Operating Manual

ALTAIR 5X – Multi Gas Detector
ALTAIR 5X IR – Multi Gas Detector

The Safety Company

Declaration of Conformity

Manufactured by: Mine Safety Appliances Company
                     1000 Cranberry Woods Drive
                     Cranberry Township, PA 16066 USA

The manufacturer or the European Authorized Representative
                     MSA AUER GmbH, Thiemannstrasse 1, D-12059 Berlin

declares that the product:

ALTAIR 5X, ALTAIR 5XIR

Complies with the provisions of the council directive 94/9/EC [ATEX]. This declaration is based on the EC-Type Examination Certificate
          FTZU 08 ATEX 0340 X and FTZU 09 ATEX 0006 X

in accordance with Annex III of the ATEX Directive 94/9/EC. Quality Assurance Notification issued by Ineris of France, Notified Body number 0080, in accordance with Annex IV of the ATEX Directive 94/9/EC.

We additionally declare that this product is in conformance with the
EMC Directive 2004 / 108 / EC in accordance with the standards

          EN 50270: 2007 Type 2 , EN 61000 - 6 - 3: 2007

MSA AUER GmbH   Berlin, April 2011
Dr. Axel Schubert
R&D Instruments

Contents

1 Safety Regulations

1.1 Correct Use

The ALTAIR 5X and ALTAIR 5X IR Multigas Detectors are for use by trained and qualified personnel. They are designed to be used when performing a hazard assessment to:

- Assess potential worker exposure to combustible and toxic gases and vapours as well as low level of oxygen.
- Determine the appropriate gas and vapour monitoring needed for a workplace.

The ALTAIR 5X and ALTAIR 5X IR Multigas Detectors can be equipped to detect:

- Combustible gases and certain combustible vapours
- Oxygen-deficient or oxygen-rich atmospheres
- Specific toxic gases for which a sensor is installed.

The ALTAIR 5X and ALTAIR 5X IR Multigas Detectors are designed to:

- Detect gases and vapours in air only
- The ALTAIR 5X IR gas detector can also contain one infrared sensor to detect CO_2 or specific combustible gases up to 100 % Vol.

> While the device can detect up to 30 % oxygen in ambient air, it is approved for use only up to 21 % oxygen.

- Read and follow all instructions carefully.
- Perform a blocked flow test before each day's use if equipped with an integral pump.
- Perform a Bump Test before each day's use, and adjust if necessary.
- Perform a Bump Test more frequently if exposed to silicone, silicates, lead-containing compounds, hydrogen sulfide, or high contaminant levels.
- Recheck calibration if device is subjected to physical shock.
- Use only to detect gases/vapours for which a sensor is installed.
- Do not use to detect combustible dusts or mists.
- Make sure adequate oxygen is present.
- Never block the pump inlet except to perform a sampling safety test.

- Have a trained and qualified person interpret device readings.
- Do not remove battery pack from device while in a hazardous location.
- Do not recharge Li Ion battery in a combustible location.
- Do not replace alkaline batteries in a combustible location.
- Do not alter or modify device.
- Use only MSA-approved sampling lines.
- Do not use silicone tubing or sampling lines.
- Wait sufficient time for the reading; response times vary, based on gas and length of sampling line.
- Do not use the device with integral pump for prolonged periods in an atmosphere containing a concentration of fuel or solvent vapours that may be greater than 10 % LEL.

It is imperative that this operating manual be read and observed when using the product. In particular, the safety instructions, as well as the information for the use and operation of the product, must be carefully read and observed. Furthermore, the national regulations applicable in the user's country must be taken into account for a safe use.

⚠ **Danger!**
This product is supporting life and health. Inappropriate use, maintenance or servicing may affect the function of the device and thereby seriously compromise the user's life.

Before use the product operability must be verified. The product must not be used if the function test is unsuccessful, it is damaged, a competent servicing/maintenance has not been made, genuine MSA spare parts have not been used.

Alternative use, or use outside this specification will be considered as non-compliance. This also applies especially to unauthorised alterations to the product and to commissioning work that has not been carried out by MSA or authorised persons.

1.2   Liability Information

MSA accepts no liability in cases where the product has been used inappropriately or not as intended. The selection and use of the product are the exclusive responsibility of the individual operator.

Product liability claims, warranties also as guarantees made by MSA with respect to the product are voided, if it is not used, serviced or maintained in accordance with the instructions in this manual.

1.3 Safety and Precautionary Measures to be Adopted

Check calibration more frequently if the device is subjected to physical shock or high levels of contaminants. Also, check calibration more frequently if the tested atmosphere contains the following materials, which may desensitise the combustible gas sensor and reduce its readings:

- Organic silicones
- Silicates
- Lead-containing compounds
- Sulphur compound exposures over 200 ppm or exposures over 50 ppm for one minute.

- The minimum concentration of a combustible gas in air that can ignite is defined as the Lower Explosive Limit [LEL].
A combustible gas reading of "100" or "5.00" indicates the atmosphere is above 100 % LEL or 5.00 % Vol CH_4, and an explosion hazard exists. Move away from hazardous area immediately.

- Do not use the device to test for combustible or toxic gases in the following atmospheres as this may result in erroneous readings:

  - Oxygen-deficient or oxygen-rich atmospheres
  - Reducing atmospheres
  - Furnace stacks
  - Inert environments [only IR sensors acceptable for use]
  - Atmospheres containing combustible airborne mists/dusts.

- Do not use the ALTAIR 5X and ALTAIR 5X IR Multigas Detectors to test for combustible gases in atmospheres containing vapours from liquids with a high flash point [above 38 °C, 100 °F] as this may result in erroneously low readings.

- Allow sufficient time for device to display accurate reading. Response times vary based on the type of sensor being utilised [→chapter 5.3]. Allow a minimum of 1 second per foot [3 seconds per metre] of sample line to allow the sample to be drawn through the sensors.

- Sampling lines made from 1.57 mm [0.062 inch] inner diameter tubing provide fast transport times to the device; however, they must be limited to 15 m [50 feet] in length.

- Sampling of reactive toxic gases [Cl_2, ClO_2, NH_3] must only be done with the reactive gas sample line and probe kits listed in the chapter 6 Accessories table.

- All device readings and information must be interpreted by someone trained and qualified in interpreting device readings in relation to the specific environment, industrial practice and exposure limitations.
- Use of the Galaxy® Automated Test System is an alternate MSHA-approved method for calibrating MSHA-approved ALTAIR 5X devices.
- Use only calibration gas that is 2.5 % Methane with an accuracy of +5 % when calibrating MSHA-approved ALTAIR 5X devices.
- The maximum acceptable user-set [password protected] Galaxy Test System tolerance on Bump Limits must be set to 10 % or less when calibrating MSHA-approved ALTAIR 5X devices.
- For 30 CFR Part 75 determinations, the maximum acceptable userset [password protected] Galaxy Test System tolerance on Bump Limits must only be set to such that 19.5 % oxygen can be detected with an accuracy of +0.5 % when calibrating MSHA-approved ALTAIR 5X devices.

Observe proper battery maintenance

Use only battery chargers made available by MSA for use with this device; other chargers may damage the battery pack and the device. Dispose of in accordance with local health and safety regulations.

Be aware of environmental conditions

A number of environmental factors may affect the sensor readings, including changes in pressure, humidity and temperature.

Pressure and humidity changes also affect the amount of oxygen actually present in the atmosphere.

Be aware of the procedures for handling electrostatically sensitive electronics

The device contains electrostatically sensitive components. Do not open or repair the device without using appropriate electrostatic discharge [ESD] protection. The warranty does not cover damage caused by electrostatic discharges.

Be aware of the product regulations

Follow all relevant national regulations applicable in the country of use.

Be aware of the warranty regulations

The warranties made by Mine Safety Appliances Company with respect to the product are voided if the product is not used and maintained in accordance with the instructions in this manual. Please protect yourself and others by following them. We

encourage our customers to write or call regarding this equipment prior to use or for any additional information relative to use or service.

1.4 Warranty

ITEM	WARRANTY PERIOD
Chassis and electronics	Three years*
COMB, O_2, H_2S, CO, SO_2, IR sensors	Three years*
Cl_2, NH_3 sensors	Two years*
ClO_2, HCN, NO_2, PH_3 sensors	One year*

* For extended warranty offerings please contact MSA

This warranty does not cover filters, fuses, etc. As the battery pack ages, there will be a reduction in useable device run time. Certain other accessories not specifically listed here may have different warranty periods. This warranty is valid only if the product is maintained and used in accordance with Seller's instructions and/or recommendations.

The Seller shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorised service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning this product. Seller makes no warranty concerning components or accessories not manufactured by the Seller, but will pass on to the Purchaser all warranties of manufacturers of such components.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

Exclusive Remedy

It is expressly agreed that Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of Seller, or for any other cause of action, shall be the replacement at Seller's option, of any equipment or parts thereof, which after examination by Seller is proven to be defective.

Replacement equipment and/or parts will be provided at no cost to Purchaser, F.O.B. Seller's Plant. Failure of Seller to successfully replace any nonconforming equipment or parts shall not cause the remedy established hereby to fail of its essential purpose.

Exclusion of Consequential Damage

Purchaser specifically understands and agrees that under no circumstances will seller be liable to purchaser for economic, special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of nonoperation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

2   Description

2.1   Overview

Fig. 1   Device view

1	*LEDs [2 red "Alarm", 1 green "Safe"]*	*7*	**MSA** link *Communication*
2	*Horn*	*8*	*Pump inlet*
3	*Display*	*9*	*Filter*
4	*▲ Button*	*10*	*Belt Clip [ALTAIR 5X only]*
5	***ON/OFF*** *Button*	*11*	*Charging connections*
6	*▼ Button*	*12*	*Charge Status LED*

The device monitors gases in ambient air and in the workplace.

The ALTAIR 5X is available with a maximum of four sensors, which can display readings for five separate gases [one Dual Toxic Sensor provides both CO and H_2S sensing capabilities in a single sensor].

The ALTAIR 5X IR is available with a maximum of five sensors, which can display readings for six separate gases [one Dual Toxic Sensor provides both CO and H_2S sensing capabilities in a single sensor].

The ALTAIR 5X and ALTAIR 5X IR detectors are available with either a mono-chrome or colour display.

While the device can detect up to 30 % oxygen in ambient air, it is approved for use only up to 21 % oxygen.

The alarm levels for the individual gases are factory-set and can be changed through the device Setup Menu. These changes can also be made through MSA Link Software. Ensure that the latest version of the MSA Link software has been downloaded from MSA's website **www.msanet.com**.

It is recommended that after making changes using MSA Link software, the device should be turned off and on.

2.2   Device Hardware Interfaces

Device operation is dialog driven from the display with the aid of the three function buttons [→ Fig. 1].

The devices have three buttons for user operation. Each button can function as a "soft key", as defined directly above the button.

Button Definitions

Button	Description
ON/OFF	The **ON/OFF** button is used to turn device ON or OFF and to confirm user action selections.
▼	The ▼ button is used to page down through data screens or to decrease the values in Set-up mode through data screens or to decrease the values in Setup mode. This button is also used to initiate a Bump Test for the installed sensors, directly from the MEASURING page.
	If the user is granted access to the MotionAlert setting feature, this button can be used to activate the InstantAlertTM alarm.
▲	The ▲ button is used to reset peak, STEL TWA and alarms [where possible] or perform calibration in measuring mode. It is also used as page up or to increase the values in set-up mode.

When the ▲ button and the ▼ button are pressed simultaneously while in normal measure mode, the Setup mode can be entered after the password is confirmed.

LED Definitions

LED	Description
RED [Alarm]	The red LEDs are visual indications of an alarm condition or any type of error in the device.
GREEN [Safe]	The Safe LED flashes once every 15 seconds to notify the user that the device is ON and operating under the conditions defined below: - The green SAFE LED is enabled - Combustible reading is 0 % LEL or 0 % Vol - Oxygen [O_2] reading is 20.8 % - Carbon Dioxide [CO_2] reading is < 0.03 % - All other sensor readings are 0 ppm - No gas alarms are present [low or high] - Device is not in Low Battery warning or alarm - STEL and TWA readings are 0 ppm This option can be turned OFF through the MSA Link software.
YELLOW [Fault]	The Fault LED activates if any of several fault conditions during operation. This includes: - A device memory error - A sensor determined to be missing or inoperative - A pump fault These faults are also indicated by activation of device alarm LEDs, horn, and vibrating alarm

Alarms

The device is equipped with multiple alarms for increased user safety:

Vibrating Alarm

The device vibrates when any alarm condition is active. This can be turned off through the SETUP- ALARM OPTIONS menu [$\rightarrow$ chapter 3.4].

Horn

The horn provides an audible alarm.

InstantAlert™ Alarm

The InstantAlert exclusive feature allows the user to manually activate an audible alarm to alert those nearby to potentially dangerous situations. Holding the ▼ button for approximately 5 seconds while in Normal Measure Mode activates the InstantAlert alarm. Access to this feature may be restricted. See chapter 3.4 for means to allow/disallow user access.

MotionAlert™ Alarm

If MotionAlert is turned ON [+ = ON] [see chapter 3.4], the device activates a "Man Down" alarm if motion is not detected within 30 seconds. The Alarm LEDs flash, and the horn activates with an increasing audible frequency. MotionAlert is always turned OFF when the device is turned OFF. It must always be turned ON prior to use.

Access to this feature may be restricted. See chapter 3.4 for means to allow/disallow user access.

Stealth Mode

Stealth Mode disables the visual, audible and vibrating alarms. MSA recommends that this feature be left in its default "OFF" state. Stealth mode can be turned ON through the SETUP - INSTRUMENT OPTIONS menu [chapter 3.4]. The message "Alarms OFF" flashes on the monochrome display when Stealth mode is ON. On the colour display, all three alarm icons are shown as OFF.

