

# METITO



*mach*  
**4**

# chlorinator

## General Description

The *mach 4* is a state-of-the-art chlorinator using the latest technology to provide the best value for money. The *mach 4* is designed for use with common chlorine cylinders and drums. It exceeds chlorine and water industry recognized standards, has built-in safety and reliability functions and incorporates a multi-purpose yoke that achieves secure fitting to most cylinders and drums used throughout the world. It can be used indoors, or outdoors under cover.

The *mach 4* is ideal for short occasional dosing or 24 hours-a-day continuous treatment of water. Once set it will remain working reliably, only needing attention when the empty cylinder or drum has to be replaced. In either the manual or semi-automatic mode, stopping treatment is accomplished by simply turning off the water supply.

The *mach 4* is moulded in tough chemical resistant acrylonitrile butadiene styrene and textured to provide an easy-grip surface; the external fitments are shrouded against damage caused by everyday handling, and the special tube connectors are virtually unbreakable. In addition, rare metals such as monel, pure silver and tantalum, combined with non-perishable fluorocarbons and metal-oxidized fluorolastomer rubbers, provide the optimum protection against chlorine corrosion-giving the *mach 4* strength, durability and overall superiority.

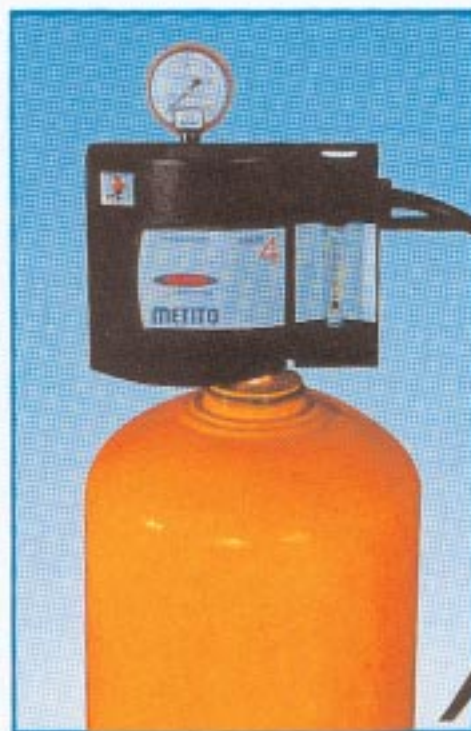
The *mach 4* chlorinator can be fitted direct on a cylinder, drum or header. The yoke clamps the *mach 4* clear of the cylinder neck and, when fixed to a drum, is forward of any protruding studs permitting a wide variety of cylinders or drums to be used. Flexible connector tubes and yoke valves are provided to enable up to four cylinders or drums to be connected in parallel. A large size filter is provided for drum and header mounted models in addition to a heated drip leg to vaporise liquid spill-over when drums are first opened for service. An optional pressure gauge can be fitted to all models to indicate pressure changes or to signal a blocked filter, and an automatic switchover module is available to automatically change from duty to standby cylinders or drums.

## Why Chlorine

During the last 50 years, chlorine has been the world's main disinfectant; it is set to remain so for the foreseeable future because other methods do not provide the same protection against disease for the equivalent cost. Its unique performance has set the standard against which other methods are judged. Given the medical and technical question marks against other methods, it is clear that chlorine will continue to be crucial in ensuring the world's supply of safe drinking water

## Type of Chlorine

Chlorine suitable for the *mach 4* is liquified gas held in certified steel cylinders and drums. These vessels vary from country to country but the most common types are approximately 65kg for cylinders and 1000kg for drums. They are not completely filled with liquid chlorine and the space left allows the chlorine to expand and the gas to vaporize. A cylinder standing upright discharges gas, while a drum laying horizontal discharges gas from the upper valve or liquid from the lower valve. This lower valve must never be used for supplying the *mach 4* chlorinator without the use of an evaporator. Drums with Y angled valves or valves not parallel to the drum axis will require the Manifold Mounted *mach 4*. The chlorine should ideally be 99.5% pure. The cylinders or drums are manifolded together where demand exceeds the rate at which chlorine discharges from an individual vessel. The rate is commonly based on 24 hours-a-day continuous discharge and is equal to a maximum of 1% per hour of the weight the chlorine, i.e. a 65kg cylinder will discharge 0.65kg/h and a one-ton drum, 10kg/h.



