MMA
Temperature Control System
User Guide

smart hot runner solutions

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Precautions

WARNING

Use of this equipment in a manner not specified by the manufacturer may impair protection provided by the equipment.

In addition to presenting a potential fire hazard, high voltage and high temperature can damage equipment and cause severe injury or death. When installing or using this instrument, follow all instructions carefully and use approved safety controls.

Hazardous potentials exist on components inside the mainframe and Temperature Controller. Always disconnect AC power to the mainframe when servicing the Temperature Controllers or the mainframe.

Because these temperature controls or associated equipment may not always fail safe, an approved temperature and/or pressure safety control should be used for safe operation.

The Temperature Controller power switch must be in the "OFF" position before you put a Temperature Controller into an energized mainframe, or remove a Temperature Controller from an energized mainframe. If the mainframe supports the SafeChange™ feature, enable SafeChange on the Temperature Controller to reduce the possibility of damage to the Temperature Controller when installing or removing a Temperature Controller from the mainframe. Temperature Controllers are shipped with the SafeChange feature disabled. To determine whether the mainframe supports SafeChange and to enable SafeChange, follow the instructions in Section 3.

Turn off power to the Temperature Controller before cleaning the exterior of the Temperature Controller. Follow the cleaning instructions in 6.2.

Failure to observe these precautions can result in exposure to a potentially lethal shock hazard.

Changing DIP switch and jumper settings, and all wiring should be done by an experienced technician. The Temperature Controller and wiring should be installed in accordance with national and local electrical codes. To avoid serious personal injury and damage to equipment, follow all warnings and cautions provided in the manual supplied with the mainframe.

Precautions

CAUTION

If a Temperature Controller shows signs of having been damaged during shipping, do not power up or install the Temperature Controller. Save all packing materials and report any damage to the carrier immediately. When the Temperature Controller is powered up, the output may be activated. Consider the effects on your process before powering up the Temperature Controller.

Do not locate this instrument where it may be subjected to excessive shock, vibration, dirt, moisture, oil, or other liquids.

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Specified operating ambient temperature is 0 to 65°C (32 to 150°F).

CE EMC Compliance

This unit is compliant with the following standards when properly installed into a grounded metal housing. EMC testing was conducted with a load of 1 amp and setpoint of 200ºC (400ºF).

EMC directive (89/336/EEC)
EN 50081-1 (1992 edition)
EN 50082-1 (1992 edition)
Low Voltage Directive (73/23/EEC)
EN 61010-1 (1992 edition, Amendments 1, 2, 3, 4 and 11)

Caution

USE OF THIS EQUIPMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURE MAY IMPAIR PROTECTION PROVIDED BY THE EQUIPMENT

UNIT	OUTPUT RATING	FUSE RATING (AMPS)	TYPE
MMA-15	15/208/240	15	Fast-Acting 'A'

CLEANING INSTRUCTIONS

1. Remove power from the unit prior to any cleaning operation.
2. Use a cotton cloth to gently and sparingly apply isopropyl alcohol only. Do not use cleaners or other solvents as they may damage the unit.
3. Allow the unit to dry completely prior to reapplying power.

CAUTION : Refer to accompanying documents

CAUTION : Risk of electrical shock

See 6.2 for detailed cleaning instructions.

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This page provides an overview of the setup and installation process.
Note that no calibration or tuning is required.

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3	Temperature Controllers are set at the factory for the functionality listed below. If any of these settings are not appropriate for your application, change the DIP switches. switch 1 factory setting: use of failsafe enabled (bumpless transfer disabled) switch 2 factory setting: unit of measure—Fahrenheit for North America and Celsius for other shipping destinations switch 3 factory setting: factory (troubleshooting) mode disabled switch 4 factory setting: soft start enabled switch 5 factory setting: sensor type—type J thermocouple (already changed to K if you bought the Temperature Controllers with option 00K) switch 6 factory setting: use of external standby signal enabled switch 7 factory setting: configured standby setpoint used in closed loop (auto) mode or one quarter operator-set standby output percent used in open loop (manual) mode; you can change this setting so that the output in standby is always zero switch 8 factory setting: enter Idle mode after startup	3.5
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1.1 About this User Guide

This user guide contains all the information needed to set up and operate MMA-15 Hot Runner Temperature Controllers. Instructions for wiring, installing, and troubleshooting the Temperature Controllers are in the manual supplied with the mainframe.

1.2 MMA-15 Features and Benefits

1.2.1 Introduction

The MMA-15 Hot Runner Temperature Controllers offer many advanced features designed to increase productivity and ensure fast, accurate, and repeatable temperature control based on input from a J or K thermocouple.
Each MMA-15 unit is designed to control one temperature zone.

1.2.2 Convenient User Interface

MMA-15 Temperature Controllers are equipped with a bright two-line LED display that is easy to read over wide viewing angles. The zone's process value is displayed on the top line (three digits). The lower line (three digits) displays the zone's setpoint (closed loop mode) or output percent (open loop mode).
An orange indicator on the MMA-15 front panel[1] indicates heater on, and a red LED indicates a high or low deviation alarm.
Front panel keys make it easy to change mode, and to change the setpoint (closed loop mode) or output percent (open loop mode).

→ See Section 2. for detailed instructions for using the front panel.

1.2.3 Automatic Control

In closed loop (auto) mode each MMA-15 Temperature Controller uses a single TRIAC output to implement an incremental integral algorithm that does not require tuning.

1.2.4 Soft Start for Heater Bake Out

All MMA-15 Hot Runner Temperature Controllers support a soft start feature to extend the life of the heaters and the moulds[1]. The soft start allows slow dissipation of moisture in heaters by gradually applying power to the heaters.
When a soft start is executed, phase angle firing starts at 5% output power and steps up the output 5% every 30 seconds. The soft start lasts five minutes or until the process temperature reaches 93ºC (200ºF) or the current setpoint, whichever is lower.
The orange soft start indicator is on during soft start in closed loop (auto) mode.
You can stop the soft start (not recommended) by pressing the mode key.
The Temperature Controller will remain in closed loop (auto) mode.

1. The Soft Start can be disabled (not recommended) using DIP switch 4; see 3.5.

A soft start is executed:

- every time the Temperature Controller starts in closed loop (auto) mode and the process value is less than the current setpoint or 93ºC (200ºF), whichever is lower
  –and–
- every time the Temperature Controller is returned to closed loop (auto) operation and the PV is less than the setpoint or 93ºC (200ºF), whichever is lower.

→ See 2.2 for detailed start up information.

1.2.5 Standby

1.2.5.1 Introduction

An external signal can be used to change the Temperature Controller to standby mode. A menu item (see 4.4) allows you to specify a standby setpoint. When in standby—either closed loop (auto) or open loop (manual)—the soft start indicator LED will blink to indicate standby mode.

1.2.5.2 Closed Loop Standby

If the Temperature Controller is in closed loop (auto) mode when the external standby signal turns on, the setpoint used (and displayed) will be the lower of the current setpoint or the configured standby setpoint. You can use the front panel to change the setpoint, and if the new setpoint is lower than the standby setpoint, the new setpoint is used instead of the configured standby setpoint. This behaviour can be overridden with DIP switches; see 1.2.5.6 for details.

1.2.5.3 Open Loop Standby

If the Temperature Controller is in open loop (manual) mode when the external standby signal turns on, the output percent will be set to one-fourth of the output percent most recently set using the Temperature Controller front panel. You can use the front panel to change the output percent while the unit is in standby. The output percent actually used in standby is always one-quarter of the output percent set using the front panel.

While you are changing the output during standby, the non-standby output value is displayed, and then the unit goes back to displaying the output actually in use.

For example, suppose the open loop (manual) mode output percent in use before the unit is put into standby is 80%. When an external signal is used to put the unit in standby, 20% will be used and displayed (one-quarter of the previously set output).

If you want the unit to use 25% during standby, push the ▲ key until 100 is displayed. When you stop pushing the ▲ key, the standby output used and displayed will be 25%.

This behaviour can be overridden with DIP switches; see 1.2.5.6 for details.

1.2.5.4 Coming Out of Standby

When the external standby signal turns off, the Temperature Controller returns to its previous mode and current setpoint (closed loop mode) or output percent (open loop mode). If the Temperature Controller is in closed loop (auto) mode and the process value is below 93ºC (200ºF) or the setpoint, whichever is lower, the unit will do a soft start.

1.2.5.5 Idle Mode Takes Precedence

After power-up, an MMA-15 is in Idle mode until the operator takes the unit out of Idle mode (see 2.2.2). If an external standby signal is received while the Temperature Controller is in Idle mode, the soft start LED (item 1 in the illustration in 2.1) flashes only once. The external standby signal has no other effect.

