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ODORANT INJECTION SYSTEM

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Figure 1. Dosaodor DO200 Injection Panel and Control Panel



WARNING

Only qualified and instructed personnel can install and handle the odorant tank.

The odorizing system must be installed, operated and maintained in accordance to all applicable rules and standards.

Follow the instructions, especially the ones relevant to “pressure risk”.

The installation, operation and maintenance procedures, if not performed by qualified personnel, can be dangerous.

These circumstances can lead to damage to the devices, injuries to people or damage to properties due to gas or liquid leakage. If there is a leak in the system, the released gas can accumulate and provoke fires or explosions.

Dosaodor DO200

Explosions of parts under pressure can occur if the system is installed where its operating conditions (PS and TS) can be exceeded or where service conditions can exceed the limits of the piping or its connections.

Call immediately qualified service personnel in case of any issue.

In order to avoid these conditions, install the device in a safe place, where it is protected to the exposure to damage and/or corrosive substances, and where operating conditions are within the limits of the device (the product cannot be exposed to operating conditions different from what it has been designed for).

Do not exceed the pressure nominal values of the single components of the system.

Benefits:

- Operational safety
- Extreme reliability
- Very low maintenance
- Ease of use
- Results certainty

The system does not use any dosing pumps to inject the odorant liquid in the downstream pipelines, it uses the natural gas differential pressure, which is always present between the upstream and downstream sections of a reduction and metering gas station (minimum 1 bar) and an electrically controlled panel unit certified according to the ATEX international directive. In case 1 bar differential pressure is not present, it can be used methane or nitrogen cylinder pack to inject the odorant liquid downstream.

The injection panel is made of stainless steel, without a painted finish, or screen printing as odorizing liquids are aggressive.

Before any scheduled or unplanned maintenance, the system can be cleaned from odorant by performing a simple procedure that pushes the odorant inside the injection panel into the main odorant tank.

This allows the operator to perform the maintenance in an easier and safer way.

A pressure differential level transmitter measures in real time the quantity of liquid injected into the pipe, while the control panel automatically adjusts the dosing rate depending on the odorant quantity injected, measured by the level transmitter, compared to the instant natural gas flow rate (measured by a flow meter, or sent by a flow computer), ensuring great system reliability and overall accuracy.

The same differential pressure transmitter measures in real time the odorant level from the main tank, allowing an easy planning of the refill activities, providing the necessary information for the refilling of the tank.

Optionally the injection panel can be equipped with two injection valves, one for high (H) and one for low (L) flow rates.

The system can automatically switch between the injector valves based on the programmed data and current flow rate.

In the event of malfunctioning or power outages, the control panel saves the programming data by means of a buffer battery and sends out a signal to activate any emergency devices (it normally restarts operation of the absorption-type emergency system).

The Dosaodor DO200 complies to UNI-CIG 9463.

INTRODUCTION

Scope of the Manual

This manual provides installation, start-up and maintenance instructions for the Dosaodor DO200 odorant injection system. Information on the other equipment used with DO200 is found in separate manuals.

PRODUCT DESCRIPTION

The Dosaodor DO200 is a Smart odorant system for natural gas, that injects odorant proportional to the flow rate of the gas in transit. The Dosaodor DO200 is completely configurable and can interface with remote monitor and control system.

The system can be configured to use redundant injectors and/or emergency absorption system.

The equipment consists of an injection panel to be installed in the hazardous area and a control panel to be installed in the safe area, interconnected by electric cables.

The system ensures the dosing rate while keeping the desired odorant concentration level steady with over the entire flow range of the system, even when the flow is extremely variable and extremely low.

This particular feature guarantees high safety within the sphere of the natural gas distribution for public use. In fact, by maintaining a constant level of odorant concentration no matter what the gas flow rate, any leakage of gas can clearly be identified reducing the possibility of accidents.

In addition to this, recorded reports of the gas volumes, and the quantity of odorant emitted, allow gas grid operators the data for confirming the correct operation of the gas systems.

Absorption System

The absorption type backup system is constituted by a pneumatic valve actioned by a solenoid valve, both installed on the piping spool between the odorant tank and the main gas line, downstream the ΔP valve.

When the absorption system is activated, the pneumatic valve actioned by the solenoid valve opens ensuring gas flow through the tank, due to the differential pressure created on the gas main line by a dedicated valve (butterfly or ball valve depending on the operating pressures of the reducing station).

The gas, being in contact with the surface of the odorant liquid inside the tank, gets soaked with the same liquid, going back to the main line properly odorized.

The regulation of the gas flow is performed through the needle valve installed on the tank.

The setting of the absorption system is fixed; it is therefore necessary to modify it in case of a change in the operating conditions.

The absorption system tank is also used as service tank for the main injection system, ensuring, during normal functioning, the feeding of liquid to the injection panel.

The following accessories are installed on the tank:

- Level indicator
- Inlet needle valve
- Outlet valve
- Odorant loading valve
- Tank pressure gauge
- Liquid feeding assembly to the injection panel
- Collection basin

Double Injection System

As emergency system, instead of the absorption system, a second Dosaodor DO200 can be foreseen.

The system Injection + Injection works exactly like the system Injection + Absorption type; in this case the backup is ensured by the second Dosaodor DO200.

In this configuration, instead of one injection panel, two identical ones (Master / Slave) will be installed. In case of malfunctioning of the main panel, the second one will be activated and will work in the same way.

The selection between Master or Slave system is done through a dedicated switch.

Both systems will have dedicated power feeding and auxiliary batteries pack (optional).

Table 1. Maximum Odorizable Gas Flow Rate Smc/h

MAXIMUM SYSTEM CAPACITY l/h	DOSAGE 40 mg/Smc (THT)	DOSAGE 10 mg/Smc (mercaptans)
0,5	12500	50000
1	25500	100000
2	50000	200000
4	100000	400000
6	150000	600000
8	200000	800000
10	250000	1000000
12	300000	1200000
14	350000	1400000

Dosaodor DO200

CHARACTERISTICS

Control Panel

Cabinet material / Protection degree	Resin / IP55
Installation	Wall
Power Requirements	24 Vdc 100-240 Vac 50/60 Hz
Consumption	120 W @ 24 Vdc
Electromagnetic interferences	Compliant to 89/336/CE
Operating temperature	0 +40 °C
Humidity	10% - 90% not condensate
Installation site	Safe Area (not classified)
Dimensions	640 x 430 x 250 mm (h x l x p)

Input signals

Level measurement	Analog 4 – 20 mA (Exd)
Instant analog flow rate from Flow Computer (or from flow meter)	Analog 4 – 20 mA
Instant pulse flow rate from Flow Computer (or from flow meter)	Pulse
Cylinders pressure measurement (optional)	Analog 4 – 20 mA (Exd)

Output signals

Loading solenoid valve	24 Vdc (Exe)
Low dosing solenoid valve	24 Vdc (Exe)
High dosing solenoid valve	24 Vdc (Exe)
Pressurization solenoid valve	24 Vdc (Exe)
Absorption control solenoid valve	24 Vdc (Exe)

Communication ports

- 1 RS232 UART port (5 pin connector)
- 2 USB 2.0 ports (Type A)
- 1 Ethernet RJ45 port

Display

TFT LCD capacitive 7" Touchscreen	
Password	Default/programmable

Operating mode

Automatic - Excluded

Remote communication

Gateway 4G (optional)

Communication protocol

MODBUS RTU/TCP

Remote control software

Integrated web server

Injection Panel

Material	Stainless Steel
Liquid odorants	THT/Mercaptans
Installation	Wall or floor (optional)
Maximum feeding pressure	100 barg
Working Temperature	-10 +60 °C
Dimensions	1030 x 500 x 300 mm (h x l x p)
Weight	30 kg

Sampling cylinder characteristics (optional)

Refer to Emerson offices for proper application. The sampling cylinder tank will be delivered already installed in the Dosaodor DO200 injection panel. The injection panel has been designed to hold sampling cylinder tank weight.



WARNING

Maximum allowable Pressure (PS)	100 bar
Maximum working pressure	100 bar
Body material:	Stainless steel
Connections	1/4" NPT-F

Solenoid valves characteristics

Maximum working pressure	100 bar
Maximum differential pressure	19 bar
Body material	Stainless steel
Gasket material	FKM - FFKM
Valve operation	Electromagnetic
Power Supply	24 Vdc

SA/2 Pressure stabilizer characteristics

Maximum working pressure (PS)	100 bar
Body material	Steel
Gasket material	NBR rubber

For the operation and maintenance of the pressure stabilizer type SA/2 please see the Instruction Manual D103653X012.

INJECTION PANEL WITH SINGLE INJECTOR WITH SAMPLING TUBE

Key Description

- B Sampling tube
- C1 Multipolar cable inlet
- dPT Pressure differential level transmitter
- EV1 Loading solenoid valve
- EV3 Dosing solenoid valve
- EV4 Pressurization solenoid valve
- PI Pressure gauge
- R1 Pressure reducer I° stage
- R2 Pressure reducer II° stage
- S Junction box
- T1 Gas inlet pressure
- T2 Reference/unloading pressure
- T3 Level transmitter calibration intake
- T4 Odorant liquid loading intake
- T5 Odorant liquid injection intake
- V1 Valve cell L
- V2 Valve cell H
- V3 Injection isolation valve
- V4 Pipe isolation valve
- V5 Upstream pressure intake isolation valve
- VR Check valve

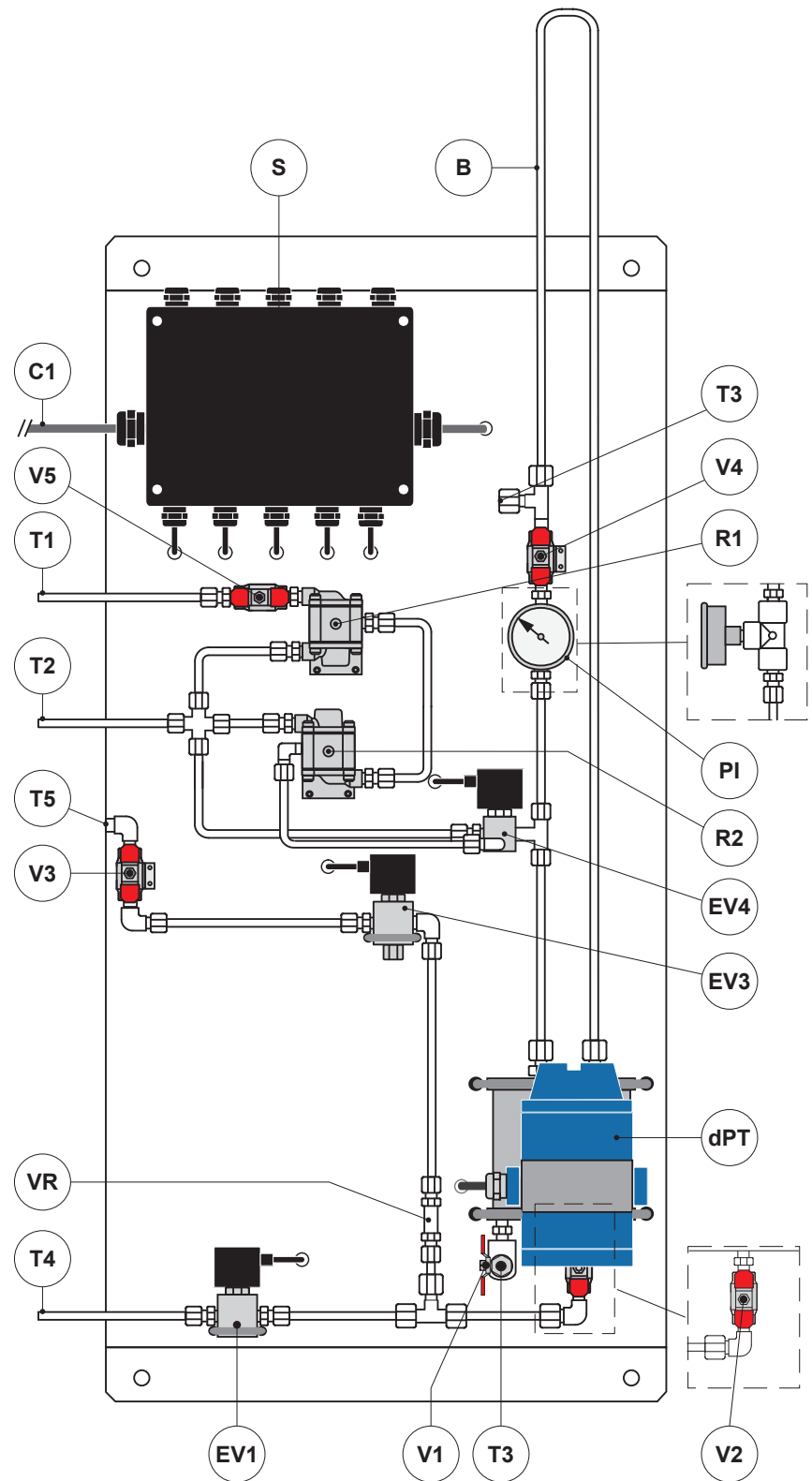


Figure 2. List of Main Components of the Injection Panel with Single Injector with Sampling Tube

INJECTION PANEL WITH SINGLE INJECTOR WITH SAMPLING CYLINDER

Key Description

- B Sampling cylinder
- C1 Multipolar cable inlet
- dPT Pressure differential level transmitter
- EV1 Loading solenoid valve
- EV3 Dosing solenoid valve
- EV4 Pressurization solenoid valve
- PI Pressure gauge
- R1 Pressure reducer I° stage
- R2 Pressure reducer II° stage
- S Junction box
- T1 Gas inlet pressure
- T2 Reference/unloading pressure
- T3 Level transmitter calibration intake
- T4 Odorant liquid loading intake
- T5 Odorant liquid injection intake
- V1 Valve cell L
- V2 Valve cell H
- V3 Injection isolation valve
- V4 Pipe isolation valve
- V5 Upstream pressure intake isolation valve
- VR Check valve

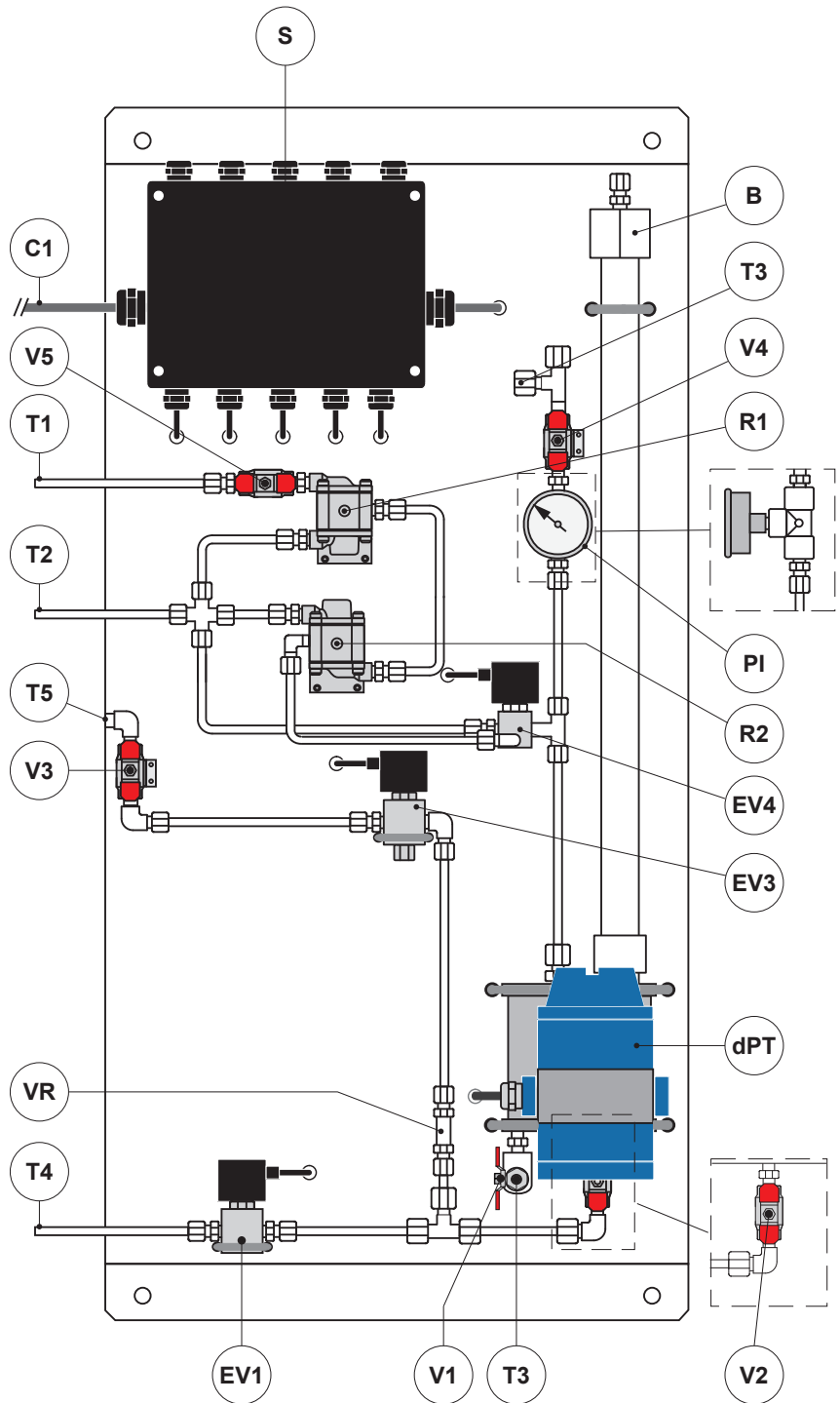


Figure 3. List of Main Components of the Injection Panel with Single Injector with Sampling Cylinder

INJECTION PANEL WITH DOUBLE INJECTOR WITH SAMPLING TUBE

Key Description

- B Sampling tube
- C1 Multipolar cable inlet
- dPT Pressure differential level transmitter
- EV1 Loading solenoid valve
- EV2 Low dosing solenoid valve
- EV3 High dosing solenoid valve
- EV4 Pressurization solenoid valve
- PI Pressure gauge
- R1 Pressure reducer I° stage
- R2 Pressure reducer II° stage
- S Junction box
- T1 Gas inlet pressure
- T2 Reference/unloading pressure
- T3 Level transmitter calibration intake
- T4 Odorant liquid loading intake
- T5 Odorant liquid injection intake
- VM Micrometric valve
- V1 Valve cell L
- V2 Valve cell H
- V3 Injection isolation valve
- V4 Pipe isolation valve
- V5 Upstream pressure intake isolation valve
- VR Check valve

