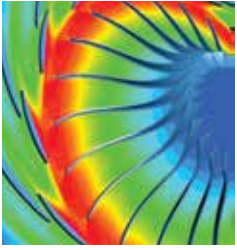


Plant Air Centrifugal Compressors

TURBO-AIR series featuring oil-free air

TECHNOLOGY





You have many distinct advantages when you partner with Cameron for your centrifugal compressor needs. Cameron

not only manufactures centrifugal air and gas compressors, we also

provide aftermarket products and services for a broad customer base around the world.

The cutting-edge solutions we deliver for plant air requirements are made possible by

the unique blend of product quality, engineering talent and dedicated teamwork we offer

to every customer.

CENTRIFUGAL COMPRESSORS

Cameron is a global company and we are committed to meeting your needs with high-quality centrifugal compressor technology while exceeding your expectations with

reliable service and support. Our main manufacturing facility is located in Buffalo, NY, and

we have distribution in more than 80 sales and service locations

worldwide.



TURBO-AIR Series of Compressors

The following pages highlight Cameron's TURBO-AIR® series of compressors for plant air applications which offer top-notch performance and design flexibility for plant and process air applications.

The TURBO-AIR compressors are completely packaged on a common base for easy installation and are available in a number of capacities from 112 kW to 1680 kW (150 to 2250 hp).

Industries worldwide depend on Cameron for efficient and reliable oil-free air. Plant air applications include:

- Textiles
- Food and beverage
- Automotive
- Pharmaceuticals
- Chemicals
- Electronics
- Aerospace
- Industrial gases
- Water treatment
- Snowmaking
- Power generation
- General industrial
- Petrochemical
- Oil and gas refineries

