Ventilation ECM
Technical Specifications

TS05-13 July 8, 2023

Important Safety Information

WARNING

- Read all instructions thoroughly and be familiar with the equipment before installing or working on it.
- Only trained and qualified professionals familiar with Ventilation ECM motors should service the motor and control unit.
- Before connecting or disconnecting cables or other electrical connections, verify that the electrical power to the system is removed. Failure to comply may cause serious damage to the motor or HVAC system or injury.
- Because of the risk of electric shock, only individuals thoroughly trained in the use of multi-meters should conduct voltage tests.
- Never touch the metal contacts on the multi-meter during a test.
- Always check testing equipment for proper operation before use.

WARNING

Installation, operation, and maintenance must be performed by qualified personnel. Familiarization with and adherence to the National Electrical Code (NEC) and National Fire Protection Association (NFPA) standards and to local codes are required. It is important to observe safety precautions to protect personnel from possible injury. Personnel should be instructed for handling each of the following:

- Insulate all connections carefully to prevent grounding or short circuits. Reinstall all conduit and terminal box covers.
- To avoid overheating or loss of performance, voltage to the motor control unit must be within ± 10% of the nameplate voltage.
- Make sure the unit is electrically grounded and that proper electrical installation, wiring, and controls are used consistent with local and national electric codes. Refer to the ***NEC Handbook*** and ***NFPA No. 70***. Employ qualified electricians.
- Code requirements differ from state to state. Install equipment using qualified electricians in accordance with the applicable codes and ordinances in your area and in accordance with the NEC. All electrical connections should be made and maintained by a qualified or licensed electrician.
- Make sure there are no unusual noises or vibrations when the motor is running.
- Avoid contact with circuits or rotating parts.
- Provide proper safeguards for personnel against rotating parts.

⚠ WARNING

- Always disconnect electrical power at the fuse box or circuit breaker panel before handling electrical connections or performing maintenance on this unit. Allow the motor to come to a complete stop and wait three (3) minutes. This allows the capacitors to discharge any residual voltage.
- All aspects of the installation must conform to the applicable requirements of the NEC, including ***Article 430 (Motor Circuits and Controllers)*** as well as all local codes.
- Double-check to make sure that electrical power is removed and that it cannot be turned on while you are working on the equipment.
- A poor electrical connection can overheat and cause terminal and/or terminal board failures. Examine the wiring harness "Quick Connect" terminals carefully for any signs of physical deterioration or loose fit to the terminals on the motor terminal board.
- If there is evidence of deterioration or loose fit, remove the "Quick-Connect" terminals from the wiring harness and then connect the harness wires directly to the motor terminal board wiring terminals.
- Care must be taken to assure connections are made to the proper terminals and adequate electrical clearances are maintained.
- The control unit on the motor contains hazardous voltage.

⚠ CAUTION

- Wear safety glasses to inspect the equipment while it is running or while working on equipment.

NOTICE

The motor and control unit are assembled and calibrated as a set. Replacing either the motor or control unit with other unsuitable parts could drastically affect performance tolerance.

- There are no serviceable parts in the motor and control.
- To prevent permanent damage to the unit, **DO NOT** apply **208-230-277** Vac to the motor with a Jumper Wire in **positions 4** and **5**. Refer to the diagram on **page 6**.
- **DO NOT** strike the motor shaft with a hammer or other tool as this may damage the bearings.
- **DO NOT** operate the motor without the blower wheel or fan attached.
- Voltage symbols vary among different multi-meters and may be displayed as Vac, AC, V, or a V beneath a wavy line. Select the correct symbol and set the multi-meter to the voltage closest to but higher than the voltage you are measuring.
- The Ventilation ECM motor is properly packaged for shipment and storage and should be kept in a clean and dry indoor area.

1. Product Information

1.1. Description

1.1.1. The Ventilation ECM is designed for air moving circulation blowers and fans used in typical heating, ventilating, and air conditioning systems. This is a tri-voltage motor operating at 115/208-230/277 Vac electrical power.

1.1.2. The Technical Specifications cover the nominal operating parameters. Testing can be done outside of these nominal ranges with the Lab Development Tool. When using expanded ranges, the motor must be tested and validated by the OEM for proper motor function.

