

GDS404+

SERIES

OPERATING HANDBOOK

This document is not contractual and the equipment specification may be modified at any time without prior notice.



Contents

Description	3
Technical Specification	4
Installation	5
Commissioning	6
Service – routine attention	8
Table of lower explosive limits / exposure limits.....	9

ILLUSTRATIONS

Fig	
1	Front View – Controls9
2	Display Board – Overrange Alarm (AL3)..... 10
3	Mother Board Detail and Field Terminals 11
4	Alarm Board – Component Layout..... 12
5	Sensor Termination..... 13

REFERENCE DOCUMENTS

See [Product QR code booklet C1837](#)

[Equipment installation guidelines C1144](#)

[Wiring and terminations for sensors and panels C1770](#)

[Gas sensor locations G973](#)

[Aspirated sample line installations C1892](#)

[Transmitter – Flammable Sensor \(Technical Sheet C1883\)](#)

[Transmitter – Toxic/Oxygen Sensor \(Technical Sheet C1882\)](#)

SYSTEM DATA – EQUIPMENT OWNER USE

Manufacture date:		Works Order No:		
Sensor type:	life:	life:	life:	life:
Gas:				
Range:				
Low alarm trip:				
High alarm trip:				
Fault Relay: Normally Energised – Latched				
Alarm Relays: Normally De-Energised – Latched				
Details:				

Description

The GDS 404+ is a multi channel combustible and toxic gas monitor, which can accommodate up to 4 sensor channels housed in wall mounting enclosure. Sensors may be added or removed as required, but should be carried out with the power to the unit switched off.

Each sensor continuously monitors for gas, the display will show the gas type being monitored, the current gas reading and the location of the sensors.

The gas alarms are activated at preset levels and will remain on until the gas clears, these in turn activate the appropriate alarm relays. The fault indicator is initiated should the sensor connecting lines become open/short circuit, or an electronic fault be detected.

The control unit requires an AC mains power supply and/or a low voltage DC power supply. When both are provided the low voltage DC acts as a standby supply in the event of an AC mains power failure.

MAINS ON LAMP (P)

GREEN indicates that power is being supplied to the control unit. When the optional standby battery is fitted loss of mains supply will result in the GREEN Mains ON Lamp changing to RED.

GAS ALARM

Will be indicated by a red LED and display channel changing to a red background with text indication the alarm status. Fault conditions are indicated by amber displays.

SOUNDER

Initiated in the presence of a fault or gas alarm condition.

TEST

When pressed for 15 seconds alarm indications are activated.

If pressed for a further 15 seconds alarm relays will change state.

RESET

Used to mute the sounder and reset alarms, gas alarms cannot be reset until the gas concentration has decreased below the set alarm level.

ALARM RELAY INHIBIT

Pressing the reset pad for 15 seconds will inhibit the alarm relays which is indicated by one or more of the following indications depending upon the model build.

- 1 – front panel Amber Fault / Inhibit LED
- 2 – Motherboard mounted Amber LED D30 located adjacent to the inhibit relay
- 3 – Amber LED (inh) located on each plug in alarm card.

To remove the inhibit press the reset pad for 15 seconds.

ZERO POTENTIOMETER

Meter zero adjust when the sensor is monitoring a gas free atmosphere.

SPAN POTENTIOMETER

Used to adjust the meter indication to read correctly when the sensor is subject to a test gas of known concentration.

ALARM SET SWITCH

Alarm trip points setting.

SENSOR CURRENT POTENTIOMETER

Sensor supply adjustment.

Technical Specification

NUMBER OF CHANNELS

ONE, TWO, THREE OR FOUR CHANNELS

OUTPUTS

Common Relays – user selectable

- Low Alarm – D.P.C.O. normally energised or de-energised– default set ND
- Latched or Unlatched – default set latched
- High Alarm – D.P.C.O normally energised or de-energised– default set ND
- Latched or Unlatched – default set latched
- Third Alarm – D.P.C.O. normally energised or de-energised– default set ND
- Latched or Unlatched – default set latched
- Fault Alarm – S.P.C.O normally energised or de-energised– default set ND
- Global Alarm Relay – S.P.C.O. changes on all alarms and is resettable at all times (sounder/beacon contacts)
- Inhibit Indicator – S.P.C.O contacts 1A@24v DC

Channel Relays

- High and Low Alarm relays S.P.C.O. normally energised or de-energised– default set ND
- Latched or Unlatched – default set latched
- All contacts rated 3A/230v AC

DC Output

(screw terminals) 100mA max @24vDC (sounder/beacon)

SENSOR CABLE

Flammable (catalytic) – 3 core, 1.5mm screened cable, mineral insulated copper sheathed or steel wire armoured – maximum cable loop resistance 20 ohms.

Toxic/Oxygen – 3 core 0.5 mm screened cable, mineral insulated copper sheathed or steel wire armoured – maximum cable loop resistance 200 ohms.

