

High Performance Blowers

AMP28

TYPICAL APPLICATIONS

- Pressure management mattresses
- Large format printers
- Vacuum systems
- Low noise, high pressure applications

FEATURES

- 24 VDC, other voltages available
- AC input available
- Open collector tach output, weak pull-up on board
- 0 - 5 V or PWM input speed control (0 - 10 V on AC version)
- Internal or external drive electronics
- High efficiency 3-phase brushless DC motor
- Optional external drive with direct access to Halls and phase leads
- UL recognized component

BENEFITS

- Low noise
- High efficiency
- Integrated electronics with customizable system interface
- Variable speed
- High power density
- High pressure
- Long life



The Moog AirMax™ P28 series of fans and blowers provides excellent output power per unit volume through the use of compact, high energy 3-phase brushless DC motors and efficient airfoil design. The motor utilizes high energy rare earth magnets to provide the blower with the necessary torque to provide maximum airflow in the minimum amount of system space.

These high efficiency compact air movers use high reliability, long-life ball bearings with specially formulated lubrication to extend the life without the need to re-lubricate.

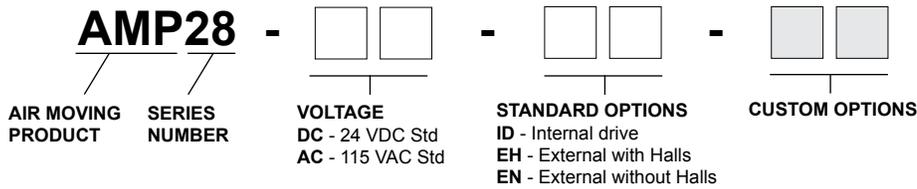
For more information about how this product can be tailored to fit your specific application, contact our applications engineers.

MOOG

High Performance Blowers

SPECIFICATION AND NUMBERING SYSTEM

Part Numbering System Guide



Note: AC input with external drive is **not** an AC motor. It is a 150 VDC brushless DC motor / permanent magnet synchronous motor.

AMP28 SPECIFICATIONS

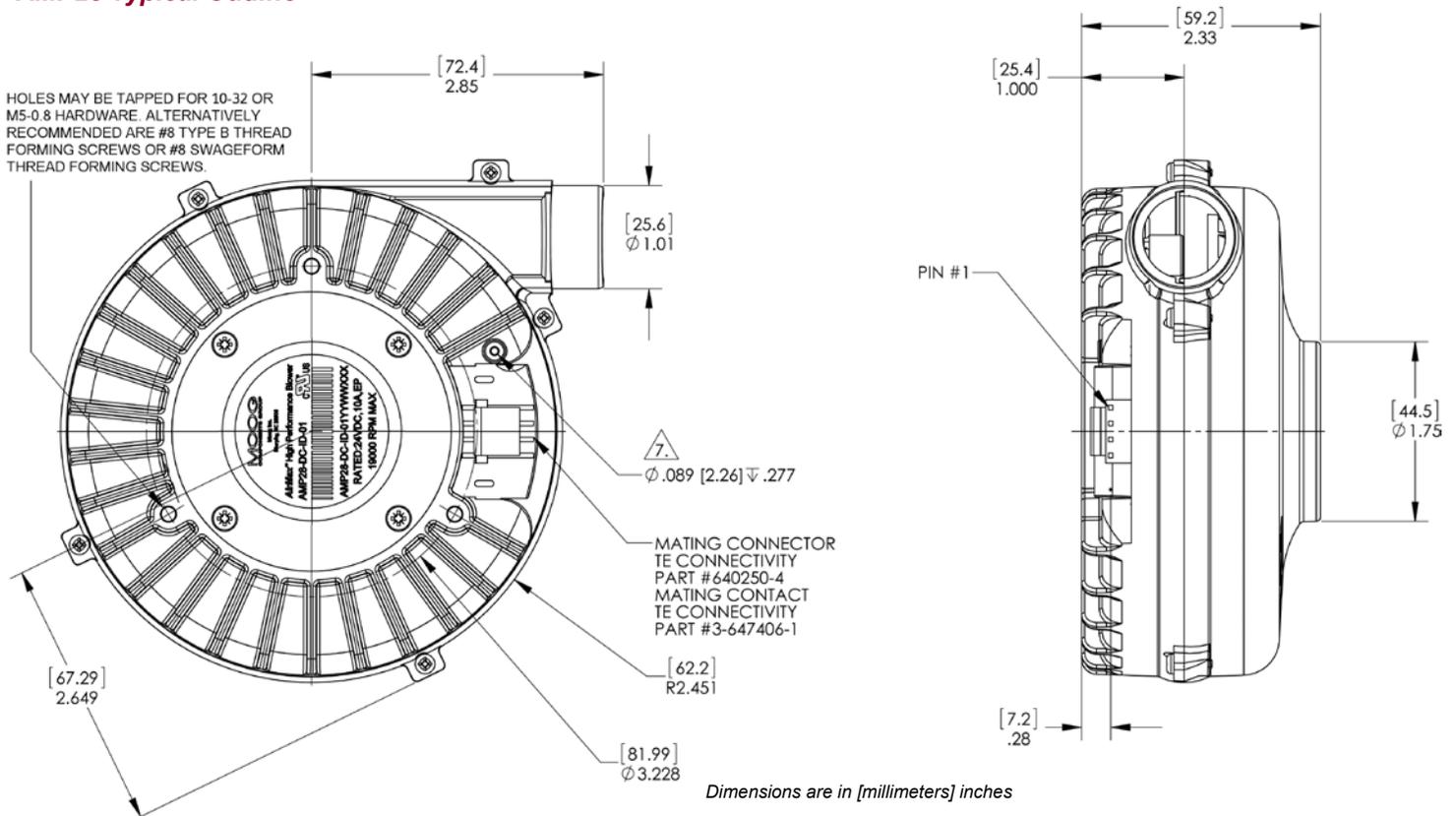
Timing Diagram for EH Option (4 Pole) CCW Rotation

