

May 2010

Type Dosaodor-D Odorant Injection System Controlled by Type ROC809 Remote Telemetry Unit Unit for North America Installation



Figure 1. Type ROC809 Remote Telemetry Unit



Figure 2. Standard Wick Insert



Figure 3. Type Dosaodor-D Pneumatic Panel

Type Dosaodor-D

Specifications

Pneumatic Panel:

Material

Stainless steel plate

Installation

Wall mount

Weight

55 to 100 pounds (25 to 45 kg)
(based on configuration)

Overpressure Relief Valve**Stainless Steel with Following Rating Options:**

200 psi (14,0 bar)

550 psi (38,0 bar)

870 psi (60,0 bar)

Electrical Protection

Explosion proof

Class I, Division 1 and 2 - Groups B, C, D

Class I, Zone 1 and 2 - Groups IIB + H2, IIA

Mechanical Connections**Odorant Inlet and Discharge**

1/4-inch (6,4 mm) OD Tube fitting (double ferrule)

Gas Inlet and Discharge

3/8-inch (9,5 mm) OD Tube fitting (single ferrule)

Maximum Working Pressure

Supply: 1450 psi (100 bar)

Injection: 870 psi (60,0 bar)

Odorant Flow Rate

0.13 to 3.70 gallons per hour (0,5 to 14,0 l/hr)
(0.89 to 24.97 pounds/hr at 6.75 pounds/gal)

Temperature Range

14° to 140°F (-10° to 60°C)

Odorant Calibration Cylinder:

Body Material

304 Stainless steel

Maximum Working Pressure

870 psi (60,0 bar)

Maximum Emergency Design Pressure

1450 psi (100 bar)

Solenoid Valves:

Body Material

304 Stainless steel

Gasket Material

Fluorocarbon (FKM)

Valve Operation

Electromagnetic

Maximum Working Pressure

870 psi (60,0 bar)

Power Requirements

12 Vdc

Electrical Protection

Explosion proof

Class I, Division 1 - Groups A, B, C, D

Stabilizer Filter Type SA/2:

Body Material

Steel

Maximum Working Pressure

1450 psi (100 bar)

Gasket Material

Nitrile (NBR)

Type ROC809 Controller

The I/O modules used in the Type ROC809 controller are standard ROC800 Series modules with no special equipment required

Barrier Specifications

See Table 1

I/O Requirements

See Table 2

Type ROC809 Technical Specifications

Go to: <http://www.emersonprocess.com/remote/>

Recommended Odorant Filter Specification

50 µm (filter is included)

Introduction

Type Dosaodor-D is a computerized odorant injection system for natural gas using patented solenoid injector technology that eliminates the need for plunger pumps.

The solenoid injectors provide odorant injection accuracy to be maintained over the entire flow range of the system, approaching infinite turn down.

Automatic calibration during operation adjusts for any changes in mechanical components and also detects failures for alarming. Report by exception alarming is a configurable option.

The system can also be configured to use redundant injectors and/or an emergency backup or bypass absorption system.

Real time and historical data can be read locally or remotely by a laptop computer using ROCLINK 800 configuration software, or remotely using third party SCADA products utilizing ROC or Modbus protocol.

ROCLINK 800 software is available for complete configuration and operation of the system including:

- Display of real time and historical data
- Configuration of alarms
- Archival of historical data

Benefits

- Uniform distribution of odorant due to frequent smaller injections and enhanced absorption from the wick insertion.
- High turndown ratio. For example, one specific configuration would evenly distribute odorant at flow rates from 2000 to 1 200 000 SCFH (53,6 to 32 160 Nm³/h) without mechanical adjustment.
- Automatic calibration of injection system during normal operation ensuring consistent odorization.
- Environmentally friendly with no venting of gas or odorant while operating.
- Extremely low maintenance cost.
- Variety of redundancy and backup options for reliable odorization.
- User friendly configuration software.

- Standard and scalable hardware platform that supports additional station I/O for AGA flow calculations and PID control algorithms.

Operation

The Type Dosaodor-D odorant injection system operates on the basic principle of a fixed differential pressure and orifice used to measure a non-compressible fluid.

Fixed differential pressure is maintained using double cut regulation by fixed differential pressure regulators (Type SA/2 regulators) which reference P_2 and reduce the inlet pressure of a regulating station to $P_2 + \Delta P$. $\Delta P_{min} = 8.7$ psi (0,60 bar), $\Delta P_{max} = 21.7$ psi (1,5 bar) (an alternate high-pressure source can be used). This pressure loading of the odorant calibration cylinder filled with odorant is used to inject liquid odorant into the downstream pipeline through an on/off valve (the fixed orifice¹) with a known flow coefficient that is controlled by the automated system. The objective of the automated control system is to maintain an injection rate specified by the user which is proportional to the gas flow. Accuracy of injection is accomplished utilizing relatively small injections which are automatically resized over a wide range dependent upon variations in the gas flow. This results in a turn down ratio for the system that can exceed 500:1 (the addition of a simple bypass system utilizing the odorant storage tank can allow the turn down ratio to approach infinity). An odorant calibration cylinder with a fixed volume is utilized to recalibrate the injection valve flow coefficient each time the odorant calibration cylinder is refilled.

During the refill cycle the pressure used for injection is relieved into the downstream pipeline which eliminates venting of gas to atmosphere or an expansion tank. Liquid odorant refill of the odorant calibration cylinder is typically accomplished by using all or some part of the $P_2 + \Delta P$ pressure to load the odorant storage tank thus pushing the liquid out of the tank and into the odorant calibration cylinder, $\Delta P=8.7$ to 21.7 psi (0,60 to 1,5 bar).

Since the unit uses only pressure for injection there are few moving parts in the system resulting in very little maintenance. Relatively low cost options for both automated and emergency redundancy for odorization are also available.

The gas flow rate is obtained through either a corrected gas volume pulse input or an instantaneous flow rate analog input (4 to 20mA) signal. The gas

1. Although the valve orifice is fixed for a specific application the valve can be adjusted manually to accommodate flow rates as small as 2 MSCFH to over 33 000 MSCFH with one injector.

Type Dosaodor-D

flow rate can also be configured manually to a fixed value. Odorant injection rate is then calculated using accumulated flow in order to reduce variability.

In cases where the station does not have a flow computer, the Type ROC809 can be connected directly to a pulse output from the turbine, or an analog output from a differential pressure transmitter (Rosemount Types 3051 and 3095, etc.).

Variability between the calculated and actual injection volume is used to automatically adjust injection parameters for any changes in the system and to detect alarm conditions or system failure, the odorant calibration cylinder is used to monitor the actual use of odorant. In the event of power failure, configuration information and archived historical data are maintained.

Type Dosaodor-D is designed to purge the odorant back into the tank in the event that mechanical maintenance is required. Odorant is pushed back into the tank and gas is purged through the system to absorb any remaining liquid.

General Safety Rules

Only qualified personnel shall install and operate the odorizing system.

Odorizing systems should be installed, operated, and maintained in accordance with international and applicable codes and regulations.

Installation, operation, and maintenance procedures performed by unqualified personnel may result in unsafe operation.

This condition may result in equipment damage or personal, environment injury. If a leak develops in the system, the escaping gas may accumulate and become a fire or explosion hazard. Immediately call qualified service personnel in case of trouble.

The service engineers (operators and maintenance workers of odorizing systems) shall comply, in any case, with the following rules:

1. Always wear safety clothing to prevent the product from coming in contact with the skin, eyes, or to prevent it from being inhaled;
2. In case of leaks or liquid spillage, be prepared to neutralize or contain the liquid.

Site Requirements

Careful consideration when locating the ROC809 on the site can help reduce future operational problems. Consider the following items when choosing a location:

- **Local, state, and federal codes often place restrictions on locations and dictate site requirements.** Examples of these restrictions are: the amount of distance from a meter run, distance from pipe flanges, and hazardous area classifications. Ensure that all code requirements are met.
- Choose a location for the ROC **that minimizes the length of signal and power wiring.**
- **The ROC809 is equipped for radio communications should be located so the antenna has an unobstructed signal path.** Antennas should not be aimed into storage tanks, buildings, or other tall structures. If possible, antennas should be located at the highest point on the site. Overhead clearance should be sufficient to allow the antenna to be raised to a height of at least 20 feet (6 m).
- To minimize interference with radio communications, **choose a location for the ROC away from electrical noise sources**, such as engines, large electric motors, and utility line transformers.
- Choose a location for the ROC **away from heavy traffic areas to reduce the risk of being damaged by vehicles.** However, provide adequate vehicle access to aid monitoring and maintenance.
- **The site must comply with class limits of Part 15 of the FCC rules.** Operation is subject to the following two conditions: (1) The device may not cause harmful interference, and (2) the device must accept any interference received, including interference that may cause undesired operation.

Compliance with Hazardous Area Standards

The ROC hazardous location approval is for Class I, Division 2, Groups A, B, C, and D. The Class, Division, and Group terms include:

1. **Class** defines the general nature of the hazardous material in the surrounding atmosphere. Class I is for locations where flammable gases or vapors may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

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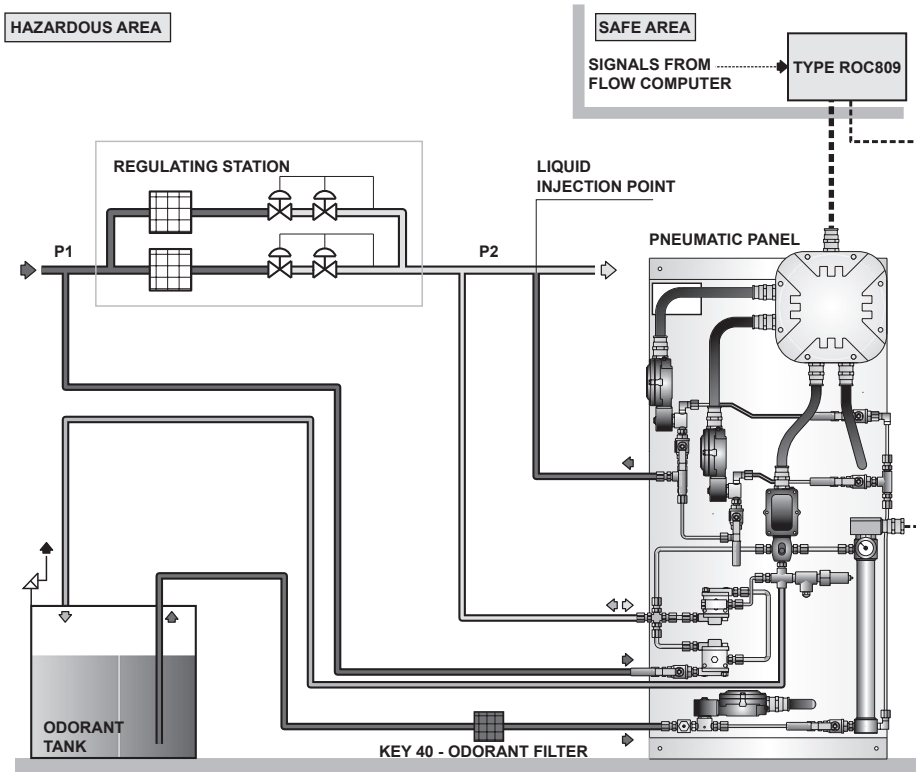


Figure 4. General Installation Schematic

Table 1. Barrier Specifications

	I. S. BARRIER PARAMETERS	MUST BE	LEVEL SWITCH + CABLE PARAMETERS
1	Co	≥	Ci + Cc
2	Lo	≥	Li + Lc
3 Alternative to previous one	Lo/Ro	≥	Lc/Rc

2. **Division** defines the probability of hazardous material being present in an ignitable concentration in the surrounding atmosphere. Division 2 locations are locations that are presumed to be hazardous only in an abnormal situation.

3. **Group** defines the hazardous material in the surrounding atmosphere. Groups A to D are as follows:

- **Group A** – Atmosphere containing acetylene.
- **Group B** – Atmosphere containing hydrogen, gases, or vapors of equivalent nature.
- **Group C** – Atmosphere containing ethylene, gases, or vapors of equivalent nature.

