Installation and maintenance guide

PCP CONTROLLER VOLUMETRIC PUMP

DAV TECH SRL
Via Ravizza, 30 - 36075 Montecchio Maggiore (VI) - ITALIA
Tel. 0039 0444 574510 - Fax 0039 0444 574324
davtech@davtech.it - www.davtech.it

INDEX

INTRODUCTION

This manual provides you all the information you need for the use and maintenance of the system.
The good operation and durability of the equipment will depend on the good maintenance and attention in its use.
This manual is designed for maintenance operators and technicians, and contains the characteristics, technical data, operating instructions and preventive and corrective maintenance plan.
Operators and maintenance technicians must read what is stated in this manual before operating on the system.
This document and the documentation attached must be kept throughout the life of the equipment and stored in a place accessible to the personnel proposed for use and maintenance of the same.

REFERENCES TO ECC STANDARDS

The machine to which this manual is referred complies with the following:
•Machinery Directive 2006/42/EC of the European Parliament and council of 17 May 2006
•2014/30/EU: of the European Parliament and of the Council of 26 February 2014 concerning the harmonization of member states' laws on electromagnetic compatibility (recast).

CONTENTS OF MANUAL

The following manual contains all the information related to the use and maintenance of the controller.
Then there is the list of subjects dealt with.
>Summary of the indications provided for marking, excluding the serial number, possibly supplemented with indications to facilitate maintenance operations, such as references to importers or any service centers;

> Expected terms of use, intended as normal use and reasonably intended use;

> Instructions to run without any risk:

- commissioning
- use
- transport
- installation
- assembly and disassembly
- adjustment
- maintenance and repair

This document will be accompanied by drawings and diagrams necessary for commissioning, maintenance, control and inspection and, if necessary, repair.

TOPIC AND PURPOSE OF THE MANUAL

This manual is dedicated to the user for the maintenance of the equipment, in order to provide main technical data characteristic of the system, a technical description of the various functional groups that make it up, as well as the main procedures of use and the information necessary to carry out the preventive and corrective maintenance of the plant.

The manual is aimed at personnel who has a good knowledge of processing techniques, mechanical and electrical design; it involves both the management staff and the technical assistance technicians.

This manual contains information about the machine to allow the personnel using it to operate safely and ensure perfect efficiency throughout their life. For the proper use of the system, it is assumed that the working environment is adapted to current regulations in the areas of safety and hygiene.

MANUAL USE AND RETENTION

This user and maintenance manual is related only to the "**PCP CONTROLLER**" machine made by D**AV TECH SRL** and is prepared in accordance with the Machinery Directive 2006/42/EC of the European Parliament and Council of 17 May 2006.

The function of the machine is only to **control and manage the dispensing of single-component products through the PCP series of dispensing.**

The machine must be installed in an appropriate working environment and the surrounding space must always be cleared of obstacles, clean and well lit.

What is contained in this manual does not include any risks that may arise after coupling with other machines.

It is forbidden to modify or tamper this manual by personnel not delegated by the Manufacturer.

The User Manual and Maintenance can never replace an adequate operator experience.

In case of transfer of the plant, the user is invited to report to the manufacturer the address of the new owner to facilitate the transmission of any additions of the Manual to the new user.

The Manual is related to the configuration of the plant under the conditions in which it was made and reflects the state of the technique at the time of marketing of the machine.

This Manual and its annexes must be carefully kept in an easily accessible place known to all users (operators and maintenance personnel) and must always be available for consultation.

