

Teledyne API – San Diego Facility



Teledyne-API is a leading supplier of the following instrumentation products and services:

- **Ambient air quality gas analyzers**
- **Source level emissions gas analyzers**
- **Zero-air Generators**
- **Dynamic Dilution Calibrators**
- **Particulate Monitors**
- **Technical support services**
 - **Service support**
 - **Repair**
 - **Training**



Ambient air quality gas analyzers:

- T Series & N Series gas analyzers
- Gases measured:
 - SO₂, H₂S, TRS, TS
 - NO, NO₂, NO_x, NO_y, NH₃, "True NO₂", "Direct NO₂"
 - CO, CO₂
 - O₂, O₃
- Measurement technologies:
 - UV Fluorescence
 - Chemiluminescent w/ Moly or Photolytic Converter; Cavity Attenuated Phase Shift (CAPS)
 - IR Gas Filter Correlation
 - UV Absorption
 - Paramagnetic
- Most analyzers available in ambient, source and trace level versions
- All ambient analyzer models US EPA FEM or FRM approved
- T-API provides many analyzers to federal, state and local regulatory agencies, including: USEPA, CARB, SCAQMD, SDAPCD, etc.
- NumaView software



Source level emissions gas analyzers:

- T Series and N Series gas analyzers
- Gases measured:
 - SO₂, TRS
 - NO, NO₂, NO_x
 - CO, CO₂,
 - O₂
- Measurement technologies:
 - UV Fluorescence
 - Chemiluminescent w/ Moly or SS converter
 - Gas Filter Correlation IR
 - Paramagnetic
- Most analyzers available in mid and high level versions, with dual ranges
- T-API provides analyzers to many CEMS integrators for compliance monitoring
- NumaView software



N Series Gas Instruments

September, 2022



N Series Highlights

- Smart Internal Hardware Modules
 - Easy field replacement with pre-calibrated and tested modules
- CAN Bus Communications Architecture
 - Simplified, common cabling for increased reliability
- 24VDC Internal Power
 - Lower power consumption and unified power requirement
- Split Fold-down Rear Panel
 - Access to internal pneumatic connections
- NumaView™ Software Interface
 - Familiar, mature, and customizable with real-time graphing, diagnostic alerts, and preventative maintenance capabilities
- Flow System Module with Pump Duty Cycle Control*
 - Reduces pump duty cycle for increased lifetime

* PDCC is on internal pumps only for certain models

N Series Front Panel



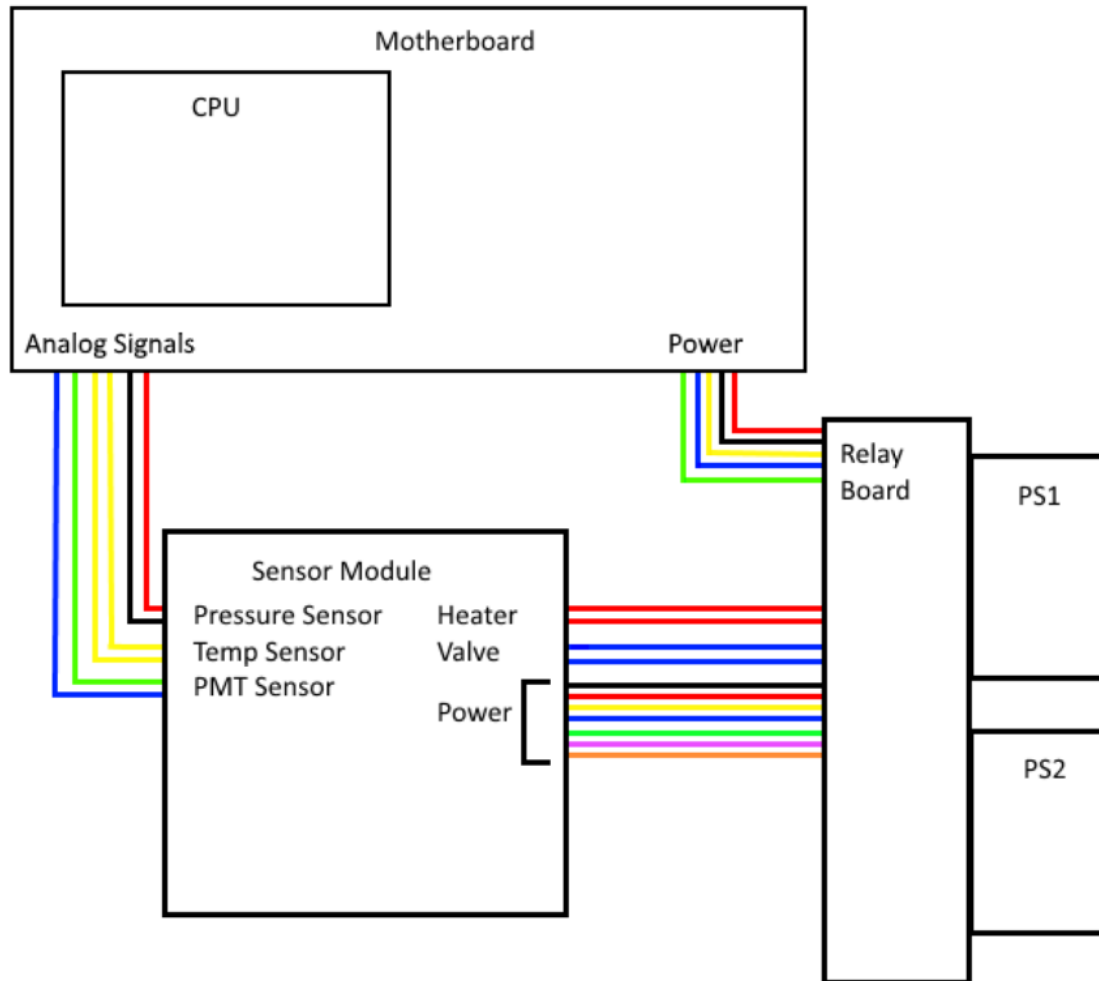
- Standard 19" rack mountable chassis
- Optional ears, handles, and/or slides
- Capacitive, color touch-screen display
- 2 front-panel USB ports
- Soft power switch

N Series Rear Panel



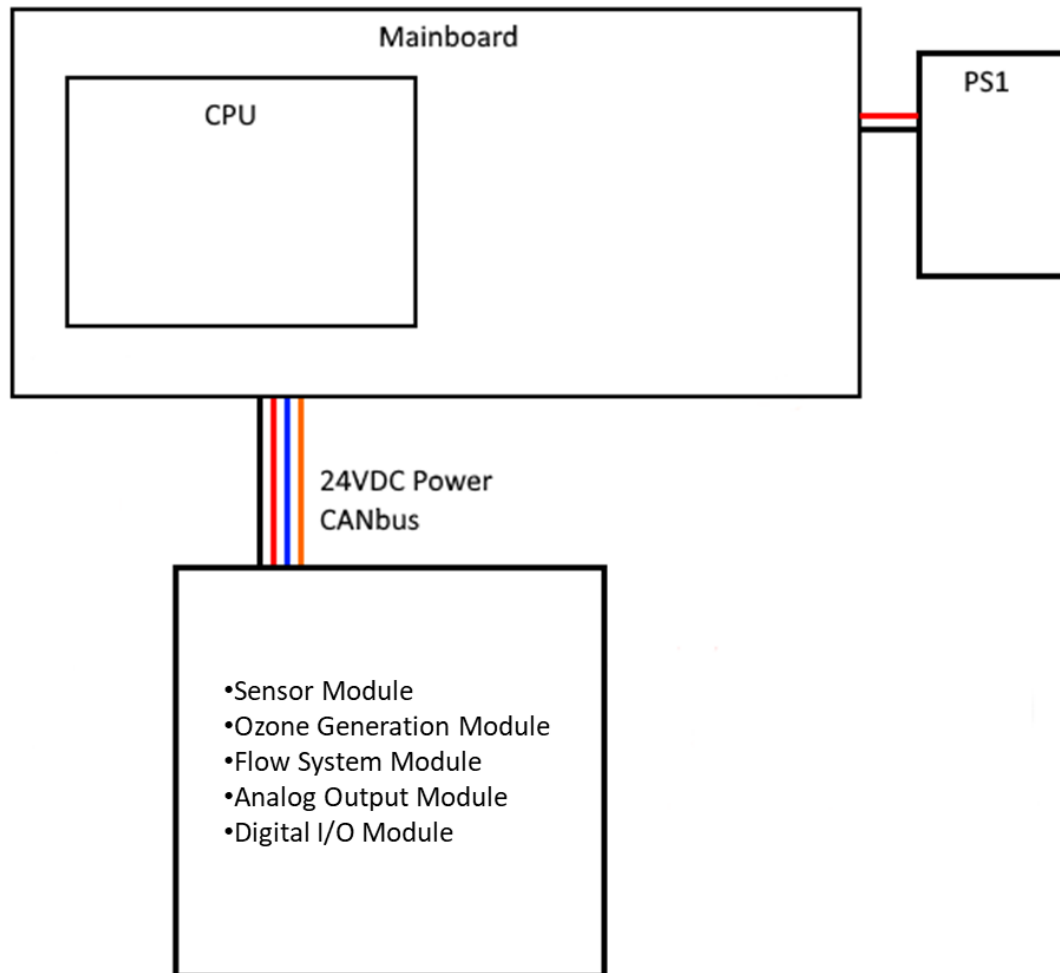
- Split fold-down rear panel
- Robust pneumatic bulkhead fittings
- Ethernet and serial communications with Modbus protocol
- Analog output and Digital expansion cards (optional)

