

G24 Temperature Controller



The G24 Temperature Controller

Synventive introduces the next generation in temperature control: the G24. Focused on the plastics industry, Synventive is an expert in process optimization. The G24 is everything you would expect in a next generation control system from Synventive:

- Easier to Use (New Mold Wizard)
- Less Expensive
- Smaller
- Faster
- More Flexible/Standardization
- Improved Interlocks
- Mold Doctor®
- Early Material/Plastic Leak Detection
- 5 Year Warranty*

Partnership

Hot runner molding requires a temperature controller. If the temperature controller fails, the process either stops or is crippled. When selecting a temperature control supplier, you are selecting a partner who is critical to your product and profitability.

Triangulated Control Technology®

All Synventive temperature controllers feature Triangulated Control Technology®. Using this unique technology, our controllers:

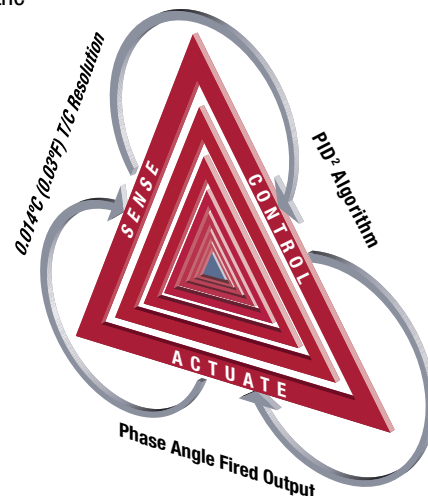
Sense – Twenty (20) times per second, Synventive controllers precisely measure the temperature.

Control – The proprietary self-optimizing Synventive PID² control algorithm adjusts if the actual temperature deviates 0.03°F (0.014°C) from set point. The second derivative (PID²) monitors the actual temperature rate of change. As a result, the output to the heater is regulated in advance of the typical proportional band to limit or eliminate over and undershoot.

Actuate – Using phase angle fired output (0.1% resolution; 1000 steps), the Synventive controller delivers smooth and exact power to each heater for the ultimate in temperature control.

Triangulating your process with a Synventive controller means achieving better temperature control, which could result in:

- Enhanced part quality
- Reduced scrap
- Improved part weight consistency
- Material savings
- Higher profit margins



Power Priority®

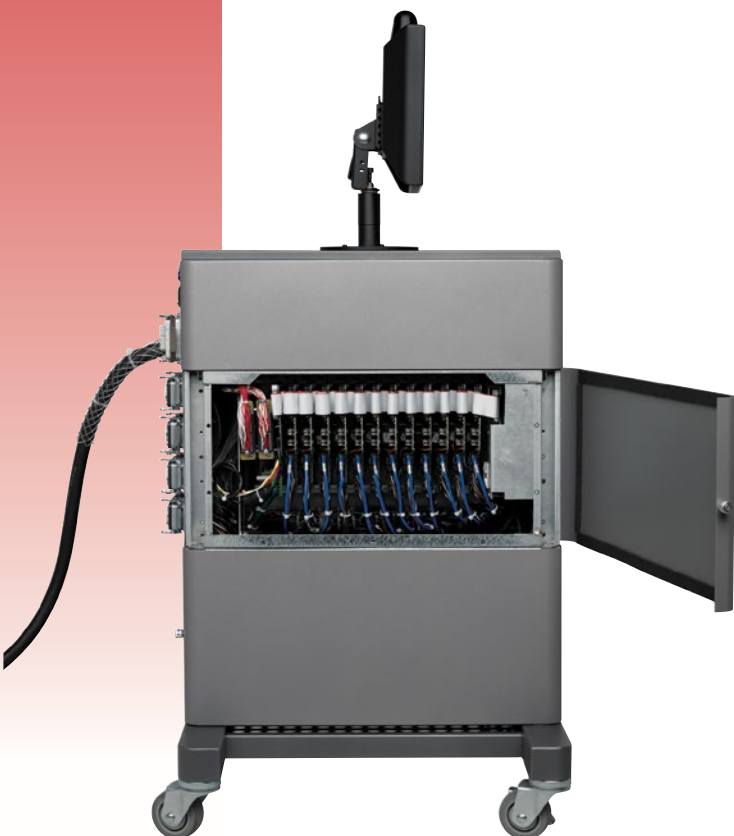
“Low mass”, or extremely small hot runner nozzles are a unique challenge to control. To smooth the power and the melt heat history, Synventive created Power Priority®. Power Priority® smooths the power output to individual zones. Users have the option to manually apply a Power Priority® set point from 1 (light) to 4 (heavy), providing unparalleled control for applications where it is most needed.

