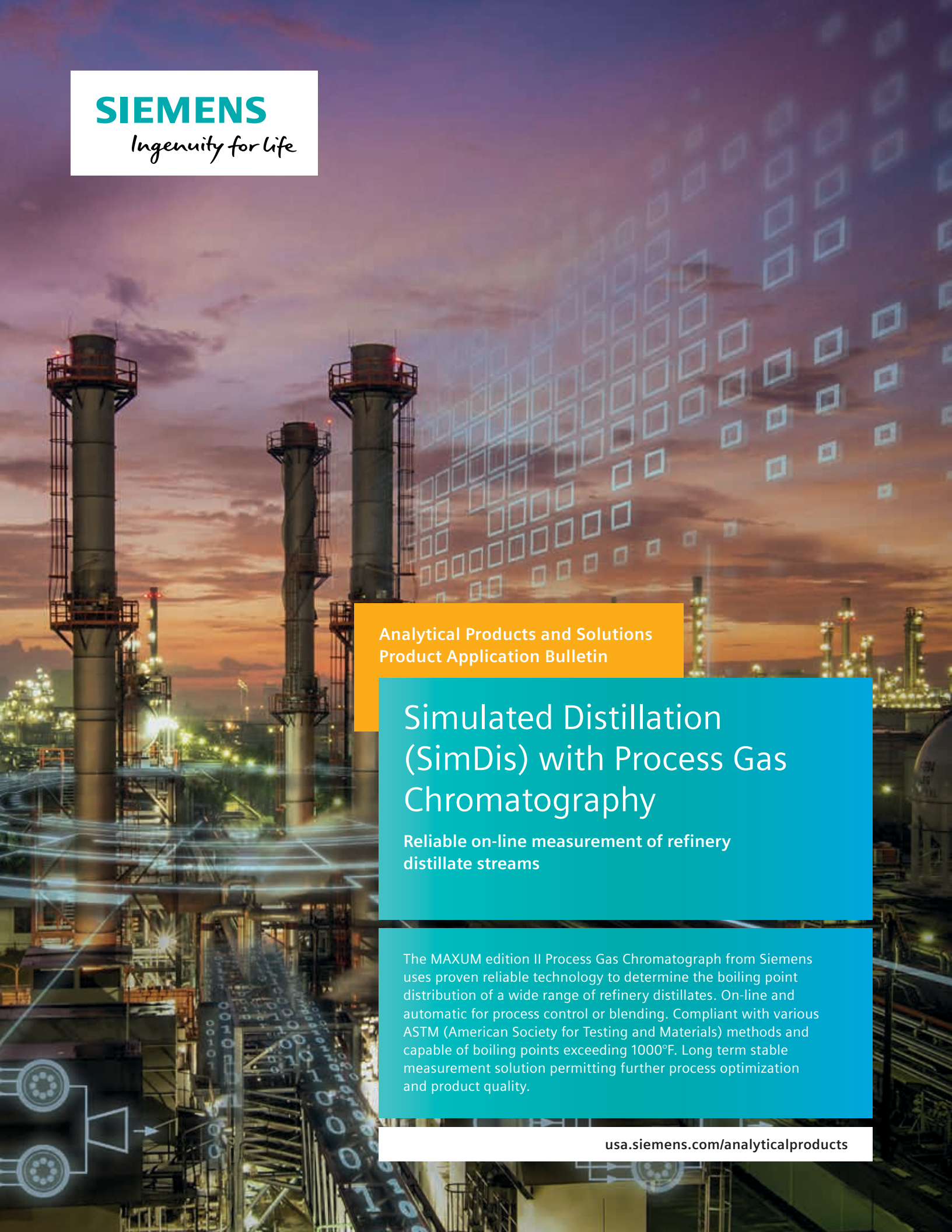


SIEMENS
Ingenuity for life

Analytical Products and Solutions
Product Application Bulletin

Simulated Distillation (SimDis) with Process Gas Chromatography

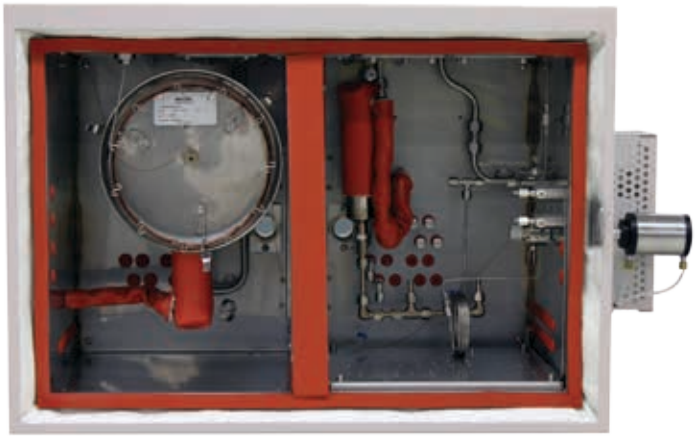
Reliable on-line measurement of refinery distillate streams

The MAXUM edition II Process Gas Chromatograph from Siemens uses proven reliable technology to determine the boiling point distribution of a wide range of refinery distillates. On-line and automatic for process control or blending. Compliant with various ASTM (American Society for Testing and Materials) methods and capable of boiling points exceeding 1000°F. Long term stable measurement solution permitting further process optimization and product quality.