1.2.5.6 Customising Standby Behaviour

The Temperature Controller may be configured via DIP switch 7 (see 3.5) to turn the output OFF when the standby signal is on. This is true for both closed loop (auto) and open loop (manual) operation. In this case, when the standby signal is on, the lower display will show "OFF" instead of the setpoint (closed loop) or output percentage (open loop).
Use of an external standby signal can be disabled with DIP switch 6 (see 3.5).

1.2.6 Process Protection Features

1.2.6.1 Deviation Alarms

Each MMA-15 Hot Runner Temperature Controller supports configurable deviation alarms. The zone's red alarm LED (on the front panel) lights if the process value:

- falls below the zone setpoint minus the low alarm value, or
- rises above the zone setpoint plus the high alarm value.

The alarm status indicator remains lit as long as the process value deviates from the setpoint by at least the configured deviation alarm value.
While a zone is in alarm, **HI** or **Lo** is also displayed.
The default high and low deviation alarm values are 17ºC (30ºF). Instructions for changing these defaults are in 4.4.
If the mainframe is equipped with communications and option 050, a contact closure is available to activate an external alarm device.

1.2.6.2 Loop Break Detection

The Temperature Controller monitors the input change. If the input value does not change or reach setpoint within the configured loop break time (default = five minutes) while the Temperature Controller is operating in closed loop (auto) mode, the Temperature Controller goes to open loop (manual) mode with 0% output, which can then be adjusted.
Instructions for configuring the loop break detection interval and for disabling loop break detection are in 4.4

1.2.6.3 Sensor Error Monitoring

The Temperature Controller can detect a reversed sensor or open sensor. See 5.2 and 5.3 for details.

1.2.7 Current Display

You can display the output current (expressed in tenths of an amp). Instructions for displaying the current output are in 2.3.6.

1.2.8 Ease of Setup

DIP switches and a setup menu make it easy to prepare the unit for use.
For information about switch settings, see 3.5.
For information about installation, including use of the setup menu, see Section 4.

1.3 Specifications

1.3.1 Operating Limits

Ambient Temperature 0°C to 65°C (32°F to 150°F)
Relative Humidity Tolerance 10 to 95 % Non-Condensing
Shipping Temperature –40°C to 70°C (–40°F to 158°F)
Power Requirements 208 to 240 Vac 50 or 60 Hz nominal (115 Vac optional)

1.3.2 Performance

Temperature Accuracy ± 0.3 % of full scale
Setpoint Resolution 1°C / 1°F
Repeatability ± 0.1 % of full scale
Temperature Stability ± 0.5 % of full scale over the ambient range of 0°C to 55°C (32°F to 150°F)
Thermocouple Cold-End Tracking automatic, better than 0.02°C per degree Celsius (0.02°F per degree Fahrenheit)
Noise Rejection Series Mode > 70 dB
Process Sampling Rate 10 Hz (100 ms)

1.3.3 Connections and Mounting

MMA-15 Temperature Controllers are designed for installation in a Hot Runner mainframe (or other compatible mainframe). Removal of an MMA-15 Temperature Controller from the mainframe requires unlatching of a locking pin (standard Temperature Controllers) or removal of a locking screw (CE-compliant Temperature Controllers).

1.3.4 Inputs

Thermocouple J or K (grounded or ungrounded)
Supported Sensor Range 37 to 537°C (100 to 999°F)

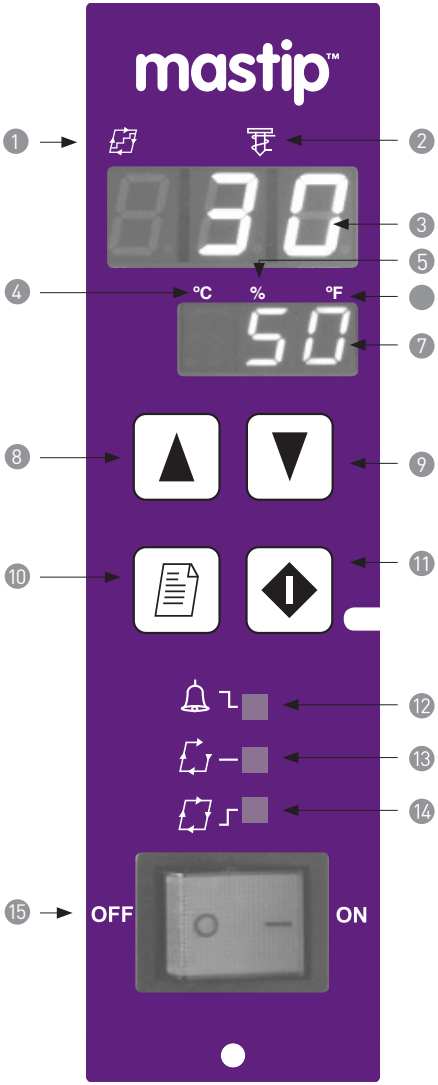
1.3.5 Output

Voltages 240 Vac nominal
Power Capability 15 amperes, 3600 watts @ 240 Vac
Overload Protection Triac and load use high speed fuses.
Both sides of input power are fused (ABC; GBB optional).
Power Line Isolation Optically and transformer isolated from AC lines. Isolation voltage is greater than 2500 volts.
Output Drive Internal solid state TRIAC, triggered by AC zero crossing pulses for control (phase angle during soft start)

1.3.6 CE EMC Compliance

For details on the Temperature Controller's CE EMC compliance, please see page 4.

2.1 MMA-15 Front Panel



1. **Soft Start and Standby Indicator** – lit (orange) when soft start is active; blinks to indicate standby
2. **Output Status Indicator** – lit (orange) when output is on
3. **Process Value (PV) Display** - alternates with Idle active status or error message when necessary
4. **Celsius Indicator** – lit (green) when PV and SP are displayed in degrees C
5. **Output Percent Indicator** – lit (green) when open loop mode output % is displayed on lower line
6. **Fahrenheit Indicator** – lit (green) when PV and SP are displayed in degrees F
7. **Setpoint (SP) Display** - (closed loop mode) or output percent (open loop mode); operator can choose to display output current (in tenths of an amp) as described in 2.3.6
8. **Up Key** – increases setpoint (closed loop mode) or output percent (open loop mode); press and hold for rapid change
9. **Down Key** – decreases setpoint (closed loop mode) or output percent (open loop mode); press and hold for rapid change
10. **Mode Key** – cycles between open loop and closed loop mode; active mode indicated by lit LED (13 & 14); disabled during Idle mode
11. **Exit Idle Key**
12. **Alarm Indicator** – lit (red) when PV varies from the SP by the configured deviation alarm value (low or high)
13. **Open Loop Mode Indicator** – lit (green) when manual control is active
14. **Closed Loop Mode Indicator** – lit (green) when automatic control is active
15. **Power Switch - must be off when removing or installing Temperature Controller.**

2.2 What Happens When you Power Up the Temperature Controller

2.2.1 Display

Turn on the Temperature Controller by pressing the "I" end of the 15 A power switch on the front panel. When an MMA-15 Temperature Controller is powered up, "-A-" is displayed in the upper display, confirming that this is an MMA-15, and the firmware level is displayed in the lower display[2]. Next, all segments of the display and all LED indicators light.

2.2.2 Idle Mode

After a loss of input power is experienced Idle Mode prevents the module from returning output power to the hot runner system heaters. When the input power is applied to the module the output power remains off, and the top display alternates between "idL" and the process value until the Exit Idle key is pressed .

Use of Idle Mode can be disabled with DIP switch 8; see 3.5.

2.2.3 Control Mode

After the Temperature Controller is taken out of Idle mode, it will be in the last control mode used, either closed loop (auto) or open loop (manual).

If the Temperature Controller is in closed loop mode, the sequence of Temperature Controller actions that follow when the unit is taken out of Idle and the state of the Temperature Controller output depend on the process value. If the process value is less than or equal to 93ºC (200ºF) or the setpoint (whichever is lower), the Temperature Controller does a soft start (described in 1.2.4). Otherwise, the Temperature Controller will enter the normal closed loop (auto) control mode. You can stop the soft start (not recommended) by pressing the mode key .

If the Temperature Controller is in open loop (manual) mode, the Temperature Controller sets the output percentage to the last percentage used.

2. It is a good idea to make a note of the firmware version number. If you phone for technical support, you will be asked for this version information, as well as for the complete model number of the Temperature Controller in question.

2.3 Operation Basics

2.3.1 See PV

To see the process value: Look at the top line of the display. The top line shows the PV for the zone, unless the Temperature Controller detects an error. (For error codes, see 5.3.)

2.3.2 See if Output is On

To see if the output is on: Look at the Heat indicator above the PV for the zone. This orange indicator is on when the output is on.

