



# E.KO IONISER®

## OPERATING INSTRUCTION

E.KO IONISER 1501™® / E.KO IONISER 1502™® / E.KO IONISER 1503™®



be clean.  
stay green.

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# INSTRUCTION MANUAL

**E.KO IONISER 1501™® / E.KO IONISER 1502™® / E.KO IONISER 1503™®**

We are very pleased that you have chosen the E.KO IONISER® System.

The E.KO IONISER® System 1501 / 1502 / 1503 replaces completely the traditional mixed bed resins and is a very environmentally friendly exchange system with a long lifespan. Thanks to its high efficiency, it can simultaneously execute the pre-deionisation and the internal deionisation of the process water in your wire eroding machine. Check your E.KO IONISER® carefully for damage caused during delivery. Should there be any, contact your dealer and complete the damage report form.

## NEW INSTALLATION AND COMMISSIONING

Before you connect the E.KO IONISER® 1501 to the original hoses of your EDM machine, the system should be rinsed. - Rinsing Instructions page 4.

To connect the system to your machine, the supplied add-on kit must be fitted as per the installation instructions. After installation, check the throughflow as well as the flow direction and make sure the connections do not leak.

Remove the green adhesive film from the input to the E.KO IONISER® and connect the system to the wire eroding machine. The quick connectors lock into place with a click and can be released with the integrated dark grey unlock button. Check the function of the KORROSTOP3® measurement device. Depending on the type of machine, the E.KO IONISER® reaches to its maximum deionisation capacity within 20 minutes.

The E.KO IONISER® is filled with deionised water, enabling the start-up phase to be kept as short as possible.

## IMPORTANT INFORMATION

The maximum working pressure of 5 bar cannot be exceeded. The device will be damaged (due to overpressure) and water will leak!

## COMMISSIONING, RINSING INSTRUCTION AND MAINTENANCE

Before you connect the E.KO IONISER® 1501 to the original hoses of your EDM machine, the system should be rinsed.

### RINSING INSTRUCTIONS

For rinsing, you need the following items from the E.KO IONISER® connection kit:



1 x CPC coupling ½"  
Art.No. 400566



1 x CPC plug ½"  
Art.No. 400562

### RINSING STEPS

Connect CPC coupling and CPC plug with the CPC ports of the E.KO IONISER®.  
Now connect the water inlet with the tap of your water line and direct the output line into sewer system or sink.

**Pay attention to the correct direction of flow when connecting!**

Now rinse the E.KO IONISER® for 3-5 minutes (max. 25°C water temperature).

After rinsing, turn off the water supply. **The system may no longer be pressurized when clamping off!**

Remove the two CPC connections used for rinsing and now connect the E.KO IONISER® to the original hoses of your EDM machine.

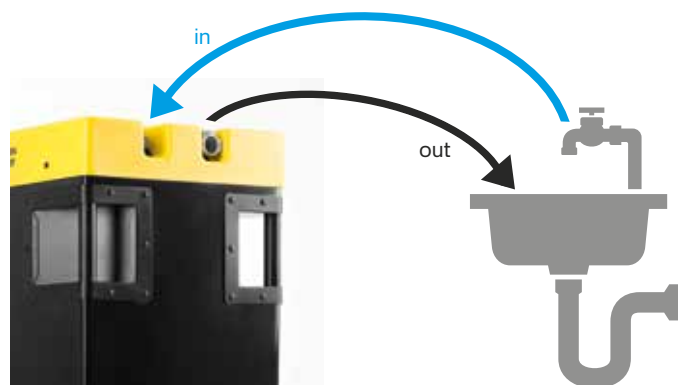
The E.KO IONISER® is now fully operational.

## IMPORTANT INFORMATION

Always clamp off the CPC connections on the E.KO IONISER® while depressurised!  
If the system remains pressurised when clamping off, the E.KO IONISER® will be damaged!

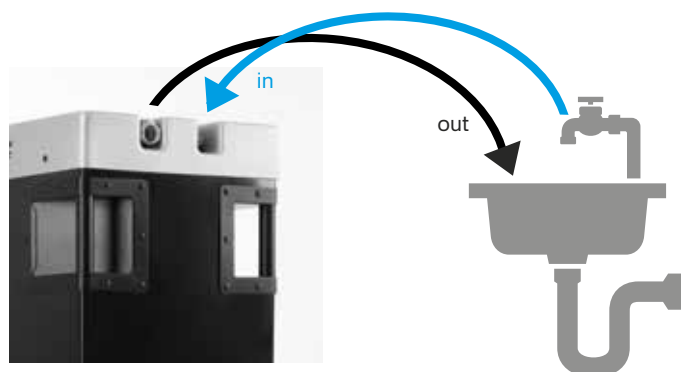


E.KO  
IONISER® 1501



E.KO  
IONISER® 1502 / 1503

Input / Eingang / Entrée / Ingresso



## WHEN SHOULD THE E.KO IONISER® BE REPLACED?

The system is equivalent to the performance of approximately 200 l of mixed bed resins. This performance was measured with new (not regenerated) mixed bed resin in a 20-l pressure bottle (resin cartridge).

