

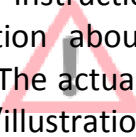
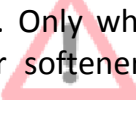
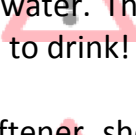


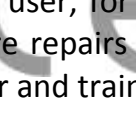

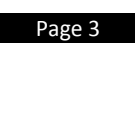
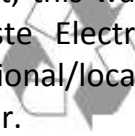
Technical Manual
WATER SOFTENER



TABLE OF CONTENT

| | |
|--|---------|
| Table of content | Page 2 |
| Warning & Safety instructions | Page 3 |
| Operating conditions & Requirements | Page 4 |
| Installation | Page 5 |
| Start-up | Page 6 |
| Electronic control panel | Page 7 |
| Maintenance | Page 11 |
| Hydraulic flow diagrams - Eco..... | Page 12 |
| Hydraulic flow diagrams - Eco ⁺ | Page 13 |
| Troubleshooting..... | Page 14 |
| Electrical wiring diagrams | Page 16 |
| Default parameter settings | Page 17 |
| Exploded view - Slimline 11L, 14L | Page 18 |
| Exploded view - Slimline 17L, 24L, 30L | Page 20 |
| Exploded view - Valve body assembly - Eco | Page 22 |
| Exploded view - Valve body assembly - Eco ⁺ | Page 24 |
| Exploded view - Valve body assembly | Page 26 |
| Technical data - Eco | Page 27 |
| Technical data - Eco ⁺ | Page 28 |

WARNING & SAFETY INSTRUCTIONS

- Before you begin the installation of the water softener, we advise you read and carefully follow the instructions contained in this manual. It contains important information about safety, installation, use and maintenance of the product. The actual system that you have received, may differ from the pictures/illustrations/descriptions in this Technical Manual. 
- Failure to follow the instructions could cause personal injury or damage to the appliance or property. Only when installed, commissioned and serviced correctly, the water softener will offer you many years of trouble-free operation. 
- The water softener is intended to 'soften' the water, meaning it will remove hardness minerals; it will not necessarily remove other contaminants present in the water. The water softener will not purify polluted water or make it safe to drink! 
- Installation of the water softener should only be undertaken by a competent person, aware of the local codes in force. All plumbing and electrical connections must be done in accordance with local codes. 
- Before setting up the water softener, make sure to check it for any externally visible damage; do not install or use when damaged. 
- Use a hand truck to transport the water softener. To prevent accident or injury, do not hoist the water softener over your shoulder. Do not lay the water softener on its side. 
- Keep this Technical Manual in a safe place and ensure that new users are familiar with the content. 
- The water softener is designed and manufactured in accordance with current safety requirements and regulations. Incorrect repairs can result in unforeseen danger for the user, for which the manufacturer cannot be held responsible. Therefore repairs should only be undertaken by a competent technician, familiar and trained for this product. 
- In respect of the environment, this water softener should be disposed of in accordance with Waste Electrical and Electronic Equipment requirements. Refer to national/local laws and codes for correct recycling of this water softener. 

OPERATING CONDITIONS & REQUIREMENTS

- **OPERATING PRESSURE: min. 1,4 / max. 8,3 bar**
 - this system is configured to perform optimally at an operating pressure of 3 bar ($\pm\frac{1}{2}$ bar); in case of a lower or higher operating pressure the performance may be affected negatively!
 - check water pressure regularly.
 - take into account that night time water pressure may be considerably higher than day time water pressure.
 - install a pressure reducer ahead of the water softener if necessary.

- **OPERATING TEMPERATURE: min. 2 / max. 48 °C**
 - do not install the water softener in an environment where high ambient temperatures (e.g. unvented boiler house) or freezing temperatures can occur.
 - the water softener cannot be exposed to outdoor elements, such as direct sunlight or atmospheric precipitation.
 - do not install the water softener too close to a water heater; keep at least 3 m of piping between the outlet of the water softener and the inlet of the water heater; water heaters can sometimes transmit heat back down the cold pipe into the control valve; always install a check valve at the outlet of the water softener.

- **ELECTRICAL CONNECTION: 230V-50Hz**
 - this water softener only works on 24VAC; it is equipped with a 230/24V-50Hz transformer; always use it in combination with the supplied transformer.
 - make sure to plug the transformer into a power outlet, which is installed in a dry location, with the proper rating and over-current protection.

INSTALLATION

Picture 1&10

To facilitate the installation, you may want to remove the salt lid and main cover from the water softener.

INLET & OUTLET

Check the water pressure at the place of installation of the water softener; it should never exceed 8,3 bar.

In case of high concentration of impurities in the inlet water, we recommend the installation of a sediment filter, ahead of the water softener.

We strongly recommend the use of flexible hoses to connect the water softener to the water distribution system; use hoses with a large diameter in order to limit the pressure loss.

If the water softener is not equipped with the factory bypass (optional), we strongly recommend to install a 3-valve bypass system (not included with this product!) to isolate the water softener from the water distribution system in case of repairs. It allows to turn off the water to the water softener, while maintaining (untreated) water supply to the user.

WITH FACTORY BYPASS (optional)

Picture 2

- ❶ = mains water supply (untreated water)
- ❷ = inlet of water softener (untreated water)
- ❸ = outlet of water softener (treated water)
- ❹ = house/application (treated water)

1. Screw the factory bypass onto the elbow connections of the water softener (❷&❸); make sure to install the gasket seals. Tighten the nuts firmly by hand.
2. Screw the connection kit with nuts onto the factory bypass (❶&❹); make sure to install the gasket seals. Tighten the nuts firmly by hand.
3. Connect the mains water supply to the adaptor on the inlet port of the factory bypass (❶).
4. Connect the house/application to the adaptor on the outlet port of the factory bypass (❹).

WITH 3-VALVE BYPASS SYSTEM (not included)

Picture 3

- ❶ = mains water supply (untreated water)
- ❷ = inlet of water softener (untreated water)
- ❸ = outlet of water softener (treated water)
- ❹ = house/application (treated water)

1. Install the 3-valve bypass system.
2. Screw the connection kit with nuts onto the elbow connections of the water softener (❷&❸); make sure to install the gasket seals. Tighten the nuts firmly by hand.
3. Connect the 3-valve bypass system to the adaptors on the in (❷) and out (❸) elbow connections.
4. Connect the mains water supply to the inlet of the 3-valve bypass system (❶).
5. Connect the house/application to the outlet of the 3-valve bypass system (❹).

DRAIN

- We recommend the use of a stand pipe with air trap.
- To prevent backflow from the sewerage system into the water softener, always make sure to have an air gap between the end of the drain hose and the sewerage system itself; as a rule of thumb, the air gap should be minimum 2x the diameter of the drain hose.
- Always use separate drain hoses for the control valve (evacuation of rinse water) and the softener cabinet's overflow.
- Lay-out the drain hoses in such a way that pressure loss is minimized; avoid kinks and unnecessary elevations.
- Make sure that the sewerage system is suitable for the rinse water flow rate of the water softener.

Picture 4

1. Connect a 13 mm hose to the drain solenoid of the control valve (❶); secure it by means of a clamp.
2. Run the drain hose to the sewerage system and connect it to the stand pipe assuring sufficient air gap. This drain line operates under pressure, so it may be installed higher than the water softener.
3. Connect a 13 mm hose to the cabinet overflow elbow, located at the back side of the water softener; secure it by means of a clamp.
4. Run the drain hose to the sewerage system and connect it to the stand pipe assuring sufficient air gap. This drain line does NOT operate under pressure, so it may NOT be installed higher than the water softener.

ELECTRICAL

Picture 5

1. Plug the transformers output lead into the socket on the water softeners power cord; secure it by means of the TwistLock clamp.
2. Plug the transformer into an electrical outlet.

START-UP

PRESSURIZING

1. Make sure the bypass system is in 'bypass' position.
2. Make sure the electronic controller of the water softener is in service mode.
3. Open the mains water supply.
4. Open a cold treated water faucet nearby the water softener and let the water run for a few minutes until all air is purged and all foreign material that may have resulted from the installation is washed out; close the tap.
5. Gently pressurize the water softener, by putting it into service:
 - *factory bypass:*
 1. open the 'outlet' valve;
 2. slowly open the 'inlet' valve.
 - *3-valve bypass:*
 1. close the 'bypass' valve;
 2. open the 'outlet' valve;
 3. slowly open the 'inlet' valve.
6. After 2-3 minutes, open a cold treated water faucet nearby the water softener and let the water run for a few minutes until all air is purged from the installation and the resin bed is rinsed (it is normal for the rinse water to show some discoloration!); close the tap.
7. Check the water softener and all hydraulic connections for leaks.

After the first regenerations of the water softener, some slight discoloration of the treated water might occur. This is totally harmless and will disappear rapidly!

BRINE CABINET

8. Add water conditioner salt to the brine cabinet.

ELECTRONIC CONTROL PANEL


9. Program the electronic controller.

ADJUSTMENT RESIDUAL HARDNESS WITH FACTORY BYPASS (optional)

Picture 6

10. Adjust the residual hardness of the water that leaves the softener, by means of the adjusting screw, incorporated in the 'outlet' valve of the factory bypass:
 - to raise the residual hardness: turn the screw counter clockwise; usually 1 turn corresponds to a residual hardness of ± 4 °f (± 2 °d), 2 turns to ± 8 °f (± 4 °d).
 - to reduce the residual hardness: turn the screw clockwise.

PERFORM REGENERATION




11. Manually initiate a regeneration, by pressing the **scroll**  button repeatedly until the display shows:

Regen in 10 sec

12. Leave the water softener in this position; the countdown timer will countdown to 0 sec and start a regeneration.

ELECTRONIC CONTROL PANEL

 **Picture 7**

| symbol | button | function |
|---|--------|--|
|  | SCROLL | to advance to the next parameter |
|  | UP | to increase the value of the parameter |
|  | DOWN | to decrease the value of the parameter |

POWER-UP

After power-up, the display will show the installed software version for 5 seconds, f.e.:

EZ3P5e EZ3PB r11

Afterwards it will automatically revert back to the service display.

POWER FAILURE

In the event of a power failure, the program will remain stored in the NOVRAM® during an undefined period, while an incorporated SuperCap (capacitor) will maintain the correct time of day during a period of several hours; consequently, in case of prolonged power failure, the time of day might not be maintained; if this happens, the time of day will be reset to 8:00 when the power supply is re-established, while the indication will *flash*, indicating that the time of day needs to be set.

8:00 1000L -

When the power failure occurs during the execution of an automatic regeneration, the control valve will immediately return to the service position; when the power supply is re-established, the control valve will stay in the service position for 60 sec. and restart a complete regeneration from the beginning.

TIMER FAILURE

In the event of a timer failure, the display will show the message:

Service Required

In such case, entering one of the programming levels can possibly solve the problem. However if the problem persists, professional service is required.

SERVICE MODE

In **service mode** the display shows the time of day, the remaining capacity and the water usage indicator:

20:51 1000L -


REGENERATION MODE

In **regeneration mode** the display shows the actual regeneration cycle and, where relevant, the total remaining regeneration time and remaining cycle time:

BRINE FILL

REGEN PENDING

Rgn:XXX CycY:ZZZ


*The control valve can be **reset to service mode** at any time by pressing the **scroll**  button, as such manually advancing it through the regeneration cycles.*

CHECKING THE FLOW METER



In case of water usage, the remaining capacity counter in the service display will count back per unit, i.e. per litre. This way the correct functioning of the water meter can be verified.

MANUAL REGENERATION

It is possible to manually initiate a regeneration.

1. Press the **scroll**  button repeatedly until the display shows:


Regen in 10 sec

- If the control valve is left in this position, the countdown timer will countdown to 0 sec and *start a regeneration.*
 - To cancel this mode, press the **scroll**  button before the countdown timer has reached 0 sec; the control valve will return to the service mode.
2. Press the **scroll**  button again if you want to manually advance the control valve to the next regeneration cycle.



