



# 146 Series Class A Convection Ovens

Blue M Class A ovens are mechanical convection, electric heated chambers that include safety features recommended in NFPA Bulletin 86 as standard. The design of the chamber concedes that the element temperature may be well above the auto-ignition point of some flammable materials. However, this is mitigated by maintaining a non-explosive mixture through the use of higher than normal exhaust rates. Increased element KW compensates for this exhaust factor or increase in makeup/intake air.

## ▶ Oven Features

- All-welded and sealed construction inner chamber
- Circulation and exhaust blowers using stainless steel blower wheels are rendered spark resistant through the use of aluminum blower housings and aluminum inlet rings. Each are equipped with a differential air pressure type switch
- Automatic initial timed purge air cycle
- Fire extinguisher port with spring loaded fingers
- Pressure relief (blowout) panel installed in the chamber rear wall is guarded and retained by a steel safety retaining cage
- Door switch disables heat and circulation blower upon door opening and initiates the purge cycle
- Emergency shutdown pushbutton switch
- Safety placard warning is installed on the front of the oven
- Adjustable shelf levels
- All-welded, heavy-duty exterior with heavy-gauge, reinforced, cold-rolled steel
- Corrosion-resistant, 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
- Every oven is fully assembled and individually factory tested
- Circuit breaker provided for ground fault protection as standard
- 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
- Independent, over-temperature protection (high limit controller included)
- 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
- Direct drive, multi-blade, centrifugal blower with high-volume air delivery and dynamically balanced or noise reduction
- Exhaust blower system maintains a safe air ventilation rate through the oven with a constant exchange of fresh ambient air with process air
- Airflow switch provided as standard to protect oven and product
- 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



- ✓ World class chamber engineering that meets NFPA Bulletin 86 requirements.
- ✓ Designed to satisfy the most challenging applications.
- ✓ Our engineered-to-order skills can accommodate your unique requirements.



Blue M is a brand of Thermal Product Solutions, LLC.

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

[www.bluem.com](http://www.bluem.com)

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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
- Curing
- Drying
- Photo Resist
- Solvents, Coatings, and Paint Curing
- 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



High volume horizontal air recirculation system and electric heating system allow for maximum temperature uniformity in 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) 90 minutes or less depending on model, voltage and exhaust rate, 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

Model Dimensions					
Model	DCSA – 206 (Bench Model)	DCSA – 256 (Bench Model)	DCSA – 296 (Floor Model)	DCSA – 336 (Floor Model)	DCSA – 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)	38 x 37 x 67 (966 x 940 x 1702)	45 x 40 x 63 (1143 x 1016 x 1601)	43 x 47 x 75 (1092 x 1194 x 1905)	43 x 42 x 88 (1092 x 1194 x 2235)	66 x 46 x 86 (1677 x 1169 x 2184)
Machine Footprint (sq. ft.)	9.8	12.5	14.0	12.5	21.1
Approx Unit Weight (lbs)	650	900	900	950	1400

Load / Capacity					
Max Number of Shelves <sup>†</sup>	8	8	10	17	16
Shelf Spacing (inches)	2	2	2	2	2
Shelf Weight Capacity (lbs) <sup>††</sup>	125	225	200	225	150
Chamber Capacity (lbs) <sup>††</sup>	400	400	400	400	400
Floor Load Rating (lbs) <sup>††</sup>	75	75	75	75	100
Door(s)	Single Door Right-Hinged				

Performance					
Airflow SCFM @ 0.5"WC	785	925	1230	1230	1600
Airflow SFPM	314	333	283	233	267
Max Exhaust SCFM at Ambient <sup>†††</sup>	140	375	140	140	140
Heat Rejection <sup>†††</sup> (BTUH) <sup>††††</sup>	4727	5672	7428	8643	12965

Electrical Service					
Model	DCSA – 206 (Bench Model)	DCSA – 256 (Bench Model)	DCSA – 296 (Floor Model)	DCSA – 336 (Floor Model)	DCSA – 1406 (Floor Model)
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)

<sup>†</sup>Shelves not included with the unit

<sup>††</sup>Distributed Load

<sup>†††</sup>Approximate

<sup>††††</sup>Estimated values at unit's max temperature with the oven ducted outside of the room



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# CLASS A OPERATION

In addition to meeting NFPA recommendations, this oven design has exceptional exhaust capabilities for handling solvents. A negative pressure is maintained in the work chamber that ensures that all hazardous vapors will be expelled through the exhaust duct and not through the oven, blower shaft seal or any other apertures. These ovens are complete systems. No additions are required to meet the recommendations of NFPA Bulletin 86 for processing hazardous workloads.

- **Chamber.** Interior chamber seams are heli-arc welded vapor tight to prevent fume infiltration into the insulated walls. Without proper sealing, fumes will condense on insulation and could ignite.
- **Purge timer and door switch.** These devices are provided to prevent the element heat up and allow the exhaust blowers to run for a preset time after every door opening. This clears excessive fumes from the chamber before energizing a possible ignition source, e.g., the heating elements or an electrical fault that may create an arc inside the chamber.
- **Blowout relief panel.** The panel provides one square foot area per 15 cubic feet of chamber liner volume. The panel will blow out and relieve the internal chamber pressure if a low-level explosion occurs, minimizing possible damage.
- **Over-Temperature protection (OTP).** Preventing uncontrolled temperature rise is imperative. This protection device is independent of the primary control circuit and includes its own contactor to disconnect the main chamber power line.
- **Direct-drive blower systems.** Direct drive systems eliminate potential failures of belt driven systems.
- **Forced exhaust system.** This system maintains negative pressure inside the chamber improving the exhaust of hazardous vapors. The designed exhaust flow rate is calculated to dilute flammable vapors to a concentration well below the flammable limit. Dampers at the chamber intake and forced exhaust are factory-set to meet individual chamber exhaust requirements. An airflow switch de-energizes the heaters in the event of airflow loss.
- **Fire extinguishing port.** Sprinkler head, CO2 or foam systems that respond to over-temperature protection control, their own direct-flame or smoke-sensing devices are at times specified by regulatory agencies for hazardous applications.
- **Airflow interlock protection devices.** These devices shut down heating power unless blower systems are operating properly. They ensure three important aspects of operations. First is that the dilution air is thoroughly mixed with the chamber air. Secondly, that enough airflow passes over the heaters to prevent burnout. Lastly, they make certain of proper airflow during the initial purge cycle.

