

The Biomarker Catalogue



Page 167-208
Petroleum



The collection of reference standards
- 2008 -



Chapter III-2: Petroleum applications

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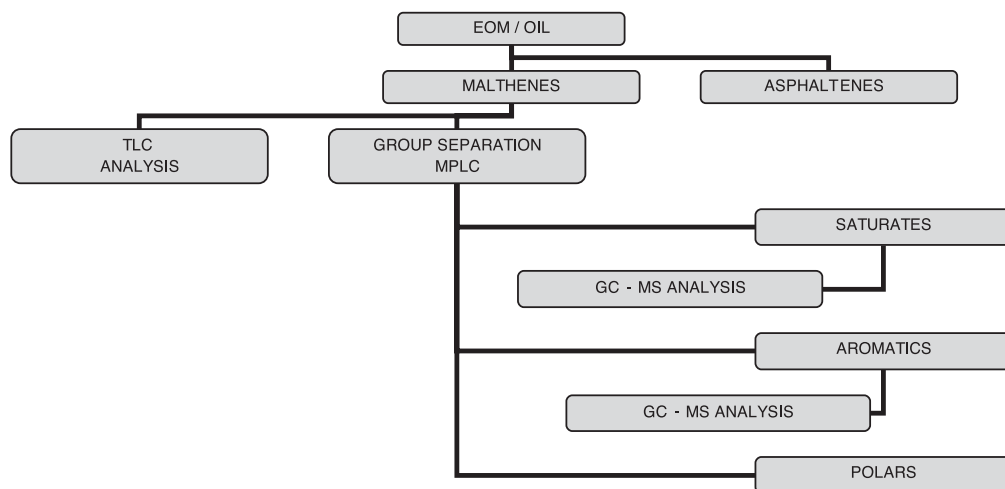


Geochemical analysis and petroleum exploration

Calibration mixtures and group separation

General

The calibration mixtures described in this chapter are applicable for petroleum and organic geochemical analysis and are applicable to oil spill analysis and other types of petroleum and biomarker analysis. Recommendations made by “The Norwegian Industry Guide to Geochemical Analysis” (NIGOGA) are followed in the preparation of most of these products.



Analysis of oils and rocks using internal standards ISTD

The rock samples are extracted by Soxhlet extraction in dichloromethane-methanol mixture. The solvents are removed under vacuum, and the remaining extractable organic matter (EOM) is added to the required internal standard cocktail before further treatment. Similarly, the crude oil (or oil spill), topped or untopped, is added to the internal standard cocktail before deasphalting. The deasphalted sample is separated into saturated, aromatic and polar fractions by MPLC before a detailed GC and GC-MS analysis. In general, it is recommended to add the internal standards as early as possible in the process in order to account for experimental errors.



Internal standards (NIGOGA recommendations)

| Chiron No. | Saturated Hydrocarbons | CAS No. |
|------------|-------------------------------|--------------|
| 0652.30 | Squalane | [111-01-3] |
| 1019.12 | n-Dodecane-d ₂₆ | [16416-30-1] |
| 1020.16 | n-Hexadecane-d ₃₄ | [15716-08-2] |
| 1021.20 | n-Eicosane-d ₄₂ | [62369-67-9] |
| 1022.24 | n-Tetracosane-d ₅₀ | [16416-32-3] |

| Chiron No. | Saturated Biomarkers | CAS No. |
|------------|--|---------------|
| 0641.24 | 5β(H)-Cholane | [80373-86-0] |
| 0977.27 | d ₂ C ₂₇ ααα (20R) Cholestane | [122241-86-5] |
| 0975.27 | d ₄ C ₂₇ ααα (20R) Cholestane | [205529-74-4] |
| 0976.29 | d ₂ C ₂₉ ααα (20R) Ethylcholestane | |
| 0974.29 | d ₄ C ₂₉ ααα (20R) Ethylcholestane | |
| 0987.29 | d ₂ Nor-17β(H),21α(H)-hopane, d ₂ Isoadiantane | |

| Chiron No. | Aromatics | CAS No. |
|------------|---|---------------|
| 1313.10 | 1-Fluoronaphthalene, F-PAH® | [321-38-0] |
| 2364.11 | 2-Fluoro-6-methylnaphthalene | [324-42-5] |
| 2873.15 | 3-Fluoro-6-methylphenanthrene | [84194-32-2] |
| 2364.11 | 2-Fluoro-6-methylnaphthalene, F-PAH® | [324-42-5] |
| 1316.14 | 3-Fluorophenanthrene, F-PAH® | [440-40-4] |
| 2873.15 | 3-Fluoro-6-methylphenanthrene, F-PAH® | [84194-32-2] |
| 1318.16 | 1-Fluoropyrene, F-PAH® | [1691-65-2] |
| 1712.12 | 4-Fluorobiphenyl, F-PAH® | [117044-44-7] |
| 1329.18 | 2-Fluorochrysene, F-PAH® | |
| 2872.19 | 9-Fluoro-5-methylchrysene | [64977-46-8] |
| 2872.19 | 9-Fluoro-5-methylchrysene, F-PAH® | [64977-46-8] |
| 0978.10 | Naphthalene-d ₈ | [1146-65-2] |
| 0387.11 | 1-Methylnaphthalene-d ₁₀ | [38072-94-5] |
| 0388.12 | 1,8-Dimethylnaphthalene-d ₁₂ | [104489-29-4] |
| 0389.14 | Phenanthrene-d ₁₀ | [1517-22-2] |
| 0329.16 | Pyrene-d ₁₀ | [1718-52-1] |
| 1086.12 | Biphenyl-d ₁₀ | [1486-01-7] |
| 1024.18 | Chrysene-d ₁₂ | [1719-03-5] |
| 0328.20 | 2,2'-Binaphthyl-d ₁₄ | [210487-05-1] |

| Chiron No. | Methyldibenzothiophenes | CAS No. |
|------------|-----------------------------------|--------------|
| 1692.12 | 2-Fluorodibenzothiophene, F-PASH | [1721-81-9] |
| 0383.1 | 2-Dibenzothiophene-d ₈ | [33262-29-2] |

| Chiron No. | Aromatic Biomarkers | CAS No. |
|------------|---|-----------------|
| 0983.21 | d ₃ C ₂₁ Monoaromatic sterane | [33262-29-2] |
| 0986.28 | d ₃ C _{28/C29} Monoaromatic sterane | |
| 0984.20 | d ₂ C ₂₀ Triaromatic sterane | [205529-79-9] |
| 0981.28 | d ₂ C _{27/C28} Triaromatic sterane | [-/205529-81-3] |
| 0985.28 | d ₂ C ₂₈ Triaromatic sterane | [205529-81-3] |



Internal standard cocktails

S-4009-ASS-IO
S-4009-ASS-5IO

Routine Biomarker Internal Standard Cocktail 1

7 Analytes, each concentration as listed in isooctane; units: 10x1mL, 1x5mL, 5x5mL
Please inquire for other quantities.

| Chiron No. | Name | CAS No. | Conc. |
|------------|--|---------------|------------|
| 1019.12 | n-Dodecane-d ₂₆ | [16416-30-1] | 1000 µg/mL |
| 1020.16 | n-Hexadecane-d ₃₄ | [15716-08-2] | 1000 µg/mL |
| 0977.27 | d ₃ C ₂₇ Cholestane | [122241-86-5] | 50 µg/mL |
| 0978.10 | Naphthalene-d ₈ | [1146-65-2] | 100 µg/mL |
| 0389.14 | Phenanthrene-d ₁₀ | [1517-22-2] | 100 µg/mL |
| 0383.12 | Dibenzothiophene-d ₈ | [33262-29-2] | 100 µg/mL |
| 0985.28 | d ₃ C ₂₈ Triaromatic Sterane | [205529-81-3] | 25 µg/mL |

S-4079-ASS-IO
S-4079-ASS-5IO

Routine Biomarker Internal Standard Cocktail 3

7 Analytes, each concentration as listed in isooctane; units: 10x1mL, 1x5mL, 5x5mL
Please inquire for other quantities.

| Chiron No. | Name | CAS No. | Conc. |
|------------|------------------------------|--------------|------------|
| 1019.12 | n-Dodecane-d ₂₆ | [16416-30-1] | 2000 µg/mL |
| 1020.16 | n-Hexadecane-d ₃₄ | [15716-08-2] | 2000 µg/mL |
| 0641.24 | 5β(H)-Cholane | [80373-86-0] | 12 µg/mL |
| 0978.10 | Naphthalene-d ₈ | [1146-65-2] | 24 µg/mL |
| 1086.12 | Biphenyl-d ₁₀ | [1486-01-7] | 24 µg/mL |
| 0389.14 | Phenanthrene-d ₁₀ | [1517-22-2] | 24 µg/mL |
| 1024.18 | Chrysene-d ₁₂ | [1719-03-5] | 24 µg/mL |

S-4121-ASS-IO
S-4121-ASS-5IO

Routine Biomarker Internal Standard Cocktail 4

7 Analytes, each concentration as listed in isooctane; units: 10x1mL, 1x5mL, 5x5mL
Please inquire for other quantities.

| Chiron No. | Name | CAS No. | Conc. |
|------------|------------------------------|--------------|------------|
| 1019.12 | n-Dodecane-d ₂₆ | [16416-30-1] | 2000 µg/mL |
| 1020.16 | n-Hexadecane-d ₃₄ | [15716-08-2] | 2000 µg/mL |
| 0641.24 | 5β(H)-Cholane | [80373-86-0] | 12 µg/mL |
| 1313.10 | 1-Fluoronaphthalene, F-PAH® | [321-38-0] | 24 µg/mL |
| 1712.12 | 4-Fluorobiphenyl, F-PAH® | [324-74-3] | 24 µg/mL |
| 1316.14 | 3-Fluorophenanthrene, F-PAH® | [440-40-4] | 24 µg/mL |
| 1329.18 | 2-Fluorochrysene, F-PAH® | | 24 µg/mL |

S-4253-ASS-IO
S-4253-ASS-5IO

Routine Biomarker Internal Standard Cocktail 5

9 Analytes, each concentration as listed in isooctane; units: 10x1mL, 1x5mL, 5x5mL
Please inquire for other quantities.

| Chiron No. | Name | CAS No. | Conc. |
|------------|------------------------------|--------------|------------|
| 1019.12 | n-Dodecane-d ₂₆ | [16416-30-1] | 2000 µg/mL |
| 1020.16 | n-Hexadecane-d ₃₄ | [15716-08-2] | 2000 µg/mL |
| 0641.24 | 5β(H)-Cholane | [80373-86-0] | 12 µg/mL |
| 1313.10 | 1-Fluoronaphthalene, F-PAH® | [321-38-0] | 24 µg/mL |
| 1712.12 | 4-Fluorobiphenyl, F-PAH® | [324-74-3] | 24 µg/mL |



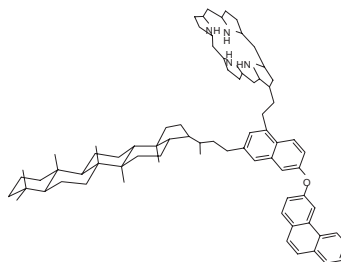
| | | | |
|---------|--|---------------|----------|
| 1316.14 | 3-Fluorophenanthrene, F-PAH® | [440-40-4] | 24 µg/mL |
| 1329.18 | 2-Fluorochrysene, F-PAH® | | 24 µg/mL |
| 1692.12 | 2-Fluorodibenzothiophene, F-PASH | [177586-38-8] | 24 µg/mL |
| 0985.28 | d ₂ C ₂₈ Triaromatic Sterane | [205529-81-3] | 12 µg/mL |

Asphaltene precipitation

ASP

Chiron offers technical services and expertise:

- ✓ Isolation and purification of asphaltene standards
- ✓ Separation by chromatography
- ✓ Asphaltene derivatization
- ✓ Characterization



The asphaltenes are the pentane/heptane insoluble components of the oil.

Asphaltenes are complex mixtures of unknown components, usually highly aromatised, and of high molecular weight. The quantity and the composition of asphaltenes from different sources vary a lot. Better knowledge of the asphaltenes is important due to their practical and economical impact for the petroleum industry.

In most cases, the asphaltenes are not analysed, just weighed. For a more detailed asphaltene analysis, a number of methods can be applied.

Asphaltenes can be separated into groups according to polarity by chromatography, and they can be derivatized to simplify analysis.

Purified Asphaltenes is available on request.

Bulk composition of deasphaltened oils or rock extracts by TLC-FID

TLC-FID

S-4101-ASS-5DC

latroscan Standard 1

3 Analytes, each concentration as listed in dichloromethane; units: 1x5mL, 5x5mL

| Chiron No. | Name | CAS No. | Conc. |
|------------|--------------|------------|--------------|
| 0816.14 | Phenanthrene | [85-01-8] | 5 mg/15 mL |
| 0652.30 | Squalane | [111-01-3] | 100 µL/15 mL |
| 1711.10 | 1-Decanol | [112-30-1] | 200 µL/15 mL |

S-4105-ASS-5DC

latroscan Standard 2

3 Analytes, each concentration as listed in dichloromethane; units: 1x5mL, 5x5mL

| Chiron No. | Name | CAS No. | Conc. |
|------------|--------------|------------|-------------|
| 0816.14 | Phenanthrene | [85-01-8] | 5 mg/15 mL |
| 0652.30 | Squalane | [111-01-3] | 20 µL/15 mL |
| 1711.10 | 1-Decanol | [112-30-1] | 20 µL/15 mL |



GC analysis of whole (depressurized) fluid and PIONA standards

WOGC

GC analysis of the whole fluid will provide the composition of the gasoline-range hydrocarbons. The oil is analysed by GC using a capillary column with a nonpolar stationary phase.

Quantitative whole oil standards

Procedural Requirements:

S-4018-1ML

Whole Oil Light Hydrocarbons C5-C8 by GC

Hydrocarbons C5-C8, Neat 1 mL, 28 components

| Chiron No. | Name | CAS No. | Relative ratio (by weight): |
|------------|--------------------------------|--------------|--------------------------------|
| 1234.6 | 2,2-Dimethylbutane | [75-83-2] | 3 |
| 1250.5 | Cyclopentane | [287-92-3] | 3 |
| 1233.6 | 2,3-Dimethylbutane | [79-29-8] | 2 |
| 1235.6 | 2-Methylpentane | [107-83-5] | 6 |
| 1236.6 | 3-Methylpentane | [96-14-0] | 5 |
| 1232.6 | n-Hexane | [110-54-3] | 8 |
| 1237.7 | 2,2-Dimethylpentane | [590-35-2] | 1 |
| 1249.6 | Methylcyclopentane | [96-37-7] | 3 |
| 1241.7 | 2,4-Dimethylpentane | [108-08-7] | 1 |
| 1300.6 | Benzene | [71-43-2] | 3 |
| 1305.7 | 3,3-Dimethylpentane | [562-49-2] | 1 |
| 1301.6 | Cyclohexane | [110-82-7] | 3 |
| 1238.7 | 2-Methylhexane | [591-76-4] | 3 |
| 1239.7 | 2,3-Dimethylpentane | [565-59-3] | 3 |
| 1302.7 | 1,1-Dimethylcyclopentane | [1638-26-2] | 1 |
| 1257.7 | 3-Methylhexane | [589-34-4] | 2 |
| 1252.7 | cis-1,3-Dimethylcyclopentane | [2532-58-3] | 0.3 |
| 1253.7 | trans-1,3-Dimethylcyclopentane | [1759-58-6] | 0.3 |
| 1255.7 | 3-Ethylpentane | [617-78-7] | 2 |
| 1256.7 | trans-1,2-Dimethylcyclopentane | [822-50-4] | 0.3 |
| 1240.7 | n-Heptane | [142-82-5] | 8 |
| 1254.7 | cis-1,2-Dimethylcyclopentane | [1192-18-3] | 0.3 |
| 1248.7 | Methylcyclohexane | [108-87-2] | 7 |
| 1251.7 | Ethylcyclopentane | [1640-89-7] | 2 |
| 1264.7 | Toluene | [108-88-3] | 6 |
| 1242.8 | n-Octane | [111-65-9] | 8 |
| 1266.8 | m-Xylene | [108-38-3] | 3 |
| 1265.8 | p-Xylene | [106-42-3] | 2 |

For n-Paraffin mixtures, see S-4135 (page 181) and pages 186-190.