Traditional Gas Instrument Wiring Architecture



- Requires host controller (motherboard)
- Multiple power supplies
- Relay board to transmit power
- Analog signals transmitted separately
- Many, many electrical connections and variable cable styles

N Series Wiring Architecture

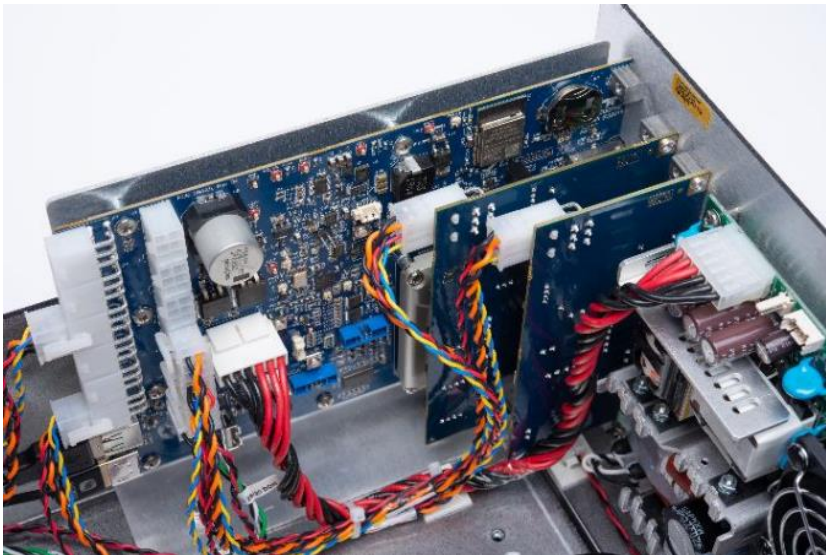


- Single, universal power supply
- Power and data provided in a single cable set
- All CAN Bus cables and connectors are common
- *Simplified cabling and connections = improved reliability!!*

Common Smart Modules

■ Mainboard Module

- Serves as the “carrier board” for the CPU
- Provides the core set of user-accessible I/O, including Ethernet and Serial ports
- DC power distribution and CAN bus hub
- Provides all power management including soft power switch



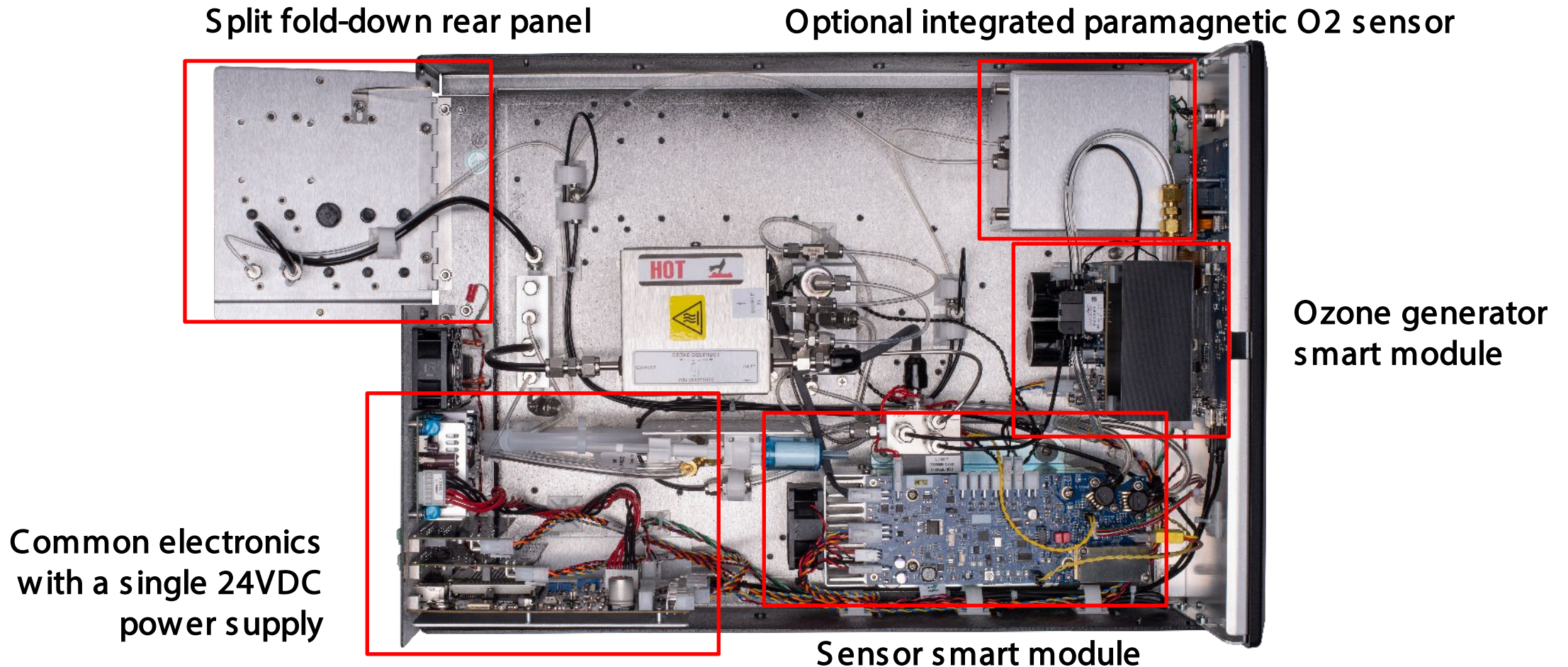
■ Communication Modules

- Digital I/O expansion
 - Status out, control in, alarm relays
- Analog outputs
 - 3 x current (4-20 mA)
 - 4 x voltage (5 or 10V)

N Series CEM Instrument Models

Gas	Model	Ranges (Min / Max)
SO ₂ (Sulfur Dioxide)	N100	0-50 ppb / 0-20 ppm
SO ₂	N100H	0-10 ppm / 0-5,000 ppm
NO, NO ₂ , NO _x (Nitrogen Oxide, Nitrogen Dioxide)	N200	0-50 ppb / 0-20 ppm
NO, NO ₂ , NO _x	N200M	0-1 ppm / 0-200 ppm
NO, NO ₂ , NO _x	N200H	0-5 ppm / 0-5,000 ppm
CO (Carbon Monoxide)	N300	0-1 ppm / 0-1,000 ppm
CO	N300M	0-5 ppm / 0-5,000 ppm
CO ₂ (Carbon Dioxide)	Integrated paramagnetic O ₂ and/or NDIR CO ₂ sensors available for some models.	
		0-2 ppm / 0-2,000 ppm
CO ₂	N360M	0-4 ppm / 0-4,000 ppm

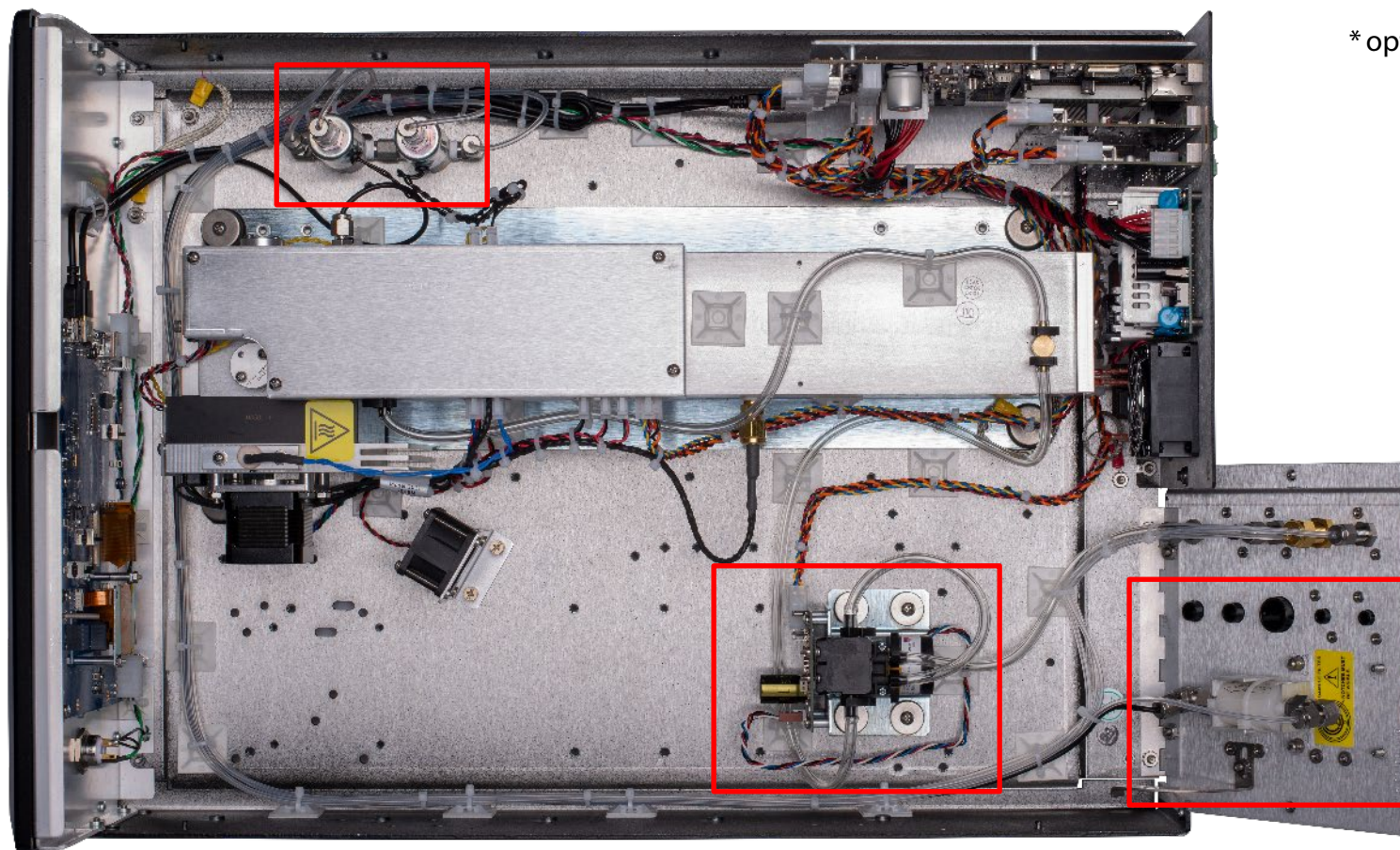
Internal Layout (N200M)



