Belimo
Gas Monitors

Operating Manual

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BELIMO

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1.0 General description

Safety Note

This operating manual provides all of the required information to properly install, operate, and maintain a Belimo gas monitoring system. Installation, operation, and maintenance not in accordance with this manual can result in a hazardous situation or harm. Please read and understand this document before installing and servicing your own system.

General Description

Closely monitoring the quality of air that we breathe improves our well-being. It keeps us safe and comfortable, and saves us energy and money, by allowing for on demand ventilation as opposed to continuous or scheduled ventilation.

All Belimo gas monitors are factory calibrated and can monitor up to two different gases simultaneously. All monitors feature internal horn and strobe alarms, and CAN bus communication that allows for standalone operation. Select models provide direct control through analog outputs and relays, and integration into a building management system (BMS) through BACnet MS/TP. All monitors are wired daisy chain, allowing up to 32 devices per chain, and can be easily assigned to groups on-site to zone ventilation on the same network. Optional accessories include communication modules, relay units, sensor modules, calibration kits, external horn and strobe alarms, transformers, duct and splash proof enclosures, high low kits, and security screws. All Belimo branded gas monitoring products come with a five-year warranty and all sensor modules come with a one-year warranty.

1.1 Warnings

- All Belimo gas monitors are designed to monitor the air quality, or for gas leaks, where under normal conditions, the targeted gases are not present in high concentrations in the space.
- All devices must be powered down during installation, and prior to operation and maintenance.
- All Belimo gas monitoring systems must be installed, operated, and maintained by trained personnel in accordance with local codes. It is their responsibility to provide a safe and functional system.
- Installers must take caution for electrostatic discharge (ESD) during installation, service, and replacement of sensor modules.
- Install devices in locations that are easily serviceable, safely accessible, and protected from physical damage from cars, forklifts, equipment, etc.
- To prevent electrical interference, keep all devices and wiring away from mercury vapor lights, variable speed drives, and radio repeaters.
- To prevent mechanical interference, keep all devices and wiring away from electrical shock, continuous mechanical shock, and vibration.
- Substances to avoid include silicon vapor, paint fumes, and solvents, which can destroy or affect gas monitor performance.
- Do not paint any gas monitors or accessories.
- Protect gas monitors from continuous exposure to water with a splash proof enclosure.
- Use accessories and parts meeting or exceeding Belimo specifications.
- For methane, propane, and hydrogen applications, it is required to have more than one gas monitor installed in each room.
- For all applications it is recommended to have more than one gas monitor installed in each room to limit the chance of failures.
- All gas monitors require a warm up time to operate normally (See section 3.4).
- Belimo gas monitors and communication modules can be password protected.
- Belimo gas monitors are required to be calibrated annually or more frequently as specified. Upon calibration, it is highly recommended to verify proper operation of the gas monitoring system.
- Annual sensor module replacement is required when using catalytic technology to monitor for methane, propane, and hydrogen.
- Intended applications include residential, light commercial, and light industrial. Non intended applications include heavy commercial, heavy industrial, or hazardous locations.

WARNING: DO NOT PAINT THE MONITOR

1.2 Applications

- **Residential Applications**
  - Private homes
  - Apartment buildings
  - Condominium buildings
- **Light Commercial Applications**
  - Schools
  - Hospitals
  - Commercial buildings
  - Shopping malls
  - Service centers
  - Retail
  - Offices
  - Hotels
  - Warehouses
  - Data centers
- **Light Industrial Applications**
  - Food processing plants
  - Textile plants
  - Vehicle and machinery facilities
  - Warehouses
- **Vehicle Emissions (CO, NO_2)**
  - Enclosed parking garages
  - Loading docks
  - Automotive maintenance facilities
  - Truck maintenance facilities
  - Fire stations
  - Ambulance bays
  - Boiler rooms
  - Warehouses
- **Indoor Air Quality (CO_2)**
  - Classrooms (0...2000 ppm)
  - Conference rooms (0...2000 ppm)
  - Warehouses (0...2000 ppm)
  - Medical gas storage (0...2000 ppm)
  - Laboratories (0...5000 / 0...10000 ppm)
  - Breweries (0...5000 / 0...10000 ppm)
  - Indoor greenhouses (0...5000 / 0...10000 ppm)
  - Mechanical rooms (0...5000 / 0...10000 ppm)
  - Compressor rooms (0...5000 / 0...10000 ppm)
- **Combustible and Toxic Gases (NH_3, CH_4, C_3H_8, H_2, H_2S, CL_2, O_2 Leak, O_2 Depletion)**
  - Food processing plants (NH_3)
  - Cold storage (NH_3)
  - Ice rinks (NH_3)
  - Mechanical rooms (NH_3)
  - Compressor rooms (NH_3)
  - Landfills (NH_3, H_2S, CH_4)
  - Water and wastewater treatment plants (NH_3, H_2S, CL_2)
  - Recycle centers (NH_3, H_2S)
  - Natural gas leaks (CH_4)
  - Commercial kitchens (C_3H_8, CH_4)
  - Laboratories (C_3H_8, O_2 Leak O_2 Depletion)
  - Warehouses (C_3H_8, H_2)
  - Lead acid battery charging stations (H_2)
  - Swimming pool mechanical rooms (CL_2)
  - Medical gas storage (O_2 Leak, O_2 Depletion)
  - Welding facilities (O_2 Leak, O_2 Depletion)
- **Refrigerant Gas Leak Detection (Broadband Infrared)**
  - Mechanical rooms
  - Compressor rooms
  - Grocery stores

1.3 Features

- Gas monitors monitor for up to two different gases in each device.
- Stand alone operation through CAN bus
- Integration into a BMS system through BACnet MS/TP
- Three adjustable alarm levels
- Adjustable relays and analog outputs
- Internal horn and strobe alarms
- Factory calibrated and field replaceable sensor modules
- Programmable display and a four-button keypad
- Binary input for external switch or input (fan on or damper open)
- BACnet Testing Laboratories (BTL) listed smart sensor

1.4 Specifications

- Supply voltage:
  - 24 V AC, 50/60 Hz, 0.21 A, 5 VA
  - 24 V DC, 0.07 A, 3 W
- Operating temperature range:
  - -4ºF...+122ºF [-20ºC...+50ºC]: CO_2 (0…5000 / 10000 ppm), NH_3, H_2S, CL_2, O_2 Leak, O_2 Depletion
  - -4ºF...+104ºF [-20ºC...+40ºC]: CO, NO_2
  - 14ºF...+122ºF [-10ºC...+40ºC]: CH_4, C_3H_8, H_2
  - 32ºF...+122ºF [0ºC...+40ºC]: CO_2 (0…2000 ppm)
- Operating humidity range:
  - 15...90% RH continuous, 0...99% RH intermittent, non-condensing
- Operating altitude range:
  - Maximum altitude 6560 ft [2000 m]
  - Calibration verification is recommended above 2000 ft [610 m]
- Relays:
  - SPDT, 5A @ 125 V AC / 4A @ 24 V DC, non-inductive x1 relay available on all -A models. x2 relays available on all -B models. x4 relays available on relay units
- Analog outputs:
  - 4...20 mA or 2...10 V, user selectable (analog outputs available on -A models) x2 analog outputs available on all -A models.
- Agency listings:
  - Certified by CSA according to C22.2. No. 61010-1
  - Certified to UL according to UL 2075 and ULC-S588 for the following models: 22G02-5A, 22G02-5B, 22G02-5C, 22G14-5A, 22G14-5B, 22G14-5C, 22G0214-5A, 22G0214-5B, 22G0214-5C
- Housings:
  - Flame resistant polycarbonate ABS plastic enclosure rated to UL94 5 VA and NEMA 2 / IP44
  - For indoor use
  - Pollution degree 2

1.5 User Interface

- Home screen shows gas types, gas concentrations, and alarm level statuses
- Over 77 different programmable settings
- 4 button keypad for programming and calibration
- Optional password protection
- Red LED alarm level indicators for alarm level 1 and 2
- High intensity white LED strobe and horn alarm (80 dB @ 1 meter) for alarm level 3

2.0 Model selection guide

Gas Monitors

22G	xx	yy	-5	..
	Gas Type Identification Number, Top Sensor	Gas Type Identification Number, Bottom Sensor		Model of Gas Monitor

