

KDC2000F Helium Compressor Operating Manual

CATALOGUE

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SAFETY

GENERAL

CSIC Pride(Nanjing) Cryogenic Technology Co.,Ltd. (CPCT) equipment is designed to operate safely when the installation, operation and servicing are performed in accordance with the instructions in this technical manual. For Service Center locations, see the Service section of this manual.

SPECIAL NOTICES

Three types of special notices -- WARNINGS, CAUTIONS and NOTES are used in this technical manual.

WARNINGS

WARNINGS call attention to actions or conditions that can result in serious injury or death.

CAUTIONS

CAUTIONS call attention to actions or conditions that can result in damage to the equipment or in abnormal performance.

NOTES

NOTES give important, additional information, explanations or recommendations related to the appropriate topic or procedure.

Like other safety instructions, appear within rectangles in the text where they are applicable. Because of their importance, they are summarized in this Safety section and in the General Technical Manual, and should be read first.

WARNINGS!

AVOID ELECTRIC SHOCK.

All electrical supply equipment must meet applicable codes and be installed by qualified personnel.

Disconnect the power to the compressor before troubleshooting the electrical components.

Permit only qualified electrical technicians to open electrical enclosures, to perform electrical checks or to perform tests with the power supply connected and wiring exposed. Failure to observe this warning can result in serious injury or death.

AVOID INJURY.

Never use compressed helium gas from a cylinder without a proper regulator. Overpressure can cause serious injury if the system equipment ruptures.

During operation, some surfaces under the compressor's cover become hot. Allow the compressor to cool for 1/2 hour after shutdown before removing the cover for maintenance.

Always wear eye protection when handling pressurized gas lines and other pressurized equipment. Never apply heat to a pressurized gas line or other pressurized components.

Disconnect gas lines only when the compressor is stopped. Disconnecting the cold head while it is cold can create excessively high internal pressure as the gas warms. Material failure and uncontrolled pressure release can cause serious injury.

Use two wrenches when disconnecting a gas line coupling to avoid loosening the cold head or compressor coupling. Gas pressure can project the coupling with enough force to cause serious injury.

The compressor is charged with helium gas. Except when disconnecting the adsorber or the gas lines, vent both supply and return Aeroquip couplings to atmospheric pressure before disassembly.

Always vent a gas-charged component before beginning to disassemble its couplings. Gas pressure can launch a loose coupling with enough force to cause serious injury.

The adsorber is charged with helium gas. Follow the used adsorber venting procedure for safe disposal of the used adsorber.

CAUTIONS!

PRESERVE YOUR WARRANTY.

Equipment without warranty will void warranty. Modification to equipment without the consent of the manufacturer will void the warranty. Specifications require the use of 99.999% pure helium gas. Using a less quality helium can damage the system and void the warranty.

AVOID GAS LEAKS.

Check the condition of the gasket face seal. Be sure the gasket face seal is in place and the sealing surfaces are clean before connecting. Replace the gasket face seal if it is damaged or missing. Keep the gas line couplings aligned when making or breaking a coupling connection. Leaks can occur due to the weight of the gas line or due to a sharp bend near the connection.

AVOID CONTAMINATION.

When checking the compressor for shipping damage, do not connect the gas lines and the cold head. The components may become contaminated with compressor oil. Follow the charging or venting procedures to prevent reversed flow of system gas. Do not charge through the supply coupling. Do not vent through the return coupling. Reversed flow can contaminate the system with compressor oil. A leaking coupling on an Adsorber should not be repaired in the field. Consult a Service Center. Venting the Adsorber will introduce contaminants to the system, which cannot be removed in the field.

PREVENT EQUIPMENT DAMAGE.

Damage to gas lines can result from crimping by repeated bending and repositioning. Always thoroughly drain the coolant from the cooling circuit if the compressor is to be shipped or stored. If the compressor is wired for 220 ($\pm 10\%$) V1~ electrical service, connecting to a higher voltage may damage the control circuit. Never pull a vacuum on the compressor or on the cold head. The motors will short circuit if started.

AVOID A MALFUNCTION.

Repeatedly charging the system with helium gas rather than locating and repairing gas leaks can cause a malfunction. Impurities are introduced at an abnormal rate and can freeze in the cold head. Do not allow air to get into the helium gas refrigerant of the system. Moisture from the atmosphere can seriously degrade cold head performance.

AVOID EQUIPMENT FAILURE, CONTAMINATION OR A NUISANCE SHUTDOWN.

Do not tip the compressor greater than 5 degrees from horizontal, to avoid flowing oil into unwanted places.

SERVICE

SERVICE CENTER

Address: No.32 Changqing Street, Jiangning Development

District, Nanjing 211106, China

TEL: +86-25-68626268

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INTRODUCTION

Helium Compressors, Model KDC2000F

The compressors are designed to deliver high-pressure, oil-free, helium gas to cryogenic refrigerators. Cold head cables are used with the compressor to supply electrical power to cold heads. Self-sealing gas couplings allow for easy connection to and disconnection from the rest of the closed-cycle cryogenic refrigeration system.

Pressures are stated as gauge, not absolute. Pressure units are bar and pounds per square inch (psig). For reference:

1 bar = 14.5 psig.

1 MPa = 10 bar

Definition of Symbols used in this manual and on equipment:






Symbols	Definitions
	Mains Disconnect On
	Mains Disconnect Off
	Note
	Protective Earth (Ground)
	Dangerous Voltage

Figure1 Symbols and Definitions

PRINCIPLES of OPERATION

The compressor continuously draws low-pressure helium from the system return line. It compresses, cools and cleans the gas, then delivers it through the system gas supply line to the cold head. See Figure 2.

