YORK®

Sound reduction solutions for air-cooled chillers

The power behind **your mission**

Johnson Controls

Accurate sound data for all YORK® air-cooled chillers

Quiet operation in air-cooled chillers is critical in many commercial and industrial applications. In order for HVAC system designers to meet the sound requirements of any air-cooled chiller application, there must first be a reliable source of available sound data for the chiller products that will be analyzed for selection.

YORK® air-cooled chillers are tested in accordance with AHRI 370, ISO 3744 and ISO 9614. The sound data published in YORK air-cooled chiller product documentation is based on accurate measurements captured during extensive testing across the entire map of operation in some of the world's most advanced chiller test laboratory facilities. The sound data for a YORK air-cooled chiller is accurate and third-party validated.

HVAC designers can use this trustworthy data for most applications where sound levels are an important factor.

Some applications are so critical that more specific sound data is required. Expected variations in sourced components and manufacturing processes can and do result in slightly different sound profiles between otherwise identical products. Johnson Controls provides an additional level of sound value assurance through an optional factory sound test during which the sound levels of a specific air-cooled chiller can be measured and documented after the manufacturing process is completed and just prior to project delivery. This optional service is available through your Johnson Controls HVAC sales representative.

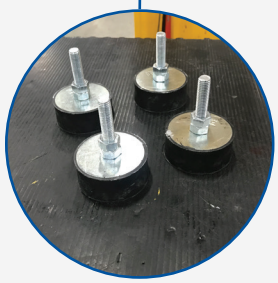
Engineered components designed for quiet operation

Fan motor/blades

Air management is provided by specially matched fan motor/fan blade sets that are positioned within partitioned condenser sections. This enables control over the sound of discharged air.

Screw compressor discharge

On screw chillers, the main discharge gas lines between the compressor and oil separator are fitted with a specially formulated, high-density, inorganic polymeric material that dampens sound transmission.

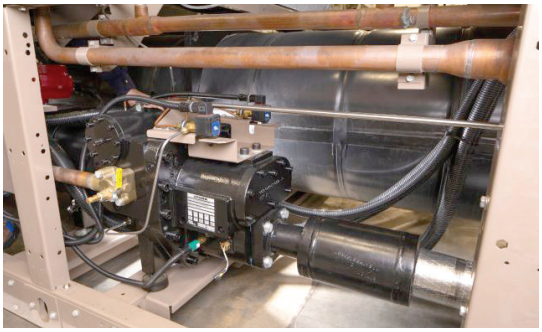


Compressor isolation

Fitting resilient elastomers under the compressor feet minimizes vibrations being transmitted to the frame. This enhances the low-sound operation of the unit.

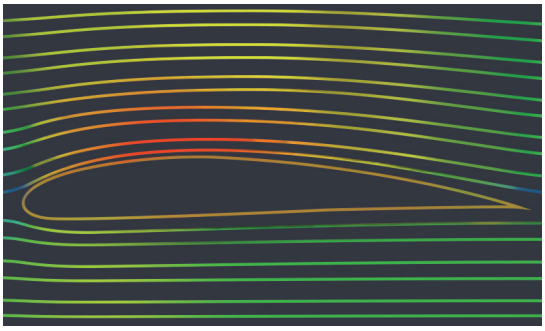
Compressor discharge muffler

Screw chillers include an acoustically tuned internal muffler matched to the compressor that harnesses discharge gas pulsations for greater sound attenuation.



Compressors

The design of the screw compressor casing was developed using finite element analysis software to minimize sound and vibration during operation. The compression volume ratio of the compressor is optimized for operating conditions to further cut down both sound and vibrations. In addition, acoustically tuned mufflers are a standard feature on all screw compressor chillers to reduce noise from the discharge of the compressor. The scroll compressor discharge casing has also been carefully designed to muffle discharge noise.



Condenser fans

YORK® air-cooled chillers are equipped with low-noise condenser fans as a standard feature. Standard condenser fans are designed with airfoil-shaped blades to provide optimal efficiency and low noise levels. The fan shroud and fan blade design have been optimized to provide a superior combination of low noise and high efficiency, with pitch angle, motor support distance, and the number of blades and motor supports all taken into account. No detail is overlooked.

