



**USER AND MAINTENANCE MANUAL**

**HRS**  
hevac



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# 1 - GENERAL

## 1.1 - Preface

Your heat exchanger will give you full satisfaction provided you maintain it well, in full, and diligently.

- Be sure to keep the following documents in a safe place:
  - 1) this owner's and servicing manual (supplied with the heat exchanger);
  - 2) the CE certificate of conformity, if necessary;
- Your plate heat exchanger has a limited range of temperatures and pressures. As it is highly sensitive to sudden changes in these parameters, all precautions must be taken to avoid operating outside the limits indicated on the label.
  - 1) Excessive temperatures will damage the gaskets (install the appropriate safety thermostats, etc.).
  - 2) Excessive operating pressures or differential pressures will damage the gaskets and plates (install the appropriate safety valves, etc.).
- Plate heat exchangers are highly sensitive to pressure surges. Accordingly, the control must be designed to prevent this occurring and **QUARTER-TURN VALVES MUST NOT BE INSTALLED ON ANY OF THE CIRCUITS.**
- Given the large number of gaskets, leaks may occasionally occur. To protect against this eventuality, install protective screens if dangerous fluids are used or the temperatures rise to above 60°C.
- HRS may not be held liable for any damage or injury resulting from failure to follow the instructions in this manual.

- CIPRIANI is not liable for any consequences that may result from the accidental mixing of the fluids used in the heat exchanger.

## 1.2 - Regulations

- Official inspections: some heat exchangers must be regularly inspected by official bodies. It is the operator's responsibility to organise these inspections directly with the competent bodies. The dossier sent to our principal must therefore be kept in a safe place.
- The heat exchanger category set out in the European Pressure Equipment Directive 97/23/EC is specified on the data plate on the heat exchanger and on a label placed on the last page of this manual.
- You must make sure that the entire system complies with the directives and legislation in effect in the country of operation.
- This heat exchanger must not be used for purposes other than those stated on the order documents. In particular, do not use fluids other than those specified at the time of ordering.
- Scrupulously comply with the operating conditions set out in the order documents. They were used to determine the equipment category set out in the European Pressure Equipment Directive. HRS shall not be held liable for any or consequential or incidental damages resulting from failure to do so.
- HRS must be notified of any changes in the operating conditions and will inform you of the procedure to follow.

### 1.3 - Warranty

- Unless otherwise indicated, our equipment is guaranteed for 12 months after commissioning and no more than 18 months after invoicing. Our warranty is limited to the replacement of defective parts used under the intended conditions. However, it does not cover normal wear and tear, damage resulting from corrosion, fouling or the use of fluids incompatible with the materials used in the heat exchanger, or consequential damage.
- Gaskets are warranted for six months.
- Keep a maintenance log. You may be requested to provide in order to benefit from the warranty.
- The warranty is valid only if the heat exchanger is operated under the conditions set out in the order documents. It will be applied only if the pressures and temperatures of the fluids can be measured on the heat exchanger's inlets and outlets and the maintenance log is held and kept up to date.
- The plate pack is surrounded by a strap that, if left unbroken, serves as proof that the heat exchanger has not been disassembled. Removing this strap will void the warranty.
- Spare parts are warranted only if the storage instructions have been followed (see the section on storage).
- HRS must be promptly notified of all defects in writing. If HRS's liability for the defect is proven, HRS pledges to react quickly and to remedy it within the terms of the warranty.

### 1.4 - Residual risks : damage > cause (prevention)



#### POSSIBLE BODILY INJURY

- Unit tipover > Failure to follow the handling or anchoring instructions (the unit has a very high centre of gravity; follow the rigging instructions; anchor the unit to the floor).
- Burns > Direct contact with the unit while in operation or with scalding or corrosive fluids following a leak (cut off the supply to the unit; set up barriers around it; wear PPE = Personal Protective Equipment).
- Cuts > Handling the plates without protective glove (wear PPE).
- Injury > Caused by pressure, affecting in particular the eyes or bare skin (wear PPE and prohibit access by unauthorised personnel).
- Poisoning > Skin contact with, or inhalation of, a dangerous fluid (wear PPE and use safety equipment).
- Poisoning > Combustion of the gaskets (never dispose of the gaskets by burning them).
- Poisoning > Accidental mixing of circulating fluids resulting in the release of hazardous fumes (make sure that resulting mixture is not dangerous).



#### COMMON TYPES OF EQUIPMENT DAMAGE

- Gasket destruction > One fluid circulated at a high temperature (always circulate the cold fluid FIRST and the hot fluid LAST).

- Gasket destruction > Sudden changes in pressure or temperature (monitor the control).
- Gasket destruction > Overrun of operating conditions (check the operating parameters).
- Plate destruction > Corrosion or erosion (check the type and speed of the fluids being circulated; install filters).
- Plate destruction > Overpressure (check the pressure of the fluids; watch out for sudden or frequent changes in pressure or temperature).
- Plate destruction > The heat exchanger has frozen (either make sure that the room temperature does not drop below 0°C while the system is not in use or drain the circuits).
- Leaks > The tightening dimension is wrong (check the tightness of the plate pack).
- Leaks > The frame or a number of plates are dented (contact HRS).
- Pollution > Leak of a dangerous or polluting fluid (have spill trays on hand).
- Explosion > Accidental mixing of circulating fluids resulting in the release of explosive fumes (make sure that resulting mixture is not dangerous).

