Another object of the present invention will be to provide a heat exchanger element and a heat exchanger system for heat exchange between two or more fluids that are maintenance-friendly.

These objects are achieved with a method for manufacturing of a heat exchanger element for heat exchange between fluids, a heat exchanger element, a guiding element for a heat exchanger element and a modular system for heat exchange between fluids comprising a number of guiding elements and heat exchanger elements in accordance with the invention with the features of independent claim 1. Advantageous embodiments of the present invention are indicated in dependent claims.

According to a first aspect of the present invention, there is provided a modular system for heat exchange between fluids, comprising two end plates wherein at least one end plate is configured with inlets and outlets for fluids, the modular system comprising a number of heat exchanger elements and a number of guiding elements, wherein each heat exchanger element comprises a folded sheet material comprising a plurality of slits extending in a longitudinal direction of the folded sheet material, which longitudinal extending slits form the fluids flow paths, the folded sheet material being cast in one piece in an outer casing, wherein a central throughgoing opening of the outer casing covers an outer circumference of the folded sheet material, exposing a frontside and a backside of the folded sheet material and where two through holes, forming the inlets and outlets for each fluid, is provided on opposite sides of the central throughgoing opening of the outer casing, each guiding element comprises two inlets and two outlets for fluids, and a bead or edge, provided on one side, forming an enclosure around the inlet and outlet for a first fluid, and a bead or edge on an opposite side, forming an enclosure around the inlet and outlet for a second fluid, which heat exchanger elements and guiding elements are arranged successively following each other, the heat exchanger elements being arranged that two adjacent heat exchanger elements on sides facing each other carry the same fluid.

According to a second aspect of the present invention, there is provided a method for manufacturing of a heat exchanger element for heat exchange between fluids, the heat exchanger element comprising a sheet material and an outer casing, wherein the method comprises the following steps:
-folding the sheet material into a plurality of slits extending in a longitudinal direction of the sheet material,
-placing the folded sheet material into a mould (not shown), and
-adding a material into the mould (not shown) to cast the folded sheet material and the outer casing in one piece, wherein a central opening of the outer casing covers an outer circumference of the folded sheet material, thereby exposing opposite sides of the folded sheet material.

The present invention relates to a method for manufacturing a heat exchanger element for heat exchange between fluids, where the heat exchanger element comprises a sheet material and an outer casing, wherein the method comprises the following steps:

-folding the sheet material into a plurality of slits extending in a longitudinal direction of the sheet material, thereby providing a folded sheet material having four end surfaces and two opposite heat transfer surfaces,

-placing the folded sheet material into a mould, and

-adding a material into the mould to cast the folded sheet material and an outer casing for the heat exchanger element in one piece, the moulding providing a heat exchanger element where the outer casing of the heat exchanger element covers only the end surfaces of the folded sheet material and leaving the two opposite heat transfer surfaces exposed through a central opening, the moulding further providing two through holes on opposite sides of the central opening of the outer casing, the two through holes forming the inlets and outlets for each fluid.

In an alternative embodiment the method for manufacturing a heat exchanger element may comprise the further step of adding a plurality of handles into the mould, whereby the heat exchanger element will be provided with handles.

The outer casing of the heat exchanger element will thus integrate with and cover the folded sheet material around a circumference of the folded sheet material, while the two opposite heat transfer surfaces will be open and exposed to the surroundings.

The above method for manufacturing of the heat exchanger element will provide a fluid tight connection between the outer casing and the folded sheet material, whereby the heat exchanger element can thus be manufactured without the use of gaskets, seals or the like.

In one embodiment the heat exchanger element may be manufactured by one end surface of the folded sheet material is placed in the mould and a material, for instance polyurethane (PU), is poured into the mould. When the material has solidified, the process is repeated for an opposite end surface of the folded sheet material.

