

# **Installation, Operation, and Maintenance Manual**

## **API 6D Swing Check Valve - CVA Series**





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## 1 INTRODUCTION

### 1.1 SCOPE

The C&C CVA Series is an API 6D full bore flanged end Swing Check Valve features stainless steel clapper with O-ring seals designed to allow flow in only one direction and prevent reverse flow in piping systems. The cover is bolted to the body and sealed with an O-ring. The following information is intended for the proper installation, operation, and maintenance of C&C's CVA Series swing check valves.

### 1.2 DISCLAIMER

When properly operated, maintained, and installed in applications suitable to the materials of construction, C&C's CVA Series swing check valves will provide long and trouble-free service. The **End User** is responsible for ordering the correct valve(s) and operating the valve(s) in observance of the valve's pressure rating and temperature limits. Prior to installation, the valve and valve's nameplate should be checked for proper identification to ensure the valve is of proper type, material(s) and is of a suitable pressure class, service media compatibility and temperature limit to satisfy the application requirements.



The **End User** is advised that misapplication of the product may result in injuries, death and/or property damage.

### 1.3 SAFETY INFORMATION



We **highly recommend** that this entire document be read prior to proceeding with any installation, operation, or maintenance.

Due to the hazardous nature of pressurized piping systems, it is recommended the following precautions and guidelines, at a minimum, must be followed to minimize hazards related to pressurized piping systems:

- (a) CVA Series valves are intended to be used **only** in gas and liquid applications containing **no** solid particles in the piping systems. Solid particles in slurry service may deposit or scratch sealing surfaces and effect the sealing capability of the valve therefore, we do not recommend the use of this valve in slurry service.
- (b) The End User is responsible for meeting state, local, and all applicable national safety practices and codes.
- (c) The End User is responsible for minimizing other hazards associated with the installation, operation, and maintenance of pressurized piping systems.
- (d) The valve's nameplate indicates the materials of construction and maximum operating pressure at maximum and minimum operating temperatures. The valve can be safely operated within these limits.

- (e) The End User is responsible to select valve material based on the service media. Contact CNC Flow Control to confirm whether valve design is suitable for the application. CNC Flow Control requires a complete description of the application before making any recommendation.



Do **not** operate any valve beyond the pressure and temperature limits stated on the valve's nameplate.

## 2 VALVE INFORMATION

### 2.1 NAMEPLATE

Each C&C CVA Series swing check valve is equipped with an identification nameplate placed on the valve's cover. Following is an example of the nameplate containing the valve's pertinent data.

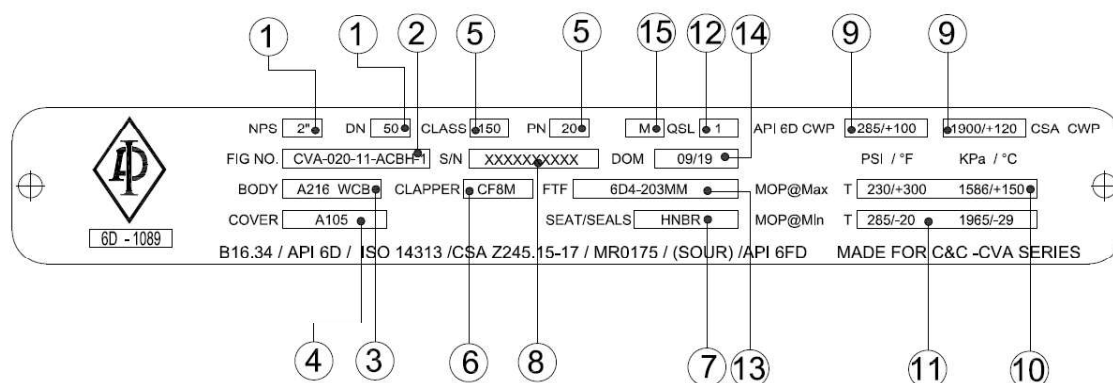


Figure 1: C&C CVA Series piston check valve's nameplate

Table 1: Valve nameplate information

| Item | Description        | Item | Description                             |
|------|--------------------|------|-----------------------------------------|
| 1    | Nominal Pipe Size  | 9    | Maximum Pressure at Ambient Temperature |
| 2    | Figure Number      | 10   | Maximum Pressure at Maximum Temperature |
| 3    | Body Material      | 11   | Maximum Pressure at Minimum Temperature |
| 4    | Cover Material     | 12   | Quality Specification Level (QSL)       |
| 5    | Pressure Class     | 13   | Face-to-Face Length                     |
| 6    | Clapper Material   | 14   | Manufactured Date                       |
| 7    | Seat/Seat Material | 15   | Impacted Tested                         |
| 8    | Serial Number      |      |                                         |

