7.0 Calibration

7.1 User Calibration

The G100 range of instruments are fully calibrated during manufacture and when returned for service. However, to improve accuracy between services a user/field calibration can be performed.

This section sets out the correct procedures to achieve an accurate user calibration.

✍ Note: If the calibration is completed incorrectly it may decrease the accuracy of the instrument.

Two important terms that are used within this section are "Zero" and "Span".

Zero: The point at which the instrument is calibrated when there is none of the target gas present.

Span: The point at which the instrument is calibrated when a known quantity of the target gas is present.

7.2 Calibration Gases

User calibration of the instrument will improve the data accuracy in the range of the calibration gases used. However, it may cause less accurate readings of concentrations outside this calibrated range. Users should select the correct calibration gas for the expected gas levels on their particular application. Only use gases with a known certified gas concentration.

✍ Note: Certified calibration gases can be supplied by VIASENSOR.

⚠ Warning	For each gas used the appropriate material safety data sheet must be read and understood before proceeding. Calibration gases and the use of pressure regulators can be dangerous.

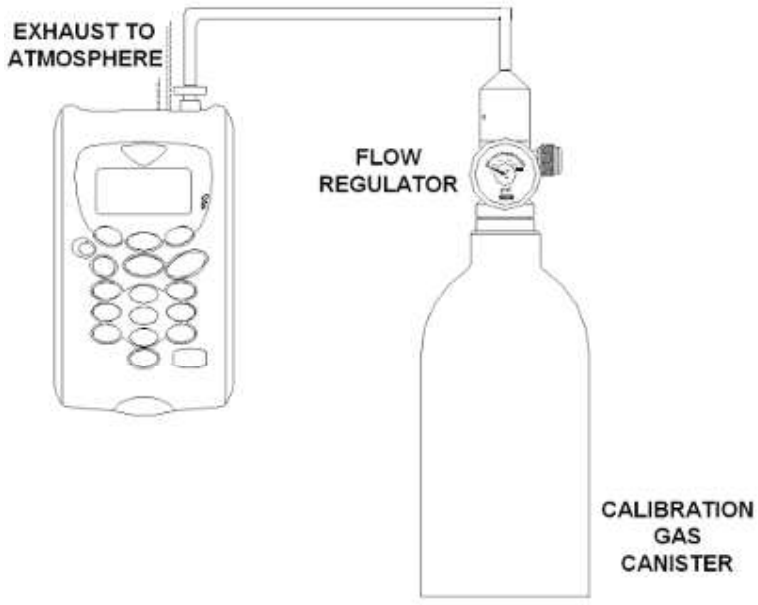
7.3 Calibration Set-up

The regulator supplied with the calibration kit has been configured to deliver a fixed flow. It only requires a few turns to open and no adjustment is necessary.

⚠ Warning	**Exhaust Port** When the instrument is being calibrated, there are two possible exits for the gas; via the usual manner out of the exhaust port of the instrument or in cases of over-pressurisation the 1/16″ port on the pressure relief valve. It is recommended that both ports have exhaust tubing attached. The exhaust tubing must exit in a well-vented area. Ensure there are no leaks in the tubing and connections. The calibration should always be carried out in a safe area with all necessary precautions taken as all pressurised gases are potentially dangerous.

7.4 Calibration Equipment

The diagram below displays the regulator and tubing equipment for user calibration:



- Certified calibration gas cylinders can be supplied by VIASENSOR . Please refer to the VIASENSOR website www.viasensor.com for further information.

- The regulator supplied with the calibration kit is recommended as flow and pressure rates are factory set.

  ✍ Note: Maximum input pressure 100" W.C. (approx. 3.6 PSI), maximum flow 300 ml/min. (0.3 Liters/min.)

7.5 Calibration Method

Before you begin ensure the unit is stabilized at its working temperature before performing any of the calibration operations.

To achieve the processes set out in this section, press 'Key 3 – Calibration' from the 'Main' menu. The first screen displayed provides the option to select the gas that requires calibration.

Calibration

The exact calibration method can vary depending on the gases used.

7.5.1 Zero CO_2 Channel:

For maximum accuracy it is recommended that the CO_2 Channel is zeroed using bottled gas (certified 100% N_2). However, if nitrogen gas is not available the optional soda lime filter kit can be fitted to the gas inlet. This allows the user to perform a zero using normal air as the soda lime filter will absorb virtually all CO_2 from the sample air. For both these options select 'Key 1-Zero with N_2' from the user calibration menu.

