User Guide

MSe1 or MSe2 Fog Generator
with PLC and Modbus RTU interfaces

(Revision A/b, January 2020, © MDG Fog Generators Ltd)

CE

MADE IN CANADA
FABRIQUÉ AU CANADA

Les Générateurs de Brouillard MDG Ltée / MDG Fog Generators Ltd
10301 avenue Pelletier, Montréal, Québec, Canada H1H 3R2
Tel. 514-272-6040 / 800-663-3020 - Fax 514-722-3229
www.mdgfog.com e-mail : info@mdgfog.com

Intentionally left blank

Table of content

User Guide

Congratulations! You are now in possession of a MDG ***MSe1 or MSe2*** Fog Generator.

We hope this Fog Generator will bring you long hours of satisfaction.

Please read the following instructions carefully and completely before installing your Fog Generator and turning it on.

CAUTION

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

CAUTION

If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

How to read this User Guide

WARNING and **CAUTION** are used throughout this manual to forewarn of possible danger to the users if precautions are not observed. As is customary in military and some commercial manuals, the precautions will always precede the steps to which it refers so that the users will be aware of any potential danger before performing the task.

WARNING and **CAUTION** labels are key equipment parts. Do not remove, change or cover these labels. If the labels are not readable, contact ***MDG Fog Generators Ltd***.

BOLD TEXT: Contains important information, cautionary steps and warnings that should be read and understood prior to installing the unit.

BOLD and ITALIC TEXT: pertains to product names and trademarks, proprietary names and products made by MDG Fog Generators Ltd.

Please read the following instructions carefully and completely before installing, pressurizing and turning on the Fog Generator.

Qualified Personnel

MDG Fog Generators Ltd systems will perform as designed but are to be installed, operated, and serviced by trained personnel. Installation, operation and servicing of this equipment require trained personnel with technical skills in electrical theory and fluid dynamics. This manual is not a substitute for qualified technicians or local authorities on electricity, gas, fluid, or engineering, and therefore does not supersede, amend or void local safety installation practices. Please refer to local authorities for further information.

Need a little Help?

At MDG, we try our best to provide you with complete information for our products. Despite our best efforts, sometimes, a little more is required due to the specifics of your project and installation. We're looking forward to go that extra mile for you.

Contact us:

By Phone: +1-800-663-3020 +1-514-272-6040

By Fax: +1-514-722-3229

By e-mail: info@mdgfog.com

On the Web: www.mdgfog.com

By Mail: **MDG Fog Generators Ltd.**
10301, Avenue Pelletier
Montréal, QC, H1H 3R2
Canada

Please note that our business hours are from **08h00 to 12h00** and from **12h30 to 17h00** (8:00AM to 12:00PM and 12:30PM 5:00PM), **Eastern (GMT -5)**.

Copyright Notice

Basic description

The ***MSe1 or MSe2 Fog Generators*** were designed with safety and reliability in mind. They are capable of generating pure white, non-toxic fog for as long as you have fluid (100% duty cycles). Pulsating the Fog Signal ON and OFF can control the amount of the fog emission. They are one of the quietest in the industry. The fog generated is also one of the safest and environmentally safe.

These Fog generators are also equipped, as a standard feature, with the **Automatic Purging System**™ (**APS**™). This system purges the heating module after the first heating cycle and after every emission of fog preventing residual build up and clogging.

At the heart of the MDG Fog Systems is an electronic assembly that keeps the heat exchanger at a very stable temperature, with three different types of fail-safe systems. Those three types of electronic fail-safe systems are designed to protect against over and under-heating conditions and against component failure. When an overheating condition is detected, or if the internal temperature of the generator reaches 70°C (158°F), a safety circuit is triggered. This circuit removes the power to the heating elements, preventing hazardous conditions. When an under-heating condition occurs, the generator will stop producing fog until the temperature of the heating module is back within parameters.

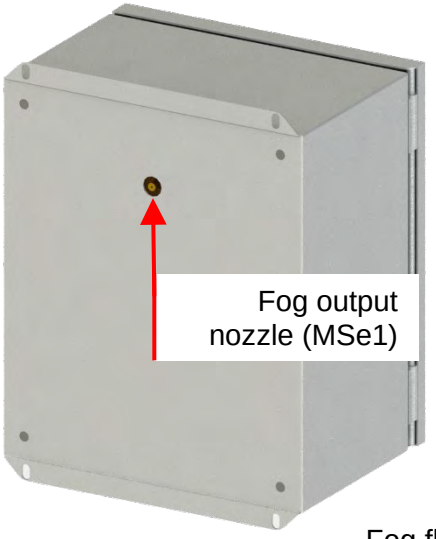
If an error occurs, the Fog Generator will automatically shut down, and the Fail state will be displayed on the LCD, in the Status Menu. Check the ***FAIL State*** and ***Troubleshooting*** paragraphs for diagnostics.

When « Fog On » mode is activated, the MDG *Fog Generator* will produce fog for as long as the ready level is reached (temperature) and all other control parameters are within specifications. When « Fog On » mode is deactivated, the **APS™** cycle is automatically initiated to clear the heating module. Never remove the power to a generator while it is producing fog – See the ***Shut down procedure***.

WARNING

- When not in use **ALWAYS** switch off the power switch located on the back panel, and **disconnect the gas line, the fog fluid line and the AC line.**
- **Never install above people**.
- This ***MSe1 or MSe2 Fog Generator*** must be installed in an upright position on a stable and leveled surface.
- Use in a well-ventilated area.
- Do not operate at less than 2 meters (6.5 ft.) from people.
- The maximum operating pressure is 345 kPa / 3,45 bar / 50 psi.

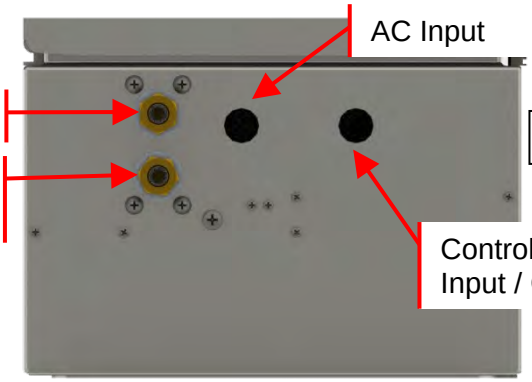
FRONT



Fog output nozzle (MSe1)

BACK

Access door



AC Input

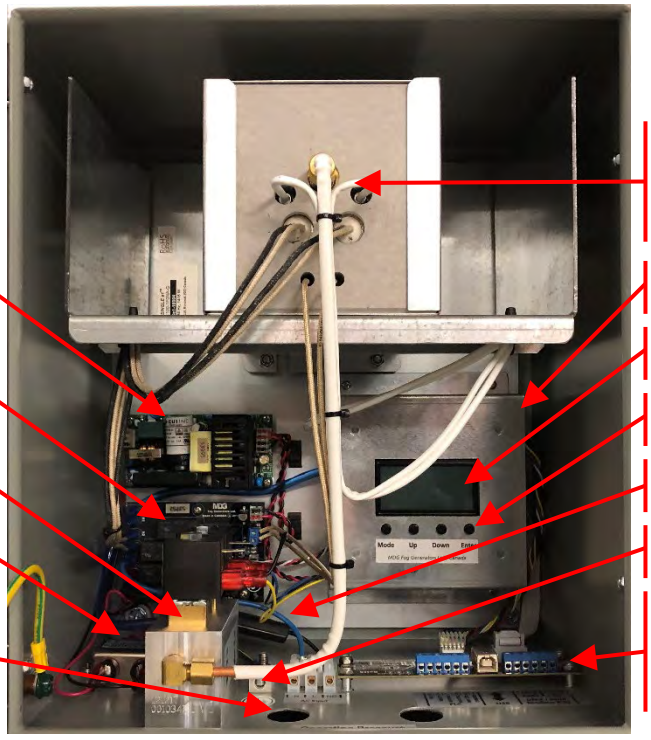
Fog fluid input

CO_2 or N_2 Gas input
50 psi ± 5%

BOTTOM

Control
Input / Output

INSIDE



Heating module
- MSe1 : 1 nozzle
- MSe2 : 2 nozzles

Power Supply
24 VDC

Main Control board

Heater Control board

LCD

Keyboard

Combiner

Fuse (15 A)

IEC Filter

AC Ground

AC input, 1480 W,
100-250 VAC
50/60 Hz

MODBUS RTU,
PLC and USB
Connectors

Pre-Install

Environmental Requirements

- 0 °C to 50 °C (32 °F to 122 °F) operating temperature
- 2 m (6.5 ft) clearance on all sides and in front of the equipment required.
- Wall-mounting hardware (not provided) must support 22.4 kg (49.2 lb) on four suspension points (see Dimensions paragraph).
- Enclosure type: NEMA 4-12
- Storage conditions: -40°C (-40°F) to 60°C (140°F), 80% relative humidity @ 60°C (140°F).