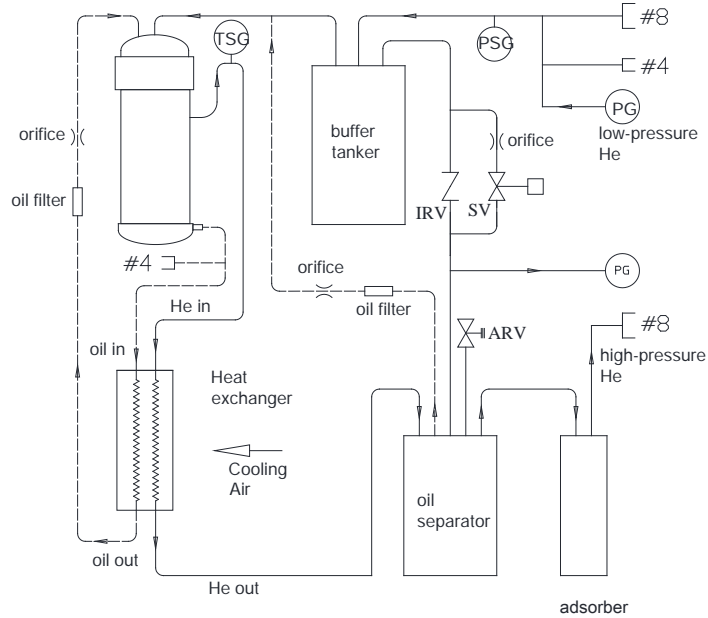


Figure 2 Compressor Flow Diagram

Key

Acronyms	Explanations
TSG	Gas temperature thermistor
ARV	Atmospheric relief valve
IRV	Internal relief valve
SV	Solenoid valve
PT	Pressure transducer
PG	Pressure gauge

When helium gas leaves the compressor capsule, the gas contains heat and compressor lubricant. Both must be removed. From the compressor capsule, the hot gas with its entrained oil flows out of the shell. The gas next flows through one circuit of a three-circuit, Air cooled, heat exchanger, where it is cooled. Next, the gas passes through the oil separator and the Adsorber for oil and moisture removal. From the Adsorber, the high-pressure helium gas flows to the cold head through the gas lines.

Through the system gas return line, low-pressure gas from the cold head flows into the compressor. A gas line containing an internal relief valve (IRV) connects the high-pressure line to the low-pressure line. The relief valve will open to prevent overloading the motor when the system gas lines are not connected to the compressor.

Oil is separated from the gas in three stages. The first stage is by gravity when the gas passes through the first stage oil separator. The second stage is in the second oil separator whose element collects oil mist from the gas; oil is agglomerated and returned to the compressor. The third stage is the Adsorber that removes any remaining oil the gas is carrying.

Oil collected in the oil separators flows back to the compressor capsule through capillary tubes and orifices. The differential gas pressure across the system is the moving force, and the restriction size limits the amount of gas bypassed. The small amount of oil collected in the Adsorber remains there and is removed only by replacing the Adsorber.

Before being returned to the compressor capsule, the oil separated in the first stage oil separator flows through the heat exchanger where it is cooled. It is then injected into the low pressure side of the compressor capsule to absorb heat and lubricate the compressor capsule.

DISCRIPTION

Components

Helium Supply and Helium Return Pressure Couplings

Both supply (high pressure) and return (low pressure) are self-sealing, size 8, male (8M), Aeroquip, bulkhead couplings and are the points of connection on the front panel for the gas lines.

Helium Charge

A size 4, male (4M), Aeroquip coupling located on the front of the compressor is used for charging or venting helium gas refrigerant.

Pressure Gauge

Indicates gas pressure in the supply line and gas return line. When the compressor is not running, the two (2) gauges located on the compressor' s front panel shows the equalization pressure.

Cold Head Power Receptacle

Mounted on the front panel for connecting a cable to supply electrical power from the compressor to the cold head.

Mains Power Switch

Mounted on the front panel, it provides a means to disconnect power and it protects the compressor from electrical overload. This device is labeled "Main Power" .

Fuses

One (1) (250V-GB13539) fuses, located inside the electrical chassis box, protect the overload of input circuit. Electrical Chassis - The electrical box contains electrical components and connections and distributes power to all system circuits.

Heat Exchanger

Uses air to cool the high-pressure helium refrigerant and the compressor' s lubricating oil.

Oil Separator

Removes most of the remaining entrained oil from the gas stream. This unit needs no servicing or replacement.

Oil Orifice

The orifice returns oil collected in the oil separator sump to the compressor for recycling.

Adsorber

The adsorber removes any oil and moisture the gas is carrying which did not drop out in the separator. The adsorber has a finite life and must be replaced at regular intervals.

Atmosphere Relief Valve [ARV]

The pressure relief valve prevents the compressor from operating at an unsafe pressure by venting to the atmosphere.

Oil Filter

Filters in the oil lines ensure that the oil returns to the capillary and orifices is clean, and won't block the capillary and orifices.

Compressor High Temperature Motor Protector Switch

Located inside the compressor motor, the switch senses compressor motor temperature and stops the motor if the temperature is too high. The switch resets after cool down.

Supply Gas High Temperature Thermistor

Senses discharge gas temperature. It causes the compressor to shut down if the temperature of the high-pressure helium from the compressor is too high.

Oil Injection Orifices

These orifices are installed in the oil return lines and control the flow rate of oil returned to the compressor.

Internal Relief Valve [IRV]

The internal relief valve opens to allow the compressor to be operated in the stand-alone mode or when the system gas lines are disconnected, to avoid overloading the motor.

SPECIFICATIONS

KDC2000F Compressor Details

Two (2) size 8M gas couplings; Air-cooled; $\sim 220V (\pm 10\%) V1 \sim 50Hz$

Electrical Characteristics

Service required: Delta connected, 3 wires (single phase plus protective ground or earth.) A screw-mounted, detachable connector is provided on the electrical front panel for connecting power to the compressor.

Power consumption:	Gifford-McMahon (GM) Operation	Startup
KDC2000F	3.0 - 3.2kW@50Hz	< 3.5 kW@50Hz

Rated load current:

For the KDC2000A compressor, 16 amperes

Locked rotor current:

For the KDC2000A compressor, 25 amperes at 50Hz

Internal circuit protection

Cold head motor: One (1) (10A 250V/3A) fuses, located on the circuit, supply and protect cold head motor.

NOTES

POWER OPTION power supply of 50Hz 220V@V1 is preferred, which is used to drive KDE401 cryocooler; Abnormal sound will occur in the motor if 60Hz power supply is used.

