WE CLAIM:

1. A method for determining an inferential relationship between an inferred energy content and at least one measured quantity, the inferential relationship yielding a calorific value, the method using a computer (200) having a processor (210) configured to execute commands based on data stored in a memory (220), the processor (210) implementing steps of an inference module (204) stored in the memory (220), the method comprising:

determining, by the inference module (204), the inferential relationship by analyzing a relationship between known measurements of at least one measured energy content of at least one fluid and at least one corresponding measured value of a same type as the at least one measured quantity,

wherein the inferential relationship has a density term (B), wherein one of the at least one measured quantity is a measured density (ρ) and the density term (B) has an inverse density ($1/\rho$), the density term (B) representing an inverse relationship between density (ρ) and the calorific value, and wherein the measured density (ρ) is not a density of air (ρ_{air}).

2. A method as claimed in claim 1, wherein the inference module (204) does not account for any of viscosity (η), specific gravity, and the density of air (ρ_{air}) in the density term (B).

3. A method as claimed in claims 1 and 2, wherein the inference module (204) determines the inferential relationship without accounting for any of a heat capacity, a thermal conductivity, a dielectric constant, a refractive index, a thermal diffusivity, a laminar resistance, and a turbulent resistance.

4. A method as claimed in claims 1 to 3, wherein another of the at least one measured quantity is a measured viscosity (η), the inferential relationship further comprising a shift term (A) and a viscosity term (C), the viscosity term (C) accounting for the measured viscosity (η).

5. A method as claimed in claim 4, wherein the inferential relationship is a sum of the shift term (A), the density term (B), and the viscosity term (C).

6. A method as claimed in claims 3 to 5, wherein the viscosity term (C) has a viscosity (η), the viscosity term (C) representing a direct relationship between viscosity (η) and the calorific value.

7. A method as claimed in claims 3 to 6, wherein the at least one measured value further comprises a measured temperature (T) and a measured pressure (P) wherein the shift term (A) comprises a corresponding temperature and pressure dependent shift term coefficient ($k_1(P,T)$), the density term (B) comprises a corresponding temperature and pressure dependent density term coefficient ($k_2(P,T)$), and the viscosity term (C) comprises a corresponding temperature and pressure dependent viscosity term coefficient ($k_3(P,T)$).

8. A method as claimed in claim 7, wherein the density term (B) is the density term coefficient ($k_2(P,T)$) multiplied by the inverse density ($1/\rho$).

9. A method as claimed in claims 7 and 8, wherein the viscosity term (C) is the viscosity term coefficient ($k_3(P,T)$) multiplied by the viscosity (η).

10. A method as claimed in claims 7 to 9, wherein the shift term (A) is the shift term coefficient ($k_1(P,T)$).

11. A method as claimed in claims 7 to 10, wherein the inferential relationship is represented by the equation, $CV = k_1(P,T) + k_2(P,T) \times \frac{1}{\rho} + k_3(P,T) \times \eta$.

12. A method as claimed in claims 7 to 11, wherein the shift term coefficient ($k_1(P,T)$), the density term coefficient ($k_2(P,T)$), and viscosity term coefficient ($k_3(P,T)$) are derived using corresponding coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) associated with the at least one fluid.

13. A method as claimed in claims 7 to 12, wherein the shift term coefficient ($k_1(P,T)$) is dependent upon a relationship between the measured pressure (P), the measured temperature (T), and at least one shift coefficient constant (e.g. a_1-a_4) of the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4), the density term coefficient ($k_2(P,T)$) is dependent upon a relationship between the measured pressure (P), the measured temperature (T) and at least one density coefficient constant (e.g. b_1-b_4) of the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4), and the viscosity term coefficient ($k_3(P,T)$) is dependent upon a relationship between the measured pressure (P), the measured temperature (T) and at least one viscosity coefficient constant (e.g. c_1-c_4) of the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4).

