

i³C Mini Intelligent Control Station

- 3.5" TFT Colour Touchscreen
- 65,535 Colours, QVGA (320 x 240)
- MicroSD™ Data storage upto 32GB
- Real Time Clock
- 1 CAN Port, 1 RS-232, 1 RS-485
- 1 Integral Ethernet Port
- USB Port for Programming
- USB Port for Flash Drives upto 2TB
- Addressable function keys
- 1MB RAM (Program), 27MB (Graphical)
- IP65 (NEMA4)
- 10 - 30 VDC Power Supply
- Online Programming
- Free Configuration Software
- Remote I/O Communication
- Optional - Modem (SMS, GSM, GPRS)



Options & Ordering Codes

Standard Options	DI	DO	AI	AO
i3CM12Y/10D03-SEHF	12	6 Relay	4	-
i3CM12Y/13C14-SEHF	12	12	2*	2
i3CM12Y/20B05-SEHF	24	16	2	-
i3CM12Y/10B04-SEHF	12	12	2	-
i3CM12Y/10E24-SEHF	12	12	6*	4
i3CM12Y/00000-SEHF	-	-	-	-

* Universal Analogue Inputs

i3	CM	12	Y	/	10	D	0	3	-	S	E	H	F
Colour Display					Digital Outputs								
320 x 240					0 No Digital Output					Serial			
CM					3 6 (Relay)					In-built Ethernet and CAN port			
Comms Ports					4 12 (DC)								
RS-232, RS-485					5 16 (DC)								
Programmable Keys													
4 Programmable Keys													
Y													
Digital Inputs					Analogue Outputs								
No Digital Input					0 No Analogue Output								
12 Digital Inputs					1 2 (12 Bit)								
24 Digital Inputs					2 4 (12 Bit)								
12 Digital Inputs + Temperature PT100/TC													
					Analogue Inputs								
					0 No Analogue Input								
					B 2 (12 Bit)					iCAN			
					C 2 (14 Bit)					CANopen			
					D 4 (12 Bit)					Devicenet			
					E 6 (14/17 Bit)					J1939			
										H			
										A			
										D			
										J			
										MicroSD™ Flash Card			

i³C Mini Intelligent Control Station

Technical Specifications

General Specifications	
Required Power (Steady State)	190mA @ 12VDC / 95mA @ 24VDC
Required Power (Inrush)	2A for <1ms @ 24VDC DC Switched
Primary Voltage Range	10-30VDC
Relative Humidity	5 to 95% Non-Condensing
Clock Accuracy	+/-20ppm Maximum at 25°C (+/-1 Minute per month)
Operating Air Temperature	-10°C to +60°C
Storage Temperature	-30°C to +70°C
Weight	0.34kg (without I/O)
Approvals	cUL, UL, CE

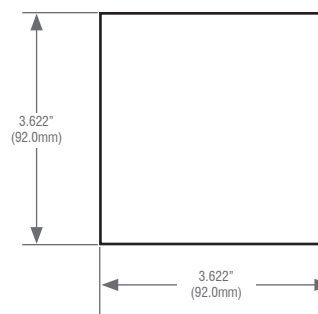
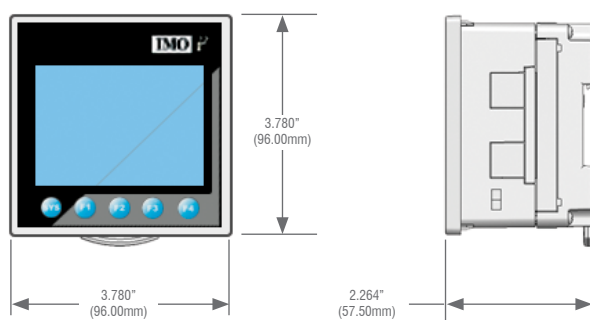
Display Specifications	
Display Type	3.5" QVGA TFT
Resolution	320 x 240
Colour	16-bit (65,536)
Screen Memory	27MB
User-Programmable Screens	1023
Backlight	LED - 50,000 hour life
Screen Update Rate	User configurable within the scan time (perceived as instantaneous in many cases)

