‘How to’ Use CO_2 monitors in education and care settings

***RP24-0 Last updated 25 April 2023**. This has been developed by the Department for Education and currently applies to **England only**. Further guidance may be developed by the devolved governments.*

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1. Introduction

This guide sets out how education and childcare settings can use CO_2 monitors most effectively to help identify poor ventilation, reduce respiratory illnesses and allergic reactions, as well as improve concentration and alertness of indoor spaces.

Good ventilation reduces the risk of spreading airborne diseases, so a focus on improving general air flow, through fresh air or effective mechanical systems, can help to create a safer environment for staff and students. You can generally maintain and increase the supply of fresh air by opening windows and doors – **although fire doors must remain closed**.

In any indoor space we share the air with the people around us. CO_2 monitors measure ventilation by proxy: they inform us how much of the air we are breathing in has been breathed out by others. The resulting CO_2 concentration is measured in parts per million (ppm). You can use CO_2 monitors to help you:

1. assess how well ventilated your spaces are
2. balance good ventilation with thermal comfort and energy usage

There are many different types of CO_2 monitors available. The most effective portable devices to use are non-dispersive infrared (NDIR) CO_2 monitors. This is the type provided by DfE to eligible education settings.

2. The DfE's CO_2 monitor programme

- **Good ventilation is important for a healthy indoor environment. Good ventilation will reduce the risk of respiratory illness, improve students' concentration and create a healthier environment for staff and students.** CO2 monitors can help you assess and manage your ventilation.

- Since Autumn 2021 the **DfE has delivered over 700,000 CO_2 monitors** to state-funded settings, including early years, schools and further education providers. This means that all eligible settings now have an assigned monitor for every teaching and childcare space.

- The rollout was conducted in two phases. The first phase in Autumn 2021 provided settings with enough monitors for 50% of teaching and childcare spaces. SEND and AP settings received enough monitors for 100% of spaces. The second phase began in December 2022 and has provided all eligible settings with additional monitors for the remaining 50% of teaching and childcare spaces.

- When the monitors indicate lower levels of CO_2 ventilation rates can be reduced. Opening windows regularly for 10 minutes, or a small amount continuously, can still reduce CO_2 levels substantially compared to spaces with no fresh air.

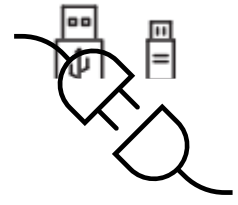
3. Setting up the CO_2 monitor

A CO_2 monitor looks like this:

In the box with the monitor you should find the following:

CO_2 monitor

Power plug



User guide

or relevant QR code

For all technical queries, please visit Rexel's website, the supplier used by the DfE to provide these devices to education and care settings. A video guide on how to setup your monitor can also be found on the website.

4. Where should you use CO_2 monitors?

CO_2 monitors are best suited to spaces which are densely occupied for approximately one hour or more.

In education and childcare settings this includes, but is not limited to:

- ✓ teaching spaces (including lecture rooms, classrooms and practical teaching spaces)
- ✓ indoor play spaces (e.g. rooms in nurseries)
- ✓ staff rooms, large offices, meeting rooms, group or breakout rooms

Monitoring is not recommended for use in areas where CO_2 monitors are unlikely to give reliable readings, including:

- ✗ large, open internal spaces and spaces with higher ceilings, such as sports halls or atriums
- ✗ spaces that are densely occupied for shorter periods, such as corridors or lobbies
- ✗ areas with low occupancy density including kitchens and toilets, or offices with one or two occupants
- spaces where there are other sources of CO_2, e.g. bunsen burners or gas cookers

! Rooms that already have CO_2 monitoring integral to their building management system will not require additional standalone monitors. Your facilities management team should know if monitoring is already in place.

5. Guide to placement of monitors & measuring CO_2 levels

Placement

You should place CO_2 monitors:

- at table or head height when seated
- away from ventilation outlets, such as grilles or windows
- at least 0.5m away from occupants (closer than this could give inaccurate readings)

Measuring

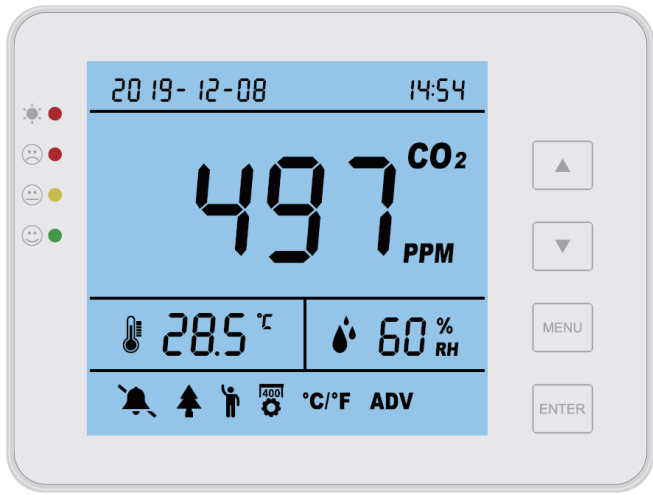
- **Regularly checking your monitor will allow you to be flexible in how you respond to managing ventilation and conserving energy by closing windows when it is cold.**
- Depending on the model, your CO_2 monitor will refresh and show a new reading anywhere from every few seconds to every 10 minutes.
- There should be no need to interrupt a lesson to take a reading.