Electrical Requirements

- Operating voltage: 100-250 VAC, single phase. 50Hz – 60Hz, 1415 W nominal (1100 – 1480 W).
- Ground / Earth connection REQUIRED.
- AC cable: 2 mm^2 (14 AWG), 3-wires, 105 °C copper, 300 V, CE UL/CSA compliant cable, Cable OD: 6.0-12 mm (0.23-0.47 in)
- Data cable: 0.75mm^2 (22 AWG), CE UL/CSA compliant cable.

Tubing Requirements

- FLUID INPUT: ¼" NPT connector, 9.5 mm diameter tubing (3/8 inch) recommended
- GAS INPUT: ¼" NPT connector, 6.3 mm (1/4 inch) tubing recommended

Unpacking

The system is carefully packed at the factory for shipment. Each enclosure is custom fitted into a heavy-duty wooden frame cardboard box. Upon arrival, carefully inspect the containers for any shipping damage.

CAUTION

If **ANY** damage is found, immediately report it to the freight service and to ***MDG Fog*** within 24 hours.

When opening the container, ensure that you do not damage the exterior finish of the enclosure. Save all packing material for eventual equipment factory return.

A User Guide (this User Guide) is provided with the ***MSe1 or MSe2™ Fog Generator.***

Installing the MSe1 or MSe2

Careful planning must be used when selecting the location to mount the equipment:

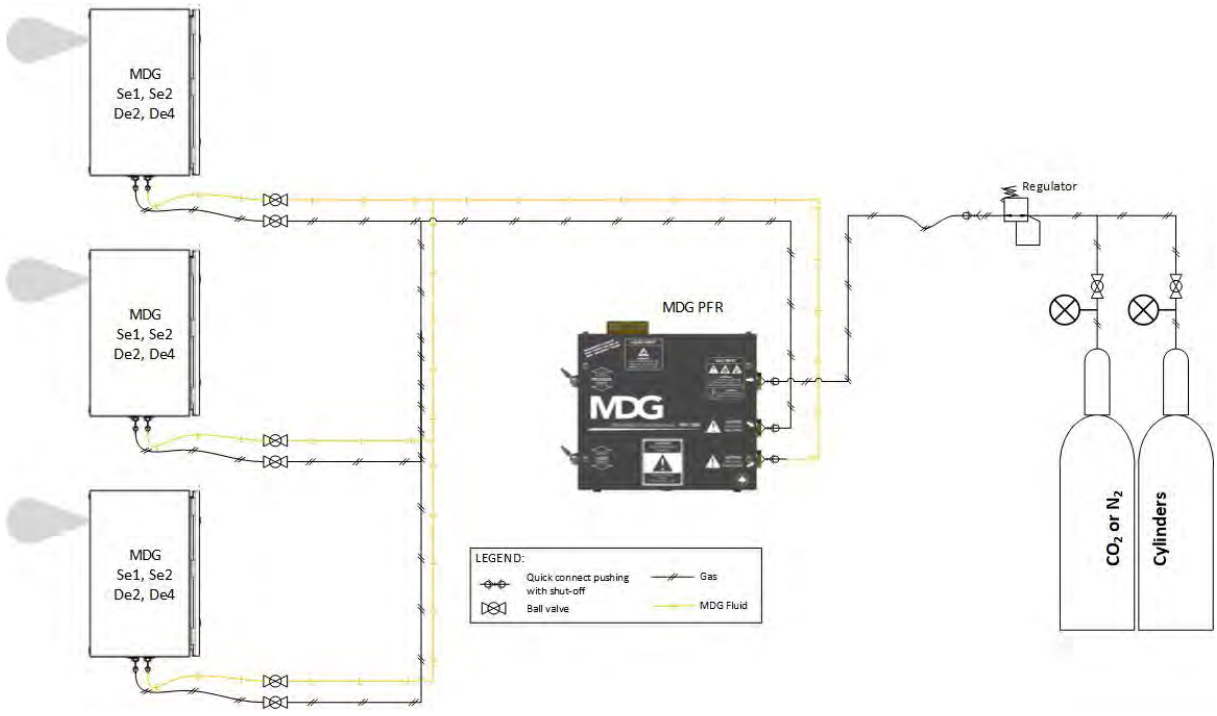
- The ***MSe1 or MSe2***™ can be installed indoor or outdoor, away from heavy dust or any harsh environment situations.
- Ensure there is enough space for all conduit and tubing runs. Where possible, mount the ***MSe1 or MSe2***™ as close as possible to external reservoir.
- The MDG ***MSe1 or MSe2*** requires 2 m (6.56 ft) of clearance to the front.

CAUTION

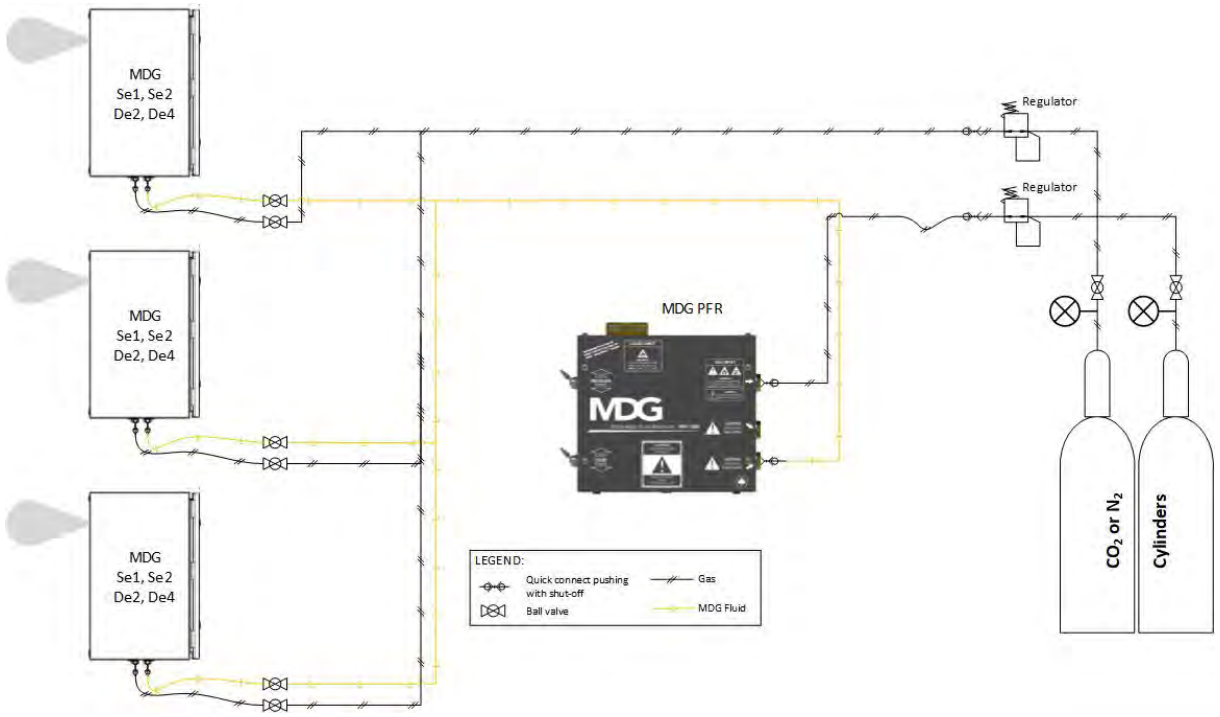
To avoid fire hazard and explosion risk, only use **MDG Neutral Fog Fluid**™. Not doing so **WILL** damage the equipment's components and void the warranty.

Typical installation

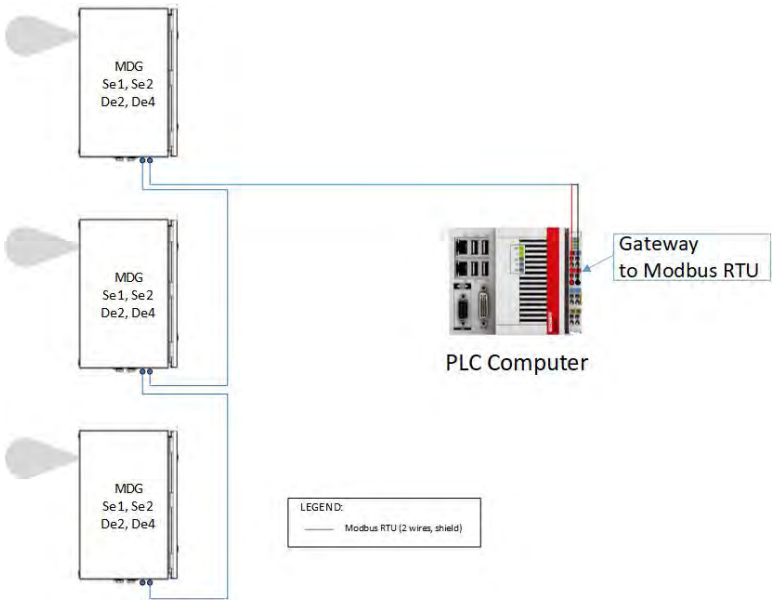
If the fog generators (**Se1, Se2, De2, De4, MSe1 or MSe2**) are at the same elevation than the pressurized reservoir **PFR** or if the distance is below 100 meters, the fog generators can be connected directly to the **PFR**.