**Prohibit access to the system by unauthorised personnel.**

**Make sure that servicing technicians  
have the proper training.**

**Keep this manual near the heat exchanger.**

## 1.5 - Receiving the unit

- Upon delivery, check the contents for missing or damaged items. Note any missing or damaged items on the delivery slip. Inform the carrier of said damaged or missing items by registered letter within three days of delivery and forward a copy to HRS.
- The front of each heat exchanger is fitted with a data plate listing a service number. Please state this number in all correspondence.

## 1.6 - Handling

- The handling and unloading equipment is for the account of the recipient.
- Follow the rigging instructions (Figures 1a, 1b and 2).
- Use web slings (no metal chains). Insert them in the designated notches on the head and follower.
- The unit's weight is stated on the delivery slip and the shipping note.



- When moving and handling the heat exchanger, make sure that it is properly supported and secured as its high centre of gravity may cause it to tip over easily.
- Never lift the unit by its guide rails, compression bolts or pipes, as doing so can cause them to bend.
- Shield the plates from impacts as they could cause irreparable leaks.

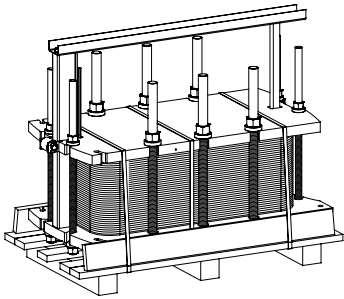


Fig. 1a

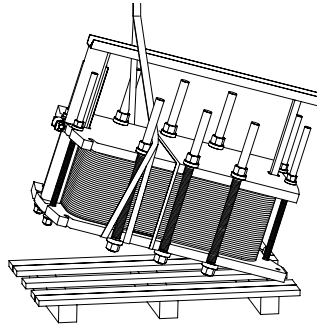


Fig. 1b

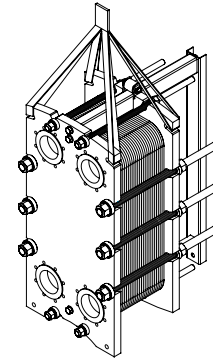
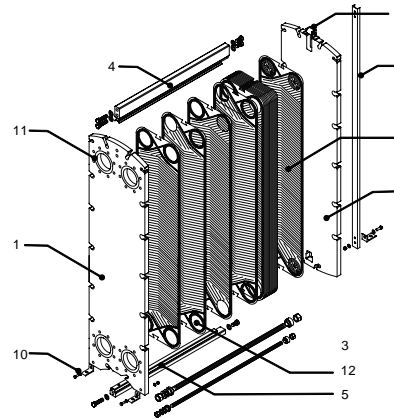
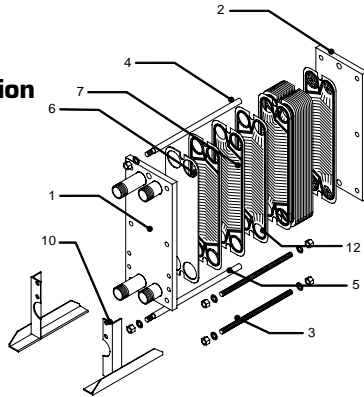


Fig. 2

## 1.7 - Intended use

- HRS gasketed plate heat exchangers are designed to heat or cool fluids by means of heat transfer through indirect contact with another fluid.
- Your heat exchanger's specific operating conditions are set out in the order documents.
- If the heat exchanger will be used with fluids intended for human consumption, please contact your HRS consultant.
- The heat exchanger and its components must never be used for purposes other than those for which they were initially designed.



## 1.8 - Description



- 1 - Fixed head (front)
- 2 - Movable follower (rear)
- 3 - Tie bolts
- 4 - Carrying bar
- 5 - Guide bar
- 6 - Pressure plate
- 7 - Plates + gaskets
- 8 - Support column
- 9 - Roller
- 10 - Foot
- 11 - Port liners
- 12 - Porthole

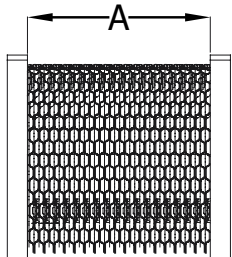
## 1.9 - Data plate

- The data plate is fastened on the fixed head (front).
- Example:

ANNO / Year		DATA / Date
TIPO / Type		ORC/
SERIE / Serial No.		
CIRCUITAZIONI / Multipasses		
SERRAGGIO / Tightening Measure		MAX. mm MIN. mm
PS	bar	97/23/CE PED Directives
PT	bar	Volume (l)
TS - / + °C		
<small>PER LA CORRETTA RESA UTILIZZARE SOLO IN RISPETTO DEL PROGRAMMA TERMICO CONCORDATO IN FASE DI PROGETTO            FOR THE CORRECT PERFORMANCE USE PHE IN FULL RESPECT OF THE THERMAL SPECIFICATIONS AS AGREED IN THE PROJECT</small>		
<small>Temperature in riferimento al materiale delle guarnizioni / Only referred to gasket material</small> 160°C / -10°C		
 - Non rimuovere l'etichetta / Do not Remove the label - Apparecchio a pressione / Pressure Equipment - Pericolo di ustione / Burning danger		



