

## Universal Input, Single Output Valve Controller (3A)

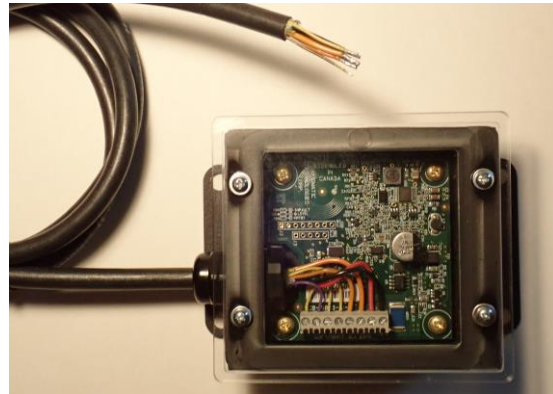
With Near Field Communication (NFC)

Configurable with Android and Apple iOS Devices and Smartphones

P/N: AX020710-1.5M

### Features:

- 1 universal signal input, user selectable as:
  - Voltage
  - Current
  - PWM
  - Frequency
  - Digital
- 1 output drives a solenoid, user selectable as:
  - proportional current 0-3 A
  - proportional voltage up to Vps
  - Digital Hotshot
  - PWM signal
  - Digital on/off
- 1 auxiliary 0-5V output feedback
- +5V Reference output;
- 12Vdc, 24Vdc nominal
- PCB assembly with four (4) 2-pin push-in terminal blocks
- Multiple LED indicators
- IP67 for metal box once cable is added
- Smartphone with E-Write NFC Android application configures the controller when placed in proximity. The application is also available for Apple iOS devices like iPhones.
- E-Write NFC provides flexible user configurability for application-specific input-output relationship with slope or time response.
- Protected and secure communication



### Ordering Part Numbers:

**AX020710-1.5M** - Universal Input, Single Valve Controller (3A), NFC, 1 8-pin Screw Terminal Block, Metal Box, 1.5 M Cable

**AX020710-PG9** - Universal Input, Single Valve Controller (3A), NFC, 1 8-pin Screw Terminal Block, Metal Box, Strain Relief (1 PG9)

**AX020710** – Universal Input, Single Valve Controller (3A), NFC, 1 8-pin Screw Terminal Block, PCB

*If custom settings are requested, a unique part number will be assigned before ordering.*

## Description

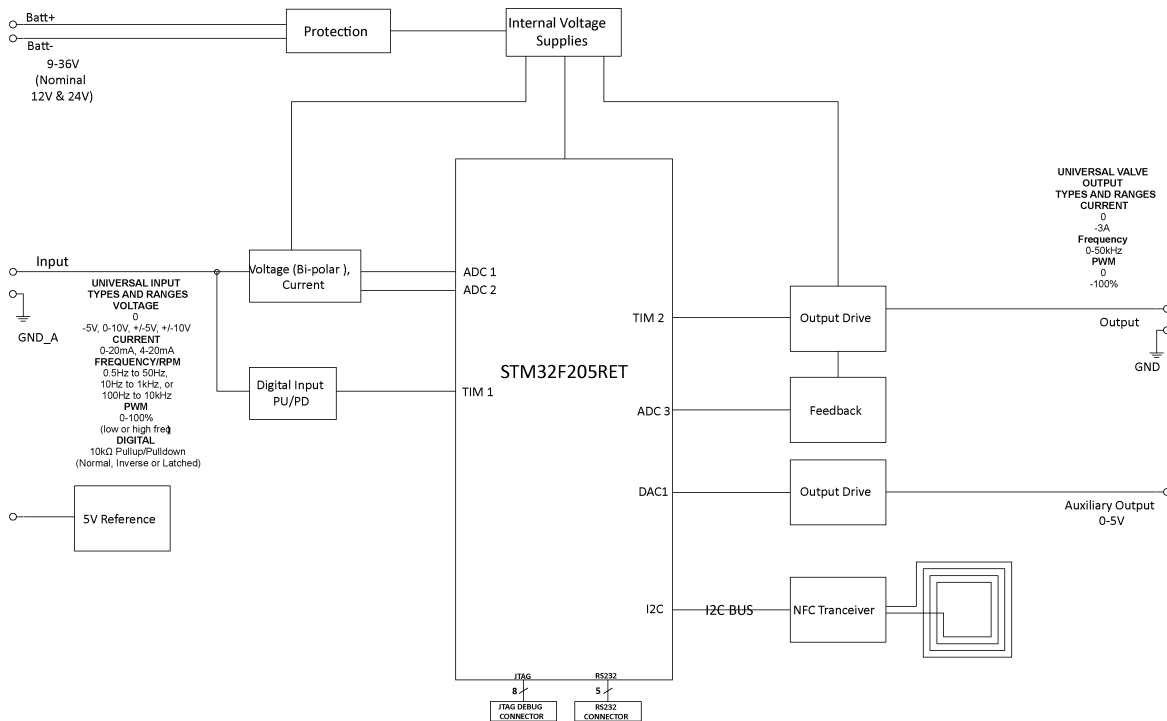
As a highly flexible controller, it accepts one command signal input and drives a solenoid up to 3A. Many control profile parameters are user configurable. A PCB form factor is available. Operation is from -40 to 85 °C. Designed to interface with 12V or 24V battery power, it is suitable for machine and industrial applications.

