



DID YOU KNOW #2

CAN I SWITCH MY HEATING ELEMENTS DIRECTLY FROM MY CONTROLLER

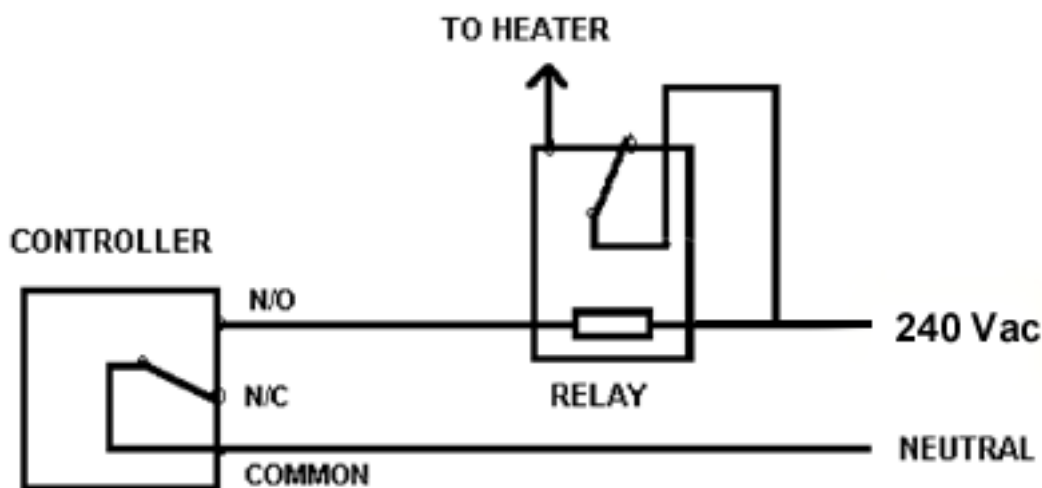
**ELECTRICALLY SPEAKING THE ANSWER IS YES, BUT
PRACTICALLY THE ANSWER IS AN EMPHATIC NO!**

OK, so why do we say NO you may ask. You may say “Oh but my elements only draw 3 amps and the relay output in the temperature controller is rated at 5 amps, so why not switch them directly ?

Electrically speaking it is ok to connect a 3 amp load and switch it through a relay rated at 5 amps. It will work just fine!

Practically though it is not. The reason is that if and when the element packs up and it short circuits, the short circuit current will most likely blow the little 5 amp relay right off the PCB in the controller. Now instead of just having to replace a relatively cheap relay or contactor, you may well end up having to buy a whole new temperature controller.

So for the record, this is how, in it's simplest form it should be connected using a relay or contactor:



LET'S BRIEFLY LOOK AT THE THEORY BEHIND THIS :

We will use two formulae. **Power = volts x amps** and **Volts = amps x resistance**

Power is the power of the heating element in watts

Volts is the voltage used (in our case 240 volts)

Amps is the electrical current that will flow through the element

Resistance (ohms) is the electrical resistance of the heating element

Let's say we have an element of 800 watts. So power = 800 watts

Power = Volts x amps (using the formulae above)

So 800 watts = 240 volts x amps

Therefore amps (current) = $800 / 240 = \underline{\underline{3.33 \text{ amps}}}$ (So our element will draw 3.33 amps)

Now from our other formulae substituting what we know we can work out the element resistance

Volts = amps x resistance

240 (volts) = 3.33 (amps) x resistance (ohms)

Therefore the resistance of the element = $240 / 3.33 = \underline{\underline{72.07 \text{ ohms}}}$.

So let's stop for a second and review what we have so far

1. Our heating element of 800 watts
2. Supply voltage of 240 volts
3. This heating element as we have seen will draw 3.33 amps
4. The element will have a resistance of 72.07 ohms.

So at this stage all is fine, we can switch this element directly from our controller. It only draws 3.33 amps and the controller contact rating is 5 amps. It seems OK. **But now let's say the heating element blows.** It shorts to earth $\frac{1}{8}$ of the way through the element. That means that the *resistance* left in the element is only $\frac{1}{8} \times 72.07 = 9.00$ ohms

Now using our formulae again let's see what current it will now be flowing through what is left of the element

Volts = resistance x amps

So amps
= volts / resistance
= $240 / 9.00$
= **26.66 amps**

26.66 amps will clearly blow the little relay rated at 5 amps.

So to avoid damaging the controller each time there is a short on our elements and having to replace the whole controller, at considerable cost, we suggest you use a relay or contactor to switch the heating elements.

QIS WILL BE HAPPY TO ANSWER ANY QUESTIONS YOU MAY HAVE. JUST CONTACT US WITH YOUR QUERIES.

REMEMBER WE SUPPLY A FINE RANGE OF TEMPERATURE CONTROLLERS AND SOLID STATE RELAYS AT VERY INEXPENSIVE PRICES QIS GREY SMITH 01244 539295