Data sheet DS/PGC5007B-EN Rev. A

PGC5007B Total sulfur analyzer
PGC5000 Series gas chromatographs

Measurement made easy

Online ASTM method D7041-04 (2010)

ASTM method approval
- The first and only Total Sulfur Process Analyzer with an online ASTM method
- ASTM D7041-04(2010)

Wide range of streams and measurement levels
- Vapor and liquid samples
- Percent to ppb level measurements

Data and communication
- Designed for the process analytical network
- Industry standards available for Distributed Control Systems (DCS)

Flexible analyzer system configuration options
- PGC5000 Series multiple oven platform
- Extensive I/O options
- Standard modular SHS (vapor and liquid)
- Optional Smart SHS compatibility (vapor and liquid)
- Added to existing PGC5000 series applications

Simplest Total Sulfur application method
- Sample Injection → Oxidation → Separation → Detection

Online, process analysis design
- Process hardened hardware
  - Valves
  - Vaporizer
  - Furnace
  - Column
  - Detector

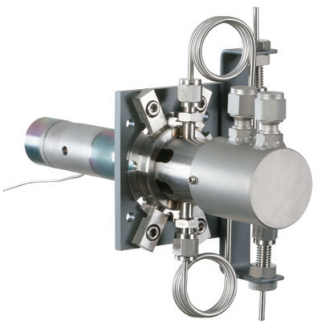
Power and productivity for a better world™

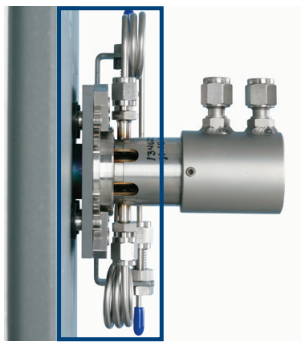
PGC5007B Total sulfur analyzer
PGC5000 Series gas chromatographs

Latest analyzer designs

New LSV and vaporizer assembly

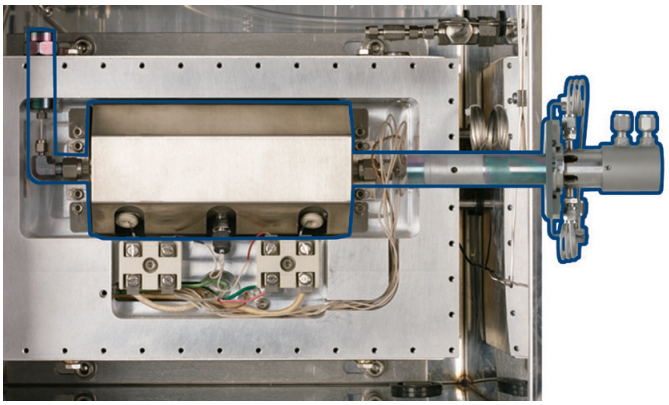
— Thermal isolation for sample lines from oxidation furnace temperature
  — Prevents unwanted vaporizaztion of liquids with highly volitle components, i.e. gasoline
  — Provides improved analysis accuracy





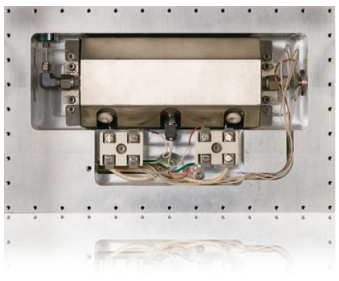
Direct injection for liquid samples

— Provides complete vaporization of heavy samples and ensures complete oxidation in furnace
  — Improves analysis on heavy samples
  — Improves detection limits and performance for sub-ppm levels
  — Eliminates contamination from partially vaporized samples



