Plate Heat Exchanger Instruction Manual





Table of contents,

- 1 Safety precaution
- 2 General information
 - 2.1 Applicatio
 - 2.2 Data Plate
 - 2.3 Unit specific information
 - 2.3.1 Plate marking
 - 2.3.2 Data Print
 - 2.3.3 Parts List

3 Installation

- 3.1 Lifting
- 3.2 Tightening
- 3.3 Piping

4 The main components

- .4.1 Main components
- 4.2 How it works

5 Operation

5.1 Start up and running conditions

- 5.1.1 Checking the cleaning result
- 5.1.2 Chlorine as a growth inhibitor
- ,5.2 Cleaning
 - 5.2.1 Cleaning flow rate
 - 5.2.2 Cleaning agents
 - 5.2.3 Checking the cleaning result
 - 5.2.4 Cleaning of deposits from cooling or heating medium

3

4

5

5

5

5 6

6

6

7

7

7

7 7

7

7 8

8

8

8 9

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9-10

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11

1<u>2</u> 12

12

12

12

12

13

13

13

13

13

13

13

13

13

13

13

- 5.2.5 Examples of cleaning programs
- 5.3 Sterilisation
 - 5.3.1 By heat
- 5.3.2 Chemically

Maintenance and Service

- 6.1 Opening and closing
 - 6.1.1 Opening 6.1.2 Closing
- 6.2 Removal and insertion of plates
 - 6.2.1 Removal of plates
 - 6.2.2 Insertion of plates
- 6.3 Regasketing
 - 6.3.1 The Clip-On gasket 👘

6.4 Dismantling

- * 6.4.1 Plates
 - 6.4.2 Connection plates
- 6.4.3 Dismounting pressure plate
- 6.5 Maintenance
 - 6.5.1 Sheet material
 - 6.5.2 Gasket rubber
 - 6.5.3 Stainless steel cladding
 - 6.5.4 Lubrication
- 6.6 Fault finding
 - 6.6.1 Performance of the PHE with regard to heat transfer
 - and/or pressure drop is abnormal
 - 6.6.2 Leakage to the outside
 - 6.6.3 Liquids mixing, inside leakage
- 6.7 Spare parts
 - 6.7.1 Parts List

2

1 Safety precautions

To avoid injuries and damages, follow the instructions in this manual. Also comply with applicable local safety regulations.

Protective gloves

To avoid hand injuries from sharp edges, protective gloves should always be worn when handling plates and protective sheets.



Lifting

Never lift the heat exchanger by the connections or the studs around them. Straps placed around tightening bolts and carrying bar should be used.



Protective sheets

To prevent from injury or damage in case of leakage and spouting liquid or steam, when necessary we can supply protective sheets for all plate heat exchangers.



2 General information

2.1 Application

This plate heat exchanger is used for heating or cooling food or other products with low to medium viscosity. The delivered plate heat exchanger is dimensioned for the specific application, set out in the Data Print, and must not be used in any other way without consulting the supplier.

2.2 Data plate

On the Data Plate, which is fixed to the frame plate, the type of unit, manufacturing number and manufacturing year can be found. The on the plate given working pressure and temperature are only according to the pressure vessel code.

2.3 Unit specific information

Information about this specific unit, identified through the manufacturing number which can be found on the Data Plate as well as on the unit specific information, is provided separately. This information contains the Data Print, a Plate Marking explanation and Parts List. In all correspondence with the supplier, please refer to the manufacturing number, for true identification of the apparatus.

2.3.1 Plate marking

The plates are identified by one or more markings punched into the plate.

2.3.2 Data Print

The Data Print, which is located in the inside pocket of this manual, gives specific details about the plate pack and should be closely studied.

The first page identifies: -

- The manufacturing number
- The type of heat exchanger
- The customer
- Our agent through whom the heat exchanger was purchased
- The supplier
- Measurements and plate installation

The second page specifies:

- The media section by section
- Location of the inlet and outlet connections
- Choice of material in connections, plates and gaskets
- The area of the heat transfer surface
- The plate grouping

On the following page - or pages - is a listing of the plate package, specifying for each plate in sequence from the frame plate to the pressure plate:

- The spare part ordering number
- The corners where holes have been punched
- The flow direction along the plate

Attached to the Data Print is a design drawing of the plate heat exchanger.

It is important to use the Data Print in all correspondence with the supplier, in order to get a quick and correct answer. If the heat exchanger is rebuilt it is important to notify the supplier so that the Data Prints in our archives can be kept up to date.

