Monitor the conditions that cause Condensation, Damp and Mould within the home.

It's a combination of a number of factors that causes condensation, damp and mould to develop in our homes. Three key factors that cause these conditions are the room temperature, the humidity level and the internal surface temperature of your windows, walls and ceilings. You can simply monitor these variables using the Aranet4 Home and Thermapen Surface Temperature Sensor.

Condensation

Is a condition that is reached when the humidity within a room at a certain temperature meets a cold surface which also must be below a certain temperature, at that point the moisture in the air turns to condensation on the cold surface? This tipping point is known as the 'Dew Point' temperature.

Humidity

Humidity is a natural part of our atmosphere, it basically a measure of the amount of water vapour in the air. Water vapour enters the atmosphere via evaporation from large bodies of water including rivers, lakes, and oceans. But within your home, humidity is more down to you and your family and what they do! Like cooking, washing and drying cloths & bedding, taking a bath or having a shower even breathing increases the level of humidity/moisture in our homes.

Dew Point

The dew point temperature depends entirely on the humidity level and temperature of the air in the room. The higher the humidity and air temperature in the room, the higher the dew point temperature will be and thus the sooner condensation forms on colder surfaces that are at or below this temperature.
It is important to understand the relationship between air temperature the humidity level and the dew point temperature at which condensation will form.

Table 1 below indicates how the humidity level and the air temperature actually set the 'Dew Point' temperature.

Using the chart to check what the 'Dew Point' temperature is with a room temperature of 22°C and a humidity level of 60%RH we have 13.9°C. So under these conditions condensation will form on any surface below 13.9°C.

		Dew Point Temperature = Surface Temperature (°C)													
		Relative Humidity (%)													
		30	35	40	45	50	55	60	65	70	75	80	85	90	95
Room Temperature (°C)	30	10.5	12.9	14.9	16.8	18.4	20.0	21.4	22.7	23.9	25.1	26.2	27.2	28.2	29.1
	29	9.7	12.0	14.0	15.9	17.5	19.0	20.4	21.7	23.0	24.1	25.2	26.2	27.2	28.1
	28	8.8	11.1	13.1	15.0	16.6	18.1	19.5	20.8	22.0	23.2	24.2	25.2	26.1	27.1
	27	8.0	10.2	12.2	14.1	15.7	17.2	18.6	19.9	21.1	22.2	23.3	24.3	25.2	26.1
	26	7.1	9.4	11.4	13.2	14.8	16.3	17.6	18.9	20.1	21.2	22.3	23.3	24.2	25.1
	25	6.2	8.5	10.5	12.2	13.9	15.3	16.7	18.0	19.1	20.3	21.3	22.3	23.2	24.1
	24	5.4	7.6	9.6	11.3	12.9	14.4	15.8	17.0	18.2	19.3	20.3	21.3	22.3	23.3
	23	4.5	6.7	8.7	10.4	12.0	13.5	14.8	16.1	17.2	18.3	19.4	20.3	21.3	22.2
	22	3.6	5.9	7.8	9.5	11.1	12.5	13.9	15.1	16.3	17.4	18.4	19.4	20.3	21.2
	21	2.8	5.0	6.9	8.6	10.2	11.6	12.9	14.2	15.3	16.4	17.4	18.4	19.3	20.2
	20	1.9	4.1	6.0	7.7	9.3	10.7	12.0	13.2	14.4	15.4	16.5	17.4	18.3	19.2
	19	1.0	3.2	5.1	6.8	8.3	9.8	11.1	12.3	13.4	14.5	15.5	16.4	17.3	18.2
	18	0.2	2.3	4.2	5.9	7.4	8.8	10.1	11.3	12.5	13.5	14.5	15.4	16.3	17.2
	17	-0.6	1.4	3.3	5.0	6.5	7.9	9.2	10.5	11.5	12.5	13.5	14.5	15.4	16.2
	16	-1.4	0.3	2.4	4.1	5.6	7.0	8.3	9.4	10.5	11.6	12.6	13.5	14.4	15.2

Table 1

The 'Dew Point' with a room temperature of 22°C and a humidity level of 60% is 13.9°C

