

# ECONOMY ANALOG VALVE CONTROLLER

DIN rail mount

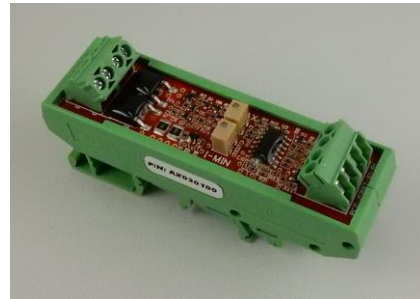
P/N: AX020100, AX020140

## Function

The controller supplies a solenoid valve with current proportional to an input control (0-5 VDC, 10K potentiometer or 4-20 mA).

## Features

- Maximum current adjustment does not affect minimum current setting
- Adjustments accessible with a removable cover
- Broad range of supply voltage (9 to 32 VDC) with no degradation in performance
- Current sensing circuit maintains output current regardless of changes in input voltage and coil resistance
- Modern technology utilizing high frequency switching output (PWM)
- Energy efficient design (no heat sink is required)
- Simple control with a 10K Potentiometer, 0-5 Vdc or 4-20 mA control signal
- Maximum current output of 2 A for AX020100 and 300 mA for AX020140
- Conformal coated assembly
- DIN rail mount
- Electronic limiting circuit means no internal fuses
- Short circuit proof (in case of solenoid failure or miswiring)
- Reverse polarity protection
- Can disconnect load while controller is powered ("Hot Swap")



## Application

Accurate control of hydraulic and pneumatic proportional solenoid valves used in mobile construction equipment and industrial processes.

## Ordering Part Numbers

DIN rail mount, Analog Input, 1 Output: <b>AX020100</b>
DIN rail mount, 0-5VDC Analog Input, 1 Output: <b>AX020140</b>

## 1.0 Description

The controller simplifies control of proportional solenoids by supplying a current proportional to an input control (0-5 VDC or 10K potentiometer or 4-20 mA). It accepts power supply voltages from 9 to 32 VDC. This linear solenoid driver utilizes high frequency switching output (PWM) to provide a DC current output. Maximum current output is 2 Amps for AX020100 and 300mA for AX020140. A current sensing circuit maintains output current regardless of changes in input voltage and coil resistance. The user can adjust maximum and minimum current to suit the application. Dither frequency and amplitude are factory set. In this economy version of the connector controller there are no ramps. The unit is installed on a DIN rail.

## 1.1 Technical Specifications:

Specifications are indicative and subject to change. Actual performance will vary depending on the application and operating conditions. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Approvals/Limitations and Return Materials Process as described on [www.axiomatic.com/service.html](http://www.axiomatic.com/service.html)

All specifications are typical at nominal input voltage and 25°C unless otherwise specified.

### General Specifications

Operating conditions	-40 to +85°C (-40 to 185°F) 0 to 85% relative humidity
Storage temperature	-50 to 125°C (-58 to 257°F)
Weight	0.062 lb. (0.028 kg)
Electromagnetic compatibility (EMC)	CE marking
Electrical connection	2 4-pin Terminal Blocks Phoenix Contact P/N: PTA 1.5/4-3.5 Accepts 16-26 AWG wire. For pinout, see Figure 1.0.
Protection	Conformal coated PCB assembly (both sides)
Enclosure and Dimensions	PA66 Nylon, Phoenix Contact P/N: UMK-SE 11, 25-1-2970442 (housing) and UMK-FE VE 500-29063654 (DIN rail foot)  Mounts on DIN rail NS 32 or NS 35/7.5 For dimensions, see Figure 1.0.