ELECTRONIC CONTROL PANEL


PROGRAMMING INSTRUCTIONS - INSTALLER

Before entering the programming mode, make sure that the control valve is in the service mode.

1. Press the **scroll**  button; the display will show:


Language : English

- Press the **up**  or **down**  button to set the language.



2. Press the **scroll**  button again; the display will show:

Set time: 20:51

- Press the **up**  or **down**  button to set the time of day.

3. Press the **scroll**  button again; the display will show:

Set hardn.: XX°f

- Press the **up**  or **down**  button to set the hardness of the incoming untreated water.

ELECTRONIC CONTROL PANEL

PROGRAMMING INSTRUCTIONS - PARAMETER SET LEVEL

☑ All configuration parameters on this water softener have been pre-programmed in the factory, to offer optimal performance in a wide range of applications and situations. See table at the end of this manual for default factory parameter settings. Nevertheless it may be necessary or desirable to change any of these parameters, to further optimize the water softeners performance or to adapt it to the specific requirements of the installation.

☑ Before entering the programming mode, make sure that the control valve is in the service mode.

1. Press the **scroll** ⏪ button and hold it for 5 sec until the display shows:

System Check

2. Within 10 sec, press the **up** ⬆ button; the display will show:

HardUnit: °f

- Press the **up** ⬆ or **down** ⬇ button to set the hardness unit. **Make sure to also adjust/convert the exchange capacity!**

3. Press the **scroll** ⏪ button again; the display will show:

ExCap: 5.1 °f M3/L

- Press the **up** ⬆ or **down** ⬇ button to set the exchange capacity per litre of resin.

4. Press the **scroll** ⏪ button again; the display will show:

Resin:XXX liters

- Press the **up** ⬆ or **down** ⬇ button to set the volume of resin.

5. Press the **scroll** ⏪ button again; the display will show:

Override:10 days

- Press the **up** ⬆ or **down** ⬇ button to set the number of days between regenerations.

6. Press the **scroll** ⏪ button again; the display will show:

Cycle 1: XXX sec

- Press the **up** ⬆ or **down** ⬇ button to set the length of the regeneration cycle.
- Press the **scroll** ⏪ button again to advance to the next regeneration cycle.

| | Eco | Eco ⁺ |
|-----------------------|---------|------------------|
| Refill | Cycle 1 | Cycle 1 |
| Brine preparation | Cycle 2 | Cycle 2 |
| Backwash | / | Cycle 3 |
| Brine draw/slow rinse | Cycle 3 | Cycle 4 |
| Fast rinse | / | Cycle 5 |

7. Press the **scroll** ⏪ button again; the display will show:

MTR: SNAP SENSOR

- Press the **up** ⬆ or **down** ⬇ button to set the type of water meter sensor.

8. Press the **scroll** ⏪ button again; the display will show:

Regen: Dlyd/Immd

- Press the **up** ⬆ or **down** ⬇ button to set the regeneration mode:
 - **Dlyd/Immd**: when the remaining capacity equals the reserve capacity, a *delayed regeneration* is started at the programmed time of regeneration; however when the remaining capacity equals 0 before the programmed time of regeneration is reached, an *immediate regeneration* is started.
 - **Immediate**: when the remaining capacity equals 0, an *immediate regeneration* is started.
 - **Delayed**: when the remaining capacity equals the reserve capacity, a *delayed regeneration* is started.

9. Press the **scroll** ⏪ button again; the display will show (only when the regeneration mode was set to 'Delayed' or 'Dlyd/Immd'):

Regen @ 2:00

- Press the **up** ⬆ or **down** ⬇ button to set the time of regeneration.

10. Press the **scroll** ⏪ button again; the display will show (only when the regeneration mode was set to 'Dlyd' or 'Dlyd/Immd'):

Rsrv Variable

- Press the **up** ⬆ or **down** ⬇ button to set the reserve capacity:
 - **Variable**: the reserve capacity is calculated automatically, based on the registered daily water usage.
 - **Fxd**: press the **scroll** ⏪ button again and press the **up** ⬆ or **down** ⬇ button to set the reserve capacity to a fixed amount.

11. Press the **scroll** ⏪ button again; the display will show:

Exit

- Press the **up** ⬆ or **down** ⬇ button to save the program into the NOVRAM® and exit the programming level.


ELECTRONIC CONTROL PANEL

DIAGNOSTICS LEVEL


Besides of all programming parameters, a series of operating parameters can be consulted in the diagnostics level; particularly during a service intervention, these parameters can be helpful to identify the cause of a problem or malfunction

Before entering the programming mode, make sure that the control valve is in the service mode.


Accessing the Diagnostics level

1. Press the **scroll**  button and hold it for 5 sec until the display shows:

System Check

2. Within 10 sec, press the **down**  button; the display will show:

Regen XXdays ago


- You are now in the Diagnostics level.
- Press the **scroll**  button to advance to the next diagnostics parameter.

Available diagnostics parameters



- **Regen X days ago**: display shows number of days since last regeneration of the system.
- **In Srvc**: display shows total number of days that the system is in service.
- **# of Regens**: display shows the total number of regenerations that have taken place since installation.
- **TotVol**: display shows the total water usage through the system since installation.
- **LastRgn@**: display shows the water usage at the moment of the last regeneration.
- **InstFlow**: display shows the instantaneous flow rate.
- **AvgVol**: display shows the average daily water usage.
- **Capacity**: display shows the calculated volume of softened water between regenerations.
- **Hardness**: display shows the setting of the water hardness.
- **Rsrv**: display shows the setting of the reserve capacity.
- **Regen @**: display shows the setting of the time of regeneration.
- **Override**: display shows the setting of the number of days between regenerations.
- **Cycle X**: display shows the setting of the length of the corresponding regeneration cycle.
- **Units**: display shows that control is programmed for Metric units.
- **MTR**: display shows the setting of the water meter.
- **Capacity**: display shows that control is programmed for hardness setting.
- **Regen**: display shows the setting of the regeneration mode.
- **Valve Type**: display shows the valve type setting.
- **MP Resets**: display shows the number of resets of the microprocessor (for factory purpose only).
- **Memory Reset**: display shows the number of corrupt memory start-ups (for factory purpose only).

- **EZ3P5e EZ3PB r11**: display shows the software version (for factory purpose only).
- **CapToUse**: display shows the remaining capacity.
- **Fill**: display shows the refill time used for the previous regeneration.
- **Reserve**: display shows the calculated reserve capacity.

Exiting the Diagnostics level

1. If no button is pressed within 5 minutes, the microprocessor will exit the diagnostics level and return to the service mode.
2. Press the **scroll**  button repeatedly until the display shows:

Exit

- Press the **up**  or **down**  button to exit the diagnostics level.

MAINTENANCE

ROUTINE CHECKS

Regularly the user should perform a basic check to verify if the water softener is functioning correctly, on the basis of the following control points:

1. Check settings of electronic control panel.
2. Measure water hardness before/after water softener.
3. Check drain line from control valve; there shouldn't be any water flow (unless water softener is in regeneration).
4. Check drain line from cabinet overflow; there shouldn't be any water flow.
5. Check water softener and surrounding area; there shouldn't be any water leakages.

BYPASSING THE WATER SOFTENER

Occasionally it may be necessary to put the water softener hydraulically in bypass, i.e. to isolate it from the water distribution system; f.e.:

- in case of an urgent technical problem;
- when it is not necessary to supply treated water to the house/application (refill swimming pool, irrigation,...).

WITH FACTORY BYPASS (optional)

Picture 8.a

SERVICE POSITION

- ❶ = inlet valve to water softener is OPEN
- ❷ = outlet valve from water softener is OPEN

Picture 8.b

BYPASS POSITION

- ❶ = inlet valve to water softener is CLOSED
- ❷ = outlet valve from water softener is CLOSED

Picture 8.c

MAINTENANCE POSITION

- ❶ = inlet valve to water softener is OPEN
- ❷ = outlet valve from water softener is CLOSED

WITH 3-VALVE BYPASS SYSTEM (not included)

Picture 9.a

SERVICE POSITION

- ❶ = bypass valve is CLOSED
- ❷ = inlet valve to water softener is OPEN
- ❸ = outlet valve from water softener is OPEN

Picture 9.b

BYPASS POSITION

- ❶ = bypass valve is OPEN
- ❷ = inlet valve to water softener is CLOSED
- ❸ = outlet valve from water softener is CLOSED

Picture 9.c

MAINTENANCE POSITION

- ❶ = bypass valve is OPEN
- ❷ = inlet valve to water softener is OPEN
- ❸ = outlet valve from water softener is CLOSED

WATER CONDITIONER SALT

Picture 10

The water softener needs 'brine' for its periodic regenerations. This brine solution is made from water, that is automatically dosed in the brine cabinet by the control valve, and water conditioner salt. The user should make sure that the brine cabinet is always kept full of water conditioner salt. Therefore he should periodically check the salt level inside the brine cabinet and refill it if necessary. The salt lid can be removed completely to facilitate refilling.

Ideally the level of water conditioner salt inside the brine cabinet is kept between 1/3 and 2/3. A lower level of water conditioner salt can cause insufficient brine saturation, resulting in a loss of softening capacity. A higher level of water conditioner salt can cause salt bridging (hard crust or salt bridges in the brine cabinet). When you suspect salt bridging:

- carefully pound on the outside of the brine cabinet to break loose the salt bridges;
- using a broom (or like blunt tool) carefully push the salt to break it apart;
- pour warm water over the top of the salt to dissolve it.

BRINE CABINET

To retain the appearance of the water softener, simply wipe it with a damp cloth or clean it with a mild soap solution; never use abrasive cleaners, ammonia or solvents.

RESIN CLEANER

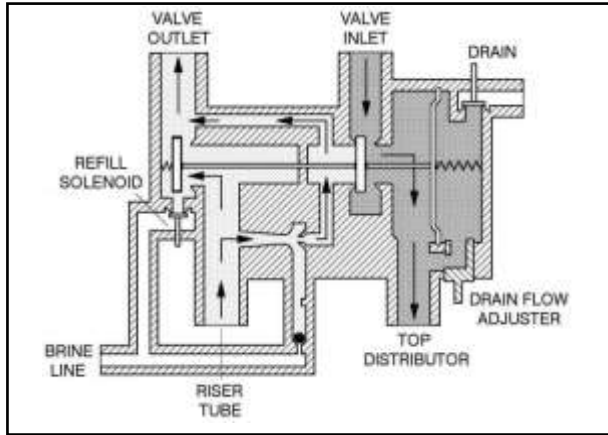
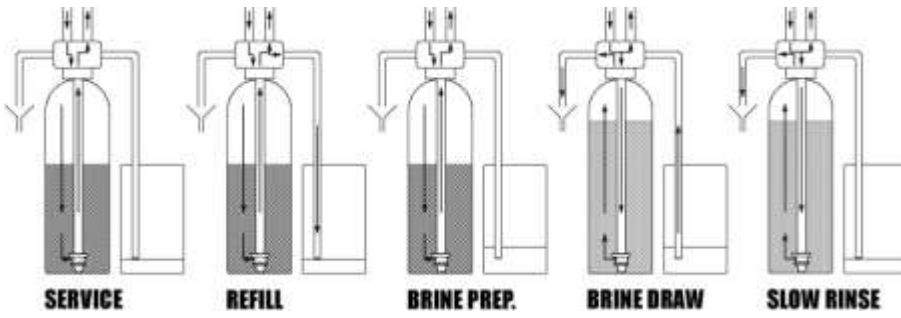
Other contaminants (f.e. iron) present in the feed water can cause the resin bed to foul up, resulting in a loss of softening capacity. An approved resin cleaner can be used periodically to thoroughly clean the resin bed.

