ATB Series - Integral Throttle Body Actuators

- Low-Cost, Maintenance Free, Compact Design
- Various Bore Sizes Available (25 - 85mm)
- Precise, Real-Time Engine Speed Control
- Flexible Design for Engine, Manifold & Fuel Mixer Considerations
- Adaptable to Corrosive Environmental Conditions
- Rapid Response to Transient Load Conditions
- Optional Throttle Position Feedback Sensor
- Mounts in Any Position, No Mechanical Linkage, No Mounting Brackets
- Idle Adjustment Screw
- Economic low-pressure versions available for non-turbo engines
- Sealed versions are standard and MUST be used on turbo-charged engines (Please note: only sealed versions of T3 types and T2 feedback types are available)
- High Temperature versions are also available for pre-intercooler location

INTRODUCTION

The ATB Series integral throttle body electric actuator is designed to control the air or an air/fuel mixture to a gaseous-fueled engine. They are typically used to control an engine by working in tandem with a conventional fuel mixer. The design baseline for the ATB Series incorporates fast response and proven reliability to allow for efficient and more precise control. The ATB Series actuator directly drives the throttle plate. Internal return springs provide for a normally closed valve for fail-safe operation. This ensures that the throttle plate returns to the minimum fuel position when the actuator becomes de-energized. ATB Series actuators are also designed to accept system battery voltages of either 12 or 24 VDC and are available with a throttle position feedback sensor.

DESCRIPTION

ATB Series actuators are proportional electromagnetic devices designed for precise, efficient metering of airflow to a gaseous-fueled engine. When coupled with a GAC speed control unit and GAC speed sensor, a basic closed-loop governor system is established. Operation of this closed-loop governor system is as follows: The magnetic speed sensor, mounted strategically on the engine, will generate real-time electrical pulses, which are directly proportional to engine RPM. The electronic speed control unit monitors these pulses and compares them to a preset engine speed setting. If these pulses differ from the preset engine speed setting, the speed control unit will initiate a calculated response. This response is an increase or decrease in current flow to the actuator, which in turn changes the throttle plate’s positioning. As the throttle plate’s position changes, the amount of air and fuel is increased/decreased as necessary to cause the engine speed to return to the preset engine speed setting. The throttle plate’s shaft rotation is proportional to the amount of actuator current and is counterbalanced by the internal return springs.
The ATB Series design uses steel, precision grade, lubricated bearings to provide low friction support to the throttle shaft. Therefore, no maintenance is necessary. GAC also offers high temperature versions suitable for operation on the downstream side of the turbo. The results are a rapid, proportional response to actuator positional changes and outstanding reliability consistent with GAC expectations.

GAC offers five different electronic speed controls for use with the ATB Series, all of which are field proven and 100% tested. The ESD-2401, ESD-5526E and ESD-5330 are compatible with all 12V and 24V ATB Series throttle bodies. The ESD-5403 control is recommended for all ATB Series throttle bodies with feedback sensor. For more information contact your Huegli Tech dealer.

INSTALLATION

The actuator is mounted rigidly between the engine’s intake manifold and the gas mixer. The preferred mounting orientation for the ATB Series is with the throttle shaft parallel to the engine crank shaft. Normal vibration from the engine will not affect the operation of the actuator. The ATB Series are designed to provide an exact fit to the various manifolds and mixers available. The Selection Chart on page 3 allows for proper sizing of the ATB to the engine.

POSSIBLE ARRANGEMENTS OF THE ATB

Naturally Aspirated Engines

![Diagram of Naturally Aspirated Engines]

Turbocharged Intercooler Engines

![Diagram of Turbocharged Intercooler Engines]

Note:

In case of turbo charged engine, it is highly recommended to use the sealed version, example: ATB-XXXXX24. On turbocharged engines the ATB is normally mounted after the charge air cooler, hence temperature is low. In case the engine does not have a charge air cooler, or the ATB can not be mounted after the charge air cooler, it is recommended to use the ATB with finned heat sink, XXXXXXXN14, since the air gas mixture has a considerable high temperature and will unnecessarily heat the ATB which can result in damage.