## THE LIFESPAN OF THE E.KO IONISER® IS ALWAYS DEPENDENT ON:

- Refill volume of fresh water (for example vaporisation in summer)
- Type of filter - condition and size of the filter (fineness of the filter in  $\mu\text{m}$ )
- Adjusted conductivity in the work basin
- Processed materials (carbide and copper)
- Condition of the process water in the wire eroding machine

# IMPORTANT

Chemicals in your process water, such as conservation additives against rust, oil, detergents and other pollutants, can considerably shorten the lifespan of the E.KO IONISER® !

## REPLACEMENT RECOMMENDATION

- the display lamp on the KORROSTOP3® measurement device is blinking
- the deionisation process takes noticeably too long
- the E.KO IONISER® has been in use longer than 12 months (hygiene/contamination)

Please order your next E.KO IONISER® from your dealer in good time!

# ATTENTION

After consulting your dealer, take into account the corresponding delivery to ensure you receive your replacement in time for uninterrupted service!

## STORAGE OF THE E.KO IONISER®

TO ENSURE TROUBLE-FREE FUNCTIONING OF THE E.KO IONISER®, COMPLY WITH THE FOLLOWING STORAGE CONDITIONS:

- maximum storage period of 6 months
- storage temperature 5 – 35°C
- absolute protection from frost and direct solar radiation
- do not store horizontally
- do not store standing on its cap
- do not expose to extreme temperature fluctuations
- do not store one on top of the other

Due to temperature fluctuations and high humidity, condensed water may leak from the unit (there are small holes near the bottom on the edges of the body).

## RETURN TRANSPORT / EXCHANGE

Leave the water that is in the E.KO IONISER® in the appliance. The system is always delivered from the factory prefilled with deionised water. It is thus not necessary to empty out the water remaining in the E.KO IONISER®. During the exchange, there is no loss of water in your wire eroding machine.

For the return transport to your dealer, please use the original packing from the initial delivery. The E.KO IONISER® must be returned on the supplied EUROPALETTE - firmly strapped or tied on - and with the connections on the top. Please, never return the E.KO IONISER® positioned horizontally or with the connections pointing downwards, as this can cause transport damage! Always use the packaging for your documents (delivery note, transport papers) - ensure they are easily visible - and not the plastic housing of the appliance.

## PLEASE NOTE

If the return transport is done correctly, you can save yourself and us unnecessary effort eliminating the need for - damage report/insurance report.

For more information, please contact your E.KO IONISER® system dealer.





## TECHNICAL DATA E.KO IONISER®

	<b>E.KO IONISER® 1501</b>	<b>E.KO IONISER® 1502</b>	<b>E.KO IONISER® 1503</b>
<b>SYSTEM DATA</b>	<b>EDM</b>	<b>EDM</b>	
Length	660 mm	660 mm	660 mm
Width	370 mm	370 mm	370 mm
Height	1150 mm	1150 mm	1150 mm
Weight	160 kg	160 kg	160 kg
Appliance colour	PE black	PE black	PE black
Lid colour	ABS yellow	ABS silver grey	ABS white
Max. lid load allowed	50 kg	50 kg	50 kg

### HYDRAULIC CAPACITY

Max. throughflow rate	40 l/min	40 l/min	40 l/min
Min. throughflow rate	1 l/min	1 l/min	1 l/min
Max. operating pressure	5 bar	5 bar	5 bar
Max. incoming conductivity	2500 µS/cm <sup>1</sup>	2500 µS/cm <sup>1</sup>	2500 µS/cm <sup>1</sup>
Conductivity	< 0,01 µS/cm <sup>1</sup>	< 0,01 µS/cm <sup>1</sup>	< 0,01 µS/cm <sup>1</sup>
Counter value mixed bed resin	approx. 200 l	approx. 200 l*	approx. 200 l
Permitted incoming pH range	6.5 - 9.5	6.5 - 9.5	6.5 - 9.5
KORROSTOP3®	yes	yes	yes
Min. operating temperature	5 °C	5 °C	5 °C
Max. operating temperature	50 °C	50 °C	50 °C

\* exclusively for utilisation with carbide

### STANDARD EQUIPMENT

EASY-fast couplings	yes	yes	yes
CONNECT Add-on kit	option	option	option





# SAFETY DATA SHEET

In accordance with EU 453/2010

Revised March 30, 2015

## 1. SUBSTANCE/PREPARATION AND COMPANY DESIGNATION

### 1.1 Trade Name/Product Name

E.KO IONISER 1501™® (customs tariff number 8421 2100)

E.KO IONISER 1502™® (customs tariff number 8421 2100)

E.KO IONISER 1503™® (customs tariff number 8421 2100)

The product is a portable and self-contained water treatment plant with double wall safety container and is not pressurized and thus not subject to CE rules and regulations. Material: PE-HD, PP

#### Additional information

The product is exempt from registration in accordance with the measures under Title II and VI and Article 2(9) of the REACH regulation.