2.3.3 Monitor for Alarms

To watch for deviation alarms: Look at the red alarm LED (next to symbol).
This LED lights if the process value goes above or below the zone setpoint by the configured deviation alarm value. The alarm status indicator remains lit as long as the process value deviates from the setpoint by at least the configured deviation alarm value.
While a zone is in alarm, **HI** or **Lo** is also displayed. The default deviation alarm values are 17ºC (30ºF). Instructions for changing these defaults are in 4.4.

2.3.4 Change Mode

To change the mode: Press the mode key to light the LED for the mode you want.

Closed loop (auto control) – Temperature Controller uses the input value to calculate the output needed to maintain the setpoint shown on the lower line. When entering closed loop mode, if the process value is less than or equal to 93ºC (200ºF) or the setpoint (whichever is lower), the Temperature Controller does a soft start (described in 1.2.4). Otherwise, the Temperature Controller will enter the normal closed loop (auto) control mode. You can stop the soft start (not recommended) by pressing the mode key .

Open loop (manual control) – Temperature Controller output is the percent shown on the lower line. The process value is displayed, but not used to calculate the output. If bumpless transfer is disabled (the default), then when the unit is put into open loop (manual) mode, the output will be set to the last open loop mode output percent used. If bumpless transfer is enabled as described in 3.5, then transfer from closed loop (auto) to open loop (manual) mode is "bumpless" when the automatic control stability requirement is met (ie. process value has been within 5ºC (9ºF) of the setpoint for at least two minutes). If this automatic control stability requirement is not met, then the last open loop mode (manual) output percent is used.

2.3.5 Change Setpoint or Output

To change the setpoint (closed loop mode) or output (open loop mode): Press the ▲ or ▼ key until the displayed value has been changed to the new value you want.

2.3.6 Display Current Output

To display the current output: Press the mode key . (If you hold the mode key for more than a second, the mode of the Temperature Controller will not be changed when you release the key.) As long as the mode key is pressed, the current output will be displayed instead of the setpoint or output percent.
The current is expressed in tenths of an amp and alternates with -A-. For example, if the output is 8.3 amps, the Temperature Controller will display 083 (alternating with -A-).

3.1 Introduction

Temperature Controllers are shipped with SafeChange disabled because the Temperature Controller will not work if the SafeChange feature is enabled but the mainframe does not support SafeChange. You can enable SafeChange quickly and easily using a jumper setting as described in this section.
Basic setup choices are made using DIP switches as described in this section.
If you plan to display the process value and enter the setpoint in the unit of measure that is not the default for your location, you must change the DIP switch setting.
Read and heed the warnings and cautions in the front of this manual before checking the mainframe for SafeChange capability or changing Temperature Controller DIP switch settings.

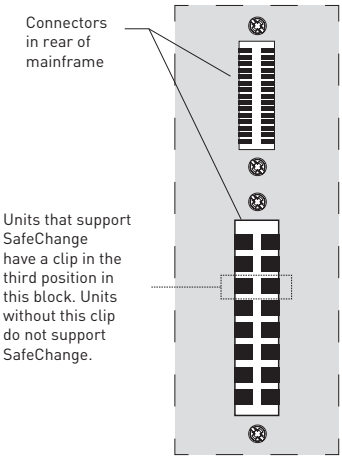
3.2 Checking Mainframe for SafeChange Capability

Do not enable SafeChange unless the mainframe supports this feature.
Use of the SafeChange feature does not eliminate the need for careful installation and removal of Temperature Controllers.
Always turn off power to the Temperature Controller and the mainframe when installing or removing a Temperature Controller.

To check the mainframe for SafeChange capability:

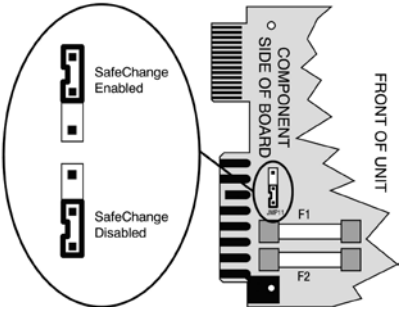
1. Turn off power to the mainframe.
2. Remove a blanking panel or a Temperature Controller that is OFF, so you can look into the mainframe.
3. Look at the lower connector block on the backplane (shown below). If a metal clip is in the third position in the connector block, then the mainframe supports SafeChange.

To reduce the possibility of damage to the Temperature Controller, you should enable SafeChange on the Temperature Controller before installing it in the mainframe; see 3.3.
If the third position in the connector block does not contain a metal clip, then the mainframe does not support SafeChange. You can add a clip to convert the mainframe; see 3.4.



Location of Clip in Mainframe to Support SafeChange

3.3 Enabling the SafeChange Feature



Location of SafeChange Jumper JMPII

Temperature Controllers are shipped with SafeChange disabled, because the Temperature Controller will not work if the SafeChange feature is enabled, but the mainframe does not support SafeChange. You can enable SafeChange quickly and easily.
To enable the SafeChange feature, move the JMP11 jumper block from the disabled position to the enabled position as marked on the printed circuit board (and as shown left).

3.4 Adding a SafeChange Clip to the Mainframe

You can convert an older mainframe to support SafeChange. To make the conversion, you must add a clip to the third position in the lower connector block (on the backplane) in every slot; see the illustration in 3.2. The clip is p/n 216D001U01.

To install the clip:

1. Turn off power to the mainframe.
2. Remove the back cover of the mainframe.
3. Position a clip in the third (open) position in each lower connector block and press. The clip will snap into position.

3.5 DIP Switch Settings

The ON switch position is towards the centre of the board.

Switch Number	If ON	If OFF	Factory Setting
1	Failsafe enabled AND bumpless transfer disabled If the failsafe feature is enabled, then when an open sensor is detected, the configured failsafe output percent is used.	Failsafe is disabled AND bumpless transfer enabled For more info see: 2.3.4 – bumpless transfer 4.4 – failsafe output percent configuration	ON
2	Degrees Celsius	Degrees Fahrenheit	ON
3	Factory mode enabled in menu	Factory mode disabled	OFF
4	Soft start disabled	Soft start enabled	OFF
5	K thermocouple	J thermocouple	OFF
6	Hardware standby signal ignored See Notes 1 and 2	Active hardware standby signal will cause Temperature Controller to use lower of setpoint or configured standby setpoint (in closed loop mode) OR one-quarter of last output percent (in open loop mode) until the standby signal is off	OFF
7	Output turned off when standby signal is received, regardless of mode or configured standby setpoint; output remains off until standby signal is off - See Note 2	Active hardware standby signal will cause Temperature Controller to use lower of setpoint or configured standby setpoint (in closed loop mode) OR one-quarter of last output percent (in open loop mode) until the standby signal is off	OFF - See Note 1
8	Idle mode not used	Temperature Controller goes into Idle mode (output off) when powered up	OFF

Note 1: Switch 7 is ignored if Switch 6 is ON.

Note 2: Features enabled/disabled with switches 6 and 7 require communication and standby/alarm option in mainframe.

4.1 Prepare the Temperature Controller

Unpack the Temperature Controller.
Inspect the Temperature Controller for damage.
Make sure the power switch on the front of the Temperature Controller is set to off (O).
If a Temperature Controller shows signs of having been damaged during shipping, do not install or power up the Temperature Controller. Save all packing materials and report any damage to the carrier immediately.

4.2 Install the Temperature Controller

This guide assumes that the mainframe has already been wired as described in the installation manual supplied with the mainframe.

a) Make sure the plunger in center of the locking pin is pulled out (or loosen the locking screw).
b) With the Temperature Controller and mainframe power switches set to off (O), align the Temperature Controller's printed circuit board with the guide channels in a slot in the Hot Runner mainframe.
c) Slide the Temperature Controller into the mainframe until the Temperature Controller's connectors are firmly seated in the backplane of the mainframe.
d) Lock the Temperature Controller into the frame by pressing in the plunger on the locking pin (or tighten the locking screw).

4.3 Apply Power to the Mainframe and Temperature Controller

Power-up behaviour is described in 2.2.

a) Before powering up the Temperature Controller, consider the effects on your process when the output is activated. Make site-specific preparations.
b) Turn on the power to the mainframe.
c) Set the power switch on the front of the Temperature Controller to on (I).
Note that the power switch is illuminated when the power is on. [3]

[3] If the switch is on and power is on at the mains, but the switch is not lit, check the Temperature Controller fuses; see 6.3

4.4 Set Failsafe Output Percentage and Standby Temperature

By default, the failsafe output percent, used when an open sensor is detected, is set to zero. We strongly recommend that you use the setup menu to set this to a value suitable for your process.
The Temperature Controller uses the configured failsafe output (instead of zero) only if switch 1 is ON. (See 5.2 for more information about the failsafe feature.)
If use of standby mode is enabled with Switch 6 (see 3.5), then we recommend that you also set a standby setpoint appropriate for your process.
This standby setpoint can be overridden using Switch 7 (see 3.5).
While in the setup menu, you can also change the high and low deviation alarm values, and the loop break detection time from the defaults (if necessary).

