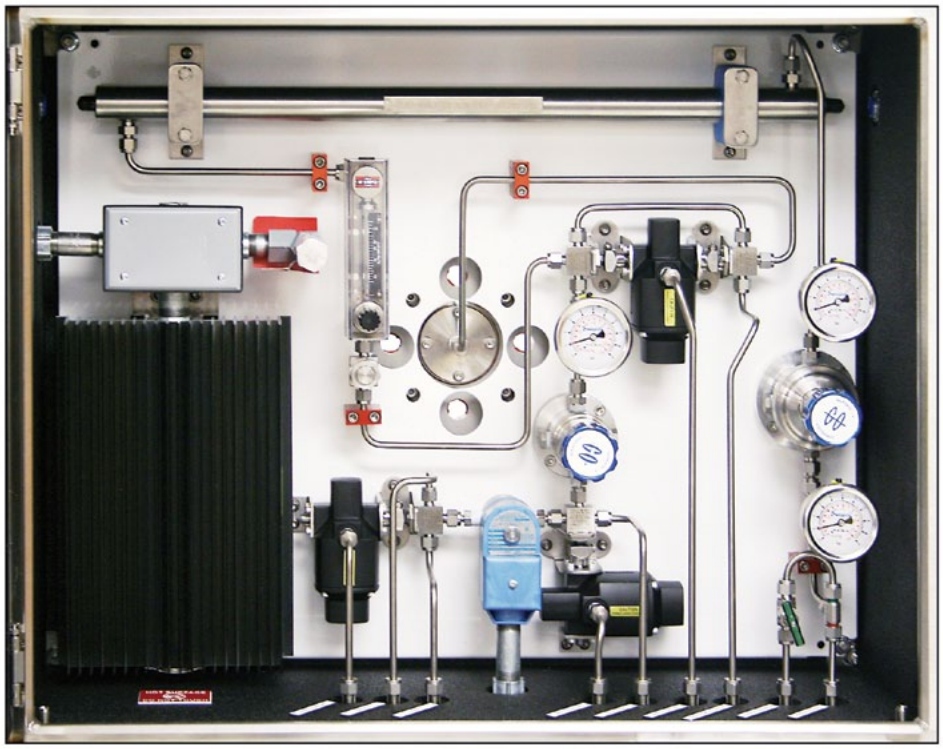
DS-604A

Close-Coupled SCS Design

Data Sheet SC-004A — Revised 28 September 2012



Description

When it comes to sampling from flue gas streams, traditional cross-stack (in situ) and extractive methods each have their unique strengths and pitfalls. While in situ sampling bests extractive methods in response time and sample integrity, it falls far short of extraction in terms of measurement verification and ease of installation.

As a conceptual hybrid of these two methods, close-coupled sampling elegantly retains the advantages of both. The sample conditioning system (containing all flow cells and optics) is mounted directly on the stack. The sampling probe enters the stack through the weld neck, drawing a continuous sample by means of an enclosed aspirator.

- enclosure mounted directly on stack via **sintered metal probe**
- sample **flow cell** is already mounted inside the enclosure
- **wetted parts:** SS316 tubing/fittings, Viton gaskets, quartz optical windows

Mounting Directly on Stack

The close-coupled SCS enclosure is mounted directly on the stack via the sintered metal probe.