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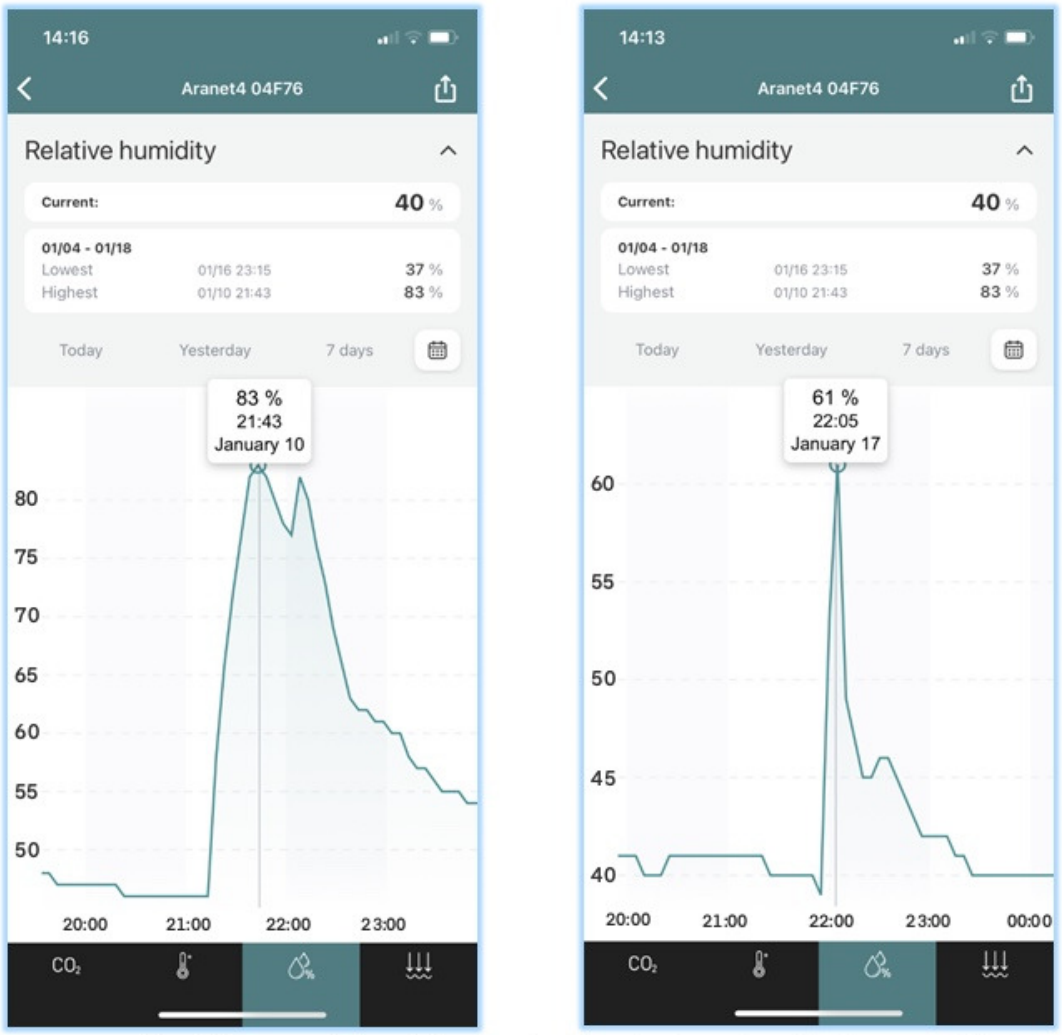
The following basic examples below will help you to understand how these principles work in practice:

A four walled room is kept at a constant temperature of 22˚C by a central heating system. The room is used frequently and there is no ventilation in the room, which causes the relative humidity of the air in the room to rise to 60% for extended periods of time. Two of the walls in the room are internal walls and their normal surface temperatures are each maintained around 20˚C. Two of the walls are external walls; one was constructed as part of a recent renovation project and has the benefit of cavity wall insulation it was also fitted with a large double glazed window. Whereas the other external wall is an older solid wall with no insulation. It has been a cold month, with external temperatures down around -5 to + 5˚C and the normal surface temperature of the insulated wall has been around 18˚C and the internal glass on the window down to 16˚C but the temperature of the solid wall has been below 12˚C for long periods and you can now see the effects of damp and mould on this wall.

The only surface in the room that is often below 14˚C is the uninsulated wall which goes below 12˚C and this is why this is the only surface in this room that exhibits damp and mould due to moisture/condensation forming at the dew point temperature of 14˚C and below.

Below is an example of measurements taken to show the difference in the humidity levels formed when taking a long bath compared to a quick shower!