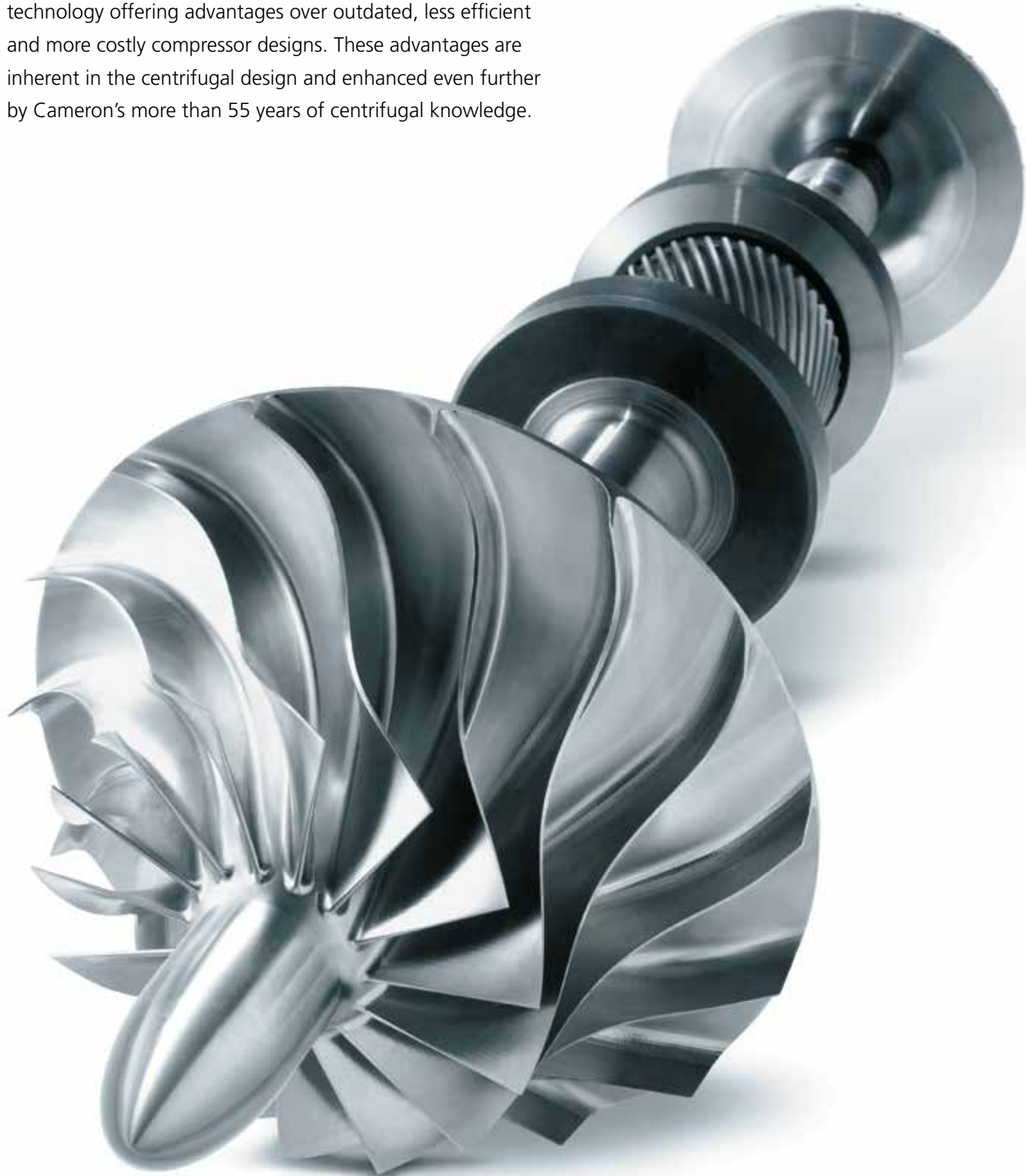


Cameron – A History of Innovation

- 1955** JOY Manufacturing Co. established facility in Buffalo, NY
- 1960** First small integrally-gear centrifugal compressor introduced
- 1965** Introduced the first packaged centrifugal compressor
- 1971** First four-stage, nitrogen-recycling machine for liquefaction of industrial gases
- 1980** Introduced the first microprocessor-controlled compressor
- 1987** Purchased by Cooper Industries, Inc. – major capital investments made
- 1988** First seven-stage, dual-service machine with three pinions in each gear box
- 1994** Introduced the TURBO-AIR 2000 incorporating the fourth generation of microprocessor-based control
- 1995** Cooper Cameron Corporation established
- 1997** Introduced TURBO-AIR 3000 – major capital investments made
- 1999** Introduced TURBO-AIR 6000
- 2001** Introduced TURBO-AIR Cooled™ 2000
 - Entered process gas market
 - Introduced TURBO-AIR 11,000
 - Introduced TURBO DryPak™
 - Introduced Vantage Control Panel
- 2004** Introduced MSG® Alpha centrifugal gas compressor
- 2004** Introduced MAESTRO™ series of control systems
- 2005** Introduced TURBO-AIR 2020
- 2006** Cooper Cameron Corporation becomes Cameron
- 2008** Introduced TURBO-AIR high-pressure series

The Advantages of Centrifugal Compressor Technology

Integrally geared centrifugal compressors represent the latest technology offering advantages over outdated, less efficient and more costly compressor designs. These advantages are inherent in the centrifugal design and enhanced even further by Cameron's more than 55 years of centrifugal knowledge.



Compare Cameron's innovative centrifugal compressor technology with other machines, such as rotary screw compressors, and the advantages are clear.

CAMCARE

The Complete Solution for Compressor Maintenance

CAMCARE™ is a comprehensive, preventative maintenance program aimed at reducing unplanned maintenance along with minimizing machine outages.

CAMCARE is available for all of your centrifugal compressor equipment.



In Compliance With API Standards

- API 672 for packaged integrally geared centrifugal compressors
- API 614 for lubrication systems
- API 670 for machinery protection systems
- API 671 for coupling systems

Cameron's Centrifugal Compressors

Other Compressors

- No wearing parts requiring regular replacement
- Oil filter elements and seal gas filter elements are easily replaced

- Require regular maintenance and periodic replacement of air ends
- Result in high-operating expenses and significant machine downtime

- 100% oil free
- Prevent contamination of system

- Oil filters must be installed at discharge
- Potential for oil carryover that foul the process

- Pulsation free and require no dampers

- Require the use of pulsation dampers to reduce pressure fluctuations

- Automatic operation for any operating condition
- State-of-the-art MAESTRO suite of controls
- PLC control available

- Limited control capability
- Costly, high-maintenance variable speed available

- Essentially vibration-free
- No special foundation is required

- Require a large and deep foundation to handle heavy weight and unbalanced forces
- Precautions must be taken to prevent transmission of vibration to other equipment



