Johnson Controls

YORK

YVAM Air-Cooled Magnetic Bearing Centrifugal Chiller

Sustainability in data center cooling

YORK® YVAM
Air-Cooled Magnetic Bearing Centrifugal Chiller

Purpose built to support uptime, efficiency and total cost of ownership requirements, YORK® YVAM Air-Cooled Magnetic Bearing Centrifugal Chillers from Johnson Controls leverage pioneering magnetic bearing technology for reliable, real-world performance in hyperscale and colocation data centers.

- **Sustainable** - Optimized for R-1234ze ultra-low GWP refrigerant
- **Efficient** - Off-design performance comparable to economization
- **Quiet** - Full load sound is only 65 dBA at 10 meters
- **Responsive** - Quick Start returns to full load in as few as 3 minutes
- **Clean** - Active front end lowers harmonic distortion to meet IEEE-519

Reliable desing

Secure uptime

High efficiency

Carbon neutrality and sustainability

Proven reliability

Johnson Controls is a leading supplier of water-cooled centrifugal and variable-speed driven air-cooled chillers. And in the YORK® YVAM, the majority of its core components have already been proven in tens of thousands of chillers operating in some of the world's most challenging conditions. Even the active magnetic bearing driveline pioneered by YORK® – the most advanced driveline available – has been relied upon in mission critical applications for the US Navy since 1998, thanks to its frictionless operation and simplified design with fewer moving parts.

Reduced costs

Beyond its remarkable reliability, the single-stage, magnetic bearing centrifugal compressor found in the YORK® YVAM has been optimized for high efficiency and standard-setting off-design performance, which translates to greater OPEX and CAPEX savings opportunities. After all, the amount of money spent on energy costs over the life of the chiller in most data centers can be several times the initial chiller cost.

In many applications, the lower input power requirements can also allow for reduced-capacity generators, transformers, switchboards, automatic transfer witches and wiring – all of which can translate to an even greater potential for savings.

Sustainable Operation

The lubrication-free design of the YORK® YVAM simplifies maintenance while enhancing overall reliability. Eliminating the need for a lubrication-based mechanical system also eliminates the need to collect oil samples, replace oil filters and perform other system checks while, at the same time, simultaneously improving heat transfer performance.

At off-design conditions, the YVAM operates so efficiently that its performance is comparable to chillers with integral water-side economizers. This means free-cooling coils are not required for economization, which eliminates the stacked coil design, glycol, weight, complexity and related costs associated with free-cooling chillers.

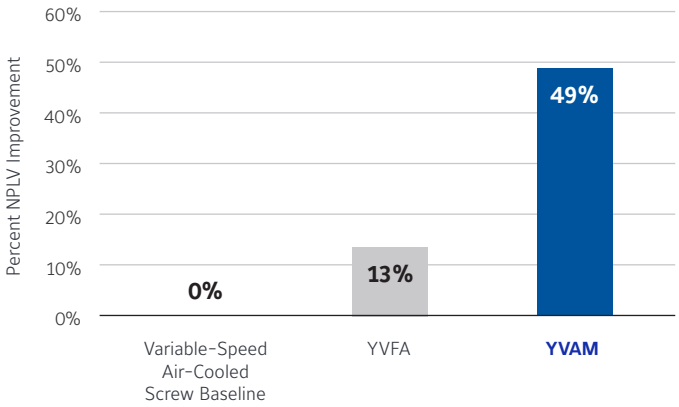
Lower sound levels

The magnetic driveline in the YORK® YVAM virtually eliminates noise that comes from the screw compressors of traditional, air-cooled chiller drivelines. When compared to many screw chillers, the YVAM produces notably less sound, with full-load sound of just 65 dBA at 10m.

Smarter control

The YORK® YVAM Chiller includes a variable-speed drive (VSD) with an active front end to help control capacity, which, in turn, reduces harmonics and eliminates inrush. Every YVAM complies with IEEE-519 for voltage and current harmonic distortion. And the patented capacity control logic of the YVAM responds rapidly to changing demand, delivering higher part-load efficiency and helping to ensure compliance with regulatory requirements.