POWER SUPPLY

230, 110v, AC 50/60Hz. or 24v DC (21–30 volts tolerance)

POWER CONSUMPTION

Per channel

Normal operating condition	3w
Full alarm condition	4.5w

OVERLOAD PROTECTION

1A fuse – AC

1 amp anti-surge fuse – DC

2 amp anti-surge fuse – Batteries.

ACCURACY

±5% F.S.D

REPEATABILITY

±2% F.S.D

ENVIRONMENTAL

Ambient operation temp.	0 to 50 degrees centigrade
Storage temperature	–20 degrees to +60 degrees centigrade
Humidity range	0 to 90% RH
Case Ingress Protection	IP52 – Option IP65

MISCELLANEOUS

CE Cert No.	C511
Dimensions	310mm wide x 265mm high x 75mm deep
Weight	3.5kg

ADD ON OPTIONS:

Standby battery 1 hour – Field installation – position the batteries so that they are supported by the battery locating bracket and then retained using the tie-wrap, connect the battery connectors to terminal blocks JP11 and JP12.

Installation

The GDS 404+ Series control instrumentation is designed for installation in a safe area only. Siting of the instrument should be chosen with regard to the following points:

- (a) Cable within the enclosure should be cut back to the minimum length and having been terminated should be kept away from electronic components and the ribbon cable. Cable requiring to pass from the bottom of the enclosure to the top should be run down the right hand side adjacent to the enclosure metalwork.
- (b) Away from sources of local heat and with room for adequate ventilation.
- (c) Within easy reach and audible distance of operating personnel.
- (d) Convenient to a separately fused power supply.
- (e) Incoming sensor cables and outgoing alarm annunciation.
- (f) Sensor cables to be electrically shielded i.e. M.I.C.C., steel wire armoured, screened cable.

To prevent any effect from earth currents the cable shielding should be grounded at one end only.

The instrumentation should be subjected to a minimum of vibration and shock.

Ascertain the voltage rating of the power supply to which the instrument will be connected

SITING THE SENSING HEADS

A key feature of the installation is the correct siting of the sensing head. Several considerations must be taken into account, the most important being the density of the gas.

Density (air = 1)			
Acetone	2.0	n-Hexane	3.0
Ammonia	0.6	Hydrogen	0.1
Benzene	2.8	Methane	0.6
n-Butane	2.0	n-Octane	3.9
Carbon monoxide	1.0	n-Pentane	2.5
Ethane	1.0	n-Propane	1.6
Ethyl alcohol	1.6	Town gas	0.4-0.7
n-Heptane	3.5	Xylene	3.7

Under still air conditions, a 'lighter than air' gas such as methane leaking from a small orifice at ground level, will rise in a plume the shape of which approximates an inverted cone. As the gas rises, it draws air from the surroundings and creates a turbulence. Resulting from this there occurs rapid dilution and, unless a sensor is positioned within the plume, there will be no initial indication of a leak.

As gas continues to escape, the diluted concentration rises to ceiling level and begins to layer. In time the concentration at ceiling level will increase and this, in turn, will displace air downwards.

Dangerous levels will, therefore, tend to occur at ceiling level and the thickness of this layer will increase with the passage of time.

Ventilation of the room will of course alter the situation significantly but it should be remembered that if the ventilator is not at ceiling level, a dangerous concentration can still occur between the top of the ventilator and the ceiling.

For heavier than air gases such as propane or butane, the formation of dangerous layers occurs at ground level. These gases tend to behave like water and will run down gradients and pool at the lowest point.

The number of heads required in individual rooms is determined by the number of possible hazards in the vicinity.

Gas leakage may occur around valves, flanges and anywhere where gas pipes are jointed. It may be possible to cover several probable gas leaks in one room by the careful siting of a single head. Cable ducts, trenches and manholes are also likely places where a build up of heavy gases may collect.

When siting a head in such places it is most important to ensure that there is no likelihood of flooding by water, or excessive dust which may block the sintered disc and prevent gas reaching the sensor.

When monitoring gases outside, those lighter than air will be quickly dispersed, but gases heavier than air will tend to form in layers and again cause a dangerous hazard. When siting heads outside prevailing winds must be taken into consideration and adequate protection given against wind and rain.

POISONING OF CATALYTIC SENSORS

Catalytic elements used in flammable gas sensors are liable to be rendered inactive due to 'poisoning' by certain groups of compounds. In general contact with any gaseous compound capable of producing an involatile residue upon heating is to be avoided.

Examples of such substances are:

- Silicon containing vapours, as emitted by silicone polishes, greases and oils.
- Petroleum vapours containing tetra-ethyl lead or other organo-metallic compounds.
- Phosphorus in the form of phosphate esters.

These compounds will permanently affect the detector and if their presence is suspected the response of the detector should be determined by the calibration procedure.

It is also possible that the reaction of the detector to a flammable gas could be inhibited by halogen containing gases such as chloroform, carbon tetra chloride and trichloro-ethylene. This effect is not permanent.

Commissioning

Before applying power to the instrument ensure that all detector heads are connected to the sensor terminals on the printed circuit board (fig 2) and that each detector head is connected to its appropriate channel:

WARNING – DO NOT INSERT OR REMOVE ALARM CARDS FROM THE MOTHERBOARD WHILE THE POWER IS ON

Switch on power to the instrument.

