

Wellness Water Conditioning with kaltecCool

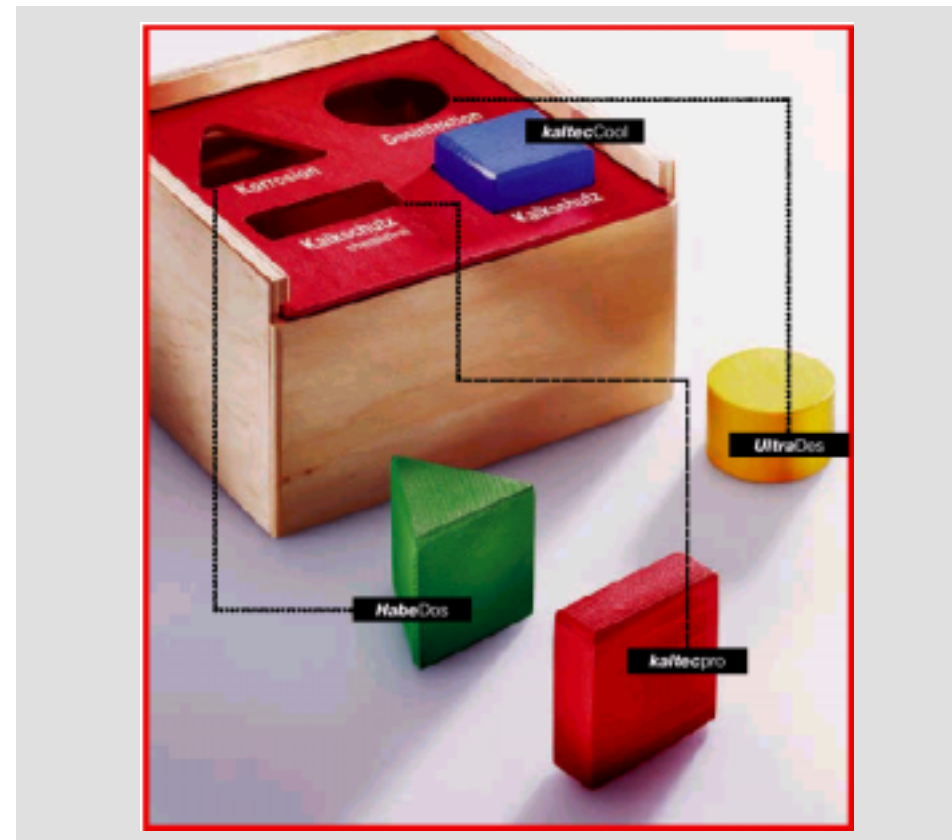
Honeywell's latest exciting developments

Setting new accents for profitable growth.

- Easiest selection for all drinking water problems
- Expand professional image
- Safest, hassle-free technology
- Easiest installation and adjustment

for your customers.

- Effective problem solving
- State of the art, modern and trendy design
- Safety and more additional benefits
- Easiest handling
- Cost effective, little maintenance required



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Wellness Water Conditioning with kaltecCool

PW 51 *kaltecCool* Wellness Water Conditioning

The novel *kaltecCool* concept

- proven process of ion exchange
- no softening, replaces Calcium for Magnesium
- effective scaling protection
- Integrated solution against scale and corrosion
- No sodium or potassium increase
- Necessity for phosphate dosing ruled out
- little salt consumption (magnesium chloride)
- environmental friendliness by low salt currents
- Works positive for health and wellness
- Fully automatic, hydropowered operation
- No electrical mains, no electrical consumption
- Readily expandable with further modules
- Helps save money by sanitation effect in scaled up old installations



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Wellness Water Conditioning with kaltecCool

Scale protection with Magnesium

The novel *kaltecCool* concept

- Water hardness represents the sum of hardness minerals in the water, i.e. mostly the earth alkaline metals calcium and magnesium
- **Total hardness will not change** by an exchange of calcium for magnesium.
- Unlike calcium, magnesium has no scaling potential at all.
- In contrast there is a slow formation of an extremely compact and stable protective layer made of magnesium hydroxide, thus fighting corrosion
- Existing scale layers are slowly removed in sanitation mode.
- As hardness remains constant, the water does not become corrosive even though scale dissolving.



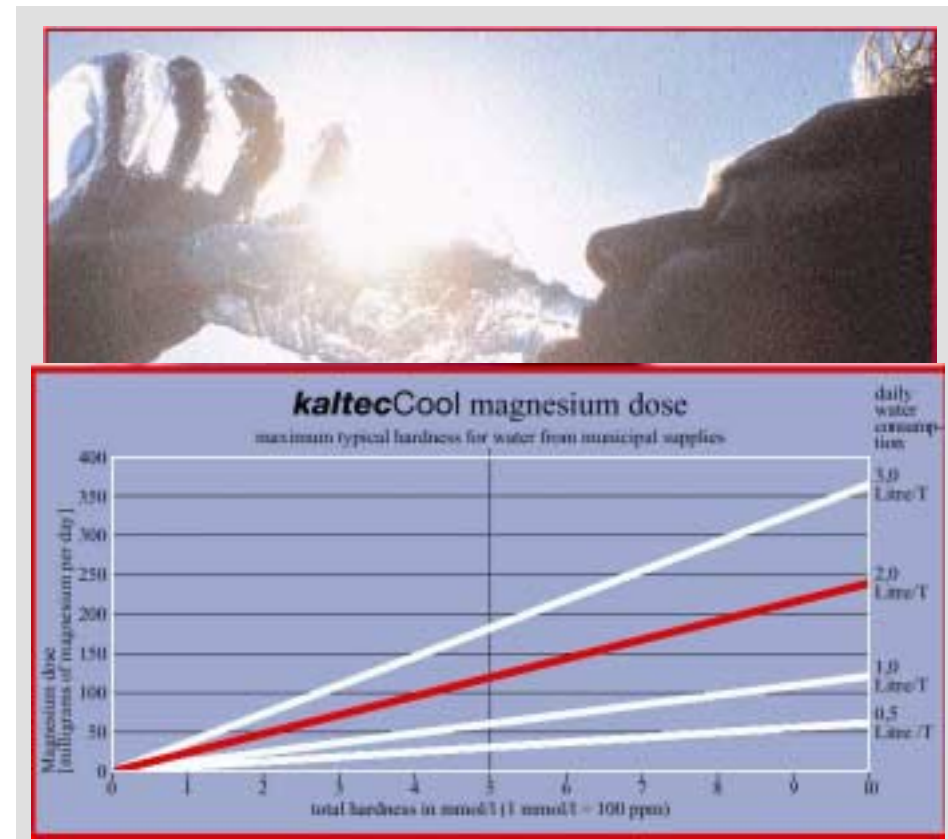
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Wellness by Magnesium

