

Thermo Scientific

EK45/EK90

Immersion Coolers

Thermo Scientific Manual P/N U01184 Rev. 08/01/2016

Installation Operation

Visit our Web site at:

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Product Service Information, Applications
Notes, SDS Forms, e-mail.

Voice Info: (800) 258-0830



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Warranty

Preface

Compliance

The Declaration of Conformity is located in the back of this manual.

WEEE

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with 'wheelie bin' symbol:



Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State, dispose of or recycle this product through them. Further information on Thermo Fisher Scientific's compliance with these Directives is available at:

www.thermoscientific.com/WEEERoHS

After-sale Support

Thermo Fisher Scientific is committed to customer service both during and after the sale. If you have questions concerning the cooler operation, or questions concerning spare parts or Service Contracts, call our Sales, Service and Customer Support phone number, see this manual's inside cover for contact information.



Sample Nameplate

Before calling, please obtain the serial number printed on the nameplate located on the upper rear of the cooler.

Feedback

We appreciate any feedback you can give us on this manual. Please e-mail us at tcmanuals@thermofisher.com. Be sure to include the manual part number and the revision date listed on the front cover.

Warranty

Thermo Scientific Immersion Coolers have a warranty against defective parts and workmanship for 24 months from date of shipment. See back page of this manual for more details.

Unpacking

Retain all cartons and packing material until the cooler is operated and found to be in good condition. If the cooler shows external or internal damage contact the transportation company and file a damage claim. Under ICC regulations, this is your responsibility.



Take into account its weight when unpacking and transporting. We recommend two people lift the cooler. ▲

NOTE Leave coolers in an upright position at room temperature ($\sim 25^{\circ}\text{C}$) for 24 hours before starting. This will ensure the lubrication oil has drained back into the compressor. ▲

Section 1 Safety

Safety Warnings

Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your cooler. If you have any questions concerning the operation of your cooler or the information in this manual, please contact us. See inside cover for contact information.



DANGER indicates an imminently hazardous situation which, if not avoided, *will* result in death or serious injury.



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, may result in minor or moderate injury. It is also be used to alert against unsafe practices.



The lightning flash with arrow symbol, within an equilateral triangle, is intended to alert the user to the presence of non-insulated "dangerous voltage" within the cooler's enclosure. The voltage magnitude is significant enough to constitute a risk of electrical shock.



This label indicates read the manual.

NOTE The cooler's equipment design incorporates a complete sheet metal enclosure for personnel protection from mechanical and electrical hazards. ▲

Observe all warning labels. ▲

Never remove warning labels. ▲

Use the cooler solely for the intended application. Do not operated in rooms used for medical purposes and/or in the vicinity of patients. ▲

The cooler construction provides protection against the risk of electrical shock by grounding appropriate metal parts. The protection will not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided. ▲

Operate the cooler using only the supplied line cords, never operate equipment with damaged cords. ▲

Ensure all electrical connections are made prior to starting the cooler. ▲

Always turn the cooler off and disconnect the supply voltage from its power source before moving performing any service or maintenance procedures. Ensure cooler is at a safe temperature before handling. ▲

Never place the cooler in a location or atmosphere where excessive heat, moisture, or corrosive materials are present. ▲

Leave cooler in an upright position at room temperature (~25°C) for 24 hours before starting. This will ensure the lubrication oil has drained back into the compressor. ▲

Other than water, before using any fluid, or when performing maintenance where contact with the fluid is likely, refer to the manufacturer's MSDS and EC Safety Data sheet for handling precautions. ▲

The cooler's evaporator coil must not be kinked, bent or twisted. This can lead to evaporator coil damage and a refrigeration leakage. ▲

Ensure, that no toxic gases can be generated by the fluid. Flammable gases can build up over the fluid during usage. ▲

Never use corrosive or flammable fluids with this cooler. Use of these fluids will void the manufacturer's warranty. ▲

Never operate the cooler with panels removed. ▲

Transport the cooler with care. Sudden jolts or drops can damage its components. ▲

Do not clean the cooler with solvents, only use a soft cloth and water. ▲

Refer service and repairs to a qualified technician. ▲

Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and will void the manufacturer's warranty. ▲

Personal Protective Equipment

There are no special personal protective equipment requirements needed to perform normal operation. We do recommend wearing eye protection and gloves.