*Shown is the mach 4 Cylinder Mounted Model with optional pressure gauge which is able to exceed the normal withdrawal rates and can be specified upto 2kg/h flowrate when fitted to a 65kg cylinder.*

## How Much Chlorine

The amounts of chlorine shown in the table below are typical dose rates for everyday use. Normally, the chlorinating equipment is 100% oversized in order to permit increased dosing at times of high contamination levels that are likely to occur when rivers, wells or tanks are misused, or during other emergency situations.

Treatment	Typical Rates mg/l	Purpose
<b>Water for drinking/ Culinary purposes</b>		
Oxidation	up to 5	Prechlorination
	up to 0.5	Postchlorination
	3 - 5	Taste and odour control
	2 - 10	Iron bacteria control
	0.63 x Fe	Precipitation of iron
	1.3 x Mn	Precipitation of manganese
Pipes and Tanks	2.1 x H <sub>2</sub> S	Hydrogen sulphide odour control
	8.4 x H <sub>2</sub> S	Hydrogen sulphide destruction
Pipes and Tanks	25 - 50	Disinfection before use
<b>Waste Water</b>		
	1 - 15	Raw sewage, also odour control
	8 - 10	Primary effluent, Settlement
	3 - 10	Primary effluent, filters
	2 - 8	Activated sludge effluent
	30 - 45	Septic tank effluent
	5 - 10	BOD reduction
<b>Swimming Pools</b>	1 - 5	Disinfection and algae control
<b>Water</b>		
General	3 - 5	Algae & Bacteria slime control
Cooling	5 - 15	Shock treatment
Cooling	3 - 5	Continuous treatment
Chilling	20	
Washdown	50	
Surface	1 - 10	Check water first
Well	1 - 5	

## How the mach 4 Works

In the chlorination process, a variable flow of chlorine gas mixes with a constant flow of water. It discharges as a biocidal solution into the treated water where it dilutes to a lower level, commonly known as the chlorine residual. Depending on the amount of chlorine consumed by organisms and compounds in the water, the chlorine gas is varied up or down to change the solution strength and so achieve a desired residual. The residual can be measured separately by a hand-held comparator or a bench-top titrator, or automatically with an on-line residual analyzer.

With the *mach 4* in operation, chlorine gas is connected to the inlet safety valve of the chlorinator. The separate ejector is started up and the vacuum on one side of the diaphragm in the chlorinator allows atmospheric pressure to move the diaphragm forward and open the inlet safety valve; at the same time the loss-of-gas indicator moves to its duty position. The chlorine gas then enters the vacuum stream, passing through the flowmeter and rate valve and into the ejector through a check valve, and mixes with the fast flowing water in the ejector.



Pictured is the 2kg/h ejector diffuser and check valve.

Once set, the process is continuous. Should the gas supply not be renewed and the empty vessel remain connected, the indicator shows loss-of-gas and the solution strength will reduce to zero. In addition, the no gas shut-off valve closes to initiate automatic switchover (where fitted) and prevent suck-back into the chlorine vessel. In the event of low vacuum caused by the ejector stopping or a leak in the system, the inlet safety valve closes and safely stops the flow of gas. The pressure relief valve vents chlorine to the atmosphere should it leak past the inlet safety valve.

The ejector works by water jetting from the nozzle at speed, reducing the surrounding void to vacuum. This vacuum draws the chlorine through the chlorinator. The chlorine mixes with the water passing through the ejector and discharges as chlorine solution. The energy of the jet should be sufficient to overcome the opposing back pressure and create the sonic velocity conditions across the rate valve in the chlorinator. A check valve is fitted to prevent water flooding back into the chlorinator. The ejector requires an inlet pressure higher than the back pressure and, if a suitable supply is not available, a booster pump should be installed.

