

Temperature stability is what the industry is after. If manufacturers were to build the ultimate espresso machine, it would include PID temperature control. Several manufacturers have headed that direction in the past few years, including but not limited to Synesso and La Marzocco. The benefit to those of us that tinker with espresso machines is that we now have direction based on theory, as well as practice.

The kit you have purchased has been tested and is designed for placement on La Marzocco espresso machines. This kit is a work in progress, as more PID kits are installed on more machines, and more information becomes available we will post updated parameters and troubleshooting information at the following link: [http://espressoparts.com/product/LM\\_PIDKIT](http://espressoparts.com/product/LM_PIDKIT)

This kit is the result of many efforts and is compiled using the exact parts utilized in the La Marzocco Linea Hybrid machine, so be assured that la Marzocco engineers are pleased with the results, and have endorsed this system.

Installation is fairly straight forward, and we recommend that the PID Controller be located in a cool protected space, such as under the boilers on the left side of the frame. **DO NOT INSTALL THE UNIT NEAR A HEAT SOURCE!** ~ heat is a PID controllers worse enemy...

The thermocouple physically replaces the thermo-well for the brew boiler thermostat. A wrap of Teflon will ensure a water tight seal.

The SSR can be mounted most any location, however it does generate some heat. Mounting to a heat-sink of some type is not required however it does help.

## PID Tuning

A lot can be said about tuning, we have found several articles with regards to espresso machine installations that say it better than we can, and to be honest, these are the steps we use to tune our controllers. This fine piece of instructional text, comes by way of John F. Murphy who was an early adopter of PID control on a Rancilio Silvia machine. You can read about his project at <http://www.murphyslawonline.com/Silvia/>.

In order for the PID to work its magic, various parameters must be set on the controller itself. Fortunately, the PID controller takes care of the hard parts through a process called 'autotuning,' where through trial and error the PID determines its own optimum settings necessary to hold the boiler at the desired setpoint. There are a few parameters that need to be set by hand, these parameters may be found on the next page.

## **(A) Manual Settings**

Make the following settings by hand. There are about 50 parameters that can be set manually; I only changed five.

(i) Primary Menu (Press and hold SEL key for 3 seconds)

The only item of interest on the primary menu is autotune, which is discussed in section 8(b).

(ii) Secondary Menu (Press and hold SEL key for 7 seconds)

TC (cycle time): I have mine set to 1.

P-n2 (input type): Make sure this is set to 2 for type J thermocouple or 3 for type K.

P-dP (decimal point resolution): Set this to 1 to display temps in 1/10th degree increments.

(iii) Factory Presets Menu (Press and hold SEL for 9 seconds)

P-dF (input filter constant): This setting filters out quick changes in thermocouple readings and slows down PID responses, which for our application is a bad thing. I have mine set to 0.

FUZY (fuzzy logic): Helps eliminate overshoot. Set to 'On.'

## **(B) Autotuning**

Autotuning is the process where the PID controller determines how output to the heating element affects boiler temperature. After autotuning, the PID sets its own proportional, integral and derivative parameters so you don't have to worry about it.

*To activate autotuning:*

(i) Turn on Your machine and the PID and let her warm up for, say, an hour.

(ii) Run some water through the portafilter or steam wand to lower the boiler temp.

(iii) Press the SEL key for 3 seconds, then the down arrow key until 'AT' (looks like 'A7') appears on the PID display.

(iv) Press the SEL key once to select autotuning.

(v) Press the up key once. The PID should display '1'. The autotune LED on the PID will start to blink.

(vi) Wait a while (about 7 minutes in my experience). When autotuning is complete, the PID will return to the current temperature display.

That's all there is to it, your espresso machine should be ready to go!

Mr. Greg Scace, is another guy who knows a thing or two about temperature control. Greg has provided the following parameters for the La Marzocco Linea espresso machines. He has set his Fuji PXR to the settings below and says this is the way to go, and we have found this to be true as well.