22Gxxyy-5A
- CAN bus
- BACnet MS/TP
- 1 relay
- 2 analog outputs

22Gxxyy-5B
- CAN bus
- BACnet MS/TP
- 2 relays

22Gxxyy-5C
- CAN bus

Communication Modules

C	-22G	-5	..
			Model of Communication Module

C-22G-5A
- CAN bus
- BACnet MS/TP
- 1 relay
- 2 analog outputs

C-22G-5B
- CAN bus
- BACnet MS/TP
- 2 relays

C-22G-5C
- CAN bus

Relay Units

C	-22G	-50
		Relay Unit

C-22G-50

- CAN bus
- 4 relays

Sensor Modules

R	-G	xx
		Gas Type Identification Number

Miscellaneous Accessories

A	-22G	-A	xx
			Accessory Identification Number

APPLICATION	GAS TYPE	ABBREVIATION	GAS TYPE IDENTIFICATION NUMBER	MEASURING RANGE
Vehicle Emissions	Carbon Monoxide	CO	02	0...250 ppm
		CO Null H_2	03	0...250 ppm
	Nitrogen Dioxide	NO_2	14	0...10 ppm
Indoor Air Quality	Carbon Dioxide	CO_2	15-003	0...2000 ppm
			15-005	0...5000 ppm
			15-006	0...10000 ppm
Combustible and Toxic Gases	Ammonia	NH_3	04	0...250 ppm
	Methane	CH_4	05	0...50% LEL
	Propane	C_3H_8	06	0...50% LEL
	Hydrogen	H_2	08	0...50% LEL
	Hydrogen Sulfide	H_2S	16	0...50 ppm
	Chlorine	CL_2	17	0...10 ppm
	Oxygen Leak	O_2 Leak	22	0...50% O_2
	Oxygen Depletion	O_2 Depletion	23	0...50% O_2
	Argon	Ar (O_2 Depletion)	23	0...50% O_2
	Helium	He (O_2 Depletion)	23	0...50% O_2
	Nitrogen	N_2 (O_2 Depletion)	23	0...50% O_2
Refrigerant Gas Leak Detection	Infrared Broadband Refrigerant	IR Ref.	21	0...2000 ppm
	R11, R22, R23, R32, R123, R125, *R134A, R404A, R407A, R407C, R407F, R410A, R448A, R449A, R452A, R455A, R507, R513A, R1233zd, R1234yf, R1234ze			
	*Default			

ACCESSORY TYPE	GAS TYPE IDENTIFICATION NUMBER
Calibration kit (22G21-5C)	A-22G-A08
Splash proof enclosure	A-22G-A12
Duct mount enclosure	A-22G-A13
High low kit	A-22G-A14
External visual / strobe alarm	A-22G-A15
External audible / horn alarm	A-22G-A16
Calibration kit	A-22G-A22
Replacement calibration cap and hose	A-22G-A23
Security screws	A-22G-A24
Transformer 50 VA	A-22G-A50
Transformer 100 VA	A-22G-A100

3.0 Installation

3.1 Placement

Coverage area

All Belimo gas monitors sense gases through the principle of diffusion. Guidelines for the placement of diffusion type monitors are based on the reasonable delay for gas to get from the source to the monitor.

- For **air quality** monitoring (where the location of the target gas changes) the generally acceptable maximum radius of coverage is 50 feet (15 meters), and the area of coverage is 7800 square feet (700 square meters).
- For **leak detection** monitoring (where the location of the potential leak is known), it is best practice to place the gas monitor as close to the leak as possible. The generally acceptable maximum radius of coverage is 30 feet (10 meters), and the area of coverage is 2800 square feet (300 square meters).

The coverage area of all gas monitors does not extend beyond any obstruction that impedes the natural circulation of air. This includes walls, stairs, elevators, shelving with solid fill, tool chests, etc. The gas monitor must "see" the area of coverage; if not, additional gas monitors are required.

Mounting height (based on gas density relative to air)

1. For gases with a **lighter density to air:**
   Ammonia (NH_3), Methane (natural gas, CH_4), Hydrogen (H_2):
   Install at 1 to 3 feet (0.3 to 0.9 meters) from the ceiling
2. For gases with a **similar density to air:**
   Carbon monoxide (CO), Carbon dioxide (CO_2), Oxygen leak (O_2 leak), Oxygen depletion (O_2 dep.):
   Install at 3 to 7 feet (1 to 2 meters) from the floor.

   Nitrogen dioxide (NO_2): If diesel exhaust is **under** vehicles, or if the ceiling height is 15 feet or less, install at 3 to 7 feet (1 to 2 meters) from the floor.
   Nitrogen dioxide (NO_2): If diesel exhaust is **above** vehicles, or if the ceiling height is above 15 feet, install at half the ceiling height and above the vehicles.
3. For gases with a **heavier density to air:**
   Propane (C_3H_8), Hydrogen sulfide (H_2S), Chlorine (CL2), Refrigerants:
   Install at 1 to 2 feet (0.3 to 0.5 meters) from the floor.

For all types of gas monitors avoid drafts, obstacles, aerosols, and silicones and place them in the center of their area of coverage as much as possible. In all cases the gas monitors must be installed above obstructions to allow circulation of air. Example: maintenance garages in automobile dealerships where tool chests, worktables, and storage racks typically line all walls.

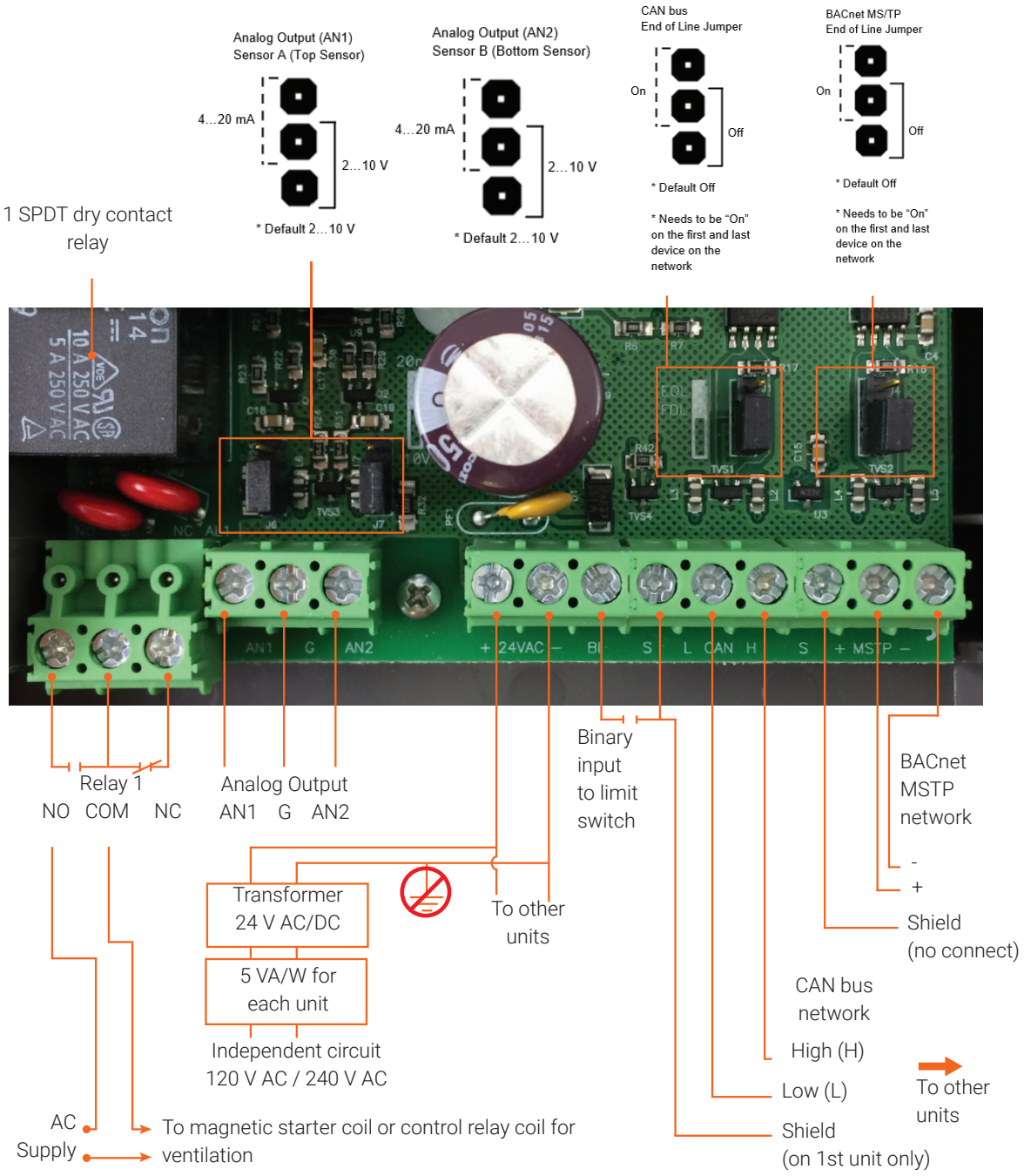
Installation on round columns

Please follow coverage area and mounting height recommendations above. To install gas monitors on round columns, use the plastic yellow feet provided with the gas monitor for stability. The plastic yellow feet are not required if installed on a flat wall.

