

Gas Odorization System GOE 2000



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Serving the Gas Industry
- WORLDWIDE

Method of operation

In order to immediately detect natural gas leaking, it is necessary to add an odorous substance (odorant) to the odourless natural gas. Special devices adding the odorant in the required concentration are used for this process, which is called odorization.

The GOE 2000 odorization system operates according to the injection method. An electromagnetically operated reciprocating diaphragm pump injects the odorant through an injection nozzle into the gas flow. The proportioning pump receives an electric pulse from the associated control unit and then performs a stroke which delivers a settable quantity of odorant. The number and sequence of pulses are determined by the control unit on the basis of volume-proportional pulses received from a volumetric meter.

The odorant is drawn from a reserve tank into which it flows from a connected odorant tank according to the principle of communicating vessels.

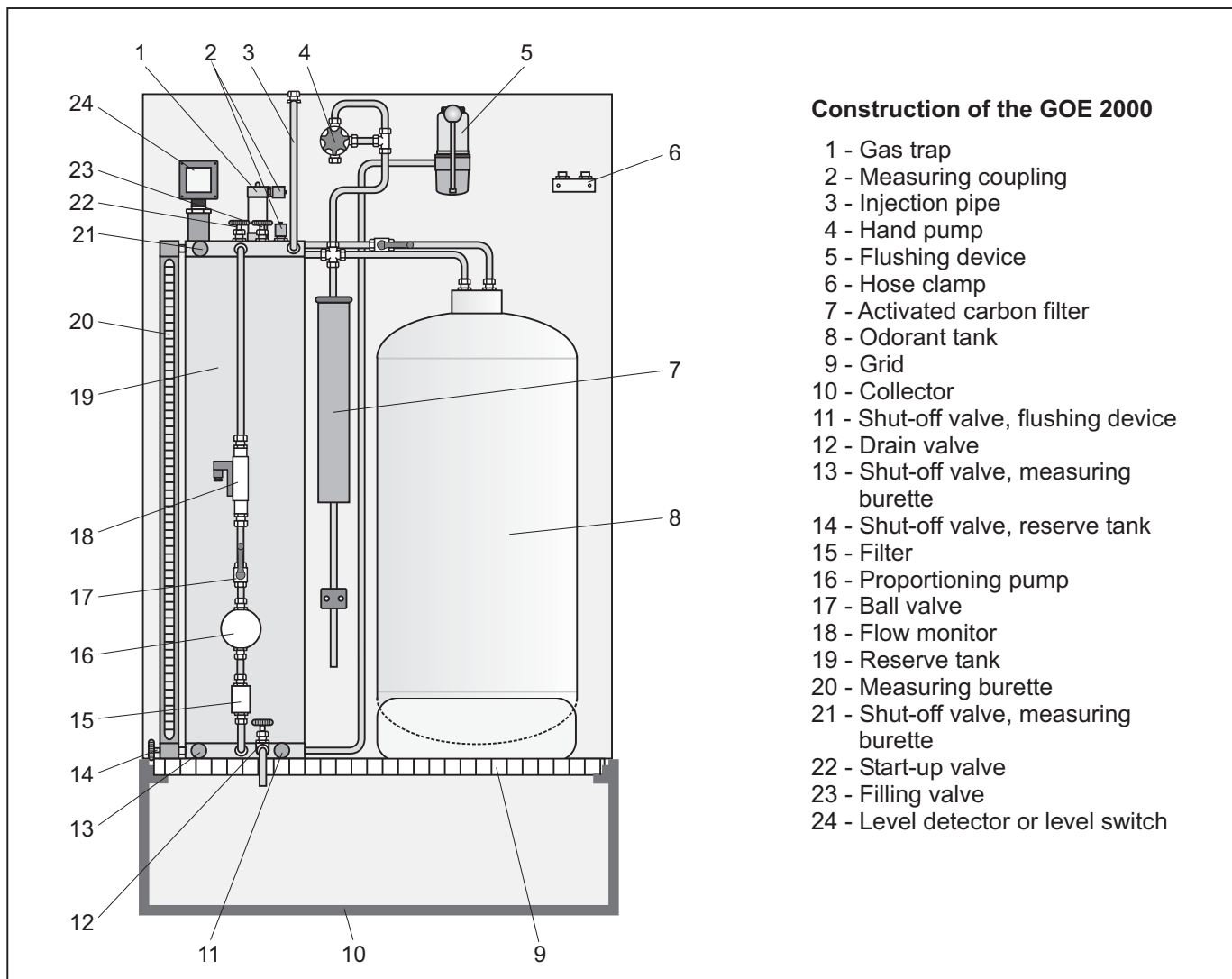
Construction

The individual components are fixed to a mounting plate which is installed above a collector. The odorant tank is also located on the collector at the same level as the reserve tank. Almost all valves are integrated into the enclosure of the reserve tank which reduces the number of pipe connections and possible leak-ages.