BLK 2

P-ZU = 250 f

P-SL = 50 f

BLK 3

SV-H = 215 f

Control Parameters

P = 0.5

I = 225

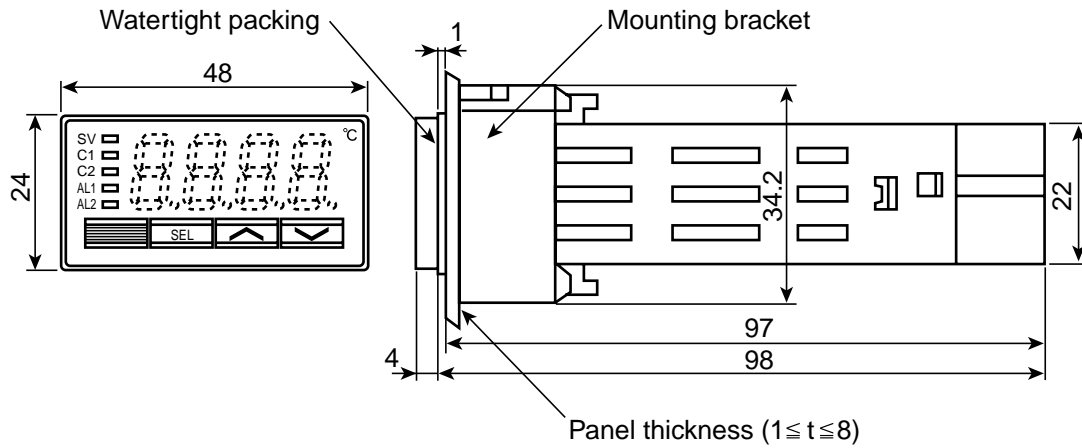
D = 4

# 1

# Installation/mounting

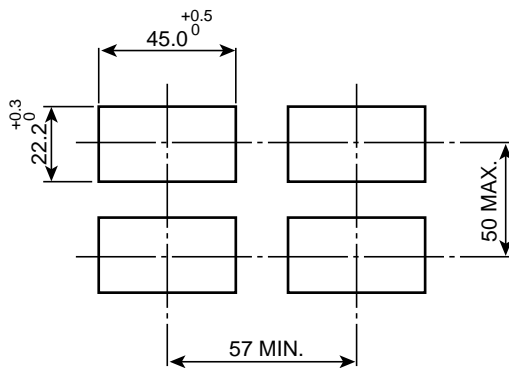
## Outline and Panel Cutout Dimensions (Standard type/Waterproof type)

Outline dimensions (Unit : mm)

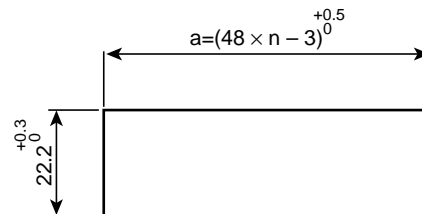


Panel cutout dimensions (Unit : mm)

For separate mounting



For mounting close together (n controllers)



