

WATERCO

Water, the liquid of life

**MICRON SIDE MOUNT DEEP BED NOZZLE PLATE
(SPDD)
COMMERCIAL FILTER**

TECHNICAL MANUAL



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FILTER
DESCRIPTION
AND
CONSTRUCTION



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DESCRIPTION

The Micron Side Mount Nozzle Plate Deep Bed (SPDD) series filters, come with a nozzle plate lateral configuration, have a filter media bed depth of 1200 mm, and a 2.5 bar, 4.0 bar, 6.0 bar, and 8.0 bar pressure rating. The filters can be used with a combination of in depth filtration techniques, and a variety of media, to provide everything from sediment removal to the elimination of minerals and odours from water.

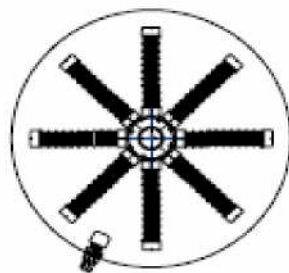
Combining filter housings and various filter media, Micron Deep Bed filters can be fitted in configurations to provide multi-stage water treatment. With easy access for filter media filling and removal, the SPDD series filters are versatile and can be used in most water treatment applications.

CONSTRUCTION

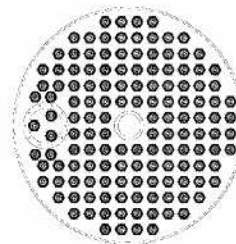
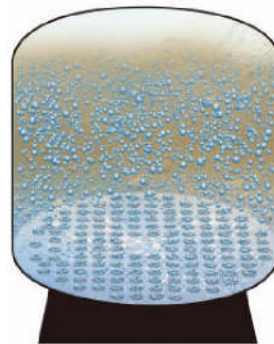
The SPDD series of filters embody the latest in filament wound fiberglass; Waterco's digitally controlled filament winding machine faultlessly winds continuous strands of high quality fiberglass filament under controlled tension to create a seamless one-piece vessel with refined consistency and superior quality technique making it very resistant to corrosion and abrasion. There are no welds, seams, or special tank linings, which can corrode or undergo electrolytic reactions. The fabrication technique involved in making the SPDD series of media filters ensure that it will stand up very well to environmental extremes.

Nozzle Plate Lateral System:

SPDD filters are fitted with a plate and nozzle system, which allows a uniform undisturbed flow through the media bed for filtering. The plate system also allows the use of air purging as part of the backwash procedure, thus reducing the water required for backwashing.



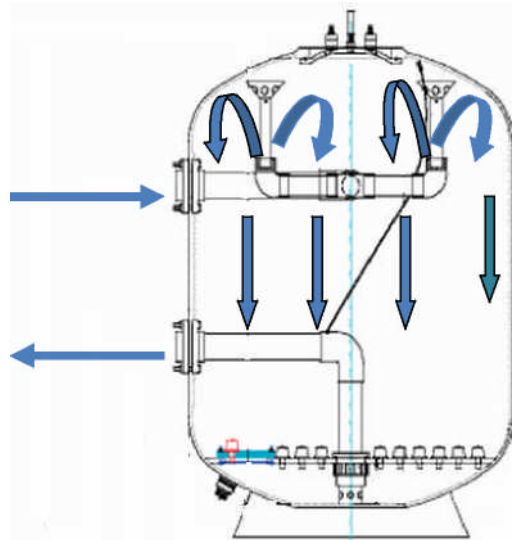
Conventional lateral configuration



Nozzle Plate Configuration

Basic Principles of Operation

Filtration Flow:

