QMX

Tubular Mixed Flow | Product Guide | LOREN COOK COMPANY

INTRODUCTION

QMX has a wide range of benefits. These features make QMX your ideal solution when low sound, high efficiency or compact size are required.

DESIGNED FOR
supply, exhaust or return air movement applications

DESIGNED WITH
the latest Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA) softwares

PERFORMANCE RANGE
500-179,000 CFM

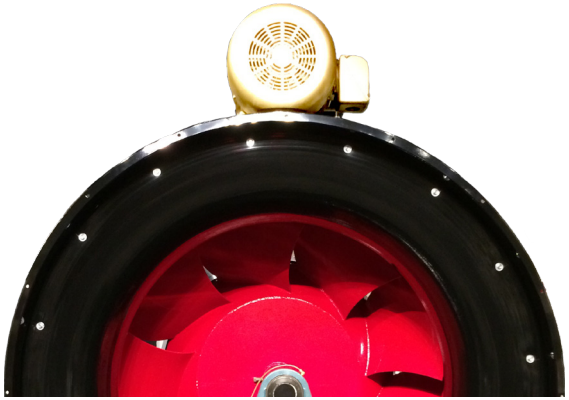
STATIC PRESSURES
up to 15" wg

EQUIPPED WITH
the Cook Contour® axial-centrifugal hybrid impeller

REDUCED
fan size, motor horsepower and fan sound levels when compared to other inline fans

OFFERED IN 18 SIZES
ranging from 90 to 600

CHOOSE FROM
three different wheel types: QMX, QMXHP, QMXXP

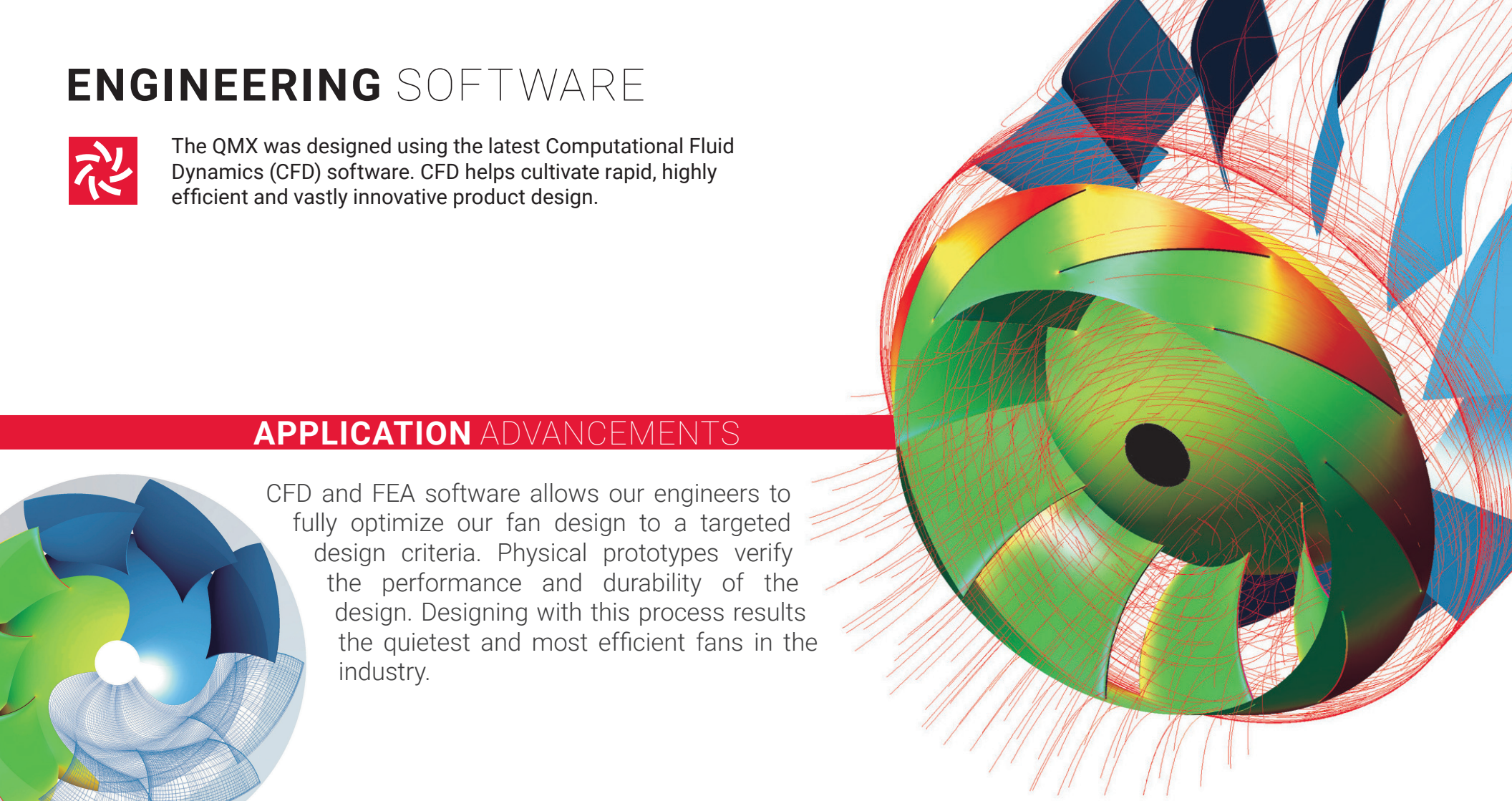


EXTRA BENEFITS

- QMX utilizes a relatively large diameter wheel in a small housing, which results in slower wheel speeds and quieter operation.
- UL/cUL 705 Listing is standard on all QMX models.
- QMX's Cook Contour® mixed-flow wheel combines the high airflow features of an axial fan with the pressure capabilities and static efficiency of a centrifugal blower.
- QMX can be 2–3 fan sizes smaller than an equivalent performing tubular inline blower, resulting in significant space and cost savings.

ENGINEERING SOFTWARE

The QMX was designed using the latest Computational Fluid Dynamics (CFD) software. CFD helps cultivate rapid, highly efficient and vastly innovative product design.



APPLICATION ADVANCEMENTS

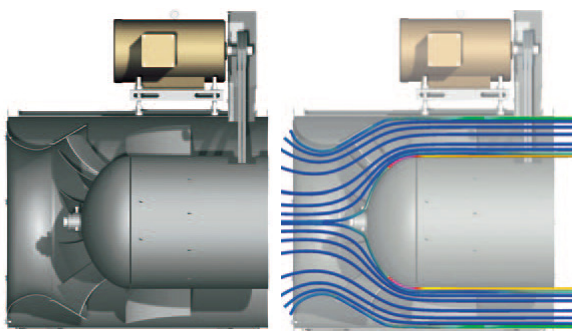
CFD and FEA software allows our engineers to fully optimize our fan design to a targeted design criteria. Physical prototypes verify the performance and durability of the design. Designing with this process results the quietest and most efficient fans in the industry.

MIXED-FLOW ADVANTAGES

The Cook Contour® mixed-flow wheel produces a highly efficient, quiet and compact tubular inline fan. Proper airflow is crucial for high fan efficiency. Let's see how it works.

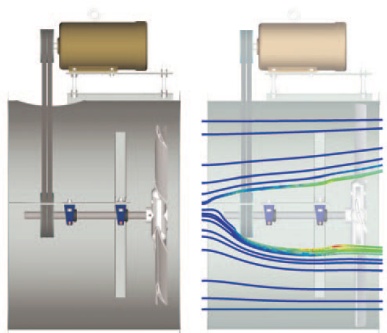
These illustrations show cross sections of typical mixed-flow, tubular centrifugal and axial fans. Flow lines developed with CFD software and added to the illustrations show the different air patterns between each type of fan. Areas in red indicate high turbulence zones that result in loss of efficiency and excess noise.

MIXED-FLOW



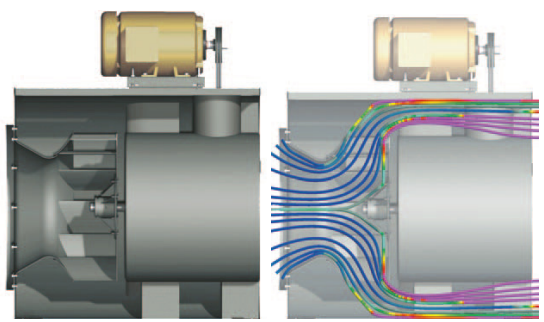
- Two gentle changes in airflow direction
- Lower RPM required for equal flow and pressure
- Highest static efficiency of inline fans
- Smallest diameter with equal performance
- Lowest sound levels of equal size units
- Large inlet opening yields low inlet velocities
- Design allows for close wall proximities when used in built-up air handlers.

AXIAL



- Airflow straight through with no direction changes
- High airflow volume in a relatively small diameter
- May require inlet bell and outlet cone
- Less efficient at high pressures

CENTRIFUGAL

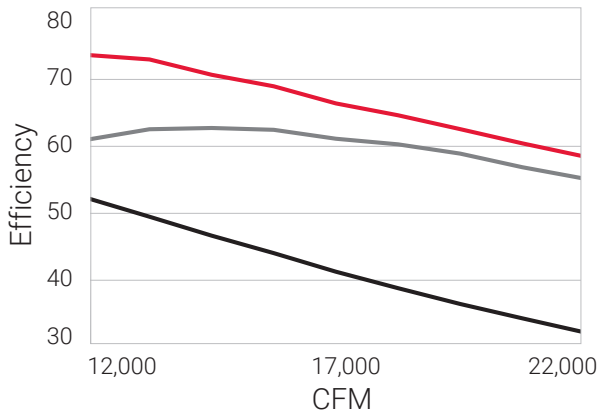


- Two abrupt 90° changes in airflow directions
- High pressure capability
- Higher RPM required for equal flow and pressure
- Larger size required for equal performance

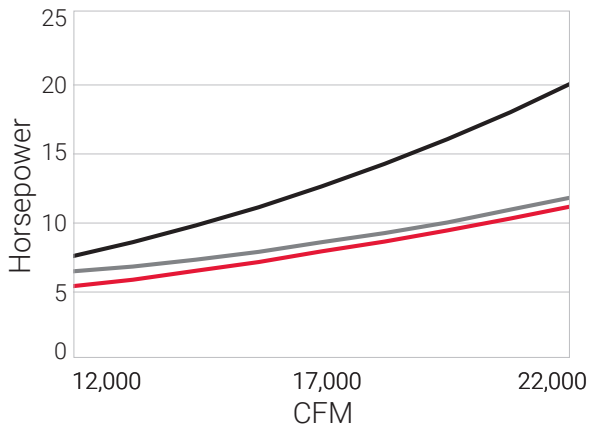
PERFORMANCE COMPARISON

Compare the QMX static efficiency, horsepower, and sound power performance to our CIC and VAB units to see why the QMX is the superior choice.