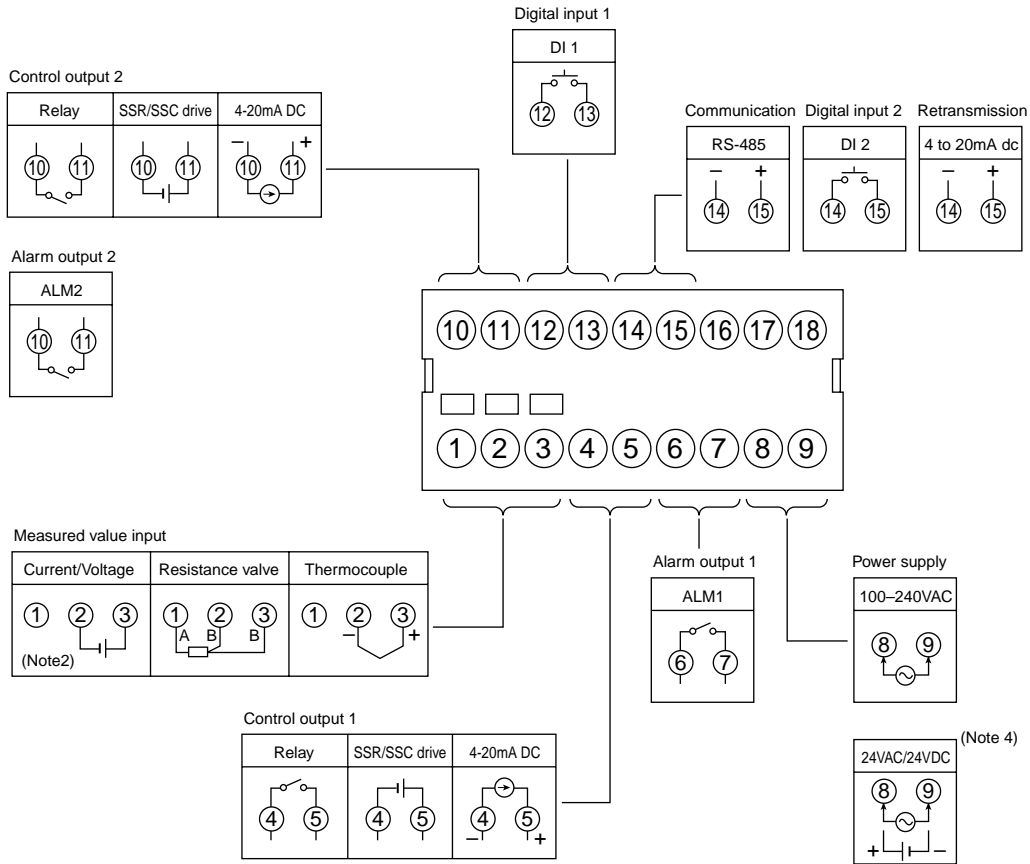
Number of units	2	3	4	5	6
a	93	141	189	237	285

- Note:
- Watertight feature is unavailable if mounted close together.
  - Maximum ambient temperature is 45°C if mounted close together.

# 2

# Wiring

## Terminal Connection Diagram (100 to 240 Vac)



Note1) Check the power supply voltage before installation.

Note2) Connect the I/V unit (250Ω resistor) (accessory) between the terminal ② and ③ in case of current input.

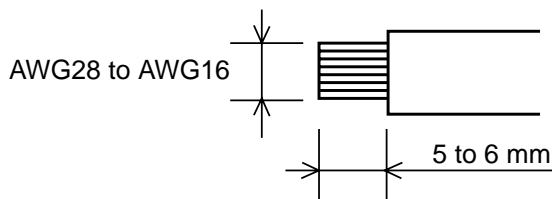
Note3) Tighten the terminal screw securely with fastening torque of 0.4N·m.

Note4) When the 10th digit of the code symbol is "C", "A", or "B", connect the power according to the connection diagram of 24VAC/24VDC power supply. Input of power of 30VAC/30VDC or more will damage the instrument.

## Designation of Wiring Material

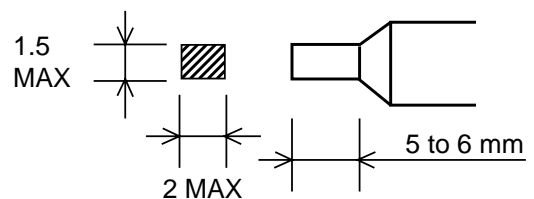
- Wire

Gauge: AWG28 (0.1mm<sup>2</sup>) to AWG16 (1.25mm<sup>2</sup>)  
Strip-off length: 5 to 6 mm