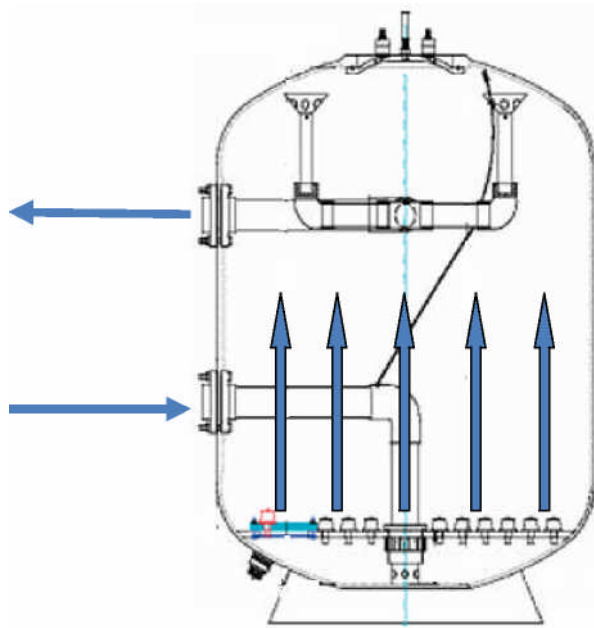


Unfiltered water enters the filter tank through the influent port. Once entering the distribution header, the water flows through a hydraulically balanced system of diverters strategically placed over the filter bed in sets of three (3) or four (4). Even distribution of the water is achieved throughout the filter tank, which results in low levels of turbulence and minimal differential pressure losses. Water flow paths are parallel and vertical at the surface of the filter media bed resulting in flow capacities of up to 13.6 Litres/sec per m² of filter area without creating channeling within the filter bed.

Under high flow rates, suspended solids within the water are exposed to unbalanced forces while flowing through the filter bed. These unbalanced forces cause the suspended particles to travel in an irregular path around and towards the grains of filter media. Upon contact, the suspended solids are trapped on the jagged edges of the filter media grains. This filtration process is also aided through straining at the surface of the filter bed and electrostatic attraction of the suspended solids and filtration media. Through this process of filtration, solids are collected and contained throughout the media bed thus providing long filter cycles between backwashes.

The filtered water is then collected through the use of “V” slotted laterals designed to retain the small filter media particles. After entering the collection header, the filtered water exits the tank through the effluent port.

Backwash (Reverse Flow):



Backwashing is the reversal of water flow through the filter bed. In general we suggest that backwashing be initiated when the pressure gauge indicates an increase in pressure of about 50 kPa (7.3 psi) from the pressure reading of the clean filter, which is the pressure reading on the filter gauge when the filter is initially put into service or after a successful backwash procedure. Backwashing is achieved by routing the water flow into the collection header and laterals, up through the filter bed then exiting through the diverter and distribution header. The time required for the backwash cycle will vary depending on overall water condition. This reversal of flow will cause the filter bed to lift and expand, (also called fluidization). The fluidization of the media bed allows the collected solids to be released and discharged to waste.

During backwash, circulation patterns are established within the media bed, which facilitate even and thorough cleansing of the filter media. The hydraulic balance created through the distribution and collection system design reduces water velocity to below that of the media-settling rate, preventing loss of filter media during backwash. The solids that have been released during fluidization are collected and discharge to waste through the diverter and distribution header.

Using Air/Water Backwashing

Air/water backwashing generally utilizes air at a rate of about $50 \text{ m}^3/\text{hr}/\text{m}^2$ filter area, in conjunction with water provides much more violent agitation of the media than water only. Air/Water backwashing should be done at sub-fluidization levels (about $25 \text{ m}^3/\text{hr}/\text{m}^2$, which will provide excellent backwashing of the filter with at least a 25% saving in backwash water and a reduced risk of media loss during backwashing.

INSTALLATION



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FILTER INSTALLATIONS.

Position the filter:

1. Filters should be located so that they are **free from flooding**, such as away from sumps, flood areas etc.
2. Filters should be placed on a **suitable base (such as level concrete)** to prevent any strain from the attached plumbing.
3. The filter pad/base should be designed so that it will **not collapse** under the **operational weight** of the filter.
4. The filter should be positioned so that it is easily accessible for the **operation** of the valving system.
5. **The filter should be placed so that it is accessible** for maintenance (also any optional extras supplied as part of the filter such as a manhole, or a sight glass should be accessible).
6. **Valving should be positioned at a convenient height** for valve operation.
7. **Preferably, the filter should be positioned as close to the water source as possible for maximum operation.**

NOTE:

1. Ensure the filter is on a **level pad/base** to promote an even water flow over the media bed.
2. Where necessary ensure that a foot **valve (non-return valve)** is installed when using a pump that is installed **above 500mm from water source**.
3. Ensure that a pressure-limiting valve is installed if using mains water or a high-pressure pump.