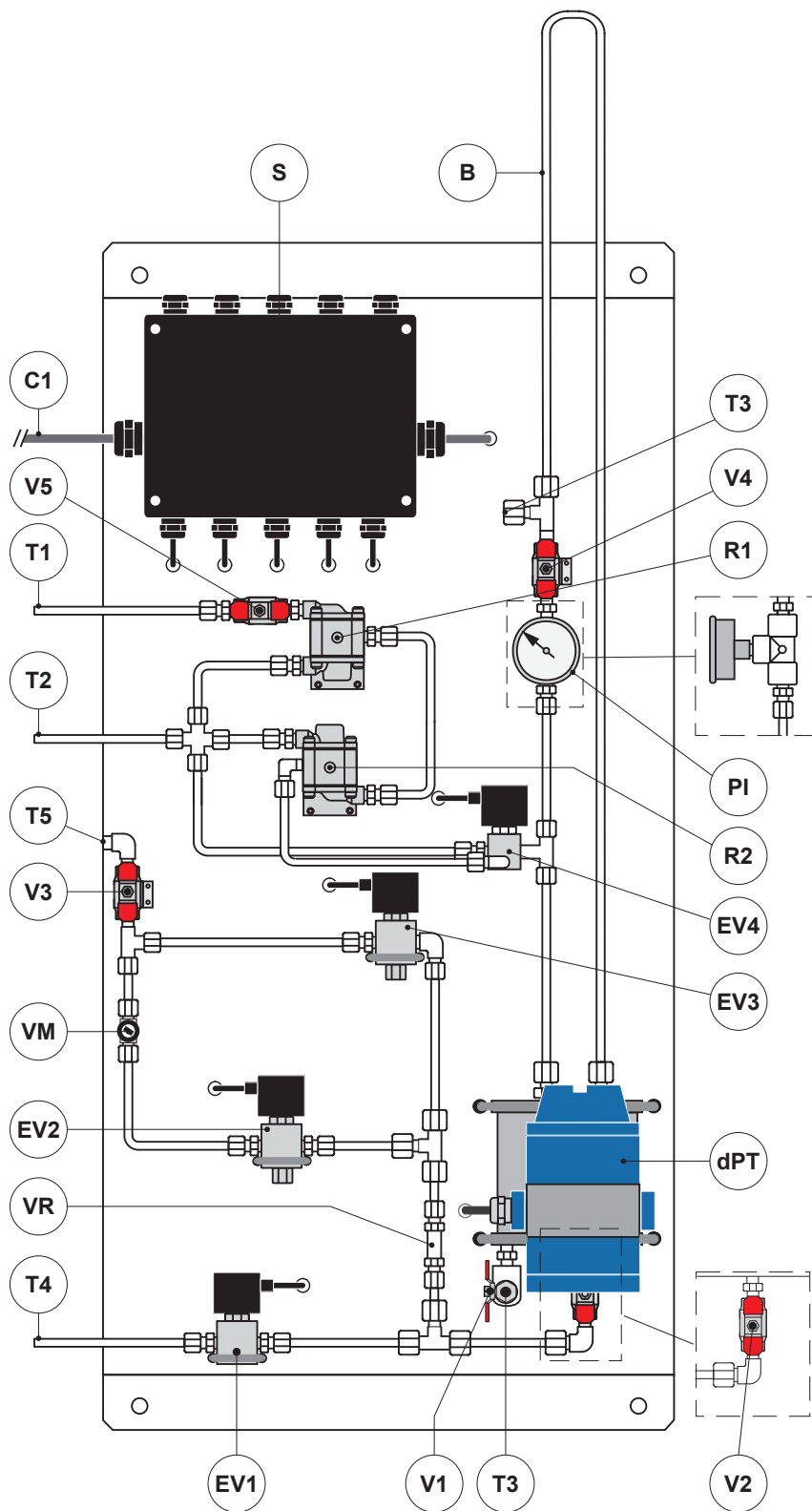


Figure 4. List of Main Components of the Injection Panel with Double Injector with Sampling Tube

INJECTION PANEL WITH DOUBLE INJECTOR WITH SAMPLING CYLINDER

Key Description

- B Sampling cylinder
- C1 Multipolar cable inlet
- dPT Pressure differential level transmitter
- EV1 Loading solenoid valve
- EV2 Low dosing solenoid valve
- EV3 High dosing solenoid valve
- EV4 Pressurization solenoid valve
- PI Pressure gauge
- R1 Pressure reducer I° stage
- R2 Pressure reducer II° stage
- S Junction box
- T1 Gas inlet pressure
- T2 Reference/unloading pressure
- T3 Level transmitter calibration intake
- T4 Odorant liquid loading intake
- T5 Odorant liquid injection intake
- VM Micrometric valve
- V1 Valve cell L
- V2 Valve cell H
- V3 Injection isolation valve
- V4 Pipe isolation valve
- V5 Upstream pressure intake isolation valve
- VR Check valve

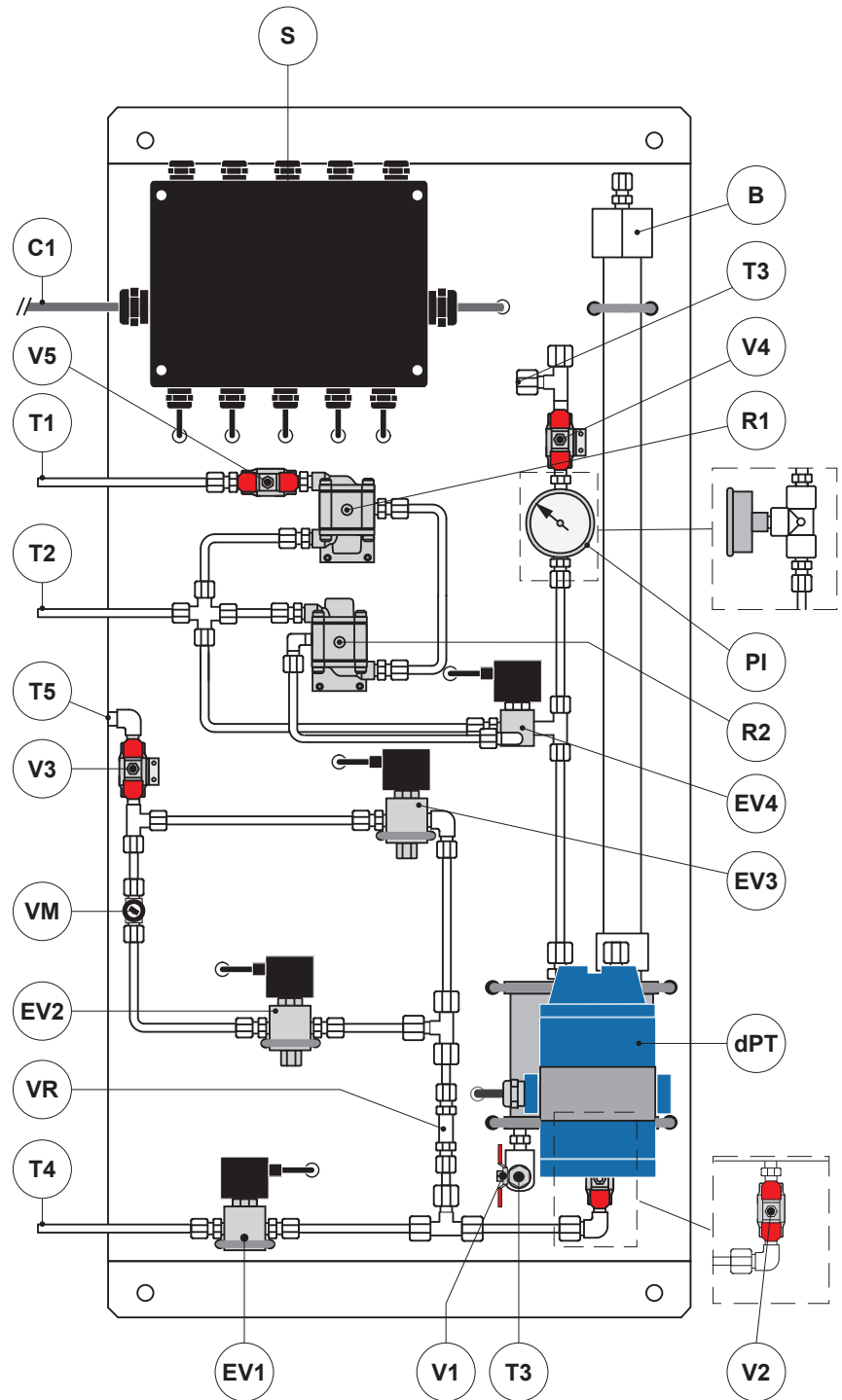


Figure 5. List of Main Components of the Injection Panel with Double Injector with Sampling Cylinder

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CONTROL PANEL

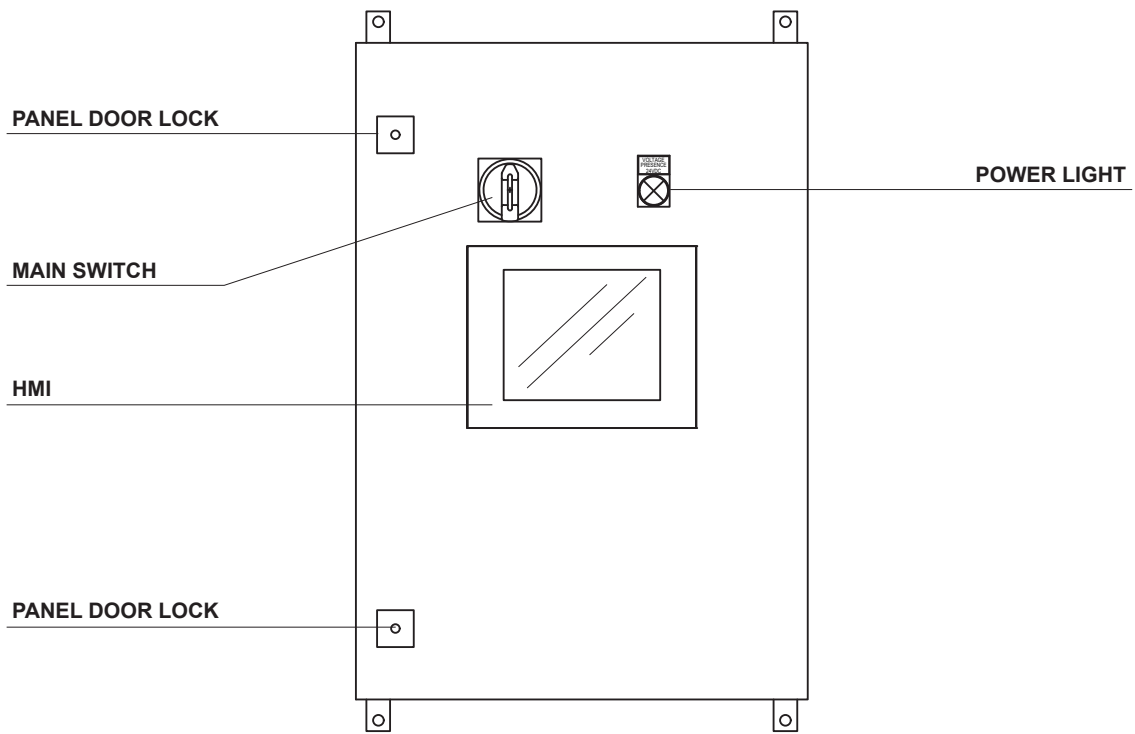


Figure 6. Control Panel with 220 V Power Supply

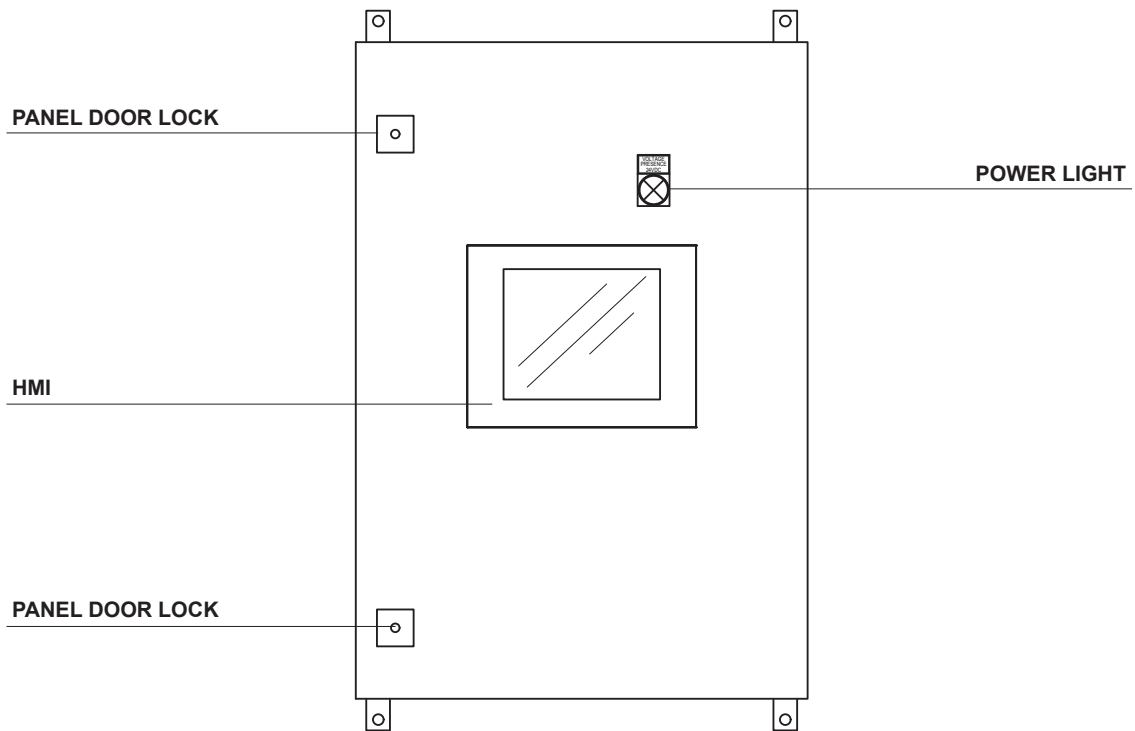


Figure 7. Control Panel with 24 V Power Supply

For images of the inside of the control panel, refer to the consultation of the wiring diagram supplied with the panel.

ATEX REQUIREMENTS

According to the following documents:

- I-N97 CEN/SFG-I “ATEX-Guidance Sheet (ATEX Guideline of Sector Forum Gas - Infrastructure)”
- FAREGAZ Position on ATEX Topics,

The Dosaodor DO200 injection system is classified as “Installation” according to chapt. 5.2.2 of “ATEX Guide Lines 4.a Edition - September 2012”, therefore it’s not included in Directive 2014/34/UE (ATEX I).

ATEX devices that are included in Dosaodor DO200 system must be Ex-certified.

Dosaodor DO200 system must comply to Directive 1999/92/EC (ATEX II) and the other applicable National standards.

Odorizing systems (absorption and/or injection types) are designed as independent installations or as part of pressure reducing stations (ref.: EN 12186).

Dosaodor DO200 is sold on the market with all its complementary parts, like for example the bypass for activating the absorption type system, the material for electric installation and all the other components to be properly installed on site.

The technical reference standards are released at National level (in Italy: UNI 9463-1 and 9463-2), but odorizing systems must be installed under the responsibility of the user after completing the risk analysis (dangerous areas classification, etc.) and, during the start-up, also the testing and necessary set-ups are realized under the user responsibility.

TRANSPORT AND HANDLING

Suitable and consolidated procedures for transportation and handling have to be adopted in order to avoid any damage to the devices under pressure due to abnormal stress.

The product can be lifted and positioned with standard lifting devices. A special care has to be taken to avoid any damage to installed accessories.

STORAGE

The Dosaodor DO200 is supplied with all the surfaces completely protected (painted or in stainless steel), so it does not require special precautions for the storage; it is enough to follow some recommendations.

At its arrival on site, the product has to be completely inspected to check any possible damage caused by the transport. Inspect also the conditions of the pressure accessories that are installed (valves, level indicators, etc.).

INSTALLATION

General Rules



WARNING

National safety standards must be followed for the installation and operation of odorizing systems, in particular for the electric connections, fire and lightning protections, and for the procedures of odorant liquid handling.

All ventilation means must be supplied in the pressure reducing stations where the pressure equipment is installed.

Before the installation, check that operating conditions are suitable with the limit ranges.

For odorant tank installation:

- **Foresee an adequate cathodic protection and electric isolation to avoid any corrosion.**
- **Gas must be cleaned through dedicated filters/separators/dust collectors to avoid any risk of erosion or abrasion in the parts under pressure.**

COMPONENTS POSITIONING

Control Panel

To be installed in an electrically “Safe” area. Therefore, in natural gas decompression plants, the facilities suited to these purposes are the following:

- Electric power facility, a defined area designed and built to house all electrical devices linked to and controlled by the station. i.e. Flow computers, remote monitoring units, telephones, etc.
- Heating plant, that is, a defined area designed and built to house the boilers needed for the heating of gas. This area must be built and installed according to the specifications for an electrically “Safe area” classification.
- Rooms and storage units located outside the areas defined as “Hazardous areas” according to the actual regulation.

It is recommended that the control panel installation guarantees an easy opening of main door.

It is best to install the unit in the immediate vicinity of the flow computer, to facilitate the connection of the cable receiving signals from the Dosaodor DO200 during operation.

Ground connections of the electronic control unit and shielded cables to must be connected an equipotential node (mandatory only for the countries members of the EEC).

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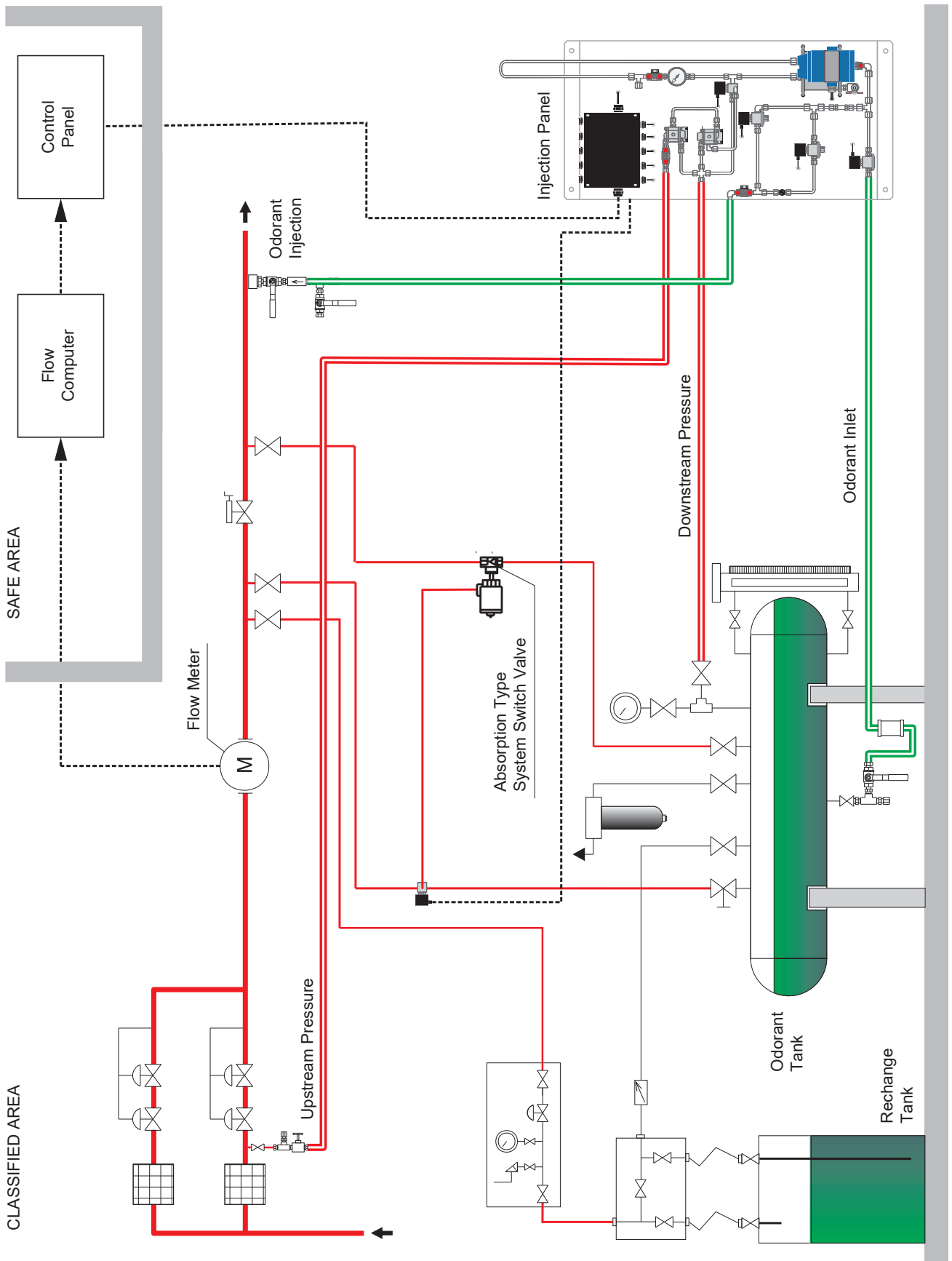


Figure 8. Connections Schematic of Dosaodor DO200 System with Absorption and Inlet Pressure Supply

