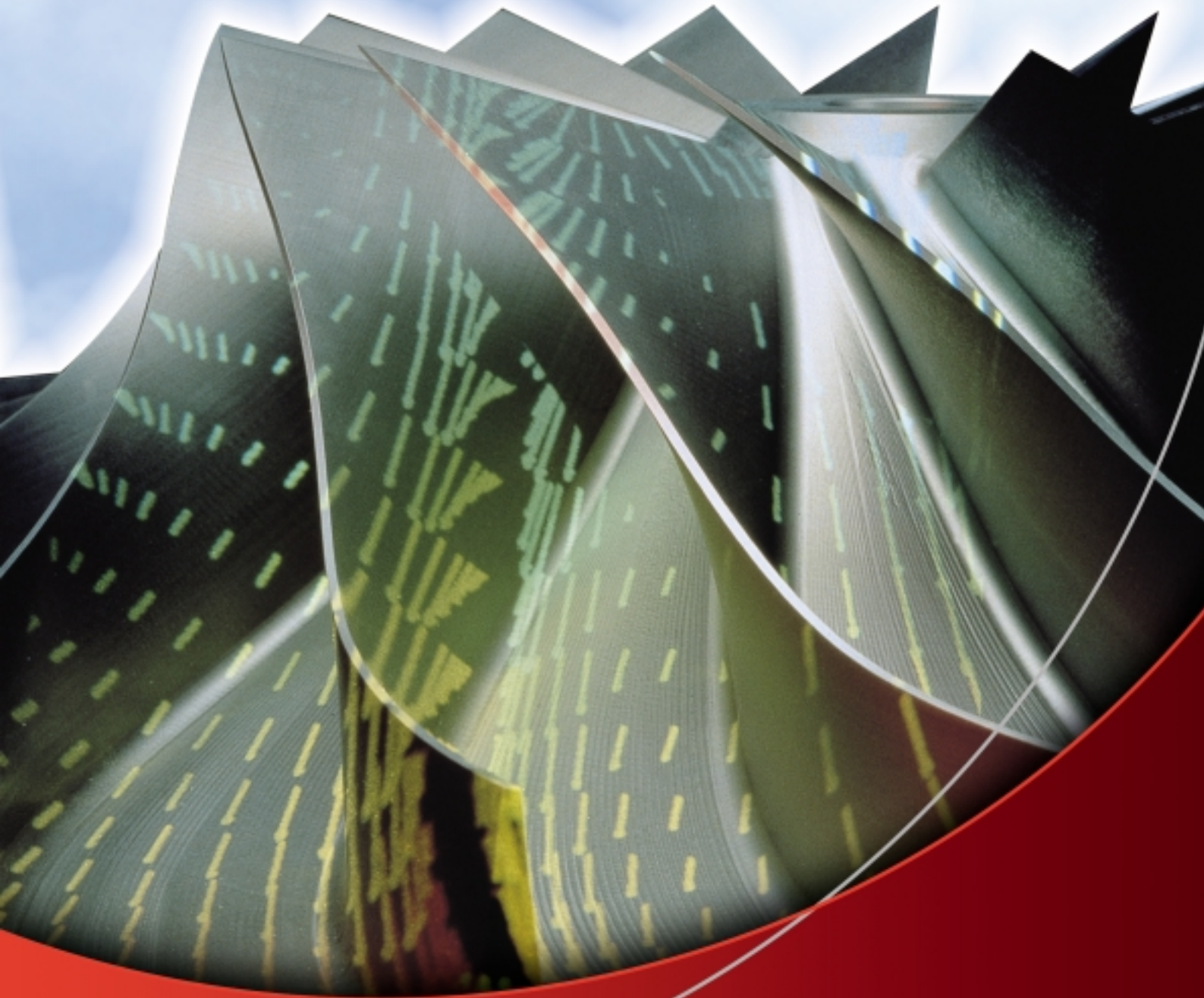




# *Centac*<sup>®</sup>

*Centrifugal Oil Free Air Compressors*



# A worldwide enterprise

To maximize customer connectivity around the globe Ingersoll Rand Air Solutions maintains manufacturing facilities, warehouses, offices and repair centers across the globe. And with 450 locations in 42 countries, Ingersoll Rand can provide a level of local service and support unmatched in the industry.



*Air Solutions manufacturing plants*

## Industry Leadership

Ingersoll Rand is the worldwide leader in centrifugal technology. Since 1911, they have been designing and manufacturing centrifugal compressors to meet industry requirements. These design capabilities led to the creation of the CENTAC product line in 1968. Over 20000 CENTAC compressors have been installed since that time.



*CENTAC manufacturing plant in Vignate (Milan) ITALY*



## ISO 9001 Quality System Certification

The assurance of a recognized standard of quality in designing, manufacturing, selling and servicing our CENTAC products.

Total Quality Management is the only way Ingersoll Rand can meet its customers' requirements. We do this through the resources of our people, the products and the range of services we provide.

The quality of the Ingersoll Rand products and services is the result of the synergy between advanced technology and the desire to meet customers' satisfaction.

