Arkal Spin Klin 4” Galaxy

User Guide

Installation and Operation Instructions

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1. Introduction

General

Arkal Filtration Systems congratulates you for purchasing the 4" Spin Klin Galaxy filter. All Arkal's filters are easy to install, use and service and require no special skills to operate. For operation and maintenance of this filter please follow the instructions in this manual. This Arkal 4" Spin Klin Galaxy battery is an automatic self-cleaning filter designed for non-hazardous liquids only and for operation within the pressure framework described in the specifications table.

2. Safety Instructions

General Safety Instructions

- The manufacturer filtration products always operate as components in a larger system. It is essential for the system designers, installers and operators to comply with all the relevant safety standards.
- Prior to installation, operation, maintenance or any other type of action carried out on the filter, read carefully the installation and operation instructions.
- During installation, operation or maintenance of the filter all conventional safety instructions should be observed in order to avoid danger to the workers, the public or to property in the vicinity.
- The system has to be used for non hazardous liquids only!
- Please note: The filter enters into a flushing mode automatically, without prior warning.
- No change or modification to the equipment is permitted without a written notification given by the manufacturer or by its representative, on the manufacturer's behalf.
- Always observe standard safety instructions and good engineering practices whilst working in the filter's vicinity.
- Use the filter only for its intended use as designed by the manufacturer, any misuse of the filter may lead to undesired damage and may affect your warranty coverage. Please consult with the manufacturer prior to any non-regular use of this equipment.
- System's cleaning and maintenance shall be carried out only when explosive atmosphere is not present!

Installation

General

- Install the filter according to the detailed Installation Instructions provided with the filter by the manufacturer and according to the description given in this manual.
- Make sure to leave enough clearance, side and top, so as to enable easy access for future treatments and safe maintenance operations.
- The user should arrange suitable lighting at the area of the filter to enable good visibility and safe maintenance.

- The user should arrange suitable platforms and safety barriers to enable easy and safe access to the filter without climbing on pipes and other equipment. The user should verify that any platform, barrier, ladder or other such equipment is built, installed and used in accordance with the relevant local authorized standards.
- Check and re-tighten all bolts during commissioning and after the first week of operation.
- Use only appropriate standard tools and equipment operated by qualified operators when installing, operating and maintaining the filter.
- When installation is required in hazardous environment sites, underground or high above ground, make sure that the site design and the auxiliary equipment are appropriate and that installation procedures are carried out in accordance with the relevant standards and regulations.
- Ensure walking areas about the installation are slip free when wet.

Shipment and transporting

- Shipping and transporting the filter must be done in a safe and stable manner and in accordance with the relevant standards and regulations.
- For shipping, lifting and positioning the filter, use only approved lifting equipment and authorized employees and contractors.

Electricity

- Electric wiring should be performed by an authorized electrician only, using standardized and approved components.
- The system must be installed with suitable electrical earthing that would prevent any electrostatic discharge from the system.
- Install a **lockable** main power cut-off switch close to the control panel.
- If due to site constraints, the control panel is installed without a clear line-of sight of the filter, an additional **lockable** power disconnect cut-off switch should be installed near each filter unit.
- Installation of the filter should be performed so as to avoid direct water splashing on the electrical components or on the control panel.

Pneumatics

- Install a **lockable** main cut-off switch, **featured with a pressure release mechanism,** on the compressed air supply line close to the control panel.
- If the control panel is installed far away and there is no eye contact with the filter, a **lockable** compressed air cut-off switch, **featured with a pressure release mechanism,** should be installed near each filter unit.
- The user should make sure that the compressed air supplied to the filter never exceeds the maximum designated pressure for this filter. An air-pressure reduction valve should be installed on the compressed air supply line upstream of the filter's pneumatic inlet port.

Hydraulics

- Extra safety devices should be installed on hot water applications to avoid skin burn danger.
- The user should install a manual Water Cut-off Valve next to the filter's inlet port.
- In cases where the downstream piping network downstream of the filter is pressurized an additional manual Water Cut-off Valve should be installed next to the filter outlet port.
- The user should make sure that the system includes a Pressure Release / Drainage Valve to enable release of residual pressure prior to any maintenance procedure performed on the filter.
- The user should make sure that the filter is never exposed to water pressure exceeding the maximum designated pressure for this filter, if needed a Pressure Reduction Valve should be installed upstream of the filter's water inlet port.
- Please note that the maximum working pressure indicated at the filter's specifications table includes the pressure caused by fluid hammer and pressure surge effects.

Civil Engineering

- Make sure that the filter installation is done by the manufacturer qualified technicians.
- Make sure that any civil engineering work at the installation site such as construction, lifting, welding, etc. is done by qualified workers / technicians / contractors and in accordance with the relevant local standards.
- While using lifting equipment, make sure that the filter or the lifted part is chained securely and in a safe manner.
- Do not leave lifted equipment if there is no necessity. Avoid working below lifted equipment.
- Wear a safety helmet while using lifting equipment.
- Make sure that the flooring is sloped to for drainage and to avoid accumulation of liquids.