Setup Menu Defaults	
ALo	Alarm low : 17ºC (30ºF) below set temperature
AHi	Alarm high : 17ºC (30ºF) above set temperature
Lbt	Loop break time : 5 minutes; if set to zero, loop break detection is disabled
F-S	Failsafe output 0 %
Sbt	Standby mode setpoint

To access the setup menu for a zone:

a) Press the mode key to enter open loop (manual) mode.
b) Press the ▲ to change the open loop (manual) output percent (lower line of display) to 2.
c) Press and hold the mode key for 3 seconds or until the upper display shows ALo.
d) Release the mode key .

To step through menu items (displayed on top line), press the mode key .
To change the currently displayed value for a parameter (lower line), press the ▲ or ▼ key.
To exit the setup menu, cycle the power to the Temperature Controller.

4.5 Adjust the Setpoint

When the Temperature Controller is powered up, taken out of Idle mode, and put into closed loop (auto) mode, the Temperature Controller will automatically do a soft start for heater bake out if the process value is below 93ºC (200ºF) or the setpoint, whichever is lower. (PV is on the top line of the display. SP is on the lower line.) During the soft start the soft start indicator is lit.
During the soft start (which lasts five minutes or until the PV is 93ºC (200ºF) or setpoint, whichever is lower), adjust the setpoint to a value that is representative of the setpoint you expect to use when the Temperature Controller is in service.
To adjust the setpoint press the ▲ or ▼ key.
The display reverts to the closed loop (auto) mode operating display: PV on top line, SP on lower line.
MMA-15 Temperature Controllers are calibrated at the factory and ready to use.

5.1 Introduction

Usually the Temperature Controller displays the process variable on the top line and the setpoint on the lower line of the display. However, when the Temperature Controller is in Idle mode and when the Temperature Controller detects a problem with the input, messages are displayed to alert you to conditions that require your attention.

5.2 Open Thermocouple Detection

When the Temperature Controller detects an open sensor, an error message is displayed (see below). If the failsafe feature is enabled as described in 3.5, then when an open sensor is detected, the failsafe output percent configured as described in 4.4 is used.

If the failsafe feature is disabled, then when an open sensor is detected the output used depends on whether the Temperature Controller has been operating in closed loop (auto) mode and whether the automatic Temperature Control stability requirement is met: process value has been within 5ºC (9ºF) of the setpoint for at least two minutes.

- If the Temperature Controller is in closed loop mode and this automatic control stability requirement is met, then the last closed loop output percent is used when an open sensor is detected.
- If the Temperature Controller is in closed loop mode and this automatic control stability requirement is not met, OR if the Temperature Controller is in open loop (manual) mode, then the last open loop output percent is used when an open sensor is detected.

5.3 Summary of Messages

If the Temperature Controller is in Idle mode or if the Temperature Controller detects a problem, a message will be displayed.
These messages are summarised below.

	Idle Mode (see Note 1)	Open Thermocouple Detected	Loop Break Detected	Reversed Sensor Leads Detected
Top line display	Process value alternates with `idL` If the PV cannot be read, no PV will be displayed. If the Temperature Controller used open loop (manual) mode most recently and the PV cannot be read, the alarm LED will be lit.	Goes high first (see Note 2 below), then `OPn / tC`	PV stops rising and remains below setpoint, and then after five minutes `Err`	Goes low first (see Note 3 below), then `rEu / tC` Changing numerical values.
Lower line display	Most recent setpoint (closed loop mode) or most recent output percent (open loop mode)	Configured failsafe output percent (default=0) (see 5.2 above)	`LOP / HE`	`0` (zero output %)
Output	OFF	configured failsafe output percent (default=0)	OFF (see Note 2)	ON while low, then OFF (see Note 3)
Alarm LED	n/a	ON	ON	ON

Note 1: The Temperature Controller goes into Idle mode after power-up unless Idle mode has been disabled during setup; see 3.5

Note 2: At first, a falsely increasing process value is displayed on the top line; the setpoint remains on display on the lower line, and the output remains on until the process value is greater than the setpoint.

Note 3: At first, `Lo` alternates with display of the decreasing process value on the top line; the setpoint remains on display on the lower line, and the output remains on until the sensor error is detected.

6.1 Introduction

This section contains instructions for cleaning the front panel of the Temperature Controller and instructions for replacing the fuses.
Except for fuses, the Temperature Controller contains no user-serviceable parts

WARNING

Do not attempt to clean any part of a Temperature Controller other than the front panel.

If you want to clean the front panel of a single Temperature Controller, use the power switch on the front of the Temperature Controller to turn it off, and then remove the Temperature Controller from the mainframe.

If you want to clean the front panel of several Temperature Controllers, turn off all Temperature Controllers in the mainframe and turn off power to the mainframe before cleaning the Temperature Controllers while they are in the mainframe.

While cleaning a Temperature Controller's front panel, do not allow alcohol to enter the switch.

Allow Temperature Controllers and mainframes to dry thoroughly before restoring power. Do not use a heater or compressed air to dry the units.

Failure to observe these precautions can result in exposure to a potentially lethal shock hazard.

The Temperature Controller power switch should be in the "OFF" position before you put a Temperature Controller into an energised mainframe, or remove a Temperature Controller from an energised mainframe. Failure to observe these precautions can result in damage to the connectors and printed circuit boards.

6.2 Cleaning the Front Panel

To clean an MMA-15 Temperature Controller:

1. Read the safety warnings above before you start cleaning a Temperature Controller.
2. To clean the front panel of a single Temperature Controller, put the Temperature Controller power switch in the "OFF" position, and then remove the Temperature Controller from the energised mainframe by pulling out the plunger on the locking pin (or loosening the locking screw), and pulling on the handle on the front of the Temperature Controller.
   Alternatively, if you plan to clean the front panel of several Temperature Controllers, put the power switch of every Temperature Controller in the mainframe in the "OFF" position, and then turn off power to the entire mainframe. After the mainframe has been de-energised, you can clean the Temperature Controllers while they are in the mainframe.
3. Use a cotton cloth to gently and sparingly apply isopropyl alcohol to the front panel of the Temperature Controller.
   Do not use cleaning solutions or other solvents.
   Use of anything other than isopropyl alcohol can result in damage to the Temperature Controller.
   Do not allow alcohol to enter the power switch on the Temperature Controller's front panel.
4. Allow the Temperature Controller to air-dry thoroughly. Do not use a heater or compressed air to dry the unit.
5. Inspect all surfaces to make sure that they are completely dry.
6. When the Temperature Controller is completely dry, re-install it and return it to service.

6.3 Replacing the Fuses

Each MMA-15 Temperature Controller contains two fuses, located on the main printed circuit board.

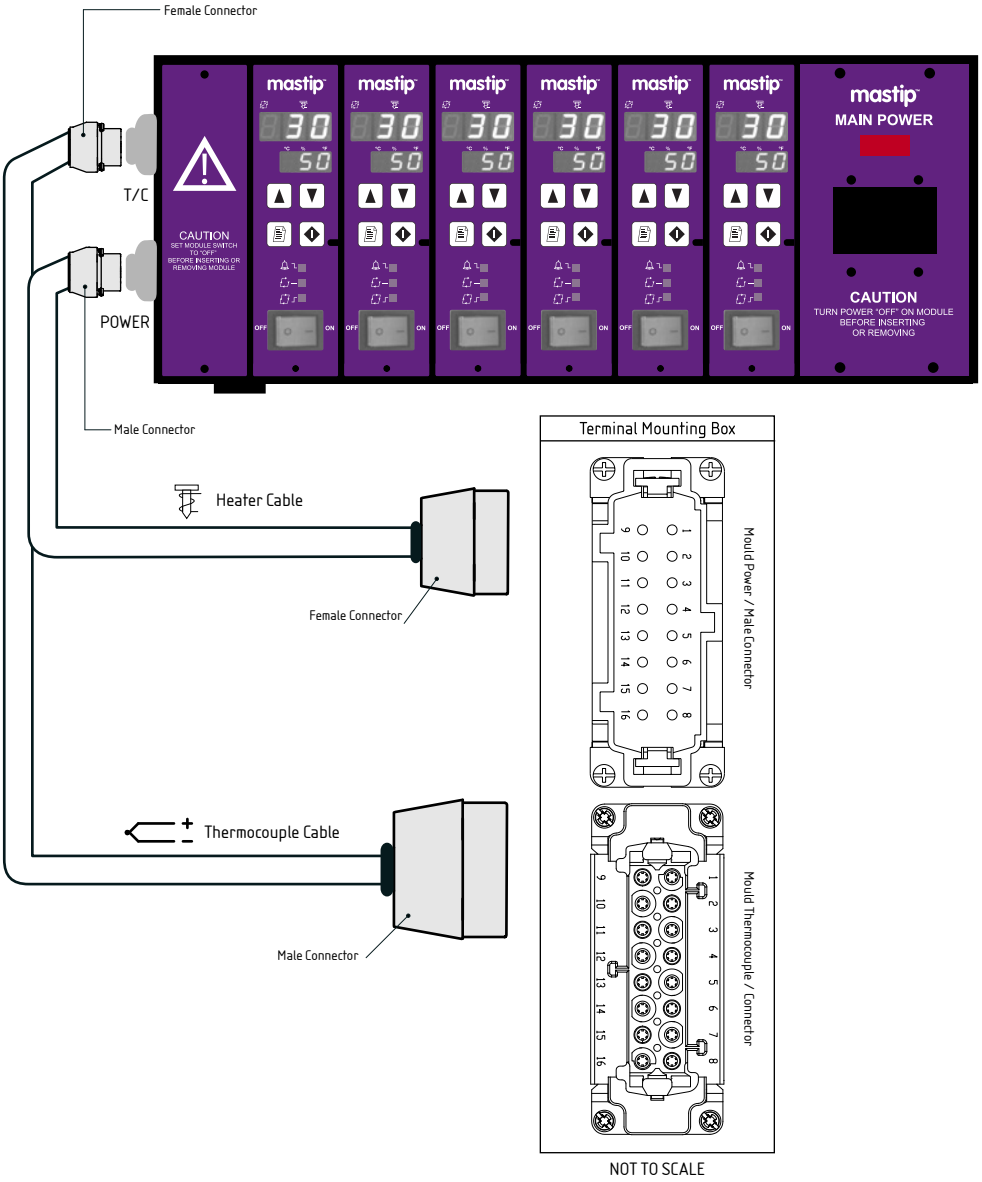
To replace the fuses:

1. Make sure that you have the correct replacement fuse – Type F fast-acting 250 Vac fuses rated at 15 amps. Suitable fuses are p/n 210B001U01 and Littlefuse Inc. p/n 314015.
2. Put the power switch of the Temperature Controller in the "OFF" position.
3. Pull out the plunger in the locking pin (or loosen the locking screw).
4. Use the handle on the front of the Temperature Controller to pull it out of the mainframe.
5. Replace the fuses.
6. Re-install the Temperature Controller and return it to service.

6.4 Unit Repairs

It is recommended that units requiring service be returned to an authorised service centre. Before a Temperature Controller is returned for service, please consult the service centre nearest you. In many cases, the problem can be cleared up over the telephone.
When the unit needs to be returned, the service centre will ask for a detailed explanation of problems encountered and a purchase order to cover any charge. This information should also be put in the box with the unit. Following these instructions should expedite return of the unit to you.

7.1 Mainframe to Mould Interconnection Diagram

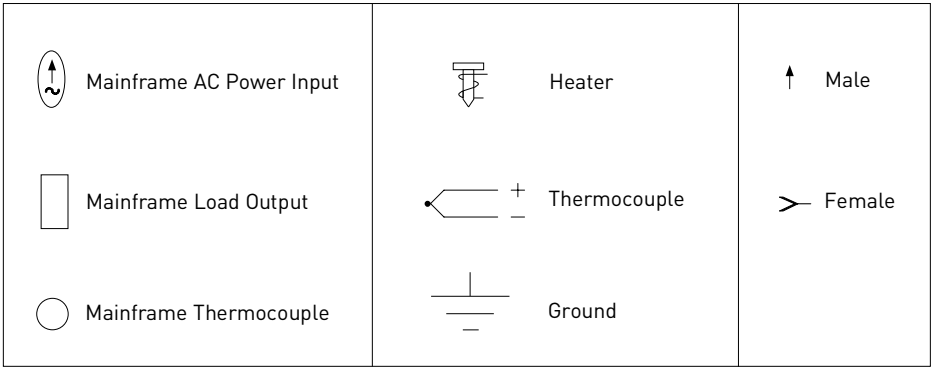


8.1 Before Connecting the Power

- Use a Mega ohm meter to check each heater lead. Resistance to ground should be greater than 2MΩ @ 600 VDC
- Check the negative (-) and positive (+) thermocouple wires are connected to the correct terminals
- Measure the continuity between negative (-) and positive (+) thermocouple leads with an ohm meter
- Use an ohm meter to measure between heater power leads. Calculate the resistance with the formula below

$$\Omega = V^2 / W$$

8.2 Mainframe Wiring Key



Caution: Installation and service should be performed by qualified personnel only.
The unit must be OFF prior to connecting the unit to a power source.

Mastip recommends that you install a service disconnect switch. A service disconnect switch provides a convenient and safe method for disconnecting all power from the Temperature Controller.

9.1 Connecting Input Power to the Mainframe

Always check the serial number label to confirm the system voltage.
All main frames are wired for 240 volts, line to neutral 50/60 Hz, 3 phase power.
If single phase operation is required, it must be specified at time of order.

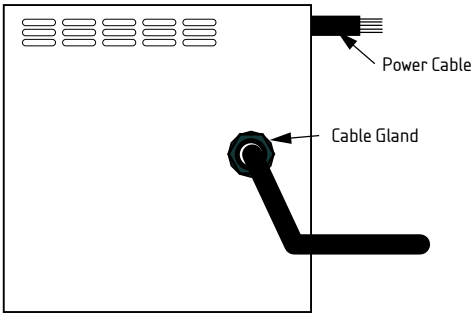
ONE

Remove screws on back panel and remove the panel

TWO

Select the correct input cable size and configuration based on load requirements and local electrical codes.

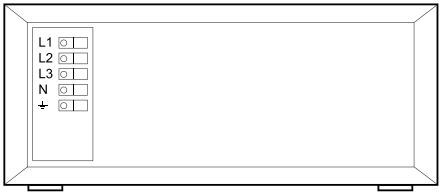
TWO



Right Side Panel

Insert the input cable through the cable gland on the right side panel of the main frame.

FOUR



Mainframe rear with terminal block

SIX

Replace the back panel and screw in screws.

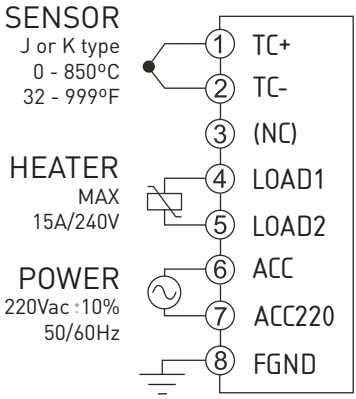
SEVEN

Take up excess slack in the cable and secure it in the strain-relief cable gland on the outside of the cabinet.

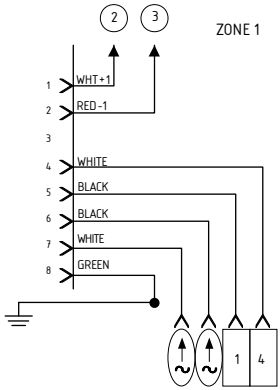
EIGHT

Route the AC input cable to a switched 3 phase mains outlet.
Ensure the ground lead is connected.

9.2 Edge Connector

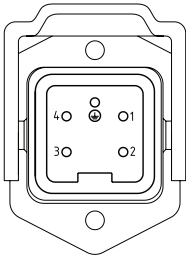


10.1 Mainframe Wiring Diagram for MSA (1 Zone)



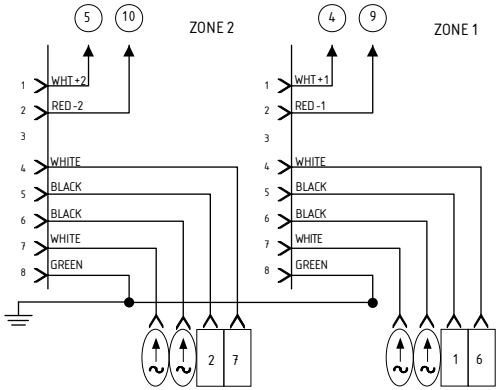
10.2 Power and Thermocouple Mould Connector Assignments MSA (1 Zone)

1 Zone Mould Connector
5 Pin Combination Male Power and Thermocouple Connector
10A Max



1 Zone, 5 Pin Mould Connector		
Zone	Pin Number	Connection
1	1	Power
	2	Thermocouple +
	3	Thermocouple -
	4	Return
	⏚	Ground

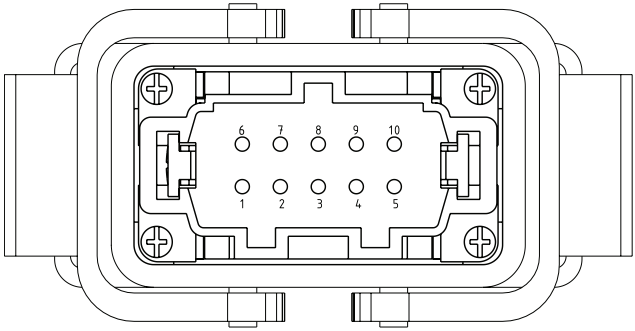
11.1 Mainframe Wiring Diagram for 2 Zone



