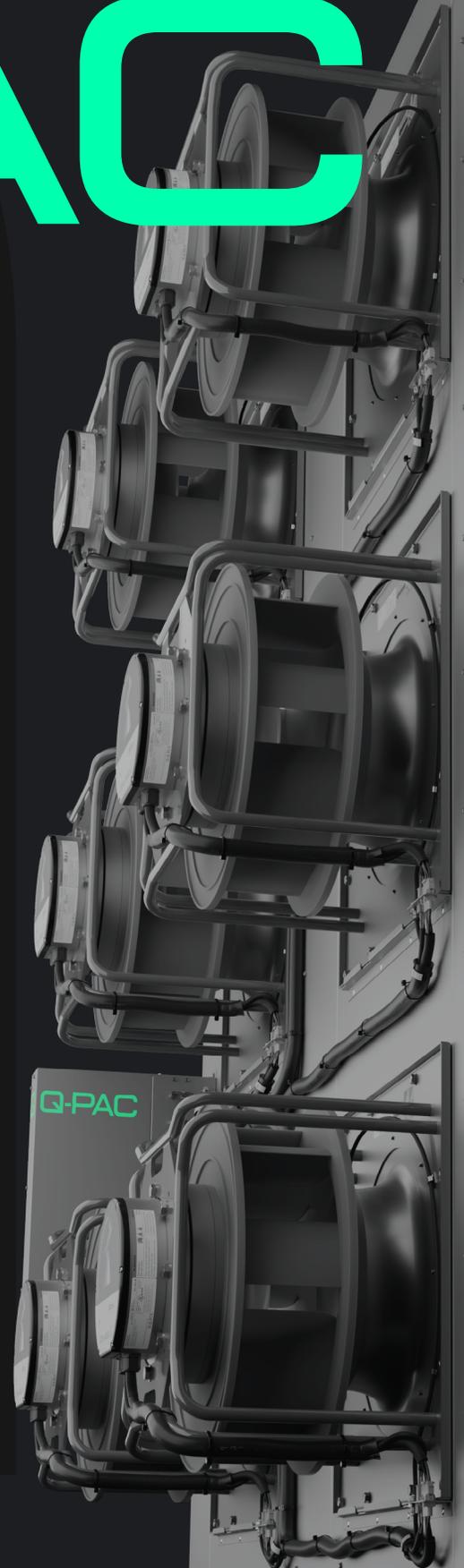


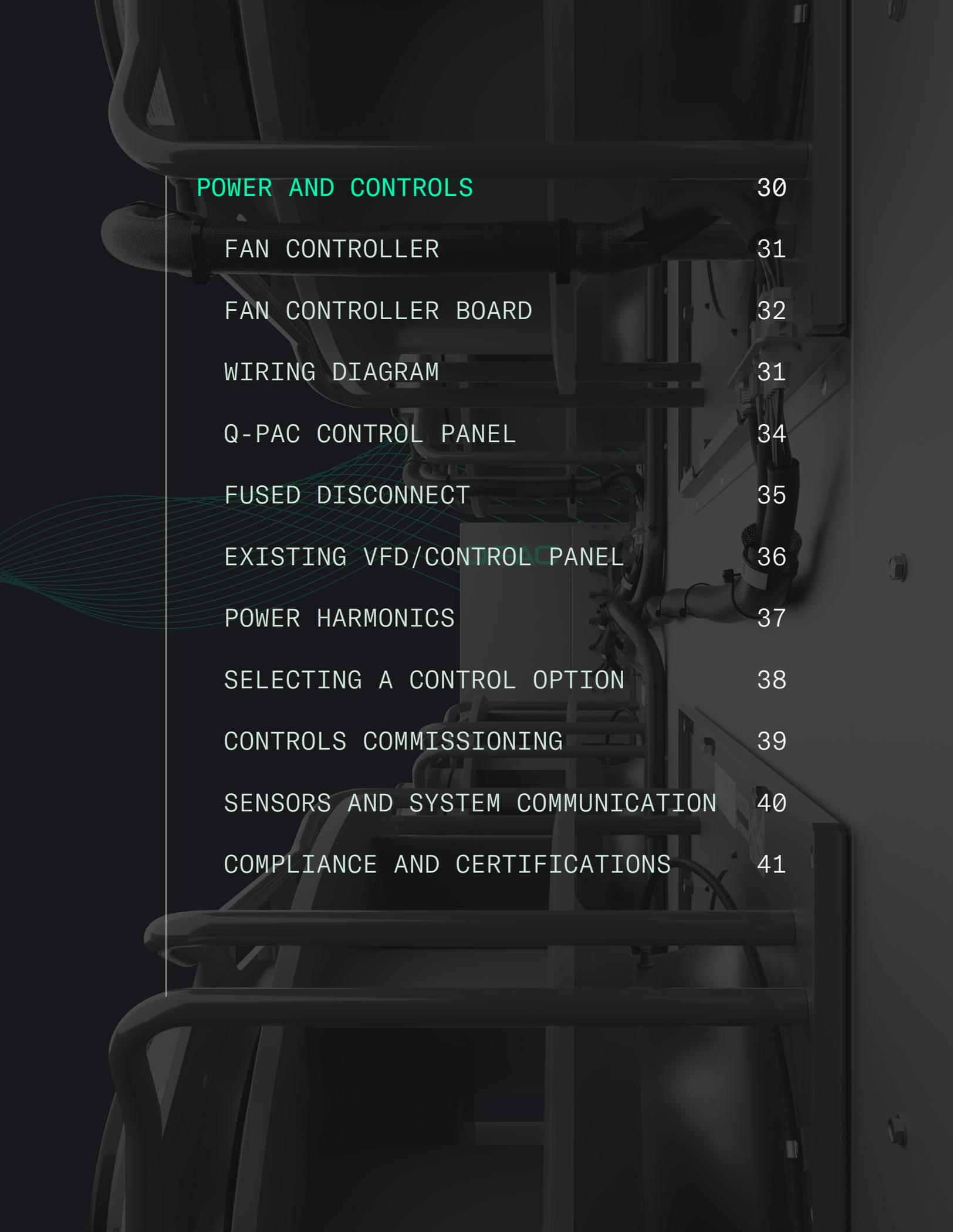
Q-PAC

FAN APPLICATION GUIDE



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ABOUT Q-PAC

Q-PAC is a fan company.

Our team believes that today's fans are creating endless and costly complexities. This is what inspired us to create a smarter fan for commercial air handlers that reduces complexities and simplifies operation. Forever. We believe that moving air should be simple and our team continues to challenge legacy thinking and technology through pioneering research, elevated design, and a passion for efficiency. We're a team of innovators—industry veterans and young minds alike—all pulling together to move air like never before.

Guided by four core values – curiosity, relentlessness, agility, and passion – Q-PAC continues to invest in people to inspire growth and innovation. By fostering a team truly connected to the mission, Q-PAC is building a foundation for long-term product innovation and industry evolution.

Great Place to Work-certified™, Q-PAC believes in fun as much as productivity. An accessible, open-office atmosphere fosters open conversations and cooperation. Q-PAC emphasizes blended workspaces and out-of-office team building activities to develop strong collaboration.



THE MULTIMOTOR PLENUM FAN

The goal of comfort cooling is to have a livable, comfortable environment at all times. The challenge is that fans inevitably fail, often at inopportune moments. Fan arrays were intended to mitigate this issue by sharing the load across several fans, but ultimately introduced more complexity in the design, installation, and operation of the fan system. The multimotor plenum fan (MPF) is a new type of fan, combining the simplicity of traditional single-motor blowers and plenum fans and the reliability of fan arrays, resolving the trade-off between these fan types.

SINGLE DEVICE

A key advantage of single-motor fans is a single point for power and control—one point of interaction for the BMS. Fan arrays often require a proprietary external panel to facilitate this, but the MPF condenses this architecture internally, allowing it to pair directly to the BMS or chosen control device without an external control panel.

RESILIENCY

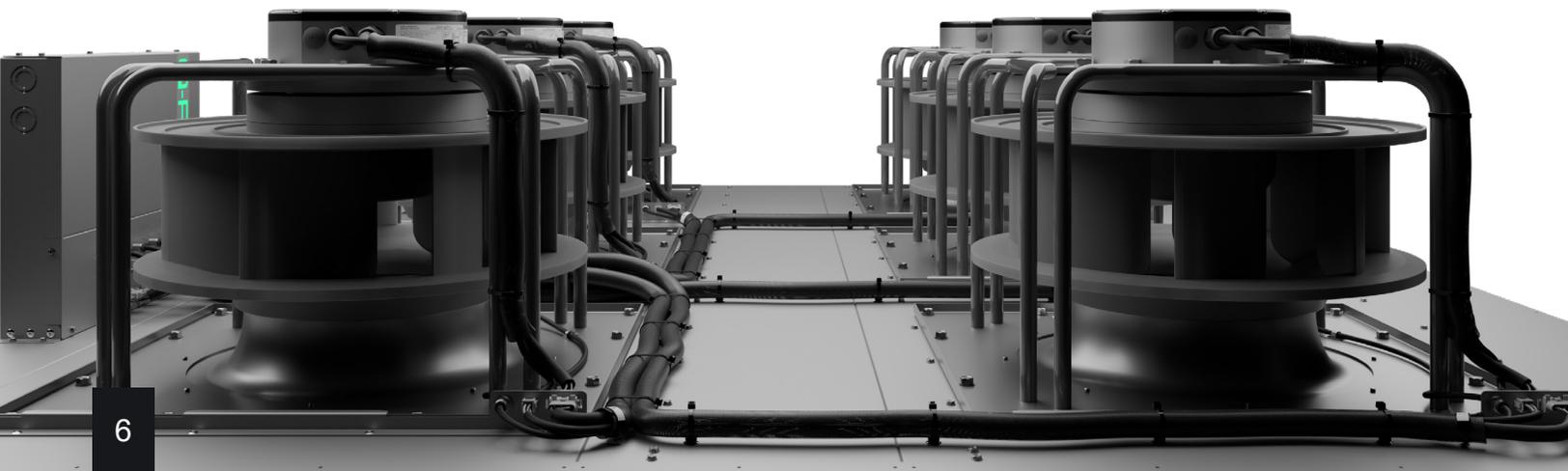
This is the downside of single-motor fans and the advantage of fan arrays. If a single-motor fan fails, airflow is lost without redundancy. This is the appeal of fan arrays. The MPF maintains this ability through the multimotor design; when one motor fails, the fan speed can increase to maintain the system airflow. Resiliency means continuous airflow.

UNISON OPERATION

A single device means that each motor is controlled simultaneously. The MPF receives one control signal and operates each motor individually. While fan arrays have to achieve the same control, this is typically requires an external control panel.

VERIFIED PERFORMANCE

The advantage of single-motor, single-fan systems is proven performance. Conversely, fan arrays often combine on a theoretical, extrapolated performance of a singular fan. This results in ambiguous performance when a fan fails. The MPF establishes a verified, tested performance curve to remove the unknowns.



“New” doesn’t have to be difficult. The tables below give a comparison of the multimotor plenum fan (MPF) and existing fan technology.

	SINGLE-MOTOR FANS	FAN ARRAY	MPF
SINGLE DEVICE	The motor, often paired with a variable frequency drive (VFD) serves as the single point of power and control. By design, these fans are typically only available as a single assembly for installation (as opposed to knockdown).	Typically rely on a proprietary control panel to serve as the single connection point. Commonly require wiring to each motor and field assembly and fabrication.	An intermediary device on the fan serves as the connection point for power and control. Motors are pre-wired for simple installation. Available as a singular assembly for fast installation.
SPEED MODULATION	Typically use AC motors for higher horsepower, and therefore rely on a VFD to control the motor speed.	Speed control relies on an external device, either a VFD or proprietary control panel depending on the use of AC or EC motors, respectively.	Using EC motors for better efficiency across the full range of operation, the fan accepts a speed control signal directly.
RESILIENCY	A single motor, single impeller means that failure results in lost airflow. Solving this issue requires installing a redundant fan for twice the cost, or more.	Fan arrays established the practice of dividing the airflow across multiple fans so that fan failure did not result in lost airflow.	The multimotor design continues the concept of shared load to ensure sustained airflow in the event of motor failure.
REPAIR AND REPLACEMENT	Often attributed with a long lifespan, components often require specialty machining or skilled labor for repair. Their relatively large size makes them impractical for replacement in urban and critical applications.	Fan arrays are often modular by design, making them ideal for replacement applications; however, that same design often requires significant disassembly and technical knowledge to replace and address motors/impellers.	Designed around the concept of motor replacement, repairs are typically simple. As with fan arrays, the use of multiple motors encourages a modular design or knockdown assembly, making them ideal for fan replacement.