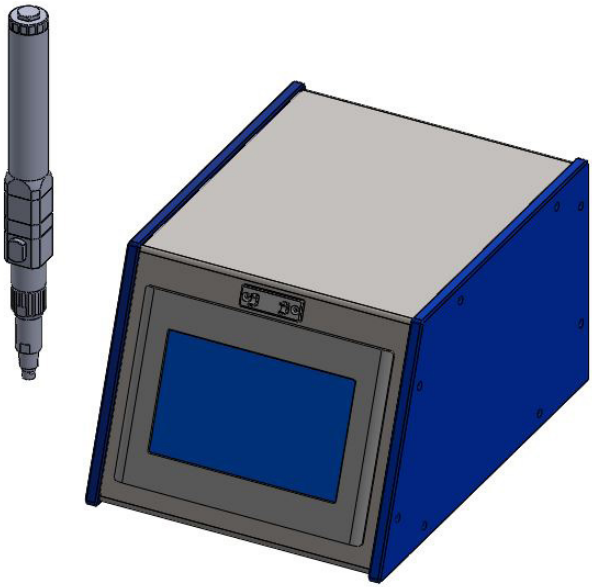
WARNINGS AND GUARANTEES

All the construction elements, the connecting and control devices have been designed and manufactured with an adequate degree of safety, such as to withstand abnormal stresses or in any case higher than those of normal use.
An accurate choice was made of the materials and components to be used in the construction of the equipment, subjecting to regular testing before delivery.
The good performance, over the time, of the system also depends on proper use and adequate preventive maintenance.
It prohibits the use of the system for a different use than what is indicated in the manual and the manufacturer cannot be held responsible for failures, inconveniences or injuries due to non-compliance with this prohibition.
The warranty conditions agreed with suppliers for the different parts of the machine and with the customer. All is specified in the respective contract documents.
The manufacturer of the machine provides assistance in the manner specified by the manual.
Looking to the complexity of the machine, the specialist assistance of the manufacturer must be expressly used for any intervention not provided for and authorized by the manual.
Original spare parts should preferably always be used. Incorrect assembly and/or use of non-original spare parts exempt the manufacturer from any liability.

MANUFACTURER'S ADDRESS

For any needs, information or doubts regarding use, maintenance, installation or request of spare parts , please contact the technical office of Dav tech S.r.l.
Any request for assistance from the customer or technical aspects of the document must be addressed to:

DAV Tech S.r.l.
Via G. Ravizza, 30
36075 - Montecchio Maggiore (VI)
ITALY
Tel. +39 0444 574510



CONDITIONS OF USE

Power supply voltage	100-230V +- 10% (singlephase)
Average consumption	250 W
Frequency	50-60 Hz
Room temperature	From 10 to 45 °C
Humidity	From 5 to 90% non-condensing
Ionizing radiation	NOT allowed
Storage temperature	From –20 to 55 °C

CONTROLLER FEATURES

- Two-mode dispensing management: predetermined quantity and same-speed dispensing (jog);
- Automatic purge;
- Output pressure monitoring;
- Levels management;
- Digital input communication with an external device, also with recipe selection;
- MODBUS communication via TCP/IP.

INSTALLATION

The machine must be positioned also considering compliance with current regulations regarding the requirements of the working environments, lighting, ventilation, etc. (Annex IV 81/2008).
The electrical connection to the grid must be made with the supplied cable.

CONNECTIONS

In the back of the controller there are various connectors that allow you to communicate with external systems and control the PCP dispensing device.
This paragraph explains the function of each connector.

1. **Power outlet: connect to the power supply.**
2. **Power switch: power on the controller.**
3. **Ethernet port: allows you to communicate with the controller via TCP/IP Modbus protocol, can also be used to perform remote technical assistance.**
4. **Control: allows you to receive dispensing signals and send the end-of-dispensing signal.**
5. **Out: allows you to communicate with external devices via digital signals.**
6. **In: allows you to receive digital inputs to perform various operations.**
7. **Level: allows you to receive the signal from the product level sensor.**
8. **Pressure: allows you to receive the signal from the pressure sensor installed output to the PCP.**
9. **Dispenser: allows you to communicate with PCP.**

WARNING! The power sources that are on the connectors must be used only for probes connected to the controller input. If you need to connect the controller with an external device that already has a power source, you must connect ONLY the negative one (GND); the positive MUST NOT be connected, because if you do so the power sources will be in parallel.

DIAGRAM AND FUNCTION OF CONNECTORS

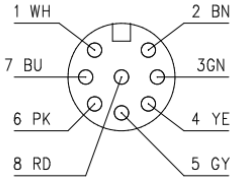
This paragraph describes connection patterns for using cables.

INPUT CONNECTOR (IN)

CONNECTOR C3		
M12 8 POLES M. INPUT		
PIN	**COLOR**	**DESCRIPTION**
1	WHITE	BIT 0 RICIPES
2	BROWN	BIT 1 RICIPES
3	GREEN	BIT 2 RICIPES
4	YELLOW	BIT 3 RICIPES
5	GREY	BIT 4 RICIPES
6	PINK	START DISPENSING
7	BLUE	PARK
8	RED	+ 24 VDC

INPUT CONNECTOR

CONNECTOR LEGEND M12 8 POLES



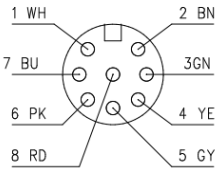
Through this connector it is possible to call the recipes (if selected the mode “recipes from digital I/O”), perform a dispensing command or inform the controller that the dispensing device is in the parking position (park).