Internal Layout (N300)

Internal
Zero/Span Valve
Assy*

* options available on ambient models

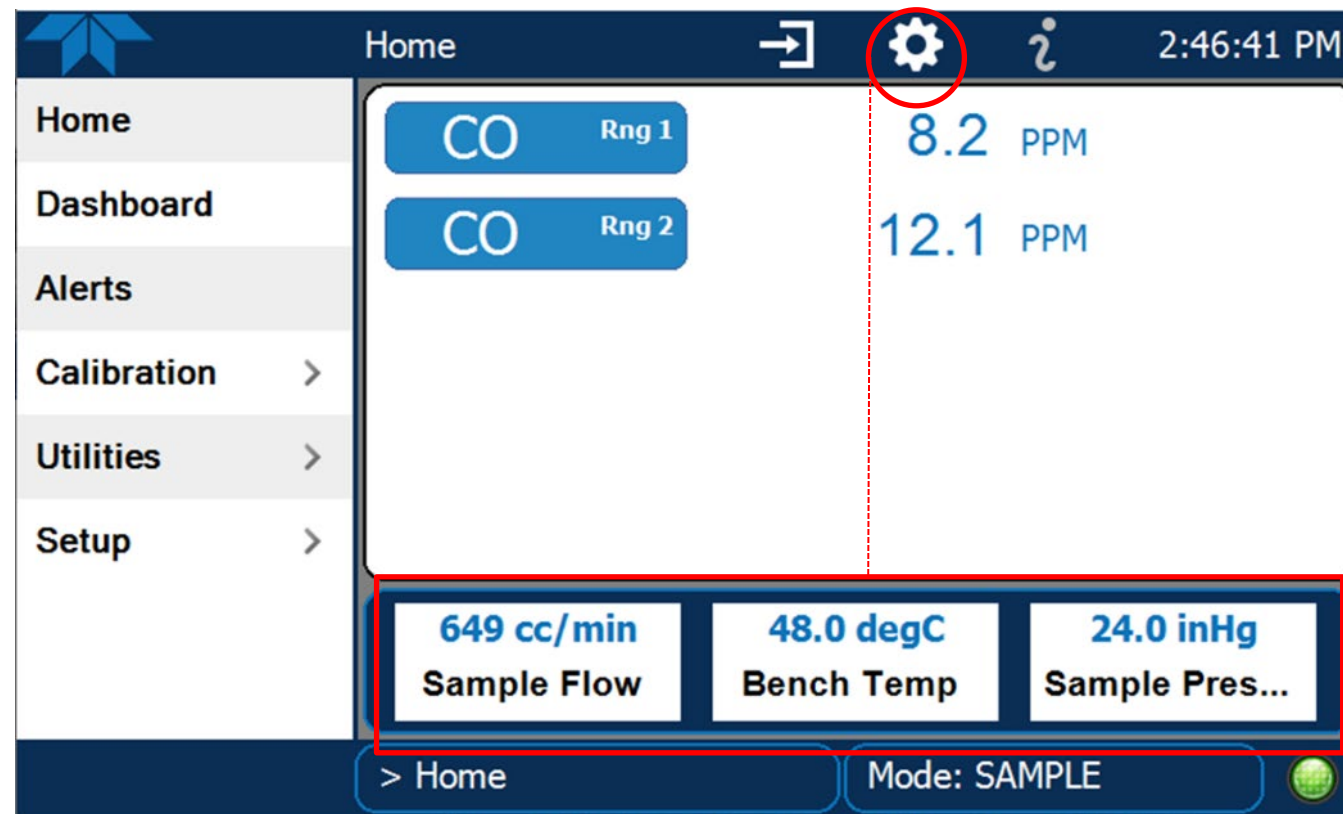


Long-life or 47mm
sample filter
holders*

Flow system smart module with Pulse-width modulated (PWM) control

NumaView™ Software Interface

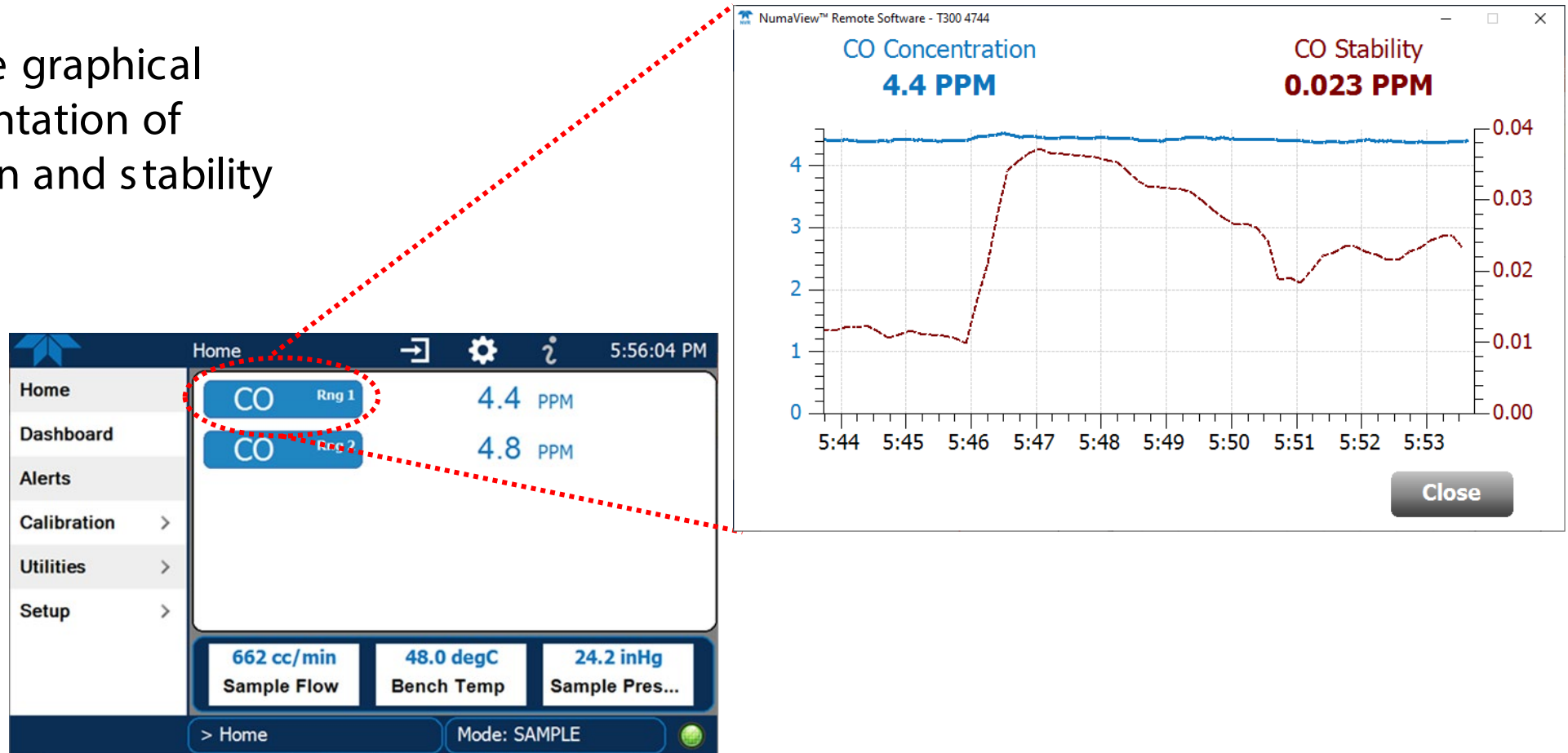
Customizable, content rich, and intuitive user interface