THE Q-PAC MULTIMOTOR PLENUM FAN



**SMART FAN
TECHNOLOGY**

**ADAPTIVE
FRAME**

**KNOCKDOWN &
ASSEMBLED**

**AUTOMATED
DESIGN**

The Q-PAC Multimotor Plenum Fan, referenced simply as the Q-PAC Fan, is an evolution in Q-PAC's history of producing traditional fan arrays. By expanding functionality of the Fan Controller to support basic analog connections and standard communication protocols, the Q-PAC Fan is no longer dependent on the Q-PAC Control Panel. Now established as a single, simple device, it is able to function interchangeably with other fan technology.

As the pioneer multimotor plenum fan, it exhibits the base features of the fan type, but also offers the following features to simplify fan ownership and operation.

The Fan Controller does more than just distribute power and control to each motor of the MPF. The Q-PAC MPF is a smart fan and the Fan Controller is its brain. The Fan Controller receives feedback from each motor allowing it to check motor status, calculate the airflow across each impeller, and manage fan alarms. In addition to supporting simple analog connections for power and controls, the controller supports Modbus communication with even more features in development.

Many fan arrays use standard-sized cubes or fixed configurations, requiring onsite fabrication to seal gaps and complete the pressure wall. The Q-PAC Fan eliminates this step with custom sheet metal panels sized to fit each application, allowing it to serve as the air handler's pressure wall without field modifications. It mounts directly to an existing flange in the air handler when available; otherwise, included Perimeter Angles act as an adapter for easy installation.

While the Q-PAC Fan is commonly installed in new air handling units, Q-PAC's fan systems have been used in field applications for almost a decade. Designed with interlocking panels and other features supporting rapid assembly, the fan can ship knockdown as a series of pallets with accompanying assembly instructions. The Q-PAC Fan is also available as a factory-assembled device ready for installation—no assembly required.

Q-PAC Fans are designed in a matter of seconds. Our engineers developed a parametric design engine that can optimize motor selections and design the supporting fan frame for any application. Users input a few basic requirements—airflow, dimensions, and power supply—and see their recommended fan and performance details instantaneously. There is no need to wait hours or even days for the manual design of a fan array or needing to settle for a “close enough” fit of a blower's performance in a limited catalog.

PLUG FANS

INTERCHANGEABLE

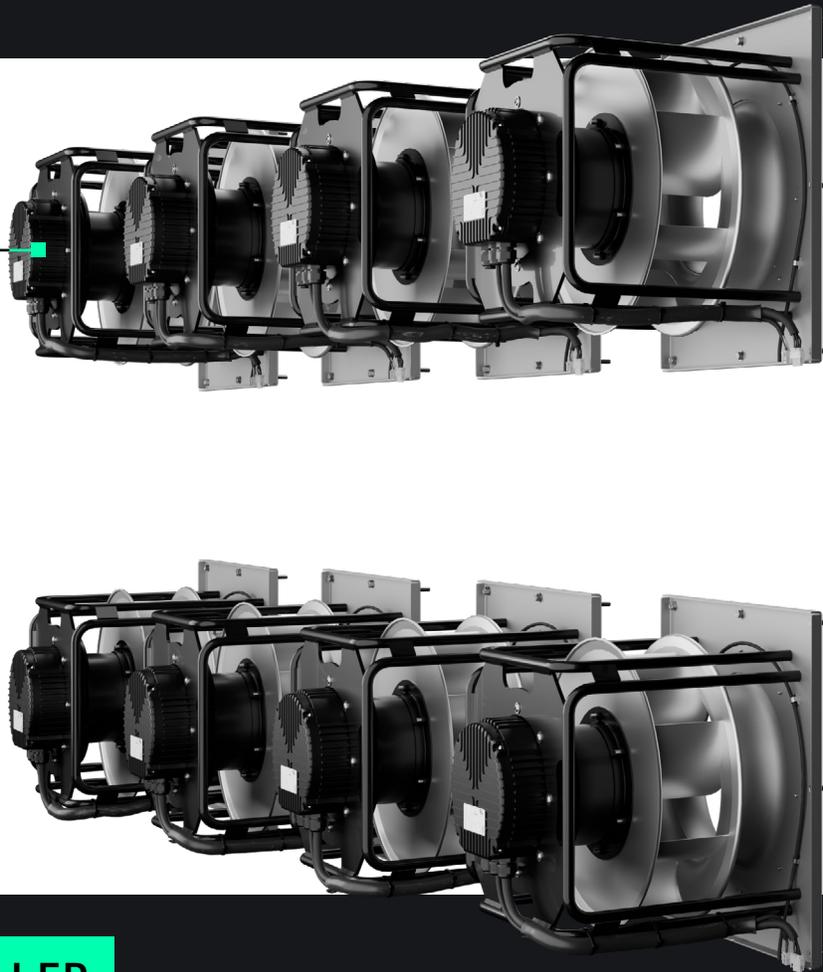
Q-PAC's motor harness standardizes connections across all plug fans of the same model. With no addressing, plug fans can be installed anywhere on the Q-PAC Fan, or on other fans using the same motor.

ECM TECHNOLOGY

The Q-PAC Fan implements electrically commutated motors, eliminating the need for VFDs and creating opportunities for improved control and efficiency. Select models can even mitigate issues with power harmonics.

PRE-WIRED MOTORS

Motors are factory-wired with a unique harness for power and control, terminating in a simple plug connection. A pressure tube monitors the pressure drop across in the inlet cone for airflow monitoring.



FAN CONTROLLER

SINGLE POINT

The Fan Controller serves as the single point of connection for power and controls. There is no field wiring of motors. Motors are connected with plug-and-play harnesses connected back to the Fan Controller.

STANDARD COMMUNICATION

While Q-PAC Control Panels provide the simplest integration of the Q-PAC Fan, they are not required. The Fan Controller supports direct connections over analog and Modbus for control and feedback.

MOTOR PROTECTION

The Fan Controller includes branch circuit protection sized to the connected EC motors (Class CC 15A/20A).

FAN FRAME

ADAPTIVE DESIGN

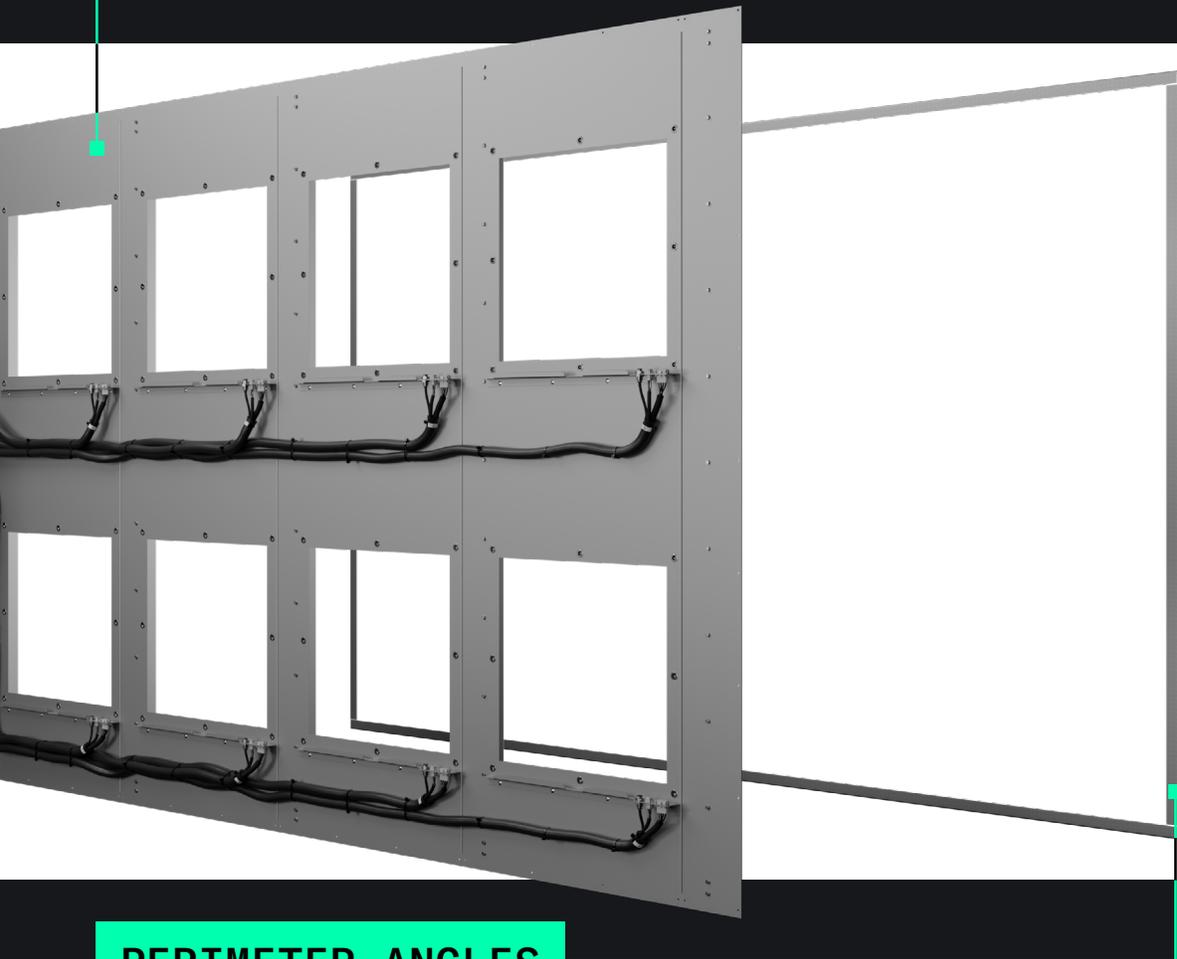
Designed to order, the Q-PAC Fan Frame matches cabinet dimensions. Each Q-PAC Fan can scale up to 150 inches wide and 140 inches tall.

PRESSURE WALL

With the Q-PAC Fan covering the entire span of the air handler, there is no need for field fabrication to cover gaps. The Q-PAC Fan Frame is designed for operating pressures up to 9 inWc.

RAPID ASSEMBLY

From interlocking panels to ledges, rivet nuts, and plug-and-play harnesses, the Q-PAC Fan is designed for rapid assembly and efficient maintenance.



PERIMETER ANGLES

AIR HANDLERS ADAPTERS

The Q-PAC Fan is designed for installation to a flanged surface in the air handler. The Perimeter Angle serves as supplemental adapter for air handlers without a suitable flange.

CUSTOM FIT

Not all air handler walls are perfectly straight—and that's okay. Perimeter Angles are designed to absorb up to 1/2" of dimensional variance. This makes fan installation worry-free, even in older or field-modified units.

VERSATILE INSTALLATIONS

Perimeter Angles enable installation anywhere in the air handler, ensuring optimized performance and maintenance space.

APPLYING THE Q-PAC FAN

IN THE MARKET

The Q-PAC Fan is designed for comfort cooling of commercial spaces—the spaces where people live and breathe.

The Q-PAC Fan is rated for ambient temperatures between 104 °F / 40 °C and -20 °F / -29 °C and non-condensing relative humidities between 5 and 95%. The fan's enclosures are rated IP20 for the Fan Controller and IP54 for all motors.

Typical applications include:

- **COMMERCIAL BUILDINGS**

Office spaces, retail environments, hotels, restaurants, and convention centers.