# The Widest Market Coverage

## Automotive

- More automobiles around the world are being produced with CENTAC.
- Applications include assembly plants and component parts plants.
- Reliable oil free air ensures optimum painting conditions.



## Textiles/Fibres

- CENTAC is the leader for the new technology mills.
- Applications include airjet weaving, spinning, texturizing and utility air.
- 100% oil free air ensures continuous and faster production.
- CENTAC constant pressure is critical for optimum quality products.



## Power Generation

- Ingersoll Rand has been in this business for more than 25 years with CENTAC.
- CENTAC provides reliable air for various applications including sootblowing, general services, ash conveying, flue gas, desulfurization and wastewater treatment.
- Advanced Control Systems are provided for precise control and rapid response to handle a large range of varying demand cycles.



## Chemicals/Refinery

- A package designed to meet the performance and reliability expectation of API Std. 672.
- High quality materials are selected to cope with the most severe operating environments.
- Custom design available for various applications.

## Air Separation

- CENTAC are used as feed and recycle compressors in air and nitrogen production.
- CENTAC's efficiency, wide turndown and reliability are the key to successful operations.
- Customized packages available.

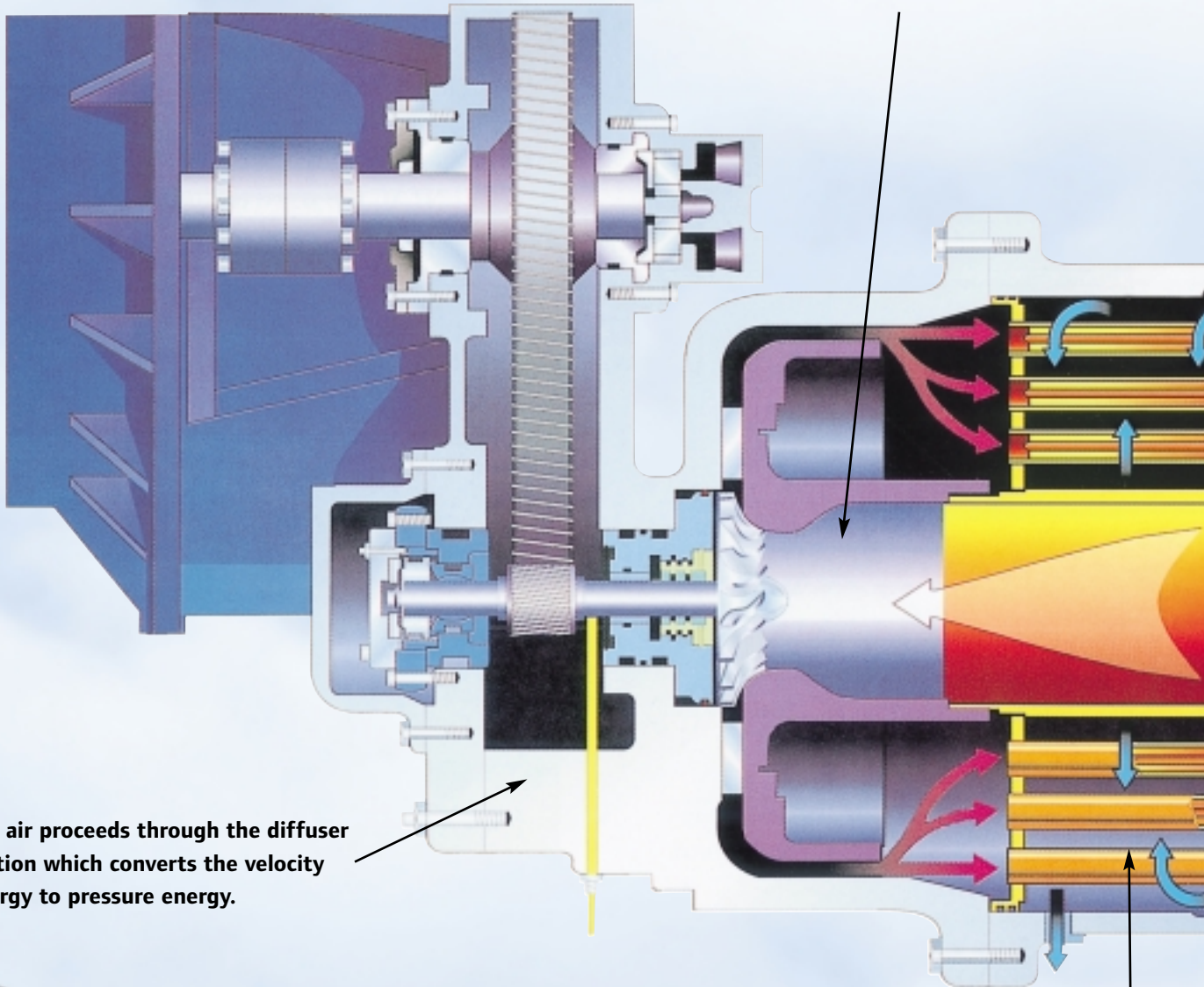
## Other Industries Served

- Glass
- Iron & steel
- Electronics
- Food & beverage
- Pharmaceutical
- PET bottle blowing
- Pulp & Paper
- Metal mining
- Coal mining
- Cement conveying
- Oil extraction
- Brewings
- Plastics

# Simplicity by Design

The diagram below demonstrates how a CENTAC compressor works. The depicted sequence repeats in each succeeding stage until the compressor achieves desired operating pressure.

