

# Type Dosaodor-D Odorant Injection System



Figure 1. Type ROC809 Remote Telemetry Unit



Figure 2. Standard Wick Insert

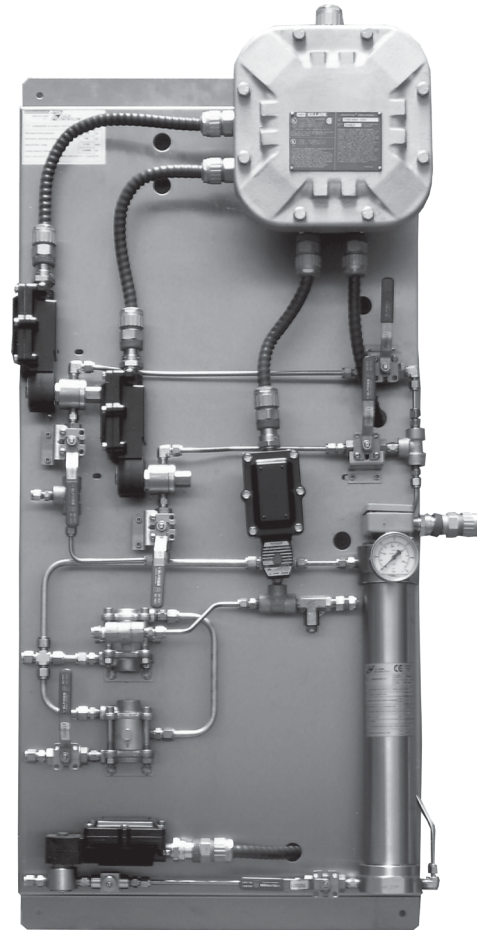


Figure 3. Type Dosaodor-D Pneumatic Panel

## 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.

# Type Dosaodor-D

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## Specifications

The Specifications section on this page provides the ratings and other specifications for Type Dosaodor-D.

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### Pneumatic Panel:

**Material**

Stainless steel plate

**Installation**

Wall mount

**Weight**

55 to 100 lbs / 25 to 45 kg  
(based on configuration)

**Overpressure Relief Valve**

*Stainless Steel with Following Rating Options:*

200 psi / 13.8 bar

550 psi / 37.9 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 in. / 6.4 mm OD Tube fitting (double ferrule)

*Gas Inlet and Discharge*

3/8 in. / 10 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 gal/hr / 0.5 to 14.0 l/hr  
(0.89 to 24.97 lbs/hr at 6.75 lbs/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) rubber

### Type ROC809 Remote Telemetry Unit:

**Refer to Type ROC809 technical specifications.  
please go to:**

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

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

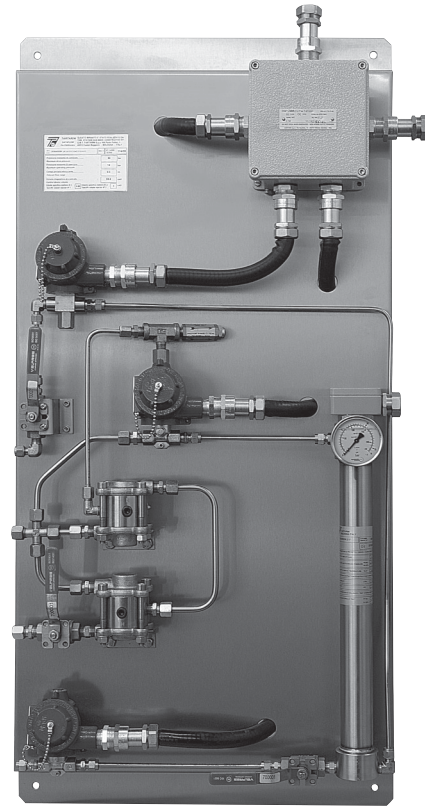
## Benefits

- 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 1,000,000 SCFH / 53.6 to 26,800 Nm<sup>3</sup>/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  $P_2 + \Delta P$ .  $\Delta P = 8.7$  to  $21.7$  psi /  $0.60$  to  $1.5$  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 orifice<sup>(1)</sup>) 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



**Figure 4.** Type Dosaodor-D Intrinsically Safe Panel

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 by-pass 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.

