

**Air Products Smart Technology
enables the connection of the
digital world...**

**Solutions, gases and expertise
for the electronics industry**

Generating a Cleaner Future

As end products become increasingly sophisticated, electronics manufacturing continues to respond and evolve dynamically. Air Products has been working with the world's major electronic companies for many decades, supporting a wide range of activity from semiconductor processing to assembly and testing.

Operating closely alongside electronics customers gives us an in-depth understanding of manufacturing complexities and enables us to provide the industry with the best gas supply products and solutions. That specialist expertise also enables us to constantly develop innovative solutions to improve your process and reduce your operational costs.

Soldering Technology

Air Products has created a line of products, NitroFAS (Nitrogen for Advanced Soldering), for optimum electronics soldering:.

Inert reflow soldering

Our applications team can provide inerting trials, audits and optimisation studies to improve your reflow processes, increase productivity and deliver overall cost savings through optimised gas usage.

• NitroFAS Intelligent Nitrogen Control System (INCS):

Our Intelligent Nitrogen Control System can be used in reflow furnaces or any furnace where a nitrogen (N₂) inert atmosphere is needed to form solder joints. This is particularly important in the Integrated Circuit (IC) packaging or Printed Circuit Boards Assembly (PCBA) industry.

The INCS features an automatic closed-loop control system, which enables you to continuously control the N₂ flow to the furnace and therefore stabilise the level of oxygen (O₂) at desired set point. This can significantly reduce N₂ consumption, while still maintaining high quality joints.

INCS benefits include:

- Greater consistency of O₂ ppm levels – less fluctuation of O₂ content.
- Savings between 10-20% in N₂ consumption depending on the conditions.



Air Products INCS System

Inert wave soldering

• NitroFAS Intelligent Wave Soldering (IWS)

Inert wave soldering is designed to lower costs and improve the quality of electronics manufacturing during Through Hole Technology (THT) soldering.

We provide optimised retrofit inerting technology that addresses the major issues faced by PCB assembly and packaging customers. This technique creates an inert atmosphere for solder pot in wave soldering furnaces to reduce dross, improve wetting, and deliver better quality results.

We also supply a customised nitrogen protection device designed to help you optimise results.

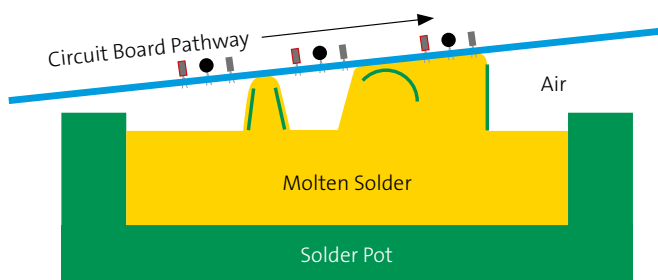
IWS benefits include:

- Dross reduction of up to 80%*
- Solder bar reduction of ~30-50%*
- A ~80% reduction in maintenance
- A reduction in defects of up to 80%
- Flux consumption reduced by 10-30%*