Part Number		AMP28-DC-ID	AMP28-AC-ID
Input Voltage	VDC	24*	115 VAC
Input Power		See Curve	See Curve
Maximum Ambient Temperature	Degrees C	70	70
Weight	lbs / kg	1.3 / .59	1.3 / .59
Tach Out		Open collector	Open collector
Speed Control		0 - 5 V	0 - 10 V

DEGREES	ELEC												
	0	60	120	180	240	300	360	60	120	180	240	300	360
	MECH												
	0	30	60	90	120	150	180	210	240	270	300	330	360
S1 OUT													
S2 OUT													
S3 OUT													
A COIL	-	0	+	+	0	-	-	0	+	+	0	-	
B COIL	+	+	0	-	-	0	+	+	0	-	-	0	
C COIL	0	-	-	0	+	+	0	-	-	0	+	+	

* 24 VDC typical. Other voltages and AC input available upon request.

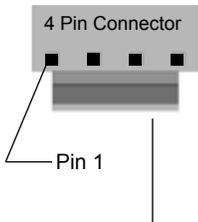
AMP28 Typical Outline



High Performance Blowers

Pin Arrangements

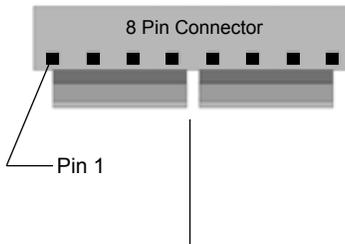
DC-ID Option



Pin Number	Function
1	+V
2	-V
3	V Speed
4	Tach Out

Mating Part Number **640250-4***
 Refer to page 4 for electrical interface details

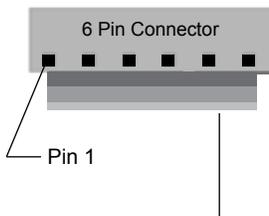
EH Option



Pin Number	Function
1	Phase C
2	Phase B
3	Phase A
4	Signal GND
5	Signal PWR
6	S1
7	S2
8	S3

