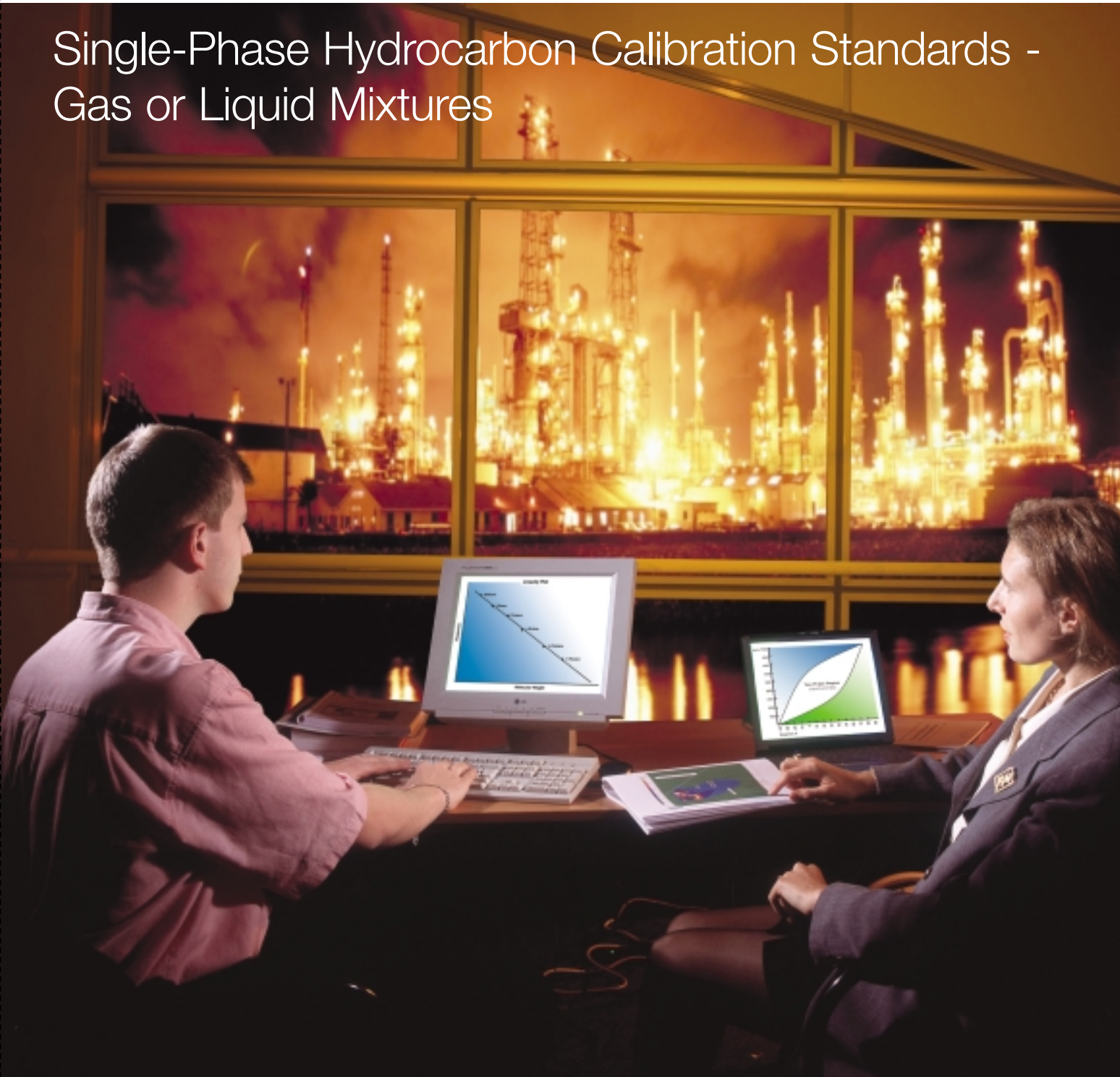


# UNIPHASE™

Single-Phase Hydrocarbon Calibration Standards -  
Gas or Liquid Mixtures





## WHAT HAPPENS WITH TWO PHASES?

The figure below is a typical, computer-generated, two-phase envelope of a multi-component hydrocarbon mixture. It shows the conditions of temperature and pressure necessary to maintain the mixture as a single phase, either liquid or gas. If a sample is withdrawn when the mixture is in two phases, it will be inaccurate and the integrity of the remaining mixture will be destroyed. UNIPHASE® ensures that your mixture will not fall into the two-phase region.