- **INSTITUTIONS**

Hospitals, healthcare facilities, schools, colleges and universities, and religious centers.

- **ENTERTAINMENT VENUES**

Sports arenas and stadiums, museums, and theaters.

- **TRANSPORTATION FACILITIES**

Airports, train stations, and other transportation hubs.

- **LIGHT INDUSTRIAL FACILITIES**

Warehouses, distribution centers, and clean-room manufacturing.

The Q-PAC Fan is **NOT** intended for:

- Corrosive or explosive environments
- Heavy industrial facilities
- High-temperature applications (above 104 °F / 40 °C)
- Wet or high-moisture environments (such as cooling towers or washdown applications)





FAN REPLACEMENT

The Q-PAC Fan can replace many typical fans currently in service, so long as the following conditions are met:

- 3 Phase power, 200-240V or 440-480V
- Operating static pressure between 1 and 9 inWc.
- Airflow up to 90,000 CFM (single Q-PAC Fan) or 300,000 CFM (multiple Q-PAC Fans)

1



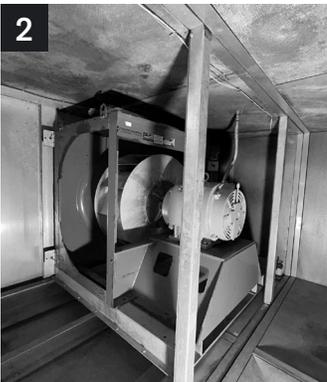
The Q-PAC Fan is commonly used to replace:

- Centrifugal blowers [1]
- Plenum fans [2]
- AC/EC fan arrays and fan walls [3]

The Q-PAC Fan can also replace the following axial fans, though the system may require significant rework—relocating ductwork and installing the fan close to the cooling coils (in a plenum space).

- Tubeaxial fans
- Vaneaxial fans
- Direct drive axial fans

2



3



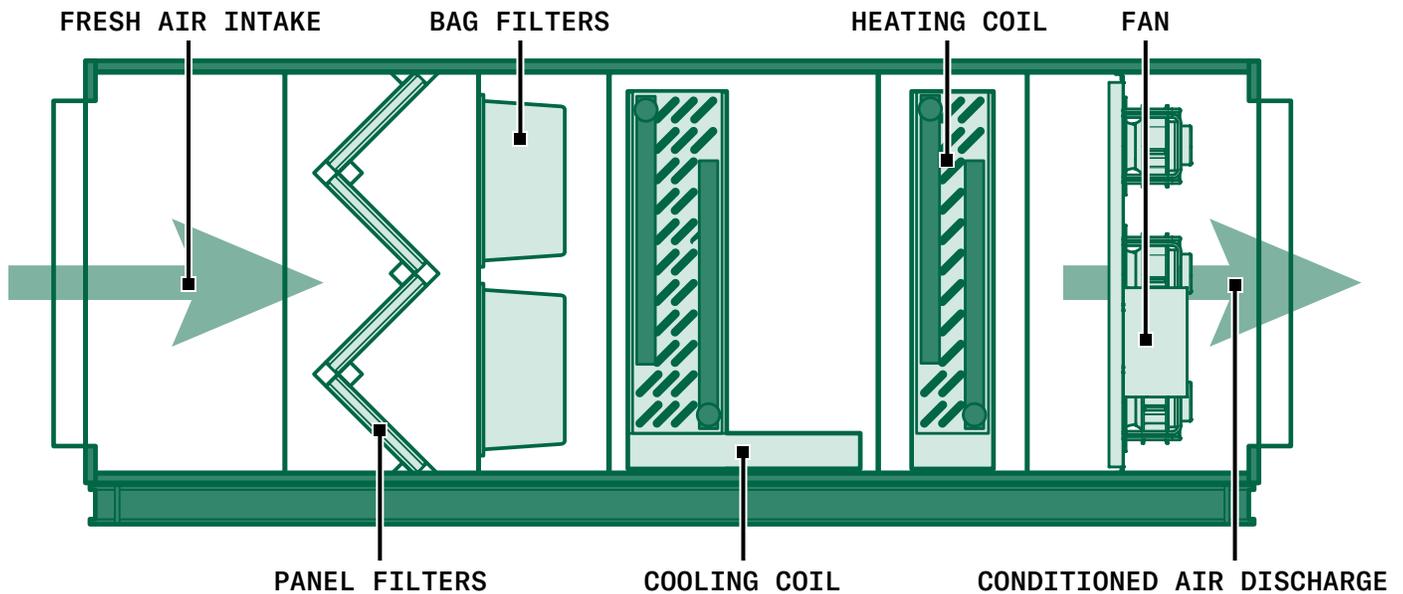
The Q-PAC Fan is versatile, but is not suitable for every application. The Q-PAC Fan is **NOT** recommended for the following applications:

APPLICATION	REASON
<p>HIGH TEMPERATURE FANS</p> <p>Oven/kiln fans, combustion air fans, and furnace/heat-treating exhaust fans</p>	<p>The EC motors used in the Q-PAC Fan are not rated for temperatures above 104 °F / 40 °C</p>
<p>PROCESS OR MATERIAL HANDLING FANS</p> <p>Radial blade fans, paddle wheel fans, and fans designed for moving particulate-laden air (dust, chips, debris)</p>	<p>The impellers used in the Q-PAC Fan are not intended for handling solid particles or aggressive airflow applications.</p>
<p>CORROSION-RESISTANT OR CHEMICAL DUTY FANS</p> <p>Fiber-reinforced plastic (FRP), polypropylene, or epoxy-lined fans</p>	<p>Q-PAC Fans are designed for comfort cooling applications and do not use corrosion-proof materials.</p>
<p>EXPLOSION-PROOF OR HAZARDOUS LOCATION FANS</p> <p>UL Class 1, Division 1 or 2 Fans and spark resistant fans (AMCA Type B or C)</p>	<p>The Q-PAC Fan is not explosion-proof rated and should not be used in classified environments.</p>
<p>SANITARY OR WASHDOWN FANS</p> <p>Stainless sanitary fans, NSF-certified fans, and IP66-rated fans</p>	<p>Q-PAC does not use sealed components or stainless steel materials and is not rated for hygienic or washdown conditions.</p>
<p>ULTRA-LOW OR ULTRA-HIGH FLOW FANS</p> <p>Residential or miniature utility fans (< 2,500 CFM) and axial fans (> 300,000 CFM)</p>	<p>A single Q-PAC Fan is intended for airflows between 2,500 and 90,000 CFM, depending on specific fan configuration. Fans can be combined to generate airflows up to 300,000 CFM.</p>

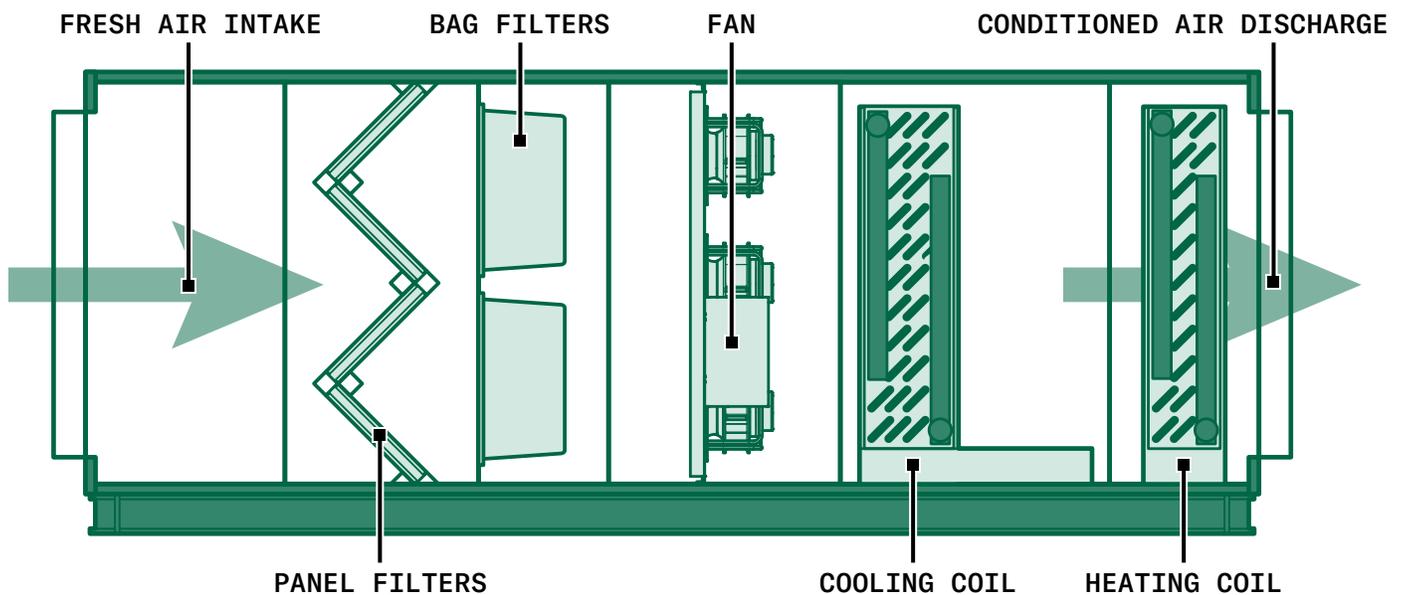
CONFIGURATIONS

The location of the Q-PAC Fan will depend on the arrangement of the system. The fan will either be placed after the filters and coils (draw through) or after the filters and before the coils (blow through). Examples of these arrangements are given below.

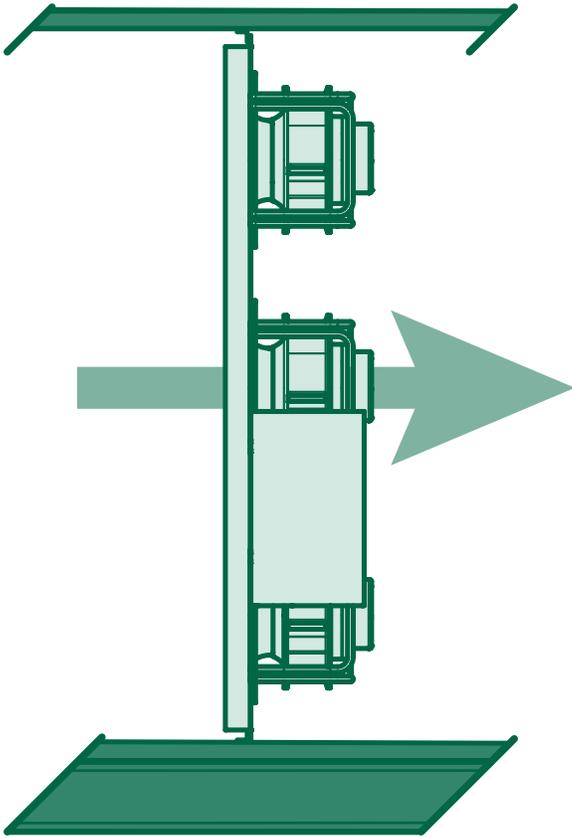
DRAW THROUGH



BLOW THROUGH



The Q-PAC Fan also supports horizontal and vertical airflow for both draw through and blow through configurations.



HORIZONTAL AIRFLOW

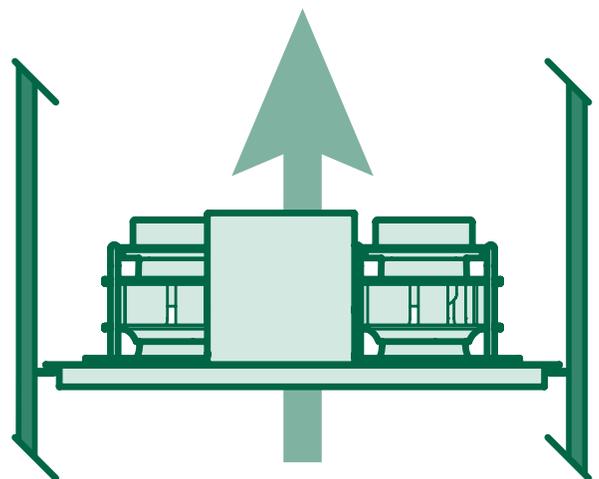
This orientation places the Q-PAC Fan in-line with the filters and coils, with airflow parallel to the floor. This is the recommended and most common application of the Q-PAC Fan.