Part-Load Performance Improvement at Typical Data Center Design Conditions



Faster restarts

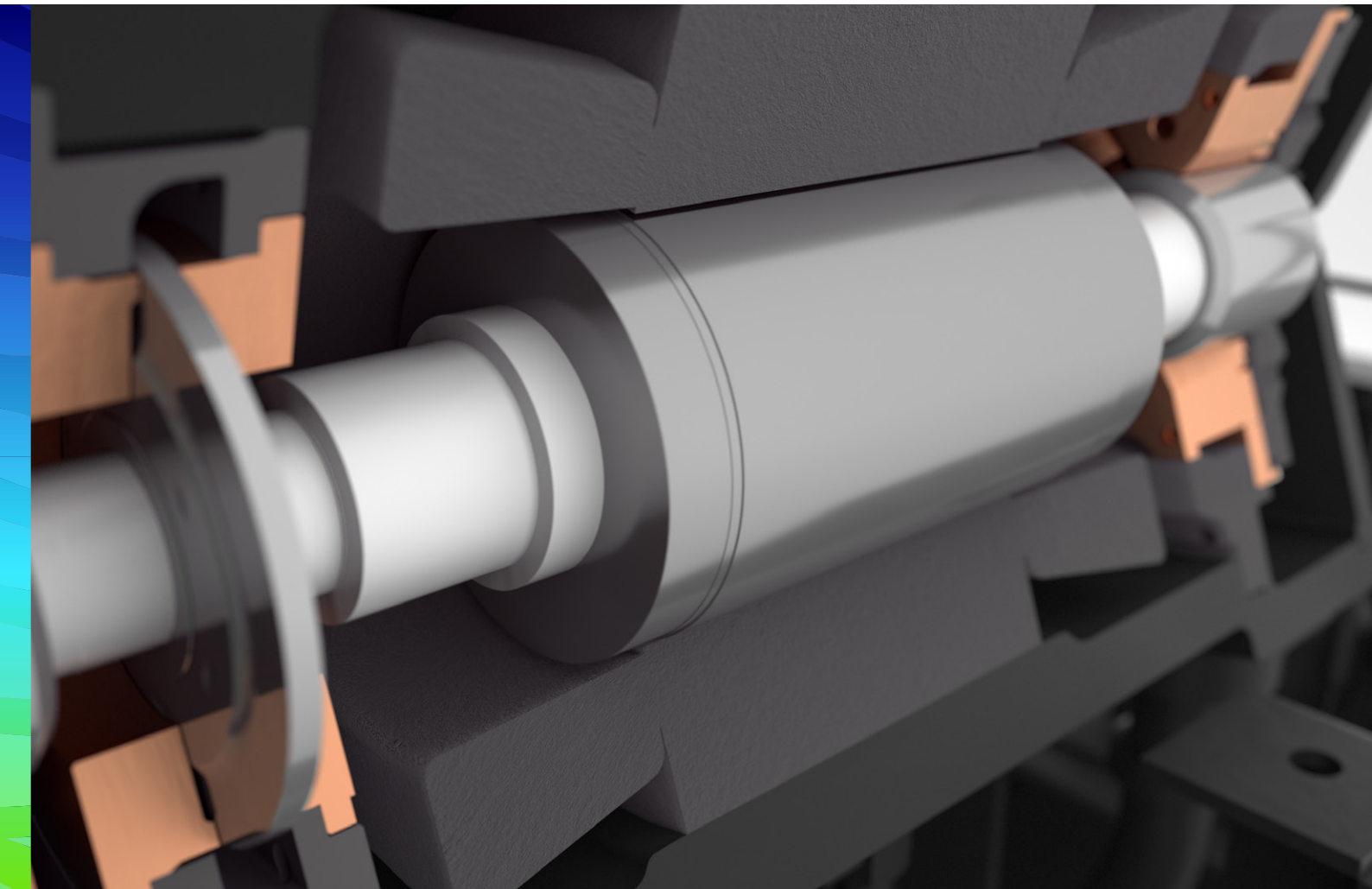
In mission-critical and temperature-sensitive processes and applications, uptime is important. The YORK® YVAM uses a suite of proven innovations and technologies to help ensure sustained operation. For example, its VSD eliminates harsh inrush currents, while our Quick Start feature provides the fastest chiller restart following a power failure. In fact, the YVAM can return to full load in as little as three minutes after power is restored by keeping the agnetic bearing controller, control panel and VSD control circuits energized via integral emergency power management system. This proven technology is included on all our magnetic bearing chillers, including the renowned YORK® YMC² and YORK® YZ.