OUTPUT CONNECTOR (OUT)

CONNECTOR C4		
M12 8 POLES F. OUTPUT		
PIN	**COLOR**	**DESCRIPTION**
1	WHITE	ALLARM
2	BROWN	READY
3	GREEN	END DISPENSING
4	YELLOW	COMM. EV
5	GREY	RESIN ALLARM
6	PINK	HARDNER ALLARM
7	BLUE	NOT CONNECTED
8	RED	0 VDC

OUTPUT CONNECTOR

CONNECTOR LEGEND M12 8 POLES



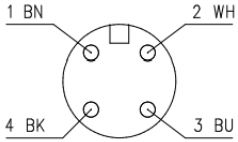
Through this connector the controller communicates with digital signals various dispensing states.
The description of the signals it transmits is given in the table above. For “EV Command” max. 10W usage.

CONTROL CONNECTOR

CONNECTOR C5		
M8 4 POLES F. START + END DISPENSING		
PIN	**COLOR**	**DESCRIPTION**
1	BROWN	+ 24 VDC
2	WHITE	END DISPENSING
3	BLUE	0 VDC
4	BLACK	+ 24 VDC

CONNECTOR START - END DISPENSING

CONNECTOR LEGEND M8 4 POLES

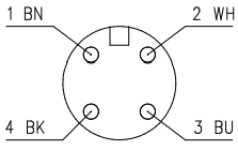


Through this connector it is possible to control the dispensing and receive an end-dispensing signal.
Same signals/data are received from the “IN” and “OUT” connectors, the “control” connector can be used as an alternative.

LEVEL CONNECTOR (LEVEL)

CONNECTOR C7		
M12 4 POLES F. RESIN LEVEL		
PIN	**COLOR**	**DESCRIPTION**
1	BROWN	+ 24 VDC
2	WHITE	NOT CONNECTED
3	BLUE	0 VDC
4	BLACK	PRODUCT LEVEL

LEVEL CONNECTOR CONNECTOR LEGEND M12 4 POLES

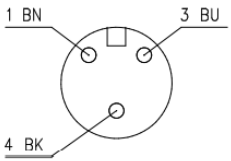


Through this connector the controller receives the product A (resin) exhaustion signal.
You can set it NO or NC through the controller parameters.

PRESSURE CONNECTOR

CONNECTOR C9		
M8 3 POLES F. PUMP PRESSURE SWITCH A		
PIN	**COLOR**	**DESCRIPTION**
1	BROWN	+ 24 VDC
2		
3	BLUE	0 VDC
4	BLACK	PRESSURE SWITCH SIGNAL

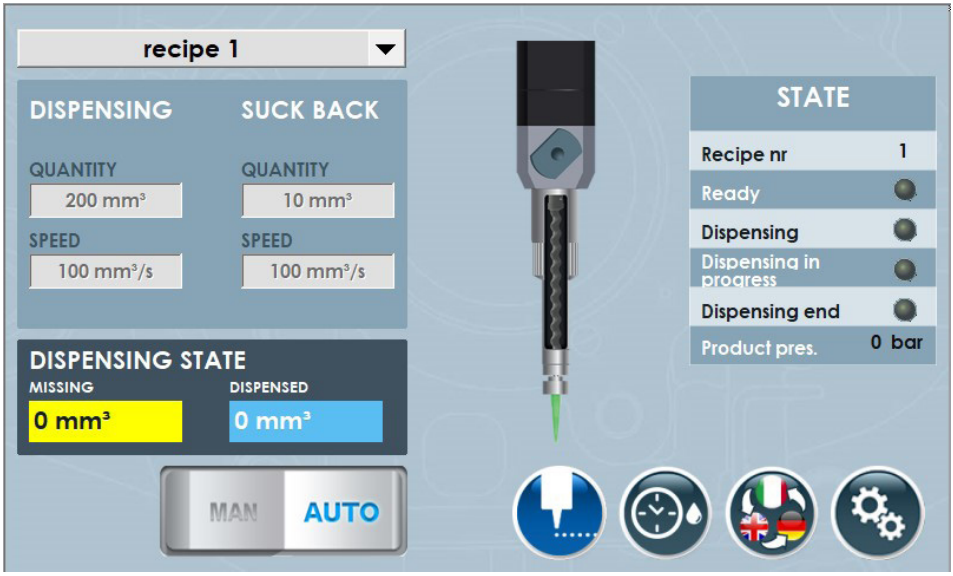
PRESSURE CONNECTOR CONNECTOR LEGEND M8 3 POLES



Through this connector the controller receives the analog signal indicating the output pressure of product.