In limited applications, it may also be advantageous to install the Q-PAC Fan on a tilt. This may be common in replacement applications with vertical ductwork immediately after the fan. In these applications, it is recommended the angle of installation does not exceed 15° or a setback of more than 12 inches.

VERTICAL AIRFLOW

This orientation, often referenced as “upblast” or “downblast” (not shown) is common in applications with limited floor space or in which airflow needs to be pushed to adjacent floors.

This orientation changes the distribution of the weight of fan components and requirements for maintenance. It is recommended to contact Q-PAC for applications with an effective height exceeding 80 inches to confirm proper fan support.



CLEARANCES

For ideal performance and ample maintenance space, it is recommended that the total distance between the upstream filters/coils and the downstream discharge duct/coils be at least 54 in. This allows room for proper inlet and outlet airflow development as well as suitable space to maneuver for maintenance.

INLET CLEARANCE

Distance between upstream filters/coils and the Q-PAC Fan inlet.

18-20 in [1]

DISCHARGE CLEARANCE

Distance between the downstream discharge duct/coils and the end of fan motors/Fan Controller.

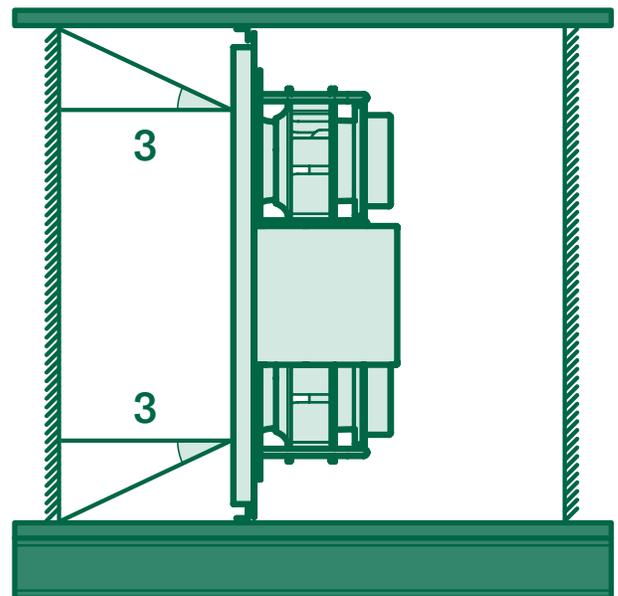
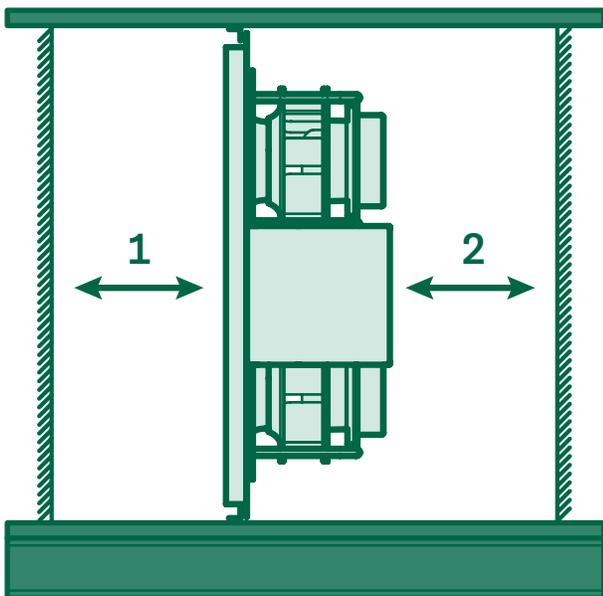
36 in [2]

INLET ANGLE

The angle between the top or bottom of the upstream filters/coils and the nearest inlet cone of the fan.

< 45° [3]

If these conditions cannot be satisfied, it is recommended to adjust the fan selection criteria for a higher static pressure.



SPECIFICATION

Selecting the Q-PAC Fan for your application is based on three factors:

PERFORMANCE

The required airflow of the fan - volume (CFM) and static pressure (inWc).

DIMENSIONS

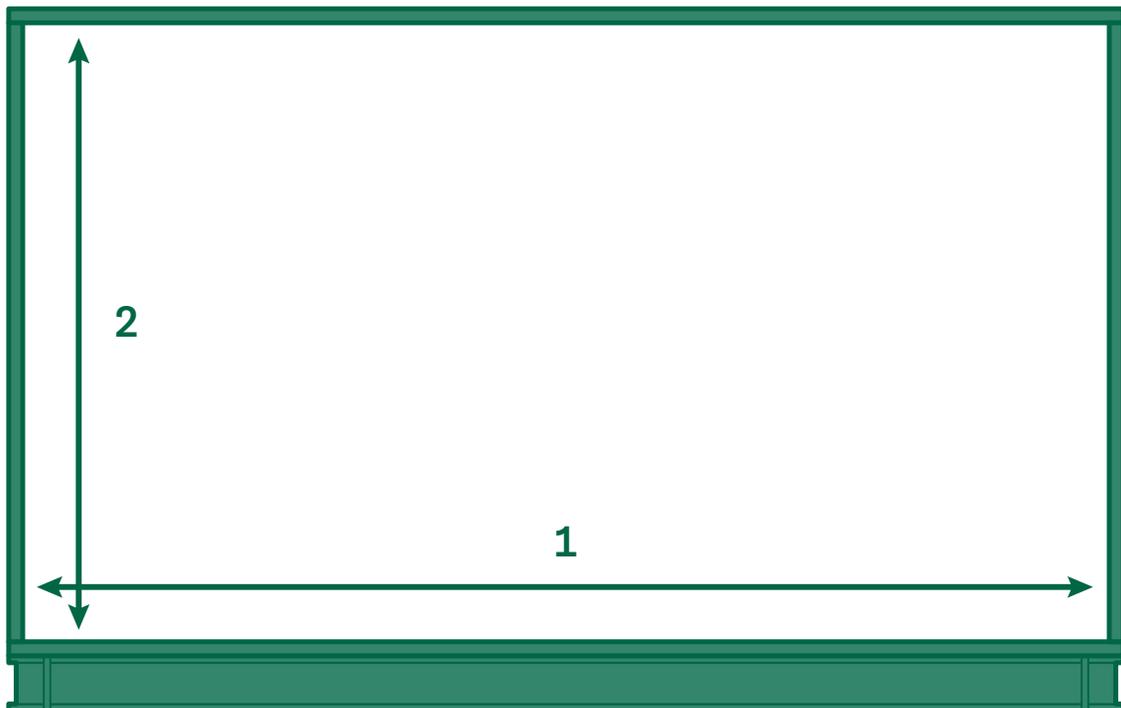
The available width [1] and height [2] to install the fan inside the air handler.

OPTIONS AND ACCESSORIES

Configuration options such as the location of the Fan Controller as well as fan accessories such as a fused disconnect or external control panel.

Specified airflow should be based on the performance of the existing/original fan or as determined by the specifying engineer or other entity.

The dimensions should be carefully measured inside the air handler, from wall to wall and floor to ceiling. It is recommended to measure in multiple locations to account for squareness deviations and to ensure that all measurements are within a 0.5 in range. The average measurements shall then be used to specify the fan. Do **not** reduce the dimensions when specifying the fan as the Q-PAC Fan includes a 0.5 in tolerance to allow for dimensional variance.



MOUNTING

The Q-PAC Fan is designed to mount to a flange within the air handler — an existing feature of the air handler or supplied flange to support the installation of the Q-PAC Fan.

EXISTING FLANGE

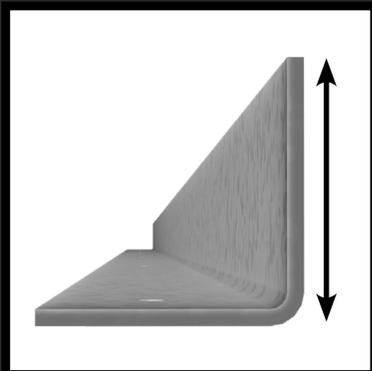
If installing the Q-PAC Fan to an existing flange, the flange should satisfy the following criteria:

SIZE	0.625 in minimum 1.250 in maximum See Figure [1].
MATERIAL	Mild steel or equivalent, suitable rigid material. Recommended minimum thickness of 16-gauge (0.06"). Concrete and other rigid structures are also sufficient.

The fan and supplied flange must be mounted to a rigid surface. If not, there is risk of the fan shifting under pressure, creating a risk of damage to the AHU components and even injury. Do not mount the Q-PAC Fan to thin or flexible surfaces, such as perforated metal. The mounting surface must encompass the full perimeter of the fan; unsupported edges may pose a risk of failure under pressure.

When specifying a Q-PAC Fan for an existing flange, cabinet measurements should be taken from flange end to flange end. Add 2" to both the width and height for a 1" overlap between the Q-PAC Fan and flange.

Flange size is measured based on an uninterrupted, flat mounting surface, as shown below.



NO EXISTING FLANGE

This case shall represent situations in which there is no existing flange within the air handler that is suitable for installation, or in which the existing flanges do not allow for recommended equipment clearances.

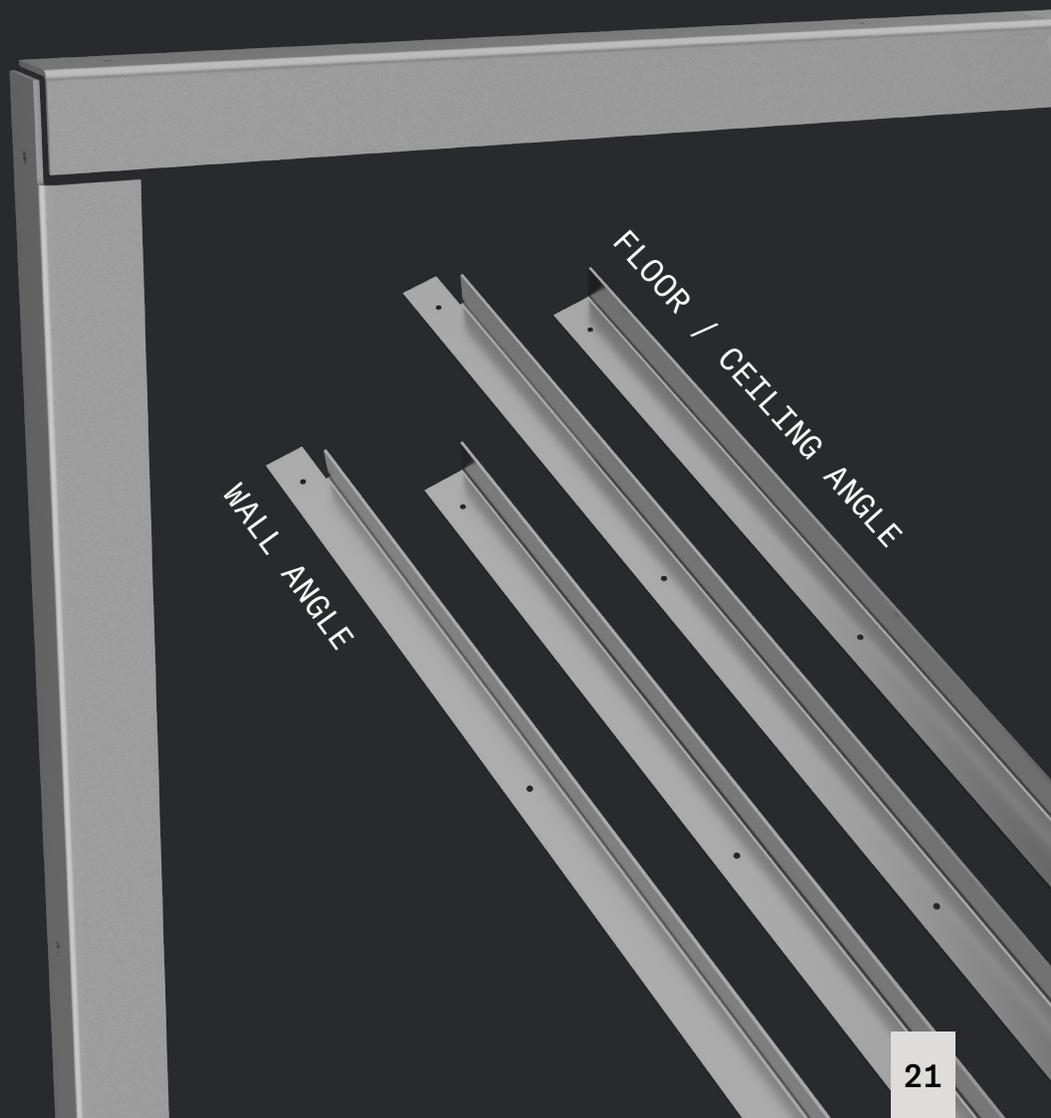
For these cases, the Q-PAC Fan is shipped with a set of Perimeter Angles.