Commissioning

- Read carefully the Commissioning and the First Start-up Operation instructions prior to any attempt to operate the filter.
- In order to achieve maximum performance and smooth operation of the filter it is crucial to perform the startup and first operation procedures exactly as described in this manual.
- Commissioning the filter should be done by an authorized the manufacturer technician, do not attempt to commission the filter unaccompanied since this may lead to undesired damage and may affect your warranty coverage.

Operation and Control

- Do not operate the filter before reading carefully and being familiar with its operation instructions.
- Observe the safety stickers on the filter and never perform any operation contradicting the instructions given.
- Never operate or use the filter for purposes other than its original design and operational envelope.
- The system has to be used for non hazardous liquids only!
- System's cleaning and maintenance shall be carried out only when explosive atmosphere is not present!

Maintenance

Before any maintenance or non-regular operation

- Servicing the filter should be done only by technicians authorized by the manufacturer.
- System's cleaning and maintenance shall be carried out only when explosive atmosphere is not present!
- Disconnect the filter from the power supply and lock the Main Power Switch.
- Disconnect the compressed air supply, release the residual pressure and lock the Pneumatics Main Valve.
- Disconnect the filter from the water system by closing and securing the manual inlet valve. In cases where the downstream piping network is pressurized, close and secure the manual outlet valve also.
- Release the residual water pressure by opening the pressure release / drainage valve.
- Empty the filter by opening the drainage valve.
- In hot water systems wait till the filter components cool off to a safe temperature.
- Place warning signs around the work area as required by the local standards and procedures.
- Inspect the filter’s safety stickers and replace any damaged or faded sticker.

Special Note

Before opening the filter clamp, check that the filter is not under pressure.

3. Description & Operation

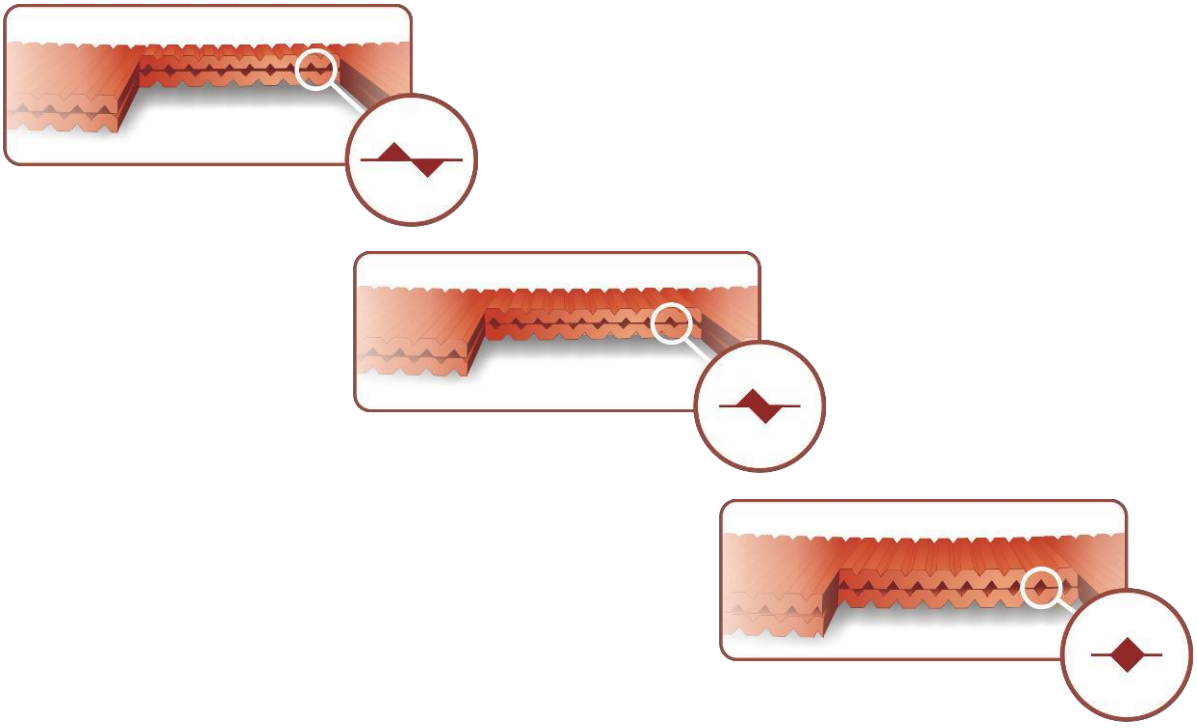
3.1 Disc Filtration Technology

Arkal Filtration Systems uses a specially designed disc filtration technology. Thin, color-coded polypropylene discs are diagonally grooved on both sides to a specific micron size. A series of these discs are then stacked and compressed on a specially designed spine. When stacked, the groove on top runs opposite to the groove below, creating a filtration element with a statistically significant series of valleys and traps for solids. The stack is enclosed in corrosion and pressure resistant housing.

During the filtration process, the filtration discs are tightly compressed together by the spring's power and the differential pressure, thus providing high filtration efficiency. Filtration occurs while water is percolated from the outer diameter to the inner diameter of the element. Depending on the micron rating, there are from 18 (in 400 micron discs) to 32 (in 20 micron discs) stopping points in each track, thus creating the unique in-depth filtration.