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

Connectivity	
Serial Ports	1 RS-232 & 1 RS-485 on first modular jack (MJ1/2)
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/O, Peer-to-Peer Comms, i3 Configurator
Ethernet	10/100MB (Auto-MDX), Modbus TCP, HTTP, FTP, SMTP, i3 Configurator, Ethernet IP
Remote I/O	IOS, Smart I/O, iSmart
Removable Memory	MicroSD™ (support for 32GB max) Application updates, Datalogging, more

Input / Output Specifications										
Model	DC In	DC Out	Relays	HS In	HS Out	mA/V In	mA/V RTD/TC	mA/V Out	High Speed Counters	
10D03	12		6	4		4			Number of Counters	2
10B04	12	12		4	2	2			Maximum Frequency	500kHz each
20B05	24	16		4	2	2			Accumulator Size	32-bits each
13C14	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 Analogue I/O. Model 13C14 features 14/16-bit Analogue I/O. High-speed outputs can be used for PWM and Pulse Train Outputs, currently limited to <65kHz. Model 10E14 features a 14/17 bit Analogue I/O.									Pulse Measurement	Frequency Measurement
									2 Position Controlled Outputs 1 ON/OFF Setpoint per Output	
*Up to six mA/V In, RTD/TC, and mA/V Out										

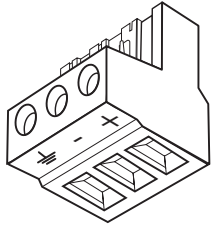
Dimensions & Panel Cutout



CUTOUT TOLERANCE
TO MEET NEMA
STANDARDS IS
±0.005" (0.1mm)
Max. Panel Thickness
is 5mm

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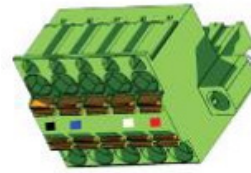
Ports & Connectors



DC Input / Frame

Torque rating: 4.5-7 Lb-in
(0.50-0.78Nm)

DC- is internally connected to I/O V-,
but is isolated from CAN V-
A Class 2 power supply must be used



CAN

Locking Spring-Clamp
2-Terminators Per Conductor
Mounting screw torque rating: 4.5 Lb-in
(0.50Nm)

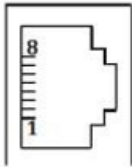
SHLD and V+ pins are not
internally connected to i³C Mini

Primary Power Port Pins

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

Primary Power Port Pins

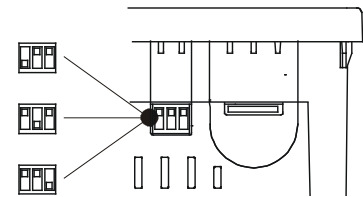
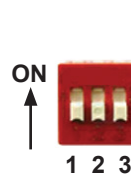
Pin	Signal	Description	Direction
1	V-	CAN Ground - Black	-
2	CN L	CAN Data Low - Blue	IN / OUT
3	SHLD	Shield Ground - None	-
4	CN H	CAN Data High - White	IN / OUT
5	V+ (NC)	No Connect - Red	-



MJ1/2 Independent Serial Ports

MJ1: RS-232 with Full Handshaking
MJ2: RS-485 Half-Duplex

DIP Switches



PIN	MJ1 PINS		MJ2 PINS	
	Signal	Direction	Signal	Direction
8	TXD	OUT	-	-
7	RXD	IN	-	-
6	0 V	Ground	0 V	Ground
5	+5V@60mA	OUT	+5V@60mA	OUT
4	RTS	OUT	-	-
3	CTS	IN	-	-
2	-	-	RX- / TX-	IN / OUT
1	-	-	RX+ / TX+	IN / OUT

Switch	Name	Function	Default
1	RS-485 Termination	ON = Terminated	OFF
2	Spare	Always Off	OFF
3	Factory Use	Always Off	OFF

Built-in I/O

I/O is mapped into i³C 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 i³C Mini User's Manual.

