Blue M®

146 Series

Inert Gas Mechanical Convection Ovens

The Blue M Inert Gas Mechanical Convection Oven, which we pressure-test at normal operating levels, is ideal for industrial oven applications that involve curing, heat treating and packaging of electronic components as well as other applications which require controlled atmosphere environment.

Oven Features

- Adjustable inert gas purge system including a flowmeter, two way gas control valve, cycle start-up high flow purge, low flow adjustment, chamber pressure gauge and supply connection allowing for consistently low oxygen PPM levels within the work chamber
- All-welded and sealed construction assures continuously low oxygen levels
- Fiberglass insulation to ensure safe cabinet skin temperature
- Door switch (disables heat and circulation blower upon door opening)
- Stainless steel, cooling coil provided; water supply required
- Adjustable shelf levels
- Heavy-duty door - double-wall, insulated construction
- Independent, over-temperature protection (high limit controller) included
- Every oven is fully assembled and individually factory tested
- Circuit breaker provided for ground fault protection as standard
- Single or three phase operation available in 50 Hz or 60 Hz

Uniform, Accurate and Reliable Temperature Control

- Available with profiling or single setpoint temperature controls, Ethernet and USB communications
- Horizontal airflow assures uniform thermal performance under most loading conditions
- Exclusive Blue M Eterna heating elements - the most reliable available, with heavy-gauge high temperature nickel chromium wire and low-watt density for longer service life
- Airflow switch provided as standard to protect oven and product
- Direct drive, multi-blade, centrifugal blower with high-volume air delivery and dynamically balanced or noise reduction
- Uniformity: Blue M can provide varying levels of uniformity; if you have a specific tolerance or specification which must be met, please contact us with your requirements so we can ensure the equipment is designed, tested, and adjusted to meet those requirements

Designed to satisfy the most challenging applications.

Our engineered-to-order skills can accommodate your unique requirements.

TPS™ Thermal Product Solutions

»Blue M »Gruenberg »Lindberg/MPH »Lunaire
»Redline Chambers »Tenney »Wisconsin Oven

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INDUSTRY SOLUTIONS

Blue M's experienced engineers are able to meet even the most stringent requirements when designing customer equipment.

Applications

- Aging
- Annealing
- ASTM Testing
- Drying
- Photo Resist
- Stress-Relief

Industries

- Aerospace
- Agriculture
- Automotive
- Defense
- Education
- Electronics
- Energy
- Government
- Medical
- Oil & Gas
- Pharmaceutical
- Research & Development
- Rubbers & Plastics
- Semiconductors
- Telecom
- Textiles







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OVEN SPECIFICATIONS

*Model DCCI-1406 (Clean Room) includes HEPA filtration

Oven Construction

- All-welded, heavy-duty exterior with heavy-gauge, reinforced, cold-rolled steel
- Corrosion-resistant, all-welded and sealed, stainless steel (type 304) interior
- Fiberglass insulation to ensure safe cabinet skin temperature
- Heavy-duty door - double-wall, insulated construction
- Baked on white powder-coated enamel finish on exterior for long-lasting corrosion protection

Model Dimensions					
Model	DCI – 206 (Bench Model)	DCI – 256 (Bench Model)	DCI – 296 (Floor Model)	DCI – 336 (Floor Model)	DCI – 1406 (Floor Model)
Cubic Feet (Liters)	4.2 (119)	5.8 (164)	9 (255)	11 (312)	24 (680)
Work Space Inches (mm) (W x D x H)	20 x 18 x 20 (508 x 457 x 508)	25 x 20 x 20 (635 x 508 x 508)	25 x 25 x 25 (635 x 635 x 635)	25 x 20 x 38 (635 x 508 x 965)	48 x 24 x 36 (1219 x 610 x 914)
Exterior Inches (mm) (W x D x H)	42 x 34 x 56 (1067 x 864 x 1423)	47 x 36 x 56 (1194 x 914 x 1423)	47 x 40 x 70 (1194 x 1016 x 1778)	47 x 36 x 83 (1194 x 914 x 2109)	70 x 40 x 81 (1778 x 1016 x 2058)
Machine Footprint (sq. ft.)	9.9	11.8	13.1	11.8	19.5
Approx Unit Weight (lbs)	600	700	850	900	1350
Load / Capacity					
Max Number of Shelves†	8	8	10	17	16
Shelf Spacing (inches)	2	2	2	2	2
Shelf Weight Capacity (lbs)††	125	225	200	225	150
Chamber Capacity (lbs) ††	400	400	400	400	400
Floor Load Rating (lbs) ††	75	75	75	75	100
Door(s) †††	Single Door Right-Hinged				

