M-series Intrinsically Safe I/O

- Features full system modularity
- Reduces system footprint
- Decreases installation time and expense
- Plug-and-play installation saves money
- Phased installation saves time
- Easy to use
- This fail-safe design enables you to initially install I.S.
- Real-time, online equipment additions

DeltaV™ M-series Intrinsically Safe I/O makes your I.S. installations easy and compact.

Introduction

DeltaV™ M-series Intrinsically Safe Input/Output (I.S. I/O) provides the perfect solution to the precarious situation of running I/O in hazardous areas. DeltaV I.S. I/O is a distributed I/O system capable of withstanding Class I Division 2 and IEC Zone II environmental conditions. The I.S. I/O subsystem connects field circuits and field devices to the DeltaV system. Intrinsically safe field circuits and field devices can enter Class I Division 1, Zone 1, and Zone 0. The DeltaV I.S. I/O supports industry-standard AI, AO, DI, and DO, applications.

Benefits

Features full system modularity. The I.S. I/O subsystem was designed to optimize your automation investment. All components are fully modular and installable under power. You add I/O interface carriers and I/O interfaces in groups of 8 channels, as you need them. The modular design enables you to buy the exact amount of I/O cards and power/controllers that you need. Add more DeltaV I/O as your system grows.

Reduces system footprint. The state-of-the-art form factor design of the DeltaV I/O components enables you to mount the I/O interface carrier in a junction box in the field. You significantly reduce the footprint of your equipment and free up valuable control room space for other uses.

Decreases installation time and expense. DeltaV Intrinsically Safe I/O are native DeltaV I/O cards that are part of the controller's I/O subsystem. This eliminates the need for third party barriers or interface mapping. Save even further on wiring expenses by installing I.S. I/O in the field, close to the actual field devices. Mounting the controller with the I/O further reduces your wiring expenditures by eliminating the need for long runs of multi-cores.

Plug-and-play installation saves money. We talked to customers like you to find out what you wanted in an I/O system. We designed and produced exactly what you wanted. The I.S. I/O subsystem is easy to use. All I.S. I/O components plug into the I/O interface carrier. You can install the I/O interface carriers to manage anticipated growth, without purchasing the I/O interfaces until you're ready to install your additional field devices.

Phased installation saves time. Mount the I/O interface carrier and you are ready to begin installing the field devices. I/O terminal blocks plug directly onto the I/O interface carrier—there's no need to have the I/O cards installed.

Easy to use. I.S. I/O interfaces and terminal blocks have I/O function keys. These keys ensure that the correct I/O card is always plugged into the corresponding terminal block—easy!

This fail-safe design enables you to initially install I.S. I/O quickly and efficiently. When you need to replace an I/O card the function key design ensures that you will always install it correctly. DeltaV I.S. I/O—easy to install and maintain.

Real-time, online equipment additions. Online addition of new I/O interfaces means your process does not get interrupted. As new equipment is added, DeltaV Explorer acknowledges it and assigns it basic configuration.

Product Description

A variety of analog and discrete I/O cards are available to meet your specific requirements. All I/O cards are enclosed in a common form factor that plugs into the I/O interface carrier. The housing is clearly labeled with the I/O card type. Clearly visible LEDs on the top of the I/O card display the power, error, and status to the channels included in the I/O card. (It is important to note that, when connecting standard I/O carriers to I.S.I/O carriers, more standard I.O. carriers may not be added after I.S. carriers—the I.S.I/O carriers must always be mounted last in line.)

Hardware Specifications

Common Environmental Specifications for all I/O Interfaces	
Category	**Specifications**
Operating temperature	-40 to 60 °C (-40 to 140 °F)
Storage temperature	-40 to 85 °C (-40 to 185 °F)
Relative humidity	5 to 95% , non-condensing
Airborne contaminants	ISA-S71.04-1985 Airborne Contaminants Class G3 Conformal coating
Protection rating	IP 20, NEMA 12
Hazardous area/location* I/O Interfaces Field circuits	CENELEC Zone 2 IIC T4 hazardous area Class I, Div 2, Groups A. B, C, D T4 hazardous locations. CENELEC Zone 0, IIC hazardous area or Class 1, Div 1, Groups A,B,C,D hazardous locations
Shock	10 g ½-sine wave for 11 ms
Vibration	1 mm peak-to-peak from 5 to 16 Hz; 0.5 g from 16 to 150 Hz
Dimensions	H 10.7 cm (4.2 in.) W 4.1 cm (1.6 in.) Depth 10.5 cm (4.1 in.)

