



# Water

## Hygiene & Reprocessing Training Material

Start [➤](#)

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The Content is a summary of the steps necessary to properly reprocess thermolabile endoscopes.

Always follow the detailed steps instructed in the latest **endoscope instruction for use (reprocessing manual)**.

Click on the „I agree“-button to start



**01** Water for Endoscope Processing

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**02** Water Quality

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**03** Production of Water Qualities

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# 01

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# Water for Endoscope Processing

# Water for Endoscope Processing

## Water Quality



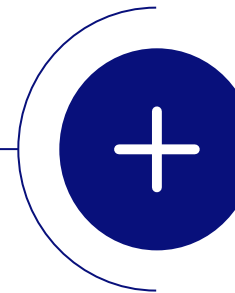
Click on the Plus-Symbols for further information.

# Water for Endoscope Processing

## Water Quality

Consists of 2 components

- Chemical quality
- Microbiological quality



Click on the Plus-Symbols for further information.

# Water for Endoscope Processing

## Water Quality



Tap water not always meets drinking water requirements

- Need chemical and/or microbiological improvement
- Especially for final rinse water

Click on the Plus-Symbols for further information.

# Water for Endoscope Processing

## Water Quality

Chemical improvement  
of tap water by means of:

Softening

A

Reverse osmosis plant

B

Filter (e.g. activated carbon)

C

Combination of A - C

D



Microbiological improvement  
of tap water by means of:

A

Filter (e.g. 0.2µm sterile filter)

B

UV

C

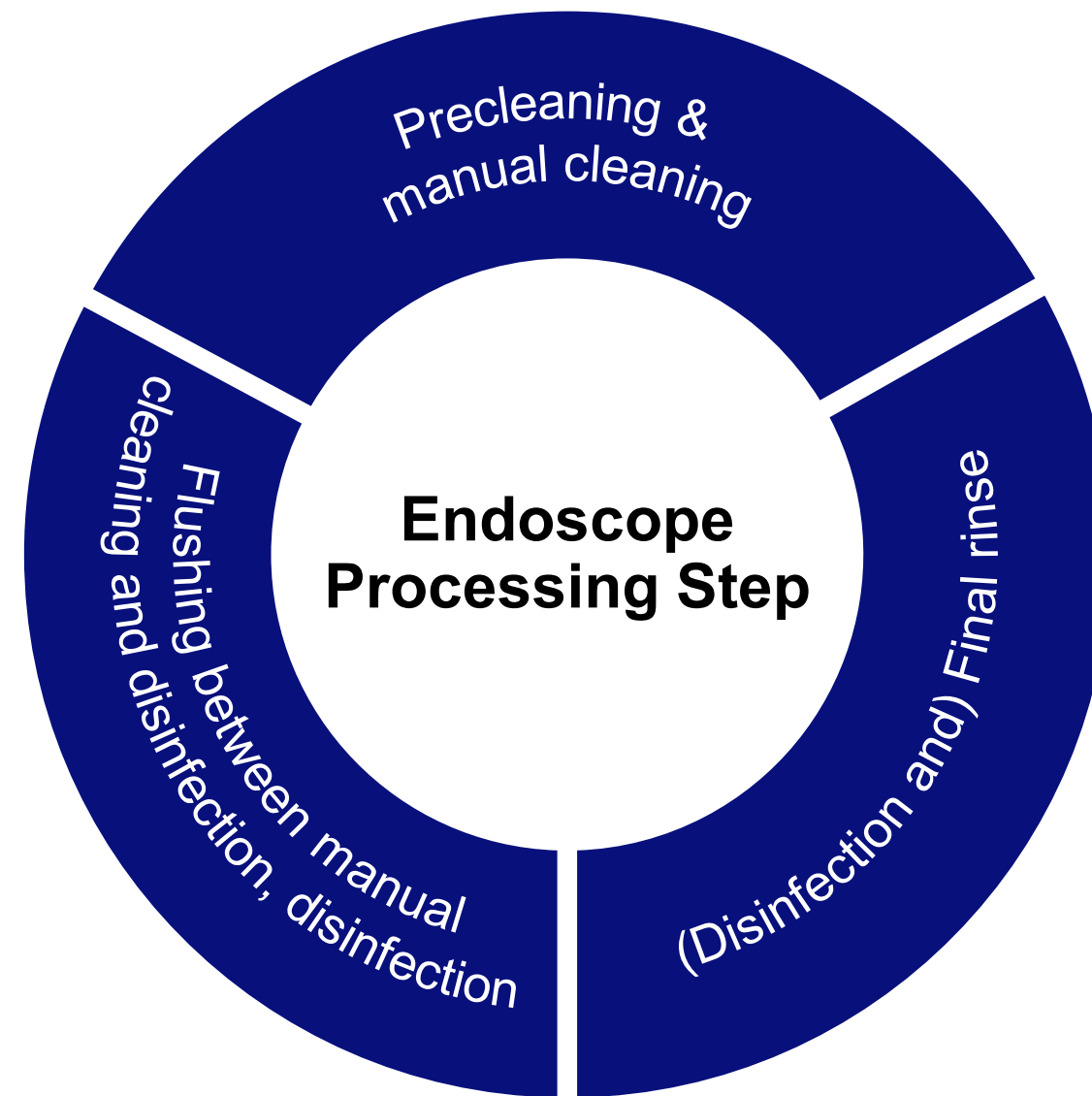
Thermal disinfection (heating)

D

Combination of A - C



# Water for Endoscope Processing



Click on the buttons for further information.

