PARTS, SYSTEMS AND AUTOMATIONS FOR FLUID DISPENSING

USE AND MAINTENANCE MANUAL

MANUAL METERING SYSTEM DA – 1000V

COD.: **DTVI_DA1000V_2434**
REV.: **00**
DATE: **22/08/2024**

TRANSLATED FROM ORIGINAL
Read carefully before use!

EN

Summary

1 GENERAL INFORMATION

This manual contains information regarding the installation, use, maintenance and end of life of the component and provides indications for the most suitable behavior for correct operation. This manual has been designed to be simple and as straightforward as possible, with a subdivision into chapters and sub-chapters that allows you to find any information you need quickly. In addition, the manual begins by giving a general description of the contents, then an overview of the component, to arrive at aspects of safety, transport, installation and use and finally to the end of life. If you have any doubts about the interpretation or reading of this document, please contact the manufacturer.

DAV Tech declines any responsibility relating to improper use of the component. Observe the specifications in this manual.

Read this manual before handling the component or performing any action on it.

The manual is an essential safety requirement and must accompany the component throughout its life cycle.

It is the task of the end user to optimize the functionality of the component, always considering the purpose for which it was built.

You are asked to keep this manual, together with the attached documentation, in good condition, legible and complete. In addition, it must be stored in the vicinity of the component or, in any case, in a place accessible and known to all personnel who use the component itself or who must perform maintenance or inspection interventions. If the manual deteriorates or is no longer complete, a copy must be requested from the manufacturer, indicating the code of the manual and the revision.

The manual is intended for personnel who use the component (operators), who perform maintenance on it (maintenance technicians), and for personnel who must perform checks or inspections. The manufacturer is not liable for damage to the component caused by personnel who have not followed the instructions in the manual.

If you have any doubts about the correct interpretation of the information contained in this manual, please contact the manufacturer.

GUARANTEE

During the design phase, a careful choice of materials and components to be used in the project was made and they were subjected to regular testing before delivery. All elements have been designed and manufactured with an adequate degree of safety, such as to be able to withstand stresses greater than those of normal use.

The warranty is valid for a period of 12 months from the date of commissioning and in any case no longer than 15 months from the date of delivery. Work carried out during the warranty period does not extend the warranty period in any way.

The manufacturer is not liable for defects due to normal wear and tear of parts which, by their nature, decay.

1.1 Symbology

Below are the symbols that are used to give a greater impact to the importance of the concept you want to give.

ATTENTION!
Refers to a warning that could lead to minor damage (minor injuries, damage to the component requiring maintenance work).

DANGER!
It refers to a major event that could cause major damage (death, permanent injury, irreversible breakage of the component).

NOTE. Indicate relevant information or insight.

OBLIGATION. It indicates a task that must be performed, related to both the component and the manual.

REFERENCE. Links to an external document that is important to view

In addition, the list of symbols is integrated with that of the personnel responsible for using the component and its function, together with other symbols used within the manual.

Operator
A (qualified) person capable of operating the component, adjusting, cleaning, starting or resetting the component. The operator is not authorized to perform maintenance.

Mechanical maintenance technician
Qualified technician able to carry out mechanical, adjustment, maintenance and routine repair work described in this manual. He is not authorized to carry out interventions on electrical systems in the presence of voltage.

Electrical maintenance technician
Qualified technician able to carry out electrical, adjustment, maintenance and routine repair work described in this manual. It can work in the presence of voltage on electrical cabinets and junction boxes. He is not authorized to carry out interventions on the mechanical side.

Manufacturer's technician
Qualified technician made available by the manufacturer to carry out operations of a complex nature in particular situations, or in any case as agreed with the customer.

1.2 Reference standards

The reference standards and directives of this manual are the following:

Directives

- 2006/42/EC – Machinery Directive;

1.3 Declaration of incorporation (Annex II B DIR. 2006/42/EC)

Manufacturer's name: **DAV Tech Srl**
Address: Via G. Ravizza, 30, .36075, Montecchio Maggiore (VI)

DECLARES THAT THE ALMOST MACHINE

Component:	DA-1000V
Model:	Electric actuator controlled by a special controller
ID:	
Year:	2024
Intended use:	Manual fluid dispensing managed by external controller

COMPLIES WITH THE INCORPORATION PROVISIONS OF DIRECTIVE 2006/42/EC

The technical documentation has been drawn up in accordance with Annex VII B, as required by the following:

- Machinery Directive 2006/42/EC of the European Parliament and Council of 17 May 2006

IT ALSO DECLARES THAT:

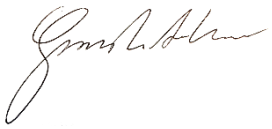
- Undertakings are undertaken to provide, in response to a properly substantiated request from the national authorities, relevant information on this partly completed machine;
- The technical file was prepared by Andrea Grazioli, via Ravizza, 30, Montecchio Maggiore (VI), IT.

This quasi-machine cannot be used until the machinery on which it will be used is declared compliant with regulation 2006/42/EC.

Montecchio Maggiore, 22 August 2024

The legal representative

Andrea Grazioli



1.4 Glossary

The following are the most used terms within this manual with their meanings.

TERM	DEFINITION
Enable	Term that defines the act of preparing (enabling) an action. The action will be triggered as soon as the criteria are met, which consequently leads to the activation of the enabled action.
Active	The action that is performed instantaneously when the control is activated.
Human controls	This defines those commands that, used for manual operations, must be kept activated for the action to be performed. When the command is released, the action stops.
Two-hand controls	Human-controlled controls that require two manual controls to be operated simultaneously to perform an action.
P.P.E.	Personal protective equipment. They include all the items necessary to ensure the protection of personnel from possible accidental damage (safety shoes, gloves, helmet, and more).
Display	It is used to display information. It can be in any shape and size, even touch screen.
Manufacturer	Natural or legal person who designed and manufactured the component covered by this manual.
HP	High Pressure. An acronym that indicates high pressure.
Icon	A small image that represents a command, a function or even a document or an operating program, which appears on a computer screen. When selected by the user, it initiates the function or program it symbolizes.
Joystick	Lever manipulator used in control panels.
N.A.	Not Applicable, i.e. it indicates that it is a field that does not apply to this manual and that it cannot be integrated into the component.
Operator panel	A control station where the machine control instruments are located
P.I.	Possible Implementation, i.e. it is currently absent from the component described in this manual, but it is possible to make an addition and implement it.
Screen	Interface system between man and component. Screenshots are the images displayed on the operator panel that allow the user to receive and provide information to the management software.
Push-button panel	Composition of buttons and selectors that allow you to act directly on the behavior of the component.
Keyboard	Keyboard only (stand-alone element) or in addition to a display (keys only, no selectors or other)
Touch screen	Touch screen that allows the user to interact with a graphic interface using their fingers or objects.

1.5 Service and manufacturer contact details

For any reason relating to the use, maintenance or request of spare parts, the customer must contact the manufacturer (or the service center if present) directly, specifying the identification data of the component.

The customer can make use of the technical and commercial support of local agents or importers, who are in direct contact with the company DAV Tech Srl.

Company name	**DAV Tech Srl**
Postal address	Via Ravizza, 30, 37065, Montecchio Maggiore (VI) – (IT)
Telephone	+39 0444 574510
Fax	+39 0444 574324
email	davtech@davtech.it
Website	www.davtech.it

2 PRESENTATION AND OPERATION

In this manual we want to deepen the operation of the "DA 1000 V" component (also called "nanopen") and its controller. It was decided to make a single manual in this case because the nanopen alone has too simplified an operation to make a separate manual. In this case it is a manual electric actuator with volumetric dosing, which performs the dosing when the control arrives from the control unit or from other manual methods (such as footpeg or button).

In other words, the function of this component is:

DISPENSING OF VARIOUS TYPES OF FLUID

Intended use is the use described in the chapter below, while improper use is considered any other use that is not described in this manual, with products of different material and format from those for which it was built.