For PIONA mixtures, see pages 180-185.



Quantitative control standards (for integration and response factor control)

S-4011 Whole Oil Quantitative Control Standards Set (S-4012+S-4013)

S-4012 Pristane/n-Heptadecane Control Standard
Pristane/n-Heptadecane = 1:2
(1000µg Pristane and 2000µg n-Heptadecane in 1 mL isooctane)

S-4013 Benzene/n-Hexane Control Standard
Benzene/n-Hexane = 1:2 (Neat 1 mL)

Qualitative control standards (baseline separation control)

S-4014 Whole Oil Separation Control Set (S-4015 - S-4017 + S-4012)
Neat mixtures (0.25 mL) of the Control mixtures 1-3, 1 mL solution of the Control mixture 4 in isooctane solution

S-4015 Whole Oil Control Mixture 1

| Chiron No. | Name | CAS No. | Relative ratios by weight: |
|------------|---------------------|------------|----------------------------|
| 1237.7 | 2,2-Dimethylpentane | [590-35-2] | 0.5 |
| 1249.6 | Methylcyclopentane | [96-37-7] | 1.5 |
| 1241.7 | 2,4-Dimethylpentane | [108-08-7] | 0.5 |

S-4016 Whole Oil Control Mixture 2

| Chiron No. | Name | CAS No. | Relative ratios by weight: |
|------------|---------------------|------------|----------------------------|
| 1300.6 | Benzene | [71-43-2] | 1.5 |
| 1305.7 | 3,3-Dimethylpentane | [562-49-2] | 0.15 |
| 1301.6 | Cyclohexane | [110-82-7] | 1.5 |

S-4017 Whole Oil Control Mixture 3

| Chiron No. | Name | CAS No. | Relative ratios by weight: |
|------------|--------------------------------|-------------|----------------------------|
| 1238.7 | 2-Methylhexane | [591-76-4] | 1.5 |
| 1239.7 | 2,3-Dimethylpentane | [565-59-3] | 1.5 |
| 1302.7 | 1,1-Dimethylcyclopentane | [1638-26-2] | 0.5 |
| 1257.7 | 3-Methylhexane | [589-34-4] | 1.0 |
| 1252.7 | 1,3-cis-Dimethylcyclopentane | [2532-58-3] | 0.2 |
| 1253.7 | 1,3-trans-Dimethylcyclopentane | [1759-58-6] | 0.2 |
| 1256.7 | 1,2-trans-Dimethylcyclopentane | [822-50-4] | 0.2 |
| 1254.7 | 1,2-cis-Dimethylcyclopentane | [1192-18-3] | 0.2 |

S-4012 Whole Oil Control Mixture 4
1000µg Pristane and 2000µg n-Heptadecane in 1 mL isooctane



GC analysis of the saturated hydrocarbon fraction

SAT GC

General

The GC analysis will provide quantitative information on the molecular composition of the saturated hydrocarbon fraction. Control Standards are available for baseline separation and integration control of the following parameters:

Pristane/n-C17 (Integration and baseline separation control)
n-C15/n-C20 (Integration control)
n-C30/n-C20 (Integration control)
n-C17/(n-C17+n-C27) (Integration control)

Quantitative control standards (for integration control)

| | |
|---------------|--|
| S-4019-ASS-IO | Saturated Fraction GC Control Set (S-4012 + S-4020) |
| S-4012-ASS-IO | Pristane/n-Heptadecane (Integration and baseline control) 1000µg Pristane and 2000µg n-Heptadecane in 1 mL isoootane Pristane/n-Heptadecane = 1:2 |
| S-4020-ASS-IO | n-C15/n-C20, Pentadecane/Eicosane (Integration control) 1500 µg Pentadecane and 1000 µg Eicosane in 1 mL isoootane n-Pentadecane/n-Eicosane = 3:2 |
| S-4021-ASS-IO | n-C30/n-C20, n-Triacontane/n-Eicosane (Integration control) 1000 µg n-Triacontane and 2000 µg n-Eicosane in 1 mL isoootane n-Triacontane/n-Eicosane = 1:2 |
| S-4022-ASS-IO | n-C17/(n-C17 + n-C27) (Integration control) 2000 µg + 500 µg in isoootane solution in 1 mL isoootane n-Heptadecane/n-Heptacosane = 4:1 |

S-4023-ASS-IO Saturated Fraction Integration and Separation

Control Standard

6 Analytes, each concentration as listed in isoootane; unit: 1x1mL.

| Chiron No. | Name | CAS No. | Conc. (mg/mL) |
|------------|-----------------------|-------------|---------------|
| 1135.15 | n-Pentadecane (n-C15) | [629-62-9] | 2 |
| 1137.17 | n-Heptadecane (n-C17) | [629-78-7] | 2 |
| 0635.19 | Pristane | [1921-70-6] | 1 |
| 1140.20 | n-Eicosane (n-C20) | [112-95-8] | 1 |
| 1147.27 | n-Heptacosane (n-C27) | [593-49-7] | 0,4 |
| 1150.30 | n-Triacontane (n-C30) | [638-68-6] | 0,3 |

**S-4024-SET****CPI (1) Control Standards Set**

| | S-4025 (mg/mL) | S-4026 (mg/mL) | S-4027 (mg/mL) |
|----------|-----------------------|-----------------------|-----------------------|
| C22 | 1.0 | 1.0 | 1.0 |
| C23 | 0.9 | 1.0 | 1.1 |
| C24 | 0.8 | 0.8 | 0.8 |
| C25 | 0.7 | 0.8 | 0.9 |
| C26 | 0.6 | 0.6 | 0.6 |
| C27 | 0.5 | 0.6 | 0.7 |
| C28 | 0.4 | 0.4 | 0.4 |
| C29 | 0.3 | 0.4 | 0.5 |
| C30 | 0.2 | 0.2 | 0.2 |
| CPI (1): | 1.0 | 1.17 | 1.33 |

$$\text{CPI (1)} = 2(\text{C23} + \text{C25} + \text{C27} + \text{C29}) / [\text{C22} + 2(\text{C24} + \text{C26} + \text{C28}) + \text{C30}]$$

CPI (1) values significantly above or below (unusual) 1.0 indicate that the oil or extract is immature. Values of 1.0 suggest that the oil or extract is mature. Ref: The Biomarker Guide.

GC analysis of the aromatic fraction**ARO GC**

The GC analysis will provide a fingerprint of the hydrocarbon fraction. Molecular ratios are provided from the GC-MS data. To be analysed, the aromatic fraction is obtained by liquid chromatography of deasphalthened oil or EOM.

Single component standards available for GC-FID/GC-FPD of the aromatic fraction:

| | | |
|-------------------------|-------|---|
| C2-C4 Naphthalenes: | C2 | All possible isomers available |
| | C3 | 16 Isomers available |
| | C4 | 4 Isomers available: |
| | | 2-Butylnaphthalene 1261.14 |
| | | Eudalene 0737,14 |
| | | 1,4,6,7-Tetramethylnaphthalene 0707.14 |
| | | 1,2,5,6-Tetramethylnaphthalene 0167.14 |
| C0-C4 Phenanthrenes | C0-C2 | All possible C0-C2 isomers are available |
| | C3 | 9 Trimethyl and ethylmethyl isomers available |
| | C4 | Five isomers available including: |
| | | Retene 0794.18 |
| | | 9-Butylphenanthrene 1026.18 |
| | | 1,2,6,9-Tetramethylphenanthrene 0785.18 |
| C0-C4 Dibenzothiophenes | C0-C1 | All isomers available |
| | C2 | 11 Dimethyl- and ethyldibenzothiophenes |
| | C3 | 8 Trimethyl- and propyldibenzothiophenes |
| | C4 | 2- and 4-Butyldibenzothiophene |



GC-MS analysis of oil, EOM or saturated hydrocarbon fraction

SAT/EOM GC-MS

The purpose of the GC-MS analysis is to obtain quantitative information on the biomarker composition.

It is recommended to monitor the following ions:

| m/z | |
|------------|--|
| 177 | Terpanes |
| 191 | Tri- and tetracyclic diterpanes, pentacyclic triterpanes |
| 205 | Pentacyclic hopanelike triterpanes, C31 |
| 217 | Regular and rearranged steranes |
| 218 | Regular and rearranged steranes (mainly $\beta\beta$) |
| 231 | 4-Methylsteranes (mainly $\alpha\alpha$) |
| 232 | 4-Methylsteranes (mainly $\beta\beta$) |
| 253 | Monoaromatic steranes (not to be present) |
| 259 | Rearranged steranes (diasteranes) |

Available standards

See the Compounds section for details, pages 246-273.

Quantitative NPD-standards

NPD = Naphthalene – Phenanthrene – Dibenzothiophene

S-4028-ASS-IO **Aromatic Fraction Peak Height Control Set (S-4029 + S-4030)**

S-4029-ASS-IO **1-Methylphenanthrene/Phenanthrene = 1:2 (0,67)**
1000 + 2000 $\mu\text{g/ml}$ in isooctane, 1 mL pr. vial

S-4030-ASS-IO **C20 Triaromatic sterane (0857,20)/**
C26 Triaromatic sterane (0854,26) = 1:3 (0,33)
50 + 150 $\mu\text{g/mL}$ in isooctane, 1 mL pr. vial

S-4032-ASS-IO **Methylphenanthrene Index Cocktail**
5 Analytes, each concentration as listed in isooctane; unit: 1x1mL

| Chiron No. | Name | Cas.No | Relative ratios by weight: |
|-------------------|----------------------|---------------|---------------------------------------|
| 0816.14 | Phenanthrene | [85-01-8] | 1.5 |
| 0813.15 | 3-Methylphenanthrene | [832-71-3] | 1.0 |
| 0812.15 | 2-Methylphenanthrene | [2531-84-2] | 1.0 |
| 0815.15 | 9-Methylphenanthrene | [883-20-5] | 1.5 |
| 0811.15 | 1-Methylphenanthrene | [832-69-9] | 1.0 |

$$\text{MPI 1} = 1,5(2\text{MP} + 3\text{MP}) / (\text{P} + 1\text{MP} + 9\text{MP})$$

$$\text{MPI 2} = 3(2\text{MP}) / (\text{P} + 1\text{MP} + 9\text{MP})$$

$$\text{F 1} = (2\text{MP} + 3\text{MP}) / (2\text{MP} + 3\text{MP} + 9\text{MP} + 1\text{MP})$$

**S-4033-ASS-IO****Dibenzothiophene Cocktail**

5 Analytes, each concentration as listed in isoootane; unit: 1x1mL

| Chiron No. | Name | CAS No. | Relative ratios by weight: |
|------------|--------------------------|--------------|-------------------------------|
| 0884.12 | Dibenzothiophene | [132-65-0] | 1.5 |
| 0887.13 | 4-Methyldibenzothiophene | [7372-88-5] | 1.5 |
| 2499.13 | 3-Methyldibenzothiophene | [16587-52-3] | 0.5 |
| 0886.13 | 2-Methyldibenzothiophene | [20928-02-3] | 0.5 |
| 2501.13 | 1-Methyldibenzothiophene | [31317-07-4] | 0.5 |

S-4034-ASS-IO**NPD* Cocktail**

20 Analytes, each concentration as listed in isoootane; unit: 1x1mL

| Chiron No. | Name | CAS No. | mg/mL in isoootane: |
|------------|--------------------------|--------------|---------------------|
| 0712.11 | 1-Methylnaphthalene | [90-12-0] | 0.5 |
| 0713.11 | 2-Methylnaphthalene | [91-57-6] | 0.5 |
| 0722.12 | 1,3-Dimethylnaphthalene | [575-41-7] | 0.5 |
| 0723.12 | 1,4-Dimethylnaphthalene | [571-58-4] | 0.5 |
| 0724.12 | 1,5-Dimethylnaphthalene | [571-61-9] | 0.5 |
| 0725.12 | 1,6-Dimethylnaphthalene | [575-43-9] | 0.5 |
| 0726.12 | 1,7-Dimethylnaphthalene | [575-37-1] | 0.5 |
| 0729.12 | 2,6-Dimethylnaphthalene | [581-42-0] | 0.5 |
| 0731.12 | 2,7-Dimethylnaphthalene | [582-16-1] | 0.5 |
| 0341.12 | Biphenyl | [92-52-4] | 0.5 |
| 0816.14 | Phenanthrene | [85-01-8] | 0.5 |
| 0811.15 | 1-Methylphenanthrene | [832-69-9] | 0.25 |
| 0713.11 | 2-Methylphenanthrene | [91-57-6] | 0.25 |
| 0813.15 | 3-Methylphenanthrene | [832-71-3] | 0.25 |
| 0815.15 | 9-Methylphenanthrene | [883-20-5] | 0.25 |
| 0884.12 | Dibenzothiophene | [132-65-0] | 0.25 |
| 2501.13 | 1-Methyldibenzothiophene | [31317-07-4] | 0.1 |
| 0886.13 | 2-Methyldibenzothiophene | [20928-02-3] | 0.1 |
| 2499.13 | 3-Methyldibenzothiophene | [16587-52-3] | 0.1 |
| 0887.13 | 4-Methyldibenzothiophene | [7372-88-5] | 0.1 |

For other NDP Cocktails: See the Environmental section, pages 143-147.

S-4122-ASS-IO**NPD Internal Standard Cocktail**

3 Analytes, each concentration as listed in isoootane; units: 1x1mL, 5x1mL, 10x1mL

| Chiron No. | Name | CAS No. | Cons. |
|------------|--------------------------|---------------|------------|
| 1313.10 | 1-Fluoronaphthalene | [321-38-0] | 1.0 mg/mL |
| 1316.14 | 3-Fluorophenanthrene | [440-40-4] | 0.5 mg/mL |
| 1692.12 | 2-Fluorodibenzothiophene | [177586-38-8] | 0.25 mg/mL |



