

## PCR INSTRUCTION MANUAL

# 1. General Remarks

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This manual allows the user to be familiarized with and understand the function of the API PCR product (Precooler-Chiller-Reheater) with regard to its usage.

The information in this manual is intended to provide instruction for proper installation, operation and maintenance of PCRs manufactured by API Heat Transfer. Adherence to these guidelines will help improve safety and extend the useful life of the product.

This PCR manual should be read and understood by anyone who is responsible for the following tasks:

- installation the PCR product in the final assembly
- putting into service
- operation
- maintenance
- transport

The API PCR product is meant to be installed in another machine/ device (end product). It is forbidden to put this PCR product into service in a final assembly that is not in full compliance with the **2006/42/EC** regulation.

It is strongly recommended that the final assembly manufacturer incorporate these guidelines into the final assembly user's manual.

# 2. Safety and Warnings

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**2.1.** PCR meets current standards and directives. A risk assessment has been executed. Due to the principle of operation there are residual risks which have to be taken into account during design, manufacturing, operation and maintenance of the equipment into which the cooler is installed. Therefore, mind the following instructions and take safety measures as mentioned below as well as any additional safety measures that may be applicable.

**2.2.** All equipment must be installed by fully qualified professionally accredited personnel and it must be in compliance with all local and national codes and regulations for electrical, pressurized piping, and mechanical installation.

**2.3.** Due to its principle of operation, the cooler may be damaged in an extreme over-pressure event. Hazardous substances and energy may be released. In order to protect emergency staff and personnel, take precautions in accordance with the positioning, size and purpose of the equipment.

**2.4.** The API PCR can only be used if it is in technically good condition and only in accordance with this manual. The unit should be taken out of service if any minor damage could escalate to greater damage or injury.

**2.5.** Any modifications of the PCR that may affect its safety must be given approval by the manufacturer before the modification is made. This regulation is also valid when installing the PCR into the final assembly (setting the vents, additional welding, etc.)

**2.6.** Spare parts must comply with the original product requirements. This is always guaranteed by using original spare parts the manufacturer.

**2.7.** All electrical parts must be installed and connected by qualified and experienced personal.

**2.8.** All the pipes, cables, screw connections should be regularly checked and repaired or replaced as required.

**2.9.** Before attempting any repair or replacement of damaged pressure parts, be sure that the system is completely shut down and depressurized (0 bar pressure).

**2.10.** When the PCR is functioning, the surface temperatures can be above **50°C** or below **0°C**. There is the risk of getting burned. During operation, touching the cold/ hot surfaces should be avoided.

**2.11.** The appropriate means of transportation/ hoists should be used.

**2.12.** The end product should be so built/ constructed that the maximal allowed pressure (PS) will not be exceeded. **A brief over-pressure of not more than 10% is allowed.**

## 3. Product Description

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### 3.1. Usage

The API PCR uses special manufacturing, testing and performance techniques intended for heat exchangers used in refrigerant air drying applications (mobile or stationary compressors).

The PCR is not intended for any other use.

### 3.2. Technical Data

The maximum allowable working conditions are mentioned on the nameplates of each PCR model.

### 3.3 Acceptable Fluids

The API PCR is designed for drying compressed air using any one of a number of common refrigerants. These refrigerants may include R-22, R-134a, R-404a, R-407C, or R-410a. Other refrigerants may be used as long as they are compatible with aluminum and their saturation pressures during exposure to operating and storage temperatures do not exceed the unit nameplate maximum allowable working pressure.

Do not violate these operational limits.

## 4. Mounting

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### 4.1. Mounting Situation

For the PCR to function properly, it must be mounted in the specific orientation that was defined during the technical development stage of the dryer assembly. Mounting the PCR must be done using only the specially provided mounting elements. The PCR must be properly insulated to ensure that no extremely cold or hot surfaces are exposed during operation.

### 4.2. Mounting in Dirty Ambient Conditions

Fouling on the heat transfer surfaces decreases the effectiveness of the PCR. In ambient conditions where fouling is likely it is important to regularly clean the unit per the cleaning methods described in section 7.