†Shelves not included with the unit
††Distributed Load
†††Reverse door hinge available as an option

Electrical Service					
Model	DC – 206 (Bench Model)	DC – 256 (Bench Model)	DC – 296 (Floor Model)	DC – 336 (Floor Model)	DC – 1406 (Floor Model)
208 VAC 1 Ph 60 Hz Heater KW Line Current (Amps)	3 (17)	4.5 (26)	6 (35)	6 (35)	6.8 (38)
240 VAC 1 Ph 60 Hz Heater KW Line Current (Amps)	4 (20)	6 (29)	8 (40)	8 (40)	9 (44)
208 VAC 3Ph 60 Hz Heater KW Line Current (Amps)	6.8 (20)	9 (27)	13.5 (40)	13.5 (40)	18 (53)
240 VAC 3Ph 60 Hz Heater KW Line Current (Amps)	9 (23)	12 (31)	18 (46)	18 (46)	24 (61)
480 VAC 3Ph 60 Hz Heater KW Line Current (Amps)	9 (12)	12 (16)	18 (23)	18 (23)	24 (31)

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OVEN PERFORMANCE

Temperature	
Standard Temperature Range	15°C (27°F) above ambient to 350°C (662°F)
Controller Accuracy	+/- 1.0°C (+/- 1.8°F)
Controller Resolution	+/- 0.1°C (+/- 0.1°F)
Heat up time†	350°C (662°F) 60 minutes or less depending on model and voltage, empty chamber
Uniformity	Blue M can provide varying levels of uniformity; if you have a specific tolerance or specification that must be met, please contact us with your requirements so we can ensure the equipment is designed, tested, and adjusted to meet those requirements
†DCCI Clean Room models are limited to 0.5°C per minute due to HEPA filtration	

Performance					
Model	DCI – 206 (Bench Model)	DCI – 256 (Bench Model)	DCI – 296 (Floor Model)	DCI – 336 (Floor Model)	DCI – 1406 (Floor Model)
Airflow SCFM @ 0.5" WC	785	925	1230	1230	1600
Airflow SFPM	314	333	283	233	267
N2 Purge Flow (SCFH)	100	200	200	200	300
Purge Time (min.)	27	18	30	30	48
N2 Run Flow (SCFH)	25	30	60	60	120
N2 Flow Rate (SCFH) Range	10-100	20-200	20-200	20-200	60-600
Heat Rejection††† (BTUH) ††††	4727	5672	7428	8643	12965
Vent Port Max Flow (SCFH) at Ambient†††	100	200	200	200	600
Pressure Relief (Check) Valve (inches)	¾-inch FNPT				
Water Supply	3–4 GPM at 30–40 PSIG at 75°F Maximum				
†††Approximate ††††Estimated values at unit's max temperature with the oven ducted outside of the room					

High volume horizontal air recirculation system and electric heating system allow for maximum temperature uniformity in performance

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INERT GAS OPERATION

Overview

The inert gas sytem maintains an inert atmosphere in the oven at a slight positive pressure during the entire process cycle. The oven is initially purged of atmospheric air for a specific time period before heating is allowed to begin. A constant flow of inert gas is then maintained during the heating and cooling cycles. Inert gas flow and chamber pressure are monitored and regulated with various instruments on the front control panel. The gas is injected into the chamber through a small port located beneath the blower wheel in the conditioning plenum in the bottom oven, and above the blower wheel in the top oven. The following inert gases are approved for DCI models:

- Argon†
- Carbon Dioxide
- Helium
- Nitrogen

Initial Chamber Purge Cycle

Before the process cycle is allowed to begin, a chamber purge cycle is initiated which lasts for a set amount of time dependent on oven size and purge rate. The purge cycle is designed to purge the chamber of existing atmospheric air and replace it with an inert gas. All oxygen, water vapor, airborne contaminants, etc., are removed. The Purge Rate Adjustment needle valve on the flowmeter is used to adjust gas flow during the Purge Cycle.

A Purge Timer is used to time the purge cycle. After product is loaded, the oven door is securely closed and the chamber is started, the timer energizes to open the Gas Purge solenoid valve and start the purge. The circulation blower will start and the heating system will be disabled. The purge timer resets each time the door is opened.

TPS recommends that a volume of inert gas at least 5 to 10 times the volume of the work chamber be forced through the oven. The Gas Flow Rate Table reflects a rate of approximately 7 times the volume for the chamber listed.

Run (Heat Process) Cycle:

After the purge cycle has been completed, the purge timer output will open to deenergize and close the Gas Purge solenoid valve. The inert gas supply will now flow into the chamber through the Run Flow Adjustment valve on the gas control panel. This flow level maintains a slightly positive pressure in the chamber during the heat process cycle. The heating circuitry is then enabled to start the heat process cycle.

A Strato-flo Check Valve maintains a slight positive pressure in the chamber during the process cycle. The valve spring is removed so that very little pressure is required to open the check valve. This ensures the chamber does not become highly pressurized with the injection of any gas. A chamber pressure gauge marked in 0-5 inches of W.C. is provided on the gas panel.

Cool Down Cycle:

Upon completion of the heat process cycle the heating system will be disabled. During the Cool Down Cycle, the inert gas atmosphere must be maintained until the work load is below the temperature at which oxidation will occur. 125°C is considered the highest safe temperature for most workloads. The Cool Down Flow Rate is identical to the Run Flow Rate listed in the Gas Flow Rate Table.

Gas Flow Rate Table

Model	DCI – 206 (Bench Model)	DCI – 256 (Bench Model)	DCI – 296 (Floor Model)	DCI – 336 (Floor Model)	DCI – 1406 (Floor Model)
N2 Purge Flow (SCFH)	100	200	200	200	300
Purge Time (min.)	27	18	30	30	48
N2 Run Flow (SCFH)	25	30	60	60	120
N2 Flow Rate (SCFH) Range	10-100	20-200	20-200	20-200	60-600

†Use of Argon will limit voltage to 240 max

INERT GAS SYSTEM

Options

Trace Oxygen Transmitter Option

The Alpha Omega Series 3510 Trace Oxygen Transmitter will use the secondary channel of the controller to read and display the oxygen level measured inside the chamber. This O2 measurement system will be configured to turn on the chamber's purge system and turn off the heating element once a high O2 PPM condition is detected. The controller will be configured to prevent the start of the heating process until the O2 PPM level reaches the desired set point level.

An alarm silence switch will be provided for the high O2 alarm. The system includes O2 solenoid valves, which will close and disable the sampling pump when the door is opened and remain off until the completion of the initial purge cycle is completed. The purge system is wired so that it does not turn ON the heating elements of the oven during the purge cycle.

The Series 3510 Trace Oxygen Transmitter has a single range of 0-500 PPM, which includes two manual isolation valves, two AC powered solenoid valves (used to protect the oxygen sensor from exposure to air), high capacity in-line filter, and sample pump mounted on the side of the enclosure, and a flow meter.

N2 Run Valve

An N2 Run Solenoid Valve to turn OFF N2 flow when the oven is idle.

