GROUP BARCHEMICALS®

LA FORMULA PERFETTA

LINEA AGRI

# PROFESSIONAL LINE BARCHEMICALS GENERAL CATALOG AGRI LINE PRODUCTS FOR IRRIGATION

*Updated Edition* **2025 - 1**

BIOSICUREZZA

ECHA EUROPEAN CHEMICALS AGENCY

PMC REGISTERED PRODUCTS

40 ANNI 1984-2024 BARCHEMICALS

BARCHEMICALS®

ENGLISH

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Price List is valid from  the date of issue.
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Issue date January 2025 (Rev. 4)

GROUP BARCHEMICALS®
THE PERFECT FORMULA

40 ANNI BARCHEMICALS

# BIOSAFETY IN AGRICULTURE CLEANING, SANITIZATION AND MAINTENANCE OF DISTRIBUTION PLANTS

This Catalogue is the result of over forty years of experience of a Large Italian Group: **BARCHEMICALS GROUP**.

Barchemicals Group represents an entirely Italian reality made up today of three companies that share projects, visions and values, including Safety for customers and collaborators and the protection and respect for Environmental Resources.

The companies operate in the primary water treatment sector (industrial, drinking, recreational, agricultural) both in Italy and abroad, ranging at 360 ° on every management problem, with particular regard to the sectors:

- disinfection and water treatment,
- environmental disinfection and sanitization,
- control and automation.

The Group - founded and directed by dr. Corrado Barani - is the owner of numerous patents; the resources dedicated to Research and Innovation make up the majority of investments.

Barchemicals is the parent company; produces chemical products for the treatment and conditioning of all types of water. Thirty years of experience is condensed into 5 product lines: Swimming pool, Detergent, RT line, "I Sali della Vita®" and the AGRI line.

**Thanks to an innovative and efficient production system, the company designs and produces high quality and reliable chemical specialties internally.**

The products - strictly "Made in Italy" meet high quality criteria and become developed through a rigid path of researches and safety tests.

**The Chemical Catalog AGRI Line is aimed at the most qualified operators who work at the service of agriculture.**

The constant attention to Research and Development has allowed the creation of innovative products, the products of the AGRI Line respond to the main requirements of the most important Biosecurity protocols.

The balanced formulations between the various components and the use of active ingredients normally used also in the food sector are the guarantee that these products, having carried out their detergent and disinfectant action, even in contact with the ground or in some cases directly on the plants, do not leave toxic residues for humans, animals and plants themselves, but indeed, in some cases, they can themselves become a source of essential elements for plant growth.

**Linea AGRI products are particularly suitable for organic or greenhouse crops where, by preventing the formation of biofilm and fighting against the most common bacterial agents that are toxic to humans and animals**, such as legionellosis, they fully comply with safety regulations in the workplace (law 81/2008).

For disinfection in the zootechnical field, for the protection of the health of operators and potentially exposed subjects, the products that are PMC certified (Medical Surgical Presidium) are highlighted.

BARCHEMICALS® ENGINEERING CORPORATION BARCHEMICALS biopharma

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**Barchemicals believes in Biosafety and, thanks to over thirty years of experience, introduces the fundamental and innovative concept of Biosecurity also in agriculture and livestock farming.**

**Biosecurity in agriculture is environmental safety, protection of land and plant species, protection of animal and human health:**

• in the formulations the polluting substances for the environment are totally absent;

• all the substances used are scrupulously checked to verify their purity, to eliminate the risk of introducing dangerous substances into the environment even in small quantities (heavy metals, toxic organic substances, solvents ...) which can become very dangerous if, due to a their accumulation, they enter the food cycle;

• study and development of efficient and suitable formulations for crops that are made with biological protocol with compounds normally present in nature (fruit acids, ...).

Biosecurity is also, and above all, proposing treatments that eliminate the risk of spreading very dangerous diseases, such as legionellosis, by irrigation systems that work in sprinkling or in close contact with people (irrigation with sprinkling over the foliage, irrigation of sports facilities and fountains).

Biosecurity in agriculture also means preventing all those phenomena which, in the short or long term, can cause direct or indirect diseases to the people who work or may come into contact with this sector. Precisely for this reason, the Barchemicals Research and Development department, together with universities and private or public research institutes, finances and supports the research of new less polluting and more effective materials.

In particular, Barchemicals pays considerable attention to the development of biocides, effective even at low dosages, which are less dangerous for people's health and which do not present phenomena of acquired resistance.

Barchemicals is aware of having a very important social role as in the first 35 years of its life it gave work and dozens and dozens of people, it helped to raise many young people who spent, for more or less long periods, in its laboratories and at its offices or production departments.

Barchemicals has contributed, through the competitive stimulus of free competition, to raise the quality of water treatment systems in Italy and abroad.

Barchemicals is - and will always be - at the forefront, because the development of research and the promotion of people's health and well-being are intrinsic in its DNA and in its Core Values.

Biosecurity is the latest goal that Barchemicals is now trying to achieve for the good of all.

## WHAT DOES THE COMMITMENT TO BIOSAFETY MEAN FOR BARCHEMICALS GROUP?

1. First of all, carry out the registration of products that contain the active biocidal ingredients, present in the authorized lists at European level (BPR) and at local level, if outside Europe.
2. Carry out the registration of PMC in Italy when the ministry of health requests it.
3. Avoid using unauthorized products or products lacking technical equivalence as required by the BPR.
4. Select suppliers based on strict ethical and moral criteria and based on the quality of raw materials.
5. Carry out R&D in collaboration with Universities and Research Institutes.
6. Promote conferences and continuous training of its staff and customers.
7. Promote R&D scholarships.
8. Develop new systems for water and air treatment (biomaterials, chemical-physical systems, UV, etc.)
9. Join and organize conferences and events that promote Biosafety.
10. Widen the fields of application of Biosafety, help the transfer of their skills in all sectors of water treatment: swimming pools, drinking water for human and animal use, sanitary water, industrial water, waste water, water for food use and water for washing and food processing.
11. Promote the expansion of the concept of Biosafety also in developing countries.

Castelnuovo Rangone, 01 September 2021

BARCHEMICALS GROUP

**Barani dr. Corrado**

# Index

## The applications of products for cleaning, sanitizing and maintenance of irrigation systems



## The product data



## Dosing System



## Scientific appendix

# Alphabetical Index



## LEGEND

BO = Bottle
FL = Bottle
TA = Tank
IBC = 1000 liter tank
SE = Bucket
PZ = Piece

# IRRIGATION

## SPECIFIC PRODUCTS
### FOR EVERY NEED

**FUNCTIONAL PROBLEMS OF DISTRIBUTION SYSTEMS:**

- limestone, iron and manganese occlusions with well water;
- occlusion from mucilage with well and surface water;
- specific cleaning treatments with high organic loads (fertigation with biodigested).

**THE COMPATIBILITY OF PRODUCTS IN ORGANIC CROPS:**

- prohibition of using substances incompatible with organic protocols.

**HEALTH PROBLEMS FOR WORKERS AND WOMEN PEOPLE WHO MAY BE EXPOSED TO RISKS:**

- treatments of greenhouse crops with dangerous substances;
- risk of legionellosis with irrigation for sprinkling and nebulization for workers and potentially exposed people.

**PHYTOTOXIC SUBSTANCES, NUTRITIONAL PROBLEMS AND SOIL DEPLETION:**

- integrate nutritional supplies with irrigation;
- avoid the presence of phytotoxic elements generally present in industrial products.

**ACQUA ACID**

**ACQUA QUEST**

**ACQUA CLEAN**

**ACQUA QUEST Fe/Mn**

**ACQUA POL**

**ACQUA OXI**

**ACQUA OXI PLUS**

**ACQUA CHLOR**

**BIOCHLOR**

## CLEANING, SANITIZATION AND MAINTENANCE

# OF THE MICROIRRIGATION SYSTEM

## WITH DRIPLINE OR WITH MICROSPRINKLER

# PRODUCT SELECTION GUIDE

**ACQUA ACID**

It can be used with continuous, periodic or seasonal treatments.
Removes dirt caused by scale and biofilm.
Removes limescale deposits due to Ca and Mg.
Prevents the formation of deposits of Ca, Mg, Fe and Mn.
Corrects the pH if too basic well water is used.
It brings phosphorus to the soil.

**ACQUA QUEST**

It is used with continuous treatments.
Prevents the formation of deposits of Ca, Mg, Fe and Mn. It brings phosphorus to the soil.
**It can be used in crops with ORGANIC protocols.**

**ACQUA POL**

It is used with continuous treatments.
Prevents the formation of Ca, Mg deposits.
It brings phosphorus to the soil.

**ACQUA OXI**

It can be used with continuous, periodic or seasonal treatments.
Removes dirt caused by scale and biofilm.
Prevents the formation of deposits of Ca, Mg, Fe and Mn. Prevents the formation of biofilms.
**Zero-residue product.**

**ACQUA CHLOR**

It can be used with continuous, periodic or seasonal treatments.
Removes dirt caused by scale and biofilm.
Prevents the formation of deposits of Ca, Mg, Fe and Mn. Prevents the formation of biofilms.
Designed for the cleaning and maintenance of **digestate and sewage distribution lines.**

# REMOVAL OF IRON AND MANGANESE. THE SOLUTION OF THE PROBLEM

**Iron** and **Manganese** are metals commonly found in soil, and therefore in water as well. They are usually in reduced form and dissolved in groundwater, but as soon as the water is pumped for irrigation, it causes oxidation.

$$2Fe^{2+}_{(aq)} + \frac{1}{2}\,O_2 + 5H_2O \rightarrow 2Fe\,(OH)_3 \downarrow + 4H^+$$

$$2Mn^{2+}_{(aq)} + \frac{1}{2}\,O_2 + H_2O \rightarrow MnO_2 \downarrow + 2H^+$$

The oxidation products are solid and generate serious problems of occlusion of the micro irrigation system.
The presence of Fe and Mn in bivalent form (2+) also favors the proliferation of bacteria which, taking advantage of the oxidation reactions, generate biofilm which further aggravates the clogging problems of irrigation networks.
It is established that the acceptable limits in water for micro irrigation systems are 0.3 mg / l of iron and 0.2 mg / l of manganese.
The removal of iron and manganese from the water with traditional systems involves an oxidation phase carried out in large tanks followed by filtration of the solid deposits. The traditional process is overall very expensive because it involves high costs both in equipment and in energy (the water must be pumped several times).