14. A method as claimed in claim 13, wherein the relationship between the measured pressure (P), the measured temperature (T), and the at least one shift coefficient constant (e.g. a_1-a_4) is represented by the equation, $k_1(P,T) = [a_1 + a_2(T-20)] + [a_3 + a_4(T-20)] \times P$, the relationship between the measured pressure (P), the measured temperature (T) and the at least one density coefficient constant (e.g. b_1-b_4) is represented by the equation, $k_2(P,T) = [b_1 + b_2(T-20)] + [b_3 + b_4(T-20)] \times P$, and the relationship between measured pressure (P), the measured temperature (T), and the at least one viscosity coefficient constant (e.g. c_1-c_4) is represented by the equation, $k_3(P,T) = [c_1 + c_2(T-20)] + [c_3 + c_4(T-20)] \times P$.

15. A method as claimed in claims 1 to 4, the inferential relationship further comprising an inert term (D), the inert term accounting for a percent composition of carbon dioxide (%CO_2), the inert term (D) having a temperature (T) and pressure (P) dependent inert term coefficient ($k_4(P,T)$), wherein the inert term coefficient ($k_4(P,T)$) is determined using inert term coefficient constants (e.g. d1-d4).

16. A method as claimed in claim 15, the inert term coefficient ($k_4(P,T)$) being determined from the relationship, $k_4(P,T) = [d_1 + d_2(T-20)] + [d_3 + d_4(T-20)] \times P$, the inferential relationship being $CV = k_1(P,T) + k_2(P,T) \times \frac{1}{\rho} + k_3(P,T) \times \eta + k_4(P,T) \times \%CO_2$.

17. A method as claimed in claims 11 to 16, wherein the analyzing, by the inference module (204), further comprises associating the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) with at least one class of fluids of which one or more of the at least one fluid is a member.

18. A method as claimed in claim 17, wherein the at least one class of fluids is one or more of fuel gas, natural gas, flare gas, liquefied natural gas, biogas, shale gas, and a class of fluid associated with a geographic region.

19. A method as claimed in claims 13 to 18, wherein the inferential relationship may be characterized by the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) such that the coefficient constants may be used as predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) in a live inferential determination of the calorific value that is determined live while taking live measurements of the same type as the at least one measured value.

20. A method as claimed in claims 1 to 19, wherein the inferred energy content is an inferred calorific value.

21. A method for using an inferential relationship between an inferred energy content and at least one measured quantity of a fluid, the predetermined inferential relationship yielding a calorific value, the method using a computer (200) having a processor (210) configured to execute commands based on data stored in a memory (220), the processor (210) implementing steps of an inference module (204) stored in the memory (220), the method comprising:

receiving, by the inference module (204), at least one measured value of a type of the at least one measured quantity; and

inferring, by the inference module (204), the calorific value from the inferential relationship and the at least one measured quantity,

wherein the inferential relationship has a density term (B) and one of the at least one measured value is a measured density (ρ) and the density term (B) has an inverse

density ($1/\rho$), the density term (B) representing an inverse relationship between the measured density (ρ) and the calorific value and wherein the measured density (ρ) is not a density of air (ρ_{air}).

22. A method as claimed in claim 21, wherein the inference module (204) does not account for any of viscosity (η), specific gravity, and the density of air (ρ_{air}) in the density term (B).

23. A method as claimed in claims 21 and 22, wherein the inference module (204) infers a calorific value without accounting for any of a heat capacity, a thermal conductivity, a dielectric constant, a refractive index, a thermal diffusivity, a laminar resistance, and a turbulent resistance.

24. A method as claimed in claims 21 to 23, wherein another of the at least one measured value is a measured viscosity (η), the inferential relationship further comprising a shift term (A) and a viscosity term (C), the viscosity term (C) accounting for the measured viscosity (η).

25. A method as claimed in claim 24, wherein the inferential relationship is a sum of the shift term (A), the density term (B), and the viscosity term (C).

26. A method as claimed in claims 24 and 25, wherein the viscosity term (C) has a viscosity (η), the viscosity term (C) representing a direct relationship between viscosity (η) and the calorific value.