Low N2 Pressure Switch with Alarm

A Nitrogen Low Pressure Alarm with audible and visual indicator and alarm silence switch is installed. An alarm will alert operator indicating low inlet pressure at the supply (below 40PSIG). The pressure switch will remove power to the oven heaters in the event of a loss of inlet pressure at the N2 supply line that results in low or loss of N2 flow.

High O2 Alarm Indicator (pilot light) with Alarm Silence Switch

The red High O2 (Oxygen) Alarm Light will illuminate when a high level of oxygen is detected by the optional Oxygen Analyzer/Transmitter.

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INERT GAS SYSTEM

Options

Dual Gas System

A dual inlet gas line for nitrogen (N2) and clean dry air (CDA) is a specialized system designed to safely and efficiently deliver two different gases to the oven chamber. This dual inlet gas line system allows for the efficient use of nitrogen and clean dry air in various applications, providing flexibility, safety, and control over gas delivery. Please note that this is a general description and the actual design and components of a dual inlet gas line can vary based on the specific requirements of the application. This system typically consists of the following components:

- Inlet Lines: Two separate inlet lines are used, one for each gas. Each line will have a Run solenoid valve. Run Solenoid Valves turn OFF the gas flow when the oven is idle.
- Outlet Line: The gases are delivered to the oven through an outlet line/port located beneath the blower wheel in the conditioning plenum.
- Control System: The system includes a control system that allows the user to switch between the gases. This can be achieved by using the oven controller programmed to have an event to switch between N2 and CDA supply. Flow meter(s) allow for manual adjustment of the gas flow rates.
- Pressure Regulators (by customer): Each inlet line will require a pressure regulator (supplied by customer) to control the pressure of the gas being delivered. The regulators ensure that the gases are delivered at the correct pressure.

Scan for more options

Under Temperature Protection

Under Temperature Protection (UTP) provides electronic limit control with and independent thermocouple sensor, pilot light and buzzer. Pilot light illuminates and buzzer sounds when limit temperature is reached.

Alarm Silence / End of Process Pushbutton Light

The white Alarm Silence / End of Process Pushbutton light illuminates at the end of the process cycle. The pushbutton silences an alarm.

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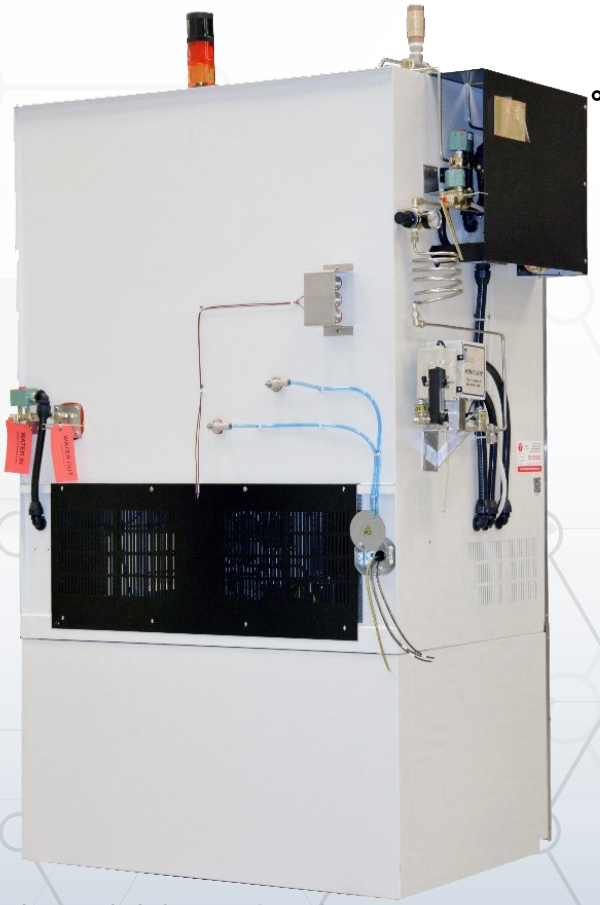
OPTIONS & ACCESSORIES

Blue M industrial and laboratory ovens are available with a variety of options to enhance the capabilities and performance of the unit. Options categories include ergonomics, performance, process control/electrical and safety. Ask your sales representative for additional options and custom solutions.



