BX316 XP Gas Detection Controller

BX316 XP 16 Sensor Gas Detection Controller

16
Sensor

Conventional

8888
Illuminated
Digital Display

4-20mA

IP65

FEATURES

- **Up to 16 sensors in one or two zones**
- **Data-logging Facility**
- **Wall mounted**
- **Illuminated digital display**
- **Detection of Toxic 0-300ppm / Explosive Gas(es) 0-20%LEL and Particulate Matter**
- **4-20mA signal sensor input**
- **2 alarm stages - Pre-alarm and main alarm**
- **IP65 protective rating**
- **CE certified and approved to EN 50194 EN 50291 EMC EN50270**
- **2 years guarantee - 3 years by registering at duomo.co.uk**

OVERVIEW

The BX318 XP control unit has been engineered to fulfill contemporary market demands while adhering to European standards for gas detection, utilizing conventional sensors in a flexible and innovative manner.

Up to 16 remote sensors from 4-20mA can be connected in conventional mode for a single area or 8 + 8 sensors for two separate zones. Gas concentration measured by each sensor is sequentially shown on display, with a location description.

When a coupled sensor readings surpasses the pre-alarm threshold, the control unit emits a proportional sound signal based on the gas concentration detected. It displays the sensor number, gas amount, and origin, while the triggered alarm is recorded in a memory (Data-logger) that can store up to 50 events for printing. The unit offers two alarm levels: 1st LEVEL, pre-alarm, adjustable between 3% and 16% of L.E.L. or 45 to 240 ppm. The 2nd LEVEL, general alarm, activates at 20% of L.E.L. or 300 ppm, with PM alarm levels set on the Quanto PM sensor. Additionally, the control unit includes two general alarm relays, with or without a Positive Safety Switch, allowing independent control of two solenoid valves.

Expansion Cards
Relay card: each card has 4 relays, it can connect up to 16 cards (Optional)
Converter card: Current to Voltage

SPECIFICATION

Power

Power Supply	230V (enclosure) 12VDC module
Secondary Battery	(Not supplied) 12VDC ± 10% Max 2.2Ah
Battery Charger	Charger Capacity 2.2Ah
Power Consumption	12V - 25W Maximum 230V - 30W Maximum
Relay Contact Range	10A resistive 230VAC, 5A 30VDC resistive

Alarm Settings

Pre-Alarm No.1	Can be set from 3% LEL (45ppm) to 16% LEL (240ppm)
Pre-Alarm No.2	N/A
Main Alarm	Fixed at 20% LEL / 300ppm
Sensor Fault	Short circuit, interruption, sensor deterioration

Technical Specification

Dimensions	Width 270mm | Height 220mm | Depth 120mm
Weight	260 grams
Display	Illuminated digital display
Mounting	Wall mounted
Input Signal	4-20mA x up to 16
Device Precision	1% FS
Reaction Time	<2 seconds from received signal
Working Temperature	-10°C to 45°C
Start-up Self-Diagnostic Delay	90 seconds
Protective Rating	IP66

Configuration

Positive Safety	Yes (General functions menu)
Main Alarm Relay Actuation	Yes (General functions menu)
Gas Type Selection	Yes (Sensors menu)
Timed Sensor Test Facility	Yes
Emergency Stop Connections	Yes
O_2 Compatibility as Standard	Yes (Sensors menu) - Increase/Depletion

Perhipheral Specification

No. of Remote sensors	16 sensors
Maximum Sensor distance	100m
Cable Diameter for sensors	1mm^2 CSA (Screened and earthed at the controller end)