Magnesium for your well-being

- Magnesium is often called the “feel-good-mineral” and plays a central role in most lifestyle drinks
- The recommended basic allowance (dose) for magnesium is 310 - 420 milligramms per day.
- The internationally recommended supplementary dose is 250 milligramms per day.
- However, about 70% of all Europeans do not take in their basic allowance; approx. 20% even less than 2/3 of the recommended daily dose.
- **kaltecCool** helps counteracting the magnesium deficiency.
- Example: At 400 ppm hardness and 1.5 L daily water consumption, **kaltecCool** will support the daily magnesium dose by:
 - 70 milligramms in the wellness mode
 - 140 milligramms in sanitation mode



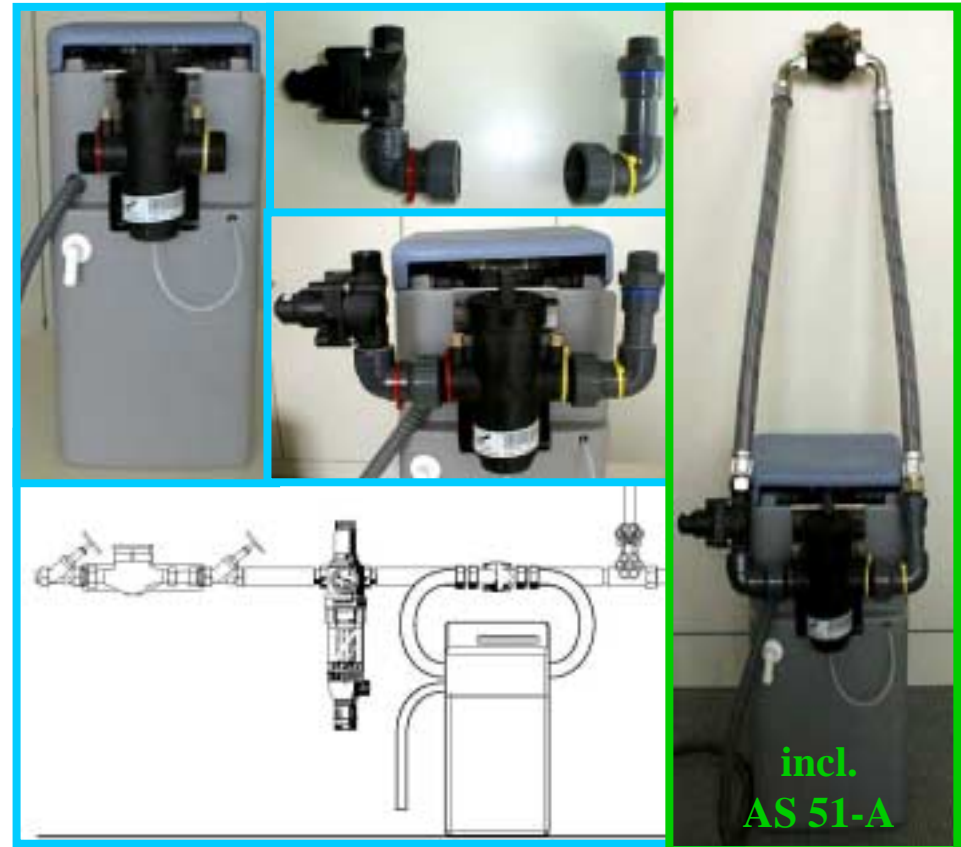
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kaltecCool Installation

Installation of the *kaltecCool* device:

- suitable for all single family homes
- installs right behind water meter and filter, or before the entrance into the water heating system
- may be combined with backflow preventer BA 295 in softening mode
- Garden line should be left untreated
- Hassle-free installation using AS 51-A on horizontal or vertical pipework, 3/4" - 1 1/4"
- Sewer line may reach 2 m high difference
- All components are colour coded for easiest installation
- Initial setting adjustment for total hardness only can be done in 2 minutes.



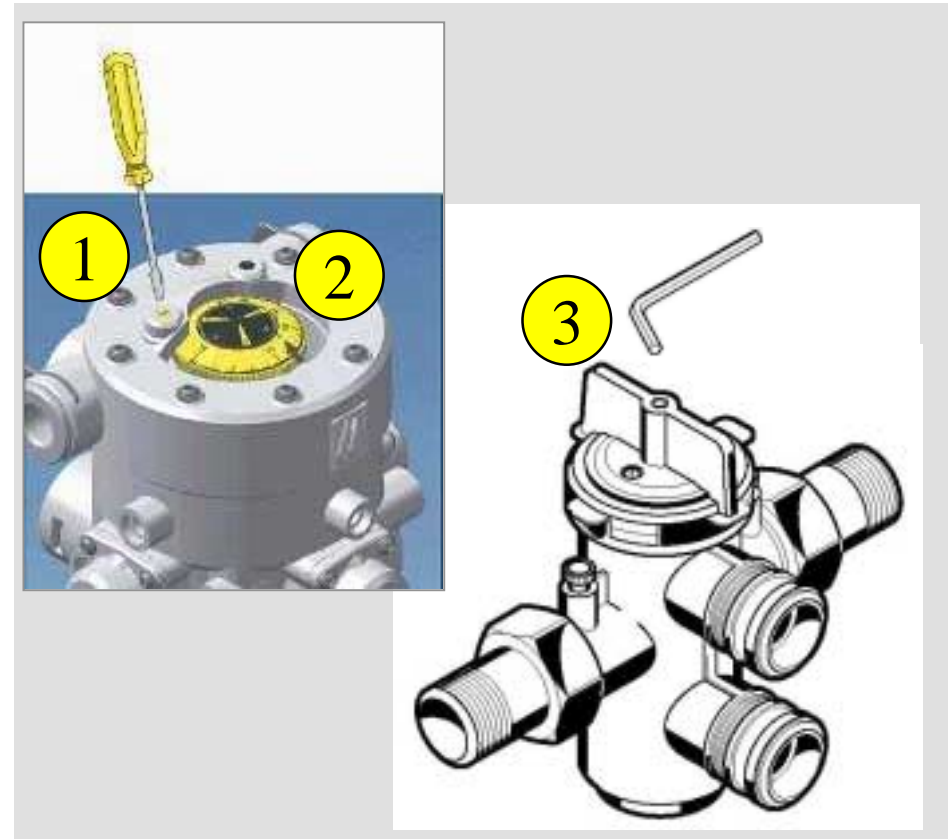
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kaltecCool Setting into operation

