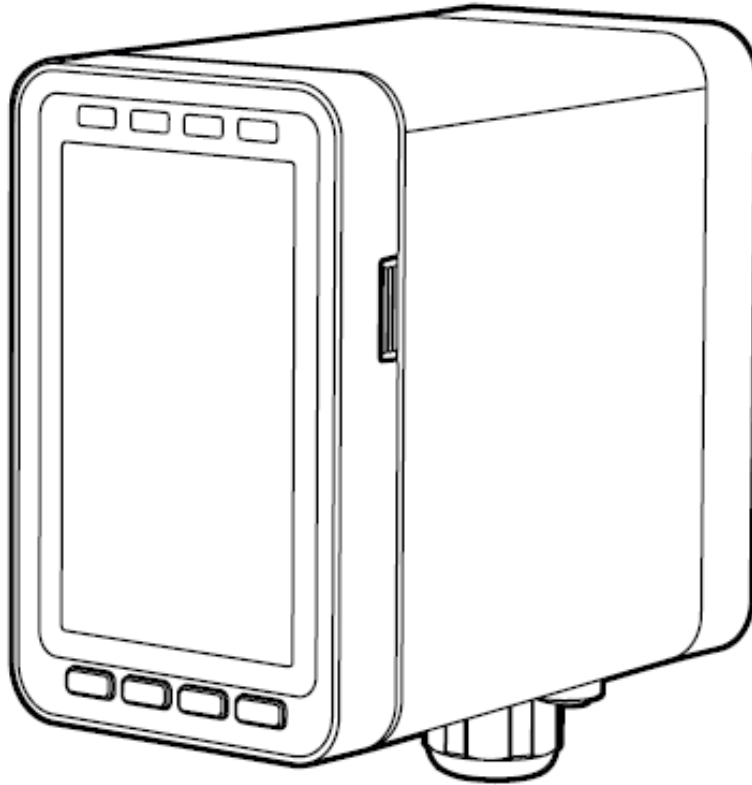


USER MANUAL



MIDAS-M MULTIGAS TRANSMITTER

Fixed Single Point Extracted

Multi Gas Transmitter

Honeywell

3016M5001 Rev A
ECO HAA190080

Table Of Contents

CHAPTER 1 – Introduction	7
About Us	7
Product Description	7
Overview	8
User Interface	9
Default Configuration	10
CHAPTER 2 – Installation	11
Mount the Transmitter Device	11
Mount the Relay Module	15
Sample and Exhausting Tubing Calculations	17
In-Line Filters	18
Local Detector Option	18
Electrical Installation	19
Electrical Connection	23
Wiring The Relay Module	26
Mount The Sensor Cartridge	28
CHAPTER 3 – Device & Web Operations	29
Comissioning	29
Monitoring Mode	30
Review Information	32
Setup Operations	34

Test Mode	36
Calibration Mode	38
Calibration & Bump Test	39
Bump Test	40
Internal Web Server	41
Physical Network Components	41
Internet Settings	41
Running the Web Server	42
CHAPTER 4 – Maintenance	65
System Leak Check	66
CHAPTER 5 – Additional Information	69
EU Directive 2012/19/EU: Waste Electrical and Electronic Equipment (WEEE)	69
Troubleshooting and Fault Diagnosis	70
Specifications	74
Ordering	77
Transmitter	77
Cartridge	77
Smart Sensor	78
Accessories	78
Gas Table	82
Combination Index	84
Reflex	85
A Modbus/TCP Interface	86
Security	99

Modbus TCP	99
DOS attack	99
Install Web Server Certificate in Google Chrome	101
Install Web Server Certificate in MS Browsers	103
Warranty	105
Sensor Cartridge Warranty	106
Contact Us	107

1 Introduction

Learn what you need to know about the Honeywell Midas®-M Gas Detector before operating.

About Us

Honeywell Analytics: the global leader in gas detection

While you build a better world, we're building smarter safety.

For nearly 50 years, Honeywell Analytics has been protecting people who put their lives on the line every day. It takes a special level of drive and dedication to work in hostile environments, and we believe your workers deserve the same kind of commitment from us when it comes to securing their health and safety.

Right from the start, our founders were determined to find better ways to design, build and manufacture reliable gas detection solutions. Through advanced technology and pure industry know-how, Honeywell Analytics continues to improve and evolve our products. Today, we're proud to partner with customers worldwide who share our vision of vigilance and rely on us to help them protect what matters most.

From custom-designed solutions to unmatched training and support, Honeywell Analytics is simply the smartest choice when you demand the best in safety.

Product Description

The Honeywell Midas®-M is a Fixed Extractive Single Point with 4-in-1 Multi Gas Detector that draws a sample locally or from a remote point to a sensor cartridge that is located inside the detector's chassis. A wide range of toxic, flammable and oxygen gas sensor cartridges are available that enable detection of gases used or generated in the Semiconductor and other manufacturing industries.

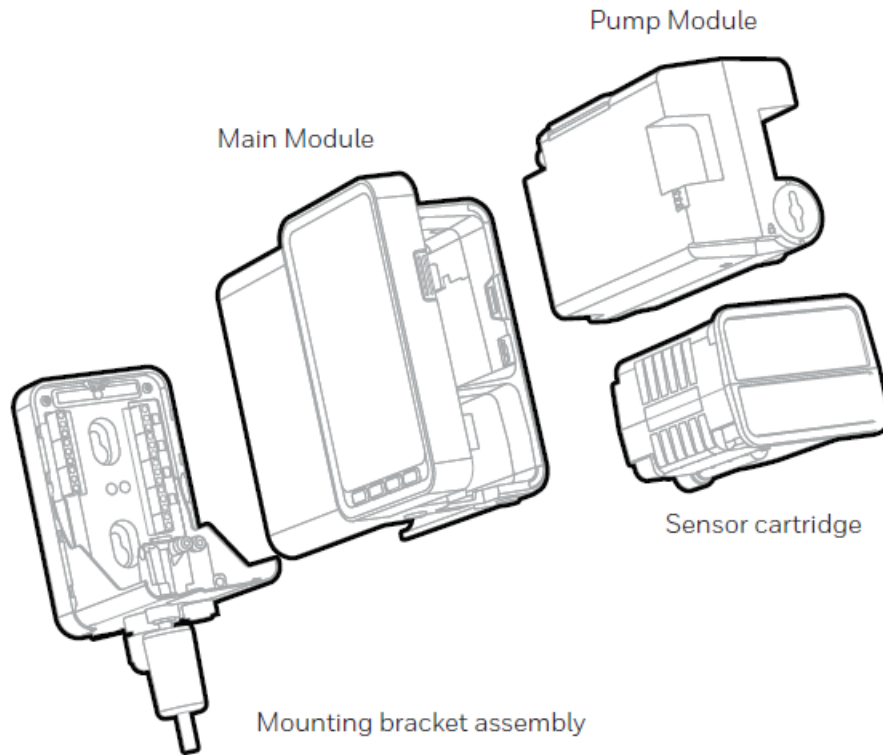
Midas-M is shipped from the factory with the security function disabled. We strongly recommend enabling this function for safe use of the detector. To enable it, select **Set up > Security** and type an 8 character password.

Midas-M is wall mounted and displays gas concentration, alarm, fault and status information via its backlit LCD and LEDs. A simple to use 4-button keypad located under the display provides the facility to set-up, review, operate and make changes to the detector's configuration.

Midas-M has flexible power and communications capabilities built in as standard. These include 3 on board relays, 0-21 mA analog output, Modbus/TCP outputs for signal and service connectivity as well as Power over Ethernet (PoE) connection that enables a single Ethernet connection to be made for all power, control and communication requirements.

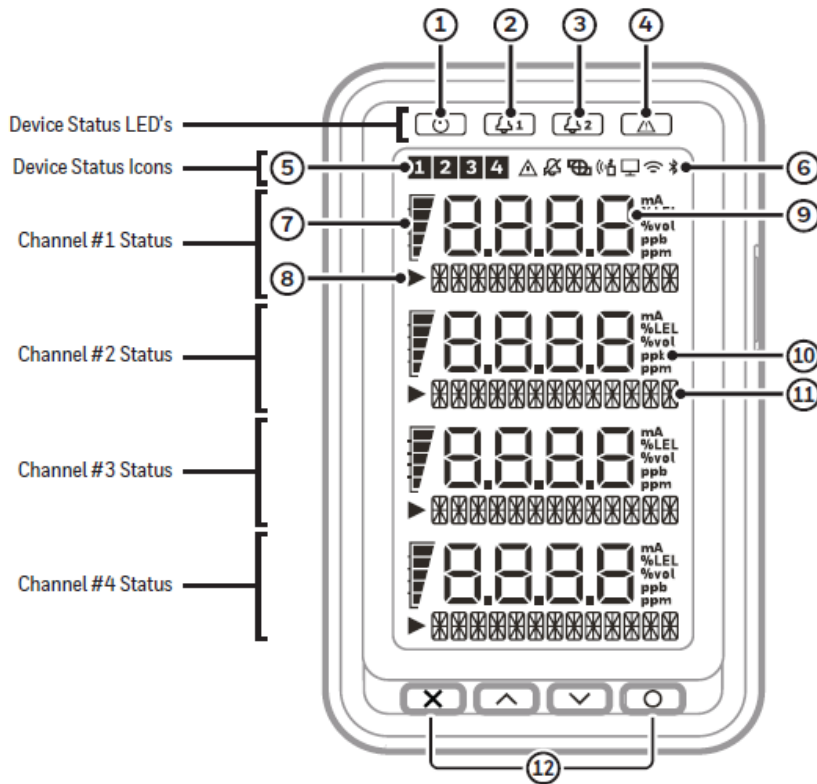
Overview

The Midas-M gas detector comprises of 4 parts: the main module, the mounting bracket assembly, the sensor cartridge and the pump module.



User Interface

Detector's User Interface overview.



- | | |
|---|--|
| ① Power LED | ⑦ Bar graph for gas concentration display |
| ② Alarm 1 LED | ⑧ Entry indicator for menu operation |
| ③ Alarm 2 LED | ⑨ Gas concentration |
| ④ Fault LED | ⑩ Unit |
| ⑤ Selected channel number indicator for menu operation | ⑪ Gas name, menu, fault message |
| ⑥ Device status icons | ⑫ Buttons |
| <div style="display: flex; justify-content: space-between;"> <div> <p>📶 Wireless Connected</p> <p>🔗 Bluetooth Connected</p> <p>🔧 Internal pump running</p> </div> <div> <p>⚠️ Fault</p> <p>🚫 Inhibit</p> <p>🔧 Bump test in progress</p> </div> </div> | <div style="display: flex; flex-direction: column; align-items: center;"> <div>✕ Cancel</div> <div>○ Accept</div> <div>⬆️ Up</div> <div>⬇️ Down</div> </div> |

Default Configuration

The Midas-M gas detector is factory-configured.

NOTE: Oxygen levels are 20.9% v/v in a normal atmosphere, equivalent to 17.3 mA. Use caution when integrating an oxygen Midas-M unit using the 4-20 mA output since fault, inhibit, and no power conditions are below 4 mA and, by default, an oxygen depletion alarm is triggered on a falling alarm (default 19.5% v/v). In that case, Honeywell Analytics recommends one of the following:

- Use Modbus TCP digital communications
- Use discrete relay inputs instead of a 4-20 mA signal to trigger gas alarms
- Program the control system of the 4-20 mA input with logic and a delay (e.g., 1 second) before triggering an alarm to determine if the 4-20 mA output is at one of the 0-4 mA conditions described above.

Contact Honeywell Analytics for further information.

Factory Default Configuration

	Toxic Gas	flammable gas ¹	oxygen
Full Scale (FS)	Typically 4 x Threshold Limit Value (TLV)	100% Lower Explosive Limit (LEL)	25% Volume (v/v)
Alarm 1 (Relay 1)	1/2 TLV	10% LEL	23.5% v/v (Rising)
	Normally de-energized, energizes on alarm.		
Alarm 2 (Relay 2)	TLV	20% LEL	19.5% v/v (Falling)
	Normally de-energized, energizes on alarm.		
Fault (Relay 3)	Normally energizes, de-energized on fault.		
Latching	Latching. Alarm and fault relays DO NOT automatically reset when reading falls below alarm thresholds. Relays MUST be manually reset.		
Passcode	No Passcode set.		
Address	169.254.60.47 subnet mask 255.255.255.0		
Current source with:			
1.0 mA	Fault		
2.0 mA	Inhibit		
3.0 mA	Maintenance Fault		
4.0 to 20.0 mA	Gas reading (normal operation)		
21.0 mA	Over range		
¹ Not yet released			

2 Installation

For ease of installation Midas-M has been designed to allow the installation of the mounting bracket assembly and main module separately from the other parts of the detector. The detector location and hard wiring can therefore be completed before fitting the detector's main module and sensor cartridge.

WARNING

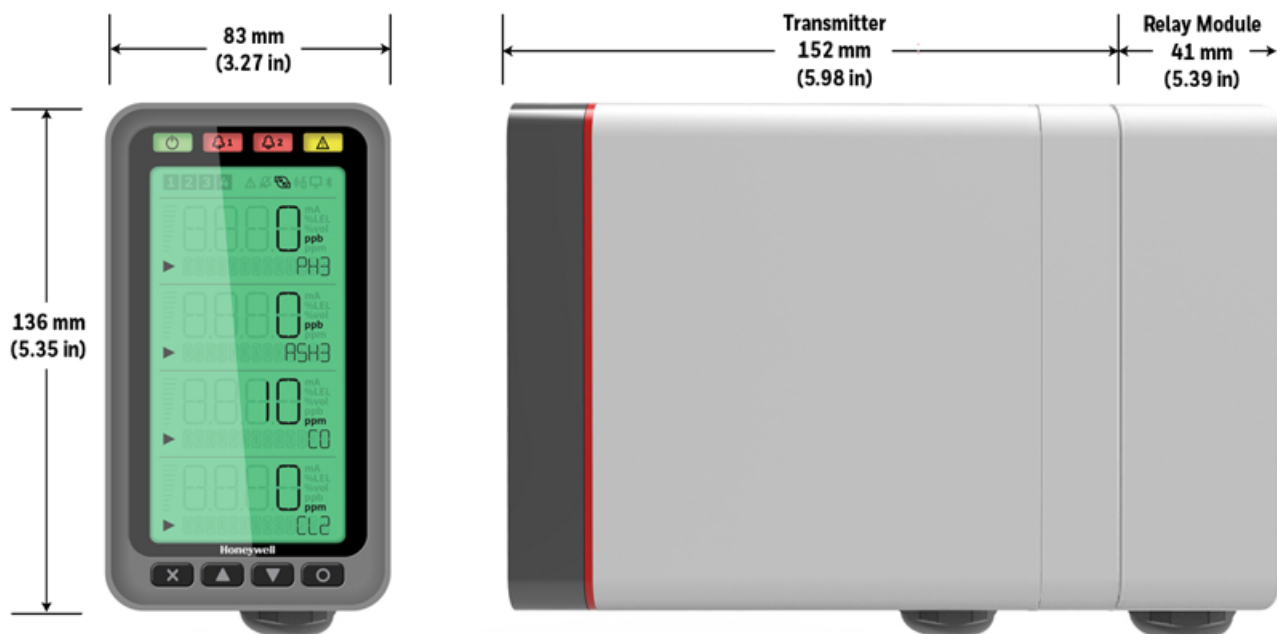
Midas-M is designed for installation and use in indoor safe area non-explosive atmospheres. Installation must be in accordance with the recognized standards of the appropriate authority in the country concerned. Prior to carrying out any installation ensure local regulations and site procedures are followed.

Ensure the connection of all modules (e.g pump, and cartridge module) with the main module. Otherwise, Midas-M can have flow leakage or malfunction.

Mount the Transmitter Device

The Midas-M gas detector has an integral mounting bracket assembly that is easily mounted to a suitable vertical surface such as a wall, tool housing, mounting plate on a pole etc.

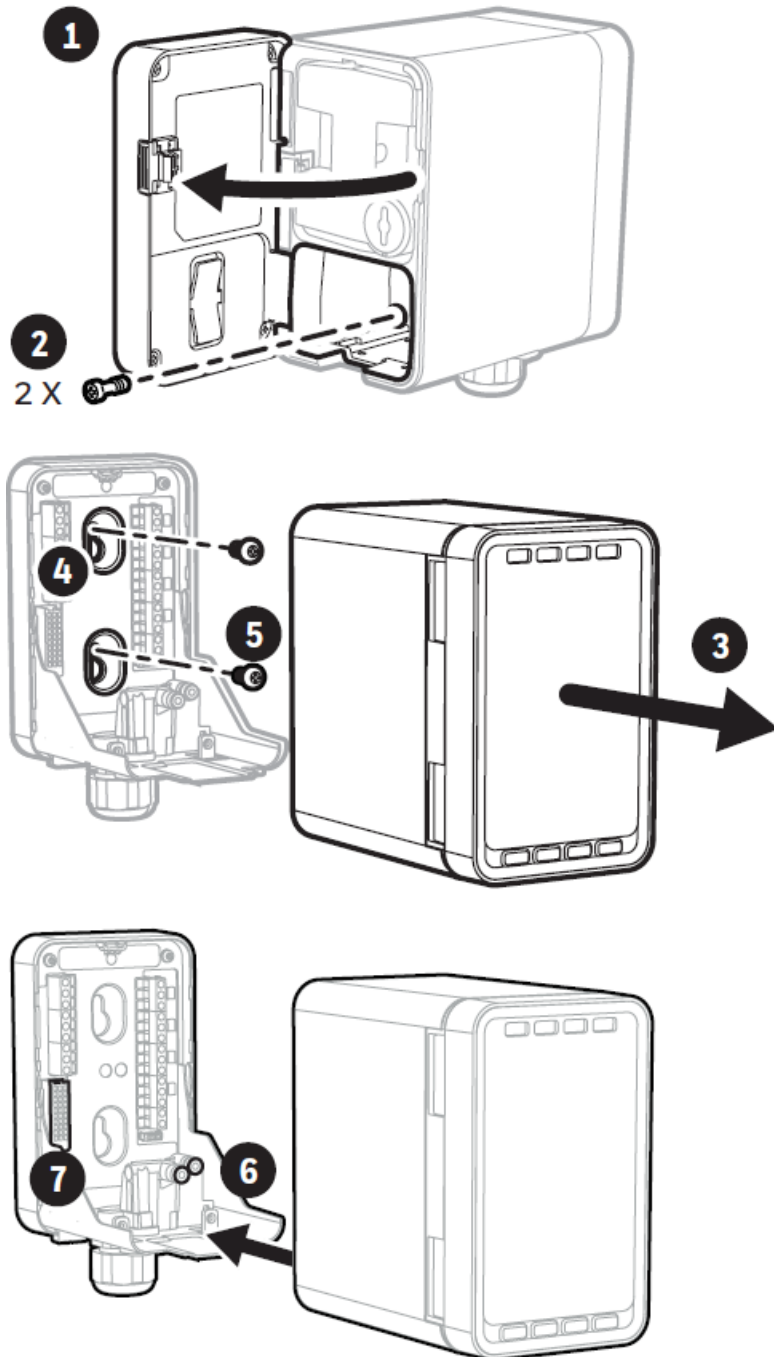
Midas-M outline dimensions

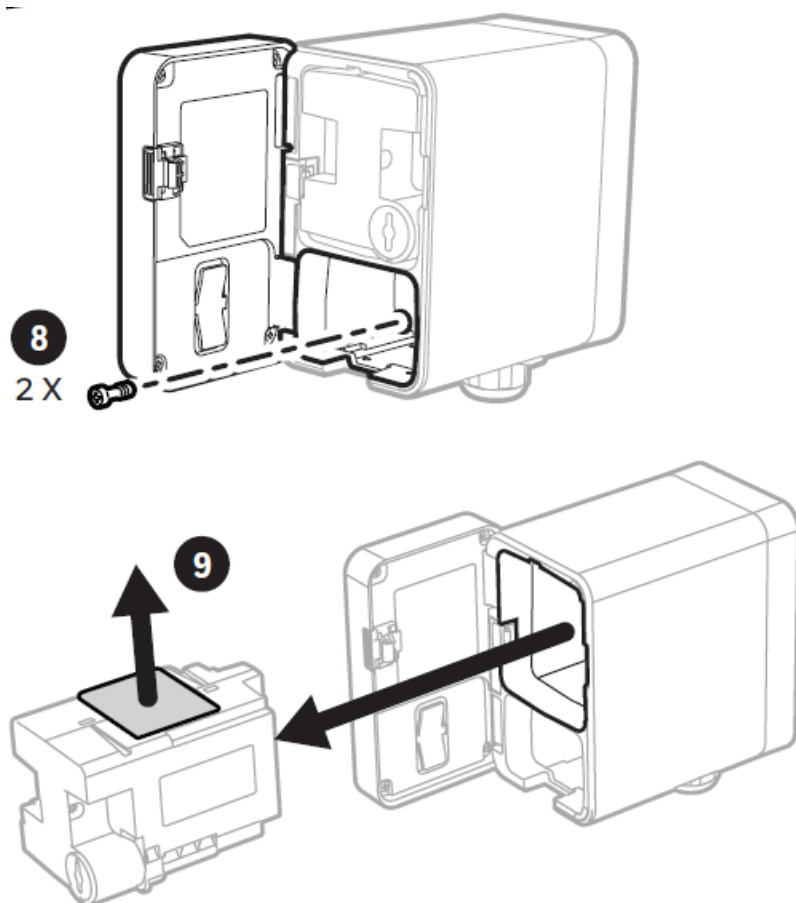


NOTE

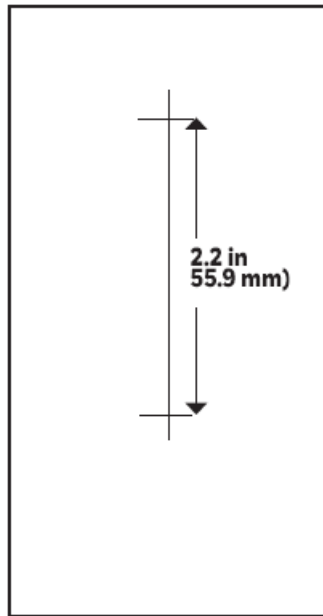
Notice the space required to install the instrument, open the door, push in/pull out modules, and tubing.

Mounting procedure





1. the door.
2. Un-tight the two screws.
3. Carefully pull the main module forward.
4. Drill two holes 2.2 in (55.9 mm) Use 2 x M4 Screws or equivalent for mounting (head size 7-11 mm).