Using Near Field Communication (NFC), the wireless valve controller is remotely configurable via a smartphone application. Bringing the two devices within 3 cm\* (1 inch) of each other, the NFC technology uses magnetic induction between two loop antennas to communicate within the globally available radio frequency ISM band of 13.56 MHz.

There are 3 models available: a PCB installed in a metal box with 1.5 m unterminated cable (AX020710-1.5M), PCB installed in a metal box with PG9 strain relief (AX020710-PG9), or PCB Assembly (AX020710).

\*The distance will vary with different phones.

## Block Diagram



## 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 <https://www.axiomatic.com/service/>.

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

## Input Specifications

|                              |  |
|------------------------------|--|
| Power Supply Input - Nominal | 12Vdc or 24Vdc nominal (9...36 VDC power supply range)   |
| Protection                   | Reverse polarity protection is provided.<br>Overvoltage protection up to 45V is provided.<br>Overvoltage (undervoltage) shutdown of the output load is provided. |
| Universal Signal Input       | Refer to Table 1.0 All inputs are user selectable.   |

**Table 1.0 –User Configurable Universal Input**

| Analog Input Functions      | Voltage Input or Current Input   |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
|-----------------------------|--|----------------|-------|-----|-------|--------------|---|----|------|---------------|---|----|------|--------------------------|---|----|-----|---------------|---|----|-----|----------------|---|-----|---|-------------------|----|-------|----|--------------------|-----|--------|----|---------------------|---|----|------|-----------|-----|--------|----|
| Voltage Input               | 0-5 V (Impedance 110 k $\Omega$ )<br>0-10 V (Impedance 130 k $\Omega$ )<br>+/- 5V (Impedance 110 k $\Omega$ )<br>+/- 10V (Impedance 130 k $\Omega$ )   |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Current Input               | 0-20 mA (Impedance 249 $\Omega$ )<br>4-20 mA (Impedance 249 $\Omega$ )   |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Discrete Input Functions    | Digital Input, PWM Input or Frequency Input  |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Input                       | 12-bit ADC   |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Digital Input Level         | Accepts 5V TTL and up to V <sub>PS</sub><br>Threshold: Low <1 V; High >2.2 V   |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Digital Input               | Active High or Active Low<br>Amplitude: 0 to +V <sub>ps</sub>  |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Input Impedance             | 1 M $\Omega$ High impedance, 10K $\Omega$ pull down, 10K $\Omega$ pull up to +6V   |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| PWM Input                   | Low Frequency (10 Hz to 1 kHz)<br>High Frequency (100 Hz to 10 kHz)<br>0 to 100% D.C.  |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Frequency Input             | 0.5 Hz to 50 Hz;<br>10 Hz to 1 kHz; or<br>100 Hz to 10 kHz<br>1 to 99% D.C.  |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Input Accuracy              | < 1%   |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Input                       | 16-bit Timer   |                |       |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Maximum and Minimum Ratings | <table border="1"> <thead> <tr> <th>Characteristic</th> <th>Min</th> <th>Max</th> <th>Units</th> </tr> </thead> <tbody> <tr> <td>Power Supply</td> <td>9</td> <td>36</td> <td>V dc</td> </tr> <tr> <td>Voltage Input</td> <td>0</td> <td>36</td> <td>V dc</td> </tr> <tr> <td>Current Input 0(4)-20 mA</td> <td>0</td> <td>12</td> <td>Vdc</td> </tr> <tr> <td>Digital Input</td> <td>0</td> <td>36</td> <td>Vdc</td> </tr> <tr> <td>PWM Duty Cycle</td> <td>0</td> <td>100</td> <td>%</td> </tr> <tr> <td>PWM Low Frequency</td> <td>10</td> <td>1 000</td> <td>Hz</td> </tr> <tr> <td>PWM High Frequency</td> <td>100</td> <td>10 000</td> <td>Hz</td> </tr> <tr> <td>PWM Voltage pk - pk</td> <td>0</td> <td>36</td> <td>V dc</td> </tr> <tr> <td>Frequency</td> <td>0.5</td> <td>10 000</td> <td>Hz</td> </tr> </tbody> </table> | Characteristic | Min   | Max | Units | Power Supply | 9 | 36 | V dc | Voltage Input | 0 | 36 | V dc | Current Input 0(4)-20 mA | 0 | 12 | Vdc | Digital Input | 0 | 36 | Vdc | PWM Duty Cycle | 0 | 100 | % | PWM Low Frequency | 10 | 1 000 | Hz | PWM High Frequency | 100 | 10 000 | Hz | PWM Voltage pk - pk | 0 | 36 | V dc | Frequency | 0.5 | 10 000 | Hz |
| Characteristic              | Min  | Max            | Units |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Power Supply                | 9  | 36             | V dc  |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Voltage Input               | 0  | 36             | V dc  |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Current Input 0(4)-20 mA    | 0  | 12             | Vdc   |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Digital Input               | 0  | 36             | Vdc   |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| PWM Duty Cycle              | 0  | 100            | %     |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| PWM Low Frequency           | 10   | 1 000          | Hz    |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| PWM High Frequency          | 100  | 10 000         | Hz    |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| PWM Voltage pk - pk         | 0  | 36             | V dc  |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |
| Frequency                   | 0.5  | 10 000         | Hz    |     |       |              |   |    |      |               |   |    |      |                          |   |    |     |               |   |    |     |                |   |     |   |                   |    |       |    |                    |     |        |    |                     |   |    |      |           |     |        |    |

## Lookup Table Specifications

|              |   |
|--------------|---|
| Lookup Table | Can be used to create different input-to-output responses<br>Ramp or Time Response<br>Up to 5 Slopes/Time slots<br>The user can map the Universal Input as control to the Lookup Table and configure the required slopes for the output |
|--------------|---|

