



KEES, INC.

Products for Food Service & Sheet Metal Industry

400 S. INDUSTRIAL DRIVE - P.O. BOX L - ELKHART LAKE, WISCONSIN 53020 - (920) 876-3391 - FAX (920) 876-3065

Electric Heater Instructions

WARNING! Electrical shock hazard! Disconnect all power sources before doing any work on the unit.

General:

The requirements and practices described below are based on the National Electric Code and the Space Heating Standard of the Underwriters Laboratories Inc. (UL). Although UL requirements are uniform throughout the country, local electrical codes may deviate from the National Electric Code; therefore, local inspection authorities should be consulted regarding local requirements.

Electrical Wiring Instructions:

1. Separate circuits are required for the make-up air unit and the heater. The required minimum size of supply conductors is marked at the field wiring terminals within the heater control box.
2. Use the wiring diagram supplied with the heater as a guide in correlating field wiring with the heater internal wiring.
3. All field wiring to the heater must meet the requirements of the National Electric Code (NEC) and any other applicable local or state codes.
4. Wiring to the heater must be rated for 75°C minimum.
5. If a motor control center is included with the make-up air unit, the fan is interlocked to the control circuit by the factory so the electric heater is not on unless the fan is on. If the motor control center is not included then this must be done in the field.
6. If the heater does not have a built-in disconnect switch, then a remote disconnect provided by others must be installed in accordance with the NEC, Article 424-65.
7. If included, the step controller is pre-wired with the KW divided equally among the steps.
8. If included, the duct thermostat must be placed in the blower discharge to monitor the heated air.

Sequence of Operation:

1. Make-up air unit is started.
2. The step controller is allowed to regulate the heat if the following safety features are met:
 - fan interlock made
 - airflow switch made
 - automatic high temperature limit not tripped
 - manual high temperature limit not tripped
3. Above the temperature setpoint none of the elements are energized. As the temperature falls below the setpoint the first step is energized then additional ones if the setpoint is not met.
4. Unnecessary cycling is avoided by temperature and time delays programmed into the controller.



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Direct Expansion (Dx) Coil Instructions

Application Recommendations:

1. Piping should be in accordance with accepted industry standards. Pipework should be supported independently of the coils. Undue stress should not be applied at the connection to coil headers.
2. The condensate drain pipe should be sized adequately to ensure the condensate drains properly.
3. When connecting suction and liquid connections make sure the coil is free from all foreign material. Make sure all joints are tight and free of leakage.
4. KEES, Incorporated does not supply compressor or condensing units. Contact your compressor and/or condenser manufacturer for further instruction on Dx coil installation and operation.

Maintenance Instructions:

1. Filters upstream of the coil should be checked regularly for dirtiness and clogging. If the filters are dirty, they should be cleaned or replaced. It is important that the coils stay clean to maintain maximum heat transfer capability.
2. Coils must be clean to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum clean. Soiled fins reduce the capacity of the coil, demand more energy from the fan, and create an environment for odor and bacteria to grow and spread through the conditioned zone. High pressure water (700 Psi or less) may be used to clean coils with fin thickness over 0.0095 inches thick. **TEST THE SPRAY PRESSURE** over a small corner of the coil to determine if the fins will withstand the spray pressure.

For coils with fragile fins or high fin density, foaming chemical sprays and washes are available. Many coil cleaners contain harsh chemicals, so they must be used with caution by qualified personnel only. Care must be taken not to damage the coils, including fins, while cleaning. **CAUTION: Fin edges are sharp.**

3. Drain pans in any air conditioning unit will have some moisture in them, therefore, algae and other organisms will grow due to airborne spores and bacteria. Periodic cleaning is necessary to prevent this build-up from plugging the drain and causing the drain pan to overflow. Inspect twice a year to avoid the possibility of overflow. Also, drain pans should be kept clean to prevent the spread of disease. Qualified personnel should perform cleaning.



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Water Coil Instructions

Application Recommendations:

1. Piping should be in accordance with accepted industry standards.
2. Connect the WATER SUPPLY TO THE BOTTOM CONNECTION on the air leaving side and the WATER RETURN TO THE TOP CONNECTION on the air entering side. The extra bottom connection can be used for an auxiliary manual drain connection, and the extra top connection can be used for an automatic air vent or the extra connections can be capped. Connecting the supply and/or return in any other manner will result in very poor performance.
3. The air vent at the uppermost point should be temporarily opened during system start-up to release all of the air from the coil. To maintain heat transfer capacity, periodically vent any air in coil.
4. Water coils are not normally recommended for use with entering air temperatures below 40F; however, special high-pressure water coils have been used successfully on high temperature hot water jobs with low entering air temperatures when correctly controlled. No control system can be depended on to be 100% safe against freeze-up with water coils. Glycol solutions or brines are the only safe media for operation of water coils with low entering air conditions.
5. When fresh and return air are to be heated by hot water coil, care should be used in the design of the duct work to ensure thorough mixing before the air enters the coil. The return air should always enter the bottom of the duct and fresh air should enter the top of the duct. The greater the distance between the mixing point and the entrance to the coil, the better the application. Temperature control elements should be located to sense the lowest temperature air that will enter the coil. Always install gasketed fresh air dampers which are automatically controlled to close whenever the water leaving the coil is too cool, or the fan stops. Care should be used in designing fresh air intake to prevent stack effect (or wind) from forcing cold air through the coils when the fan is shut down. Two sets of dampers are frequently required. CONTINUOUS WATER CIRCULATION THROUGH THE COIL AT ALL TIMES IS HIGHLY RECOMMENDED.
6. Pipe sizes for the system must be selected on the basis of the head (pressure) available from the circulation pump. The velocity should not exceed 8 feet per second and the friction loss should be approximately 3 feet of water column per 100 feet of pipe.
7. For chilled water coils, the condensate drain pipe should be sized adequately to ensure the condensate drains properly.

