



Left: Floor-mounted model, Right: Wall-mounted model

## **WALLACE & TIERNAN® GAS FEED SYSTEMS V2000™ CHLORINATOR**

### **INTRODUCTION**

Evoqua Water Technologies chlorination equipment has the benefit of 100 years of experience in gas feed technology. V2000™ chlorinators are available as both floor-mounted and wall-mounted units. The floor-mounted units are available in a variety of configurations with capacities up to 200 kg/h (10,000 ppd) of chlorine. The more compact wall-mounted unit has a capacity of up to 60 kg/h (3,000 ppd) of chlorine. V2000 chlorinators handle all water treatment gases -chlorine, ammonia, sulphur dioxide and carbon dioxide.

### **TYPICAL APPLICATIONS**

#### **Municipal or Industrial Water**

- Disinfection of potable water
- Treatment of cooling water to inhibit biological growth and algae control in irrigation systems

#### **Municipal or Industrial Waste Treatment**

- Disinfection of municipal sewage effluent and industrial waste streams

#### **Chemical Processing**

- Treatment of industrial wastes from:
  - metal finishing
  - pulp and paper operations

- chemical plants
- food processing plant discharges

#### **Industrial Process Water**

- Taste and odor control in bottling plants and breweries
- Tempering water treatment
- High purity water in:
  - electronics
  - pharmaceuticals
  - cosmetic industries

### **KEY BENEFITS**

- Safe all-vacuum operation using accurate, reliable, proven, V-notch gas flow control
- Large 250mm (10") flowmeters for the highest degree of readability and +/- 4% of indicated accuracy
- Large vacuum regulators with unique, integral pressure check valve that all but eliminate the possibility of venting gas to the atmosphere
- Built-in non-isolating, automatic switchover option for continuous operation and complete withdrawal from any container, if required
- Complete design and system supply of all gas feeding and handling equipment, residual analyzers, control systems, gas detectors and accessories

## FEATURES

### V-Notch gives superior gas-flow control



The V-notch orifice consists of a precisely grooved plug sliding in a fitted ring. Any position of the plug in the ring results in a specific orifice size

and corresponding feed rate. This results in accurate gas-flow control and excellent repeatability. Control ranges from manual to sophisticated automatic arrangements. The V-notch resists fouling and corrosion; manufactured in a chemical-resistant, self-lubricating plastic.

### Front access

The chlorinator's front panel lifts up and out for easy access to components that are most frequently serviced, such as the V-notch orifice and flowmeter.



### Dedicated automatic controllers

The SFC controller is designed specifically for chlorination/disinfection systems and is available in two arrangements: flow-proportional and compound loop/residual control. The controller may be mounted in the chlorinator front panel or remote. The SFC controllers provide a stroke up or down signal to the actuator and the actuator feedback signal confirms proper operation. Automating the operation of the V2000™ chlorinator optimizes the chemical feed ensuring the desired chemical residual is maintained.

### Vacuum regulating valves

Vacuum regulating valves are made of rugged plastics and metals to withstand full supply pressure. Manually operated vacuum regulating valves incorporate a gas shut off feature to enable container changes without admitting air, dirt or moisture to the control module and without shutting off the injector. Filters protect control components from impurities carried with the gas. The 60 kg/h (3,000 ppd) and 200 kg/h (10,000 ppd) vacuum regulators optionally utilize a unique secondary pressure check and pressure relief valve designed to all but eliminate the possibility of gas being released to the atmosphere. The pressure check valve is designed to be fully open or closed with a very low pressure drop across the valve seat, minimizing fouling and assuring positive closure in the absence of a vacuum.

For systems utilizing evaporators, the vacuum-regulating valve used with the 60 kg/h (3,000 ppd) and the 200 kg/h (10,000 ppd) modules have an electric 'fail safe' actuator. It is designed to give positive shut-off of the gas supply should evaporator temperature or water level fall below the operating limit or should power fail. The vacuum regulating valve also has a low-temperature switch designed to close the electric operator and activate an alarm in the event of liquid chlorine reaching the vacuum regulator.