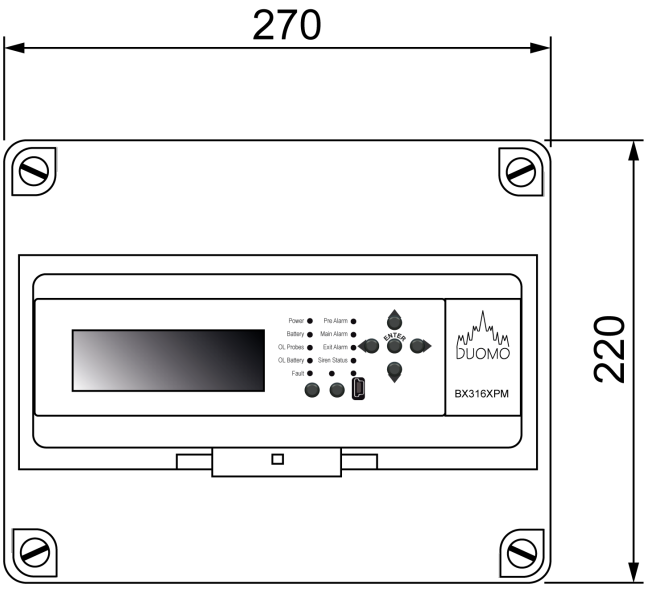
Compatibility

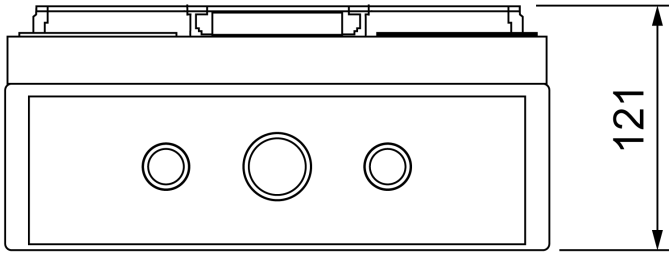
Sensor Compatibility	All Duomo Sensors (Explosive, toxic gas, PM and oxygen)

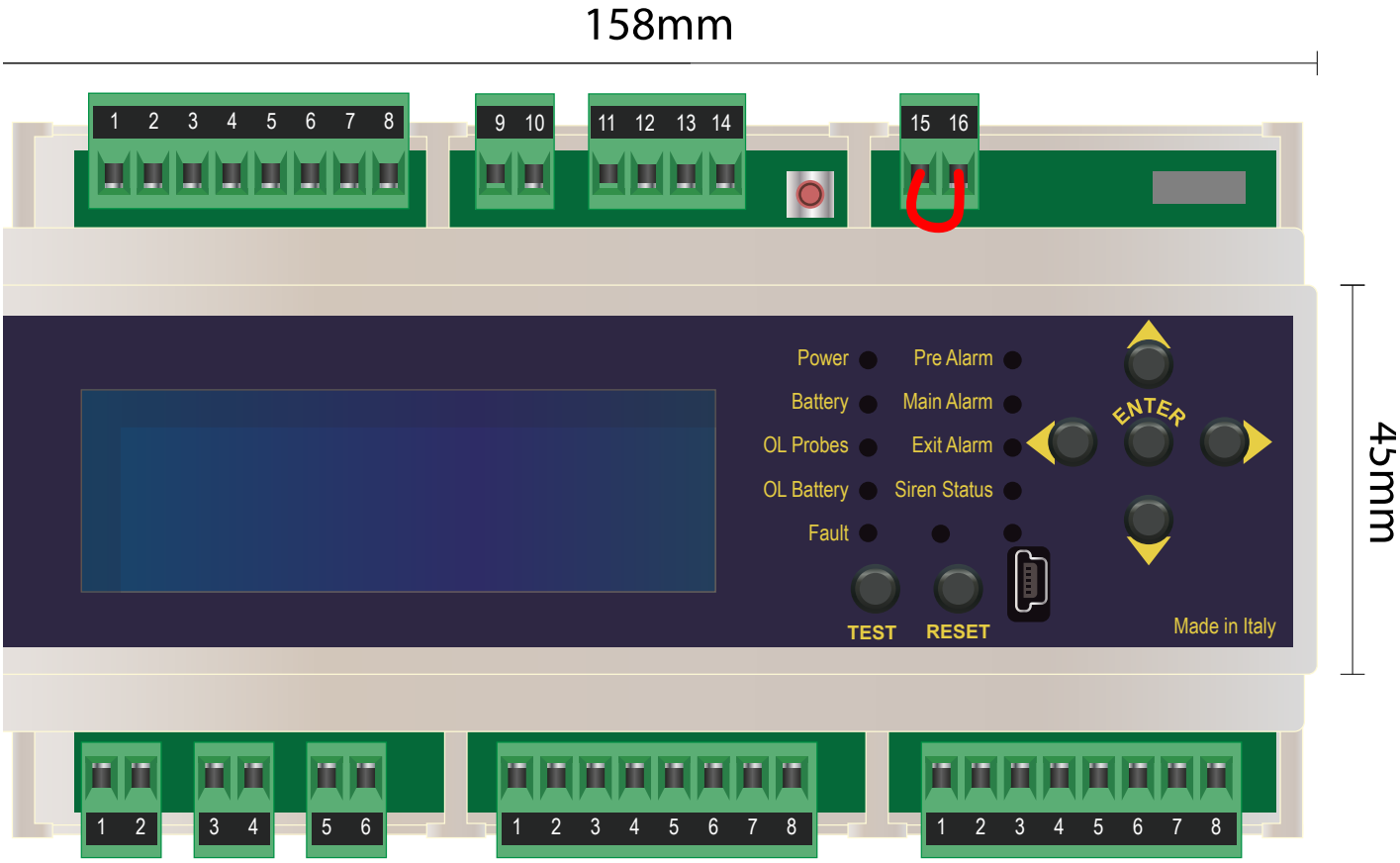
Approvals, Certifications and Guarantee

Approvals	EN 61010-1, EN 50270, EN 50271, EN 45544-3, EN 60079-29-1, EN 50104
Guarantee	2 years as standard 3 years by registering at www.duomo.co.uk

