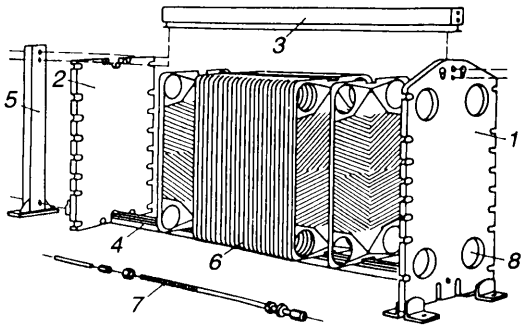
GW

Manual for SWEP
Plate Heat Exchangers type GW (Semi-Welded)

- Installation
- Operation
- Maintenance



1. Fixed cover plate
2. Movable cover plate
3. Carrying bar
4. Guiding bar
5. End support
6. Plates / Elements
7. Tightening bolt
8. Connection port

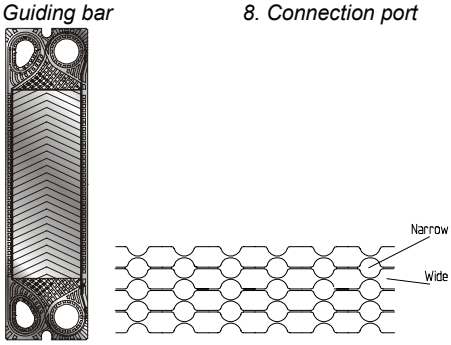
1. PLATE HEAT EXCHANGERS GENERAL DESCRIPTION

Between two frame plates of steel, the heat transfer surfaces — the heat exchanger plates/elements — are clamped with the aid of tightening bolts. The heat exchanger's construction enables a plate heat exchanger to be easily opened for inspection and cleaning.

Semi-welded plate heat exchangers consist of a number of plate pairs (also referred to as elements) and a frame assembly. Plate pairs are laser-welded together to form a sealed channel or element. In order to close off or seal two of the four portholes in the element, a laser weld is extended diagonally in front of the two vertically aligned ports. Refrigerant or corrosive fluids, which enter the sealed channel through the inlet port, flow inside the element. Each heat exchanger plate is pressed in one piece. In a standard one-pass unit, each plate (except for the end plate) has four holes punched out, one in each corner.

Specially designed, double-ring gaskets are glued on either side of the inlet and outlet ports, thereby creating a seal around the ports. Perimeter gaskets (also referred to as parallel gaskets) are placed on either side of the element, creating a sealed envelope to contain the process fluid. The process fluid flows between the elements in the gasketed channels. The groove of the gasket is at the bottom plane of the plate. The corrugations in the plate support the gaskets on both sides.

SWEP presses 3 different single plates called GW-80 plates. The different plate types are designated by a letter (C,D or F). Two GW-80 plates are laser-welded together to form an element. Two GW-80C plates are called a GW-81 element. Two GW-80F plates are called a GW-83 element. A plate pack normally consists of a start plate (single plate) + elements + end plate (GW-80D).



GW-83 Element *The asymmetrical pattern used in GW-81*

2. INSTALLATION

SWEP's plate heat exchangers are pressure-tested at the factory before delivery. A product control certificate is issued with each heat exchanger. SWEP can provide gas testing in house as an option.

2.1 Erection

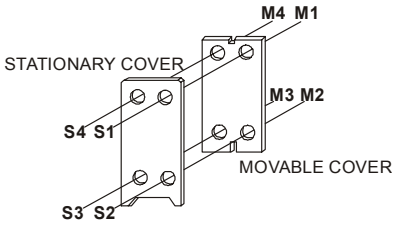
The heat exchanger must be installed with clearance on both sides:

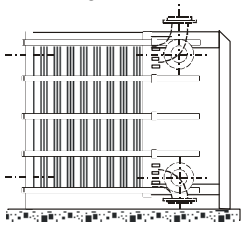
Clearance	Size
600 mm	GW-81P, GW-81SR, GW-83P, GW-83SR

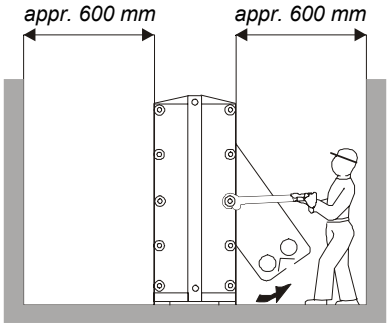
All connections to the heat exchanger must be provided with shut-off valves. The lower connections (S2 and S3; M2 and M3) must be provided with drain valves. The upper connections (S1 and S4; M1 and M4) must be provided with venting devices at their highest points.

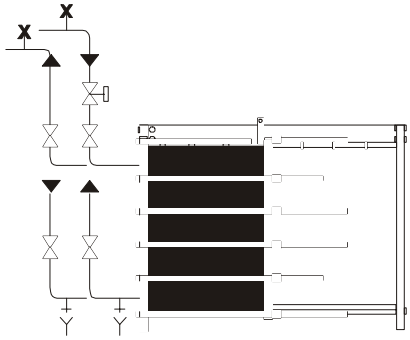
The hot side's regulating valve should be installed in the feed pipe between the pump and the shot-off valve.

