8 Current AI Module with HART and Protection PO1114/P

Doc. Code: CE109322 Revision: A

Product Description

The PO1114/P module is part of Ponto Series and has 8 isolated analog inputs for current measurement with protection against voltage surge on the inputs. This module is applied for control and supervision of machines, automation processes and where it is required remote parameterization of transmitters through an asset management tool that uses HART technology over PROFIBUS.

The picture shows the product installed on an analog I/O spring-clamp terminal base.

The module main features are:

- Analog input module
- Measurement of two current scales: 0-20 mA and 4-20 mA
- Inputs with protection against voltage surge
- HART protocol (4-20 mA)
- Isolation for internal logic as much as for external power supply
- Local and remote diagnosis
- Hot swapping with no interference on panel cabling
- Remote parameterization via software
- Remote parameterization of transmitters through asset management tools
- Analog inputs with galvanic isolation from logic
- Field cabling connected to the terminal base, therefore eliminating intermediary terminal blocks for field signals
- Filters parameters configurable by software
- Automatic addressing
- Automatic verification of module type based on the bus head

Ordering Information

Included Items

The product packaging contains the following items:

- PO1114/P module
- Installation guide

Product Code

The following code should be used to purchase the product:

Code	Description
PO1114/P	8 Current AI Module with HART and Protection

Related Products

The following products must be purchased separately when necessary:

Code	Description
PO6001	Analog I/O spring-clamp terminal base
PO8510	10 sheets with 14 labels of 16 tags for printer
PO8523	Spring terminal block tool

Notes

PO8510: this product consists of A4 sheets with labels where the tags may be printed, in the case the user wishes so, using MasterTool ProPonto Software - MT6000.

PO8523: this product is an isolated tool to connect the cables into the spring-clamp terminal bases PO6001 and PO6101.

Product Features

General Features

	PO1114/P
Module type	8 analog inputs with protection
Input type	Current
Data format	16 bits in 2 complement, aligned to the left
Converter resolution	16 bits monotonicity guaranteed, no missing codes
Channel terminal block information	1 terminal for power supply 24 Vdc of sensors 4-20 mA (P) 1 terminal for current input (I) 1 terminal for each I/O return (0 Vdc), interconnected (N) 1 terminal for shield cable (G)
Diagnostic indication	Two multifunctional LEDs with indication of module OK status, out of range input and missing of parameterization
Configurable parameters	Measurement range per input point Enabling of HART protocol Filters: 176 ms, 880 ms, 1760 ms
Selftest	A/D converter and all the control logic
Hot swap	Yes
Protections	Yes, protection against voltage surge
External power supply voltage	19 to 30 Vdc including ripple Maximum input current – 65 mA @ 24 Vdc.
In-rush input current	1.2A @ 24 Vdc
Scanning Time	22 ms per channel; 176 ms for all channels
Initialization time	5 s (maximum)
Isolation	
Inputs to logic circuits	1500 Vac up to 1 minute
Inputs to ground	1500 Vac up to 1 minute
Power supply to logic	1500 Vac up to 1 minute
Between inputs	No isolation
Bus power consumption	30 mA
Dissipated power	1.6 W
Dimensions	99.2 x 51.1 x 83.8 mm
Environment conditions	Consult general features of Ponto Series (CE109000)
Compatible terminal bases	PO6001: Spring-clamp analog I/O terminal base

Notes

Scanning time: necessary amount time for a channel conversion. To convert all 8 channels at the same time, scanning time is 8 times one channel. Scanning time on head depends on transmission time on bus (see CT of PO5064/65 head).

Initialization time: the time the module takes to make its inner initializations, while data is not available to the CPU. After this time, channels scan is initiated and data starts to be updated. This time also occurs at each system reconfiguration which had changed module parameters.

Power supply interruptions: power supply interruptions, during at least 10 ms may be supported, since the module is operating in its nominal voltage of 24 Vdc or greater. Longer interruptions or in voltages lower than its nominal one may cause module reset.