- **Group D** – Atmosphere containing propane, gases, or vapors of equivalent nature.

For the ROC809 to be approved for hazardous locations, it must be installed in accordance with the National Electrical Code (NEC) guidelines or other applicable codes.

 **NOTICE**

Refer to the ROC809 User Manual for installation. Incorrect installation in a hazardous area could result in personal injury or property damage. Generally, control unit installation in hazardous area is not recommended.

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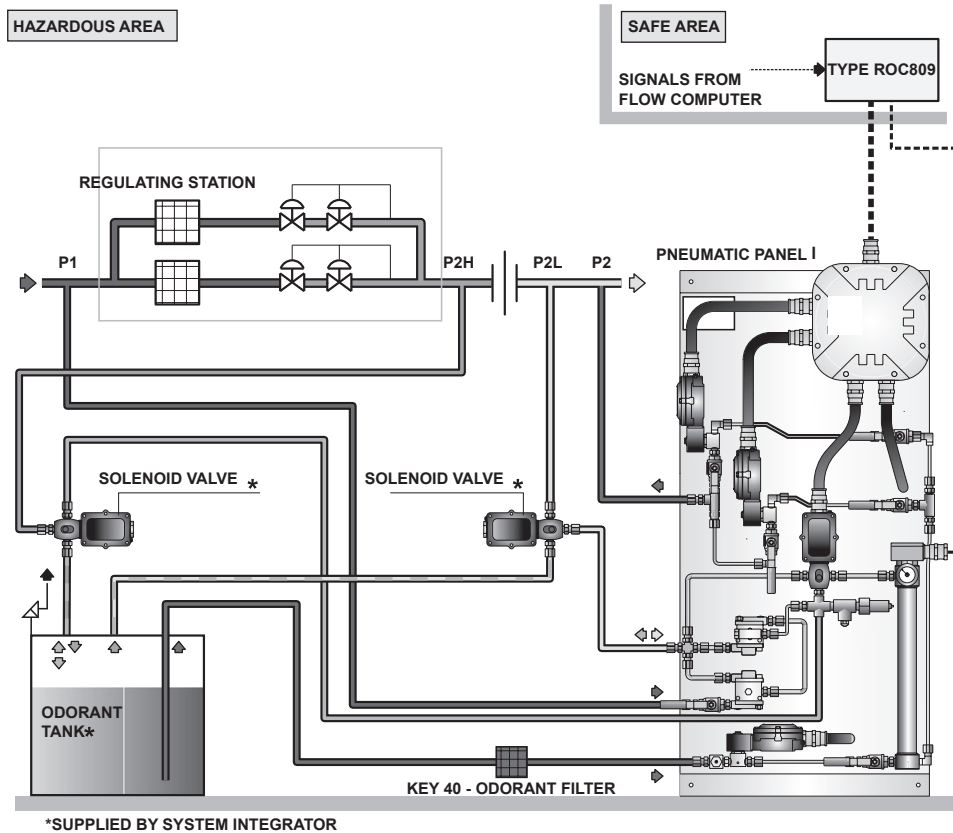


Figure 5. Automated Pressure Balancing System with Bypass Schematic

CAUTION

When working on units located in a hazardous area (where explosive gases may be present), make sure the area is in a non-hazardous state before performing procedures. Performing procedures in a hazardous area could result in personal injury or property damage.

Best Practices for Installation

1. Install a sight/drip glass to monitor odorant injection. If the odorant storage tank is large, a bypass is recommended to reduce the time it takes to pressurize the tank.
2. Before installing the pneumatic panel, verify float activation of magnetic switches in odorant calibration cylinder. Use an Ohm meter and

validate that when the panel is upright and the float is at the bottom one set of wires has conductivity (brown). Then tip the panel upside down which will cause the float to slide up the stem to the high level magnetic switch and the second magnetic switch wire should then have conductivity (green).

3. Get and read the Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012). Get the information that is printed on the panel for odorant calibration cylinder capacity (CONTROL DEVICE VOLUME) and injector valve flow coefficients (SPECIFIC VOLUME INJECTOR N° X). Get the three values related to the used odorant: specific gravity (normally about 0.6); specific weight (normally about 6.75 pounds per gallon) and finally the initial injection rate (normally in the 0.5 to 1.0 pound of odorant per million cubic feet of gas range).

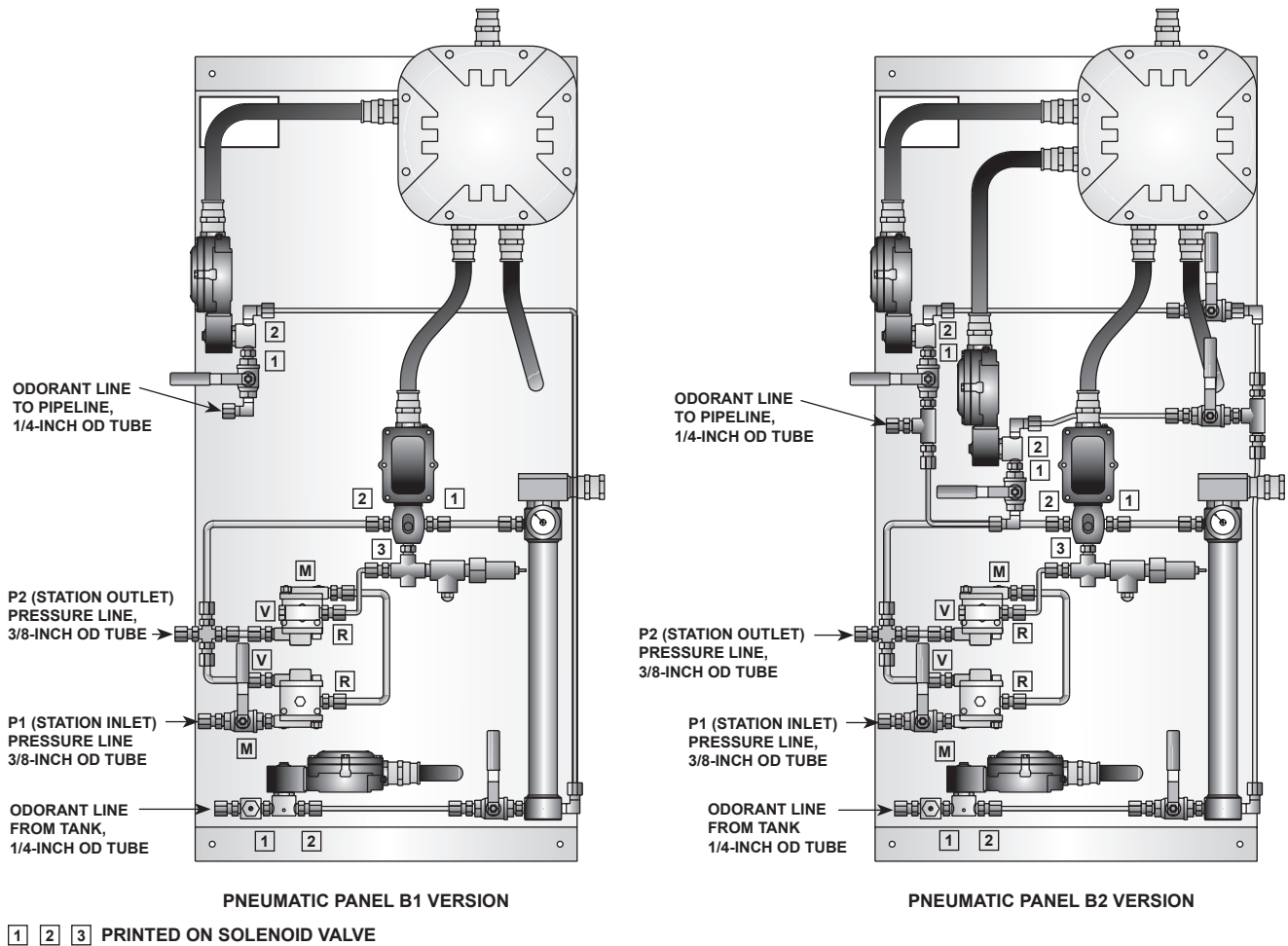


Figure 6. Connections for Pneumatic Panel

4. Install quarter turn hand valves at each end of tubing runs for easy isolation during troubleshooting or repairs.
5. Install "Pete's Plugs" so that a pressure gauge can be placed into different parts of the system (e.g. storage tank pressure, pressure at point of pipeline injection; pipeline, or supply pressure to Type SA/2) for troubleshooting.
6. If odorant storage tank is kept at $P2 + \Delta P$ pressure then a flow control valve must be installed in the liquid line to control refill time. Swagelok flow control (metering) valves are recommended: M and 31 Series. Suggested refill time: 45 seconds minimum to 120 seconds. However, if the storage tank floats with the pipeline by using added solenoid valves, then this valve is not needed.
7. As above, refill of the odorant calibration cylinder should take at least 45 seconds to a couple minutes. Considering this value, assume that odorant is already at the low level of the odorant calibration cylinder (you have not purged the odorant back into the tank or are not just starting up the system and need to fill all the tubing coming to the odorant calibration cylinder).
8. Type ROC809 digital output modules (DOs) do not drive the solenoids directly; wires are used to power the supply (see Figure 8).
9. Get a cross over ethernet cable to connect directly from a PC to the Type ROC809 ethernet port. See Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012).

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Table 2. I/O Requirements⁽¹⁾

SLOT	REQUIREMENT	DESCRIPTION	POINT DESCRIPTION	(SPECIFICATION SHEET)
1	Optional	Communication Card	Not Applicable	6.3:COM
2	Optional	Communication Card	Not Applicable	6.3:COM
3	Optional	Communication Card	Not Applicable	6.3:COM
4	Choose according to Flow Rate input	Pulse Inputs	Channel 1: Flow Input from computer or pulse meter	6.3:PI
			Channel 2: Spare	
5	Choose according to Flow Rate input	Analog Inputs	Channel 1: Flow Input from computer	6.3:AI
			Channel 2: Supply tank level input	
			Channel 3: Spare	
			Channel 4: Spare	
6	Required	Discrete Inputs	Channel 1: Odorant calibration cylinder high level	6.3:DI
			Channel 2: Odorant calibration cylinder low level	
			Channel 3: Gas flow computer alarm ⁽²⁾	
			Channel 4: Spare	
			Channel 5: Spare	
			Channel 6: Spare	
			Channel 7: Spare	
			Channel 8: Spare	
7	Optional	Analog Outputs	Channel 1: Instantaneous Odorant Concentration	6.3:AO
			Channel 2: Average Odorant Concentration for Current Day	
			Channel 3: Spare	
			Channel 4: Spare	
8	Required	Discrete Relay Outputs	Channel 1: Injector #1 solenoid	6.3:IOM3
			Channel 2: Injector #2 solenoid	
			Channel 3: Odorant calibration cylinder pressure solenoid/Tank pressure solenoid	
			Channel 4: Odorant calibration cylinder refill control solenoid	
			Channel 5: System is offline	
9	Required	Discrete Relay Outputs	Channel 1: Alarm Output	6.3:IOM3
			Channel 2: Low odorant supply tank level	
			Channel 3: Gas volume output pulse	
			Channel 4: Odorant volume output pulse	
			Channel 5: Spare	

1. Each module must be inserted in the assigned slot.

2. This point should be manually reconfigured if it is not connected to an external flow computer see Dosaodor User Manual (D103117X012), Alarm Output Contact Selection, Flow Computer.

10. For the low flow conditions, set the odorizer control program scan time to 20 seconds (default is 2 seconds) to improve current value read out for flow. See Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012).
11. Review configuration of system, set alarm, and other parameters while mechanical installation is in progress (including odorant calibration cylinder volume and initial injector valve flow coefficient(s)). See Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012).
12. Spend time training on the operation, configuration, and troubleshooting tools for the system.
13. After landing all control wiring and before loading the system with pressure, activate each digital output to verify correct wiring and operation of solenoids.
14. In an orderly manner pressurize the system with nitrogen (IF USED) from the high pressure supply and for reference to the pipeline pressure.
15. Check tubing and fittings for any leakage.