USER INTERFACE

The system is equipped with an HMI display, through the display you can see the states and parameters set in the controller, and eventually modify them.



RECIPE SELECTION

• **RECIPE SELECTION**: in “auto” mode it is not possible to change the parameters of the recipe “on the fly” but you can select one of the recipes set through the drop-down menu.

DISPENSING

• **QUANTITY**: indicates the quantity that is automatically delivered after pressing the “dispensing” button on the screen, **if the quantity is zero, the system goes in jog mode, so the quantity matches to the dispensing signal active time**

• **SPEED**: indicates the speed (flow rate) at which the product is dispensed.

SUCK BACK

• **QUANTITY**: indicates the quantity that is automatically sucked back at the end of the dispensing time.
• **SPEED**: indicates the speed (flow rate) at which the product is sucked.

MAN/AUTO SWITCH

• It allows you to switch from recipe selection mode via drop-down menu (auto) to direct data entry mode (man). When the selector is on “man” you can enter directly dispensing data that you want to use.

SYSTEM STATUS

- **RECIPE NR**: indicates the number of the recipe currently selected/recalled.
- **READY**: indicates that the system is ready and therefore ready to work.
- **DISPENSING**: indicates the reception of the dispensing signal.
- **DISPENSING IN PROGRESS**: indicates an ongoing dispensing.
- **DISPENSING END**: indicates the end of a dispensing cycle.
- **PRESSURE:** indicates the output pressure detected by the sensor of the PCP pump (if installed).

BUTTONS

- **DISPENSING**: performs a dispensing cycle according to the parameters set in the current recipe.
- **PURGE ACTIVATION (DROP CLOCK):** when pressed (orange) indicates the ability to automatically purge in the set modes. This button is displayed only if automatic purging is enabled.
- **LANGUAGE SELECTION:** language changing.
- **GEARS**: access to the main menu.

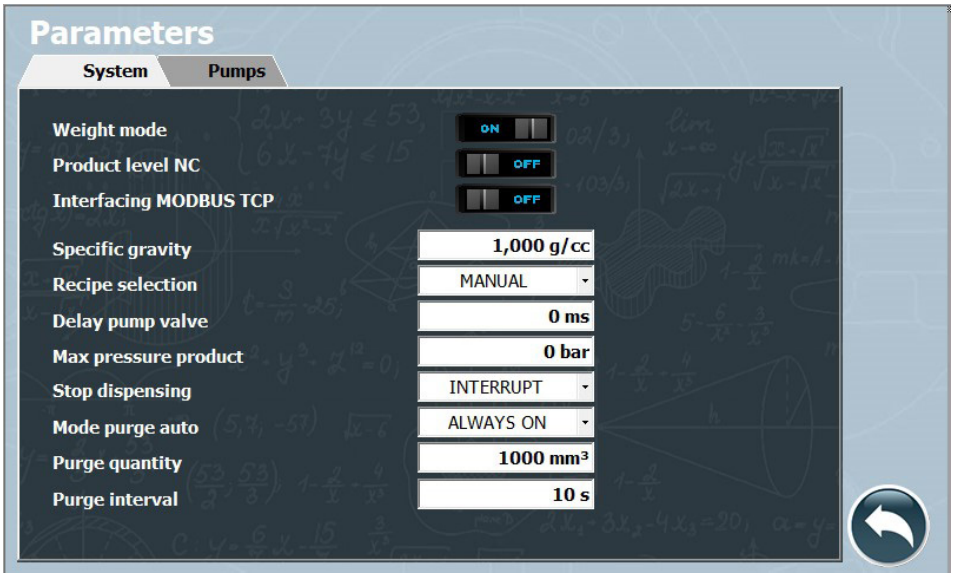
LOGIN CREDENTIALS

In order to access to various menu, enter the following credentials:

USER: dav
PASSWORD: dav

To access more advanced levels of settings contact Dav Tech.

