Claims

1. A respiratory assistance apparatus comprising:

a flow generator configured to provide ~~a~~ breathing gases to a patient, the breathing gases comprising supplemental oxygen provided from an oxygen source,

a controller configured to control an oxygen concentration of the breathing gases,

at least one sensor, the at least one sensor configured to provide a measurement indicative of ~~the~~ a patient's blood oxygen concentration to the controller,

wherein the controller is configured determine a target oxygen concentration of the breathing gases,

wherein the controller is configured to calculate an estimated future value of the patient's blood oxygen concentration based on:

a difference between an initial oxygen concentration of the breathing gases and the target oxygen concentration of the breathing gases, and

the measurement indicative of the patient's blood oxygen concentration.

2. The respiratory assistance apparatus of claim 1, wherein the controller is configured to control the oxygen concentration of the breathing gases based on the target oxygen concentration.

3. The respiratory assistance apparatus of claim 1 or claim 2, wherein the estimated future value of the patient's blood oxygen concentration is further based on a time from when the controller controls the oxygen concentration of the breathing gases to the target oxygen concentration.

4. The respiratory assistance apparatus of any one of claims 1 to 3, wherein the controller is configured to receive an input, and based on the input determine ~~an~~the target oxygen concentration of the breathing gases.

5. The respiratory assistance apparatus of claim 4, wherein the input comprises a target oxygen concentration range comprising an upper target oxygen concentration, and a lower target oxygen concentration.

6. The respiratory assistance apparatus of any one of claims 1 to 5, wherein the controller is configured to compare said estimated future value of the patient's blood oxygen concentration with ~~a blood oxygen concentration alarm threshold and/or~~ a blood oxygen concentration alarm range, and generate an alarm output if the estimated future value of the patient's blood oxygen concentration is not within said blood oxygen concentration alarm range, and wherein

the blood oxygen concentration alarm range comprises an upper blood oxygen concentration alarm threshold, and a lower blood oxygen concentration alarm threshold.

7. ~~The respiratory assistance apparatus of claim 6, wherein the blood oxygen concentration alarm range comprises an upper blood oxygen concentration alarm threshold, and a lower blood oxygen concentration alarm threshold.~~The respiratory assistance apparatus of any one of claims 1 to 5, wherein the controller is configured to generate an alarm output based on the estimated future value of the patient's blood oxygen concentration and a comparison with a blood oxygen concentration alarm threshold, and wherein the controller is configured to generate said alarm output if the estimated future value of the patient's blood oxygen concentration is above an upper blood oxygen concentration alarm threshold or below a lower blood oxygen concentration alarm threshold.

8. The respiratory assistance apparatus of claim 6 or claim 7, wherein the upper blood oxygen concentration alarm threshold and/or the lower blood oxygen concentration alarm threshold is/are determined based on ~~the~~ a time from when the controller controls the oxygen concentration of the breathing gases to the target oxygen concentration.

9. The respiratory assistance apparatus of any one of claims 6 to 8, wherein the upper blood oxygen concentration alarm threshold and/or the lower blood oxygen concentration alarm threshold ~~may be~~is/are determined based on an amount of a change in target oxygen concentration.

10. The respiratory assistance apparatus of any one of claims 6 to ~~9~~8, wherein the upper blood oxygen concentration alarm threshold and/or the lower blood oxygen concentration alarm threshold ~~may be~~is/are determined ~~or~~ based on the target oxygen concentration

11. The respiratory assistance apparatus of any one of claims 6 to 10, wherein the upper blood oxygen concentration alarm threshold and/or the lower blood oxygen concentration alarm threshold ~~may be~~ is/are determined based on the current oxygen concentration of gases.

12. The respiratory assistance apparatus of any one of claims 6 to 11, wherein the upper blood oxygen concentration alarm threshold and/or the lower blood oxygen concentration alarm threshold is/are based on the target blood oxygen concentration.

