



# **USE AND MAINTENANCE MANUAL**

## **AQUA CUBIC TRIPLEX**

**EC DECLARATION OF CONFORMITY**

**Producer**            **S.I.A.T.A. S.r.l.**  
address                Via Virginio 370/372  
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Declares that the following material:

**PN**  
**AC-TRI/05**

**Description**  
**AQUA CUBIC TRIPLEX**

Conforms to the essential pre-requisites of the following **DIRECTIVES**:

- **Electromagnetic Compatibility 89/336/CEE, 93/68/CEE**
- **Low Voltage 73/23/CEE, 93/68/CEE**

The fulfilment of the following regulations has been verified:

**EN 50081-1** General Regulation on Emissions – part 1 residential, commercial and light industry environment

**EN 50082-1** General Regulation on Immunity – part 1:residential, commercial and light industry environments

S.I.A.T.A. S.R.L. has a Quality System which conforms to the requirements of the regulation:

**ISO 9001/UNI EN ISO 9001-ed. 1994** (Certificate n°95.022 SGS ICS )

Date  
03.03.1998

Director  
LUIGI FERRALI

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## 1 – INTRODUCTION

**Aqua Cubic Triplex** is a controller dedicated to the realisation of water **softening** systems working on the principle of the ionic exchange of the resins.

The systems can be produced according to the following **operative modalities**:

- **one single column**;
- **two alternated single columns**;
- **two duplex columns in parallel**;
- **one duplex column**;
- **two single columns in parallel**;
- **three single columns**

**Aqua Cubic Triplex** automatically calculates the volume of water which can be treated based on the hardness of the water, on the volume of the cylinders and on the exchange capacity of the resins used, values which must be programmed by the operator when the appliance is installed.

It is also possible to programme a **percentage of reserve of the total volume**, which allows for the regeneration of the resins to be started before they have completely run out.

**Aqua Cubic Triplex** allows for columns with **different dimensional characteristics** to be controlled, that is with different volume values, also allowing the differentiation of the regeneration cycle times.

The **regeneration** cycle is completely **programmable**: it can be started up by the control on the **volume**, **manually**, or by an **external signal**, it is possible to cancel the whole cycle or to jump one or more phases. The regeneration may be **immediate** or **deferred** to a programmed time. The regeneration includes a **stand-by**.

**Aqua Cubic Triplex** may be connected to a computer via **RS232** using the cable cod. 881-1, so as to be able to acquire and then analyse the progress of the work parameters

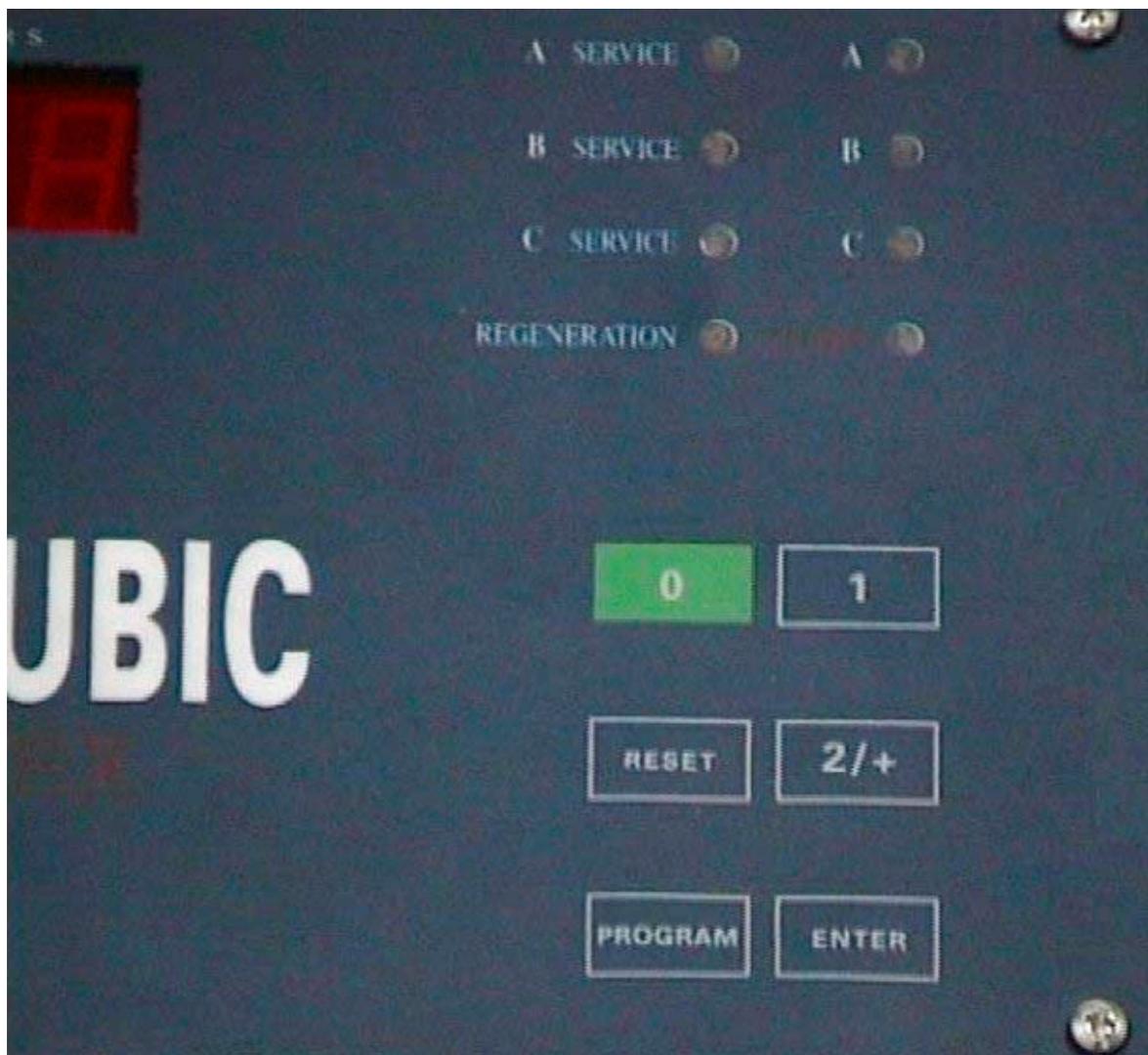
**Aqua Cubic Triplex** is equipped with a **buffer battery** which allows for the work parameters to be retained in the memory should the electricity current fail.

**Aqua Cubic Triplex** is equipped with an **EEPROM memory**, on which the programmed data is memorised, with the capacity to retain data for over **10 years**.

**Aqua Cubic Triplex**, like all the range of SIATA controllers, conforms to the EEC Directives and is produced in the SIATA plant of Montespertoli which operates with the certified Quality System according to the regulation

**ISO 9001 / UNI EN ISO 9001.**

## 2 – TECHNICAL DATA



Supply voltage	230 Vac $\pm$ 10%
Network frequency	50 Hz $\pm$ 3%
Power absorbed	30 VA
Operative temperature	0° C – 55° C
Class of protection	IP65
Protection from disturbances	ICE 65 Trial class 4 ( 3000 V )
Reading scale	0 – 999,999 Litres
Container dimensions	240 mm x 185 mm x 115 mm
Total weight	1.5 Kg

### 3 – EXPLANATION OF THE LEDs AND OF THE KEYS

**Tab. 1 – Functionality of the LEDs**

Led	Meaning
A SERVICE	The column A is in service
B SERVICE	The column B is in service
C SERVICE	The column C is in service
REGENERATION	Regeneration in progress
A	The display is visualising the data of the column A
B	The display is visualising the data of the column B
C	The display is visualising the data of the column C
ALARM	Alarm

**Tab. 2 – Functionality of the keys**

<b>0</b>	Key in the number <b>0</b> in the programming code. Within a programming code annuls the value of the number being modified.
<b>RESET</b>	Allows for the programming to be exited from without memorising the last value keyed in.
<b>PROGRAM</b>	Allows access to the programming functions.
<b>1</b>	Key in the number <b>1</b> in the programming code.
<b>2 / +</b>	Key in the number <b>2</b> in the programming code. During the programming increases the value on the display. During the service, allows the column visualised by the display to be changed.
<b>ENTER</b>	Confirms the programming code keyed in.

### 4 – STATES OF VISUALISATION OF THE DISPLAY

The display allows the visualisation of the data and of the operative states. When possible, the key **2/+** allows for the passing from one column to the other. In this case, the LEDs **A**, **B** or **C** will indicate to which column the data visualised refers.

**Tab. 3 – Visualisation of the display**

Display	Operative state / Data visualised
<b>1 2 2.4</b>	The column is in service. The display shows the available volume.
<b>----</b>	The column is in the <i>stand-by</i> phase after the regeneration.
<b>1 C 2 0</b>	The column is in regeneration.
<b>0.0 0 0</b>	The column has finished the volume programmed and is waiting to regenerate.

## 5 – GENERAL

The installation of the *controller* must be carried out by qualified personnel; the installation procedures must be carried out when the controller is disconnected from the electricity supply

### 5.1 – Packaging and storage

The packaging consists of a cardboard box with a label identifying the product, carrying the following information: name of producer and PN producer **AC-TRI24/05**; the **quick reference guide** for the installation and programming may be found inside.

No particular procedures are necessary for the removal of the controller from the packaging.

The controller must be stored in environments with the following characteristics:

- Temperature of between +0°C and +55°C;
- Relative humidity of between 30 % and 95 %.

### 5.2 – Installation

The appliance consists of a PVC box with a cover in plexi-glass which may be opened manually, giving access to the keypad, and of a cover which may be removed by loosening two screws and which gives access to the external connection terminal board.