Check that the green power lamp is on.

Each channel alarm card has a green (ACTIVE) indicator located on the mother board (D102, D202, D302, D402).

On power up these will flash for 60 seconds indicating that the sensors are stabilising, during this period all alarms are held in the off condition.

Where an internal standby battery has been supplied the connectors should be made on JP11 and JP12.

Re-set alarms by pressing the reset button located on the front panel.

Allow ten minutes for the sensors to stabilise.

Any flammable or toxic sensors should be adjusted to read zero by means of appropriate ZERO POTENTIOMETER marked (Z) on the alarm module, or for oxygen sensor adjust the s-span potentiometer for a reading of 20.8 repeat for Channel 2, 3 and 4.

CALIBRATION

Establish calibration figures with respect to the L.E.L. limit or the T.L.V. limit of the calibration gas being used.

See page 10.

The following calibration gases are recommended:

Flammable gases – 2.5% methane in air. Toxic gases – T.L.V. When using this gas ensure adequate ventilation.

If necessary zero each detector channel in clean air (for ambient oxygen monitoring the meter should be adjusted to read 20.8% using the s-span potentiometer – disconnect one sensor lead to adjust zero.

Apply the calibration gas to the appropriate head at a flow rate of approximately 1 litre per minute.

When the meter reads a steady value adjust the Span Potentiometer marked (S) to obtain the correct reading for the calibration gas being used.

SERVICE ADJUSTMENTS

The following adjustments need only be made if the standard factory settings (see test certificate) are to be adjusted.

CALIBRATION WHEN USING 4~20mA SENSOR TRANSMITTERS

Where a sensor transmitter has been supplied the setting up procedure as described on pages 14 to 22 should be followed.

NOTE: Where a transmitter is used, adjustment of the alarm module calibration potentiometer is not required (factory set for 4~20mA input signals), gas calibration need only be carried out at the detector head end.

ALARM LEVEL ADJUSTMENT (LO/HI)

1. Alarm levels may be adjusted as follows: –

For toxic/flammable gases zero the instrument in clean air using the zero potentiometer (for ambient oxygen monitoring the meter should be adjusted to read 20.8 using the s-span potentiometer).

2. Press the alarm set switch for approximately 2 seconds the sounder will bleep and the low alarm indicator will come on, the green power indicator will turn off, release the alarm switch.
3. Using the zero potentiometer adjust the digital display for the required low trip level reading, press the alarm set switch until the high alarm indicator comes on, release the alarm set switch.
4. Adjust the digital display to read the required high trip level reading and again press the alarm set switch both alarm indicators will come on.
5. Zero the digital display (toxic/flammable) or 20.8 for oxygen and press alarm set switch, alarm indicators will turn off and the green power indicator will turn on.

THIRD ALARM (AL3) SET UP PROCEDURE

The screen displays all required information simultaneously as well as the sensor's name/location with a maximum of 16 characters.

The third alarm (AL3) is set using the potentiometer on the front panel PCB labelled RL4. This is a global alarm that applies to all four channels. One sensor zero level should be raised up to the desired alarm level by turning that channel's zero pot. The Alarm 3 set pot should then be turned until the third alarm just activates default setting (80~100 FSD). The zero pot can then be adjusted back to normal setting (see page 10).

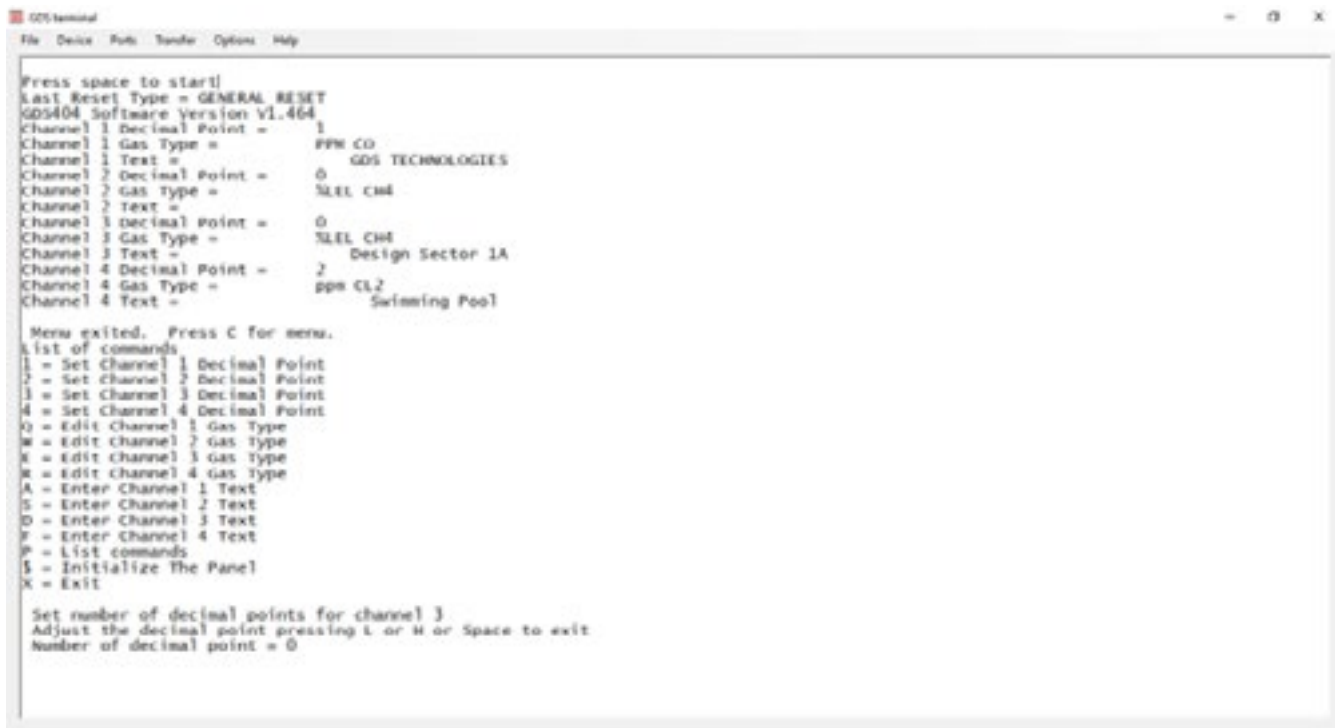
There are jumpers for setting the third alarm level relay to be normally energised/de-energised (jumper fitted for normally energised) and the alarm being latched/unlatched (jumper fitted for latched).

