

# Industrial gas solutions for automotive manufacturers and suppliers



For more than 50 years, Air Products has offered industrial gases, gas atmospheres and technical support to help automotive manufacturers and their suppliers improve product quality, reduce operating costs and increase production. Our broad capabilities for the automotive industry help our customers succeed in the competitive global automotive industry that demands consistent high quality and value as it faces new challenges in fuel efficiency, high reliability, driver safety and smart connectivity.

## Total solutions

An automobile is more than just a means of transportation—and Air Products is more than just a supplier of industrial gases. We build business relationships based on a thorough understanding of your needs. We focus on finding ways to help improve your operation, lower your overall costs and deliver innovative products to your customers.

Our account managers, engineers and technicians have worked with customers to optimize their gas supply modes and uncovered ways to improve processes that rely on industrial gases. Our goal is to help you in as many ways as we can with your gas applications—so you can concentrate on your core business.

## Special capabilities

Air Products has developed an array of capabilities specific to the automotive Industry.

### Full range of gases

- World's largest producer and supplier of liquid and gaseous hydrogen and helium
- A global leading manufacturer of nitrogen, oxygen and argon

### Why choose Air Products?

- Air Products owns and operates hundreds of gas plants worldwide—all tied into sophisticated distribution networks that can efficiently serve the needs of our automotive and other customers
- Maintain an excellent record of meeting on-time needs and volume requirements for gases, from tanker delivery and on-site plants to pipeline and microbulk supply

## Applications support

Our applications engineers bring vast knowledge and experience in applying gases to metals processing, metal fabrication, and electronic assembly, packaging and testing. We can help you in the following areas:

### Metal processing and fabrication:

- Traditional metals processing applications for component parts for tier suppliers, such as hardening, HIPing, annealing, brazing, sintering, thermal spray, etc.
- Thermal spray cooling with cryogenic nitrogen vapor to improve productivity while achieving high-quality coatings
- Cryogenic nitrogen cooling processes to improve material properties, increasing toughness and wear resistance
- Optimized heat treating atmospheres for improved part quality and consistency, higher productivity and operational cost savings
- Argon, nitrogen and hydrogen for powder metal production processes to improve product quality and throughput
- Oxygen level control system for reflow soldering to improve process consistency, reduce nitrogen consumption and widen operating window
- System understanding and process optimization capabilities for wave, reflow and selective soldering operations

### Comprehensive services and training

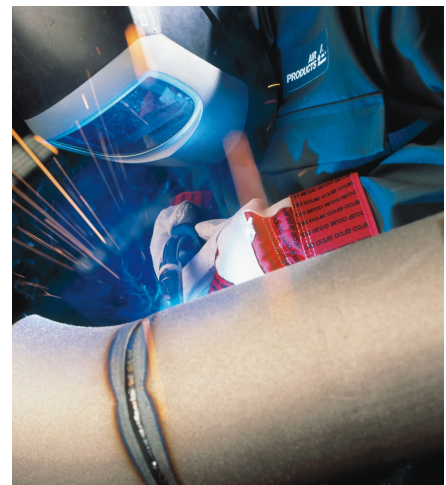
- Process audits to help optimize the use of industrial gases in your operation and potentially uncover areas for improvement
  - Available training can include gas handling, metal applications, troubleshooting atmosphere problems and other topics to keep furnace operations optimal and efficient
  - Leak checking, furnace profiling, metallurgical analysis and consultancy, analytical calibration and other services to improve operations
- Inert wave soldering system for dross reduction, better joint quality and overall cost of ownership improvement
  - Electron attachment for fluxless soldering leading to reduced void formation and lower operating temperature

### Electronic assembly, packaging and testing

## Total safety support

Air Products is committed to safety. We design and operate our facilities to the highest safety standards. We design our systems at our customers' facilities with safety in mind. Here are some of our safety-related accomplishments:

- Among the leaders in safety-related awards in our industry
- A top performer of the American Chemistry Council (ACC) year after year
- The first industrial gas company in the United States to have successfully completed a third-party Management Systems Verification of its environment, health and safety processes
- Consistently exceed the average for lost-time injury frequency rates for large companies