PERIMETER ANGLES

The Perimeter Angles are set of formed sheet metal components made from 14-gauge G90 (galvanized) steel. The Perimeter Angles serve as an adapter enabling installation of the fan in air handlers which do not have an existing, compatible flange in a suitable location within the air handler. They are provided for every order, every fan, to ensure that the fan can always be successfully installed.

The set consists of a minimum of four angles—two for the air handler walls and two for the floor and ceiling, shown to the right. For wider installations, the floor and ceiling angles may be divided into multiple segments for transport.

Shown on the right, Perimeter Angles as installed feature a 1/4 in gap to allow for dimensional discrepancies or imperfections in the air handler surfaces. The angles also allow for a 1/2 in clearance with the Q-PAC Fan for these same reasons.



INSTALLING THE Q-PAC MULTIMOTOR PLENUM FAN



ASSEMBLED

The assembled Q-PAC Fan will be ideal for factory installations with access to a forklift and overhead crane. The Q-PAC Fan will arrive fully-assembled, requiring only mounting to a suitable flange (see MOUNTING) and wiring power and controls to the Fan Controller.

The fan will be supplied with a minimum of two (2) certified lifting points to support installation into the air handling unit.

This installation method will be ideal for production lines, offering a significant reduction in required labor and mechanical and electrical knowledge.

REQUIREMENTS

- Forklift
- Overhead crane (with minimum rating of 2,500 lbs)
- Basic tools:
 - Impact driver and bits
 - Flathead screwdriver
 - Wire strippers

KNOCKDOWN

The Q-PAC Fan is also available to ship knockdown for on-site (field) assembly. This option is advantageous for cases in which it is impractical to transport a fully-assembled fan and limited access to the air handler, as is common in fan replacement applications.

The knockdown fan arrives with components divided amongst a series of pallets for the Fan Frame and Fan Controller, plug fans, and optional accessories such as a control panel. These components are relatively lightweight, allowing crews to carry components up stairs, through doorways, and even down shafts, if necessary. Note that the Fan Frame panels and Perimeter Angle will be the full height of the fan, which may impact transport through tight spaces.

With included assembly and wiring guides, the fan can be assembled in far less time than it will take to cut out the existing fan—typically less than two (2) hours.

REQUIREMENTS

- Minimum of two people capable of lifting up to 50 lbs
- Basic mechanical and electrical knowledge
- Basic tools:
 - Impact driver and bits
 - Flathead screwdriver
 - Wire strippers
 - Scissors or cutting tool



FAN FRAME

The Fan Frame consists of a set of interlocking sheet metal panels, fastened together to form the fan's structural wall, as well as the individual harnesses which connect each motor back to the Fan Controller.

The “adaptability” of the Q-PAC Fan also stems from the Fan Frame. The frame's design is programmatically generated, meaning that the fan's dimensions can be tailored to an individual application's requirements automatically. This includes generating the harness routes with pre-punched holes for a simplified mounting experience.

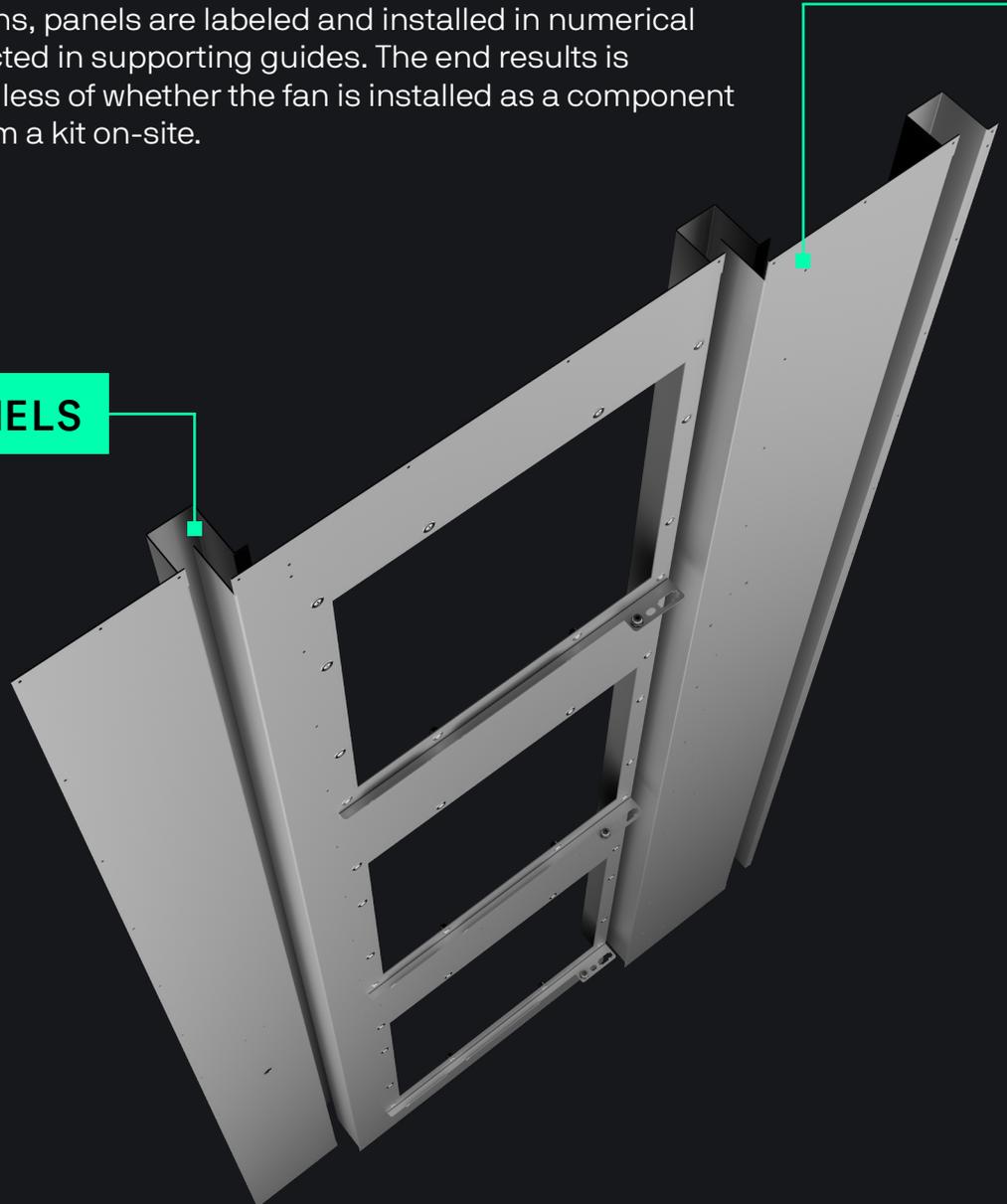
The frame includes a 1-1/4” perimeter flange with a pre-set mounting hole pattern, enabling the installation of the Q-PAC Fan into any Air Handling Unit as well as built-up air handlers for fan replacement.

For fan replacement applications, panels are labeled and installed in numerical order from left to right, as reflected in supporting guides. The end result is consistent performance regardless of whether the fan is installed as a component at the factory or assembled from a kit on-site.

INTERLOCKING PANELS

The strength of the Q-PAC Fan Frame is achieved through the joining of interlocking A653 G90 (galvanized) steel sheet metal panels.

Each panel consists of a structural C-channel, a bracing flange, or both for interior panels. The bracing flange nests against the far face of the C-channel and is fastened together to reinforce the frame.



PLUG FAN MOUNTS

Pre-installed rivet nuts provide fast and secure mounting of each plug fan, all from the downstream side of the fan.

LEDGES

Each mounting location is equipped with a sheet metal ledge. This ledge will support the weight of the plug fan as it is fastened to the frame. This means that fan replacement can often be carried out by one person. Ledges also feature mounts for the frame harness, simplifying replacement.

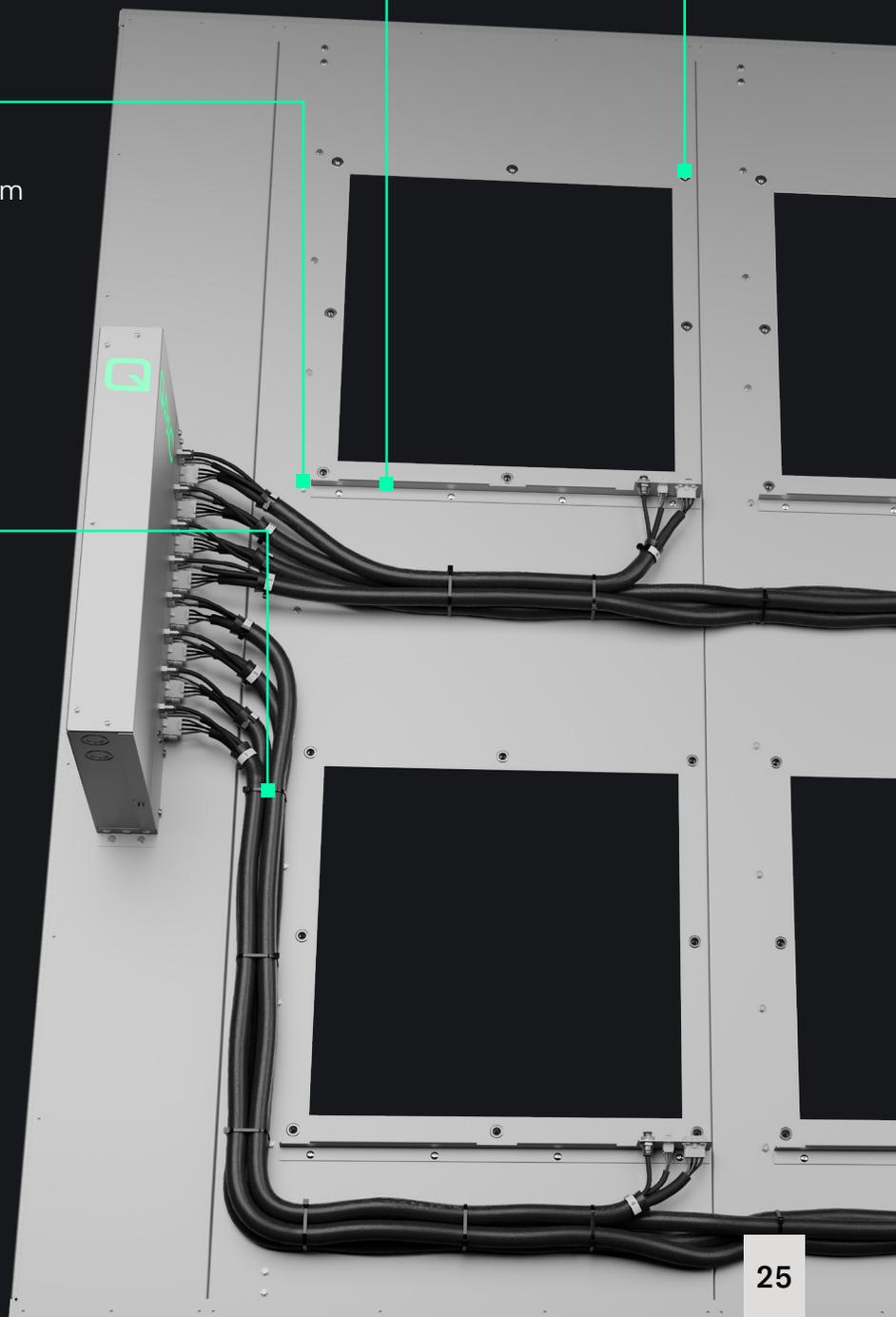
PANEL SCREWS

The fan frame can be assembled entirely from the downstream surface, without the use of nuts or similar fasteners. This is achieved through the use of self-drilling screws, supported with pre-punched holes on each frame panel for the channel and perimeter screws.

