# DeltaV™ M-series Traditional I/O




*The DeltaV™ I/O Subsystem is Easy to Install and Maintain.*

- Decreases capital equipment costs
- Decreases installation time and expense
- Increases productivity
- Increases process availability

## Introduction

Traditional I/O is a modular subsystem that offers flexibility during installation. It's designed to be installed in the field, near your devices. Traditional I/O is equipped with function and field wiring protection keys to ensure that the correct I/O card is always plugged into the corresponding terminal block. Modularity, protection keys, and plug-and-play capabilities make DeltaV™ Traditional I/O a smart choice for your process control system.

## Benefits

### Decreases Capital Equipment Costs

**Full System Modularity:** The Traditional I/O subsystem was designed with your investment in mind. All components are fully modular and may be installable under power. You add I/O interface carriers and I/O interfaces in groups of 4, 8, 16, or 32 channels as you need them. The modular design enables you to purchase the exact amount of I/O cards, 8-wide or 4-wide carriers, power/ controllers, and 2-wide carriers you need and add more DeltaV I/O as your system grows.

# Product Description

## The Traditional I/O Subsystem Includes:

- I/O interface carrier (a DIN rail surface mounted) on which all I/O related components are installed
- Bulk AC to 24V DC power supply for field devices
- An I/O interface consisting of an I/O card and an I/O terminal block
- A variety of analog and discrete I/O cards enclosed in a common form factor that easily plugs into the I/O interface carrier
- A variety of I/O terminal blocks mounted on the I/O interface carrier that can be pre-wired before I/O card installation

## I/O Cards

A variety of analog and discrete I/O cards are available to meet your specific requirements. The following cards support simplex or redundant installation:

- AI 4-20 mA HART 8 channels
- AO-4-20 mA HART 8 channels
- DI, 24V DC Dry Contact, 8 channels
- DO 24V DC High-Side, 8 channels




*A Traditional I/O Card Easily Plugs into an I/O Carrier.*

- AI (Plus) 4-20 mA HART, 16 channels
- AO (Plus) 4-20 mA HART, 16 channels
- DI (Plus) 24V DC, Dry Contact, 32 channels
- DO (Plus) 24V DC, High-Side, 32 channels

The following I/O cards are supported in simplex format to meet your field wiring needs:

- RTD, 8-channels
- Thermocouple, 8 channels
- Millivolt, 8 channels
- DI, High Density, 32 channels
- DI 24V DC Isolated, 8 channels
- Multi-Function, 4 channels (Isolated DI)
- Sequence of Event, 16 channels (DI 24 V DC)
- DI 120V AC Low Side Detection, 8 channels
- DI 120V AC Isolated, 8 channels
- DO 24V DC Isolated, 8 channels
- DO 120/230V AC High-Side, 8 channels
- DO 120/230 Isolated, 8 channels

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 enclosed I/O card type. All cards have power and internal error indicators. Eight-channel cards have clearly visible channel status LEDs.

All cards meet ISA G3 corrosion specifications by the careful selection of superior electronic components and the use of conformal coating.

Pulse Counters are available on most DI cards. The supported maximum frequency varies from 0.1 Hz on AC signals to 75 or 120 Hz on 24V DC inputs. For higher pulse counts, up to 50 KHz, use the Multi-Function card's high speed pulse input.

The DeltaV system provides control module level time stamping for log events and alarms. For greater event resolution, the 16-channel Sequence-of-Events DI card can provide signal driven events to a resolution of +/- 0.25 ms per card, or within 1 ms per controller. Please refer to the **Sequence of Events** PDS for more information on Sequence-of-Event data collection and system options for this feature.

### I/O Card Redundancy

Redundant I/O cards are available for critical applications. The same card can be used in simplex or redundant applications. When installed on a two-wide redundant terminal block, the cards are recognized as a redundant pair by the controller. The controller scans each card and determines which card is acting as the active interface. When a fault is detected, the system automatically switches to the standby I/O card.

DeltaV Control modules reference simplex and redundant I/O channels identically and there is no special configuration required to take advantage of redundancy.

Switchover of a redundant I/O card is completed within two scans of the I/O bus. Make-before-break contacts ensure digital field instruments remain powered and the process is undisturbed. Analog output signals are briefly driven by both cards for < 5 ms during switchover of the card.