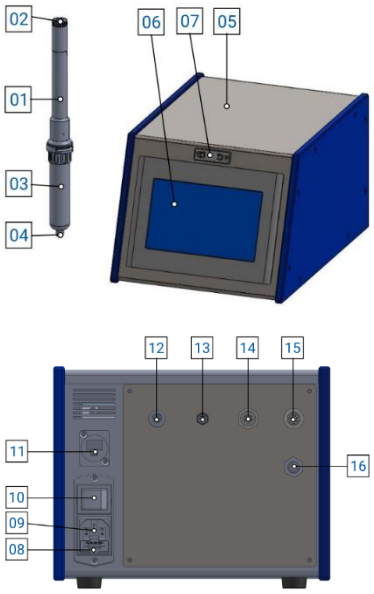


Figure 01 – Detail DA-1000V

No.	DESCRIPTION
01	NanoPen DA-1000V
02	Nanopen electrical connection
03	Syringe
04	Fluid output
05	Controller DA-1000V
06	Controller control screen
07	Display pen slot
08	Power fuse housing
09	Power connector
10	Power switch
11	Ethernet connector
12	ON/OFF actuator connector (M5 3-pole F)
13	Control connector (M8 4-pole F)
14	OUT connector (M12 8-pin F)
15	IN connector (M12 8-pin M)
16	Nanopen connector

Before using a certain type of fluid, it is necessary to check that:

- The viscosity of the fluid is compatible with the characteristics of the actuator;
- The characteristics of the fluid meet the desired requirements;
- The technical data sheet of the fluid provided by the manufacturer contains all the information regarding the product such as viscosity, applications, drying times and storage;
- The fluid storage time has not been exceeded;
- The fluid packages are tightly sealed.

SPECIAL VERSIONS

There are no special versions of this component at the time of writing this manual. However, it should be noted that this component can have syringes in sizes 3cc, 5cc, 10cc, and 30cc.

OPERATION

This system has two modes of operation:

- Stand alone, in which only the DA-1000V is used without connecting it to other external elements;
- Connected to other external control elements.

In both cases, the operation of this system is similar, i.e. the controller has specific screens for controlling the electric actuator, from which you can control the working mode, the start and stop of the work, the type of recipe, and all the related settings. From here, it is connected via a special cable to the nanopen, which has an electric motor for the control of the piston that enters the syringe and pushes the product towards the nozzle.

In the case of connection to external control elements, the system can send notifications about dosing cycles and any alarms to the system, placing it in parallel with another system that is already working.

For minimum working pressures, please refer to Chapter 2.2.

Below we want to explain how the nanopen works.

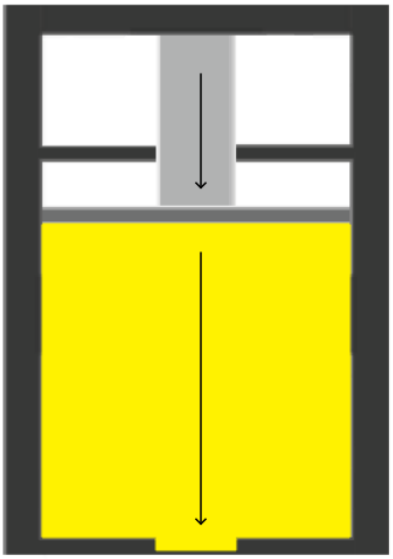


Figure 02 – Dosing phase

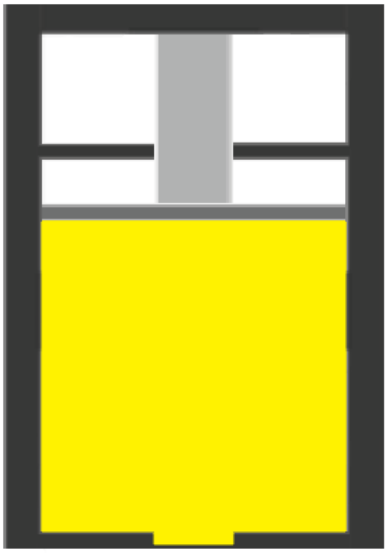


Figure 03 – Resting phase

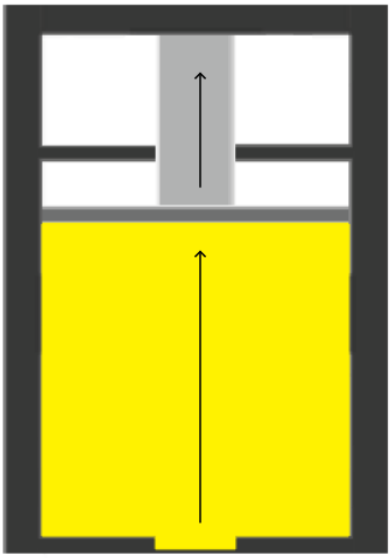
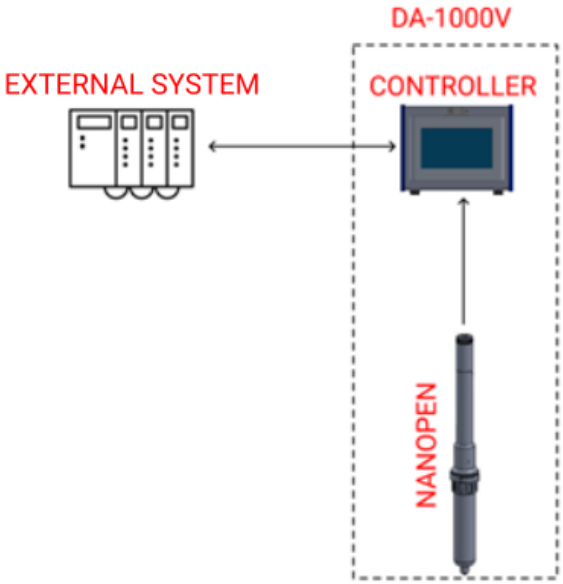


Figure 04 – Recall phase

The fluid, which is located inside the special syringe, is pushed by the piston on the nanopen when the dosing command from the controller arrives. Once the dosing command stops, the piston stops and does not perform any more dosing until the next command. If it is set by the recipe, or by the operator in the case of manual control, the suck back is also performed, i.e. at the end of the dosage the system recalls the piston to ensure that there are no excessive drops of fluid that can affect the dosage itself.



COLOR	MEANING
BLACK	Data
RED	Notes

Figure 05 – Connection example

2.1 Exploded

N.A.

2.2 Technical data

All the technical characteristics concerning the component of this manual are indicated below.

SPECIFICATIONS		
Description	**UdM**	**Values**
GENERAL		
Model	\	DA-1000V
Activation	\	Electric
CONTROLLER		
Single-phase power supply	V	110/230
Power supply fuse voltage	V	250
Input	W	250
Screen type	\	Capacitive
NANOPEN		
Cartridge type	cc	3
		5
		10
		30
Dosing flow rate	mm^3/sec	3cc -> 3.6
		5cc -> 12.7
		10cc -> 25
		30cc -> 138

ENVIRONMENTAL CHARACTERISTICS		
Description	**UdM**	**Values**
Working Ambient Temperature	°C	5 ÷ 45
Storage Ambient Temperature	°C	-20 ÷ 55
Permissible non-condensing humidity	%	5 ÷ 90

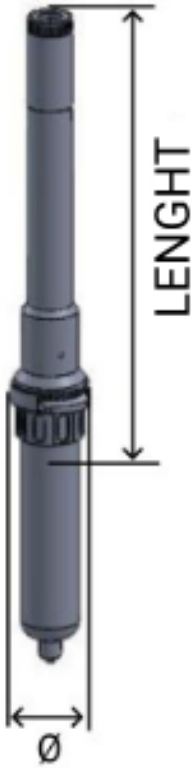
USABLE FLUIDS
Silicones
Oils
Glues
Liquid gaskets
Grease
Resins
Various medium-high viscosity products (contact the manufacturer for more information)