## 2.2 VALVE MARKING

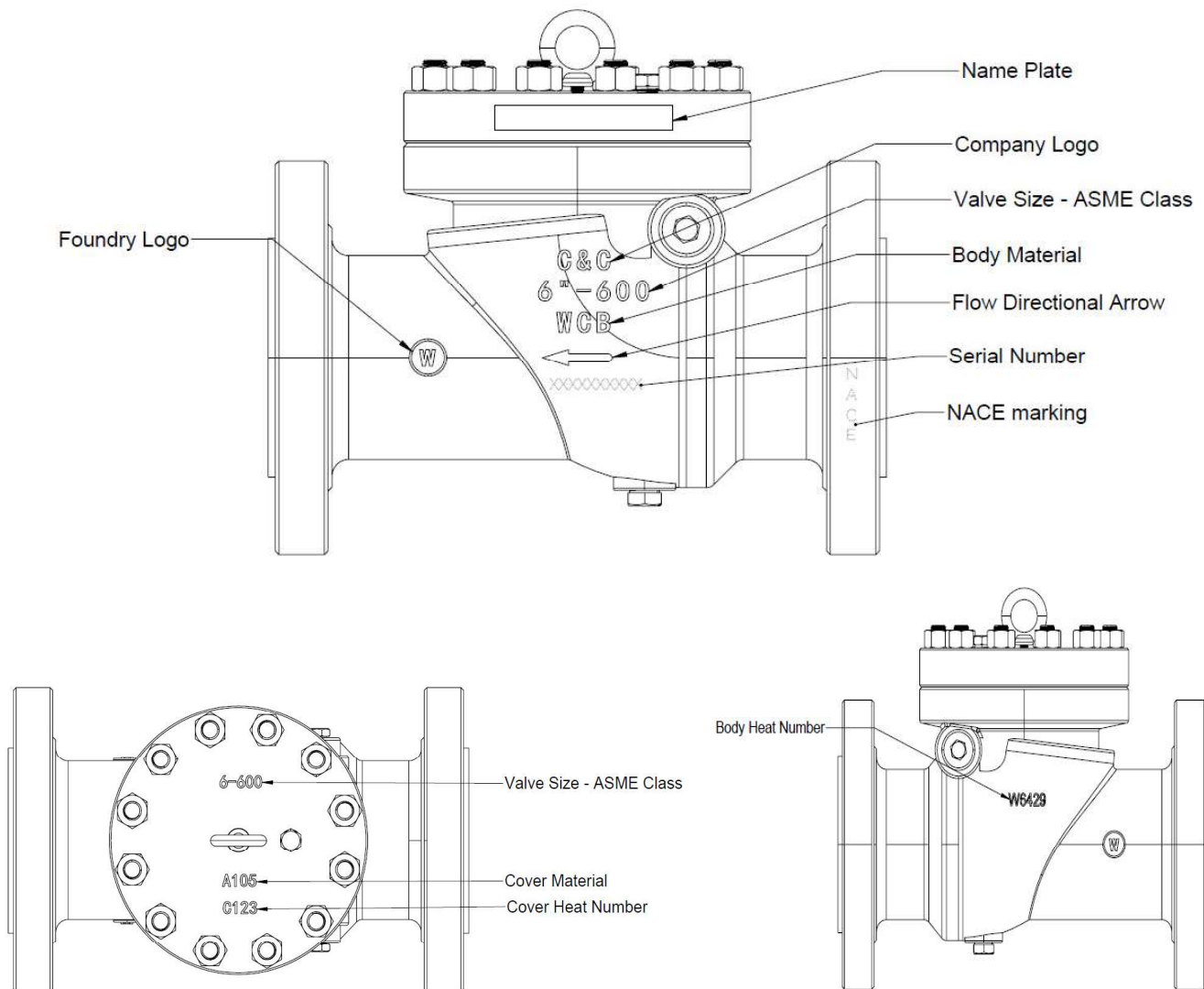


Figure 2: C&C CVA Series swing check valve body marking and nameplate placement

## 2.3 BILL OF MATERIALS

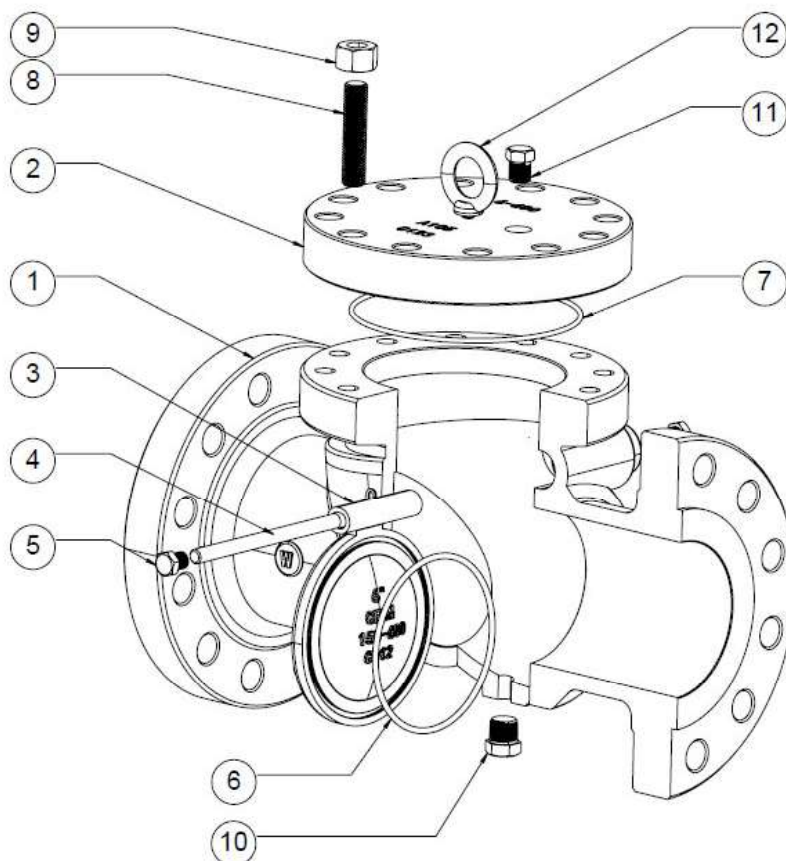


Figure 3: C&C CVA Series swing check valve exploded view

Table 2: CVA Series bill of materials

| Item                                                                  | Qty | Name             | Material                                                                                                | Specification |
|-----------------------------------------------------------------------|-----|------------------|---------------------------------------------------------------------------------------------------------|---------------|
| 1                                                                     | 1   | Body             | For materials of construction and material specification refer to the corresponding valve sales drawing |               |
| 2                                                                     | 1   | Cover            |                                                                                                         |               |
| 3                                                                     | 1   | Clapper          |                                                                                                         |               |
| 4                                                                     | 1   | Pin              |                                                                                                         |               |
| 5                                                                     | 2   | Pin Plug         |                                                                                                         |               |
| 6                                                                     | 1   | Clapper O-Ring** |                                                                                                         |               |
| 7                                                                     | 1   | Cover O-Ring     |                                                                                                         |               |
| 8                                                                     | *   | Stud             |                                                                                                         |               |
| 9                                                                     | *   | Nut              |                                                                                                         |               |
| 10                                                                    | 1   | Drain Plug       |                                                                                                         |               |
| 11                                                                    | *   | Cover Plug       |                                                                                                         |               |
| 12                                                                    | *   | Eye Bolt         |                                                                                                         |               |
| * - Quantities as required                                            |     |                  |                                                                                                         |               |
| ** - Ring type joint (RTJ) metallic gasket for ASME Class 2500 valve. |     |                  |                                                                                                         |               |

### 3 RECEIVING, HANDLING AND STORAGE

#### 3.1 RECEIVING AND HANDLING

Valves should be inspected upon receipt to determine:

- Packaging integrity
- Compliance to the purchase order
- Correct type, pressure class, size, body & trim material, and quantity
- Damage caused during shipping and handling to the valve or flange end connections

Any damage noticed during receiving inspection, should be evaluated to determine its severity and to implement repairs if possible. Severe damage to the valve should be reported to CNC Flow Control.