Analog Inputs

	PO1114/P – Current mode		
Precision	± 0.1 % of full range @ 25 ºC ± 0.005% / ºC of full range		
Input impedance	260 Ω		
Maximum input voltage	30 Vdc		
Crosstalk @ 100hz	- 30 dB (minimum)		
Scanning time	22 ms per channel		
Ranges	**Range**	**Counting**	**Resolution**
	0 to 20 mA	0 to 30000	0.669 μA
	4 to 20 mA	0 to 30000	0.669 μA
	4 to 20 mA with HART	0 to 30000	0.669 μA
Range slack	+ 5%		
Over-range	Indicates the end of measurement range		

HART

	PO1114/P
Operation mode	Monodrop
Allows secondary master	Yes

Compatibility With Other Products

The following table describes the main Altus products compatible with PO1114/P:

	Compatible version
PO5064	1.00 or higher
PO5065	1.00 or higher
ALT_0BAF.GSD (PROFIBUS)	1.00 or higher
ALT_0BB0.GSD (PROFIBUS)	1.00 or higher
ProPonto MT6000	1.59 or higher
MasterTool MT8000	5.42 or higher

ATTENTION:
This product is not compatible with PROFIBUS heads PO5063V1 and PO5063V5.

Installation

ATTENTION:

ESD (Electro Static Discharge) sensitive device. Always touch a grounded metallic object before handling the device.

Electrical Installation

PO1114/P module installation must be done on a PO6001 base.