Table of Filtration Grades of the Discs and Color Code

Color Code	Blue	Yellow	Red	Black	Brown	Green	Purple	Gray
Micron	400	200	130	100	70	55	40	20
Mesh	40	80	120	140				
PP								
Nylon								



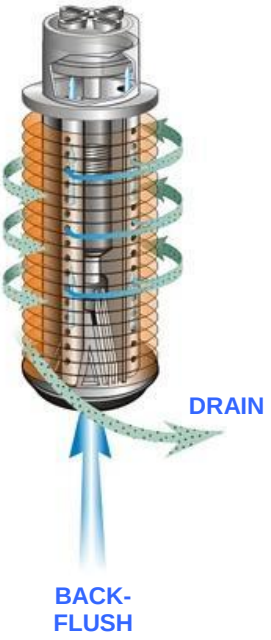
3.2 Spin Klin Technology

Spin Klin Spine - The Core of the Spin Klin Filtration System

The Spin Klin® discs are stacked on the Spin Klin® spine. The discs are color-coded according to micron size, and are assembled to suit your water filtration requirements. The spine assembly has a spring compression unit and an internal piston, which operate during alternate filtration or back-flush modes. Inside the housing a spring and the pressure difference compress the discs tightly during the filtration process, forcing the water to flow between the grooves and trap the solids.

Spin Klin Automatic Back-flush Operation

Activated by an external command (differential pressure or time) alternate units of the Spin Klin® system go into back-flush mode. Three-way valve closes the inlet to the filter pod and opens the drain. During the back-flush process, the compression spring is released and the pressure difference is eliminated.The spine piston rises up, releasing the pressure on the discs. Tangential jets of clean water are pumped at high pressure in the opposite direction through nozzles at the center of the spine. The discs spin free and clear, loosening the trapped solids. Solids are quickly and efficiently flushed out through the drain.



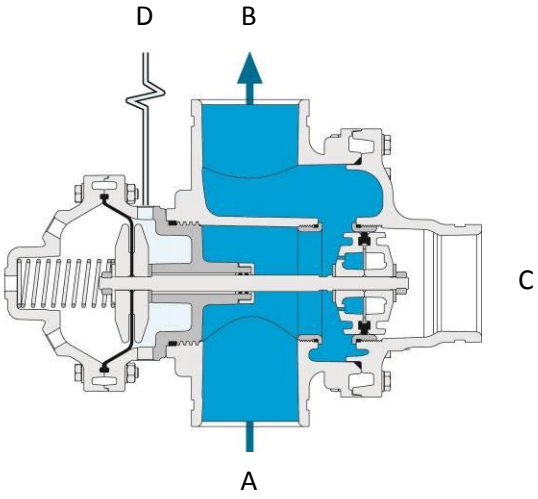
Modes of the filter's Control valve

Filtration Position:

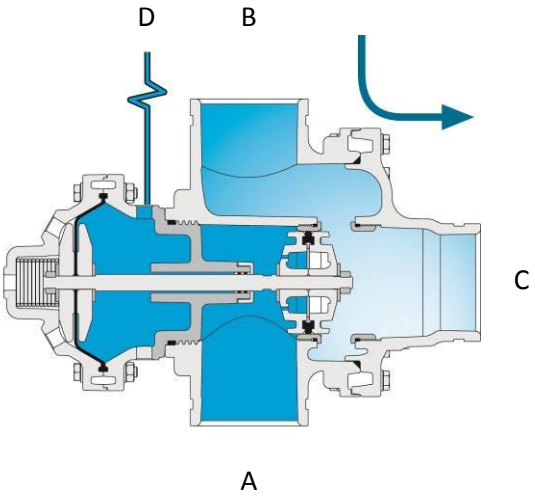
Water flows from port [A] (main supply) to port [B] (filter connection). Port [C] (drain water outlet) is closed by the seal.

Back-flush Position:

Command pressure is applied to the diaphragm's control chamber through port [D]. The diaphragm moves the sealed shaft, port [A] closes, preventing flow to the filter. Port [C] opens, allowing flushing water to flow from port [B] (filter connection) to the drain.



Filtration Mode



Back-flush Mode

Filtration Process

During the filtration process the water flows through the inlet manifold into the filters through their 4”x4” inlet valves. The filtered water flows through the outlet manifold of the system.

Back-flush Process

The back-flush process begins with a signal from the control unit activated by the pressure difference between the inlet and the outlet or by a time interval.
A signal is transported to the 4”x 4”inlet valve of the first filter pod causing the valve to close the 4” inlet to the filter and to open the 4” drain port.

Filter No.1 is now in a back-flush mode.

