

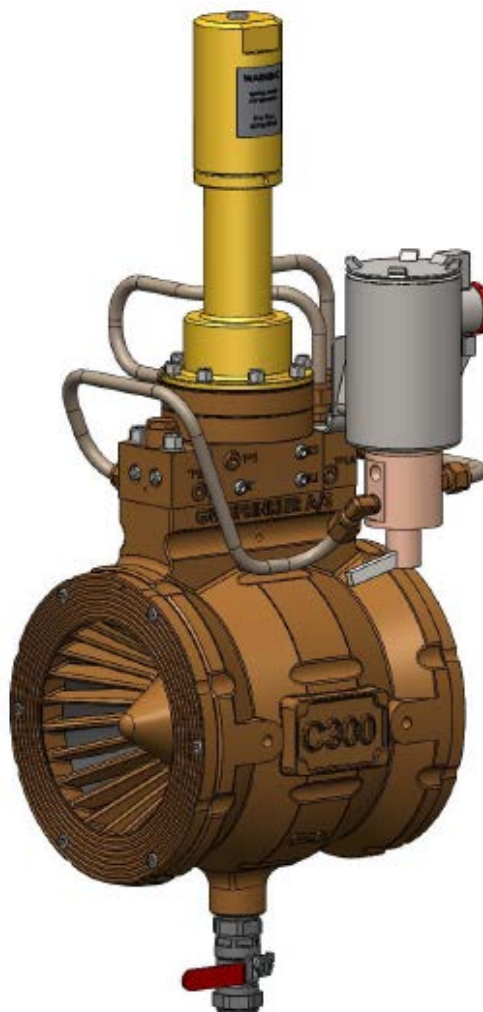
GW C-300 – AUTOMATIC WATER CONTROL VALVE (AWCV) WITH PRESSURE CONTROL & SOLENOID



GW SPRINKLER A/S

MANUAL

INSTALLATION, OPERATION & MAINTENANCE (IO&M)



GW C-300 AWCV with PRESSURE CONTROL & SOLENOID

Material	80 (3")	100 (4")	150 (6")	200 (8")	250 (10")	300 (12")
Ni. Al. Bronze	64.515.34	64.516.34	64.517.34	64.518.34	64.519.34	64.520.34
Super Duplex	64.515.36	64.516.36	64.517.36	64.518.36	64.519.36	64.520.36
Titanium	64.515.37	64.516.37	64.517.37	64.518.37	64.519.37	64.520.37

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HEALTH AND SAFETY AT WORK

Section 6 of the Health and Safety at Work act 1974 imposes specific duties on manufacturers, importers, designers and suppliers to ensure that articles supplied for use at work are safe and without risk to health.

The section states:

1. It shall be the duty of any person who designs, manufactures, imports or supplies any article for use at work -
 - a. to ensure, so far as is reasonably practicable, that the article is so designed and constructed as to be safe and without risks to health when properly used;
 - b. to carry out or arrange for the carrying out of such testing and examinations as may be necessary for the performance of the duty imposed on him by the preceding paragraph;
 - c. to take such steps as are necessary to secure that there will be available in connection with the use of the article at work adequate information about the use for which it is designed and has been tested, and about any conditions necessary to ensure that, when put to use, it will be safe and without risks to health.
2. It shall be the duty of any person who undertakes the design or manufacture of any article for use at work to carry out or arrange for the carrying out of any necessary research with a view to the discovery and, so far as is reasonably practicable, the elimination or minimisation of any risks to health or safety to which the design or article may give rise.
3. It shall be the duty of any person who erects or installs any article for use at work in any premises where the article is to be used by persons at work to ensure, so far as it is reasonably practicable, that nothing about the way in which it is erected or installed makes it unsafe or a risk to health when properly used.

The above is an extract from "Croners H&S Manual" - September 1987.

Service

The Health and Safety at Work Act 1974 imposes specific duties on the user of an installed system to ensure that the system is properly maintained in good repair so as to prevent danger. Advice is given in BS 7273: Part 1: 1990 - The Operation of Fire Protection Measures.

Support

After completing these procedures support is available by:

	International
Telephone	+45 64 72 20 55
Fax	+45 64 72 22 55
E-mail	Sales.dep@gwsprinkler.com

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INTRODUCTION

Function

The GW C-300 deluge valve is fitted in a fire water mains, or section supply branch pipes, in accordance with the requirements of NFPA 13/15 to:

- a) In stand-by position stay fully closed solely by utilizing the inlet (upstream) pressure as acting (closing) force.
- b) Upon instruction to provide a controlled opening – supplying a pressure regulated flow of water with no water hammer, and a very low pressure drop across the valve in the fully open position.
- c) Upon instruction to provide a controlled closing, thus eliminating the damaging effect of water hammer and reaction forces in the connected pipe work.

Principle of operation

In the closed position (Fig.1)), water from the upstream side (1) of the GW C-300 deluge valve is allowed, via a restrictor controlled port, to enter and pressurise the *sleeve cavity*, defined by the area (2) within the valve between the elastomeric sleeve (3) and the body casing (4) via the pilot system (5). This pressure prevents a flow through the valve by compressing the sleeve tightly around the inner core seat (6), thus maintaining the valve closed. It is this feature which keeps the valve closed also under surge conditions, as the high transient pressure is seen simultaneously at both the inlet of the valve and in the sleeve cavity, thereby allowing the sleeve compression in the seat area to keep a biasing action to the closed position.

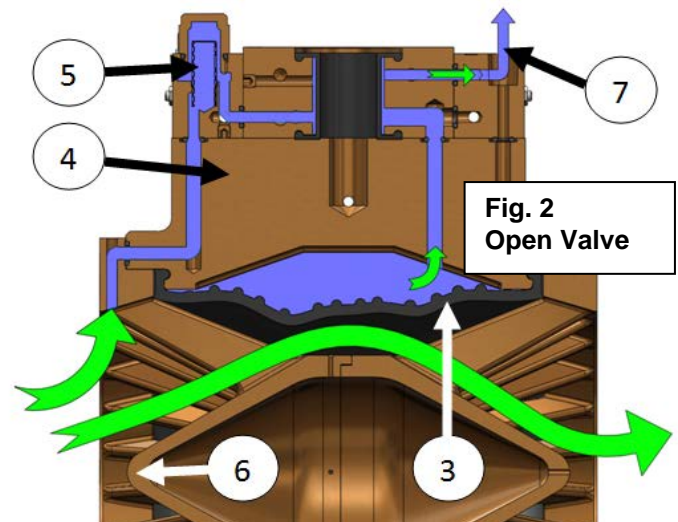
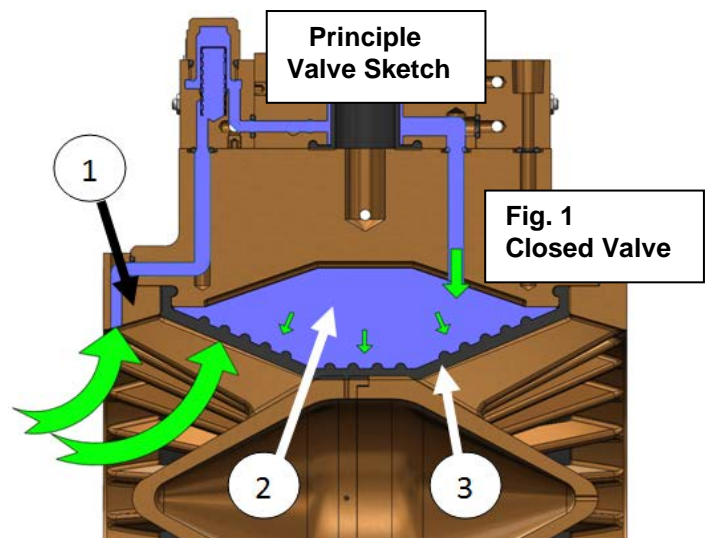
The opening of the valve (Fig. 2) is achieved by releasing the pressure from the sleeve cavity via a restrictor controlled vent opening (7). The elastomeric sleeve expands, thus allowing water to flow through the valve.

Description of operation

The GW C-300 deluge valve is closed, or maintained in the closed position, by diverting upstream water to the sleeve cavity. This is accomplished by the Solenoid Valve. In the **de-energized** state the Solenoid switches its position to “supply ON/ drain OFF”, which allows upstream water to flow to the sleeve cavity, thus closing the deluge valve.

When **energized** the Solenoid Valve switches to position: “supply OFF/ drain ON”, which allows the water to drain from the sleeve cavity, thus opening the deluge valve.

The GW C-300 deluge valve can be operated manually by opening the Manual Release Valve fitted at the bottom of the valve body.



GW C-300 deluge valve body

The valve comprises of a tubular casing fitted, at the respective ends, with an inlet and outlet body (cone). Each inlet and outlet body incorporates a central tapered core (valve seat) surrounded by longitudinal slots which provide the water passage through the valve. These inlet and out bodies clamp an elastomeric (flow control) sleeve into the casing.

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Pilot valve (read in conjunction with page 6 : Pilot Valve – cut away)

The Pilot valve comprises an inlet, central, and outlet manifold block (= Center Block Assembly), bolted on top of the casing and providing the water passageways for flow control. The inlet manifold block contains the removable in-line strainer and the centre block contains the adjustable pilot valve flow restrictors.

Each of the ports in the inlet, central and outlet manifold blocks are provided with ¼" NPT screwed external outlets, designated Terminal Points (TP).

The Pilot Regulator assembly is bolted on top of the central manifold block. This assembly comprises a spring loaded piston operated cam (spindle) (12). The spindle controls the movement of stainless steel balls (13) in the ball guide (15). These balls then act on the elastomeric pilot sleeve to control the water into and out from the sleeve cavity. The pressure to control the valve is derived from the valves upstream water supply via an integral port in the inlet body.

The regulated pressure is adjusted (SET) by rotating the adjusting sleeve (19) mounted on top of the pilot control valve. Rotation clockwise will compress the spring (4) and increase the SET-pressure. Rotation counter clockwise will relax the spring and reduce the SET-pressure.

As the downstream pressure is sensed to be equal to the SET-pressure, the pilot control valve operates to close the internal ports and the elastomeric sleeve cavity pressure becomes hydraulically locked to provide a constant orifice for the flow conditions.

Any change in the flow conditions e.g., increased downstream water flow demand, will cause a drop in the downstream pressure. This, in turn, will cause the pilot control valve to release pressure from the elastomeric sleeve cavity, thus increasing the flow orifice and supply of water to downstream to re-establish/maintain the SET-pressure.

The pilot control valve will constantly continue to monitor the downstream pressure and adjust the orifice opening for as long as water is supplied to the system.

Heavy Duty Design

The GW C-300 deluge valve series is designed to meet the rigid operational demands from oil & gas and petro chemical processing industry.