NOTE

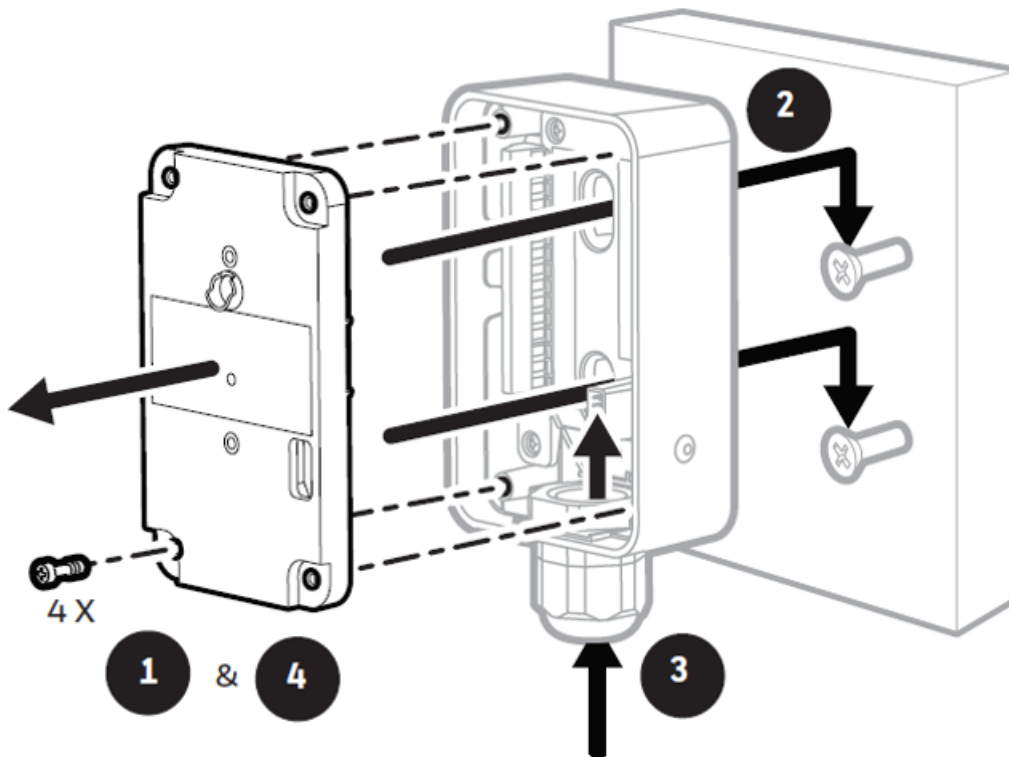
This drill template is not to scale.

5.
 - a. Partially screw the fixings into the mounting surface.
 - b. Place the mounting bracket assembly over the screws, so they pass through the mounting holes and then slide down to locate in the slots.
 - c. Tighten the screws to secure the mounting bracket assembly.
6.
 - a. Align the rounded corner at the lower of the main module with the similar rounded corner at the bottom of the mounting bracket assembly
 - b. Slide the main module backward while pushing the main module up after connecting with a mounting bracket so that the PCB connector and tubes engage simultaneously.
7. Ensure the PCB, connector, and tubes are fully engaged by firmly pushing the main module horizontally backward on the mounting bracket assembly. **DO NOT PUSH ON THE LCD AS THIS MAY DAMAGE IT.**
8.
 - a. Align the two fixing screws located at the bottom of the module with the screw threads on the mounting bracket assembly.
 - b. Tighten the screws to secure the module to the mounting bracket assembly.
9. Remove the internal packing card securing the pump. Failure to remove this packing will result in damage to the Midas-M detector.

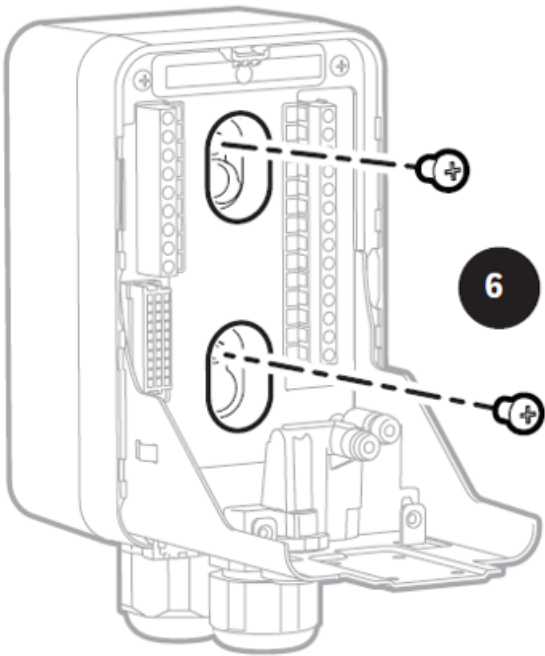
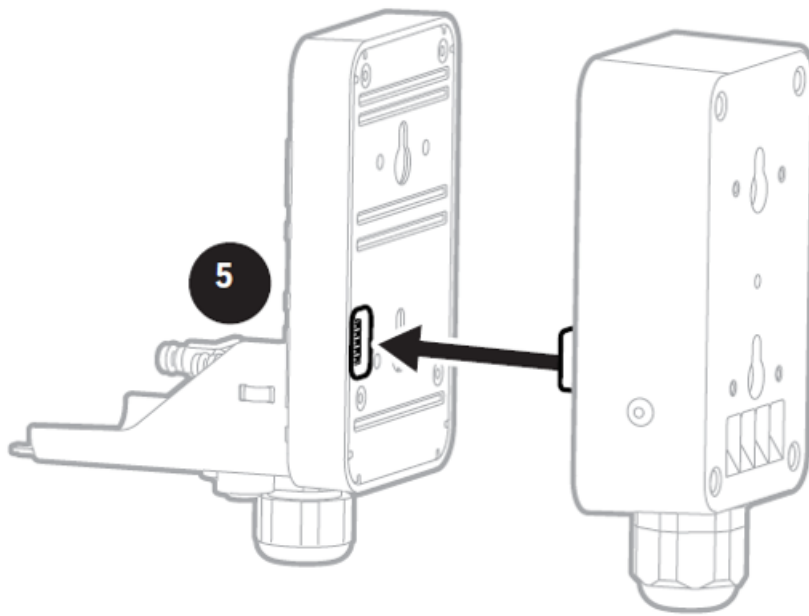
Mount the Relay Module

The Relay Module has an integral mounting bracket assembly that is easily mounted to a suitable vertical surface such as a wall, tool housing, mounting plate on a pole etc.

1. Pull out the four screws and remove the plate cover.
2.
 - a. Partially screw the fixings into the mounting surface.
 - b. Place the Relay module over the screws, so they pass through the holes to locate in the slots.
 - c. Tighten the screws to fix the Relay Module to the surface.
3. Connect the wire through the cable gland to the terminal block.
4. Place the plate cover in position and screw the four screws you removed in Step 1.



5. Push the mounting bracket assembly horizontally and engage the Relay Module connector.
6.
 - a. Align the screw holes and the slot-boundaries, and tight the machine screws (3016D0355) provided in packaging.
 - b. Connect the mounting bracket assembly to the Relay Module.



Sample and Exhausting Tubing Calculations

Description of flow rate, and tubing vacuum at the inlet and exhaust points,

Inlet sample specifications

Description	Maximum
Tubing Length, m (ft)	30 (100)
Sample Point Vacuum	-25.4 cm H ₂ O (-10 in H ₂ O)
Transport Time (sec), ID 1/8" ¹	25
Transport Time (sec), ID 3/16"	53
Flow rate, cc/min.	600 (Flow is constant) ²
Tubing OD, mm (in)	6.35 (0.25)
Tubing ID, mm (in)	3.18 (0.125)

¹Honeywell Analytics recommends thick-wall tubing (1/8" ID) for best speed of response. Due to its lower surface area, thick-wall tubing may require less conditioning than thin-wall tubing.

² The flow rate is electronically maintained at approximately 600 cc/min and may vary within acceptable tolerances.

Tubing lengths vary among gases. See the Gas Chart for recommended lengths.

NOTE

Honeywell Analytics recommends the use of Teflon FEP (Fluorinated Ethylene Polymer) tubing to assure proper sample transport. The properties of Teflon FEP make it the best choice for transporting sample toxic gases to instruments when compared with the properties of other similar tubing materials.

Outlet sample specifications

description	maximum
Tubing Length, m (ft)	30 (100)
Back Pressure at Exhaust Point	20.3 cm H ₂ O (8 in H ₂ O)
Flow rate, cc/min	600 (Flow is constant)

description	maximum
Tubing OD, mm (in)	6.35 (0.25)
Tubing ID, mm (in)	4.76 (0.188)

Prepare Tubing

1. Cut the tube squarely and remove any burrs.
2. Mark from end of tube the length of insertion. The insertion length of Midas-M from the end of tube is 15.5 mm.

NOTE

When inserting the tube into the inlet/outlet port of the Midas-M, make sure that it is inserted up to the marked position.

In-Line Filters

External filters must be used to protect the tubing from contamination. Use particulate filter part number 780248 for normal gases and 1830-0055 or 1991-0147 for corrosive gases. Replace the filter every 3 months. Refer to the Gases Table for specific gases.

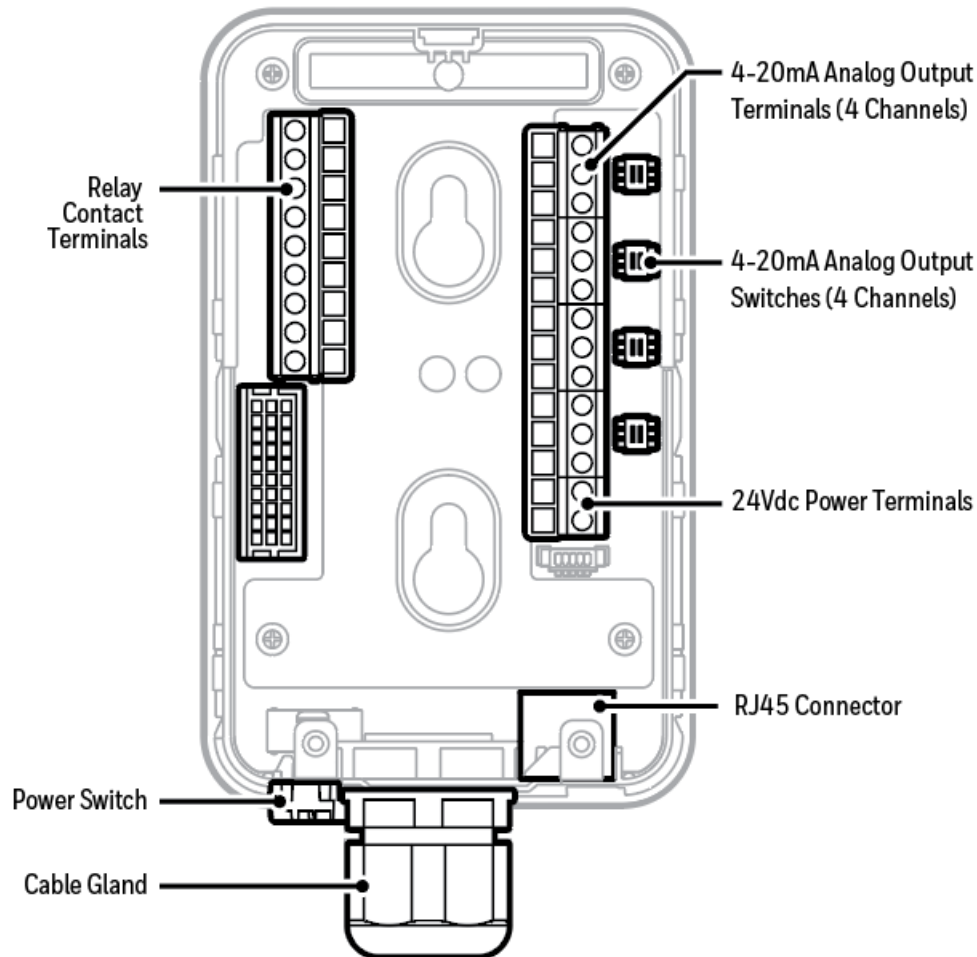
Local Detector Option

The Midas-M gas detector can also be used to monitor for gas at the location of the detector. To do this, an inline filter is simply connected to the sensor cartridge gas inlet port. The external dust filter part number is 780248 for normal gases and 1830-0055 or 1991-0147 for corrosive gases. The area around the detector is then being monitored as opposed to a sample being drawn from a remote location.

Electrical Installation

Access for the electrical wires to the terminal module is made via the PG16 cable gland located at the bottom of the mounting bracket assembly. The cable gland can be removed and replaced with a suitable conduit fitting if required.

Typical wire routing



The terminals used are suitable for conductors of 24 to 14 AWG (0.5 to 1.8mm Dia.). We recommend using the 16 AWG (1.5 mm Dia.) conductors.

If Power over Ethernet (PoE) is used to power the device, then 24 VDC power must not also be connected to the device, (or conversely, if 24 VDC is used to power the Midas-M, then electrical power via the Ethernet port must not be applied). Failure to observe this requirement may cause damage to the gas detection system and will not be covered by the standard warranty.

When connecting the wires ensure that the power switch is in the off position.

NOTE

Earthing Requirements: If the Midas-M unit's metal chassis is not connected directly to a metal surface for earthing purposes, an additional earth wire will be required. Connect a

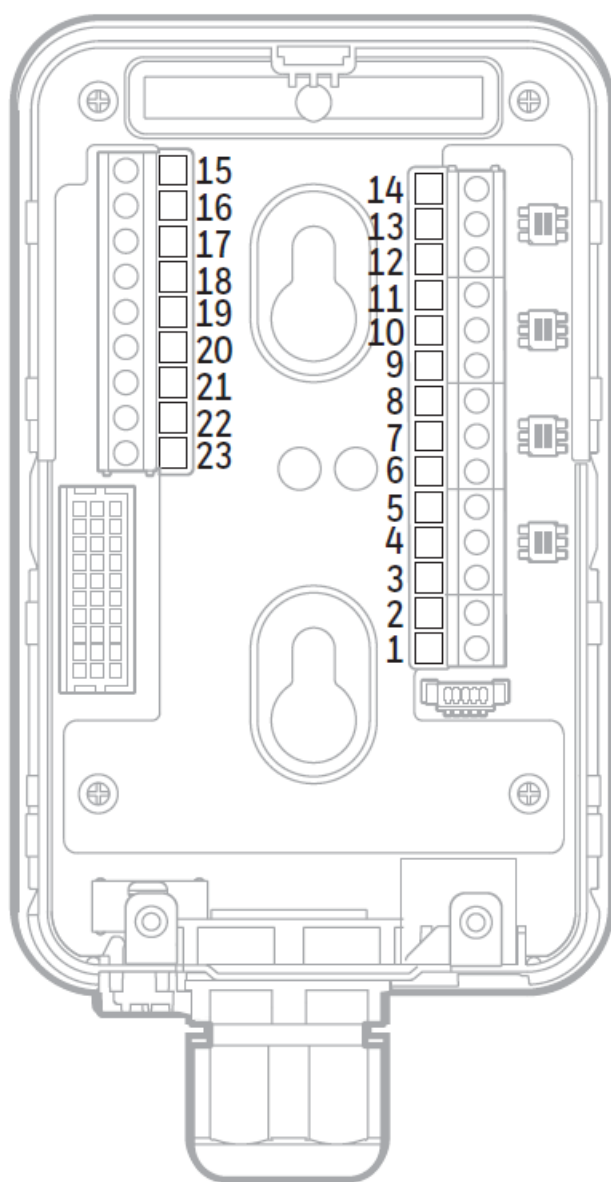
wire via the PG16 gland to the dedicated earth tag (screw terminal) located on the bottom bracket and connect the other end of the wire to a dedicated external earthing point. If Power over Ethernet (PoE) power supply is being used, shielded CAT5 Ethernet cable is recommended. Please ensure that your wiring avoids earth ground loops that may affect the performance of your equipment.

NOTE

Instrument grounding is required to ensure stable performance and to limit the effects of radiofrequency interference before installation.

The following diagram shows the terminal module layout and terminal identification as well as the jumper locations.

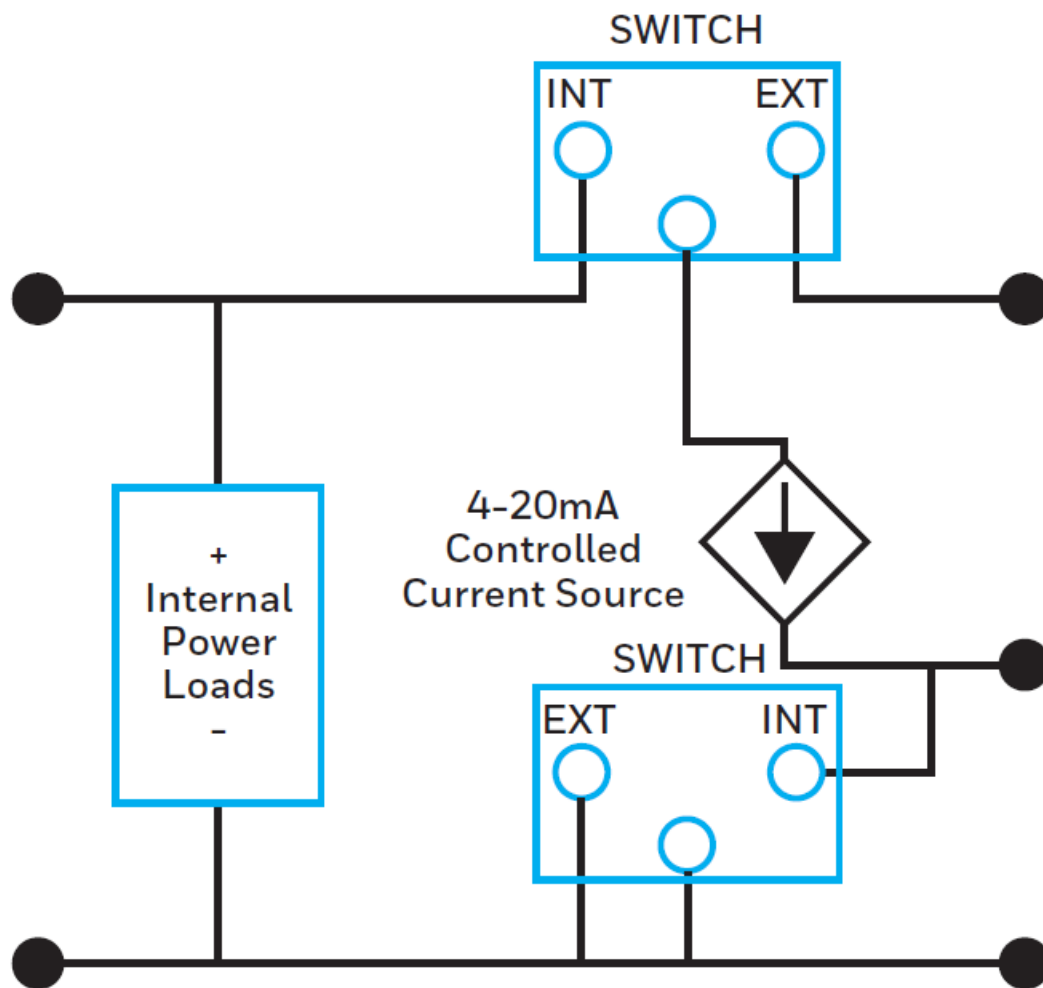
Transmitter Terminals



Transmitter Terminals

terminal number	function	description
1	24Vdc Input	0Vdc
2	24Vdc Input	+24Vdc
3	mA output - Channel 1	COM
4	mA output - Channel 1	mA-
5	mA output - Channel 1	mA+
6	mA output - Channel 2	COM
7	mA output - Channel 2	mA-
8	mA output - Channel 2	mA+
9	mA output - Channel 3	COM
10	mA output - Channel 3	mA-
11	mA output - Channel 3	mA+
12	mA output - Channel 4	COM
13	mA output - Channel 4	mA-
14	mA output - Channel 4	mA+
15	Relay 1	Normally Closed
16	Relay 1	Common
17	Relay 1	Normally Open
18	Relay 2	Normally Closed
19	Relay 2	Common
20	Relay 2	Normally Open
21	Relay 3	Normally Closed

terminal number	function	description
22	Relay 3	Common
23	Relay 3	Normally Open



Relay function table

Display	Description	Relay 1	Relay 2	Relay 3
INSTRUMENT F ONLY	Instrument fault only	Alarm 1	Alarm 2	Instrument fault
SEPARATE F	Separate fault relays	Any alarm	Maintenance fault	Instrument fault
COMBINED F	Combined fault relay	Alarm 1	Alarm 2	Any fault

Electrical Connection

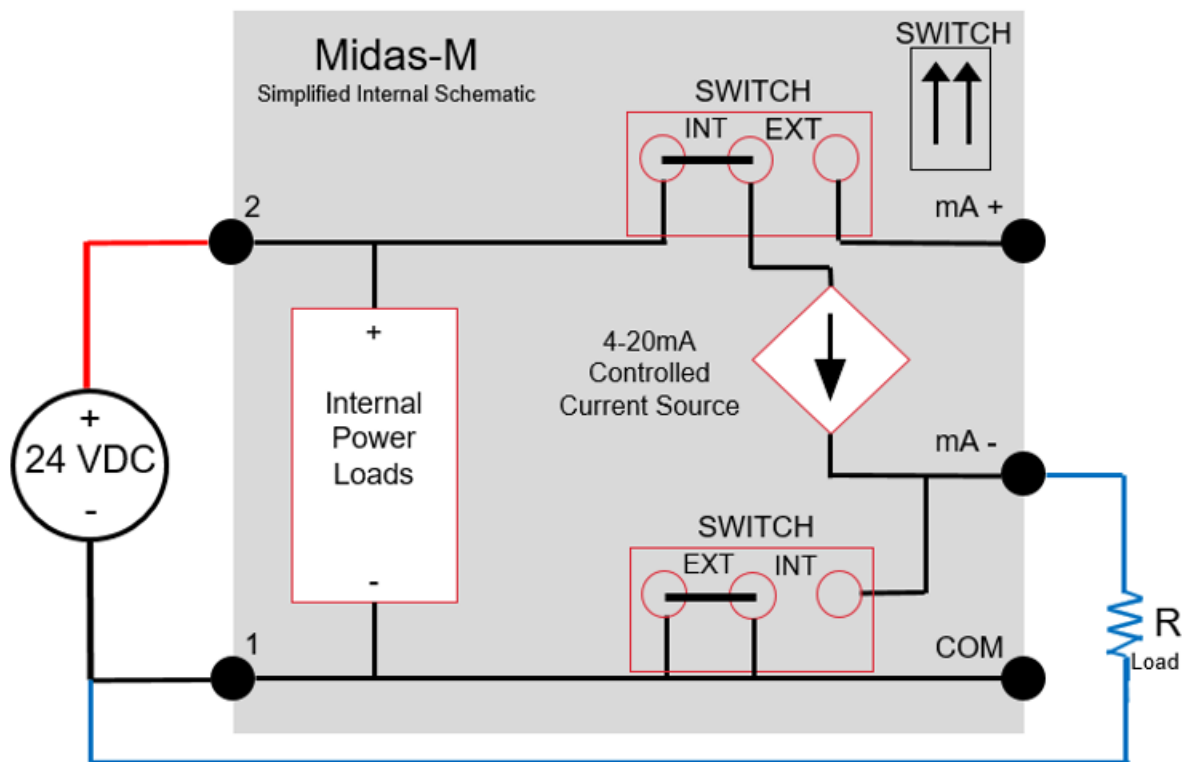
Midas-M can be powered by either 24 VDC via traditional discrete wiring or by approximately 48 VDC delivered through the Ethernet cable from a PoE source. In either case, the 4-20 mA analog output can be used.