**1** Air enters the compressor through the machine-mounted inlet control valve and flows to the first stage where the impeller imparts velocity energy to the air.

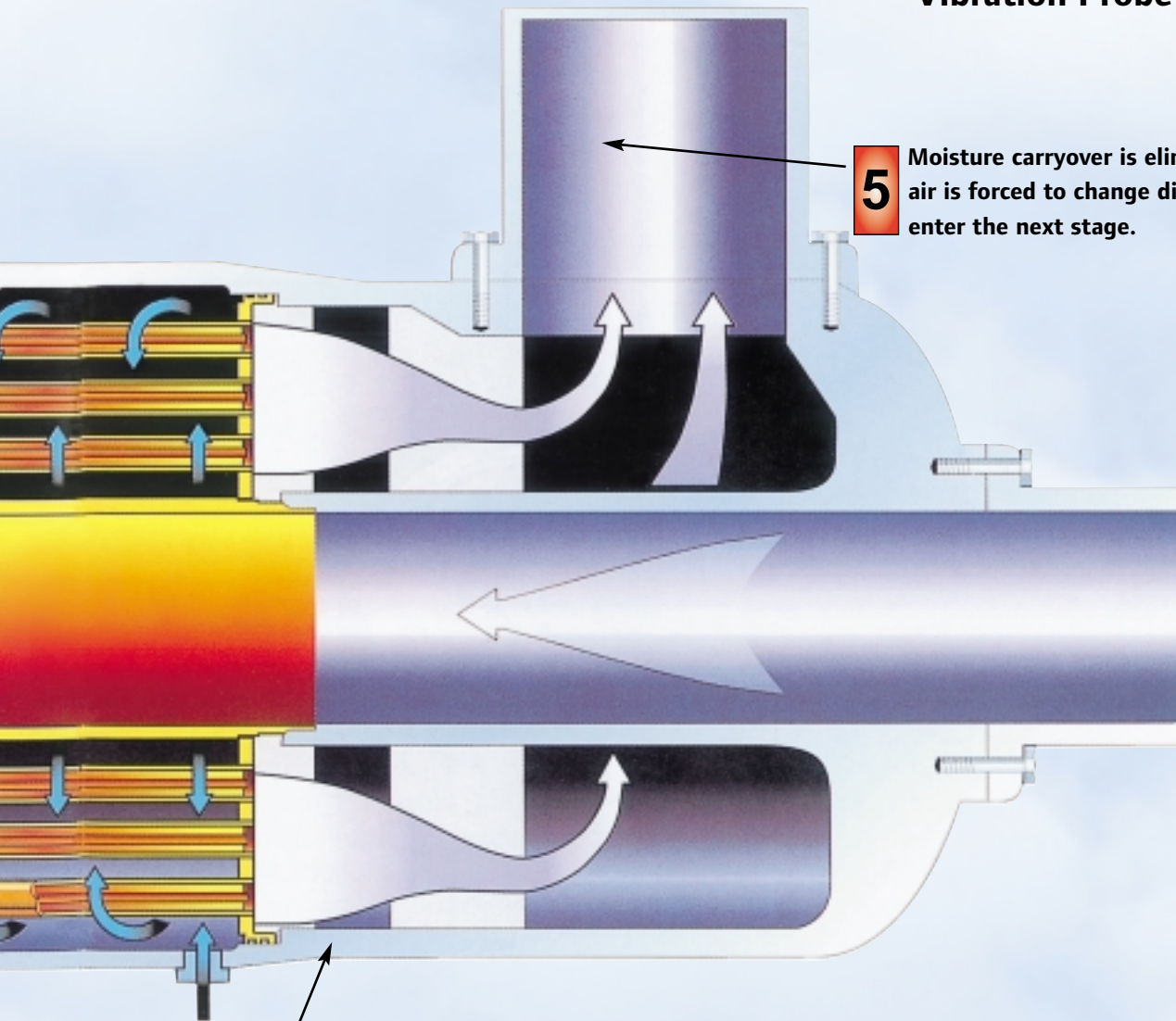


**2** The air proceeds through the diffuser section which converts the velocity energy to pressure energy.

**3** The built-in intercooler removes the heat of compression, which improves efficiency.

# Simple Air End Design

- Diffuser
- Seal Cartridge
- Carbon Ring Seals
- Plain Bearing
- Built-in Coolers
- Thrust Bearing
- Vibration Probe