- Désignation/Type: Example of PWB 4 11 027H00:  
 4 = Model,  
 1 = Number of passes for the hot fluid,  
 1 = Number of passes for the cold fluid,  
 027 = Number of plates,  
 H = Type of plates (H: high efficiency; L: low efficiency;  
 M: mixed),  
 00 = Proportion of H plates, in % (H00 = 100% H  
 plates; M30 = 30% H plates),  
 Special case: L00 = 100% L plates



- SERIE/Serial No.: = Manufacturing number used to identify your heat exchanger.
- CIRCUIT = Number of passes for the hot fluid - for the cold fluid.
- SERRAGE/Tightening Measure = Tightening dimension (A) between the inside of the fixed head and the inside of the follower, in mm.
- PS = Maximum allowable pressure in accordance with PED 97/23/EC, in bar.

- PT = Test pressure, in bar.
- 97/23/CE PED Directives = Exchanger category (fluid group).
- Volume (l) = Total capacity of the exchanger, in litres.
- TS = Minimum and maximum allowable temperatures.
- CE = Only for category I, II, III and IV heat exchangers: unit conforms to the European Pressure Equipment Directive (PED 97/23/EC). This symbol may be followed by the number of the **notified body** for category II, III and IV heat exchangers.

## 2 - STORAGE

- Store the units in a dry room protected from the weather and maintained at a temperature of between +5°C and +60°C. Make sure that they do not touch any walls or each other or are in direct contact with the floor. Protect them from impacts and make sure that nothing is placed on them.
- The heat exchangers must be placed on blocks that have been adjusted to ensure adequate stability and levelness. The floor must be protected from caving in.
- Do not remove the seals on the ends of the pipes until you are ready to make the hydraulic connections.
- All unused spare parts must be stored away from damp, light, and dust, and protected from impacts.
- Gaskets and gasketed plates must be stored in a cardboard box at a temperature of between 10°C and 30°C. Maximum shelf life: 6 to 12 months.

### 3 - INSTALLATION

Always read this guide carefully before working on the unit and keep it in a safe place for future reference.

#### 3.1 - Choice of location

The intended location of the unit should be fully accessible so as to ease servicing and maintenance operations and allow easy removal of the plates from the side of the unit (Fig. 3). Adequate clearance must be left in front of the safety and control devices.

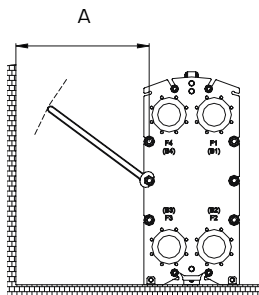


Fig. 3

minimum recommended value (mm)	
Model	A
DN32	700
DN65	1000
DN100	1500
DN150	1500
DN200	2000



#### 3.2 - Installation recommendations

- HRS plate heat exchangers have a limited operating pressure and temperature range. Install all the necessary safety devices to prevent overrunning the limits specified on the order documents. Approval to use the plate heat exchangers at higher conditions must be obtained from CIPRIANI. It is recommended to fit pressure and temperature test points near the unit.
- Make sure that the heat exchanger is compliant with the safety rules in force on the site of use (explosive atmosphere, etc.).
- Install burn hazard signs wherever the surface temperature of pipes exceeds 60°C.
- If the heat exchanger is to be installed on framework, the structure must be designed to withstand the weight of the exchanger when in operation (filled) and with its accessories.
- If necessary, affix the hazard symbol corresponding to the fluid in accordance with applicable standards.
- Take all appropriate steps to mitigate the effects of any significant human, environmental or financial consequences of failure.
- Make sure that the heat exchanger is always installed vertically, stable, and secured using all its anchorage points. If necessary, fit additional anchors suitable for the foreseeable stresses.
- Install drains and vents, shut-off valves, and fill and drain

valves on the pipes so that the heat exchanger can be serviced without disrupting the system.

- In the event of seasonal use, drain the heat exchanger completely to prevent any risk of freezing or corrosion if a corrosive fluid is used.
- If accessories are installed on the heat exchanger, refer to their specific instructions.

### 3.3 - Hydraulic connections

- To keep the insides of the pipes clean, do not remove the seals on their ends until you are ready to make the hydraulic connections.
- The insides of the pipes must be free of all foreign matter (sand, welding slag, other solid matter, etc.) that could damage the plates and gaskets.
- Filtration: If the fluids to be circulated through the heat exchanger contain suspended matter, a filtration system of up to 500  $\mu\text{m}$  must be installed.
- Check the tightening dimension specified on the data plate. Refer to section 5.7 if retightening is needed.
- Make the hydraulic connections as instructed on the label on the frame or on the plate arrangement drawing.
- Never insert foreign matter into the circuit.
- No strain should be placed on the pipes (weight of connected pipes, expansion, vibrations etc.).
- If threaded couplings are used, do not apply the tightening torque to the threaded nozzles.
- Threaded nozzles are not welded to the fixed head. To avoid damaging the first gasket, hold the threaded noz-

zles in place with pliers and screw on the pipes (Fig. 4).