Mating Part Number **640250-8***

AC-ID Option

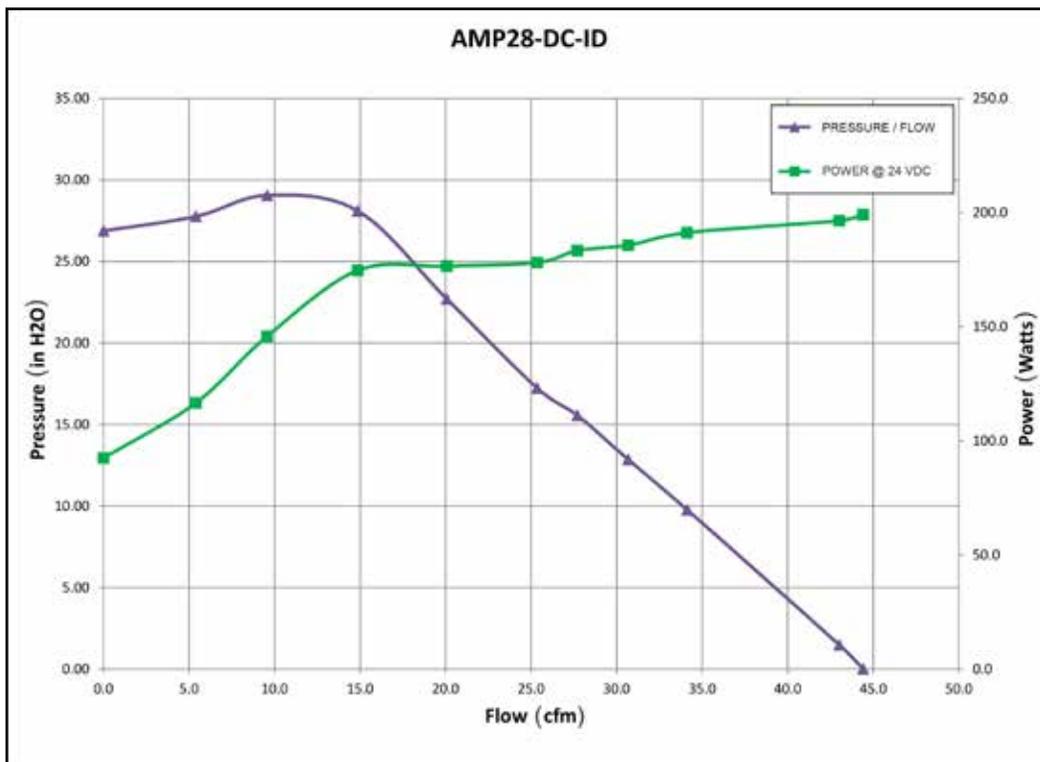


Pin Number	Function
1	VAC
2	V Neutral
3	+10 V Isolated
4	Tach Isolated
5	V Speed Isolated
6	Isolated GND

Mating Part Number **640250-6***

*TE connectivity with SL-156 style contacts

AMP28 Performance Curves



AMP28-DC-ID Electrical Interface

The AMP28-DC-ID blower is a fully integrated, single stage blower capable of producing up to 28 in H₂O (6.97 kPa) of pressure and delivering up to 45 CFM (21.2 L/S). We have designed the AMP28-DC-ID with the features necessary to interface to a variety of systems, from the simplest power-supply only connection to more complex closed-loop systems.

Basic Specifications

Supply Voltage	13.5 V - 30 V
Supply Current	0 A - 10 A
Pulses/Rev	2
Maximum Speed	19,000 RPM
Maximum Tach Frequency	633 Hz
Speed Control Range	0 V - 5 V

Physical Interface

The AMP28-DC-ID has a 4-pin connector. Two of the pins are for power and two are for signal. Moog recommends housing part number 640250-4 by TE Connectivity using contacts 3-647406-1 and 18 AWG wire for the power leads.



Figure 1 – Pins Numbered Left to Right

Pin Number	Function
1	+ V Power
2	- V Power rtn
3	V Speed Control
4	Tach Out Signal

Pin 1 must be connected to a power supply voltage between 20 V and 28 V with the return connected to Pin 2. Pin 3 must be connected to a variable or static voltage ranging between 0 V and 28 V. Pin 4 is an output signal representing speed that is not required for operation.

Power

Pins 1 and 2 are the primary power pins of the unit. The power interface should be designed with the capacity to handle the rated 10 A potential current draw of the AMP28-DC-ID. The recommended connector interface is sufficient for ensuring low impedances at the connection points. Additionally, short harness length and larger gauge wire are encouraged in order to reduce impedances and losses during operation.

Tachometer Signal

The tachometer signal output is in the form of a square wave between 0 V and 3.3 V which has a frequency that corresponds to the current speed of the wheel. The relationship between the tachometer signal frequency and the speed of the blower is characterized by:

$$\text{RPM} = \text{freqInHz} \times 30$$

The tachometer electrical interface consists of an open-collector transistor pulled up to 3.3 V via a 10 kΩ resistor. This signal must be connected to a high-impedance input in order to remain TTL compatible. The tachometer signal may be pulled up to a higher voltage as long as a relatively low-value resistor is used for the external pull-up. An example connection schematic is shown (Figure 2) which translates the output to a 5 V circuit. This arrangement allows the customer to maintain TTL voltage levels while pulling the tachometer signal to 5 V using the additional pull-up. In this case, the voltage ranges between 4.84 V at the high logic level and 0.06 V at the low logic level, well within the TTL acceptable voltages. The maximum external pull-up voltage is 20 V and the resistance must be chosen such that the current is less than 50 mA.