Protection

Closed loop wet heater bakeout - 120 times per second (at 60 Hz), the G24 module checks the heater for a short. If the heater is shorted, the output is adjusted within 8.3 milliseconds to protect the heater, cables and controller.

Reliability

Synventive products lead the market in reliability. The expected life is 10 – 15 years based on the quality of heater electrical maintenance. Some Synventive controllers have been in continuous operation for 25+ years.



Easier to Use (New Mold Wizard)



Best industry practices and actual operation are often not the same. The G24 is designed to be understood with 5 minutes of training, and programmable to automatically operate according to the industry's best practices. The New Mold Wizard effortlessly guides the user through (1) zone identification and group creation, (2) setpoint entry, (3) monitor zone configuration, (4) sophisticated mold startup functions, (5) advanced zone monitor functions, (6) heating the mold and (7) saving the menu. During this process the software automatically tunes each zone, engages the plastic leak detection alarm, sets the imminent heater failure alarm and saves everything back to the mold menu automatically after the "good parts" button is confirmed by the operator. The Wizard makes everyone a controller configuration expert.

Less Expensive

By leveraging the global electronics supply chain with new components that take the place of multiple previous components, Synventive has been able to reduce the price of the G24 product line in relation to existing Synventive products. Synventive, long known as the reliability and control leader in the industry, combines a competitive price with superior performance in the G24 controller.

Smaller

Each control module has a 15 or 30 amp per zone output rating. Up to 24 zones can be placed in a single control block. When compared to the Synventive TTC product line, this specific 128 zone controller has a 48% smaller footprint.

Faster

The G24 utilizes industrial USB connectivity for up to a 0.1 second screen update rate. Streaming real-time control numbers to the screen allows the user to better see what is happening inside the tool so they can diagnose difficult to understand issues.

More Flexible/Standardization

The standard two zone 15 amp per zone output module easily controls both nozzle and manifold zones making the controller easy to use across a range of molds for effortless production scheduling. The G24 is even able to control up to 30 amp zones with a 15 amp module by restricting the maximum output to 15 amps using our RMS limiting feature.

Improved Interlocks

The tools of today are far more sophisticated and sensitive than the tools of yesteryear. Machine interlocks ensure bad parts are not produced and catastrophic damage is avoided. The G24 makes the interlocking task easier than ever with on-screen interlock signal inversion and manual testing signals to speed setup.

Mold Doctor®

Automate your mold troubleshooting with Mold Doctor®. Elusive problems that appear suddenly and without changes to the process can be diagnosed with a quantitative thermodynamic zone analysis.

Early Leak Detection

When material/plastic leaks into the mold it occupies a former air space. Eliminating the air space creates a heat sink to the surrounding mass. In automatic mode, the controller increases the power to compensate for the loss in heat. The New Mold Wizard automatically sets the watt baseline and engages the alarm after the "good parts" part button is confirmed by the operator. Precisely measuring the actual wattage can be the difference between a short trip to the tool room or weeks of lost production.

5 Year Warranty*

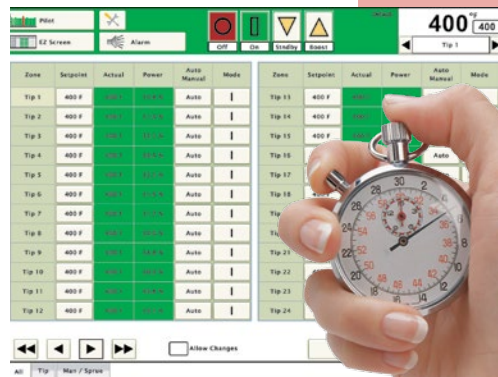
Every G24 controller comes with a full 5-year warranty and is backed by the industry-leading worldwide service and support that our customers expect from Synventive.