Optimized for
Ultimate Performance

The design premise for the YORK® YVAM was simple: Don't just make a new chiller – make the best chiller for specific data center applications for our customers. This was accomplished through a holistic approach to system design and engineering, optimizing every component around a carefully selected next generation refrigerant for ultimate performance.

Magnetic driveline superiority

The YORK® YVAM uses an purpose built variable speed drive and advanced magnetic bearing technology to deliver extraordinary efficiency, superior durability, simplified maintenance and a wider operating envelope than any chiller using oil- or refrigerant-lubricated compressor bearings. This driveline features a single moving assembly suspended in a magnetic field that does not require lubrication. With 80% fewer moving parts than traditional oil- or refrigerant-lubricated drivelines, longevity is enhanced and maintenance is reduced.



Designed for critical applications

It's essential to maximize chiller uptime for mission-critical, temperature sensitive applications. Data centers and high-value connected loads face a constant threat of violating service level agreements, equipment failures and lost production, all of which cost money. Owners and operators must have confidence in the equipment serving their processes.

Reduce risk of cooling disruption

Quick Start saves both time and money by:

- Reducing time for chiller restart after a power failure
- Rapidly bringing the chiller back to pre-power failure operating capacity
- Maintaining temperature of critical spaces and equipment
- Lowering the risk of damage to temperature-sensitive equipment

Since uptime is vital, Quick Start is included as standard on all YORK® YVAM magnetic bearing centrifugal chillers.

Smarter power management

YVAM chillers include an integral emergency power management system, which ensures critical systems remain energized through a power outage. During a power failure, the magnetic bearing controller, Optiview Panel and OptiSpeed variable-speed drive control circuits remain energized until an emergency generator is activated. This eliminates the need for a control panel reboot, so the chiller is able to restart the moment power is restored and compressor coastdown is complete.

Variable Speed Drive

- Standard product meets IEEE-519 requirements
- Active front end ensures TDD is kept below 5%
- Displacement power factor 0.97 or better
- Delivers highest part load efficiency for real-world energy savings at off-design conditions
- Near-zero in-rush increases motor life
- Liquid cooled to reduce maintenance costs

Magnetic-Bearing Technology

To eliminate mechanical-contact losses in the driveline, the YVAM chiller utilises a permanent-magnet motor and active magnetic-bearing technology.

Modernized Controls

- Full screen display and graphics
- Panel keeps record of shutdowns in memory
- Remote control through BAS:
  - BACnet
  - ModBus
  - N2
  - LON
- Continuous system monitoring
- Trending data with ability to customize points