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

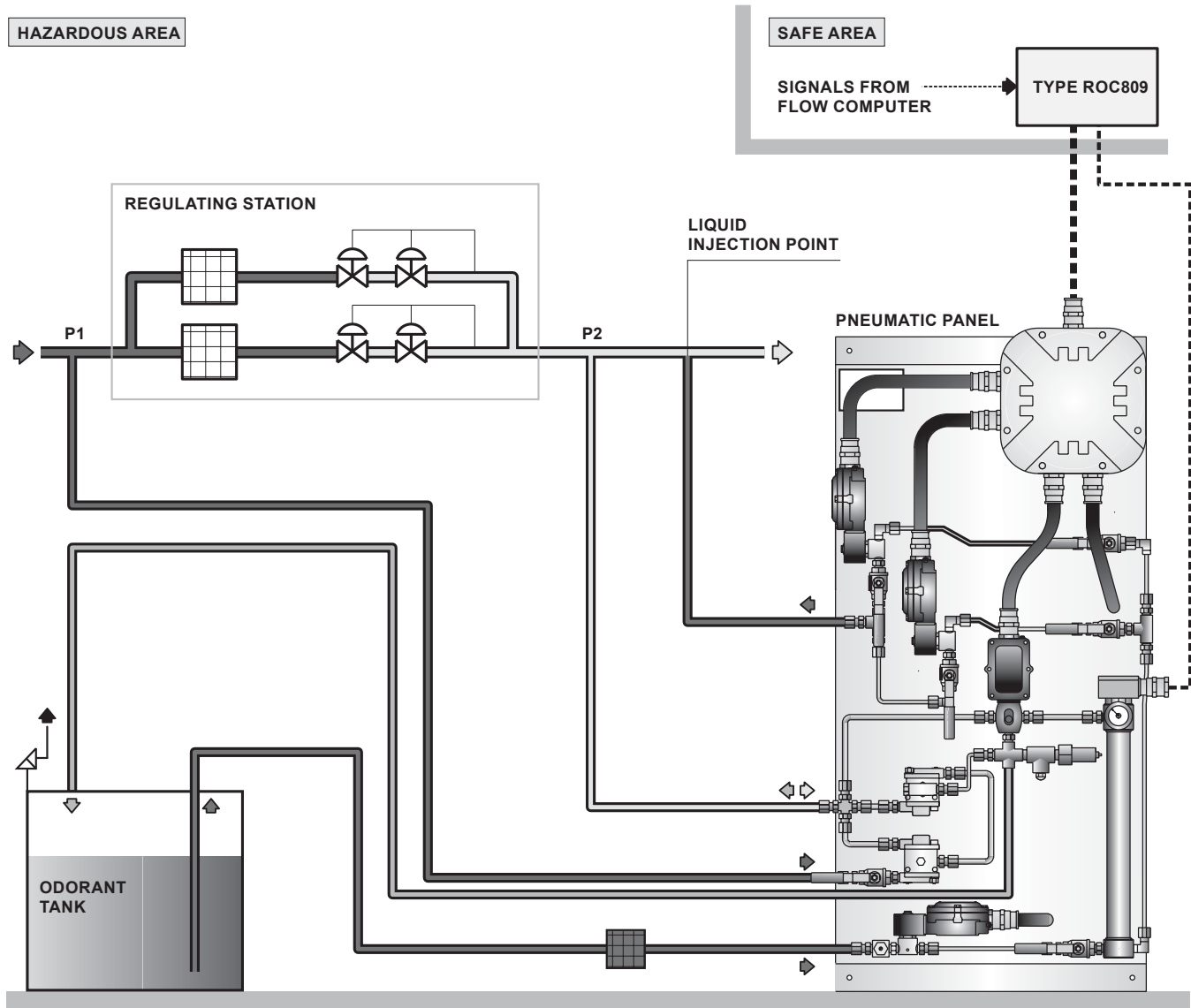
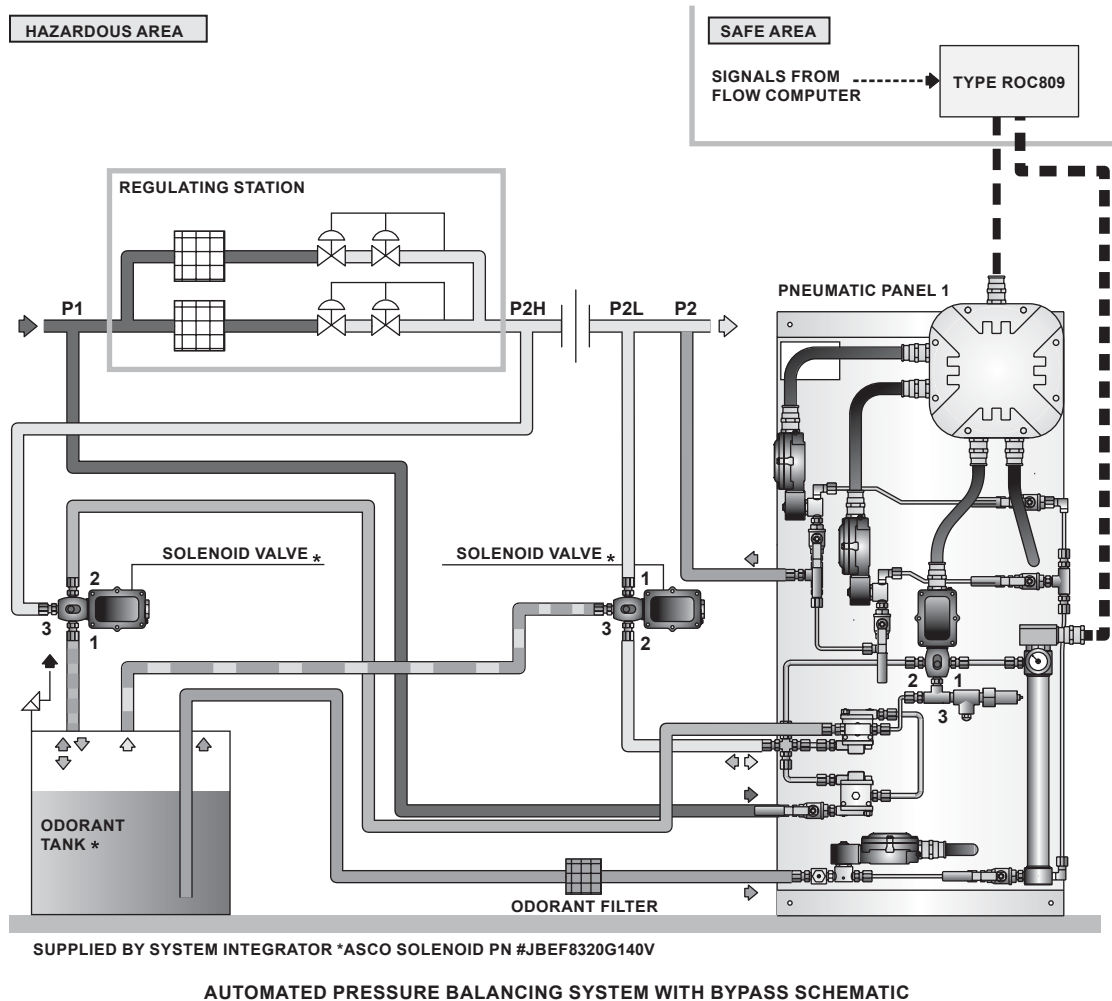