### Non-isolating automatic switchover

To ensure a continuous supply of gas being fed, automatic switchover from an empty container is achieved by a pair of optional switchover vacuum regulating valves. The valve on standby is held closed by a detent-type lockout. When the on-line supply is exhausted, system vacuum rises to a higher-than-normal level. This increased



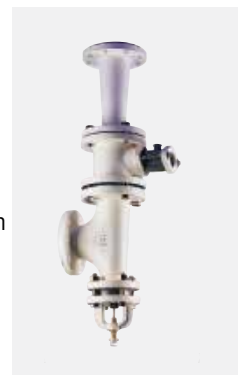
vacuum overcomes the latching force of the detent and the standby supply comes online along with the original supply. Automatic switchover valves are available only with capacities to 60 kg/h (3,000 ppd) of chlorine and are not for use with evaporators. A liquid-chlorine switchover system is available for evaporators.

### Injectors

The injectors used with V2000 chlorinators are designed to create a powerful and efficient operating vacuum, to save water and minimize energy consumption.

19mm (3/4") and 25mm (1") injectors are fixed throat, differential-type, constructed from PVC. They have a built-in double spring diaphragm and poppet check valves to protect against backflooding.

The differential type 50mm (2") injector can be PVC or bronze-bodied for higher pressures, both versions have an adjustable throat for optimum site adjustment. The 75mm (3") and 100mm (4") injectors are plastic and rubber-lined cast iron with adjustable throats. Adjustable throat injectors permit operation to be fine tuned based on site hydraulic conditions. As these conditions change, for instance due to booster pump impeller wear, the injector can be adjusted to maintain proper performance.



75mm (3") Injector

## OPERATION

In all V2000™ chlorinators, the system operates under a vacuum produced at the aspirator-type injector. Vacuum is transmitted to the control module and then to the vacuum-regulating valve by plastic pipe or tubing.

Gas enters the vacuum regulating valve. Here a diaphragm senses vacuum on one side and atmospheric pressure on the other. Force on the diaphragm displaces a spring-loaded stem off of its seat. This tends to maintain the proper operating vacuum ahead of the control module and permits gas to flow toward the control module. Still under vacuum, gas enters the control module. Its flow rate is measured as it passes through the flowmeter and controlled at the V-notch by changing orifice area. At this point, stable gas flow is determined by a differential-regulating valve. This valve maintains a constant differential across the V-notch.

Gas next passes to the injector. At the injector, metered gas is dissolved in the water stream. The resultant solution is discharged to the point of application.

## CONTROL METHODS

Feed rate of any V2000 chlorinator is controlled by either one or both of these methods: interrupting the injector-water supply to shut off the chlorinator's operating vacuum or changing V-notch-orifice area while holding vacuum differential across the orifice constant.

### Manual control

Manual control by changing orifice area (V-notch-plug position) via an adjustment knob on the front of the chlorinator.

### Start-stop or program control

This type of control is achieved with simple implementation. A V2000 chlorinator's operating vacuum is started and stopped by interrupting the injector water supply. A solenoid valve or motorized valve is wired into the control circuit of a pump, switch, controller, or timer. Similar to this, a special solenoid valve can be used in the gas line to the injector. This solenoid is available with the 10kg/h (500 ppd) capacity model only.

## TECHNICAL DATA

### Operating range

Manual 20:1; automatic 10:1.

## Control

Manual, remote manual, start-stop, and program. Also the following automatic modes: flow proportional, direct residual and compound-loop control.

### Injector-operating water

Must be reasonably clean. Pressure and flow depend on injector size, chlorinator capacity, and back pressure at application point.

Note: For ammonia service, injector-operating water with hardness level in excess of 35 mg/l may require softening.