If neither of the recommended methods is available the user can select the option to perform an air calibration. This option assumes that the user has access to fresh air at around 390ppm. Generally, this can be found outside or in a well ventilated corridor (typically, an office or lab would have a higher CO_2 concentration).

1) From the 'Calibration' Menu, press 'Key 2 - CO_2 channel'.

User Calibration

2) Press either 'Key 1 - Zero with N_2' (recommended) or 'Key 2 - Zero with Air' from the menu. Then, either attach the 100% N_2 or sample pipe to allow access to fresh air.

3) Ensure the zero gas has flowed and is stable.

4) Press the 'Start' key. The instrument will now wait (approximately 60 seconds) for the gas reading to stabilise at the correct level. If zeroing with air press the 'Pump' key to draw in fresh air.

5) The instrument will then indicate a successful zero has been completed. Press the soft-key 'Accept' to confirm the calibration and 'Store' the new user offset. Alternatively, soft-key 'Reject' to exit without change.

   ✍ Note: If the calibration failed then purge and try again or select a different air source.

   If using G110 – very high concentrations of CO_2 may take up to **30 minutes** to purge completely.

7.5.2 Span CO_2 Channel:

It is recommended that the instrument is spanned to target the desired reading range (e.g. 5%); ideally this should not be a low level close to zero.

1) If not already preset, enter the **span target**, i.e. certified concentration of your calibration gas. Press 'Key 1' and enter the new value. Then attach the gas and open regulator valve to allow the gas to flow.

2) Press the 'Start' key and wait for the reading to stabilise. This can take a couple of minutes. Press the 'Pump' key to draw sample gas.

3) Once a stable reading is shown press the soft-key 'Accept'. A successful span calibration message will then be displayed. Press the soft-key 'Accept' again to confirm the calibration and 'Store' the new user span. Alternatively, press soft-key 'Reject' to exit without change.

✍ Note: If the calibration failed then try again using a longer purge time or different target gas.

7.5.3 Zero O_2 Channel:

It is not required to zero the O_2 channel. A span calibration corrects the reading across the whole range.

7.5.4 Span O_2 Channel:

It is recommended that the O_2 channel is spanned in fresh air with a target concentration of 20.9%, although other gases and target concentrations can be used if required.

1) If not already preset, enter the **span target**, i.e. certified concentration of your calibration gas. To change the span target press 'key1' and enter the new value.

2) Press the soft-key 'Start' and wait for the reading to stabilise. Press the 'Pump' key to draw in fresh air. It can take a couple of minutes to stabilize.

3) Once a stable reading is shown press the soft-key 'Accept'. A successful span calibration message should then be displayed. Press the soft-key 'Accept' again to confirm the calibration and 'Store' the new user span. Alternatively, press soft-key 'Reject' to exit without change.

✍ Note: If the calibration failed then try again using a longer purge time or different target gas.

7.5.5 Reset Factory Settings

This option will reset the instrument to its factory programmed calibration characteristics and will clear the user calibration points for both gas channels.

1) To reset to factory settings, press 'Key 1 - Factory Reset' from the 'Calibration' menu.

User Calibration - Reset

2) To prevent the user calibration data being accidentally erased the user must confirm the action by pressing the soft-key 'Accept', or soft-key 'Reject' to exit without change.

7.6 Last Field Calibration

This data can be found in the 'Information' screen accessed via the 'Utilities' menu. This option displays the date that the last field calibration was perfomed on the instrument.

7.7 Calibration Record

The G100 instruments have the capability to log user calibrations via the 'Event Log'. This can be used as an aid in ensuring that gas measurements are valid and accurate.

During calibration the instrument will record the following in the event log. For each entry the time and date will be stored.

Event	**Data Recorded**
Successful user zero CO_2	Type (N_2 or Air) and Readings before and after
Successful user span CO_2	Target Value, Readings before and after
Successful user span O_2	Target Value, Readings before and after
Failed user zero CO_2	Type (N_2 or Air) and Reading
Failed user span CO_2	Target Value, Gas Reading
Failed user span O_2	Target Value, Gas Reading
Return to factory settings	

✍ Note: If the calibration failed, then try again using a longer purge time or different target gas. This event log can only be downloaded and viewed via the optional Analyzer Data Manager software. It cannot be viewed on the analyzer screen.