# Water for Endoscope Processing

## Recommended Water Quality

Drinking water

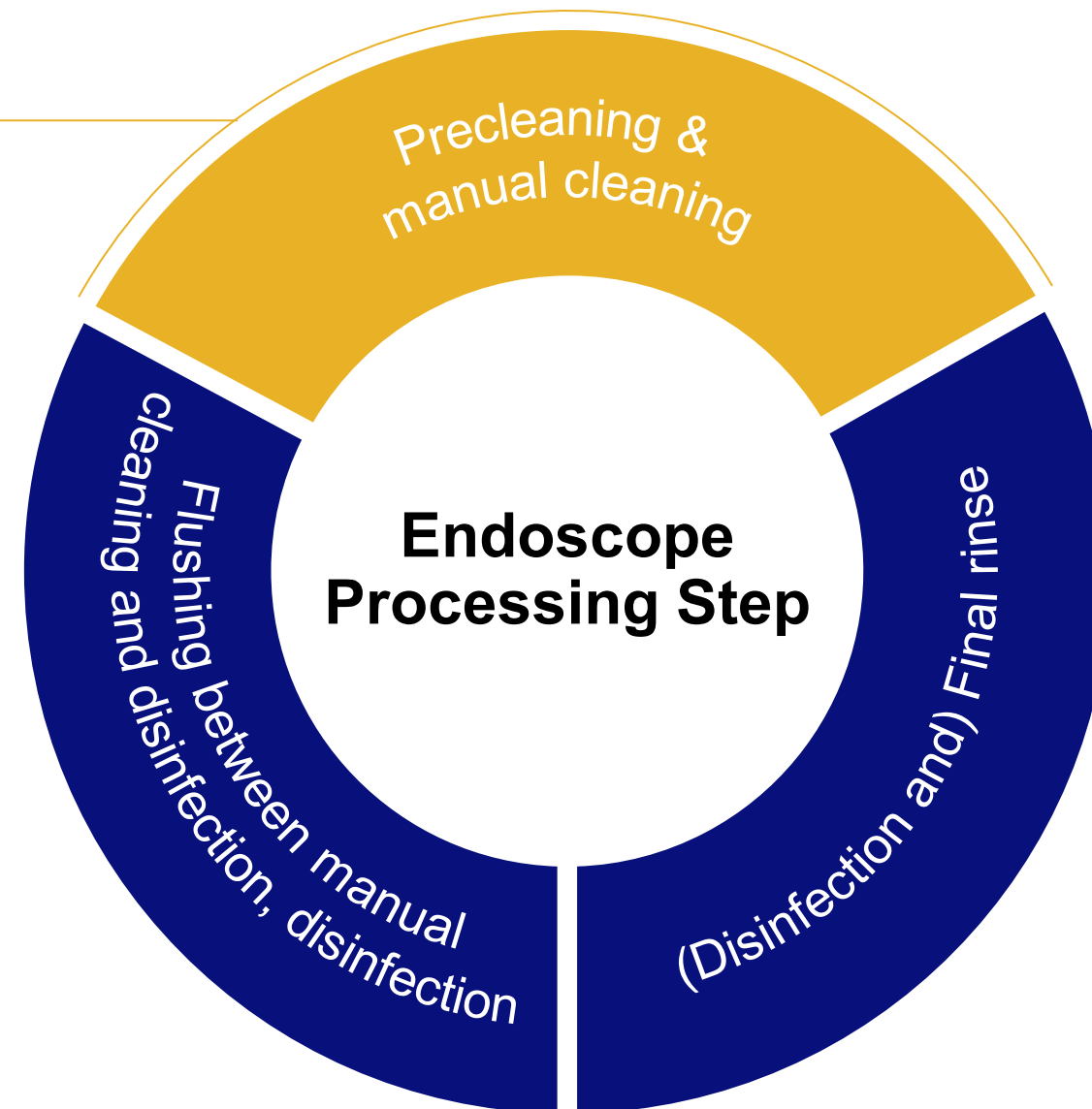
## How to Achieve the Desired Water Quality

Drinking water out of the tap to prepare cleaning solution

- Periodic tests to ensure requirements of drinking water

Endoscope is contaminated **at this point**

- Goal is the mechanical removal of gross debris
- No higher water quality needed



Click on the buttons for further information.