2.3.3 Parts List

All parts of the plate heat exchanger are identified by a number. Whenever contacting the supplier about a part, be sure to state its identification number, which is found in Parts List.





3 Installation

3.1 Lifting

When lifting the unopened packing case, please observe the markings on the case indicating where to place the lifting hooks.

The centre of gravity of the loads is important and is usually marked on the topside of the case; the actual centre of gravity is located on a vertical line directly below this mark.

If you are to lift the heat exchanger itself, straps should be used, and they should be placed around tightening bolts and carrying bar (see page 3).

Note: Never lift by the connections or the studs around them!



3.2 Tightening

Check that dimension A is in accordance with the drawing.



3.3 Piping

Fit the pipes so that tension is not transferred to the heat exchanger.

Pipes connected to the pressure plate and to the connection plates must allow a variation of $\pm 1\%$ of the distance from the connection to the frame plate according to the drawing.

The pressure plate must be moved when the heat exchanger is opened. Therefore no fixed pipes should be fitted inside the shaded area. Use, for example, a short bend directed sideways.



	. .				· .		(C8- 5	SR
1 Frame plate					2 Pressure plate	_			
Part number		Н	ole		Part number		He	ble	
	S1	S2	S3	S4	<u> </u>	T1	T2	T3	T4
1640832-01	x	X	X	X	1640835-01	X	X	X	X
164083202	X	X	X		1640835-02	X	X	X	
1640832-03		X	X	X	1640835-03		X	X	X
1640832-04	X		X	X	1640835-04	X	† <u></u>	X	X
1640832-05	x	X		X	1640835-05	X	X	-	X
1640832-06	x	x			1640835-06	X	X		
1640832-07	X		X		1640835-07	X		x	
164083208	X			X	1640835-08	X			x
1640832-09		X	X		1640835-09		X	x	<u> </u>
1640832-10		X		X	1640835-10		X		x
1640832-11			X	X	1640835-11			X	x
1640832-12	X				1640835-12	x			<u> </u>
1640832-13		X			1640835-13		X		
1640832-14			X		1640835-14			x	
1640832-15				X	1640835-15				x
1640832-16					1640835-16				

.

Pos	Part Number	Name	Comments
3	1640441-01	Foot	Low foot
	1640548-01	Foot	High foot
4 ·	1640885-02	Levelling screw	For low foot
	1 <u>640885–</u> 01	Levelling screw	For high foot
5	221046303	Screw	M6S 16x40
6	223101-37	Washer	BRB 17x30
7	1620780-01	Shaft	
8	26008004	Stop screw	SK6SS 6x8
9	528402-03	Needle bearing	NKI 20/16 INA
10	1620781-01	Wheel	

11 Carrying bar	12 Guiding bar	Length	 Max. no. of plates 	
		mm	0.5mm	0.6mm
1623150-01	32323-4001-2	1200	142	140
1623150-02	32323-4001-4	1800	236	233
1623150-03	32323-4001-6	2400	331	326
1623150-04	32323-4001-8	3000	425	419
1623150-05	32323-4002-1	3600	440	440

13 14 15 16	221046–05 221046–06 223101–35 221046–11	Screw Screw Washer Screw
17	22104 6 –02	Screw
18	1640448–01	Support column
19	1640445-01	Foot
	1640551-01	Foot
20	2210463-03	Screw
21	223101-37	Washer
22	221803-40	Nut

M6S 12x100 M6S 12x40 BRB 13x24 M6S 12x70 M6S 12x25

Low foot High foot M6S 16x40 BRB 17x30 M16

Pos Part Number Name

3

Comments

23 Ti	ghtening bolt / Locki	ng bolt	Length	 Max. no. of plates 		
M24			mm	0.5mm	0.6mm	
1640	815-03 / 1640815-03		1160 / 1160 ⁻	142	140	
1640	815-05 / 1640815-04	· · · · ·	1760 / 1460	236	233	
1640	815–07 / 1640815–06		2360 / 2060	331	326	
1640	815–08 / 1640815–07		2960 / 2360	425	419	
1640	815-09 / 1640815-08		3560 / 2960	440	440	
24 25	1624183-01 1640840-01	Bearing box Lock washer	、	<u></u>		
26	1641667-01 1641667-02	Nut Nut		SA TÜV		

27 Protecting p		Length mm		Length bolt	Max. no	o of plates	
SA	ΤÜV	SA	TÜV	Inner pipe	mm	0.5mm	0.6mm
1641357–03	164135713	1008	993		1160	142	140
1641357-04	1641357–14	1308	1293]	1460	236	233
164135705	1641357–15	1608	1593	A + 60	1760	236	233
1641357-06	1641357–16	1908	1893]	2060	331	326
1641357–07	1641357-17	2208	2193		2360	331	326
1641357–08	1641357–18	2808	2793	1	2960	425	419
1641357–09	1641357-19	3408	3393		3560	440	440

28 29	1641360-03 1995-101-096	Cap Plastic tube	-
30	1625308–01	Blind connection	See below
35 36 37 38 39		Connection End plate I Channel plates End plate II Connection plate	See plate hanging list See plate hanging list See plate hanging list See page 5

• When conn. plates: Reduce max. no. of plates with 13 plates / conn. plate.