The analog output can be configured for fully isolated operation. With 24 VDC power the 4-20 mA output can be configured for sink, source or isolated output operations. Following are some schematic diagrams of typical electrical connection configuration.

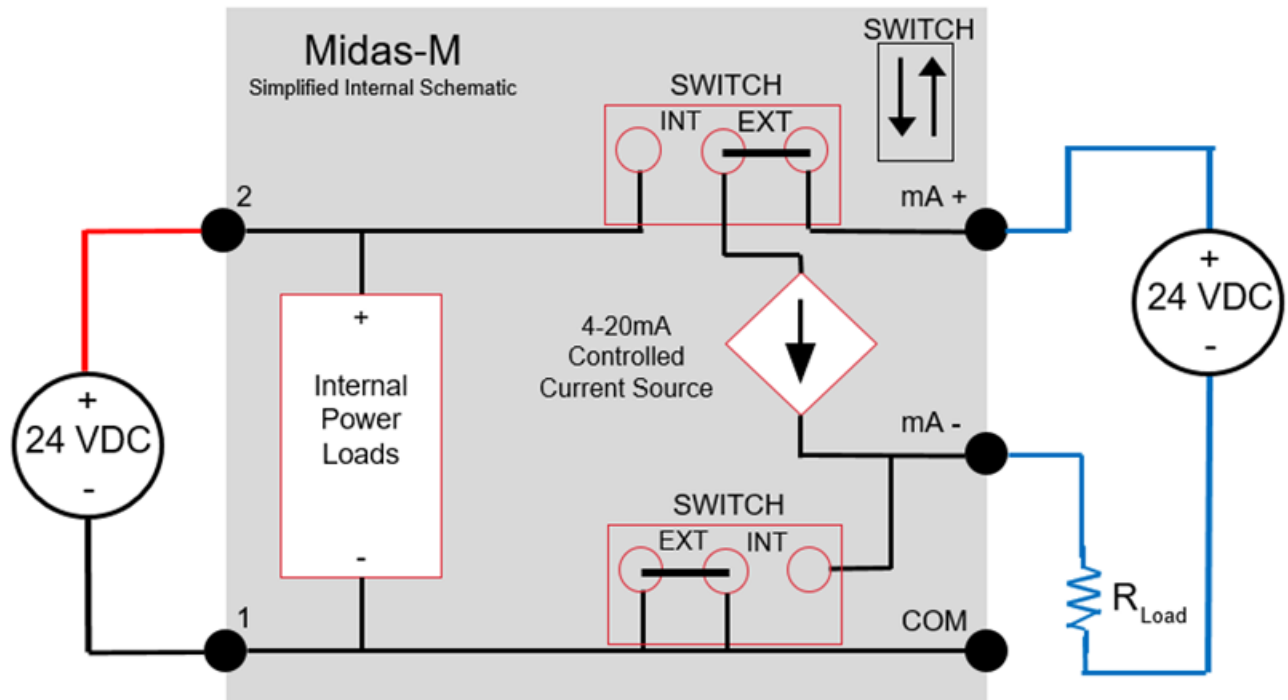
NOTE

When wiring the Midas-M Transmitter to a controller, program the controller for a 1-2 second delay before reporting to prevent false alarms.

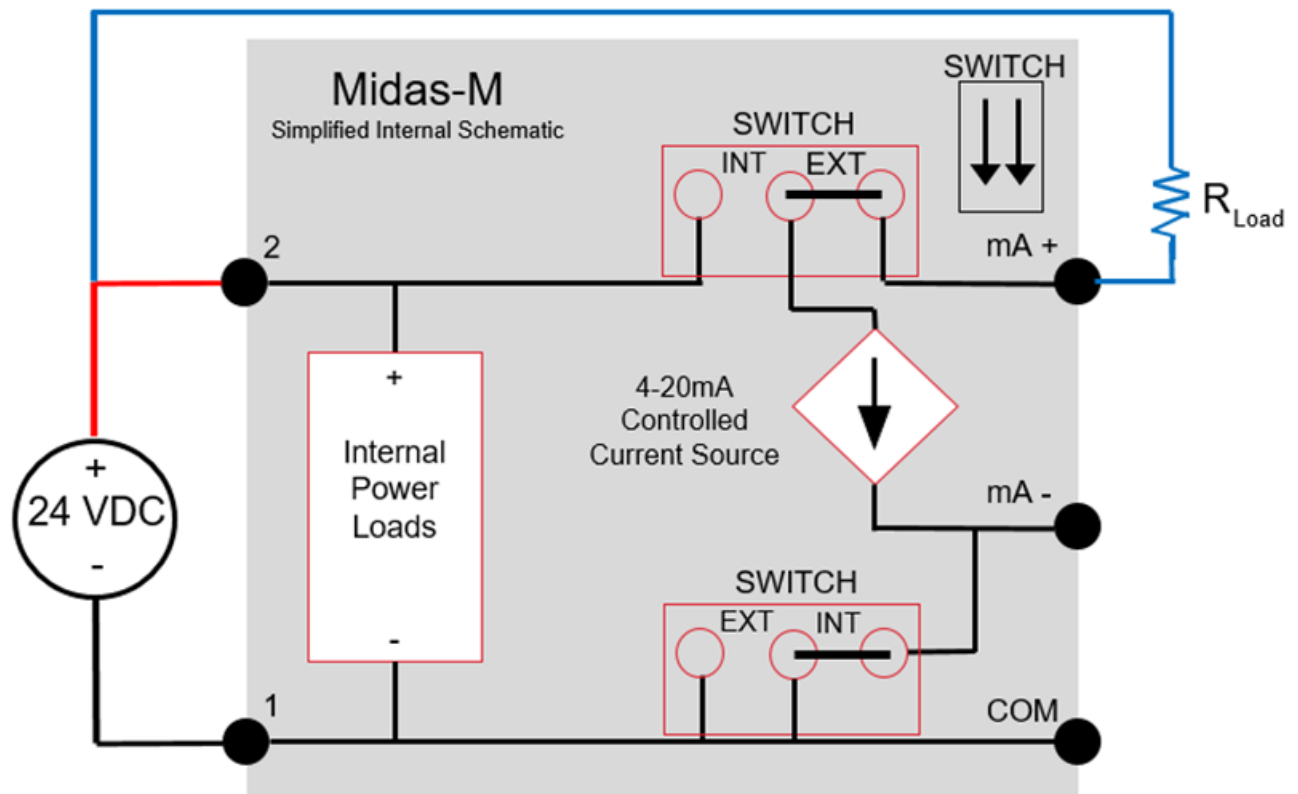
Generic example Midas-M 3-wire sourcing



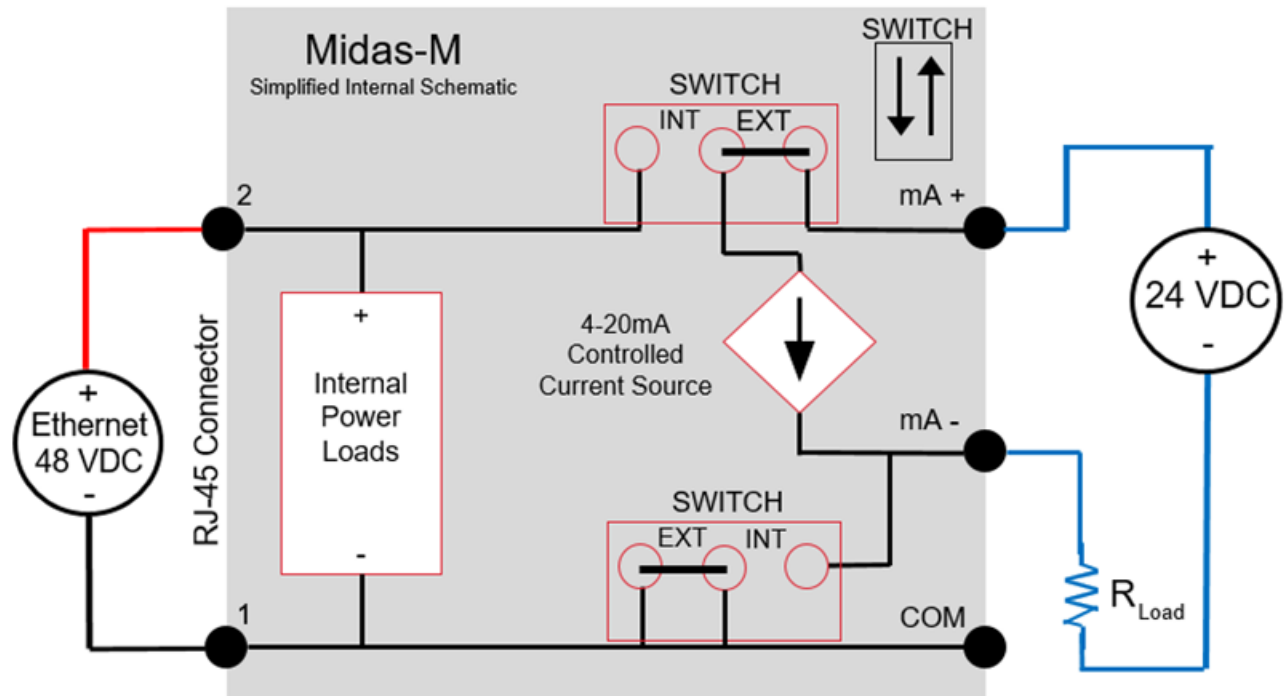
Generic example Midas-M 4-Wire Isolated output



Generic example Midas-M 3-wire Sinking output



Generic example Midas-M Isolated 4-20mA output w/PoE power



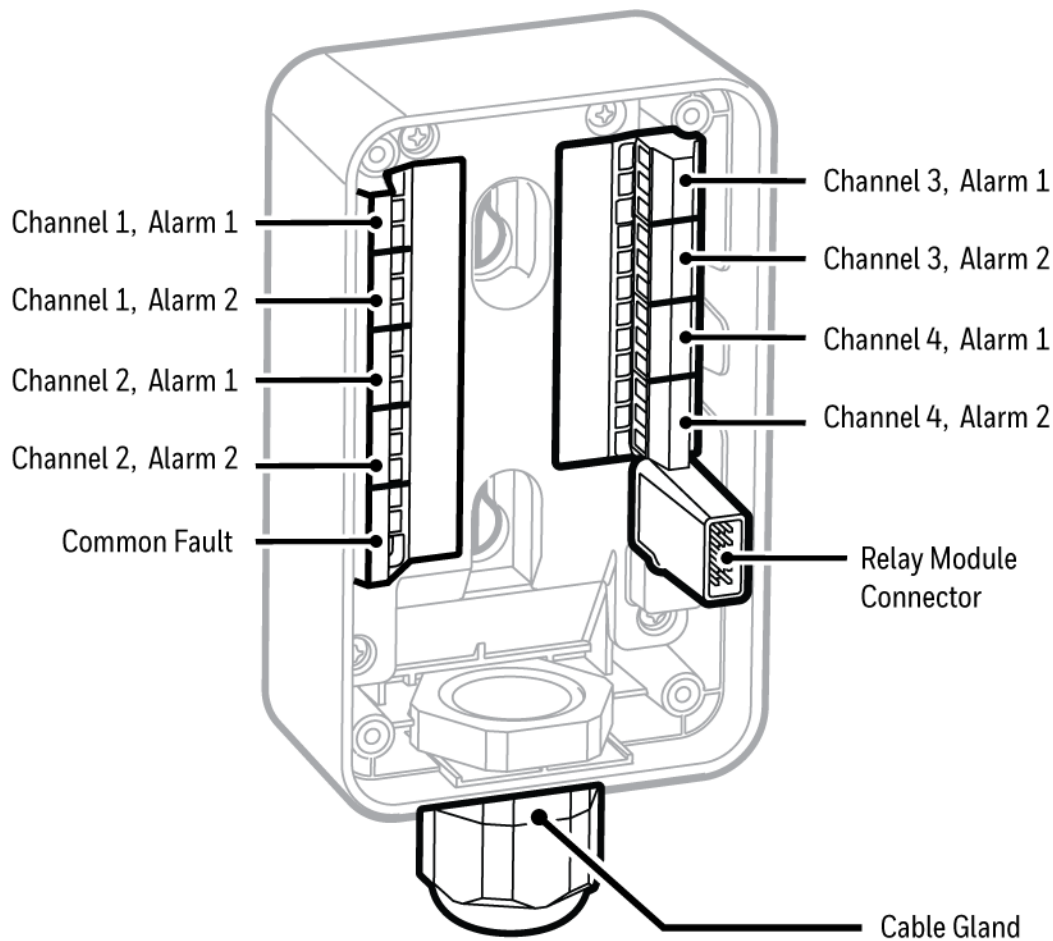
Wiring The Relay Module

The Midas-M relay module contains:

Nine relays to activate external devices.

Eight gas alarm relays which indicate level 1 and level 2 alarms of each channel.

A common fault relay which indicate maintenance fault or instrument fault.



Specifications

Power Supply	No separated power supply required Supplied from the Midas-M transmitter
Power consumption	< 1.45 W
Relay rating	1.0 A @ 30VDC or 0.5 A @ 125 VAC max, 10 uA @ 10 mV minimum
Wiring	14 AWG maximum per each channel

Default configuration

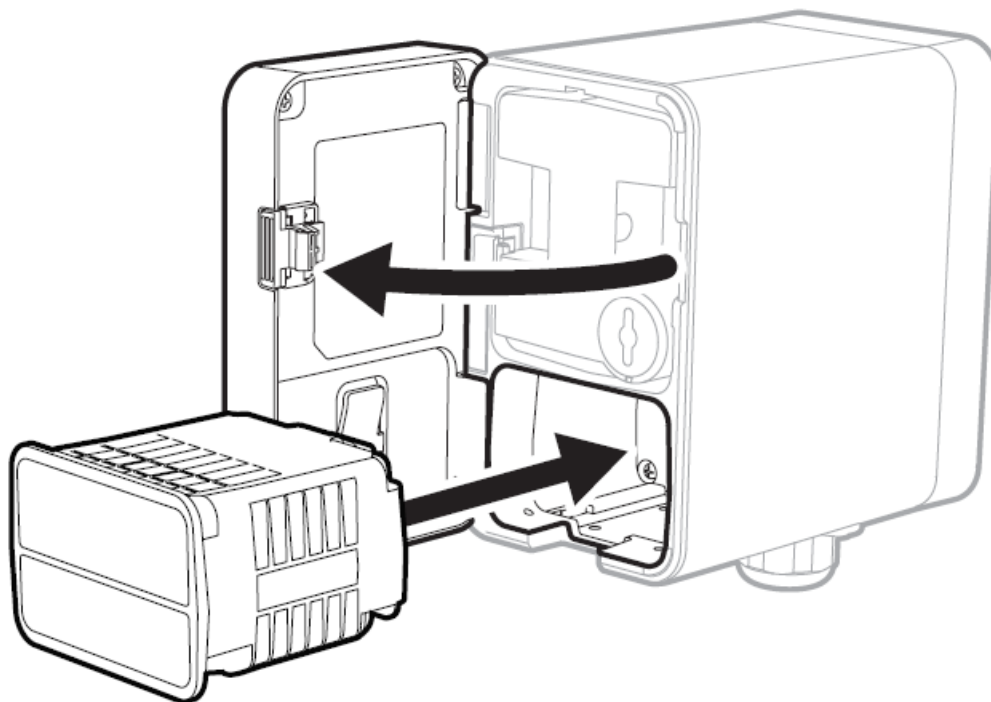
All alarm relays	Normally de-energized, energized on alarm
Common fault relay	Normally energized, de-energized on fault

Mount The Sensor Cartridge

The Midas-M Sensor Cartridge enables the detection of a wide range of asphyxiant, toxic, flammable, pyrophoric, corrosive, and oxidizer (including Oxygen) gases. The plug & play Sensor Cartridge is located inside the detector's chassis.

NOTE

The Midas-M sensor cartridge is supplied separately.
Before use, verify the part number and type of sensor cartridge is correct for your application.



1. Turn the power off.
2. Open the door and remove the BiAS battery module and the two plug caps from the sensor cartridge.
3. Align the Sensor cartridge pins with the socket in the sensor cartridge chamber and then push the sensor cartridge gently until fully seated.
4. Close the door.
5.
 - a. Press the 'O' button to clear the "Detect New Cartridge " message.
 - b. Confirm that the green LED is flashing, and that the yellow and red LEDs are off.
 - c. Confirm the display shows a concentration of zero as appropriate.

3

Device & Web Operations

Learn what you can do with your Honeywell Midas®-M Detector, from commissioning to Maintenance

Comissioning

Comissioning should be followed carefully and only performed by suitably trained personnel.

WARNING

Before carrying out any work, ensure local and site procedures are followed. Ensure that the associated control panel is inhibited to prevent false alarms.

1. Ensure the detector is wired correctly.
2. Ensure that the correct sensor cartridge is fitted. (If the cartridge has not been stored at room temperature, allow one hour for equilibration.)
3. Ensure the ON/OFF switch on the bottom of the mounting bracket assembly is in the **ON** position.
4. Apply power to the system. Wait for a couple of minutes until the start-up routine completes.
5. After the start-up routine, the detector will display the Normal/Monitoring Operating Mode.
6. Perform a leak test to ensure all connections are secure. 'Waiting...' will be displayed on booting time.
7. Allow the detector to stabilize until the 'Warm-up' message is no longer displayed after booting. The maximum warm-up time is dependent on sensor type. Refer to individual cartridge data sheets. Warm-up times are typically much faster.
8. Ensure the correct ID code is selected in **Set-up > alarm** menu
9. If this is a first-time start-up, the "Detect New Cartridge ~" message could be displayed. Press the 'O' button to clear the message.

Monitoring Mode

After commissioning, the Midas-M detector is set in the Monitoring Mode, which is the starting point for all of the device's operations.



The examples in the following table are for a linear 4-20 mA output over a full scale range of 2 ppm. The current output for a given gas concentration will be different for other full scale ranges (linear 4 mA = 0 % full scale to 20 mA = 100 % full scale). The alarm and fault relays are in default (latching) mode.

Normal Operation Display and Outputs.

This table is based on the default configuration of toxic sensor type.

Status	Relay Status	4-20mA out-put	LEDs	Backlight
Alarm 1	Alarm relay 1 activated	mA output to match the concentration	Green flash Alarm 1 Red on	Red on of the channel

Status	Relay Status	4-20mA out-put	LEDs	Backlight
	Alarm relay 2 de-activated Fault relay de-activated			
Alarm 2	Alarm relay 1 activated Alarm relay 2 activated Fault relay de-activated	mA output to match the concentration	Green flash Alarm 1 Red on Alarm 2 Red flash	Red flash of the channel
Greater than full scale	Alarm relay 1 activated Alarm relay 2 activated Fault relay de-activated	21mA	Green flash Alarm 1 Red on Alarm 2 Red flash Yellow on	Yellow on of the channel
Inhibit	Alarm relay 1 de-activated Alarm relay 2 de-activated Fault relay de-activated	2mA	Green flash	
Maintenance fault	Alarm relay 1 de-activated Alarm relay 2 de-activated Fault relay de-activated	3mA	Green flash Yellow on	Yellow on of the channel or all channels dependent on fault type
Instrument fault	Alarm relay 1 de-activated Alarm relay 2 de-activated Fault relay activated	1mA	Green flash Yellow flash	Yellow flash of the channel or all channels dependent on fault type

Review Information

From the Review Mode, you can see the information of transmitter, cartridge, alarm, 4-20mA, relays, fault, calibration, date/time, network, event log, and advance.

1. Go to the Monitoring Mode.
2. By pressing  or  buttons you are entered automatically to the Review Mode and one of the Review options is displayed under **Review**.



3. Press  or  buttons to scroll to your desired option.
4. Press  to accept and enter the selected option.
5. Repeat Steps 3 and 4 to continue exploring more options from the Review Mode.
6. Optional Step: Press  to cancel and return one step back.

From the Review Mode panel, you can review any of the following options:

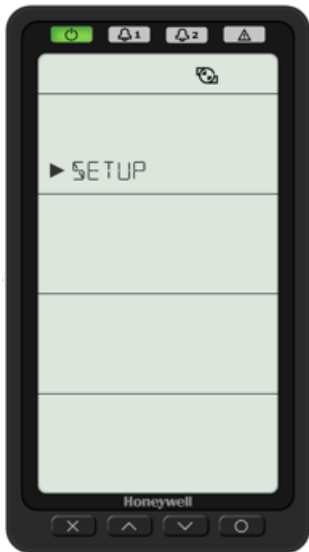
Option	Information you can review from selected option
Transmitter	• FW Revision • Part Number • Serial Number • FW checksum • Web version
Cartridge	• FW Revision • Boot loader revision • Part Number • Serial Number • Sensor parameter revision of each channel
Alarms	• Gas type of each channel

Option	Information you can review from selected option
	• Alarm 1 type and level of each channel • Alarm 2 type and level of each channel • Deadband level of each channel • Alarm latching/non-latching of each channel • Alarm delay time of each channel
4-20mA	Concentration range of 4-20mA output of each channel
Internal Relays	• Relay configuration • Relay energized/de-energized in normal condition
External Relays	Relay energized/de-energized in normal condition
Faults	• Latching/Non-latching • Maintenance fault enable/disable • Temperature fault enable/disable
Calibration	• Calibration interval of each channel • Calibration due days of each channel • Sensor expired days of each channel
Date/Time	Date and Time
Network	• IP obtain method • IP address • Subnet Mask • Gateway • MAC Address
Event Log	Event logs
Advance	Channel ON/OFF

Setup Operations

From the Setup Mode, you can configure alarms, 4-20mA, relays, faults, channels, date & time, network, advance, and security.

1. Go to the Monitoring Mode.
2. Press  or  buttons and hold for one second to enter the Main Menu, and one of the Menu options is displayed.



3. Press  or  buttons to scroll to **Setup**.
4. Press  to accept and enter the Setup menu.
5. Press  or  to continue exploring more options from the Setup Mode, and then press  to accept it.
6. Optional Step: Press  to cancel and return one step back.