Sensor Life Alarm

The device evaluates the condition of the sensors during Calibration. As the end of a sensor's life approaches, a warning is provided. While the sensor is still fully functional, the warning gives the user time to plan for a replacement sensor to minimise downtime. The Sensor Life indicator ♥ displays during ongoing operations as a reminder of a sensor's pending end of life.

When a sensor's end-of-life is reached, sensor calibration will not be successful, and the user is then alerted by a Sensor Life Alarm. A flashing Sensor Life iindicator ♥ displays during ongoing operations until the sensor is replaced and/or successfully calibrated.

On the monochrome display the Sensor Life indicator appears on the display at the same position as the MotionAlert indicator. If MotionAlert is enabled [the **+** indicator displays] and a Sensor Life warning or alarm occurs, the Sensor Life indicator ♥ takes priority and is shown instead.

On the colour display, each displayed gas will have its own Sensor Life indicator. If a sensor is in end-of-life warning, its indicator will be an orange ♥. If a sensor has reached end-of-life, it is in alarm and its Sensor Life indicator will be a continuous blinking red ♥.

See chapter 3.8 for additional details on Sensor Life determination and indication.

Backlight

The backlight automatically activates when any front panel button is pressed and remains ON for the duration of user-selected timeout.

This duration can be changed using the SETUP - INSTRUMENT MODE
[→ chapter 3.4] or through MSA Link software.

Operating Beep

Operating Beep

This operating beep activates every 30 seconds by momentarily beeping the horn and flashing the alarm LEDs under the following conditions:

- Operating beep is enabled

- Device is on normal Measure Gases page

- Device is not in battery warning

- Device is not in gas alarm

2.3   On-Screen Indicators

Monochrome Display
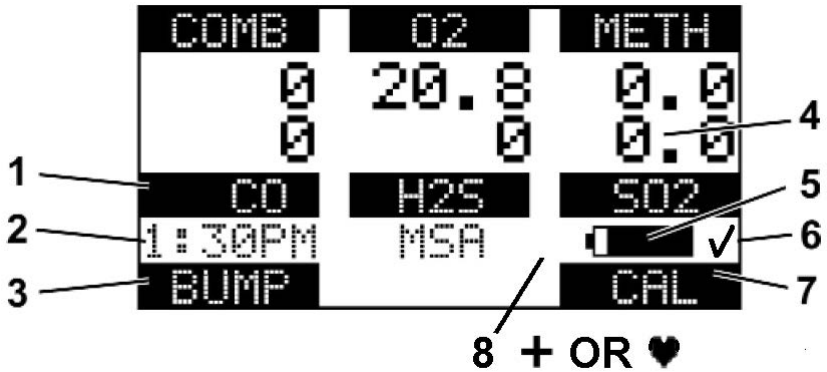
Fig. 2   Monochrome Display

1	*Gas Type*	*5*	*Battery Condition*
2	*Current Time*	*6*	*Motion Alert Icon ON*
3	*"Soft Key" ▼*	*7*	*"Soft Key" ▲*
4	*Gas Concentration*	*8*	*+ MotionAlert [+ = ON]*
			♥ Sensor Life Indicator

On a monochrome display, a message appears every 30 seconds if the Vibration, Horn or LED alarms are turned OFF.

Colour Display
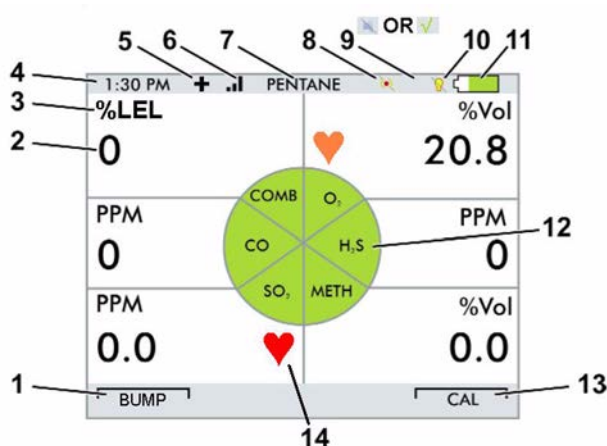
Fig. 3 Colour display

1		"Soft Key" ▼ Indicator	8		Vibration alarm off
2		Gas reading	9		Horn OFF or successful Bump Test/Calibration Indicator
3		Gas Concentration Units	10		LED off
4		Current Time	11		Battery Condition
5		Motion Alert symbol ON	12		Gas Type
6		Wireless ON	13		"Soft Key" ▲ Indicator
7		Combustible Gas type calibration	14	♥	Sensor Life Indicator

Battery Indicator

The battery condition icon continuously displays in the upper right-hand corner of the colour display and in the lower right hand corner of the monochrome display. A bar represents the charging level of the battery.

The nominal run-time of the device [COMB, O_2, H_2S, with pump and monochrome display] at room temperature is 17 hours. Actual run-time will vary depending on ambient temperature and alarm conditions.

Low Battery Warning

⚠ **Attention!**
If battery warning alarm activates, stop using the device as it no longer has enough power to indicate potential hazards, and persons relying on this product for their safety could sustain serious personal injury or death.
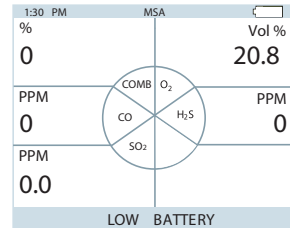
Fig. 4   Battery Warning

The duration of remaining device operation during a Low Battery Warning depends on ambient temperatures, battery condition alarm status.

When the device goes into battery warning the:

- battery life indicator continuously blinks

- alarm sounds and alarm LEDs flash once per minute

- Safe LED no longer flashes

- device continues to operate until it is turned OFF or battery shutdown occurs.

Battery Shut Down

> ⚠️ **Attention!**
> If battery alarm displays, stop using the device as it no longer has enough power to indicate potential hazards, and persons relying on this product for their safety could sustain serious personal injury or death.

The device goes into battery shutdown mode 60 seconds before final shutdown [when the batteries can no longer operate the device]:

- "BATTERY ALARM" flashes on the display

- Alarm sounds

- Alarm LEDs flash

- Fault LED is on

- No other pages can be viewed; after approximately one minute, the device automatically turns OFF.
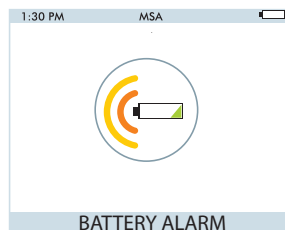
Fig. 5   Battery Shut Down

When battery shutdown condition occurs:

(1)   Leave the area immediately.

(2)   Recharge or replace the battery pack.

Battery Charging

> ⚠ **Warning!**
> Risk of explosion: Do not recharge device in hazardous area.

> ⚠ **Attention!**
> Use of any charger, other than the charger supplied with the device, may damage or improperly charge the batteries.

> ℹ For users in Australia/ New Zealand: The charge cradle is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take adequate measures.

The charger is capable of charging a completely depleted pack in less than six hours in normal, room-temperature environments.

> ℹ Allow very hot or cold devices to stabilise for one hour at room temperature before attempting to charge.

- Minimum and maximum ambient temperature to charge the device is 10 °C [50 °F] and 35 °C [95 °F], respectively.
- For best results, charge the device at room temperature [23 °C].

To Charge the Device
- Firmly insert the charger connector into the charge port on the back of the device.
- An LED in the battery pack is used to indicate on the charge status.

  Red = charging, Green = charged, yellow = fault
- If a problem is detected during charging [LED turns yellow]:

  Disconnect the charger momentarily to reset the charge cycle.
- The charger must be disconnected for the device to operate.
- The battery pack may be charged separately from the device
- During periods of non-use, the charger may remain connected to the device/ battery pack.

2.4 Viewing Optional Displays

The Main Screen appears at device turn-ON.

Optional displays can be viewed by pressing the ▼ button to move to the screen as indicated by the "soft key".

[For the monochromatic display the name of the page is displayed, for the colour version it is represented by an icon.]

Advance on ▼

```
┌─────────┐   ┌──────────┐   ┌────────┐   ┌────────┐   ┌─────────┐   ┌─────────┐
│  MAIN   │   │          │   │        │   │        │   │         │   │         │
│ MEASURE │──→│ BUMP TEST?│──→│ PEAK * │──→│ MIN *¹ │──→│ STEL *¹ │──→│ TWA *¹  │
│  PAGE   │   │          │   │        │   │        │   │         │   │         │
└─────────┘   └──────────┘   └────────┘   └────────┘   └─────────┘   └─────────┘
```

Advance on ▼

```
┌──────────┐   ┌──────────┐   ┌──────────┐   ┌──────────┐   ┌────────┐
│          │   │  MOTION  │   │          │   │          │   │        │
│ WIRELESS**│←─│  ALERT   │←─│ CAL DUE  │←─│ LAST CAL │←─│  DATE  │
│          │   │ STATUS * │   │  DATE *  │   │  DATE *  │   │        │
└──────────┘   └──────────┘   └──────────┘   └──────────┘   └────────┘
```

Advance on
ON/OFF

* IF ENABLED
** IF WIRELESS IS INSTALLED
¹ NOT VALID FOR ALL SENSORS

Bump Test [BUMP page]

```
┌───────────────────────────┐
│ COMB        O2            │
│  20      20.8             │
│    0        0       0.0   │
│  CO        H2S      SO2   │
│ 1:30PM     MSA      ▣     │
│      HIGH ALARM           │
└───────────────────────────┘
```
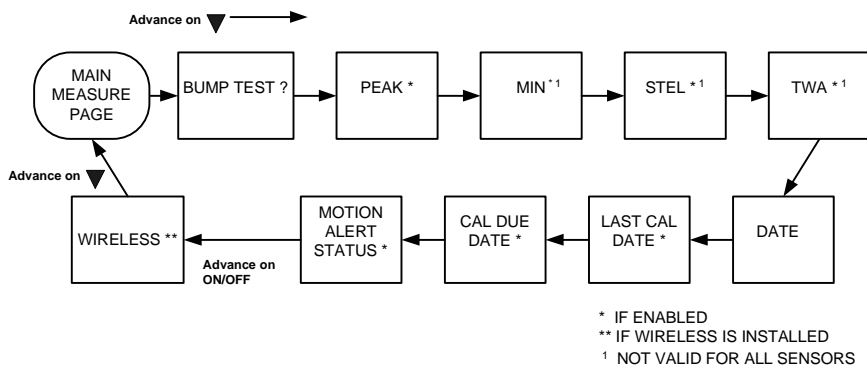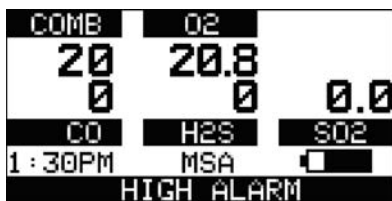
This page allows the user to perform an automated Bump Test on the device. To perform the test, the [YES] button is pressed.
See chapter 3.7 for details on performing the Bump Test.

If the ▼ button is pressed, the Bump Test is not performed, and the display shows the next page in the sequence [PEAK].

If the ▲ button is pressed, the Bump Test is not performed, and the display reverts back to the normal MEASURE page.

Peak Readings [PEAK page]

Monochromatic display   **Colour display**

PEAK

This page shows the highest levels of gas recorded by the device since turn-ON or since peak readings were reset.

To reset the peak readings:

(1)   Access the PEAK page.

(2)   Press the ▲ button.

Minimum Readings [MIN page]

Monochromatic display   **Colour display**

MIN

This page shows the lowest level of oxygen recorded by the device since turn-ON or since the MIN reading was reset. It is only shown if an oxygen sensor is installed and enabled.

To reset the MIN reading:

(1)   Access the MIN page.

(2)   Press the ▲ button.

Short Term Exposure Limits [STEL page]

⚠ **Attention!**
If the STEL alarm activates, leave the contaminated area immediately; the ambient gas concentration has reached the preset STEL alarm level. Failure to follow this warning will cause over-exposure to toxic gases and persons relying on this product for their safety could sustain serious personal injury or death.

Monochromatic display   **Colour display**

STEL

This page shows the average exposure over a 15-minute period.

When the amount of gas detected by device is greater than the STEL limit:

- Alarm sounds, alarm lights flash.
- Alarm LEDs flash
- "STEL ALARM" message flashes.

To reset the STEL:

(1) Access the STEL page.
(2) Press the ▲ button.

The STEL alarm is calculated over a 15-minute exposure.

STEL calculation examples:

Assume the device has been running for at least 15 minutes:

15 minute exposure of 35 ppm:

$$\frac{[15 \text{ minutes x } 35 \text{ ppm}]}{15 \text{ minutes}} = 35 \text{ ppm}$$

10 minute exposure of 35 ppm and 5 minutes exposure of 5 ppm:

$$\frac{[10 \text{ minutes x } 35 \text{ ppm}] + [5 \text{ minutes x } 5 \text{ ppm}]}{15 \text{ minutes}} = 25 \text{ ppm}$$

This page can be de-activated through MSA Link software.

Time Weighted Average [TWA page]

⚠️ **Attention!**
If the TWA alarm activates, leave the contaminated area immediately; the ambient gas concentration has reached the preset TWA alarm level. Failure to follow this warning will cause over-exposure to toxic gases and persons relying on this product for their safety could sustain serious personal injury or death.

This page shows the average exposure over 8 hours since the device was turned ON or since the TWA reading was reset. When the amount of gas detected is greater than the eight-hour TWA limit:

Monochromatic display   **Colour display**

TWA

- Alarm sounds

- Alarm LEDs flash

- "TWA ALARM" message flashes.

To reset the TWA:

(1)   Access the TWA page.

(2)   Press the ▲ button.

The TWA alarm is calculated over an eight-hour exposure.