CLAIMS

1. A modular system ~~(S)~~ for heat exchange between fluids, comprising two end plates ~~(2)~~ wherein at least one end plate ~~(2)~~ is configured with inlets ~~(15, 16)~~ and outlets ~~(17, 18)~~ for fluids, the modular system ~~(S)~~ comprising a number of heat exchanger elements ~~(1)~~ and a number of guiding elements ~~(12)~~, wherein ~~**characterised in that**~~ each heat exchanger element ~~(1)~~ comprises a folded sheet material ~~(2)~~ comprising a plurality of slits ~~(7)~~ extending in a longitudinal direction of the folded sheet material ~~(2)~~, which longitudinal extending slits ~~(7)~~ form the fluids flow paths, the folded sheet material ~~(2)~~ being cast in one piece in an outer casing ~~(3)~~, wherein a central throughgoing opening ~~(4)~~ of the outer casing ~~(3)~~ covers an outer circumference of the folded sheet material ~~(2)~~, exposing a frontside and a backside of the folded sheet material and where two through holes ~~(5)~~, forming the inlets and outlets for each fluid, is provided on opposite sides of the central throughgoing opening ~~(4)~~ of the outer casing ~~(3)~~, each guiding element ~~(12)~~ comprises two inlets ~~(15, 16)~~ and two outlets ~~(17, 18)~~ for fluids, and a bead or edge ~~(20)~~, provided on one side, forming an enclosure around the inlet ~~(15)~~ and outlet ~~(16)~~ for a first fluid, and a bead or edge ~~(21)~~ on an opposite side, forming an enclosure around the inlet ~~(17)~~ and outlet ~~(18)~~ for a second fluid, which heat exchanger elements ~~(1)~~ and guiding elements ~~(12)~~ are arranged successively following each other, the heat exchanger elements ~~(1)~~ being arranged that two adjacent heat exchanger elements ~~(1)~~ on sides facing each other carry the same fluid.

2. The modular system ~~(S)~~ according to claim 1, ~~characterised in that~~ wherein the sheet material ~~(2)~~ is made of titanium.

3. The modular system ~~(S)~~ according to claim 1, wherein ~~characterised in that~~ a ratio between a slit width and slit depth of a slit ~~(7)~~ is less than 0.15.

4. The modular system ~~(S)~~ according to any one of the preceding claims, wherein ~~characterised in~~ walls of the slits ~~(7)~~ in the folded sheet material ~~(2)~~ are configured as planar faces, part circles or arcs.

5. The modular system ~~(S)~~ according to claim 1, wherein ~~characterized in that~~ the guiding element ~~(12)~~ further comprises at least a filter ~~(19)~~ provided on either end of the guiding element ~~(12)~~.

6. The modular system ~~(S)~~ according to claim 1, wherein ~~characterised in that~~ at least one end plate ~~(11)~~ comprises an inlet and outlet ~~(15, 16; 17, 18)~~ for each of the fluids to be heat exchanged.

7. The modular system ~~(S)~~ according to claim 1 or 6, wherein ~~characterized in that~~ the end plates ~~(11)~~ are provided with a plurality of recesses ~~(13)~~ around a circumference of the end plate ~~(11)~~, where a corresponding number of locking elements ~~(14)~~ cooperate with the plurality of recesses ~~(13)~~ to assem-

ble and fasten the end plates ~~(11)~~, guiding elements ~~(12)~~ and heat exchanger elements ~~(1)~~.

8. A method for manufacturing of a heat exchanger element ~~(1)~~ for heat exchange between fluids, the heat exchanger element ~~(1)~~ comprising a sheet material ~~(2)~~ and an outer casing ~~(3)~~, wherein ~~**characterized in that**~~ the method comprises the following steps:
-folding the sheet material ~~(2)~~ into a plurality of slits ~~(7)~~ extending in a longitudinal direction of the sheet material ~~(2)~~,
-placing the folded sheet material ~~(2)~~ into a mould (not shown), and
-adding a material into the mould (not shown) to cast the folded sheet material ~~(2)~~ and the outer casing ~~(3)~~ in one piece, wherein a central opening ~~(4)~~ of the outer casing ~~(3)~~ covers an outer circumference of the folded sheet material ~~(2)~~, thereby exposing opposite sides of the folded sheet material ~~(2)~~.

9. The method according to claim 8, the method comprising the further step of:
-adding a plurality of handles ~~(6)~~ into the mould.