### 1.2 Identified Uses

Absorbent, catalyst and/or ion exchange

### 1.3 Company Designation, Supplier

easymetal GmbH  
Resselstraße 12  
A-2120 Wolkersdorf  
Phone: +43 2245 20 123  
Fax: +43 2245 20 123 45  
office@easymetal.com

### 1.4 Emergency Phone Numbers

Italy +39 (0) 2 95250555  
Great Britain +44 (0) 191 4898181  
France +33 88 736000  
Spain +34 (9) 48822700  
Belgium +32 (0) 3 5410016  
Austria +43 (1) 4064343  
Local poison centers

## 2. POSSIBLE HAZARDS/DANGERS

### 2.1. Product Classification

Classification in accordance with Regulation (EC) No. 1272/2008

The substance is not classified according to the CLP regulation

Classification in accordance with Directive 67/548/EEC or 1999/45/EC: n/a

Special hazards for people and the environment: n/a

### 2.2 Label Elements

Labeling in accordance with Regulation (EC) No. 1272/2008: n/a

Hazard pictogram: n/a

Signal word: n/a

Hazard notes: n/a

- 2.3 **Other Hazards**  
Results of the PBT and vPvB assessment  
PBT: inapplicable  
vPvB: inapplicable

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is mixture

<u>Designation</u>	<u>Quantity</u>	<u>CAS No.</u>	<u>Classification EG1272/2008</u>
Water	> = 40 - < = 80%	7732-18-5	not classified
Polymer	> = 10 - < = 50%	69011-20-7	Eye cor/irr, 1, H318
Polymer	> = 10 - < = 50%	69011-18-3	Eye cor/irr, 1, H318

<u>Designation</u>	<u>Quantity</u>	<u>CAS No.</u>	<u>Classification 67/548/EWG</u>
Water	> = 40 - < = 80%	7732-18-5	not classified
Polymer	> = 10 - < = 50%	69011-20-7	Xi: R41
Polymer	> = 10 - < = 50%	69011-18-3	Xi: R41

### 4. FIRST AID MEASURES

#### 4.1 **Description of First Aid Measures**

After eye contact:

Not applicable when used as intended. Flush eyes sufficiently with water while keeping eyelids open.

Then consult physician (ophthalmologist) immediately.

After skin contact:

Not applicable when used as intended. Remove product mechanically.

Wash the affected skin areas thoroughly with soap and water. In case of skin reaction, seek medical attention.

After inhalation:

Not applicable when used as intended. Take person outside to get fresh air; medical attention is required in case of respiratory complaints.

After ingestion:

Not applicable when used as intended. Rinse mouth with plenty of water. If you feel unwell, seek medical advice.

#### 4.2 **Most Important Acute and Delayed Symptoms and Effects**

No other relevant information available.

#### 4.3 **Information on Immediate Medical Attention and Special Treatment**

No other relevant information available.

### 5. FIREFIGHTING MEASURES

#### 5.1. **Extinguishing media:**

CO<sub>2</sub>, foam, dry powder, for larger fires also water spray.

5.2. **Special Product Hazards**

No data available

5.3 **Information on Firefighting**

In the event of a fire, wear self-contained breathing apparatus if and where necessary.

5.3 **Further Information**

No data available

## 6. ACCIDENTAL RELEASE MEASURES

6.1 **Personal Precautions, Protective Equipment and Emergency Procedures**

Not required

6.2 **Environmental Precautions:** Dilute with plenty of water

6.3 **Methods and Material for Containment and Cleaning**

Absorb with liquid-binding material (sand, diatomite, acid binder, universal binder, sawdust).

6.4 **References to Other Sections**

No dangerous substances are released.

Information for safe handling, see section 7.

Information about personal protective equipment, see section 8.

## 7. HANDLING AND STORAGE

7.1 **Precautions for Safe Handling**

No special measures required.

Information about fire and explosion protection:

No special measures required.

7.2 **Conditions for Safe Storage and Consideration of Incompatib**

Storage:

Requirement for storage rooms and vessels: No special requirements.

Indication for combined storage: not required

Further information about storage conditions: none

Storage class: 10

Classification according to Ordinance on Industrial Safety and Health (BetrSichV): -

7.3 **Specific End-Uses**

No other relevant information available.

## 8. LIMITATION AND MONITORING OF EXPOSURE PERSONAL PROTECTIVE EQUIPMENT

Additional information about design of technical systems:

No further details, see section 7.