## Output Specifications

|                         |  |
|-------------------------|--|
| Output                  | Up to 3A<br>Half-bridge, High Side Sourcing, Current Sensing, Grounded Load<br>High Frequency (25 kHz)<br>The user can select the following options for output using the E-Write NFC. <ul style="list-style-type: none"> <li>• Proportional Output Current (with current sensing) (0-3A)</li> <li>• Proportional Output Voltage (up to V<sub>ps</sub>)</li> <li>• Digital Hotshot</li> <li>• Output PWM Duty Cycle (0-100% D.C.)</li> <li>• Digital On/Off (Gnd-V<sub>ps</sub>)</li> </ul> |
| Configurable Parameters | Refer to Table 2.0.  |

| Table 2.0 Configurable Output Parameters |                 |               |
|--|-----------------|---------------|
| Parameter                                | Minimum Range   | Maximum Range |
| Output Current                           | 0A              | 3A            |
| Ramp Up / Ramp Down                      | 0ms (no ramp)   | 60,000ms      |
| Dither amplitude (level)                 | 0mA (no dither) | 400mA         |
| Current dither frequency                 | 50Hz            | 500Hz         |
| PWM frequency                            | 1Hz             | 25kHz         |

|                        |   |
|------------------------|---|
| Output Accuracy        | Output Current mode $\leq 1\%$<br>Output Voltage mode $\leq 1\%$<br>Output PWM Duty Cycle mode $\leq 1\%$ |
| Output Resolution      | Output Current mode 1 mA<br>Output Voltage mode 0.1V<br>Output PWM mode 0.1%                              |
| Protection             | Overcurrent and short circuit protection  |
| Auxiliary Output       | 0-5V output is proportional to the proportional output range.<br>Short circuit protection is provided.    |
| Auxiliary Output Scale | 20% of proportional output range  |
| Voltage Reference      | +5V, 50 mA maximum load   |

### General Specifications

| Microcontroller        | STM32F205RET6<br>32-bit, 512 Kbit program flash   |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
|------------------------|---|-------|----------|---|---------|---|---------|---|------------|---|------------|---|---------|---|-----------|---|------------------|---|---------------|
| Quiescent Current      | 34 mA @ 24Vdc   |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| LED Indicator          | Power, heartbeat, input fault indication and output fault indication  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Control Logic          | User configurable   |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Communications         | Near Field Communication<br>Full-duplex<br>Data rate: 106 kbit/s<br>Complies with ISO1443 (RF protocol), ISO13239, and ISO7816<br>Protected and secure configuration  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| User Interface         | E-WRITE NFC Application is available from Google Play for Android devices.<br><a href="https://play.google.com/store/apps/details?id=axiomatic.nfcproject">https://play.google.com/store/apps/details?id=axiomatic.nfcproject</a><br>The application is also available for Apple iOS devices like iPhones.  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Operating Conditions   | -40 to 85 °C (-40 to 185 °F)  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Dimensions             | Metal Box with gasket and PG9 strain relief<br>114.3 x 27.9 x 79.4 mm 4.50 x 1.01 x 3.13 inches<br>(W x D x H excluding PG9 strain relief)<br><br>The cable is 1.5M in length and is unterminated.<br>Refer to Figure 1.0.  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Protection             | IP00 for PCB<br>IP67 for Metal Box once cable is added  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Vibration - Pending    | MIL-STD-202G, Method 204D test condition C (Sine)<br>and Method 214A, test condition B (Random)<br>10 g peak (Sine)<br>7.68 Grms peak (Random)  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Shock - Pending        | MIL- STD-202G, Method 213B, test condition A<br>50g (half sine pulse, 9ms long, 8 per axis)   |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Approvals              | CE marking  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Weight                 | 1.0 lb. (0.453 kg)  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| Electrical Connections | 1 8-pin screw terminal block (Wieland P/N: 25.197.0853.0)<br>Use 18-20 AWG wire for connection to power and solenoid. <table border="1" data-bbox="589 1577 1040 1843"> <thead> <tr> <th>PIN #</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>POWER -</td> </tr> <tr> <td>2</td> <td>POWER +</td> </tr> <tr> <td>3</td> <td>SOLENOID -</td> </tr> <tr> <td>4</td> <td>SOLENOID +</td> </tr> <tr> <td>5</td> <td>INPUT +</td> </tr> <tr> <td>6</td> <td>INPUT GND</td> </tr> <tr> <td>7</td> <td>AUXILIARY OUTPUT</td> </tr> <tr> <td>8</td> <td>+5V REFERENCE</td> </tr> </tbody> </table> | PIN # | FUNCTION | 1 | POWER - | 2 | POWER + | 3 | SOLENOID - | 4 | SOLENOID + | 5 | INPUT + | 6 | INPUT GND | 7 | AUXILIARY OUTPUT | 8 | +5V REFERENCE |
| PIN #                  | FUNCTION  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| 1                      | POWER -   |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| 2                      | POWER +   |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| 3                      | SOLENOID -  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| 4                      | SOLENOID +  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| 5                      | INPUT +   |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| 6                      | INPUT GND   |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| 7                      | AUXILIARY OUTPUT  |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |
| 8                      | +5V REFERENCE   |       |          |   |         |   |         |   |            |   |            |   |         |   |           |   |                  |   |               |