User-definable
meter variables

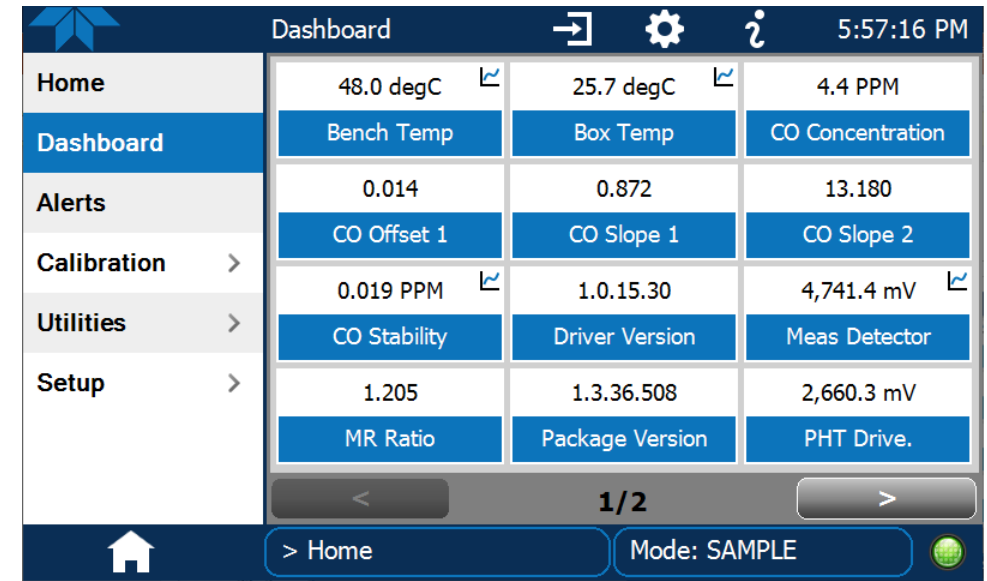
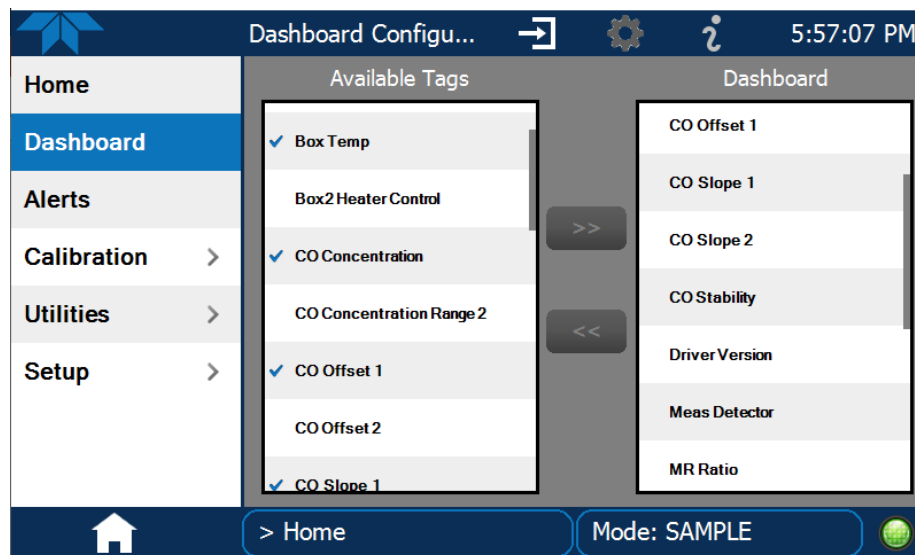
Intuitive User Interface

Real-time graphical representation of concentration and stability



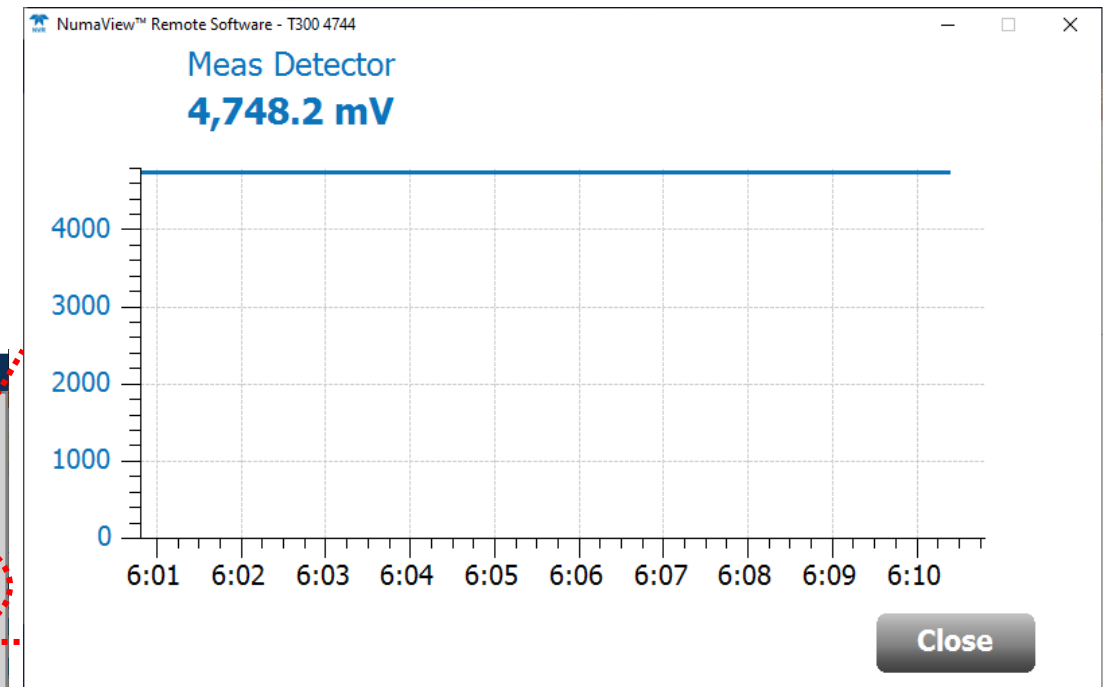
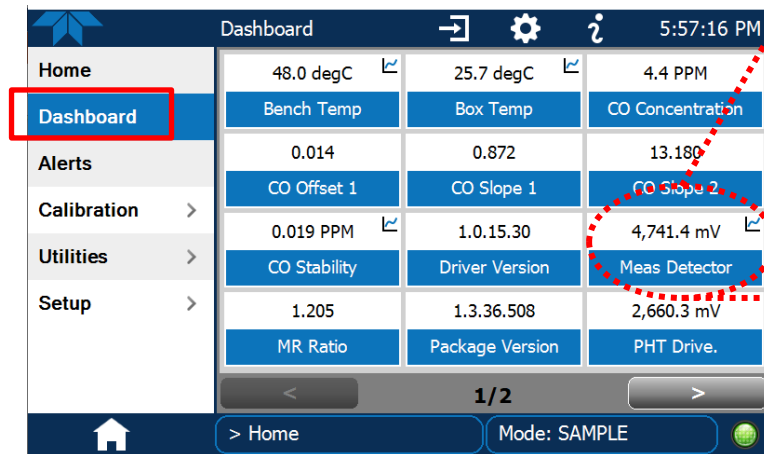
Intuitive User Interface