Adjusting *kaltecCool*:

- Take off the lid cover
- Adjust the local water hardness on the yellow scale, using the yellow adjustment screw **(1)**
- Turn the black screw **(2)** until black program dial starts an automatic regeneration cycle
- Put lid cover back in position, done.
- Adjusting the blending device (supplied as standard) can mostly be skipped as the device is preset to long-term wellness mode ex works .
- Only if desired, the device may be switched between wellness and sanitation modes with a hexagonal key **(3)**



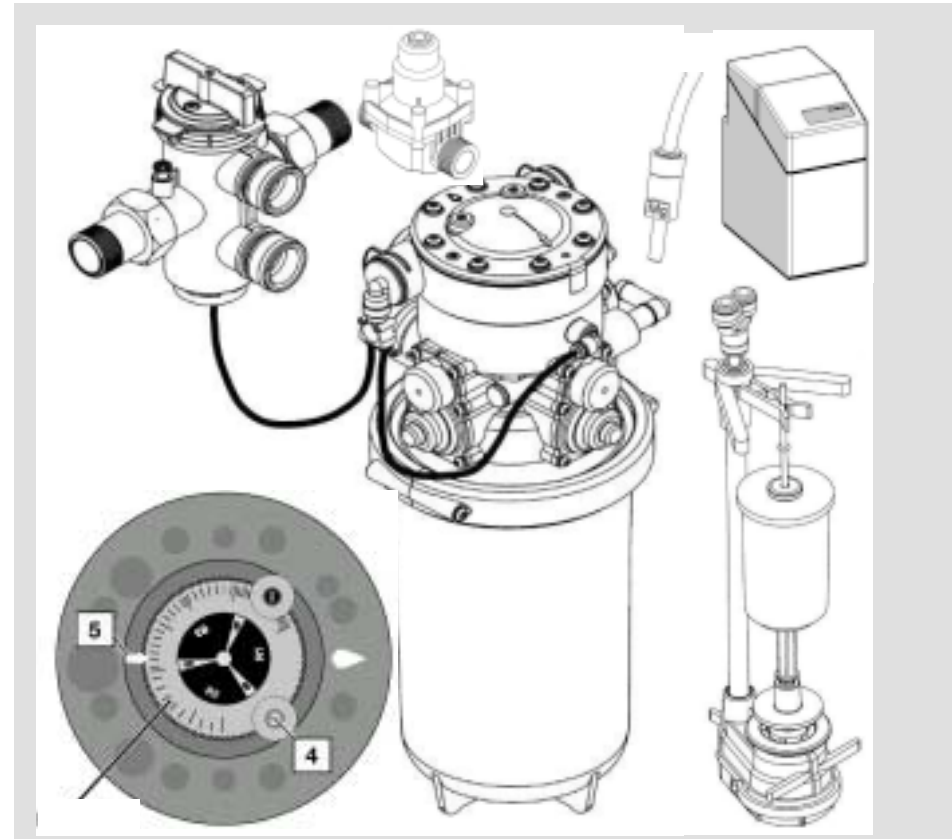
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PW 51 *kaltecCool* internal components

***kaltecCool* comprises:**

- compact cabinet style housing with separately removable two-part lid cover
- Glass fibre reinforced Noryl bottle filled with highly valued, monospheric cation exchange resin
- Fully hydraulic, highly precise volume controlled automatic regeneration controller with automatic bypass opening
- Adjustment dial for total hardness
- Program cycle indicator dial with manual regeneration start
- overflow protected brine valve set with float
- Exchangeable magnesium control valve
- Adapter (3/4") including blending valve, bypass and sampling cocks
- back pressure regulator



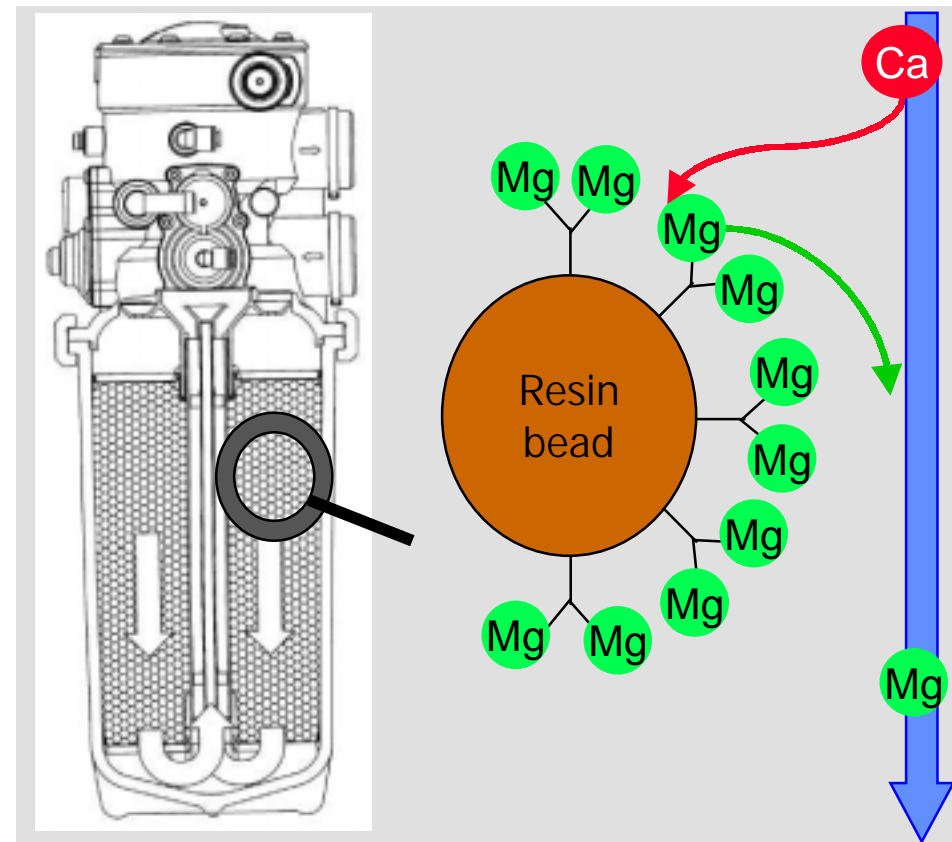
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PW 51 *kaltecCool* Method of operation: Service flow

Ion exchange principle

- During service operation, the water flows through the device in an upside-down direction
- Occasional dirt particles are removed by a strainer before resin contact.
- The resin inside the device collects every single calcium ion passing by and releases in exchange one magnesium ion into the water (Sodium: 2)
- Theoretically, the process can be run until all the stored magnesium on the resin has been exchanged for calcium, i.e. until the devices' "total exchange capacity" has been reached.
- At full initial magnesium loading, the nominal exchange capacity (3.2 L resin volume) of *kaltecCool* accounts up to 1.66 mol or as many as 1.000.000.000.000.000.000.000.000 calcium ions (10 faculty 24).