From the Setup Mode panel, you can review any of the following options:

Option	Operations you can Setup from selected option
Alarms	• Gas type of each channel • Correlation factor of each channel if gas type is “USER” • Alarm 1 type and level of each channel • Alarm 2 type and level of each channel • Deadband level of each channel • Alarm latching/non-latching of each channel • Alarm delay time of each channel
4-20mA	Concentration range of 4-20mA output of each channel.
Internal	• Relay configuration (Instrument Fault Only, Separate Fault Relay,

Option	Operations you can Setup from selected option
Relays	Combined Fault Relay). Relay energized/de-energized in normal condition.
External Relays	Relay energized/de-energized in normal condition.
Faults	Latching/Non-latching Maintenance fault enable/disable Temperature fault enable/disable.
Calibration	Calibration interval of each channel
Date/Time	- Date - Date format (YYYY MM DD, DD MM YYYY, MM DD YYYY) - Time
Network	- IP obtain method (Manual, Auto) - IP address - Subnet Mask - Gateway
Advance	Channel ON/OFF
Security	- Security ON/OFF - Password

Test Mode

From the TestMode, you can test Bump, Simulation, 4-20mA, and Inhibit.

1. Go to the Monitoring Mode.
2. Press or buttons and hold for one second to enter the Main Menu, and one of the Menu options is displayed.



3. Press or buttons to scroll to **Test**.
4. Press to accept and enter the Test menu.
5. Press or to continue exploring more options from the Test Mode, and then press to accept it.
6. Optional Step: Press to cancel and return one step back.

From the Test Mode panel, you can test any of the following options:

Option	Operations you can Test from the selected option
Bump	Gas bump test
Simulation	• Alarm 1 of each channel • Alarm 2 of each channel • Maintenance Fault • Instrument Fault
4-20mA	Force 4-20mA output of each channel
Inhibit	• Inhibit ON/OFF

Option	Operations you can Test from the selected option
	• Inhibit time

Calibration Mode

From the Configuration Mode, you can configure Zero, Span, Flow, and 4-20mA.

- 1. Go to the Monitoring Mode.
- 2. Press  or  buttons and hold for one second to enter the Main Menu, and one of the Menu options is displayed.
- 3. Press  or  buttons to scroll to **Calibration**.
- 4. Press  to accept and enter the Calibration menu.



- 5. Press  or  to continue exploring more options from the Calibration Mode, and then press  to accept it.
- 6. Optional Step: Press  to cancel and return one step back.

From the Calibration Mode panel, you can configure any of the following options:

Option	Operations you can calibrate from the selected option
Zero	Zero gas calibration of each channel
Span	Span gas calibration of each channel
Flow	Pump flow calibration
4-20mA	4-20mA output calibration of each channel

Calibration & Bump Test

All Midas-M sensor cartridges are pre-calibrated by Honeywell Analytics using traceable gas standards and approved calibration methods to a proven ISO 9000 quality controlled procedure. The Midas-M sensor cartridge design is very robust and resistant to long term drift; in fact in a normal operating environment it is possible to extend the calibration interval with Midas-M up to 24 months (subject to local requirements concerning calibrations). This design feature is another element that supports Midas-M as a long term cost effective gas detection solution. Honeywell Analytics recommends frequent bump testing to confirm performance.

NOTE

It is the sole responsibility of each user to determine their own calibration and bump test schedule based on their own safety assessments and understanding of local requirements.

Just prior to commissioning, each Midas-M unit should be zero calibrated to ensure accuracy. It is recommended that the unit be powered with the cartridge installed for at least 30 minutes prior to conducting a zero calibration. A second zero calibration may be required after a 24 hour period which is dependent on the site conditions. O2 sensors are not zero calibrated but should be span gas calibrated. See the Gas Table for span gas calibration details. If the ambient condition in the area the detector is monitoring experiences a long-term change, it is necessary to perform a zero calibration to allow the unit to adjust to the new conditions.

NOTE

When performing a zero calibration, be sure that the area is free of the target gas and/or interfering gases (refer to the cartridge data sheets for further details), as the presence of a background gas will affect the ability for the detector to properly calibrate to the correct levels. If the sample area cannot be verified to be free of the target gas or cross-sensitive gases, use a cylinder of zero air to perform the calibration

Calibration of an electrochemical sensor cartridge is a relatively complex discipline to master and it is possible that in less ideal field conditions the calibration can be far less accurate than under laboratory conditions and therefore substantial inaccuracies can be introduced. In the absence of any formal calibration policy by the end user, it is preferable to retain the original factory calibration.

Care must be taken to ensure that the correct materials for an extractive application are obtained from reputable suppliers and are of proven quality and composition. Inappropriate calibration equipment will lead to under - or over-presenting the wrong concentration of gas to the sensor cartridge during the calibration period. Likewise contaminated or inadequately flushed tubing and other gas-wet surfaces can also introduce errors into the calibration process. Only qualified, trained personnel should attempt to perform gas calibrations; contact your local Honeywell Analytics Service Representative for further details on calibration services. Testing should be performed at the end of the sample tube or at the detector with a short length of tubing. Applying gas with a short length (less than 5 feet/1.5 meters) of clean FEP tubing will give optimal results for confirming the accuracy and response time of the cartridge.

Applying gas at the end of the installed sample line will test the full system including the whole length of tubing. This will verify the integrity of the tubing. Sample line integrity can also be

checked by performing a leak check. Note that there will be additional transport time due to the tubing length and conditioning the gas-wet surfaces.

Bump tests are also used as an approximate means to present a controlled gas release to the sensor cartridge in order to verify that the transmitter does respond accordingly. Bump testing is popular as typical experiences show that a smaller list of easier to handle gases can be used to provide functional tests on a wider range of gas types. In the absence of a formal calibration policy from the end user, Honeywell Analytics would recommend a minimum semi-annual schedule of at least one bump test per sensor with the appropriate test gas.

Bump testing may reduce sensor cartridge lifetime and the accuracy of the calibration if applied incorrectly or too frequently. Use only the target gas or the recommended bump test gas.

Zero calibration is a recommended procedure that should be performed periodically to improve the performance of the sensor. This is particularly important when the sensor is operating outside of normal environmental conditions (20°C, 50% rH).

The Gas Table indicates the recommended calibration or bump test gas for the Midas-M sensor cartridges:

Consult with your Honeywell Analytics Service Representative for approved methods and materials before commencing calibrations and bump tests.

Bump Test

A bump test is not intended to be an accurate calibration, but is used as a confidence check to ensure that the gas detection system is functional. Since some of the target gases are difficult to handle, bump testing often makes use of cross sensitivities so that more convenient gases can be used. In bump test mode, the Modbus/TCP outputs are not inhibited. Only the 4-20 mA and alarm outputs are inhibited. The bump gas test is a functional check only. Consult local guidelines for recommended best practices. Bump test concentrations are calculated to generate a minimum first alarm level response.

Preparation

Most of the test gases are highly toxic. It is essential that personnel using these toxic gases be trained in their use. Ensure that the test gas will be vented safely.

Applying test gas may cause alarm, fault or maintenance fault indications on the 4-20 mA loop, relays or digital outputs. Before starting a test, ensure that suitable steps have been taken to prevent these indications from triggering unwanted actions. The Midas-M gas detector has a special mode for bump testing where the alarm outputs are inhibited.

Finishing

Wait for the gas reading to return to normal levels. This may take some time, especially if concentrations above the recommended levels have been used or if the test gas has been applied for an extended period of time.

Ensure that any latched faults or alarms that have been generated by the testing have been cleared.

Make sure that the gas detection system is fully restored to its normal operating state and that any control system overrides used during the testing have been removed.

The alarms generated by the testing will have created entries in the transmitter's history log.

Troubleshooting

If the test does not produce a satisfactory result, check the following points:

- Check the gas cylinder concentration and type are correct
- Check the expiration date of the cylinder.
- Check that there is sufficient gas left in the cylinder.
- Check that there are no leaks on the test system.
- Make sure that the tubing length is as short as possible and that there are no blockages.
- Make sure that the transmitter is not displaying a fault before the test is started.

Internal Web Server

The Midas-M gas detector unit utilizes an Ethernet port with the TCP/IP protocol as standard. The Midas-M can function as a HTML web page server and these web pages can be viewed on external computer equipment (PC, PocketPC etc.) by using a standard software program, i.e.; Microsoft Internet Explorer 11, Safari, or Chrome . These web pages replicate the user interface on the front panel of the Midas-M in a more flexible and friendly format for diagnostic and data entry purposes. The web pages also contain additional features not available via the keypad.

This procedure explains how to view web pages for a single Midas-M which is connected to a single PC only. Of course it is possible to connect hundreds of Midas-M units to an Ethernet network. More information may be required from the local IT department and Honeywell Analytics as appropriate.

Physical Network Components

The Ethernet physical network is intended to connect computers to other computers through hubs. MIDAS-M has a 10/100 Mbps Ethernet transceiver and supports Auto-MDIX. It supports Auto-Negotiation for selecting the highest performance mode of operation. To use CAT5 standard or higher shield ethernet cable is recommended for the highest efficiency communication speed.

Internet Settings

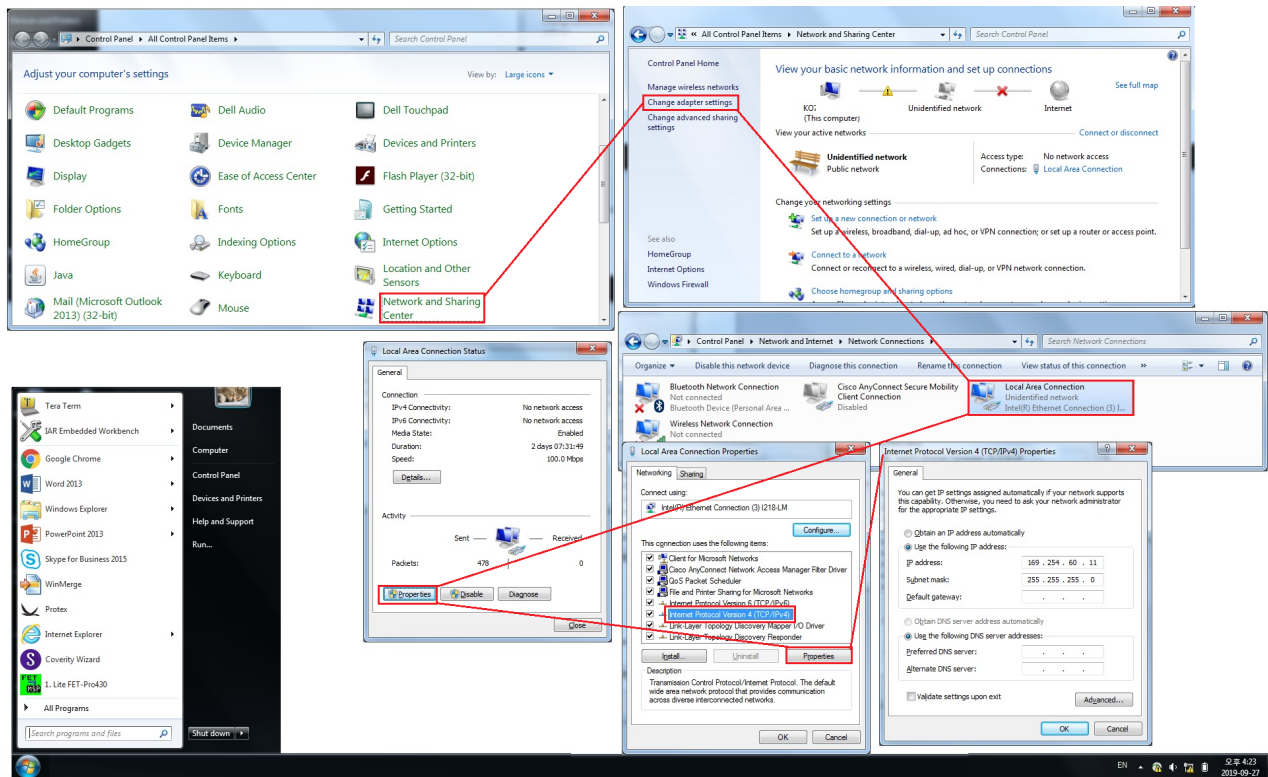
Communications requires knowledge of the IP address and netmask of both the Midas-M and the PC. Unless the Midas-M is connected to a network with a DHCP server, the addresses must be set manually.

The procedure for setting the IP address of a PC is detailed in the following example using a PC loaded with Microsoft™ Windows 7 and Internet Explorer version 11.0 or higher as illustrated as follows.

In the usual case the netmask for both computers should be set to 255.255.255.0. The most-significant three bytes of the IP address must be identical and the least-significant byte must be

unique. For example, if the IP address of the Midas-M was set to 169.254.60.47 (the factory default) then an appropriate IP address for the PC would be 169.254.60.42.

IP Address setting in Windows 7



Running the Web Server

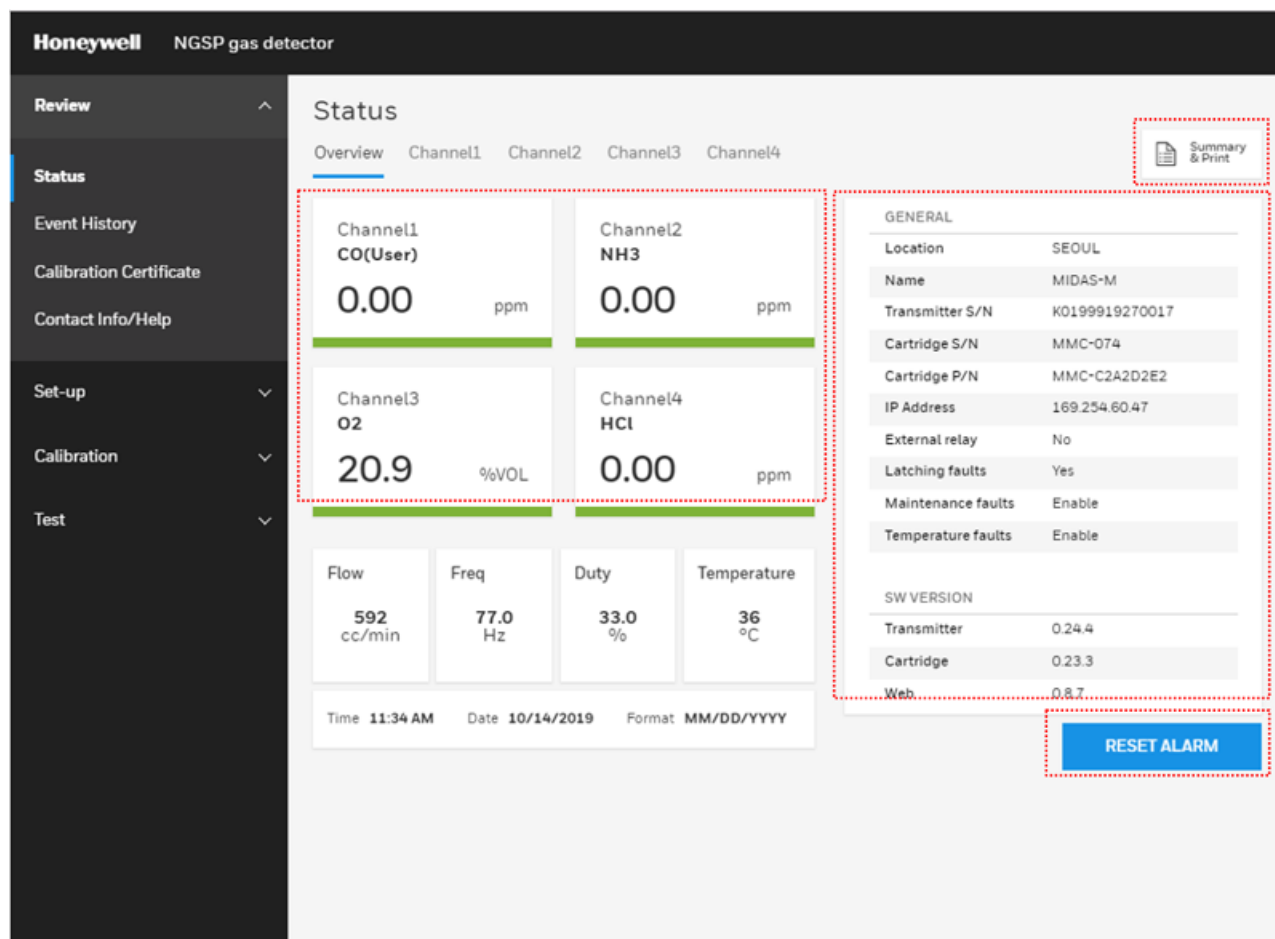
In a web browser, set the URL to “http://xxx.xxx.xxx.xxx” where the “xxx” fields are replaced with the IP address of the Midas-M.

Device's Overview

Display general information about the device and gas information of each channel.

From the home page, select **General > Status > Overview**.

The following image shows the information you can review from the Overview page.



Overview page

Option	Description
Channels	The gas information for each channel is displayed. The color bar under each box shows the status of the channel.
General	Device's general information
Summary & Print	A print-ready summary of device's information.
Reset Alarm	If alarms are occurring, reset the alarms.

Log Review

On this page, you can view information about records in text format and as a detailed graph. From the home page, select **General > Event History**.

Honeywell | NGSP gas detector

Review

Status

Event History

Calibration Certificate

Contact Info/Help

Set-up

Calibration

Test

2019 09 30 10:22:46	Information	-	Device Power-Up	0.000, 0.000 0.000, 0.000 0.000, 0.000	
2019 09 30 10:22:38	Information	-	Transmitter FW Update	0.000, 24.00 4.000, 0.000 0.000, 0.000	
2019 09 30 10:21:17	Information	-	Cartridge and Cells are Same	0.000, 0.000 0.000, 0.000 0.000, 0.000	
2019 09 30 10:21:15	Information	-	Device Power-Up	0.000, 0.000 0.000, 0.000 0.000, 0.000	
2019 09 30 10:21:07	Information	-	Web File Update	0.000, 8.000 4.000, 0.000 0.000, 0.000	
2019 09 30 09:57:54	Information	-	Reset Alarm/Fault, Warm-up locally	0.000, 0.000 0.000, 0.000 0.000, 0.000	
2019 09 30 09:57:53	Information	-	Cartridge and Cells are Same	0.000, 0.000 0.000, 0.000 0.000, 0.000	
2019 09 30 09:57:50	Fault	-	F60: [The cartridge absent] Cleared	0.000, 0.000 0.000, 0.000 0.000, 0.000	
2019 09 30 09:56:59	Fault	-	F60: [The cartridge absent] Occurred	0.000, 0.000 0.000, 0.000 0.000, 0.000	
2019 09 30 09:25:05	Information	-	Reset Alarm/Fault, Warm-up on the Web	0.000, 0.000 0.000, 0.000 0.000, 0.000	
2019 09 29 20:07:00	Alarm	4 (HCl)	Alarm1 Cleared	0.900, 1.000 2.000, 611.0 585.0, 596.0	>
2019 09 29 20:07:00	Alarm	4 (HCl)	Alarm1 Occurred	1.200, 1.000 2.000, 611.0 616.0, 596.0	>
2019 09 29 19:58:56	Alarm	4 (HCl)	Alarm1 Cleared	0.950, 1.000 2.000, 602.0 583.0, 597.0	>
2019 09 29 19:58:56	Alarm	4 (HCl)	Alarm1 Occurred	1.200, 1.000 2.000, 602.0 583.0, 596.0	>

Events 49 to 64 of 1586

<<

<

1

2

3

4

5

>

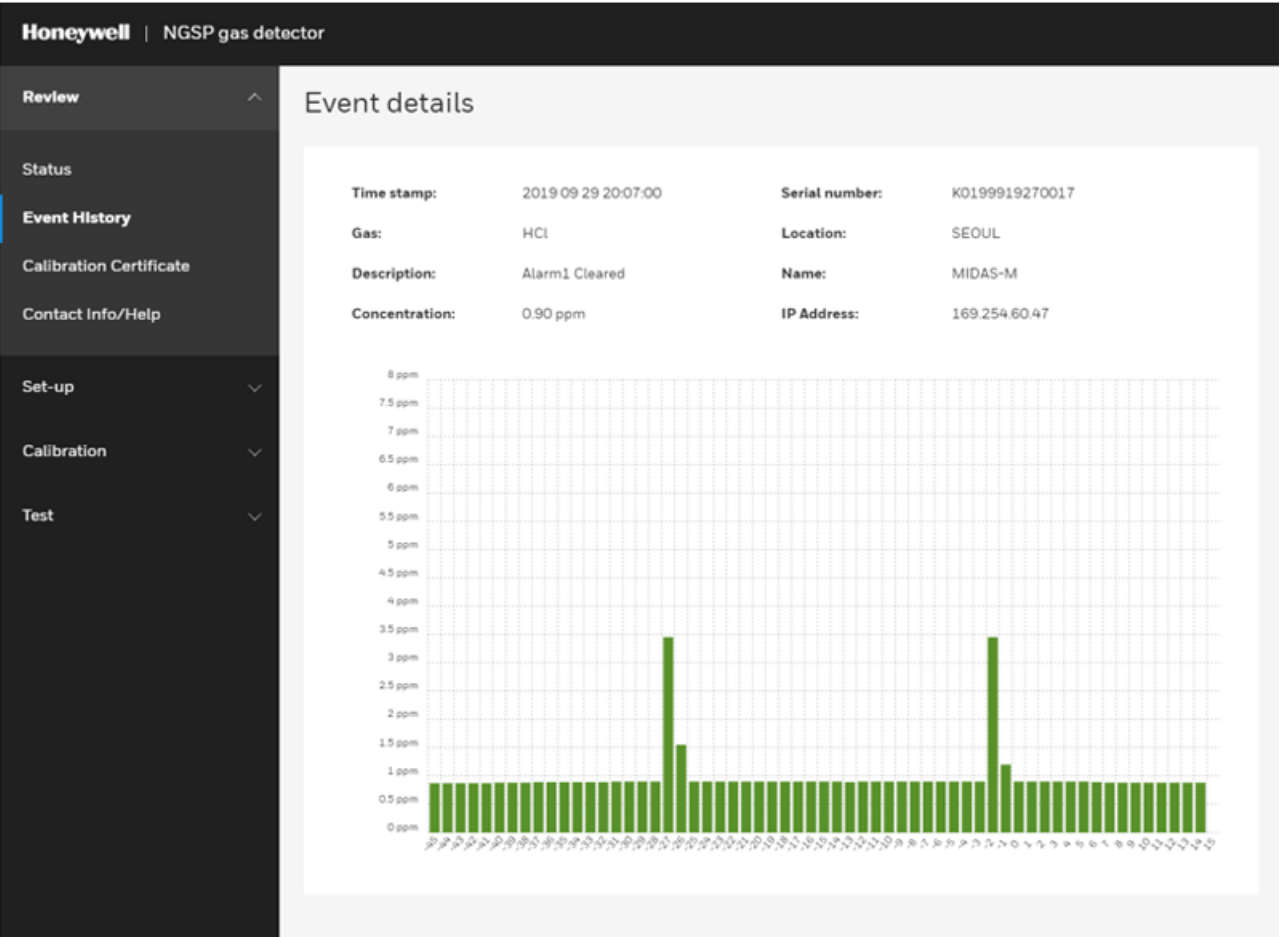
>>

RESET ALARM

MAKE PRINTABLE VERSION

Click to view the record as a graph

The following graph shows detailed information about the selected log. The graphic displays the gas concentration before and after a specific time from when the event occurred.