16. Open liquid odorant fill tubing valve to odorant calibration cylinder and check for leaks.
17. Do a manual refill of the odorant calibration cylinder; check for any leaks in tubing and fittings and correct operation of magnetic switches.
18. Do a purge of the odorant calibration cylinder (for training and correct operation of components).
19. Refill odorant calibration cylinder.
20. Set operation mode to Manual and set flow rate to high level (50 000 MCFH to 75 000 MCFH) in order to push odorant through the injection solenoids and remaining tubing down to the pipeline.
21. Once odorant appears in sight glass, place system in Automatic mode and continue setting up configuration parameters.
22. Observe first refill of odorant calibration cylinder and recalculation of injector flow coefficient.
23. After a period of operation and allowing several odorant calibration cylinder refills, analyze actual injection rate against target. To confirm everything is working correctly locate a calibration refill (at the top of the hour) in the event log. Next, find where there was another refill at the top of another hour, this may be several hours or even days later. Count the number of refills that occurred during that time. The volume of the odorant calibration cylinder tells you how much odorant was measured into the pipeline during that time. Referring to the computer, you can add up the gas flow during that same period since AGA calculations are summarized for each hour at the top of the hour. Now you can divide the volume of odorant you calculated by the gas flow volume for the same period and verify the injection rate.

Injection System Configuration Schemes

The Type DOSAODOR-D product works using the differential pressure that is present in regulating station. For non-differential applications (no regulating stations involved) please refer to appropriate solutions and related documentation.

Installation schematic depends on the application and needs of the customer. In the following pages, good practices and best practices will be described.

Just to give an idea about different configurations and installation options (see Figures 4 and 5), the following are the most common:

1. Additional odorant flow control valve may be used on odorant liquid line when odorant storage tank is maintained at $P_2 + \Delta P$. $\Delta P = 8.7$ to 21.7 psi (0,60 to 1,5 bar). C_v for built-in control valve (position 23, Figures 12, 13): $C_v = 0.11$. Odorant calibration cylinder refill time should be contained in the 45 to 120 seconds. If these constraints cannot be satisfied tuning the built-in flow control valve, an additional flow control valve must be used according to working conditions, to obtain the required refill time. Swagelok flow control (metering) valves are recommended: M and 31 Series.
2. Optional 3-way valve for pressurizing odorant storage tank to $P_2 + \Delta P$. $\Delta P = 8.7$ to 21.7 psi (0,60 to 1,5 bar) when tank is maintained at P_2 . When the 3-way valve is not energized then the storage tank is maintained at (floats with) P_2 . When it is energized for a liquid refill of the odorant calibration cylinder then the pressure begins going up towards $P_2 + \Delta P$ bar until the refill is completed.
3. Optional 3-way valve for maintaining odorant storage tank at P_2 . This is commonly used with option 2. Refer to Figure 5.
4. Option for odorant storage tank relief to P_2 . If P_2 pressure (refer to Figures 4 and 5) is highly variable or there is excess buildup of pressure in the storage tank due to temperature changes and at the same option 2 is not used, then a simple pressure relief valve may be needed to relieve excess pressure from the storage tank into P_2 stream.
5. Option for odorant calibration cylinder relief to P_2 . If the pressures in P_2 are highly variable, like what may occur in a straight line pipe with no regulator station, then the pressure in the odorant calibration cylinder may be raised to a value that is too high for the system to work properly during operations. To resolve this issue a relief valve may be installed across the 3-way valve on the pneumatic panel, to vent excess pressure from the odorant calibration cylinder into the downstream pipeline.
6. Options for utilizing odorant storage tank as a bypass or absorption system. This functionality may be activated by the Type Dosaodor-D system when disabled or in fault.

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Most frequent combinations.

- A. 1 and 6 with 4 and/or 5
- B. 2 and 3 with 6
- C. 4 and/or 5 with 6
- D. 2 and 3 should be used together

Pneumatic Panel Installation

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

All of the panel components are resistant to chemical attack from all of the odorizing liquids, to the elements and to those conditions specified in regulations regarding safety and electrical equipment.

It is essential that the distance between the panel and the injection location be as short as possible, as a short route limits the quantity of odorant subjected to pressure and thus reduces the chances of leakage of liquid occurring.

The pneumatic panel (Figure 3) is intended to be wall mounted. Two spacing brackets are part of the standard equipment supplied with the panel. The standard equipment contains two brackets, standard or extended injection wick, odorant filter, and screws.

Four openings are provided for pipe connections, and they are located at the end points of the support panel. The positions and sizes of the openings can be easily identified from Figure 6.

Pneumatic Lines and Connections

The pneumatic connections between the Type Dosaodor-D panel, the gas line, and the odorant tank should be carried out using stainless steel piping only. Refer to Figure 6 for pipe sizes.

CAUTION

The pipeline connecting the Type Dosaodor-D panel with the odorant tank should be configured to avoid the creation of possible air/gas pockets (obstacles to the odorant flow).

Piping should be installed as straight as possible, with a constant grade, and without any sequences of upward and downward inclines.

Polytetrafluoroethylene (PTFE) tape or thread sealer should be used on all pipe fittings to prevent odorant leakage.

Type ROC809 Controller Installation

Planning is essential to a good installation. Because installation requirements depend on many factors, such as the application, location, ground conditions, climate, and accessibility, this document only provides generalized guidelines.

WARNING

Failure to follow the following installation requirements could result in equipment malfunction and loss of odorant injection. Loss of odorant in the natural gas supply could result in personal injury and property damage from undetected leaking natural gas.

Level Float and Switch Wiring

Type ROC809 must not receive the signals directly from the odorant calibration cylinder (low and high level). For safety reasons a barrier must be installed.

Barrier Specifications

Verify connection cable and field device capacitance and inductance do not exceed the limits given for the Intrinsically Safe barrier.

Level Switch Safe Parameters:

Ci (Equivalent input capacitance) = 20pF

Li (Equivalent input inductance) = 4μH

If the results are negative, condition 3 prevails on 2, since cable resistance reduces circuit current (consequently reducing the stored electrokinetic energy).

Cable parameters:

Cc (Equivalent input capacitance)

Lc (Equivalent input inductance)

Rc (Equivalent input resistance)

Environmental Requirements

NOTICE

The ROC809 requires protection from direct exposure to rain, snow, ice, blowing dust or debris, and corrosive atmospheres.

In salt spray environments, it is especially important to ensure that the enclosure is sealed properly, including all entry and exit points.

- Always install the ROC809 in a user-supplied enclosure.
- If the ROC809 is installed outside a building, it must be placed in a National Electrical Manufacturer's Association (NEMA) 3 or higher rated enclosure to ensure the necessary level of protection.
- The ROC809 operates over a wide range of temperatures. In extreme climates it may be necessary to provide temperature-controlling devices to maintain stable operating conditions.
- In extremely hot climates, a filtered ventilation system or air conditioning may be required.
- In extremely cold climates, it may be necessary to provide a thermostatically controlled heater in the same enclosure as the ROC809.
- To maintain a non-condensing atmosphere inside the ROC809 enclosure in areas of high humidity, it may be necessary to add heat or dehumidification.

I/O Configuration

Several options are available on the Type ROC809 controller. Outputs may be added to interface with external devices such as systems for remote data transmission, remote monitoring, and remote surveillance. Table 2 lists the minimal requirements.



NOTICE

Each module must be inserted in the assigned slot as shown in Table 2.

Further configuration information is provided in the Type Dosaodor-D Software for Configuration

of Type Dosaodor-D Odorant Injection System Manual (D103117X012).

Refer to the ROC809 Remote Operations Controller Instruction Manual (Form A6116).

Electrical Connections Schematics

The electrical connections between the enclosure and pneumatic panel should be completed according to Figures 7 and 8.

Preliminary Checks

Before turning on the electronic control unit:

1. Gas Volume/Gas Delivery signal type must be set to one of the following input signals:
 - Pulse input
 - Analog input
 - Internal Orifice
 - Internal Turbine
2. Check all of the electrical and pneumatic connections for proper conformity throughout the entire system, using the diagrams and drawings supplied by the system integrator.
3. Make sure that all of the valves for connection between the pneumatic panel and remaining part of the station are leak free. Turn on the electronic control unit.

Control Unit Power-On and Parameters Set-Up

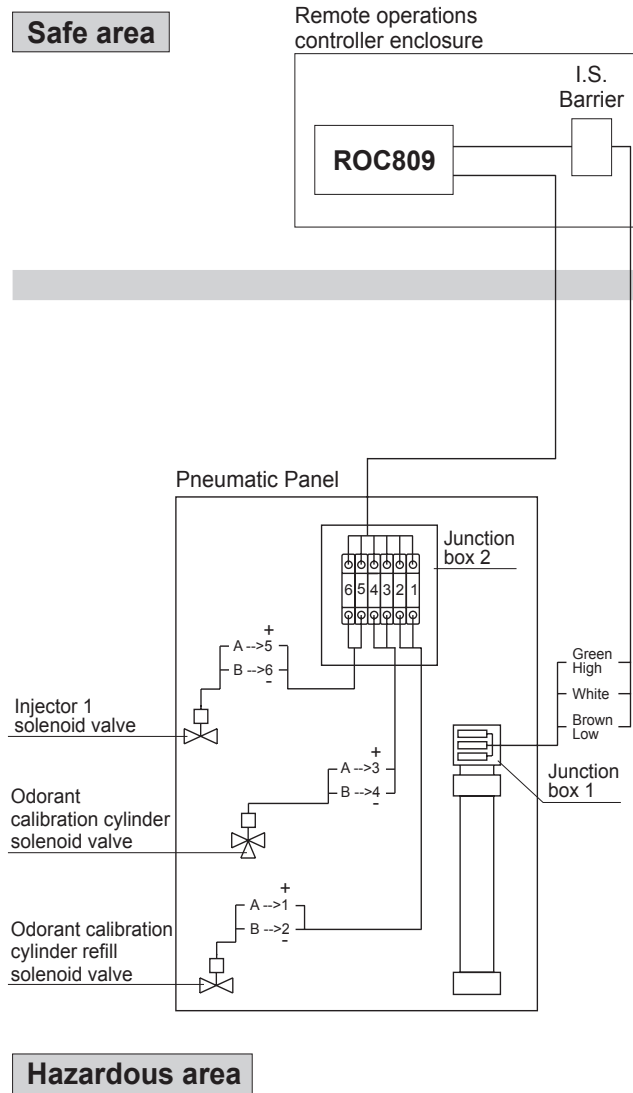
After all of the checks in the preceding section and suggested by the system integrator have been carried out, turn on the system, set it in Disable mode and configure parameters as described in:

“Procedure and Compilation of Work Parameters” chapter of **Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012)**.

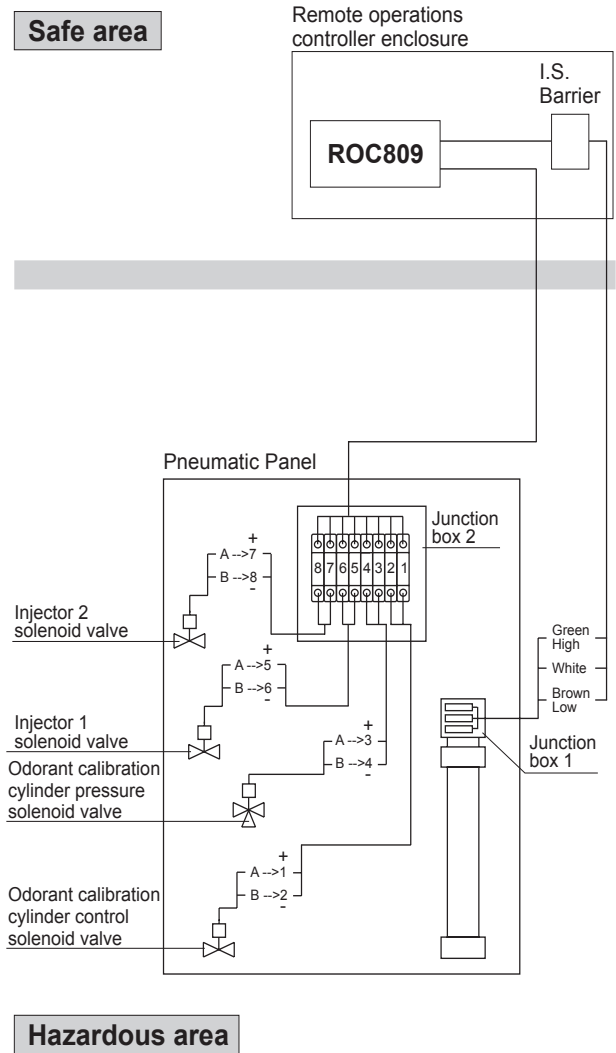
Programmed and Displayed Data

Please refer to Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012).