- **PARAMETERS:** access to the parameter menu.
- **RECIPES:** access to the recipe setup menu.
- **INTERFACING:** access to inputs and outputs status.



• **WEIGHT MODE:** The controller has the possibility to work in "weight mode", this means that after entering the "specific gravity" all calculations and units will be expressed in mg instead of mm3 (the parameter appears only if "weight mode" is on ON).

• **PRODUCT LEVEL NC:** Depending on the type of sensor connected, you can use a NO (OFF switch) or NC (ON switch) contact. When a level sensor is used, upon receipt of the signal the controller blocks the execution of new dispensing cycles until the signal remains.

• **INTERFACING VIA MODBUS TCP:** If ON enables TCP/IP MODBUS communication.

• **SPECIFIC GRAVITY:** indicates the specific gravity of the product (only if "weight mode" is on "ON")

• **RECIPE SELECTION:** indicates how the recipe is chosen;
> Manual - (via drop-down menu).
> Digital I/O - (via connector "IN").
> TCP/IP MODBUS - (via TCP/IP MODBUS after enabling the selector "interfacing via TCP/IP MODBUS").

• **MAX PRESSURE:** indicates the maximum output pressure threshold beyond which the controller enters an alarm state. Each pump displacement bears different maximum pressures, the maximum pressure can be set at a value lower than those written in the table but NOT higher.

PUMP SIZE	OUTPUT MAX PRESSURE (Bar)
005	30
015	20
050	20
150	20
500	15
1000	15

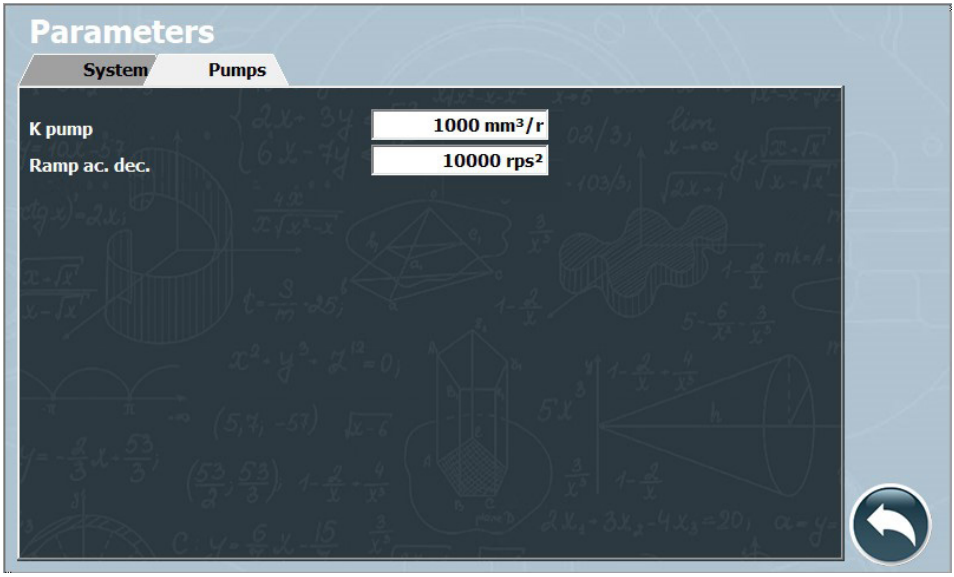
• **DELAY PUMP VALVE:** indicates the time between the opening of a possible electro-valve and the beginning of the dispensing cycle. If no electro-valve is used leave it at zero.

• **DISPENSING STOP:** indicates the criteria by which to end the current dosing cycle;
> **None** - (it will not be possible to stop the dispensing cycle in progress).
> **Interruption** - (when the dispensing signal is released, the cycle will be interrupted; at the next signal the dosing cycle will start over).
> **Pause HI** - (the current dispensing cycle will be stop when the controller receives a dispensing signal again; when the dispensing signal is sent again, the cycle will be resumed from the interruption and the remaining quantity will be dosed.)
> **Pause LO** - (the current dispensing cycle will be paused when the controller receives no longer the dispensing signal; when the dispensing signal is sent back, the cycle will be resumed and will end if the signal remains "high" for the duration of the cycle).