The box is covered by a certificate with the **IP65** grade of protection, **Aqua Cubic Triplex** is therefore protected against infiltration of dust and direct jets of water. This protection is valid when the cover is closed, and the wiring slots are of the correct size for the cables used and are correctly assembled. If these conditions are not respected, the level of protection falls to **IP40**, which gives no protection against infiltration of dust and water.

The back of the box is equipped with mechanical details which allow it to be wall-mounted.

### 5.3 – Electrical connections

The electrical connection of the *controller* must take place conforming to the conditions stated in the diagram **CE0024** shown on the attached page.

The appliance is equipped with **free contact exits** with the following signals.

- **Dosage pump**
- **A in service**
- **B in service**
- **C in service**
- **Alarm**

#### **Warning!!**

Before carrying out any installation and/or maintenance operation, check that the *controller* is **disconnected from the electricity supply**.

### 5.4 – Protection devices

The appliance is protected from current overloads by a 1.6A **supply retardant fuse** which is assembled on the front panel. It is also protected against disturbances originating from the electricity supply by filters mounted inside the controller.

## 6 – INSTRUCTIONS FOR USE

### 6.1 – Turning on

The appliance is turned on via the main switch **ON (I) - OFF (0)** situated on the front panel. This switch acts on both supply cables

The supply voltage must be **24 Vac - 50 Hz.** (on demand **24 vac – 50 Hz.** )

Check the supply voltage using the adhesive labels situated on the cover of the connections.

### 6.2 – Programming of the operative modalities

Before proceeding to the programming of **Aqua Cubic Triplex**, it must be checked that the distributor cams are positioned at the **stroke end** and that any **unused limit switch** entries on the terminal are closed with a connector bridge. If this simple rule is not respected, **Aqua Cubic Triplex** cannot enter into service and access to the keypad will be limited after a few operations.

The programming will be carried out via the keypad on the front of the appliance.

**Aqua Cubic Triplex Plus** has the following operative modalities:

**Tab. 4 – Table of the operative modalities**

Code	Description	Rotation times
<b>P P P 0</b>	One single column	Regeneration in <b>6</b> phases with rotation time of <b>34</b> seconds
<b>P P P 1</b>	Three single columns	Regeneration in <b>6</b> phases with rotation time of <b>34</b> seconds
<b>P P P 2</b>	Two alternated single columns	Regeneration in <b>6</b> phases with rotation time of <b>34</b> seconds
<b>P P P 4</b>	One duplex column	Regeneration in <b>4</b> phases with rotation time of <b>25</b> seconds
<b>P P P 6</b>	Two duplex columns in parallel	Regeneration in <b>4</b> phases with rotation time of <b>25</b> seconds
<b>P P P A</b>	Two single columns in parallel	Regeneration in <b>6</b> phases with rotation time of <b>34</b> seconds

The selection takes place in accordance with the following sequence:

**Tab. 5 – Selection of the operative modalities**

	Display	Operative state / Data visualised
<b>PROGRAM</b>	<b>P 0 0 0</b>	State of access to the selection of the operative modality
<b>ENTER</b>	<b>P P P x</b>	Visualisation of the current operative modality (x = 0, 1, 2, 4, 6, A)
<b>2 / +</b>	<b>P P P *</b>	The key <b>2 / +</b> modifies the operative modality as per tab. 4

## 6.2.1 – PPP0 – One single column

### 6.2.1.a – Operative characteristics.

This operative modality has been provided to resolve **situations of emergency**; **Aqua Cubic Triplex** allows for the use of a distributor connected to a valve to ensure the supply of treated water to the utiliser when breakdowns of any degree of gravity do not allow the system to work fully and properly ( see par. 7.5 for details ).

The distributor must be connected to the terminals of the column A.

When the column is in service, the **LED A Service** will come on on the panel and the relative signal on the pins **43 – 44** of the terminal board will be active. The **LED A** will be on, to confirm the fact that the display is visualising the parameters of that column. As soon as the controller is in the position of waiting for the regeneration time, for example because the volume has run out, the signal on the terminal board will go out, while the **LED A Service** will remain on on the panel. As soon as the regeneration cycle starts, the signal on the terminal board will remain off, while on the panel, the **LED A Service** will go out, and the **LED Regeneration** will come on. The display will show the progression of the regeneration cycle.

This operative modality has the regeneration cycle composed of **6 phases of 34 seconds each**, that is it allows the use of the cam with stand-by. This function cannot be used, since at the end of the cycle the distributor must immediately position itself in service.

The start of the regeneration cycle is controlled by the flags **0HP**, **1HP**, and **2HP**.

To know how the controller reacts to the events, consult tab. 6. In the column **Programming** find the sequence of values which corresponds to that programmed on the controller, and so, on the basis of the events, the manner in which the controller will react may be seen.

**Tab. 6 – Consequences of the events on the reaction of the controller based on the programming.**

Programming			Events			
			The reg. time is set off with the finished days. (1)	The volume reaches the reserve.	The volume runs out.	Remote start active for 15 seconds. (2)
0HP	1HP	2HP				
0	0	0	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
0	0	1	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
0	1	0	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
0	1	1	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
1	0	0	The reg. starts.	The reg. starts at the time	The reg. starts at the time	Immediate start.
1	0	1	The reg. starts.	The reg. starts at the time	The reg. starts at the time	The reg. starts at the time
1	1	0	The reg. starts.	The reg. starts at the time	The reg. starts at the time	Immediate start.
1	1	1	The reg. starts.	The reg. starts at the time	The reg. starts at the time	The reg. starts at the time

#### N.B. :

- (1) The expression “when the days have run out” is substituted with the expression “on the active days” when the flag 1HP is at 1. In fact, in these cases, the interval days between two regenerations are not programmed, but the active days of the week on which the regeneration cycle is required. See par. 6.3.
- (2) The start of the cycle is immediate if, at the moment of the activation of the remote Start signal, the controller is in service. If, on the other hand, it is waiting for the regeneration time because the volume has run out, and the controller is therefore not in service, the remote start signal is ignored and the regeneration will be carried out at the programmed time.
- (3) The expression “The reg. starts at the time” means that the cycle starts at the programmed time even if the programmed interval days have not passed or if it is not an active day for the start of the regeneration cycle.

### 6.2.1.b – Programming of the flags

Tab. 7 shows the options available for the modality **PPP0**:

**Tab. 7 – Selection of the operative modality “one single column, PPP0”**

	FLAG	Display	Operative state / Data visualised
PROGRAM		<b>P 0 0 0</b>	State of access to the selection of the operative modality
ENTER		<b>P P P x</b>	Visualisation of the current operative modality (x = 0, 1, 2, 4, 6, A)
2 / +		<b>P P P 0</b>	The key 2 / + modifies the operative modality as in tab. 4 : returns to 0
PROGRAM	0 H P	<b>0 H P 0</b>	Immediate regeneration by finished volume.
2 / +	0 H P	<b>0 H P 1</b>	Regeneration at the programmed time and deferred to the time by finished volume.
PROGRAM	1 H P	<b>1 H P 0</b>	The interval days between two regenerations are programmed.
2 / +	1 H P	<b>1 H P 1</b>	The active days of the week are programmed.
PROGRAM	2 H P	<b>2 H P 0</b>	Immediate regeneration by <b>Remote Start</b>
2 / +	2 H P	<b>2 H P 1</b>	Regeneration deferred to the programmed time by <b>Remote Start</b>
PROGRAM	3 H P	<b>3 H P 1</b>	Enables the reading of the brine tank level sensors (see par. 6.12)
PROGRAM	0 C P	<b>0 C P 0</b>	Modality of the litre counter divider (0 = free, see par. 6.7)
2 / +	0 C P	<b>0 C P 1</b>	Modality of the litre counter divider (1 = pre-programmed, see par. 6.7)
PROGRAM	1 C P	<b>1 C P 0</b>	FLAG not used
PROGRAM	2 C P	<b>2 C P 0</b>	The new programming is immediately operative.
2 / +	2 C P	<b>2 C P 1</b>	The new programming is operative after the next regeneration
PROGRAM	3 C P	<b>3 C P 0</b>	FLAG not used
PROGRAM			The rapid <i>flashing</i> of the display indicates that the values have been saved in the eeprom.

At the end of the programming the code **220** must always be keyed in (see par. 6.3) to initialise **Aqua Cubic Triplex** with the new parameters.

Note that the control on the reserve (flag 0dP) is automatically active and cannot be deactivated.

### 6.2.1.c – List of codes to be programmed

For the programming and the meaning of the codes, see par. 6.3. In this modality, the programming of the following codes is recommended:

**Tab. 8 – Table of the codes recommended in the modality “one single column, PPP0”**

Code	Meaning
011	Programming of the value of the exchange capacity of the resins
012	Programming of the regeneration time and the interval days between two regenerations
020	Programming of the time and day of the week
100	Programming of the volume of resin and of the percentage of reserve of the column A
110	Programming of the litre counter divider ( prescaler )
112	Programming of the regeneration cycle ( stop times )
010	Programming of the hardness value
220	Initialisation of the system

### 6.2.2 – PPP1 – Three single columns.

#### 6.2.2.a – Operative characteristics.

This operative modality allows for the use of **three distributors each of which is connected to a single SIATA valve**. The three columns **alternate in service**, so that while two are in service, the third **will be first in regeneration and then in stand-by**.

When the controller is put into service, typically after having keyed in the **220**, the column C is put into stand-by, while the columns A and B are put into service. The signals to the pins 43 – 44 and 45 – 46 of the terminal board will be active, respectively for the column A and the column B, while the pins 47 – 48 for the column C will be inactive. The LEDs **A Service** and **B Service** on the panel will be on, while the LED **C Service** will be off. The LED **A** will be on to indicate that the display is visualising the volume of the column A.

With the key **2/+** it is possible to change the column visualised on the display. Each time the key is pressed, the LEDs **A**, **B** or **C** will come on when the data of the relative column is transferred to the display. If the column visualised is in service it is possible to read the residual volume. If it is in regeneration it is possible to follow the progression. If it is in stand-by, the display will show four lines.