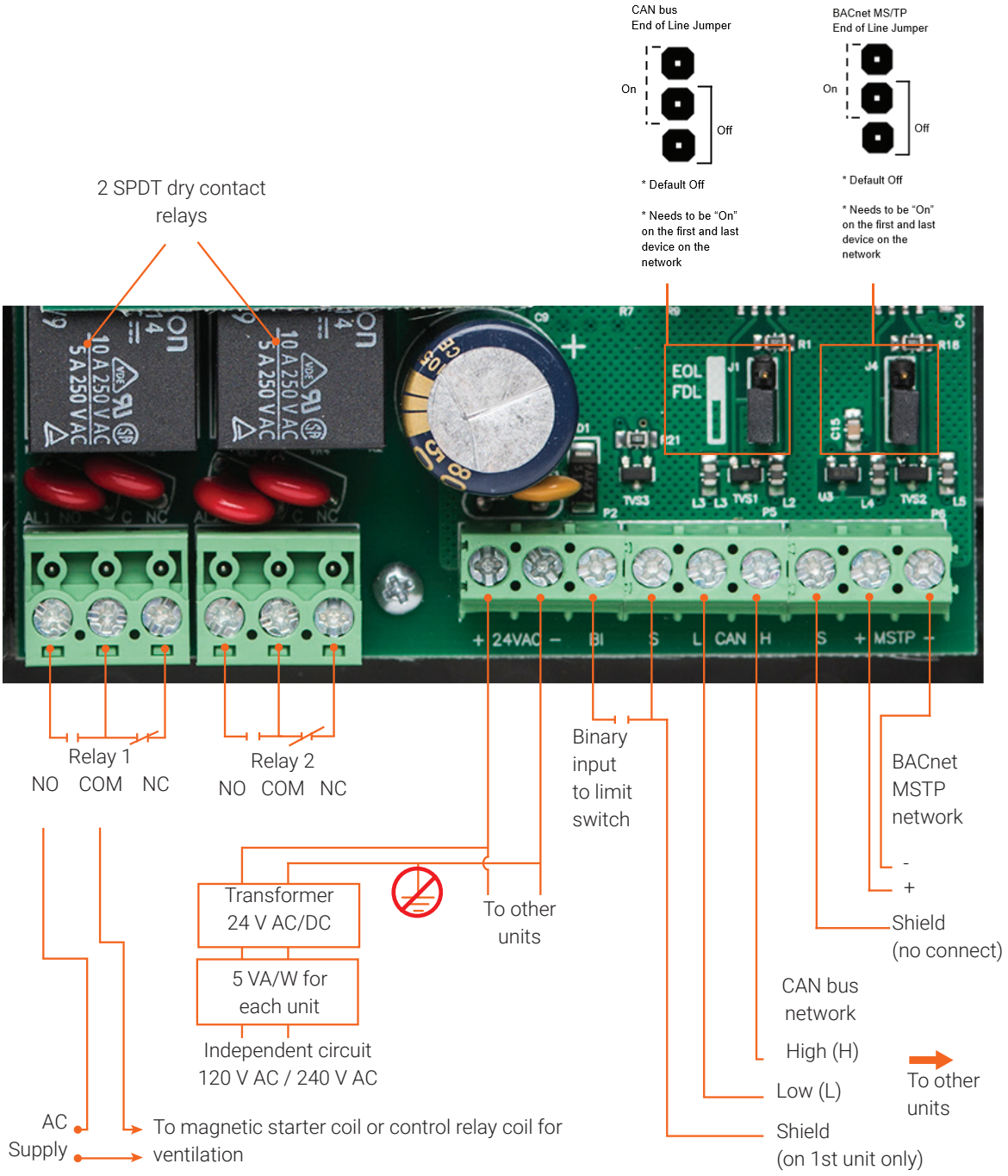
3.2 Wiring

Use 18...20 AWG (0.75...0.5 mm2) cable for power.
Use 22...24 AWG (0.34...0.25 mm²) twisted pair, low capacitance, shielded, communication cable for BACnet MS/TP and CAN bus.

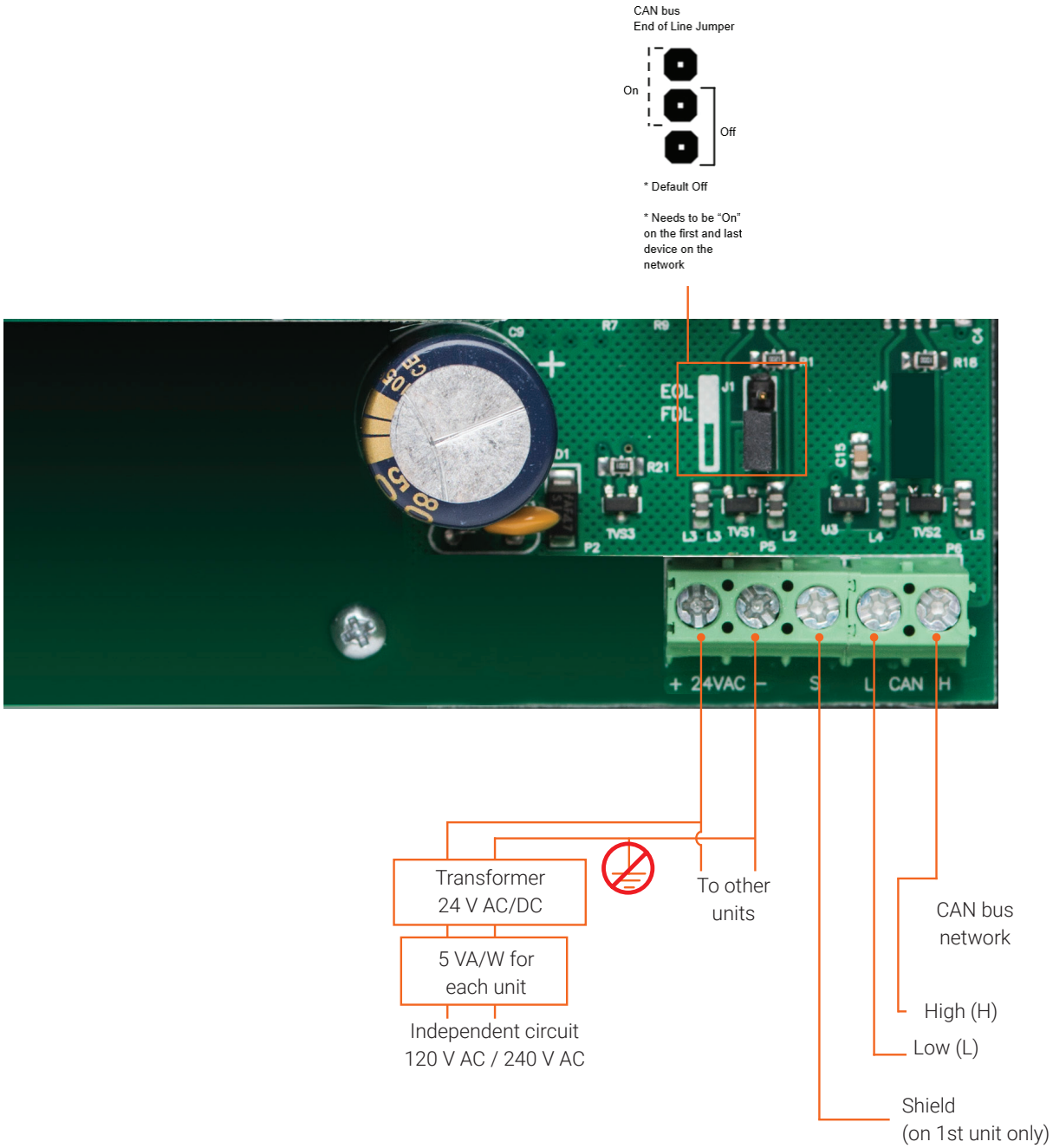
3.2.1 Wiring Diagram -A Model (22Gxx-5A / C-22G-5A)



3.2.2 Wiring Diagram -B Model (22Gxx-5B / C-22G-5B)



3.2.3 Wiring Diagram -C Model (22Gxx-5C / C-22G-5C)



3.3 Warm-up Time

All Belimo gas monitors require a warm up time for the sensor modules to fully stabilize.

GAS TYPE IDENTIFICATION NUMBER	DESCRIPTION	WARM UP TIME
02, 03, 04, 14, 16, 17	02 (Carbon Monoxide) 03 (Carbon Monoxide Null H2) 04 (Ammonia) 14 (Nitrogen Dioxide) 16 (Hydrogen Sulfide) 17 (Chlorine)	5 minutes
15-xxx	15-003 (Carbon dioxide, 0…2000 ppm) 15-005 (Carbon dioxide, 0…5000 ppm) 15-006 (Carbon dioxide, 0…10000 ppm)	10 minutes
21	21 (Infrared Broadband Refrigerant)	1 hour
05, 06, 08	05 (Propane / Natural Gas) 06 (Methane) 08 (Hydrogen)	24 hours
22, 23	22 (Oxygen Leak) 23 (Oxygen Depletion)	48 hours

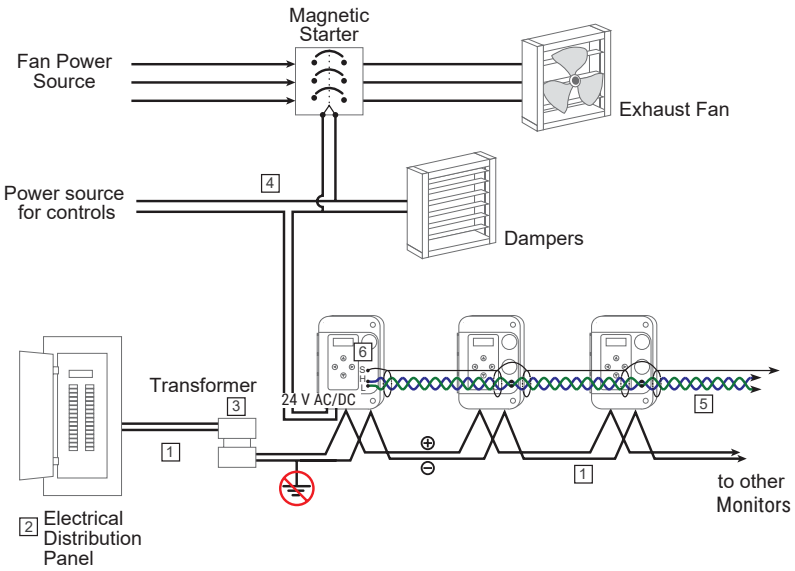
3.4 Check List

Important
All wiring must conform to local building codes, regulations and laws. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1. Use ½ inch EMT conduit for all wiring.
2. A switch or circuit breaker must be included in the installation. It must be suitably located and easily reached in a secure location and identified as the disconnect for the "Gas Monitoring System".
3. Install enclosed 120 to 24 V AC/DC or 240 to 24 V AC/DC transformer. For the size of transformer allow 5 VA or 3 W for each gas monitor, communication module, and relay unit. Use 18...20 AWG (0.75...0.5 mm²) wire for power. Do not tie the secondary to ground. Connect multiple devices to one transformer. Ensure that the polarity of the power connections is the same at each device, otherwise communication will not function.
4. Connect relay contacts (usually relay 1) to ventilation system. Use a magnetic starter so that the gas monitor, communication module, or relay unit contacts energize the starter coil and not the fan motor directly. Relay contacts are rated at 5 amps @ 125 VAC non-inductive.
5. For multiple devices inter-connected using CAN bus, connect a 22...24 AWG (0.34...0.25 mm²) twisted pair, low capacitance, shielded communication cable from screw "L" and "H" on one device to the next, and continue the daisy chain to the last device. Maintain the same polarity on each unit. Do not use star, T, or H junctions, only a continuous daisy chain. Make all daisy chain connections at the devices. Connect the shield to "S" on the first device only and join shields together at each additional device after the first.