Cold head power requirement: 220 V \sim , 0.2~0.3amperes, supplied from the compressor for KDE401 series.

Cold head power supply:

A cable connects the cold head to the compressor.

Class I:

Grounded equipment

Compressor control logic provides:

- ON and OFF buttons for operation of the compressor and the cold head.
- Front panel LCD display of operating time.
- Automatic restart of compressor after power interruption.
- Automatic shut off for the following system faults.
 - High gas discharge temperature, when thermistor reads > 93° C
 - High compressor motor windings temperature, switch opens at 160° C, resets at 69° C.
 - High compressor motor current draw: KDC2000A trips at 17 amperes.
 - Low gas return pressure, < 2.5bar

Front Panel Connections (See Figure 3)

- Helium gas connections: size 8, male (8M) Aeroquip couplings, high-pressure supply and low-pressure return.
- Helium fill port: size 4, male (4M) Aeroquip coupling.
- Mains power connector: Rectangular industrial connector

Environmental Requirements

Item	Operating	Storage
Ambient Temperature	4-30°C	-20-50°C
Relative Humidity	30%—70%	10%-90% (non-condensing)
Magnetic Field Limits	≤50 Gauss	
Atmospheric Pressure	70kPa-110kPa	20kPa-110kPa

NOTES

Operating the equipment out of specifications may void the warranty.

Mounting Position

Compressor must be mounted base down and level within 5 degrees of horizontal.

Refrigerant Quality

Refrigerant is 99.999% pure helium gas with a dew point temperature less than -50° C at 20.7 bar.

CAUTION!

PRESERVE YOUR WARRANTY.

Specifications require the use of 99.999% pure helium gas. Using a lesser quality of helium can damage the system and void the warranty.

Color Codes

SUPPLY (Yellow) - Helium high-pressure gas supply from the compressor to the cold head.

RETURN (Green) - Helium low-pressure gas return to the compressor from the cold head.

Optional Spacing

Allow 600 mm space in front of the compressor for access to electrical, gas connections. Allow 600 mm space on the left and right side (when facing the front) of the compressor for maintenance of the adsorber and air flowing. Allow 400 mm space on the back for fan airway.

Maintenance Intervals

Compressor adsorber: 27000 operating hours (3 years)

Noise Level

< 70 dB(A) at 1m

Dimensions

See Figure 4. Four removable eyebolts are furnished for lifting.

Weight (approximate)

Compressor: 89 kg

General Operating Conditions

Normal pressure and temperature data are listed above. User should record monthly the operating conditions in a logbook. Keep this record of data for reference and later comparisons.

Supplier Name and Address

CSIC Pride(Nanjing) Cryogenic Technology Co.,Ltd.
No.32 Changqing Street, Jiangning District, Nanjing 211106 P.R.C.
TEL: +86-25-68626268

Application of Q/320115 NJKD01-2011 Standard

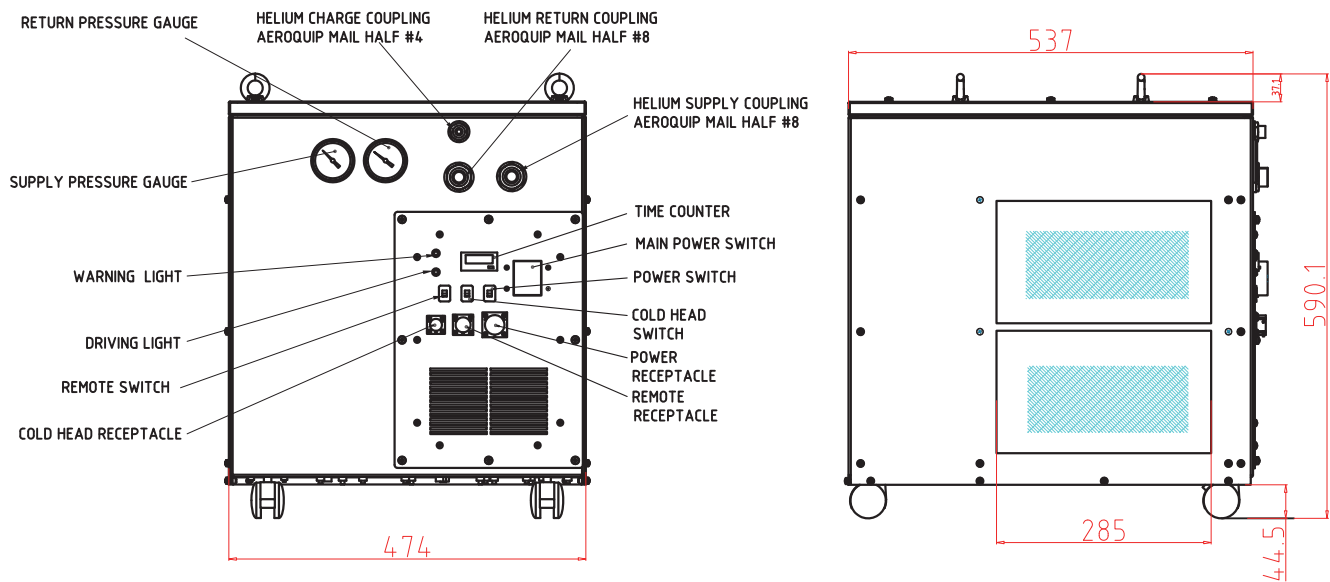


Figure 3 KDC2000F Compressor, Front View

INSTALLATION

Introduction

Install the KDC2000F Compressor, Cold Head Cable and the Gas Lines according to the following procedures. The following installation procedures are based on standard arrangements of equipment, using CPCT standard components.

To prevent contaminating the components or the system, it is important to follow the procedures in this manual step by step.

NOTE

Be sure to have 99.999% pure helium gas available for installation of the system. See Refrigerant Quality in Specifications.

Receipt Inspection Instructions

CAUTION!

AVOID EQUIPMENT FAILURE, CONTAMINATION OR A NUISANCE SHUTDOWN.