Figure 5. General Installation Schematic

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 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, 3095, etc.).



- REGULATING STATION INLET PRESSURE
- ODORANT CALIBRATION CYLINDER LOADING PRESSURE
- REGULATING STATION OUTLET PRESSURE
- ODORANT INJECTION PRESSURE

**Figure 6.** Type Dosaodor Automated Pressure Balancing System with Bypass Schematic

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.

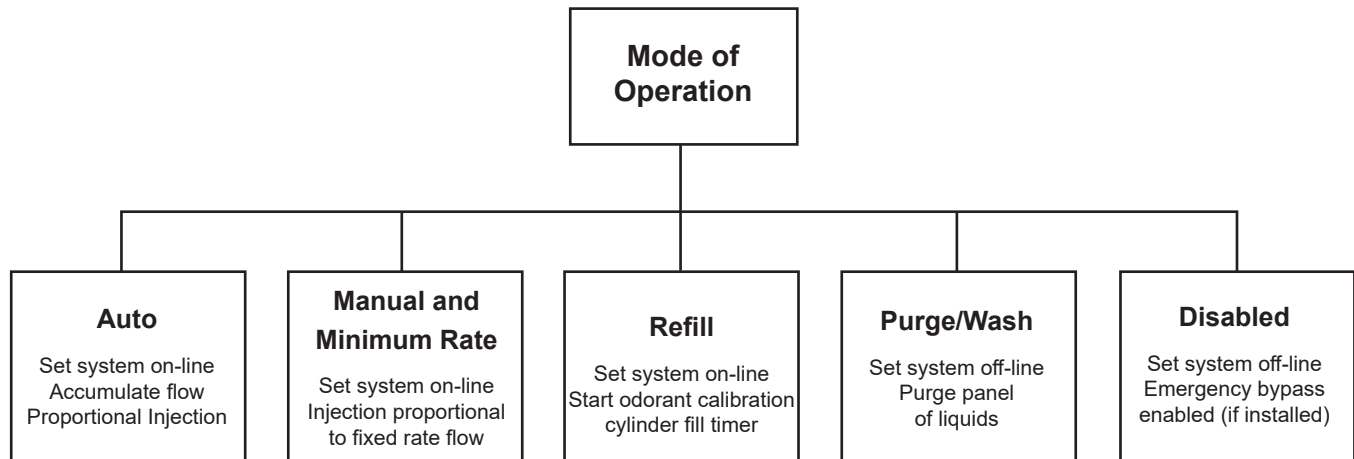
Type Dosaodor-D is designed to purge the odorant back into the tank in the event that mechanical maintenance is required. Odorant is pushed back into the tank and gas is purged through the system to absorb any remaining liquid.