TWA calculation examples:

1 hour exposure of 50 ppm:

$$\frac{[1 \text{ hour x } 50 \text{ ppm}] + [7 \text{ hours x } 0 \text{ ppm}]}{8 \text{ hours}} = 6.25 \text{ ppm}$$

4 hour exposure of 50 ppm and 4 hour exposure of 100 ppm:

$$\frac{[4 \text{ hours x } 50 \text{ ppm}] + [4 \text{ hours x } 100 \text{ ppm}]}{8 \text{ hours}} = 75 \text{ ppm}$$

12 hour exposure of 100 ppm:

$$\frac{[12 \text{ hours x } 100 \text{ ppm}]}{8 \text{ hours}} = 150 \text{ ppm}$$

> **ℹ** This page can be de-activated through MSA Link software.

Date Display

Current date appears on the display in the format: **MMM-DD-YY**.

Last cal page

Displays the device last successful calibration date in the format: **MMM-DD-YY**. This page can be de-activated through MSA Link software or the SETUP - CAL OPTIONS page.

Cal due page

Displays the days until the device's next calibration is due [user selectable]. This page can be de-activated through MSA Link software or the SETUP - CAL OPTIONS page.

Motion Alert Activation Page

When the MotionAlert feature is active, the **+** symbol appears. The device enters pre-alarm when no motion is detected for 20 seconds. This condition can be cleared by moving the device. MotionAlert is turned OFF each time the device is powered OFF. After 30 seconds of no motion, the full MotionAlert alarm is triggered. This alarm can only be cleared by pressing the ▲ button. This page displays if it was selected in Setup Mode. To activate or deactivate the MotionAlert feature, press the ▲ button while the MOTIONALERT ACTIVATION page is displayed.

2.5 Sensor Missing Alarm

Enabled IR and XCell sensors are continuously monitored for proper function. If, during operation, the IR or an XCell sensor is detected as failed or disconnected, this alarm message appears.

- "SENSOR MISSING" flashes on the display.

- The problematic sensor is indicated.

- The alarm sounds and the Fault and Alarm LEDs flash.

- The alarm can be silenced by pressing the ▲ button; no other pages can be viewed.

- If there is a sensor error the device will not be operable.

2.6 Monitoring Toxic Gases

The device can monitor the concentration of a variety of toxic gases in ambient air. Which toxic gases are monitored depends on the installed sensors.

The device displays the gas concentration in parts per million [ppm] or mg/m^3 on the Measuring page.

⚠ **Attention!**

If an alarm is triggered while using the device, leave the area immediately.

Remaining in the area under such circumstances can cause serious personal injury or death.

The device has four gas alarms:

- HIGH Alarm

- LOW Alarm

- STEL Alarm

- TWA Alarm
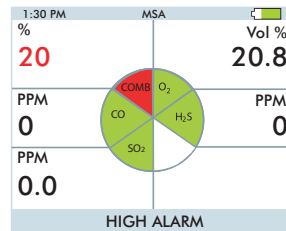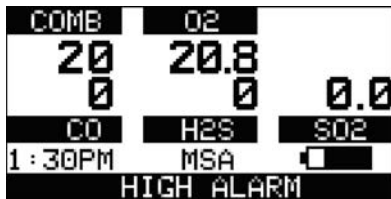
Fig. 6   Alarm Conditions [here High Alarm]

If the gas concentration reaches or exceeds the alarm set point, the device:

- the alarm message displays and flashes in combination with the corresponding gas concentration

- backlight turns on

- alarm sounds [if active]

- alarm LEDs flash [if active]

- vibrating alarm triggers [if active]

2.7 Monitoring Oxygen Concentration

The device monitors the oxygen concentration in ambient air. The alarm set points can be set to activate on two different conditions:

- Enriched - oxygen concentration > 20.8 % or

- Deficient - oxygen concentration < 19.5 %.

> **i** While the device can detect up to 30 % oxygen in ambient air, it is approved for use only up to 21 % oxygen.

> ⚠ **Attention!**
> If an alarm is triggered while using the device, leave the area immediately.
>
> Remaining in the area under such circumstances can cause serious personal injury or death.

When the alarm set point is reached for either of the above conditions:

- the alarm message displays and flashes in combination with the corresponding gas concentration

- backlight turns on

- alarm sounds [if active]

- alarm LEDs flash [if active]

- vibrating alarm triggers [if active]

> **i** The LOW alarm [oxygen deficient] is latching and will not reset when the O_2 concentration rises above the LOW set point. To reset the alarm press the ▲ button. If the alarm is latching, the ▲ button silences the alarm for five seconds. Alarms can be made latching or unlatching via MSA Link software.
>
> False oxygen alarms can occur due to changes in barometric pressure [altitude], humidity or extreme changes in ambient temperature.
>
> It is recommended that an oxygen calibration be performed at the temperature and pressure of use. Be sure that the device is in known fresh air before performing a calibration.

2.8 Monitoring Combustible Gases

The device can be equipped with a catalytic combustible sensor that detects a variety of combustible gases up to 100 % LEL and displays the reading as either % LEL or % CH_4. The ALTAIR 5X IR can also contain an IR combustible sensor. The IR sensor displays the reading in % Vol.

> ⚠ **Attention!**
> If an alarm is triggered while using the device, leave the area immediately.
>
> Remaining in the area under such circumstances can cause serious personal injury or death.

The catalytic combustible and the 25 % Vol Butane IR sensor have two alarm setpoints:

- HIGH Alarm
- LOW Alarm

If the gas concentration reaches or exceeds the alarm set point, the device:

- alarm message displays and flashes in combination with the corresponding gas concentration:
- backlight turns on
- alarm sounds [if active]
- alarm LEDs flash [if active]

The 100 % Vol IR sensors have no alarm setpoints.

Gas Exposure of 100 % LEL

> ℹ When gas reading exceeds 100 % of the lower explosive limit [LEL],, the device enters a Lock Alarm state and displays "xxx" in place of the actual reading.

> ⚠ **Attention!**
> A catalytic combustible gas reading of "xxx" indicates the atmosphere could be above 100 % LEL or 5.00 % Vol CH_4 and an explosion hazard exists. Move away from contaminated area immediately.

For ALTAIR 5X IR devices with an enabled 100 % Vol methane IR sensor, the LockAlarm will clear, and the catalytic combustible again displays combustible concentrations when the gas sample drops to a lower level. For devices without an en-

abled 100 % Vol methane IR sensor, the user can clear the LockAlarm state only by turning the device OFF, and then ON again in a fresh air environment. When catalytic combustible gas reading digits appear, the device is available for measuring gases once again.

LockAlarm of the catalytic combustible sensor occurs during Bump Testing and calibration of a % Vol combustible IR sensor.

After the IR sensor Bump Test, the LockAlarm must be cleared [as described above] before the catalytic combustible sensor is again able to measure and provide readings.

Check your national standard values for 100 % LEL. Some countries use 5 Vol % and some use 4.4 Vol % as 100 % LEL CH_4.

3 Operation

Device operation is dialog driven from the display with the aid of the three function buttons [→ chapter 2.2].

For more information, see the flow charts in chapter 7.

3.1 Environmental Factors

A number of environmental factors may affect the gas sensor readings, including changes in pressure, humidity and temperature. Pressure and humidity changes affect the amount of oxygen actually present in the atmosphere.

Pressure Changes

If pressure changes rapidly [e.g., stepping through airlock], the oxygen sensor reading may temporarily shift and possibly cause the detector to alarm. While the percentage of oxygen may remain at or near 20.8 Vol %, the total amount of oxygen present in the atmosphere available for respiration may become a hazard if the overall pressure is reduced by a significant degree.

Humidity Changes

If humidity changes by any significant degree [e.g., going from a dry, air conditioned environment to outdoor, moisture laden air], oxygen readings can be reduced by up to 0.5 %, due to water vapour in the air displacing oxygen.

The oxygen sensor has a special filter to reduce the effects of humidity changes on oxygen readings. This effect will not be noticed immediately, but slowly impacts oxygen readings over several hours.

Temperature Changes

The sensors have built-in temperature compensation. However, if temperature shifts dramatically, the sensor reading could shift.

3.2 Turning ON and Fresh Air Setup

Device operation is dialog driven from the display with the aid of the three function buttons [→ chapter 2.2].

For more information, see the flow charts in chapter 7.

Turn the device ON with the **ON/OFF** button.

The device performs a self test:

During the self test, the device checks alarm LEDs, audible alarm vibrating alarm and installed sensors.

The device displays:

- Startup logo
- Software version, device serial number, company name, department and user names
- Sampling system safety test

During the turn-ON sequence, if a sensor was changed since the previous device operation, the current listing of the installed sensors displays and user interaction is required.

- ▷ The user must accept the new configuration by pressing the ▲ button.
- ▷ If the current sensor configuration is not accepted, the device alarms and is not usable.

- Combustible gas type and sensor units [monochrome display only]
- Alarm setpoints Low Alarm
- Alarm setpoints High Alarm
- Alarm setpoints STEL Alarm [if enabled]
- Alarm setpoints TWA Alarm [if enabled]
- Settings for calibration cylinder
- Current date
- Last calibration date [optional]
- CAL due date. If the calibration due date is activated, the message "**CAL DUE; X DAYS**" appears on the device display.

- X = the number of days until a calibration is due, user selectable for 1 to 180 days.

If the number of days until calibration is due reaches 0, an alert occurs and "**CAL DUE, NOW**" displays.

- Press the ▲ button to clear the alert
- Sensor warm-up period
- Fresh Air Setup option [optional].

The Main Measure Page will appear.

The presence of a ♥ indicator on the display means a sensor is approaching or has reached its end-of-life. See chapter 2.2 for details on the Sensor Life Alarm situation.

Refer to flowchart in Appendix, chapter 7.1.

Sampling Safety Test

Upon startup, an alarm [visual, audible and vibrating] is triggered and the customer is prompted to block the pumps/sampling system of the device within 30 seconds.

When the device detects a pump flow block, it will display a PASS message. The startup sequence will be resumed.

If the device does not detect a pump flow block, it will display an error message.

The device will shut off after the customer acknowledges this message by pressing the ▲ button.

Check your sampling system if this occurs and contact MSA as needed.

Users can check the operation of the sampling system anytime during operation by blocking the sampling system to generate a pump alarm.

⚠ **Warning!**

Do not use the pump, sample line, or probe unless the pump alarm activates when the flow is blocked. Lack of an alarm is an indication that a sample may not be drawn to the sensors, which could cause inaccurate readings.

Failure to follow the above can result in serious personal injury or death.

Never let the end of the sampling line touch or go under any liquid surface. If liquid is drawn into the device, readings will be inaccurate and device could be damaged. We recommend the use of an MSA sample probe containing a special membrane filter, permeable to gas but impermeable to water, to prevent such an occurrence.

Fresh Air Setup [FAS]

The **F**resh **A**ir **S**etup [FAS] is for automatic ZERO calibration of the device.

The FAS has limits. If a hazardous level of gas is present, the device ignores the FAS command and the device alarm activates.

The ability to perform an FAS at device turn-ON can be disabled by using MSA Link software.

🛈	The Fresh Air Setup is not available for the CO_2 sensor.

	Warning!
⚠️	Do not activate the Fresh Air Setup unless you are certain you are in fresh, uncontaminated air; otherwise, inaccurate readings can occur which can falsely indicate that a hazardous atmosphere is safe. If you have any doubts as to the quality of the surrounding air, do not use the Fresh Air Setup feature. Do not use the Fresh Air Setup as a substitute for daily calibration checks. The calibration check is required to verify span accuracy. Failure to follow this warning can result in serious personal injury or death.
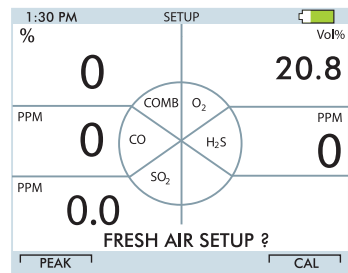
Fig. 7   Fresh Air Setup

The device displays a blinking "FRESH AIR SETUP?", prompting the user to perform a Fresh Air Setup:

(1) Press the ▲ button to bypass the Fresh Air Setup.
   ▷ The Fresh Air Setup is skipped and the device goes to the Measuring page [Main page].

(2) Press the ▼ button to perform the Fresh Air Setup.
   ▷ The device starts the FAS sequence and the FAS screen displays.
   ▷ A progress bar shows the user how much of the FAS has been completed.
   ▷ At the end of the FAS, the device displays either
      "FRESH AIR SETUP PASS" or "FRESH AIR SETUP FAIL".

If the FAS fails, perform a zero calibration [→ chapter 3.8].

Special Consideration for Oxygen Sensor

Under the following situations, the oxygen sensor display reading may be suppressed for up to 30 minutes at device turn-ON as a sensor 'cook down' is performed.

This could occur if:

- the oxygen sensor was just installed
- the battery pack was allowed to be deep-discharged
- the battery pack was removed from the device.

During this time, the oxygen sensor numeric position on the display indicates "PLEASE WAIT". While this message displays, the device cannot respond to a:

- Fresh Air Setup
- Calibration
- Bump Test procedure.

When the numeric oxygen reading appears, the FAS, calibration, or Bump Test procedures may be performed.

3.3 Measurement Mode [Normal Operation]

The following options pages can be executed from the Normal Operation screen:

BUMP page [ALTAIR 5X only]		This page allows user to perform a Bump Test on installed sensors
Peak Page*		This page shows the peak readings for all sensors.
Min Page		This page shows the minimum readings for the oxygen sensor.
STEL Page*		This page shows the calculated STEL readings of the instrument.
TWA Page		This page shows the calculated TWA readings of the instrument.
Date Page		This page shows actual date settings of the instrument.
Last Cal Date		This page shows the date of the last calibration.
Cal Due*		This page shows the set date for the next calibration.
Motion Alert		This page allows the Motion Alert Feature to be activated or deactivated.
Wireless		This page allows the Wireless communication to be activated or deactivated.