All connections to the movable cover must be made using removable 90° elbows, allowing the movable cover to be pushed back for servicing.









ALL NOZZLE LOADING MUST BE MINIMIZED DURING INSTALLATION AND OPERATION. THERMAL EXPANSION OF THE PIPING MUST NOT AFFECT THE PHE.

IN CASE OF WELDING, THE PHE MUST NOT BE USED AS A GROUNDING MECHANISM AS ELECTRIC ARCS MAY OCCUR BEWEEN THE HEAT TRANSFER PLATES.

3. OPERATION

- Check that the operating data does not exceed that given on the heat exchanger's machine plate.
- Check that all tightening bolts are properly tightened.

3.1 Pumps

Pumps feeding the heat exchanger must be provided with regulating valves. If the pumps can deliver a higher pressure than the rated pressure for the heat exchanger, safety valves must be installed. The pumps must not suck in air.

3.2 Start-up

To avoid pressure shock the pumps must be started against closed valves. The valves in the inlet and outlet should be opened at the same time as far as possible. The flow rate is then increased slowly until operating temperature is reached. Hammering must be avoided, otherwise the rubber gaskets may be displaced and cause leakage.

3.3 Venting

Immediately after start-up the exchanger must be vented. Remaining air can cause air locks and serious scorching of the plates, reducing the heat transfer capacity and increasing the risk of corrosion.

3.4 Shut-down

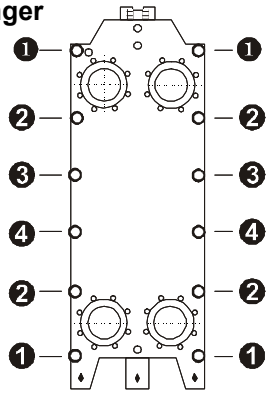
Shut-down should take place slowly.

For longer periods of down-time and especially when there is a risk of freezing or if the media are aggressive, the heat exchanger must be emptied and cleaned. While the unit is not in use, ease the tension on the tightening bolts so that the plates just lie against each other, but close enough to prevent any dirt entering between them.

4. MAINTENANCE

4.1.1 Opening the heat exchanger

- Cool the heat exchanger. If possible allow the heat exchanger to stand and cool over night.
- Disconnect any connections to the movable cover plate.
- Remove bolts **1**.
- Slacken nuts **2**, **3** and **4** alternately, so that the movable cover plate can move parallel with the frame plate.
- Remove bolts **3** and **4.**
- Slacken nuts **2** alternately.



4.1.2 Taking out the plates

Use gloves — the plate / element edges are sharp!

If two or more elements have stuck together they must be separated carefully so that the gaskets are kept on the correct plate.

If an element has been so damaged and cannot be repaired or replaced with an identical one, it must be taken out.

If the number of plates are changed, the thickness of the clamped plate pack, the A-measure, also changes. (see 4.3.2).

Special plates, such as the first and last plates, and turning plates in multi-pass heat exchangers, must be replaced with identical plates.

4.1.3 Cleaning the plates

Fouling of the plate heat exchanger often depends on the flow velocity through the heat exchanger being too low. Where the possibility exists to increase the flow, this should be tried out if the heat exchanger shows signs of reduced capacity or increased pressure drop.

However, with products that crystallise or heavily foul the plates or if the heat transfer surfaces have been scorched, opening and cleaning the heat exchanger is necessary.

- The heat exchanger is opened according to 4.1.1.
- Steel wool or brushes of carbon steel must not be used, nor may stainless steel be used on titanium plates.
- In the first place the heat transfer surface is cleaned by rinsing with a powerful jet of water and scrubbing with a nylon or similar brush.
- Take care not to damage the gaskets.
- Oxide or chalk deposits are removed with a soft brush and 2-5% nitric acid solution. (Hydrochloric or sulphuric acid may not be used). Organic deposits containing proteins are removed with a soft brush and 2% solution of sodium hydroxide solution at 50°C.
- Surfaces with greasy deposits are cleaned with kerosene and a soft brush. After cleaning, rinse thoroughly with water.

IMPORTANT: SODIUM HYDROXIDE AND CONCENTRATED NITRIC ACID CAN SERIOUSLY HARM THE SKIN AND MUSCOUS MEMBRANES. THE SOLUTIONS MUST BE HANDLED WITH THE GREATEST CARE. ALWAYS WEAR PROTECTIVE GOGGLES AND PROTECT HANDS WITH RUBBER GLOVES.

4.2 Gaskets

This range of plates has the gasket groove at the bottom of the plate. Every element has one parallel gasket and two O-ring gaskets glued S3/S4. The start plate has special start O-ring gaskets glued on the front side, two start O-rings for S1/S2 and two start O-rings for S3/S4.

4.2.1 Adjusting the gaskets

A gasket that has come loose, either partly or entirely, must be glued. If only a short length has become detached, gluing and adjusting can be carried out immediately before clamping, with the plates still sitting in the frame. If the entire gasket has become detached, the plate should be taken out of the heat exchanger.

