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ONLINE ANALYSER VERIFICATION AND TERMINAL CORRELATION RESULTS – L410-AT-0001

26/03/2025

CERTIFICATE OF CALIBRATION

Approved signatory
Name: **Alan Boulton**
Signature

Issued by **EffecTech**
Date of Issue **03 June 2020**
Certificate Number **20/0378/04**

EffecTech
Global Leaders in Gas Measurement

Dove House
Dove Fields
Uttoxeter
Staffordshire ST14 8HU
United Kingdom
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0590

Customer	: CAC Gas & Instrumentation Pty. Ltd. Unit 3 / 36 Holbeche Rd., Arndell Park, NSW 2148, Australia.
Customer reference	: PO No.PO4283 (Part Code: 50ST-INPX-LNGCALCH4)
Product Description	: Certified Reference Material (CRM) for use as a calibration gas mixture in natural gas analysis Multi-component natural gas mixture
Preparation method	: Mixture prepared by ISO 6142-1:2015 - *Gas Analysis - Preparation of calibration gas mixtures - Part 1 : Gravimetric method for Class I mixtures*
Calibration method	: Mixture calibrated by ISO 6143:2001 - *Gas Analysis - Comparison methods for determining and checking the composition of calibration gas mixtures* using high precision gas chromatography
Traceability	: Mixture classified as a Calibrated Gas Mixture (CGM) at Level-3 in the metrological hierarchy of traceability by direct analytical comparison with a Secondary Reference Gas Mixture (SRGM)
Cylinder number	: 20/4451
Date of calibration	: 29 May 2020
Contents pressure	: 100 bar
Cylinder size	: 50 litres
Cylinder material	: steel
Valve outlet connection	: BS341 - No.4

Minimum usage pressure	: 3 bar
Usage temperature range	: 15 to 50°C
Storage (transport) temperature range	: -33 to 50°C

Composition

component	amount fraction (%mol/mol)
oxygen	0.00980 ± 0.00017
nitrogen	0.5986 ± 0.0020
carbon dioxide*	0.01012 ± 0.00022
methane	83.851 ± 0.041
ethane	14.016 ± 0.041
propane	1.3018 ± 0.0049
iso-butane	0.06074 ± 0.00045
n-butane	0.04103 ± 0.00045
iso-pentane	0.06085 ± 0.00040
n-pentane	0.04050 ± 0.00030
n-hexane	0.01010 ± 0.00020

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution provides a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.The reference values presented in this certificate apply to the calibration of the individual and unique gas mixture identified above

*these components/quantities are not UKAS accredited as they lie outside the scope of accreditation for our laboratory

The following information provided on stability and the expiry date is outside the scope of UKAS accreditation but is required to fulfil the mandatory requirements of ISO 6141:2015 - *Gas Analysis - Contents of certificates for calibration gas mixtures*

Stability	: EffecTech stability studies of similar gas mixtures in this type of cylinder/valve combination have demonstrated a shelf-life of 5 years, providing the contents pressure and usage/storage temperature remain within the limits stated in the table above.
Expiry date	: 29 May 2025

To re-order this gas mixture contact CAC Gas & Instrumentation quoting certificate number 20/0378/04.
tel: 1300 CAC GAS (+61 2 8676 6500) email: cac@cacgas.com.au

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0590

Certificate number

20/0378/04

Physical Properties

Physical properties are calculated from composition in accordance with the international standard ISO 6976:1995 (E) including amendment No.1 - May 1998.

Properties are calculated at a reference pressure of 1.01325 bar and at reference temperatures stated.

Note :- In accordance with the recommendations of the international standard, the gas mixture is assumed dry (free from moisture) for the purpose of these calculations.

Reference conditions	**primary** combustion 15°C metering 15°C	**secondary** combustion 0°C metering 0°C
mean molecular mass	18.557 ± 0.019 $kg \cdot kmol^{-1}$	18.557 ± 0.019 $kg \cdot kmol^{-1}$
compression factor	0.9972 ± 0.0010	0.9967 ± 0.0010
Real gas properties		
superior calorific value	42.511 ± 0.043 $MJ \cdot m^{-3}$	44.938 ± 0.045 $MJ \cdot m^{-3}$
	1002.4 ± 1.0 $kJ \cdot mol^{-1}$	1003.9 ± 1.0 $kJ \cdot mol^{-1}$
	54.016 ± 0.054 $MJ \cdot kg^{-1}$	54.099 ± 0.054 $MJ \cdot kg^{-1}$
inferior calorific value	38.438 ± 0.038 $MJ \cdot m^{-3}$	40.577 ± 0.041 $MJ \cdot m^{-3}$
	906.33 ± 0.91 $kJ \cdot mol^{-1}$	906.48 ± 0.91 $kJ \cdot mol^{-1}$
	48.840 ± 0.049 $MJ \cdot kg^{-1}$	48.848 ± 0.049 $MJ \cdot kg^{-1}$
relative density	0.64224 ± 0.00064	0.64248 ± 0.00064
density	0.78701 ± 0.00079 $kg \cdot m^{-3}$	0.83068 ± 0.00083 $kg \cdot m^{-3}$
Wobbe index	53.046 ± 0.053 $MJ \cdot m^{-3}$	56.065 ± 0.056 $MJ \cdot m^{-3}$
Ideal gas properties		
superior calorific value	42.393 ± 0.042 $MJ \cdot m^{-3}$	44.789 ± 0.045 $MJ \cdot m^{-3}$
	1002.4 ± 1.0 $kJ \cdot mol^{-1}$	1003.9 ± 1.0 $kJ \cdot mol^{-1}$
	54.016 ± 0.054 $MJ \cdot kg^{-1}$	54.099 ± 0.054 $MJ \cdot kg^{-1}$
inferior calorific value	38.331 ± 0.038 $MJ \cdot m^{-3}$	40.443 ± 0.040 $MJ \cdot m^{-3}$
	906.33 ± 0.91 $kJ \cdot mol^{-1}$	906.48 ± 0.91 $kJ \cdot mol^{-1}$
	48.840 ± 0.049 $MJ \cdot kg^{-1}$	48.848 ± 0.049 $MJ \cdot kg^{-1}$
relative density	0.64072 ± 0.00064	0.64072 ± 0.00064
density	0.78482 ± 0.00078 $kg \cdot m^{-3}$	0.82792 ± 0.00083 $kg \cdot m^{-3}$
Wobbe index	52.961 ± 0.053 $MJ \cdot m^{-3}$	55.955 ± 0.056 $MJ \cdot m^{-3}$

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution provides a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

ADVICE on the storage and use of your calibration gas mixture

The calibration gas mixture supplied to you contains components which are condensable under certain conditions of temperature. It is important that these conditions are avoided where possible during storage and usage of the mixture.

Please read this advice in conjunction with recommended storage/usage conditions given son the certificate of calibration.

Storage

*Has the ambient temperature during **storage** dropped below the hydrocarbon dew temperature at contents pressure?*

If so then there will be stratification of your mixture into two phases (vapour and liquid)

The withdrawal of any gas phase content from this two phase mixture will invalidate the certified reference values we have provided with your calibration gas.

Advice before use

There will be no record of the minimum temperature to which your gas mixture has been exposed in transport to you. Hence, there is no guarantee that the gas mixture has not been exposed to temperatures below the hydrocarbon dew temperature of your mixture at contents pressure. If you suspect the gas has been exposed to temperatures below this the contents must be allowed to equilibrate at a greater temperature for a minimum period of about 24 hours. Following this equilibration time your mixture should be entirely homogeneous and gaseous. Often, it is good practice to roll the cylinder, where possible, to encourage mixing during equilibration.

Use

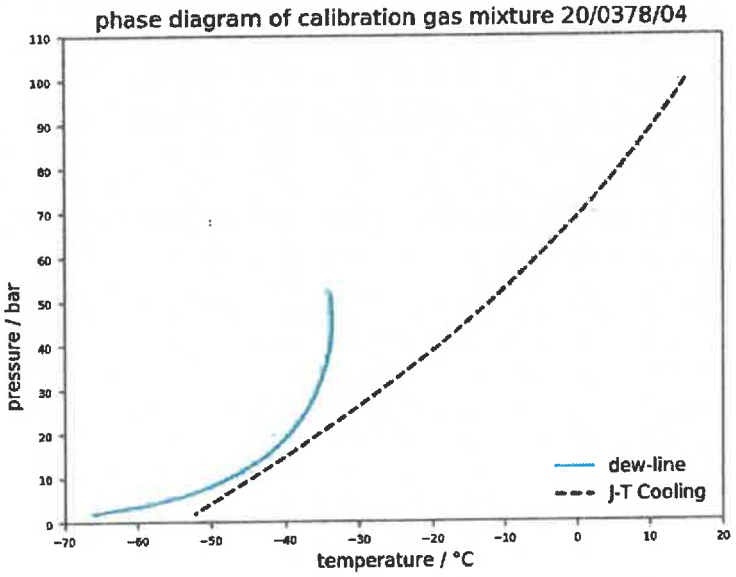
*When in **use** does condensation occur in your gas mixture following depressurisation as a result of cooling?*

Your gas mixture cools when it is depressurised through your pressure regulator. This is called Joule-Thomson (or Joule-Kelvin) cooling. If the gas cools to below the hydrocarbon dew temperature at its pressure then your mixture will stratify into two phases (vapour and liquid).

If this occurs the gas phase composition delivered to your application will not be representative of the certified reference values we have provided with your calibration gas.

Advice during use

The diagram below shows the pressure-temperature phase characteristics of your particular calibration mixture. Conditions shown to the left of the hydrocarbon dewline are in the two phase (liquid and vapour) region, whilst to the right your mixture remains as a single phase vapour. The cooling curve shown does not enter the two-phase region.



This demonstrates that during use your mixture remains entirely in the vapour phase should it be depressurised in a single stage from contents pressure and at a starting temperature of 15 °C.
Technical information : The dewline and the cooling curve were calculated using GasVLE™ and constructed using the LRS equation of state (EOS) and the cooling curve generated from a simulated isenthalpic flash calculation assuming adiabatic conditions starting at contents pressure and the stated temperature.

LNG Calibration Standard Instrument: L410-AT-0001		Data File: GC Run 1	Data File: GC Run 2	Data File: GC Run 3	Cal Date: 26/12/2025	Cylinder No: 20/0378/04 Expiry 29/05/2025			
Compound	Certified Value	Area	Area	Area	Av. Peak area across 3 Cal runs-2 d.p				
Detector (TCD/FID)	mol %	25uV*s (TCD)/ pA*s (FID)	25uV*s (TCD)/ pA*s (FID)	25uV*s (TCD)/ pA*s (FID)	Average Peak Area (Run1+Run2+Run3)/3	Response Factor (Certified Value/Average Peak Area)	0.5% of average peak area (GPA2261:2000 - Clause 6.3)	Acceptance Criteria - Peak Area Min	Acceptance Criteria - Peak Area Max
Methane	83.851	11335017472.00000	11339749376.00000	11336787968.00000	11337184938.67	7.39610E-09	56685924.69	11280499013.97	11393870863.36
Ethane	14.016	3036556800.00000	3037437696.00000	3036833792.00000	3036942762.67	4.61517E-09	15184713.81	3021758048.85	3052127476.48
Propane	1.3018	361765792.00000	361883136.00000	361867104.00000	361838677.33	3.59774E-09	1809193.39	360029483.95	363647870.72
Isobutane	0.06074	19612376.00000	19614218.00000	19581268.00000	19602620.67	3.09857E-09	98013.10	19504607.56	19700633.77
n-Butane	0.04103	13480954.00000	13438538.00000	13484492.00000	13467994.67	3.04648E-09	67339.97	13400654.69	13535334.64
Isopentane	0.06085	22627960.00000	22968436.00000	22743584.00000	22779993.33	2.67120E-09	113899.97	22666093.37	22893893.30
n-Pentane	0.04050	15312978.00000	15459209.00000	15441074.00000	15404420.33	2.62912E-09	77022.10	15327398.23	15481442.44
n-Hexane	0.01010	6178527.00000	6175425.00000	6196797.00000	6183583.00	1.63336E-09	30917.92	6152665.09	6214500.92
Carbon dioxide	0.01012	1717084.00000	1740055.00000	1691675.00000	1716271.33	5.89650E-09	8581.36	1707689.98	1724852.69
Oxygen	0.00980	3741232.00000	3721951.50000	3711986.00000	3725056.50	2.63083E-09	18625.28	3706431.22	3743681.78
Nitrogen	0.5986	98402216.00000	98402584.00000	98319184.00000	98374661.33	6.08490E-09	491873.31	97882788.03	98866534.64
Total	100.001								

Analyst : MC *Date :* 27/03/2025

Checked by : EM *Date :* 27/03/2025

Legend

- Within Specification
- Outside Specification
- Cylinder certified value and calculated precision data
- Calculated value
- Data entry

Final Calibration Report

Date-Time : 03/24/2025 12:51:54 PM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Calibration Str Mode : Calibration Cycle Start Time : 12/26/2024 06:51:25 AM
Analyzer : L410 AT 0001 Stream Seq. : 2

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317
Calibration Certificate Details : 20/0378/04

Component Name	Cal Conc.	Old RF	New RF	*	RF % Dev.	Old RT	New RT	*	RT % Dev.
C6+ 47/35/17	0.0101%	6.096834e+08	6.124863e+08	*	0.46	54.4	55.1	*	1.32
Propane	1.3018%	2.797421e+08	2.779806e+08	*	-0.63	109.4	110.3	*	0.77
i-Butane	0.06074%	3.235855e+08	3.226497e+08	*	-0.29	142.5	143.4	*	0.63
n-Butane	0.04103%	3.297555e+08	3.280896e+08	*	-0.51	165.1	166.1	*	0.62
i-Pentane	0.06085%	3.765299e+08	3.756124e+08	*	-0.24	244.4	245.6	*	0.52
n-Pentane	0.0405%	3.8341e+08	3.81485e+08	*	-0.50	278.0	279.6	*	0.58
Nitrogen	0.5986%	1.655195e+08	1.643182e+08	*	-0.73	367.9	370.0	*	0.57
Methane	83.851%	1.361862e+08	1.352192e+08	*	-0.71	388.6	391.1	*	0.66
Carbon Dioxide	0.01012%	1.726072e+08	1.695519e+08	*	-1.77	497.8	502.2	*	0.89
Ethane	14.016%	2.18093e+08	2.166906e+08	*	-0.64	591.1	596.9	*	0.97
Oxygen	0.0098%	3.700859e+08	3.792825e+08	*	2.49	458.5	453.2	*	-1.15

"*" indicates components whose Retention Times and Response Factors were updated.

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

Calibration Report

Calibration Run 1 of 3

Date-Time : 03/24/2025 11:40:51 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Calibration Str Mode : Calibration Cycle Start Time : 12/26/2024 06:29:25 AM
Analyzer : L410 AT 0001 Stream Seq. : 2

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

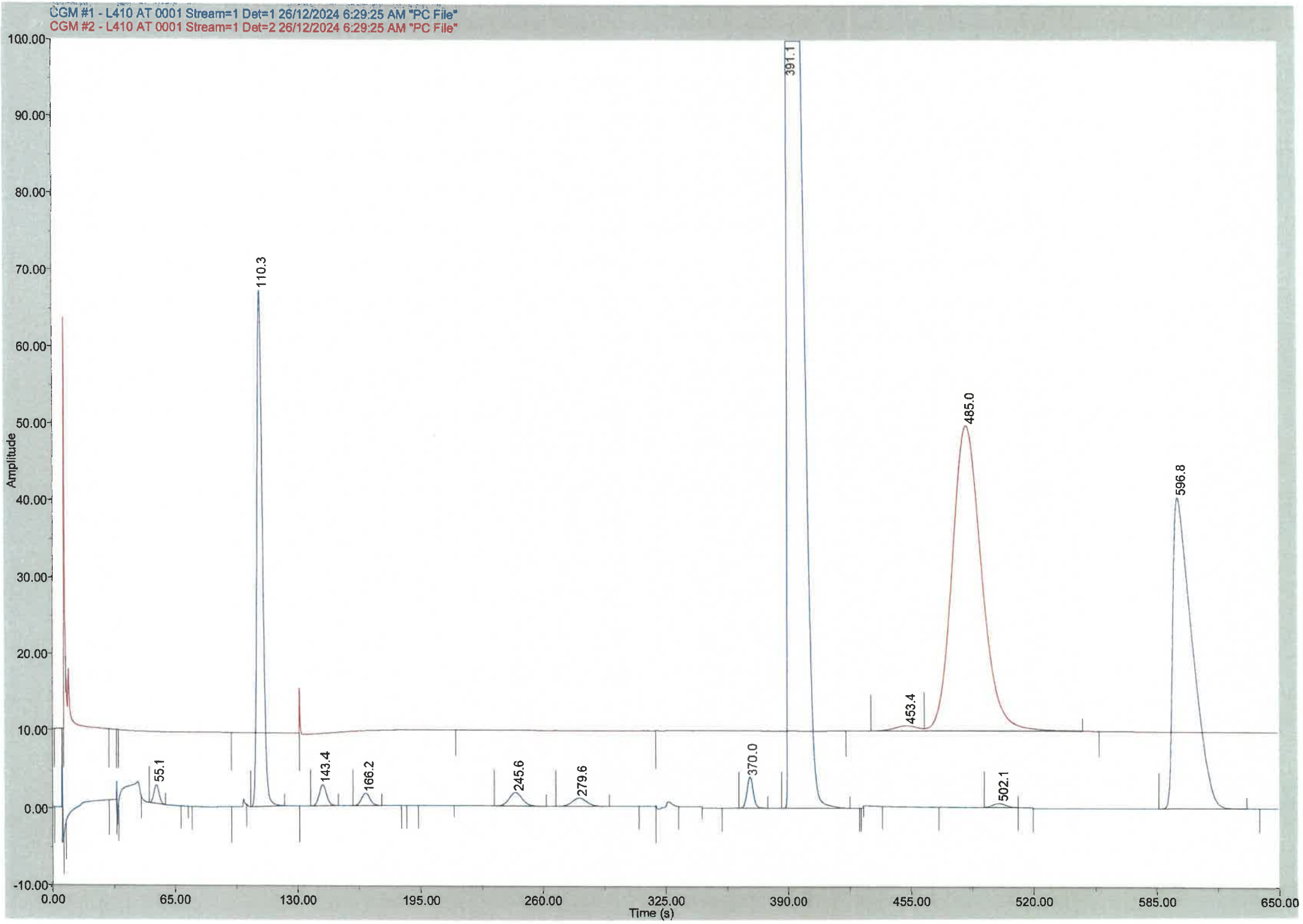
Component Name	Cal Conc.	Raw Data	New RF	RF % Dev.	New RT	RT % Dev.
C6+ 47/35/17	0.0101%	6178527.00	6.117354e+08	0.34	55.1	1.32
Propane	1.3018%	361765792.00	2.778966e+08	-0.66	110.3	0.77
i-Butane	0.06074%	19612376.00	3.228906e+08	-0.21	143.4	0.63
n-Butane	0.04103%	13480954.00	3.285633e+08	-0.36	166.2	0.65
i-Pentane	0.06085%	22627960.00	3.718646e+08	-1.24	245.6	0.52
n-Pentane	0.0405%	15312978.00	3.780982e+08	-1.39	279.6	0.58
Nitrogen	0.5986%	98402216.00	1.643873e+08	-0.68	370.0	0.57
Methane	83.851%	11335017472.00	1.351805e+08	-0.74	391.1	0.65
Carbon Dioxide	0.01012%	1717084.00	1.696723e+08	-1.70	502.1	0.86
Ethane	14.016%	3036556800.00	2.166493e+08	-0.66	596.8	0.96
Oxygen	0.0098%	3741232.00	3.817584e+08	3.15	453.4	-1.13

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000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CGM #2 - L410 AT 0001 Stream=1 Det=2 26/12/2024 6:29:25 AM "PC File"
Amplitude
Time (s)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0.00
65.00
130.00
195.00
260.00
325.00
390.00
455.00
520.00
585.00
650.00
110.3
391.1
485.0
596.8
453.4
55.1
143.4
166.2
245.6
279.6
370.0
502.1

Calibration Report

Calibration Run 2 of 3

Date-Time : 03/24/2025 11:40:50 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Calibration Str Mode : Calibration Cycle Start Time : 12/26/2024 06:40:25 AM
Analyzer : L410 AT 0001 Stream Seq. : 2

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

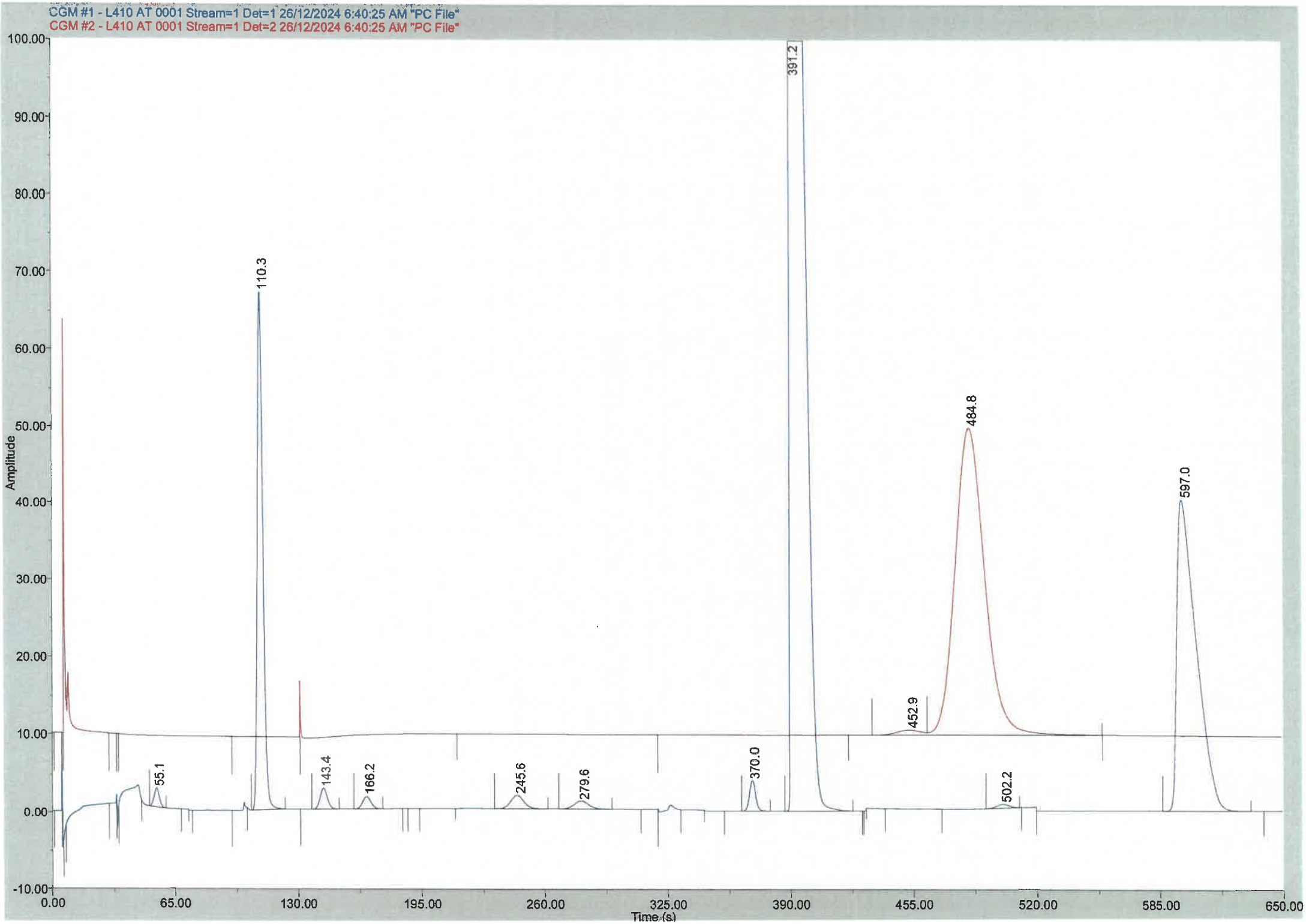
Component Name	Cal Conc.	Raw Data	New RF	RF % Dev.	New RT	RT % Dev.
C6+ 47/35/17	0.0101%	6175425.00	6.114282e+08	0.29	55.1	1.32
Propane	1.3018%	361883136.00	2.779867e+08	-0.63	110.3	0.77
i-Butane	0.06074%	19614218.00	3.229209e+08	-0.21	143.4	0.63
n-Butane	0.04103%	13438538.00	3.275296e+08	-0.68	166.2	0.65
i-Pentane	0.06085%	22968436.00	3.774599e+08	0.25	245.6	0.52
n-Pentane	0.0405%	15459209.00	3.817089e+08	-0.44	279.6	0.58
Nitrogen	0.5986%	98402584.00	1.643879e+08	-0.68	370.0	0.57
Methane	83.851%	11339749376.00	1.352369e+08	-0.70	391.2	0.68
Carbon Dioxide	0.01012%	1740055.00	1.719422e+08	-0.39	502.2	0.89
Ethane	14.016%	3037437696.00	2.167122e+08	-0.63	597.0	0.99
Oxygen	0.0098%	3721951.50	3.79791e+08	2.62	452.9	-1.23