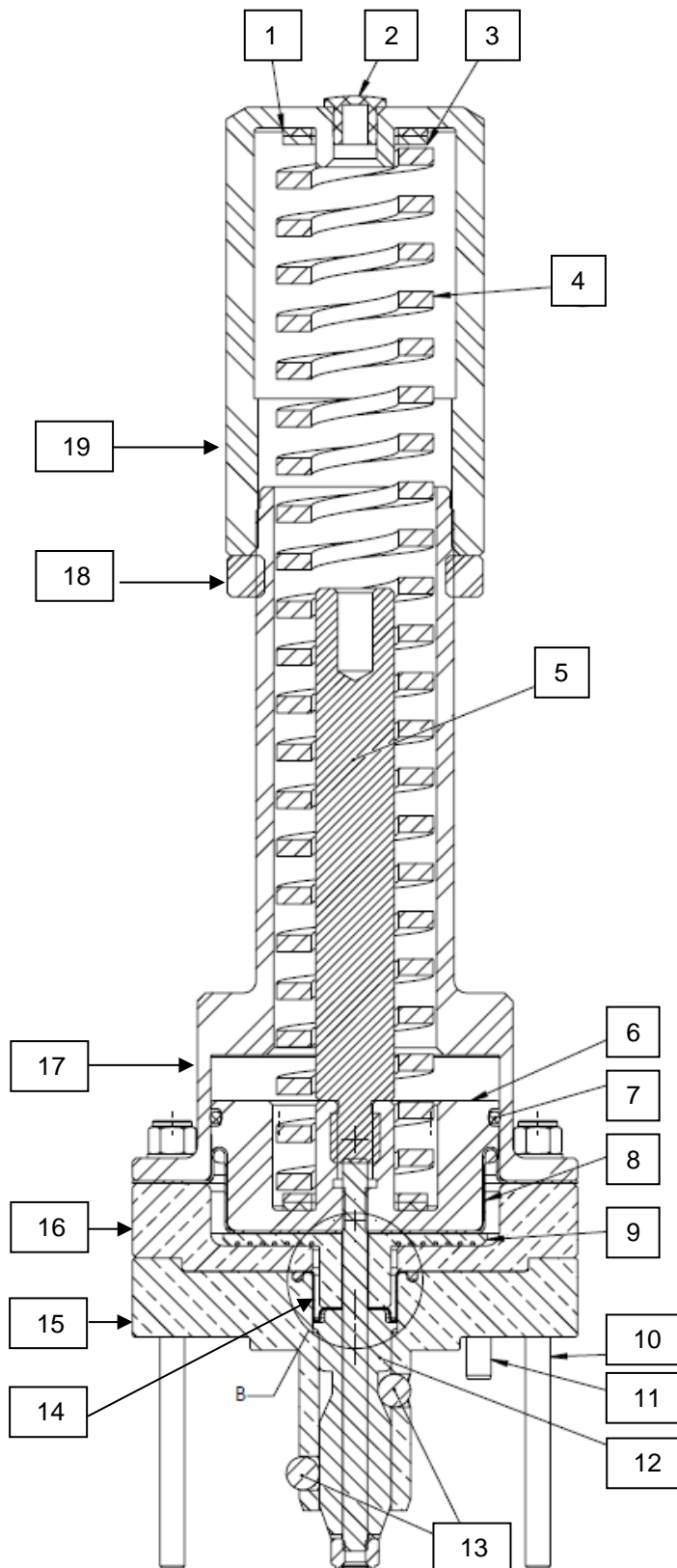
The focus is on a high level of reliability in harsh environments – hence the GW C-300 deluge valve is designed with a minimum of mechanical moving parts. The few mechanical parts present (located in the Pilot) are 100% isolated from the flow media, protected by elastomeric sleeves and diaphragms, thus eliminating the risk of sticking.

All wetted parts are made from highly corrosion resistant materials – with Ni Al Bronze as standard.

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Pilot valve (cut away)



- 1: Washer (PTFE)
- 2: Plug
- 3: Washer (SS316)
- 4: Compression spring
- 5: Spring support
- 6: Piston
- 7: O-ring
- 8: Rolling diaphragm
- 9: Diaphragm support
- 10: Stud
- 11: Dowel pin
- 12: Pilot spindle (cam)
- 13: Ball
- 14: Beaded Diaphragm
- 15: Ball Guide
- 16: Diaphragm Housing
- 17: Spring Housing
- 18: Lock Nut
- 19: Adjusting Sleeve

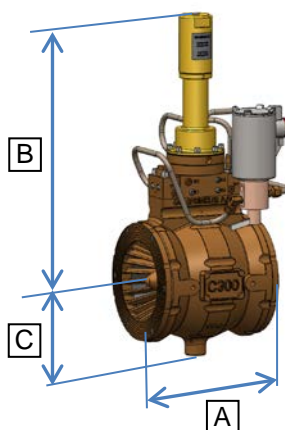
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TECHNICAL SPECIFICATION

Parameter	Range
Min. supply pressure	5 barg
Max. supply pressure	20 barg
Recommended operating pressure (inlet)	5 to 8 bar above valve set-pressure
Pilot regulated pressure	3 to 7 bar (standard)
(downstream SET-pressure range)	7 to 12 bar (special) on request
Inlet pressure to achieve full open	Min. 4 bar
Solenoid valve specifications	24V DC - 9,6W, 3/2 way, NC, max. 20 barg

Size dia. mm (inch)	80 (3")	100 (4")	150 (6")	200 (8")	250 (10")	300 (12")
Kv (m3/h)	206	370	757	1.540	1.770	2.570
Min. flow rate (l/min.)	100	100	750	2.000	3.000	4.500
Max. flow rate (l/min.)	3.000	5.000	11.200	20.000	30.000	45.000
Weight (Kg, approx.)						
Ni. Al. Bronze	20	25	44	63	103	180
Super Duplex	23	29	50	72	118	205
Titanium	12	16	27	38	61	106
Dimensions (mm)						
A	167	167	237	304	350	440
B	417	439	471	499	534	572
C	112	132	162	184	217	248



Materials

	Ni. Al. Bronze	Titanium	Super Duplex 25Cr
Casing and Inlet/Outlet Body	BS1400 AB2 ASTM B148 UNS C95800	Titanium ASTM B367 Grade C-2	ASTM 995 Gr. 6A UNS B93380
Pilot & Actuator (wetted parts)	BS1400 AB2, ASTM B148 or SAE 660	Titanium ASTM B348 Gr.5	ASTM A276
Pilot & Actuator (non-wetted parts)	Gunmetal	SnNi-plated Gunmetal	SnNi-plated Gunmetal
Flow Control Sleeve	Natural Rubber	Natural Rubber	Natural Rubber
Pilot Sleeve	Natural Rubber	Natural Rubber	Natural Rubber

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INSTALLATION

Preamble

The GW C-300 deluge valve assembly is designed to be clamped between pipe flanges to ANSI B16.5 Class 150 or 300 using full length studs, nuts and washers. The Valve may be positioned vertically or horizontally. Suitable sealing gaskets to ANSI B16.21 RF are to be inserted between flanged joints.

The water inlet supply to the valve should be equipped with a suitable strainer to prevent the ingress of harmful materials. Isolating butterfly type valve should be fitted upstream of the GW C-300 deluge valve assembly.

Upstream and downstream of the valve the pipe work should be straight for at least 3 pipe diameters without valves, bends or fittings. This will ensure that a stable flow regime exists at the entrance and exit from the valve. Ensure that the valve can be withdrawn from the pipework for routine maintenance/repair procedures. The larger valves may require the use of slings and strops when positioning. Lifting eye tapings are provided on the side of the larger valves (6" and larger). Care must be taken to ensure that the Pneumatic Actuator and small bore pipe work is **not** utilised for lifting.

Pressure gauges are to be provided to monitor the valve inlet and/or outlet pressure. For accurate readings the gauges should be located in straight lengths of pipework away from valves and fittings.

For test purposes a full bore test/drain outlet with separate isolation valve should be provided in the pipework on the outlet side of the GW C-300 deluge valve assembly.

The GW C-300 deluge valve sleeve vent (1/2" NPT) is supplied with a 1/2" isolating valve which acts as a means for air-bleeding of the sleeve cavity – as well as a manual release of the deluge valve, and shall be piped to waste.

The Solenoid Valve (port "INLET", 1/4" NPT) should be piped to waste. (Tubing diameter min. 10 mm, maximum length 2 meters, using full flow fittings).

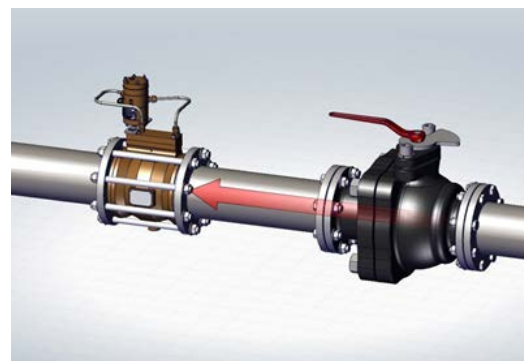
A pressure operated switch (to give remote indication of operation) may be connected to the discharge pipe work.

GW C-300 deluge valves shall be installed in such way to avoid physical damage and exposure to freezing temperatures.

Procedure (read in conjunction with Annex 1)

1. Ensure that the upstream isolating valve (4) is closed.
2. Ensure that all interfacing flange surfaces are clean and the arrow on the valve points in the flow direction (i.e. to the nozzles).
3. Locate and align the sealing gaskets on the water inlet and outlet flanges (gasket to ANSI B16.21 RF). Fit the tie-rods between the two flanges. Each tie-rod is fitted initially by inserting the top end through the upper flange from its underside with the lower end of the tie-rod canted outwards to clear the lower flange, then pull it through the upper flange and finally lower it down through the lower flange, installing isolation bushes if required.
4. Fit and tighten the nuts and washers on the tie-rods, ensuring at least 1 1/2 - 2 full threads are visible. Ensure the flanges are pulled down evenly to a maximum torque in accordance with the piping/bolting specification. The deluge valve casing and inlet and outlet bodies should be clamped to a point where there is no visible gap between casing and end cones – i.e. metal to metal.
5. Secure the drain pipe connection from manual release valve (3).
6. Connect the power supply (9) to the Solenoid (2). De-energize to switch the Solenoid Valve to the "supply ON/ drain OFF" position.
7. Continue onto *commissioning*.

NOTE: ON NO ACCOUNT SHOULD THE SMALL BORE PIPEWORK OR PNEUMATIC ACTUATOR (OR OTHER FITTINGS) BE USED TO LIFT, SLING OR MANOEUVRE THE VALVE ASSEMBLY.



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COMMISSIONING (read in conjunction with Annex 1)

Preamble

Ensure an adequate water supply (20 bar max.).

It is essential that the operator, or commissioning engineer, reads these procedures prior to the operation of the valve. Failure to do so could result in the valve failing to open, or damage to the valve or pipework.

Any hydrostatic tests must be less than 20 barg.

The only commissioning procedure required for the GW C-300 deluge valve is to carry out a check of the installation and the operation of the Solenoid Valve prior to a functional test of the system.

It is recommended that the GW C-300 deluge valve response time check list (see page 26) is completed during commissioning and retained for future reference.

