Claims

1. A flow control module (39) for controlling the flow in a hydronic system (1), wherein the hydronic system (1) comprises

- a primary side (3) with a first port (21) in fluid connection with an output (23) of at least one source element (7), a second port (27) in fluid connection with an input (29) of the at least one source element (7), and at least one controllable primary side flow actuator (9) for providing a primary side flow (q_1),
- a secondary side (5) with a third port (31) in fluid connection with an input (33) of at least one load element (11), a fourth port (35) in fluid connection with an output (37) of the at least one load element (11), and at least one controllable secondary side flow actuator (13) for providing a secondary side flow (q_2), and
- an intermediary transfer element (17) between the primary side (3) and the secondary side (5), wherein the intermediary transfer element (17) is in fluid connection with the first port (21), the second port (27), the third port (31) and the fourth port (35),

characterised in that

the flow control module (39) is configured

- to minimise the thermal power transfer of the intermediary transfer element (17) from the first port (21) to the second port (27) and/or from the fourth port (35) to the third port (31), and/or
- to maximise the thermal power transfer of the intermediary transfer element (17) from the first port (21) to the third port (31) and/or from the fourth port (35) to the second port (27),

by controlling, in a continuous or regularly closed-loop manner based on minimising a signed deviation value ($\Delta\Delta v$) being correlated with the thermal power transfer of the intermediary transfer element (17), the primary side flow (q_1) by means of the at least one controllable primary side flow actuator (9) and the secondary side flow (q_2) by means of the at least one controllable secondary side flow actuator (13),

wherein the flow control module (39) is configured to decrease the secondary side flow (q_2) if the signed deviation value ($\Delta\Delta v$) is below a negative reference value and the primary side flow (q_1) cannot be increased.

2. The flow control module (39) according to claim 1, wherein the signed deviation value ($\Delta\Delta v$) is a difference between a first differential and a second differential, wherein the first differential is a differential between any two measured variables of a group of four variables and the second differential is a differential between the other two measured variables of said group of four variables, wherein the group of four variables comprises a first variable (T_1,p_1) of fluid flowing through the first port (21), a second variable (T_2,p_2) of fluid flowing through the second port (27), a third variable (T_3,p_3) of fluid flowing through the third port (31), and a fourth variable (T_4,p_4) of fluid flowing through the fourth port (35).

3. The flow control module (39) according to claim 2, wherein the first variable (T_1,p_1) is the temperature and/or pressure of fluid flowing through the first port (21), the second variable (T_2,p_2) is the temperature and/or pressure of fluid flowing through the second port (27), the third variable (T_3,p_3) is the temperature and/or pressure of fluid flowing through the third port (31), and the fourth variable (T_4,p_4) is the temperature and/or pressure of fluid flowing through the fourth port (35).

4. The flow control module (39) according to claim 1, wherein the signed deviation value ($\Delta\Delta v$) is a difference between a measured or determined flow (q) in a common line as the intermediary transfer element (17) and a zero common line flow.

5. The flow control module (39) according to claim 1, wherein the signed deviation value ($\Delta\Delta v$) is a difference between a flow differential (Δq) in a heat exchanger as the intermediary transfer element (17) and a zero heat exchanger differential flow.

6. The flow control module (39) according to any of the preceding claims, wherein the flow control module (39) is configured to maintain a current primary side flow (q_1) if the signed deviation value ($\Delta\Delta v$) is essentially zero.

7. The flow control module (39) according to any of the preceding claims, wherein the flow control module (39) is configured to increase the primary side flow (q_1) if the signed deviation value ($\Delta\Delta v$) is below a negative reference value.

8. The flow control module (39) according to any of the preceding claims, wherein the flow control module (39) is configured to maintain the primary side flow (q_1) if the signed deviation value ($\Delta\Delta v$) is below a negative reference value and the primary side flow (q_1) is at or above a predetermined maximum threshold (q_{max}).

9. The flow control module (39) according to any of the preceding claims, wherein the flow control module (39) is configured to decrease the primary side flow (q_1) if the signed deviation value ($\Delta\Delta v$) is above a positive reference value.

10. The flow control module (39) according to any of the preceding claims, wherein the flow control module (39) is configured to maintain a current primary side flow (q_1) if the signed deviation value ($\Delta\Delta v$) is above a positive reference value and the primary side flow (q_1) is at or below a predetermined minimum threshold (q_{min}).