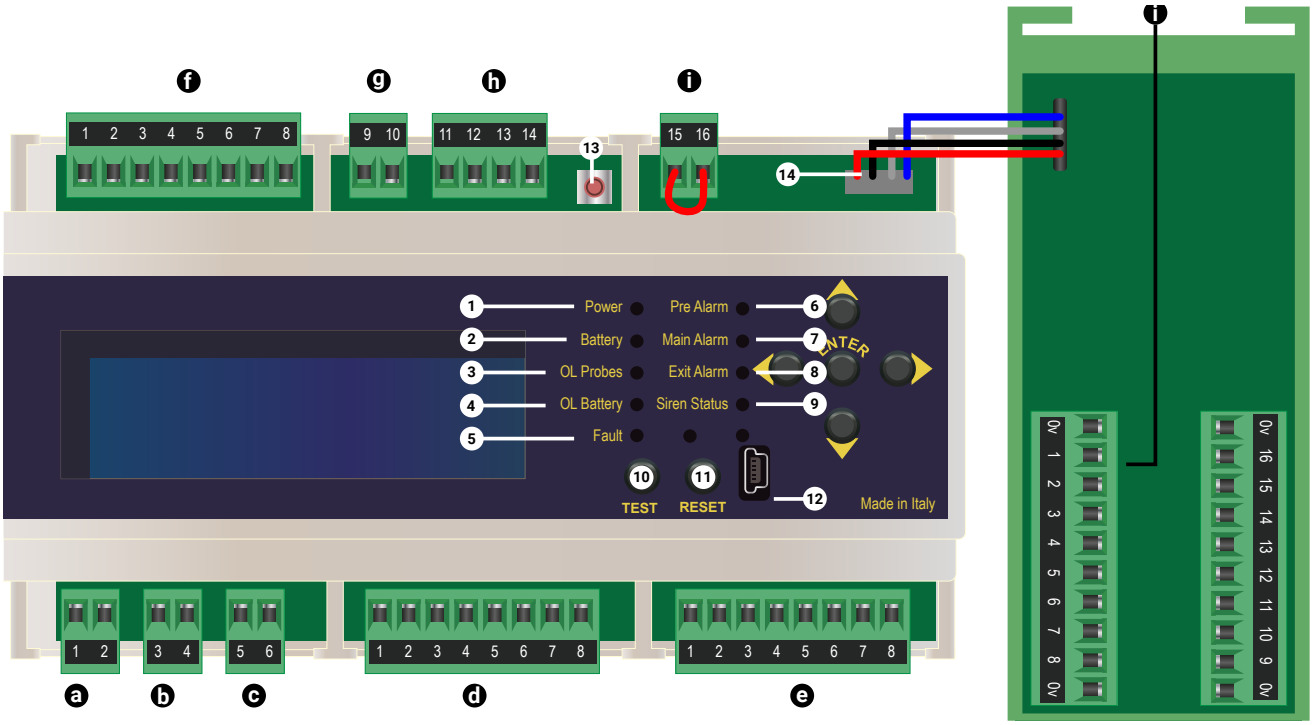
Dimensions


270
220
BX316XPM


121


158mm
45mm
1 2 3 4 5 6 7 8
9 10
11 12 13 14
15 16
Power
Battery
OL Probes
OL Battery
Fault
Pre Alarm
Main Alarm
Exit Alarm
Siren Status
ENTER
TEST
RESET
Made in Italy
1 2
3 4
5 6
1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8

Connections & Interface



Interface

1. **MAINS** Illuminated when BX316XP is powered by mains voltage.
2. **Battery** Illuminated when BX316XP is powered by battery, Flashes when battery voltage is less than 10.8 V
3. **PROBE OVER LOAD** Illuminates when short circuit or a high absorption of current by the sensor and the relative connection cables. Check the battery and the connection cables.
4. **BATTERY OVER LOAD** Illuminated when battery is connected incorrectly or there is an abnormal current absorption. Check the battery and the connection cables.
5. **FAULT** Illuminated and flashes when a connected sensor is faulty, the connection cables are interrupted, or there is a connection error. When this LED is on, the device is no longer able to detect and activates all the relays, both on the 1st threshold and on the 2nd threshold. To restore the operation, sensor must be repaired or removed using the settings program and the RESET button must be pressed. This signal is type "autoreset"
6. **PRE-ALARM LED (PRE-ALARM)** Illuminated when the gas concentration level has reached the pre-alarm threshold, which can be modified by the user (see dedicated chapter).
7. **MAIN ALARM (GENERAL ALARM)** Illuminated when the concentration level of the gas has reached the main alarm threshold.
8. **EXIT ALARM** Illuminated when you press the remote alarm button, at the same time the word "BTN" appears on the display
9. **EXTERNAL SIREN LED** for activating the EXTERNAL SIREN. Illuminates RED when external siren is disconnected. (Access to this function requires password).
10. **TEST button** Pressing and holding this button simulates a gas leak.
11. **RESET button** Press this button to reset all memories.
12. **Printer USB port** Connection to print the data stored in the memory.
13. **Restart button** It is used to Reset the control unit without having to remove primary voltage.
14. **Expansion card connection** Quick-fit socket for inserting expansion cards. cod. CARD-RLS4 Relay expansion card, cod. CARD-BMS16 conversion board from current to voltage