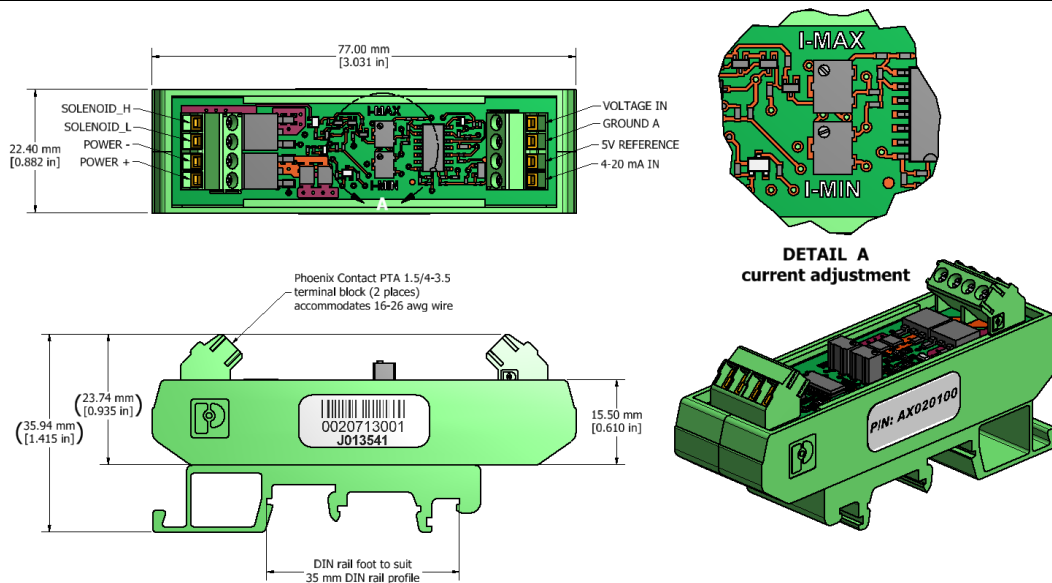


Figure 1.0 - Dimensional Drawing  
(Dimensions of AX020100 and AX020140 are identical.)

### Electrical Specifications

Operating voltage (power supply requirement)	9 to 32 VDC nominal power supply range
Control input signal options	Model: AX020100 and AX020140

	0-5 VDC voltage signal or 10K Potentiometer (accepts 5K to 50K pots) or 4-20 mA
Input resistance	200K Ohms
Range of output current	Model AX020100: 0- 2 Amps Model AX020140: 0-300 mA
Response time	<10 mSec. (measured @24V, 5V input, solenoid inductance of <20 mH)
Solenoid resistance selection (nominal)	$R_{coil} \leq (V_{power\ supply} - 1.5\ V)/I_{-max}$
Internal supply for setpoint potentiometer	+5 VDC, 5 mA
Current dither frequency	100 Hz $\pm$ 10%
Dither amplitude	5% of rated maximum current (fixed)

\* Note 1: For proper operation, match the power supply voltage with rating of solenoid coil. Operation with a supply voltage lower than the solenoid rated voltage may result in reduced max. current output.

Note 2: The coil should have no polarity or protection diodes for proper operation of the device.

Note 3: Do not exceed the current rating of the solenoid coil with the maximum current output of the driver.

### Adjustments (single turn trim pots)

Minimum current setting	Model AX020100: 0 to 500 mA Model AX020140: 0 to 75 mA
Maximum current setting	Model AX020100: 600 to 2000 mA Model AX020140: 80 mA to 300 mA

## 2.0 Installation Procedures:

### 2.1 DIN rail Mounting

- Ensure the DIN rail clip is mounted on the rail firmly.

### 2.2 Necessary Equipment

- AX020100 or AX020140 Controller
- Cartridge or Block Proportional Solenoid Valve
- Hydraulic power source and load circuit
- Power Supply (9 to 32 VDC)
- DC voltmeter (optional)
- Choice of Inputs: 0-5 VDC or 10K potentiometer
- External fusing recommended (3 A)

## 2.3 Installation Steps

- Supply voltage should be between 9 and 32 VDC. Excess voltage will damage the controller. Match the power supply voltage with the voltage rating of the solenoid coil. Operating the controller with a supply voltage lower than the solenoid rated voltage may result in reduced maximum current output. The maximum current output of the controller should not exceed the current rating of the solenoid coil.
- The coil should have no polarity or protection diodes for proper operation of the device.
- Do not install the controller near high voltage relays or other sources of electrical interference.
- Connect the power supply, command potentiometer or input signal and valve solenoid as shown on Figure 1.0 and in Section 2.4. Put isolation sleeves on any unused wires for the potentiometer.
- Set the command potentiometer or voltage signal to the maximum level and confirm it is operating properly.

## 2.4 Wiring Connections

Connect the cable conductors to the power supply, input signal or potentiometer and load, as follows and per Figure 1.0.