A permanently installed hand pump is used for filling the reserve tank during start-up and during the time when the odorant tank is changed. In this way, the liquid column is formed which enables the levels to be equalized according to the principle of communicating vessels. A gas trap prevents this liquid column from being interrupted.

An activated carbon filter prevents odorant from escaping to the outside when the system is vented.

For monitoring purposes, the system can be equipped with a level switch (giving an alarm when the level falls below minimum) or a level detector (level measurement).



Features

- **Odorizes according to the injection method**
Injection is performed by a reciprocating diaphragm pump which is controlled by volume-proportional pulses.
- **Odorant is drawn from the odorant tank according to the principle of communicating vessels**
No auxiliary pressure is required (neither overpressure nor underpressure). A permanently installed hand pump is used only when the system is started up or when the odorant tank is changed.
- **High proportioning accuracy**
In this way, a constant odorant concentration is achieved in the gas flow.
- **Wide operating range**
- **High level of reliability**
All parts coming into contact with the odorant are manufactured from stainless steel, glass or Viton.
- **Infinitely variable setting of the odorant concentration**
The setting of the odorant concentration can be performed at the pump and is also possible during operation.
- **Suitable for use with all common odorants**
e.g. for THT or mercaptans
- **Installed on a mounting plate with SWAGELOK fittings ready for connection**
- **Odorant tank can be changed without interrupting operation**
- **Venting the pump head poses no problems even if the gas line is under pressure**
- **Low on maintenance**
- **Equipped with a stored-program control unit**
- **Convertible to sulfur-free odorant.**

Options

- **Level switch** giving an alarm when the filling level falls below a preset minimum value.
- **Level detector** for continuous level measurement. The odorant concentration produced can be calculated automatically through the change in the filling level.
- **Flow monitor** installed in the injection pipe for monitoring the proportioning pump.
- **High-pressure flushing and venting device** for flushing the fittings installed in the suction and injection pipes and for venting the proportioning pump. Maximum gas back pressure: 80 bar.
- **Manual button** (EEx i or EEx d), including manual/automatic changeover, for manual pump control.

Special design

The GOE 2000 odorization system can be equipped with a second proportioning pump that is used either as a standby pump which will start to operate automatically when the process pump fails or as a second pump which operates parallel to the first pump to increase the output.

Accessories

- **Injection nozzle** for injecting the odorant into the gas flow, including a non-return valve and a manual stop valve. There are different lengths available for nominal pipe diameters from DN 50 to DN 800.
- **Weldolet** (PN 100) for installing the injection nozzle, with G $\frac{1}{2}$ ", G $\frac{3}{4}$ " or G1" internal thread.
- **Collector** made of stainless steel with grid and supporting feet, manufactured and tested in compliance with WHG (100 litres or 200 litres).
- **Weather-proof concrete cabinet** with separate, gas-tight electrical section for installing the GOE 2000 odorization system with odorant tank, collector and control unit.
- **Insulating coupling** for the injection pipe, dia. 6 mm, for the electrical isolation of the piping and the odorization system.
- **Odorant tank** as per DIN 30 650 (50 litres or 200 litres) for transportation and storage, approved by DVGW.
- **2 flexible PTFE hoses** with stainless-steel sheathing for connecting the odorant tank with the reserve tank.

Proportioning pump

The GOE 2000 odorization system is equipped with a reciprocating diaphragm pump, i.e. the mechanism is separated from the odorant by means of a diaphragm, so that there is a minimum risk of corrosion or leaks.

The pump receives electric pulses from the control unit and, as a result of such a pulse, the pump performs a stroke which delivers a defined volume. This displacement is infinitely variable and the five pump sizes available cover a range of 10 mm³ to 1,100 mm³.

When designing an odorization system, it should be taken into account that the maximum stroke frequency is 1.2 Hz or 2 Hz depending on the type of pump to be used, and this will limit the pump's output.

The odorant concentration in the gas in mg per standard cubic metre can be calculated as follows:

$$c = \frac{\rho \cdot V_d}{Q_n} \cdot f$$

where

- c is the odorant concentration in the gas (mg/m³)
- ρ is the density of the odorant (g/cm³)
- V_d is the preset displacement (mm³)
- f is the stroke frequency (pulses/h)
- Q_n is the flow rate at base conditions (m³/h).

The maximum odorizable gas flow in m³/h, with which the required odorant concentration is reached can then be calculated as follows:

$$Q_{n,max} = \frac{\rho \cdot V_{d,max}}{c} \cdot f_{max}$$

where

- V_{d,max} is the maximum displacement (mm³)
- f_{max} is the maximum stroke frequency (pulses/h)
- Q_{n,max} is the maximum odorizable flow rate at base conditions (m³/h).