1.2. Environmental

1.2.1. Continuous Operating Temperature

1.2.1.1. Full Shaft Output Power: 0° C to 40° C (Note: This is an "air-over" motor.)

1.2.1.2. Reduced Shaft Output Power: -40° C to 0° C & 40° C to 60° C

1.2.2. Storage Temperature: -55° C to 95° C

1.2.3. Humidity: 0 to 100% RH (condensing)

1.3. Ratings

1.3.1. Rated Speed

1.3.1.1. Speed Range: 300-1800 RPM

1.3.1.2. Efficiency: Standard (82% max)

1.3.2. Rated Torque

1.3.2.1. Maximum Starting Torque: 6 in-lb.

1.3.2.2. Minimum Torque Rating: 6 in-lb.

1.3.3. This document applies to 1, 3/4, 1/2, and 1/3HP models for indoor blower applications designed to operate from a typical 115/208-230/277 Vac, single phase line supply.

Rated Shaft Output Power	Rated Shaft Output Torque	Rated Shaft Output Speed	Rated Speed
1HP	45.0 in-lb.	1400 RPM	300-1800 RPM
3/4HP	33.7 in-lb.		
1/2HP	22.5 in-lb.		
1/3HP	15.0 in-lb.		

1.3.4. Standby Power Rating

1.3.4.1. These are maximum standby power numbers for each voltage rating.

Voltage	1HP	3/4HP	1/2 & 1/3HP
115 Vac	3.21 Watts	3.00 Watts	2.86 Watts
208-230 Vac	2.90 Watts	2.81 Watts	2.75 Watts
277 Vac	3.37 Watts	3.35 Watts	3.38 Watts

1.4. Direction: CCW - viewed from lead end (reversable)

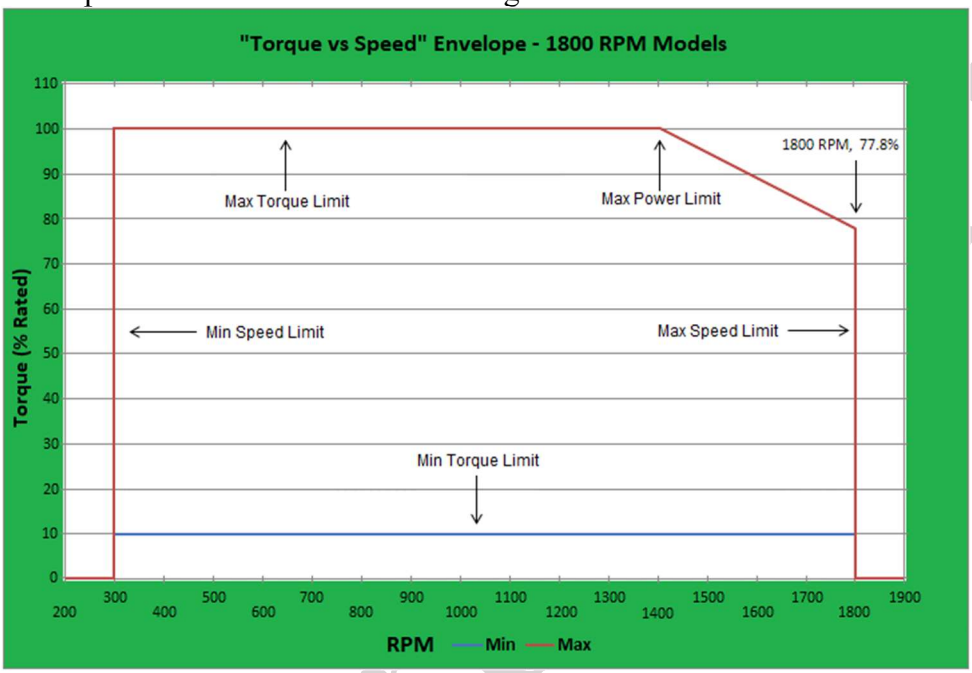
1.5. Operating Modes

1.5.1. Constant Torque

1.5.2. Constant Speed

1.6. Operating Envelope

1.6.1. Although the maximum operating speed is listed as 1800 RPM, full torque is only available up to the speed (usually 1400 RPM) where that torque generates the rated HP shaft output power. Above this speed, torque scales back to maintain constant power. The Operating Envelope below is based on a 1HP rating.