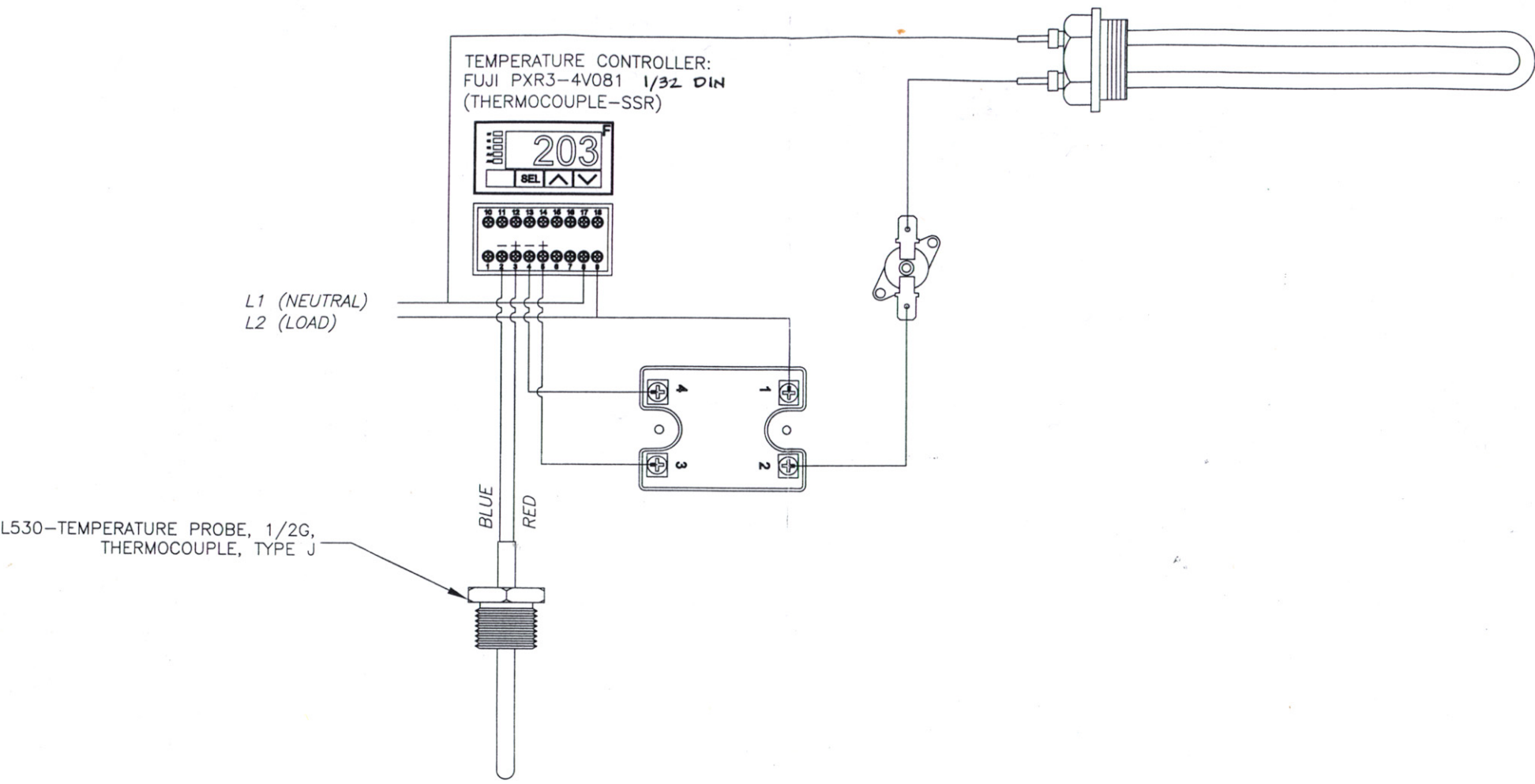
- Rod terminal

Dimension of exposed conductor section:  
2 x 1.5 mm or smaller  
Length of exposed conductor section:  
5 to 6 mm



### Caution

To prevent disconnection or short circuit, never use the wire other than the one stated above, and make sure to insert it toward the recess of the terminal block.  
Fastening torque: 0.4N·m



THERMOCOUPLE NOTE:  
WIRE COLOR CODES DIFFER AROUND THE WORLD. IF FOR SOME REASON THE  
THERMOCOUPLE IS GIVING INCONSISTANT RESULTS REVERSE POSITION OF  
THERMOCOUPLE WIRES ON TEMPERATURE CONTROLLER

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<small>1124 NW 54TH ST. SEATTLE, WA 98107 (206) 706-9104</small>		TITLE <b>ELEC SCHEMATIC</b>	
<small>ALL DIMENSIONS IN MILLIMETERS</small>		SCALE NONE	
DRAWN BY: WGC	DATE: 8/15/03	DWG. NO. FUJI PXR3	REV. NO. 0