AP-100 Advanced Process Controller

Datasheet

- PID Controllers

- Signal Operations

- Micro-PLC

- Trend Viewing & Recording

- Event Viewing & Recording

The AP-100 Advanced Process Controller is an all-in-one industrial control solution that combines powerful functionally with user-friendly ease of use. The AP-100 enables the user to quickly and easily setup complex control strategies including Feed-Forward, Feed-Back and Cascade PID Control.

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PID Controllers

The AP-100 has 2 single PID controller that can be configured as Master or Slave Cascade PID control configuration. Controllers can be configured for Open-Loop, Feedback and Feed-Forward modes. Both PID controllers have very fast execution times and can be user selected to execute up to 50 times per second (50 Hz).

The Input signal range from 0.00% to 100.00% can be divided up into 1 to 5 zones. Each Zone can be configured to have separate Proportional, Integral and Derivative gain constants. The enables better performance for each PID Controller.
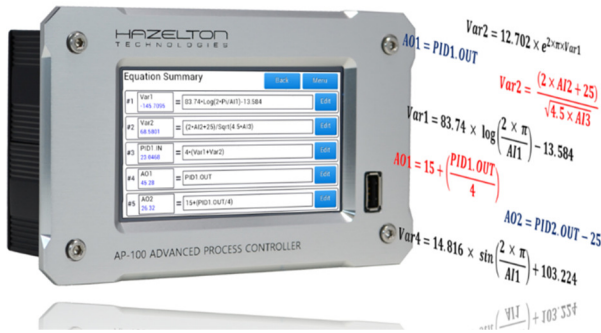
Equations & Signal Operations

The AP-100 is able to perform advanced mathematical operations on Input & Output signals that are either Digital or Analogue, in the form of Equations. Up to 5 floating-point (32-bit) intermediate variables are available. Maths operations such as Sin, Cos, Tan, Log10, Exponential and Square-Root are available for implementing any equation or algorithm. Some examples of Equation uses are:

➢ To assign signals to PID Controllers.
➢ Create feed-forward & feed-back signals.
➢ To linearize Input & Output signals.
➢ Add/subtract signals from each other.

Micro-PLC

Compute logical expressions with configurable IF Statements. The AP-100 is able to evaluate logical expressions to execute certain equations based on whether the logical expressions are true or false.

IF Statements can also be used to log an event in the Alarm & Events log. The AP-100 device supports two different 'IF Statements' which, when enabled, will execute 100 times per second (every 10mS) during each CPU cycle.
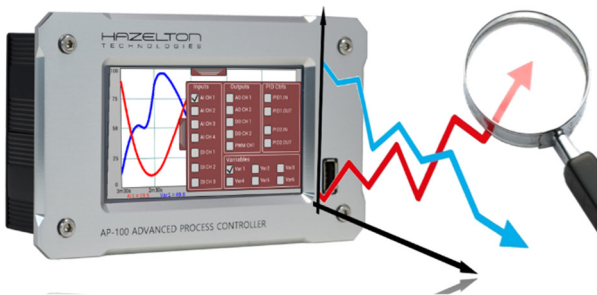
Trend Viewing & Recording

View & Record trends of analogue Input & Output signals, as well as intermediate variables. Use the touchscreen to zoom In & Out as well as forward & back in time of any trends.

Recorded trend data with sample rates as fast as 3 samples per second, to 8Gb of internal flash memory. Insert a USB memory device into the AP-100 to save trend data in .CSV to later be opened and viewed in MS Excel (or spreadsheet program).

Alarm & Event Recording

The AP-100 can capture 10,000+ Alarm & Events and save them to internal flash memory with the recorded Date, Time, Type and Description. The easy to used touchscreen interface allows the user to view Alarm & Events with Up & Down scroll buttons. Input channels can be configured to generate Alarm or Events if the input signal comes within specified ranges. IF Statements can also be configured to generate an Alarm or Events if an expression comes True. Insert a USB memory device into the front of the AP-100 to save the data as a .CSV file that can later be viewed in MS Excel (or spreadsheet program).