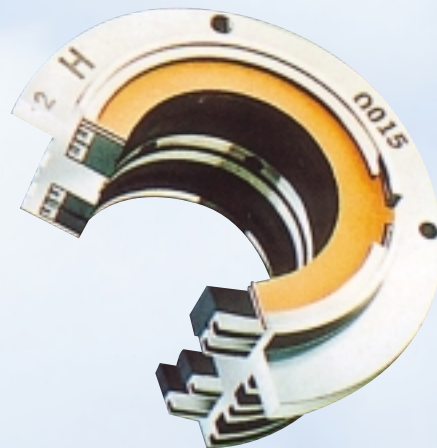


**5** Moisture carryover is eliminated when the air is forced to change direction 180° to enter the next stage.

**4** Air passes through a stainless steel moisture separator in a low velocity zone to remove condensate.

# High Quality Rotor Assembly

- Short single-impeller / single-pinion rotors minimize overhung weight. The rotor assembly provides excellent stability. Normal operating clearances between the impeller and diffuser are not affected by air or water temperature changes.
- The thrust collar allows effective dissipation of aerodynamic thrust loads generated during operation. This prevents these loads from being transmitted to the main gear train and maximizes gear life.
- The backward-leaning, steep-curve, impeller geometry (pioneered by Ingersoll Rand) provides excellent control capability over the widest operating range.
- The exclusive polygon fit assures positive locking between both the impeller and the thrust collar to the pinion and permits easy assembly and disassembly. The polygon fit also increases contact area and eliminates stress-producing keys or shrink fits.
- CENTAC impellers are manufactured from high grade investment cast stainless steel for high strength, maximum corrosion and erosion resistance.
- Full-floating, long life, efficient non-contact carbon ring seals insure oil free air and minimize air leakage under all operating conditions.
- The exclusive CENTAC vertically-split design allows for single-piece bearings and seals. Field replacement of these components is quick and simple with only one running clearance to set per stage. These clearances are set external to the casing in a matter of minutes.



# Superior Rotor Mechanics

The CENTAC rotor assembly optimizes efficiency, ensures reliability and simplifies maintenance

- Stable pinions permit the use of simple, but proven hydrodynamic sleeve bearings. Yearly inspections are not required. Other bearing designs can be utilized for special applications.
- All bearings use a conventional low-pressure lube-oil system to achieve effective rotor dampening and oil-film stability. Oil pressure is supplied by a shaft-driven main oil pump with a backup electric-driven pre-lube and post-lube pump.
- Thrust loads are predictable, unidirectional and low; minimizing power consumption. Aerodynamic thrust is absorbed at each pinion by an hydrodynamic thrust bearing.
- Standard radial and thrust bearings have no moving parts. This simplicity provides the ability to effectively monitor the bearing condition through shaft vibration; thus eliminating the time and the expense for periodic inspection.



# High Efficiency Heat Exchangers

The air-in-tube/water-in-shell CENTAC air cooler provides several important benefits:

- The water-side to air-side surface is twice that of fin tube coolers. This allows for more efficient cooling, lower approach temperatures and less performance deterioration from fouling. This results in lower water flow requirements and less cooler maintenance.
- The water-side to air-side surface is twice that of fin tube coolers.
- Internal air coolers eliminate high temperature piping entering and exiting the compressor. With the CENTAC design, there is no exposed piping. Costly expansion joints in the piping are eliminated. The water-over-the-tube configuration also dampens the air noise.
- The CENTAC air cooler can be back-flushed while operating or chemically cleaned in place. Both options minimize downtime required to clean coolers.
- For adverse environments, special coolers are available, CENTAC's standard air coolers can be provided with a phenolic resin coating. In addition, external air coolers, with a variety of materials of construction, can be provided to meet your specific needs.



# A Package Designed ...

## **Simplicity By Design**

The CENTAC packaging concept has many advantages, but the primary advantage is its simplicity. The CENTAC compressor package will minimize field installation by providing many of its major components already mounted and piped. In addition, the compact design of the CENTAC compressor will save you time and money.

## **Superior Lube Oil System.**

- Low pressure system 1.7 bar
- Designed for leak free operation
- Shaft-driven main oil pump

## **Built-in Air Coolers**

- No external piping means easy installation
- Eliminate need for expansion joints
- No exposed hot air piping
- Reduced noise level due to internal piping
- Reduced package size
- Low pressure drop



## **Simplified Bearing Design**

- Hydrodynamic (oil-film) radial bearings
- Full load hydrodynamic thrust bearings
- Full load hydrodynamic reverse thrust bearings
- Radial and thrust bearings pre-assemble into a single cartridge



# ... for Your Installation and Application



## Custom Designed Package

Package can be designed to your needs as far as:

- Control system
- Lube oil system
- Cooling system
- Air system
- Main driver

## Vertically-Split Casing

- Complete and easy access to all components
- Fewer clearances to set (one clearance to be set during rotor installation)
- Rotor clearances set external to machine (no need to open casing)
- No yearly inspection required

## Non-Contact Air/Oil Seals

- Full-floating carbon-ring seals
- Oil free air under all operating conditions
- Low seal losses; minimal air leakage

