AFFINITY™ F-SERIES CHILLER

User Manual D5075

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Introduction

Congratulations on your purchase of an Affinity™ product.

I want to personally welcome you to the Lydall larger family. In October of 2001, Lydall purchased Affinity Industries, in an effort to expand capability as a Total Thermal Solutions Provider. Affinity's chillers and heat exchangers complement Lydall's existing wide array of Passive Thermal Solutions, augmenting Lydall's engineered thermal solutions for use in appliance, cryogenic, building products, and automotive markets. Our group is market driven as a formidable thermal solution manufacturer.

Lydall, Inc. is a New York Stock Exchange listed company (NYSE: LDL) headquartered in Manchester, CT. Our company, with ten operations in the United States, France, one in Germany, and Sales/Service Offices in Japan and Singapore, is recognized for working with customers to satisfy their unique thermal solution needs, and for delivering high quality, innovative products, and exceptional service.

Affinity™ products are high-precision specialty temperature-controlled equipment. The following product manual is designed to help you realize the full value of your purchase.

We highly recommend that you read this manual in its entirety. The manual will assist your company with the installation, operation, and routine maintenance of your Affinity™ product. Please keep this manual readily accessible to operation and service personnel to ensure you get the most out of our product.

If you have any questions about this model, or have other thermal solution needs, do not hesitate to call our Sales department (603-539-3600) or the 24/7 Service department (603-539-5005).

Thank you for your confidence in our ability to meet and/or exceed your needs and expectations.

Sincerely,

John Tattersall
Group Vice President
Lydall Industrial Thermal Solutions, Inc.

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Equipment Precautions

Failure to adhere to these precautions will void the warranty and may damage the chiller.

1. The chiller has been shipped without coolant. Do not run the chiller without connecting the coolant lines and keeping them filled with the appropriate coolant. Never run the pump without prime because it will be quickly damaged without liquid.

2. Never use coolants which are incompatible with the components in this chiller's coolant loop. Some coolants may not damage the coolant loop components, yet may significantly derate the chiller's cooling capacity. **Never use automotive antifreeze or other antifreeze containing silicates because silicates will cause the pump seals to fail**. Check with Lydall if there are questions about the coolant.

3. Maximum storage temperature for the unit is 52EC (125EF).

4. This chiller is designed for indoor use only. Do not operate the chiller in ambient temperatures below 7EC (45EF) or above 30EC (86EF). If the chiller has been exposed to temperatures below 7EC, allow 24 hours at ambient temperatures above 7EC to warm the oil in the compressor as well as the refrigerant before starting.

5. The cabinet of the chiller is designed to vent air. Maintain free space, equal to the height of the chiller, for air flow on the condenser side (the side where the coolant lines connect). Either the opposite side or the top of the chiller must have an equal amount of free space. When air flow becomes impeded, cooling capacity decreases and electrical efficiency drops as motor load increases.

6. Regularly check the condenser for dirt, dust, etc.. Disconnect electric power to the chiller, remove the bonnet, and clean as required to maintain flow through the condenser. (Condenser fins are easily bent. Use care when cleaning.)

7. This chiller is powered by three phase electricity. Verify pump rotation before operating. Rotation should be in the same direction as the arrow on the pump casing. Only qualified electrical service technicians should switch legs on three phase power to change pump rotation. Note: Jog the pump very briefly to observe the rotation. Verify pump rotation when the chiller is connected to a different circuit.

8. Routinely inspect the pump inlet strainer located in the reservoir for debris. Turn off the chiller, then remove and clean the strainer as required to permit free flow of coolant. Prevent foreign debris from entering the coolant line while the strainer is removed. Hint: Wrap the strainer in a plastic sandwich bag to contain most of the debris. Failure to keep the strainer clean will reduce coolant flow and may damage the pump.

Equipment Precautions

9. Do not operate the chiller at coolant temperatures above or below the values it was specified to deliver.

10. Do not run the chiller with cooling loads that exceed its factory rated cooling capacity.

11. Never operate damaged or leaking equipment.

12. The chiller must not be transported unless suitably protected. Original factory packaging in good condition or equivalent is required. Request air-ride trucks when transporting over land.

13. The chiller must be thoroughly drained and the coolant lines blown dry with low pressure air before shipping or storing.

14. Modifying the chiller without express written consent from Lydall will void the warranty.

Safety Precautions

1. Heed all warning labels. Do not remove.

2. Do not operate the chiller with the bonnet removed. The bonnet protects personnel from rotating parts and hot surfaces and also protects the chiller's components.