- If the ports on the fixed head are fitted with protective built-in linings, the linings must be sufficiently compressed so that the head and the counter-flange are separated by a 2 mm gap (tightening any further will damage the linings).

- In the case of a multi-pass heat exchanger (fluid inlet and outlet ports on both ends): install an expansion fitting or a horseshoe loop and use detachable pipes so that more plates can be added and the movable follower can be removed.

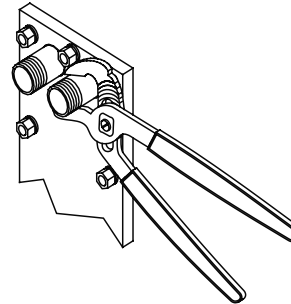
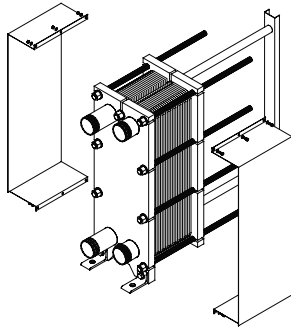


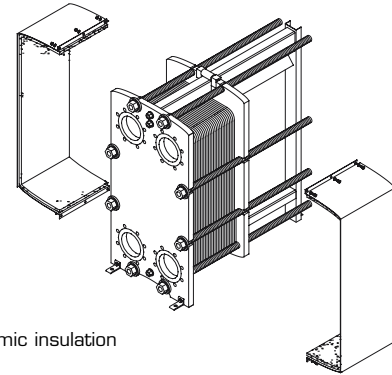
Fig.4

### 3.4 - Insulation and protection accessories

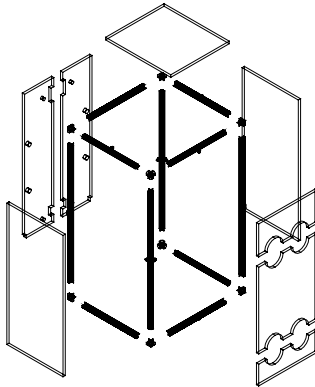
Stainless steel  
plate pack shroud



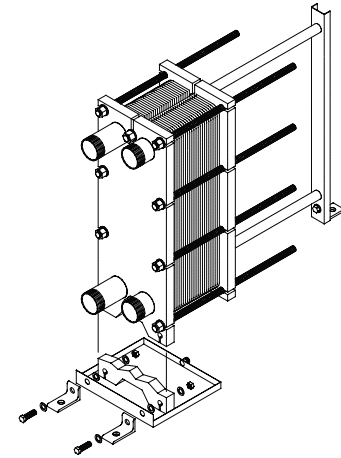
Stainless steel shroud  
with Superwool 607 ceramic insulation



Insulation kit



Condensate drain pan



## 4 - OPERATION



### 4.1 - Commissioning

- Make sure that the heat exchangers do not operate under conditions that are severer than the design conditions (pressure, temperature, flow rate, fluid type).
- Make sure that the tightening dimension matches that shown on the data plate. Never tighten beyond this dimension.
- Open the valves slowly to avoid pressure surges and thermal shock.

*Sudden changes in temperature or pressure as well as sudden intrushes of hot fluid in a cold unit (or vice versa) may damage the gaskets and plates and cause leaks.*

- Make sure that the heat exchanger is not subject to vibrations or frequent short cycles.
- Purge air from the two circuits completely after circulating the fluids. Air left inside the circuits may cause product overheating, reduce the exchanger's efficiency and increase the risks of corrosion.

### 4.2 - Post-commissioning tests

After running the system for one hour:

- Check for signs of leaks. Weak flow rates, however, are normal during commissioning.
- Check the pressures and temperatures of all the fluids being circulated.

## 5 - MAINTENANCE

- All maintenance operations must be carried out by qualified, trained personnel.
- The heat exchanger may not be altered in any way without HRS's consent.
- As the maintenance intervals depend on a multitude of parameters (fluids, temperatures, etc.), the frequency of preventive maintenance is left to the operator's judgment. Nevertheless, a maintenance inspection is recommended at least once a year.
- Periodically check the condition of the corrosion protection coatings and apply touch-ups as needed.

### 5.1 - Preventive maintenance

- Our experience shows that, when used under normal operating conditions, gasketed heat exchangers have a service life of over 10 years. We advise against opening them too often.
- Inquire about applicable environmental standards and prevailing legislation, particularly regarding the frequency of checks and what to do in the event of a leak.
- Once a year, test the operation of all safety devices, check the condition of the insulation, look for signs of external corrosion and test the pressure on the heat exchanger outlet.



- Record all periodic checks and problems in the maintenance log.

### **Short-term storage (< 3 months)**

- 1) Gradually lower the pressure in each circuit.
- 2) Turn off the pumps and close the shut-off valves.
- 3) Let the heat exchanger cool to room temperature.
- 4) Completely drain the heat exchanger and close the drain and vent valves.