• **AUTO PURGE MODE:** indicates under what circumstances it is necessary to carry out an automatic purge; the general switch to activate automatic purging (when on "ON" and "Park") is present on the main page.
> **Always OFF** - (automatic purging will not be performed).
> **Always ON** - (automatic purging will always be performed according to the settings indicated below).
> **ParK** - (automatic purging will only be carried out if the parking signal is received).

• **PURGE QUANTITY:** indicates the amount of product to be purged.

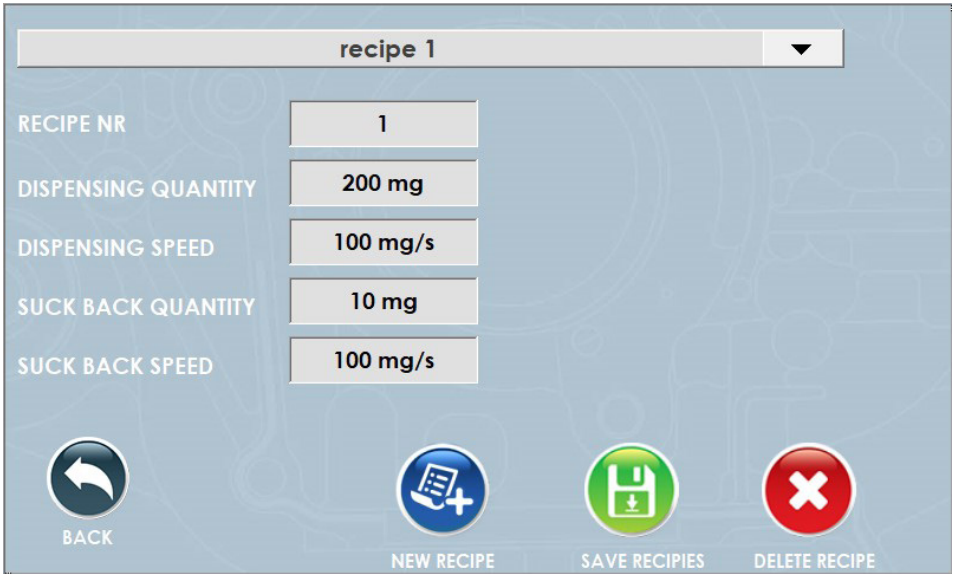
• **PURGE INTERVAL:** indicates with what interval to purge the above quantity.



• **K PUMP:** indicates the volume of product dispensed with each complete rotation of the pump. The table below shows the actual indicative displacements of each pump model.

PUMP MODEL	REAL DISPLACEMENT (mm3/r)
005	5
015	17
050	50
150	180
500	470
1000	1060

• **ACC. DEC. RAMP:** indicates acceleration and deceleration ramp.



- **RECIPE DESCRIPTION:** allows you to change the description of the current recipe or choose another recipe.
- **RECIPE NR:** allows you to give a number to specific recipe for recall via external signals.
- **DISPENSING QUANTITY:** quantity to be dispensed when the current recipe is selected, if left at zero the quantity corresponds to the time in which the dispensing signal is maintained.
- **DISPENSING SPEED:** the flow rate with which the system will deliver the set quantity.
- **SUCK BACK QUANTITY:** indicates the amount that is automatically sucked at the end of the dispensing.
- **SUCK BACK SPEED:** indicates the speed (flow rate) at which the product is sucked back.