1.7. Inrush Current

1.7.1. The following are the values for each voltage level.

115V = 8.25A
230V = 16.5A
277V = 19.5A

1.8. External Power Factor Correction

1.8.1. External power factor correction (e.g., an input choke) can be added, if needed, to limit the maximum input current at full load. For 230 Vac, the recommended external chokes are:

1HP	3/4HP	1/2 & 1/3 HP
Wabash 8100.100HP.00	Wabash 8087.075HP.00	Wabash 8087.050HP.00

1.9. Protection

1.9.1. Locked Rotor

1.9.1.1. The motor will trip and attempt to restart until the locked rotor condition is cleared.

1.9.2. Over Current
1.9.2.1. Motor performance is reduced until the current returns to normal operating parameters. If the motor is unable to reach normal operating current by reducing performance, it will turn off. If the condition clears, the motor will automatically restart.
1.9.3. Overpower
1.9.3.1. Limits shaft output power by reducing the motor performance.
1.9.4. Over Speed
1.9.4.1. Motor performance is reduced until the speed returns to normal operating parameters. If the motor is unable to reach normal operating speed by reducing performance, it will turn off. If the condition clears, the motor will automatically restart.
1.9.5. Over Temperature
1.9.5.1. Motor performance is reduced until the power module temperature returns to normal operating parameters. If the motor is unable to reach normal operating temperature by reducing performance, it will turn off. If the condition clears, the motor will automatically restart.
1.9.6. Phase Current Balance
1.9.6.1. Output current from the 3 phases is evaluated and, if out of balance, the motor turns off. If the condition clears, the motor will automatically restart.
1.9.7. Surge
1.9.7.1. Up to 6kV
1.9.8. Under Voltage
1.9.8.1. Turns motor off for low voltage. When the voltage returns to acceptable operating levels the motor will automatically restart. If the condition clears, the motor will automatically restart.

2. Electrical Installation

2.1. AC Supply Requirements
2.1.1. Voltage Range
2.1.1.1. The unit is intended to operate from a typical 115/208-230/277 Vac single phase 50 or 60 Hz line supply. Full rated performance is guaranteed between the Minimum Full Performance Voltage and the Maximum Operating Voltage. Below the Minimum Full Performance Voltage, output torque will be de-rated linearly to zero at the Minimum Operating Voltage.

Input Voltage	Minimum Operating Voltage	Minimum Full Performance Voltage	Maximum Operating Voltage
115 Vac	75 Vac	104 Vac	132 Vac
208-230 Vac	150 Vac	184 Vac	264 Vac
277 Vac	159 Vac	239 Vac	305 Vac

2.1.2. Frequency

2.1.2.1. The input AC supply frequency is 50 or 60 Hz nominal. The units will operate with frequency variations up to ± 5 percent of the nominal value.

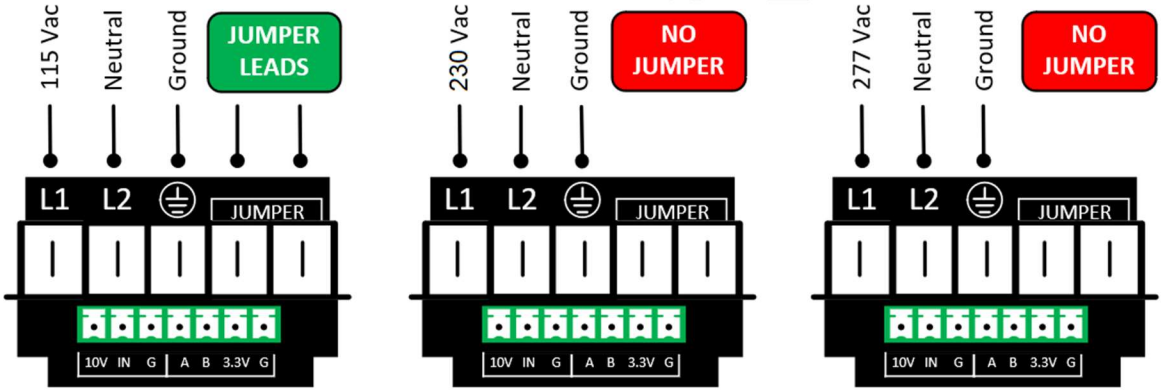
2.2. AC Input (Power Connector)

2.2.1. Power and Jumper terminals accommodate 3/16 inch "Quick Connect" Clips or "Spade" terminals.

Pin*	115V	208-230V	277V
1	L1	L1	L1
2	Neutral	Neutral	Neutral
3	Ground	Ground	Ground
4	Jump to 1	-	-
5	Jump to 2	-	-

*Pin numbers are counted from left to right (when facing the Power Connector).

2.2.2. Operating the motor at **208-230/277 Vac with Jumper Leads installed** on the Power Connector will cause significant damage to the motor.



115 Vac System **230 Vac System** **277 Vac System**

2.3. Control Input (Communication Connector)

Pin*	Description
1	10V = 10 Vdc Supply
2	IN = 0-10 Vdc
3	G = Common
4	A = Not used for running
5	B = Not used for running
6	3.3V = Not used for running
7	G = Not used for running

*Pin numbers are counted from left to right (facing the Communication Connector).

