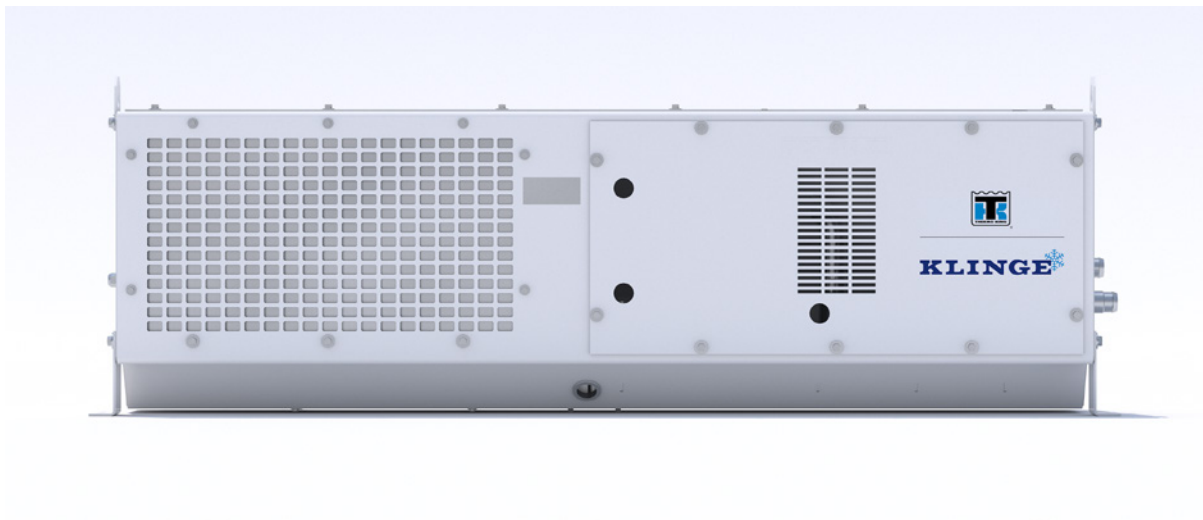




KLINGE 

ATEX Manual



MODEL TCR-110 Z2

ROAD TANKER AND ISO TANK CONTAINER REFRIGERATION UNIT
FOR ZONE 2 HAZARDOUS LOCATIONS CERTIFIED TO ATEX ZONE 2

 II 3 G

Ex db eb h nA nC IIB T3 Gc



TRANE
TECHNOLOGIES™

REVISION RECORD

Rev	Description	Date	Approved
C	polyolester was polyol ether (pg 24)	2016/06/09	BES
D	Changed Glycol Temp Limit Switch illustration, pg 15; updated Limit Chart, pg 52	2016/07/12	BES
E	Pg 81 Item 6 was K31-00858-40, re-printed to show illustrations on pgs 74, 76, 78 & 80	2016/11/09	BES
F	Inserted "Main Power Connection" at 1.11.2, updated electrical schematic, added "UNCONTROLLED IF PRINTED" to footer	2016/11/30	BES
G	Updated Section 7.5 Piping Schematic (pgs 66 & 67)	2017/03/28	BES
H	Revised manual part number (was K35-05850-53), added Service and Spare Parts Request information (pg 4)	2018/02/14	BES
J	Added probe accuracy table (pg 19)	2018/04/30	BES
K	Added Dual System alarm codes A41 & A42 to Alarm Code table	2018/06/01	BES
L	Revised Section 3.1, Section 7.6B Item 6 was K31-00858-40	2018/08/08	BES
M	Removed standard operation, service and parts information, creating ATEX specific information document	2020/9/30	BES
N	Updated ATEX string	2021/08/09	BES
P	Updated per Intertek review	2023/06/20	BES
R	Added refrigerant R-513A	2025/02/11	BES

Use of this Manual

This manual must be used in conjunction with the current revision of Klinge Corporation manual TCR-110 Z2 Operation Manual.

The use of this manual is intended for the safe operation of the equipment described. It is therefore reasoned that persons who have the occasion to use this manual have a knowledge of mechanical and electrical systems and components addressed by its' contents. However, efforts have been made to enable persons less familiar with these systems to use this manual.