Two interlocks are required. An electrical interlock to disconnect the heating element circuit if the motor overload protection device disconnects the blower motor and a differential pressure switch that responds directly to airflow loss.



## For Class A Ovens:

“On completion of an oven installation” and “after any modifications are made to the ventilation system” the National Fire Protection Agency requires that “airflow tests shall be conducted” to make sure that the minimum flow rate is still being achieved. (NFPA 86, Section 11.4)

Exhaust piping can result in back pressure on the exhauster, causing a reduction in the safety ventilation rate. If you have added a run of exhaust piping to your Class A oven, TPS can send a service technician to verify that the ventilation rate is still safe.



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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.

## MSA Ultima® X5000 Gas Monitor (Optional)

An MSA Ultima Gas Monitor continuously monitors the concentration of flammable vapors in the chamber. The system is complete with a coalescing filter, filter element, and calibration kit with calibration gas. When a gas monitor is provided, NFPA 86 permits operation with vapor concentrations up to 50 percent of the Lower Flammable Limit (LFL).

The gas monitor detects and responds to process upset conditions to initiate reduction of the vapor concentration before the concentration exceeds 50 percent of the LFL. Should the vapor concentration reach a preset alarm level, the monitor de-energizes the heating circuits and activates an alarm to notify operators. The process is prevented from restarting until the vapor concentration is below the alarm limit and the operator has manually reset the system.

Use of a monitor results in lower operating costs by reducing the make-up air flow requirement and the associated heater energy usage.



Model DCSA-256 with optional MSA Gas Monitoring System

## Available Oven Options



Nickel-plated wire rod shelves



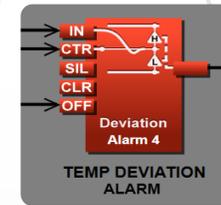
Stainless steel slotted shelves



Semi-pierced duct walls for tuning airflow



Redundant Overtemperature Protection



Temperature deviation alarm with visual and audible alerts



Temperature Recorders (paper or paperless)



End of Process Alarm with Alarm Silence



Light tower with audible alarm



Swivel casters with levelling feet



Fused Disconnect with Lock Out / Tag Out System



Maintenance Lockout



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  $\pm 0.1^\circ\text{F}/^\circ\text{F}$  ( $\pm 0.1^\circ\text{C}/^\circ\text{C}$ ) 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:  $\pm 0.1^\circ\text{F}/^\circ\text{F}$  ( $\pm 0.1^\circ\text{C}/^\circ\text{C}$ ) rise in ambient max



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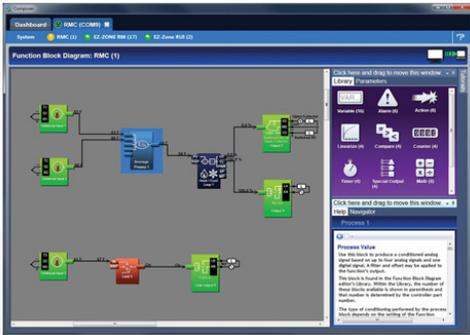
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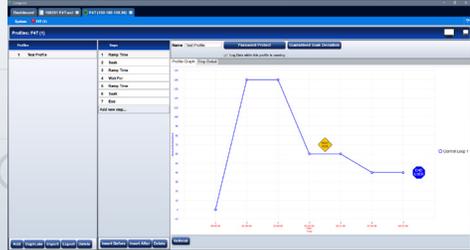
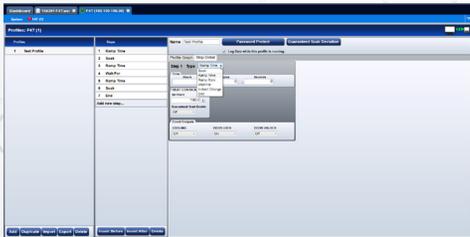
# SOFTWARE PACKAGES

## 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.



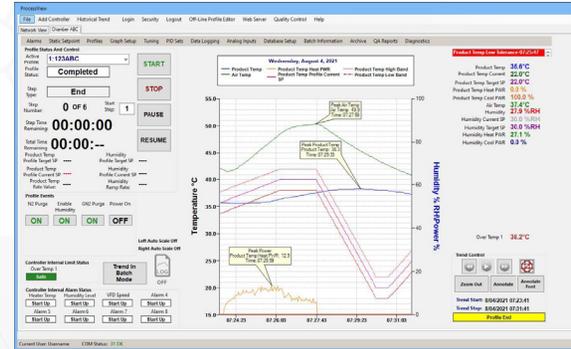
Scan here for additional Watlow Composer specifications, software and demos, and training and education information.



- ✓ 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.**

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

Scan for Additional 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



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