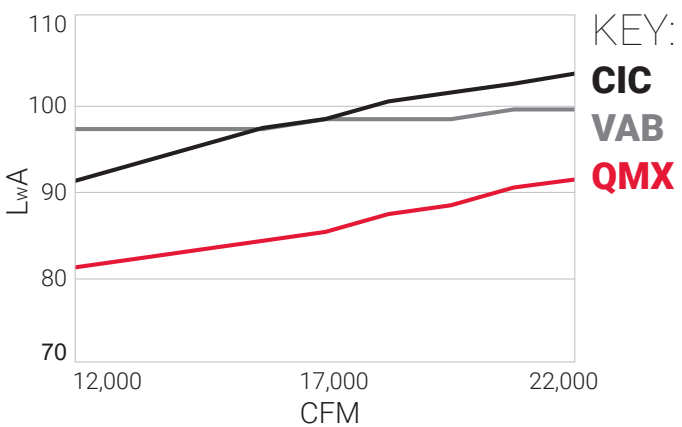
STATIC EFFICIENCY



HORSEPOWER



SOUND POWER



***270 QMX vs comparably sized CIC (tublar centrifugal) and VAB (vane axial) fans.**

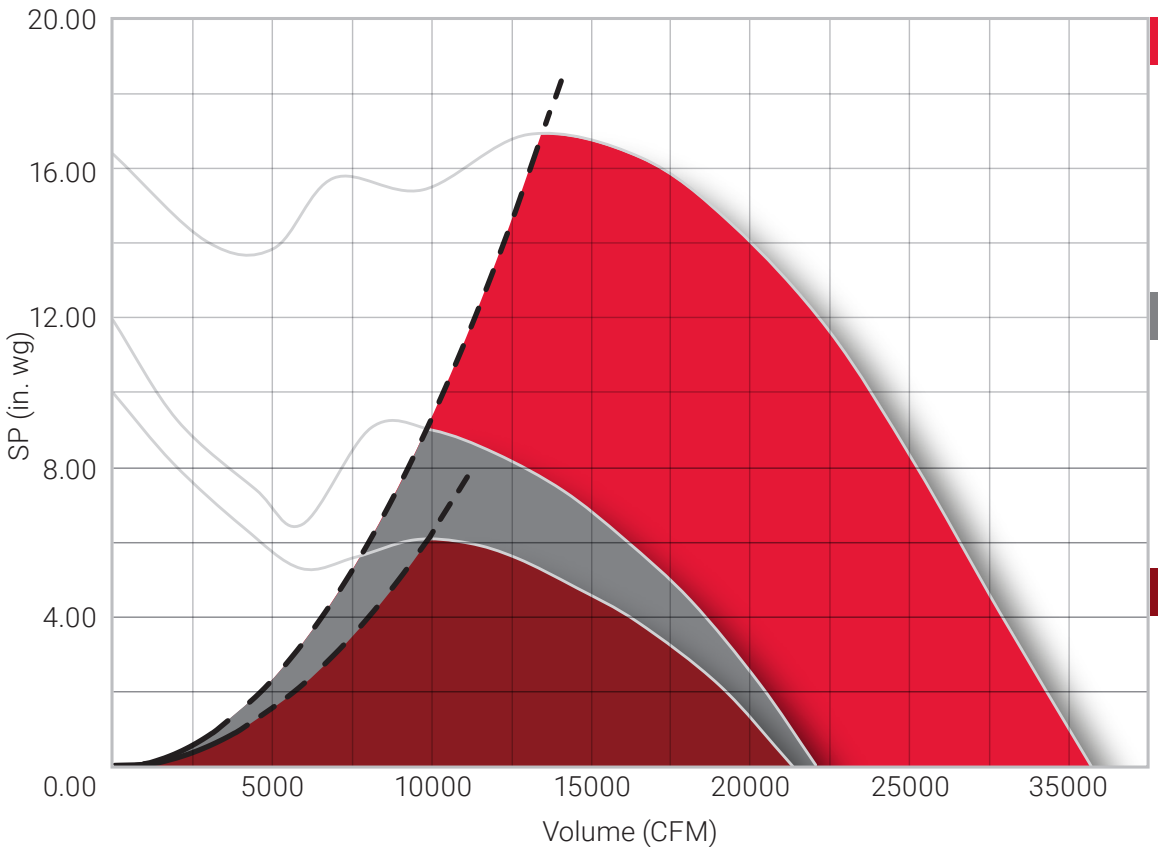
PERFORMANCE ADVANTAGES

Performance	Size*	Static Efficiency			Horsepower			Sound Power (LwA)		
		QMX Mixed Flow	CIC Tubular Centrifugal	VAB Vane Axial	QMX Mixed Flow	CIC Tubular Centrifugal	VAB Vane Axial	QMX Mixed Flow	CIC Tubular Centrifugal	VAB Vane Axial
10,000 CFM @ 1" wg	225 QMX	55%	31%	49%	2.84	5.14	3.02	83	93	89
10,000 CFM @ 4" wg	225 QMXHP	66%	57%	53%	9.57	11.00	11.30	91	96	102
10,000 CFM @ 7" wg	225 QMXXP	69%	63%	-	16.00	17.50	-	91	100	-
40,000 CFM @ 3" wg	445 QMX	72%	51%	62%	26.40	36.60	29.10	88	98	100
40,000 CFM @ 6" wg	445 QMXHP	74%	59%	48%	51.10	63.40	75.20	94	101	111
40,000 CFM @ 9" wg	445 QMXXP	64%	62%	-	87.80	91.00	-	101	105	-

***Size based on closest comparable housing diameter.**

PERFORMANCE COMPARISON

The QMX, QMXHP and QMXXP are each designed for a specific performance range. The curves chart below illustrates typical performance limits of the QMX, QMXHP and QMXXP.



QMXXP

- Optimized for typical Class-3 static pressures of 8" to 15" wg
- Airflow capacity up to 179,000 CFM
- Utilizes a true airfoil blade to achieve maximum efficiency at highest static pressures

QMXHP

- Optimized for typical Class-2 static pressures of 4" to 8" wg
- Airflow capacity up to 118,000 CFM
- Utilizes a true airfoil blade to achieve maximum efficiency at higher static pressures

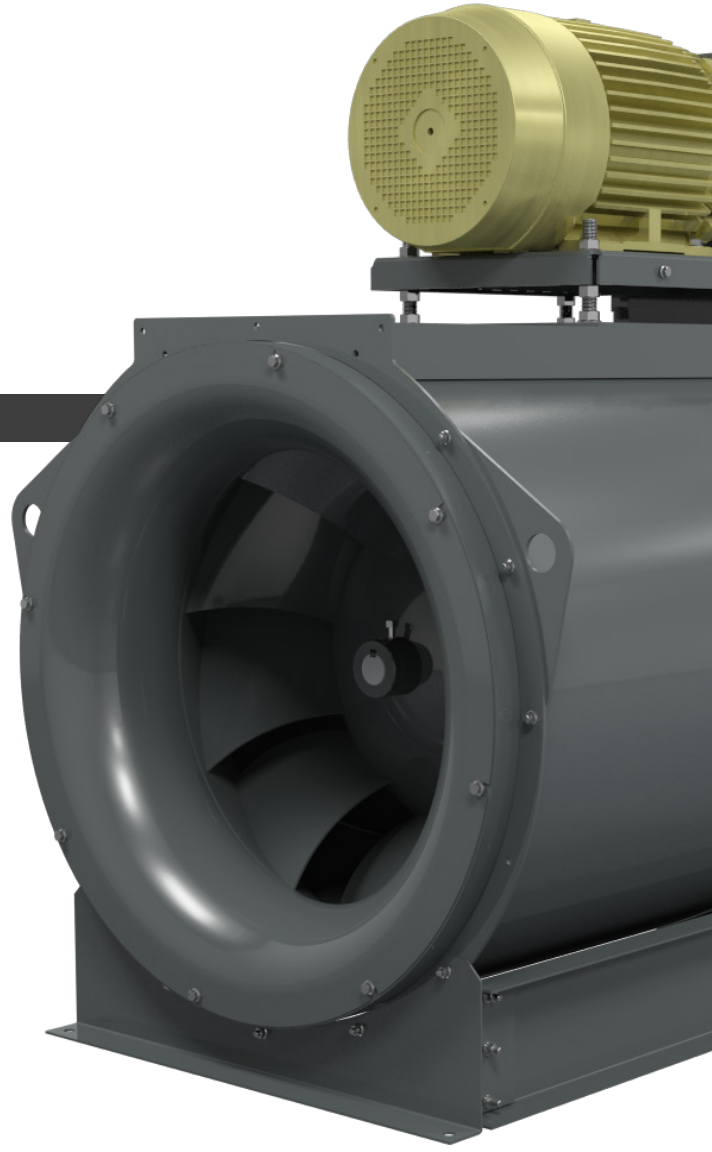
QMX

- Optimized for typical Class-1 static pressures of 0.5" to 4" wg
- Airflow capacity up to 124,000 CFM
- Utilizes a contoured, single thickness blade with 3D curvature to achieve maximum airflow and efficiency while maintaining low sound levels

LEVEL COMPARISON

The QMX is available in three construction levels. Each level has been designed to meet various specific requirements. See below for key differences between levels.