PARTS LISTS

C8-SR

IM 70689–E1 0010



CONNECTION PLATE C8

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Pos	Part Number	<u>Name</u>	Comment
		_	
39	1640377-01	Connection plate	
40	1640386-01	Bolt	
41	1640385-01	Dished washer	
42	1640387-01	Acron nut	
43	1640867-01	Double corner	Position A-1 and A-3
44	1640867-07	Double corner, 3A	Position A-1 and A-3
45	1640867-02	Double corner	Position A-2 and A-4
46	1640867–08	Double corner, 3A	Position A-2 and A-4
47	164086601	Single corner	Vertical position A-1 and A-3 if botttom towards frame plate, otherwise A-2 and A-4
48	1640866-06	Single corner, 3A	Vertical position A-1 and A-3 if botttom towards frame plate, otherwise A-2 and A-4
49	1640866-02	Single corner	Horizontal all positions
50	1640866-07	Single corner, 3A	Horizontal all positions
51	164086603	Single corner	Vertical position A-2 and A-4 if botttom towards frame plate; otherwise A-1 and A-3
52	164086608	Single corner, 3A	Vertical position A-2 and A-4 if botttom towards frame plate, otherwise A-1 and A-3
53	1625318-01	Through passage	
54	1′625318–02	Through passage, 3A	
55	1640864-01	Through passage	With 2" connection, position A-1 and A-3
56	1640864-03	Through passage, 3A	With 2" connection, position A-1 and A-3
57	1640864-02	Through passage	With 2" connection, position A-2 and A-4
58	1640864-04	Through passage, 3A	With 2" connection, position A-2 and A-4
59	1640865-01	Through passage	With dive tube and nib, position A-1
60	1640865-02	Through passage	With dive tube and nib, position A-4
61	1640865–03	Through passage	With dive tube, position A-1 and A-3
62	1640865-04	Through passage	With dive tube, position A-2 and A-4
63	1625304-01	Blind corner	
64	223101-61	Washer	BRB 10.5x22
65	221803-29	Nut	M6M 10
*			

Note! Nipples not included for single and double corner.



4 The main components

4.1 Main components



4.2 How it works

Working pronciple and connections of a heat exchanger with counter current and parallel flow.



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5 Operation

5.1 Start up and running conditions

Pumps must be started against closed valves and valves operated as smoothly as possible.

Avoid situations where pumps temporarily run empty on the suction side.

In automated installations, program pump starts and stops and actuation of valves, so that the amplitude and frequency of pressure variation is as low as possible.

Use efficient dampers at the inlet and outlet of homogenizer connected to the heat exchanger.

Venting of liquid circuits must be considered. Pumps must not draw air into the heat exchanger. When the velocity is low, e.g. for viscous products, venting possibilities at the uppermost points of the circuit may be necessary. It should be possible to vent a tubular holder.

5.1.1 Checking the cleaning result

A new heat exchanger should be opened and the plate surfaces carefully inspected already after the first test run.

5.1.2 Chlorine as a growth inhibitor

Chlorine, commonly used as growth inhibitor in cooling water systems, reduces the corrosion resistance of stainless steels (including SMO).

Chlorine weakens the protection layer of these steels making them more susceptible to corrosion attacks then they otherwise should be. It is a matter of time of exposure and concen-tration.

In every case where chlorination of non-titanium equipment cannot be avoided, your local representative must be consulted.

Note!

Titanium is not affected by chlorine.

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5.2 Cleaning

Immediately after a production cycle, the product side is normally cleaned with lye and / or acid. Sterilisation is performed immediately before staring the next production cycle.

WARNING!

Caustic soda and nitric acid can cause serious injuries to skin and mucous membranes.

Handle with great care! always use protective goggles and protect your hands with rubber.

5.2.1 Cleaning flow rate

The cleaning flow rate should always be at least the same as the productions flow rate. Increased flow rate may be required in some cases as e.g. milk sterilisation and processing of viscous liquids or liquids containing particles.