Variable speed drive controls

Variable speed drives on compressors and fans reduce their speed as the cooling capacity demand from the chiller decreases during the day and night. The reduction in compressor and fan speed also reduces the noise generated by the chiller and helps to achieve the lowest sound levels possible while maintaining optimal efficiency levels. YVAA and YVFA air-cooled chiller controls are also equipped with a sound-limiting feature that can be used to limit the noise of the chiller during the most sound-sensitive periods of the day. This mode allows a chiller operator to set a limit on the maximum sound level the chiller can produce. When the chiller enters the sound-limited mode and when it returns to the normal operating mode can be scheduled in the chiller control interface.

Acoustical lagging covers

Screw compressors create tonal noise during operation. Chillers with screw compressors are equipped with specially formulated high-density acoustical lagging material that dampens sound transmission from components on the chiller, including the suction and discharge piping and oil separators.

Vibration isolation

YORK® screw and scroll compressor chillers use specially designed neoprene isolators under the compressor base to significantly reduce the transmission of vibrations from the compressor to the chiller frame.

All YORK chillers can also be fitted with vibration isolators mounted under the chiller base frame to further reduce vibrations making their way into the mounted structure.

Solutions for meeting the most demanding low-noise environments

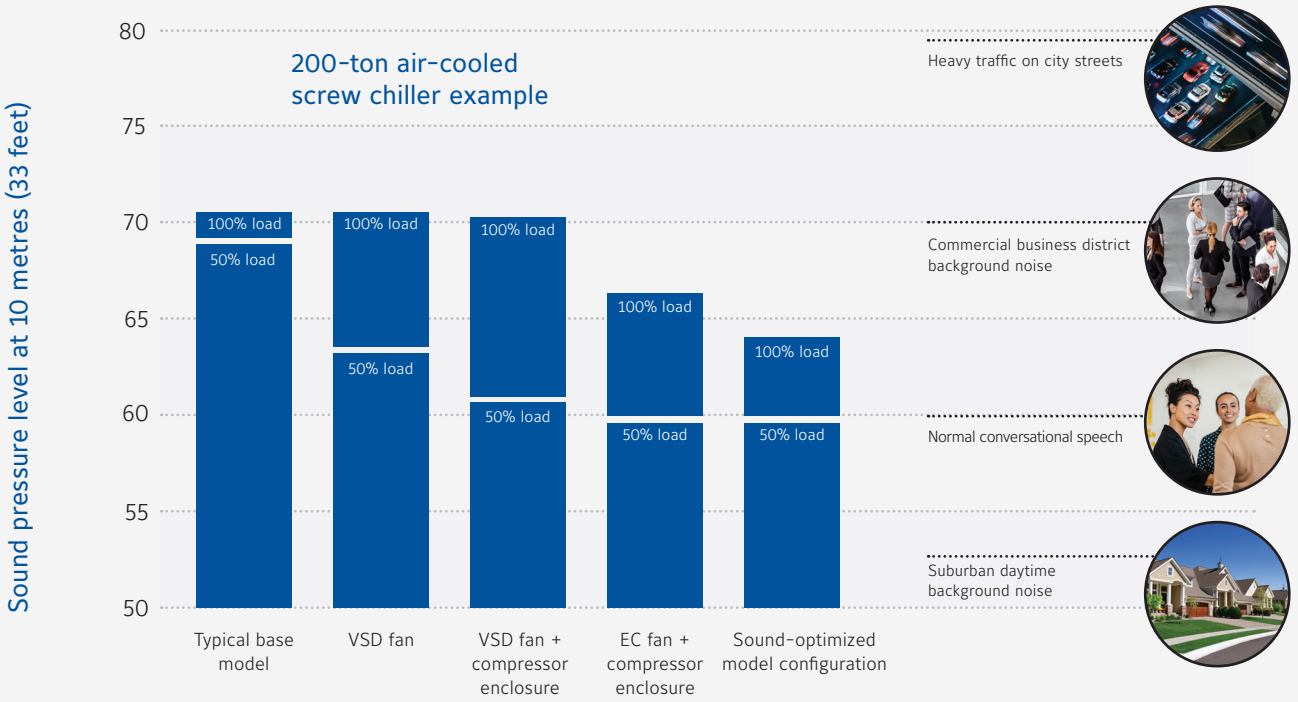
Sometimes the situation at a site calls for additional measures to reduce the impact of noise from the chiller on the surrounding environment and neighbors. YORK® air-cooled chillers can be equipped with special options to meet site-specific noise requirements and property boundary regulations or to maintain comfortable chiller operation during more sound-sensitive periods of the day and night.