Fixed Address	Digital/Analogue I/O Function	i ³ C Mini Model				
		10D03	10B04	20B05	13C14	10E24
%I1	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
%AI1	Analogue 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
	Analogue Outputs	n/a	n/a	n/a	9-10	n/a

Reserved areas maintain backward compatibility with other i³C Controller models

Default Address*	High Speed Counter Function	i ³ C Mini Models
%I1601	Status Bits	1-8
&Q1601	Command Bits	1-32
%AI0401	Accumulator 1&2	1-8
%AQ0401	Preload & Match Values	1-12

*Starting Address locations for %I, %Q, %AI & %AQ may be re-mapped by user

Default Address*	High Speed Output Function	i ³ C Mini Models
%I1617	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 & %AQ may be re-mapped by user

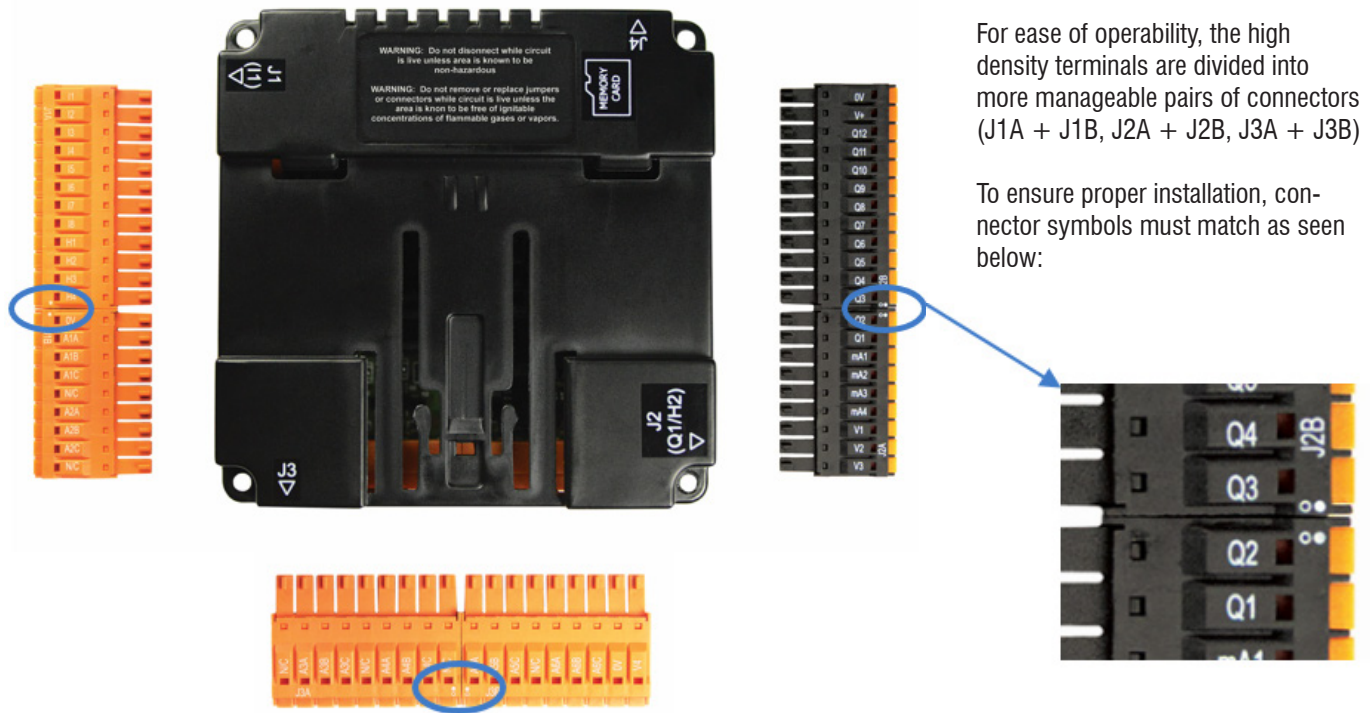
**Q1-Q2 are part of the Fixed I/O Map. In High Speed Output mode they can be used to initiate a Stepper/PTO Move

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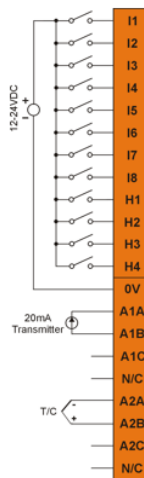
10E24 I/O Board Specifications