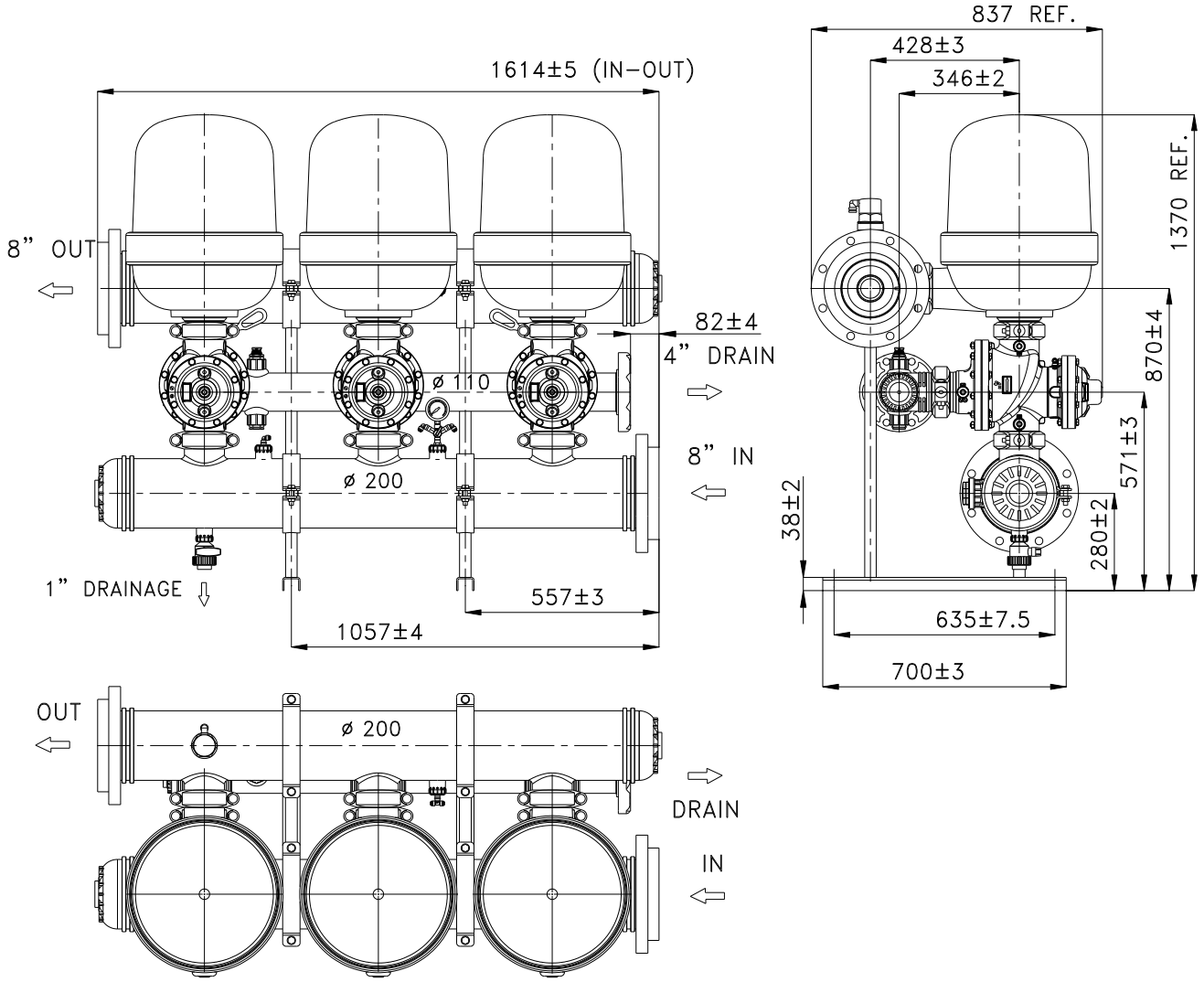
The 5 Spin Klin spines of filter pod No.1 operate simultaneously, releasing the compressed discs. Tangential jets of water are pumped against the discs, causing them to spin fast and free, flushing trapped solids out to the drain.

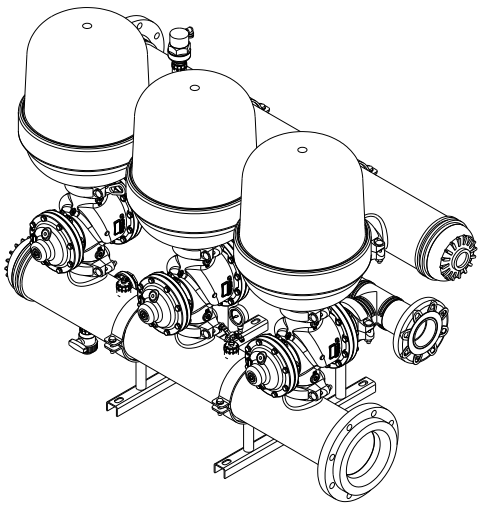
Filtered water for the back-flush process is supplied by a different external water source rather than by the filter’s water as in regular flushing.
The back-flush time per pod is 20 seconds. When the time elapses the control unit stops the back-flush signal to the solenoid.
The solenoid releases the water pressure signal allowing the inlet valve and the discs of the 5 spines to return to filtration mode.
Once pod No.1 is in filtration mode again the control unit sends a signal to begin the back-flush process of pod No.2 and so on till the last pod of the system.

