



Installation and Operation Manual

Advantage® 2.1 Actuator



WILLIAMS
WC
CARVER CO.



ITT





Table of Contents

1 Introduction and Safety	2
1.1 Safety message levels	2
1.2 User health and safety	2
2 Transportation and storage	4
2.1 Handling and unpacking guidelines.....	4
2.2 Storage, disposal, and return requirements	4
3 Product Description	5
3.1 Actuator identification	5
3.2 Bonnet description.....	6
3.3 Valve diaphragm identification.....	7
4 Installation.....	8
4.1 Precautions	8
4.2 Install the valve and topworks	8
4.3 Change the compressor, tube nut, and snap ring	9
4.4 Mount the topworks to the valve.....	10
4.5 Tighten the bonnet fasteners.....	10
4.6 Fastener torque table for valve body to topworks	11
4.7 Actuator operating pressure	11
4.8 Set the adjustable opening stop	11
4.9 Disassemble the valve	12
4.10 Replace the valve diaphragm.....	12

1 Introduction and Safety

1.1 Safety message levels

Definitions

Safety message level	Indication
 DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
 WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
 CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury
 ELECTRICAL HAZARD:	The possibility of electrical risks if instructions are not followed in a proper manner
NOTICE:	<ul style="list-style-type: none">• A potential situation which, if not avoided, could result in an undesirable result or state• A practice not related to personal injury

1.2 User health and safety

General precautions

This product is designed and manufactured using good workmanship and materials, and meets all applicable industry standards. This product should be used only as recommended by ITT.



WARNING:

- Misapplication of the valve can result in injury or property damage. Select valves and valve components of the proper materials and make sure that they are consistent with your specific performance requirements. Incorrect application of this product includes but is not limited to:
 - Exceeding the pressure or temperature rating
 - Failing to maintain this product according to the recommendations
 - Using this product to contain or control media that is incompatible with the materials of construction

Qualifications and training

The personnel responsible for the assembly, operation, inspection, and maintenance of the valve must be appropriately qualified. The operating company must do the following tasks:

- Define the responsibilities and competency of all personnel handling this equipment.
- Provide instruction and training.

- Ensure that the contents of the operating instructions have been fully understood by the personnel.

Instruction and training can be carried out by either ITT or the reseller of the valve by order of the operating company



WARNING:

California Proposition 65 Cancer <http://www.P65Warnings.ca.gov>. Plastics in product contain Glass Wool Fibers, known to the State of California to cause cancer. Wash hands after handling.

Non-compliance risks

Failure to comply with all safety precautions can result in the following conditions:

- Death or serious injury due to electrical, mechanical, and chemical influences
- Environmental damage due to the leakage of dangerous materials
- Product damage
- Property damage
- Loss of all claims for damages

Operational safety precautions

Be aware of these safety precautions when operating this product:

- Do not leave hot or cold components of the product unsecured against contact if they are a source of danger.
- Do not remove the contact guard for moving parts when the product is in operation. Never operate the product without the contact guard installed.
- Do not hang items from the product. Any accessories must be firmly or permanently attached.
- Do not use the product as a step or hand hold.
- Do not paint over the identification tag, warnings, notices, or other identification marks associated with the product.

Maintenance safety precautions

Be aware of these safety precautions when performing maintenance on this product:

- You must decontaminate the product if it has been exposed to harmful substances such as caustic chemicals.

Use of unauthorized parts

Reconstruction or modification of the product is only permissible after consultation with ITT. Genuine spare parts and accessories authorized by ITT serve to maintain safety. Use of non-genuine ITT parts can annul liability of the manufacturer for the consequences. ITT parts are not to be used in conjunction with products not supplied by ITT as this improper use can annul all liability for the consequences.

Unacceptable modes of operation

The operational reliability of this product is only guaranteed when it is used as designated. The operating limits given on the identification tag and in the data sheet may not be exceeded under any circumstances. If the identification tag is missing or worn, contact ITT for specific instructions.

2 Transportation and storage

2.1 Handling and unpacking guidelines

**CAUTION:**

Always observe the applicable standards and regulations regarding the prevention of accidents when handling the product.

Handling guidelines

Follow these guidelines when handling the product to prevent damage:

- Use care when handling the product.
- Leave protective caps and covers on the product until installation.

Unpacking guidelines

Follow these guidelines when unpacking the product:

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. Do not lift or pull on the electrical conduit lines. Doing so may cause the POC switches to come out of calibration.

2.2 Storage, disposal, and return requirements

Storage

If you are not immediately installing the product after delivery, store it as follows:

- Store the product in a dry room that maintains a constant temperature.
- Make sure that the products are not stacked on top of one another.

Disposal

Dispose of this product and associated components in compliance with federal, state, and local regulations.