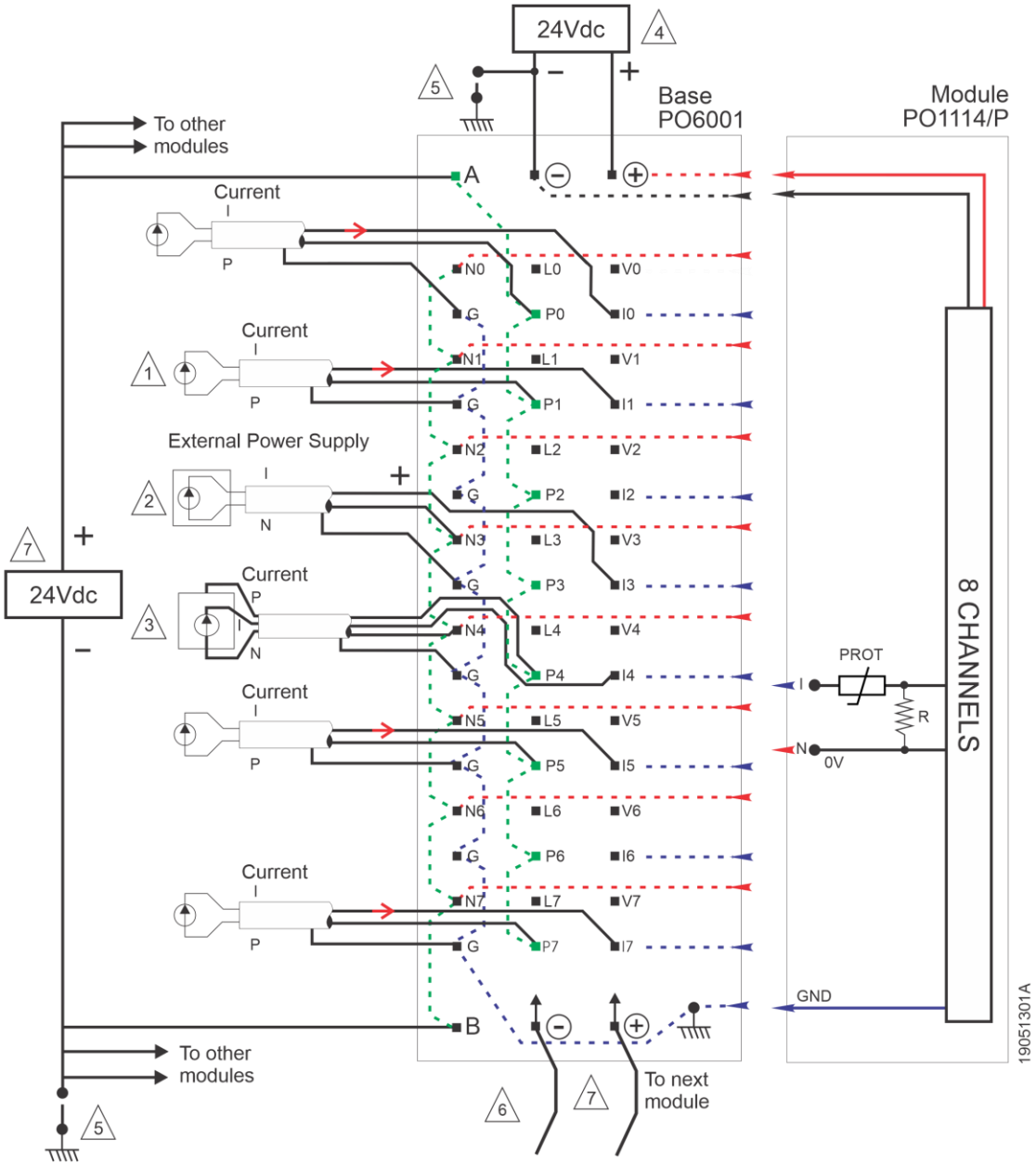


Diagram Notes:

1-This is the required connection for 2-wire current sensors – the sensor is powered by terminal P. The 24 Vdc power supply comes from terminal P. Current signal will be considered as positive when it comes in terminal I.

2-When using current sensors that require external power (four wires): the input signal is connected to terminal I and returns to sensor through terminal N.

3- Sensors that require 24 Vdc power supply can use the 24 Vdc voltage available in all P terminals. This is connected to the field power supply (7).

4-Electrical installation is done by feeding the module base with a 24 Vdc power supply. This connection is done via terminals marked by (+) and (-). This connection is mandatory, because it is the only way to supply power to the module.

5-The common point for the power supply (4) and the sensor (7) may be connected to the panel ground. This connection is not mandatory, but it is recommended in order to reduce electrical noise in automation systems.

6- The next module may be fed through the points (+) and (-) on this module base. The maximum number of module bases that may be connected in this way is 10. No other device can be connected to these terminal strips.

7-This power supply may provide 24 Vdc to feed the sensors. We recommend the use of a power supply different from the one indicated in the item (4), because, in case of a field short-circuit fail, the system will not fail and is capable to assist maintenance procedures through diagnostics messages.

Module Power Supply:

The PO1114/P module uses a 24 Vdc regulated power supply – terminals (+) and (-). This power supply may be used also to feed the field sensors. We recommend using separate power supplies for larger systems.

Field Cabling:

When installing the module please follow procedures described below in order to avoid electromagnetic interference:

- Avoid sharing the same conduit for high voltage or current cables (for instance, motors power supply) and sensor cables.
- Identify and eliminate other noise sources, such as faulty or unprotected contactors and sparks produced by the wearing down of motors' brushes.
- Use shielded cables for carrying input signals and ground only one of the shielding ends.

ATTENTION:

It should be used the recommendations from standard IEEE 518-1977 Guide for the Installation of Electrical Equipment to Minimize Electrical Noise Input to Controllers from External Sources.

ATTENTION:

Atmospheric discharges (lightnings) may cause damages to the modules although their protections.

Additional protections should be used if module's power comes from a power supply located outside the cabinet where the module is installed, because this makes it vulnerable to this kind of discharges.

ATTENTION:

This is an analog module and its installation near radio-frequency emitter devices may interfere in the precision of inputs. Avoid installing it near radio equipment, antennas and similar devices.

Field wiring should be shielded because radio-frequency coupling may occur in field signals.

The module has been tested with electromagnetic fields of intensities up to 10 V/m. In those conditions, observed precision was at least 0.5%. This field intensity corresponds to the maximum values considered by international standards to industrial environment. Stronger fields can cause greater performance depreciation.

Tests with portable radio transmitters (walkie-talkies) near the module (1 m) caused no alteration in nominal precision.

Mechanical Assembly

The mechanical assembly is described in the Ponto Series Utilization Manual (MU209000). There are no special requirements in mechanical assembly of this module.

Please adjust the module base mechanical code, when assembly this module on its base, to 14 (1 on switch A and 4 on switch B).