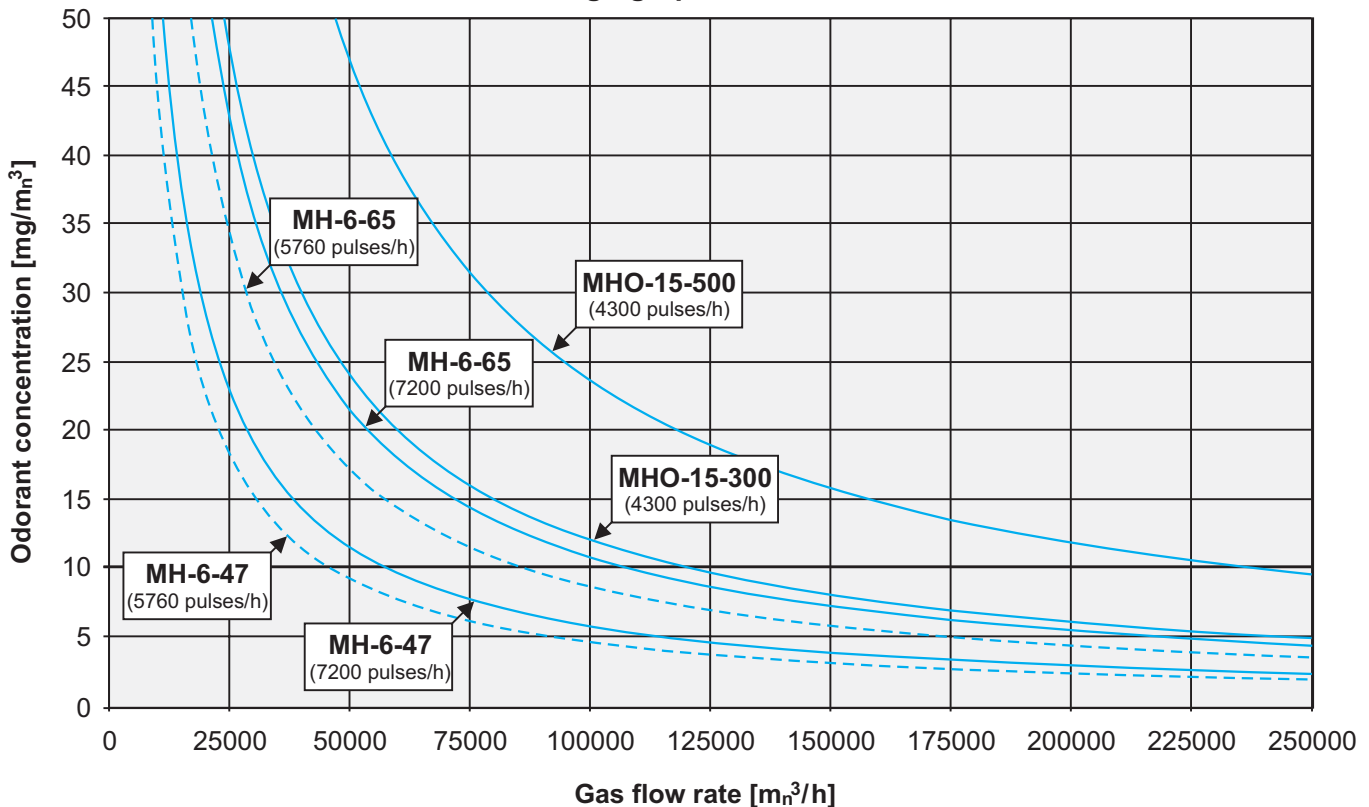
For the maximum values for the different pump types, please refer to the table with specifications on the last page.

For odorization in accordance with regulations, DVGW Code of Practice G 280 specifies a minimum odorant concentration of 10 mg/m³ for THT and 3.8 mg/m³ for mercaptans.

The graph below shows the maximum possible concentration of THT (ρ = 1 g/cm³) as a function of the flow rate at base conditions for the five types of pumps. In the case of mercaptans, the curves are up to 20% below the curves for THT in accordance with their lower density values.

In continuous operation, the pumps should be operated with a frequency below 3,600 strokes/h to avoid excessive wear. This should be taken into account when the pump is chosen.

Design graph for THT



Control unit

The GOE 2000 odorization system incorporates the OSG 2000 control unit which enables the proportioning pump to be controlled by volume-proportional pulses, provided those can be received from a gas meter or volume corrector. The volume pulses received are scaled up or down and, if appropriate, they are evaluated in order to generate the control pulses for the odorization pump in accordance with the required odorant concentration.