DISPLAY TEXT CHANGES

Gas library, decimal places, sensor name/location, and default alarm settings are set up using a PC via a micro USB to USB lead using GDS terminal or hyperterminal software.

Connect the front panel to a PC using a micro USB lead, this should auto-detect and appear as a com port, the number of which can be found in windows 'device manager' ports for example. The terminal program should be set up using the same method and settings as the GDS combi panel (baud rate 2400).

The terminal window will appear as below. Follow the onscreen instructions:



```
GDS terminal
File Device Ports Transfer Options Help

Press space to start!
Last Reset Type = GENERAL RESET
GDS404 Software Version v1.464
Channel 1 Decimal Point = 1
Channel 1 Gas Type = PPM CO
Channel 1 Text = GDS TECHNOLOGIES
Channel 2 Decimal Point = 0
Channel 2 Gas Type = SLEL CH4
Channel 2 Text =
Channel 3 Decimal Point = 0
Channel 3 Gas Type = SLEL CH4
Channel 3 Text = Design Sector 1A
Channel 4 Decimal Point = 2
Channel 4 Gas Type = ppm CL2
Channel 4 Text = Swimming Pool

Menu exited. Press C for menu.
List of commands
1 = Set Channel 1 Decimal Point
2 = Set Channel 2 Decimal Point
3 = Set Channel 3 Decimal Point
4 = Set Channel 4 Decimal Point
Q = Edit Channel 1 Gas Type
W = Edit Channel 2 Gas Type
X = Edit Channel 3 Gas Type
M = Edit Channel 4 Gas Type
A = Enter Channel 1 Text
S = Enter Channel 2 Text
D = Enter Channel 3 Text
F = Enter Channel 4 Text
P = List commands
I = Initialize The Panel
X = Exit

Set number of decimal points for channel 3
Adjust the decimal point pressing 1 or 4 or Space to exit
Number of decimal point = 0
```

Press the character on the left of the list of commands to change that specific setting. The sensor name has 16 available characters and the gas type has 8.

SENSOR SUPPLY ADJUSTMENT (CATALYTIC SENSOR)

Factory set – no further adjustment required unless a change of sensor type is being made.

For ease of setting, measurements are taken across a 1 ohm resistor (located on each sensor board) which is connected in series with the supply to the detector head. Current required by each type of sensor is (VQ21 –300mA/VQ23 DCP–335mA) therefore, measuring mV across the 1 ohm resistor at test point TP1 or TP2 (on the mother board) and sv test point on each sensor board, will provide a mV reading proportional to mA's supplied, adjustment may be carried out using the sensor volts adjustment potentiometer.

Alternatively the sensor voltage may be set at the detector head across terminals P and W (VQ21 2v/VQ23 DCP 2.5v) and again use the sensor volts adjust potentiometer.

4–20MA OUTPUT ADJUSTMENT

Adjustments: With the load connected to the appropriate 4–20–mA output terminal (typically 100 ohms) and a digital volt meter connected to the test pins TP3 + TP4 – ensure that the sensor is in clean air, and that the instrument is reading zero.

Adjust the 4mA potentiometer to read 4mV on the digital voltmeter.

Using the appropriate sensor zero potentiometer adjust the alarm panel digital display for full scale reading.

Adjust the 20mA output potentiometer until the digital voltmeter reads 20mV

Return the alarm panel digital display reading to zero by readjusting the zero potentiometer.

