | OUT | $+5 \mathrm{~V} @ 60 \mathrm{~mA}$ | OUT |
| 4 | RTS | OUT | - | - |
| 3 | CTS | IN | - | - |
| 2 | - | - | $\mathrm{RX}-/ \mathrm{TX}-$ | IN / OUT |
| 1 | - | - | $\mathrm{RX}+/$ TX + | IN / OUT |

## DIP Switches



| Switch | Name | Function | Default |
| :---: | :---: | :---: | :---: |
| 1 | MJ3 RS485 Termination | ON = Terminated | OFF |
| 2 | MJ3 Duplex | ON = Half | OFF |
| 3 |  | OFF = Full |  |
| 4 | MJ3 RS485 Termination | ON = Terminated | OFF |


| Fixed Address | Digital/Analog I/O Function | i3CX Model |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 10003 | 10804 | 20805 | $13 \mathrm{C14}$ | 10E14 |
| \%11 | Digital Inputs | 1-12 | 1-12 | 1-24 | 1-12 | 1-12 |
|  | Reserved | 13-32 | 13-31 | 25-31 | 13-31 | 13-31 |
|  | ESCP Alarm | n/a | 32 | 32 | 32 | 32 |
| \%Q1 | Digital Outputs | 1-6 | 1-12 | 1-16 | 1-12 | 1-12 |
|  | Reserved | 7-24 | 13-24 | 17-24 | 13-24 | 13-24 |
| \%Al1 | Analog Inputs | 1-4 | 1-2 | 1-2 | 1-2 | 1-4:33-38 |
|  | Reserved | 5-12 | 3-12 | 3-12 | 3-12 | n/a |
| \%AQ1 | Reserved | n/a | 1-8 | 1-8 | 1-8 | 1-12 |
|  | Analog Outputs | n/a | n/a | n/a | 9-10 | n/a |


| Default <br> Address* | High Speed <br> Counter <br> Function | i3CX Models |
| :--- | :--- | :--- |
| \%11601 | Status Bits | $1-8$ |
| \&Q1601 | Command Bits | $1-32$ |
| \%AI0401 | Accumulator <br> $1 \& 2$ | $1-8$ |
| \%AQ0401 |  <br> Match Values | $1-12$ |
| *Starting Address locations for |  |  |
| \%l, \%Q, \%AI \& \%AQ may |  |  |
| be re-mapped by user |  |  |


| Default Address* | High Speed <br> Output <br> Function | i3CX Models |
| :---: | :---: | :---: |
| \%11617 | Status Bits | 1-8 |
| \&Q** | Command Bits | 1-32 |
| n/a | n/a | n/a |
| \%AQ0421 | PWM or Pulse Train Parameters | 1-20 |
| *Starting Address locations for $\% I \& \% A Q$ may be re-mapped by user |  |  |
| **Q1-Q2 <br> Speed Ou | are part of the Fixed ut mode they can Stepper/PTO M | Map. In High sed to initiate a |