External manual alarm button.
The control unit is designed to be connected to a manual alarm button. Pressing the button the control unit will go directly into alarm even when it is in the programming state or warm up, closing all the auxiliaries connected to it. When pressed on the message "alarm activated by external button" is displayed on LCD.

BX316XP status conditions

Depending on the input signal of the remote sensors, the control unit can be found in the following working conditions:

NORMAL MODE: Controller is receiving signal from the sensors corresponding to a gas level of 0-9% of LEL (explosive gases) and 0-300 ppm (toxic gases). Buzzer and Relays are off and no alarm or fault LEDs illuminated.

PRE-ALARM: Controller is receiving signal from the sensors corresponding to an explosive gas level of 5-9% of LEL (explosive gases) for toxic gases set from 75 to 135ppm (toxic gases). The relays switch and the red pre-alarm LED is illuminated. The buzzer sounds and the display shows the % of gas detected.

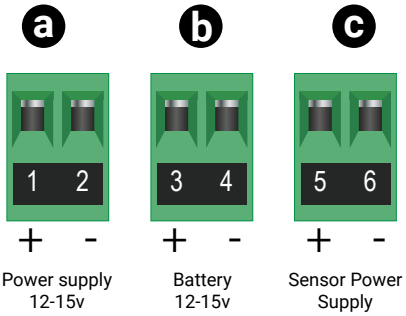
1st ALARM: the control unit receives a signal from the sensors corresponding to an explosive gas level set for each probe between 10% and 20% of the LEL; for toxic gases set from 150 to 300 ppm. The relays switch and the red general alarm LED lights up. The buzzer sounds and the display shows the% of gas detected.

2nd ALARM: the control unit receives a signal from the sensors corresponding to an explosive gas level set for each probe between 10% and 50% of the LEL; for toxic gases set from 150 to 300 ppm. The relays switch and the red general alarm LED lights up. The buzzer sounds and the display shows the% of gas detected.

GENERAL ALARM: the control unit receives a signal from the sensors corresponding to a gas level higher than 20% LEL for explosive gases and greater than 300 ppm for toxic gases. The main alarm relay also changes state and the red "20/300" LED also lights up, the "General alarm" LED flashes. The general alarm relay is energized. The buzzer is on (high frequency).

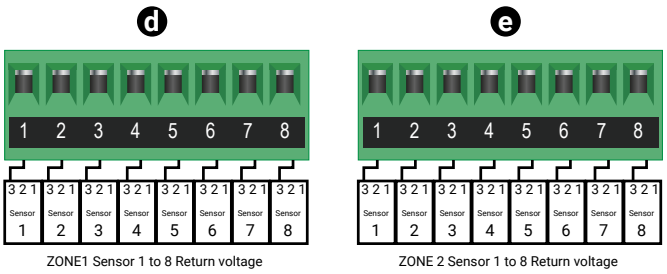
OVER / UNDER RANGE: the control unit receives an under / over range signal. This condition is signaled by two different flashing frequencies of the explosive gas LEDs. The relays are off and no alarm or fault LED lights up. The buzzer is off.

Connections



(a) Main power supply (1 positive, 2 negative)
(b) Backup power supply (3 positive, 4 negative)
(c) Sensor power supply (5 positive, 6 negative)
Warning: Optional battery charged directly from controller

Sensor Connections

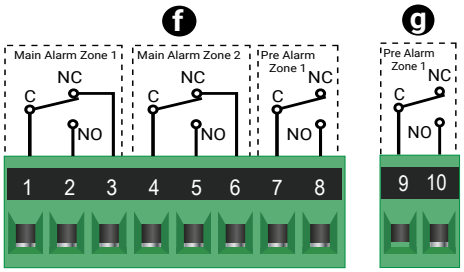


(d)
Terminal 1: Sensor 1 return signal
Terminal 2: Sensor 2 return signal
Terminal 3: Sensor 3 return signal
Terminal 4: Sensor 4 return signal
Terminal 5: Sensor 5 return signal
Terminal 6: Sensor 6 return signal
Terminal 7: Sensor 7 return signal
Terminal 8: Sensor 8 return signal

(e)
Terminal 1: Sensor 1 return signal
Terminal 2: Sensor 2 return signal
Terminal 3: Sensor 3 return signal
Terminal 4: Sensor 4 return signal
Terminal 5: Sensor 5 return signal
Terminal 6: Sensor 6 return signal
Terminal 7: Sensor 7 return signal
Terminal 8: Sensor 8 return signal

