Ovation™ Micro Controller Model OMC100

Features

- Supports 32 embedded, software-defined I/O channels in a compact design.
- Provides secure, reliable control for remotely located plants or processes.
- Eight of the 32 channels can be configured for Highway Addressable Remote Transducer (HART) protocol.
- Provides an independent user interface that allows all 32 I/O channels to be configured independently.
- Offers a modular I/O base design for flexible placement within space-constrained areas.
- Uses standard Ovation engineering tools for configuration and maintenance.
- Allows expanded operating temperature.
- Supports low power requirements.
- Offers an optional configuration as a standalone system using an Ovation remote station.
- Includes wide area network communication capability that tolerates low bandwidth or intermittent networks.
- Embedded communication protocol drivers provide connectivity with third-party devices without the need for extra hardware.
- Compatible with all Ovation I/O modules including specialty versions for excitation control and machinery health monitoring as well as high-density modules with increased channel capacity.
- Provides a multiprotocol serial communications port for communicating with devices that support RS232, RS485, or CAN Bus.
- Offers built in diagnostics and alert features.

Introduction

The newest member of the Ovation compact controller series, the Ovation Micro Controller, Model OMC100, integrates all the precision field controls of an Ovation Controller with 32 embedded, software-defined I/O channels, all in one condensed package. Like its OCR and OCC counterparts, the OMC100 provides the same outstanding performance and mission-critical operations for the power and water/wastewater industries, but with a flexible and scalable footprint.

The embedded, configurable I/O channels consist of the following:

- Analog Output – Voltage range from 0 to 10V out.
- Analog Output – Current range 4-20mA with/without HART
- Analog Input – Voltage range 0 to 10 V Input
- Analog Input – Current range 4-20mA with/without HART
- Digital Output – 24 Volt DC
- Digital Input – 24 Volt DC Contact Input
- Thermocouple
- RTD – 2 and 3 wire RTD measurements.

In addition, the OMC100 is equipped with two 9-pin Dsub connectors. One connector allows you to add one branch of Ovation I/O. The I/O branch supports the full range of Ovation analog, digital, turbine, high density, interface, excitation, and machinery health monitor I/O modules, all configured in the Ovation Developer Studio. The other 9-pin Dsub connector allows the OMC100 to communicate with field devices that support RS232, RS485, or Controller Area Network (CAN) bus connections. CAN bus is a standard that allows microcontrollers and devices to communicate with each other's applications without a host computer.

The OMC100 can be used in space-constrained settings without disrupting the existing infrastructure. With its compact size and extended temperature ranges, the OMC100 allows equipment to be placed in environmentally challenged locations. Placing an Ovation OMC100 Controller close to field devices significantly lowers cost associated with field wiring, terminations, and circuit checking compared to traditional Controllers located in a control room.

The Emerson Communication Protocol Suite (CPS), built into the OMC100, enables direct interface to third-party I/O or other devices, such as programmable logic controllers (PLCs), programmable automation controllers (PACs) and real-time automation controllers (RTACs), without the need for extra hardware.

In addition to standard Ovation local area network connections, the OMC100 can also communicate through a wide area network. This option allows an Ovation Controller node to be placed in an area that cannot easily access an Ovation network. Starting with Ovation 3.8 and above, all compact controllers can initiate a secure Virtual Private Network (VPN) connection locally from a Controller. This eliminates the need for routers at the ends and results in a cost savings.

The Controller communicates securely through an internet protocol (IP) connection using a wide variety of wired and wireless media options. Process control continues even if the connection to the host system is lost.

OMC100 supports local historical data recording for deployments on a Wide Area Network (WAN) where the Ovation Process Historian (OPH) Scanners are on the main Ovation Network, and the OMC100 is on the remote WAN. In this configuration, the amount of network traffic between the WAN and OPH is greatly reduced. The OMC100 scanner can buffer up to one million samples of process data without data loss in situations where the network connectivity between the WAN and OPH is interrupted.

When paired with an Ovation remote station, the OMC100 can operate as a standalone control system.