The equipment may be installed in a number of configurations. Each may have optional items and differing external details provided by third parties. The specific electrical circuit and pipe diagram are posted on the unit as decals.

Most external and internal pipework parts are standard commercially available pipe fittings and not covered here. For external pipe fitting, replace like for like, taking care to replace stainless steel with stainless steel.

This form will help us determine model and age of the equipment, location, basic details about the issue, who to contact and how to best handle the issues with the equipment. A service ticket number will be provided in a response email once the form is received and processed. If the equipment is out of warranty, charges may apply for extensive technical support.

Suggestions as to improvement in content and format are welcome and should be addressed to engineering@klingecorp.com. Corrections and improvements will be included on dated revisions – the latest of which will be available upon request.

Service Request

Requests for Service should be directed to the Klinge Service Team. The below link should be used to place all requests for service and will afford the quickest response time.

<https://klingecorp.com/request-service/>

This form will help us determine model and age of the equipment, location, basic details about the issue, who to contact and how to best handle the issues with the equipment. A service ticket number will be provided in a response email once the form is received and processed. If the equipment is out of warranty, charges may apply for extensive technical support.

Additionally, our Service Department can be reached via email at technical@klingecorp.com.

Spare Parts Request

Requests for Spare Parts should be directed to our Parts Department via email at spares@klingecorp.com. Please have available at the time of the request the Serial Number of the equipment to ensure that the proper part is provided.

Common Optional Items Are:

- Electrical heat - any size up to 12kW can be provided. There are several mounting locations on the TCR unit for the heater but it may also be mounted on the container. The preferred orientation of a heater is to have it piped in series with the outlet of the pump with the element horizontal.
- Various heat transfer fluids
- Onboard independent data logger.
- Remote telemetering signals to an external data logger and/or
 - Satellite communication aerial.

As stated elsewhere, various heat transfer liquids can be used specific to the application, the common heat transfer liquid being diluted ethylene glycol for most chemicals and diluted propylene glycol for food grade tanks. For high temperature cargoes synthetic oils may be used. For very low temperature and hazardous cargoes that react with water or water-based coolants "Dowtherm Q" has been used.

- Special note on using Dowtherm Q

Dowtherm Q is a by-product of Diphenylethane Ethylenated benzene, a proprietary composition and brand of low temperature heat transfer liquid made by Dow Chemicals. It is an excellent heat transfer liquid with a freezing point of -40°C. It is not a "hazardous chemical" as defined by the USA OSHA Hazardous Communication Standard, 29 CFR 1910.1200, but must be handled with care.

Maintenance mechanics should be made aware of the hazards of handling the liquid and the local legislation relating to recycling, recovery and disposal. This is available on the appropriate safety data sheet.

Klinge can fax or email you the latest revision of the US/Canadian Material Safety Data Sheet or your local Dow Chemical sales and technical support office can send you a copy of the same data particular to your location, language, custom and legislation.

It is a paint stripper, keep it off the tank's paintwork. It will dissolve bitumen, black top road surfaces, keep it off the tarmac. Over time coolant reacts with and dissolves natural and synthetic rubbers and some plastics as used in the flexible hose, the pump seal and the bladder of the pneumatic expansion tank.

This requires a planned maintenance program to periodically inspect and replace these parts. Klinge Corporation Engineering Department can give advice on a particular installation configuration and service interval. The owner and operator are encouraged to contact engineering@klingecorp.com once the tank using Dowtherm Q enters service.

Table of Contents

General Safety 6

Equipment Cleaning7

Dismantling and Disposal.....7

1. Refrigeration Unit8

2. ATEX Compliance.....8

3. ATEX Certification9

4. Special Conditions For Safe Use 10

5. Conditions where the equipment shall not be used -10

6. Ignition Hazard Assessment 10

General Safety



Refer to Operation and Service Manual before operating and servicing equipment.



Use proper lockout/tagout procedures before servicing equipment.



Wear ear protection when working around the equipment for extended periods of time.



Safety glasses should be worn at all times when operating or servicing the refrigeration unit.



Do not use this Equipment for any purpose not described in this Manual.