If the valve's flange protectors are found to be missing or damaged, an inspection of the valve's flow bore/cavity is required to remove any foreign material that may have entered the valve.

Lifting shall be done with slings, straps or hooks using valve body or end flanges. The C&C CVA Series swing check valve is supplied with lifting eyebolt for size 6" & larger attached to the cover bolting to facilitate the removal of cover during repair. **Only** lifting devices that are rated for the valve weight shall be used when lifting any C&C valves.



The **End User** is advised to follow all applicable industry recommendations when lifting the valve. Failure to follow good practices may result in injuries, death and/or property damage.

#### 3.2 STORAGE

Valves received in their original shipping containers may be stored for up to a year provided they are stored indoors and not exposed to extreme temperatures, contamination by dirt or high humidity. C&C CVA Series swing check valves are shipped with flange end protectors which should remain installed until the valves are ready to be installed. If valves are to be stored indoors for longer than a year, it is recommended that periodic inspection on the valve be carried out to ensure proper storage and valve condition.



Non-observance of crate handling markings **could** result in serious injury of people and damage to the goods.



If the valve is removed from its original shipping container or stored outdoors, the **End User** must ensure that the valve is adequately protected to prevent valve damage or contamination.

## 4 INSTALLATION

### 4.1 GENERAL INFORMATION

C&C's CVA Series swing check valves are 100% tested at the factory per API 6D and shipped ready for installation. Consider the following points before installation:

- Experienced and trained personnel should install this valve
- State, local, and all applicable national safety practices and codes relating to valve or pressurized equipment installation should be followed
- Inspect valve documentation, nameplate, and body markings to ensure that the correct valve is installed
- Inspect the entire valve for damage prior to installation
- Inspect the flange sealing surface for dents or scratches that may affect sealing
- Remove flange end protectors prior to installation
- Observe the valve flow directional arrow for guidance on proper orientation. The valve must be installed with the flow line in the same direction as the flow directional arrow present on the valve's body.



Failure to correctly match the flow directional arrow with the pipeline flow direction will result in undesired valve operation.

- Thoroughly clean the adjacent piping system to remove foreign material that may cause damage to the valves sealing surface
- Prior to installation, piping must be properly aligned and supported to reduce mechanical loading on the valves end connections.
- Proper mating flange and gasket size and type must be used when installing the valve.
- Verify that the space available for installation is adequate to allow the valve to be installed and serviced in line if so desired

### 4.2 HORIZONTAL INSTALLATION

All C&C CVA Series swing check valves shall be installed in the horizontal position with the cover upright and arrow mark on the body pointing in the direction of flow.



The valve **shall not** be installed horizontally with the cover pointing downward from the vertical position.

### 4.3 VERTICAL INSTALLATION

When installing the C&C CVA Series swing check valves in vertical position, only install with the arrow mark on the body pointing in upward direction. The valve **cannot** be used with vertical downward flow.

## 5 OPERATION

### 5.1 NORMAL OPERATION ACTIVITY

The C&C CVA Series swing check valve operates without any outside assistance. The valve closes and opens automatically with varying pipeline flow.

With no flow through the valve, the force generated by the gravity causes the clapper to swing closed. As flow is increased, the clapper is forced open to allow fluid to pass. If flow is decreased, reversed flow causes the clapper to close to prevent back flow.

### 5.2 HIGH TEMPERATURE SERVICE

Some valves do have operating temperatures that can be very dangerous to people or animals. To avoid any kind of injuries operators must ensure the valve surfaces that reach such temperatures are suitably protected against accidental contact. Operators are recommended to always provide efficient protection/insulation of the valve surfaces that may be touched by personnel and/or animals and that are beyond tolerable limits (as a suggestion use -4°F through +140°F).

