1746-NI4 Analog Input Module

The 1746-NI4 Analog Input module contains 4 analog input channels that are user selectable per channel for voltage or current to support a variety of monitoring and controlling applications

1746-NIO4I and NIO4V Analog Combination Modules

The NIO4I and NIO4V Analog Combination I/O modules provide two input and two output channels in a single slot module. The 1746-NIO4I module contains two current or voltage inputs (user selectable per channel), and two current outputs. The 176-NIO4V module contains two current or voltage inputs (user selectable per channel) and two voltage outputs.

1746-NO4I and NO4V Analog Output Modules

The NO4I and NO4V Analog Output Modules provide 4 analog output channels. The NO4I module contains four current outputs. The NO4V module contains four voltage outputs. Both of these modules support a variety of monitoring and controlling applications.

Catalog 1746-	Input Channels per Module	Output Channels per Module	Backplane Current Draw		External 24V dc Power Supply Tolerances
			5V (max.)	24V (max.)	
NI4	4 differential, voltage or current selectable per channel, not individually isolated	NA	35 mA	85 mA	NA
NIO4I	2 differential, voltage or current selectable per channel, not individually isolated	2 current outputs, not individually isolated	55 mA	145 mA	NA
NIO4V	2 differential, voltage or current selectable per channel, not individually isolated	2 voltage outputs, not individually isolated	55 mA	115 mA	NA
NO4I	NA	4 current outputs, not individually isolated	55 mA	195 mA	24 ±10% at 195 mA max. (21.6 to 26.4V dc)(1)
NO4V	NA	4 voltage outputs, not individually isolated	55 mA	145 mA	24 ±10% at 145 mA max. (21.6 to 26.4V dc)(1)

(1) Required for some applications if SLC 24V power is not readily available.

For more specification information, refer to Appendix A.

Procedures

1.	**Check the contents of shipping box.**	**Reference**

Unpack the shipping box making sure that the contents include:

- Analog I/O module (Catalog Number 1746-Series)
- installation instructions (publication 1746-IN008)

If the contents are incomplete, call your local Allen–Bradley representative for assistance.

2.	**Determine your power requirements for the modular controller.**	**Reference**

Review the power requirements of your system to see that your chassis supports placement of the analog module.

Chapter 3 *(Installing and Wiring Your Analog Module)*

Appendix A *(Specifications)*

- For modular style systems, calculate the total load on the system power supply using the procedure described in the *SLC 500 Modular Hardware Style User Manual* (publication 1747-UM011) or the *SLC 500 Family System Overview* (publication 1747-SO001).
- For fixed SLC 500 controllers, refer to the *SLC 500 Fixed Hardware Style Installation & Operation Manual* (publication 1747-6.21).

Catalog Number	Backplane Current Draw		External 24V dc Power Supply Tolerance
	5V (max.)	24V (max.)	
1746-NI4	35 mA	85 mA	NA
1746-NIO4I	55 mA	145 mA	NA
1746-NIO4V	55 mA	115 mA	NA
1746-NO4I	55 mA	195 mA	24 ±10% at 195 mA max. (21.6 to 26.4V dc)[1]
1746-NO4V	55 mA	145 mA	24 ±10% at 145 mA max. (21.6 to 26.4V dc)[1]

(1) Required for some applications if SLC 24V power is not readily available.

Specifications

Analog Modules Specification

This section lists the specifications for the 1746-NI4, NIO4I, NIO4V, NO4I and NO4V analog modules. They include:

- General specifications
- Current and Voltage input specifications
- Current and Voltage output specifications

General Specifications for NI4, NIO4I, NIO4V, NO4I, and NO4V

Specification	Value
SLC Communication Format	16 Bit Two's Complement Binary
Field Wiring to Backplane Isolation	500V dc
Update Time	512 µs for all channels in parallel
Recommended Cable	Shielded Belden #8761
Maximum Wire Size	#14 AWG (maximum)
Terminal Block	Removable
Location	1746 chassis
Calibration	Factory Calibrated (Refer to calibration procedure, pg. D-2)
Noise Immunity	NEMA Standard ICS 2-230
Environmental Conditions Operating Temperature Storage Temperature Relative Humidity	 0° to +60° C (+32° to +140° F) -40° to +85° C (-40° to +185° F) 5 to 95% (non–condensing)
Agency Certification (when product or packaging is marked)	c UL us C-UL Listed Industrial Control Equipment for use in Class 1, Div 2 Hazardous Locations CE Marked for all applicable directives C-Tick N223 Marked for all applicable acts