## Automatic Switchover

This self-energized, vacuum operated module, automatically switches duty and standby chlorinators connected to cylinders or drums in order to maintain treatment. In operation, the excess vacuum produced by loss-of-gas conditions from an empty vessel acts on two diaphragms which open and shut the valves and re-directs the



*Drum mounted Mach 4 chlorinator shown fitted with optional chlorine pressure gauge.*

### SCOPE OF SUPPLY

#### *mach 4* Chlorinator

- Chlorinator (1)
- Ejector (1)
- Standard accessories (1 set) comprising: cylinder wrench, set of standard spares, ammonia squeeze bottle, O&M instructions, lead cylinder washers (10), chlorine wall card, changing cylinders wall card, 8m vent and vacuum tubing.

#### *mach 4* Automatic Switchover System

- Chlorinator less rate valve (2)
- Ejector (1)
- Switchover module (1)
- Remote meter with rate valve (1)
- Standard switchover spares (1 set)
- Standard accessories (1 set)

gas from the full cylinder or drum. The flow of gas is indicated on the related chlorinator now in service. The empty vessel is replaced and the cycle repeats when the next loss-of-gas occurs without the need for re-setting.

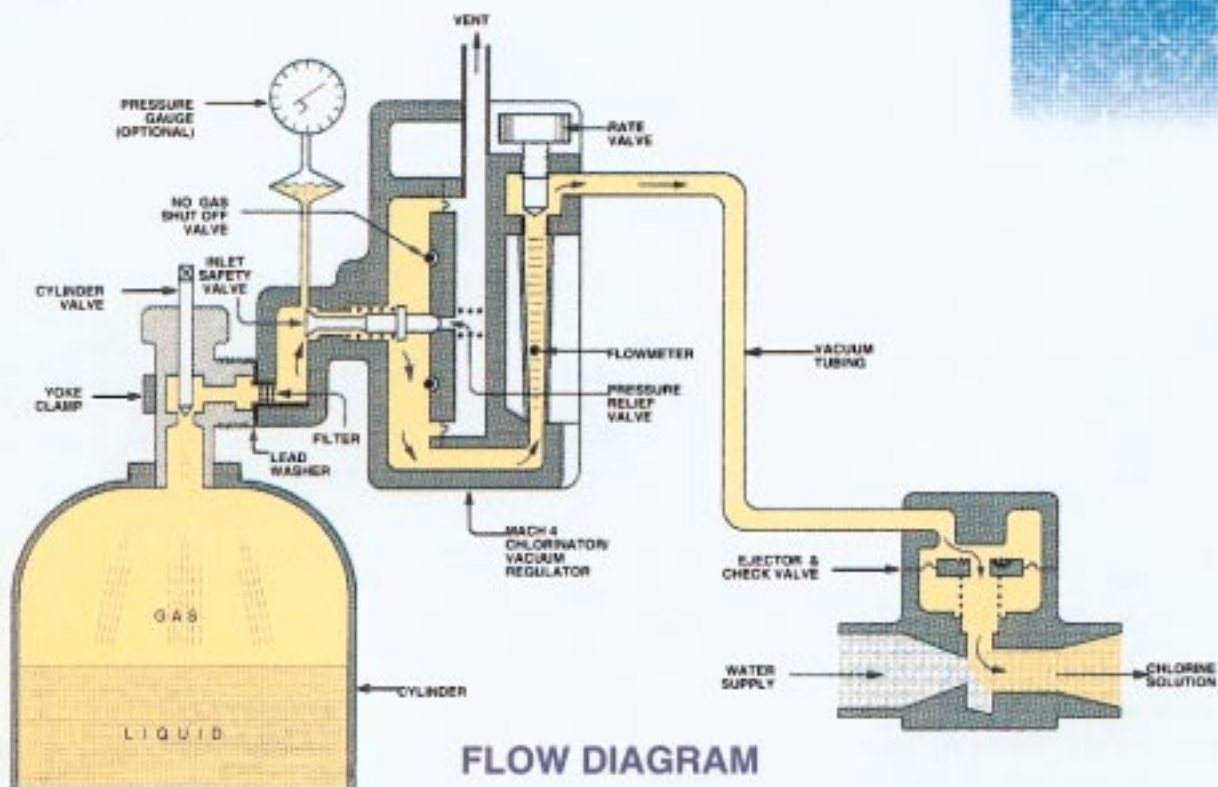
## Why Choose a mach 4

A convenient way of judging the merits of the *mach 4* chlorinator is to ask three questions, namely: Is it the right quality? Will the cost be within budget? and Will it be supplied on time? The *mach 4* gives the best overall value on all counts:

\* Quality • Built with superior materials to resist corrosion • Rugged construction to achieve long life • Manufactured and tested under strict Quality Assurance Procedures • Conforms to chlorine and water industry standards • Registered design based on building block principles to permit addition of optional items.