Fully configurable dashboard



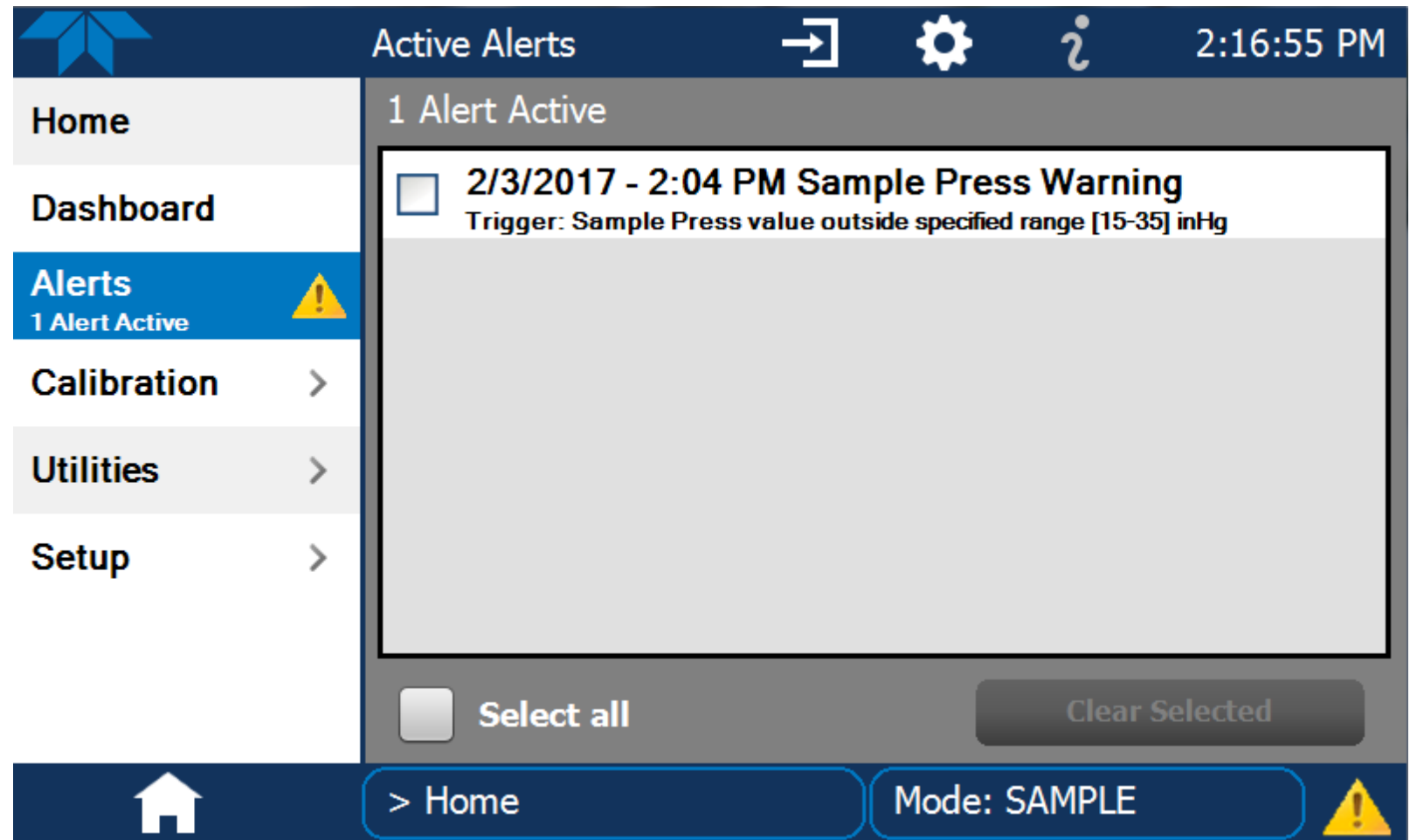
Intuitive User Interface

Real-time graphical representation of test functions



Intuitive User Interface

Simultaneous display of
all active alerts with
time stamp and cause



Intuitive User Interface

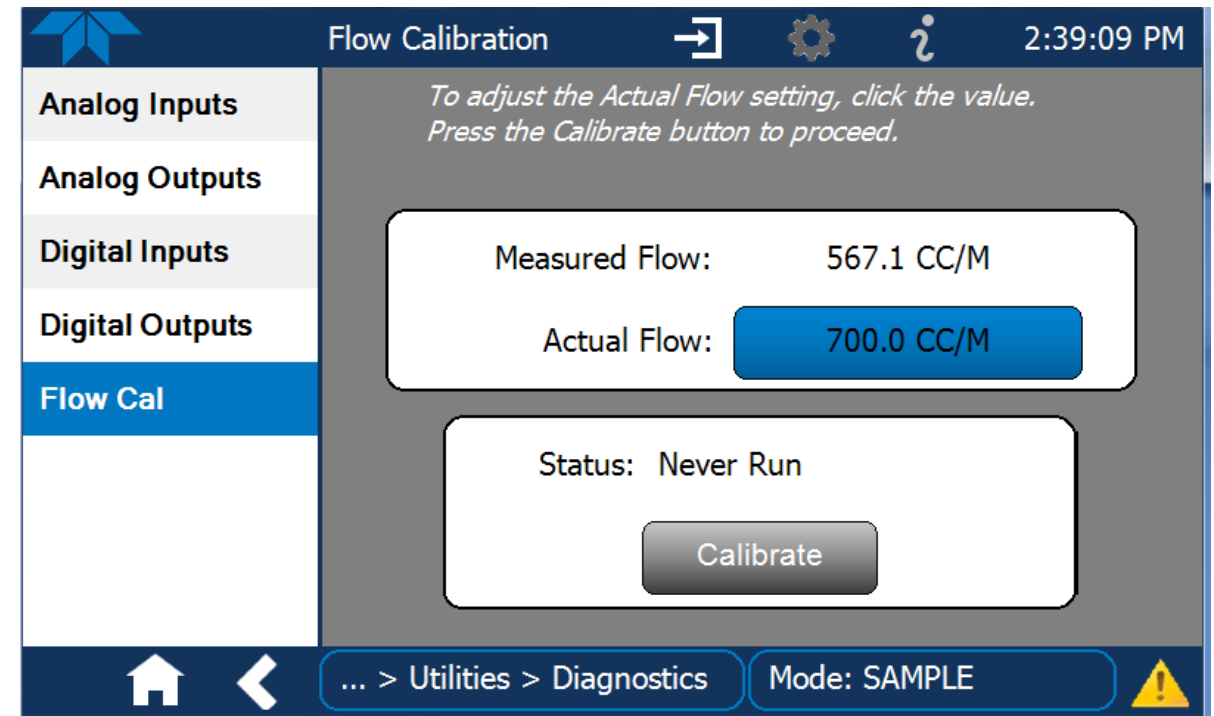
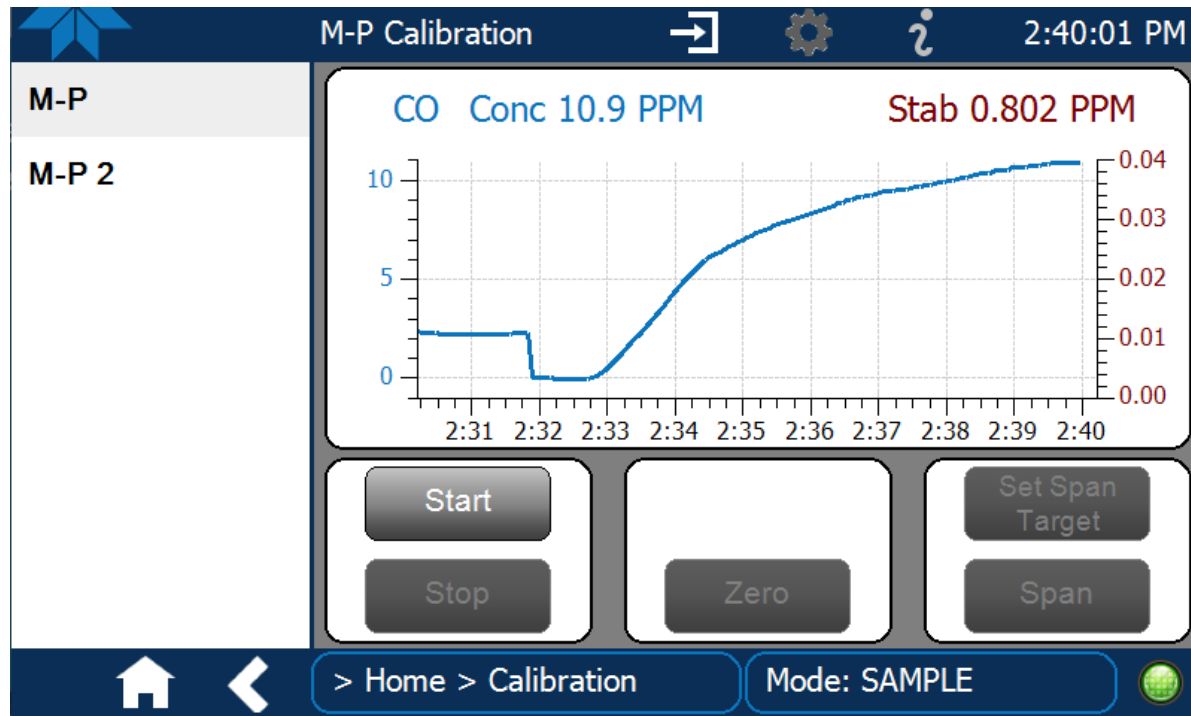
Custom events and warnings

The screenshot displays the 'Events Configuration' screen. On the left is a vertical menu with options: Data Logging, Events (highlighted), Dashboard, Vars, Homescreen, Digital Outputs, Analog Outputs, and Instrument. The main area shows the configuration for an event named 'Sample Press Warning'. The description is 'Warning raised when the sample pressure is out of range'. The event is enabled, visible, and latching. The trigger tag is 'Sample Press' and the condition is 'Out Of Range'. The low pressure limit is set to 15 inHg and the high pressure limit is set to 35 inHg. At the bottom, there are 'Done' and 'Cancel' buttons. The bottom status bar shows a home icon, a back arrow, a breadcrumb '> Home > Setup', the mode 'Mode: SAMPLE', and a warning icon.

