THERMADRAFT

FORCED DRAFT HEAT EXCHANGER

1. General

1.1 Introduction

The ThermaDraft heat exchanger may only be installed, commissioned and maintained by an authorised plant machinery specialist, paying close attention to these instructions and all other relevant regulations. Failure to do so relieves the manufacturer of any liability and invalidates any warranty.

This instruction manual is provided to familiarise the user with the ThermaDraft heat exchanger and its use. The ThermaDraft heat exchanger may be installed into a mechanical seal support system. In that case, this instruction manual may be combined with an instruction manual for the wider mechanical seal support system, and the two instruction manuals should both be referenced. The instructions must be read and applied whenever work is done on the ThermaDraft heat exchanger and must be available to the operating and maintenance personnel.

These instructions will help to avoid danger and increase reliability. They should be used with the appropriate mechanical seal instruction manual.

The following important terms and definitions are used in this document.

1.2 European and/or UK declaration of incorporation (machinery directive 2006/42/EC, and UK SI 2008 no. 1597)

If appropriate this is attached.

1.3 European and/or UK declaration of conformity (pressure equipment directive 2014/68/EU, and UK SI 2016 no. 1105)

In assessing the hazard classification for the European or UK pressure equipment directive/regulations the process fluid, the liquid volume and the design pressure will define the hazard classification.

If appropriate this is attached.

1.4 European and/or UK declaration of conformity (atex 2014/34/EU, and equipment and UK SI 2016 no. 1107)

These instructions are intended for use with the system operating in Equipment Group II, category 2GD and 3GD.

The Declaration covers the complete seal and support system into which a ThermaDraft is installed, and the Maximum Surface temperature is recorded in the Mechanical Seal instruction manual.

If appropriate this is attached.

2. Safety and environment

The safety notes refer to the system supplied. They can never be exclusive, and must be used in connection with the relevant safety regulations for the machine, auxiliary equipment, plant and sealed product.

2.1 Warning symbols

The following symbols are used in this instruction manual to highlight information of particular importance:

Danger - Mandatory instructions designed to prevent personal injury or extensive damage.

Warning of electric current.

Environmental note - Compliance is required with any additional warning signs affixed to the system.

ATTENTION Special instructions or information to avoid damage to the system or its surroundings.

2.2 Safety instructions

ATTENTION

Every working practice that compromises personal safety is to be avoided. All safety requirements in this document must be strictly adhered to.

In the event of an operating problem, the machinery must be switched off immediately and made safe! Problems must be solved promptly.

Ensure suitable protective clothing is used when maintaining the system.

ThermaDraft heat exchangers are often used to cool process fluids in mechanical seal support systems. During any maintenance operation operators must thus assume they will be exposed to the liquid or gaseous properties of the process fluid and have suitable protective gloves, clothing, respirators and equipment.

Particular note must be taken of the relevant guidelines for the electrical installations.

Surface temperatures above 60 °C (140 °F) should be protected against accidental contact.

The equipment sealed by this seal system must be operated within its recommended design limits.

Compounds containing PTFE, fluorocarbons and perfluoroelastomers should never be burnt as the fumes and residues are highly toxic. If this accidentally occurs protective equipment should be worn as hydrofluoric acid may be present.

Additional equipment, flanges and joint seals used with the ThermaDraft heat exchanger system must be rated for the appropriate electrical and pressure requirements and are to be chemically compatible with the process fluid.

- During venting or draining of the ThermaDraft heat exchanger it should be piped to a vent or reservoir where it can be safely contained or disposed.
- All above according to the local legislation.
- For further information and safe operating limits contact John Crane
- All periodical maintenance checks have to be in accordance with local legislation and rules.

All welding or cutting operations are forbidden without permission from John Crane.

If you are in any doubt please contact your local John Crane office for further information before proceeding.

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2.3 Environmental aspects

2.3.1 Company policy extract

"It is the policy of John Crane to manage its business activities in an environmentally responsible manner, comply with all relevant laws and regulations, prevent pollution, and continually improve its environmental performance, certification to the latest issue of ISO 14001 ensures compliance."



John Crane adopts the 'Design For the Environment' (DFE) principle in making this product. Using this product will benefit the environment directly by:

- **Reducing waste** of precious resources through decreasing the risk of leakage and minimising energy consumption.
- **Preventing pollution** through controlling harmful emissions to the atmosphere and ground contamination.
- **Preserving valuable materials** through the use of high quality durable materials.

2.3.2 Recycling

Product refurbishment

This product has been designed for long life.

Disposal

When the product is considered to be beyond economical repair and potential reuse, it should be disposed of by **environmentally beneficial** means. The product can be disassembled with ease.

Scrapped components

These should be handled with extra care due to possible contamination. They should be **recycled** through **local** industrial recycling plants.