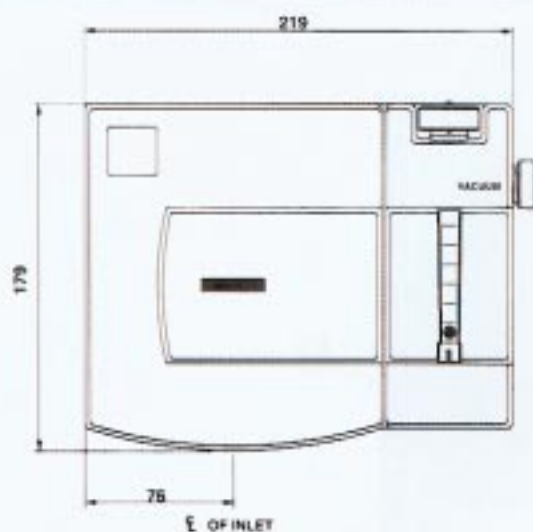
\* Cost • Economic treatment over many years achieved with minimal capital outlay, minor maintenance and spares cost, and effective after-sales-service.

\* Delivery • Standard models and spares are held in stock for final testing before immediate or pre-scheduled dispatch.  
• Computerized inventory and manufacturing program ensures rapid processing of orders.



## Features

<b>Safety</b>	<ul style="list-style-type: none"> <li>* All-vacuum operation prevents leaks.</li> <li>* Built-in over pressure relief valve.</li> <li>* Positive Acting gas valves with tight shut-off</li> <li>* Built-in ejector check valve prevents flooding</li> </ul>	<b>Flexibility</b>	<ul style="list-style-type: none"> <li>* Universal yoke fixing for cylinders and drums.</li> <li>* Manifold model complete with valves and tubes.</li> <li>* Cartridge heated vaporizer for drum models.</li> <li>* Optional automatic or stop/start control</li> <li>* Automatic switchover and pressure gauge options.</li> <li>* Building block principle for easy-to-add items.</li> <li>* Ejectors to 25bar back pressures available.</li> </ul>
<b>Reliability</b>	<ul style="list-style-type: none"> <li>* High-impact (ABS) superior corrosion resistant materials.</li> <li>* Sturdy tubing connectors.</li> <li>* Sonic velocity based flowrate stability.</li> <li>* Integral filters keep valves clean.</li> <li>* Flowmeter and valve shrouded against damage.</li> </ul>	<b>Quality</b>	<ul style="list-style-type: none"> <li>* Water and chlorine industry standard.</li> <li>* Stylized casings with grip finish.</li> <li>* Manufactured and tested to strict QA procedures</li> </ul>
<b>Economy</b>	<ul style="list-style-type: none"> <li>* Minimal spares and maintenance costs.</li> <li>* Economic procurement and operation.</li> </ul>		



### SHIPPING DETAILS

Cylinder or Manifold mounted chlorinator with ejector and standard items.

### SIZE, cm

34 x 30 x 20

As above with automatic switchover.

34 x 30 x 40

Drum mounted chlorinator with ejector and standard items.