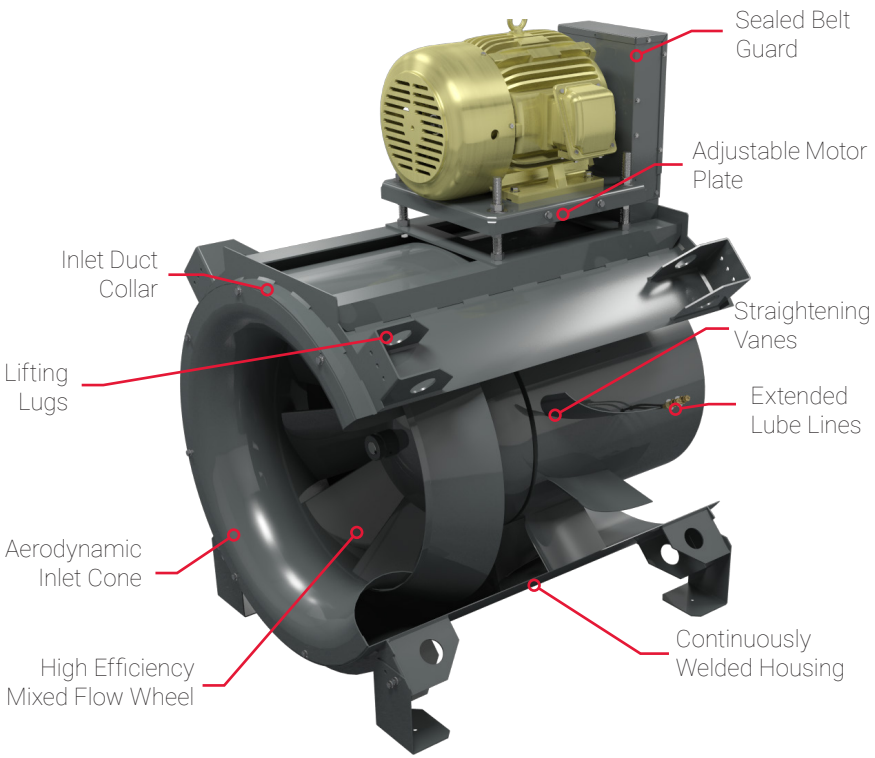
	LEVEL 1	**LEVEL** 2	**LEVEL** 3
PRESSURE RANGE	Up to 4”	Up to 8”	Up to 15”
PRICE	$	$$	$$$
WEIGHT			
AVAILABLE ARRANGEMENTS	9	3, 4, 9	9
AVAILABLE SIZES	165–600	90–600	150–600
WHEEL OPTIONS	QMX QMXHP	QMX QMXHP QMXXP	QMXXP



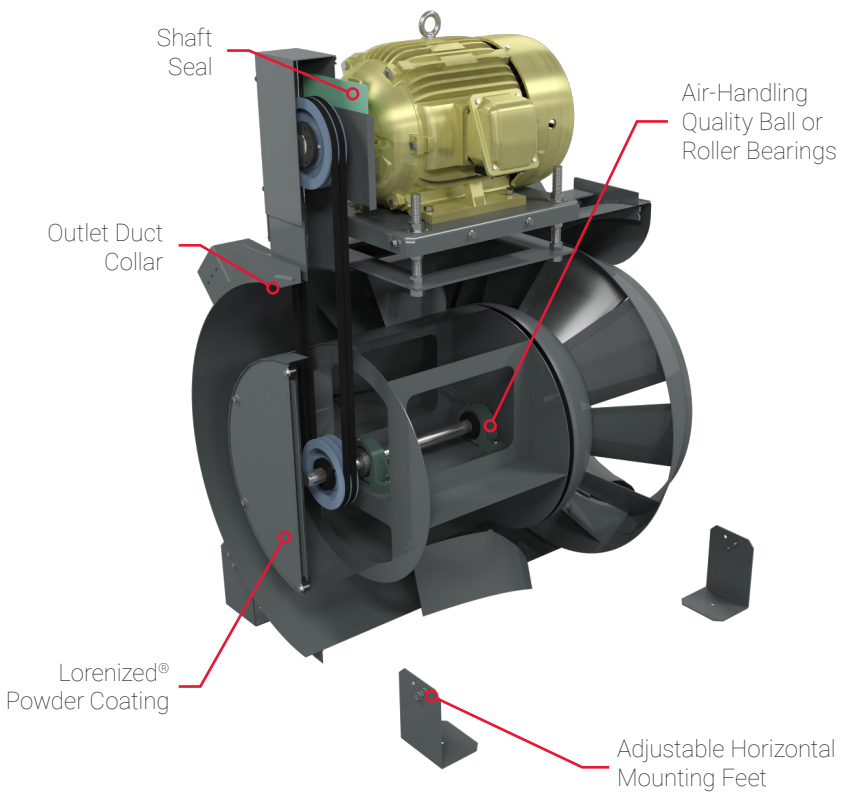
LEVEL ONE FEATURES

The Level One standard construction features are shown below on the QMXHP Arrangement 9.

INLET VIEW



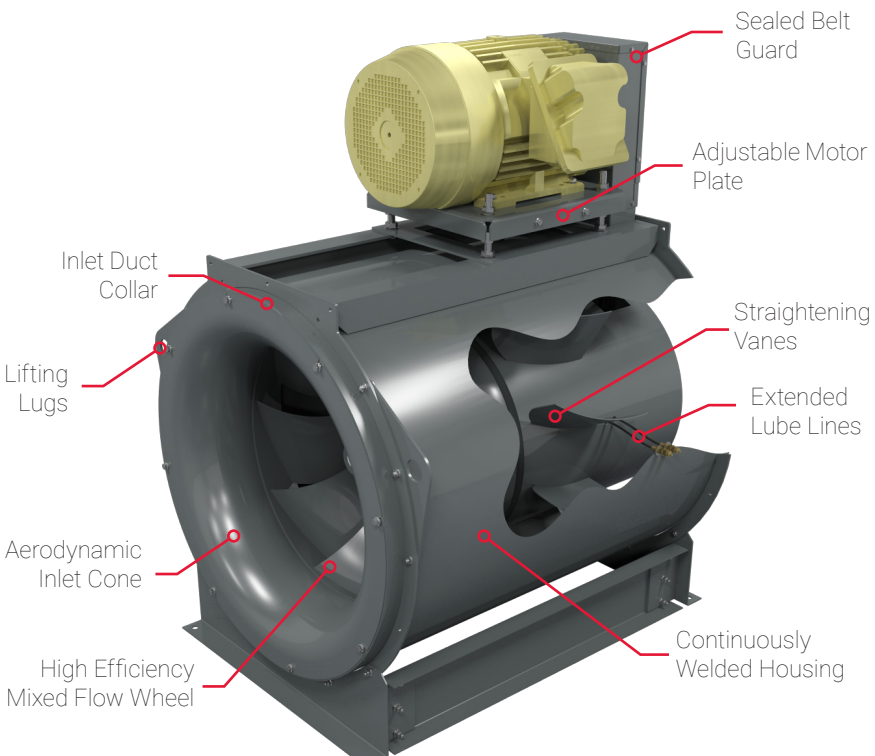
OUTLET VIEW



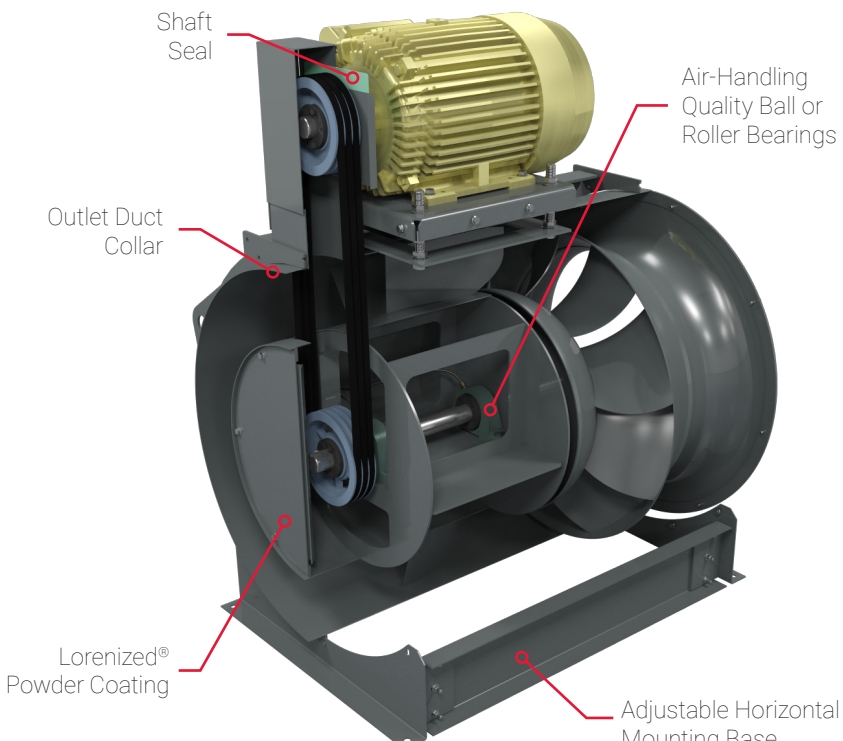
LEVEL TWO FEATURES

The Level Two standard construction features are shown below on the QMX Arrangement 9.