Parameterization

The CPU or field network head define via software the PO1114/P module parameterization. The identification of this module on GSD files and on configuration tools is the same of PO1114, since they are identical from software perspective. The parameterization sets the measurement modes as well as filtering. The software which configures the field bus master sets the parameterization. For further information, please consult Ponto Series Utilization Manual and Manuals for the Interfaces and Field Network Heads. The parameterization is set through user-friendly menus. For reference purposes, the binary codes are shown as follows.

Parameters Bytes

The module parameterization is defined by ten bytes. The first two bytes set the general module aspects and the remaining eight bytes set the parameterization of each analog input.

The bytes are be defined as the following.

Byte	Parameters
0	Module (General)
1	Module (General)
2	Channel 0
3	Channel 1
4	Channel 2
5	Channel 3
6	Channel 4
7	Channel 5
8	Channel 6
9	Channel 7

Bits

Description of the parameterization bits for each byte:

Byte 0 - Module (General)								Description
7	6	5	4	3	2	1	0	
				1	0	1	0	Number of parameters bytes
0	0	0	0					Not used

Notes

Byte 0: The byte 0 carries always the 0AH value, with no options.

Byte 1 – Module (General)								Description
7	6	5	4	3	2	1	0	
0	0	0	0	0	0	0	0	Not used

Bytes 2 to 9								Description
7	6	5	4	3	2	1	0	
	0	0						Sampling time of 176 ms (1 channel sampling) (default)
	X	1						880 ms filter (5 channel sampling)
	1	0						1760 ms filter (10 channel sampling)
				0	0	0	0	Deactivated channel
				1	0	0	1	Current: 0 to 20 mA
				1	0	1	0	Current: 4 to 20 mA
				1	1	0	0	Current: 4 a 20 mA with HART
0			0					Not used (always zero)

Notes

Byte 2 to 9: the bytes 2 to 9 define each analog channel input configuration. The three higher bits define the filtering mode and the five lower bits define the analog mode.

Deactivated channel: if the channel is configured like deactivated, the value provided by the module is always zero.

Deactivated channel: sampling time is not changed by channels deactivation.

Deactivated channel: if all channels are deactivated, the module indicates parameterization error.

Example

Byte	Parameters	7	6	5	4	3	2	1	0	Hex Value	Description
0	Module (General)	0	0	0	0	1	0	1	0	0A	Fixed value
1	Module (General)	0	0	0	0	0	0	0	0	00	Fixed value
2	Channel 0	0	0	0	0	0	0	0	0	00	Deactivated channel
3	Channel 1	0	0	0	0	0	0	0	0	00	Deactivated channel
4	Channel 2	0	0	0	0	1	0	0	1	09	Current 0 to 20 mA
5	Channel 3	0	0	0	0	1	0	0	1	09	Current 0 to 20 mA
6	Channel 4	0	0	0	0	1	0	1	0	0A	Current 4 to 20 mA
7	Channel 5	0	0	0	0	1	0	1	0	0A	Current 4 to 20 mA
8	Channel 6	0	0	0	0	1	1	0	0	0C	Current 4 to 20 mA with HART
9	Channel 7	0	0	0	0	1	1	0	0	0C	Current 4 to 20 mA with HART

Diagnostics

The PO1114/P module provides ten bytes for operating diagnosis including information about the connected sensors. The first two bytes indicate the general aspects related to the module operation.

Byte	Diagnosis
0	Module (General)
1	Module (General)
2	Channel 0
3	Channel 1
4	Channel 2
5	Channel 3
6	Channel 4
7	Channel 5
8	Channel 6
9	Channel 7

When the module is a PROFIBUS remote device, the diagnosis information is available to the CPU, which contains the PROFIBUS Master Interface, only for faulty cases. In this case, the respective codes are sent in the decimal form.

Byte 0 – Module (General)								PROFIBUS Message Code	Description
7	6	5	4	3	2	1	0		
						0		-	Normal operation
						1		09	- Parameterization error - Inner error on module or module in starting mode
				0				-	Normal operation
				1				31	Not parameterized module
	0							-	Normal voltage supply
	1							02	External voltage lower than 19 Vdc
0		0	0		0		0	-	Always zeros

Notes

Byte 0: during initialization time, the module may present the diagnosis general bits 1 and 3.