SANITIZING THE WATER SOFTENER

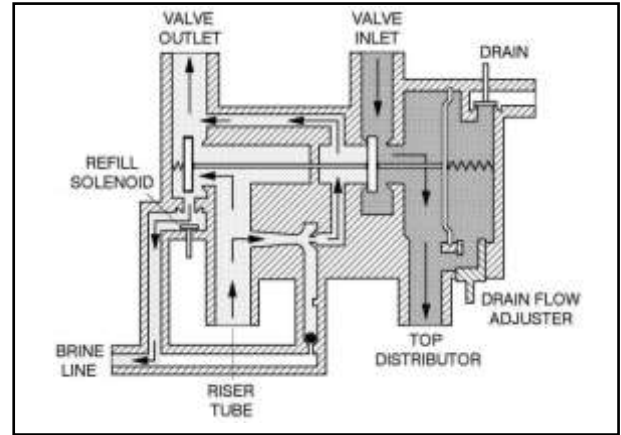
This water softener is manufactured from premium quality material and assembled in safe conditions to assure it is clean and sanitary. If installed and serviced correctly, this water softener will not infect or contaminate your water supply. However, as in any 'device' plumbed-in in your water distribution system, a proliferation of bacteria is possible, especially in case of 'stagnant water'. Therefore this water softener is equipped with a 'days override' feature, that will automatically rinse the resin bed periodically, even in case of low or absence of water usage.

If the power supply to the water softener is disconnected for a longer period of time, we recommend, when the power supply is re-established, to manually initiate a complete regeneration.

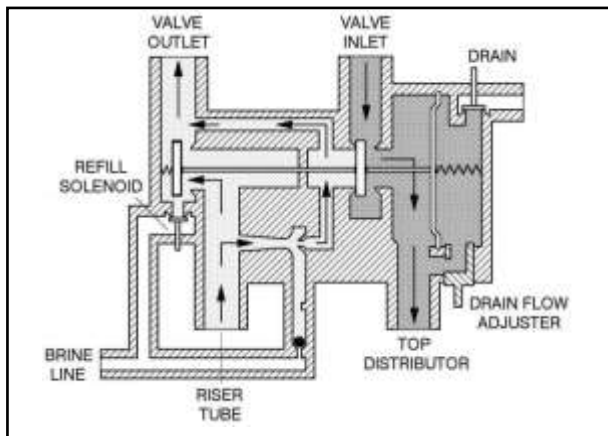
HYDRAULIC FLOW DIAGRAMS - ECO



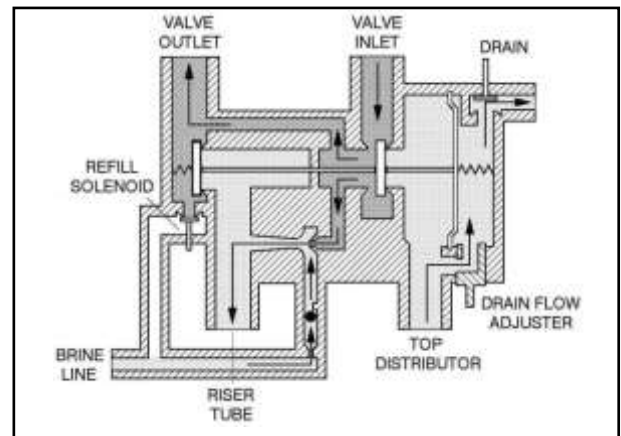
SERVICE



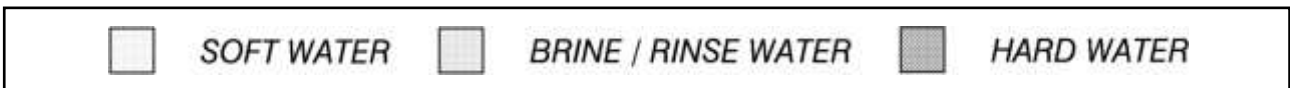
REFILL



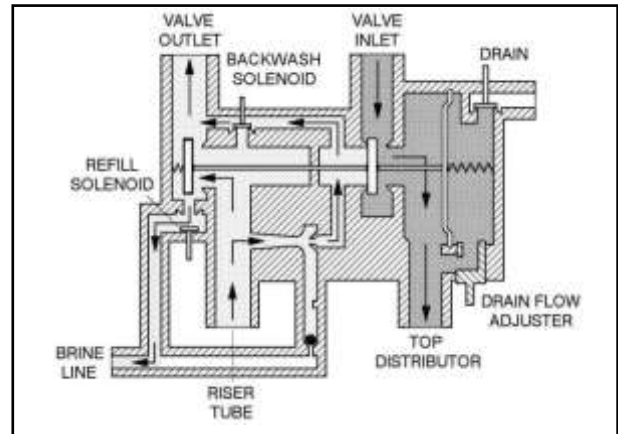
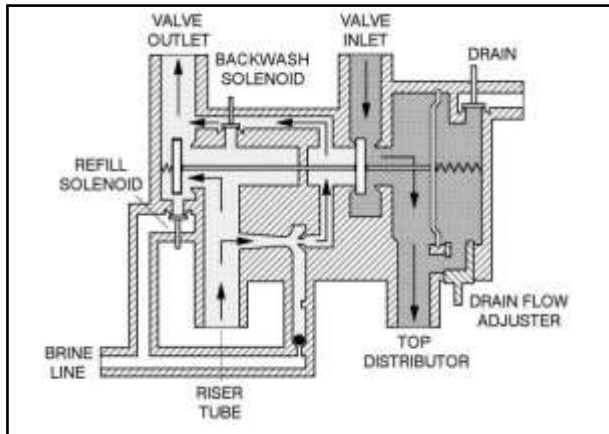
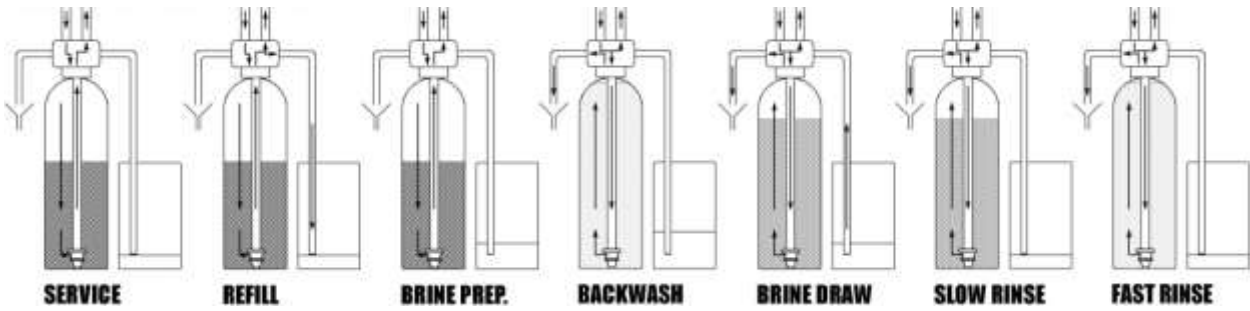
BRINE PREPARATION



BRINE DRAW / SLOW RINSE

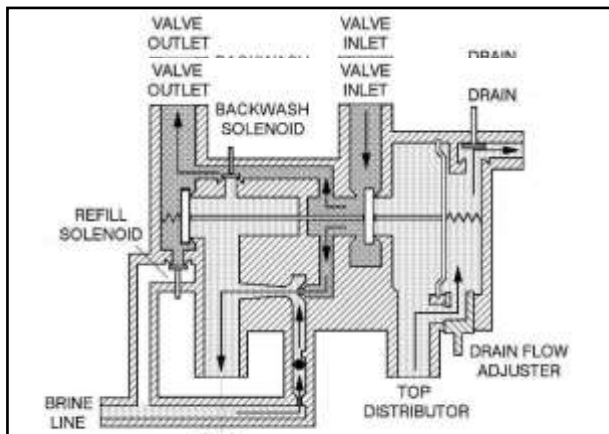


HYDRAULIC FLOW DIAGRAMS - ECO⁺

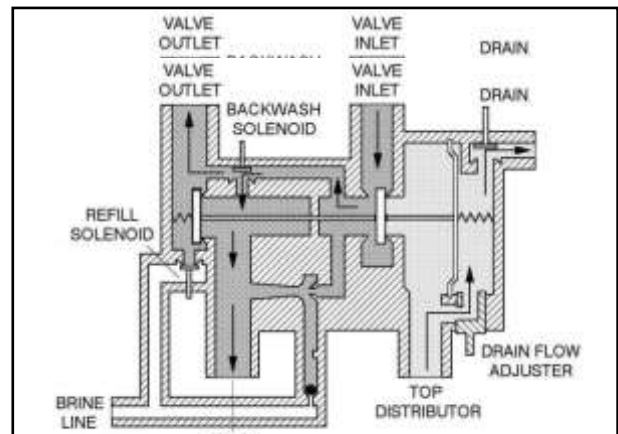


SERVICE

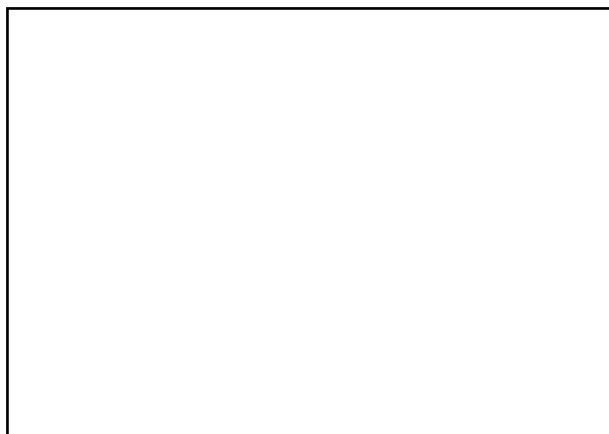
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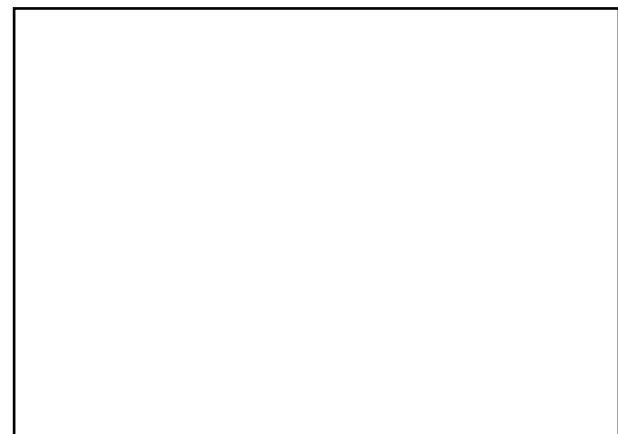
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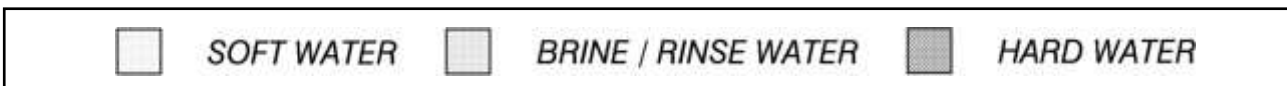
BA