Get a Calibration Certificate

Get the calibration information implemented on a per-channels basis when the device was manufactured.

On this page, you can view information from the producer, device, and name of the calibrator.

From the home page, select **General > Calibration Certificate**.

Honeywell

NGSP gas detector

Review

Status

Event History

Calibration Certificate

Contact Info/Help

Set-up

Calibration

Test

Channel1

Channel2

Channel3

Channel4

Summary & Print

Honeywell

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Tel: +82 (0)2 6909 0300
Fax: +82 (0)2 2025 0388

Email: analytics.ap@honeywell.com
Web: www.honeywellanalytics.com

Electronic certificate of calibration

Part Number	3016L0637
Serial Number	MMS-C1-28
Calibration Date	7 10 2019 11:43:11
Factory Calibration Gas	Carbon Monoxide (0.0 ~ 100.0 ppm)

This sensor cartridge was calibrated using equipment which is subject to regular verification and whose calibration is traceable to national standards. Gases for which traceability to national standards is not available have been obtained from reputable sources.

The calibration was carried out in accordance with the general requirements of the company's BS EN ISO 9001:2015 approval.

Records are kept for all sensor cartridge calibrations and copies are available on request.

Calibrated by: Operator

MAKE PRINTABLE VERSION

Get Fault and Contact information

To get fault's list and Contact info, select **General > Contact Info/Help**.

Honeywell

NGSP gas detector

Review

Status

Event History

Calibration Certificate

Contact Info/Help

Set-up

Calibration

Test

Contact Info/Help

Summary & Print

Contact information

Current contact information can be found at the Honeywell Analytics web site.
Please visit us online at: <http://www.honeywellanalytics.com>
Requires a connection to the internet.

Fault information

NUMBER	NAME	DATA FIELD	CONDITION	RECOVERY
M02	Simulated M fault	N/A	User enters simulation mode	Reset simulated fault
M10	Baseline Warning	Concentration without deadband	Cell baseline has drifted.	Check for background gas concentration, temperature or humidity fluctuations. Perform zero calibration. Replace cell.
M11	Over Range	Peak concentration	Large concentration of gas has been detected. The NGSP requires an independent confirmation that the gas hazard is gone.	Supply known clean air to the NGSP and clear the fault.
M20	Calibration Expired	Days until fault	The user specified calibration interval has elapsed.	Perform zero and span calibrations. Increase span calibration period. (zero days = disabled)
M21	Cell Expires Soon	Days until fault	Cell is old and will expire soon.	Replace the cartridge or the cell with a new.
M40	Temperature Near Limit	Temperature (C)	Temperature is within 5 C of limit.	Check installation environment.
M41	Flow Low	Flow (cc/min)	NGSP is no longer able to regulate the flow.	Check filters and pump.
F01	LED indicator error	N/A	LED indicator has no response	Replace the LCD
F02	Simulated F Fault	N/A	User enters simulation mode	Reset simulated fault
F10	Baseline Fault	Concentration without deadband	Cell baseline has drifted.	Check for background gas concentration, temperature or humidity fluctuations. Perform zero calibration. Replace cell.
F20	Calibration Expired too long	N/A	Too long since last calibration.	Replace or calibrate the Cell.
F21	Cell Expired	N/A	Cell is too old.	Replace the cartridge or cell.

Set up Gas and Alarm

Set up gas detection and alarm set for each channel.

On the home page, select **Set-up>Gas/Alarm**.

1. Set the desired channel.
2. Gas: Set the gas you want to detect on each channel. Gas-name and K-factor (weight value for gas value) can be set only for User-gas.

Note: You cannot set the range.

3. Set the concentration at which Alarm1 occurs.
4. Set the concentration at which Alarm2 occurs.
5. Enter the **Dead band**.
6. Enter the **Alarm delay**. When an alarm condition is reached, an alarm occurs at a delayed time.
7. Set up **Latching** in an alarm situation.
8. Set the time for calibrating the progress alarm.
9. Click **Accept**.

Honeywell NGSP gas detector

Review
Set-up
General
Gas/Alarm
Relays
4-20 mA
Faults
Network
Time/Date
Advance
Calibration
Test

Gas/Alarm

Channel1 Channel2 Channel3 Channel4

Summary & Print

Set-up gas

Gas name	User gas name	K-factor	Range
CO(User)	CO(User)	1	0.0 - 100.0 ppm

Alarm level 1

12.5 ppm ☒ Normal (up) ☐ Depletion (down)

Alarm level 2

25.0 ppm ☒ Normal (up) ☐ Depletion (down)

Dead band

11 ppm

Alarm delay

3 seconds

Latching alarms

Yes

Calibration period

180 days

RESET TO DEFAULT RESET ACCEPT

Configure the Relays

Set the Alarm and Fault relays.

On the home page, select **Set-up > Relays**.

You can set the relays as follows:

- **Relay configuration:** Set the operation conditions for Relay 1,2,3.
- **Alarm relay:** Set whether to generate alarm relay.
- **Fault relay:** Set whether to generate a fault relay.

The screenshot shows the Honeywell NGSP gas detector web interface. The left sidebar contains a navigation menu with the following items: Review, Set-up (selected), General, Gas/Alarm, Relays, 4-20 mA, Faults, Network, Time/Date, Advance, Calibration, and Test. The main content area is titled 'Relays' and includes a 'Summary & Print' button in the top right corner. The 'Set-up' section is active, showing 'Relay configuration' with three radio button options: 'Instrument fault only' (selected), 'Separate fault only', and 'Combined fault only'. To the right of these options is a table with three columns: 'Relay1', 'Relay2', and 'Relay3'. The table contains the following data:

	Relay1	Relay2	Relay3
☒ Instrument fault only	Alarm1	Alarm2	Instrument fault
☐ Separate fault only	Any alarm	Maintenance fault	Instrument fault
☐ Combined fault only	Alarm1	Alarm2	Any fault

Below the table, the 'Alarm relay' section has two radio button options: 'Energized' and 'De-energized' (selected). The 'Fault relay' section has two radio button options: 'Energized' (selected) and 'De-energized'. At the bottom right of the page, there are two buttons: 'RESET' and 'ACCEPT'.

Set up the 4-20 mA

Set the ratio of mA and concentration values.

On the home page, select **Set-up > 4-20 mA**.

You can set the 4-20mA as follows:

- **Channel:** Select the channel to set.
- **Output 4 mA:** Set the gas concentration for 4mA.
- **Output 20 mA:** Set the gas concentration for 20mA.

The screenshot displays the Honeywell NGSP gas detector web interface. On the left is a dark sidebar menu with options: Review, Set-up (selected), General, Gas/Alarm, Relays, 4-20 mA (highlighted), Faults, Network, Time/Date, Advance, Calibration, and Test. The main content area is titled '4-20 mA' and includes tabs for Channel1, Channel2, Channel3, and Channel4. A 'Summary & Print' button is in the top right. The 'Set-up' section contains two input fields: 'Output 4 mA' with a value of 0.0 ppm and 'Output 20 mA' with a value of 100.0 ppm. At the bottom right are 'RESET' and 'ACCEPT' buttons.

Set up Faults

Set a Fault Occurrence

On the home page, select **Set-up > Faults**.

You can set the faults as follows:

- **Latching faults:** Set whether to perform latching when faults occur.
- **Maintenance:** Set whether to generate a fault for maintenance
- **Temperature:** Set whether to generate a fault for Temperature. This option is enabled if the Maintenance setting is allowed too.

The screenshot displays the Honeywell NGSP gas detector web interface. On the left is a dark sidebar menu with the following items: Review, Set-up (expanded), General, Gas/Alarm, Relays, 4-20 mA, Faults (highlighted), Network, Time/Date, Advance, Calibration, and Test. The main content area is titled 'Faults' and contains a 'Set-up' section with three radio button options: 'Latching faults' (Yes selected), 'Maintenance' (Enable selected), and 'Temperature' (Enable selected). A 'Summary & Print' icon is in the top right corner. At the bottom right are 'RESET' and 'ACCEPT' buttons.

Set up the Network

Set an specific network.

On the home page, select **Set-up > Network**.

You can set the network as follows:

- **Obtain IP:** You can select whether Manual or Automatic.
- **Ip address, Subnet, and Default gateway** are enabled only when the **Obtain IP** option is set to Manual.
- **Hostname:** Hostname setting.

The screenshot shows the 'Network' configuration page for a Honeywell NGSP gas detector. The left sidebar contains a menu with options: Review, Set-up (selected), General, Gas/Alarm, Relays, 4-20 mA, Faults, Network (highlighted), Time/Date, Advance, Calibration, and Test. The main content area is titled 'Network' and includes a 'Summary & Print' icon. Under the 'Set-up' section, the 'Obtain IP' option is set to 'Manual'. The 'IP address' is configured as 169.254.60.47, the 'Subnet' as 255.255.255.0, and the 'Default gateway' as 169.254.60.1. The 'Hostname' is set to 'MIDAS-M'. At the bottom right, there are 'RESET' and 'ACCEPT' buttons.

Field	Value
Obtain IP	Manual
IP address	169.254.60.47
Subnet	255.255.255.0
Default gateway	169.254.60.1
Hostname	MIDAS-M

Set up the Time and Date

Set the time and date.

On the home page, select **Set-up > Time/Date**.

You can set the Time and Date in a 24 hour format and synchronize it with the computer.

The screenshot shows the Honeywell NGSP gas detector web interface. On the left is a dark sidebar with a menu: Review, Set-up (highlighted), General, Gas/Alarm, Relays, 4-20 mA, Faults, Network, Time/Date (highlighted), Advance, Calibration, and Test. The main content area is titled 'Time/Date' and includes a 'Summary & Print' icon. Under the 'Set-up' heading, a note states: 'Time does not automatically update with regional daylight savings changes.' Below this, a red warning message reads: 'Time is entered in 24 hour format.' The time and date are set using input fields: Year (2019), Month (10), Day (14), Hour (14), and Minute (31). Under 'Date format', three radio buttons are shown: YYYY/MM/DD, DD/MM/YYYY, and MM/DD/YYYY (which is selected). At the bottom right are three buttons: 'SYNCHRONIZE WITH COMPUTER', 'CHANGE', and 'RESET'.

Turn Channels on/OFF

You can turn ON/OFF an individual channel.

On the home page, select **Set-up > Advance**.

Honeywell NGSP gas detector

Review ▾

Set-up ▴

General

Gas/Alarm

Relays

4-20 mA

Faults

Network

Time/Date

Advance

Calibration ▾

Test ▾

Advance

Summary & Print

Set-up

Sensor on/off configuration

Channel1 ☒ On ☐ Off

Channel2 ☒ On ☐ Off

Channel3 ☒ On ☐ Off

Channel4 ☒ On ☐ Off

RESET ACCEPT

Zero Calibration

Perform Zero calibration for a specific channel or all at once.

1. On the home page, select **Calibration > Zero Calibration**.
2. Select the channel or channels to zero calibrate, and then click **Start**.

Honeywell NGSP gas detector

Review ▾

Set-up ▾

Calibration ▴

Zero Calibration

Span Calibration

Flow Calibration

4-20 mA Calibration

Test ▾

Zero Calibration

Summary & Print

Setup for zero calibration

Select channel to proceed zero calibrate

☒ Channel1 ☐ Channel2 ☐ Channel3 ☐ Channel4 ☐ All

START

3. Wait until the gas reading is stable, and then click **Accept**.

Zero gas calibration

×

Press Next when gas reading is stable

Channel1

Gas conc

0.00 mA

Stable

CANCEL

ACCEPT

Zero gas calibration

×

Press Next when gas reading is stable

Channel1

Gas conc

0.00 mA

Stable

Channel2

Gas conc

-

-

Channel3

Gas conc

-

-

Channel4

Gas conc

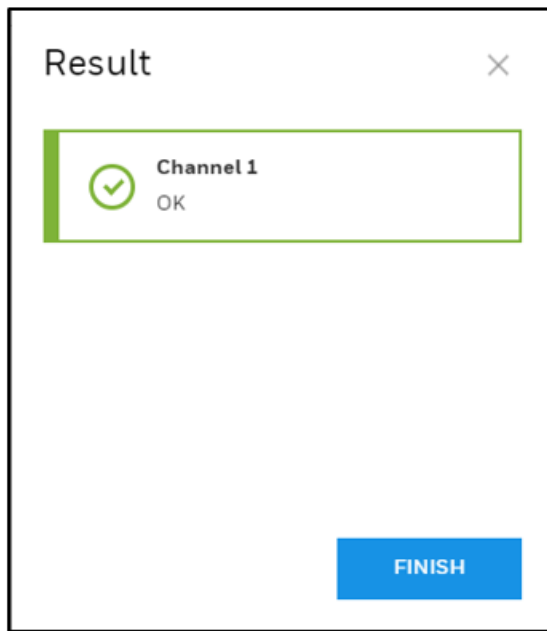
-

-

CANCEL

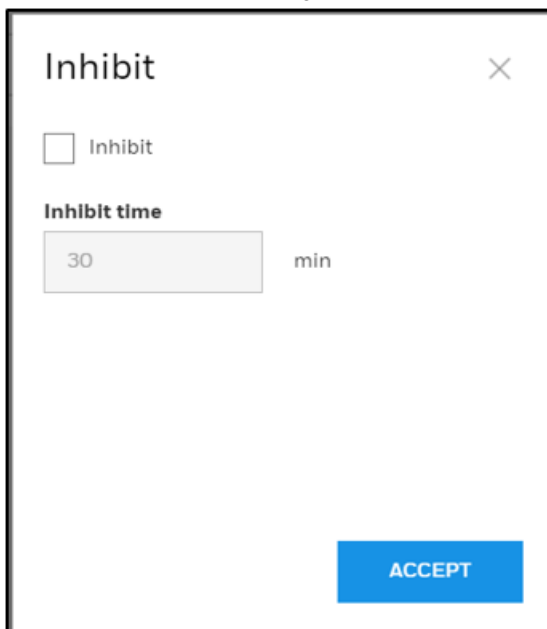
ACCEPT

4. On the Result window the status of zero calibration is displayed. Click **Finish**.



The screenshot shows a window titled "Result" with a close button (X) in the top right corner. Inside the window, there is a green-bordered box containing a green checkmark icon, the text "Channel 1", and "OK" below it. At the bottom right of the window is a blue button labeled "FINISH".

5. In the Inhibit window you have the option to check Inhibit, and then click **Accept**.



The screenshot shows a window titled "Inhibit" with a close button (X) in the top right corner. Inside the window, there is a checkbox labeled "Inhibit". Below this is a section labeled "Inhibit time" with a text input field containing the number "30" and the unit "min" to its right. At the bottom right of the window is a blue button labeled "ACCEPT".

Span Calibration

Perform an span calibration for each channel of the device.

1. On the home page, select **Calibration > Span Calibration**.
2. On the Span calibration page, you can select the gas, the gas type, and the target concentration.
3. Click **Start** and then follow screen instructions.

Honeywell

NGSP gas detector

Review

Set-up

Calibration

Zero Calibration

Span Calibration

Flow Calibration

4-20 mA Calibration

Test

Span Calibration

Summary & Print

Setup for span calibration

Select channel to proceed span calibrate

Channel1

Channel2

Channel3

Channel4

Select gas

CO

Gas type

Humidify

Dry

Target concentration

50.0

ppm

START

Flow Calibration

Calibrate the amount of gas entering the device.

On the home page, select **Calibration > Flow Calibration**, and then follow screen instructions. You can adjust setpoints, and sync setpoints.

Flow Calibration

Do you want to proceed with flow calibration?

YES NO

Adjust setpoint 1

Setpoint 1 Adjustment by using Increase/Decrease button.

Setpoint 1 target

600 cc

^ v

Next

Sync setpoint 1

Setpoint 1

600 cc

Next

Sync setpoint 2

Setpoint 2

700 cc

Next

Calibrate 4-20 mA

Perform a mA calibration for each channel of the device.

1. On the home page, select **Calibration > 4-20mA Calibration**.
2. Select a channel, and then click **Start**.
3. Increase or decrease the mA value, and then click **Next** to Zero calibration (4 mA).

Adjust zero

×

Zero Adjustment by using Increase/Decrease button.

Zero target

4.00

mA

^

∨

Next

4. Increase or decrease the mA value, and then click **Next** to calibrate the span (20mA).

Adjust span

Span Adjustment by using Increase/Decrease button.

Span target

mA

^

▼

FINISH

Perform a Bump Test

Perform a Bump Test on diverse channels.

1. On the home page, select **Test > Bump Test**.
2. Click Enter Bump Test Mode.
3. Optional Step. You can click **Stop Bump Test** to cancel the procedure.

Honeywell NGSP gas detector

Review

Set-up

Calibration

Test

Bump Test

Alarm/Fault Simulation

Inhibit

4-20 mA Test

Bump Test

Channel 1
CO(User)

0.00 ppm

Flow
589 cc/min

Channel 2
NH3

0.00 ppm

Flow
589 cc/min

Channel 3
O2

20.9 %VOL

Flow
589 cc/min

Channel 4
HCl

0.00 ppm

Flow
589 cc/min

Perform test
The inhibit icon is also displayed indicating that no alarm outputs will be generated during this process.
Apply the bump test gas and the display will show the measured gas concentration.
Note: Unit must be in normal monitoring mode.

STOP BUMP TEST MODE

Perform an Alarm or Fault Simulation

Simulate function for testing alarm faults.

1. On the home page, select **Test > Alarm/Fault Simulation**.
2. Select a Channel.
3. Select whether the simulation should be on an Alarm or a Instrument fault.
4. Click **Accept**.

The screenshot displays the Honeywell NGSP gas detector's web interface. On the left is a dark sidebar menu with options: Review, Set-up, Calibration, Test (highlighted), Bump Test, Alarm/Fault Simulation (sub-highlighted), Inhibit, and 4-20 mA Test. The main content area is titled 'Alarm/Fault Simulation' and includes a 'Summary & Print' icon in the top right. Below the title, a red warning message states: 'Proceeding with Alarm or Fault simulation may cause unexpected alarm activation.' A 'Channel' dropdown menu is set to 'Channel1'. Under the 'Simulation' section, there are five radio button options: 'No simulation' (selected), 'Simulate alarm 1', 'Simulate alarm 2', 'Simulate instrument fault', and 'Simulate maintenance fault'. A blue 'ACCEPT' button is located at the bottom right of the interface.

Perform Inhibit Test

Enable or disable the inhibit state.

1. On the home page, select **Test > Inhibit**.
2. From the **Inhibit level** option, select No inhibit or Inhibit.
3. Select the **Inhibit timeout** in minutes.
4. Click **Accept**.

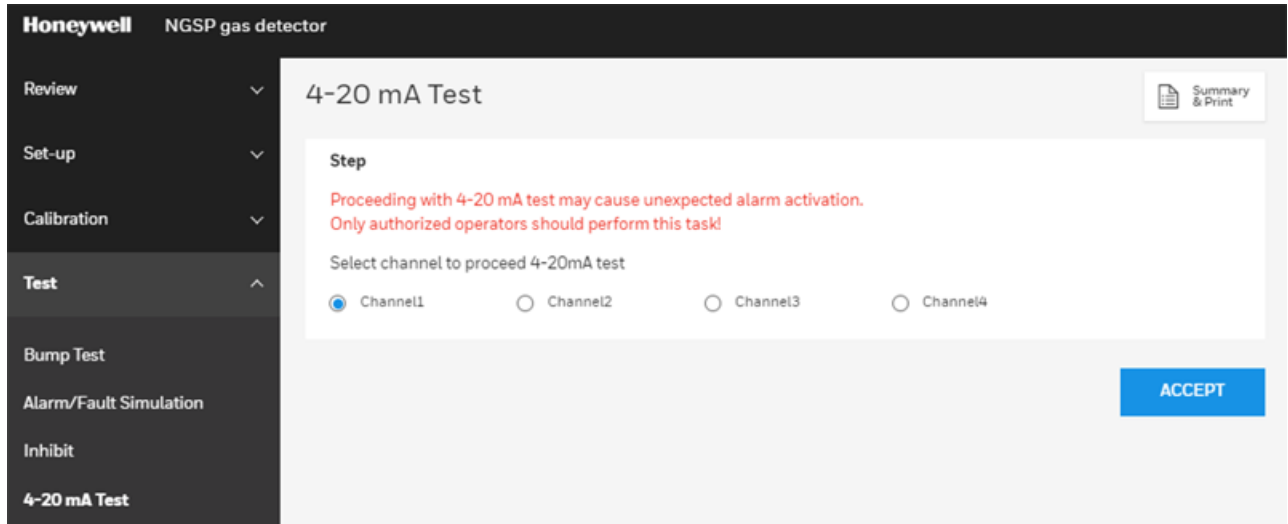
The screenshot displays the Honeywell NGSP gas detector web interface. On the left is a dark sidebar menu with options: Review, Set-up, Calibration, Test (highlighted), Bump Test, Alarm/Fault Simulation, Inhibit, and 4-20 mA Test. The main content area is titled 'Inhibit' and includes a 'Summary & Print' button in the top right. Below the title, a 'Perform test' section contains a red warning message: 'NGSP continues to monitors gases in this test mode.' The 'Inhibit level' section has two radio button options: 'No inhibit' (selected) and 'Inhibit'. The 'Inhibit timeout' section features a text input field with the value '30' and a 'min' unit label. At the bottom right of the main area is a blue 'ACCEPT' button.

Perform a 4-20mA test

Test the mA value on a channel.

Note: The 4-20 MA test may cause unexpected alarm activation. Only authorized operators should perform this task.

1. On the home page, select **Test > 4-20 mA Test**.
2. Select a Channel.
3. Click **Accept**.



The screenshot shows the Honeywell NGSP gas detector interface. On the left is a dark sidebar menu with options: Review, Set-up, Calibration, Test (highlighted), Bump Test, Alarm/Fault Simulation, Inhibit, and 4-20 mA Test. The main area is titled '4-20 mA Test' and contains a 'Step' section with a red warning: 'Proceeding with 4-20 mA test may cause unexpected alarm activation. Only authorized operators should perform this task'. Below this, it says 'Select channel to proceed 4-20mA test' and shows four radio button options: Channel1 (selected), Channel2, Channel3, and Channel4. A blue 'ACCEPT' button is in the bottom right corner. A 'Summary & Print' link is in the top right corner.

4. Increase or decrease the mA value.
5. Click **Close**.

4-20 mA analog output test

×

Simulation Adjustment by using increase/decrease button.

Simulation

4.0

mA

^

∨

CLOSE

4 Maintenance

Midas-M is a fully serviceable product designed with modular components that can be readily replaced by trained service personnel so as to minimize the time that the gas detector is not available.