**Refer to Zone 0 installation instructions (12P1990) for information on installing in hazardous areas.*

Intrinsically Safe Analog I/O Cards

Specifications for DeltaV I.S. I/O AI, 4 to 20 mA with HART	
Number of channels	8
Isolation LocalBus to any channel Between channels I. S. Channel to non-I. S. LocalBus	 60 VAC None 250 VAC
Nominal signal range (span)	4 to 20 mA
Full signal range	2 to 22 mA,
LocalBus current (12 VDC nominal) per card	600 mA
Line fault detection short circuit current open circuit current	 >21.5 mA < 0.5 mA
Resolution	16 bits
Calibration	None required
Optional loop disconnect	Yes
Voltage to transmitter @ 20 mA	15 V (min)
Temperature stability	±0.006% of span per °C

Specifications for DeltaV I.S. I/O AO, 4 to 20 mA with HART	
Number of channels	8
Isolation LocalBus to any channel Between channels I. S. channel to non-I. S. LocalBus	 60 VAC None 250 VAC
Nominal signal range (span)	4 to 20 mA
Full signal range	1 to 22 mA,
LocalBus current (12 VDC nominal) per card	630 mA (typical)
Open circuit detection threshold	0.7 mA ±0.2 mA
Resolution	12 bits
Calibration	None required
Optional loop disconnect	Yes
Voltage to load	13 V (min) @ 20 mA
Load resistance	650 Ω max.
Temperature stability	±0.006% of span per °C

Intrinsically Safe Discrete I/O Cards

Specifications for DeltaV I.S. I/O DI	
Number of channels	16
Isolation LocalBus to any channel Between channels I. S. Channel to non-I. S. LocalBus	 60 VAC None 250 VAC
Detection level for On	>2.1 mA
Detection level for Off	<1.2 mA
Output Impedance	100 Ω @ >6 mA (wetting current)
LocalBus current (12 VDC nominal) per card	350 mA
Switching hysteresis	200 μA nominal
Applicable specifications	NAMUR, DIN 19234
Voltage applied to sensor	7.0 to 9.0 V from 1 k Ω ±10%
Line fault detection short circuit open circuit	 < 100 Ω > 50 k Ω
Maximum input frequency in pulse counting mode	20 Hz
Minimum pulse width detected	45 ms
Optional loop disconnect	No

Specifications for DeltaV I.S. I/O DO	
Number of channels	4
Isolation LocalBus to any channel Between channels I. S. Channel to non-I. S. LocalBus	 60 VAC None 250 VAC
Output range	22 V 11 V @ 45 mA load 25 V maximum
Off state leakage	N/A
LocalBus current (12 VDC nominal) per card	560 mA
Field circuit power per card	None
Configurable channel types:	**Output**
Discrete Output	Output stays in last state submitted by the controller.
Momentary Output	Output is active for a pre-configured time period (100 ms to 100 s).
Continuous Pulse Output	Output is active as a percentage of a pre-configured base time period (100 ms to 100 s). Resolution = 5 ms
Minimum output voltage	22 V (open circuit) 11 V at 45 mA
Maximum output voltage	25 V
Current limit per channel	45 mA (min)
Output supply ripple	<0.5% of output (peak to peak)
Line fault detection short circuit open circuit	 <15 Ω >13 k Ω
Optional loop disconnect	Yes

Intrinsically Safe Power Supply

The intrinsically safe power supply accepts 24 VDC power and converts it to 12 VDC to power the DeltaV I.S. I/O cards. The number of I/O cards that can be powered by a single Intrinsically Safe Power Supply depends on the I. S. I/O card type. Optional power supply redundancy is supported by adding power supplies at a rate of n + 1. The following table gives the specifications for the DeltaV I.S. I/O Power Supply.