### Pressure at application point

5 bar (75 psi) is the maximum allowable back pressure with flexible plastic pipe or hose. Higher pressures require suitably rated high-pressure hose or rigid pipe for the solution line. A solution pump after the injector will allow application against higher pressure.

#### Maximum injector-water pressure (bar/iC)

19mm (3/4") PVC	16 bar/38°C	10 bar/55°C
25mm (1") PVC	21 bar/38°C	10 bar/55°C
50mm (2") PVC	8.5 bar/38°C	4.5 bar/55°C
50mm (2") bronze injector	17 bar/38°C	8.5 bar/55°C
75mm (3") or 100mm (4")	12 bar/38°C	6 bar/55°C

#### Maximum injector-water pressure (psi/iF)

19mm (3/4") PVC	230 psi/100°F	150 psi/130°F
25mm (1") PVC	300 psi/100°F	150 psi/130°F
50mm (2") PVC	125 psi/100°F	65 psi/130°F
50mm (2") bronze injector	250 psi/100°F	125 psi/130°F
75mm (3") or 100mm (4")	175 psi/100°F	90 psi/130°F

## Connections

### 10 kg/h (500 ppd) module:

Vacuum regulating valve inlet has a captive yoke connection to cylinder, header or ton-container valve; outlet to control module is 13mm (1/2") female NPT pipe connection with threaded-compression fittings for 13mm x 16mm (1/2" x 5/8") polyethylene tubing. Control module also has 13mm (1/2") female NPT with adapter for 13mm x 16mm (1/2" x 5/8") tubing to injector. Injector inlet is 25mm (1") female NPT, discharge is 19mm (3/4") NPT with adapters for 19mm (3/4"), 25mm (1") or 38mm (1 1/2") pipe or hose.

### 60 kg/h (3,000 ppd) module:

Vacuum regulating valve inlet is 25mm (1") female NPT, outlet is reversible adapter for 25mm (1") female NPT or 25mm (1") female socket. Control module inlet is reversible adapter for 25mm (1") female NPT or 25mm (1") female socket (removal of adapter provides 38mm (1 1/2") female slip joint); outlet is 19mm (3/4") female slip-joint adapter (removal of adapter provides 19mm (3/4") female NPT). Vent is threaded-compression fitting for 7mm x 10mm (1/4" x 3/8") tubing. PVC injector inlet, 50mm (2") female NPT; discharge, 38mm (1 1/2") female pipe or 50mm (2") hose.

### 200 kg/h (10,000 ppd) module:

Vacuum regulating valve inlet is 25mm (1") female NPT; outlet is 38mm (1 1/2") female slip-joint connection. Control module inlet and outlet are 38mm (1 1/2") female slip-joint connections. Vent is threaded-compression fitting for 13mm x 10mm (1/2" x 3/8") plastic tubing. 75mm (3") and 100mm (4") injectors have 75mm (3") and 100mm (4") flanged pipe connections.

### Electrical requirements

Automatic arrangements require 120 volts  $\pm 10\%$ , 0.3 amp or 240 volts  $\pm 10\%$ , 0.15 amps, 115-volts, 50/60 Hz, 15 watts for heater at optional ton-container connection used with 4 kg/h (200ppd) and 10 kg/h (500ppd) vacuum regulating valves and for heater on the 60 kg/h (3,000ppd) and 200 kg/h (10,000ppd) vacuum regulating valves. There may be other accessories such as alarms and solution or booster pumps.

### Items furnished

Each V2000™ chlorinator includes a control module, vacuum regulating valve, injector, operating-vacuum gauge, injector-vacuum gauge, flowmeter for one capacity, vent screen, wall-mounting bracket and heater for vacuum-regulating valve 60 kg/h (3000ppd) and 200 kg/h (10,000ppd) only, removable gas filter 60 kg/h (3000ppd) and 200 kg/h (10,000ppd) only, lubricant, gaskets, wrenches and instruction books. Optional but necessary to complete an installation are: plastic pipe or tubing for gas supply (vacuum regulating valve to control unit to injector); polyethylene vent tubing; rigid pipe or high pressure hose for injector inlet and discharge; main connection or fittings for the point of application.