Packaging

All packaging materials used are made from **recyclable**, environmentally friendly materials.

When in doubt or for further information and advice on this subject, please consult **John Crane**.

3. Transportation and storage

Transport and store the product where possible in its original packaging.

It is necessary to protect and preserve the integrity of the equipment between shipment and installation/start-up at site. This is particularly important when extended periods of storage are envisaged.

ThermaDraft heat exchangers may be shipped first to the rotating equipment vendor to be mounted on the rotating equipment baseplate complete with the connecting pipework. In this event follow the instructions as given in the rotating equipment IOM.

ThermaDraft heat exchangers, which are to be mounted off the rotating equipment baseplate, shall be shipped directly to site and shall be packed in suitable crates or cases to protect them from damage during shipment. All openings to the product are closed and sealed for shipping. In this event follow the following instructions.

On arrival at site and before unloading for storage, a visual inspection of the crate/case should be carried out for signs of damage during shipment. In the event of any damage the crate/case must be opened, and the contents thoroughly examined for signs of equipment damage. All bolts and threaded connections should be checked for signs that they have come loose during transport. If any seals are broken, then the system is assumed to be contaminated and shall be cleaned accordingly. All loose connections or bolts should be correctly tightened to eliminate any loosening which has occurred during transportation or as part of the cleaning process. Any damage must be reported on the delivery note with a description of the damage. Damaged heat exchangers, including when the damage is not externally visible, are to be reported to the shipping agent and John Crane within 24 hours.

If the parts are considered acceptable with no visual signs of damage, the crate/case should be properly closed again prior to storage.

After checking for shipment damage, the following recommendations should be undertaken to prevent deterioration arising from long term storage.

- The ThermaDraft heat exchanger should be replaced in the original packaging and if possible, the crate/case should be stored away from direct sunlight, in a well-ventilated building with a hard floor.
- Temperature control is not normally necessary. However, sudden or large temperature changes greater than **40°C (72°F temperature difference)** should be avoided.
- If stored outdoors, place the crate/case on timber bearers resting on a concrete or similarly hard surface.
- The crate/case must then be wrapped with waterproof tarpaulin to prevent ingress of water and dirt.
- Loose components or accessories in the case should be stored as above, after proper itemisation.
- A weekly visual external inspection of the protection and preservation should be undertaken, and any deficiencies noticed should be corrected without delay.
- The ThermaDraft heat exchanger must be stored far from backwater to avoid the MIC phenomenon (microbial corrosion).

NOTE Should water, condensation, sand, dirt or other contaminant enter the product, through package/tarpaulin damage or improperly positioned covers, the cause of the problem must be eliminated and the equipment thoroughly dried and cleaned before re-storing.

If used ThermaDraft parts are to be transported to the manufacturer or a third party they have to be cleaned, decontaminated and require safe handling instructions externally attached.

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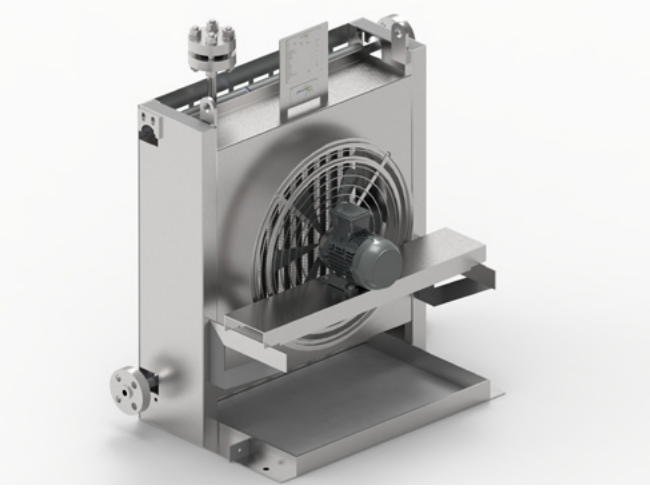
ATTENTION The ThermaDraft heat exchanger normally does not require any preservatives; it is resistant against most environmental conditions.
Ensure preservatives and cleaning agents do not affect the elastomers.

4. Description of the system

4.1 Function of the system

ThermaDraft heat exchangers are used to remove heat from process or barrier liquids, used as the lubrication for mechanical seals. Hot liquid enters the ThermaDraft heat exchanger, then passes through a finned tube array, built from a set of interconnected finned tubes to increase the heat exchange surface area. A flow of air is forced over the exterior of the finned tube array, and heat passes from the liquid into the air. The cooled liquid then exits the ThermaDraft and is used to provide lubrication for mechanical seals.

The forced draft of air is induced by a motor driven fan, to ensure a good heat exchange takes place, without relying on natural wind to provide airflow.