62 x 30 x 20

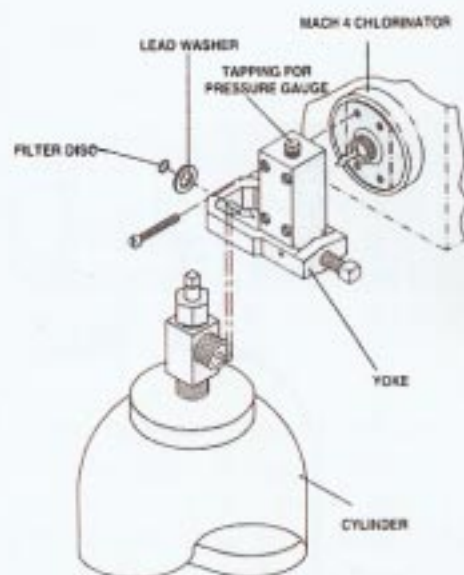
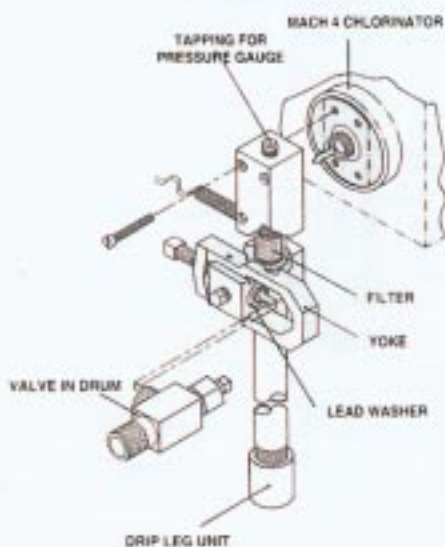
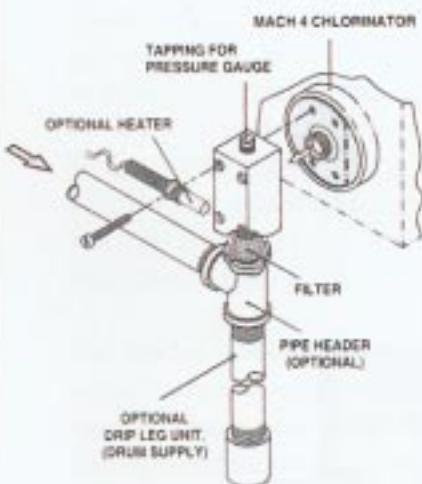
As above with automatic switchover.

62 x 30 x 40

MANIFOLD MOUNTED

DRUM MOUNTED

CYLINDER MOUNTED



Inquiry and Order check list		Booster Pump	yes/no
Select <i>mach 4</i> model	Cylinder/Drum/Manifold Mounted	Chlorine Pressure Gauge	yes/no
Select Capacity	25, 80, 200, 500, 1000, 2000, 4000, 10000 g/h	Cylinder Manifold	yes/no
Specify Back Pressure	... bar	Drum Manifold	yes/no
Automatic Switchover	yes/no	Residual Measurement	Comparator/Titrator/Residual Analyzer
Power Supply (for heaters)	A.C. 110V or A.C. 220V	Any other items	Specify Requirements



Rear view of cylinder mounted *mach 4* with optional pressure gauge

## 7 Technical Data

**mach 4 materials.** Hi-impact chemical resistant ABS & PVC body parts; tantalum alloy spring; silver rate valve, seat and relief valve; fluorocarbon lead oxide rubber diaphragms and O-rings; PTFE seat; FEP diaphragm; borosilicate glass flowmeter; fluorocarbon coated manifold; Aluminum-Silicone-Bronze inlet valve body; monel and stainless steel screws; porous inlet filter.

**Control Principle.** Stable gas flow with zero drift by regulated upstream vacuum and sonic velocity across variable rate control orifice.