128 zones
96 cavity

Delta: 150 amp
Wye: 70 amp

Width: 20in / 50.8cm
Depth: 23in / 58.4cm
Height: 50.25in / 127.6cm



*2-year warranty on the touch screen interface

Standard Configurations

Control Blocks

Half size control block

12 zones (15 amp per zone)

Maximum zones and circuit breaker shown for each enclosure

Control Blocks

Full size control block

24 zones (15 amp per zone) or 6 zones (30 amp per zone)

Maximum zones and circuit breaker shown for each enclosure

Options

Remote Mount Touch Screen

21 feet, 6.4 meters or 42 feet, 12.8 meters

Daisy Chain

Link multiple enclosures



M

12 zones

Delta: 50 amp

Wye: 30 amp



T1

24 zones

Delta: 100 amp

Wye: 60 amp



T1

24 zones

Delta: 150 amp

Wye: 80 amp



T2

48 zones

Delta: 100 amp

Wye: 60 amp



T2

48 zones

Delta: 200 amp

Wye: 100 amp



MS

12 zones

Delta: 50 amp

Wye: 30 amp



S1

24 zones

Delta: 100 amp

Wye: 60 amp



S2

48 zones

Delta: 100 amp

Wye: 60 amp



S2

48 zones

Delta: 200 amp

Wye: 100 amp



S3

72 zones

Delta: 200 amp

Wye: 100 amp

Standard Circuit Breakers

Enclosure	30	50	60	70	80	100	125	150	200	250	300
M or MS	D or W	Delta									
S or T short top	D or W	D or W	Wye	Delta		Delta					
S1 or T1 tall top		D or W	Wye	Delta	Wye	Delta	Delta	Delta			
S2, S3 or T2 tall top		D or W	Wye	Delta	Wye	D or W	Delta	Delta	Delta		
D tall top		D or W	Wye	D or W		D or W	D or W	D or W	D or W	Delta	Delta



D2

96 zones
Delta: 300 amp
Wye: 200 amp



D3

144 zones
Delta: 300 amp
Wye: 200 amp



D4

192 zones
Delta: 300 amp
Wye: 200 amp

Cable Hanger

Cable Hanger

The optional cable hanger can be added to any G24 controller. Constructed of steel this durable double sided cable holder eases controller storage and transport.



Transformers

Transformers

Optional 480 VAC to 240 VAC Delta/Delta three phase 2:1 step down transformers are available. The smaller transformer pod can contain a 15, 30 or 45 kva transformer. The larger transformer pod can contain a 75 or 112 kva transformer. Each transformer pod is detachable, has forced air cooling and an independent circuit breaker.



New Mold Wizard



Startup Wizard

Existing Mold

Select a Menu

Menu Selected

Default.mnu (2013-07-26 5:17 PM)

Default_1.mnu (2013-07-26 5:16 PM)

Mold 1628.mnu (2012-11-16 1:41 PM)

Mold 4502B.mnu (2012-10-16 10:14 AM)

Launch

New Mold Wizard

Start the Mold Wizard

Step 1 - Identify Zones in the Mold

Step 2 - Enter Setpoints

Step 3 - Setup the Monitor Zones

Step 4 - Setup the Mold Startup Functions

Step 5 - Setup the Zone Monitor Functions

Step 6 - Heat the Mold

Step 7 - Save a Menu

Automatically Tune the Zones

Automatically Engage the Zone Leak Detection

Automatically Engage the Heater Failure Detection

Tool Room

Mold Doctor®

Wiring Analysis

Thermodynamic Analysis

Fault Analysis

Historical Mold Performance

Main Screen

81 F

Tip 1

All Tip Man-Sprue Monitor

Startup Wizard

Step 3/7

Setpoint Table

Zone	Tip 1	Tip 2	Tip 3	Tip 4	Tip 5	Tip 6	Tip 7	Tip 8	Tip 9	Tip 10	Tip 11	Tip 12	Tip 13	Tip 14	Tip 15	Tip 16
Setpoint	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manual Setpoint	0.0															
In Manual																
Locked																
Value	79.7															
Deviation	79.7															

Enter Temperature Setpoint

Tip 1

Upper Limit 750

Entry Was 0

Lower Limit 0

Send SP to the 'All' Group

Send SP to the 'Tip' Group

Send SP to the 'Man-Sprue' Group

Send SP to the 'Monitor' Group

Send SP to Tip 1

Cancel

2 Set

Adm Changes

All Tip Man-Sprue Monitor

Startup Wizard

Step 4/7

Mold Startup Functions

Sequence Start

Even Heat ECO Startup

Sequence Cool

Even Cool

Sequence Start is a function that will automatically turn ON groups of zones in a programmable sequence. The function can contain 1-4 stages. A stage is enabled with the use of the checkbox by the name of the stage.