Process Applications

Like the other members of the Ovation Controller family, the OMC100 Micro Controller is designed to meet the demanding requirements of a broad range of process applications, which include:

- Continuous PID (proportional–integral–derivative) control
- Sequential function chart control
- Boolean logic
- Advanced control
- Model Predictive Control
- Fuzzy logic
- Neural Network
- Special logic and timing functions
- Data acquisition
- Sequence of events processing
- Process point sensor/limit checking
- Process point alarm processing
- Process point conversion to engineering units
- Process point database storage
- Local and remote I/O interface
- Process point tagout

Standard Functions

The following sections discuss standard Controller functions.

Control Execution

Like the OCC100 Compact Controller, the OMC100 Micro Controller executes simple to complex modulating, discrete, and sequential control strategies, and performs data acquisition and monitoring functions. The Micro Controller can update the values of up to 10,000 points.

The OMC100 Controller supports up to three control tasks at loop speeds ranging from 10 milliseconds to 300 seconds. Each control task is comprised of the I/O process point input scan, control scheme execution, and an output scan. All three control tasks have user-selectable loop speeds.

Control Scheme

OMC100 functionality is defined by control sheets created from an extensive library of standard and advanced Ovation algorithms specifically designed for the power, water, and wastewater industries. Control sheets provide the basis for executing, documenting, and automatically creating control tuning diagrams used during commissioning and when adjusting control schemes. On average, the OMC100 Controller can execute more than 1,000 control sheets.

Sequence-of-Events

Integral sequence of events processing capability is provided using Ovation I/O (from a total of 32 channels, a maximum of 4 channels are available at a time) and standard Controller software. With a resolution of one millisecond, the sequence of events subsystem records the sequence in which a set of user-defined digital input indications change state, providing a valuable troubleshooting and diagnostic tool for high-speed electrical systems. In addition to the higher resolution time tags, sequence-of-events points may be used in control schemes like any other I/O point, including limit checking and alarming.

Alarm Processing

The OMC100 processes limits and alarms based on each process point's database definition. These functions are performed regardless of whether the point is scanned for input to a control loop or for data acquisition/monitoring, separate from control functions. The alarm status of each point in the Controller is updated with each scan.

The status may indicate whether a point value has:

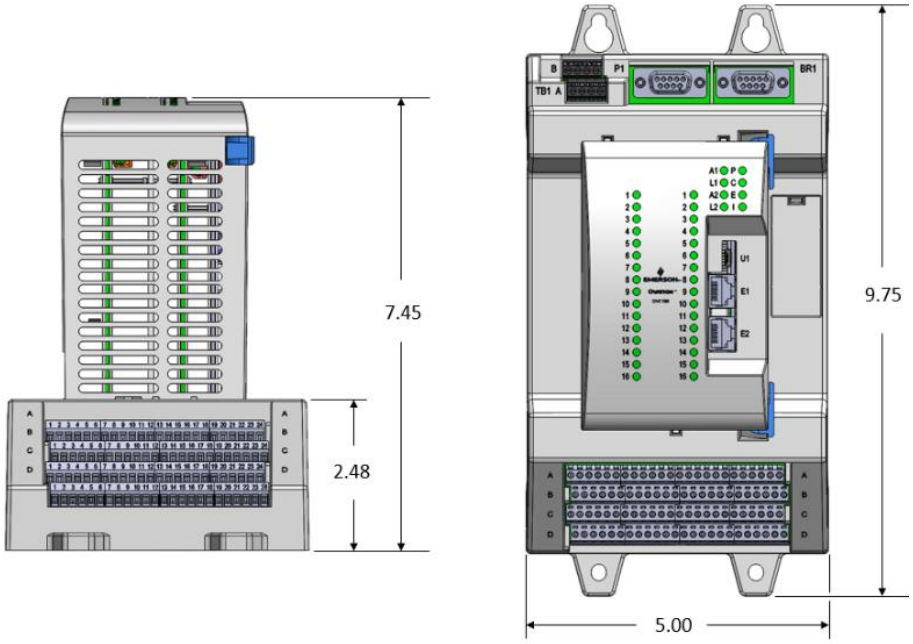
- Exceeded the range of the sensor
- Exceeded the user-defined limits
- Changed state (discrete points)
- Passed an incremental limit

Alarm reporting can be delayed on a per-point basis for a user-specified period. The OMC100 generates alarms upon exceedance of:

- Five user-specified high limit values
- Highest limit value plus an integer time incremental value
- Five user-specified low limit values
- Lowest limit value less an integer times an incremental value

Compact Size

The OMC100's modular architecture provides cost-effective and scalable footprints for space-constrained areas.



