

CLAIMS

1. A pressure compensating system (1) for a dual fluid flow system,
wherein the pressure compensating system (1) comprises:
 - a fluid pipe (3) having a first fluid pipe portion (3a) and a second fluid
5 pipe portion (3b),
 - wherein the first fluid pipe portion (3a) has a first fluid inlet (5a) and a
first fluid outlet (7a) for a first fluid flow (O_2),
 - wherein the second fluid pipe portion (3b) has a second fluid inlet (5b)
and a second fluid outlet (7b) for a second fluid flow (H_2) separate from the
10 first fluid flow (O_2), and
 - a pressure compensator (11) arranged in the fluid pipe (3), separating
the first fluid pipe portion (3a) and the second fluid pipe portion (3b),
wherein the pressure compensator (11) is configured to move in the fluid pipe
(3) between the first fluid outlet (7a) and the second fluid outlet (7b) to
15 thereby at least partially obstruct one of the first fluid outlet (7a) and the
second fluid outlet (7b) in response to a pressure differences between the first
fluid pipe portion (3a) and the second fluid pipe portion (3b) to provide
pressure compensation between the first fluid pipe portion (3a) and the
second fluid pipe portion (3b).
- 20 2. The pressure compensating system (1) as claimed in claim 1, wherein in
a direction from the first fluid inlet (5a) to the second fluid inlet (5b) along
the fluid pipe (3), the first fluid outlet (7a) is arranged after the first fluid inlet
(5a) followed by the second fluid outlet (7b) followed by the second fluid inlet
(5b).
- 25 3. The pressure compensating system (1) as claimed in claim 1 or 2,
wherein the pressure compensator comprises (11) an incompressible fluid.
4. The pressure compensating system (1) as claimed in claim 3, wherein
the incompressible fluid is a liquid.

5. The pressure compensating system (1) as claimed in claim 3 or 4, wherein the pressure compensator (11) comprises a first plunger (11a) and a second plunger (11b), wherein the incompressible fluid is provided between the first plunger (11a) and the second plunger (11b) which act to seal the incompressible fluid therebetween.
6. The pressure compensating system (1) as claimed in claim 5, wherein the first plunger (11a) is configured to be in fluid communication with the first fluid inlet (5a) and the second plunger (11b) is configured to be in fluid communication with the second fluid inlet (5b).
7. The pressure compensating system (1) as claimed in any of the preceding claims, wherein the first fluid pipe portion (3a) and the second fluid pipe portion (3b) are connected via a bend (9) and the pressure compensator (11) is located in the bend (9).
8. The pressure compensating system (1) as claimed in any of the preceding claims, wherein the first fluid pipe portion (3a) is provided with a first release valve (21a) configured to discharge fluid from the first fluid pipe portion (3a) in an initial state of the dual fluid flow system, and the second fluid pipe portion (3b) is provided with a second release valve (21b) configured to discharge fluid from the second fluid pipe portion (3b) in an initial state of the dual fluid flow system.
9. The pressure compensating system (1) as claimed in claim 8, wherein the first release valve (21a) and of the second release valve (21b) are configured to be controlled by external control.
10. The pressure compensating system (1) as claimed in claim 8 or 9, wherein the first release valve (21a) is a first solenoid valve and the second discharge vale (21b) is a second solenoid valve.
11. The pressure compensating system (1) as claimed in any of the preceding claims, wherein the first fluid outlet (7a) has a first axial section (13) with a tapering cross-section in the direction of the first fluid flow (O_2)

and a second axial section (15) downstream of the first axial section (13) with an increasing cross-section, and the second fluid outlet (7b) has a third axial section (17) with a tapering cross-section in the direction of the second fluid flow (H_2) and a fourth axial section (19) downstream of the third axial section (17) with an increasing cross-section.

12. The pressure compensating system (1) as claimed in claim 11, wherein the first axial section (13) and the second axial section (15) form a converging-diverging nozzle structure which has a nozzle throat or waist having a diameter in the range of microns.
- 10 13. The pressure compensating system (1) as claimed in claim 11 or 12, wherein the third axial section (17) and the fourth axial section (19) form a converging-diverging nozzle structure which has a nozzle throat or waist having a diameter in the range of microns.
- 15 14. The pressure compensating system (1) as claimed in any of the preceding claims, comprising a first membrane assembly which includes PTFE membranes and a microporous filter membrane configured filter moisture and prevent flooding of the first fluid pipe portion (3a).
- 20 15. The pressure compensating system (1) as claimed in any of the preceding claims, comprising a second membrane assembly which includes PTFE membranes and a microporous filter membrane configured filter moisture and prevent flooding of the second fluid pipe portion (3b).
16. A high-pressure electrolyser system (23) comprising:
 - an electrolyser stack (25) provided with an oxygen gas outlet (36a) and a hydrogen gas outlet (36b) and a water inlet (31) for filling the electrolyser stack (25) with water,
 - a water inlet valve (33) configured to provide a one-way valve functionality of the water inlet (31), and

a pressure compensating system (1) according to any of claims 1-15,
wherein the first fluid inlet (5a) is connected to the oxygen gas outlet (36a)
and the second fluid inlet (5b) is connected to the hydrogen gas outlet (36b).

17. The high-pressure electrolyser system (23) as claimed in claim 16,
5 wherein the electrolyser stack (25) comprises a plurality of electrode plates
(27a, 27b), each electrode plate (27a, 27b) having an inner metal frame (43)
provided with electrode elements (46), and an outer heat conducting polymer
frame (45) holding the inner metal frame (43).

18. The high-pressure electrolyser system (23) as claimed in claim 16 or 17,
10 wherein the electrolyser stack (25) comprises a plurality of electrode plates
(27a, 27b), each electrode plate (27a, 27b) comprising an outer frame (45)
and electrode elements (46) extending in a space (47) between opposite sides
of the outer frame (46), each electrode plate (27a, 27b) having a hydrogen
channel (53) and an oxygen channel (51) extending through the outer frame
15 (45), and a first outlet channel (59) and a second outlet channel (61)
connecting the space (47) and one of the hydrogen channel (53) and the
oxygen channel (51), wherein each first outlet channel (59) has a tapering
shape in a direction from the space (47) to the hydrogen channel (53) or
oxygen channel (51) and each second outlet channel (61) has a tapering shape
20 in a direction from the hydrogen channel (53) or oxygen channel (51) to the
space (47).

19. The high-pressure electrolyser system (23) as claimed in any of claims
16-18, comprising:

a first pump and a second pump,
25 a first sensor and a second sensor, and
a pump control system configured to be connected to the first sensor
and the second sensor,

wherein the first sensor is configured to detect a water level in the
electrolyser stack (25), wherein based on the water level the pump control

system is configured to activate the first pump to pump more water into the electrolyser stack (25),

wherein the second sensor is configured to detect a temperature in the electrolyser stack (25), wherein in case the temperature is above a threshold
5 value, the pump control system is configured to activate the second pump to pump water from the electrolyser stack (25).