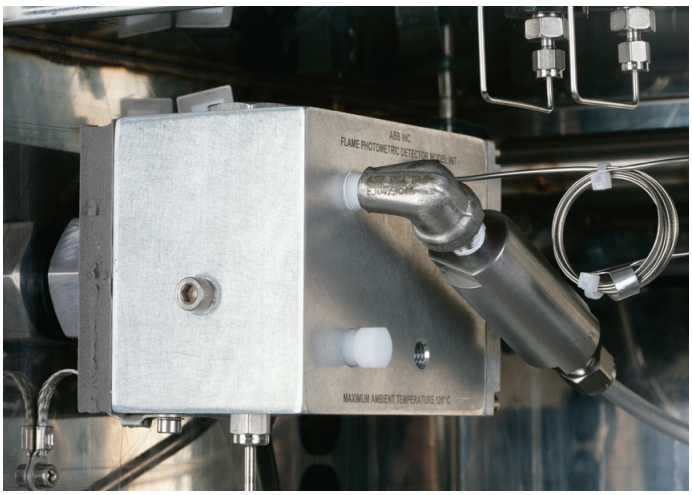
New oxidation furnace

— Lower furnace temperature requirement
  — 900 °C for complete conversion and longer life-expectancy of quartz
— Reliability
  — Easier to maintain and more accessible furnace assembly



New flame photometric detector (FPD) with latest photomuliplier tube (PMT) technology

— Smaller compact design saves space for use in the PGC5000B Smart Oven™
  — Overall smaller design enhances sensitivity for ppm and ppb sulfur measurements
— Thermo electrically cooled PMT provides superior life expectancy



ASTM D7041-04(2010)

Precision and bias data:

Repeatability and Reproducibility

X (mgS/kg)	Gasoline Repeatability	Gasoline Reproducibility	Diesel Repeatability	Diesel Reproducibility
3	0.53	2.08	0.28	2.63
6	0.53	2.28	0.33	3.15
9	0.53	2.47	0.37	3.5
15	0.53	2.87	0.42	3.99
30	0.53	3.85	0.5	4.78
50	0.53	5.17	0.57	5.45
80	0.53	7.14	0.65	6.16

Application

Description:

A fixed volume of sample from the process stream is injected via a sample inject valve. Air transports the sample into the furnace, where it oxidizes the sample to carbon dioxide, water, and sulfur dioxide. These components are separated using packed columns and pass into the FPD, where the trace levels of Total Sulfur are measured.

Method highlights:

Sample sweep

- Results are a matrix independent measurement at the detector
- Guaranteeing interference free measurements
- Insures complete oxidation of the injected sample