Pipe run:

Minimize the length of pipe and particularly 90° fittings to obtain the least amount of friction loss as possible. Always use sufficient pipe supports to minimise stress on pipe joints or filter bulkhead fittings. **This will ensure maximum efficiency.**

Isolation valves:

If filtration system is to be installed below water level or is supplied from mains water, **shut off valves should be installed before the filter and after the filter.** This will prevent water flow during any routine maintenance that may be required.

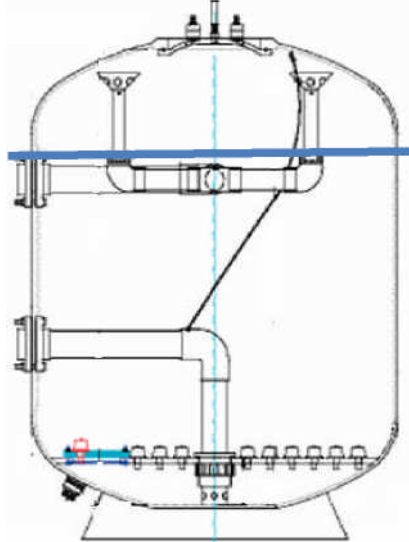
Exposure:

When possible provide adequate protection from the weather to ensure maximum life.

Adding the Media

Filter Media (granular media such as Sand, Zeolite, Mixed Bed Media et):

Filter media shall consist of mixed bed media, uniformly graded silica sand, Zeoplus (zeolite), or other granular media, which shall be free of limestone or clay. The filter will require a filter media bed depth, which shall extend to an approximate level below the top of the hydraulic distribution lenses as follows (the exception to this may be other chemical reactive media which may require a larger freebore):



1. Check the filter size to determine the amount of media required. **(see filter data table).**
2. Make sure that the top distributor and bottom collector assemblies are intact inside the filter tank.
3. Make sure the Media Port is securely installed.
4. Fill the filter tank with water to approximately 1/3 of the filter capacity.
5. Load the proper amount of media through the top of the filter.

NOTE: Media must be added SLOWLY so that tank nozzles and nozzle plate are not damaged. It is important to divert the media off to the side of the tank during the loading process so that the media is not dumped directly onto the laterals.

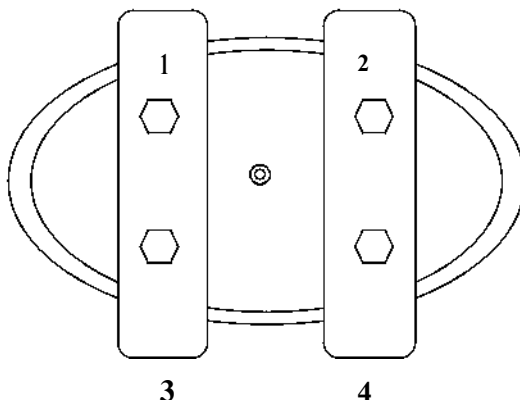
6. After all media is added, level the media, making sure that there are no “peaks” or “valleys” of media. The media level should be below the bottom of the top distributor pipe.
7. **OPTIONAL PEA GRAVEL - To improve the backwash efficiency, we recommend using pea gravel to cover the collector assembly, (nozzles). If you choose to use pea gravel, only put enough to just cover the laterals and proceed to load media on top of the pea gravel. It is important to divert the pea gravel off to the side of the tank during the loading process so that the pea gravel is not dumped directly onto the laterals. This can be easily done using a piece of cardboard shaped like a chute. The water in the tank will help reduce the impact of pea gravel onto the laterals.**

Media Dump Port and Bulk Head Fittings:

All Waterco deep bed filters will be fitted with a dual Media / Water bulkhead, located at the underside of the vessel. The media port can be used for the removal of media and/or water from the filter vessel.