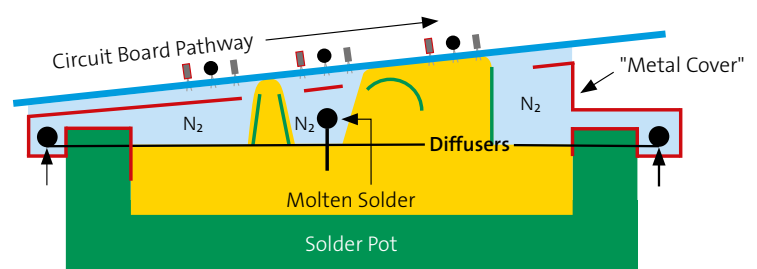
**Compared with soldering in air.*

• Gas conditions optimisation

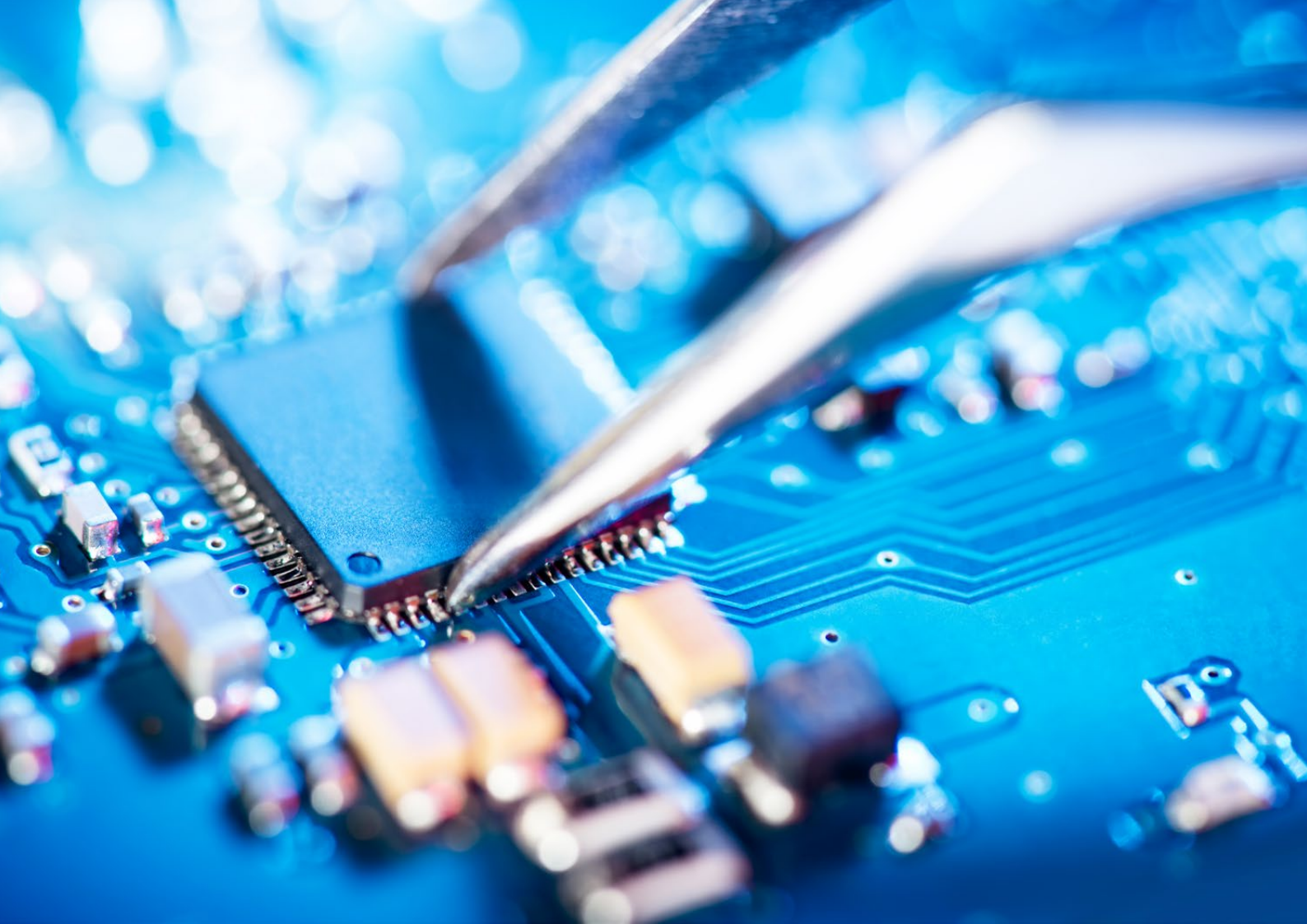
Our applications team can help you optimise your process gas conditions, including delivering a specific flow and pressure, and providing gas heaters to ensure the correct temperature even during the process.