Training

The user must review and understand all the sections in this manual before operating the cooler.

Section 2 General Information

Description and Intended Use

The EK45 Immersion Cooler has a one-stage refrigerating circuit. The coolant circuit's evaporator coil, shaped as spiral-shaped cooling element, connects to the cooling unit with a flexible, specially heat-insulated hose. It can be immersed in a vessel with an inner diameter of >85 mm and a depth of >200 mm. The cooling unit compressor is air-cooled and fully hermetically sealed.

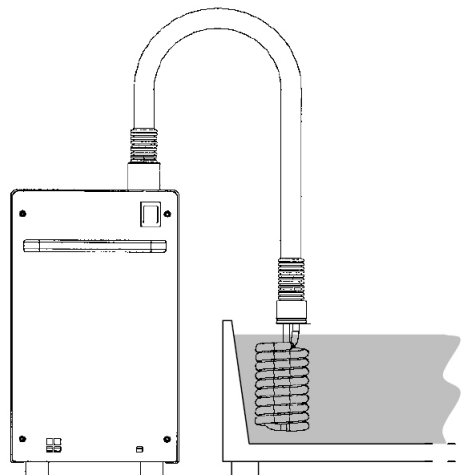
The EK90 has a two-stage refrigerating circuit. The cooling element is a flexible corrugated coil and can be bent to the desired vessel. The inner diameter of the vessel cannot be smaller than 110 mm ($2 \times$ the smallest bending radius of 40 mm = 80 mm plus $2 \times$ the diameter of the corrugated coil at 13 mm = 26 mm). The vessel depth can be as small as 100 mm. These are the minimum dimensions for the cooling element however frequent bending with very small radii can damage the corrugated coil. If multiple bends are necessary a minimum diameter of at least 250 mm (bending radius of 110 mm) is required.

Both units are equipped with a built-in temperature controller with a red LED display.

A temperature stability of approximately $\pm 1^{\circ}\text{C}$ to 2°C is possible. Any temperature within the working temperature range can be set, see next page. A heater may be necessary for applications requiring temperatures above the ambient temperature.

The temperature controller features the display of the actual temperature, the setpoint temperature and a control status display.

Both are supplied with a Pt100 temperature sensor. The sensor is monitored for breakage and short-circuiting. The sensor should be located in the bath in the direct vicinity of the cooler's evaporator coil.



Cooling is done using heat exchangers that draw off and expel the heat. The cooling capacity depends to a great extent on the free flow of cooling air through the two ventilation grids. These grids (one at the front and one at the rear side) must be kept free of all obstacles at all times!

Specifications/ Equipment Ratings

	EK45	EK90
Working Temperature Range¹	-45°C to +40°C -49°F to +104°F	-90°C to +40°C -130°F to +104°F
Ambient Temperature Range²	+10°C to +40°C +50°F to +104°F	+10°C to +40°C +50°F to +104°F
Maximum Relative Humidity (Non Condensing)	80%/31°C to 50%/40°C	80%/31°C to 50%/40°C
Operating Altitude	Sea Level to 2000 meters (6560 feet)	Sea Level to 2000 meters (6560 feet)
Pollution Degree	2	2
Overvoltage Category	II	II
Degree of Protection	IP20	IP20
Sound Level³	less than 58 dBA	less than 58 dBA
Cooling Capacity at +20°C	350 watts/60Hz (300 watts/50Hz)	300 watts
at -10°C	250 watts/60Hz (220 watts/50Hz)	280 watts
at -40°C	-	170 watts
at -60°C	-	100 watts
Compressor Cooling	Air	Air
Refrigerant	R404A	R404A/R23
Hose Length	150 cm	150 cm
Cooling Coil (Ø x L)	81 x 195 mm	13 x 900 mm
Smallest Bending Radius⁴	-	40mm
Cooler Dimensions (H x W x D)	380 x 225 x 465 mm	490 x 380 x 460 mm
Evaporator Material	300 Series Stainless Steel	300 Series Stainless Steel
Nominal Weight kg/lb	27.2 / 60.0	62.7 / 138.2
Electrical Requirements⁵	230V/50Hz or 115V/60Hz	230V/50Hz or 115V/60Hz
Total Maximum Wattage	900VA	1300VA

1. The lowest possible temperature in a bath and the shortest cooling down time are dependent on: the volume of liquid to be cooled, the type of liquid and its viscosity at the desired working temperature, the heat conductivity of the liquid, the bath vessel and covering insulation, the heat created by any EK immersed in the bath used to recirculate or stir the liquid.