|          |  |
|----------|--|
| Mounting | <p>Program the unit before installing in a control panel or metal box.</p> <p>Mounting holes are sized for #6 or M4 bolts on the PCB Assembly P/N: AX020710. The bolt length will be determined by the end-user's mounting plate thickness. The mounting flange of the controller is 0.062 inches (1.5 mm) thick. If the module is mounted without an enclosure, it should be mounted vertically with connectors facing left or right to reduce likelihood of moisture entry. All field wiring should be suitable for the operating temperature range. Install the unit with appropriate space available for servicing and for adequate wire harness access.</p> |
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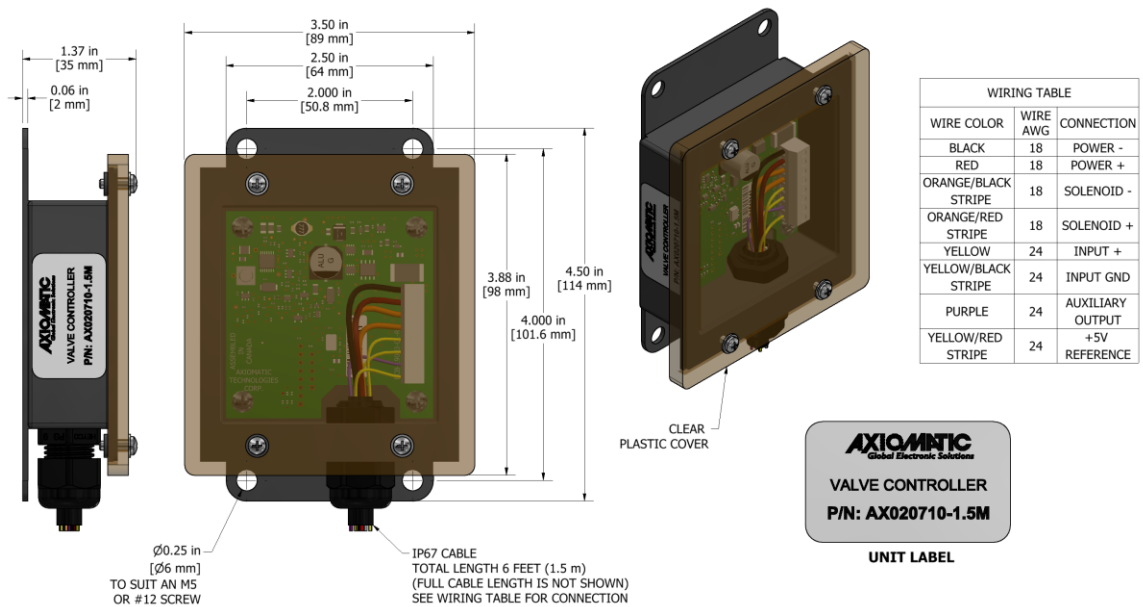


Figure 1.0. – Dimensional Drawing

Form: TDAX020710-1.5M-02/13/2024