Sequence Cool is a function that will automatically turn OFF groups of zones in a programmable sequence. The function can contain 1-4 stages. A stage is enabled with the use of the checkbox by the name of the stage.

Even Heat is a function that forces all zones in the selected group to stay within 20F (11C) of the coldest zone in that group during start-up. This is commonly used to bring tips up to temperature along with the slowest manifold zone, thereby ensuring that the tips are not at setpoint for a long time waiting for the manifolds to come up to temperature. The zones will remain in Even Heat until they are within 20F (11C) of their final setpoint. A selection of "-" will disable the Even Heat.

Even Cool is a function that will automatically lower the temperature setpoints of all of the zones in the selected group. All zones in the selected group will stay within 20F (11C) of the hottest zone in that group during cool down. All of the manual zones in the Even Cool group will be turned off when the function is started. All of the zones in the system will be turned off when all of the zones in the Even Cool group are lower than the completion point.

4 Program

Startup Wizard

Step 6/7

Heat the Mold

299 F

400

Sequence Chart

Tip 1

Heat

All Tip Man-Sprue Monitor

Startup Wizard

Step 1/7

Mold Startup Wizard Zone Analysis

Start the Zone Analysis

Zone analysis is complete.

#	Zone	Run Status	Actual Value	Peak Value	Peak Watts	Zone Type	Comments
121	Tip 121	Off	80F	0.35 A	95 W	Tip	OK
122	Tip 122	Off	81F	0.40 A	95 W	Tip	OK
123	Tip 123	Off	80F	0.38 A	95 W	Tip	OK
124	Tip 124	Off	79F	0.40 A	95 W	Tip	OK
125	Tip 125	Off	81F	0.39 A	95 W	Tip	OK
126	Tip 126	Off	80F	0.40 A	95 W	Tip	OK
127	Tip 127	Off	80F	0.36 A	92 W	Tip	OK
128	Tip 128	Off	82F	0.35 A	95 W	Tip	OK
129	Sprue	Off	84F	7.82 A	1,829 W	Sprue	OK
130	Man 1	Off	83F	7.82 A	1,877 W	Man	OK
131	Man 2	Off	81F	7.90 A	1,872 W	Man	OK
132	Man 3	Off	85F	7.96 A	1,900 W	Man	OK
133	Man 4	Off	84F	7.90 A	1,800 W	Man	OK
134	Man 5	Off	84F	7.56 A	1,813 W	Man	OK

1 Learn

Startup Wizard

Step 3/7

Monitor Zones

Zone Monitor 1

Is a Monitor Zone

Temperature Value

Test for High Alarm

High Alarm Setpoint

Test for Low Alarm

Low Alarm Setpoint

In Alarm

Monitor Zones Alarm Setup:

Alarm Only

Activate Standby for the 'Remote Standby' group when a Monitor Zone Alarm is detected

Turn Off all of the zones in the controller when a Monitor Zone Alarm is detected

Include Monitor Zone Alarms in the 'OK to Run' output

Monitor Zone Alarm Delay Time (sec)

20

Adm Changes

All Tip Man-Sprue Monitor

Startup Wizard

Step 5/7

Mold Monitor

Heater Watt Monitor:

Enable Watt Alarm (Plastic Leak Detection)

Tolerance to apply to High Watt Alarm Setpoints

Automatically Setup the Watt Alarm Monitor (Plastic Leak Detection) After the Zones have Heated

Heater Resistance Monitor:

Enable Heater Resistance Monitor (Predict Heater Failure)

Automatically Setup the Resistance Monitor (Predict Heater Failure) After the Zones have Heated

Automatically Slave Auto-Select Tuning to the Tuning Setpoint After the Zones have Heated

5 Predict

Startup Wizard

Step 7/7

Save the Menu

Select a Menu

Mold 1745C.mnu (2013-07-26 5:56 PM)

Default.mnu (2013-07-26 5:52 PM)

Default_1.mnu (2013-07-26 5:45 PM)

Mold 1628.mnu (2012-11-16 1:41 PM)

Mold 4502B.mnu (2012-10-16 10:14 AM)

New Menu Name

Mold 1745C.mnu

Save Menu

7 Save

Making Good Parts?