6. Understanding CO_2 monitor readings

A consistent value under 800ppm will show as green and implies that a space is well ventilated. You can consider opening your windows slightly less wide or closing them. A consistent value of over 800ppm will show as amber/orange and should be seen as an early indicator to increase ventilation.

A consistent value over 1500ppm CO_2 concentration in an occupied space is an indicator of poor ventilation. This will also be indicated by a red light on the CO_2 monitors supplied by DfE. Monitors not supplied by DfE may be calibrated so that the red light comes on at a lower or higher level.

You should take action to improve ventilation where CO_2 readings are consistently higher than 1500ppm. There is no need to stop using the room.



This monitor shows a CO_2 concentration of **497ppm.**

Please note: The displayed figure of 497ppm is for illustration purposes only and is more representative of outdoor than indoor conditions.

- **Remember to look out for sustained high values**: Because many factors influence the level of CO_2 measured in a space, a single snapshot reading is unlikely to be reliable. We therefore recommend waiting for 5 minutes before taking action, to allow for a reading to settle.

7. Advice on improving ventilation

It is important to remember that high CO_2 levels in a room are not a direct proxy for infection risk. CO_2 monitors are intended to help you identify areas that are poorly ventilated, so that you can improve ventilation. There is no need to stop using the room.
It is the responsibility of settings to decide on the use of affected rooms in accordance with their risk assessment procedures and obligations under health and safety law.

Comprehensive advice on how to improve ventilation in your setting is available from UKHSA, HSE, and CIBSE. Please consult:

- The UK Health Security Agency's guidance on using ventilation to reduce the spread of respiratory infections, including COVID-19.
- The Health and Safety Executive's (HSE) guidance on ventilation in the workplace.
- The Chartered Institution of Building Services Engineers (CIBSE) 'Emerging from Lockdown' advice.
- The Royal Academy of Engineering's (RAE's) interactive infographic on why clean air is vital to health and how to manage ventilation.
- The CoSchools webpage offering tools to help create healthier school environments.

8. Advice to help settings save energy

Knowing when a teaching space has high CO_2 levels will help settings identify when to improve ventilation, for example by opening windows. This will help to improve concentration and lower the risk of airborne infections.

- If your CO_2 monitor is showing levels **under 800ppm** (green light) then you can consider partly or completely closing windows for thermal comfort. Do so gradually and in stages.

- If your CO_2 monitor is showing levels **over 800ppm** (amber light), consider opening windows and/or doors. Higher-level openings first and then, if necessary, also lower-level openings.

- Should CO_2 levels go **over 1500ppm** (red light) for a sustained period, this is an indicator of poor ventilation. Windows and doors should be opened to return readings to lower levels.

- **Continue to monitor CO_2 levels regularly and use them to make changes to ventilation flexibly.**

9. Note on risk assessments

- Your setting risk assessment should cover identifying any poorly ventilated spaces, including through the use of CO_2 monitors. If you do not already address ventilation in your assessment, you should add this in now that you have received your CO_2 monitors.

- For more information on what leaders must do in relation to health and safety risk assessments and managing risk, see health and safety: responsibilities and duties for schools.

- You should note that Health & Safety law says that employers, including education and childcare settings which are the employers for their settings, must make sure there is an adequate supply of fresh air (ventilation) in enclosed areas of the workplace.

10. Questions & Answers

Question: Should we stop using a room, if the CO_2 monitor keeps going red (above 1500ppm)?

Answer: Where readings are consistently higher than 1500ppm, you should take action to improve ventilation. This does not mean that you need to stop using the room. Comprehensive advice on how to improve ventilation in your setting is available from the UK Health and Security Agency (UKHSA) and the Health and Safety Executive (HSE).

Question: When the windows are open, the classroom is cold. How can settings balance good ventilation with keeping classrooms warm?

Answer: For practical advice on this issue, please see section 8 of this slide pack.

Question: I already have CO_2 monitors in my school/college, should I continue to use them?

Answer: Yes, if you already have CO_2 monitors installed you should continue to use them. The CO_2 monitors delivered will enable you to fit monitors into the remaining classrooms that do not have them yet.

Question: We have more monitors than we require, what should we do with the surplus?

Answer: If you have more monitors than is required to have one in each classroom/childcare space, please explore alternative uses across the school estate and your community. CO_2 monitors can help you to flexibly assess ventilation and are suitable for most spaces in education settings and beyond, for example staff rooms, shared office spaces, or local community centres. CO_2 monitors are intended for use for years to come, therefore surplus monitors could also be kept for replacement should any of the monitors in use become damaged or faulty.

For any further questions, you can contact the DfE here: Contact the Department for Education - Contact type - DFE Online Forms