11. The flow control module (39) according to any of the preceding claims, wherein the flow control module (39) is integrated in one of the at least one controllable primary side flow actuator (9) and/or one of the at least one controllable secondary side flow actuator (13).

12. The flow control module (39) according to any of the preceding claims, wherein the flow control module (39) is integrated in a cloud-based computer system and/or a building management system (BMS).

13. A method for controlling the flow in a hydronic system (1), wherein the hydronic system (1) comprises

- a primary side (3) having a first port (21) in fluid connection with an output (23) of at least one source element (7), a second port (27) in fluid connection with an input (29) of the at least one source element (7), and at least one controllable primary side flow actuator (9) for providing a primary side flow (q_1),
- a secondary side (5) having a third port (31) in fluid connection with an input output (33) of at least one load element (11), a fourth port (35) in fluid connection with an output (37) of the at least one load element (11), and at least one controllable secondary side flow actuator (13) for providing a secondary side flow (q_2), and
- an intermediary transfer element (17) between the primary side (3) and the secondary side (3), wherein the intermediary transfer element is in fluid connection with the first port (21), the second port (27), the third port (31) and the fourth port (35),

the method comprising

- minimising the thermal power transfer of the intermediary transfer element (17) from the first port (21) to the second port (27) and/or from the fourth port (35) to the third port (31), and/or
- maximising the thermal power transfer of the intermediary transfer element (17) from the first port (21) to the third port (31) and/or from the fourth port (35) to the second port (27),

by controlling, in a continuous or regularly closed-loop manner based on minimising a signed deviation value ($\Delta\Delta v$) being correlated with the thermal power transfer of the intermediary transfer element (17), the primary side flow (q_1) by means of the at least one controllable primary side flow actuator (9) and the secondary side flow (q_2) by means of the at least one controllable secondary side flow actuator (13) unit,

wherein the secondary side flow (q_2) is decreased if the signed deviation value ($\Delta\Delta v$) is below a negative reference value and the primary side flow (q_1) cannot be increased.

14. The method according to claim 13, wherein the signed deviation value ($\Delta\Delta v$) is a difference between a first differential and a second differential, wherein the first differential is a differential between any two measured variables of a group of four variables and the second differential is a differential between the other

two measured variables of said group of four variables, wherein the group of four variables comprises a first variable (T_1,p_1) of fluid flowing through the first port (21), a second variable (T_2,p_2) of fluid flowing through the second port (27), a third variable (T_3,p_3) of fluid flowing through the third port (31), and a fourth variable (T_4,p_4) of fluid flowing through the fourth port (35).

15. The method according to claim 14, wherein the first variable (T_1,p_1) is the temperature and/or pressure of fluid flowing through the first port (21), the second variable (T_2,p_2) is the temperature and/or pressure of fluid flowing through the second port (27), the third variable (T_3,p_3) is the temperature and/or pressure of fluid flowing through the third port (31), and the fourth variable (T_4,p_4) is the temperature and/or pressure of fluid flowing through the fourth port (35).

16. The method according to claim 13, wherein the signed deviation value ($\Delta\Delta v$) is a difference between a measured or determined flow (q) in a common line as the intermediary transfer element (17) and a zero common line flow.

17. The method according to claim 13, wherein the signed deviation value ($\Delta\Delta v$) is a difference between a flow differential (Δq) in a heat exchanger as the intermediary transfer element (17) and a zero heat exchanger differential flow.

18. The method according to any of the claims 13 to 17, wherein a current primary side flow (q_1) is maintained if the signed deviation value ($\Delta\Delta v$) is essentially zero.

19. The method according to any of the claims 13 to 18, wherein the primary side flow (q_1) is increased if the signed deviation value ($\Delta\Delta v$) is below a negative reference value.

20. The method according to any of the claims 13 to 19, wherein the primary side flow (q_1) is maintained if the signed deviation value ($\Delta\Delta v$) is below a negative reference value and the primary side flow (q_1) is at or above a predetermined maximum threshold (q_{max}).

21. The method according to any of the claims 13 to 20, wherein the primary side flow (q_1) is decreased if the signed deviation value ($\Delta\Delta v$) is above a positive reference value.

22. The method according to any of the claims 13 to 21, wherein a current primary side flow (q_1) is maintained if the signed deviation value ($\Delta\Delta v$) is above a positive reference value and the primary side flow (q_1) is at or below a predetermined minimum threshold (q_{min}).