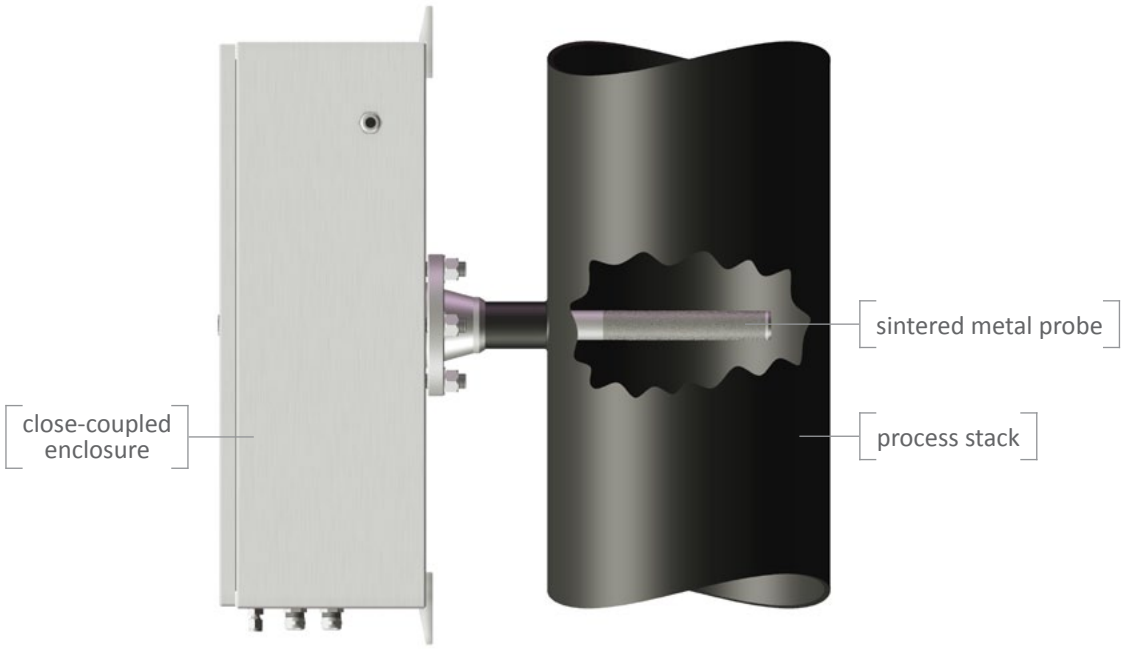


Figure 1: Side view of close-coupled mounting configuration.

Interior of Close-Coupled SCS

The core components of the close-coupled SCS are highlighted below. This image illustrates the minimal sample transport route from the probe to the flow cell (measurement point).

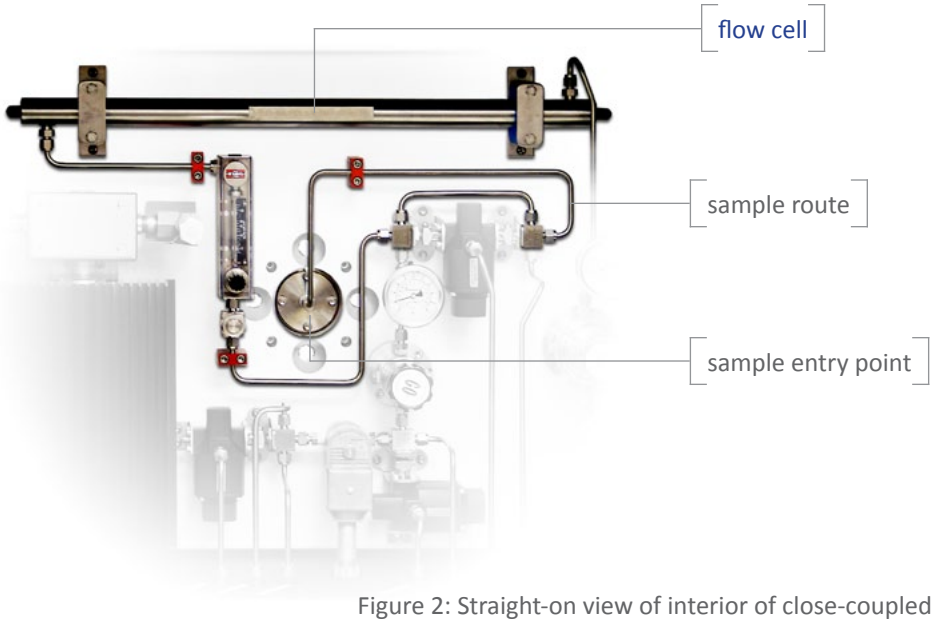


Figure 2: Straight-on view of interior of close-coupled SCS.

