

ControlWave[®] Micro Analog Input / Output Modules

The Analog Input (AI), Analog Output (AO), and Analog Input/Output (AI/O) modules provide the ControlWave[®] Micro with the ability to monitor and control various analog field signals. The following AI, AO, and AI/O modules are available.

- 6 Analog Inputs and 2 Analog Outputs module
- 6 Analog Inputs module
- 8 Isolated Analog Inputs module
- 4 Isolated Analog Outputs module

All I/O modules have surge protection that meets C37.90-1978 and IEC 801-5 specifications.

6 Analog Inputs and 2 Analog Outputs Module

The 6 Analog Inputs and 2 Analog Outputs module provides six analog inputs and two analog outputs. Analog inputs are externally sourced, single-ended, and individually jumper configurable for either 4 to 20 mA or 1 to 5 Vdc operation. Analog outputs are externally sourced (11 to 30 Vdc) and individually jumper configurable for 4 to 20 mA or 1 to 5 Vdc. Surge suppression between each signal and ground is achieved with 30 Vdc transorbs. The 6 Analog Inputs and 2 Analog Outputs module is available with local or remote terminations.

8 Isolated High Common Mode (HCM) Analog Inputs Module

The 8 Isolated High Common Mode (HCM) Analog Inputs module provides eight differential analog inputs. Analog inputs are individually jumper configurable as internally sourced 4 to 20 mA non-isolated operation or externally sourced 4 to 20 mA, 1 to 5 Vdc, or 0 to 10 Vdc isolated operation. The analog input circuitry is electrically isolated from the bus interface circuitry of the ControlWave Micro. The 8 Isolated HCM Analog Inputs module is available with local or remote terminations.

6 Analog Inputs Module

The 6 Analog Inputs module provides six analog input channels. Analog inputs are externally sourced, single-ended, and individually jumper configurable for either 4 to 20 mA or 1 to 5 Vdc operation. Surge suppression between each signal and ground is achieved with 30 Vdc transorbs. The 6 Analog Inputs module is available with local or remote terminations.

4 Isolated Analog Outputs Module

The 4 Isolated Analog Outputs module provides four analog outputs that can be individually jumper configured for 4 to 20 mA or 1 to 5 Vdc isolated operation. Analog outputs are electrically isolated from the CPU power system. Calibration data for each channel is stored in an onboard EEPROM for both current and voltage mode configurations. The 4 Isolated Analog Outputs module is available with local or remote terminations.

Local or Remote Terminations

All analog I/O modules are available factory configured for either local terminations that consist of two 10-point terminal block assemblies or remote terminations that consist of two 14-pin mass termination headers. Terminations are pluggable and accept a maximum wire size of 14 AWG (American Wire Gauge).

Remote terminations provide a convenient alternative to the standard direct connect termination. Remote terminations allow a concentration of electrical connections from one or more controllers to be located in a single area, such as the rear of a 19-inch cabinet. For more information on remote terminations, refer to *Product Date Sheet CWMICRO*.



6 Analog Inputs and 2 Analog Outputs Module

ControlWave Micro Non Isolated 6 Analog Inputs Module

Field Wiring Terminals



Terminal Block 1	Definition
1	Positive Analog Input 1
2	Ground
3	Positive Analog Input 2
4	Ground
5	Positive Analog Input 3
6	Ground
7	Positive Analog Input 4
8	Ground
9	Ground
10	Ground

Terminal Block 2	Definition
1	Positive Analog Input 5
2	Ground
3	Positive Analog Input 6
4	Ground
5	Not Used
6	Not Used
7	Not Used
8	Not Used
9	Not Used
10	Not Used

Inputs

Quantity	Six channels
Type	Single-ended, externally sourced, jumper configurable as 1 to 5 Vdc or 4 to 20 mA.
Resolution	14-bit SAR ADC
Impedance	1 to 5 Vdc Inputs 1 MΩ 4 to 20 mA Inputs 250 Ω
Reference Accuracy (after calibration) at 25°C (77°F)	±0.1% of span.
Accuracy Over Operating Temperature Range [-40 to 70°C (-40 to 158°F)]	±0.2% of span.
Input Filter	500 ms to 99.9% of input signal.
Conversion Time	10 ms per channel
Surge Suppression	30 Vdc transorb between signal and ground Meets ANSI/IEEE C37.90-1978 specifications

Power

Consumption	Analog Input	0.011 W
	Analog Output	0.014 W
	Analog Output External Loop Power at 24 Vdc	1.13 W