3. Connect the chiller to a properly fused disconnect box in compliance with the NEC (National Electric Code) as well as state and local codes for American usage, or local and national codes for European usage. Maximum fuses must not exceed the maximum rating found on the serial tag on the electrical box. The voltage, phase, and frequency of the power source must also match the requirements specified on the serial tag. To reduce the risk of electric shock:

   Do not remove cover of the remote control box (if included). Refer servicing to properly qualified and licensed personnel.

   Disconnect electrical power before opening the electrical box, except for the checking of the phase reverse relay or phase monitor if included with this unit (phase reverse relays or phase monitors will never be included in single phase units). Power must be applied in order for the phase reverse relay or phase monitor to indicate phase sequence.

   Do not operate equipment with damaged electric power cords.

   Turn off the chiller and disconnect electric power before servicing or moving.

4. Coolant lines, filters, and other components which connect to the chiller must be capable of withstanding the maximum pressure that the pump in the chiller can deliver at the maximum expected temperature.

5. The coolant loop has not been designed for potable water applications. Do not use the chiller for potable water. Never hook the water lines of a water-cooled unit to a potable water source or immerse a hose connected to a potable water source in the reservoir without providing back flow protection. A loss of pressure in the water source could lead to a back flow of the fluid in the unit, resulting in a possible contamination of the potable water source.

6. Vapors of some alcohol based antifreezes as well as other coolants may cause explosion if exposed to flame or spark.

7. Certain antifreezes may be poisonous if ingested.

Installation

Transporting

An Affinity™ chiller rolls easily on its four swivel casters. The brakes must be off on the two locking casters when moving the chiller. Roll the chiller gently to its operating location. The cushioned casters will help to dampen shock. Lock the casters when the unit is in place. If the chiller will be carried with a lift truck, proceed slowly and carefully to avoid jarring the chiller. Insert the forks from the condenser or electrical box side (the longer dimension) to catch both of the reinforcing rails of the chassis, taking care to prevent damage to the casters.

If the chiller will be shipped, protect it from shock and vibration or the warranty will be void. The chiller must not be transported unless suitably protected. Original factory packaging in good condition or equivalent is required. Request air-ride trucks when transporting over land.

Before shipping or storing the unit, it must be thoroughly drained and blown dry with low pressure air. Lydall will not accept any unit containing measurable amounts of fluid. Fluid left in the unit during shipping may damage components within the unit. Such damage is not covered by warranty.

Placement

Select a level location near the application, free from dripping or spraying moisture and excessive dust. Keep the coolant lines short to allow the pump to provide maximum pressure and flow to the application. If the chiller will be placed more than 25 feet from the application, call Lydall to discuss placement and how it might affect performance.

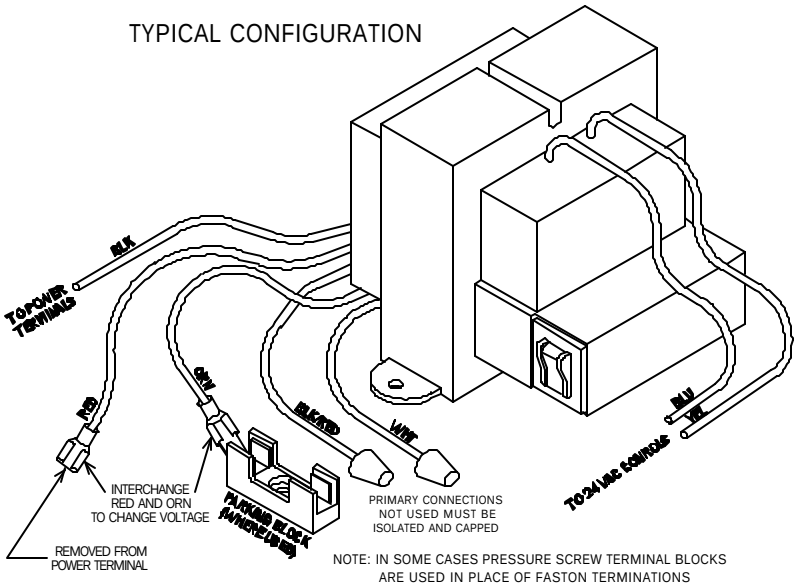
Units with non-pressurized reservoirs should never be installed more than 25 feet below the process or overflow may occur. Distances may vary slightly due to elevations above sea level. Call Lydall service for more information.