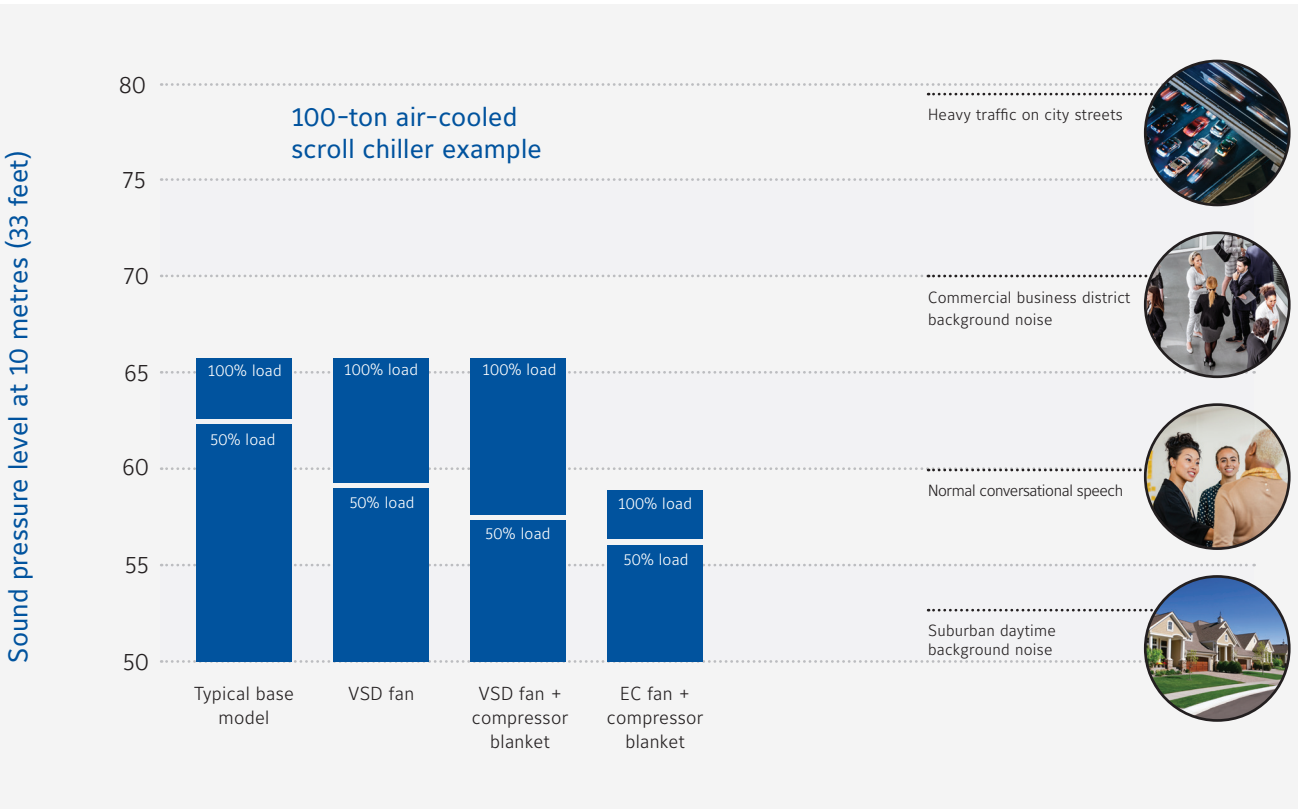
Compressor noise reduction

Humans are most sensitive to the working noise generated by the compressors on air-cooled chillers. Compressor sound-attenuation options help to reduce that tonal noise. Air-cooled screw chillers can be equipped with compressor sound enclosures with rigid walls lined with absorbent material. Air-cooled scroll chillers can be equipped with sound-attenuation blankets on each individual compressor.