8.1 **Parameters to be Monitored**

Components with workplace-related limit values to be monitored: n/a

Additional notes: The lists valid during the preparation were used as a basis.

## 8.2 Limitation and Monitoring of Exposure/Personal Protective Equipment

Respiratory protection:  
Not required when used as intended.

Eye protection:  
Not required when used as intended.

Hand protection and material of gloves:  
Not required when used as intended.

Technical protection measures (ventilation):  
A ventilation system is not required when used as intended

## 9 . PHYSICAL/CHEMICAL PROPERTIES

**Appearance:** Liquid, colorless  
**Oder:** Odorless, possibly short-term ammonia-like odor  
**pH-value:** Neutral  
**Solubility:** Not soluble in water  
**Boiling point:** 100°C  
**Risk of explosion:** Not subject to explosions  
**Self-ignition:** Not self-igniting  
**Flash point:** Approx. 200°C  
**Oxidizing properties:** Oxidizing agents, acids and bases  
**Freezing point:** Not applicable  
**Steam/vapor density:** Not applicable

## 10. STABILITY AND REACTIVITY

- 10.1 **Reactivity**  
No data available
- 10.2 **Chemical Stability**  
Stable under recommended storage conditions
- 10.3 **Possibility of Dangerous Reactions**  
No data available
- 10.4 **Conditions to Avoid**  
No data available
- 10.5 **Incompatible Materials**  
Starke Oxidationsmittel
- 10.6 **Additional Decomposition Products**  
No data available

## 11. INFORMATION ON TOXICOLOGICAL EFFECTS

Acute toxicity: No data available

Chemical burn/skin irritation: No data available

Serious eye damage/irritation: No data available

Respiratory or skin sensitization: No data available

Germ cell mutagenicity: No data available

Carcinogenicity: IARC: No component of this product present in a concentration equal to or higher than 0.1% is identified by the IARC as a probable, potential or proven carcinogen for humans.

Reproductive toxicity: No data available

Reproductive toxicity: No data available

Specific target organ toxicity - single exposure: No data available

Specific target organ toxicity - repeated exposure: No data available

Aspiration hazard: No data available

Additional information: RTECS: No data available

## 12. ECOLOGICAL INFORMATION

Toxicity: No data available

Persistence and degradability: No data available

Bioaccumulative potential: No data available

Mobility in soil: No data available

Results of the PBT and vPvB assessment:

A PBT/vPvB assessment is not available since a chemical safety assessment has been carried out/is not required.

Other adverse effects: No data available

Water hazard class: The product is not classified as a water pollutant.

## 13. DISPOSAL INFORMATION

Disposal only to the supplier (owner). The device may not be distributed to third parties or non-licensed dealer.

The product is 100% recyclable, therefore no disposal by a third party.

Dealer information: +43 2245 20 123

## 14. TRANSPORT INFORMATION

Not dangerous cargo. Keep separate from food and beverages

### 14.1 UN-Number

ADR, ADN, IMDG, IATA not required

### 14.2 UN Proper Shipping Designation

ADR, ADN, IMDG, IATA not required

- 14.3 **Transport Hazard Classes**  
ADR/RID: Not dangerous goods  
ADN: Not dangerous goods  
IMDG: Not dangerous goods  
IATA: Not dangerous goods
- 14.4 **Packaging Group**  
ADR, IMDG, IATA not required
- 14.5 **Environmental Hazards**  
ADR/RID: no  
IMDG Marine pollutant: no  
IATA: no
- 14.6 **Special Precautions for Users**  
No data available
- 14.7 **Bulk Goods Transport as per Annex II of MARPOL Agreement 73/78 and IBC-Code**  
Not applicable
- 14.8 **Additional Information**  
ADR comments: Not a hazardous material in accordance with RID/ADR/GGVS  
UN „Model Regulation“: -

## 15. LEGISLATION

- 15.1 **Safety, Health and Environmental Rules and Regulations/Legislation Specific to the Substance or Mixture**  
European inventory of existing substances currently available on the market (EINECS)  
The components of this product are listed in the EINECS or are subject to exception rules for this inventory.
- 15.2 **Safety Assessment**  
Not applicable
- 15.3 **Water Hazard Class**  
Generally not a water pollutant.

## 16. ADDITIONAL INFORMATION

**Hazard note in section 3**  
H318 causes severe eye damage

**R phrases in section 3**  
R41 risk of serious damage to eyes



All data and information refer to the device E.KO IONISER™ @ 1501/1502/1503 and not to specific individual components.

The data and information is based on the present state of our knowledge; however, they represent no assurance of product features and do not establish a legal contractual relationship. They only refer to the designated product and may no longer apply if the product is used along with other materials or in a handling or operational process. Users must verify for themselves that all statements are appropriate and complete for their application or usage.

All older versions are no longer valid.