Yes

No

Cancel

Confirm

Mold Doctor®

Troubleshoot Your Mold

Mold Doctor® is an off-line (tool room), advanced troubleshooting tool consisting of four diagnostic tests:

Wiring Analysis: checks the wiring of the tool. The software clearly tells the user of miswired zones and how to fix them.

Fault Analysis: quickly identifies the following problems: thermocouple open, thermocouple reversed, thermocouple pinched, open fuse, heater short/wet, heater open, uncontrolled output and ground fault.

Thermodynamic Analysis: automatically heats all selected zones to 400° F (204° C) and cools to 330° F (165° C). During the heating and cooling process Mold Doctor® records critical information and reports to the user. Compare like zones against one another; major differences in the four key areas (resistance, power consumption, heating and cooling rates) will point you towards a solution. Once the tool is qualified, save a thermodynamic analysis as your known “good parts” baseline. Future problems will be easy to diagnose using the historical mold performance tool.

Historical Mold Performance: allows the user to easily compare a known “good” thermodynamic analysis baseline to the current “suspect” thermodynamic analysis. Intuitively troubleshoot your mold with hard data.

Mold Doctor®

Wiring Analysis Thermodynamic Analysis

Fault Analysis Historical Mold Performance Update Job Information

1. Stop the machine. Mold Doctor® will take over control of the outputs when tests are being conducted.
2. Select a group of zones to be tested. All of the zones in the group will be tested.
3. Update the Job Information on the Information screen for the data to be included in the Report.
4. Select the type of test to be performed.
5. Even Heat is disabled during the Thermodynamic Analysis test. It will be restored when the test is completed.

Done

All Tip Man-Setup Monitor

Thermodynamic Analysis is Complete

Thermodynamic Analysis is Complete. Press 'Cancel' to return to Mold Doctor®. Press 'Save TDA File' to save the results for later viewing and comparison by using the 'Historical Mold Performance' function.

Cancel Test Generate Report Save TDA File

Zone	Run Status	Actual Value	Heater Ohms	Heater Watts	@400F Watts	@400F Percent	Heating Rate F/min	Cooling Rate F/min	Comments
Tip 116	Off	80F	606	95	38	31.3	32.82	14.94	OK
Tip 117	Off	79F	628	92	38	32.4	31.96	15.23	OK
Tip 118	Off	80F	607	95	32	33.6	32.83	16.17	OK
Tip 119	Off	80F	624	93	31	33.4	32.09	15.66	OK
Tip 120	Off	80F	691	96	30	31.9	33.09	15.38	OK
Tip 121	Off	80F	612	94	30	31.6	32.48	14.93	OK
Tip 122	Off	81F	610	95	29	30.7	32.83	14.39	OK
Tip 123	Off	80F	611	95	29	31.8	32.89	14.74	OK
Tip 124	Off	81F	610	95	32	33.5	32.60	15.82	OK
Tip 125	Off	80F	611	95	31	32.6	32.47	15.41	OK
Tip 126	Off	79F	610	95	30	32.1	32.41	15.24	OK
Tip 127	Off	80F	628	92	31	33.6	31.76	15.64	OK
Tip 128	Off	79F	612	94	31	32.7	32.73	15.79	OK
Sprue	Off	82F	32	1,829	312	17.1	12.62	2.31	OK
Man 1	Off	79F	31	1,877	294	15.7	13.29	2.25	OK
Man 2	Off	79F	31	1,873	317	17.8	12.96	2.36	OK
Man 3	Off	79F	30	1,908	308	16.1	13.20	2.46	OK
Man 4	Off	79F	31	1,888	295	15.7	13.11	2.32	OK

All Tip Man-Setup Monitor

Calibration

Calibrate your controllers in house quickly, easily and without a calibration technician. Establish a thermocouple source equivalent to the controller. The difference between the calibrator value and the control screen is the calibration error. The Calibration software corrects the error with an accuracy of $\pm 0.2^\circ \text{F}$ ($\pm 0.1^\circ \text{C}$).