Do not tip the compressor more than 5 degrees from horizontal to avoid flowing oil into unwanted places.

CAUTION!

AVOID CONTAMINATION.

When checking the compressor for shipping damage, do not connect gas lines and cold head. The components may become contaminated with compressor oil.

1. Upon receipt, inspect the shipping container and the compressor for damage.
 - 1.1 If there is any evidence of external damage to the container, be sure the carrier's driver sees the damage. Note it on the shipping documents and have the driver acknowledge it by his initials on the delivery receipt.
 - 1.2 Remove the compressor from its shipping container and inspect for damage. If there was external damage to the compressor, remove its covers and check for internal damage. Notify the carrier immediately and take photographs of the damage to document your claim to the carrier. Keep the damaged shipping container.

NOTE

Retain the shipping containers, if reusable, for returning the components to the factory if reconditioning is required. If internal damage is suspected, retain the shipping container for proof to the carrier.

2. Inspect for Proper Charge Pressure

- 2.1 The Charge Pressure of the Compressor Unit can be checked from the outside of the shipping container without removing the packaging.
- 2.2 Look through the “peep hole” on the container. View the pressure gauge on the Compressor Unit front panel. The pressure gauge should indicate 217-225 psig at 20° C.
- 2.3 If the gauge indicates 0 psig (0 bar), the Compressor Unit cannot be used. Contact the supplier.

3. Upon receipt, inspect Tip-N-Tell Sensor on Package for Activation

- 3.1 The Tip-N-Tell sensor mounted on the shipping container package surface should be checked upon receipt and before unpackaging to verify the “Compressor Unit shipping container” was NOT tipped during transport.
- 3.2 If activated, Tip-N-Tell sensor won't turn red in the arrow as shown below. Proceed with internal inspection. If the sensor turns red, notify the carrier immediately and take photographs of the tip to document your claim to the carrier.



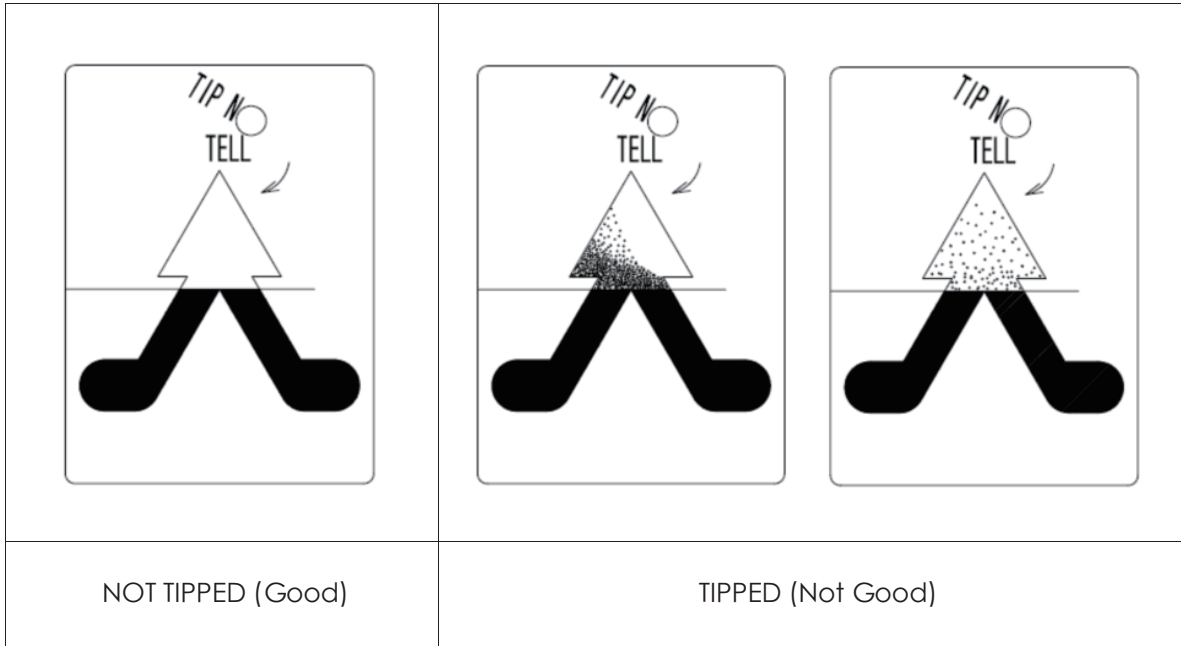
Unpackaging and Product Inspection Instructions

1. Unpackaging Instructions

- 1.1 Remove the straps around the package.
- 1.2 Remove the Packaging Cover Shell and Inside Cushions.
- 1.3 Put down the side board, place on end on the flat floor, and insert the sealing bar in the container into the gap between the floor and slope.
- 1.4 Hold the compressor steadily, and pull it out of the package along the track slowly.
- 1.5 Retain the reusable shipping container parts for possible reuse. This includes the wooden base, cushion blocks, cushion sealing bars, and etc.

2. Inspect the Tip-N-Tell Sensor on Compressor Unit for Activation.

2.1 Check the Tip-N-Tell sensor mounted on the compressor rear panel. If the Tip-N-Tell sensor shows no mishandling and there is no apparent physical damage, skip Steps 2.2 and 2.3 and proceed to the section Compressor Location.



2.2 The equalization pressure is within specifications:

If the compressor has been momentarily tipped (less than one hour) and the equalization pressure is within specifications, allow it to stand upright for two hours before performing this step.

⚠ WARNING!

AVOID ELECTRIC SHOCK.

All electrical supply equipment must meet applicable codes and be installed by qualified personnel. Permit only qualified electrical technicians to open electrical enclosures, to perform electrical checks or to perform tests with the power supply connected and wiring exposed. Failure to observe this warning can result in serious injury or death.

⚠ CAUTION!

PREVENT EQUIPMENT DAMAGE.

If the KDC2000F compressor is wired for 220 (± 10%) V1~, 50Hz electrical service, connecting to a higher voltage may damage the control circuit.

Connect power to the compressor. See the next sections Compressor Location, Electrical Supply Connection, Coolant Connections. Test run the compressor for two (2) hours minimum. If there are no problems during this time, stop the compressor and proceed to assemble the system.