Checks

1. The GW C-300 deluge valve (1) outlet is connected to the protected area's distribution pipework (downstream) via an isolating valve (5).
2. The GW C-300 deluge valve upstream Isolating Valve (4) is closed.
3. The main water supply isolating valve is closed. (Clients Supply)
4. The GW C-300 deluge valve downstream Isolation Valve (5) is closed.
5. The system test/drain valve (6) is piped to waste/drain and closed.
6. The GW C-300 deluge valve sleeve cavity (jacket) outlet is piped to waste/drain via an isolating valve (3), and closed.
7. The Solenoid Valve (2) port (marked with "INLET") is piped to waste/drain.
8. The Solenoid Valve is closed - i.e. power supply (9) is deactivated (off).

Procedure

Stop the commissioning if any part of the pipe work or valve shows any leakage or erratic behaviour.

1. Open the Main water supply isolating valve. (Clients Supply)
2. Open the GW C-300 deluge valve sleeve cavity outlet valve (3) to bleed any trapped air.
3. Partially open the GW C-300 deluge valve upstream Isolation Valve (4) to fill the GW C-300 deluge valve (1) and the upstream pipework.
4. When plain water (no air) is trickling from the GW C-300 deluge valve sleeve cavity outlet pipe, **close** the 1/2" isolating valve (3).
5. Fully open the upstream Isolation Valve (4) to impose full water pressure on the GW C-300 deluge valve.
6. Open the **Test and Drain Valve** (6).
7. Confirm that the GW C-300 deluge valve inlet pressure gauge (7) registers line pressure, and the GW C-300 deluge valve outlet pressure gauge (8) reads zero (= deluge valve is closed).
8. Confirm no water is flowing through the valve.
9. Switch ON (energize) the power supply (9) to the Solenoid Valve (2). NOTE: The Solenoid will latch in the open position!!
10. Observe the water discharging overboard from the system Test/Drain line. Allow the system to function for one minute approx. to prove correct operation and note the discharge pressure.
11. Close the GW C-300 deluge (1) valve by: **de-energizing** the Solenoid Valve AND pushing/lifting the Latch (located at the bottom of the Solenoid Valve) back to the perpendicular (90°) position!

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12. IMPORTANT : FULL FLOODING TEST

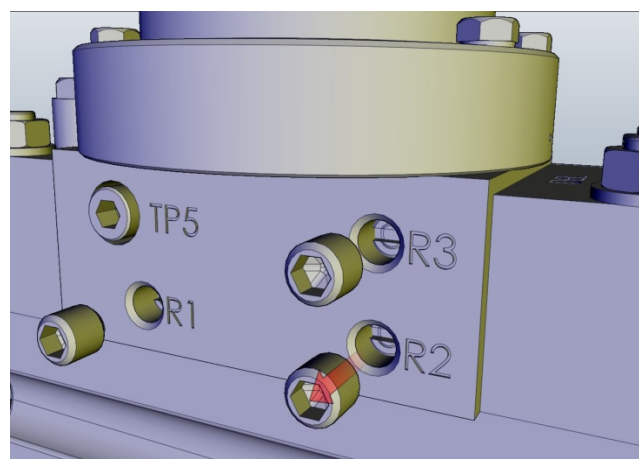
This test must only be carried out with the full authority of the client as water will be discharged into the protected area !!.

13. Close the test valve (6) and **open the main discharge valve (5)** which will allow for deluge of the risk.
14. Energize the Solenoid Valve (2). **This will open / trip the GW C-300 deluge valve !!.**
15. Note the discharge pressure (8) and observe full and correct flow from all nozzles.
16. Close the GW C-300 deluge (1) valve by: de-energizing the Solenoid Valve AND pushing/lifting the Latch (located at the bottom of the Solenoid Valve) back to the perpendicular (90°) position - allowing the Solenoid to operate (switch position) - and impose full line pressure to the sleeve cavity, thus closing the GW C-300 deluge valve.
17. Open the system Test/Drain valve (6) in the GW C-300 deluge valve discharge pipework to drain the system pipework.
18. Close the system Test/Drain Valve (6) on the GW C-300 deluge valve discharge pipework.
19. The test is now completed.

Pilot valve restrictors

The Deluge Valve has a three way pilot which operates by allowing a controlled water flow in or out of the sleeve cavity during pressure compensation.

At the desired set point, water is locked in the sleeve cavity and no water flows within the pilot system. Should the outlet pressure drop, thereby requiring the sleeve cavity to be vented, the vent port of the pilot opens and allows water to pass from the sleeve cavity through the pilot to the vent line, thereby having to pass through restrictors R2 & R3. Correspondingly, should the outlet pressure rise, the sleeve cavity requires more water to close the valve down. Here, the inlet port of the pilot opens allowing water to pass across R1 & R2 into the sleeve cavity. It can be seen from the functional description that a combination of settings of these restrictors can alter the valves characteristics (opening and closing speed).



The pilot valve incorporates three variable/adjustable restrictors, (R1, R2 and R3). The purpose of these is to enable the user to tune the valve's performance to meet the service conditions and required opening and closing characteristics.

After removing the protective plug adjust the central screwed restrictor with the tool 64/70506. Finger pressure is only required.

The Restrictor is a needle valve. Rotating clockwise (screw in) reduces the orifice (and water flow), hence slowing down the reaction of the deluge valve. Rotating the restrictor counter clockwise will do the opposite.

Following commissioning and the satisfactory operation of the valve, the restrictors must be locked in position with the protective plug.

Once set, the restrictors should not require further adjustment. If the valve's characteristics alter, this is not normally a function of the restrictors and reference should be made to the Fault Finding Section of this Manual.

Do not tamper with the Restrictor settings once set

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R1 (Lower Left on Centre Block)	Initial setting is 4 turns open from fully in.	Governs the closing speed of the valve.
R2 (Lower Right on Centre Block)	Initial setting is 6 turns open. Shall NOT be adjusted!	Alters the speed at which water enters and leaves the sleeve cavity. Responds to the pressures within the control pilot chamber and alters the speed of response of the valve.
R3 (Upper Right on Centre Block)	Initial setting is 4 turns open from fully in.	Governs the opening speed of the valve while it is pressure regulating.

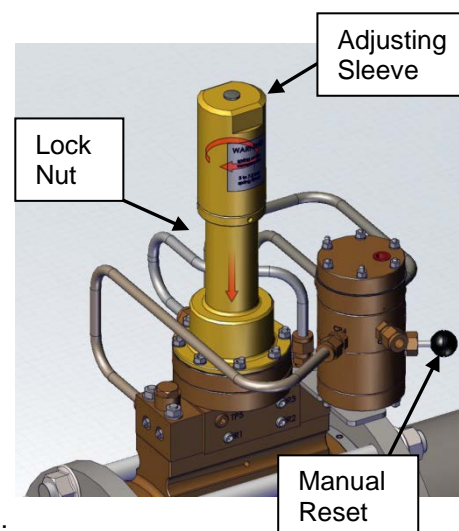
Note: later versions of the pilot do not have restrictor R2. This is unused in this valve variant.

Discharge Pressure (Set-pressure) Adjustment

The regulated pressure measured downstream of the valve may vary slightly as the flow through the valve changes. This is due to the integral position of the pressure sensing port on the valve outlet. Moving the sense connection to a stable flow region downstream in a straight section of pipework will stop these fluctuations.

The valve may be factory set to discharge at a nominal pressure (typical @ 4 barg - refer to despatch information). To increase the discharge pressure, screw the adjusting sleeve downwards (clockwise).

The Standard spring (blue color) covers the range of 3 to 7 barg. DO NOT adjust sleeve below 3 barg for the 3 to 7 barg spring - or below 7 barg for the 7 to 12 barg spring (optional).



NOTE: For each complete rotation of the adjusting sleeve, the pressure will change:

Spring type	Pressure range	Bar change per revolution	Revolutions per bar change
Blue (standard)	3 to 7 bar	0,13	7,7
Silver (optional)	7 to 12 bar	0,2	5,0

Note: The above data are close approximations for guidance only. The effectiveness of any set pressure adjustment shall always be verified by conducting a full flow test.

Following final adjustment, ensure the adjusting sleeve is locked in position by the lock nut.

Resetting procedure (after activation of GW C-300 deluge valve)

1. Close the GW C-300 deluge (1) valve by: pulling out the manual reset latch / black knob (10) on the Pneumatic Actuator (2) - and, with the latch pulled, reinstate the air pressure (9) to the Pneumatic Actuator (2) and allowing it to operate (switch position) and impose full line pressure to the sleeve cavity to close the GW C-300 deluge valve.

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2. Attend the affected protected area.
3. Inspect all pipework and fittings for possible fire damage and carry out remedial repairs as necessary.
4. Open the system Test/Drain valve (6) to drain the surplus water downstream of the GW C-300 deluge valve.
5. Close the system Test/Drain valve (6).
6. Confirm that the pressure on the upstream side (7) of the GW C-300 deluge valve is at line pressure, and that the main downstream discharge valve (5) (to system/nozzles) is OPEN.

THE SYSTEM IS NOW FULLY REINSTATED.

MAINTENANCE SCHEDULE (read in conjunction with Annex 1)

Inspection and testing should be carried out in accordance with NFPA Standards, the requirements of the Authority Having Jurisdiction (AHJ) – and the following instructions:

Monthly: Visual Inspection

- Check for no damage to valve, piping and trim parts.
- No leaking from tell-tale holes (body, pilot or actuator) and seals.
- Check that all valves and handles are in “In Service” position.
- Operate upstream (4) & downstream (5) isolating valves to avoid sticking *).

*)

The system design provides for isolating valves to remain in the OPEN position for long periods. Close and open the valve several times at monthly intervals to ensure freedom of movement. Leave and lock the valve in the OPEN position

6 months

- Conduct a **partial flow test** (see note below) adequate to move the sleeve from the seat.
- Check and rinse inlet-strainer.

12 months

- Conduct a **full flow test** at maximum pump capacity.
- Check that required downstream pressure/flow (8) is achieved.

36 months

- Replace the elastomeric sleeve, diaphragms and seals in service – and those held unused as spare stock. Spares should be used within a two year shelf life to provide a 3 year “in service” life (5 year total life).
- Check and rinse inlet-strainer.
- Check and clean all water channels/bores forming part of the valve and manifold block internal water way.

The “in service” life of the elastomeric sleeve can be extended annually to a **maximum “in service” period of 5 years** from the date of first installation – or 6 years from valve manufacture, whichever is the sooner, provided that a “maximum extension test” (see below) to fully stretch the flow control sleeve within the deluge valve body, is performed – AND is followed by a full flow test. Replace the elastomeric sleeve if the deluge valve does not seal 100% after “maximum extension test”.

NOTE: FLOW TESTS: Extract from NFPA 25: Records indicating the date the deluge valve was last tripped and the tripping time as well as the individual and organisation conducting the test shall be maintained at a location or in a manner readily available for review by the Authority Having Jurisdiction (AHJ).

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MAXIMUM EXTENSION TEST (read in conjunction with Annex 1)

NOTE: Stop the test if any part of the pipe work or valve shows any leaks or dangerous behaviour.