INLET VIEW



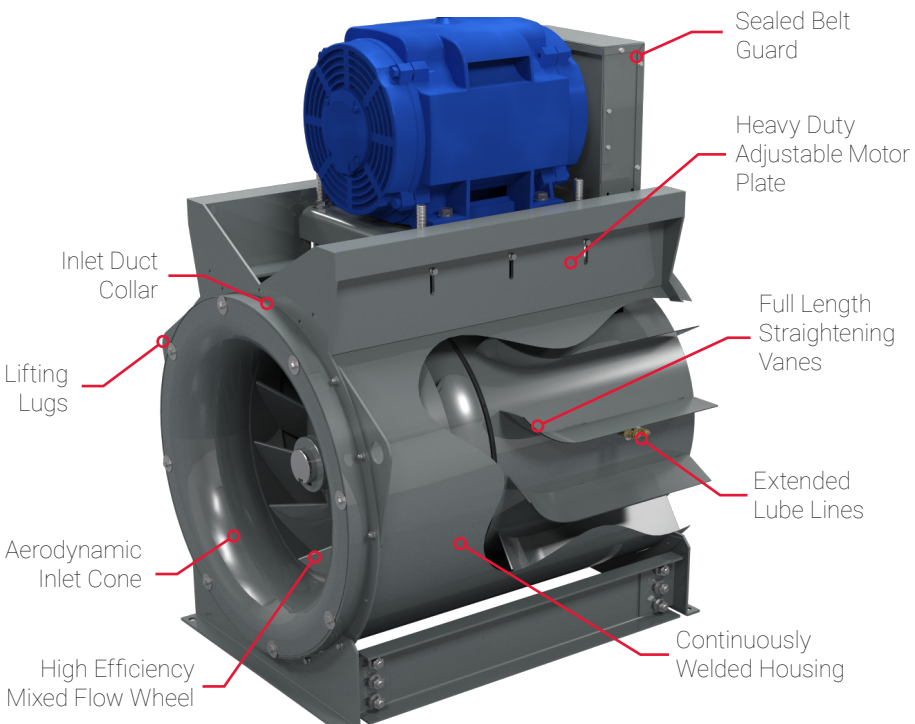
OUTLET VIEW



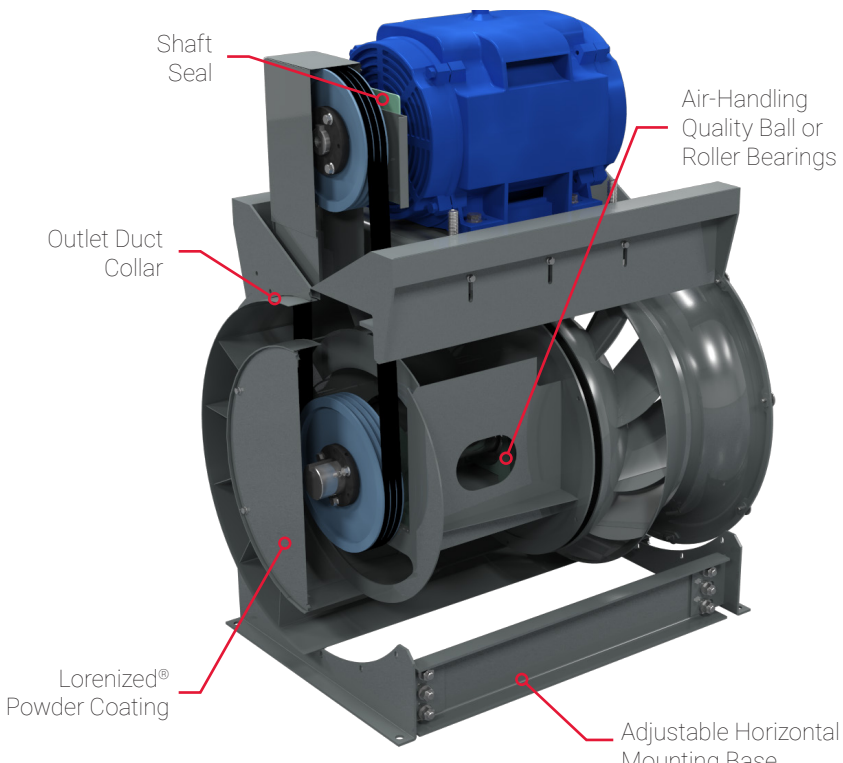
LEVEL THREE FEATURES

The Level Three standard construction features are shown below on the QMXXP Arrangement 9.

INLET VIEW



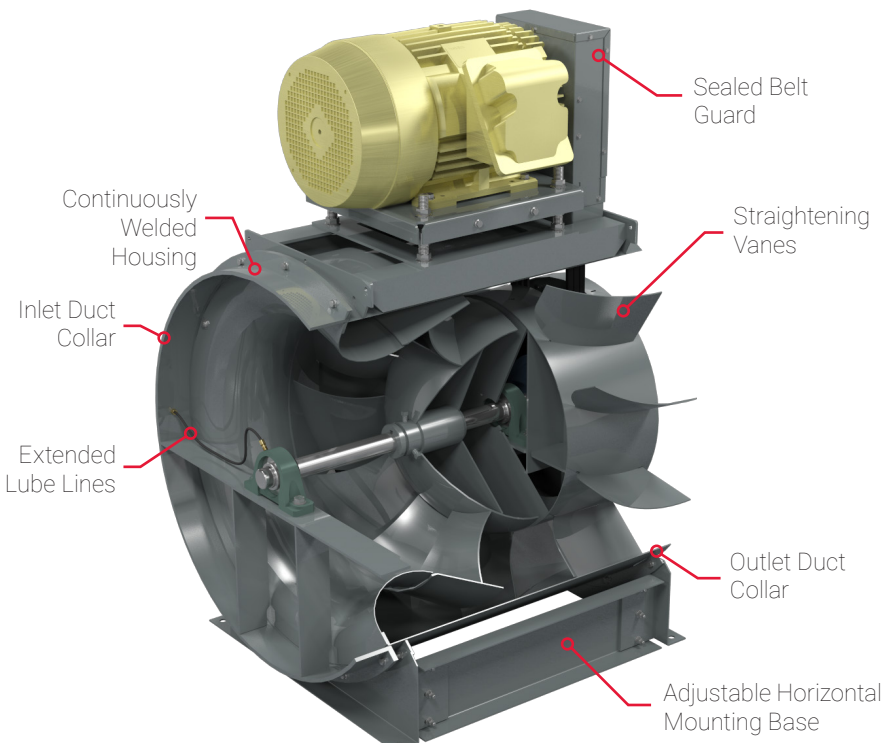
OUTLET VIEW



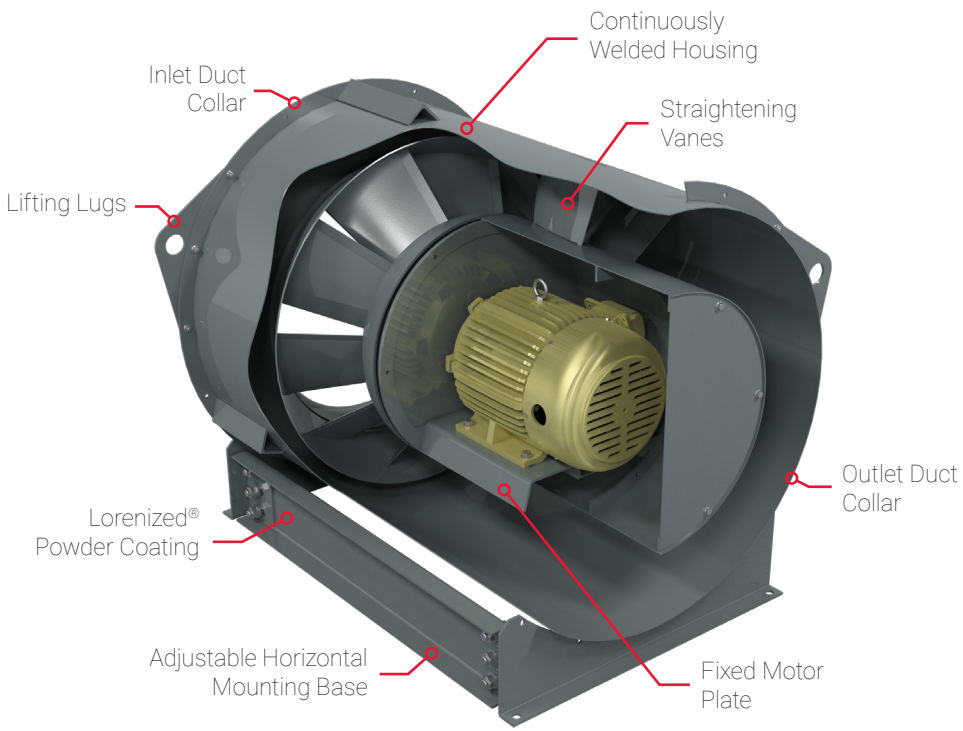
ADDITIONAL ARRANGEMENTS

The QMX/QMXHP Arrangements 3 and 4 shown below offer additional construction features. The Arrangement 4 is also available in a Dual Door version and a Bifurcated version.

ARRANGEMENT 3



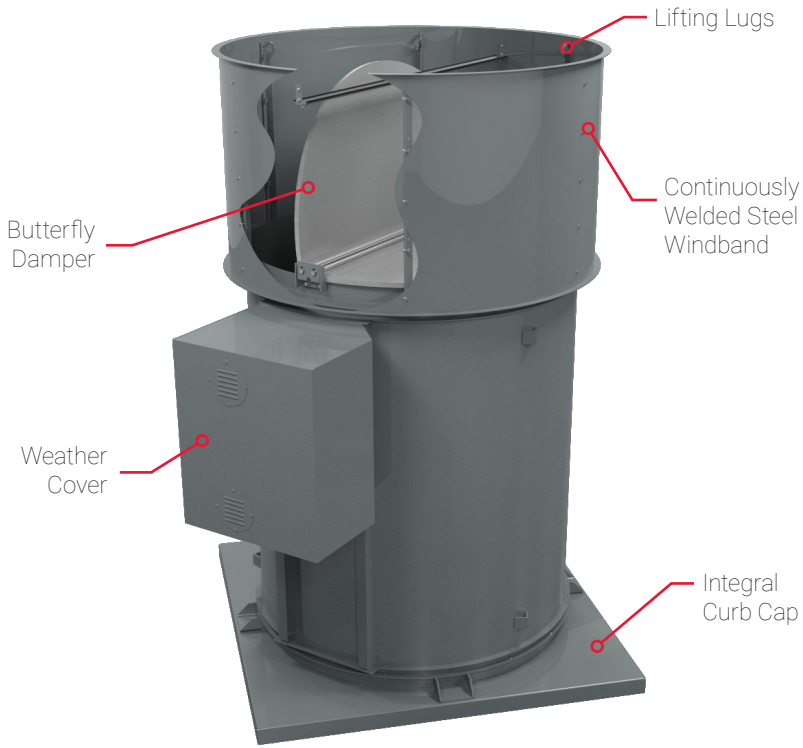
ARRANGEMENT 4



ADDITIONAL CONFIGURATIONS

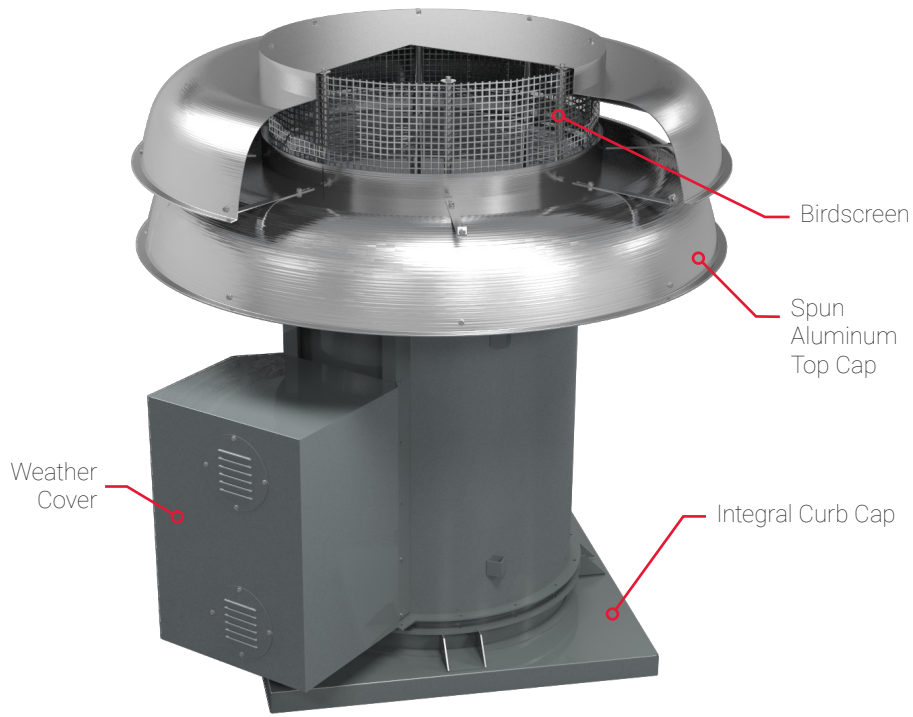
The QMX models QMXU/QMXHPU AND QMXE/QMXS/ QMXHPE/QMXHPS shown below offer additional construction features for mixed-flow blowers.