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 0001 Stream=1 Det=1 26/12/2024 6:40:25 AM "PC File"
CGM #2 - L410 AT 0001 Stream=1 Det=2 26/12/2024 6:40:25 AM "PC File"
Amplitude
Time (s)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0.00
65.00
130.00
195.00
260.00
325.00
390.00
455.00
520.00
585.00
650.00
55.1
110.3
143.4
166.2
245.6
279.6
370.0
391.2
452.9
484.8
502.2
597.0

Calibration Report

Calibration Run 3 of 3

Date-Time : 03/24/2025 11:40:49 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Calibration Str Mode : Calibration Cycle Start Time : 12/26/2024 06:51:25 AM
Analyzer : L410 AT 0001 Stream Seq. : 2

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

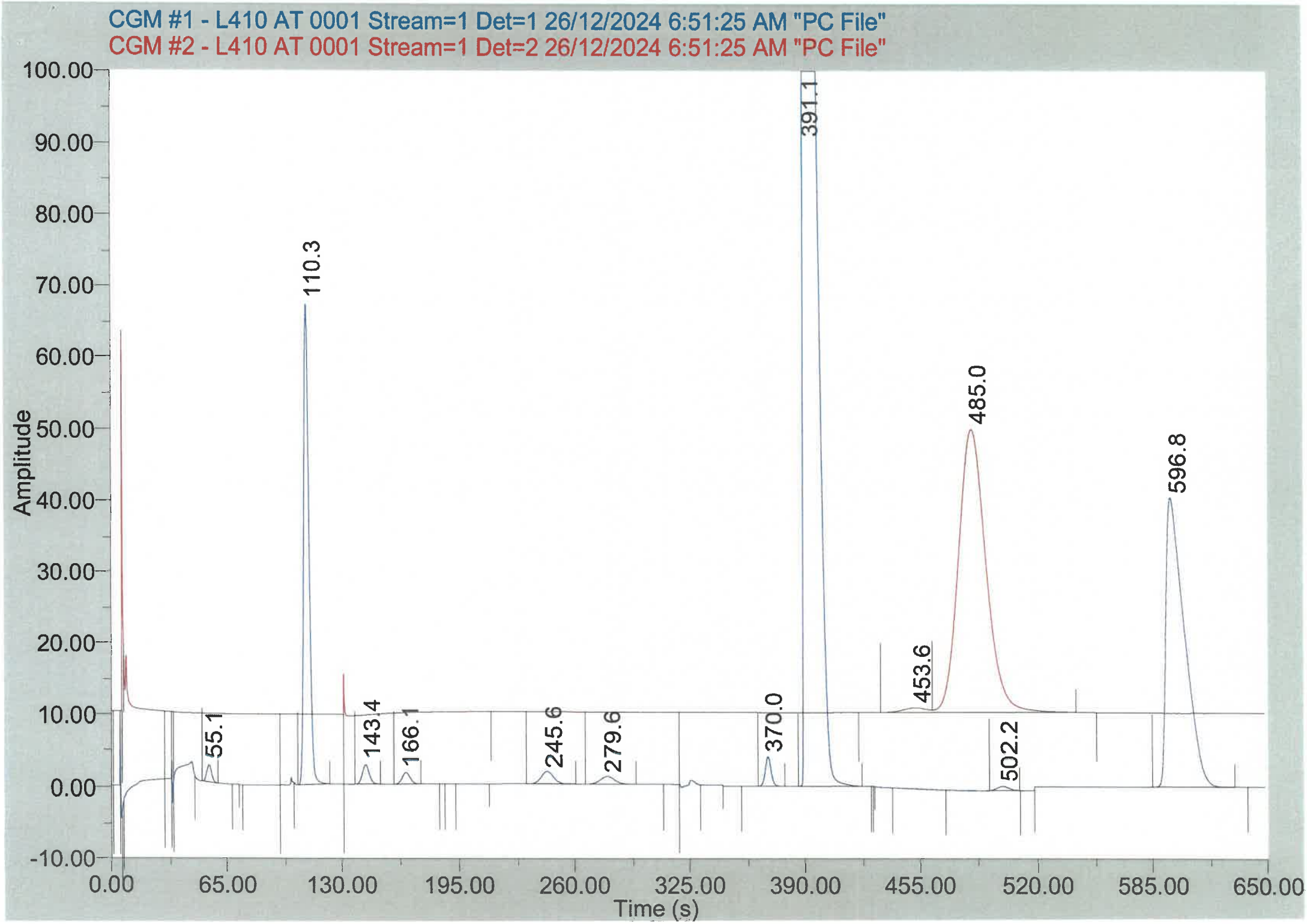
Component Name	Cal Conc.	Raw Data	New RF	RF % Dev.	New RT	RT % Dev.
C6+ 47/35/17	0.0101%	6196797.00	6.135443e+08	0.63	55.1	1.32
Propane	1.3018%	361867104.00	2.779744e+08	-0.63	110.3	0.77
i-Butane	0.06074%	19581268.00	3.223785e+08	-0.37	143.4	0.63
n-Butane	0.04103%	13484492.00	3.286496e+08	-0.34	166.1	0.58
i-Pentane	0.06085%	22743584.00	3.737647e+08	-0.73	245.6	0.52
n-Pentane	0.0405%	15441074.00	3.812611e+08	-0.56	279.6	0.58
Nitrogen	0.5986%	98319184.00	1.642486e+08	-0.77	370.0	0.57
Methane	83.851%	11336787968.00	1.352016e+08	-0.72	391.1	0.65
Carbon Dioxide	0.01012%	1691675.00	1.671616e+08	-3.15	502.2	0.89
Ethane	14.016%	3036833792.00	2.166691e+08	-0.65	596.8	0.96
Oxygen	0.0098%	3711986.00	3.787741e+08	2.35	453.6	-1.07

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 0001 Stream=1 Det=1 26/12/2024 6:51:25 AM "PC File"
CGM #2 - L410 AT 0001 Stream=1 Det=2 26/12/2024 6:51:25 AM "PC File"
Amplitude
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
110.3
391.1
485.0
596.8
453.6
55.1
143.4
166.1
245.6
279.6
370.0
502.2
0.00
65.00
130.00
195.00
260.00
325.00
390.00
455.00
520.00
585.00
650.00
Time (s)

CERTIFIED REFERENCE MATERIAL

Replacement of Certificate of Calibration Serial No 21/1161/05

Approved signatory
Name: **Alan Boulton**
Signature

Issued by **EffecTech**
Date of issue **08 July 2022**

Certificate number **21/1161/05A**

EffecTech
Global Leaders in Gas Measurement

Dove House
Dove Fields
Uttoxeter
Staffordshire ST14 8HU
United Kingdom

www.effectech.co.uk

ilac-MRA

UKAS REFERENCE MATERIALS 5710

Customer	: CAC Gas & Instrumentation Pty. Ltd. Unit 3 / 36 Holbeche Rd., Arndell Park, NSW 2148, Australia.
Customer reference	: PO No.PO5181 (Part Code: 50ST-INPX-LNGQC1CH4)
Product description	: Certified Reference Material (CRM) for use in natural gas analysis Multi-component natural gas mixture
Preparation method	: Mixture prepared by ISO 6142-1:2015 - *Gas Analysis - Preparation of calibration gas mixtures - Part 1 : Gravimetric method for Class I mixtures*
Calibration method	: Mixture calibrated by ISO 6143:2001 - *Gas Analysis - Comparison methods for determining and checking the composition of calibration gas mixtures* using high precision gas chromatography
Metrological traceability	: Mixture classified as a Certified Reference Material (CRM) on which the values are assigned through an unbroken chain of analytical comparisons to a Primary Reference Gas Mixture
Stability	: EffecTech stability studies of similar gas mixtures in this type of cylinder/valve combination have demonstrated a shelf-life of 5 years providing the contents pressure and usage/storage temperature remain within the limits stated in the table below.
Handling and Use	: Supplementary advice is annexed to this certificate on the handling, storage and use of this certified reference material. General instructions for the proper use of gas mixtures can be found in ISO 16664: *Gas Analysis - Handling of calibration gases and gas mixtures*

Date of production	: 24 August 2021	Cylinder number	: 21/41835
Expiry date	: 24 August 2026	Contents pressure	: 109 bar
Minimum usage pressure	: 3 bar	Cylinder size	: 50 litres
Usage temperature range	: 15 to 50 °C	Cylinder material	: steel
Storage temperature range	: -38 to 50 °C	Valve outlet connection	: BS 341 - No.4

Composition

component	amount fraction (%mol/mol)
oxygen	0.00968 ± 0.00016
nitrogen	0.1991 ± 0.0023
carbon dioxide*	0.01011 ± 0.00024
methane	85.804 ± 0.024
ethane	13.005 ± 0.033
propane	0.8003 ± 0.0024
iso-butane	0.04969 ± 0.00045
n-butane	0.03059 ± 0.00045
iso-pentane	0.05040 ± 0.00036
n-pentane	0.03050 ± 0.00025
n-hexane	0.01023 ± 0.00020

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution provides a level of confidence of approximately 95%.

* these components/quantities are not UKAS accredited as they lie outside the scope of accreditation for our laboratory

The contents of this certificate comply with the mandatory requirements of ISO Guide 31:2015 - *Reference materials — Contents of certificates, labels and accompanying documentation* and ISO 6141:2015 - *Gas Analysis - Contents of certificates for calibration gas mixtures*

To re-order this gas mixture contact CAC Gas & Instrumentation quoting certificate number 21/1161/05A.
tel: 1300 CAC GAS (+61 2 8676 6500) email: cac@cacgas.com.au

Physical Properties

Reference conditions	**primary** combustion 15°C metering 15°C		**secondary** combustion 0°C metering 0°C	
mean molar mass	18.206 ± 0.018	$kg \cdot kmol^{-1}$	18.206 ± 0.018	$kg \cdot kmol^{-1}$
compression factor	0.9973 ± 0.0010		0.9968 ± 0.0010	
Real gas properties				
superior calorific value	42.047 ± 0.042	$MJ \cdot m^{-3}$	44.447 ± 0.044	$MJ \cdot m^{-3}$
	991.52 ± 0.99	$kJ \cdot mol^{-1}$	993.05 ± 0.99	$kJ \cdot mol^{-1}$
	54.461 ± 0.054	$MJ \cdot kg^{-1}$	54.544 ± 0.055	$MJ \cdot kg^{-1}$
inferior calorific value	38.000 ± 0.038	$MJ \cdot m^{-3}$	40.114 ± 0.040	$MJ \cdot m^{-3}$
	896.09 ± 0.90	$kJ \cdot mol^{-1}$	896.24 ± 0.90	$kJ \cdot mol^{-1}$
	49.219 ± 0.049	$MJ \cdot kg^{-1}$	49.227 ± 0.049	$MJ \cdot kg^{-1}$
relative density	0.63004 ± 0.00063		0.63027 ± 0.00063	
density	0.77206 ± 0.00077	$kg \cdot m^{-3}$	0.81489 ± 0.00081	$kg \cdot m^{-3}$
superior Wobbe index	52.972 ± 0.053	$MJ \cdot m^{-3}$	55.987 ± 0.056	$MJ \cdot m^{-3}$
Ideal gas properties				
superior calorific value	41.934 ± 0.042	$MJ \cdot m^{-3}$	44.305 ± 0.044	$MJ \cdot m^{-3}$
	991.52 ± 0.99	$kJ \cdot mol^{-1}$	993.05 ± 0.99	$kJ \cdot mol^{-1}$
	54.461 ± 0.054	$MJ \cdot kg^{-1}$	54.544 ± 0.055	$MJ \cdot kg^{-1}$
inferior calorific value	37.898 ± 0.038	$MJ \cdot m^{-3}$	39.985 ± 0.040	$MJ \cdot m^{-3}$
	896.09 ± 0.90	$kJ \cdot mol^{-1}$	896.24 ± 0.90	$kJ \cdot mol^{-1}$
	49.219 ± 0.049	$MJ \cdot kg^{-1}$	49.227 ± 0.049	$MJ \cdot kg^{-1}$
relative density	0.62861 ± 0.00063		0.62861 ± 0.00063	
density	0.76998 ± 0.00077	$kg \cdot m^{-3}$	0.81227 ± 0.00081	$kg \cdot m^{-3}$
superior Wobbe index	52.890 ± 0.053	$MJ \cdot m^{-3}$	55.880 ± 0.056	$MJ \cdot m^{-3}$

The physical properties above are calculated from composition at a reference pressure of 1.01325 bar and at the combustion and metering temperatures stated in accordance with the international standard ISO 6976:1995 - *Natural Gas - Calculation of calorific value, density, relative density and Wobbe index from composition* (including amendment No.1 - May 1998).

For the purpose of these calculations, and in accordance with the recommendations of the international standard, the gas mixture is assumed dry (free from moisture).

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution provides a level of confidence of approximately 95%.

CERTIFIED REFERENCE MATERIAL

Replacement of Certificate of Calibration Serial No 21/1161/05

UKAS accredited reference material producer no.5710

Certificate number

21/1161/05A

Replacement History

Certificate number	Reason for replacement
21/1161/05	Original Certificate
21/1161/05A	Certificate regenerated following an investigation on the intracalibration on the danalyzer. The investigation highlighted that the software was predicting a quadractic fit for ethane. This was used in the original certification which resulted in a bias in between ethane and methane values. However, a linear fit is more appropriate. Certificates re-issued according to this revised dataset.

ADVICE on the storage and use of your calibration gas mixture

The calibration gas mixture supplied to you contains components which are condensable under certain conditions of temperature. It is important that these conditions are avoided where possible during storage and usage of the mixture.

Please read this advice in conjunction with recommended storage/usage conditions given on the certificate of calibration.

Storage

*Has the ambient temperature during **storage** dropped below the hydrocarbon dew temperature at contents pressure?*

If so then there will be stratification of your mixture into two phases (vapour and liquid)

The withdrawal of any gas phase content from this two phase mixture will invalidate the certified reference values we have provided with your calibration gas.

Advice before use

There will be no record of the minimum temperature to which your gas mixture has been exposed in transport to you. Hence, there is no guarantee that the gas mixture has not been exposed to temperatures below the hydrocarbon dew temperature of your mixture at contents pressure. If you suspect the gas has been exposed to temperatures below this the contents must be allowed to equilibrate at a greater temperature for a minimum period of about 24 hours. Following this equilibration time your mixture should be entirely homogeneous and gaseous. Often, it is good practice to roll the cylinder, where possible, to encourage mixing during equilibration.

Use

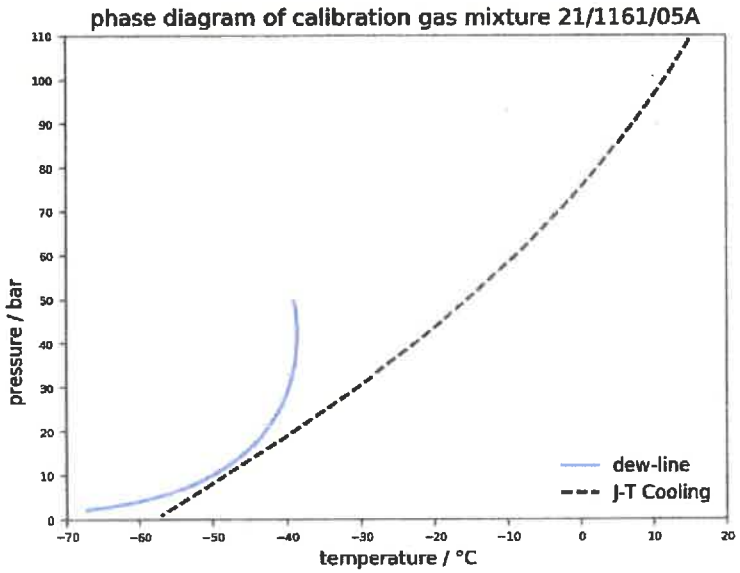
*When in **use** does condensation occur in your gas mixture following depressurisation as a result of cooling?*

Your gas mixture cools when it is depressurised through your pressure regulator. This is called Joule-Thomson (or Joule-Kelvin) cooling. If the gas cools to below the hydrocarbon dew temperature at its pressure then your mixture will stratify into two phases (vapour and liquid).

If this occurs the gas phase composition delivered to your application will not be representative of the certified reference values we have provided with your calibration gas.

Advice during use

The diagram below shows the pressure-temperature phase characteristics of your particular calibration mixture. Conditions shown to the left of the hydrocarbon dewline are in the two phase (liquid and vapour) region, whilst to the right your mixture remains as a single phase vapour. The cooling curve shown does not enter the two-phase region.



This demonstrates that during use your mixture remains entirely in the vapour phase should it be depressurised in a single stage from contents pressure and at a starting temperature of 15°C.

Technical information : The dewline and the cooling curve were calculated using GasVLE™ and constructed using the LRS equation of state (EOS) and the cooling curve generated from a simulated isenthalpic flash calculation assuming adiabatic conditions starting at contents pressure and the stated temperature.

LNG Verification Gas Cylinder ID: 21/41835 Certificate ID: 21/1161/05A Instrument ID: L410AT0001		Verification Run 1 Data File:	Verification Run 2 Data File:	GPA 2261 : 2000 (Acceptance Criteria)					ISO 6974 : 5 (Acceptance Criteria)						GPA 2261 : 1964 (Acceptance Criteria)		
				Repeatability		Reproducibility			Repeatability		Reproducibility			Repeatability	Reproducibility		
Compound	Certified Value (mol%)	Normalised mol%	Normalised mol%	Difference between runs [ABS (Run1 -Run 2)]	GPA 2261 : 2000 Repeatability Limit	QC Mean Normalised mol% (Run1+Run2)/2	Difference (QC Mean - Certified Value)	GPA 2261 : 2000 Reproducibility - Limit	Difference between runs [ABS (Run1 -Run 2)]	Calculated ISO 6974-5 Repeatability limit, based on mean CRM value	QC Mean Normalised mol% (Run1+Run2)/2	Difference (QC Mean - Certified Value)	Calculated ISO 6974-5 Reproducibility Limit	GPA 2261 : 1964 Repeatability	QC Mean Normalised mol% (Run1+Run2)/2	Difference (QC Mean - Certified Value)	GPA 2261 : 1964 Reproducibility - Limit
Methane	85.804	85.78	85.78	0.00	0.17	85.78	0.02	0.60	0.00	0.03	85.78	0.02	0.07	N/A	85.78	0.02	0.30
Ethane	13.005	13.03	13.03	0.00	0.13	13.03	0.02	0.26	0.00	0.02	13.03	0.02	0.04	N/A	13.03	0.02	0.10
Propane	0.8003	0.80	0.80	0.00	0.01	0.80	0.00	0.02	0.00	0.01	0.80	0.00	0.02	N/A	0.80	0.00	0.03
Isobutane	0.04969	0.05	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.01	0.05	0.00	0.01	N/A	0.05	0.00	0.03
n-Butane	0.03059	0.03	0.03	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.01	N/A	0.03	0.00	0.03
Isopentane	0.05040	0.05	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.01	0.05	0.00	0.01	N/A	0.05	0.00	0.03
n-Pentane	0.03050	0.03	0.03	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.01	N/A	0.03	0.00	0.03
n-Hexane	0.01023	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	N/A	0.01	0.00	N/A	N/A	0.01	0.00	0.00
Carbon dioxide	0.01011	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	N/A	0.01	0.00	0.03
Oxygen	0.00968	0.01	0.01	0.00	N/A	0.01	0.00	N/A	0.00	0.00	0.01	0.00	0.01	N/A	0.01	0.00	0.03
Nitrogen	0.1991	0.20	0.20	0.00	0.00	0.20	0.00	0.01	0.00	0.01	0.20	0.00	0.01	N/A	0.20	0.00	0.03
Normalised Total	100.00	100.00	100.00														
Un-Normalised Total (+/-1%)		100.00	100.10														

Analyst : CM/DH *Date :* 26-Mar-25

Checked by : EM *Date :* 26-Mar-25

Calculated value
Within Specification
Outside Specification
Cylinder certified value and calculated precision data
Data entry

ISO Analysis

Date-Time : 03/26/2025 06:46:07 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:09:28 AM
Analyzer : L410 AT 0001 Stream Seq. : 2
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

	Primary	Secondary
Reference Temperature - Combustion Deg.C	15.0	15.0
Reference Temperature - Metering Deg.C	15.0	15.0
Calorific Value - Units	MJ/mol	MJ/mol

Component Name	Mole Percent	Relative Density	Superior CV Pri units	Inferior CV Pri units	Superior CV Sec Units	Inferior CV Sec units
C6+ 47/35/17	0.0103%	0.0003	0.0005	0.0004	0.0005	0.0004
Propane	0.8037%	0.0122	0.0179	0.0164	0.0179	0.0164
i-Butane	0.0503%	0.0010	0.0014	0.0013	0.0014	0.0013
n-Butane	0.0305%	0.0006	0.0009	0.0008	0.0009	0.0008
i-Pentane	0.0502%	0.0013	0.0018	0.0016	0.0018	0.0016
n-Pentane	0.0301%	0.0008	0.0011	0.0010	0.0011	0.0010
Nitrogen	0.2031%	0.0020	0.0000	0.0000	0.0000	0.0000
Methane	85.7772%	0.4751	0.7648	0.6885	0.7648	0.6885
Carbon Dioxide	0.0085%	0.0001	0.0000	0.0000	0.0000	0.0000
Ethane	13.0263%	0.1352	0.2035	0.1861	0.2035	0.1861
Oxygen	0.0098%	0.0001	0.0000	0.0000	0.0000	0.0000
TOTALS	100.0000%	0.6288	0.9917	0.8963	0.9917	0.8963

'*' indicates user-defined components

Primary Compressibility Factor(Z) @ 1.01560 BarA and 15.0 Deg.C = 0.99731

Base Pressure		1.01560 BarA
Real Superior CV - Dry - Primary	=	0.9917 MJ/mol
Real Superior CV - Sat - Primary	=	0.9750 MJ/mol
Real Inferior CV - Dry - Primary	=	0.8963 MJ/mol
Real Inferior CV - Sat - Primary	=	0.8812 MJ/mol
Real Superior CV - Dry - Secondary	=	0.9917 MJ/mol
Real Superior CV - Sat - Secondary	=	0.9750 MJ/mol
Real Inferior CV - Dry - Secondary	=	0.8963 MJ/mol
Real Inferior CV - Sat - Secondary	=	0.8812 MJ/mol
Real Relative Density Gas - Primary	=	0.6302
Real Gas Density - Primary	=	0.7723 kg/m3
Real Wobbe index - Sup - Primary	=	1.2493 MJ/mol
Average Molar Mass	=	18.211
Total Unnormalized Mole Percent	=	100.002