BRINE DRAW / SLOW RINSE



FAST RINSE



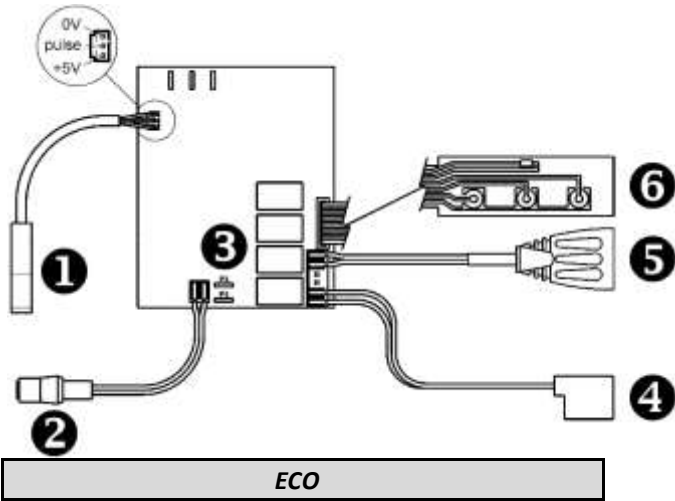
TROUBLESHOOTING

| PROBLEM | CAUSE | SOLUTION |
|--|---|--|
| Hard (untreated) water to service | Open or defective bypass | Close or replace bypass |
| | Water softener in regeneration | Wait until regeneration finishes or manually advance regeneration to end |
| | No salt in brine cabinet | Add salt and initiate regeneration manually |
| | Salt bridging | Break salt bridge(s) and initiate regeneration manually |
| | Change in raw water hardness | Measure the hardness of the incoming untreated water and adjust programming accordingly |
| | Water softener fails to start a regeneration | Refer to problem "Water softener fails to start a regeneration" |
| | Control valve fails to draw brine | Refer to problem "Valve fails to draw brine" |
| | Decreasing exchange capacity of resin | Clean or replace resin bed |
| | Loss of resin | Refer to problem "Loss of resin" |
| Leak at riser tube | Verify that riser tube is seated correctly and is not cracked | |
| Residual hardness in treated water | Bypass not completely closed | Close bypass |
| Water softener fails to start a regeneration | Faulty electrical supply | Verify electrical service (fuse, transformer,...) |
| | Defective flow meter | Clean and/or replace flow meter |
| | Defective PCB | Replace PCB |
| | Defective drain solenoid | Replace drain solenoid |
| | Body stem assembly switches continuously | Check operating pressure; must be higher than 1,4 bar |
| Water softener uses too much salt | Excessive water in brine cabinet | Refer to problem "Excessive water in brine cabinet" |
| | System regenerates too frequently | Verify program |
| Excessive water in brine cabinet | Control valve fails to draw brine | Refer to problem "Control valve fails to draw brine" |
| | Improper refill time setting | Verify that refill time corresponds to the proper salt level and amount of resin |
| | Missing refill flow control | Verify that refill flow control is installed and properly sized |
| | Leak from control valve to brine cabinet | Clean or replace plunger and solenoid diaphragm of refill solenoid |
| Salt taste in treated water | Excessive water in brine tank | Refer to problem "Excessive water in brine tank" |
| | Injector undersized | Verify injector selection |
| | Improper brine/slow rinse time setting | Verify that brine/slow rinse time corresponds to the proper salt level and amount of resin |
| Loss of water pressure | Mineral or iron build-up in resin tank | Clean resin bed and control valve; increase regeneration frequency |
| | Plugged lower and/or upper distributor | Verify that distributors are free of debris |
| | Crushed lower and/or upper distributor | Replace distributor(s) |
| Drain line from control valve flows continuously | Water softener in regeneration | Wait until regeneration finishes or manually advance regeneration to end |
| | Drain solenoid stuck in open position | Clean drain solenoid |
| | Defective PCB | Replace PCB |
| Drain line from brine cabinet overflow flows continuously | Excessive water in brine cabinet | Refer to problem "Excessive water in brine cabinet" |
| | Leak between control valve and pressure tank | Verify seal between control valve and pressure tank |
| Control valve fails to refill brine tank | Improper refill time setting | Verify that refill time corresponds to salt level and amount of resin |
| | Plugged refill flow control | Clean refill flow control |
| Loss of resin | Lower and/or upper distributor damaged | Replace distributor(s) |
| | Leak between riser tube and upper distributor | Verify that riser tube is seated correctly and is not cracked |

TROUBLESHOOTING

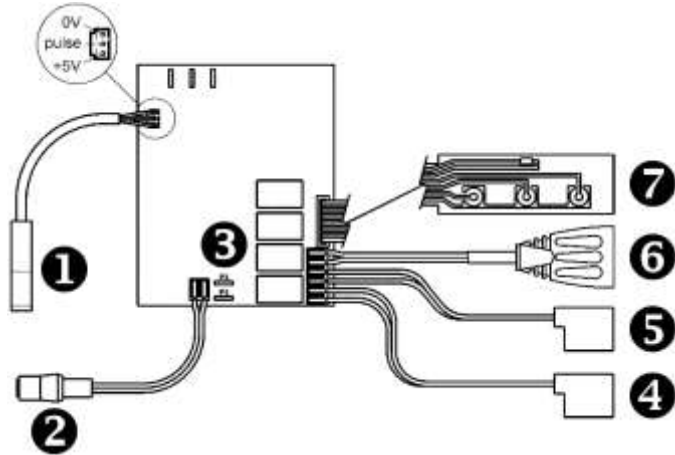
| PROBLEM | CAUSE | SOLUTION |
|-----------------------------------|--|---|
| Control valve fails to draw brine | Low operating pressure | Check operating pressure; must be higher than 1,4 bar |
| | Drain flow adjuster closed too much | Open drain flow adjuster slowly until unit draws brine |
| | Plugged injector and/or brine restrictor | Clean injector and/or brine restrictor |
| | Plugged injector filter | Clean injector filter |
| | Restricted drain line | Verify drain line for kinks or restrictions |
| | Restricted brine line | Verify brine line for kinks or restrictions |
| | Leak in brine line | Verify brine line and connections for air leakage |
| | No water in brine tank | Refer to problem "Control valve fails to refill brine tank" |
| | Backwash solenoid remains open | Verify solenoid membrane and plunger |

ELECTRICAL WIRING DIAGRAMS



- ❶ = flow meter
- ❷ = power lead
- ❸ = 24VAC auxilliary contact, closed during regeneration (max. 500mA)
- ❹ = refill solenoid (white)
- ❺ = drain solenoid
- ❻ = key pad

ECO⁺



- ❶ = flow meter
- ❷ = power lead
- ❸ = 24VAC auxilliary contact, closed during regeneration (max. 500mA)
- ❹ = refill solenoid (white)
- ❺ = backwash solenoid (black)
- ❻ = drain solenoid
- ❼ = key pad

DEFAULT PARAMETER SETTINGS

| Model | Eco | | | | |
|---|-----------|-----------|-----------|-----------|-----------|
| | 11 | 14 | 17 | 24 | 30 |
| Resin | | | | | |
| Hardness unit ⁽¹⁾ | °f | °f | °f | °f | °f |
| Exchange capacity per liter resin (°f M ³ /L) ^{(1) (2)} | 5,1 | 5,1 | 5,1 | 5,1 | 5,1 |
| Resin (liters) | 11 | 14 | 17 | 24 | 30 |
| Override (days) | 10 | 10 | 10 | 10 | 10 |
| Cycle 1: REFILL (sec) ⁽²⁾ | 242 | 308 | 374 | 528 | 660 |
| Cycle 2: BRINE PREPARATION (min) | 15 | 15 | 15 | 15 | 15 |
| Cycle 3: BRINE DRAW/SLOW RINSE (min) | 57 | 59 | 102 | 109 | 133 |
| MTR | SNAP | SNAP | SNAP | SNAP | SNAP |
| Regen | Dlyd/Immd | Dlyd/Immd | Dlyd/Immd | Dlyd/Immd | Dlyd/Immd |
| Regen @ | 2:00 | 2:00 | 2:00 | 2:00 | 2:00 |
| Rsrv | Variable | Variable | Variable | Variable | Variable |

(1) When the Hardness unit is changed, the Exchange capacity per liter resin needs to be adjusted accordingly; to convert from °f to °d, multiply x 0,56; 5,1 °f M³/L equals 2,9 °d M³/L.

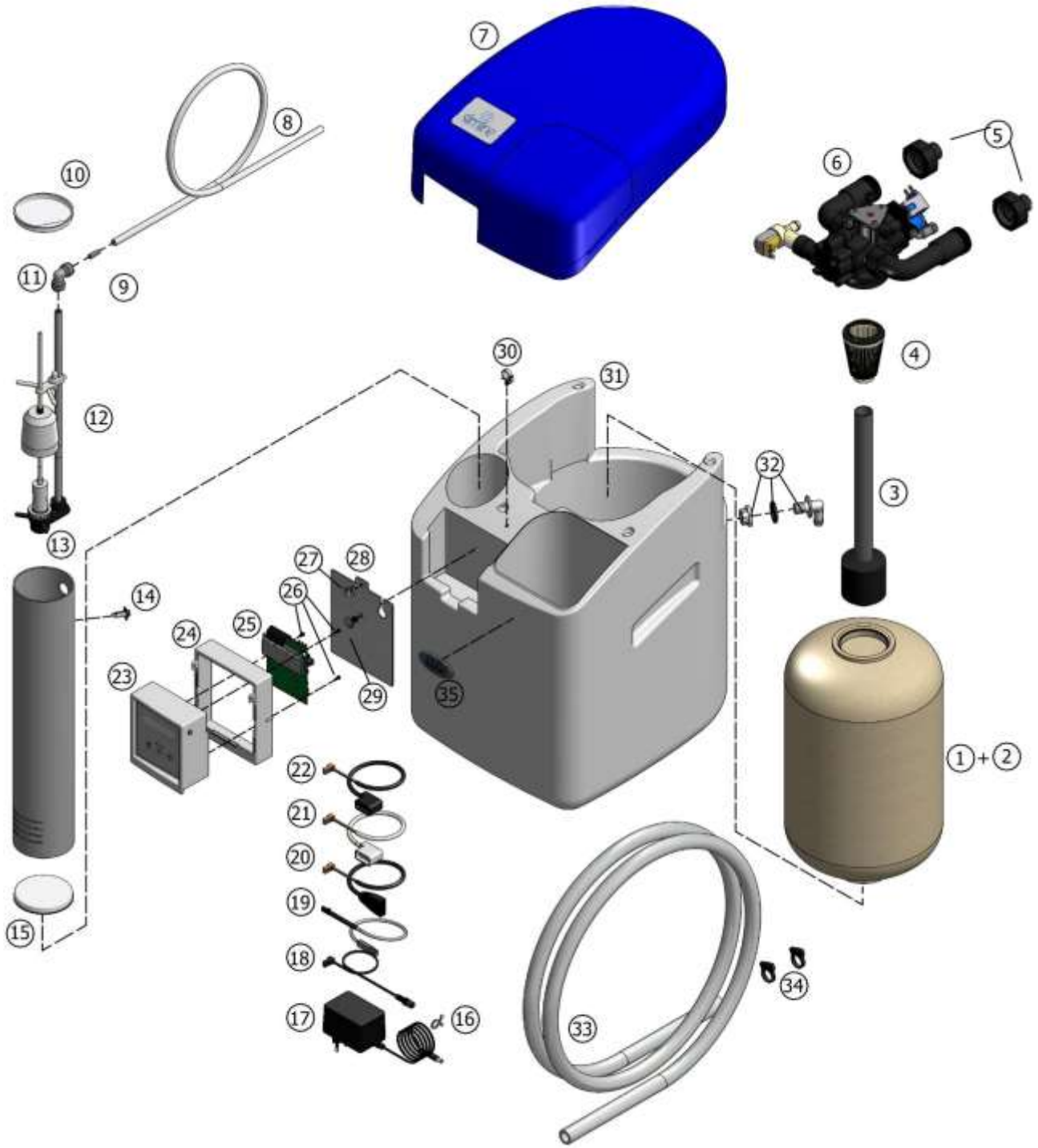
(2) When the Exchange capacity per liter resin is changed, the refill cycle time needs to be adjusted accordingly.

| Model | Eco ⁺ | | |
|---|------------------|-----------|-----------|
| | 11 | 17 | 24 |
| Resin | | | |
| Hardness unit ⁽¹⁾ | °f | °f | °f |
| Exchange capacity per liter resin (°f M ³ /L) ^{(1) (2)} | 5,1 | 5,1 | 5,1 |
| Resin (liters) | 11 | 17 | 24 |
| Override (days) | 10 | 10 | 10 |
| Cycle 1: REFILL (sec) ⁽²⁾ | 242 | 374 | 528 |
| Cycle 2: BRINE PREPARATION (min) | 15 | 15 | 15 |
| Cycle 3: BACKWASH (min) | 3 | 3 | 3 |
| Cycle 4: BRINE DRAW/SLOW RINSE (min) | 57 | 102 | 128 |
| Cycle 5: FAST RINSE (min) | 2 | 2 | 2 |
| MTR | SNAP | SNAP | SNAP |
| Regen | Dlyd/Immd | Dlyd/Immd | Dlyd/Immd |
| Regen @ | 2:00 | 2:00 | 2:00 |
| Rsrv | Variable | Variable | Variable |

(1) When the Hardness unit is changed, the Exchange capacity per liter resin needs to be adjusted accordingly; to convert from °f to °d, multiply x 0,56; 5,1 °f M³/L equals 2,9 °d M³/L.

