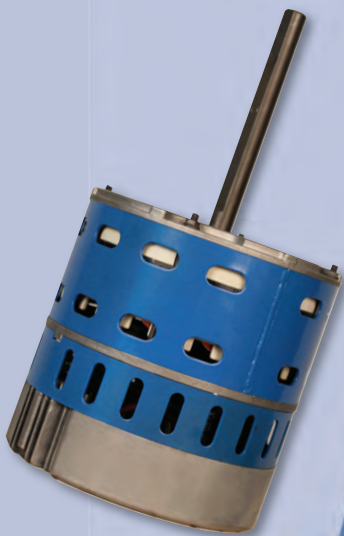


# High Efficiency Motors



## AZURE<sup>®</sup> Digi-Motor<sup>®</sup>



Azure<sup>®</sup> Direct Drive Motor



Azure<sup>®</sup> Condenser Fan Motor



Azure<sup>®</sup> 3.3" Commercial Refrigeration Evaporator Fan Motor

## ECM for Commercial Refrigeration



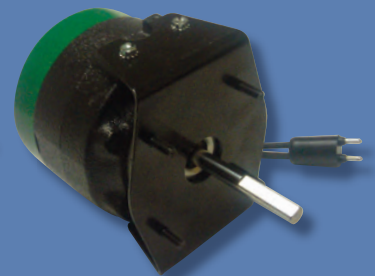
Fan/Motor System



Made in USA Case Motor



IP55 Rated Case Motor



3.3" Evaporator Fan Motor

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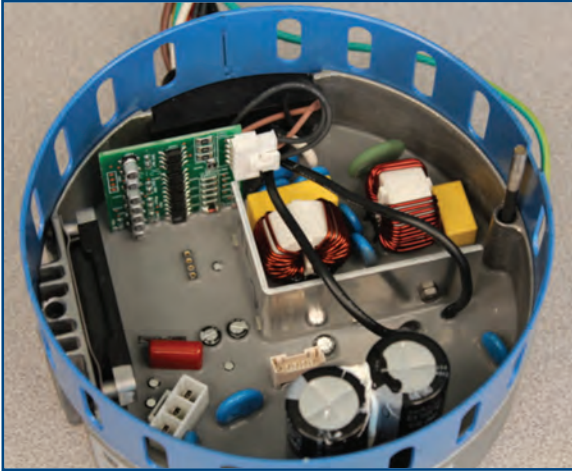
**MARS Technical Help Line**

**800-678-9888**

M-F 8 am – 5 pm EST.

## AZURE<sup>®</sup> Digi-Motor<sup>®</sup>

### The Next-Generation of Variable Speed Technology

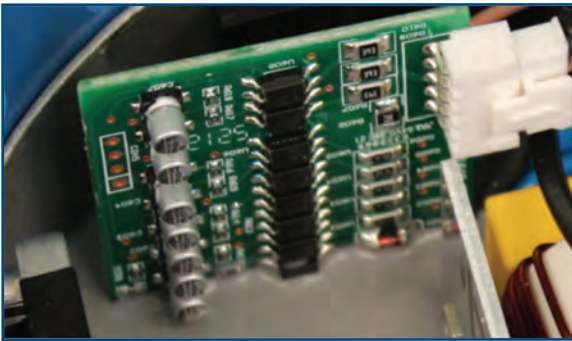


The Azure<sup>®</sup> Digi-Motor<sup>®</sup> from MARS is a high efficiency variable speed direct drive blower motor for a multitude of applications including heat pumps, air handlers, and fossil fuel equipment. Azure<sup>®</sup> replaces both standard PSC and OEM Genteq X-13 motors. Two motors cover ratings from 1/5 HP to 1 HP at 115V or 230V and CW or CCW rotation.

Azure<sup>®</sup> features an auto sizing learn mode. In start-up learn mode, Azure<sup>®</sup> runs for approximately 2 minutes measuring the external static pressure of the system application. Azure<sup>®</sup> then assigns torque values to each of its speed taps self-programming itself to the correct HP for the application.

Obtaining correct airflow can often be a challenging process. An optional hand held programmer (MARS No. 08502) can be plugged into an access port on Azure<sup>®</sup> to display the percentage of torque being applied by the speed tap being energized. For example, a display of 46 indicates Azure<sup>®</sup> is providing 46% of maximum available motor torque. Although Azure<sup>®</sup> automatically sizes to each application, this tool can be used to manually increase or decrease (torque) motor speed to customize the installation.

### Software Learns Every Application



Exclusive onboard software auto sizes Azure<sup>®</sup> to every application so you don't have to. This is especially important if anything has changed the originally intended external static pressure of the system. Why duplicate someone else's mistake? Allow Azure<sup>®</sup> to handle the adjustments.