Common NPD hydrocarbons in oil

Naphthalenes/Phenanthrenes/Dibenzothiophenes, relative elution

| Chiron No.* | Name | CAS No. | Label | m/z |
|----------------|-------------------------------------|---|-----------|-----|
| 0713.11-K-IO | 2-Methylnaphthalene | [91-57-6] | 2-MN | 142 |
| 0712.11-K-IO | 1-Methylnaphthalene | [90-12-0] | 1-MN | 142 |
| 0715.12-K-IO | 2-Ethylnaphthalene | [939-27-5] | 2-EN | 156 |
| 0714.12-K-IO | 1-Ethylnaphthalene | [1127-76-0] | 1-EN | 156 |
| 0729.12-K-IO | 2,6-Dimethylnaphthalene | [581-42-0] | 2,6-DMN | 156 |
| 0731.12-K-IO | 2,7-Dimethylnaphthalene | [582-16-1] | 2,7-DMN | 156 |
| 0722.12-K-IO | 1,3-Dimethylnaphthalene | [575-41-7] | 1,3-DMN | 156 |
| 0726.12-K-IO | 1,7-Dimethylnaphthalene | [575-37-1] | 1,7-DMN | 156 |
| 0725.12-K-IO | 1,6-Dimethylnaphthalene | [575-43-9] | 1,6-DMN | 156 |
| 0728.12-K-IO | 2,3-Dimethylnaphthalene | [581-40-8] | 2,3-DMN | 156 |
| 0723.12-K-IO | 1,4-Dimethylnaphthalene | [571-58-4] | 1,4-DMN | 156 |
| 0724.12-K-IO | 1,5-Dimethylnaphthalene | [571-61-9] | 1,5-DMN | 156 |
| 0721.12-K-IO | 1,2-Dimethylnaphthalene | [573-98-8] | 1,2-DMN | 156 |
| 0170.13-500-IO | 1,3,7-Trimethylnaphthalene | [2131-38-6] | 1,3,7-TMN | 170 |
| not available | 1,3,6-Trimethylnaphthalene | | 1,3,6-TMN | 170 |
| not available | 1,3,5-Trimethylnaphthalene | | 1,3,5-TMN | 170 |
| 0705.13-500-IO | 1,4,6-Trimethylnaphthalene | [2131-42-2] | 1,4,6-TMN | 170 |
| 0441.13-500-IO | 2,3,6-Trimethylnaphthalene | [829-26-5] | 2,3,6-TMN | 170 |
| not available | 1,6,7-Trimethylnaphthalene (=2,3,8) | | 1,6,7-TMN | 170 |
| not available | 1,2,7-Trimethylnaphthalene | | 1,2,7-TMN | 170 |
| 0703.13-500-IO | 1,2,6-Trimethylnaphthalene | [3031-05-8] | 1,2,6-TMN | 170 |
| 0701.13-500-IO | 1,2,4-Trimethylnaphthalene | [2717-42-2] | 1,2,4-TMN | 170 |
| 0702.13-500-IO | 1,2,5-Trimethylnaphthalene | [641-91-8] | 1,2,5-TMN | 170 |
| 0816.14-K-IO | Phenanthrene | [85-01-8] | P | 178 |
| 0813.15-K-IO | 3-Methylphenanthrene | [832-71-3] | 3-MP | 192 |
| 0812.15-K-IO | 2-Methylphenanthrene | [2531-84-2] | 2-MP | 192 |
| 0815.15-K-IO | 9-Methylphenanthrene | [883-20-5] | 9-MP | 192 |
| 0811.15-K-IO | 1-Methylphenanthrene | [832-69-9] | 1-MP | 192 |
| not available | 2-Ethylphenanthrene | | 2-EP | 206 |
| 1028.16-K-IO | 9-Ethylphenanthrene | [3674-75-7] | 9-EP | 206 |
| 0768.16-500-IO | 3,6-Dimethylphenanthrene | [1576-67-6] | 3,6-DMP | 206 |
| not available | 1-Ethylphenanthrene | | 1-EP | 206 |
| 0766.16-K-IO | 2,6-Dimethylphenanthrene | [17980-16-4] / [33954-06-2] | 2,6-DMP | 206 |
| 0765.16-K-IO | 2,7-Dimethylphenanthrene | [3674-66-6] / [1576-69-8] / [3674-69-9] | 2,7-DMP | 206 |
| 0766.16-K-IO | 3,5-Dimethylphenanthrene | [17980-16-4] / [33954-06-2] | 3,5-DMP | m/z |
| 0876.16-500-IO | 1,3-Dimethylphenanthrene | [16664-45-2] | 1,3-DMP | 142 |
| 0881.16-K-IO | 2,10-Dimethylphenanthrene | [2479-54-3] / [23189-63-1] | 2,10-DMP | 142 |
| 0769.16-500-IO | 3,9-Dimethylphenanthrene | [66291-32-5] | 3,9-DMP | 156 |
| 0882.16-500-IO | 3,10-Dimethylphenanthrene | [66291-33-6] | 3,10-DMP | 156 |
| 0762.16-500-IO | 1,6-Dimethylphenanthrene | [20291-74-1] | 1,6-DMP | 156 |
| 0765.16-K-IO | 2,5-Dimethylphenanthrene | [3674-66-6] / [1576-69-8] / [3674-69-9] | 2,5-DMP | 156 |
| 0767.16-K-IO | 2,9-Dimethylphenanthrene | [17980-09-5] / [66291-34-7] | 2,9-DMP | 156 |



| | | | | |
|----------------|---------------------------|--------------------------------|----------|-----|
| 0761.16-K-IO | 1,7-Dimethylphenanthrene | [66271-87-2]/ [483-87-4] | 1,7-DMP | 156 |
| 0879.16-K-IO | 2,3-Dimethylphenanthrene | [3674-65-5]/ [66291-31-4] | 2,3-DMP | 156 |
| 0764.16-500-IO | 1,9-Dimethylphenanthrene | [20291-73-0] | 1,9-DMP | 156 |
| 0767.16-K-IO | 4,9-Dimethylphenanthrene | [17980-09-5]/ [66291-34-7] | 4,9-DMP | 156 |
| 0881.16-K-IO | 4,10-Dimethylphenanthrene | [2479-54-3]/ [23189-63-1] | 4,10-DMP | 156 |
| 0763.16-500-IO | 1,8-Dimethylphenanthrene | [7372-87-4] | 1,8-DMP | 156 |
| 0794.16-500-IO | Retene | [483-65-8] | Retene | 170 |
| 0884.12-500-IO | Dibenzothiophene | [132-65-0] | DBT | 170 |
| 0887.13-500-IO | 4-Methyldibenzothiophene | [7372-88-5] | 4-MDBT | 170 |
| 2799.13-5MG | 3-Methyldibenzothiophene | [6587-52-3] | 3-MDBT | 170 |
| 0886.13-500-IO | 2-Methyldibenzothiophene | [20928-02-3] | 2-MDBT | 170 |
| 2501.13-100-T | 1-Methyldibenzothiophene | [31317-07-4] | 1-MDBT | 170 |

*Ref. the compounds section for details.

Ring C monoaromatic steroid hydrocarbons, m/z 253

| Chiron No. | Name | Isomer | CAS No. |
|----------------|--------------------------|-------------------------------|--|
| 0861.21-100-IO | C21 Monoaromatic sterane | 5 α (H),10 β (H) | [98774-59-5]/ [98774-61-9] |
| 0862.21-100-IO | C21 Monoaromatic sterane | 5 α (H),10 β (H) | [98774-61-9]/ [98774-59-5] |
| 0858.27-100-IO | C27 Monoaromatic sterane | 5 α (H),10 β (H) | [98819-92-2]/ [98819-91-1] |
| 0858.27-100-IO | C27 Monoaromatic sterane | 5 α (H),10 β (H) | [98819-92-2]/ [98819-91-1] |
| 0859.28-100-IO | C28 Monoaromatic sterane | 5 α (H),10 β (H) | [102045-91-0]/ [102045-92-1]/ [81943-49-9]/ [81943-51-3] |
| 0859.28-100-IO | C28 Monoaromatic sterane | 5 α (H),10 β (H) | [102045-91-0]/ [102045-92-1]/ [81943-49-9]/ [81943-51-3] |
| 0860.29-100-IO | C29 Monoaromatic sterane | 5 α (H),10 β (H) | [205176-21-2]/ [81943-51-3] |
| 0860.29-100-IO | C29 Monoaromatic sterane | 5 α (H),10 β (H) | [205176-21-2]/ [81943-51-3] |

Ring ABC triaromatic steroid hydrocarbons, m/z 231

| Chiron No. | Name | CAS No. |
|------------|-------------------------|------------------------------|
| 0857.20 | C20 Triaromatic sterane | [81943-50-2] |
| 0854.26 | C26 Triaromatic sterane | [80382-29-2] |
| 0855.27 | C27 Triaromatic sterane | [80382-32-7] / [80382-33-8] |
| 0856.28 | C28 Triaromatic sterane | [80382-33-8] |



Gas-chromatography isotope-ratio mass-spectrometry (GC-IRMS) analysis

GC-IRMS

Cf. Pages 222 and 430-431.

References

NIGOGA 4, 2000 The Norwegian Industry Guide to Organic Geochemical Analysis, www.npd.no
The Biomarker Guide, Volume 1 and 2, Peters, K.E., Walters C.C., and Moldowan, J.M. Cambridge University Press 2005.

Petroleum analysis and petroleum products

Our petroleum standards are listed according to applications, in most cases with a reference to proposed international methods.

A complete list of individual compounds is found in the Compounds section, page 223 and onward.

Custom made “creative solutions” from any of the individual components are available on request and demand. Please inquire by fax or e-mail and state the required analytes, concentrations and solvent(s).

PIONA, PONA, PNA analysis

The application of the mixtures is in the petrochemical industry for the quantitative and qualitative determination for components of complex mixtures of hydrocarbons.

The mixtures are used to determine retention times, indices, and monitor response factors of crude petroleum and refinery streams.

The PIONA mixtures are made for a complete analysis of paraffins, isoparaffins, olefines, naphthenes, and aromatics in petroleum.

P – Paraffins (n-paraffins, n-alkanes)

I – Isoparaffins (branched alkanes)

O – Olefines (alkenes, paraffins with one or several double bonds)

N – Naphthenes (saturated ring compounds, usually with alkyl substituents)

A – Aromatics (simple aromatics and alkyl substituted aromatics)

Whole oil quantitative standards, PIONA MIXTURES

S-4127

PIONA Mixture 1, C5-C15

135-140 n-paraffins, isoparaffins, olefins, naphthenes and aromatics

This standard is composed of the PIONA mixtures listed below (S-4135, S-4136, S-4137, S-4119 and S-4156).



Approximate weight percentage:

| | |
|--------------|-----|
| n-Paraffins | 19% |
| Isoparaffins | 19% |
| Olefins | 18% |
| Naphthenes | 20% |
| Aromatics | 23% |

The standard is supplied with a datasheet listing the weight % for each component in the formulation. The composition, as stated on the analytical certificate, may vary slightly from batch to batch.

Cost-effective PIONA-sets for routine applications are available on request.

n-Paraffins
S-4135-01ML
S-4135-05ML

PIONA Mixture 1 - Paraffines

11 n-Paraffins with varying Wt% as listed below; units: 0.1mL, 0.5 mL neat.

| Chiron No. | Name: | Wt.% | Chiron No. | Name: | Wt.% |
|------------|-----------|------|------------|---------------|------|
| 1299.5 | n-Pentane | 13 | 1131.11 | n-Undecane | 7 |
| 1232.6 | n-Hexane | 12 | 1132.12 | n-Dodecane | 7 |
| 1240.7 | n-Heptane | 12 | 1133.13 | n-Tridecane | 7 |
| 1242.8 | n-Octane | 11 | 1134.14 | n-Tetradecane | 7 |
| 1245.9 | n-Nonane | 10 | 1135.15 | n-Pentadecane | 6 |
| 1875.10 | n-Decane | 8 | | | |

A number of other n-alkane standards are supplied as specified below, page 186.

Isoparaffins
S-4136-01ML
S-4136-05ML

PIONA Mixture 1 - Isoparaffines

37 Isoparaffins with varying Wt.% as listed below; units: 0.1 mL, 0.5 mL neat.

| Chiron No. | Name: | Wt.% | Chiron No. | Name: | Wt.% |
|------------|------------------------|------|------------|-------------------------|------|
| 1231.5 | I2-Methylbutane | 2.6 | 1872.8 | 3-Methylheptane | 3.8 |
| 1233.6 | 2,3-Dimethylbutane | 1.4 | 1255.7 | 3-Ethylheptane | 2.9 |
| 1235.6 | 2-Methylpentane | 4.4 | 2985.8 | 2,5-Dimethylheptane | 3.1 |
| 1236.6 | 3-Methylpentane | 3.2 | 2996.9 | 3,5-Dimethylheptane (D) | 0.4 |
| 1237.7 | 2,2-Dimethylpentane | 4.2 | 2994.9 | 3,3-Dimethylheptane | 3.3 |
| 1241.7 | 2,4-Dimethylpentane | 3.1 | 2996.9 | 3,5-Dimethylheptane (L) | 0.4 |
| 3853.7 | 2,2,3-Trimethylbutane | 3.1 | 2991.9 | 2,3-Dimethylheptane | 1.5 |
| 1305.7 | 3,3-Dimethylpentane | 1.3 | 2995.9 | 3,4-Dimethylheptane (D) | 1.7 |
| 1238.7 | 2-Methylhexane | 3.6 | 2995.9 | 3,4-Dimethylheptane (L) | 2.0 |
| 1239.7 | 2,3-Dimethylpentane | 1.6 | 0958.9 | 2-Methyloctane | 5.1 |
| 1257.7 | 3-Methylhexane | 4.5 | 0963.9 | 3-Methyloctane | 2.7 |
| 1255.7 | 3-Ethylpentane | 1.6 | 3856.9 | 3,3-Diethylpentane | 3.3 |
| 2986.8 | 2,2-Dimethylhexane | 1.4 | 3854.10 | 2,2-Dimethyloctane | 3.1 |
| 2985.8 | 2,5-Dimethylhexane | 3.2 | 3009.10 | 3,3-Dimethyloctane | 1.7 |
| 3855.8 | 2,2,3-Trimethylpentane | 3.2 | 3005.10 | 2,3-Dimethyloctane | 1.6 |
| 2984.8 | 2,4-Dimethylhexane | 1.6 | 0959.10 | 2-Methylnonane | 3.3 |
| 2983.8 | 2,3-Dimethylhexane | 1.4 | 3857.10 | 3-Ethylloctane | 3.3 |
| 1243.8 | 2-Methylheptane | 4.6 | 0964.10 | 3-Methylnonane | 3.4 |
| 1873.8 | 4-Methylheptane | 3.4 | | | |

A number of other n-alkane/isoalkane standards are supplied as specified below, page 186.



Olefins

S-4137-01ML

S-4137-05ML

PIONA Mixture 1 - Olefins

25 Olefins with varying Wt.% as listed below; units: 0.1 mL, 0.5 mL neat

| Chiron No. | Name: | Wt.% | Chiron No. | Name: | Wt.% |
|------------|------------------------|------|------------|-----------------|------|
| 3019.5 | 3-Methyl-1-butene | 2.0 | 3026.7 | cis-3-Heptene | 5.0 |
| 3015.5 | 1-Pentene | 4.0 | 3025.7 | trans-2-Heptene | 2.5 |
| 2643.5 | 2-Methyl-1-butene | 1.5 | 3024.7 | cis-2-Heptene | 4.5 |
| 3038.5 | 2-Methyl-1,3-butadiene | 2.5 | 2648.8 | 1-Octene | 8.0 |
| 3017.5 | trans-2-Pentene | 4.0 | 3029.8 | trans-2-Octene | 2.0 |
| 3016.5 | cis-2-Pentene | 2.0 | 3028.8 | cis-2-Octene | 5.0 |
| 2651.6 | 4-Methyl-1-pentene | 4.0 | 2645.9 | 1-Nonene | 9.0 |
| 2649.6 | 1-Hexene | 7.5 | 3034.9 | trans-3-Nonene | 2.0 |
| 3021.6 | trans-2-Hexene | 2.0 | 3033.9 | cis-3-Nonene | 2.0 |
| 2681.6 | 2-Methyl-2-pentene | 4.0 | 3032.9 | trans-2-Nonene | 2.0 |
| 3020.6 | cis-2-Hexene | 3.0 | 3031.9 | cis-2-Nonene | 2.0 |
| 2684.7 | 1-Heptene | 9.0 | 2642.10 | 1-Decene | 8.0 |
| 3027.7 | trans-3-Heptene | 2.5 | | | |

A number of other olefin standards are supplied according to ASTM methods specified below and in the Methods section, page 45 and onward.

Naphthenes

S-4119-01-ML

S-4119-05ML

PIONA Mixture 1 - Naphthenes

30 Naphthenes with varying Wt.% as listed below; units: 0.1 mL, 0.5 mL neat

| Chiron No. | Name: | Wt.% | Chiron No. | Name: | Wt.% |
|------------|---------------------------------|------|------------|---------------------------------|------|
| 1250.5 | Cyclopentane | 5.0 | 3988.8 | ccc-1,2,3-Trimethylcyclopentane | 1.0 |
| 1249.6 | Methylcyclopentane | 5.0 | 3989.8 | Isopropylcyclopentane | 2.5 |
| 1248.7 | Cyclohexane | 5.5 | 1867.8 | cis-1,2-Dimethylcyclohexane | 3.5 |
| 1302.7 | 1,1-Dimethylcyclopentane | 3.5 | 3990.8 | n-Propylcyclopentane | 2.5 |
| 1252.7 | cis-1,3-Dimethylcyclopentane | 1.0 | 3991.9 | ccc-1,3,5-Trimethylcyclohexane | 3.0 |
| 1256.7 | trans-1,2-Dimethylcyclopentane | 2.5 | 3992.9 | 1,1,4-Trimethylcyclohexane | 4.0 |
| 1253.7 | trans-1,3-Dimethylcyclopentane | 3.0 | 3993.9 | ctt-1,2,4-Trimethylcyclohexane | 2.5 |
| 1248.7 | Methylcyclohexane | 7.5 | 3994.9 | ctc-1,2,4-Trimethylcyclohexane | 3.5 |
| 1251.7 | Ethylcyclopentane | 2.5 | 3995.9 | 1,1,2-Trimethylcyclohexane | 3.5 |
| 3984.8 | ctc-1,2,3-Trimethylcyclopentane | 2.5 | 3996.9 | Isobutylcyclopentane | 3.5 |
| 3985.8 | cct-1,2,4-Trimethylcyclopentane | 3.5 | 3997.9 | Isopropylcyclohexane | 4.5 |
| 3986.8 | ctc-1,2,4-Trimethylcyclopentane | 2.5 | 3998.9 | n-Butylcyclopentane | 3.5 |
| 1866.8 | trans-1,4-Dimethylcyclohexane | 3.5 | 3999.10 | Isobutylcyclohexane | 4.5 |
| 3987.8 | 1-Ethyl-1-methylcyclopentane | 1.5 | 8000.10 | t-1-Methyl-2-propylcyclohexane | 4.0 |
| 1868.8 | trans-1,2-Dimethylcyclohexane | 2.5 | 8001.10 | t-1-Methyl-2-(4MP)cyclopentane | 2.5 |

A number of other naphthene standards are specified below or supplied according to ASTM methods specified below and in the Methods section, page 45 and onward.



