



	Butane, C <sub>4</sub> H <sub>10</sub>	0-25%Vol	0.1%Vol
	Methane, CH <sub>4</sub>	0-100%Vol	1%Vol
	Propane, C <sub>3</sub> H <sub>8</sub>	0-100%Vol	1%Vol
	VOC	0-2000 ppm	0.1 ppm

### BASIC OPERATIONAL FEATURES

Instrument buttons	Buttons on instrument must be easy to operate while user wears gloves.
Inadvertent shutoff	Instrument shall be designed to protect against accidental shutoff.
Zero adjustments	Instrument shall provide Fresh Air Setup (FAS) function at user's discretion.
Zero adjustment safety lockout	FAS function shall not allow unit to zero out hazardous readings.
Confidence signals	Instrument shall provide periodic audible and visual signals indicating instrument operation. User shall have option of disabling audible and visual signals if desired.
Time/date	Instrument must be able to display time and date. User must be able to reset time and date without tools.
Last calibration date	Instrument must be able to display last successful calibration date.
Instrument power-on	Power-on instrument button must be clearly marked.

### ADVANCED DISPLAY & SOFTWARE OPTIONS

Industrial hygiene displays	Instrument shall have capability of displaying PEAK, STEL and TWA at user's discretion. User shall have ability to enable/disable STEL and TWA functions.
Instrument settings	All settable instrument parameters (alarm set points, expected calibration gas values, etc.) shall be protected by user-selectable password.
Reset of functions	User shall be provided with capability of resetting PEAK, STEL and TWA readings in the field.
Measurement units	Unit shall be capable of displaying both types of gas sensors installed and measurement units for each gas.

### INSTRUMENT ALARMS

MotionAlert™ feature	Instrument shall offer standard MotionAlert feature. When activated, instrument shall eventually activate latch alarm when no instrument movement is detected for 30 seconds.
InstantAlert™ feature	Instrument shall have InstantAlert feature to allow users manual activation of all alarms if situation requires.
Visual alarms	Visual alarms shall consist of bright, flashing LEDs on top and bottom of instrument and positive indication on unit's display for alarm type identification.
Audible alarm	Audible alarm shall be rated at a typical >95 dB.
Vibrating alarm	Unit shall be offered with standard vibrating alarm.
Lockalarm™ Circuit feature	Catalytic combustible channel shall have non-resettable latching alarm when combustible gas level exceeds 100% LEL, or 5.00%Vol CH <sub>4</sub> when no 0-100%Vol CH <sub>4</sub> IR sensor is installed.
Auto recover feature	Catalytic combustible channel shall auto recover from Lockalarm Circuit situation if 0-100 %Vol CH <sub>4</sub> IR sensor is installed and reading returns to low methane levels.
Oxygen alarms	Oxygen channel shall have alarm set points for both oxygen deficiency and oxygen enrichment.
Alarms set points	Alarm set points must be user-settable.
STEL and TWA alarm	Instrument shall provide audible, visual and vibrating alarms if STEL or TWA levels are exceeded. Alarm set points for STEL and TWA shall be user-selectable.
Battery alarms	Monitor shall provide user with 10-minute warning of battery power loss in all environmental conditions. Power consumption alarms shall activate audible, visual and vibrating alarms.

INSTRUMENT POWER	
Run time	Instrument run time shall be at least 20 hours at room temperature. IR version run time shall be at least 17 hours at room temperature. PID version run time shall be at least 13 hours at room temperature. 5XM version run time shall be at least 18 hours at room temperature.
Power supply	Instrument shall be equipped with rechargeable lithium-ion battery. Alkaline option available (except IR or PID).
Battery life indication	Monitor shall provide icon depicting estimated remaining battery operation time. Battery icon must always be visible when instrument is powered on.
Charging cradle	Optional charging cradle shall be offered.
Charger input voltages	Chargers shall be available for 110VAC/220 VAC and 12-24 VDC.
Charging status	Both instrument and charging cradle shall provide visual indication of battery charging status.