~~13. The respiratory assistance apparatus of any one of claims 6 to 12, wherein the controller is configured to generate an alarm output based on the estimated future value of the patient's blood oxygen concentration and a comparison with to a blood oxygen concentration alarm threshold~~

~~14. The respiratory assistance apparatus of claim 13, wherein the controller is configured to generate said alarm output if the estimated future value of the patient's blood oxygen concentration is above or below the blood oxygen concentration threshold.~~

~~15. The respiratory assistance apparatus of claim 14, wherein said alarm threshold is based on the time from when the controller controls the oxygen concentration of the breathing gases to the target oxygen concentration.~~

~~16. The respiratory assistance apparatus of any one of claims 1 to 15, wherein the input comprises a target blood oxygen concentration, and the blood oxygen concentration alarm range is based on the target blood oxygen concentration.~~

~~17.~~13. The respiratory assistance apparatus of any one of claims 6 to ~~16~~12, wherein the upper blood oxygen concentration alarm threshold ~~blood oxygen concentration threshold and/or blood oxygen concentration alarm range~~ is~~are~~ based on the difference between the target oxygen concentration and the or an upper target oxygen concentration.

14. The respiratory assistance apparatus of any one of claims 6 to 13, wherein the respiratory assistance apparatus, or an associated device, is configured to display the alarm output, or information associated with the alarm output.

15. The respiratory assistance apparatus of any one of claims 6 to 14, wherein the respiratory assistance apparatus, or the or an associated device is configured to display the estimated future value of the patient's blood oxygen concentration.

16. The respiratory assistance apparatus of any one of claims 1 to 15, wherein the estimated future value of the patient's blood oxygen concentration is based on an oxygen efficiency of the patient and/or a haemoglobin saturation function.

17. The respiratory assistance apparatus of any one of claims 1 to 16, wherein the oxygen efficiency of the patient is based on the measurement indicative of a patient's blood oxygen concentration divided by a measured oxygen concentration of the breathing gases.

18. The respiratory assistance apparatus of any one of claims 1 to 17, wherein the oxygen efficiency of the patient is received as an input.

19. The respiratory assistance apparatus of any one of claims 1 to 18, wherein the controller is configured to calculate the estimated future value of the patient's blood oxygen concentration based on stored breathing gases oxygen concentration data.

20. The respiratory assistance apparatus of claim 19, wherein stored breathing gases oxygen concentrations of the stored breathing gases oxygen concentration data are weighted based on an associated timestamp.

~~18. A respiratory assistance apparatus comprising:~~

~~a flow generator configured to provide a breathing gas to a patient, the breathing gas comprising supplemental oxygen provided from an oxygen source,~~

~~at least one sensor, the at least one sensor configured to provide a measurement indicative of the patient's blood oxygen concentration to the controller,~~

~~a controller, the controller configured to receive an input, the input comprising a target oxygen concentration range comprising an upper target oxygen concentration, and/or a lower target oxygen concentration,~~

~~a controller, the controller configured to control an oxygen concentration of the breathing gases to a target oxygen concentration, where the target oxygen concentration is within said target oxygen concentration range comprising an upper target oxygen concentration and a lower target oxygen concentration,~~

~~wherein the controller is configured to:~~

~~calculate an estimated maximum future value of a patient's blood oxygen concentration for the target oxygen concentration range based on the measurement indicative of a patient blood oxygen concentration and a difference between the target oxygen concentration and the upper target oxygen concentration or~~

~~calculate an estimated minimum future value of a patient's blood oxygen concentration for the target oxygen concentration range based on the measurement indicative of a patient blood oxygen concentration, and a difference between the target oxygen concentration and the lower target oxygen concentration.~~

~~19. The respiratory assistance apparatus of claim 18, wherein the controller is configured to control an oxygen concentration of the breathing gases from an initial oxygen concentration to a target oxygen concentration.~~

~~20. The respiratory assistance apparatus of claim 18 or claim 19, wherein the initial oxygen concentration is an oxygen concentration before the controller controls the oxygen concentration of the breathing gases to the target oxygen concentration.~~

21. The respiratory assistance apparatus of any one of claims 18 to 20, wherein the respiratory assistance apparatus is configured to receive an input indicative of the target oxygen concentration range.