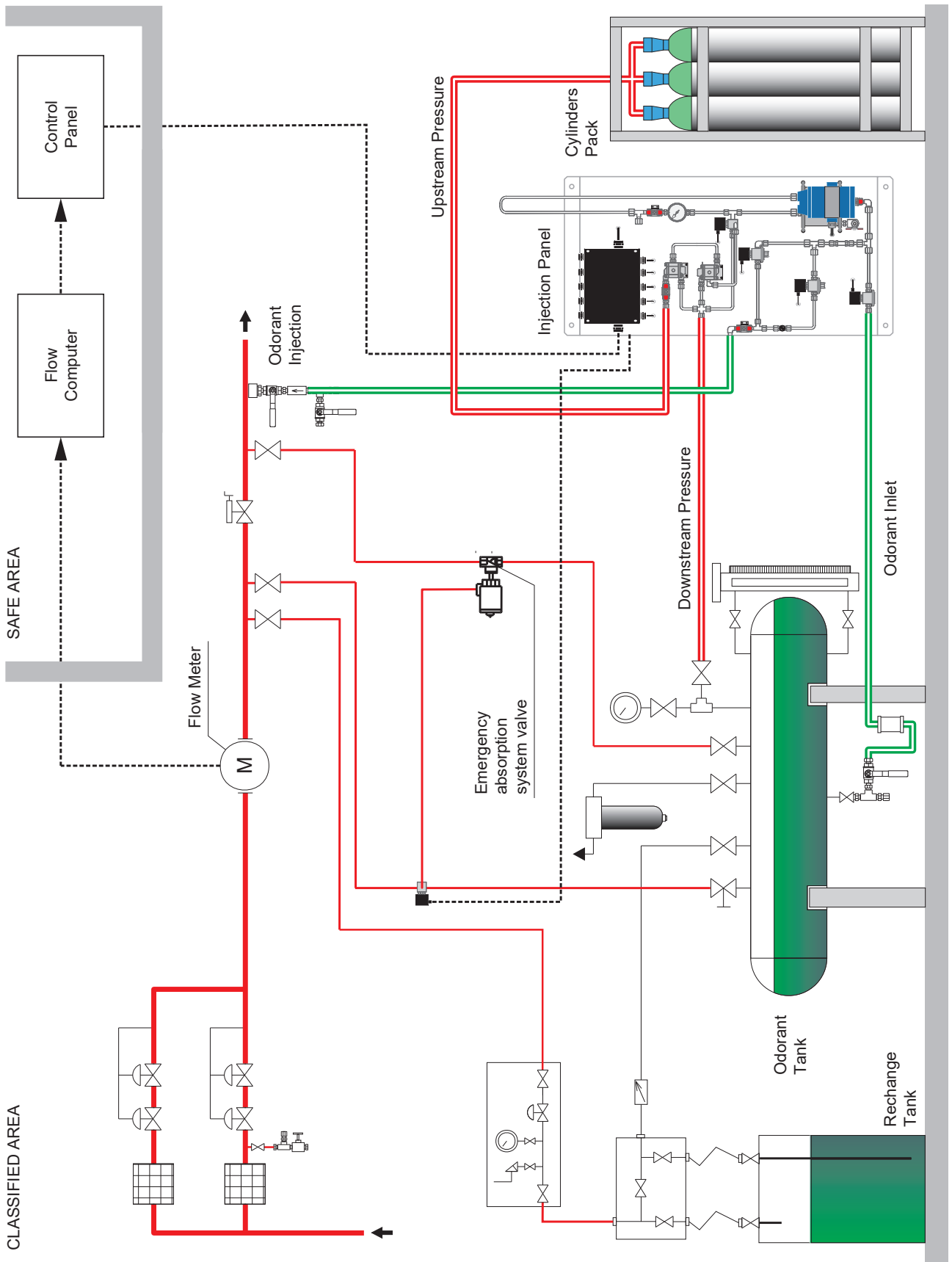


Figure 9. Connections Schematic of Dosaodor DO200 System with Absorption and Cylinders Pack Supply

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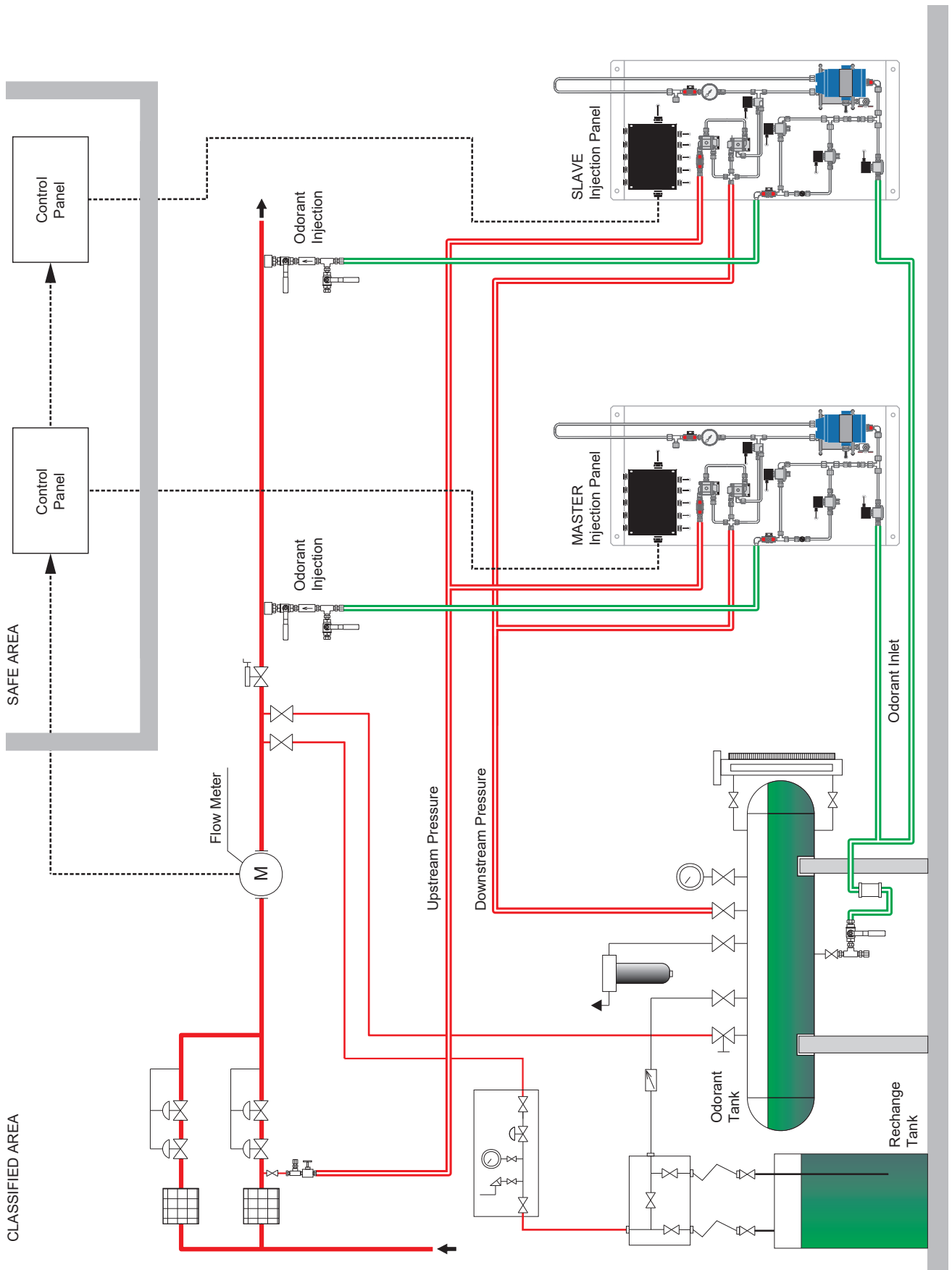


Figure 10. Connections Schematic of Dosaodor DO200 Master / Slave System with Absorption and Inlet Pressure Supply

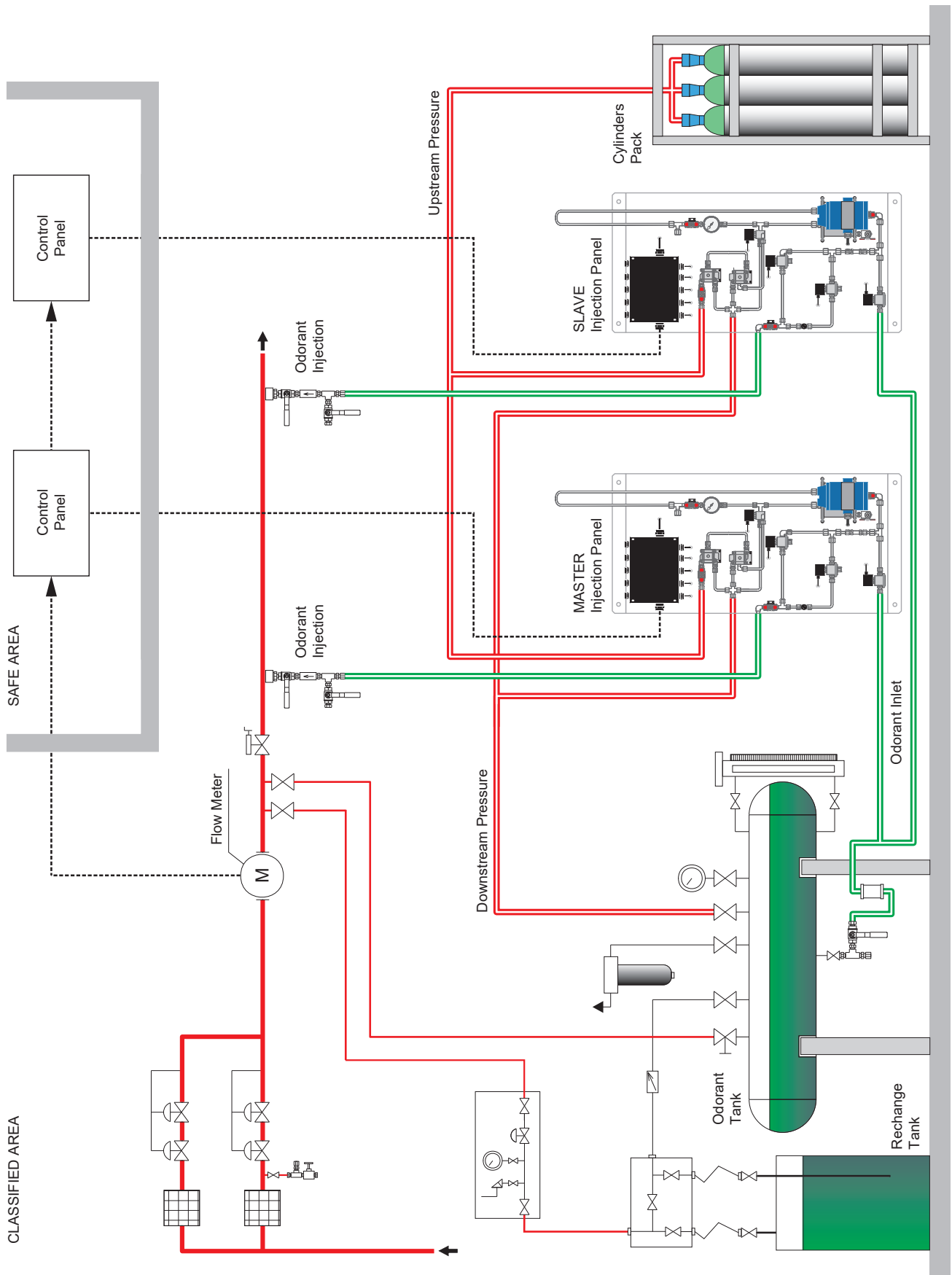


Figure 11. Connections Schematic of Dosaodor DO200 Master / Slave System with Absorption and Cylinders Pack Supply

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Injection Pressures Greater than 6 bar

Key	Qty	Description
1.	1	Tap NAM 1/2" M-F
2.	1	RX/181 pilot – FKM – setting = 6 bar
3.	1	Relief valve – FKM – 1/4" NPT-M setting = 7 bar
4.	1	Solenoid valve 3-way DN 1/4" NPT-F, Eexd
5.	4	Straight fitting DN 1/4" NPT-M

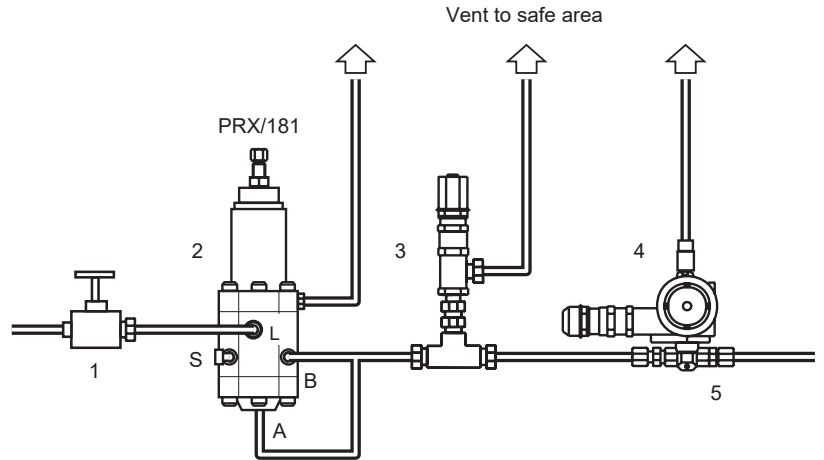


Figure 12. Injection Pressures Greater than 6 bar Connection Schematic Detail (required only when the absorption type system is included)

Liquid Odorant Injectors

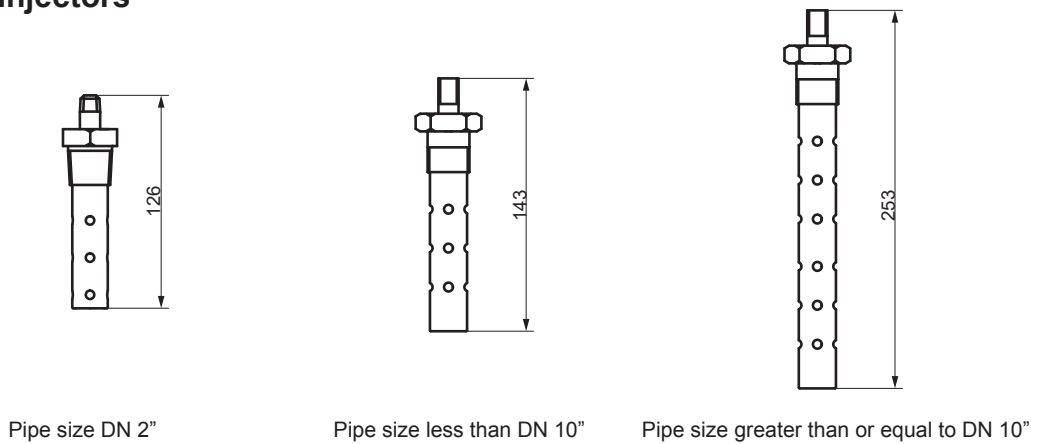


Figure 13. Liquid Odorant Injectors Connection DN 3/4"

Odorant Filter Dimensions and Connections

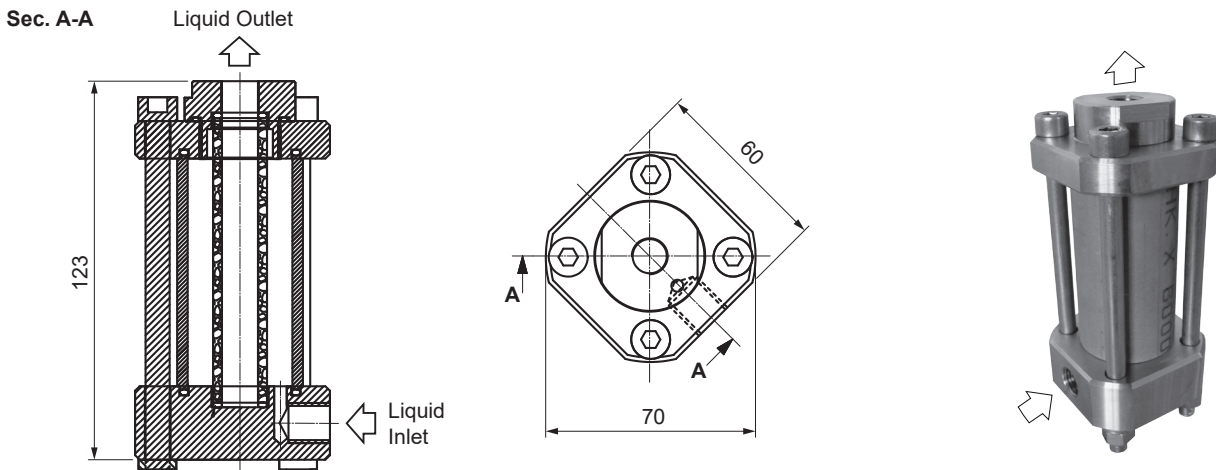


Figure 14. Odorant Filter Dimensions and Connections

Injection Panel

To be installed in the immediate vicinity of the odorant pick-up point (absorption-type tank or other type of tank).

All its components can resist to the chemical attack of all odorant liquids and the aggression of atmospheric agents; it has to comply with the requirements to guarantee electric safety.



The injector has to be installed on the downstream piping of the station. It is important to minimize the distance between panel and injector, as a short distance limits the quantity of odorant under pressure, reducing the possibility to have liquid micro leaks.

The panel, in its standard version, is designed for floor installation; upon request, a support can be supplied for wall installation.

It is very important to check that the lowest point of the tank from which the odorant is picked up (bottom) is located at a height of at least 50 cm from floor level, and that the panel is positioned with the lower anchoring brackets resting on the floor.

Lower height between 40 cm and 50 cm shall be evaluated punctually based on the instantaneous gas flow rates.

For wall installation (optional), two spacer brackets are supplied to install the panel at a certain distance from the supporting wall.

The Dosaodor DO200 system includes an accessory kit necessary for the standard installation of the system. For the installation of the optional absorption type system refer to Figure 8.

Pneumatic Lines

The pneumatic connections between the Dosaodor DO200 panel, the gas piping and the odorant tank must be realized only with stainless steel tubing of adequate diameter; in this way the system is suitable to work also with mercaptan odorants.



The piping connecting the Dosaodor DO200 panel with the odorant tank has to be shaped in a way to avoid air/gas pockets, therefore it is suggested to make it as straight as possible and with a constant slope, with absolutely no rises and descents.

COMPONENTS CONNECTIONS

Electric Connections on Site

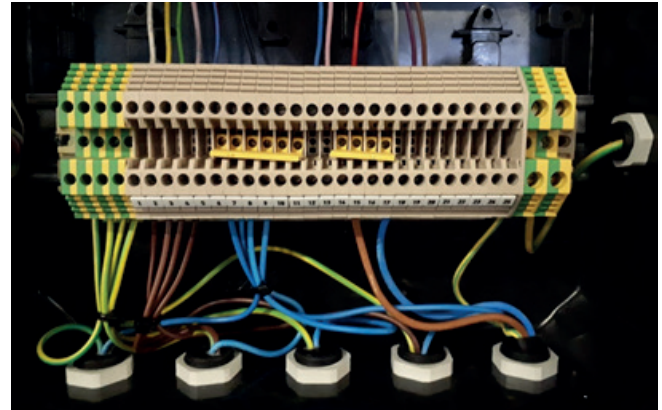


Figure 15. Electric Connections

The junction box S, installed on the injection panel, collects all the signals (input and output) present on site. Inside the box there is a terminal for the connections, with numbered clamps and ground clamps.

The lower clamps are connected to the solenoid valves commands and analog signals coming from the measurement instrumentation.

Table 2. Electrical Connection of the Solenoid Valves to the Junction Box

DEVICES		JUNCTION BOX S
EV1 LOAD	Brown	1
	Blue	6
	Green	Ground
EV2 INJECTION L	Brown	2
	Blue	7
	Green	Ground
EV3 INJECTION H	Brown	3
	Blue	8
	Green	Ground
EV4 PRESSURE	Brown	4
	Blue	9
	Green	Ground
EV5 ABSORPTION	Brown	5
	Blue	10
	Green	Ground

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Table 3. Electrical Connection of the Differential Level Pressure Transmitter to the Junction Box

DEVICES		JUNCTION BOX S
DP LEVEL TRANSMITTER	PWR +	15
	COMM -	18
	GND	Ground
CYLINDERS PRESSURE	SIGNAL +	17
	SIGNAL -	20
	GND	Ground
TANK LEVEL TRANSMITTER (OPTIONAL)	SIGNAL +	16
	SIGNAL -	19
	GND	Ground

The injection panel and the control panel are connected through a multipolar cable:

FR20HH2R (12 x 0,75 mm²) or similar.

This cable is connected to the upper clamps in the Junction Box S of injection panel, and to the terminal of the control unit located in the control panel.