Good manufacturing and packaging techniques will eliminate the stability and mixture integrity problems that are inherent in hydrocarbon calibration standard mixtures. Over the years, Alphasgas has developed the expertise and techniques that assure the most accurate and stable hydrocarbon mixtures available. These specialty gas mixtures are prepared and certified to exact specifications on a timely basis while maintaining consistent and reliable quality.

Gas and liquid hydrocarbon calibration mixtures are usually combinations of many high- and low-molecular weight components. Changes in conditions such as temperature, cylinder pressure and the mixture of high- and low-molecular weight components may offer potential problems of condensation and vaporization. These phase changes may result in calibration mixtures containing two phases: gas and liquid. When this occurs, the sample withdrawn will be inaccurate and the integrity of the remaining mixture destroyed.

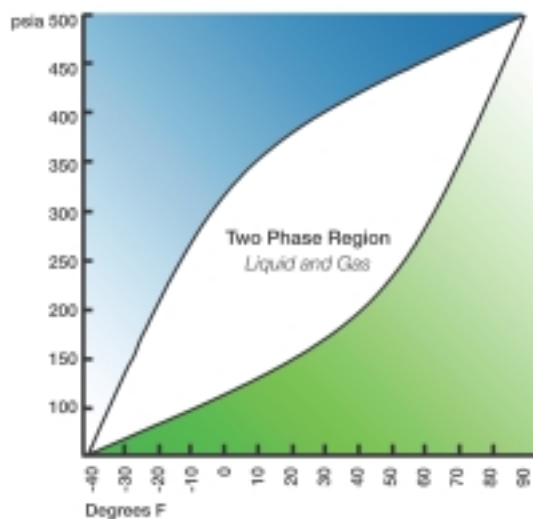
## UNIPHASE®

Air Liquide has developed a computer program that specifies the correct pressure at which mixtures can be made and still maintained as a single phase. This is the foundation of the UNIPHASE product line of single-phase gases or liquid hydrocarbon calibration mixtures.

All components of UNIPHASE mixtures are analyzed for purity before mixing and are of the highest available purity. These high-quality calibration standards are prepared gravimetrically on high-load, high-sensitivity balances, which are calibrated against weights traceable to the Institute for National Measurements Standards (INMS) of the National Research Council of Canada (NRCC) and National Institute of Standards and Technology (NIST). After preparation and thorough mixing, each standard is analyzed to verify composition. Gravimetric data composition documentation is supplied with each standard.

Gaseous UNIPHASE calibration standards, such as BTU mixtures and natural gas standards, are supplied in various sizes of high and low-pressure cylinders. Contents will vary depending on mixture composition and pressure. Your Air Liquide representative can help you select the cylinder size that best suits your application requirements.

Liquefied UNIPHASE calibration standards are made with the same high-purity components as the gaseous phase mixtures, gravimetrically, and with the same precision and accuracy. They are packaged in portable piston cylinders of typically 1,000 cc capacity and feature a unique, free-moving piston. The piston cylinder is the most accurate and reliable method for eliminating fractionization.



## Certification

After blending, each cylinder of gaseous and liquid UNIPHASE calibration standards is analyzed using dedicated instrumentation. Specific hydrocarbons through C12 are identified, quantified and reported in the extended analysis of liquid hydrocarbon standards.



## PRESSURE REGULATORS

The recommended pressure regulator for high-pressure gaseous UNIPHASE mixtures is the series 412-3332-350. This is a highly accurate and dependable two-stage regulator manufactured of brass barstock with stainless steel diaphragms and supplied with a packless, diffusion-resistant, diaphragm outlet valve.

For low-pressure gaseous UNIPHASE mixtures, the 402-3732-510 series regulator is a good choice. It is a single-stage brass barstock regulator with a stainless steel diaphragm and supplied with a brass diaphragm outlet valve that is packless and diffusion resistant.