2.4. Interface Connectors

2.4.1. Power Terminals: TE 2-520194-2

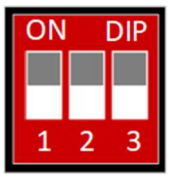
2.4.2. Comm Terminals: TE 284506-7

2.5. Operational Settings

2.5.1. Operation is controlled via the three (3) Dipswitch settings located on the right-hand side of the Communication Connector. There are two Dipswitch Operational Modes.

2.5.1.1. OEM Mode

2.5.1.2. Aftermarket Mode



2.5.1.3. Setting the daughter board to OEM/Aftermarket is done in an EEPROM setting, either with the Lab Development Tool or via a request for programming by Nidec.

2.5.1.4. When implementing a change to Dipswitch Settings, power the motor down and wait two (2) minutes before restoring electrical power.

2.5.2. Dipswitch Functionality Description

Setting	Dipswitch 1	Dipswitch 2	Dipswitch 3
OFF	Internal Pot	Trim Min	0-10V Input
ON	External Pot	Trim Max	10-0V Input

2.5.3. Dipswitch (OEM Mode)

2.5.3.1. Dipswitch 1 - Pot Setting (OFF = Internal Pot, ON = External Pot)

2.5.3.2. Dipswitch 2 - Trim setting (OFF = Min, ON = Max)

2.5.3.3. Dipswitch 3 - Logic (OFF = Normal Logic 0-10, ON = Inverse Logic10-0)

2.5.4. Dipswitch (Aftermarket Mode)

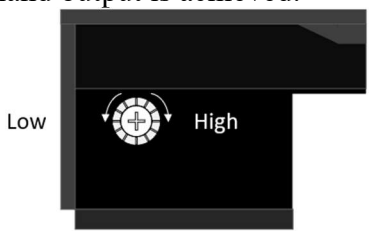
2.5.4.1. Dipswitch 1- Pot Setting (OFF = Internal Pot, ON = External Pot)

2.5.4.2. Dipswitch 2 - Control Mode (OFF = Torque, ON = Speed)

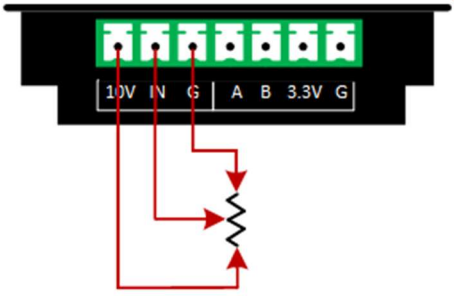
2.5.4.3. Dipswitch 3 - Direction (OFF = CCW, ON = CW)

2.5.5. Controlling Output/Setting Demand

2.5.5.1. Internal Pot: Located in the round tunnel on the left-hand side of the Communication Connector. Move Dipswitch 1 to the OFF position. Adjust the potentiometer until the desired demand output is achieved.

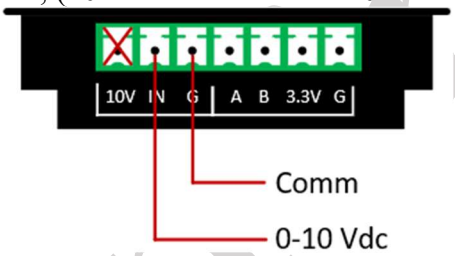


2.5.5.2. External Pot: This connection is made via the green, low voltage side of the Communication Connector. For demand, set Dipswitch 1 to the ON position.



Note: When using OEM Mode, the onboard pot can be turned into a Trim feature when the External Pot is enabled. Depending on the Dipswitch 2 setting, it will trim either the Min Speed or the Max Speed.

2.5.5.3. Input Wiring for 0-10V (& 10-0V): This connection is also made via the green, low voltage side of the Communication Connector. Set the Dipswitch 3 position per the user preference, (10V = max demand or 0V = max demand).



Note: **DO NOT** apply 10V to Pin 1. This terminal is not used for 0-10V operation.