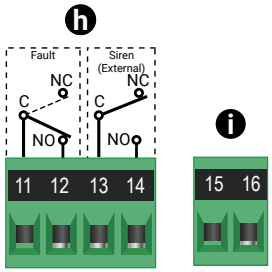
Warning:
- 8 sensors can be connected to each zone.
- Sensors must conform to 4-20mA current loop system

Relay Connections



(f)
Terminal 1,2,3: Main Alarm ZONE 1
Terminal 4,5,6: Main Alarm ZONE 2
Terminal 7,8: Pre Alarm ZONE 1

(g)
Terminal 9,10 Pre Alarm ZONE 2



(h)
Terminal 11and 12: Sensor Fault
Terminal 13 and 14: External Siren

(i)
Terminal 15,16 Optional External Emergency Stop.
(Remove Link to install E.Stop connections)

Expansion Cards

(Up to 8 expansion cards can be connected (relay card CARD-RLS4), having 4 relays each.

The relays can be associated with the desired probe
Each relay can be associated with the following functions: Pre-Alarm, Alarm, Fault or not used

See 14 on previous 'Connections and Interface' page

Precautions

TERMS & EXPECTATIONS: The installation, service and removal at the end of its functional life of the BX316XP must be carried out by authorised and capable personnel.

Be sure to disconnect the controller from the power supply before making changes to the connections. After making all the connections and configurations, the system can be powered up

Check the integrity of the sensor after having removed it from the box.

Check that the power supply to be supplied to the appliance is compatible with the limits illustrated above. When making the electrical connections, follow the drawing carefully.

Any use of the detector for purposes other than the intended one is considered improper, in this case Duomo (UK) therefore disclaims any responsibility for possible damages caused to people, animals or objects.

IMPORTANT: Function testing should be carried out with calibrated test gas to ensure sufficient and safe gas concentration to activate the main alarm.

WARNING!

- This control unit is NOT built for installation in ATEX classified areas
- To meet the requirements as a control unit according to the standard BS EN 60079-29-1:2016+A11:2022 Duomo (UK) has relied on programming and functions via a microprocessor with a numeric alpha display
- All the wiring of the remote sensors must be made using wires with a minimum section of 1.0 mm2 and no longer than 100m. Do not use the same conduit for signal and power cables.
- If strong EMC disturbances are present the use of shielded cables is strongly recommended. The screen must be connected to the 'PE' terminal of the control unit.
- The appliance must be connected to the power supply by means fused and isolated supply switch
- The installation and electrical connections of this appliance must be carried out by technical personnel qualified to carruy out such work, and in compliance with the current technical and safety standards.
- Be sure to turn off the power before wiring the device.
- Safety depends on the installer (whose responsibility is to set up a detection system in compliance with existing standards, both European and National) to choose the correct type of loads to be connected to the control unit and the correct configuration of the system parameters.
- In case of doubt, please contact the Duomo Technical Department. (01905) 797989.

Keep in mind the following precautions to keep the BX316XP in good working order

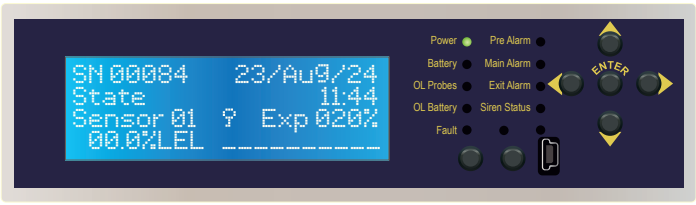
- Do not allow it to become wet.
- The control unit is not waterproof if immersed in water or exposed to high humidity - (with then front panel open) it can be seriously damaged.
- Do not drop it.
- Heavy knocks or falls during transportation or installation can damage the appliance.
- Avoid abrupt temperature fluctuations - Sudden temperature variations can cause condensation and the probe could work poorly.
- Never clean the device with chemical products. If necessary, wash with a moist cloth.

Controls & Navigation

Warmup

This display appears when BX316XP is powered up with a 90 second warmup countdown, Main Screen is then displayed.