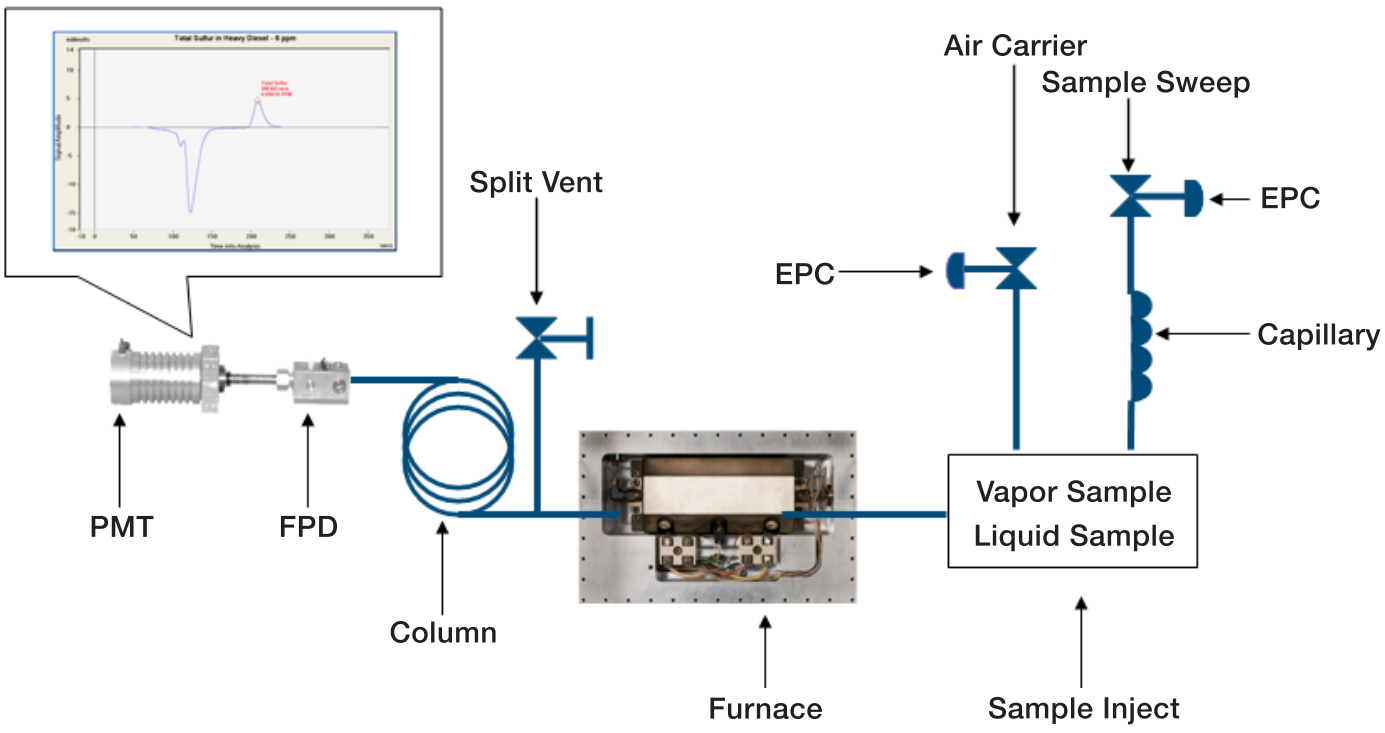
Lower oxidation furnace temperature

- Leads to a long life span of the oxidation chamber and heating element

Usage:

The PGC5007 performs a Total Sulfur analysis for a range of streams, liquid and vapor, from natural gas to gasoline and diesel. The reaction below demonstrates the conversion of the sample to Total Sulfur for measurement.