# Type Dosaodor-D

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## Modes of Operation

The system is designed to operate in one of six modes which determine the system function and how outputs will be controlled.



### Auto Mode

System is set on-line. Injection rate is calculated based on current flow rate input (pulse or analog input) and configured concentration.

### Manual Mode

System is set on-line. Injection rate is calculated based on configured manual gas flow rate and concentration.

### Minimum Rate Mode

System is set on-line. Injection rate is calculated based on configured minimum flow rate and concentration.

### Refill Mode

Injector is off-line. Odorant calibration cylinder is refilled with odorant and calculation is performed to verify injector volume rate. Once refill is complete, system returns to prior mode (during normal operation).

### Purge/Wash Mode

System is set off-line. Odorant is emptied from odorant calibration cylinder and back to the supply tank. During Gas Wash Cycle, solenoids are opened to allow gas flow through the odorant calibration cylinder and injectors. Gas Wash Cycle and Injector Flush Cycle are available.

### Disabled Mode

Injector and panel functions are off-line. Emergency bypass system enabled if available.

## ROCLINK 800 Configuration Software

ROCLINK 800 Configuration Software, a Windows® based program, enables complete configuration either local or remote of the Type Dosaodor-D odorant system. This allows the viewing of data in real time, management of the historical data and control of the alarm conditions. Connection is via serial port, ethernet port or remote communications.

ROCLINK 800 software has an user friendly Windows interface. The Configuration Tree navigation interface makes accessing features quick and easy. Drop-down menus simplify accessing the software functions. Dialog boxes and drop-down list boxes help direct selections and data entry. Actions can be performed with the keyboard or a mouse.

The main specifications of the ROCLINK 800 software are as follows:

- MS Windows interface
- Single configuration point for all connectable odorizing units
- Complete configuration for each parameter of the odorizer system
- Display of real time data, historical data and alarms