Water Coil Instructions (continued)

Maintenance Instructions:

1. Filters upstream of the coil should be checked regularly for dirtiness and clogging. If the filters are dirty, they should be cleaned or replaced. It is important that the coils stay clean to maintain maximum heat transfer capability.
2. Coils must be clean to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum clean. Soiled fins reduce the capacity of the coil, demand more energy from the fan, and create an environment for odor and bacteria to grow and spread through the conditioned zone. High pressure water (700 Psi or less) may be used to clean coils with fin thickness over 0.0095 inches thick. **TEST THE SPRAY PRESSURE** over a small corner of the coil to determine if the fins will withstand the spray pressure.

For coils with fragile fins or high fin density, foaming chemical sprays and washes are available. Many coil cleaners contain harsh chemicals, so they must be used with caution by qualified personnel only. Care must be taken not to damage the coils, including fins, while cleaning. **CAUTION: Fin edges are sharp.**

3. Drain pans in any air conditioning unit will have some moisture in them, therefore, algae and other organisms will grow due to airborne spores and bacteria. Periodic cleaning is necessary to prevent this build-up from plugging the drain and causing the drain pan to overflow. Inspect twice a year to avoid the possibility of overflow. Also, drain pans should be kept clean to prevent the spread of disease. Qualified personnel should perform cleaning.

Winterizing Coils:

1. Coils freeze-up can be caused by such things as air stratification and failure of outdoor air dampers and/or preheat coils. Routine draining of water cooling coils for winter shutdown cannot be depended upon as insurance against freeze-up. Severe coil damage may result. It is recommended that all coils be drained as thoroughly as possible and then treated in the following manner.
2. Fill each coil independently with an antifreeze solution using a small circulating pump and again thoroughly drain. Check freezing point of antifreeze before proceeding to next coil. Due to a small amount of water always remaining in each coil, there will be diluting effect. The small amount of antifreeze solution remaining in the coil must always be concentrated enough to prevent freeze-up.
3. **NOTE:** Carefully read instructions for mixing antifreeze solution used. Some products will have a higher freezing point in their natural state than when mixed with water.



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Steam Coil Instructions

Application Recommendations:

Satisfactory operation and service life are best ensured when coils are installed with proper piping, trap, and support arrangement. The following notes are recommended for the coil unit installation and operation.

General:

1. Provide separate supports and hangers for the unit and the piping.
2. Be certain that adequate piping flexibility is provided. Stresses resulting from expansion of closely coupled piping and coil arrangement can cause serious damage.
3. Standard steam coils are pitched in the casings when installed for horizontal air flow. The CASING MUST BE LEVEL after the unit is installed for proper condensate drainage. If condensate is not removed the coil will suffer from water hammering and will have a shortened life. On vertical air flow applications, the coils must be pitched when installed.
4. Do not reduce pipe size at the coil return connection. Carry return connection size through the dirt pocket, making the reduction at the branch leading to the trap.
5. It is recommended that vacuum breakers be installed on all applications to prevent retaining condensate in the coil. Generally, the vacuum breaker is to be connected between the coil inlet and the return main. The vacuum breaker should be open to the atmosphere and the trap design should allow venting of large quantities of air.
6. Do not drip supply mains through the coil.
7. Do not attempt to lift condensate when using modulating or on-off control.
8. Do not reduce the pipe size leaving the coil.

Traps:

1. Size traps in accordance with the manufacturer's recommendations. Be certain that the required pressure differential will always be available. DO NOT UNDERSIZE.
2. Float and thermostatic or bucket traps are recommended for low pressure steam. On high pressure systems, bucket traps are normally recommended. The thermostatic traps should be used only for air venting.

Traps (continued):

3. Bucket traps are recommended for use with on-off control only.
4. Locate traps at least 12 inches below the coil return connection.

Controls:

1. On high pressure installations, a two-position steam valve with a face and bypass arrangement is preferred where modulating control is required.
2. Modulating valves must be size properly. DO NOT UNDERSIZE.

Freezing Conditions (Entering air below 35°F):

1. 5 PSI steam must be supplied to the coil at all times.
2. Modulating valves are not recommended. Control should be by means of face and bypass dampers.
3. Provision should always be made to thoroughly mix fresh air and return air before it enters the coil on return air units. Also, temperature control elements must be properly located to obtain true air mixture temperatures.
4. As additional protection against freeze-up, the trap should be installed sufficiently far below the coil to provide an adequate hydrostatic head to ensure removal of condensate during an interruption in the steam pressure. Estimate 3 feet for each 1 PSI of trap differential required.
5. On start up, admit steam to coil ten minutes before admitting outdoor air.
6. Provision must be made to close fresh air dampers if steam supply pressure falls below minimum specified.

Coil Maintenance

Filters:

Filters upstream of the coil should be checked regularly for dirtiness and clogging. If the filters are dirty, they should be cleaned or replaced. It is important that the coils stay clean to maintain maximum heat transfer capability.

Cleaning:

Coils must be clean to obtain maximum performance. Soiled fins reduce the capacity of the coil, demand more energy from the fan, and create a medium for order and bacteria to grow and spread through the conditioned zone. High pressure water (700 Psi or less) may be used to clean coils with fin thickness over .0095 inches thick. TEST THE SPRAY PRESSURE over a small corner of the coil to determine if the fins will withstand the spray pressure. For coils with fragile fins or high fin density, foaming chemical sprays and washes air available. Many coil cleaners contain harsh chemicals, so they must be used with caution by qualified personnel only. Care must be taken not to damage the coils. FINS ARE SHARP! Use caution when working with coils.