Table 4. Electrical Connections of the Multipolar Cable to the Junction Box

DEVICES	JUNCTION BOX S	MULTIPOLAR CABLE (COLORED POLES)	MULTIPOLAR CABLE (NUMBERED POLES)
EV1 LOAD Solenoid Valve	1	White	1
EV2 INJECTION L Solenoid Valve	2	Yellow	2
EV3 INJECTION H Solenoid Valve	3	Green	3
EV4 PRESSURE Solenoid Valve	4	Grey-pink	4
EV5 ABSORPTION Solenoid Valve	5	Red-blue	5
0 V	8	Black	6
External Flow Meter (+)	12	Blue	7
External Flow Meter (-)	13	Pink	8
24Vdc	15	Red	9
Dpt Level Transmitter (-)	18	Grey	10
Tank Level Transmitter (optional) (-)	19	Purple	11
Cylinders Pressure Transmitter (-)	20	Brown	12
-	Ground	Shielding	Shielding

Electric Connections in the Control panel

Table 5. Electrical Connection of the Junction Box to the Control Panel

DESCRIPTION	TYPE
Control Panel Power Supply	Power supply 230 Vac
Injection Panel Power Supply	Power supply 24 Vdc
Impulsive Flow Rate	Digital Input
External Feedback M/S	24 V
M/S Selector	24 V
External UPS feedback	24 V
DP Level Transmitter	Analog Input
Flow Rate Active Signal from Flow Computer	Analog Input
AI Spare 01	Analog Input
AI Spare 02	Analog Input
EV3 INJECTION H Solenoid Valve	Digital output
EV2 INJECTION L Solenoid Valve	Digital output
EV4 PRESSURE Solenoid Valve	Digital output
EV5 ABSORPTION Solenoid Valve	Digital output
EV1 LOAD Solenoid Valve	Digital output
System Alarm	Digital output
Power Supply	Digital output

For the connections on the control panel terminals, refer to the consultation of the electrical scheme supplied with the panel.

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Pneumatic Connections

If Teflon tape is not available, it is recommended to use a thread sealer of strong type on all the junction fittings to avoid any leak of odorant.

For the withdrawal of the liquid from the odorant tank, it is recommended to use, where available, an intake valve on the bottom of the tank; If it is not available it shall connect to the bleed intake on the bottom of the level indicator.

For pneumatic connections use the tubing in the following table (see Figure 9 and 10):

Table 6. Pneumatic Connections

DESCRIPTION	PIPING
Odorant Inlet	Tube 6 x 1 mm AISI 316L
Downstream Pressure	Tube 8 x 1 mm AISI 316L
Inlet Pressure	Tube 8 x 1 mm AISI 316L
Odorant Injection	Tube 6 x 1 mm AISI 316L

STARTUP

Preliminary Checks

Before Commissioning and start-up the Dosaodor DO200 is mandatory do a preliminary check.

Upon delivery on site the equipment must be inspected for damages occurred during transportation. As a minimum, the following points must be inspected:

- Integrity of connections and equipment sealing
- Status of the HMI Touch Screen panel. If it is damaged is not possible to startup the Dosaodor DO200
- Visual check of critical areas such as pipe plugs, electrical connection, etc

Any damage shall be reported to the project team and to the vendor to agree and coordinate any repair work.

The Injection Panel has been subject to a hydrostatic test at the factory according to applicable codes and thoroughly inspected for leakage during that test.

However, handling during transportation or moving into place may have loosened gasket seals therefore it is recommended to recheck all bolted connections prior to startup.

Equipment operating at high pressure should be warmed up slowly and uniformly before applying full pressure.

Pressure should be increased in stages of approximately 10% of operating pressure up to the operating value. In case of leakage or other issues, the procedure should be immediately stopped, and the problem investigated and solved before a new startup.

Before startup and after the initial startup, at normal operating pressure and temperature, it is recommended to inspect all gasketed joints for tightness.

Before switching on the electronic control unit, it is necessary to define and set the Gas Volume/Gas Delivery signal type.

The control unit can acquire an Analog Gas Instant Flow Rate signal 4-20 mA (Standard Configuration) or an BF pulse Gas Volume signal (to be configured).

Check all of the electrical and pneumatic connections for proper conformity throughout the entire system, using the diagrams and drawings as specified.

Check that all valves for connection between the Injection Panel and remaining part of the station are perfectly closed as it is only possible to proceed with switching on the control unit only under these conditions.

Control Panel Power-on

If all preliminary checks described in the preceding section have been carried out, the system can be switched on.

On the cabinet door turn the general "MAIN SWITCH" to position "1-ON":

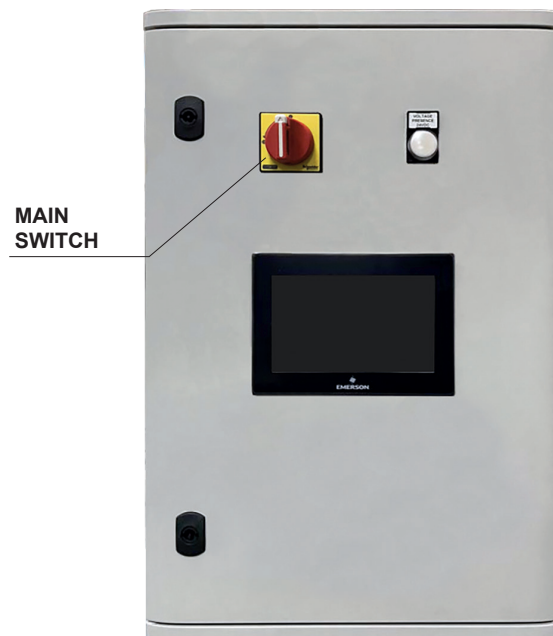


Figure 16. Control Panel Main Switch

If the startup is correct, the display located on the control panel will switch on and show in sequence the splash screen with Emerson logo, and then the home page = "OVERVIEW".

System startup

The system is delivered pre-configured in the factory with the parameters necessary for its operation based on the specifications of the system where installed. The following parameters must be configured on site:

- Tank Geometry Data, if the injection panel is equipped with the Sampling tube and there is no external tank level transmitter

If the sampling cylinder is present in the injection panel, the system will not measure the tank level and it will be necessary to connect the signal from an external level transmitter to the system and configure the corresponding SPARE analog input and the related alarm thresholds

- Full scale signal of the instantaneous gas flow rate signal or the impulse weight value in case of impulsive gas flow
- Concentration set
- Any additional analog signals (eg cylinder pressure)

Before starting the Dosaodor DO200, make sure that all pneumatic connections have been made correctly and that the junction fittings are all well tightened.

To do this, proceed as follows:

1. Close the odorant inlet valve, located at the base of the tank.
2. Open the three gas shut-off valves on the main pipe (valve downstream of the panel, valve upstream, injection valve).
3. Check, using a can of leaking foam, if there are gas leaks (check ALL joints).
4. Accessing with Operator credentials, on the OVERVIEW page, press the INJECTION button to start the system.

The system will start the filling phase by opening the filling solenoid valve and depressurizing the injection panel, putting the injection panel in communication with the tank.

This condition will be maintained for a maximum of 300 seconds, at the end, the system will exclude it by signaling an odorant refill failure alarm.

5. During this time, check for the presence of gas leaks in the section of piping that connects the Injection Panel with the odorant tank.
6. If there are no leaks, wait for the system to go into alarm and open the filling valve located on the tank.
7. On the control panel, press the injection button twice. The first press will reset the alarms (red light), the second press will activate the system (green light).
8. The system will now be in RUN, will repeat the loading phase. Once filled with liquid, the injection panel will begin the dosing phase.

The Dosaodor DO200 has two work phases that are performed in a cyclic sequence: LOAD phase and INJECTION phase.

1. In the LOAD phase the system switches the pressurization solenoid valve to balance the pressure of the injection panel with the pressure of the tank.
1. The fill solenoid valve is opened, putting the injection panel in communication with the tank. For the principle of communicating vessels, the liquid flows from the tank towards the injection panel. When the liquid level stabilizes, the system updates the residual liquid level of the tank and closes the filling solenoid valve and starting the INJECTION phase.
1. In the INJECTION phase, the system switches the pressurization solenoid valve again by adding a delta pressure in addition to the line pressure value, to ensure adequate thrust pressure for the injection of the odorant liquid into the network. The high pressure is regulated by two SA / 2 pressure regulators and can be taken upstream of the pressure reduction or from cylinders (nitrogen or other inert gas).

Depending on the gas flow rate, the odorant liquid is automatically injected through the injection solenoid valves (based on the type of injection panel).

In the version of the injection panel with two solenoid valves (Injection L or Injection H), the selection of use of one or the other valve is determined by the instantaneous flow rate of the gas as a function of appropriate thresholds set.

Once the injection phase is complete, the system will start the LOADING phase again.

Dosaodor DO200

MAINTENANCE

Procedures and Recommended Times for Ordinary /Extraordinary Maintenance Operations

It is evident that Emerson's Dosaodor DO200 dosing system, based on its technology materials and equipment used, including field experiences, generally requires routine maintenance once every three solar years.



WARNING

At regular intervals, an examination of the general operating conditions of the system should be carried out.

The frequency of inspection/control and replacement depends on the severity of the terms of service and the applicable national laws and rules/rules, a minimum check every 12 months is recommended.

Specific procedures are prepared by the service provider or end-user according national and applicable codes and regulations.

If any odorant liquid or gas leakage or gas escaping occurs, safety procedures shall be applied to shut-down the odorizing system.

For shutting down the Dosaodor DO200 when required, slowly reduce the pressure in the system to avoid any possible damage.

Never open the equipment before the pressure has been completely released.

Ordinary Maintenance

For the execution of the routine maintenance operations it is necessary to procure the appropriate maintenance kit, it contains all the spare parts that will need to be replaced to the plant in order to renew it and make it

re-compliant with the functional specifications with which it was originally constructed.

Extraordinary Maintenance

It will have to be carried out if the system no longer injects the necessary amount of odorizing, this situation is detected and highlighted by the control unit. In order to carry out maintenance operations, you must have personnel

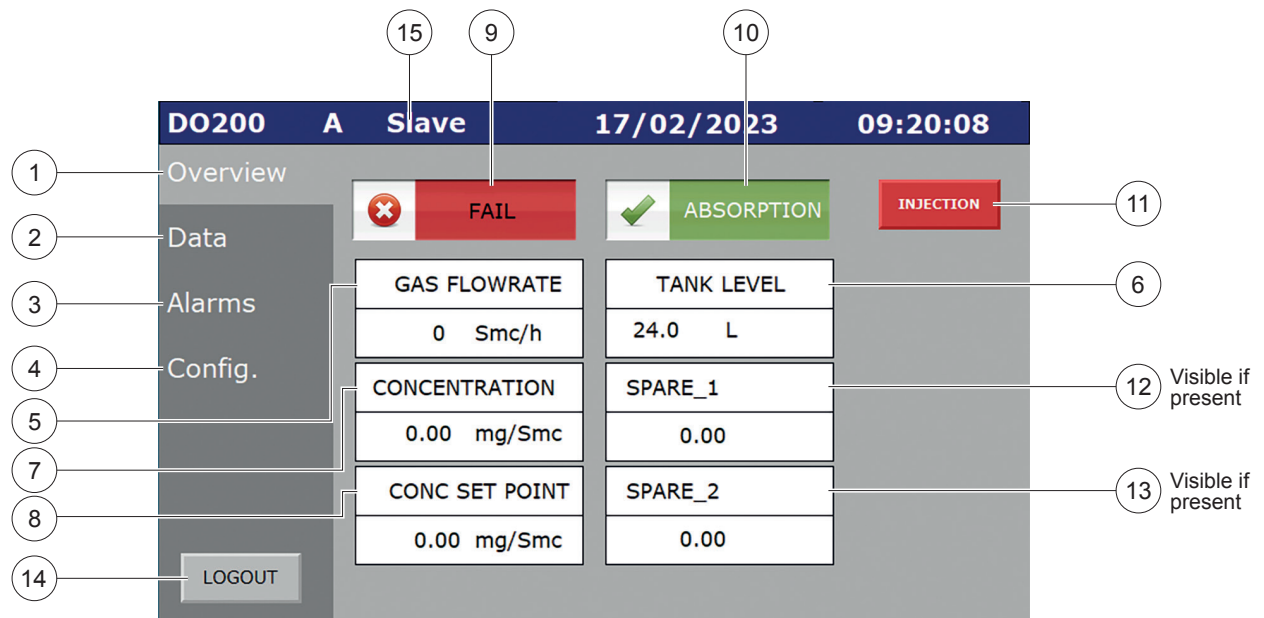
for the purpose, in particular you must be able to carry out mechanical/pneumatic interventions, having clear the necessary knowledge inherent in the safety procedures that inevitably need to be adopted when intervening on plants that handle flammable and/or odorant liquids.

WASTE DISPOSAL REQUIREMENTS

The disposal of waste and e-waste from packaging, spare parts, lubricants, whole equipment/systems and produced in occasion of on-site surveillance activities (during service life and/or at the end of their service life), shall be carried out in accordance with the requirements of applicable local regulation (laws and rules).

TOUCH SCREEN PANEL

Panoramic - Injection + Absorption

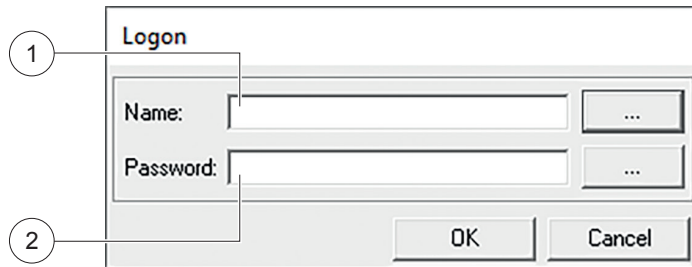



1. Menu Overview: if pressed, you pass to the mail screen.
2. Menu Data: if pressed, you pass to the page of data process index.
3. Menu Alarms: if pressed, you pass to the list of current alarms, their history and thresholds' settings.
4. Menu Config. (minimum level access administrator): if pressed, you pass to the page of general HMI settings related to the display and the configuration parameter of the serial lines.
5. Numeric display of gas flow rate (Smc/h).
6. Numeric display of residual level inside the tank (l).
7. Numeric display of the current concentration (mg/Smc).
8. Numeric display of the odorant set point (mg/Smc) – input enable with user access Administrator.
9. Operation mode of the system:
 - Background color red = injection not active (FAIL/STANDBY)
 - Background color green = injection active (RUN)
10. Operation mode of the emergency system:
 - Background color red = absorption not active
 - Background color green = absorption active
11. Button of injection activation/deactivation (access level Operator):
 - Color green: injection active
 - Color red: injection not active. System in emergency (absorption active or injection active by a slave)
12. Numeric display of the analog signal of "Spare 1" (settable only by user Manufacturer and visible if present).
13. Numeric display of the analog signal of "Spare 2" (settable only by user Manufacturer and visible if present).
14. Login/Logout.
15. Visible if Master/Slave Configuration is enabled
 - A DO200 A - B DO200 B - Master DO200 Master - Slave DO200 Slave

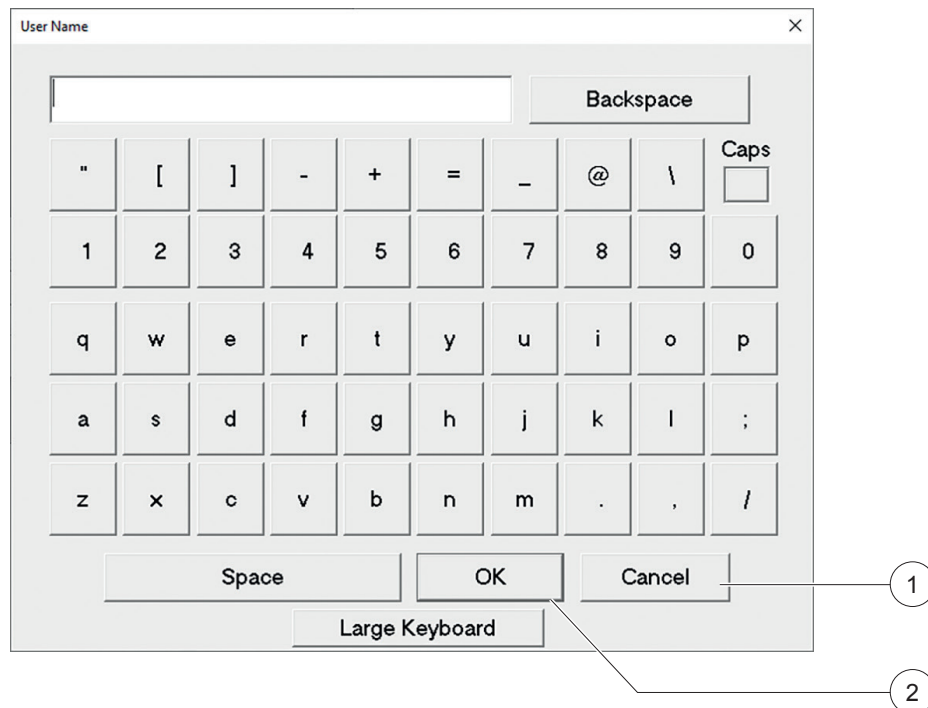
At the top of the screen, on the right, is shown the timestamp of the system synchronized with the PLC one.


HOW TO DO THE AUTHENTICATION

By pressing Login from the menu on the left, the following screen opens:



1. Name: The Username can be entered in the box using the keyboard directly, or by touching the key  the Username can be entered using the pop-up keyboard.



2. Password: the Password can be typed inside the box using the keyboard directly, or by touching the key  the password can be entered using the pop-up keyboard.

To write Username or Password, press the corresponding letters and then confirm by pressing the OK key (2) or cancel with the Cancel key (1).

ACCESS LEVELS HMI

Table 7. HMI Level

GROUP IN HMI	USER	PASSWORD
1:SecurityGroup01	Op	bbbb
2:SecurityGroup02	Admin	cccc

1 is the lowest access, 2 the highest:

1. No Log In

From the Overview of the panel, only the main operating parameters are visible: alarms, process data and operating status of the system.

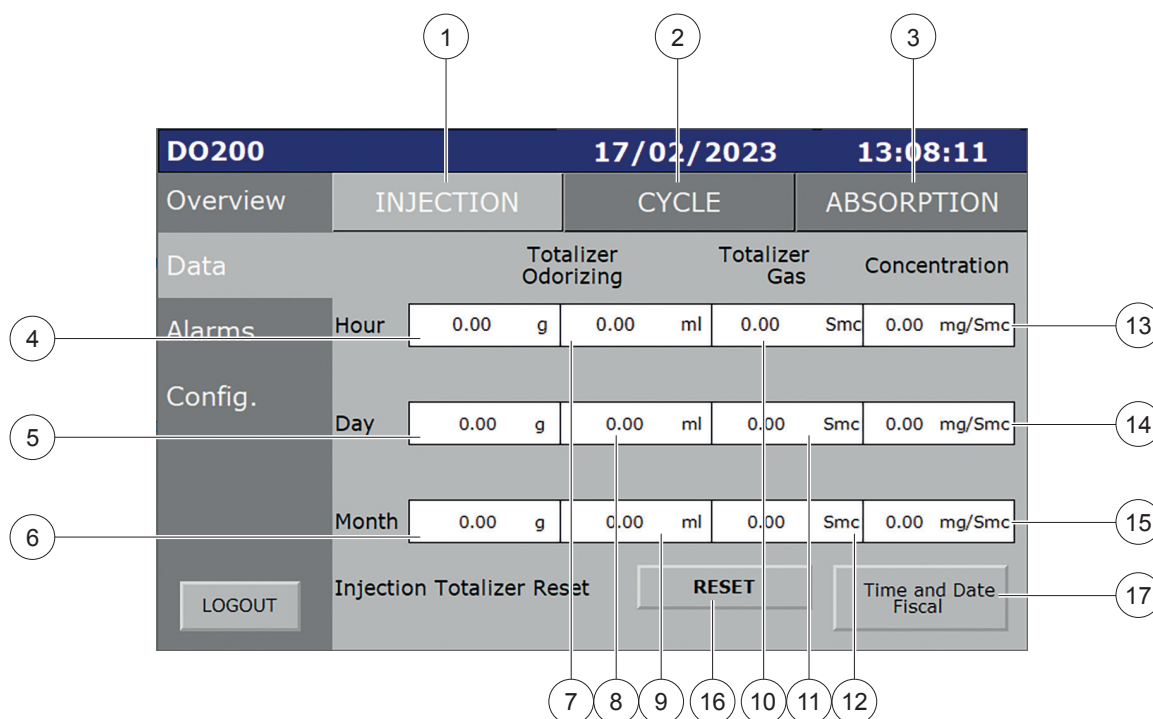
2. Op

The access as Operator allows, in addition to viewer functions, to act on other settings, such as pressing the start AUTO/MAN (OVERVIEW page), resetting the values of index (PROCESS DATA pages), and enabling the fixed flow function (ALARM THRESHOLDS page).