If the compressor malfunctions during the two (2) hour test, contact the supplier. TEL: +86-25-68626268; FAX: +86-25-68626273.

2.3 If the equalization pressure is outside the specified range or there is physical damage to the compressor enclosure or the compressor has been on its side or upside down for an extended period of time (more than one hour), contact the supplier and notify the delivering carrier of the damage.

NOTE

When checking the compressor for shipping damage, do not connect gas lines and cold head. The components may become contaminated with compressor oil.

3. Inspect for Visible Damage of Compressor Unit.

3.1 Inspect the exterior panels of the Compressor Unit for evidence of damage.

3.2 If there was external damage to the compressor, remove the compressor unit panels and check for internal damage. Notify the carrier immediately and take photographs of the damage to document your claim to the carrier.

3.3 If any irrecoverable damage is found (e.g. oil Leakage, panel deformation), contact the supplier.

Compressor Location

Place the compressor in a location that is protected from the elements and where the ambient temperature will always be within the range of 4° C to 30° C.

The compressor must be installed base down, within 5 degrees of horizontal, and preferably at a height convenient for making connections and reading the pressure gauge.

Allow 600 mm space in FRONT of the compressor for access to electrical and gas connections. Allow 600 mm on the RIGHT side (when facing the front) of the compressor for maintenance of the adsorber. Allow 600 mm on the LEFT side (when facing the front) of the compressor for Air flow. Allow 400 mm on the BACK side of the compressor for FAN AIRWAY.

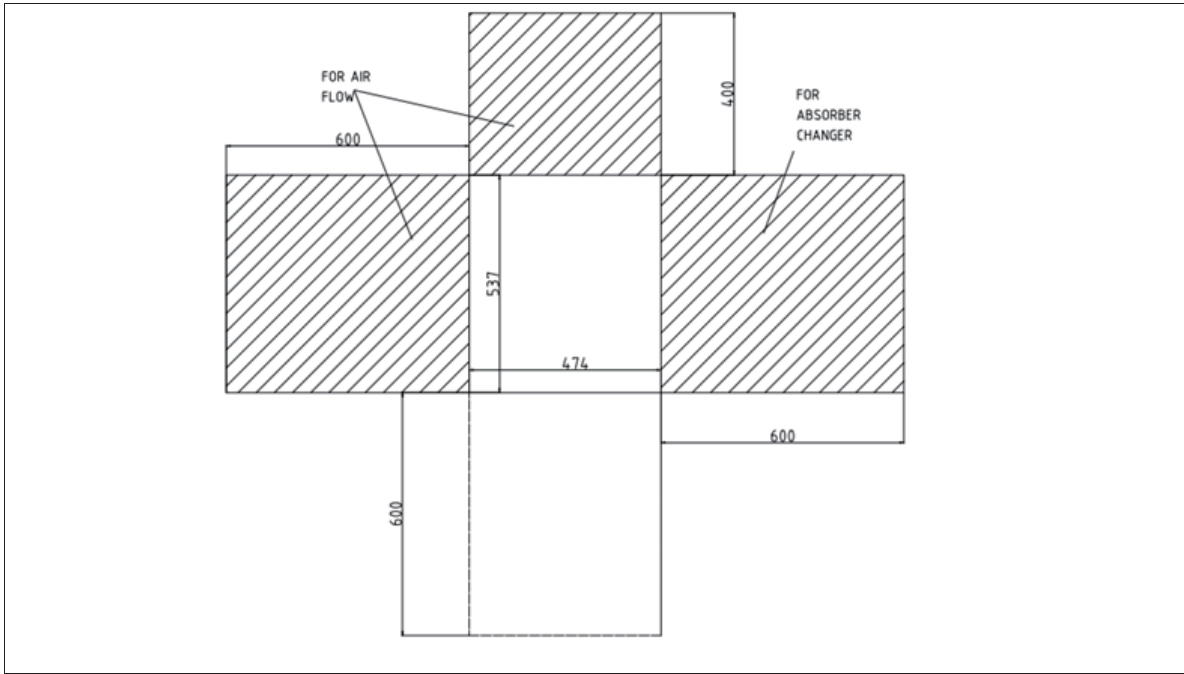


Figure 4 Location area for KDC2000A Compressor

Compressor Electrical Control Panel

See Figure 5.



Figure 5 Electrical Control Panel

Compressor Voltage Selection

The KDC2000F Compressor is factory set for 220 V1~@50Hz. Don't use the other power source. A phase separation circuit is used in the compressor to keep coldhead motor running smoothly, as the single phase power source can't drive the motor along. Specific resistor and capacitor are used to design the phase separation circuit. They are chosen based on the power source of 220V@50Hz.

Before power is supplied, the following procedure must be applied.

WARNING!

AVOID ELECTRIC SHOCK.

Permit only qualified electrical technicians to open electrical enclosures, to perform electrical checks or to perform tests with the power supply connected and wiring exposed. Failure to observe this warning can result in serious injury or death.

CAUTION!

PREVENT EQUIPMENT DAMAGE.

The motor for KDE401 cryocooler is wired 3-phase power. But a single phase power is used for KDC 2000F. An internal phase circuit is equipped in electronic control box. Through the using of resistance and capacitance, the refrigerator drive power is transformed from single-phase into three-phase power to drive. Resistors and capacitors are selected according to 50Hz and the cryocooler. If you replace the 60Hz power supply to drive the compressor or replace the other series of refrigerators, you need to re-match the resistance and capacitance, otherwise the motor torque will be unbalanced, causing the motor stuck or abnormal.

Supply Connection

The Compressor must be installed in a circuit capable of supplying the specified voltage and power. The wiring method used for connection to the front panel power connector must meet applicable codes. Male joint and female joint shall be matched.

WARNING!

AVOID ELECTRIC SHOCK.

All electrical supply equipment must meet applicable codes and be installed by qualified personnel. Permit only qualified electrical technicians to open electrical enclosures, to perform electrical checks or to perform tests with the power supply connected and wiring exposed. Failure to observe this warning can result in serious injury or death.