# TWO PRODUCTS TO USE
## FOR EFFECTIVE CLEANING IN SHOCK TREATMENTS

### *ACQUA CLEAN*

**Removes the most stubborn encrustations due to hardness** and the presence of high quantities of **iron** and **manganese** salts, ACQUA CLEAN completes the action in the shock treatment.

Also to be used in maintenance treatments.

### *ACQUA QUEST Fe/Mn*

After the action of ACQUA QUEST Fe / Mn removes encrustations due to hardness and the presence of high quantities of iron and manganese salts.

**Also to be used in maintenance treatments.**

## CLEANING, SANITIZATION AND MAINTENANCE

# OF THE GREENHOUSE MICROIRRIGATION SYSTEM

## DRIPWING - NEBULIZATION

In greenhouse crops there are specific problems related to:
- possible exposure of workers and people to toxic products in closed environments;
- prevention of legionella due to the high proliferation of microorganisms at constantly high temperatures in closed environments;
- compliance with the rules contained in law 81/2008 on safety in the workplace.

# PRODUCT SELECTION GUIDE

**ACQUA QUEST**

It is used with continuous treatments.
Prevents the formation of deposits of Ca, Mg, Fe and Mn.
It brings phosphorus to the soil.

**ACQUA OXI**

It can be used with continuous, periodic or seasonal treatments.
Removes dirt caused by scale and biofilm.
Prevents the formation of deposits of Ca, Mg, Fe and Mn.
Prevents the formation of biofilms.
**Zero-residue product.**

**BIOCHLOR**

**Surgical Medical Unit No. 19916**
Suitable for washing fruit and vegetables.

## CLEANING, SANITIZATION AND MAINTENANCE

# OF FOUNTAINS AND PLANTS FOR THE IRRIGATION OF THE PUBLIC AND SPORTS GREEN

In the management of these systems, in addition to the problems of cleaning dirt deposits and encrustations the exposure of people to the risk of legionella infection is of fundamental importance due to the high probability of spread of the bacterium in the aerosol generated by the distribution devices and, at the same time, for the easy accessibility of the systems themselves.

## PRODUCT SELECTION GUIDE

**ACQUA OXI**

It can be used with continuous, periodic or seasonal treatments.
Removes dirt caused by scale and biofilm.
Prevents the formation of deposits of Ca, Mg, Fe and Mn.
Prevents the formation of biofilms.
**Zero-residue product.**

**ACQUA CHLOR**

It can be used with continuous, periodic or seasonal treatments.
Removes dirt caused by scale and biofilm.
Prevents the formation of deposits of Ca, Mg, Fe and Mn.
Prevents the formation of biofilms.

**BIOCHLOR**

**Medical Surgical Unit No. 19916**
**Eliminates the danger of Legionellosis.**

## CLEANING, SANITIZATION AND MAINTENANCE

# OF THE IRRIGATION SYSTEM ABOVE THE FOLIAGE

In overhead irrigation, specific problems arise relating to the dispersion of aerosols for systems built near inhabited areas, in these cases, especially with the use of surface irrigation water, the risk of legionella infection increases.
In the presence of well water, the problem of stains on fruit can arise.

## PRODUCT SELECTION GUIDE

**ACQUA OXI**

It can be used with continuous, periodic or seasonal treatments.
Removes dirt caused by scale and biofilm.
Prevents the formation of deposits of Ca, Mg, Fe and Mn. Prevents the formation of biofilms.
**Zero-residue product.**

**ACQUA QUEST**

It is used with continuous treatments.
Prevents the formation of deposits of Ca, Mg, Fe and Mn. It brings phosphorus to the soil.
**Prevents the formation of stains on fruit.**

# PREVENTION OF SPOTS ON FRUIT

## IN WATERING ABOVE THE FOLIAGE

**With irrigation above the foliage of orchards, especially using well water with high hardness, they can form unsightly stains on fruit.**

The use of appropriate complexing agents continuously added to the irrigation water in minimal quantities carefully dosed can eliminate the inconvenience.

**ACQUA QUEST**

It is used with continuous treatments.
Prevents the formation of deposits of Ca, Mg, Fe and Mn.
It brings phosphorus to the soil.
**It can be used in crops with ORGANIC protocols.**
**Prevents the formation of stains on fruit.**

**ACQUA OXI**

It can be used with continuous, periodic or seasonal treatments.
Removes dirt caused by scale and biofilm.
Prevents the formation of deposits of Ca, Mg, Fe and Mn.
Prevents the formation of biofilms.
**Zero-residue product.**

## CLEANING, SANITIZATION AND MAINTENANCE

# OF THE PLANT IN FERTIRRIGAZONE WITH BIODIGESTATE

## DRIPLINE AND TAPE HOSE

**In fertigation with biodigested products there are specific problems relating to the need to use the liquid part of the by-product obtained from anaerobic digestion.**

When using a micro irrigation system, the preventive elimination of the suspended solid fraction (organic in nature) is absolutely necessary.

Even after a very careful filtration (which can also be replaced by the lagooning of the sewage), an extremely high bacterial load remains, of the order of ten million units in a milliliter.

Even a modest injection in the line, of the order of 2% of filtered biodigestate, introduces a quantity of microorganisms that can seriously compromise the functionality of the irrigation system in a short time and over short distances.

**ACQUA OXI PLUS**

It can be used with periodic or seasonal treatments.
Removes the dirty caused from encrustations and biofilms
Prevents the formation of deposits of Ca, Mg, Fe and Mn.
Prevents the formation of biofilms.

**ACQUA CHLOR**

It can be used with continuous, periodic or seasonal treatments
Removes dirt caused by scale and biofilm.
Prevents the formation of deposits of Ca, Mg, Fe and Mn.
Prevents the formation of biofilms.
Designed for cleaning and maintenance of **distribution lines of biodigestate and sewage.**

# PRODUCT DATA

- ACQUA ACID
- ACQUA QUEST
- ACQUA CLEAN
- ACQUA QUEST Fe/Mn
- ACQUA POL
- ACQUA OXI
- ACQUA OXI PLUS
- ACQUA CHLOR
- BIOCHLOR

# ACQUA ACID

Coe UFI: 3830-70C3-6002-4790

## PRODUCT DATA

| | |
|---|---|
| Composition | **Blend of phosphoric-based acids and organic fruit acids** |
| Main actions | **Prevention and removal of Ca and Mg salt deposits and Fe and Mn oxides**<br>**Decreasing of the pH value**<br>**It improves the quality of the soil by counteracting the negative effect due to the presence of sodium**<br>**Addition of phosphorus to the soil** |
| Complementary action | **Elimination of biofilm** |
| Type of treatment | **Seasonal - Periodic - Continuous** |
| BIOSECURITY | **Formulated with certified substances, without impurities, without industrial residues, without heavy metals even in traces** |

## WHEN IT SHOULD BE USED
## ANALYTICAL REFERENCE PARAMETERS (CATALOG APPENDIX)

| Parameter | Unit of measure | No risk | Medium risk | High risk |
|---|---|---|---|---|
| pH of the water | number | <7 | 7 - 8 | > 8 |
| Electrical conductivity - Salinity | µS/cm | <800 | 800 - 3200 | > 3200 |
| Salts of Ca and Mg - Hardness | °F | <15 | 15 - 25 | > 25 |
| Carbonates and bicarbonates - RSC index | number | <1.25 | 1.25 - 2.50 | > 2.50 |
| Bicarbonates | mg / liter | <150 | 150 - 300 | > 300 |
| Saturation Index - IdS | number | <0 | | > 0 |
| Iron | mg / liter | <0.2 | 0.2 - 1.5 | > 1.5 |
| Manganese | mg / liter | <0.1 | 0.1 - 1.5 | > 1.5 |

## DOSAGE OF THE PRODUCT

| | | |
|---|---|---|
| **PH correction for well water** | Concentration of the product determined by the starting pH value and the desired final value | |
| **Periodic or seasonal cleaning *** | Concentration of the product<br>Duration of treatment | **2.0 L / m3**<br>**2.0 hours each cleaning** |
| **Continuous dosing *** | Concentration of the product | **200 mL/m³** |

* The values shown in the table are standard references to be defined case by case after water analysis and any laboratory tests.