For naturally aspirated engine, the normal ATB version can be used XXXXXXXN2. All ATB’s generally are equipped with a show glass which indicates the position, except version XXXXXXXN1 which is on hot side will not have a position in indicator.

If uncertain, please consult Huegli Tech or your nearest Huegli Tech distributor for correct version.

IDLE ADJUSTMENT

An adjustable Idle Stop setscrew is provided to set a fixed fuel opening if desired. Using the appropriate Hex wrench, you must completely remove the first ‘locking’ setscrew. This will give you access to the inner Idle setscrew for adjustment using the same Hex wrench. Turning the wrench clockwise will increase the fixed plugging the actuator or by turning off the governor power once the engine is running and then setting the engine speed to the desired setting. Adjustment is complete once you have replaced the locking setscrew. The locking setscrew should only be tightened to snug plus a ¼ turn.
WIRING

All throttle body actuators are pre-wired for either 12 or 24 VDC systems. Use the included wiring harness CH-112 (loose wires 1.8m) to connect the actuator to the speed control unit’s output terminals. Prior to connecting the actuator cable, twist it so that there is about one complete twist per inch along the entire length of the cable. This will substantially reduce EMI effects on the control system. For applications where EMI is still a concern, shielded cable for the actuator is recommended.

OPTIONAL IDLE ADJUSTMENT

An adjustable Idle Stop setscrew is provided to set a fixed fuel opening if desired. Using the appropriate Hex wrench, you must completely remove the first “locking” setscrew. This will give you access to the inner Idle Adjustment setscrew for adjustment using the same Hex wrench. Turning the wrench clockwise will increase the fixed throttle opening. Typically, the engine speed should be set by unplugging the actuator or by turning off the governor power once the engine is running and then setting the engine speed to the desired setting. Adjustment is complete once you have replaced the locking setscrew. The locking setscrew should only be tightened to snug plus a ¼ turn.

WARNING

An overspeed shutdown device, independent of the governor system, should be provided to prevent loss of engine control, which may cause personal injury or equipment damage.

TROUBLESHOOTING

If the governor system fails to operate, the following test can be performed. Shut engine down, disconnect the actuator cable and measure the resistance at the actuator connector. Next, check resistance from each wire to the actuator housing and compare readings to values shown in Table 1. If the resistance values differ from values shown, the actuator is defective. This test is only to ensure that there is no obstruction, wire breakage or metal-on-metal contact inside the throttle body.

Make sure to reconnect the actuator cable. Next, energize the actuator to full fuel (follow steps in the speed control publication). The throttle plate should move fully open. Next, rotate the throttle plate to determine if the plate moves smoothly without binding or sticking.

Table 1.

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 Coil Resistance</td>
<td></td>
</tr>
<tr>
<td>Red to White (12 VDC)</td>
<td>2.2 Ω</td>
</tr>
<tr>
<td>Red to White (24 VDC)</td>
<td>8.6 Ω</td>
</tr>
<tr>
<td>T2 Coil Resistance</td>
<td></td>
</tr>
<tr>
<td>Red to White (12 VDC)</td>
<td>1.4 Ω</td>
</tr>
<tr>
<td>Red to White (24 VDC)</td>
<td>5.3 Ω</td>
</tr>
<tr>
<td>T3 Coil Resistance</td>
<td></td>
</tr>
<tr>
<td>Red to White (12 VDC)</td>
<td>0.9 Ω</td>
</tr>
<tr>
<td>Red to White (24 VDC)</td>
<td>3.3 Ω</td>
</tr>
<tr>
<td>T1 &amp; T2 &amp; T3</td>
<td></td>
</tr>
<tr>
<td>Red to Actuator Housing</td>
<td>&gt; 5 Mega Ω</td>
</tr>
<tr>
<td>White to Actuator Housing</td>
<td>&gt; 5 Mega Ω</td>
</tr>
</tbody>
</table>
SPECIFICATIONS

PERFORMANCE
Maximum Throttle Plate Rotation ............................................................... 65° +/- 1 degree