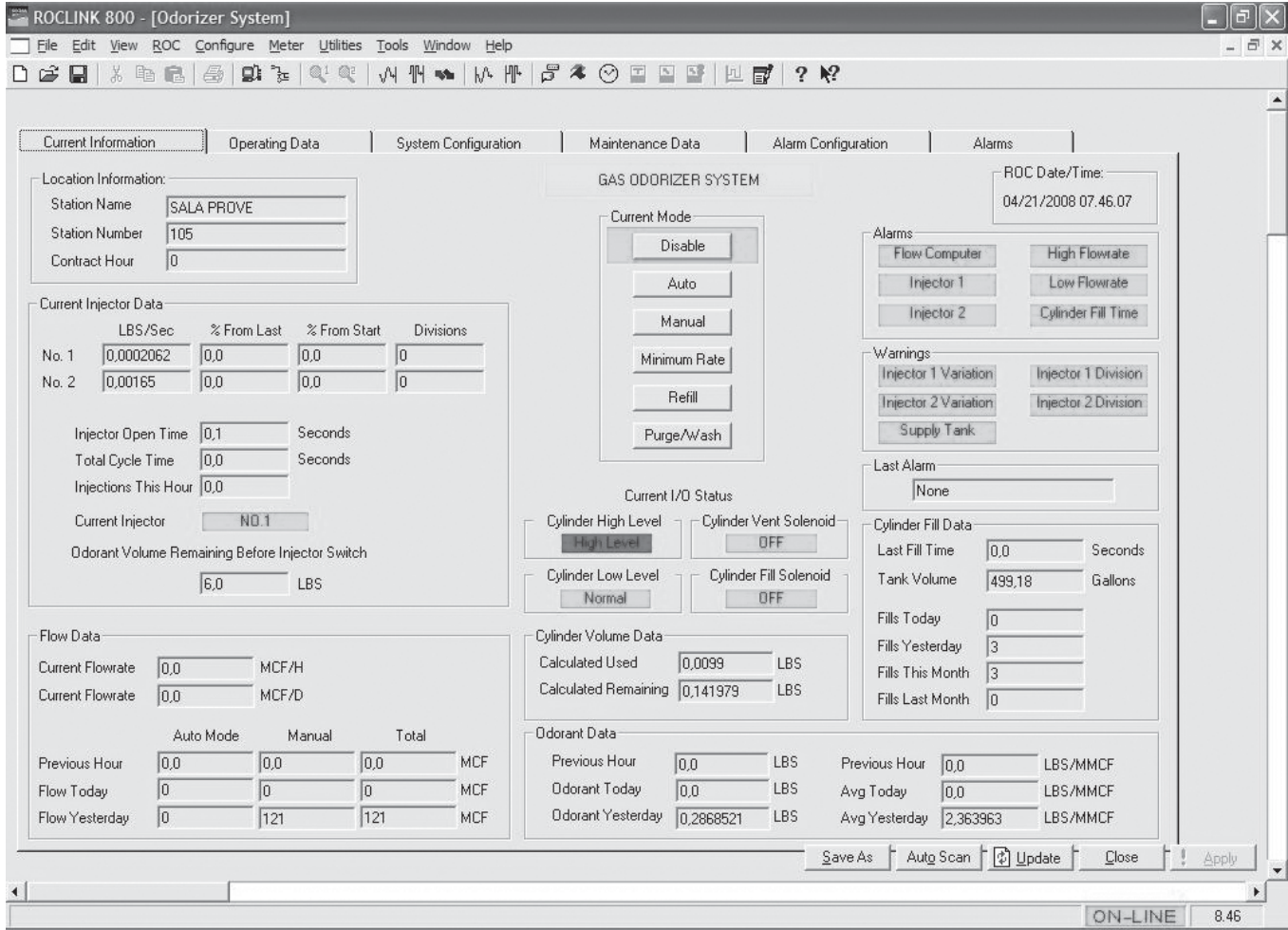


Figure 7. Type Dosaodor-D Configuration Display

## Minimum Software and Hardware Requirements

- Pentium®-class processor (233 MHz or greater recommended)
- CD-ROM drive
- Windows 98, ME, NT 4.0 (Service Pack 6), 2000 (Service Pack 2) or XP
- 64 MB of RAM (Random Access Memory)
- 15 to 75 MB of available hard disk space, depending on operating system and revision level

## Configuration Selection

The purpose of this section is to facilitate Ordering Guide selections.

The minimum requirements for product installation are as follows:

1. There must be a differential pressure of at least 14.5 psi / 1 bar between upstream and downstream of the regulation station.
2. The tank containing the odorant fluid must be pressurized. The odorant storage tank is usually pressurized by the system up to 8.7 to 21.7 psi / 0.60 to 1.5 bar higher than outlet pressure.
3. Downstream pressure must be maintained as constant as possible in order to maintain accuracy of odorant injection.

If these conditions are not fulfilled, please contact your Emerson representative for alternate configurations.

### A) Base Panel

#### A6 Option

- Construction based on North American standards with CSA certified components.

# Type Dosaodor-D

- Configuration does not include the Type ROC809 controller necessary for the functioning of the system. The Type ROC809 is available from the Remote Automation Solutions.

## B) Model (Select One)

### B1 Option – Single Injector

- This option provides only one injection solenoid.

### B2 Option – Dual Injector

- This option provides two injection solenoids installed in parallel for redundancy in the event of an injector failure.
- An alternate use of dual injectors is for increased turndown. In the event the flow conditions vary, it is possible to create a low flow injector and a high flow injector for scenarios such as seasonal loads.

### Notes

**The two solenoid valves do not operate simultaneously. It is therefore not possible to use the B2 configuration in order to serve two gas transport lines at the same time.**

**The two solenoid valves can work in exchange mode. When the desired quantity of odorant (determined by a parameter accessible by the user) is injected, the solenoid valve that has just operated will go into rest mode leaving the task of injection to the alternate solenoid valve.**

## C) Maximum Odorant Injection Rate (Select One)

The injector solenoid is selected based on the maximum gas flow rate and the desired odorant concentration. The following information and calculation will determine this value.

From a theoretical viewpoint, this takes into account the following:

### International Standard Unit

C = concentration of odorant (mg/Sm<sup>3</sup>)

Qg = maximum gas flow rate (Sm<sup>3</sup>/h)

ρ = density of liquid odorant (kg/dm<sup>3</sup>)

Qo = maximum odorant flow rate (l/h)

$Q_o = C * Q_g / (1,000,000 * \rho)$

For the purposes of proportioning, we may consider the odorant density as ρ = 1 kg/dm<sup>3</sup>.

For example, if the maximum line flow is 90,000 Sm<sup>3</sup>/h and the odorant used is THT (with a desired concentration of 40 mg/Sm<sup>3</sup>) then the appropriate option from the table below is C4.

By formula:

$$Q_o = \left( \frac{40 \text{ mg}}{\text{Sm}^3} \right) \left( \frac{1 \text{ kg}}{1,000,000 \text{ mg}} \right) \left( \frac{90,000 \text{ Sm}^3}{\text{h}} \right) \left( \frac{\text{dm}^3}{1 \text{ kg}} \right) \left( \frac{1 \text{ l}}{1 \text{ dm}^3} \right)$$

$$Q_o = 3.6 \text{ l/hr}$$

Using the equation result, the fourth column of Table 1 shows the first value exceeding the calculated value which will suggest which configuration to choose (in the specific case of C4).