External in-line air filters should be replaced every three months or more frequently if the system is sampling in environments that have high levels of particulate matter or very acidic / wet atmospheres. Similarly, the internal particulate filter should be replaced every two years or more frequently if the sample lines are prone to heavy contamination. Refer to the following table.

Every sensor cartridge is shipped with a 2 years warranty. All sensor cartridges are factory calibrated to traceable national standards before shipment to the end user.

Note that testing or calibrating with the wrong (incorrect, out of date, non-traceable) calibration gases, calibration equipment, methods or operating conditions can actually damage the sensor cartridge's lifetime and alter the calibration adversely. Only qualified calibration technicians should attempt to calibrate the Midas-M gas detector.

The internal pump module is designed to operate for a minimum of 24 months and it is recommended that this pump module (part number MM-PM) be replaced every 2 years.

Recommended maintenance schedule

Component	Frequency
Pump	2 years or as needed
Internal filter	2 years or as needed
External Sample Line Filter	Part Number 780248, every 3-6 months
	Part Number 1991-0147, every 3-6 months
	Part Number 1830-0055, every 3-6 months
Leak Check	Leak Check every 6 months or after replacing any component.
Bump Test	6 months
Flow Calibration	Flow Calibrate after pump, internal and external filter replacement.

See the Gas Table for the correct filter requirement for your application.

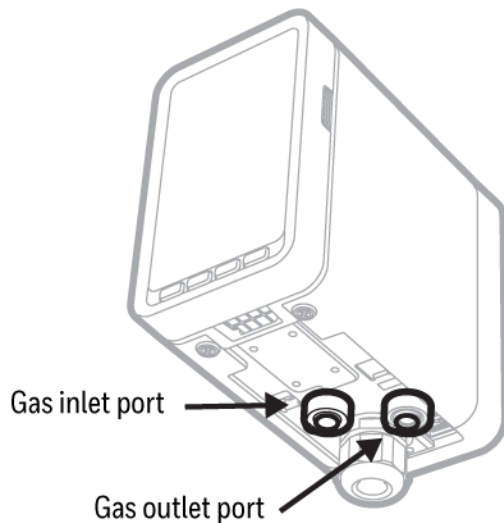
NOTE

Every sensor cartridge warranty: Typically, two years depending on the sensor type. The Bias battery will last only about six months. After replacement, allow at least a day for the cartridge to reach equilibrium.

System Leak Check

When performing a leak check, the Midas-M must be placed in Inhibit mode to prevent false concentrations or faults to be activated when plugging the Sample or Exhaust Lines. Example: O₂ (oxygen) – plugging of the ports causes the O₂ levels within the Midas-M flow path to be depleted as the sample becomes stagnant. The result is the concentration levels begin to fall and trigger the alarms for the O₂ depletion.

1. Place the Midas-M into Inhibit.
2. Plug the Inlet Sample line.



3. The flow meter indicators will begin to drop and ultimately disappear within seconds.
4. Continue to keep the port plugged until the Midas-M reports an “F₄₁” (Flow Fail) – approximate time to fault is 24 seconds.
5. Remove the plug.
6. Allow 15 seconds or so to allow the Midas-M flow to stabilize then clear the fault by pressing and holding ‘X’
7. Plug the Outlet Exhaust line.
8. The flow meter indicators will begin to drop and ultimately disappear within seconds.
9. Continue to keep the port plugged until the Midas-M reports an “F₄₁” (Flow Fail) – approximate time to fault is 24 seconds.
10. Remove the plug.

11. Allow 15 seconds or so to allow the Midas-M flow and concentrations to stabilize then clear the fault by pressing and holding 'X'
12. Return the unit to the Monitoring Mode.

5 Additional Information

Learn from about strategic information related to the Honeywell Midas®-M Detector.

EU Directive 2012/19/EU: Waste Electrical and Electronic Equipment (WEEE)



This symbol indicates that the product must not be disposed of as general industrial or domestic waste. This product should be disposed of through suitable WEEE disposal facilities. For more information about disposal of this product, contact your local authority, distributor or the manufacturer.

Troubleshooting and Fault Diagnosis

General troubleshooting guide and specific fault code table for the Midas-M gas detector.

Fault code descriptions

Number	Date	Data Field	Condition	Recovery
M02	Simulated M fault	N/A	User enters simulation mode	Reset simulated fault
M10	Baseline warning	Concentration without Deadband	Cell baseline has drifted.	Check for background gas concentration, temperature, or humidity fluctuations. Perform zero calibration. Replace cell.
M11	Over Range	Peak concentration	Large concentration of gas has been detected. The Midas-M requires an independent confirmation that the gas hazard is gone.	Supply clean air to the Midas-M and clear the fault.
M20	Calibration expired	Days until fault	The user-specified calibration interval has elapsed.	Perform zero and span calibrations. Increase span calibration period. (zero days = disabled)
M21	Cell expires soon	Days until fault	Cell is old and will expire soon.	Replace the cartridge or the cell with a new.
M40	Temperature Near Limit	Temperature (C)	Temperature is within 5 C of limit.	Check installation environment.
M41	Flow Low	Flow (cc/min)	Midas-M is no longer able to regulate the flow.	Check filters and pump.
F01	LED indicator error	N/A	LED indicator has no response.	Replace the LCD
F02	Simulated F Fault	N/A	User enters simulation mode	Reset simulated fault

Number	Date	Data Field	Condition	Recovery
F10	Baseline Fault	Concentration without Deadband	Cell baseline has drifted.	Check for background gas concentration, temperature or humidity fluctuations. Perform zero calibration. Replace cell.
F20	Calibration Expired too long.	N/A	Too long since last calibration.	Replace or calibrate the Cell.
F21	Cell expired.	N/A	Cell is too old.	Replace the cartridge or cell.
F40	Temperature Limits Exceeded	Temperature (C)	Temperature is out of limit.	Check installation environment.
F41	Flow Fail	Flow (cc/min)	Flow < 70% of nominal for 24 seconds	Check filters and pump.
F42	Pump Memory error	N/A	Pump memory has no response or corrupted data	Reboot
F43	Pump absent	N/A	There is no pump	Device Power off and then insert the pump
F44	LIT test fail	N/A	LIT test failed	Check a flow path
F50	Cell Failure	N/A	Reflex test fail of toxic cell	Replace cell
F51	Cell comm. Failure	N/A	It has failed to communicate with IR cell	Replace IR cell
F52	Cell memory error	N/A	Cell memory has no response or corrupted data	Replace cell
F53	Cell Memory Invalid	N/A	Checksum error.	Replace cell
F54	Cell IR	N/A	Cell IR voltage is out of	Replace cell

Number	Date	Data Field	Condition	Recovery
	voltage error		range	
F60	The absent cartridge	N/A	No communications.	Reset cartridge. Replace cartridge.
F61	Cartridge wrong type	Cell ID	Cartridge has one or more empty channel	Replace cartridge.
F62	No valid cell	N/A	Cartridge has no valid cell	Replace cartridge.
F63	Cartridge Memory Invalid	N/A	Checksum error.	Reboot
F64	Cartridge app Memory Invalid	N/A	Checksum error.	Replace cartridge.
F65	Cartridge 3.3V error	Voltage	Cartridge 3.3V is out of range	Replace cartridge.
F66	Cartridge 5V error	Voltage	Cartridge 5V is out of range	Replace cartridge.
F67	Cartridge app failed	N/A	Cannot start cartridge app	Update the latest cartridge app
F80	Transmitter NOR flash error	N/A	No communication	Replace the transmitter
F81	Transmitter memory invalid	N/A	Checksum error.	Reboot
F82	Transmitter memory comm. Error	N/A	Communication failed	Reboot
F83	Transmitter app memory invalid	N/A	Checksum error.	Replace transmitter or update the latest version
F84	Transmitter 3.3V error	Voltage	Transmitter 3.3V is out of range	Replace Transmitter

Number	Date	Data Field	Condition	Recovery
F85	Transmitter 24V error	Voltage	Transmitter 24V is out of range	Replace Transmitter
F86	Transmitter 5V error	Voltage	Transmitter 5V is out of range	Replace Transmitter

Specifications

Specifications	
Transmitter Dimension	
Size (unit with Cartridge)	"136 mm (H) X 83 mm (W) X 152 mm (D) (5.35 X 3.27 X 5.98 in)"
Weight - Transmitter	1.3 kg (2.87 lb)
Weight - Cartridge	0.17 ~ 0.22 kg (0.38 ~ 0.49 lb) dependent on sensor type
Optional Relay Dimension	
Size	"137 mm (H) X 84 mm (W) X 41 mm (D) (5.39 X 3.31 X 1.61 in)"
Weight	0.31 kg (0.68 lb)
Power Requirements	
Operating Voltage	24 VDC Nominal, -15 to +10% (20.4 to 26.4 VDC)
"Operating Voltage with Power over Ethernet (PoE)"	48 VDC PoE (IEEE 802.3af compliant)
Power Consumption	
Transmitter unit (normal condition) ¹	Typ. 5W
Transmitter unit (full load condition) ²	≤ 11.45W
Transmitter with Optional Relay	≤ 12.9 W
Outputs	
Visuals	"Alarm, power, fault LEDs, and LCD with all the gas readings and events. LEDs: Power (Green), Alarm 1 (Red), Alarm 2 (Red), Fault (Yellow)"
Relays in Transmitter	"Alarm1, Alarm2, Fault Relays (3) rated 1.0 A @ 30Vdc or 0.5A @ 125Vac Max 10uA @ 10mV minimum, configurable as normally open or closed, latched or unlatched"

Specifications	
Relays in Optional Relay	"8 relays for Alarm1 and Alarm2 of each channel and a relay for common fault rated 1.0 A @ 30Vdc or 0.5 A @ 125 Vac Max 10uA @ 10mV minimum, configurable as normally open or closed, latched or unlatched"
Analog	3 wire sink, 3 wire source, or 4 wire fully isolated; 0 to 21 mA for each channel
Digital Communications	Modbus / TCP Ethernet / Power over Ethernet (PoE)
Certification and Specification	
	"CE marked Meets EN 50270:2015+AC:2016 and EN61000-6-4:2007+A1 ETL approved UL 61010-1:2012 Ed.3 IEEE 802.3af-2003"
Performance	
	Refer to Individual sensor datasheets
Transport System	
Flow Rate	600 mL/min
Transport Time	2 to 25 seconds maximum
Sample Line Tubing	3.18 mm ID X 6.35 mm OD (0.125 X 0.25 in)
Tubing Length	Up to 30 m (100 ft) with FEP tubing
Exhaust Line Tubing	4.76 mm ID X 6.35 mm OD (0.188 X 0.25 in)
Exhaust Length	Up to 30 m (100 ft)
Ambient Point	In line air filter required
Operating Temperature	
	0°C to +40°C (32°F to 104°F)
Wiring Requirement	
4-20mA	2 wire, 14 AWG maximum
Digital	CAT5 Cable or equivalent: RJ45 connector
Gas Concentration Display and Interface	
Instrument	"4-digit alphanumeric display with separate units, concentration bar graph for each channel and other icon driven indicators 4 button interface keypad"

Specifications	
Remote	Internet browser access via Ethernet
Installation Details	
Mounting	Wall mounted using pre-drilled holes on chassis. Options for DIN rail.
Material	"Cover: Plastic (Polycarbonate) Chassis/Mounting Bracket: Zinc plated steel Red frame : Liquid coated Aluminum "
Warranty	
Transmitter unit	1 year
Sensor cartridge	2 years

¹ Normal condition: (1) No gas alarm, (2) Without tube and pressure/vacuum

² Full load condition: (1) All 4 channels gas alarm are on, (2) Maximum tubing length and pressure/vacuum on the inlet/exhaust line

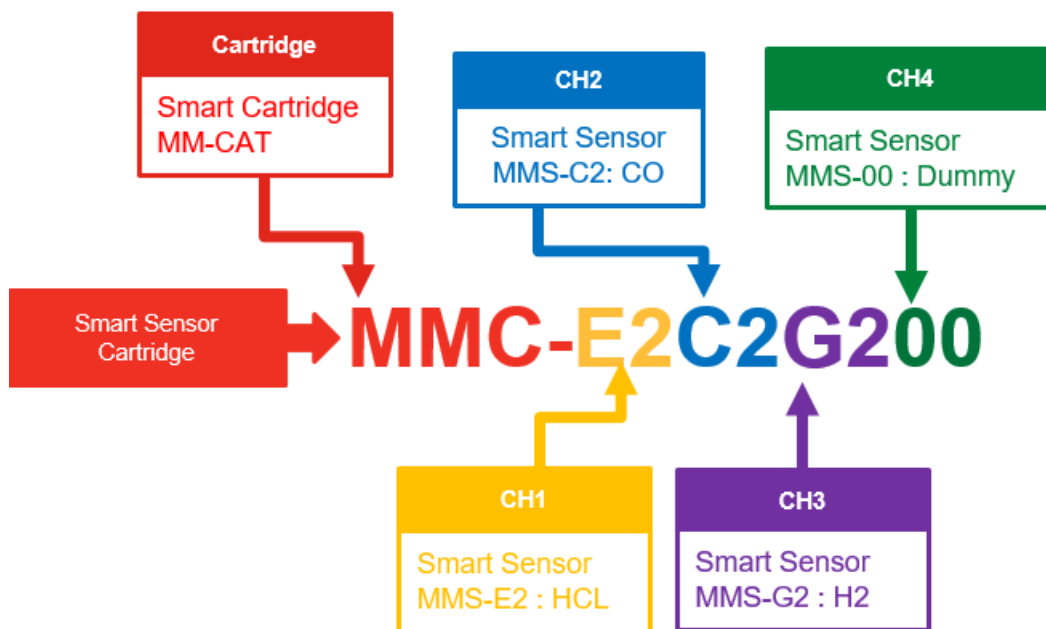
Ordering

This section contains details of how to order complete Midas-M detector and sensor cartridge kits, separate transmitters and sensor cartridges as well as spares and accessories.

Transmitter

Part Number	Description
MMT-01	Midas-M 4-20mA Extractive Transmitter
MMT-02	Midas-M TCP/IP Modbus Extractive Transmitter
MMT-T01	Midas-M 4-20mA Extractive Transmitter with Tube
MMT-T02	Midas-M TCP/IP Modbus Extractive Transmitter with Tube
MMT-B01	Midas-M 4-20mA Extractive Transmitter Bulk Package (6pcs)
MMT-B02	Midas-M TCP/IP Modbus Extractive Transmitter Bulk Package (6pcs)

Cartridge



Part Number	Description
MMC-xxxxxxx	Midas-M Sensor Cartridge with Smart Sensors

Smart Sensor	Code
Dummy	00
Hydrogen Chloride (HCl) 0 - 8ppm, 2 years	E2
Silane (SiH ₄) 0 -20 ppm, 2 years	X2
Hydrogen (H ₂) 0 - 1000ppm, 2 years	G2
Chlorine (Cl ₂) 0 - 2ppm, 2 years	L2
Ammonia (NH ₃) 0 - 100ppm, 2 years	A2
Carbon Monoxide (CO) 0 - 100ppm, 2 years	C2
Phosphine (PH ₃) 0 - 1200ppb, 2 years	R2
Ozone (O ₃) 0 - 0.4ppm, 2 years	U2
Oxygen (O ₂) 0 - 25%v/v, 3 years	D2
Sulphur Dioxide (SO ₂) 0 - 8ppm, 2 years	S2
Hydrogen Flouride (HF) 0 - 12ppm, 2 years	Z2

Smart Sensor

Part number	Description
MMS-00	Midas-M Dummy Sensor
MMS-E2	Midas-M Hydrogen Chloride (HCl) 0 - 8ppm, 2 years
MMS-X2	Midas-M Silane (SiH ₄) 0 -20 ppm, 2 years
MMS-G2	Midas-M Hydrogen (H ₂) 0 - 1000ppm, 2 years
MMS-L2	Midas-M Chlorine (Cl ₂) 0 - 2ppm, 2 years
MMS-A2	Midas-M Ammonia (NH ₃) 0 - 100ppm, 2 years
MMS-C2	Midas-M Carbon Monoxide (CO) 0 - 100ppm, 2 years
MMS-R2	Midas-M Phosphine (PH ₃) 0 - 1200ppb, 2 years
MMS-U2	Midas-M Ozone (O ₃) 0 - 0.4ppm, 2 years
MMS-D2	Midas-M Oxygen (O ₂) 0 - 25%v/v, 3 years
MMS-S2	Midas-M Sulphur Dioxide (SO ₂) 0 - 8ppm, 2 years
MMS-Z2	Midas-M Hydrogen Flouride (HF) 0 - 12ppm, 2 years

Accessories

Modules / Replacements

Part number	Description
MM-REL	Midas-M Relay Module
MM-PM	Midas-M Pump Module
MM-FIL	Midas-M Filter Module
MM-FRT	Midas-M Front Module
MM-B01	Midas-M 4-20mA Base Module
MM-B02	Midas-M TCP/IP Base Module
MM-M01	Midas-M 4-20mA Main Module
MM-M02	Midas-M TCP/IP Main Module
MM-CAT	Midas-M Cartridge wo Smart Sensors

Mounting Accessories	
Part number	Description
MIDAS-A-036	MIDAS DIN Rail Mounting Kit
0235-0128	Flexible Conduit 21" - length
0235-0163	Flexible Conduit 27" - length
MVIP3632-2A	2A 24VDC power supply in vented NEMA 4 enclosure
MVIP3632-5A	5A 24VDC power supply in vented NEMA 4 enclosure

Duct Sampling Adaptors	
Part number	Description
1283K1090	Duct Adapter for 1/4" O.D. tubing for 4-16" round ducts
0235-0095	Union Fitting 1/4" tube, polypropylene

Tubing and External Sample Line Filters	
Part number	Description
780248	End of Line Particulate Filter, Disposable
1991-0147	End of Line Particulate Filter for Corrosive Gases, Disposable This disposable filter provides protection against particulate build up in the sample line when monitoring for Corrosive Gases.
0235-0095	Union Fitting - Use to connect disposable filter to end of line

1830-0055	End of Line Particulate Filter for Corrosive Gases, Reusable This reusable filter housing provides protection against particulate build up in the sample line when monitoring for Corrosive Gases. Replaceable filter element (P/N 0235-1072) purchased separately
0235-1072	Replacement "Corrosive" Filter Elements (pk 100) For use in 1830-0055 filter housing
102599	Tubing Teflon® FEP 1/4" OD x 1/8" ID (Sample inlet) (Price per Foot)
1991-0136	Tubing Teflon® FEP 1/4" OD x 1/8" ID (Sample Inlet) (100' continuous length)
100440	Tubing Polypropylene 1/4" OD X 3/16" ID (Exhaust) (Price per Foot)
1991-0137	Tubing Polypropylene 1/4" OD X 3/16" ID (Exhaust) (100' continuous length)

Gas Table

Gas Name	Formula	Range	Resolution	Default Alarm 1	Default Alarm 2	Sensor Part Number	Maximum Sensor Warm-up Time(minutes)	Flow Rate (cc/min)	Calibration				Bump Test			Recommended Maximum Sample Line Length(m)	End of line filter
									Calibration Gas	Conc.	Output Equiv. (ppm)	Exp Time (sec)	Recommended Bump Test Gas	Conc (ppm)	Max Time (sec)		
Hydrogen Chloride	HCl	0 - 8 ppm	0.05 ppm	1 ppm	2 ppm	MMS-E2	20	600	HCl	4	4	300	HCl	4-6	180	5 ¹	1991-0147
Boron Trichloride	BCl3	0 - 8 ppm	0.05 ppm	1 ppm	2 ppm	MMS-E2	20	600	HCl	4	4	300	HCl	4-6	180	5 ¹	1991-0147
Dichlorosilane	SiH2Cl2	0 - 8 ppm	0.05 ppm	1 ppm	2 ppm	MMS-E2	20	600	HCl	4	4	300	HCl	4-6	180	5 ¹	1991-0147
Hydrogen Bromide	HBr	0 - 8 ppm	0.05 ppm	1 ppm	2 ppm	MMS-E2	20	600	HCl	4	4.5	300	HCl	4-6	180	5 ¹	1991-0147
Silane	SiH4	0 - 20 ppm	0.01 ppm	2.5 ppm	5 ppm	MMS-X2	20	600	SiH4	10	10	300	SiH4	10	180	30	"780248, 1991-0147 or 1830-0055""780248, 1991-0147 or 1830-0055"
Disilane	Si2H6	0 - 20 ppm	0.05 ppm	1 ppm	2 ppm	MMS-E2	20	600	SiH4	4	4	300	SiH4	10	180	10	"780248, 1991-0147 or 1830-0055"
Hydrogen (ppm)	H2	0 - 1000 ppm	5 ppm	125 ppm	250 ppm	MMS-G2	10	600	H2	500	500	300	H2	500	180	30	"780248, 1991-0147 or 1830-0055"
Chlorine	Cl2	0 - 2 ppm	0.01 ppm	0.25 ppm	0.5 ppm	MMS-L2	10	600	Cl2	1	1	300	Cl2	1	180	10	1991-0147 or 1830-0055
Ammonia	NH3	0 - 100 ppm	0.5 ppm	12.5 ppm	25 ppm	MMS-A2	10	600	NH3	50	50	300	NH3	50	180	10	"780248, 1991-0147 or 1830-0055"
Carbon Monoxide	CO	0 - 100 ppm	0.5 ppm	12.5 ppm	25 ppm	MMS-C2	10	600	CO	50	50	300	CO	50	180	30	"780248, 1991-0147 or 1830-0055"
Phosphine	PH3	0 - 1200 ppb	5 ppb	150 ppb	300 ppb	MMS-R2	20	600	PH3	600 ppb	600 ppb	300	PH3	600	180	30	"780248, 1991-0147 or 1830-0055"
Ozone	O3	0 - 0.4 ppm	0.002 ppm	0.05 ppm	0.1 ppm	MMS-U2	10	600	O3	0.2	0.2	300	NO2 ²	1	180	5	1830-0055
Oxygen Proficiency & Deficiency	O2	0 - 25 %vol	0.1 %vol	23.5 %vol	19.5 %vol	MMS-D2	30	600	O2	Air	20.9 %vol	300	O2	Air	180	30	"780248, 1991-0147 or 1830-0055"
Sulfur Dioxide	SO2	0 - 8 ppm	0.05 ppm	1 ppm	2 ppm	MMS-S2	10	600	SO2	4	4	300	SO2	4	180	30	1991-0147 or 1830-0055
Hydrogen	HF	0 - 12	0.05 ppm	1.5	3 pmm	MMS-	20	600	HF	6	6	300	Cl2	10	180	5 ¹	1991-0147 or

Gas Name	Formula	Range	Resolution	Default Alarm 1	Default Alarm 2	Sensor Part Number	Maximum Sensor Warm-up Time(minutes)	Flow Rate (cc/min)	Calibration				Bump Test			Recommended Maximum Sample Line Length(m)	End of line filter
									Calibration Gas	Conc.	Output Equiv. (ppm)	Exp Time (sec)	Recommended Bump Test Gas	Conc (ppm)	Max Time (sec)		
Fluoride		ppm		ppm		Z2											1830-0055
Boron Trifluoride	BF3	0 - 8 ppm	0.05 ppm	1 ppm	2 ppm	MMS-Z2	20	600	HF	4	5.2	300	Cl2	5	180	5 ¹	1991-0147 or 1830-0055
Tungsten Hexafluoride	WF6	0 - 12 ppm	0.05 ppm	1.5 ppm	3 ppm	MMS-Z2	20	600	HF	6	6	300	Cl2	10	180	5 ¹	1991-0147 or 1830-0055
	¹ Recommended to keep the sample lines as short as possible where the RH condition at the sample point is high (above %50 RH); there will be some sample loss due to absorption onto the sample line. ² An ozone generator can be used instead of 1 ppm NO2.																