CALIBRATION															
Calibration tools	Unit shall require no special tools for calibration other than cylinder, regulator and tubing to supply gas to instrument.														
Calibration access	Calibration access can be hidden behind password when desired.														
Pushbutton calibration	Calibration shall be easily performed using instrument's pushbuttons. Internal instrument access or tools shall not be necessary for calibration.														
Calibration time	Span calibration shall not exceed 60 seconds for LEL, O <sub>2</sub> , CO, H <sub>2</sub> S, SO <sub>2</sub> , and NO <sub>2</sub> XCell sensors and PID. Other gases shall not exceed the following span calibration times: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Gas type</th> <th>Span time</th> </tr> </thead> <tbody> <tr> <td>Chlorine</td> <td>2 minutes</td> </tr> <tr> <td>Ammonia</td> <td>2 minutes</td> </tr> <tr> <td>Nitrogen dioxide (Series 20)</td> <td>4 minutes</td> </tr> <tr> <td>Chlorine dioxide</td> <td>6 minutes</td> </tr> <tr> <td>Phosphine</td> <td>4 minutes</td> </tr> <tr> <td>Hydrogen cyanide</td> <td>4 minutes</td> </tr> </tbody> </table>	Gas type	Span time	Chlorine	2 minutes	Ammonia	2 minutes	Nitrogen dioxide (Series 20)	4 minutes	Chlorine dioxide	6 minutes	Phosphine	4 minutes	Hydrogen cyanide	4 minutes
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Automatic calibration	Instrument shall be compatible with optional automated test and with calibration system able to store data. External system shall automatically recognize and calibrate instrument and retain all calibration records.														

SAMPLING SYSTEMS	
Sampling modes	Instrument shall be available with internal pump.
Sampling systems filters	Pump must contain user-replaceable filters to prevent liquids and dust ingress.
Allowable sample line length	Instrument must be capable of sample draw from 50 feet within 9 seconds or from 80 feet (24, 38 m) within 15 seconds. (Should be 1'/second rule of thumb, will verify in testing. Tubing up to a certain length (TBD) will need to be 1/16"ID and then 1/8"ID for anything longer.) Standard version Altair 5X.
Fluid ingress protection	Sample probe shall be offered that is designed to prevent water and debris from entering instrument.
Reactive gas monitoring	Special sample probe shall be offered when used with Cl <sub>2</sub> , NH <sub>3</sub> and ClO <sub>2</sub> .

SENSOR CHARACTERISTICS AND PERFORMANCE																											
Sensor life	LEL, O <sub>2</sub> , CO, H <sub>2</sub> S, NO <sub>2</sub> . SO <sub>2</sub> XCell sensors and IR sensors shall have expected 4-year life. NH <sub>3</sub> and Cl <sub>2</sub> sensors shall have expected 3-year life.																										
End-of-life sensor indicator	Instrument shall notify user when sensor is close to and at its end-of-life following calibration.																										
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All sensors	All sensors should have built-in/dedicated control circuitry, including drive circuits, memory, microprocessor, and analog-to-digital converter to all for sensor level control and compensation.
Oxygen sensor	Oxygen sensor shall be lead-free and use non-consumable chemical reaction.
Combustible sensor	Combustible sensor must have at minimum the following poison resistance: 3000 ppm*hours to H2S 90 ppm*hours to silicon
CO / H2S sensor	CO / H2S sensor shall be designed with extremely robust carbon filter for CO channel to block interference. Sensor shall be designed for virtually no cross-channel interference.
NH3 sensor	NH3 sensor shall use non-consuming chemical reaction and self-recover after significant gas exposures. Sensor shall have 3-year or greater expected life.
SO2 sensor	SO2 sensor shall have response time of 10 seconds or less, use non-consuming chemical reaction and self-recover after significant gas exposures. Sensor shall have 3-year or greater expected life.
NO2 sensor	NO2 sensor shall have response time of 15 seconds or fewer. Sensor shall have 4-year or greater expected life.
Cl2 sensor	Cl2 sensor shall have minimal drift even under dry conditions. Sensor shall have virtually no cross-interference with CO, H2S and SO2. Sensor shall have 3-year or greater expected life.
IR sensors	IR sensor shall not rely upon mirror to obtain appropriate path length, as mirrors are highly susceptible to humidity and to condensing atmospheric conditions.

<sup>1</sup> All response times are calculated using manufacturer-recommended operation.

<sup>2</sup> Dirt, dust and cleanliness of sampling line can and will impact response time.