11.2 Power and Thermocouple Mould Connector Assignments for 2 Zone

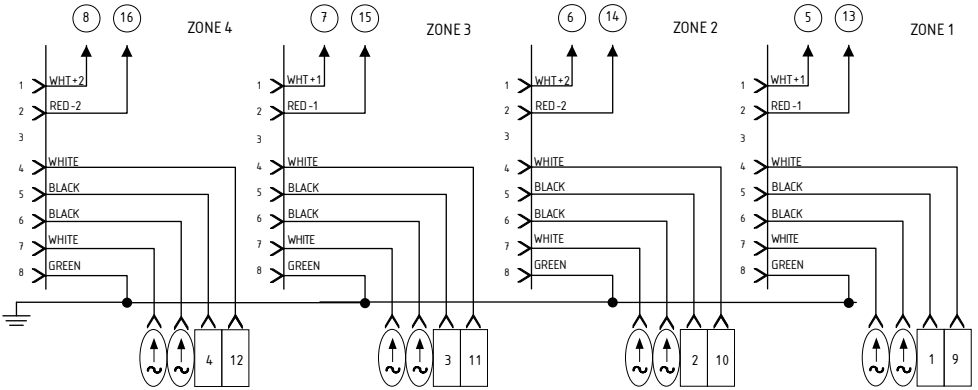
2 Zone Mould Connector

10 Pin Combination Male Power and Thermocouple Connector



2 Zone, 10 Pin Mould Connector		
Zone	Pin Number	Connection
1	1	Power
	4	Thermocouple +
	9	Thermocouple -
	6	Return
2	2	Power
	5	Thermocouple +
	10	Thermocouple -
	7	Return
	⏚	Ground

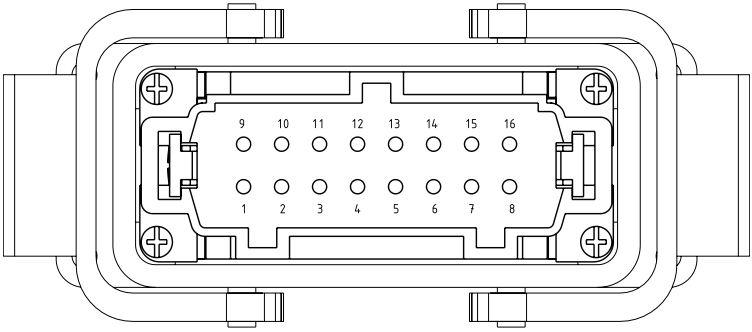
12.1 Mainframe Wiring Diagram for 4 Zone



12.2 Power and Thermocouple Mould Connector Assignments for 4 Zone

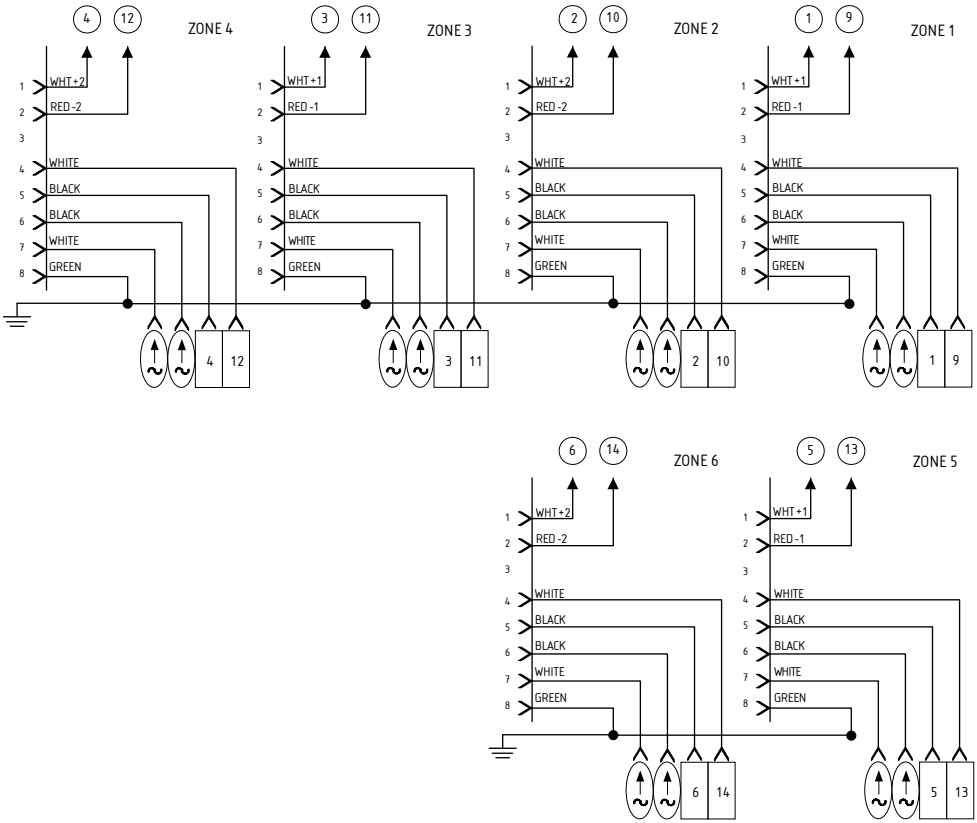
4 Zone Mould Connector

16 Pin Combination Male Power and Thermocouple Connector



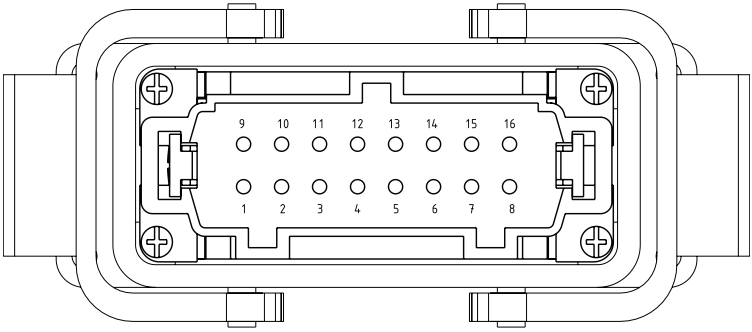
4 Zone, 16 Pin Mould Connector		
Zone	Pin Number	Connection
1	1	Power
	5	Thermocouple +
	13	Thermocouple -
	9	Return
2	2	Power
	6	Thermocouple +
	14	Thermocouple -
	10	Return
3	3	Power
	7	Thermocouple +
	15	Thermocouple -
	11	Return
4	4	Power
	8	Thermocouple +
	16	Thermocouple -
	12	Return
	⏚	Ground

13.1 Mainframe Wiring Diagram for 6 Zone



13.2 Power Mould Connector Assignments for 6 Zone

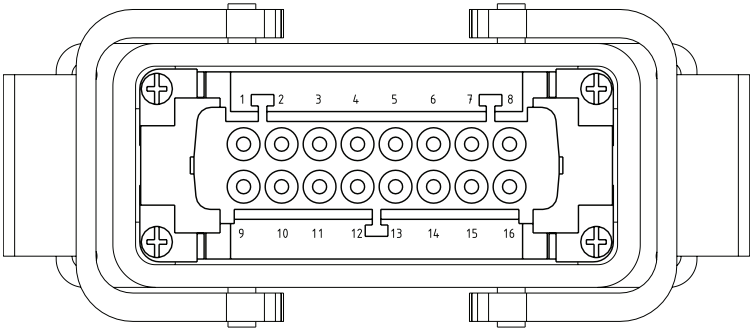
6 Zone Mould Connector - Power
16 Pin Male Power Connector



6 Zone, 16 Pin Mould Connector		
Zone	Pin Number	Connection
1	1	Power
	9	Return
2	2	Power
	10	Return
3	3	Power
	11	Return
4	4	Power
	12	Return
5	5	Power
	13	Return
6	6	Power
	14	Return
	⏚	Ground

13.3 Thermocouple Mould Connector Assignments for 6 Zone

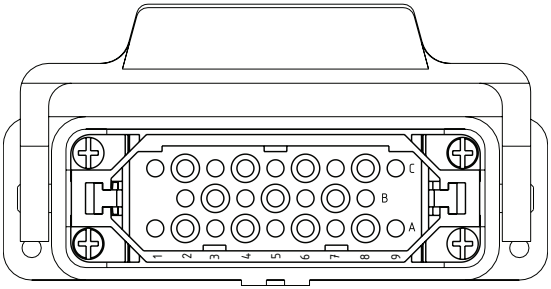
6 Zone Mould Connector - Thermocouple
16 Pin Female Thermocouple Connector