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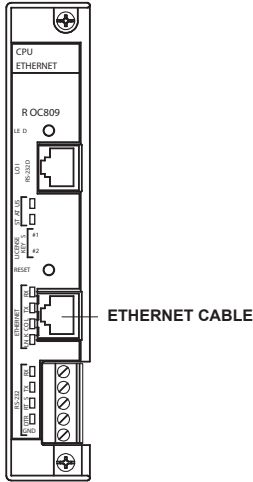
TYPE DOSAODOR-D B1 VERSION



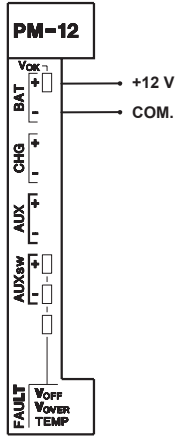
TYPE DOSAODOR-D B2 VERSION

Figure 7. Electrical Connections Schematics

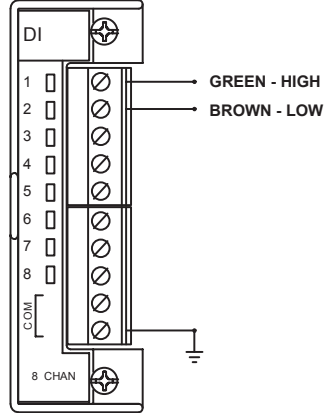
Type Dosaodor-D



ETHERNET CONNECTION

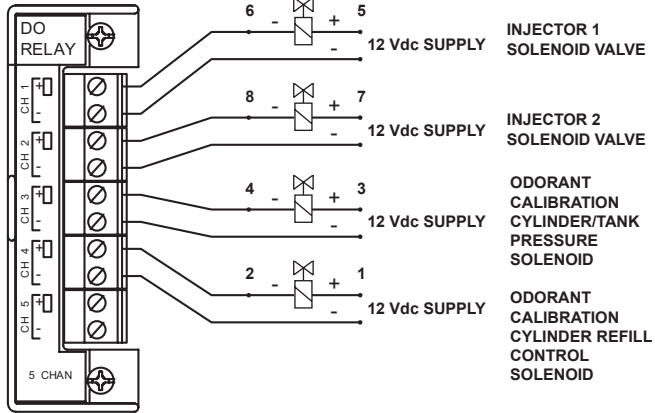


SUPPLY VOLTAGE CONNECTIONS

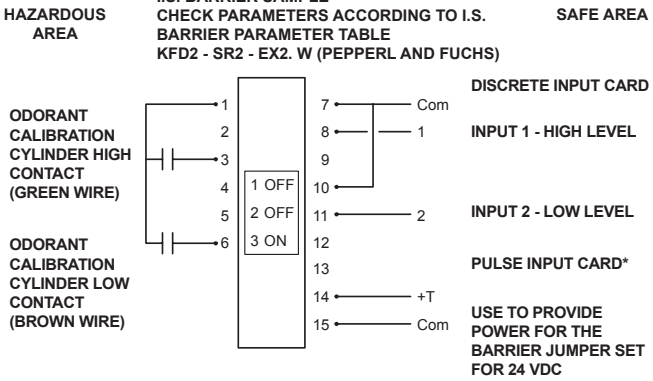


REFER TO TYPE DOSAODOR-D SCHEMATICS ON PAGE 12 JUNCTION BOX 1

LEVEL SWITCH CONNECTIONS



SOLENOID VALVES CONNECTIONS



BARRIER

REFER TO TYPE DOSAODOR-D SCHEMATICS ON PAGE 12 JUNCTION BOX 2. EXTERNAL POWER SUPPLY IS NEEDED.

*ALTERNATIVE POWER FOR THE BARRIER: ANALOG INPUT BOARD (AI - 12).

Figure 8. Type ROC809 Electrical Connections

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NOTICE

The factory tuning procedure of the injection solenoid valve is conducted with a specific gravity value of 1.

The value entered in the fields “Entered Volume For Injector 1 (lbs/sec), Entered Volume For Injector 2 (lbs/sec) must be calculated. Multiply the specific gravity of the odorant to be injected (typical values range between 0.5 and 1.0) by the value found on the nameplate of the pneumatic panel titled: Specific volume injector N°1.

For example, with an odorant specific gravity of 0.6 and the specific volume of injector 1 being 0.0132 lb/s, the entered value would be:

$$0.6 * 0.0132 = 0.00792 \text{ (entered value)}$$

If the Entered Volume for Injector 1 changes more or less than the 10% of the label value, the calibration procedure is required. See section labelled “Injection Valve Calibration.”

Startup and Testing

Additional Materials Required

In order to proceed with system startup, you should have at least 0.14 gallon of liquid capable of neutralizing the effect of the odorant used.

The most frequently used liquid is a mixture of sodium hypochlorite (bleach) with denatured alcohol and a small amount of “fragranced” liquid soap.

Preliminary Checks

Make sure all pipe and pipe connections are pressure tight and leak free before starting up the system.

Proceed as follows using Figures 4 and 5 as reference:

- Close the odorant input valve found at the base of the pickup tank. The use of this valve is strongly suggested for every installation.
- Open the two gas on/off valves found on the main line (upstream station, downstream regulators).

- Using a suitable spray, check for any gas leaks (check ALL fittings).
- Proceed by switching on the Type ROC809, setting the system in Disable mode.
- Check the line section connecting the pneumatic panel with the odorant tank for any gas leaks.

If no leaks are detected, prime the entire system.

Priming the Pneumatic Panel

- Open the 4 on/off gas valves found on the main line (Upstream filters, Downstream regulators, Odorant injection, High-pressure gas supply to the panel).
- Open the two on/off odorant valves found on the pneumatic panel.
- Open the on/off odorant valve found at the base of the odorant storage tank.
- Switch on the Type ROC809 control unit.
- Check the programmed data for accuracy.
- Eliminate any alarms present.
- Start the Wash cycle as described in **Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System (D103117X012)**.

Stop the wash cycle after an interval of time that is sufficient to drain the section of the line joining the pneumatic panel with the injection point: Approximately 12 seconds for each meter of pipeline installed (DN 6 x 4 mm).

Once the priming/drainage phase is completed, the system is ready for operation. Make sure that the flow computer is transmitting the gas volumes correctly (Using ROCLINK 800 Software).

Set to zero all of the internal counters (look at Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System manual (D103117X012)).

Set the system in Auto mode.

The system will start dosing the odorant proportionally to the flow rate of the gas in transit.

Maintenance and Operation Injection Valve Tuning

Procedures and Recommended Timing for Routine/Extraordinary Maintenance Operations

The Type Dosaodor-D system that you have purchased has been manufactured with state-of-the-art technology and materials currently available.

Type Dosaodor-D odorizing system and its accessories are subjected to normal wear/aging and must be inspected periodically.

The frequency of inspection/checks and replacement depends upon the severity of service conditions and upon applicable National or Industry codes, standards, and regulations/recommendations.

Maintenance may be accomplished following proper procedures that are detailed in the Instruction Manual.

Routine Maintenance:

For routine maintenance operations, refer to the parts list and appropriate assembly drawings. It includes all spare parts that may need to be replaced in the system enabling the system to comply with the functional specification it was originally designed.

System Shutdown



WARNING

To avoid personal injury or property damage from sudden release of pressure, isolate the equipment from the pressure system, and release all pressure from the connections before performing maintenance operations.

These are the operations to be carried out:

- Purge/Wash cycle by means of Natural Gas (follow the procedure on page 18).
- After completing the Purge/Wash Cycle, close all valves on the pneumatic panel.
- Close the needle valve located on the pipe detecting the odorizing pressure (low pressure branch).
- Close the odorant outlet valve located on the tank from which the odorant is picked up.

- Cut-off power supply to the electronic control unit.
- Depressurized the pneumatic panel by loosening the joint located in the upper left part of the control odorant calibration cylinder.

Recommended Parts Replacement

- Replace all rubber parts inside the two pressure filter-regulators model Type SA/2.
- Replace the filter cartridge located inside the filter housing.

Restart the system, following the instructions described in "Startup and Testing" section.

Extraordinary Maintenance:

It shall be carried out in case the system stops injecting the necessary odorant quantity. Alarm messages may highlight this condition. Please refer to troubleshooting section.

Professionally trained staff is required to perform maintenance operations.

Operators shall perform mechanical/pneumatic interventions, and be well informed on all instructions related to safety operations, that have to be met during any intervention on systems managing flammable and/or odorizing liquids.

Injection Valve Calibration



NOTICE

In some cases, the Injection valve may need calibration. This may be needed when:

- 1. Injector alarms take place frequently.**
- 2. The injection solenoid valve is replaced with a new one that has not been calibrated.**
- 3. During startup, if the injection solenoid valve calibration is not adequate to the working conditions (frequent injector alarms may take place).**
- 4. The Entered Volume for the injector changes more or less than 10% of the label value.**

Type Dosaodor-D

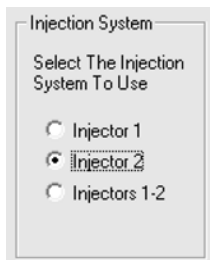
Before starting the calibration procedure, the system must be correctly installed and tested. Refer to Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012) for following programming steps.

CAUTION

During the calibration procedure gas overodorization or underodorization may take place.

To avoid this, the calibration process might be accomplished “off-line” using simulation devices (Plastic tank containing anti-freezing liquid). Please contact your local Sales Office in case off-line calibration is mandatory.

Put the system in Disable mode.
Select the injector to be calibrated. See Screenshot 1.



Screenshot 1: Injection System

Enter following data:

- Odorant Injection Concentration (depending on the odorant type). See Screenshot 2.
- Entered Specific Volume for the Injector that must be calibrated. See Screenshot 2.

Choose data from Table 3a or 3b (according to odorant flow rate) and multiply this value for the odorant Specific Gravity.

Definition:

$$\text{Odorant Specific Gravity} = \frac{\text{podorant}/\text{pH}_2\text{O}}{\text{podorant}/8,32}$$

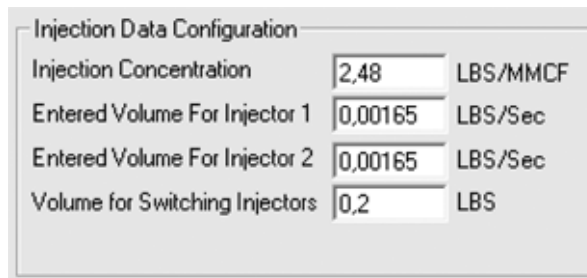
$$\text{podorant} = \text{Odorant Density [LBS/Gal]}$$

$$\text{pH}_2\text{O} = 8,32 \text{ LBS/Gal}$$

Examples:

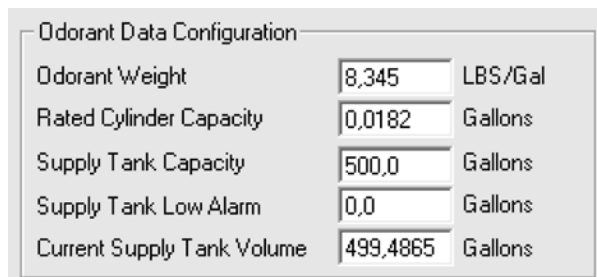
$$\rho_{\text{Sulfur base odorant}} = 8,345 \text{ LBS/Gal}$$

$$\rho_{\text{Mercaptan base odorant}} = 6,776 \text{ LBS/Gal}$$



Screenshot 2: Injection Data Configuration

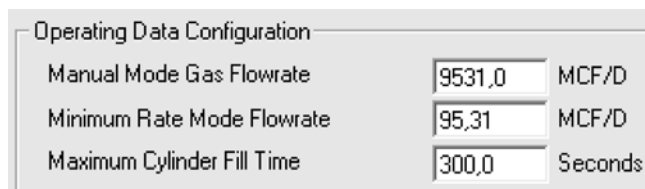
- Odorant Weight (depending on odorant type). See Screenshot 3.
- Rated Odorant Calibration Cylinder Capacity (see proper value on pneumatic panel nameplate). See Screenshot 3.