Connectivity

The OMC100 includes embedded Ethernet link protocol drivers for communicating with intelligent electronic devices (IEDs) and other third-party devices equipped with embedded Controllers such as smart inverters, weather stations, protective relaying systems, or motor control centers.

The scalable Controller performs data acquisition functions by communicating with Ethernet-capable I/O systems available from numerous vendors and various types of PLCs, PACs, and RTACs using the onboard communication protocol drivers. The OMC100 can acquire smart field device information for archiving to the Historian, displaying on a workstation connected to the Ovation network, or for use with asset management functions through Emerson's AMS Suite technologies or Ovation machine works software.

Network Options

The Ovation Micro Controller uses two methods to communicate with the Ovation network. The first method is through a direct, local area network. Optionally, the OMC100 can communicate over a wide area network, allowing an Ovation drop to operate in an area not accessible to the Ovation network. In this case, the OMC100 uses an Ethernet connection, such as a Virtual Private Network or cellular network, to communicate with the host Ovation network. This method allows the control processes to continue at the remote location even if the connection to the host Ovation system is lost.

Every OMC100 includes two network interfaces that support Ethernet communications per the IEEE 802.3-2008 standard.

OMC100 Specifications

Ovation Micro Controller Model OMC100 - Specifications	
Item	**Capability**
Controller module	• Xilinx Zynq Ultrascale System on a Chip (Soc) quad core ARM Cortex A53 processors. • 1 GB LPDDR4 SDRAM. • 1GB flash drive with on-board clear and format capability • 256 MB QSPI NOR flash • 2 Ethernet MACs • USB capability • Hot swappable • Integrated module temperature monitoring (SOC)

Controller base	• Two configurable 9-pin Dsub connectors:
	  • One that supports one full branch (8 I/O modules) of I/O.
	  • One that supports multiprotocol serial communications.
	• Four rows of I/O terminations that are brought out to 96 pins located at the bottom of the Controller base.
	• 2 x 4 terminal for 24V input power as well as providing pass through connections to daisy-chain to Horizontal I/O bases.

Originated points	Up to 10,000 points
Process control tasks	Up to three, each with a different loop execution rate
Control task loop execution time	All three tasks are user definable, with each task individually defined to execute at a rate between 10 milliseconds and 300 seconds in increments of 10 milliseconds in up to three control task areas.
Ethernet ports	2 Ethernet ports per controller module - 2 independent MACs on the OMC100 Controller,10/100/1000 Base T, RJ45 connectors
Remote Node Interface	Supports up to 16 Ovation remote node interface nodes; each node supports up to 64 Ovation I/O modules
Operating Temperature	-20°C to +70°C (-4°F to 158°F)
Controller electronics module +24V main power	• 10.96 W Typical (Controller only – no I/O) • 20 W Typical (Controller and i/O with typical configuration) • 25 W Maximum (Controller and I/O with maximum configuration)

Ovation Micro Controller Model OMC100 - Specifications	
Item	**Capability**
Supported Protocols	Refer to the Communication Protocol Software Compatibility Matrix data sheet for more information.
Certifications	IEC61131-2, CE Mark, and KC Mark

Onboard I/O Module Specifications

Dielectric isolation	
Description	**Value**
Field Side to Logic Side	1000 VDC/60s
Field Side to Earth Ground	1000 VDC/60s
Logic Side to Earth Ground	1000 VDC/60s
Channel to Channel	1000 VDC/60s
Logic Side to Ethernet	2121 VDC/60s
Logic Side to Earth Ground	1000 VDC/60s
Earth to Ethernet	2121 VDC/60s

Analog Input ratings	
Description	**Value**
Number	16 channels at most (2 maximum per four-channel grouping) *
Valid Input Range	4 - 20 mA with/without HART (calibrated range)
Full Signal Range	0 to 25 mA
Short Circuit Over Current Protection Limit	25 - 35 mA Externally powered 24.5 mA Loop powered