22. The respiratory assistance apparatus of claim 21, wherein the target oxygen concentration range is input via a user interface.

23. The respiratory assistance apparatus of any one of claims 18 to 22, wherein the estimated maximum future value and/or the estimated minimum future value is based on an estimated oxygen efficiency.

24. The respiratory assistance apparatus of any one of claims 18 to 23, wherein the estimated maximum future value and/or the estimated minimum future value is updated in real time.

25. The respiratory assistance apparatus of any one of claims 18 to 22, wherein the maximum or minimum future value is after an effect of a change of oxygen concentration has been realised on patient blood oxygen.

26. A respiratory assistance apparatus comprising

a flow generator configured to provide a breathing gas to a patient, the breathing gas comprising supplemental oxygen provided from an oxygen source,

at least one sensor, the at least one sensor configured to provide a measurement indicative of the patient's blood oxygen concentration to the controller,

wherein during operation of the apparatus the controller is configured to store breathing gases oxygen concentration data, wherein the stored breathing gases oxygen concentration data comprises one or more oxygen concentrations of the breathing gases each oxygen concentrations of the breathing gases having an associated timestamp,

wherein the controller is configured to calculate an estimated future value of the patient's blood oxygen concentration based on:

the stored breathing gases oxygen concentration data, wherein the oxygen concentrations of the breathing gases are weighted based on the associated timestamp, and

the measurement indicative of the patient's blood oxygen concentration.

27. The respiratory assistance apparatus of claim 26, wherein the controller is configured to calculate an estimated future value of the patient's blood oxygen concentration based on:

an estimated oxygen efficiency ratio for the patient,

a haemoglobin saturation function.

28. A respiratory assistance apparatus comprising

a flow generator configured to provide a breathing gas to a patient, the breathing gas comprising supplemental oxygen provided from an oxygen source,

at least one sensor, the at least one sensor configured to provide a measurement indicative of the patient's blood oxygen concentration to the controller,

wherein during operation of the apparatus the controller is configured to store breathing gases oxygen concentration data, wherein the stored breathing gases oxygen concentration data comprises one or more oxygen concentrations of the breathing gases each oxygen concentrations of the breathing gases having an associated timestamp,

wherein the controller is configured to calculate an estimated maximum future value of the patient's blood oxygen concentration based on:

the stored breathing gases oxygen concentration data, wherein the oxygen concentrations of the breathing gases are weighted based on the associated timestamp, and

the measurement indicative of the patient's blood oxygen concentration

a difference between the current oxygen concentration of the breathing gases and a upper target oxygen concentration.

29. The respiratory apparatus of claim 28, wherein the controller is configured to calculate an estimated maximum future value of the patient's blood oxygen concentration based on:

an estimated oxygen efficiency ratio for the patient,

a haemoglobin saturation function.

30. A respiratory assistance apparatus comprising

a flow generator configured to provide a breathing gas to a patient, the breathing gas comprising supplemental oxygen provided from an oxygen source,

at least one sensor, the at least one sensor configured to provide a measurement indicative of the patient's blood oxygen concentration to the controller,

wherein during operation of the apparatus the controller is configured to store breathing gases oxygen concentration data, wherein the stored breathing gases oxygen concentration data comprises one or more oxygen concentrations of the breathing gases each oxygen concentrations of the breathing gases having an associated timestamp,

wherein the controller is configured to calculate an estimated minimum future value of the patient's blood oxygen concentration based on:

the stored breathing gases oxygen concentration data, wherein the oxygen concentrations of the breathing gases are weighted based on the associated timestamp, and

the measurement indicative of the patient's blood oxygen concentration

a difference between the oxygen concentration of the breathing gases at the current estimation phase and a lower target oxygen concentration.