(2) When the Exchange capacity per liter resin is changed, the refill cycle time needs to be adjusted accordingly.

EXPLODED VIEW - SLIMLINE 11L, 14L

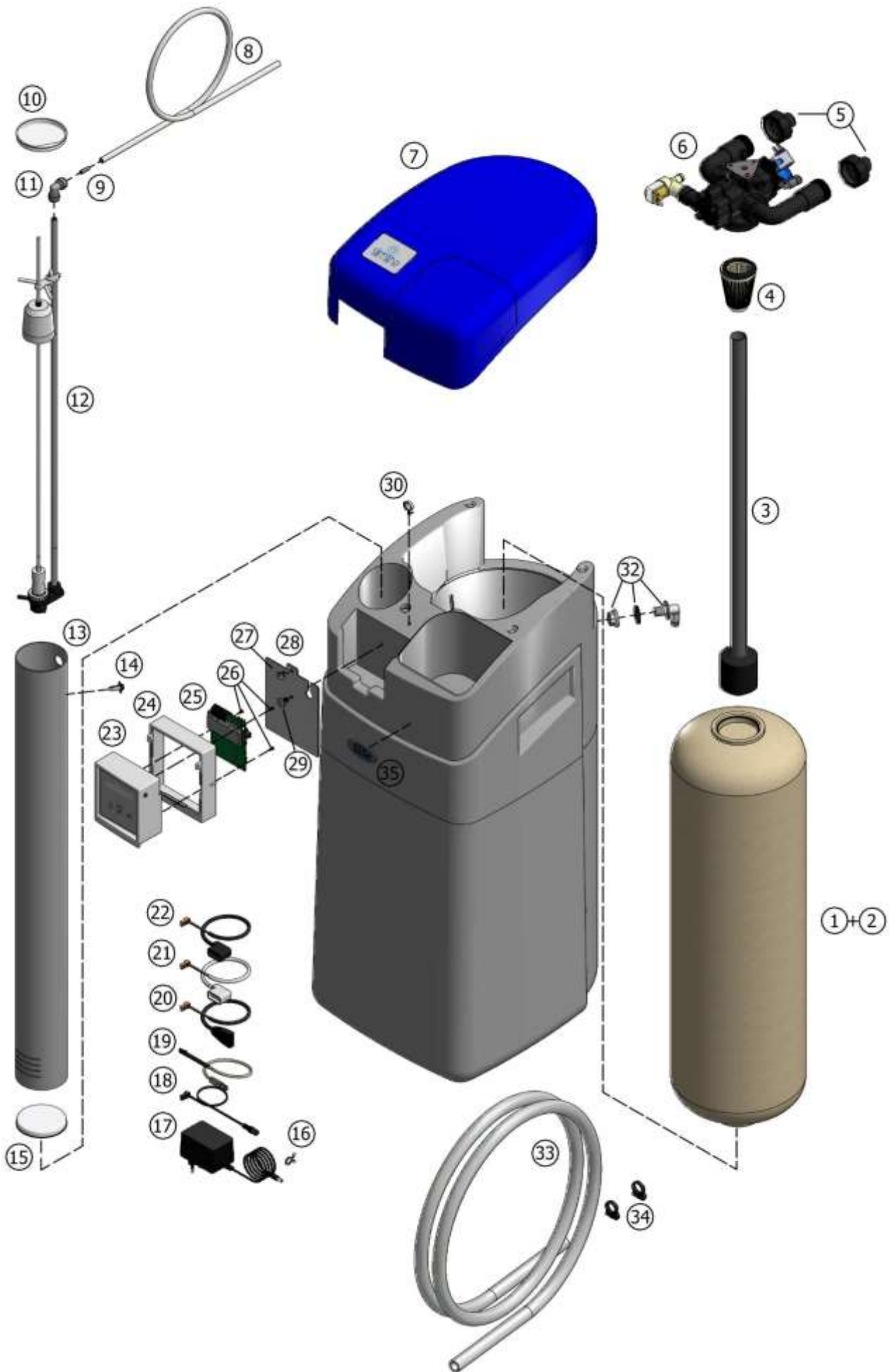


EXPLODED VIEW - SLIMLINE 11L, 14L

| Item | PN | Description | Remark | (*) |
|------|--------------|---|-------------------------|-----|
| 1 | PT/1016/CP | Pressure tank 10x16 | | ✓ |
| 2 | E8000 | Softening resin | | ✓ |
| 3 | 38528 | Riser tube assembly with deflector | to be cut to length | ✓ |
| 4 | 287/166 | Top distributor | | ✓ |
| 5 | 568/303/6 | Connection kit ¾" male | | ✓ |
| 6 | 541NCX9B/J80 | Valve body assembly | Eco | ✓ |
| | 541NCX4B/J8J | Valve body assembly | Eco ⁺ 14L | ✓ |
| 7 | 38529 | Cover assembly | | ✓ |
| 8 | H1015/2 | Brine line polytube | to be ordered per meter | ✓ |
| 9 | 38519 | Brine line filter | | ✓ |
| 10 | H1016/2 | Brine well cap, top | | |
| 11 | DM/A6EU6 | Quick-fit elbow 3/8" | | ✓ |
| 12 | 38530 | Brine valve assembly 464 | to be cut to length | ✓ |
| 13 | BW3.5/047 | Brine well, 47 cm | | |
| 14 | 38536 | Screw rivet, brine well | | |
| 15 | H1016/4 | Brine well cap, bottom | | |
| 16 | 72263 | Twist lock clamp, power cord | | |
| 17 | 28/298/11 | Transformer 230/24V - 50 Hz, 24VA, EuroT plug | | ✓ |
| 18 | 70971 | Power cord | | ✓ |
| 19 | 72760 | Flow meter cable | | ✓ |
| 20 | 72761 | Drain solenoid cable | | ✓ |
| 21 | 72686 | Refill solenoid cable (white) | | ✓ |
| 22 | 72685 | Backwash solenoid cable (black) | Eco ⁺ | ✓ |
| 23 | 38531 | PCB housing assy | | |
| 24 | 38624 | PCB frame | | |
| 25 | 72788 | Printed Circuit Board | Eco | ✓ |
| | 72787 | Printed Circuit Board | Eco ⁺ | ✓ |
| 26 | 15/102 | Screw, PCB | | |
| 27 | 38458 | Stopper, back plate | | |
| 28 | 38632 | Back plate | | |
| 29 | 19098 | Retainer, back plate | | |
| 30 | 38631 | Cable tie | | |
| 31 | 38628 | Mini cabinet body | | |
| 32 | 38532 | Overflow assembly | | |
| 33 | 38522 | Drain hose | to be ordered per meter | |
| 34 | 38521 | Clamp, drain hose (2x) | | |
| 35 | 39004 | Dome label 'ERIE Water Treatment Controls' | | |