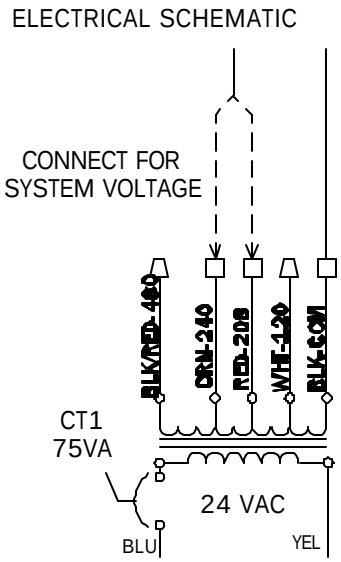
Electrical Requirements

Connect the chiller to a properly fused disconnect box in compliance with the NEC (National Electric Code) as well as state and local codes for American usage, or national and local codes for European usage. Maximum fuse sizes in the disconnect box must not exceed the maximum ratings specified on the serial tag of the chiller (found on the electrical box near where the power cord connects). The voltage, phase, and frequency of the power source must also match the requirements specified on the serial tag.

Note: Affinity™ models that can operate at 208-230 Volts 60 Hertz have been set at the factory for 208-220 Volt operation. If the operating voltage will be greater than 220 Volts, a qualified electrician should remove the red wire from the contactor and replace it with the orange wire taken from the dummy fuse block. Attach the red wire to the dummy fuse block as shown in the diagram below.

Installation





Warning: To reduce the risk of electric shock, do NOT remove cover from the electrical box. It contains exposed high voltage wires. Refer servicing to qualified personnel. Disconnect power to the chiller before servicing.

Priming the Pump and Connecting the Coolant Loop

DO NOT RUN THE PUMP DRY. If the pump does not establish prime, the pump shaft seal may overheat and be damaged in less than a minute. Use the following instructions when filling and assembling the coolant lines to prevent damage to the pump shaft seal.

1. Close the reservoir drain.

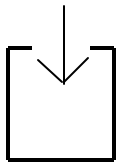
2. Fully open the flow control valve (if included).

3. Have extra coolant to add as the pump primes and the coolant loop fills.

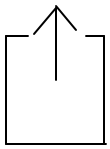
4. Fill the reservoir with coolant. Do not fill above the height of the coolant loop connection fittings or fluid may leak out.

Installation

5. Connect the coolant lines from the application to the FPT (female pipe thread) fittings near the top of the chiller as follows. Do not over tighten the insert and do not use a sealant that will lock the male threads to the female threads.
   a. Connect the coolant line coming back from the application to the RETURN fitting.
   b. Connect the coolant line going to the application to the SUPPLY fitting.



RETURN



SUPPLY

6. Check for proper pump rotation by “bump” starting the chiller. Bump start by placing the ON/OFF/SET switch in the ON position for one or two seconds. Pump rotation should be in the same direction as the arrow on the pump. If the direction of rotation is incorrect, a qualified electrical technician should exchange any two of the wires in the incoming power source (DO NOT change any wiring inside the chiller). Check again for proper pump rotation as above.

7. When the previous steps are complete, turn the chiller on by placing the ON/OFF/SET switch in the ON position. Immediately check for flow. If within five seconds no turbulence is visible in the reservoir or the supply pressure gauge shows no pressure reading, shut the chiller off by placing the ON/OFF/SET switch in the OFF position. If flow is established, continue filling the reservoir until the low level alarm shuts off. Do not allow the reservoir to overflow.

8. If the pump does not establish prime, disconnect the SUPPLY coolant line to vent any trapped air, reconnect the line, and repeat step 7.

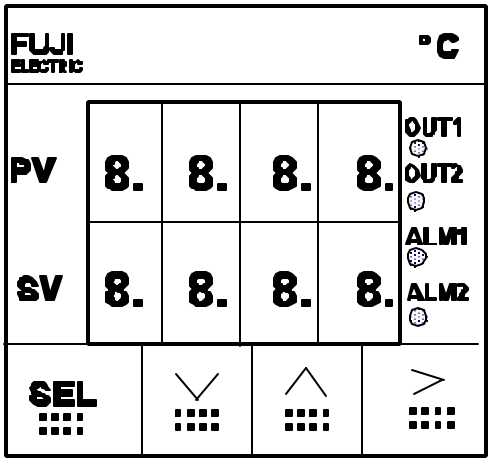
9. If the pump still does not prime, use the following steps:
   a. Disconnect both coolant lines (have a container handy to catch any overflow from the RETURN fitting).
   b. Force coolant into the SUPPLY fitting. The fluid will force the air out of the lines in the chiller and out of the pump head, causing it to escape into the reservoir. If tap water will be the source of coolant, simply connect the tap water line to the SUPPLY fitting and turn on the tap. If a source of coolant other than tap water will be used, elevate the coolant a few feet above the chiller, connect to the SUPPLY fitting, and let gravity force the air out into the reservoir. Remember to have a container handy to catch any overflow from the RETURN fitting.
   c. Reconnect the coolant lines and repeat step 6. Stop filling when the reservoir is full to within a few inches of the top. Do not allow the reservoir to overflow.