Hardware Alerts automatically report hardware integrity errors for both the primary and secondary cards. Any event that causes a switchover is also reported automatically through the system hardware alerts and is logged in the Event Chronicle.

Events that can cause a switchover include:

- Hardware failure within the active card.
- Communications failure between the active card and the controller.
- Detection of a fault in the field wiring.

A switchover may also be initiated from the diagnostics explorer, and the health and status of both cards and their channels are available in the diagnostics explorer.

The system automatically commissions a new standby card. In safe areas, failed cards can be replaced under power. In hazardous areas, appropriate installation procedures must be followed.

## Hardware Specifications

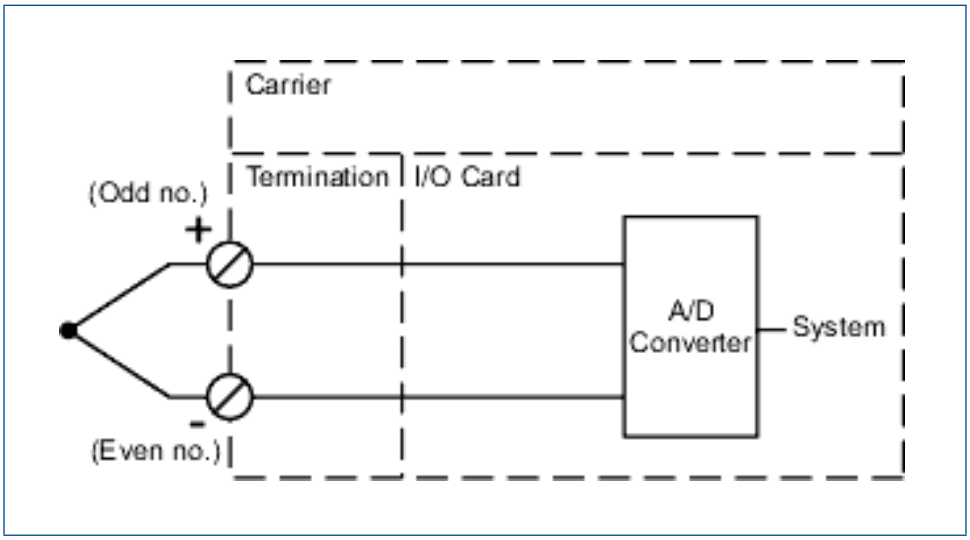
| Common Environmental Specifications for all I/O Interfaces | |
|---|---|
| **Category** | **Specifications** |
| Operating Temperature* | -40 to 70°C (-40 to 158°F) |
| Storage Temperature | -40 to 85°C (-40 to 185°F) |
| Relative Humidity | 5 to 95%, non-condensing |
| Airborne Contaminants | ISA-S71.04-1985 Airborne Contaminants Class G3<br>Conformal coating |
| Protection Rating | IP 20 |
| Shock | 10 g ½-sine wave for 11 ms |
| Vibration | 1 mm peak-to-peak from 5 to 16 Hz;<br>0.5 g from 16 to 150 Hz |
| Dimensions | H 10.7 cm (4.2 in.)<br>W 4.1 cm (1.6 in.)<br>Depth 10.5 cm (4.1 in.) |

*Operating any electronics at the higher end of its temperature range for long periods of time will shorten its expected lifetime, see **Effects of Heat and Airflow Inside an Enclosure** White Paper for more information.

| Specifications for Thermocouple/mV Input Card, 8-channel | |
|---|---|
| Channels per Card | Eight |
| Sensor Types Thermocouple mV | B, E, J, K, N, R, S, T, uncharacterized<br>Low level voltage source |
| Sensor Ranges | See table next page |
| Repeatability | 0.05% of span |
| A/D Resolution | 16-bit |
| Calibration | None required |
| Units | °C, °F |
| Cold Junction Compensation<br>(Not available on mV channels) | Local: Integrally mounted in terminal block<br>External: Configure one channel as external cold junction compensation for remaining inputs |
| Isolation | Each channel is optically isolated from the system and factory tested to 1500V DC<br>■ Channels 1, 2, 3, and 4 are isolated from channels 5, 6, 7, and 8 (verified by 1500V DC factory test)<br>■ Thermocouples attached to channels 1, 2, 3, and 4 are not electrically isolated and should be within + 0.7V DC of each other<br>■ Thermocouples attached to channels 5, 6, 7, and 8 are not electrically isolated and should be within + 0.7V DC of each other |
| Common Mode Rejection | 120 dB at DC/50/60 Hz |
| Common Mode Impedance | > 10 mega ohms |
| Normal Mode Rejection | 60 dB at 60 Hz |
| LocalBus Current (12V DC nominal) | 210 mA |
| Open Sensor Detection | Yes (< 70 nA) |
| Open Sensor Detection Time | 10 seconds |