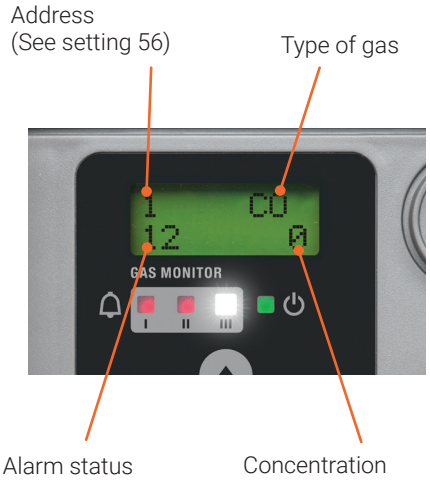
6. When using CAN bus or BACnet MS/TP, move the end-of-line jumper to the on position (top two pins) on the first and last devices on the daisy chain only. A communication module or relay unit can be located anywhere on the chain. Ensure all device's EOL jumpers are off (bottom two pins) if they are in the middle of the chain. Device addresses can be in any location on the chain.
7. Power on the units. They will display the gas types, gas concentrations, and alarm level statuses. First, set the CAN bus address on each gas monitor or communication module on the CAN bus network. Press → until you reach programmable setting 39. Press ↑ to switch from 0 to change the CAN bus address. Press ↑ and ← simultaneously to save (the screen will show "OK" if it was saved correctly), then press and hold ← for a few seconds to return home.

   To verify if the devices are communicating correctly, change setting no. 56 on one device. Press → until you reach programmable setting 56. Press ↑ to switch from 0 to 1, to turn on the network display. Press ↑ and ← simultaneously to save (the screen will show "OK" if it was saved correctly), then press and hold ← for a few seconds to return home. The unit will display each device connected on CAN bus in order of their address. If the unit does not display all of the devices on the network, check the following:
   - each unit must have a unique address, programmable setting 39, with no duplicates
   - end-of-line jumpers are set on units at ends of cable only
   - polarity of the communication cable and the AC/DC 24 V is the same on all units
   - verify wire connections for shorts, loose wires, etc.
8. To further test communication, press and hold the up button on any monitor for at least 5 seconds to start manual mode (default 5 minutes). This will close the relay 1 on that unit and all of the other units on the network. See section 5 to set up a configuration for multiple zones.



4.0 Operation

4.1 Screen Display



The LCD shows the gas type, concentration, and alarm level status. If the gas monitor has two sensor modules, the display will alternate between the two. **1** indicates that alarm level one has been reached. The alarm level one parameter is configurable per programmable settings 0, 1, 2 for sensor A (top sensor) and 18, 19, 20 for sensor B (bottom sensor). It can also be activated by other gas monitors on the CAN bus network per programmable settings 36.

2 indicates that alarm level two has been reached. The alarm level two parameter is configurable per programmable settings 3, 4, 5 for sensor A (top sensor) and 21, 22, 23 for sensor B (bottom sensor). It can also be activated by other gas monitors on the CAN bus network per programmable setting 37.

3 indicates that alarm level three has been reached. The alarm level three parameter is configurable per programmable settings 6, 7, 8 for sensor A (top sensor) and 24, 25, 26 for sensor B (bottom sensor). It can also be activated by other gas monitors on the CAN bus network per programmable setting 38.

M indicates that manual override is active. It provides the ability to test the ventilation system and manually bring in fresh air. To activate the manual override, go to the home screen and press and hold ↑ for at least 5 seconds to start. To adjust the time interval when the manual override automatically turns off, click ↑ again to increase the time between 5 to 60 minutes. The alarm level 1 will activate (or alarm level 2 or 3 per programmable setting 69) and transmit messages (programmable settings 9-17 for sensor A and 27-35 for sensor B) to other devices on the CAN bus network. The gas monitor will return to normal operation after the time runs down. To cancel the manual override, press ↓ several times to reduce the time left to run, or from the home screen press ↓ several times until the manual override turns off. M also is displayed when the auto cycle is on; refer to programmable setting 73.

T indicates that alarm one is on due to high ambient temperature reading (setting 51). This can be useful during summer ventilation. Please note that all gas monitors and communication modules have an internal temperature sensor. If turned on, the home screen will alternate between showing the gas type, gas concentration, alarm level status, and the temperature. To turn this on, press → until you reach programmable setting 44. Press ↑ to switch from 0 to 1, to turn on the temperature display. Press ↑ and ← simultaneously to save, then press and hold ← for a few seconds to return home.

To view the firmware of the device at any time, press and hold ← and ↓ at the same time. The firmware will appear on the display.

4.2 Default Alarm Levels

Alarm level thresholds are factory set with default values, but should be set to suit local regulations.

APPLICATION	GAS TYPE	GAS TYPE IDENTIFICATION NUMBER	MEASURING RANGE	ALARM LEVEL 1 (DEFAULT)	ALARM LEVEL 2 (DEFAULT)	ALARM LEVEL 3 (DEFAULT)
Vehicle Emissions	Carbon Monoxide (CO)	02	0...250 ppm	25 ppm	35 ppm	75 ppm
	Carbon Monoxide (CO Null H_2)	03	0...250 ppm	25 ppm	35 ppm	75 ppm
	Nitrogen Dioxide (NO_2)	14	0...10 ppm	0.5 ppm	1.0 ppm	2.0 ppm
Indoor Air Quality	Carbon Dioxide (CO_2)	15-003	0...2000 ppm	800 ppm	1200 ppm	1500 ppm
	Carbon Dioxide (CO_2)	15-005	0...5000 ppm	2000 ppm	3000 ppm	4000 ppm
	Carbon Dioxide (CO_2)	15-006	0...10000 ppm	2000 ppm	3000 ppm	4000 ppm
Combustible and Toxic Gases	Ammonia (NH_3)	04	0...250 ppm	25 ppm	50 ppm	100 ppm
	Methane (CH_4)	05	0...50% LEL	10% LEL	15% LEL	20% LEL
	Propane (C_3H_8)	06	0...50% LEL	10% LEL	15% LEL	20% LEL
	Hydrogen (H_2)	08	0...50% LEL	10% LEL	15% LEL	20% LEL
	Hydrogen Sulfide (H_2S)	16	0...50 ppm	2.5 ppm	3.5 ppm	7.5 ppm
	Chlorine (CL_2)	17	0...10 ppm	0.5 ppm	1.0 ppm	2.0 ppm
	Oxygen Leak (O_2 Leak)	22	0...50% O_2	24% O_2	27% O_2	30% O_2
	Oxygen Depletion (O_2 Depletion)	23	0...50% O_2	18% O_2	17% O_2	16% O_2
Refrigerant Gas Leak Detection	Infrared Broadband Refrigerant (IR)	21	0...2000 ppm	250 ppm	350 ppm	750 ppm

per UL 2075 / ULC-S588 the alarm levels for CO shall not exceed 200 ppm.

4.3 Changing Settings

Press → and ← to move through the programmable settings. If the keypad lock is on, enter the password first. The screen will display the setting number, a short description of the setting (e.g. AL1 for alarm level 1 set point) and the current setting. To change the programmable settings, press the ↑ or ↓ buttons to increase or decrease the value.

To save, press ↑ and ← buttons at the same time. The word "OK" will appear. If you do not see "OK" and the new value on the screen it is because the buttons were not pressed simultaneously and the new value was not saved. Please try again.

4.4 Password Protection

All Belimo gas monitors and communication modules can be password protected with a six-keystroke password. This locks the keypad and programmable settings to protect them from being tampered with. The default password is ↑↓↑↓↑↓. To create a unique six keystroke password, please follow the steps below.