The lowest temperatures possible for the EK45 and EK90 specified above were reached in a Dewar vessel with a volume of 2 liters. Methylcyclohexane was used as the bath liquid and the bath was not stirred.

2. The cooling capacity is reduced at ambient temperatures of > 25°C. 30°C max ambient for setpoints >20°C for EK90, or >0°C for EK45. Example: Setpoint 40°C, max ambient = 30°C.

3. 1 meter from EK.

4. Never bend the probe when it is cold.

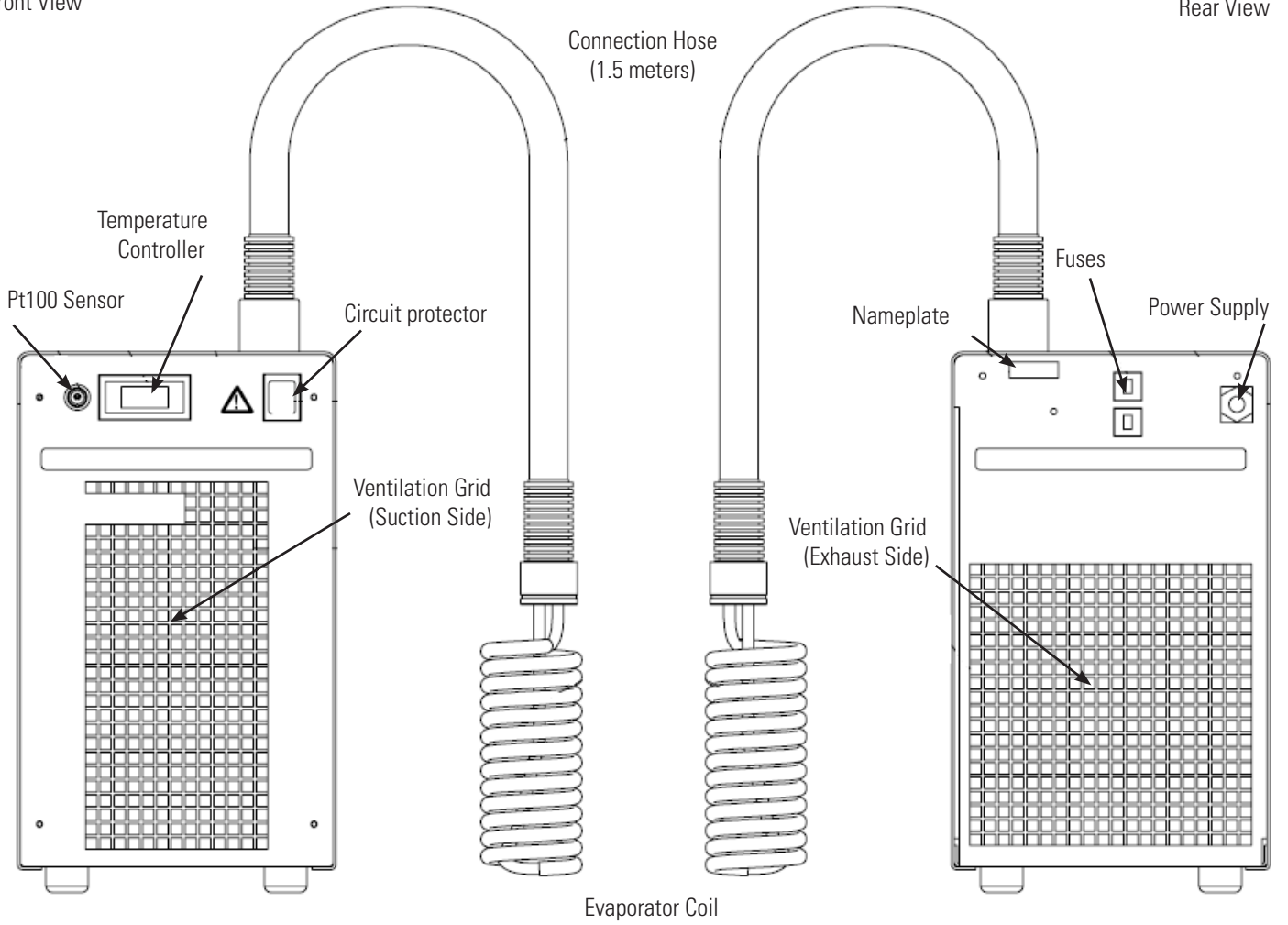
5. Nominal values ±10%.