## PHYSICO-CHEMICAL PROPERTIES OF THE PRODUCT

| | |
|---|---|
| **Appearance** | Colorless liquid |
| **Smell** | Pungent |
| **Solubility in water** | Complete |
| **pH of the product TQ** | 0 to 20 ° C |
| **Specific weight at 25 ° C** | 1.24 kg / L |


## PACKAGING

| Code | Description | Packaging | Pallet Quantity |
|---|---|---|---|
| 010616004 | ACQUA ACID | FU 10 L | 400 L |

# ACQUA QUEST

Code UFI: W590-40YG-A006-SSGF

## PRODUCT DATA

| | |
|---|---|
| Composition | **Fruit acids and phosphorus salts for food use** |
| Main actions | **Prevention of deposits of Ca and Mg salts and oxides of Fe and Mn Addition of phosphorus to the soil** |
| Type of treatment | **Continuous** |
| BIOSAFETY | **Formulated with certified substances, free from impurities, free from industrial residues, free from heavy metals even in traces** |
| SPECIFIC USES | **Cleaning treatments inside greenhouses**<br>**Cleaning treatments for crops with ORGANIC protocols Prevention of stains on fruit in sprinkling irrigation** |

## WHEN IT SHOULD BE USED ANALYTICAL REFERENCE PARAMETERS (CATALOG APPENDIX)

| Parameter | Unit of measure | No risk | Medium risk | High risk |
|---|---|---|---|---|
| Electrical conductivity - Salinity | µS/cm | <800 | 800 - 3200 | > 3200 |
| Salts of Ca and Mg - Hardness | °F | <15 | 15 - 25 | > 25 |
| Iron | mg / liter | <0.2 | 0.2 - 1.5 | > 1.5 |
| Manganese | mg / liter | <0.1 | 0.1 - 1.5 | > 1.5 |

## CONTINUOUS DOSING OF THE PRODUCT

| | |
|---|---|
| **Concentration of the product with hardness <15 ° F** | **10 mL/m³** |
| **Concentration of the product with hardness between 15 ° F and 25 ° F** | **20 mL/m³** |
| **Concentration of the product with hardness> 25 ° F** | **30 mL/m³** |
| **Concentration of the product with presence of Fe + Mn> 0.2 mg / L** | **50 mL/m³** |

* The values shown in the table are standard references to be defined case by case after water analysis and any laboratory tests.

## PHYSICO-CHEMICAL PROPERTIES OF THE PRODUCT

| | |
|---|---|
| **Appearance** | Slightly amber liquid |
| **Smell** | Odorless |
| **Solubility in water** | Complete |
| **pH of the product TQ** | 0.9 at 20 ° C |
| **Specific weight at 25 ° C** | 1,13 kg/L |


## PACKAGING

| Code | Description | Packaging | Pallet Quantity |
|---|---|---|---|
| 010620004 | ACQUA QUEST | FU 10 L | 400 L |

# ACQUA CLEAN

Code UFI: G0N0-W0XG-W00J-3SWK

## PRODUCT DATA

| | |
|---|---|
| Composition | **Blend of fruit acids with food grade phosphorus salts and co-formulants** |
| Main actions | **Removes the most stubborn encrustations in micro-irrigation networks due to the presence of very hard water rich in Fe and Mn**<br>**Addition of phosphorus to the soil** |
| Type of treatment | **Shock treatments for deep cleaning and maintenance treatments** |
| BIOSAFETY | **Formulated with certified substances, free from impurities, free from industrial residues, free from heavy metals even in traces** |
| SPECIFIC USES | **Particularly suitable for hard waters rich in Fe and Mn** |

## WHEN IT SHOULD BE USED ANALYTICAL REFERENCE PARAMETERS (CATALOG APPENDIX)

| Parameter | Unit of measure | High risk |
|---|---|---|
| Hardness | °F | > 50 |
| Iron | mg/liter | > 1,0 |
| Manganese | mg/liter | > 1,0 |

## DOSING OF THE PRODUCT

| | | | |
|---|---|---|---|
| **Shock treatments for deep cleaning *** | Concentration of the product (depending on the degree of crossing) | minimum 5,0 L/m³ | maximum 10 L/m³ |
| | Duration of treatment | Minimum 30 minutes for each cleaning ** | |
| | Then treat with ACQUA QUEST Fe / Mn (see product sheet) | | |
| **Continuous dosing for maintenance treatments *** | The dosage must be done at the wellhead to avoid deposits of particles caused by the hardness and precipitation of Iron and Manganese. | | |
| | Dose the product to bring the pH to values below 4.0 | | |
| | Concentration of the product | minimum 300 mL/m³ | maximum 500 mL/m³ |

* The values shown in the table are standard references to be defined case by case after water analysis and any laboratory tests.

* * rinse the lines before use if the product comes into contact with metal parts.

## PHYSICO-CHEMICAL PROPERTIES OF THE PRODUCT

| | |
|---|---|
| **Appearance** | Red liquid |
| **Smell** | Pungent |
| **Solubility in water** | Complete |
| **pH of the product TQ** | 0 < 1 a 20°C |
| **Specific weight at 25 ° C** | 1,13 kg/L |


## PACKAGING

| Code | Description | Packaging | Pallet Quantity |
|---|---|---|---|
| 010626004 | ACQUA CLEAN | FU 10 L | 400 L |
| 010626010 | ACQUA CLEAN | 1000 L tank | - |

# ACQUA QUEST Fe/Mn

Code UFI: T030-Q08W-800K-46HT

## PRODUCT DATA

| | |
|---|---|
| Composition | **Blend of ANTISCALE agents derived from phosphoric acid and fruit acids** |
| Main actions | **Cleaning of nozzles in networks for micro irrigation even in the presence of very hard water rich in Fe and Mn**<br>**Addition of phosphorus to the soil** |
| Type of treatment | **Shock treatments for deep cleaning and maintenance treatments** |
| BIOSAFETY | **Formulated with certified substances, free from impurities, free from industrial residues, free from heavy metals even in traces** |
| SPECIFIC USES | **Particularly suitable for hard waters rich in Fe and Mn** |

## WHEN IT SHOULD BE USED ANALYTICAL REFERENCE PARAMETERS (CATALOG APPENDIX)

| Parameter | Unit of measure | High risk |
|---|---|---|
| Hardness | °F | > 50 |
| Iron | mg/liter | > 1,0 |
| Manganese | mg/liter | > 1,0 |

## DOSING OF THE PRODUCT

| | | | |
|---|---|---|---|
| **Shock treatments for deep cleaning *** | Preliminarily treat with ACQUA CLEAN (see product sheet) | | |
| | Concentration of the product<br>(depending on the degree of encrustation) | minimum<br>5,0 L/m³ | maximum<br>10 L/m³ |
| | Duration of treatment | Minimum 30 minutes for each cleaning | |
| **Continuous dosing for maintenance treatments *** | The dosage must be done at the wellhead to avoid deposits of particles caused by the hardness and precipitation of Iron and Manganese. | | |
| | Concentration of the product | minimum<br>100 mL/m³ | maximum<br>200 mL/m³ |

* The values shown in the table are standard references to be defined case by case after water analysis and any laboratory tests.

## PHYSICO-CHEMICAL PROPERTIES OF THE PRODUCT

| | |
|---|---|
| **Appearance** | Clear transparent liquid |
| **Smell** | Odorless |
| **Solubility in water** | Complete |
| **pH of the product TQ** | 0 <2 at 20 ° C |
| **Specific weight at 25 ° C** | 1.13 kg / L |


## PACKAGING

| Code | Description | Packaging | Pallet Quantity |
|---|---|---|---|
| 010621004 | ACQUA QUEST FeMn | FU 10 L | 400 L |
| 010621010 | ACQUA QUEST FeMn | 1000 L tank | - |

# ACQUA POL

Code UFI: 0060-E0ES-Y00W-94X2

## PRODUCT DATA

| | |
|---|---|
| Composition | **Blend of inorganic polyphosphates and chelating organophosphates for food use** |
| Main actions | **Prevention of deposits of Ca and Mg salts and oxides of Fe and Mn<br>Addition of phosphorus to the soil** |
| Type of treatment | **Continuous** |
| BIOSAFETY | **Formulated with certified substances, free from impurities, free from industrial residues, free from heavy metals even in traces** |

## WHEN IT SHOULD BE USED
## ANALYTICAL REFERENCE PARAMETERS (CATALOG APPENDIX)

| Parameter | Unit of measure | No risk | Medium risk | High risk |
|---|---|---|---|---|
| Electrical conductivity - Salinity | µS/cm | < 800 | 800 - 3200 | > 3200 |
| Salts of Ca and Mg - Hardness | °F | < 15 | 15 - 25 | > 25 |
| Iron | mg/liter | < 0,3 | 0,3 - 1,5 | > 1,5 |
| Manganese | mg/liter | < 0,2 | 0,2 - 1,5 | > 1,5 |

## CONTINUOUS DOSING OF THE PRODUCT

| | |
|---|---|
| **Concentration of the product with hardness <15 ° F** | 10 mL/m³ |
| **Concentration of the product with hardness between 15 ° F and 25 ° F** | 20 mL/m³ |
| **Concentration of the product with hardness> 25 ° F** | 30 mL/m³ |
| **Concentration of the product with presence of Fe + Mn> 0.2 mg / L** | + 30 mL/m³ |

* The values shown in the table are standard references to be defined case by case after water analysis and any laboratory tests.