For "Piston" Cylinders, the 492-2322 series regulator is an Ultra High Pressure, Brass Barstock, Piston Sensed model.

## COMPONENT SELECTION

Commonly requested components and their ranges include, but are not limited to, the following:

Components	Liquid Blends Mol%	Gaseous Blends Mol%
Helium	--	0.01 - 10
Nitrogen	0.1 - 5	0.01 - 95
Methane	0.1 - 5	0.01 - 95
Carbon Dioxide	0.1 - 5	0.01 - 20
Ethane	0.1 - 95	0.01 - 95
Propane	0.1 - 95	0.01 - 95
Isobutane	0.1 - 95	0.01 - 10
N-Butane	0.1 - 95	0.01 - 10
Isopentane	0.1 - 95	0.01 - 2
N-Pentane	0.1 - 95	0.01 - 2
Hexanes	--	0.01 - 0.3
Hexanes Plus	0.1 - 95	--



## Certification

Each cylinder is supplied with:

- Accurate composition values in mole weight and liquid volume percentages
- Analytical parameters (analytical accuracy of  $\pm 1\%$  or  $0.02\%$  absolute, whichever is smaller, depending on the concentration of the component)
- Copy of the chromatogram

In addition to the above, natural gas and natural gas liquids are supplied with additional data:

- Calculated BTU values, both wet and dry, at various pressures
- Calculated relative density, both real and ideal
- Compressibility factor
- Average molecular weight
- Response linearity plot



## NATURAL GAS REFERENCE STANDARDS

These mixtures are supplied with an analysis of the components (mol %), the BTU value, the specific gravity and the compressibility factor.

The GPA Natural Gas Reference Mixture is a standard that is listed by the Gas Processors Association in GPA publication No. 2261 Analysis of Natural Gas by Gas Chromatography. This is also listed by ASTM in Test Method D-1945.

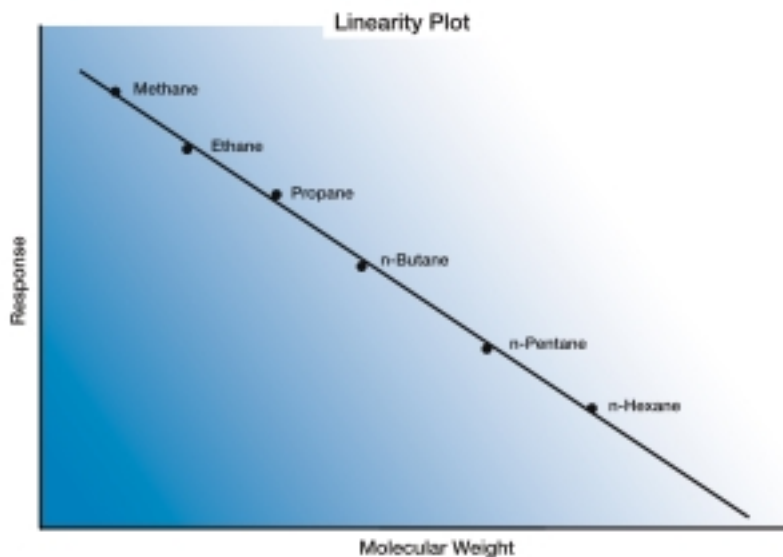
Contact your nearest Air Liquide representative for other gas mixtures and technical information.

## STANDARD LIQUID HYDROCARBON CALIBRATION BLENDS

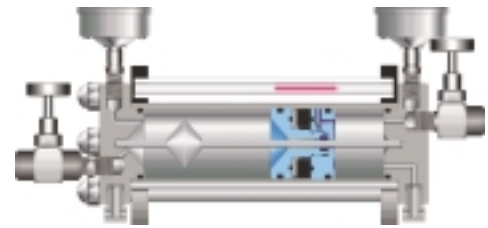
Standard liquid hydrocarbon calibration blends are available, as are custom blends prepared to your specifications. Each is prepared gravimetrically on high-load, high-sensitivity balances and calibrated against weights traceable to INMS, NRCC and NIST. After blending, each mixture is analyzed by dedicated instrumentation for composition verification. Specific hydrocarbons through C12 are identified, quantified and reported in the extended analysis.