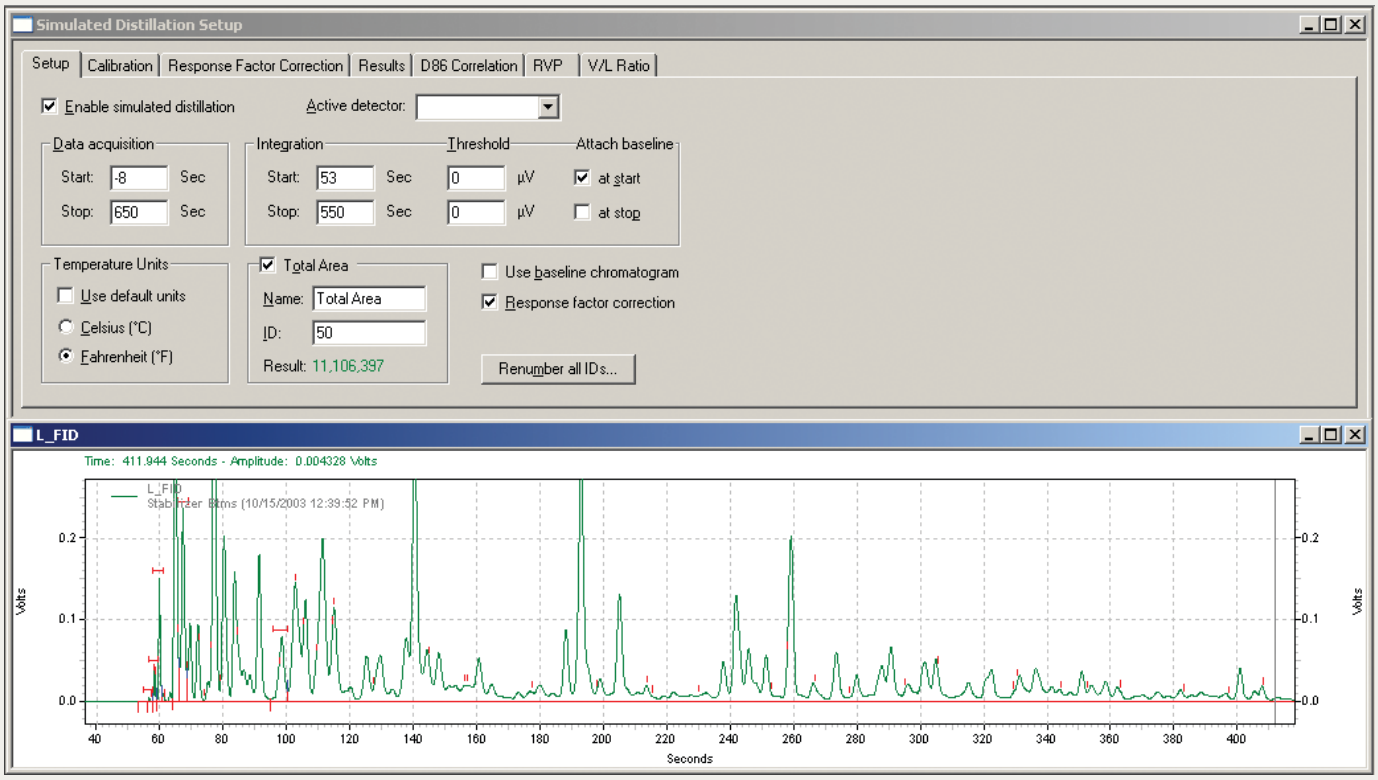
usa.siemens.com/analyticalproducts

On-Line Physical Property Measurement Using Process Gas Chromatography

The primary role of a modern refinery is the distillation of crude oil into a variety of product streams that are used to make gasoline, diesel, kerosene and other petroleum products. Efficient separation and combination of the hundreds of hydrocarbons requires on-line process analyzers. One of the physical property monitored is the distillation profile of each of these streams during the refining process. Simulated Distillation based on gas chromatography is utilized to characterize the boiling point distribution of hydrocarbon mixtures up to a boiling point of 1013°F (545°C) in compliance with ASTM D2887 or up to 963°F (517°C) according ASTM D86. Simulated Distillation process gas chromatography provides this information online and in a reliable manner using the Siemens Maxum Gas Chromatograph platform, known for its superior hardware capabilities, reliability and unsurpassed connectivity.



Maxum SimDist utilizes a Programmed Temperature oven to measure distillate streams with endpoints as high as 1013°F (545°C) without sacrificing precision reliability.