4.2 Instrumentation and fittings

The system is supplied with the following:

- Process inlet (flanged or threaded)
- Process outlet (flanged or threaded)
- Drain connection (flanged or threaded)
- Vent connection (flanged or threaded)

5. Installation and assembly

5.1 Before installation

Prior to installation ensure that internally all connecting pipe work has been thoroughly cleaned. Remove protection caps from pipes and connections. Check all fittings/connections for damage replacing if necessary.

5.2 lifting

ThermaDraft heat exchangers may be lifted by a forklift. In doing so, ensure that the product is not lifted directly by the drip tray or the finned coil. The forks must be long enough to enable lifting the cooler past its center of gravity.

If hoisting ThermaDraft heat exchangers, the lifting points must be used. All lifting procedures must be carefully carried out by properly qualified personnel, ensuring absolute safety at all times. If in doubt about the proper hoisting or lifting method, please contact John Crane.

5.3 Mounting

ThermaDraft heat exchangers must be mounted such that they can contract and expand due to thermal expansion. All heat exchangers must be set up level.

The ThermaDraft should be secured in place using the four holes/slots on the foot plate of the product, using four M16 or 5/8" USC bolts.

Weight information and dimensions are listed on the product nameplate and on GA drawings.

There may be specific recommendations to the mounting location, and interconnecting pipework, depending on the mechanical seal support system that the ThermaDraft heat exchanger is being installed into. See the installation manual for that seal support system for more details.

Connect the vent and drain connections to suitable collection systems or safe drains, as necessary.

5.4 Electrical connections

Only authorised and qualified personnel are permitted to carry out work on electrical systems. International and local safety regulations must be followed in all cases.

Before connecting cables, check the electrical data on the name plate matches the available power supply and complies with the area hazard classification.

Connect the motor to a suitable electrical supply. Refer to the diagrams in the terminal housing and the supplier's instruction manual for wiring instructions. Connect the electrical component using flexible conduit or armoured cable to assist removal of the component for maintenance purposes.

The maximum load of the motors and the recommended settings for the overload relays are to be respected. The built-in thermal overload protection must be integrated into the control circuit when a connection in the terminal box is present. The electrical control circuit should be arranged with a manual reset device in order to prevent continuous on/off switching (tripping) of the motors. Suppliers and manufacturers of electrical motors provide no guarantee for motors that are combusted through overload. For correct installation and operation of fan speed control systems, follow instructions given in the controller and fan manuals.

Once connected, the fan should be briefly run to check correct direction of rotation, as indicated by the arrow on the ThermaDraft. If necessary, change the phase wiring on the motor to obtain correct direction of rotation.

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An earthing lug is provided, and should be connected to a suitable earthing point.

5.5 Leak check

During transit, tube fittings and flanges may work loose, check all fittings/connections for tightness. Upon first filling, slowly pressurise the ThermaDraft cooler.

Check all joints and if necessary rectify any leaks found.

6. Commissioning and decommissioning

6.1 Commissioning

Before starting the machine (pump or mixer) carry out the following operations:

ATTENTION Before commencing the start-up procedure, review and become familiar with all the available instructions concerning the equipment, especially the safety warnings.

A. Open the vent connection at the top of the ThermaDraft.

B. Slowly fill the seal support system (including the ThermaDraft cooler) with the process/barrier liquid until air is fully vented. For oils, allow 30 minutes for all air to fully work its way out of the vent.

C. Close the vent valve.

D. Ensure the fan is switched on, and rotating in the direction indicated by the arrow on the side of the ThermaDraft, before the main customer equipment is put under pressure or experiences elevated temperatures.

E. Follow other commissioning steps for the mechanical seal support system as per the instruction manual.

Rotating fan blades can cause injuries to fingers. Never operate fans without the mounted protection guards and take care of loose clothing. Switch power off before any maintenance.

Ensure the drip tray is empty before lifting or disassembling. The weight of any leftover water or ice could injure the operator if the drip tray fell open.

6.2 Normal running

The equipment shall be kept clean and free from debris to allow ease of access and to maintain good heat exchanger performance. Care should be taken to prevent damage to the product from accidental knocks and/or exposure to excessive sources or heat. Disconnection of any part of the system should not be undertaken without the appropriate authorisation and until all pressure has been completely discharged and system allowed to cool. All joints broken for maintenance should be plugged off to prevent ingress of dirt.

During normal operation the only attention required is to monitor the rotation of the fan and that the temperature of the system is maintained. Perform a visual inspection of airflow and system temperature at least every 48 hours.

6.3 Decommissioning

Work on the seal or system must only be carried out when the machine is stationary, and secured against any unforeseen start-up. Isolation from connections to pressurisation sources must be carried out.

Before carrying out any work on the ThermaDraft, the equipment must be shut down and fully depressurised. Once this has been done carefully drain any liquids before carrying out any maintenance.

If the heat exchanger is to be removed cover any open tubing fittings/connections to prevent contamination.