**Table 1. Maximum Odorant Injection Rate using International Standard Unit**

ORDER FORM CONFIGURATION	MAXIMUM GAS VOLUME, Sm <sup>3</sup> /h		MAXIMUM INJECTION RATE, GAL/HR / L/HR
	40 mg/Sm <sup>3</sup> (THT)	10 mg/Sm <sup>3</sup> (Mercaptan)	
C1	12,500	50,000	0.13 / 0.5
C2	25,500	100,000	0.26 / 1.0
C3	50,000	200,000	0.53 / 2.0
C4	100,000	400,000	1.06 / 4.0
C5	150,000	600,000	1.59 / 6.0
C6	200,000	800,000	2.11 / 8.0
C7	250,000	1,000,000	2.64 / 10.0
C8	300,000	1,200,000	3.17 / 12.0
C9	350,000	1,400,000	3.70 / 14.0



If different odorant concentrations from those specified in the table (40 and 10 mg/Sm<sup>3</sup>) are used, it is advisable to use the given formula and fourth column of Table 2 (Maximum Injection Rate) to determine the correct configuration.

For example, if the maximum line flow is 15,000 Sm<sup>3</sup>/h and the odorant used is THT (with a desired concentration of 38 mg/Sm<sup>3</sup>) then the appropriate option is C2.

$$Q_o = \left( \frac{38 \text{ mg}}{\text{Sm}^3} \right) \left( \frac{1 \text{ kg}}{1,000,000 \text{ mg}} \right) \left( \frac{15,000 \text{ Sm}^3}{\text{h}} \right) \left( \frac{\text{dm}^3}{1 \text{ kg}} \right) \left( \frac{1 \text{ l}}{1 \text{ dm}^3} \right)$$

$$Q_o = 0.57 \text{ l/hr}$$

### North America Standard Unit

- C = concentration of odorant (lbs/MMSCF)
- ρ = density of liquid odorant (lbs/gal)
- Q<sub>g</sub> = maximum gas flow rate (MMSCF/h)
- Q<sub>o</sub> = maximum odorant flow rate (gal/h)
- Q<sub>o</sub> = C \* Q<sub>g</sub> / ρ

For example, if the maximum line flow is 7 MMSCF/h and the odorant used is THT (with a desired concentration of 1.0 lbs/MMSCF) then the appropriate option from Table 2 is C4.

By formula:

$$Q_o = \left( \frac{1 \text{ lb}}{\text{MMSCF}} \right) \left( \frac{7 \text{ MMSCF}}{\text{h}} \right) \left( \frac{\text{gal}}{6.75 \text{ lbs}} \right) = 1.04 \text{ gal/hr}$$

At 6.75 lbs/gal is equivalent to:

$$\left( \frac{1.04 \text{ gal}}{\text{h}} \right) \left( \frac{6.75 \text{ lbs}}{\text{gal}} \right) = 7 \text{ lbs/hr}$$

Using the equation result, the fifth column of Table 2 shows the first value exceeding the calculated value which will suggest which configuration to choose (in the specific case of C4).

If different odorant concentrations from those specified in the table (1.0 and 0.5 lbs/MMSCF) are used it is advisable to use the given formula and the table to determine the correct configuration.

If a different density is required, use the fourth column for selection.

For example, if the maximum line flow is 20 MMSCF/h and the odorant used is mercaptan (with a desired concentration of 0.6 lbs/MMSCF) then the appropriate option from Table 2 is C6.

$$Q_o = \left( \frac{0.6 \text{ lb}}{\text{MMSCF}} \right) \left( \frac{20 \text{ MMSCF}}{\text{h}} \right) \left( \frac{\text{gal}}{6.75 \text{ lbs}} \right) = 1.78 \text{ gal/hr}$$

At 6.75 lbs/gal is equivalent to:

$$\left( \frac{1.78 \text{ gal}}{\text{h}} \right) \left( \frac{6.75 \text{ lbs}}{\text{gal}} \right) = 12 \text{ lbs/hr}$$

### I) Maximum Working Pressure (Select One)

Select based on maximum working pressure (downstream pressure, in the injection area). The density constraint is required to let the "floating system" present in the odorant calibration cylinder work properly.