# Water for Endoscope Processing

## Recommended Water Quality

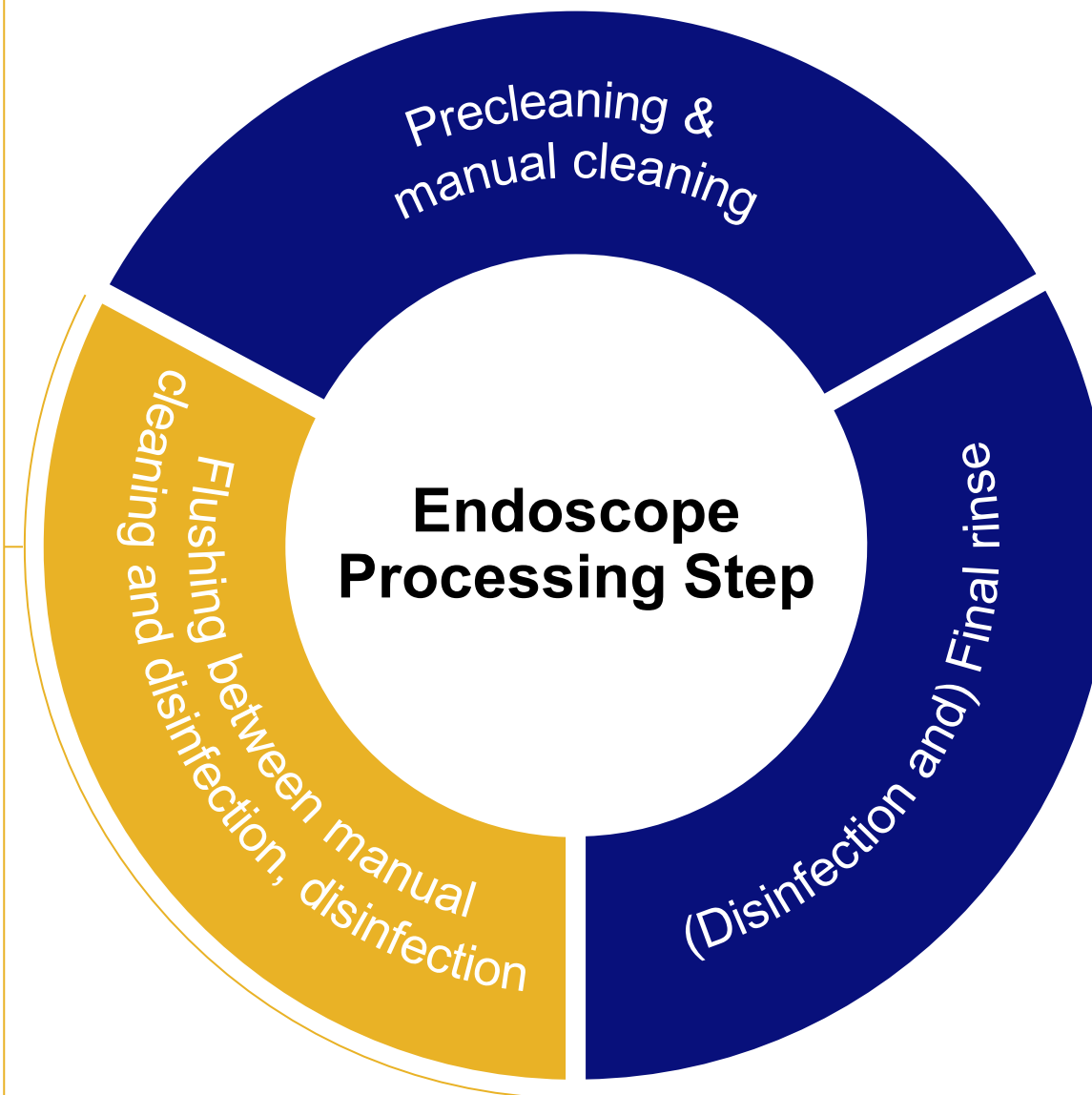
Drinking water

## How to Achieve the Desired Water Quality

Drinking water could be used when periodically checked

**BUT:** At this point, the first microbiological load has been removed

- If heavily contaminated water is used, the biological load will increase again and disinfection will be more difficult
- Sterile-filtered water can be used to ensure a continuous reduction of microbiological load – especially for manual processing



Click on the buttons for further information.

# Water for Endoscope Processing



## Recommended Water Quality

Treated (RO or soft potable water which is filtered, heated and/or UV disinfected) or sterile purified water

## How to Achieve the Desired Water Quality

Final rinse water quality should be free from microorganisms and the chemical concentration limited/low

- To avoid recontamination of the endoscope after successful cleaning and disinfection

Click on the buttons for further information.

# 02 Water Quality

# Water Quality

## Water qualities, their nature & purpose in endoscope processing

Click on the buttons for further information.

### Tap water, potable water

#### Definition:

Collective term for technically in water pipes (pipelines) supplied or local water

#### Chemical Quality:

Not defined

US:

- >150 ppm CaCO<sub>3</sub>

#### Microbiological Quality:

Not defined

#### Production:

Extracted from the earth or from wells

After treating in the waterworks possibly sent to users!

#### Step in endoscope processing:

All steps but the final rinse step(s)

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# Water Quality

## Water qualities, their nature & purpose in endoscope processing

Click on the buttons for further information.

### Industrial water, process water (not intended for human consumption)

#### Definition:

Serves as specific technical, commercial, agricultural or domestic application

#### Chemical Quality:

Depending on the requirements of the respective process

#### Microbiological Quality:

Minimum level of hygiene, depending on requirements of the respective process, e.g.:

- no algae or lime for cooling units
- deionized water for steam turbines

#### Production:

Depending on the requirements of the respective process

#### Step in endoscope processing:

All steps but the final rinse step(s)

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# Water Quality

## Water qualities, their nature & purpose in endoscope processing

Click on the buttons for further information.

### Drinking water

#### Definition:

Water for human consumption:

- Personal hygiene, cooking, beverages etc.

Quality requirements:

- EU COUNCIL DIRECTIVE 98/83/EC on the quality of water intended for human consumption (1998)

#### Chemical Quality:

- May contain varying quantities of calcium, magnesium, sodium chloride, sulfate carbonate
- Might contain certain chloride concentration

US:

- pH ~6.5 – 8.5

#### Microbiological Quality:

EU:

- May contain maximum 100 cfu/ml at 22 °C
- No E. coli bacteria (100 ml)

#### Production:

Extracted from groundwater and wells

Treated according to guidelines in the waterworks

#### Step in endoscope processing:

All steps but the final rinse step(s)

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# Water Quality

## Water qualities, their nature & purpose in endoscope processing

Click on the buttons for further information.

### Soft water

#### Definition:

Reduction of water hardness (mainly calcium and magnesium ions) to a specified level

#### Chemical Quality:

Limited amount of calcium and magnesium ions; but may still have further ions, e.g.:

- US: <10 ppm CaCO<sub>3</sub>
- NL: <50 mg/l CaCO<sub>3</sub>
- DE: <8.4 °dH (84 mgCaO)

#### Microbiological Quality:

Not defined

#### Production:

Water softener, ion exchanger

- changes calcium and magnesium for potassium and sodium (cations only)

#### Step in endoscope processing:

All steps but the final rinse step(s)

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< 17 | 28 >

# Water Quality

## Water qualities, their nature & purpose in endoscope processing

Click on the buttons for further information.

### Deionized (DI) water, demineralized water Reverse Osmosis (RO) water

#### Definition:

Does not contain ANY minerals

#### Chemical Quality:

NO minerals

- Purity of demineralized water measured in mS/m or  $\mu\text{S/cm}$  (electrical conductivity)
- Value to be achieved depends on the intended use

#### Microbiological Quality:

NO special requirements

- No removing of viruses or bacterias or other microorganisms
- Microbiological quality depends on the intended use

#### Production:

Mineral extraction by Ion exchanger (cations and anions) or RO plants

#### Step in endoscope processing:

All steps but the final rinse step(s)

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# Water Quality

## Water qualities, their nature & purpose in endoscope processing

Click on the buttons for further information.