Faster restarts, faster loading

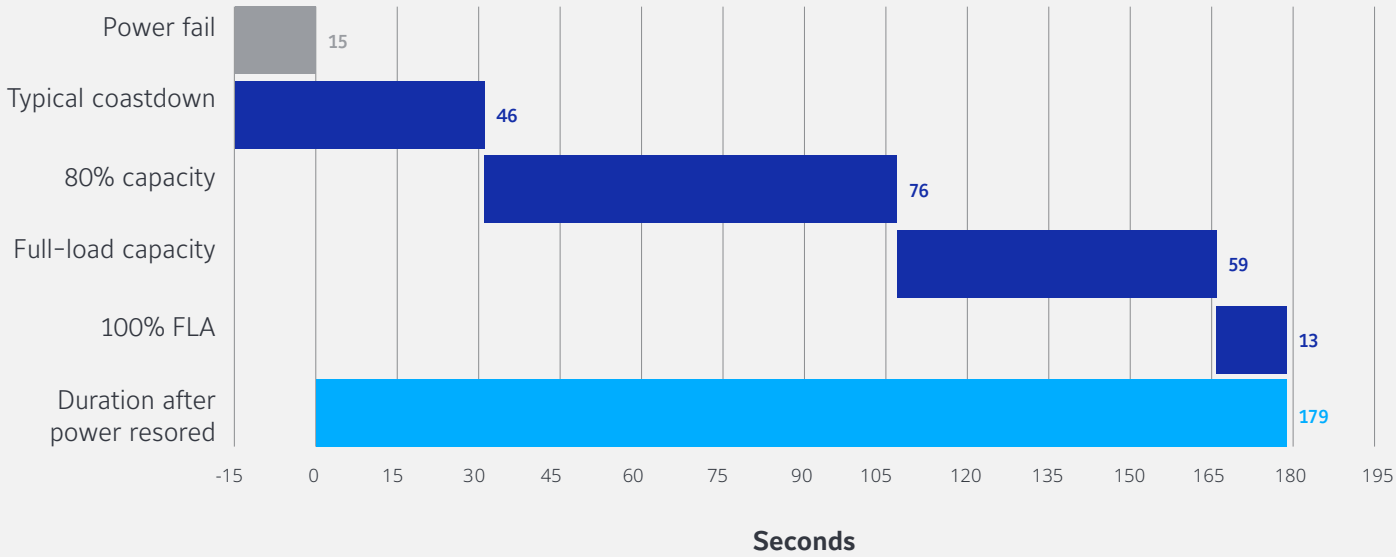
The YVAM air-cooled centrifugal chiller offers exceptionally fast restart times while precisely controlling to setpoint. This means your chiller will return to its original operating conditions more quickly, ensuring your facility experiences reduced downtime. YVAM chillers can return to pre-power failure operating capacity in as little as three minutes once power is restored.

Several factors can alter or improve the recovery times of a chiller with the Quick Start feature, including the specific chiller configuration, the duration of the power interruption and the operating condition prior to a power failure.

Ask for a demonstration test

We'll be happy to set up a demonstration test so that you can see for yourself the restart times and capacity recovery for your specific chiller, design parameters and length of power failure. To arrange your demonstration and for details on a YVAM chiller with the Quick Start feature, or to learn more about more Quick Start features, contact your local Johnson Controls branch today.

Figure 1 – Example of restart and capacity recovery time for a YVAM chiller after 15-second power failure



Reliable design

- YVAM was designed and built using flagship products (YMC² and YVAA/YVFA) which have been **rigorously tested** in several applications globally over the last 10+ years. N+2 is sufficient; 2N redundancy is not required
- Flexible and simple design **needs no oil** to support magnetic bearing compressors, needs no free-cooling coils and uses a single refrigerant circuit to produce **1.5+ MW of cooling**
- **Quickstart** feature using on-board UPS reduces the required thermal storage capacity
- **Low sound power level** allows the data center owner and operators to be good corporate citizens and meet the Municipal Noise Control Ordinances during daytime and nighttime

Secure uptime

- While the HVAC system of a data center is designed to **provide uptime at extreme weather and design operating conditions**, the benefits of the YVAM are even better at real world ambient conditions (highest bin hours) and part-load conditions
- YVAM is designed on a **global product platform** and localized for the individual markets. This allows for localized manufacturing and support, global supply chains and global adoption of best practices
- We don't need to overdesign the cooling architecture of the data centers to guarantee uptime. We can ensure reliability and uptime by **using right-sized equipment with a wide operating map and intelligent operating sequences**

High efficiency

- Designed specifically for the current and future needs of the data center vertical, the YVAM operates efficiently at all real **world data center design conditions**
- **Chilled Water Reset** may be used to right size the cooling infrastructure. Rather than overdesign the chillers for the hottest day in 20 years, the chillers may be selected for an average summer and use techniques like virtualized servers, running redundant chillers and dynamic chilled water setpoint to monitor and maintain capacity during extreme weather conditions / events
- **Modernized controls and communication protocols** allow Chilled Water Reset, in conjunction with YORK Computer Room Air Handler (CRAH) design. On a hot afternoon, the chilled water setpoint may be raised to maintain chiller capacity and deliver the design cooling capacity. When the ambient temperature is very low, the chilled water setpoint can be lowered to save motor power in the CRAH fans and the server fans

