



Installation

Causes of Compressor Failure— Models CSHS, CSHA, CSHB, CSHC

Including Approved Oils for Trane

Compressor Model CSHA and Interchangeability of CSHA and CSHS

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.



Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs and HCFCs such as saturated or unsaturated HFCs and HCFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in **NEC** and your local/state electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, **MUST** follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- Before installing/servicing this unit, technicians **MUST** put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). **ALWAYS** refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labeling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.
- If there is a risk of energized electrical contact, arc, or flash, technicians **MUST** put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit. **NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

⚠ WARNING**Follow EHS Policies!**

Failure to follow instructions below could result in death or serious injury.

- All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.
- Non-Trane personnel should always follow local regulations.

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Introduction

This literature discusses causes of compressor failure for compressor models CSHS, CSHA, CSHB, and CSHC. It also includes a discussion of approved oils for Trane Compressor Model CSHA, and interchangeability of CSHA and CSHS compressors.

Causes of Compressor Failure

Compressor failure is usually the result of system deficiencies. Failure to look for and correct the cause of the problem(s) will place the new compressor in jeopardy and may lead to another failure.

⚠ WARNING

Hazardous Service Procedures!

The maintenance and troubleshooting procedures recommended in this section of the manual could result in exposure to electrical, mechanical or other potential safety hazards. Always refer to the safety warnings provided throughout this manual concerning these procedures. When possible, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks. Failure to follow all of the recommended safety warnings provided, could result in death or serious injury.

The following steps are recommended:

1. Determine if the failure is electrical or mechanical. Note that an electrical failure does not rule out the possibility of a mechanical failure also.
2. If the failure is electrical, check for system contamination using an acid test kit for oil analysis.
 - If acid is present, a replaceable core suction filter with an acid cleanup core is required.
 - If no acid is present, a standard suction filter must be installed to remove any debris/ contamination from the original failure.
 - Look for defective contactors, loose connections, unbalanced voltage; review the control system to insure that it works properly; check for chattering contactors or relays.
3. If the failure is mechanical, a standard suction filter must be installed to remove any contamination from the original failure. Mechanical failures can be caused by poor refrigerant control or loss of refrigerant.
 - Check for defective expansion valves, restricted air/water flow, excessively long or oversized liquid line, defective or improperly selected components such as refrigerant distributors, distributor tubes and hot gas by pass valves, or refrigerant control valves.

- If the system is equipped with a solenoid valve, it should be checked for proper operation. The scroll compressor must not be allowed to run into a vacuum.
 - Check the low pressure switches to ensure that they are operating properly.
4. Loss of oil may be a problem.
 - Drain the oil out of the compressor and measure the oil. The approximate operating oil charge should be as follows:

CSHS	093, 100—8 pints	140, 150—14 pints
CSHA	093, 100—8.5 pints	140, 150—13.8 pints
CSHB	062, 075—5.25 pints	083, 093, 100—7.5 pints
CSHC	062, 075—5.25 pints	083, 093, 100—7.5 pints

- If the amount of oil is significantly below the oil charge shown, look for the cause of oil loss.
 - Look for oversize suction lines, improperly formed suction line traps, poorly designed refrigerant piping, oil leaks, oil logged evaporator or condenser.
- Note:** It is important not to overcharge the system with oil. Overcharging the system with oil can result in suction pressure swings.
5. Oil Appearance—What it tells:
 - Dark and Thick—Indicates a general motor burn. Oil in the system should be changed. Suction filter-drier cleanup is mandatory.
 - Discolored and Slightly Odorous—Indicates a possible spot burn or probable dirty system due to copper oxides generated during the installation of the system without the use of inert gas-suction line filter suggested.
 - Fine Metallic Particles in the Oil—Indicates a bearing or scroll failure. Look for excessive flood back. Compressor seriously diluted with refrigerant. Oil in system should be changed. Suction filter drier cleanup is mandatory.
 - If Water is in the Oil—If the system is a chiller or has a water cooled condenser, look for a refrigerant to water side leak. Ensure a liquid line drier is replaced/added.
 - Clean and Sweet—This condition does not tell what happened but it tells you what probably didn't happen—no burn out, no system contamination, no excessive wear.
 6. Changing Oil Manifold Sets—Whenever one of the compressors fails in a manifold set, the oil must be changed in the remaining compressors in that set.
 7. Approved Replacement Oil—Refer to [“Approved Oils for Trane Compressor Model CSHA and Interchangeability of CSHA and CSHS Compressors,”](#)

p. 5 and/or PART-SVB12A-EN (*General Service Bulletin: Recommended Oils for Trane Equipment*), or the most recent revision, for compressors installed in Trane or American Standard products.

8. Liquid Line Driers—Install or change the liquid line drier to help protect the new compressor against the inclusion of moisture or other contaminants. This should be done any time a system is opened for service.
9. Evacuation—Use a vacuum pump and an electronic vacuum gauge; evacuate the system to 500 microns or less. Once 500 microns has been obtained, a time vs. pressure rise should be performed. Maximum allowable rise over 15 minutes is 200 microns.
10. Charge Properly—Refrigeration systems require accurate charging. Weigh the charge in or charge system to proper subcooling value. Refer to unit operation/maintenance manual for proper charging methods and proper superheat/subcooling valves.

Subcooling is determined by taking the refrigerant pressure in the liquid line at the liquid line king valve, converting it to a saturated liquid temperature, and subtracting the liquid line temperature. The difference between these two temperatures is subcooling. Standard range (unit running at full load) for water cooled products is 10°F to 15°F and for air-cooled products is 15°F to 20°F, with a minimum allowable at the expansion valve of 5°F.