Byte 1 – Module (General)								PROFIBUS Message Code	Description
7	6	5	4	3	2	1	0		
0	0	0	0	0	0	0	0	-	Always zeros

Byte 2 a 9 - Channel diagnosis								PROFIBUS Message Codes	Description
7	6	5	4	3	2	1	0		
					0			-	Normal input
					1			18	Open loop current
				0				-	Measurement scale in range
				1				19	Measurement scale over-range
0	0	0	0			0	0	-	Always zeros

Notes

Open loop current: open loop indication only exists for 4-20 mA or 4-20 mA ranges with HART.

Measurement scale over-range: over-range indication denotes the end of measurement range 4-20 mA or 0-20 mA, but over-range current value varies with module calibration. At 0-20 mA range, the measure of final value is lower than 32767 in over-range.

The diagnosis LED indicates the following situations:

LED DG	Meaning	Causes
On	Normal operation	
Blinking 1X	Head is not accessing module or logic fault at module	Wrong module type for the position Non-declared module Damaged module
Blinking 3X	Power supply lower than nominal one	Power supply is below the specified limit
Blinking 4X (the fault identification is done through CPU diagnosis word)	No continuity at current signal current 4 – 20 mA in some channel	Field cable open
	Measurement scale over-range	Sensor signal above the scale measurement
	Parameterization error	All channels are deactivated

LED 17	Meaning	Causes
On	Normal operation	
Blinking 1X	Parameterization error	Parameterization is not valid
Off	No parameterization	Parameterization is missing

Notes

Other behaviors: any diagnosis information different from the ones listed above indicates that the module must be forwarded to Altus Support service.

Blinking priority: the diagnosis priority is from the higher number of blinking times to the lower.

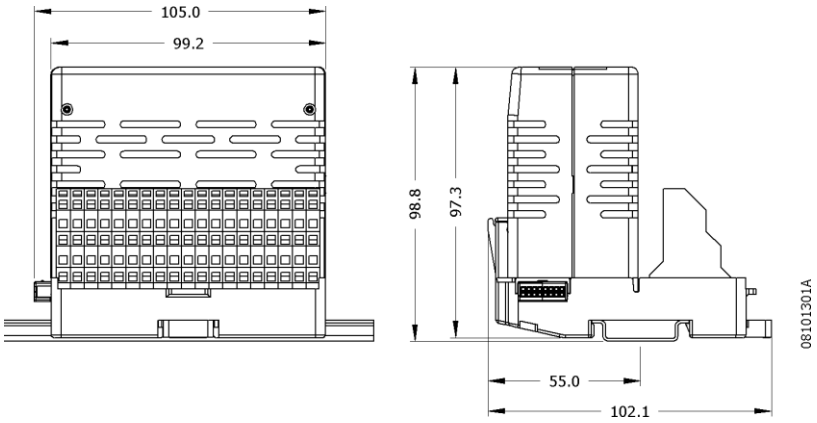
Physical Dimensions

Dimensions in mm.

The electrical panel dimensions should take into consideration the module terminal base sizes.

Ponto Series Utilization Manual IP20 (MU209000) must be consulted for panel general dimensioning.

Beside, there's a PO1114/P module assembled on a PO6001 terminal base on DIN TS35 rail.



Maintenance

Hot-swapping procedures are described in the Ponto Series Utilization Manual (MU209000).

All the module adjusts are set via software in Altus industrial area.

Manuals

For further technical details, configuration, installation and programming of Ponto Series products, please consult following documents:

Document Code	Description
CE109000	Ponto Series General Characteristics
MU209000	Ponto Series Utilization Manual - IP20
MU299040	User Manual MT6000 – MasterTool ProPonto
MU209503	User Manual PO5064 and PO5065 - PROFIBUS Head
MU299604	User Manual MasterTool MT8000
MU203026	User Manual ProfiTool - AL-3865

Also consult the user manuals for the field network heads and compatible CPUs.