Faster (0.1 sec Screen Updates)

Chart Recording

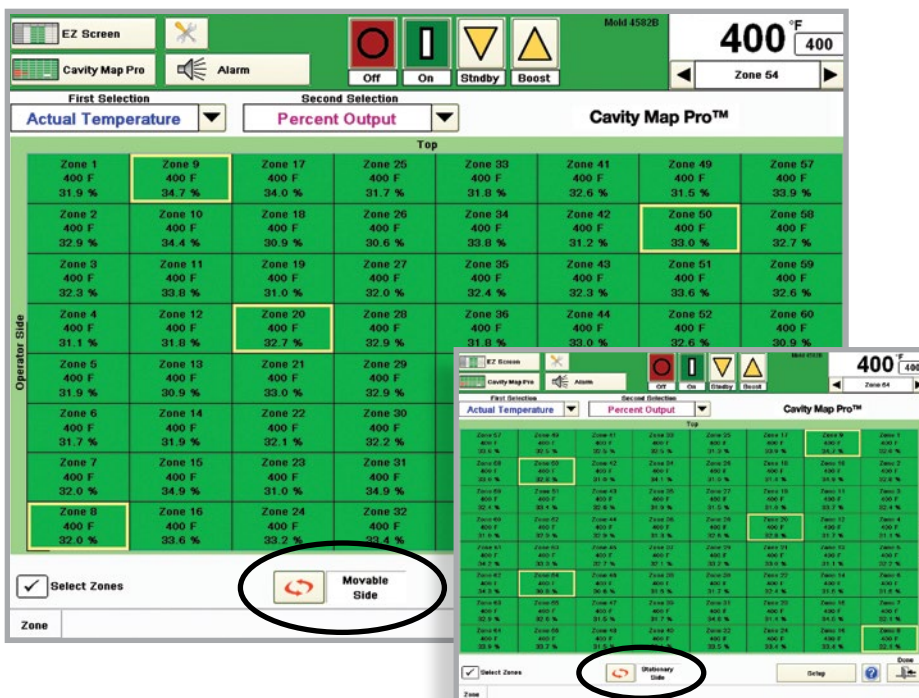
Chart recorder and statistical analysis software allows the user to record the performance of their hot runner tool, print reports to the USB drive or watch databases of production runs on-screen with our playback mode. Pause live action on the line graph and manually or automatically place injection marks on the screen for in-depth analysis.



Cavity Map Pro™

Cavity Map Pro™

Quickly create a cavity map that is saved with the mold menu. The on-screen tools allow the user to create common nozzle layout patterns instantly. Select zones to study closer and flip the image to quickly identify which zone/cavity to change or investigate.



“Lights Out” Molding

Improved Interlocks

The tools of today are far more sophisticated and sensitive than the tools of yesteryear. Machine interlocks ensure bad parts are not produced and catastrophic damage is avoided. The G24 makes the interlocking task easier than ever with on-screen interlock signal inversion and manual testing signals to speed setup.

Best Practices

Power Application

An optional Sequence Start can be activated to only power the manifold/sprue zones, wait until they reach temperature, start a soak period countdown timer and finally heat the smaller, faster heating nozzle zones. This practice is always recommended but seldom done in the industry. The primary benefits include maintaining the integrity of the manifold seal by controlling heat expansion and preventing material degradation caused by excessive nozzle heater material residence time. When the “Must use sequence start to turn zones on” button is selected all other methods of applying power are disabled to guarantee proper startup.