## Simple Rotor Mechanics

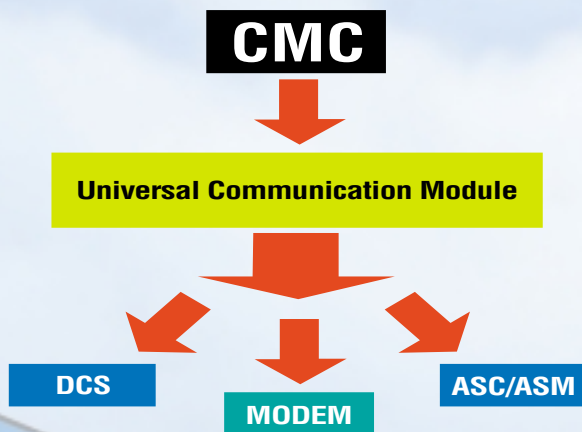
- Single-impeller/single-pinion design
- Optimum efficiency
- Minimum bearing loads
- Low vibration
- Individual vibration probe per stage

# A Control System Programmed with You in Mind

The CENTAC microcontroller is installed on thousands of installations around the world. The CENTAC microcontroller is a state-of-the-art control system that gives you total control. The heart of the system is an advanced process computer which is totally self-regulated, providing complete integration of the compressor, motor, starter and auxiliary equipment.



*Centac Microcontroller*



## Easy to Use

- Simple twelve button keypad
- Operating parameters, alert settings and shutdown settings are presented on the graphical LCD display
- Set points are changed with the touch of a button

## Self Diagnostic

- Event log details the last sixteen events that have occurred
- Includes logic to determine a microcontroller malfunction

## Control Flexibility

- Standard modulate (constant pressure control)
- Standard energy optimization (auto dual control)
- Modulate control fine tunes compressor output when sequencing multiple compressor installations

## Dependable

- 4-20 mA signal eliminates outside electrical interference
- Microcontroller's fail-safe feature stores all operating parameters at time of shutdown during a power failure
- System will automatically adjust to a start condition once power is restored after a power failure

## Enhanced Communications

- Allows for integration into a plantwide control system
- Allows for integration into a plantwide control system
- Energy management to save money
- Communicates operational functions to various remote terminal systems, personal computers or Distribution Control System (DCS).

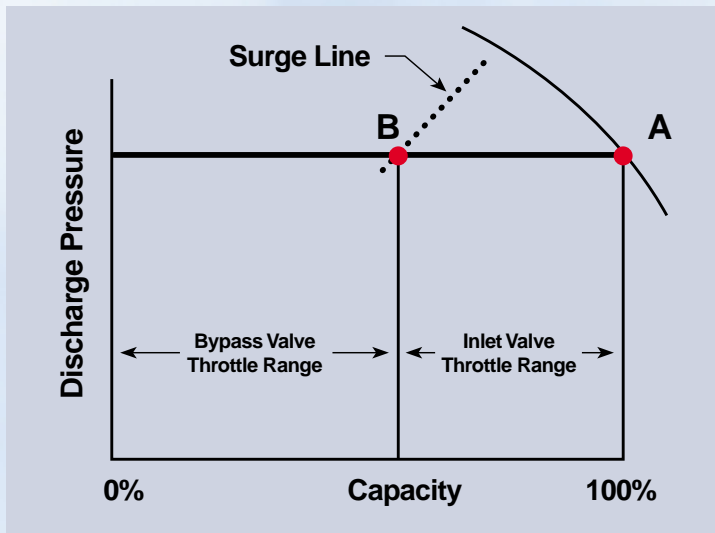
The optional Universal Communications Module provides an industrial interface to Distributed Control Systems (DCS) utilising MODBUS protocol.

# Reduce Your Cost of Compressed Air

## CMC Control System

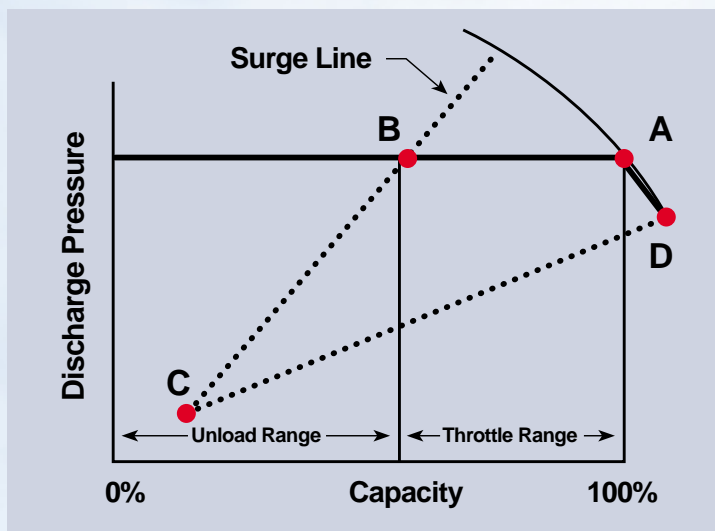
The CMC offers two control systems as standard to suit individual plant requirements.