27. A method as claimed in claims 24 to 26, wherein the at least one measured value further comprises a measured temperature (T) and a measured pressure (P) wherein the shift term (A) comprises a corresponding temperature and pressure dependent shift term coefficient ($k_1(P,T)$), the density term (B) comprises a corresponding temperature and pressure dependent density term coefficient ($k_2(P,T)$), and the viscosity term (C) comprises a corresponding temperature and pressure dependent viscosity term coefficient ($k_3(P,T)$).

28. A method as claimed in claim 27, wherein the density term (B) is the density term coefficient ($k_2(P,T)$) multiplied by the inverse density ($1/\rho$).

29. A method as claimed in claims 27 and 28, wherein the viscosity term (C) is the viscosity term coefficient ($k_3(P,T)$) multiplied by the viscosity (η).

30. A method as claimed in claims 27 to 29, wherein the shift term (A) is the shift term coefficient ($k_1(P,T)$).

31. A method as claimed in claims 27 to 30, wherein the inferential relationship is represented by the equation, $CV = k_1(P,T) + k_2(P,T) \times \frac{1}{\rho} + k_3(P,T) \times \eta$.

32. A method as claimed in claims 27 to 31, wherein the shift term coefficient ($k_1(P,T)$), the density term coefficient ($k_2(P,T)$), and viscosity term coefficient ($k_3(P,T)$) are evaluated using corresponding predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) associated with the fluid.

33. A method as claimed in claims 27 to 32, wherein the shift term coefficient ($k_1(P,T)$) is evaluated, by the inference module (204), using a relationship between the measured pressure (P), the measured temperature (T), and at least one predetermined shift coefficient constant (e.g. a_1-a_4) of the predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4), the density term coefficient ($k_2(P,T)$) is evaluated, by the inference module (204), using a relationship between the measured pressure (P), the measured temperature (T) and at least one predetermined density coefficient constant (e.g. b_1-b_4) of the predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4), and the viscosity term coefficient ($k_3(P,T)$) is evaluated, by the inference module (204), using a relationship between the measured pressure (P), the measured temperature (T) and at least one predetermined viscosity coefficient constant (e.g. c_1-c_4) of the predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4).

34. A method as claimed in claim 33, wherein the relationship between the measured pressure (P), the measured temperature (T) and the at least one predetermined shift coefficient constant (e.g. a_1-a_4) is represented by the equation, $k_1(P,T) = [a_1 + a_2(T-20)] + [a_3 + a_4(T-20)] \times P$, the relationship between the measured pressure (P), the measured temperature (T) and the at least one predetermined density coefficient constant (e.g. b_1-b_4) is represented by the equation, $k_2(P,T) = [b_1 + b_2(T-20)] + [b_3 + b_4(T-20)] \times P$, the relationship between the measured pressure (P), the measured temperature (T) and the at least one predetermined viscosity coefficient constant (e.g. c_1-c_4) is represented by the equation, $k_3(P,T) = [c_1 + c_2(T-20)] + [c_3 + c_4(T-20)] \times P$.

35. A method as claimed in claims 21 to 24, the at least one measured value further comprising a measured inert content, wherein the measured inert content is a percent composition of carbon dioxide by volume (%CO_2), the inferential relationship further having an inert term (D), the inert term (D) accounting for the percent composition of carbon dioxide (%CO_2), the inert term (D) having a temperature (T) and pressure (P) dependent inert term coefficient ($k_4(P,T)$), wherein the inert term coefficient ($k_4(P,T)$) is determined using inert term coefficient constants (e.g. d1-d4).

36. A method as claimed in claim 15, the inert term coefficient ($k_4(P,T)$) being determined from the relationship, $k_4(P,T) = [d_1 + d_2(T-20)] + [d_3 + d_4(T-20)] \times P$, the inferential relationship being $CV = k_1(P,T) + k_2(P,T) \times \frac{1}{\rho} + k_3(P,T) \times \eta + k_4(P,T) \times \%CO_2$.

37. A method as claimed in claims 32 to 36, wherein the inferring, by the inference module (204), comprises inferring a calorific value of the fluid using predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) associated with at least one class of fluids of which one or more of the at least one fluid is a member.