QMXU UPBLAST EXHAUST



QMXE/QMXS EXHAUST/SUPPLY

(QMXS shown)

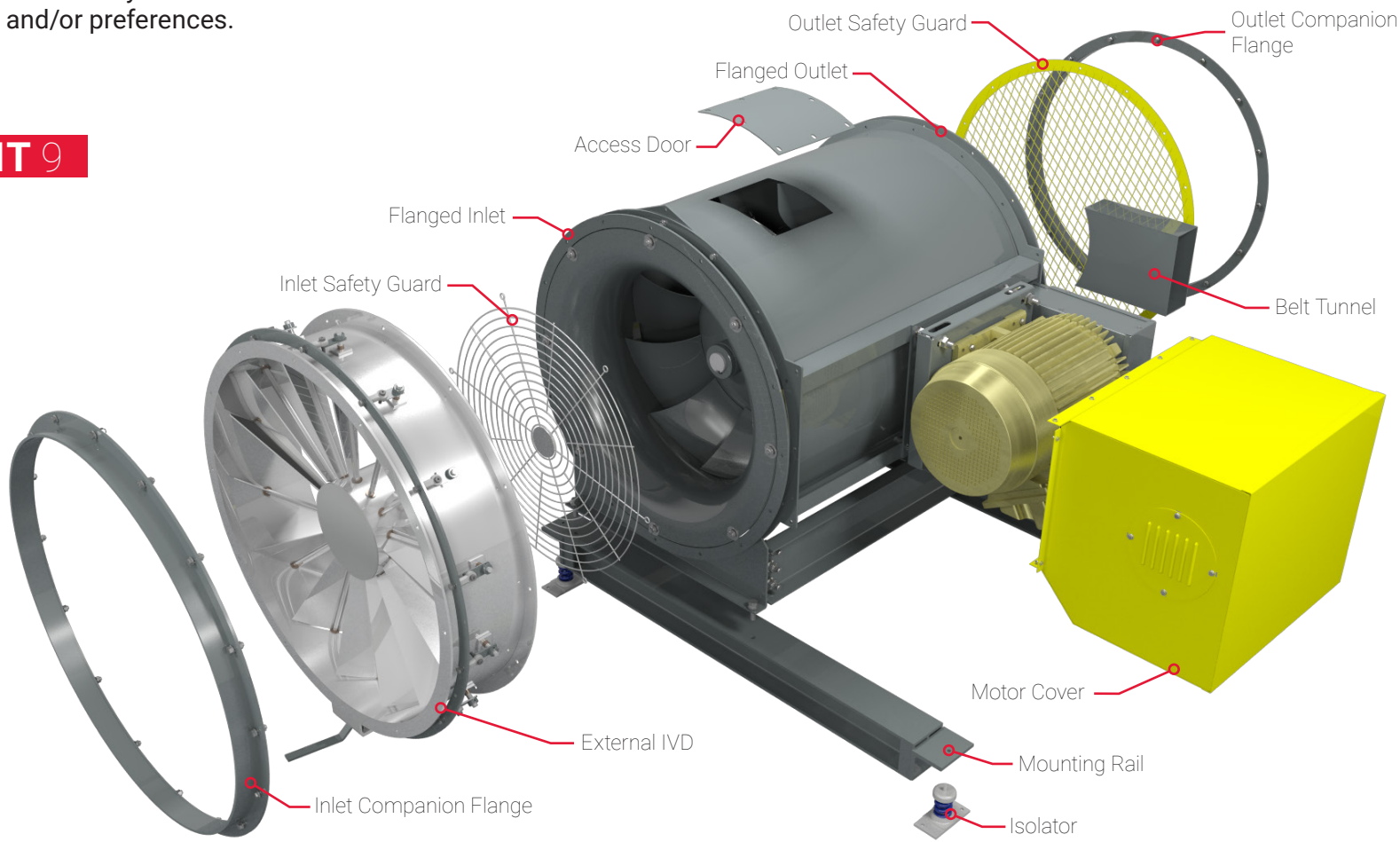


QMX ACCESSORIES

Beyond the QMX Standard Construction Features, Cook offers accessories to fit your custom air-movement requirements and/or preferences.

ARRANGEMENT 9

Details on next page.



ACCESSORIES EXPLAINED

Beyond the QMX Standard Construction Features, Cook offers accessories to fit your custom air-movement requirements and/or preferences.

ACCESS DOOR
- Available in a bolted or hinged configuration
- Provides access to the wheel for cleaning and inspection
- Standard on QMXU, QMXHPU, QMXE, QMXS, QMXHPE QMXHPS and on all Arrangement 3 units

ENCLOSED BELT TUNNEL
- Provides protection for belts and drives from heat and abrasive airstream
- Standard on QMXE, QMXHPE, QMXS, QMXHPS, QMXU and QMXHPU

EXTERNAL IVD
- External IVD provides precise air volume control while maintaining efficiency and stable operation at reduced fan loading

FLANGED INLET/OUTLET
- For flange-type duct attachments.
- Allows fan removal without disturbing the surrounding ductwork

INLET/OUTLET COMPANION FLANGE
- Attached to the adjacent ductwork to provide an exact mate to the flanged connection on the fan

INLET/OUTLET SAFETY GUARDS
- Protect personnel and prevent debris from entering the fan
- Safety guards are constructed of expanded metal
- Discharge Guard on QMXU

MOTOR COVER
- Shields the motor from dirt and debris
- Provides protection for personnel

MOUNTING RAILS/BASE
- Available for installation where the motor center of gravity is offset
- Provides method of maintaining uniform isolator load with respect to fan center of gravity

Additional accessories not pictured.

DRAIN
- Optional drain is located in the bottom of the fan housing
- Continuously welded to the housing and threaded for a ¾ inch pipe connection
- A drain is standard on QMXU and QMXHPU

EXTENDED LIFE BEARINGS
- Extended life bearings provide up to L10 life in excess of 200,000 hours

FLEXIBLE DUCT CONNECTOR
- Provides a flexible connection between the fan and the attached ductwork
- Constructed of reinforced neoprene fabric and aluminum bands
- ***NOT to be used for UL762 or smoke control units or temperatures in excess of 250˚F.***

ROOF CURB
- Roof support structures for fans and ventilators
- Available for flat, pitched and peaked roofs with or without insulation

RUB RING
- Prevents the shaft and wheel from contacting the inner housing
- Constructed of aluminum

SHAFT SEAL
- Reduces air leakage around fan shaft in high pressure applications
- Constructed of aluminum and aramid fiber/NBD gasket material

ALUMINUM WHEEL
- In applications where spark resistance or reduced starting torque is necessary
- NOT to be used in smoke control applications

MOTOR HEAT SHIELD
- Dissipate heat away from the fan motor

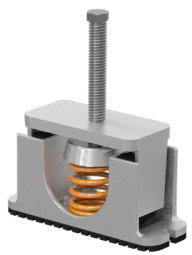
METAL LUBE LINES
- Extended lube lines are available in copper or Stainless Steel

QMX ISOLATORS

Cook offers six types of isolators which reduce vibration transmission from equipment to building structure.

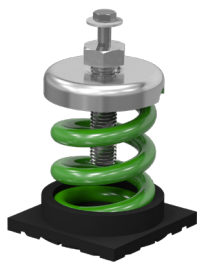
HOUSED SPRING

floor mounted



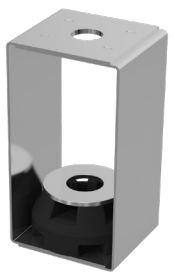
FREE STANDING SPRING

floor mounted



RUBBER-IN-SHEAR

ceiling mounted



RESTRAINED SPRING

floor mounted

SPRING

ceiling mounted

RUBBER-IN-SHEAR

floor mounted

See our Vibration Isolation Brochure for more information.

ACCESSORY PACKAGES

Cook also offers two accessory packages, Spark Resistant and High Temperature. These provide a quick and simplified purchasing process.

SPARK-RESISTANT PACKAGE

Type	Description	Included Options	
A	All parts of the Air Moving Device (AMD) in contact with the air or gas being handled shall be made of non-ferrous material.	▸ All aluminum construction ▸ Stainless steel shaft and hardware ▸ Shaft seal ▸ Enclosed belt tunnel	Aluminum Dampers: QMXU Arr. 9 only
B	The AMD shall have an entirely non-ferrous wheel or impeller and non-ferrous ring about the opening through which the shaft passes.	▸ Aluminum wheel ▸ Rub ring and shaft seal ▸ Enclosed belt tunnel	Arr. 9 only
C	The AMD shall be so constructed that a shift of the wheel or impeller or shaft will not permit two ferrous parts of the AMD to rub or strike.	▸ Rub ring and shaft seal ▸ Enclosed belt tunnel	Arr. 9 only

Spark-Resistant Package Notes:

- Bearings shall not be placed in the air or gas stream
- The user shall electrically ground all AMD parts

HIGH TEMP PACKAGE

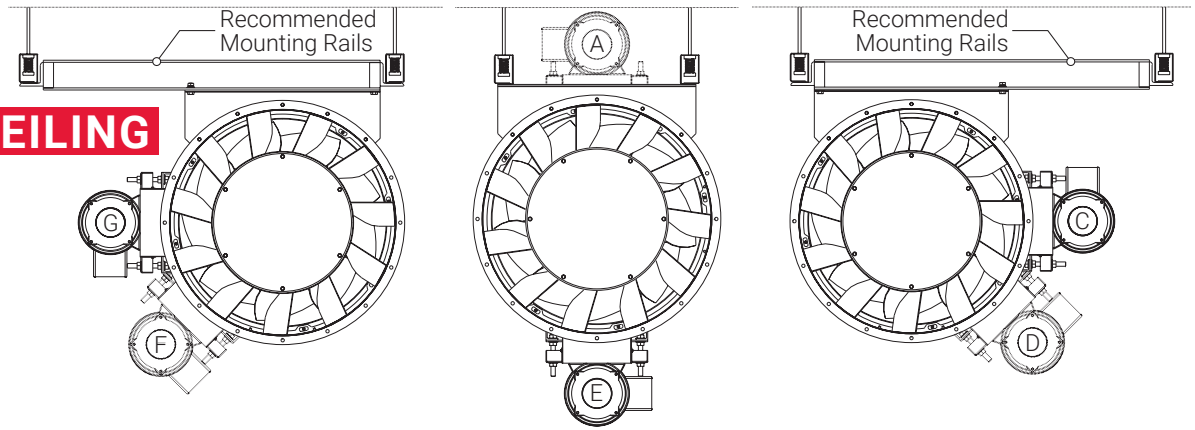
Temperature Range (°F)	Construction Requirements
-20° - 180°	▸ Standard Construction
180° - 230°	▸ Enclosed Belt Tunnel ▸ Standard Bearings (Arr. 9) ▸ High Temperature Bearings (Arr. 3) ▸ Metal Lube Lines
231° - 300° (Arrangement 9 only)	▸ Enclosed Belt Tunnel ▸ High Temperature Paint ▸ Motor Heat Shield ▸ RPM Limited to 96% of Max at 300°F ▸ Shaft Seal* ▸ High Temperature Bearings* ▸ Metal Lube Lines
301° - 500° (Arrangement 9 only)	▸ Enclosed Belt Tunnel ▸ High Temperature Paint ▸ High Temperature Bearings ▸ Motor Heat Shield ▸ RPM Limited to 91% of Max at 500°F ▸ Steel Wheel Construction ▸ Shaft Seal* ▸ Shaft Cooler* ▸ Ventilation Tube* ▸ Metal Lube Lines

* Only required when above 1/2" w.g.

