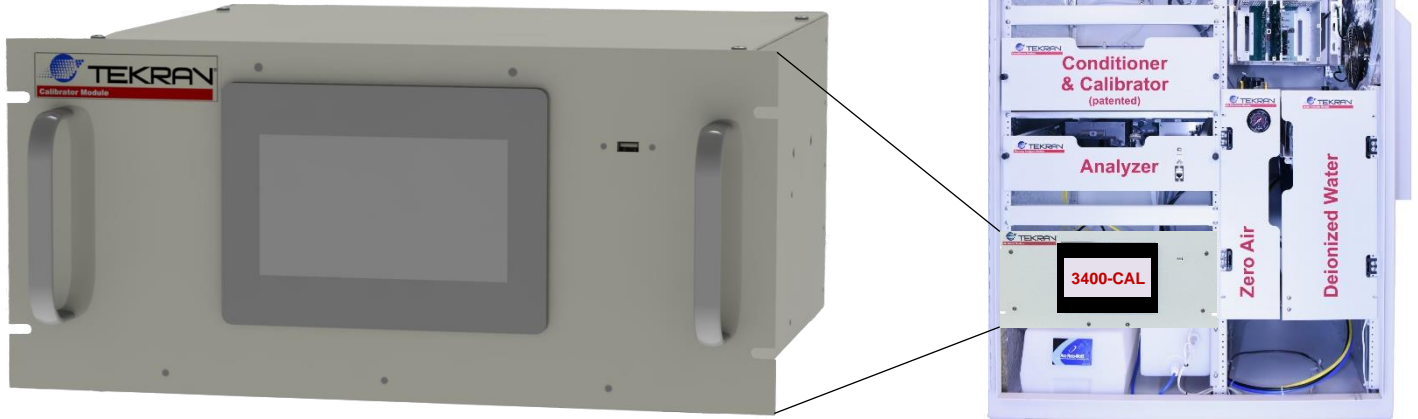


Model 3400-CAL Elemental & Oxidized Mercury Calibrator for the Model 3400 HgCEMS

Rev. 062023



The Model 3400-CAL integrates seamlessly inside the Tekran® 3400 HgCEMS. The Tekran® Model 3400-CAL Elemental & Oxidized Mercury Calibrator provides NIST traceable calibration gas for system calibration. The 3400-CAL is an added, programmable calibration gas source that complements the standard calibration gas source already installed inside the 3400 HgCEMS, necessary to comply with USEPA and other government regulations. It can be used as a stand-alone mercury source and calibration system for monitoring or control technology research. The 3400-CAL can be set to automatically generate multi-point calibration gas. The 3400-CAL delivers elemental mercury gas using a NIST traceable, temperature controlled, saturated mercury vapor source. It generates oxidized mercury using a patented method that reacts HCl with elemental mercury to produce gaseous HgCl_2 for system calibration or converter efficiency evaluation. Precision mass flow controllers dilute the mercury source output to the desired value. The mercury generator is capable of continuously producing large flow rates of calibration gas at virtually no ongoing cost.

Unlike other saturated sources, the Model 3400-CAL contains a host of advanced features providing superior accuracy and unattended, remote operation.

Product Highlights

- Hg output range¹: 0.5 to 1900 $\mu\text{g}/\text{m}^3$
- Calibration gas delivery rate¹: 2 to 30 SLPM
- Mercury source life: many years
- Allowable ambient temp: +5 to +40°C
- Hg source control range²: +5.00 to +50.00°C
- Independent linearization tables for each MFC

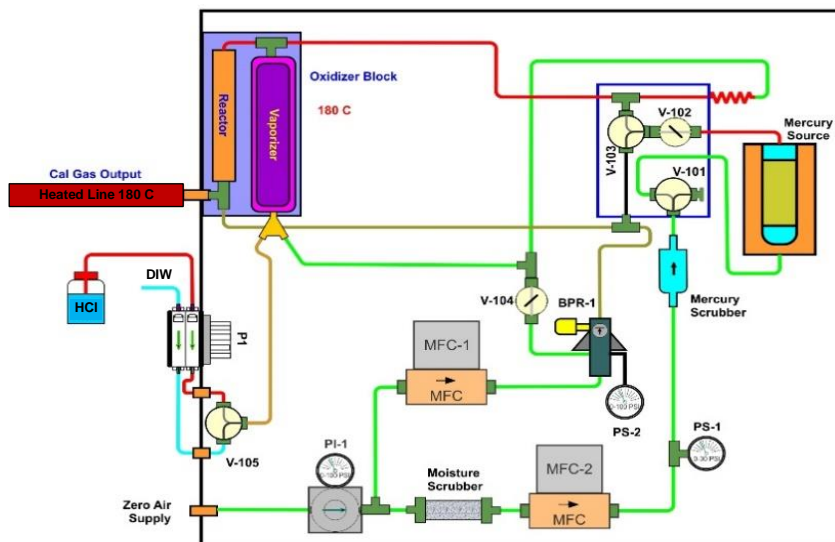
Applications

- Coal fired power plant MATS monitoring
- Waste incinerator emissions
- Industrial boiler emissions
- Biogas energy plant emissions
- Cement plant MACT compliance monitoring
- Mercury removal process control
- Natural gas processing plant emissions
- Other industrial emission sources

Principles of Operation

A Peltier heater/cooler maintains precise temperature control of the mercury reservoir. A mass flow controller, MFC-1, keeps precise and accurate carrier flow through the mercury chamber. The source exit flow is saturated with elemental mercury vapor and is then diluted by the flow from MFC-2. Solenoid valves isolate the source when mercury is not required and also select between two available output paths. The backpressure regulators provide the requisite inlet pressure (>45 PSI) to ensure proper nebulizer function and efficiency of the oxidizer block. The valve manifold is heated to minimize any condensation of mercury vapor in the undiluted portion of the flow path. Additional safety interlocks ensure the source is activated only when all temperatures are stable.

3400-CAL Flow Diagram



Product Features

- Calibration gas output port
- High output rate: up to 30 SLPM
- Heated/cooled saturated mercury source
- Ultra-precise source control
 - Repeatability: $\pm 0.02^{\circ}\text{C}$
 - Accuracy: $\pm 0.05^{\circ}\text{C}$
 - Range²: +5.00 to +50.00°C
- Automatic purging of system lines after high value calibrations or upon error detection
- MFCs individually calibrated to minimize errors at low flow settings
 - Multi-point calibration tables
 - Linear interpolation between calibration points
- Solenoid valves provide control functions
 - Isolation of Hg source until safe to activate
 - Selection between main and auxiliary outputs
 - Venting of source during stabilization period
- Precision pressure sensor for constant output concentration despite back pressure variations

Remote Control

The 3400-CAL is integrated into the 3400 HgCEMS as a sub-component, and can be controlled by the ANLZ module MCU via RS485-RTU.

- Readout and logging of all current temperatures, pressures and flows
- Setting of all temperatures and MFC set points
- Initiation of immediate or automatic calibration sequences
- Periodic temperature sensor and MFC recalibrations
- Output log files available in standard CSV format

Due to ongoing development, all listed specifications are subject to change.

¹ Standard Unit. Other working ranges are available. Not all output flow/concentration combinations are available simultaneously.

² Other temperature ranges available. Contact Tekran for details.