38. A method as claimed in claim 37, wherein the at least one class of fluids is one or more of fuel gas, natural gas, flare gas, liquefied natural gas, biogas, shale gas, and a class of fluid associated with a geographic region.

39. A method as claimed in claims 21 to 38, further comprising:

measuring, by a vibratory sensor (5), at least one raw data signal, while the fluid is interacting with the vibratory sensor (5);

supplying, by the vibratory sensor (5), the at least one raw data signal to a measurement module (202);

processing, by the measurement module (202), the at least one raw data signal to determine data representing one or more of the at least one measured value;

wherein the receiving, by the inference module (204) comprises receiving the data representing the one or more of the at least one measured value from the measurement module (202).

40. A method as claimed in claim 39, wherein the one or more of the at least one measured value comprises the measured density (ρ).

41. A method as claimed in claims 28 to 40, further comprising measuring, by a pressure sensor (150), the measured pressure (P), wherein the receiving, by the inference module (204), comprises receiving the measured pressure (P).

42. A method as claimed in claims 21 to 41, wherein one or more of the measured temperature (T) and the measured pressure (P) is assumed to be consistent.

43. A method as claimed in claims 21 to 42, wherein the inferred energy content is a calorific value.

44. An apparatus for using an inferential relationship between an inferred energy content and at least one measured quantity of a fluid, the inferential relationship yielding a calorific value, the apparatus having a computer (200) having a processor (210) configured to execute commands based on data stored in a memory (220), the processor (210) implementing steps of an inference module (204) stored in the memory (220), the inference module (204) configured to:

receive at least one measured value of a type of the at least one measured quantity; and

infer the calorific value from the inferential relationship and the at least one measured quantity,

wherein the inferential relationship has a density term (B) and one of the at least one measured value is a measured density (ρ) and the density term (B) has an inverse density ($1/\rho$), the density term (B) representing an inverse relationship between the measured density (ρ) and the calorific value and wherein the measured density (ρ) is not a density of air (ρ_{air}).

45. An apparatus as claimed in claim 44, wherein the inference module (204) does not account for any of viscosity (η), specific gravity, and the density of air (ρ_{air}) in the density term (B).

46. An apparatus as claimed in claims 44 and 45, wherein the inference module (204) infers the calorific value without accounting for any of heat capacity, thermal conductivity, a dielectric constant, a refractive index, thermal diffusivity, a laminar resistance, and a turbulent resistance.

47. An apparatus as claimed in claims 44 to 46, wherein another of the at least one measured value is a measured viscosity (η), the inferential relationship further comprising a shift term (A) and a viscosity term (C), the viscosity term (C) accounting for the measured viscosity (η).

48. An apparatus as claimed in claim 47, wherein the inferential relationship is a sum of the shift term (A), the density term (B), and the viscosity term (C).

49. An apparatus as claimed in claims 47 and 48, wherein the viscosity term (C) has a viscosity (η), the viscosity term (C) representing a direct relationship between viscosity (η) and the calorific value.

50. An apparatus as claimed in claims 47 to 49, wherein the at least one measured value further comprises a measured temperature (T) and a measured pressure (P) wherein the shift term (A) comprises a corresponding temperature and pressure dependent shift term coefficient ($k_1(P,T)$), the density term (B) comprises a corresponding temperature and pressure dependent density term coefficient ($k_2(P,T)$), and the viscosity term (C) comprises a corresponding temperature and pressure dependent viscosity term coefficient ($k_3(P,T)$).

51. An apparatus as claimed in claim 50, wherein the density term (B) is the density term coefficient ($k_2(P,T)$) multiplied by the inverse density ($1/\rho$).

52. An apparatus as claimed in claims 50 and 51, wherein the viscosity term (C) is the viscosity term coefficient ($k_3(P,T)$) multiplied by the viscosity (η).