31. The respiratory assistance apparatus of claim 30, wherein the controller is configured to calculate an estimated minimum future value of the patient's blood oxygen concentration based on:

an estimated oxygen efficiency ratio for the patient,

a haemoglobin saturation function.

32. The respiratory assistance apparatus of claim 30 or 31, wherein the associated timestamp comprises a time when the associated oxygen concentration of the breathing gases was recorded, and/or measured and/or stored.

33. The respiratory assistance apparatus of any one of claims 30 to 32, wherein the associated timestamp comprises a time elapsed since the associated oxygen concentration of the breathing gases was recorded, and/or measured and/or stored.

34. The respiratory assistance apparatus of any one of claims 30 to 33, wherein the controller is configured to determine a series of changes to oxygen concentration of the breathing gases in the stored breathing gases oxygen concentration data.

35. The respiratory assistance apparatus of any one of claims 30 to 34, wherein the oxygen concentration of the breathing gases is controlled to a target oxygen concentration of the breathing gases.

36. The respiratory assistance apparatus of any one of claims 30 to 34, wherein the oxygen concentration of the breathing gases is a measured oxygen concentration of the breathing gases.

37. The respiratory assistance apparatus of any one of claims 30 to 36, wherein the apparatus comprises at least one gases composition sensor, the gases composition sensor configured to provide a measurement indicative of the oxygen concentration of the breathing gases to the controller

38. The respiratory assistance apparatus of any one of claims 30 to 37, wherein the controller is configured to update the stored the oxygen concentration of the breathing gases at regular time intervals, or irregular time intervals.

39. The respiratory assistance apparatus of any one of claims 30 to 38, wherein the controller is configured to update the stored oxygen concentration of the breathing gases, when a target oxygen concentration of the breathing gases is updated by the controller.

40. The respiratory assistance apparatus of any one of claims 30 to 39, wherein the weighting based on the associated timestamp is based on a decay function.

41. The respiratory assistance apparatus of any one of claims 30 to 40, wherein the stored oxygen concentration data is transmitted to one or more servers, or a patient monitoring unit, and/or a nurse monitoring station, in communication with the respiratory therapy apparatus.

42. A respiratory assistance apparatus comprising

a flow generator configured to provide a breathing gas to a patient, the breathing gas comprising supplemental oxygen provided from an oxygen source,

at least one sensor, the at least one sensor configured to provide a measurement indicative of the patient's blood oxygen concentration to the controller,

wherein the controller is configured to maintain a sum of changes of the breathing gases oxygen concentration,

wherein the controller is configured to execute an estimation update phase, the estimation update phase comprising:

applying a decay function to the sum of changes of the oxygen concentration of the breathing gases,

calculating a difference between the oxygen concentration of the breathing gases at the current estimation update phase, and the oxygen concentration of the breathing gases at the previous estimation update phase,

adding the difference to the sum of changes to the oxygen concentration of the breathing gases

wherein the controller is configured to calculate an estimated future value of the patient's blood oxygen concentration based on:

the sum of changes of the oxygen concentration of the breathing gases, and

the measurement indicative of the patient's blood oxygen concentration.

43. The respiratory assistance apparatus of claim 42, wherein the controller is configured to calculate an estimated future value of the patient's blood oxygen concentration based on:

an estimated oxygen efficiency ratio for the patient,

a haemoglobin saturation function.