When one of the columns in service goes into in regeneration by finished volume, the column in stand-by will go into service in place of the column which has just run out. The LEDs on the panel will come on to indicate the new situation. The LED **Regeneration** will be on for the whole duration of the regeneration cycle. The signals to the pins of the terminal board mentioned above will also activate in accordance with the new situation.

This operative modality is not programmable. As seen in tab. 9, any programming of the flags always takes place in the same way.

When one column finishes the available volume, the controller immediately enters into regeneration, and the column in stand-by enters into service. If both of the columns in service have a residual volume of less than the calculated reserve, the controller will start up a regeneration immediately for the column which in that moment has the lowest volume. The control on the reserve cannot be deactivated. If this control is not required, the effects can be minimised by programming the percentage of reserve at the minimum value of 10%.

**Tab. 9 – Consequences of the events on the working of the controller on the basis of the programming..**

Programming			Events			
			The reg. time is set off with the finished days.	The volume reaches the reserve.	The volume runs.	Remote start active for 15 seconds.
0HP	1HP	2HP				
0	0	0	The reg. does not start.	Imm. Start (1)	Immediate start.	Not available.
0	0	1	The reg. does not start.	Imm. Start (1)	Immediate start.	Not available.
0	1	0	The reg. does not start.	Imm. Start (1)	Immediate start.	Not available.
0	1	1	The reg. does not start.	Imm. Start (1)	Immediate start.	Not available.
1	0	0	The reg. does not start.	Imm. Start (1)	Immediate start.	Not available.
1	0	1	The reg. does not start.	Imm. Start (1)	Immediate start.	Not available.
1	1	0	The reg. does not start.	Imm. Start (1)	Immediate start.	Not available.
1	1	1	The reg. does not start.	Imm. Start (1)	Immediate start.	Not available.

**N.B. :**

- 1) The start of the cycle is immediate only when both of the columns in service have a volume below the value of reserve. The column which has the lowest volume out of the two starts in regeneration. If only one of the columns reaches the value of reserve, the regeneration does not start, even at the programmed time.

**6.2.2.b – Programming of the flags**

Tab. 10 shows the options available for the modality **PPP1**:

**Tab. 10 – Selection of the operative modality “three alternated single columns, PPP1”**

	FLAG	Display	Operative state / Data visualised
PROGRAM		<b>P 0 0 0</b>	State of access to the selection of the operative modality
ENTER		<b>P P P x</b>	Visualisation of the current operative modality (x = 0, 1, 2, 4, 6, A)
2 / +		<b>P P P 1</b>	The key 2 / + modifies the operative modality as per tab. 4 : returns to 1
PROGRAM	<b>0 H P</b>	<b>0 H P 0</b>	FLAG not used
PROGRAM	<b>1 H P</b>	<b>1 H P 0</b>	FLAG not used
PROGRAM	<b>2 H P</b>	<b>2 H P 0</b>	FLAG not used
PROGRAM	<b>3 H P</b>	<b>3 H P 0</b>	Enables the reading of the brine tank level sensors (see par. 6.12)
PROGRAM	<b>0 C P</b>	<b>0 C P 0</b>	Modality of the litre counter divider (0 =free, see par. 6.7)
2 / +	<b>0 C P</b>	<b>0 C P 1</b>	Modality of the litre counter divider (1 = pre-programmed, see par. 6.7)
PROGRAM	<b>1 C P</b>	<b>1 C P 0</b>	Same times of the regeneration cycle for the columns <b>A/C</b> and <b>B</b>
2 / +	<b>1 C P</b>	<b>1 C P 1</b>	Different times of the regeneration cycle for the columns <b>A/C</b> and <b>B</b>
PROGRAM	<b>2 C P</b>	<b>2 C P 0</b>	The new programming is immediately operative.
2 / +	<b>2 C P</b>	<b>2 C P 1</b>	The new programming is operative after the next regeneration

PROGRAM	3 C P	3 C P 0	FLAG not used
PROGRAM			The rapid <i>flashing</i> of the display indicates that the values have been saved in the eeprom

At the end of the programming the code **220** must always be keyed in (see par. 6.3) to initialise **Aqua Cubic Triplex** with the new parameters.

### 6.2.2.c – List of codes to be programmed

For the programming and the meaning of the codes see par. 6.3. In this modality, the programming of the following codes is recommended:

**Tab. 11 – Table of the codes recommended in the modality “three alternated single columns, PPP1”**

Code	Meaning
011	Programming of the value of the capacity of resins exchange
020	Programming of the time and of the day of the week (non influential)
100	Programming of the volume of resin and of the percentage of reserve of the column <b>A</b>
110	Programming of the litre counter divider (prescaler)
112	Programming of the regeneration cycle ( stop times ).
210	Transfer of the parameters programmed for the column <b>A</b> to the <b>B</b> and <b>C</b>
010	Programming of the hardness value
220	Initialisation of the system

#### N.B. :

If the three columns are of the same dimensions, it is supposed that they will also be regenerated with the same times of the regeneration cycle. To this end, the flag 1CP must be programmed with the value 0. If the separate programming of the cycle times of the column **B** is required, (the columns **A** and **C** use the same times, programmed with the code 112), it is necessary to add to the list of tab. 11, the code 111, and the flag 1CP must be programmed with the value 1.

In the case in which columns of different dimensions are used, the recommended programming varies as follows:

**Tab. 12 – Table of the codes recommended in the modality “three alternated single columns, PPP1” of different dimensions**

Code	Meaning
011	Programming of the value of the capacity of resins exchange
020	Programming of the time and of the day of the week ( non influential )
100	Programming of the volume of resin and of the percentage of reserve of the column <b>A</b>
101	Programming of the volume of resin and of the percentage of reserve of the column <b>B</b>
102	Programming of the volume of resin and of the percentage of reserve of the column <b>C</b>
110	Programming of the litre counter divider ( prescaler )
111	Programming of the regeneration cycle ( stop times ) per the column <b>B</b>
112	Programming of the regeneration cycle ( stop times ) for the columns <b>A</b> and <b>C</b>
010	Programming of the hardness value
220	Initialisation of the system

Remember that in order to use **Aqua Cubic Triplex** as described in tab. 12, the flag **1CP** must be programmed to **1**.

### 6.2.3 – PPP2 – Two alternated single columns.

#### 6.2.3.a – Operative characteristics.

This operative modality allows for the use of **two distributors, each of which connected to a single SIATA valve**. The two columns **alternate in service**, and so while one is in service, the other **will be first in regeneration and then in stand-by**.

As soon as it is put into service, typically after having keyed in the code **220**, the column B is put into stand-by, while the column A is put into service. The signal to the pins 43 – 44 of the terminal board will be active, while the signal to the pins 45 – 46 for the column B will be inactive. The LED **A Service** on the panel will be on, while the LED **B Service** will be off. The LED **A** will be on to indicate that the display is visualising the volume of the column A.

With the key **2/+** it is possible to change the column visualised on the display. Each time the key is pressed, the LEDs **A** or **B** will come on when the data of the relative column is transferred to the display. Se the column visualised is in service the residual volume can be read. If it is in regeneration, the progression can be followed. If it is in stand-by, the display will show four lines.

When the column in service goes into regeneration by finished volume, the column in stand-by will go into service in place of the column which has just run out. The LEDs on the panel will come on to indicate a new situation. The LED **Regeneration** will be on for the whole duration of the regeneration cycle. The signals to the pins of the terminal board shown above will also activate in line with the new situation.

At the end of the cycle the cam will remain in the stand-by position.

This operative modality is not programmable. As may be seen in tab. 13, any programming of the flags always brings on the same result.

When one column finishes the available volume, the controller immediately enters into regeneration, and the column in stand-by enters into service. There is no control either on the reserve or on the remote start.

**Tab. 13 – Consequences of the events on the working of the controller on the basis of the programming.**

Programming			Events			
			The reg. time is set off with the finished days.	The volume reaches the reserve.	The volume runs out.	Remote start active for 15 seconds.
0HP	1HP	2HP				
0	0	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
0	0	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
0	1	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
0	1	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	0	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	0	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	1	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	1	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.

### 6.2.3.b – Programming of the flags

Tab. 14 shows the options available for the modality **PPP2**:

**Tab. 14 – Selection of the operative modality “two alternated single columns, PPP2”**

	FLAG	Display	Operative state / Data visualised
PROGRAM		<b>P 0 0 0</b>	State of access to the selection of the operative modality
ENTER		<b>P P P x</b>	Visualisation of the current operative modality (x = 0, 1, 2, 4, 6, A)
2 / +		<b>P P P 2</b>	The key <b>2 / +</b> modifies the operative modality as per tab. 4 : returns to 2
PROGRAM	<b>0 H P</b>	<b>0 H P 0</b>	FLAG not used
PROGRAM	<b>1 H P</b>	<b>1 H P 0</b>	FLAG not used
PROGRAM	<b>2 H P</b>	<b>2 H P 0</b>	FLAG not used
PROGRAM	<b>3 H P</b>	<b>3 H P 0</b>	Enables the reading of the brine tank level sensors (see par.6.12)
PROGRAM	<b>0 C P</b>	<b>0 C P 0</b>	Modality of the litre counter divider (0 = free see par. 6.7)
2 / +	<b>0 C P</b>	<b>0 C P 1</b>	Modality of the litre counter divider (1 = pre-programmed see par. 6.7)
PROGRAM	<b>1 C P</b>	<b>1 C P 0</b>	Same times of the regeneration cycle for the columns <b>A</b> and <b>B</b>
2 / +	<b>1 C P</b>	<b>1 C P 1</b>	Different times of the regeneration cycle for the columns <b>A</b> and <b>B</b>
PROGRAM	<b>2 C P</b>	<b>2 C P 0</b>	The new programming is immediately operative.
2 / +	<b>2 C P</b>	<b>2 C P 1</b>	The new programming is operative after the next regeneration.
PROGRAM	<b>3 C P</b>	<b>3 C P 0</b>	FLAG not used
PROGRAM			The rapid <i>flashing</i> of the display indicates that the values have been saved in the eeprom.