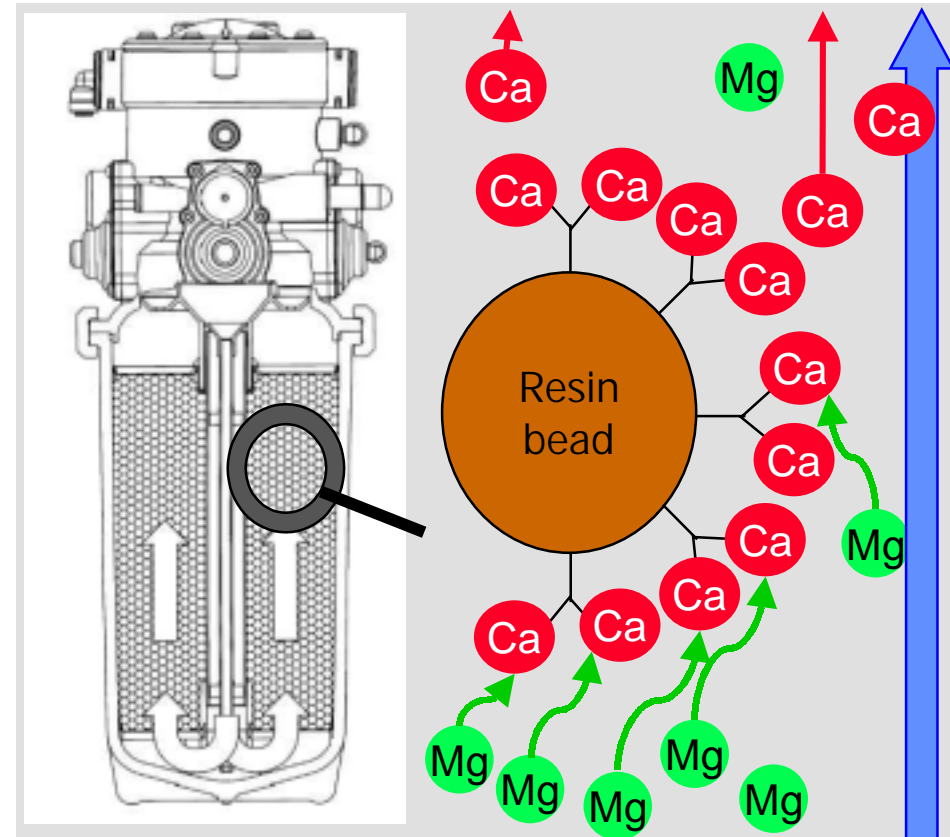
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PW 51 *kaltecCool* Method of operation: Regeneration

Purpose of the regeneration

- The water current through the device is inverted to downside-up for regeneration
- This flushes the strainer on the upper end.
- The resin is literally flooded with magnesium ions. By high outnumbering, the magnesium replaces the calcium on the resin again.
- The released calcium is fed to the sewer, together with the regeneration water current.
- Finally, the device is rinsed with fresh water to dispose of any brine left in the resin bed, and to prevent brine rests from entering into the installation.
- The device is ready for service flow again.



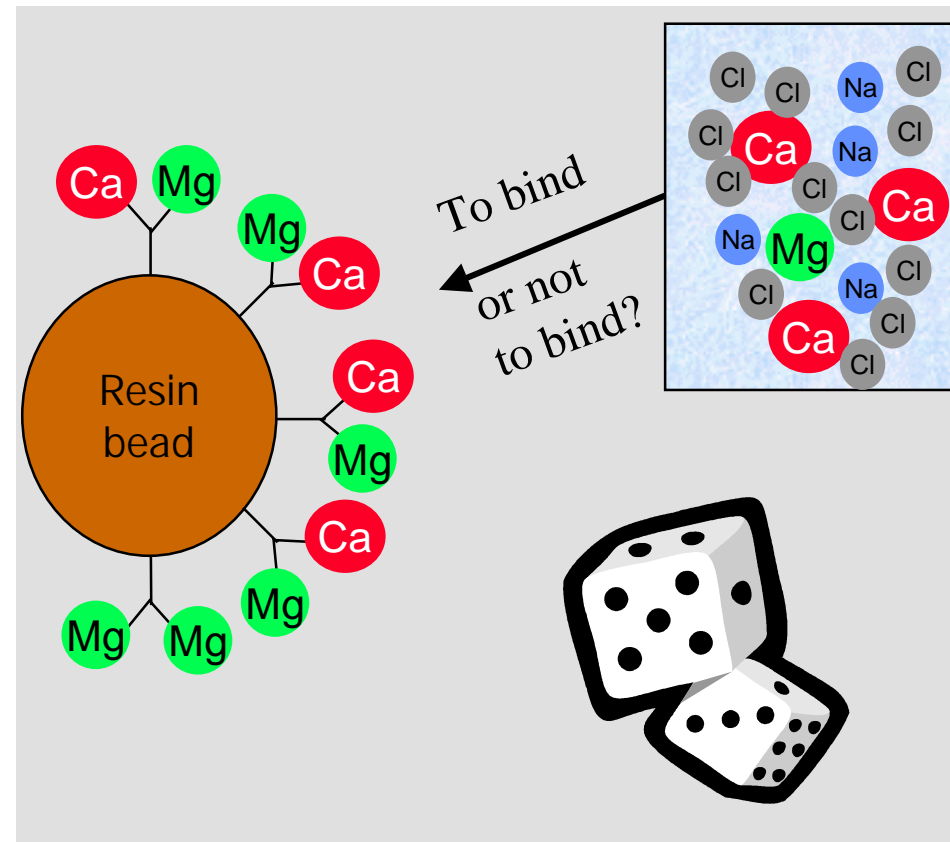
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Ion exchange theory

Binding and selectivity

- “Selectivity” describes any ion’s chance to be bound to the ion exchange resin versus the chance of another ion.
- The selectivity is a specific figure for the respective system of ions and exchange resins
- In most cases, ions with a higher charge (e.g. Ca^{++}) will bind more readily than ions with a lower charge (e.g. Na^{+}), and for equal charges, larger ions (e.g. Ca^{++}) will bind more readily than smaller ions (e.g. Mg^{++}).
- Comparison with “a binding dice contest”:
 - Calcium “wins” vs magnesium when throwing a number between 1 and 5 (high selectivity);
 - Magnesium will only “win” and therefore bind with a 6 (lower selectivity)
- Sodium would win against Ca or Mg only if the dice comes to rest on its edge
- After 10^{24} single rounds, the final result is very well determined with these rules.