### Distilled water, Aqua destillata

#### Definition:

Free of ions, trace elements and other impurities

#### Chemical Quality:

Characterized by a low to nonexistent concentration of ions

#### Microbiological Quality:

The distilled water is “relatively pure”

- No claim to microbiological sterility

#### Production:

Obtained by distillation (heated and collection of evaporated water)

#### Step in endoscope processing:

All steps but the final rinse step(s)

#### BUT:

- Too expensive!

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# Water Quality

## Water qualities, their nature & purpose in endoscope processing

Click on the buttons for further information.

### Sterile-filtrated water

#### Definition:

Particularly pure water quality

#### Chemical Quality:

Should not contain any minerals bigger than 0.2  $\mu\text{m}$

#### Microbiological Quality:

Definition of the FDA

- Retention of 7 Log (99.99999 %) of the test bacteria *Brevundimonas diminuta*

#### Production:

Membrane filtration with membranes smaller than 0.2  $\mu\text{m}$

#### Step in endoscope processing:

All

- Most practicable solution for final rinse water quality

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# Water Quality

## Water qualities, their nature & purpose in endoscope processing

Click on the buttons for further information.

### Sterile water

#### Definition:

Almost 100 % free of any microorganisms (bacteria, spores and other microbiological organisms), including endotoxins

#### Chemical Quality:

Should not contain any minerals

#### Microbiological Quality:

Almost 100 % free of any microorganisms including endotoxins

#### Production:

Filtered with special membranes

#### Step in endoscope processing:

All

#### BUT:

- Too expensive

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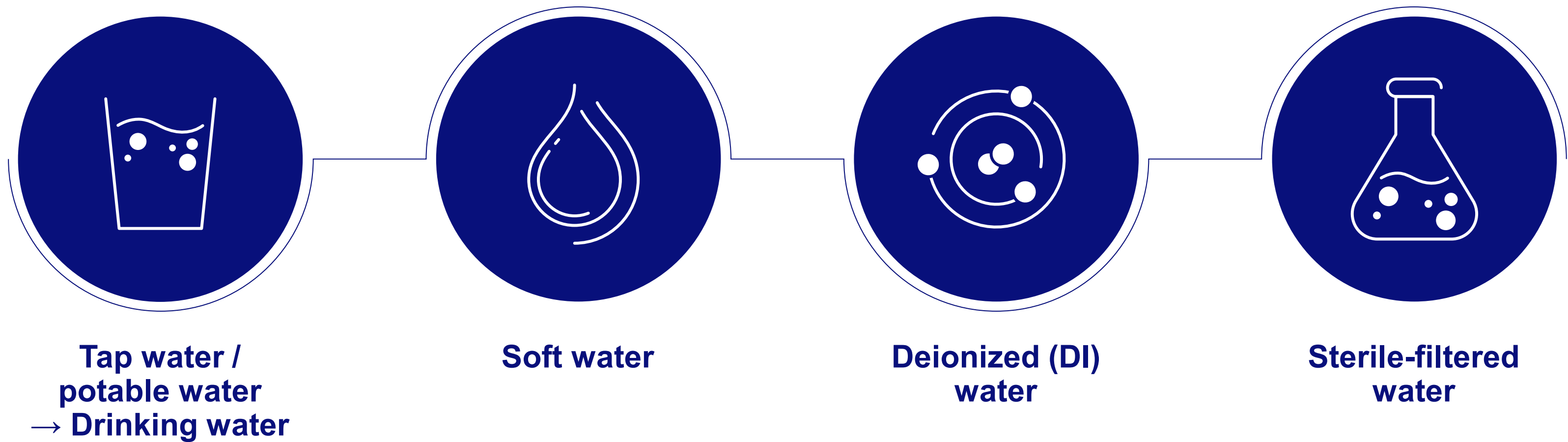
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# 03

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## Production of Water Qualities

# Production of Water Qualities



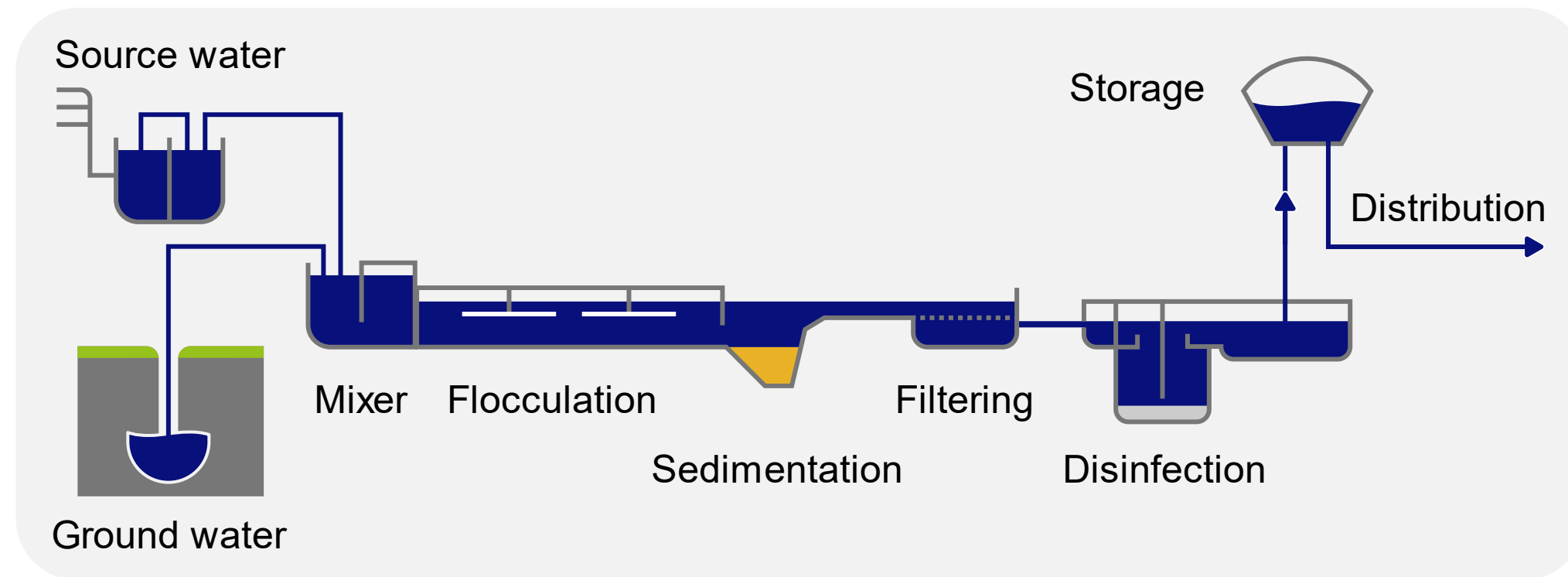
Click on the buttons  
for further information.