Complete access to all the measurement and calibration settings is easily available through the dedicated SimDis displays of the Maxum GC Portal workstation software.

The Siemens Maxum GC Simulated Distillation (SimDis) application uses a dual oven configuration with an isothermal air bath oven for the injection valve and a temperature programmed oven compartment for the actual analysis with a metal capillary column. The Flame Ionization Detector FID is heated independently of the oven temperature to ensure measurement integrity.

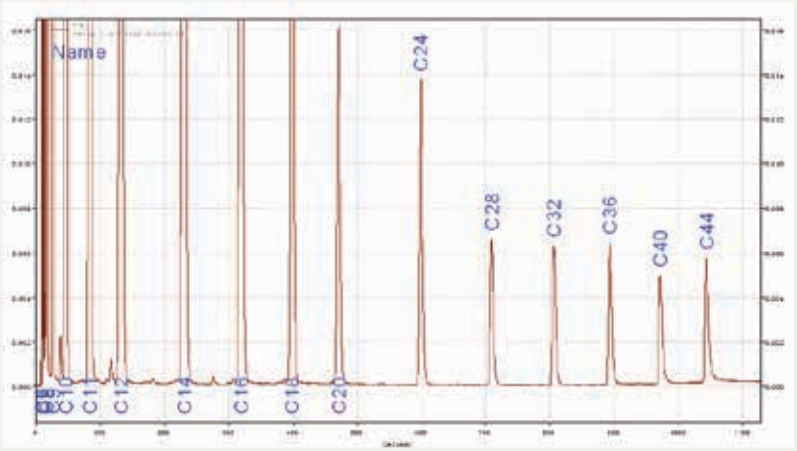
The analysis begins with a liquid injection valve that injects a discrete amount of sample splitless into a metal capillary column. By avoiding a mechanical sample splitter, issues of sample corruption and boiling point discrimination are avoided. During the analysis, the column compartment ramps up the temperature according to a precise profile. As the sample flows through the column, the chemical components are "distilled" according to their boiling point. The components then elute into a FID for detection.

