Operator’s Manual

ACF-10 Series
Acoustical Flow Sensor for Solids
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• Warranty and Warranty Restrictions

APG warrants its products to be free from defects of material and workmanship and will, without charge, replace or repair any equipment found defective upon inspection at its factory, provided the equipment has been returned, transportation prepaid, within 18 months from date of shipment from factory.

THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES NOT EXPRESSLY SET FORTH HEREIN, WHETHER EXPRESSED OR IMPLIED BY OPERATION OF LAW OR OTHERWISE INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

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Warranty is specifically at the factory. Any on site service will be provided at the sole expense of the Purchaser at standard field service rates.

All associated equipment must be protected by properly rated electronic/electrical protection devices. APG shall not be liable for any damage due to improper engineering or installation by the purchaser or third parties. Proper installation, operation and maintenance of the product becomes the responsibility of the user upon receipt of the product.

Returns and allowances must be authorized by APG in advance. APG will assign a Return Material Authorization (RMA) number which must appear on all related papers and the outside of the shipping carton. All returns are subject to the final review by APG. Returns are subject to restocking charges as determined by APG’s “Credit Return Policy”.

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• **Introduction**

The ACF-10 Acoustical Flow Sensor is a compact unit that detects audible noise made by powders and grains which is converted to a relay output.

In addition, since the ACF-10 is attached to the outside of the pipe or chute and does not contact directly with the grains to be detected, the ACF-10 will not have critical problems of flow fluctuations caused by conventional contact-type sensor inside the pipes and chutes, and with abrasion and corrosion problems of the contact-type sensor. The ACF-10 can be easily attached to existing pipes with straps.

The ACF-10 is easily adjusted with the use of four LED.
• Specifications

Operating Characteristics

On Indication ................... Red LED (4)
Output Capacity:
   Relay Contact ............... 240 V 2 A AC
                                  30 V 2 A DC (resistive load)
Sensitivity Adjustment..... Adjusting by offset and gain trimmers
Output Functions ............. Detect switch
   On Delay adjusting trimmer (approx. 0.1 to 7 sec.)
   Off Delay adjusting trimmer (approx. 0.1 to 7 sec.)
Ambient Temperature ...... -10 to 70°C (14 to 158°F) without dewing
Ambient Humidity .......... Max. 85% RH

Electrical Characteristics

Power Supply Voltage ..... 22~264 VDC AC (50/60 Hz)
Withstand Voltage ........ 1,500 VAC 1 minute (between line terminals and
                          output terminals)
Insulation Resistance ..... 500 VDC 100 MΩ (between line terminals and
                          output terminals)
Power Consumption ....... Approx. 2.5 VA (at 100 VAC)

Mechanical Characteristics

Vibration Proof .......... 60~2000 Hz 10 G

Others

Material ....................... ABS, PC
Construction ................... Drip-proof (IP54)
Installation .................... Attaching band or metal fixtures (option)
Wire Inlet ...................... PF1/2 (cable gland method, gasket I.D. ø10 and ø8)
• **Principle of Operation**

When grains flow within a distributed tube such as a pipe or a chute, by collision and friction between grains themselves or between grains and the wall of the distributed tube, various sounds and vibrations will be generated. The sound pickup of the ACF-10 attached outside the distributed tube receives the generated sounds and vibrations and converts the signal to a relay output.

**Explanation of Functions**

**Offset Adjustment**

By adjusting the signals (noise: sounds and vibrations generating during the operation of the surrounding equipment) from the sound pickup when the grains are not flowing, the component of noise can be cancelled.

**Gain Adjustment**

When the grains flows, by adjusting to amplify only the component of signals, the signals can be increased to a desired voltage.
• Installation

The ACF-10 can be attached by fastening the band or the metal fixtures with two bolts.

Cautions in Selecting a Place to be Attached

Select a place where a lot of sounds and vibrations are generating to install the ACF-10. Be sure to install the receiving part so that it can contact firmly with the wall of a distributed tube. If the receiving part does not contact firmly due the rugged surface of the wall, paint the surface with silicon grease etc. to increase the contact efficiency. Unless the receiving part is in contact firmly with the wall, the sensor will be insensitive.
• Wiring

Supply Voltage: 24-264V AC/DC
Relay Contact Output: 240V 2A AC (resistive load)
• Adjustment

1. DETECT Switch
   For shifting the magnetizing state of the output relay. The magnetizing state of the output relay is as follows:
   **At Non-Detection**  |  **At Detection**
   --- | ---
   Detect On | OFF | ON
   Non Detect | ON | OFF

2. OFFSET Adjusting Trimmer
   An offset adjusting trimmer for noise component
   left ... larger  |  right ... smaller

3. GAIN Adjustment Trimmer
   An adjusting trimmer for amplifying only input signals
   left ... smaller | right ... larger