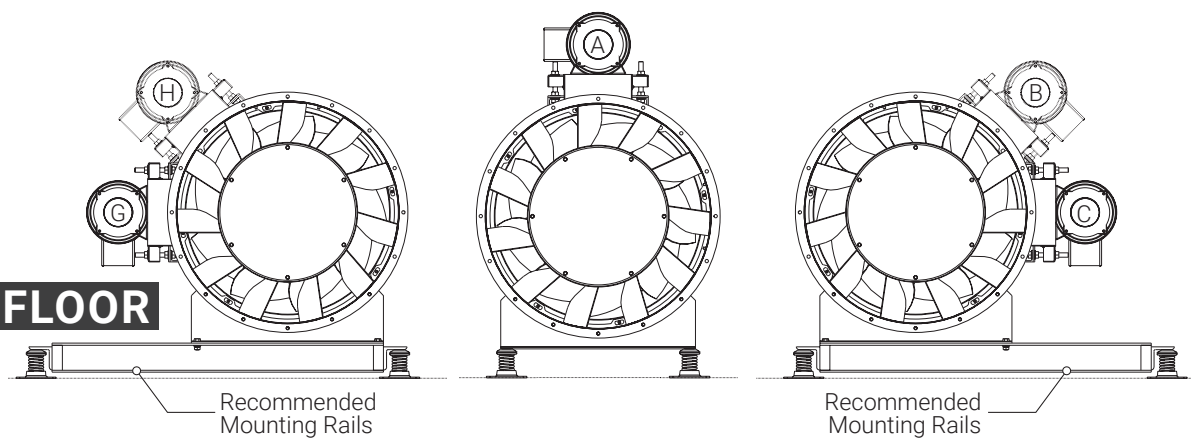
INSTALLATION & MOUNTING

Recommended horizontal installation and mounting are shown here for various motor positions. Additional detail can be found in the QMX Installation, Operation and Maintenance Manual.

CEILING



FLOOR



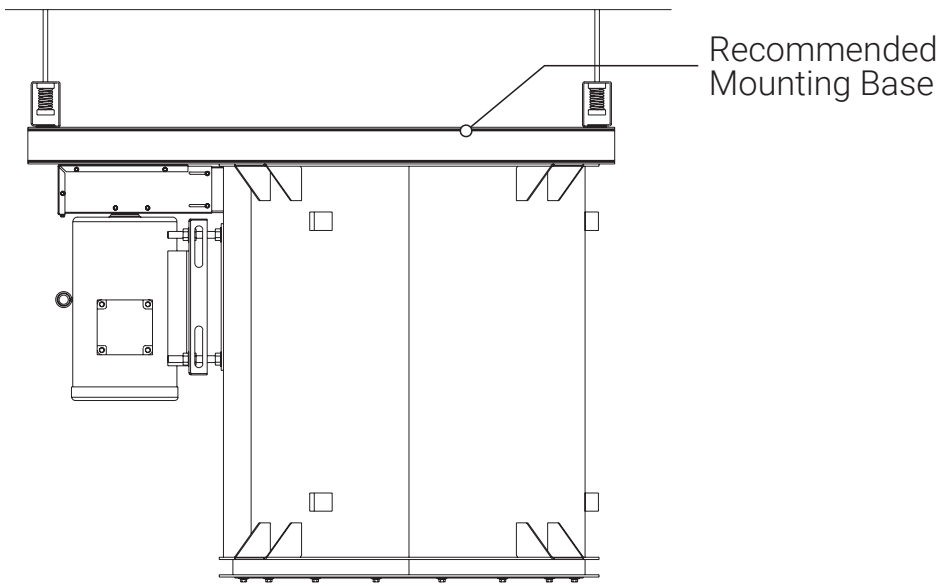
DESIGN BENEFITS

- Horizontal mounting configurations are provided with a standard support for both ceiling and floor applications.
- The mounting configurations and the motor position can be changed in the field.
- Lifting lugs are provided to assist in product installation.
- Mounting rails are recommended for horizontal configurations with motor positions B, C, D, F, G and H with vibration isolation.
- Motor position is determined by viewing fan outlet.

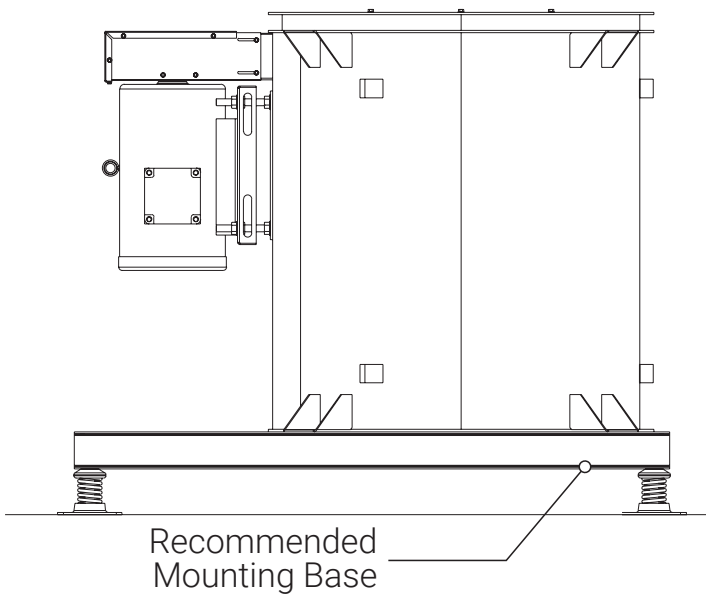
INSTALLATION & MOUNTING

Recommended vertical installation and mounting. Additional detail can be found in the QMX Installation, Operation and Maintenance Manual.

CEILING



FLOOR

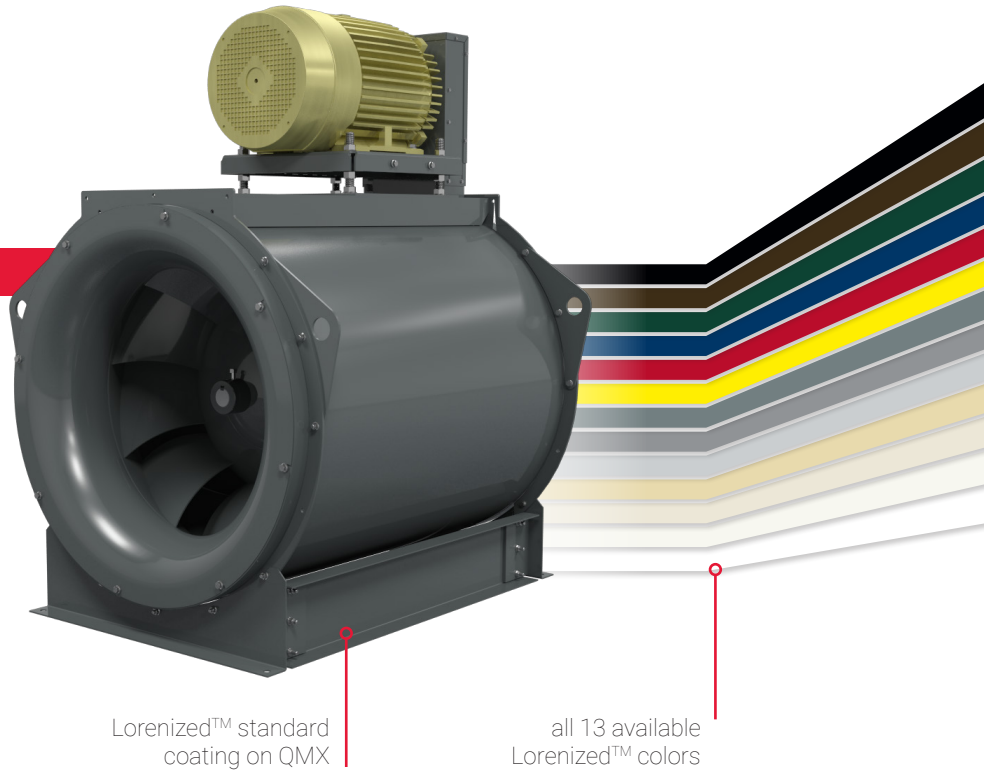


DESIGN BENEFITS

- Vertical mounting configurations are provided with four heavy duty mounting brackets welded to each end.
- The brackets allow a unit to be installed in either ceiling or floor configuration in both upblast and downblast applications.
- Vertical mounting base are suggested for any vertical installation with vibration isolation.

STANDARD COATING

The QMX is available with six coatings. The Lorenized™ coating in gray is standard. Lorenized™ is also available in 12 other colors shown.



LORENIZED™ COATING

- Electrostatically applied, baked polyester powder coating
- Undergoes a five-stage environmentally friendly pretreatment/wash process before coating
- Baked and cured at 400°F; final coating thickness of 1.5–2.5 mil
- Coating is required to exceed 1,000 hour salt spray under ASTM B117 test method
- Offers strong chemical resistance, durable mechanical performance and tough protection from outdoor elements

OPTIONAL COATINGS

Each type of coating offers unique qualities, benefits and color availability.

COOK HIGH TEMP COATING

- Solvent based, heat resistant liquid coating which exhibits good corrosion resistance and color stability
- Final coating thickness is 0.8–1.5 mil
- Withstands service temperatures up to 1,000°F

Available in **BLACK**.

COOK EPOXY POWDER

- Electrostatically applied, baked epoxy powder coating
- Final coating thickness is 2.5–3.5 mil
- For outdoor applications, an optional UV resistant topcoat is available to prevent coating deterioration

Available in **DARK GRAY**.

AIR DRY PHENOLIC

HERESITE® VR-514

- Conventional spray applied phenolic resin coating
- Final coating thickness is 2.0–4.0 mil
- For outdoor applications, an optional UV resistant topcoat (Heresite® UC-5500) is required to prevent deterioration of the coating

Available in **BROWN**.