### **Long-term storage (> 3 months)**

Carry out the above steps as well as the following:

- 1) Flush the heat exchanger circuits with water to remove all residue.
- 2) Loosen the nuts on the tie bolts to reduce the compression on the gaskets.
- 3) Apply a rust preventive on the tie bolts.
- 4) When recommissioning the heat exchanger, lubricate the tie bolts and guide bars then go to section 4.1.
- 5) Retighten the plates to the dimension shown on the data plate.

## **5.2 - Disassembly**

- CIPRIANI heat exchangers are surrounded by a strap which, if broken, will void the warranty. You must obtain CIPRIANI's written permission in order to remove the strap.
- Store the plates on a flat, clean surface away from ferrous particles and dirt.
- For easier reassembly, stack them in the order of disassembly or number them.

### **Procedure**

- 1) Disconnect the pipes at the back of the frame (multi-circuit units).
- 2) Clean and lubricate the tie bolts.
- 3) Measure the tightening dimension.
- 4) Loosen all the nuts in the order shown in Figure 6. Pull back the movable follower and carefully remove the plates one by one so as not to damage them. Wear protective gloves while doing so as the edges of the plates are sharp.
- 5) Remove the gaskets by lifting the tabs out of their slots on the edges of the plates.
- 6) Clean the heat exchanger.

- Separate the plates carefully. Take extra care with the clip-on gaskets as they tend to stick to the plates after long periods of operation at high temperatures. Gaskets that retain their original properties may be reused.
- Never mix new and old gaskets as the difference in elasticity will result in overcompression of the new gaskets and reduce their service life.

## **5.3 - Manual cleaning**

- Always wear safety glasses and protective gloves and follow the instructions for the cleaning products used.
- Dispose of wastewater in accordance with prevailing environmental protection regulations.
- Never use metal tools, abrasives, or corrosives.
- Use a soft, non-metallic brush and suitable detergent.

- A pressure washer may be used provided the necessary precautions are taken to avoid damaging the gaskets.
- Soak the plates in a detergent solution if they are coated with thick deposits.
- Thoroughly rinse the plates, and especially the gaskets, in cold or lukewarm water.
- Degrease the plates before reinstalling them, especially if one of the fluids circulated is a lubricant (e.g. oil).
- Carefully check the condition and sealing surfaces of the gaskets, the flatness of the plates, and the overall cleanliness.

#### **5.4 - Clean in place (CIP)**

- CIP is recommended if the heat exchanger requires frequent cleaning or is hard to disassemble.
- CIP can be performed provided it is impossible for particles to build up inside the heat exchanger. Likewise, if there is a risk of the surfaces of the plates being damaged by particles, manual cleaning should be performed.
- The CIP procedure must be determined with a specialised firm when the system is designed.
- After the first few cleanings, it may be necessary to open the heat exchanger in order to check the degree of cleanliness, adjust the cycle time and determine the best product concentrations.

#### **Procedure**

- 1) Completely drain all the circuits (if this is not possible, run fresh water through the circuits until the process fluids have been completely flushed out).
- 2) Clean with fresh water (with a low chloride content for the

stainless steel plates) at a temperature of around 40°C to eliminate all traces of the process fluids.

*Run this water in the opposite direction of normal operation. An even better result can be obtained by running the water alternately in one direction and then the other (this is advised for steam applications or to eliminate residues such as fibres and particles). The use of filters upstream of the heat exchanger will reduce the need for this.*

- 3) Completely drain the water from the circuits and connect the CIP unit. Do not let the solution sit in the exchanger.
- 4) For even better cleaning, use a centrifugal pump installed between the CIP and the heat exchanger. Circulate the detergent solution in the direction opposite that of the fluids so as to eliminate all traces of dirt.
- 5) Circulate a quantity of detergent solution at above the nominal flow rate but without exceeding the maximum allowable flow rate (determined by the nominal diameter).
- 6) Thoroughly flush both circuits with fresh water.

#### **5.5 - Detergents**

- Never use hydrochloric acid (HCl) or chlorinated compounds with stainless steel.
- Never use phosphoric acid with titanium.
- Suitable detergents may be obtained from specialised firms. Specify the plate and gasket types to obtain a detergent that will not remove the protective oxide layer on the plates or destroy the gaskets.
- Nitric acid (HNO<sub>3</sub>) and sodium hydroxide (NaOH) may be

used to clean stainless steel and titanium plates.

- Polyphosphates may also be used.

### Descaling

- Use a nitric acid (HNO<sub>3</sub>) or citric acid solution: 1.5% concentration by weight, max. temperature 65°C (1.5% by weight corresponds to 1.75 l of 62% HNO<sub>3</sub> for 100 litres of water) or a polyphosphate solution (NaPO<sub>4</sub> or Na<sub>3</sub>PO<sub>4</sub>): 1.5% max. concentration by weight, max. temperature 50°C.

### Degreasing

- Degrease stainless steel or titanium plates with a sodium hydroxide (NaOH) solution: 1.5% max. concentration by weight, max. temperature 65°C (1.5% by weight corresponds to 3.75 l of 30% NaOH for 100 litres of water).
- Do not use hydrochloric acid or water with a chloride content of over 300 ppm to clean stainless steel plates.
- Do not use phosphoric acid to clean titanium plates.