At the end of the programming the code **220** must always be keyed in (see par. 6.3) to initialise **Aqua Cubic Triplex** with the new parameters.

### 6.2.3.c – List of codes to be programmed

For the programming and the meaning of the codes see par. 6.3. In this modality, the programming of the following codes is recommended:

**Tab. 15 – Table of the codes recommended in the modality “two alternated single columns, PPP2”**

Code	Meaning
011	Programming of the value of the capacity of resins exchange
100	Programming of the volume of resin and of the percentage of reserve of the column <b>A</b>
110	Programming of the litre counter divider ( prescaler )
112	Programming of the regeneration cycle ( stop times )
210	Transfer of the parameters programmed for the column <b>A</b> on the column <b>B</b>
010	Programming of the hardness value
220	Initialisation of the system

In the case of use of columns of different dimensions, the recommended programming varies as follows:

**Tab. 16 – Table of the codes recommended in the modality “two alternated single columns, PPP2” different columns**

Code	Meaning
011	Programming of the value of the capacity of resins exchange
100	Programming of the volume of resin and of the percentage of reserve of the column <b>A</b>
101	Programming of the volume of resin and of the percentage of reserve of the column <b>B</b>
110	Programming of the litre counter divider ( prescaler )
111	Programming of the regeneration cycle ( stop times ) for the column <b>B</b>
112	Programming of the regeneration cycle ( stop times ) for the column <b>A</b>
010	Programming of the hardness value
220	Initialisation of the system

Remember that in order to use **Aqua Cubic Triplex** as described in tab. 16, the flag **1CP** must be programmed to **1**.

## 6.2.4 – PPP4 – One duplex column.

### 6.2.4.a – Operative characteristics.

In this modality a **single distributor connected to 2 SIATA valves** is used. The distributor is connected to the terminals of the column A.

This distributor has a special cam, modified so as to divide the 360° of rotation between the two valves; the first 180° are dedicated to column A, the second to column B. Normally defined as column A is the valve connected to the pilots 1 and 2, those nearest to the distributor, and defined column B is the valve connected to the pilots 3 and 4 ( see also the connections indicated in the attached page C).

Which of the two columns is active, and therefore which valve is in use, depends only on the position of the cam of the distributor. The controller cannot know which column is in service. In fact, as will be shown, both the optical and electrical signals will always communicate that column A is in service.

Suppose the following operations are to be carried out when the distributor has the cam in the stroke end position at the beginning of the first 180° of rotation, that is so as to have the valve A in service. After having keyed in the code **220**, the controller will begin with the valve A in service. The signal to the pins 43 – 44 of the terminal board will be active. The LED **A Service** on the panel will be on. The LED **A** will be on to indicate that the display is visualising the volume of the column A.

The key **2/+**, which normally allows for the column visualised on the display to be changed, cannot be used until a regeneration starts. Normally the display shows the parameters of the column in service, indicating that they belong to the column A. Having positioned the distributor so as to have the valve A in service, the parameters visualised are in fact those of the column A. As soon as this valve enters into regeneration, regeneration, the signal to the pins 43 – 44 goes out and the rotation of the cam causes valve B to be put into service. The display visualises the progression of the regeneration cycle.

Now pressing the key **2/+** it is possible to visualise the residual volume of the column as soon as it has entered into in service, that is the volume of the valve B. Note that the LED **A** still remains on.

As soon as the regeneration terminates, the LEDs on the panel will indicate again that the column A is in service and that its parameters are being visualised. In reality, the display is showing the parameters of the valve B, those which, during the regeneration cycle, it was possible to see only with the key **2/+**. When the valve B has run out of volume and starts the regeneration, the operations just described will be repeated and the parameters of valve A will be visualised again.

To summarise:

- 1- the controller always indicates that the column A is in service;
- 2- the signal to the pins 43 – 44 of the terminal board goes off during the regeneration, so this signal cannot be used for an electrical column exchange;
- 3- which valve is actually in service depends only on the position of the cam of the distributor;
- 4- during the regeneration, pressing the key **2/+** it is possible to visualise the volume of the column which has taken over in service.

This operative modality is not programmable. As shown in tab. 17, any programming of the flags always brings on the same result.

When one column finishes the available volume, the controller immediately enters into regeneration. The rotation of the cam controls the exchange of the columns, so the stand-by valve enters into service.

**Tab. 17 – Consequences of the events on the functioning of the controller on the basis of the programming.**

Programming			Events			
			The reg. time is set off with the finished days.	The volume reaches the reserve.	The volume runs out.	Remote start active for 15 seconds.
0HP	1HP	2HP				
0	0	0	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
0	0	1	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
0	1	0	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
0	1	1	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
1	0	0	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
1	0	1	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
1	1	0	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.
1	1	1	The reg. does not start.	The reg. does not start.	Immediate start.	Immediate start.

#### 6.2.4.b – Programming of the flags

Tab. 18 shows the options available for the modality **PPP4**:

**Tab. 18 – Selection of the operative modality “one duplex column, PPP4”**

	FLAG	Display	Operative state / Data visualised
PROGRAM		<b>P 0 0 0</b>	State of access to the selection of the operative modality
ENTER		<b>P P P x</b>	Visualisation of the current operative modality (x = 0, 1, 2, 4, 6, A)
2 / +		<b>P P P 4</b>	The key 2 / + modifies the operative modality as per tab. 4 : returns to 4
PROGRAM	<b>0 H P</b>	<b>0 H P 0</b>	FLAG not used
PROGRAM	<b>1 H P</b>	<b>1 H P 0</b>	FLAG not used
PROGRAM	<b>2 H P</b>	<b>2 H P 0</b>	FLAG not used
PROGRAM	<b>3 H P</b>	<b>3 H P 0</b>	Enables the reading of the brine tank level sensors (see par. 6.12).
PROGRAM	<b>0 C P</b>	<b>0 C P 0</b>	Modality of the litre counter divider (0 = free see par. 6.7)
2 / +	<b>0 C P</b>	<b>0 C P 1</b>	Modality of the litre counter divider (1 = pre-programmed see par. 6.7)
PROGRAM	<b>1 C P</b>	<b>1 C P 0</b>	FLAG not used
PROGRAM	<b>2 C P</b>	<b>2 C P 0</b>	The new programming is immediately operative.
2 / +	<b>2 C P</b>	<b>2 C P 1</b>	The new programming is operative after the next regeneration
PROGRAM	<b>3 C P</b>	<b>3 C P 0</b>	FLAG not used
PROGRAM			The rapid <i>flashing</i> of the display indicates that the values have been saved in the eeprom.

At the end of the programming the code **220** must be keyed in (see par. 6.3) to initialise **Aqua Cubic Triplex** with the new parameters.

#### 6.2.4.c – List of codes to be programmed

For the programming and the meaning of the codes see par. 6.3. In this modality, the programming of the following codes is recommended:

**Tab. 19 – Table of the codes recommended in the modality “one duplex column, PPP4”**

Code	Meaning
<b>011</b>	Setting of the value of the capacity of resins exchange
<b>100</b>	Setting of the volume of resin and of the percentage of reserve of the column <b>A</b>
<b>110</b>	Setting of the litre counter divider ( prescaler )
<b>112</b>	Setting of the regeneration cycle ( stop times )
<b>010</b>	Setting of the hardness value
<b>220</b>	Initialisation of the system

**It should be pointed out that the two columns must be of the same dimensions. It is not possible to change in any way the two columns, either for the dimensions, or for the regeneration cycle.**

#### 6.2.5 – PPP6 – Two duplex columns in parallel.

##### 6.2.5.a – Operative characteristics.

In this modality **two distributors, each connected to 2 SIATA valves** are used. **Both of the columns are in service.** The system therefore consists of 4 valves, of which two are always in service at the same time.

Both of the distributors use the cam described in par. 6.2.4.a; there is no stand-by position, and the 360° of rotation are divided between the two; the first 180° are dedicated to the first valve, the second valve.

Also in this case, therefore, which of the two valves for each distributor is active depends only on the position of the cam. The controller cannot know which valve is actually in service.

Supposing the following operations are to be carried out when both of the distributors have the cam in the stroke end position at the beginning of the first 180° of rotation, that is so as to have the valve **A** in service. After having keyed in the code **220**, the controller will start up with both of the columns in service, and for both the first valve is in service. The signal to the pins 43 – 44 and 45 – 46 of the terminal board will be active. The LEDs **A Service** and **B Service** on the panel will be on. The LED **A** will be on to indicate that the display is visualising the volume of the column **A**.

With the key **2/+** it is possible to change the column visualised on the display. Each time it is pressed, the LEDs **A** or **B** will come on when the data of the relative volume is transferred onto the display. If the column visualised is in service, it will be possible to read the residual volume. If it is in regeneration it will be possible to follow the progression. When one column is in regeneration, it is not possible to visualise the parameters of the valve in service.

This operative modality is not programmable. As shown in tab. 20, any programming of the flags always leads to the same result.

When one column finishes the available volume, the controller immediately enters into regeneration. The rotation of the cam controls the exchange of the columns, and the valve in stand-by enters into service.

**Tab. 20 – Consequences of the event on the working of the controller on the basis of the programming.**

Programming			Events			
			The reg. time is set off with the finished days.	The volume reaches the reserve..	The volume runs out.	Remote start active for 15 seconds.
0HP	1HP	2HP				
0	0	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
0	0	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
0	1	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
0	1	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	0	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	0	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	1	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	1	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.