4. ON DELAY Adjusting Trimmer
   A time adjusting trimmer for ON DELAY
   Max. setting time is approx. 7 seconds

5. OFF DELAY Adjusting Trimmer
   A time adjusting trimmer for OFF DELAY. Max. setting time is approx. 7 seconds

6. LED Display
   The red LED (4 pieces) indicate the intensity of input signals. When the LED illuminate, the relay will be switched on.
Preparations
Attach the ACF-10 to a distributed tube to check up again the wiring before switching on. After switching on, the ACF-10 starts operating in an initial time of some 2 seconds by the initial time circuit. Within the initial delay time, the relay will not operate.

(1) Flow Detection
Set the OFFSET trimmer to center, the GAIN trimmer to extreme left (min.) and the DETECT switch to DETECT position before starting the following procedures.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ★ Stop the flow grains</td>
<td>ZERO RY ON</td>
</tr>
<tr>
<td>(The magnitude of noise component is indicated)</td>
<td></td>
</tr>
<tr>
<td>2 Rotate the OFFSET trimmer to</td>
<td>ZERO RY ON</td>
</tr>
<tr>
<td>illuminate the ZERO LED</td>
<td></td>
</tr>
<tr>
<td>3 ★ Start flowing grains.</td>
<td>ZERO RY ON</td>
</tr>
<tr>
<td>Rotate the GAIN trimmer to adjust</td>
<td></td>
</tr>
<tr>
<td>to illuminate RY ON LED</td>
<td></td>
</tr>
</tbody>
</table>

(2) Plugged Detection
Set the OFFSET trimmer to center, the GAIN trimmer to extreme left (min.) and the DETECT switch to DETECT position before starting the following procedures.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ★ Grains flowing.</td>
<td>ZERO RY ON</td>
</tr>
<tr>
<td>(Rotate the GAIN trimmer 3-4</td>
<td></td>
</tr>
<tr>
<td>readings to the right)</td>
<td></td>
</tr>
<tr>
<td>2 Rotate the OFFSET trimmer to</td>
<td>ZERO RY ON</td>
</tr>
<tr>
<td>a position where the RY ON LED is</td>
<td></td>
</tr>
<tr>
<td>put out.</td>
<td></td>
</tr>
<tr>
<td>3 Rotate the GAIN trimmer to</td>
<td>ZERO RY ON</td>
</tr>
<tr>
<td>adjust to illuminate RY ON LED</td>
<td></td>
</tr>
<tr>
<td>4 ★ Stop the flow of grains.</td>
<td>ZERO RY ON</td>
</tr>
</tbody>
</table>
Other Functions

(1) Setting of DETECT switch
- Depending upon position of DETECT switch, the relay will operate as follows:

<table>
<thead>
<tr>
<th></th>
<th>Detect Side</th>
<th>Non Detect Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Contact</td>
<td>OPEN</td>
<td>CLOSE</td>
</tr>
</tbody>
</table>

(2) Setting of DELAY TIME

<table>
<thead>
<tr>
<th></th>
<th>ON DELAY</th>
<th>OFF DELAY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.1 to 7 seconds</td>
<td>0.1 to 7 seconds</td>
</tr>
</tbody>
</table>

ON DELAY: Delay in output for change from non-detection to detection.
OFF DELAY: Delay in output for change from detection to non-detection.
Cautions on Handling

Wiring

Use the connection cables of \( \varnothing 5 \) to \( \varnothing 10 \) mm cross section.

If using cables other than specified diameter and strained cables, drip-proof must be maintained.

Treat the cable as shown in the following figure.

After passing the cable through the cable gland, making press-fit is recommended for easy-to-work.

Shape of solderless terminals for cable

Use the solderless terminal with the size as shown in the figure below.

Recommended press-fit terminal: nominal 1.25-3.5

Use the terminal with insulating tube.
Other Cautions

- If the ACF-10 is dropped or receive a strong shock, it may be damaged. Handle with care.
- Do not use the ACF-10 in a vapor and corrosive gases or misty environments.
- Be sure to check up the terminal numbers before wiring. Be sure to fasten the cable gland and the cover. If the fastening is loose, this may damage the drip-proof.
- When using the ACF-10 outside, install to avoid direct sunlight or attach a sunshading cover to avoid the temperature rise and the effect of ultraviolet rays.

Check Up

Check up the ACF-10’s operational functions with the following procedures. Be sure to wire the ACF-10 before switching on. In approximately 2 seconds, set the OFFSET trimmer in the center to tap lightly the receiving part by a finger nail. When the illumination of the LED moves rightward from the zero point, the operations are regarded as normal.
• Dimensions — in./mm
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