Service – routine attention

The owner or occupier of the premises should place the supervision of the system in the charge of a responsible executive whose duty it should be to ensure the day to day operation of the system and to lay down the procedure for dealing with a gas alarm or fault warning. To ensure reliability an agreement should be negotiated for regular servicing. When a service contract cannot be arranged an employee with suitable experience of electrical equipment should be trained to deal with the more simple servicing and instructed not to attempt to exceed the scope of such training.

Liaison should be established with those responsible for maintenance of the building fabric or redecoration etc. to ensure that their work does not cause a fault or otherwise interfere with the operation of the gas alarm installation. Particular attention appertaining to the Detector Head.

The operating instructions should be kept available preferably with the control unit, all faults, service tests and routine attention given should be recorded.

DAILY: A check should be made that any fault condition which may be indicated is in fact being attended to and that all other indicators are normal.

WEEKLY: In plants involving a high risk process or having gases which may cause loss of sensitivity a check on calibration should be carried out.

TWICE YEARLY MAINTENANCE SCHEDULE

1. All zeros at the control unit to be checked, logged and aligned.
2. Each detector to be gas tested and reading logged (sensitivity checked).
3. Field indicators to be tested.
4. All alarm set points checked and re–aligned.
5. Lamp Test.
6. All faulty parts replaced where required.
7. All filter elements checked and replaced as necessary.
8. Power supply – complete functional check.
9. Visual inspection made to confirm that all cabling fitting and equipment is secure, undamaged and adequately protected.

FAULT DIAGNOSIS

- | | |
|----------------------|---------------------------------------|
| Unable to zero meter | 1. Sensor open circuit |
| | 2. Sensor leads incorrectly connected |
| | 3 Alarm card not positioned correctly |

No front panel indication – Check ribbon cable is connected correctly

ACTION TO BE TAKEN IF THE APPARATUS ALARM SOUNDS:

- A Extinguish all naked flames, including all smoking materials.
- B Turn off all gas appliances.
- C Do not switch on or off any electrical lights or appliances.
- D Turn off the gas supply at the gas emergency control and/or (with L.P.G supply) the storage tank.
- E Open doors and windows to increase ventilation

If the alarm continues to operate, even after an alarm re-setting action where appropriate, and the cause of the leak is not apparent and/or cannot be corrected, vacate the premises and immediately notify the gas supplier and/or the gas emergency 24 hour service in order that the installation may be tested and made safe and any necessary repair carried out.

Table of lower explosive limits – L.E.L.

The figures quoted below are taken from British Standards Institute publication BS EN 60079-20-1:2010 and show the L.E.L. of some of the more common gases and vapours:

GAS	L.E.L. % VOLUME
Acetone	2.5
Ammonia	15.0
Benzene.....	1.2
n-Butane	1.4
Carbon monoxide	10.9
Ethylene	2.3
Heptane.....	0.85
Hexane	1.0
Hydrogen	4.0
Methane	4.4
Propane	1.7
Pentane	1.1
Toluene.....	1.0
Xylene	0.9

Table of occupational exposure limits – P.P.M.

The figures quoted below are taken from guidance note EH40 from the Health and Safety Executive and ACGIH.

GAS	8 HOUR – T.W.A. – P.P.M.
Hydrogen sulphide	5
Carbon monoxide	30
Sulphur dioxide.....	2
Nitrogen monoxide	25
Nitrogen dioxide.....	3
Chlorine	0.5
Ammonia	25
Ozone.....	0.1
Ethylene oxide.....	5

INDICATORS

L.E.L.	–	Lower Explosive Limit
PPM	–	Parts Per Million
% vol.	–	% Volume
Hi	–	High Alarm (Red)
Lo	–	Low Alarm (Red)
C ₁ –C ₄	–	Channel (Sensor)
	–	Fault Indicator (Amber)
	–	Power On (Green)
	–	Mains Fail (Red)
	–	Inhibit (Amber)
Reset	–	Sounder/Alarms
Test	–	Electronic System Test