6 Zone, 16 Pin Mould Connector		
Zone	Pin Number	Connection
1	1	Thermcouple +
	9	Thermcouple -
2	2	Thermcouple +
	10	Thermcouple -
3	3	Thermcouple +
	11	Thermcouple -
4	4	Thermcouple +
	12	Thermcouple -
5	5	Thermcouple +
	13	Thermcouple -
6	6	Thermcouple +
	14	Thermcouple -
	⏚	Ground

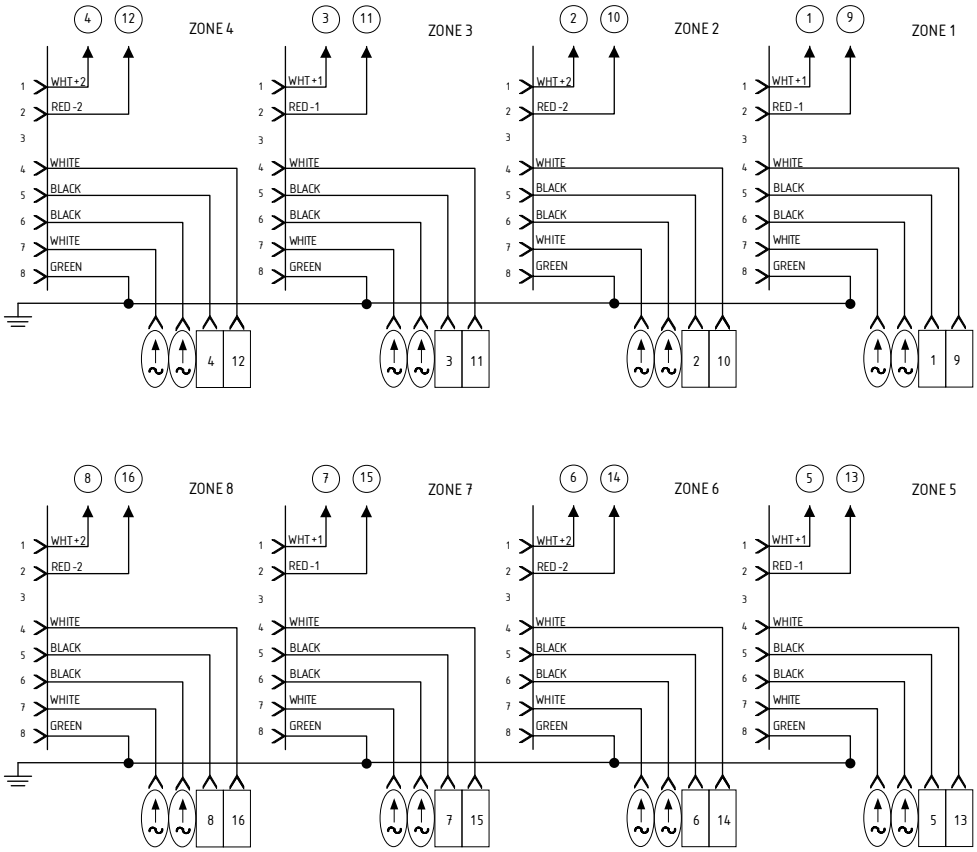
13.4 Power Mould Connector Assignments for 6 Zone

6 Zone Mould Connector - Power
25 Pin Male Power Connector
10A Max



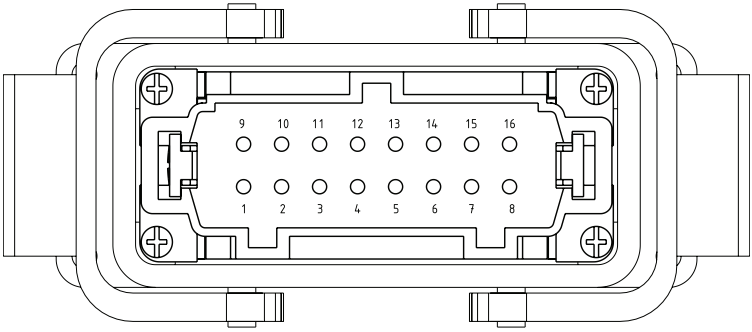
6 Zone, 25 Pin Mould Connector		
Zone	Pin Number	Connection
1	A1	Power
	A2	Return
2	A3	Power
	A4	Return
3	A5	Power
	A6	Return
4	A7	Power
	A8	Return
5	B2	Power
	B3	Return
6	B4	Power
	B5	Return
	⏚	Ground

14.1 Mainframe Wiring Diagram for 8 Zone



14.2 Power Mould Connector Assignments for 8 Zone

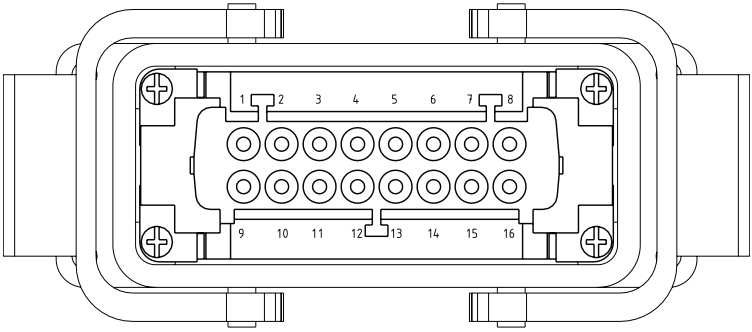
8 Zone Mould Connector - Power
16 Pin Male Power Connector



8 Zone, 16 Pin Mould Connector		
Zone	Pin Number	Connection
1	1	Power
	9	Return
2	2	Power
	10	Return
3	3	Power
	11	Return
4	4	Power
	12	Return
5	5	Power
	13	Return
6	6	Power
	14	Return
7	7	Power
	15	Return
8	8	Power
	16	Return
	⏚	Ground

14.3 Thermocouple Mould Connector Assignments for 8 Zone

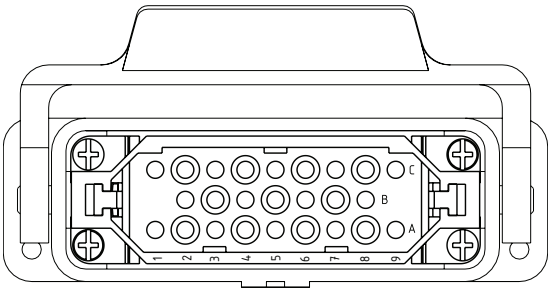
8 Zone Mould Connector - Thermocouple
16 Pin Female Thermocouple Connector



8 Zone, 16 Pin Mould Connector		
Zone	Pin Number	Connection
1	1	Thermcouple +
	9	Thermcouple -
2	2	Thermcouple +
	10	Thermcouple -
3	3	Thermcouple +
	11	Thermcouple -
4	4	Thermcouple +
	12	Thermcouple -
5	5	Thermcouple +
	13	Thermcouple -
6	6	Thermcouple +
	14	Thermcouple -
7	7	Thermcouple +
	15	Thermcouple -
8	8	Thermcouple +
	16	Thermcouple -
	⏚	Ground