BUTTONS

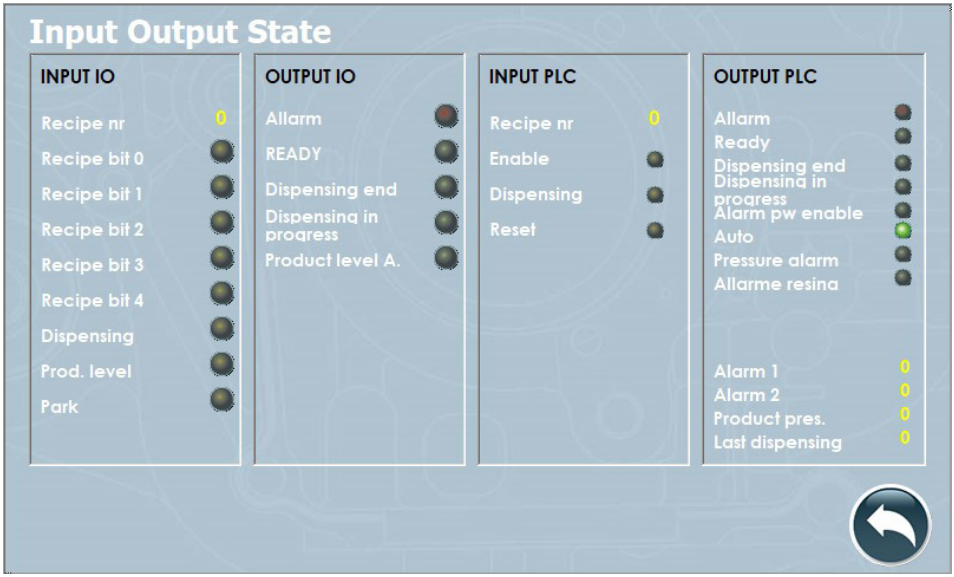
- **NEW RECIPE:** Create a new recipe with zero parameters.
- **FLOPPY DISK:** Save the recipe.
- **CROSS:** Delete the selected recipe.

RECIPE SELECTION LOGIC FROM I/O

When I/O recipes are selected, up to 32 recipes can be recalled. In the table below the matches between active BIT and selected recipe:

N.B.: To switch from one recipe to another it takes about 200ms, consider this time in the case of cycles with different recipes.

RECIPE	BIT
0	00000
1	10000
2	10000
3	11000
4	10000
5	10100
6	11000
7	11100
8	10000
9	10010
10	10100
11	10110
12	11000
13	11010
14	11100
15	11110
16	10000
17	10001
18	10010
19	10011
20	10100
21	10101
22	10110
23	10111
24	11000
25	11001
26	11010
27	11011
28	11100
29	11101
30	11110
31	11111



On this page you can view in real time all the states of the controller inputs and outputs.

- **INPUT/OUTPUT IO** when working in digital I/O.
- **INPUT/OUTPUT PLC** when working in TCP/IP MODBUS.

TURNING ON THE MACHINE

Before proceeding to the first power on, make sure that the controller is properly connected to the supply and properly connected to the PCP dispenser.

TURN ON PROCEDURE:

The controller must be accessed via the switch on the back.
After waiting for the HMI to turn on, reset any alarms.

SHUTDOWN PROCEDURE:

To turn OFF the controller simply press the switch on the back.

FIRST START AND USEFUL TIPS

The controller is designed to work stand-alone or to work with external signals.
The controller communicates the various states and operations via digital I/O signals or by TCP/IP MODBUS protocol depending on the settings you select.

VERIFY CONNECTIONS

The first time you start the system, check all connections you made.
To operate in stand-alone mode, it is enough to connect only the motor cables of the PCP dispensing machine.

PUMP BAITING
At the first start of the PCP dosing system, it is recommended to lure the system with the product and start dosing with a flow rate not exceeding half the displacement of the pump (for example with a PCP 050 I can set maximum 25mm3/s.
This is to avoid having the "dry" pump work at high speeds.
The moment the product starts to exit then it is possible to use higher speeds always considering any limits given by products with high viscosity or high abrasion, with this type of products it is recommended to stay at low flow rates.

AIR BUBBLES ELIMINATION
On the first baiting it is very important to purge any residual air inside the pump.
To do this use the front purge valve present in each of the two pumps and, if this is not enough, tilt the pump upwards while a continuous dispensing is carried out to facilitate the ejection of the air.

START DISPENSING
After you have done the preliminary operations, you can start dispensing.
Set the parameters in recipe and press the button/send the dispensing signal.
If the dispensing has not been successful, the controller will notify it with a pop-up alarm.

DON'T OVERDO WITH SUCK BACK FUNCTION
The parameters that regulate the suck back function are very useful to dampen the pressure that is generated in the output of the pump, and consequently avoid post-dose drips.
Sucking back means sucking product back, setting the quantity starting from low values with suck back flow equal to or lower than the dosage flowrate and trying until the desired effect is achieved. Do not overdo it with the quantity otherwise you risk sucking air.

"FAST COMMAND" MODE

In case of use with very tight cycle times in which even a few tenths of a second of latency can affect, the controller can be used in "fast" mode, to use the controller under these conditions it is enough to set the "stop" mode in the parameter "stop dispensing".
As described in the previous paragraph, in "interruption" mode it is necessary to maintain the dispensing control for the duration of the dose cycle, i.e. until you receive the "end of dispensing" signal.