## 6 MAINTENANCE

The C&C CVA Series swing check valve requires little to no attention during operation. The valve is a self-contained unit responding automatically to pipeline flow. Due to the top entry construction of C&C's CVA Series swing check valve, maintenance on the valve can be carried out inline or offline. During inline maintenance, the valve must be isolated in the pipeline and depressurized.



Depressurization and isolation **must** be done from associated piping system equipment both upstream and downstream to the valve.

As with all pressurized equipment, proper PPE should be worn when preparing to service the valve. Observe the following general warning before disassembly begins.



- A valve is a pressurized device containing energized fluids and should be handled with extreme care.
- Depending on the operating condition, the valve's surface temperature may be dangerously hot or cold.
- Depending on the process fluid, the valve may be required to be decontaminated or flushed before any maintenance can begin.
- Upon disassembly, attention should be paid to the possibility of releasing dangerous and/or ignitable service media.

Once the valve is depressurized and allowed to cool, if applicable, disassembly may begin. To disassemble the C&C CVA Series swing check valve, follow the steps below. Refer to Figure 3.

## 6.1 DISASSEMBLY

1. Unscrew the drain plug (10) and cover plug (11). Clean and inspect the pipe threads for damage.



When removing the drain and cover plug, exercise extreme caution since in rare cases, pressure may still be trapped in the valve cavity.

2. Untighten and remove all the hex nuts (9).
3. Unscrew the body/cover studs (8) and then remove the valve cover (2) using the eye bolt (12), where applicable.
4. Remove, clean, and inspect the valve cover O-Ring (7) for signs of damage.
5. For ASME class 2500, RTJ metallic gasket shall be removed and replaced with new gasket during re-assembly.



O-rings and the corresponding mating surface(s) should be visually inspected for nicks, cuts, scratches, or signs of damage that may affect the O-ring's sealing capability.

6. Unscrew the pin plugs (5).
7. Remove the clapper (3). Clean and inspect the clapper and the clapper O-Ring (6) for damage.
8. Remove the pin (4) from the clapper (3) and inspect the pin for any damage.
9. Inspect the body (1) seating surface for damage.

## 6.2 RECONDITIONING

Once the valve is disassembled, clean and inspect all components to ensure that the valve functions properly once reassembled. Consider the following points before reassembly:

- Metallic parts can be cleaned using cloths, wet with a generic cleaner.
- To clean O-Rings use dry, clean cloths. If possible, it is recommended to wash the O-Rings with soap and water, rinsing with clean water.
- After cleaning components be sure that there are no damaged parts and, particularly, there are no scores on metallic surfaces in moving or sealing areas. Also, check the condition of the O-Rings making sure that they have not been damaged.
- Replace any damaged parts.

**Note:** Contact CNC Flow Control for any spare parts.

## 6.3 RE-ASSEMBLY

To re-assemble the C&C CVA Series swing check valve, follow the steps below. Refer to Figure 3

1. Insert the pin (4) into the clapper (3).

2. Install the clapper O-Ring (6) into the clapper groove. A thin even coat of Parker's Super O-Lube or equivalent lubricant may be used on the O-ring and mating surfaces. Ensure that the O-ring is not damaged during installation.
3. Install the clapper assembly into the body (1)
4. Apply pipe sealant or Teflon tape to the threads of the pin plugs (5). Hand tight the pin plugs into the body (1). Using a wrench tighten the pin plug two turns past hand tight.
5. Insert the cover O-Ring (7) into the cover groove or new RTJ gasket into the body groove as applicable. A thin even coat of Parker's Super O-Lube or equivalent lubricant may be used on the O-ring and mating surfaces. Ensure that the O-Ring or RTJ gasket is not damaged during installation.



Lubricants such as oils and greases used while assembling the valve should be compatible with the process fluid, valve materials of construction and the O-ring material.

6. Apply a liberal amount of thread lubricant to the stud's threads and screw in the studs (8) into the valve body. Place the cover (2) over the studs and the body using eyebolt (12).
7. Screw on the hex nuts (9) and hand tighten. Using a wrench tighten the hex nuts in a star pattern to the torque shown in Table 3.
8. Apply pipe sealant or Teflon tape to the threads of the cover plug (11) and drain plug (10). Hand tighten the pipe plug onto the cover. Using a wrench tighten the pipe plug two turns past hand tight.