Condenser fan noise reduction

The EC condenser fan option provides a premium solution for applications where minimizing sound generated by the fan is needed to meet the strictest noise requirements. The design of the fan shroud, fan blades, motor, and motor supports have all been optimized to provide optimum levels of low noise and high efficiency. EC fans also have forward-swept blade designs that generate less tonal noise than conventional fan blade designs.


Sound pressure level at 10 metres (33 feet)
80
75
70
65
60
55
50
200-ton air-cooled
screw chiller example
100% load
50% load
Typical base model
VSD fan
VSD fan + compressor enclosure
EC fan + compressor enclosure
Sound-optimized model configuration
Heavy traffic on city streets
Commercial business district background noise
Normal conversational speech
Suburban daytime background noise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scroll chiller example
100% load
50% load
Typical base model
VSD fan
VSD fan + compressor blanket
EC fan + compressor blanket
Heavy traffic on city streets
Commercial business district background noise
Normal conversational speech
Suburban daytime background noise

A systematic approach to achieving economical sound reduction

It is important to understand the relationship between the measurement of sound in decibels (dB) and the perception of sound levels in the human ear when evaluating sound-reduction solutions. Table A helps you understand the differences in sound levels.

Difference in Sound Level	Perceived Change to the Human Ear
1-2 dB	No perceptible difference in sound level
3 dB	Threshold of human perception of a difference in sound level
6 dB	Clearly noticeable difference in sound level
10 dB	Human perception is twice as loud

The following systematic approach to applying noise reduction features helps to achieve the most effective and economical solution for meeting sound requirements:

- **Include a variable speed drive (VSD) option for the condenser fans** to ensure they are operating as quietly as possible at off-peak load conditions. VSD fans can help to reduce overall chiller noise levels at 50 percent load operating conditions by as much as 4-5 A-weighted decibels (dBA). For YVAA and YVFA air-cooled screw chillers, make use of the standard SilentNight control feature to limit chiller noise during the most sound-sensitive periods of the day.
- **Add a compressor sound enclosure or compressor sound blanket option** to reduce noise from the compressor casing. A compressor enclosure/blanket alone can reduce overall chiller sound levels by 1-2 dBA at full load operating conditions. At 50 percent load conditions, the compressor enclosure can help to cut sound levels by as much as 5-6 dBA when paired with VSD fans.
- **Equip the chiller with a vibration isolator kit** to minimize transmission of vibration and noise from the chiller into the structure or building on which it is mounted.
- **Use the EC fan option to provide premium fan efficiency and low sound levels.** When paired with a compressor sound enclosure or blanket kit, the EC fan option can help to reach overall chiller sound level reductions of 4-6 dBA at full load operation and 9-10 dBA at 50 percent load operation.
- In addition to the optional sound reduction kits, YORK® YVAA air-cooled screw chillers can be specially configured by the sales engineering experts to be optimized for low-sound operation at a specified design capacity. A combination of components on the unit package can be specially matched to minimize the sound of the chiller to meet a specific sound level limit. An optimized model configuration can operate anywhere from 2-4 dBA quieter than a non-optimized configuration.

Contact your Johnson Controls HVAC representative today to discuss how we can help you meet the sound levels required in your application.

YORK®

About Johnson Controls

Johnson Controls is making the world safer, smarter and more sustainable – one building at a time. Our technology portfolio integrates every aspect of a building – whether security systems, energy management, fire protection or HVACR – to ensure that we exceed customer expectations at all times. We operate in more than 150 countries through our unmatched network of branches and distribution channels, helping building owners, operators, engineers and contractors enhance the full lifecycle of any facility. Our arsenal of brands includes some of the most trusted names in the industry, such as Tyco®, YORK®, Metasys®, Ruskin®, Titus®, Frick®, PENN®, Sabroe®, Simplex® and Grinnell®.

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