## PHYSICO-CHEMICAL PROPERTIES OF THE PRODUCT

| | |
|---|---|
| **Appearance** | Slightly amber liquid |
| **Smell** | Odorless |
| **Solubility in water** | Complete |
| **pH of the product TQ** | 7,8 a 20°C |
| **Specific weight at 25 ° C** | 1,11 kg/L |


## PACKAGING

| Code | Description | Packaging | Pallet Quantity |
|---|---|---|---|
| 010622004 | ACQUA POL | FU 10 L | 400 L |

# ACQUA OXI

Code UFI: GA30-R01G-G00J-SJV2

## PRODUCT DATA

| | |
|---|---|
| Composition | **Bio oxidant based on natural peroxides** |
| Main actions | **Prevention and removal of algae and biofilm deposits**<br>**Disinfectant action** |
| Azione complementare | **Prevention and removal of limescale deposits** |
| Type of treatment | **Seasonal - Periodic - Continuous** |
| BIOSAFETY | **Formulated with certified substances, free from impurities, free from industrial residues, free from heavy metals even in traces** |
| SPECIFIC USES | **Cleaning treatments inside greenhouses**<br>**Cleaning treatments for crops with ORGANIC protocols**<br>**Prevention of legionella for greenhouse crops, irrigation with sprinkling of public and sports green, in systems for fountains** |

## WHEN IT SHOULD BE USED ANALYTICAL REFERENCE PARAMETERS (CATALOG APPENDIX)

| Parameter | Unit of measure | No risk | Medium risk | High risk |
|---|---|---|---|---|
| Microbiological analysis | CFU / mL | < 10000 | 10000 - 50000 | > 50000 |
| Salts of Ca and Mg - Hardness | °F | < 20 | 20 - 30 | > 30 |

### HIGHLIGHTS: THE SYNERGIES

The encrustations caused by calcareous deposits, iron and manganese are favored by the presence of biofilm deposits generated by microorganisms that create sites of possible aggregation of inorganic compounds.
The presence of limestone deposits in turn favors the proliferation of microorganisms that can have a protective environment in which to encapsulate and multiply. The presence of Fe2 + and Mn2 + allows some bacteria to proliferate (ferrobacteria) resulting in the development of mucilage that overlap the oxidized Fe and Mn deposits.
Water analysis and laboratory tests help to develop effective processes such as:

- in the pipes where the presence of limestone and biofilm deposits is found, the action of Acqua OXI alone allows you to remove all solid deposits with a single treatment and prevent their re-formation, at the same time carrying out a strong sanitizing action;
- in distribution systems, disinfection can be ineffective if it is not combined with a preventive descaling treatment. Acqua Oxi solves this problem by acting on two levels: it eliminates organic and inorganic deposits and sanitizes surfaces and irrigation water.

## CONTINUOUS DOSING OF THE PRODUCT

| | | | |
|---|---|---|---|
| **Shock treatments *** | Active oxygen content range | Minimum<br>60 mg/L | Maximum<br>80 mg/L |
| | Concentration of the product | 200 mL/m$^3$ | 300 mL/m$^3$ |
| | Duration of treatment | 2.0 hours each cleaning | |
| **Continuous dosing *** | Active oxygen content range | Minimum<br>10 mg/L | Maximum<br>40 mg/L |
| | Concentration of the product | 100 mL/m$^3$ | 200 mL/m$^3$ |

* The values shown in the table are standard references to be defined case by case after water analysis and any laboratory tests.

## PHYSICO-CHEMICAL PROPERTIES OF THE PRODUCT

| | |
|---|---|
| **Appearance** | Colorless liquid |
| **Smell** | Pungent |
| **Solubility in water** | Complete |
| **pH of the product TQ** | 2,7 a 20°C |
| **Specific weight at 25 ° C** | 1,07 kg/L |


## PACKAGING

| Code | Description | Packaging | Pallet Quantity |
|---|---|---|---|
| 010614004 | ACQUA OXI | FU 10 L | 400 L |
| 010614008 | ACQUA OXI | 1000 L IBC | - |

# ACQUA OXI PLUS

Code UFI: XYA0-S0FT-R00K-NXQT

## PRODUCT DATA

| | |
|---|---|
| Composition | **Bio oxidant based on CONCENTRATED natural peroxides** |
| Main actions | **Removal of algae and biofilm deposits**<br>**Disinfectant action** |
| Azione complementare | **Prevention and removal of limescale deposits** |
| Type of treatment | **Periodic** |
| BIOSAFETY | **Formulated with certified substances, free from impurities, free from industrial residues, free from heavy metals even in traces** |
| SPECIFIC USES | **leaning treatments for irrigation systems that use biodigested as fertilizer** |

## WHEN IT SHOULD BE USED ANALYTICAL REFERENCE PARAMETERS (CATALOG APPENDIX)

| Parameter | Unit of measure | No risk | Medium risk | High risk |
|---|---|---|---|---|
| Microbiological analysis | CFU/mL | < 10000 | 10000 - 50000 | > 50000 |

**HIGHLIGHTS: THE TREATMENT OF WATER WITH BIODIGESTATE**

The bacterial load of the supernatant of the biodigestate is of the order of 10000000 units of microorganisms in a mL.
The reference values for the concentration of biodigested injected online are of the order of 2%.
Even with this dilution there remains a high risk of proliferation and clogging of the micro-irrigation lines to the point of compromising the functionality of the seasonal hose before the end of the crop irrigation season.

The ACQUA OXI PLUS product is designed to perform an energetic action and ensure an adequate degree of cleaning even over long distances of drip distribution.

## CONTINUOUS DOSING OF THE PRODUCT

| | | | |
|---|---|---|---|
| **Periodic treatments *** | Active oxygen content range | Minimum<br>60 mg/L | Maximum<br>80 mg/L |
| | Concentration of the product | 300 mL/$m^3$ | 400 mL/$m^3$ |
| | Duration of treatment | 2.0 hours each cleaning | |

* The values shown in the table are standard references to be defined case by case after water analysis and any laboratory tests.

## PHYSICO-CHEMICAL PROPERTIES OF THE PRODUCT

| | |
|---|---|
| **Appearance** | Colorless liquid |
| **Smell** | Pungent |
| **Solubility in water** | Complete |
| **pH of the product TQ** | 2,7 a 20°C |
| **Specific weight at 25 ° C** | 1,07 kg/L |


## PACKAGING

| Code | Description | Packaging | Pallet Quantity |
|---|---|---|---|
| 010617006 | ACQUA OXI PLUS | FU 10 L | 400 L |

# ACQUA CHLOR

Code UFI: F9A0-Q0XN-900N-C729

## PRODUCT DATA

| | |
|---|---|
| Composition | **Sodium hypochlorite based oxidant** |
| Main actions | **Prevention and removal of algae and biofilm deposits**<br>**Disinfectant action** |
| Azione complementare | **Prevention and removal of limescale deposits** |
| Type of treatment | **Seasonal - Periodic - Continuous** |
| BIOSAFETY | **Formulated with certified substances, free from impurities, free from industrial residues, free from heavy metals even in traces** |
| SPECIFIC USES | **Prevention of legionella in fountain systems** |

## WHEN IT SHOULD BE USED
## ANALYTICAL REFERENCE PARAMETERS
## (CATALOG APPENDIX)

| Parameter | Unit of measure | No risk | Medium risk | High risk |
|---|---|---|---|---|
| Microbiological analysis | CFU/mL | < 10000 | 10000 - 50000 | > 50000 |
| Salts of Ca and Mg - Hardness | °F | < 20 | 20 - 30 | > 30 |

## CONTINUOUS DOSING OF THE PRODUCT

| | | | |
|---|---|---|---|
| **Hyperchlorination at the end of the season*** | Free chlorine content range | Minimum 50 mg/L | Maximum 150 mg/L |
| | Concentration of the product | 500 mL/m³ | 1500 mL/m³ |
| | Duration of treatment | 60 minuti | |
| **Supercloration for maximum 5 min / cycle *** | Free chlorine content | 50 mg/L | |
| | Concentration of the product | 500 mL/m³ | |
| **Intermittent dosing for 20 minutes max / day *** | Free chlorine content range | Minimum 10 mg/L | Maximum 30 mg/L |
| | Concentration of the product | 100 mL/m³ | 300 mL/m³ |
| **Continuous dosing** | Free chlorine content range | Minimum 1,0 mg/L | Minimum 10 mg/L |
| | Concentration of the product | 10 mL/m³ | 100 mL/m³ |

*The values shown in the table are standard references to be defined case by case after water analysis and any laboratory tests.

## PHYSICO-CHEMICAL PROPERTIES OF THE PRODUCT

| | |
|---|---|
| **Appearance** | Pale yellow liquid |
| **Smell** | Weak chlorine |
| **Solubility in water** | Complete |
| **pH of the product TQ** | > 12 to 20 ° C |
| **Specific weight at 25 ° C** | 1.20 kg / L |


## PACKAGING

| Code | Description | Packaging | Pallet Quantity |
|---|---|---|---|
| 010618004 | ACQUA CHLOR | FU 10 L | 400 L |

# BIOCHLOR

**Code UFI: S7F0-00PW-D00D-TWV8**
**Case numbers Italia: BC-SU046860-06 F3_PT5 e BC -UF046050-51 F6_PT2_PT3_PT4**

# PRODUCT DATA

| | |
|---|---|
| Composition | **Concentrated disinfectant solution based on sodium hypochlorite** |
| Main actions | **Disinfection of water distribution systems in farms to control the contamination of gram positive and gram negative bacteria and of Legionella** |
| Type of treatment | **Periodic** |
| BIOSAFETY | **Formulated with certified substances without impurities, industrial residuals and heavy metals even in traces** |
| SPECIFIC USES | **Washing and disinfection of fruit and vegetables** |

## IN EVIDENCE

**MEDICAL SURGICAL DEVICE.**
**Registration of the Ministry of Health n. 19916**

**Reference regulations**
Infection in the workplace (Legislative Decree 81/2008)
Infection of the population (2015 GUIDELINES)
DGR ER 828 12 June 2017

## CONTINUOUS DOSING OF THE PRODUCT

| | |
|---|---|
| **Disinfection of water distribution systems in the farms for the control of contamination of gram positive and gram negative bacteria and of Legionella** | Dosage of the product in a quantity equal to 33.5 liters per cubic meter of water (equal to 1000 ppm of free chlorine active). Leave on for at least 15 minutes and rinse with drinking water until completely eliminated (up to residual free chlorine below 0.2 ppm) |
| **Washing and disinfection of fruit and vegetables** | Dosage of the product in a quantity equal to 10 mL of product per liter of water (equal to 300 ppm of free active chlorine).<br>Leave to act for at least 15 minutes and rinse thoroughly with drinking water until all traces of residual free chlorine are completely eliminated |