Analog Input ratings	
Description	**Value**
Input Sampling Rate	Sets bits [4:3] in the ADC_CONFIG register • 00: enables the 50 Hz and 60 Hz rejection, resulting in a sampling rate of 20 SPS. • 01: disables the 50 Hz and 60 Hz rejection, resulting in a sampling rate of 4.8 kSPS. • 10: enables the 50 Hz and 60 Hz rejection and HART noise rejection, resulting in a sampling rate of 10 SPS. • 11: disables the 50 Hz and 60 Hz rejection, resulting in a sampling rate of 1.2 kSPS.
Resolution	16 bits, no missing code
Input Impedance Loop Powered	120 Ω, typical - without HART, includes 100 Ω R_{SENSE} 230 ~ 315 Ω, typical - with HART, includes 100 Ω R_{SENSE}
Input Impedance External Powered	175 Ω, typical - without HART, includes 100 Ω R_{SENSE} 230 ~ 330 Ω, typical - with HART, includes 100 Ω R_{SENSE}
Reference Accuracy	±0.10% FS, ±0.5 x LSB @ 99.7% confidence Reference condition: 25° C (77° F) ±1° C (30.2° F) ambient temperature, 50% ±1% RH, 0 V common mode
Temp. Coefficient	0.375uA / °C (15PPM / °C) of the full-scale value when configured for 50 or 60 cycle rejection. **Note:** *Temperature characteristics of the channels are determined mainly by the characteristics of the voltage reference IC.*
Drift	12 PPM (-20° C ~ 70° C) (-4° F ~ 158° F)
Common Mode Rejection	80 dB
Normal Mode Rejection	70 dB
HART Channels	Up to 8 HART analog inputs can be configured. The HART channel must be located on the first channel of each four-channel grouping (for example: 1, 5, 9, 13, 17, 21, 25, 29).

Analog Input ratings	
Description	**Value**
Voltage Input Signal Range	
Number	32 channels at most
Valid Input / Full Signal Range	0 - 10V @ max 100 ohm source impedance
Short Circuit Over Current Protection Limit	0.12 mA at 200 kΩ to GND enabled
Input Sample Rate	Sets bits [4:3] in the ADC_CONFIG register • 00: enables the 50 Hz and 60 Hz rejection, resulting in a sampling rate of 20 SPS. • 01: disables the 50 Hz and 60 Hz rejection, resulting in a sampling rate of 4.8 kSPS. • 10: enables the 50 Hz and 60 Hz rejection and HART noise rejection, resulting in a sampling rate of 10 SPS. • 11: disables the 50 Hz and 60 Hz rejection, resulting in a sampling rate of 1.2 kSPS.
Input Impedance	175 kΩ - 215 kΩ typical. at 200 kΩ to GND enabled
Resolution	16 bits, no missing code
Reference Accuracy	±0.10% FS, ±0.5 x LSB, ±10uV @ 99.7% confidence (per SAMA Standard PMC20), when configured for 50 or 60 Hz rejection. Reference condition: 25° C (77° F) ±1° C (33.8° F) ambient temperature, 50% ±1% RH, 0 VDC common mode. 0 VAC normal mode.
Temperature Coefficient	0.375 µV / °C (15PPM / °C) of the full-scale value when configured for 50 or 60 cycle rejection. **Note:** *Temperature characteristics of the channels are determined mainly by the characteristics of the voltage reference IC.*
Drift	10 PPM (-20° C ~ 70° C) (-4° F ~ 158° F)
Common Mode Rejection	80 dB
Normal Mode Rejection	50 dB

Analog Output Ratings	
Description	**Value**
Number	16 channels at most (2 maximum per four-channel grouping) *
Valid Input Range	4 - 20mA with/without HART (calibrated range)
Full Signal Range	0 to 25 mA
Channel Full-Scale Settling Time	0.21 mS typical (600 ohm load)
Resolution	13 bits
Accuracy	0.1% FS (20 mA) Reference condition: 25° C (77° F) ±1° C (33.8° F) ambient temperature over input power supply voltage range. Temperature coefficient is 25 ppm / °C (77 ppm / °F) FS
Output Noise	Measured at the I/OP x screw terminal with 250 Ω, load, 12.5 mA output 0.15 LSB p-p @ 0.1 Hz to 10 Hz bandwidth 2 nA / √Hz @ 1 kHz, 12.5 mA output
Output Loading	</= 600 ohms
Compliance Voltage	19.6 V at 25 mA
HART Channels	Up to 8 HART Analog Outputs can be configured. The HART Channel must be located on the first channel of each four-channel grouping (for example: 1, 5, 9, 13, 17, 21, 25, 29).
Voltage Output Ratings	
Number	32 channels at most
Valid Output Range	0 to 10 V (calibrated range)
Full Signal Range	0 - 11 V
Short Circuit Over Current Protection Limit	7 mA typical