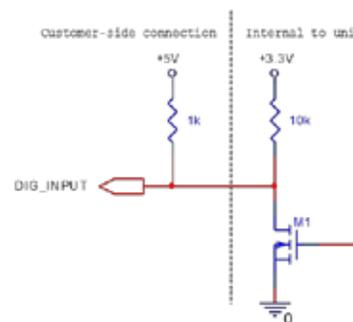


Figure 2

AMP28-DC-ID Electrical Interface

In cases in which isolation is required on the tachometer signal, a slightly more complex circuit (Figure 3) could be used in order to attain the current required to adequately drive an optocoupler.

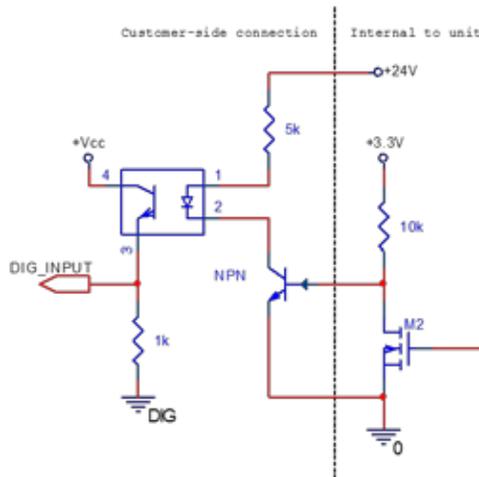


Figure 3

Care must be taken when choosing the optocoupler and resistor values in order to maintain the frequency response of the circuit while also operating in the saturation region of the optocoupler.

Speed Control – ON/OFF Control

The speed control input is flexible in order to increase compatibility across a variety of systems. The simplest speed control configuration involves connecting the harness +V pin (Pin 1) to the speed control pin (Pin 3, Figure 4). This method ensures that the unit is operating at its maximum operating point at all times when it is powered.

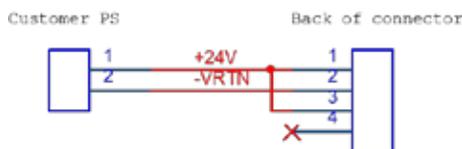


Figure 4

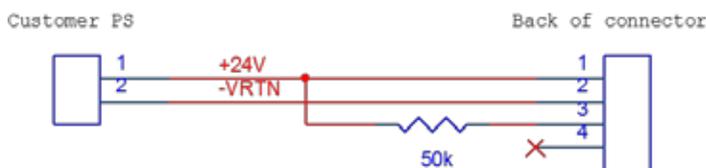


Figure 5

Figure 5 shows a variation on this method that allows the speed to be set using a single resistor. As the resistor value is increased, the speed of the unit is decreased.

A slightly more complex method allows the unit to be turned on or off using a single digital output (Figure 6).

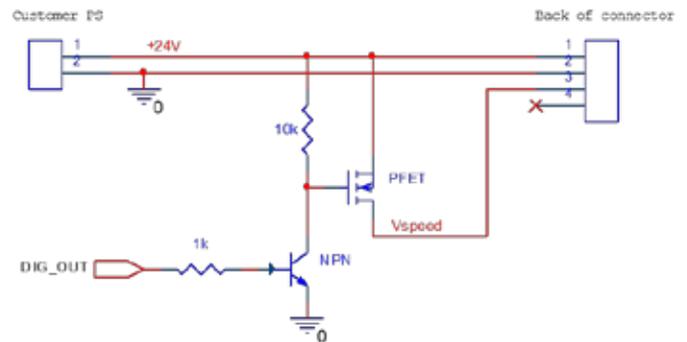


Figure 6

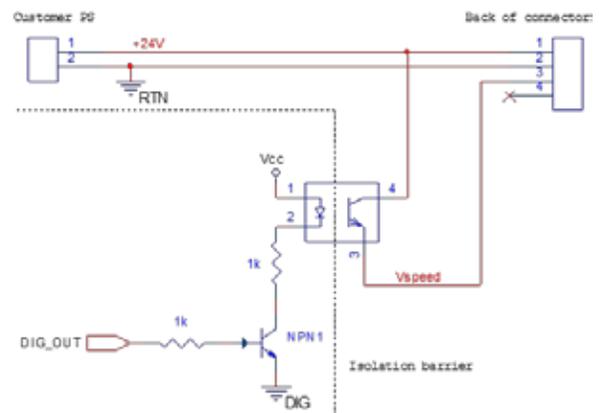


Figure 7

In this circuit, a high state on DIG_OUT will result in applying +24 V to the speed control circuit. This simple, cost-effective circuit allows the customer power supply and control to be operating while maintaining discrete on/off control of the blower and without having to resort to more expensive high current devices. If isolation is required, a similar circuit using an optocoupler could be utilized (Figure 7). In both of these circuits, a series resistor may be added to reduce the set point of the speed similar to the technique used in Figure 5.