FRAME HARNESSES

Each motor connects to a dedicated harness integrated into the Fan Frame. This Frame Harness is custom-fabricated and includes separate cables for power and control, as well as a tube for measuring differential pressure across the inlet cone. The entire assembly is enclosed in a UL VW-1-compliant sleeve and clearly labeled with the corresponding motor mounting location.

Each harness follows a predetermined route on the frame, marked by pre-punched holes and secured with a push-mount cable tie.



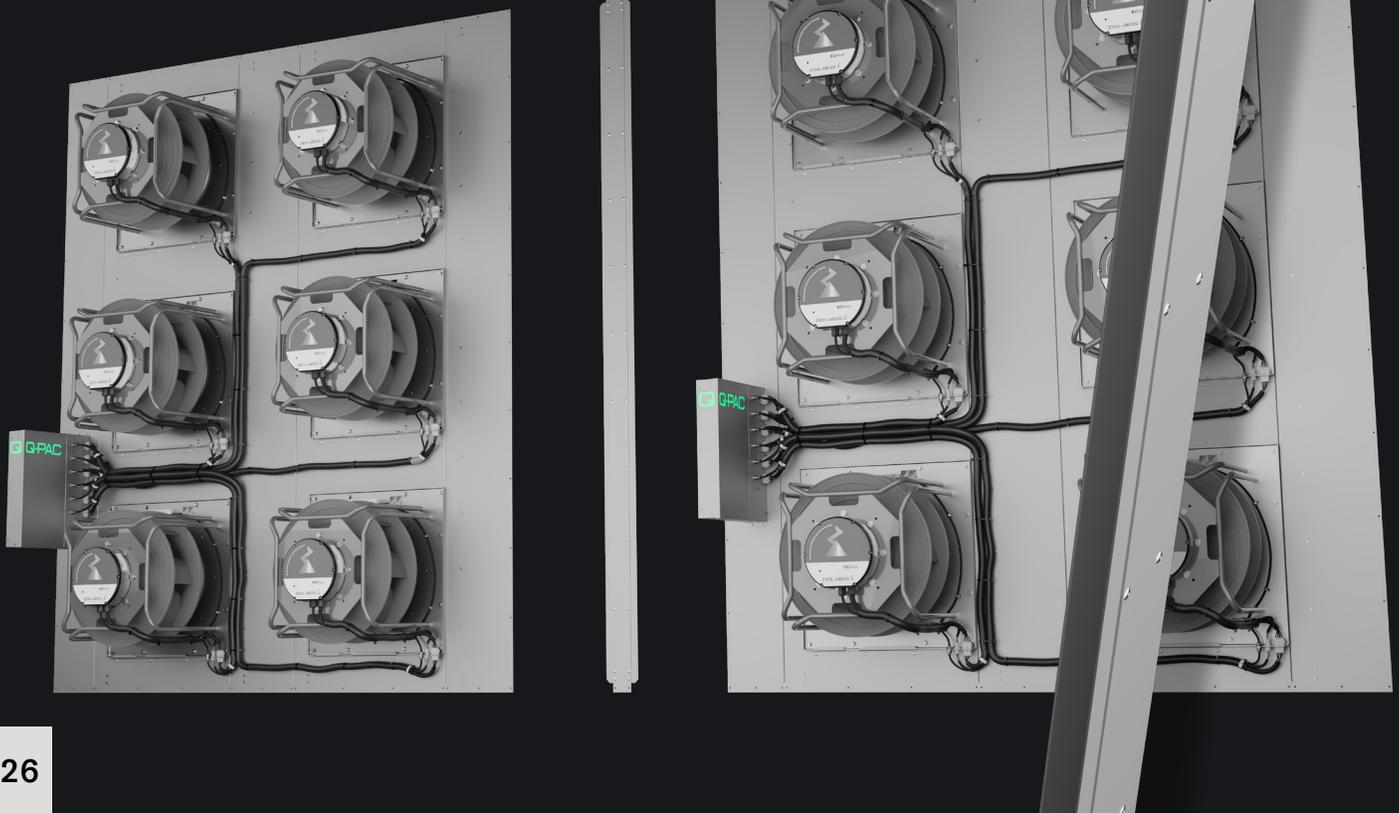
MULTI-FAN SYSTEMS

While a single Q-PAC Fan is sufficient for common applications, larger systems may require multiple Q-PAC Fans to achieve their required airflow, up to or even above 300,000 CFM. Q-PAC supports systems of up to four fans in a single air stream, paired to a single Control Panel.

Multi-fan systems can be installed as a continuous pressure wall using the Perimeter Angles and Coupler. The Perimeter Angles span the full dimensions of the air handler, as specified at the time of order. The Coupler connects adjacent fans, provides a mounting interface that simulates a structural flange, and serves as vertical support for additional fans.

COUPLER

The Coupler is a structural connector consisting of a sheet metal channel and flanged adapter. Couplers are automatically provided for systems of two or more Q-PAC Fans, enabling the fans to be joined together to form a rigid, continuous pressure wall.



INSTALLATION

Installing a multi-fan Q-PAC system is a simple, repeatable process that mirrors the assembly and installation of a single Q-PAC Fan, with added modular connections. Key differences in the assembly process for multiple fans are described below.

ASSEMBLY

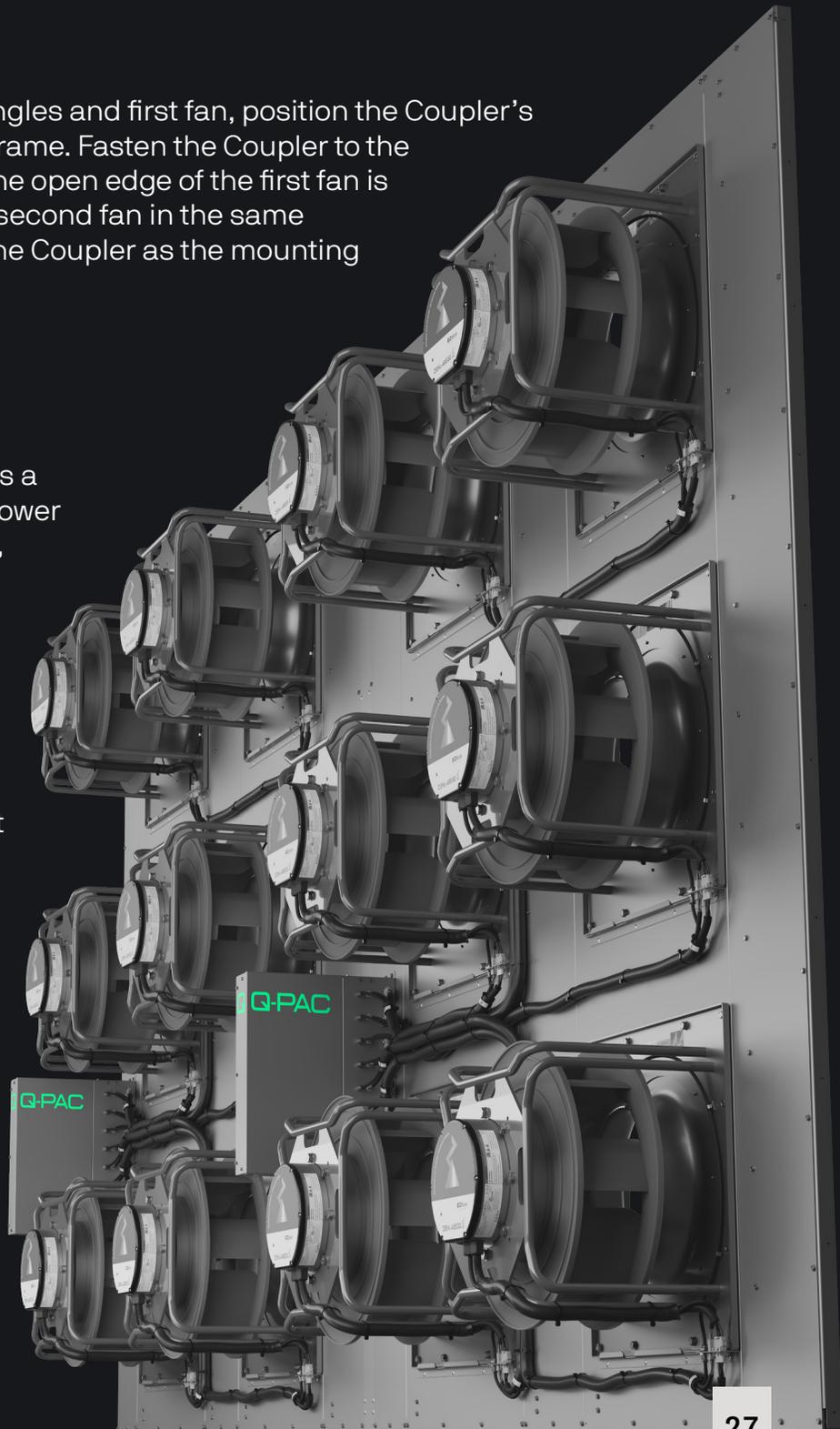
Following installation of the Perimeter Angles and first fan, position the Coupler's flange behind the open edge of the fan frame. Fasten the Coupler to the Perimeter Angles to secure the flange. The open edge of the first fan is then fastened to the Coupler. Install the second fan in the same manner, using the remaining flange of the Coupler as the mounting interface.

POWER AND CONTROL

For a basic installation, each fan requires a dedicated connection for three-phase power and controls. For intended performance, each fan must receive the same control signal and run at the same speed.

For systems using Modbus communication, the Modbus connections must be daisy-chained from the external control panel to the first Fan Controller and then subsequent Fan Controllers.

The Q-PAC Control Panel simplifies this wiring process with dedicated terminals for each pin of the Fan Controller Board. This enables each Fan Controller to connect directly back to the Control Panel, internalizing the daisy-chain topology of the controllers.



EC PLUG FANS

Plug fans are the air-movers of the Q-PAC Fan, consisting of:

MOTORIZED IMPELLER	The assembly of a motor and backward-curved impeller, typically with direct mounting.
INLET CONE	The flow-directing device on the intake of the plug fan assembly. Fan performance is calculated based on the pressure drop across the inlet cone.
MOUNTING FRAME	The structural frame used to combine the motorized impeller, inlet cone, and mounting plate into a singular device.
MOUNTING PLATE	The interface for mounting the Plug Fan to another structure.
MOTOR HARNESS	A pre-wired adapter between the Plug Fan's motor and the frame harness, consisting of a cable for each power and control and a tube to measure the differential pressure across each inlet cone—all wrapped in a UL VW-1-compliant sleeve.

Plug fans do not require installation-specific addressing or harness lengths. This means a spare plug fan can be used to replace any failed motor of the Q-PAC Fan, or even other Q-PAC Fans with the same model.