(*) Recommended Spare Part

EXPLODED VIEW - SLIMLINE 17L, 24L, 30L

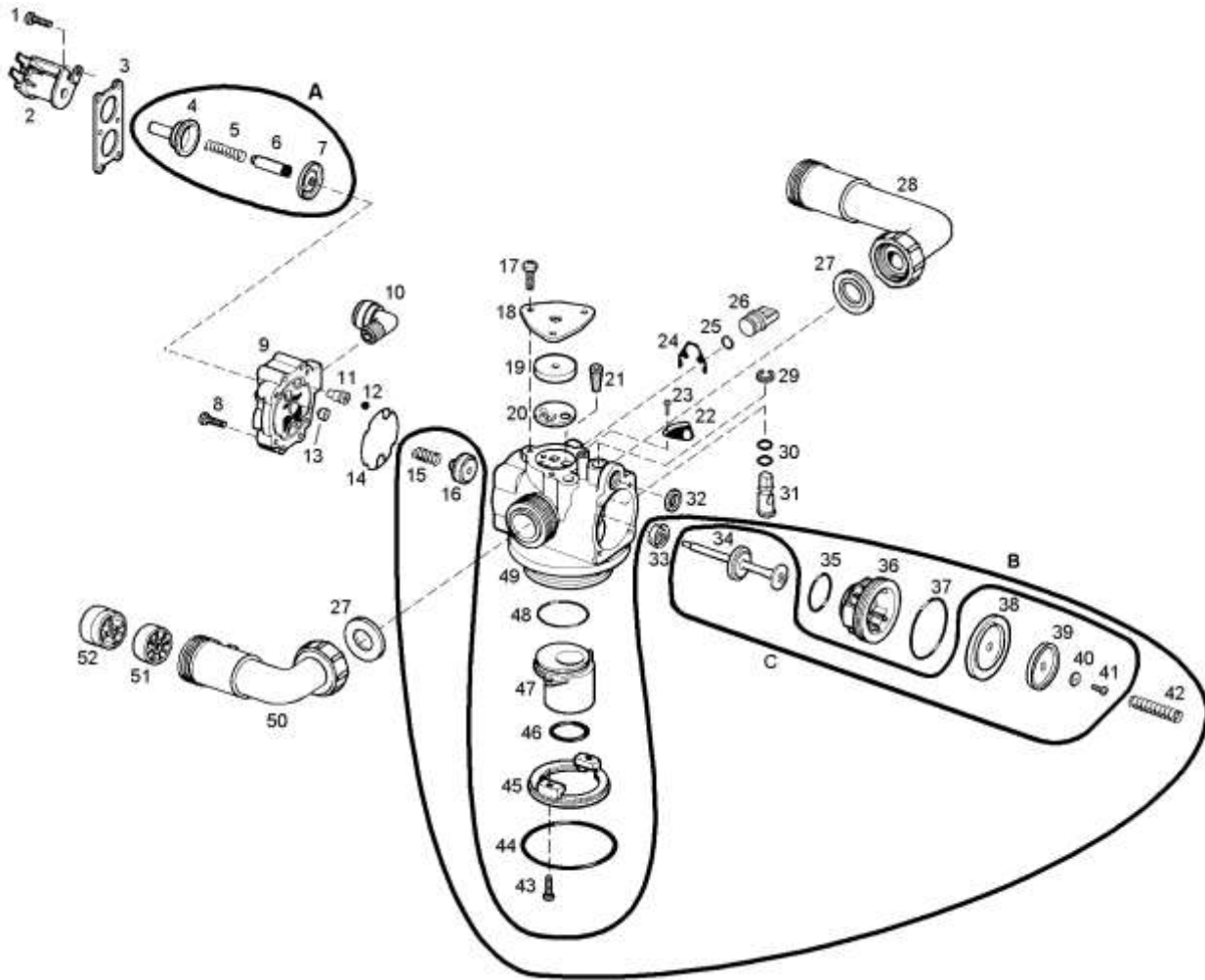


EXPLODED VIEW - SLIMLINE 17L, 24L, 30L

| Item | PN | Description | Remark | (*) |
|------|--|---|---|-------------|
| 1 | PT/0932/CP PT/1032/CP | Pressure tank 9x32 Pressure tank 10x32 | Eco 17L, Eco 24L, Eco ⁺ 17L Eco 30L, Eco ⁺ 24L | ✓ ✓ |
| 2 | E8000 | Softening resin | | ✓ |
| 3 | 38528 | Riser tube assembly with deflector | to be cut to length | ✓ |
| 4 | 287/166 | Top distributor | | ✓ |
| 5 | 568/303/6 | Connection kit ¾" male | | |
| 6 | 541NCX9B/J80 541NCX4B/J8G 541NCX4B/J8J | Valve body assembly Valve body assembly Valve body assembly | Eco Eco ⁺ 17L Eco ⁺ 24L | ✓ ✓ ✓ |
| 7 | 38529 | Cover assembly | | ✓ |
| 8 | H1015/2 | Brine line polytube | to be ordered per meter | ✓ |
| 9 | 38519 | Brine line filter | | ✓ |
| 10 | H1016/2 | Brine well cap, top | | |
| 11 | DM/A6EU6 | Quick-fit elbow 3/8" | | ✓ |
| 12 | 38530 | Brine valve assembly 464 | to be cut to length | ✓ |
| 13 | BW3.5/088 | Brine well | | |
| 14 | 38536 | Screw rivet, brine well | | |
| 15 | H1016/4 | Brine well cap, bottom | | |
| 16 | 28/298/11 | Transformer 230/24V - 50 Hz, 24VA, EuroT plug | | ✓ |
| 17 | 72263 | Twist lock clamp, power cord | | |
| 18 | 70971 | Power cord | | ✓ |
| 19 | 72760 | Flow meter cable | | ✓ |
| 20 | 72761 | Drain solenoid cable | | ✓ |
| 21 | 72686 | Refill solenoid cable (white) | | ✓ |
| 22 | 72685 | Backwash solenoid cable (black) | Eco ⁺ only | ✓ |
| 23 | 38531 | PCB housing assy | | |
| 24 | 38624 | PCB frame | | |
| 25 | 72788 72787 | Printed Circuit Board Printed Circuit Board | Eco Eco ⁺ | ✓ ✓ |
| 26 | 15/102 | Screw, PCB | | |
| 27 | 38458 | Stopper, back plate | | |
| 28 | 38632 | Back plate | | |
| 29 | 19098 | Retainer, back plate | | |
| 30 | 38631 | Cable tie | | |
| 31 | 38690 | Maxi cabinet body | | |
| 32 | 38532 | Overflow assembly | | |
| 33 | 38522 | Drain hose | to be ordered per meter | |
| 34 | 38521 | Clamp, drain hose (2x) | | |
| 35 | 39004 | Dome label 'ERIE Water Treatment Controls' | | |

(*) Recommended Spare Part

EXPLODED VIEW - VALVE BODY ASSEMBLY - ECO

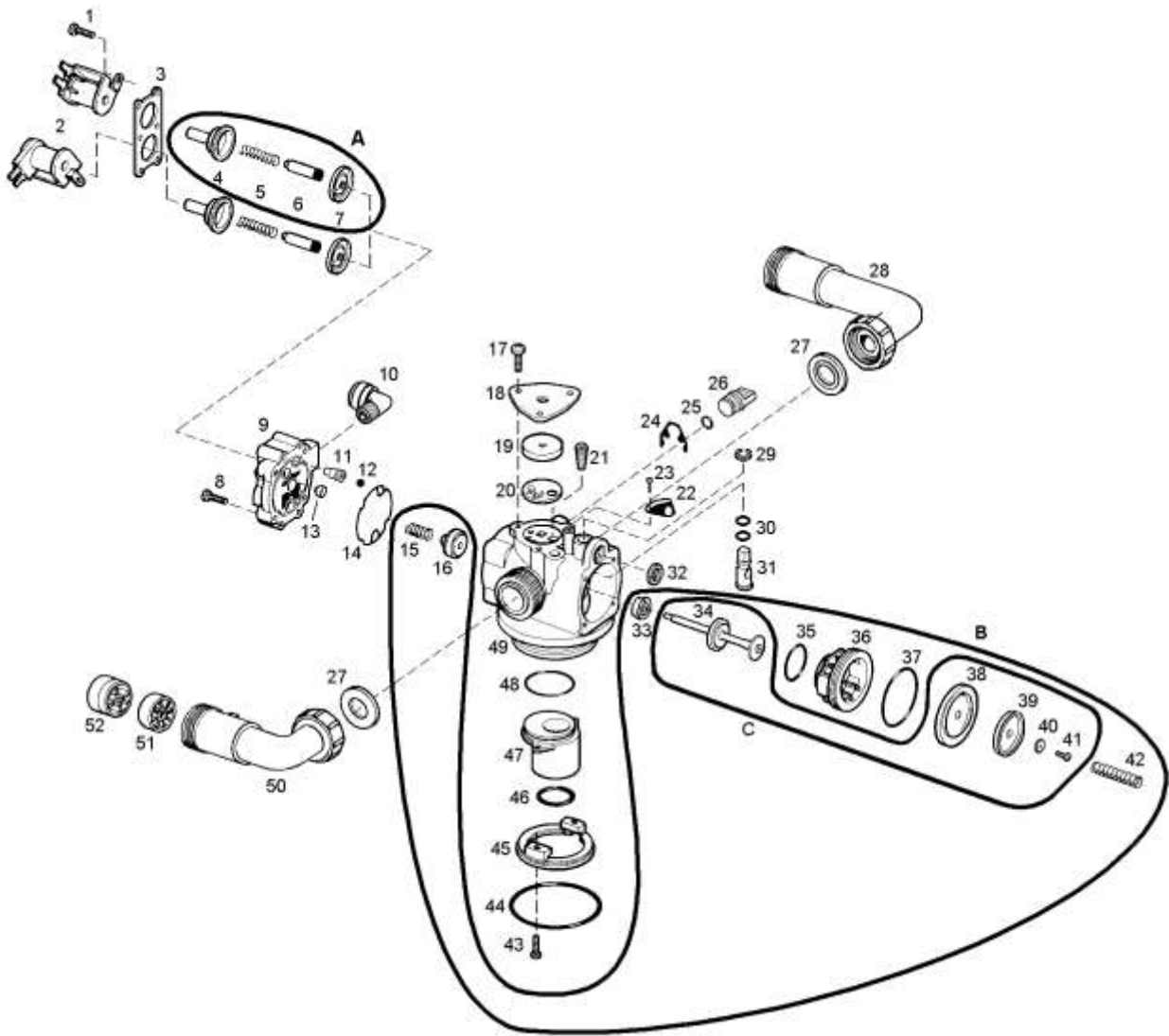


EXPLODED VIEW - VALVE BODY ASSEMBLY - ECO

| Item | PN | Description | Remark | (*) |
|------|-------------|--------------------------------------|--------|-----|
| 1 | 15/90 | Screw, solenoid retainer (4x) | | |
| 2 | 413/134/24 | Solenoid | | ✓ |
| 3 | 541/229 | Retainer, solenoid | | |
| 4 | 413/58 | Guide, solenoid | | |
| 5 | 413/62 | Spring, solenoid plunger | | ✓ |
| 6 | 74099 | Plunger, solenoid | | ✓ |
| 7 | 74098 | Diaphragm, solenoid | | ✓ |
| 8 | 15/222 | Screw, back cap (4x) | | |
| 9 | 541/286/2/E | Back cap | | |
| 10 | DM/A6ME4 | Brine elbow | | |
| 11 | 74022 | Brine draw restrictor 1,0 mm (black) | | |
| 12 | 541/275 | Check ball | | ✓ |
| 13 | 568/385/2/A | Refill flow control 0,25 gpm | | |
| 14 | 541/206 | Gasket, back cap | | |
| 15 | 541/239 | Spring, check disc | | |
| 16 | 541/246 | Check disc | | |
| 17 | 15/89 | Screw, cover plate (3x) | | |
| 18 | 541/221 | Cover plate, injector | | |
| 19 | 428/5 | Injector disc #5 | | ✓ |
| 20 | 541/325 | Gasket, injector | | ✓ |
| 21 | 72604 | Filter, injector | | ✓ |
| 22 | 72609 | Locking plate, drain flow adjuster | | |
| 23 | 15/76 | Screw, locking plate | | |
| 24 | 541/254 | Spring clip | | |
| 25 | 186/118 | O-ring, brine plug | | |
| 26 | 541/273 | Brine plug | | |
| 27 | 72467 | Union gasket (2x) | | ✓ |
| 28 | 72542 | Elbow, inlet | | ✓ |
| 29 | 19/19 | Clip, drain flow adjuster | | |
| 30 | 186/134 | O-ring, drain flow adjuster (2x) | | |
| 31 | 541/238 | Drain flow adjuster | | |
| 32 | 529/244 | O-ring, drain port | | |
| 33 | 467/216 | Seal, body stem | | |
| 34 | 72605 | Body stem | | ✓ |
| 35 | 185/024/1 | O-ring, seat insert (small) | | |
| 36 | 541/204 | Seat insert | | |
| 37 | 185/029/1 | O-ring, seat insert (large) | | |
| 38 | 72602 | Main diaphragm | | ✓ |
| 39 | 72507 | Retainer, main diaphragm | | |
| 40 | 72245 | Washer, main diaphragm | | |
| 41 | 72552 | Screw, main diaphragm | | |
| 42 | 516/221 | Spring, main diaphragm | | |
| 43 | 15/90 | Screw, adapter ring (2x) | | |
| 44 | 185/67/4 | O-ring, tank | | ✓ |
| 45 | 541/232 | Adapter ring | | |
| 46 | 185/214/1 | O-ring, riser tube | | |
| 47 | 541/218 | Riser insert 1,050" | | |
| 48 | 185/029/1 | O-ring, riser insert | | |
| 49 | 541/257/1 | Valve body (incl. 467/216) | | |
| 50 | 72543 | Elbow, outlet | | ✓ |
| 51 | 72544 | Impeller | | ✓ |
| 52 | 72545 | Hub, Impeller | | |
| A | RK/413 | Repair kit solenoid diaphragm | | ✓ |
| B | RK/541/244 | Repair kit body stem and seat | | ✓ |
| C | 72611 | Repair kit body stem | | |