44. A respiratory assistance apparatus comprising

a flow generator configured to provide a breathing gas to a patient, the breathing gas comprising supplemental oxygen provided from an oxygen source,

at least one sensor, the at least one sensor configured to provide a measurement indicative of the patient's blood oxygen concentration to the controller,

wherein the controller is configured to maintain a sum of changes of the breathing gases oxygen concentration,

wherein the controller is configured to execute an estimation update phase, the estimation update phase comprising:

applying a decay function to the sum of changes of the oxygen concentration of the breathing gases,

calculating a difference between the oxygen concentration of the breathing gases at the current estimation update phase, and the oxygen concentration of the breathing gases at the previous estimation update phase,

adding the difference to the sum of changes to the oxygen concentration of the breathing gases

wherein the controller is configured to calculate an estimated maximum future value of the patient's blood oxygen concentration based on:

the sum of changes of the oxygen concentration of the breathing gases , and

the measurement indicative of the patient's blood oxygen concentration

a difference between the oxygen concentration of the breathing gases at the current estimation phase and a upper target oxygen concentration.

45. The respiratory assistance apparatus of claim 44, wherein the controller is configured to calculate an estimated maximum future value of the patient's blood oxygen concentration based on:

an estimated oxygen efficiency ratio for the patient,

a haemoglobin saturation function.

46. A respiratory assistance apparatus comprising

a flow generator configured to provide a breathing gas to a patient, the breathing gas comprising supplemental oxygen provided from an oxygen source,

at least one sensor, the at least one sensor configured to provide a measurement indicative of the patient's blood oxygen concentration to the controller,

wherein the controller is configured to maintain a sum of changes of the breathing gases oxygen concentration,

wherein the controller is configured to execute an estimation update phase, the estimation update phase comprising:

applying a decay function to the sum of changes of the oxygen concentration of the breathing gases,

calculating a difference between the oxygen concentration of the breathing gases at the current estimation update phase, and the oxygen concentration of the breathing gases at the previous estimation update phase,

adding the difference to the sum of changes to the oxygen concentration of the breathing gases

wherein the controller is configured to calculate an estimated minimum future value of the patient's blood oxygen concentration based on:

the sum of changes of the oxygen concentration of the breathing gases , and

the measurement indicative of the patient's blood oxygen concentration

a difference between the oxygen concentration of the breathing gases at the current estimation phase and a lower target oxygen concentration.

47. The respiratory assistance apparatus of claim 46, wherein the controller is configured to calculate an estimated minimum future value of the patient's blood oxygen concentration based on:

an estimated oxygen efficiency ratio for the patient,

a haemoglobin saturation function.

48. The respiratory assistance apparatus of any one of claims 42 to 47, wherein the controller is configured to execute the estimation update phase at regular time intervals, or irregular time intervals.

49. The respiratory assistance apparatus of any one of claims 42 to 47, wherein the controller is configured to execute the estimation update in real time.

50. The respiratory assistance apparatus of any one of claims 42 to 47, wherein the controller is configured to execute the estimation update phase periodically.

51. The respiratory assistance apparatus of any one of claims 42 to 47, wherein the controller is configured to execute the estimation update phase when a target oxygen concentration of the breathing gases is updated by the controller.

52. The respiratory assistance apparatus of any one of claims 42 to 51, wherein the controller is configured to control the oxygen concentration of the breathing gases to a target oxygen concentration,

53. The respiratory assistance apparatus of any one of claims 42 to 47, wherein the oxygen concentration of the breathing gases is controlled to a target oxygen concentration of the breathing gases.

54. The respiratory assistance apparatus of any one of claims 42 to 53, wherein the oxygen concentration of the breathing gases is a measured oxygen concentration of the breathing gases.

55. The respiratory assistance apparatus of any one of claims 1 to 54, wherein the apparatus comprises at least one gases composition sensor, the gases composition sensor configured to provide a measurement indicative of the oxygen concentration of the breathing gases to the controller

56. The respiratory assistance apparatus of any one of claims 1 to 55, wherein the controller is configured to update a target oxygen concentration of the breathing gases, and control an oxygen concentration of the breathing gases from an initial oxygen concentration to the target oxygen concentration.

57. The respiratory assistance apparatus of any one of claims 1 to 56, wherein the target oxygen concentration is provided by an oxygen concentration controller.