Because Azure<sup>®</sup> is a constant torque motor design, it works to deliver constant airflow even as the air filter(s) become dirty. Constant torque = constant comfort.

### Outboard Surge Protection Prevents Costly Repairs



A common mode of failure for electronically commutated motors is surge suppressor burnout. This requires the expensive control module (end bell) to be replaced. Azure<sup>®</sup> features an outboard surge protector located within the motor wire harness that can easily and affordably be replaced.

### Hand Held Programmer Allows Custom Speed Tuning

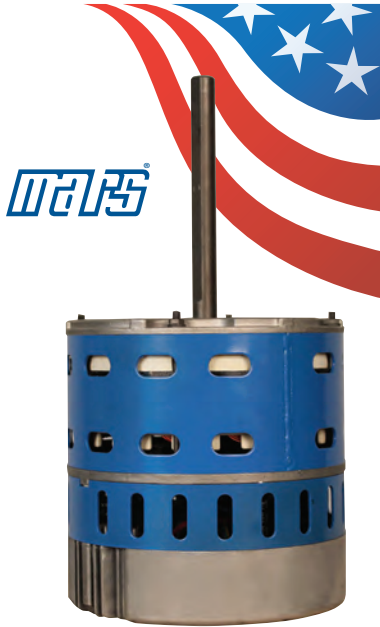


The optional hand held programmer (MARS No. 08502) allows 4 of the 5 speed taps to be manually adjusted for the following purposes (NOTE: The 625 RPM constant fan tap cannot be adjusted):

- To reduce the operating speed of the blower to the low end of the acceptable range in order to maximize dehumidification during the cooling cycle
- To increase the blower speed to assist in high altitude CFM issues
- To duplicate motor speeds on 2 or more of the 4 speed taps
- To assist in setting speeds on multi-stage systems requiring up to 4 blower speeds

The hand held programmer is a portable tool, and unlike PWM control boards it need not be left with the application. The hand held programmer is compatible with all Azure<sup>®</sup> Digi-Motors<sup>®</sup> from MARS.

Assembled in the USA



## AZURE® Digi-Motor®

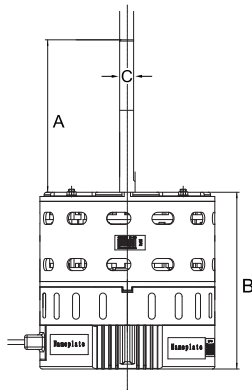
### Ball Bearing

The Azure® Digi-Motor® from MARS is a high efficiency variable speed direct drive blower motor for a multitude of applications. Azure® is a replacement for both standard PSC and Genteq X-13 motors. Two motors cover ratings from 1/5 HP to 1 HP at 115V or 230V and CW or CCW.

Azure® features an auto sizing learn mode. In start-up learn mode, Azure® runs or approximately 2 minutes measuring the external static pressure of the system application. Azure® then assigns torque values to each of its speed taps self-programming itself to the correct horsepower for the application.

If none of the four speeds provides perfect airflow for the application or if duplicate speeds are desired on 2 or more taps, an optional hand held programmer (MARS No. 08502) can be used. The programmer connects to Azure® and displays the percentage of torque applied to the speed tap being energized. The percentage (motor speed) can then be increased or decreased and permanently set with the programmer. This tool overrides the motor torques established in the auto sizing mode.

Unlike other electronically commutated motors, an outboard surge protector is included within Azure's® wire harness. This is a replaceable device (MARS No. 08593).



### Features:

- Outboard replaceable surge protector
- Adjustable speeds (with optional MARS No. 08502)
- 4 speeds plus 625 RPM constant fan mode
- Reversible rotation
- High efficiency 85%
- Multi-horsepower
- Dual voltage
- Belly band mount

### Specifications:

- Class "B" insulation
- 48 Frame
- Thermal overload protected
- Operating temperature range: -20°C to 55°C (-4°F to 131°F)
- UL Recognized

### Cross Reference to Competitive ECM Products

MARS No.	Azure®	Century/AO Smith	US Motors/Emerson	GE/Genteq
10860	10800	CS1056, CSL1056	5522ET, 5532ET, 5542ET (1/3 HP & 1/2 HP), 5552ET (1/2 HP)	6001, 6002, 6005, 6103E, 6203E, 6105E, 6205E
10861	10801	CS1106, CSL1106	5552ET, 5542ET (3/4 HP)	6003, 6004, 6010, 6107E, 6207E, 6110E, 6210E