Detailed Controller Comparison

	LEC	TTC	Touch Screen Choice	
			G24 Mini	G24 Full
Core Description				
Temperature control	■	■	■	■
Temperature control - maximum zones	24	280	48	480
Sequential valve gate control - integrated option		■		
Sequential valve gate control - outputs		8/16/32		
5 year warranty (2 years on touch screen interface)	■	■	■	■
Modular design	■	■	■	■
Controller warm up time - instant	■	■	■	■
If interface fails – the controller still controls	■	■	■	■
Emergency interface - use a Windows® computer	XP	XP	XP or 7	XP or 7
Automatic/manual control	■	■	■	■
Zone “on”, “off” and “locked off”	■	■	■	■
Set points in tenths		■	■	■
Adaptive PID ² control algorithm with Power Priority®		■	■	■
Algorithm is executed 20 times per second	■	■	■	■
Extended tuning ranges (fast/slow)	■	■	■	■
Output resolution 0.1%	■	■	■	■
Output attenuation - maximum output (1% increments)			■	■
RMS limit to module max. - control larger heaters			■	■
Phase angle firing (1000 Steps; 0.1%)	■	■	■	■
Wet heater bakeout	■	■	■	■
Power compensation in manual mode	■	■	■	■
Degree F/C	■	■	■	■
Thermocouple J/K	■	■	■	■
Thermocouple (T/C) filtering - none	■	■	■	■
T/C resolution 0.03° F (0.014° C) over full scale	■	■	■	■
T/C calibration accuracy 0.2° F (0.1° C) over full scale	■	■	■	■
Operating temperature 32-122° F (0-50° C)	■	■	■	■
Input power 180-265 VAC; 480 VAC optional	■	■	■	■
Delta/wye convertible option	■	■	■	■
Circuit breaker sized to load - TTC/G24 - 300 amp maximum	■	■	■	■
Actual Values				
Actual temperature	■	■	■	■
% Output	■	■	■	■
Deviation from set point		■	■	■
Amps (resolution 0.01 amps)	■	■	■	■
Volts		■	■	■
Watts		■	■	■
Kilowatt monitor (instant, average, max., min.)				■
Ohms		■	■	■
Alarms				
(+) High temperature (adjustable; 20° F [10° C] default)	■	■	■	■
(-) Low temperature (adjustable; 20° F [10° C] default)	■	■	■	■
Thermocouple open (remembered % output)	■	■	■	■
Thermocouple reversed	■	■	■	■
Thermocouple pinched (adjustable time)	■	■	■	■
Open fuse	■	■	■	■
Shorted heater/wet	■	■	■	■
Programmable heater short threshold (amps)			■	■
Open heater	■	■	■	■
Uncontrolled output (relay power cut off)	■	■	■	■
Heater resistance monitoring (predict failure)		■	■	■
Heater wattage monitoring (detect leaks) - auto calc.		■	■	■
Ground fault detection			■	■
Critical over temperature alarm (adjustable)	■	■	■	■
Temperature monitoring (J/K) with programmable action		■	■	■
Alarm history - zone alarms		■	■	■
Alarm history graph - zone alarms				■
Zone alarm configure - “none”, “flasher”, “flasher & contacts”			■	■
Alarm history - system and status			■	■

	LEC	TTC	Touch Screen Choice G24 Mini	G24 Full
Operational Features				
Menu storage		1000+	40	1000+
Menu "auto save" (optional)				
Programmable groups				
Instant grouping				
Sequence Start (up to 4 stages with delay timers)				
Sequence Cool (up to 4 stages with delay timers)				
Sequenced Power Up - manual activation				
Boost (selectable time/amount) - Automatic mode				
Boost (selectable time/amount) - Manual mode				
Trim				
Even Heat (controlled heating - 20° F [10° C] max. variance)				
Even Cool (controlled cooling - 15° F [7° C] max. variance)				
Automatic set point limit				
Manual set point limit				
Security levels				
Security level customization (4 levels)				
On power up "on" or "off" ("ask" touch screen only)				
Auto load manual remembered % output				
Operator identification				
Tool graphics with real time data overlay				
Cavity Map Pro® with "mirror" button				
Thermocouple "rewire"				
Copy Output				
Standby timer until system "off"				
PDF writer				
PDF viewer - import or export files				
USB port				
On-line help				
Software Features				
New Mold Wizard				
Maximum screen update rate (in seconds)	6	0.5	1	0.1
E-Z Screen - 5 minutes to train				
Gammavision® (SPC data/graphing)				
Pause line graph with "injection marks" (manual and automatic)				
Instant data reporting (hours)	/ 24	24	24	48
Data report storage (up to 1 year) - pdf format				
Mold Doctor® (advanced troubleshooting)				
Calibration (0.2° F [0.1° C] accuracy over full scale)				
On screen printing				
Print to USB drive				
Networking (Ethernet IP) - stream .csv file - bidirectional				
Remote troubleshooting/operation				
Field software identification of enclosure connectors and pins				
Time and date change during operation				
Touch screen calibration during operation				
On-screen keyboard for Windows® tasks				
Find this module LED				
Daisy chain enclosures				
Inputs (24 VDC required)				
Standby				
Material protection				
Inhibit/Allow				
Sequence Start				
Sequenced power up				
Remote boost				
Mold ID - 63 combinations - auto menu load				
Sequence Cool				
Even Cool				
Water flow interface				
Chiller interface				
Barrel temperature interface				
Dryer interface				
Auxiliary interface				
External manifold leak detect (Airtect)				
Outputs				
Resettable alarm output				
Non-resettable alarm output				
"OK to Run" output with status page				
Audible alarm				
Manual activation/deactivation to speed interlock setup				