**Full Modulation Control** where Constant Pressure is needed over the complete capacity range.



*Constant pressure mode*

**Auto Dual Efficiency Control** which combines Upper Range Modulation with On-Line/Off-Line for most efficient running.



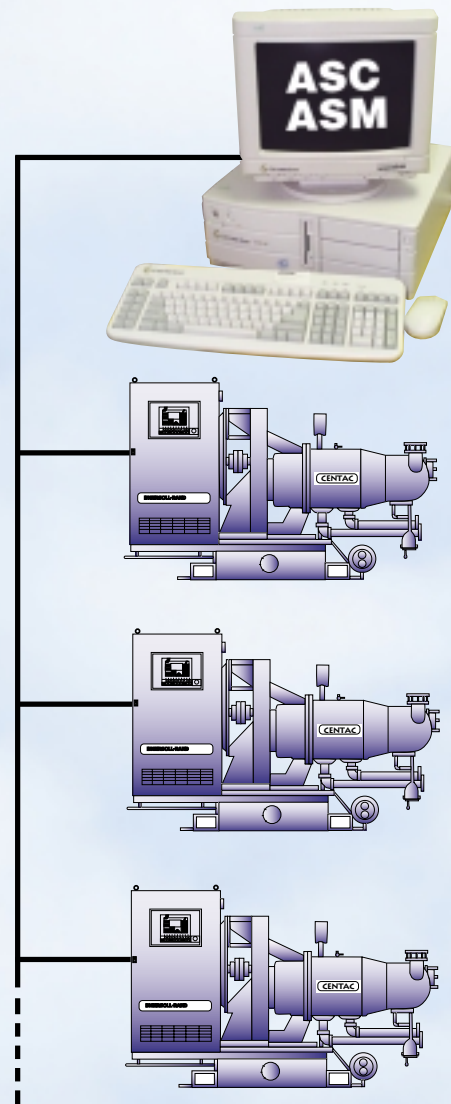
*Auto dual efficiency mode*

## Air System Controller - ASC

### Air System Manager - ASM

ASC/ASM are the most advanced & proven centrifugal compressor management systems.

They combine efficient load sharing with remote control & monitoring capabilities.



An Air System Controller or an Air System Manager can save you thousands of Euros on your multiple unit installations by monitoring and controlling your compressed air system and reducing the running time.

# When You Need It Most, The Support Is There:

## **CENTAC Worldwide Aftermarket Services**

Our commitment to you becomes even stronger when the compressor is shipped to your plant. As a worldwide organization our mission is to reduce the life cycle cost of your compressors. We will do this by providing you with the most competitive and responsive service and support, product and aerodynamic enhancements, and engineering capabilities designed to reduce the costs associated with compressing air.



*Ingersoll Rand's service organisation is ready to serve you anytime, everywhere.*

## **Customer Support**

Responding to your needs

- 24 hour worldwide coverage
- Immediate shipment
- Latest design technology
- Customer compressor history
- True Ingersoll Rand parts designed for your machine and backed by the Ingersoll Rand warranty

## **Local Service**

Serving you quickly and efficiently

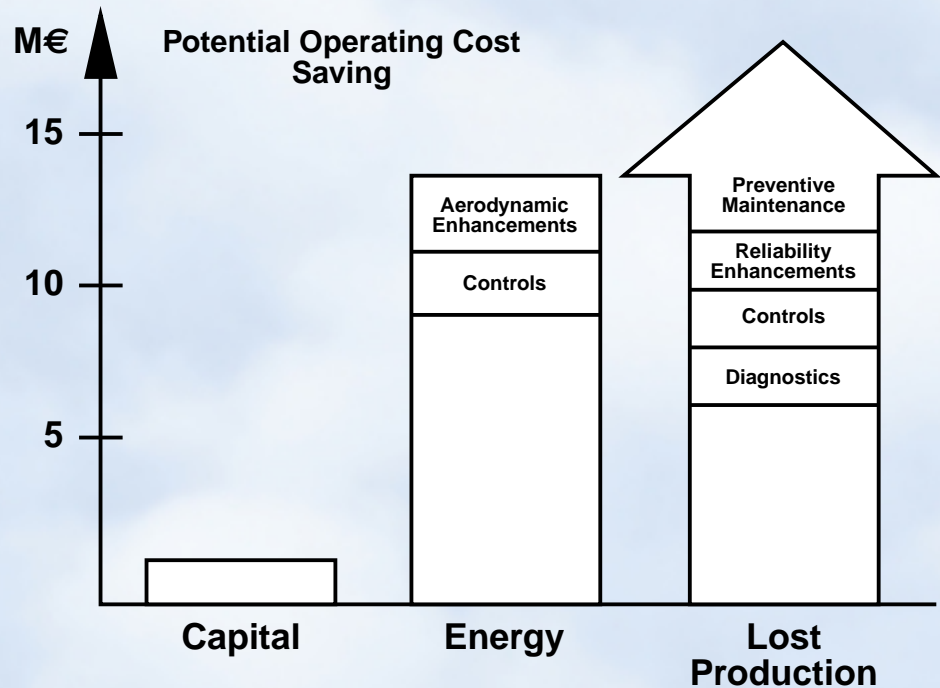
- Unsurpassed service organization in the world
- With over 150 offices worldwide
- Certified factory-trained service people
- 24 hour coverage for parts