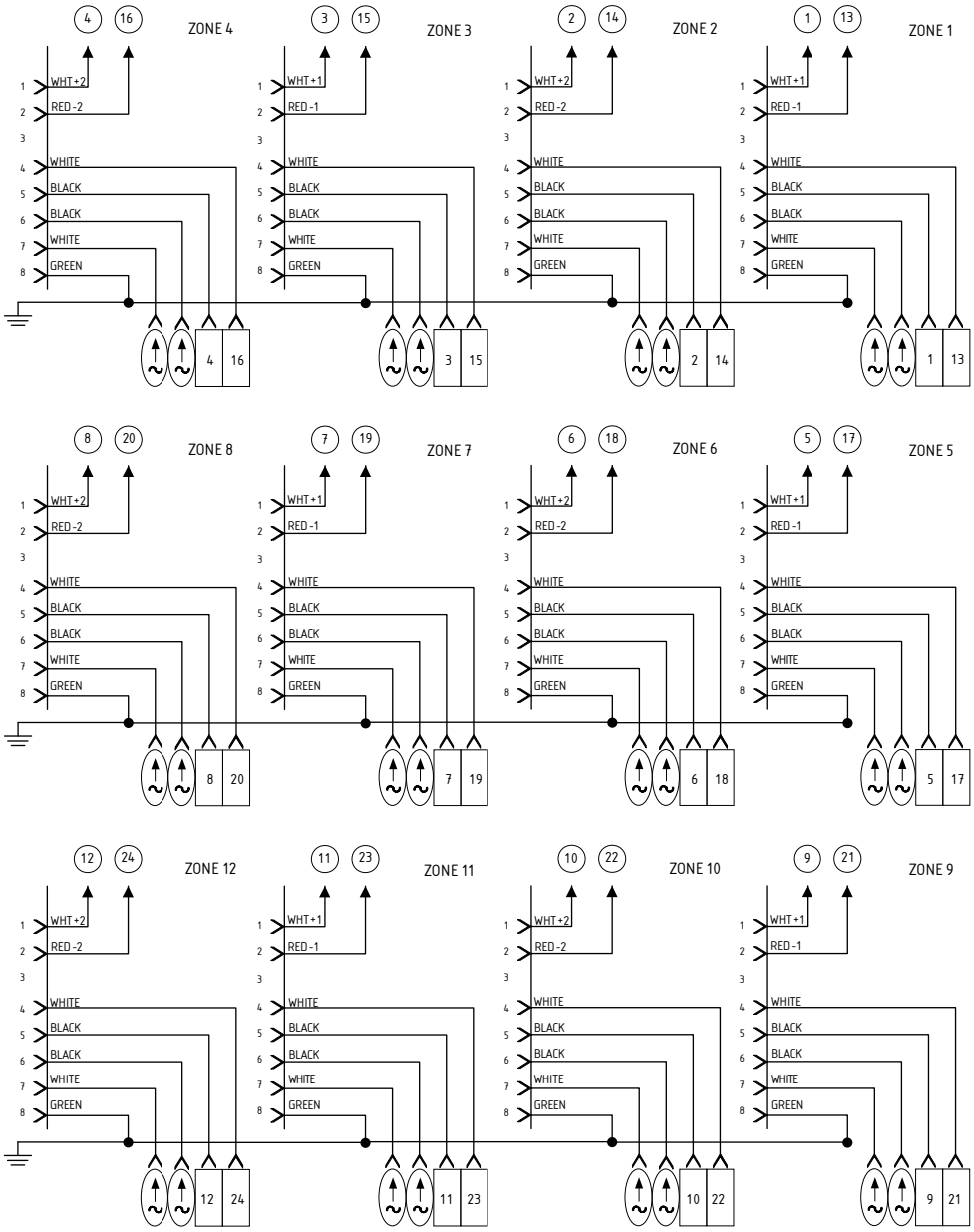
14.4 Power Connector Assignments for 8 Zone

8 Zone Mould Connector - Power
25 Pin Male Power Connector
10A Max



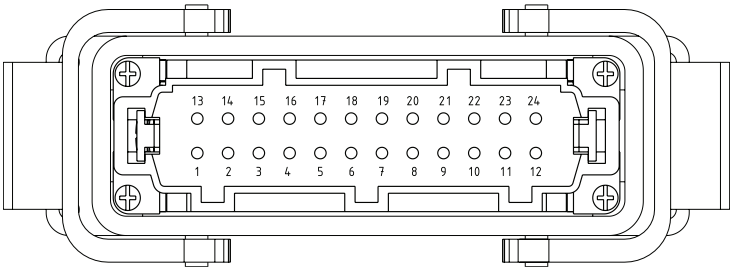
8 Zone, 25 Pin Mould Connector		
Zone	Pin Number	Connection
1	A1	Power
	A2	Return
2	A3	Power
	A4	Return
3	A5	Power
	A6	Return
4	A7	Power
	A8	Return
5	B2	Power
	B3	Return
6	B4	Power
	B5	Return
7	B6	Power
	B7	Return
8	C1	Power
	C2	Return
	⏚	Ground

15.1 Mainframe Wiring Diagram for 12 Zone



15.2 Power Mould Connector Assignments for 12 Zone

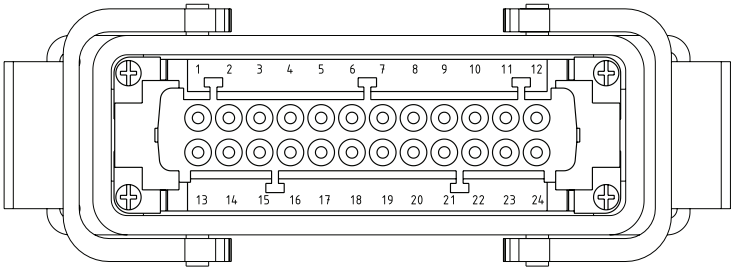
12 Zone Mould Connector - Power
24 Pin Male Power Connector



12 Zone, 24 Pin Mould Connector		
Zone	Pin Number	Connection
1	1	Power
	13	Return
2	2	Power
	14	Return
3	3	Power
	15	Return
4	4	Power
	16	Return
5	5	Power
	17	Return
6	6	Power
	18	Return
7	7	Power
	19	Return
8	8	Power
	20	Return
9	9	Power
	21	Return
10	10	Power
	22	Return
11	11	Power
	23	Return
12	12	Power
	24	Return
	⏚	Ground

15.3 Thermocouple Connector Assignments for 12 Zone

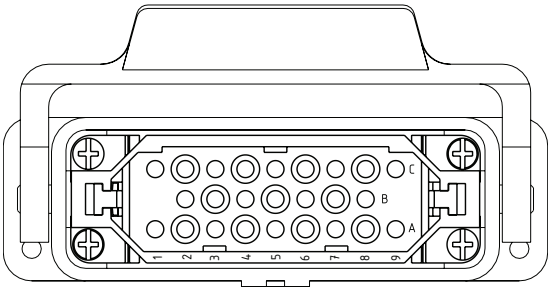
12 Zone Mould Connector - Thermocouple
24 Pin Female Thermocouple Connector



12 Zone, 24 Pin Mould Connector		
Zone	Pin Number	Connection
1	1	Thermocouple +
	13	Thermocouple -
2	2	Thermocouple +
	14	Thermocouple -
3	3	Thermocouple +
	15	Thermocouple -
4	4	Thermocouple +
	16	Thermocouple -
5	5	Thermocouple +
	17	Thermocouple -
6	6	Thermocouple +
	18	Thermocouple -
7	7	Thermocouple +
	19	Thermocouple -
8	8	Thermocouple +
	20	Thermocouple -
9	9	Thermocouple +
	21	Thermocouple -
10	10	Thermocouple +
	22	Thermocouple -
11	11	Thermocouple +
	23	Thermocouple -
12	12	Thermocouple +
	24	Thermocouple -
	⏚	Ground

15.4 Power Connector Pin Assignments for 12 Zone

12 Zone Mould Connector - Power
25 Pin Male Power Connector
10A Max



12 Zone, 25 Pin Mould Connector		
Zone	Pin Number	Connection
1	A1	Power
	A2	Return
2	A3	Power
	A4	Return
3	A5	Power
	A6	Return
4	A7	Power
	A8	Return
5	B2	Power
	B3	Return
6	B4	Power
	B5	Return
7	B6	Power
	B7	Return
8	C1	Power
	C2	Return
9	C3	Power
	C4	Return
10	C5	Power
	C6	Return
11	C7	Power
	C8	Return
12	A9	Power
	C9	Return
	⏚	Ground

16.1 Troubleshooting

Fault Description	Troubleshooting Guide
1. Unit will not power up	Verify the unit is installed properly Ensure mainframe input mains wiring is correct Test the power switch
2. PV window is not displaying values or is unstable	Test power leads for leakage Verify the unit is grounded
3. Temperature does not increase	Verify the unit is installed properly Check the extension cable is not loose or broken Check the heater is not faulty

17.1 Introduction

Before you call for technical support, please look at this section to see if your question is covered here. If you do call for technical assistance, be ready to supply the following information:

- complete model number of Temperature Controller (and firmware version if known)
- symptoms of the problem
- unusual events, if any, that preceded the problem
- remedies you have already tried

17.2 FAQs

7.2.1 Do I have to calibrate a new Temperature Controller?

No

7.2.2 Why doesn't the displayed PV match the value on a thermometer in the process?

Unless the thermometer and the sensor providing input to the Temperature Controller are very close to one another, their readings will not match in some applications, because of temperature variations within the process.

7.2.3 I turned on the power; why doesn't the temperature rise?

If SafeChange is enabled, but the mainframe does not support SafeChange, the Temperature Controller will not apply power to the heater. Instructions for checking to see if a mainframe supports SafeChange are in 3.2. Instructions for disabling SafeChange are in 3.3.

7.2.4 I changed the failsafe value, but the Temperature Controller still uses zero when an open Thermocouple is detected. Why?

When an open sensor is detected, an MMA-15 Temperature Controller always uses zero as the failsafe output percent if DIP switch 1 is OFF. To use the configured value, turn on switch 1 (see 3.5).

7.2.5 I increased the output percent while the unit is in open loop (manual) mode standby. Why is the process temperature dropping?

If the Temperature Controller is in open loop (manual) mode when the external standby signal turns on, the output percent will be set to one-fourth of the current output percent. You can use the front panel to change the output percent while the unit is in standby. The output percent actually used in standby, however, is always only one-quarter of the output percent set using the front panel.

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