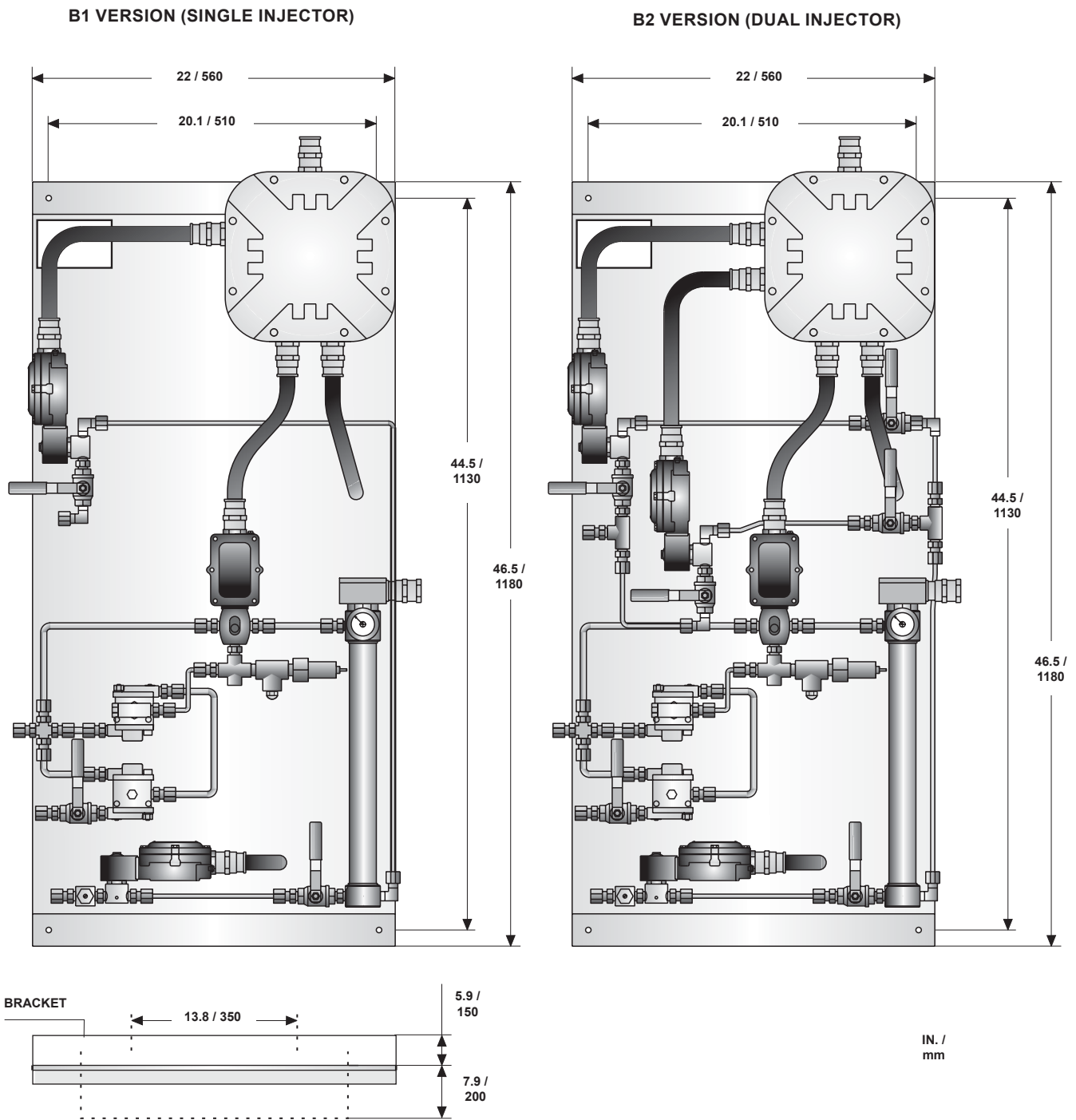
#### I1 Option

Maximum injection pressure equal to 200 psi / 13.8 bar. A requirement for functioning is that the density of the liquid odorant is >=5.8 lbs/gal / 0.70 kg/dm<sup>3</sup>.

**Table 2. Maximum Odorant Injection Rate using North American Standard Unit**

ORDER FORM CONFIGURATION	MAXIMUM GAS VOLUME, MMSCF/H		MAXIMUM INJECTION RATE, GAL/HR / L/HR	MAXIMUM INJECTION RATE, LBS/HR (AT 6.75 LBS/GAL)
	1.0 lbs/MMSCF (THT)	0.5 lbs/MMSCF (Mercaptan)		
C1	0.89	1.78	0.13 / 0.5	0.89
C2	1.78	3.57	0.26 / 1.0	1.78
C3	3.57	7.13	0.53 / 2.0	3.57
C4	7.13	14.27	1.06 / 4.0	7.13
C5	10.70	21.40	1.58 / 6.0	10.70
C6	14.27	28.53	2.11 / 8.0	14.27
C7	17.83	35.67	2.64 / 10.0	17.83
C8	21.40	42.80	3.17 / 12.0	21.40
C9	24.97	49.93	3.70 / 14.0	24.97

# Type Dosaodor-D



## OPTIONAL STAINLESS STEEL CABINET

DIMENSIONS IN IN. / mm: 37 x 18.2 x 78.4 / 940 x 460 x 1990

Figure 8. Pneumatic Panel Overall Dimensions

## I2 Option

Maximum injection pressure equal to 550 psi / 37.9 bar. A requirement for functioning is that the density of the liquid odorant is  $\geq 4.6$  lbs/gal /  $0.55$  kg/dm<sup>3</sup>.