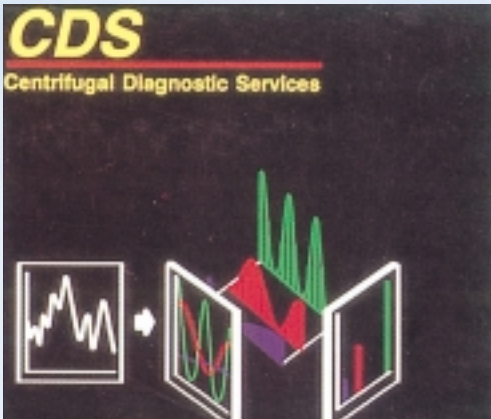
*With 24 hour worldwide coverage and immediate shipment, true Ingersoll Rand parts can meet your requirements.*

# Reduce Compressors Life Cycle Cost

Basis: 0.06 €/kWh  
20 Year Life Cycle  
20 Hours/Day Operation



**140 m<sup>3</sup>/min Compressors**



*Centrifugal Diagnostic Services® helps monitor vibration on Centac compressors to increase reliability and prevent unnecessary maintenance and lost production.*

## Engineering Services

Designed to reduce the life cycle costs of your compressors

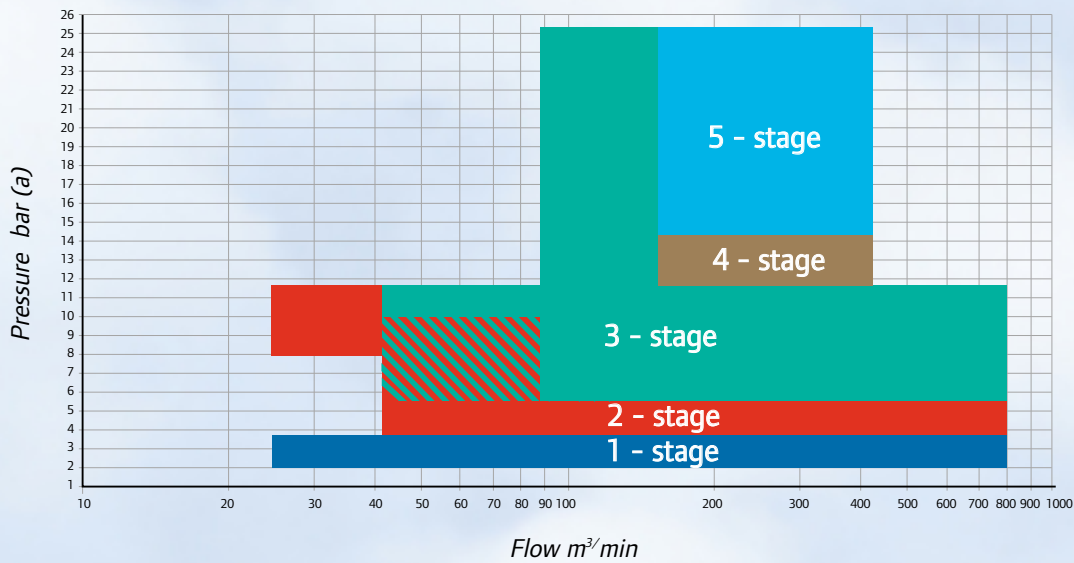
- Centrifugal Diagnostic Services®
- CENTAC software packages such as Service View, ASC/ASM and much more
- Lubricants
- Controls

## CENTAC Enhancements

Continuing to improve your processes to save you money through the latest technology in controls, aerodynamics and mechanical reliability

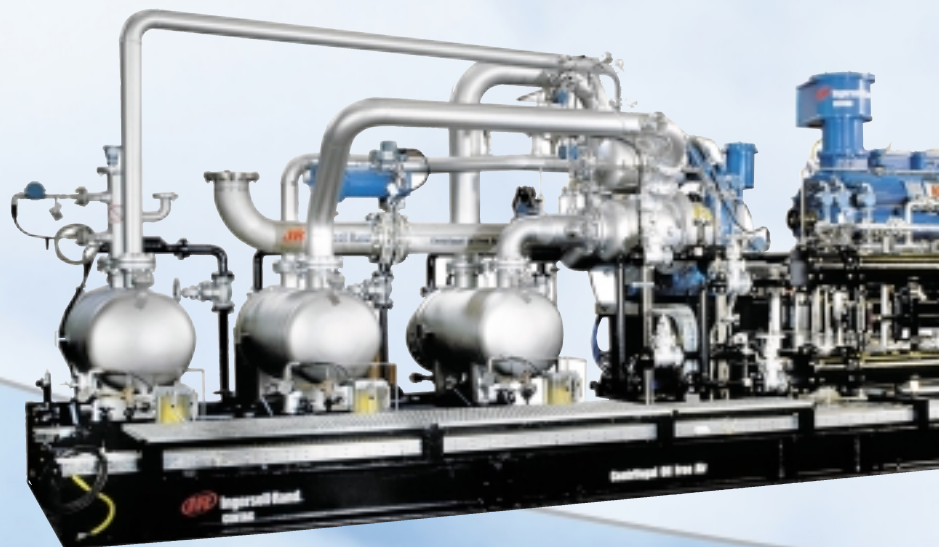
- Reduced energy costs
- Reduced capital costs
- Reduced maintenance
- Increased reliability
- Improved process integration