• Thermo Fisher Scientific reserves the right to change specifications without notice.

EK45

Front View

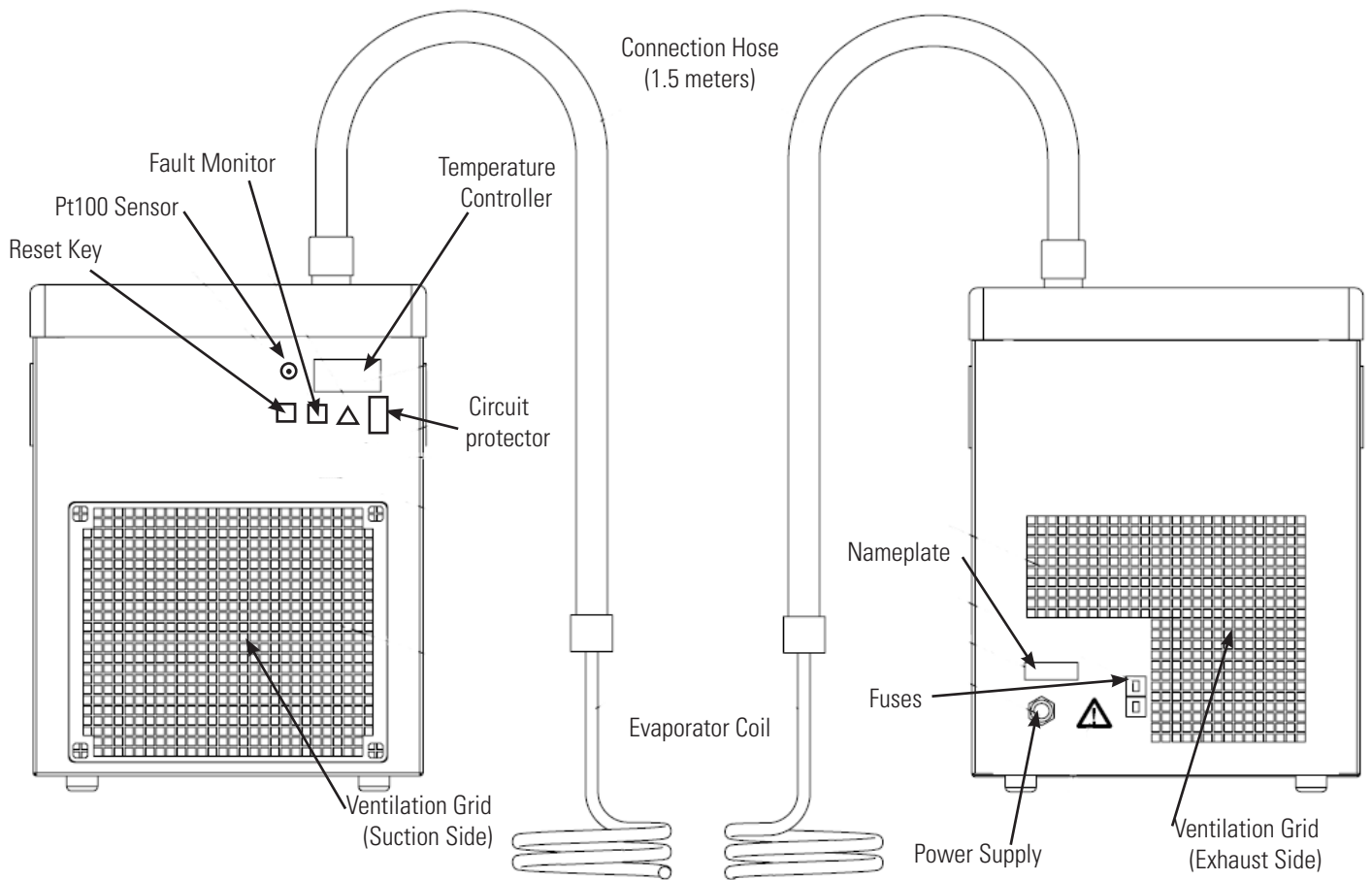
Rear View



EK90

Front View

Rear View



Section 3 Installation

The immersion circulator is designed for continuous operation and for indoor use.



Never place the cooler in a location where excessive heat, moisture, inadequate ventilation, or corrosive materials are present. ▲



Leave coolers in an upright position at room temperature (~25°C) for 24 hours before starting. This will ensure the lubrication oil has drained back into the compressor. ▲

Ventilation

The cooler requires clean air for proper operation. Air enters from the front and exits through the rear.

Electrical Requirements



The cooler construction provides protection against the risk of electrical shock by grounding appropriate metal parts. The protection will not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided. ▲

The cooler is intended for use on a dedicated outlet.



The cooler's power cord is the electrical disconnecting device, it must be easily accessible at all times. ▲



Operate the cooler using only the supplied line cords, never operate equipment with damaged cords. ▲

Refer to the nameplate on the rear of the cooler for specific electrical requirements. Voltage range deviations of $\pm 10\%$ are permissible. The outlet must be rated as suitable for the total power consumption of the cooler.



Ensure the electrical cords do not come in contact with the evaporator coil or hose. ▲

Fuses

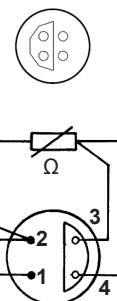