### 350 RPM to 1400 RPM Operating Range\* – Ball Bearing

MARS NO.	HP	VOLTS	RPM	ROTATION	DIMENSIONS		
					A	B	C
10860	1/5-1/2	115/230	1075	Rev	4.93	5.72	1/2
10861	1/2-1	115/230	1075	Rev	4.93	6.66	1/2

\* with use of optional hand held programmer MARS No. 08502



08502

## Azure® Hand Held Programmer

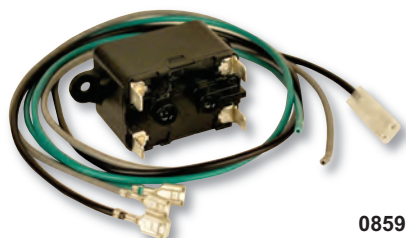
The Azure® Hand Held Programmer allows the Azure® Digi-Motor® (MARS No. 10860/10861) to be custom speed tuned to each application. Although the motor performs an auto sizing function that will correctly assign torque to each of the speed taps for the installed application, there may be instances when custom speeds are desired.

### Features:

- Allows blower speed to be reduced to the low end of CFM tolerance for improved dehumidification
- Allows duplicate speeds to be set on multiple speed taps
- Allows CFM to be maximized especially in high altitude applications
- Provides speed tap flexibility for multi-stage systems



08593



08595

## Accessories for Azure® Digi-Motor®

MARS NO.	DESCRIPTION
08502	Azure® Hand Held Programmer 10860/10861
08593	Surge Protector 10860/10861
08595	Constant Fan Kit

## AZURE® Digi-Motor®

### Condenser Fan Applications

#### 825 & 1075 RPM Motor in One

One Azure® model replaces most standard 208-230V PSC condenser fan motors up to 1/2 HP.

This motor is simple to install. The Azure® condenser fan motor connects the same as a standard PSC condenser fan motor, BUT WITHOUT the capacitor. Just plug the motor into a 115V power source (using supplied programming cable) and select 1 of 4 operating modes and then install the motor:

1075 RPM CW • 1075 RPM CCW • 825 RPM CW • 825 RPM CCW

Unlike other ECM motors, an outboard surge protector is included with the Azure® wiring harness. This is a replaceable device that is much less expensive to replace than replacing the entire motor in the event of a power surge.

#### Easy to Set-Up-

- Simply plug the motor into a 115V power source (using supplied programming cable) and select 1 of 4 operating modes and then install the motor:

1075 RPM CW • 1075 RPM CCW • 825 RPM CW • 825 RPM CCW

#### Easy to Install –

- Connects the same as a standard PSC condenser fan motor, BUT WITHOUT the capacitor.

#### Outboard Surge Protection –

- Unlike other ECM motors, an outboard surge protector is included with the Azure® wiring harness. This is a replaceable device that is much less expensive to replace than replacing the entire motor in the event of a power surge.

#### Features:

- Multi horsepower, self-adjusting up to 1/2HP
- 825/1075 RPM, single speed
- Reversible rotation
- High Efficiency
- Shaft Up/Down Mounting
- No capacitor required
- Water slinger on shaft
- UL Recognized

#### Cross Reference

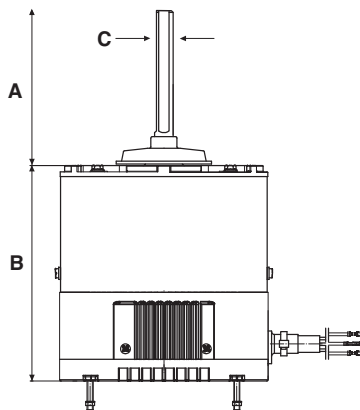
MARS No.	Replaces
10870	PSC motors up to 1/2 HP

#### Ball Bearing

MARS NO.	HP	VOLTS	RPM	ROTATION	DIMENSIONS		
					A	B	C
10870	1/5 - 1/2	208-230	825/1075	Rev	6.00	5.95	1/2

#### Replacement Item for Azure® Digi-Motor®

MARS NO.	DESCRIPTION
08598	Replacement Surge Protector 10870



### PTAC-ECM Motor Replacement

The MARS double shaft PTAC-ECM motors are high efficiency motors for direct replacement for shaded pole and PSC motors used in a wide range of fan coil assemblies and PTAC applications as an energy saving retrofit.