COMMERCIAL FILTER LID INSTALLATION INSTRUCTIONS

1. CLEAN O-RING AND INNER SEALING SURFACE THOROUGHLY BEFORE INSERTING LID INTO FILTER
2. LOOSEN NUTS AGAINST LID ON BOLTS 1 AND 3
3. INSERT LID INTO FILTER AND PULL UP TO THE SEALING POSITION HOLDING THE AIR VENT FITTING.
4. PLACE YOKE OVER BOLTS 2 AND 4 AND SECURE WITH WASHERS AND NUTS (HAND TIGHT ONLY)
5. PULL UP BOLTS 1 AND 3 AND RETIGHTEN NUTS AGAINST LID.
6. PLACE YOKE OVER BOLTS 1 AND 3 AND SECURE WITH WASHERS AND NUTS (HAND TIGHT ONLY)
7. WRENCH TIGHTEN NUTS AGAINST YOKES 1/2 TURN AT A TIME USING THE PATTERN 1 -4-2-3. REPEAT SAME PATTERN UNTIL ALL NUTS ARE SUFFICIENTLY TIGHT.



NOTES:

1. BE SURE TO CLEAN O-RING AND SEALING SURFACE PRIOR TO LID INSTALLATION. SAND FROM THE FILTER CAN CAUSE THE LID TO LEAK.
2. DO NOT OVER TIGHTEN LID. YOKE BOLTS HAVE O-RINGS SEALING AGAINST LEAKS. IF THE BOLTS ARE OVER TIGHTENED THE O-RING MAY DEFORM AND CAUSE A LEAK.
3. IF THE ABOVE PATTERN IS NOT FOLLOWED, THE LID MAY LEAK. IF THIS OCCURS LOOSEN THE NUTS, HAND TIGHTEN AND REPEAT STEP 7 ABOVE.

Multi - Port Valve Operation

(Note: MPV's are not used for filters with port sizes larger than 100 mm and, in some instances, may not be used in commercial or industrial applications with smaller port sizes).

1. Filter-Normal position for filtering the body of water;

The flow of water is directed to the valve ports, which, then distributes the influent water evenly to the top of the filter media bed.

The water travels evenly down through the filter media bed to the under-drain assembly. The under-drain assembly has finely slotted arms called laterals, which allows the passage of cleaned water. The cleaned water travels up through the centre stem (pipe) to the multi-port valve, which re-directs the filtered water to its end point.

2. Backwash-Position for cleaning the filter media.

The flow of water is directed in reverse of filtering to flush out the foreign matter or debris from the filter media bed. To achieve efficient removal of foreign matter or debris, the water is evenly distributed by the under-drain assembly up through the media bed, lifting and agitating the media to release the foreign matter or debris. The water flows through the no clogging ports of the multi-port valve, directly to the backwash outlet. The dirty water flows past the clear sight glass to the drain.

3. Rinse-Flushes clean the filter system.

The flow of water is directed down through the filter media bed to the under drain assembly-up the centre stem (pipe) and out through the backwash outlet. This process settles the filter media bed into place and flushes any remaining foreign matter or debris out of the filter-especially the multi-port valve.

4. Waste- Directs the water flow to waste bypassing the filter media bed.

The flow of water is directed to the backwash outlet bypassing the filter media. This function may be used when it is necessary to lower the level of the body of water in the system.

5. Re-circulate

This function will direct the flow of water to a holding vessel (or swimming pool) with out filtration.

6. Closed

This function shuts off all the flow to the filter and holding vessel or swimming pool. The position is not used with the pump system operating.

The manual operation of the multi-port valve or mode selection is to be done with the pump switched off.

Independent Valving:

In many commercial and industrial applications, MPV's are not used and each system is valved in accordance with the systems unique hydraulic or chemical requirements.

The valving configuration can vary depending on the number of filters in a train and filter backwash configuration (in other words how many filters will be backwashed simultaneously).