Do not operate this equipment without all guards and covers in place.



Do not operate this equipment from any power source that does not match the voltage rating stamped on the equipment. Refer to the Manufacturer's Identification Label for operational requirements.



Beware of high voltage (400-480 volt) in various parts of the unit, especially when CB1 is in the ON position. It is recommended that a thorough study of the wiring diagram be made to determine where high voltage may be encountered when electric power is fed to the unit.



Note: The electrical system will automatically restart the unit in case of power failures.



Refrigerant is heavier than air. Therefore, it settles in the lowest places and will expel air (oxygen) from a small confined space, resulting in dizziness or suffocation to an occupant.



Arc flash potential when equipment is operating.



Fans present possible hand injury when equipment is operating.

When installing, operating or servicing the equipment, follow all local regulatory standards.

All service and maintenance procedures should be performed in accordance with Section 608 of the Clean Air Act (CAA), prohibiting the venting of refrigerants into the atmosphere and providing for the use of refrigerant recycling and recovering equipment to be used whenever a system is opened.



Always wear approved goggles or eye shields when working with refrigerant to prevent eye injury if refrigerant is accidentally discharged into the face of the service engineer.

- When any work is to be done on the components of the refrigeration system, be sure that the unit cannot be started automatically or accidentally. If valves are closed and/or circuits interrupted during service procedures, the control switches should be suitably tagged with such notations.
- Do not exert excessive pressure when tightening flare nuts, as it may result in a rupture of the flare or stripped threads.
- Never, under any circumstances, apply heat to a refrigerant cylinder by using a naked flame. Should it be considered necessary to apply heat to a cylinder to create a refrigerant flow when recharging a system, place the cylinder in a container of hot or warm water to a point about 3/4 of the height of the cylinder.
- Even this method requires that a pressure gauge is in use in the charging line to indicate the pressure in the cylinder at all times.
 - Never close the shut-off valve in the cylinder while the cylinder is being heated.
 - The use of a manifold gauge set will permit compliance with CAA regulations by having a gauge in the line and a shut-off valve on the manifold to stop the flow of refrigerant into the system and allow the gauge to read cylinder pressure.
 - Always replace refrigerant cylinder valve and connection caps after using the cylinder, and do not permit a cylinder to be dropped or hit severely by another object.

Equipment Cleaning

If it should become necessary to clean the exterior of the electrical panel of this equipment, do not use liquid cleaners, aerosols, abrasive pads, scouring powders or solvents, such as benzine or alcohol. Use a soft cloth lightly moistened with a mild detergent solution.

Dismantling and Disposal



Hydraulics/Lubricants – Must be recycled as required by local environmental law – do not dispose of by pouring down the drain.



Electronics – Must be recycled as required by local environmental law – do not dispose of by adding to the Municipal waste stream.



Metal/Other Parts of the System – Must be recycled as required by local environmental law.



Refrigerant – Must be reclaimed and recycled as required by local environmental law. Do not release refrigerant into atmosphere.

1. Refrigeration Unit

The Klinge Model TCR-110-Z2 refrigeration unit is designed specifically for operating in Zone 2 Hazardous Locations. The unit is charged with R-404A, R-452A, R-134a or R-513A refrigerant.

⚠ WARNING

The control box can only be opened in a hazardous location when the flow of power has been cut using the Main Power Disconnect Switch.

This unit is designed to maintain temperatures from -20oC (-4oF) to +29oC (84oF) automatically, utilizing cooling and optional heating cycles.

The unit is designed to operate on 400/480 volt AC +/-10%, 3 phase 50/60 Hz +/-2.5%.

Control System power is provided by a single-phase transformer which steps down the high voltage power source to 24 volt and 14 volt AC single phase.

A self-diagnostic function test checks the condition of the refrigeration unit automatically and is performed by the microprocessor thermostat. This saves labor costs and makes pre-trip inspections reliable.

A phase sequence sensing and control system is installed in the electrical control section; this system will automatically reverse two of the phases if required to correct component rotation, regardless of the incoming phase sequence of the power.

All motors, including the compressor, are equipped with automatic reset internal thermal overload protection.