3. Admin

Access as ADMINISTRATOR allows, in addition to viewer and operator functions, to set the parameters of the ALARM THRESHOLDS page in their entirety, to set the set point of the desired concentration ratio (OVERVIEW page).

PROCESS DATA: INJECTION



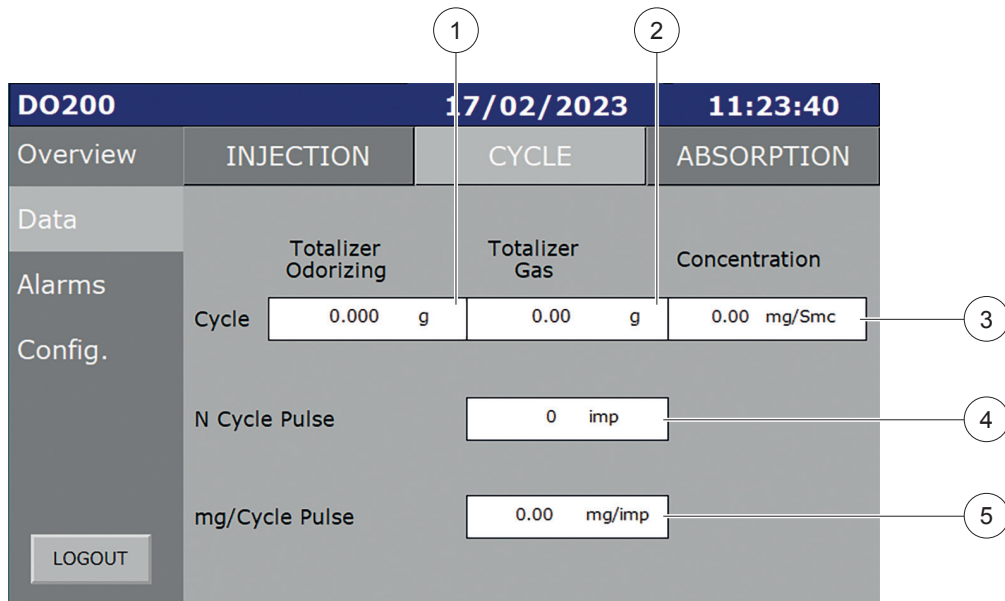
1. Process Data\Injection page.
2. Process Data\Cycle page.
3. Process Data\Absorption page.
4. Numeric visualization of odorant g injected in the current hour.
5. Numeric visualization of odorant g injected in the current day.
6. Numeric visualization of odorant g injected in the current month.
7. Numeric visualization of odorant ml injected in the current hour.
8. Numeric visualization of odorant ml injected in the current day.
9. Numeric visualization of odorant ml injected in the current month.
10. Numeric visualization of CH4 mc passed in the current hour.
11. Numeric visualization of CH4 mc passed in the current day.
12. Numeric visualization of CH4 mc passed in the current month.
13. Numeric visualization of concentration calculated in the current hour.
14. Numeric visualization of concentration calculated in the current day.
15. Numeric visualization of concentration calculated in the current month.
16. RESET: if pressed, reset all the injection index of the system (access level Operator).
17. Fiscal dates and time: if pressed, it opens a popup (see below) where you can set the fiscal day and time (operator access level). By default they are set: 6 for the fiscal hour and 1 for the fiscal day.

Fiscal Day&Time
✕

Fiscal Hour

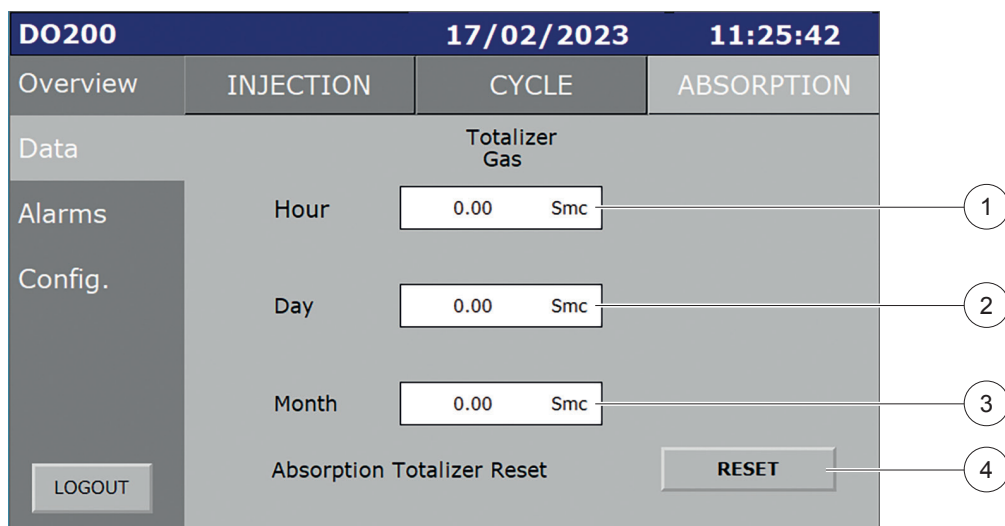
Fiscal Day

PROCESS DATA: CYCLE



1. Numeric visualization of odorant g injected in the previous cycle.
2. Numeric visualization of CH4 mc passed in the previous cycle.
3. Numeric visualization of concentration calculated in the previous cycle.
4. Number of odorant pulses calculated in the previous cycle.
5. Numeric visualization of the mg/imp. average calculated in the previous cycle.

PROCESS DATA: ABSORPTION



1. Numeric visualization of CH4 mc passed in the current hour with absorption active.
2. Numeric visualization of CH4 mc passed in the current day with absorption active.
3. Numeric visualization of CH4 mc passed in the current month with absorption active.
4. RESET: if pressed, reset all the injection index of the system with absorption active (access level Operator).

ACTIVE ALARMS

In this page are displayed the currently active alarms.

1. Column date of the alarm: displays the date when the alarm was triggered.
2. Column time of the alarm: displays the time when the alarm was triggered.
3. Number id of the alarm.
4. Column message of the alarm: description of the alarm.
5. Active alarms page.
6. History of alarms page.
7. Alarm thresholds page.

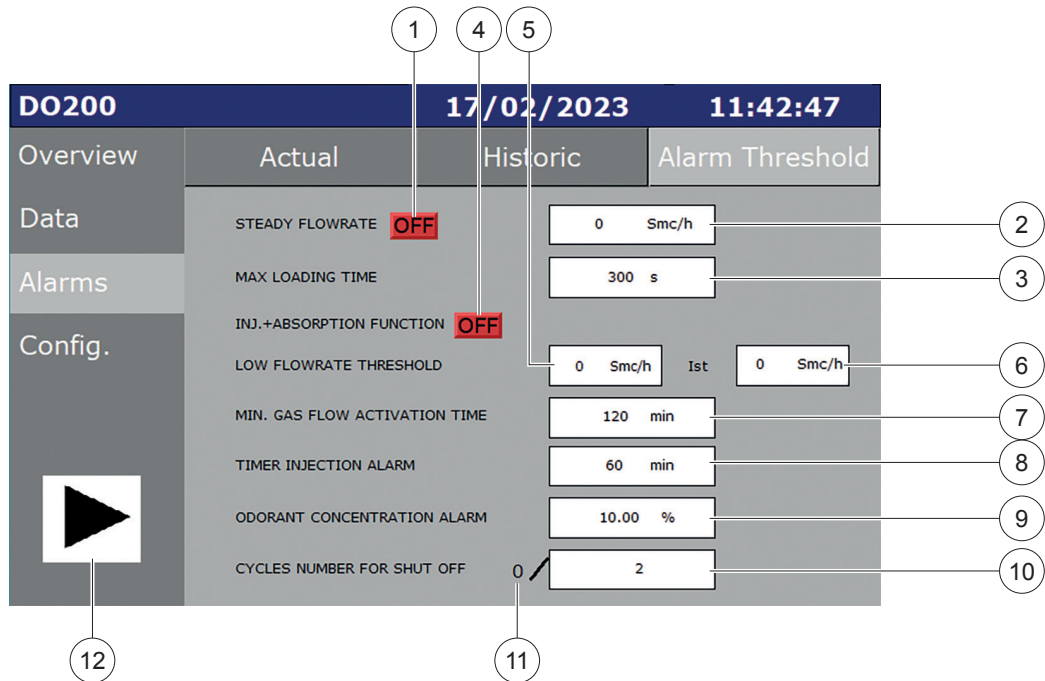
If there is at least one active alarm, the red light on the left menu flashes.

Note: All alarms are displayed in chronological order.

ALARM HISTORY

The HISTORY page is structured as the current alarms page but displays historical alarms: if highlighted in red, they refer to the time when they are unleashed; if in green they are reset (automatically).

ALARM THRESHOLDS



With level access operator:

1. Button On/Off **STEADY GAS FLOWRATE**

This key activates (or deactivates) the “steady gas flowrate” function. If it’s green (ON), in case of gas flow rate sensor failure, the system simulates the flow value with the value set in the field 2; if red (OFF), in case of gas flow rate sensor failure, the system does not simulate the flow value. Activating this function allows you to dose a fixed amount in the event of a range sensor failure.

2. Field **STEADY GAS FLOWRATE**

If pressed, you can set the fixed flow value for the function described at point 1.

With level access administrator:

3. Field **MAXIMUM CHARGING TIME**

If pressed, you can set a value (seconds) that will match the maximum duration of the charge phase. If the charge is not completed within this time, the system stops due to Maximum Load Time Exceeded.

4. Button **FUNCTION INJ. + ABS.**

Pressing this key activates (or deactivates) the function for which the DO200 system activates the Absorption System if the flow rate falls below the ‘LOW FLOW THRESHOLD’ (field 5).

5. Field **LOW FLOWRATE THRESHOLD**

If pressed, it is possible to set the minimum value (0 by default) below which the flow rate currently reported by the fiscal meter is not tolerated: if the flow rate is lower than this limit and Key 4 is not active, the set time is valid. to Field 5, after which the Absorption System is activated.

6. Field **LOW FLOWRATE HYSTERESIS**

If pressed, it is possible to set the hysteresis with respect to Field 5. for which the return of the low flow alarm is established, deactivating the absorption.

7. Field **ACTIVATION TIME MIN GAS FLOWRATE**

If pressed, it is possible to set a timer that is enabled when the flow rate is lower than the value set in Field 4. If this condition is verified for the set time, the system goes into alarm and Absorption System is activated.

8. Field **TIMER INJECTION ALARM**

If pressed, it is possible to set a timer that is enabled when the instantaneous ratio is out of range (+/- 30%). If this condition is verified for the set time, the system goes into alarm or anomaly, injection not working according to the configuration (single or double) of valves set.

9. Field **ODORANT CONCENTRATION ALARM**

If pressed, it is possible to set a percentage value relating to the report alarm.

Dosaodor DO200

10. Field SET NUMBER OF CYCLES PER BLOCK

If pressed, it allows to set the number of consecutive cycles with a ratio calculated outside the established precision band (ODORANT CONCENTRATION ALARM).

11. Display SET NUMBER OF CYCLES PER BLOCK

Display of the count of cycles performed with an inaccurate value.

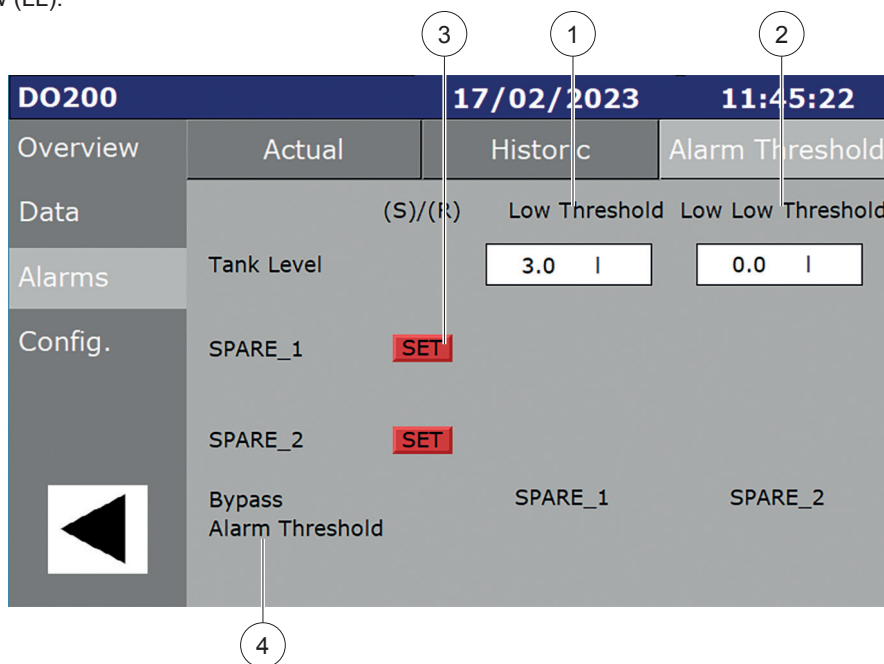
12. Button to move to the second page of setting I/O alarm thresholds.



The concentration alarm is activated when, for a set number of consecutive cycles, it's results outside the established range (alarm threshold). If the calculated value is within the precision band, the "counter" is reset.

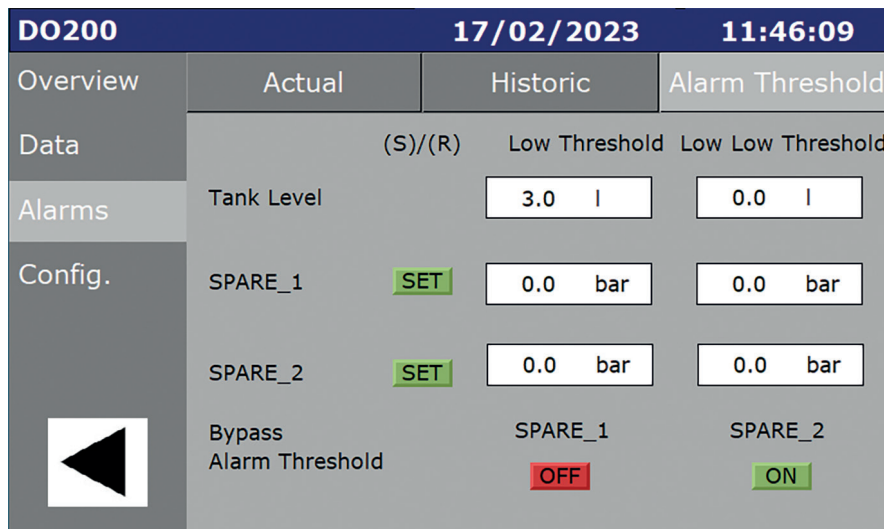
By entering the admin credentials, you can access the second page of the I/O alarm thresholds. In a situation where there are also (wired) analog signal spares (SPARE 1 and SPARE 2 by default), the display is as follows and for each signal you can set:

1. Threshold low (L).
2. Threshold very low (LL).



In addition, for the spares is possible:

3. Press the SET button to view and set the threshold limits.
4. Press the BYPASS Thresholds button to exclude the system from the alarms relating to the thresholds.



ALARMS DESCRIPTION

Table 8. Alarms

Nr.	ALARM NAME	WHEN ACTIVATED	WHAT DOES IT DO	HOW TO REARM	WHAT TO CHECK
000	Alarm system in manual mode	It is activated when the system is excluded, i.e. injection is disabled by the main start button (injection status OFF)	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Press the key automatic/manual
001	Alarm tank level low	It is activated when the tank level has dropped below the value "Low tank level"	Monitor Signaling	Automatic	Recharge the odorant tank
002	Alarm tank level very low	It is activated when the tank level has dropped below the value "very low tank level"	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Recharge the tank
003	Alarm concentration THT - CH4 not correct	Activates after making several consecutive cycles (set on the panel) with an incorrect calculated ratio value (thresholds set to panel)	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check for leaks or occlusions, check valve operation pressurization
004	Alarm charge Ev closed due to max level of sampling tube	This alarm is triggered when the level of the "burette" has exceeded the level of the tank	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check the circuit pressure injection. Purge the L socket of the differential pressure transducer injection panel
005	Alarm sampling tube not charged	It is activated when the level of the "burette" doesn't change after you've past the loading phase	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check injection panel pressure, verify the correct opening of valves liquid phase interception and pressure Input
006	Alarm injection failed	Activates when at the end of the cycle the level of the "burette" is not changed despite having injections, or if the instant ratio is out of band of the plus or 30% of the set settled	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check injection panel pressure, verify the correct opening of valves liquid phase interception and pressure Input
007 007a	Alarm signal SPARE 1 / cylinder pressure	Activates if the connected spare 1 / cylinder pressure analog input is not detected	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check the electrical connection of the Spare 1 / cylinder pressure signal
008 008a	Alarm signal SPARE 2 / Delta P Absorption System	Activates if the connected Spare 2 / Delta P Absorption System analog input is not detected	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check the electrical connection of the Spare 2 / Delta P Absorption System signal
009	Alarm signal sample tube in fail	Turns on when the signal pressure transducer differential of the panel injection has an anomaly and is not detected	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check the signal 4-20 mA of the differential pressure transducer injection panel
010	Alarm signal gas flowrate in fail	Activates when the flow signal is not connected, or it is not detected correctly	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check the electrical connection of the Flow rate signal
011	Alarm sampling tube level override	It is activated when the level of the sampling tube or the sampling cylinder exceeds the max height of the tank.	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check injection panel low pressure connection. Contact support
012	Alarm timeout maximum charging exceeded	Activates when the load phase remains active for a certain time(panel-set)	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Check for leaks or occlusions in the system's loading circuit
013	Alarm concentration setpoint equal to zero	Activates if the "Concentration" parameter has not been configured correctly in panel and is equal to zero	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Set the parameter appropriately on the Overview page
014	Alarm SPAN I/O gas flowrate equal to zero	Activates if the "Span" parameter of the flow signal (in I/O configuration) has not been configured correctly to panel and is equal to zero	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Set the parameter appropriately on the page. HMI "Input/Output" (Configuration menu)
015	Alarm set MC/PULSE equal to zero	Activates if the "MC/pulse" parameter has not been configured correctly in panel and is equal to zero	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Set the parameter appropriately on the page. HMI "Input/Output" (Configuration menu)
016	Alarm SPAN I/O sampling tube level equal to zero	Activates if the "Span" parameter of the "burette" level signal (in I/O configuration) has not been configured correctly on panel and is equal to zero	Monitor Signaling, disable injection, active emergency odorization system	Press the key automatic/manual	Set the parameter appropriately on the page. HMI "Input/Output" (Configuration menu)

Table 8. Alarms (continue)