#### Applications:

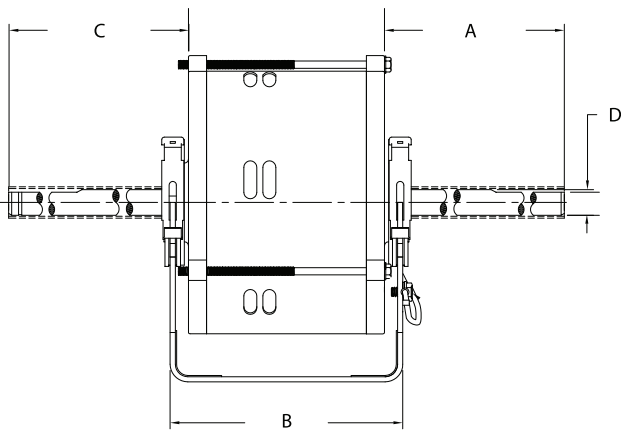
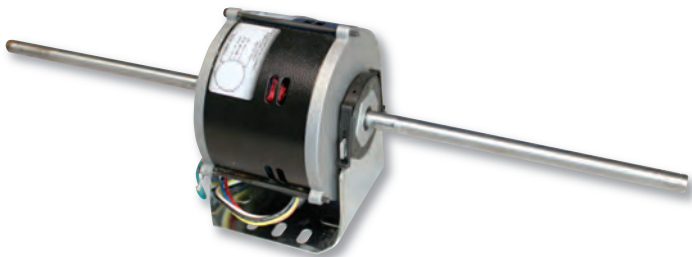
Fan Coils, Air Conditioners, Blowers, Shaded Pole, PTAC Units

#### Features:

- Single phase
- Energy efficient
- Includes resilient mounting base
- 54 Inch leads

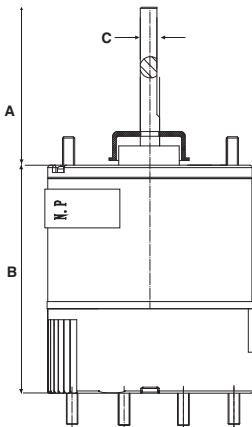
#### Specifications:

- 42 Frame
- 60 Hertz
- Class "B" insulation



### 1100/900/700 RPM

MARS NO.	HP	VOLTS	AMPS	ROT OSE	DIMENSIONS			
					A	B	C	D
10820	1/10	120	1.6	CCW	9.30	4.52	9.30	1/2



## AZURE® Digi-Motor®

### 3.3" Commercial Refrigeration Evaporator Fan Motor

#### Ball Bearing

Azure® is an electronically controlled 3.3" motor (ECM) that replaces all 1/15 - 1/25 HP, 115/230V, and 1550/800 RPM commercial refrigeration evaporator fan motors for walk in cooler/freezer applications. For 1550 RPM, this motor connects easily to the fan controller via a standard Lyall plug. For 2-speed applications, the Lyall plug can be removed and the motor can be wired directly to a separate 2-speed control module using the included second speed tap for 800 RPM. Motor rotation is set using a simple jumper wire. Azure® is rated for 115V or 230V with nothing to set; plug it in to either voltage and it adapts to the correct voltage.

#### Specifications:

- Temperature Operating Range: -40° to 131°F
- Multi horsepower, self-adjusting from 1/15 to 1/25HP
- 1 or 2 speed operation (1550/800 RPM)
- Reversible rotation
- Auto voltage select (115/230V)
- High efficiency ECM technology
- No capacitor required
- UL Recognized

#### Cross Reference

MARS No.	Regal Beloit/Morrill	Wellington	US Motors
10850	5100, 5105, 5106, 5101, 5111, 5200, 5201, 5205, 5206, 5211	ECR 85/95	EC5404D, EC5405D

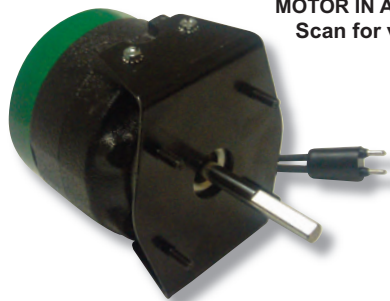
MARS NO.	HP	VOLTS	RPM	ROTATION	DIMENSIONS		
					A	B	C
10850	1/15 - 1/25	115/230	1550/800	Rev	2.5	3.74	5/16



### Walk-In Cooler Evaporator EC Fan Motors



SEE THIS  
MOTOR IN ACTION!  
Scan for video



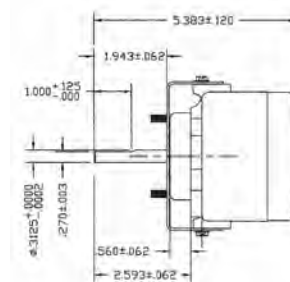
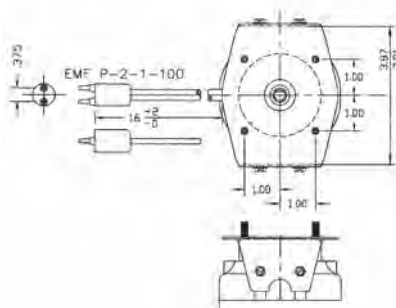
MARS American Iron Motors are high efficiency designs that are made in America incorporating EM&S patented, permanent magnet ECM technology that brings outstanding energy savings.