COOK EASY-CLEAN POWDER

- Electrostatically applied, baked modified epoxy silicone powder coating
- High temperature "non-stick" coating
- Final coating thickness is 1.0–2.0 mil

Available in **BLACK**.

COOK PHENOLIC EPOXY POWDER

- Electrostatically applied, baked phenolic epoxy powder coating
- Final coating thickness is 1.5–4.0 mil
- For outdoor applications, an optional UV resistant topcoat is required to prevent coating deterioration

Available in **LIGHT GRAY** and **BROWN**.

See our Coatings Brochure for more information.

QMX CERTIFICATIONS

Through professional third party companies, the following information explains which products have obtained and maintained the title of "certified" here at Loren Cook Company.

AMCA SOUND AND AIR

AMCA Certified Ratings Seal

Loren Cook products that bear the AMCA Certified Ratings Seal are licensed by AMCA International. These products meet the AMCA Standard and are within the product scope of AMCA International.

QMX | QMXHP | QMXXP

QMXD | QMXHPD

SEISMIC

Seismically Qualified

The below QMX models have been shake table tested to exceed spectral response accelerations covering the most severe seismic conditions found within the United States.

Level 2 Only

QMX | QMXHP | QMXXP

SEISMICALLY QUALIFIED

For more information, see Seismic Certification Flyer.

UL 705 LISTED

Power Ventilator

The UL 705 Listing is the standard for electrical safety for permanently connected power ventilators. All QMX models are constructed in accordance with UL 705, only when with motors.

All Models

Listed

CERTIFICATIONS CONTINUED

The Cook products shown below are either UL Listed for Power Ventilator for Smoke Control Systems or UL 762 Listed for Restaurant Exhaust Appliances.

SMOKE CONTROL

Power Ventilator for Smoke Control Systems

The UL Listing "Power Ventilator for Smoke Control Systems" is a test procedure and category initiated by Loren Cook Company and developed in a joint effort with UL in 1990. The products below are UL Smoke Control Listed.

Sizes 90–600	QMX	QMXHP	QMXU	QMXHPU
Sizes 150–600	QMXD	QMXHPD	QMXDU	QMXHPDU
	QMXXP	QMXXPU		

Listed

UL Requirements

- Unit must be listed under UL 705
- Unit must be supplied with belt tunnel, motor heat shield, steel wheel construction
- Unit must withstand specified elevated air stream temperature for specified duration

For more information, see UL Smoke Control Flyer.

UL 762 LISTED

Power Ventilator Restaurant Exhaust Appliances

Loren Cook Company products that bear the UL 762 Listing are designed to exhaust contaminated or grease-laden air. The products shown below are UL Listed to operate continuously at the shown elevated temperatures.

Max. Temp. 300°F	QMX	QMXHP	QMXU
	QMXXP	QMXXPU	QMXHPU
Max. Temp. 500°F	QMX	QMXHP	QMXXP

Listed

UL Requirements

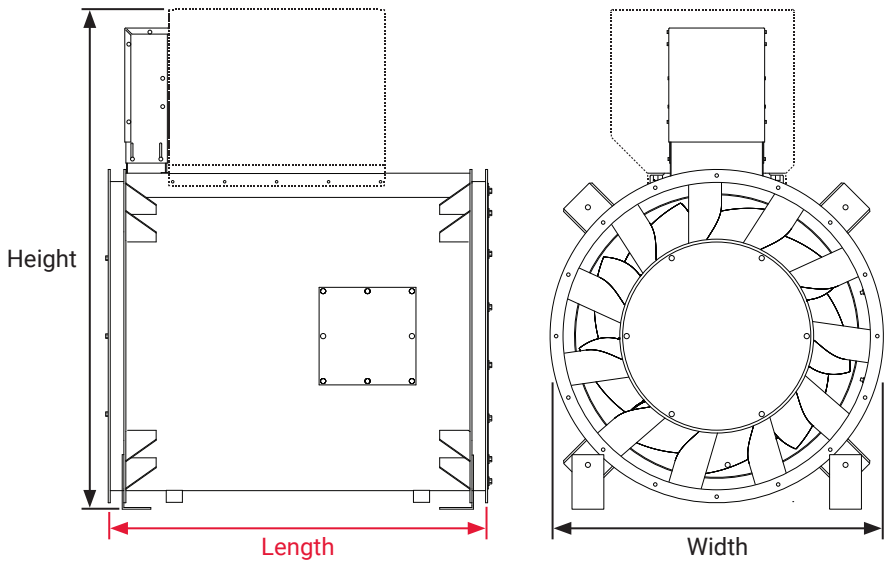
- Unit must be supplied with drain, access door, flanged inlet and outlet, belt tunnel and motor heat shield
- Outdoor applications must be supplied with a weather cover
- Applications above 300° require steel wheel

For more information, see UL 762 Restaurant Flyer.

OVERALL DIMENSIONS

The following overall dimensions are in inches. For more detailed dimensions, see the product submittal.

ARRANGEMENT 9 LEVEL 1

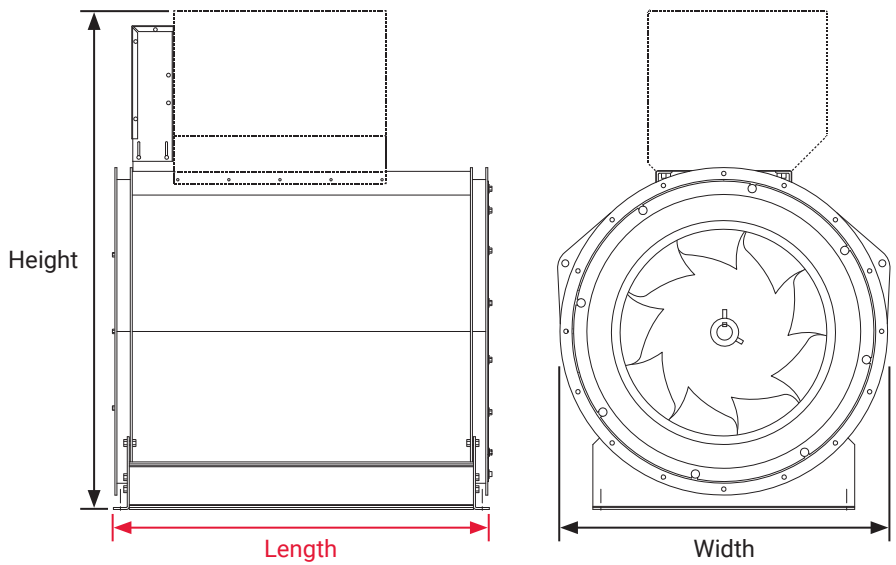


Unit Size	165	180	202	225	245	270	300	330	365	402	445	490	540	600
Height	39 15/16	43 7/16	47 1/8	50 1/4	55 3/8	61 3/8	66 1/2	70 1/2	76 11/16	84 11/16	92 15/16	99 9/16	109 1/8	120 1/4
Length	33	35	37 1/2	41	44 1/2	47	54	58 1/2	64	68 1/2	74	80 1/2	87	95 1/2
Width	26 1/2	28 5/8	31 3/4	34 15/16	37 3/4	41 5/16	45 1/2	49 3/4	54 3/4	59 15/16	66 1/16	72 3/8	79 7/16	88

OVERALL DIMENSIONS

The following overall dimensions are in inches. For more detailed dimensions, see the product submittal.

ARRANGEMENT 9 LEVEL 2

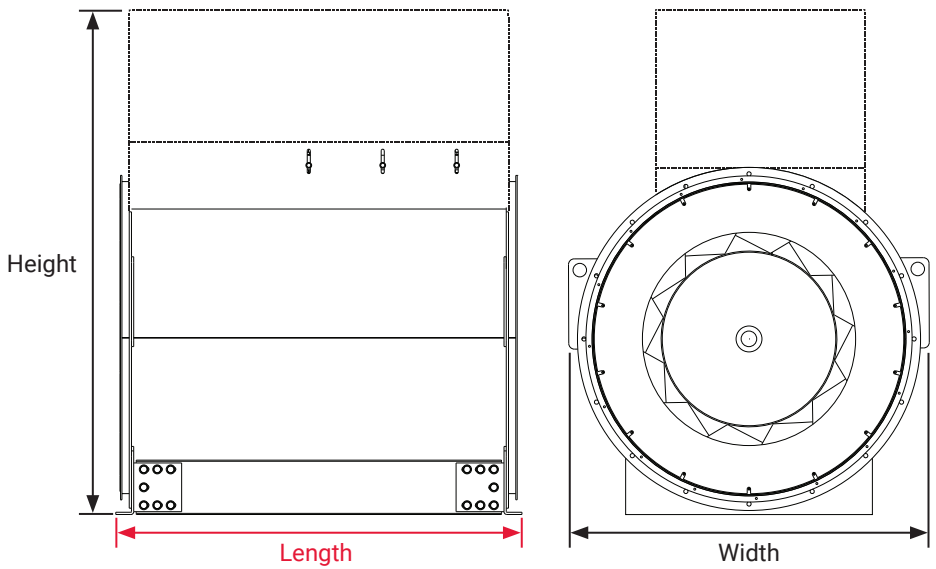


Unit Size	90	120	135	150	165	180	202	225	245	270	300	330	365	402	445	490	540	600
Height	28 1/8	34 5/8	36 7/8	39 1/2	43 7/16	45 7/16	49 1/8	53 3/4	56 7/8	61 3/8	68 1/2	72 1/2	80 11/16	88 11/16	94 15/16	103 9/16	111 1/8	122 1/4
Length	19 7/8	24	27	30	33	35	37 1/2	41	44 1/2	47	54	58 1/2	64	68 1/2	74	80 1/2	87	95 1/2
Width	15 7/8	20 1/16	22 1/4	24 3/8	26 1/2	28 5/8	31 3/4	34 15/16	37 3/4	41 5/16	45 1/2	49 3/4	54 3/4	59 15/16	66 1/16	72 1/2	79 9/16	88 3/8

OVERALL DIMENSIONS

The following overall dimensions are in inches. For more detailed dimensions, see the product submittal.