All units are equipped with automatic thermally-triggered fuses. A red marking indicates a triggered fuse. Allow the unit to cool, approximately five minutes, before pressing the fuse reset on the rear of the unit.

If the fuse triggers again the cooler has a defect. Contact our Customer Service and Support.

Temperature Sensor

The Pt100 sensor should be located in the bath in the direct vicinity of the evaporator coil.

A temperature accuracy of approximately 1 to 2°C is possible. Any temperature within the working temperature range can be set. A heater is necessary for applications which require temperatures above the respective ambient temperature.



Tube and Coil



Never sharply bend the evaporator tube and coil or form it into a small radius. ▲

Damage caused by an excessive bending of the cooling coil is not covered by our warranty.

Evaporator hose – the smallest permissible bending radius is 125 mm.

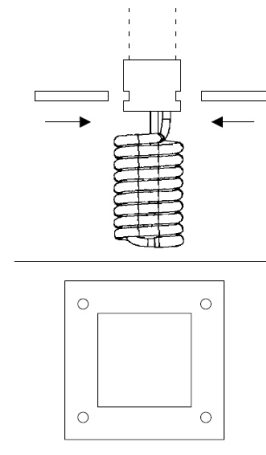
Evaporator coil (cooling coil) – the smallest permissible bending radius for the EK90 is 40 mm (one bend), or 110 mm (more than one bend).

Mounting Accessory (EK45 only)

To fit the evaporator in the optional clamping bracket slide the metal plates supplied with the bracket into the slot above the evaporator coil.

Insert the cooling element through the rectangular opening

Attach the inserted plates using four screws.



Do not kink the evaporator hose. ▲

Fluid Considerations



Only use the approved fluids listed below. Never use corrosive or flammable fluids with this cooler. ▲



Handle and dispose all liquids in accordance with the fluid manufacturers specification and/or the MSDS for the fluid used. ▲

Thermo Scientific takes no responsibility for damages caused by the selection of an unsuitable fluid.