Analog Output Ratings	
Description	**Value**
Output Channel Full Scale Settling Time	0.28 mS typical (1.33K Load)
Resolution	13 bits, no missing code
Accuracy	0.10% FS Reference condition: 25° C (77° F) ±1° C (33.8° F) ambient temperature over input power supply voltage range.
Output Noise	Measured at the I/OP x screw terminal, 2.5 V output 0.07 LSB p-p @ 0.1 Hz to 10 Hz bandwidth 320nV / ✓Hz @ 1 kHz, 12.5 mA output
Output Loading	1333 ohms minimum (7.5 mA maximum load)

Digital Input ratings	
Description	**Value**
Number	32 channels at most
Signal Range	The 24 VDC single-ended digital input specifications are shown in the following table.

Digital Input – VDC Single-Ended Digital Input Specifications					
Input Level	**On Input Voltage (VDC)**		**Off Input Voltage (VDC)**	**On Input Current (mA)**	**Off Input Current (mA)**
24 VDC	12 (Min)	38 (Max)	9 (Max)	2.1 (Min)	3.7 (Max)	2.5 (Max)

Digital Input – 24 VDC Single-Ended Digital Input Propagation Delays		
Input Level	**Delay Time for Contact Closing (msec)**	**Delay Time for Contact Opening (msec)**
24 VDC	4.34 (Typical)	4.39 (Typical)

Digital Output ratings	
Description	**Value**
Number	16 channels at most (2 maximum per four-channel grouping) *

Digital Output Channel Specifications				
Channel Type	**Min**	**Typical**	**Max**	**Conditions**
	Digital Output			
Voltage Range	23 VDC	23.7 VDC	24 VDC	Onboard ISO field 24 V supply max
Load Current	-	-	25 mA	16 Channels, 2 maximum per four-channel grouping
Leakage Current (OFF State)	-	1 µA	2 µA	24 VDC, 25° C (77° F)
Resistance (ON State)	-	1 ohm	2 ohm	
Turn ON Time	-	0.5 mS	1 mS	Typical values: If = 2.4 mA Rload = 10K ohms
Turn OFF Time		1 mS	2 mS	Vload = 24 VDC
Overcurrent Protection	48.5 mA		49.6 mA	25° C (77° F)
Inrush Current Time Limit	50 µS		85 µS	Test Rload from 56 - 400 Ω, 25° C (77° F)
Overcurrent Response Time			2 µS	

Thermocouple Input ratings	
Description	**Value**
Number	32 channels at most

Thermocouple Input ratings	
Description	**Value**
Input Signal Range Definition	±100 mV @ maximum 100 ohm source impedance
Input Sample Rate	Sets bits [4:3] in the ADC_CONFIG register • 00: enables the 50 Hz and 60 Hz rejection, resulting in a sampling rate of 20 SPS. • 01: disables the 50 Hz and 60 Hz rejection, resulting in a sampling rate of 4.8 kSPS. • 10: enables the 50 Hz and 60 Hz rejection and HART noise rejection, resulting in a sampling rate of 10 SPS. • 11: disables the 50 Hz and 60 Hz rejection, resulting in a sampling rate of 1.2 kSPS.
Resolution	16 bits
Input Impedance	175 kΩ ~ 215 kΩ typical @200 kΩ to GND enabled
Reference Accuracy	±0.10% FS, ±0.5 LSB ±0.10 uV @ 99.7% confidence (per SAMA standard PMC20) when configured for 50 or 60 Hz rejection. Reference conditions: 25° C (77° F) ±1° C (30.2° F) ambient temperature, 50% ±1% RH, 0 VDC common mode, 0 VAC normal mode.
Temperature Coefficient	1.56 µV / °C (15PPM / °C) of the full-scale value when configured for 50 or 60 cycle rejection. **Note:** *Temperature characteristics of the channels are determined mainly by the characteristics of the voltage reference IC.*
Drift	10 PPM (-20° C ~ 70° C (-4° F ~ 158° F)
Common Mode Rejection	80 dB
Normal Mode Rejection	63 dB
Thermocouples Supported	