### DATA LOGGING (INSTRUMENT DATA STORAGE)

Data logging	Instrument must be available with standard data logging.
Event log	Instrument shall record at least 1000 events.
Data log capacity	Data log shall record and store data for average of 200 hours (at 1-minute intervals) without overwriting existing information during normal use.
Gas record content	Data log entries shall contain as minimum date, time and record of peak and average readings for each gas sensor (oxygen shall be recorded as maximum and minimum for these intervals).
Atmospheric record	Instrument shall have provisions to record atmospheric temperature changes.
Record intervals	Time span among data records shall be user-selectable from 15 seconds to 15 minutes.
Data retention	Instrument data stored in memory shall not be lost or corrupted in event of sudden instrument power loss.
Activity record content page	Instrument data log shall record and be capable of reporting significant instrument events including: <ul style="list-style-type: none"> <li>• Gas and battery alarms.</li> <li>• Fresh air setups, sensor re-zeroing and calibrations.</li> <li>• Battery voltage and elapsed run time.</li> </ul>

### CERTIFICATIONS

North America	<p><b>USA / UL</b>  Class I, Division 1, Groups A, B, C &amp; D  Class II, Division 1, Groups E, F &amp; G  Class III, Division 1  Ambient temperature: -40 C to +50 C; T4  ALTAIR 5X Multigas Detector with alkaline battery pack T3/T4  ALTAIR 5X or ALTAIR 5X iR Multigas Detector with rechargeable battery pack T4</p> <p><b>Canada CSA</b>  Class I, Division 1, Groups A, B, C &amp; D  CAN/CSA C22.2 No. 152 Combustible Gas Detection Instruments  C22.2 No. 152 Performance Ambient Temperature: -20° C to +50° C  C22.2 No. 157 Intrinsic Safety Ambient Temperature: -40° C to +50° C  ALTAIR 5X Multigas Detector with alkaline battery pack T3/T4  ALTAIR 5X or ALTAIR 5X iR Multigas Detector with rechargeable battery pack T4</p> <p><b>Mining</b>  MSHA 30 CFR Part 22  PADEP</p>
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Europe	<p><b>ATEX Directive 94/9/EC</b>  ALTAIR 5X Multigas Detector:  II 2G Ex d ia mb IIC Gb IP65 – Zone 1 when XCell® Ex Sensor is installed.  II 1G Ex ia IIC Ga IP65 – Zone 0 when XCell Ex Sensor is not installed.  ALTAIR 5X Multigas Detector with rechargeable battery pack T4  I M1 Ex ia I Ma</p> <p>ALTAIR 5X iR Multigas Detector II 2G Ex d e ia mb IIC T4 Gb IP65  CE 0080 Directive 2004/108/EEC (EMC): EN 50270 Type 2, EN61000-6-3</p>
Australia / New Zealand	<p><b>ANZEx Australia/New Zealand - Test Safe Australia</b>  ALTAIR 5X &amp; ALTAIR 5X iR Multigas Detector  Ex ia sa IIC T4 (Zone 0) IP65  ALTAIR 5X Multigas Detector with alkaline battery pack T3/T4  ALTAIR 5X or ALTAIR 5X iR Multigas Detector with rechargeable battery pack T4  Ex ia sa I (Zone 0) IP65</p> <p><b>IECEx - Test Safe Australia</b>  ALTAIR 5X &amp; ALTAIR 5X iR Multigas Detector  Ex ia mb d IIC IP65 – Zone 1 when XCell Ex Sensor is installed.  Ex ia IIC IP65 – Zone 0 when XCell Ex Sensor is not installed.  ALTAIR 5X Multigas Detector with alkaline battery pack T3/T4  ALTAIR 5X or ALTAIR 5X iR Multigas Detector with rechargeable battery pack T4  Ex ia I IP65 – Zone 0</p>
Manufacturing system quality approvals	Instrument manufacturer must be certified as compliant with ISO 9001 provisions.

**ENVIRONMENTAL**

Temperature	Normal operation: 0° to 40° C Extended: -20° to 50° C Short periods (15 minutes): -40° to +50° C (all except PID)
Humidity	15-90% RH (non-condensing) continuous 5-95% RH (non-condensing) for short periods.

**MAINTENANCE & WARRANTIES**

Sensor replacement	Sensors shall be easily accessed and replaced by users if desired by purchaser.
Warranty, consumables	Instrument shall have 3-year back-to-back warranty under normal use conditions, including CO/H2S/LEL/O2/SO2/NO2 XCell and IR sensors. NH3 and Cl2 shall be warranted for 2 years. Other sensors shall be warranted for at least 12 months.