## LINEARITY TEST

**All UNIPHASE standards used by the gas producing industry are subject to a linearity plot. According to procedure GPA-2177, the plot of chromatographic response factor vs. molecular weight of the normal alkanes must result in a straight line. This plot is supplied with each cylinder ordered.**



CONSTANT-PRESSURE CYLINDERS:  
SAFE AND HOMOGENEOUS HYDROCARBON STANDARDS



Constant-pressure piston cylinders provide for the most accurate method to ensure sample integrity for Air Liquide UNIPHASE calibration standards or your own process sample.

The piston cylinder allows the user to remove a liquid or gas hydrocarbon sample from a sampling point or from the cylinder itself. This is done without changing the pressure of the product or exposing it to contaminants.

This type of cylinder has a free-moving piston that functions as a movable barrier, separating the sample chamber from the pre-charged inert gas chamber. A pre-charged inert gas on the opposite side of the piston barrier prevents the hydrocarbons from flashing as the cylinder is filled, during transportation, or while an analytical sample is being removed. The entire sample is consistent from the beginning to the end of sample removal with no fractionization of the components.

Complete mixing is accomplished by inverting the cylinder several times. Each cylinder has a stainless steel weighted plumb for mixing. It slides along the cylinder sizer, thereby eliminating any contact with the cylinder wall. (A vortex mixer cylinder is also available by request.)

#### CONTENTS GAUGE

The piston is tracked by magnetic indicators in a clear acrylic tube located on the outside of the cylinder. It locates the position of the piston and provides a measure of the cylinder contents.

#### SAFETY

The cylinder and all wetted parts are constructed of 316 stainless steel, combining high strength for safety and excellent corrosion resistance. Each cylinder is hydrostatically tested to 3600 psi and checked for leaks and defects.

#### TC APPROVED

Transport Canada approves the sample vessel for the transportation of hydrocarbons to a pressure of 1800 psi by motor carrier or cargo-only aircraft.

#### SHIPPING CASE

A shipping case is recommended for carrying convenience and for the protection of the cylinder during transportation.



## UNIPHASE

SINGLE-PHASE HYDROCARBON CALIBRATION STANDARDS -  
GAS OR LIQUIDE MIXTURES

### SAMPLE CYLINDER COMPARISON

This example is based on using a gravimetrically prepared mixture with the composition of carbon dioxide and C1 through C6 paraffin's. Three different types of cylinders were filled with this mixture. Samples were removed from all three cylinders and analyzed by gas chromatography.

The analytical results of the samples from the piston cylinder agreed with the gravimetric composition while fractionization was indicated in the other two types of cylinders. The fractionization problem with the high- and low-pressure cylinders increased as more samples were withdrawn, while the samples from the piston cylinder remained constant.



Air Liquide will recommend to you the most reliable cylinder for GPA, ASTM, and custom liquid or gaseous hydrocarbon calibration standards.



ADDITIONAL HYDROCARBON CALIBRATION STANDARDS  
PARAFFIN, ISOPARRAFINS, AROMATICS, NAPHTHENES, OLEFINS



The P-N-A/P-I-A-N-0 mixtures are used to calibrate analytical instrumentation for the analysis of NAPHTHA, gasoline, and refinery aromatic mixtures. Air Liquide P-N-A, P-O-N-A, and P-I-A-N-0 standard or custom blended calibration standards are supplied in septum vials for easy syringe injection into chromatographic instrumentation. Each vial is accompanied by a chromatogram and a certification of composition determined gravimetrically. The certification lists the weight, mole and liquid volume percentages, the molecular weight, specific gravity, boiling point, and the chromatographic retention order and elution times for each component. Also listed are the instrument conditions used to produce the chromatogram. These highly accurate, gravimetrically prepared hydrocarbon standards have a preparation tolerance of 1% or better, depending on the concentration of the component. For more details on the P-N-A, P-O-N-A, and P-I-A-N-0 calibration standards, contact your local Air Liquide representative and request the P-I-A-N-0 brochure.



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