Screenshot 3: Injection Data Configuration

- Manual Mode Gas Flow Rate. See Screenshot 4.

Choose data from Table 3a or 3b; if Injection Concentration is different from 2,48 LBS/MMCF (40mg/m³), then calculate the new value by the formula below.



Screenshot 4: Operating Data Configuration

If required **Injection Concentration** is different from 2,48 LBS/MMCF (40mg/m³) then the **Manual Mode Gas Flow Rate** value must be recalculated by the following formula:

Table 3a. Imperial Parameters

ODORANT FLOW RATE (SEE PNEUMATIC PANEL NAMEPLATE)	INJECTION CONCENTRATION	MANUAL MODE GAS FLOW RATE	SPECIFIC VOLUME FOR INJECTOR ⁽¹⁾
MCF/h	LBS/MMCF	MCF/D	LBS/sec
17,7	2,48	9.531	0,00165
35,3		19.062	0,00330
70,6		38.124	0,00660
141,3		76.248	0,01320
211,9		114.372	0,01980
282,5		152.496	0,02640
353,1		190.620	0,03300
423,8		228.744	0,03960
494,4		266.868	0,04620

1. The specific volume entered for injector must be calculated. Multiply the specific gravity of the odorant to be injected (typical values range between 0.5 and 1.0) by the value that may be found on the nameplate of the pneumatic panel titled: Specific volume injector N°1. These values are listed in right column of above table. Example, with an odorant specific gravity of 0.6 and the specific volume of injector 1 being 0,0132 lbs/sec, the entered value would be: $0.6 * 0,0132 = 0,00792$ (entered value).

Table 3b. International Standard Parameters

ODORANT FLOW RATE (SEE PNEUMATIC PANEL NAMEPLATE)	INJECTION CONCENTRATION	MANUAL MODE GAS FLOW RATE	SPECIFIC VOLUME FOR INJECTOR ⁽¹⁾
l/h	mg/m ³	Stm ³ /D	g/s
0,5	40	270 000	0,75
1		540 000	1,5
2		1 080 000	3
4		2 160 000	6
6		3 240 000	9
8		4 320 000	12
10		5 400 000	15
12		6 480 000	18
14		7 560 000	21

1. The specific volume entered for injector must be calculated. Multiply the specific gravity of the odorant to be injected (typical values range between 0.5 and 1.0) by the value that may be found on the nameplate of the pneumatic panel titled: Specific volume injector N°1. These values are listed in right column of above table. Example, with an odorant specific gravity of 0.6 and the specific volume of injector 1 being 6 g/sec, the entered value would be: $0.6 * 6 = 3.6$ (entered value).

English Imperial Units

Manual Mode Gas Flow Rate = (2,48 x Manual Mode Gas Flow Rate (2,48))/ Injection Concentration

International Standard Units

Manual Mode Gas Flow Rate = (40 x Manual Mode Gas Flow Rate (40))/ Injection Concentration

“Manual Mode Gas Flow Rate (2,48)” and “Manual Mode Gas Flow Rate (40)” values are listed in the third column of Tables 3a and 3b.

Example:

Injection Concentration = 0,62 LBS/MMCF

Odorant Flow Rate = 17,7 MCF/h

Manual Mode Gas Flow Rate = (2,48 x 9.531)/ 0,62 = 38.124 MCF/D

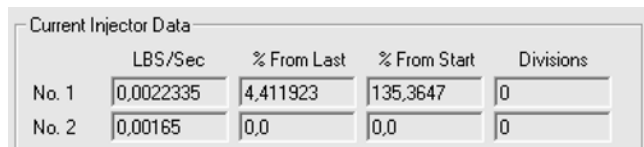
Position the metering device screw more or less open depending on the odorant flow rate. In order to obtain low odorant flow rate the orifice must be nearly closed and vice versa.

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Put the system in Manual mode to start the injection (push Manual button).

In order to calibrate the injection solenoid valve, verify from “Current Injection Data” the current Specific Volume value related to the “in calibration” injector.

This value will change at every refilling of the odorant calibration cylinder. See Screenshot 5.



Current Injector Data				
	LBS/Sec	% From Last	% From Start	Divisions
No. 1	0,0022335	4,411923	135,3647	0
No. 2	0,00165	0,0	0,0	0

Screenshot 5: Current Injector Data

If Specific Volume value related to the “in calibration” injector is > than Entered Volume for Injector value, then rotate the metering device screw on the injection solenoid valve counterclockwise in order to reduce orifice size.

See Figures 12 and 13, item 39 for the injection solenoid valve. See Figure 10, item 39G for Metering Devices screw for injection solenoid valve.

If Specific Volume value related to the “in calibration” injector is < than Entered Volume for Injector value then do the opposite.

Use a common screwdriver for calibrating the metering device.

Note

Turning the screw a little corresponds to high odorant flow rate variation.

Wait at least two refilling cycles before adjusting the metering device. Have at least two similar (+/- 5%) value readings before validate it. See “% From Last” value in Screenshot 5.

Specific Volume value is acceptable when it is equal to entered value +/- 10%.

See “% From Start” value in Screenshot 5 (acceptable values: $90\% \leq \text{Entered Volume} \leq 110\%$).

Put the system in Disable mode.

Change Manual mode Gas Flow rate to the desired value in working conditions.

Put the system in Auto mode to start injection.

Purge/Wash Cycle by Means of Natural Gas (Odorant Recovery and Gas Washing Cycles)

CAUTION

The purging/washing operation has to be completed before any routine or extraordinary maintenance intervention and before dismantling the Type Dosaodor-D odorizing system.

During washing operation with natural gas, the control activates both injectors at the same time (to improve the drying process and reduce time for the operation). Only the selected injector is used in case of injector flush.

The Purge/Wash cycle drains out all the odorizing liquid present in the injection system to allow partial or full dismantling without particular problems (odor or toxicity) for the operators.

The odorant inside the Type Dosaodor-D system is pushed into the odorizer tank. Only a small part is injected to the line.

Odorant Recovery Cycle must always take place before Gas wash. Follow the procedure below (refer to Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012)):

- Close the refilling manual valve close to the odorant calibration cylinder (look at Figure 6).
- Put the system in Refill and Disabled mode sequentially several times (refer to Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012)). This will increase the odorant calibration cylinder pressure (as the Gauge mounted on the odorant calibration cylinder indicates).
- Put the system in Purge/Wash mode Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012)).
- Open the refilling manual valve close to the odorant calibration cylinder (look at Figure 6).
- Start Odorant Recovery Cycle (refer to Dosaodor-D Software for Configuration of Dosaodor-D Odorant Injection System Manual (D103117X012)).

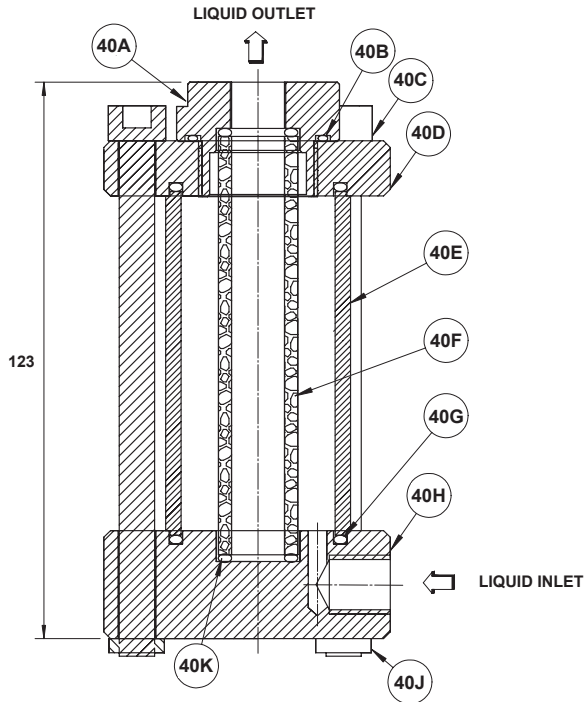


Figure 9. Odorant Filter - Maintenance

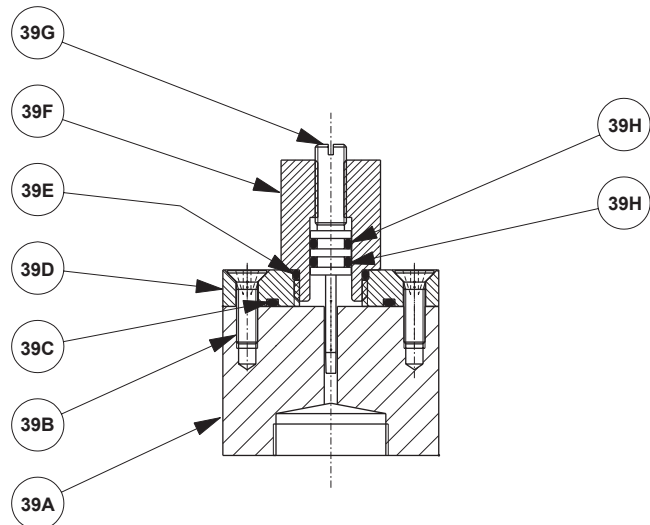


Figure 10. Two Way Injection Solenoid Valve - Maintenance

- Stop Odorant Recovery Cycle after about 15 seconds (depending on the installation conditions) and eventually repeat the procedure if needed.
- Select gas wash time.
- Run gas wash cycle.
- The cycle will be terminated when the Gas Wash cycle time will expire.
- Put the system in disable mode and turn it off before maintenance operations.

At this point all valves of the system have to be closed and you can perform maintenance operations on the involved parts.

After completing all operations, to restart the system open the system valves, turn ON the odorizer, reset the existing alarms and put the system in AUTO (MANUAL or MINIMUM RATE).