Physical

Dimensions	152.4 mm H by 25.4 mm W by 88.9 mm L (6 in. H by 1 in. W by 3.5 in. L)
Weight	128 g (4.5 oz)

Terminations	Local	Two 10-point terminal block assemblies
	Remote	Two 14-pin mass termination headers
Wiring	Up to 14 AWG at the removable terminal block	
Environmental		
Same as the ControlWave Micro in which it is installed		
Approvals		
Same as the ControlWave Micro in which it is installed		

ControlWave Micro Non Isolated 6 Analog Inputs and 2 Analog Outputs Module

Field Wiring Terminals



Terminal Block 1	Definition
1	Positive Analog Input 1
2	Ground
3	Positive Analog Input 2
4	Ground
5	Positive Analog Input 3
6	Ground
7	Positive Analog Input 4
8	Ground
9	Ground
10	Ground

Terminal Block 2	Definition
1	Positive Analog Input 5
2	Ground
3	Positive Analog Input 6
4	Ground
5	Positive Analog Output 1
6	Ground
7	Positive Analog Output 2
8	Ground
9	External Voltage
10	Ground

Inputs		
Quantity	Six channels	
Type	Single-ended, externally sourced, jumper configurable as 1 to 5 Vdc or 4 to 20 mA	
Resolution	14-bit SAR ADC	
Impedance	1 to 5 Vdc Inputs	1 MΩ
	4 to 20 mA Inputs	250 Ω
Reference Accuracy (after calibration) at 25°C (77°F)	±0.1% of span	
Accuracy Over Operating Temperature Range [-40 to 70°C (-40 to 158°F)]	±0.2% of span	
Input Filter	500 ms to 99.9% of input signal	
Conversion Time	10 ms per channel	
Surge Suppression	30 Vdc transorb between signal and ground	
	Meets ANSI/IEEE C37.90-1978 specifications	

Outputs		
Quantity	Two channels	
Type	Single-ended, externally sourced, jumper configurable as 1 to 5 Vdc or 4 to 20 mA	
	1 to 5 Vdc	5 mA maximum output current into external load with external voltage range of 11 to 30 Vdc
	4 to 20 mA	250 Ω load with 11 Vdc external power source 650 Ω load with 24 Vdc external power source
Resolution	12 bits	
Reference Accuracy (after calibration) at 25°C (77°F)	Current Output	$\pm 0.1\%$ of span
	Voltage Output	$\pm 0.1\% + [0.057 * I_{load \text{ in mA}}]\%$ of span
Accuracy Over Operating Temperature Range [-20 to 70°C (-4 to 158°F)]	Current Output	$\pm 0.2\%$ of span
	Voltage Output	$\pm 0.2\% + [0.057 * I_{load \text{ in mA}}]\%$ of span
Accuracy Over Operating Temperature Range [-40 to 70°C (-40 to 158°F)]	Current Output	$\pm 0.3\%$ of span
	Voltage Output	$\pm 0.3\% + [0.057 * I_{load \text{ in mA}}]\%$ of span
Surge Suppression	30 Vdc transorb between signal and ground Meets ANSI/IEEE C37.90-1978 specifications	
Power		
Consumption	Analog Input	0.011 W
	Analog Output	0.014 W
	Analog Output External Loop Power at 24 Vdc	1.13 W
Physical		
Dimensions	152.4 mm H by 25.4 mm W by 88.9 mm L (6 in. H by 1 in. W by 3.5 in. L)	
Weight	142 g (5 oz)	
Terminations	Local	Two 10-point terminal block assemblies
	Remote	Two 14-pin mass termination headers
Wiring	Up to 14 AWG at the removable terminal block	
Environmental		
Same as the ControlWave Micro in which it is installed		
Approvals		
Same as the ControlWave Micro in which it is installed		

ControlWave Micro Isolated 8 High Common Mode (HCM) Analog Inputs Module

Field Wiring Terminals



Terminal Block 1	Definition
1	Positive Analog Input 1
2	Negative Analog Input 1
3	Positive Analog Input 2
4	Negative Analog Input 2
5	Positive Analog Input 3
6	Negative Analog Input 3
7	Positive Analog Input 4
8	Negative Analog Input 4
9	Isolated Ground
10	Isolated Ground

Terminal Block 2	Definition
1	Positive Analog Input 5
2	Negative Analog Input 5
3	Positive Analog Input 6
4	Negative Analog Input 6
5	Positive Analog Input 7
6	Negative Analog Input 7
7	Positive Analog Input 8
8	Negative Analog Input 8
9	Isolated Ground
10	Isolated Ground