# 5. Assembly

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## 5.1. Operating Conditions

Remember to follow all safety guidelines listed in this manual.

Mount units only from the integral mounting bosses. The fluid connections are not designed to support any external loads or vibrations. A properly mounted PCR is grounded to the dryer frame to prevent static build-up.

PCR's have no moving parts, all aluminum construction. PCR's can be inspected internally with a borescope.

PCR's are all aluminum construction and are not affected by exposure to air, water or helium during leak testing.

The single OEM purchaser encloses installed PCR's in a molded Styrofoam shell. The shell is external to PCR's and can easily be visually inspected.

OEM use of the hot gas bypass valve ensures stable PCR temperatures during dryer operation. The airside nozzles are connected to the end user's piping or to a steel pipe manifold assembly. The refrigerant side is connected to copper refrigerant lines. Non-electrolytic fluids wet the mating surfaces to prevent galvanic corrosion.

Use of an appropriate pressure limiting device is required in the compressed air system where a PCR is used.

Use of an inlet filter as required by the OEM O&M dryer manual will buffer inlet pulsations from reciprocating air compressors and prevent blockage. OEM O&M manual recommends the use of a properly sized receiver, pulsation dampers, and flex connections.

Improper coolant flow may cause freeze-up. Use a properly sized hot gas bypass valve to ensure coolant flow matches cooling demand. "Terms of Sale" dictate that purchaser assumes responsibility for damage due to corrosion, erosion, and flow induced vibration.

PCR's have all aluminum construction. Aluminum retains its strength within the foreseeable temperature extremes. At lower temperatures, aluminum strength increases without embrittlement or loss of ductility.

To prevent extreme conditions in the refrigerant circuit, the OEM equips the finished dryers with a hot gas bypass valve, fan pressure switch, high temperature thermostat, high pressure switch, and low pressure switch.

Never expose the dryer to ambient temperatures below 41 F (5 C) or above 104 F (40 C). The compressed air inlet temperature must never exceed 122 F (50 C). These requirements exist to protect the non-PCR dryer components and to prevent exceeding the dryer cooling capacity.

The end user is required to install an appropriate pressure limiting device in the compressed air system where a PCR is used.

The contained fluids are known to be non-toxic and not harmful to the all-aluminum construction. When mounted in the proper orientation, the PCR process and coolant connections are oriented in such a way as to also serve as the required vents and drains.

During installation of the PCR, appropriate tools should be used to avoid putting any additional stress on the elements.

All the components in the end product have to be mounted securely to prevent breakage. The flanges or any other mounting parts should not be damaged during the installation. Any damaged element can cause a leak in the system.

## 6. Putting into Service

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### 6.1. Leakage Test

All API PCRs are leak tested before leaving the manufacturing facility. After installing the PCR in the end product, the end machine manufacturer should check to ensure that no leaks exist in the system.

**Do not operate the refrigeration circuit if there are any leaks known to be present. Severe damage to system may occur due to a shortage of refrigerant!**

### 6.2. Control

If normal operating temperatures are not reached during start-up or if temperatures rise too rapidly then check these items before attempting to restart the system:

- Check that there are no leaks in the refrigerant circuit.
- Ensure that the system is charged with the correct amount of refrigerant.
- Check the evaporating and suction temperatures in the refrigeration circuit and adjust the hot gas bypass valve accordingly.
- Verify that the heat transfer surfaces are free of fouling.
- Verify that the compressed air inlet temperature is not exceeding specified limits.

After resolving these items, restart the system, check that normal operating conditions have been achieved, and repeat this troubleshooting process if required.

## 7. Use and Maintenance

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### 7.1. Condensate

Accumulating condensate has to be removed by special means. This happens by a water separator which is built-in between the air to refrigerant heat exchanger and the air to air heat exchanger combined with an OEM supplied condensate drain trap that discharges the condensate without releasing excessive amounts of compressed air.