Aromatics

S-4156-01ML

S-4156-05ML

PIONA Mixture 1 - Aromatics

37 Aromatics with varying Wt.% as listed below; units: 0.1 mL, 0.5 mL neat

| Chiron No. | Name: | Wt.% | Chiron No. | Name: | Wt.% |
|------------|-----------------------------|------|------------|-------------------------------|------|
| 1300.6 | Benzene | 3.1 | 1268.8 | Ethylbenzene | 1.6 |
| 1264.7 | Toluene | 4.6 | 1266.8 | m-Xylene | 2.9 |
| 1267.8 | o-Xylene | 3.2 | 1265.8 | p-Xylene | 3.0 |
| 2155.9 | Isopropylbenzene | 3.1 | 0392.10 | n-Butylbenzene | 2.9 |
| 1298.9 | n-Propylbenzene | 1.7 | 2172.10 | 1,2-Diethylbenzene | 3.1 |
| 1273.9 | 1-Methyl-3-ethylbenzene | 2.9 | 2345.10 | 1-Methyl-2-n-propylbenzene | 1.5 |
| 1272.9 | 1-Methyl-4-ethylbenzene | 3.2 | 2340.10 | 1,4-Dimethyl-2-ethylbenzene | 3.0 |
| 1269.9 | 1,3,5-Trimethylbenzene | 3.5 | 2339.10 | 1,3-Dimethyl-5-ethylbenzene | 1.3 |
| 2156.10 | 1-Methyl-2-ethylbenzene | 4.5 | 2338.10 | 1,2-Dimethyl-4-ethylbenzene | 2.7 |
| 1270.9 | 1,2,4-Trimethylbenzene | 4.3 | 2330.10 | 1,3-Dimethyl-2-ethylbenzene | 2.7 |
| 2343.10 | tert-Butylbenzene | 2.7 | 2337.10 | 1,2-Dimethyl-3-ethylbenzene | 3.0 |
| 2342.10 | Isobutylbenzene | 0.9 | 2158.10 | 1,2,4,5-Tetramethylbenzene | 2.0 |
| 2341.10 | sec-Butylbenzene | 1.5 | 2331.11 | 2-Methylbutylbenzene | 1.4 |
| 2328.10 | 1-Methyl-3-isopropylbenzene | 1.4 | 2336.11 | n-Pentylbenzene | 1.5 |
| 0924.10 | 1-Methyl-4-isopropylbenzene | 2.8 | 2332.12 | t-1-Butyl-3,5-dimethylbenzene | 3.0 |
| 2329.10 | 1-Methyl-2-isopropylbenzene | 2.7 | 2333.12 | t-1-Butyl-4-ethylbenzene | 3.0 |
| 2346.10 | 1-Methyl-3-n-propylbenzene | 3.2 | 2335.12 | 1,3,5-Triethylbenzene | 2.0 |
| 2347.10 | 1-Methyl-4-n-propylbenzene | 1.5 | 2334.12 | 1,2,4-Triethylbenzene | 3.1 |
| 0393.12 | n-Hexylbenzene | 4.7 | | | |

A number of other aromatic standards are specified below or supplied according to ASTM methods specified below and in the Methods section, page 45 and onward.

S-4018-1ML

PIONA Mixture 2, C5-C8

(See also Whole Oil Light Hydrocarbons C5-C8 by GC, S-4018 Quantitative Whole Oil Standard, page 172)

Hydrocarbons C5-C8, Neat 1 ml, 28 n-Paraffins, isoparaffins, olefins, naphthenes, and aromatics. For a detailed composition, see page 172.

Approximate weight percentage:

| | |
|--------------|------|
| n-Paraffins | 28 % |
| Isoparaffins | 33 % |
| Naphthenes | 23 % |
| Aromatics | 16 % |

The standard is a custom made mixture for the analysis of light hydrocarbons. The standard is supplied with a datasheet listing the weight% for each component in the formulation.



S-4067-1ML

PIONA Mixture 3, C5-C25Hydrocarbons C5-C25, 1 ml neat,
n-paraffins, isoparaffins, olefins, naphthenes, and aromatics.

| Prod.no. | Compound | CAS no. | Purity | Weight % |
|-----------------|--------------------------------|----------------|---------------|-----------------|
| 8030.5 | Isopentane | [78-78-4] | 99+% | 3.00 |
| 1299.5 | n-Pentane | [109-66-0] | 99+% | 3.98 |
| 1250.5 | Cyclopentane | [287-92-3] | 99 % | 1.52 |
| 1233.6 | 2,3-Dimethylbutane | [75-83-2] | 99 % | 1.01 |
| 1235.6 | 2-Methylpentane | [107-83-5] | 99+% | 3.00 |
| 1236.6 | 3-Methylpentane | [96-14-0] | 99+% | 2.50 |
| 1232.6 | n-Hexane | [110-54-3] | 99 % | 4.29 |
| 1237.7 | 2,2-Dimethylpentane | [590-35-2] | 99.9 % | 0.51 |
| 1249.6 | Methylcyclopentane | [96-37-7] | 99 % | 1.52 |
| 1241.7 | 2,4-Dimethylpentane | [108-08-7] | 99 % | 0.51 |
| 1300.6 | Benzene | [71-43-2] | 99.9 % | 1.53 |
| 1301.6 | Cyclohexane | [110-82-7] | 99.5 % | 1.50 |
| 1238.7 | 2-Methylhexane | [591-76-4] | 98 % | 1.51 |
| 1239.7 | 2,3-Dimethylpentane | [565-59-3] | 99 % | 1.52 |
| 1302.7 | 1,1-Dimethylcyclopentane | [1638-26-2] | 99 % | 0.50 |
| 1257.7 | 3-Methylhexane | [589-43-4] | 99 % | 1.00 |
| 1252.7 | 1,3-cis-Dimethylcyclopentane | [2532-58-3] | 99.8 % | 0.22 |
| 1253.7 | 1,3-trans-Dimethylcyclopentane | [1759-58-6] | 99 % | 0.22 |
| 1255.7 | 3-Ethylpentane | [617-78-7] | 98 % | 1.01 |
| 0443.8 | 2,2,4-Trimethylpentane | [540-84-1] | 99.5 % | 2.99 |
| 1240.7 | n-Heptane | [142-82-5] | 99 % | 3.98 |
| 1248.7 | Methylcyclohexane | [108-87-2] | 99 % | 3.48 |
| 1251.7 | Ethylcyclopentane | [1640-89-7] | 99.7 % | 1.00 |
| 1264.7 | Toluene | [108-88-3] | 99.5 % | 2.98 |
| 1243.8 | 2-Methylheptane | [592-27-8] | 99 % | 1.49 |
| 1242.8 | n-Octane | [111-65-9] | 99 % | 3.98 |
| 1258.8 | Ethylcyclohexane | [1678-91-7] | 99 % | 1.50 |
| 1246.9 | 2,6-Dimethylheptane | [1072-05-5] | 99 % | 1.29 |
| 1259.9 | 1,1,3-Trimethylcyclohexane | [3073-66-3] | 99 % | 1.10 |
| 1268.8 | Ethylbenzene | [100-41-4] | 99 % | 0.99 |
| 1266.8 | m-Xylene | [108-38-3] | 99 % | 1.61 |
| 1265.8 | p-Xylene | [106-42-3] | 99 % | 1.12 |
| 0963.9 | 3-Methyloctane | [2216-33-3] | 99 % | 1.50 |
| 1267.8 | o-Xylene | [95-47-6] | 99 % | 1.40 |
| 1245.9 | n-Nonane | [111-84-2] | 99 % | 4.96 |
| 1298.9 | Propylbenzene | [103-65-1] | 98 % | 0.32 |
| 1273.9 | 1-Ethyl-3-methylbenzene | [620-14-4] | 99 % | 1.10 |
| 1272.9 | 1-Ethyl-4-methylbenzene | [622-96-8] | 99 % | 0.43 |
| 1271.9 | 1,3,5-Trimethylbenzene | [108-67-8] | 98+% | 0.60 |
| 1270.9 | 1,2,4-Trimethylbenzene | [95-63-6] | 98 % | 1.29 |
| 0413.10 | n-Decane | [124-18-5] | 99 % | 4.96 |
| 1274.9 | 1,2,3-Trimethylbenzene | [526-73-8] | 99 % | 0.80 |
| 1131.11 | n-Undecane | [1120-21-4] | 99 % | 5.01 |

Approximate weight percentage:

| | |
|--------------|------|
| n-Paraffins | 50 % |
| Isoparaffins | 23 % |
| Naphthenes | 13 % |
| Aromatics | 14 % |



The standard is a custom made mixture for the analysis of whole oil hydrocarbons. This standard is supplied with a datasheet listing the molecular weights, the densities, the purity of each component (normally 99+%), and the relative retention times on a Varian CP-Sil PONA CB column.

S-4128-500MG

**PIONA Mixture 4
Hydrocarbon Test Mixture, ASTM D 5443**

28 Analytes with varying Wt% as listed below; unit: 500 mg neat

| Chiron No. | Name | Wt.% | Chiron No. | Name | Wt.% |
|------------|----------------------------------|------|------------|----------------------------|------|
| 1250.5 | Cyclopentane | 1.0 | 1875.10 | n-Decane | 4.5 |
| 1299.5 | n-Pentane | 1.0 | 1131.11 | n-Undecane | 3.5 |
| 1301.6 | Cyclohexane | 2.0 | 1132.12 | n-Dodecane | 3.0 |
| 1233.6 | 2,3-Dimethylbutane | 2.0 | 1300.6 | Benzene | 2.5 |
| 1232.6 | n-Hexane | 2.0 | 1264.7 | Toluene | 2.0 |
| 2649.6 | 1-Hexene | 1.5 | 0718.10 | trans-Decahydronaphthalene | 4.0 |
| 1248.7 | Methylcyclohexane | 4.5 | 1134.14 | n-Tetradecane | 4.5 |
| 3971.7 | 4-Methyl-1-hexene | 1.5 | 1268.8 | Ethylbenzene | 4.5 |
| 1240.7 | n-Heptane | 3.5 | 1267.8 | o-Xylene | 4.0 |
| 1867.8 | cis-1,2-Dimethylcyclohexane | 5.0 | 1298.9 | n-Propylbenzene | 5.0 |
| 1201.10 | Isooctane | 5.0 | 1270.9 | 1,2,4-Trimethylbenzene | 4.5 |
| 1242.8 | n-Octane | 5.0 | 1274.9 | 1,2,3-Trimethylbenzene | 5.0 |
| 3974.9 | 1cis,2cis,4-Trimethylcyclohexane | 4.5 | 2158.10 | 1,2,4,5-Tetramethylbenzene | 5.0 |
| 1245.9 | n-Nonane | 4.5 | 2159.11 | Pentamethylbenzene | 5.0 |

S-4147-1ML

Calibration Standard ASTM D 3710

16 Analytes, each Wt.% as listed; units: 1x1mL, 5x1 mL neat

This standard can be used for qualitative and quantitative analysis.

| Chiron No. | Name | Wt.% | Chiron No. | Name | Wt.% |
|------------|---------------------|------|------------|-----------------|------|
| 1231.5 | 2-Methylbutane | 10.0 | 1265.8 | p-Xylene | 13.0 |
| 1299.5 | n-Pentane | 8.0 | 1298.9 | n-Propylbenzene | 5.0 |
| 1235.6 | 2-Methylpentane | 6.0 | 1875.10 | n-Decane | 4.0 |
| 1232.6 | n-Hexane | 6.0 | 0392.10 | n-Butylbenzene | 4.0 |
| 1241.7 | 2,4-Dimethylpentane | 6.0 | 1132.12 | n-Dodecane | 3.5 |
| 1240.7 | n-Heptane | 10.0 | 1133.13 | n-Tridecane | 2.5 |
| 1264.7 | Toluene | 11.0 | 1134.14 | n-Tetradecane | 2.5 |
| 1242.8 | n-Octane | 6.0 | 1135.15 | n-Pentadecane | 2.5 |



Other n-paraffins mixes

Hydrocarbon analysis

Chiron offers different paraffin mixtures specially made to suit our customers requirements.

Different variations are possible. Please inquire by fax or by e-mail. In addition to the neat mixture S-4136 above, the following solutions and neat mixtures are available:

| | |
|------------------------------|--|
| S-4066-K-IO | n-Alkanes C14-C32 (even + pristane/phytane) 12 Analytes, each 1000 µg/mL in isooctane; units: 1x1mL, 5x1mL, 10x1mL This standard includes all the even n-paraffins + pristane and phytane. |
| S-4108-100-CY | n-Alkanes C10-C40 (even) 12 Analytes, each 100µg/ml in cyclohexane; units: 1x1mL, 5x1mL, 10x1mL This standard includes all the even n-paraffins. |
| S-4106-100-CY | n-Alkanes C10-C40 (even + pristane/phytane) 18 Analytes, each 100µg/ml in cyclohexane; units: 1x1mL, 5x1mL, 10x1mL This standard includes all the even n-paraffins + pristane and phytane. |
| S-4109-100-CY | n-Alkanes C10-C40 (even and uneven) 31 Analytes, each 100µg/mL in cyclohexane; units: 1x1mL, 5x1mL, 10x1mL This standard includes all the n-paraffins C10-C40. |
| S-4110-100-CY | n-Alkanes C10-C40 (all +pristane/phytane) 33 Analytes, each 100µg/mL in cyclohexane; units: 1x1mL, 5x1mL, 10x1mL This standard includes all the n-paraffins C10-C40 + pristane and phytane. |
| S-4348-K-IO | n-Alkanes C20-C34, all even + pristane/phytane, 10 Analytes, each 1000µg/mL in isooctane; units: 1x1mL, 5x1mL |
| S-4407-2K-CY | n-Alkanes C10-C36 (C10,12,16,20,24,25,28,32,34,35,36), 11 Analytes, each 2000µg/mL in cyclohexane; unit: 1x1mL |
| S-4425-100-CY | n-Alkanes C8-C26, all even and uneven, 19 analytes, each 100µg/mL in cyclohexane; unit: 1x10mL screw cap bottle |
| S-4435-100-IO S-4435-K-IO | n-Alkanes C10-C25, all even and uneven, 11 analytes, each 100µg/mL or 1000µg/mL in isooctane; units: 1x1mL, 5x1mL, 10x1mL |
| S-4350-5K-DC | Deuterated n-Alkane Mixture 2 (C8,12,16,36), 4 analytes, each 5000µg/mL in dichloromethane; unit: 1x10mL screw cap bottle |
| S-4437-K-IO | Deuterated n-Alkane Mixture 3 (C12,16,20,24,30,32,36), 7 analytes, each 1000µg/mL in isooctane; unit: 1x1mL |



S-4075-100-5DC
S-4075-100-10DC

n-Alkanes C10-C40 (even + some uneven)

24 Analytes, each 100µg/mL in dichloromethane; units: 1x5mL, 1x10mL in screw-capped bottle. This standard includes all the even n-paraffins C10-C40 + extra addition of some uneven n-paraffins C10-C40.

| | | | | |
|-----|-----|-----|-----|----------|
| C10 | C17 | C22 | C27 | C36 |
| C12 | C18 | C23 | C28 | C40 |
| C14 | C19 | C24 | C30 | Pristane |
| C15 | C20 | C25 | C32 | Phytane |
| C16 | C21 | C26 | C34 | |

S-4108-50-PE
S-4108-50-5PE

ISO 9377-2 Standard Mixture of n-Alkanes C10-C40 (all even)

Determination of Hydrocarbon Oil in Water Index

16 Analytes, each 50 µg/mL in n-Pentane; units: 1x1mL, 1x5 mL, 10x1mL

S-4108-100-CY
S-4108-100-5CY

This standard is also available as 100µg/mL in Cyclohexane

Units: 1x1mL, 1x5 mL, 10x1mL

S-4107-50-PE
S-4107-50-5PE

ISO 9377-2 Standard Mixture of n-Alkanes C20-C40 (all even)

Determination of Hydrocarbon Oil in Water Index

11 Analytes, each 50µg/mL in n-Pentane; units: 1x1mL, 1x5mL, 10x1mL

S-4107-50-HX
S-4170-50-5HX

This standard is also available as 50µg/mL in n-hexane; units 1x1mL, 1x5mL, 10x1mL

Use this standard for system performance evaluation.