### 6.2.5.b – Programming of the flags

Tab. 21 shows the options available for the modality **PPP6**:

**Tab. 21 – Selection of the operative modality “two duplex columns in parallel, PPP6”**

	FLAG	Display	Operative state / Data visualised
PROGRAM		<b>P 0 0 0</b>	State of access to the selection of the operative modality
ENTER		<b>P P P x</b>	Visualisation of the current operative modality (x = 0, 1, 2, 4, 6, A)
2 / +		<b>P P P A</b>	The key <b>2 / +</b> modifies the operative modality as per tab. 4 : returns to 6
PROGRAM	<b>0 H P</b>	<b>0 H P 0</b>	FLAG not used
PROGRAM	<b>1 H P</b>	<b>1 H P 0</b>	FLAG not used
PROGRAM	<b>2 H P</b>	<b>2 H P 0</b>	FLAG not used
PROGRAM	<b>3 H P</b>	<b>3 H P 0</b>	Enables the reading of the brine tank level sensors (see par. 6.12).
PROGRAM	<b>0 C P</b>	<b>0 C P 0</b>	Modality of the litre counter divider (0 = free see par. 6.7)
2 / +	<b>0 C P</b>	<b>0 C P 1</b>	Modality of the litre counter divider (1 = pre-programmed see par. 6.7)
PROGRAM	<b>1 C P</b>	<b>1 C P 0</b>	Same times of the regeneration cycle for the two columns <b>A</b> and <b>B</b>
2 / +	<b>1 C P</b>	<b>1 C P 1</b>	Different times of the regeneration cycle for the two columns <b>A</b> and <b>B</b>
PROGRAM	<b>2 C P</b>	<b>2 C P 0</b>	The new programming is immediately operative.
2 / +	<b>2 C P</b>	<b>2 C P 1</b>	The new programming is operative after the next regeneration
PROGRAM	<b>3 C P</b>	<b>3 C P 0</b>	FLAG not used
PROGRAM			The rapid <i>flashing</i> of the display indicates that the values have been saved in the eeprom

At the end of the programming the code **220** must always be keyed in (see par. 6.3) to initialise per **Aqua Cubic Triplex** with the new parameters.

### 6.2.5.c – List of codes to be programmed

For the programming and the meaning of the codes see par. 6.3. In this modality, the programming of the following codes is recommended:

**Tab. 22 – Table of the codes recommended in the modality “two duplex columns in parallel, PPP6”**

Code	Meaning
011	Programming of the value of the capacity of resins exchange
100	Programming of the volume of resin and of the percentage of reserve of the column <b>A</b>
110	Programming of the litre counter divider ( prescaler )
112	Programming of the regeneration cycle ( stop times )
210	Transfer of the parameters programmed for column <b>A</b> on column <b>B</b>
010	Programming of the hardness value
220	Initialisation of the system

If columns of different dimensions are used, the programming recommended varies as follows:

**Tab. 23 – Table of codes recommended in modality “two duplex columns in parallel, PPP6” different columns**

Code	Meaning
011	Programming value of the capacity of resins exchange
100	Programming of the volume of resin and of the percentage of reserve of the column <b>A</b>
101	Programming of the volume of resin and of the percentage of reserve of the column <b>B</b>
110	Programming of the litre counter divider ( prescaler )
111	Programming of the regeneration cycle ( stop times ) of the column <b>B</b>
112	Programming of the regeneration cycle ( stop times ) of the column <b>A</b>
010	Programming of the hardness value
220	Initialisation of the system

Remember that to use **Aqua Cubic Triplex** as shown in tab. 23, the flag **ICP** must be programmed to **1**.

It should be pointed out that the difference in dimension refers to the tanks onto which the valves are mounted. The tanks controlled by the same distributor must be of the same sizes. It is not possible to change the two tanks in any way, either for the dimensions, or for the regeneration cycle.

It is however possible to change the dimensions (and so the regeneration cycle) of the two tanks connected to a distributor of the dimensions (and the cycle) of the two tanks connected to the other distributor (tanks which must also be of the same dimensions as each other) through the instructions in tab. 23.

## 6.2.6 – PPPA – Two single columns in parallel

### 6.2.6.a – Operative characteristics.

In this modality there are **two distributors, each of which is connected to a SIATA valve. Both of the columns are in service.** It is not possible to have both of the columns in regeneration.

After having keyed in the code **220**, both of the columns are put into service. The signals to the pins 43 – 44 and 45 – 46 of the terminal board will be active. Both of the LEDs **A Service** and **B Service** on the panel will be on. The LED **A** will be on to indicate that the display is visualising the volume of the column A.

With the key **2/+** it is possible to change the column visualised on the display. Each time the key is pressed, LEDs **A** or **B** will come on when the data of the relative column is transferred to the display. If the column visualised is in service it will be possible to read the residual volume. If it is in regeneration it will be possible to follow the progression.

The two columns cannot regenerate at the same time. If one column finishes its volume while the other is regenerating, it will simply go into, disactivating the signal of service active on the terminal board, while waiting for the other column to terminate the regeneration. As soon as this condition has been reached, the column which has just finished the cycle will enter into service, while the column waiting will begin its regeneration.

This operative modality is not programmable. As shown in tab. 24, any programming of the flags always brings on the same result.

When one column finishes the available volume, the controller enters immediately into in regeneration. There is no control on the remote start.

**Tab. 24 – Consequences of the events on the working of the controller on the basis of the programming.**

Programming			Events			
0HP	1HP	2HP	The reg. time is set off with the finished time.	The volume reaches the reserve.	The volume runs out.	Remote start active for 15 seconds.
0	0	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
0	0	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
0	1	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
0	1	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	0	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	0	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	1	0	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.
1	1	1	The reg. does not start.	The reg. does not start.	Immediate start.	Not available.

### 6.2.6.b – Programming of the flags

Tab. 25 shows the options available for the modality **PPPA**:

**Tab. 25 – Selection of the operative modality “two single columns in parallel, PPPA”**

	FLAG	Display	Operative state / Data visualised
PROGRAM		<b>P 0 0 0</b>	State of access to the selection of the operative modality
ENTER		<b>P P P x</b>	Visualisation of the current operative modality (x = 0, 1, 2, 4, 6, A)
2 / +		<b>P P P A</b>	The key <b>2 / +</b> modifies the operative modality as per tab. 4 : returns to A
PROGRAM	<b>0 H P</b>	<b>0 H P 0</b>	FLAG not used
PROGRAM	<b>1 H P</b>	<b>1 H P 0</b>	FLAG not used
PROGRAM	<b>2 H P</b>	<b>2 H P 0</b>	FLAG not used
PROGRAM	<b>3 H P</b>	<b>3 H P 0</b>	Enables the reading of the brine tank level sensors (see par.6.12)
PROGRAM	<b>0 C P</b>	<b>0 C P 0</b>	Modality of the litre counter divider (0 = free see par. 6.7)
2 / +	<b>0 C P</b>	<b>0 C P 1</b>	Modality of the litre counter divider (1 = pre-programmed see par. 6.7)
PROGRAM	<b>1 C P</b>	<b>1 C P 0</b>	Same times of the regeneration cycle for the two columns <b>A</b> and <b>B</b>
2 / +	<b>1 C P</b>	<b>1 C P 1</b>	Different times of the regeneration cycle for the two columns <b>A</b> and <b>B</b>
PROGRAM	<b>2 C P</b>	<b>2 C P 0</b>	The new programming is immediately operative.
2 / +	<b>2 C P</b>	<b>2 C P 1</b>	The new programming is operative after the next regeneration
PROGRAM	<b>3 C P</b>	<b>3 C P 0</b>	FLAG not used
PROGRAM			The rapid <i>flashing</i> of the display indicates that the values have been saved in the eeprom

At the end of the programming the code **220** must always be keyed in (see par. 6.3) to initialise **Aqua Cubic Triplex** with the new parameters.

### 6.2.5.c – List of codes to be programmed

For the programming and the meaning of the codes see par. 6.3. In this modality, the programming of the following codes is recommended:

**Tab. 26 – Table of the codes recommended in the modality “two single columns in parallel, PPPA”**

Code	Meaning
011	Programming of the value of the capacity of resins exchange
100	Programming of the volume of resin and of the percentage of reserve of the column <b>A</b>
110	Programming of the litre counter divider ( prescaler )
112	Programming of the regeneration cycle ( stop times )
210	Transfer of the parameters programmed for column <b>A</b> on column <b>B</b>
010	Programming of the hardness value
220	Initialisation of the system

If columns of different dimensions are used, the programming recommended varies as follows:

**Tab. 27 – Table of the codes recommended in the modality “due single columns in parallel, PPPA” different columns**

Code	Meaning
011	Programming value of the capacity of resins exchange
100	Programming of the volume of resin and of the percentage of reserve of the column <b>A</b>
101	Programming of the volume of resin and of the percentage of reserve of the column <b>B</b>
110	Programming of the litre counter divider ( prescaler )
111	Programming of the regeneration cycle ( stop times ) of the column <b>B</b>
112	Programming of the regeneration cycle ( stop times ) of the column <b>A</b>
010	Programming of the hardness value
220	Initialisation of the system

Remember that to use **Aqua Cubic Triplex** as shown in tab. 27, the flag **1CP** must be programmed to **1**.

## 6.3 – Programming codes

The work parameters necessary for **Aqua Cubic Triplex** to work properly are set accesses them via the *programming* codes, under which the parameters inherent to a specific functionality of the controller are grouped together. The next paragraphs show how the programming codes are accessed and their use.