Field	Value
Name	Sample Press Warning
Description	Warning raised when the sample pressure is out of range
Enabled	<input checked="" type="checkbox"/>
Visible	<input checked="" type="checkbox"/>
Latching	<input checked="" type="checkbox"/>
Trigger Tag	Sample Press
Condition	Out Of Range
Low	15 inHg
High	35 inHg

Intuitive User Interface

Simple Calibrations



Data Acquisition and Logging

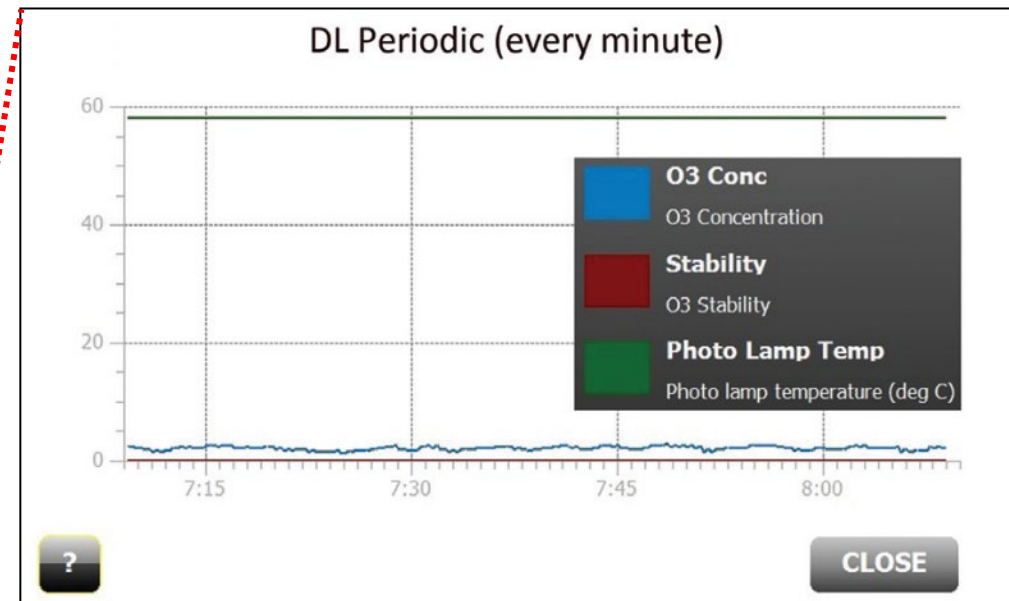
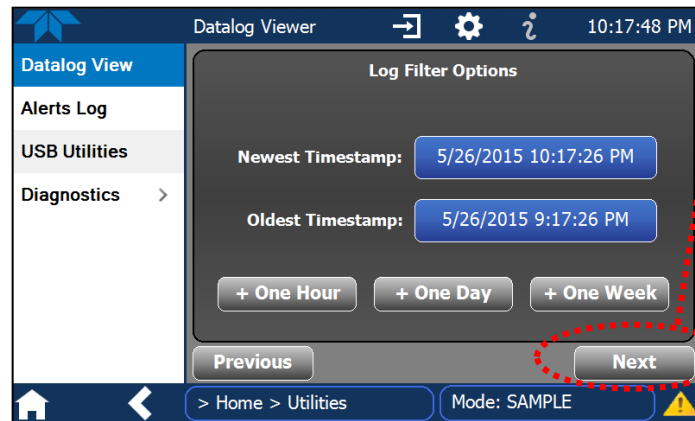
Triggers for data logging,
including periodic and
conditional

The screenshot displays the 'Datalog Configuration' interface. On the left is a vertical menu with options: Data Logging (selected), Events, Dashboard, Vars, Homescreen, Digital Outputs, Analog Outputs, and Instrument. The main area contains configuration fields for a log named 'HIRES'. The 'Description' field is empty. The 'Enabled' checkbox is checked. The 'Max Records' is set to 10000. The 'Log Tags' field contains 'Bench Temp, Box Temp, CO Concentration, Si'. The 'Trigger Type' is 'Periodic Trigger'. Below this, a grey box contains 'Interval' set to 1 Minute and 'Start Time' set to 08/21/2020 8:21:00 AM. At the bottom are buttons for 'Global Settings...', 'Done', and 'Cancel'. The bottom status bar shows '> Home > Setup' and 'Mode: SAMPLE'.

Name	HIRES		
Description			
Enabled	<input checked="" type="checkbox"/>	Max Records	10000
Log Tags	Bench Temp, Box Temp, CO Concentration, Si		
Trigger Type	Periodic Trigger		
Interval	1	Minute	
Start Time	08/21/2020 8:21:00 AM		

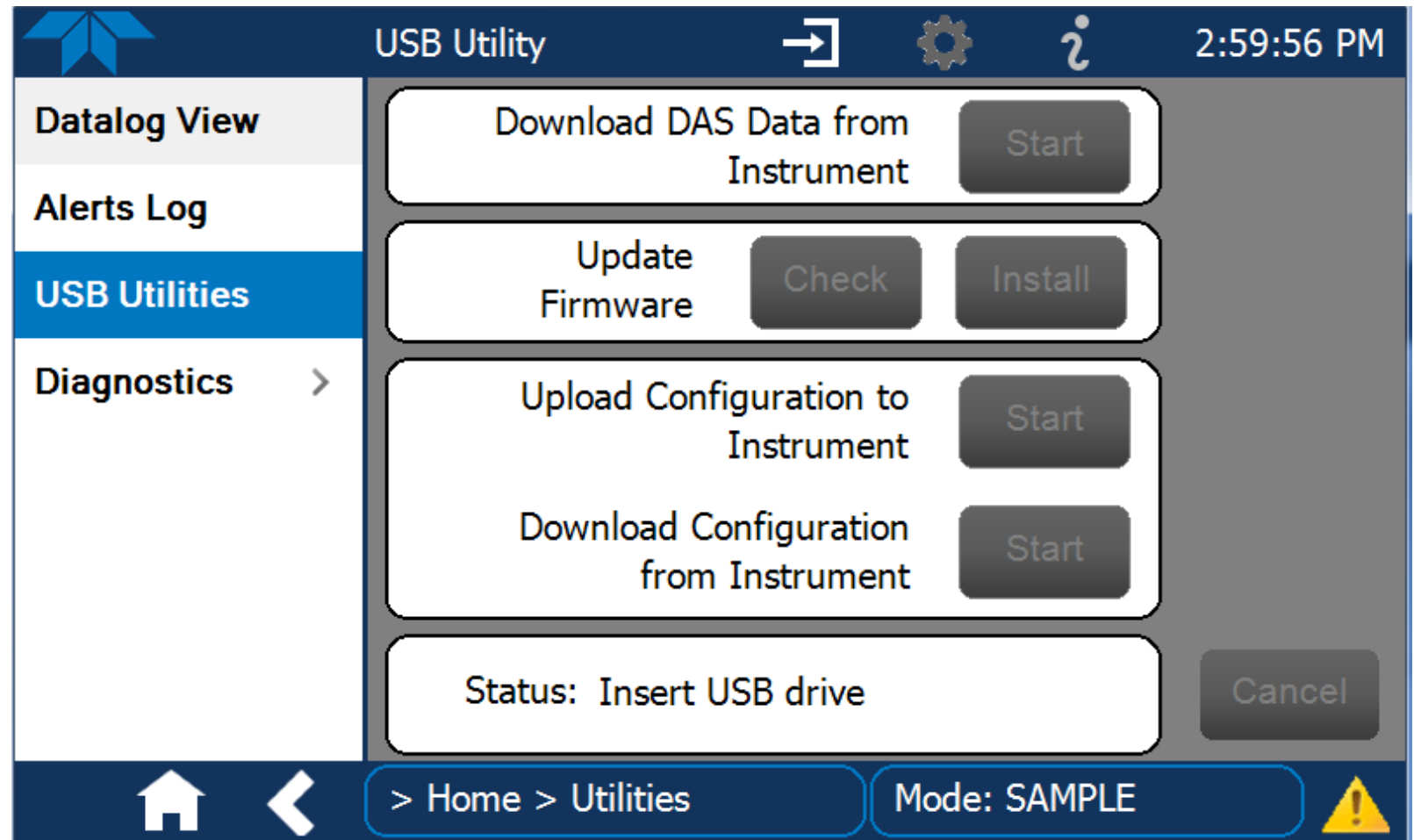
Data Acquisition and Logging

Customizable datasets that
can be viewed on the GUI



Full USB Support

Data Upload and
Download



Analog Outputs

Easily map any data 'tags' to any analog output

The screenshot shows the 'Analog Output 1' configuration screen. On the left is a vertical menu with options: 'Analog Output1' (selected), 'Analog Output2', 'Analog Output3', 'Analog Output4', and 'Analog Output Cal'. The main area contains two columns of settings. The first column has 'Signal Out' set to 'CO Concentration', 'Min' set to '0.0 PPM', and 'Max' set to '100.0 PPM'. The second column has 'Calibration Type' set to 'MANUAL', 'Range' set to 'Current', and 'Recorder Offset' set to '0 mV'. There is a checked checkbox for 'Allow Overrange'. An 'Apply' button is at the bottom right. The top status bar shows the title 'Analog Output 1', navigation icons, a gear icon, an info icon, and the time '6:13:22 PM'. The bottom navigation bar includes a home icon, a back icon, a breadcrumb trail '... Setup > Analog Outputs', a mode indicator 'Mode: SAMPLE', and a green circular status icon.