* The display of these pages can be de-activated through MSA Link software

For further information see chapter 7.

3.4 Device Setup

The device allows the user to access and modify the following parameters through direct button interface:

- Calibration Options
- Alarm Options
- Instrument Options

These menus can be accessed only from the measure page by pressing and holding the ▼ and ▲ buttons simultaneously until you are prompted for a password.

The operation is as follows:

(1) Turn the device ON and wait until the measure page appears.

(2) Simultaneously press and hold the ▼ and ▲ buttons for approximately five seconds.

  ■ The default password is "672".

Monochrome display **PASSWORD**	**Colour display** **PASSWORD**
000	**000**

(3) Enter the first digit by pressing the ▼ or ▲ button and confirm with the **ON/OFF** button.

  ▷ The cursor jumps to the second digit.

(4) Enter the second as well as the third digit.

  ▷ Incorrect password: device returns to the Main Page.

  ▷ Correct password: user can set the device options.

The password can be changed with a PC through the MSA Link software.

The following Options are available by pressing the ▼ and ▲ buttons:

- Calibration Options - see chapter 3.4
- Alarm Options - see chapter 3.4
- Instrument Options - see chapter 3.4

Calibration Setup

Monochrome display
CALIBRATION OPTIONS

Colour display
CALIBRATION OPTIONS

The Calibration Options menu allows the user to:

- modify the calibration cylinder settings [CYLINDER SETUP]
- enable/disable calibration due and to set the number of days [CAL DUE OPTIONS]
- enable/disable the option to show the last cal date at turn on and [LAST CAL DATE]
- enable/disable the option for password protected calibration [CAL PASSWORD]

Press:

- the ▼ button go to next page

    the ▲ button to go previous page

    the **ON/OFF** button to enter setup.

Setting Calibration Cylinder

This option has a dialog similar to the span calibration dialog.

The display shows all active sensors.

(1) Press the **ON/OFF** button to enter setup.

   ▷ The screen for the first calibration cylinder displays.

(2) Press

   ▷ the ▼ or ▲ button to change the value.

   ▷ the **ON/OFF** button to confirm the setup.

With this confirmation the device automatically moves to the next cylinder setting.

(3) Repeat the sequence for changing the required settings for all necessary gas values.

After the last setting is performed, the device returns to the
Calibration Options menu.

Setting Cal Due Options

(1)   Press the **ON/OFF** button to enter setup.

(2)   Press the ▼ or ▲ button to enable/disable this option.

(3)   Press the **ON/OFF** button to confirm.

(4)   After confirmation the device prompts the user to enter the number of days for the reminder.

(5)   Change number of days by pressing the ▼ or ▲ button.

(6)   Press the **ON/OFF** button to go to the next menu.

Setting Last Cal Date

(1)   Press the **ON/OFF** button to enable/disable this option.

(2)   Press the ▼ button to go to the next page.

(3)   Press the ▲ button to go to the previous page.

Setting Calibration Password

(1)   Press the **ON/OFF** button to enable/disable this option.

(2)   Press the ▼ button to go to the next page.

(3)   Press the ▲ button to go to the previous page.

Back To Main Menu

(1)   Press the **ON/OFF** button to go to Device Setup Menu
   ▷ The Cal Options screen displays

(2)   Press the ▼ button to go to the next [Alarm options] or the ▲ button to exit the Setup menu.

Alarm Setup

Monochrome display   **Colour display**
ALARM OPTIONS   **ALARM OPTIONS**

The Alarm Options Menu allows the user to:

- enable/disable the vibrating alarm
- enable/disable the audible alarm [horn]
- enable/disable the Alarm LED
- enable/disable the MOTIONALERT SELECTION page.
- set Sensor Alarms.

Press

- the ▼ button go to next page

  the ▲ button to go previous page

  the **ON/OFF** button to enter setup.

Setting Vibrating Alarm

Press the **ON/OFF** button to enable/disable this option.

Setting Horn

Press **ON/OFF** button to enable/disable this option.

Setting LED Alarm

Press **ON/OFF** button to enable/disable this option.

Setting MotionAlert Access

Setting this parameter allows the user to access the MOTIONALERT page from the MEASURE page.

If access is denied here:

- the user cannot access the MOTIONALERT page to enable or disable that feature
- the InstantAlert feature [chapter 2.2.3.3] cannot be activated.

(1) To grant or deny user access to the MOTIONALERT page, use the button to change the indicated selection.

User access is:

▷ permitted when the setting indicates ON.

▷ denied when the setting indicates OFF.

(2) The selection is confirmed by pressing either the ▼ or ▲ button.

Setting Sensor Alarms

This page allows modifying the preset alarm values of:

- LOW Alarm

- HIGH Alarm

- STEL Alarm

- TWA Alarm.

(1) Press the button to enter Sensor Alarm setup.

▷ LOW Alarm Setup screen displays.
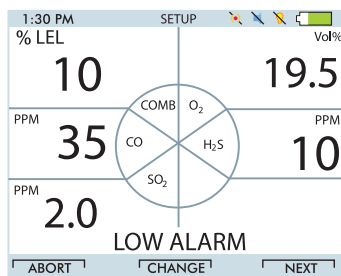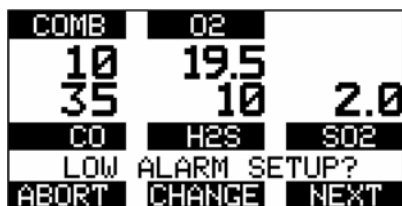
Fig. 8   Sensor Alarm Setup

(2) Press

the ▼ button to abort the operation or

the ▲ button to go to next alarm setup or

the **ON/OFF** button to change the alarm setpoints.

▷ Alarm Value for the first Sensor displays.

Fig. 9   Sensor Alarm Setup

(3)   Set values for Sensor Alarm by pressing the ▼ or ▲ button.

(4)   Press the **ON/OFF** button to confirm set values.

(5)   Repeat setting for all other sensors.

(6)   Press the ▲ button to return to the Alarm Options menu.

(7)   Repeat setting for all other alarm types.

Instrument Options

Monochrome display **ALARM OPTIONS**	**Colour display** **ALARM OPTIONS**

The Instrument Options menu allows modifying different device options:

-   Sensor Setup [enable/disable the channel]

-   Language Setup

-   Time Date Setup

-   Datalog Intervals

-   Stealth Mode

-   Operating Beep

-   Display Contrast [monochrome only]

-   Backlight Options.

Press

-   the ▼ button go to next page

    the ▲ button to go previous page

    the **ON/OFF** button to enter setup.

Setting Sensor Options

(1) Press the **ON/OFF** button to enter setup.

  ▷ Following screen displays:
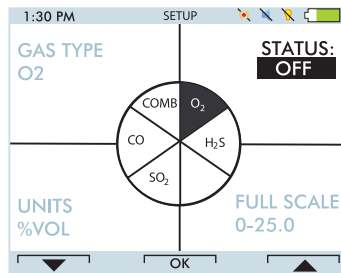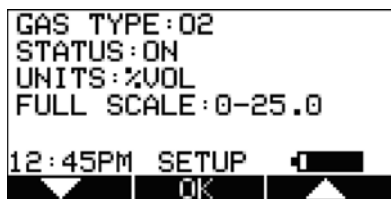
Fig. 10   Sensor Alarm Setup

(2) Press the ▼ button to select sensor, press the **ON/OFF** button to make changes.

  ▷ The sensor information is displayed and the sensor can be enabled or disabled.

> ℹ️ Other operations such as changing the gas type [Methane, Butane, Propane etc. for the combustible sensor] and units [ppm to mg/m^3] are only possible using the MSA Link software.

(3) Change status by pressing the ▼ or ▲ button.

(4) Press the **ON/OFF** button to confirm and advance to next screen [next sensor].

(5) Perform the sequence for all other sensors.

  ▷ After setting up the last sensor the device goes to the next Setup Page.

Language Setup

This option is for setting the language of the device.

(1) Press the **ON/OFF** button to enter setup.

Change language by pressing the ▼ or ▲ button.

Confirm with the **ON/OFF** button.

The device goes to the next Setup Page.

Time and Date Setup

This option is for setting the device time and date. The device first prompts to set the time and then it prompts for the date.

| i | The time can be set up for either regular AM/PM or military time [through MSA Link software]. AM/PM time is the default setting. |

(1) Press the **ON/OFF** button to enter setup.

(2) Change hours by pressing the ▼ or ▲ button.

(3) Confirm with the **ON/OFF** button.

(4) Change minutes by pressing the ▼ or ▲ button.

(5) Confirm with the **ON/OFF** button.

 ▷ The device goes to the Set Date Page.

(6) Change month, date and year by pressing the ▼ or ▲ button and confirming with the **ON/OFF** button.

 ▷ The device goes to the next Setup Page.

Setting Datalog Intervals

This option is for setting the intervals at which all the readings will be logged.

(1) Press the **ON/OFF** button to enter setup.

(2) Change interval by pressing the ▼ or ▲ button.

(3) Confirm with the **ON/OFF** button.

 ▷ The device goes to the next Setup Page.

Setting Stealth Mode

Stealth mode disables the visual, audible and vibrating alarms.

(1) Press the **ON/OFF** button to change mode [ON/OFF].

(2) Press the ▼ button to go to the next page or the ▲ button to return to previous page.

Setting Operating Beep

(1) Press the **ON/OFF** button to change mode [ON/OFF].

(2) Press the ▼ button to go to the next page or the ▲ button to return to previous page.

Setting the Contrast [monochrome display]

(1) Press ▼ or ▲ button to adjust the contrast levels.

Press **ON/OFF** button to confirm the contrast level.

Setting Backlight

(1) Press the **ON/OFF** button to enter setup.

Change option by pressing the ▼ or ▲ button.

Press the **ON/OFF** button to enter.

Change timeout by pressing the ▼ or ▲ button.

Press **ON/OFF** button to confirm timeout.

Back To Main Menu

There are three options at this point:

the ▼ button	Sensor Options menu
the ▲ button	Previous Setup page in the Instrument Options menu
the **ON/OFF** button	Instrument Options menu

3.5 MSA Link Operation

Connecting device to PC

(1) Switch on the device and align the Datalink Communication port on the device to the IR interface of the PC.

(2) Use the MSA Link software to communicate with the device.

See MSA Link documentation for detailed instructions.

3.6 Function Tests

Alarm Test

- Turn on the device. Verify that:
- alarm LEDs flash
- horn sounds briefly
- vibrating alarm triggers briefly.

3.7 Bump Test

> ⚠ **Attention!**
> Perform a Bump Test before each day's use to verify proper device operation. Failure to perform this test can result in serious personal injury or death.

This test quickly confirms that the gas sensors are functioning. Perform a full calibration periodically to ensure accuracy and immediately if the device fails the Bump Test. The Bump Test can be performed using the procedure below or automatically using the GALAXY Test Stand.

> ℹ The Galaxy cannot test Chlorine Dioxide, % Vol Butane, % Vol Propane and % Vol Methane sensors.
> For these sensors, use this Bump Test procedure.

Equipment

See accessory section for ordering information for these components.

- Calibration Check Gas Cylinder

  See Section 5.4 for calibration gas target values and appropriate MSA calibration gas cylinders.

- Demand Flow Regulator[s]
- Tubing appropriate for the gases to be tested
- Kits containing tubing and regulators suitable for reactive and non-reactive gases are available from MSA.

Performing a Bump Test

For ALTAIR 5X IR devices with combustible % Vol IR sensors, the following gas levels should not be exceeded when used for daily Bump Tests:

- IR Butane 25 % Vol - 2% Vol Butane Cal Check gas
- IR Propane 100 % Vol - 8% Propane Cal Check gas
- IR Methane 100 % Vol - 20% Methane Cal Check gas.

(1) While the device is turned ON in a clean, fresh air environment, verify that readings indicate no gas is present.

(2) From the normal measure screen press the ▼ button to display "BUMP TEST?".

(3) Verify the gas concentrations displayed match the Calibration Check Gas Cylinder. If they do not, adjust the values through the Calibration Setup menu.
   ▷ Depending on the sensors installed, there could be one to five separate Bump Tests performed, each with a different cylinder, regulator, and tubing used.

(4) Attach the demand regulator [supplied in the calibration kit] to the cylinder providing the indicated gases.

(5) Connect tubing [supplied in the calibration kit] to the regulator.

(6) Attach the other end of tubing to the device pump inlet.

(7) Press the **ON/OFF** button to start the bump test:
   ▷ the progress bar advances
   ▷ the sensors respond to the gas.

The message BUMP TEST PASS indicates a successful Bump Test of the sensors.

If any sensor fails the Bump Test:

- the message BUMP TEST FAIL appears
- the failed sensor is indicated.

If there are more sensors to be Bump Tested, the next sensor displays and the process repeats from Step 4.

If there are no more sensors to be Bump Tested, the tubing can be removed from the device pump inlet.

In the ALTAIR 5X IR, Bump Testing of a combustible IR sensor causes the catalytic combustible sensor to enter the LockAlarm condition. While an device with a % Vol methane IR sensor automatically recovers from LockAlarm, % Vol propane or butane devices do not. For these devices, clear the LockAlarm state by turning the device off, then on while in a fresh air environment. See chapter 2.8 for additional details.

After the Bump Test

After all installed sensors pass the Bump Test, the √ symbol displays on the MEASURE page. This √ symbol appears on the:

-    colour display in the upper feature bar

-    monochrome display in the lower-right corner.

If any sensor was not bump tested, or fails the Bump Test, the √ symbol does not display.

The colour display:

-    temporarily shows the √ symbol at each gas reading for successfully bump tested sensors

-     √ symbol is then replaced by the present gas reading.