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-1	1120.4838
HHV BTU/SCF Str-Cal	1135.6036
HHV BTU/SCF Str-4	1122.2458

Analysis Report (GPA)

Date-Time	: 03/26/2025 06:47:01 AM	Analysis time	: 650.00 sec	Cycle Time	: 660.00 sec
Stream	: Validation Str	Mode	: Analysis	Cycle Start Time	: 03/26/2025 06:09:28 AM
Analyzer	: L410 AT 0001	Stream Seq.	: 2		
Company	: INPEX ICHTHYS PROJECT				

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

Component Name	Mole Percent	Dry Gross BTU
C6+ 47/35/17	0.0103%	0.55
Propane	0.8037%	20.27
i-Butane	0.0503%	1.64
n-Butane	0.0305%	1.00
i-Pentane	0.0502%	2.01
n-Pentane	0.0301%	1.21
Nitrogen	0.2031%	0.00
Methane	85.7772%	868.36
Carbon Dioxide	0.0085%	0.00
Ethane	13.0263%	231.06
Oxygen	0.0098%	0.00
TOTALS	100.0000%	1126.09

'*' indicates user-defined components

Base Pressure		14.73003 PSIA
Gross Dry BTU	=	1126.0918
Actual Net BTU	=	1017.8122
Total Unnormalized Mole Percent	=	100.002
Average Molecular wgt.	=	18.21
Wobbe	=	1420.43

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-1	1120.4838

HHV BTU/SCF Str-Cal	1135.6036
HHV BTU/SCF Str-4	1122.2458

Raw Data Report

Date-Time : 03/26/2025 07:14:24 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:09:28 AM
Analyzer : L410 AT 0001

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

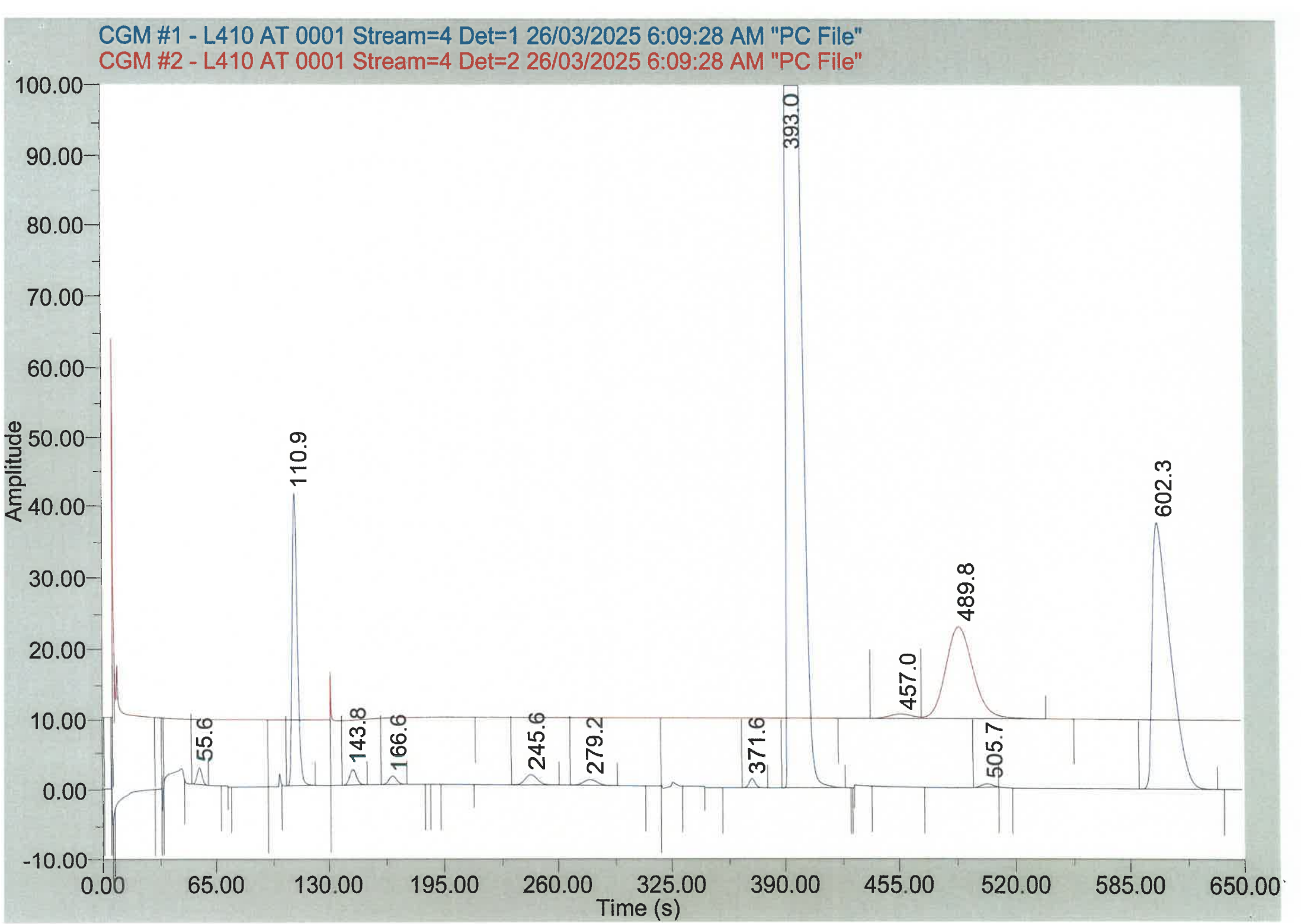
Peak No.	Ret Time	Peak Area	Peak Height	Det No.	Method	Baseline Start	Baseline End	Integration Start	Integration End	Peak Width@ Half Height	Partial Peak
1	55.6	6.31887e+06	37,689	1	4	-241,788	-244,981	51.2	60.6	3.4	No
2	110.9	2.23418e+08	1,298,201	1	1	-240,288	-237,786	105.4	122.0	3.2	No
3	143.8	1.62151e+07	71,071	1	1	-237,909	-235,372	137.4	151.7	4.4	No
4	166.6	9.99311e+06	38,244	1	1	-235,022	-233,762	159.8	174.6	5.0	No
5	245.6	1.88675e+07	46,847	1	1	-236,841	-237,650	234.4	261.6	7.7	No
6	279.2	1.14973e+07	25,849	1	4	-238,166	-240,820	268.0	294.9	8.6	No
7	371.6	3.33739e+07	168,242	1	1	-246,566	-247,864	365.9	380.5	3.7	No
8	393.0	1.1599e+10	33,878,723	1	1	-248,984	-245,437	388.7	424.7	6.6	No
9	505.7	1.44715e+06	3,972	1	100	-252,020	-251,319	497.6	512.0	7.0	No
10	602.3	2.82273e+09	4,757,539	1	1	-256,376	-254,536	591.7	636.1	11.2	No
1	457.0	3.70145e+06	4,933	2	2	-216,353	-216,263	439.2	468.5	14.6	No
2	489.8	9.25822e+07	102,786	2	3	-216,263	-216,048	468.5	539.0	16.8	No

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 0001 Stream=4 Det=1 26/03/2025 6:09:28 AM "PC File"
CGM #2 - L410 AT 0001 Stream=4 Det=2 26/03/2025 6:09:28 AM "PC File"
Amplitude
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0.00
65.00
130.00
195.00
260.00
325.00
390.00
455.00
520.00
585.00
650.00
Time (s)
55.6
110.9
143.8
166.6
245.6
279.2
371.6
393.0
457.0
489.8
505.7
602.3

ISO Analysis

Date-Time : 03/26/2025 06:46:39 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:20:28 AM
Analyzer : L410 AT 0001 Stream Seq. : 2
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

	Primary	Secondary
Reference Temperature - Combustion Deg.C	15.0	15.0
Reference Temperature - Metering Deg.C	15.0	15.0
Calorific Value - Units	MJ/mol	MJ/mol

Component Name	Mole Percent	Relative Density	Superior CV Pri units	Inferior CV Pri units	Superior CV Sec Units	Inferior CV Sec units
C6+ 47/35/17	0.0103%	0.0003	0.0005	0.0004	0.0005	0.0004
Propane	0.8044%	0.0122	0.0179	0.0164	0.0179	0.0164
i-Butane	0.0500%	0.0010	0.0014	0.0013	0.0014	0.0013
n-Butane	0.0303%	0.0006	0.0009	0.0008	0.0009	0.0008
i-Pentane	0.0505%	0.0013	0.0018	0.0016	0.0018	0.0016
n-Pentane	0.0299%	0.0007	0.0011	0.0010	0.0011	0.0010
Nitrogen	0.2033%	0.0020	0.0000	0.0000	0.0000	0.0000
Methane	85.7706%	0.4751	0.7647	0.6885	0.7647	0.6885
Carbon Dioxide	0.0078%	0.0001	0.0000	0.0000	0.0000	0.0000
Ethane	13.0330%	0.1353	0.2036	0.1862	0.2036	0.1862
Oxygen	0.0098%	0.0001	0.0000	0.0000	0.0000	0.0000
TOTALS	100.0000%	0.6288	0.9918	0.8963	0.9918	0.8963

'*' indicates user-defined components

Primary Compressibility Factor(Z) @ 1.01560 BarA and 15.0 Deg.C = 0.99731

Base Pressure		1.01560 BarA
Real Superior CV - Dry - Primary	=	0.9918 MJ/mol
Real Superior CV - Sat - Primary	=	0.9751 MJ/mol
Real Inferior CV - Dry - Primary	=	0.8963 MJ/mol
Real Inferior CV - Sat - Primary	=	0.8812 MJ/mol
Real Superior CV - Dry - Secondary	=	0.9918 MJ/mol
Real Superior CV - Sat - Secondary	=	0.9751 MJ/mol
Real Inferior CV - Dry - Secondary	=	0.8963 MJ/mol
Real Inferior CV - Sat - Secondary	=	0.8812 MJ/mol
Real Relative Density Gas - Primary	=	0.6302
Real Gas Density - Primary	=	0.7723 kg/m3
Real Wobbe index - Sup - Primary	=	1.2493 MJ/mol
Average Molar Mass	=	18.212
Total Unnormalized Mole Percent	=	100.096

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-1	1120.4838
HHV BTU/SCF Str-Cal	1135.6036
HHV BTU/SCF Str-4	1122.2458

Analysis Report (GPA)

Date-Time : 03/26/2025 06:47:37 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:20:28 AM
Analyzer : L410 AT 0001 Stream Seq. : 2
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

Component Name	Mole Percent	Dry Gross BTU
C6+ 47/35/17	0.0103%	0.55
Propane	0.8044%	20.29
i-Butane	0.0500%	1.63
n-Butane	0.0303%	0.99
i-Pentane	0.0505%	2.02
n-Pentane	0.0299%	1.20
Nitrogen	0.2033%	0.00
Methane	85.7706%	868.29
Carbon Dioxide	0.0078%	0.00
Ethane	13.0330%	231.18
Oxygen	0.0098%	0.00
TOTALS	100.0000%	1126.15

'*' indicates user-defined components

Base Pressure 14.73003 PSIA

Gross Dry BTU	=	1126.1508
Actual Net BTU	=	1017.8671
Total Unnormalized Mole Percent	=	100.096
Average Molecular wgt.	=	18.21
Wobbe	=	1420.47

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-1	1120.4838

HHV BTU/SCF Str-Cal	1135.6036
HHV BTU/SCF Str-4	1122.2458

Raw Data Report

Date-Time : 03/26/2025 07:15:06 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:20:28 AM
Analyzer : L410 AT 0001

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

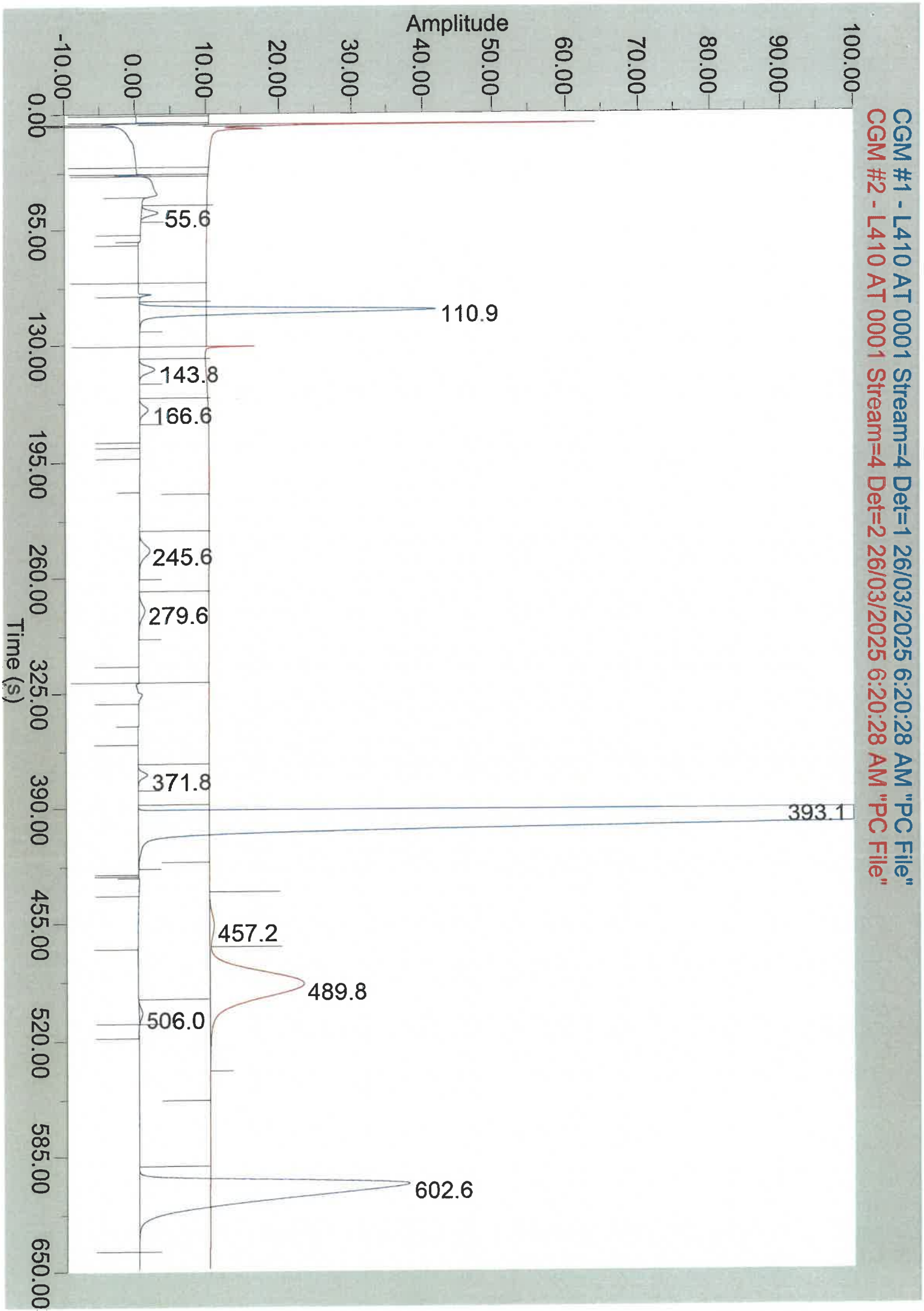
Peak No.	Ret Time	Peak Area	Peak Height	Det No.	Method	Baseline Start	Baseline End	Integration Start	Integration End	Peak Width@ Half Height	Partial Peak
1	55.6	6.33395e+06	37,627	1	4	-240,049	-243,153	51.5	60.6	3.1	No
2	110.9	2.2381e+08	1,299,202	1	1	-240,047	-238,441	105.5	122.4	3.2	No
3	143.8	1.61474e+07	70,965	1	1	-240,726	-239,984	137.6	151.9	4.3	No
4	166.6	9.96072e+06	38,224	1	1	-240,103	-239,305	160.0	174.7	4.9	No
5	245.6	1.89695e+07	46,924	1	1	-242,259	-243,868	234.8	262.0	8.0	No
6	279.6	1.14319e+07	25,892	1	4	-244,581	-247,368	268.7	295.6	8.3	No
7	371.8	3.34427e+07	168,330	1	1	-250,936	-251,622	365.9	380.6	3.7	No
8	393.1	1.16089e+10	33,873,656	1	1	-252,816	-249,334	388.7	424.8	6.6	No
9	506.0	1.32589e+06	3,786	1	100	-254,466	-253,459	497.9	512.0	6.7	No
10	602.6	2.82683e+09	4,757,008	1	100	-251,799	-250,881	592.0	640.0	11.3	No
1	457.2	3.71479e+06	4,950	2	2	-216,937	-216,795	437.8	468.7	14.6	No
2	489.8	9.24459e+07	102,767	2	3	-216,795	-216,477	468.7	538.6	16.6	No

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


Amplitude
-10.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Time (s)
0.00
65.00
130.00
195.00
260.00
325.00
390.00
455.00
520.00
585.00
650.00
55.6
110.9
143.8
166.6
245.6
279.6
371.8
393.1
457.2
489.8
506.0
602.6
CGM #1 - L410 AT 0001 Stream=4 Det=1 26/03/2025 6:20:28 AM "PC File"
CGM #2 - L410 AT 0001 Stream=4 Det=2 26/03/2025 6:20:28 AM "PC File"

CERTIFIED REFERENCE MATERIAL

Approved signatory
Name: **Gautami Snewin**
Signature

Issued by **EffecTech**
Date of issue **12 April 2023**

Certificate number **23/0472/01**

EffecTech
Global Leaders in Gas Measurement

Dove House
Dove Fields
Uttoxeter
Staffordshire ST14 8HU
United Kingdom

www.effectech.co.uk

ilac-MRA

UKAS REFERENCE MATERIALS 5710

Customer	: CAC Gas & Instrumentation Pty. Limited Unit 3 / 36 Holbeche Rd., Arndell Park, NSW 2148, Australia.
Customer reference	: PO No.PO6534 (Part Code: 10AL-INPX-SPC6O2PT)
Product description	: Certified Reference Material (CRM) for use in natural gas analysis Multi-component natural gas mixture
Preparation method	: Mixture prepared by ISO 6142-1:2015 - *Gas Analysis - Preparation of calibration gas mixtures - Part 1 : Gravimetric method for Class I mixtures*
Value assignment	: Values assigned by ISO 6143:2001 - *Gas Analysis - Comparison methods for determining and checking the composition of calibration gas mixtures* using high precision gas chromatography
Metrological traceability	: Mixture classified as a Certified Reference Material (CRM) on which the values are assigned through an unbroken chain of analytical comparisons to a Primary Reference Gas Mixture
Stability	: EffecTech stability studies of similar gas mixtures in this type of cylinder/valve combination have demonstrated a shelf-life of 5 years providing the contents pressure and usage/storage temperature remain within the limits stated in the table below.
Handling and Use	: Supplementary advice is annexed to this certificate on the handling, storage and use of this certified reference material. General instructions for the proper use of gas mixtures can be found in ISO 16664: *Gas Analysis - Handling of calibration gases and gas mixtures*

Date of production	: 27 March 2023	Cylinder number	: D172603
Expiry date	: 27 March 2028	Contents pressure	: 84 bar
Minimum usage pressure	: 3 bar	Cylinder size	: 10 litres
Usage temperature range	: 0 to 50 °C	Cylinder material	: aluminium
Storage temperature range	: -40 to 50 °C	Valve outlet connection	: BS 341 - No.4

Composition

component	amount fraction (%mol/mol)
oxygen	0.00995 ± 0.00017
nitrogen	0.3781 ± 0.0079
carbon dioxide⋆	0.00993 ± 0.00020
methane	84.756 ± 0.025
ethane	13.713 ± 0.034
propane	0.9921 ± 0.0034
iso-butane	0.04939 ± 0.00045
n-butane	0.01987 ± 0.00045
iso-pentane	0.05067 ± 0.00036
n-pentane	0.02026 ± 0.00020

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution provides a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with JCGM 100:2008 - *Evaluation of measurement data - Guide to the expression of uncertainty in measurement* (GUM).

⋆ these components/quantities are not UKAS accredited as they lie outside the scope of accreditation for our laboratory

The contents of this certificate comply with the mandatory requirements of ISO Guide 31:2015 - *Reference materials — Contents of certificates, labels and accompanying documentation* and ISO 6141:2015 - *Gas Analysis - Contents of certificates for calibration gas mixtures*

To re-order this gas mixture contact CAC Gas & Instrumentation quoting certificate number 23/0472/01.
tel: 1300 CAC GAS (+61 2 8676 6500) email: cac@cacgas.com.au

EffecTech is accredited by UKAS as a producer of this certified reference material according to ISO 17034:2016.

The laboratory activities reported were performed at the location of the issuing body
The reference values reported relate only to the specific mixture identified in this certificate

CERTIFIED REFERENCE MATERIAL

UKAS accredited reference material producer no.5710

Certificate number

23/0472/01

Physical Properties

Reference conditions	**primary** combustion 15 °C metering 15 °C		**secondary** combustion 0 °C metering 0 °C	
mean molar mass	18.363 ± 0.018	$kg \cdot kmol^{-1}$	18.363 ± 0.018	$kg \cdot kmol^{-1}$
compression factor	0.9973 ± 0.0010		0.9967 ± 0.0010	
Real gas properties				
superior calorific value	42.256 ± 0.042	$MJ \cdot m^{-3}$	44.668 ± 0.045	$MJ \cdot m^{-3}$
	996.4 ± 1.0	$kJ \cdot mol^{-1}$	997.9 ± 1.0	$kJ \cdot mol^{-1}$
	54.260 ± 0.054	$MJ \cdot kg^{-1}$	54.344 ± 0.054	$MJ \cdot kg^{-1}$
inferior calorific value	38.197 ± 0.038	$MJ \cdot m^{-3}$	40.323 ± 0.040	$MJ \cdot m^{-3}$
	900.70 ± 0.90	$kJ \cdot mol^{-1}$	900.85 ± 0.90	$kJ \cdot mol^{-1}$
	49.048 ± 0.049	$MJ \cdot kg^{-1}$	49.057 ± 0.049	$MJ \cdot kg^{-1}$
relative density	0.63551 ± 0.00064		0.63574 ± 0.00064	
density	0.77876 ± 0.00078	$kg \cdot m^{-3}$	0.82196 ± 0.00082	$kg \cdot m^{-3}$
superior Wobbe index	53.006 ± 0.053	$MJ \cdot m^{-3}$	56.022 ± 0.056	$MJ \cdot m^{-3}$
Ideal gas properties				
superior calorific value	42.140 ± 0.042	$MJ \cdot m^{-3}$	44.523 ± 0.045	$MJ \cdot m^{-3}$
	996.4 ± 1.0	$kJ \cdot mol^{-1}$	997.9 ± 1.0	$kJ \cdot mol^{-1}$
	54.260 ± 0.054	$MJ \cdot kg^{-1}$	54.344 ± 0.054	$MJ \cdot kg^{-1}$
inferior calorific value	38.093 ± 0.038	$MJ \cdot m^{-3}$	40.191 ± 0.040	$MJ \cdot m^{-3}$
	900.70 ± 0.90	$kJ \cdot mol^{-1}$	900.85 ± 0.90	$kJ \cdot mol^{-1}$
	49.048 ± 0.049	$MJ \cdot kg^{-1}$	49.057 ± 0.049	$MJ \cdot kg^{-1}$
relative density	0.63404 ± 0.00063		0.63404 ± 0.00063	
density	0.77663 ± 0.00078	$kg \cdot m^{-3}$	0.81928 ± 0.00082	$kg \cdot m^{-3}$
superior Wobbe index	52.922 ± 0.053	$MJ \cdot m^{-3}$	55.914 ± 0.056	$MJ \cdot m^{-3}$

The physical properties above are calculated from composition at a reference pressure of 1.01325 bar and at the combustion and metering temperatures stated in accordance with the international standard ISO 6976:1995 - *Natural Gas - Calculation of calorific value, density, relative density and Wobbe index from composition* (including amendment No.1 - May 1998).