Wave soldering in air



Wave soldering with N₂ protection



Benefits of nitrogen inerting

For reflow soldering

- Elimination of metal surface oxidation
- Improved wetting of solder to component leads and board
- Reduction in soldering defects
- Compatible with low residue flux solder pastes
- Improvements in first pass soldering yields
- Labor cost reduction
- Easier post-soldering cleaning (when required)
- Wider process window
- Option of idle time feature to reduce N₂ consumption
- Process parameter tracking

For wave soldering

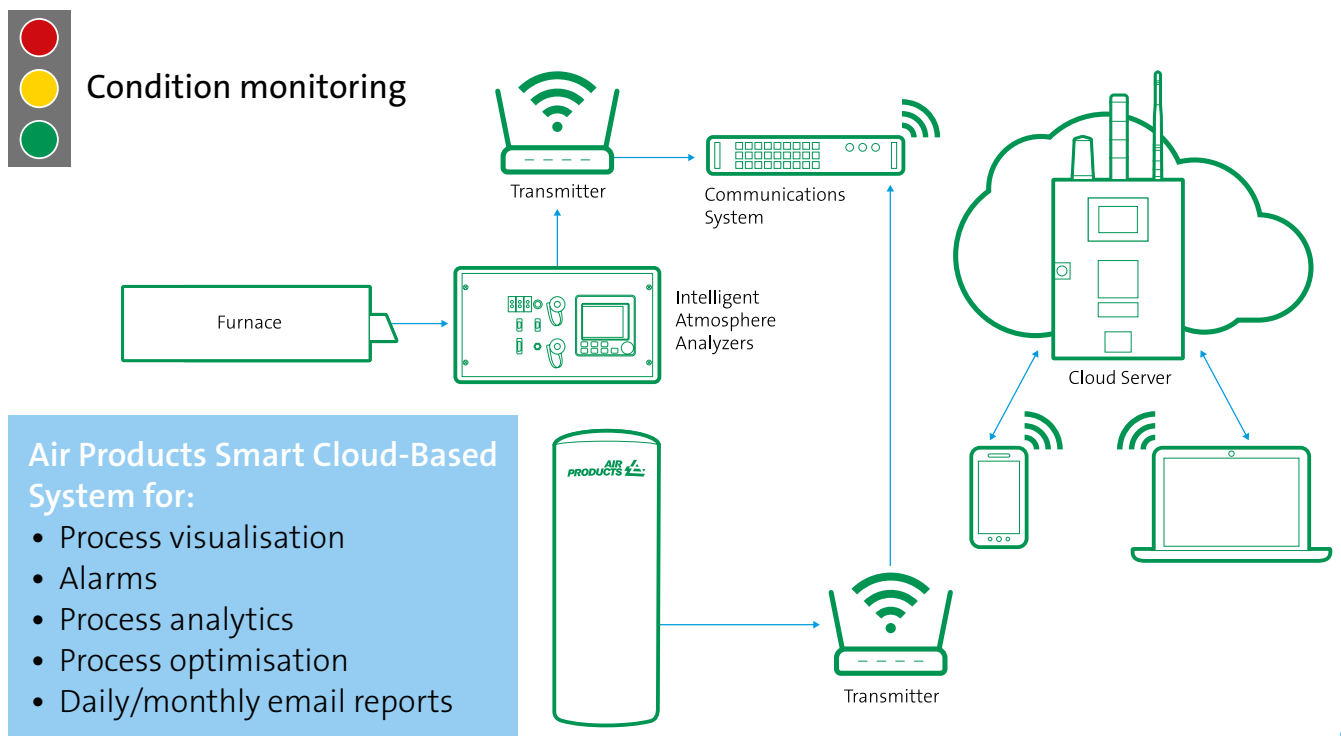
- Reduced oxygen in soldering atmosphere
- Improved solder wetting
- Increased wetting force and decreased wetting time for improved plated through hole fill
- Reduction of flux volume per board by using less active flux chemistry
- Significant reduction in dross formation = less cleaning and lower consumption of solder
- Reduced equipment maintenance = reduced costs
- No-clean process can be implemented
- Solder ball formation minimised
- Wider process window/increased uptime
- Defect reduction

Air Products Smart Technology

Industry 4.0 is beginning to shape the way manufacturing equipment is designed and operated. To help you track key parameters, Air Products has developed Smart Technology, a platform that can give you insight into your process and helps you optimise it.

Using diagnostic sensor and wireless cloud-based communications technology, our Smart Technology can monitor and control your operation, track key process parameters, and advise on process optimisation using advanced analytics.