### 6.3.1 – Access to the programming codes

The following table represents the procedure which must be carried out to access the programming codes:  
( Where **P x x x** appears in place of the **x**, it should be understood that there are numbers which vary on the basis of the pressing of the keys. )

**Tab. 28 – Access to the programming codes**

	Display	Meaning
<b>PROGRAM</b>	<b>P 0 0 0</b>	Modality of insertion of the programming code
<b>0 - 1 - 2/+</b>	<b>P x x x</b>	Composition of the number on the display through the keys shown; after the first three numbers have been inserted, pressing again moves the number to the left, eliminating the first number keyed in and inserting the new number on the right.
<b>ENTER</b>	<b>P x x x</b>	Confirms the code selected and accesses its programming code.

### 6.3.2 – List of programming codes and their use.

The following table lists the programming codes available.

For each of the codes the sequence of the parameters as they appear on the display and their meaning in the functioning cycle of **Aqua Cubic Triplex** will be described.

The code is accessed with the instructions shown in tab. 24; within each code, the key **2/+** allows the parameter to be modified, while the key **PROGRAM** allows the modifications carried out to be memorised.

**Tab. 29 – Table of the programming codes**

Code visualised		Display	Meaning
<b>P 0 0 2</b>	<b>ENTER</b>		Modifies the <b>movement times</b> of all of the phases of the regeneration taking them to <b>5 seconds</b> . May be used to carry out trial regenerations. To reset the correct times, the programming of the flags must be run through. <b>Cannot be used for trials with the hydraulic distributors.</b>
<b>P 0 1 0</b>	<b>ENTER</b>	<b>d H x x</b>	Programming of the <b>hardness value</b> . May have values from <b>1</b> to <b>99</b> . At the end of the programming calculates the new volume values, which become active immediately if the <b>2CP</b> is programmed to <b>0</b> , otherwise, will become active after the first regeneration or the reset of the appliance using the code <b>220</b> . The hardness value must be expressed in <i>French degrees</i> .
<b>P 0 1 1</b>	<b>ENTER</b>	<b>C h x.x</b>	Programming of the <b>value of capacity of resins exchange</b> ; <b>xx</b> may go from <b>1.4</b> to <b>9.0</b> , and is expressed in terms of gr CaCO <sub>3</sub> /litre resin.

P 0 1 2	ENTER	X X X X	<b>Regeneration time;</b> to change the flashing digit, use the 2/+, press <b>PROGRAM</b> to go from the minutes to the hours.
	PROGRAM	P - X X	<b>Days of interval</b> between two regenerations ( <b>from 1 to 30</b> )
		1 P P X	<b>Active days.</b> If the flag <b>1HP</b> is programmed with the value <b>1</b> , instead of the interval days, the days of the week on which the regeneration is to be carried out are programmed.
P 0 2 0	ENTER	X X X X	Programming of the <b>local time</b> .
	PROGRAM	P - - X	Programming of the <b>day of the week:</b> x may be 1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday, 7=Sunday
P 1 0 0	ENTER	X X X X	Programming of the <b>volume of the resin</b> (in litres) of the column <b>A:</b> may go from <b>1 to 10000</b> ( to have 10000 litres, programme <b>0000</b> )
	PROGRAM	H H X X	Programming of the <b>percentage of reserve</b> of the column <b>A;</b> the value of the reserve may go from 10% to 80% of the total volume.
	PROGRAM	A A 0 5	Tolerance on the capacity of the cylinder. The value <b>00</b> is recommended.
P 1 0 1	ENTER	X X X X	Programming of the <b>volume of the resin</b> (in litres) of the column <b>B:</b> may go from <b>1 to 10000</b> ( to have 10000 litres, programme <b>0000</b> )
	PROGRAM	H H X X	Programming of the <b>percentage of reserve</b> of the column <b>B;</b> the value of the reserve may go from 10% to 80% of the total volume.
	PROGRAM	A A 0 5	Tolerance on the capacity of the cylinder. The value <b>00</b> is recommended.
P 1 0 2	ENTER	X X X X	Programming of the <b>volume of the resin</b> (in litres) of the column <b>C:</b> may go from <b>1 to 10000</b> ( to have 10000 litres, programme <b>0000</b> )
	PROGRAM	H H X X	Programming of the <b>percentage of reserve</b> of the column <b>C;</b> the value of the reserve may go from 10% to 80% of the total volume.
	PROGRAM	A A 0 5	Tolerance on the capacity of the cylinder. The value <b>00</b> is recommended
P 1 1 0	ENTER	X X X X	Programming of the <b>ratio impulses/litre</b> (prescaler) of the counter. If the flag <b>0CP</b> is at <b>0</b> , the divider is free and the value may go from <b>0 to 899</b> impulses / litre. If <b>0CP</b> is at <b>1</b> the divider is pre-programmed; see par 6.6 for the list of the available options.
P 1 1 1	ENTER	1 C X X	Programming of the <b>stop times</b> , in minutes, of the <b>regeneration cycle</b> of the column <b>B;</b> xx varies from <b>1 to 99</b> minutes
	PROGRAM	* C X X	* stands for the phases 2, 3 and 4 of the regeneration cycle of the column <b>B</b>
P 1 1 2	ENTER	1 C X X	Programming of the <b>stop times</b> , in minutes, of the <b>regeneration cycle</b> of the columns <b>A</b> and <b>C;</b> xx varies from <b>1 to 99</b> minutes
	PROGRAM	* C X X	* stands for the phases 2, 3 e 4 of the regeneration cycle of the columns <b>A</b> e <b>C.</b>
P 2 0 0	ENTER	X X X X	Programming of the <b>value of division</b> (prescaler) of the <b>dosage pump;</b> this value is decreased by all the counters; the duration of the impulse is fixed at <b>1 second</b>
P 2 1 0	ENTER		Transfers the parameters programmed for the column <b>A</b> to the columns <b>B</b> and <b>C.</b>
P 2 1 1	ENTER		Calculates the volume and the reserve
P 2 1 2	ENTER		<b>Activates the counters</b> of the active columns and the values of the treatable volume to the work memory visible on the display.
P 2 2 0	ENTER		<b>Initialisation of the system.</b> Function to be used always when carrying out modifications in the in the operative modality or in the programming of the parameters.
P 2 2 1	ENTER		Causes the <b>forced regeneration</b> of the column visualised on the display. Through the flag <b>1dP</b> , this function is available directly on the keypad. The key <b>1</b> starts up the regeneration and the key <b>0</b> stops it. The key <b>1</b> , pressed during the stop phase, wipes off the residual time and allows the next phase to be passed to.

P 2 2 2	ENTER		During the stop phase of the regeneration, <b>causes the residual time to be wiped off</b> and thus allows the next phase to be passed to. When the flag <b>1dP</b> is at <b>1</b> , this same function is available on the key <b>1</b>
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#### 6.4 – Characteristics of the cam with stand-by.

In the descriptions of the functioning of the different operative modalities, a particular position of the cam of the distributors called “stand-by” position was mentioned. This position is at 205”, that is 307° of rotation from the fundamental position of stroke end, and corresponds with the stop position of the sixth phase of the regeneration cycle.

In the modality “three alternated single columns, PPP1” and “two alternated single columns, PPP2”, as soon as the system is started up with the code 220, the controller puts into rotation the column which must go into stand-by (column C in the first case and column B in the second). The columns which must go into service are positioned on the stroke end. When one column in service finishes the volume, the column in stand-by is put into rotation in order to reach the position of stroke end, after which the column which has run out starts the regeneration cycle. At the end, it will be left in the stop position of the sixth phase, that is in the stand-by position.

This description is not valid for the other operative modalities, since these have the regenerated column going back into service immediately, that is in the position of stroke end. Further exceptions are the modality “one duplex column, PPP4” and “two duplex columns in parallel, PPP6” in which the cycle is composed of 4 phases with 25” of rotation.

The regeneration cycle with stand-by is composed of 6 phases with rotation times of 34”.

The phases are the following:

Phase 1, Backcurrent rinse

Phase 2, Suction

Phase 3, Slow rinse

Phase 4, Slow rinse

Phase 5, Fast rinse

Phase 6, Stand-by

It is clear immediately that the phases 3 and 4 are both dedicated to the slow rinse. In the programming of the cycle, the total time of the rinse must be divided between the two phases, or all programmed in one of the two **wiping off** the stop time of the other phase. Supposing 30 minutes is to be programmed, then 3C15 and 4C15, or 3C05 and 4C25, or 3C00 and 4C30, or 3C20 and 4C10 may all be set with the same result.

#### 6.5 – Programming of the reserve

**Aqua Cubic Triplex** allows for the volume of treatable water to be controlled, putting it into ratio with a possible **reserve** value. This is programmed via the codes **100, 101 and 102** respectively for columns **A, B and C**, and expresses the **percentage of the total volume available** which must be held in reserve. Thus, if there are 10000 treatable litres available and if 70% reserve is required, the value **HH70** in the codes above must be programmed and the code **211** keyed in to have the calculations of the volume carried out.

If **Aqua Cubic Triplex** is programmed as «**one single column**», the control on the reserve will be automatically activated when the flag **OHP** is programmed to **1** (start of the regeneration deferred to the programmed time) and cannot be deactivated. When the volume reaches the value of the reserve, the regeneration will start at the programmed time.

If **Aqua Cubic Triplex** is programmed as «**three single columns** », the control of the reserve will be automatically activated whichever is the programming of the flags, and cannot be deactivated. When both columns in service have their volume value lower than the reserve value, the regeneration will start for the column with the lower volume of the two. If only one column reaches the value of the reserve, the control is not effective.

When the control on the reserve is not desired and cannot be deactivated, the effects may be minimised by programming the minimum value, that is 10%, of the total volume.  
In the other modalities, the control on the reserve is not available.

## 6.6 – Remote Start

**Aqua Cubic Triplex** makes a «remote start» entry available which allows for the regeneration to be started up by an **external automatism** or manually via a button positioned at some distance from the controller. Whichever device is used, this must be of the *normally open* type, and to start up the regeneration, must be closed for at least 15 seconds.

The remote start is available only when only one distributor is active, therefore in the modality **PPP0**, one single column and **PPP4**, one duplex column.