The monochrome display does not show √ symbols for individual gas readings.

The √ symbol shows for 24 hours after the Bump Test.

If a sensor fails the Bump Test, calibrate the device as described in chapter 3.8.

3.8   Calibration

The ALTAIR 5X can be calibrated either manually using this procedure or automatically using the GALAXY test stand. Refer to chapter 7.5.

The use of the demand regulators listed in chapter 6 is recommended.

⚠ **Attention!**
Special conditions with toxic gases!

If the device is to be checked or calibrated for toxic gases, prerequisites are required; otherwise, incorrect calibration would result in incorrect device operation.

Reactive toxic gases [e.g., chlorine, ammonia, chlorine dioxide] have the property of diffusing into the rubber and plastic tubes so that the volume of test gas available in the device would no longer be sufficient to correctly perform device calibration.

For this reason, when calibrating the device with toxic gases, certain prerequisites are required:

- A special pressure regulator

- Short connection tubes between the pressure regulator and the device [approximately one inch]

- Connection tubes made from a material that does not absorb the test gases [e.g., PTFE].

NOTE: If using normal tubes and pressure regulators, expose them to the required test gas for an extended time period. Keep these materials dedicated for use with that test gas only; do not use them for other gases.

For example, for chlorine, allow the entire contents of a test gas cylinder to flow through the pressure regulator and tubes before using to calibrate the device. Mark these materials for use with chlorine only.

Zero Calibration

(1) Press the ▲ button in Normal Measurement page.

▷ ZERO screen displays.

To skip the ZERO procedure and move directly to the span calibration procedure, push the ▲ button. If no button is pushed for 30 seconds, the device prompts user to perform a SPAN calibration before device returns to the Normal Measurement page.

To perform ONLY a Fresh Air Setup at this time, press the button. The device then performs a Fresh Air Setup as described in chapter 3.2. When the Fresh Air Setup is complete, the device returns to the normal Measure screen.

(2) Press the ▲ button to confirm the ZERO screen, i. e. to execute zero calibration.

▷ The message "SENSOR RE-FRESH" displays, followed by the message "ZERO CALIBRATION".

▷ The "REFRESH" message does not appear if a catalytic combustible sensor is not installed.

▷ ZERO calibration starts.

▷ A progress bar shows the user how much of the calibration has been completed.

During the first moments of a ZERO calibration, the combustible sensor reading may be replaced by a moving display of dashed lines [**- -**]. This is normal.
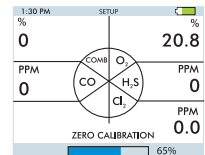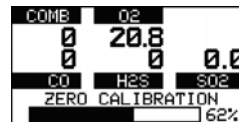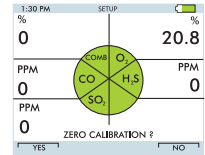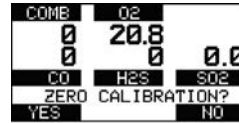
▷ After the ZERO calibration is completed the device displays either

"ZERO CALIBRATION PASS"

or

"ZERO CALIBRATION FAIL".
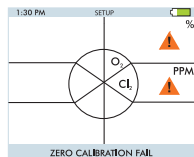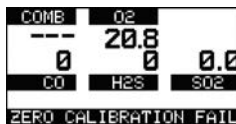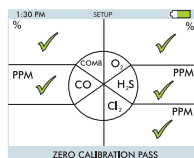
▷ Only if the device passes the zero calibration the SPAN screen displays.
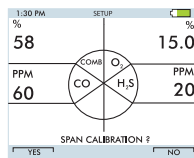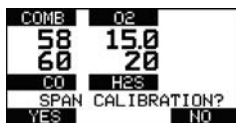
Span Calibration

To skip the Span calibration procedure, push the ▲ button.

> ℹ️ If the SPAN calibration of the combustible sensor is skipped after a successful ZERO calibration, the combustible sensor reading may be replaced with a moving display of dashed lines [**- -**] for a few moments. This is normal, and the device is fully operational once a combustible gas reading reappears.

If no button is pushed for 30 seconds, span calibration is skipped.

Because of the different possible combinations of gases, skipping a Span calibration could advance the user to the Span calibration of another installed sensor, or back to Measrung mode.

When calibrating with combustible gases > 100 % LEL, select the "Yes" option to prompt "Span Calibration?" BEFORE applying gas to the device.

(1) Connect one end of tubing to the cylinder regulator [supplied in the calibration kit].

(2) Connect the other end of the tubing to the pump inlet.

(3) Press the ▼ button to calibrate [span] the device.

 ▷ "SPAN CALIBRATION" flashes

 ▷ SPAN calibration starts.

 ▷ A progress bar shows the user how much of the calibration has already been completed.

 ▷ After the SPAN calibration is completed, the device displays either

"SPAN CALIBRATION PASS"

or

"SPAN CALIBRATION FAIL"

 ▷ The device returns to Measuring mode.
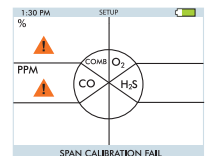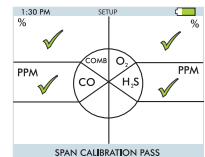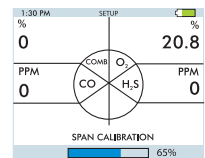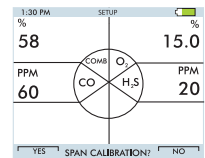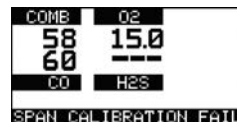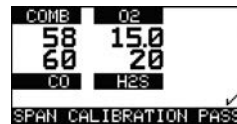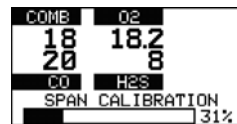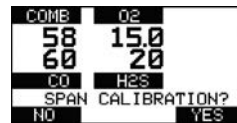
If a sensor is nearing its end-of-life, the "PASS" display is followed by the Sensor Life indicator ♥display.

- While the sensor is still fully functional, this warning gives the user time to plan for a replacement sensor to minimise downtime.
- The ©indicator blinks as the device returns to Measure mode.
- After 15 seconds, the blinking stops, but the ♥ indicator continues to display during ongoing operations as a reminder of a sensor's pending end-of-life.

If a span calibration fails:

- The Sensor Life Indicator ♥ blinks to show a sensor has reached its end-of-life and should be replaced.
- The device remains in the Sensor Life alarm condition until the ▲ button is pressed.
- After the alarm is cleared, the device enters Measure mode and the Sensor Life indicator ♥ blinks during ongoing operations until the sensor is replaced and/or successfully calibrated.

Span calibration can fail for reasons other than a sensor at the end of its life. If a span calibration failure occurs, verify items such as:

- sufficient gas remaining in the calibration cylinder
- gas expiration date
- integrity of calibration tubing/fittings, etc.
- ■ Reattempt the span calibration before replacing the sensor.

Finishing Sucessful Calibration

(1)   Remove the calibration tube from pump inlet.

The calibration procedure adjusts the span value for any sensor that passes the calibration test. Sensors that fail calibration are left unchanged.

In the ALTAIR 5X IR, a combustible IR sensor calibration causes the catalytic combustible sensor to enter the LockAlarm condition.

-   While an device with a % Vol methane IR sensor automatically recovers from LockAlarm, % Vol propane and butane devices do not; for these devices, the LockAlarm state is cleared by turning the device off, then on while in a fresh air environment [→ chapter 3.2 for details]

After a sucessful calibration, each successfully calibrated sensor temporarily shows a √ symbol at its gas reading.

These √ symbols remain visible for a few moments and are then replaced by the present gas reading

The monochrome display does not show √ symbols for individual gas readings.

Since residual gas may be present, the device may briefly go into an exposure alarm after the calibration sequence is completed.

A √ symbol displays on the MEASURE page.This √ symbol appears on the:

-   colour display in the upper feature bar
-   monochrome display in the lower-right corner.

The √ symbol shows for 24 hours after the calibration.

> **i**   If the horn alarm is turned OFF, the calibration √ symbol does not appear on the colour display.

Calibration with the Galaxy Test System

The device can be calibrated using the Galaxy Automated Test System - contact MSA for a list of compatible gases and concentrations.

Similar to the successful [manual] calibration described in chapter 3.8, a √ symbol displays on the MEASURE page after successful Galaxy calibration.

3.9   Shutdown

For shutdown press and hold the **ON/OFF** button.
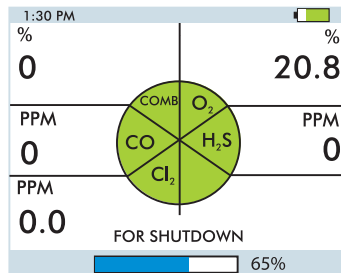
Fig. 11   Shutdown

The device displays a blinking "HOLD BUTTON FOR SHUTDOWN" and a progress
bar shows the user how much longer to hold the button to complete the shutdown.

4   Maintenance

If irregularities occur during operation, use the displayed error codes to determine
appropriate next steps.
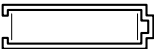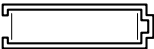
⚠️ **Warning!**

Repair or alteration of the device beyond the procedures described in
this manual or by anyone other than a person authorised by MSA, could
cause the unit to fail to perform properly. Use only genuine MSA replace-
ment parts when performing any maintenance procedures described in
this manual.

Substitution of components can seriously impair performance of the unit,
alter intrinsic safety characteristics or void agency approvals. Failure to
follow this warning can result in serious personal injury or death.

4.1 Troubleshooting

Problem	Description	Reaction
Alternating display		
ERROR ADC	Analogue measurement error	Contact MSA
ERROR COMB	Combustible sensor power supply error.	Contact MSA
ERROR MEM	External Memory error	Contact MSA
ERROR PROG	Program error	Contact MSA
ERROR RAM	RAM error	Contact MSA
[battery icon]	LOW BATTERY Battery Warning repeats every 30 seconds	Remove from service as soon as possible and re-charge or replace battery
[battery icon]	BATTERY ALARM Battery is completely discharged	Device is no longer sensing gas; Remove from service and recharge or replace battery.
Device does not turn ON	Battery fully discharged	Remove from service as soon as possible and recharge or replace battery pack.
MISSING SENSOR	Sensor damaged or missing	Replace sensor
NO SENSORS	No sensors are enabled	Device must have at least one sensor enabled at all times
[heart icon]	Sensor warning	Sensor is near the end of its life
[heart icon] [flashing]	Sensor alarm	Sensor has reached the end of its life and cannot be calibrated. Replace sensor and recalibrate.

4.2 Verifying Pump Operation

Users can check operation of the sampling system any time during operation by blocking the sampling system to generate a pump alarm.

When the pump inlet, sample line or probe is blocked, the pump alarm must activate.

Once gas readings are displayed, plug the free end of the sampling line or probe.

- The pump motor shuts down and an alarm sounds.
- PUMP ERROR will flash on the display.

When the pump inlet, sample line or probe is blocked, the pump alarm must activate.

■ Press the ▲ button to reset the alarm and restart the pump.

If the alarm does not activate:

- Check the sample line and probe for leaks.
- Once leak is fixed, recheck pump alarm by blocking the flow.
- ■ Press the ▲ button to reset the alarm and restart the pump.

⚠	**Warning!**
	Do not use the pump, sample line, or probe unless the pump alarm activates when the flow is blocked. Lack of an alarm is an indication that a sample may not be drawn to the sensors, which could cause inaccurate readings.
	Failure to follow the above can result in serious personal injury or death.
	Never let the end of the sampling line touch or go under any liquid surface. If liquid is drawn into the device, readings will be inaccurate and device could be damaged. We recommend the use of an MSA sample probe containing a special membrane filter, permeable to gas but impermeable to water, to prevent such an occurrence.

During operation, a pump alarm may occur when the:

- Flow system is blocked
- Pump is inoperative
- Sample lines are attached or removed.

To Clear Pump Alarm

(1) Correct any flow blockage.
(2) Press the button.
    ▷ The Pump will now restart.

4.3 Replacing the Battery

> ⚠️ **Warning!**
> Never replace the battery in a hazardous area.
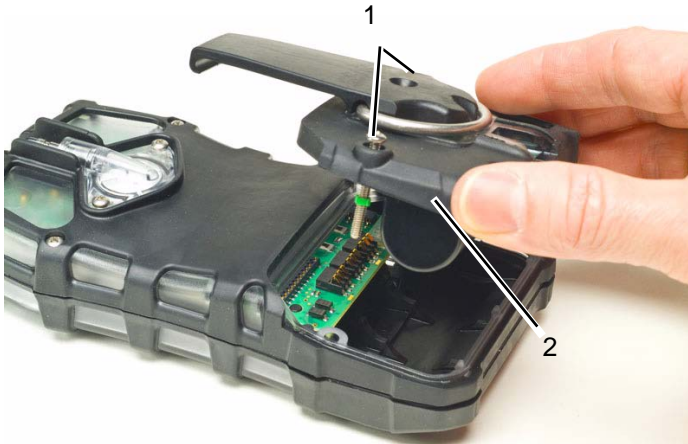
Fig. 12   Battery Replacement

1   Captive screw   2   Battery pack

(1) Unscrew the two captive screws on the rear of the device.

(2) Pull the battery pack out of the device by gripping the sides and lifting it up and away from the device.

Fig. 13   Battery Replacement

1   Battery holder

(3) For alkaline battery packs [ALTAIR 5X only]:
  ▷ Remove the battery holder circuit board from the pack door.
  ▷ Replace the 3 cells, using only those listed on the label.

    ▷ Be sure to observe proper polarity on the cells.

    ▷ Place the battery holder circuit board back in the device and reinstall the
       door.

    ▷ Tighten the 2 screws.