## PHYSICO-CHEMICAL PROPERTIES OF THE PRODUCT

| | |
|---|---|
| **Appearance** | Pale yellow liquid |
| **Smell** | Mild chlorine |
| **Solubility in water** | Complete |
| **pH of the product TQ** | > 11.5 at 20 ° C |
| **Specific weight at 25 ° C** | 1.11 kg / L |


## PACKAGING

| Code | Description | Packaging | Pallet Quantity |
|---|---|---|---|
| 8602020004 | BIOCHLOR | BO 250 ML (CONF 10 PZ) | 650 PZ |
| 860202015 | BIOCHLOR | BO 1 L | 300 PZ |
| 860202017 | BIOCHLOR | FU 10 L | 400 L |

# DOSING SYSTEMS

## SMART SYSTEM AGRI®

PATENTED SYSTEM


Patented dosing system including:

- Pulse launching meter – 1" cold water
- Proportional dosing pump for management of the agent
- Disinfectant from 0 to 4 lt/h (6 atm)
- Reactor for the activation of the active ingredient
- Support panel and instructions for use and assembly
- Working temperature from 4° to 35°

| Code | Descripiton |
|---|---|
| 280202020 | SMART SYSTEM AGRI – 1" |

# PRE-DILUTION AND DOSING SYSTEMS

## D D S - 3 0 0 0  G R A N U L A R

SDIC AND CALCIUM HYPOCHLORITE GRANULAR

Dilution and dosing system for granular biocides


Dilution and dosing system for high solubility granular biocides: SDIC (Dichloro) and Calcium Hypochlorite.

- 
- Works at atmospheric pressure
- Float level sensor
- It is possible to manage up to 4 points of chlorination at the same time using only one DDS 3000 Granular and two DSCs in series
- DSC controls 2 chlorination systems and manages the dosing and the preparation of the chlorination solution.
- Loading hopper capacity about 25 kg
- New lid with closure anti-odor
- Avoid product caking
- Dimensions: maximum height 125 cm, maximum diameter 110 cm
- Weight approx. 25 kg

### *DDS 3000 GRANULAR*

Loading hopper capacity approx.25 kg
12 V electric motor
Safety lock during loading
Dimensions: H 125 cm (maximum H including green hopper) x D 110 cm
Weight about 25 kg


### *SYSTEM PARTS*

**DDS 3000 GRANULAR**
Equipment where the preparation and dilution of the chlorinated solution takes place.
It consists of: tank, product loading hopper, agitator, float, outlets for the chlorinated solution and unloading.

**PEV 3000 SOLENOID VALVE PANEL**
Water flow control device. It is activated when the electronic float for level control detects the absence of chlorinated solution.

**DSC NEW**
Electronic control unit capable of managing up to two tanks at the same time. He supervises the preparation of the solutions and their dosage.

**SCU - SECURITY CONTROL UNIT**
Security Control Unit
Dispositivo per il dosaggio del prodotto granulare all'interno del DDS.

| Code | Description |
|---|---|
| 120202098 | DDS 3000 GRANULAR + PEV 3000 + SCU |

# DDS-3000 INDUSTRIAL

## CALCIUM HYPOCHLORITE IN BIOQUARK TABLETS

Diluting and dosing system for BIOQUARK


Patented system fore the dilution and dosing of BIOQUARK, Calcium Hypochlorite in tablets.
Special model for obtaining highly diluted chlorinated solutions.

- It works under atmospheric pressure.
- Floating level sensor.
- It is possible to manage multiple chlorination points simultaneously using a single DDS 3000 INDUSTRIAL
- Capacity of the product basket approx. 50 kg.
- Dimensions: maximum height 140 cm, maximum diameter 110cm.
- Weight: approx. 20 kg.

### *DDS 3000 INDUSTRIAL*

Capacity of the product basket more than 50 kg
Dimensions: maximum height 140 cm,
maximum diameter 110 cm
Weight: approx. 20 kg

### *SYSTEM PARTS*

**DDS 3000 INDUSTRIAL**
Equipment where the product is diluted. It is made up of: cistern, drum for the product, shaker, ultrasound sensor, outlets for the chlorinated and drainage solution.

**PEV 3000 INDUSTRIAL SOLENOID VALVE PANEL**
Device for controlling the flow of water. It is activated when the ultrasound sensor detects the absence of chlorinated solution.

**DSC NEW**
Double Station Controller. Electronic control unit capable of managing up to two pools simultaneously.
Oversee the preparation of the solutions and their dosing.

| Code | Description |
|---|---|
| 120202059 | DDS 3000 INDUSTRIAL + DSC + PEV 3000 - 24V |

# PNEUMATIC PUMPS

## PNEUMATIC PUMP FJ 3/8

Dosing pump

- Dosing pump for solutions containing main drain and abrasive elements.
- Flow rate: from 50 L/hr up to 1200 L/ hr with pressure delta 6 atmospheres
- Viton membrane.

| Code | Descripiton | Lt/ora | Bar |
|---|---|---|---|
| 061402003 | FJ 3/8 PNEUMATIC PUMP | 50 / 1.200 | * |
| 061499122 | AIR REGULATION UNIT | - | - |

*Determined according to the setting of the Air Regulation group

# MECHANICAL PUMPS

## MEMBRANE DOSING PUMP ENG-EM

Pompe di dosaggio

- Flow rate: 10 ÷ 90 l / h
- Maximum pressure: 5 bar
- Motor: 0.06 kW - 3ph (IP55)
- 0.06 kW - 1ph (IP55)
- Frequency from 26 to 144 rpm
- Diaphragm diameter 70 mm
- Pump head: SS 316 PVDF
- Maximum temperature:SS 316 40°C
- PVDF 40°C
- Environment dosing temperature +5 ÷ +45 °C
- Storage temperature -10 ÷ +50 °C
- Small size - to facilitate installation
- Rugged plastic outer housing - ensures ease of installation and durability
- Simple yet robust construction - providing ideal value for money
- 0.06 kw high efficiency motor with high flow rate 10-90 l / h

| Code | Descripiton | Lt/ora | Bar |
|---|---|---|---|
| 061220066 | MEMBRANE DOSING PUMP 90L/H-5 BAR - ENG-EM | 10-90 | 5 |

# MEASUREMENT AND ANALYSIS

| Code | Descripiton |
|---|---|
| 440402646 | QUANTOFIX - BOX INDICATING PEROXIDES 100PPM PACKAGE. 100 |
| 440402035 | QUANTOFIX - BOX INDICATING PEROXIDES 25PPM PACKAGE. 100 |

| Code | Descripiton |
|---|---|
| 075002 | CHLORINE/pH TABLETS POOL TESTER |
| 076020 | REPLACEMENT TABLETS DPD1- RAPID- 250 PIECE FOR POOL TETER |
| 076023 | REPLACEMENT TABLETS DPD3- RAPID- 250 PIECE FOR POOL TETER |
| 076027 | REPLACEMENT TABLETS RED PH- RAPID- 250 PIECE FOR POOL TESTER |
| 076025 | REPLACEMENT TABLETS DPD4- RAPID- 250 PIECE FOR POOL TESTER |
| 0123056073 | CHLORINE /pH DROPS TEST KIT |
| 079001 | OTO REPLACEMENT DROPS 15 CC |
| 079002 | REPLACEMENT RED DROPS 15 CC |

# ADDENDUM

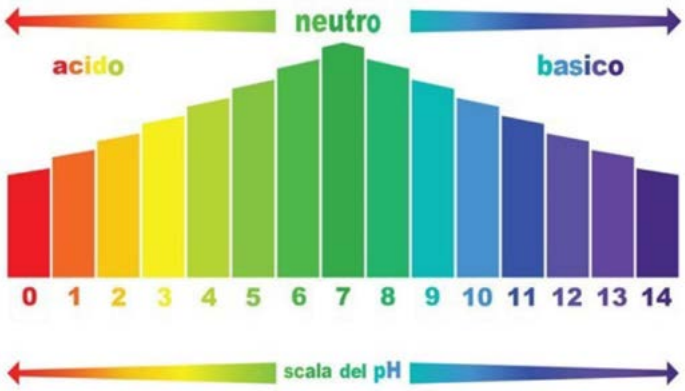
## THE pH OF THE WATER

neutral, while in groundwater the pH is frequently basic.

The basic pH is mainly due to bicarbonates present which can bring alkalinity even to values higher than 8.

PH values higher than 7.5 indicate the presence of bicarbonates and contribute to raising the pH of the soil solution with consequent lower availability of the

essential elements for the nourishment of plants, pH values below 7.0 allow maximum use of microelements, in particular iron, which remain available in the soil.




### PH RISK

Nozzle clogging
Declineof soil conditions
Less availability of nutrients

| No risk | Medium risk | High risk |
|---|---|---|
| < 7 | 7 - 8 | > 8 |

## ELECTRICAL CONDUCTIVITY - SALINITY

The water used for irrigation always contains a certain amount of dissolved salts, the concentration of which varies within rather wide limits depending on the origin. The waters coming from superficial courses (rivers, streams) and from reservoirs (natural and artificial) generally have a low content of dissolved salts; in the waters coming from more or less deep aquifers the saline content is often high.

In groundwater there are generally $Na^{+}$, $K^{+}$, $Ca^{++}$, $Mg^{++}$, $NH^{4+}$ , $HCO^{3-}$ , $Cl^{-}$, $SO_4^{2-}$ , $NO_3^{-}$ ions, Heavy metal ions commonly present are $Fe^{2+}$, $Mn^{2+}$, other toxic heavy metals (Pb and Cr) may be present, deriving from anthropogenic pollution phenomena.