For the purpose of these calculations, and in accordance with the recommendations of the international standard, the gas mixture is assumed dry (free from moisture).

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution provides a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with JCGM 100:2008 - *Evaluation of measurement data - Guide to the expression of uncertainty in measurement* (GUM).

ADVICE on the storage and use of your calibration gas mixture

The calibration gas mixture supplied to you contains components which are condensable under certain conditions of temperature. It is important that these conditions are avoided where possible during storage and usage of the mixture.

Please read this advice in conjunction with recommended storage/usage conditions given on the certificate of calibration.

Storage

*Has the ambient temperature during **storage** dropped below the hydrocarbon dew temperature at contents pressure?*

If so then there will be stratification of your mixture into two phases (vapour and liquid)

The withdrawal of any gas phase content from this two phase mixture will invalidate the certified reference values we have provided with your calibration gas.

Advice before use

There will be no record of the minimum temperature to which your gas mixture has been exposed in transport to you. Hence, there is no guarantee that the gas mixture has not been exposed to temperatures below the hydrocarbon dew temperature of your mixture at contents pressure. If you suspect the gas has been exposed to temperatures below this the contents must be allowed to equilibrate at a greater temperature for a minimum period of about 24 hours. Following this equilibration time your mixture should be entirely homogeneous and gaseous. Often, it is good practice to roll the cylinder, where possible, to encourage mixing during equilibration.

Use

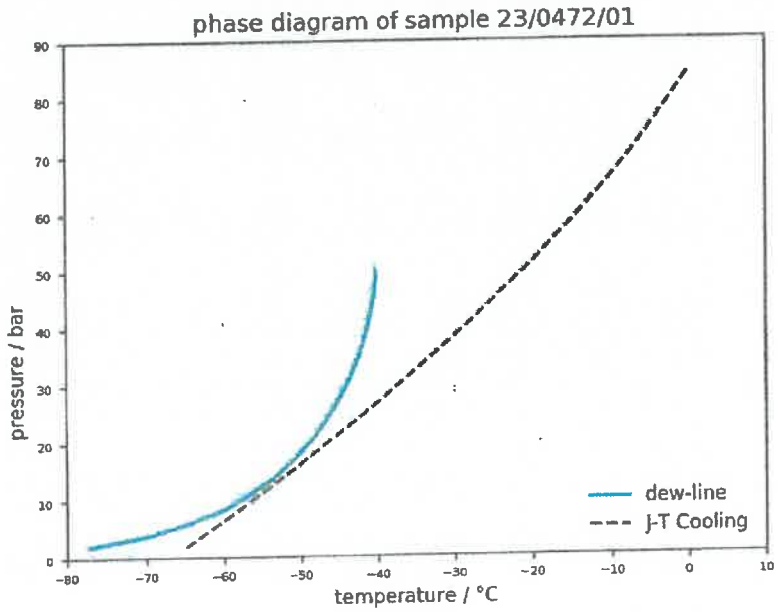
*When in **use** does condensation occur in your gas mixture following depressurisation as a result of cooling?*

Your gas mixture cools when it is depressurised through your pressure regulator. This is called Joule-Thomson (or Joule-Kelvin) cooling. If the gas cools to below the hydrocarbon dew temperature at its pressure then your mixture will stratify into two phases (vapour and liquid).

If this occurs the gas phase composition delivered to your application will not be representative of the certified reference values we have provided with your calibration gas.

Advice during use

The diagram below shows the pressure-temperature phase characteristics of your particular calibration mixture. Conditions shown to the left of the hydrocarbon dewline are in the two phase (liquid and vapour) region, whilst to the right your mixture remains as a single phase vapour. The cooling curve shown does not enter the two-phase region.



This demonstrates that during use your mixture remains entirely in the vapour phase should it be depressurised in a single stage from contents pressure and at a starting temperature of 0 °C.

Technical information : The dewline and the cooling curve were calculated using GasVLE™ and constructed using the LRS equation of state (EOS) and the cooling curve generated from a simulated isenthalpic flash calculation assuming adiabatic conditions starting at contents pressure and the stated temperature.

Terminal Correlation Sample		Terminal Correlation Run 1	Terminal Correlation Run 2	GPA 2261 : 2000 (Acceptance Criteria)					ISO 6974 : 5 (Acceptance Criteria)					GPA 2261 : 1964 (Acceptance Criteria)		
				Repeatability		Reproducibility			Repeatability		Reproducibility		Repeatability	Reproducibility		
Compound	Certified Value (mol%)	Normalised mol%	Normalised mol%	Difference between runs [ABS (Run1 -Run 2)]	GPA 2261 : 2000 Repeatability Limit	QC Mean Normalised mol% (Run1+Run2)/2	Difference (QC Mean - Certified Value)	GPA 2261 : 2000 Reproducibility - Limit	Difference between runs [ABS (Run1 -Run 2)]	Calculated ISO 6974-5 Repeatability limit, based on mean CRM value	Terminal Correlation Mean Normalised mol% (Run1+Run2)/2	Difference (QC Mean - Certified Value)	Calculated ISO 6974-5 Reproducibility Limit	GPA 2261 : 1964 Repeatability	QC Mean Normalised mol% (Run1+Run2)/2	Difference (QC Mean - Certified Value)	GPA 2261 : 1964 Reproducibility - Limit
Methane	84.756	84.72	84.72	0.00	0.17	84.72	0.04	0.59	0.00	0.03	84.72	0.04	0.07	N/A	84.72	0.04	0.30
Ethane	13.713	13.74	13.74	0.00	0.14	13.74	0.03	0.27	0.00	0.02	13.74	0.03	0.04	N/A	13.74	0.03	0.10
Propane	0.9921	0.99	0.99	0.00	0.01	0.99	0.00	0.02	0.00	0.01	0.99	0.00	0.02	N/A	0.99	0.00	0.03
Isobutane	0.04939	0.05	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.01	0.05	0.00	0.01	N/A	0.05	0.00	0.03
n-Butane	0.01987	0.02	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.01	N/A	0.02	0.00	0.03
Isopentane	0.05067	0.05	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.01	0.05	0.00	0.01	N/A	0.05	0.00	0.03
n-Pentane	0.02026	0.02	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.01	N/A	0.02	0.00	0.03
n-Hexane	0.00000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	N/A	0.00	0.00	N/A	N/A	0.00	0.00	0.00
Carbon dioxide	0.00993	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	N/A	0.01	0.00	0.03
Oxygen	0.00995	0.01	0.01	0.00	N/A	0.01	0.00	N/A	0.00	0.00	0.01	0.00	0.01	N/A	0.01	0.00	0.03
Nitrogen	0.3781	0.39	0.39	0.00	0.01	0.39	0.01	0.03	0.00	0.01	0.39	0.01	0.02	N/A	0.39	0.01	0.03
Normalised Total	100.00	100.00	100.00														
Un-Normalised Total (+/-1%)		100.23	100.38														

Terminal Correlation (L410AT0001) GHV calculation PT Provider cylinder certified value		
Gross Heating Value (Vol)	996.41	MJ/Kmol
Gross Heating Value (Vol)	1128.78	BTU/scf

Terminal Correlation (L410AT0001) GHV calculation L410AT0001 Average Result		
Gross Heating Value (Vol)	996.45	MJ/Kmol
Gross Heating Value (Vol)	1128.83	BTU/scf
Gross heating value Difference	0.05	BTU/scf
Allowable Difference	5	BTU/scf

Analyst : CM/DH *Date :* 26-Mar-2025

Checked by : EM *Date :* 26-Mar-2025

Calculated value
Within Specification
Outside Specification
Cylinder certified value and calculated precision data
Data entry

Analysis Report (GPA)

Date-Time : 03/26/2025 11:23:39 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:31:26 AM
Analyzer : L410 AT 0001 Stream Seq. : 2
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

Component Name	Mole Percent	Dry Gross BTU
C6+ 47/35/17	0.0000%	0.00
Propane	0.9935%	25.06
i-Butane	0.0498%	1.62
n-Butane	0.0194%	0.64
i-Pentane	0.0506%	2.03
n-Pentane	0.0200%	0.81
Nitrogen	0.3947%	0.00
Methane	84.7095%	857.55
Carbon Dioxide	0.0077%	0.00
Ethane	13.7448%	243.80
Oxygen	0.0100%	0.00
TOTALS	100.0000%	1131.50

'*' indicates user-defined components

Base Pressure		14.73003 PSIA
Gross Dry BTU	=	1131.5035
Actual Net BTU	=	1022.9311
Total Unnormalized Mole Percent	=	100.229
Average Molecular wgt.	=	18.37
Wobbe	=	1421.10

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-1	1121.8792

HHV BTU/SCF Str-Cal	1135.6036
HHV BTU/SCF Str-4	1122.2458

ISO Analysis

Date-Time : 03/26/2025 11:25:15 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:31:26 AM
Analyzer : L410 AT 0001 Stream Seq. : 2
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

	Primary	Secondary
Reference Temperature - Combustion Deg.C	15.0	15.0
Reference Temperature - Metering Deg.C	15.0	15.0
Calorific Value - Units	MJ/mol	MJ/mol

Component Name	Mole Percent	Relative Density	Superior CV Pri units	Inferior CV Pri units	Superior CV Sec Units	Inferior CV Sec units
C6+ 47/35/17	0.0000%	0.0000	0.0000	0.0000	0.0000	0.0000
Propane	0.9935%	0.0151	0.0221	0.0203	0.0221	0.0203
i-Butane	0.0498%	0.0010	0.0014	0.0013	0.0014	0.0013
n-Butane	0.0194%	0.0004	0.0006	0.0005	0.0006	0.0005
i-Pentane	0.0506%	0.0013	0.0018	0.0017	0.0018	0.0017
n-Pentane	0.0200%	0.0005	0.0007	0.0007	0.0007	0.0007
Nitrogen	0.3947%	0.0038	0.0000	0.0000	0.0000	0.0000
Methane	84.7095%	0.4692	0.7552	0.6800	0.7552	0.6800
Carbon Dioxide	0.0077%	0.0001	0.0000	0.0000	0.0000	0.0000
Ethane	13.7448%	0.1427	0.2147	0.1964	0.2147	0.1964
Oxygen	0.0100%	0.0001	0.0000	0.0000	0.0000	0.0000
TOTALS	100.0000%	0.6342	0.9965	0.9008	0.9965	0.9008

'*' indicates user-defined components

Primary Compressibility Factor(Z) @ 1.01560 BarA and 15.0 Deg.C = 0.99727

Base Pressure		1.01560 BarA
Real Superior CV - Dry - Primary	=	0.9965 MJ/mol
Real Superior CV - Sat - Primary	=	0.9797 MJ/mol
Real Inferior CV - Dry - Primary	=	0.9008 MJ/mol
Real Inferior CV - Sat - Primary	=	0.8856 MJ/mol
Real Superior CV - Dry - Secondary	=	0.9965 MJ/mol
Real Superior CV - Sat - Secondary	=	0.9797 MJ/mol
Real Inferior CV - Dry - Secondary	=	0.9008 MJ/mol
Real Inferior CV - Sat - Secondary	=	0.8856 MJ/mol
Real Relative Density Gas - Primary	=	0.6357
Real Gas Density - Primary	=	0.7790 kg/m3
Real Wobbe index - Sup - Primary	=	1.2498 MJ/mol
Average Molar Mass	=	18.369
Total Unnormalized Mole Percent	=	100.229

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-1	1121.8792
HHV BTU/SCF Str-Cal	1135.6036
HHV BTU/SCF Str-4	1122.2458

Raw Data Report

Date-Time : 03/26/2025 11:26:17 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:31:26 AM
Analyzer : L410 AT 0001

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

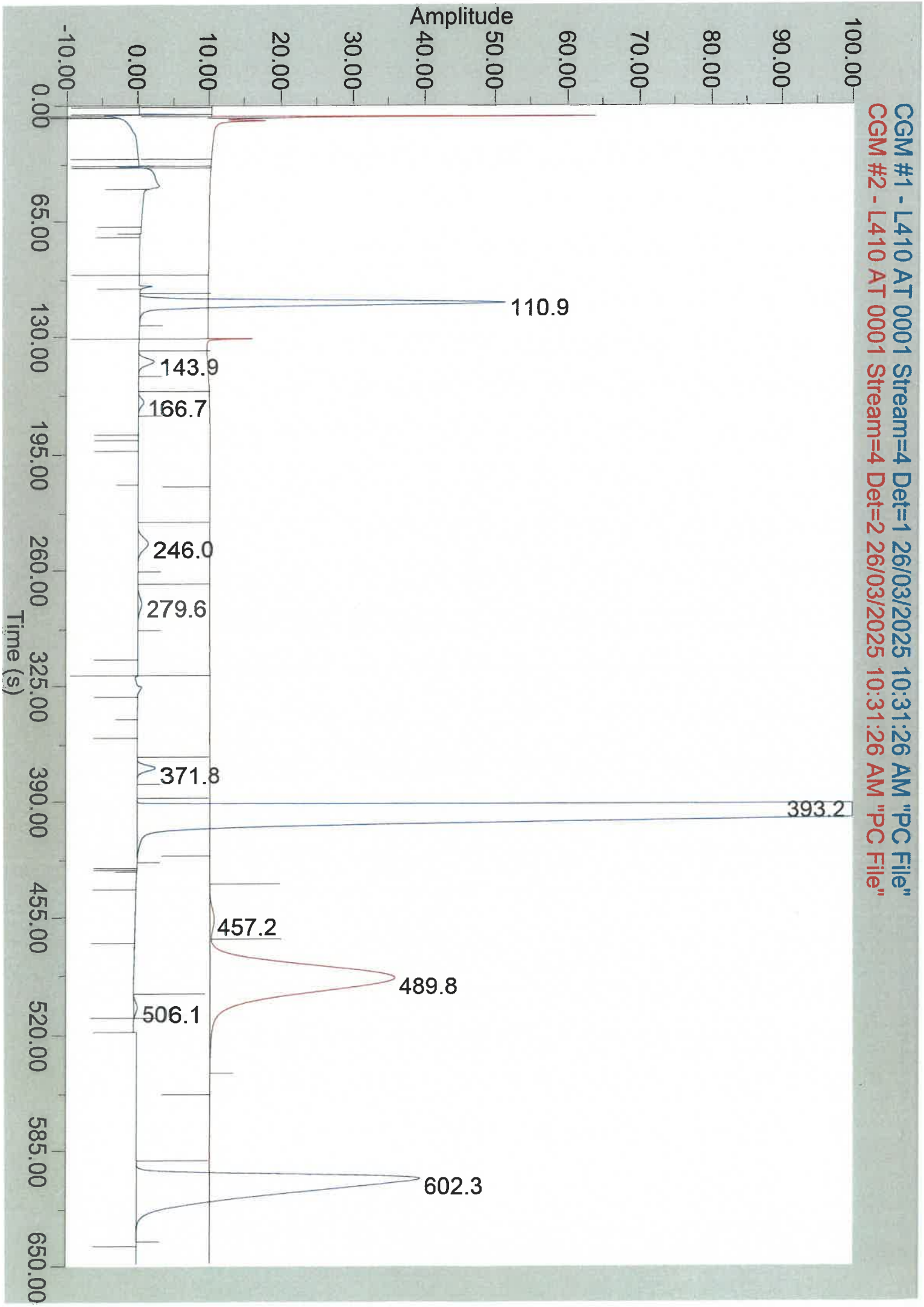
Peak No.	Ret Time	Peak Area	Peak Height	Det No.	Method	Baseline Start	Baseline End	Integration Start	Integration End	Peak Width@ Half Height	Partial Peak
1	110.9	2.76817e+08	1,604,127	1	1	-248,934	-249,486	105.6	123.5	3.4	No
2	143.9	1.61095e+07	70,734	1	1	-252,663	-252,630	137.8	152.0	4.4	No
3	166.7	6.38616e+06	24,612	1	1	-253,051	-252,768	160.6	174.4	4.9	No
4	246.0	1.90436e+07	47,306	1	1	-253,505	-253,464	234.1	261.6	7.7	No
5	279.6	7.66046e+06	17,134	1	1	-253,454	-253,264	268.7	294.6	8.6	No
6	371.8	6.49983e+07	333,405	1	1	-255,430	-255,583	365.6	380.9	3.7	No
7	393.2	1.14806e+10	33,638,703	1	1	-256,532	-251,841	388.8	424.8	6.6	No
8	506.1	1.30048e+06	3,744	1	100	-258,823	-258,120	498.4	512.0	6.8	No
9	602.3	2.98519e+09	4,969,809	1	1	-256,778	-254,238	592.0	637.5	11.4	No
1	457.2	3.7837e+06	5,051	2	2	-219,342	-219,216	437.0	467.8	14.9	No
2	489.8	1.84324e+08	204,280	2	3	-219,216	-218,909	467.8	543.1	16.8	No

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


Amplitude
-10.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Time (s)
0.00
65.00
130.00
195.00
260.00
325.00
390.00
455.00
520.00
585.00
650.00
CGM #1 - L410 AT 0001 Stream=4 Det=1 26/03/2025 10:31:26 AM "PC File"
CGM #2 - L410 AT 0001 Stream=4 Det=2 26/03/2025 10:31:26 AM "PC File"
110.9
143.9
166.7
246.0
279.6
371.8
393.2
457.2
489.8
506.1
602.3

Analysis Report (GPA)

Date-Time : 03/26/2025 11:24:45 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:42:26 AM
Analyzer : L410 AT 0001 Stream Seq. : 2
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

Component Name	Mole Percent	Dry Gross BTU
C6+ 47/35/17	0.0000%	0.00
Propane	0.9931%	25.04
i-Butane	0.0499%	1.63
n-Butane	0.0194%	0.63
i-Pentane	0.0499%	2.00
n-Pentane	0.0199%	0.80
Nitrogen	0.3950%	0.00
Methane	84.7147%	857.60
Carbon Dioxide	0.0074%	0.00
Ethane	13.7406%	243.73
Oxygen	0.0101%	0.00
TOTALS	100.0000%	1131.44

'*' indicates user-defined components

Base Pressure		14.73003 PSIA
Gross Dry BTU	=	1131.4407
Actual Net BTU	=	1022.8724
Total Unnormalized Mole Percent	=	100.382
Average Molecular wgt.	=	18.37
Wobbe	=	1421.06

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-1	1121.8792

HHV BTU/SCF Str-Cal	1135.6036
HHV BTU/SCF Str-4	1122.2458

ISO Analysis

Date-Time : 03/26/2025 11:25:34 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:42:26 AM
Analyzer : L410 AT 0001 Stream Seq. : 2
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

	Primary	Secondary
Reference Temperature - Combustion Deg.C	15.0	15.0
Reference Temperature - Metering Deg.C	15.0	15.0
Calorific Value - Units	MJ/mol	MJ/mol

Component Name	Mole Percent	Relative Density	Superior CV Pri units	Inferior CV Pri units	Superior CV Sec Units	Inferior CV Sec units
C6+ 47/35/17	0.0000%	0.0000	0.0000	0.0000	0.0000	0.0000
Propane	0.9931%	0.0151	0.0221	0.0203	0.0221	0.0203
i-Butane	0.0499%	0.0010	0.0014	0.0013	0.0014	0.0013
n-Butane	0.0194%	0.0004	0.0006	0.0005	0.0006	0.0005
i-Pentane	0.0499%	0.0012	0.0018	0.0016	0.0018	0.0016
n-Pentane	0.0199%	0.0005	0.0007	0.0007	0.0007	0.0007
Nitrogen	0.3950%	0.0038	0.0000	0.0000	0.0000	0.0000
Methane	84.7147%	0.4692	0.7553	0.6800	0.7553	0.6800
Carbon Dioxide	0.0074%	0.0001	0.0000	0.0000	0.0000	0.0000
Ethane	13.7406%	0.1427	0.2146	0.1963	0.2146	0.1963
Oxygen	0.0101%	0.0001	0.0000	0.0000	0.0000	0.0000
TOTALS	100.0000%	0.6342	0.9964	0.9007	0.9964	0.9007

'*' indicates user-defined components

Primary Compressibility Factor(Z) @ 1.01560 BarA and 15.0 Deg.C = 0.99727

Base Pressure		1.01560 BarA
Real Superior CV - Dry - Primary	=	0.9964 MJ/mol
Real Superior CV - Sat - Primary	=	0.9797 MJ/mol
Real Inferior CV - Dry - Primary	=	0.9007 MJ/mol
Real Inferior CV - Sat - Primary	=	0.8856 MJ/mol
Real Superior CV - Dry - Secondary	=	0.9964 MJ/mol
Real Superior CV - Sat - Secondary	=	0.9797 MJ/mol
Real Inferior CV - Dry - Secondary	=	0.9007 MJ/mol
Real Inferior CV - Sat - Secondary	=	0.8856 MJ/mol
Real Relative Density Gas - Primary	=	0.6357
Real Gas Density - Primary	=	0.7790 kg/m3
Real Wobbe index - Sup - Primary	=	1.2498 MJ/mol
Average Molar Mass	=	18.368
Total Unnormalized Mole Percent	=	100.382

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-1	1121.8792
HHV BTU/SCF Str-Cal	1135.6036
HHV BTU/SCF Str-4	1122.2458

Raw Data Report

Date-Time : 03/26/2025 11:26:38 AM Analysis time : 650.00 sec Cycle Time : 660.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:42:26 AM
Analyzer : L410 AT 0001