S-4424-50-PE
S-4424-50-5PE

**ISO 9377-2 Mod Standard Mixture of n-Alkanes + BTEX II
C7+C8+C9+C10+C20+C40+BTEX in n-Pentane**

Determination of Hydrocarbon Oil in Water Index

10 Analytes, each 50 µg/mL in n-pentane; units: 1x1mL, 1x5 mL, 10x1mL

| Chiron No. | Name | | Chiron No. | Name | |
|------------|--------------|-----|------------|----------------|-----|
| 1300.6 | Benzene | B | 1240.7 | n-Heptane | C7 |
| 1264.7 | Toluene | T | 1242.8 | n-Octane | C8 |
| 1268.8 | Ethylbenzene | E | 1245.9 | n-Nonane | C9 |
| 1267.8 | o-Xylene | o-X | 1875.10 | n-Decane | C10 |
| 1266.8 | m-Xylene | m-X | 1140.20 | n-Eicosane | C20 |
| 1265.8 | p-Xylene | p-X | 1160.40 | n-Tetracontane | C40 |

S-4395-50-PE
S-4395-50-5PE

**ISO 9377-2 Mod Standard Mixture of n-Alkanes + BTEX III
C7+C8+C9+C10-C40 (all even)+BTEX in n-Pentane**

Determination of Hydrocarbon Oil in Water Index

25 Analytes, each 50 µg/mL in n-pentane; units: 1x1mL, 1x5mL, 10x1mL

| Chiron No. | Name | | Chiron No. | Name | |
|------------|--------------|-----|------------|---------------|-----|
| 1300.6 | Benzene | B | 1138.18 | n-Octadecane | C18 |
| 1264.7 | Toluene | T | 1140.20 | n-Eicosane | C20 |
| 1268.8 | Ethylbenzene | E | 1142.22 | n-Docosane | C22 |
| 1267.8 | o-Xylene | o-X | 1144.24 | n-Tetracosane | C24 |
| 1266.8 | m-Xylene | m-X | 1146.26 | n-Hexacosane | C26 |
| 1265.8 | p-Xylene | p-X | 1148.28 | n-Octacosane | C28 |
| 1240.7 | n-Heptane | C7 | 1150.30 | n-Triacontane | C30 |



| | | | | | |
|---------|----------------|-----|---------|---------------------|-----|
| 1242.8 | n-Octane | C8 | 1152.32 | n-Dotriacontane | C32 |
| 1245.9 | n-Nonane | C9 | 1154.34 | n-Tetraatriacontane | C34 |
| 1875.10 | n-Decane | C10 | 1156.36 | n-Hexatriacontane | C36 |
| 1132.12 | n-Dodecane | C12 | 1158.38 | n-Octatriacontane | C38 |
| 1144.24 | n-Tetradecane | C14 | 1160.40 | n-Tetracontane | C40 |
| 1136.16 | n-Hexanedecane | C16 | | | |

S-4112-100MG

S-4112-1G

Petrochemical Calibration Mixture C6-C44, ASTM D 2887 and D 635218 Analytes, each 6.25 Wt.% in carbon disulfide (CS₂); units: 1x100mg, 1x1g neat.

Use for determining column resolution as well as for quantitative analysis.

| Chiron No. | Name | | Chiron No. | Name | |
|------------|---------------|-----|------------|---------------------|-----|
| 1232.6 | n-Hexane | C6 | 1138.18 | n-Octadecane | C18 |
| 1240.7 | n-Heptane | C7 | 1140.20 | n-Eicosane | C20 |
| 1242.8 | n-Octane | C8 | 1144.24 | n-Tetracosane | C24 |
| 1245.9 | n-Nonane | C9 | 1148.28 | n-Octacosane | C28 |
| 1875.10 | n-Decane | C10 | 1152.32 | n-Dotriacontane | C32 |
| 1131.11 | n-Undecane | C11 | 1156.36 | n-Hexatriacontane | C36 |
| 1132.12 | n-Dodecane | C12 | 1160.40 | n-Tetracontane | C40 |
| 1134.14 | n-Tetradecane | C14 | 1247.44 | n-Tetratetracontane | C44 |
| 1136.16 | n-Hexadecane | C16 | | | |

S-4149-500-MX

S-4149-500-5MX

Hydrocarbon Window Defining Standard C8-C40, ASTM D-2887 and D 635235 Analytes, each 500 µg/mL in CS₂:CH₂Cl₂ (3:1); units: 1x1mL, 1x5mL

| Chiron No. | Name | | Chiron No. | Name | |
|------------|-------------|-----|------------|-------------------|-----|
| 1242.8 | Octane | C8 | 1144.24 | Tetracosane | C24 |
| 1245.9 | Nonane | C9 | 1145.25 | Pentacosane | C25 |
| 1875.10 | Decane | C10 | 1146.26 | Hexacosane | C26 |
| 1131.11 | Undecane | C11 | 1147.27 | Heptacosane | C27 |
| 1132.12 | Dodecane | C12 | 1148.28 | Octacosane | C28 |
| 1133.13 | Tridecane | C13 | 1149.29 | Nonacosane | C29 |
| 1134.14 | Tetradecane | C14 | 1150.30 | Triacontane | C30 |
| 1135.15 | Pentadecane | C15 | 1151.31 | n-Hentriacontane | C31 |
| 1136.16 | Hexadecane | C16 | 1152.32 | Dotriacontane | C32 |
| 1137.17 | Heptadecane | C17 | 1153.33 | Tritriacontane | C33 |
| 1138.18 | Octadecane | C18 | 1154.34 | Tetraatriacontane | C34 |
| 0635.19 | Pristane | C19 | 1155.35 | Pentatriacontane | C35 |
| 1139.19 | Nonadecane | C19 | 1156.36 | Hexatriacontane | C36 |
| 0629.20 | Phytane | C20 | 1157.37 | Heptatriacontane | C37 |
| 1140.20 | Eicosane | C20 | 1158.38 | Octatriacontane | C38 |
| 1141.21 | Heneicosane | C21 | 1159.39 | Nonatriacontane | C39 |
| 1142.22 | Docosane | C22 | 1160.40 | Tetracontane | C40 |
| 1143.23 | Tricosane | C23 | | | |

Simulated distillation standard**SIM DIS**

Simulated Distillation (SIM DIS) and Proposed Motor Oil Volatility Method.

The standard can be used for normal temperature analytical requirements when generating boiling point versus retention time calibration curves.



S-4211-5ML

Stock SIM DIS Paraffin Solution (C5-C18)

14 Analytes, each Wt.% as listed; unit: 1x5 mL neat

| Chiron No. | Name | Wt.% | Chiron No. | Name | Wt.% |
|------------|------------|------|------------|---------------|--------|
| 1299.5 | n-Pentane | 6.66 | 1132.12 | n-Dodecane | 13..33 |
| 1232.6 | n-Hexane | 6.66 | 1134.14 | n-Tetradecane | 6.66 |
| 1240.7 | n-Heptane | 6.66 | 1135.15 | n-Pentadecane | 6.66 |
| 1242.8 | n-Octane | 6.66 | 1136.16 | n-Hexadecane | 6.66 |
| 1245.9 | n-Nonane | 6.66 | 1137.17 | n-Heptadecane | 6.66 |
| 1875.10 | n-Decane | 6.66 | 1138.18 | n-Octadecane | 6.66 |
| 1131.11 | n-Undecane | 6.66 | 1140.20 | n-Eicosane | 6.66 |

S-4152-100-CY

Quantitative Linearity Wax Mixture C16-C44, ASTM D 5442

12 Analytes, each 0.01 Wt. % in Cyclohexane; units: 1x1mL, 5x1mL

| Chiron No. | Name | | Chiron No. | Name | |
|------------|---------------|-----|------------|---------------------|-----|
| 1136.16 | n-Hexadecane | C16 | 1148.28 | n-Octacosane | C28 |
| 1138.18 | n-Octadecane | C18 | 1150.30 | n-Triacontane | C30 |
| 1140.20 | n-Eicosane | C20 | 1152.32 | n-Dotriacontane | C32 |
| 1142.22 | n-Docosane | C22 | 1156.36 | n-Hexatriacontane | C36 |
| 1144.24 | n-Tetracosane | C24 | 1160.40 | n-Tetracontane | C40 |
| 1146.26 | n-Hexacosane | C26 | 1247.44 | n-Tetratetracontane | C44 |

S-4139-500MG

Retention Time Wax Mixture C16-C44, ASTM D 5542

12 Analytes, each 8.3 Wt. %; unit: 1x500mg neat

Use this standard to establish the retention times from C16 to C44.

| Chiron No. | Name | | Chiron No. | Name | |
|------------|---------------|-----|------------|---------------------|-----|
| 1136.16 | n-Hexadecane | C16 | 1148.28 | n-Octacosane | C28 |
| 1138.18 | n-Octadecane | C18 | 1150.30 | n-Triacontane | C30 |
| 1140.20 | n-Eicosane | C20 | 1152.32 | n-Dotriacontane | C32 |
| 1142.22 | n-Docosane | C22 | 1156.36 | n-Hexatriacontane | C36 |
| 1144.24 | n-Tetracosane | C24 | 1160.40 | n-Tetracontane | C40 |
| 1146.26 | n-Hexacosane | C26 | 1247.44 | n-Tetratetracontane | C44 |

Other isoparaffin mixtures**NEW****2-methyl, 3-methyl and 4-methylalkane mixtures**

S-4434-100-4DC

Methylhydrocarbons Mixture C5-C8 (+phytane/pristane)

13 Analytes, each 100 µg/mL in dichloromethane; unit: 1x4.5mL Certan® bottle

| Chiron No. | Compound | CAS No. |
|------------|-----------------|------------|
| 1231.5 | 2-Methylbutane | [78-78-4] |
| 1235.6 | 2-Methylpentane | [107-83-5] |
| 1236.6 | 3-Methylpentane | [96-14-0] |
| 1238.7 | 2-Methylhexane | [591-76-4] |
| 1257.7 | 3-Methylhexane | [589-34-4] |
| 1243.8 | 2-Methylheptane | [592-27-8] |



| | | |
|---------|--------------------|-------------|
| 1872.8 | 3-Methylheptane | [589-81-1] |
| 1873.8 | 4-Methylheptane | [589-53-7] |
| 1249.6 | Methylcyclopentane | [96-37-7] |
| 1248.7 | Methylcyclohexane | [108-87-2] |
| 1870.8 | Methylcycloheptane | [4126-78-7] |
| 0635.19 | Pristane | [1921-70-6] |
| 0629.20 | Phytane | [638-36-8] |

Other naphthene mixtures

NEW**S-4438-K-IO****Alkylcycloalkane Mixture 1**

9 Analytes, each 1000µg/mL in isooctane; unit: 1x1.1mL

| Chiron No. | Compound | CAS.No. |
|------------|-------------------------|--------------|
| 2285.12 | n-Hexylcyclohexane | [4292-75-5] |
| 1044.13 | n-Heptylcyclohexane | [5617-41-4] |
| 0110.14 | n-Octylcyclohexane | [1795-15-9] |
| 1045.15 | n-Nonylcyclohexane | [2883-02-5] |
| 1046.16 | n-Decylcyclohexane | [1795-16-0] |
| 1071.17 | n-Undecylcyclohexane | [54105-66-7] |
| 1072.18 | n-Dodecylcyclohexane | [1795-17-1] |
| 1047.19 | n-Tridecylcyclohexane | [6006-33-3] |
| 1500.20 | n-Tetradecylcyclohexane | [1795-18-2] |

S-4439-K-IO**Alkylcycloalkane Mixture 2**

5 Analytes, each 1000µg/mL in isooctane; unit: 1x1.1mL

| Chiron No. | Compound | CAS.No. |
|------------|-------------------------|--------------|
| 1073.21 | n-Pentadecylcyclohexane | [6006-95-7] |
| 1871.22 | n-Hexadecylcyclohexane | [6812-38-0] |
| 1074.23 | n-Heptadecylcyclohexane | [19781-73-8] |
| 1501.24 | n-Octadecylcyclohexane | [4445-06-1] |
| 1048.25 | n-Nonadecylcyclohexane | [22349-03-7] |

BTEX and other aromatics mixtures

S-4342-100-ME**BTEX + BaP**

S-4342-100-50-ME

6 Analytes, each 100µg/mL in methanol; units: 1x1mL, 1x50mL

| Chiron No. | Compound | CAS No. |
|------------|----------------|------------|
| 1300.6 | Benzene | [71-43-2] |
| 1264.7 | Toluene | [108-88-3] |
| 1268.8 | Ethylbenzene | [100-41-4] |
| 1266.8 | m-Xylene | [108-38-3] |
| 1267.8 | o-Xylene | [95-47-6] |
| 0239.20 | Benzo[a]pyrene | [50-32-8] |

**S-4400-10K-2ME****BTX Mixture 1**

5 Analytes, each 10mg/mL in methanol; unit: 1x2mL

| Chiron No. | Compound | CAS No. |
|------------|----------|------------|
| 1300.6 | Benzene | [71-43-2] |
| 1264.7 | Toluene | [108-88-3] |
| 1267.7 | o-Xylene | [95-47-6] |
| 1265.8 | p-Xylene | [106-42-3] |
| 1266.8 | m-Xylene | [108-38-3] |

S-4257: BTX Mixture See the THP part in the Environmental section

S-4218: BTX Mixture See the THP part in the Environmental section

S-4219: BTX Mixture See the THP part in the Environmental section

S-4408-200-CY**S-4408-200-10CY****BTEX Mixture 4**

6 Analytes, each 200µg/mL in cyclohexane; units: 1x1mL, 1x10 mL

| Chiron No. | Compound | CAS No. |
|------------|--------------|------------|
| 1300.6 | Benzene | [71-43-2] |
| 1264.7 | Toluene | [108-88-3] |
| 1268.8 | Ethylbenzene | [100-41-4] |
| 1267.7 | o-Xylene | [95-47-6] |
| 1265.8 | p-Xylene | [106-42-3] |
| 1266.8 | m-Xylene | [108-38-3] |

S-4441-100-ME**BTEX Mixture 5**

5 Analytes, each 100µg/mL in methanol; unit: 1x5mL screw cap bottle

| Chiron No. | Compound | CAS No. |
|------------|--------------|------------|
| 1300.6 | Benzene | [71-43-2] |
| 1264.7 | Toluene | [108-88-3] |
| 1268.8 | Ethylbenzene | [100-41-4] |
| 1266.8 | m-Xylene | [108-38-3] |
| 1267.8 | o-Xylene | [95-47-6] |

S-4447-K-IO**n-Alkylbenzene Mixture**

16 Analytes, each 1000µg/mL in isooctane; unit: 1x1.1mL

| Chiron No. | Compound | CAS No. |
|------------|---------------------|-------------|
| 0392.10 | n-Butylbenzene | [104-51-8] |
| 2336.11 | n-Pentylbenzene | [538-68-1] |
| 0393.12 | n-Hexylbenzene | [1077-16-3] |
| 3508.13 | n-Heptylbenzene | [1078-71-3] |
| 0330.14 | n-Octylbenzene | [2189-60-8] |
| 1076.15 | n-Nonylbenzene | [1081-77-2] |
| 0331.16 | n-Decylbenzene | [104-72-3] |
| 1077.17 | n-Undecylbenzene | [6742-54-7] |
| 0332.18 | n-Dodecylbenzene | [123-01-3] |
| 1078.19 | n-Tridecylbenzene | [123-02-4] |
| 1079.20 | n-Tetradecylbenzene | [1459-10-5] |
| 1080.21 | n-Pentadecylbenzene | [2131-18-2] |