## OPTIONS

### Gas Flow Transmitter

Non-inferential measurement of the rate of gas flow through any V2000 chlorinator. Consists of an IP66 (NEMA 4X) sensor transmitter with a 4-20mA output directly proportional to gas flow.

### Automatic switchover

A pair of vacuum regulating valves designed to switch to a fresh gas supply on an empty container. Liquid systems available for use with evaporators.

### Ton-container Kit

Adapts the vacuum regulating valve for mounting on a ton container valve. It has a drip leg to trap initial spurts of liquid and a heater to evaporate them (4 kg/h (200ppd) and 10 kg/h (500ppd) vacuum-regulating valves).

### Related options

Cylinder and ton-container valves, and connections; header valves with manifolding and connections; vent and injector inlet and outlet lines and clamps; main connections; alarms; solution and booster pumps; water-line solenoid valves; water-line pressure gauge; high-low vacuum switch and alarm; gas-line solenoid valves, safety equipment; on-line residual analyzers; residual test kits and instruments; chlorine detector; two-cylinder scales; evaporators; spare parts; maintenance tools, PM Kit® replacement parts.

### Floor-mounted model

#### Overall dimensions (H x W x D)

1735mm x 700mm x 405mm (68 1/4" x 27 1/2" x 16").

#### Shipping weight

Chlorinator and items furnished - 113 kg (250 lbs).

### Wall-mounted model

#### Overall dimensions (H x W x D)

910mm x 699mm x 300mm (36" x 27 1/4" x 12").