Operation

Using the Controller

This chiller comes with a FUJI ELECTRIC 1/16 DIN temperature controller. This controller is a programmable microprocessor, which offers many more features than are necessary to master at this point.

This controller come pre-programmed according to the Affinity™ model selected. If some of the controller's additional features become necessary, call Lydall service (603-539-5005) for technical assistance or consult the FUJI ELECTRIC Instruction Manual.



To power the controller without powering the chiller, place the ON/OFF/SET switch in the SET position. The digital display will light up. The number next to PV is the actual process coolant temperature. The number next to SV is the Set-Value (desired) temperature. Lights next to OUT1, OUT2, ALM1, and ALM2 may also appear. A light on next to OUT1 (when the switch is in the ON position) indicates that the chiller is cooling. Both ALM1 and ALM2 are alarms that are configured differently for different chillers.

Changing the Set-Value Temperature

Change the Set-Value by pressing the (>) key on the controller keypad. SV will change to a leading zero display. Continue pressing the (>) key until the appropriate digit flashes. Press the (v) or (w) key on the controller keypad until the digit changes to the desired value. Toggle through using the (>), (v), and (w) keys to change the appropriate digits until the Set-Value reads as desired. Continue pressing the (>) key until the last digit flashes. Press the (>) key one more time and all leading zeroes will extinguish. This locks in the Set-Value temperature.

Operation

Caution: Never program in a Set-Value temperature of more than 32EC (90EF) unless this Affinity™ model is specifically modified to operate at higher coolant temperatures. Never program in a Set-Value temperature of less than 5EC (40EF) unless a suitable antifreeze is used as coolant **AND** this unit is designed to operate at below freezing temperatures.

Turn the whole system on by placing the ON/OFF/SET switch in the ON position. The Set-Value temperature can be changed with the switch in either the ON or SET position.

Air bubbles will be visible rising in the reservoir as the pump forces air out of the coolant loop. After the air has been purged from the coolant loop, a steady turbulence will appear in the reservoir. This turbulence mixes the coolant to deliver more precise temperature stability in the coolant supply than the controller indicates.

Safety Alarms (Temperature)

The controller has ALM1 and ALM2 lights. ALM2 may or may not operate depending on the exact model of the PYX controller. The alarm(s) have been preset at the factory to come on when the temperature of the circulating coolant is above or below the temperature the chiller has been set to deliver.

The OUT1 light on the controller (when lit) indicates that the refrigerant solenoid valve is open to allow refrigerant to flow to the heat exchanger. If the light is on most of the time, most of the chiller's capacity is being used. If the light is on infrequently, much less than the chiller's full capacity is being used.

Communications

The 9-pin connector on the control panel provides RS485 communications from the chiller to the RS232 converter on pins 2, 3 and 5.

This unit contains advanced communications diagnostics. Diagnostics displays include all alarms and faults, as well as integrated temperature control. For additional information on the WinChill communications interface, consult the WinChill manual also supplied with this unit.

In order for units with WinChill RS232 Communications to meet CE Compliance, the external RS232 cable which connects the unit to the customer's equipment **must be shielded**. This is required to meet the EMC immunity requirements of EN61326 for industrial locations. The cable must not exceed 30 feet in length. The shield construction must be a braid (minimum 85% tinned copper) over aluminum foil (minimum 100% coverage) shield with a 360E shield termination at each end of the cable. One possible source for cable meeting this requirement is **Black Box**, part number EGM12D.

For units with WinChill RS485 communications, the cable must not exceed one thousand feet in length.

Operation

Preventive Maintenance

A stainless steel mesh strainer attaches to the pump suction port near the bottom of the reservoir. It can easily be removed for cleaning. First turn the pump off, then pull off the strainer, rinse it clean, and push it back on. To protect the pump, routinely inspect the strainer to be sure it is clean and properly attached. Hint: If the strainer is coated with debris, wrap it with a plastic sandwich bag before pulling it off to prevent most of the debris from escaping into the reservoir. The frequency of checking and cleaning this strainer will depend on the cleanliness of the process and the fluid.