Return

Ensure these requirements are met before you return a product to ITT:

- Contact ITT for specific instructions on how to return the product.
- Clean the valve of all hazardous material.
- Complete a Material Safety Data Sheet or Process Data Sheet for any process fluid that could remain on the valve.
- Obtain a Return Material Authorization from the factory.

3 Product Description

3.1 Actuator identification

Design Overview

The actuator is a spring or double acting pneumatic actuator.

To determine if you have an Advantage actuator or an Advantage actuator 2.1 locate the spindle compressor connection and determine if you have a pin connection or modular compressor design.



Figure 1: Pin connection for Advantage actuator



Figure 2: Compressor for Advantage 2.0 actuator

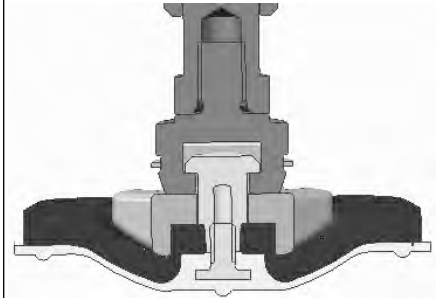


Figure 3: Modular compressor with snap ring retention for Advantage 2.1 actuator

Model number

The actuator model number is located on the ITT identification tag. The model number is a four digit number defining the actuator as follows.

Table 1: Actuator

Code	Description
B	Advantage 2.1 actuator

Table 2: Mode of operation

Code	Description
1	Fail open (spring to open, air to close) (direct acting)
2	Fail close (spring to close, air to open) (reverse acting)
3	Double acting (air to open, air to close)

Table 3: Actuator series

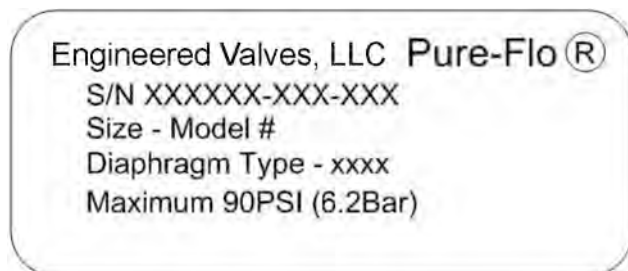
Code* ¹	Actuator series* ²
03, 04	3
05, 06	5
08, 09	8
16, 17	16

*1 For fail close actuators, codes are specific spring combinations.

*2 Series number equates to diaphragm effective area.

Table 4: Examples

Model number	Description
B308	Advantage 2.1 actuator, double acting, series 8
B216	Advantage 2.1 actuator, fail close, series 16 with a spring set

Identification tag

Line	Description
1	Valve serial number
2	Valve size and model number
3	Valve diaphragm type
4	Maximum recommended actuation pressure

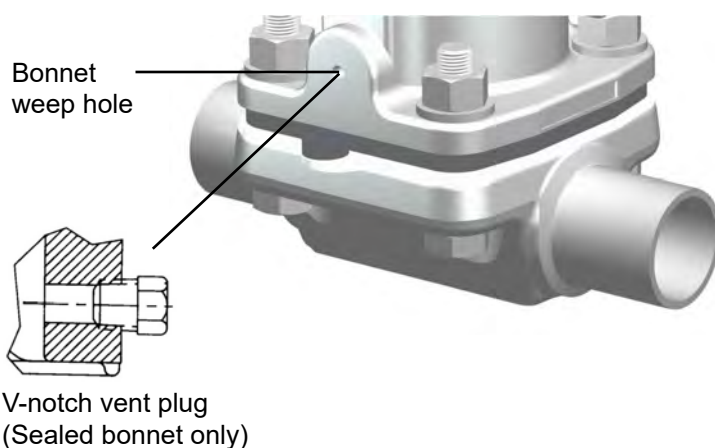
3.2 Bonnet description

Non-Sealed bonnet

The non-sealed bonnet has a weep hole that indicates a diaphragm failure by allowing process fluid that accumulates in the bonnet to pass through the hole.

Sealed bonnet

The sealed bonnet uses a special “V-notch” vent plug, which permits leak detection.

**Figure 4: Weep hole and V-notch vent plug**

3.3 Valve diaphragm identification

Diaphragm tab codes

All diaphragm materials and physical properties are batch traceable via permanent codes molded into the diaphragm tabs. The molding date, grade of diaphragm, and size provide traceability to original batch records.