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Specification

General

General

Analogue Inputs:	**4**	(2 x *4-20mA or 0-20mA or 0-40mA), (2 x *0-10V or 0-5V or ±5V or ±10V)
Analogue Outputs:	**2**	*4-20mA or 0-20mA or 0-40mA or 0-10V or 0-5V or ±5V or ±10V)
		*software selectable
Digital Inputs:	**4**	
Digital Outputs:	**3**	Relay 2 Amps
Pulse Width Modulation:	**1**	Software selectable frequency
Features:		PID Controller (Independent or Cascade)
		Data Recording & Storage
		USB Trend Downloading (.csv file)
		Maths Functions

Environmental Performance

Ambient Temperature:	0 to 50°C	(Operating)
	-20 to +70°C	(Storage)
Humidity Range:	5% to 85% RH*	(Operating)
	5% to 85% RH*	(Storage)
		*non condensing
Protection:	IP3x	(International)
Shock/Vibration:	o BS EN61131-2	(5 to 150 Hz. at 1g; 1 octave per min.)
Altitude:	<2000 meters	
Atmosphere:	Not suitable for use in explosive or corrosive atmospheres.	
Electrical Safety:	BS EN61010-1	(Installation category II; Pollution degree 2)
Electromagnetic Compatibility Emissions:	BS EN61326 Class B – Light industrial	
Immunity:	BS EN61326 Industrial	

Physical

Weight:	1.5kg (3.30lbs)
Panel Cutout dimensions:	146 mm x 84 mm (±1 mm) or 5.7 in x 3.3 in (±0.3 in)
Depth behind panel:	80 mm (3.26 in)

Operator Interface:

Display:	4.3" TFT colour display Touchscreen (480 pixels wide x 272 pixels high)
Controls:	Resistance touchscreen display

Power Requirements:

Supply voltage:	12 V_DC to 32 V_DC
Power dissipation:	5 Watts (max)
Fuse type:	No internal fuse fitted

Battery Backup

Stored data:	Time and Date
Replacement period:	N/A. Built-in internal rechargeable battery. No need to replace.
Support time:	2 months with unit unpowered

USB port

Number of ports:	One on the front of instrument
Standard:	USB 2.0
Transmission speeds:	100Mbit/sec (High speed device)
Max current:	<100mA
Peripherals supported:	Mass storage device (32GB max)

Update/Archive rates

Sample rate (input/output):	100Hz
Trend update:	3Hz
Archive sample value:	Latest value at archive time
Display value:	Latest value at display update time

Analogue Input

General

|	
Number of inputs channels:	Four
Current input types:	2 x *4-20mA or 0-20mA or 0-40mA
Voltage input types:	2 x *0-10V or 0-5V or ±5V or ±10V
	*software selectable
Input type mix:	Freely configurable with 2 x voltage type and 2 x current type.
Sample rate:	100 Hz (10ms)
Conversion method:	12 bit delta sigma
Input impedance:	260 Ω for mA current inputs (internal) 10 MΩ for Voltage inputs

Noise Rejection

Mains rejection (48 to 65 Hz)	>95 dB	(Series mode)
	>180 dB	(Common mode)
Overvoltage protection:	±15V RMS	(Internal TVS diode)

Isolation

Isolation (Input channel to common electronics):	1500Vrms, (15kV/μs transient)
Isolation (Input to Output):	1500Vrms, (15kV/μs transient)
Isolation (between input channels):	60Vrms (common negative terminal connection)

Functional Internal Circuit Diagram:

Current Input

Voltage Input
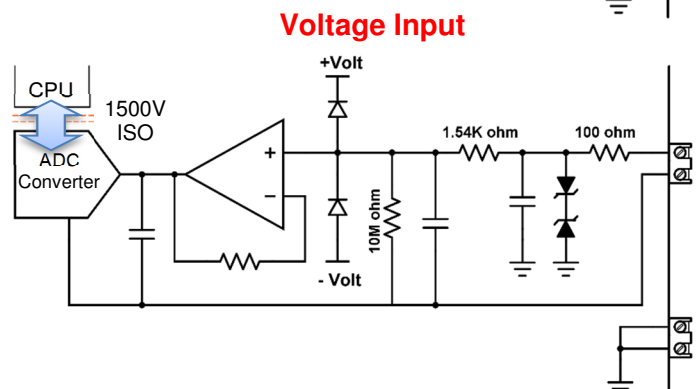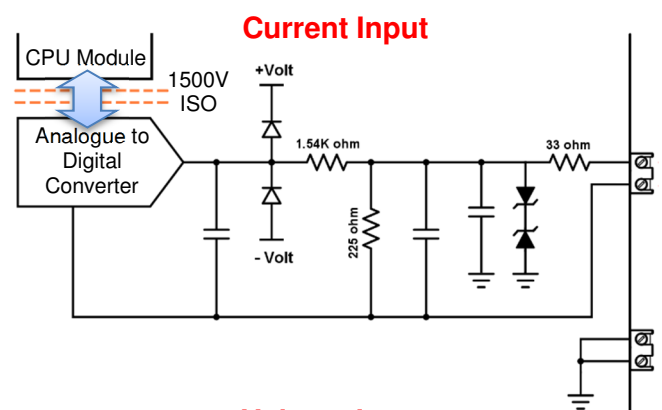
## Analogue Output

General

Number of output channels:	Two
Output channel types:	2 x *4-20mA or 0-20mA or 0-10V or 0-5V *software selectable
Output type mix:	Freely configurable with 2 x voltage or current type.
Max Output CH Current:	35mA Continuous (Internally limited)
Sample rate:	100 Hz (10ms)
Conversion method:	16 bits
Thermal drift:	<75ppm/°C

Isolation

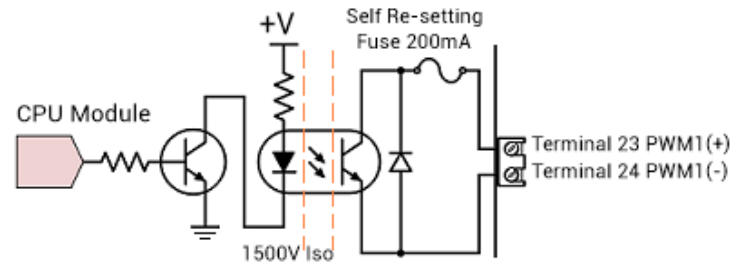|	
Isolation (Output channel to common electronics):	1500Vrms, (15kV/µs transient)
Isolation (Output to Input):	1500Vrms, (15kV/µs transient)
Isolation (between output channels):	60Vrms (common negative terminal connection)

Functional Internal Circuit Diagram:
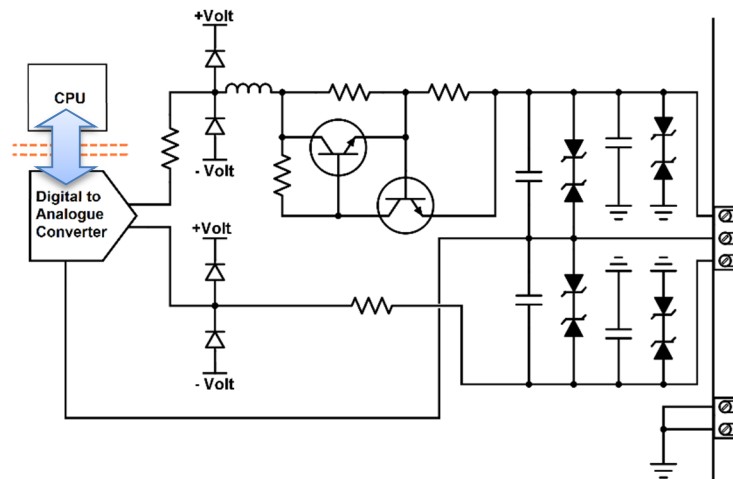
Pulse Width Modulation Output

Operating Voltage Range:	0 to 100 Volts
ON State Current:	200mA (max) Internal Self-Resetting Fuse. Disconnect supply and wait 5 seconds to reset channel.
Range:	0% to 100% Duty Cycle
Frequency:	1 to 1000 Hz (software configurable)
Isolation (Output channel to common electronics):	1500Vrms, (15kV/µs transient)
Isolation (Output to Input):	1500Vrms, (15kV/µs transient)
Isolation (between output channels):	1500Vrms, (15kV/µs transient)

Functional Internal Circuit Diagram:

Digital Inputs

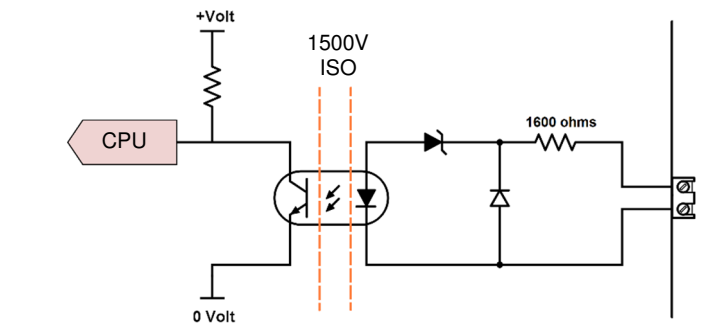|	
Input Impedance:	1600 Ω
Logical '0' Voltage Range:	0 to 7 Volts dc
Logical '1' Voltage Range:	10 to 32 Volts dc
Refresh Rate:	100 Hz (10mS)
Isolation (Output channel to common electronics):	1500Vrms, (15kV/µs transient)
Isolation (Output to Input):	1500Vrms, (15kV/µs transient)
Isolation (between output channels):	1500Vrms, (15kV/µs transient)

Functional Internal Circuit Diagram:

Digital Output (Relay)

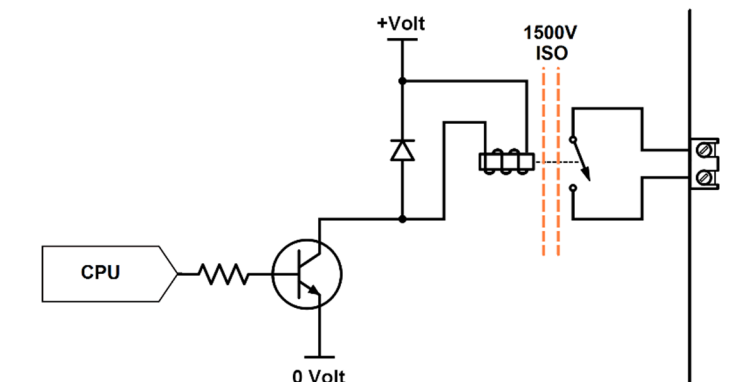|	
Maximum Switching Voltage:	60 V dc
Maximum Switching Current:	2 Amps
Maximum Carrying Current:	2 Amps
Refresh Rate:	100 Hz (10mS)
Isolation (Output channel to common electronics):	1500Vrms, (15kV/µs transient)
Isolation (Output to Input):	1500Vrms, (15kV/µs transient)
Isolation (between output channels):	1500Vrms, (15kV/µs transient)

Functional Internal Circuit Diagram:

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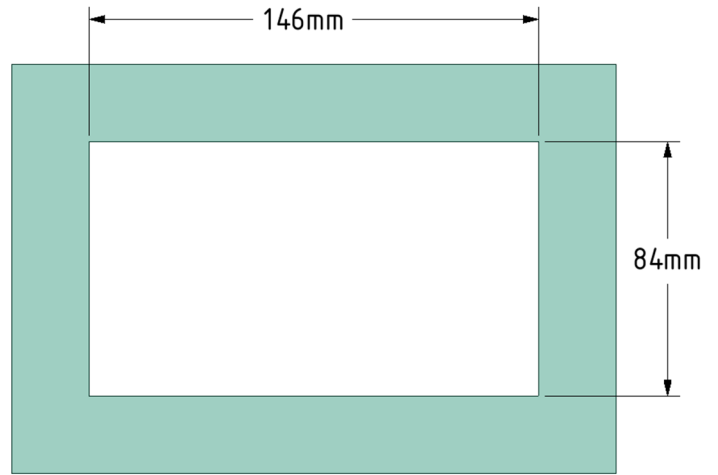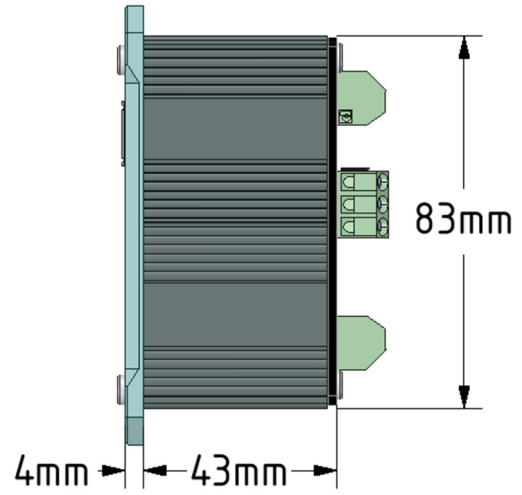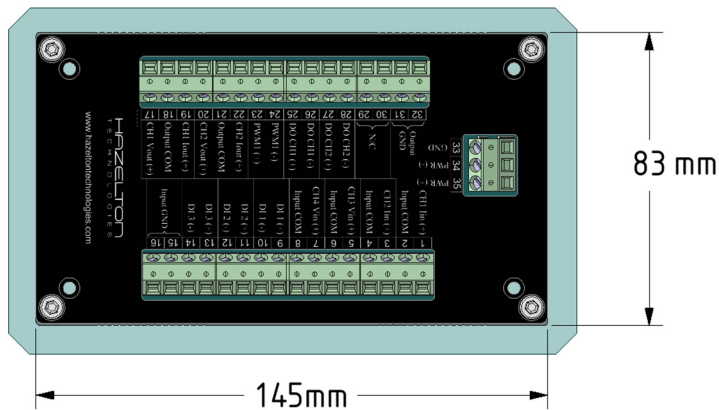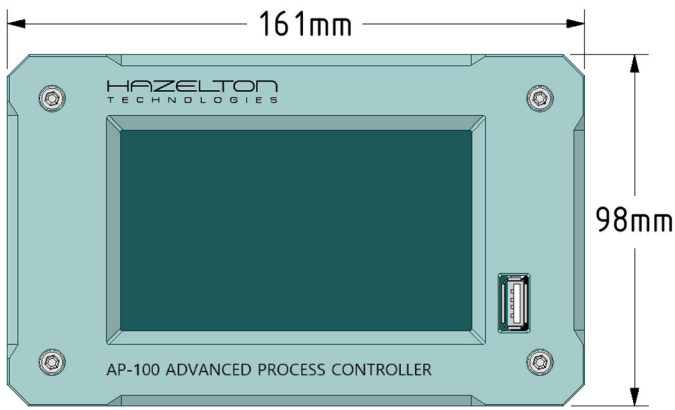TECHNOLOGIES

Electrical Terminals Layout

33	34	35
GND	PWR (−)	PWR (+)

32	Output GND		CH1 Iin (+)	1
31			Input COM	2
30	N/C		CH2 Iin (+)	3
29			Input COM	4
28	DO CH2 (−)		CH3 Vin (+)	5
27	DO CH2 (+)		Input COM	6
26	DO CH1 (−)		CH4 Vin (+)	7
25	DO CH1 (+)		Input COM	8
24	PWM1 (−)		DI 1 (+)	9
23	PWM1 (+)		DI 1 (−)	10
22	CH2 Iout (+)		DI 2 (+)	11
21	Output COM		DI 2 (−)	12
20	CH2 Vout (+)		DI 3 (+)	13
19	CH1 Iout (+)		DI 3 (−)	14
18	Output COM		Input GND	15
17	CH1 Vout (+)			16

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83mm
4mm — 43mm
146mm
84mm

Device Dimensions

161mm
98mm
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AP-100 ADVANCED PROCESS CONTROLLER

83 mm
145mm

Device Electrical Isolation Diagram

AI1 (mA) → Analogue Inputs
AI2 (mA) →
AI3 (Volt) →
AI4 (Volt) →

1500V ISO

CPU Module

1500V ISO → Analogue Outputs → AO1 (mA/Volt)
→ AO2 (mA/Volt)

DI1 → Digital Input — 1500V ISO
DI2 → Digital Input — 1500V ISO
DI3 → Digital Input — 1500V ISO

1500V ISO → PWM Output → PWM1
1500V ISO → Contactor Output → DO1
1500V ISO → Contactor Output → DO2

1500V ISO

12 to 32 Volts DC → Power Supply