Injection Solenoid Valve Cleaning with Liquid Odorant (Injector Flush)

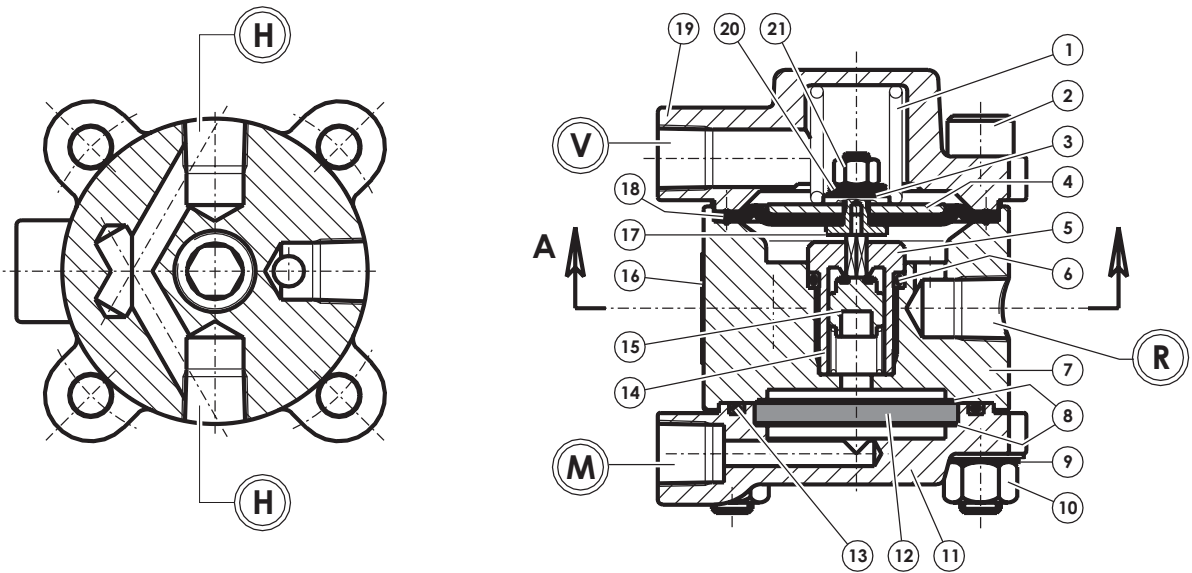


NOTICE

During the washing operation with natural gas the control activates both injectors at the same time (to increase the drying process), during injector flush just the selected injector is activated. This allows the system to increase the pressure for cleaning the dirty injector and reduce potential over odorization issues.

For injector selection, please refer to Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012).

Type Dosaodor-D



LEGEND

H - NOT USED
M - STABILIZER INLET
R - STABILIZER OUTLET
V - PIPELINE REFERENCE PRESSURE

Figure 11. Type SA/2 Supply Filter

Procedure:

- Put the system in Disable mode (refer to Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012));
- Turn injector valve adjusting screw in (closed) counting the number of turns to close the valve completely;
- Fully open the injector valve adjustment screw (there are O-rings installed so the screw will not come out and will not leak);
- Put the system in Purge/Wash mode (refer to Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012));
- Start the injector Flush Cycle pushing start button (refer to Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012));
- Repeat previous step (increasing "injector Flush Cycle time if needed") according to the needs. 1 second is the suggested injector flush cycle time, 5 seconds is the maximum allowed time;
- Put the system in Disable mode (refer to Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012));
- Fully close the injector valve adjustment screw;
- Turn injector adjusting screw out (open) for the same number of turns required to close the valve in the first step.
- Put the system in required Operation mode to start injection.

Replacement of the Filtering Cartridge (See Figure 9)

CAUTION

Before replacing the filtering cartridge (key 6, Figure 9), all devices mounted on the pneumatic panel have to drain out the odorizing liquid they contain.

To do this, follow the instructions reported in paragraph "Purge/Wash Cycle by Means of Natural Gas" section.

After completing the operation with the gas, close all on-off valves of the system and proceed as follows:

- Slowly loosen the fitting located on the upper part of the filter;
- Remove the connection on the upper intake of the filter;
- Unscrew and remove the upper closing cap (key 1) of the filter;
- Take out the cartridge filter (key 6) by means of a small screwdriver; Take out the O-rings (keys 10 and 2);
- Fit back the new cartridge filter (key 6) and O-rings (keys 10 and 2) and place back the closing cap (key 1);
- Open all valves and make sure that there are no leaks;
- Restart the system.

Three Way Pressure/Depressure Solenoid Valve

For Maintenance and Installation refer to ASCO Bulletin 8320 Form No. V6055R2.

Two Way Filling Solenoid Valves

For Maintenance and Installation refer to ASCO Bulletin 8262/8263 Form No. V5256R9.

Two Way Injection Solenoid Valve

The injection solenoid valve is mounted in the reverse orientation as compared to what ASCO documentation suggest. This is correct according to the application.

For Maintenance and Installation (considering the note above) refer to ASCO Bulletin 8262/8263 Form No. V5256R9.

Maintenance Procedure (refer to Figure 10)

Before replacing the O-rings, the odorizing liquid that is contained in the devices mounted on the pneumatic panel must be drained out. Follow the instructions in paragraph "Purge/Wash Cycle by Means of Natural Gas" - Type Dosaodor-D Software for Configuration of Type Dosaodor-D Odorant Injection System Manual (D103117X012).

When the operation is accomplished, close all on-off valves of the system and proceed as follows:

- Slowly loosen the fittings located on the two way injection solenoid valve;
- Remove the connections on the intakes of the two way injection solenoid valve;
- Apply the ASCO Installation and Maintenance Instructions form No. V5256R9 for replacing parts supplied in ASCO rebuild kit;
- Before replacing the body valve O-rings, count the turns unscrewing counterclockwise key 7 completely;
- Unscrew the four screws (keys 2);
- Unscrew key 6;
- Unscrew key 7;
- Take out the O-rings keys 3, 5, and 8;
- Fit back the new O-rings keys 3, 5, and 8;
- Reassemble keys 7, 6, and 4;
- Place back the four screws (keys 2);
- Replace the key 7 in the previous position. Consider the warnings that are included in the ASCO documentation about checking the valve for proper operation before starting service;
- Open all valves and make sure that no leaks exist;
- Restart the system.

Type SA/2 (See Figure 11)

Maintenance

Replacing filter

1. Remove screw (key 2), cover (key 11). Replace felt (key 12) and O-ring (key 13).

Replacing stabilizer diaphragm and seal pad

1. Remove cover (key 19); spring (key 1) and diaphragm assembly (keys 21, 20, 3, 4, 18, and 17). Replace diaphragm if necessary.
2. Unscrew seat (key 5), replace O-ring (key 15) and O-ring (key 6).
3. Reassemble by reversing the above sequence.

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Disassembly

1. Disconnect pilot supply filter regulator and remove it from the line.
2. Remove bolts, washers, and nuts from body and separate upper and lower covers from the body. When separating the covers from the body, be aware of loose components.
3. Remove and inspect O-ring for damage or wear, and replace if necessary. Lightly lubricate the O-ring before placing it back in the filter cover.
4. Clean screens. Replace filter pad.
5. Inspect diaphragm for damage or wear, and replace if necessary. Check the seating surface of the screw unit for erosion, scratches, spurs, or other damage, and replace if necessary.
6. Unscrew and remove the regulator seat. Inspect O-ring for damage or wear, and replace if necessary. Lightly lubricate the O-ring and place it on the regulator seat.
7. Pull pad holder unit out of the body. Inspect the seat for damage, replace if necessary.
8. Set the filter net on the spring and insert the regulator seat. Tighten the regulator seat until it stops.
9. Lightly lubricate the outer and inner rims of the diaphragm. Place the diaphragm assembly on top of the regulator seat. The screw unit will slide into regulator seat. Use care to avoid damage to parts when reassembling.
10. Set the spring on top of the nut.
11. Align the regulator cover over the body with the sense port opposite the pilot supply port.
12. Place the filter pad and screens, one on each side of the filter pad, on the filter cover.
13. Pick up the body and place it on the filter cover with the inlet port aligned vertically with the sense port.
14. Insert bolts. Place washers and nuts on the end of the bolts. Tighten the nuts.

Troubleshooting

List of Alarms and Warnings, Causes and Suggested Actions

Injector Alarm

- Type 1 high limit alarm
- Type 2 low limit alarm

General Alarm

- Flow computer alarm
- High flow rate alarm
- Low flow rate alarm
- Odorant calibration cylinder fill time alarm

Warnings

- Injector Variation warning
- Injector Division warning - Type 1 (high contact)
- Injector Division warning - Type 2 (low contact)
- Supply Tank warning

Spare Part Selection

Level Switch - Gauge - Proportional Valve Code Selection

To select the proper code for level switch, gauge, and proportional valve please check the Type Dosaodor-D identification label the values of:

- Maximum operate pressure
- Odorant flow range

These two values allow you to identify the correct raw codes in the codes table.

For example with Odorant flow range = 0.26 gal/h and Maximum operate pressure = 200 psi the correct Level switch code is highlighted in gray.

Please use the following complete codes table.

Table 4. Troubleshooting

ERROR MESSAGE	DESCRIPTION	PROBABLE CAUSES	ACTIONS
Flow Computer Alarm	The discrete input signal from the Flow computer indicates the Flow Computer is no longer sending valid data.	<ol style="list-style-type: none"> Flow computer failure. The cable connection to the flow computer has been damaged. 	<ol style="list-style-type: none"> 1a. Check the Flow computer Input on the Type Dosaodor control system: a closed contact should indicate the absence of fault on the flow computer. 1b. Check flow computer. 2. Check cable connection to the flow computer.
Injector Alarm Type 1 - High Limit Alarm	<p>The injector has been failed and has been placed out of service by the controller.</p> <p>The new calculated specific volume for injector is greater than 500% of the entered specific volume.</p>	<p>The system recalculates the specific volume parameter for the injector when the odorant refilling cycle has been accomplished. The system triggers an alarm if the calculated value is too high to be compensated by the control algorithm.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> Incorrect parameters have been entered. A calibration of the injection valve (excessive opening) took place with incorrect modification of "entered volume for injector" parameter. An issue in the electrical connection from the level switch to the Control unit took place. 	<ol style="list-style-type: none"> 1. Check the entered parameters. 2. Reduce the opening of the injection solenoid valve orifice turning anti-clockwise the needle valve that is mounted on it. 3a. Check the level switch on odorant calibration cylinder. 3b. Check I.S. barrier
Injector Alarm Type 2 - Low Limit Alarm	<p>The injector has failed and has been placed out of service by the controller.</p> <p>The new calculated specific volume for injector is less than 20% of the entered specific volume.</p>	<p>The system recalculates the specific volume parameter for the injector when the odorant refilling cycle has been accomplished. The system triggers an alarm if the calculated value is too low to be compensated by the control algorithm.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> Incorrect parameters have been entered. A calibration of the injection valve (excessive closure) took place with incorrect modification of "entered volume for injector" parameter. Dust in the injector solenoid valve. Downstream pressure is higher than injection pressure in odorant calibration cylinder (injection pressure is not sufficient). Type SA/2 unit may be in fault. Injection ball valve is closed. An issue in the electrical connection from the level switch to the Control unit took place. The odorant outlet ball valve downstream injection solenoid valve is closed. 	<ol style="list-style-type: none"> 1. Check the entered parameters. 2. Increase the opening of the injection solenoid valve orifice by turning the needle valve clockwise that is mounted on it. 3. Clean the injection solenoid valve (using the procedure described in this Instruction Manual) and eventually clean or replace the odorant filter cartridge. 4a. Check Type SA/2 regulator. 4b. Check sensing line of Type SA/2 regulator. See maintenance procedure described in this Instruction Manual. 5. Check injection ball valve. 6a. Check the level switch on odorant calibration cylinder. 6b. Check I.S. barrier. 7. Check odorant outlet valve downstream injection solenoid valve.