1. Date code
2. Supplier code

Figure 5: Elastomer diaphragm front



1. Valve size
2. Grade of diaphragm

Figure 6: Elastomer diaphragm back



1. Material code
2. Date code

Figure 7: PTFE diaphragm

4 Installation

4.1 Precautions



WARNING:

- All procedures must be performed by qualified personnel.
- When the process fluid is hazardous, thermal (hot or cold), or corrosive, take extra precautions. Employ the appropriate safety devices and be prepared to control a process media leak.
- Always wear protective clothing and equipment to safeguard the eyes, face, hands, skin, and lungs from the fluid in the line.
- Do not disassemble the actuator in the field. The actuator contains energized springs which can cause injury. The product is designed to be recycled in its entirety.



CAUTION:

- Disconnect electrical, pneumatic, and hydraulic power before servicing actuator or automation components.

4.2 Install the valve and topworks

NOTICE:

The topworks size and configuration can limit the actual operating pressure. Consult the Pure-Flo catalog for pressure limitations. Consult the factory or engineering catalog for vacuum operation.

Consider the following information before installing the actuator:

- The series 3, 5, 8, or 16 stainless steel bonnet Advantage 2.1 actuator can have the air inlets positioned in any quadrant.
 - The maximum valve operating pressure is 10.34 bar | 150 psig. This pressure is applicable up to 38°C | 100°F. Valves at maximum pressure cannot be used at maximum temperatures.
 - The maximum actuator pressure is 6.2 bar | 90 psi.
1. If you have a weld end valve, then consider the following:

If you are welding ...	Then ...
Manually	Remove the topworks.
In line for schedule 10 or heavier pipe	Remove the topworks.
In line for schedule 5 or lighter pipe and tubing	You can weld with automatic equipment. Before you perform the weld: <ol style="list-style-type: none"> 1. Remove the topworks (optional). 2. If left installed, set the valve to the open position. 3. Properly purge the valve with an inert gas.

2. Install the valve.

If the valve is a ...	Then ...
Dia-Flo diaphragm valve	For horizontal piping systems to be drained through the valve, install the valve spindle between 0° and 30° above horizontal. For vertical piping systems, no specific orientation is required.
Pure-Flo diaphragm valve	Install with the raised hash marks (castings) or small machined dots (forgings) on the valve body at the 12 o'clock position to achieve the optimum drain angle.



- Prior to pressurization (with the valve slightly open), tighten the bonnet fasteners. For more information, see [4.5 Tighten the bonnet fasteners on page 10](#).
- Connect the air line.

Connection size is 1/8" NPT.

NOTICE:

Air line connections should be made with care so as not to damage the actuator covers.

- Cycle the valve two to three times to verify smooth operation.

4.3 Change the compressor, tube nut, and snap ring

To switch diaphragm types between EPDM and PTFE, the tube nut must be changed. Follow the steps below before you switch diaphragm types.

- Insert a screw driver or similar thin blade between compressor and bonnet flange.



Figure 8: Remove the compressor

- Apply light pressure to back side of compressor finger.
- Remove compressor and snap ring assembly.



Figure 9: Compressor assembly

4. Replace with new snap ring, tube nut and compressor (only 0.5 and 0.75" sizes). Do not re-use snap ring.

4.4 Mount the topworks to the valve

1. Regulate the air pressure

If the topworks is ...	Then regulate the air pressure ...
Fail open or double acting	In the upper cover to extend the compressor.
Fail close	In the lower cover to properly position the valve diaphragm.

2. Install the valve diaphragm.
For more information, see [4.10 Replace the valve diaphragm on page 12](#).
3. Assemble the valve body and tighten the bonnet fasteners.
For more information, see [4.5 Tighten the bonnet fasteners on page 10](#).

4.5 Tighten the bonnet fasteners



CAUTION:

Do not tighten fasteners while the system is pressurized or at elevated temperatures (greater than 38°C | 100°F).

1. Depressurize the system.
2. Use regulated air pressure to position diaphragm so that valve is slightly open.
You may need to use air pressure to actuate the valve.
3. Tighten the bonnet fasteners in a crisscross pattern.
For more information, see [4.6 Fastener torque table for valve body to topworks on page 11](#).
4. Make multiple crisscross passes to build up torque to the final table value. Make additional crisscross passes using final table values to evenly tighten each fastener to within 5% of torque value.
5. Retighten the bonnet fasteners as noted above at ambient conditions after the system has cycled through operating pressure and temperature.
6. Monitor the valve for leakage:

If leakage ...	Then ...
Occurs at the body/bonnet flange sealing area	Depressurize the system and retighten the bonnet fasteners as noted above.

If leakage ...	Then ...
Continues	Depressurize the system and retighten the bonnet fasteners as noted above. (maximum 3rd re-torque)
Continues	Replace the valve diaphragm.

For more information, see [4.10 Replace the valve diaphragm on page 12](#).

4.6 Fastener torque table for valve body to topworks

Values given are for lubricated fasteners.