$i^{3} \mathrm{CX}$ Intelligent Control Station

## 10 E24 I/O Board Specifications

| Digital DC Inputs |  | Digital DC Outputs |  |
| :---: | :---: | :---: | :---: |
| Inputs per Module | 12 | Outputs per Module | 12 |
| Commons per Module | 1 | Commons per Module | 1 |
| Input Voltage Range | 10-30 VDC | Output Type | Sourcing / 10 K Pull-Down |
| Absolute Max Voltage | 35 VDC Max | Absolute Max Voltage | 30 VD Max |
| Input Impedance | $10 \mathrm{k} \Omega$ | Output Protection | Short Circuit \& Overvoltage |
| Input Current | Positive Logic Negative Logic | Max Output Current per Point | 0.5A |
| Upper Threshold | $0.8 \mathrm{~mA} \quad-1.6 \mathrm{~mA}$ | Max Total Current per driver | 2 A Continuous |
| Lower Threshold | $0.3 \mathrm{~mA} \quad-2.1 \mathrm{~mA}$ | Max Output Supply Voltage | 30 VDC |
| Min "On" Input | 8 VDC | Min Output Supply Voltage | 10 VDC |
| Max "Off" Input | 3 VDC | Max Voltage Drop at Related Current | 0.25 VDC |
| Galvanic Isolation | None | I/O Indication | None |
| OFF to ON Response | 1 ms | Galvanic Isolation | None |
| ON to OFF Response | 1 ms | Min Load | None |
| Logic Polarity | Positive and Negative based on Common pin level. | OFF to ON Response | 150 ns |
| 1/0 Indication | None | ON to OFF Response | 150 ns |
| High Speed Counter Inputs | 4 - DIN 8-12 | PWM Out | 500 KHz |
| High Speed Counter Max Freq | 鱽 500 KHz | Output Characteristics | Current Sourcing (Postitive Logic) |
| Connector Type | 3.5 mm Pluggable cage clamp connector |  |  |
| Analog Inputs, High Resolution |  |  |  |
| Number of Channels | 6 | Absolute Max Input Voltage | -0.5 to 12V DC |
| Input Range |  | Input Impedance (Clamped @ -0.5 to $10.23 \mathrm{VDC})$. | $\begin{gathered} \mathrm{TC} / \mathrm{RTD} / \mathrm{mV}>2 \mathrm{M} \Omega \\ \mathrm{~mA}: 15 \Omega+1.5 \mathrm{~V} \\ \mathrm{~V}: 1.1 \mathrm{M} \Omega \end{gathered}$ |
| Nominal Resolution | $14-17$ Bits (variable depending on input type) | Galvanic Isolation | None |
| Sensor Range and Accuracy | Input Type | Range | Accuracy |
|  | TC J | -120 to $1000^{\circ} \mathrm{C} /-184$ to $1832^{\circ} \mathrm{F}$ | $\pm 0.2 \% \mathrm{FS} \pm 1^{\circ} \mathrm{C}$ |
|  | TC K | -130 to $1372^{\circ} \mathrm{C} /-202$ to $2501.6^{\circ} \mathrm{F}$ | $\pm 0.2 \% \mathrm{FS} \pm 1^{\circ} \mathrm{C}$ |
|  | TC T | -130 to $400^{\circ} \mathrm{C} /-202$ to $752^{\circ} \mathrm{F}$ | $\pm 0.2 \% \mathrm{FS} \pm 1^{\circ} \mathrm{C}$ |
|  | TC E | -130 to $780^{\circ} \mathrm{C} /-202$ to $1436^{\circ} \mathrm{F}$ | $\pm 0.2 \% \mathrm{FS} \pm 1^{\circ} \mathrm{C}$ |
|  | TC N | -130 to $1300^{\circ} \mathrm{C} /-202$ to $2372^{\circ} \mathrm{F}$ | $\pm 0.2 \% \mathrm{FS} \pm 1^{\circ} \mathrm{C}$ |
|  | TC R, S | 20 to $1768^{\circ} \mathrm{C} / 68$ to $3214.4^{\circ} \mathrm{F}$ | $\pm 0.2 \% \mathrm{FS} \pm 3^{\circ} \mathrm{C}$ |
|  | TC B | 100 to $1820^{\circ} \mathrm{C} / 212$ to $3308^{\circ} \mathrm{F}$ | $\pm 0.2 \% \mathrm{FS} \pm 3^{\circ} \mathrm{C}$ |
|  | PT100/1000 | -200 to $850^{\circ} \mathrm{C} /-328$ to $1562^{\circ} \mathrm{F}$ | $\pm 0.15 \%$ FS |
|  | 0-20mA | 0-20mA | $\pm 0.15 \%$ FS |
|  | 0-60mV | 0-60mV | $\pm 0.15 \%$ FS |
|  | 0-10V | 0-10V | $\pm 0.15 \%$ FS |