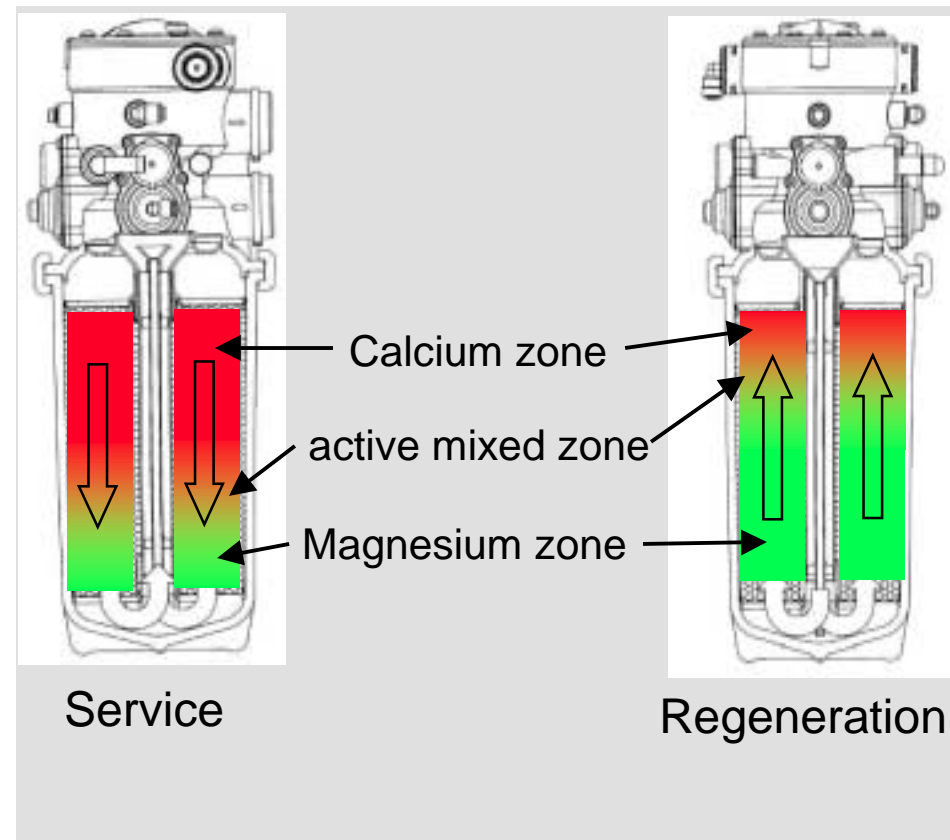
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PW 51 *kaltecCool* Mode of operation

Countercurrent regeneration process

- Applying the rules of the “dice contest”, there will be the formation of three zones inside the resin bed: One zone saturated with calcium, one zone saturated with magnesium, and one mixed zone.
- The ion exchange process itself is limited to this mixed zone only.
- With continued operation the mixed zone slowly moves down the resin bed. In effect this means slow growth of the calcium saturated zone on cost of the magnesium saturated zone..
- Regeneration pushes the mixed zone back up.
- Useful service is possible until the magnesium saturated zone starts vanishing. The remaining capacity of the mixed zone is not used.
- Also regeneration is done only until the mixed zone approaches the upper end. The remaining capacity of the mixed zone is not regenerated. This allows for most economic operation.



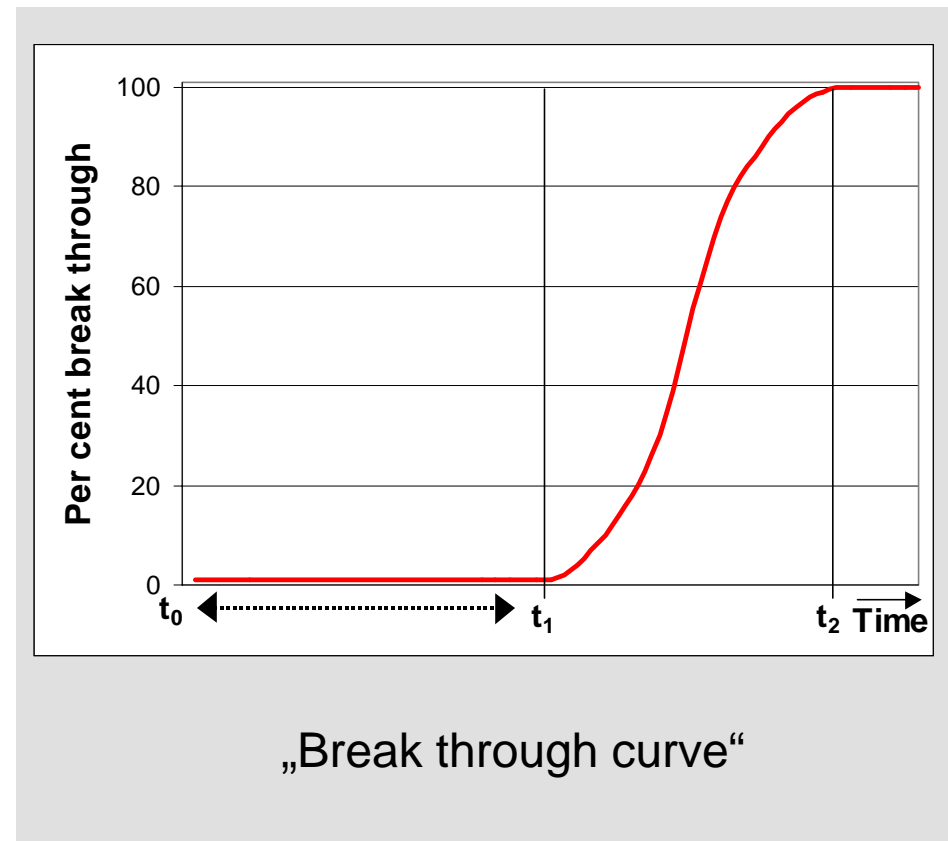
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Ion exchange theory

Break through behaviour

- In terms of the product water, the behaviour of an unregenerated ion exchanger can be described with a break through curve
- At $t=0$ the ion exchanger starts fully regenerated. Operation is fully effective until $t=1$.
- At $t=1$ the magnesium saturated zone has vanished. In between times $t=1$ and $t=2$ one can see the wandering of the mixed zone through the device's effluent.
- From $t=2$ the mixed zone is gone. The whole capacity is saturated with calcium. There is no more treatment effect.
- The useful operation time is between $t=0$ and $t=1$ only. $T=1$ is the latest possible point for regeneration start to achieve defined treatment success at anytime.