58. The respiratory assistance apparatus of any one of claims 1 to 57, wherein the or a input further comprises the target blood oxygen concentration.

59. The respiratory assistance apparatus of any one of claims 1 to 58, wherein the or a target blood oxygen concentration is a range.

60. The respiratory assistance apparatus of claim 59, wherein the target blood oxygen concentration comprises an upper target blood oxygen concentration and/or a lower target blood oxygen concentration.

61. The respiratory assistance apparatus of claim 59 or 60, wherein the controller is configured to determine the target oxygen concentration based on a mid point of target blood oxygen concentration range.

62. The respiratory assistance apparatus of any one of claims 59 to 61, wherein the controller is configured to control the target blood oxygen concentration to be within the upper target blood oxygen concentration and the lower target blood oxygen concentration.

63. The respiratory assistance apparatus of any one of claims 1 to 62, wherein the controller is configured to vary the target oxygen concentration to control the patient blood oxygen concentration to the target blood oxygen concentration.

64. The respiratory assistance apparatus of any one of claims 1 to 63, wherein the controller is configured to vary the amount of supplemental oxygen provided from an oxygen source to the breathing gas to control the oxygen concentration of the breathing gases.

65. The respiratory assistance apparatus of any one of claims 1 to 64, wherein the apparatus comprises at least one valving arrangement.

66. The respiratory assistance apparatus of claim 65, wherein the valving arrangement is in fluid communication with the blower

67. The respiratory assistance apparatus of claim 65 or 66, wherein the valving arrangement may be controllable to adjust the amount of oxygen introduced into the gases flow.

68. The respiratory assistance apparatus of any one of claims 1 or 67, wherein the controller is configured to generate an alarm output.

69. The respiratory assistance apparatus of claim 68, wherein the alarm output may be transmitted to one or more servers, or a patient monitoring unit, and/or a nurse monitoring station, in communication with the respiratory therapy apparatus.

70. The respiratory assistance apparatus of claim 68 or claim 69, wherein the alarm output comprises at least one alarm parameter.

71. The respiratory assistance apparatus of any one of claims 68 to 70, wherein the controller is configured to generate the alarm output based on the estimated future value of the patient's blood oxygen concentration, and/or the estimated maximum or minimum future value of a patient's blood oxygen concentration

72. The respiratory assistance apparatus of claim 70, wherein the controller is configured to compare said estimated maximum future value of a patient's blood oxygen concentration with the upper target blood oxygen concentration, and generate the alarm output if the estimated maximum future value of a patient's blood oxygen concentration is less than the upper target blood oxygen concentration.

73. The respiratory assistance apparatus of any one of claims 68 to 71, wherein an alarm parameter of the alarm output is based on the magnitude of the difference between the estimated maximum future value of a patient's blood oxygen concentration with the upper target blood oxygen concentration.

74. The respiratory assistance apparatus of any one of claims 68 to 72, wherein the controller is configured to compare said estimated minimum future value of a patient's blood oxygen concentration with the lower target blood oxygen concentration, and generate an alarm output if the estimated minimum future value of a patient's blood oxygen concentration is less than the lower target blood oxygen concentration.

75. The respiratory assistance apparatus of any one of claims 70 to 74, wherein an alarm parameter of the alarm output is based on the magnitude of the difference between the estimated minimum future value of a patient's blood oxygen concentration with the lower target blood oxygen concentration.

76. The respiratory assistance apparatus of any one of claims 70 to 75, wherein the alarm parameter is the alarm time, or the alarm intensity.

77. The respiratory assistance apparatus of any one of claims 70 to 76, wherein the alarm output is provided to a display.

78. The respiratory assistance apparatus of any one of claims 70 to 77, wherein the alarm output is configured to present a message on a display.

79. The respiratory assistance apparatus of any one of claims 70 to 78, wherein the alarm output is configured to generate a sound, or provide an indication.