Initial Screen

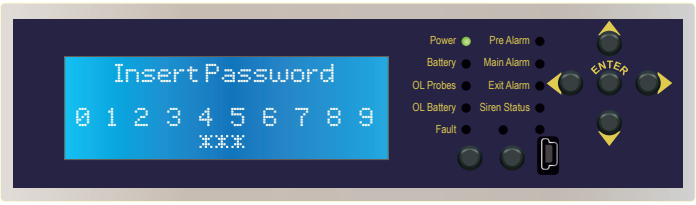


ENTER - Sensor display lock ON/OFF
: Locked sensor display
- : Cycles active sensors every 8 seconds

ENTER (HOLD 5 seconds) - Access MAIN MENU
◀▶ - Accelerate current sensor being displayed

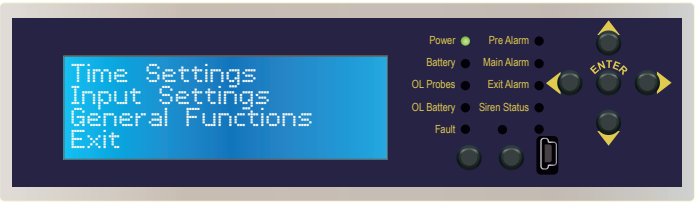
On Display

- Display has Registration number
- Date & Time
- Work State
- Currently monitored sensor
- Target gas
- Explosive or Toxic sensor
- L.E.L or ppm sensor value
- Bar graph of gas level

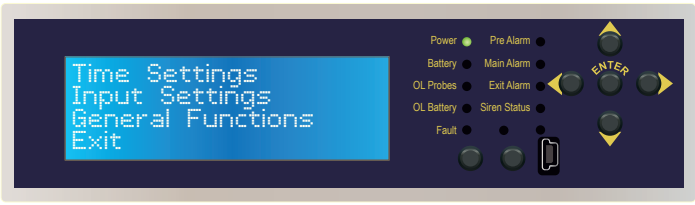


◀▶ - Choose password digits (Default password is 1234)
ENTER - Select digits

Successful password input displays MAIN MENU.



Main Menu



▼▲ - Choose menu option
ENTER - Select option

Time Settings

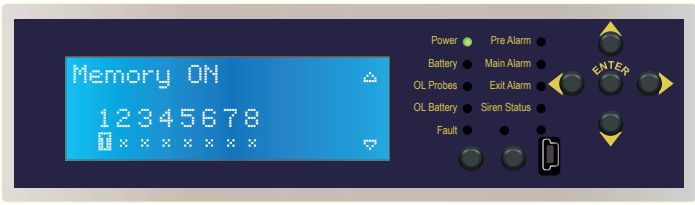
◀▶ - Select (Day/Month/Year or Hour/Minute) option
ENTER - Increment selected date or time
ENTER (HOLD) - Cycle through available options much quicker
Select to return to **MAIN MENU**

Input Settings

Probe Settings

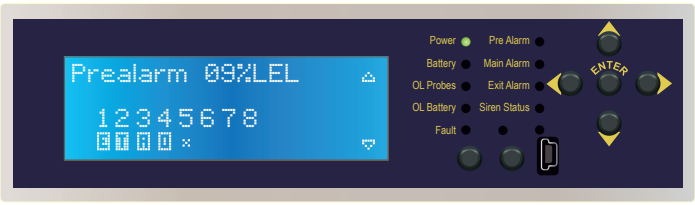
◀▶ - Select Sensor
ENTER - Change selected sensor between
Explosive
Toxic
Oxygen
CO2 sensor
No connected sensor
Continue to **Memory**

Memory Settings



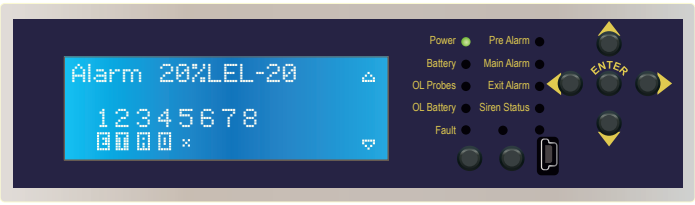
◀▶ - Select Sensor
ENTER - Select Memory ON/OFF (for toxic sensors only)
ON - Controller requires manual reset (**RESET** button)
OFF - Controller Auto resets (<50ppm)
Return to **Probe Settings**
Continue to **Pre Alarm**

Pre alarm Settings



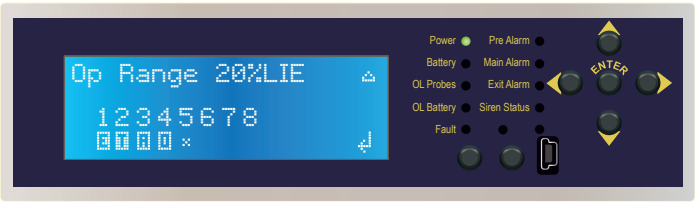
◄► - Select Sensor
ENTER - Choose Pre alarm settings for selected sensor
⏶ Return to **Memory Settings**
⏷ Continue to **Alarm**

Alarm Settings



◄► - Select Sensor
ENTER - Choose Alarm settings for selected sensor
⏶ Return to **Pre Alarm**
⏷ Continue to **OP Range**

OP Range Settings



◄► - Select Sensor
ENTER - Choose Alarm settings for selected sensor

Note: Oxygen sensors operating range is factory set to 20%

Given the importance of this operation a confimation screen will appear. Select between YES/NO with **ENTER**

The operating range will change from 20% to 100% of LEL. Remember to change Sensor too.