Unsuitable bath fluids are fluids which:

- are very highly viscous (much higher than 30 mPas at the respective working temperature) or
- have corrosive characteristics or

For fluid selection consider application requirements, operating temperature range, material compatibility, safety concerns, and environmental issues.

Approved Fluids

-50°C to 40°C — Synth 60 Synthetic heat transfer liquids are hygroscopic and require frequent changing.

-70°C to 40°C — SIL 100 This liquid has very long term stability. Due to the high viscosity at low temperatures we recommend using a stirrer.

-10°C to 40°C — 50/50 Water with Laboratory Grade Ethylene Glycol
Below 5°C water has to be mixed with a glycol. The amount of glycol added should cover a temperature range 5°C lower than the operating temperature of the particular application. This will prevent the water/glycol from gelling (freezing) near the evaporating coil.

50% ethylene glycol is the maximum recommendation. Excess glycol deteriorates the temperature accuracy due to its high viscosity.

Thermo Scientific heat transfer fluids are supplied with an EC Safety Data Sheet.



Ensure, when selecting the heat transfer fluid, that no toxic gases can be generated. Inflammable gases can build up over the fluid during usage. ▲

Shipment/Storage

Do not store the cooler below -20°C , and $<80\%$ relative humidity.

Decommissioning/ Disposal



Decommissioning prepares equipment for safe and secure transportation.

Decommissioning must be performed only by qualified dealer using certified equipment. All prevailing regulations must be followed. ▲

Consider decommissioning the cooler when:

- It fails to maintain desired specifications
- It no longer meets safety standards
- It is beyond repair for its age and worth

Refrigerant and compressor oil must be recovered from equipment before disposal.

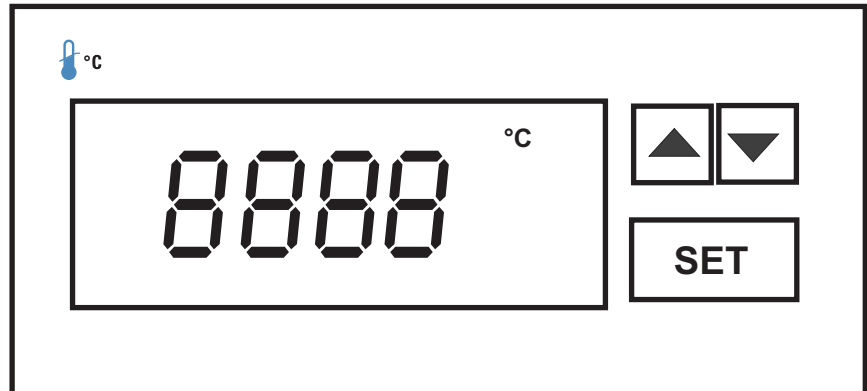
Direct questions about cooler decommissioning or disposal to our Sales, Service and Customer Support.



Handle and dispose fluids in accordance with the manufacturers specification and/or the MSDS for the material used. ▲

Section 4 Operation

Controller



The controller displays the current sensor temperature.

To view the setpoint press the **SET** key. To change the setpoint press and hold the **SET** key for two seconds. Use the ▲ key to raise or the ▼ key to lower the displayed setpoint value. Press the **SET** key again to store and display the new setpoint value. The controller automatically displays the current temperature.

NOTE If no entry is made within three seconds the value shown in the display automatically switches back to the current temperature and the controller returns to the previous setpoint value. ▲

EK 90 only



Fault display light illuminates to indicate a fault has occurred.



Reset button resets the cooler after a fault or interruption.

Setup



Leave the cooler in an upright position at room temperature (~25°C) for 24 hours before starting. This will ensure the lubrication oil has drained back into the compressor. ▲

Immerse the cooling coil (evaporator) of the cooler into a suitable bath vessel. The coil must be completely covered with liquid otherwise ice will form.

Start Up Shut Down

- To start the cooler place the circuit protector located on the front of the cooler to the **I** position.

NOTE If the cooler is started in poor environmental conditions, the pressure safety device may respond after approximately one minute and shut down the unit. Press the reset button. If fault reoccurs several times contact our Customer Service and Support. ▲

Once the unit is turned on, the refrigeration system will reduce the temperature of the cooling fluid in the work area to the lowest achievable temperature under the existing heat load conditions.