Setting	Value
Signal Out	CO Concentration
Calibration Type	MANUAL
Min	0.0 PPM
Max	100.0 PPM
Range	Current
Recorder Offset	0 mV
Allow Overrange	<input checked="" type="checkbox"/>

Teledyne API N Series Gas Analyzers



Designed for today, prepared for tomorrow

T Series... Stack Instruments

- *T100* SO₂ Analyzer
 - *T100H* High-Level SO₂ Analyzer
 - *T101* H₂S Analyzer
 - *T102* TRS Analyzer
 - *T108* Total Sulfur Analyzer
 - *T200* Low-Level NO_x Analyzer
 - *T200M* Mid-Level NO_x Analyzer
 - *T200H* High-Level NO_x Analyzer
 - *T300U* Ultra Low-Level CO Analyzer
 - *T300* Low-Level CO Analyzer
 - *T300M* Mid-Level CO Analyzer
 - *T360* CO₂ Analyzer
 - *T360M* Mid-Level CO₂ Analyzer
 - *T802* Oxygen Analyzer*
-
- Optional Paramagnetic O₂ Sensor
 - *Optional NDIR CO₂ Sensor

T Series CO Instrument Models

- T300U
 - Range: 0 -100 ppm
 - LDL: < 20 ppb
- T300
 - Range: 0 – 1,000 ppm
 - LDL: < 0.04 ppm
- T300M
 - Range: 0 – 5,000 ppm
 - LDL: 0.2 ppm

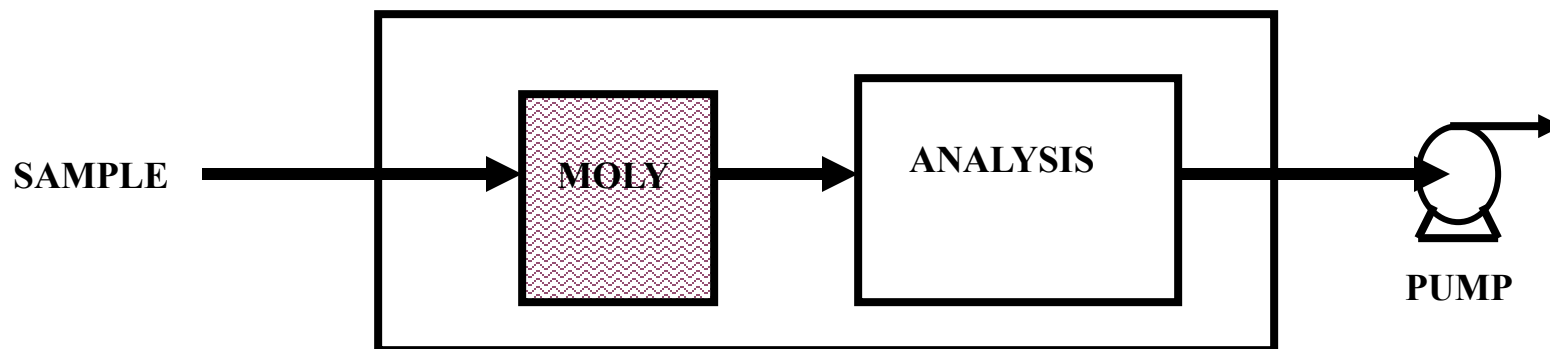


T Series NOx Instrument Models

- T200
 - Range: 0 – 20 ppm
 - LDL: 0.04 ppb
- T200M
 - Range: 0 – 200 ppm
 - LDL: 40 ppb
- T200H
 - Range: 0 – 5,000 ppm
 - LDL: 40 ppb



Choosing a NO_x Converter



For ambient applications, the choice is simple:
Use a molybdenum catalytic converter, heated to
315°C. This will convert >98% of the NO₂.

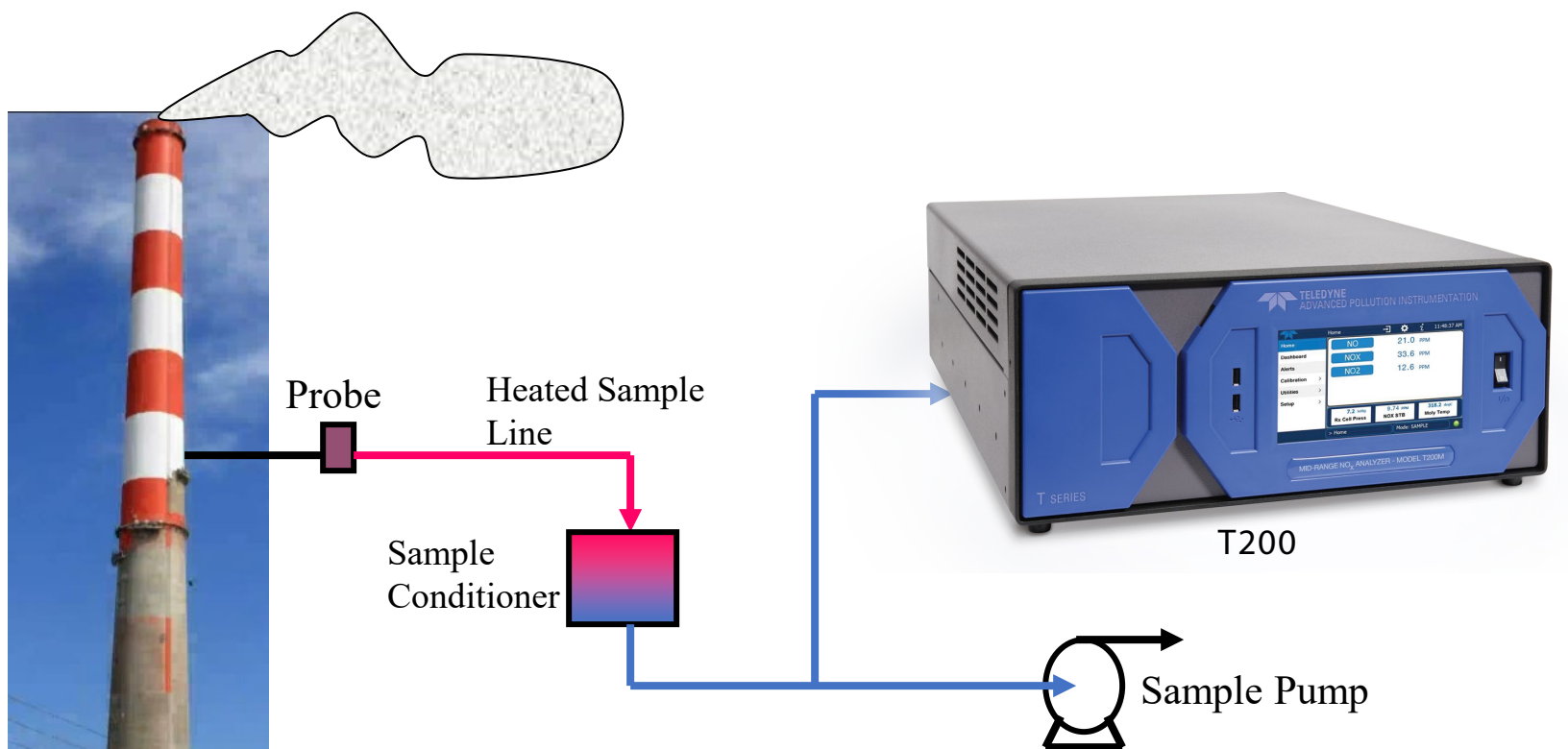
Choosing a NO_x Converter



T200M

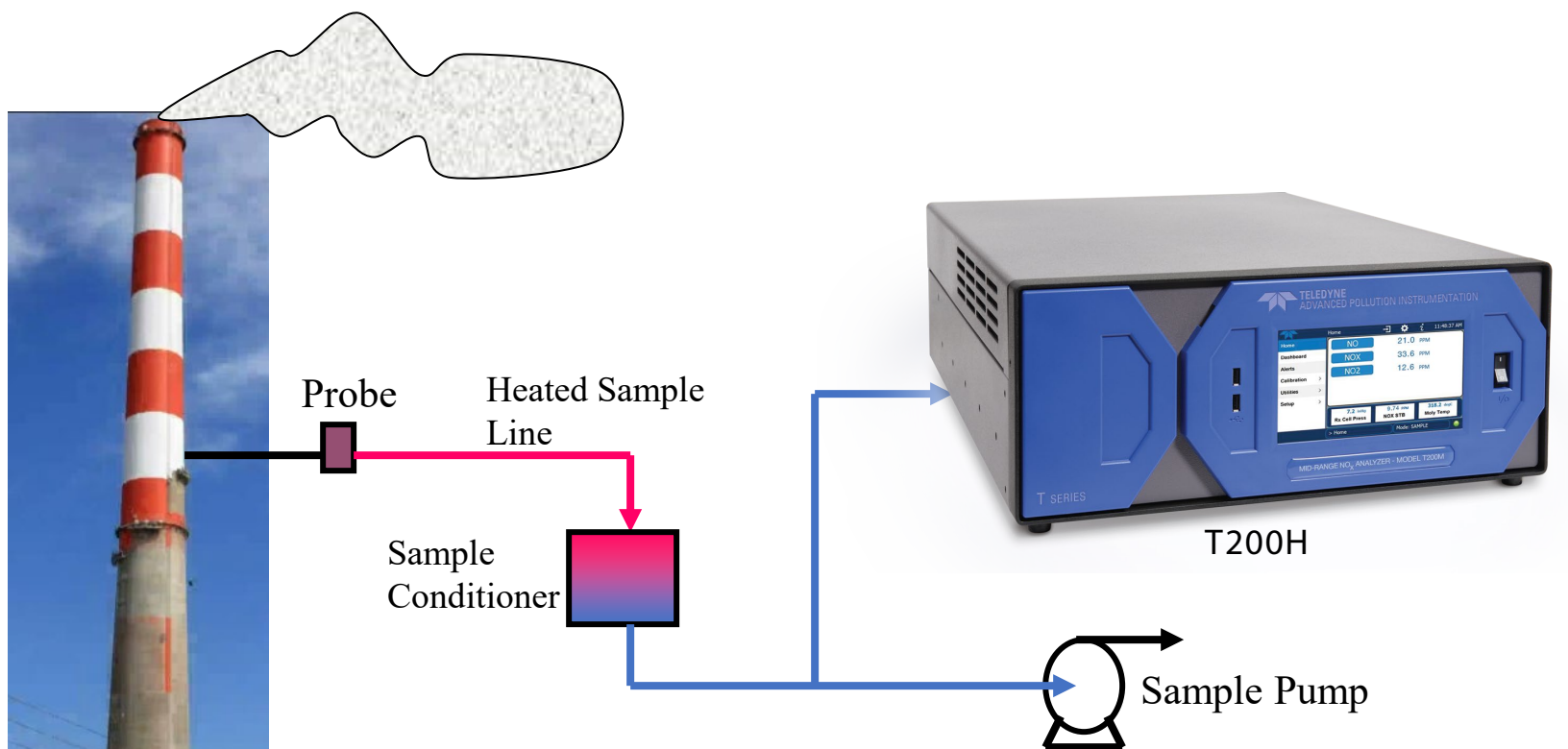
The choice, when sampling stacks, requires a little thought. First you need to determine the level of NO₂ that you *expect* the analyzer to see. Typically, the hotter the combustion process, the more NO₂ will be produced.