53. An apparatus as claimed in claims 50 to 52, wherein the shift term (A) is the shift term coefficient ($k_1(P,T)$).

54. An apparatus as claimed in claims 50 to 53, wherein the inferential relationship is represented by the equation, $CV = k_1(P,T) + k_2(P,T) \times \frac{1}{\rho} + k_3(P,T) \times \eta$.

55. An apparatus as claimed in claims 50 to 54, wherein the shift term coefficient ($k_1(P,T)$), the density term coefficient ($k_2(P,T)$), and viscosity term coefficient ($k_3(P,T)$) are evaluated using corresponding predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) associated with the fluid.

56. An apparatus as claimed in claims 50 to 55, wherein the shift term coefficient ($k_1(P,T)$) is evaluated, by the inference module (204), using a relationship between the measured pressure (P), the measured temperature (T), and at least one predetermined shift coefficient constant (e.g. a_1-a_4) of the predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4), the density term coefficient ($k_2(P,T)$) is evaluated, by the inference module (204), using a relationship between the measured pressure (P), the measured temperature (T) and at least one predetermined density coefficient constant

(e.g. b_1-b_4) of the predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4), and the viscosity term coefficient ($k_3(P,T)$) is evaluated, by the inference module (204), using a relationship between the measured pressure (P), the measured temperature (T) and at least one predetermined viscosity coefficient constant (e.g. c_1-c_4) of the predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4).

57. An apparatus as claimed in claim 56, wherein the relationship between the measured pressure (P), the measured temperature (T) and the at least one predetermined shift coefficient constant (e.g. a_1-a_4) is represented by the equation, $k_1(P,T) = [a_1 + a_2(T-20)] + [a_3 + a_4(T-20)] \times P$, the relationship between the measured pressure (P), the measured temperature (T) and the at least one predetermined density coefficient constant (e.g. b_1-b_4) is represented by the equation, $k_2(P,T) = [b_1 + b_2(T-20)] + [b_3 + b_4(T-20)] \times P$, the relationship between the measured pressure (P), the measured temperature (T) and the at least one predetermined viscosity coefficient constant (e.g. c_1-c_4) is represented by the equation, $k_3(P,T) = [c_1 + c_2(T-20)] + [c_3 + c_4(T-20)] \times P$.

58. An apparatus as claimed in claims 44 to 47, the inferential relationship further comprising an inert term (D), the inert term accounting for a percent composition of carbon dioxide (%CO_2), the inert term (D) having a temperature (T) and pressure (P) dependent inert term coefficient ($k_4(P,T)$), wherein the inert term coefficient ($k_4(P,T)$) is determined using inert term coefficient constants (e.g. d1-d4).

59. An apparatus as claimed in claim 58, the inert term coefficient ($k_4(P,T)$) being determined from the relationship, $k_4(P,T) = [d_1 + d_2(T-20)] + [d_3 + d_4(T-20)] \times P$, the inferential relationship being $CV = k_1(P,T) + k_2(P,T) \times \frac{1}{\rho} + k_3(P,T) \times \eta + k_4(P,T) \times \%CO_2$.

60. An apparatus as claimed in claims 55 to 59, wherein the inferring, by the inference module (204), comprises inferring the calorific value of the fluid using predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) associated with at least one class of fluids of which one or more of the at least one fluid is a member.

61. An apparatus as claimed in claim 60, wherein the at least one class of fluids is one or more of fuel gas, natural gas, flare gas, liquefied natural gas, shale gas, biogas, and a class of fluids from a geographic region.

62. An apparatus as claimed in claims 44 to 61, wherein one or more of the measured temperature (T) and the measured pressure (P) is a constant, based on a determination, by the inference module (204), that the one or more of the measured temperature (T) and the measured pressure (P) is sufficiently consistent in operating conditions.

63. An apparatus as claimed in claims 44 to 62, further comprising a measurement module (202) stored in the memory (220), the measurement module configured to:

receive, by the measurement module (202), at least one raw data signal; and

process, by the measurement module (202), the at least one raw data signal to determine data representing one or more of the at least one measured value,

wherein the receiving, by the inference module (204), comprises receiving the data representing the one or more of the at least one measured value from the measurement module (202).