AMP28-DC-ID Electrical Interface

Speed Control – Variable Speed

The speed control voltage input may also be controlled linearly between 0 V and 5 V using a low-impedance source to control the voltage. Ideally, an operational amplifier capable of driving a minimum of 2 mA would be connected directly to the speed control input (Figure 8).

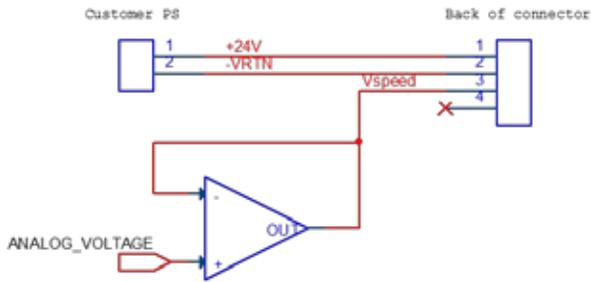


Figure 8

Driving the speed control input directly with a 0 V - 5 V pulse-width modulated signal with a frequency of 500 Hz or greater is also possible. This is the most cost-effective method of variable speed control since the digital output of the system controller may be connected directly to the speed control input (Figure 9). Note that the output impedance of the PWM signal should not exceed 1 k Ω .

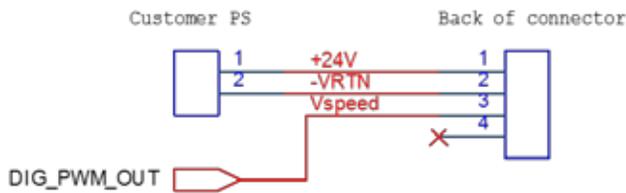


Figure 9

This connection method requires that the digital system ground be the same as the power supply ground, so care must be taken in the system to isolate any power supply electrical noise from the digital side. For full-range speed control, the driving PWM signal must be 0 V to 5 V and range from 0% duty cycle to 100% duty cycle. Other combinations of voltage and duty cycle are possible as well.

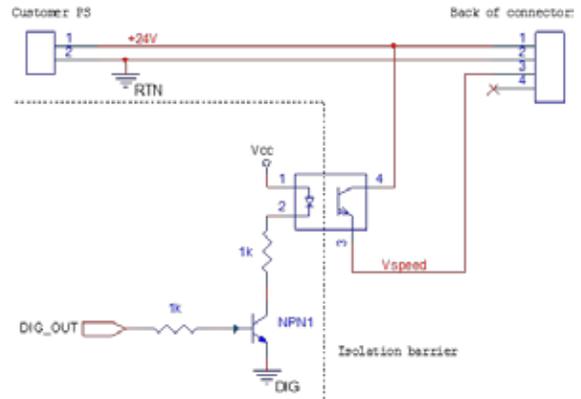


Figure 10

The user may require isolated PWM speed control. The circuit outlined in Figure 11 may be implemented should the system designer wish to utilize pulse-width modulation for linear speed control while maintaining isolation between the digital and power supply circuits. Care must be exercised that the optocoupler chosen has the frequency characteristic to adequately pass a 500 Hz square wave and that the resistor values chosen will allow the optocoupler to saturate when active and turn off when inactive. Low duty cycles may also be required for linear range control since the linear range is 0 V to 5 V while the high-level voltage on the blower side will be 24 V.

Assuming that the circuit in Figure 6 is implemented, a generic speed versus voltage relationship may be realized for a particular system. This relationship is equally valid for PWM duty cycle, with 0% duty cycle at the 0 V point and 100% duty cycle at 5 V.

Between 0 V and 0.4 V, the AMP28-DC-ID is not operating. The unit begins operation at 0.45 V and, as the control voltage is increased, the speed of the blower increases proportionally. Hysteresis has been added to the starting point in order to prevent oscillation between the operating and non-operating conditions. The AMP28-DC-ID is limited to a maximum speed of 19,000 RPM.

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