Deposits:

#### Calcium

Recommended detergents: 4% nitric acid solution at 60°C max. - 4% citric acid solution at 60°C max.

#### Oils and greases

Recommended detergents: paraffin or kerosene (as these fluids may damage NBR and EPDM gaskets, limit the contact time to no more than 30 minutes)

#### Sludges, metal oxides

Recommended detergents: 8% nitric acid solution at 60°C max. - 4% citric acid solution at 60°C max.

### Organic matter

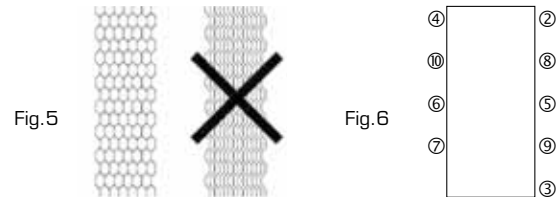
Recommended detergents: 2% sodium hydroxide solution at 40°C max.

## 5.6 - Liquid penetrant testing

- Corrosion, galvanic coupling and erosion can create holes in the plates. As such damage is not always visible to the naked eye, we recommend performing liquid penetrant tests to check for holes or microcracks. HRS's technical support team can advise you on the appropriate products.

## 5.7 - Reassembly

- Before reassembling the heat exchanger, make sure that all the plates and gaskets are clean and free of grease.
- When arranged correctly, the stacked plates form a honeycomb pattern (Fig. 5).
- For even tightening of the plates, tighten the nuts in the order shown in Figure 6.





- The tightening dimension (distance from the inside of the fixed head to inside of the mobile head) is specified on the data plate.
- Overtightening may irreversibly distort the plates. If you feel it is necessary to tighten beyond the recommended dimension, contact HRS's After-Sales Department to obtain advice.
- The order of assembly and the arrangement of the plates are specified on the plate arrangement drawing.

### Procedure

- 1) Press the clip-on gaskets into their grooves on the plates, making sure that the leak detector vents on each is facing up to ensure detection of fluid leaks. Make sure that all the tabs are firmly locked in their notches then turn each plate over and check again.
- 2) Starting from the fixed head, assemble the plates on the bar one by one with the gaskets facing the fixed head.
- 3) Insert the tie bolts then tighten them gradually and evenly in the reverse order of disassembly (Fig. 6) until the specified tightening dimension is obtained. Check that this dimension is the same on each side.
- 4) It is recommended to perform a pressure test after all

maintenance on the plates and gaskets in order to check the heat exchanger's internal and external tightness. The maximum pressure for each circuit should be equal to the working pressure and should never exceed the rated pressure (PS) specified on the data plate. The recommended testing time is 10 minutes.

*Nevertheless, it is the user's responsibility to check national regulations and local codes affecting such a test.*

*If different conditions are required, the reader is reminded that the heat exchangers should never be tested at pressures greater than the test pressure (PT) specified on the data plate and that the pressure differences between the two circuits during testing should never be higher than the maximum allowable differential pressure.*

- 5) If a leak occurs, lower the pressure then retighten the nuts and repeat the test. If the leak persists, check the gaskets and plates for signs of wear, damage or dirt. If necessary, replace the gaskets.

## 5.8 - Plate codes

Example with balanced H and L patterns

Code

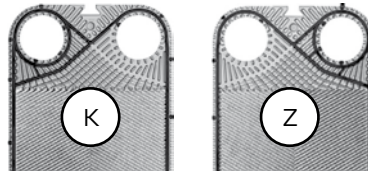


Fig.a

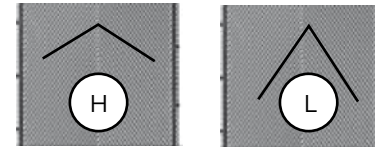


Fig.b

No.	type
1	K1234H*
2	Z1234L
3	K1234H
4	Z1234L
5	K1234H
6	Z1234L
7	K1234H
8	Z1234L
9	K1234H
10	Z1234L
11	K1234H
12	Z1234L
13	K0000H

● Example with plate No. 10: Z 1234 L

- 10 = sequence number
- The first letter indicates the plate arrangement and gasket position (Fig. a)  
K = ink on left  
Z = link on right
- The four-digit code indicates the location of each porthole and whether it is closed or open (Fig. c)  
1234 = open  
0=closed  
For example, 1204 indicates that porthole No. 3 is closed.
- The last letter indicates the plate type (Fig. b):  
H = HIGH EFFICIENCY plate with wide chevron pattern  
L = Low Delta P plate with narrow chevron pattern