LOW MAINTENANCE



OIL-FREE AIR



NO PULSATION



OPTIMUM CONTROL



NO VIBRATION

Simple Installation

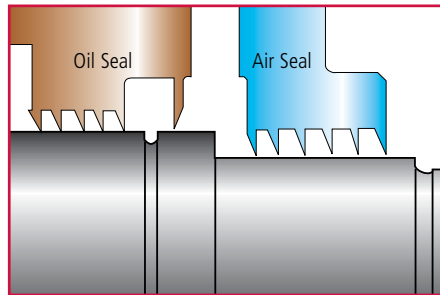
- Compressor, lubrication system, intercoolers, shaft coupling, coupling guard, interconnecting piping, etc., all on a common base
- Easy component accessibility
- Great flexibility to tailor a machine to your needs
- Minimizes required floor space
- Pulsation free

Inherent Variable Load Capability

Cameron's state-of-the-art control systems give our centrifugal compressors inherent variable load capability without high-maintenance, variable speed drivers. This distinctive feature results in:

- Higher efficiency
- Lower maintenance
- Easier operation

Oil-Free Air



Seals – Non-contact, non-wearing labyrinth air and oil seals. No buffer air required for oil-free air. Eliminates the need for periodic replacement of carbon seals.

- Prevents contamination of your system
- Removes the potential for compressed air pipeline fires caused by oil carryover
- Eliminates costly waste disposal problems associated with oil-laden condensate
- Eliminates the expense and maintenance of oil removal filters

High Reliability

Cameron's centrifugal compressors are reliable due to features such as:

- Thrust loads absorbed at low speed
- Stainless steel compression elements
- Conservative, high-quality gear design
- Unlimited life pinion bearing design
- Non-contact air and oil seals



Advanced Pinion Bearing Design – For unlimited life and operation at any load.

Easy Operation/Maintenance



Intercoolers – Water-in-tube intercooler and aftercooler bundles slide out for easy inspection and cleaning.

- Intercooler and aftercooler bundles easily removed for cleaning
- Accessible horizontally split gear box for quick inspection
- Water-in-tube design intercoolers allow simple mechanical cleaning

- State-of-the-art controls with a choice of exclusive control systems
- Total automatic operation for any operating condition
- Self-diagnostics
- No wearing parts requiring periodic changes or replacement in the compression elements
- No oil removal filters to clean



Horizontal Split Gear Box – Allows for easy access when customer's maintenance policy requires periodic inspection.

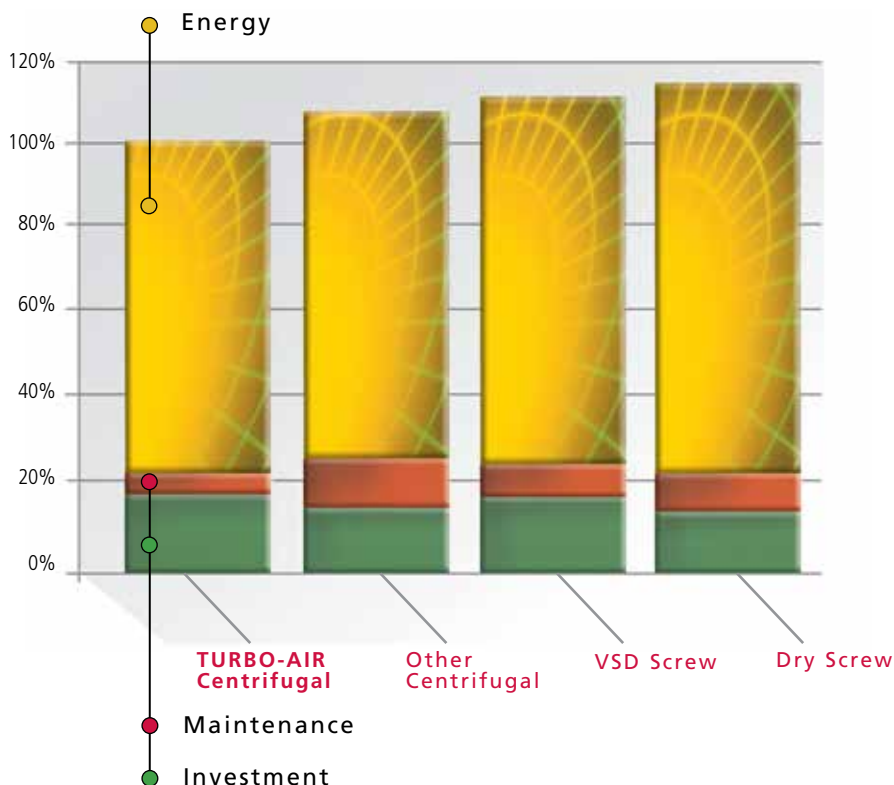
Lowest Compressor Operating Cost

Over time, the energy required to power a compressed air system is the largest cost associated with a compressor, particularly in today's fluctuating energy markets. That is why, to determine the best return on your investment over the life cycle of a compressor, it is important to consider the initial investment, energy and maintenance.