Connect mains power supply cable into the mains power receptacle (see Figure 6)



Figure 6 Mains Power Receptacle

Main Power Switch

Main power switch see Figure 7.



Figure 6 Mains Power Receptacle

Main Power Switch

Main power switch see Figure 7.



Figure 8 Button Display

LCD Display

See Figure 9 for LCD Display.



Figure 9 LCD Display

Cold Head Motor Socket

See Figure 12 for cold head motor socket.



Figure 10 Cold Head Motor Socket

Install the Gas Lines

Tool required: Open-end wrenches, 1", 1/8", 1 3/16"

Gas lines are shipped with protective dust plugs. Do not remove the plugs until the gas lines are ready to be attached. All bending and routing of gas lines should take place with plugs in place.

⚠ WARNING!

AVOID INJURY.

Always wear eye protection when handling pressurized gas lines and other pressurized equipment. Never apply heat to a pressurized gas line or other pressurized components.

⚠ CAUTION!

PREVENT EQUIPMENT DAMAGE.

Damage to gas lines can result from crimping by repeated bending and repositioning.

NOTE

Be sure to have 99.999% pure helium gas available at the installation site in case gas needs to be added to the system. See Refrigerant Quality in Specifications in this manual.

1. Identification labels are furnished with the gas lines. Before installing the gas lines, identify each with an appropriate label, SUPPLY (high pressure, color-coded red) or RETURN (low pressure, color-coded green) by applying the label adjacent to each coupling. See Figure 11.

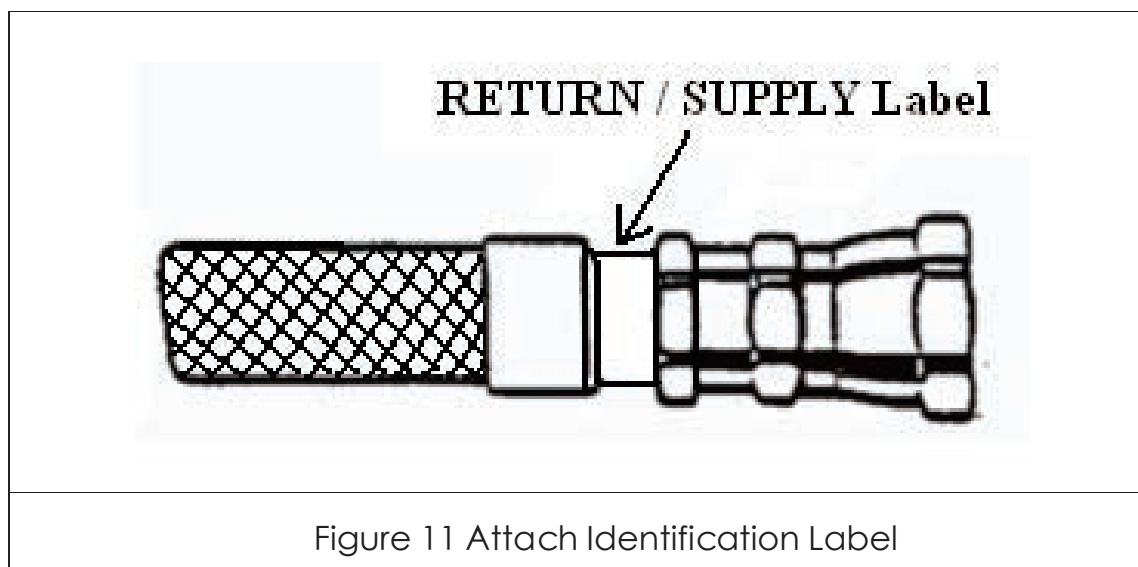


Figure 11 Attach Identification Label

NOTE

Supply and return gas lines are identical. Labels are used to prevent making a wrong connection at installation or at reassembly following maintenance.

2. Arrange the system components so that the gas lines will be protected from stress and traffic. Observe the minimum bend radius of 180 mm when routing gas lines. Provide supports where needed.

3. Remove the dust caps from the compressor's supply and return gas couplings.

Connect the gas lines to the compressor's supply and return couplings. Use two wrenches to tighten the coupling. Torque all couplings to 47 ± 7 Nm for the 8# self-sealing connector. See Figure 12. Tighten each coupling before proceeding to the next one.

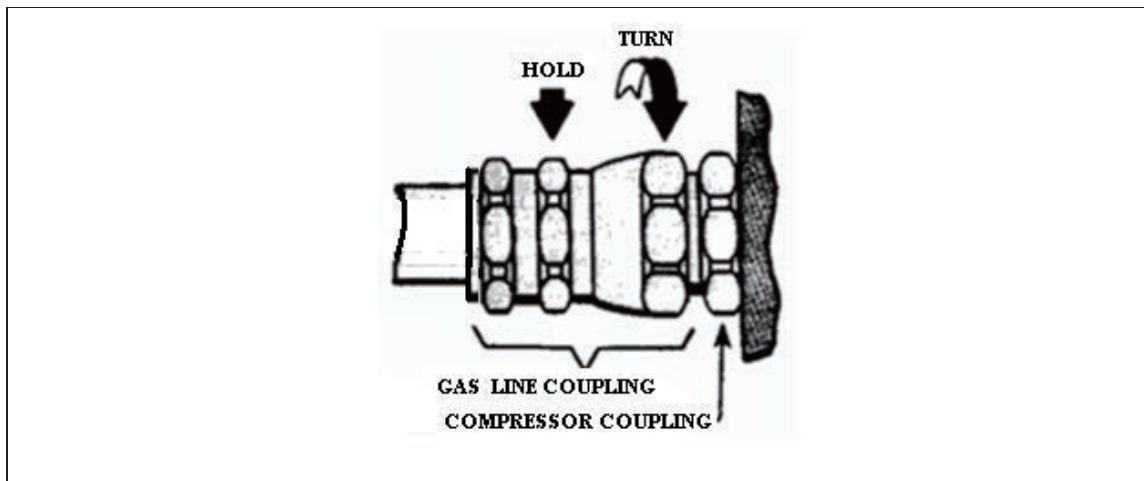


Figure 12 Gas Line Connections

⚠ CAUTION!