1. Ensure that the GW C-300 deluge valve upstream (4) and downstream (5) isolating valves and system test/drain valve (6) are closed – and the Solenoid Valve (2) is closed - i.e. power supply (9) is disconnected (de-energized).
2. Energize the Solenoid Valve to switch it to “supply OFF/ drain ON” position - allowing water to drain from the sleeve cavity.
3. Open the GW-C-300 deluge valve sleeve vent outlet (manual release valve) (3) to fully drain the valve sleeve cavity.
4. Partially open the deluge valve upstream isolation valve (4) to fill the GW C-300 deluge valve and upstream pipe work.
5. When water has stopped trickling from the GW C-300 deluge valve sleeve cavity outlet pipe, close the manual release valve (3).
6. Fully open the deluge valve upstream isolation (4) valve to impose full pump water pressure on the deluge valve to fully stretch the elastomeric sleeve. Leave the valve pressurized for 1 minute. Check that downstream pressure (8) reads same pressure as inlet (upstream) pressure (7).
7. De-energize the Solenoid Valve AND push/lift the Latch, located at the bottom of the Solenoid Valve, back to perpendicular (90°) position - allowing the Solenoid to operate (switch position) and impose full line pressure to the sleeve cavity to close the GW C-300 deluge valve.
8. Slowly open the downstream Test and Drain Valve (6).
9. Confirm that the deluge valve inlet pressure gauge (7) registers line pressure and the deluge valve outlet pressure gauge (8) reads zero – and no water flows through the valve.
10. If the deluge valve does not fully seal, the elastomeric flow control sleeve should be replaced.
11. Close test/drain valve (6) and proceed with full flow test.

MAINTENANCE PROCEDURES

Valve Removal (read in conjunction with Annex 1)

Obtain a permit to disable the system.

Isolate the water supply to the GW C-300 deluge valve system.

IMPORTANT: If a by-pass system is fitted around the GW C-300 deluge valve assembly, ensure a water supply is available to this system to enable emergency operation when/while the GW C-300 deluge valve is removed.

1. Close the upstream Isolation Valve (4) and lock in position
2. Open the Test/Drain valve (6) to drain the GW C-300 deluge valve system pipework.
3. Operate (energize) the Solenoid Valve (2) to drain the water.
4. Disconnect the piped connection between the GW C-300 deluge manual release valve (3) and the drain pipe.
5. Disconnect the power supply (9) to the Solenoid Valve.
6. Release and remove the tie-rods securing/clamping the GW C-300 deluge valve.
7. Slacken the pipe supports, then gently jack the pipework apart and carefully withdraw the GW C-300 deluge valve, together with the sealing gaskets.

NOTE: When manhandling the GW C-300 deluge valve, consider its size and weight.

DO NOT USE THE SMALL BORE PIPEWORK, PNEUMATIC ACTUATOR OR OTHER FITTINGS TO LIFT, SLING OR MANOEUVRE THE VALVE ASSEMBLY. For lifting - fit and use lifting eyes in tapped/threaded holes located on valve body exterior (on 6” valves and larger).

MANUAL

INSTALLATION, OPERATION & MAINTENANCE (IO&M)

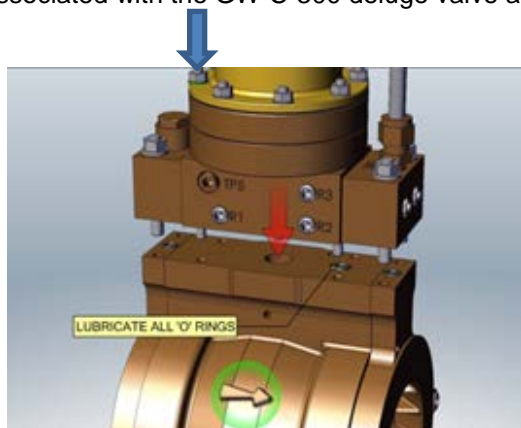
Valve Elastomer Sleeve Renewal

Equipment Required

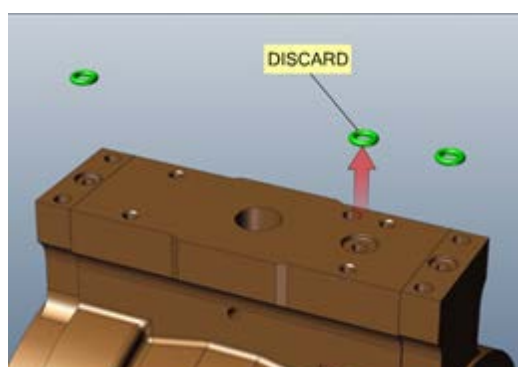
1. A set of appropriate sized A/F spanners and wrenches.
2. Valve Sleeve Spare Part Kit (according to data sheet: DV070 1001 A).
3. Rubber Lubricant Emulsion (1 litre bottle) - Part No. CV64/62163.

Renewal of Elastomeric Sleeve

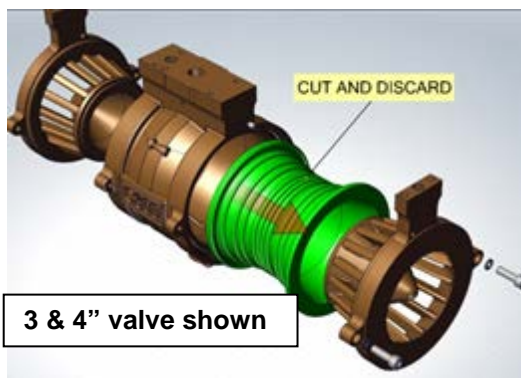
When the valve is removed for servicing, the opportunity should be taken to renew all elastomeric components associated with the GW C-300 deluge valve and the Pneumatic Actuator.



1. Support the Valve horizontally. Withdraw the Pneumatic Actuator and Pilot/Center Block as a complete assembly by releasing the retaining bolts fitted.

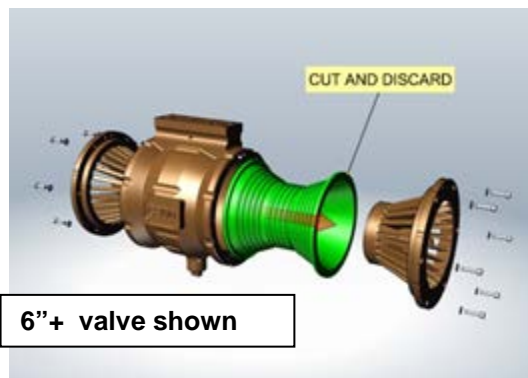


2. Remove the 'O' sealing rings located in each of the three ports associated with the inlet body, the outlet body and the valve casing, and discard.



3 & 4" valve shown

3. Stand the Valve on its outlet (see arrow on body) Release the bolts securing the inlet body to the casing and prise apart taking care not to damage the faces. Withdraw the inlet body and place on a clean surface.



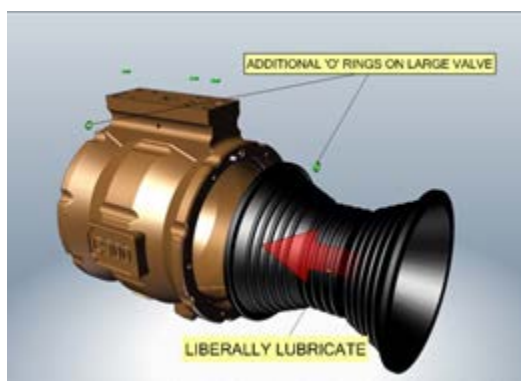
6" + valve shown

4. Invert the Valve and repeat the procedure for the outlet body, then the elastomeric sleeve may be pulled clear, cut and discarded. When disassembled, use the opportunity to check and clean the water intake bores located in the inlet & outlet cones, top inside.

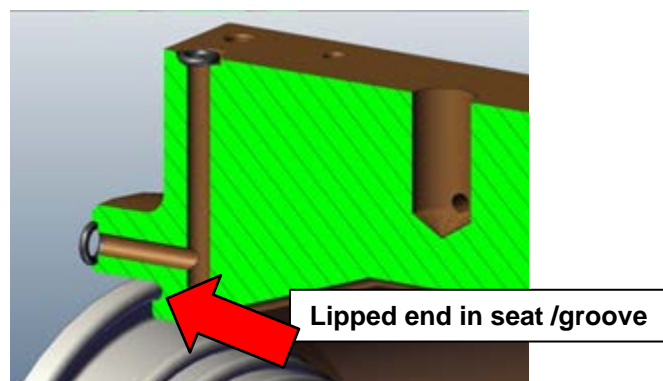
MANUAL

INSTALLATION, OPERATION & MAINTENANCE (IO&M)

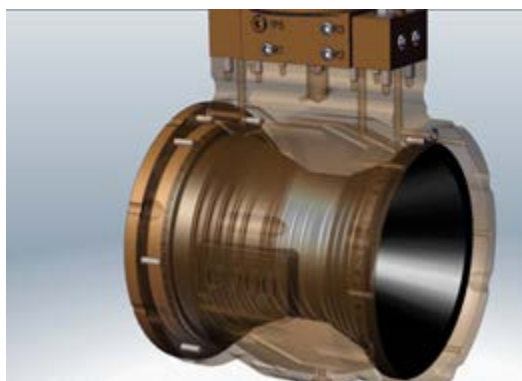
Sleeve Assembly, all except 100mm (4") Valves



1. Support the Valve casing horizontally. For the 150mm (6") and larger valves, fit new O-Rings into the casing to seat on the Inlet and Outlet Cones.



2. Insert the replacement sleeve into the valve casing. Carefully work into position until each lipped end of the sleeve is seated in the groove each end of the casing.



3. Liberally apply Rubber Lubricant Emulsion to the elastomeric flow control sleeve inside surface to reduce friction when fitting the cones. Locate the inlet cone ensuring the core does not damage the sleeve's surface. Fit the body retaining bolts and evenly tighten down. Repeat for the outlet body.

Sleeve Assembly, 100mm (4") Valve

The 100 mm elastomeric sleeve may appear undersized – but is designed this way! Liberally apply Rubber Lubricant Emulsion to the elastomeric flow control sleeve and ease the flow control sleeve onto the inlet body until it reaches the base. Carefully lower the casing over the sleeve taking note of its correct orientation. Then turn the valve over and partly secure the Inlet Body. Re-lubricate the downstream end of the sleeve. Carefully lower the outlet body into the sleeve. As the body is worked down, use a blunt instrument between the vanes (e.g., a small ring spanner) to push the sleeve outwards. When the sleeve is in position, partly tighten the securing bolts and nuts. In turn, slightly tighten the bolts on each end of the valve – so the end cones are "simultaneously" screwed in. Observe – and push/expand the elastomeric sleeve so its lip fits into the annular grooves.

All Valves

Select correct sized o-rings from the Spares Kit, lubricate and fit into the respective grooves on the valve and Center Block block interfaces. Secure the Center Block to the valve by tightening the retaining bolts. It is recommended to secure the bolts by applying a few droplets of removable threadlocker – e.g. Loctite

Reinstatement Procedure

Follow the Installation Procedure.