Nr.	ALARM NAME	WHEN ACTIVATED	WHAT DOES IT DO	HOW TO REARM	WHAT TO CHECK
017 017a	Alarm threshold low SPARE 1 / Cylinders pressure	Is activated when the level of the SPARE 1 / Cylinders pressure signal has dropped below the low threshold value	Monitor Signaling,	Automatic	Adjust the threshold value, monitor the operation of the device, or connection, from the field and check for any electrical anomalies
018 018a	Alarm threshold very low SPARE 1 / Cylinders pressure	Activates when the level of the SPARE 1 / Cylinders pressure signal has dropped below the very low threshold value	Monitor Signaling,	Automatic	
020	Alarm threshold low SPARE 2	Is activated when the level of the SPARE 1 signal has dropped below the low threshold value	Monitor Signaling,	Automatic	Adjust the threshold value, monitor the operation of the device, or connection, from the field and check for any electrical anomalies
021	Alarm threshold very low SPARE 2	Activates when the level of the SPARE 1 signal has dropped below the very low threshold value	Monitor Signaling,	Automatic	
022	Alarm threshold very low SPARE 2	Activates when the level of the SPARE 2 signal has dropped below the very low threshold value	Monitor Signaling (alarm light only) and disables the system cycle if the SET Bypass alarm thresholds is OFF	Press the key Automatic/Manual	
023 023a	Alarm SPAN I/O SPARE 1 / Cylinders pressure equal to zero	Activates if the "Span" parameter of the Spare 1 / Cylinders pressure signal (in I/O configuration) has not been configured correctly in panel and is zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Input/Output" (Configuration menu)
024 024a	Alarm SPAN I/O SPARE 2 / Delta P Absorption SystemSystema equal to zero	Activates if the "Span" parameter of the Spare 2 / Delta P Absorption SystemSystema signal (in I/O configuration) has not been configured correctly on panel and is zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Input/Output" (Configuration menu)
025	Alarm set odorant concentration equal to zero	Activates if the "Report Alarm" parameter has not been configured correctly on panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Alarm Thresholds" (Alarms menu)
026	Alarm cycles number for shut off equal to zero	Is triggered if the "Set Number Cycles Per Block" parameter has not been configured correctly on panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Alarm Thresholds" (Alarms menu)
027	Alarm charging time (with level update) equal to zero	Is triggered if the parameter "Burette load time (with level update)" has not been configured correctly to panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Tank" (Configuration menu)
029	Alarm waiting injection time equal to zero	Activates if the parameter "time waiting injection" has not been configured correctly to panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Tank" (Configuration menu)
030	Alarm cylinder maximum level equal to zero	Activates if the "Maximum Burette Level" parameter has not been configured correctly on panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Injection Panel" (Configuration menu)
031	Alarm switch SOV threshold does not correct	You enable if the "Exchange Threshold from inj. H to inj. L" has not been configured correctly in panel and is larger than a default limit of 250	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Injection Panel" (Configuration menu)
032	Alarm cycles for charging equal to zero	You enable if the "Cycles for liv. reading parameter tank" has not been configured correctly to panel and turns out to be zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Tank" (Configuration menu)
033	Alarm maximum charging time equal to zero	Activates if the "Maximum Load Time" parameter has not been configured correctly on panel and is zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on the page. HMI "Tank" (Configuration menu)
041	Alarm Low Gas Flowrate	Activates if the INJECTION FUNCTION + ABSORPTION SYSTEMSYSTEM and the scaled flow rate are lower than the low flow rate threshold set on page. HMI of the alarm thresholds	Monitor Signaling, activates the emergency odorization system	Automatic	Check correct acquisition of the flow signal, wait for the automatic reset of the alarm
042	Alarm no power supply	Acativates if the cause is the main power supply failure (not due to breaker disconnection) and this is supplied by a UPS system	Monitor Signaling	Automatic	Electrically check for possible causes on the main power supply circuit to the PLC

Table 8. Alarms (continue)

Nr.	ALARM NAME	WHEN ACTIVATED	WHAT DOES IT DO	HOW TO REARM	WHAT TO CHECK
043	Alarm low battery autonomy	Activates to signal that the batteries are below a certain autonomy threshold to provide electrical charge to the system	Monitor Signaling	Automatic	If connected to a battery charger, check / monitor its correct operation to ensure automatic battery recharge and return above the threshold; otherwise, replace the battery.
044	Alarm battery disconnected	Activates if the batteries are electrically disconnected from the system	Monitor Signaling	Automatic	Restore the electrical connection (battery disconnection signal) to the system
048	Alarm no power supply due to switch disconnection	Activates if the cause of the power failure is due to the disconnection of the main switch and the control panel continues to be powered by an external system	Monitor Signaling	Automatic	Electrically restore the main power supply.
049	Alarm maximum volume of tank (capacity) equal to ZERO	Activates if the "Tank capacity" parameter has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. "Tank Data" HMI (Configuration menu -> Tank)
050	Alarm value threshold low (L) tank equal to ZERO	Activates if the "Low threshold (L)" parameter of the tank level has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. 2 HMI "Alarm thresholds" (Alarms menu)
051	Alarm value density equal to ZERO	Activates if the "Density" parameter has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. 2 HMI "Injection Panel" (Configuration menu)
052	Alarm value threshold low (L) gas bottles pressure equal to ZERO	Activates if the "Low threshold (L)" parameter of the gas cylinder pressure has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. 2 HMI "Alarm thresholds" (Alarms menu)
053	Alarm value threshold very low (LL) gas bottles pressure equal to ZERO	Activates if the "Very low threshold (LL)" parameter of the gas cylinder pressure has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. 2 HMI "Alarm thresholds" (Alarms menu)
056	Alarm sampling tube internal diameter equal to ZERO	Activates if the "Sample tube internal diameter" parameter has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. 2 HMI "Injection Panel" (Configuration menu)
057	Alarm cylinder (tank) external diameter equal to ZERO	Activates if the "External cylinder diameter" parameter has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. "Tank Data" HMI (Configuration menu -> Tank)
058	Alarm cylinder wall thickness equal to ZERO	Activates if the "Cylinder schedule" parameter has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. "Tank Data" HMI (Configuration menu -> Tank)
059	Alarm cap radius equal to ZERO	Activates if the "Cap radius" parameter has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. "Tank Data" HMI (Configuration menu -> Tank)
060	Alarm cap external semiaxis equal to ZERO	Activates if the parameter "cap external semiaxis" has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. "Tank Data" HMI (Configuration menu -> Tank)
061	Alarm cap wall thickness equal to ZERO	Activates if the "Cap wall thickness" parameter has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. "Tank Data" HMI (Configuration menu -> Tank)
062	Alarm offset Transmitter-Tank equal to ZERO	Activates if the "Offset Transmitter-Tank" parameter has not been correctly configured on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. "Tank Data" HMI (Configuration menu -> Tank)
063	Alarm value cylinder (tank) length equal to ZERO	Activates if the "Cylinder length" parameter (or "Cylinder height" in the case of a vertical tank) has not been configured correctly on the panel and is equal to zero	Monitor Signaling, prevents the system from starting	Press the key Automatic/Manual	Set the parameter appropriately on pag. "Tank Data" HMI (Configuration menu -> Tank)
064	Alarm Absorption System active	Activates when the emergency odor system valve is activated	Monitor Signaling	Automatic	Analyze the cause (alarm) for which the injection is excluded (FAIL)
065	Alarm parameter setting not valid	Activates when a variable necessary for system operation has not been set	Monitor Signaling, disable injection, active emergency odorization system	Press the key Automatic/Manual	Check the set values and which other alarms are reported between 013, 014, 015, 016, 023, 023a, 024, 024a, 025, 026, 027, 028, 029, 030, 031, 032, 033, 049, 050, 051, 052, 053, 056, 057, 058, 059, 060, 061, 062, 063

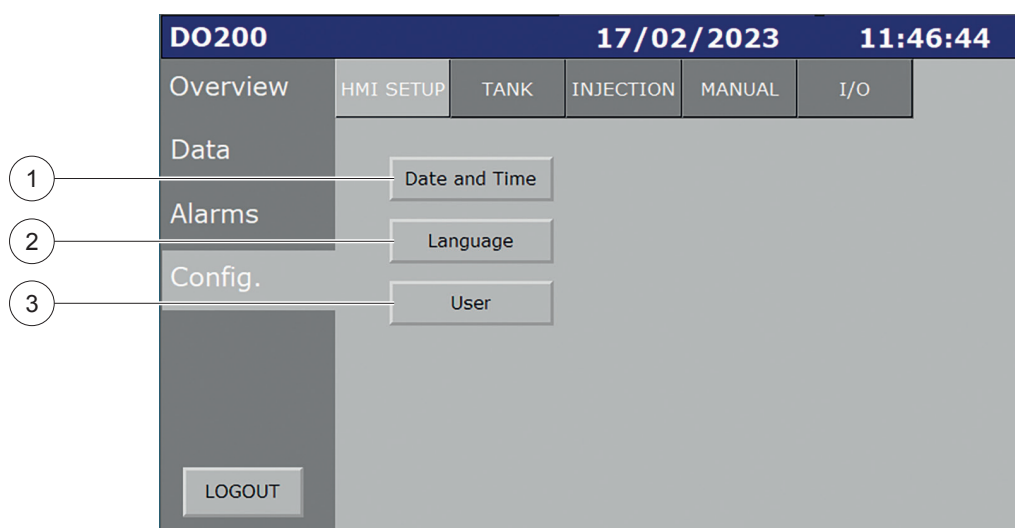
WARNINGS DESCRIPTION

Table 9. Warning

Nr.	WARNING DESCRIPTION	WHEN ACTIVATED	WHAT DOES IT DO	HOW TO REARM	ALARM RESET
001	Warning injection failed	Activates when incorrect operation occurs during the injection phase (see cause linked to Alarm 006)	Signaling to monitors only if the redundant solenoid valves exchange is controlled and of these only one is anomaly; injection deactivation and active odorizing emergency system	Press the key Automatic/Manual	See Alarm 006 -Check Warning 002 or Warning 003
002	Warning EV2 in fail	It is activated at the time the electrovalve exchange was commanded and Warning 001 occurred	Signaling to monitors only if the configuration of the redundant valves is active; injection deactivation if the EV1 is also abnormal and active odorizing emergency system	Press the key Automatic/Manual	See Alarm 006
003	Warning EV1 in fail	It is activated at the time the solenoid valve exchange was commanded and Warning 001 occurred	Signaling to monitors only if the configuration of the redundant valves is active; injection deactivation if the EV2 is also abnormal and active odorizing emergency system	Press the key Automatic/Manual	See Alarm 006

CONFIGURATION

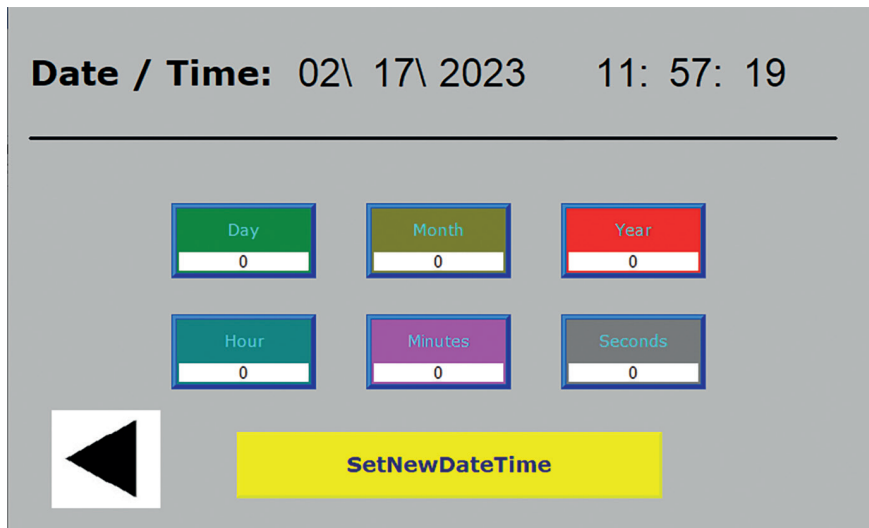
HMI Setup



The fifth section, visible and available only under administrator access, is regarded to the following HMI setup:

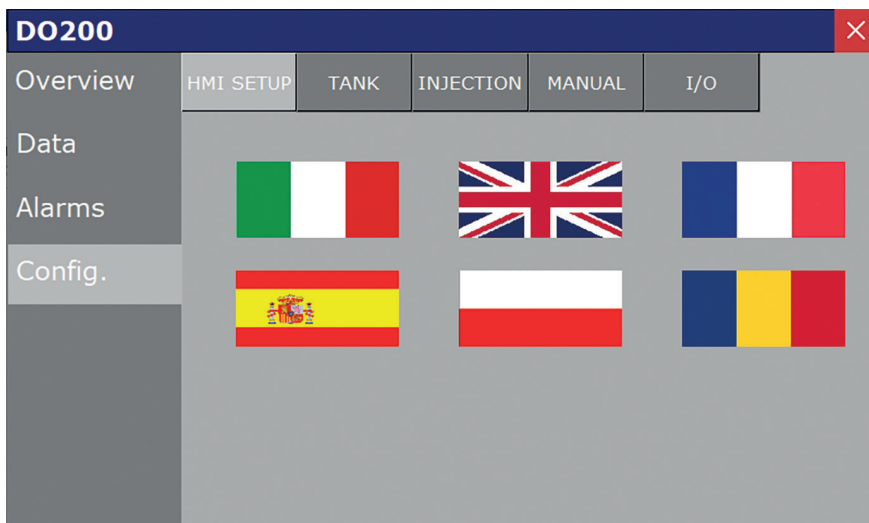
1. Date/Time: if pressed, you pass to the timestamp synchronization screen.
2. Language: if pressed, you pass to the language selection for the HMI's pages.
3. User: if pressed, your pass to the users management page.

DATE/TIME



On this screen is possible to set the date and the time. Once the data has been entered, the button 1 (Save) allows you to save them and synchronize PLC and HMI with the new settings.

LANGUAGE



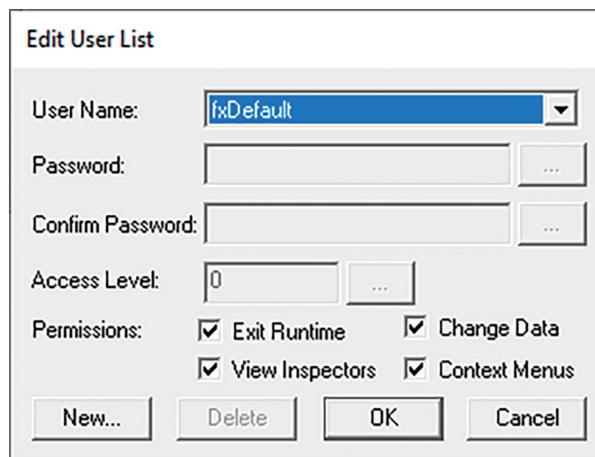
On this screen you can select the language for the HMI's pages.

USER

This section is dedicated to the user management and to the related password to access the system..

In this screen it is possible to add, delete and edit the user name and its password from the default (not editable) structured HMI levels, visible by clicking on the group pane of the currently logged-on user (Group), which is allowed and limited to all levels below the maximum (Administrator).

To add additional users at administrator level, you must ask for it when commissioning authorized personnel.



Edit User List

User Name: fxDefault

Password: [] [...]

Confirm Password: [] [...]


Access Level: 0 [...]

Permissions: Exit Runtime Change Data
 View Inspectors Context Menus

[New...] [Delete] [OK] [Cancel]

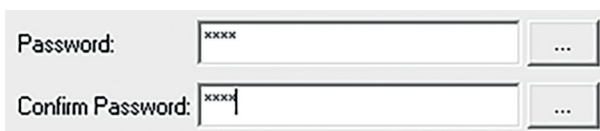
How to Add a New User

1. Select the key **New...** a window will appear from which it is possible to select the user name from the **User Name** field by typing it directly in the appropriate box or from the keyboard that appears by pressing the button **[...]**



User Name: [] [...]

2. Type the password to be assigned to the new user in the **Password** field and confirm it in the **Confirm Password** field. The chosen password will be represented with asterisks ****.



Password: [****] [...]

Confirm Password: [****] [...]

3. Assign the access level to the new user from the **Access Level** field. The possible values are between 0 and 999 bearing in mind that the access level equal to 0 corresponds to the absence of security.
4. Press the **OK** key to exit the **Add User** menu.

How to Change Password of an Existing Users

1. From the **User Name** field choose the user for which you want to change the password by selecting it from the drop-down menu:

2. Type the new password to be assigned to the user in the **Password** field and confirm it in the **Confirm Password** field. The chosen password will be represented with asterisks ****.

3. Press the **OK** key to exit the **Edit User List** menu.

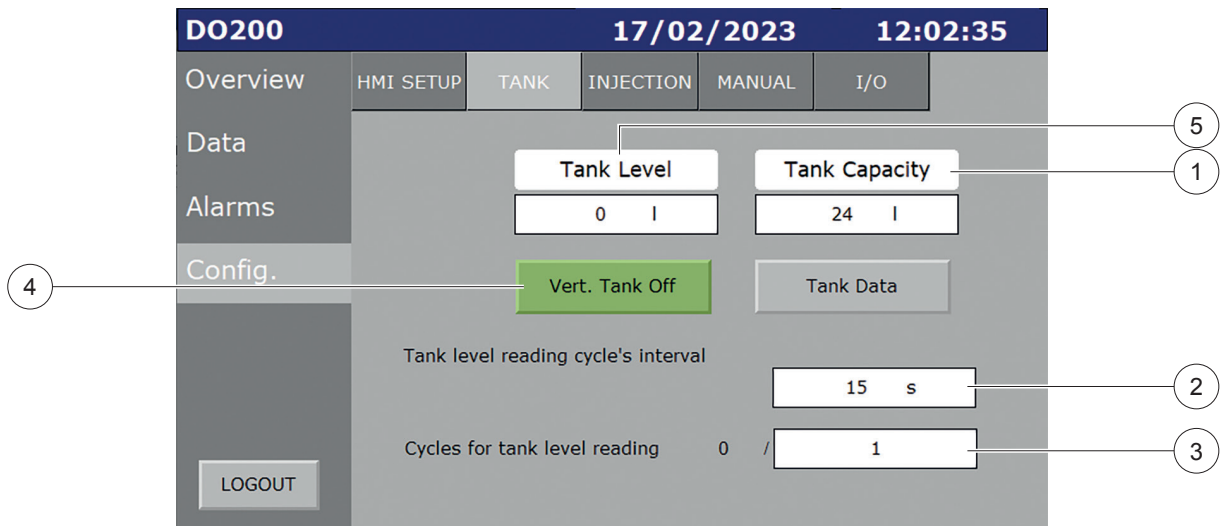
How to Delete an Existing User

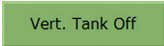
1. From the **User Name** field choose the user you want to remove by selecting it from the drop-down menu:

2. Select the user you want to remove from the list and press the **Delete** button.
3. Press the **OK** key to exit the **Edit User List** menu.

TANK

The TANK page summarizes the settings on the data of the same, both.

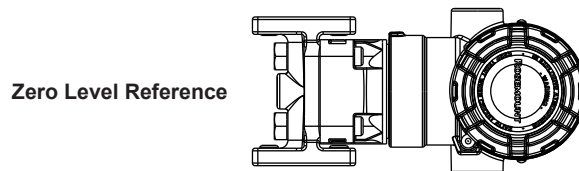


1. Display of the maximum capacity of the tank.
2. **Charge Time (Cycle)**
This parameter indicates the waiting time from the moment in which the liquid level inside the sample tube during the loading phase is stable; the output of this timer marks the end of the loading step and the update of the calculated level inside the tank.
3. **Tank Level Reading Cycle's Interval**
This parameter corresponds to the cycle count set for which to command and view the update of the liquid level inside the tank.
4. Button to enable the configuration of a vertically developed tank (manufacturer access level). Press the button to access the geometric configuration of the tank.
With a vertical development configuration of the tank  in the popup of its configuration of geometric data, the length of the cylinder is to be understood as the height A, see figure in the following page.
5. Display of the current tank level (calculated quantity of liters of liquid).

Geometric Configuration of the Tank

DO200		17/02/2023	12:15:06
Overview		TANK DATA	
1	Data	Offset Transm-Tank	354.0 mm
2	Alarms	Maximum Capacity	24.0000 mm
3		Cylinder Ext. Diameter (G)	225.0 mm
4	Config.	Cylinder height (A)	590.0 mm
5		Cylinder Wall Thickness (D)	5.0 mm
6		Cap Radius (E)	215 mm
7		Cap External Semiaxis (B)	65.0 mm
8		Cap Wall Thickness (F)	3.0 mm

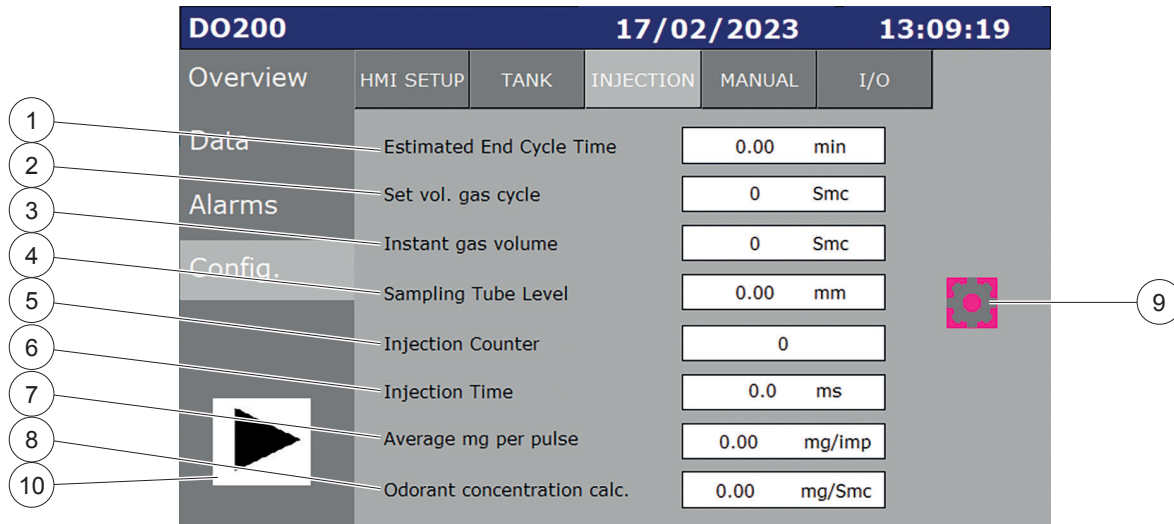
1. Offset Transmitter-Tank: is the delta level (in mm) between the zero point level of the DP transmitter and the zero point level of the tank.