In the event that volume pulses fail, there is an internal pulse generator available and, for testing purposes, the proportioning pump can also be controlled manually by means of a manual button.

The OSG 2000 control unit is based on a stored-program controller in conjunction with an operator and display panel. Therefore, it is possible to modify or enhance functions optionally.

In addition, the control system has a modular structure and can therefore be customized to meet the individual requirements of each odorization system. Thanks to ample space available in the various cases, additional modules for further functions can be retrofitted.



OSG 2000-W (wall-mounting enclosure)

Case variants

Wall-mounting enclosure (Type OSG 2000-W)

Available as door-type sheet steel housing with fastening lugs. Dimensions:

W x H x D = 430 x 235 x 180 mm

19" rack-mounting case (Type OSG 2000-E)

Compact unit for control cabinet installation with the following dimensions:

W x H x D = 84 depth units x 3 height units x 150 mm
(1 height unit = 43.13 mm; 1 depth unit = 5.02 mm)

Decentralized installation (Type OSG 2000-M)

The operating unit and the control unit are installed at different locations. Dimensions:

Operating unit: W x H x D = 84 depth units x 3 height units x 45 mm

Control unit: W x H x D = 430 x 130 x 130 mm

Operation is always menu-driven via the keyboard of the operator and display panel with cleartext display.

Power supply is also the same for all variants: 230 VAC / 50 Hz.

Functions

The control unit has standard functions and additional optional functions which can be individually supplemented depending on the plant design and customer requirements.

Standard functions:

- External volume pulses (the proportioning pump is controlled through volume-proportional pulses)
- Storage and processing of external volume pulses (when the maximum stroke frequency of the proportioning pump is exceeded)
- Addition or subtraction of external volume pulses (in the case of two gas routes)
- Evaluation of external volume pulses
- Internal pulse generator
- Automatic mode (changeover between internal and external pulses in accordance with parameter settings)
- Manual mode
- Delivery monitoring with alarm signalling
- Level monitoring with alarm signalling when odorant level falls below the limit value.
- Solenoid valve control system (in the case of injection intervals of more than 30 seconds, a solenoid valve in the injection pipe is shut until the next pulse is received.)
- 5 relay outputs
- MPI interface for transmitting process data

Additional functions (options):

- Calculation of the pump setting
- Calculation of the odorant concentration and the filling height through continuous level measurement
- Profibus interface (in preparation)
- Additional customized functions

For a detailed description of the OSG 2000 odorization system, please refer to RMG Publication No. 4.351-E.

Gas Odorization System

GOE 2000

Specifications

Dimensions (H x W x D) GOE 2000 without collector 100 litre collector 200 litre collector	1225 x 720 x 770 mm 300 x 770 x 770 mm 400 x 1000 x 770 mm										
Weight¹⁾ (depending on the pump type) - GOE 2000 with 17 litre reserve tank - GOE 2000 with 35 litre reserve tank 100 litre collector with grid 200 litre collector with grid	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">MH-6-47 / MH-6-65</td> <td style="width: 33%;">MHO-15-300 / MHO-15-500</td> </tr> <tr> <td>62 kg</td> <td>68 kg</td> </tr> <tr> <td>80 kg</td> <td>86 kg</td> </tr> <tr> <td>30 kg</td> <td></td> </tr> <tr> <td>40 kg</td> <td></td> </tr> </table>	MH-6-47 / MH-6-65	MHO-15-300 / MHO-15-500	62 kg	68 kg	80 kg	86 kg	30 kg		40 kg	
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62 kg	68 kg										
80 kg	86 kg										
30 kg											
40 kg											
Connection of injection pipe	Dia. 6 mm, SWAGELOK fitting										
Power supply	230 V AC (via control unit)										
Power requirement	approx. 56 VA										
Ambient temperature range	+5°C to +50°C										
Reserve tank	17 litres when using a 50 litre odorant tank 35 litres when using a 200 litre odorant tank										
Explosion protection (proportioning pump)	Ex e G 4, approved for Zone 1										
Immersion length of injection nozzle	DN 50 - DN 100: 93 mm DN 150: 143 mm DN 200: 178 mm DN 250 - DN 300: 190 mm DN 400 - DN 500: 320 mm DN 600 - DN 800: 480 mm										

¹⁾ Without collector and odorant tank

Proportioning pumps

Pump type	Max. back pressure (bar/gauge)	Displacement (mm ³)	Max. displacement (pulses/h)
MH-6-47	40	10 - 80	7200 ²⁾
MH-6-65	20	15 - 150	7200 ²⁾
MHO-15-300 (5 / 12.5)	80	30 - 280	4300
MHO-15-500 (7 / 12.5)	40	60 - 550	4300

²⁾ In conjunction with a level detector for odorant calculations 5,760 pulses/h

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