For the waters used for irrigation it is important to evaluate the total content of dissolved salts, this quantity is defined with the TDS (Total Dissolved Solids) which is measured in ppm (parts per million or even mg / liter). The evaluation of the TDS is done quickly with the measurement of the specific conductivity EC which is normally expressed in µS/cm. [EC (µS/cm) = 1,5 TDS (mg/liter)].

### EC RISK (Unit of measure µS/cm)

Nozzle clogging
Worsening of soil conditions
Less availability of nutrients

| No risk | Medium risk | High risk |
|---|---|---|
| < 800 | 800 - 3200 | > 3200 |

# Salts of Ca and Mg and other polyvalent metal ions - Hardness

Among the ions contained in the water some are responsible for the phenomenon of hardness, mainly the presence of bicarbonates of $Ca^{++}$ e $Mg^{++}$, due to the action of rain on calcareous soils generates the hardness of the water according to the reaction:

$$CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$$

Hardness is expressed in °F ((French degrees). To calculate the total hardness, all the bivalent positive ions are considered (for groundwater the $Ca^{++}$ e $Mg^{++}$ions are normally considered), they transform into $CaCO_3$ and it is considered that a French degree is equivalent to 10 mg / liter of $CaCO_3$.

For water intended for irrigation purposes, the temporary hardness given by the bicarbonates of Ca and Mg present is important, in fact by simple heating to 50 ° the carbon dioxide is removed as a gas and the carbonates are deposited:

$$Ca(HCO_3)_2 \rightarrow CaCO_3 + CO_2 + H_2O$$

Generally a weakly acidic pH (with values below 6.8) prevents carbonates from settling.

**HAZARD HARDNESS (UNIT OF MEASUREMENT ° F)**

Nozzle clogging

| No risk | Medium risk | High risk |
|---|---|---|
| < 15 | 15 - 25 | > 25 |

# Sodium Determination - SAR Index

A high concentration of sodium ions in water causes problems with soil permeability and causes infiltration problems. This happens because the sodium replaces the calcium and magnesium absorbed by the soil clay and causes the dispersion of the soil particles, generating a hard and compact soil.

The SAR index relates the negative action that sodium exerts on the soil structure with the positive ones of calcium and magnesium.

Coastal areas are the most vulnerable in this respect because the infiltration of sea water in them involves a high risk of salinity in the water that is then pumped from the wells, the overexploitation of groundwater resources which represent the predominant availability in the coastal areas cause more and more seawater intrusion.

The SAR value is defined by the equation:

$$SAR = \frac{[Na]}{\sqrt{\frac{[Ca] + [Mg]}{2}}}$$

**SAR RISK** (numerical index)

Worsening of soil conditions
Less availability of nutrients

| No risk | Medium risk | High risk |
|---|---|---|
| < 3,0 | 3,0 - 9,0 | > 9,0 |

# Carbonates and bicarbonates - determination of the RSC index

High concentrations of carbonate ($CO_3^{=}$) and bicarbonate ($HCO_3^{-}$), or values higher than 180-240 mg / L, increase the SAR index. In fact, the carbonate and bicarbonate ions combined with calcium or magnesium precipitate in the form of calcium carbonate ($CaCO_3$) or magnesium carbonate ($MgCO_3$) especially when the solution concentrates in the soil in arid conditions.

The precipitation of carbonates decreases the concentration of Ca and Mg and, with the same sodium, the SAR index increases. The index used to describe the danger given by high concentrations of carbonates and bicarbonates is the Residual Sodium Carbonate (RSC)

$$RSC = \frac{\left(\frac{mg}{L} CO_3^{--}\right)}{61} + \frac{\left(\frac{mg}{L} HCO_3^{-}\right)}{30} - \frac{\left(\frac{mg}{L} Ca^{++}\right)}{20} - \frac{\left(\frac{mg}{L} Mg^{++}\right)}{12}$$

In case of a high RSC index it is recommended to correct the pH of the irrigation water up to values of 6.2

**RSC RISK** (numerical index)

Nozzle clogging

Worsening of soil conditions
Less availability of nutrients

| No risk | Medium risk | High risk |
|---|---|---|
| < 1,25 | 1,25 - 2,50 | > 2,50 |

# Bicarbonates

High concentrations of bicarbonate (HCO3-) increase the SAR index. As already mentioned, bicarbonate ions combined with calcium or magnesium precipitate in the form of calcium carbonate (CaCO3) or magnesium carbonate (MgCO3) especially when the solution concentrates in the soil in arid conditions.

The precipitation of carbonates decreases the concentration of Ca and Mg and, with the same sodium, the SAR index increases.

**RISK of bicarbonates** (a measure mg / L)

Nozzle clogging

Worsening of soil conditions
Less availability of nutrients

| No risk | Medium risk | High risk |
|---|---|---|
| < 150 | 150 - 300 | > 300 |

# Saturation Index

The saturation index value is based on the action of carbon dioxide ($CO_2$) dissolved in water which exerts a solubilizing action on carbonates:

$$CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$$

Two possible cases:
water supersaturated with CO2 (IdS <0): the calcium carbonate is kept in solution;
CO2 undersaturated water (IdS> 0): encrusting water with a tendency to form deposits and encrustations.
Langelier's method is used for calculating the saturation index:
**Ids = pH - pHs**
where **pHs = (9,3 + A + B) - (C + D)**

A = index corresponding to the total solid substances
B = index corresponding to the water temperature
C = index corresponding to temporary hardness
D = index corresponding to the methyl-orange alkalinity

For irrigated water it is not possible to think of modifying total solids and temperature. In case of a high saturation index, it is necessary to acidify the water to remove the CO2, thus limiting the precipitation of carbonates.

### RISK IDS (Numerical Index)

Nozzle clogging

| No risk | Medium risk | High risk |
|---|---|---|
| < 0 | | > 0 |

# Iron and Manganese

Significant quantities of $Fe^{2+}$ and $Mn^{2+}$ can be found in groundwater with considerable problems. $Fe^{2+}$ yes rapidly oxidizes to $Fe^{3+}$ and consequently precipitates as Fe hydroxide.

Plus the energy freed from the oxidation of $Fe^{2+}$ and $Mn^{2+}$ ions, it allows some bacteria to proliferate (ferrobacteria) resulting in the development of often colored mucilages that contribute to the clogging of the nozzles in micro-irrigation.

To eliminate the effects of iron and manganese present in irrigation water, it is possible to use specific products as an alternative to expensive aeration / sedimentation tanks where water is accumulated before being used for irrigation.

### RISK Fe and Mn (unit of measure mg / L)

Nozzle clogging

Proliferation of ferrobacteria and line occlusion

| | No risk | Medium risk | High risk |
|---|---|---|---|
| **Fe** | < 0,2 | 0,2 - 1,5 | > 1,5 |
| **Mn** | < 0,1 | 0,1 - 1,5 | > 1,5 |

# Microorganisms

All the waters used in irrigation contain microorganisms of various kinds.

Surface waters (reservoirs, canals, rivers) contain a generally higher quantity of microorganisms than groundwater.

The presence of microorganisms causes clogging of the nozzles in micro-irrigation, even an accurate filtration that eliminates suspended solids can be insufficient if the quantity of microorganisms is so high as to cause new proliferation of solid organic matter in relatively short piping sections, even tens of meters , especially in cases where the water stagnates due to interruption of irrigation.

Solid deposits of microorganisms are growth points of calcareous deposits in the case of waters that have the chemical characteristics to create encrustations (groundwater)

Finally, the presence of Fe2 + causes the proliferation of ferrobacteria which use the energy released by the oxidation to Fe3 + for their growth.

The products used for the elimination of microorganisms, with the addition of anti-scaling agents, are often effective for the removal of biofilm but also to avoid the deposit of limestone, iron and manganese.

**Biofilm RISK** (unit of measure n°/mL)

Nozzle clogging

Proliferation of microorganisms
Calcareous deposits

| No risk | Medium risk | High risk |
|---|---|---|
| < 10000 | 10000 - 50000 | > 50000 |

# Legionella

Legionellosis is an infectious disease caused by bacteria of the genus Legionella that can manifest itself with pneumonia, often of serious damage, or with a flu-like illness. Legionellosis has an incubation period ranging from 2 to 10 days. The average lethality rate is 10%.

Legionella infections are subjected to special surveillance by the World Health Organization (WHO), by the European Community in which the European Working Group for Legionella Infections (EWGLI) operates and by the Istituto Superiore di Sanità, which established since 1983 the National Register of Legionellosis.

Legionella is found in all natural surface waters, the risk factors are: temperature between 25 ° C and 42 ° C, stagnation in tanks and pipes (formation of biofilm), deposits in pipes, presence of sediments and organic material, presence of trace elements (Zn, Fe, Mn), presence of algae and aquatic amoebas.