## 7 PROPER VALVE TESTING

Always perform an API 6D pressure test before re-installing the valve into the line to verify that the maintenance operation has been satisfactorily performed and to re-certify pressure containment capability of the valve. Testing shall only be performed by qualified personnel.



Installing the valve in the line without pressure testing could cause leakage of production media and a potentially hazardous situation.

### 7.1 SHELL TEST

There shall not be any leakage when the valve is pressurized from the upstream side, along the flow direction arrow on the body, and both ends blanked. Testing pressure is 1.5 times the maximum operating pressure. Test duration is 2min for 4" and under valves, 5min for 6" to 10" valves, 15min for 12" to 18" and 30min for 20" and larger. Follow the below steps to shell test the swing check valve:

- (a) Open the downstream vent valve of the test machine.
- (b) Fill the valve with test fluid (Venting air through the downstream vent).
- (c) Close the vent valve and apply pressure in accordance with 1.5 times the maximum operating pressure of the valve.
- (d) Visually check the valve sealing areas for signs of leakage.
- (e) Depressurize the valve (Do not remove the fluid).

## 7.2 HYDROSTATIC SEAT TEST

Valves are to be subjected to a hydrostatic seat test after the shell test. There is to be no leakage under test pressure. Test pressure is to be applied to the appropriate end of the valve and should be 1.1 times maximum operating pressure. Test durations are 2min for 4" and under valves, 5min for 6" to 18" and 10min for 20" and larger valves. Follow the below steps to seat test the swing check valve:

- Pressurize the downstream side (In the direction of the required flow blockage) of the valve to 1.1 times the maximum operating pressure.
- Open the upstream vent valve.
- Check for leakage at the upstream vent.
- Depressurize the valve and flush the test fluid.

## 7.3 SUPPLEMENTAL AIR SEAT TEST

The seat test specified in Section 7.2, with modification shown below, shall be repeated at a test pressure between 80 psig and 100 psig using air as the test medium.

- All test fluid shall be purged from the valve before beginning the supplemental air seat test.
- Check for leakage by immersing the upstream vent valve in a fluid.

## 8 BOLTS TIGHTENING TORQUE

Table 3: Cover bolting minimum required bolt torque

| Valve Port Size<br>Inch (DN) | ASME Class | Cover bolting sizes (Inches) |                                    | Bolting Torque<br>(In-lbf)<br>B7M/B8M |
|------------------------------|------------|------------------------------|------------------------------------|---------------------------------------|
|                              |            | Stud<br>(Qty.) Size          | Nut<br>"Width across the<br>flats" |                                       |
| 2" (50)                      | 150        | (4) ½"-13UNC                 | 7/8"                               | 716                                   |
|                              | 300        | (4) ½"-13UNC                 | 7/8"                               | 716                                   |
|                              | 600        | (8) 5/8"-11UNC               | 1-1/16"                            | 1248                                  |
|                              | 900        | (8) 7/8"-9UNC                | 1-7/16"                            | 3956                                  |
|                              | 1500       | (8) 7/8"-9UNC                | 1-7/16"                            | 3956                                  |
| 3" (80)                      | 150        | (6) ½"-13UNC                 | 7/8"                               | 716                                   |
|                              | 300        | (6) 5/8" - 11UNC             | 1-1/16"                            | 1248                                  |
|                              | 600        | (8) 3/4"-10UNC               | 1-1/4"                             | 2513                                  |
|                              | 900        | (8) 7/8"-9UNC                | 1-7/16"                            | 3956                                  |
|                              | 1500       | (8) 1-1/8"-8UNC              | 1-13/16"                           | 7921                                  |
| 4" (100)                     | 150        | (6) ½"-13UNC                 | 7/8"                               | 797                                   |
|                              | 300        | (8) 5/8" - 11UNC             | 1-1/16"                            | 1248                                  |
|                              | 600        | (12) 3/4"-10UNC              | 1-1/4"                             | 2513                                  |
|                              | 900        | (8) 1-1/8"-8UNC              | 1-13/16"                           | 7921                                  |
|                              | 1500       | (8) 1-1/4"-8UNC              | 2"                                 | 10797                                 |
| 6" (150)                     | 150        | (12) 3/4"-10UNC              | 1-1/4"                             | 2513                                  |
|                              | 300        | (12) 7/8"-9UNC               | 1-7/16"                            | 3956                                  |
|                              | 600        | (12) 7/8"-9UNC               | 1-7/16"                            | 3956                                  |
|                              | 900        | (12) 1-1/4"-8UNC             | 2"                                 | 10797                                 |
|                              | 1500       | (12) 1-3/8"-8UNC             | 2-3/16"                            | 15116                                 |