As the chart demonstrates, Cameron's series of TURBO-AIR centrifugal compressors provides the lowest total life cycle cost of any compressor, including dry screw, variable speed drive (VSD) screw and other centrifugal compressors. Keep in mind, VSD manufacturers often tout energy savings with unrealistic turndowns of up to 50%. At this point, you would be better off purchasing a smaller compressor and reducing your initial investment. Also, as screw compressors wear out, energy consumption increases.

Compared to other machines of similar capacity, Cameron's series of TURBO-AIR centrifugal compressors are the most efficient oil-free compressors at full load, part load and no load. The power savings delivered can significantly speed up payback on your initial investment, and the savings continue to build the more you use a TURBO-AIR centrifugal compressor.

Life Cycle Cost Comparison Over 10 Years Operation 80% Loaded



Variable Inlet Guide Vanes



- Variable inlet guide vanes can offer power savings of up to 9%
- Inlet vanes impart a whirling motion to the inlet air flow in the same direction as the impeller operation, reducing the work input
- Net power savings at reduced flow or on days colder than the design temperature
- Inlet vanes are positioned close to the impeller to achieve maximum benefit

The Right Compressor for Your Needs

No matter what your application, there is a centrifugal compressor to meet your requirements. With over 18,000 installations worldwide, on nearly every continent, Cameron's products are proven in a wide variety of industries. Plant air applications include:

- Textiles
- Pharmaceuticals
- Aerospace
- Water treatment
- General industrial
- Food and beverage
- Chemicals
- Industrial gases
- Snowmaking
- Petrochemical
- Automotive
- Electronics
- Oil and gas refineries
- Power generation



112 kW (150 hp) TURBO-AIR Cooled and TURBO DryPak compressors installed at a manufacturing plant, hot air from air coolers are used to heat the factory.



520 kW (700 hp) TURBO-AIR compressors installed at plastics processing facility.



Three 150 kW (200 hp) TURBO-AIR compressors installed at an electronics facility.



225 kW (300 hp) TURBO-AIR compressor installed at a semiconductor facility.



One 225 kW (300 hp) TURBO-AIR compressor installed at a major university for instrument air.



260 kW (350 hp) TURBO-AIR compressors installed at an automotive facility.



One 375 kW (500 hp) TURBO-AIR compressor in compliance with API 672 for an oil refinery.

Control Systems

Cameron can provide the right control system engineered for your applications.

MAESTRO Suite of Controls

MAESTRO™ is the Cameron suite of control systems that offer optimal protection and control for your compressed air system. The MAESTRO suite contains a model that is sure to be in tune with your needs.

MAESTRO Universal

- Windows CE driven system includes a built-in web server and setup wizard for quick configuration
- Able to handle multiple stages and designed for many makes and models of compressors
- 10" color graphic display provides easy monitoring
- Built-in USB port for system configuration and data logging
- Capable of monitoring and controlling the total system across multiple units

MAESTRO PLC

- Utilizes an Allen-Bradley CompactLogix L35E ethernet CPU which includes: 16 digital inputs, 16 digital outputs, 12 analog inputs, 2 analog outputs and 6 RTD inputs
- Comes standard with an Allen-Bradley PanelView™ 700 7" color display
- Networking software available for automation of multiple units and total system automation
- Stainless steel enclosure available as an upgrade

ISO Certified Class Zero

Cameron's TURBO-AIR centrifugal compressor product line has been engineered to produce oil-free air for more than 55 years. This certification now officially acknowledges our compressor's ability to produce 100% certified oil-free air, providing our customers with enhanced quality assurance.