Carbon neutrality and sustainability

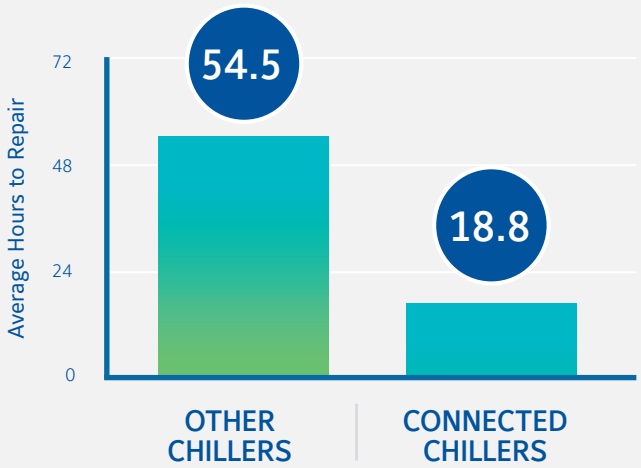
- The YVAM is lighter and can produce economization or free-cooling-like efficiencies in the absence of the weights and pressure drops associated with free-cooling coils. The carbon footprint of the chiller, building structural steel, transportation and manufacturing processes are smaller
- **Renewable power** should be used as much as possible and the use of fossil fuels and water for power generation should be minimized. Renewable power is a precious commodity, so lowering annual power consumption by infrastructure equipment (power and cooling) is important
  The base refrigerant used by the YVAM is R-1234ze with **a low global warming potential (GWP) of 7**
- YVAM can provide chilled water as low as **17°C for cooling air-cooled servers** using aisle containment. YVAM can also produce **32°C chilled water for liquid-cooled servers.** So, the same equipment may be used as the server architecture changes in the future. This increased product **lifecycle reduces the landfill waste** associated with replacing cooling infrastructure
- **No water consumption** in the YVAM supports the growing importance of water usage effectiveness (WUE) and the conservation of water as a precious commodity

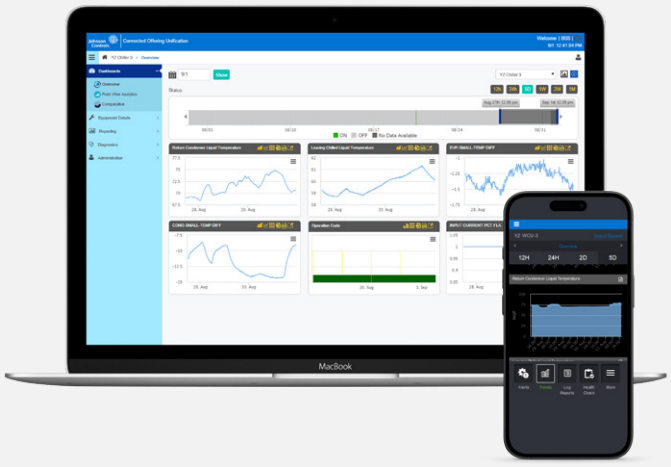
Long-Term
Peace-of-Mind

Through a secure connection, our available Smart Connected Chiller technology uses a cloud-based analytics platform that combines remote monitoring and predictive analytics to proactively diagnose issues and reduce downtime – resulting in a 65% improvement in mean time to repair and a 66% average reduction in unplanned shutdowns versus other chillers. When maintenance is required, you can rely on our global network of over 15,000 technicians operating from more than 500 branch offices in 150 countries to provide any necessary on-site service. As the world's leading provider of HVAC equipment, controls and services, you can count on YORK® to minimize downtime and safeguard your system's performance for the long haul.

65% Improvement in Mean Time to Repair

Greater Uptime





Industry-leading remote monitoring and cloud-based analysis give 24/7 access to chiller trend data and predictive analytics. And that means less time to repair, fewer shutdowns and superior total uptime.