## ABBREVIATIONS AND ACRONYMS

**RID:** Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations

Concerning the International Transport of Dangerous Goods by Rail)

**ICAO:** International Civil Aviation Organization

**ADR:** Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

**IMDG:** International Maritime Code for Dangerous Goods

**IATA:** International Air Transport Association

**GHS:** Globally Harmonized System of Classification and Labelling of Chemicals

**EINECS:** European Inventory of Existing Commercial Chemical Substances

**CAS:** Chemical Abstracts Service (division of the American Chemical Society)



# INSTALLATION REPORT

E.KO IONISER 1501™® / E.KO IONISER 1502™® / E.KO IONISER 1503™®

Technician: \_\_\_\_\_

Date of installation: \_\_\_\_\_ Serial number: \_\_\_\_\_

## CLIENT

Company: \_\_\_\_\_

Contact person: \_\_\_\_\_ Tel.: \_\_\_\_\_ CT: \_\_\_\_\_ FAX: \_\_\_\_\_

Street: \_\_\_\_\_

Post code: \_\_\_\_\_ Town/City : \_\_\_\_\_

## MACHINE

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Year of manufacture: \_\_\_\_\_

Operating hours by IB: \_\_\_\_\_

Cutting time/year: \_\_\_\_\_

Filter: \_\_\_\_\_ Model: \_\_\_\_\_ Carrier: \_\_\_\_\_

Mixed bed resin brand: \_\_\_\_\_

## INSTALLATION

Conductivity

fresh water: Conductivity: \_\_\_\_\_  $\mu\text{S}/\text{cm}^1$  pH value: \_\_\_\_\_ pH Hardness: \_\_\_\_\_  $^\circ\text{dH}$

Conductivity

E.KO IONISER®: Conductivity: \_\_\_\_\_  $\mu\text{S}/\text{cm}^1$  pH value: \_\_\_\_\_ pH

Temperature: \_\_\_\_\_  $^\circ\text{C}$  Flow rate: \_\_\_\_\_ l/min

Add-on kit: \_\_\_\_\_ Other: \_\_\_\_\_



# DAMAGE REPORT

E.KO IONISER 1501™® / E.KO IONISER 1502™® / E.KO IONISER 1503™®

Date: \_\_\_\_\_ Dealer: \_\_\_\_\_

Client: \_\_\_\_\_

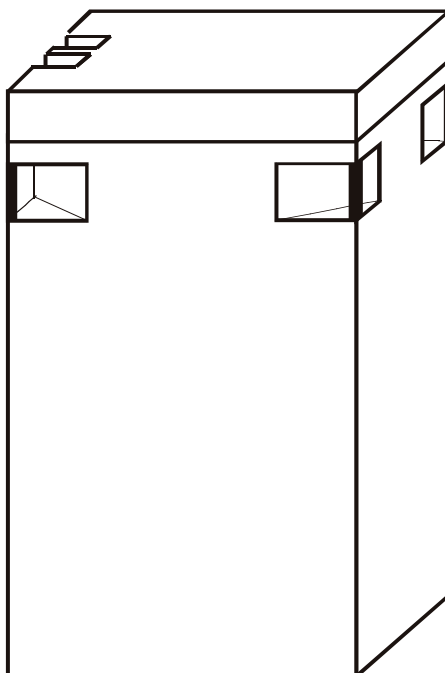
Telephone: \_\_\_\_\_ CT: \_\_\_\_\_ FAX: \_\_\_\_\_

Carrier: \_\_\_\_\_

Serial number: \_\_\_\_\_

Please mark the defective/damaged part with a cross. Several marks (at different places) are possible. Make a copy of the damage report and then add it to the delivery documentation of the E.KO IONISER® system.

Please fax the completed **DAMAGE REPORT IMMEDIATELY** to your supplier and/or dealer. Fax easymetal GmbH: **+43 2245 20 123 45**.





# CARBIDE AND COPPER

## E.KO IONISER® WATER TREATMENT FOR CARBIDE AND COPPER

HERE IS SOME ADVICE ON HOW YOU CAN IMPROVE YOUR WORKING PERFORMANCE WITH YOUR E.KO IONISER:

1. Increase the troughflow rate of the deionisation
  - Remove blockages in the hose and/or the hose connections
2. Try to adjust to the lowest possible conductivity in your working basin
  - depending on the machine type - via the management utility or manually

THIS IMPROVES:

- Reaction time of the deionisation (water quality more stable)