If the fog generators (**Se1, Se2, De2, De4, MSe1 or MSe2**) are positioned at a higher elevation than the **PFR** (more than 3 meters) or if the distance is over 100 meters, you may be obliged to separate the gas line for the fog generators, and increase the pressure of the **PFR** to compensate the pressure of the fluid column (elevation) or the pressure drop due to friction (see also the ***PFR User Guide***).



The figure below shows typical configuration of data circuit for the same configuration. In this case, the control signal (Modbus RTU gateway) is mounted in a classical daisy chain topology.



Installation

STEP 1: Mounting Hardware

Using 1 5/8" Unistruct (or equivalent – not provided), affix the hardware to the wall / structure upon which the cabinet will mount (see position of mountings hole in ***Dimensions*** section).

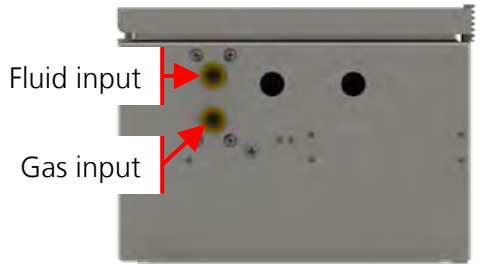
Ensure it is leveled and balanced. Avoid installing above people.

Mount the **MSe1 or MSe2**™ fog generator to the hardware.

STEP 2: Mounting Fittings

On the bottom side of the **MSe1 or MSe2**:

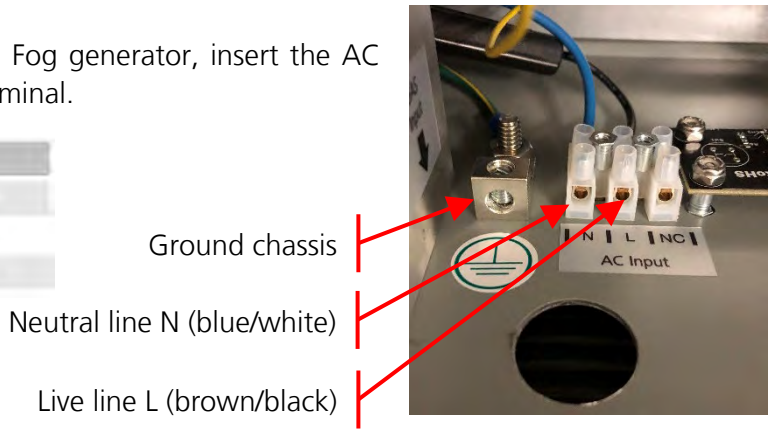
- Install a 1/4" NPT male connector (Elbow or Straight) on the Gas input
- Install the 1/4" NPT male connector (Elbow or Straight) on the Fluid input



STEP 3: AC Power cable

On the bottom side of the **MSe1 or MSe2** Fog generator, insert the AC cable, and then connect it to the internal terminal.

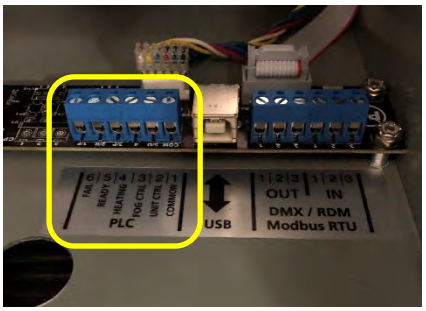
Wiring	VDE	UL
L ⇒	brown	black
N ⇒	blue	white
⏚ ⇒	green/yellow	green



Do not forget to connect the ground to the chassis.

STEP 4: Connect the Digital PLC (if required)

Connect the data wiring to the terminal. The voltage range is between 5 to 30 VDC, with an automatic detection of the common (negative or positive).



Digital PLC:	Pin 1:	Common
	Pin 2:	Unit ON signal
	Pin 3:	Fog ON signal
	Pin 4:	Heating status
	Pin 5:	Ready status
	Pin 6:	Fail status

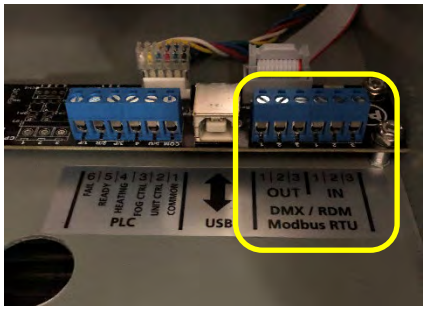
STEP 5: Connect the Modbus cable (if required)

MDG Products are using Modbus RTU protocol over RS-485 in 2 wire transmission mode (half-duplex). In this mode, TXD+ and RXD+, on the Master device, are wired together to TXD+ and RXD+ on the Slave device(s). TXD- and RXD- on the Master device are wired together to TXD- and RXD- on the Slave device(s).

Only one pair of cable connects the Master device to the Slave device(s).

Connect the data wiring to the terminal.

Modbus:	Pin 1 (In/Out):	Shield
	Pin 2 (In/Out):	Signal (-)
	Pin 3 (In/Out):	Signal (+)



STEP 6: Connect the Fluid Line

Connect the fluid line to the fluid input.

Fill the external reservoir and connect the reservoir as described in its ***User Guide***.

STEP 7: Connect the Gas Line

Connect the gas line to the gas input.

Open the gas bottle and set the pressure to 50 psi (3.5 bar, or 350 kPa).

STEP 8: Connect Power

WARNING

RISK OF ELECTRIC SHOCK

Ensure that the power is disconnected before working on A/C

Make sure that the circuit is connected to a breaker of proper capacity.

Connect the power cord 100-250 VAC, 50-60 Hz,1480 W max.

Working with the Fog Generator

The MDG ***MSe1 or MSe2 Fog Generator*** is quite easy to operate and requires no preventive maintenance.

Switch On the power.

The MDG Fog generator will display, on the LCD, during four (4) seconds, the following message:

MDG Fog Generators
BooLoader
Testing ….

These four seconds allow you to connect the generator to your PC, via a USB cable, to update the firmware of the control board (*see BootLoader* for further details).

Then, the MDG Fog Generator will display during one (1) second, the following message:

MSe1 (or MSe2)
by
MDG Fog Generators
(V: x.xx – F: y.yyy)

where 'x.xx' is the version of your generator, and 'y.yyy' is the firmware of the program.

The program will load the configuration parameters saved in the EEPROM memory.

Finally, the screen will display the menu.

The Keyboard

The user can scroll in the menu by using the buttons of the keyboard:

'**Down**' moves the selection to the next menu or decrease a data value.

- When at the end of a list, the program moves back to the first item of this list.
- If the selected menu is a **data input menu**, keeping this key pressed will decrease the value more rapidly.
- In a **data input menu**, when the value reaches its minimum value, the program continues with the maximum value.

'**Up**' moves the selection to the previous menu or increases a data value.

- If the item is the first of a menu, the program moves the selection to the last item of that menu.
- If the selected menu is a **data input menu**, keeping this key pressed will increase the value more rapidly.
- In a **data input menu**, when the value reaches its maximum value, the program continues with the minimum value.

'**Mode**' moves the last selection to the upper level

- This key has no effect in the first level.
- In a **data input menu**, pressing this key allows to exit the menu without changing any value (escape).

'**Enter**' confirms a selection or data value.

- This key selects an item and allows the user to modify it.
- In a **toggle menu**, this key confirms the selection and moves the cursor back to the upper level menu.
- In a **data input menu**, this key confirms the value of the data and moves the cursor back to the upper level menu.

LCD Saver

The program can automatically switch off the LCD screen (menu display and backlight) if there is no keyboard activity. The user can choose between a 30 second and a 2 minutes delay in the **Settings Menu** (« SETTINGS ▸ LCD SAVER »).

When the LCD Saver is activated, just press any key of the keyboard to re-activate the LCD screen functions.

The user can also deactivate the LCD saver by selecting the OFF option.