**Welding gas options to suit your needs through improved productivity, fewer rejects, and better working environment.**

**Table 1: Automotive Metals Processing and Fabrication Applications for Industrial Gases**

	Argon	Helium	Hydrogen	Nitrogen	Oxygen
Vacuum annealing	•	•			
Hot isostatic pressing (HIPing)	•				
Powder production	•		•	•	
Sinter HIPing	•	•	•		
Thermal spray/plasma spray	•	•	•	•	•
Cutting and welding	•	•		•	•
Lasers				•	
Inerting	•			•	
Quenching (backfill)	•	•		•	
Leak detection		•			
Purging	•	•		•	
Annealing			•	•	
Brazing			•	•	
Sintering			•	•	
Hardening			•	•	
Cryo-treating/shrink fitting				•	
Machining				•	
Composites curing				•	
Environmental testing				•	

**Comprehensive range of state-of-the-art equipment**

- Patented gas blending and flow control equipment for accuracy, precision and operational flexibility
- Analytical panels for real-time monitoring and control of furnace parameters to improve quality and safety
- Process control and monitoring systems for consistent product quality with less rework
- ICEFLY® machining technology for longer tool life, higher cutting speeds and a clean work environment
- Thermal spray cooling technology to lower costs, reduce powder and gas waste, and improve product quality
- Design, engineering and installation of rigid or flexible vacuum jacketed cryogenic piping
- State-of-the-art cryogenic liquid flow metering
- Nitrogen Inert Wave Soldering system for electronics packaging
- Proprietary Electron Attachment system for fluxless soldering during wafer bump reflow, die attach and flip chip assemblies
- Oxygen level control system for reflow soldering
- Gas cabinets, chemical delivery equipment and cleaning systems for electronic specialty materials



Proper selection of gases can provide beneficial metallurgical properties, surface quality, and dimensional control.

**Table 2: Automotive Electronics Applications**

	Argon	Helium	Hydrogen	Nitrogen	Oxygen	Other gases and equipment
Semiconductor manufacturing processes	●	●	●	●	●	Electronic specialty gases, chemicals gas cabinets, chemical delivery equipment and cleaning systems
<b>Integrated circuit assembly</b>						
Cu wire bonding			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels
Flip chip assembly			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels, E-Attach
Plasma cleaning	●		●	●	●	Electronic specialty gases and gas cabinets
Die attach			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels, E-Attach
Ball attach			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels
IGBT power module			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels, E-Attach
Leak testing		●				
<b>PCB assembly</b>						
Reflow soldering			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels/high-purity PSA
Wave soldering				●		High-purity PSA
Selective soldering			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels
Ceramic metallization			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels
Glass to metal sealing	●		●	●		H <sub>2</sub> /N <sub>2</sub> blend panels
Metal thick film firing			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels
Brazing			●	●		H <sub>2</sub> /N <sub>2</sub> blend panels
Dry box inerting				●		Membrane/PSA systems
Thermal/environmental testing				●		
Conductive adhesive curing				●		

Whether you're processing automotive metal parts by annealing, sintering, brazing, carburizing, vacuum-treating, thermal spraying, welding metal parts; or you are making, assembling or testing the ever growing number of electronics components and systems used in today's automobiles, Air Products offers high-purity gases, gas handling equipment and technology and – most importantly – unmatched industry experience to help you improve product quality and consistency, operate more efficiently and reduce cost. To learn more about our capabilities for automotive manufacturers and their suppliers, or to tell us more about your needs, contact us at the office nearest you.

**For more information, please contact us at:**

**North America, Corporate Headquarters**

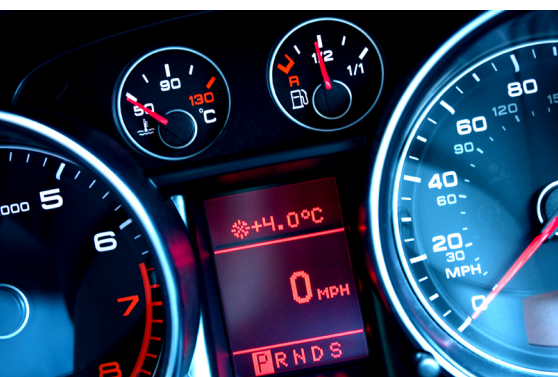
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**Industrial gases are essential for the manufacturing, assembly and testing of highly reliable electronic components making up nearly 40% of today's new automobiles.**



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