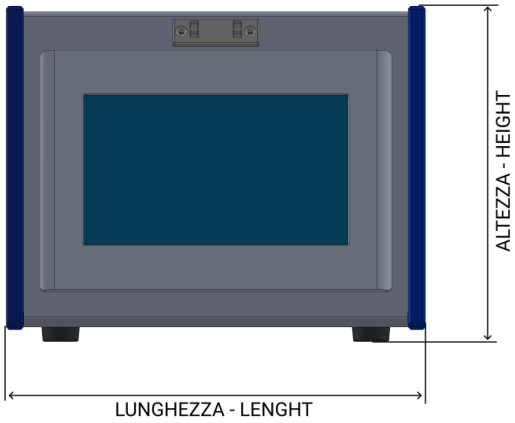
NANOOPEN DIMENSIONAL AND WEIGHT CHARACTERISTICS		
Description	**UdM**	**Value**
Component length (min ÷ max) [1]	mm	180 ÷ 230
Component diameter (min ÷ max)	mm	20 ÷ 30
Component weight	kg	0.13 ÷ 0.23

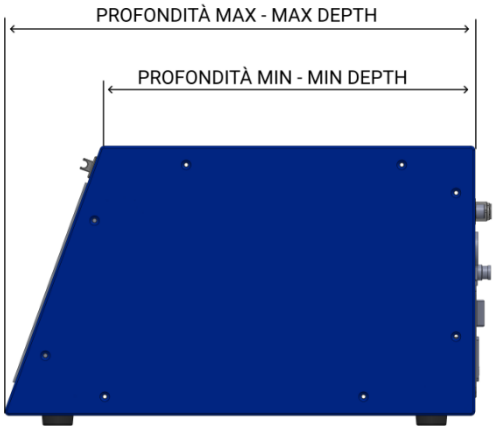
DIMENSIONAL AND WEIGHT CHARACTERISTICS CONTROLLER		
Description	**UdM**	**Value**
Component length (min ÷ max)	mm	243
Component height (min ÷ max)	mm	195
Component depth (min ÷ max)	mm	261 ÷ 324
Component weight	kg	6.6

[1] This size was taken without considering the inserted syringe

Components







You can request the 3D of the component in the desired version from the manufacturer without any obligation.

3 SAFETY

The following is a list of warnings regarding the component covered by this manual. Please read carefully before proceeding to the next chapters.

DANGER!
Before operating the component or performing any action on it, read this manual carefully.

DANGER!
Do not use the component while under the influence of drugs or other substances that may impair attention and reaction ability.

DANGER!
Operators must only perform operations or interventions that are within the competence of the role and qualification assigned.

FIRE/EXPLOSION HAZARD!
This component is not designed to work in an ATEX environment.

ATTENTION!
Modifications to the component must not be made to achieve performance other than that for which it was designed and built, unless authorized by the manufacturer.

The component may only be used by trained and authorized operators and for the sole purpose for which it was designed and manufactured.

The component is manufactured in compliance with the technical safety standards in force at the time of its construction.

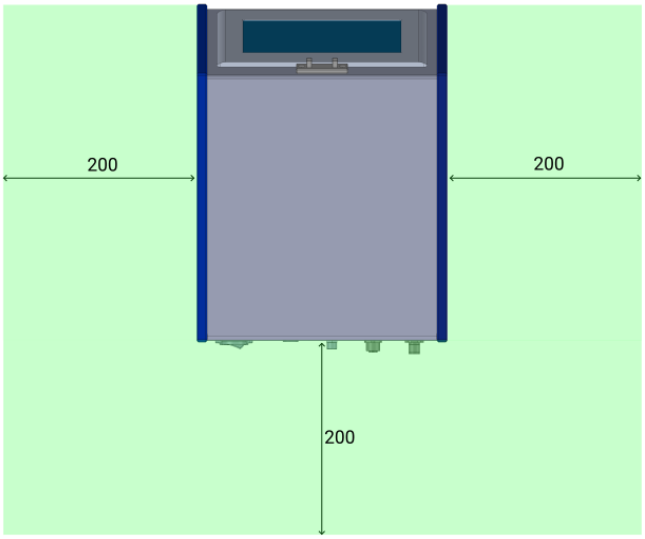
3.1 Machine safety devices

N.A.

3.2 Free useful spaces

These are those spaces that must be respected during the installation of the component and serve to allow the passage of personnel safely, as well as allowing maintenance and cleaning operations to be carried out safely.

For the electrical panel, a free space equal to the size of the open door increased by 60cm is required.



In this image, the areas that are clear of any obstacles have been marked in green.

3.3 Risk areas and residual risk

N.A.

4 TRANSPORT AND HANDLING

Once you have received the goods, you must check that the packaging is intact and that there is an exact correspondence with the material ordered.

ATTENTION!
The original configuration of the component must not be changed. The manufacturer is not liable for damage caused by inappropriate use of the component.

ATTENTION!
If the packaging is not intact, contact the manufacturer immediately, also sending photos of the condition of the packaging. Do not open it until you have notified the manufacturer.

5 INSTALLATION

The installation of the component is carried out by the customer. If necessary, you can contact the manufacturer to have a specialist technician help you.

To be able to place the controller, just place it on a table, as it is equipped with support feet. It is not possible, however, to place it in other positions: it must remain resting on a surface parallel to the ground.

The actuator, on the other hand, is set up for support, which must also be placed on a plane parallel to the ground.

It is recommended that you perform a component check before beginning the installation. If it is evidently damaged, please contact the manufacturer.

ATTENTION!
Please remove the packaging with the utmost care. If damage is caused to the component, the manufacturer is not liable.

Dispose of the packaging correctly, considering the different nature of the components and following the regulations in force in the country.

5.1 Positioning

N.A.

5.2 Connections

In this chapter, we want to explain the connection method that must be used for the component. The following types of connection are provided:

- Electrical connection;

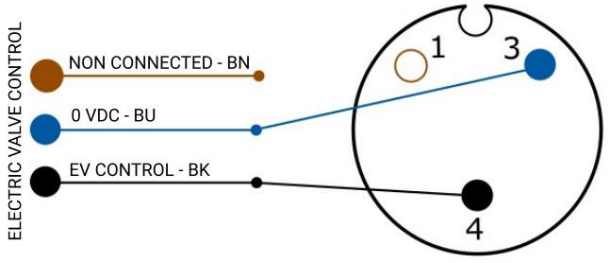
5.2.1 Electric

Authorized personnel		**PPE to wear**	    
Machine status	PLC installed, with outgoing communication cable		
Power Values	See chapter 2.2		
Necessary preparations	N.A.		
Materials needed	N.A.		
Equipment needed	N.A.		

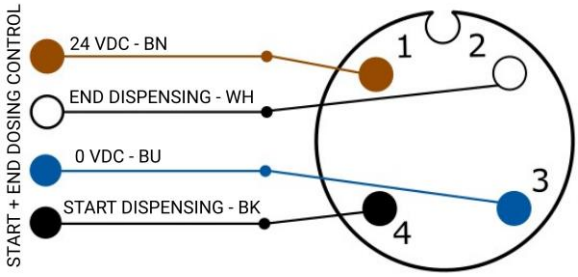
The electricity connection is at the expense of the customer.

ATTENTION!
The power supplies on the connectors are used to power transducers and sensors connected to the controller inputs. In the event that you need to interface the controller with an external system that has its own power supply, please only share the negative pole (GND). The positive pole must not be lumped together, otherwise the power supplies of the two systems are in parallel.