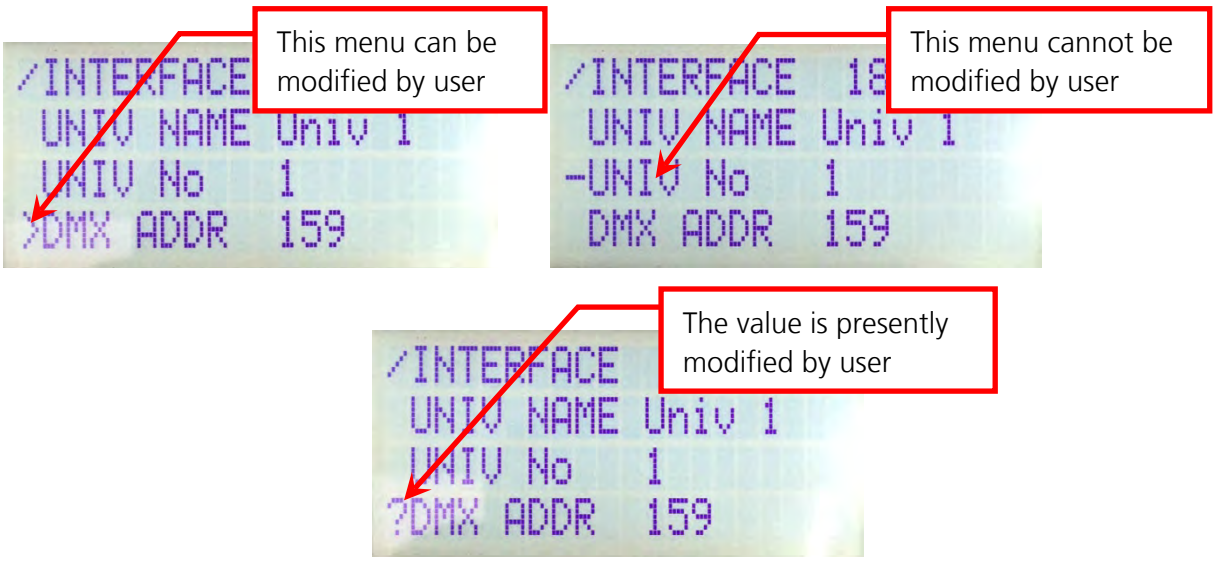
Menu Tree

The menu is divided in four (4) main menus:

- **Status Menu** summarizes all the state of the fog generator. None of its sub menus can be modified.
- **Control Menu** allows the user to control locally the MDG MSe1 or MSe2. All its sub menus can be set, as long as the generator is not in Modbus or PLC mode.
- **Interface Menu** allows the user to define or verify the communication via **Modbus RTU**.
- **Settings Menu** summarizes general configuration of the generator.

The menu is refreshed every second.

- Items preceded by the « - » character are state messages or parameters, updated by the program. The user cannot modify them.
- Items preceded by the « > » character are control parameters.
- The user, within specific ranges or choices, can **MODIFY** them. In user input mode, the value or the choice is preceded with the « **?** » character.



The tree menu architecture is explained below. Items highlighted in blue are state menu (-), and those highlighted in yellow are control menu (>).

STATUS		*Status menu*
STATE	----	*Status **State***
	UNIT OFF	*- the generator is **off***
	xx% HEAT	*- the generator is **heating**, but not ready*
	PURGE	*- the generator is **purging** the heating module*
	READY	*- the generator is generator is **ready** to produce fog*
	FOG ON	*- the generator is producing **Fog***
	FAIL	*- the generator is off, due to a **failure** (see diagnostic)*
ERROR	----	***Error** message when **State = FAIL** (see diagnostic)*
TEMP.	----	***Temperature** status (heating module)*
	TOO LOW	*- temperature **too low***
	OK	*- temperature within specifications (**ready**)*
	TOO HIGH	*- temperature **too high***
PRESSURE	xx.x	*Current **pressure***
PCB TEMP	----	***Temperature** of the board (see Units)*
RUN TIME	xx.x	*Total Run Time in decimal hours*
FOG TIME	xx.x	*Total Fog Time in decimal hours*
LAST ERR	yyyyy	*Code for the Last five (5) errors* *See **Fail State** paragraph*
CONTROL		*Control menu*
UNIT	----	***Unit** toggle*
	OFF	*- the generator is **off***
	ON	*- the generator is **on***
FOG	----	***Fog** toggle*
	OFF	*- the fog is **off***
	ON	*- the fog is **on***

INTERFACE		*Modbus Menu*
COMM.	----	***Communication** toggle*
	LOCAL	*- the generator is controlled by the **keyboard ONLY***
	MODBUS	*- the generator is controlled by **MODBUS ONLY***
	PLC	*- the generator is controlled by **PLC (In/Out) ONLY***
BROADCAST	----	***Broadcast** toggle*
	YES	*- the generator **accepts** Broadcast commands*
	NO	*- the generator **rejects** Broadcast commands*
SLAVE ADD	yyy	***Slave Address** (1 to 247)*
BAUD RATE	----	***Baud rate** toggle**,** from 1,200 to 230,400 baud*
PARITY	----	***Parity** toggle*
	NONE	*- None parity, 2 Stop Bits*
	ODD	*- Odd parity, 1 Stop Bit*
	EVEN	*- Even parity, 1 Stop Bit*
SERIAL NO	yyyyyy	MDG ***Serial Number***
SETTINGS		*Settings menu*
UNITS	----	***Units** toggle*
	PSI/°C	*- pressure in **psi**, temperature in **Celsius***
	kPA/°C	*- pressure in **kPa**, temperature in **Celsius***
	BAR/°C	*- pressure in **bar**, temperature in **Celsius***
	PSI/°F	*- pressure in **psi**, temperature in **Fahrenheit***
LCD SAVER	----	***LCD Saver Mode***
	30 s	*- LCD saver is activated after 30 s*
	2 mn	*- LCD saver is activated after 2 min*
	OFF	*- LCD Saver is Off*
VERSION	x.xx	***Model Version***
FIRMWARE	x.xx	***Program Firmware***

Operating instructions

The MDG ***MSe1 or MSe2 Fog Generator*** can be controlled either locally, with the keyboard, via Modbus (see ***Modbus Control*** paragraph) or via Digital PLC (see ***Digital PLC Control*** paragraph).

This paragraph focuses on **LOCAL control**.

Starting Procedures

When powering up the generator, the control program configures the Input/Output, and loads the configuration parameters saved in the EEPROM memory.

At this point, the MDG ***MSe1 or MSe2*** switches to stand-by mode, and most of the electronic controls are off.

When the generator is manually switched to **«UNIT ON»** mode («CONTROL ▸ UNIT ▸ ON»), the program starts the heating cycle («STATUS ▸ STATE = % HEAT»), which will last approximately 7 to 8 minutes.

When the temperature reaches READY level («STATUS ▸ STATE = READY»), the Automatic Purging System™ (APS™) will be initiated («STATUS ▸ STATE = PURGING»).

After the first purging cycle is completed (approx. time 30 sec.) the generator is ready to produce fog.

Fog Production

When the generator is manually switched to **«FOG ON»** mode («CONTROL ▸ FOG ▸ ON»), the ***MSe1 or MSe2*** will start producing fog.

The MDG ***MSe1 or MSe2*** will produce fog as long as the control parameters are within specifications, and the fog fluid reservoir filled.

If a critical problem occurs, the program shuts down automatically the fog generator, and displays an error message in the **State Menu** (see *Fail State*) and the LCD will flash.

When the generator is manually switched to **«FOG OFF»** mode («CONTROL ▸ FOG ▸ OFF»), the **MSe1** ***or MSe2*** will stop producing fog and initiate the automatic purging cycle.

WARNING

Never power off a generator while it is producing fog *– See the shut down procedure.*

Shut down procedure

Never shut down the MDG ***MSe1 or MSe2*** while making Fog.

Power off the generator observing the following sequence:

- **Turn off** the fog emission,
- Wait 30 seconds for the **APS™** cycle to complete,
- Switch the generator **«UNIT OFF»** mode («CONTROL ▸ UNIT ▸ OFF»),
- Power off the MDG ***MSe1 or MSe2*****,** by switching off the "MAIN POWER SWITCH".

Switching directly the generator in **«UNIT OFF»** mode via Modbus Protocol or via PLC will yield the same result as above. Wait for all the cycles to complete before powering off the generator.

FAIL State

FAIL state mode is initiated if any critical error occurs.

In this state, the MDG ***MSe1 or MSe2*** is **off,** awaiting an action from the user.

A critical error is always displayed in the **Status Menu** («STATUS ▸ ERROR»), as well as the five (5) last critical errors («STATUS ▸ LAST ERR»),

- **ERROR = HEATER LAST ERR CODE = 6**

  This error will occur if the temperature of the heating module is not increasing with the proper thermal ramp.

  This is generally due to a heater cartridge(s) problem. Shut down the generator and restart it. Check the heating process with the value of the Status («STATUS ▸ STATE ▸ xx% HEAT»). If the percent is not increasing, the heater cartridges have failed.