5.2.2 Cleaning agents

1 % by weight NaOH at max. 80°C. Dissolve 1 kg of caustic soda in 100 litres of water or mix 2.2 litres of 33 % NaOH solution in 100 litres of water.

0.5 % by weight HNO₃ at max. 70 °C. Mix 0.7 litres of 53 % (36Be) nitric acid in 100 litres of water.

Detergents containing wetting and complex-formed agents beside the caustic soda or nitric acid may also be used. The maximal NaOH and HNO_3 concentrations by weight should be respected.

Detergents must be dosed gradually in order to avoid excessive concentration locally and temporarily.

Solid deposits can be removed by opening the heat exchanger and cleaning it with a soft brush and 10 % nitric acid.

5.2.3 Checking the cleaning result

A new heat exchanger should be opened and the plate surfaces carefully inspected after the first test run.

If the unit is clean the interval can then be extended according to practical experience. Once a month, usually is regarded as a good practice.

5.2.4 Cleaning of deposits from cooling medium or heating medium

Solid deposits can be removed by opening the heat exchanger and cleaning it with a soft brush and 10 % nitric acid.

Note! Rinse well.

5.2.5 Examples of cleaning programs

Products rich in protein			Products poor in protein				
Coolers		Pasteurisers and otherHigh content of insol components, e.g. ne and tomato juice		soluble nectar	Low content of insoluble components, e.g. beer and wine		
Daily	Weekly	Daily	Daily	Weekly	Daily**	Weekly	
Rinsing 5 min Lye 20 min Rinsing 10 min Stop Sterilisation 10 min	Rinsing 5 min Acid 15 min Rinsing 5 min Lye 20 min Rinsing 10 min Stop Sterilisation 10 min	Rinsing 5 min Acid 15 min Rinsing 5 min Lye 20 min Rinsing 5 min* Acid 15 min* Rinsing 10 min Stop	Rinsing 10 min Lye 30 min Rinsing 10 min Stop Sterilisation 10 min	Rinsing 10 min Lye 30 min Rinsing 5 min* Acid 15 min* Rinsing 10 min Stop Sterilisation 10 min	Rinsing 5 min Lye 15 min Rinsing 10 min Stop Sterilisation 10 min	Rinsing 5 min Lye 15 min Rinsing 5 min* Acid 15 min* Rinsing 10 min Stop Sterilisat.10min	

* The need for an additional acid cycle in order to remove chalk deposits depends on the product. In many cases it is possible to carry out cleaning at considerably longer intervals. Sometimes it is possible to eliminate acid cleaning altogether. ** In some cases, where the risk for growth of microorganisms is slight, it is possible to eliminate daily cleaning and replace it by: Rinsing 20 min - stop - sterilisation 20 min.

5.3 Sterilisation

5.3.1 By heat

Circulate water of 90 °C until all parts of the system have been kept at the required temperature for at least ten minutes. To get all parts, and especially the heating section, at final temperature it is normally necessary to change between forward and return flow.

5.3.2 Chemically

Before introducing the hypochlorite solution, make sure that the equipment is clean and free from deposits and that no acid residues are left.

Dose gradually 100 cm^3 of hypochlorite solution, containing max. 150 g/l active chlorine to 100 l of circulation water at a max. temperature of 20 °C.

Treat for five minutes, up to maximum 15 minutes.

Rinse well after sterilisation.

6 Maintenance and Service

6.1 Opening and closing

The bolts have one lock washer and one guide washer each. The lock washer is placed under the nut and the guide washer under the bolt head. They are operated from frame plate side with either pneumatic or manual spanner.

(If needed washers can be placed vice versa, but can be placed vice versa, but can then only be opened with a manual spanner from pressure plate end).



Before proceeding further:

- 1. Switch off pumps and steam
- 2. Close valves and isolate the PHE from the rest of the system
- 3. Wait until the unit is cooled down (below 40 °C)
- 4. Drain the PHE
- 5. Dismantle pipes
- 6. Remove protecting sheets (use gloves)



6.1.1 Opening

19.9

Opening procedure:

1. Inspect the sliding surfaces of the carrying bar and wipe clean.



3. Pull back the covers on the tightening bolts and brush the threads clean with a steel wire brush.





4. Lubricate the threads with a thin layer of grease, e.g. Gleitmo 800 or equivalent.





5. Mark the plate assembly on the outside by a diagonal line, or number the plates in sequence.

6. Measure and note down the dimension A.









6.1.2 Closing

- Check that all gaskets are clean and correctly posi tioned in the grooves. Even slight product remains or foreign particles may cause leakage. If a PHE is opened without previously having been efficiently cleaned by circulation, it is necessary to brush the plates manually and to rinse them with a water-hose.
- Push the plate pack together manually and place two diagonaly opposite bolts in positions. Tighten them evenly, so that the pressure plate is never more than 25 mm (1") from being parallel to the frame. Tighten until measure A is reached.
- 3. If the plate pack has been marked on the outside check this.
- 4. If the plates are correctly assembled, the edges form a "honeycomb" pattern.
- 5. Mount remaining bolts and check measure A on both sides, at top and bottom.
- 6. Mount protections sheets (if provided).
- 7. Connect pipes.
- 8. If the PHE does not seal when the measure A has been reached, it can be tightened further to A-0.5 %.

6.2 Removal and insertion of plates

6.2.1 Removal of plates

1. Push the pressure plate against the support column.

2. Remove the plates.

6.2.2 Insertion of plates

Hang the plates according to instructions on the Data Print. Read the platage table in the Data Print from the top and down.







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rist.			-
			Arlelelelelelelelelelelele
Party and the second second			lelelelelelelelele

6.3 Regasketing

6.3.1 The Clip-On gasket

The Clip-on gasket is attached to the plate by two gasket prongs which slip under the edge of the plate to hold the gasket securely in alignment in the gasket groove.

The prongs are situated at regular intervals around the periphery of the plate.

It is possible to change gasket without removing the plate from the frame.

When the plate heat exchanger is then assembled and tightened, the gasket provides a tight seal around the plate.

NOTE!

Before closing the apparatus: Check that all the gasket prongs are in correct position.



gs are in correct position.

6.4 Dismantling

6.4.1 Plates

The plates can easily be taken down (and remounted) simply by tilting in two perpendicular directions.

6.4.2 Connection plates

The corner pieces are spot welded or fixed with screws accessible under the lids on one side of the connection plate.

6.4.3 Dismounting pressure plate

Dismounting procedure:

- 1. Push the pressure plate against the support column.
- 2. A fork-lift truck holds the carrying bar in the horizontal position.
- 3. Attach the rope to the pressure plate.
- 4. Place a support under the guide bar.
- 5. Loosen the support column.



6.5 Maintenance

6.5.1 Sheet material

Even stainless steel can corrode. Chlorine ions are hazardous.

Avoid cooling brines containing chlorine salts as NaCl and, most harmful, CaCl₂.

Inspect the plates regularly, say once a month, for possible corrosion attacks, especially on a new installation and after changing the running conditions.

6.5.2 Gasket rubber

On opening the PHE, check that all gaskets are clean, in good condition and correctly positioned in the grooves of plates and connections.

The store room for spare gaskets should be cool and dark. Gaskets must not be stored hanging or twisted or subject to great load.

6.5.3 Stainless steel cladding

The stainless steel cladding on frame, pressure plate and connection plates is glass blasted.

Clean with cloth wetted by paraffin oil. Do not degrease the surface!

6.5.4 Lubrication

Lubricate the bolt threads with an EP (extreme pressure) grease, for example Gleitmo 800 or equivalent.

Grease the suspension wheels on pressure and connection plates.

6.6 Fault-finding

6.6.1 Performance of the PHE with regard to heat transfer and/or pressure drop is abnormal

Check the platage. A consequence of wrongly located plates can be that some channels are by-passed, creating dead area. Stagnation will follow, making circulation cleaning impossible and creating immediate risk of corrosion and/or product contamination.

6.6.2 Leakage to the outside

Check A-measure.



If the leakage continues, mark the leaking plates, open and replace the gaskets in question.

6.6.3 Liquids mixing, inside leakage

Apply water pressure on one side of all the sections in the unit. Fill the other side with water and then open all connections on that side. If a plate is perforated, water will pour out of one side of the corresponding open connections.

The plates of the faulty section are then examined by means of current crevice-detection liquids. A large plate section may be divided and the pressure test repeated in order to reduce the number of plates on which the crevice-detector has to be applied.

When corresponding with the supplier regarding defect on plates, please specify:

- Defect heat exchanger manufacturing number
- Plate identification number
- Position of plate in the heat exchanger (note on plate specification or platage diagram)
- Liquid(s) in contact with damaged surface
- Other relevant observations

6.7 Spare parts

6.7.1 Parts List

The Parts List, which is included in the Spare Parts & Plate Arrangement folder, you can find the Spare Parts Ordering Number for all parts in your plate heat exchanger.

\land Alfa Laval

Gaskets Clip 8