I.S. I/O Power Supply Specifications	
Input voltage	18.5 36 VDC
Output current	5A
Output voltage	12 VDC ±5%
Input protection	Internally fused, non-replaceable
Input/output isolation	250 V ac rms (tested at 1,500 V ac rms)
Input connection	2 part screw terminal, each duplicated
Cable size	2.5 mm2
Overvoltage protection	Output protected at 110% to 120%
Operating temperature optimum orientation (full load) worst case orientation	 0 to 55 °C (32 to 131 °F) 0 to 50 °C (32 to 122 °F)
Storage temperature	-40 to +85 °C (-40 to 185 °F)
Relative humidity	5 to 95%, non-condensing
Airborne contaminants	ISA-S71.04-1985 airborne contaminants class G3
Shock	10 g, 11 ms pulse width, to BS EN 60 068-2-27
Vibration	2 g @ 10-100 Hz to BS IN60 068-2-6 and BS 2011 part 2.1
Mounting	On either slot of 2-wide power/controller carrier
LED Indicators:	
Green – DC Power	Input DC power is applied and internal fuse/diode is sound.
External connectors:	
Primary power	DC input, 3-wire

LocalBus Isolator

- The DeltaV LocalBus Isolator protects the I.S. I/O from fault voltages from AC main power supplies. The LocalBus Isolator also links intrinsically safe I/O with non-intrinsically-safe I/O. The following table gives the specifications for the DeltaV LocalBus Isolator.

LocalBus Isolator Specifications		
Dimensions	**Centimeters**	**Inches**
Height	11.0	4.3
Width	4.2	1.7
Depth	16.0	6.2
Weight	250 grams	8.7 oz

Carriers

All DeltaV I.S. I/O cards are contained in modular 8-wide carriers. Connect the carriers in the most efficient configuration for your plant. The carriers have multi-pin connectors to ensure that I.S. I/O is never connected to non-I.S. I/O.

Power supplies for I.S. I/O modules using field wiring have their own modular carriers. These carriers connect between the I/O carriers.

Use a LocalBus isolator to connect I.S. I/O with non-I.S. field wiring. The LocalBus isolator resides on its own carrier.

Carrier Specifications

Common Environmental Specifications for all Carriers	
Category	**Specifications**
Relative humidity	5 to 95% RH, non-condensing
Airborne contaminants	ISA-S71.04-1985 Airborne Contaminants Class G3
Protection rating	IP 20, NEMA 12
Shock	10 g ½-sine wave for 11 ms
Vibration	1 mm peak-to-peak from 5 to 16 Hz; 0.5 g from 16 to 150 Hz
Hazardous area/location*	CENELEC Zone 2 IIC T4 hazardous areas Class I, Div 2, Groups A, B, C, D T4 hazardous locations.
Applicable standards	Factory Mutual Research Co., Class I Div 2, Groups A-D hazardous locations. EN 50 014: 1992 electrical apparatus for potentially explosive atmospheres, general requirements. EN 50 020: 1995 Electrical apparatus for potentially explosive atmospheres, intrinsically safe “i”. EC directive 94/9/EC (ATEX 100A)

**Refer to Zone 0 installation instructions (12P1990) for information on installing in hazardous areas.*

8-Wide I.S. I/O Carrier Specifications		
Capacity	Eight I/O cards and eight terminal blocks	
Dimensions	**Centimeters**	**Inches**
Height	16.5	6.5
Width	33.6	13.2
Depth	3.1	1.2

I.S. I/O Power Supply Carrier Specifications		
Capacity	One I.S. power supply	
Dimensions	**Centimeters**	**Inches**
Height	16.5	6.5
Width	8.4	3.3
Depth	3.1	1.2

LocalBus Isolator Carrier Specifications		
Capacity	One LocalBus Isolator	
Dimensions	**Centimeters**	**Inches**
Height	16.5	6.5
Width	8.4	3.3
Depth	3.1	1.2

I.S. 1-wide Carrier Extender (Left and Right) Specifications		
Capacity	Single cable	
Dimensions	**Centimeters**	**Inches**
Height	16.5	6.5
Width	4.2	1.7
Depth	3.1	1.2

System Compatibility

- M-series I/O cards are not compatible with S-series Controllers and Carriers.

Ordering Information

Description	Model Number
8-channel AI, 4-20 mA with HART	
with I/O term block	VE4012S2B1
with loop disconnect term block	VE4012S2B2
8-channel AO, 4-20 mA with HART	
with I/O term block	VE4013S2B1
with loop disconnect term block	VE4013S2B2
16-channel DI, switch/proximity detector	VE4010B1
4-channel, DO, solenoid driver, IIC Gas Groups	
with I/O term block	VE4011B1
with loop disconnect term block	VE4011B2
8-wide carrier without carrier extension cable	VE4060C0
with carrier extension cable	VE4060C1
24 VDC input I/O module supply and carrier	VE5010
LocalBus isolator and carrier	VE4070

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