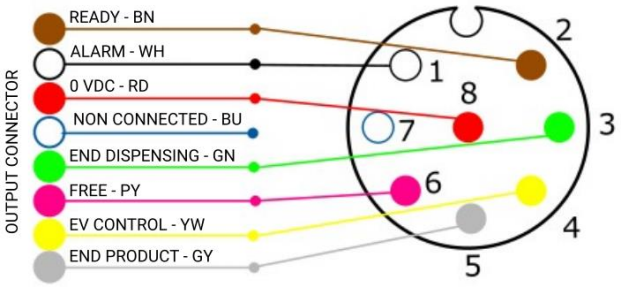
To make the electrical connection, the electrical cable (which must comply with the specifications given in chapter 2.2) must be connected to the appropriate connectors, which must be connected to the controller in the direction of connection. Here's an outline of what connector pins do:



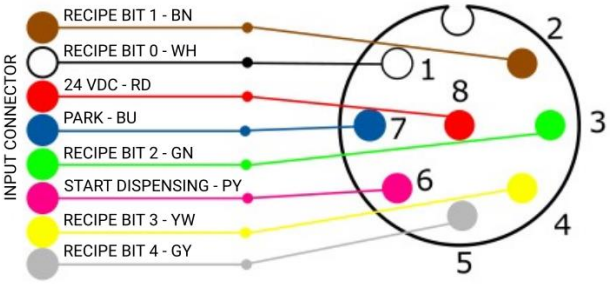
Connector No. 12 Chapter 2 Figure 01 (1)



Connector No. 13 chapter 2 Figure 01 (2)

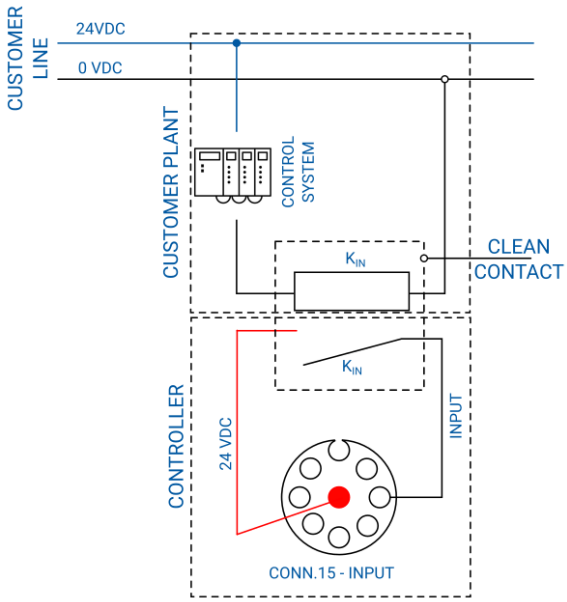


Connector No. 14 chapter 2 Figure 01 (3)

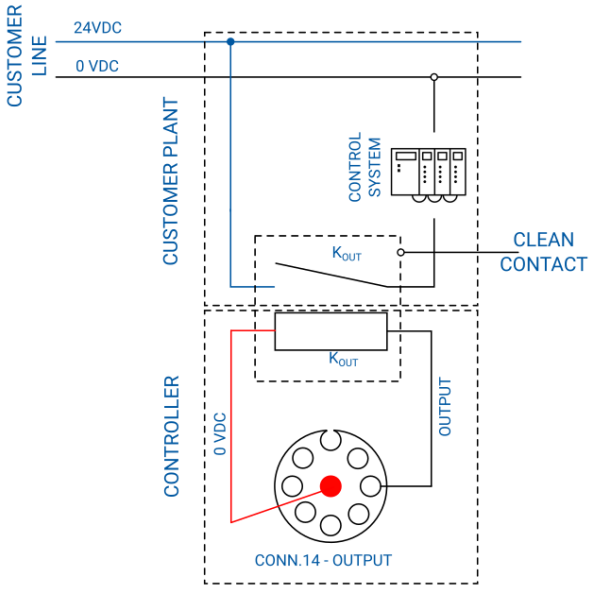


Connector No. 15 chapter 2 Figure 01 (4)

(1) It is used as an alternative, since the same signal is obtained with the "OUT" connector, No. 14. If used, the solenoid valve should not draw more than 10W;
(2) The same signals are given by the No. 15 and No.14 "IN" and "OUT" connectors, it can be used as an alternative;
(3) From here the controller communicates the various dosing states with digital signals. For "EV CONTROL" (YELLOW) there must be 10W of maximum absorption;
(4) From this connector, recipes can be recalled (if "recipes from digital I/O" is selected), a dosing command can be executed, or the controller can be informed that the dispenser is parked.



Connection of inputs with external system



Connection of outputs with external system

ATTENTION!

The figures above show how to connect an input or output signal to an external control system. Particular attention should be paid to when the 24 VDC (input) and when the 0 VDC (output) should be connected. In addition, clean contacts are required for making connections, as shown in the illustrations. The connection diagram is generic for each type of input or output, i.e. it can be connected to the PIN of the desired connector. In addition, a control system is a generic system, which can be a PLC, another controller, a switch, or something else.

ATTENTION!

If you want to connect several inputs (or outputs), you must set up several dry contacts; that is, for each input (or output) that you want to connect, you need to have a single dry contact.

The dry contact indicated in the images is that of the customer's electrical panel, it is not the responsibility of the manufacturer.

5.2.2 Pneumatic

N.A.

5.3 Commissioning

The commissioning of the component is carried out once the positioning and connection of the connections has been completed. Before commissioning the component, the following checks must be carried out:

- Check that the connections have been connected correctly;
- Check that the component is free of dirt or residues of various kinds;
- Check that the connectors have been connected correctly;
- Make sure that the components are resting on a surface as indicated in the previous chapters.

ATTENTION!
If even one of the above points does not comply, commissioning must not be carried out.
Commissioning should only be carried out when all points have been successfully completed.

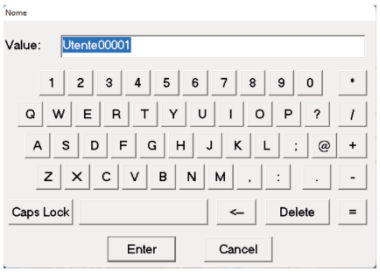
6 SOFTWARE

In this chapter we want to deepen the software part of the component, we want to see both the operator terminal and the screens that are displayed and how to change screens.

The operator terminal is a touch screen and is used to display the current screen, change screens, check the status of values within the component. The software starts automatically as soon as the component is powered.

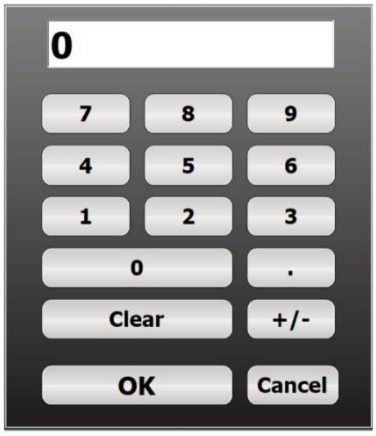
This symbol appears on any screen when an alarm arises. By pressing on this symbol, you can access the ALARMS and SIGNALS screen and you can view the alarm and, if necessary, reset it.

By pressing on any interactive field on a screen, the numeric keypad appears to help the operator fill in the field itself. Keypads can be of two types:



Alphanumeric keypad: appears in case you need to enter texts as well as numbers. It is typically used to enter username, password, recipe name, or similar fields. Some keys are:

- CAPS LOCK: Select lowercase/uppercase character;
- BACK: delete the last character inserted;
- CLEAR: Clear all values in the field;
- OK (ENTER): confirm the characters entered and close the keypad;
- CANCEL: Close the keypad without making any changes.



Numeric keypad: appears if you only need to enter numbers. It is typically used to enter passwords or similar fields. Some keys are:

- +/-: converts values from positive to negative;
- CLEAR: Clears all typed values;
- OK: Confirms the entered heats and closes the keypad;
- CANCEL: Closes the keypad without making any changes.