Conversion Speed Minimum all channels converted in approx. 150mS
Analog Outputs

| Analog Outputs |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Number of Channels |  | 4 | Minimum Current Load | $500 \Omega$ |
| Output Ranges | 0-10VDC, 0-2 | 20mA, 4-20mA | Galvanic Isolation | None |
| Nomimnal Resolution |  | Bits | Conversion Speed | Min all channels once per scan |
| Response Time | One update | per ladder scan |  |  |
| Max Error at $25^{\circ} \mathrm{C}$ (excluding zero) | $\begin{aligned} & \hline 0-20 \mathrm{~mA} \\ & 0-10 \mathrm{~V} \end{aligned}$ | $\begin{aligned} & \hline 0.1 \% \text { of FS } \\ & 0.1 \% \text { of } \mathrm{FS} \end{aligned}$ | Additional Error for temperatures other than $25^{\circ} \mathrm{C}$ | $20 \mathrm{~mA} \quad 0.0126 \% /{ }^{\circ} \mathrm{C}$ |

## TECHNICAL DATASHEET

$i^{3}$ CX Intelligent Control Station


For ease of operability, the high density terminals are divided into more manageable pairs of connectors $(\mathrm{J} 1 \mathrm{~A}+\mathrm{J} 1 \mathrm{~B}, \mathrm{~J} 2 \mathrm{~A}+\mathrm{J} 2 \mathrm{~B}, \mathrm{~J} 3 \mathrm{~A}+\mathrm{J} 3 \mathrm{~B})$

To ensure proper installation, connector symbols must match as seen below:


| J1 (Orange/Green) |  | Signal Name |
| :---: | :---: | :---: |
| $\underset{\leftrightarrows}{\leftrightarrows}$ | 11 | V IN1 |
|  | 12 | V IN2 |
|  | 13 | V IN3 |
|  | 14 | V IN4 |
|  | 15 | V IN5 |
|  | 16 | V IN6 |
|  | 17 | V IN7 |
|  | 18 | V IN8 |
|  | H1 | HSC1 / V IN9 |
|  | H2 | HSC2 / V IN10 |
|  | H3 | HSC3 / V IN11 |
|  | H4 | HSC4 / V IN12 |
| $\stackrel{\varrho}{\leftrightharpoons}$ | OV | Common |
|  | A1A | Univ. Al 1 pin 1 |
|  | A1B | Univ. Al 1 pin 2 |
|  | A1C | Univ. Al 1 pin 3 |
|  | NC | No Connect |
|  | A2A | Univ. Al 2 pin 1 |
|  | A2B | Univ. Al 2 pin 2 |
|  | A2C | Univ. Al 2 pin 3 |
|  | NC | No Connect |



| J2 (Black/Green) |  | Signal Name |
| :---: | :---: | :---: |
| $\stackrel{\nwarrow}{~}$ | V3 | V OUT 3* |
|  | V2 | V OUT 2* |
|  | V1 | V OUT 1* |
|  | mA4 | mA Out 4* |
|  | mA3 | mA Out 3* |
|  | mA2 | mA Out 2* |
|  | mA1 | mA Out 1* |
|  | Q1 | OUT 1/ PWM1 |
|  | Q2 | OUT 2/ PWM2 |
| $\stackrel{\infty}{5}$ | Q3 | OUT 3 |
|  | Q4 | OUT 4 |
|  | Q5 | OUT 5 |
|  | Q6 | OUT 6 |
|  | Q7 | OUT 7 |
|  | Q8 | OUT 8 |
|  | Q9 | OUT 9 |
|  | Q10 | OUT 10 |
|  | Q11 | OUT 11 |
|  | Q12 | OUT 12 |
|  | V+ | V External+ |
|  | OV | Common |

[^0]

[^1]
## $i^{3} \mathrm{CX}$ Intelligent Control Station

## Example of Universal Input Wiring Schematic



## Configuration

The data registers as follows:-

| Digital Inputs | Digital Outputs | Analog Inputs | Analog Outputs |
| :---: | :---: | :---: | :---: |
| $\% \mid 1-12$ | \%Q1-12 | \%Al1-4, \%Al33-38 | \%AQ9-12 |

Note: The first four analog inputs are mapped to both \%Al1-4 and \%Al33-36, analogue input channels 5 \& 6 are mapped to \%AI37 and \%Al38 respectively only.