Firmware Revision, Checksum : 2.2.3, 2016/04/15, 0x53be1317

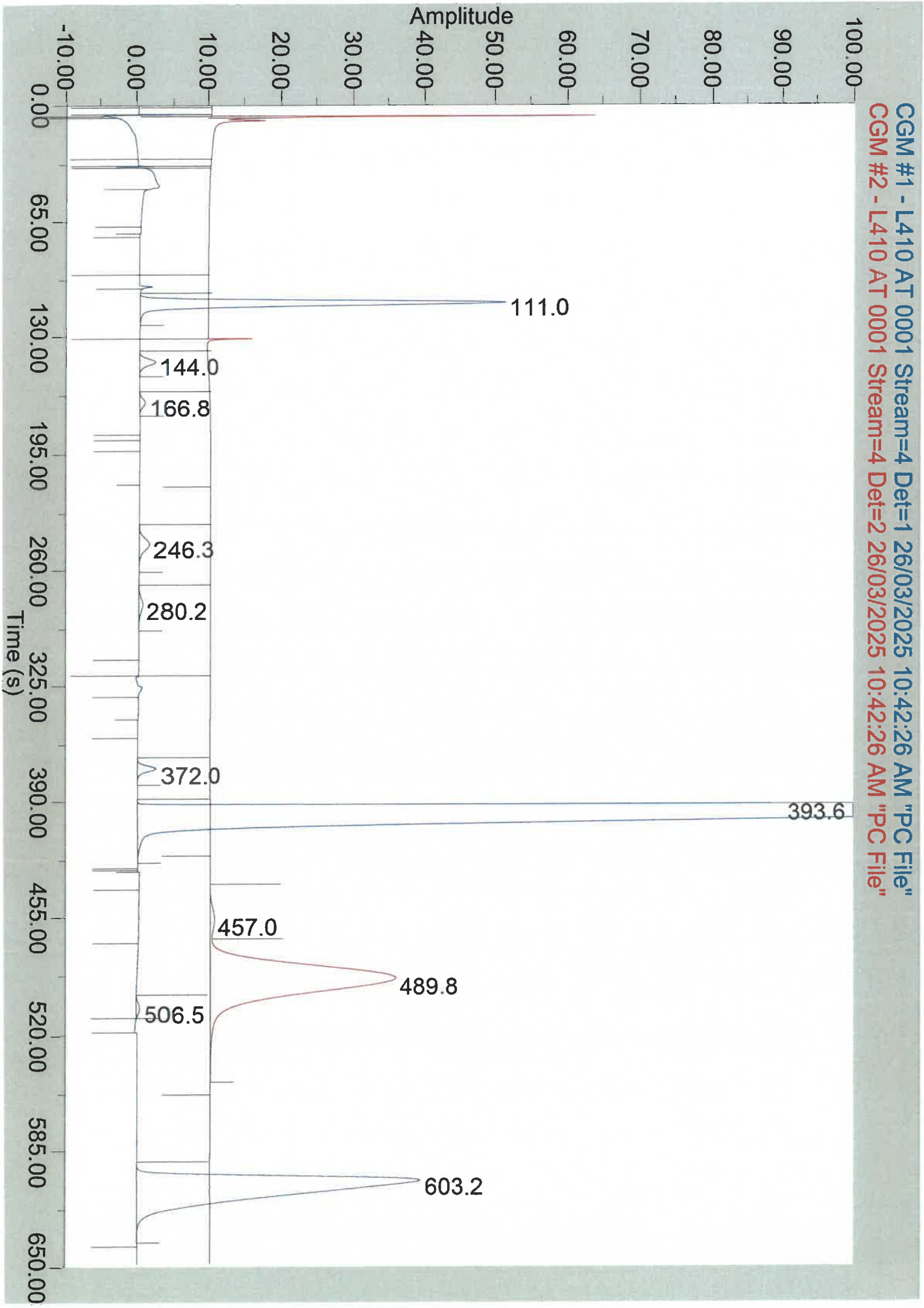
Peak No.	Ret Time	Peak Area	Peak Height	Det No.	Method	Baseline Start	Baseline End	Integration Start	Integration End	Peak Width@ Half Height	Partial Peak
1	111.0	2.77108e+08	1,603,762	1	1	-246,183	-245,761	105.4	123.4	3.2	No
2	144.0	1.61642e+07	70,764	1	1	-247,992	-246,903	137.8	152.2	4.3	No
3	166.8	6.38818e+06	24,677	1	1	-246,874	-246,242	160.6	174.4	5.0	No
4	246.3	1.88259e+07	46,935	1	1	-247,210	-248,122	235.1	262.0	7.7	No
5	280.2	7.62489e+06	17,086	1	4	-248,478	-249,186	269.0	294.6	8.3	No
6	372.0	6.51513e+07	333,332	1	1	-253,336	-253,562	365.8	381.2	3.7	No
7	393.6	1.14988e+10	33,603,404	1	1	-254,596	-249,386	389.0	425.0	6.6	No
8	506.5	1.25502e+06	3,625	1	100	-256,369	-256,274	499.1	512.0	6.5	No
9	603.2	2.98884e+09	4,965,620	1	1	-260,445	-256,397	592.6	637.9	11.4	No
1	457.0	3.84986e+06	5,106	2	2	-219,036	-218,973	436.8	467.5	15.4	No
2	489.8	1.84781e+08	204,423	2	3	-218,973	-218,809	467.5	547.9	16.8	No

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


Amplitude
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0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
Time (s)
0.00
65.00
130.00
195.00
260.00
325.00
390.00
455.00
520.00
585.00
650.00
111.0
144.0
166.8
246.3
280.2
372.0
393.6
457.0
489.8
506.5
603.2
CGM #1 - L410 AT 0001 Stream=4 Det=1 26/03/2025 10:42:26 AM "PC File"
CGM #2 - L410 AT 0001 Stream=4 Det=2 26/03/2025 10:42:26 AM "PC File"

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ONLINE ANALYSER VERIFICATION AND TERMINAL CORRELATION RESULTS – L410-AT-1001

26/03/2025

CERTIFICATE OF CALIBRATION

Approved signatory
Name: **Alan Boulton**
Signature

Issued by **EffecTech**
Date of Issue **03 June 2020** Certificate Number **20/0378/04**

EffecTech
Global Leaders in Gas Measurement

Dove House
Dove Fields
Uttoxeter
Staffordshire ST14 8HU
United Kingdom www.effectech.co.uk

ilac-MRA UKAS CALIBRATION 0590

Customer	: CAC Gas & Instrumentation Pty. Ltd. Unit 3 / 36 Holbeche Rd., Arndell Park, NSW 2148, Australia.
Customer reference	: PO No.PO4283 (Part Code: 50ST-INPX-LNGCALCH4)
Product Description	: Certified Reference Material (CRM) for use as a calibration gas mixture in natural gas analysis Multi-component natural gas mixture
Preparation method	: Mixture prepared by ISO 6142-1:2015 - *Gas Analysis - Preparation of calibration gas mixtures - Part 1 : Gravimetric method for Class I mixtures*
Calibration method	: Mixture calibrated by ISO 6143:2001 - *Gas Analysis - Comparison methods for determining and checking the composition of calibration gas mixtures* using high precision gas chromatography
Traceability	: Mixture classified as a Calibrated Gas Mixture (CGM) at Level-3 in the metrological hierarchy of traceability by direct analytical comparison with a Secondary Reference Gas Mixture (SRGM)
Cylinder number	: 20/4451
Date of calibration	: 29 May 2020
Contents pressure	: 100 bar
Cylinder size	: 50 litres
Cylinder material	: steel
Valve outlet connection	: BS341 - No.4

Minimum usage pressure	: 3 bar
Usage temperature range	: 15 to 50°C
Storage (transport) temperature range	: -33 to 50°C

Composition

component	amount fraction (%mol/mol)
oxygen	0.00980 ± 0.00017
nitrogen	0.5986 ± 0.0020
carbon dioxide*	0.01012 ± 0.00022
methane	83.851 ± 0.041
ethane	14.016 ± 0.041
propane	1.3018 ± 0.0049
iso-butane	0.06074 ± 0.00045
n-butane	0.04103 ± 0.00045
iso-pentane	0.06085 ± 0.00040
n-pentane	0.04050 ± 0.00030
n-hexane	0.01010 ± 0.00020

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution provides a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.The reference values presented in this certificate apply to the calibration of the individual and unique gas mixture identified above

*these components/quantities are not UKAS accredited as they lie outside the scope of accreditation for our laboratory

The following information provided on stability and the expiry date is outside the scope of UKAS accreditation but is required to fulfil the mandatory requirements of ISO 6141:2015 - *Gas Analysis - Contents of certificates for calibration gas mixtures*

Stability	: EffecTech stability studies of similar gas mixtures in this type of cylinder/valve combination have demonstrated a shelf-life of 5 years, providing the contents pressure and usage/storage temperature remain within the limits stated in the table above.
Expiry date	: 29 May 2025

To re-order this gas mixture contact CAC Gas & Instrumentation quoting certificate number 20/0378/04.
tel: 1300 CAC GAS (+61 2 8676 6500) email: cac@cacgas.com.au

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0590

Certificate number

20/0378/04

Physical Properties

Physical properties are calculated from composition in accordance with the international standard ISO 6976:1995 (E) including amendment No.1 - May 1998.

Properties are calculated at a reference pressure of 1.01325 bar and at reference temperatures stated.

Note :- In accordance with the recommendations of the international standard, the gas mixture is assumed dry (free from molsture) for the purpose of these calculations.

Reference conditions	**primary** combustion 15°C metering 15°C	**secondary** combustion 0°C metering 0°C
mean molecular mass	18.557 ± 0.019 kg·kmol^{-1}	18.557 ± 0.019 kg·kmol^{-1}
compression factor	0.9972 ± 0.0010	0.9967 ± 0.0010
Real gas properties		
superior calorific value	42.511 ± 0.043 MJ·m^{-3}	44.938 ± 0.045 MJ·m^{-3}
	1002.4 ± 1.0 kJ·mol^{-1}	1003.9 ± 1.0 kJ·mol^{-1}
	54.016 ± 0.054 MJ·kg^{-1}	54.099 ± 0.054 MJ·kg^{-1}
inferior calorific value	38.438 ± 0.038 MJ·m^{-3}	40.577 ± 0.041 MJ·m^{-3}
	906.33 ± 0.91 kJ·mol^{-1}	906.48 ± 0.91 kJ·mol^{-1}
	48.840 ± 0.049 MJ·kg^{-1}	48.848 ± 0.049 MJ·kg^{-1}
relative density	0.64224 ± 0.00064	0.64248 ± 0.00064
density	0.78701 ± 0.00079 kg·m^{-3}	0.83068 ± 0.00083 kg·m^{-3}
Wobbe index	53.046 ± 0.053 MJ·m^{-3}	56.065 ± 0.056 MJ·m^{-3}
Ideal gas properties		
superior calorific value	42.393 ± 0.042 MJ·m^{-3}	44.789 ± 0.045 MJ·m^{-3}
	1002.4 ± 1.0 kJ·mol^{-1}	1003.9 ± 1.0 kJ·mol^{-1}
	54.016 ± 0.054 MJ·kg^{-1}	54.099 ± 0.054 MJ·kg^{-1}
inferior calorific value	38.331 ± 0.038 MJ·m^{-3}	40.443 ± 0.040 MJ·m^{-3}
	906.33 ± 0.91 kJ·mol^{-1}	906.48 ± 0.91 kJ·mol^{-1}
	48.840 ± 0.049 MJ·kg^{-1}	48.848 ± 0.049 MJ·kg^{-1}
relative density	0.64072 ± 0.00064	0.64072 ± 0.00064
density	0.78482 ± 0.00078 kg·m^{-3}	0.82792 ± 0.00083 kg·m^{-3}
Wobbe index	52.961 ± 0.053 MJ·m^{-3}	55.955 ± 0.056 MJ·m^{-3}

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution provides a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

ADVICE on the storage and use of your calibration gas mixture

The calibration gas mixture supplied to you contains components which are condensable under certain conditions of temperature. It is important that these conditions are avoided where possible during storage and usage of the mixture.

Please read this advice in conjunction with recommended storage/usage conditions given son the certificate of calibration.

Storage

*Has the ambient temperature during **storage** dropped below the hydrocarbon dew temperature at contents pressure?*

If so then there will be stratification of your mixture into two phases (vapour and liquid)

The withdrawal of any gas phase content from this two phase mixture will invalidate the certified reference values we have provided with your calibration gas.

Advice before use

There will be no record of the minimum temperature to which your gas mixture has been exposed in transport to you. Hence, there is no guarantee that the gas mixture has not been exposed to temperatures below the hydrocarbon dew temperature of your mixture at contents pressure. If you suspect the gas has been exposed to temperatures below this the contents must be allowed to equilibrate at a greater temperature for a minimum period of about 24 hours. Following this equilibration time your mixture should be entirely homogeneous and gaseous. Often, it is good practice to roll the cylinder, where possible, to encourage mixing during equilibration.

Use

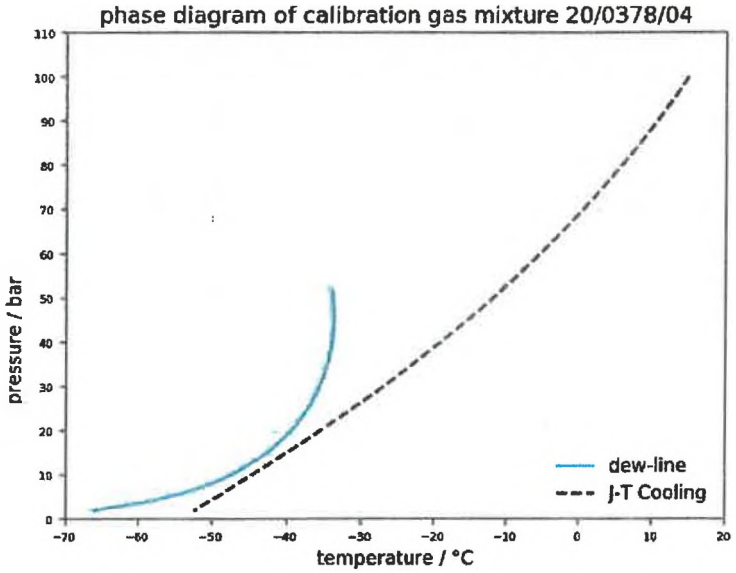
*When in **use** does condensation occur in your gas mixture following depressurisation as a result of cooling?*

Your gas mixture cools when it is depressurised through your pressure regulator. This is called Joule-Thomson (or Joule-Kelvin) cooling. If the gas cools to below the hydrocarbon dew temperature at its pressure then your mixture will stratify into two phases (vapour and liquid).

If this occurs the gas phase composition delivered to your application will not be representative of the certified reference values we have provided with your calibration gas.

Advice during use

The diagram below shows the pressure-temperature phase characteristics of your particular calibration mixture. Conditions shown to the left of the hydrocarbon dewline are in the two phase (liquid and vapour) region, whilst to the right your mixture remains as a single phase vapour. The cooling curve shown does not enter the two-phase region.



This demonstrates that during use your mixture remains entirely in the vapour phase should it be depressurised in a single stage from contents pressure and at a starting temperature of 15°C.

Technical information : The dewline and the cooling curve were calculated using GasVLE™ and constructed using the LRS equation of state (EOS) and the cooling curve generated from a simulated isenthalpic flash calculation assuming adiabatic conditions starting at contents pressure and the stated temperature.

LNG Calibration Standard Instrument: L410-AT-1001		Data File: GC run 1	Data File: GC run 2	Data File: GC run 3	Cal Date: 05/10/2025	Cylinder No: 20/0378/04 Expiry 29/05/2025			
Compound	Certified Value	Area	Area	Area	Av. Peak area across 3 Cal runs-2 d.p				
Detector (TCD/FID)	mol %	25uV*s (TCD)/ pA*s (FID)	25uV*s (TCD)/ pA*s (FID)	25uV*s (TCD)/ pA*s (FID)	Average Peak Area (Run1+Run2+Run3)/3	Response Factor (Certified Value/Average Peak Area)	0.5% of average peak area (GPA2261:2000 - Clause 6.3)	Acceptance Criteria - Peak Area Min	Acceptance Criteria - Peak Area Max
Methane	83.851	13243736064.00000	13240438784.00000	13236643840.00000	13240272896.00	6.33303E-09	66201364.48	13174071531.52	13306474260.48
Ethane	14.016	3496186880.00000	3495451392.00000	3495474432.00000	3495704234.67	4.00949E-09	17478521.17	3478225713.49	3513182755.84
Propane	1.3018	397362304.00000	397266336.00000	397151744.00000	397260128.00	3.27695E-09	1986300.64	395273827.36	399246428.64
Isobutane	0.06074	21560592.00000	21519500.00000	21512730.00000	21530940.67	2.82106E-09	107654.70	21423285.96	21638595.37
n-Butane	0.04103	14749695.00000	14721774.00000	14704044.00000	14725171.00	2.78639E-09	73625.86	14651545.15	14798796.86
Isopentane	0.06085	24701976.00000	24742676.00000	24716912.00000	24720521.33	2.46152E-09	123602.61	24596918.73	24844123.94
n-Pentane	0.04050	16689359.00000	16759731.00000	16779344.00000	16742811.33	2.41895E-09	83714.06	16659097.28	16826525.39
n-Hexane	0.01010	4829350.00000	4823621.00000	4847129.00000	4833366.67	2.08964E-09	24166.83	4809199.83	4857533.50
Carbon dioxide	0.01012	2135343.00000	2148327.50000	2115144.00000	2132938.17	4.74463E-09	10664.69	2122273.48	2143602.86
Oxygen	0.00980	5896264.50000	5903542.50000	6397400.00000	6065735.67	1.61563E-09	30328.68	6035406.99	6096064.35
Nitrogen	0.5986	116704512.00000	116832408.00000	116701376.00000	116746098.67	5.12737E-09	583730.49	116162368.17	117329829.16
Total	100.001								

Analyst : MC *Date :* 27/03/2025

Checked by : EM *Date :* 27/03/2025

Legend

Within Specification

Outside Specification

Cylinder certified value and calculated precision data

Calculated value

Data entry

Final Calibration Report

Date-Time : 03/24/2025 12:53:09 PM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Calibration Str Mode : Calibration Cycle Start Time : 10/05/2024 10:57:38 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2
Calibration Certificate Details : 20/0378/04

Component Name	Cal Conc.	Old RF	New RF	*	RF % Dev.	Old RT	New RT	*	RT % Dev.
C6+ 47/35/17	0.0101%	4.797614e+08	4.7875e+08	*	-0.21	43.1	42.4	*	-1.58
Propane	1.302%	3.054878e+08	3.051229e+08	*	-0.12	89.7	89.7	*	0.02
i-Butane	0.06074%	3.543497e+08	3.54233e+08	*	-0.03	116.4	116.4	*	-0.03
n-Butane	0.04103%	3.597368e+08	3.585891e+08	*	-0.32	134.5	134.5	*	-0.01
i-Pentane	0.06085%	4.075481e+08	4.064058e+08	*	-0.28	198.0	198.3	*	0.16
n-Pentane	0.0405%	4.166889e+08	4.140627e+08	*	-0.63	225.2	225.2	*	0.00
Nitrogen	0.5986%	1.953809e+08	1.950667e+08	*	-0.16	349.8	351.8	*	0.57
Methane	83.85%	1.580482e+08	1.578817e+08	*	-0.11	365.1	367.2	*	0.56
Carbon Dioxide	0.01012%	2.119615e+08	2.106458e+08	*	-0.62	453.9	456.0	*	0.45
Ethane	14.02%	2.500414e+08	2.493909e+08	*	-0.26	530.0	532.2	*	0.41
Oxygen	0.0098%	6.282081e+08	6.275991e+08	*	-0.10	454.6	454.9	*	0.07

"*" indicates components whose Retention Times and Response Factors were updated.

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

Calibration Report

Calibration Run 1 of 3

Date-Time : 03/24/2025 11:45:19 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Calibration Str Mode : Calibration Cycle Start Time : 10/05/2024 10:35:28 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

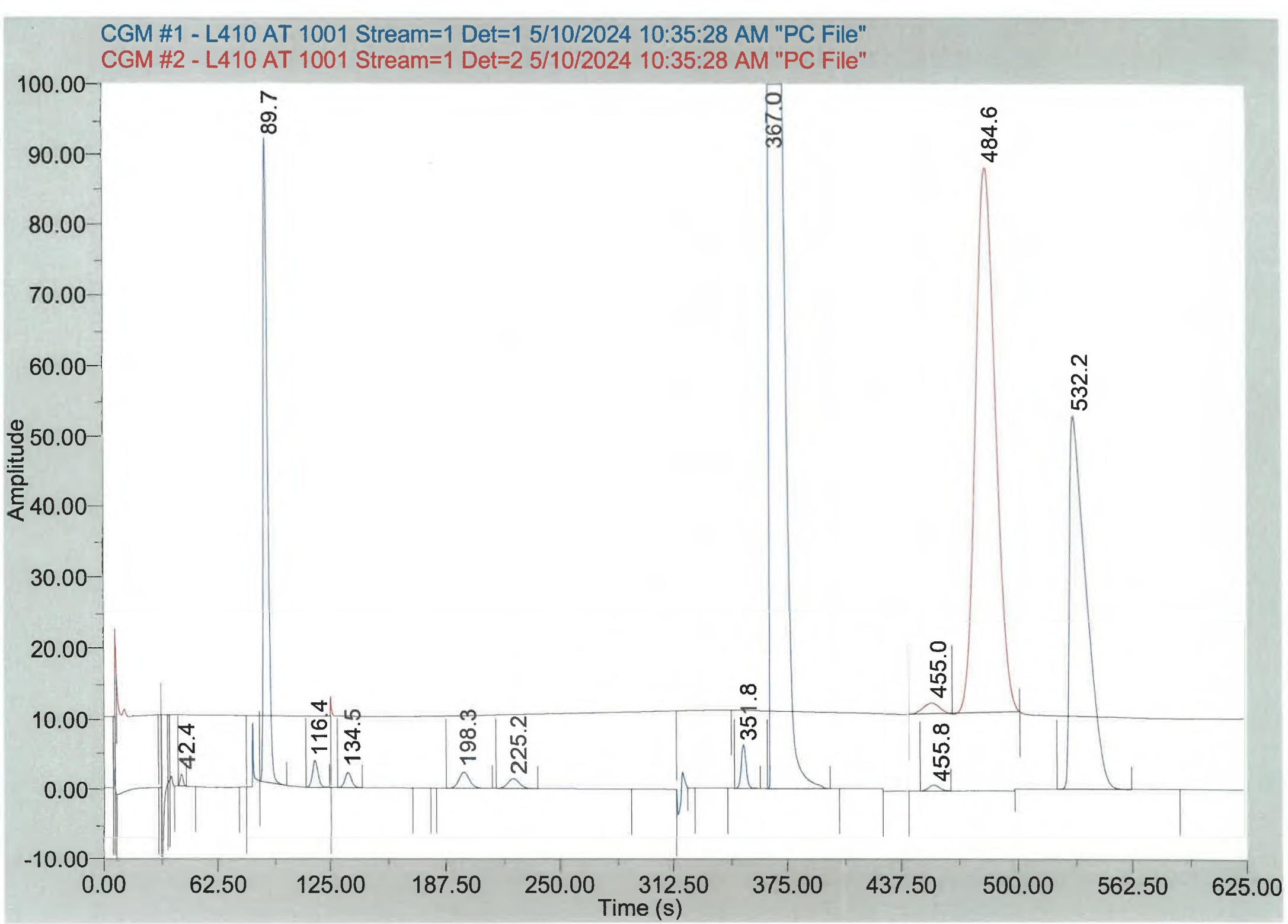
Component Name	Cal Conc.	Raw Data	New RF	RF % Dev.	New RT	RT % Dev.
C6+ 47/35/17	0.0101%	4829350.00	4.781535e+08	-0.34	42.4	-1.58
Propane	1.3018%	397362304.00	3.052407e+08	-0.08	89.7	0.02
i-Butane	0.0607%	21560592.00	3.549653e+08	0.17	116.4	-0.03
n-Butane	0.0410%	14749695.00	3.594856e+08	-0.07	134.5	-0.01
i-Pentane	0.0608%	24701976.00	4.059487e+08	-0.39	198.3	0.16
n-Pentane	0.0405%	16689359.00	4.120829e+08	-1.11	225.2	0.00
Nitrogen	0.5986%	116704512.00	1.949624e+08	-0.21	351.8	0.57
Methane	83.8510%	13243736064.00	1.579437e+08	-0.07	367.0	0.53
Carbon Dioxide	0.0101%	2135343.00	2.110023e+08	-0.45	455.8	0.43
Ethane	14.0160%	3496186880.00	2.494426e+08	-0.24	532.2	0.41
Oxygen	0.0098%	5896264.50	6.016596e+08	-4.23	455.0	0.09

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 1001 Stream=1 Det=1 5/10/2024 10:35:28 AM "PC File"
CGM #2 - L410 AT 1001 Stream=1 Det=2 5/10/2024 10:35:28 AM "PC File"
Amplitude
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0.00
62.50
125.00
187.50
250.00
312.50
375.00
437.50
500.00
562.50
625.00
Time (s)
89.7
367.0
484.6
532.2
455.0
351.8
455.8
42.4
116.4
134.5
198.3
225.2

Calibration Report

Calibration Run 2 of 3

Date-Time : 03/24/2025 11:45:18 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Calibration Str Mode : Calibration Cycle Start Time : 10/05/2024 10:47:03 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