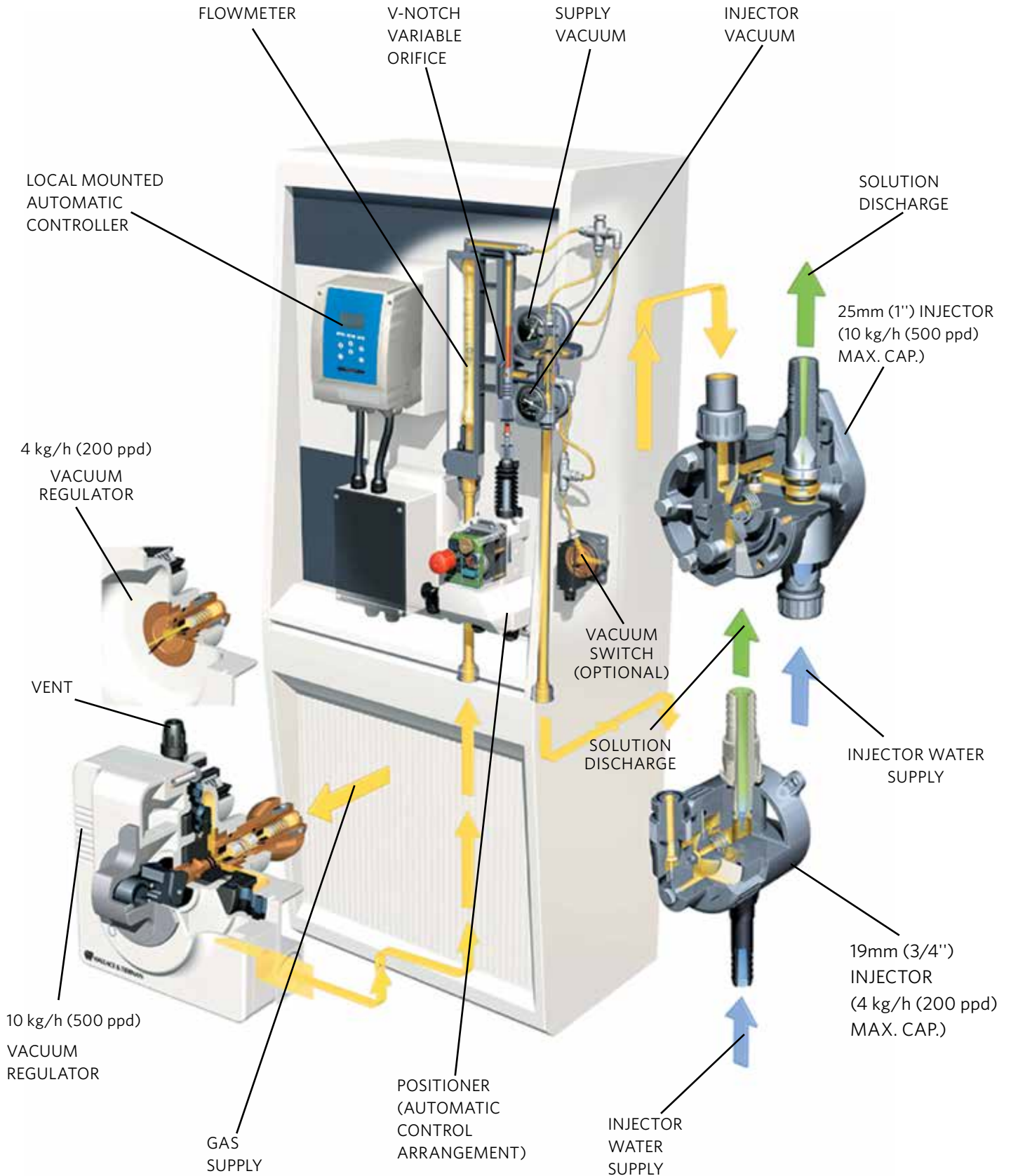
#### Shipping weight

36 kg (80 lbs).

### Chlorine warning

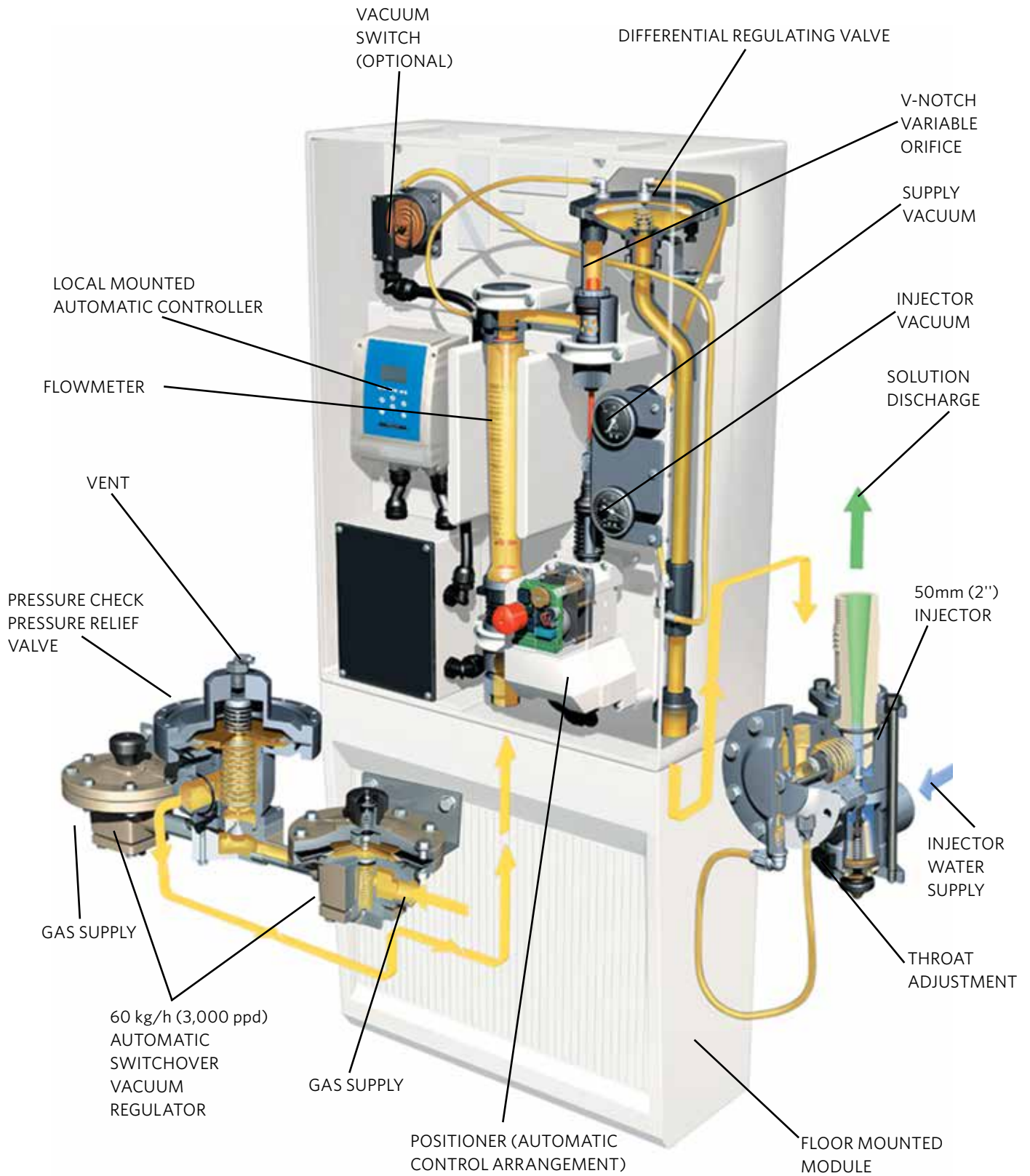
All unattended chlorine containers and chlorination equipment should be continuously monitored for leaks. Sensitive chlorine detectors which will respond quickly to the presence of chlorine in the ambient air should be installed at each site.