The onset of the pathology requires:

• that there is a high concentration of bacteria in the water;

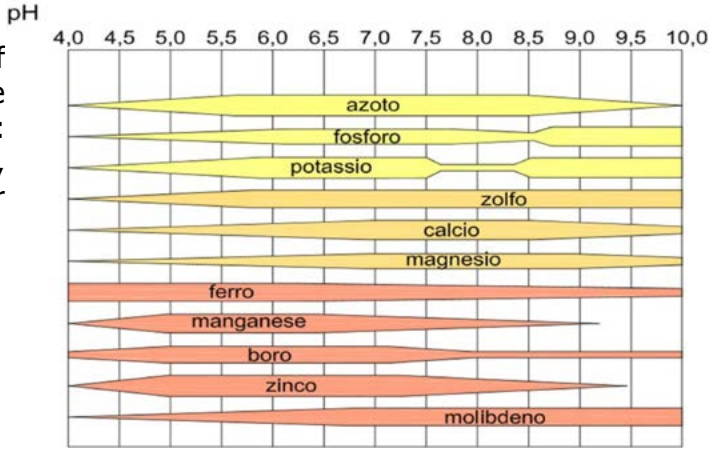
• that this is dispersed in the form of an aerosol;

• that the transport mechanisms allow inhalation by susceptible people (irrigation with sprinkling, with nebulization, fountains, etc ...).

| **Nutritional elements for plants** Presence of nutrients in dry tissue vegetable (average reference values). | | Form available for plants | Concentration in dry tissue | |
|---|---|---|---|---|
| | | | mg/kg | % |
| **Structural nutrients** | Carbon | $CO_2$ | - | 45 |
| | Hydrogen | $H_2O$ | - | 6,0 |
| | Oxygen | $O_2 – H_2O$ | - | 45 |
| **Macro nutrients** | Nitrogen | $NO_3^-$ - $NH_4^+$ | - | 1,5 |
| | Potassium | $K^+$ | - | 1,0 |
| | Phosphorus | $H_2PO_4^-$ - $HPO_4^{2-}$ | - | 0,20 |
| **Meso Nutrients** | Calcium | $Ca^{2+}$ | - | 0,50 |
| | Magnesium | $Mg^{2+}$ | - | 0,20 |
| | Sulfur | $SO_4^{2-}$ | - | 0,10 |
| **Micro nutrients** | Iron | $Fe^{2+}$ - $Fe^{3+}$ | 100 | 0,010 |
| | Manganese | $Mn^{2+}$ | 50 | 0,0050 |
| | Copper | $Cu^+$ - $Cu^{2+}$ | 6 | 0,00060 |
| | Zinc | $Zn^{2+}$ | 20 | 0,0020 |
| | Molybdenum | $MoO_4^{2-}$ | 0,1 | 0,000010 |
| | Boron | $H_3BO_3$ | 20 | 0,0020 |
| | Chlorine | $Cl^-$ | 100 | 0,010 |

# Availability of nutrients as a function of pH

In treatments to adapt the characteristics of irrigation water, it is important to correct the pH. The pH of the soil is also important for micronutrients: for all micronutrients in cationic form (copper, zinc, manganese, iron) the higher solubility (hence their availability) is at low pH values (higher acidity).



# Nutritional elements for plants

The "limit values" of the water used for irrigation are shown in the table below. They are reference limit values and concern the toxicological aspects for plants, they are differentiated between greenhouse cultivation and open field cultivation. They are indicative values and represent an adequate tool for a preliminary assessment.

| LIMIT VALUES | | Unit of measure | Limits for greenhouse crops | Limits for open field crops |
|---|---|---|---|---|
| **Meso nutrients** | Calcium (Ca) | ppm (mg/liter) | < 150 | - |
| | Magnesium (Mg) | ppm (mg/liter) | < 35 | - |
| | Sulphates ($SO_4^{--}$) | ppm (mg/liter) of sulfur (S) | < 50 | < 300 |
| **Micro nutrients** | Iron (Fe) (heavy metal) | ppm (mg/liter) | < 1,0 | < 3,0 |
| | Manganese (Mn) (heavy metal) | ppm (mg/liter) | < 0,6 | < 2,0 |
| | Copper (Cu) (heavy metal) | ppm (mg/liter) | < 0,3 | < 1,0 |
| | Zinc (Zn) (heavy metal) | ppm (mg/liter) | < 0,3 | < 3,0 |
| | Molybdenum (Mo) (heavy metal) | ppm (mg/liter) | < 0,05 | < 0,05 |
| | Boron (B) | ppm (mg/liter) | < 0,3 | < 2,0 |
| | Chlorides (Cl-) | ppm (mg/liter) | < 50 | < 200 |
| | Sodium (Na) | ppm (mg/liter) | < 50 | < 150 |
| **Cadmium (Cd) (heavy metal)** | | ppm (mg/liter) | < 0,01 | < 0,01 |
| **Chromium (Cr) (heavy metal)** | | ppm (mg/liter) | < 0,1 | < 0,1 |
| **Nickel (Ni) (heavy metal)** | | ppm (mg/liter) | < 0,2 | < 0,2 |
| **Lead (Pb) (heavy metal)** | | ppm (mg/liter) | < 5,0 | < 5,0 |
| **Mercury (Hg) (heavy metal)** | | ppm (mg/liter) | < 0,002 | < 0,002 |
| **Fluorides (F-)** | | ppm (mg/liter) | < 1,0 | < 1,0 |
| **Surfactants** | | ppm (mg/liter) | < 0,5 | < 0,5 |
| **Suspended solids** | | ppm (mg/liter) | < 30 | < 30 |

# Nutritional elements for plants

For micronutrients it is important to consider the deficiency but also the possible concentration of toxicity. As an indication, the average concentrations of micronutrients (in mg / kg) in tissues of mature leaves taken from different plant species are reported. It should be noted that Boron has a narrow range of toxicity.

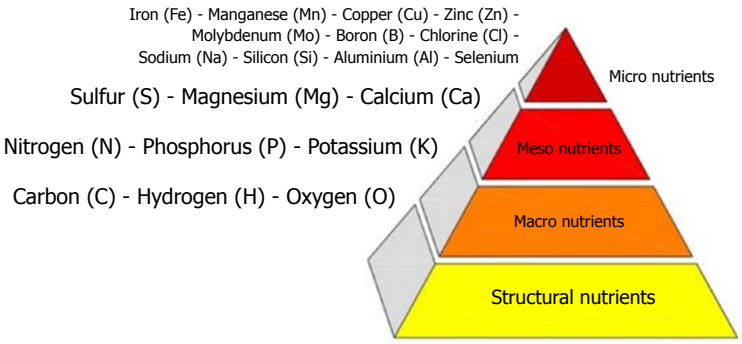
| Concentrations in ppm | | | | |
|---|---|---|---|---|
| | | Lacking | Sufficient (normal) | Excessive or toxic |
| **Micro nutrients** | Iron | < 50 | 100 - 500 | > 500 |
| | Manganese | < 15 - 25 | 20 - 300 | > 300 - 500 |
| | Copper | < 2 - 5 | 5 - 30 | > 20 - 100 |
| | Zinc | < 10 - 20 | 20 - 150 | > 100 - 400 |
| | Molybdenum | < 0,03 - 0,15 | 0,1 - 0,2 | > 100 |
| | Boron | < 5 - 30 | 10 - 200 | > 50 - 200 |
| | Chlorine | < 100 | 100 - 500 | > 500 - 1000 |

**The prevalent use of chemical fertilizers over organic or organ-mineral ones and the abandonment of organic amendments can lead to the removal of micronutrients that are usually not included in fertilization plans.**

Based on the chemical analysis of the water used for irrigation, the formulation of the products has the fundamental objectives of:

- pursue a high efficacy in correcting the chemical and microbiological characteristics of the water;
- ensure biological safety (absence of toxic elements for plants, animals and humans);
- bring useful microelements to stimulate correct plant growth.

**In the products for cleaning and maintenance of micro-irrigation systems it is therefore possible to add micronutrient substances in the quantities required by the agronomist according to the nutritional needs of the cultivated crops (see product sheets).**



# GENERAL SALES CONDITIONS

Pursuant to Art. 1469 bis c.c., the parties, after ample discussion and negotiations, declare to regulate the ongoing rapport as in the past according to the following terms and conditions, which will be applied equally to all supplies and/or commercial interaction entered into between the parties in the future.

**1. ORDERS - BUYER INSOLVENCY** – 1.1.) The purchaser's order has the value of an irrevocable purchase offer and is not binding for the seller, which reserves the right to accept it in writing directly or through a legal representative. The sales agreement will be considered fulfilled only upon receipt by the purchaser of the order confirmation by the seller's legal representative. 1.2) Upon the seller's acceptance of the order, the agreement is considered closed and, in the event that the goods are not collected, the purchaser will be considered insolvent and, as a result, will be liable to pay a fee equal to 50% the amount of the invoice, without prejudice to greater damages. The agreement will be considered fulfilled even in the event of partial acceptance of the order, so that the failed collection of the goods will entitle the seller to demand the fee described in the above paragraph, to be calculated on the lower amount of the invoice. 1.3) Any specific agreement relative to the supply mentioned in this order and under the terms of delivery, even if with the participation of agents or those appointed by the seller, cannot bind the latter unless expressly accepted in writing by their legal representative. 1.4) The total and/or partial fulfilment of the order by the seller implies acceptance of the order. 1.5) The purchaser has absolutely no right to withdraw unilaterally from the order or contract. 1.6) If, once the order has been confirmed, the seller becomes aware of unpaid bills, confiscations, restraint orders or any judicial acts in general in the name of the purchaser, or if the seller learns that the purchaser is in financial difficultly, the seller can, if they wish, suspend the contract and demand certain guarantees, or dissolve the contract due to its breach by the purchaser, under art. 1456 of the civil code, communicating this in writing with return receipt or telegram. The exercise of this faculty does not give the purchaser any right to claim reimbursement of damages or other. 1.7) The minimum order accepted is of € 250.00 + V.A.T.

**2. PRICES AND PAYMENTS** – 2.1.) The sales price, where unspecified, is the one found in the seller's price list in vigour on the date the contract is finalised. 2.2) Should the purchaser fail to receive the products when they are ready for delivery, or their preparation and delivery were not possible for reasons of no fault of the seller, the prices, if not already foreseen in the order, will be subject to variations in the seller's price list and, in any case, to the variation of the cost of material and manual labour used from the time the goods have been prepared up until the moment of collection by the buyer or acceptance of the delivery. 2.3) Taxes, duties and expenses relative to the emission of bills of exchange or any regularisation of the contract, are at the purchaser's expense. 2.4) Payments must always be made in accordance with the terms and conditions agreed upon, in Euro, in cash and at the seller's headquarters. It is at the seller's discretion whether or not to accept promissory notes and cheques, or authorise drafts or issue bank receipts. This, however, does not bring about under any circumstances, either novation of the original credit, nor any prejudices towards any title retention agreement, nor territorial change in the event of a legal dispute. 2.5) Payments made to seller's agents will not be accepted unless previously authorised by the seller in writing. 2.6) Late payment sees interest mature at a rate foreseen under art. 5 of the Legislative Decree 231/2002 effective pursuant to art. 4 of the same Leg. Decree. 2.7) Any amounts unpaid by the purchaser authorise the seller to instruct immediately a legal representative to proceed to the collection of the outstanding balance, plus legal fees.