ARRANGEMENT 9 LEVEL 3

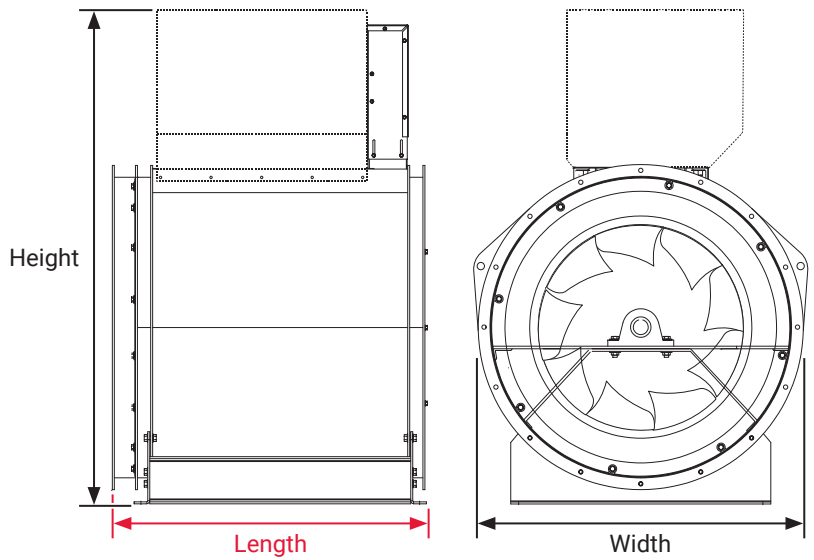


Unit Size	150	165	180	202	225	245	270	300	330	365	402	445	490	540	600
Height	43	44 15/16	48 15/16	52 5/8	57 3/4	60 7/8	65 3/8	74 1/2	78 1/2	84 11/16	90 11/16	96 15/16	103 9/16	111 1/8	129 1/4
Length	30	33	35	37 1/2	41	44 1/2	47	54	58 1/2	64	68 1/2	74	80 1/2	87	95 1/2
Width	25 1/4	27 3/8	28 1/2	32 5/8	35 13/16	38 5/8	42 3/16	46 3/4	51	56 3/4	61 15/16	68 13/16	75 7/8	85 15/16	92 7/8

OVERALL DIMENSIONS

The following overall dimensions are in inches. For more detailed dimensions, see the product submittal.

ARRANGEMENT 3

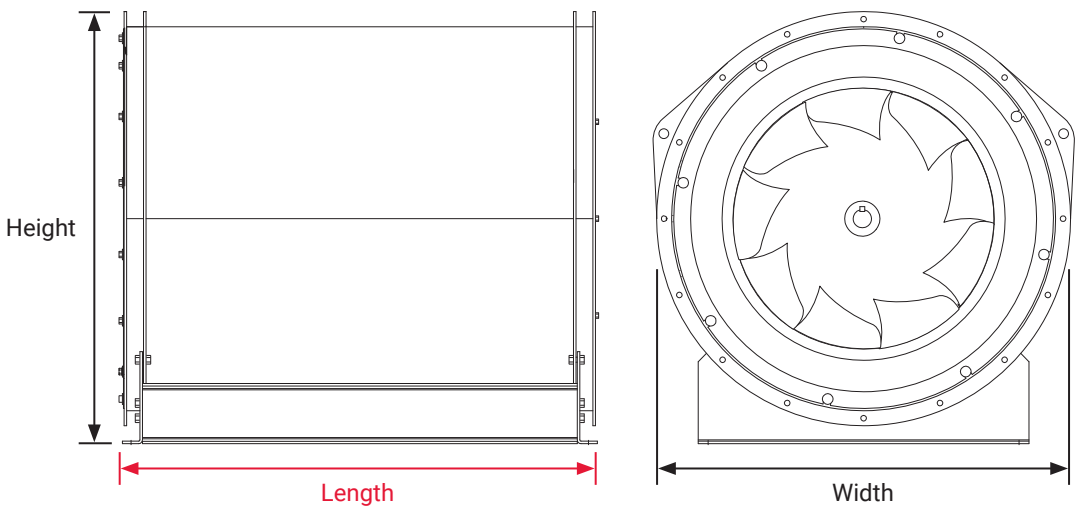


Unit Size	180	202	225	245	270	300	330	365	402	445	490	540	600
Height	45 7/16	49 1/8	53 3/4	56 7/8	61 3/8	68 1/2	72 1/2	80 11/16	88 11/16	94 15/16	103 9/16	111 1/8	122 1/4
Length	29 1/4	31 13/16	33 13/16	35 13/16	38	37 13/16	40 1/8	44	47 15/16	52 9/16	57 15/16	64 3/8	70 15/16
Width	28 5/8	31 3/4	34 15/16	37 3/4	41 5/16	45 1/2	49 3/4	54 3/4	59 15/16	66 1/16	72 1/2	79 9/16	88 3/8

OVERALL DIMENSIONS

The following overall dimensions are in inches. For more detailed dimensions, see the product submittal.

ARRANGEMENT 4

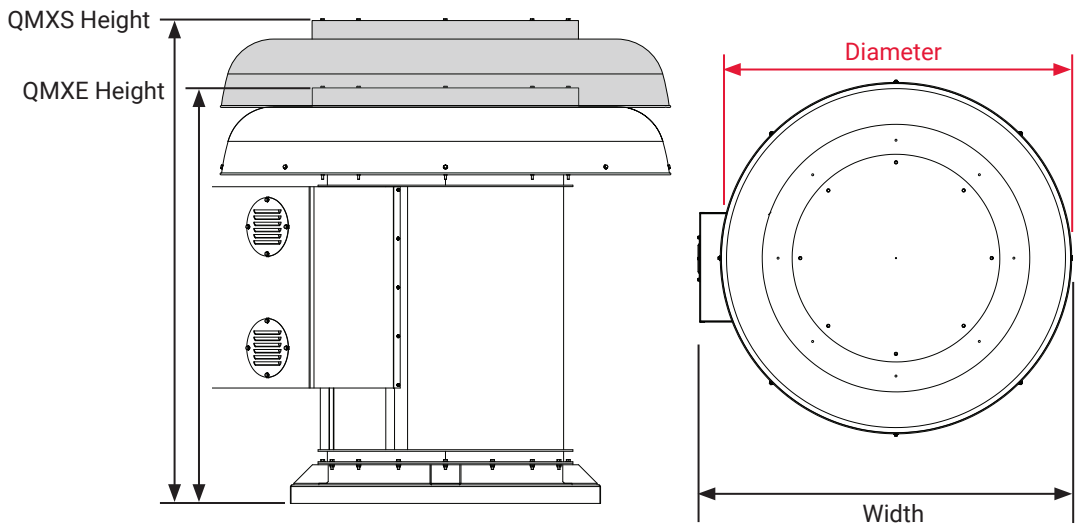


Unit Size	150	165	180	202	225	245	270	300	330	365	402	445	490	540	600
Height	25 3/8	27 9/16	29 13/16	33 1/8	36 1/2	39 3/8	43 1/8	47 1/2	51 7/8	57 3/16	62 11/16	69 1/16	75 5/8	83 1/16	93 15/16
Length	30 1/4	33 1/4	35 1/8	37 3/4	41 1/4	44 3/4	47 1/4	54 1/4	58 3/4	65 1/4	69 3/4	75 1/4	81 3/4	88 1/4	96 3/4
Width	24 3/8	26 1/2	28 5/8	31 3/4	34 15/16	37 3/4	41 5/16	45 1/2	49 3/4	54 3/4	59 15/16	66 1/16	72 1/2	79 9/16	88 3/8

OVERALL DIMENSIONS

The following overall dimensions are in inches. For more detailed dimensions, see the product submittal.

ARRANGEMENT 9 QMXE/QMXS EXHAUST/SUPPLY

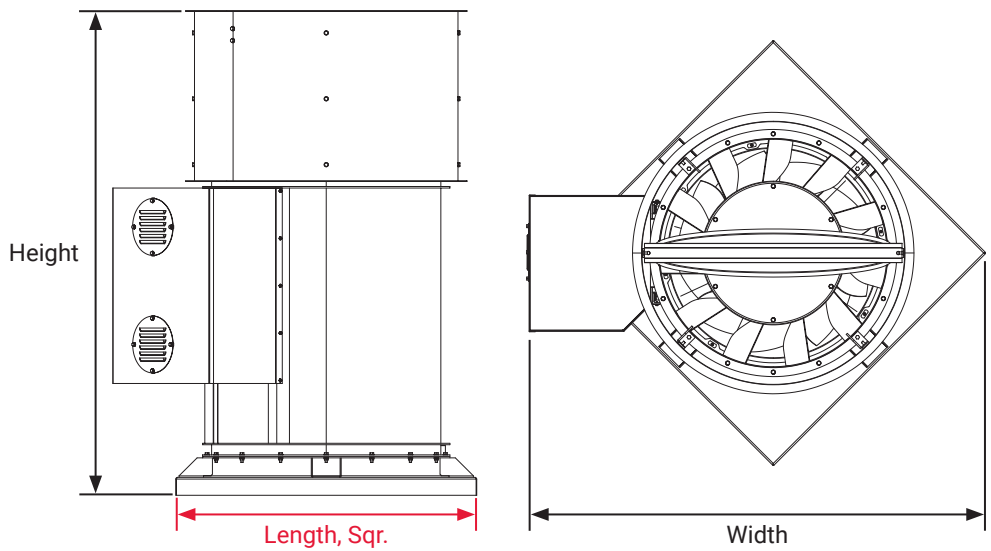


Unit Size	90	120	135	150	165	180	202	225	245	270	300
QMXE Height	39 3/16	39 5/8	43 15/16	46 15/16	51 1/8	57 3/4	60 1/2	64	64 7/16	67 3/16	74
QMXS Height	45 3/4	46 11/16	53 3/4	56 3/4	62 1/2	71 13/16	76 1/16	79 9/16	75 7/16	78 3/16	85 9/16
Diameter	28 9/16	32 13/16	43 9/16	43 9/16	47 5/8	52 5/8	62 5/8	62 5/8	73 5/8	73 5/8	73 5/8
Width	37 3/8	43 5/8	46 1/2	51	55	57 3/4	61 13/16	68 1/8	71 13/16	76 5/16	85

OVERALL DIMENSIONS

The following overall dimensions are in inches. For more detailed dimensions, see the product submittal.

ARRANGEMENT 9 QMXU



Unit Size	90	120	135	150	165	180	202	225	245	270	300	330	365	402	445	490	540	600
Height	40 9/16	45 11/16	49 11/16	54 11/16	58 11/16	61 11/16	65 11/16	70 11/16	76 5/8	80 7/8	90 1/4	96 3/4	104 7/8	112 3/8	120 7/8	131 3/8	141 7/8	154 3/8
Length	20 1/4	24 1/4	26 1/4	30 1/4	35 1/4	37 1/4	40 1/4	43 1/4	46 1/4	50 1/4	54 1/4	58 1/4	64 1/4	69 1/4	75 1/4	82 3/8	90 3/8	98 3/8
Width	37 3/8	43 5/8	46 1/2	51	55	57 3/4	61 13/16	68 1/8	71 13/16	76 5/16	82	89 1/4	96 1/4	105	112 7/16	122 1/2	131 7/8	142

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