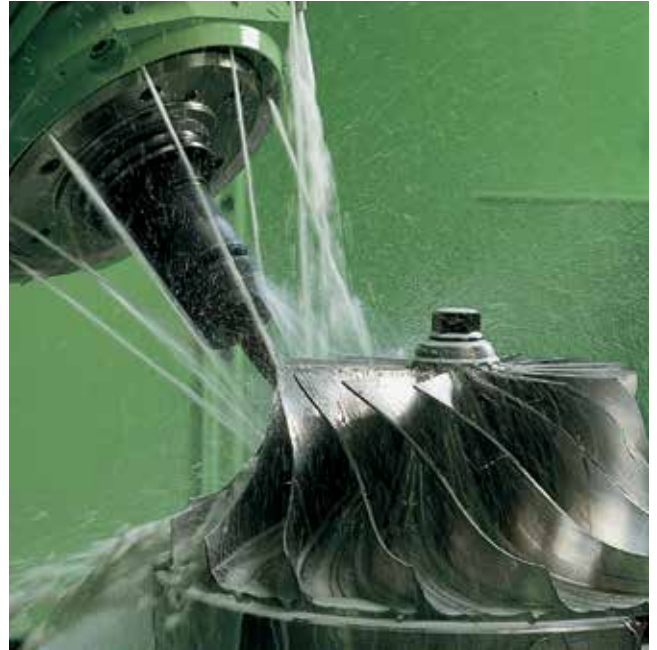


Dedicated Manufacturing Capabilities

Cameron's manufacturing facilities are among the most advanced in the industry, utilizing leading technology operated by an experienced and skilled workforce. Everything we do at our ISO 9001:2000 facilities is aimed at improving quality and shortening delivery times.

Manufacturing Technology Highlights

- CAD/CAM systems
- Vertical turning centers
- Impeller milling centers – five-axis
- Horizontal boring centers
- Cell manufacturing and work team techniques
- State-of-the-art testing facilities



TURBO-AIR Series Compressor Models

Cameron's revolutionary TURBO-AIR centrifugal compressor offers an advanced, state-of-the-art source of oil-free air for plant air and other applications.



TURBO-AIR 2000



TURBO-AIR 2020



TURBO-AIR Cooled 2000



TURBO-AIR 3000



TURBO-AIR 6000



TURBO-AIR 9000



TURBO-AIR 11,000



TURBO DryPak and Twin-Turbo



TURBO-AIR 2040



TURBO-AIR 6040

TURBO-AIR 2000 – 93 to 260 kW (125 to 350 hp) and 14.3 to 48.1 m³/min (505 to 1700 cf/min)

TURBO-AIR 2020 – Two-stage 187 to 298 kW (250 to 400 hp) and 28 to 57 m³/min (1000 to 2000 cf/min) offering the best specific power of any two-stage compressor

TURBO-AIR Cooled 2000 – 93 to 260 kW (125 to 350 hp) and 14.3 to 48.1 m³/min (505 to 1700 cf/min)

TURBO-AIR 2040 – 430 to 597 kW (580 to 800 hp) and 42 to 51 m³/min (1500 to 1800 cf/min), up to 610 psig

TURBO-AIR 6040 – 1678 kW (2250 hp) and 127 to 167 m³/min (4500 to 6000 cf/min), up to 610 psig

TURBO-AIR 3000 – 298 to 597 kW (400 to 800 hp) and 57 to 113 m³/min (2000 to 4000 cf/min)

TURBO-AIR 6000 – 670 to 1270 kW (900 to 1700 hp) and 113 to 226 m³/min (4000 to 8000 cf/min)

TURBO-AIR 9000 – 1120 to 1680 kW (1500 to 2250 hp) and 184 to 334 m³/min (6500 to 11,800 cf/min)

TURBO-AIR 11000 – 900 to 1900 kW (1250 to 2500 hp) and 232 to 405 m³/min (8200 to 14,300 cf/min)

TURBO DryPak – Patented dryer and compressor package featuring adjustable dew point performance

Twin-Turbo – Combined service compressor for dual process air and booster applications



API 672/TURBO-AIR 3000

Cameron provides a complete line of centrifugal compressors that meet API 672 requirements. Shown is an API 672 compliant unit for an oil refinery in Texas – 2300 cfm, 500 hp, 150 psi (65 m³/min, 375 kW, 10.3 bar).



TURBO DryPak Compressed Air Dryer

Cameron's patented dryer and compressor package utilizes the heat of compression as the regenerating power to remove moisture without heaters or blowers. TURBO DryPak features adjustable dew point performance.



TURBO-AIR Cooled 2000

Cameron's TURBO-AIR Cooled 2000 centrifugal compressor is designed for applications where there is limited or no water available for cooling. It features innovative air-to-air cooling technology in a reliable centrifugal design. High ambient and sub-zero ambient packages are available.



