MECHATECH SYSTEMS

TECHNICAL VACUUM EXCELLENCE SINCE 2008

PARTICULATE GAS SAMPLING UNIT (MOBILE)

OPERATING INSTRUCTIONS

October 2025 (issue 2)
Publication ref: 2IZ245-1

MechaTech Systems Ltd, Unit 9, Brunel Way, Thornbury Industrial Estate, Thornbury, Bristol. BS35 3UR, UK

Tel **+ 44 (0) 1454 414723** | Email: **enquiries@mechatechsystems.co.uk** | **www.mechatechsystems.co.uk**

Registered in England and Wales No.6469333 | VAT Reg no: 928 7530 93 | DUNS No: 211040934

CONTENTS

Document changes

Company	Author	Checked	Issue	Date
Severn Science	Severn Science	NA	1	March 2005
Mechatech Systems	K Cassam	M Warburton	2	October 2025

1. INTRODUCTION

The mobile gas sampling unit has been designed and manufactured to meet the requirements of the customer.

2. PRINCIPLE

The instrument is used to extract a sample of gas when connected with suitable inlet / outlet hoses. The sample is drawn through a combined filter / activated carbon container to remove particulate and radioactive iodine species. The sample flow rate is regulated by a mass flow controller, which automatically compensates for changes in system pressure. The pump is turned on and off manually to start and finish sampling. After an appropriate volume (mass) of gas has been sampled, the particulate material and activated carbon granules are analysed for their radioactivity from which the total burdens of particulates and iodine species released to the environment can be calculated.

3. DESCRIPTION

3.1 General Assembly

The sampling equipment is mounted in a mobile cubicle with removable front and rear panels. Heavy-duty castors (two swivel and two fixed) are fitted to the base. The filter unit is easily accessible from the front of the equipment via a hinged, lockable Perspex door. Inlet and outlet connections protrude from the top panel, with the inlet connection (1/2" Swagelok quick connect, female type QF8-B-8PM) positioned directly above and in line with the filter unit and isolation valve and outlet connection (1/2" Swagelok quick connect, male, type QF8-S-8PM). A mains isolator is mounted on the right-hand side panel.

The front control panel comprises a flow controller / display, a pump on / off button, fault and power indicators, buzzer and mute control.

The pump is mounted in the base of the unit together with the mass flow controller. The unit operates from a power source of 110-volt 50Hz.

The flow diagram for the system is detailed in drawing 8246 and drawing 8258 issue B show the wiring diagram.

3.2 Iodine filter unit (drawing 8264A1A)

The iodine filter unit is dismounted by unscrewing the knurled ring and placing the lower half of the filter body on the bracket below the unit. This allows access to the filter paper grilles and the activated charcoal container.

4. OPERATION (see flow diagram 8246)

4.1 Fill the activated carbon container and place in the lower half of the filter unit. Place filter paper grilles above the container and assemble unit in accordance with drawing 8264A1A by connecting the upper and lower components using the knurled clamping ring.

4.2 Check that the gas inlet and extract connections have been fully secured between the probe and the extract respectively.

4.3 Connect the unit to a 110-volt 50Hz power source and turn on the mains isolator. The power indicator will illuminate.

4.4 Set the flow rate set point (on the CCD100 controller) by following the instructions below:

a) Press the 'Up or Down' button and hold to select desired setpoint for flow.
b) The setpoint display will extinguish if not interacted with after a few seconds.

Note: The flow rate set point is not retained on a power cycle and has to be re-set every time the unit is powered up.

4.5 Open the inlet isolation valve SS-63TS8

4.6 Press the 'pump start' button and note the time.

At the end of the test, press the 'pump stop' button and note the time. To remove the sample:

4.7 Open the front Perspex door and close valve SS-63TS8

4.8 Open the filter unit by unscrewing the knurled nut and allow the bottom half of the unit to be detached from the top section.

4.9 Remove the carbon container and filter paper for examination by the appropriate radioactive counting techniques.

5. ALARMS

The flow controller has two user adjustable alarm set points. These are factory configured as follows:

Set point selected	60l/min
Low flow warning (Trip 1)	57l/min (the alarm warning will activate if the flow drops to 57l/min. In this state, the alarm indicator on the front panel will illuminate and the buzzer will activate. The buzzer can be turned off by pressing the 'mute' button. The alarm is non-latching.

Note: Recommend setting of 3L/min below selected set point.

Low flow alarm (Trip 2)	54l/min (if the flow rate drops to 54l/min, the alarm indictor will illuminate, and the pump will stop (the test is aborted). In this state, the pump indicator is illuminated even though the pump has stopped. To re-set, press pump stop.

Note: Recommend setting of 6L/min below selected set point.

Note: If the flow rate set point is changed, the alarm set points must also be changed, as follows:

a) Press the 'Menu button. Then use the 'Up or Down' button to relay, then enter.
b) Use 'Up or Down' button to select Trip 1 or Trip2, press enter. Use 'Up/Down' to select desired value and menu or override to select required digit field.
c) Press the function button twice to revert to measurement mode.

Note: There are numerous other user configurable functions on the flow controller that are within this controller. These settings should **NOT** be changed and may render the controller inoperable. The factory configuration parameters are given below:

Setpoint: INI VAL: 0,0
INI MODE: AUTO
SOURCE: INT
Inputs: UNITS: L/MIN
RANGE; 100.0
FS (V): 5.000

6. ROUTINE MAINTENANCE

The unit will require little by way of maintenance apart from routine checks in accordance with details provided below.

6.1 Gas Sampling Pump

Maintenance requirements for the pump are limited and are detailed in the manufacturers' literature.

6.2 Filter Unit

The maintenance requirements of the iodine filter unit are limited to periodic replacement of O-rings.

APPENDIX 1 LIST OF DRAWINGS

8258	Wiring Diagram
8246	Flow Diagram
8264A1A	Filter Unit

APPENDIX 2 ASSOCIATED DOCUMENTS

VT4.8 Vacuum Pump

CCD100 Flow controller / display

HFC-203 Mass flow controller

APPENDIX 3 GAS CORRECTION FACTOR

The HFC-203 Mass flow controller is calibrated with dry nitrogen. A correction factor must be applied to flow rate measurements if the equipment is used with gases other than nitrogen. In the case of carbon dioxide, the correction factor is 0.7526. Further details are included with this appendix.