⏶ Return to **Alarm**
↲ Select to return to **MAIN MENU**

Exit

ENTER - Select to return to **MAIN SCREEN**

General Settings

▼▲ - Choose menu option
ENTER - Choose settings

Relay: CONTINUOUS/PULSED
Continuous: Relay remains closed for entire duration of alarm condition (If memory is selected, the relay will remain switched until **RESET** button is pressed)
Pulsed: The relay reamins closed for 20 seconds, after which it is de-energised

Positive Safety: ON/OFF
Depending on the type of system, there may be a need to select Positive Safety. In this mode the operation of the two manual alarm relays is reversed.
Selection
Use the ▼▲ keys to select the Sic message. Positive Safety. Each time the "ENTER" button is pressed, the ON / OFF message will change.

In the "ON" position, the Positive Safety function is activated. In the "OFF" position, the Positive Safety function is deactivated.

Once chosen, move with the ▼▲ buttons on the next selection.

Siren: ON/OFF
Select the word Siren with the ▼▲ keys

Each time the "ENTER" button is pressed, the ON / OFF message will change.

In the "ON" position the Siren is enabled; The LED on the panel goes out.
In the "OFF" position the Siren is silenced; The LED on the panel lights up.

Buzzer: ON/OFF
Select the word Buzzer with the ▼▲ keys

Each time the "ENTER" button is pressed, the ON / OFF message will change.

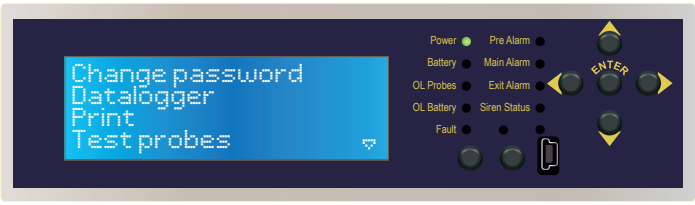
In the "OFF" position the Buzzer is silenced.
In the "ON" position the Buzzer is enabled.

⏷ Continue to **Advanced Settings**

Advanced Functions

▼▲ - Choose menu option
ENTER - Choose advanced functions

Change password



Move with the ◄► buttons over the desired number and press "ENTER", each time the number selected will light up. Proceed with the insertion until all four numbers are turned on.

Once entered, the word "CONFIRMED" lights up. Memorize your password and don't forget it! If you forget your password you can find the "PUK" number written on the warranty sheet.

From this moment, to access the ECU programming, the new Password must be entered. After the change the program switches to the next function. "Data logger"

Datalogger

Move with the ▼▲ buttons using either x1 or x10 to advance through events.

All security and general fault events are stored in the data logger, including network blackouts, battery operation or discharge, etc.

All data is stored with codes, each code corresponds to an event. See table below for error code event types:

Type of Event	Code
1 Pre-alarm	E00-S01
2 Alarm	E01-S01
3 Generic Fault Sensor	E02-S01
4 Black Out	E03-C00
5 Voltage Recovery	E04-C00
6 Low Battery	E05-C00
10 Sensor off	E09-S01
11 Device Reset	E10-C00
12 Clock Battery	E11-C00

Test Probes

Process to functional control the gas detection sensors.

Conventional probes transmit the signal to the control unit in current from 4 to 20 mA values.

4 mA - No gas
20 mA - Gas alarm level threshold.

In the start-up phase the cursor positions itself on sensor 1. Voltage and the current detected by the sensor is displayed.

Move to desired sensor with the ◄► buttons

Maintenence Program

This ensures that gas flow is not interrupted during maintenance operations and inhibits the external siren.

The interruption period is managed directly by the technician based on the size of the installation. Position yourself above the word: "maintenance: 00"

Press "ENTER" button to adjust the maintenence time period (15 - 30 - 45 - 60 minutes)

N.B. At the end of the countdown the device returns to normal operating status. During the maintenance period "in Maintenance" and remaining minutes are displayed.

Maintenance interruption
If the job ends before the set time, pressing the "RESET" button exits the maintenance cycle.

Functional test

A function test should be carried out every 6 months minimum. Using calibration gas of the target gas over the level of the alarm threshold the sensor can be tested. This teset the sensor is reacting and the the correct functions are activated by the controller.

At least once a year A more accurate check must be carried out by a specialised technician who must issue the verification certificate with the Duomo TS1007 tester.

The decommissioning of the system must be carried out by a specialised technician.

Factory Reset

Warning! Factoy reset erases all user-entered data.

Select “Factory reset”, Pressing “ENTER” the writing starts to flash.

Hold down “ENTER” for 4 seconds, a grid appears with 10 empty rectangles that gradually fill up, at the end of which the BX316XP is totally reset, and starts a new 90 second warm up countdown.

Relay Expansion cards

Up to a maximum of 16 CARD-RLS4 Relay Expansion cards can be connected to the control unit.