General Analog Input

Catalog 1746-	Input Channels per Module	Output Channels per Module	Backplane Current Draw		External 24V dc Power Supply Tolerance
			5V (max.)	24V (max.)	
NI4	4 differential, voltage or current selectable per channel, not individually isolated	NA	35 mA	85 mA	NA
NIO4I	2 differential, voltage or current selectable per channel, not individually isolated	2 current outputs, not individually isolated	55 mA	145 mA	NA
NIO4V	2 differential, voltage or current selectable per channel, not individually isolated	2 voltage outputs, not individually isolated	55 mA	115 mA	NA
NO4I	NA	4 current outputs, not individually isolated	55 mA	195 mA	24 ±10% at 195 mA max. (21.6 to 26.4V dc)(1)
NO4V	NA	4 voltage outputs, not individually isolated	55 mA	145 mA	24 ±10% at 145 mA max. (21.6 to 26.4V dc)(1)

(1) Required for some applications if SLC 24V power is not readily available.

Specifications for NI4, NIO4I, and NIO4V

Specification	1746-NI4	1746-NIO4I, -NIO4V
Converter Resolution	16 bit	
Repeatability	±1 LSB	
Location of LSB in I/O image word	0000 0000 0000 0001	
Non–linearity	0.01%	
Common Mode Voltage Range	-20 to +20 volts	
Common Mode Rejection at 0 to 10 Hz (min.)	50 dB	
Common Mode Rejection at 60 Hz (min.)	105 dB	
Normal Mode Rejection at 60 Hz (min.)	55 dB	
Channel Bandwidth	10 Hz	
Step Response	60 ms at 95%	
Conversion Method	Delta–Sigma Modulation	
Impedance to ANL COM	380K ohms(1)	500K ohms
Impedance channel to channel	760K ohms(2)	1M ohms

(1) The value listed is for Series B and greater. For Series A, the impedance to ANL COM is 500K Ohms.

(2) The value listed is for Series B and greater. For Series A, the impedance channel to channel is 500K Ohms.

Current-Loop Input Specifications for NI4, NIO4I, and NIO4V

Specification	1746-NI4, -NI04I, -NIO4V
Input Range (Normal Operation)	-20 to +20 mA
Absolute Maximum Input Current	-30 to +30 mA
Absolute Maximum Input Voltage	±7.5V dc or 7.5V ac RMS
Current Input Coding -20 to +20 mA	-16,384 to +16,384
Input Impedance	250 Ohms
Resolution	1.22070 µA per LSB
Full Scale	20 mA
Overall Accuracy at +25° C (77° F) (max.)	±0.365% of full scale
Overall Accuracy at 0° to +60° C (32° to 140° F) (max.)	±0.642% of full scale(1)
Overall Accuracy Drift (max.)	+79 ppm/5 C of full scale
Gain Error at +25° C (77° F) (max.)	+0.323%
Gain Error at 0° to +60° C (32° to 140° F) (max.)	±0.556%
Gain Error Drift (max.)	±67ppm/° C
Offset Error at +25° C (77° F) (max.) (Iin = 0, Vcm = 0)	±7 LSB
Offset Error at 0° to +60° C (32° to 140° F) (max.) (Iin = 0, Vcm = 0)	±14 LSB
Offset Error Drift (max.) (Iin = 0, Vcm = 0)	±0.20 LSB/° C

(1) Refer to Appendix C for a method to improve accuracy over temperature.

Current Output Specifications for NI04I and NO4I

Specification	1746-NI04I, -N04I
Converter Resolution	14 bit
Location of LSB in I/O image word	0000 0000 0000 01XX
Non–linearity	0.05%
Conversion Method	R-2R Ladder
Step Response	2.5 ms (at 95%)
Load Range	0 to 500 Ohms
Maximum Load Reactance	100 µH
Current Output Coding (0 to +21 mA - 1 LSB)	0 to +32764
Output Range (Normal)	0 to +20 mA
Overrange Capability	5% (0 to +21 mA - 1 LSB)
Resolution	2.56348 µA per LSB
Full Scale	21 mA
Overall Accuracy at +25° C (77° F) (max.)	±0.298% of full scale
Overall Accuracy at 0° to +60° C (32° to 140° F) (max.)	±0.541% of full scale
Overall Accuracy Drift (max.)	±70 ppm/° C of full scale
Gain Error at +25° C (77° F) (max.)	±0.298%
Gain Error at 0° to +60° C (32° to 140° F) (max.)	±0.516%
Gain Error Drift (max.)	±62 ppm/° C
Offset Error at +25° C (77° F) (max.)	±10 LSB
Offset Error at 0° to +60° C (32° to 140° F) (max.)	±12 LSB
Offset Error Drift (max.)	±0.06 LSB/° C