$$R\text{-}S + R\text{-}H + Air(O_2) \xrightarrow[900°C]{} SO_2 + CO_2 + H_2O$$



PGC5007B Total sulfur analyzer
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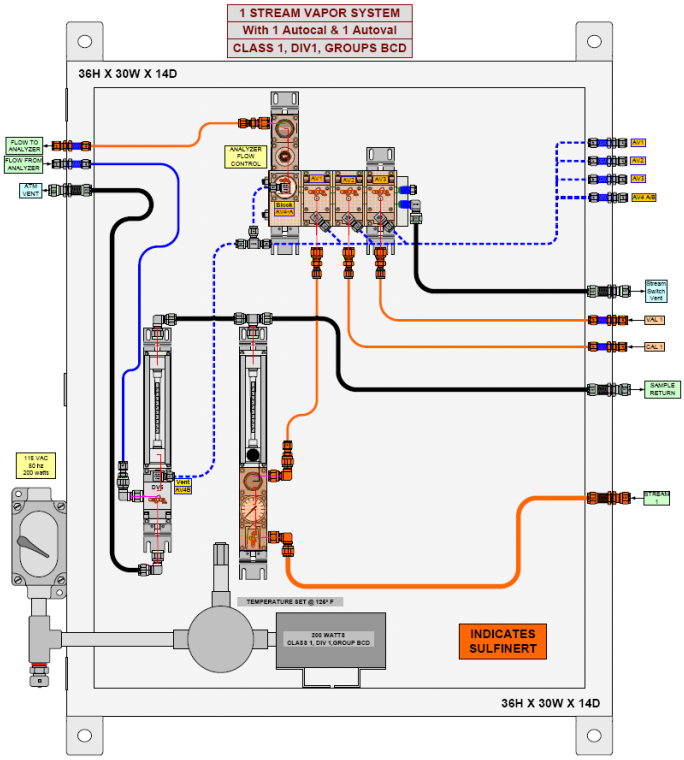
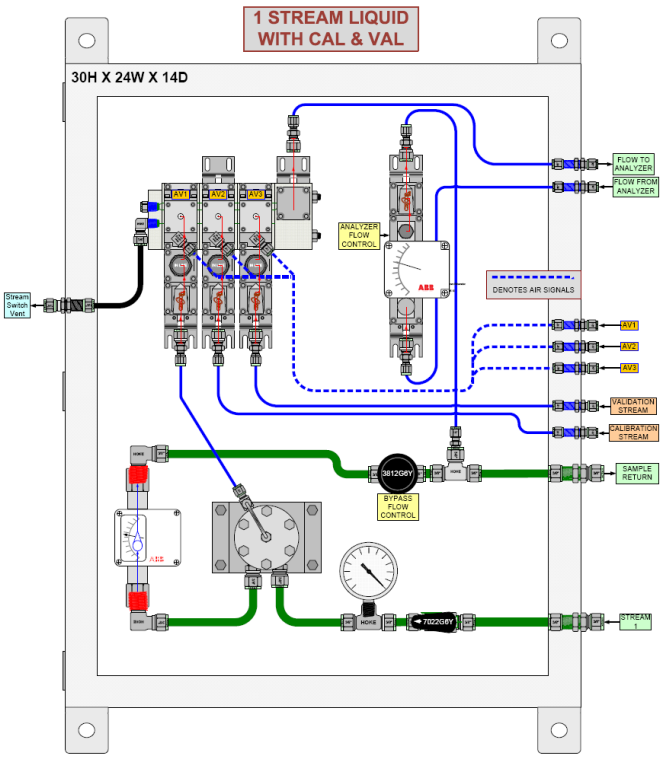
Standard vapor sample system

Sulfinert coating, single stream, single calibration, single validation.