1. Press → to enter settings.
2. Press and hold → until you reach setting MO PASS?
   *This is the last setting and it does not have a number.
3. Press ↑ to enter a new password.
4. Enter any six keystroke password using the ↑ ↓ ← → buttons.
5. Re-enter the six keystroke password using the ↑ ↓ ← → buttons.
6. Press and hold → until you reach setting 49 (Keyboard Lock).
7. Press ↑ to switch 0 to 1.
8. Press ↑ and ← at the same time to save.
   *If saved correctly the word "OK" will appear on the LCD. If you do not see "OK" and the new value on the LCD, it is because the buttons were not pressed at the same time. Please try again.
9. Hold ← for five seconds to return to the home screen. You should now be locked out. Input your password to access the programmable settings.
   *If you enter your password and it does not work the first time, wait ten seconds and try again. Remember your password.

4.5 List of Settings

All programmable settings (shown in section 4.4) are factory set with default values to facilitate set up and commissioning and can be changed at any time. Alarm level thresholds are also factory set with default values but should be set to suit local regulations. Upgrading firmware will not affect user settings. Note: Hold left and down arrows at the same time to display firmware version.

Programmable settings for sensor A (top sensor module)

NO.	NAME	DESCRIPTION	RANGE	DEFAULT
0	AL1	Alarm 1 threshold, activates relay 1	Gas specific. See section 4.2	
1	A1Del	Alarm 1 delay on (seconds)	2...1000	30
2	A1Off	Alarm 1 delay off (seconds)	0...1000	20
3	AL2	Alarm 2 threshold, activates relay 2	Gas specific. See section 4.2	
4	AL2Del	Alarm 2 delay on (seconds)	2...1000	30
5	AL2Off	Alarm 2 delay off (seconds)	0...1000	20
6	AL3	Alarm 3 threshold, activates horn and strobe	Gas specific. See section 4.2	
7	A3Del	Alarm 3 delay on (seconds)	2...1000	180
8	A3Off	Alarm 3 delay off (seconds)	0...1000	20
9	A1Tx	Alarm 1 transmit message, CAN bus	0...255	1
10	A1Tx	Alarm 1 transmit message, CAN bus	0...255	*0
11	A1Tx	Alarm 1 transmit message, CAN bus	0...255	*0
12	A2Tx	Alarm 2 transmit message, CAN bus	0...255	2
13	A2Tx	Alarm 2 transmit message, CAN bus	0...255	*0
14	A2Tx	Alarm 2 transmit message, CAN bus	0...255	*0
15	A3Tx	Alarm 3 transmit message, CAN bus	0...255	3
16	A3Tx	Alarm 3 transmit message, CAN bus	0...255	*0
17	A3Tx	Alarm 3 transmit message, CAN bus	0...255	*0

*0 = inactive

Programmable settings for sensor B (bottom sensor module)

NO.	NAME	DESCRIPTION	RANGE	DEFAULT
18	AL1-B	Alarm 1 threshold, activates relay 1	Gas specific. See section 4.2	
19	A1Del	Alarm 1 delay on (seconds)	2...1000	30
20	A1Off	Alarm 1 delay off (seconds)	0...1000	20
21	AL2-B	Alarm 2 threshold, activates relay 2	Gas specific. See section 4.2	
22	A2Del	Alarm 2 delay on (seconds)	2...1000	30
23	A2Off	Alarm 2 delay off (seconds)	0...1000	20
24	AL3-B	Alarm 3 threshold, activates horn and strobe	Gas specific. See section 4.2	
25	A3Del	Alarm 3 delay on (seconds)	2...1000	180
26	A3Off	Alarm 3 delay off (seconds)	0...1000	20
27	A1Tx	Alarm 1 transmit message, CAN bus	0...255	1
28	A1Tx	Alarm 1 transmit message, CAN bus	0...255	*0
29	A1Tx	Alarm 1 transmit message, CAN bus	0...255	*0
30	A2Tx	Alarm 2 transmit message, CAN bus	0...255	2
31	A2Tx	Alarm 2 transmit message, CAN bus	0...255	*0
32	BiTx	Binary input transmit message when limit switch is closed, CAN bus. See section 3.2.1	0...255	*0
33	A3Tx	Alarm 3 transmit message, CAN bus	0...255	3
34	A3Tx	Alarm 3 transmit message, CAN bus	0...255	*0
35	A3Tx	Alarm 3 transmit message, CAN bus	0...255	*0

*0 = inactive

Programmable settings for the gas monitor

NO.	NAME	DESCRIPTION	RANGE	DEFAULT
36	R1Rx	Receive message to activate relay 1, CAN bus	0...255	1
37	R2Rx	Receive message to activate relay 2, CAN bus	0...255	2
38	R3Rx	Receive message to activate horn and strobe CAN bus	0...255	0
39	Adr	CAN bus address	0...31	*0
40	AnZA	Accessing this option forces analog output A to low for testing with multimeter only and no external cables attached. Use up and down arrows to adjust lowest setting (default 2 V or 4 mA) and save	0...1023	
41	AnSA	Accessing this option forces analog output A to high for testing with multimeter only and no external cables attached. Use up and down arrows to adjust highest setting (default 10 V or 20 mA) and save.	0...1023	
42	AnZB	Same as option 40 but for output B	0...1023	
43	AnSB	Same as option 41 but for output B	0...1023	
44	Temp	Temperature display enabled	*0/1	*0
45	Aud	Local horn and strobe alarms enabled on alarm 3	*0/1	1
46	BAC	BACnet MS/TP mode select 0 = BACnet communication disabled 1 = BACnet communication enabled 2 = BACnet communication enabled and displays all devices on CAN bus	0/1/2	*0
47	BMA	BACnet MS/TP MAC address	0...127	1
48	BBR	BACnet MS/TP baud rate 0 = 9600 1 = 19200 2 = 38400 3 = 76800	0/1/2/3	3
49	KBL	Keyboard lock, blocks access to programmable settings	0/1	*0
50	TMod	Temperature modify/calibrate	-9°F +9°C	0
51	ATHi	High temperature alarm limit used for summer ventilation. Alarm 1 is activated when temperature exceeds this setting. Changing programmable setting 72 (temperature units, °C/°F) will auto convert programmable settings 51 and 55 back to their default values.	0...90°C 0...150°F	60°C 40°F

*0 = inactive

Programmable settings for the gas monitor

NO.	NAME	DESCRIPTION	RANGE	DEFAULT
52	W/U	Warm up delay disables alarms, seconds	0...255	60
53	BMM	BACnet MS/TP maximum MAC address when polling for master	0...127	127
54	BDiag	BACnet MS/TP diagnostic display while accessing this setting. In format XXXXYYZZ. Where YY is MAC address (in hex) of the device that just passed the token to the current one. ZZ is the device to which the token was passed to. Example 0305 would display on gas monitor or communication module with MAC address 4 For refrigerant gas leak detection monitors (22G21-5C) programmable setting 54 is used to reset the zero point of the sensor module. This needs to be done after installation.		
55	ATLo	Low temperature alarm limit (alarm 3). 0=off Changing programmable setting 72 (temperature units, °C/°F) will auto convert programmable settings 51 and 55 back to their default values.		*0
56	Net	Enables the home screen of any device to remotely view all devices on CAN bus. 1 = 0n	0/1	*0
57	Ref-A	To select scale and type of refrigerant gas for sensor A. When replacing a methane (R-G05) or propane (R-G06) sensor module, programmable setting 57 and / or 58 must be used to confirm that the proper gas type is selected. Available refrigerants to select for 22G21-5C: *R134A (Default), R11, R22, R23, R32, R123, R125, R404A, R407A, R407C, R407F, R410A, R448A, R449A, R452A, R455A, R507, R513A, R1233zd, R1234yf, R1234ze	select from list	CH_4 (Methane & Propane sensors) R134a (Refrigerant sensor)
58	Ref-B	When replacing a methane (R-G05) or propane (R-G06) sensor module, programmable setting 57 and / or 58 must be used to confirm that the proper gas type is selected.		CH_4 (Methane & Propane sensors)
59	FltTx	Fault alarm transmit message, CAN bus. Will transmit this message through CAN bus to activate relays when a fault or error is present on the gas monitor.	0...255	*0
60	ADTxA	Analog drive transmit message, sensor A (top sensor) CAN bus	0...255	*0
61	AMinA	Analog drive. Minimum percent of scale for zero output. Sensor A (top sensor)	0...100	3
62	AMaxA	Analog drive. Maximum percent of scale for full scale output. Sensor A (top sensor)	0...100	100
63	ADRxA	Receive message code to control local analog output. Sensor A (top sensor)	0...255	*0
64	ADTxB	Analog drive transmit message, sensor B (bottom) CAN bus	0...255	*0

*0 = inactive

Programmable settings for the gas monitor

NO.	NAME	DESCRIPTION	RANGE	DEFAULT
65	AMinB	Analog drive. Minimum percent of scale for zero output. Sensor B (bottom sensor)	0...255	3
66	AMaxB	Analog drive. Maximum percent of scale for full scale output. Sensor B (bottom sensor)	0...100	100
67	ADRxB	Receive message code to control local analog output. Sensor B (bottom sensor)	0...255	*0
68	Baud	Baud rate for CAN bus. Maximum wire length is 1500 feet at rate 0 and 3000 feet at rate 1	0/1	0
69	Man	Manual override from home screen activates alarms 1, 1+2, 1+2+3. See section 4.1	1/2/3	1
70	BDI	BACnet MS/TP device instance Enter part 1 (1000 to 4,194,303) Press right arrow Enter part 2 (0 to 999)	0...4,194, 303	60,000 +BMA
71	Light	0 = backlight on when keyboard activated 1 = backlight always on	0/1	0
72	°C/°F	0 = °C, 1 = °F Changing programmable setting 72 will auto convert programmable settings 51 and 55 back to their default values.	0/1	0
73	Cycle	Automatic cycle timer Alarm 1 00C = total Cycle time in minutes Press right arrow 00R = Run time in minutes	0...255	*00/00 (inactive)
74	Age	Sensor module A (top sensor) age in days Press right arrow to display Sensor module B (bottom sensor)		0
75	VSD A	Variable speed drive logic analog outputs A combines analog outputs over CAN bus. See programmable settings 60-66 0 = highest reading wins 1= sensor readings are averaged 2= auto ramping increases analog output by one-minute intervals on alarm 1 and decreases when below alarm.	0/1/2	0
76	RDAL	Reset Default Alarms 0 = Sensor A (top sensor) 1 = Sensor B (bottom sensor) 2 = Both sensors	0/1/2	0
77	NQty	Number of gas monitors and communication modules on CAN bus	0...32	*0
	MO PASS?	Password protection Allows the user to select a six-keystroke password to lock the keypad and programmable settings		