4.2.2 Suitable gasket glue

Only certain glues may be used for gluing gaskets, namely Bostik 1782, 3M EC 1099, Bond Spray 77 or Pliobond 20/30 Synthetic glue. Do not use other types of glue, they may contain chlorine or other substances which attack the plate material. To facilitate application with a brush, the glue should be diluted with acetone. Maximum dilution 1:1.

4.2.3 Cleaning the gasket groove

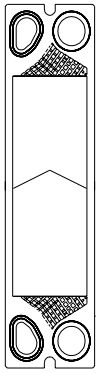
The solvent must not contain chlorine.

Clean the plates from residues of old gaskets. — Small patches of glue, hard to remove, that are securely stuck to the gasket groove may remain there. They provide an excellent foundation for the new gasket. Wash the gasket groove so that it is completely free of oil and other greasy substances, using a rag and acetone or other solvent not containing chlorine compounds. Then let the plate dry off.

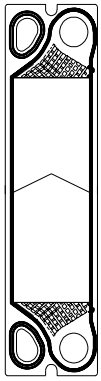
4.2.4 Gluing the gaskets

The glue is applied with a small flat brush to those parts of the plate's gasket groove in which the gasket shall lie. These parts of the gasket groove are easily recognised as they differ in colour arising from previous residues of glue. The gasket is then placed into position on the plate. After drying for about 30 seconds (the time depends on the thickness of the glue film and on how much the glue has been diluted), the glue holds the rubber gasket firmly in place in the gasket groove, thus facilitating mounting. The plate must then be held under light pressure with the aid of other plates or a stiff sheet of other material of suitable weight for about ½ hour.

When the glue joint has dried, the gasket should be coated with talc to prevent the plates subsequently sticking to each other. The plates are then ready to assemble into the frame.



Startplate - 2+2 O-rings

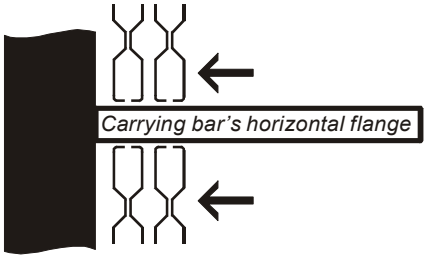


PARALLEL- 1 parallel gasket and two double O-ring gaskets

4.3. Assembly

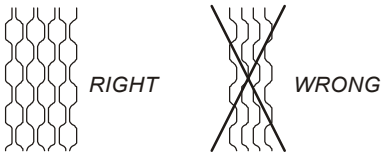
Before the heat exchanger is assembled, inspect all gaskets and surfaces that lie against the gaskets. Particles that may jeopardise the integrity of the seals or damage the gaskets or sealing surfaces, must be removed. Note that contaminants usually collect at the lower part of the plates.

Plates that have been provided with new gaskets must be checked to make sure that the gaskets are fitted in the correct gasket groove.



Frame plate

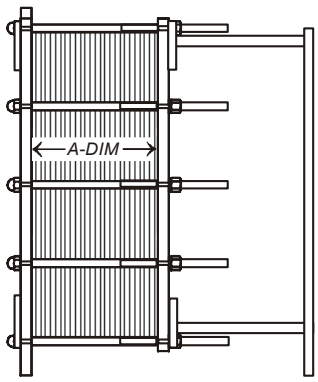
The plate edges form a regular honeycomb pattern.



4.3.2 Tightening the heat exchanger

The plate pack must be compressed to a specific thickness — the A-dimension. The A-dimension ±3% gives the inside length in millimetres between the fixed cover plate and the movable plate.

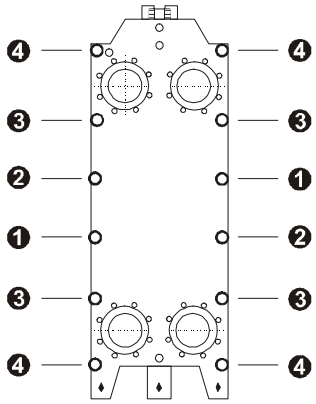
Size	Plate thickness	A-dimension
GW-81	0.5 mm	2.9 × number of plates
GW-83	0.5 mm	2.9 × number of plates



NOTE:
With large plate packs the A-dimension can deviate somewhat from that given above, ±3%, due to tolerances in the plate thickness and depth of pressing. With the correct A-dimension the plates lie in metallic contact with each other. Check this by examining the plate edges around the heat exchanger. Further compression can deform the plates. The nuts must be tightened alternately. The movable cover plate must always be moved parallel to the frame at all times, and never drawn out of alignment.

- Tighten the bolts **3** alternately.
- As the resistance increases also tighten bolts **1** and **2** always alternately.
- Tighten bolts **4**.
- Check the A-dimension along the heat exchanger.

NOTE: Never tighten the exchanger while it is under pressure!



4.3.3 Lubrication
The tightening bolts must be kept lubricated with molybdenum disulphide or its equivalent, particularly on the sections of thread used for opening and closing the equipment.

5. ORDERING SPARE PARTS
When ordering spare parts the heat exchanger type and production number must be quoted. These are given on the unit's machine plate.

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