On each board there are 4 auxiliary relays, to be associated with the desired probe. With a maximum of 64 relays.

The functions related to: Pre-Alarm, Alarm, Fault or not used can be associated to each selected relay

Each selected relay can be associated with a specific range of probes from 1 to 16.

CARD-RLS4- Indicates the address set in the card in reading. Each time the ENTER button is pressed, the CARD-RLS4 card to be set is selected.

Relay - Each press of "ENTER" chooses the Relay (from 1 to 4) to which you want to associate a function.

Func. With each press of "ENTER" choose the function to associate: not used-pre-alarm-alarm-failure

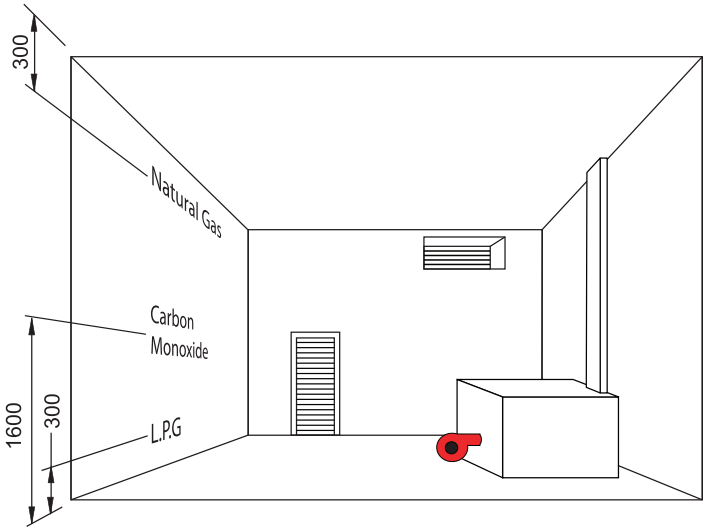
PROBE. Each press of "ENTER" chooses the interval of the sensors to which I must associate the function of the relay

Sensor positioning

The BX316XP is a safety device designed to give audible alarms and automatically provide latched electrical isolation of associated gas safety shut off valves in the event of a gas leak or build up of toxic gases.

The sensors can be located up to 100m from the gas detector. Cable size should be 1mm^2 CSA. If the sensor cables are run separately in specific conduit it is not essential to use screened cable but if the cables are routed through conduit or trunking containing other wiring the use of screened cable is advisable. The wiring should be performed by a qualified person in accordance with current regulations. The plug-in terminal rail makes installation easy and quick. Do not mount close to any heat source or in an area where moisture is likely to effect operation. The IP rating of this unit is IP44. Sensors should be positioned as shown below.

If you require any guidance on this please call Duomo technical support on +44 1905 797989.



In case of alarm

Extinguish any naked flames.
Do not switch lights or electrical devices on or off.
Open all windows and door to increase ventalation.

- If the ALARM LED is off the levels of gas have dropped. A responsible, qualified person is now safe to find the cause of the alarm.
- If the alarm sound reamins constant and the cause is not evident or not possible to eliminate turn off the emergency isolation valaves to the area and contact your gas provider emergency line. They will advise accordingly.

Troubleshooting

The Problem	The Solution
If the device does not start up.	Check that the power supply is correctly connected. If powered by the battery, check that the is power is correctly connected.
If the Fault LED lights up, the system reports an error status.	**Possible cause:** The input current loop is interrupted or the sensor is not powered. **Solution:** Check the connections between the sensor and the control unit for interruption. Also check presence of a voltage around 12 VDC between the "+ V" and "GND" terminals of the reference input.
If the Over Load Probe LED lights up.	Check that the power polarity has not been inverted, that no short-circuit is present, that the sensors were not damaged during installation, that no excessive current absorption is present.
If the Over Load Battery LED lights up.	Check that the connection cables are not short-circuited, that the polarity has not been inverted, or that the battery is not damaged.
If the control unit is repeatedly issuing an alarm.	Check that there are no gas leaks. If the alarm signal and the FAULT indicator light turn on together, check the sensors.
If the control unit is issuing an alarm and does not shut off the devices connected to it.	Check that the wiring is correct and that the jumper that carries power to the relay has been set properly. All relays must be free from electrical power. Check the drawing of the connections.
If a 12Vdc solenoid valve is connected to the BX308/xp, which does not work well	Direct connection of 12Vdc solenoid valves or sirens to the BX316XP is not permitted. An external power unit must always be used. The BX316XP gives a max current of 200mA.

DUOMO
GAS SAFETY CONTROLS

BX316XP 18072023 rev4

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01905 797989

www.duomo.co.uk
sales@duomo.co.uk

linkedin.com/company duomo-uk

@DuomoUK

5 The Furlong, Berry Hill Industrial Estate, Droitwich, Worcestershire, WR9 9AH