MANUAL

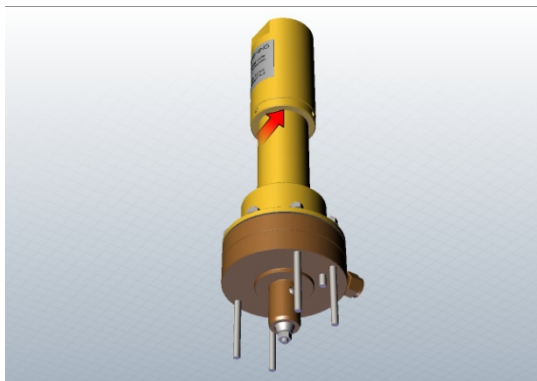
INSTALLATION, OPERATION & MAINTENANCE (IO&M)

Pilot

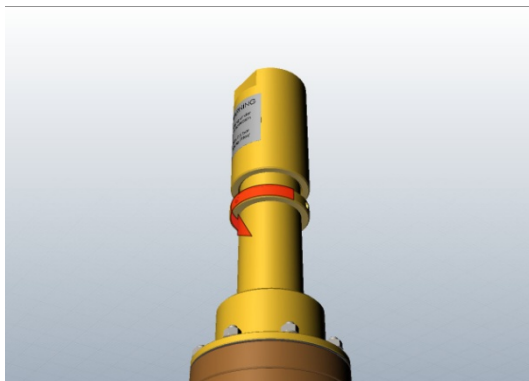
Complete the deluge valve isolation procedure.

Spring Inspection

(may be conducted without removing deluge valve from pipe work provided proper isolation of deluge valve is completed.)



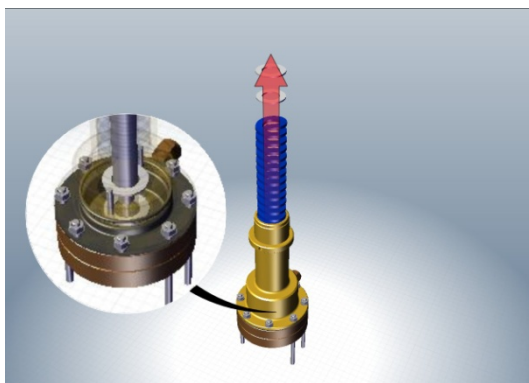
1. Mark the position of the Adjusting Sleeve Locknut (to retain actual SET-pressure).



2. Slacken the Adjusting sleeve locknut sufficiently to release the sleeve.



3. Fully unscrew the adjusting sleeve and remove (beware of potential spring force)



4. Withdraw the spring and the thrust washers located on top of the spring.

- 5.** Using a length of suitable wire with a hook formed at one end; withdraw the remaining thrust washers from the spring housing. If difficulty is met in withdrawing the thrust washers, it will be necessary to remove the Pilot from the Deluge Valve.
- 6.** Inspect all items. A component showing signs of corrosion must be replaced. Obtain a spring service kit for the appropriate spring.

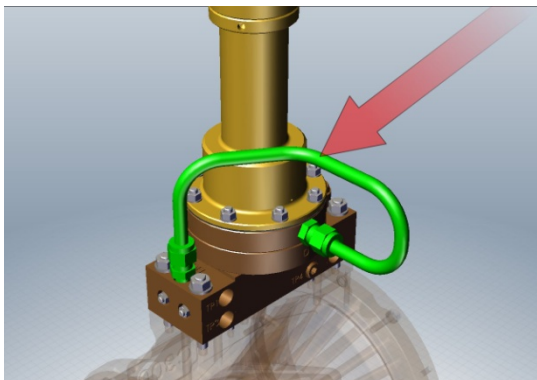
Service Kit No.	Spring Rating
CV64/90158	3 to 7 bar
CV64/90157	7 to 12 bar

- 7.** Clean and dry the interior of the Spring Housing.
- 8.** Fit spring with a pair of thrust washers at each end. A stainless steel washer is inserted between the spring and the PTFE washer (see: Pilot Cut Away, page 6).

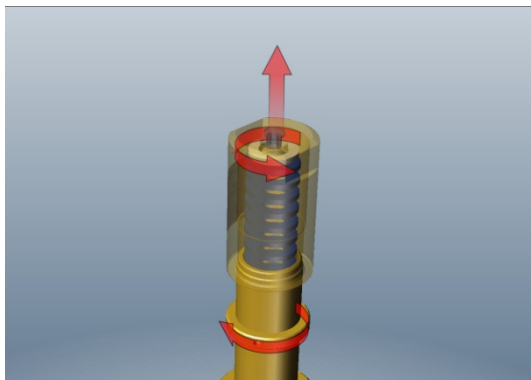
MANUAL

INSTALLATION, OPERATION & MAINTENANCE (IO&M)

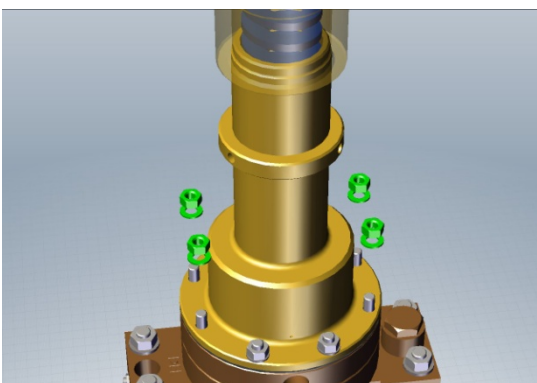
Pilot Regulator Assembly - Renewal of Diaphragms



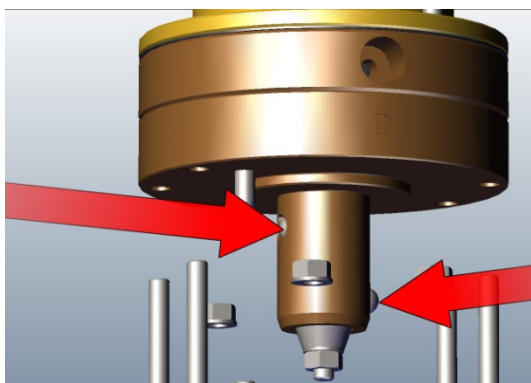
1. Remove the Pressure Sense Pipe between the Regulator Assembly and the End Block.



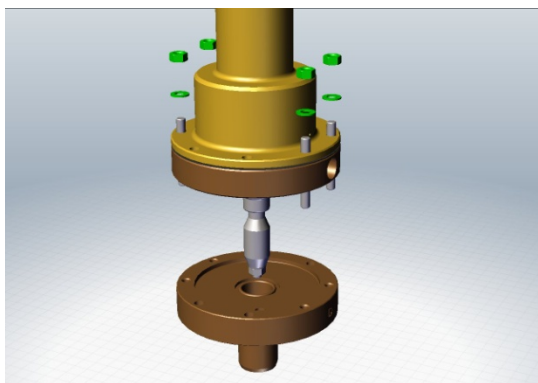
2. Slacken the Pressure Adjusting Sleeve. See the Spring Inspection procedure.



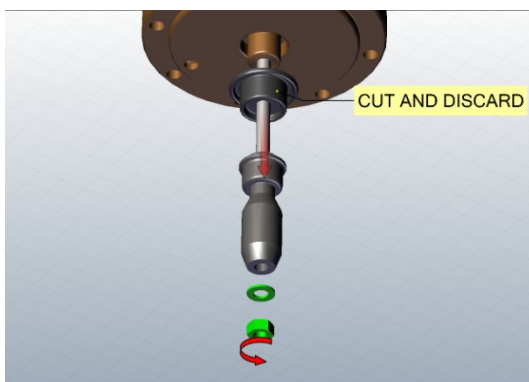
3. Remove the two pairs of M6 nuts and washers which retain the Regulator Assembly



4. Carefully withdraw the Regulator Assembly. 2 x Ø 8mm steel balls are housed in drilled ports of the Ball Guide.



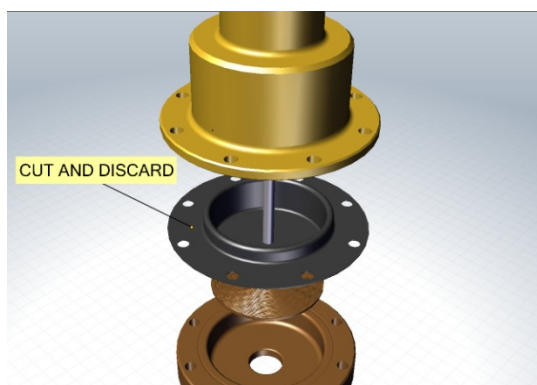
5. Remove the other 4 x M6 nuts and washers. Separate ball guide and spring housing.



6. Release the M6 'Nyloc' nut and withdraw the Main Pilot Spindle.

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INSTALLATION, OPERATION & MAINTENANCE (IO&M)

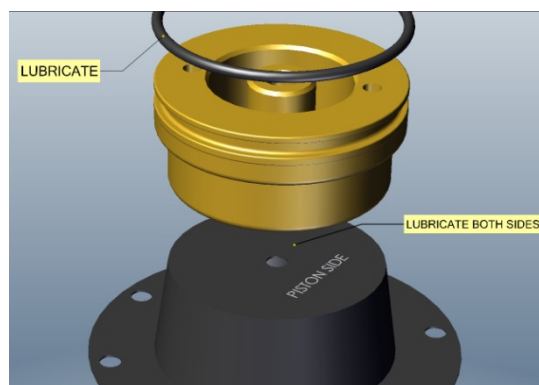


7. Withdraw the Diaphragm Support and remove the Diaphragm and discard. Cut to prevent re-use.

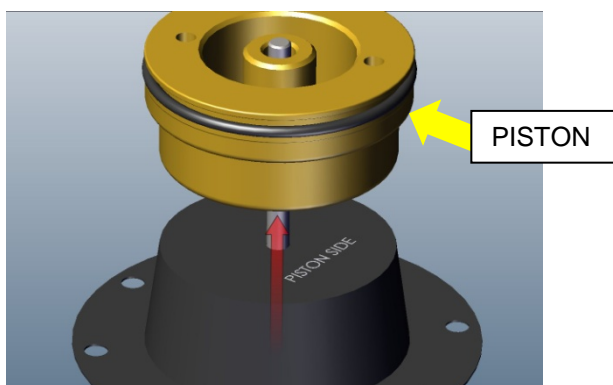
Assembly of the PILOT

Great care must be taken to ensure the diaphragms are installed correctly orientated without damage, abrasion or twisting, as this will cause the diaphragms to prematurely rupture.