T/C Types	Temperature Range (° C)
B or TB	+0 ~ +1820
E or TE	-270 ~ +1000
J or TJ	-210 ~ +760
K or TK	-270 ~ +1372

Thermocouple Input ratings	
Description	**Value**
	N or TN: -270 ~ +1300 R or TR: 0 ~ +1684 S/TS: 0 ~ +1768 T/TT: -270 ~ +385
Temperature Sensor	PT1000. Thermocouple compensation temperature sensors (one on each side of the terminal block).
Note: *An open thermocouple will result in an Attention status to the Ovation Controller.*	
Temperature Range	-55° C to +125° C (-67° F to 257° F)
Sampling Rate	Samples at the control task scan rate of the Ovation point associated with the PT1000.
Resolution	0.02° C (32° F)
Accuracy	±0.5° C (-20° C to 70° C range) / (±32.9° F) (-4° F to 158° F range)

Signal Ratings for RTD	
Description	**Value**
Number	32 channels at most (2 wire) 16 channels at most (3 wire)
Max Sourcing Current	1.2 mA
Input Impedance	1 MΩ
Accuracy	±0.10% FS @ 99.7% confidence (per SAMA Standard PMC20) Reference conditions: • 25° C (77° F) ±1° C (33.8° F) ambient temperature • 50% ±1% Relative Humidity • 0 V common mode

Signal Ratings for RTD	
Description	**Value**
	• 0 VAC normal mode noise • Equal lead resistance • Lead resistance < (R[full-scale] / 5 but not to exceed 100 ohms) Error due to non-equal lead resistance: (RDIFF/Rfull-scale) x 100% RL1 = Resistance of the cable from EXA to the RTD RL2 = Resistance of the cable from EXB to the RTD. RDIFF = |RL1-RL2|
Temperature Coefficient	1.56 µV / °C (15 PPM / °C) of the full-scale value when configured for 50 or 60 cycle rejection. **Note:** *Temperature characteristics of the channels are determined mainly by the characteristics of the voltage reference IC.*
Drift	10 PPM (-20° C ~ 70° C (-4° F ~ 158° F)
Offset and Gain Temp. Drift Compensation	No
Self-Calibration	None, Manual Calibration
Common Mode Rejection	80 dB
Normal Mode Rejection	65 dB
Open Wire Detection	A full-scale reading indicates a broken wire. This causes a bit in the Node record to be set, triggering an alarm.

RTD Types		
Scale	**R (cold, ohms)**	**R (hot, ohms)**
Unused Channel	N/A	N/A
3W 10 Ohm Pl (-18° C to 649° C) (0° F to 1200° F)	6	106.3
3W 10 Ohm Cu (-18° C to 150° C) (0° F to 302° F)	8.5	16.5
3W 50 Ohm Cu (0° C to 140° C) (32° F to 284° F)	50	80

RTD Types		
Scale	**R (cold, ohms)**	**R (hot, ohms)**
3W 50 Ohm Cu (0° C to 110° C) (32° F to 230° F)	53	78
3W 100 Ohm Pl (-20° C to 168° C) (-4° F to 334° F)	92	163.67
3W 100 Ohm Pl (0° C to 271° C) (32° F to 520° F)	100	200
3W 100 Ohm Cu (-100° C to 260° C) (-148° F to 500° F)	56.76	211.57
3W 100 Ohm Pl (0° C to 560° C) (32° F to 1040° F)	100	300
3W 120 Ohm Ni (-11° C to 240° C) (12° F to 464° F)	109	360
3W 120 Ohm Ni (0° C to 66° C) (32° F to 150° F)	120	170
3W 120 Ohm Ni (0° C to 122° C) (32° F to 278° F)	120	225
3W 500 Ohm Pl (0° C to 500° C) (32° F to 932° F)	500	1404.9
Note: *The Custom selection is when you choose a particular RTD that is not on the pre-defined list of RTDs.*		

Terminal Block Interface	
I/O Terminal Blocks	
Maximum wire size	14 to 28 AWG (solid or stranded)
Configuration	4 row x 24 position
Power Terminal Blocks	
Maximum wire size	14 to 28 AWG (solid or stranded)
Configuration	2 row x 4 position

***** Users can configure 16 channels total of the following I/O types, with a maximum of two per channel set:

- 4-20 mA Current Input – Loop Powered
- 4-20 mA Current Output
- 24 V Digital Output