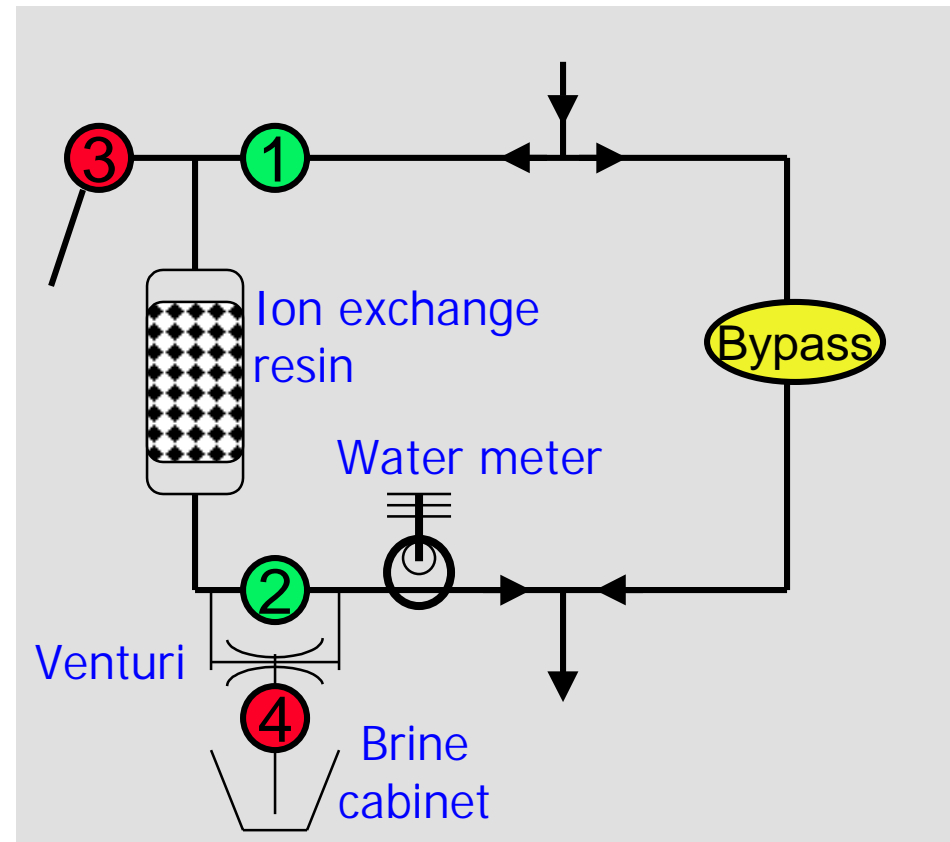


Wellness Water Conditioning with kaltecCool

Automatic Regeneration Control of *kaltecCool*

Mode of operation in Service Flow

- Valves 1, 2 and (where applicable) blending device are open
- Valves 3, 4 and bypass are closed
- The water flows by adjustable proportions (wellness and sanitation modes) through the blending device (bypass) as well as through the ion exchange resin.
- The actually treated water current is registered by the water meter after exiting from the ion exchange resin via valve 2.
- The water meter will then initiate an automatic regeneration after a defined throughput (e.g. 1.000 l), as to the adjustment of the hardness setting screw.



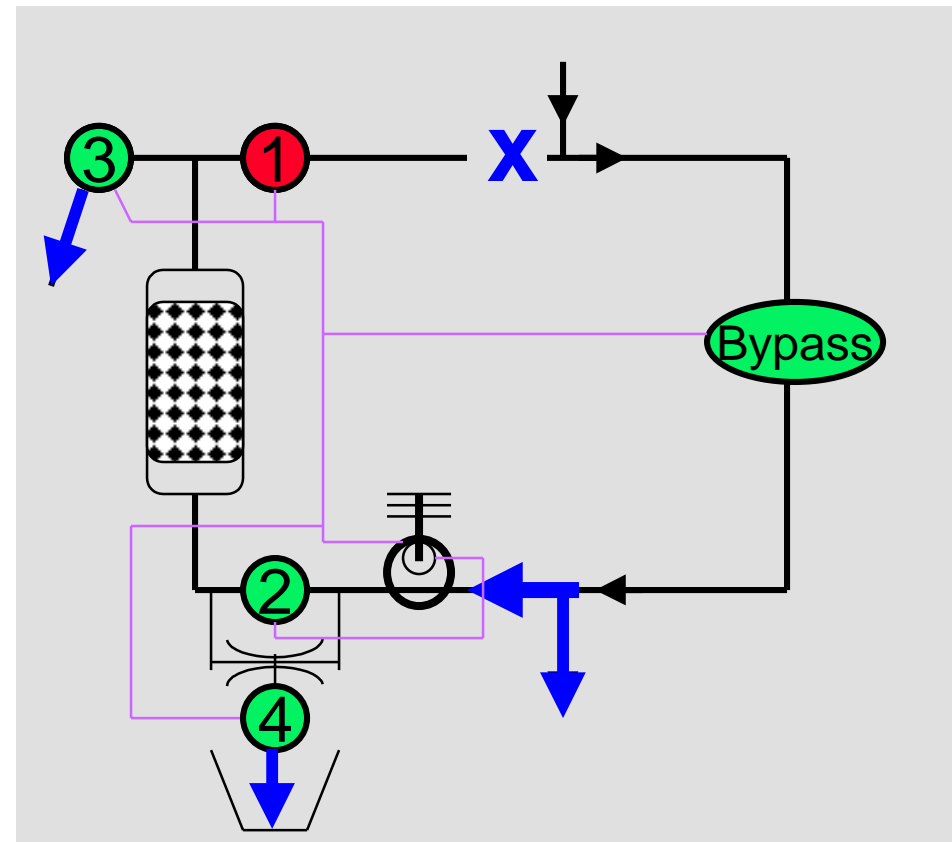
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Wellness Water Conditioning with kaltecCool

Automatic Regeneration Control of *kaltecCool*

Regeneration Cycle, Phase I

- The complete regeneration control and all valve operation incidents are solely hydropowered.
- Valve 1 closes whereas the bypass is fully opened (uninterrupted water supply).
- Valve 3 opens.
- As valve 2 remains still open, the flow direction through the resin bed reverses, and there is a short high current backwash of the upper strainer
- At the same time, valve 4 opens.
- This flushes the brine line for the subsequent regeneration.