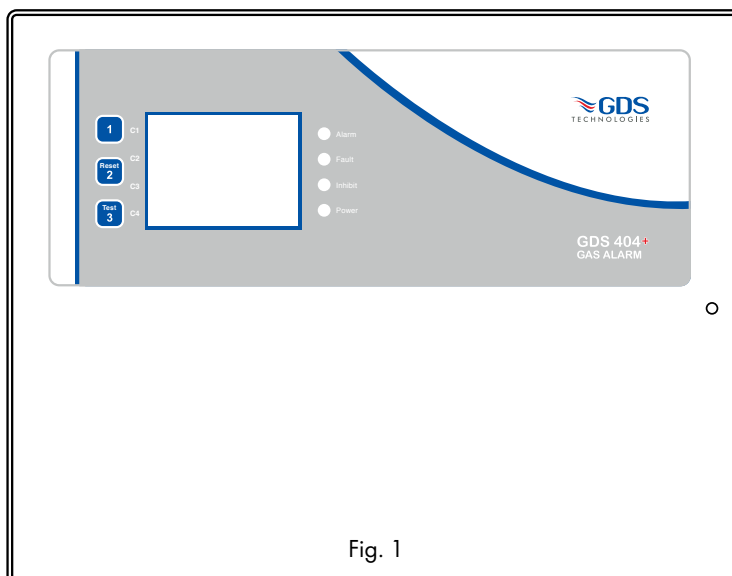
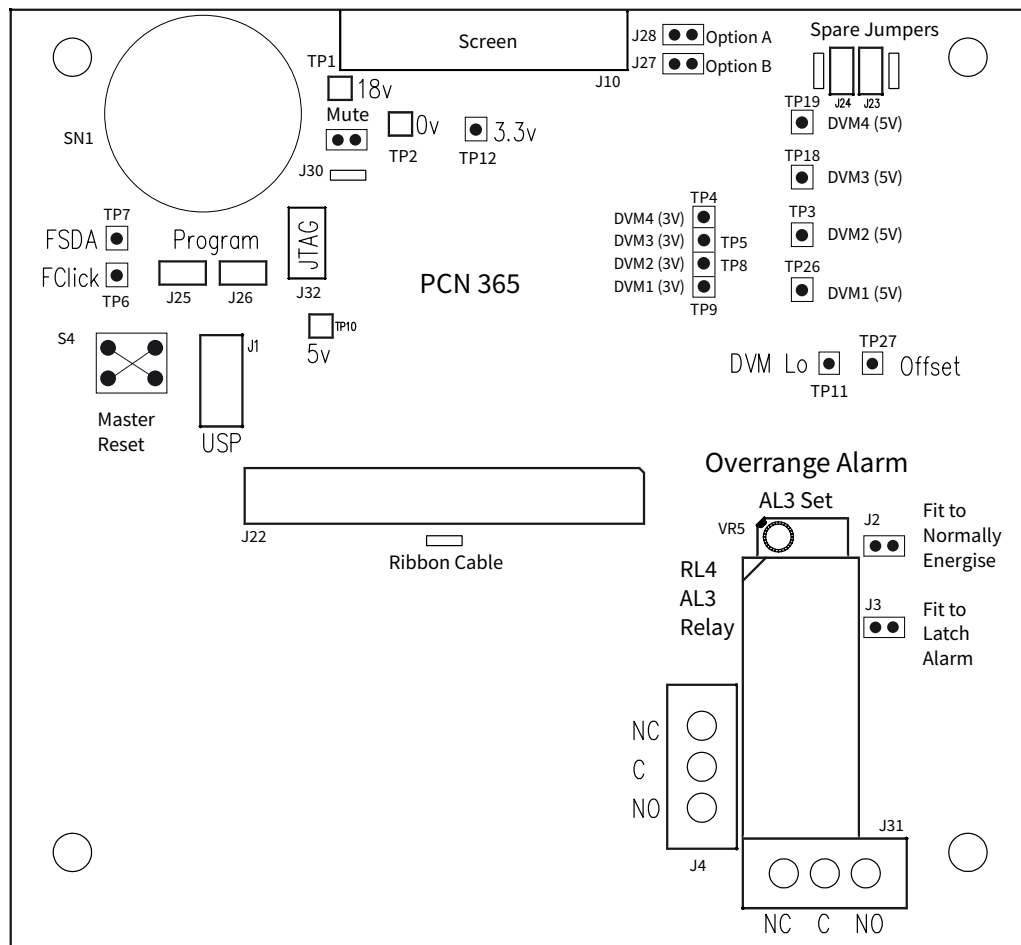