Limited feature



Touch screen or laptop required (LEC)

Windows XP® and Windows 7® are registered trademarks of Microsoft Corporation

Performance

Thermocouple Calibration Accuracy	0.2°F (0.1°C)
Control Accuracy (steady state)	± 0.1°F (± 0.05°C)
Heater Short Detection Time	8.3 msec. or 120 times per second at 60 Hz
PID ² Algorithm Execution Time	50 msec. or 20 times per second
Tuning	Automatic, self optimizing, manual override
Manual Mode	Power compensation for incoming voltage variation
Degrees F or C	Field Selectable
Operating Range	0-932°F (0-500°C)
Output Range	0-240 VAC, Phase angle fired, 1000 steps
Standby Temperature	User Selectable (0-932°F, 0-500°C)
Remote Input	24 VDC

Input

Thermocouple	Type J standard; Type K selectable
Cold Junction Compensation	Internal to enclosure
External Resistance	10 Meg. Ohms
Temp. Variation due to T/C Length	None

Electrical

Input Voltage	180-265 VAC Delta/Wye (phase voltage)
Frequency	47-53 Hz, 57-63 Hz
Ambient Temperature Range	32-122°F (0-50°C)
Humidity Range	10-95% non-condensing
Output Module Rating	240 VAC; 2 zone - 15 amps/zone 3600 watts/zone 240 VAC; 1 zone - 30 amps/zone 7200 watts/zone
Communications Electrical Standard	Industrial USB 2.0

Performance Standards

U.S., Canadian and International:	CE Mark; EMC: IEC 61000 - (6-2, 6-4, 4-2, 4-3, 4-4, 4-5, 4-6, 4-11)
Designed to meet	Safety IEC 61010, UL-508, UL-873 and CSA

Languages

English, Deutsch, Français, Czech, русский, Italiano, Español, Portuguese, 英語 中文 영어

Physical

	*Height (inches/millimeters)	Width (inches/millimeters)	Depth (inches/millimeters)	*Weight (pounds/kilograms)
M enclosure	20.00/508	10.00/254	12.50/318	50.0/22.7
MS enclosure	36.50/927	23.00/584	20.00/508	75.1/34.1
T1 enclosure - short top	21.25/540	10/254	23/584	75.1/34.1
T1 enclosure - tall top	25.75/654	10/254	23/584	80.1/36.3
T2 enclosure - short top	32.00/813	10/254	23/584	130.4/59.1
T2 enclosure - tall top	36.50/927	10/254	23/584	135.4/61.4
S1/S2 enclosure - short top	35.00/889	20/508	23/584	139.4/63.2
S1/S2 enclosure - tall top	39.50/1003	20/508	23/584	144.4/65.5
S3 enclosure - tall top	50.25/1276	20/508	23/584	199.7/90.6
D2 enclosure - tall top	39.50/1003	20/508	23/584	243.6/110.5
D3 enclosure - tall top	50.25/1276	20/508	23/584	343.2/155.7
D4 enclosure - tall top	61.00/1549	20/508	23/584	442.8/200.9



*Height and weight excludes screen
Specifications subject to change without notice



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