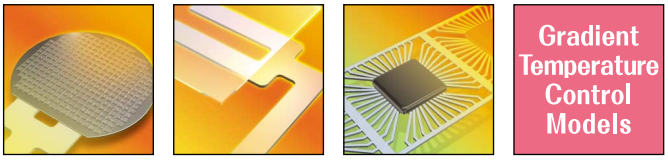
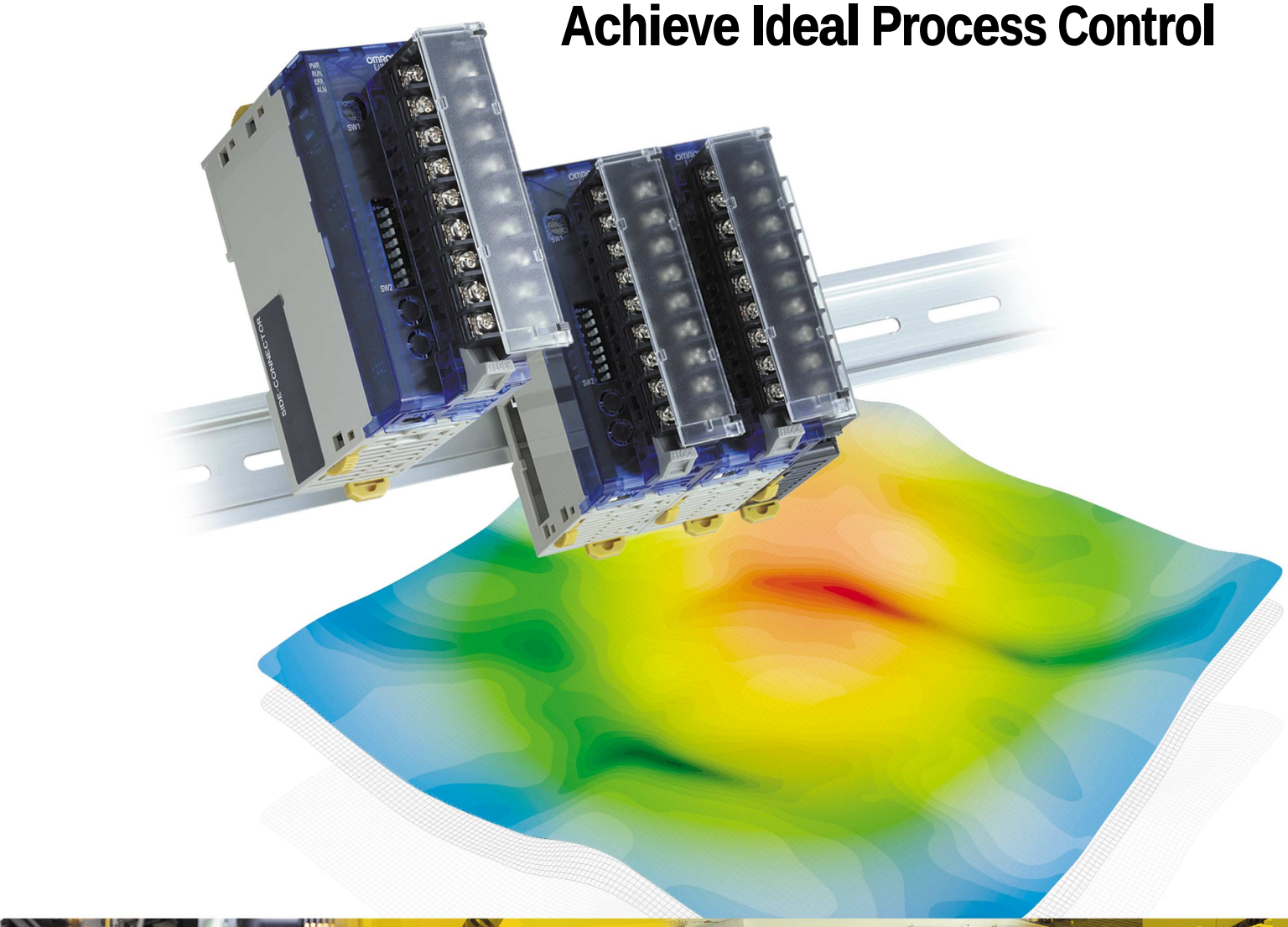
OMRON