AVOID GAS LEAKS.

Check the condition of the gasket seal on the female half of each coupling. Be sure the gasket seal is in place and the sealing surfaces are clean before connecting. Replace the gasket seal if it is damaged or missing. Keep the gas line couplings aligned when making or breaking a coupling connection. Leaks can occur due to the weight of the gas line or due to a sharp bend near the connection.

NOTE

Retain the dust caps and plugs to re-cover the couplings when they are not in use.

Adjust System Equalization Pressure

When the compressor is at room temperature of 20°C, check to see if its equalization pressure is at a constant value. When it is at equalization pressure, the pressure will change slightly based on the temperature change. If the pressure deviated from the specified range, check to see if the gas supply is wrong, or gas leaks.

1. Check all the gas lines connecting the compressor and clod head according to the system schematic diagram.

2. Connect power to the compressor. Switch the compressor mains power to ON. Do not start the compressor.

3. . Check the return pressure from the gas gauge.

4. Check to see if the values displayed are in the specified range and the system temperature is 20°C.

5. If the pressure is too high, following tools are required:

1. charge, a size 4, valve, female Aeroquip coupling

2. 5/8" and 3/4" flat wrenches

5.1 Check the compressor has stopped and temperature stays at 20°C.

5.2 Make sure the valve on the charge is closed. Use two wrenches to connect the adaptor to the #4 male Aeroquip coupling.

5.3 Slowly opens the adaptor valve, vent all the helium in the system. Close the valve when required pressure obtained.

5.4 Use the two wrenches to take the adaptor off.

6. If the pressure is too low, following tools are required:

1. charge, a size 4, valve, female Aeroquip coupling, 5/8" and 3/4" flat wrenches

2. Helium bottle

3. Relief valve

4. Gas line

6.1 Stop the compressor.

6.2 Install a charge, and open the valve slowly. Use two wrenches to connect the adaptor to the #4 male Aeroquip coupling. Close the valve.

6.3 Connect the helium gas line to the helium bottle with 99.999% purity of helium, and the temperature is -50°C at 20.7bar.

6.4 Clean the gas line thoroughly when connecting the gas line to the charge. Open the relief valve slightly; allow some gas to clean the gas line. At the same time, slightly open the valve on the charge, release some gas in the compressor, clear the remaining gas at the charge connector. Then both the gas line and the charge are cleaned. Connect these two parts without close the valve and relief, then close the charge valve. It is critical to remove all the impurities in the system.

6.5 Adjust the relief valve to equalize the pressure. See the specifications. Slightly open the valve on the charge. Fill in the helium to reach system equalization pressure.

6.6 Close the relieve valve on the charge and gas bottle.

6.7 Remove the gas line and charge. Keep the gas line clean and store it.

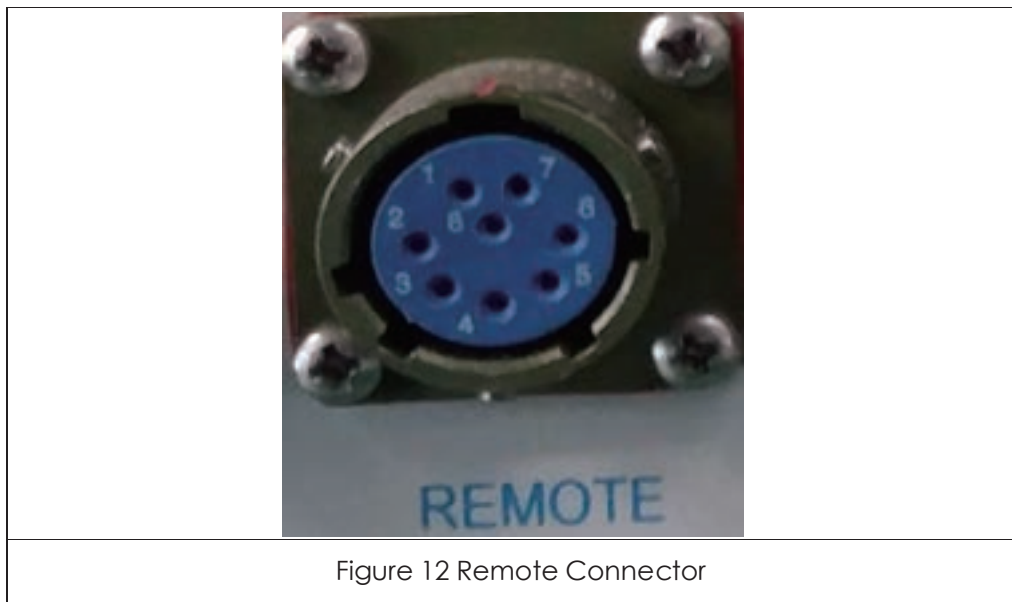
Install the Cold Head Cable(s)

1. Be sure the compressor is not running by pressing the POWER SWITCH button on OFF.
2. Connect the cold head cable to the cold head cable receptacle on the compressor front panel. Connect the other end of the cable to the electrical receptacle on the cold head.

Diagnostic Interface Connector

Tool required: Small, flat blade screwdriver

A connector is located on the front panel of the compressor for software update. A connector is located on the front panel for remote control and to supply remote indication of the operating status of the compressor. See Figure 12.



NOTE

The conenctor pin assignments are shown in the Appendix Section of this manual.

Prestart Check

1. Check that the gas lines are connected and that the supply is connected to the SUPPLY in connection. Tighten the fittings if necessary.

2. Check that all electric connections are made:

a. Power to the compressor

b. Cold head cable

c. Diagnostic interface cable (if used)

3. Check that the electrical power supply is switched on.

Check that the equalization pressure is as specified when the compressor is at room temperature 20° C.

OPERATION

Starting

Supply power to the compressor. Turn the knob of the main power switch on the front of the compressor to ON. Push the DRIVE button on the compressor's front panel. Make sure the power source is 220V, V1 @50Hz~.

CAUTION!

PREVENT EQUIPMENT DAMAGE.