- **ERROR = P. LOW LAST ERR CODE = 7**

  This error will occur if the generator is unable to reach the operating pressure within a fixed time interval.

  This may be due to a leaking gas line (between the gas bottle and the generator), a closed or empty gas bottle, the set pressure of the regulator below 50 psi (3.5 bar, or 350 kPa), a ball valve closed on the gas line or a problem with the pressure transducer.

  With CO_2 bottle, check your regulator is not frozen.

- **ERROR = P. HIGH LAST ERR CODE = 8**

  This error will occur if the pressure is too high.

  This may be due to a solenoid valve malfunction (electronic or physical blockage), a regulator problem, a problem with the pressure transducer, the heating module partially clogged or the use of cryogenic (liquid) gas.

- **ERROR = T. HIGH LAST ERR CODE = 4**

  This error will occur if the temperature of the heating module is too high.

  This is generally due to an electronic problem. Shut down the generator and restart it.

- **ERROR = T. SAF LAST ERR CODE = 5**

  This error will occur if abnormal temperature difference between the two sensors of the heating module is detected.

  This is generally due to an electronic or a sensor problem. Shut down the generator and restart it.

- **ERROR = PCB HIGH LAST ERR CODE = D**

  This error will occur when the internal temperature of the generator is too high.

  This may happen if the external temperature is high. You can check the PCB temperature in the status menu («STATUS ▸ PCB TEMP»).

  Move the generator in the shade or to a cooler location. Shut down, wait few minutes, and then restart the generator.

- **ERROR = WD RST LAST ERR CODE = E**

  This error will occur if the watchdog (software safety) resets the generator.

  This is generally due to software error, an interference or chip problem. Shut down the generator and restart it.

Please contact an Authorized Service Center if any problem persists.

Digital PLC Control

The ***MSe1 or MSe2*** Fog Generator can also be controlled via Digital PLC.

In this mode, the **LOCAL control is disabled**, but user can scroll through the menu to check the different status.

The PLC mode uses an isolated interface. The voltage range is between 5 to 30 VDC, with an automatic detection of the common (negative or positive).

The PLC interface uses two (2) digital Input channels:

- UNIT ON = Active High
- FOG ON = Active High

and three (3) digital Outputs channels:

- HEAT ON = Active high
- READY ON = Active high
- FAIL ON = Active high.

The input Channels are ON when the control signal is at a high level («Active High»).

The Output Channels are activated, when the output signal is at a high level («Active High»).

The MDG ***MSe1 or MSe2*** provides a fast way to check the communication mode:

Modbus Control

The MDG ***MSe1 or MSe2*** Fog Generator can be controlled via **Modbus RTU** Protocol, over RS-485 in 2 wire transmission mode (half-duplex).

In this mode, the **LOCAL control is disabled**, but user can scroll through the menu to check the different status.

Modbus is a request-response protocol implemented using a master-slave relationship. In a master-slave relationship, communications are based on two principles:

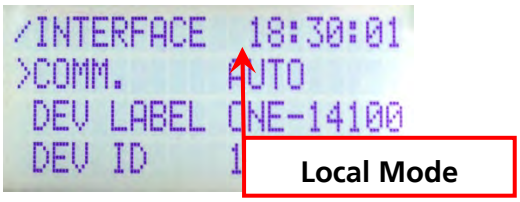
- the master must initiate a request and then wait for a response from a slave,
- the master is responsible for initiating every interaction.

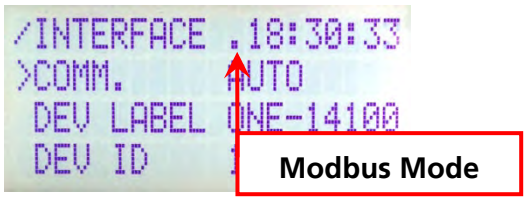
To operate the MDG ***MSe1 or MSe2*** Fog Generator in MODBUS RTU mode:

- You must have a PLC system with a Serial line (RS-485, half-duplex) and a MODBUS RTU protocol interface implemented,
- You need to integrate a flow code in your system to be able to discuss with the MDG ***MSe1 or MSe2***,

  This can be as simple as few buttons and control lights on a console up to a full Web HMI via a phone.
- You must ensure that the following list is fulfilled (*see also the **User Guide** for more details*):
  - Be sure you have uploaded the last MODBUS firmware corresponding to your MDG ***MSe1 or MSe2***,
  - Check the personality to determine the behavior of the product,
  - Connect the RS-485 date line to the signal bus,
  - Set a Unique Address number in the «INTERFACE ▸ SLAVE ADD» Menu,
  - Set the speed of the communication, in the «INTERFACE ▸ BAUD RATE» Menu,
  - Set the parity of the communication, in the «INTERFACE ▸ PARITY» Menu,
  - Switch the Communication mode to MODBUS, in the «INTERFACE ▸ COMM.» Menu.

The MDG ***MSe1 or MSe2*** provides a fast way to check the communication mode:





The MDG ***MSe1 or MSe2*** Fog Generator acts as a MODBUS slave and any transmitted bytes are interpreted according to MODBUS specification (www.modbus.org).

Data is transmitted in packets, so-called frames, with a maximum of 256 bytes in length.

Every packet includes a 16-bit CRC check sum (initial value: 0xFFFF).

Slave address	Function code	Data	CRC (Error Check)	
1 byte	1 byte	0.. 252 bytes	2 bytes	
			CRC low-byte	CRC high-byte

The MDG ***MSe1 or MSe2*** Fog Generator Slave Address can be any number from 1 to 247.

The MDG Fog Generator accepts messages sent to address 0 (broadcast messages) for writing functions, but this function can be disable.

With the exception of broadcast messages, the MDG Fog Generator will always respond to a MODBUS message so the master knows the message was received.

The MDG Fog generator supports the following MODBUS Control commands:

- 0x01 Read Coil Status Register from 000001 to 065535
- 0x05 Force (Write) Single Coil
- 0x0F Force (Write) Multiple Coils
- 0x02 Read Input Status Register from 100001 to 165535
- 0x04 Read Input Registers Register from 300001 to 365535
- 0x03 Read Holding Register Register from 400001 to 465535
- 0x06 Preset (Write) Single Register
- 0x10 Preset (Write) Multiple Registers

All MODBUS request received are checked for validity before execution. With any error, the MDG Product responds with one of the following exceptions:

Code	Name	Meaning
0x01	ILLEGAL FUNCTION	The function code received in the request is not permissible for the register address.
0x02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address.

The Modbus block parameters implemented in the MDG ***MSe1 or MSe2 Fog Generator*** are summarized in the following table:

Data Access	Address	Type	Size	**R**ead **W**rite	Scale	Unit	Description	Command Status
COILS (BIT)	000001	bool	1	R / W	-	-	UNIT Demand	0 = Unit Off, 1 = Unit On
	000002	bool	1	R / W	-	-	FOG Demand	0 = Fog Off, 1 = Fog On
	RESERVED							
	000031	bool	1	R / W	-	-	Broadcast Demand	0 = Accept, 1 = Reject
	000032	bool	1	W	-	-	RESET Demand	1 = Reset
DISCRETE INPUTS (BIT)	100001	bool	1	R	-	-	MODBUS Status	0 = Disable (LOCAL) 1 = Enable
	100002	bool	1	R	-	-	FAIL Status	0 = No Error, 1 = Fail (See also Holding Reg. 400003)
	100003	bool	1	R	-	-	HEATING Status	1 = Heating
	100004	bool	1	R	-	-	READY Status	1 = Ready
	100005	bool	1	R	-	-	FOG Status	1 = Fogging
	RESERVED							
	100009	bool	1	R	-	-	Broadcast Status	1 = Reject broadcast
INPUT REGISTERS (16 BITS)	300001	uint	1	R	-	-	MDG ID Code	ID = 0x4D44 (hex) = 19780 (dec) = 'MD' (char)
	300002	uint	1	R	-	-	Model Number[1]	ID = 0x07 (hex) = 8 (dec)
	300003	uint	1	R	-	-	Post Serial Number[1]	5 digits XXXXX
	300004	uint	1	R	100	-	Version Number	XXX for X.XX
	300005	uint	1	R	1,000	-	Firmware Number	YYYY for Y.YYY
	300006	uint	1	R	-	-	Option	0 = Se1 1 = Se2 2 = MSe1 3 = MSe2
HOLDING REGISTERS (16 BITS)	400001	RESERVED						
	400002	uint	1	R	-	-	Status	0 = Unit Off 1 = Heating 2 = Initial Purge 3 = Ready 4 = Fog 5 = Purge 6 = Vent 7 = Fail
	400003	uint	1	R	-	-	Fault code	0 = 0x00 = No error 4 = 0x04 = Temp. Too High 5 = 0x05 = Temp. Safety 6 = 0x06 = Temp. Timeout 7 = 0x07 = Pressure too Low 8 =0x08 = Pressure too High 13 = 0x0D = PCB Temp too High 14 = 0x0E = WD Timeout
	400004	float	2	R	-	°C	PCB Temperature	Live Temperature of the board
	400006	float	2	R	-	psi	Pressure	Live pressure
	400008	uint	1	R	-	%	HM Temperature	Normalized temperature of the Heating module

Table 1: Modbus Parameters.