Modular Temperature Controller EJ1



Propriety Gradient Temperature Control Algorithm

Achieve Ideal Process Control



realizing

Solve Process Control Problems with OMRON's Unique Gradient Temperature Control Algorithm

OMRON's Gradient Temperature Control Achieves planar Control

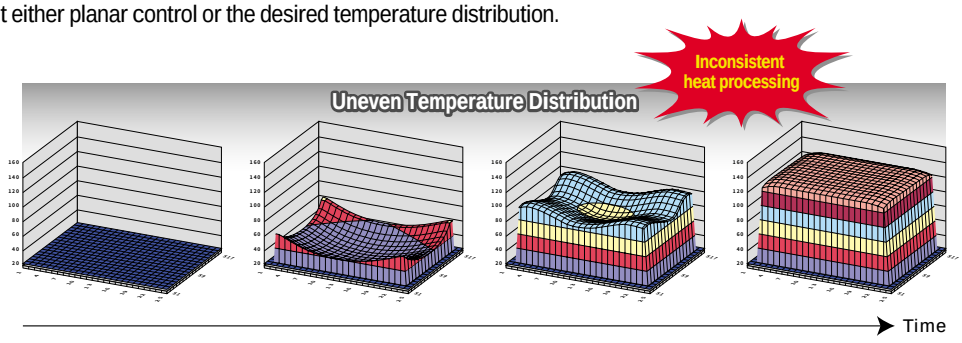
Quality is compromised and yield reduced by inconsistent workpiece processing temperatures. But now you can achieve planar process temperature control with OMRON's unique gradient temperature control algorithm. You not only increase heat processing quality, but also reduce energy loss waiting for temperatures to stabilize and reduce the work required to adjust for interference between heaters. Let us solve your precise process control needs for batch ovens, glass substrate hot plates, and more.

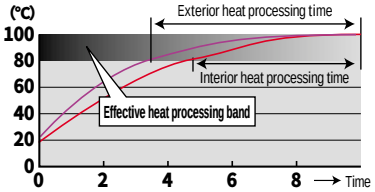
Note: Planar is necessary for heat processing with multi-point temperature control that requires a uniform temperature across a flat surface, such as is required for semiconductor wafers and liquid-crystal panels.

1 Higher Quality through Planar Control

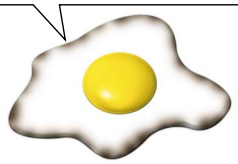
Freely set either planar control or the desired temperature distribution.

Conventional temperature control

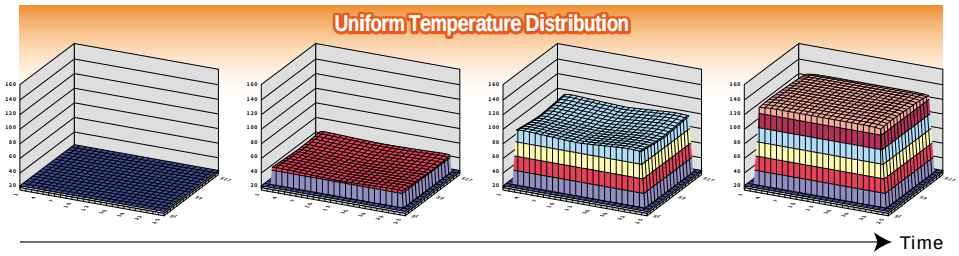


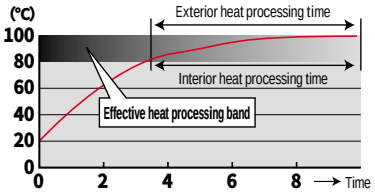


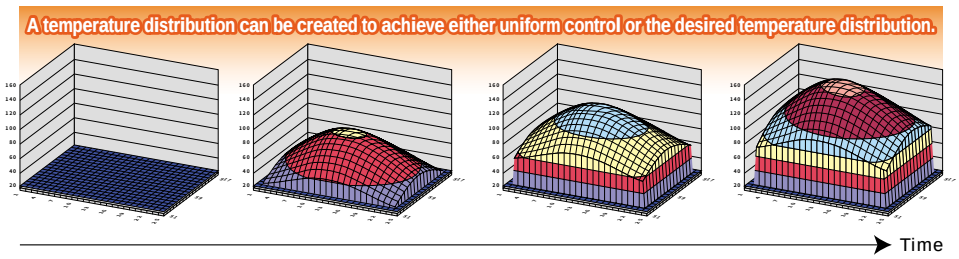
Heat processing faults occur on the exterior.