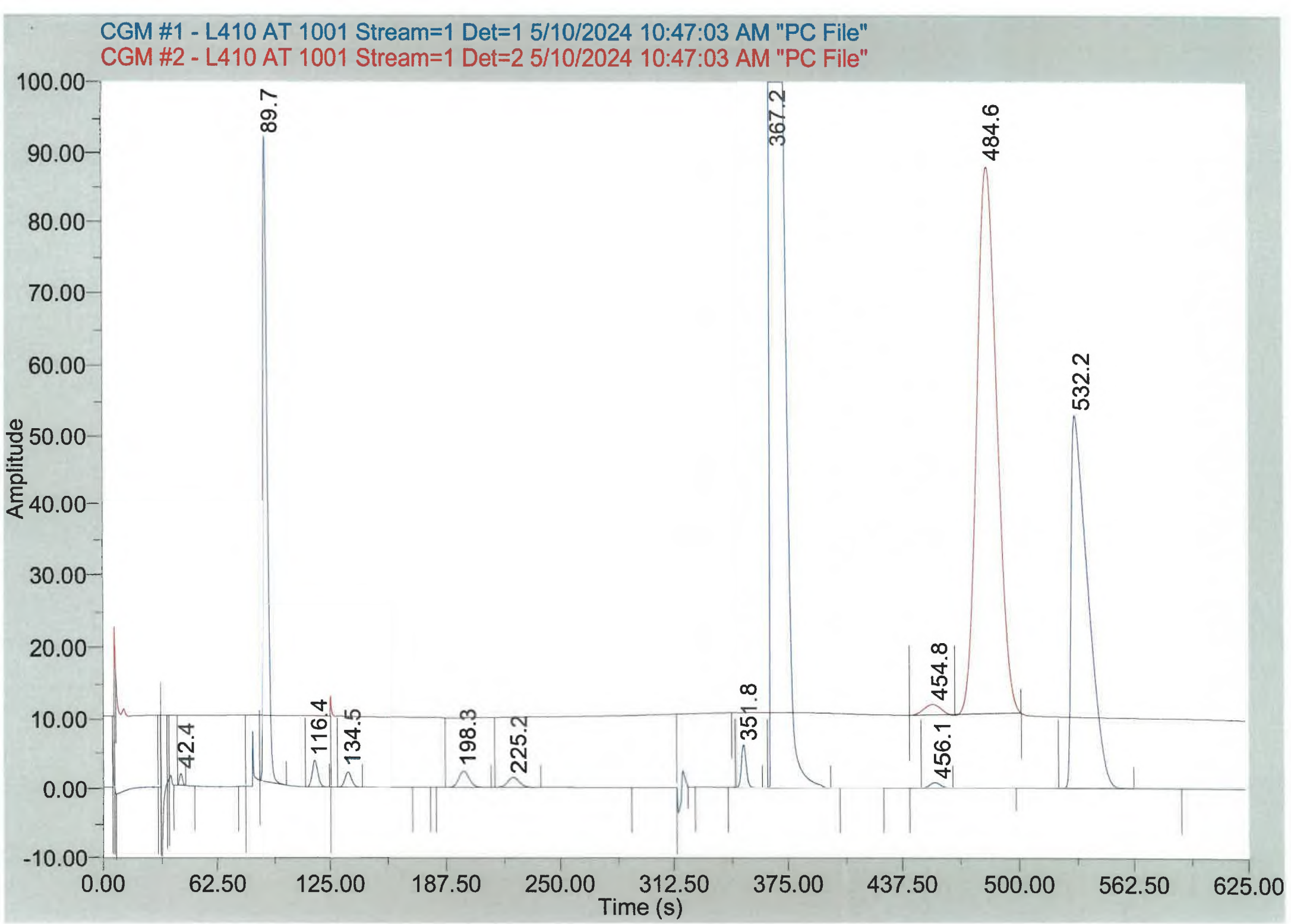
Component Name	Cal Conc.	Raw Data	New RF	RF % Dev.	New RT	RT % Dev.
C6+ 47/35/17	0.0101%	4823621.00	4.775863e+08	-0.45	42.4	-1.58
Propane	1.3018%	397266336.00	3.051669e+08	-0.11	89.7	0.02
i-Butane	0.0607%	21519500.00	3.542888e+08	-0.02	116.4	-0.03
n-Butane	0.0410%	14721774.00	3.588051e+08	-0.26	134.5	-0.01
i-Pentane	0.0608%	24742676.00	4.066175e+08	-0.23	198.3	0.16
n-Pentane	0.0405%	16759731.00	4.138205e+08	-0.69	225.2	0.00
Nitrogen	0.5986%	116832408.00	1.951761e+08	-0.10	351.8	0.57
Methane	83.8510%	13240438784.00	1.579044e+08	-0.09	367.2	0.56
Carbon Dioxide	0.0101%	2148327.50	2.122853e+08	0.15	456.1	0.48
Ethane	14.0160%	3495451392.00	2.493901e+08	-0.26	532.2	0.41
Oxygen	0.0098%	5903542.50	6.024023e+08	-4.11	454.8	0.04

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 1001 Stream=1 Det=1 5/10/2024 10:47:03 AM "PC File"
CGM #2 - L410 AT 1001 Stream=1 Det=2 5/10/2024 10:47:03 AM "PC File"
Amplitude
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
89.7
367.2
484.6
532.2
42.4
116.4
134.5
198.3
225.2
351.8
454.8
456.1
0.00
62.50
125.00
187.50
250.00
312.50
375.00
437.50
500.00
562.50
625.00
Time (s)

Calibration Report

Calibration Run 3 of 3

Date-Time : 03/24/2025 11:45:16 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Calibration Str Mode : Calibration Cycle Start Time : 10/05/2024 10:57:38 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

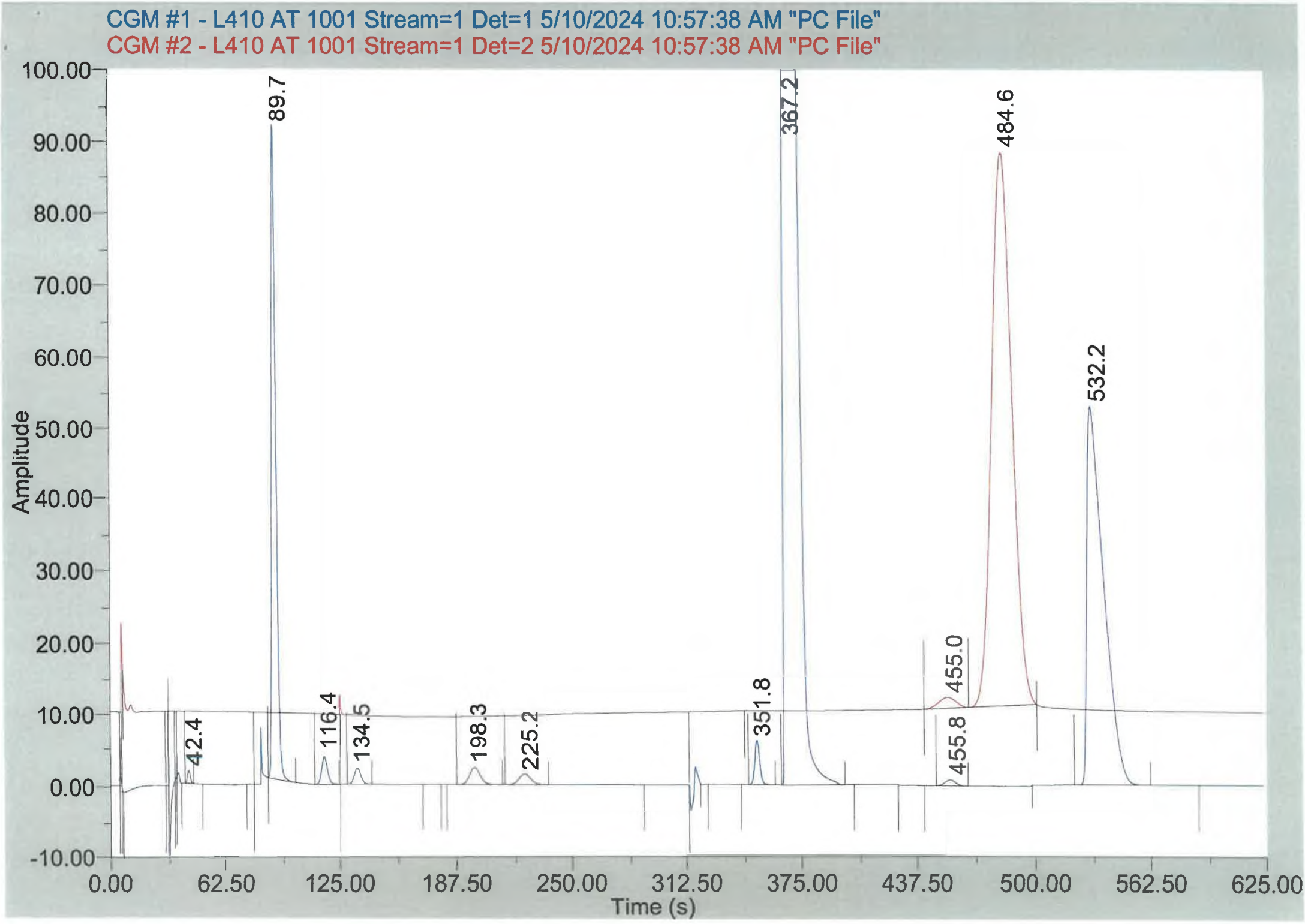
Component Name	Cal Conc.	Raw Data	New RF	RF % Dev.	New RT	RT % Dev.
C6+ 47/35/17	0.0101%	4847129.00	4.799138e+08	0.03	42.4	-1.58
Propane	1.3018%	397151744.00	3.050789e+08	-0.13	89.7	0.02
i-Butane	0.0607%	21512730.00	3.541773e+08	-0.05	116.4	-0.03
n-Butane	0.0410%	14704044.00	3.58373e+08	-0.38	134.5	-0.01
i-Pentane	0.0608%	24716912.00	4.061941e+08	-0.33	198.3	0.16
n-Pentane	0.0405%	16779344.00	4.143048e+08	-0.57	225.2	0.00
Nitrogen	0.5986%	116701376.00	1.949572e+08	-0.22	351.8	0.57
Methane	83.8510%	13236643840.00	1.578591e+08	-0.12	367.2	0.56
Carbon Dioxide	0.0101%	2115144.00	2.090063e+08	-1.39	455.8	0.43
Ethane	14.0160%	3495474432.00	2.493917e+08	-0.26	532.2	0.41
Oxygen	0.0098%	6397400.00	6.527959e+08	3.91	455.0	0.09

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 1001 Stream=1 Det=1 5/10/2024 10:57:38 AM "PC File"
CGM #2 - L410 AT 1001 Stream=1 Det=2 5/10/2024 10:57:38 AM "PC File"
Amplitude
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
89.7
367.2
484.6
532.2
455.0
455.8
351.8
42.4
116.4
134.5
198.3
225.2
0.00
62.50
125.00
187.50
250.00
312.50
375.00
437.50
500.00
562.50
625.00
Time (s)

CERTIFIED REFERENCE MATERIAL

Replacement of Certificate of Calibration Serial No 21/1161/05

Approved signatory
Name: **Alan Boulton**
Signature

Issued by **EffecTech**
Date of issue **08 July 2022** Certificate number **21/1161/05A**

EffecTech
Global Leaders in Gas Measurement

Dove House
Dove Fields
Uttoxeter
Staffordshire ST14 8HU
United Kingdom www.effectech.co.uk

ilac-MRA UKAS REFERENCE MATERIALS 5710

Customer	: CAC Gas & Instrumentation Pty. Ltd. Unit 3 / 36 Holbeche Rd., Arndell Park, NSW 2148, Australia.
Customer reference	: PO No.PO5181 (Part Code: 50ST-INPX-LNGQC1CH4)
Product description	: Certified Reference Material (CRM) for use in natural gas analysis Multi-component natural gas mixture
Preparation method	: Mixture prepared by ISO 6142-1:2015 - *Gas Analysis - Preparation of calibration gas mixtures - Part 1 : Gravimetric method for Class I mixtures*
Calibration method	: Mixture calibrated by ISO 6143:2001 - *Gas Analysis - Comparison methods for determining and checking the composition of calibration gas mixtures* using high precision gas chromatography
Metrological traceability	: Mixture classified as a Certified Reference Material (CRM) on which the values are assigned through an unbroken chain of analytical comparisons to a Primary Reference Gas Mixture
Stability	: EffecTech stability studies of similar gas mixtures in this type of cylinder/valve combination have demonstrated a shelf-life of 5 years providing the contents pressure and usage/storage temperature remain within the limits stated in the table below.
Handling and Use	: Supplementary advice is annexed to this certificate on the handling, storage and use of this certified reference material. General instructions for the proper use of gas mixtures can be found in ISO 16664: *Gas Analysis - Handling of calibration gases and gas mixtures*

Date of production	: 24 August 2021	Cylinder number	: 21/41835
Expiry date	: 24 August 2026	Contents pressure	: 109 bar
Minimum usage pressure	: 3 bar	Cylinder size	: 50 litres
Usage temperature range	: 15 to 50 °C	Cylinder material	: steel
Storage temperature range	: -38 to 50 °C	Valve outlet connection	: BS 341 - No.4

Composition

component	amount fraction (%mol/mol)
oxygen	0.00968 ± 0.00016
nitrogen	0.1991 ± 0.0023
carbon dioxide⋆	0.01011 ± 0.00024
methane	85.804 ± 0.024
ethane	13.005 ± 0.033
propane	0.8003 ± 0.0024
iso-butane	0.04969 ± 0.00045
n-butane	0.03059 ± 0.00045
iso-pentane	0.05040 ± 0.00036
n-pentane	0.03050 ± 0.00025
n-hexane	0.01023 ± 0.00020

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution provides a level of confidence of approximately 95%.

⋆ these components/quantities are not UKAS accredited as they lie outside the scope of accreditation for our laboratory

The contents of this certificate comply with the mandatory requirements of ISO Guide 31:2015 - *Reference materials — Contents of certificates, labels and accompanying documentation* and ISO 6141:2015 - *Gas Analysis - Contents of certificates for calibration gas mixtures*

To re-order this gas mixture contact CAC Gas & Instrumentation quoting certificate number 21/1161/05A.
tel: 1300 CAC GAS (+61 2 8676 6500) email: cac@cacgas.com.au

EffecTech is accredited by UKAS as a producer of this certified reference material according to ISO 17034:2016.

The laboratory activities reported were performed at the location of the issuing body
The reference values reported relate only to the specific mixture identified in this certificate

Physical Properties

Reference conditions	**primary** combustion 15°C metering 15°C		**secondary** combustion 0°C metering 0°C	
mean molar mass	18.206 ± 0.018	$kg \cdot kmol^{-1}$	18.206 ± 0.018	$kg \cdot kmol^{-1}$
compression factor	0.9973 ± 0.0010		0.9968 ± 0.0010	
Real gas properties				
superior calorific value	42.047 ± 0.042	$MJ \cdot m^{-3}$	44.447 ± 0.044	$MJ \cdot m^{-3}$
	991.52 ± 0.99	$kJ \cdot mol^{-1}$	993.05 ± 0.99	$kJ \cdot mol^{-1}$
	54.461 ± 0.054	$MJ \cdot kg^{-1}$	54.544 ± 0.055	$MJ \cdot kg^{-1}$
inferior calorific value	38.000 ± 0.038	$MJ \cdot m^{-3}$	40.114 ± 0.040	$MJ \cdot m^{-3}$
	896.09 ± 0.90	$kJ \cdot mol^{-1}$	896.24 ± 0.90	$kJ \cdot mol^{-1}$
	49.219 ± 0.049	$MJ \cdot kg^{-1}$	49.227 ± 0.049	$MJ \cdot kg^{-1}$
relative density	0.63004 ± 0.00063		0.63027 ± 0.00063	
density	0.77206 ± 0.00077	$kg \cdot m^{-3}$	0.81489 ± 0.00081	$kg \cdot m^{-3}$
superior Wobbe index	52.972 ± 0.053	$MJ \cdot m^{-3}$	55.987 ± 0.056	$MJ \cdot m^{-3}$
Ideal gas properties				
superior calorific value	41.934 ± 0.042	$MJ \cdot m^{-3}$	44.305 ± 0.044	$MJ \cdot m^{-3}$
	991.52 ± 0.99	$kJ \cdot mol^{-1}$	993.05 ± 0.99	$kJ \cdot mol^{-1}$
	54.461 ± 0.054	$MJ \cdot kg^{-1}$	54.544 ± 0.055	$MJ \cdot kg^{-1}$
inferior calorific value	37.898 ± 0.038	$MJ \cdot m^{-3}$	39.985 ± 0.040	$MJ \cdot m^{-3}$
	896.09 ± 0.90	$kJ \cdot mol^{-1}$	896.24 ± 0.90	$kJ \cdot mol^{-1}$
	49.219 ± 0.049	$MJ \cdot kg^{-1}$	49.227 ± 0.049	$MJ \cdot kg^{-1}$
relative density	0.62861 ± 0.00063		0.62861 ± 0.00063	
density	0.76998 ± 0.00077	$kg \cdot m^{-3}$	0.81227 ± 0.00081	$kg \cdot m^{-3}$
superior Wobbe index	52.890 ± 0.053	$MJ \cdot m^{-3}$	55.880 ± 0.056	$MJ \cdot m^{-3}$

The physical properties above are calculated from composition at a reference pressure of 1.01325 bar and at the combustion and metering temperatures stated in accordance with the International standard ISO 6976:1995 - *Natural Gas - Calculation of calorific value, density, relative density and Wobbe index from composition* (including amendment No.1 - May 1998).

For the purpose of these calculations, and in accordance with the recommendations of the international standard, the gas mixture is assumed dry (free from moisture).

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution provides a level of confidence of approximately 95%.

CERTIFIED REFERENCE MATERIAL

Replacement of Certificate of Calibration Serial No 21/1161/05

UKAS accredited reference material producer no.5710

Certificate number

21/1161/05A

Replacement History

Certificate number	Reason for replacement
21/1161/05	Original Certificate
21/1161/05A	Certificate regenerated following an investigation on the intracalibration on the danalyzer. The investigation highlighted that the software was predicting a quadractic fit for ethane. This was used in the original certification which resulted in a bias in between ethane and methane values. However, a linear fit is more appropriate. Certificates re-issued according to this revised dataset.

ADVICE on the storage and use of your calibration gas mixture

The calibration gas mixture supplied to you contains components which are condensable under certain conditions of temperature. It is important that these conditions are avoided where possible during storage and usage of the mixture.

Please read this advice in conjunction with recommended storage/usage conditions given on the certificate of calibration.

Storage

*Has the ambient temperature during **storage** dropped below the hydrocarbon dew temperature at contents pressure?*

If so then there will be stratification of your mixture into two phases (vapour and liquid)

The withdrawal of any gas phase content from this two phase mixture will invalidate the certified reference values we have provided with your calibration gas.

Advice before use

There will be no record of the minimum temperature to which your gas mixture has been exposed in transport to you. Hence, there is no guarantee that the gas mixture has not been exposed to temperatures below the hydrocarbon dew temperature of your mixture at contents pressure. If you suspect the gas has been exposed to temperatures below this the contents must be allowed to equilibrate at a greater temperature for a minimum period of about 24 hours. Following this equilibration time your mixture should be entirely homogeneous and gaseous. Often, it is good practice to roll the cylinder, where possible, to encourage mixing during equilibration.

Use

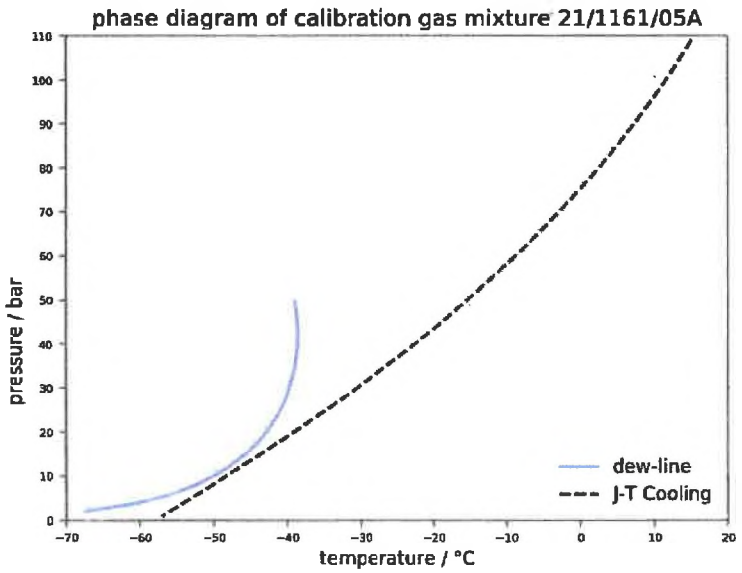
*When in **use** does condensation occur in your gas mixture following depressurisation as a result of cooling?*

Your gas mixture cools when it is depressurised through your pressure regulator. This is called Joule-Thomson (or Joule-Kelvin) cooling. If the gas cools to below the hydrocarbon dew temperature at its pressure then your mixture will stratify into two phases (vapour and liquid).

If this occurs the gas phase composition delivered to your application will not be representative of the certified reference values we have provided with your calibration gas.

Advice during use

The diagram below shows the pressure-temperature phase characteristics of your particular calibration mixture. Conditions shown to the left of the hydrocarbon dewline are in the two phase (liquid and vapour) region, whilst to the right your mixture remains as a single phase vapour. The cooling curve shown does not enter the two-phase region.



This demonstrates that during use your mixture remains entirely in the vapour phase should it be depressurised in a single stage from contents pressure and at a starting temperature of 15°C.

Technical information : The dewline and the cooling curve were calculated using GasVLE™ and constructed using the LRS equation of state (EOS) and the cooling curve generated from a simulated isenthalpic flash calculation assuming adiabatic conditions starting at contents pressure and the stated temperature.