## IMPORTANT INFORMATION

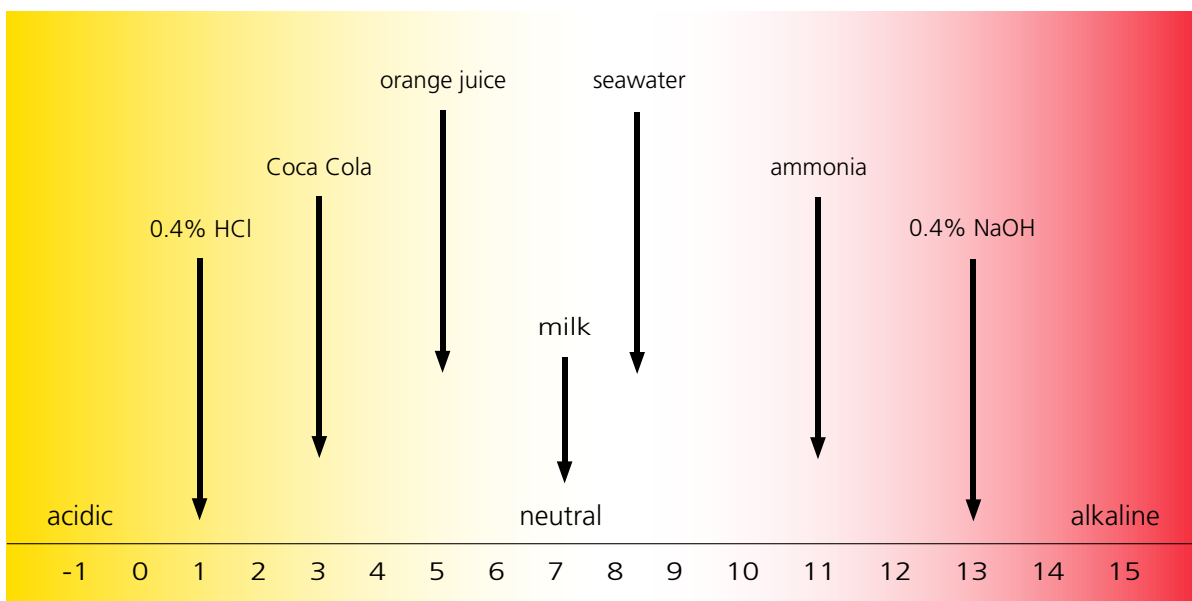
With low conductivity and a high troughflow rate, the lifespan of the E.KO IONISER® can be considerably reduced.

# pH VALUE

The pH value indicates how acidic or how alkaline a sample is. A pH value of 7 means that the sample is neutral – it does not react to acid or alkali. Almost neutral is, for example, fresh tap water.

Samples are acid when the pH value is under 7, as in lemonade, lemon juice or hydrochloric acid. In practice, pH values are known to be below -1.

An alkaline sample has a pH value over 7, for example, stale tap water, water that contains detergent or sodium hydroxide. The pH scale extends to beyond 15.



The further away the pH value is from 7, the more aggressive the sample. Per pH unit, the acid or the alkaline effect increases by a factor of 10.

For the measurement of pH there are electrochemical pH measurement systems, test sticks, indicators or colorimeters. Of all these processes only the electrochemical measurement yields definitive results. This measurement is effected with a pH measuring chain.

The measuring chain is an electronic sensor, comprising of a measuring and a reference electrode. Dependent on the pH value of the solution to be measured, the voltage on a membrane changes. Present-day ordinary measuring chains are built in such a way that at a pH value of 7 the voltage of the membrane amounts to 0 mV. The more the pH value of the solution to be measured diverges from pH = 7, the stronger is the voltage signal. The pH-meter calculates the measured value from this signal.

Because of acid rain, which is also responsible for the dying forests, the acidity of European open waters has increased considerably over the past decades. The acidity of a lake can be measured with litmus paper. It is an indicator on a paper strip which turns redder, the higher the acid concentration is in the water. The graduation of the red colouration corresponds to a scale which is also referred to as the pH-scale.



The starting point of the scale is neutral water, which always has a pH value of 7. Values under 7 indicate acids, values over 7 indicate alkalis.

The smaller the pH value, the stronger is the available acid. The scale is graduated in such a way that, per unit, the acidity increases by a factor of 10. An acid with the pH value of 3 is ten times stronger than an acid with the pH value of 4!

## APPROXIMATE pH VALUE OF TYPICAL MATERIALS AND CHEMICALS

Hydrochloric acid 35 %	pH = -1	Beer	pH = 5
Hydrochloric acid 3.5 %	pH = 0	Skin surface	pH = 5.5
Hydrochloric acid 0.35 %	pH = 1	Mineral water	pH = 6
Stomach acid	pH = 1	Pure water	pH = 7
Lemon juice	pH = 2	Blood	pH = 7.4
Vinegar essence	pH = 2	Clean see water	pH = 8.3
Vinegar	pH = 3		
Coca Cola	pH = 3	Detergent in solution	pH = 10
Wine	pH = 4	Sodium hydroxide 3 %	pH = 14
Sour milk	pH = 4.5	Sodium hydroxide 30 %	pH = 15

## EXTENDED DEFINITION FOR THE ADVANCED ONES

Strictly speaking, the pH value is a measurement that indicates how high the concentration of  $H_3O^+$  ions [ $H_3O^+$ ] in a watery solution is. It is expressed by the negative decadic logarithm of the  $H_3O^+$  ions concentration:

$$pH = - \log [H_3O^+]$$

### EXAMPLE:

In pure water, there are always  $10^{-7}$  mol/l  $H_3O^+$  - ions (as well as  $OH^-$  - ions).