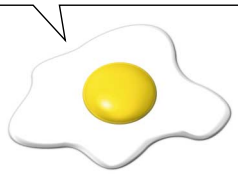
Gradient temperature control





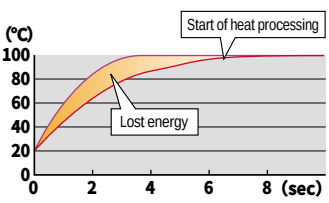


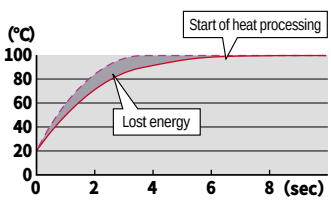
High quality is achieved across the entire surface.



2 Reduced Energy Loss

The energy lost while the overall temperature stabilizes is reduced.



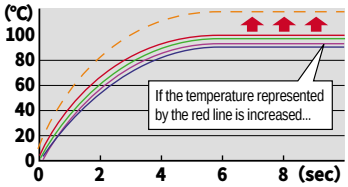


Conventional temperature control

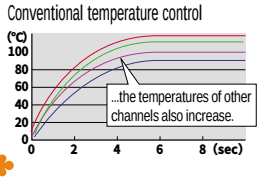
Gradient temperature control

3 Reduced Adjustment Work

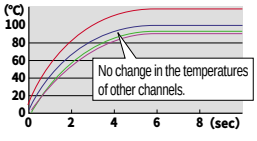
Gradient temperature control accounts for interference between heaters.



Conventional temperature control

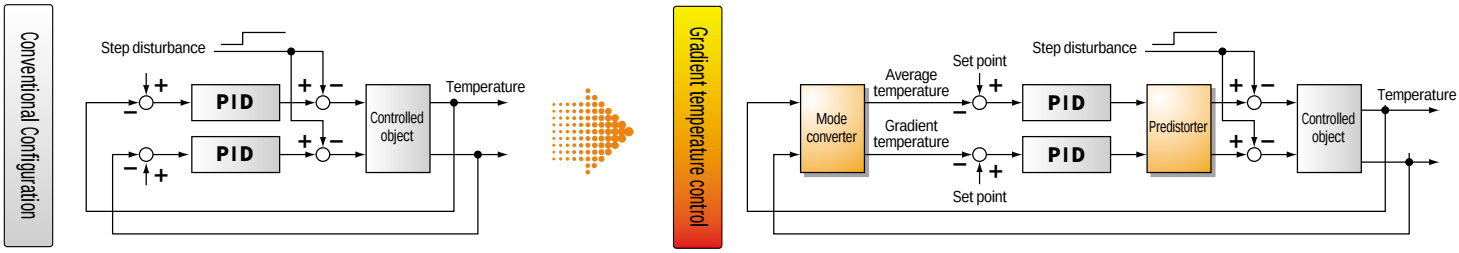


Gradient temperature control



Note: The graphs represent data when all temperatures are increased.

Uniform Control by Separately Controlling Average Temperatures and Gradient Temperatures (i.e., Temperature Differences between Channels)

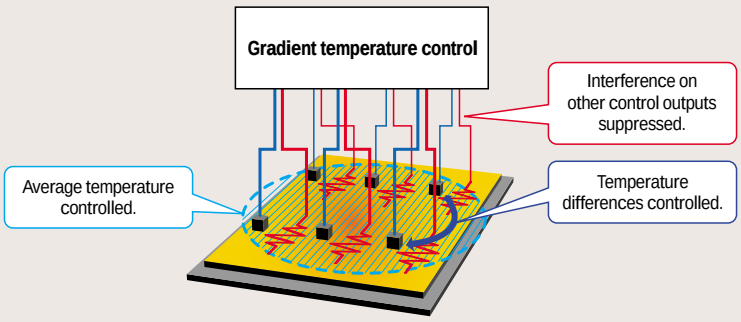


The above example is for 2-channel temperature control (patent pending).

What Is Gradient Temperature Control?