4.4   Live Maintenance Procedure - Replacing or Adding a Sensor

Any factory-installed Series 20 or XCell sensor may be removed or replaced with a
like type.

The type of any sensor must not be changed. If the type of any sensor [including
the IR sensor] is to be changed, the device must be returned to an authorised serv-
ice center.

⚠ **Attention!**

Before handling the PC board, ensure you are properly grounded; oth-
erwise, static charges from your body could damage the electronics.
Such damage is not covered by the warranty. Grounding straps and kits
are available from electronics suppliers.

⚠ **Warning!**

Remove and reinstall sensors carefully, ensuring that the components
are not damaged; otherwise device intrinsic safety may be adversely af-
fected, wrong readings could occur, and persons relying on this product
for their safety could sustain serious personal injury or death.

ℹ While device case is open, do not touch any internal components with
metallic/conductive objects or tools.

Damage to the device can occur.

Fig. 14   Sensor Replacement [new pic necessary]

(1)   Verify that the device is turned OFF.

(2)   Remove the battery pack.

(3)   Remove the two remaining case screws, and remove the case front.

(4)   Gently remove the sensor to be replaced.

(5)   Carefully align the new sensor contact pins with the sockets on the printed circuit board.

(6)   Press the new sensor into place.

(7)   Note the position restrictions in the following table.
   ▷ Adapter [part no. 10110183] is required for XCell usage in position 3.
   ▷ If a sensor is not to be installed, ensure that a sensor plug is installed properly in its place.

SENSOR	OPERATIONAL ONLY IN POSITION
XCell combustible sensor	1
XCell O_2 sensor	2
XCell CO-H_2S Two-tox sensor	2 or 4
XCell SO_2, Cl_2, NH_3	3 or 4
Series 20 sensor	3

(8)   Reinstall the sensor gasket in the case front.

(9)   Reinstall the front case, screws, and battery pack.

If a change in XCell Sensor configuration is detected during the device turn-on process:

- The "ACCEPT?" prompt appears on the display
- The ▼ button accepts the sensor configuration
- The ▲ button rejects the sensor configuration; the device is not operational.

When an XCell sensor is replaced, the device automatically enables the sensor after t the change has been accepted. If a Series 20 sensor is replaced, it must be ensured that the sensor is enabled [→ chapter 3.4].

If the oxygen sensor was replaced, see chapter 3.2 regarding the oxygen reading display.

(10) Allow sensors to stabilise at least 30 minutes before calibration.

(11) Calibrate device before use.

<table>
<tr><td>⚠</td><td>**Warning!**
Calibration is required after a sensor is installed; otherwise, the device will not perform as expected and persons relying on this product for their safety could sustain serious personal injury or death.</td></tr>
</table>

4.5 Replacing the Pump Filter

(1) Turn off the device.

(2) Unscrew the two captive screws from the clear filter cover on the back of the device to access the filter.

(3) Carefully lift out the O-ring and the filter disk.

(4) Use both the paper-like filter and the fibrous dust filter [the thicker disk] as supplied in Maintenance Kit [P/N 10114949] if the device is NOT configured to use a reactive toxic gas sensor [does not have a Cl_2, ClO_2, or NH_3 sensor].

Use ONLY the paper filter supplied in the Reactive Gas Maintenance Kit [P/N 10114950] if the device IS configured to use a reactive toxic gas sensor [Cl_2, ClO_2, or NH_3].

(5) Place the new paper-like filter into the recess in the back of the device. If it is to be used, place the fibrous dust filter into the clear filter cover.

<table>
<tr><td>⚠</td><td>**Attention!**
Use of the fibrous dust filter or the incorrect paper filter for the measurement of reactive gasses could cause erroneous readings.</td></tr>
</table>

(6) Replace the O-ring in the recess.

(7) Re-install the clear filter cover on the back of the device.

4.6 Cleaning

Clean the exterior of the device regularly using only a damp cloth. Do not use clea-ning agents as many contain silicones which will damage the combustible sensor.

4.7 Storage

When not in use, store the device in a safe, dry place between 18 °C and 30 °C [65°F and 86°F]. After storage, always recheck device calibration before use. If not to be used in 30 days remove battery pack.

4.8 Shipment

Pack the device in its original shipping container with suitable padding. If the origi-nal container is unavailable, an equivalent container may be substituted.

5   Technical Specifications/Certifications

5.1   Technical Specifications

Weight	0.45 kg [1 lb] - device with battery and clip [ALTAIR 5X]
Weight [with IR Sensor]	0.52 kg/1.15 lb
Dimensions [cm]	17 x 8.87 x 4.55 pumped, without belt clip [ALTAIR 5X]
	17 x 8.87 x 4.01 diffusion, without belt clip [ALTAIR 5X]
Dimensions [with IR Sensor]	17 x 8.94 x 4.88 cm
Alarms	LEDs, audible alarm, vibrating alarm
Volume of audible alarm	95 dB typical
Displays	Monochrome / Colour
Battery types	Rechargeable Li ION battery
	Replaceable AA alkaline [ALTAIR 5X only]
Charging time	$\leq$ 6 hours
	The maximum safe area charging voltage
	Um = 6.7 Volts D.C.
Normal Temperature range	0° C to 40 °C [32 °F – 104 °F]
Extended Temperature range	-20° C to 50 °C [-4 °F – 122 °F] Monochrome display
	-10° C to 50 °C [14 °F – 122 °F] Colour display
	-20 °C to 40 °C [- 4 °F – 104 °F]
	for devices with ClO_2 sensors
Short Term Operations [15 minutes] temperature range	-40 °C to 50 °C [-40 °F – 122 °F]
Humidity range	15 - 90 % relative humidity, non-condensing,
	5 - 95 % RH intermittent
Atmospheric pressure range	80 kPa to 120 kPa [11.6 to 17.4 PSIA]
Ingress protection	IP 65

Measuring methods	Combustible gases - Catalytic or Infrared sensor
	Oxygen and Toxic gases - Electrochemical or Infrared sensor
Warranty	Standard two years. Extended options available
	[see full warranty for specific limitations].

Measuring range	**H_2S**	**CO**	**O_2**	**Combustible**
	0-200 ppm	0-2000 ppm	0-30 % Vol.	0-100 % LEL
				0-5.00 % CH_4

Measuring range	**SO_2**	**NO_2**	**NH_3**	***PH_3**
	0-20.0 ppm	0-20 ppm	0-100 ppm	0-5.00 ppm
	Cl_2	**HCN**	**Cl_2**	**ClO_2***
	0-10 ppm	0-100 ppm	0-20.0 ppm	0-1.00 ppm
		NO		
		0-250 ppm		

*check with MSA for sensor availability

5.2   Factory-set Alarm thresholds

Sensor	LOW alarm	High alarm	SETPOINT min	SETPOINT max	STEL	TWA
COMB	10 % LEL	20 % LEL	5 % LEL	60 % LEL	--[1]	--[1]
CO	25 ppm	100 ppm	1.5 ppm	1700 ppm	100 ppm	25 ppm
H_2S	10 ppm	15 ppm	5 ppm	175 ppm	15 ppm	10 ppm
HCN	4.5 ppm	10.0 ppm	2.0 ppm	20.0 ppm	10 ppm	4.5 ppm
O_2	19.5 %	23.0 %	5.0 %	24.0 %	--[1]	--[1]
SO_2	2.0 ppm	5.0 ppm	2.0 ppm	17.5 ppm	5.0 ppm	2.0 ppm
NO_2	2.0 ppm	5.0 ppm	1.0 ppm	17.5 ppm	5.0 ppm	2.0 ppm
NH_3	25 ppm	50 ppm	10 ppm	75 ppm	35 ppm	25 ppm
PH_3	0.3 ppm	1.0 ppm	0.3 ppm	3,75 ppm	1.0 ppm	0.3 ppm
CL_2	0.5 ppm	1.0 ppm	0.3 ppm	10 ppm	1.0 ppm	0.5 ppm
ClO_2	0.1 ppm	0.3 ppm	0.1 ppm	0.9 ppm	0.3 ppm	0.1 ppm
HCN	4.5 ppm	10.0 ppm	2.0 ppm	20.0 ppm	10.0 ppm	4.5 ppm

Sensor	LOW alarm	High alarm	SETPOINT min	SETPOINT max	STEL	TWA
IR CO_2 [10 % Vol]	0.5 % Vol	1.5 %	0,2 % Vol	8 % Vol	0.5 %	1.5 %
IR Propane [100 % Vol]	- -[2]	- -[2]	- -[2]	- -[2]	--[1]	--[1]
IR Butane [25 % Vol]	8 % Vol	15 % Vol	5 % Vol	25 % Vol	--[1]	--[1]
IR Methane [100 % Vol]	- -[2]	- -[2]	- -[2]	- -[2]	--[1]	--[1]

[1]STEL and TWA not applicable for combustible and oxygen gases.

[2]No alarm thresholds are possible for the 0-100 % Vol Methane and Propane IR sensors. In environments with >100 % LEL combustible gas present, devices with a catalytic combustible LEL sensor will be in a latching over-range alarm, and the 100 % Vol IR sensors will display the % Vol gas reading.

5.3 Performance Specifications

Sensor	Range	Resolution	Reproducibility	Response time
Combustible Gas	0 to 100 % LEL or 0 to 5 % CH_4	1 % LEL or 0.05 Vol % CH_4	Normal temp. range: <50 % LEL: 3 % LEL 50-100 % LEL: 5 % LEL <2.5 % CH_4: 0.15 % CH_4 2.5-5.00 % CH_4: 0.25 % CH_4 Extended temp. range: <50 % LEL: 5 % LEL <2.5 % CH_4: 0.25 % CH_4 2.5-5.00 % CH_4: 0.40 % CH_4	t[90]< 15 sec [Pentane] [normal temp.] t[90]< 10 sec [Methane] [normal temp.]
Oxygen	$0 - 30\% O_2$	$0.1\% O_2$	$0.7 \% O_2$ for $0 – 30 \% O_2$	t[90]< 10 sec [normal temp.]
Carbon Monoxide	0-2000 ppm CO	1 ppm CO	normal temperature range: ±5 ppm CO or 10 % of reading, whichever is greater	t[90]< 15 sec [normal temp.]
			extended temperature range: ±10 ppm CO or 20 % of reading, whichever is greater	
Hydrogen Sulphide	0-200 ppm H_2S	1 ppm H_2S, for 3 to 200 ppm H_2S	normal temperature range: ±2 ppm H_2S or 10 % of reading, whichever is greater	t[90]< 15 sec [normal temp.]
			extended temperature range: ±20 ppm H_2S or 20 % of reading, whichever is greater	

5.4 IR sensors

Gases	Display range	Resolu-tion	Response time at 20°C	Reproducibility of the zero point	Reproducibility of the measured value[1]
			t_{90}		
CO_2	0-10 % Vol	0.01 % Vol	≤ 35 s	≤ ± 0.01 % Vol	≤ ±4 %
CH_4	0-100 % Vol	1 % Vol	≤ 34 s	≤ ± 5 % Vol	≤ ±10 %
C_3H_8	0-100 % Vol	1 % Vol	≤ 36 s	≤ ± 3 % Vol	≤ ±8 %
C_4H_{10}	0-25 % Vol	0.1 % Vol	≤ 35 s	≤ ± 0.5 % Vol	≤ ±4 %

Sensor	Range [ppm]	Resolu-tion [ppm]	Reproducibility		Nominal re-sponse*
			Normal temperature range:	Extended temp. range:	
Cl_2 Clorine	0 - 10	0.05	±0.2 ppm or 10 % of reading, whichever is greater	±0.5 ppm or 20 % of reading, whichever is greater	t[90]< 30 s]
NH_3 Ammonia	0 - 100	1	±2 ppm or 10 % of reading, whichever is greater	±5 ppm or 20 % of reading, whichever is greater	t[90]< 40 s]
HCN Hydrogen cyanide	0 - 30	0.5	±1 ppm or 10 % of reading, whichever is greater	±2 ppm or 20 % of reading, whichever is greater	t[90]< 30 s]
SO_2 Sulphur di-oxide	0 - 20	0.1	±2 ppm or 10 % of reading, whichever is greater	±3 ppm or 20 % of reading, whichever is greater	t[90]< 20 s]
ClO_2 Clorine di-oxide	0 - 1	0.01	±0.1 ppm or 10 % of reading, whichever is greater	±0.2 ppm or 20 % of reading, whichever is greater	t[90]< 2 min]
NO Nitric oxide	0 - 100	1			
NO_2 Nitrogen dioxide	0 - 20	0.1	±2 ppm or 10 % of reading, whichever is greater	±3 ppm or 20 % of reading, whichever is greater	t[90]< 40 s]
PH_3 Phosphine	0 - 5	0.05			t[90]< 30 s]

* Response time is for normal temperature range with sensor in position #3

5.5   Calibration Specifications

Sensor	Zero Gas	Zero Cal Value***	Span Cal Gas	Span Cal	
				Value	Time [min]
COMB Pentane	Fresh Air	0	1.45 % Methane	58 LEL	1
COMB Methane [0 - 5 % Vol]	Fresh Air	0	2.5 % Methane	2,5 %	1
COMB Methane [4.4 % Vol]	Fresh Air	0	1.45 % Methane	33 LEL	1
COMB Propane [1.7 % Vol]	Fresh Air	0	1.45 % Methane	58 LEL	1
COMB Propane [1.7 % Vol]	Fresh Air	0	1.45 % Methane	46 LEL	1
COMB Butane [1.4 % Vol]	Fresh Air	0	1.45 % Methane	58 LEL	1
COMB Methane [5 % Vol]	Fresh Air	0	1.45 % Methane	29 LEL	1
COMB Hydrogen	Fresh Air	0	1.45 % Methane	29 LEL	1
O_2	Fresh Air	20.8 %	15 % O_2	15 %	1
CO	Fresh Air	0	60 ppm CO	60 ppm	1
H_2S	Fresh Air	0	20 ppm H_2S	20 ppm	1
SO_2	Fresh Air	0	10 ppm SO_2	10 ppm	1
Cl_2	Fresh Air	0	10 ppm Cl_2	10 ppm	2
NO	Fresh Air	0	50 ppm NO	50 ppm	4
NO_2	Fresh Air	0	10 ppm NO_2	10 ppm	4
NH_3	Fresh Air	0	25 ppm NH_3	25 ppm	3
PH_3	Fresh Air	0	0.5 ppm PH_3	0.5 ppm	4
HCN	Fresh Air	0	10 ppm HCN	10 ppm	4
**ClO_2	Fresh Air	0	2 ppm Cl_2	0.8 ppm	6
IR CO_2 [10 % Vol]	Fresh Air	0.03 %	2.5 % CO_2	2.5 %	2
IR Butane [25 % Vol]	Fresh Air	0	8 % Butane	8 %	2

Sensor	Zero Gas	Zero Cal Value***	Span Cal Gas	Span Cal	
				Value	Time [min]
IR Propane [1.7 % Vol]	Fresh Air	0	50 % Propane	50 %	2
IR Methane [100 % Vol]	Fresh Air	0	50 % Methane	50 %	2

Span values can be changed if using different gas cylinders than those listed. Changes can be made using MSA Link software.