For 0-5 VDC or Potentiometer Control:

Use I-Min. screw to set up minimum speed with minimum control input.

Use I-Max. screw to set maximum speed with 100% of control input.

## 3.0 Set Up Adjustment Procedures:

The location of the trim pots for the set up adjustments are shown in Figure 1.0.

**WARNING:** The operator must ensure that the operation of the valve within the full scale of the control function will not cause hazards, while performing set up adjustments to the controller.

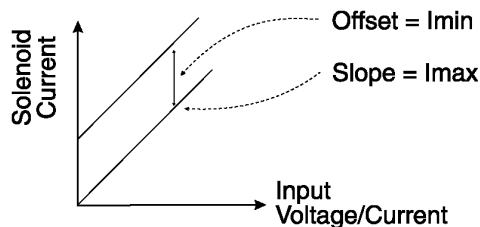
## 3.1 Preparation

Ensure that the controller is connected to an operating proportional valve.

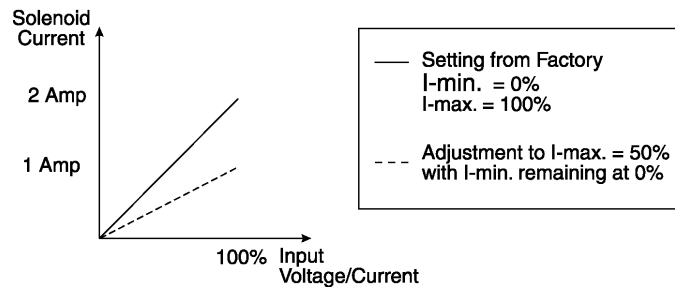
The single turn trim pots are adjusted with a Phillips #0 screwdriver.

## 3.2 Interaction Between Maximum and Minimum Current Adjustments

Adjusting the minimum current will shift the maximum current setting, as shown.



Adjusting the maximum current (I-max.) does not affect the minimum current (I-min.) setting.



### 3.3 Controller Settings

The following settings represent a typical set up for a voltage or current signal input operation scenario. Conditions will vary for other set up scenarios. I min and I max are single turn trim pots. Use a Phillips#0 screwdriver.

Trim Pot Adjustments	Range of Adjustment	Factory Setting
Minimum Current Setting (I-min.)	Model AX020100: 0 to 500 mA Model AX020140: 0 to 75 mA	0% (CCW)
Maximum Current Setting (I-max.)	Model AX020100: 600 to 2000 mA* Model AX020140: 80 mA to 300 mA	100% (CW)

CW = clockwise, CCW = Counter clockwise

\*NOTE 1: Range of max. output current is 2 A (maximum output current = minimum current setting + maximum current setting).

#### Setting the Minimum Current (I-min.)

- **Set the minimum current before setting the maximum current.**
- Apply minimum input (0 V or control potentiometer at minimum).
- The factory setting for the I-min. trim pot is 0 or fully counter clockwise (CCW).
- If the desired minimum current is greater than 0, adjust the trim pot clockwise (CW) until the desired current is achieved.

The minimum current setting can be used to take into account the mechanical valve deadband and provide desired offsets from zero to allow full control within the functional range of the specific valve.

#### Setting the Maximum Current (I-max.)

- Apply maximum control (5 V or control pot at maximum).
- The factory setting for the I-max. trim pot is 100% or fully CW.
- Turn the trim pot CCW to adjust the current setting downwards to the desired maximum.

The maximum current setting is adjusted to meet the customer's working pressure or flow range to the full scale signal input range. This provides maximum control for a specific application.

### 4.0 Start Up Procedures:

A typical start up procedure is as follows:

1. Ensure that no damage or injury can occur on the machine when the valve is operated.
2. Attach the controller to the load.
3. Switch on the power supply to the controller and apply a control signal.
4. Adjust the minimum and maximum current to suit the application.

Successful completion of these five steps means the controller and load are ready for normal use.

### 5.0 Operation:

The controller ensures a hydraulic proportional valve will function in a manner directly proportional to the control input. Accurate and repeatable operation is attained. Simple control can be achieved with a 10K Potentiometer powered by the controller's internal +5 VDC power supply or a 0-5 VDC control signal input. The controller performs within the mechanical limits of the proportional valve. No maintenance of the unit is required.

Form: TDAX0201X0-09\05\23