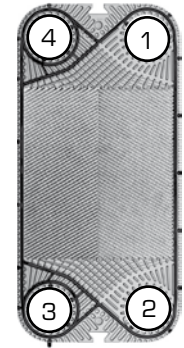


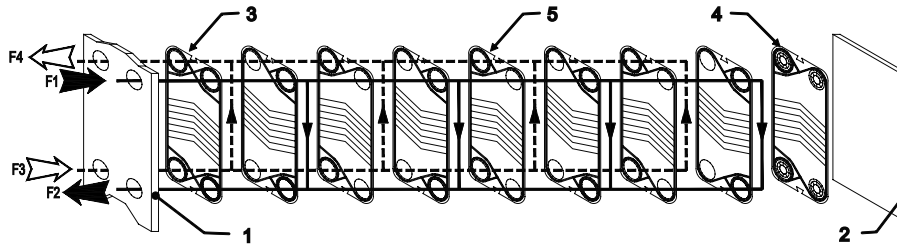
Fig.c

## 5.9 - Arrangement examples

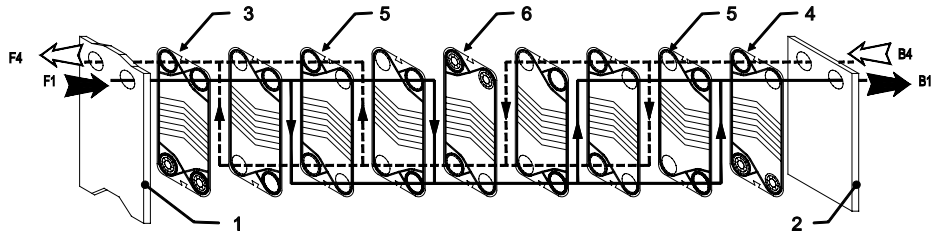
Legend:

- 1 - Fixed head
- 2 - Movable follower
- 3 - Starter plate
- 4 - End plate
- 5 - Intermediate plates
- 6 - Turning plate

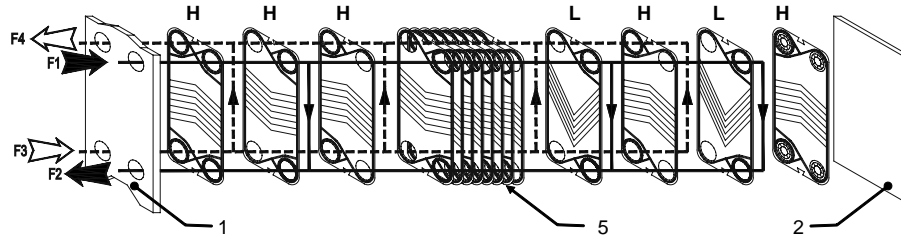
Single-pass/Single-pass arrangement [1-1]



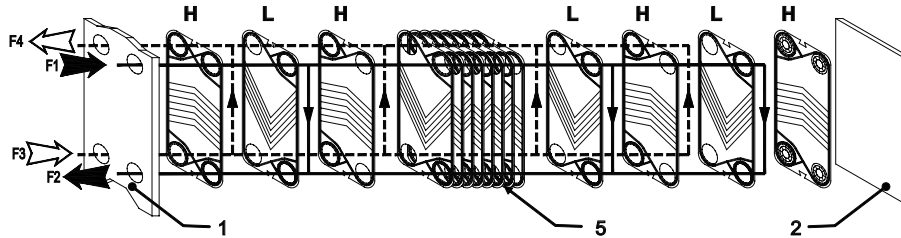
Two-pass/Two-pass arrangement [2-2]



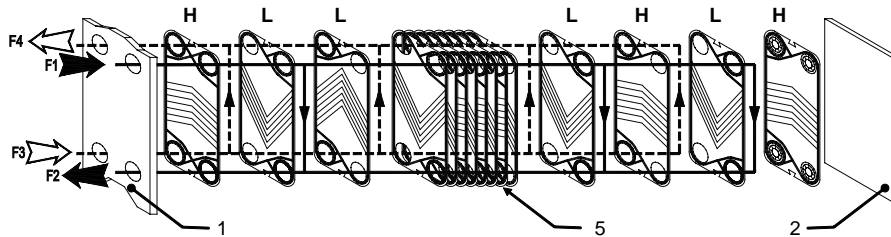
Combination : 55%-95% proportion of H plates



50/50 proportion of H and L plates



5%-45% proportion of H plates



## 5.10 - Gasket replacement

Remove the gaskets by lifting the tabs out of their notches along the edges of the plates. If the gaskets are stuck in place, do not prise them out with a sharp object. Clean the sealing surface of the replacement gasket then

place the gasket on the plate (Fig. 7) with the leak detector vents "A" facing up and align the tabs with their corresponding notches (Fig. 8). Insert the gasket tabs firmly into their notches. Make sure that the gasket is properly seated in the groove. Turn the plate over to make sure all the tabs are correctly in place.