Superheat is determined by taking the suction pressure, converting it to a saturated temperature, and subtracting that temperature from the suction line temperature. The difference between these two temperatures is superheat. It should be in the 16°F to

18°F range but should not exceed 20°F at the compressor.

Oil Sump Superheat is determined by measuring the external oil sump temperature of the compressor and the compressor saturated suction pressure (convert to saturated suction temperature). Oil Sump Superheat = External Oil Sump Temperature - Saturated Suction Temperature. Measure the external oil sump temperature on the bottom of the compressor, preferably in the center, with an insulated thermocouple.

11. Manifolder Compressors—Do not modify suction manifold piping. It contains one or more orifices for proper oil management. Modifying the manifold piping will result in improper oil return to the compressors.

Approved Oils for Trane Compressor Model CSHA and Interchangeability of CSHA and CSHS Compressors

This section explains the different use of approved oils for Trane 3-D™ scroll compressors used in Trane products. It discusses the logic for different oils shipped in factory units, and service replacement compressors and covers acceptable oil types for both manifolded and nonmanifolded sets. In addition, interchangeability of oils in CSHA 3-D scroll (gray color) and CSHS 3-D scroll (red color) compressors in a manifolded set is discussed.

Trane CSHA Compressors shipped with different types and viscosities of oil. [Table 1](#) lists the oils used with Trane CSHA and CSHS Compressors. OIL00031 is listed but was never used in the factory or service. It may be used in CSHA and CSHS compressors.

Table 1.

Model	Last Digit of Model #	Refrigerant	Compressor Source	Oil Part #	Wear Additive	Oil Type ^(a)	Viscosity
CSHS	A, B, C, D, E, F, G, H, J, O	R-22	Factory & Service	OIL00015	Yes	M	300 SUS
CSHS	^(b)	R-134a, R-407C, R-404A	Factory	OIL00037	Yes	POE	300 SUS
CSHA	0, A, B	R-22	Factory	OIL00042	Yes	M	150 SUS
CSHA	0, A, B	R-22	Service	OIL00045	Yes	M	300 SUS
CSHA	0	R-22	Pueblo-Chillers	OIL00015	No	M	300 SUS
CSHA	7, F, L	R-134a, R-407C, R-404A	Factory	OIL00078	Yes	POE	150 SUS
CSHS, CSHA	Same as listed above	R-22	Not used	OIL00031	Yes	M	300 SUS

(a) Oil Type: M= Mineral Oil, POE= Polyol Ester Oil

(b) Application Specific: Many military applications for OEM compressors used R-134a; these require POE oil.

[Table 2](#) is an oil compatibility table and the lists the recommended oils to use with different compressor combinations used in manifold sets or as a single compressor.



Introduction

Table 2.

Combination	Refrigerant	Oil Part Number
CSHS - CSHS	R-22	OIL00015
CSHS - Single	R-22	OIL00015
CSHA - CSHS	R-22	OIL00045
CSHS - CSHS	R-134a, R-407C, R-404A	OIL00037
CSHS - Single	R-134a, R-407C, R-404A	OIL00037
CSHA - CSHS	R-134a, R-407C, R-404A	OIL00037
CSHA - CSHA	R-22	OIL00045 or OIL00042
CSHA - Single	R-22	OIL00045 or OIL00042
CSHA - CSHA	R-134a, R-407C, R-404A	OIL00078 or OIL00037
CSHA - Single	R-134a, R-407C, R-404A	OIL00078 or OIL00037

When in doubt, use OIL00045 in R-22 compressors and OIL00037 in compressors that operate on R-134a, R-407C, or R-404A.

CSHS 3-D scroll compressors (red color) require 300 SUS oil for maximum bearing life. Many CSHA 3-D scroll compressors (gray color) ship with 150 SUS oil in products but can use either 150 SUS or 300 SUS oil.

All CSHA R-22 Service Compressors use OIL00045 to be compatible with the previous model CSHS compressors.

All CSHA Service Compressors with POE oil ship with OIL00078, if the compressor is used with a CSHS in a manifold set in the same circuit, the oil must be changed to OIL00037 in both compressors.

Compatibility of Compressor Oils and Affects on the System

- The use of 300 SUS oil reduces unit efficiency by less than 1 percent.
- The use of an oil with an anti-wear additive in the oil in a system that previously did not have an oil with an anti-wear additive will not be harmful to the system in any manner.
- Mixing of two of different viscosities of mineral oil will not cause any harm to the compressor.
- Do not mix POE oils since they are individually blended oils. If changing a compressor with one viscosity of POE oil, change the oil in the replacement to match what is in the system.
- If replacing a single compressor with POE oil, the residual amount left in the system will not cause a problem.

Replacement of compressors in a manifold set

Any time a compressor in a manifold is replaced, the oil in each compressor in that circuit must also be changed. This will minimize the oil contamination resulting from the compressor failure, and will improve compressor life and reliability of the remaining compressors. When system cleanup is necessary due to a motor burn or “dirty” mechanical failure, refer to general service bulletin HCOM-

SB-45B (General Service Bulletin: System Clean Up after Compressor Failure, Using a Suction Line Filter-Drier and Oil Acid Test Kit), or the most recent version, for cleanup instructions.

Table 3 provides the oil charge in pints for each model and size.

Table 3.

Model	Oil Charge Amount (Pints)
CSHS093 and CSHS100	8
CSHS140 and CSHS150	14
CSHA093 and CSHA100	8.5
CSHA125, CSHA140, and CSHA150	13.8

Notes

Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

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