The diaphragm is single coated which means that the rubber coating is applied only to one side of the fabric. The diaphragm is strongest on the rubber-side, hence the rubber side shall always be facing towards the pressurizing media (air or water). Given that it can be difficult to distinguish between rubber and fabric side, "PISTON SIDE" is printed on the fabric side of the diaphragm. **The PISTON SIDE must always be facing towards the Piston!**



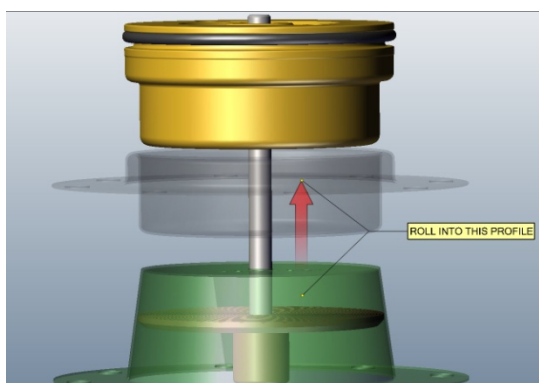
1. Lubricate the Piston 'O' ring with Rubberlube Grease and fit (Early versions of the pilot regulator do not include a piston 'O' ring). Lightly smear both sides of the Rolling Diaphragm with 'Rubberlube' grease.



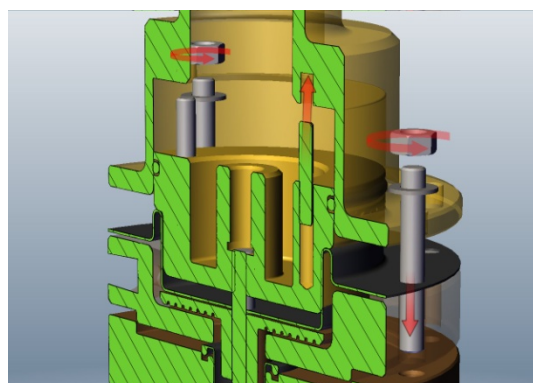
2. The texture is smooth on one side and fabric on the other (the fabric side is marked 'Piston Side'). Pressure must be applied to the smooth side to avoid rupture. Locate the Diaphragm over the central stud.

MANUAL

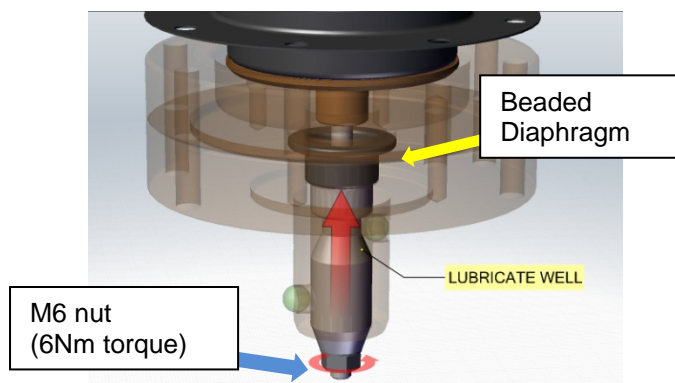
INSTALLATION, OPERATION & MAINTENANCE (IO&M)



3. Fit the Diaphragm Support over the central stud and onto the Diaphragm. While holding the Diaphragm support in position, roll the Diaphragm back on itself as shown in the diagram.

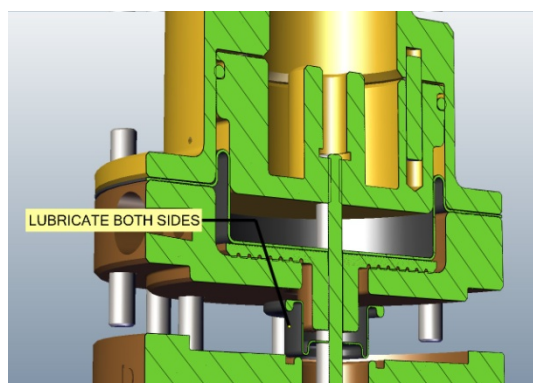


4. Insert the Piston and diaphragm housing into the Spring Housing. The stud holes must be aligned. Assembly is assisted by temporarily retaining the spring housing to the Diaphragm Housing with M6 screws.



5. Smear both sides of the Beaded Rolling Diaphragm with 'Klübersynth' grease. Locate the Diaphragm over the central stud, with the bead away from the Diaphragm Housing.

NOTE: Avoid to lubricate clamped surfaces (metal and rubber) to achieve maximum grip!



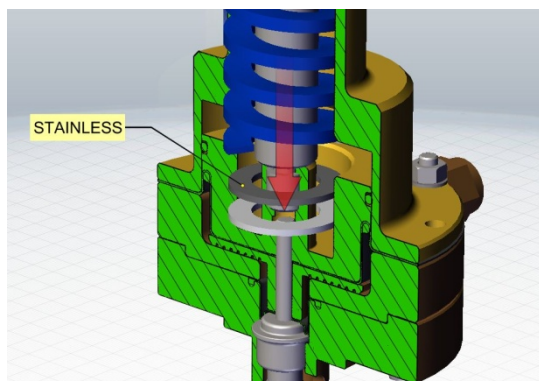
6. Fit the Pilot Spindle over the central stud. Ensure that the orientation is correct. Fit and secure the M6 'Nyloc' nut to retain the Pilot Spindle (M6 nut torque: 6 Nm +0/-0,5).

NOTE:

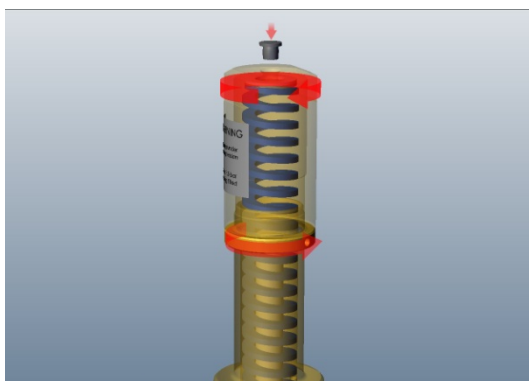
The Diaphragm must be central to the spindle. The M6 'Nyloc' nut must be tightened before the beaded end of the diaphragm is located into the Ball Guide clamped. This allows the diaphragm to rotate slightly while tightening the nut without twisting. Any twisting of the diaphragm will cause premature failure. Liberally coat the Spindle with 'Klübersynth' grease. Fit the Ball Guide over the Spindle. The beaded side of the diaphragm will locate in the groove within the Ball Guide. Secure the assembly with the 4 x M6 nuts and washers. Evenly x-tighten the nuts.

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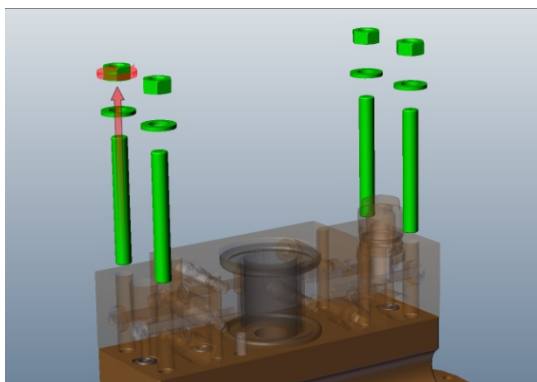
7. Fit Spring with a pair of thrust washers at each end. The stainless steel washer is inserted between the spring and the PTFE washer. The stainless steel washers are fitted in direct contact with the spring - both ends of the spring.



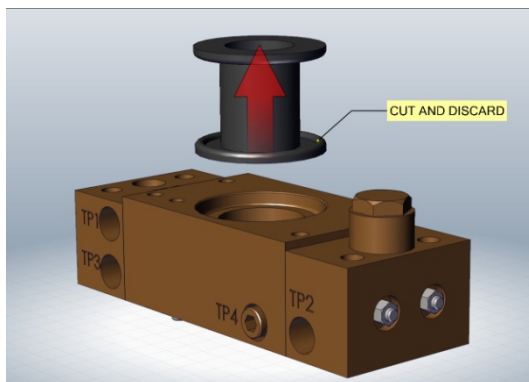
8. Screw down the Pressure Adjusting Sleeve to the previously scribed line for the pressure setting. Fit the sealing plug in the hole on top of the Adjusting Sleeve.

NOTE: Do NOT manually operate the pilot spindle as this can cause damage to the diaphragms.

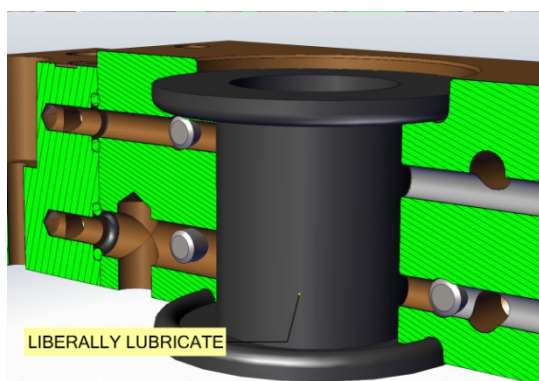
Pilot Sleeve Replacement



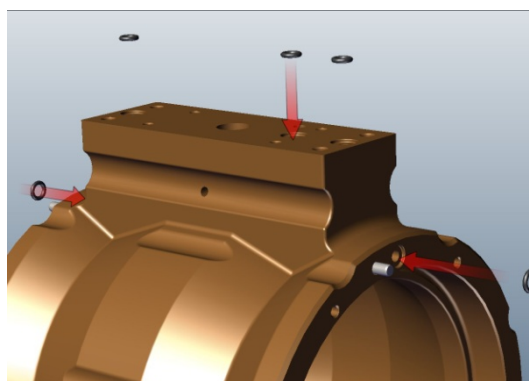
1. Remove the manifold block assembly whole from the Valve body by releasing the four retaining nuts fitted to the outer blocks.



2. Withdraw the Pilot Sleeve from the Centre Block and discard. Cut to prevent re-use.



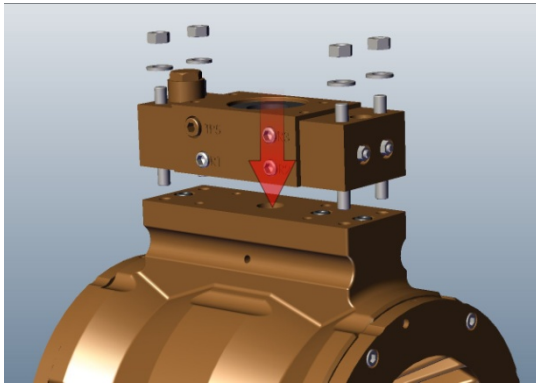
3. Liberally apply Rubber Lubricant to a new Pilot Sleeve. Fit the Sleeve into the body and confirm the moulded end flanges are correctly located in both end faces.



4. Fit new 'O' ring seals on top of the body, and at each end with a very light application of Klübersynth grease. Do not block the ports.