This is the result of the ionic product of water. Water itself is therefore always to some extent either an acid (or an alkali). This property is also designated as the autoprotolysis of water. Now we apply the concentration of  $H_3O^+$  - ions in the water to the equation for calculating the pH value:

$$pH = - \log [10^{-7}] = -[-7] = 7$$

That is why the pH of water is 7. The pOH value indicates the concentration of  $OH^-$  ions in the water. Accordingly, the pH and the pOH can always be calculated for all acids and alkalis. The sum of the two always results in 14:

$$pH + pOH = 14$$

THE FOLLOWING TABLE SHOWS THE RELATIONSHIP BETWEEN THE pH AND THE pOH IN DEPENDANCE ON THE CONCENTRATION UNDER CONSIDERATION:

<b>Solution</b>	<b>[H<sub>3</sub>O<sup>+</sup>]</b>	<b>pH value</b>	<b>[OH<sup>-</sup>]</b>	<b>pOH value</b>
10 mol/l acid	10 mol/l	-1	10 <sup>-15</sup> mol/l	15
1 mol/l acid	1 mol/l	0	10 <sup>-14</sup> mol/l	14
Pure water	10 <sup>-7</sup> mol/l	7	10 <sup>-7</sup> mol/l	7
1 mol/l base	10 <sup>-14</sup> mol/l	14	1 mol/l	0
10 mol/l base	10 <sup>-15</sup> mol/l	15	10 mol/l	-1

# ELECTRICAL CONDUCTIVITY

Electrolytic current conveyance in watery solutions is dependent on the concentration, the degree of dissociation (ionic conductivity) and the valency of the cations and anions as well as on the mobility of these ions (temperature). In waste water, it is a measure of the total salt content. The electrical conductivity of water is based on the amount of solute ionic substances present. It is dependent on the concentration, the electrochemical valency, the mobility of the ions and the degree of dissociation of the solute electrolyte. Conductivity is a measure of the concentration of ions from substances dissolved in water; however, it does not provide information about the single specific concentrations.

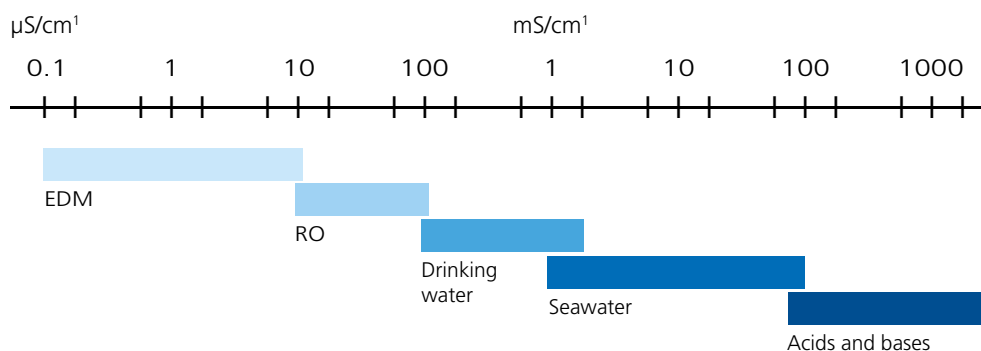
## CONDUCTIVITY

Conductivity is a sum parameter for the concentration of ions in a solution. The more salts, acids or alkalis there are in a solution, the higher is their conductivity. The unit for conductivity is S/m. The scale for watery solutions begins with purest water, having a conductivity of  $0.05 \mu\text{S}/\text{cm}^1$  (25 °C). Natural waters like tap water or surface waters are in the range of approx. 100 – 1000  $\mu\text{S}/\text{cm}^1$ . The upper end of the scale is reached with some alkalis, such as potassium hydroxide, that have values up to a little higher than 1000  $\mu\text{S}/\text{cm}^1$ .

In practice, the measurement of conductivity is used for the monitoring of installations, the production of pure water or to determine the salinity of seawater, for examples.

The calculation of conductivity is done with an electrochemical resistance measurement. In the simplest case, the measuring cell consists of two electrodes of the same type. An alternating voltage at the electrodes causes the ions which are contained in the solution to move towards the electrodes. The more ions there are in the solution, the bigger is the current flowing between the two electrodes. From this measured current the appliance then calculates, on the basis of Ohm's law, first of all the susceptance of the solution and then – with inclusion of the cell data – the conductivity.