Twin-Turbo Combined Service Compressor

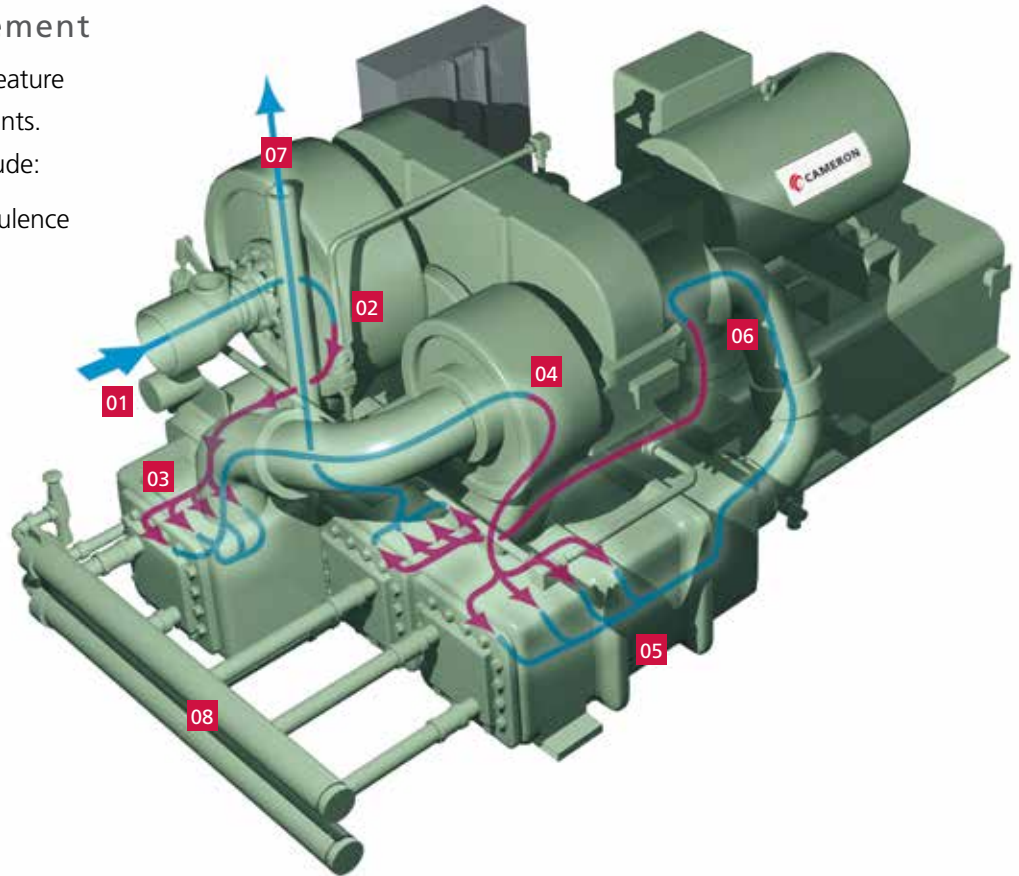
The Twin-Turbo combined service compressor delivers the proven solution for dual process air and booster applications, eliminating a compressor and reducing installation and maintenance costs.

Typical Air Flow Arrangement

Cameron's centrifugal compressors feature an arrangement of air flow components.

Advantages of this arrangement include:

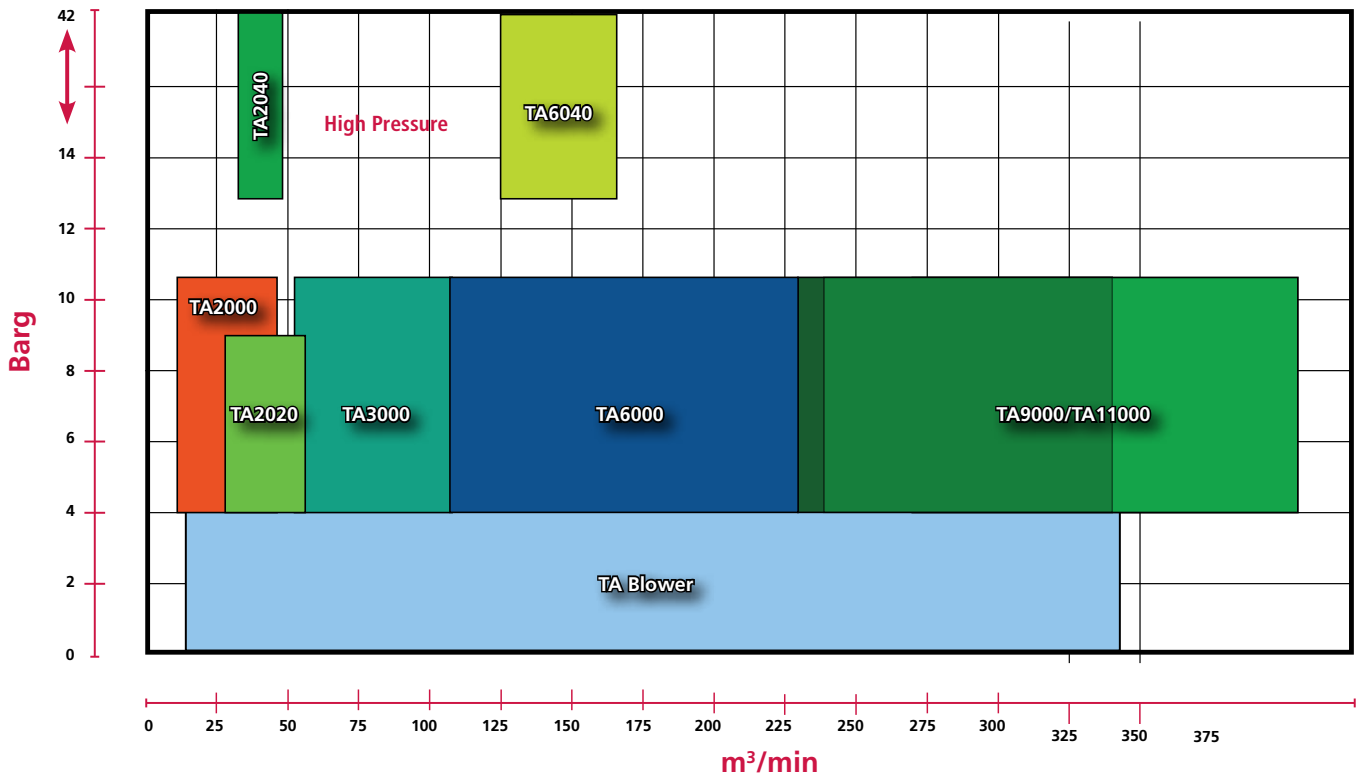
- Air movement is directed so turbulence induced friction is reduced
- Air is cooled after every stage to assure a high isothermal efficiency



TURBO-AIR

- 01: Compressor Inlet
- 02: 1st Stage Compressor Scroll
- 03: 1st Stage Intercooler
- 04: 2nd Stage Compressor Scroll
- 05: 2nd Stage Intercooler
- 06: 3rd Stage Compressor Scroll
- 07: Compressor Discharge
- 08: Water Manifold (optional)

Plant Air Product Range



Note: This chart represents a typical flow chart schematic. For greater pressure or flow requirements, consult Cameron.

Comprehensive Quality

From start to finish, from the factory to the field, in every area, for every employee, quality is the rule. You would expect that from a world-class manufacturer such as Cameron. Our objective is to fully meet your expectations.



Our Quality Policy

The key elements of Cameron's quality policy are:

- Fully meeting customer expectations and requirements
- Providing products that equal or exceed industry and government standards
- Focusing on long-term customer satisfaction
- Striving for continuous improvement
- Understanding quality is everyone's job

Our Quality Program

ISO 9001:2000 Certified Quality Management System

- Systematic approach to continuous improvement
- 15 trained ISO internal auditors

ISO 14001:1996 Certified Environmental Management System

- Dedicated to reducing and eliminating waste
- Providing a healthy and safe work environment for all employees
- Meeting or exceeding all environmental, health and safety regulatory requirements

Lean Six Sigma Training

- Addressing customer critical to quality issues
- Using process and product improvements most beneficial to our customers
- Training in sophisticated problem-solving tools

LEAN 6 SIGMA

Supplier Quality Management

- Maintain an approved vendors list
- New suppliers reviewed and evaluated prior to being added
- Supplier quality performance tracked through the non-conforming product database within our business system
- Periodic supplier performance evaluations

CE Mark Certification

- TURBO-AIR Cooled 2000 family of compressors was first to be certified
- Other plant air units and some engineered compressors have been certified

Pressure Equipment Directive – PED

- Equipment meets the PED requirements for the design and manufacture of pressure equipment and assemblies

China Pressure Vessel Code Certification

- Key suppliers have been certified to meet the China pressure vessel code
- Multiple units have been shipped meeting these requirements



IV Certification, Inc.
D 14001 REGISTERED FIRM



Added Quality Assurance from Advanced Testing Facilities

To guarantee performance meeting both customer and manufacturer specifications, Cameron's designs are fully tested for aerodynamic and mechanical performance by skilled technicians before they leave the factory.