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 VDC Max
Input Impedance	10 kΩ		Output Protection	Short Circuit & Overvoltage
Input Current	Positive Logic	Negative Logic	Max. Output Current per Point	0.5A
Upper Threshold	0.8mA	-1.6mA	Max. Total Current per driver	2 A Continuous
Lower Threshold	0.3mA	-2.1mA	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
I/O Indication	None		ON to OFF Response	150 ns
High Speed Counter Inputs	4 - DIN 8-12		PWM Out	500kHz
High Speed Counter Max. Frequency	500kHz		Output Characteristics	Current Sourcing (Positive Logic)
Connector Type	3.5mm Pluggable cage clamp connector			
Analogue Inputs, High Resolution				
Number of Channels	6		Absolute Max. Input Voltage	-0.5 to 12V DC
Input Range	0–20mA, 4-20 mA dc. 0-60mV, 0-10V dc. TC - J, K, N, T, E, R, S, B RTD - PT100, PT1000		Input Impedance (Clamped @ -0.5 to 10.23VDC).	TC / RTD / mV > 2 MΩ mA: 15 Ω + 1.5 V V: 1.1 MΩ
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°C / -184 to 1832°F	± 0.2% FS ± 1°C
	TC K		-130 to 1372°C / -202 to 2501.6°F	± 0.2% FS ± 1°C
	TC T		-130 to 400°C / -202 to 752°F	± 0.2% FS ± 1°C
	TC E		-130 to 780°C / -202 to 1436°F	± 0.2% FS ± 1°C
	TC N		-130 to 1300°C / -202 to 2372°F	± 0.2% FS ± 1°C
	TC R, S		20 to 1768°C / 68 to 3214.4°F	± 0.2% FS ± 3°C
	TC B		100 to 1820°C / 212 to 3308°F	± 0.2% FS ± 3°C
	PT100/1000		-200 to 850°C / -328 to 1562°F	± 0.15% FS
	0-20mA		0-20mA	± 0.15% FS
	0-60mV		0-60mV	± 0.15% FS
	0-10V		0-10V	± 0.15% FS
Conversion Speed	Minimum all channels converted in approx. 150mS			
Analogue Outputs				
Number of Channels	4		Minimum Current Load	500Ω
Output Ranges	0-10VDC, 0-20mA, 4-20mA		Galvanic Isolation	None
Nomimnal Resolution	12 Bits		Conversion Speed	Min. all channels once per scan
Response Time	One update per ladder scan			
Max. Error at 25°C (excluding zero)	0-20mA 0-10V	0.1% of FS 0.1% of FS	Additional Error for temperatures other than 25°C	20mA 0.0126%/°C

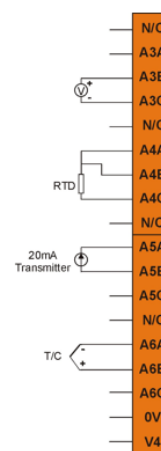
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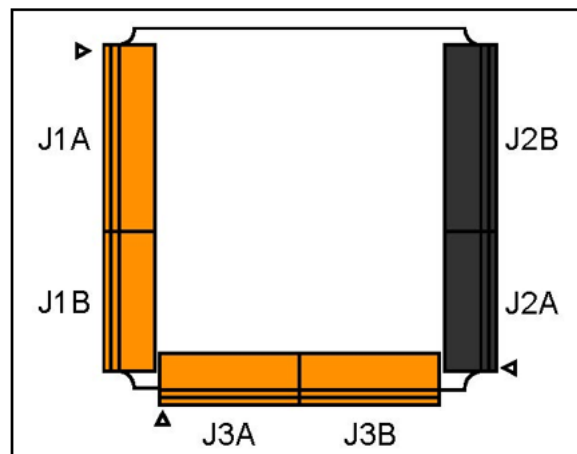
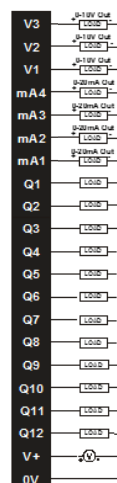
J1 (Orange/Green)	Signal Name
J1A	I1 V IN1
	I2 V IN2
	I3 V IN3
	I4 V IN4
	I5 V IN5
	I6 V IN6
	I7 V IN7
	I8 V IN8
J1B	H1 HSC1 / V IN9
	H2 HSC2 / V IN10
	H3 HSC3 / V IN11
	H4 HSC4 / V IN12
	0V Common
	A1A Univ. AI 1 pin 1
	A1B Univ. AI 1 pin 2
	A1C Univ. AI 1 pin 3
	NC No Connect
	A2A Univ. AI 2 pin 1
	A2B Univ. AI 2 pin 2
	A2C Univ. AI 2 pin 3
	NC No Connect