4. Technical Data

Parameters	**Metric**	**US**
Maximum pressure	10 bar (25°C)	145 psi (77°F)
Minimum pressure	2.8 bar	40 psi
Back-flush flow rate per POD	50 m^3/h	220 gpm
Water volume per back-flush cycle	210 liters	56 gallons
Maximum temperature	70 °C (at 4 bar)	158 °F (at 58 psi)

5. Typical Installation





6. Installation

A. Make sure that the inlet and outlet orientation is correct (shown by arrows on filter).

B. Prior to start-up check for any transport damage to the unit (system operates under pressure!).

C. Connect a back-flush drainage line.

D. Verify that all the cover clamps are properly closed!

E. Connect air pressure to the 3-way valves and solenoids.

Installation of systems with external back-flush water source

In systems equipped with external back-flush water source, the flushing of the filter is carried out by a different external water source rather than by the filter's water as in regular flushing, e.g. flushing of seawater filter by a fresh water source.
In such installation it is extremely important that the external water source meets the required back-flush pressure and flow rate specifications. For efficiently flushing this filter the external back-flush water source should be capable of supplying 50m³/hr at 5 bars.

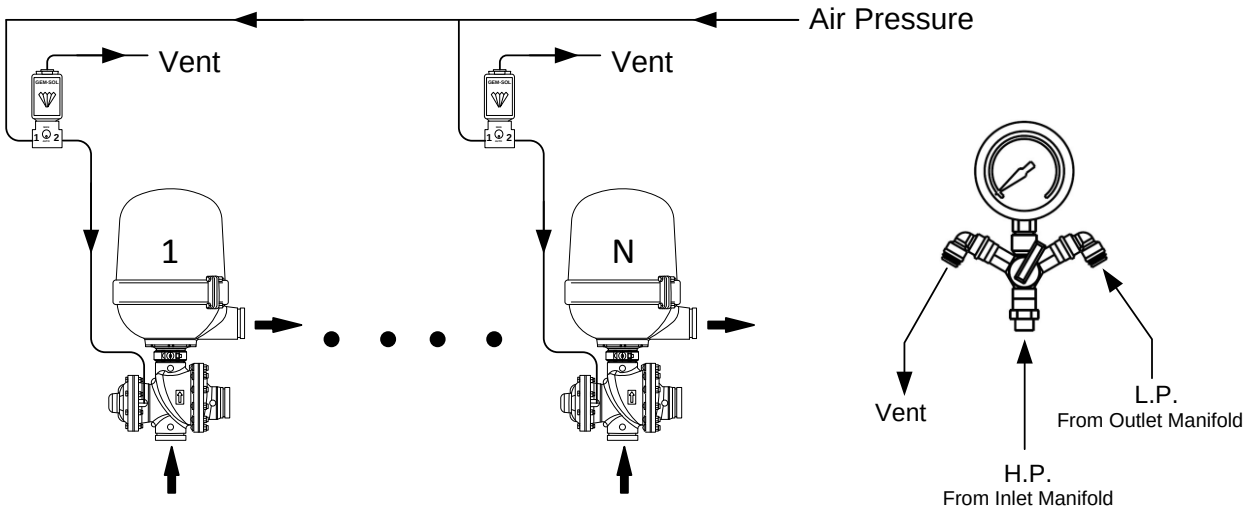
Start-up Operation

Filter Load-up during Start-up

- Close the downstream (flow control) valve (if exists)
- Run few back-flush cycles until the system is clean
- Slowly reopen the downstream valve
- If the pressure difference remains high, verify that the flow rate is not too high. An excessive flow rate through the filter causes excessive pressure loss.
- Start a back-flush cycle and make sure that all system components function correctly

Control

- Refer to the control chapter of this document before installing and operating the controller.
- Make sure that the voltage of both the solenoid unit and controller are correct.
- Check that the ΔP hydraulic switch HIGH and LOW pressure lines are correctly connected to the appropriate ports.
- Set the starting back-flush switch to the required ΔP (Recommended ΔP will range between 2.5 – 6 m, 3.5-8 PSI according to site conditions).
- Set the controller to a flush time of 20 seconds and a dwell time of 10 seconds. These settings may require adjustment to conform to local water conditions. Typically, a 1 to 3 hour interval between back-flush cycles is recommended.



Please note: The electronic controller is not included.

7. Galaxy Spin Klin - System Maintenance

Monthly Maintenance

Check inlet /outlet pressures:

In case the pressure differential is above 5 m / 7 PSI activate automatic back-flush of the Spin Klin filter battery.

In the event that the pressure differential remains high check for possible failures.

Check for leakages from the drain manifold:

In case there is a leakage of water during the filtration stage, check for possible failure at the back-flush valve seals.

Back-flush controller performance:

Check that the controller timing parameters are correctly adjusted and activate automatic back-flush cycle. In the event of possible failure at the back-flush controller, check for possible failures.

Winterization:

In order to prevent the filter battery becoming damaged during water freezing – drain all the water from the filter battery and the command filter and leave the drain valve open.