* See chapter 5.6.

**For most accurate results, calibration with ClO_2 is recommended.

***Zero cal time is one minute if a catalytic combustible or an IR sensor is installed - 30 seconds if not.

5.6 Certification

See device label for the approvals that apply to your specific device.

USA and Canada

USA	
USA / NRTL [Intrinsic Safety, Non-Mining]	UL913 for Class I, Div. 1, Groups A, B, C and D, Class II, Div. 1, -40°C to +50°C, T4
Canada	
Canada / CSA [Intrinsic Safety, Combustible Performance, Non-Mining]	CSA C22.2 No. 157 for Class I, Div. 1, Groups A, B, C and D CSA C22.2 No. 152 M1984 Combustible Performance Tamb = -40°C to +50°C, T4 for Intrinsic Safety Tamb = -20°C to +50°C, T4 for Combustible Performance

Other Countries

Australia [Intrinsic Safety, Industrial and Mining - TestSafe]	ALTAIR5X / ALTAIR5XiR Ex ia s Zone 0 I IP65 Ex ia s Zone 0 IIC T4 IP65, Tamb = -40°C to +50°C IEC60079-0, IEC60079-1, IEC60079-11, AS-1826

European Union

European Union /	ALTAIR 5X
ATEX - FTZU	[with XCell^{TM} Ex sensor not installed]
[Intrinsic Safety,	ATEX I M1 Ex ia I Ma IP65
Industrial and	ATEX II 1G Ex ia IIC T3/T4 Ga IP65,
Mining]	Tamb = -40 °C to +50 °C

ALTAIR 5X [with XCell^{TM} Ex sensor installed]
ATEX I M1 Ex ia I Mb IP65
ATEX II 2G Ex d ia mb IIC T3/T4 Gb IP65, Tamb = -40 °C to +50 °C

ALTAIR5 XIR
ATEX I M2 Ex ia e I Mb IP65
ATEX II 2G Ex ia d e mb IIC T4 Gb IP65,
Tamb = -40 °C to +50 °C

EN60079-0, EN60079-1, EN60079-7,
EN60079-11, EN60079-18,
EN60079-26, EN50271
CE 0080

IECEx   ALTAIR 5X
[Intrinsic Safety,   [with XCell^{TM} Ex sensor not installed]
Industrial and   Ex ia I IP65
Mining - TestSafe] Ex ia IIC T4 IP65, Tamb = -40°C to +50°C

ALTAIR 5X [with XCell^{TM} Ex sensor installed]
Ex ia d I IP65
Ex ia d IIC T4 IP65, Tamb = -40°C to +50°C

ALTAIR5 XIR
Ex ia d I IP65
Ex ia d IIC T4 IP65, Tamb = -40°C to +50°C
IEC60079-0, IEC60079-1, IEC60079-7, IEC60079-11,
IEC60079-18,
IEC60079-26

6 Ordering Information

Description	Part No.
Gas	
Cylinder 34L, 300 ppm CO	10029494
Cylinder 34L, 40 ppm H_2S	10011727
Cylinder 34L, 50 ppm NH_3	10011937
Cylinder 34L, 10 ppm Cl_2	10011939
Cylinder 34L, 5 ppm SO_2	10011938
Cylinder 34L, 10 ppm NO_2	10029521
Cylinder 34L, 0.5 ppm PH_3	10029522
Cylinder 34L, 2 ppm Cl_2 [To calibrate ClO_2 sensor]	711082
Cylinder 34L, 10 ppm HCN	711072
Cylinder 34L, 300 ppm CO	10029494
Cylinder 34L, 40 ppm H_2S	10011727
Cylinder 34L, 50 ppm NH_3	10011937
Cylinder 34L, 10 ppm Cl_2	10011939
Four Gas RP [1.45 % CH_4, 15.0 % O_2, 60 ppm CO, 20 ppm H_2S]	10053022
Four Gas RP [1.45 % CH_4, 15.0 % O_2, 300 ppm CO, 10 ppm H_2S]	10024230
Three Gas RP [1.45 % CH_4, 15.0 % O_2, 300 ppm CO]	10024231
Three Gas RP [0.986 % C_3H_8, 15.0 % O_2, 300 ppm CO]	10044001
Four Gas RP [0.986 % C_3H_8, 15.0 % O_2, 300 ppm CO, 10ppm H_2S]	10044002
For IR Sensors	
Cylinder 34L, 15 % Vol CO_2	10029499
Cylinder 34L, 2.5 % Vol CO_2	10069618
Cylinder 34L,1 % Vol Propane	10029476
Cylinder 34L, 8 % Vol Propane	10078013
Cylinder 34L, 50 % Vol Propane	10029475
Cylinder 34L, 0.5 % Vol Butane	10078011
Cylinder 34L, 8 % Vol Butane	10078012
Cylinder 34L, 20 % Vol Methane	10022595
Cylinder 34L, 50 % Vol Methane	10029500

Description	Part No.
Pressure reduction valve 0.25 l/min	478359
Demand regulator for exotics	10079801
Demand Regulator kit	710288
MSA Link USB dongle	10082834
MSA Link Datalogging Software	10088099
Shoulder Strap	474555
Holster, leather	10099648
Sampling Probe	10103191
Sampling Line, 1,5 m	10103188
Sampling Line, 3 m	10103189
Sampling Line, 5 m	10103190

Replacement Parts
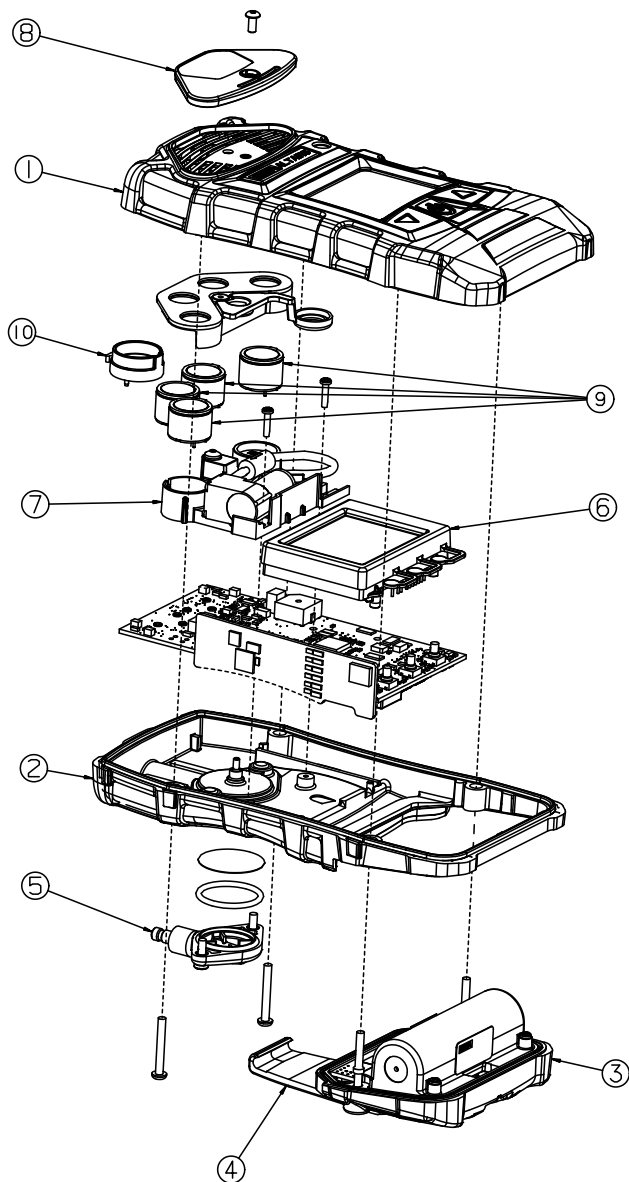
No.	Description	Part No.
1	Case assembly, upper, with label	10114853
	Case assembly, upper, [phosphorescent], with label	10114854
2	Case, lower, ALTAIR 5X	10114809
	Case, lower, ALTAIR 5X IR	10114810
	Case, lower, ALTAIR 5X IR, [phosphorescent]	10114810
3	Battery pack, rechargeable, EU/Aus, ALTAIR 5X	10114836
	Battery pack, alkaline, EU/Aus, ALTAIR 5X	10114838
	Battery pack, rechargeable, EU/Aus, ALTAIR 5X IR	10114851
	Battery Pack, rechargeable, European/Australian ALTAIR 5X IR [phosphorescent]	10114852
	Charging Cradle c/w power supply [EU]	10093057
	Charging Cradle [Australia]	10093056
	Vehicle Charger Cradle c/w 12/24V power supply	10099397
	Multi-Unit Charger, ALTAIR 5/5X Five-Unit [Europe]	10111203
	Multi-Unit Charger, ALTAIR 5/5X 10-Unit [Europe]	10111205
4	Kit, belt clip replacement, [ALTAIR 5X rechargeable]	10094830
	Kit, maintenance [includes filters, o-ring, screws]	10114949
	Kit, maintenance, reactive gas [Cl2, ClO2, NH3] [includes filters, o-ring, screws]	10114950
5	Filter cover assembly	10083591
6	Display assembly, monochrome	10111389
	Display assembly, colour	10099650
7	Sensor bracket assembly with pump, ALTAIR 5X [includes vibrator motor]	10114804
	Sensor bracket assembly with pump, ALTAIR 5X IR [includes vibrator motor]	10114805
8	Kit, pump cap replacement	10114855

No.	Description	Part No.
9	Sensor, HCN [Series 20]	10106375
	XCell Sensor, Cl_2	10106728
	Sensor, ClO_2 [Series 20]	10080222
	XCell Sensor, SO_2	10106727
	Sensor, NO_2 [Series 20]	10080224
	XCell Sensor, NH_3	10106726
	Sensor, PH_3 [Series 20]	10116638
	XCell Sensor, COMB	10106722
	XCell Sensor, O_2	10106729
	XCell Sensor, CO-H_2S, Two-Tox	10106725
	Sensor, NO [Series 20]	10114750
	XCell Sensor, CO	10106724
	XCell Sensor H_2S	10106723
	Sensor, O_3 [Series 20]	10114834
	XCell Sensor plug	10105650
	20 mm sensor plug	10088192
10	XCell adapter socket	10110183

Description	Part No.
IR sensors	
IR sensor HC 0-25 % Vol Butane	10062201
IR sensor HC 0-100 % Vol Methane	10062205
IR sensor HC 0-100 % Vol Propane	10062207
IR sensor 0-10 % Vol CO_2	10062209

7   Appendix – Flow Charts

7.1   Basic Operation

```
                        ┌──────────────────┐
                        │  TURN-ON OR      │
                        │  BATTERY         │
                        │  ATTACH          │
                        └──────────────────┘
                                │
                        ┌──────────────────┐
                        │  PUMP TEST       │
                        └──────────────────┘
                                │
                        ┌──────────────────┐
                        │  SENSOR          │
                        │  DISCOVERY       │
                        └──────────────────┘
                                │
                        ┌──────────────────┐
                        │  SENSOR AND      │
                        │  CALIBRATION     │
                        │  INFORMATION     │
                        └──────────────────┘
                                │
                        ┌──────────────────┐
                        │  FRESH AIR       │
                        │  SETUP ? *       │
                        └──────────────────┘
                                │
                                ▼
```

BUMP TEST / INFORMATIONAL PAGES (See 7.2)   ◄── Press ▼ ── MAIN MEASURE PAGE ── Hold ▲ For 5 seconds ──►   CALIBRATE (See 7.3)

InstantAlert™ *   ◄── Hold ▼ For 5 seconds

Hold ▼ and ▲ Simultaneously for 2 seconds ──►   SETUP (See 7.4)