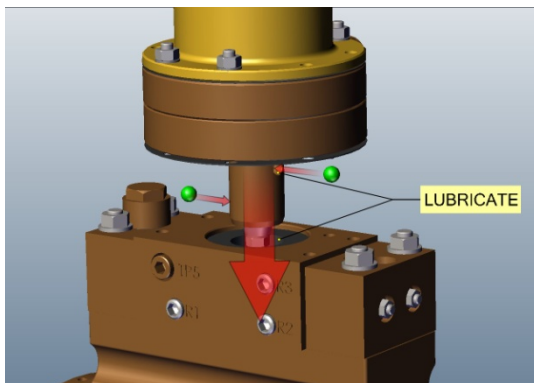
MANUAL

INSTALLATION, OPERATION & MAINTENANCE (IO&M)



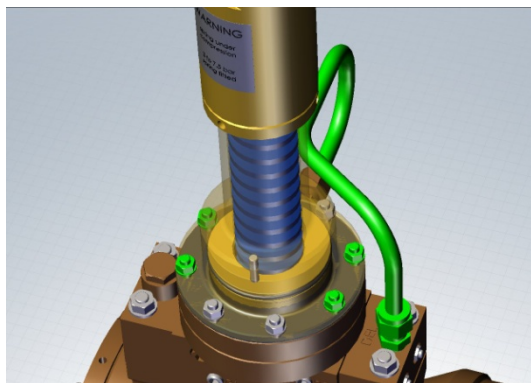
5. Fit the Manifold Block Assembly to the Valve body ensuring correct orientation and secure with the nuts and washers.

Pilot valve fitting procedure



1. Push a small amount of “Klübersynth” grease into the holes in the Ball Guide. Fit new Ø8mm steel balls. Cover the inside of the Pilot Sleeve with Rubber Lubricant Emulsion.

NOTE: When sliding the pilot into the Center Block (Pilot Sleeve) the assembly shall be exercised in a straight linear move/push (see direction of red arrow) – without twisting the pilot side to side. This is to avoid the risk of the Ø8mm protruding balls damaging / cutting the rubber Pilot Sleeve – causing a potential leak (visible at body tell tale hole located under the Center Block).



2. Orientate the Regulator Assembly and fit it to the Manifold Block. Fit the four M6 securing nuts and washers and evenly tighten down. Fit and secure the Pressure Sense Pipe to connect the Pilot Control Valve and the End Block DEL-port.

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INSTALLATION, OPERATION & MAINTENANCE (IO&M)

Solenoid Valve

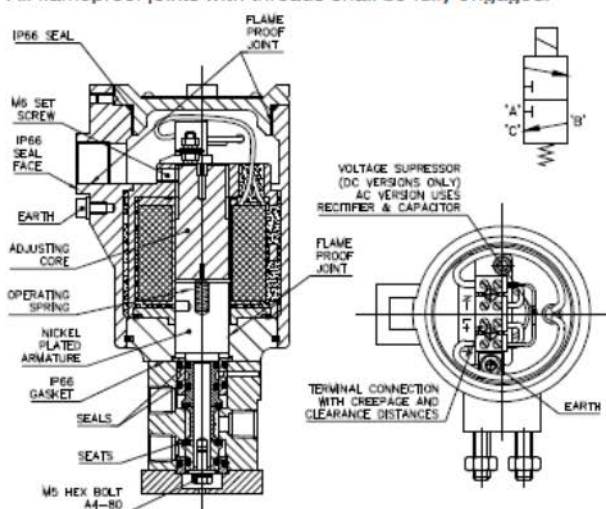
Storage and Handling

The ICO4 should not be stored in a corrosive environment. All ports should remain sealed and the valve markings made visible. Recommended storage temperature 5 to 25 °C, relative humidity <75%. Storage areas shall not contain ozone producing equipment (eg. welding equipment, mercury vapour lamps). Due attention should be paid to personal protection during handling.

Operation

All ICO4 solenoid valves consist of an Exd enclosure. In order for the enclosure to provide flameproof protection:

- None of the flameproof joints shall be damaged.
- All flameproof joints with threads shall be fully engaged.



The pressurised media is retained within the valve assembly (pressure boundary) by the mechanical strength of all its metal parts, seats and seals. Degradation of any of these components will cause the valve to leak.

The flow path of the media is altered by moving the spool assembly and engaging / disengaging the seats. The spool assembly can be moved by either:

- Energising the coil to produce an electromotive force.
- Applying a pressure to a piston.
- Applying a mechanical force to a linkage.
- Compressing a mechanical spring.

Restricting the spool movement or allowing the seats to degrade will not allow the flow to be re-directed.

The ICO4 has an IP66 rating. Degradation of the IP66 seals / gaskets / sealing faces or failure to tighten all sealing joints, will allow water to leak inside the enclosure.

For best practice, the valve should ideally be exercised at least once a month.

Removing an existing valve

Tools

Electrical 3mm Screw Driver

Allen Keys: 3/16", 2.5mm, 3mm, 4mm, 5mm, and 6mm.

A/F sockets: 8mm, 10mm, and 13mm. 5mm Tommy Bar.

1. Obtain work permit and check area for hazards.
2. Isolate valve from all pipeline and electrical supplies.
3. Loosen M5 locking screw and unscrew cover (ICO4S) or remove M6 cover bolts and cover (ICO4D).
4. Disconnect supply cable and remove.
5. Remove pipe connections from valve assembly.
6. Unscrew M8 mounting nuts (or M8 bolts) and remove the valve.

Installing a valve

General requirements

- Pipe work and media must be clean.
- Inlet filters are recommended (e.g. <10 microns).
- Prevent pipe sealant from entering the system.
- Use only correct tools. (i.e. as listed above)
- Do not use valve as a lever.
- Earth equipment to prevent the build up of an electrostatic charge.
- Ensure all interfacing equipment is rated to the expected duty conditions and will not degrade the integrity of the ICO4.

Mounting

Mount ICO4 using M8 mounting flange. Ensure M8 mounting bolts enter ICO4 mounting flange **TO A MAXIMUM DEPTH OF 8mm**. An ICO4 will function satisfactorily when mounted inclined from the vertical. However for maximum life and efficiency mount vertically. The ICO4 is not designed for use in high vibration applications. Do not invert. Do not mechanically stress the equipment.

High temperature applications

In applications where the media is > 90 °C, a high temperature spacer shall be used. The high temperature spacer provides a thermal barrier between the media and the Exd enclosure. To ensure that the spacer performs its intended function:

- The user shall provide ventilation around the valve assembly, Exd enclosure and spacer.
- The valve assembly, Exd enclosure and spacer shall not be lagged.

Additionally, ensure all associated parts, including cable glands and cabling is fit for rated duty.

Low temperature applications

Contact Maxseal Sales for special operating conditions.

Procedure

1. Make connections to the valve ports as required. **DO NOT OVERTIGHTEN.**
2. Loosen M5 locking screw and remove solenoid cover.
3. Install cable using an appropriate certified gland fit for duty.
4. Make terminal connections as labelled. All terminals must be tightened before commissioning.
5. Replace solenoid cover and lock M5 locking screw.

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INSTALLATION, OPERATION & MAINTENANCE (IO&M)

Solenoid Valve - Maintenance

It is recommended to refurbish/overhaul the Solenoid Valve in intervals of 5 years.

Spares

Only Maxseal spares kits should be used.

Main valve kit includes all seals, seats and operating spring.

Lubrication

-20°C to 90°C: Molycote 111 grease

-60°C to 50°C: Molycote 33 medium grease

Part A. Disassembling a valve

1. Remove manual reset lever retaining clip (if fitted).
2. Remove the Hex Head Bolts at the base of the valve body and remove valve body and armature assembly.
3. Secure armature with a *Tommy bar* and remove Hex Bolt/Nut at the base of the armature.
4. Separate all valve assembly components, noting orientation, sequence and position of parts,

Part B. Examining a valve's components

Examine and replace all worn or damaged parts.

The flameproof joints will retain their original certified clearances provided they are not damaged.

Replace all seals and operating springs with Maxseal spare parts kit. All seals should be lubricated and have no deformation. All seating and sealing faces should be free from contamination, marks, scratches, etc.

DO NOT MODIFY OR RECLAIM FLAMEPROOF JOINTS.

Part C. Assembling a valve

Smear all seals with recommended grease. Build assemblies in reverse order shown in part A.

Torque M5 bolts to 5Nm.

Part D. Adjusting & testing a valve

1. Loosen M5 locking screw and remove solenoid cover.
2. Make connections to valve ports as per markings.
3. Remove the M5 socket screw on the terminal plate and slide out terminal assembly to reveal core adjuster.
4. Loosen M6 core set screw.
5. Apply air to valve body and energise coil.
6. Screw down core to the point *just before* ports leak.
7. Screw core back a further 1/10 of a turn.
8. Lock M6 core set screw.
9. Ensure valve operates correctly at Nom Voltage $\pm 12\%$

Part E. Problems

If the ICO4 does not function as intended, do not install valve.

Repeat the maintenance procedures Parts A to D. If the problem persists contact Maxseal Sales.

If you are not sure about any application, maintenance or technical issue, contact Maxseal Sales for advice.

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INSTALLATION, OPERATION & MAINTENANCE (IO&M)

SPARE PARTS LIST

Elastomeric Flow Control Sleeve c/w O-ring spares kit

Size	80	100	150	200	250	300
Kit number	CV64/90119	CV64/90120	CV64/90121	CV64/90122	CV64/90123	CV64/90124

Common to all sizes of valve

Pilot Control Valve Spares Kit – CV64/90118

Comprising:

- 1 × Rolling Diaphragm - Beaded
- 1 × Rolling Diaphragm
- 1 × Pilot Sleeve
- 2 × Ø8mm Stainless Steel Balls
- 1 × Lubricant (Klübersynth) (10 g packet)
- 1 × Sealing Plug for Adjusting Sleeve
- 1 × Piston O-ring

NOTE: Elastomeric Sleeves, Diaphragms and Seals should be stored in sealed light proof black bags.
Spare stocks of sleeves, diaphragms and seals should be used within a two year shelf life to provide a 3 year in-service life (5 year total life).

Pilot Strainer (for inlet block) - CV64/70050 (to be ordered separately).

Spring Service Kit (for Pilot).

Service Kit No.	Spring Rating
CV64/90158	3 to 7 bar
CV64/90157	7 to 12 bar

Also see: Data Sheet No. DV070 1001: GW C-300 General Spares Schedule

Commissioning /Maintenance Accessories

- CV64/62163: Rubber Lubricant Emulsion
- Restrictor: CV64/70505 - Insertion / Removal Tool (fits retainer)
CV64/70506 - Adjusting Tool (fits restrictor)

Solenoid Valve Spares Kit: BE27378

Comprising: various Soft Seals and Springs required for 5 year maintenance/service.