### 7.2. Inspection / Visual Check

Visually inspect the external surface of the PCR each time it is serviced or at least on a regular basis. This visual inspection should focus on the welds to identify any cracks and ensure that they remain in good condition. Also, a leak test should be done regularly using the appropriate tools and media. A pressure test is done by exposing the PCR to the test pressure defined on the nameplate.

An API PCR doesn't need any special maintenance. But if it is exposed to heavy fouling conditions, regular cleaning is required/ recommended.

Under no circumstances should the aluminum PCR be exposed to any caustic soda (lye) solution because caustic soda is known to be corrosive to aluminum.

### 7.3. Cleaning on the Air Side

Fouling leads to a decrease of heat transfer capacity. As required, the fins can be cleaned with a cleaning solution that is compatible with aluminum. This cleaning solution should be approved by API for use in the PCR.

The internal channels, if it's necessary, can be also flushed with a special compatible cleaning solution. The duration of the flushing process depends on the degree of fouling. After clean-up, the residual liquid can be blown out with compressed air.

## 8. Transport, Storage and Preserving

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### 8.1. Transport

PCRs are packed at the API facility on common pallets and prepared for safe transportation. Normally the coolers are packed in a way that allows for up to 6 months of storage. If storage for longer periods is necessary, please consider Section 8.3: Storage.

Coolers that weigh more than 30kg should be lifted by a crane, but they should not be lifted by nozzles, drains, etc. If they are damaged due to mishandling, they should not be used.

#### 8.1.1. Transport of API PCRs with Refrigerant Inside

During the transport in high ambient temperature conditions, the pressure on the refrigerant side can increase to above the nameplate pressure of 14 bars. In this case an over pressure of 30 bars is allowed for brief periods.

### 8.2. Delivery

Upon receipt of equipment, carefully check all parts for shortages and any type of damage. Do not remove items from the shipping skid until a receiving inspection is completed and the material is found to be satisfactory. Shipping damage should be reported immediately, and a claim filed with the carrier.

### 8.3. Storage

The storage place should be clean and dry.

Avoid storing the unit in areas with rapidly fluctuating temperatures and humidity. If the unit is moved from cold temperatures to warm humid temperature condensate will form inside the unit and may create problems when pumping down for the refrigerant charge.

**If the temperatures conditions can't be held, it is recommended that the PCRs are sealed in a plastic bag.**

### 8.4. Preserving

If the PCR is to be stored for less than 6 months, there is no necessity to protect the PCR from corrosion on the internal side. If the expected storage is up to 2 years, then the air side of the API PCR should be preserved from the inside with an oil flush and capped connections. The refrigerant side connections should be sealed and the refrigerant side should be evacuated with a vacuum pump then pressurized with dry nitrogen to about 2 or 3 barG to ensure the system stays dry and free of any corrosive agents. Upon recommissioning, a simple check for the presence of positive pressure proves the unit remains leak free and ready for use.

Plans for long term storage should be mentioned at order placement because there are additional costs involved. Before preparations for long term storage, any condensate must be completely removed from the cooler. Before running the cooler again, any residual preserving medium must be completely flushed from the cooler."

## 9. Disassembly / Disposal

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After removing any liquid from the inside of the cooler, it should be fully contained in approved storage containers and disposed according to local regulations.

If a **PCR** product is to be shipped for whatever reason to any location, make sure it is vented and (in case it has been used with hazardous fluids) properly rinsed. Include a certificate about its cleanliness with the shipping documents.

The disposal should be done by qualified workers who are familiar with all code requirements.

API PCRs are all aluminum construction so they should be recycled to recover the aluminum at the end of the product's useful life.

## 10. Warranty

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API HEAT TRANSFER warrants that upon shipment the PCR products will be free from defects in materials and workmanship. The warranty is valid for a period of 12 months from the date of shipment unless national legislation demands a longer term.


If it's not negotiated differently, API standard terms and conditions of sale apply.

## 11. Support

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If you have any questions, please contact your sales representative or API Heat Transfer directly. Visit our website at **<http://www.apiheattransfer.com>** for a listing of all our sales and factory locations.



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