In the first case, the start of the regeneration may be immediate or deferred to the programmed time, depending on the programming of the flags **0HP** and **2HP** as described in par. 6.2.1.a.

In the second case, the remote start is automatically enabled for immediate start. It is not programmable in any way.

## 6.7 – Programming of the litre counter divider (prescaler)

The programming of the litre counter divider (**prescaler**) defines the ratio between the number of *impulses* read by **Aqua Cubic Triplex** and *the unit of load* in transit in the counter used ( litres or m<sup>3</sup> ).

**Aqua Cubic Triplex** has two work modes:

- **free prescaler** if the flag **0CP** is equal to **0**; in this case the prescaler may be programmed within the range of values 1 ÷ 899 (n° of impulses given by the litre counter before the volume climbs by one unit);
- **pre-programmed prescaler** if the flag **0CP** is equal to **1**, in this case the prescalers which can be used are those indicated in the first column of table 30;

**Tab. 30 – Table of the pre-programmed litre counter dividers and range of flow admissible**

Prescaler impulses/litre	Minimum load of the flow (lit/min)	Maximum load of the flow (lit/min)
14/01	0.2	40
4/1	1	150
1/1	3	600
4/10	7.5	1500
2/10	15	3000
1/10	30	6000
4/100	75	9999
2/100	150	9999
1/100	300	9999
4/1000	750	9999
2/1000	1500	9999
1/1000	3000	9999

The volume calculated by **Aqua Cubic Triplex** can go from 0 to 999,999 litres. This value is optimised in order to be able to be visualised by the display of the controller which can show only four digits.

A decimal point will appear on the display to separate the cubic metres from the litres, that is the thousands of litres from the hundreds.

The value of the volume will be visualised from the left to the right, so that a volume value of 15,500 litres will be visualised as **15.50**, a value of 350,000 litres will appear as **350.0**. During the service, the normal consumption of water will cause the volume visualised to decrease; when the most significant digit becomes zero, **Aqua Cubic Triplex** will optimise the visualisation moving the reference point towards the left, which allows new, less significant digits to be

seen. Thus, the moment the volume passes from 10,000 to 9,999 litres, the visualisation will pass from **10.00** to **9.999**, if the volume passes from 100,000 to 99,900 litres, the visualisation passes from **100.0** to **99.90**.

If using a pre-programmed prescaler, the volume calculated is optimised by rounding it off.

**Example:**

If the volume calculated is 15,435 litres and the prescaler is programmed with the type 1/10, the volume will be optimised to the value 15,430; if the prescaler chosen is the type 4/1000, the volume will become 15,000 litres and will be visualised as such on the display.

## 6.8 – Calculation of the capacity of a system

**Aqua Cubic Triplex** is able to calculate autonomously the volume of water that the system is capable of treating. The calculation is carried out using the parameters shown below.

The calculation is carried out automatically after the programming of the hardness, otherwise it can be carried out by using the code **211**.

Consult par. 6.13 for the immediate availability or otherwise of the result of the calculation.

$$\text{Treatable litres} = \frac{1000 \times A \times B}{C}$$

Where :

A = **Volume of resin in litres**

B = **Capacity of ionic exchange of the resin, on average 5 (gr of CaCO<sub>3</sub> / litre of resin)**

C = **Hardness of the water in French degrees [° F]**

## 6.9 – Putting into service

### IMPORTANT

Always remember to key in the code **220** (ref. par. 6.3) after the various phases of programming before **Aqua Cubic Triplex** has been put into service.

Always remember that before carrying out operations on the keypad of **Aqua Cubic Triplex**, it must be checked that the cams of the distributors are on the position of **stroke end** ( except when they are in regeneration, a condition which may be verified via the led **Regen**), and that any unused limit switch entries are **closed with a connector bridge**.

During the normal functioning of **Aqua Cubic Triplex**, the leds **A**, **B** or **C** will be on to indicate which column is in visualised on the display, while the leds **A Service**, **B Service** or **C Service** will indicate which columns are in service. At the same time as these, the signals **A Service** on the pins 43-44, and/or **B Service** on the pins 45-46, and/or **C Service** on the pins 47-48 of the terminal board, will be active.

## 6.10 – Connections

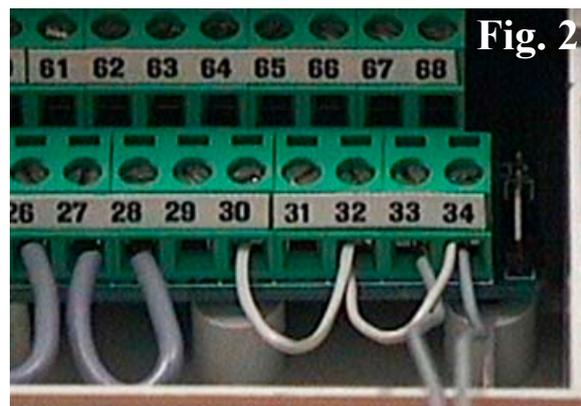
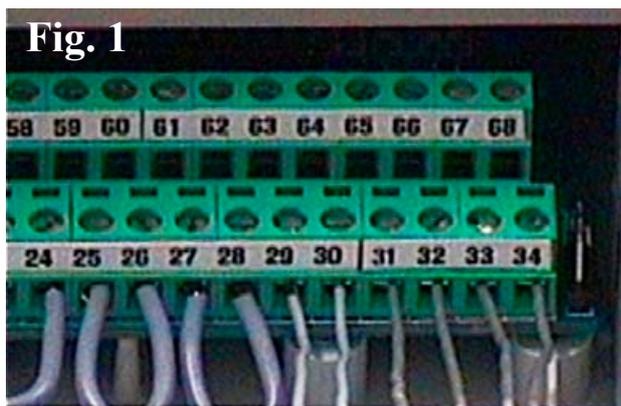
The drawing shown on the attached page **A** shows the general connections of the controller, also available on a sticker positioned under the cover giving access to the terminal board.

The drawing shown on the attached pages **B**, shows the connections between the controller and three single distributors. If one single distributor is required, the attached page to refer to must be **B**, the distributor to connect is **A-dist**, and care must be taken to close the terminals **23-24** and **25-26** with a connecting bridge.

With reference to attached page **B**, the cable cod. **96-M** is not polarised and may be assembled in any way. The cable cod. **96-S**, on the other hand, is polarised. If after assembling, positioning the distributor at the stroke end, the LED **Service** on the distributor does not come on, the connections of cable cod. **96-S** must be inverted.

**Aqua Cubic Triplex** allows for the use of the Reed type counters, which supply their signal on a pair of wires. These wires must be connected to the terminals 33 e 34 for the column A, to the terminals 31 and 32 for the column B and to the terminals 29 and 30 for the column C, as shown in fig. 1. If the use of **a single counter for all of the columns** is required, simply connect the counter to the column A and connect with a connecting bridge the terminals 30 and 32 with the terminal 34 as shown in fig. 2.

**The connections of this type of counter are not polarised. They may be assembled in any way.**



### 6.11 – Management of the dimensions of the tanks

**Aqua Cubic Triplex** allows for plants with a maximum of three columns to be realised, that is with the use of as many as three distributors, each connected to a SIATA valve, and therefore to a tank containing the resins. There are two aspects which must be taken into account for the programming of the columns; the first is the regeneration cycle, the second is the capacity dimensions.

The installer may choose whether to carry out the regeneration cycle of the columns with the same times or with different times via the flag **1CP**.

When it is programmed with the value **0**, the columns regenerate with the same times, those programmed for the column **A** with the code **112**. If, on the other hand, it is programmed with the value **1**, the column **B** is regenerated with the times programmed with the code **111**. The column **C**, if present, is always regenerated with the same times as those of the column **A**.

The programming of the capacity dimensions of the tanks is limited by the flag **1CP**. The operator may carry it out in a single solution, if they are the same, or separately if they have different capacities.

In the first case, the programming of the parameters of the column **A** with the code **100** is proceeded to, to then copy the parameters of the column **A** to the columns **B** and **C** by simply keying in the code **210**.

In the second case, the codes **100**, **101** e **102**, respectively for the columns **A**, **B** and **C** must be programmed, depending on which is needed, The columns thus programmed will enter into service depending on the operative modality selected, and will go into regeneration according to the conditions provided.

The operative modality “two duplex columns in parallel, PPP6” requires a more in-depth description

In this case the controller is connected to two distributors, which in turn are connected to two valves each. The dimensional programming carried out with the codes **100** and **101** must be understood as referring to the distributors. This means that the tanks connected to that distributor **must be the same** as each other and must conform to the inputted programming. In the same way, also the tanks connected to the other distributor must be the same as each other.

Is point it is possible to have 4 tanks the same as each other, programmed according to the instructions in tab. 22, par. 6.2.5.c, or 2 tanks connected to column A, the same as each other and 2 tanks connected to column B the same as each other and different from those of column A, programmed according to the instructions in tab. 23, par. 6.2.5.c.

#### **6.12 – The brine level sensors, flag 3HP**

**Aqua Cubic Triplex** makes two entries to the pins 11 – 12 and 13 – 14 of the terminal board available for the connection of two levels sensors for the brine tank. The first is the high level floater, the second is the low level floater. The high level floater must be of the normally closed type, that is the entry of the controller must be closed when there is brine present. The low level floater must be of the normally open type, that is the entry of the controller must be open when there is brine present.

The control of the sensor may be activated in all the operative modalities by simply programming the flag **3HP** with the value **1**.

During the stop time of the second phase of the regeneration cycle, the aspiration phase, the controller checks the state of the low level entry. If it is found to be closed, that is if there is no brine, the residual time of the phase will be cancelled and the regeneration will proceed to the next phase. Obviously, if the brine has already run out when the aspiration phase begins, this phase is stopped immediately and the cycle residual proceeds without having been able to regenerate the resins. If, however, this condition arises at any other point of the phase, the time is cancelled anyway and the cycle will carry on with the new brine.