Valve size		Bolt size		PTFE diaphragm		Elastomer diaphragm	
DN	Inch	Metric	Imperial	N-m	in-lb	N-m	in-lb
Bio-Tek (8, 10, 15)	Bio-Tek (0.25, 0.375, 0.50)	M4	#6	2.3-2.8	20-25	2.3-2.8	20-25
15	0.50	M6	1/4"	2.8-6.8	25-60	2.3-4.5	20-40
20	0.75	M6	1/4"	5.7-9.1	50-65	2.3-5.7	20-50
25	1.00	M8	5/16"	7.4-11.3	65-90	5.1-7.9	45-70
40	1.50	M10	3/8"	23-25	200-225	8.5-14.7	75-130
50	2.00	M12	7/16"	25-31	225-275	11-20	100-180

4.7 Actuator operating pressure

Maximum permitted air supply pressure

bar	kPA	psi
6.2	620	90

Actuator pressure rating

The actuator will withstand pressures well in excess of the rated pressure without risk of bursting. Maintaining operating pressure at or below the pressure rating will ensure optimum life of the operating components, such as the actuator diaphragm. However, operation at pressures up to 10.3 bar | 150 psig, for limited periods of time, will not noticeably affect the life of these components.

bar	kPA	psi
6.2	620	90

4.8 Set the adjustable opening stop

If you have a series 3, 5, 8, 16 actuator, then follow the steps below:

1. Remove the switch package, if present.
2. Using air pressure and a bleed type regulator, open the valve to the desired position.
3. Rotate the adjusting bushing counterclockwise until resistance is felt. The opening stop is now set.
4. Adjust the valve closed switch.

If you have a series 47 actuator, then follow the steps below:

1. Remove the switch package, if present.
2. Remove the clear plastic cap.
3. Using air pressure and a bleed type regulator, open the valve to desired position.
4. Rotate the adjusting bushing counterclockwise until resistance is felt. Count and record the number of turns.
5. Loosen the two jam nuts and turn the lower nut clockwise the same number of turns as recorded above.
6. Lock the nuts together.
7. Remove the switch package, if present.
8. Using air pressure and a bleed type regulator, open the valve to the desired position.
9. Rotate the adjusting bushing counterclockwise until resistance is felt. The opening stop is now set.
10. Adjust the valve closed switch.
11. Replace the clear plastic cap.

4.9 Disassemble the valve

1. Remove all line pressure.
2. If the actuator mode of operation is fail open or fail close, then load the actuator with air.

If the actuator mode of operation is ...	Then ...
Fail open	Load the actuator with sufficient air to partially close the valve.
Fail close	Load the actuator with sufficient air to partially open the valve.

3. Remove the bonnet fasteners.
4. Lift the topworks assembly from the valve body.
5. If the actuator mode of operation is fail open, then remove pressure load from the actuator.

4.10 Replace the valve diaphragm

1. Disassemble the valve.
For more information, see [4.9 Disassemble the valve on page 12](#).
2. Unscrew the diaphragm from the compressor by turning the diaphragm counterclockwise.
The replacement diaphragm should be identical in size and grade to the original diaphragm.
3. If replacing a PTFE diaphragm, then follow these steps.
 - a) Install the new elastomer backing cushion over the tube nut.



- b) Invert the PTFE diaphragm by pressing the center of the diaphragm face with your thumbs while holding the edge of the diaphragm with your fingers.



- c) Engage the threads of the diaphragm into the tube nut by rotating clockwise.



- d) Continue rotating the PTFE diaphragm clockwise into the compressor while securing the backing cushion from rotating.



4. Rotate the diaphragm until hard stop or heavy resistance is achieved and additional force does not significantly rotate the diaphragm into the compressor.



5. If replacing a PTFE diaphragm, re-invert the diaphragm.



6. If the actuator mode of operation is fail open or fail close, select one of these steps.

If the actuator mode of operation is ...	Then ...
Fail open	Reduce the air pressure until the back of the diaphragm is flat against the bonnet.
Fail close	<ol style="list-style-type: none">1. Connect the air line to the bonnet's cylinder.2. Load the chamber with sufficient air to move the diaphragm upward until the back of diaphragm is flat against the bonnet. Do not apply excessive air pressure that results in inversion of the diaphragm.

7. For more information, see [4.5 Tighten the bonnet fasteners on page 10](#).
8. If the actuator mode of operation is fail open, then release the air, allowing the valve to open.



The Williams - Carver Co., Inc.

4001 Mission Road
Kansas City, Kansas 66103
(913) 236-4949 FAX (913) 236-9331
www.williamscarver.com



ITT Engineered Valves
33 Centerville Road
Lancaster, PA 17603
USA

Form IO-Adv2.1.en-US.2020-04