| Thermocouple Sensor Type Specifications | | | | | |
|---|---|---|---|---|---|
| **Sensor Type** | **Full Scale** | **Operating Range** | **25°C Reference Accuracy** | **Temperature Drift** | **Resolution** |
| Uncharacterized (no linearization, no cold junction compensation.) | -100 to 100 mV | -100 to 100 mV | 0.1 mV | ± 0.002 mV/°C | ~0.003mV |
| B | 250 to 1810°C | 500 to 1810°C | ± 2.4°C | ± 0.056°C/°C | ~0.18°C |
| E | -200 to 1000°C | -200 to 1000°C | ± 0.6°C | ± 0.008°C/°C | ~0.07°C |
| J | -210 to 1200°C | -190 to 1200°C | ± 0.8°C | ± 0.011°C/°C | ~0.05°C |
| K | -270 to 1372°C | -200 to 1372°C | ± 0.5°C | ± 0.016°C/°C | ~0.18°C |
| N | -270 to 1300°C | -190 to 1300°C | ± 1.0°C | ± 0.007°C/°C | ~0.10°C |
| R | -50 to 1768°C | -50 to 1768°C | ± 2.1°C | ± 0.013°C/°C | ~0.14°C |
| S | -50 to 1768°C | -40 to 1768°C | ± 2.2°C | ± 0.067°C/°C | ~0.24°C |
| T | -270 to 400°C | -200 to 400°C | ± 0.7°C | ± 0.001°C/°C | ~0.04°C |

| RTD, ohms Sensor Type Specifications | | | | | |
|---|---|---|---|---|---|
| **Sensor Type** | **Full Scale** | **Operating Range** | **25°C Reference Accuracy** | **Temperature Drift** | **Resolution** |
| Low-level Voltage Source | -100 to 100 mV | -100 to 100 mV | 0.1 mV | 0.002 mV/°C | ~0.003 mV° |




*Simplified Circuit Diagram of Thermocouple/mV card, 8 Channels.*

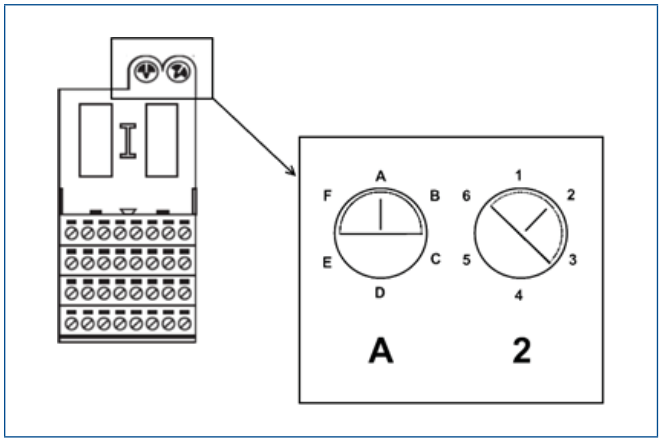
## I/O Terminal Blocks

A variety of I/O terminal blocks are available to meet specific functionality and environmental requirements of the installation. The I/O interface is a combination of the I/O card and the I/O terminal block. Each I/O interface is uniquely keyed so that once installed in a carrier slot with a terminal block, that terminal block will only accept a replacement card.



*8-channel Standard Terminal Block.*

The keying mechanism consists of two keying posts that rotate and lock into the terminal block base. Each post has 6 positions: A-F and 1-6. Each card is assigned a unique key, which is marked on the side of the I/O card:




*Terminal Block Keying Example.*

The keys prevent installation of an incorrect card, and the graphical information on the card makes it easy to determine if a keyed slot will accept a particular card.