80. The respiratory assistance apparatus of any one of claims 1 to 79, wherein the or an at least one sensor is in electronic communication with the controller.

81. The respiratory assistance apparatus of claim 80, wherein the least one sensor is a pulse oximeter, or an arterial oxygen sensor.

82. The respiratory assistance apparatus of any one of claims 1 to 81, wherein the respiratory assistance apparatus further comprises a gas composition sensor.

83. The respiratory assistance apparatus of claim 82, wherein the gas composition sensor is in electronic communication with the controller.

84. The respiratory assistance apparatus of claim 82 or 83, wherein the gas composition sensor is an oxygen concentration sensor configured to measure the oxygen concentration of the breathing gas.

85. The respiratory assistance apparatus of any one of claims 82 to 84, wherein the at least one gases composition sensor provides a signal indicative of the initial oxygen concentration of the breathing gases.

86. The respiratory assistance apparatus of claim 84 or claim 85, wherein the controller is configured to receive an oxygen concentration signal indicative of the oxygen concentration of the breathing gas from the oxygen concentration sensor.

87. The respiratory assistance apparatus of any one of claims 82 to 86, wherein the controller is configured to control the oxygen concentration of the breathing gases based on the oxygen concentration signal from the oxygen concentration sensor.

88. The respiratory assistance apparatus of any one of claims 1 to 87, wherein the controller comprises one or more processors, wherein the processors are configured with computer readable instructions.

89. The respiratory assistance apparatus of any one of claims 1 to 88, wherein the controller comprises at least one memory element, wherein the memory element is configured to store said computer readable instructions.

90. The respiratory assistance apparatus or claim 89, wherein the memory element is non-transitory.

91. The respiratory assistance apparatus of any one of claims 1 to 88, wherein the flow generator is or comprises a blower module, wherein the blower module comprises at least one blower configured to generate said flow of gases.

92. The respiratory assistance apparatus of any one of claims 1 to 88, wherein the respiratory assistance apparatus comprises at least one display, configured to display to the or an alarm output.

93. The respiratory assistance apparatus of claim 92, wherein the display comprises at least one screen.

94. The respiratory assistance apparatus of any one of claims 1 to 88, wherein the respiratory assistance apparatus comprises at least one sound generating device configured to output an audible sound.

95. A system comprising the respiratory assistance apparatus of any one of claims 1 to 94, a conduit and a user interface.

96. A method of estimating a future value of a patients' blood oxygen concentration, the method comprising:

providing the patient with a breathing gases having an initial target oxygen concentration,

measuring a patient's blood oxygen concentration,

providing the patient with a breathing gases having an target oxygen concentration,

calculating a future value of the patient's blood oxygen concentration, based on the patient's blood oxygen concentration and a difference between an initial target oxygen concentration, and the target oxygen concentration.

97. A method of estimating a maximum future value of a patient's blood oxygen concentration for a target oxygen concentration range, the method comprising:

measuring a patient's blood oxygen concentration,

providing the patient with a breathing gases having an oxygen concentration,

calculating a maximum future value of a patient's blood oxygen concentration based on the patient's blood oxygen concentration, and a difference between an upper target oxygen concentration of the target oxygen concentration range and the oxygen concentration of the breathing gases.

98. A method of estimating a minimum future value of a patient's blood oxygen concentration for a target oxygen concentration range, the method comprising

measuring a patient's blood oxygen concentration,

providing the patient with a breathing gases having an oxygen concentration,

calculating a minimum future value of a patient's blood oxygen concentration based on the patient's blood oxygen concentration, and a difference between an lower target oxygen concentration of the target oxygen concentration range and the oxygen concentration of the breathing gases.