Regularly check the condenser, located in front of the fan, for dirt, dust, etc.. To clean, disconnect the electrical power cord and remove the bonnet. Check and clean the condenser as required using a vacuum or low pressure air. Condenser fins bend easily. Use care when cleaning.

Trouble Shooting Guide

Problem	Possible Cause	Possible Remedy
Unit does not start	No power to unit, breaker tripped	Verify power to unit, close breaker after correcting fault
	Low voltage	Check electrical service to unit
	Refrigeration high pressure cut-out tripped	Will automatically reset after correcting fault
	Loose wire	Check wiring after disconnecting power
	Defective contactor or coil	Repair or replace contactor or coil
	Loss of refrigerant	Repair leak, then recharge with type and amount of refrigerant specified on serial tag
	Compressor damaged	Replace compressor - Call Lydall
Unit does not cool	Compressor internal thermostat tripped	Allow time for compressor to cool and automatically reset
	Compressor damaged	Replace compressor - Call Lydall
	Room temperature exceeds 85EF, causing cooling capacity of unit to be derated	Improve ventilation/air-conditioning to maintain room temperature < 85EF
	Evaporator damaged	Call Lydall
	Microprocessor programmed incorrectly	Reprogram microprocessor, Call Lydall
	Cooling load exceeds capacity of unit	Reduce cooling load
	Microprocessor failure	Replace microprocessor
	Loss of refrigerant	Locate and repair leak, then recharge with type and amount of refrigerant specified on serial tag
	Refrigeration solenoid coil failure	Replace solenoid coil

Problem	Possible Cause	Possible Remedy
Unit does not cool (continued)	Solid State Relay failure	Replace Solid State Relay
	Solenoid valve stuck shut	Repair or replace solenoid valve
	Defective refrigeration low pressure cut-out	Repair or replace low pressure cut-out
	Malfunctioning thermal expansion valve	Replace thermal expansion valve
	Pump damaged, loss of flow	Replace pump
	Hot gas bypass valve setting too high	Call Lydall
	Hot gas bypass valve stuck open	Repair or replace valve
	Dirty condenser fins	Gently clean condenser fins
Pump leaks	Faulty pump casing	Replace pump assembly
	Shaft seal damaged	Replace shaft seal
	Pump housing O-Ring damaged	Remove pump and rebuild
	Improper fluid	Call Lydall
Excessive noise on Start-Up	Low voltage	Check electrical service
	Wrong voltage taps used on transformer	Connect to proper taps
	Contactor or coil failure	Replace contactor or coil
Pump motor overheats	Pump thermal overload protection set too high	Reset pump thermal overload relay or replace if faulty
	Improper voltage supplied	Correct voltage
Noisy compressor	Flooding of refrigerant into crankcase	Warm crankcase if unit has been off for a long period or has been left in a cool ambient for more than a few hours

Problem	Possible Cause	Possible Remedy
Noisy compressor (continued)	Worn compressor	Replace compressor - Call Lydall
	Refrigeration high pressure cut-out set too high	Adjust setting
	Refrigeration low pressure cut-out set too low	Adjust setting
Level light remains on	Low coolant level	Check for leaks then fill reservoir
	Reservoir level switch float stuck	Clean reservoir and level switch
	Time delay relay malfunction (when used)	Replace time delay relay
	Level switch failure	Replace level switch
Level light does not work	Time delay relay has not timed out (when used)	Wait for time delay relay to time out
	Lamp burned out	Replace lamp
	Level switch failure	Replace level switch
Fault light remains on	Low coolant flow	See Problem; Low coolant flow
	No coolant flow	See Problem; No coolant flow
	Flow switch sticking	Disassemble flow switch, clean, and reinstall or replace
Low coolant flow	Pump suction strainer clogged	Remove strainer, clean and reinstall or replace
	Pump rotating backwards	Reverse one electrical phase
	Flow control valve not fully open	Open flow control valve
	Pressure relief valve set too low (unless not adjustable)	Adjust pressure relief to specification
	Low coolant level in reservoir	Check for leaks, then fill reservoir