The complete analysis of distillate products is typically performed within 15-20 minutes but can take up to 45 minutes or more for very high boiling point samples. The temperature program and consequently the cycle time is optimized to ensure adequate component definition and identification which is critical for proper boiling point determination. The Maxum SimDis analyzer is capable of working with samples that have endpoints corresponding to a normal hydrocarbon endpoint of $C_{44}H_{90}$. The chromatographic method used is described in ASTM specification D-3710, D-5399 or D-2887 depending on the application.

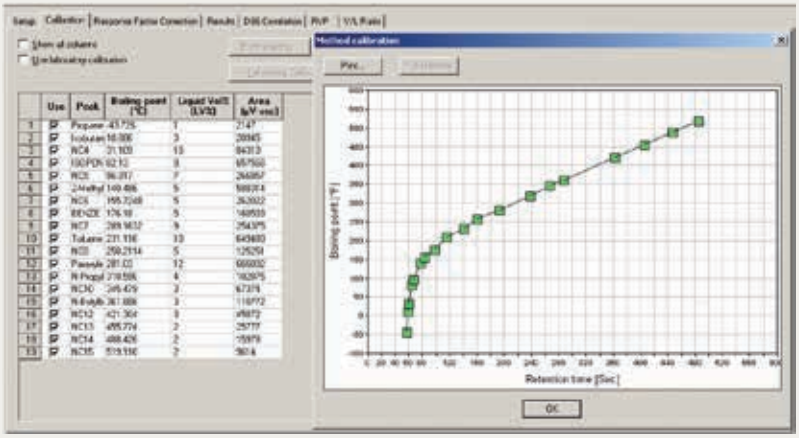
The SimDis application software within the Maxum Process GC is capable of performing a number of industry standard calculations depending on the user's requirements. Typical standard calculations available include:

- D-3710 or D-2887 Percent Off Values from 0.5% at initial boiling point (IBP) up to 99.5% at final boiling point (FBP)
- STP-577 D-86 Correlation for either the percent off values or specific temperature points
- Individual component analysis; eg, C3, C4's, C5's in gasoline
- Other correlated values such as RVP (Reid Vapor Pressure) and vapor/liquid (V/L) ratio in gasoline

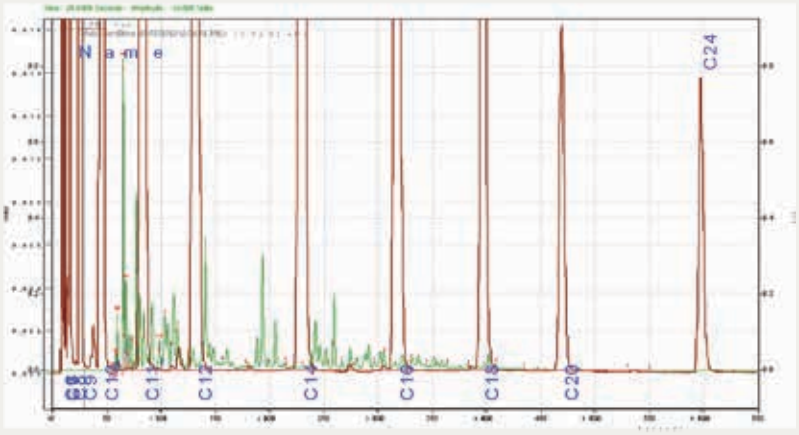
The application software requires minimal user interaction and incorporates automatic integration and calculations. The results are available in a variety of standard and customer configurable formats.



The SimDis application begins by calibrating the GC against a sample containing pure known hydrocarbons to define the correlation between elution time and boiling point. An alternative option supported by the software is to use a lab sample with known boiling properties.