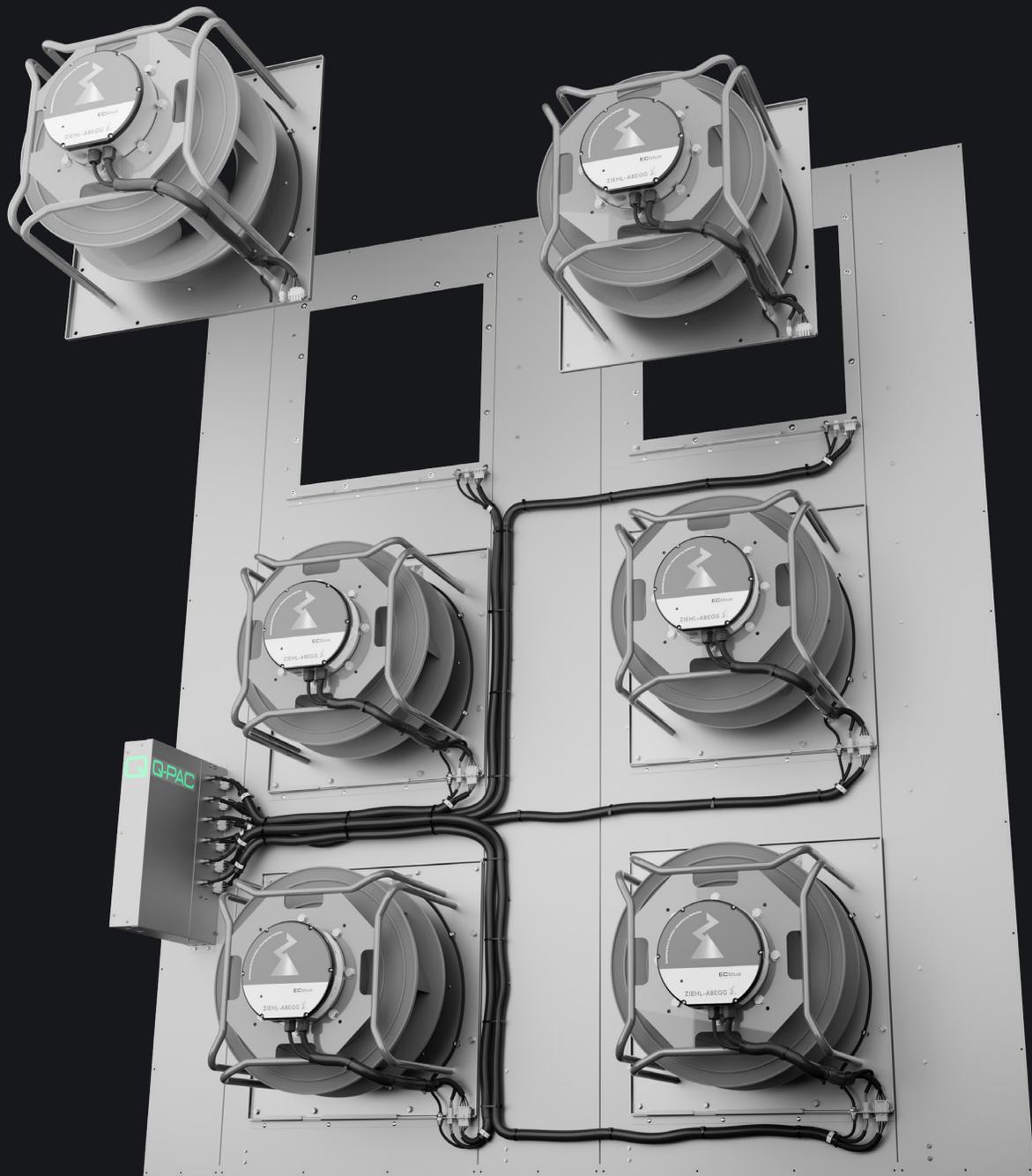
The Q-PAC Fan incorporates plug fans from the industry's leading manufacturers, notably;

- Ziehl-Abegg
- ebm papst
- Rosenberg

Q-PAC's engineers continue to review additional motor and fan manufacturers to optimize the performance of the Q-PAC Fan.

PLUG FAN REPLACEMENT

It's undeniable that electrical components inevitably fail. The Q-PAC Fan is designed with this in mind. This means that the fan is designed to simplify the replacement of the plug fan. Replacement involves the removal of a few bolts and plugs, taking only a couple minutes. The team believes in a future with recyclable motors and impellers, and so Q-PAC's engineers continue to investigate ways to reduce the labor, weight, and—most importantly—cost of replacing motorized impellers in order to provide the most robust fan on the market.



POWER AND CONTROLS

For basic operation of the Q-PAC Fan, only the following are required:

- Three phase power
 - 200-240V or 440-480V, 60Hz
- Neutral ground
- 0-10VDC analog signal for speed modulation

If no control panel is installed, NEC 430.102(B) requires installation of a disconnect.

CONTROL OPTIONS

The Q-PAC Fan supports a variety of control options to simplify integration into HVAC systems. The Q-PAC Fan can be connected to third party control panels or VFDs, such as in fan replacement applications, though full control features will require the Q-PAC Control Panel.

Basic operation requires only that a 0-10VDC analog signal be supplied to the Fan Controller.

SUPPORTED DEVICES

0-10VDC ANALOG SIGNAL

Analog signal for motor speed modulation

- Q-PAC Control Panels
- Third party control panel or VFD
- BMS (Direct connection)

MODBUS RTU

BMS integration for fan alarms; still requires analog signal for speed modulation.

- Q-PAC Control Panels
- Third party control panel or VFD
- BMS (Direct connection)

BACnet MSTP / IP

Full control and integration of the Q-PAC Fan control and alarms.

- Q-PAC Control Panels

FAN CONTROLLER

The patented Fan Controller serves as the single point of connection for power and controls to the Q-PAC Fan. It then routes power and control to each motor in the fan through a set of plug-terminated harnesses.

The Fan Controller consists of:

FAN CONTROLLER BOARD

The Fan Controller Board is the brain of the Q-PAC Fan, serving as the point of connection for controls, including the analog speed signal and modbus communication.

The board supports fan alarms, individual motor status, and airflow measurement.

FUSED PROTECTION

The Fan Controller features branch circuit protection sized to the connected EC motors (Class CC 15A/20A).

MOTORIZED IMPELLER INTERFACE BOARDS

Individual PCBs for each motor, connected to plug terminations for the motor harness power and controls and a pressure transducer connected to the push-connect pressure port.

REMOVABLE ACCESS COVER

A simple cover removable through the use of a slotted or hex tool.

CONDUIT KNOCKOUT PORTS

Standard knockout ports on the top and bottom of the Fan Controller, for 1/2", 3/4" and 1" trade sizes.

In the case of failure of the Fan Controller, the analog speed signal serves as a fallback. If the Fan Controller Board loses the 24V power supply, the Fan Controller closes a normally-open relay to bypass the controller and send the analog speed signal directly to the fan motors.



FAN CONTROLLER BOARD

The Fan Controller connections are given below. Only three phase power and AI1+ /AI1- connections are required for operation.

CN1 | ANALOG INTERFACE

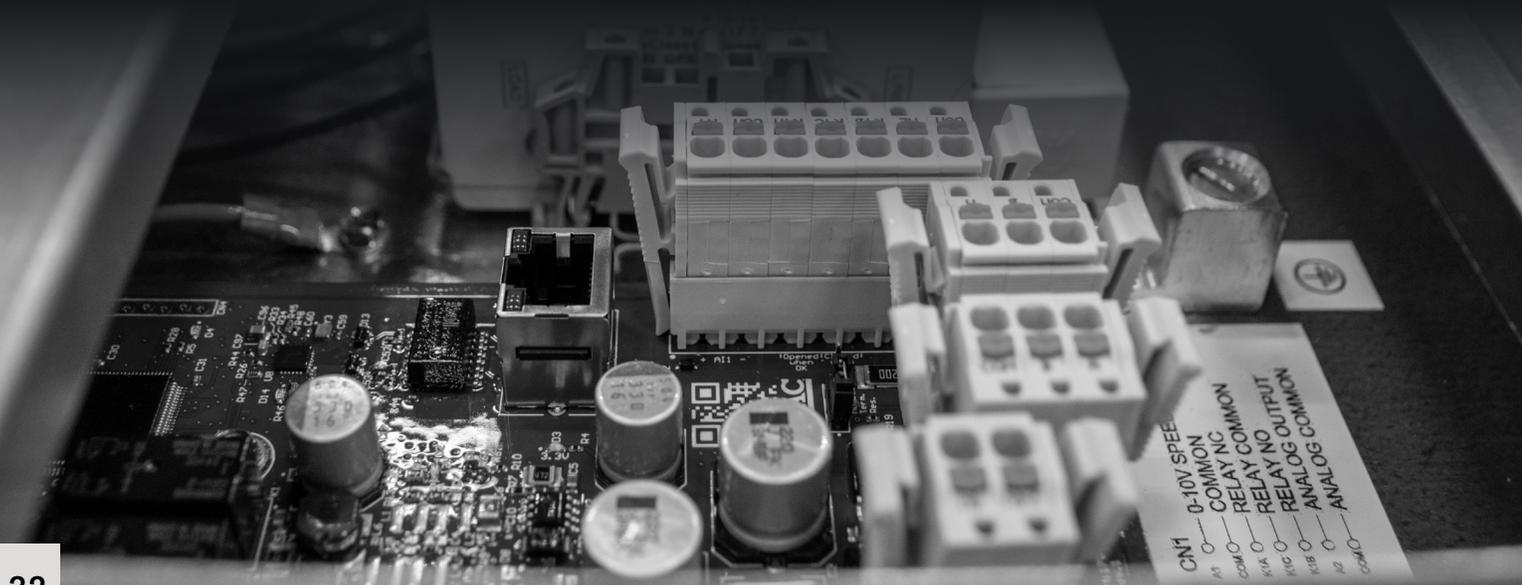
AI1+	0-10V signal proportional to motor speed.	Input speed signal protected up to 40VDC, but speed does not increase in excess of 10V.
AI1-	0-10V reference for AI1+.	
K1A	Normally closed contact of the alarm relay.	The alarm relay provides a dry contact output that changes state in the event of system fault. A fault in any motor will trigger the alarm. Fault active: K1A-K1C open, K1B-K1C closed.
K1C	Common contact of the alarm relay.	
K1B	Normally open contact of the alarm relay.	
A01+	0-10V signal proportional to the calculated airflow.	Signal is updated continuously for real-time monitoring or closed-loop control. Output is scaled to the fan configuration. Calibration values available in User Manual.
A01-	0V reference for A01+.	