Inputs

Quantity	Eight channels
Type	Isolated, jumper configurable as externally sourced 1 to 5 Vdc, 0 to 10 Vdc, 4 to 20 mA, or internally sourced 4 to 20 mA.
Resolution	21-bit Delta Sigma ADC
Impedance	1 to 5 Vdc Inputs 4 to 20 mA Inputs
Field Device Supply	24 Vdc at 200 mA
Reference Accuracy (after calibration) at 25°C (77°F)	±0.1% of span
Accuracy Over Operating Temperature Range [-20 to 70°C (-4 to 158°F)]	±0.2% of span
Accuracy Over Operating Temperature Range [-40 to 70°C (-40 to 158°F)]	±0.3% of span
Over Range	0.8 to 5.2 Vdc (for 1 to 5 Vdc Input) 3.2 to 20.8 mA (for 4 to 20 mA Input)
Common Mode Rejection	75 dB
Normal Mode Rejection	40 dB
Voltage Input Impedance	1 MΩ
Current Input Impedance	250 Ω
Bus Access	8 bits wide
Channel to System Bus Isolation	500 Vdc

Channel to Channel Common Mode Voltage	180 Vdc	
Input Filter	300 ms to 99.9%	
Conversion Time	33 ms per channel	
Surge Suppression	180 Vdc transorb between signal and ground Meets ANSI/IEEE C37.90-1978 specifications	
Power		
Consumption (8 inputs)	Analog Input (externally powered)	0.88 W at 12 Vdc 1.18 W at 24 Vdc
	Analog Input (internally powered)	7 W
Physical		
Dimensions	152.4 mm H by 25.4 mm W by 88.9 mm L (6 in. H by 1 in. W by 3.5 in. L)	
Weight	142 g (5 oz)	
Terminations	Local	Two 10-point terminal block assemblies
	Remote	Two 14-pin mass termination headers
Wiring	Up to 14 AWG at the removable terminal block	
Environmental		
Same as the ControlWave Micro in which it is installed		
Approvals		
Same as the ControlWave Micro in which it is installed		

ControlWave Micro Isolated 4 Analog Outputs Module

Field Wiring Terminals



Terminal Block 1	Definition
1	Analog Output 1 Current
2	Analog Output 1 Return
3	Analog Output 1 Voltage
4	Analog Output 1 Return
5	Analog Output 2 Current
6	Analog Output 2 Return
7	Analog Output 2 Voltage
8	Analog Output 2 Return
9	Isolated Ground
10	Isolated Ground

Terminal Block 2	Definition
1	Analog Output 3 Current
2	Analog Output 3 Return
3	Analog Output 3 Voltage
4	Analog Output 3 Return
5	Analog Output 4 Current
6	Analog Output 4 Return
7	Analog Output 4 Voltage
8	Analog Output 4 Return
9	Isolated Ground
10	Isolated Ground

Outputs		
Quantity	Four channels	
Type	Single-ended, jumper configurable as 1 to 5 Vdc or 4 to 20 mA	
Resolution	12-bit	
Over Range	0.8 to 5.2 Vdc or 3.2 to 20.8 mA	
Reference Accuracy (after calibration) at 25°C (77°F)	Current Output	±0.1% of span
	Voltage Output	0.1% + [0.114 * Iload in mA]% of span
Accuracy Over Operating Temperature Range [-40 to 70°C (-40 to 158°F)]	Current Output	±0.3% of span
	Voltage Output	0.3% + [0.114 * Iload in mA]% of span
Current Mode Compliance	650 Ω	
Max Load Current	5 mA (Voltage Mode)	
Isolation	500 Vdc channel to bus	
Power		
Consumption (four inputs)	Analog Current Output	3.0 W
	Analog Voltage Output	1.3 W
Surge Suppression	16 Vdc transorb Meets ANSI/IEEE C37.90-1978 specifications	
Physical		
Dimensions	152.4 mm H by 25.4 mm W by 88.9 mm L (6 in. H by 1 in. W by 3.5 in. L)	
Weight	128 g (4.5 oz)	
Terminations	Local	Two 10-point terminal block assemblies
	Remote	Two 14-pin mass termination headers
Wiring	Up to 14 AWG at the removable terminal block	
Environmental		
Same as the ControlWave Micro in which it is installed		
Approvals		
Same as the ControlWave Micro in which it is installed		

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