## Data Values

The analogue inputs return data types as follows:-

| Input Mode | Data Format | Comment |
| :--- | :--- | :--- |
| $0-20 \mathrm{~mA}, 4-20 \mathrm{~mA}$ | $0-32000$ |  |
| $0-10 \mathrm{~V}, 0-60 \mathrm{mV}$ | $0-32000$ | Temperature in ${ }^{\circ} \mathrm{C}$ or ${ }^{\circ} \mathrm{F}$ to 1 <br> decimal place $\mathrm{xxx} . \mathrm{y}$ |
| TC, RTD | $\circ$ <br>  | The or value is an integer, the user should divide by 10. |

Status Register

| Register | Descriptions |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| \%R1 | Bit-wise status register enable - R1.1-R1.9 enable for registers R2 to R9 |  |  |  |  |  |  |  |
| \%R2 | Firmware version |  |  |  |  |  |  |  |
| \%R3 | Watchdog count - cleared on power-up. |  |  |  |  |  |  |  |
| \%R4 | Status bits - |  |  |  | 16... 4 | 3 | 2 | 1 |
|  |  |  |  |  | Reserved | Normal | Config | Calibration |
| \%R5 | Scan rate of the 10E24 board (average) in units of $100 \mu \mathrm{~S}$. |  |  |  |  |  |  |  |
| \%R6 | Scan rate of the 10E24 board (max) in units of $100 \mu \mathrm{~S}$. |  |  |  |  |  |  |  |
| \%R7 | Channel Status | Channel 2 |  |  | Channel 1 |  |  |  |
|  | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|  | Open RTD | Out of Limits | Shorted RTD | Open TC | Open RTD | Out of Limits | Shorted RTD | Open TC |
| \%R8 | Channel Status | Channel 4 |  |  | Channel 3 |  |  |  |
|  | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|  | Open RTD | Out of Limits | Shorted RTD | Open TC | Open RTD | Out of Limits | Shorted RTD | Open TC |
| \%R9 | Channel Status | Channel 6 |  |  | Channel 5 |  |  |  |
|  | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|  | Open RTD | Out of Limits | Shorted RTD | Open TC | Open RTD | Out of Limits | Shorted RTD | Open TC |
| \%R10-14 | Reserved |  |  |  |  |  |  |  |

Note: For the purposes of the example, the block is shown starting at \%R1, but it can be set to anywhere in the \%R memory map.
$i^{3} \mathrm{CX}$ Intelligent Control Station

## Safety

WARNING: Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

WARNING: EXPLOSION HAZARD - BATTERIES MUST ONLY BE CHANGED IN an area known TO BE NON-HAZARDOUS

This equipment is suitable for use in Class 1, Division 2, Groups A, B, C and D or Non-hazardous locations only.

FOR U.S. \& CANADA ONLY
Power input and output (l/O) wiring must be in accordance with Class 1, Division 2 wiring methods of the National Electric Code, NFPA70 for installations in the U.S. or as specified in Section 18-1J2 of the Canadian Electric Code for installations within Canada and in accordance with the authority having jurisdiction.

WARNING: EXPLOSION HAZARD - Do not disconect equipment unless power has been switched off or the area is known to be non-hazardous.

WARNING: EXPLOSION HAZARD - Substitution of components may impair suitability for Class 1, Division 2.

Digital outputs shall be supplied from the same source as the i3 Controller.

WARNING: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

WARNING: To avoid the risk of electric shock or burns, always connects the earth ground before making any other connections.

WARNING: To reduce the risk of fire, electrical shock, or physical injury it is strongly recommended to fuse all Power Sources connected to the i3 controller. Be sure to locate fuses as close to the source as possible.

WARNING: Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.

WARNING: In the event of repeated failure, do not replace the fuse again as a repeated failure indicates a defective condition that will not clear by replacing the fuse.

Jumpers on connector JP1 and others shall not be removed or replaced while the circuit is live unless the area is known to be free of ignitable concentrations of flammable gases or vapours.

## Common Cause of Analog Input Tranzorb Failure

If a $4-20 \mathrm{~mA}$ circuit is initially wired with loop power, but without a load, the Analog Input could see 24 VDC . This is higher than the rating of the tranzorb. This can be solved by NOT connecting loop power prior to load connection, or by installing a low-cost PTC in series between the load and Analog Input.



[^0]:    

[^1]:    Note * Both mA \& V outputs are active for each output channel, however, only the configured output type is calibrated (maximum 4 channels simultaneously).