64. An apparatus as claimed in claims 44 to 62, wherein the apparatus is a vibratory sensor (5), the apparatus configured to interact with the fluid, wherein the computer (200) is a meter electronics (20) configured to determine one or more of the at least one measured value based on measurements taken by the vibratory sensor (5).

65. An apparatus as claimed in claims 44 to 62, the apparatus comprising:

a first tine (104a) and a second tine (104b) that interact with the fluid;

a driver (102) that receives a drive signal from the computer (200), and drives a motion in the first tine (104a) based on the drive signal;

a response sensor (106) configured to generate a response signal representing a responsive motion of the second tine (104b) and transmit the response signal to the meter electronics (20); and

wherein the meter electronics (20) is configured to determine the one or more of the at least one measured value from one or more of the drive signal and the response signal.

66. An apparatus as claimed in claims 64 and 65, wherein the one or more of the at least one measured value comprises the measured density (ρ).

67. An apparatus as claimed in claims 44 to 66, wherein the inferred energy content is a calorific value.

68. An apparatus for determining an inferential relationship between an inferred energy content and at least one measured quantity, the inferential relationship yielding a calorific value, the apparatus having a computer (200) having a processor (210) and a memory (220), the processor (210) configured to execute commands based on data stored in the memory (220), the processor (210) executing an inference module (204) stored in the memory (220), the inference module (204) configured to:

determine the inferential relationship by analyzing a relationship between known measurements of at least one measured energy content of at least one fluid and at least one corresponding measured value of a same type as the at least one measured quantity,

wherein the inferential relationship has a density term (B), wherein one of the at least one measured quantity is a measured density (ρ) and the density term (B) has an inverse density ($1/\rho$), the density term (B) representing an inverse relationship between density (ρ) and the calorific value and wherein the measured density (ρ) is not a density of air (ρ_{air}).

69. An apparatus as claimed in claim 68, wherein the inference module (204) does not account for any of viscosity (η), specific gravity, and the density of air (ρ_{air}) in the density term (B).

70. An apparatus as claimed in claims 68 and 69, wherein the inference module (204) determines the inferential relationship without accounting for any of heat capacity,

thermal conductivity, a dielectric constant, a refractive index, thermal diffusivity, a laminar resistance, and a turbulent resistance.

71. An apparatus as claimed in claims 68 to 70, wherein another of the at least one measured quantity is a measured viscosity (η), the inferential relationship further comprising a shift term (A) and a viscosity term (C), the viscosity term (C) accounting for the measured viscosity (η).

72. An apparatus as claimed in claim 71, wherein the inferential relationship is a sum of the shift term (A), the density term (B), and the viscosity term (C).

73. An apparatus as claimed in claims 71 to 72, wherein the viscosity term (C) has a viscosity (η), the viscosity term (C) representing a direct relationship between viscosity (η) and the calorific value.

74. An apparatus as claimed in claims 71 to 73, wherein the at least one measured value further comprises a measured temperature (T) and a measured pressure (P) wherein the shift term (A) comprises a corresponding temperature and pressure dependent shift term coefficient ($k_1(P,T)$), the density term (B) comprises a corresponding temperature and pressure dependent density term coefficient ($k_2(P,T)$), and the viscosity term (C) comprises a corresponding temperature and pressure dependent viscosity term coefficient ($k_3(P,T)$).

75. An apparatus as claimed in claim 74, wherein the density term (B) is the density term coefficient ($k_2(P,T)$) multiplied by the inverse density ($1/\rho$).

76. An apparatus as claimed in claims 74 and 75, wherein the viscosity term (C) is the viscosity term coefficient ($k_3(P,T)$) multiplied by the viscosity (η).

77. An apparatus as claimed in claims 74 to 76, wherein the shift term (A) is the shift term coefficient ($k_1(P,T)$).

78. An apparatus as claimed in claims 74 to 77, wherein the inferential relationship is represented by the equation, $CV = k_1(P,T) + k_2(P,T) \times \frac{1}{\rho} + k_3(P,T) \times \eta$.