CN3 | BOARD POWER SUPPLY

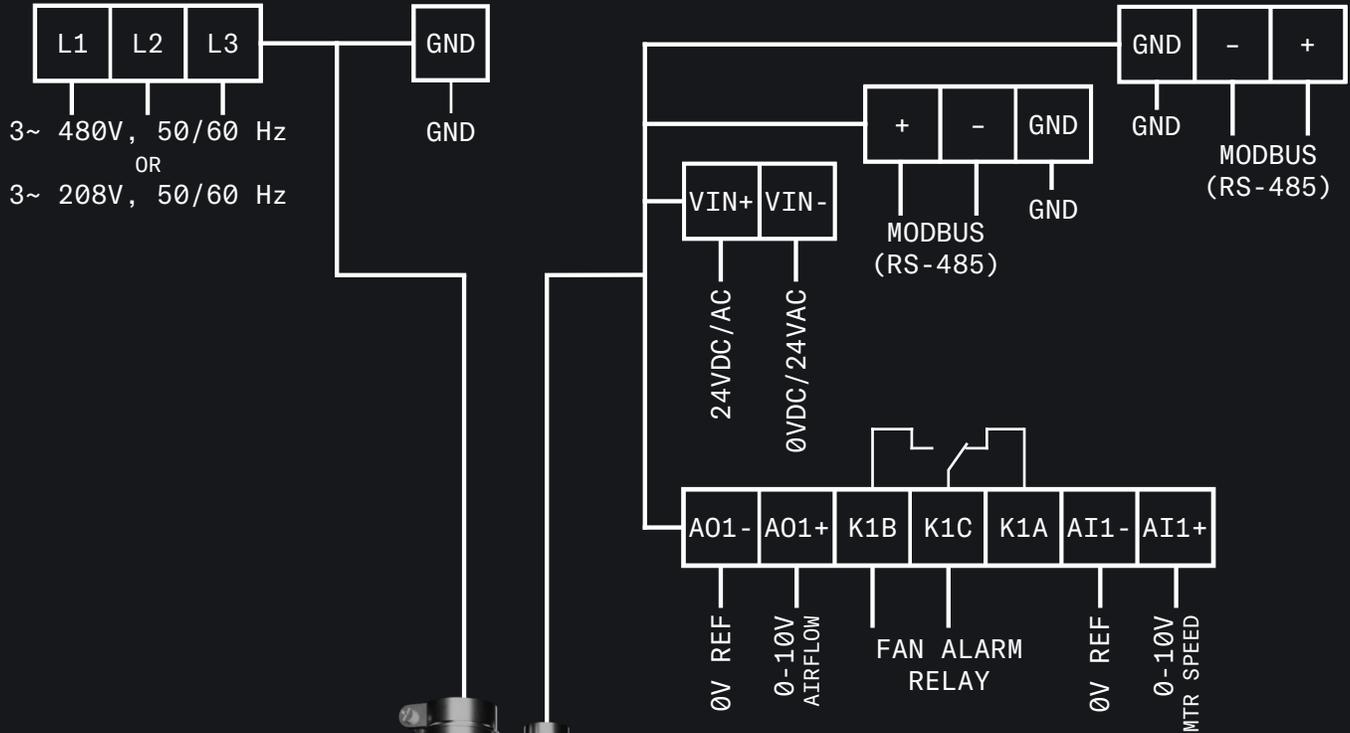
Vin+	24VDC/24VAC power supply voltage.	Fan Controller Board power supply; see User Manual for maximum voltage ratings.
Vin-	0VDC ground / 24VAC power supply.	

CN5 & CN6 | COMMUNICATIONS

+	Communications port +.	Modbus RTU over RS-485 via interchangeable communication ports (CN5 and CN6) for IN and OUT.
-	Communications port -.	
GND	Communications port ground.	



WIRING DIAGRAM



Q-PAC CONTROL PANEL

The Q-PAC Control Panel functions as a local control for the Q-PAC Fan outside of the airstream. While not required for operation of the Q-PAC Fan, both the Basic and Premium Control Panels are designed for connection to the Q-PAC Fan when there is no existing panel.

As with the Q-PAC Fan, the Control Panel is tailored to the application, offering:

- 200-240V or 440-480V 3~ 60Hz power
- Type 1 (Indoor) or Type 4 (Outdoor) panels
- Support for up to four Q-PAC Fans

Additionally, all Q-PAC Control Panels are UL 508A rated and come with the following features:



DISCONNECT SWITCH

External, padlockable rotary handle connected to a fused switch-disconnector.

SHORT CIRCUIT CURRENT PROTECTION

All Q-PAC Control Panels are rated to 100 kAIC.

FUSED PROTECTION

Current-limiting Class J fuses.

SAFETY CIRCUIT INPUT

A dry-contact safety input is available on Q-PAC Control Panels for connection to fire alarms, smoke detectors, and other interlock devices.

HAND | OFF | AUTO (HOA) SWITCH

A 3-position switch allowing users to toggle between three modes: HAND (manual operation), AUTO (automatic operation), and OFF (Shutoff).

POTENTIOMETER

A variable resistor with a rotating dial to manually adjust fan speed when in HAND mode.

PREMIUM FEATURES

The Q-PAC Premium Control panel adds the following features:

- BACnet MS/TP and IP communication
- Digital touchscreen display
- Power and airflow monitoring
- Interlock controls
- Constant airflow and constant static pressure operating modes



FUSED DISCONNECT

NEC 430.102(B) requires installation of a disconnect if there is no external control panel for the fan. To support this requirement, Q-PAC offers Schneider's VisiPacT heavy duty, fused safety switch.

- Available in NEMA 1 and 3R
- Fused overload protection
- Quick make/break operating mechanism
- Dual cover interlock
- Viewing window for verification of switch position
- Tested per UL98 and NEMA KS1 standards and listed in the UL files E2875 and E154828



EXISTING VFD/CONTROL PANEL

If the application is replacing an existing fan and the connected VFD or other panel, it is recommended to use the existing incoming power supply wires (to the VFD/panel) to connect the new control panel or disconnect to the power supply. It is important to confirm proper MCA sizing when re-using existing wires.

When connecting to an existing power supply, it is recommended that a power quality assessment be performed to detect any existing issues with power harmonics before installing the Q-PAC Fan.

When connecting to an existing VFD:

- Remove the VFD. EC motors cannot accept modified waveforms and must receive uninterrupted power. If the supplied power is modified by the VFD, the Q-PAC Fan will fault.

OR

- If the VFD includes a true bypass that allows full line voltage supplied to the fan, the VFD may be used as a disconnect.

WHAT IS MCA?

MCA refers to the Minimum Circuit Ampacity, which is the minimum wire size amperage rating required to safely carry the electrical load of the equipment under the maximum operating conditions.

POWER HARMONICS

For proper operation of an electrical system, harmonic resonance and harmonic distortion should be minimized. Building electrical distribution systems with a large number of nonlinear loads may experience harmonic resonance - the superimposing of noise from multiple devices. This causes harmonic distortion current which can accumulate at a major supply transformer causing harmonic voltage distortion.

IEEE-519 recommends harmonic measurements and limits. For Q-PAC installations ($V < 1$ kV), the recommendation is to stay below 7.5% individual and 12% total harmonic distortion. This is for the 99th percentile weekly short time, measured at the point of common connection (PCC).

Q-PAC Fans utilize motors from multiple manufacturers, offering different options to mitigate the effects of power harmonics, from the use of active and passive filters to integrated PFC solutions to optimize their power factor and limit the total harmonic distortion current.

For more information or assistance with potential power harmonics issues, contact Q-PAC Support.

Common symptoms of issues experiencing harmonics issues include:

- Nuisance tripping of circuit breakers and fuses
- Overheating of motors, cables, or electrical components
- Electromagnetic interference (EMI) on control and data signals
- Increased operation and utility cost
- Reduced power output from supply transformers

SELECTING A CONTROL OPTION

The Q-PAC Fan can be ordered standalone or with an external panel or disconnect, presenting multiple options. Because the Q-PAC Fan does not require a Q-PAC Control Panel, the disconnect and panels can be added to the system after installation to expand support. The following table summarizes feature availability across system options:

	Q-PAC FAN ONLY	DISCONNECT	BASIC CONTROL PANEL	PREMIUM CONTROL PANEL	THIRD PARTY CONTROL PANEL/VFD*
DISCONNECT SWITCH					
LOCAL SPEED CONTROL					
ANALOG AIRFLOW REPORTING					
MODBUS COMMUNICATION					
HAND / OFF / AUTO SWITCH					
BACnet MS/TP OR IP					
HMI					
SAFETY INTERLOCKS					
CONSTANT AIRFLOW / STATIC PRESSURE OPERATION					
INDIVIDUAL MOTOR STATUS REPORTING					

* Available features will depend on the selected control panel or VFD, and may require manipulation to achieve equivalent performance.

CONTROLS COMMISSIONING

Commissioning the Q-PAC Fan is intuitive and designed for minimal setup. In addition to supporting assembly documents, each order includes:

QUICK WIRING GUIDE	A one-page guide for connecting the Q-PAC Fan to supporting equipment, such as the Q-PAC Control Panel or disconnect.
USER MANUAL	A comprehensive user manual covering product interfaces, wiring and electrical ratings, Modbus communication, BACnet communication, maintenance, and more. User Manuals will vary based on purchased accessories.

To commission the Q-PAC Fan:

1. Disconnect the existing supply voltage.
2. Connect three phase power (and ground) and a 0-10V signal to the Fan Controller. The order documents will demonstrate exact connection points.

For Analog-only installations, this is all that is necessary. The Fan Controller will automatically detect the connected motors and the fan can be bump tested to confirm proper operation.

For systems using Modbus communication:

3. Connect the +, -, and GND terminals of CN5 and CN6 of the Fan Controller Board to the Digital In and Digital Out terminals of the Control Panel.
4. Configure the Modbus objects in the BMS.
5. Perform a bump test to confirm proper operation.

For systems using BACnet MS/TP or BACnet IP (Q-PAC Premium Control Panel only):

3. For MS/TP, Connect the +, -, and GND terminals of CN5 of the Fan Controller Board to the corresponding terminals of the Control Panel. For IP, connect through the included Ethernet port rather than the RS-485 ports.
4. Discover devices in the BACnet network and select the Q-PAC Fan.
5. Use BACnet object CONTROL TYPE (Multistate Value 0) to select "BACnet" as the control method.
6. Use BACnet object FAN SPEED (Analog Value 0) to set fan speed between 0 and 100%.
7. Configure the BACnet objects in the BMS.
8. Perform a bump test to confirm proper operation.

SENSORS AND SYSTEM COMMUNICATION

The Q-PAC Fan includes a number of sensors and feedback mechanisms, but access to these features is dependent on the connected device. No external sensors are required for basic operation of the Q-PAC Fan. Feature access is summarized in the table below.

Q-PAC FAN ONLY ANALOG	<ul style="list-style-type: none"> ■ Fan alarm status—via Fan Alarm Relay (K1A, K1B, K1C) ■ Airflow measurement—via AO1+ / AO1-, scaled to a 0-10V signal
Q-PAC FAN WITH MODBUS¹	<ul style="list-style-type: none"> ■ Airflow measurement ■ Fan alarm status ■ Individual motor status
Q-PAC FAN WITH PREMIUM CONTROL PANEL OVER BACNET	<ul style="list-style-type: none"> ■ Airflow measurement ■ Fan modulation ■ Local duct pressure ■ Fan speed input ■ Constant airflow control and setpoint² ■ Static pressure control and setpoint³ ■ Start/stop ■ Fan power consumption ■ Fan current measurement ■ Individual motor status ■ Interlock toggle/status ■ Fireman override status ■ System run

¹ Modbus cannot control the Q-PAC Fan; a 0-10V analog signal is required for speed control.

² The Constant Airflow control method ensures, in the event of motor failure, the fan will increase the speed of all other motors to maintain airflow. A separate static pressure sensor (not included) is recommended for ideal performance when using the Constant Airflow control method.

³ A separate static pressure sensor (not included) is required when using the Constant Static Pressure control method.

COMPLIANCE AND CERTIFICATIONS

The Q-PAC Fan is engineered with a commitment to compliance, safety, and performance. The fan and associated components meet or exceed rigorous industry standards that ensure long-term reliability and operational excellence in commercial comfort-cooling environments.

The Q-PAC Fan, components, and system accessories comply with the following standards:

Q-PAC FAN	<p>UL 60335-2-40 RECOGNIZED Household and Similar Electrical Appliances - Safety - Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers</p>	<p>RECOGNIZED COMPONENT</p> 
Q-PAC FAN CONTROLLER	<p>UL 60730-2-15 RECOGNIZED Automatic Electrical Controls - Part 2-15: Particular Requirements for Automatic Electrical Air Flow, Water Flow and Water Level Sensing Controls</p>	<p>Intertek</p>
<p>Q-PAC CONTROL PANEL PREMIUM AND BASIC</p>	<p>UL 508A LISTED Industrial Control Panels</p>	 <p>CERTIFIED</p> <p>SAFETY CA E519077</p>

Additionally, the Schneider disconnect supplied by Q-PAC is tested per UL98 and NEMA KS1 standards and listed in the UL files E2875 and E154828.

Q-PAC remains committed to meeting and exceeding the industry's evolving landscape on certification and compliance to deliver a top-performing fan. As part of this effort, Q-PAC has joined Air Movement and Control Association (AMCA) International with construction of a start-of-the-art AMCA 270-compliant airflow tunnel. This facility meets AMCA's 270 testing standards, pushing the boundaries of airflow measurement accuracy and reliability for multimotor plenum fans.