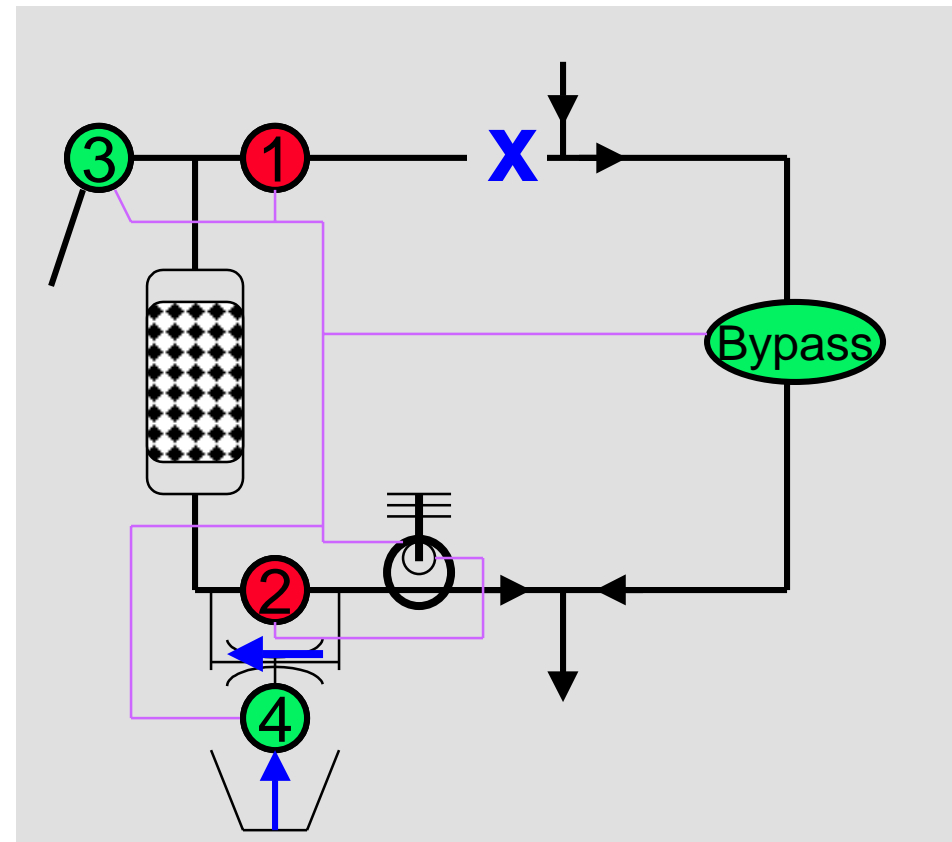
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Automatic Regeneration Control of *kaltecCool*

Regeneration Cycle, Phase II

- Valve 2 closes.
- This forces the water to flow through the Venturi at a low volume current.
- The venturi aspirates magnesium brine from the brine storage.
- Contact with magnesium brine regenerates the ion exchange resin in a countercurrent mode.
- This makes the resin ready for the next service flow phase.
- All the calcium released during the regeneration is rinsed into the sewer through valve 3



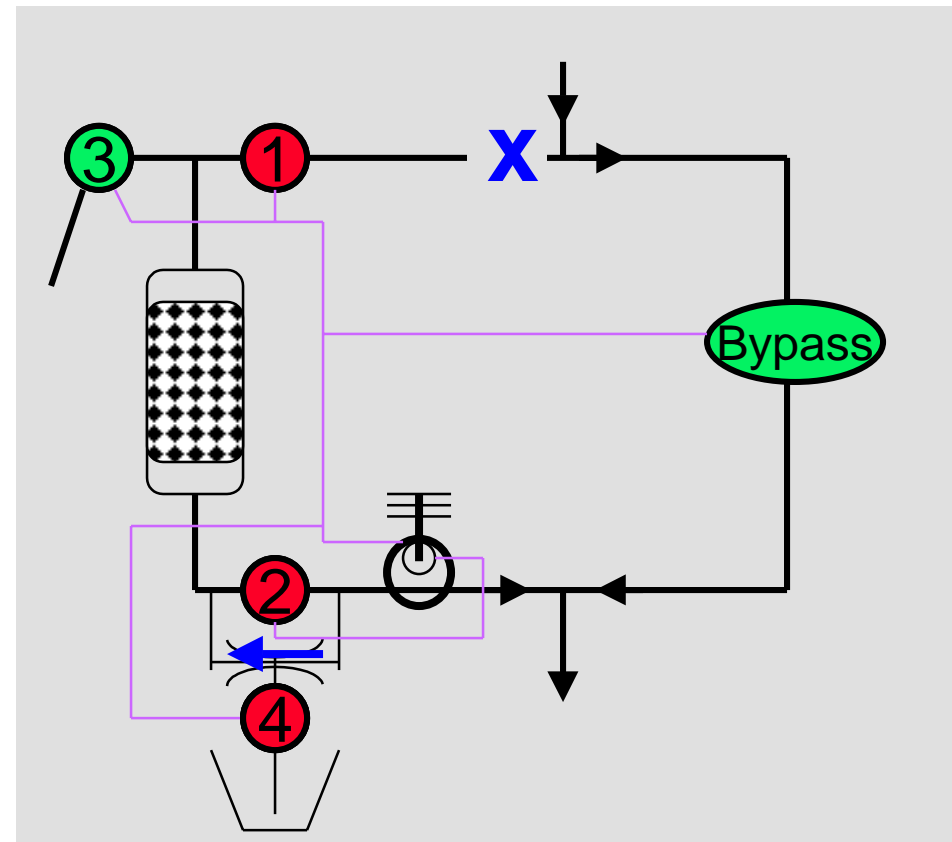
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Automatic Regeneration Control of *kaltecCool*

Regeneration Cycle, Phase III

- After sufficient brine has been aspirated, valve 4 closes and hence blocks further brine feed into the resin bed.
- Still water flows at a low current, but without aspiration through the venturi.
- The fresh water replaces the brine still present in the ion exchanger.
- This phase is therefore called „slow rinse“.