There are different I/O terminal blocks available to meet the wiring needs of field signals:

- 8-Channel terminal block
- Fused 8-Channel terminal block
- AI 8-Channel terminal block
- 2-wire AI Plus 16-Channel terminal block
- 4-wire AI Plus 16-Channel terminal block
- AO Plus 16-Channel terminal block
- DI 32-Channel terminal block
- DI Plus 32-Channel terminal block
- DO Plus 32-Channel terminal block
- RTD/Resistance terminal block
- Thermocouple terminal block

The following redundant I/O terminal blocks are available on some I/O interfaces, allowing a pair of cards to be installed as a redundant pair:

- Redundant AI 8-Channel terminal block
- Redundant AI Plus 16-Channel terminal block
- Redundant AO 8-Channel terminal block
- Redundant AO Plus 16-Channel terminal block
- Redundant Discrete 8-Channel terminal block
- Redundant DI Plus 32-Channel terminal block
- Redundant DO Plus 32-Channel terminal block

The table on the following page lists the compatible terminal blocks for each card, along with the cards unique key positions. The first terminal block listed is the recommended terminal block.

In addition to standard signal wiring, some cards may also be ordered with Mass Terminal blocks that allow these cards to be connected to the M-series Mass Connection Solutions or third party wiring solutions from Phoenix or if IS Barriers are required from Pepperl and Fuchs, mounted in an adjacent cabinet to meet special signal conditioning or for optimizing field wiring solutions. Please refer to the Alliance Program website for details on approved third-party products.

- 10-pin Mass Termination Block (simplex only)
- 16-pin Mass Termination Block (simplex only)
- 24-pin Mass Termination Block (simplex only)
- 40-pin Mass Termination Block (simplex and redundant)
- 48-pin Mass Termination Block (simplex and redundant)

## Traditional I/O and Terminal Block Compatibility

| I/O Card | I/O Card Keying | Traditional I/O Terminal Blocks | Mass Termination Blocks |
|---|---|---|---|
| AI, 8-Channel, 4–20 mA, HART | A1 | I/O terminal block<br>Fused I/O terminal block<br>4-wire I/O terminal block | 16-pin Mass termination block (Supports 2-wire Devices)<br>24-pin Mass termination block (Supports 4-wire Devices) |
| AI Plus, 16-Channel, 4-20 mA, HART | A6 | 16-Channel 2-Wire AI terminal block for Series 2 Plus<br>16-Channel 4-Wire AI terminal block for Series 2 Plus<br>Redundant 2- & 4-Wire terminal block | 48-pin AI Mass termination block for Series 2 Plus<br>Redundant 48-pin AI Mass termination block for Series 2 Plus |
| AO, 8-Channel, 4–20 mA, HART | A4 | I/O terminal block<br>Fused terminal block | 16-pin Mass termination block |
| AO Plus, 16-Channel, 4-20 mA, HART | A5 | 16-Channel AO terminal block for Series 2 Plus<br>Redundant 16-Channel AO terminal block for Series 2 Plus | 48-pin AO Mass termination block for Series 2 Plus<br>Redundant 48-pin AO Mass termination block for Series 2 Plus |
| Thermocouple, mV | C1 | I/O terminal block<br>Cold Junction Compensated (CJC) terminal block | NA |
| RTD, 8-Channel | C3 | Resistant Temperature Device (RTD) terminal block | NA |
| DI, 8-Channel, 24V DC, Dry Contact | B1 | I/O terminal block<br>Fused terminal block | 16-pin Mass termination block |
| DI, 8-Channel, 24V DC, Isolated | B2 | I/O terminal block<br>Fused terminal block | 16-pin Mass termination block |
| DI, 32-Channel, 24V DC, Dry Contact | B3 | 32-Channel terminal block | 40-pin Mass termination block |
| DI Plus, 32-Channel, 24V DC, Dry Contact | E3 | 32-Channel DI terminal block for Series 2 Plus<br>Redundant 32-Channel DI terminal block for Series 2 Plus | 40-pin DI Mass termination block for Series 2 Plus<br>Redundant 40-pin DI Mass termination block for Series 2 Plus |