**Accuracy.** +/- 4% of flowmeter capacity

**Operating range.** 20:1 manual, 10:1 automatic

**Ambient Temperature.** 1-55°C or depending on withdrawal rate from the cylinder(s).

**Gas Fitting.** Self-aligning universal yoke.

**Safety Relief.** Integral pressure relief valve with 3/8" vent tubing.

**Flowmeter.** 80mm long up to 4 kg/h. 150mm long for 10 kg/h. Graduated g/h or kg/h.

**Ejector and Check Valve.** Fixed orifice type for in-line installation.

**Pipe Connections.** 3/4" BSP and 1" hose tails to 2 kg/h. 1" BSP to 4 kg/h. 1-1/2" BSP to 10 kg/h.

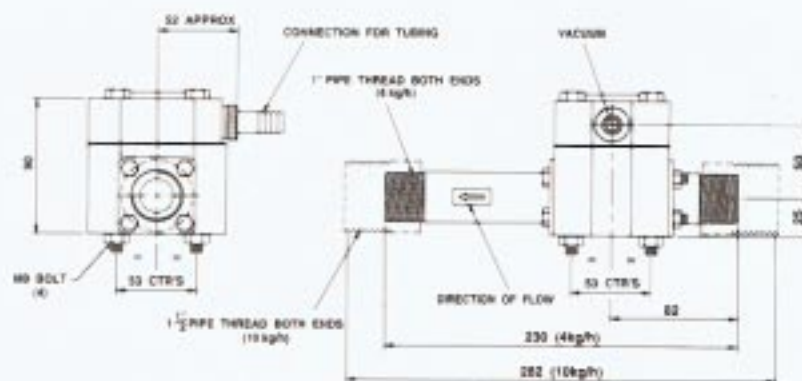
**Back Pressures.** Up to 12 bar standard ejectors;  
Up to 25 bar high pressure ejectors.

**Vacuum Piping.** 3/8" (2kg/h), 1/2" (4kg/h), 5/8" (10kg/h) polyethylene tubing as standard. Sockets pipe-tapped 1/2" BSP for alternative rigid piping.

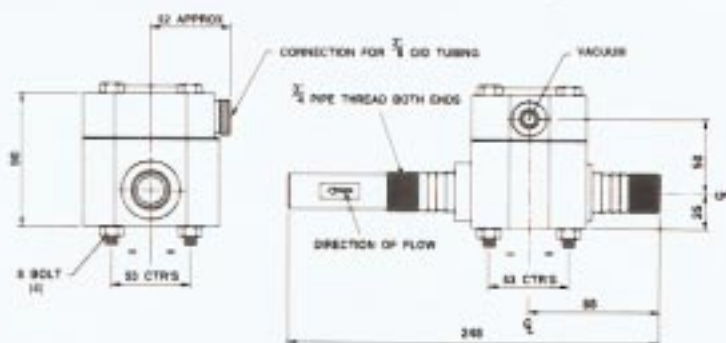
**Electrical.** AC220V or AC110V, 25W cartridge heater with 0.8m long SS braided flexible conduit (drum mounted models).

For dosing 1kg/h at zero back pressure, the ejector requires 2 bar operating pressure. Above these amounts, higher operating pressures are required which should include any head losses in piping especially where the ejector, dosing point and booster pump (if present) are separated by long distances. *In all enquiries, the back pressure and chlorine capacity should be specified which will allow the correct pressure and water flow to be advised.*

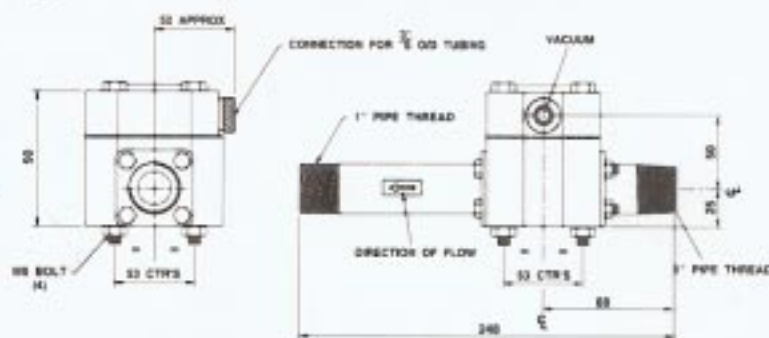
As a general guide, the ejector should be near the dosing point and, for economy reasons, the booster pump close to the ejector opting for short water and solution piping and longer vacuum tubing to the chlorinator.



4 & 10 kg/h Standard & High Pressure Ejectors



2 kg/h Standard Ejector



2 kg/h High Pressure Ejector

*Due to continuous development, rights are reserved to incorporate modifications that may not be described in this document.*



Commitment to a  
Cleaner  
Environment

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## METITO WORLDWIDE LOCATIONS

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