In general independent valving should be configured to accommodate:

1. Normal Filtration:

The water enters the filter at the top filter port and is evenly distributed over the filtration media. The water travels down through the filter media at the required rate to permit filtration and/or any chemical reactions to take place. The water passes through the fine slotted laterals and clean water comes back up through the centre riser pipe and out the bottom port to its end point.

2. Backwashing:

The flow of water is in reverse direction to the water flow during the standard filtering operation in order to flush out the foreign matter or debris from the filter media bed. The water enters through **the bottom port** and is evenly distributed by the under-drain assembly up through the media bed, lifting and agitating the media to release the foreign matter or debris. The water exits through the top port of the filter and is directed to drain.

It is advisable to view the backwash water and stop backwashing the filter once the water runs clear. **In some applications the use of a clear piece of PVC pipe in the drain line or a sight glass in the drain line is helpful in operating the backwash procedure.**

Rinsing or Flushing:

The water enters the filter through the top port and is directed down through the filter media bed to the under drain assembly-up the centre stem (pipe) and out through the bottom port and direct to drain.

This process settles the filter media bed into place and flushes any remaining foreign matter or debris out of the filter.

Waste:

There may be occasions when it is necessary to by-pass the filter and send the water to waste. If an application requires the periodic draining of a system or dilution of the water to be filtered with better quality water then valving should be set up which permits the water to bypass the filter and go to drain.

PLEASE NOTE:

The manual operation of the valve system (i.e. filter mode selection) is to be done with the pump switched off to prevent water hammer in the filter system, which can reduce system operating life.

Whether using a Multi-Port Valve or Independent Valving:

Connect all plumbing to the valve taking care **that all joints are glued or tightened** securely to prevent leaking. If using solvents please ensure you do not excessively apply to fittings as this could run into o- rings and create sealing problems.

Allow 24 hours for glue (solvent) to set before starting the filter.

Your filter is now ready for operation. **Please refer to (operation) section.**

STANDARD OPERATION



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OPERATION:

A. Start up of Waterco Filter.

1. Ensure pump has water prime (if necessary).
2. Perform rinse and/or backwash as detailed.
3. Note pressure gauge reading.

B. Regular Operation.

1. General

If Multi-port valve is used: Set multi port valve to the FILTER position and start pump (if used).

If Independent valving is used: set valves to filter mode and start the pumps

The system is now set for normal operation.

2. Automatic periodic operation - This is achieved by using a time clock to turn Pump on and off at the selected times. The system now operates automatically.
3. Filter Pressure Rise – Note the pressure gauge reading of the clean filter.
The pressure will vary according to the plumbing, pump size, mains flow size etc.

C. Backwash operation. (As a rule of thumb; backwashing is required when the filter pressure rises by 50 kPa (7.3psi) above the starting pressure of the clean filter.)

WATER ONLY BACKWASHING:

1. With pump switched off (water supply off)

If a Multi-port valve is used; place multi port valve to the BACKWASH position.

If Independent valving is used set valves so that water enters the bottom port of the filter and returns to drain from the top port (ensure there is sufficient flow rate to lift the filter bed and proper backwash the media).

2. Turn water flow on and run until water becomes clear at the viewing sight glass, or if there is no viewing glass, as with Independent valving, view the water as it enters the drain or view the water through the clear PVC pipe or sight glass in a section of the drainpipe.
3. Turn off water flow and set the valve or valves to the RINSE position.
 - If Independent valves are used the water should enter the top port of the filter and exit from the bottom port going to drain.
4. Run for approximately 10 seconds.

5. Turn off water flow/pump.

If a Multi-port valve is used reset M.P.V. to the FILTER position

If Independent valving is used set the valves to redirect water through the top filter port and filtered water out of the bottom filter port

Restart water flow for normal operation.

AIR/WATER COMBINED BACKWASHING:

1. With pump switched off (water supply off)

If a Multi-port valve is used; place multi port valve to the Backwash position.

If Independent valving is used set valves so that water enters the bottom port of the filter and returns to drain from the top port (ensure there is sufficient flow rate to lift the filter bed and properly backwash the media).