| Valve Port Size<br>Inch (DN) | ASME Class | Cover bolting sizes (Inches) |                                 | Bolting Torque<br>(In-lbf)<br>B7M/B8M |
|------------------------------|------------|------------------------------|---------------------------------|---------------------------------------|
|                              |            | Stud<br>(Qty.) Size          | Nut<br>"Width across the flats" |                                       |
| 8" (200)                     | 150        | (12) 7/8"-9UNC               | 1-7/16"                         | 3956                                  |
|                              | 300        | (12) 7/8"-9UNC               | 1-7/16"                         | 3956                                  |
|                              | 600        | (12) 1-1/8"-8UN              | 1-13/16"                        | 7921                                  |
| 10" (250)                    | 150        | (12) 7/8"-9UNC               | 1-7/16"                         | 3956                                  |
|                              | 300        | (12) 1"-8UN                  | 1-5/8"                          | 5752                                  |
|                              | 600        | (12) 1-1/4"-8UN              | 2"                              | 10797                                 |
| 12" (300)                    | 150        | (12) 7/8"-9UNC               | 1-7/16"                         | 3956                                  |
|                              | 300        | (12) 1-1/8"-8UN              | 1-13/16"                        | 7921                                  |
|                              | 600        | (18) 1-1/8"-UN               | 1-13/16"                        | 10797                                 |

## 9 TROUBLESHOOTING

Table 4: C&C CVA Series recommended solution for possible issues

| Issue                                   | Possible Cause                    | Solution                                                                                                            |
|-----------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Leakage at the cover/body seal</b>   | 1. O-Ring damage                  | 1. Remove and inspect the cover O-ring. Replace if necessary                                                        |
|                                         | 2. Insufficient cover bolt torque | 2. Check and tighten the cover bolt to the values listed in Table 3                                                 |
|                                         | 3. Seating surface damage         | 3. Inspect the body and cover O-Ring seating surface and check for damage. Replace component(s) as necessary.       |
| <b>Leakage from pipe plug</b>           | 1. Pipe plug is loose             | 1. Tighten the pipe plug hand tight and wrench tight two turns past hand tight                                      |
|                                         | 2. Damage to NPT threads          | 2. Inspect both mating threads and replace component(s) as necessary                                                |
|                                         | 3. Teflon tape/sealant needed     | 3. Unscrew the pipe plug and apply Teflon tape or sealant                                                           |
| <b>Back flow (Leakage past clapper)</b> | 1. O-Ring damage                  | 1. Remove and inspect the clapper and cover O-ring. Replace if necessary                                            |
|                                         | 2. Seating surface damage         | 2. Inspect the O-Ring seating surface and check for damage. Replace component(s) as necessary.                      |
|                                         | 3. Clapper or pin damage          | 3. Remove the clapper and pin. Inspect both components for any damage. Replace component(s) as necessary.           |
| <b>No flow through valve</b>            | 1. Incorrect valve placement      | 1. Ensure that the valve is installed with the flow direction in the same direction and the pipeline flow direction |

**Note:** Contact CNC Flow Control if you experience issues not covered in this section.



## API 6D - Swing Check Valve CVA Series

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This manual is provided for informational purposes only and is solely intended for the installation, operation, and maintenance of CNC Flow Control CVA Series API 6D swing check valves. CNC Flow Control reserves the right to change information contained in this manual without any notice. Contact CNC Flow Control at the above address for specific questions regarding this manual or valve.

Although this manual has been checked for accuracy, the Purchaser or End User is ultimately responsible for the correct installation, operation, and maintenance of any valve in their pipeline. Therefore, information contained in this manual shall not be construed as a guarantee or product warranty.