The list of messages (if any) and alarms that may appear for this system are given in chapter 9

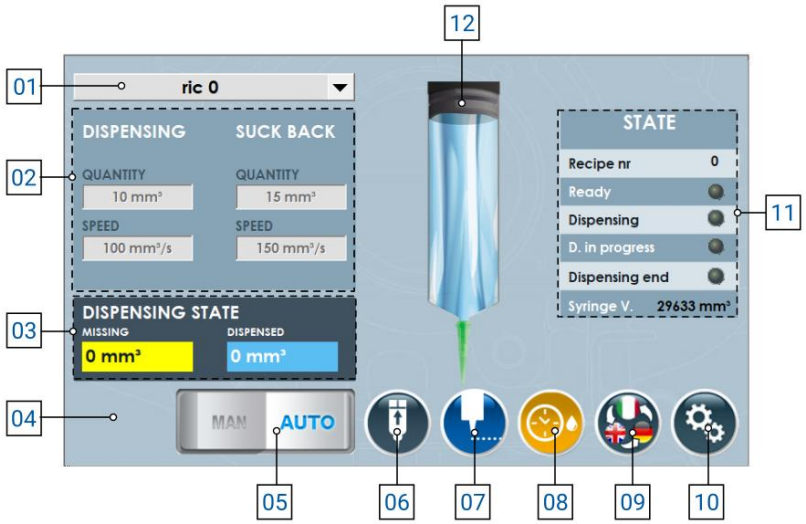
In the event of alarms in progress, the ALARMS AND SIGNALS screen appears immediately when the program is switched on, accompanied by an intermittent sound.

TO ACCESS THE SETTINGS MENU, YOU MUST USE THE FOLLOWING CREDENTIALS:

USERNAME: dav **PASSWORD:** dav

Access and modification of the parameters in the menu is allowed only with the prior authorization of the manufacturer's technicians

6.1 HOME Screen



1) Recipe selection via drop-down menu (available only with automatic mode engaged);
2) Menu to enter the parameters in manual mode (can only be modified with manual mode armed). We have:
   a) **Dosing quantity:** In this field you can set the quantity (in mm^3) to be dosed when dosing starts;

   If the quantity is left at 0, the system interprets it as "**unlimited dosing**", i.e. the system continues dosing as long as the dosing command remains active. This dosage mode is referred to as "**jog mode**".

   b) **Dosing speed:** Indicates the fluid flow rate (in mm^3/s) with which the system must perform dosing when dosing is started (see notes chapter 6.3);
   c) **Suck back quantity:** In this field you can set the quantity (in mm^3) to be recalled inside the actuator when the system has finished dosing;
   d) **Suck back speed:** Indicates the flow rate of fluid (in mm^3/s) with which the system must perform the recall inside the actuator when the system itself has finished dosing (see notes chapter 6.3);
3) Parameters that indicate the status of the current dosage, i.e. how much product still needs to be dosed (in the "missing" box) and how much product has been dosed (in the "dosed" box);
4) Alarm message if there are any. If pressed it takes you to the alarms page (chapter 9);
5) Selector to set automatic or manual mode;
6) Button used to return the extruder to its initial position;
7) Button that allows you to start dosing (**predetermined** if automatic, or manual with setting other than "0" on dosage quantity, **jog** if manual/automatic with "0" setting);
8) Button that allows you to perform automatic purge (visible only if enabled in the settings);
9) Button that allows you to perform language switching;
10) Button that allows you to access the **settings menu;**
11) A table that indicates the states of the component, namely:
    a) **Recipe nr:** Indicates the recipe number currently set in automatic mode;
    b) **Ready:** Indicates whether the component is ready to work;
    c) **Assay:** Indicates receipt of a dosing command;
    d) **D. In progress:** Indicates whether the component is performing a dosage;
    e) **End of dosing:** Indicates whether the component has finished dosing;
    f) **V. syringe:** Indicates the syringe volume currently set and in use.
12) Indicative image of the status of the electric actuator.

6.2 SETTINGS MENU screen

1) **Parameters:** Allows you to access the parameter menu, modifying them. See chapter 6.3;
2) **Recipes:** Allows you to access the recipe menu, see chapter 6.4;
3) **Interfacing:** Allows you to check the communication status between the controller and the external system, see chapter 6.5;
4) **Previous:** Go back to the previous menu, see chapter 6.1
5) **Shut Down Runtime:** Exits the system application

ATTENTION!
When you exit the application, you must turn the controller off and on again to re-enter.

6.3 PARAMETERS screen

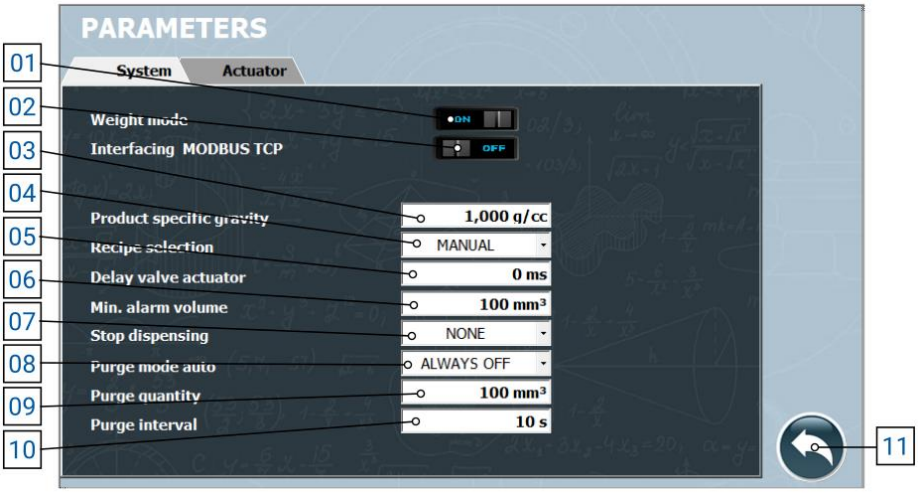
This screen contains all the values that the machine needs to be able to operate correctly. It is divided into:

- **SYSTEM:** Inside there are the general parameters of the system;
- **ACTUATOR:** This page represents all the data relating to the type of actuator used, to optimize the use of the nanopen.

ATTENTION!
The parameters shown have already been set by the manufacturer's technicians so that the machine can operate in optimal working conditions. It is advisable to make changes to these only and exclusively after consultation with the manufacturer. Any damage due to changes in parameters without consultation with the manufacturer is not covered by the warranty.

ATTENTION!
The speed parameters, both suck back and dosage, also depend a lot on the viscosity of the fluid. If the viscosity of the fluid is high (approximately 10,000 mPas or higher) it is advisable to set a low speed so as not to accumulate too much pressure inside the syringe, which could be structurally affected and have sagging. If there are strong vibrations of the component, or it does not dispense as expected, the dosing speed must be reduced.

6.3.1 SYSTEM → PARAMETERS screen



1) **Weight mode:** If enabled, it allows the system to work in weight mode (mg) and not in volume mode (mm^3). In this mode, you must set the specific gravity of the product
2) **Interfacing via MODBUS TCP:** Selector that is used to communicate to the controller that you want the instructions to come directly from the customer server.

> **ATTENTION!**
> It must be connected via a special MODBUS TCP cable, i.e. Ethernet cable.