ISO Analysis

Date-Time : 03/26/2025 06:49:05 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:09:23 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

	Primary	Secondary
Reference Temperature - Combustion Deg.C	15.0	15.0
Reference Temperature - Metering Deg.C	15.0	15.0
Calorific Value - Units	MJ/mol	MJ/mol

Component Name	Mole Percent	Relative Density	Superior CV Pri units	Inferior CV Pri units	Superior CV Sec Units	Inferior CV Sec units
C6+ 47/35/17	0.0101%	0.0003	0.0005	0.0004	0.0005	0.0004
Propane	0.7995%	0.0122	0.0178	0.0163	0.0178	0.0163
i-Butane	0.0502%	0.0010	0.0014	0.0013	0.0014	0.0013
n-Butane	0.0302%	0.0006	0.0009	0.0008	0.0009	0.0008
i-Pentane	0.0501%	0.0012	0.0018	0.0016	0.0018	0.0016
n-Pentane	0.0305%	0.0008	0.0011	0.0010	0.0011	0.0010
Nitrogen	0.2054%	0.0020	0.0000	0.0000	0.0000	0.0000
Methane	85.7648%	0.4751	0.7646	0.6884	0.7646	0.6884
Carbon Dioxide	0.0100%	0.0002	0.0000	0.0000	0.0000	0.0000
Ethane	13.0387%	0.1354	0.2037	0.1863	0.2037	0.1863
Oxygen	0.0103%	0.0001	0.0000	0.0000	0.0000	0.0000
TOTALS	100.0000%	0.6288	0.9917	0.8963	0.9917	0.8963

'*' indicates user-defined components

Primary Compressibility Factor(Z) @ 1.01560 BarA and 15.0 Deg.C = 0.99731

Base Pressures	1.01560	
Real Superior CV - Dry - Primary	0.9917	MJ/mol
Real Superior CV - Sat - Primary	0.9750	MJ/mol
Real Inferior CV - Dry - Primary	0.8963	MJ/mol
Real Inferior CV - Sat - Primary	0.8812	MJ/mol
Real Superior CV - Dry - Secondary	0.9917	MJ/mol
Real Superior CV - Sat - Secondary	0.9750	MJ/mol
Real Inferior CV - Dry - Secondary	0.8963	MJ/mol
Real Inferior CV - Sat - Secondary	0.8812	MJ/mol
Real Relative Density Gas - Primary	0.6303	
Real Gas Density - Primary	0.7723	kg/m3
Real Wobbe index - Sup - Primary	1.2492	MJ/mol
Average Molar Mass	18.212	
Total Unnormalized Mole Percent	100.037	

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-Cal	1135.4560
HHV BTU/SCF L-Analy	1123.4675
HHV BTU/SCF Str-3	1121.2532
HHV BTU/SCF Str-4	1123.4171

Analysis Report (GPA)

Date-Time	: 03/26/2025 06:49:58 AM	Analysis time	: 625.00 sec	Cycle Time	: 635.00 sec
Stream	: Validation Str	Mode	: Analysis	Cycle Start Time	: 03/26/2025 06:09:23 AM
Analyzer	: L410 AT 1001	Stream Seq.	: 2,3		
Company	: INPEX ICHTHYS PROJECT				

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

Component Name	Mole Percent	Dry Gross BTU
C6+ 47/35/17	0.0101%	0.53
Propane	0.7995%	20.16
i-Butane	0.0502%	1.64
n-Butane	0.0302%	0.99
i-Pentane	0.0501%	2.01
n-Pentane	0.0305%	1.22
Nitrogen	0.2054%	0.00
Methane	85.7648%	868.23
Carbon Dioxide	0.0100%	0.00
Ethane	13.0387%	231.28
Oxygen	0.0103%	0.00
TOTALS	100.0000%	1126.07

'*' indicates user-defined components

Base Pressures		14.73003
Gross Dry BTU	=	1126.0714
Actual Net BTU	=	1017.7947
Total Unnormalized Mole Percent	=	100.037
Average Molecular wgt.	=	18.21
Wobbe	=	1420.36

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-Cal	1135.4560

HHV BTU/SCF L-Analy	1123.4675
HHV BTU/SCF Str-3	1121.2532
HHV BTU/SCF Str-4	1123.4171

Raw Data Report

Date-Time : 03/26/2025 07:15:57 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:09:23 AM
Analyzer : L410 AT 1001

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

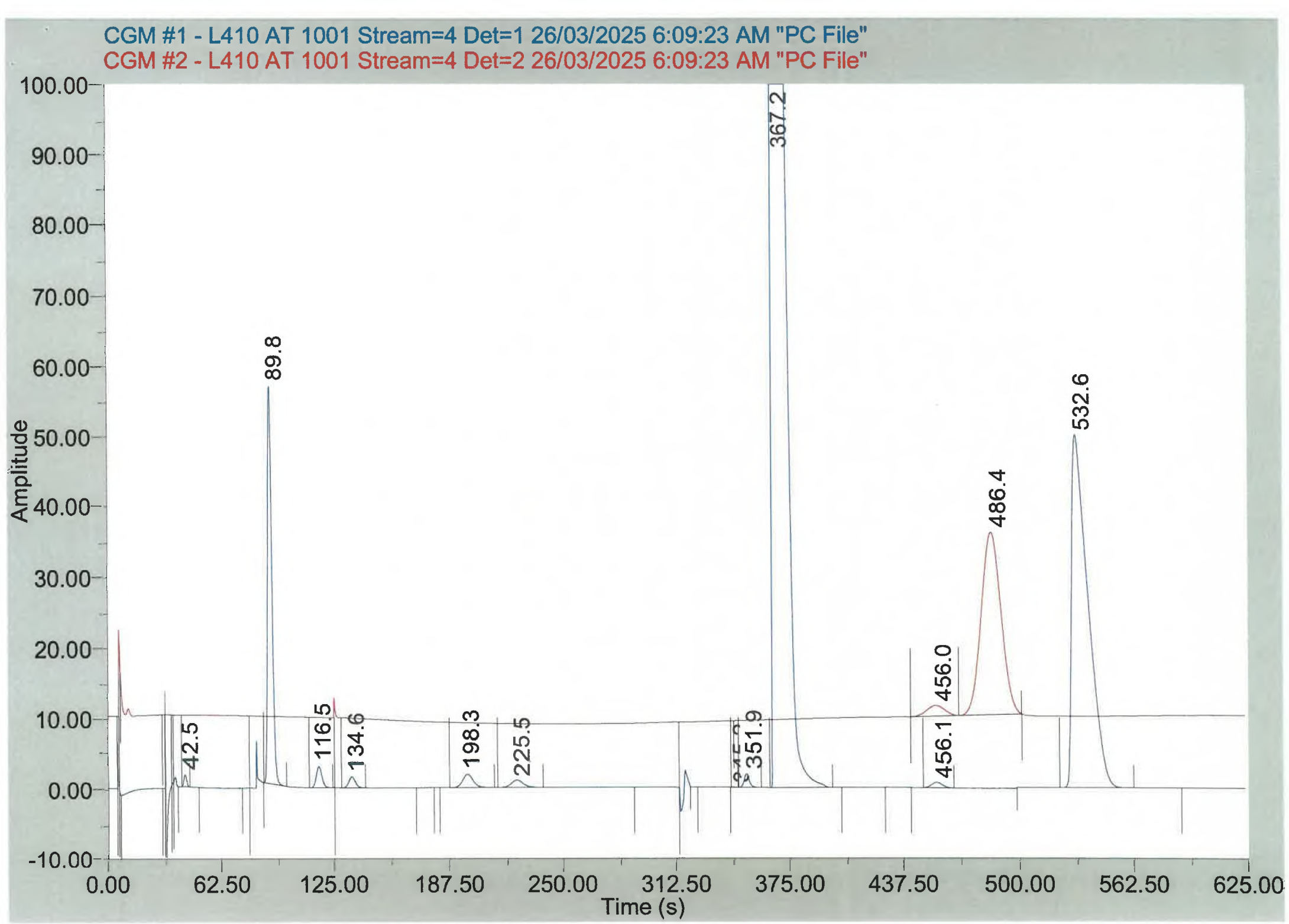
Peak No.	Ret Time	Peak Area	Peak Height	Det No.	Method	Baseline Start	Baseline End	Integration Start	Integration End	Peak Width@ Half Height	Partial Peak
1	42.5	4.84167e+06	54,341	1	1	-143,376	-145,028	40.5	44.9	1.7	No
2	89.8	2.44051e+08	1,770,646	1	4	-125,318	-143,482	86.0	98.6	2.6	No
3	116.5	1.77865e+07	95,852	1	1	-151,060	-150,668	111.1	124.0	3.5	No
4	134.6	1.08414e+07	51,451	1	1	-151,231	-151,059	129.0	142.0	4.0	No
5	198.3	2.03882e+07	61,668	1	1	-150,890	-150,291	188.4	213.0	6.4	No
6	225.5	1.26142e+07	34,325	1	1	-150,323	-150,090	215.0	239.9	7.0	No
7	345.2	213312	2,408	1	4	-147,574	-148,182	343.4	347.2	1.6	No
8	351.9	4.00847e+07	253,404	1	1	-148,219	-149,946	347.5	359.8	3.0	No
9	367.2	1.35457e+10	44,502,416	1	1	-156,528	-149,589	364.8	399.1	5.9	No
10	456.1	2.10996e+06	6,359	1	4	-152,647	-153,013	448.9	465.4	6.5	No
11	532.6	3.25294e+09	6,292,023	1	1	-153,353	-151,804	523.5	563.8	9.8	No
1	456.0	6.48998e+06	11,560	2	2	255,772	257,253	442.0	468.4	10.8	No
2	486.4	1.28307e+08	204,119	2	3	257,253	259,185	468.4	502.8	12.0	No

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 1001 Stream=4 Det=1 26/03/2025 6:09:23 AM "PC File"
CGM #2 - L410 AT 1001 Stream=4 Det=2 26/03/2025 6:09:23 AM "PC File"
Amplitude
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0.00
62.50
125.00
187.50
250.00
312.50
375.00
437.50
500.00
562.50
625.00
Time (s)
42.5
89.8
116.5
134.6
198.3
225.5
351.9
367.2
456.0
456.1
486.4
532.6

ISO Analysis

Date-Time : 03/26/2025 06:49:33 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:19:58 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

	Primary	Secondary
Reference Temperature - Combustion Deg.C	15.0	15.0
Reference Temperature - Metering Deg.C	15.0	15.0
Calorific Value - Units	MJ/mol	MJ/mol

Component Name	Mole Percent	Relative Density	Superior CV Pri units	Inferior CV Pri units	Superior CV Sec Units	Inferior CV Sec units
C6+ 47/35/17	0.0101%	0.0003	0.0005	0.0004	0.0005	0.0004
Propane	0.7995%	0.0122	0.0178	0.0163	0.0178	0.0163
i-Butane	0.0501%	0.0010	0.0014	0.0013	0.0014	0.0013
n-Butane	0.0301%	0.0006	0.0009	0.0008	0.0009	0.0008
i-Pentane	0.0503%	0.0013	0.0018	0.0016	0.0018	0.0016
n-Pentane	0.0306%	0.0008	0.0011	0.0010	0.0011	0.0010
Nitrogen	0.2054%	0.0020	0.0000	0.0000	0.0000	0.0000
Methane	85.7676%	0.4751	0.7647	0.6884	0.7647	0.6884
Carbon Dioxide	0.0099%	0.0002	0.0000	0.0000	0.0000	0.0000
Ethane	13.0366%	0.1353	0.2036	0.1863	0.2036	0.1863
Oxygen	0.0099%	0.0001	0.0000	0.0000	0.0000	0.0000
TOTALS	100.0000%	0.6288	0.9917	0.8963	0.9917	0.8963

'*' indicates user-defined components

Primary Compressibility Factor(Z) @ 1.01560 BarA and 15.0 Deg.C = 0.99731

Base Pressures	1.01560	
Real Superior CV - Dry - Primary	=	0.9917 MJ/mol
Real Superior CV - Sat - Primary	=	0.9750 MJ/mol
Real Inferior CV - Dry - Primary	=	0.8963 MJ/mol
Real Inferior CV - Sat - Primary	=	0.8812 MJ/mol
Real Superior CV - Dry - Secondary	=	0.9917 MJ/mol
Real Superior CV - Sat - Secondary	=	0.9750 MJ/mol
Real Inferior CV - Dry - Secondary	=	0.8963 MJ/mol
Real Inferior CV - Sat - Secondary	=	0.8812 MJ/mol
Real Relative Density Gas - Primary	=	0.6302
Real Gas Density - Primary	=	0.7723 kg/m3
Real Wobbe index - Sup - Primary	=	1.2492 MJ/mol
Average Molar Mass	=	18.212
Total Unnormalized Mole Percent	=	100.048

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-Cal	1135.4560
HHV BTU/SCF L-Analy	1123.4580
HHV BTU/SCF Str-3	1121.2532
HHV BTU/SCF Str-4	1123.4171

Analysis Report (GPA)

Date-Time : 03/26/2025 06:50:17 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:19:58 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

Component Name	Mole Percent	Dry Gross BTU
C6+ 47/35/17	0.0101%	0.54
Propane	0.7995%	20.16
i-Butane	0.0501%	1.63
n-Butane	0.0301%	0.98
i-Pentane	0.0503%	2.02
n-Pentane	0.0306%	1.23
Nitrogen	0.2054%	0.00
Methane	85.7676%	868.26
Carbon Dioxide	0.0099%	0.00
Ethane	13.0366%	231.24
Oxygen	0.0099%	0.00
TOTALS	100.0000%	1126.06

'*' indicates user-defined components

Base Pressures		14.73003
Gross Dry BTU	=	1126.0620
Actual Net BTU	=	1017.7857
Total Unnormalized Mole Percent	=	100.048
Average Molecular wgt.	=	18.21
Wobbe	=	1420.36

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-Cal	1135.4560

HHV BTU/SCF L-Analy	1123.4580
HHV BTU/SCF Str-3	1121.2532
HHV BTU/SCF Str-4	1123.4171

Raw Data Report

Date-Time : 03/26/2025 07:16:26 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 06:19:58 AM
Analyzer : L410 AT 1001

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

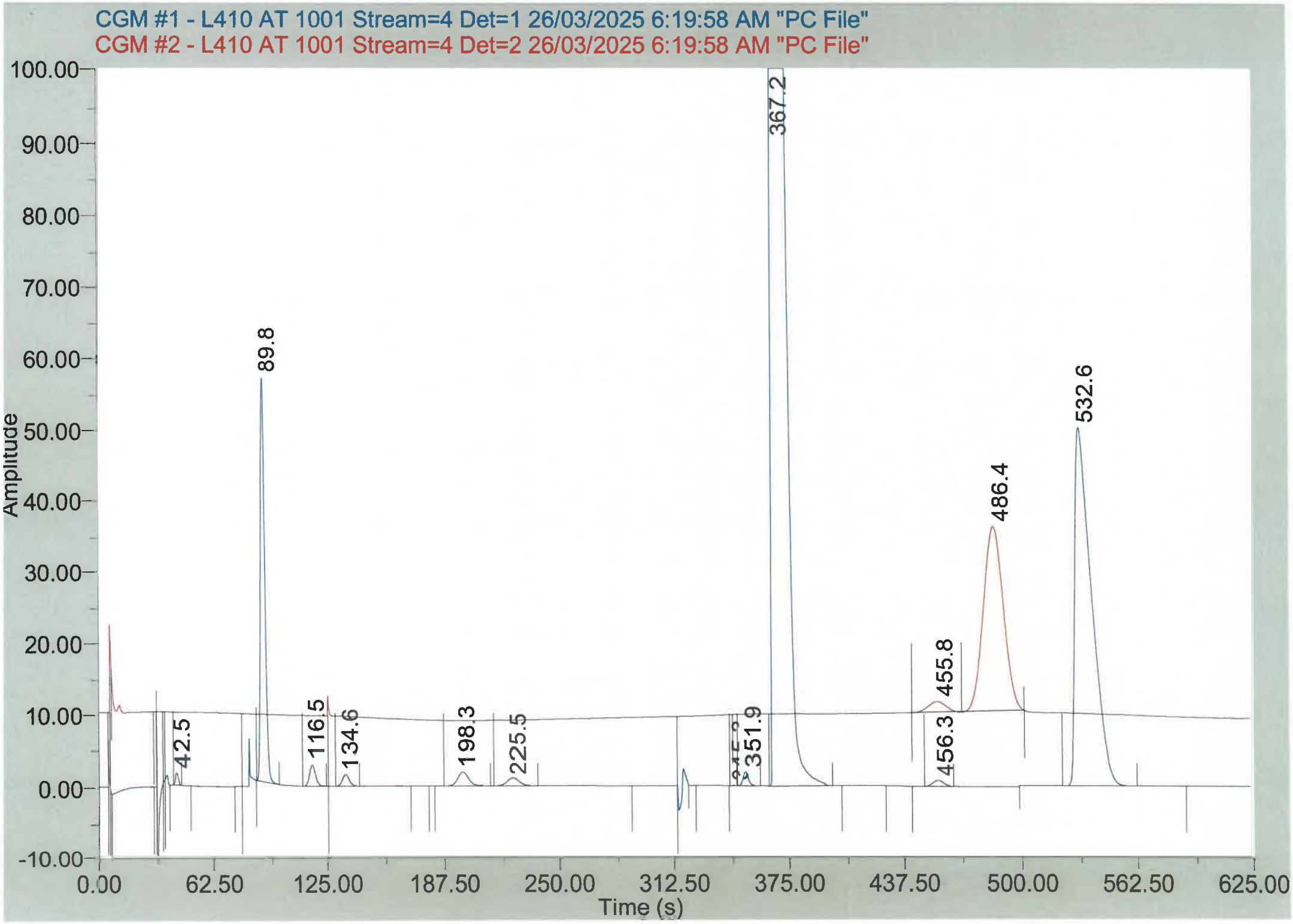
Peak No.	Ret Time	Peak Area	Peak Height	Det No.	Method	Baseline Start	Baseline End	Integration Start	Integration End	Peak Width@ Half Height	Partial Peak
1	42.5	4.8555e+06	54,258	1	1	-144,351	-145,933	40.5	44.9	1.7	No
2	89.8	2.44052e+08	1,770,420	1	4	-125,846	-143,543	86.0	98.4	2.6	No
3	116.5	1.77572e+07	95,849	1	1	-151,377	-150,930	111.1	124.0	3.5	No
4	134.6	1.08061e+07	51,406	1	1	-151,502	-151,314	129.1	142.0	4.0	No
5	198.3	2.04366e+07	61,769	1	1	-151,262	-151,184	188.1	213.4	6.4	No
6	225.5	1.26562e+07	34,372	1	4	-151,225	-151,480	215.3	239.0	7.4	No
7	345.3	210698	2,389	1	4	-149,999	-150,720	343.4	347.2	1.7	No
8	351.9	4.00916e+07	253,271	1	1	-150,760	-152,499	347.6	359.8	3.0	No
9	367.2	1.35477e+10	44,511,460	1	1	-159,001	-151,535	364.8	399.1	5.9	No
10	456.3	2.08082e+06	6,263	1	4	-154,350	-154,460	448.9	464.5	6.5	No
11	532.6	3.25277e+09	6,292,541	1	1	-154,837	-152,092	523.3	563.4	9.8	No
1	455.8	6.2451e+06	11,448	2	2	258,005	259,297	442.0	469.0	10.6	No
2	486.4	1.27635e+08	203,685	2	3	259,297	260,916	469.0	502.8	12.0	No

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 1001 Stream=4 Det=1 26/03/2025 6:19:58 AM "PC File"
CGM #2 - L410 AT 1001 Stream=4 Det=2 26/03/2025 6:19:58 AM "PC File"
Amplitude
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0.00
62.50
125.00
187.50
250.00
312.50
375.00
437.50
500.00
562.50
625.00
Time (s)
42.5
89.8
116.5
134.6
198.3
225.5
351.9
367.2
455.8
456.3
486.4
532.6

CERTIFIED REFERENCE MATERIAL

Approved signatory
Name: **Gautami Snewin**
Signature

Issued by **EffecTech**
Date of issue **12 April 2023** Certificate number **23/0472/01**

EffecTech
Global Leaders in Gas Measurement

Dove House
Dove Fields
Uttoxeter
Staffordshire ST14 8HU
United Kingdom www.effectech.co.uk

5710

Customer	: CAC Gas & Instrumentation Pty. Limited Unit 3 / 36 Holbeche Rd., Arndell Park, NSW 2148, Australia.
Customer reference	: PO No.PO6534 (Part Code: 10AL-INPX-SPC6O2PT)
Product description	: Certified Reference Material (CRM) for use in natural gas analysis Multi-component natural gas mixture
Preparation method	: Mixture prepared by ISO 6142-1:2015 - *Gas Analysis - Preparation of calibration gas mixtures - Part 1 : Gravimetric method for Class I mixtures*
Value assignment	: Values assigned by ISO 6143:2001 - *Gas Analysis - Comparison methods for determining and checking the composition of calibration gas mixtures* using high precision gas chromatography
Metrological traceability	: Mixture classified as a Certified Reference Material (CRM) on which the values are assigned through an unbroken chain of analytical comparisons to a Primary Reference Gas Mixture
Stability	: EffecTech stability studies of similar gas mixtures in this type of cylinder/valve combination have demonstrated a shelf-life of 5 years providing the contents pressure and usage/storage temperature remain within the limits stated in the table below.
Handling and Use	: Supplementary advice is annexed to this certificate on the handling, storage and use of this certified reference material. General instructions for the proper use of gas mixtures can be found in ISO 16664: *Gas Analysis - Handling of calibration gases and gas mixtures*

Date of production	: 27 March 2023	Cylinder number	: D172603
Expiry date	: 27 March 2028	Contents pressure	: 84 bar
Minimum usage pressure	: 3 bar	Cylinder size	: 10 litres
Usage temperature range	: 0 to 50 °C	Cylinder material	: aluminium
Storage temperature range	: -40 to 50 °C	Valve outlet connection	: BS 341 - No.4

Composition

component	amount fraction (%mol/mol)
oxygen	0.00995 ± 0.00017
nitrogen	0.3781 ± 0.0079
carbon dioxide⋆	0.00993 ± 0.00020
methane	84.756 ± 0.025
ethane	13.713 ± 0.034
propane	0.9921 ± 0.0034
iso-butane	0.04939 ± 0.00045
n-butane	0.01987 ± 0.00045
iso-pentane	0.05067 ± 0.00036
n-pentane	0.02026 ± 0.00020

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution provides a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with JCGM 100:2008 - *Evaluation of measurement data - Guide to the expression of uncertainty in measurement* (GUM).

⋆ these components/quantities are not UKAS accredited as they lie outside the scope of accreditation for our laboratory

The contents of this certificate comply with the mandatory requirements of ISO Guide 31:2015 - *Reference materials — Contents of certificates, labels and accompanying documentation* and ISO 6141:2015 - *Gas Analysis - Contents of certificates for calibration gas mixtures*

To re-order this gas mixture contact CAC Gas & Instrumentation quoting certificate number 23/0472/01.
tel: 1300 CAC GAS (+61 2 8676 6500) email: cac@cacgas.com.au

EffecTech is accredited by UKAS as a producer of this certified reference material according to ISO 17034:2016.

The laboratory activities reported were performed at the location of the issuing body
The reference values reported relate only to the specific mixture identified in this certificate

CERTIFIED REFERENCE MATERIAL

UKAS accredited reference material producer no.5710

Certificate number

23/0472/01

Physical Properties

Reference conditions	**primary** combustion 15 °C metering 15 °C		**secondary** combustion 0 °C metering 0 °C	
mean molar mass	18.363 ± 0.018	$kg \cdot kmol^{-1}$	18.363 ± 0.018	$kg \cdot kmol^{-1}$
compression factor	0.9973 ± 0.0010		0.9967 ± 0.0010	
Real gas properties				
superior calorific value	42.256 ± 0.042	$MJ \cdot m^{-3}$	44.668 ± 0.045	$MJ \cdot m^{-3}$
	996.4 ± 1.0	$kJ \cdot mol^{-1}$	997.9 ± 1.0	$kJ \cdot mol^{-1}$
	54.260 ± 0.054	$MJ \cdot kg^{-1}$	54.344 ± 0.054	$MJ \cdot kg^{-1}$
inferior calorific value	38.197 ± 0.038	$MJ \cdot m^{-3}$	40.323 ± 0.040	$MJ \cdot m^{-3}$
	900.70 ± 0.90	$kJ \cdot mol^{-1}$	900.85 ± 0.90	$kJ \cdot mol^{-1}$
	49.048 ± 0.049	$MJ \cdot kg^{-1}$	49.057 ± 0.049	$MJ \cdot kg^{-1}$
relative density	0.63551 ± 0.00064		0.63574 ± 0.00064	
density	0.77876 ± 0.00078	$kg \cdot m^{-3}$	0.82196 ± 0.00082	$kg \cdot m^{-3}$
superior Wobbe index	53.006 ± 0.053	$MJ \cdot m^{-3}$	56.022 ± 0.056	$MJ \cdot m^{-3}$
Ideal gas properties				
superior calorific value	42.140 ± 0.042	$MJ \cdot m^{-3}$	44.523 ± 0.045	$MJ \cdot m^{-3}$
	996.4 ± 1.0	$kJ \cdot mol^{-1}$	997.9 ± 1.0	$kJ \cdot mol^{-1}$
	54.260 ± 0.054	$MJ \cdot kg^{-1}$	54.344 ± 0.054	$MJ \cdot kg^{-1}$
inferior calorific value	38.093 ± 0.038	$MJ \cdot m^{-3}$	40.191 ± 0.040	$MJ \cdot m^{-3}$
	900.70 ± 0.90	$kJ \cdot mol^{-1}$	900.85 ± 0.90	$kJ \cdot mol^{-1}$
	49.048 ± 0.049	$MJ \cdot kg^{-1}$	49.057 ± 0.049	$MJ \cdot kg^{-1}$
relative density	0.63404 ± 0.00063		0.63404 ± 0.00063	
density	0.77663 ± 0.00078	$kg \cdot m^{-3}$	0.81928 ± 0.00082	$kg \cdot m^{-3}$
superior Wobbe index	52.922 ± 0.053	$MJ \cdot m^{-3}$	55.914 ± 0.056	$MJ \cdot m^{-3}$

The physical properties above are calculated from composition at a reference pressure of 1.01325 bar and at the combustion and metering temperatures stated in accordance with the international standard ISO 6976:1995 - *Natural Gas - Calculation of calorific value, density, relative density and Wobbe index from composition* (including amendment No.1 - May 1998).

For the purpose of these calculations, and in accordance with the recommendations of the international standard, the gas mixture is assumed dry (free from moisture).