The New Definition of Sustainability

True sustainability means the lowest total emissions from beginning to end. Adapting a chiller design to a new refrigerant is not enough. That's why the YORK® YVAM was specifically designed to maximize the potential energy efficiency of a low-GWP refrigerant. Our design optimization for the highest possible efficiency combined with a low-GWP refrigerant makes the YORK® YVAM Centrifugal Chiller the best choice for the environment.

The right refrigerant choice

In selecting a low-GWP refrigerant for the groundbreaking YORK® YVAM, we considered safety, efficiency, availability, environmental impact and cost. The YORK® YVAM was then built to have better efficiency at all design conditions, resulting in total direct and indirect emissions that are impressively low – and performance that is exceptionally high.

From the name you trust

YORK® has built a reputation of delivering chiller systems proven to be the best at operating efficiently in realworld conditions. We engineer and fully optimize our own solutions rather than package components from 3rd party suppliers. We have a long history of leadership in the aerodynamic engineering of centrifugal compressors, we pioneered the variable-speed drive (VSD) for use in chillers and we were the first to offer a chiller with inverted temperature operation.

We patented falling film evaporator designs that improve heat exchanger performance while reducing refrigerant charge, and our patented control logic provides better turn-down and quickly responds to changes in building load to improve efficiency. We have successfully transitioned in the past from one refrigerant to the next with fully optimized, long-term solutions. And we've installed YORK® magnetic bearing technology like that found in the YORK® YVAM for thousands of customers since we first introduced the technology – including many in mission-critical applications like data centers, manufacturing facilities and naval ships.

Confidence for today, and tomorrow

When you invest in a chiller from YORK®, you're getting a solution from the chiller experts. We build chillers designed to perform optimally in the conditions in which they will operate while maximizing the benefits of environmentally responsible refrigerants. We make decisions based on your business and provide the widest variety of water- and air-cooled industrial and commercial chiller solutions and services in the market. With a wider operating envelope for exceptional efficiency, low-GWP refrigerant for superior sustainability and magnetic bearings for class-leading reliability, the YORK® YVAM is a perfect example of this philosophy. Only one company makes a chiller like this because only one company can. The YORK® YVAM Magnetic Bearing Centrifugal Chiller is tomorrow's chiller, available today.

The Power
of Partnership

Johnson Controls provides a comprehensive, single point of contact for mission-critical facilities. This total-solution approach delivers increased building efficiency and proven reliability across HVAC, building management, fire, security and building optimization systems.

The YORK® YVAM Air-Cooled Magnetic Bearing Centrifugal Chiller is a prime example of how our deep experience in delivering integrated solutions leads directly to real-world results.

With a wider operating envelope for exceptional efficiency, smarter control to maximize uptime and a magnetic driveline for class-leading reliability, the YORK® YVAM sets a new standard for hyperscale and colocation data center chiller performance – and it's just one more reason having the right partner makes all the difference.

About Johnson Controls:

At Johnson Controls (NYSE:JCI), we transform the environments where people live, work, learn and play. As the global leader in smart, healthy and sustainable buildings, our mission is to reimagine the performance of buildings to serve people, places and the planet.

Building on a proud history of 140 years of innovation, we deliver the blueprint of the future for industries such as healthcare, schools, data centers, airports, stadiums, manufacturing and beyond through OpenBlue, our comprehensive digital offering.

Today, Johnson Controls offers the world`s largest portfolio of building technology and software as well as service solutions from some of the most trusted names in the industry.

About YORK:

As part of Johnson Controls, YORK is a global leader in designing and manufacturing innovative HVAC solutions. Known for its reliability and energy efficiency, YORK provides state-of-the-art chillers, heat pumps, air handling units, fan coils, and HVAC systems tailored to meet the needs of various industries, including commercial buildings, data centers, healthcare, and industrial applications.

With a proud history dating back to its founding in 1874, YORK brings 150 years of expertise to delivering cutting-edge HVAC solutions. With a focus on sustainability, YORK products are engineered to optimize performance while minimizing environmental impact, aligning with Johnson Controls' mission to create smart, healthy, and sustainable buildings.

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The power behind **your mission**