For best results we recommend stirring or agitation in the work area. When not stirred, cooling capacities will be reduced and the work area will show temperature layering, with the coldest, most dense zone at the bottom.

- To stop the cooler place the circuit protector located on the front of the cooler to the **O** position.

When the unit is shut off, wait approximately five minutes before restarting. This allows time for the refrigeration pressures to equalize. If the pressures are not allowed to equalize, the compressor will short-cycle (clicking sound) and no cooling will occur.

Section 5 Preventive Maintenance



Disconnect the power cord prior to performing any maintenance. ▲

Handle the cooler with care. Sudden jolts or drops can damage its components. ▲

There are no user serviceable components within the cooler's cabinet. Only Thermo Fisher should provide any required replacement parts.

Cleaning

Clean the cooler's surface with a soft cloth and warm water only.

Evaporator Coil

Quickly remove substances containing acidic or alkaline substances and metal shavings. They will harm the surfaces and could cause corrosion.

Condenser

For proper operation, the cooler needs to pull air through a condenser. A build up of dust or debris on the fins of the condenser will lead to a loss of cooling capacity.

On EK90s remove the front grid panel by turning the four mounting screws 90°. To replace the grid push in on the screws, do not rotate them.

Use a brush, or if necessary compressed air, to clean the condenser fins. The frequency of cleaning depends on the operating environment. We recommend making a monthly visual inspection of the condenser after initial installation. After several months, the cleaning frequency will be established.

Fluid Maintenance

The cooling fluid in the work area should be periodically replaced when operating at low temperatures. At low temperatures, the cooling fluid may collect water vapor from the air. As the concentration of water in the cooling fluid increases, performance is adversely affected.

Section 6 Troubleshooting

Error Displays

PFo No sensor is connected or the connected sensor is broken. The unit cools down to the lowest possible temperature.

PFc The connected sensor has a short circuit. The unit cools down to the lowest possible temperature.

In case of thermal overload the compressor the compressor shuts down. The compressor restarts automatically after it has cooled down.

Possible causes for the compressor shutting down:

- high ambient temperature
- poor air quantity for cooling
- compressor needs cleaning, or is defective
- refrigerant leak in the 1st stage of the cooling circuit

To easily check the cooling air flow rate place a sheet of paper on the ventilator grid suction side when the cooler is in use. The paper should adhere to the grid.

NOTE For EK90s, after the fault has been eliminated the reset key must be pressed before restarting the unit. ▲

Checklist

Cooler will not start

Check the controller for error codes, see Error Codes in this section.

Ensure the circuit protector is in the on (I) position.

Make sure supply voltage is connected and matches the cooler's nameplate rating $\pm 10\%$.

No display on controller

Cycle the circuit protector on the front of the cooler.

Inadequate temperature control

Verify the setpoint.

Check for ice build up on the cooling probe. A layer of ice will act as insulation and reduce the cooling capacity. Ice build up is often an indication that the cooling fluid needs replacing. Defrost the cooling probe and change the cooling fluid.

Make sure the condenser is free of dust and debris.

Ensure cooler installation complies with the site requirements in Sections 2 and 3.

Make sure supply voltage matches the cooler's nameplate rating $\pm 10\%$.

If the temperature continues to rise, make sure your application's heat load does not exceed the rated specifications.

Check for high thermal gradients (e.g., the application load is being turned on and off or rapidly changing).

Cooler shuts down

Ensure the circuit protector is in the on (I) position.

Check the controller for error codes.

Make sure supply voltage is connected and matches the cooler's nameplate rating $\pm 10\%$.

When the unit is shut off, wait approximately five minutes before restarting. This allows time for the refrigeration pressures to equalize. If the pressures are not allowed to equalize, the compressor will short-cycle.

Please contact Thermo Fisher Scientific Sales Service and Customer Support if you need any additional information, see inside cover for contact instructions.