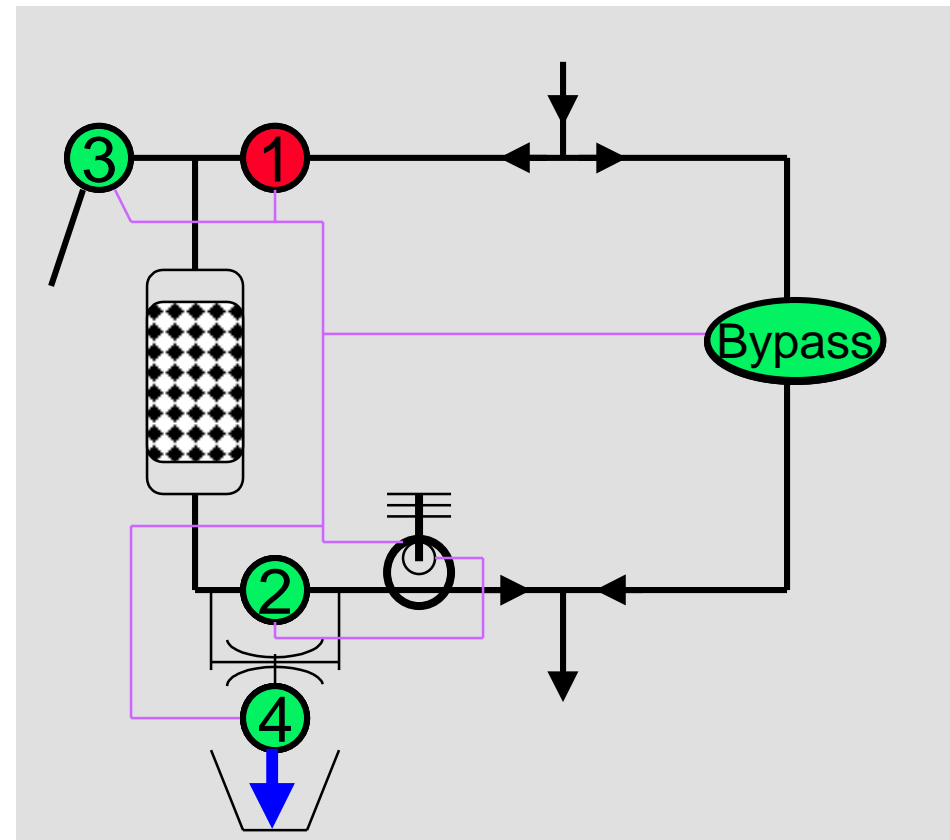
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Automatic Regeneration Control of *kaltecCool*

Regeneration Cycle, Phase IV

- Now valve 2 opens again and allows the large flow channel for a rapid rinse with high volume current
- Occasional last remainders of brine are completely washed out of the system.
- At the same time, valve 4 opens to enable the main water refill into the brine storage. The refilled water dissolves salt from the storage and forms brine.
- Finally, all valves go into their normal service flow position before valve 1 opens and clears the ion exchanger for its next service flow cycle.
- The total regeneration process takes just below 20 minutes and requires no more than 16 L water and approx. 500 g magnesium material.



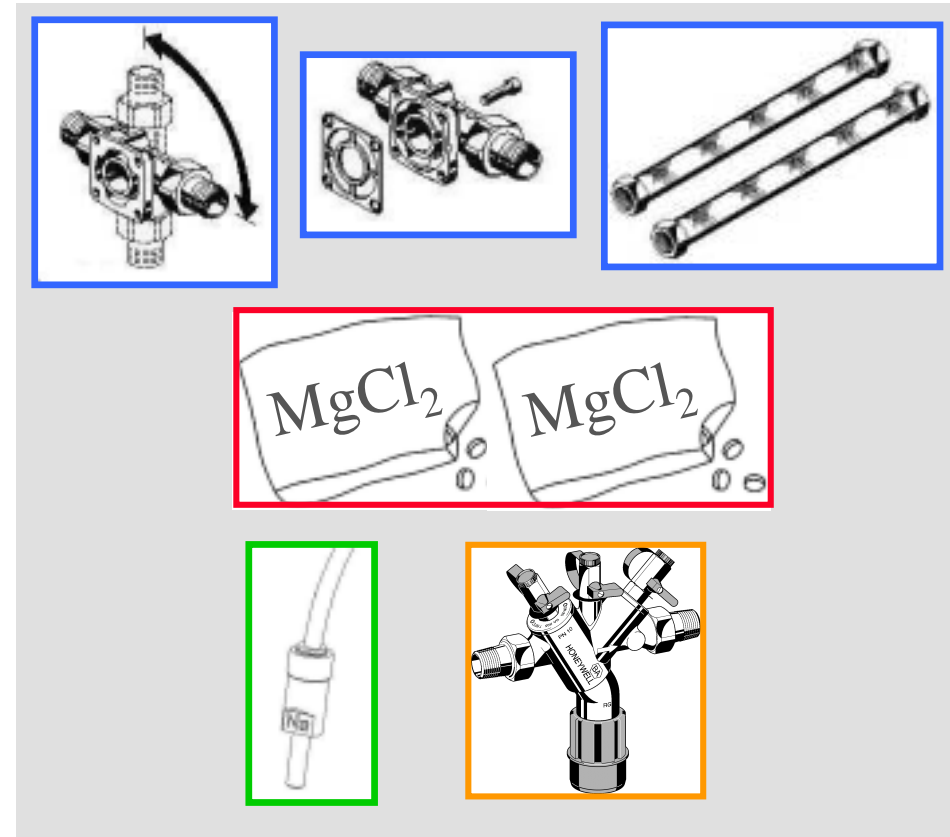
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kaltecCool Accessories

Accessories for PW 51-A

- **AS 51-...A:** Adapter Set including rotatable brass adapter 3/4", 1" or 1 1/4", suitable counter adapter, and flexibles
- **VC 51-A:** Consumable material, 2 bags per 25 kg of magnesium matter ($MgCl_2$)
- **AU 51-A** Exchange controller. Easily exchangeable Na controller to replace the magnesium controller when softening applications are required
- **BA 295-3/4A** For softening applications, retrofitting of a BA backflow preventer may be required by local regulations



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More information

Available Literature

- Fully coloured brochure of 8 pages
- Technical catalogue
- Internet <http://www.kaltecCool.com> with plenty of further information and a comprehensive free download section (Installation instructions, manuals, Technical specification sheets, ...) all accessible without login/password



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