# Production of Water Qualities

## Tap water / potable water → Drinking water

### Endoscope processing:

- Precleaning
- Manual Cleaning
- Disinfection



Drinking water of the given microbiological and chemical quality

- Depending on European & national specifications

Water extracted from the environment (e.g. from wells) is treated in waterworks

- By sedimentation, filtration and disinfection

[Back to overview](#)



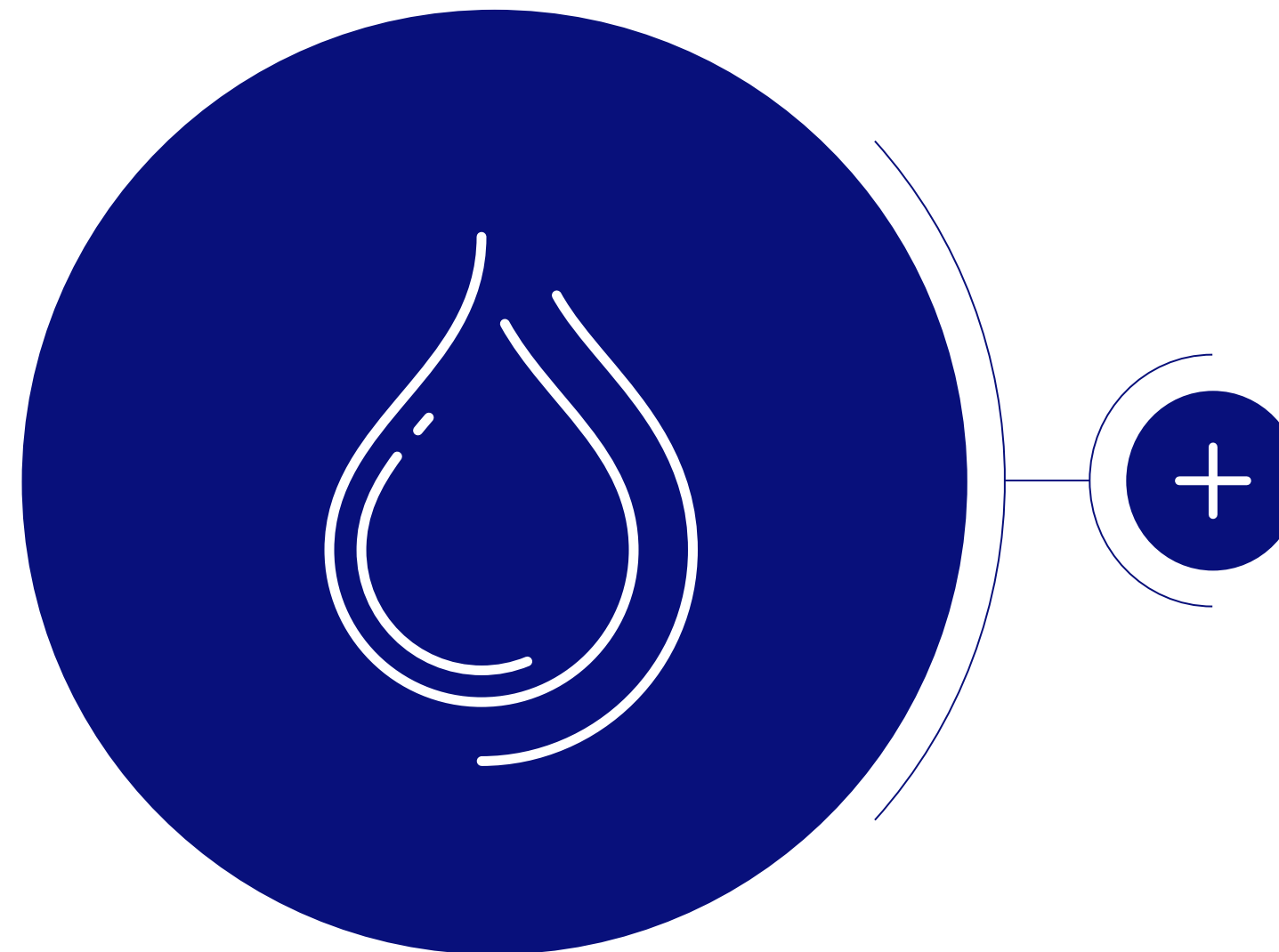
# Production of Water Qualities

## Soft water

### Endoscope processing:

- May be required in endoscope washerdisinfector (EWD/AER)
- May support cleaning efficacy

Soft water systems or cartridges must be monitored for conductivity to determine when the ionizing resin is depleted