On the left during a long bath you can see that the humidity level reached 83% and stayed above 60% for almost 2 hours but with a quick shower as shown on the right the humidity level actually only peaked at 61% and was above 50% for only a few minutes. You can guess which one produces the highest potential for condensation and then damp and mould to form.



Here we see the difference in humidity levels when having a long bath or a quick shower!

Mould

Moulds are hydrophilic fungi in that they require high levels of surface moisture. Capillary held dampness such as that originating through rising damp is not sufficient to cause mould growth. The mould requires free moisture on the surfaces to germinate. The only lasting way of avoiding severe mould is to eliminate the cause of the dampness on cold surfaces in the form of condensation which is feed by a combination of high temperature and humidity.

Mould growth on internal surfaces within your home will continue to grow if air adjacent to the cold surface contains enough moisture to feed the mould growing on the surface this can occur even above the dew point temperature.

Use the Aranet4 Home and Thermapen surface temperature sensor to monitor your living environment and learn how to control humidity and temperature to an acceptable level and reduce the conditions that form condensation.

Thermal Insulation

Thermal Insulation of your windows, walls and ceilings will all help you maintain higher internal surface temperatures this helps you to maintain a higher 'Dew Point' temperature and reduces the chance of condensation forming.

	Dew Point Temperature - Internal Air Temp = Air/Surface Temperature Difference													
	Relative Humidity (%)													
Room Temperature (°C)	30	35	40	45	50	55	60	65	70	75	80	85	90	95
30	19.5	17.1	15.1	13.2	11.6	10.0	8.6	7.3	6.1	4.9	3.8	2.8	1.8	0.9
29	19.3	17.0	15.0	13.1	11.5	10.0	8.6	7.3	6.0	4.9	3.8	2.8	1.8	0.9
28	19.2	16.9	14.9	13.0	11.4	9.9	8.5	7.2	6.0	4.8	3.8	2.8	1.9	0.9
27	19.0	16.8	14.8	12.9	11.3	9.8	8.4	7.1	5.9	4.8	3.7	2.7	1.8	0.9
26	18.9	16.6	14.6	12.8	11.2	9.7	8.4	7.1	5.9	4.8	3.7	2.7	1.8	0.9
25	18.8	16.5	14.5	12.8	11.1	9.7	8.3	7.0	5.9	4.7	3.7	2.7	1.8	0.9
24	18.6	16.4	14.4	12.7	11.1	9.6	8.2	7.0	5.8	4.7	3.7	2.7	1.7	0.7
23	18.5	16.3	14.3	12.6	11.0	9.5	8.2	6.9	5.8	4.7	3.6	2.7	1.7	0.8
22	18.4	16.1	14.2	12.5	10.9	9.5	8.1	6.9	5.7	4.6	3.6	2.6	1.7	0.8
21	18.2	16.0	14.1	12.4	10.8	9.4	8.1	6.8	5.7	4.6	3.6	2.6	1.7	0.8
20	18.1	15.9	14.0	12.3	10.7	9.3	8.0	6.8	5.6	4.6	3.5	2.6	1.7	0.8
19	18.0	15.8	13.9	12.2	10.7	9.2	7.9	6.7	5.6	4.5	3.5	2.6	1.7	0.8
18	17.8	15.7	13.8	12.1	10.6	9.2	7.9	6.7	5.5	4.5	3.5	2.6	1.7	0.8
17	17.6	15.6	13.7	12.0	10.5	9.1	7.8	6.5	5.5	4.5	3.5	2.5	1.6	0.8
16	17.4	15.7	13.6	11.9	10.4	9.0	7.7	6.6	5.5	4.4	3.4	2.5	1.6	0.8

Table 2

The temperatures listed in table 2 above is the temperature difference between the room temperature on the left and the 'Dew Point' temperature at the corresponding humidity level as shown in table 1. So you can see that at a humidity of 60% the difference between the room temperature and the surface temperature of the external windows, walls and ceilings must be above 7.7°C to 8.6°C to stop condensation forming. In the winter months the only way that this differential can be maintained is by insulating the inside room temperature from the outside temperature. So it clearly indicates that the higher the humidity is in your home the better the insulation you will require to stop condensation forming.

So the conclusion remains that you should try to maintain relatively low humidity levels within your home while at the same time maintaining good thermal insulation across all surfaces including your windows, walls and ceilings to stop condensation, damp and mould forming.