Sampling Design Comparison: Close-Coupling vs. Cross-Stack vs. Extraction

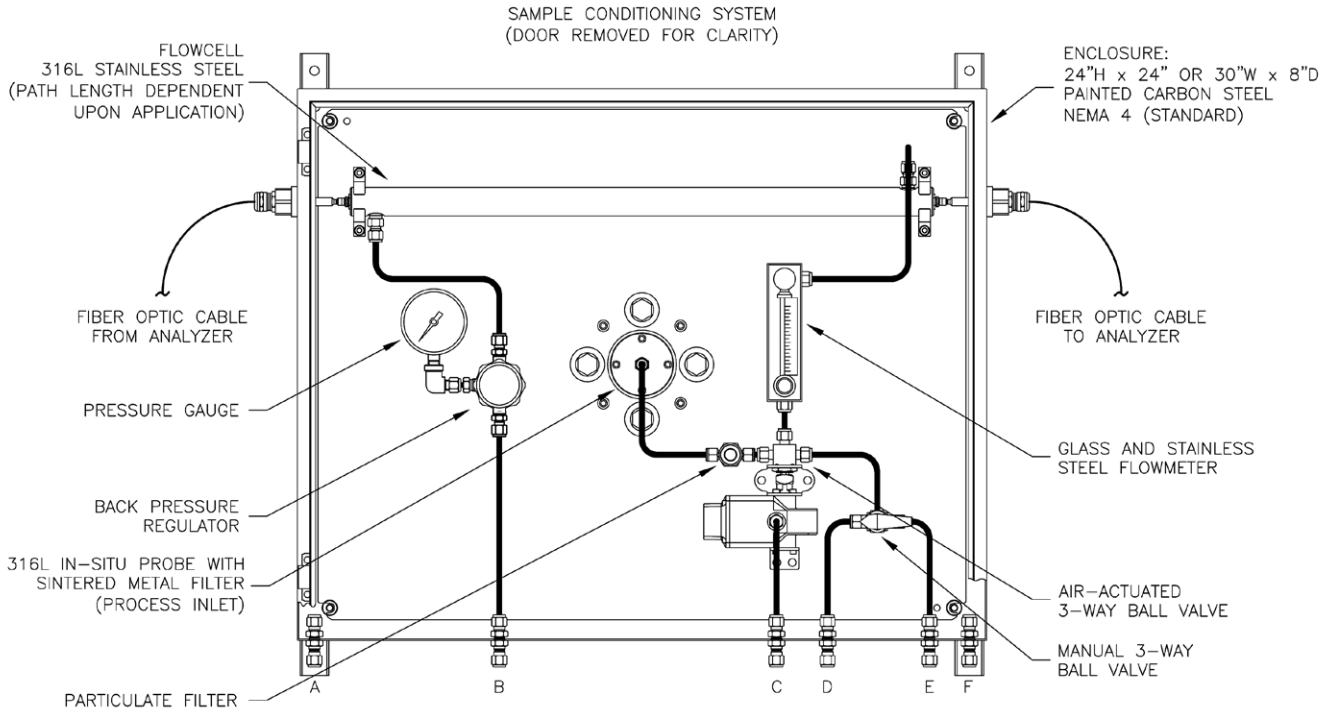
The following chart examines the differences between sampling techniques across several critical parameters.

CROSS-STACK	EXTRACTIVE	CLOSE-COUPLED
Response Time		
Fast. In situ sampling inherently reduces measurement time.	Slow. Long sample lines = sample lag.	Fast. No sample lines; the measurement cells are housed in an enclosure mounted directly on stack.
Sample Integrity		
High. No sample conditioning.	Relatively Low. Drying and dilution introduce significant measurement error.	High. Direct analysis of hot, wet sample inside mounted enclosure.
Span Checks and Zero Using Calibration Gases		
Difficult or Impossible. The stack itself cannot be filled with calibration or zero gas, and all workarounds ultimately calibrate using non-representative path lengths.	Simple but Slow. Performed externally, but long sample lines increase procedure duration (and thus downtime).	Simple and Fast. Following a user-configured schedule, the system automatically introduces calibration or zero gas to the flow cells and runs a synchronous span check or zero across all instrumentation. The procedure is brief due to minimal sample transport.
Maintenance Regimen		
Intensive. Aside from the difficulty of cleaning coated optics inside a stack, the instrumentation is also subject to heat and corrosion from the flue gas. Repairs often require total removal and thus downtime.	Intensive. Long sample lines suffer from cold spot plugging.	Mild. No sample lines to maintain; the optics are easily accessible in the mounted enclosure for monthly cleaning--a 60-second task. A shut-off valve allows for hot-tapping.
Ease of Installation		
Difficult. Aligning optics across the stack is non-trivial, and the height of the installation site poses documented human risk.	Difficult. The sample lines require expensive heat-tracing.	Easy. The sample conditioning system is mounted directly on the stack and connected to the analyzer with custom-length fiber optics.

Photograph: Close-Coupled System in the Field

Measurement: NOX and oxygen.
Location: Washington, USA.

Typical Close Coupled System - Technical Drawing



A. PURGE AIR IN/OUT, 1/4" OD

B. PROCESS RETURN, 1/4" OD

C. AIR TO VALVE, 1/4" OD

D. SPAN, 1/4" OD

E. ZERO (NITROGEN), 1/4" OD

F. PURGE AIR IN/OUT, 1/4" OD

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