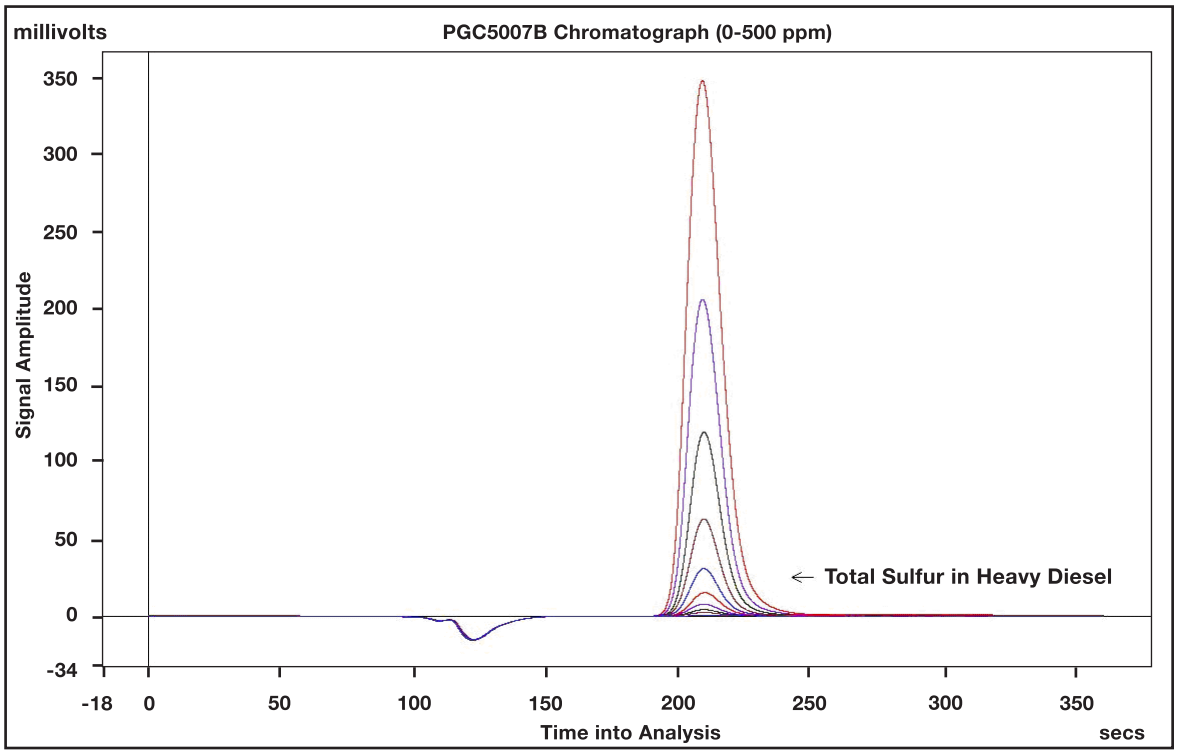
Standard liquid sample system

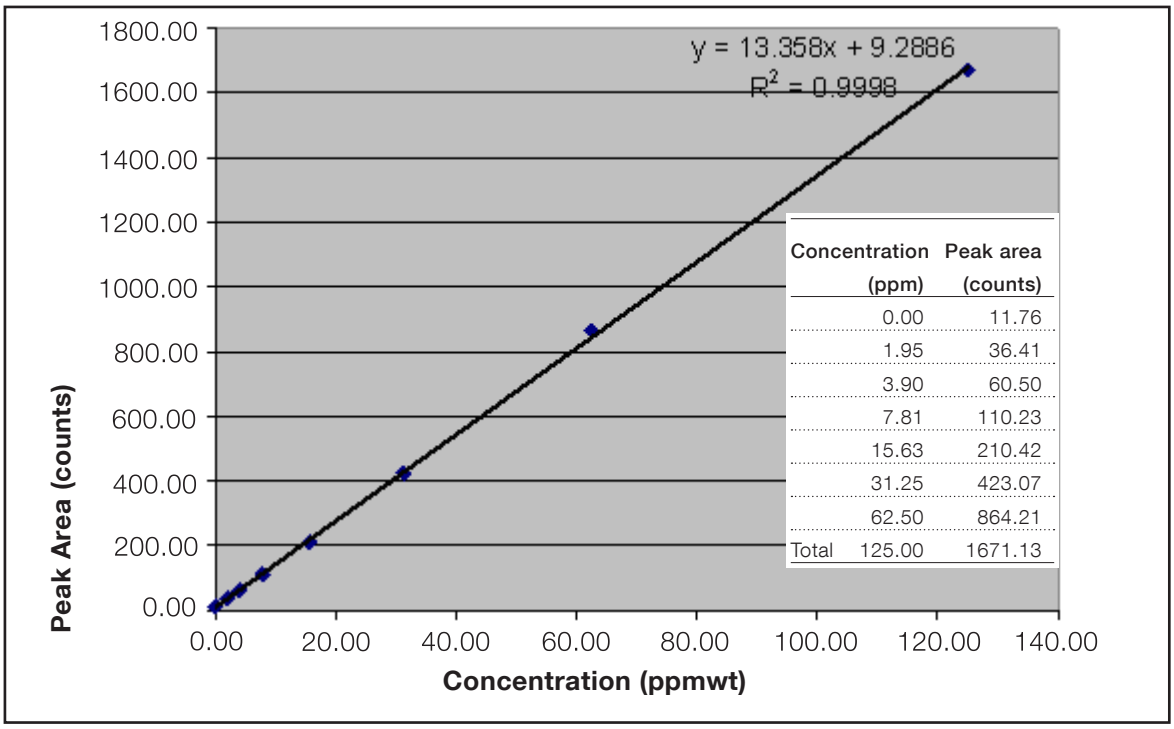
Sulfinert coating, single stream, single calibration, single validation.