79. An apparatus as claimed in claims 74 to 78, wherein the shift term coefficient ($k_1(P,T)$), the density term coefficient ($k_2(P,T)$), and viscosity term coefficient ($k_3(P,T)$) are derived using corresponding coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) associated with the at least one fluid.

80. An apparatus as claimed in claims 74 to 79, wherein the shift term coefficient ($k_1(P,T)$) is dependent upon a relationship between the measured pressure (P), the measured temperature (T), and at least one shift coefficient constant (e.g. a_1-a_4) of the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4), the density term coefficient ($k_2(P,T)$) is dependent upon a relationship between the measured pressure (P), the measured temperature (T) and at least one density coefficient constant (e.g. b_1-b_4) of the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4), and the viscosity term coefficient ($k_3(P,T)$) is dependent upon a relationship between the measured pressure (P), the measured temperature (T) and at least one viscosity coefficient constant (e.g. c_1-c_4) of the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4).

81. An apparatus as claimed in claim 80, wherein the relationship between the measured pressure (P), the measured temperature (T), and the at least one shift coefficient constant (e.g. a_1-a_4) is represented by the equation, $k_1(P,T) = [a_1 + a_2(T-20)] + [a_3 + a_4(T-20)] \times P$, the relationship between the measured pressure (P), the measured temperature (T) and the at least one density coefficient constant (e.g. b_1-b_4) is represented by the equation, $k_2(P,T) = [b_1 + b_2(T-20)] + [b_3 + b_4(T-20)] \times P$, and the relationship between measured pressure (P), the measured temperature (T), and the at least one viscosity coefficient constant (e.g. c_1-c_4) is represented by the equation, $k_3(P,T) = [c_1 + c_2(T-20)] + [c_3 + c_4(T-20)] \times P$.

82. An apparatus as claimed in claims 68 to 71, the inferential relationship further comprising an inert term (D), the inert term accounting for a percent composition of carbon dioxide ($\%CO_2$), the inert term (D) having a temperature (T) and pressure (P)

dependent inert term coefficient ($k_4(P,T)$), wherein the inert term coefficient ($k_4(P,T)$) is determined using inert term coefficient constants (e.g. d1-d4).

83. An apparatus as claimed in claim 82, the inert term coefficient ($k_4(P,T)$) being determined from the relationship, $k_4(P,T) = [d_1 + d_2(T-20)] + [d_3 + d_4(T-20)] \times P$, the inferential relationship being $CV = k_1(P,T) + k_2(P,T) \times \frac{1}{\rho} + k_3(P,T) \times \eta + k_4(P,T) \times \%CO_2$.

84. An apparatus as claimed in claims 79 to 82, wherein the analyzing, by the inference module (204), further comprises associating the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) with at least one class of fluids of which one or more of the at least one fluid is a member.

85. An apparatus as claimed in claim 84, wherein the at least one class of fluids is one or more of fuel gas, natural gas, flare gas, liquefied natural gas, shale gas, biogas, and a class of gases associated with a geographic region.

86. An apparatus as claimed in claims 80 to 85, wherein the inferential relationship may be characterized by the coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) such that the coefficient constants may be used as predetermined coefficient constants (e.g. a_1-a_4, b_1-b_4, c_1-c_4, d_1-d_4) in a live inferential determination of the calorific value that is determined live while taking live measurements of the same type as the at least one measured value.

87. An apparatus as claimed in claims 68 to 86, wherein the apparatus is a vibratory sensor (5) and the computer (200) is a meter electronics (20).

88. An apparatus as claimed in claim 87, wherein the apparatus determines one or more of the at least one measured value and the apparatus provides the one or more of the at least one measured value to the inference module (204) for use in the inferring of the calorific value.

89. An apparatus as claimed in claim 88, wherein the one or more of the at least one measured value comprises the measured density (ρ) and the measured viscosity (η).

90. An apparatus as claimed in claims 68 to 89, wherein the inferred energy content is an inferred calorific value.