NEW



| | | |
|---------|---------------------|--------------|
| 1081.22 | n-Hexadecylbenzene | [1459-09-2] |
| 1082.23 | n-Heptadecylbenzene | [14752-75-1] |
| 1083.24 | n-Octadecylbenzene | [4445-07-2] |
| 1084.25 | n-Nonadecylbenzene | [29136-19-4] |

Other olefin mixtures

S-4138-1ML

Calibration mixture for olefins, ASTM D 6550

15 Analytes, each Wt.% as listed; units: 1x1mL, 5x1mL neat

| Chiron No. | Name | Wt.% | Chiron No. | Name | Wt.% |
|------------|------------------------|------|------------|-------------------------|------|
| 2645.9 | 1-Nonene | 2.5 | 2692.6 | 3-Methyl-1,3-pentadiene | 2.0 |
| 2650.6 | Cyclohexene | 5.0 | 2643.5 | 2-Methyl-1-butene | 25.0 |
| 2649.6 | 1-Hexene | 5.0 | 2681.6 | 2-Methyl-2-pentene | 10.0 |
| 2648.8 | 1-Octene | 5.0 | 2684.7 | 1-Heptene | 10.0 |
| 2642.10 | 1-Decene | 5.0 | 2682.9 | 2-Methyl-1-octene | 2.5 |
| 3038.5 | 2-Methyl-1,3-butadiene | 5.0 | 2644.8 | 2-Methyl-1-heptene | 5.0 |
| 2651.6 | 4-Methyl-1-pentene | 5.0 | 2683.7 | 5-Methyl-1-hexene | 10.0 |
| 2669.6 | 1,5-Hexadiene | 3.0 | | | |

O-PONA – oxygenates

S-4184-K-DD

Qualitative Standard MTBE, ASTM D 5441

32 Analytes, each 0.1 Wt.% in n-Dodecane; unit: 1x1mL

| | | | |
|--------|---------------------------|---------|---------------------------------|
| 1379.1 | Methanol | 2270.3 | Acetone |
| 1299.5 | n-Pentane | 1236.6 | 3-Methylpentane |
| 3017.5 | trans-2-Pentene | 3970.4 | Isobutylene |
| 3972.5 | sec-Butyl methyl ether | 2151.5 | tert-Butyl methyl ether |
| 3976.4 | n-Butane | 3036.8 | 2,4,4-Trimethyl-2-pentene |
| 2140.4 | tert-Butanol | 1231.5 | Isopentane |
| 2141.6 | Ethyl tert-butyl ether | 8031.6 | 2,3-Dimethyl-1-butene |
| 3978.4 | trans-2-Butene | 1303.8 | 3,4,4-Trimethyl-trans-2-pentene |
| 3016.5 | cis-2-Pentene | 8032.3 | 2-Propanol |
| 2142.6 | tert-Amyl methyl ether | 3023.6 | 4-Methyl-cis-2-pentene |
| 3979.4 | cis-2-Butene | 3035.8 | 2,3,4-Trimethyl-2-pentene |
| 3018.5 | 2-Methyl-2-butene | 3015.5 | 1-Pentene |
| 1304.8 | 3,5-Dimethyl-1-hexene | 1235.6 | 2-Methylpentane |
| 3019.5 | 3-Methyl-1-butene | 2643.5 | 2-Methyl-1-butene |
| 3040.5 | Cyclopentene | 1371.4 | Methyl ethyl ketone |
| 1244.8 | 2,4,4-Trimethyl-1-pentene | 1307.12 | 2,2,4,6,6-Pentamethyl-3-heptene |

S-4183-K-DD

Quantitative Standard, ASTM D 5441

28 Analytes, each 0.1 Wt.% in n-Dodecane; unit: 1x1mL

| | | | |
|--------|-------------------|--------|------------------------|
| 1379.1 | Methanol | 8031.6 | 2,3-Dimethyl-1-butene |
| 3019.5 | 3-Methyl-1-butene | 3023.6 | 4-Methyl-cis-2-pentene |
| 2270.3 | Acetone | 1235.6 | 2-Methylpentane |
| 1231.5 | Isopentane | 1371.4 | Methyl ethyl ketone |
| 8032.3 | 2-Propanol | 1236.6 | 3-Methylpentane |



| | | | |
|--------|-------------------------|---------|---------------------------------|
| 3015.5 | 1-Pentene | 3972.5 | sec-Butyl methyl ether |
| 2643.5 | 2-Methyl-1-butene | 2141.6 | Ethyl tert-butyl ether |
| 1299.5 | n-Pentane | 2142.6 | tert-Amyl methyl ether |
| 3017.5 | trans-2-Pentene | 1304.8 | 3,5-Dimethyl-1-hexene |
| 2140.4 | tert-Butanol | 1244.8 | 2,4,4-Trimethyl-1-pentene |
| 3016.5 | cis-2-Pentene | 3036.8 | 2,4,4-Trimethyl-2-pentene |
| 3018.5 | 2-Methyl-2-butene | 1303.8 | 3,4,4-Trimethyl-trans-2-pentene |
| 3040.5 | Cyclopentene | 3035.8 | 2,3,4-Trimethyl-2-pentene |
| 1251.5 | Methyl tert-butyl ether | 1307.12 | 2,2,4,6,6-Pentamethyl-3-heptene |

S-4162-10ML**Daily Quality Control Standard, ASTM D 5986**

(without Internal Standard)

13 Analytes, each Wt.% as listed; units: 1x10mL, 5x10 mL neat

| Name: | Wt. % | Name: | Wt. % | | |
|---------|-------------------------|-------|---------|-----------------------------|---|
| 1232.6 | n-Hexane | 12 | 1264.7 | Toluene | 9 |
| 1240.7 | n-Heptane | 17 | 1266.8 | m-Xylene | 3 |
| 1242.8 | n-Octane | 17 | 1267.8 | o-Xylene | 3 |
| 1875.10 | n-Decane | 12 | 1268.8 | Ethylbenzene | 3 |
| 1132.12 | n-Dodecane | 5 | 1270.9 | 1,2,4-Trimethylbenzene | 3 |
| 0443.8 | 2,2,4,-Trimethylpentane | 12 | 2158.10 | 1,2,4,5-Tetra-methylbenzene | 3 |
| 1300.6 | Benzene | 1 | | | |

S-4131-1ML**Validation mixture for oxygenates and PONA, ASTM D 6293**

33 Analytes; units: 1x1mL, 5x1mL neat

Use this standard to monitor and make adjustments to the total operation of the system.

| Name: | Wt. % | Name: | Wt. % | | |
|---------|----------------------------------|-------|---------|--------------------------------|-----|
| 1250.5 | Cyclopentane | 1.5 | 1233.6 | 2,3-Dimethylbutane | 2.0 |
| 1299.5 | n-Pentane | 1.5 | 1232.6 | n-Hexane | 2.0 |
| 1301.6 | Cyclohexane | 2.0 | 2649.6 | 1-Hexene | 1.5 |
| 3971.7 | 4-Methyl-1-hexene | 1.5 | 1248.7 | Methylcyclohexane | 3.5 |
| 1240.7 | n-Heptane | 3.0 | 1134.14 | n-Tetradecane | 2.0 |
| 1867.8 | cis-1,2-Dimethylcyclohexane | 4.5 | 1268.8 | Ethylbenzene | 3.5 |
| 0443.8 | 2,2,4-trimethylpentane | 4.0 | 1267.8 | o-Xylene | 3.0 |
| 1242.8 | n-Octane | 4.0 | 1298.9 | n-Propylbenzene | 3.5 |
| 3974.9 | c,c,c-1,2,4-Trimethylcyclohexane | 3.5 | 1279.9 | 1,2,4-Trimethylbenzene | 3.0 |
| 1245.9 | n-Nonane | 3.0 | 1274.9 | 1,2,3-Trimethylbenzene | 2.0 |
| 1875.10 | n-Decane | 3.5 | 2158.10 | 1,2,4,5-Tetramethylbenzene | 2.0 |
| 1131.11 | n-Undecane | 2.0 | 2159.11 | Pentamethylbenzene | 2.5 |
| 1132.12 | n-Dodecane | 2.0 | 1382.2 | Ethanol | 5.0 |
| 1300.6 | Benzene | 2.5 | 2140.4 | tert-Butanol | 4.0 |
| 1264.7 | Toluene | 2.5 | 2151.5 | MTBE (methyl tert-butyl ether) | 8.0 |
| 0718.10 | trans-Decahydronaphthalene | 3.5 | 2141.6 | ETBE (ethyl tert-butyl ether) | 3.0 |
| | | | 2142.6 | TAME (tert-amyl methyl ether) | 5.0 |



S-4404-K-AN

Phenone Mixture

9 Analytes, each 1000 μ g/mL in acetonitrile; unit: 1x1mL

| Chiron No. | Compound | CAS no. |
|------------|-----------------|-------------|
| 2754.8 | Acetanilide | [103-84-4] |
| 2751.8 | Acetophenone | [98-86-2] |
| 2749.9 | Propiophenone | [93-55-0] |
| 2758.10 | n-Butyrophenone | [495-40-9] |
| 2750.11 | Valerophenone | [1009-14-9] |
| 2752.12 | Hexanophenone | [942-92-7] |
| 2748.13 | Benzophenone | [119-61-9] |
| 2757.13 | Heptanophenone | [1671-75-6] |
| 2753.14 | Octanophenone | [1674-37-9] |

International methods

For details see the Methods section, pages 13 and onward (ISO) and 45 and onward (ASTM).

- ISO 9377-2 and the modified OSPAR method:
Determination of Hydrocarbon Oil in Water Index
- ASTM D 2887-06a: Determination Boiling Range Distribution of Petroleum Fractions
- ASTM D 3606-06e1: Determination of Benzene and Toluene in Finished Motor and Aviation Gasolines by GC
- ASTM D 3710-95 (2004) Determination of Boiling Range Distribution of Gasoline and Gasoline Fractions by GC
- ASTM D 4815-04 Determination of Ethers and Alcohols in Gasolines by GC
- ASTM D 5186-03 Determination of Aromatic Content & Polynuclear Aromatic Content by SFC
- ASTM D 5307-97 (2002) Determination of Boiling Range Distribution
- ASTM D 5441-98 (2003)e1 Determination of Purity of Methyl tert-Butyl Ether by GC
- ASTM D 5442-93 (2003)e1 Analysis of Petroleum Waxes
- ASTM D 5443-04 Determination of PNA in Distillates
- ASTM D 5580-02 Determination Aromatics in Gasoline
- ASTM D 5622-95 Quantitative Determination of Total Oxygen in Gasoline and Methanol by Reductive Pyrolysis
- ASTM D 5769-06 Determination of Benzene, Toluene, and Total Aromatics in Finished Gasolines by GC-MS
- ASTM D5986-96 (2006) Quantitative Determination of Oxygenates, Benzene, Toluene, C8-C12 Aromatics and Total Aromatics
- ASTM D 6293-98 (2003)e1 Quantitative Determination of O-P
- ASTM D 6296-98 (2003)e1 Quantitative determination of Olefins
- ASTM D 6352-04e1 Determination of the Boiling Range Distribution of Petroleum Distillate Fractions by GC
- ASTM D 6379-04 IP 436-98 Aromatic Hydrocarbon Types in Aviation Fuels and Petroleum Distillates by HPLC Refractive Index
- ASTM D 6550-00 Determination of Olefin Content
- ASTM D 6591-06 = IP 391-95 Aromatic Hydrocarbon Types in Diesel Fuels and Distillates by HPLC Refractive Index.



Sulfur content determination

Overview of the Chiron sulfur calibration mixtures

(S: Chiron Product No, D: ASTM-method)

| Matrix Compound | Light White Mineral Oil (3 cst) | Light White Mineral Oil (20cSt at 40°C) | Heavy White Mineral Oil (70cSt at 40°C) | Isooctane | Toluene | Xylene | Benzene |
|---------------------------------|---------------------------------------|---|---|----------------------------|--------------------------------|--------------------------------|------------------|
| Di-n-butyl sulfide | | S-4052 | S-4051 | S-4050 | Request | | |
| | | D 2622 D 4294 D 4927 | D 2622 D 4294 D 4927 | D 3120 D 3246 D 4927 | D 5453 | | |
| Thiophene | | | | | S-4053 S-4057 | | S-4059 |
| | | | | | D 6313 | | D 1685 D 4735 |
| Dibenzothiophene | S-4159 | | | S-4055 | | S-4054 S-4058 | |
| | D 5453 | | | D 5453 | | D 6428 | |
| Benzothiophene | | | | | Request | | |
| | | | | | D 5453 | | |
| 2-Bromothiophene | | | | S-4037 | | | |
| | | | | D 5623 | | | |
| 3-Chlorothiophene | | | | S-4036 | | | |
| | | | | D 5623 | | | |
| Diphenyl sulfide | | | | S-4035 | | | |
| | | | | D 5623 | | | |
| Thiophene/ 2-Methylthiophene | | | | S-4056 | | | |
| | | | | D 2622 | | | |



Sulfur calibration standards

| | |
|--------|---|
| S-4050 | Di-n-butyl sulfide in Isooctane |
| S-4051 | Di-n-butyl sulfide in Heavy White Mineral Oil (70 cSt at 40°C) |
| S-4052 | Di-n-butyl sulfide in Light White Mineral Oil (20 cSt at 40°C) Unit: 10 mL screw cap bottle |

| Chiron No. (Matrix) | | | Concentration | |
|---------------------|---|---|----------------|--------|
| Isooctane | Light White Mineral Oil (20 cSt at 40°C) | Heavy White Mineral Oil (70 cSt at 40°C) | µgS/g (ppm) | Wt. % |
| S-4050-0-IO | S-4052-0-LW | S-4051-0-HW | Blank | 0 |
| S-4050-1-IO | S-4052-1-LW | S-4051-1-HW | 1 | 0.0001 |
| S-4050-3-IO | S-4052-3-LW | S-4051-3-HW | 3 | 0.0003 |
| S-4050-5-IO | S-4052-5-LW | S-4051-5-HW | 5 | 0.0005 |
| S-4050-10-IO | S-4052-10-LW | S-4051-10-HW | 10 | 0.0010 |
| S-4050-20-IO | S-4052-20-LW | S-4051-20-HW | 20 | 0.0020 |
| S-4050-30-IO | S-4052-30-LW | S-4051-30-HW | 30 | 0.0030 |
| S-4050-50-IO | S-4052-50-LW | S-4051-50-HW | 50 | 0.0050 |
| S-4050-75-IO | S-4052-75-LW | S-4051-75-HW | 75 | 0.0075 |
| S-4050-100-IO | S-4052-100-LW | S-4051-100-HW | 100 | 0.0100 |
| S-4050-200-IO | S-4052-200-LW | S-4051-200-HW | 200 | 0.0200 |
| | S-4052-250-LW | S-4051-250-HW | 250 | 0.0250 |
| S-4050-300-IO | S-4052-300-LW | S-4051-300-HW | 300 | 0.0300 |
| S-4050-400-IO | S-4052-400-LW | S-4051-400-HW | 400 | 0.0400 |
| S-4050-500-IO | S-4052-500-LW | S-4051-500-HW | 500 | 0.0500 |
| S-4050-750-IO | S-4052-750-LW | S-4051-750-HW | 750 | 0.0750 |
| S-4050-K-IO | S-4052-K-LW | S-4051-K-HW | 1 000 | 0.1000 |
| S-4050-2K-IO | S-4052-2K-LW | S-4051-2K-HW | 2 000 | 0.2000 |
| | S-4052-2.5K-LW | S-4051-2.5K-HW | 2 500 | 0.2500 |
| S-4050-3K-IO | S-4052-3K-LW | S-4051-3K-HW | 3 000 | 0.3000 |
| | S-4052-4K-LW | S-4051-4K-HW | 4 000 | 0.4000 |
| | S-4052-5K-LW | S-4051-5K-HW | 5 000 | 0.5000 |
| | S-4052-7K-LW | S-4051-7K-HW | 7 000 | 0.7000 |
| | S-4052-10K-LW | S-4051-10K-HW | 10 000 | 1.000 |
| | S-4052-20K-LW | S-4051-20K-HW | 20 000 | 2.000 |
| | S-4052-25K-LW | S-4051-25K-HW | 25 000 | 2.500 |
| | S-4052-30K-LW | S-4051-30K-HW | 30 000 | 3.000 |
| | S-4052-40K-LW | S-4051-40K-HW | 40 000 | 4.000 |
| | S-4052-50K-LW | S-4051-50K-HW | 50 000 | 5.000 |
| | S-4052-60K-LW | S-4051-60K-HW | 60 000 | 6.000 |
| S-4050-Kit | S-4052-Kit | S-4051-Kit | Kit of above | |