SEASONAL MAINTENANCE - DISCS

To guarantee thorough cleaning the following steps should be taken:

Close the water inlet after back-flushing the systems. Make certain that there is no pressure in the system and unscrew the nuts. (**Figure 1**)

Open the clamp. (**Figure 2**)

Remove the cover. (**Figure 3**)

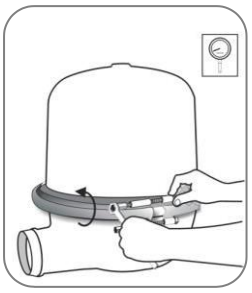


Figure 1

Figure 2

Figure 3

Unscrew the butterfly nuts on the filtration elements. (**Figure 4**)

Remove the tightening cylinders. (**Figure 5**)

Remove the disc sets (for convenience we recommend using a plastic bag). (**Figure 6**)

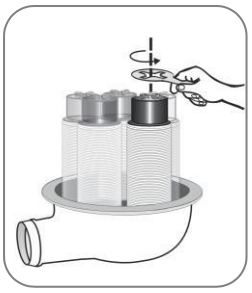


Figure 4

Figure 5

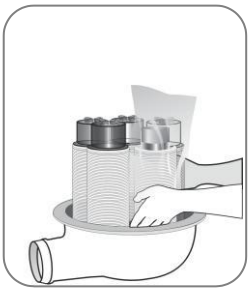


Figure 6

Tie each set on a string and place them in a cleaning solutions (HCL, Chlorine, or other) refer to the "Cleaning Recommendations for Clogged Filtration Discs". (**Figure 7-8**)

Figure 7

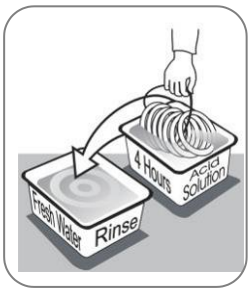


Figure 8

Ensure that the correct quantities of discs are assembled on the spines: when the discs are pressed with two hands, the top disc should be level with the imprinted circle on the outside of the spine. (**Figure 9**)

Reassemble the tightening cylinders onto the spines, return the cover and tighten the clamp. (**Figure 10**)

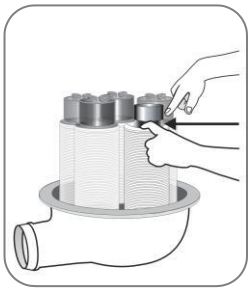


Figure 9

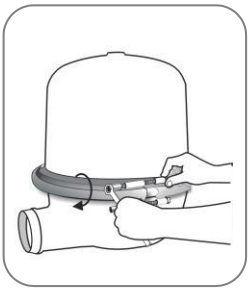


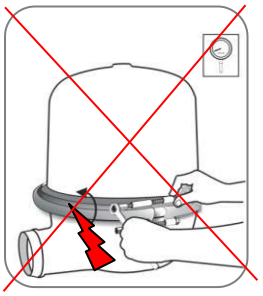
Figure 10

Attention:

When carrying out any of the following seasonal maintenance, service, or cleaning the discs – After back-flushing the system and after closing the water inlet, **make certain that there is no pressure in the system!**

Unscrew the nuts and open the clamp.

Please Note:



- Before removing the cover you may experience the vacuum phenomenon which will make the removing of the cover very difficult or almost impossible.
- **Do Not** - insert any sharp tools (objects) in between the cover and the body! You may damage the hydraulic seal and the cover!
- In order to remove the cover easily – **you should drain the water from the system**!
- You can drain the system through the command filter, or the back flush valves, once the system is empty the cover can then be removed safely and easily.

Cleaning Recommendations for Clogged Filtration Discs

Water-formed deposits may cause clogging of the filter discs. The formation of these deposits depends on the quality of the filtered water and environmental conditions like temperature, pH, light, duration of filtration and more.

Common water-formed deposits are:

- Biological or organic deposits (mostly mucous or oily to the touch, beige, brown or green in color)
- Iron oxide (rust) or other metal oxides
- Carbonates (white or gray deposit)
- Combinations of the above

If these deposits cannot be eliminated by pretreatment of the water, we recommend the following cleaning procedure:

Material and Equipment

- A well ventilated working place.
- 2 small containers (1 liter), 2 large containers (15 liter) and a stirring stick, all resistant to chemicals, preferably of polypropylene.
- Plastic rope to tie up the disc.
- Sodium Hypochlorite NaOCl -
- Strong oxidizing liquid, commercial concentration: 10%.

  Oxidizes and removes organic and biological deposits.
- Hydrochloric Acid HCl -
- Very corrosive liquid, commercial concentration: 30%.
- Dissolves and removes carbonates, iron oxide, and other deposits.
- Safety equipment: safety glasses, gloves, long pants, long sleeved shirt and shoes.

ATTENTION!

While working with chemicals protect yourself with the necessary safety equipment:

- Safety glasses, gloves, protective clothing
- Work in a well ventilated area
- Follow the manufacturer's instructions

Cleaning Organic and Biological Deposits

- Open the filter and remove dirty discs.
- Attention – Never open the filter before the pressure has been released.
- Arrange the discs loosely on the plastic rope
- Prepare a 5% Sodium Hypochlorite solution:
- Pour 5 liters of water into one of the large containers.
- Add 5 liters of Sodium Hypochlorite (10%) into the water.
- Soak the discs in the solution so that both sides are covered. To achieve maximum cleaning, agitate the discs several times with a stirring stick.
- Contact time with cleaning solution: up to 8 hours
- Remove the discs carefully from the solution, put them in the second large container and rinse them very well with clean water before placing them back in the filter.
- We recommend flushing the cleaned discs again in the filter to ensure that all chemical residues are removed.