DECLARATION OF CONFORMITY

Manufacturer: Thermo Fisher Scientific
Address: 25 Nimble Hill Road
Newington, NH 03801

We declare that the equipment named below has been designed to comply with the relevant sections of the below referenced specifications and is in accordance with the requirements of the indicated directives.

Product: EK Immersion Coolers
Models: EK20, EK30, EK45, EK90

Directives and Standards:

2014/30/EC ± Electromagnetic Compatibility Directive (EMC)

- EN 61326-1: 2013 Electrical equipment for measurement, control, and laboratory use - EMC requirements. General requirements

2014/35/EC - Low Voltage Directive (LVD):

- EN 61010-1: 2010 Safety requirements for electrical equipment for measurement, control, and laboratory use -- Part 1: General requirements.

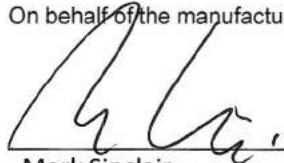
2011/65/EU - Restriction of the Use of Certain Hazardous Substances In Electrical and Electronic Equipment (RoHSD).

- EN 50581: 2012 - Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

Authorised representative in the EC:

Name: Thermo Fisher Scientific
Address: Dieselstrasse 4
76227 Karlsruhe Germany

On behalf of the manufacturer:



Date:

April 11, 2016



Mark Sinclair
R&D Director
Laboratory Equipment Division
Thermo Fisher Scientific
Newington, NH, USA

WARRANTY

Thermo Fisher Scientific warrants for 24 months from date of shipment any Thermo Scientific product according to the following terms.

Any part of the product manufactured or supplied by Thermo Fisher Scientific and found in the reasonable judgment of Thermo Fisher to be defective in material or workmanship will be repaired at an authorized Thermo Fisher Repair Depot without charge for parts or labor. The product, including any defective part must be returned to an authorized Thermo Fisher Repair Depot within the warranty period. The expense of returning the product to the authorized Thermo Fisher Repair Depot for warranty service will be paid for by the buyer. Our responsibility in respect to warranty claims is limited to performing the required repairs or replacements, and no claim of breach of warranty shall be cause for cancellation or rescission of the contract of sales of any product. With respect to products that qualify for field service repairs, Thermo Fisher Scientific's responsibility is limited to the component parts necessary for the repair and the labor that is required on site to perform the repair. Any travel labor or mileage charges are the financial responsibility of the buyer.

The buyer shall be responsible for any evaluation or warranty service call (including labor charges) if no defects are found with the Thermo Scientific product.

This warranty does not cover any product that has been subject to misuse, neglect, or accident. This warranty does not apply to any damage to the product that is the result of improper installation or maintenance, or to any product that has been operated or maintained in any way contrary to the operating or maintenance instructions specified in this Instruction and Operation Manual. This warranty does not cover any product that has been altered or modified so as to change its intended use.

In addition, this warranty does not extend to repairs made by the use of parts, accessories, or fluids which are either incompatible with the product or adversely affect its operation, performance, or durability.

Thermo Fisher Scientific reserves the right to change or improve the design of any product without assuming any obligation to modify any product previously manufactured.

THE FOREGOING EXPRESS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

OUR OBLIGATION UNDER THIS WARRANTY IS STRICTLY AND EXCLUSIVELY LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE COMPONENT PARTS AND Thermo Fisher Scientific DOES NOT ASSUME OR AUTHORIZE ANYONE TO ASSUME FOR IT ANY OTHER OBLIGATION.

Thermo Fisher Scientific ASSUMES NO RESPONSIBILITY FOR INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES INCLUDING, BUT NOT LIMITED TO LOSS OR DAMAGE TO PROPERTY, LOSS OF PROFITS OR REVENUE, LOSS OF THE PRODUCT, LOSS OF TIME, OR INCONVENIENCE.

This warranty applies to products sold by Thermo Fisher Scientific. (Refer to the warranty for products sold by the affiliated marketing company of Thermo Fisher Scientific for any additional terms.) This warranty and all matters arising pursuant to it shall be governed by the law of the State of New Hampshire, United States. All legal actions brought in relation hereto shall be filed in the appropriate state or federal courts in New Hampshire, unless waived by Thermo Fisher Scientific.

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