Choosing a NO_x Converter



RULE #1: If the expected NO₂ concentration in your straight-extractive system is less than 5 ppm, and the total NO_x is less than 10 ppm, use a Model T200 with an internal molybdenum converter. If it is greater than 5 ppm and less than 100 ppm, use the Model T200M or T200H with a moly.

Choosing a NO_x Converter



RULE #2: If the expected NO₂ concentration in your straight-extractive system is greater than 25 ppm, and you can tolerate conversion efficiencies as low as 85%, use the Model T200H with an internal “Mini-Hicon”, a stainless steel, high-temperature converter.

Choosing a NO_x Converter

In summary, for *straight-extractive* systems:

[NO₂] < 5 ppm & [NO_x] < 20 ppm & Efficiency >98%

Analyzer = Model T200, Converter = Moly

[NO₂] > 5 ppm and < 100 ppm & Efficiency >98%

Analyzer = Model T200H or T200M, Converter = Moly

[NO₂] > 25 ppm & 85% < Efficiency <100%

Analyzer = Model T200H, Converter = Mini Hicon

Final Test Validation Sheet

Model:	T 300				
Firmware:	1.0.4 BLD 81	Serial Number:	2417	Sales Order:	77646
Date:	4/20/2016	Technician:	Ngoc Nguyen	SP#:	
Parameter	Displayed As		Units	Final Test Process Control Limits at Factory**	Acceptable Limits in Use
Range	RANGE	50	PPM	0 - 1 to 0 - 1000	
Stability	STABIL	0.003	PPM	< 1 PPM with zero air	< 0.05 PPM
CO Measure	CO MEAS	4443	mV	3600 - 4800 w/zero air	2500 - 4800
CO Reference	CO REF	3702	mV	3000 - 4000 w/zero air	2500 - 4800
Measurement to Reference Ratio	MR RATIO	1.207		1.2 ± 0.05 with zero air	1.2 ± 0.1
Pressure	PRES	28.8	In-Hg-A	- 1.5" ± 1" (28.4 at sea level, 23.5 at 5000', and 19.2 at 10,000')	ambient - 1.5"
Sample Flow	SAMP	830	cc/min	800 ± 10%	500 - 1000
	SAMP	N/A	cc/min	900 ± 10% w/ O2 Sensor	
Sample Temperature	SAMPLE TEMP	47	°C	48 ± 4	
Bench Temperature	BENCH TEMP	48	°C	48 ± 1	
Wheel Temperature	WHEEL TEMP	68	°C	68 ± 2	
Box Temperature	BOX TEMP	36	°C	ambient temp + 7 ± 10	
Photo-detector Temp	PHT DRIVE	3177	mV	250 - 4750	
Slope	SLOPE	0.909		1.0 ± 0.2	1.0 ± 0.3
Offset	OFFSET	-0.004		0.05 ± 0.2	0 ± 0.3
Time of Day	TIME	11:00	hh:mm:ss		
** these are process control limits, and not specification		:30			
Test Settings					
Test Value	VALUE	Units	Acceptable Value		
Dark Cal (MEAS)	122.8	mV	125 ± 50		
Dark Cal (REF)	123	mV	125 ± 50		
ETEST	40	PPM	40 ± 2		

Health Status Report

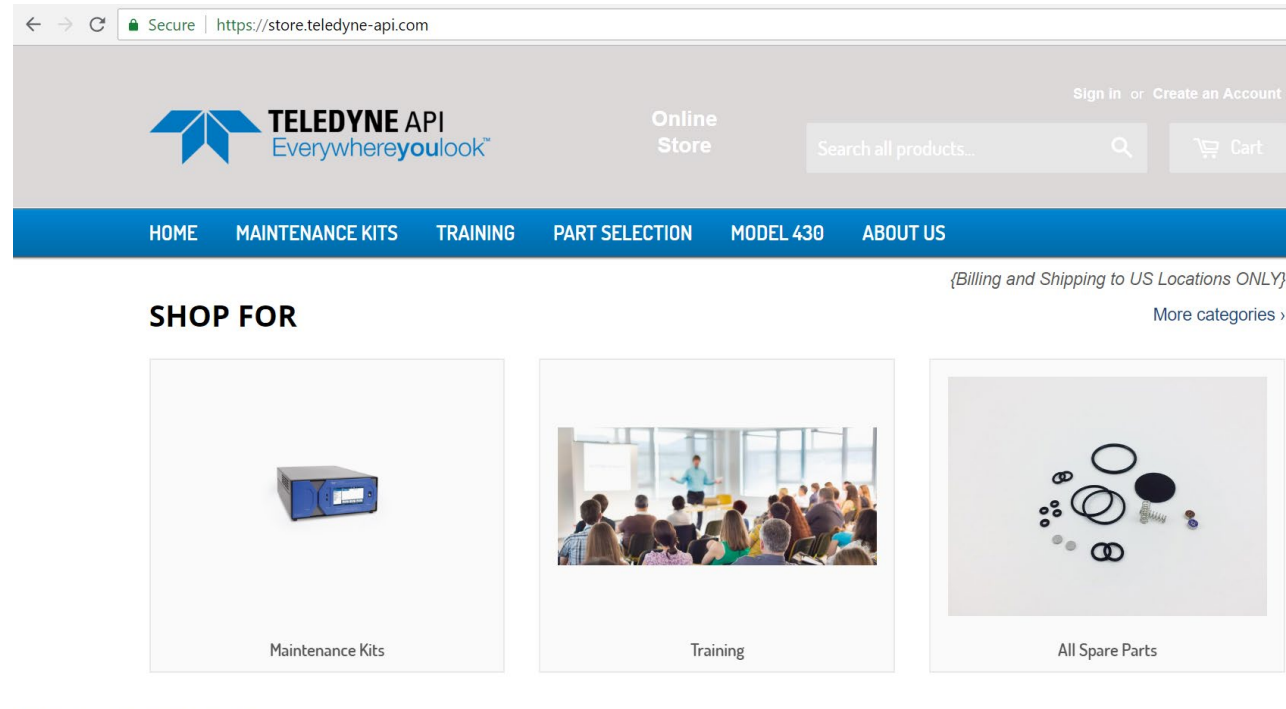
Model	Version	Serial Number	IP Address
T300M	1.3.4.133	369	0.0.0.0
Parameter	Recorded Value	Acceptable Value	
CO Stability	0.088 PPM	1 PPM Max. with Zero Air	
Meas Detector	4,229.8 mV	2500 to 4800 mV	
Ref Detector	3,509.8 mV	2500 to 4800 mV	
MR Ratio	1.212	1.1 to 1.3 with Zero Air	
Sample Pressure	29.3 inHg	(Ambient - 2) to Ambient In.Hg	
Sample Flow	1.4 cc/min	800 +/- 80 CCM	
Sample Temp	46.3 degC	48 +/- 4 degrees Celsius	
Bench Temp	48.0 degC	48 +/- 2 degrees Celsius	
Wheel Temp	68.1 degC	68 +/- 2 degrees Celsius	
Box Temp	26.7 degC	Ambient +/- 10 degrees Celsius	
CO Slope 1	0.825	1.0 +/- 0.3	
CO Offset 1	0.021	0 +/- 0.3 PPM	
Dark Ref mV	120.8 mV	125 +/- 50 mV	
Dark Cal Offset	=----- mV	125 +/- 50 mV	
Ref 4096mV	4,096.5 mV	4096 +/- 2 mV	
Ref Ground	0.0 mV	0 +/- 0.5 mV	

New Health Status Report for a quick snapshot of analyzer operational 'health'

New Webstore

Purchase spare parts, maintenance kits and training with a credit card

store.teledyne-api.com



TAPI Tech Support

- No charge for the life of the instrument
- Email: API-techsupport@teledyne.com
- Phone: 1-858-657-9800
- Secure Support:
http://eservices.teledyne-api.com/services/Users/user_login.asp
- RMA or field service request
<http://www.teledyne-api.com/service-support/rma>

Questions?