S-4053

Thiophene in Toluene

Units: 5x1mL ampoule, 1x10 mL screw cap bottle

| Chiron No. | Concentration µgS/g (ppm) | Wt. % |
|-------------------|--------------------------------------|--------------|
| S-4053-0 | Blank | 0 |
| S-4053-K | 1 000 | 0.1000 |
| S-4053-2.5K | 2 500 | 0.2500 |
| S-4053-5K | 5 000 | 0.5000 |
| S-4053-7.5K | 7 500 | 0.7500 |
| S-4053-10K | 10 000 | 1.0000 |
| S-4053-20K | 20 000 | 2.0000 |
| S-4053-30K | 30 000 | 3.0000 |
| S-4053-40K | 40 000 | 4.0000 |
| S-4053-50K | 50 000 | 5.0000 |
| S-4053-Kit | Kit of above | |

S-4059

Thiophene in Thiophene-free Benzene (ASTM D 4735-96)

Units: 1x1mL ampoule, 1x10mL screw cap bottle

| Chiron No. | Concentration µg thiophene/g (ppm) | Wt. % |
|-------------------|---|--------------|
| S-4059-0 | Blank | 0 |
| S-4059-0.5 | 0.5 | 0.00005 |
| S-4059-1 | 1.0 | 0.00010 |
| S-4059-2 | 2.0 | 0.00020 |
| S-4059-4 | 4.0 | 0.00040 |
| S-4059-Kit | Kit of above solutions | |

S-4056

Thiophene/2-Methylthiophene

(2:1) in isoctane/Toluene(3:1); Units: 5x1mL ampoules, 1x10 mL screw cap bottle

| Chiron No. | Concentration µgS/g (ppm) | Wt. % |
|-------------------|--------------------------------------|--------------|
| S-4056-0 | Blank | 0 |
| S-4056-5 | 5 | 0.0005 |
| S-4056-10 | 10 | 0.0010 |
| S-4056-25 | 25 | 0.0025 |
| S-4056-50 | 50 | 0.0050 |
| S-4056-75 | 75 | 0.0075 |
| S-4056-100 | 100 | 0.0100 |
| S-4056-250 | 250 | 0.0250 |
| S-4056-500 | 500 | 0.0500 |
| S-4056-750 | 750 | 0.0750 |
| S-4056-K | 1 000 | 0.1000 |
| S-4056-Kit | Kit of above solutions | |



S-4055
S-4054
S-4159

Dibenzothiophene in Isooctane
Dibenzothiophene in Xylene
Dibenzothiophene in White Oil 3 cSt
Units: 5x1mL ampoule, 1x10mL screw cap bottle

| Chiron No. (Matrix) | | | Concentration | |
|---------------------|----------------|-----------------|------------------------|---------|
| Isooctane | Xylene | White oil 3 cst | µgS/g (ppm) | Wt.% |
| S-4055-0-IO | S-4054-0-XY | S-4159-0-3C | Blank | 0 |
| S-4055-1-IO | | S-4159-1-3C | 1 | 0.0001 |
| S-4055-2.5-IO | | S-4159-2.5-3C | 2.5 | 0.00025 |
| S-4055-5-IO | | S-4159-5-3C | 5 | 0.0005 |
| S-4055-25-IO | | S-4159-25-3C | 25 | 0.0025 |
| S-4055-50-IO | | S-4159-50-3C | 50 | 0.0050 |
| S-4055-100-IO | | S-4159-100-3C | 100 | 0.0100 |
| S-4055-500-IO | | S-4159-500-3C | 500 | 0.0500 |
| S-4055-K-IO | S-4054-K-XY | S-4159-K-3C | 1 000 | 0.1000 |
| | S-4054-2.5K-XY | S-4159-2.5K-3C | 0.2500 | |
| | S-4054-5K-XY | | 5 000 | 0.5000 |
| | S-4054-7.5K-XY | S-4159-7K-3C | 0.7500 | |
| | S-4054-10K-XY | | 10 000 | 1.0000 |
| | S-4054-20K-XY | | 20 000 | 2.0000 |
| | S-4054-30K-XY | | 30 000 | 3.0000 |
| | S-4054-40K-XY | | 40 000 | 4.0000 |
| S-4055-Kit | S-4054-Kit | S-4159-Kit | Kit of above solutions | |

Internal standards for GC analysis

S-4035
S-4037
S-4036

Diphenylsulfide in Isooctane
2-Bromothiophene in Isooctane
3-Chlorothiophene in Isooctane
Units: 5x1mL ampoule, 1x10mL screw cap bottle

| Chiron No. | | | Concentration | |
|-------------------|------------------|-------------------|---------------|------|
| Matrix: Isooctane | | | µgS/g (ppm) | Wt.% |
| Diphenyl sulfide | 2-Bromothiophene | 3-Chlorothiophene | | |
| S-4035-0-IO | S-4037-0-IO | S-4036-0-IO | Blank | 0 |
| S-4035-K-IO | S-4037-K-IO | S-4036-K-IO | 1 000 | 0.1 |
| S-4035-5K-IO | S-4037-5K-IO | S-4036-5K-IO | 5 000 | 0.5 |
| S-4035-10K-IO | S-4037-10K-IO | S-4036-10K-IO | 10 000 | 1.0 |

Labelled standards for GC-MS analysis

| | | |
|---------------|--------------------------|-------------------------|
| 1068.4-500MG | Thiophene-d4 | 0.5 g neat |
| 0383.12-100-T | Dibenzothiophene-d8 | 100 µg/mL in toluene |
| 1692.12-K-IO | 2-Fluorodibenzothiophene | 1000 µg/mL in isooctane |



Standards by ASTM methods

- ASTM D 1685-05 Standard Test Method for Traces of Thiophene in Benzene by Spectrophotometry
- ASTM D 2622-05 Standard Test Method for Sulfur in Petroleum Products by X-Ray Spectrometry
- ASTM D 3120-06e1 Standard Test Method for Trace Quantities of Sulfur in Light Liquid Petroleum Hydrocarbons by Oxidative Microcoulometry
- ASTM D 3246-05 Standard Test Method for Sulfur in Petroleum by Oxidative Microcoulometry
- ASTM D 4294-03 Standard Test method for Sulfur in Petroleum Products by Energy-Dispersive X-ray Fluorescence Spectroscopy
- ASTM D 4735-02 Standard Test Method for Determination of Trace Thiophene in Refined Benzene by Gas Chromatography
- ASTM D 4951-06 Standard Test Method for Determination of Additive Elements in Lubricating Oils by Inductively Coupled Plasma Atomic Emission Spectrometry
- ASTM D 5453-06 Standard Test Method for Determination of Total Sulfur in Light Hydrocarbons, Motor Fuels and Oils Ultraviolet Fluorescence
- ASTM D 5623-94 (2004)e1 Standard Test Method for Sulfur Compounds in Light Petroleum Liquids by Gas Chromatography and Sulfur Selective Detection
- ASTM D 5623 Sulfur Compounds Standard I and II, see below for details
- ASTM D 6313-99 Standard Test Method for Total Sulfur in Aromatic Compounds by Hydrogenolysis and Sulfur Specific Difference Photometry
- ASTM D 6920-03 Standard Test Method for Total Sulphur in Napthenes, Distillates, Reformulated Gasolines, Diesels, Biodiesels, and Motor Fuels by Oxidative Combustion and Electrochemical Detection (Please inquire)

ASTM D 5623-94 (2004)e1

S-4039-1ML

Sulfur Compounds Standard I

14 Analytes, approximately 7,14 % of each (by weight); unit: 1x1 mL neat

Chiron No. Compound

| | |
|--------|-------------------------|
| 0184.2 | Ethandiol |
| 0185.2 | Dimethyl disulphide |
| 0186.1 | Carbon disulphide |
| 0188.4 | 2-Methyl-2-propanethiol |
| 0189.3 | 1-Propanethiol |
| 0190.3 | Ethylmethyl sulfide |
| 0933.4 | Thiophene |
| 0192.4 | 2-Methyl-1-propanethiol |
| 0193.4 | Diethyl sulfide |
| 0194.4 | 1-Butanethiol |
| 0195.5 | Dimethyl disulfide |
| 0934.5 | 2-Methylthiophene |
| 0935.5 | 3-Methylthiophene |
| 0196.4 | Diethyl disulfide |



S-4040-K-IO

Sulfur Compounds Standard II

7 Analytes, each 1000 μ g/mL in isooctane; unit: 1x1 mL

Chiron No. Compound

| | |
|---------|------------------------|
| 0946.9 | 2-Methylbenzothiophene |
| 0947.9 | 3-Methylbenzothiophene |
| 0198.9 | 4-Methylbenzothiophene |
| 0356.9 | 5-Methylbenzothiophene |
| 0199.9 | 6-Methylbenzothiophene |
| 0951.9 | 7-Methylbenzothiophene |
| 0907.12 | Diphenyl sulfide |

Special sulfur solutions

S-4072

Sulfur Standard 1

Unit: 10 mL screw cap bottle

Chiron No.

Matrix: Methanol

S-4072

Compound

Diethyl sulfide

Di-n-butyl sulfide

Concentration

0.5 ppm (w/w)

0.5 ppm (w/w)

S-4073

Sulfur Standard 2

Unit: 10 mL screw cap bottle

Chiron No.

Matrix: Methanol

S-4073

Compound

Di-n-propyl sulfide

Di-n-butyl sulfide

Concentration

0.5 ppm (w/w)

0.5 ppm (w/w)

S-4078

Sulfur Calibration Standard

Unit: 10 mL screw cap bottle or custom-made cylinders

Chiron No.

Matrix: Methanol

S-4078

Compound

Dimethyl sulfide

Methylethyl sulfide

Thiophene

Concentration

5 ppm (w/w)

5 ppm (w/w)

5 ppm (w/w)



S-4082-1-10IO
 S-4082-2.5-10IO
 S-4082-5-10IO
 S-4082-7.5-10IO
 S-4082-10-10IO

Chisulfmix/1C

10 Analytes, each in 5 different concentrations in isooctane as listed below; units: 5x10mL, one of each concentration

Chiron No. Compound

| | |
|--------|-------------------------|
| 0082.5 | Isoamyl mercaptan |
| 0086.6 | Hexathiol |
| 0090.8 | Octanethiol |
| 1014.4 | Methyl propyl disulfide |
| 0196.4 | Diethyl disulfide |
| 0190.3 | Methylethyl sulfide |
| 1002.6 | Dipropyl sulfide |
| 0933.4 | Thiophene |
| 0934.5 | 2-Methylthiophene |
| 0938.8 | Benzothiophene |

Concentration

| µgS/g (ppm) | Wt.% |
|--------------------|-------------|
| 1 | 0.0001 |
| 2.5 | 0.00025 |
| 5 | 0.0005 |
| 7.5 | 0.00075 |
| 10 | 0.0010 |

S-4070-50-5T

High Boiling Sulfur in Toluene for Diesel Fuel Analysis 1

50 ppm S in sulphur-free Toluene; unit: 1x5mL vials

Benzo[b]naphtho[2,1-d]thiophene (0485,16) +
 Benzo[b]naphtho[2,3-d]thiophene (0484,16) (1:1)

S-4071-50-5T

High Boiling Sulfur in White Oil for Diesel Fuel Analysis 2

50 ppm S in sulfur-free White Oil (20 cst); units: 1x5mL vials

Benzo[b]naphtho[2,1-d]thiophene (0485,16) +
 Benzo[b]naphtho[2,3-d]thiophene (0484,16) (1:1)

Custom prepared sulfur standard-mixtures

| Compound | Matrix | Select your preferred matrix (Solvent or white mineral oil with preferred viscosity) |
|---|---------------|---|
| Select the analytes you prefer. Pick from the Chiron Sulfur Guide. Request alternative combinations to those given above. | | Please Specify: <ul style="list-style-type: none"> - Concentration (e.g. ppmS, mg/g or µg/mL) or set of concentration for calibration mixtures. - Number of and size of vials - Type of packaging (ampoules, bottles etc.) |



Methods used for sulfur analysis

| Abbr. | Method | ASTM-method | Application | Chiron No. |
|--------------|--|---------------------|--|----------------------------|
| 1. GC | Gas Chromatography and Sulfur Selective Detection | D 5623-94 (2004) e1 | Light Petroleum | S-4035 – S-4040 |
| | Gas Chromatography and Chemiluminescence | D 5504-01(2006) | Natural Gas | Please request |
| | Gas Chromatography and Flame Photometric Detection | D 6228 | Natural gas | Please request |
| | Gas Chromatography | D 4735-02 | Thiophene in Benzene | S-4059 |
| 2. GC-MS | Coupled Gas Chromatography Mass Spectrometry | D 5739-06 | Oil Spill Source Identification | S-4041, S-4042, 1027.12 |
| 3. ICP-AES | Inductively Coupled Plasma Atomic Emission Spectroscopy | D 4951-06 | Additives in Lubr. Oils | NIST SRM 1622 in white oil |
| 4. | Oxidative Microcoulometry | D 3120-06e1 | Light Petroleum Hydrocarbons | S-4052 |
| | Oxidative Microcoulometry | D 3246-05 | Petroleum Gas | S-4052 |
| 5. XRF | Wavelength Dispersive X-Ray Fluorescence | D 2622-05 | Petroleum | S-4050, S-4051, S-4056 |
| | Wavelength Dispersive X-Ray Fluorescence | D 6443-04 | Unused Lubricating Oils and Additives | Please request |
| | Wavelength Dispersive X-Ray Fluorescence | D 4927-05 | Unused Lubricating Oils | S-4050, S-4051, S-4052 |
| | Wavelength Dispersive X-Ray Fluorescence Spectroscopy | D 6334-98(2003)e1 | Gasoline | Please request |
| 6. EDXRF | Energy Dispersive X-Ray Fluorescence Spectroscopy | D 4294-03 | Petroleum Products | S-4050, S4051 |
| | Energy Dispersive X-Ray Fluorescence Spectroscopy | D 6445-99(2004)e1 | Gasoline | Please request |
| 7. | Ultraviolet Fluorescence | D 5453-06 | Light Hydrocarbons, Motor Fuels and Oils | S-4055 |
| 8. | Hydrogenolysis and Sulfur Specific Difference Photometry | D 6313-99 | Aromatic Hydrocarbons | S-4057 |
| 9. | Lamp Method | D 1266-98(2003)e1 | Liquefied Petroleum Gas | |
| 10. | General Bomb Method | D 129-00(2005) | Petroleum Products, Lubricating Oils and Greases | |
| 11. | Doctor Test | D 4952-02(2007) | Mercaptans in Motor Fuels | |
| 12. | High-Temperature method | D 1552-03 | Petroleum Products | |
| 13. | Potentiometric method | D 3227-04a | Mercaptan in Gasolines, Kerosines etc. | |
| 14. | Spectrophotometry | D 1685-05 | Thiophene in Benzene | S-4059, Request |

Nitrogen content determination

ASTM D 4629-02 Standard Test Method for Trace Nitrogen in Liquid Petroleum Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection.

See the Methods section, page 51.