3. Agency

UL File Number: E255002
Tested to UL/CSA 646
Tested to UL/CSA 60730-1
Meets FCC Part 15 Class B
RoHS Compliant

4. Hi-Pot

4.1. DC Hi-Pot

System	**115-230 Vac**	**277 Vac**
Voltage	2550 Vdc	2675 Vdc
Current Limit	500µA	500µA
Ramp Up	2.0 seconds	2.0 seconds
Dwell	1.0 seconds	1.0 second
Ramp Down	2.0 seconds	2.0 seconds

4.2. AC Hi-Pot: **DO NOT** use an AC Hi-Pot

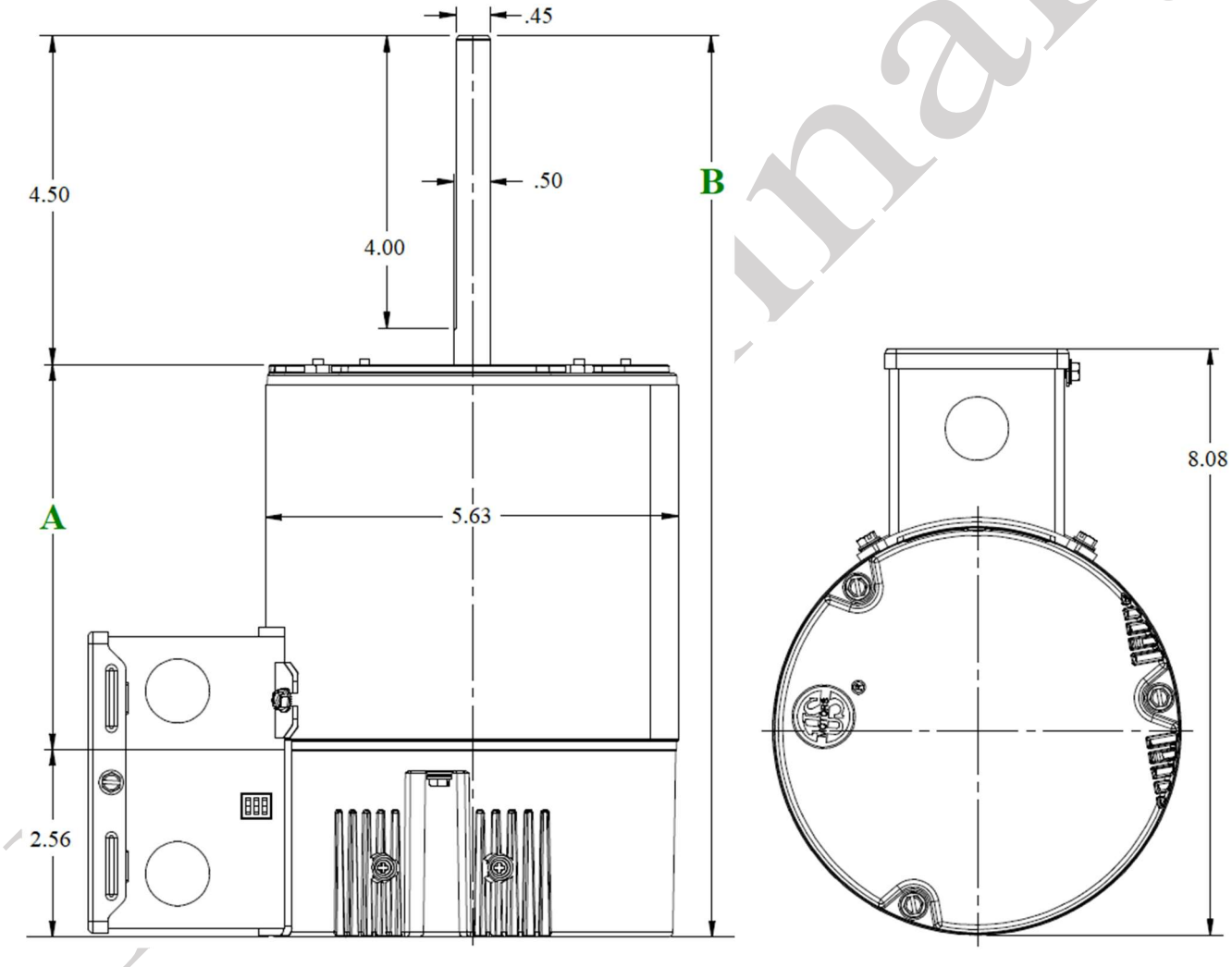
5. Motor Dimensions

5.1. Belly Band Mount

5.1.1. All motor dimensions are in inches and for reference only.

5.1.2. Standard Efficiency Aluminum

HP	Dim. A	Dim. B
1	5.28	12.35
3/4	4.91	11.97
1/2	4.53	11.60
1/3	4.16	11.22



5.2. Base Mount

5.2.1. All motor dimensions are in inches and for reference only.

5.2.2. Standard Efficiency Aluminum

HP	Dim. A	Dim. B
1	5.28	12.35
3/4	4.91	11.97
1/2	4.53	11.60
1/3	4.16	11.22