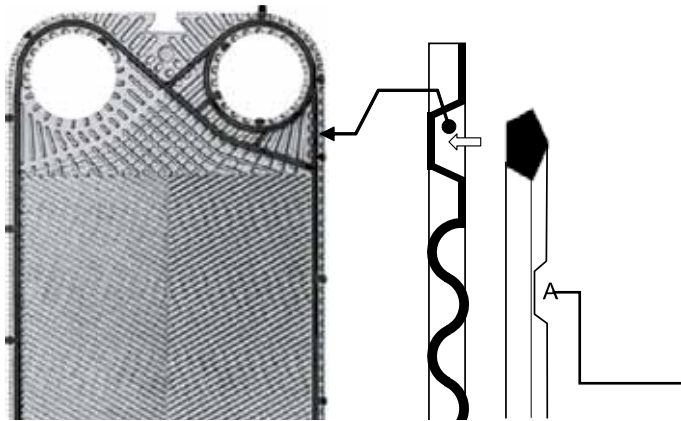


Fig.7

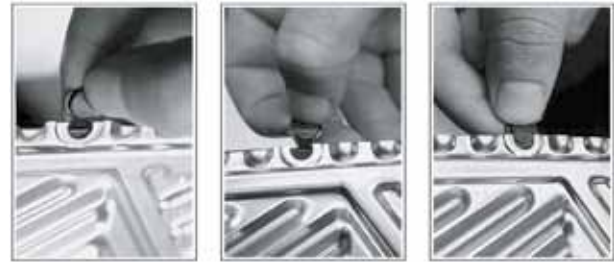


Fig.8

● A: leak detector vents are notches in the surfaces of the gasket sections around the portholes and which vent leaks to the atmosphere so that they can be detected.

## 5.11 - Increasing the transfer area

It is possible to add an even number of extra plates provided you:

- Check the plate capacity of the heat exchanger.
- Install a longer guide bar, carrying bar, and tie rods if necessary.
- Replace the data plate and the plate arrangement drawing with the new ones provided by HRS.
- Leaks generally occur when new and old gaskets are used together (different hardnesses). We therefore strongly recommend replacing all worn gaskets with new ones.

## 5.12 - Spare plates

Plates may be replaced individually or altogether. It is strongly advised to replace all the gaskets in the former case (see section 5.11).

If only a few plates are replaced, indicate the sequence of the plates to be replaced shown on the plate arrangement drawing.

## 5.13 - Troubleshooting

### FLUID LEAKS BETWEEN PLATE PACK AND FRAME

#### PROBLEM

Leak detected at the bottom of the pack.

#### POSSIBLE SOLUTIONS

- Make sure that all the bolts are correctly tightened.
- Make sure that there is no mechanical stress on any of the connections.

- Reposition or replace the gasket on the starter or end plate.
- Check the internal surface of the fixed head for defects.
- Make sure that there are no foreign bodies between the starter plate and the fixed head.
- Test the starter/end plate for signs of damage (cracks, holes).

### FLUID LEAKS BETWEEN CONNECTIONS AND FRAME

#### PROBLEM

Fluid leaks where a connection passes through the fixed head.

#### POSSIBLE SOLUTIONS

- If welded connections are used, check the condition of the welds.
- If cracks are found, contact your CIPRIANI consultant before attempting any repairs.
- If other connections are used, contact your CIPRIANI consultant.

### FLUID LEAKS FROM THE PLATE PACK

#### PROBLEM

Leak detected from plate pack.

#### POSSIBLE SOLUTIONS

- Measure the tightening dimension and check it against the data plate. Tighten if need be.
- Mark the area around the leak with a felt-tip pen then open the heat exchanger and inspect the area.
- Check the sequence and alignment of the plates.
- Check the condition of the gaskets (correct position, overall condition, elasticity). Reposition or replace the gaskets as needed.

### **INTERNAL LEAKS WITH mixing of fluids**

Contact your HRS consultant as quickly as possible.

#### **PROBLEM**

The fluids in the heat exchanger are mixing together at the unit's outlet.

#### **POSSIBLE SOLUTIONS**

- Make sure that the hydraulic connections are correct.
- Disassemble the heat exchanger and inspect the entire surface of each plate for cracks and holes with penetrant. Replace any damaged plates.

### **INCREASED PRESSURE DROPS**

#### **PROBLEM**

The pressure drop is higher than the design value.

#### **POSSIBLE SOLUTIONS**

- Check the accuracy of the measuring instruments used.
- Test the operation of the pumps.
- Fouling may be the cause. Clean the heat exchanger.
- Circulate the fluids in the opposite direction to remove any blockages in the pipes.

### **VARIATIONS IN TEMPERATURE**

#### **PROBLEM**

The heat exchanger's outlet temperatures do not correspond to the expected temperatures.

#### **POSSIBLE SOLUTIONS**

- Check the accuracy of the measuring instruments used.
- Fouling may be restricting the flow along the channels and reducing the heat transfer capacity (drop in efficiency). Clean the heat exchanger.

## **6 - DISPOSAL**

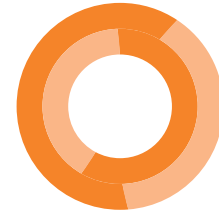
- Disconnect the heat exchanger from its power sources and wait until it has cooled fully.
- Drain the heat exchanger and collect the fluids in accordance with environmental standards.
- Dispose of the gaskets in accordance with the prevailing legislation.
- Use the lifting systems employed when installing the heat exchanger.
- Check whether any part of the heat exchanger may be recycled for another purpose.

#### **Materials:**

Consult the documentation provided with the order for information on the materials used to fabricate the heat exchanger.

- Plates: stainless steel or titanium.
  - Other metal components: carbon steel or stainless steel.
  - Gaskets: NBR, peroxide-cured EPDM, Viton®, HNBR.
- Insulation or plate protection materials: stainless steel + ceramic or aluminium + polyurethane boards.

# HRS



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