(*) Recommended Spare Part

EXPLODED VIEW - VALVE BODY ASSEMBLY - ECO⁺

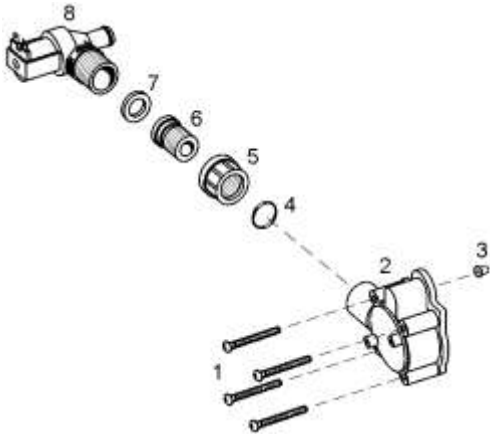


EXPLODED VIEW - VALVE BODY ASSEMBLY - ECO⁺

| Item | PN | Description | Remark | (*) |
|------|-------------|--------------------------------------|--------|-----|
| 1 | 15/90 | Screw, solenoid (6x) | | |
| 2 | 413/134/24 | Solenoid (2x) | | ✓ |
| 3 | 541/229 | Retainer, solenoid | | |
| 4 | 413/58 | Guide, solenoid (2x) | | |
| 5 | 413/62 | Spring, solenoid plunger (2x) | | ✓ |
| 6 | 74099 | Plunger, solenoid (2x) | | ✓ |
| 7 | 74098 | Diaphragm, solenoid (2x) | | ✓ |
| 8 | 15/222 | Screw, back cap (4x) | | |
| 9 | 541/274/2/E | Back cap | | |
| 10 | DM/A6ME4 | Brine elbow | | |
| 11 | 74022 | Brine draw restrictor 1,0 mm (black) | | |
| 12 | 541/275 | Check ball | | ✓ |
| 13 | 568/385/2/A | Refill flow control 0,25 gpm | | |
| 14 | 541/206 | Gasket, back cap | | |
| 15 | 541/239 | Spring, check disc | | |
| 16 | 541/246 | Check disc | | |
| 17 | 15/89 | Screw, cover plate (3x) | | |
| 18 | 541/221 | Cover plate, injector | | |
| 19 | 428/5 | Injector disc #5 | | ✓ |
| 20 | 541/325 | Gasket, injector | | ✓ |
| 21 | 72604 | Filter, injector | | ✓ |
| 22 | 72609 | Locking plate, drain flow adjuster | | |
| 23 | 15/76 | Screw, locking plate | | |
| 24 | 541/254 | Spring clip | | |
| 25 | 186/118 | O-ring, brine plug | | |
| 26 | 541/273 | Brine plug | | |
| 27 | 72467 | Union gasket (2x) | | ✓ |
| 28 | 72542 | Elbow, inlet | | |
| 29 | 19/19 | Clip, drain flow adjuster | | |
| 30 | 186/134 | O-ring, drain flow adjuster (2x) | | |
| 31 | 541/238 | Drain flow adjuster | | |
| 32 | 529/244 | O-ring, drain port | | |
| 33 | 467/216 | Seal, body stem | | |
| 34 | 72605 | Body stem | | ✓ |
| 35 | 185/024/1 | O-ring, seat insert (small) | | |
| 36 | 541/204 | Seat insert | | |
| 37 | 185/029/1 | O-ring, seat insert (large) | | |
| 38 | 72602 | Main diaphragm | | ✓ |
| 39 | 72507 | Retainer, main diaphragm | | |
| 40 | 72245 | Washer, main diaphragm | | |
| 41 | 72552 | Screw, main diaphragm | | |
| 42 | 516/221 | Spring, main diaphragm | | |
| 43 | 15/90 | Screw, adapter ring (2x) | | |
| 44 | 185/67/4 | O-ring, tank | | ✓ |
| 45 | 541/232 | Adapter ring | | |
| 46 | 185/214/1 | O-ring, riser tube | | |
| 47 | 541/218 | Riser insert 1,050" | | |
| 48 | 185/029/1 | O-ring, riser insert | | |
| 49 | 541/257/1 | Valve body (incl. 467/216) | | |
| 50 | 72543 | Elbow, outlet | | ✓ |
| 51 | 72544 | Impeller | | ✓ |
| 52 | 72545 | Hub, Impeller | | |
| A | RK/413 | Repair kit solenoid diaphragm | | ✓ |
| B | RK/541/244 | Repair kit body stem and seat | | ✓ |
| C | 72611 | Repair kit body stem | | |

(*) Recommended Spare Part

EXPLODED VIEW - VALVE BODY ASSEMBLY



| Item | PN | Description | Remark | (*) |
|------|------------------------|--|--|-----|
| 1 | 15/87 | Screw, valve head | | |
| 2 | 72216 | Valve head | | |
| 3 | 541/300/G 541/300/J | Drain flow control 2,0 gpm Drain flow control 2,6 gpm | Eco+ 11L, Eco+ 15L, Eco+ 20L Eco+ 26L | |
| 4 | 185/115/1 | O-ring, drain line adaptor | | |
| 5 | 74018 | Nut, drain solenoid | | |
| 6 | 74016 | Drain line adaptor | | |
| 7 | 74019 | Gasket, drain solenoid | | |
| 8 | 74023 | Drain solenoid | | ✓ |

(*) Recommended Spare Part



TECHNICAL DATA - ECO

Technical specifications:

| Model | Eco | | | | |
|------------------------------------|-----------------------|----|----|----|----|
| | 11 | 14 | 17 | 24 | 30 |
| Resin | | | | | |
| Operating pressure min/max (bar) | 1,4/8,3 | | | | |
| Operating temperature min/max (°C) | 2/48 | | | | |
| Electrical connection (V/Hz) | 230/50 ⁽¹⁾ | | | | |
| Maximum power consumption (VA) | 17 | | | | |
| Hydraulic connection inlet/outlet | ¾" BSP Male | | | | |

(1) Supplied with 24V transformer

Performances @ 3 bar operating pressure and brining of 125gr/Ltr of resin⁽²⁾:

| Model | Eco | | | | |
|---|-----|-----|-----|-----|-----|
| | 11 | 14 | 17 | 24 | 30 |
| Resin | | | | | |
| Nominal exchange capacity (m ³ x°f) | 56 | 71 | 87 | 122 | 153 |
| Nominal exchange capacity (m ³ x°d) | 32 | 41 | 49 | 70 | 87 |
| Salt usage per regeneration (kg) ⁽³⁾ | 1,4 | 1,8 | 2,1 | 3,0 | 3,8 |
| Exchange capacity per kg salt (m ³ x°f) | 41 | | | | |
| Exchange capacity per kg salt (m ³ x°d) | 23 | | | | |
| Service flow rate @ 1 bar pressure drop (m ³ /hr) | 2,3 | 2,3 | 2,1 | 1,9 | 2,0 |
| Recommended maximum service flow rate (m ³ /hr) ⁽³⁾ | 1,1 | 1,4 | 1,7 | 2,4 | 3,0 |
| Rinse water usage per regeneration (Ltr) ⁽⁴⁾ | 61 | 64 | 101 | 107 | 131 |

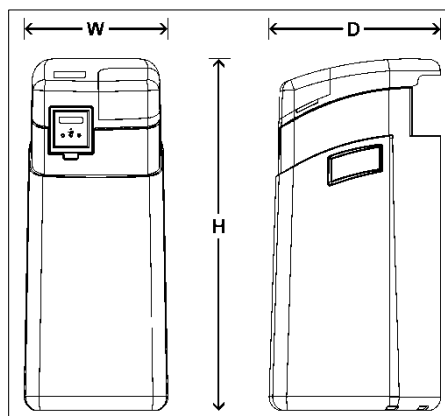
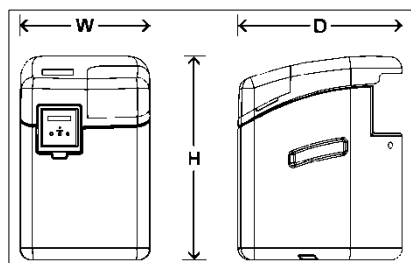
(2) Indicative numbers, performances depending on operating conditions and water quality

(3) Flow rate at which softening process is still executed adequately

(4) Maximum salt/water usage as brining is proportional (minimum of 60%)

Dimensions and weights:

| Model | Eco | | | | |
|--|------|------|------|------|------|
| | 11 | 14 | 17 | 24 | 30 |
| Resin | | | | | |
| Width (mm) (W) | 352 | 352 | 391 | 391 | 391 |
| Height (mm) (H) | 546 | 546 | 963 | 963 | 963 |
| Depth (mm) (D) | 442 | 442 | 467 | 467 | 467 |
| Depth, including bypass (mm) | 525 | 525 | 550 | 550 | 550 |
| Height inlet/outlet (mm) | 454 | 454 | 846 | 846 | 846 |
| Height inlet/outlet, including bypass (mm) | 460 | 460 | 852 | 852 | 852 |
| Weight (kg) | 19,5 | 21,0 | 30,0 | 35,5 | 41,0 |
| Weight, including bypass (kg) | 20,0 | 21,5 | 30,5 | 36,0 | 41,5 |
| Maximum salt storage capacity (kg) | 25 | 25 | 65 | 65 | 65 |



TECHNICAL DATA - ECO⁺

Technical specifications:

| Model | Eco ⁺ | | |
|------------------------------------|-----------------------|----|----|
| | 11 | 17 | 24 |
| Resin | | | |
| Operating pressure min/max (bar) | 1,4/8,3 | | |
| Operating temperature min/max (°C) | 2/48 | | |
| Electrical connection (V/Hz) | 230/50 ⁽¹⁾ | | |
| Maximum power consumption (VA) | 21 | | |
| Hydraulic connection inlet/outlet | ¾" BSP Male | | |

(1) Supplied with 24V transformer

Performances @ 3 bar operating pressure and brining of 125 gr/Ltr of resin⁽²⁾:

| Model | Eco ⁺ | | |
|---|------------------|-----|-----|
| | 11 | 17 | 24 |
| Resin | | | |
| Nominal exchange capacity (m ³ x°f) | 56 | 87 | 122 |
| Nominal exchange capacity (m ³ x°d) | 32 | 49 | 70 |
| Salt usage per regeneration (kg) ⁽³⁾ | 1,4 | 2,1 | 3,0 |
| Exchange capacity per kg salt (m ³ x°f) | 41 | | |
| Exchange capacity per kg salt (m ³ x°d) | 23 | | |
| Service flow rate @ 1 bar pressure drop (m ³ /hr) | 2,3 | 2,1 | 2,1 |
| Recommended maximum service flow rate (m ³ /hr) ⁽³⁾ | 1,1 | 1,7 | 2,4 |
| Rinse water usage per regeneration (Ltr) ⁽⁴⁾ | 110 | 139 | 175 |

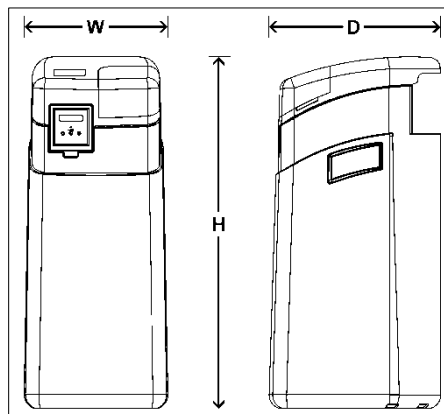
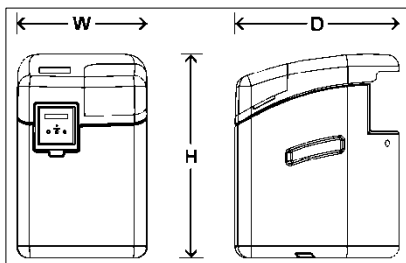
(2) Indicative numbers, performances depending on operating conditions and water quality

(3) Flow rate at which softening process is still executed adequately

(4) Maximum salt/water usage as brining is proportional (minimum of 60%)

Dimensions and weights:

| Model | Eco ⁺ | | |
|--|------------------|------|------|
| | 11 | 17 | 24 |
| Resin | | | |
| Width (mm) (W) | 352 | 391 | 391 |
| Height (mm) (H) | 546 | 963 | 963 |
| Depth (mm) (D) | 442 | 467 | 467 |
| Depth, including bypass (mm) | 525 | 550 | 550 |
| Height inlet/outlet (mm) (H2) | 454 | 846 | 846 |
| Height inlet/outlet, including bypass (mm) | 460 | 852 | 852 |
| Weight (kg) | 19,5 | 30,0 | 36,5 |
| Weight, including bypass (kg) | 20,0 | 30,5 | 37,0 |
| Maximum salt storage capacity (kg) | 25 | 65 | 65 |