The unit is delivered complete with a charge of refrigerant, compressor lubricating oil, mode-indicating LEDs, and microprocessor thermostat, factory tested and ready for operation upon installation.

2. ATEX Compliance

The Model TCR-110-Z2 Container Refrigeration Unit complies with the following:

EN 60079-0: 2018	Explosive atmospheres - Part 0: Equipment - General requirements
EN 60079-1: 2014	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
EN 60079-7: 2015/A1:2018	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"
EN 60079-15: 2010	60079-15:2019 Explosive atmospheres. Equipment protection by type of protection "n"
EN 14986: 2017	Design of fans working in potentially explosive atmospheres
EN ISO 80079-36:2016	Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic method and requirements
EN ISO 80079-37:2016	Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres - Non-electrical type of protection constructional safety 'c', control of ignition sources "b", liquid immersion "k"

3. ATEX Certification

The Klinge Model TCR-110-Z2 refrigeration unit has received ATEX Certification for use in Zone 2 Hazardous Locations.

Zone 2 is defined as an area in which ignitable concentrations of flammable gases or vapors:

- Are not likely to exist under normal operating conditions,
- May exist for short periods.

The TCR-110-Z2 system uses components that will not cause ignition of explosive gases or vapors.

Description of ATEX Certification

 II 3 G

Ex db eb h nA nC IIB T3 Gc

Tamb -20°C to +45°C

Specific marking for Explosion Protection

II	Equipment Group	
3	Equipment Category	
G	Environment	Gas
Ex	Explosion Protection	
db	Type of Protection	Flameproof Enclosure
eb	Type of Protection	Increased Safety
h	Type of Protection	Constructional Safety
nA	Type of Protection	Increased Safety
nC	Type of Protection	Increased Safety
IIB	Gas Group	Gases, Vapors and Mists - Ethylene
T3	Temperature Class	200°C (392°F)
Gc	Equipment Protection Level	Suitable for Zone 2
Tamb -20°C to +45°C Ambient temperature range of operation		

4. Special Conditions For Safe Use

- An appropriate cable conforming to the standards shall be used when connecting to the Main Power Disconnect (Part Number K25-26760-01).
- The equipment should be installed in accordance with EN 60079-14 and EN 60079-17.
- Before energizing the system, ensure the electrical control box cover is secured, with all fastening bolts tightened to a torque of 88.1 N m (65 lb.-ft.) when dry. If bolts are lubricated (use only petroleum jelly), the torque value is 67.8 N m (50 lb.-ft.).
- Before energizing the system, ensure the cover of the auxiliary junction box (if so equipped) is secured, with all fastening bolts tightened to a torque of 47.5 N m (35 lb.-ft.) when dry. If bolts are lubricated (use only petroleum jelly), the torque value is 36.6 N m (27 lb.-ft.).

5. Conditions where the equipment shall not be used –

- IIC (Hydrogen, Acetylene, etc.)
- The system shall not be operated in an outdoor environment without all cover panels in place.
- The system shall not be operated in a hazardous environment if there are signs of worn or frayed cables.

6. Ignition Hazard Assessment

Potential Ignition Source

- Hot Surfaces – The system was designed and has proven through testing to maintain surface temperatures less than T3 maximum, while in an ambient temperature of 45°C.
- Mechanically Generated Sparks – Minimum clearance requirements between rotating and stationary parts are maintained per EN 14986 also meeting the material requirements of EN 60079-0.
- Electrical Arcing – Certified EX components or enclosures have been used in the design of the system.
- Static Electrical Discharge – When contacting the solenoid coil, compressor junction box, condenser fan or evaporator fans a clean moist cloth must be used.
- Stray Electric Currents – Metal to metal contact of electrical components protects the system from stray electric currents, maintaining equal electrical potential.



Thermo King – by Trane Technologies (NYSE: TT), a global climate innovator – is a worldwide leader in sustainable transport temperature control solutions. Thermo King has been providing transport temperature control solutions for a variety of applications, including trailers, truck bodies, buses, air, shipboard containers and railway cars since 1938. For more information, visit www.thermoking.com or www.tranetechnologies.com.

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