#### Features:

- 3.3 Interchangeability
- Shaft down and horizontal mounting
- Cast iron unit bearing construction
- Front mount studs
- Rotation: shaft end

#### Specifications:

- Universal, fits most 1/15HP and smaller applications, 1550 RPM
- 230 Volt 60/50 Hz; 115 Volt 60 Hz.
- 22.5" Leads with EMF/Lyall Plug
- 4 10-32 Hex Flange nuts are supplied with each motor
- UL and cUL recognized



#### 1550 RPM - Single Speed

MARS NO.	APPLICATIONS	HP	VOLTS	AMPS	ROT SE	RPM	MARS PACK
00211*	Evaporator/Condenser	1/15	115	1.25	CW	1550	1
00212*	Evaporator/Condenser	1/15	115	1.25	CCW	1550	1
00221*	Evaporator/Condenser	1/15	230	0.77	CW	1550	1
00222*	Evaporator/Condenser	1/15	230	0.77	CCW	1550	1

#### 1550/1000 RPM - Two Speed

MARS NO.	APPLICATIONS	HP	VOLTS	AMPS	ROT SE	RPM	MARS PACK
00225*	Evaporator/Condenser	1/15	115	1.25	CW	1550/1000	1
00226*	Evaporator/Condenser	1/15	230	0.77	CW	1550/1000	1

\* Shaft and leads are on the same end

# ECM for Commercial Refrigeration

MARS SERIES 064



SEE THIS  
MOTOR IN ACTION!  
Scan for video



## ECM Technology

These 51 frame unit bearing motors are primarily used in commercial refrigeration applications, both evaporator and condenser, but can be used in any application demanding high efficiency and dependability with output ratings between 4 – 12 watts and 13 – 23 watts.

These motors significantly outperform both shaded pole and PSC technology. With efficiencies three times higher than shaded pole motors and 45% higher than PSC, in addition to the reliable and quiet unit bearing design, they provide users great reliability and excellent energy savings for their applications.

### Environmental Summary:

- Storage Temps: -40 to 80° C ambient
- Operating Temps: -40 to 55° C ambient
- Design Life: 10 years, 83,720 hours on time

### Mechanical Summary

- 3.3" Electronically commutated aluminum or cast iron unit bearing
- 1/4" x 20 threaded shaft
- Aluminum enclosure (totally enclosed)
- Five .150" diameter cored mounting holes on rear
- Horizontal shaft (+/- 15°) or vertical shaft up operating position
- Standard 18 gauge, 2 conductor leads
- Lead cord may be terminated with 1/2" stripped wire, in-house molded plugs, eyelets, 1/4" quick connects, or special terminals
- RoHS compliant

### Applications:

- Bottle Coolers
- Display Cases
- Reach-In Coolers
- Vending Machines

### Features:

- Output 4 – 12W and 13 – 23W
- ~66% peak efficiency
- Speed regulated within +/-6%
- Regulated speed; +/-6% full scale
- 1 Discrete speed
- 51fr unit bearing motor; cast aluminum frame
- Side pedestal mounting feet (2 sets standard)

MARS NO.	APPLICATION	OUTPUT WATTS	VOLTS	ROT.	RPM	MARS PACK
00650	Evaporator/Condenser	4-12	115	CW	1550	1
00651	Evaporator/Condenser	4-12	230	CW	1550	1
00652	Evaporator/Condenser (90° lyall plug)	4-12	115	CW	1550	1
00654	Evaporator/Condenser	13-23	115	CW	1550	1
00655	Evaporator/Condenser	13-23	230	CW	1550	1
00656	Evaporator/Condenser	13-23	115	CCW	1550	1
00657	Evaporator/Condenser	13-23	230	CCW	1550	1



05620



08030

## ECplus™ Wide Range Universal Refrigeration Motor

The ECplus™ electronically commutated ball bearing motor is used in commercial refrigeration applications and can replace standard shaded pole or other EC type motors ranging in size from 1 W to 22 W. The ECplus™ is approximately 3 times more efficient than standard shaded pole motors making it an excellent choice for upgrade retrofit projects. The robust IP55 rating ensures protection against water spray from maintenance wash downs.