The technology can be applied in reflow furnaces, IC packaging, or any furnace with a N₂ or other atmosphere. Our Smart Technology can also monitor tank levels and measure gas flow and pressure, and can be designed to your specific needs.



SMART Technology benefits include:

- Data collection and reporting
- Easy downloads of historical data from a cloud server
- Fast installation with no process shut down needed
- Automatic process monitoring

Electronic components cleaning

Air Products is one of the largest producers of industrial carbon dioxide. CO₂ in gaseous form can be used to clean most delicate components, such as semiconductor dies or flexible PCB. In dry ice form, CO₂ can remove a wide range of contaminants like glue, paints, flux, and many others. We can help you optimise your cleaning process, from the most gentle to the most rigorous.

Benefits of our cleaning methods include:

- Fast cleaning
- No damage on the substrate
- A complete solution (gas, pipeline, and equipment supply)



Working together/providing services

Are you looking to improve your process?

By applying the knowledge gained from our extensive worldwide customer base, Air Products' global team can evaluate your manufacturing process and address any concerns you may have.

Our consultancy and engineering services include measurement and process audits, as well as installation optimisation to determine the best equipment and the optimum industrial gas supply mode.

Benefits of our services include:

- Improved quality
- Optimised atmosphere flow rates or compositions
- Reduced rejects
- Reduced operating costs
- Safety advice



The right gas supply solution

Alongside our process optimisation technologies, we offer a complete portfolio of reliable and safe gas supply options, from cylinders and liquid/bulk gases to a range of on-site production technologies. Whatever your purity requirements, volumes, and usage needs, we can deliver the right gas supply to meet your process requirements.

High purity gases and cylinders

From a cylinder of a special calibration gas mixture to a very high purity gas, Air Products has a solution for you.

We provide a full range of packages depending on your specific gas requirements, including innovative cylinder solutions to enhance your safety and productivity. Our solutions range from portable lightweight canisters to large volume 300 bar manifolded cylinder packs.



Liquid/bulk delivered gases

Whether your application requires nitrogen, oxygen, hydrogen, argon, helium or a blend of gases, you'll benefit from our proven experience in supplying bulk gases to the electronics industry. Stored in tanks at your site and vaporised as needed for your process, our in-house fleet of computer-dispatched tankers and trained drivers enable us to quickly fulfil your gas supply needs.



On-site generated gases

We offer a full line of on-site nitrogen generation systems which deliver significant savings compared with traditional supply methods. Our High Purity Nitrogen (HPN) plants provide cryogenic-purity nitrogen at 300 to 4,000 Nm³/hr with substantial savings compared to hauled-in liquid nitrogen. HPN plants are designed to be compact and easily installed, giving you a dedicated production facility with a backup supply.

For other processes and applications, our PRISM® PSA or non-cryogenic membrane systems can provide on-site generated nitrogen at cost savings compared to traditional supply methods.



Speciality gases

As a global supplier of specialty gases to the electronics industry, Air Products has a long history of supplying rare gases to a wide range of customers.

These can be used in a number of electronics applications, including as reactive gases for excimer lasers, buffer gases for semiconductor manufacturing, in deep trench etching of DRAM integrated circuits, during the focused etch

process, and in plasma panel displays. Other applications include extreme ultraviolet (EUV) lithography and krypton fluoride (Kr/F) lasers in IC fabrication; and helium / neon (He/Ne) mixes for optical readers and laser wafer dicing. Our highly trained and experienced specialists will ensure that you are given the industrial gas supply you need, safely, efficiently and on time.

Safety

For us, safety is simply the right way to do business. We continually enhance and update our safety capabilities, and our safety services are available for everything from employee training on the safe use of our gases at your site to a complete review of your total atmosphere system, from delivery to the point-of-use.

At Air Products we are generating a cleaner future by leading the industry in energy transition.

Our Smart Technology systems can help reduce energy consumption, improve process efficiency and product reliability, while reducing carbon footprint.

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Please contact us for any additional information and to discuss your needs:

Air Products PLC
T 0800 389 0202
apukinfo@airproducts.com
airproducts.co.uk

Air Products Ireland Ltd.
T 1800 99 50 29
ieinfo@airproducts.com
airproducts.ie



tell me more*
airproducts.co.uk/electronics