J3 (Orange/Green)	Signal Name
Univ. AI	NC No Connect
	A3A Univ. AI 3 pin 1
	A3B Univ. AI 3 pin 2
	A3C Univ. AI 3 pin 3
	NC No Connect
	A4A Univ. AI 4 pin 1
	A4B Univ. AI 4 pin 2
	A4C Univ. AI 4 pin 3
Univ. AI	NC No Connect
	A5A Univ. AI 5 pin 1
	A5B Univ. AI 5 pin 2
	A5C Univ. AI 5 pin 3
	NC No Connect
	A6A Univ. AI 6 pin 1
	A6B Univ. AI 6 pin 2
	A6C Univ. AI 6 pin 3
	NC No Connect
	V4 V OUT4*



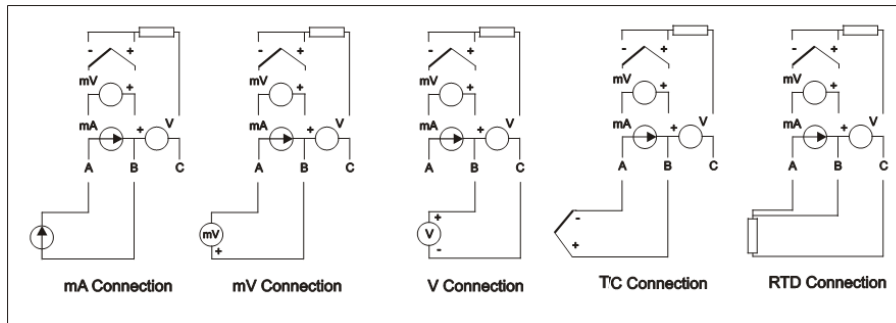
J2 (Black/Green)	Signal Name
J2A	V3 V OUT 3*
	V2 V OUT 2*
	V1 V OUT 1*
	mA4 mA Out 4*
	mA3 mA Out 3*
	mA2 mA Out 2*
	mA1 mA Out 1*
	Q1 OUT 1 / PWM1
J2B	Q2 OUT 2 / PWM2
	Q3 OUT 3
	Q4 OUT 4
	Q5 OUT 5
	Q6 OUT 6
	Q7 OUT 7
	Q8 OUT 8
	Q9 OUT 9
	Q10 OUT 10
	Q11 OUT 11
	Q12 OUT 12
	V+ V External+
	0V Common



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

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Example of Universal Input Wiring Schematic



Configuration

The data registers as follows:-

Digital Inputs	Digital Outputs	Analogue Inputs	Analogue Outputs
%I1-12	%Q1-12	%AI1-4, %AI33-38	%AQ9-12

Note: The first four Analogue inputs are mapped to both %AI1-4 and %AI33-36, analogue input channels 5 & 6 are mapped to %AI37 and %AI38 respectively only.

Data Values

The analogue inputs return data types as follows:-

Input Mode	Data Format	Comment
0-20mA, 4-20mA	0-32000	
0-10V, 0-60mV	0-32000	
TC, RTD	Temperature in °C or °F to 1 decimal place xxx.y	°C or °F may be selected in the I/O config section. The 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 100µS.							
%R6	Scan rate of the 10E24 board (max) in units of 100µS.							
%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.

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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 (I/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 disconnect 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 Analogue Input Transorb Failure

If a 4-20mA circuit is initially wired with loop power, but without a load, the analogue input could see 24VDC. This is higher than the rating of the transorb. 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 analogue input.