2. Max capacity: is maximum capacity of the tank (I).
3. Cylinder external diameter: is the external diameter of the tank in mm (dimension G).
4. Cylinder length: is the length of the cylinder part of the tank in mm (dimension A).
In case of a vertical tank, the dimension is referred to the height.
5. Cylinder wall thickness: is the wall thickness of the cylindric part of the tank (dimension D).
6. Cap radius: is the radius of the tank caps (dimension E).
7. Cap external semiaxis: is the length of the cap starting from the cylindric part of the tank (dimension B).
8. Cap wall thickness: is the Cap wall thickness (dimension F).

INJECTION PANEL

Configuration



1. Estimated End Cycle Time is the estimate duration of the cycle (min).
2. Set gas vol. cycle is the volume of gas that can be odorized with the quantity of liquid loaded, in relation to the concentration set.
3. Instant gas volume is the current gas volume.
4. Sampling tube level is the sampling tube level in millimeters (mm).
5. Injection Counter is the number of injections performed during the cycle.
6. Injection time is the opening time of each injection (msec).
7. mg/pulse is the quantity of liquid in milligrams (mg) injected per pulse.
8. Odorant concentration calculated is the calculated instant odorant concentration (mg/Smc or Nmc).
9. PID loop menu configuration button. See detailed description below.
10. Next page navigation button.

⚠ WARNING

The modification of the parameters and the operations described in the following paragraphs must be carried out by expert technicians.

Incorrect operations and / or incorrect parameters can seriously compromise the operation of the Dosaodor DO200.

DO200	17/02/2023	13:10:55							
Overview	HMI SETUP	TANK	INJECTION	MANUAL	I/O				
1	2	3	4	5	6	7	8	9	10
Data	Alarms	Config.							
			Sampling Tube inner diameter	8.00	mm				
			Minimum Sampling Tube Level	50.0	mm				
			Cylinder Max. Level	500.0	mm				
			Odorant Density	1.0000	g/cm ³				
			Injection Waiting Time	15	s				
			Switch threshold from inj. H to inj. L	250	Smc/h				Visible if the injection valves configuration is present
			Switch threshold from inj. L to inj. H	200	Smc/h				Visible if the injection valves configuration is present
			Target cycle to switch redundant SOV	0	/	0			
			Nr. of failed injection to switch SOV	0					

1. Sampling tube internal diameter in millimeters (mm).
2. Minimum level sampling tube in millimeters (mm).
3. Maximum level sampling cylinder in millimeters (mm).
4. Odorant density in g/cm³.
5. Injection waiting time is the time delay before the first injection after the charging phase.
6. Switch threshold from inj L to inj H. When the gas instant flow rate exceeds that threshold, DO200 switch from injection low solenoid valve to the injection high solenoid valve. Visible if the H/L injection valves configuration is present.
7. Switch threshold from inj H to inj L. When the gas instant flow drops below that threshold, DO200 switch from injection high solenoid valve to the injection low solenoid valve. Visible if the H/L injection valves configuration is present.
8. Target cycle to switch redundant SOV. Visible if the redundant valves configuration is present.
9. Nr. of failed injection to switch SOV. That value determines after how many injections failed the DO200 switch to a secondary SOV. Visible if the redundant valves configuration is present
10. Back page navigation button.

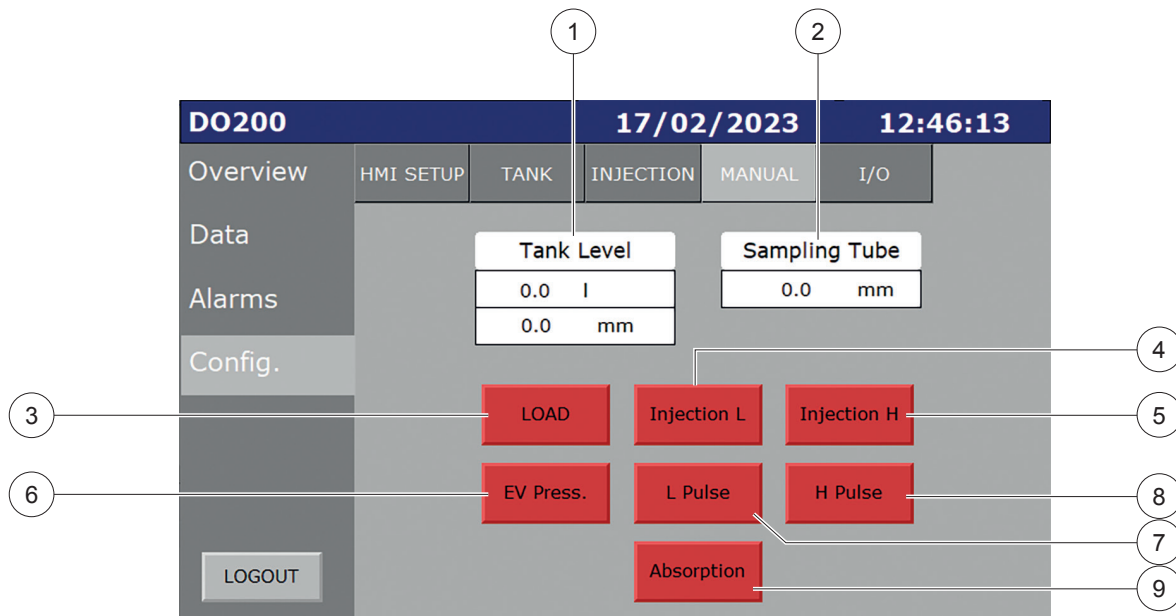
Dosaodor DO200

Dosage

Parameter	Value
Injection Control Time	0.00 s
Min. Opening Time	20 ms
Max. Opening Time	1000 ms
Proportional K	0.800
Integrative K	0.250
Opening Time	0 ms
Start PID Correction Factor	1.0
DIV Control Time	1.0

1. Injection control time. It is the update time for the injection control.
2. Injection minimum opening time. It is the injection solenoid valve minimum opening time.
3. Injection maximum opening time. It is the injection solenoid valve maximum opening time.
4. K proportional. It is PID loop the K proportional value.
5. K integrative. It is PID loop the K integrative value.
6. Solenoid valve opening time displayed.
7. Correction factor acting on the PID start-up phase and to control the start of the dosing process regulation loop.
8. Divisor correction factor on the control time (dividend) of the process: it is usually kept equal to 1.

MANUAL ACTIONS



1. Tank Level in millimeters (mm) and tank volume in liters (l).
2. Sampling Tube level in millimeters (mm).
3. Liquid Charge. That button drives the charging solenoid valve. The action is retentive.
 - RED = Not active = Closed
 - GREEN = Active = Open
4. Low Injection. That button drives the low injection solenoid valve. The action is retentive.
 - RED = Not active = Closed
 - GREEN = Active = Open
5. High Injection. That button drives the low injection solenoid valve. The action is retentive.
 - RED = Not active = Closed
 - GREEN = Active = Open
6. Pressurization Solenoid. That button drives the pressurization solenoid valve. The action is retentive.
 - RED = Not active = No added pressure
 - GREEN = Active = Added pressure
7. Low Injection (pulse). That button drives the low injection solenoid valve. The action is non retentive.
8. High Injection (pulse). That button drives the High injection solenoid valve. The action is non retentive.
9. Absorption Closed. That button drives the Absorption solenoid valve. The action is retentive.
 - RED = Not active = Absorption closed
 - GREEN = Active = Absorption Open

When the DO200 is excluded with that buttons are possible drive manually the solenoid valves on the Injection Panel for maintenance or system verification activities.

CLEANING

The basic operations for emptying the liquid in the injection panel are described below.



WARNING

The operations described in the following paragraphs must be carried out by expert technicians.

Incorrect operations can seriously dangerous.

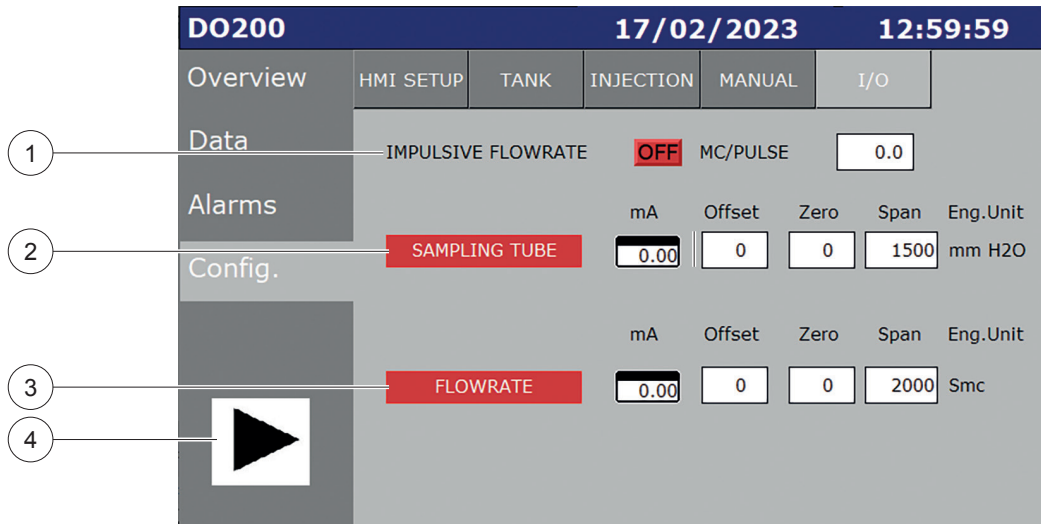
Moving liquid procedure from the injection panel to the tank

1. Click on Pressurization Solenoid (6) to put added pressure on the injection panel. The button turns green.
2. Click on Liquid Charge (3) to open the connection between the injection panel and the tank. The liquid will flow to the tank. the button turns green
3. When you hear a gurgling coming from the tank, it means that the injection panel has been emptied of liquid. The liquid will be present only in the branch of the panel downstream of the non-return valve.
4. Click on Liquid Charge (3) to close the connection between the injection panel and the tank. The button turns red.
5. Click on Pressurization Solenoid (6) to remove added pressure on the injection panel. The button turns red.

Moving Liquid Procedure from the Injection Panel to the Downstream Injection Point

1. Click on Pressurization Solenoid (6) to put added pressure on the injection panel. The button turns green.
2. Click on High Injection (4) and Low injection (5), if present, to open the injection Solenoid Valves. The liquid will flow to the injection point. The buttons turn green
3. After 10-15 min the injection panel will be emptied from the liquid.
4. Click on High Injection (4) and Low injection (5), if present, to close the injection Solenoid Valves. The buttons turn red.
5. Click on Pressurization Solenoid (6) to remove added pressure on the injection panel. The button turns red.

INPUT/OUTPUT



1. IMPULSIVE FLOW RATE

This section is dedicated to the impulsive volumetric flow rate signal. By pressing the button ON/OFF is possible to activate or deactivate the function and enter the weight for each impulse received.

- RED = Not active = OFF
- GREEN = Active = ON

2. SAMPLING TUBE LEVEL

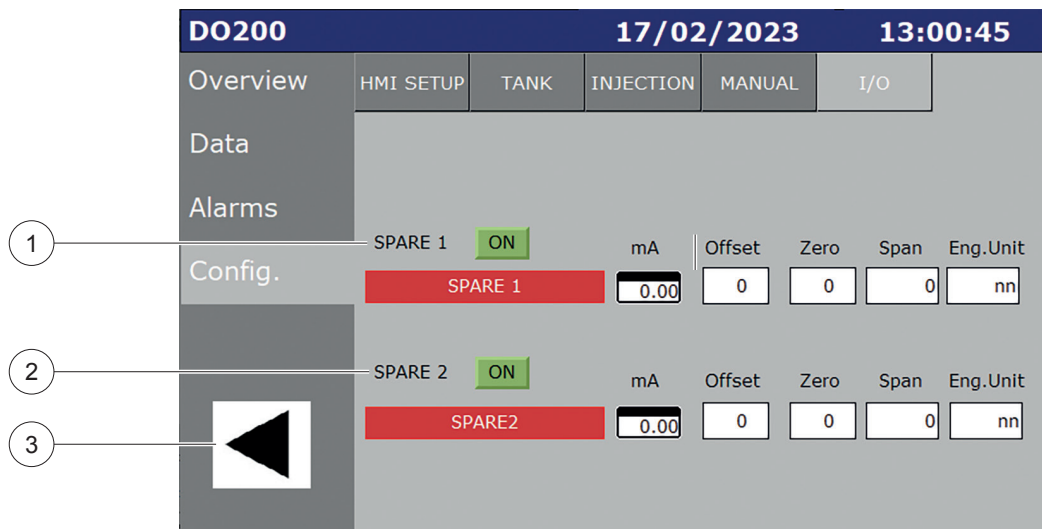
Here it is possible to set the parameters relating to the analog input of the Sampling Tube level: the zero, the span and the offset of the analog input (4-20 mA) in mm H2O and monitor the instantaneous electrical value.

3. FLOW RATE

Here it is possible to set the parameters relating to the analog input of the instant gas flow rate: the zero, the span and the offset of the analog input (4-20 mA) Smc/h and monitor the instantaneous electrical value.

4. Go to SPARE page navigation button.

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1. SPARE 1

Here it is possible to set the parameters relating to the SPARE 1 analog input: the zero, the span and the offset of the analog input (4-20mA), the description, the engineering unit and monitor the instantaneous electrical value acquired. By Pressing the button ON/OFF is possible to activate ore deactivate the SPARE 1 analog input.

- RED = Not active = OFF
- GREEN = Active = ON

2. SPARE 2

Here it is possible to set the parameters relating to the SPARE 2 analog input: the zero, the span and the offset of the analog input (4-20mA), the description, the engineering unit and monitor the instantaneous electrical value acquired. By Pressing the button ON/OFF is possible to activate ore deactivate the SPARE 2 analog input.

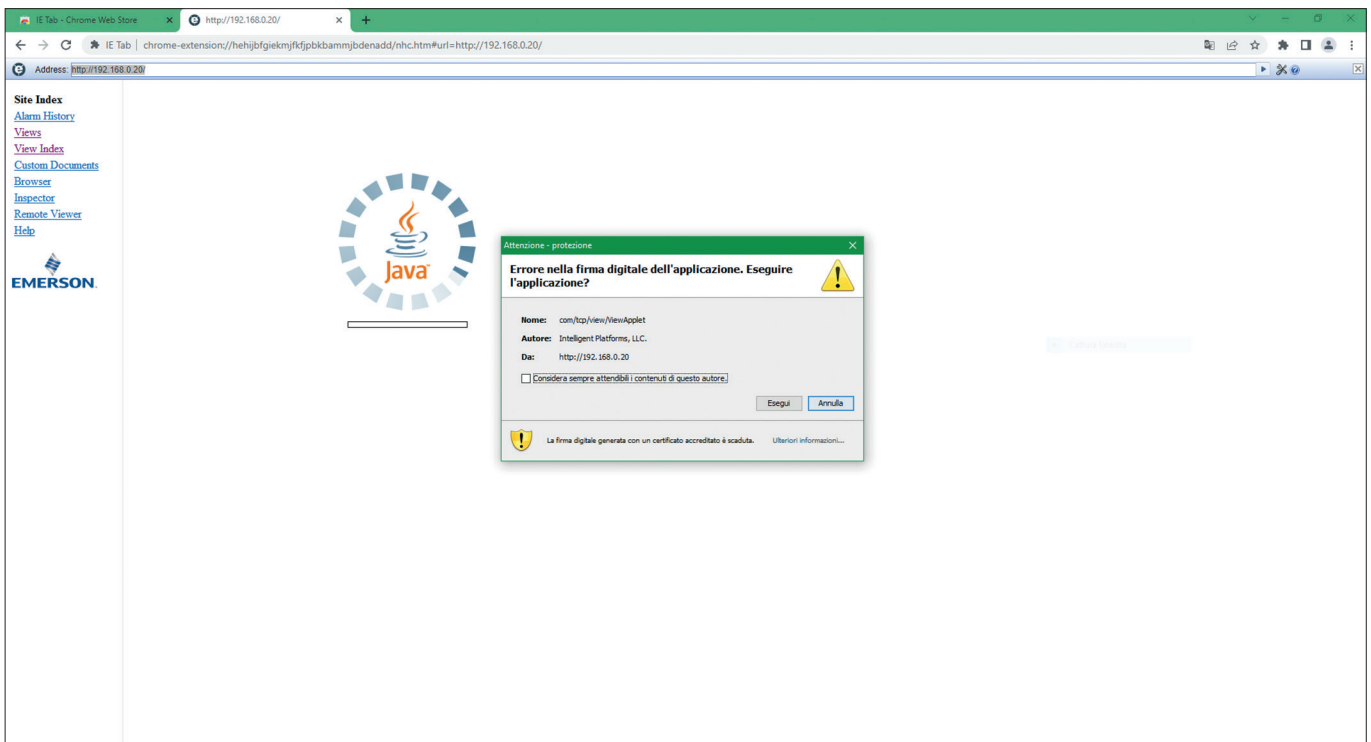
- RED = Not active = OFF
- GREEN = Active = ON

3. Back page navigation button.

WEB SERVER

Through the HMI Web server there is the possibility to view remotely all the graphical panels contained in the project. Follow the steps below to connect.

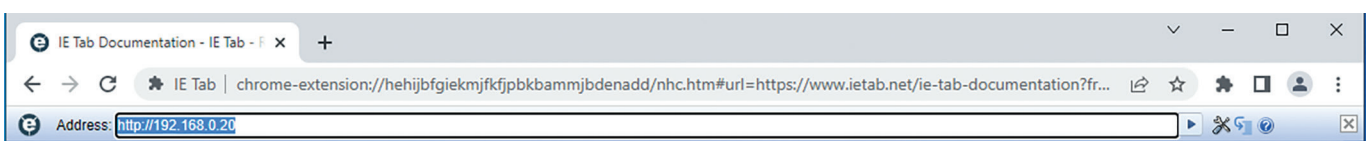
1. Connect to the LAN network of the panel or connect remotely.
2. Open the Internet Explorer browser and type the IP address of the Quick Panel <http://192.168.0.20>. At a first remote connection the web server automatically downloads the Java Plug In from the site <http://java.sun.com>. The following screen shows up.