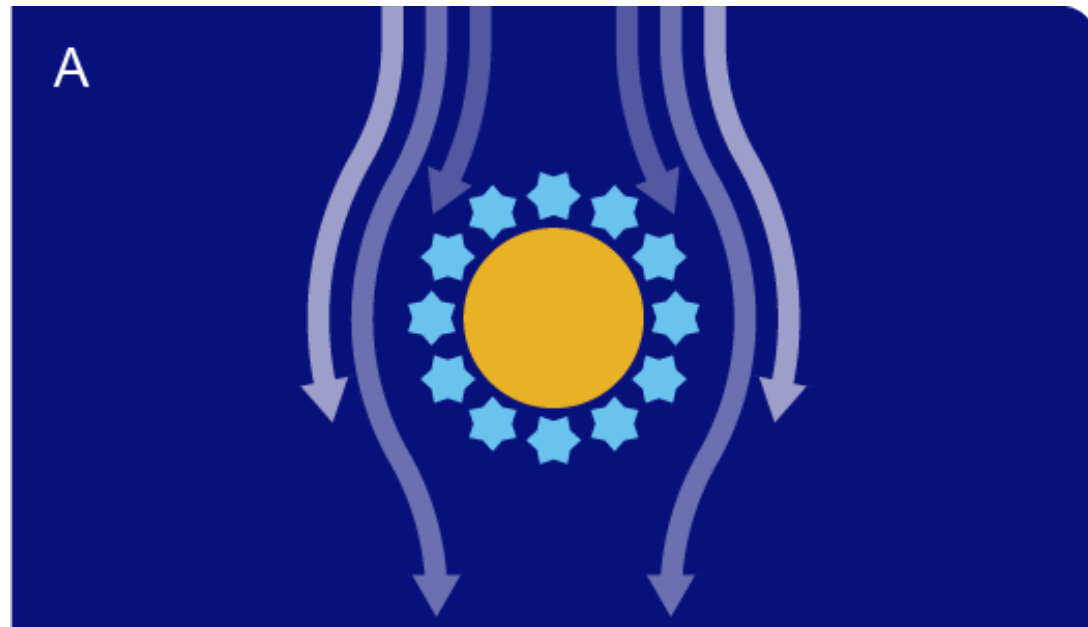


[Back to overview](#)

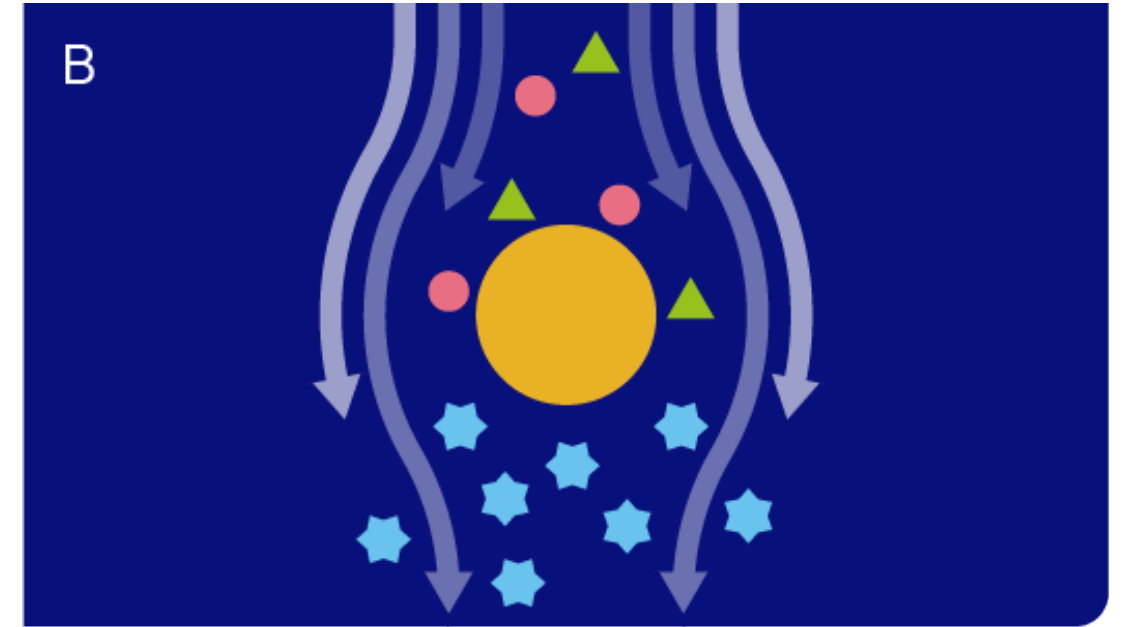
Click on the Plus-Symbol for further information.

# Production of Water Qualities

## Soft water



There is ion exchange resin in the form of small resin beads in the exchanger. Sodium ions adhere to each resin bead.



Hard water with many calcium and magnesium ions flows through the exchanger. The ion exchange resin absorbs calcium and magnesium ions from the water and releases sodium ions. This reaction is called ion exchange.

The calcium and magnesium ions remain in the exchanger.

Soft water without calcium and magnesium ions, but with sodium ions leaves the exchanger.

This process takes place until no more sodium ions are present. Sodium Ion The ion exchange resin is exhausted.