[1] Serial Number: Model(with Option)-XXXXX, example: Se1-18154

Bootloader

The MDG ***MSe1 or MSe2*** Fog Generator uses a BootLoader, also called boot manager. This program is a firmware (software embedded in a hardware device) located into the non-volatile memory of the microcontroller unit (MCU) that allows in-circuit reprogramming of the device using its USB communication port.

To upgrade the firmware, you will need:

- a computer running under Windows, with a USB 2.0 connector
- special driver for the USB, included in the package,
- a standard USB 2.0 cable, A to B Male/Male type

Contact the **MDG Fog Generators Ltd** Service to have the last package firmware upgrade for your MDG ***MSe1 or MSe2***.

Fog Fluid

Operate **the *MSe1 or MSe2 Fog generator*** only with the **MDG Neutral Fog Fluid**.

Make sure that no other liquids or particles are mixed or added to the **MDG Fog Fluid**.

The **MDG Neutral Fog Fluid** produces a pure, white, non-toxic fog.

MDG Neutral Fog Fluid is available at authorized MDG distributors or dealers.

Available in 4 L (1 US gallon), 5 L (Europe Only), 20 L (5.3 US gallon), 200 L (53 US gallon) and 1000 L (264 US gallon).

Filling the Fluid Reservoir

WARNING

Use only **MDG Neutral Fog Fluid**. Not doing so will void the warranty and may damage the generator.

CAUTION

To fill the fluid reservoir, the following sequence must be observed:

- Make sure that no fog generators are producing fog. If so, turn off the fog and wait 1 minute for the APS™ to complete its cycle.
- Depressurize the fluid reservoir by turning off the pressure switch. Wait 2 minutes for complete depressurization of the fluid reservoir.
- Now, unscrew the brass closure located on top of the fluid reservoir and slowly pour the **MDG Neutral™ Fog** Fluid until it reaches the inside bottom of the opening.
- Avoid overfilling.
- Screw back the brass closure and make sure it is hand tight.
- Turn on the pressure switch to re-pressurize the fluid reservoir. Wait 2 minutes for complete pressurization of the fluid reservoir.

Troubleshooting

Contact MDG if symptoms are not listed, or if the provided solutions fail to resolve the issue.

Table 2: Symptoms and Solutions

Symptoms	Probable Causes and Suggested Actions
The fog generator does not switch on	• Verify that AC power cord is properly connected on both ends. • Check the fuse or the breakers of your VAC entry. The wattage of the generator is around 1415 W (1100 – 1480 W). • Check the fuse inside the fog generator. • Verify the AC voltage on the power cord. 100~250 VAC.

The generator does not produce fog	• Verify that the Unit is ON
	«CONTROL ▸ UNIT ▸ ON»
	• Verify that the UNIT is READY
	«STATUS ▸ STATE = READY»
	The generator requires approximately seven to eight (7 to 8) minutes to be ready. While the heating module is warming up, the % HEAT must vary.
	• Verify that the Unit is not in a FAIL state
	«STATUS ▸ STATE = FAIL»
	If so, check the symptoms below
	• Verify the communication mode
	«INTERFACE ▸ MODE»
	You cannot control the generator locally if you are in Modbus or PLC mode, and vice-versa.
	• If you are in PLC mode
	  • Verify the cables
	  • Verify your PLC system

	…/…

Symptoms	Probable Causes and Suggested Actions

	• If you are in Modbus mode:
	  • Verify the cable
	  • Verify the Modbus Slave address and the patch
	  • Verify Baudrate, and parity

« STATE = FAIL»
VERIFY THE ERROR MESSAGES
	• ERROR = P. LOW
	  • Open the gas bottle
	  • Verify the set pressure on the regulator (50 psi, 3.4 bar or 340 kPa)
	  • Verify the regulator is not frozen
	  • Verify the gas line
	  • Verify the reading of the pressure transducer «STATUS ▸ PRESSURE» when producing fog.
	• ERROR = P. HIGH
	  • Verify the set pressure on the regulator (50 psi, 3.4 bar or 340 kPa)
	  • Verify the reading of the pressure transducer «STATUS ▸ PRESSURE»
	  • You may have a solenoid valve malfunction. Restart the generator.
	  • Verify you are not using liquid CO_2
	• ERROR = HEATER
	  • This is a heating timeout, due to a cartridge heater problem.
	  • Restart the generator and check the heating status «STATUS ▸ STATE = xx% HEAT». If the heating value is not progressing, there may be various issues.
	  • Check the Diode LED on the heater board. LED V1, V3 and V4 should be lighted when UNIT= ON before error happens.
	  • Disconnect the heater cartridge and check the resistance. You should have around 20 Ω.

	…/…

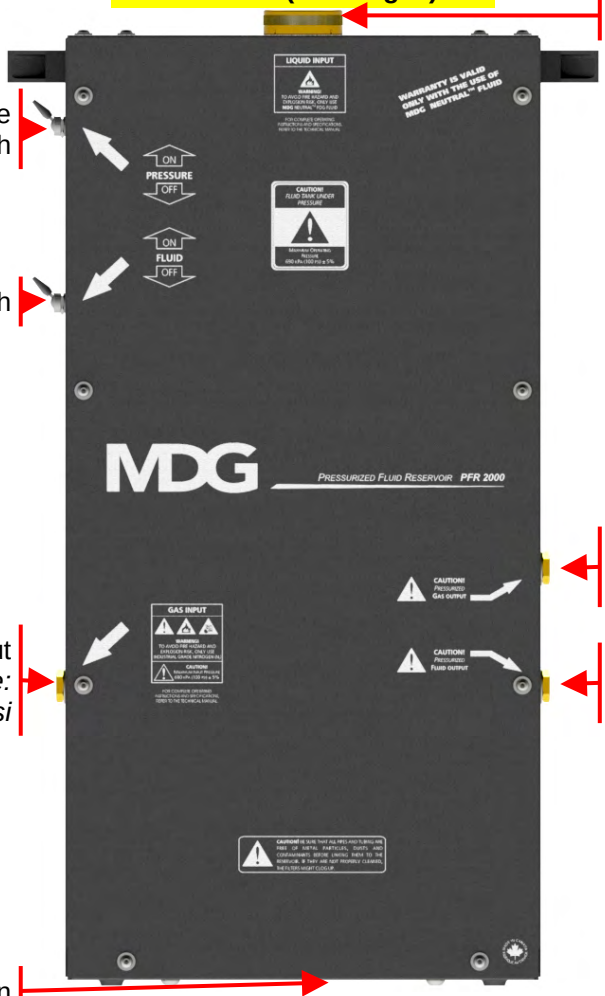
Symptoms	Probable Causes and Suggested Actions

	• ERROR = T. HIGH
	  • Restart the generator. This is generally due to an electronic problem.
	• ERROR = T. SAF
	  • Restart the generator. This is generally due to an electronic or sensor problem.
	• ERROR = PCB HIGH
	  • Check the temperature («STATUS ▸ PCB TEMP»
	  • Stop the generator for a few minutes, if it is possible
	  • Try to change the position of the generator to a cooler location.
	• ERROR = WD RESET
	  • Restart the generator.

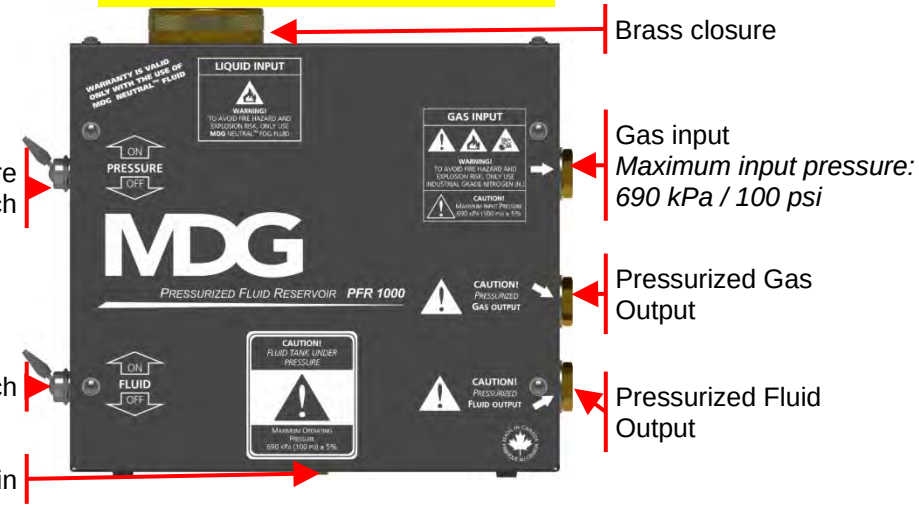
LCD displays strange letters or does not seem to work normally	In some conditions (Radio transmission or static discharges), the LCD may lose its settings. The generator is still working, but the LCD displays strange or no characters: • Wait 30 seconds without touching any key, until the LCD saver starts • Press any key If the menu does not reappear, unplug USB and Modbus, and then restart the generator.