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution provides a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with JCGM 100:2008 - *Evaluation of measurement data - Guide to the expression of uncertainty in measurement* (GUM).

ADVICE on the storage and use of your calibration gas mixture

The calibration gas mixture supplied to you contains components which are condensable under certain conditions of temperature. It is important that these conditions are avoided where possible during storage and usage of the mixture.

Please read this advice in conjunction with recommended storage/usage conditions given on the certificate of calibration.

Storage

*Has the ambient temperature during **storage** dropped below the hydrocarbon dew temperature at contents pressure?*

If so then there will be stratification of your mixture into two phases (vapour and liquid)

The withdrawal of any gas phase content from this two phase mixture will invalidate the certified reference values we have provided with your calibration gas.

Advice before use

There will be no record of the minimum temperature to which your gas mixture has been exposed in transport to you. Hence, there is no guarantee that the gas mixture has not been exposed to temperatures below the hydrocarbon dew temperature of your mixture at contents pressure. If you suspect the gas has been exposed to temperatures below this the contents must be allowed to equilibrate at a greater temperature for a minimum period of about 24 hours. Following this equilibration time your mixture should be entirely homogeneous and gaseous. Often, it is good practice to roll the cylinder, where possible, to encourage mixing during equilibration.

Use

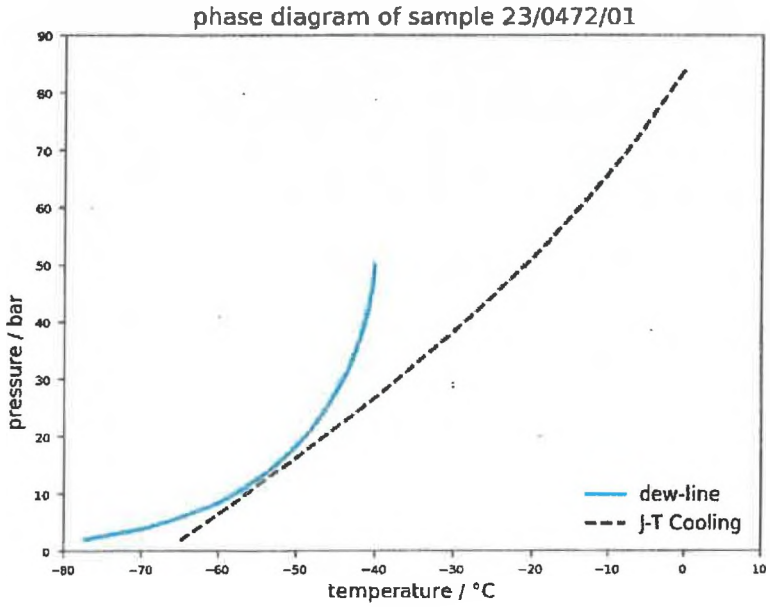
*When in **use** does condensation occur in your gas mixture following depressurisation as a result of cooling?*

Your gas mixture cools when it is depressurised through your pressure regulator. This is called Joule-Thomson (or Joule-Kelvin) cooling. If the gas cools to below the hydrocarbon dew temperature at its pressure then your mixture will stratify into two phases (vapour and liquid).

If this occurs the gas phase composition delivered to your application will not be representative of the certified reference values we have provided with your calibration gas.

Advice during use

The diagram below shows the pressure-temperature phase characteristics of your particular calibration mixture. Conditions shown to the left of the hydrocarbon dewline are in the two phase (liquid and vapour) region, whilst to the right your mixture remains as a single phase vapour. The cooling curve shown does not enter the two-phase region.



This demonstrates that during use your mixture remains entirely in the vapour phase should it be depressurised in a single stage from contents pressure and at a starting temperature of 0°C.

Technical information : The dewline and the cooling curve were calculated using GasVLE™ and constructed using the LRS equation of state (EOS) and the cooling curve generated from a simulated isenthalpic flash calculation assuming adiabatic conditions starting at contents pressure and the stated temperature.

Analysis Report (GPA)

Date-Time : 03/26/2025 11:29:54 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:31:17 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

Component Name	Mole Percent	Dry Gross BTU
C6+ 47/35/17	0.0000%	0.00
Propane	0.9887%	24.93
i-Butane	0.0499%	1.63
n-Butane	0.0194%	0.64
i-Pentane	0.0504%	2.02
n-Pentane	0.0201%	0.81
Nitrogen	0.3963%	0.00
Methane	84.7033%	857.49
Carbon Dioxide	0.0100%	0.00
Ethane	13.7533%	243.95
Oxygen	0.0086%	0.00
TOTALS	100.0000%	1131.47

'*' indicates user-defined components

Base Pressures		14.73003
Gross Dry BTU	=	1131.4679
Actual Net BTU	=	1022.8987
Total Unnormalized Mole Percent	=	100.220
Average Molecular wgt.	=	18.37
Wobbe	=	1421.04

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-Cal	1135.4560

HHV BTU/SCF L-Analy	1128.8515
HHV BTU/SCF Str-3	1122.0407
HHV BTU/SCF Str-4	1123.4171

ISO Analysis

Date-Time : 03/26/2025 11:31:01 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:31:17 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

	Primary	Secondary
Reference Temperature - Combustion Deg.C	15.0	15.0
Reference Temperature - Metering Deg.C	15.0	15.0
Calorific Value - Units	MJ/mol	MJ/mol

Component Name	Mole Percent	Relative Density	Superior CV Pri units	Inferior CV Pri units	Superior CV Sec Units	Inferior CV Sec units
C6+ 47/35/17	0.0000%	0.0000	0.0000	0.0000	0.0000	0.0000
Propane	0.9887%	0.0151	0.0220	0.0202	0.0220	0.0202
i-Butane	0.0499%	0.0010	0.0014	0.0013	0.0014	0.0013
n-Butane	0.0194%	0.0004	0.0006	0.0005	0.0006	0.0005
i-Pentane	0.0504%	0.0013	0.0018	0.0016	0.0018	0.0016
n-Pentane	0.0201%	0.0005	0.0007	0.0007	0.0007	0.0007
Nitrogen	0.3963%	0.0038	0.0000	0.0000	0.0000	0.0000
Methane	84.7033%	0.4692	0.7552	0.6799	0.7552	0.6799
Carbon Dioxide	0.0100%	0.0002	0.0000	0.0000	0.0000	0.0000
Ethane	13.7533%	0.1428	0.2148	0.1965	0.2148	0.1965
Oxygen	0.0086%	0.0001	0.0000	0.0000	0.0000	0.0000
TOTALS	100.0000%	0.6342	0.9965	0.9008	0.9965	0.9008

'*' indicates user-defined components

Primary Compressibility Factor(Z) @ 1.01560 BarA and 15.0 Deg.C = 0.99727

Base Pressures	1.01560	
Real Superior CV - Dry - Primary	=	0.9965 MJ/mol
Real Superior CV - Sat - Primary	=	0.9797 MJ/mol
Real Inferior CV - Dry - Primary	=	0.9008 MJ/mol
Real Inferior CV - Sat - Primary	=	0.8856 MJ/mol
Real Superior CV - Dry - Secondary	=	0.9965 MJ/mol
Real Superior CV - Sat - Secondary	=	0.9797 MJ/mol
Real Inferior CV - Dry - Secondary	=	0.9008 MJ/mol
Real Inferior CV - Sat - Secondary	=	0.8856 MJ/mol
Real Relative Density Gas - Primary	=	0.6357
Real Gas Density - Primary	=	0.7790 kg/m3
Real Wobbe index - Sup - Primary	=	1.2498 MJ/mol
Average Molar Mass	=	18.370
Total Unnormalized Mole Percent	=	100.220

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-Cal	1135.4560
HHV BTU/SCF L-Analy	1128.8515
HHV BTU/SCF Str-3	1122.0407
HHV BTU/SCF Str-4	1123.4171

Raw Data Report

Date-Time : 03/26/2025 11:31:55 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:31:17 AM
Analyzer : L410 AT 1001

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

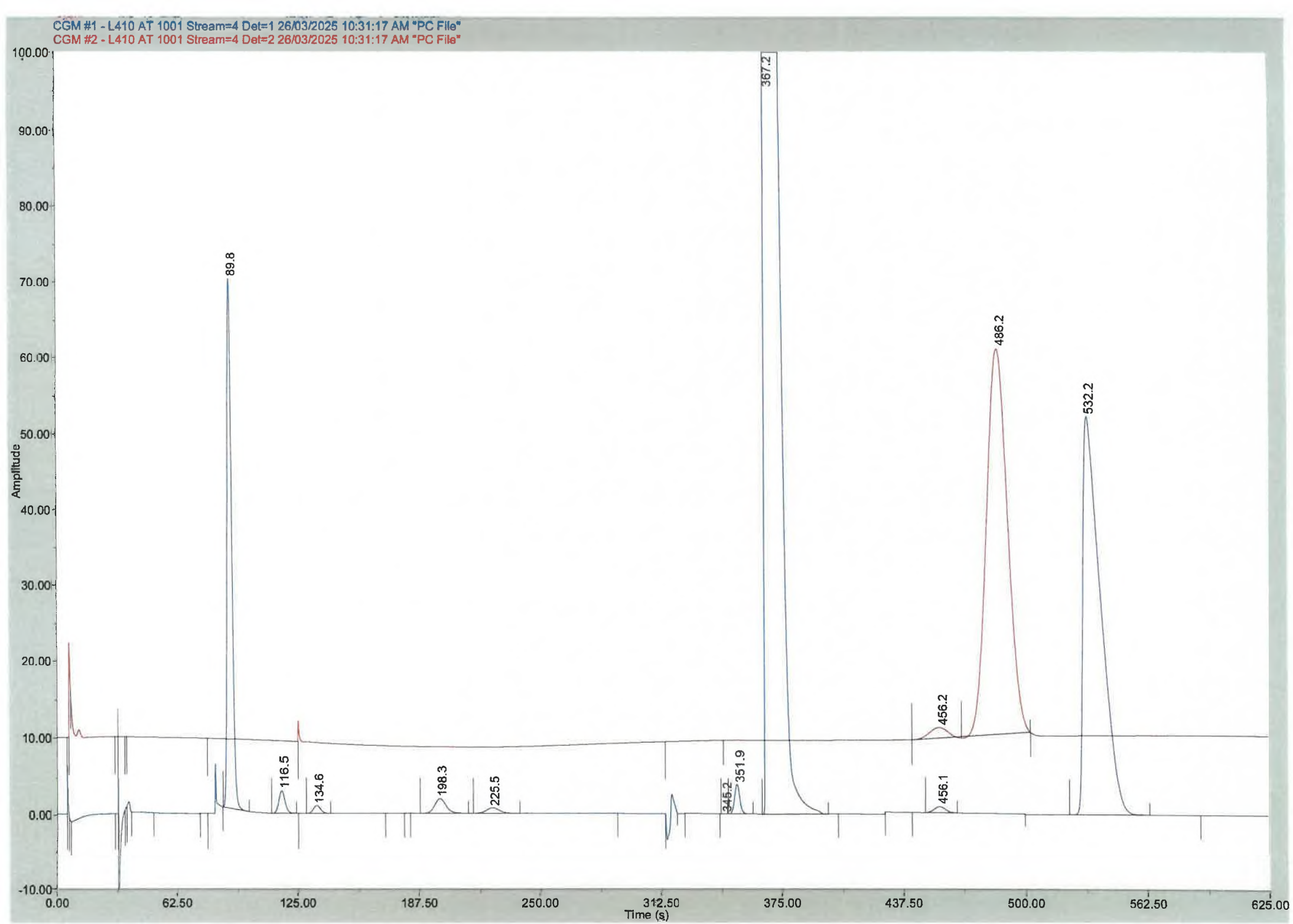
Peak No.	Ret Time	Peak Area	Peak Height	Det No.	Method	Baseline Start	Baseline End	Integration Start	Integration End	Peak Width@ Half Height	Partial Peak
1	89.8	3.02324e+08	2,186,865	1	4	-134,462	-153,711	86.0	99.6	2.8	No
2	116.5	1.77315e+07	95,480	1	1	-161,359	-160,880	111.2	124.0	3.5	No
3	134.6	6.98239e+06	33,251	1	1	-161,376	-161,183	129.2	141.7	4.0	No
4	198.3	2.05324e+07	62,119	1	1	-161,021	-160,702	188.1	213.0	6.4	No
5	225.5	8.34299e+06	22,624	1	1	-160,744	-160,951	215.6	239.6	7.0	No
6	345.2	207743	2,338	1	4	-159,556	-160,076	343.5	347.0	1.6	No
7	351.9	7.74703e+07	499,754	1	1	-160,154	-161,016	347.4	360.1	3.0	No
8	367.2	1.34025e+10	44,243,964	1	1	-167,846	-160,469	364.8	399.0	5.9	No
9	456.1	2.11388e+06	6,380	1	4	-162,898	-163,197	448.9	465.2	6.5	No
10	532.2	3.4375e+09	6,571,004	1	1	-164,476	-162,767	522.8	563.8	10.1	No
1	456.2	5.40716e+06	10,561	2	2	259,337	262,718	442.0	467.6	10.2	No
2	486.2	2.48996e+08	396,982	2	3	262,718	267,367	467.6	502.8	12.0	No

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 1001 Stream=4 Det=1 26/03/2025 10:31:17 AM "PC File"
CGM #2 - L410 AT 1001 Stream=4 Det=2 26/03/2025 10:31:17 AM "PC File"
Amplitude
Time (s)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0.00
62.50
125.00
187.50
250.00
312.50
375.00
437.50
500.00
562.50
625.00
89.8
116.5
134.6
198.3
225.5
345.2
351.9
367.2
456.2
456.1
486.2
532.2

Analysis Report (GPA)

Date-Time : 03/26/2025 11:30:28 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:41:52 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

Component Name	Mole Percent	Dry Gross BTU
C6+ 47/35/17	0.0000%	0.00
Propane	0.9888%	24.94
i-Butane	0.0499%	1.63
n-Butane	0.0195%	0.64
i-Pentane	0.0504%	2.02
n-Pentane	0.0200%	0.80
Nitrogen	0.3961%	0.00
Methane	84.7039%	857.49
Carbon Dioxide	0.0099%	0.00
Ethane	13.7528%	243.95
Oxygen	0.0089%	0.00
TOTALS	100.0000%	1131.46

'*' indicates user-defined components

Base Pressures		14.73003
Gross Dry BTU	=	1131.4631
Actual Net BTU	=	1022.8943
Total Unnormalized Mole Percent	=	100.202
Average Molecular wgt.	=	18.37
Wobbe	=	1421.03

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-Cal	1135.4560

HHV BTU/SCF L-Analy	1128.8468
HHV BTU/SCF Str-3	1122.0407
HHV BTU/SCF Str-4	1123.4171

ISO Analysis

Date-Time : 03/26/2025 11:31:21 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:41:52 AM
Analyzer : L410 AT 1001 Stream Seq. : 2,3
Company : INPEX ICHTHYS PROJECT

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

	Primary	Secondary
Reference Temperature - Combustion Deg.C	15.0	15.0
Reference Temperature - Metering Deg.C	15.0	15.0
Calorific Value - Units	MJ/mol	MJ/mol

Component Name	Mole Percent	Relative Density	Superior CV Pri units	Inferior CV Pri units	Superior CV Sec Units	Inferior CV Sec units
C6+ 47/35/17	0.0000%	0.0000	0.0000	0.0000	0.0000	0.0000
Propane	0.9888%	0.0151	0.0220	0.0202	0.0220	0.0202
i-Butane	0.0499%	0.0010	0.0014	0.0013	0.0014	0.0013
n-Butane	0.0195%	0.0004	0.0006	0.0005	0.0006	0.0005
i-Pentane	0.0504%	0.0013	0.0018	0.0016	0.0018	0.0016
n-Pentane	0.0200%	0.0005	0.0007	0.0007	0.0007	0.0007
Nitrogen	0.3961%	0.0038	0.0000	0.0000	0.0000	0.0000
Methane	84.7039%	0.4692	0.7552	0.6799	0.7552	0.6799
Carbon Dioxide	0.0099%	0.0001	0.0000	0.0000	0.0000	0.0000
Ethane	13.7528%	0.1428	0.2148	0.1965	0.2148	0.1965
Oxygen	0.0089%	0.0001	0.0000	0.0000	0.0000	0.0000
TOTALS	100.0000%	0.6342	0.9965	0.9008	0.9965	0.9008

'*' indicates user-defined components

Primary Compressibility Factor(Z) @ 1.01560 BarA and 15.0 Deg.C = 0.99727

Base Pressures	1.01560	
Real Superior CV - Dry - Primary	=	0.9965 MJ/mol
Real Superior CV - Sat - Primary	=	0.9797 MJ/mol
Real Inferior CV - Dry - Primary	=	0.9008 MJ/mol
Real Inferior CV - Sat - Primary	=	0.8856 MJ/mol
Real Superior CV - Dry - Secondary	=	0.9965 MJ/mol
Real Superior CV - Sat - Secondary	=	0.9797 MJ/mol
Real Inferior CV - Dry - Secondary	=	0.9008 MJ/mol
Real Inferior CV - Sat - Secondary	=	0.8856 MJ/mol
Real Relative Density Gas - Primary	=	0.6357
Real Gas Density - Primary	=	0.7790 kg/m3
Real Wobbe index - Sup - Primary	=	1.2498 MJ/mol
Average Molar Mass	=	18.370
Total Unnormalized Mole Percent	=	100.202

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000

USER CALCULATIONS

Calculation Name	Calculation Result
HHV BTU/SCF Str-Cal	1135.4560
HHV BTU/SCF L-Analy	1128.8468
HHV BTU/SCF Str-3	1122.0407
HHV BTU/SCF Str-4	1123.4171

Raw Data Report

Date-Time : 03/26/2025 11:32:16 AM Analysis time : 625.00 sec Cycle Time : 635.00 sec
Stream : Validation Str Mode : Analysis Cycle Start Time : 03/26/2025 10:41:52 AM
Analyzer : L410 AT 1001

Firmware Revision, Checksum : 2.1.3, 2014/11/25, 0xc18c31e2

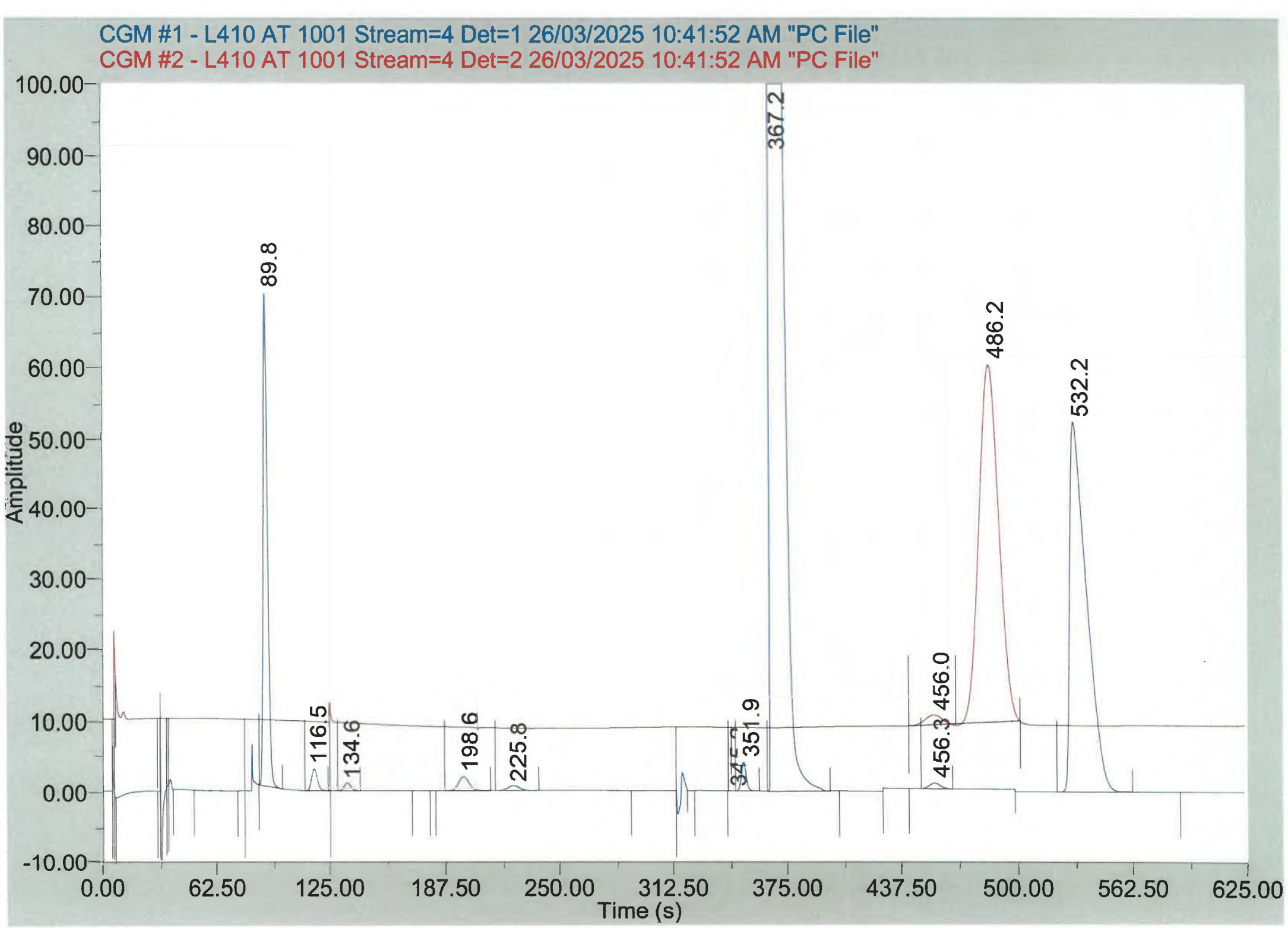
Peak No.	Ret Time	Peak Area	Peak Height	Det No.	Method	Baseline Start	Baseline End	Integration Start	Integration End	Peak Width@ Half Height	Partial Peak
1	89.8	3.02314e+08	2,186,826	1	4	-134,929	-153,109	86.0	98.8	2.8	No
2	116.5	1.77261e+07	95,503	1	1	-161,709	-161,323	111.2	124.0	3.5	No
3	134.6	6.99519e+06	33,259	1	1	-161,821	-161,593	129.2	141.7	4.0	No
4	198.6	2.05069e+07	62,056	1	1	-161,477	-161,027	188.1	213.0	6.4	No
5	225.8	8.29838e+06	22,660	1	1	-161,056	-160,941	215.6	239.6	7.0	No
6	345.2	187084	2,287	1	2	-157,383	-157,696	343.5	347.4	1.6	No
7	351.9	7.74148e+07	499,538	1	3	-157,696	-158,754	347.4	360.3	3.0	No
8	367.2	1.34002e+10	44,234,937	1	1	-165,361	-158,268	364.8	399.0	5.9	No
9	456.3	2.08087e+06	6,301	1	1	-160,715	-160,878	448.9	465.9	6.5	No
10	532.2	3.43674e+09	6,569,774	1	1	-161,314	-159,512	522.8	563.8	10.1	No
1	456.0	5.56733e+06	10,751	2	2	256,801	259,250	442.0	467.8	10.2	No
2	486.2	2.49048e+08	396,920	2	3	259,250	262,573	467.8	502.8	12.0	No

ACTIVE ALARMS

Alarm Name	Alarm State

ANALOG INPUTS

Analog Input	Value
Analog Input 1	0.000
Analog Input 2	0.000


CGM #1 - L410 AT 1001 Stream=4 Det=1 26/03/2025 10:41:52 AM "PC File"
CGM #2 - L410 AT 1001 Stream=4 Det=2 26/03/2025 10:41:52 AM "PC File"
Amplitude
Time (s)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0.00
62.50
125.00
187.50
250.00
312.50
375.00
437.50
500.00
562.50
625.00
89.8
116.5
134.6
198.6
225.8
351.9
367.2
456.0
456.3
486.2
532.2