Similarly, during the stop time of the fifth phase, the fast rinse during which the filling of the brine tank is proceeded to, the controller checks the state of the high level entry. If it is found to be closed, that is if the brine tank is full, the residual time of the phase is cancelled and the regeneration proceeds with the next phase.

#### **6.13 – Modifying the programming during service, the flag 2CP**

As already explained in par. 6.8, **Aqua Cubic Triplex** calculates the volume of water which can be treated using the values of hardness of the water, the capacity of ionic exchange of the resins and the quantity of resin used. The calculation is carried out automatically at the end of the programming of the hardness (code **010**), or otherwise may also be carried out keying in the code **211**.

When these calculations are carried out at the time of the installation, the value of volume calculated must become operative immediately, so as to be able to start up the system.

When, however, the value of hardness is modified during the service, the fact of having the new value of volume operative immediately can become extremely dangerous, in that it cancels the value of residual volume treatable by the system; the consequence is that the column runs out and the regeneration does not start because the controller thinks it has a column which is still working efficiently.

The solution is the use of the flag **2CP**, which tells the controller when to make the value of volume calculated operative.

If it is programmed with the value **0**, the modifications to the programming are immediately operative.

When it is programmed with the value **1** the modifications are operative only after the next regeneration.

It can be a good rule to programme the flag **2CP** with the value **1** at the end of the installation, so that any modifications to the parameters during the service of **Aqua Cubic Triplex** do not upset the possibility of the system to operate.

## 6.14 – The inhibit signal.

**Aqua Cubic Triplex** makes the pins 9 – 10 of the terminal board available for the connection of devices which are able to detect alarm situations, which once detected should stop the regeneration from being started. The level sensor described in par. 6.12 may be an example of this device.

Whichever parameter is controlled ( pressure, level etc.), the device connected to the terminal board must supply a closure signal, and must be of the normally open type, that is the exit wires must be open when there is no alarm situation.

The signal generated by the controller on the basis of the state of the entry to the pins 9 – 10 is called **inhibit** and is active in all the operative modalities except for the modality “ three alternated single columns, PPP1”.

When there are the conditions for the start of the cycle and the inhibit signal is active, the regeneration does not start. If the start of the cycle had been activated by the running out of the volume, when the inhibit signal stops, the regeneration will start. If, however, it had been activated by the programmed time having been reached, (in the modality “one single column, PPP0”), the controller modifies its working as follows: if the inhibit signal stops when the local time is still the same as the programmed time, the cycle will start; if the inhibit signal stops when the local time has passed the programmed time, the cycle will start only when the local time is once again the same as the programmed time.

## 7 – What to do if ...

Some basic operations for the resolution of small problems which may arise during the use of **Aqua Cubic Triplex** are described below.

If the suggestions shown do not help to resolve the situation, please call the SIATA service assistance.

### 7.1 - ... Aqua Cubic Triplex does not come on ?

1. Check that the plug is correctly inserted in the electricity socket;
2. Check that the socket is correctly supplied;
3. Check that the adapter used does actually supply 24 Vac, code AC-PLUS 1/05, check that the transformer used does actually supply 24 Vac;
4. Check that the current conductors are correctly inserted into the terminals and that these are closed correctly.
5. Check that the fuse positioned on the panel has not blown. This fuse must be of delayed 1.6A.

### 7.2 - ... the motors of the distributors do not stop ?

1. Check that the run end wires of the distributors, marked 96-S, are correctly inserted in the terminals and that these are closed correctly;

### 7.3 - ... there is no current to the utilisers?

1. Remember that **Aqua Cubic Multiplex does not supply current to the exits**, but only closures that the operator must wire at his own discretion, check that the wiring is correct, that the conductors are correctly inserted into the terminals and that these are closed correctly;

### 7.4 - ... Aqua Cubic Triplex works in an irregular way?

1. Check that the distributors are at the stroke end, that is that the motors are not in movement;
2. If using **Aqua Cubic Triplex** with a single distributor, check that the limit switch entry not used **is closed with a connector bridge**

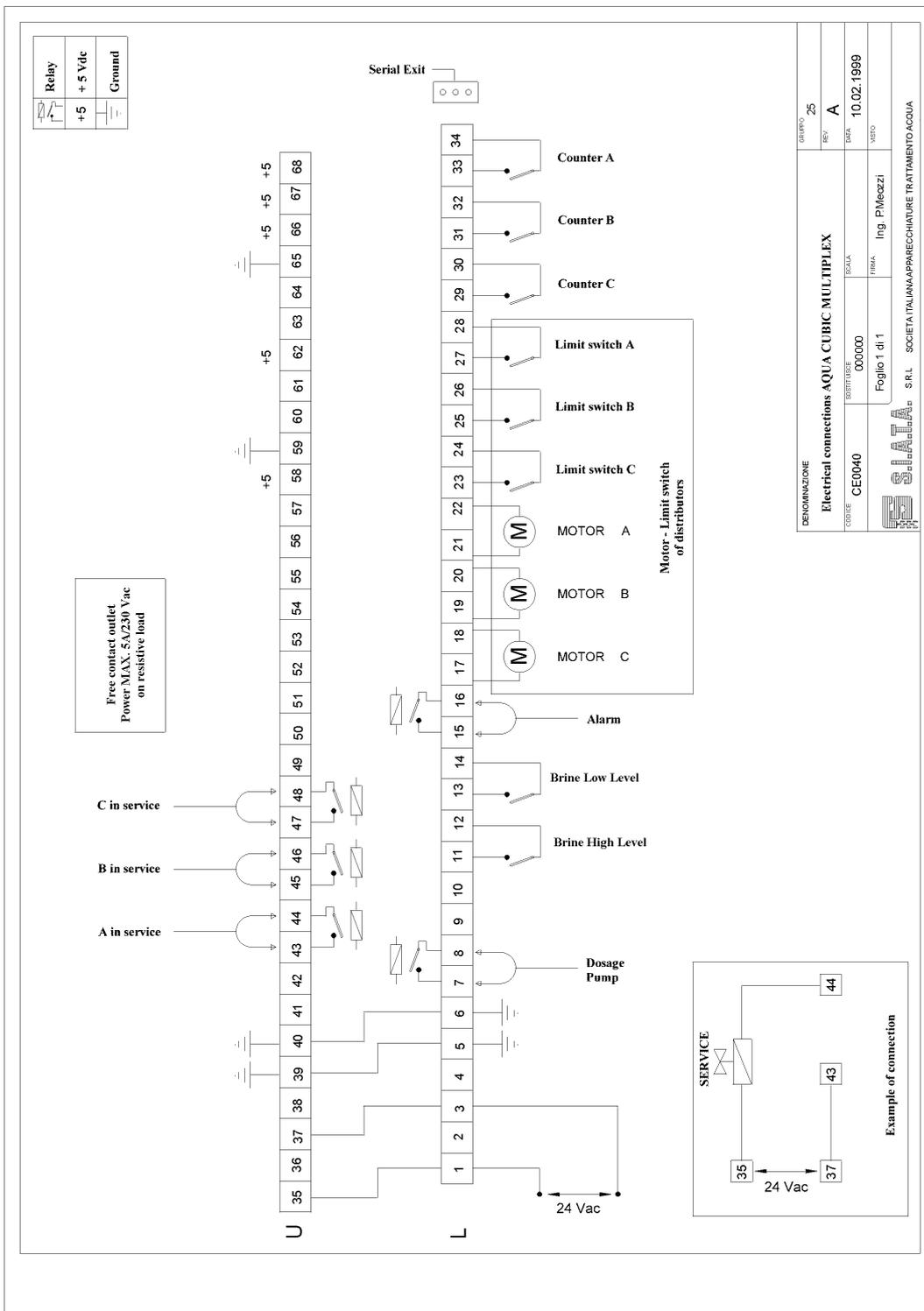
## 7.5 – ... one column is not working ?

The potential of **Aqua Cubic Triplex** allows for various functional hypotheses to resolve critical situations caused by problems in the plant or the controller and which, for one reason or another, cannot be repaired quickly. Obviously, the so-called “blocking” breakdowns remain outside of these hypotheses; these include, for example, the breaking of the general entry water tube, or the breakdown of the controller which causes it stop.

Some hypotheses:

- **The controller is programmed in the modality “one single column, PPP0”.**
- If the problem is hydraulic, the only solution is for the appliance to be repaired.
- If the problem is electrical, it is possible to programmed the controller in the modality “two single columns in parallel, PPPA”, moving all the connections on the controller of the column A to the column B. When the working column runs out of the volume, the controller carries out the regeneration, at the end of which it automatically returns into service.
- **The controller is programmed in the modality “three alternated single columns, PPP1”.**
- Whatever the problem is, as long as it is limited to only one column, the controller the controller will exclude the broken column of its own accord. In fact, this, not consuming water, will not decrease its own volume and will not go into regeneration. The other two columns will alternate in service. It is obviously essential that the operator close the hydraulic circuit of the broken column.
- **The controller is programmed in the modality “two alternated single columns, PPP2”.**
- Whatever the problem is, it is possible to programme the controller in the modality “two single columns in parallel, PPPA”, closing the hydraulic circuit of the broken column. The working column will continue to work individually. Obviously, during the regeneration, the user will be without water.
- **The controller is programmed in the modality “one duplex column, PPP4”.**
- In the case of the duplex column, whatever the problem is, the only intervention possible is repair.
- **The controller is programmed in the modality “two single columns in parallel, PPPA”.**
- Whatever the problem is, the controller will exclude the broken column of its own accord. In fact, this, not consuming water, will not decrease its own volume and will not go into regeneration. The other column will continue to work individually. Obviously, during the regeneration the user will be without water.

## Appendix A



### Appendix B