**3. DELIVERY** – 3.1.) The delivery terms are indicative and apply from the moment when all the points in the contract have been supplied and defined irrevocably, provided that the purchaser has punctually paid the instalments due. 3.2) If there are any outstanding payments, even ones relating to previous supplies, the seller has the right to suspend the implementation of the contract until payment has been made and sufficient guarantee has been given on payments due. 3.3) Delivery is carried out on weekdays and can be sufficiently postponed due to events beyond the seller's control such as strikes, trade union action, lockouts, fires, flooding, rejection of material or work, delayed delivery by third party suppliers, lack of driving force and other unforeseen events. Whatever the situation, delays caused in delivery cannot lead to any form of legal claim. 3.4) The seller has the right to make partial deliveries. 3.5) Delivery is regarded as having been completed in all its terms at the seller's headquarters on the twentieth day after delivery of the return receipt in which the seller notifies the purchaser that the products are ready. From that moment onwards, all risks to the goods become the responsibility of the purchaser and they will also be charged for storage, safekeeping, maintenance and insurance. After twenty days have elapsed since delivery of the above mentioned return receipt and if the client has not picked up the products, or the seller has been unable to deliver them, the seller has the right to sell the goods at the purchaser's expense, under art 1515 of the Civil Code.

**4. CHANGES TO THE PRODUCTS** – 4.1.) All the data and characteristics contained in the seller's catalogues, price lists, illustrations, drawings, offers and advertising material in general are entirely approximate and do not bind the seller in any way. All the photographs that appear in the catalogue are only explanatory and so no compensation will be paid for delivered material that is different from the images. 4.2) The seller reserves the right to make changes to the products where necessary, without any obligation to warn the purchaser, as long as the product's functions remain the same. 4.3) After the order has been placed, the seller is not obliged to make any changes to goods already produced, or in the course of production, that are destined for the purchaser.

**5. PROHIBITED ACTION** – 5.1.) Under no condition can the purchaser take legal action against the seller unless all the payments foreseen in the contract have been met. 5.2) From the outset, the purchaser hereby declares that no request for damages or expenses incurred from improper use of the goods, or damage that occurred during the period of time they were waiting for an authorised replacement of the goods, for the goods themselves or for their replacement, can be made.

**6. SHIPPING AND LOGISTICS** – 6.1.) Goods travel at the purchaser's risk. 6.2) Goods are intended always as sold at the seller's facility and delivered via a customer's means of transport or appointed courier. Any search for a means of transport undertaken by the seller is meant to be on behalf and in the interest of the purchaser, with no liability and/or cost for the seller. Any inclusion in the sales price of transport costs or the agreement "collection at source" does not constitute an exception to this clause. Any losses, faults, alterations of the goods and packaging for any reason are the responsibility of the customer, including in the event that, upon the logistics operator's request, the seller has to issue warranty statements. 6.3) The customer may not refuse to release the goods in transit for any reason. 6.4) When the purchaser does not specify the transport means in time, this will be selected by the seller without any responsibility being incurred by the latter. 6.5) Any delivery carried out by the purchaser for contested

goods, to be replaced on prior authorisation, must be done carriage free to the seller's factory and where the contrary occurs, the seller will have the right to refuse reception with no responsibility incurred.

**7. TESTS - PRODUCT FAULTS – WARRANTY** – 7.1.) The purchaser will be responsible for any damage or harm to the seller's testers or third-parties, while tests are being carried out, unless testing is carried out at the seller's factory. 7.2) The test will be carried out on delivery; if it should be delayed due to the fault of the purchaser, the subsequent test will have to be paid for in advance covering travel, labour and transfer costs. On completion of the test, the purchaser is obliged to issue the seller with a written declaration showing the results obtained. In the absence of this declaration, the goods sold will be regarded as having been accepted unconditionally and without reserve. 7.3) If the goods do not have to be subject to testing, when the goods are delivered, the purchaser will have to diligently check that there are no faults. 7.4) Any faults should be reported to the seller via registered mail with return receipt within eight days, which start from a) when the test is carried out; b) if no test has to be carried out, from the delivery date; c) if they are faults that were not detectable at the moment of testing or when the above mentioned checks were run, from the moment they are discovered. Failure to comply with the above mentioned terms will result in the warranty becoming null and void. 7.5) All the seller's products are guaranteed free from manufacturing faults, according to current European and Italian regulations, or according to the additional warranties acknowledged by the producer. The seller's product warranty includes only and exclusively the repair or replacement of faulty parts at the seller's factory, without granting any refunds or other expenses; the warranty becomes null if the faults are found to be due improper use of the goods, or if the seller's products have been handled, repaired or altered outside the seller's factory, or if they have been installed with materials or procedures that do not comply with REGULATIONS. 7.6) The party that declares the existence of a factory fault will have to provide proof that the product has been used properly and, in this case, that it has been correctly installed. 7.7) The cost of replacement and re-sending of faulty material will be at the purchaser's expense. 7.8) It is understood by the parties that in any case the communication of faults of the seller's products do not authorise in any way the purchaser to suspend payment of the seller's invoices.

**8. TITLE RETENTION AGREEMENT** – 8.1.) In the case of a hire purchase sale, the goods will remain the property of the seller until the purchaser has completed all the payments and will be able to be claimed wherever it may be, even if it is combined with other goods belonging to the purchaser or third parties, in compliance with art. 1523 and subsequent amendments to the civil code. 8.2) During the said period, the purchaser shall assume the obligations and responsibilities of keeper of the items supplied, and shall not be entitled to transfer, lend, pledge or move them, or allow them to be confiscated or distrained, without declaring that they are the property of the vendor and without immediately notifying the vendor by registered letter with return receipt.

**9. NON FULFILMENT BY PURCHASER - DISSOLUTION OF THE CONTRACT** – 9.1.) Failure to make two payments, even if not consecutively, of the price agreed at the time established, will lead to the purchaser forfeiting the benefit of the term and the seller exercising the right to suspend all deliveries not yet completed and/or take measures to obtain the entire outstanding sum, or the dissolution of the agreement and/or of any other sales agreement in force between the parties, under art. 1456 of the civil code, to be notified in writing via registered letter with return receipt. 9.2) Under the second hypothesis, the purchaser will need to immediately return the goods, and will have to pay a penalty of €50 per day for each day of delay in returning the goods. 9.3) The compensation for the greater damage is without prejudice and the seller will also be entitled to withhold the payments already made as a form of compensation, with the exception of larger damages incurred.

**10. TRANSFER OF CREDIT** – 10.1.) The purchaser declares that they accept from the outset, under art. 1264 of the civil code, any transfer of credit owed by the seller to the factoring agency or similar, expressly exonerating them from any other burden of notification, except to confirm that transfer has occurred, via registered letter with return receipt.

**11. COMPLAINTS - COMMUNICATION** – 11.1.) Any complaints must be made at the seller's headquarters. For the purposes of the order and subsequent contract, the purchaser declares their residence at the address shown on the front cover of the order itself and all communication will be sent to this address, or to a different legal headquarters, at the seller's discretion. 11.2) In any case, the purchaser will have to communicate to the seller any other change of contact details and addresses within 15 days of the change.

**12. APPLICABLE LAW AND COMPETENT COURT OF JURISDICTION** – 12.1.) Regardless of the purchaser's nationality and residency, this agreement is subject to the jurisdiction of the Italian Judge. 12.2) The sole competent authority in the event of any dispute shall be the Justice of the Peace or the Court of Modena, according to value. 12.3) It will, however, be the seller's right to elect of their choice, other legally recognised, competent Forums.

**13. PERSONAL DATA HANDLING** – 13.1.) Pursuant to Art. 10 of law No. 675 of 31/12/1996, your personal data may be subject to handling, meaning the collection, entering, organisation, storage, processing, modification, selection, extraction, comparison, use, interconnection, block, communication, distribution, deletion and destruction or any combination of two or more of the above. 13.2) These personal data will be handled for the following purposes: Administration, accounting, taxation, statistics, commercial, marketing, protection/management/transfer of credit, and to meet all requirements of the regulations in force and for the financial evaluation related to the proper fulfilment of the agreement. 13.3) Personal data will be handled with tools that ensure their safety and confidentiality, either in hard copy or digital format. Please be informed that with reference to the above mentioned handling, you are entitled to exercise the rights described in Art. 13 of law No. 675/96 as follows. 13.4) Your data may be communicated and distributed to the following: § Sales agents, suppliers, customers, couriers and logistics operators, collaborators, commercial and marketing companies and organisations; § Credit institutions, financing institutions, leasing companies, credit collectors, factoring companies, insurance companies, intermediation companies; § Professional firms (legal and commercial), organizations of consulting processing, statistics company; § Our subsidiary, partner or companies associated in any way. 13.5) The personal data may be communicated and Transferred even abroad, in accordance with the provisions of the law. 13.6) The company declares to have viewed the information contained herein and in Art. 13 of law No. 675/96 and to express its consent to the handling of personal data for the purposes indicated in the same. 13.7) It also declares to express its consent to the communication and distribution of data for the purposes described above, including for the commercial and marketing purposes of undetermined parties.

Notes

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