S-4140

Nitrogen Calibration Set-Low Boiling Solvents

Unit: 1x1 mL ampoules or 10 mL screw cap bottle

Nitrogen introduced using Pyridine

| Chiron No. | Concentration |
|--------------------------|----------------------|
| Matrix: isooctane | mg/kg (ppm) |
| S-4140-0-IO | Blank |
| S-4140-0.3-IO | 0.3 |
| S-4140-1.0-IO | 1.0 |
| S-4140-10-IO | 10 |
| S-4140-25-IO | 25 |
| S-4140-50-IO | 50 |
| S-4140-75-IO | 75 |
| S-4140-100-IO | 100 |

S-4141

Nitrogen Calibration Set-High Boiling Solvents

Unit: 1x1mL ampoules or 10 mL screw cap bottle

Nitrogen introduced using Carbazole

| Chiron No. | Concentration |
|--------------------------|----------------------|
| Matrix: isooctane | mg/kg (ppm) |
| S-4141-0-IO | Blank |
| S-4141-0.3-IO | 0.3 |
| S-4141-1.0-IO | 1.0 |
| S-4141-10-IO | 10 |
| S-4141-25-IO | 25 |
| S-4141-50-IO | 50 |
| S-4141-75-IO | 75 |
| S-4141-100-IO | 100 |

S-4142

Low level Nitrogen Calibration

Unit: 1x1mL ampoules or 10 mL screw cap bottle

Nitrogen introduced using Aniline

| Chiron No. | Concentration |
|--------------------------|----------------------|
| Matrix: isooctane | mg/kg (ppm) |
| S-4142-0-IO | Blank |
| S-4142-0.5-IO | 0.5 |
| S-4142-1.0-IO | 1.0 |
| S-4142-2.0-IO | 2.0 |
| S-4142-5.0-IO | 5.0 |
| S-4142-10.0-IO | 10.0 |

S-4143

Low level Nitrogen & Sulfur Calibration Set

Unit: 1x1mL ampoules or 10 mL screw cap bottle

Nitrogen introduced using Aniline / Sulfur introduced using di-n-Butyl Sulfide

| Chiron No. | Concentration |
|------------------------|----------------------|
| Matrix: Benzene | mg/kg (ppm) |
| S-4143-0-B | Blank |
| S-4143-0.25-B | 0.25 |
| S-4143-0.50-B | 0.50 |
| S-4143-1.00-B | 1.00 |



Phosphorous standards

NEW

Phosphorus in Light White Mineral Oil

Tri-n-butylphosphate, 99+% (Chiron product nr. 1399.19)
CAS [126-73-8]

Matrix: Isooctane or Light White Mineral Oil, 20cSt

Units: 1x25 mL, 1x100 mL

| Isooctane | Light White Mineral Oil 20 cSt | Concentration ppm |
|------------------|---|------------------------------|
| S-4502-0-10IO | S-4503-0-10LM | Blanc |
| S-4502-1-10IO | S-4503-1-10LM | 1 |
| S-4502-2-10IO | S-4503-2-10LM | 2 |
| S-4502-3-10IO | S-4503-3-10LM | 3 |
| S-4502-5-10IO | S-4503-5-10LM | 5 |
| S-4502-10-10IO | S-4503-10-10LM | 10 |
| S-4502-20-10IO | S-4503-20-10LM | 20 |
| S-4502-30-10IO | S-4503-30-10LM | 30 |
| S-4502-50-10IO | S-4503-50-10LM | 50 |
| S-4502-75-10IO | S-4503-75-10LM | 75 |
| S-4502-100-10IO | S-4503-100-10LM | 100 |
| S-4502-200-10IO | S-4503-200-10LM | 200 |
| S-4502-250-10IO | S-4503-250-10LM | 250 |
| S-4502-300-10IO | S-4503-300-10LM | 300 |
| S-4502-400-10IO | S-4503-400-10LM | 400 |
| S-4502-500-10IO | S-4503-500-10LM | 500 |
| S-4502-750-10IO | S-4503-750-10LM | 750 |
| S-4502-K-10IO | S-4503-K-10LM | 1 000 |
| S-4502-2K-10IO | S-4503-2K-10LM | 2 000 |
| S-4502-2.5K-10IO | S-4503-2.5K-10LM | 2 500 |
| S-4502-3K-10IO | S-4503-3K-10LM | 3 000 |
| S-4502-4K-10IO | S-4503-4K-10LM | 4 000 |
| S-4502-5K-10IO | S-4503-5K-10LM | 5 000 |
| S-4502-7K-10IO | S-4503-7K-10LM | 7 000 |
| S-4502-10K-10IO | S-4503-10K-10LM | 10 000 |
| S-4502-20K-10IO | S-4503-20K-10LM | 20 000 |
| S-4502-25K-10IO | S-4503-25K-10LM | 25 000 |
| S-4502-30K-10IO | S-4503-30K-10LM | 30 000 |
| S-4502-40K-10IO | S-4503-40K-10LM | 40 000 |
| S-4502-50K-10IO | S-4503-50K-10LM | 50 000 |
| S-4502-60K-10IO | S-4503-60K-10LM | 60 000 |
| S-4502-Kit | S-4503-Kit | Kit of above |

Also available in Heavy White Mineral Oil, 70cSt (S-4504), cf. EN-14107.



Organophosphates

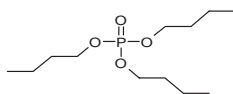
NEW

Standards for Hydraulic Fluid Analysis

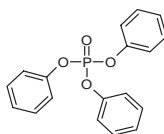
Organophosphates are extensively used in hydraulic fluids. Recent alarming reports have shown that organophosphates have neurotoxic effects.

| Chiron No. | Name | Abbr. | CAS No. |
|------------|--------------------------------------|------------|------------|
| 1400.3 | Trimethylphosphate | TMP | 512-56-1 |
| 8026.6 | Triethylphosphate | | 78-40-0 |
| 8027.9 | Tripropylphosphate | | 513-08-6 |
| 3966.12 | Triisobutylphosphate | TiBP | 126-71-6 |
| 1399.12 | Tri-n-butylphosphate | TnBP (TBP) | 126-73-8 |
| 2138.18 | Triphenylphosphate | TPP | 115-86-6 |
| 3967.19 | Tolyldiphenylphosphate | | 26444-49-5 |
| 2137.21 | Tritolylphosphate (isomeric mixture) | TTP | 1330-78-5 |
| 2135.21 | Tri-o-tolylphosphate | ToTP | 78-30-8 |
| 2134.21 | Tri-m-tolylphosphate | TmTP | 563-04-2 |
| 2136.21 | Tri-p-tolylphosphate | TpTP | 78-32-0 |
| 3687.11 | Phosphate Kit | | |

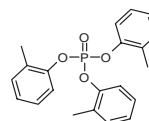
1g neat or 1000 µg/mL in isooctane solution, 1.1 mL



1399.12



2138.18



2135.21

Petrochemical products

Methanol, quality control standards

S-4043-100-10ME

Methanol QC Reference Mixture I

4 Analytes, each 100 ppm dissolved in 99.9 % methanol; units: 1x10mL, 10x10mL

| Chiron No. | Name | Chiron No. | Name |
|------------|------------|------------|-------------|
| 2270.3 | Acetone | 1382.2 | Ethanol |
| 1371.4 | 2-Butanone | 1320.3 | Isopropanol |

S-4044-200-10ME

Methanol QC Reference Mixture II

10 Analytes, each 200 ppm in 99.9 % methanol; units: 1x10mL, 5x10mL

| Chiron No. | Name | Chiron No. | Name |
|------------|----------------|------------|-------------|
| 1381.2 | Methyl formate | 1370.5 | 3-Pentanone |
| 1377.4 | 2-Butanol | 1373.7 | 1-Heptanol |
| 1375.3 | 1-Propanol | 1374.5 | 1-Pentanol |
| 1378.6 | 1-Hexanol | 1382.2 | Ethanol |
| 1372.8 | 1-Octanol | | |



S-4045-05-10ME **Methanol QC Reference Mixture III**
n-Butyl sulfide, 0.5 ppm (weight S by weight) in 99.9 % methanol; units: 1x10mL, 5x10mL

S-4088-200-10ME **Methanol QC Reference Mixture IV**
11 Analytes, each 200 ppm in methanol (Spectrograde); unit: 10x10mL

| Chiron No. | Name | Chiron No. | Name |
|------------|----------------|------------|-------------|
| 1381.2 | Methyl formate | 1370.5 | 3-Pentanone |
| 1381.2 | 2-Butanol | 1373.7 | 1-Heptanol |
| 1375.3 | 1-Propanol | 1374.5 | 1-Pentanol |
| 1376.4 | 1-Butanol | 1382.2 | Ethanol |
| 1378.6 | 1-Hexano | 1369.6 | 3-Hexanone |
| 1372.8 | 1-Octanol | | |

S-4049-005-10ME **Methanol QC Reference mixture V**
Trimethylamine, 50 ppb (weight by weight), in methanol; Unit: 10x10mL

Xylene, analysis by GC

S-4270 **p-Xylene Impurity Standard with Internal Standards**
ASTM D 3798-03, see the Methods section, page 50.
Units: 1x1mL, 5x1mL + ISTD

| Chiron No. | Name | Wt. % | Name | Wt. % | |
|------------|-------------------|-------|--------|---------------|-------|
| 1299.5 | n-Pentane | 0.15 | 1265.8 | p-Xylene | 98.65 |
| 1242.8 | n-Octane | 0.15 | 1266.8 | m-Xylene | 0.15 |
| 1300.6 | Benzene | 0.15 | 1267.8 | o-Xylene | 0.15 |
| 1264.7 | Toluene | 0.15 | 2155.9 | Cumene | 0.15 |
| 1268.8 | Ethylbenzene | 0.15 | 1298.9 | Propylbenzene | 0.15 |
| 1131.11 | n-Undecane (ITSD) | 0.5 g | | | |

Benzene, Thiophene in benzene, see ASTM D 4735-02, the Methods section, page 52.

Biodiesel fuels

Biodiesel is produced from vegetable oils, animal and fish fats and recycled grease from restaurants. Biodiesel is methyl esters of fatty acids and are used alone or blended with petroleum based fuels.

New international standards test methods for biodiesel are EN 14078, EN 14103, EN 14105 and ASTM D 6584. The complete requirements of biodiesel fuels are given in EN 14214.

These methods enable the quantitative determination of free and total glycerine by gas chromatography after silylation with MSTFA.

Derivatizing agent

| Cat.no. | Description | Package Size |
|------------|---|--------------|
| 1941.6-1ML | N-methyl-N-trimethylsilyltrifluoroacetamide (MSTFA) | 1 mL |
| 1941.6-5G | N-methyl-N-trimethylsilyltrifluoroacetamide (MSTFA) | 5 g |



Internal standards

Internal standards for EN 14105 and ASTM D 6584:

| | | |
|-----------------|---|-------|
| 3642.4-1ML | 1,2,4-Butanetriol (Internal Standard No. 1) | 1 mL |
| 3642.4-K-10PY | Internal Standard No. 1 stock solution 1000µg/mL in dry pyridine | 10 mL |
| 3643.33-1ML | 1,2,3-Tricaproylglycerol (tricarpin, Internal Standard No. 2) | 1 mL |
| 3643.33-K-10PY | Internal Standard No. 2 stock solution 1000µg/mL in dry pyridine | 10 mL |
| 3643.33-8K-10PY | Internal Standard No. 2 stock solution 8000µg/mL in dry pyridine | 10 mL |

Internal standards for EN 14103:

| | | |
|------------------|--|-------|
| 3165.18-10K-30HP | Methyl heptadecanoate, EN 14103 10 mg/mL in n-heptane | 30 mL |
|------------------|--|-------|

Reference substances (EN 14105/ASTM D 6584)

| | | |
|-----------------|--|------------|
| 3644.3-500-10PY | Glycerol stock solution 500µg/mL in dry pyridine | 10 mL |
| 3645.21-5K-10PY | 1-Monooleoylglycerol (monoolein) stock solution 5000µg/mL in dry pyridine | 10 mL |
| 3646.39-5K-10PY | 1,3-Dioleoylglycerol (diolein) stock solution 5000µg/mL in dry pyridine | 10 mL |
| 3647.57-5K-10PY | 1,2,3-Trioyleoylglycerol (triolein) stock solution 5000µg/mL each in dry pyridine | 10 mL |
| S-4497-10K-10PY | Monoglycerides 3 analytes, each 10 mg/mL in dry pyridine | 10 mL |
| 3648.19 | Monopalmitoylglycerol (monopalmitin) | [542-44-9] |
| 3649.21 | Monostearoylglycerol (monostearin) | [123-94-4] |
| 3650.21 | Monooleoylglycerol (monoolein) | [111-03-5] |

S-4475-10K-10PY

Monoglycerides

4 analytes, each 10 mg/mL in dry pyridine; unit: 1x10 mL

| | | |
|---------|--------------------------------------|-------------|
| 3648.19 | Monopalmitoylglycerol (monopalmitin) | [542-44-9] |
| 3649.21 | Monostearoylglycerol (monostearin) | [123-94-4] |
| 3650.21 | Monooleoylglycerol (monoolein) | [111-03-5] |
| 3833.21 | Monolinoylglycerol (monolinolein) | [2277-28-3] |

Standard for EN 14078

S-4495-SET-10CY

FAME as linoleic acid methyl ester (Chiron No. 3268.19)

1, 2, 4, 6, and 10 g/L in cyclohexane; unit: 5x10mL



Standard for EN 14103

S-4496-100-AC

FAME EN 14103 Reference Mixture (rape seed methyl esters)

13 analytes, each 100µg/mL in acetone; unit: 1x1mL

| | | | |
|---------|-----------------------|-------|-------------------|
| 3164.17 | Palmitic | C16 | |
| 3262.17 | Palmitolic | C16:1 | |
| 3165.18 | Heptadecanoic | C17 | Internal standard |
| 1398.19 | Steraric | C18 | |
| 3273.19 | Oleic | C18:1 | |
| 3268.19 | Linoleic | C18:2 | |
| 3266.19 | Linolenic | C18:3 | |
| 3169.21 | Arachdic | C20 | |
| 3232.21 | Eicosenoic acid (11c) | C20:1 | |
| 3171.23 | Behenic | C22 | |
| 3299.23 | Erucic | C22:1 | |
| 3173.25 | Lignoceric | C24 | |
| 3302.25 | Nervonic | C24:1 | |

Calibration solutions

S-4500-SET

Calibration solutions (EN 14105)

| Calibration solution | 1 | 2 | 3 | 4 | Syringe, µL |
|-----------------------------------|-----|-----|-----|-----|-------------|
| µL of glycerol solution | 10 | 40 | 70 | 100 | 100 |
| µL of monoolein solution | 50 | 120 | 190 | 250 | 500 |
| µL of diolein solution | 10 | 40 | 70 | 100 | 100 |
| µL of triolein solution | 10 | 30 | 60 | 80 | 100 |
| µL of internal standard sol. No.1 | 80 | 80 | 80 | 80 | 100 |
| µL of internal standard sol. No.2 | 100 | 100 | 100 | 100 | 500 |

S-4501-SET

Calibration solutions (ASTM D 6584)

| Calibration solution | 1 | 2 | 3 | 4 | Syringe, µL |
|-----------------------------------|-----|-----|-----|-----|-------------|
| µL of glycerol solution | 10 | 30 | 50 | 70 | 100 |
| µL of monoolein solution | 20 | 50 | 100 | 150 | 200 |
| µL of diolein solution | 10 | 20 | 40 | 70 | 100 |
| µL of triolein solution | 10 | 20 | 40 | 70 | 100 |
| µL of internal standard sol. No.1 | 100 | 100 | 100 | 100 | 100 |
| µL of internal standard sol. No.2 | 100 | 100 | 100 | 100 | 100 |

International methods:

For details, see the Methods section, pages 45 and onward (ASTM) and 40 and onward (EN).

- ASTM D 6584-07
- EN 14078:2004
- EN 14103:2003
- EN 14105:2003
- EN 14214:2003

Determination of Free and Total Glycerine in B-100 Biodiesel Methyl Esters by GC

Determination of fatty acid methyl esters (FAME) in middle distillates by IR

FAME for use in biofuels, diesel fuels

Fatty Acid Methyl Esters (FAME) - Determination of free and total glycerol and mono-, di-, triglyceride contents (Reference method)

Fatty acid methyl esters (FAME) for diesel engines - Requirements and test methods