Fig. 1

Fig. 2

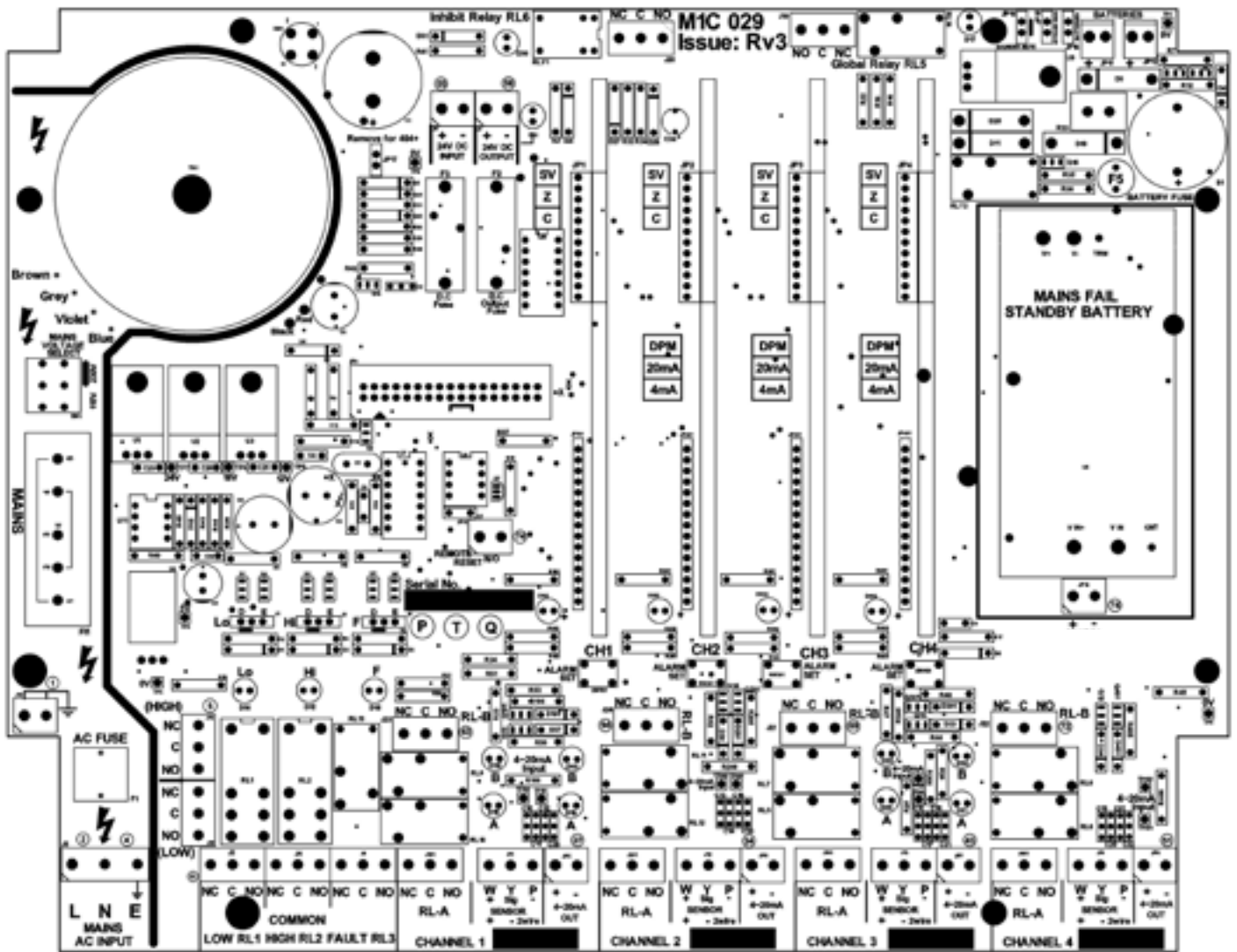


Display Board

RELAY SELECTION

Common Third Alarm Relay – Normally energised/Normally de-energised – (J2)

Fig. 3



Mother Board

RELAY SELECTION

Common High Relay – Normally energised/Normally de-energised – (J3)

Common Low Relay – Normally energised/Normally de-energised – (J1)

Global Alarm Relay – Normally de-energised

Common Fault Relay – Normally energised/Normally de-energised – (J5)

Inhibit Relay – Normally de-energised

Channel relays (1–4) A/B (Lo/Hi) see alarm board page 14

SOUNDER PERMANENT MUTE

JP10 remove

STANDBY BATTERY

Connect leads to – (JP11 and JP12)

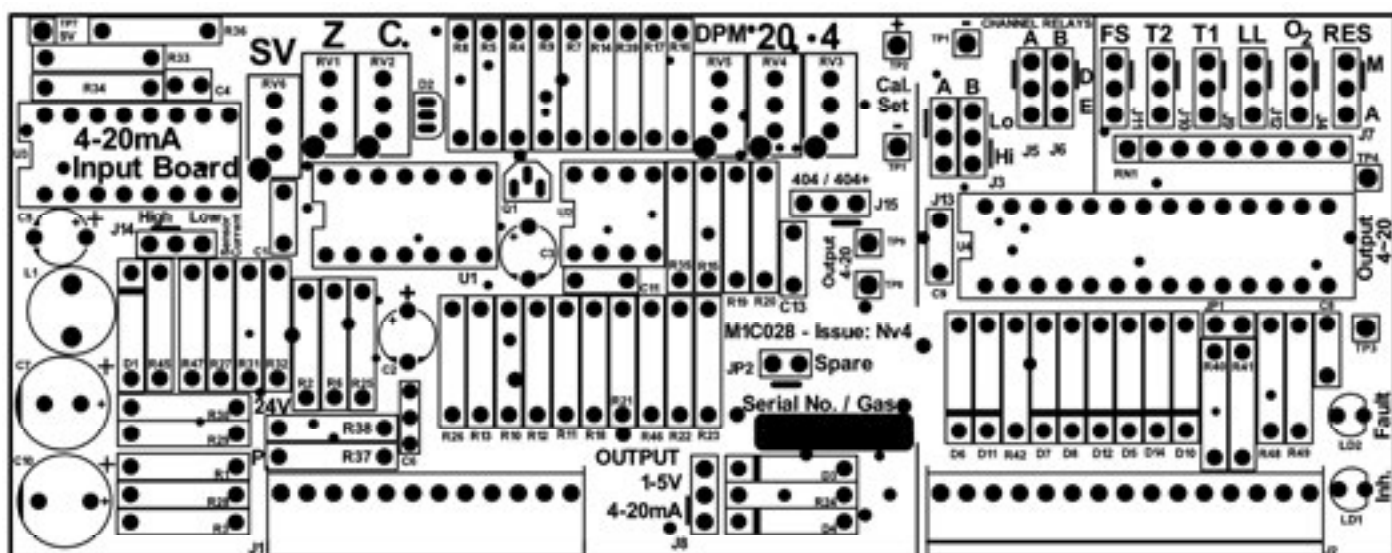
CONTROLLER SELECTION

For operation as 404 JP17 should be fitted

For operation as 404+ JP17 should be removed

(JP17 located below sounder)