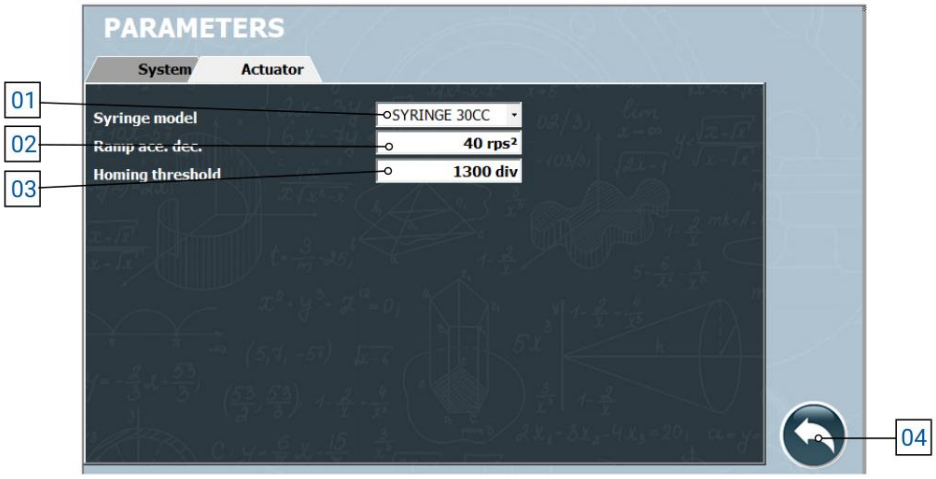
3) **Product specific weight:** It is enabled only if weight mode is set to "ON", it is used to indicate the specific weight of the product, so that the quantity of product to be dosed can be calculated exactly.
4) **Recipe choice:** Drop-down menu that allows you to select the method by which you want to select the recipe. Possible methods are:
   a) **Manual:** Allows you to select the recipe via controller (if in automatic mode), or to set the parameters with which to dose the product (if in manual mode);
   b) **Digital IO:** Allows you to receive recipes from an external system connected via the "IN" cable, No. 15 chapter 2 Figure 01;
   c) **MODBUS TCP:** Allows the system to be connected via a customer server, to receive recipes via Ethernet connection
5) **Actuator Valve Delay:** Indicates the time between the opening of a solenoid valve and the start of the dispensing cycle. If no solenoid valve is used, leave it at zero.
6) **Minimum alarm volume:** Indicates at which fluid level the product level alarm should be triggered;

7) **Stop dosing:** Indicates the mode in which you want to perform the dosing lock. In particular, the modalities can be:
   a) **None:** In this mode it is not possible to stop the dosage once it has started, except by turning off the control unit using the power switch on the back;
   b) **Interruption:** In the case of external use (control button or PLC), the dosage signal must be activated to start dispensing. As soon as it is deactivated (i.e. the dosage signal is missing), dosing stops. When activated again, dosing starts again from the beginning (it does not save the dosed amount). In the case of use via HMI display, press once to start (without holding down) and press again to stop;
   c) **HI Pause:** In this mode, there is no need to press and hold the dosing button. The dosing cycle is paused when it receives a new dosing signal. When it is sent again after the pause, the cycle is resumed from the previously dosed quantity (saves the amount of fluid dosed), completing the recipe. You can take several breaks during dosing. In the case of use via HMI display, press once to start dispensing (without holding down) and press again to stop it and, subsequently, press a third time to resume it, ending the set quantity;
   d) **LOW pause:** In this mode you need to press and hold the dosing button (or signal from PLC). The dosing cycle is paused when the dosing signal is no longer available (release the dosing button, for example). When the dosing signal is activated again, the cycle resumes from the previous point (thus keeping the dosing history saved) and continues dosing until the dosing signal is deactivated (for example, if the dosing button is pressed). To end the cycle in this mode, the dosage signal must be kept high until the recipe is completed. You can take several breaks during dosing. In the case of use via HMI display, press once to start dispensing (without holding down) and press again to stop it and, subsequently, press a third time to resume it, ending the set quantity;
8) **Automatic purge mode:** This drop-down menu allows you to select how you want to perform the automatic purge (if you want to perform it). You can set:
   a) **Always OFF:** Automatic purge is not performed in this mode;
   b) **Always ON:** In this mode, purge is always performed with the modes set in the following points if enabled from the main screen (No. 07 chapter 6.1.1);
   c) **Parking:** Automatic purge can only be performed if the system receives the park signal (e.g. via sensor) and if it is enabled from the main screen (No. 07 chapter 6.1.1).
9) **Purge Amount:** The amount of fluid that is expelled during the automatic purge mode. It is recommended to set it in such a way that it expels all the fluid present in the nozzle. The purge flow rate and suck back parameters are equivalent to those set in the recipe in use;
10) **Purge Interval:** Indicates the minimum amount of time that must elapse from the last dispense to the start of automatic purging.

ATTENTION!
The three parameters above depend on the type of fluid and how quickly it tends to cross-link in contact with air. It is advisable to keep the settings set by the manufacturer or at least contact the manufacturer if you want to change them.

11) **Back:** Button to return to the SETTINGS menu (chap. 6.2)

6.3.2 ACTUATOR → PARAMETERS screen

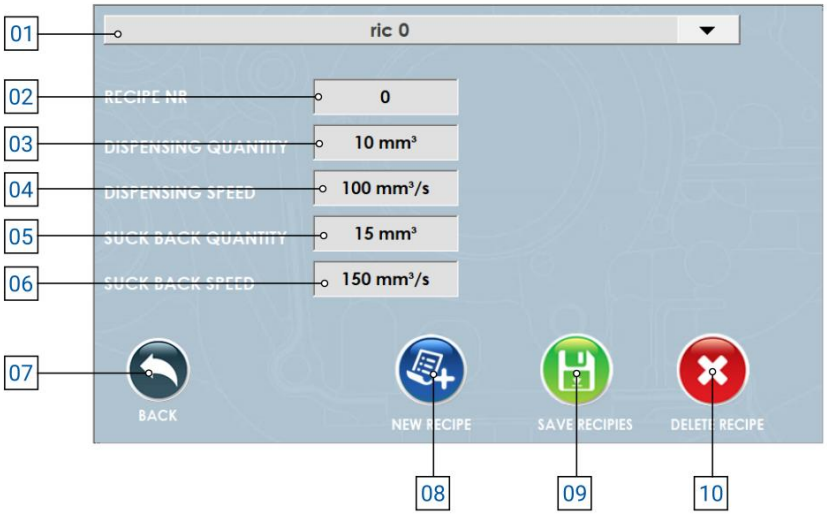


1) **Syringe Model:** This drop-down menu is used to indicate the syringe model you are using, so that you can make more precise settings for your system. There are the following choices:
   a) **3cc syringe;**
   b) **5cc syringe;**
   c) **10cc syringe;**
   d) **30cc syringe.**

ATTENTION!
If you change the entry just described, it is recommended that you restart the controller for the change to take effect.

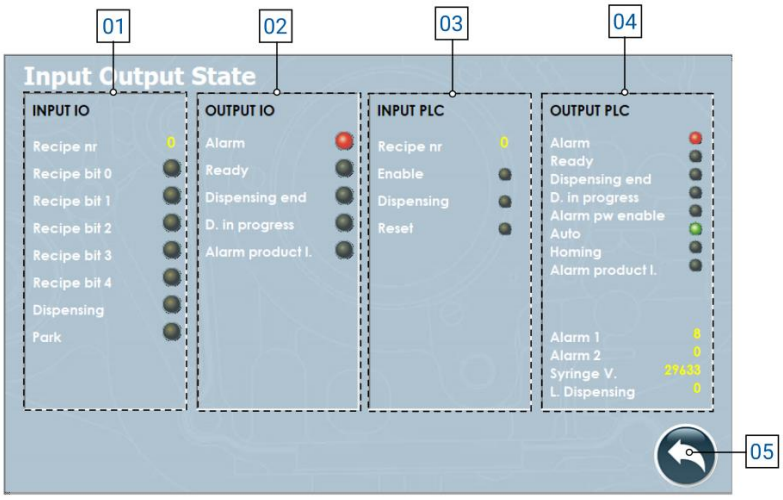
2) **Dec. acc. ramp:** Parameter that allows you to set the acceleration and deceleration ramp of the syringe to reach the set dosage rate;
3) **Homing threshold:** Analog value that indicates when the actuator is at the zero position.
4) **Back:** Button to return to the SETTINGS menu (chap. 6.2)