## Certifications

The following certifications are available for M-series Traditional I/O (see actual certificates for exact certifications for each product):

- **CE**

  EMC: EN 61326-1

- **FM**

  FM 3600

  FM 3611

- **CSA**

  CSA C22.2 No. 213

  CSA C22.2 No. 1010-1

- **ATEX**

  EN60079-0

  IEC60079-7

  EN60079-15

- **IEC-Ex**

  IEC60079-0

  IEC60079-7

  IEC60079-15

- **Marine Certifications:** IACS E10

  ABS Certificate of Design Assessment

  DNV Marine Certificate

## Hazardous Area/Location

M-series Traditional I/O Cards can be installed and used based on the following standards (see actual certificates for exact product markings for each product):

- **FM (USA)**

  Class I, Division 2, Groups A, B, C, D, T4

- **cFM (Canada)**

  Class I, Division 2, Groups A, B, C, D, T4

- **ATEX**

  II 3G Ex ec IIC T4 Gc

  II 3G Ex ec [ic] IIC T4 Gc

  II 3G Ex nA nC IIC T4 Gc

- **IEC-Ex**

  II 3G Ex ec IIC T4 Gc

  II 3G Ex ec ic IIC T4 Gc

  II 3G Ex nA nC IIC T4 Gc

Regarding the Installation instructions please refer to the following Documents:

| | |
|---|---|
| Class 1 Division 2 Installation Instructions DeltaV™ M-series | 12P1293 |
| Zone 2 Installation Instructions DeltaV M-series | 12P2046 |

## Ordering Information

| Analog Input Cards and Termination Blocks | |
|---|---|
| **Description** | **Model Number** |
| **8 Channels 4-20 mA, HART** | |
| Standard I/O Termination Block | VE4003S2B1** |
| Redundant Standard I/O Termination Block | VE4033S2B1** |
| Fused I/O Termination Block | VE4003S2B2** |
| 4-wire I/O Termination Block | VE4003S2B3** |
| 16-Pin Mass Termination Block | VE4003S2B4** |
| 24-Pin Mass Termination Block | VE4003S2B5** |
| **16 Channels 4-20 ma, HART, Plus Card** | |
| 16-Channel 2-Wire AI Terminal Block for Series 2 Plus | VE4003S2B9 |
| 16-Channel 4-Wire AI Terminal Block for Series 2 Plus | VE4003S2B10 |
| Redundant 16-Channel 2- & 4-Wire AI Terminal Block for Series 2 Plus | VE4033S2B10 |
| 48-pin AI Mass Termination Block for Series 2 Plus (to be used with DeltaV™ Signal Conditioning Cards for PLC-5 AI, or P+F HiC IS barriers and terminal boards for DeltaV DCS) | VE4003S2B11 |
| 48-pin AI Mass Termination Block for Series 2 Plus including 16-channel Analog Mass Connection Boards* | VE4053S2B11 |
| Redundant 48-pin AI Mass Termination Block for Series 2 Plus (to be used with DeltaV Signal Conditioning Cards for PLC-5 AI, or P+F HiC IS barriers and terminal boards for DeltaV DCS) | VE4033S2B11 |
| Redundant 48-pin AI Mass Termination Block for Series 2 Plus including 16-channel Analog Mass Connection Boards* | VE4083S2B11 |
| **8 Channels Thermocouple, mV** | |
| Standard I/O Termination Block | VE4003S4B1 |
| Cold Junction Compensated (CJC) Termination Block | VE4003S5B1 |
| **Analog Input Card: 8 Channels RTD** | |
| Resistant Temperature Device (RTD) Termination Block | VE4003S6B1 |

*For more details on the Mass Connection Boards and connection cables, please refer to the **M-series Mass Connection Solutions** PDS.

**Supported on DeltaV v10.3.1 and later. If card will be used on earlier DeltaV versions, please request KJ3222X1-BA2.

## Spare Part Ordering Information

| Spare Parts | |
|---|---|
| **Description** | **Model Number** |
| 250V 2A Fuse for Fused Terminal Block; Box of 20 | KJ4010X1-BC1 |
| I/O Module Hold-down Screw; Box of 20 | KJ4010X1-BP2 |

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