*0 = inactive

4.6 Sequence of Operations

1. Gas monitors and communication modules are preloaded with default programmable settings for normal operation and can be changed by the user at any time via the key pad.
2. On power-up the display will show the firmware version number and the warm up timer will count down (programmable setting 52, default 1 minute). Relays are inactive during this time. Press any button to cancel the warm-up period. To view the firmware version number at any time, press ← and ↓ at the same time.
3. The home screen on the LCD display will show the gas types, gas concentrations, and alarm level statuses. For gas monitors monitoring two gases, the display will alternate between the two gas types showing the gas type and concentration of each. If the network display option is turned on (programmable setting 56, default turned off for all gas monitors and on for communication modules) the display will show each device that is connected via the CAN bus network, its address, gas type, gas concentration, alarm level status. Each gas monitor will display for 3 seconds and then cycle to the next, lowest address to the highest and then start again.
4. If the gas level rises above the alarm 1 set point, then the delay on timer will start (by default it is set to 30 seconds). The delay on is how long the gas has to remain above the alarm level set point until the alarm turns on. It is used to prevent false alarms and to stop the fan from constantly fluctuating on and off. The timer will clear and reset if the gas drops below the alarm level 1 set point.
5. If the gas level stays above the alarm 1 set point longer than the delay on timer (default 30 seconds), alarm level 1 will activate, causing a red LED to turn on and relay one to energize (only on -A, -B models). The gas monitor will transmit a message through CAN bus saying alarm level 1 has been activated (sends out a 1 by default, programmable setting 9, 10, 11 for top sensor and 27, 28, 29 for bottom sensor). Relay 1 will stay energized as long as the gas level remains above the alarm 1 set point. In addition to this, any other gas monitors, communication modules, or relay units on CAN bus with the same relay 1 receive message (programmable setting 36, set to 1 by default) will also activate their alarm level 1, and energize their relay 1.
6. If the gas level drops below the alarm 1 set point, then the delay off timer will start (by default it is set to 20 seconds). The delay off is how long the gas has to remain below the alarm level set point until the alarm turns off. It is used to prevent false alarms and to stop the fan from constantly fluctuating on and off. The timer will clear and reset if the gas rises above the alarm level 1 set point.
7. When the delay-off timer times out relay 1 will de-energize, the alarm level 1 red LED will turn off and the relay 1 transmit message will stop being sent, thereby de-energising relays on other devices. Please note there is a 20 second delay on the CAN bus network when a code has stopped being sent.

8. If the temperature exceeds the high temperature alarm limit (programmable setting 51), relay 1 will activate, the alarm 1 red LED will turn on and the alarm 1 transmit message will be sent via the CAN bus network to other gas monitors and communication modules. When the temperature drops below the high temperature alarm limit, the alarm 1 will be turned off and the alarm 1 transmit message will stop being sent.
9. If the gas level rises to the alarm level 2 set point, then the alarm level 2 delay on timer will begin, and after timing out, the on-board relay 2 will activate, and the alarm 2 red LED will turn on. The relay 2 transmit message (default = 2) will be sent out on the CAN bus network activating remote units with that same relay 2 receive message (option 37). Note that all 3 alarms operate independently and can be higher or lower that the others.
10. When the current gas concentration drops below the alarm level 2 set point for longer than the alarm 2 delay off setting, the relay 2 will turn off, the relay 2 red LED will turn off, and the relay 2 transmit message will stop being sent on the CAN bus network.
11. When the gas concentration rises above the alarm level 3 set point for more than the alarm 3 delay on timer the audible alarm will sound,the flashing white LED strobe light will activate (programmable setting 45, enabled by default), a 3 will appear in the bottom left corner of the display, and the alarm 3 transmit message (default 3) will be sent to other gas monitors and communication modules. The alarm level 3 audible and visual alarm can be silenced by pressing any button.
12. When the gas concentration drops below the alarm 3 set point for longer than the alarm 3 delay off setting then the audible alarm and strobe flasher will stop and the alarm level 3 transmit message will stop being sent on the CAN bus network.
13. If a gas monitor experiences any faults, the device will transmit the fault transmit message, (programmable setting 59, disabled by default), to other gas monitors and communication modules on the CAN bus network.
14. Manual override mode is available to test relay functions and to activate ventilation. From the home screen press and hold the up arrow for at least 5 seconds. Press the up arrow to increase the timer by 5 minutes per click up to 60 minutes. The screen will display MAN 5 and timer will energize relay 1 and send the alarm 1 transmit message on the CAN bus network. After the time runs down the unit will return to automatic operation. To cancel, press the down arrow several times to reduce the timer to zero and return to normal operation. To activate alarm level 2 or 3 as well with this procedure, set programmable setting 69 to 2 or 3.

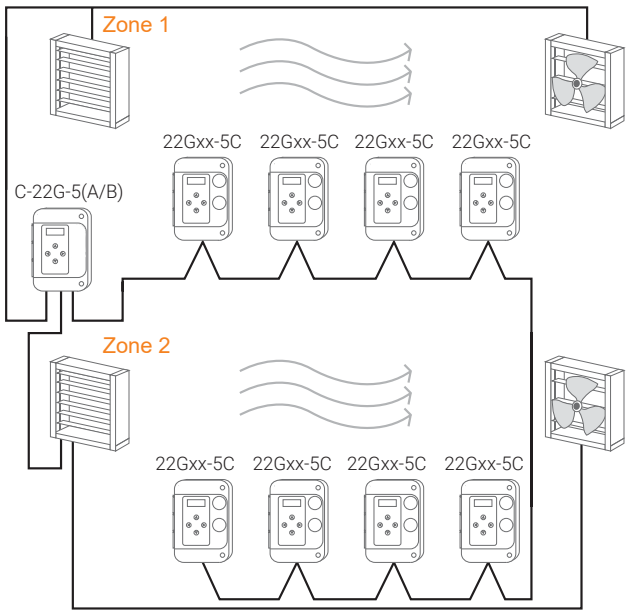
This sample sequence of operation shows the operation of a basic network for one zone. See section 4 Operation to see how to change settings and section 5 Configurations for setting up multiple zones.

5.0 Network configuration (CAN bus)

5.1 Using CAN bus with a communication module

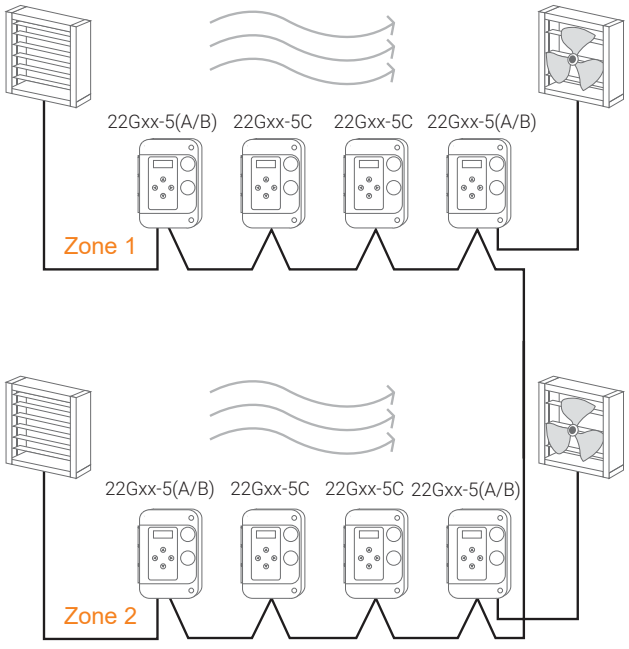
A communication module serves as the central control point for the ventilation system. Model 22Gxx-5y gas monitors transmit alarm commands to the central communication module, and the communication module physically controls external devices (ex: fans, dampers, etc.)

A communication module will display up to 32 devices (including itself) on the CAN bus network. It also displays the address, gas type, gas concentration, and alarm status for each device. The optional one or two SPDT relays on board can be configured to activate at different concentrations of gas or to operate different ventilation systems, zones or groups. If more than two relays are needed a relay unit (C-22G-50) can be added which has four additional SPDT relays.



5.2 Using CAN bus without a communication module

Any 22Gxx-5A or 22Gxx-5B gas monitors which have relays and/or analog outputs can physically control external devices (ex: fans, dampers, etc.). The use of a dedicated communication module is optional to add a display in some specific location, such as before entering a mechanical room or to interface with several fan starters located in one place. Starters and air dampers are connected to the gas monitor closest to it in each zone.