## CONDUCTIVITY OF AQUEOUS SOLUTIONS



Physicist. Professor in Munich. In 1826, Ohm discovered experimentally the fundamental law for the conduction of power which has been named after him. In 1843, he defined the simple tone as a pure sinusoidal oscillation and in 1852/1853, he made important contributions regarding the interference of linear polarised light during its passage through single axle crystals.

Ohm, Georg Simon, \*16.3.1789 Erlangen, † 6.7.1854 Munich

# OXYGEN CONTENT

Especially with the biological treatment of waste water, the precise and continuous determination of oxygen content is a basic requirement for the installation working trouble free. The efficiency of the biological purification process, both in the nitrification and in the denitrification phase, is fundamentally influenced by the quality of the aeration regulation, i.e. through the loading dependent regulation of the entry of oxygen.

The activity of microorganisms in the nitrification rises with the increasing concentration of  $O_2$ . However, at approximately 2 mg/l, an economical limit is reached, as a further increase in oxygen content no longer appreciably accelerates the process.

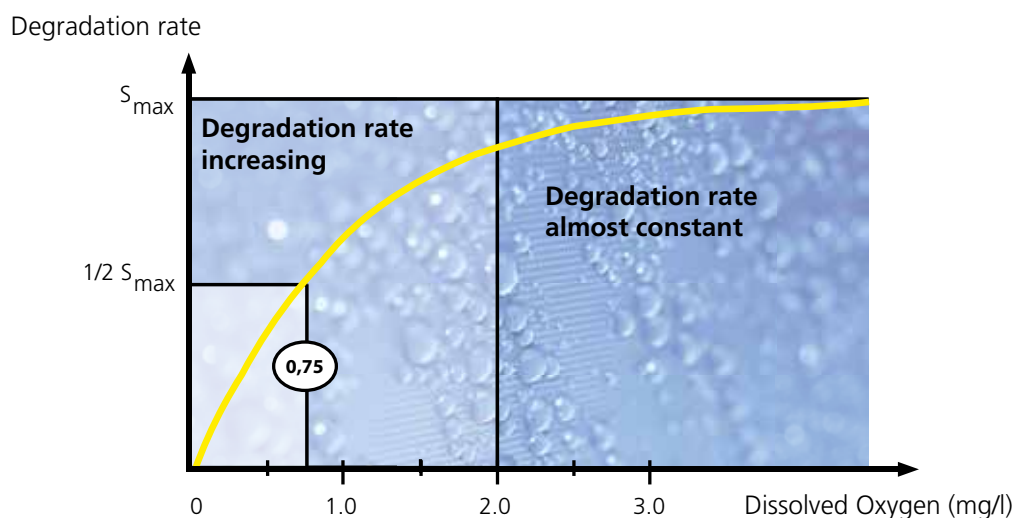
Through a concentration-dependent management of the blower you can save a considerable amount of energy, as the electricity requirement for the aeration system represents the largest operating costs in a biological sewage plant.

However, remaining oxygen affects the denitrification process. That is why a low  $O_2$  concentration is aimed at, which must, however, still be sufficient for a complete nitrification. Only the utilisation of a precise measuring device can guarantee an efficient and thus energy saving regulation of the process.

In almost every liquid there is more or less dissolved oxygen. Water in its saturated state, for example, has at a temperature of 20°C and a pressure of 1013 mbar with approximately 9 mg/l oxygen. In ethanol it can be up to 40 mg/l or in glycerine only 2 mg/l.

Every liquid absorbs oxygen until the partial pressure of the oxygen in the liquid and that in the air and/or the gases that are in contact above the liquid are in equilibrium. Furthermore, the current concentration of oxygen depends on several factors, such as the temperature, the air pressure, the oxygen consumption caused by the microbiological decomposition process or the production of oxygen by, for example, algae.

## $NH_4$ -N-DEGRADATION RATE - OXYGEN CONCENTRATION



## THE CONCENTRATION OF OXYGEN IS A DECISIVE FACTOR, E.G.:

- for the living conditions of the fish and microscopic animals in lakes and rivers
- for the decomposition process in the treatment of waste water
- for the corrosion processes in pipelines
- for the preservability of drinks

Previously, the determination of the concentration of oxygen was done by a titration process by WINKLER. Nowadays, electrochemical measuring is the process approved by the various standards authorities.

An oxygen sensor has, in the simplest of cases, a working electrode and a contra electrode. Both electrodes are to be found in an electrolyte system, which is separated from the sample by a gas-permeable membrane. The working electrode reduces the oxygen molecules to hydroxide ions. With this electrochemical reaction, a current flows in the sensor from the contra electrode to the working electrode.

The more oxygen a sample solution contains, the larger is the electrical signal. By means of this signal the oxygen measuring device calculates, thanks to the dissolubility function, the oxygen concentration in the sample.



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