POWER INPUT FOR T1
Operating Voltage .......................................................................................... 12 or 24 VDC
Normal Operating Current ........................................................................... 3 Amps @ 12 VDC
............................................................................................................. 1.5 Amps @ 24 VDC
Maximum Current – Continuously Rated .................................................. 6 Amps @ 12 VDC
............................................................................................................. 3 Amps @ 24 VDC

POWER INPUT FOR T2
Operating Voltage .......................................................................................... 12 or 24 VDC
Normal Operating Current ........................................................................... 2 Amps @ 12 VDC
............................................................................................................. 1 Amp @ 24 VDC
Maximum Current – Continuously Rated .................................................. 6 Amps @ 12 VDC
............................................................................................................. 3 Amps @ 24 VDC

POWER INPUT FOR T3
Operating Voltage .......................................................................................... 12 or 24 VDC
Normal Operating Current ........................................................................... 3 Amps @ 12 VDC
............................................................................................................. 1.5 Amps @ 24 VDC
Maximum Current – Continuously Rated .................................................. 12 Amps @ 12 VDC
............................................................................................................. 6 Amps @ 24 VDC

ENVIRONMENTAL
Operating & Storage Temperature Range ........................................... -40° to + 200° F (-40° to + 95° C)
High Temperature Version Temperature Range .................................... -40° to + 400° F (-40° to + 205° C)
Relative Humidity .......................................................................................... SAE J1455
Salt Spray ...................................................................................................... ASTM B 117-97
All Surface Finishes .............................................................................. Fungus & Corrosion Resistant

RELIABILITY
Vibration ...................................................................................................... +/- 4g, 25 to 100 Hz
Shock ......................................................................................................... 20g, 11 msec.
Testing ...................................................................................................... 100 % Functionally Tested
Rated Life .................................................................................................. > 40 million cycles

AGENCY COMPLIANCE
CSA Certified .......................................................................................... Class 1, Division 2,
............................................................................................................. Group A, B, C, & D, T3 (pending)
CE Compliant .......................................................................................... stationary industrial markets only (pending)
ATB SERIES SELECTION CHART

ATB ORDER INFORMATION

ATB \text{ bbhdd a yy - vv }

<table>
<thead>
<tr>
<th>ATB</th>
<th>bbhdd</th>
<th>a</th>
<th>yy</th>
<th>vv</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEL NAME</td>
<td>BORE SIZE</td>
<td>HOUSING</td>
<td>DRIVER</td>
<td>ELECTRICAL OPTIONS</td>
</tr>
<tr>
<td>Actuator throttle body</td>
<td>25</td>
<td>1</td>
<td>T1</td>
<td>N = Standard</td>
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<tr>
<td></td>
<td>30</td>
<td>1</td>
<td>T1</td>
<td></td>
</tr>
<tr>
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<td>1</td>
<td>T1</td>
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</tr>
<tr>
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<td>1</td>
<td>T1</td>
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<tr>
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<td>T2+</td>
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<tr>
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<td>55</td>
<td>2</td>
<td>T2+</td>
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<td>2</td>
<td>T2+</td>
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<tr>
<td></td>
<td>75</td>
<td>3</td>
<td>T3**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>85</td>
<td>3</td>
<td>T3**</td>
<td></td>
</tr>
</tbody>
</table>

*High temperature option includes 400° F (205° C) rated bearings, seals, grease, magnet wire and heat sink.

**Sealed option standard.

+ Feedback versions sealed.

Examples of Ordering

<table>
<thead>
<tr>
<th>ATB</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>ATB-552T2-F4-12</td>
<td>55mm, T2 Type Throttle Body Actuator, w Feedback, Standard Mechanical Option, 12 Volts</td>
</tr>
<tr>
<td>ATB-753T3-N1-24</td>
<td>75mm, T3 Type Throttle Body Actuator, Standard Electrical Option, High Temperature Version, 24 Volts</td>
</tr>
</tbody>
</table>
DIMENSIONS

For bore sizes 25, 30, 35 and 40mm

For bore sizes 45, 55 and 65mm

For bore sizes 75 and 85mm