After starting the system for the first time, to be certain that the the room temperature is not too high.

Stopping

Push the DRIVE button on OFF. The compressor and the cold head will stop. The output voltage of 200 V3~ (NOT REAL) from the compressor to the cold head interface stops.

Cold Head Only Run

For running the cold head only to perform a maintenance procedure, the cold head receptacle can be energized to 200 V3~ without running the compressor by:

Press COLD HAEAD DRIVE to ON,

NOTE

If the compressor stops due to a power excess, the compressor will restart automatically.

Automatic Restarting After a Helium High Temperature Shutdown.

Trouble Shooting

Error Conditions

An error condition will cause either a system alarm or a shutdown. The following table lists the alarm and the shutdown errors that are monitored. Overload trip of the Mains Power switch is not monitored or reported.

WARNING LIGHT IS ON	Type	Error	Indication
Helium temp: ERR	Shutdown	High helium discharge temperature	Temperature > 93° C
ROOM temp: ERR	Alarm	Room temperature is to high	Temperature > 40° C
Return press: ERR	Shutdown	Loss of gas charge	Return pressure < 2.5 bar

If the compressor has been shut down by one of these interlocks, do not restart until the problem has been found and corrected. Refer to the Troubleshooting Guide to identify the problem.

In the event of a shutdown error, the compressor motor and cold head valve motor are turned off. Signals are available on the REMOTE connector for output to an external device.

The Mains Power switch trips when steady-state current exceeds 1.2 x the front panel set point.

Clearing Error Conditions

When an error is corrected, the warning light is shut down.

Troubleshooting Guide

The Troubleshooting Guide that follows lists problems that can occur in the system and suggests causes and corrective actions.

Troubleshooting Guide

The Troubleshooting Guide that follows lists problems that can occur in the system and suggests causes and corrective actions.

Problem	Possible Cause	Corrective Action
System shutdown, Helium Temperature is high	Low oil level or blocked oil circulation.	Try five times to restart the compressor. If it does not start, consult the supplier.
	air temperature is too high.	supply air temperature is too high. Provide 5° C to 30° C cooling water.
	air flow rate is inadequate.	Air flow rate is too low.
	Faulty gas thermistor	Contact the supplier.
When press the start button on the compressor, it does not start up, cold head motor starts.	Helium flow reverse (Compressor supply port connects to cold head return port)	Check all the gas lines.
	Compressor motor windings high temperature switch opens. Compressor motor windings have overheated.	Cooling air is inadequate. Refer to Specifications. Consult the supplier if the problem persists. Allow about 30 minutes for the windings to cool enough for the switch to reset.
	Fuse(s) opened or poor power quality.	If power checks indicate utilities are within specifications, check fuses.
System shutdown	Fuse(s) opened or poor power quality.	If power checks indicate utilities are within specifications, check fuses.
	Compressor has lost helium charge.	Refer to Charging or Venting.
	No electrical power.	Check that the power source is on and connected.
	Wrong voltage.	Refer to the Power Supply Specification in the system manual.
	Defective component in the power circuit.	Refer to Compressor Motor troubleshooting in this section.

Compressor starts but shuts down later	Insufficient coolant for the compressor.	Check the room temperature. Refer to Specifications.
System starts but gas pressure is abnormally high or low.	Wrong equalization pressure.	Refer to Specifications and the section on Charging or Venting.
	Gas line couplings are not fully engaged.	Be sure that all gas couplings are fully engaged and torqued.
	Gas lines are connected wrong.	Reconnect. See the Installation section.
Cold head motor does not start when the compressor starts.	Cold head cable is not connected.	Stop the compressor. Connect the cable. Check connections at the cold head and at the compressor.
	Open circuit in the cold head cable.	Disconnect the cable. Check each conductor for continuity. Replace the cable if necessary.
	Fuse to protect the cold head motor is blown.	Contact the supplier to replace the fuse inside the electrical enclosure.

Maintenance

Exchange Adsorber

After 30,000hrs running, we need to exchange the adsorber in the compressor to keep the helium gas purity.

NOTE

In order to ensure the normal work of the compressor, the adsorber must be my company's adsorber.

Tools

	Error	EFFECT
1	1" Open wrench	disassembly of 8 # self-sealing joints
2	1-3/16" Open wrench	disassembly of 8 # self-sealing joints
3	Screwdriver	Remove and install screws between the adsorber base and bottom plate

Prepare

1. SHUT DOWN COMPRESSOR;
2. REMOVE THE POWER CABLE AND THE COLD HEAD POWER CABLE;
3. REMOVE THE SUPPLY AND RETURN HELIUM FLEXIBLE HOSE;

Remove Old Adsorber

1. Remove side panel;



2. Remove the adsorber self-sealing coupling
Use 3 wrenches ;



3.Remove nuts secured the adsorber and front panel;



4.Loosen the nut and washer secured the adsorber to the base panel;



5.Remove the used adsorber from the compressor.

Installing New Adsorber

1.Prepare new adsorber, lock washers, nuts, gaskets;



2.Place the lock washer over the self-sealing male above in the adsorber and tighten the nut through the front panel, tighten the nut; the torque is 23Nm.



3. Secure the adsorber to the base panel by tighten Nut .Tightening torque is14.5Nm
4. Connect the adsorber self-sealing coupling. Use 2 wrenches. Tightening torque is 50Nm
5. Sprinkle Liquid Leak Detector on the flex ling connecting coupling, in case the bubbling is found, tighten the connecting coupling again and re-check the leakage;
Ensure that the pressure gauge indication is specified value for the type of Cold head. Charge the helium gas, in case of low pressure indicating;
6. Reinstall the panels and secure them by tightening the screw.

Appendix 2 DB25 Pin Functions

PIN	FUNCTION	DESCRIPTION
1	0V	
2	WARNING	When the compressor alarm, relative to the PIN1 voltage is DC24V
3	RUNNING	When the compressor is running, the voltage relative to PIN1 is DC24V.
4, 5	REMOTE START	When the LCO/REM is dialed to the REM position, short the PIN4 and PIN5 to start the compressor.
Other	/	

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