Bump Testing Notes:

As an alternative, the actual target gas can always be used instead of a cross-sensitive gas.

Higher concentrations than the recommended ones can be used if necessary, but extra time may be needed for the reading to recover to zero.

IMPORTANT: this should only be done once to avoid the danger of poisoning the sensor.

Combination Index

	HCl (MMS-E2)	SiH4 (MMS-X2)	H2 (MMS-G2)	Cl2 (MMS-L2)	NH3 (MMS-A2)	CO (MMS-C2)	PH3 (MMS-R2)	O3 (MMS-U2)	O2 (MMS-D2)	SO2 (MMS-S2)	HF H (MMS-Z2)
HCl (MMS-E2)					NO						
SiH4 (MMS-X2)											
H2 (MMS-G2)											
Cl2 (MMS-L2)					NO						
NH3 (MMS-A2)	NO			NO							NO
CO (MMS-C2)											
PH3 (MMS-R2)											
O3 (MMS-U2)										NO	
O2 (MMS-D2)											
SO2 (MMS-S2)								NO			
HF H (MMS-Z2)					NO						

Reflex

Midas-M uses patented Honeywell Analytics technology to continuously monitor the health check status of specific electrochemical cells and alert the user if a cell enters a variety of fault conditions (such as open or short circuit etc.) which would leave the cell unable to detect gas and raise an appropriate alarm signal.

REFLEX® overcomes this unseen failure mode by applying periodically a special electronic pulse to the cell and reviewing the 'echo' from the cell as it responds to the applied signal. If the cell is deteriorating within certain pre-set limits based on the received signals then Midas-M will decrease the REFLEX sampling interval in order to establish the actual viability of the cell. Within a relatively short time, Midas-M will be able to alert the user via fault codes that the electrochemical cell is likely to be requiring replacement and is possibly unable to correctly detect gas.

REFLEX is not required for pellistors, IR, oxygen electrochemical cell or bias electrochemical cell as these sensor cartridges provide alternative electronic means to indicate open circuits and other sensor cartridge damage issues.

A Modbus/TCP Interface

The Midas-M gas detector can report concentration information in a variety of formats including relay contact closure, an analog 4-20 mA loop, Ethernet/ IP/HTML web pages and via the Modbus/TCP networking protocol. This section defines the format of data in Modbus/TCP registers. More information about Modbus/TCP can be obtained from www.modbus.org.

The Midas-M is a Modbus/TCP “server” as defined in the MODBUS Application Protocol Specification V1.0 . It supports command 03 (“read holding registers”) for registers 40001 to 40122 as listed in the following table.

The Midas-M reports floating-point concentration numbers in little-endian or Intel format. This is scaled in units of ppm for gasses which have display units of ppm or ppb. For other display units the concentration is scaled directly in display units. This applies to registers Gas Concentration and Alarm Threshold.

The Midas-M fills 122 Modbus/TCP holding registers as listed in Table 1. The Monitoring Status register is a concise summary of Midas-M status. The other registers provide more complete information.

Midas-M Modbus Register Map

Midas-M Modbus Register Map : Register 40001 is mapped with base address (zero)

(If channel is disabled, channel information is 0).

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
Holding Register						
Device Status						
40001	Reserved for future expansion	R		2		

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
40002	Monitoring Status	R	u16	2		bit 0 : Warmup bit 1 : Inhibit Mode bit 2 : Alarm/Fault simulation bit 3 : 4-20mA calibration mode bit 4 : 4-20mA test mode bit 5 : Flow calibration mode bit 6 : LIT calibration mode (Reserved) bit 7 : LIT Enabled (Reserved) bit 8 : Gas calibration mode bit 9 : Gas bump test mode bit 10 : Alarm bit 11 : Fault bit 12 ~ 15 : for future expansion
40003	Alarm State	R	u16	2		bit 0 : Ch1 Alarm 1 active bit 1 : Ch1 Alarm 2 active bit 2 : Ch2 Alarm 1 active bit 3 : Ch2 Alarm 2 active bit 4 : Ch3 Alarm 1 active bit 5 : Ch3 Alarm 2 active bit 6 : Ch4 Alarm 1 active bit 7 : Ch4 Alarm 2 active bit 8~15 : for future expansion
40004	Fault State	R	u16	2		bit 0 : Ch1 fault active bit 1 : Ch2 fault active bit 2 : Ch3 fault active bit 3 : Ch4 fault active bit 4 : Device fault active bit 5~15 : for future expansion
40005	Top Fault	R	u16	2	Number of most important active fault	

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
40006	Channel Enabled State	R	u16	2	This is the bit representation information of channel enabled. If dummy cell is attached or channel is disabled bit value is set.	bit 0 : Ch1 Dummy cell bit 1 : Ch1 Disabled bit 2 : Ch1 Reserved for further expansion bit 3 : Ch2 Dummy cell bit 4 : Ch2 Disabled bit 5 : Ch2 Reserved for further expansion bit 6 : Ch3 Dummy cell bit 7 : Ch3 Disabled bit 8 : Ch3 Reserved for further expansion bit 9 : Ch4 Dummy cell bit 10 : Ch4 Disabled bit 11 : Ch4 Reserved for further expansion bit 12~15 : for future expansion
40007 to 40008	Gas Concentration Ch1	R	f32	4	Value in float	
40009 to 40010	Gas Concentration Ch2	R	f32	4	Value in float	
40011 to 40012	Gas Concentration Ch3	R	f32	4	Value in float	
40013 to 40014	Gas Concentration Ch4	R	f32	4	Value in float	
40015 to 40016	Gas Concentration Ch1	R	u32	4	Value in fixed point	Conversion equation: ppm value = Value * 1/10 DECP
40017 to 40018	Gas Concentration Ch2	R	u32	4	Value in fixed point	Conversion equation: ppm value = Value * 1/10 DECP
40019 to 40020	Gas Concentration Ch3	R	u32	4	Value in fixed point	Conversion equation: ppm value = Value * 1/10 DECP
40021 to 40022	Gas Concentration Ch4	R	u32	4	Value in fixed point	Conversion equation: ppm value = Value * 1/10 DECP

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
40023	Decimal Point Indicator	R	u16	2	Decimal point indicator of Display Gas Concentration	bit 0 ~ 2 : Ch1 Decimal point indicator (0, 1, 2, 3) bit 3 ~ 5 : Ch2 Decimal point indicator (0, 1, 2, 3) bit 6 ~ 8 : Ch3 Decimal point indicator (0, 1, 2, 3) bit 9 ~ 11 : Ch4 Decimal point indicator (0, 1, 2, 3) bit 12~15 : for future expansion
40024	Heat beat Counter	R	u16	2	System time in seconds. Range of this value is from 0 to 59	
40025 to 40026	Device Maintenance Fault	R	u32	4	This is the bit order representation of the maintenance fault status. If any fault exists this will take a value in each bit. if any maintenance fault exists, this will take a value zero. The meaning of bit will be described as fault code in more detail	bit 0 : Simulated Maintenance Fault (m02) bit 1 : Flow Warning (m41) bit 2~31 : for future expansion

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
40027 to 40028	Device Instrument Fault	R	u32	4	This is the bit order representation of the instrument fault status. If any fault exists this will take a value in each bit. if any instrument fault exists, this will take a value zero. The meaning of bit will be described as fault code in more detail	bit 0 : LCD Fault (F01) bit 1 : Simulated Instrument Fault (F02) bit 2 : Reserved for future expansion bit 3 : Flow Fail (F41) bit 4 : Pump EEPROM (F42) bit 5 : Pump Absent (F43) bit 6 : LIT Fail (F44) (Reserved) bit 7 : Cartridge Absent (F60) bit 8 : Catridge Wrong Type (F61) bit 9 : Cartridge No valid cell (F62) bit 10 : Catridge EEPROM (F63) bit 11 : Catridge Flash (F64) bit 12 : Catridge Power 3.3v (F65) bit 13 : Catridge Power 5v (F66) bit 14 : Catridge Application Fail (F67) bit 15 : Transmitter Nor Flash (F80) bit 16 : Transmitter EEPROM Corrupted (F81) bit 17 : Transmitter EEPROM Com Fail (F82) bit 18 : Transmitter Flash (F83) bit 19 : Transmitter Power 3.3v (F84) bit 20 : Transmitter Power 24v (F85) bit 21 : Transmitter Power 5v (F86) bit 22~31 : for future expansion
40029	Relay Status	R	u16	2	The meaning of bit : Value 0 is De-energized Value 1 is Energized	bit 0 : Internal Relay 1 energized bit 1 : Internal Relay 2 energized bit 2 : Internal Relay 3 energized bit 3 : for future expansion bit 4 : External Relay Fitted bit 5 : External Relay 1 energized (Ch1 alarm1) bit 6 : External Relay 2 energized (Ch1 alarm2) bit 7 : External Relay 3 energized (Ch2 alarm1) bit 8 : External Relay 4 energized (Ch2 alarm2) bit 9 : External Relay 5 energized (Any fault) bit 10 : External Relay 6 energized (Ch3 alarm1) bit 11 : External Relay 7 energized (Ch3 alarm2) bit 12 : External Relay 8 energized (Ch4 alarm1) bit 13 : External Relay 9 energized (Ch4 alarm2) bit 14~15 : for future expansion
40030	Temperature in Celsius (oC)	R	s16	2	Temperature	

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
40031	Flow rate in cc/minute	R	u16	2	Current pump flow	
40032 ~ 40037	Reserved for future expansion	R	u16	12		
Channel 1 Information						
40038	Gas Selection	R	u16	2		bit 0 - 7 : Gas ID bit 8 - 15 : Cell ID
40039 to 40040	Alarm1 threshold	R/W	f32	4		
40041 to 40042	Alarm2 threshold	R/W	f32	4		
40043	Measuring units	R	u16	2	Concentration units	0 : N/A 1 : mA 2 : %LEL 3 : % volume 4 : ppb 5 : ppm 6 : mg/m3 7 ~ 15: reserved
40044	Alarm Status	R	u16	2		bit 0 : Alarm 1 active bit 1 : Alarm 2 active
40045	Fault Status	R	u16	2	This is the bit order representation of the channel fault status. If any fault exists this will take a value in each bit.	bit 0 : Baseline Warning (m10) bit 1 : Overrange Warning (m11) bit 2 : Calibration Expire Soon (m20) bit 3 : Cell Expire Soon (m21) bit 4 : Temperature Warning (m40) bit 5 : Baseline Fault (F10) bit 6 : Calibration Expired (F20) bit 7 : Cell Expired (F21) bit 8 : Temperature Exceeded (F40) bit 9 : Cell Failure Refelex (F50) bit 10 : Cell Failure IR Comm. (F51) bit 11 : Cell EEPROM Read Error (F52) bit 12 : Cell EEPROM Corrupted (F53) bit 13 : Cell Failure IR Volt. (F54) bit 14~15 : : for future expansion

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
40046	Cell life remaining days	R	s16	2	Days of cell remains	
40047 ~ 40049	Reserved for future expansion	R		6		
Channel 2 Information						
40050	Gas Selection	R	u16	2		bit 0 - 7 : Gas ID bit 8 - 15 : Cell ID
40051 to 40052	Alarm1 threshold	R/W	f32	4		
40053 to 40054	Alarm2 threshold	R/W	f32	4		
40055	Measuring units	R	u16	2	Concentration units	0 : N/A 1 : mA 2 : %LEL 3 : % volume 4 : ppb 5 : ppm 6 : mg/m3 7 ~ 15: reserved
40056	Alarm Status	R	u16	2		bit 0 : Alarm 1 active bit 1 : Alarm 2 active
40057	Fault Status	R	u16	2	This is the bit order representation of the channel fault status. If any fault exists this will take a value in each bit.	bit 0 : Baseline Warning (m10) bit 1 : Overrange Warning (m11) bit 2 : Calibration Expire Soon (m20) bit 3 : Cell Expire Soon (m21) bit 4 : Temperature Warning (m40) bit 5 : Baseline Fault (F10) bit 6 : Calibration Expired (F20) bit 7 : Cell Expired (F21) bit 8 : Temperature Exceeded (F40) bit 9 : Cell Failure Refelex (F50) bit 10 : Cell Failure IR Comm. (F51) bit 11 : Cell EEPROM Read Error (F52) bit 12 : Cell EEPROM Corrupted (F53) bit 13 : Cell Failure IR Volt. (F54) bit 14~15 : : for future expansion

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
40058	Cell life remaining days	R	s16	2	Days of cell remains	
40059 ~ 40061	Reserved for future expansion	R		6		
Channel 3 Information						
40062	Gas Selection	R	u16	2		bit 0 - 7 : Gas ID bit 8 - 15 : Cell ID
40063 to 40064	Alarm1 threshold	R/W	f32	4		
40065 to 40066	Alarm2 threshold	R/W	f32	4		
40067	Measuring units	R	u16	2	Concentration units	0 : N/A 1 : mA 2 : %LEL 3 : % volume 4 : ppb 5 : ppm 6 : mg/m3 7 ~ 15: reserved
40068	Alarm Status	R	u16	2		bit 0 : Alarm 1 active bit 1 : Alarm 2 active
40069	Fault Status	R	u16	2	This is the bit order representation of the channel fault status. If any fault exists this will take a value in each bit.	bit 0 : Baseline Warning (m10) bit 1 : Overrange Warning (m11) bit 2 : Calibration Expire Soon (m20) bit 3 : Cell Expire Soon (m21) bit 4 : Temperature Warning (m40) bit 5 : Baseline Fault (F10) bit 6 : Calibration Expired (F20) bit 7 : Cell Expired (F21) bit 8 : Temperature Exceeded (F40) bit 9 : Cell Failure Refelex (F50) bit 10 : Cell Failure IR Comm. (F51) bit 11 : Cell EEPROM Read Error (F52) bit 12 : Cell EEPROM Corrupted (F53) bit 13 : Cell Failure IR Volt. (F54) bit 14~15 : : for future expansion

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
40070	Cell life remaining days	R	s16	2	Days of cell remains	
40071 ~ 40073	Reserved for future expansion	R		6		
Channel 4 Information						
40074	Gas Selection	R	u16	2		bit 0 - 7 : Gas ID bit 8 - 15 : Cell ID
40075 to 40076	Alarm1 threshold	R/W	f32	4		
40077 to 40078	Alarm2 threshold	R/W	f32	4		
40079	Measuring units	R	u16	2	Concentration units	0 : N/A 1 : mA 2 : %LEL 3 : % volume 4 : ppb 5 : ppm 6 : mg/m3 7 ~ 15: reserved
40080	Alarm Status	R	u16	2		bit 0 : Alarm 1 active bit 1 : Alarm 2 active
40081	Fault Status	R	u16	2	This is the bit order representation of the channel fault status. If any fault exists this will take a value in each bit.	bit 0 : Baseline Warning (m10) bit 1 : Overrange Warning (m11) bit 2 : Calibration Expire Soon (m20) bit 3 : Cell Expire Soon (m21) bit 4 : Temperature Warning (m40) bit 5 : Baseline Fault (F10) bit 6 : Calibration Expired (F20) bit 7 : Cell Expired (F21) bit 8 : Temperature Exceeded (F40) bit 9 : Cell Failure Refelex (F50) bit 10 : Cell Failure IR Comm. (F51) bit 11 : Cell EEPROM Read Error (F52) bit 12 : Cell EEPROM Corrupted (F53) bit 13 : Cell Failure IR Volt. (F54) bit 14~15 : : for future expansion

ModBus Register Number	Information	R/W	Data Type	Data Size (Byte)	Description	Note
40082	Cell life remaining days	R	s16	2	Days of cell remains	
40083 ~ 40085	Reserved for future expansion	R		6		
Device Information						
40086 to 40095	Transmitter serial number	R	char [20]	20		ASCII code format
40096 to 40105	Cartridge serial number	R	char [20]	20		ASCII code format
40106	Time Value in Year	R/W	u16	2		
40107	Time Value in Month, Date	R/W	u16	2		bit 0 - 7 : Date bit 8 - 15 : Month
40108	Time Value in Hour, Minute	R/W	u16	2		bit 0 - 7 : Minute bit 8 - 15 : Hour
40109	Time Value in Seconds	R/W	u16	2		
40110	Firmware Version (Transmitter)	R	u16	2		bit 0 - 7 : Minor bit 8 - 15 : Major
40111	Firmware Version (Cartridge)	R	u16	2		bit 0 - 7 : Minor bit 8 - 15 : Major
40112 ~ 40121	Reserved for future expansion			20		
Write Command (Write command1 and command2 to execute)						
40122	Write Command 1	W	u16	2		0x015e : Reset Alarm & Fault 0x025e : Enter Inhibit (default 30min) 0x035e : Exit Inhibit
40123	Write Command 2	W	u16	2		Fixed value as 0x3626

Cell ID & Gas ID

Cell ID		Gas ID	
0	N/A	0	N/A
1	H2	1	H2
2	SiH4	2	SiH4
3	Cl2	3	Cl2
4	NH3 Low	4	NH3
5	NH3 High	5	HBr
6	HBr	6	HCl
7	HCl	7	CO
8	CO	8	PH3
9	PH3	9	BCl3
10	BCl3	10	HF
11	HF High	11	TEOS
12	TEOS	12	B2H6
13	B2H6	13	ClF3
14	ClF3	14	BF3
15	BF3	15	WF6
16	WF6	16	O3
17	O3	17	GeH4
18	GeH4	18	CH4
19	CH4	19	AsH3
20	AsH3	20	F2
21	F2	21	SiF4
22	SiF4	22	O2
23	O2	23	Si2H6
24	Si2H6	24	SO2
25	SO2	25	CO2
26	CO2	26	SiH2Cl2
27	SiH2Cl2	27	NO
28	NO	28	N2O
29	N2O	29	NO2
30	NO2	30	Br2
31	Br2	31	H2S
32	H2S High	32	POCl3
33	H2S Low	33	3MS

Cell ID			Gas ID	
34	POCl3		34	N2H4
35	3MS		35	TMB
36	N2H4		36	TMP
37	TMB		37	ETO
38	TMP		38	C3H8
39	ETO		39	ClO2
40	C3H8		40	HCN
41	ClO2		41	SF4
42	HCN		42	CH3COOH
43	SF4		43	COCl2
44	CH3COOH		44	HMDS
45	COCl2		45	H2Se
46	HMDS			
47	H2Se			
48	HF Low			
1234	Dummy Cell			

Fault Code

Fault Code ID	Description
00	No Fault
01	M02 - Simulated M fault
02	M10 - Baseline Warning
03	M11 - Over Range
04	M20 - Calibration Expired
05	M21 - Cell Expires Soon
06	M40 - Temperature Near Limit
07	M41 - Flow Low
08	F01 - LED indicator error
09	F02 - Simulated F Fault
10	F10 - Baseline Fault
11	F20 - Calibration Expired too long
12	F21 - Cell Expired

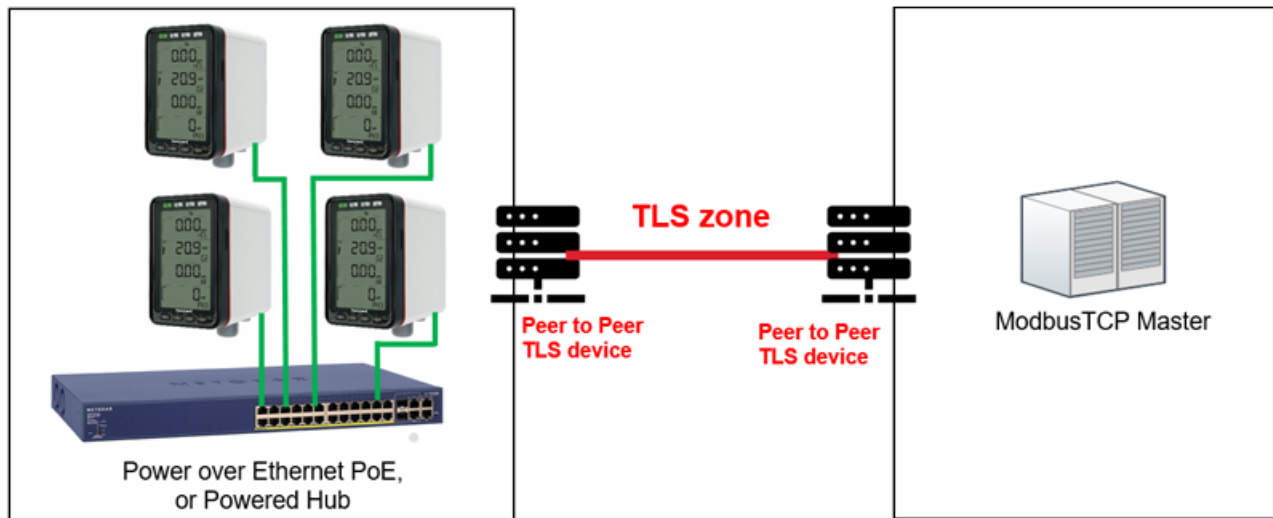
Fault Code ID	Description
13	F40 - Temperature Limits Exceeded
14	F41 - Flow Fail
15	F42 - Pump Memory error
16	F43 - Pump absent
17	F44 - LIT test fail
18	F50 - Cell Failure
19	F51 - Cell comm. Failure
20	F52 - Cell memory error
21	F53 - Cell Memory Invalid
22	F54 - Cell IR voltage error
23	F60 - The cartridge absent
24	F61 - Cartridge wrong type
25	F62 - No valid cell
26	F63 - Cartridge Memory Invalid
27	F64 - Cartridge app Memory Invalid
28	F65 - Cartridge 3.3V error
29	F66 - Cartridge 5V error
30	F67 - Cartridge app failed
31	F80 - Transmitter NOR flash error
32	F81 - Transmitter memory invalid
33	F82 - Transmitter memory comm. Error
34	F83 - Transmitter app memory invalid
35	F84 - Transmitter 3.3V error
36	F85 - Transmitter 24V error
37	F86 - Transmitter 5V error

Security

Midas-M is shipped from the factory with security disabled. It is recommended to enable the security function for safe use of the device. The security function can only be enabled through the **Set up > Security** menu of the local UI and requires at least 8 of passwords. If the security function is enabled, the web server can be accessed through HTTPS. And it is recommended to clear the browser cache to access the web server through HTTP after security is disabled.