Gradient temperature control is a control method used for multi-point control of an object subject to interference to directly control the average temperature for all points and the temperature differences at each point while eliminating the interference on other points caused by the control output for any one point.

The temperatures for multiple points are input and the average temperature for all points and the gradient temperatures (i.e., temperature differences) between each point and adjacent points are calculated to perform PID control for the present value of each point. Manipulated variable outputs are distributed so that the manipulated variable output for each PID control point does not affect the control characteristics of other PID control points (to cancel interference). This achieves consistent temperature increases at multiple points while reducing the interference on other control points.



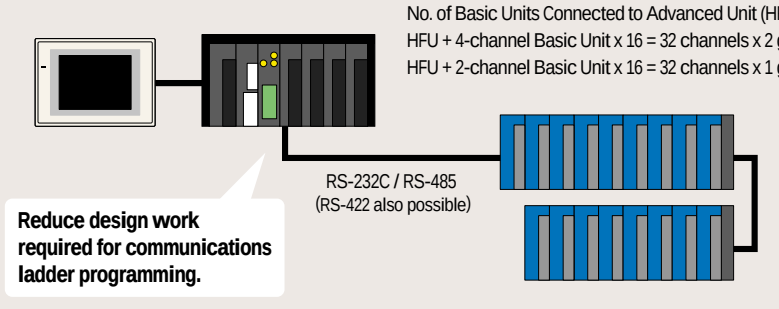
Ideal Temperature Control for Many Types of Application

Features of the EJ1 Gradient Temperature Controller

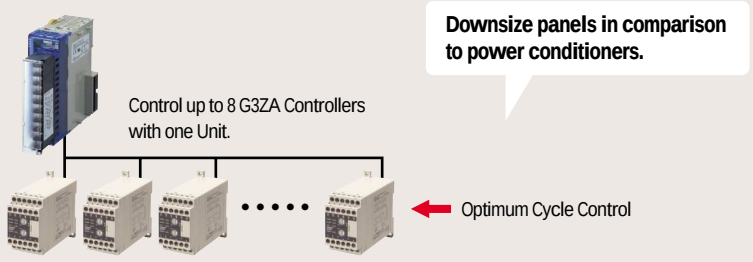
1. Gradient temperature control for 2 to 32 channels.
   - Create up to 16 groups for 2-channel gradient temperature control or up to 2 groups for 32-channel gradient temperature control.
   - Gradient temperature control or 2-PID control can be set for each group.
2. Use the overshoot adjustment function to suppress disturbances for each channel.
3. Use the G3ZA with gradient temperature control to achieve optimum cycle control.

System Configuration

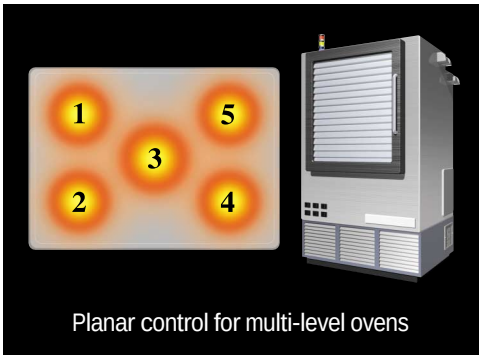
- Implement 2 groups with up to 32-channel gradient control using 4-channel Basic Units



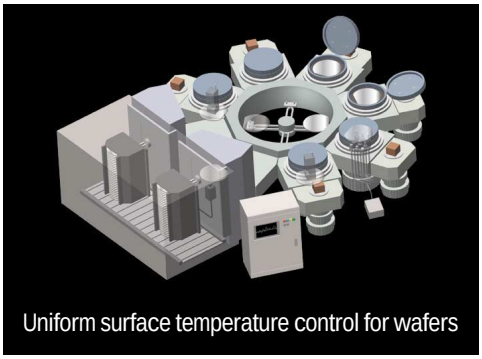
- Optimum cycle control through direct connections to the G3ZA Multi-channel Power Controller



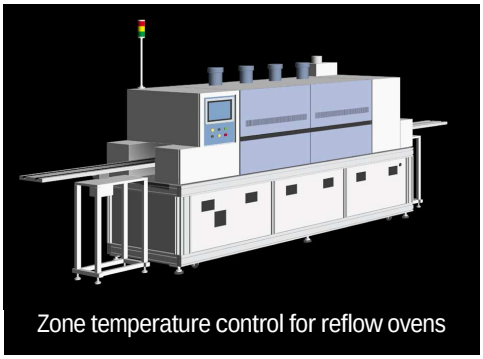
Application Examples



Planar control for multi-level ovens



Uniform surface temperature control for wafers



Zone temperature control for reflow ovens

The EJ1 Product Lineup

Standard Control Models

Achieve simple, waste-free temperature control with a flexible modular system.
For details, refer to EJ1 Modular Temperature Controller Datasheet (Cat. No. H144).