*Model DCI-256 shown with optional stand

The adjustable inert gas purge system includes a flowmeter, two-way gas control valve, cycle start-up high flow purge, low flow adjustment, chamber pressure gauge and supply connection.

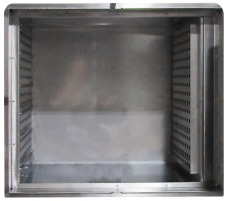
This feature allows for consistently low oxygen PPM levels within the work chamber

Available Oven Options


Nickel-plated wire rod shelves


Stainless steel slotted shelves


Semi-pierced duct walls for tuning airflow


DCCI Models with HEPA Filtration

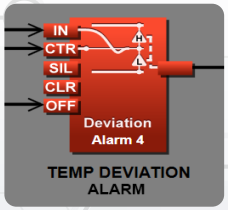
Emergency Stop Pushbutton


Pneumatic or Electro-Mechanical door lock


Fused Disconnect with Lock Out / Tag Out System


Maintenance Lockout

Redundant Overtemperature Protection



Temperature deviation alarm with visual and audible alerts


Temperature Recorders (paper or paperless)


Up to 16-channel thermocouple-based temperature data logger

24-hour, 7-day digital process timer


Light tower with audible alarm


Swivel casters with levelling feet

Scan for more options

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CONTROL SYSTEMS

Scan for additional F4T specifications and options

Scan for additional PM Plus specifications and options

The Watlow F4T Temperature Controller with INTUITION™ temperature process controller combines the flexibility of a modular I/O controller with best-in-class ease of use.

Watlow F4T Controller Features

- 4.3-inch, color touch panel with high-resolution, graphical user-interface
- 1 to 4 control loops with TRU-TUNE+ adaptive control algorithm for superior controllability
- 40 ramp and soak profiles with real-time clock and battery backup.
- Ethernet Modbus® TCP connectivity
- High-speed USB 2.0 host port
- Modular design, which offers numerous types of field pluggable modules for maximum flexibility and easiest compatibility
- Optional Data Logging capability
- Optional Graphical Trend Chart
- TPS provides panel mounted USB and Ethernet ports located on the front control panel of the equipment
- Temperature stability: Typical ±0.1°F/°F (±0.1°C/°C) rise in ambient max

Watlow's PM PLUS™, the enhanced EZ-ZONE® PM, is now more intuitive and features an enhanced interface for easier programming and readability with a SMOOTH-TOUCH™ keypad creating an industry leading user experience.

Watlow PM Plus Controller

- Integrated functions and high amperage power control output lower ownership costs
- Current monitoring detects heater current flow and provides alarm indication of a failed output device or heater load
- Features a wide range of serial communications capabilities
- User-selectable heat/cool, on-off, P, PI, PD, PID or alarm action
- Auto-tune with TRU-TUNE+ adaptive control algorithm
- Configuration communications with software saves time and improves reliability of controller setup
- Temperature stability: ±0.1°F/°F (±0.1°C/°C) rise in ambient max

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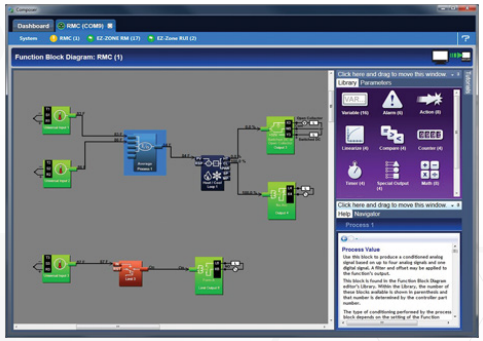
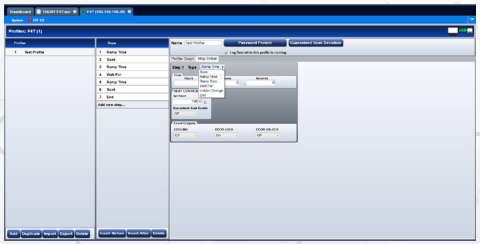
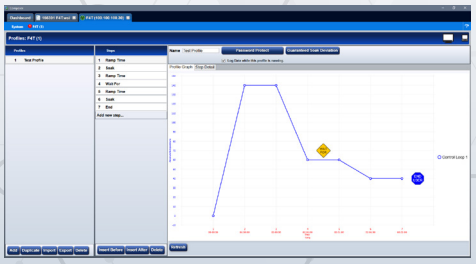
SOFTWARE PACKAGES