★ Sodium Ion    ▲ Magnesium Ion    ● Calcium Ion

# Production of Water Qualities

## Endoscope processing:

May be required for final rinse step(s)

- Manual and automated

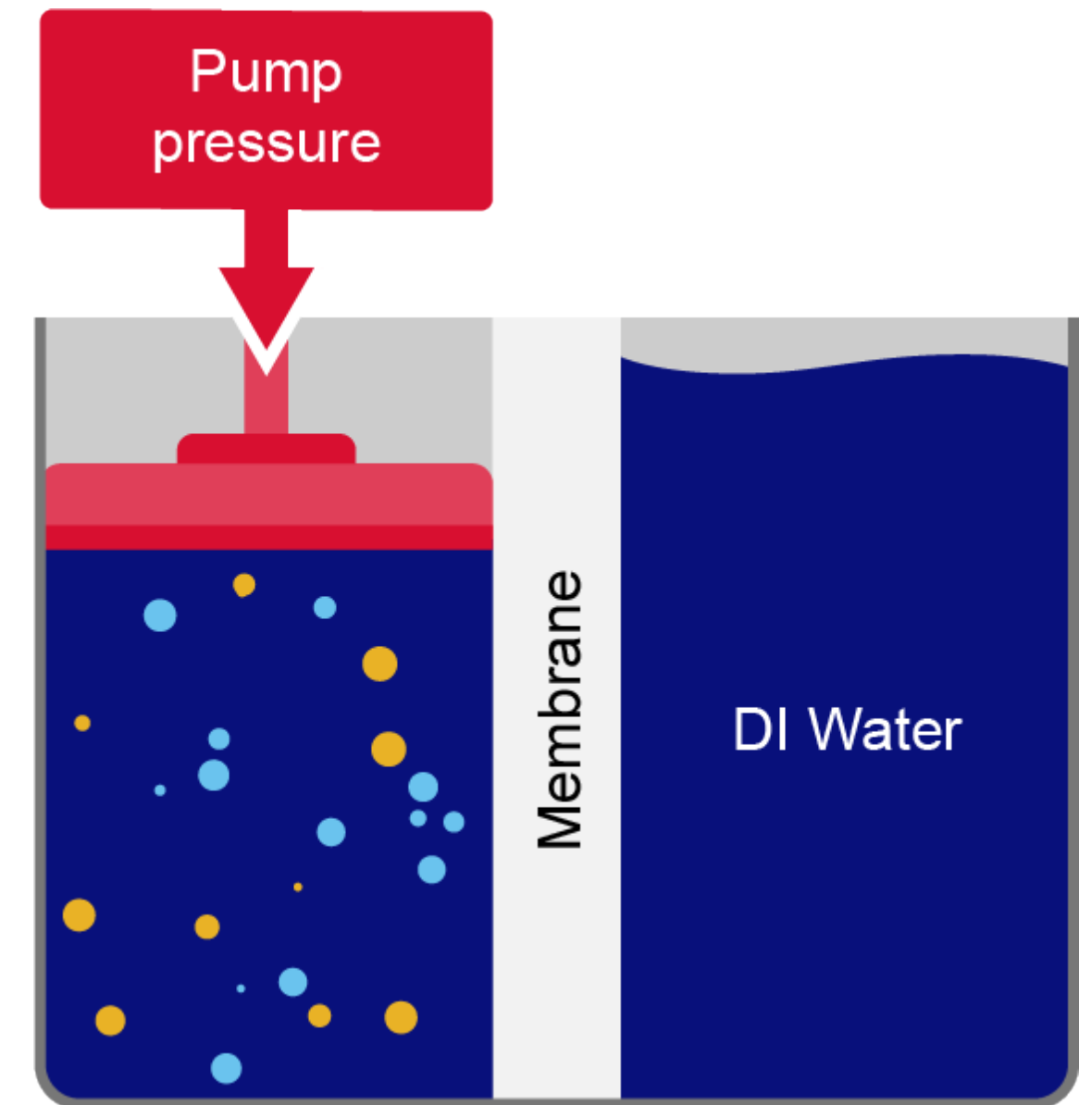
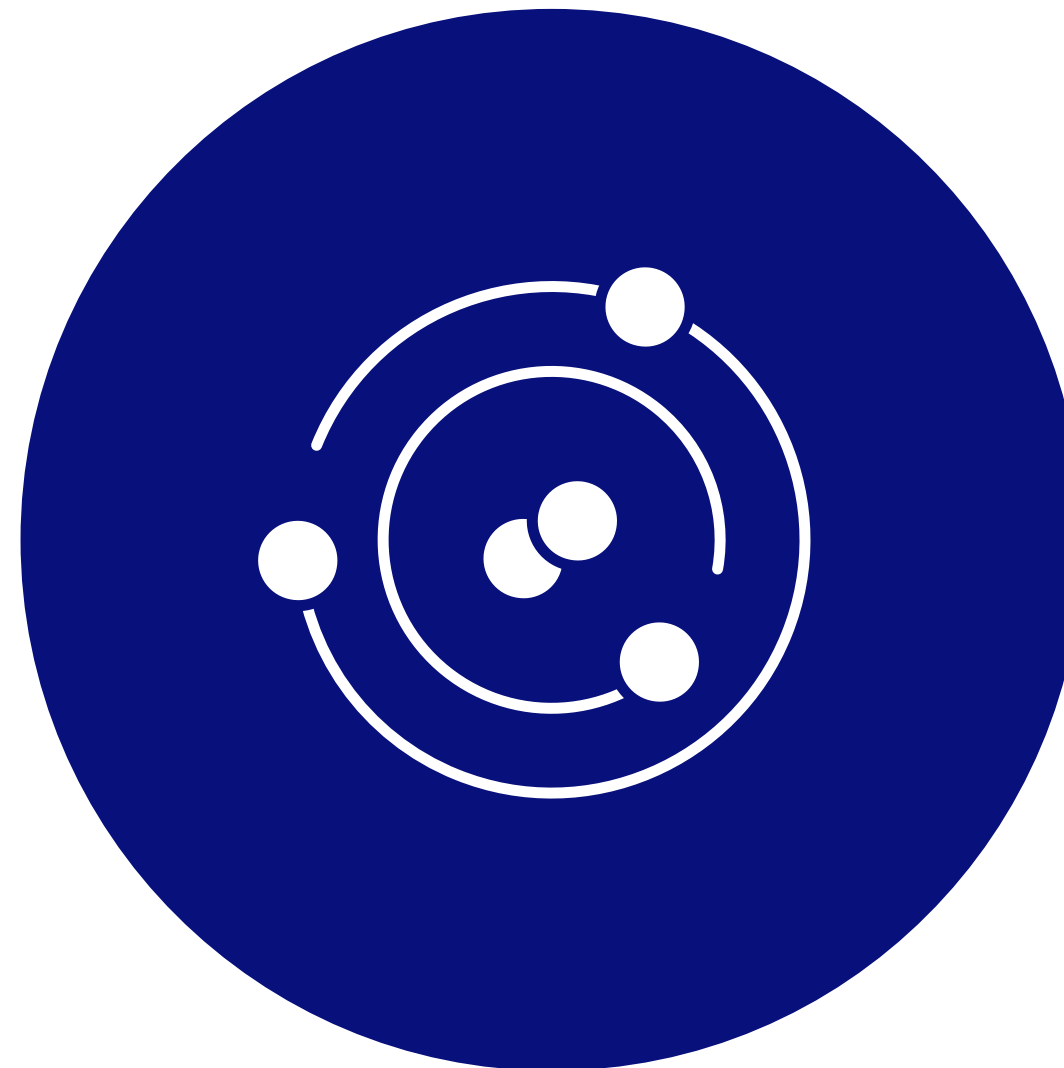
Depending on DI water quality further treatment is necessary to reach microbiological quality

