Frequently Asked Questions

Why does the temperature in my office vary so much from its setting?

There are a number of reasons that this can occur. Most temperzone controllers have fairly close differentials, and control to plus or minus 0.5 to 1.0°C. However: -

1. **Oversized**

If the unit has been oversized then in the mid-season i.e. spring and autumn when the cooling or heating load is light the unit becomes **significantly** oversized for the room load. The unit may even swing from heating to cooling cycles and back again during the day. It is probable that the minimum run timer and anti-rapid cycle timer that protect the compressor from short cycling and possible damage are having an influence and keeping the compressor on or off longer than the controller desires.

2. **Design Criteria**

Most cooling design temperatures are based on the design temperature being exceeded at 3.00 pm for approx 10 days a year on average. If the unit is correctly sized, the indoor temperature may rise a degree or two for a few hours on the days when the design temperature is exceeded. It is rare that hot conditions last more than a few days at a time. **It does not make sense to oversize a unit for a few days of the year**. This is the one reason why units should be selected as close as possible to the estimated cooling load whilst also **meeting the heating requirement**. Over sizing units is more troublesome than under sizing. Generally undersizing by 5% should not cause too many complaints.

This is one reason why units should be selected as close as possible to the room cooling **AND/OR** heating load.

3. **Diffusers**

Drafts from wrongly placed supply air diffusers could be affecting the temperature sensor built in to the wall plaque, correcting the placement or changing to a return air sensor could solve this issue.

4. **Drafts**

Drafts up the cable duct at the back of the controller surprisingly have been found to be responsible on many occasions for a poorly sensing controller.

5. **Stratification**

Stratification of the air within the room can give a false operation, the room needs good air circulation otherwise the controller does not read the temperature correctly and also the supply air may be short circuiting back to the return air.

Why does my Nominal 10 kW unit not seem to deliver the heating when I need it most?

Undersized on Heating

Air Conditioning units are often selected by contractors to meet the cooling load without considering the heating load. **It is strongly recommended by temperzone that the heating load also be considered** as sometimes it could be higher than the cooling load which means the unit could be at a disadvantage right from day one.

6. **Heating Capacity at Design**

The heating duty is totally reliant on the outdoor temperature and how much heat it contains. **Therefore the heating performance does reduce as the outside temperature falls**, though at all times the kW heat pump output is greater than the kW input. As the outside temperature falls then the heat losses through the walls, floor and ceiling increase and so the heating duty requirement increases.

The heating load should be at least considered at the lowest ambient temperatures generally expected, not necessarily the one day in the year it is even lower! Residential design temperatures are lower than commercial design temperatures because they cover 24hours.

7. Effect of De-Ice

When the outdoor temperature falls below about 4.0°C ice may start to form on the outdoor coil, the higher the moisture content of the air the more ice that may occur and in fact more icing occurs when the outdoor temperature is between zero and 4.0°C than below zero. Heat Pump units have de-icing cycles built in to dispose of the ice but this usually means reversing the cycle for a few minutes during which time there is no heating and in fact a little cooling occurs. This is why **at lower outdoor temperatures units have a Gross and Nett heating duties** shown, the difference between Gross and Nett being the allowance for de-ice cycles.

8. Night Set Back

If the heat pump is switched off at night to save energy, and that of course is a sensible thing to do, then on start up in the morning (or at any time) in heating mode then the room temperature will have fallen, how far being dependant on the outside temperature.

To reach the desired temperature requires the unit to raise the existing temperature of the air, structure and furniture (thermal mass) to that level. This is known as a pull up load which is often ignored when units are selected. **A temperature controller with night set back** would be the answer, this would keep the system in operation but allow the temperature to be maintained a few degrees lower (or higher in summer). Not as energy efficient as turning the system off but allowing the unit to respond faster when needed and some level of comfort is maintained during the set-back period.

In a new building why does it take some days before the Air Conditioning Heat Pump unit seems to work properly?

Any new building, especially a commercial building, has a large amount of concrete and other structural materials that are generally cold and full of moisture. This is most evident in the winter when trying to heat the building from scratch.

This load can be huge, consider a shopping centre built in mid-winter in the South Island with the inside of the building open to the elements. It may take a week or more when the system starts up to heat up all this material and draw out all the moisture before the space air temperature starts to feel the effect.