HFU
HFU
EJ1N-HFU

Four-channel Temperature Control Basic Unit
EJ1N-TC4

Two-channel Temperature Control Basic Unit
EJ1N-TC2

EDU
End Unit
EJ1C-EDU

Gradient Temperature Control Models

Economically achieve planar temperature control with OMRON's gradient temperature control algorithm.

HFU
HFU
EJ1G-HFU

Four-channel Temperature Control Basic Unit
EJ1G-TC4

Two-channel Temperature Control Basic Unit
EJ1G-TC2

EDU
End Unit
EJ1C-EDU

Ordering Information

●Gradient Temperature Control Models

Name	Power supply voltage	No. of control points	Control outputs 1 and 2	Control outputs 3 and 4	Auxiliary output	Functions: Heater burnout alarm	Functions: Event inputs	Communications functions	Input type	Terminal	Model
Basic Units for Gradient Control (See note 1.)	24 VDC supplied from the End Unit	2	Voltage output: 2points (for SSR drive) (See note 2.)	Transistor output: 2points (sourcing and sinking)	None	2 (See note 3.)	None	G3ZA connection port: RS-485 From End Unit: port A or port B: RS-485	Thermocouple, platinum resistance thermo-meter, analog-voltage, and analog current selectable for each channel.	M3 terminal	EJ1G-TC2A-QNH
										Screw-less clamp	EJ1G-TC2B-QNH
		4		Voltage output: 2points (for SSR drive) (See note 2.)		None				M3 terminal	EJ1G-TC4A-QQ
										Screw-less clamp	EJ1G-TC4B-QQ
HFU for Gradient Control (See note 1.)		None	None	None	Transistor output: 4points (sourcing and sinking)			From End Unit: Port A: RS-485 Port C: RS-485 or RS-232C selectable	No input	M3 terminal	EJ1G-HFUA-NFLK
										Screw-less clamp	EJ1G-HFUB-NFLK
								From End Unit: Port A: RS-485 Port C: RS-422		M3 terminal	EJ1G-HFUA-NFL2
										Screw-less clamp	EJ1G-HFUB-NFL2
End Unit (See note 1.)	24 VDC				Transistor output: 2points (sourcing and sinking)			Port A or B: RS-485 Connector: Port A		M3 terminal	EJ1G-EDUA-NFLK

Note 1. An End Unit is always required for connection to a Basic Unit or an HFU. An HFU cannot operate without a Basic Unit.
For gradient temperature control a Gradient Control HFU and Gradient Control Basic Units must be used together. External communications cannot be performed when using a Basic Unit only.
Note 2. Gradient Temperature Control Modules do not support heating/cooling control. Use the Standard Temperature Control Modules.
Note 3. When using the heater burnout alarm, purchase a Current Transformer (E54-CT1 or E54-CT3) separately.

Note: Refer to the data sheet for details. (Cat. No. H145-E1)

OMRON Corporation
Industrial Automation Company

Control Devices Division H.Q.
Analog Controller Division
Shiokoji Horikawa, Shimogyo-ku,
Kyoto, 600-8530 Japan
Tel: (81)75-344-7080/Fax: (81)75-344-7189

Regional Headquarters

OMRON EUROPE B.V.
Wegalaan 67-69, NL-2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ELECTRONICS LLC
1 East Commerce Drive, Shaumburg,
IL 60173 U.S.A.
Tel: (1)847-843-7900/Fax: (1)847-843-8568

OMRON ASIA PACIFIC PTE. LTD.
83 Clemenceau Avenue,
#11-01, UE Square,
239920 Singapore
Tel: (65)6835-3011/Fax: (65)6835-2711

OMRON CHINA CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Road (M)
Shanghai, 200120 China
Tel: (86)21-5037-2222/Fax: (86)21-5037-2200

Authorized Distributor:

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