5.3 Default Configuration

Gas monitors and communication modules are shipped pre-loaded with default settings which can be changed in the field to suit the desired sequence with simple keypad input. When a gas monitor or communication module goes into alarm level 1, 2 or 3 it activates its relays and transmits a message to other devices to activate their alarm levels and relays also. The alarm 3 transmit message is transmitted by default, but the alarm level 3 receive message (programmable setting 38) by default is turned off so the audible alarms and strobe operate locally and not everywhere. The ventilation system can be connected to any of the relays (usually level 1 relay). If the transmit and receive codes are not adjusted, all gas monitors will operate in one ventilation zone. Default alarm level set points are for general guidance and testing and should be set to suit local regulations.

5.4 Creating Zones or Groups

To control multiple zones on the same network, set the transmit messages on each gas monitor to different messages for each zone. The default transmit messages are 1, 2, 3 for alarm levels 1, 2, 3 for zone 1.

For zone 2 gas monitors set transmit messages to 4, 5, 6
For zone 3 gas monitors set messages to 7, 8, 9, and so on

5.5 Addresses

Set each gas monitor, communication module, and relay unit to a different CAN bus address (programmable setting 39). 1, 2, 3, 4 etc. It is important to have no duplicates on the same daisy chained network.

5.6 Relay Outputs

Relay number 1 and 2 will activate if the gas on that monitor goes into alarm level 1, or 2. It will also activate when it sees it's receive code (programmable setting 36, 37) on the CAN bus network sent by other gas monitors. If more than 2 relays are needed, a relay unit (C-22G-50) can be added which has four additional SPDT relays. It can be installed anywhere on the CAN network.

A communication module has no sensors on board so the relays will only activate when it sees it's receive codes on the network. The communication module could control two zones via its two relays. When no communication module is used, gas monitor physically connected to an external device (ex: fan, damper, etc.) will activate if it detects a gas, or when it sees its receive codes on the network.

6.0 Maintenance

All gas monitors and sensor modules are factory calibrated. To maintain accuracy, it is essential that the gas monitors are calibrated by a qualified technician once or twice per year, depending on the application and gas being monitored. Gas monitors sensing methane, propane, and hydrogen are required to have their sensor modules replaced once per year.

6.1 Sensor Module Types

GAS TYPE	GAS TYPE IDENTIFICATION NUMBER	SENSOR MODULE TYPE
Carbon Monoxide (CO)	02	Electro-Chemical
Carbon Monoxide (CO Null H_2)	03	
Nitrogen Dioxide (NO_2)	14	
Ammonia (NH_3)	04	
Hydrogen Sulfide (H_2S)	16	
Chlorine (CL_2)	17	
Oxygen Leak (O_2 Leak)	22	
Oxygen Depletion (O_2 Dep.)	23	
Methane (CH_4)	05	Catalytic
Propane (C_3H_8)	06	
Hydrogen (H_2)	08	
Carbon Dioxide (CO_2, 0…2000 ppm)	15-003	Infrared ABC Logic
Carbon Dioxide (CO_2, 0…5000 ppm)	15-005	Infrared Dual Channel
Carbon Dioxide (CO_2, 0…10000 ppm)	15-006	
Infrared Broadband Refrigerant (IR)	21	Infrared Broadband

6.2 Calibration Procedure Overview

All sensor modules used in Belimo gas monitors are either electro-chemical, catalytic, or infrared types. Certified gas bottles of ± 2% accuracy (or better) should be used for both the zero and the span point. In conjunction with certified gas bottles, it is recommended to use the Belimo calibration kit (A-22G-A22) that includes a regulator (0.5 LPM), tube, and cap to adjust the sensitivity of the sensor module due to normal aging. For calibrating the span point, please use a certified gas bottle that is within the specified range of the sensor module.

6.3 Calibration Procedure: Electro-Chemical and Catalytic Sensor Modules

1. Use certified gas bottles of ± 2% accuracy (or better) for calibration.
2. Before calibrating, ensure the gas monitors have been powered for a minimum of the warm up time of the sensor modules. For electro chemical type, the warm up time is 5 minutes, for catalytic type, the warm up time is 24 hours.
3. Press → to enter programmable settings.
4. Press ↑ and → at the same time to enter the calibration mode.

   *When calibrating the top sensor module (sensor A), stay at SAZ.

   *When calibrating the bottom sensor module (sensor B), press the → button twice to get to SBZ.
5. While at SAZ (sensor A) or SBZ (sensor B) flood the certified zero gas over the sensor module. To do this, connect the zero gas bottle to the Belimo regulator, and insert the calibration cap onto the sensor hole located on the gas monitor front cover. Flood the sensor with the zero gas at a flow rate of 0.5 LPM for 90 seconds or until the reading stabilizes. To calibrate gas monitors it is important to keep the front cover on, and make sure it is securely screwed to the base. When not using the Belimo calibration cap, it is important that the calibration cap you are using has a small outlet hole, otherwise the pressure will increase and distort the reading.
6. Adjust gas reading to 0 with the ↑ and ↓ buttons.
7. Press ↑ and ← at the same time to save.
8. Press → and ← to get to SAS (sensor A span) or SBS (sensor B span).
9. While at SAS (sensor A span) or SBS (sensor B span) flood the certified span gas over the sensor module. To do this, connect the span gas bottle to the Belimo regulator, and insert the calibration cap onto the sensor hole located on the gas monitor front cover. Flood the sensor with the span gas at a flow rate of 0.5 LPM for 90 seconds or until the reading stabilizes. For chlorine on average stabilization time takes 5 to 10 minutes. To calibrate gas monitors it is important to keep the front cover on, and make sure it is securely screwed to the base. When not using the Belimo calibration cap, it is important that the calibration cap you are using has a small outlet hole, otherwise the pressure will increase and distort the reading.
10. Adjust gas reading by pressing the ↑ and ↓ buttons until the concentration on the gas monitor and calibration gas bottle match.
11. Press ↑ and ← at the same time to save.

    Press and hold down ← to exit the calibration mode.

6.4 Calibration Procedure: Infrared ABC Logic and Infrared Dual Channel Sensor Modules

1. Use a certified gas bottle of ± 2% accuracy (or better) for calibration.
2. Before calibrating, ensure the gas monitors have been powered for a minimum of the warm up time of the sensor modules. For infrared ABC logic type, the warm up time is 10 minutes.
3. Press → to enter programmable settings.
4. Press ↑ and → at the same time to enter the calibration mode.
5. Do not calibrate SAZ (sensor A) or SBZ (sensor B).
6. Press → and ← to get to SAS (sensor A span) or SBS (sensor B span).
7. While at SAS (sensor A span) or SBS (sensor B span) flood the certified span gas over the sensor module. To do this, connect the span gas bottle to the Belimo regulator, and insert the calibration cap onto the sensor hole located on the gas monitor front cover. Flood the sensor with the span gas at a flow rate of 0.5 LPM for 90 seconds or until the reading stabilizes. To calibrate gas monitors it is important to keep the front cover on, and make sure it is securely screwed to the base. When not using the Belimo calibration cap, it is important that the calibration cap you are using has a small outlet hole, otherwise the pressure will increase and distort the reading.
8. Adjust gas reading by pressing the ↑ and ↓ buttons until the concentration on the gas monitor and calibration gas bottle match.
9. Press ↑ and ← at the same time to save.
10. Press and hold down ← to exit the calibration mode.

6.5 Calibration Procedure: Infrared Broadband Sensor Modules

1. Use certified gas bottles of ± 2% accuracy (or better) for calibration.
2. Before calibration install the infrared broadband gas monitors on site, on a vertical level surface. ensure the gas monitors have been powered for a minimum of the warm up time of the sensor modules. For infrared broadband type, the warm up time is 1 hour.
3. Press → to enter programmable settings.
4. Press and hold → until you reach programmable setting 57 (Select Desired Refrigerant Type). Press the ↑ and ↓ buttons to find the desired refrigerant that the gas monitor will detect. By default the gas monitor will detect R134A. To save press ↑ and ← at the same time. If saved correctly, the LCD screen will display ** OK **. Press and hold ← until the home screen is displayed. The targeted refrigerant along with its concentration will be displayed in the screen.
5. Press → to enter programmable settings.
6. Press and hold → until you reach programmable setting 54 (Zero Reset). This setting is used to set the zero point of the gas monitor. Check if programmable setting 54 is displaying any value other than 0. If any value other than 0 is shown, and there is no refrigerant gas present, reset the zero point by pressing ↑ and ↓ at the same time. Once again, allow 1 hour after the reset for the gas monitor to stabilize.