This also often results in heavy icing of the outdoor coils which cannot be de-iced because there is little or no available heat in the space from which to draw the necessary heat to melt the ice. This can then lead to compressor failure due to liquid slugging during or shortly after the start up/commissioning period.
Units need some nursing through this period and should not be left to their own devices. Crushed outdoor coil pipes caused by repeated freezing without a complete de-ice, are another symptom of this.

Why is my Unit Spitting or Leaking Water?

Water spitting from a unit down the duct or dripping from underneath could be a result of a number of issues, we will list these in the order that they are most likely: -

1. **Poor Drain Trapping**

From past experience nearly 90% of the complaints received about water leaking from a unit or water spitting down the duct are found to be caused by poor/ incorrect trapping or venting of the drain pipe or the drain pipe not sloping correctly. We recommend that the drain trap/vent/slope be investigated first before moving on to other possible issues.

Temperzone have a detail drawing of the trap/vent/slope requirements on all unit Installation and Maintenance sheets.

Not all units have identical trapping/venting requirements; check the unit installation detail pertinent for your unit.

2. Water Carry-Over

This is dependent on many factors: -the face velocity across the indoor coil, the relative humidity of the air, the actual moisture content of the air, the dew point temperature of the air, the surface temperature and associated sensible heat ratio of the coil, the fin spacing of the coil, the number and position of fans, space between them and the ease of fan entry.

Therefore it is a very subjective issue, hard to define, and people's expectations vary considerably.

At fairly **normal** return air conditions, say 21.0° to 24.0°C and at 50% RH, and with a nominal room sensible heat ratio of say 0.75 to 0.85 the **maximum air velocity across a cooling coil should be 2.5 m/s**. This should pretty well insure no water carry over would occur. Exceeding this can be problematic and can vary from unit to unit.

However, with the addition of fresh air load the %RH of the air on to the coil will increase and add more moisture load therefore the air flow/velocity should proportionally **decrease** as the fresh air quantity increases until **for a 'Full Fresh Air' system** we would recommend **the cooling coil face velocity be no more than 2.0 m/s**. This should also be considered (along with protection for the compressor) on any units with economisers fitted especially if the fresh air damper is controlled by a CO2 sensor and the compressors could remain operational with high/full fresh air. It is also a good reason why **enthalpy/wet bulb control** of the economisers' free cooling is far superior to simple temperature control.

With High Sensible Heat Applications the velocity **could be** up to 2.8 m/s without water carry over as so little moisture is condensed on the coil.

3. Water Ingress Through Fresh Air Dampers and Weatherhoods

temperzone takes great care in designing fresh air dampers and accompanying weatherhoods to try to prevent air velocities at the entries that would manage to entrap falling raindrops passing the entry. However units are often located in situations where localised wind velocities can be extreme, raindrops hitting the ground can bounce back and of course there is no accounting for almost horizontal rain in storms. It becomes an almost impossible task to design something that is 100% weatherproof for every situation. **Temperzone will not guarantee 100% weatherproof weatherhoods.**

It may be necessary under some circumstances to discard the standard weather hood and replace this with something more suitable for the site and its localised conditions.

Another interesting issue that some contractors seem to forget; when the system is being commissioned and the air flow balanced and set, this is usually done with full return air and minimum fresh air. The fresh air damper then needs to be set so that its **maximum open** position achieves the **same** air flow quantity as with full return air. Ignoring this step results in the air volume and velocity increasing substantially when the fresh air damper is opened and again is a possible cause for rainwater to become entrained leading to water carry-over.

4. <u>Water Ingress Through Panel Seals</u>

Often this is as a result of the system negative static pressure exceeding the design capability of the unit structure. Generally panel seals are designed for approximately 500 Pa to 600 Pa negative pressure. We have had reported incidences of leakage into units where the negative static has been found to be upwards of 800 Pa.

Is It True Economisers Can Add Load To A Space?

Absolutely.

Economisers are intended to use free cooling as an energy saving method for the first stage of cooling before starting compressors. However most economisers are controlled by temperature alone and ignore the moisture content of the air. It sounds good to open the economiser when the air outside is a degree cooler than the inside but it could actually add substantial total heat to the space.

As an example, consider a space controlled at 22.0°C db 50%RH; the total heat content is 8.22 g/kg. The outside air is 21.0°C 80%RH (perhaps it is raining), under temperature control the economiser would be open adding outside air to the space with a total heat content of 12.46 g/kg. That is a serious amount of extra load.

The best method of control is by enthalpy or wet bulb, that way the total heat content of the outside air must be lower than the inside air before the economiser can open.