6.4 RECIPES screen



1) **Drop-down menu:** From here you can choose the recipe to use, as well as create a new one;
2) **Recipe number:** Indicates the number that can be used to retrieve the recipe from other collaborative software (industry 4.0);
3) **Dosing quantity:** Indicates the amount of fluid you want to dose in the selected recipe;
4) **Dosing speed:** Indicates the flow rate with which the above quantity is to be dosed;
5) **Suck back quantity:** Indicates the amount of fluid to be drawn into the actuator once the fluid has been dosed;
6) **Suck back speed:** Indicates the flow rate with which the quantity of fluid indicated above is to be drawn inside the actuator;
7) **Back:** Button to return to the SETTINGS menu (chapter 6.2);
8) **New:** Button to create a new recipe;
9) **Save:** Button that is used to save the selected recipe;
10) **Delete:** Button that is used to delete the selected recipe;

6.5 INTERFACE screen



1) **I/O INPUTS:** These are all the inputs that arrive from the system to the controller to manage the process:
   a) **Recipe No.:** Indicates the recipe number set by the customer server to the controller;
   b) **Bit Recipe (0/1/2/3/4):** Indicates whether the relative bit is active or not. Based on the combination, the recipe used can be traced;
   c) **Dosage:** Indicates whether there is a demand to perform the dosage or not;
   d) **Park:** Indicates whether the actuator is required to be parked.
2) **I/O OUTPUTS:** These are all the outputs that the controller sends to the system to manage the process if connected via Digital I//O:
   a) **Alarm:** Indicates if there are active alarms;
   b) **Ready:** Indicates whether the system is ready to assay;
   c) **End of dosing:** Indicates whether the system has finished dosing;
   d) **D. In Progress:** Indicates whether the system is performing a dosage;
   e) **Level P Alarm:** Indicates if a product level alarm is present.
3) **PLC INPUT:** These are all the inputs that arrive from the system to the controller if connected via MODBUS TCP/IP:
   a) **Prescription nr:** Indicates the prescription number that the system passes to him;
   b) **Enable:** Indicates whether the controller is enabled to work or not;
   c) **Assay:** Indicates whether the assay signal arrives at the input;
   d) **Reset:** Indicates if the alarm restart command comes from the system;
4) **PLC OUTPUT:** These are all the outputs that the controller sends to the system to be able to manage the process if connected via MODBUS TCP/IP:
   a) **Alarm:** Indicates if there are active alarms;
   b) **Ready:** Indicates whether the system is ready to assay;
   c) **End of dosing:** Indicates whether the system has finished dosing;
   d) **D. In Progress:** Indicates whether the system is performing a dosage;
   e) **Alarm for enable:** The system is in alarm due to the system enable;
   f) **Auto:** The system is in automatic mode;
   g) **Homing:** The system is homing the actuator;
   h) **Level P Alarm:** Indicates if a product level alarm is present.
   i) **Alarms (1/2):** Indicates the indicative number of the active alarm, to send it to an external system;
   j) **V. syringe:** Indicates the volume of the syringe in use;
   k) **V. dispense:** Indicates the volume of product dosed in the last cycle.
5) **Back:** Button to return to the SETTINGS menu (chapter 6.2);

6.6 MODBUS TCP/IP registers

The various logs and how they were configured are described below.

You can request the sample project developed by the manufacturer in TIA Portal 16 and the MODBUS TCP/IP configuration wizard by contacting the manufacturer.

If there are indications such as "B0" under a register, the bit occupied within the register and its function is indicated, otherwise the register and the function it has, in which the whole register is occupied to indicate a certain value.

HOLDING REGISTER 0	
Status of outputs	
B0	Alarm
B1	Ready
B2	End of dosage
B3	Ongoing dosing
B4	Power enable alarm
B5	Auto Mode
B6	Home status
B7	Syringe level alarm

HOLDING REGISTER 1	
Alarms 1	
B0	Timeout modbus drive 1
B1	Free
B2	IO modbus module timeout
B3	Timeout modbus PLC
B4	Fault drive 1
B5	Pen disconnected
B6	Drive Power Alarm 1
B7	Free
B8	Level 1 alarm
B9	Free

HOLDING REGISTER 2
Alarms 2
Empty

HOLDING REGISTER 3
Syringe Level

HOLDING REGISTER 4
Last LSB dosed quantity

HOLDING REGISTER 5
Last MSB Quantity Dosed

HOLDING REGISTER 10	
Commands	
B0	Enable
B1	Dosage
B2	Alarm Reset

HOLDING REGISTER 11
Recipe

7 PROCEDURE

In this chapter we want to explain the main configurations that can be used on the component covered by this manual. In particular, we want to explain in detail:

- How to perform the syringe change;

7.1 Syringe change

Changing the syringe is the most delicate phase of using this system, as it is important to avoid air bubbles inside the syringe itself, which could change the quality of the dosage itself. To be able to change the syringe, three methods can be followed:

- Standard method with fluids that have viscosity less than 30,000 mPas;
- Standard method with fluids that have high viscosities;
- Double syringe method.

The choice of method is left to the customer, based on the equipment available.

ATTENTION!
Using the first method with fluids that have a viscosity greater than 30,000 mPas may give unsatisfactory results and cause bubbles to remain inside the syringe.

7.1.1 Standard method with viscosity less than 30,000 mPas

- Insert the metal pad inside the plunger. The smooth part of the metal pad should serve as a base for the plunger

ATTENTION!
There are different pads and plungers on the market, depending on the model. Please follow the standard models recommended by the manufacturer

- Take a new syringe (with a cap on the nozzle side) and, holding it with the nozzle side down, fill it to about 3/4 of fluid;

ATTENTION!
In the case of glue-like fluids, it is advisable not to dirty the side walls, as they then solidify and block the plunger, making the syringe ineffective

- Insert the plunger and buffer assembly inside, taking care to put the plunger on the side of the fluid;
- Once the plunger is inserted as close as possible, turn the syringe 180°, bringing the nozzle part upwards;
- By physical separation, the air is directed towards the nozzle, while the fluid approaches the plunger;
- Once the air is all towards the nozzle, remove the cap and push the plunger until a tip of fluid comes out;
- Clean the nozzle, insert the nozzle and the nanopen hook;
- The nanopen piston is put into rest mode using the appropriate button (No. 06 chapter 6.1) and the syringe is inserted into the syringe slot.

7.1.2 Standard method with high viscosities

- Insert the metal pad inside the plunger. The smooth part of the metal pad should serve as a base for the plunger

ATTENTION!
There are different pads and plungers on the market, depending on the model. Please follow the standard models recommended by the manufacturer

- Take a new syringe (with a cap on the nozzle side) and, holding it with the nozzle side down, fill it to about 3/4 of fluid;

ATTENTION!
In the case of glue-like fluids, it is advisable not to dirty the side walls, as they then solidify and block the plunger, making the syringe ineffective

- Insert the plunger and buffer assembly inside, taking care to put the plunger on the side of the fluid;
- Place the syringe on a fluid separation device (centrifuge, vibrating plate, or other) and wait for the air and fluid to separate, with the fluid towards the plunger and the air towards the nozzle;
- Open the nozzle cap and let out all the air inside the syringe by pushing through the plunger until a tip of fluid comes out;
- Clean the nozzle, insert the nozzle and the nanopen hook;
- The nanopen piston is put into rest mode using the appropriate button (No. 06 chapter 6.1) and the syringe is inserted into the syringe slot.