External Fluid Reservoir

25 Litres (6.6 US gal.)



6,5 Litres (1.66 US gal.)

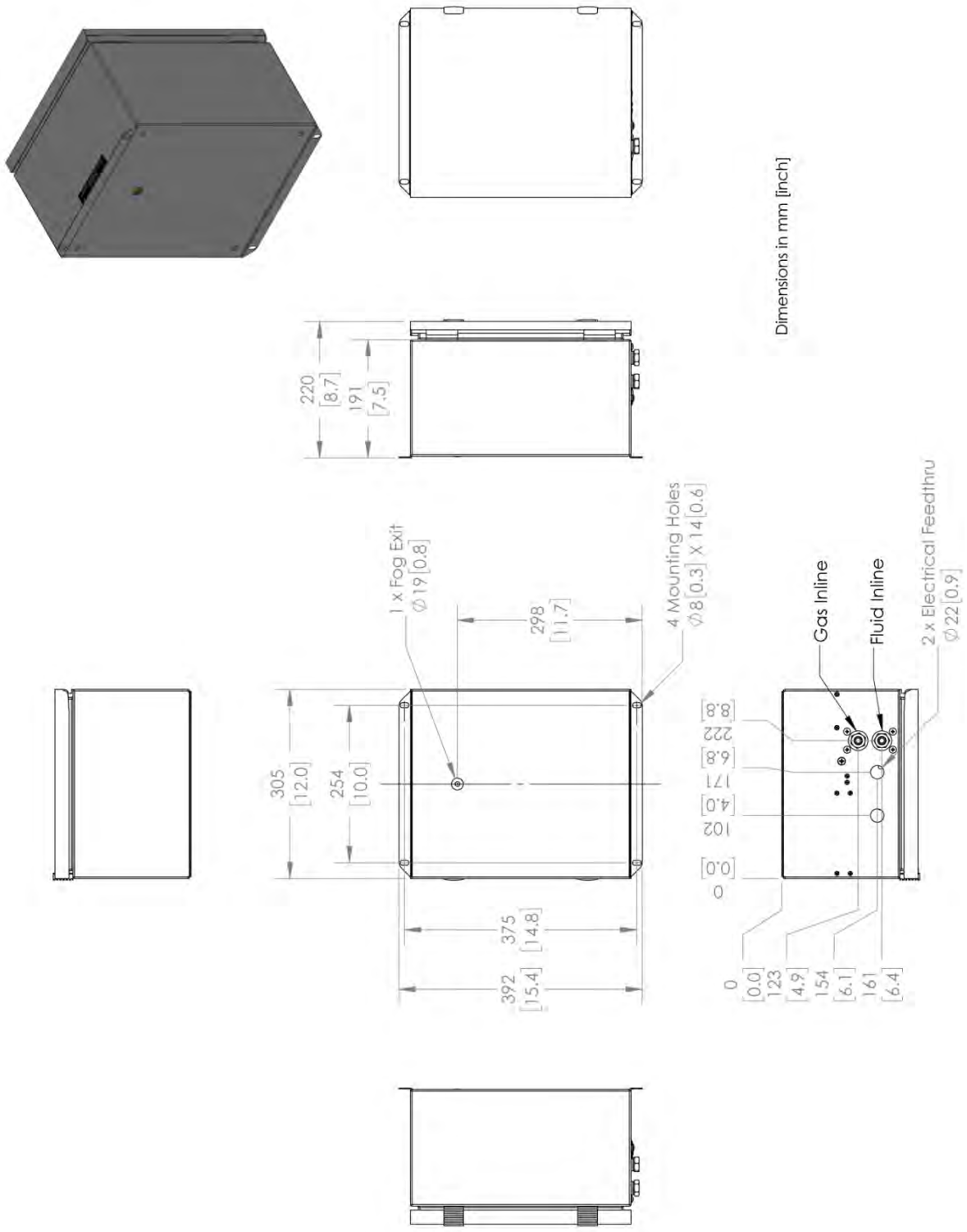


Technical specifications

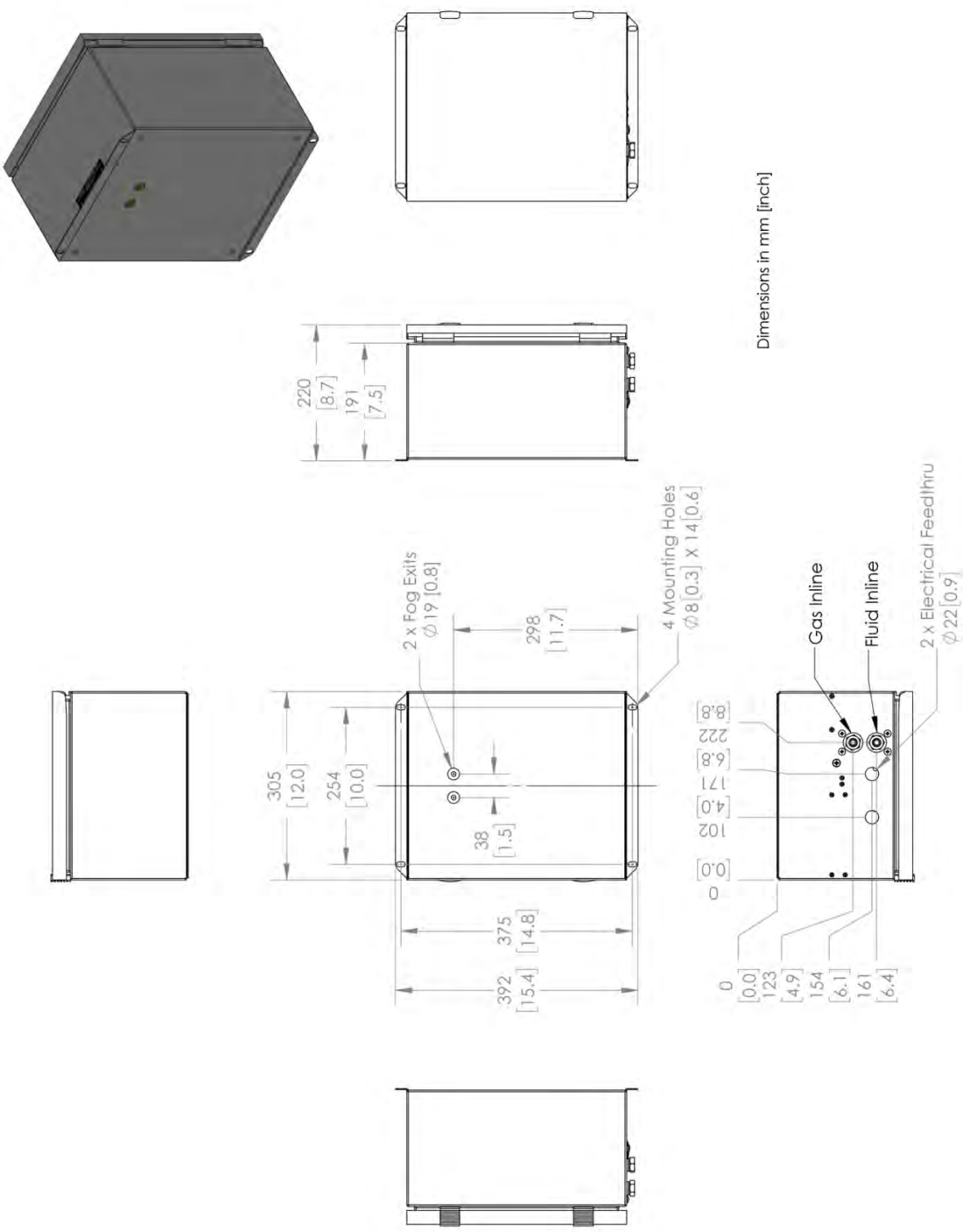
Series	Industrial Series
Maximum fog output (per minute):	MSe1: 85 m^3 (3,000 ft^3) MSe2: 170 m^3 (6,000 ft^3)
Fog colour:	Pure white
Particle size:	0.5 to 0.7 microns
Fluid consumption:	MSe1: 1.2 L (0.31 US gal.) per hour at 345 kPa / 50 psi MSe2: 2.4 L (0.62 US gal.) per hour at 345 kPa / 50 psi
Fluid type:	MDG **Neutral™** Fog Fluid ONLY SDS available on request
Gas type:	Industrial Grade CO_2 or N_2
Gas pressure input:	350 kPa / 50 psi max
Gas consumption:	MSe1: 0.97 kg (2.13 lb) per hour at 345 kPa / 50 psi MSe2: 1.94 kg (4.26 lb) per hour at 345 kPa / 50 psi
Automatic Purging System™:	Standard feature
Warm-up time:	8 minutes
Operating voltage:	100-250 VAC, 50/60Hz, 1 phase Ground / Earth connection **REQUIRED**
Power consumption:	1415 W nominal, 1100 – 1480 W
Control signal:	Manual (4 buttons keyboard + LCD) USB (diagnostic & Bootload) DMX / RDM Protocol MODBUS RTU Protocol (Half duplex) PLC (Isolated 5-30 VDC, Common Negative/Positive)
Operating temperature:	0 °C to 50 °C (32 °F to 122 °F)
Operating humidity:	90 % relative humidity @ 50 °C (122 °F), non-condensing
Storage temperature:	-40 °C (-40 ° F) to 60 °C (140 ° F)
Storage humidity:	80% relative humidity @ 60 °C (140 °F)
Approval	CE, CSA and UL pending
Dimensions	22,9 cm (9”) L x 30,5 cm (12”) W x 35,6 cm (14”) H
Weight:	13.1 kg (28.8 lb)
Shipping Dimensions:	30,5 cm (12”) L x 40,6 cm (16”) W x 73,6 cm (29”) H
Shipping Weight:	22.5 kg (49 lb)