COMPOSER® Software

COMPOSER® is Watlow's new, easy-to-use software for configuring and customizing controllers. Use it to optimize Watlow's F4T, D4T, EZ-ZONE® RM and EZ-ZONE PM products for specific applications. Task-specific views simplify all aspects of commissioning new controllers including managing the inputs and outputs from pluggable flex modules, setting up functions such as control loops and alarms and creating and editing profiles.





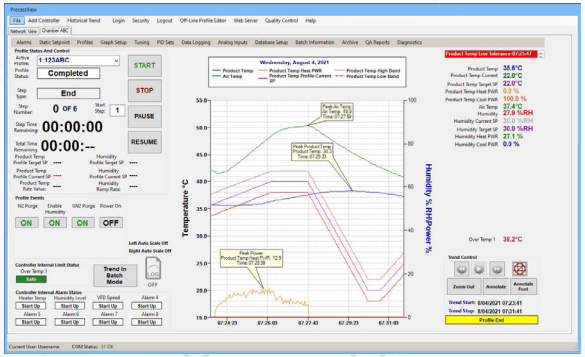


Scan here for additional Watlow Composer specifications, software and demos, and training and education information.

- Function block diagram with live data and error indication
- Depicts the configuration visually making it easy to understand and explain to others
- Multi-language support
- Provides backup of settings to restore if settings are changed or controller is replaced
- Lets users adjust window sizes and positions to work efficiently
- Data trending and batch management configurations are available

ProcessView Software

ProcessView Data Acquisition Software for Watlow's F4T, Legacy F4, and EZ-Zone® PM Controller Networks. The Software is dedicated to adding value just with Watlow F4T, Legacy F4, and EZ-Zone PM Controllers, which means there is no programming required and it outperforms other more expensive software packages on the market. ProcessView is a great replacement for legacy Watview® Software.



- Designed to work with Windows 7/10/11 operating systems allowing the use of newer PC technology
- Supports up to 50 Watlow F4T's, Legacy F4 and or EZ-Zone PM Controllers embedded on a local network
- Enabling the software's security features provides compliance to **21 CFR Part 11** industries such as Pharmaceutical, Medical and Clinical markets

Dedicated Overview Screen:

Each Controller/Chamber on the network shows real-time trend, process data, event output status and current Profile status. Profiles can be started, stopped, paused or resumed from this screen. Profile Events can be manually turned on or off if enabled.

Software Alarm Screen:

Each input sensor (temperature, humidity, etc.) can have a Software Alarm associated with it independent of the alarms hard coded in the controller. Both visual and audible notifications can be enabled in the software.

Security Screen:

All menus and screens can be password protected with 3 different role levels (Supervisor, Technician and Operator) with unique passwords.

Audit Trail Viewer:

All audit trail entries can be viewed with the audit trail viewer screen. Each audit trail entry is time stamped and answer the "How", "Why", "Who", "When" for the change. Audit trails are encrypted and can be printed or exported for auditor inspections in a readable CSV format.

Real-Time Data Log File Viewer Screen:

Displays data as it is being logged to the PC file for peace of mind and to make sure the correct data is being logged. Events are also recorded in the Data Log file along with Batch Information and Min/Max process values for each input. Notes can be added by the operator real-time as the profile or batch is running. Multiple electronic signatures can be added to data log files for tamper-proof security.