### Applications:

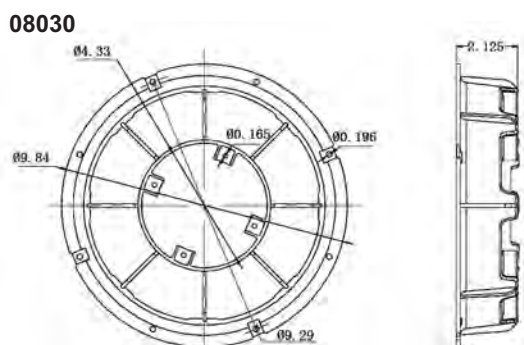
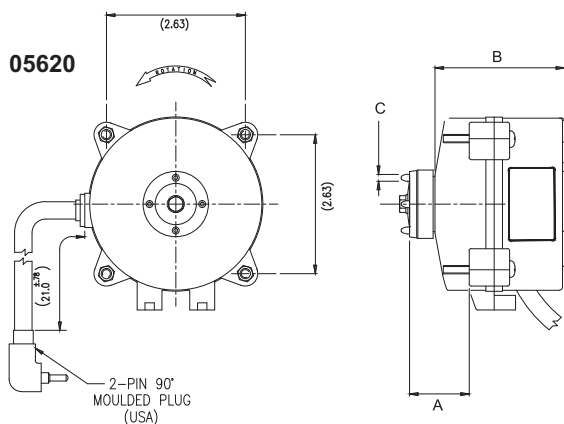
- Light commercial ventilation units
- Bottle coolers
- Vending machines
- Small walk in coolers
- Display/refrigeration display units
- Freezer cabinets
- Ice machines

### Features:

- Double side mounting pads
- 5-hole universal real mount
- Peak efficiency greater than 65%
- Incorporating 'soft start' feature ensures quiet ramp up to desired speed which assists in eliminating vibration noise & increasing life expectancy of integrated electronics
- One model covers 1 Watt to 22 Watt shaft power
- Support 6", 7", 8" & 10" (maximum 10" 28 degree pitch) fan blades

### Specifications:

- Thermally protected with electronic overload protection
- IP55 Rating
- 1550 RPM
- Approvals UL & CUL



MARS NO.	DESCRIPTION
08030*	8" Plastic Basket for ECplus™ Motor

\* Sold Separately



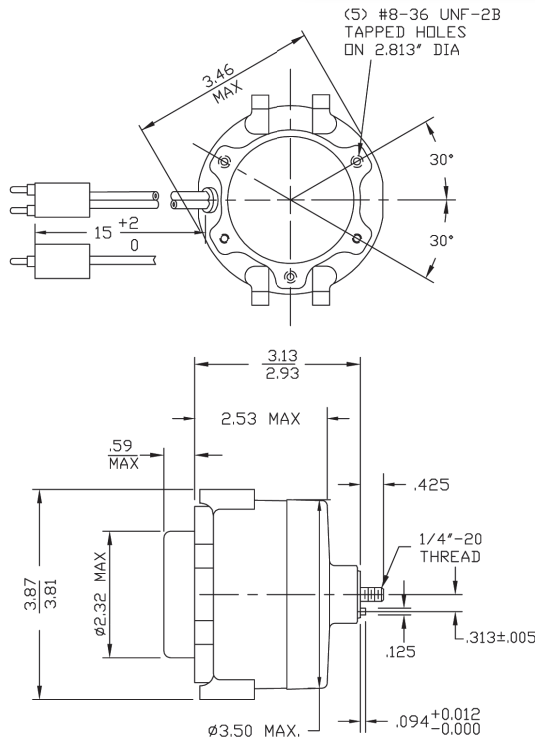
SEE THIS MOTOR IN ACTION!  
Scan for video

## 1550 RPM - 1/4 - 20 Threaded Shaft - Dual Pad Mounting

MARS NO.	WATTS	VOLTS	MAX AMPS	ROT OSE	DIMENSIONS		
					A	B	C
05620	1 - 22 Watts	120	0.42	CW	1.14	2.48	.125



The universal 5 rear mounting hole configuration and the double boss with 4 drilled and tapped mounting holes on each boss mean *no additional labor or sheet metal work!*



## Evaporator/Condenser

The Unitronix Double Duty is an electronically commutated motor that brings outstanding energy savings to the refrigeration market in the form of a direct drop-in replacement for practically all unit bearing motors. No additional labor or sheet metal work is required to replace an existing shaded pole unit bearing motor with a Unitronix Double Duty.

Heat in a refrigerated space has always been a necessary evil in the food marketing industry. Lights, motors and defrost heating elements are the culprits. But, heat shortens food storage life and adds to the load placed on the refrigeration system. The new Unitronix Double Duty dramatically reduces (by as much as 75%) the waste heat generated by refrigerated case evaporator motors.