## I3 Option

Maximum injection pressure equal to 870 psi / 60.0 bar. A requirement for functioning is that the density of the liquid odorant is  $\geq 5.8$  lbs/gal /  $0.70$  kg/dm<sup>3</sup>.

## M) Installation Options - Wick insert (Select One)

Select based on pipe size.

**Option – Standard wick insert (for downstream size < 10 in. (NPS 10 / DN 250))**

**Option – Long wick insert (for downstream size  $\geq 10$  in. (NPS 10 / DN 250))**

## O) Installation Options - Fittings (bulk brand as standard)

If the O item is not selected the standard fittings will be used (bulk brand).

### Option – Swagelok fittings

Stainless steel Swagelok fittings.

## Automation software and license key

Software for management of the Type Dosaodor-D system compatible with Type ROC809 platform hardware and Type Dosaodor-D license key.

The software may be ordered individually or in combination with the pneumatic panel.

The pneumatic panel must be ordered with the automation software and license key.

## Optional Component - Cabinet for pneumatic panel

A stainless steel cabinet may be selected as an option.

## Ordering Guide

### Base Panel

- A6 Type Dosaodor-D odorant injection system completed with:

#### Pneumatic Panel

- Stainless steel panel
- Installation kit (bracket, pipe connection, valves, etc.)
- Explosion proof Class I, Division 1 and 2 - Groups B, C, D - Class I, Zone 1 and 2 - Groups IIB+H2, IIA
- Included 1/4 in. fitting connectors for 3/8 and 1/4 in. / 9.5 and 6.4 mm OD tubing

### Model (Select One)

- B1 Single Injector
- B2 Dual Injector

### Maximum Odorant Injection Rate (Select One)

- C1 0.13 gal/hr / 0.5 l/hr
- C2 0.26 gal/hr / 1.0 l/hr
- C3 0.53 gal/hr / 2.0 l/hr
- C4 1.06 gal/hr / 4.0 l/hr
- C5 1.58 gal/hr / 6.0 l/hr
- C6 2.11 gal/hr / 8.0 l/hr
- C7 2.64 gal/hr / 10.0 l/hr
- C8 3.17 gal/hr / 12.0 l/hr
- C9 3.70 gal/hr / 14.0 l/hr

### Maximum Working Pressure (Select One)

- I1 200 psi / 13.6 bar  
(odorant  $\rho \geq 5.8$  lbs/gal /  $0.70$  kg/dm<sup>3</sup>)
- I2 550 psi / 37.9 bar  
(odorant  $\rho \geq 4.6$  lbs/gal /  $0.55$  kg/dm<sup>3</sup>)
- I3 870 psi / 60.0 bar  
(odorant  $\rho \geq 5.8$  lbs/gal /  $0.70$  kg/dm<sup>3</sup>)

### Installation Options - Wick Insert (Select One)

- Standard Wick Insert  
(for downstream size < 10 in. (NPS 10 / DN 250))
- Long Wick Insert  
(for downstream size  $\geq 10$  in. (NPS 10 / DN 250))

### Installation Options - Fittings (Bulk Brand as Standard)

- Swagelok Fittings

### Automation Software and License Key

- Software for pneumatic panel control, available with Type ROC809 plus Type Dosaodor-D license key

### Optional Component

#### Cabinet for Pneumatic Panel

- Stainless steel cabinet for pneumatic panel

- continued -

# Type Dosaodor-D

## Ordering Guide (continued)

### Type ROC809 Configurations and Options

#### Required Components

##### Quantity Description

- 1 Type ROC809E Controller
- 1 Type ROC800 12 Vdc Power Supply
- 2 Type ROC800 Discrete Relay Output Card
- 1 Type ROC800 Discrete Input Card
- 1 Type DS800 Runtime License

#### Select Input Card Type for Flow Rate Input

(Choose Only One for Configuration)

##### Quantity Description

- 1 Type ROC800 Analog Input Card
- 1 Type ROC800 Pulse Input Card

### Optional Equipment

#### Quantity Description


- 1 Type ROCLINK800 Software  
(at least 1 license required)
- 1 Type ROC800 LOI Cable
- 1 Type ROC800 Ethernet Crossover Cable
- 1 Type ROC800 RS232 Comm Module
- 1 Type ROC800 RS485 Comm Module
- 1 Type ROC800 14.4 Dial-up Modem Comm
- 1 Type ROC800 Analog Output Card
- 1 Power Supply Charger 12 Vdc

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