7. Maintenance

7.1 Routine maintenance

Check the following as part of regular site walk-around checks for trouble-free operation:

- Check the condition of the finned tube array for build up of dust (see Section 7.2).
- Check the condition of the casing. (see Section 7.3)
- Check fan is rotating, in the correct direction, with no signs of vibration (see Section 7.4)
- Support system temperature. Check that the ThermaDraft is cooling the mechanical seal support system down to the expected temperature.

7.2 Cleaning

The finned tube should be kept clean and free of built-up dust. If dust begins to build up, the fins must be cleaned.

To clean, the fan must be isolated and come to a stop before the cover is removed.

The cover should be removed and the finned tubes should be carefully brushed with a soft bristled brush, ensuring that the fins are not bent. If necessary, use cleaning agents to remove any fouling which is building up on the fins.

Ensure that the cleaning and disinfecting agents that are used do not have a corrosive effect on the materials of the ThermaDraft.

7.3 Casing

Should any damage occur during installation, this should be repaired immediately to prevent further deterioration.

Checks of the casing should be carried out at least every 3 months.

Inspect for any deterioration of coatings and/or corrosion. If such deterioration is noted, take immediate remedial action.

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7.4 Fans

Fans should be checked 3 months after commissioning and thereafter depending on operating conditions, for any dirt build-up and/or unusual vibration. Fan blades should also be checked for any erosion or corrosion and remedial action taken as necessary.

Ensure complete electrical isolation before removing fan guards for inspection.

All dirt and other contamination should be removed to avoid imbalanced running of the fan and motor bearing overheating.

The security of the fan fastenings and the integrity of the components should be checked integrally as part of the routine maintenance operation.

Where fan guards or portions of the casing have been removed for inspection, ensure that these items have been refitted and secured correctly before restarting the heat exchanger.

Troubleshooting table (Table 1)

Fault	Possible cause	Required action
Fan motor not functioning	• No power supply • No control signal (EC motors) • Fan blade blocked • Fan motor burnout	• Check/restore power supply. • Check/restore control signal. • Remove obstructions. • Check for fan blade obstructions. • Check thermal protection devices. • Replace fan motor
Excess motor noise	• Defective fan motor bearing	• Replace bearing or fan motor
Excess vibrations	• Loose fan fasteners • Unbalanced fan blades	• Tighten fasteners • Replace fan blades
Insufficient capacity	• Coil partly blocked by solid ice. • Heat exchanger coil dirty/ blocked	• Clean coil. • Check fans.

Figure 1. Process inlet connection



Figure 2.Process outlet connection

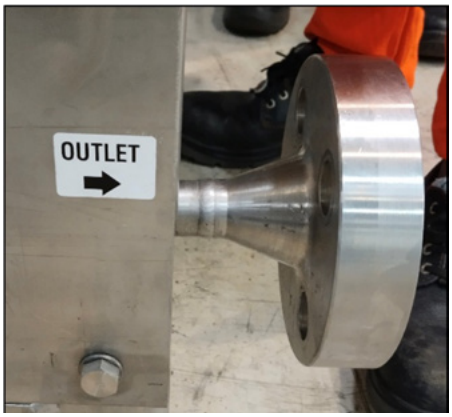


Figure 3. Lifting point location



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7.5 Shut down periods

During prolonged shutdown periods, maintenance should be carried out as detailed above. If the shutdown period is extended, all electric motors should be run once every four weeks for a minimum of 4 hours.

7.6 Spare parts

Spare parts must conform to the established technical specifications of the manufacturer. This is guaranteed with John Crane spare parts.

You are advised to stock the most important wear parts on site.

The following data is necessary for spare part orders:

- John Crane code/part number
- John Crane order/ref no.
- Part description
- Quantity

7.7 Troubleshooting

See Table 1 for basic troubleshooting steps. Consult John Crane for further support.

8. Accompanying documents

Installation Drawing (job specific) or Typical Drawing and Operational Data Sheet.

A name and data plate is fitted to each ThermaDraft heat exchanger. It contains references and part numbers which must be quoted in any communication.

For replacement parts please contact your local John Crane office, quoting the system code number.

North America
United States of America
Tel: 1-847-967-2400

Europe
United Kingdom
Tel: 44-1753-224002

Latin America
Brazil
Tel: 55-11-3371-2500

Middle East & Africa
United Arab Emirates
Tel: 971-481-27800

Asia Pacific
Singapore
Tel: 65-6518-1800

If the products featured will be used in a potentially dangerous and/or hazardous process, your John Crane representative should be consulted prior to their selection and use. In the interest of continuous development, John Crane Companies reserve the right to alter designs and specifications without prior notice. It is dangerous to smoke while handling products made from PTFE. Old and new PTFE products must not be incinerated. ISO 9001 and ISO14001 Certified, details available on request.

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