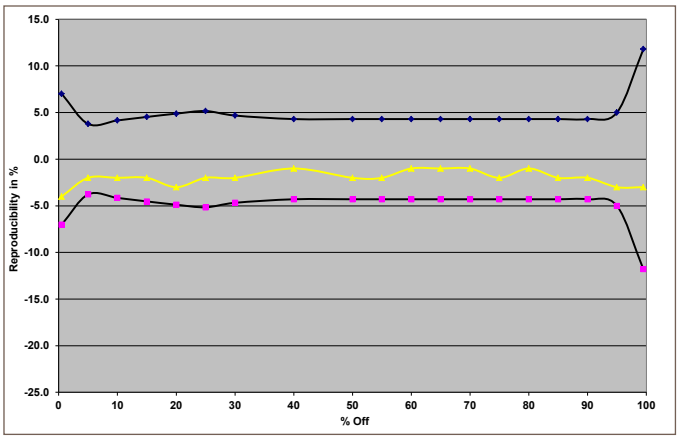


The retention time versus boiling point temperature curve is used by the SimDis GC to establish the correlation between the retention time and boiling point of the various hydrocarbons in the process sample.

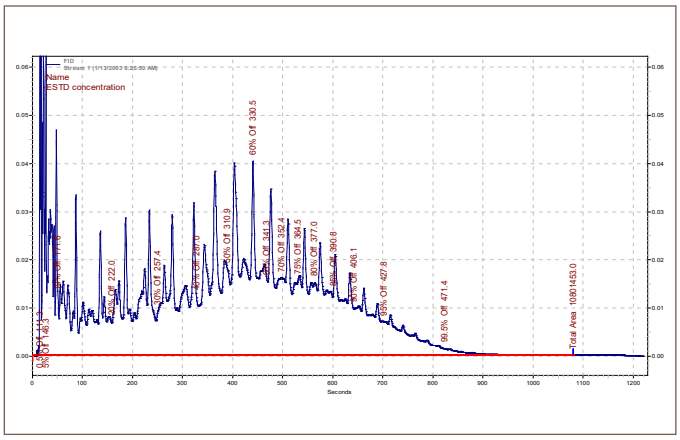


By normalizing the measured chromatogram to 100%, the software simply matches percent of the chromatogram's area to retention time to derive the corresponding boiling point. This true boiling point can then be adjusted to match the ASTM D86 equivalents if desired.

Maxum Simulated Distillation Performance and Technical Information



Reproducibility of Gasoil analyzed according ASTM D-2887 with a boiling point from 119°C (IBP) to 475°C (FBP) is well within the permissible ASTM limits.



Boiling point distribution of Gasoil analyzed according ASTM D-2887 with a boiling point range from 119°C (IBP) to 475°C (FBP).

Measurement:	Simulated Distillation
Application:	Refinery Distillates, Motor Gasoline, Naphtha, Kerosene, Jet Fuel, Gas Oils, Cycle Oils, Lube Oils and Solvents
Maximum Boiling End Point:	ASTM D2887: 545°C (1013°F), ASTM D86: 963°F (517°C)
Carbon Number Range:	C3-C44*
Oven Type:	Airbath Oven with programmed temperature oven
Injection Valve:	Rotary valve (splitless)
Column Type:	Typically metal capillary column*
Detector:	Flame Ionization Detector (FID)
Cycle Time:	Typically 15 to 20 minutes*
Repeatability:	Typically better than ±1.5°C (±3.0°F) for IBP and ±5°F (±2.8°C) for FBP*
ASTM D-86 Correlation:	According to STP-577
Calibration Method:	Choice of blended pure hydrocarbons or known laboratory sample

* Application dependent — Consult factory specific details for your application.

For more information, please contact:

Siemens Industry, Inc.
5980 West Sam Houston Parkway North
Suite 500
Houston, TX 77041
Phone: 713-939-7400
Email: ProcessAnalyticsSales.industry@siemens.com
usa.siemens.com/analyticalproducts

Published by
Siemens Industry, Inc.
Process Automation
Process Industries and Drives
100 Technology Drive,
Alpharetta, GA 30005

1-800-241-4453
info.us@siemens.com

Subject to change without prior notice
Order No.: PIASB-00003-0418
Printed in USA

usa.siemens.com/analyticalproducts