2. Check to make sure the air relief valve is not blocked.

3. Turn water flow on and run for about 10-20 seconds then GRADUALLY turn on the air valve, making certain that the filter tank does not over pressurise, and run the air/water combination until water becomes clear at the viewing sight glass, or if there is no viewing glass, as with Independent valving, view the water as it enters the drain or view the water through the clear PVC pipe or sight glass in a section of the drainpipe.

4. Gradually turn off air flow and allow water to continue for 10-20 seconds then turn off water flow and set the valve or valves to the RINSE position.

If Independent valves are used the water should enter the top port of the filter and exit from the bottom port going to drain.

5. Run for approximately 10 seconds.

6. Turn off water flow/pump.

If a Multi-port valve is used reset M.P.V. to the FILTER position

If Independent valving is used set the valves to redirect water through the top filter port and filtered water out of the bottom filter port

Restart water flow for normal operation.

MAINTENANCE



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Maintenance:

The Waterco Micron Filters are designed, manufactured, and tested to operate faithfully for extended periods of time without maintenance.

The filter media will only require changing if it has reached the limits of its designated life.

The only requirements to ensure the maximum life of the selected media are as follows.

1. Backwash the filter at the required period of time, refer to your pressure gauge.
2. Refer to the specs of the media used and implement regeneration procedures accordingly.
3. Maintain the water in good chemical balance (if used for pool or spa, or industrial applications where water chemistry is critical) Mains water and rural water supplies need to be monitored. Saturation (life) in mains water or bore (rural) will vary depending on water quality.
4. Keep all pre – filters equipment clean to maintain good water flow.
5. Replace pressure gauge if faulty readings are observed.
6. Filter water regularly.
7. Maintain a sound – regular maintenance regime.

TROUBLE SHOOTING:

If a Multi-port Valve or Independent valving is used.

- Above normal or excessive force to operate the M.P.V. or Independent valves can indicate scoring or jamming with foreign matter or debris.
- If this condition persists after rinsing, disassemble the valve to clear, refer maintenance below. Continued operation of the valve may result in a non-sealing condition (where Multi-port valve are concerned damage to spider gasket). This will give water loss to the backwash line or to inefficient filtering.

Insufficient Filtration:

1. Insufficient filtration time.
2. Heavy contaminants or dirt load.
3. Dirty filter- requires backwashing.
4. Air leaking on suction (influent line).
5. Pump impeller vanes blocked.
6. Insufficient water supply (water level low, blockage).
7. Pump not primed.
8. Incorrect water chemistry.
9. Excessive flow of water for filter size. Foreign matter or debris forced through filter media bed into under drain.
10. Other restrictions including resistance from other inline equipment such as strainers. Operating the filter on re-circulate will determine if the restriction is in the filter.
11. Clogged or channelled filter media. Perform backwash or regeneration.

Disassembly (replacing filter media and or under-drains)

Whilst disassembly of the filter or valve is unlikely to be required the following is relevant.

Ensure that the pump or water supply is turned off and all valves are in the off position.

1. Removal filter media can be done with the use of a **slurry pump, which will suck out the fluidised media.** Remove the top manhole cover and ensure that there is sufficient water to fluidise the filter media so the slurry pump can be used taking care not to break the laterals while the last portion of filter media is being removed.
2. Under drain laterals unscrew from the manifold in sections to allow for removal and replacement.

If a Multi port valve is used it is removed in the reverse order to installation.

1. Unscrew from the body of the filter and lift away. Ensure that all plumbing is Disconnected
2. Lift off the top of valve for inspection.
3. Grease and change components if required.
4. You can drive handle pin out of handle to remove spring.

Re-Assembly:

1. Under drain stem and manifold can be replaced whilst in the filter.
2. Replace the media. Refer to adding media section.
3. Open valves after completed.

Multi - port valves (if one is used).

1. Re-assemble in reverse order of above.
2. Replace components as necessary.
3. Lightly lubricate all o-rings and seals to ensure smooth easy fit.
4. Do not over tighten screws.