7.1.3 Double syringe method

- Insert the metal pad inside the plunger. The smooth part of the metal pad should serve as a base for the plunger

ATTENTION!
There are different pads and plungers on the market, depending on the model. Please follow the standard models recommended by the manufacturer

- Take a new syringe and one with the fluid and, using a special fitting, join the two cartridges;
- Insert the plunger inside the new syringe (in the one with the fluid there should already be the plunger)
- Pushing through the plunger of the filled syringe and keeping the empty syringe pressurized, push the fluid into the new syringe;
- Remove the now empty syringe and the fitting and put the appropriate nozzle;
- Insert the nanopen hook;
- The nanopen piston is put into rest mode using the appropriate button (No. 06 chapter 6.1) and the syringe is inserted into the syringe slot.

8 MAINTENANCE

Maintenance interventions are all those activities that must be performed on the component which, if carried out correctly, allows it to have a longer life. In general, maintenance is divided into two groups:

- **Ordinary maintenance**, which are interventions on a regular basis or that can be carried out by the customer's staff, are the most important activities as they allow the component to be kept in good working condition;

ATTENTION!
Ordinary maintenance must be carried out in the manner and timing indicated in the following chapters.

- **Extraordinary maintenance**, i.e. all those interventions that are not regularly carried out or that have not been planned, or interventions that cannot be carried out by the Customer. They can also arise from the lack of routine maintenance.

ATTENTION!
Extraordinary maintenance work must be carried out together with the manufacturer's specialized technicians.

Regarding attendance, it must be considered that:

- **When necessary:** Operation to be carried out when the need to be carried out is seen;
- **Every machine start or job end:** Indicates a daily period, in general. This can imply every 24 hours (i.e. at the beginning of the shift of every day, or the end of the shift of every day), or even more frequently, depending on the application;
- **Long pause:** Indicates a period approximately greater than an hour;
- **Each drum change:** Indicates each time the fuel system (tank, drum, cartridge or other) is changed;
- **Each mixer disassembly:** Indicates that each time the mixer is replaced, a certain operation must be performed;
- **Weekly:** Indicates a period equal to seven calendar days;
- **Monthly:** Indicates a period equal to one calendar month;
- **Semi-annual:** Indicates a period equal to six calendar months;
- **Yearly:** Indicates a period equal to one calendar year.

ATTENTION!
The times given below are indicative as they depend on how the component is used. Follow the variations suggested by the technicians.

Assigned	Description	Frequency	Chapter
	Perform an actuator function test	Every machine start-up or end of work	\
	Perform a surface cleaning of the actuator	Every machine start-up or end of work	\

ATTENTION!
Only use soft brushes or cotton cloths to clean the actuator.

9 SYSTEM MESSAGES

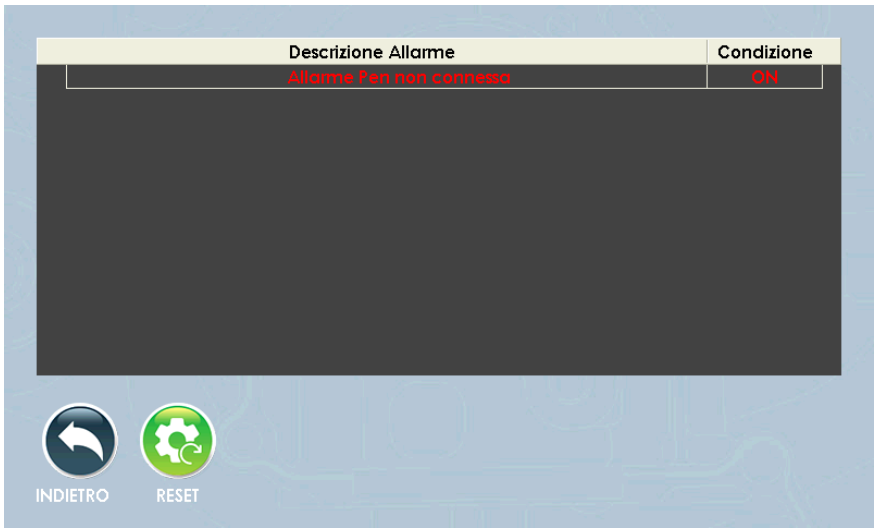
In this chapter, the two types of messaging that are present inside the machine are explored and listed. There are these two types:

- **Alarm:** warning from the machinery to the operator indicating a problem, which can be electrical, pneumatic or generic;
- **Mechanical defect:** This part deals with the defects that there may be on a mechanical level with the nanopen.

This chapter lists all the messages that the system produces, with their explanation, and all the alarms that the system emits, with their explanation and method of resolution of the specific alarm.

In general, to remove an alarm, you must:

- Identify the alarm (if there is more than one alarm, identify only one);
- Resolve the cause of the alarm, as indicated in the next chapter;
- From the operator terminal, access the alarm screen by pressing on the yellow triangle symbol. A screen like the figure below opens;
- Reset the specific alarm;
- Once all alarms have been reset, press the AUX RESET button from the hand control (chapter 2.1 number 05.b).



9.1 Alarms (controllers)

ALARM	CAUSE	SOLUTION
Drive power enable alarm	The drive is not receiving power	Check that all conditions are met for operation, turn the controller off and on again
The controller does not turn on	Lack of power	Replace fuses, check power line
Drive connection alarm	The drive is not properly connected	Check that all conditions are met for operation, turn the controller off and on again
Motor position alarm	The motor has not reached the defined position	Check that there are no foreign objects blocking the handling. Power cycle the controller.
Drive Alarm	The drive is on alert	Check that all conditions are met for operation, turn the controller off and on again
Tracking error alarm	The motor is not moving according to the controller's commands	Check that there are no foreign objects blocking the handling. Power cycle the controller.
Phase A/B alarm motor disconnected	The motor is not properly connected	Check that all conditions are met for operation, turn the controller off and on again. If necessary, replace the connection cable between the controller and nanopen
Product Level Alarm	The syringe has reached the minimum amount of product	Change syringe following the procedure
Pen alarm not connected	The nanopen is not properly connected to the controller	Check that all conditions are met for operation, turn the controller off and on again. If necessary, replace the connection cable between the controller and nanopen
Positioning timeout alarm	The motor has not reached the defined position	Check that there are no foreign objects blocking the handling. Power cycle the controller.
Drive over-temperature alarm	The drive has reached its maximum temperature	Place the controller in a cooler position and check that the drive is working properly
Drive power timeout alarm	The drive is not responding	Check that all conditions are met for operation, turn the controller off and on again
PLC modbus timeout alarm	Communication error via modbus TCP/IP	Check the wiring. Check that the Modbus TCP/IP selector switch in the settings is in "ON" (No. 02 chapter 6.3.1)

9.2 Mechanical defect (nanopen)

DEFECT	CAUSE	SOLUTION
No fluid or not very fluid	The actuator does not receive the command	Check the actuator control (solenoid valve). Perform a manual test
	The nozzle is clogged	Unscrew and clean the nozzle
	The filter is dirty (if any)	Wash or replace the filter
	Fluid residues present in the system	Disassemble and clean any solid particles
Excessive vibration on tool or does not deliver as expected	The set speed is too high (fluid too viscous or nozzle too small)	Decrease fluid dispensing speed
The nozzle drips even if the actuator is not driven	Dirt in the nozzle	Clean or replace the nozzle
The plunger does not move	Fluid has glued the plunger in place	Change syringe

10 END OF LIFE

End-of-life refers to all those activities that put the component out of service. End-of-life activities can be:

- **Storage,** i.e. when the component is placed inside the warehouse for an unspecified period waiting for a third party to buy the component;
- **Dismantling,** i.e. when the component has reached the end of work period, whether it is due to age, obsolescence or faults that cannot be repaired, or that it is possible to repair but it is worth buying a new component.

If installation is not planned soon, the component can remain packaged and must be stored in a sheltered and preferably closed place. The ambient temperatures to be observed are given in chapter 2.2.

On the other hand, for the dismantling and consequent scrapping of the component or its parts, the different nature of the various components must be considered, and a differentiated scrapping must be carried out. We recommend that you commission specialist companies for this purpose and must always observe the applicable laws on waste disposal.