3. In case this procedure doesn't work, a possibility is to open Chrome following the step below:
 - Open Chrome and install IE Tab, an extension which allows to view different web pages with the Internet Explorer layout
 - After the installing, verify in Instruments>Internet Options>Extensions if the IE Tab extension was added successfully (the icon will be showed close to the toolbar of the browser address)

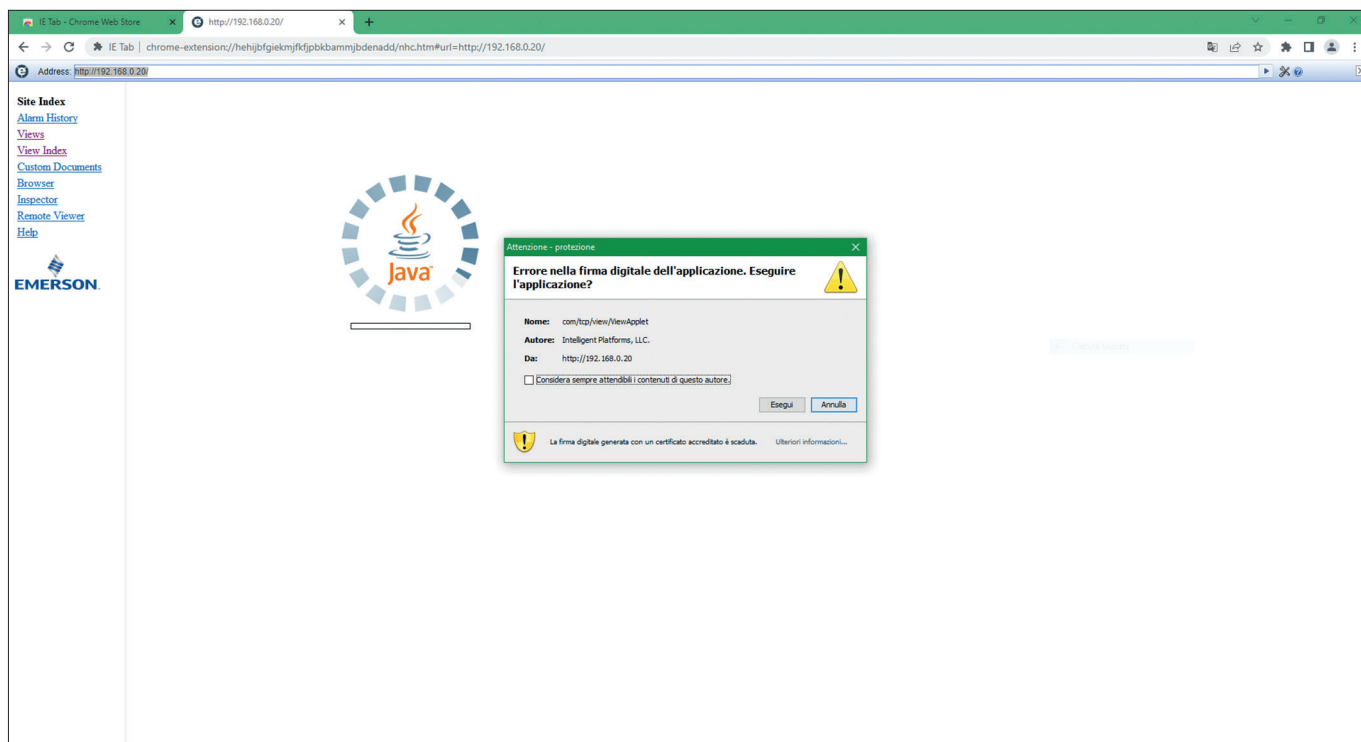


- To visualize the web site through Internet Explorer, click on the IE Tab icon (next to the address bar) and type the IP address <http://192.168.0.20> in the IE Tab bar, as the following picture shows

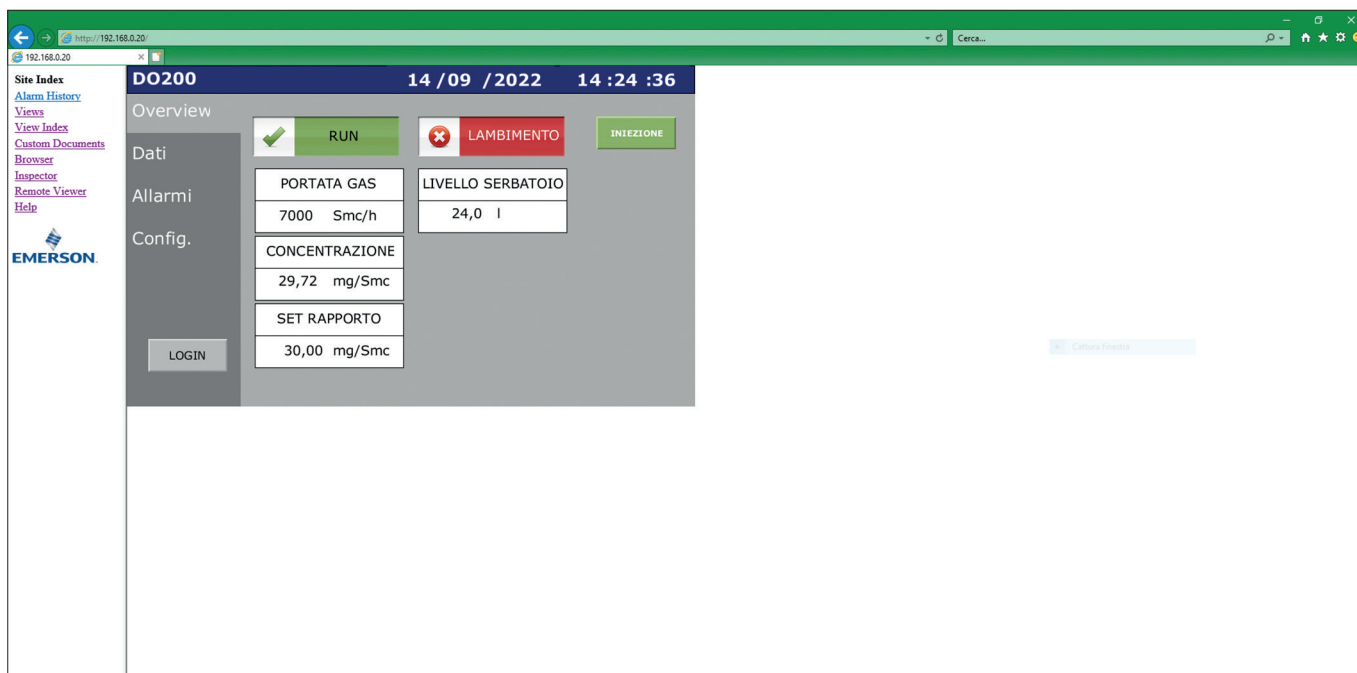


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- Wait for the page to load

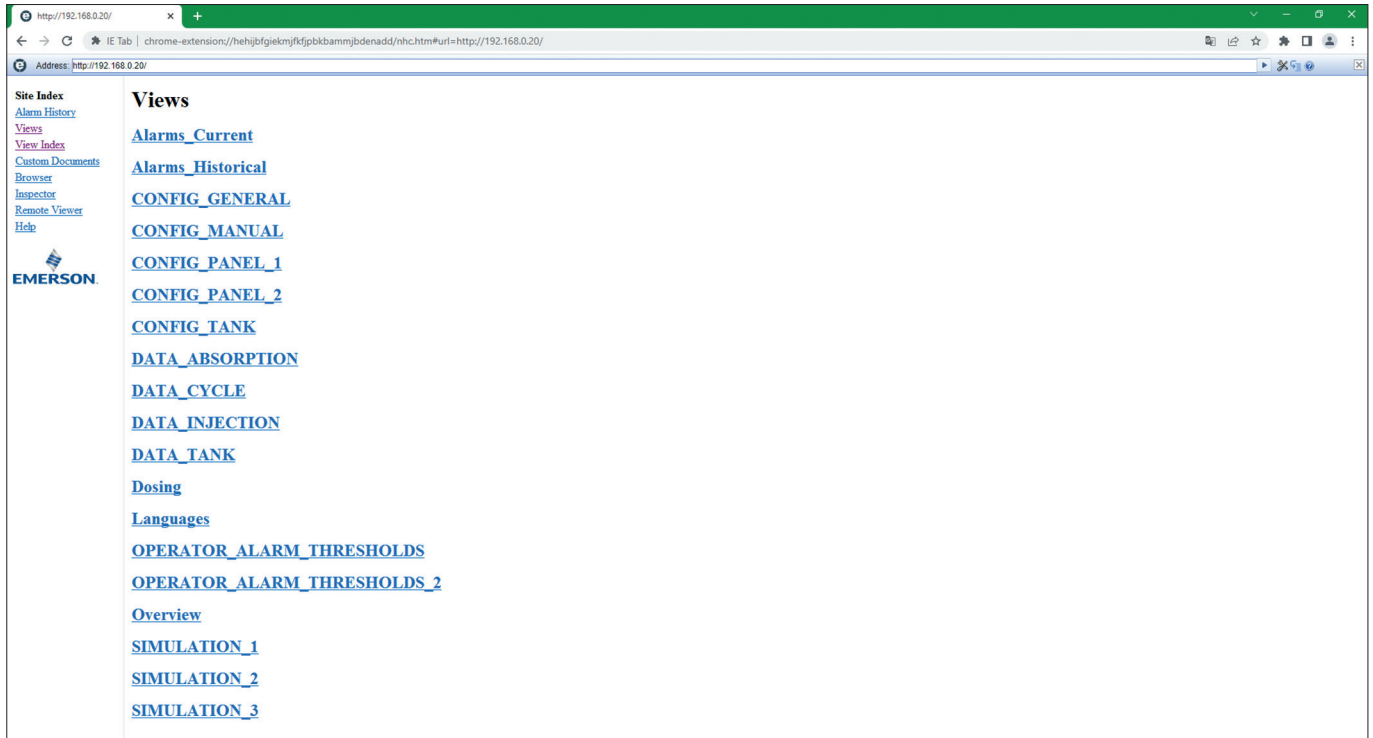


1. Click on “Esegui” and wait for the graphic panels to load. Below, an image of the Overview page of the panel.



From the left side of the page, it is possible to access the Overview page by clicking on “Views”. From this page, it is also possible to access all the other graphical panels.

Alternatively, by clicking on “View Index” it is possible to open each graphical panel as the following picture shows.



Dosaodor DO200

LOG FILE

Data Log

The system records on a file contained in the Log folder in the SD memory of the PLC, the operating data with a sampling every 5 minutes organized by months for a maximum of 1 year of operation.

The file is in CSV format and can be processed in MS Excel. File name example: **Gennaio.CSV**

The table below shows the data in each line of the file and the related headers.

Table 10. Data Log File Header and Description

FILE HEADER	DESCRIPTION
Gas Flow rate	Gas Flow Rate
Concentration	Instant concentration
Concentration Set Point	Concentration Set Point
Tank Level	Tank Level
Status	State of operation

Totalization Log

The system records, on a file contained in the Averages folder in the SD memory of the PLC, data of the averages with a sampling every hour organized by months for a maximum of 1 year of operation.

The file is in CSV format and can be processed in MS Excel. File name example: **Avg_Gennaio.CSV**

The table below shows the data in each line of the file and the related headers.

Table 11. Totalization Log File Header and Description

FILE HEADER	DESCRIPTION
Tot odo. g hh	Total odorant hour in grams
Tot odo. ml hh	Total odorant hour in milliliters
Tot odo. g dd	Total odorant g day in grams
Tot odo. ml dd	Total odorant ml day in milliliters
Tot odo. g mm	Total odorant g month in grams
Tot odo. ml mm	Total odorant ml month in milliliters
Tot Gas Vol. hh	Total gas volume per hour in cubic meters
Tot Gas Vol. dd	Total gas volume per day in cubic meters
Tot Gas Vol. mm	Total gas volume per month in cubic meters
Tot Gas vol. Abs. hh	Total gas volume per hour in cubic meters with lapping in operation
Tot Gas vol. Abs. dd	Total gas volume per day in cubic meters with lapping in operation
Tot Gas vol. Abs. mm	Total gas volume per month in cubic meters with lapping in operation
Conc. Set Point	Set Concentration
Conc. hh	Concentration hour
Conc. dd	Concentration day
Conc. mm	Concentration month

Event Logs

The system records all the operations performed (e.g. modifications, alarms, accesses) in a DATABASE.LOG file. This file is contained in a folder whose path is specified within the PLC.

The DATABASE.LOG file can be opened using the TrendX application and possibly exported in a CSV file as explained in the guide for using the program.



WARNING

The modification of the configuration file parameters must be carried out by expert technicians.

Incorrect parameters can seriously compromise the correct functioning of the Dosaodor-D.

Dosaodor DO200

MODBUS TABLE

Modbus addresses are to be considered 0 x Output coils for BOOL type variables and 4 x Output Registers for INT and REAL type variables. To be able to read REAL type data, swap the WORD starting from the decimal address.

Table 12. Modbus

VARIABLE DESCRIPTION	READ/WRITE	DATA TYPE	I/O ADDRESS
000: Alarm system in manual mode	R	BOOL	1
001: Alarm tank level low (L)	R	BOOL	2
002: Alarm tank level very low (LL)	R	BOOL	3
003: Alarm concentration THT-CH4 not correct	R	BOOL	4
004: Alarm charge Ev closed due to max level of sampling tube	R	BOOL	5
005: Alarm sampling tube not charged	R	BOOL	6
006: Alarm injection failed	R	BOOL	7
007: Alarm input signal SPARE 1	R	BOOL	8
007a: Alarm signal cylinder pressure	R	BOOL	9
008: Alarm signal input SPARE 2	R	BOOL	10
008a: Alarm signal Delta P Absorption system	R	BOOL	11
009: Alarm signal sampling tube in fail	R	BOOL	12
010: Alarm signal gas flowrate	R	BOOL	13
011: Alarm sampling tube level override	R	BOOL	14
012: Alarm timeout maximum charging exceeded	R	BOOL	15
013: Alarm concentration setpoint equal to zero	R	BOOL	16
014: Alarm span I/O gas flowrate equal to zero	R	BOOL	17
015: Alarm set MC/PULSE equal to zero	R	BOOL	18
016: Alarm span I/O sampling tube level equal to zero	R	BOOL	19
017: Alarm threshold low SPARE 1 (L)	R	BOOL	20
017a: Alarm threshold low cylinders pressure (L)	R	BOOL	21
018: Alarm threshold very low SPARE1 (LL)	R	BOOL	22
018a: Alarm threshold very low cylinders pressure (LL)	R	BOOL	23
020: Alarm threshold low SPARE 2 (L)	R	BOOL	24
021: Alarm threshold very low SPARE 2 (LL)	R	BOOL	25
023: Alarm SPAN I/O SPARE 1	R	BOOL	26
023a: Alarm SPAN I/O cylinders pressure equal to zero	R	BOOL	27
024: Alarm SPAN I/O SPARE 2	R	BOOL	28
024a: Alarm SPAN I/O Delta P Absorption System equal to zero	R	BOOL	29
025: Alarm set odorant concentration equal to zero	R	BOOL	30
026: Alarm cycles number for shut off equal to zero	R	BOOL	31
027: Alarm charging time (with level update) equal to zero	R	BOOL	32
029: Alarm waiting injection time equal to zero	R	BOOL	33
030: Alarm cylinder maximum level equal to zero	R	BOOL	34
031: Alarm switch SOV threshold not correct	R	BOOL	35
032: Alarm cycles for charging equal to zero	R	BOOL	36
033: Alarm maximum charging time equal to zero	R	BOOL	37
041: Alarm Low Gas Flowrate	R	BOOL	38
042: Alarm no power supply	R	BOOL	39
043: Alarm low battery autonomy	R	BOOL	40
044: Alarm battery disconnected	R	BOOL	41

Table 12. Modbus (continue)

VARIABLE DESCRIPTION	READ/WRITE	DATA TYPE	I/O ADDRESS
048: alarm no power supply due to switch disconnection	R	BOOL	42
049: Alarm maximum volume tank (capacity) equal to ZERO	R	BOOL	43
050: Alarm value threshold low (L) tank equal to ZERO	R	BOOL	44
051: Alarm value density equal to ZERO	R	BOOL	45
052: Alarm value threshold low (L) gas bottles pressure equal to ZERO	R	BOOL	46
053: Alarm value threshold very low (LL) gas bottles pressure equal to ZERO	R	BOOL	47
056: Alarm sampling tube internal diameter equal to ZERO	R	BOOL	48
057: Alarm cylinder (tank) external diameter equal to ZERO	R	BOOL	49
058: Alarm cylinder wall thickness equal to ZERO	R	BOOL	50
059: Alarm cap radius equal to ZERO	R	BOOL	51
060: Alarm cap external semiaxis equal to ZERO	R	BOOL	52
061: Alarm cap wall thickness equal to ZERO	R	BOOL	53
062: Alarm offset Transmitter-Tank equal to ZERO	R	BOOL	54
063: Alarm value cylinder (tank) length equal to ZERO	R	BOOL	55
064: Alarm Absorption system active	R	BOOL	56
065: Alarm parameter setting not valid	R	BOOL	57
001: Warning injection failed	R	BOOL	58
002: Warning EV2 in fail	R	BOOL	59
003: Warning EV1 in fail	R	BOOL	60
Sampling tube analog signal state	R	BOOL	61
Master in operation	R	BOOL	62
Power supply	R	BOOL	63
Power supply from UPS	R	BOOL	64
System FAIL status	R	BOOL	65
Sampling tube analog signal state	R	BOOL	66
Instant flowrate analog signal state	R	BOOL	67
SPARE 1 analog signal state	R	BOOL	68
SPARE 2 analog signal state	R	BOOL	69
Date and Time update	R/W	BOOL	70
Injection button (Auto mode)	R/W	BOOL	71
Steady flowrate activation	R/W	BOOL	72
Reset injection totalizers	R/W	BOOL	73
Reset absorption totalizers	R/W	BOOL	74
Current time (seconds)	R	INT	1
Current time (minutes)	R	INT	3
Current time (hours)	R	INT	5
Current Date (day)	R	INT	7
Current Date (month)	R	INT	9
Current Date (year)	R	INT	11
Set time (seconds)	R/W	INT	13
Set time (minutes)	R/W	INT	15
Set time (hour)	R/W	INT	17
Set date (day)	R/W	INT	19
Set date (month)	R/W	INT	21
Set date (year)	R/W	INT	23

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Table 12. Modbus (continue)

VARIABLE DESCRIPTION	READ/WRITE	DATA TYPE	I/O ADDRESS
Set fiscal time	R/W	INT	25
Set fiscal date	R/W	INT	27
Machine State 0: FAIL 1:STANDBY 2: RUN	R	UINT	29
Scaled Instant flow signal (Smc/h)	R	REAL	31
Spare 1 scaled analog signal (eng. unit)	R	REAL	33
Spare 2 scaled analog signal (eng. unit)	R	REAL	35
Tank Volume (l)	R	REAL	37
THT - CH4 odorant concentration value (mg/mc)	R	REAL	39
CH4 / hour totalizer (Smc)	R	REAL	41
CH4 / day totalizer (Smc)	R	REAL	43
CH4 / month totalizer (Smc)	R	REAL	45
THT / hour totalizer (g)	R	REAL	47
THT / day totalizer (g)	R	REAL	49
THT / month totalizer (g)	R	REAL	51
THT-CH4 concentration / hour (mg/Smc)	R	REAL	53
THT-CH4 concentration / day (mg/Smc)	R	REAL	55
THT-CH4 concentration / month (mg/Smc)	R	REAL	57
CH4 absorption system totalizer/ hour (Smc)	R	REAL	59
CH4 absorption system totalizer / day (Smc)	R	REAL	61
CH4 absorption system totalizer / month (Smc)	R	REAL	63
MC / Pulse (g)	R	REAL	65
Sampling tube odorant level (mm)	R	REAL	67
Injection pulse time (ms)	R	REAL	69
Concentration setpoint (mg/Smc)	R/W	REAL	71
Density (g/cm ³)	R/W	REAL	73
Steady flowrate value (Smc/h)	R/W	REAL	75
CH4 cycle totalizer (Smc)	R	REAL	77
THT cycle totalizer (Smc)	R	REAL	79
Totalizzatore ciclo precedente CH4 (Smc)	R	REAL	81
Totalizzatore ciclo precedente THT (Smc)	R	REAL	83
Previous cycle concentration (mg/Smc)	R	REAL	85
Number of previous cycle impulses (imp)	R	REAL	87
Average of mg / pulse of the cycle	R	REAL	89
Average of mg / pulse of the last cycle	R	REAL	91
Zero signal SPARE 1	R/W	REAL	93
Span signal SPARE 1	R/W	REAL	95
Offset signal SPARE 1	R/W	REAL	97
Zero signal SPARE 2	R/W	REAL	99
Span signal SPARE 2	R/W	REAL	101
Offset signal SPARE 2	R/W	REAL	103
EV exchange threshold from inj. L to inj. H (Smc / h)	R/W	REAL	105
EV exchange threshold from inj. H to inj. L (Smc / h)	R/W	REAL	107
Concentration alarm set (%)	R/W	REAL	109
Low tank level threshold (L)	R/W	REAL	111
Very low tank level threshold (LL)	R/W	REAL	113

Table 12. Modbus (continue)

VARIABLE DESCRIPTION	READ/WRITE	DATA TYPE	I/O ADDRESS
Low threshold SPARE 1	R/W	REAL	115
Low Low threshold SPARE 1	R/W	REAL	117
Low threshold SPARE 2	R/W	REAL	119
Low Low threshold SPARE 2	R/W	REAL	121

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