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FAULT FINDING

Fault	Cause	Remedial Action
Valve does not open (WATER CANNOT ESCAPE FROM SLEEVE CAVITY)	a) Rupture of flow control sleeve on inlet side of valve	Renew sleeve
	b) Restrictor R3 fully screwed in	Check and adjust all restrictors
	c) Ruptured pilot sleeve	Renew pilot sleeve
	d) Non operation of Solenoid valve	Check for water flow
Valve does not close (WATER CANNOT ENTER SLEEVE CAVITY)	a) Rupture of flow control sleeve on discharge side of valve	Renew sleeve
	b) Blocked filter	Clean filter
	c) Restrictor R1 screwed fully in	Adjust restrictor
	d) Ruptured pilot sleeve	Renew pilot sleeve
	e) Solenoid latch not re-set (90°)	Push/lift latch to 90° position
Valve does not regulate	a) Restrictor settings incorrect	Adjust restrictors
	b) Blocked filter	Clean filter
	c) Ruptured pilot sleeve	Renew pilot sleeve
	d) Ruptured diaphragms	Renew diaphragms
	e) Pilot valve spindle sticking	Check spindle & pilot sleeve
	f) Sensing port / pipe blocked	Check and clean port/pipe
System set pressure incorrect	a) Unauthorised adjustment of Pilot Adjusting Sleeve	Adjust Pilot
	b) R3 set too far "in"	Adjust R3
	c) Deterioration of spring	Renew spring
Water leaking from the side of the Pilot valve	Pilot valve large diaphragm ruptured	Renew diaphragm
Water leaking from 'tell tale' hole in valve casing	a) Pilot valve beaded diaphragm ruptured	Renew beaded diaphragm
	b) Pilot sleeve ruptured	Renew pilot sleeve

GW C-300 – AUTOMATIC WATER CONTROL VALVE (AWCV) WITH PRESSURE CONTROL & SOLENOID

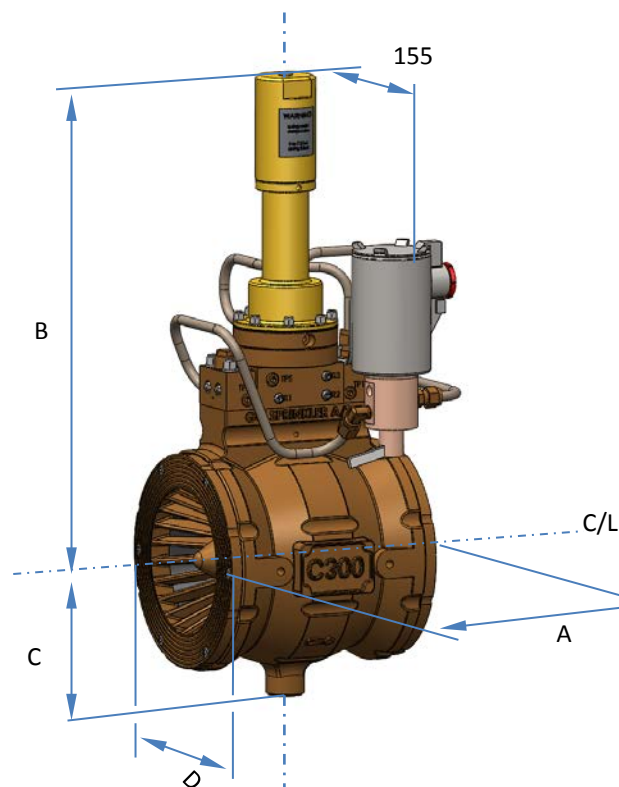


GW SPRINKLER A/S

MANUAL

INSTALLATION, OPERATION & MAINTENANCE (IO&M)

P & ID



All dimensions in mm.

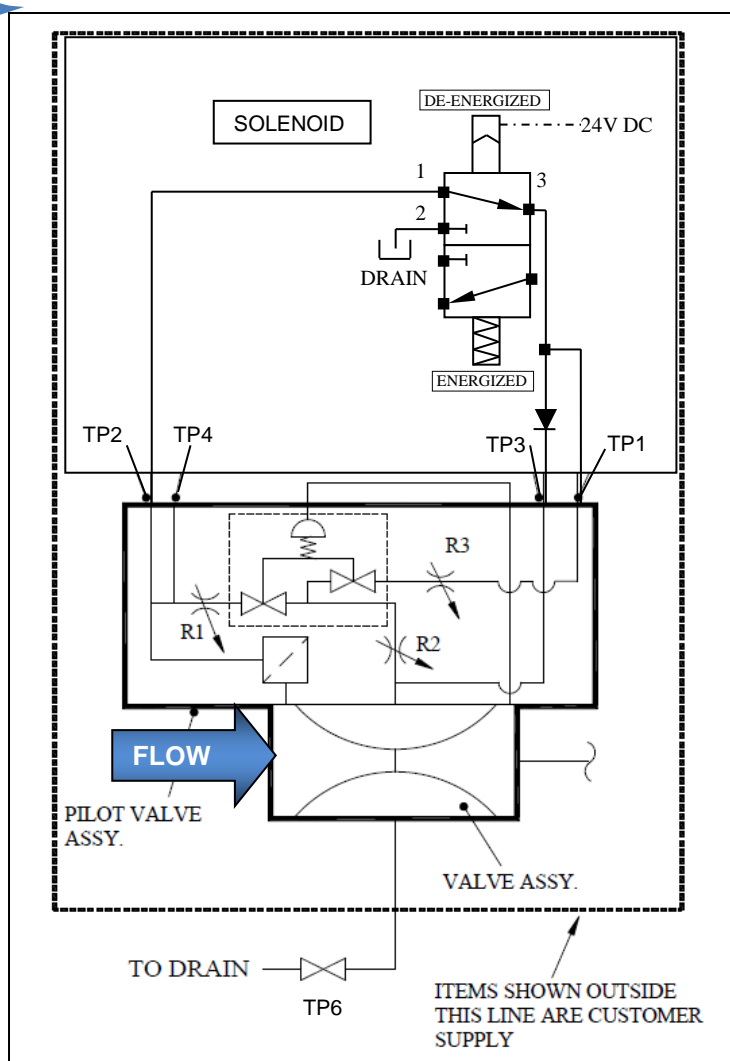
	A	B *)	C	D **)
80 (3")	167	405	112	128
100 (4")	167	427	132	161
150 (6")	237	459	162	222
200 (8")	304	487	184	295
250 (10")	350	522	217	336
300 (12")	440	560	248	406

*) SET at 4 bar (blue spring)

**) Fitment: Wafer fits between ANSI/ASME B16.5 Class 150 or 300 lbs. flanges using full length studs, nuts and washers. Gasket to ANSI B16.21 RF.

P & ID:

Port	Description	Size
R1	Inlet Restrictor (closing)	
R2	Jacket Restrictor	
R3	Outlet Restrictor (opening)	
TP1	Exhaust to open valve	1/4" NPT
TP2	Supply to close valve	1/4" NPT
TP3	Inlet to close valve	1/4" NPT
TP4	Plugged	1/4" NPT
TP6	Manual Release	1/2" NPT
1	Solenoid "INLET"	1/4" NPT
2	Solenoid "EXHAUST"	1/4" NPT
3	Solenoid "OUTLET"	1/4" NPT

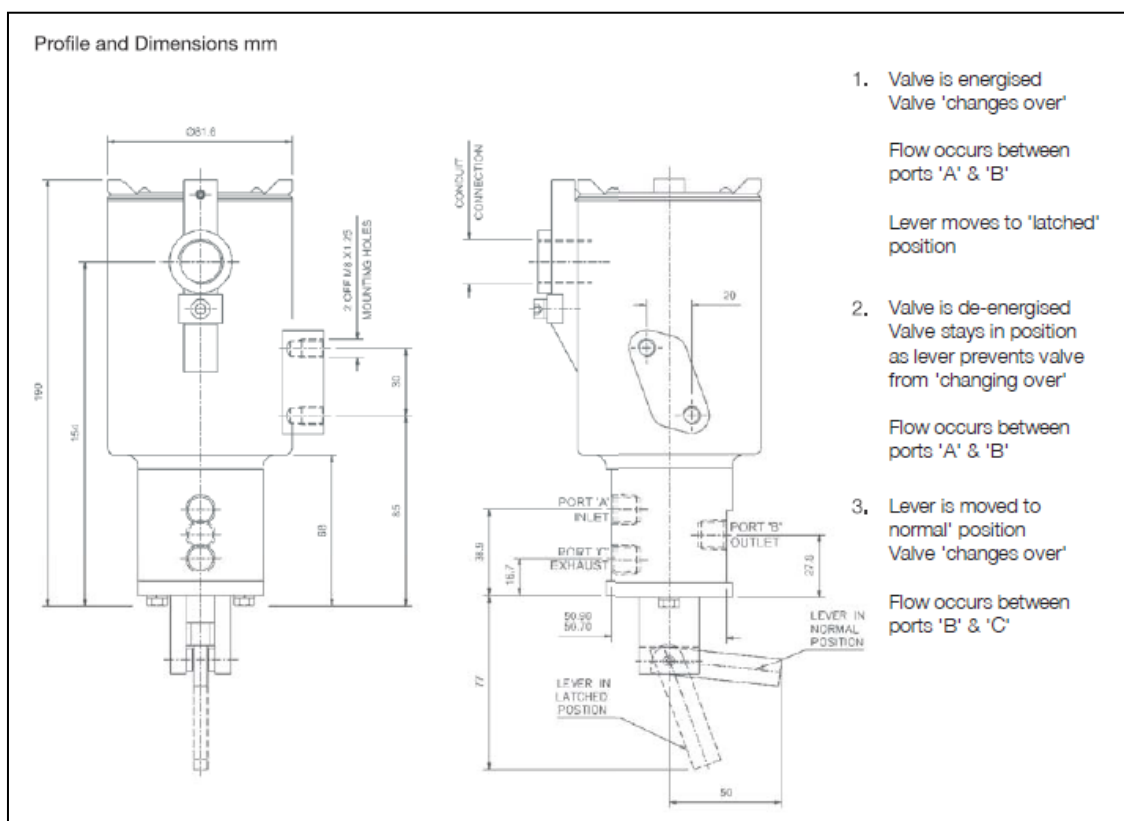


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**Solenoid
Data:**

Type	ICO4S 1/4" 3/2 A-L-L
Materials of construction	
Pot & Cover	SS316
Valve body	Ni Al Bronze (sea water application)
O-rings	High Nitrile (NBR)
Coil insulation	Class H
Max. inlet pressure	20 bar
Flow Rates	Cv = 0,8 / Kv = 11,5
Temperature ratings	
media	Min/Max -20°/90°C
ambient	Min/Max 0°/60°C
Conduit Connection	M20 x 1,5 Conduit Thread
Power Consumption	9,6 W (for extreme service)
Voltage	24 DC
IP	IP66/X8 NEMA 4X
Configuration	NC (standard) / (NO (optional))
ATEX	Complies with ATEX Directive 94/9/EC
ATEX Code	Ex II 2 G Exd II C T6/T4



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INSTALLATION, OPERATION & MAINTENANCE (IO&M)

Annex 1.

Valve & Instrumentation Schematic

POS.		In Service	POS.		In Service
1	GW C-300 Deluge valve		6	Test/ Drain Valve	Closed
2	Solenoid Valve 3/2 Way, (NC)	De-energized	7	Upstream Pressure Gauge	
3	½" Manual Release Valve	Closed	8	Downstream Pressure Gauge	
4	Upstream Isolation Valve	Open	9	Power Supply, 24 DC / 9,6 W	Off
5	Downstream Isolation Valve	Open	10	Manual Reset Latch	90° position