Application

Chromatograms and detector linearity:





Concentration (ppm)	Peak area (counts)
0.00	11.76
1.95	36.41
3.90	60.50
7.81	110.23
15.63	210.42
31.25	423.07
62.50	864.21
Total 125.00	1671.13

PGC5007B Total sulfur analyzer
PGC5000 Series gas chromatographs

PGC5007B Oven

Physical

Environmental (enclosure):	Protected from weather: IP 54, (NEMA 3 equivalent)
Ambient temperature range:	0 to +50° C (32 to 122° F)
Humidity:	95% relative humidity, non-condensing
Dimensions:	596.5 mm W x 419.1 mm D x 609.6 mm H (23.5 in. W x 16.5 in. D x 24 in. H)
Weight:	54.4 kg (120 lb) (minimum, configuration dependent)
Wall:	32 mm (1.3 in.) from wall with brackets
Floor:	Optional dolly with casters
EMI/RFI considerations:	Conforms to Class A industrial environment
Electrical entries:	Left side
Pneumatic entries:	Right side
Sample entries:	Vapor: right side, 1 each model M2CP Liquid: right side, 1 each model 791 LSV
Vents:	Right side

Safety area classification

CSA / NRTL:	Class I, Division 1; Gas groups B, C, D with type Y-Purge Class I, Division 2; Gas groups B, C, D Temperature code T3 – T2
ATEX / IEC:	Zone 1: CE 0344; II2G, Ex py de IIB+H2 T3 – T2 Zone 2: CE; II3G Ex nA nL de IIB+H2 T3 – T2
CN / KO / RU:	Ex px de IIB+H2 T3 – T2 With X-purge power interlock
(Purge wait time)	18 minutes (Class I, Division 1 / Zone 1 area)

Power

	(Hot, neutral, ground)
Voltage:	100-240 Vac
Frequency:	50/60 Hz
Power consumption:	1,200 Watts startup, 900 Watts steady-state operation Typical, varies with installed options

Instrument air

Supply connection:	3/8 inch tube, minimum
Supply pressure:	414 kPa (60 psig)
Quality:	Instrument grade: Clean, oil free and -34° C, (-30° F) dewpoint
Flow rates:	Steady state: 127-147 L/min (4.5-5.2 ft3/min) at 20° C Y-purge types

Analytical detectors

Standard detector:	Photomutiplier tube with flame photometric burner block

Isothermal analytical oven

Oven liner:	Stainless Steel
Internal dimensions:	327.7 mm W x 391.16 mm H x 287 mm D (12.9 in. W x 15.4 in. H x 11.3 in. D)
Number of valves:	Vapor application: 1 internal vapor sample valve Liquid application: 1 external liquid sample valve
Columns:	Packed
Heat:	Forced air
Temperature control method:	Closed loop PID
Oven temperature:	Ambient +30°C to 180°C Set to ~ 112° C for total sulfur applications
Setpoint resolution:	1°C
Temperature stability:	Steady ambient: ±0.1°C Ambient range: ±1.0°C

Oxidation furnace

Furnace material:	Stainless Steel shell over a ceramic core, all enclosed in a flameproof housing
Internal dimensions:	305 mm W x 153 mm H x 102 mm D (12 in. W x 6 in. H x 4 in. D)
Ceramic core heat:	Electric
Temperature control method:	Closed loop PID
Furnace temperature:	900°C

Gas control

Electronic control method:	Closed loop PID; temperature stabilized
Number of zones:	1 for air, 1 for burner fuel and 1 for sweep gas
Filtration:	2µm at inlet, provided
Inlet pressure:	Minimum: Setpoint + 69 kPa (10 psig) Maximum: 1034 kPa (150 psig)
Range:	0-100 psig, bubble tight, non-venting
Gauges:	Electronic readout: 0.01 psig resolution
Setpoint resolution:	0.01 psig
Accuracy:	0-50 psig: 1.7% 50-100 psig: 2.7%
Repeatability:	±0.1 psig
Allowable gasses:	Zero grade air - carrier, Zero grade air - burner air GC grade H2 - burner fuel

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