# A Broad Range of Compressors ...



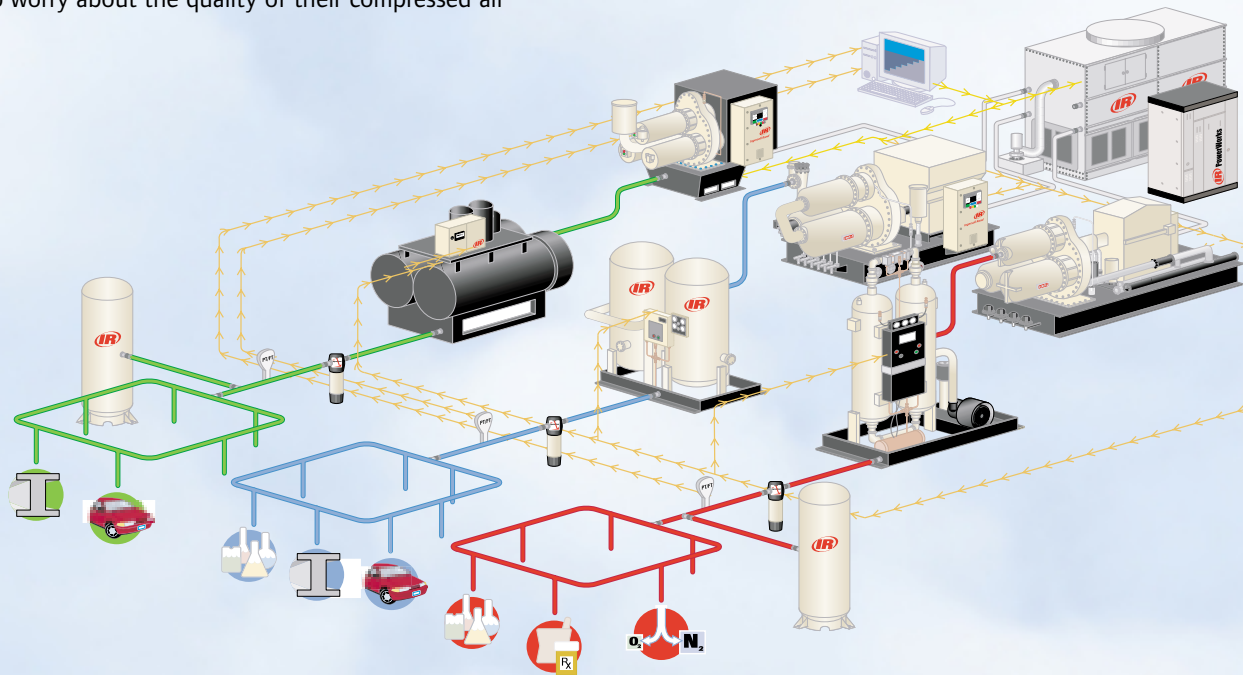
Centac compressors are available as complete packages with flanged or foot mounted motors for maximum flexibility to meet widest customer requirements.

CENTAC engineered process packages are also available to meet the stringent requirements of API Std. 672.



# ...for a Broad Range of Solutions

Ingersoll Rand Air Solutions today represent more than the worldwide benchmark for centrifugal compressors. Centac encompasses a full range of solutions including: air and cooling water treatment systems, remote monitoring and energy management systems, air distribution systems, turnkey installations, Auditing services and AirCare programs. By offering single-source system capability from implementation to operation, Ingersoll Rand provides customers with reliable, energy efficient and cost saving air system solutions, allowing customers to focus on their operation and never have to worry about the quality of their compressed air



## Heat-of-Compression Dryers

The Hoc dryer is the most energy efficient adsorption dryer available. It recovers the heat that is a natural by-product of the compression process and utilizes in the air drying process to provide moisture-free air while consuming virtually no energy. Ingersoll Rand heat-of-compression dryers, both H-Series and HC-Series, are the world's simplest and most reliable regenerative dryers. The H-Series dryer provides instruments air quality with a very low initial cost. The HC-Series is a more sophisticated dryer, which includes a stripping and cooling cycle, delivering  $-40^{\circ}\text{C}$  or lower constant dew point without any temperature or dew point spike.





Ingersoll Rand Industrial Technologies provides products, services and solutions to enhance the efficiency and productivity of our commercial, industrial and process customers. Our innovative products include air compressors, air systems components, tools, pumps, material and fluid handling systems and microturbines.

[www.air.ingersollrand.com](http://www.air.ingersollrand.com)

Ingersoll Rand air compressors are not designed, intended or approved for breathing applications. Ingersoll Rand does not approve specialized equipment for breathing air applications and assumes no responsibility or liability for compressors used for breathing air service.

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Product improvement is a continuing goal at Ingersoll Rand. Designs and specifications are subject to change without notice or obligation.

**Ingersoll Rand Industrial Technologies**

**Air Solutions**

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