Nine Test Stands

Our test facility in Buffalo, NY includes nine test stands.

- Variable speed drives to simulate actual operating speed and meet the speed requirements of the ASME PTC-10 type 2 test
- Package testing of machines up to 8200 kW (11,000 hp)
- The test stands are separated into three individual bays allowing one machine to be set up while another is tested
- Computer controlled cooling towers are used to simulate actual coolant conditions



Test Center Computerized Control Room

Cameron's test center control room provides computer control of cooling water, input speed and lubricating oil supply.

- Aerodynamic testing through the use of finely calibrated pressure and temperature instruments
- Vibration monitoring
- Vibration frequency analysis

Testing Observation and Documentation

Upon request, you are welcome to observe testing of your compressor and complete test documentation is available.

- Documentation can be provided for full operating tests to identify air capacity, pressure, temperature and horsepower
- Vibration data for both steady state and coast down operation is recorded to verify rotor critical speed and response



Cameron's test center control room provides computer control of cooling water, input speed and lubricating oil supply.



Standard package test of TURBO-AIR 2000 in Cameron's test center.

Aftermarket Services and Support

How else can we prove our commitment to your total satisfaction? With CAMSERV™ aftermarket services, Cameron provides the industry's most comprehensive resource for top-notch aftermarket products, engineering solutions and field service. Cameron's CAMSERV services network is there, whenever and wherever you need it.





Worldwide Customer Support

Cameron has over 80 representatives and distributors worldwide to service your needs wherever your application is located. We keep life cycle records on every unit we manufacture, enabling us to be a partner with you, now and in the future.

Genuine Parts

- Genuine parts produced in the same facility for more than 55 years
- Extensive inventory in strategic locations around the world backed by our written warranty
- Cross-checked against unit maintenance records to ensure correctness

Technical Support

Our goal, like yours, is to keep your unit running and our technical support is geared to do just that.

Installation and Start Up

- Concierge preventive maintenance programs
- Diagnostic and troubleshooting services
- Vibration analysis and trending
- Remote monitoring

Repair Proficiency

- State-of-the-art-equipment for turnkey repairs
- Complete documentation package
- Strategic locations to serve a broad customer base including Houston, TX; Buffalo, NY; Milan, Italy; and Gaomi, China

Factory Training

- Comprehensive, onsite training seminars for you and your personnel
- Instruction on a variety of topics including Level II courses offering hands-on training
- Courses can be tailored to your needs at our Buffalo, NY, training center



Smart Product Upgrades

Cameron is constantly striving to improve efficiency and enhance performance. We incorporate these advances into retrofit kits that enable you to keep your equipment up to date.

Control Retrofits

- Re-aero kits to improve efficiency or match changing conditions
- Oil and cooling water system enhancements
- Motor upgrades

Cameron Offers More

In addition to our TURBO-AIR series of products, Cameron offers engineered air, industrial and process gas centrifugal compressors, designed for specific applications with a wide range of capacities and power ranges. Our MSG® (Multi-Stage Geared) compressors are application engineered with a number of available configurations for flow requirements from 2720 m³/hr (1620 cf/min) to 255,000 m³/hr (150,000 cf/min) to over 33,500 kW (45,000 hp) and 83 barg (1200 psig).



4MSG-16/15 Air Compressor



3R2MSGPB-5G/30 Gas Compressor



TAE-55 Air Compressor



Fuel gas booster skid

4MSG-16/15 Air Compressor – Application: Located in China, used as a main air compressor for air separation plant. Specifications: Flow = 59,000 Nm³/hr, Discharge Pressure = 1241 kPaA

3R2MSGPB-5G/30 Gas Compressor – Application: Located in Algeria, used as a boil off compressor. API 617. Specifications: Flow = 20,000 kg/hr, Discharge Pressure = 7.47 kg/cm²A

TAE-55 Air Compressor – Application: Oil refinery in Texas. Powered by a Dresser Rand steam turbine. Used as an air compressor for the Olefins Plant. API 672 special service. Specifications: Flow = 6700 SCFM, Discharge Pressure = 125 psig

Fuel gas booster skid – One compressor packaged with gas scrubbers, Allen Bradley ContoLogix PLC, seal rack, motors, bypass and recirculation piping. Specifications: Flow = 69,864 MMSCFD, Discharge Pressure = 710 psig

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www.c-a-m.com/cs



HSE Policy Statement

At Cameron, we are committed ethically, financially and personally to a working environment where no one gets hurt and nothing gets harmed.