Fig. 4



Alarm Board (plug in)

RELAY SELECTION

Channel Relay A – Low/High Alarm – Lo/Hi – Factory set – Low } for A+B
 Channel Relay B – Low/High Alarm – Lo/Hi – Factory set – High
 Normally energised or de-energised – E/D – Factory set – De-energised (D)

AUTOMATIC OR MANUAL RESET – A/M

Oxygen Monitoring (factory set) – O₂
 Oxygen Alarm Set Low/Low Alarm – LL
 Time delay to alarm – T1 – 10 secs
 T2 – 30 secs

When used with GDS300 Flow sample systems – FS

SENSOR SELECTION

24v (4/20mA input) P – Pellistor (mV input)

4~20MA OUTPUT

TP3/TP4

CALIBRATION

TP1/TP2

ADJUSTMENTS

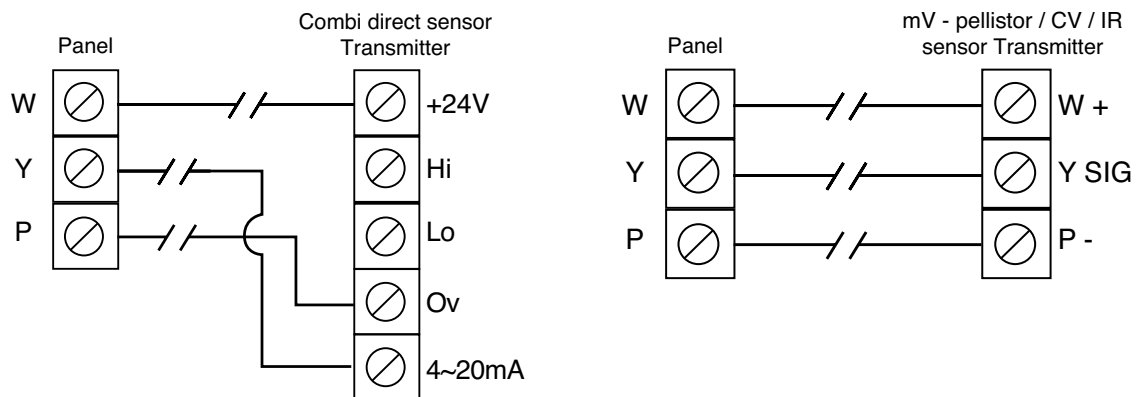
Potentiometer	RV1	–	Sensor Zero
Potentiometer	RV2	–	Sensor Calibration
Potentiometer	RV3	–	4~20mA signal output – 4mA adjust
Potentiometer	RV4	–	4~20mA signal output – 20mA adjust
Potentiometer	RV5	–	GDS 404+ display span (factory set)
Potentiometer	RV6	–	Sensor Supply

ALARM BOARD SELECTION

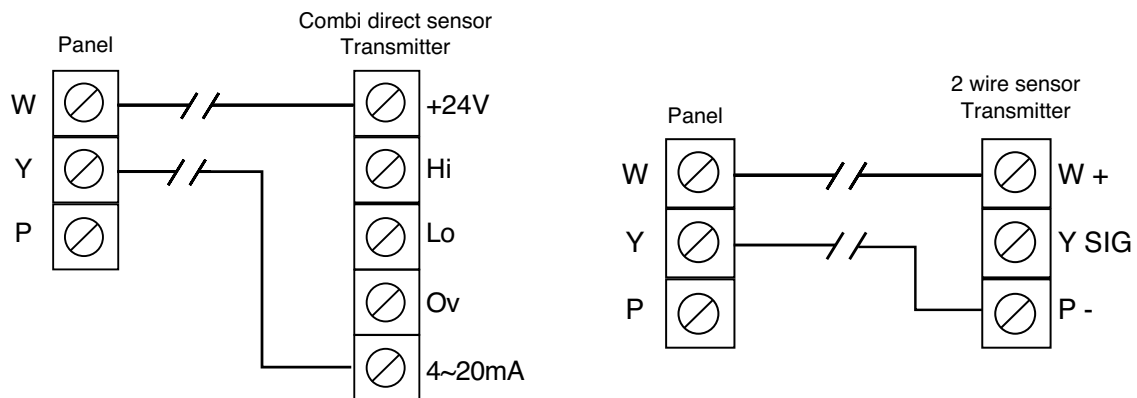
For operation as 404 JP1 should be fitted and J15 should be set to 404
 For operation as 404+ JP1 should be removed and J15 should be set to 404+
 (J15 located above SN block, J1 located below U4 (large IC))

Fig. 5

3 WIRE SENSOR



2 WIRE SENSOR



3 WIRE REDLINE (2 PCB) INFRA RED SENSOR