7. Verify that programmable setting 54 (Zero Reset) displays 0. If a non 0 value between ±5 exists, change this value to 0 by adjusting the Sensor A Zero (SAZ) . To do this go to the home screen, press ↑ and → at the same time to enter the calibration mode, and adjust SAZ gas reading to 0 (the top value) with the ↑ and ↓ buttons. Press ↑ and ← at the same time to save. If it does not repeat step 6.
8. Press and hold ← until the home screen is displayed.
9. Press ↑ and → at the same time to enter the calibration mode.
10. While at SAZ (sensor A) flood the certified zero gas over the sensor module. To do this, connect the zero gas bottle to the Belimo regulator, and insert the calibration cap onto the rectangular sensor hole located on the gas monitor front cover. Flood the sensor with the zero gas at a flow rate of 0.5 LPM for 90 seconds or until the reading stabilizes. To calibrate gas monitors it is important to keep the front cover on, and make sure it is securely screwed to the base. When not using the Belimo calibration cap, it is important that the calibration cap you are using has a small outlet hole, otherwise the pressure will increase and distort the reading.
11. Adjust gas reading to 0 with the ↑ and ↓ buttons.
12. Press ↑ and ← at the same time to save.
13. Press → and ← to get to SAS (sensor A span)
14. While at SAS (sensor A span) flood the certified span gas over the sensor module. To do this, connect the span gas bottle to the Belimo regulator, and insert the calibration cap onto the sensor hole located on the gas monitor front cover. Flood the sensor with the span gas at a flow rate of 0.5 LPM for 90 seconds or until the reading stabilizes. To calibrate gas monitors it is important to keep the front cover on, and make sure it is securely screwed to the base. When not using the Belimo calibration cap, it is important that the calibration cap you are using has a small outlet hole, otherwise the pressure will increase and distort the reading.
15. Adjust gas reading by pressing the ↑ and ↓ buttons until the concentration on the gas monitor and calibration gas bottle match.
16. Press ↑ and ← at the same time to save.
17. Press and hold down ← to exit the calibration mode.
18. After calibration press and hold → until you reach programmable setting 57, and select the refrigerant gas to be monitored.
19. Press ↑ and ← at the same time to save.
20. Hold ← for five seconds to return to the home screen.

6.6 Sensor Module Replacement

All sensor modules are factory calibrated but are required to be recalibrated at a minimum of once per year. When installing gas monitors in locations above 2000 ft [610 m], it is recommended to perform calibration upon installation.

1. Remove the existing sensor module by opening the gas monitor cover and pulling the sensor module out from the gas monitor. The entire sensor module should be removed, which includes the sensing element and the small green PCB board attached to it.
2. Install the new sensor module by removing it from its packaging and inserting the metal pins into the the correct location on the gas monitor.
3. Press → to enter settings.
4. Press ↑ and → at the same time to enter the calibration mode.
   *When replacing the top sensor module (sensor A), stay at SAZ.
   *When replacing the bottom sensor module (sensor B), press the → button twice to get to SBZ.
5. Press ↑ and ← at the same time to register the sensor module. The gas level will then be displayed on the top line of the LCD, and the gas monitor will stop flashing and beeping, and will function normally.
6. Press and hold down ← to exit the calibration mode.

6.7 Sensor Module Expected Life Span and End of Life

All sensor modules have an expected life span and an end of life. The expected life span is how long the sensor module will last (under normal conditions) until it should be replaced with a new one. Please note that the exact lifespan of the sensor module is heavily dependent on the application, including how dirty the environment is and how much of the target gas is present in the environment.

The end of life is a safety precaution, and it is how long the sensor module can stay powered in the gas monitor until the gas monitor will go into alarm to tell the end user it is time to replace the sensor module.

APPLICATION	GAS TYPE	NOMENCLATURE	EXPECTED LIFESPAN (YEARS)	END OF LIFE (YEARS)
Vehicle Emissions	Carbon Monoxide (CO)	02	5...8	10
	Carbon Monoxide (CO Null H_2)	03	2...4	5
	Nitrogen Dioxide (NO_2)	14	2...4	5
Indoor Air Quality	Carbon Dioxide (CO_2)	15-003	10	13
	Carbon Dioxide (CO_2)	15-005	10	13
	Carbon Dioxide (CO_2)	15-006	10	13
Combustible and Toxic Gases	Ammonia (NH_3)	04	2...4	5
	Methane (CH_4)	05	4...7*	9*
	Propane (C_3H_8)	06	3...5*	8*
	Hydrogen (H_2)	08	4...7*	9*
	Hydrogen Sulfide (H_2S)	16	2...4	5
	Chlorine (CL_2)	17	2...4	5
	Oxygen Leak (O_2 Leak)	22	3...6	8
	Oxygen Depletion (O_2 Depletion)	23	3...6	8
	Argon (Ar), (O_2 Depletion)	23	3...6	8
	Helium (He), (O_2 Depletion)	23	3...6	8
	Nitrogen (N_2), (O_2 Depletion)	23	3...6	8
Refrigerant Gas Leak Detection	Infrared Broadband Refrigerant (IR)	21	5...10	15

* Methane (CH4), Propane (C3H8), and Hydrogen (H2) sensor modules are required to be replaced annually. They are not recommended to be re calibrated.

6.8 Fault Monitoring

FAULT CODE	MESSAGE
00	Error cleared (no error)
01	No sensor
02	Low voltage
04	High voltage
08	Sensor A missing or not registered
10	Sensor B missing or not registered
18	Both sensors missing or not registered
20	Sensor A end of life (need to replace sensor)
40	Sensor B end of life (need to replace sensor)
60	Both sensors end of life
80	CAN bus error: Qty not matching option 77
Err-S	Missing sensors

Notes:

- For 22Gxx-5A & C-22G-5A model, any fault from above table will turn the corresponding analog output to 0V/0mA
- On BACnet MS/TP, any fault from the above table will change the system status of the device object to non operational.

Please contact Belimo technical support with any fault codes not in this list.

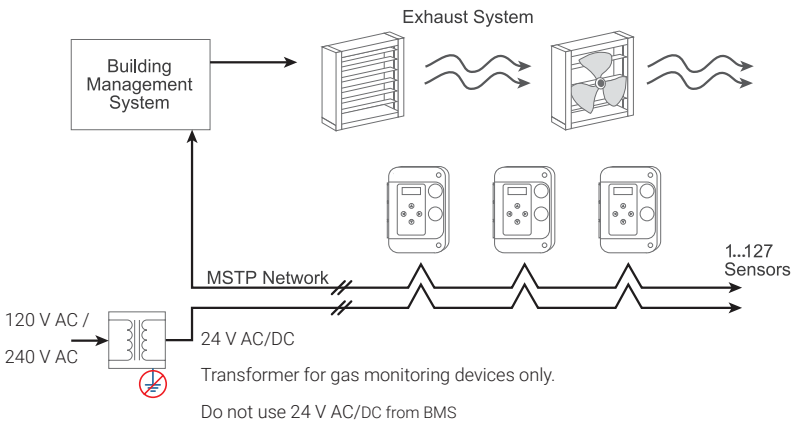
7.0 Network configuration (BACnet MS/TP)

For instructions on changing settings, see section 4.3

Setting 46	BACnet MS/TP mode select 0 = communication disabled 1 = communication enabled 2 = communication enabled and display all monitors on CAN network	0, 1, 2	*0
Setting 47	BACnet MS/TP MAC address	0-127	0
Setting 48	Baud rate	0 = 9600 1 = 19200 2 = 38400 3 = 76800	3
Setting 53	Max master	0-127	127
Setting 54	Diagnostic tool to test MS/TP communication. Format XXXXYYZZ where YY= ID of device that passed token to current sensor and ZZ = ID of device that received token.		
Setting 70	Device ID	4,194,303	60,000+BMA

*0 = inactive

Ventilation Controlled by BACnet Building Automation

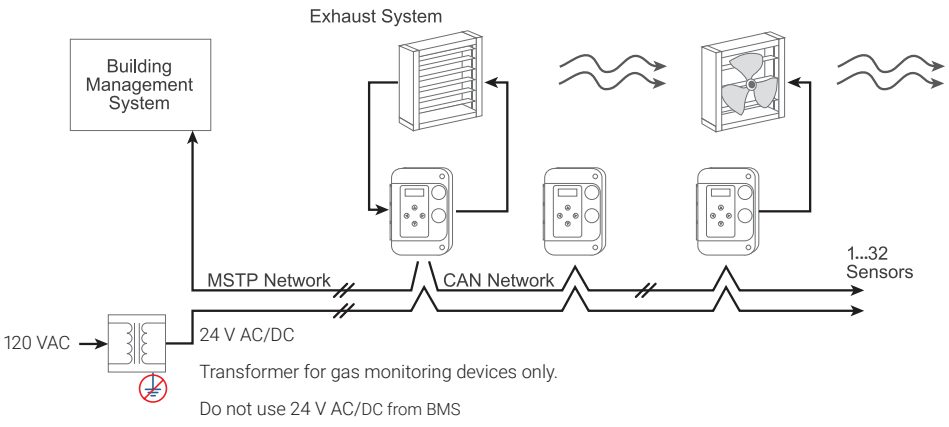


Object Table

TYPE AND INSTANCE	OBJECT NAME	OBJECT PROPERTY	PARAMETER
AV0	gas reading 1	Present value (R)	Gas reading local sensor A
AV1	gas reading 2	Present value (R)	Gas reading local sensor B
AV2	Ambient temperature	Present value (R)	Temperature in celsius
BI 0	Input 1	Present value (R)	Auxiliary input state 0/1
BO 0	Relay 1	Present value (R/W)	Relay 1 status on 0/1
BO 1	Relay 2 or alarm 2	Present value (R/W)	Relay 2 or alarm 2 status 0/1
BO 2	Alarm 3	Present value (R/W)	Alarm 3 Indicator status 0/1
AV XYY	Gas reading XYY	Present value (R)	Gas reading remote sensors if setting 46=2

X = sensor 1 (top) or 2 (bottom),
YY = CAN bus address
Analog value for each gas reading will display description of gas type and scale

Ventilation controlled directly by gas monitors



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