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Blue M Warranty

LIMITED WARRANTY TO ORIGINAL PURCHASERS. Blue M ("Blue M") warrants to the original purchaser that Blue M owns and will convey clear title to each product that it manufactures and delivers. Additionally, and provided the original purchaser has paid the full purchase price for a product or service, Blue M warrants that from the date it ships and, if applicable, installs a product, or finishes performing a service, the product Blue M manufactured shall conform to written specifications that Blue M approved, and the product shall be free from defects in material and workmanship for twenty-four (24) months, (with the exceptions of the Ultra Temp and LO/GO series, which have a 12 month warranty). Blue M further warrants that any service it performs shall conform to written specifications that Blue M approved and be free from defects in workmanship for twenty-four (24) months (with the exceptions of the Ultra Temp series, which are covered for 12 months. No service warranty for LO/GO series). If a purchaser purchases a TPS Preventive Maintenance & Calibration plan at the end of the warranty period, these limited warranties shall each be extended by twelve (12) months, (with the exceptions of the LO/GO series) subject to the exclusions below. If, within that time period, the original purchaser notifies Blue M in writing of an alleged non-conformity, and Blue M determines, to its reasonable satisfaction, that a product or service is, in fact, non-conforming, then Blue M shall, at its option and expense, repair or replace the non-conforming product or correct the non-conforming service, either at the original purchaser's or Blue M's factory. Warranty Exclusions. This limited warranty shall not apply to (i) labor to replace a part in a product located outside of the U.S., (ii) a service Blue M performed outside of the U.S., (iii) any loss or damage resulting from normal wear and tear or alteration, misuse, or abuse, including any loss or damage caused by customer products or processes, (iv) improper installation, operation, maintenance, or repair by the original purchaser or a third party with or without TPS' permission, (v) improper water quality out of range specifications as noted by TPS, (vi) improperly configured customer controllers or customer training issues, (vii) consumable items, including, but not limited to, filters, drive belts, light bulbs, lamps, wear strips/surfaces, gaskets, fuses, conveyor belts, contactors, valves, spark plugs, and other similar items. If on-site warranty work is required for a product located outside of the continental U.S, Blue M will charge the customer on a time and materials basis, plus reasonable expenses for travel, lodging and meals.

THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS, STATUTORY OR IMPLIED, AND STATES BLUE M'S ENTIRE WARRANTY AND THE ORIGINAL PURCHASER'S SOLE AND EXCLUSIVE REMEDY RELATED TO PRODUCTS OR SERVICES BLUE M PROVIDED. BLUE M EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES IMPOSED BY COURSE OF DEALING OR USAGE OF TRADE.

Scan for Additional Warranty Information

For full details, exclusions, and other information on our warranty please go to: https://www.bluem.com/warranty-information

International Support

- All models available in 50 & 60 Hertz configurations
- CE, cUL, & UL-508A available
- Authorized reps / servicers in most countries

TPS MAX Program

The TPS MAX Program allows the customer to purchase future service and/or parts without the need to have a purchase order approved and released when parts or service are needed. These funds are available to be used on parts or service in the future, saving you and your company costly down-time. Enrollment also entitles you to the many advantages listed below. Enrollment in the TPS MAX Program requires a minimum purchase of $5,000.00. Amounts above $5,000.00 will be accepted. Funds do not expire.

10% Off:

- Service Labor (including: training, installation, preventive maintenance)
- Travel Time
- Calibration Services
- Parts
- Mileage
- Ground Shipping on Parts

Aftermarket Services

Optimize. Revitalize. Maximize.

From installation, parts and global support to servicing, testing and yearly maintenance, we are here to ensure your TPS product achieves maximum performance.

GAMP Documentation may include FRS, HDS, SDS, FAT, SAT, and IQ/OQ.

Services Include:

- Installation Supervision
- Start-up & Training
- Preventative Maintenance
- Temperature Uniformity
- Instrument Calibration
- GAMP Documentation

Blue M - 146 Series Inert Gas Mechanical Convection Ovens 020924 rev3

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