- Disinfection by heating, chemicals or filtration

Production of DI water with cartridges in different sizes and reverse osmosis (RO) systems

- Depending on the required amount of water

## Deionized (DI) water



● Cations ● Anions

[Back to overview](#)

# Production of Water Qualities

## Endoscope processing:

Always in final rinse step(s)

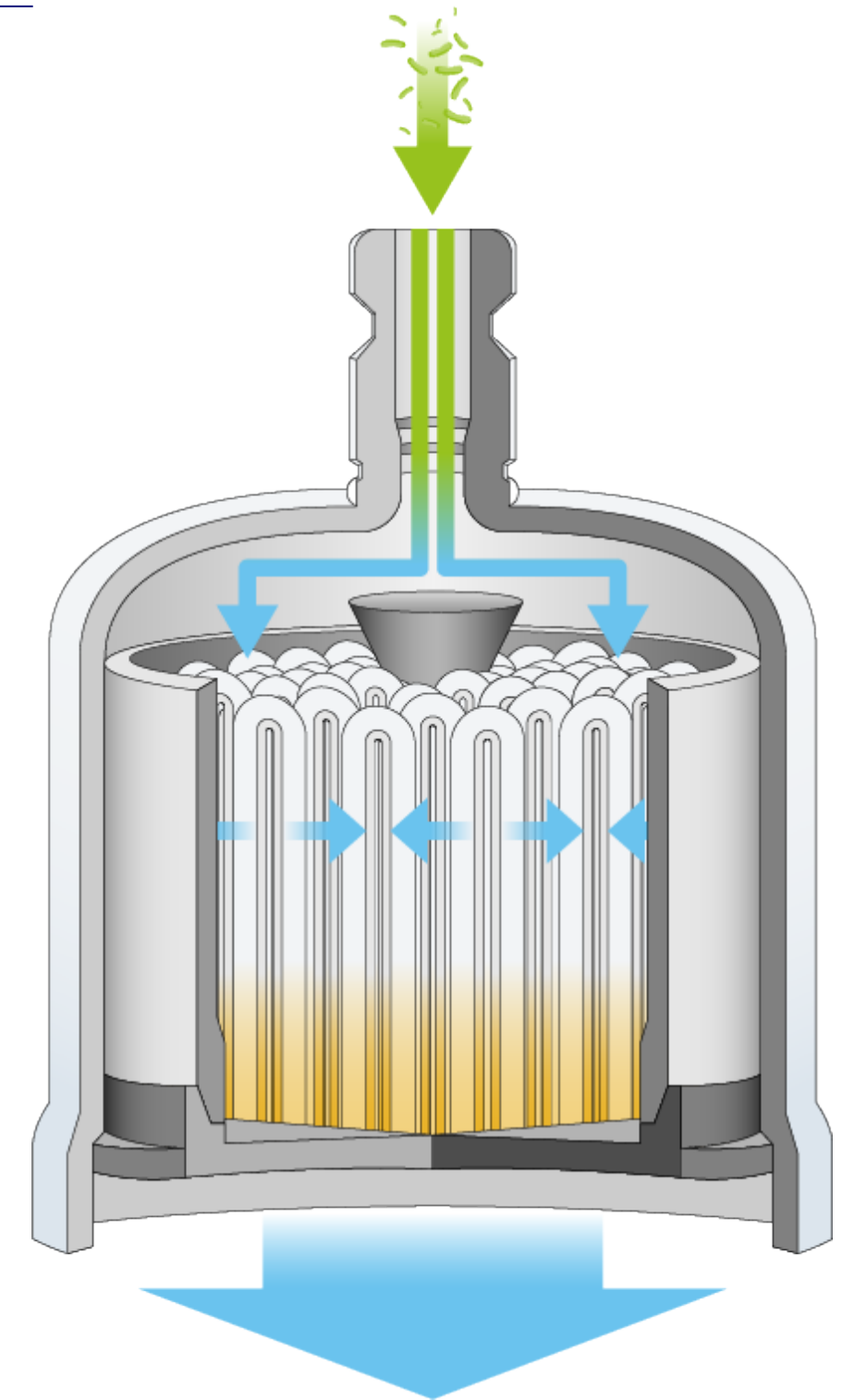
- Manual and automated (if no other water disinfection)

Water is pressed from the outside into the 0.2 µm large membrane

- Filtered through the membrane
- Flows out free of microorganisms (not sterile and endotoxin-free)

Filters are available in different sizes and with different amounts of water volumes

## Sterile-filtered water



[Back to overview](#)

**OLYMPUS**

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 Restart