**10 KG/H (500 PPD) ARRANGEMENT**



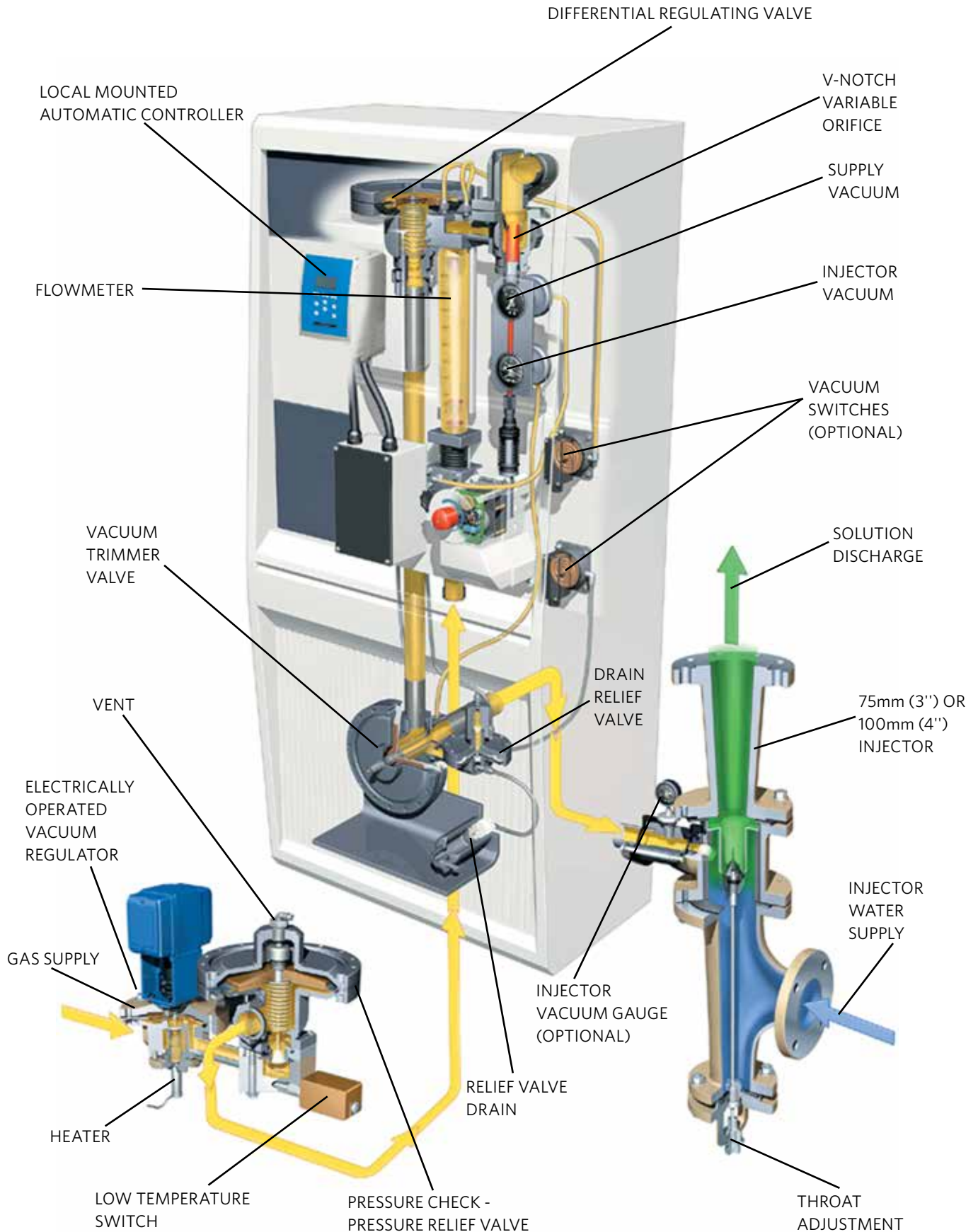


## 60 KG/H (3,000 PPD) ARRANGEMENT



NB: Also available in a wall-mounted configuration

## 200 KG/H (10,000 PPD) ARRANGEMENT



## FLOWMETER CAPACITY TABLE

Model	Chlorine			Sulphur Dioxide			Ammonia			Carbon Dioxide		
	Scale Max Cap, Lb/24Hr	Scale Max Cap, Kg/Hr	Scale Max Cap, Gm/Hr	Scale Max Cap, Lb/24Hr	Scale Max Cap, Kg/Hr	Scale Max Cap, Gm/Hr	Scale Max Cap, Lb/24Hr	Scale Max Cap, Kg/Hr	Scale Max Cap, Gm/Hr	Scale Max Cap, Lb/24Hr	Scale Max Cap, Kg/Hr	Scale Max Cap, Gm/Hr
V2005	3		60	2.7		54	1.3		27	2.4		487
	10		200	9		180	4.5		90	8		160
	20		400	18		360	9		180	16		320
	30		600	45		900	22.5		450	40		800
	50	1		90	1.8		45		900	80	1.6	
	100	2		180	3.6		95	1.9		200	4	
	200	4		225	4.5		112.5	2.2		400	8	
	250	5		475	9		240	4.7				
	500	10										
	750	15										
V2030	50	1		45		900	23		450	40		800
	100	2		90	1.8		45		900	80	1.6	
	250	5		225	4.5		112.5	2		200	4	
	500	10		450	9		240	5		400	8	
	1000	20		900	18		475	9		800	16	
	2000	40		1800	36		1350	28		2400	50	
	3000	62.5		2700	56							
V2100	1000	20		900	18		450	9				
	2000	40		1900	36		950	18				
	3000	62.5		2700	56		1350	28				
	4000	75		4500	90		2250	45				
	5000	100		9000	180		4500	90				
	6000	115										
	8000	150										
	10000	200										



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