Hold ⏻ For 5 seconds ──► TURN OFF

* IF ENABLED

7.2   Bump Test/ Informational Pages

```
                        ⬡ BUMP TEST /
                          INFORMATIONAL
                          PAGES ⬡
                              │
                              ▼
  ┌──────────┐          ┌──────────┐          ╭──────────╮
  │ PERFORM  │◀─────────│  BUMP    │─────────▶│  MAIN    │
  │ SESOR    │          │  TEST?   │          │ MEASURE  │
  │ BUMP TEST│  Press ⏻ │          │ Press ▲  │  PAGE    │
  └──────────┘          └──────────┘          ╰──────────╯
       │                 Press ▼
       │                    │
       │                    ▼
       │                ┌──────────┐          ┌──────────┐
       │            ◀───│ PEAK *   │─────────▶│ RESET    │
       │      Press ⏻   │          │ Press ▲  │ PEAK     │
       │                └──────────┘          └──────────┘
       │                 Press ▼
       │                    │
       │                    ▼
       │                ┌──────────┐          ┌──────────┐
       │            ◀───│  MIN     │─────────▶│ RESET    │
       │      Press ⏻   │          │ Press ▲  │ MIN      │
       │                └──────────┘          └──────────┘
       │                 Press ▼
       │                    │
       │                    ▼
       │                ┌──────────┐          ┌──────────┐
       │            ◀───│ STEL *   │─────────▶│ RESET    │
       │      Press ⏻   │          │ Press ▲  │ STEL     │
       │                └──────────┘          └──────────┘
       │                 Press ▼
       │                    │
       ▼                    ▼
  ╭──────────╮          ┌──────────┐          ┌──────────┐
  │  MAIN    │◀─────────│  TWA *   │─────────▶│ RESET    │
  │ MEASURE  │          │          │ Press ▲  │ TWA      │
  │  PAGE    │  Press ⏻ │          │          │          │
  ╰──────────╯          └──────────┘          └──────────┘
                              │
                              ▼
                          Continue
                          To Section
                          7.2-cont.
```

* IF ENABLED (NOT VALID FOR
  ALL SENSORS)

Continued

DATE

Press ⏻

Press ▼

LAST CAL
DATE *

Press ⏻

Press ▼

CAL DUE
DATE *

Press ⏻

Press ▼

MOTION
ALERT
STATUS *

Press ▲

TOGGLE
ON /OFF

Press ⏻

Press ▼

WIRELESS **

Press ▲

TOGGLE
ON /OFF

Press ⏻

Press ▼

MAIN
MEASURE
PAGE
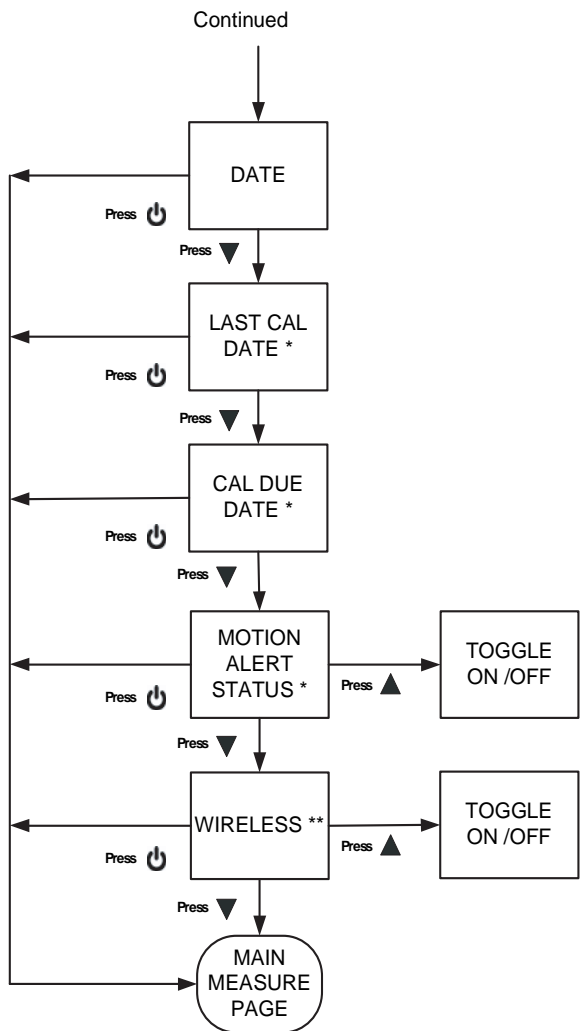
* IF ENABLED

** IF WIRELESS IS INSTALLED

7.3   Calibrations

```
                         ⟨   CALIBRATE   ⟩
                                │
                                │
                        ┌───────────────┐
                        │  PASSWORD ?    │
                        │ (IF REQUIRED)  │──────── PASSWORD
                        └───────────────┘           FAIL
                                │
                                ▼
 ┌──────────────┐       ┌───────────────┐       ┌──────────────┐
 │    ZERO      │◄──────│  ZERO CAL ?    │──────►│  PERFORM     │
 │ CALIBRATION  │ Press ▼│               │ Press ⏻│  FRESH AIR   │
 └──────────────┘       └───────────────┘       │    SETUP     │
        │                   Press ▲              └──────────────┘
        │                       │
        │                       ▼
 ┌──────────────┐       ┌───────────────┐
 │    SPAN      │◄──────│  SPAN CAL ?    │
 │ CALIBRATION  │ Press ▼│               │
 └──────────────┘       │ (REPEATS AS    │
                        │  NECESSARY)    │
                        └───────────────┘
                            Press ▲
                                │
                                ▼
                        ⟨    MAIN     ⟩
                        │  MEASURE    │◄────────────
                        │    PAGE     │
                        ⟨─────────────⟩
```

7.4   Setup

7.5   Calibration Options

```
                          ⬡ CALIBRATION
                            OPTIONS
                               │
                               │
                               ▼
            ┌──────────────────┐   Press ⏻    ┌──────────────┐
            │     CYLINDER     │──────────────▶│   SET SPAN   │
            │     SETTINGS     │               │  GAS FOR     │
            └──────────────────┘               │    EACH      │
               │                               │   SENSOR     │
         Press ▼                               └──────────────┘
               │
               ▼
            ┌──────────────────┐   Press ⏻    ┌──────────────┐
            │  CALIBRATION DUE │──────────────▶│  ON / OFF,   │
            │                  │               │  SET # OF    │
            └──────────────────┘               │    DAYS      │
               │                               └──────────────┘
         Press ▼
               │
               ▼
            ┌──────────────────┐   Press ⏻    ┌──────────────┐
            │  SHOW LAST CAL   │──────────────▶│   TOGGLE     │
            │ DATE AT STARTUP  │               │   ON / OFF   │
            └──────────────────┘               └──────────────┘
               │
         Press ▼
               │
               ▼
            ┌──────────────────┐   Press ⏻    ┌──────────────┐
            │    PASSWORD      │──────────────▶│   TOGGLE     │
            │   PROTECTED      │               │   ON / OFF   │
            │  CALIBRATION     │               └──────────────┘
            └──────────────────┘
               │
         Press ▼
               │
               ▼
            ┌──────────────────┐
            │  BACK TO SETUP ? │
            │                  │
            └──────────────────┘
               │
        Press ⏻ │
               ▼
             RETURN TO
              SETUP
```

7.6   Alarm Options

```
                    ⬡ ALARM
                      OPTIONS
                         │
                         │
            ┌────────────────────┐        ┌──────────────┐
            │                    │ Press ⏻ │   TOGGLE     │
            │      VIBRATOR      │────────▶│   ON/OFF     │
            │                    │        └──────────────┘
            └────────────────────┘
      Press ▼    │
                 ▼
            ┌────────────────────┐        ┌──────────────┐
            │                    │ Press ⏻ │   TOGGLE     │
            │       HORN         │────────▶│   ON/OFF     │
            │                    │        └──────────────┘
            └────────────────────┘
      Press ▼    │
                 ▼
            ┌────────────────────┐        ┌──────────────┐
            │                    │ Press ⏻ │   TOGGLE     │
            │    ALARM LEDS      │────────▶│   ON/OFF     │
            │                    │        └──────────────┘
            └────────────────────┘
      Press ▼    │
                 ▼
            ┌────────────────────┐        ┌──────────────┐
            │  USER ACCESS TO    │ Press ⏻ │   TOGGLE     │
            │   MOTION ALERT     │────────▶│   ON/OFF     │
            │                    │        └──────────────┘
            └────────────────────┘
      Press ▼    │
                 ▼
            ┌────────────────────┐        ⬡  SENSOR
            │                    │ Press ⏻    ALARM SETUP
            │   SENSOR ALARMS ?  │────────▶   (See 7.6.2)
            │                    │
            └────────────────────┘
      Press ▼    │
                 ▼
            ┌────────────────────┐
            │                    │
            │   BACK TO SETUP ?  │
            │                    │
            └────────────────────┘
      Press ⏻    │
                 ▼
               RETURN TO
                 SETUP
```

Sensor Alarm Setup

```
                    ┌──────────┐
                   ╱  SENSOR    ╲
                  ⟨   ALARM      ⟩
                   ╲  SETUP     ╱
                    └──────────┘
                         │
                         ▼
      ◄──────────┌──────────────┐         ┌──────────────┐
   Press ▼       │   SETUP      │         │ MODIFY LOW   │
                 │   LOW        │ Press ⏻ │ ALARMS FOR   │
                 │   ALARMS ?   │────────►│ ALL          │
                 └──────────────┘         │ SENSORS      │
          Press ▲      │                  └──────────────┘
                       ▼
      ◄──────────┌──────────────┐         ┌──────────────┐
   Press ▼       │   SETUP      │         │ MODIFY HIGH  │
                 │   HIGH       │ Press ⏻ │ ALARMS FOR   │
                 │   ALARMS ?   │────────►│ ALL          │
                 └──────────────┘         │ SENSORS      │
          Press ▲      │                  └──────────────┘
                       ▼
      ◄──────────┌──────────────┐         ┌──────────────┐
   Press ▼       │   SETUP      │         │   MODIFY     │
                 │   STEL       │ Press ⏻ │   STEL       │
                 │   ALARMS ?   │────────►│   ALARMS     │
                 └──────────────┘         └──────────────┘
          Press ▲      │
                       ▼
      ◄──────────┌──────────────┐         ┌──────────────┐
   Press ▼       │   SETUP      │         │   MODIFY     │
                 │   TWA        │ Press ⏻ │   TWA        │
                 │   ALARMS ?   │────────►│   ALARMS     │
                 └──────────────┘         └──────────────┘
          Press ▲      │
                       ▼
                 RETURN
                 TO ALARM
                 OPTIONS
```

NOTE: STEL AND TWA ARE NOT
         VALID FOR ALL SENSORS

7.7 Instrument Options

```
         ⬡ INSTRUMENT
           OPTIONS ⬡
              │
              │
      ┌───────────────┐            ⬡ SENSOR
      │ SENSOR SETUP  │── Press ⏻ ──▶  SETUP ⬡
      └───────────────┘            (See 7.7.2)
         Press ▼
              │
      ┌───────────────┐            ┌──────────┐
      │   LANGUAGE    │── Press ⏻ ─▶│  SELECT  │
      └───────────────┘            └──────────┘
         Press ▼
              │
      ┌───────────────┐            ┌──────────┐
      │  TIME / DATE  │── Press ⏻ ─▶│   SET    │
      └───────────────┘            │  HH:MM   │
         Press ▼                   │ MM:DD:YY │
              │                    └──────────┘
      ┌───────────────┐            ┌──────────┐
      │   DATALOG     │── Press ⏻ ─▶│   SET    │
      │   INTERVAL    │            │  MM:SS   │
      └───────────────┘            └──────────┘
         Press ▼
              │
      ┌───────────────┐            ┌──────────┐
      │ STEALTH MODE  │── Press ⏻ ─▶│  TOGGLE  │
      └───────────────┘            │  ON/OFF  │
         Press ▼                   └──────────┘
              │
           Continue
           To Section
           7.7.1-cont
```

Continued

OPERATING BEEP → Press ⏻ → TOGGLE ON/OFF

Press ▼

CONTRAST (MONO ONLY) → Press ⏻ → ADJUST

Press ▼

BACKLIGHT → Press ⏻ → ON / OFF TIMEOUT PERIOD

Press ▼

BACK TO SETUP ?

Press ⏻

RETURN TO SETUP

7.8 Sensor Setup

RETURN TO
INSTRUMENT
OPTIONS

** IF INSTALLED

8   Changeable Feature Summary

Feature	Initial Setting	Setup Path to Change this Setting	Changeable with MSA link?
Setup Password	672	-	Yes
Vibrating Alarm	ON	ALARM OPTIONS	Yes
Horn Alarm	ON	ALARM OPTIONS	Yes
LED Alarm	ON	ALARM OPTIONS	Yes
Safe LED [green]	ON	-	Yes
Operating Beep [alarm LEDs & horn]	OFF	INSTRUMENT OPTIONS	Yes
Stealth	OFF	INSTRUMENT OPTIONS	No
MotionAlert - Access	Allowed	ALARM OPTIONS	No
MotionAlert	OFF	Use ▼ button from MEASURE page	No
Sensor Alarm Levels		ALARM OPTIONS / SENSOR ALARM SETUP	Yes
Enable / Disable High & Low Alarms	Enabled	-	Yes
Turn Sensors ON / OFF	ON	INSTRUMENT OPTIONS / SENSOR SETUP	Yes
Show Peak	ON	-	Yes
Show STEL, TWA	ON	-	Yes
Cal Cylinder Setup		CAL OPTIONS	Yes
Show Last Cal Date	ON	CAL OPTIONS	Yes
Show Cal Due	ON	CAL OPTIONS	No
Cal Password Required	OFF	CAL OPTIONS	No
Backlight	Enabled	-	No
Backlight Duration	10 s	INSTRUMENT OPTIONS	Yes
Display Contrast	Factory-set	INSTRUMENT OPTIONS	No
Language	User-set	INSTRUMENT OPTIONS	No
Date, Time	User-set	INSTRUMENT OPTIONS	Yes
Datalog Interval	3 min	INSTRUMENT OPTIONS	Yes
Custom Logo Screen	Factory-set	Certified service center	Yes

Feature	Initial Setting	Setup Path to Change this Setting	Changeable with MSA link?
Instrument S/N	Factory-set	-	No
Company Name	Blank	-	Yes
Dept./User Name	Blank	-	Yes

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MSA AUER Austria
Kaplanstrasse 8
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The Safety Company