Problem	Possible Cause	Possible Remedy
Low coolant flow (continued)	Restriction in coolant lines external to chiller	Eliminate restrictions in coolant lines external to chiller
	Frozen evaporator	Call Lydall
	Flow switch clogged	Disassemble flow switch, clean, and reinstall or replace
No coolant flow	Pump not primed	Prime pump
	Pump suction strainer clogged	Remove and clean strainer, then reinstall
	No coolant in reservoir	Check for leaks, then fill reservoir
	Pump overload tripped	Wait 5 minutes for overload to reset
	Pump motor shaft bound to seal	Replace pump or renew seal
	Pump housing improperly torqued	Remove pump, torque to specifications, test, and reinstall
	Damaged pump	Replace pump
	Frozen evaporator	Call Lydall
	Clogged line or closed valve in external piping	Check external piping for dirt or closed valve
	Leak(s) in external piping	Check for leaks and repair if needed
Chiller shuts down during operation	Refrigeration high pressure cut-out set too low	Adjust and reset high pressure cut-out
	Refrigeration low pressure cut-out set too high	Adjust and reset low pressure cut-out
	Dirty condenser fins	Gently clean condenser fins
	Excess refrigerant charge	Remove excess refrigerant and recharge to specifications on serial tag

Problem	Possible Cause	Possible Remedy
Chiller shuts down during operation (continued)	Pump overload setting too low	Adjust and reset pump thermal overload relay to specifications, or replace if faulty
	Pump overload tripped	Determine reason for trip. If pump is damaged, repair or replace
	Low voltage	Check service to chiller
Temperature display reads incorrectly	Loose wire	Check wiring after disconnecting power
	Broken RTD	Replace RTD
	Microprocessor failure	Replace microprocessor
Too much recirculating pressure to process	Flow control valve set too high	Throttle flow control valve
	Pressure relief valve set too high (unless not adjustable)	Adjust pressure relief valve
Compressor turns on and off automatically	Discharge pressure too high	Determine cause and correct
	Condenser fan(s) not on	Check motor(s) and wiring
	Refrigeration high pressure cut-out set to automatic	Check settings
Chiller cools well below desired Setpoint	Microprocessor programmed incorrectly	Reprogram microprocessor - Call Lydall
	Malfunctioning solenoid valve	Repair or replace solenoid valve
	Solid State Relay failure	Replace Solid State Relay
	Microprocessor failure	Replace microprocessor
Compressor does not run	Compressor internal thermostat tripped	Allow time for compressor to cool and automatically reset
	Motor burned out	Replace - Call Lydall

Problem	Possible Cause	Possible Remedy
Microprocessor does not work	5 second delay has not timed out	Wait at least 5 seconds after turning on
	Microprocessor programmed incorrectly	Reprogram microprocessor - Call Lydall
	Microprocessor failure	Replace microprocessor

Warranty

The Lydall Limited Warranty

Twelve-Month Warranty
Parts and Labor

Lydall Industrial Thermal Solutions Inc. warrants this product to the original Owner for a period of twelve (12) months from the date of shipment. Lydall will repair, or, at its discretion, replace any part found to contain a manufacturing defect in material or workmanship, without charge to the Owner, for twelve months from date of shipment. Shipping costs are excluded from warranty. Service labor will be at no charge during the warranty period as long as the labor is supplied at the Lydall plant in Ossipee, New Hampshire, or by a Lydall approved service provider. Replacement or repaired parts will be warranted only for the un-expired portion of the original Warranty. To obtain prompt warranty service, contact Lydall, PO Box 1000, Ossipee, New Hampshire, 03864, USA.

Before returning any equipment to Lydall for repair, it is necessary to contact the Lydall Service Department for a Return Material Authorization number and an authorized service depot location where the repairs will be completed.

This Warranty does not cover the following: Damage or failure of any part caused by accident, customer shipping, storage, misuse, customer modification, fire, flood, Acts of God, or resulting from failure to properly install, operate, or maintain the product in accordance with the printed instructions provided in the User Manual. As noted in the User Manual, any modification of the unit without expressed written consent from Lydall will void the warranty.

In no event shall Lydall be liable for any repairs or service or any consequence of any repair or service that are not performed in strict accordance with all applicable city, county, state, and federal laws.

Further limitations and exclusions: This Warranty is in lieu of any other warranties, expressed or implied, including merchantability or fitness for a particular purpose. In no event shall Lydall be liable for any consequential or incidental damages that the Owner may incur resulting from purchase or use of this Lydall product. The buyer's sole and exclusive remedy and the liability limit of Lydall, for any loss whatever, shall not exceed the purchase price paid by the purchaser for the Lydall product on which a claim is made.

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