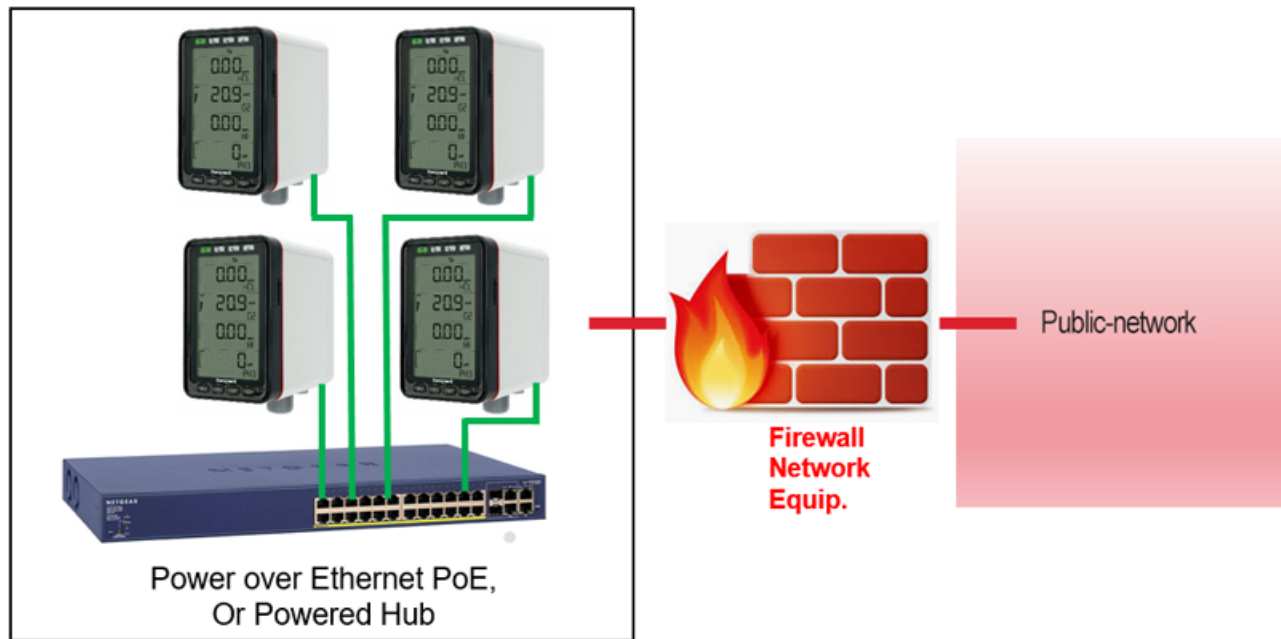
Modbus TCP

The MODBUS protocol does not have any authentication and integrity checking function. So the bump-in-the wire solution is recommended using a network equipment with SSL VPN Firewall function to protect the Midas-M from external attacks.



DOS attack

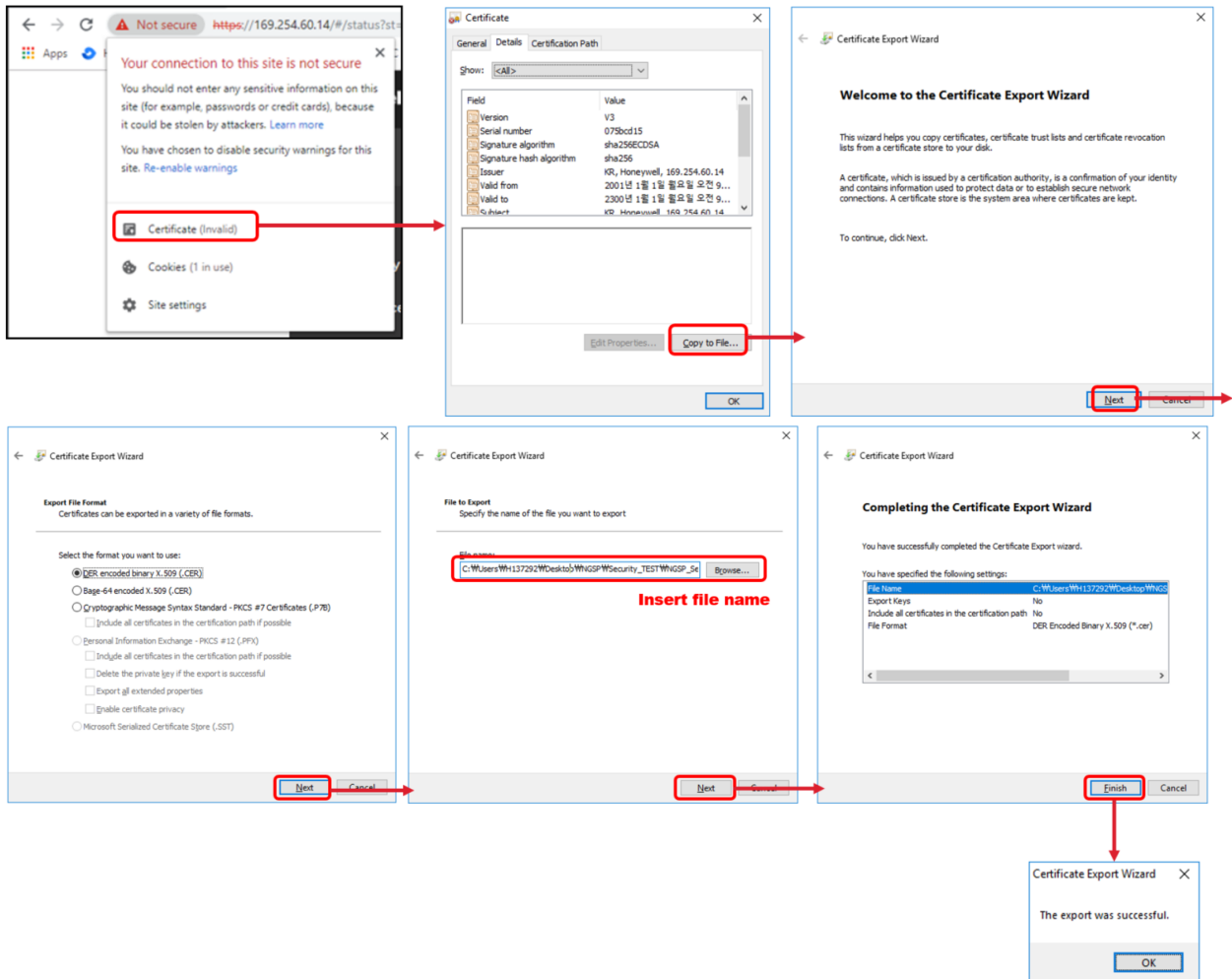
The web application may not work due to DoS attacks. The Midas device is even needed to restart for the web application to work properly. So the bump-in-the wire solution is recommended using a network firewall hardware solution that can detect and block DoS attacks.



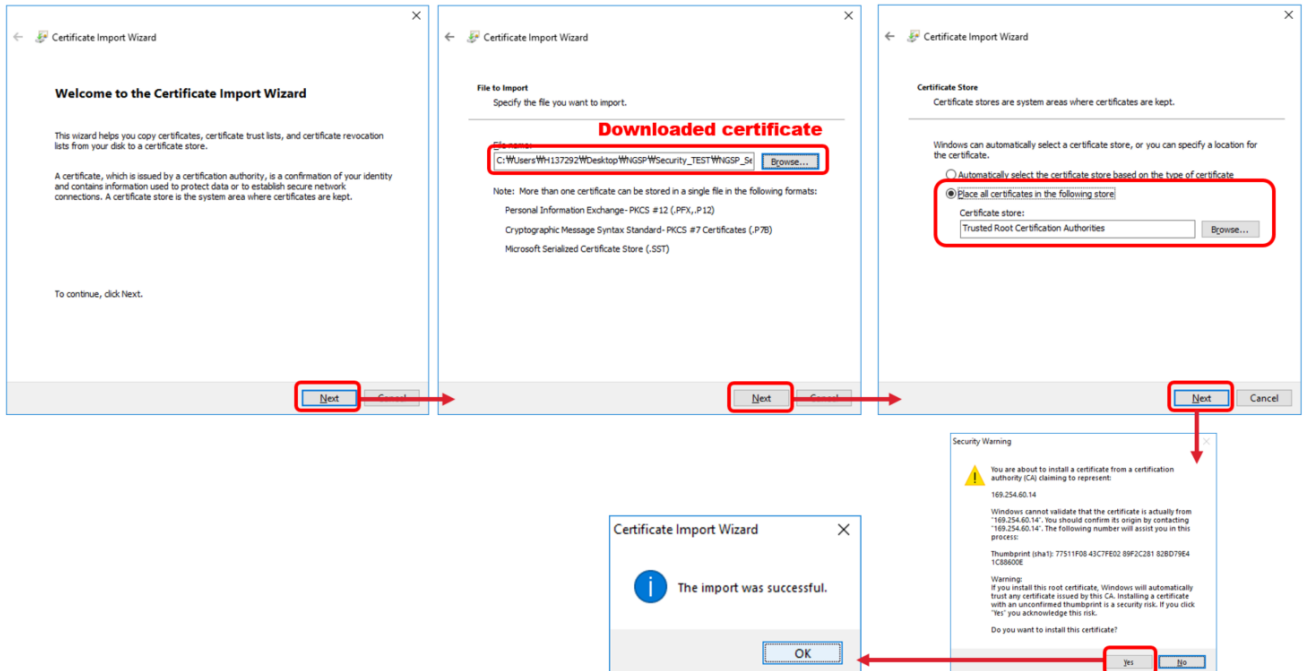
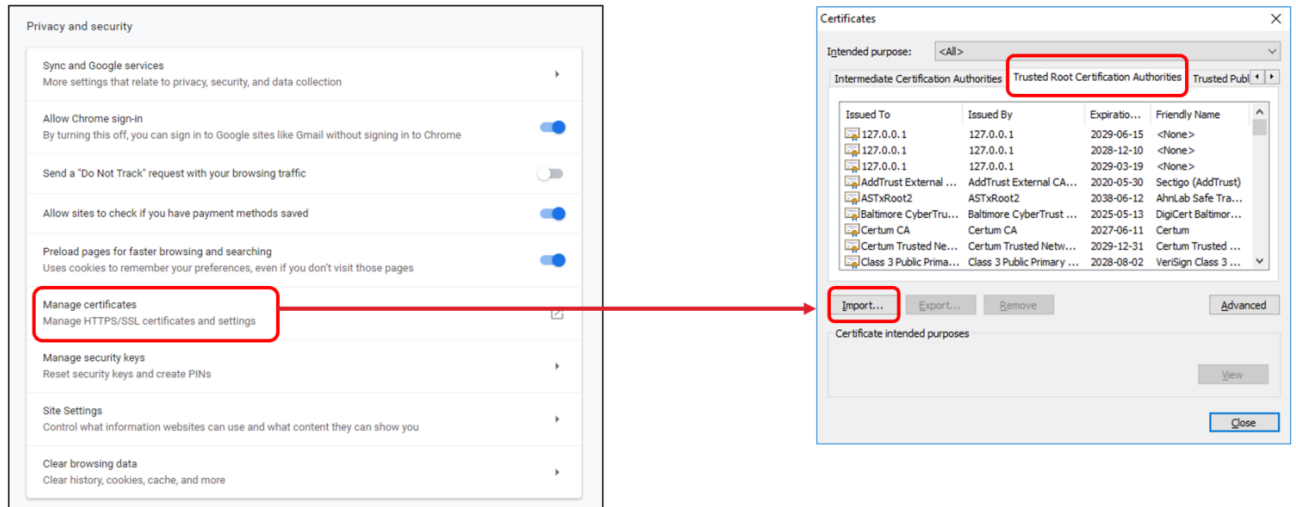
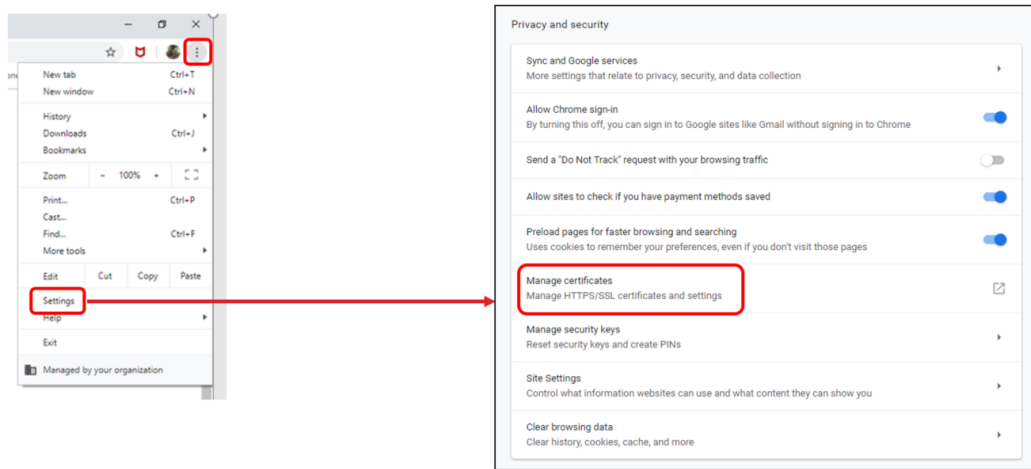
Install Web Server Certificate in Google Chrome

How to install a web sever certificate in a Chrome web browser, when the security function is enabled.

1. Open Chrome browser window and type `https://xxx.xxx.xxx.xxx` (device address) as the URL, and then press **ENTER** to connect to the device. A "Connection to this site is not secure" message is displayed.
2. Click **Certificate** to download the certificate and follow onscreen instructions.



3. On the Chrome main page, click the three dots (Advanced) button and select **Settings > Manage certificates** and then follow onscreen instructions as follows to set the certificate.

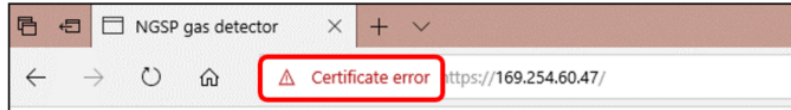


4. Close and re-open the Chrome Web browser, and then access to your device's address <https://xxx.xxx.xxx.xxx> . A "Connection is secure" message is displayed. The certificate should be reinstalled when the IP address is changed

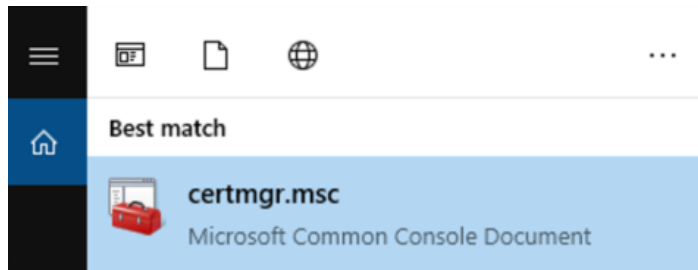
Install Web Server Certificate in MS Browsers

How to install a web sever certificate in Microsoft Internet Explorer and Edger, when the security function is enabled.

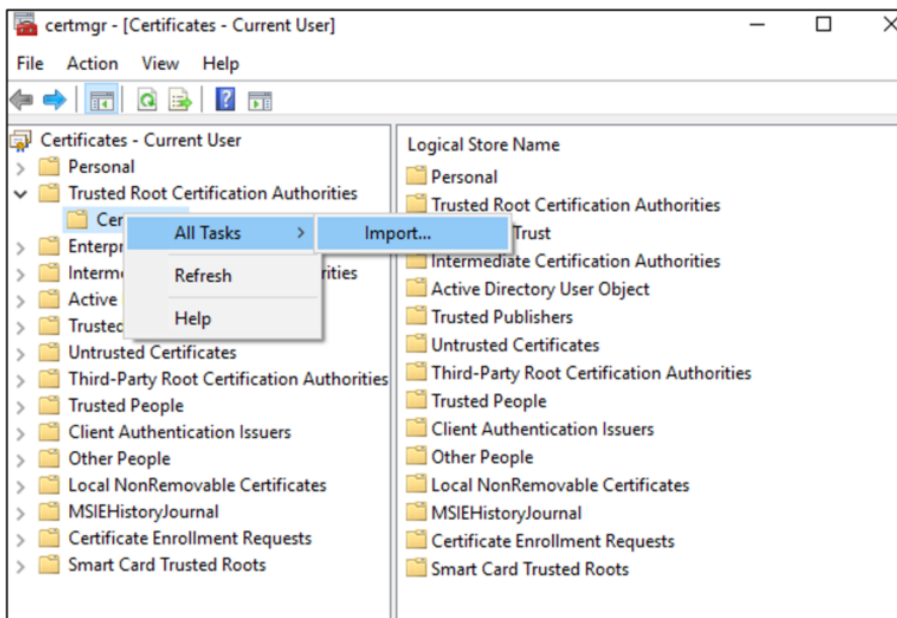
1. Open browser window and access <https://xxx.xxx.xxx.xxx> (device address) in your browser. Click “Certificate error” text. The Certificate Information window is displayed.



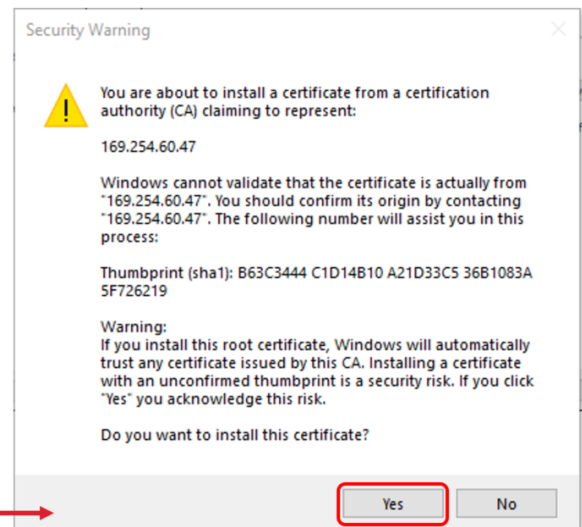
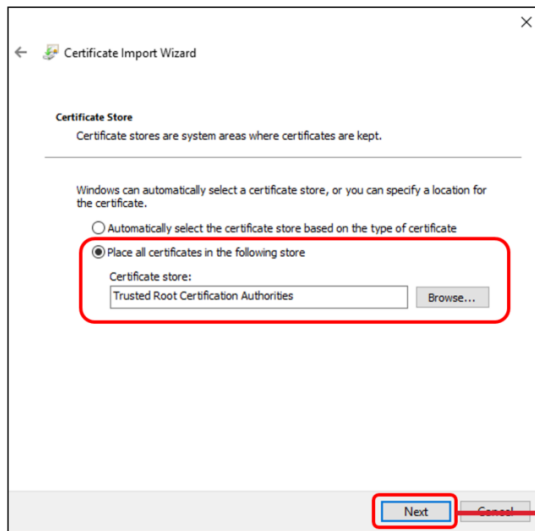
2. Click **Export to File** and then save the certificate in your PC or device.
3. On your computer locate and run Certificate Manager **certmgr.msc**



4. On the Certificate Manager window, expand **Trusted Root Certification Authorities** and right click on **Certificates**. Select **All tasks > Import...**



5. Follow the Certificate Import Wizard onscreen instructions.



The certificate should be reinstalled when the IP address is changed

Warranty

All products are designed and manufactured to the latest internationally recognized standards by Honeywell Analytics under a Quality Management System that is certified to ISO 9001.

As such, the Midas-M Transmitter (including the pump) is warranted under proper use, to the original end- user purchaser, against any defects in materials or workmanship related failures for a **period of 12 months** from the date of first turn-on or 18 months from delivery from Honeywell Analytics to the customer, whichever is less. Separate warranty conditions apply to the sensor cartridges limited as indicated below. During this period, Honeywell Analytics will repair or replace defective parts on an exchange basis, F.O.B. to approved service centers on a global basis.

This warranty does not cover damage caused by accident, abuse, abnormal operating conditions or extreme poisoning of the sensor cartridge.

Defective equipment must be returned to Honeywell Analytics for repair. Before returning materials for repair or replacement, the Customer must obtain a Service Event Number (SE#) by contacting Honeywell Analytics Service in advance; include a detailed report stating the nature of the defect and ship the equipment prepaid to Honeywell Analytics' factory. If no detail report is included, Honeywell Analytics reserves the right to charge an investigative fee (prices available upon request) before any repair or replacement is performed. Returned goods must detail the Service Event Number (SE#) clearly on the package.

Service in the field or at the customer's premises is not covered under these warranty terms. Time and travel expenses for on-site warranty services will be charged at Honeywell Analytics' normal billing rates.

Contact your Honeywell Analytics representative for information on available Service Contracts.

Honeywell Analytics shall not be liable for any loss or damage whatsoever or howsoever occasioned which may be a direct or indirect result of the use or operation of the Contract Goods by the Buyer or any Party.

This warranty covers the gas detector and parts sold to the Buyer only by authorized distributors, dealers and representatives as appointed by Honeywell Analytics. This warranty does not cover defects attributable to improper installation, repair by an unauthorized person or the use of unauthorized accessories/parts on the product. A warranty claim will only be accepted if a proof of purchase is submitted and all conditions obtained within this Warranty are met.

Honeywell Analytics reserves the right to validate any warranty claim prior to processing. Upon acceptance of a warranty claim, Honeywell Analytics will repair or replace the defective product free of charge. The initial warranty period is not extended by virtue of any works carried out there after.

Instruments which have been repaired or replaced during the warranty period are warranted for the remainder of the unexpired portion of the original warranty period.

Honeywell Analytics is released from all obligations under its warranty in the event repairs or modifications are made by persons other than its own authorized personnel, unless such work is

authorized in writing by Honeywell Analytics. The initial warranty period is not extended by virtue of any works carried out there under.

Honeywell Analytics reserves the right to change this policy at any time. Contact Honeywell Analytics for the most current warranty information.

Sensor Cartridge Warranty

Midas-M sensor cartridges with part numbers beginning in MIDAS-E carry a **24 month warranty** from switch-on/installation or up to 30 months from the date of shipment from Honeywell Analytics, whichever is less, provided this takes place before the “Activate Before” date on the cartridge. Pro-rata after “Activate Before”/ install by date.

- The oxygen sensor cartridge is guaranteed to operate satisfactorily for the period described above and will be replaced at no charge within that period only if it will not provide a correct reading after calibration by Authorized Service personnel. Physical or chemical damage, resulting from exposure to improper elements, is not covered.
- The toxic sensor cartridges are guaranteed to operate satisfactorily for the period described above. They will be replaced at no charge within that period only if they will not provide a correct reading after calibration by Authorized Service personnel, and only if the sensor cartridge membranes exhibit no physical or chemical damage resulting from exposure to improper substances.

Note that the Midas-M sensor cartridge stores an electronic history of each individual sensor cartridge’s manufacture, warranty and calibration activity that is accessible by Authorized Service personnel.

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