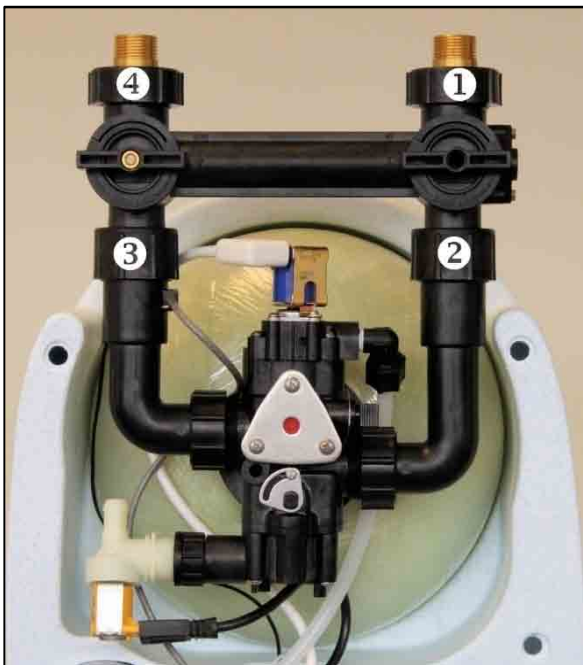




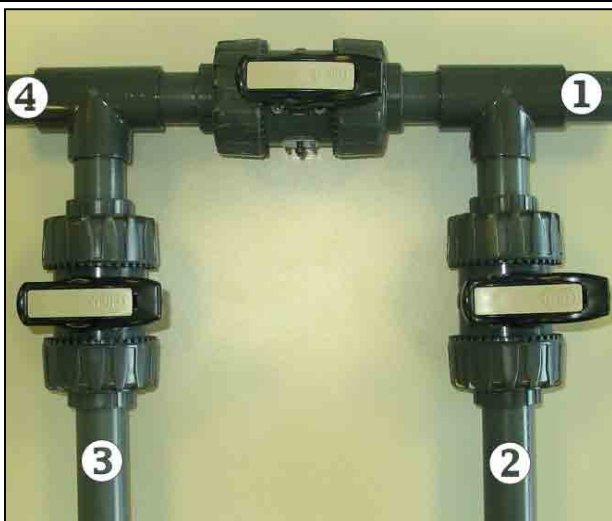
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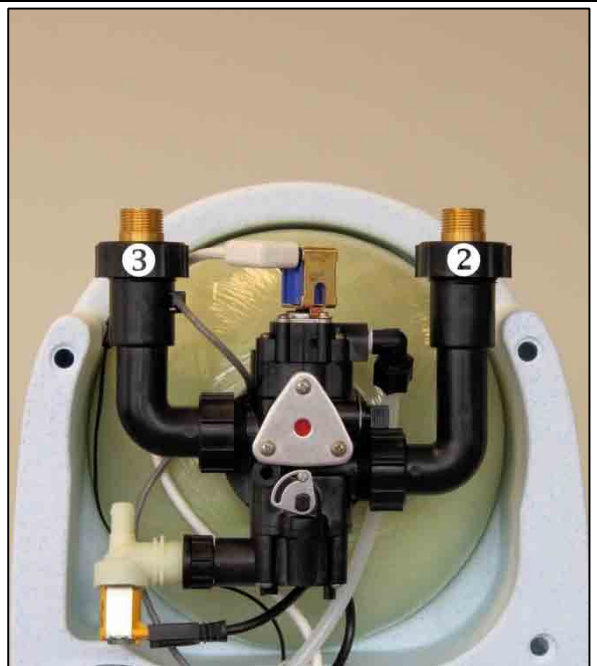
2



3.a

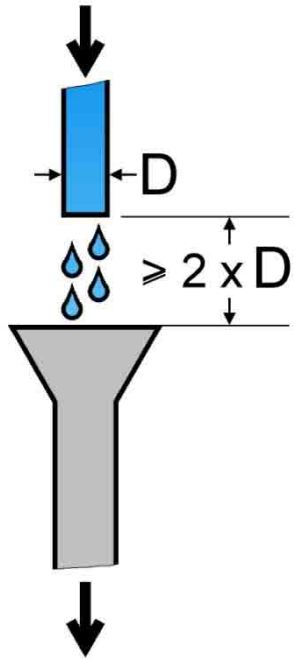


3.b

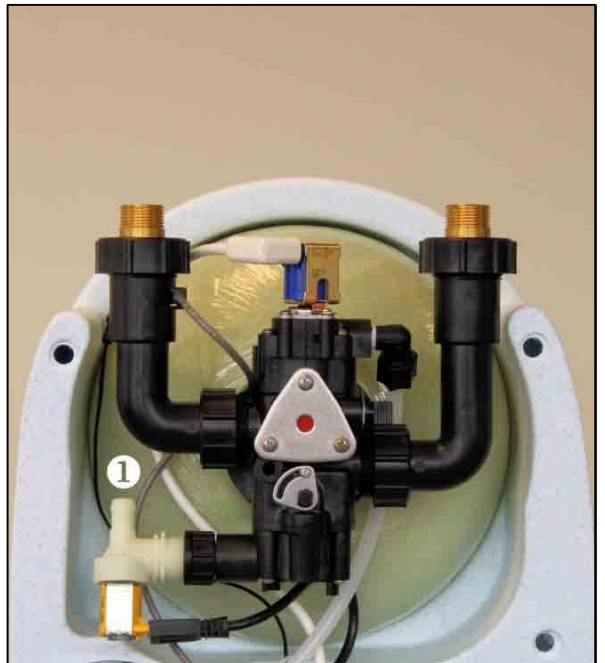




4.a



4.b



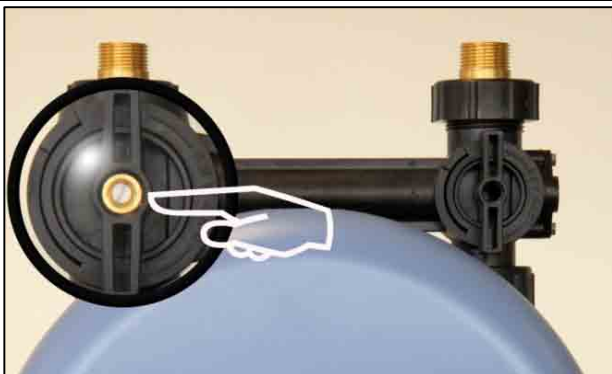
5.a



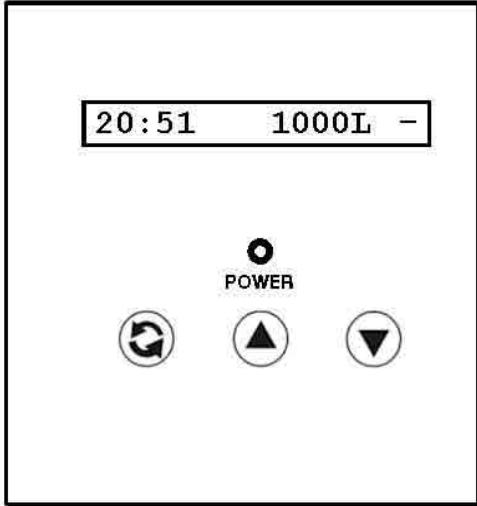
5.b



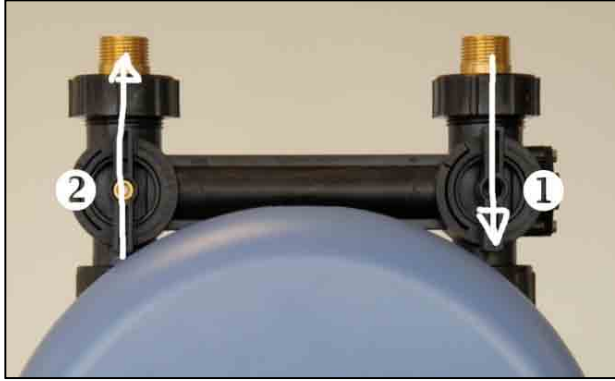
6



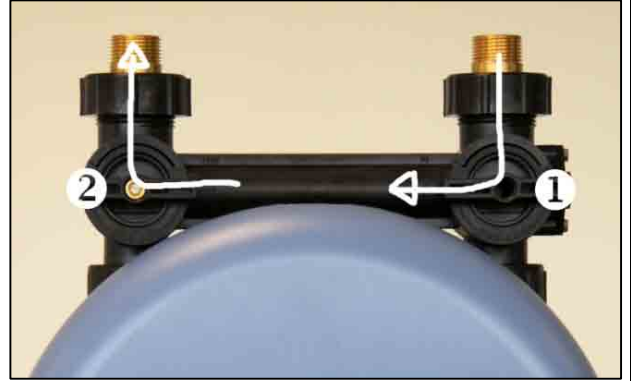
7



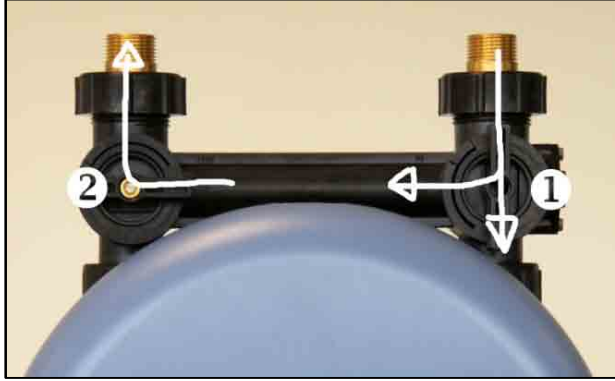
8.a



8.b

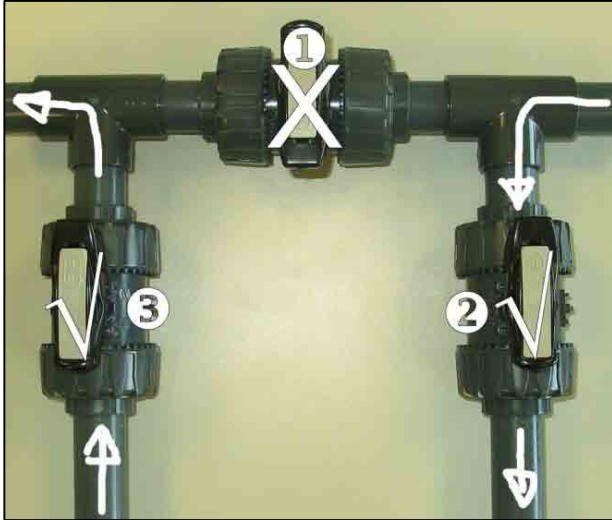


8.c

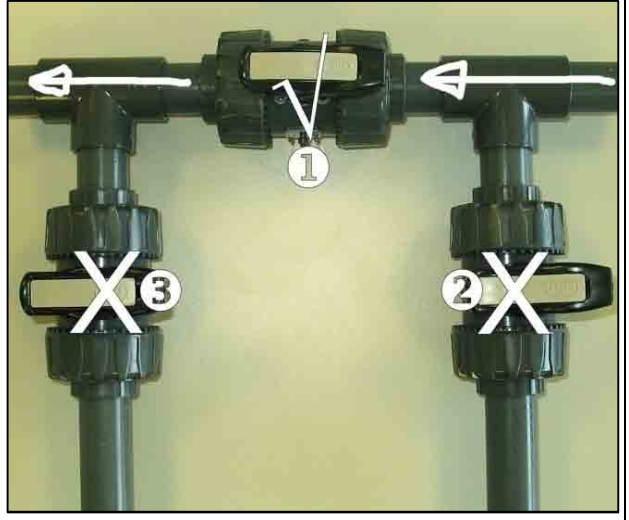




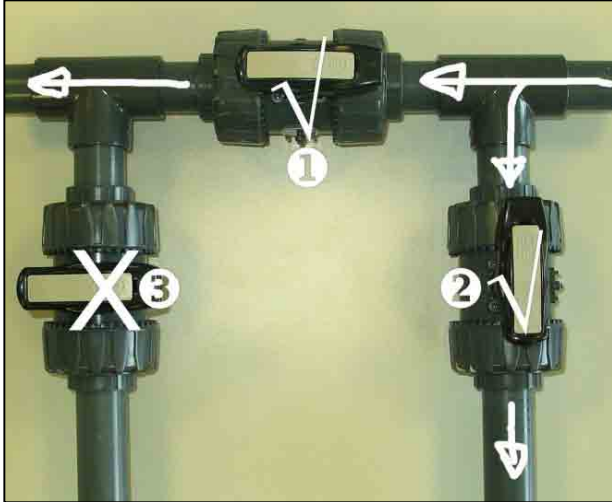
9.a



9.b



9.c



10