### Features:

- Special wide temperature range lubrication system
- High capacity oil reservoir spiral grooved shaft for efficient distribution of oil to the bearing surface
- Mounting hardware included
- Water shield included
- Tapped & Drilled Mounting Holes:

#### Universal Evaporator Mount

- Standard 3-Hole
- Custom 4-Hole Hussmann Style

#### Universal Condenser Mount

- Double Boss

### Specifications:

- 1550 RPM standard
- Cast iron
- Unit bearing
- EMF P-2-1A lyall power plug
- 15" leads
- UL file no. E128044



SEE THIS MOTOR IN ACTION!  
Scan for video

MARS NO.	APPLICATIONS	OUTPUT WATTS	VOLTS	NOMINAL AMPS	ROT OSE	RPM	MARS PACK
00621	Evaporator/Condenser	6-12	115	0.25	CW	1550	1
00621 BULK	Evaporator/Condenser	6-12	115	0.25	CW	1550	6
00622	Evap/Cond, 90° Lyall Plug	6-12	115	0.25	CW	1550	1
00624	Evaporator/Condenser	14-16	115	0.50	CW	1550	1
00625	Evap/Cond, 90° Lyall Plug	14-16	115	0.50	CW	1550	1

### 58 MM Series Replacement ECM Fan/Motor System



The 58MM Series replacement ECM Fan/Motor systems are primarily used in commercial refrigeration air moving applications demanding high efficiency and dependability. These motors are moisture resistant, reliable, quiet unit bearing design with efficiencies three times higher than shaded pole motors and 45% higher than PSC. These replacement ECM Fan/Motor systems are all metal in design and have 1 discrete speed, variable torque, low temperature lubrication system which makes them extremely quiet with low vibration.

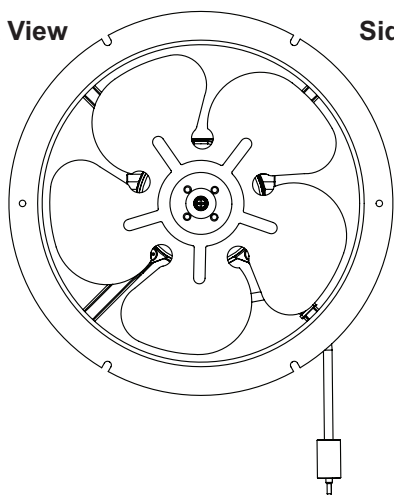
#### Features:

- Lyall plug
- Class B insulation
- 60 Hertz
- Thermal protection
- Single phase

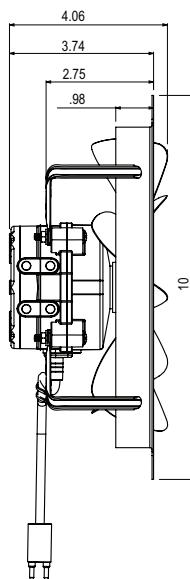
#### Specifications:

- -40 to 55°C ambient operating temp.
- Single speed
- Maximum watts 36

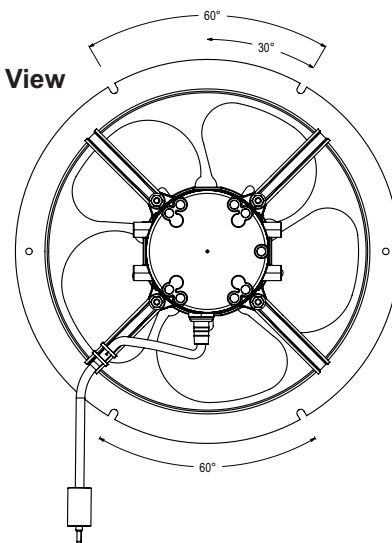
Front View



Side View

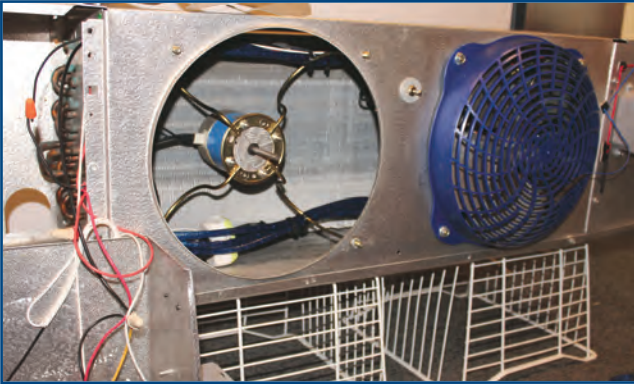


Rear View

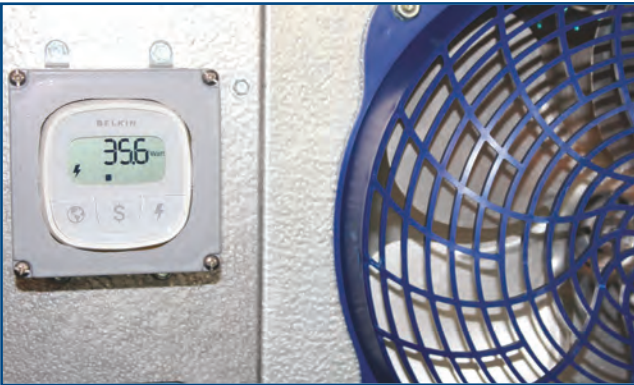


MARS NO.	GE NO. 5SME58	REPLACES RPM	VOLTAGE	MAX AMPS	ROT. OSE	AT 0.05" CFM	AT 0.10" CFM	AT 0.15" CFM
05470	AAF1027	1340	115	0.30	CW	330	270	210
05471	AAF1026	1470	115	0.40	CW	370	300	200
05472	AAF1031	1650	115	0.40	CW	400	360	255

## ECM Power Consumption Comparison



The Azure® 3.3" (MARS 10850) is installed in a test walk-in cooler evaporator; a standard efficiency shaded pole 3.3" motor is installed on the right.



The Azure® 3.3" motor consumes only 35.6 Watts at 1550 RPM.



The standard efficiency shaded pole motor consumes 102 Watts or nearly 3 times more power at 1550 RPM.



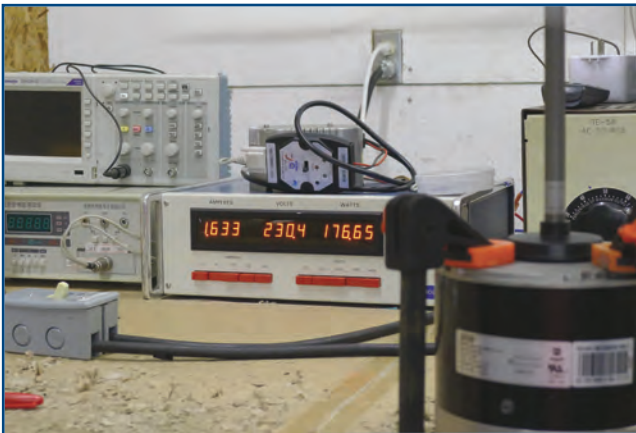
Because Azure® 3.3" is a high efficiency motor, the majority of the input power is converted to usable output shaft power. The result is a cool running motor that produces very little heat which reduces the load on the refrigeration system further saving energy.



The standard 3.3" motor is much less efficient than Azure. As a result, a greater portion of the input power is lost in the form of heat. A warmer running motor increases the load on the refrigeration system which further drives up the cost of operation.

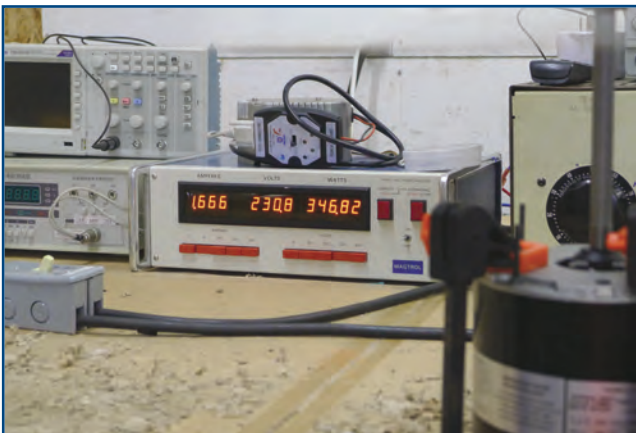
**CONCLUSION:** Electronically commutated motor (ECM) technology consumes significantly less power and can save the end user a significant amount of money. Due to the large number of motors and long run times, commercial refrigeration applications are ideal for ECM technology.

## Wattage vs Amperage



The Azure® condenser fan motor (MARS 10870) is being bench tested for power consumption.

Test Amperage: 1.633  
Test Voltage: 230.4  
Test Wattage: 176.65



The standard efficiency PSC motor draws nearly the same amperage, but the motor consumes nearly 2 times the power.

Test Amperage: 1.666  
Test Voltage: 230.8  
Test Wattage: 346.82

**CONCLUSION:** Motor efficiency comparisons should be based on power consumption (wattage), not on current draw (amperage). Utilities charge end users for wattage (kW-Hr) consumption, not amperage consumption. The low power factor of ECM technology makes it less costly to operate than the standard technology PSC motor.

**MARS Technical Help Line**

**800-678-9888**

M-F 8 am – 5 pm EST.



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