99. A method of estimating a future value of a patients' blood oxygen concentration, the method comprising:

providing the patient with a breathing gases,

during operation of the apparatus storing breathing gases oxygen concentration data, wherein the stored breathing gases oxygen concentration data comprises a plurality of oxygen concentrations of the breathing gases each oxygen concentration of the breathing gases having an associated timestamp,

measuring a patient's blood oxygen concentration,

calculating an estimated future value of the patient's blood oxygen concentration based on:

the stored breathing gases oxygen concentration data, wherein the oxygen concentrations of the breathing gases are weighted based on the associated timestamp, and

the measurement indicative of the patient's blood oxygen concentration.

100. A method of estimating an estimated maximum future value of the patient's blood oxygen concentration, the method comprising:

providing the patient with a breathing gases,

during operation of the apparatus storing breathing gases oxygen concentration data, wherein the stored breathing gases oxygen concentration data comprises one or more oxygen concentrations of the breathing gases each oxygen concentrations of the breathing gases having an associated timestamp,

measuring a patient's blood oxygen concentration,

calculating an estimated maximum future value of the patient's blood oxygen concentration based on:

the stored breathing gases oxygen concentration data, wherein oxygen concentrations of the breathing gases are weighted based on the associated timestamp, and

the measurement indicative of the patient's blood oxygen concentration

a difference between the current oxygen concentration of the breathing gases and a upper target oxygen concentration.

101. A method of estimating an estimated minimum future value of the patient's blood oxygen concentration, the method comprising:

providing the patient with a breathing gases,

during operation of the apparatus storing breathing gases oxygen concentration data, wherein the stored breathing gases oxygen concentration data comprises one or more oxygen concentrations of the breathing gases each oxygen concentrations of the breathing gases having an associated timestamp,

measuring a patient's blood oxygen concentration,

calculating an estimated minimum future value of the patient's blood oxygen concentration based on:

the stored breathing gases oxygen concentration data, wherein the stored breathing gases oxygen concentration data is weighted based on the associated timestamp, and

the measurement indicative of the patient's blood oxygen concentration

a difference between the oxygen concentration of the breathing gases at the current estimation phase and a lower target oxygen concentration.

102. A method of estimating a future value of a patients' blood oxygen concentration, the method comprising:

providing the patient with a breathing gases,

maintaining a sum of changes of the breathing gases oxygen concentration,

executing an estimation update phase, the estimation update phase comprising:

applying a decay function to the sum of changes of the oxygen concentration of the breathing gases,

calculating a difference between the oxygen concentration of the breathing gases at the current estimation update phase, and the oxygen concentration of the breathing gases at the previous estimation update phase,

adding the difference to the sum of changes to the oxygen concentration of the breathing gases.

103. The method of claim 101 or claim 102, wherein the controller is configured to calculate an estimated future value of the patient's blood oxygen concentration based on:

the sum of changes of the oxygen concentration of the breathing gases, and

the measurement indicative of the patient's blood oxygen concentration.

104. The method of any one of claim 101 to 103, wherein the controller is configured to calculate an estimated maximum future value of the patient's blood oxygen concentration based on:

the sum of changes of the oxygen concentration of the breathing gases , and

the measurement indicative of the patient's blood oxygen concentration

a difference between the oxygen concentration of the breathing gases at the current estimation phase and a upper target oxygen concentration.

105. The method of any one of claims 101 to 104, wherein the controller is configured to calculate an estimated minimum future value of the patient's blood oxygen concentration based on:

the sum of changes of the oxygen concentration of the breathing gases , and

the measurement indicative of the patient's blood oxygen concentration

a difference between the oxygen concentration of the breathing gases at the current estimation phase and a lower target oxygen concentration.

~~106. A flow therapy apparatus used for providing the method of any one of claims 96 to 105~~

~~107. Use of a flow therapy apparatus comprising for providing the method of any one of claims 96 to 105~~

~~108. A flow therapy apparatus or use of a flow therapy apparatus of claim 106 or 107, wherein the flow therapy apparatus is the apparatus of any one of claims 1 to 95.~~