The cleaning solution can be used for several sets of discs. As the cleaning activity of the solution deteriorates, it may be necessary to soak the discs for a longer time.

Cleaning Carbonates and Iron Deposits

- Open the filter and remove the dirty discs.
- Arrange the discs loosely on the plastic rope.
- Prepare a 5% Solution of Hydrochloric Acid:
    - Pour 10 liters of water into one of the large containers.
    - Carefully add 2 liters of Hydrochloric Acid (30%) into the water. Soak the discs in the solution so that both sides will be covered.
    - PLEASE NOTE: Carbonates react violently with hydrochloric acid (foaming, gas evolution). To achieve maximum cleaning, agitate the discs several times with a stirring stick.
- Contact time with cleaning solution: 1 - 8 hours.
- Remove the discs carefully from the solution and rinse them well with clean water before placing them back in the filter.
- We recommend flushing the cleaned discs again in the filter to ensure that all chemical residues are removed.

The cleaning solution can be used for several sets of discs. It may be necessary to soak the discs for a longer period of time as the cleaning activity of the solution deteriorates.

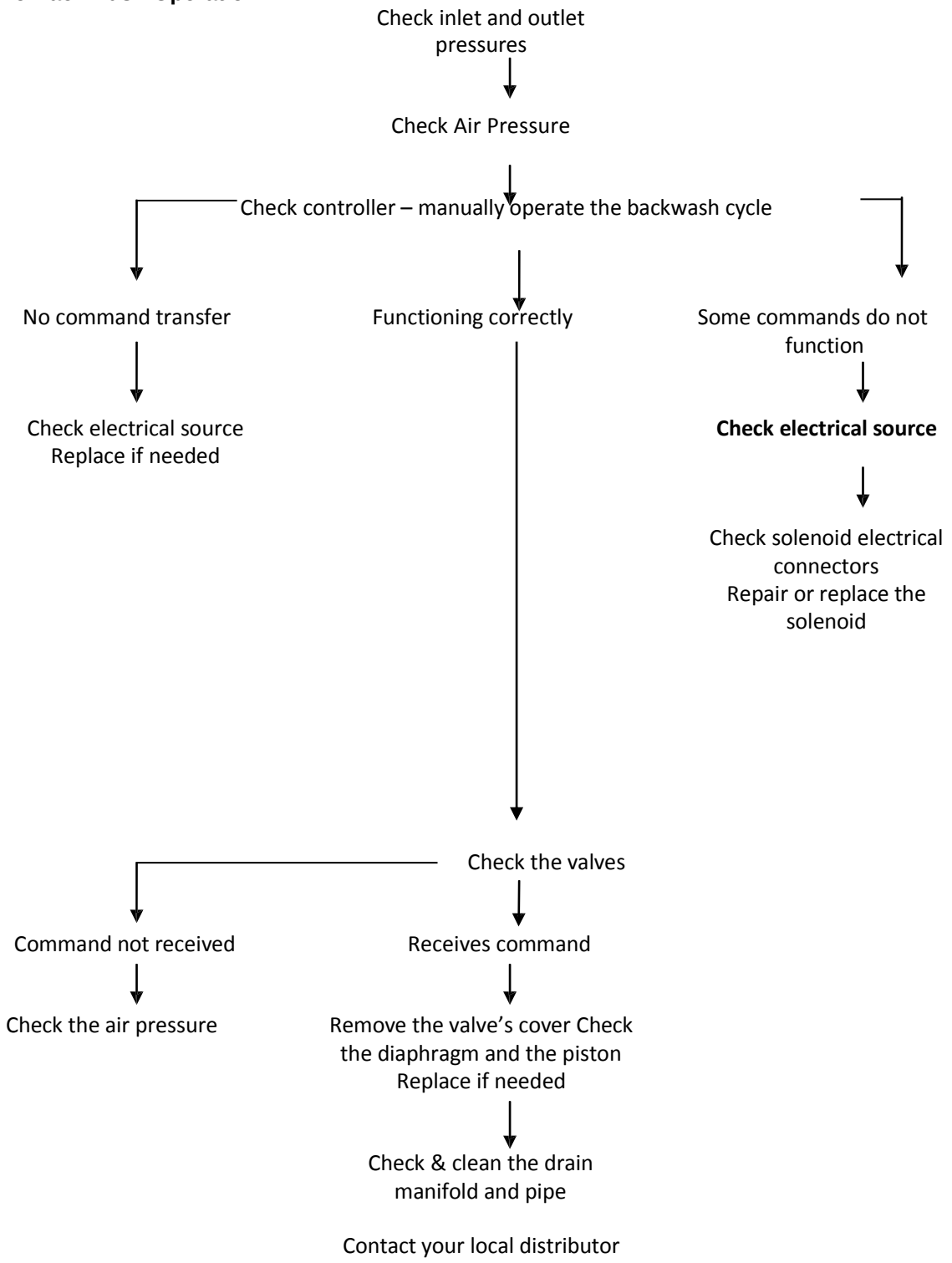
Cleaning Complex Deposits

If the composition of the deposit is not known, perform the following test:

- Take 5 discs for the test.
- Soak 2 discs in a 5% Sodium Hypochlorite Solution.
- Preparation of the solution:
- Pour 1 cup of water into a small container, then add 1 cup of Sodium Hypochlorite (10% NaOCl).
- Soak 2 discs in a 5% Hydrochloric Acid Solution.
- Preparation of the solution:
- Pour 2½ cups (= 500ml) of water into a small container, then add carefully
- ½ cup (= 100ml) of Hydrochloric Acid (30% HCL).
- Keep one disc as a control.
- Observe the cleaning process:
- If one of the solutions removes all of the deposit, clean the discs in that solution according to the instructions above.
- If neither solution removes the deposit completely, continue with the test procedure.
- Remove the discs from both solutions, rinse them well with water and soak them in the second solution: put the two discs, which have been in the Sodium Hypochlorite Solution, in the Hydrochloric Acid Solution, and the other way round.
- Check the cleaning process:
- If one of the treatments removes all of the deposit, clean all of the discs following the same two-step procedure in the exact same order. Rinse the discs well between the two cleaning processes. If the deposit hasn't been completely removed, send a set of untreated discs to the laboratory for further examination.

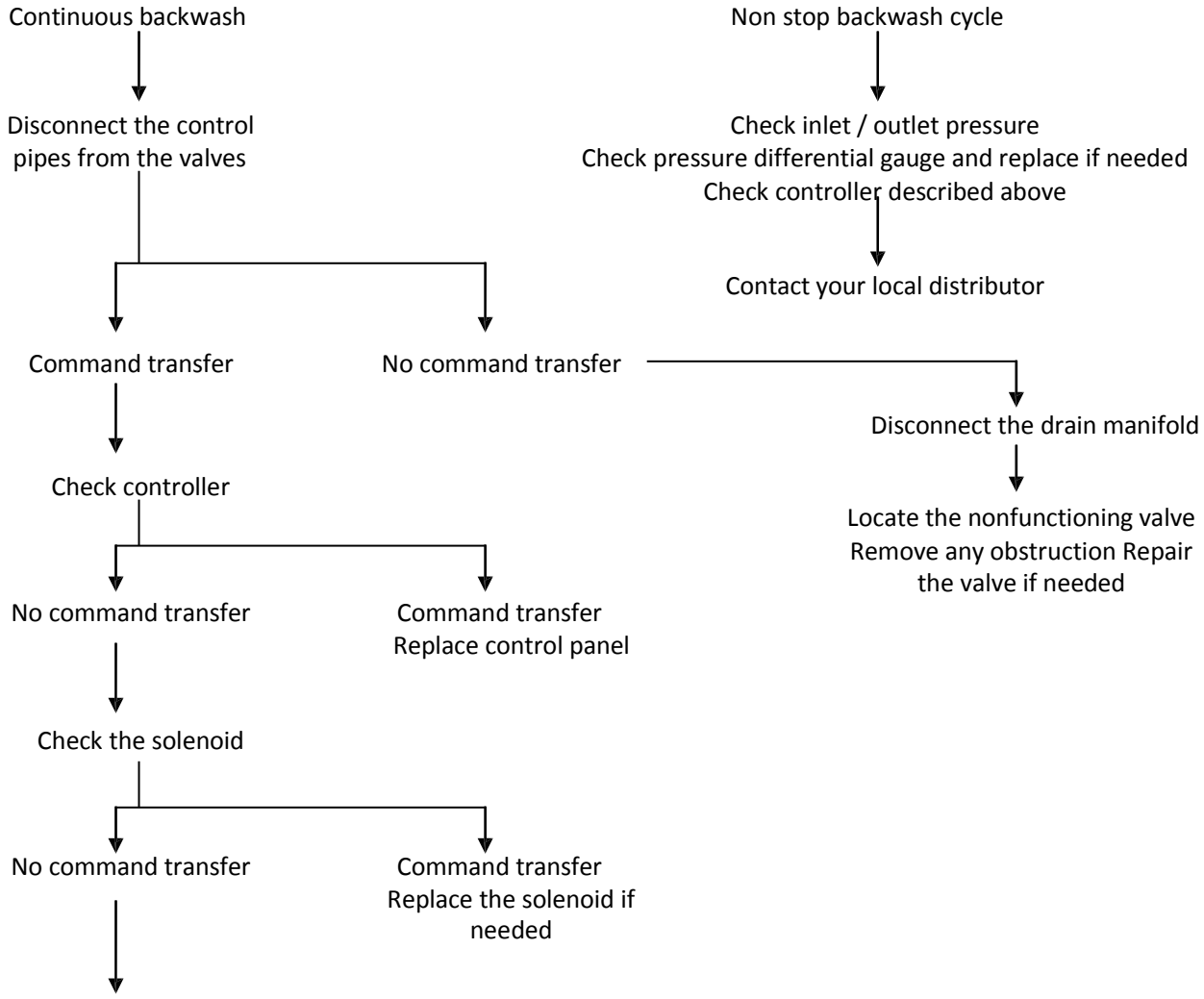
8. Troubleshooting

No Back-flush Operation



Identifying Malfunctions in the Galaxy system

Continuous or Non-stop Backwashing



Contact your local distributor