CONTROLS FUNCTIONING MODE

The dispenser can be controlled via HMI, digital input or MODBUS TCP/IP. These can work combined between each other. Also, depending on the active mode (predetermined quantity or same-speed dispensing (jog)), the controller works differently:

- same-speed dispensing (jog): the controller controls the dispensing until there's the control signal; if this signal ends, the dispensing ends. In this mode, the end dispensing signal is not active;

- predetermined quantity: the controller works differently based on the "End dispensing" parameter, that is:

- "None" mode: To begin the dispensing is sufficient to give an impulse to the system (i.e. press the button). It's not possible to interrupt the dispensing cycle and the end dispensing signal is not active;

- "Interruption" mode: To begin the dispensing the command must be continuous (i.e. keep pressing the button) until setpoint value is reached. When the setpoint is reached, the end dispensing signal is activated and is possible to turn off the dispensing command;

- "Pause HI" mode: To begin the dispensing is sufficient to give an impulse to the system (i.e. press the button) and with a second impulse is possible to block the dispensing. To continue the dispensing, another impulse is needed and so on;

- "Pause LO" mode: To begin the dispensing the command must be continuous (i.e. keep pressing the button). If the command is interrupted, the dispensing is blocked, until the command is resumed again.

MODBUS PLC REGISTERS

HOLDING REGISTER 0
OUTPUT STATUS
B0 -> Alarm
B1-> Ready
B2-> Dispensing end
B3-> Dispensing in progress
B4-> Power enable alarm
B5-> Mod AUTO
B6-> Pressure alarm
B7-> level alarm

HOLDING REGISTER 1
Alarms 1
B0 -> Timeout modbus drive 1
B1 ->
B2 -> Timeout modbus IO module
B3 -> Timeout modbus PLC
B4 -> Fault drive 1
B5 ->
B6 -> Power alarm drive 1
B7 -> Max pressure
B8-> Level 1 alarm

HOLDING REGISTER 2
Alarms 2
<empty>

HOLDING REGISTER 3
Pressure 1

HOLDING REGISTER 4
<empty>

HOLDING REGISTER 5
Last dispensed quantity LSB

HOLDING REGISTER 6
Last dispensed quantity MSB

HOLDING REGISTER 10
Commands
B0 -> enable
B1 -> dispensg
B2 -> alarms reset

HOLDING REGISTER 11
Recipe

TROUBLESHOOTING

ERROR MESSAGES	CAUSE	PROBLEM RESOLUTION
Drive Power Enablement Alarm	Drive does not receive power	Make sure that all conditions are in place for operation, turn the controller OFF and ON again.
The controller does not turn on	Lack of power supply	Replace fuses, check the power line
Drive Connection Alarm	Drive is not connected correctly	Make sure all conditions are ok for operation, turn the controller OFF and ON again
Drive Alarm	The drive is on alarm	Make sure there are all the conditions for operation, turn the controller OFF and ON again.
Level Alarm	The minimum quantity of product has been reached.	Change cartridge/top up tank.
Pressure Alarm	Output pressure from the pump has exceeded the maximum threshold.	Check that there are no obstructions in the circuit, reduce the dispensing rate.
Drive Power Timeout Alarm	The drive is not responding	Make sure there are all the conditions for operation, turn the controller OFF and ON again.
PLC modbus timeout alarm	TCP/IP modbus communication error	Check wiring and verify that the TCP/IP MODBUS selector in the settings is on.

PCP COMPONENTS LEGEND

CONTROLLER ACCESSORIES PCP

	USE	CABLE TYPE	QUANTITY
A	POWER SUPPLY	Power Supply Cable	1
B	CONTROL	M8-4 poles Male	1
C	OUT	M12-8 poles Male	1
D	IN	M12-8 poles Female	1
E	LEVEL	M12-5 poles Male - Female	1
G	MOTOR PCP	Chogori	1
O	PRESSURE	M8-3 poles Male	1

DAV TECH SRL Via Ravizza, 30 - 36075 Montecchio Maggiore (VI) - ITALY - Tel. 0039 0444 574510 - Fax 0039 0444 574324
davtech@davtech.it - www.davtech.it