- continued -

Type Dosaodor-D

Table 4. Troubleshooting (continued)

ERROR MESSAGE	DESCRIPTION	PROBABLE CAUSES	ACTIONS
High Flow rate Alarm	The "current daily flow rate" is greater than or equal to the entered "High Flow Alarm limit" for a period of time longer than the value entered in the "High Flow Alarm Delay" field.	<ol style="list-style-type: none"> 1. Incorrect parameters have been entered. 2. Gas flow rate is too high for the installed Type DOSAODOR-D configuration. 3. The real daily flow rate is too high. 	<ol style="list-style-type: none"> 1. Check the entered parameters. 2. Check maximum station flow rate and the Type DOSAODOR – D configuration (chosen odorant flow capacity is present in the nameplate). 3. No action on Type Dosaodor unit.
Low Flow rate Alarm	The "current daily flow rate" is less than or equal to the entered "Low Flow Alarm limit" for a period of time longer than the value entered in the "Low Flow Alarm Delay" field.	<ol style="list-style-type: none"> 1. Incorrect parameters have been entered. 2. The real daily flow rate is too low. 	<ol style="list-style-type: none"> 1. Check the entered parameters. 2. No action on Type Dosaodor unit.
Odorant Calibration Cylinder Fill Time Alarm	The time to refill the odorant calibration cylinder has exceeded the allowed time limit ("Maximum Odorant Calibration Cylinder Fill time" field). This alarm caused the system to go into Disabled Mode.	<ol style="list-style-type: none"> 1. Ball valve in odorant refilling tubing to pneumatic panel is closed. 2. Odorant tank is empty. 3a. Pressure in odorant tank is lower than downstream pressure. 3b. Electrical connection fault of high level switch of odorant calibration cylinder. 4. Odorant filter is dirty. 5. 3-way pressure/depressure solenoid valve is in fault. 6a. Filling solenoid valve is faulty. 6b. Type SA/2 regulator sensing line is partially or completely closed. 7. "Maximum Odorant Calibration Cylinder Fill time" value is too low. 8. Ice may have formed preventing odorant flow or movement of level switch float. Water may be contained in the odorant liquid or in the tubing during installation. 9a. Odorant loading tubes may be obstructed. 9b. I.S. barrier may be faulty. 	<ol style="list-style-type: none"> 1. Open ball valve in odorant refilling tubing to pneumatic panel. 2. Refill the odorant tank. 3a. Verify that the pressure in odorant tank is equal to or greater than downstream pressure. 3b. Check the electrical connection of high level switch of odorant calibration cylinder. 4. Clean the odorant filter or replace the filter cartridge. 5. Maintenance on the 3-way pressure/depressure solenoid valve. Replace the valve in case maintenance activity is not sufficient. 6a. Maintenance on filling solenoid valve. Replace the valve in case maintenance activity is not sufficient. 6b. Verify if closed and clean the Type SA/2 regulator sensing line. 7. Increase the programmed "Maximum Odorant Calibration Cylinder Fill time" suggested values: from 45 seconds to 2 minutes. 8. Dismantle tubing, if ice is present, warm tubing and use compressed air to clean it. 9a. Dismantle tubing and if dirt is present, clean with compressed air. 9b. Replace the I.S. barrier.

- continued -

Table 4. Troubleshooting (continued)

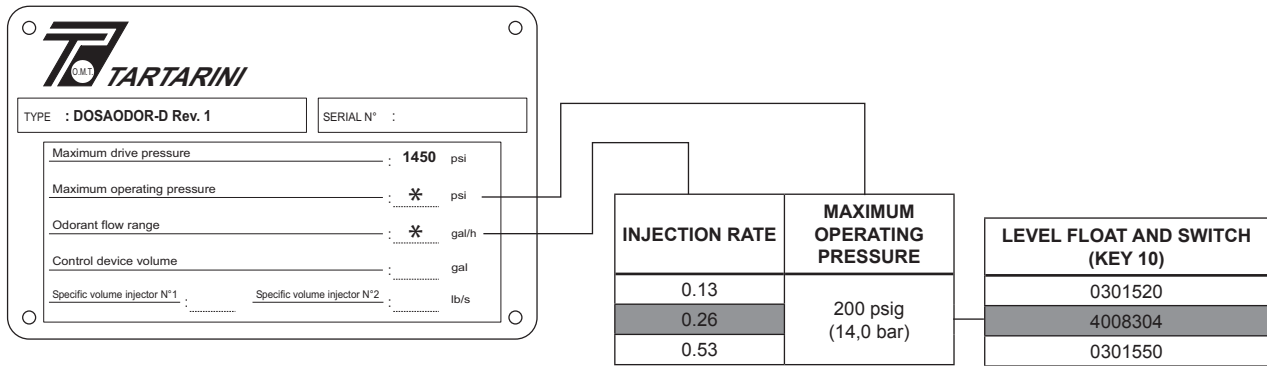
WARNING MESSAGE	DESCRIPTION	PROBABLE CAUSES	ACTIONS
Injector Variation	The current calculated injector specific volume has varied from the last value or from the entered value by an amount that exceeds the warning limits. The limits for the warning are configured on the Alarm Configuration screen.	This may occur if: 1. Dust is present in the orifice of the injection solenoid valve. This may also give an Injector division warning. 2. Downstream pressure changed (not stable pressure).	Warning limits are defined and entered by the operator. No action is required if the purpose is just monitoring the "injector specific volume" parameter. If big variations take place 1. Use "Injector solenoid valve cleaning with Liquid odorant" procedure. 2. Investigate the downstream pressure.
Injector Division Warning Type 1 (High Contact)	After every refill cycle for the odorant calibration cylinder, the injector specific volume is recalculated. The control algorithm may divide the value by 2 in an attempt to continue operation and search for the new correct value, according to the new process parameters (working conditions). This warning may indicate that the working conditions (process parameters) changed, in this case the warning does not require any activity by the operator (the system is calculating the new correct model according to the new working conditions). The division (after a refill cycle) may take place when: The odorant used volume that was calculated reaches 30% of odorant calibration cylinder volume (rated odorant calibration cylinder capacity) and the high level contact has not cleared.	This may occur if: 1. The value of "rated odorant calibration cylinder capacity parameter" is much lower than the real volume of the measurement odorant calibration cylinder (wrong parameter value). 2. The entered parameter value for "injector specific volume" is much greater than the real capacity of injection (which can be adjusted mechanically). 3. Odorant calibration cylinder has overfilled. 4. Injector ball valve is partially closed. 5. Dust is present in the orifice of the injection solenoid valve. 6. Downstream pressure changed (pressure not stable).	1. Check the rated odorant calibration cylinder capacity parameter value. 2. If the system goes to injector alarm, the injection valve calibration procedure may be used (in extreme cases). 3. Odorant calibration refilling should take at least 45 seconds. Check odorant tank pressure and/or the calibration of flow valve (should be mounted in the liquid line to control refill time). 4. Check the injector valve ball. 5. Use "Injector solenoid valve cleaning with Liquid odorant" procedure.
Injector Division Warning Type 2 (Low Contact)	After every refill cycle for the odorant calibration cylinder, the injector specific volume is recalculated. The control algorithm may decide to divide by 2 the value in an attempt to continue operation and search for the new correct value, according to the new process parameters (working conditions). This warning may indicate that the working conditions (process parameters) changed, in this case the warning does not require any activity by the operator (the system is calculating the new correct model according to the new working conditions). The division (after a cycle refill) may take place when: The calculated odorant used volume reaches 130% of odorant calibration cylinder volume ("rated odorant calibration cylinder capacity") and a low level signal has not been received.	This may occur if: 1. The value of "rated odorant calibration cylinder capacity parameter" is much lower than the real volume of the odorant calibration cylinder (incorrect parameter value). 2. The entered parameter value for "injector specific volume" is much greater than the real capacity of injection (can be adjusted mechanically). 3. Odorant calibration cylinder has overfilled. 4. Injector ball valve is partially closed. 5. Dust is present in the orifice of the injection solenoid valve. 6. Downstream pressure changed (not stable pressure).	1. Check the rated odorant calibration cylinder capacity parameter value. 2. Check if the entered specific volume for injector parameter is in compliance with the real capacity of injection. If the system goes to injector alarm, the injection valve calibration procedure may be used (in extreme cases). 3. Odorant calibration refilling should take at least 45 seconds. Check odorant tank pressure and/or the calibration of flow valve (should be mounted in the liquid line to control refill time). 4. Check the injector valve ball. 5. Use "Injector solenoid valve cleaning with Liquid odorant" procedure.

- continued -

Type Dosaodor-D

Table 4. Troubleshooting (continued)

WARNING MESSAGE	DESCRIPTION	PROBABLE CAUSES	ACTIONS
Supply Tank Warning	The Odorant Supply Tank has reached a low level. The user sets the volume level at which the warning will be triggered in the system configuration data.	<ol style="list-style-type: none"> 1. If the supply tank level is coming in from the analog input, this can occur whenever the analog input value is less than or equal to the low alarm level set by the user. 2. If the tank level is User Entered, in other words if the user enters an initial tank volume, the only time this is checked is at the end of a fill cycle, as this should be the only time the volume of the odorant supply tank changes. 3. "The Current Supply Tank volume" value is higher than the "Supply Tank Capacity" value. 	<ol style="list-style-type: none"> 1a. Check odorant level in odorant supply tank. 1b. Check in "System Configuration" <i>Analog Supply Tank Level Input Section:</i> Low Scale Value (Zero) <i>Odorant Data Configuration Section:</i> Supply Tank Low Alarm Current Supply Tank Volume 2a. Check odorant level in odorant supply tank. 2b. Check in "System Configuration" <i>Odorant Data Configuration Section:</i> Supply Tank Capacity Current Supply Tank Volume 3. Check in "System Configuration" <i>Odorant Data Configuration Section:</i> Supply Tank Capacity Current Supply Tank Volume



Type Dosaodor-D

Table 5. Parts Specific to Construction

INJECTION RATE			MAXIMUM OPERATING PRESSURE		CALIBRATION CYLINDER DIAMETER		CYLINDER	LEVEL FLOAT AND SWITCH	GAUGE	RELIEF				
pounds/hr*	Gal/hr	liters/hr	Psig	Bar	Inch	mm	Key 19	Key 10	Key 12	Key 15				
0.89	0.13	0.5	200	14,0	1	25,4	M2007351X12	M0301520X12	M4009302X12	M2007429X12				
1.78	0.26	1					M2007351X12	M4008304X12						
3.57	0.53	2					M2007351X12	M0301550X12						
7.13	1.06	4					M2007360X12	M0301660X12						
0.89	0.13	0.5	550	38,0	2	50,8	M2007360X12	M0301530X12	M4009309X12	M4009421X12				
1.78	0.26	1					M2007360X12	M0301530X12						
3.57	0.53	2					M2007360X12	M0301530X12						
7.13	1.06	4					M2007360X12	M0301540X12						
10.7	1.59	6					M2007360X12	M0301540X12						
14.27	2.11	8					3	76,2			M2007379X12	M0301540X12		
17.83	2.64	10			M2007379X12	M0301540X12								
21.4	3.17	12			4	102	M2007380X12	M0301540X12						
24.97	3.7	14					M2007380X12	M0301540X12						
0.89	0.13	0.5			870	60,0	2	50,8			M2007360X12	M0301560X12	M4009309X12	M4009310X12
1.78	0.26	1									M2007360X12	M0301560X12		
3.57	0.53	2									M2007360X12	M0301560X12		
7.13	1.06	4	M2007360X12	M4008926X12										
10.7	1.59	6	M2007360X12	M4008926X12										
14.27	2.11	8	3	76,2					M2007379X12	M4008926X12				
17.83	2.64	10					M2007379X12	M4008926X12						
21.4	3.17	12	4	102			M2007380X12	M4008926X12						
24.97	3.7	14					M2007380X12	M4008926X12						