Dimensions

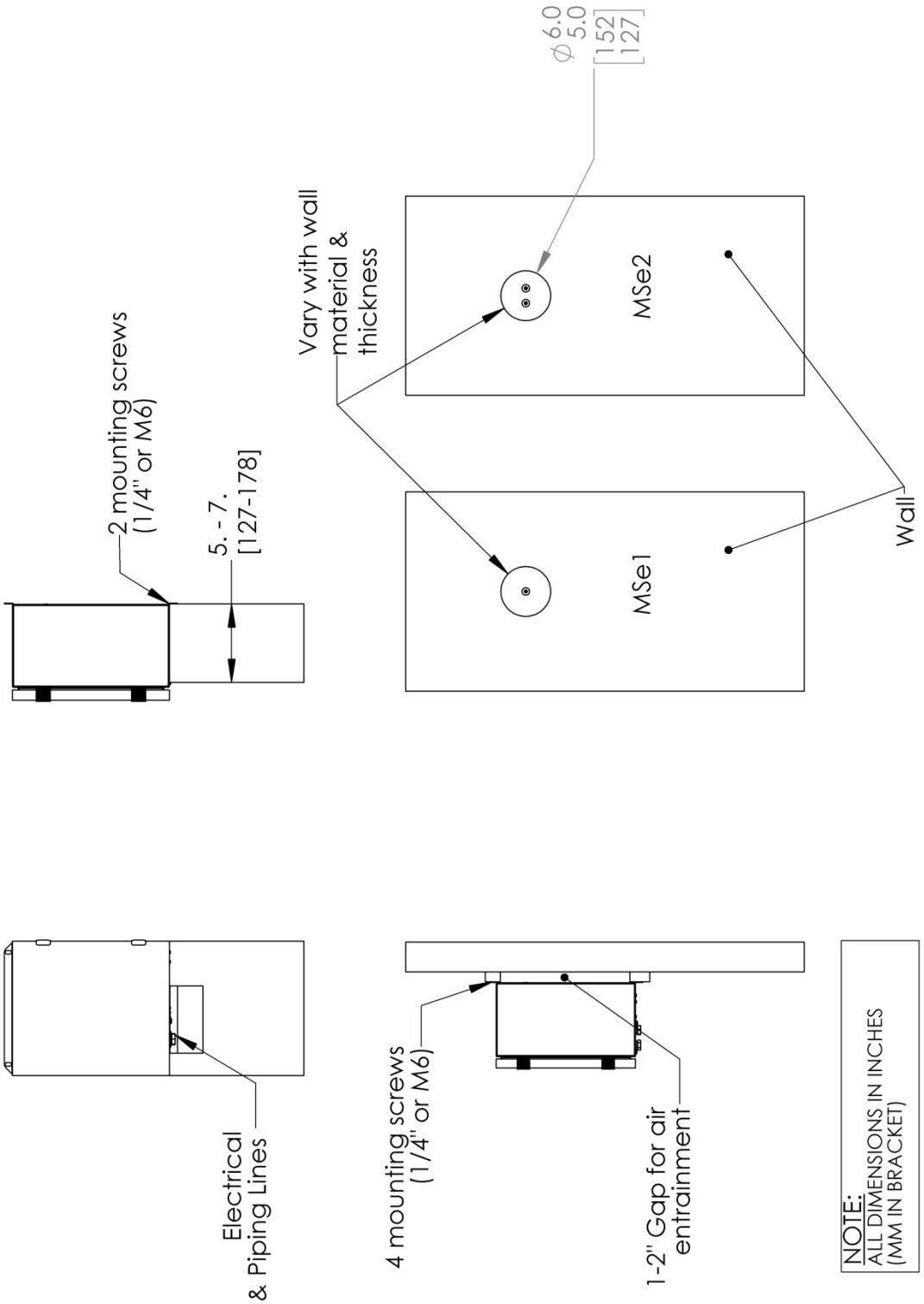
MDG MSe1



MDG MSe2


Dimensions in mm [inch]
220 [8.7]
191 [7.5]
2 x Fog Exits Ø19 [0.8]
298 [11.7]
4 Mounting Holes Ø8 [0.3] x 14 [0.6]
Gas Inline
Fluid Inline
2 x Electrical Feedthru Ø22 [0.9]
305 [12.0]
254 [10.0]
38 [1.5]
375 [14.8]
392 [15.4]
0 [0.0]
102 [4.0]
171 [6.8]
222 [8.8]
0 [0.0]
123 [4.9]
154 [6.1]
161 [6.4]

Installation



Warranty

When installed and operated as recommended, **MDG Fog Generators Ltd** guarantees that this product will remain free of defects in parts and labour for a period of two (2) years from the moment it is delivered. This warranty does not apply if the product has been modified without our written authorization, or repaired without a written authorization from MDG or one of its authorized service centres, or if it is used under conditions for which it has not been designed, or if any other fluid than the **MDG Neutral Fog Fluid** has been used. **MDG Fog Generators Ltd** is not responsible for any damages resulting from a faulty installation or from abusive use of the product.

If any device is found unsatisfactory under the terms of this warranty, **MDG Fog Generators Ltd** will repair or replace it free of all charges, except transportation costs.

This warranty applies only to the product itself and **MDG Fog Generators Ltd** declines responsibility for any losses, costs, or damages resulting from its use.

MDG Fog Generators Ltd shall not be liable for consequential damage in case of any failure to meet the conditions of any warranty or shipping schedule, nor will claims for labour, loss of profits, repairs, or other expenses incidental to replacement be allowed.

The repair or replacement of the product, by **MDG Fog Generators Ltd** shall constitute fulfilment of all obligations to the purchaser.

No other guarantees or warranties, expressed or implied, are made by **MDG Fog Generators Ltd** in connection with its products. This warranty is non-transferable and applies to the original purchaser only.

To obtain satisfaction under the terms of this warranty, contact your local sales office, and we will be pleased to help you.

Declaration of conformity

CE

EC DECLARATION OF CONFORMITY

According to IEC/ISO 17050

We, **MDG Fog Generators Ltd**
10301 ave Pelletier
Montreal, QC, Canada, H1H 3R2

declare under our sole responsibility, that the product including options or accessories

Fog Generators models: Me1, Me2, Me4 and Me8,
MAX 3000 APS, MAX 5000 APS and MAX 5000 APS H.O.
ATMe, ATMOSPHERE APS and ATMOSPHERE APS H.O.
ICE FOG Q and ICE FOG Compack
MM, MINI SINGLE, SINGLE and DUAL

to which this declaration relates, is in conformity with the following standards:

IEC 60335-1: 2001 (Fourth Edition) incl. Corr.1:2002 + A1:2004 + A2:2006
Household and similar electrical appliances – Safety/Part 1, September 2006
CISPR 22:2008-09/EN 55022, Class B
IEC 61000-6-1:2005/EN61000-6-1:2007, (EMC)-Part 6-1
FCC PART 15, Subpart B, class B

By conformance with the standards referenced, the product follows the provisions of the directives listed below:

2006/95/EC Low Voltage Directive
2004/108/EC EMC Directive
2011/65/EU RoHS2 Directive

Martin Michaud, President
August 17, 2012
Montreal, Canada

Notes