* Assumes odorant density of 6.75 pounds/gal

Type Dosaodor-D

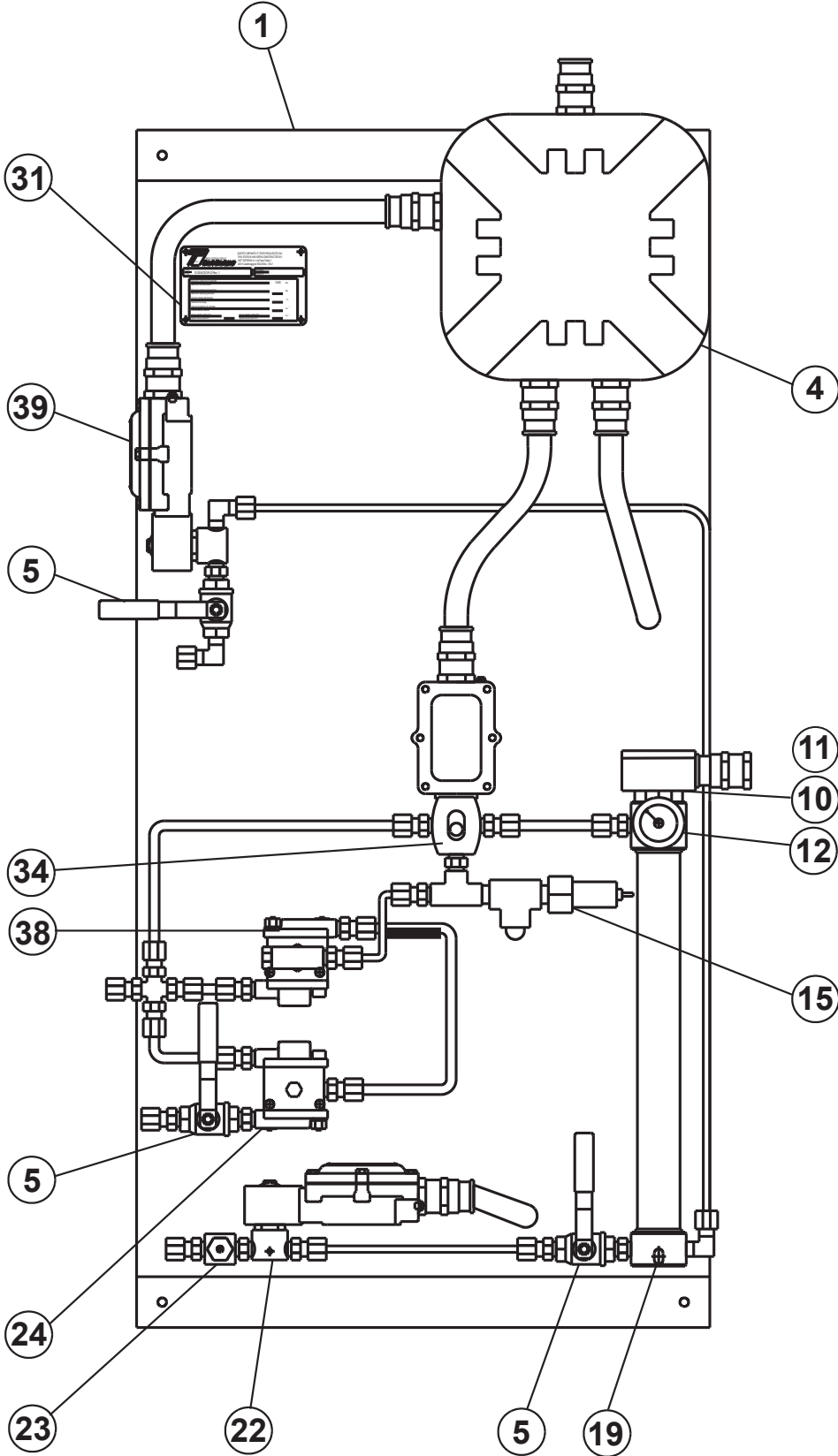


Figure 12. Pneumatic Panel B1 Version Assembly

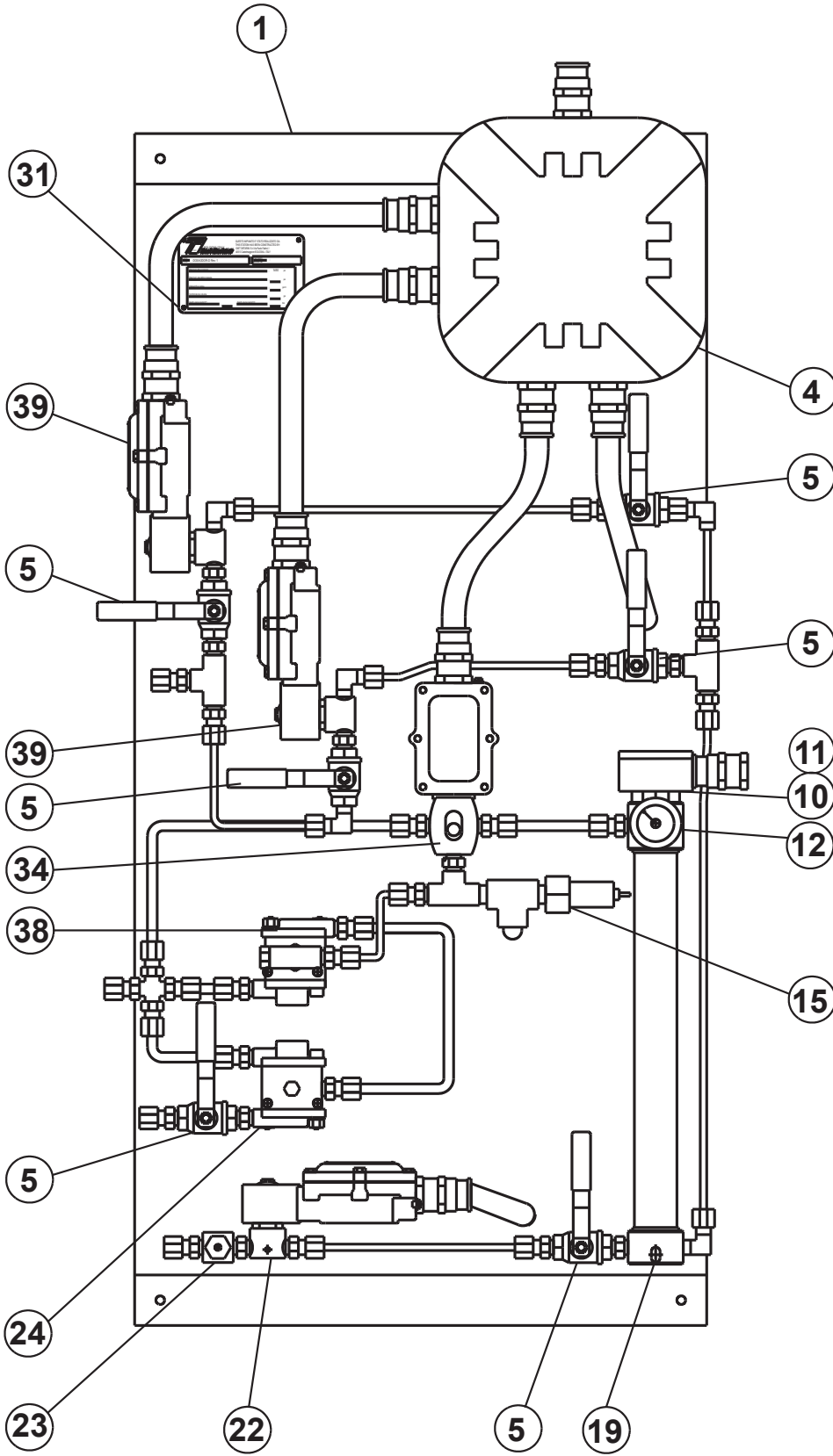


Figure 13. Pneumatic Panel B2 Version Assembly

Type Dosaodor-D

Parts List

Type Dosaodor-D (Figures 4 and 5)

The following items are provided for installation.

Key	Description	Part Number
2	Standard Wick Insert (not shown) or Extended Wick Insert (not shown)	M2006542X12 M2007371X12
40	Odorant Filter	M4008542X12
41	Screw M8 x 16 (4 required) (not shown)	M5058026X12

The odorant filter should be installed between the odorant storage tank and pneumatic panel per Figures 4 and 5.

The filtering capacity of the odorant filter is 50 µm.

Type SA/2 Supply Filter (Figure 11)

Key	Description	Part Number
	Elastomer Parts Kits (Order 1 kit for each Type SA/2) (include keys: 6, 12, 13, 15, and 18)	
	Nitrile (NBR) (standard) Fluorocarbon (FKM)	GD89995X012 GD89995X022
1	Spring Setpoint range: 43.5 to 72.5 psig (3 to 5 bar) Setpoint range: 8.7 to 21.7 psig (0,6 to 1,5 bar)	M0192560X12 M0101230X12
2	Screw	M5058003X12
3	Washer	M0248490X12
4	Plate	M0174470X12
5	Regulator Seat	M0200830X12
6*	O-ring Nitrile (NBR) (standard) Fluorocarbon (FKM)	GD01001X032 GD01001X042
7	Body	M0297920X12
8	Filter Net	M0102200X12
9	Washer	M5057002X12
10	Nut	M5060005X12
11	Filter Cover	M0174411X12
12*	Felt	GD10221X012
13*	O-ring Nitrile (NBR) (standard) Fluorocarbon (FKM)	GD01009X032 GD01009X042
14	Spring	M0105970X12
15*	Pad Holder Nitrile (NBR) (standard) Fluorocarbon (FKM)	GD23337X012 GD23337X022
17	Screw Unit	M0200790X12
18*	Diaphragm	GD17446X012
19	Regulator Cover	M0239890X12
20	Spring Washer	M5001003X12
21	Locking Nut	M5006012X12

*Recommended Spare Parts.

Pneumatic Panel (Figures 12 and 13)

Key	Description	Part Number
1	Panel	M0302140X12
4	Junction Box	M4009730X12
5	Ball Valve Three required for B1 version Six required for B2 version	M4006023X12
10	Level Switch and Float	See Table 5
11	Odorant Calibration Cylinder Junction Box	M0301510X12
12	Gauge	See Table 5
15	Relief Valve	See Table 5
19	Odorant Calibration Cylinder	See Table 5
22*	Two Way Filling Solenoid Valve	M2007497X12
23	Needle Valve	M2007495X12
24	Type SA/2 Supply Regulator (Nitrile (NBR) Elastomers) [Setpoint range: 43.5 to 72.5 psig (3 to 5 bar)]	FSSA-1
31	Identification Label	
34*	Three Way Pressure/Depressure Solenoid Valve	M4009297X12
38	Type SA/2 Supply Regulator, (Nitrile (NBR) Elastomers) [Setpoint range: 8.7 to 21.7 psig (0,6 to 1,5 bar)]	FSSA-5
39*	Two Way Injection Solenoid Valve (Two required for B2 version)	M2007496X12

Odorant Filter (Figure 9)

Key	Description	Part Number
	Parts kit (includes required quantities of keys 40B, 40F, and 40K)	M2201078X12
40A	Plug	M0301870X12
40B	O-ring 2118 for Odorant Filter	M6020174X12
40C	Screw M8X130 TCEI (4 required)	M5058035X12
40D	Upper Cover	M0301880X12
40E	Cylinder Body	M0301900X12
40F	Odorant Filter Cartridge	M0302500X12
40G	Seal (2 required)	M6020085X12
40H	Lower Cover	M0301890X12
40J	Nut (4 required)	M5063006X12
40K	O-ring 3056 for Odorant Filter (2 required)	M6020180X12

Solenoid Valves and Maintenance Kits (Figures 12 and 13)



NOTICE

The current version of solenoids may be used to replace previous solenoid versions. Current version of solenoids has been used from the first half of 2006. However, some mounting and wiring modifications will be required. Please use the following part numbers as reference. Listed maintenance kits are available for both current and obsolete solenoid versions.

Key	Description	Part Number
22	Two Way filling Solenoid valve	
	Replacing part number	M2007497X12
	Obsolete part number	M4008918X12
	Maintenance Kits	M4009758X12
34	Three Way Pressure/Depressure Solenoid Valve	
	Replacing part number	M4009297X12
	Obsolete part number	M4008919X12
	Maintenance Kits	M4009759X12
39	Two Way Injection Solenoid Valve	
	Replacing part number	M2007496X12
	Obsolete part number	M4008022X12
	Maintenance Kits*	M2201079X12

Two Way Injection Solenoid Valve (Figure 10)

Key	Description	Part Number
	Parts Kit (Includes Keys 39C, 39E, and 39H)	M2201079X12
39A	Valve body	M0302720X12
39B	Screw M4X1X14 (4 required)	M5101001X12
39C*	O-ring 20.35x1.78	M6020109X12
39D	Flange	M0302710X12
39E*	O-ring 10.82x1.78	M6020115X12
39F	Metering Device Body	M0301480X12
39G	Metering Device Needle	M0303560X12
39H*	O-ring 4.48x1.78 (2 required)	M6020173X12

*Refer to Figure 10. Contains following parts: kit M4009758X12, keys 39E and 39H. M4009758X12 contains Key 39C (Figure 10).

Type Dosaodor-D

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