DAE Systems
Dynamic-Air Engineering, Inc.

TB-2008-003
Motor Selection Guide
Basic Motor Technology Overview

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AC Induction Motors

- AC Induction Motors are brushless for long life

Standard Input Power- 200 VAC, 400 Hz, 3 phase per

Optional Power- 115 VAC single phase, 400 Hz

440 VAC, 60Hz, 3 Phase

What is an AC Induction Motor? Essentially this is a non-permanent magnet motor with a wound field and copper barred rotor.

Advantages: High Speed rigid construction

Poles:	Speed (RPM'S MAX)
2	23000
4	11,800
6	7660
8	7000

Operating Temperature Range: -65F- +160F

Bearings: ABEC CLASS 7

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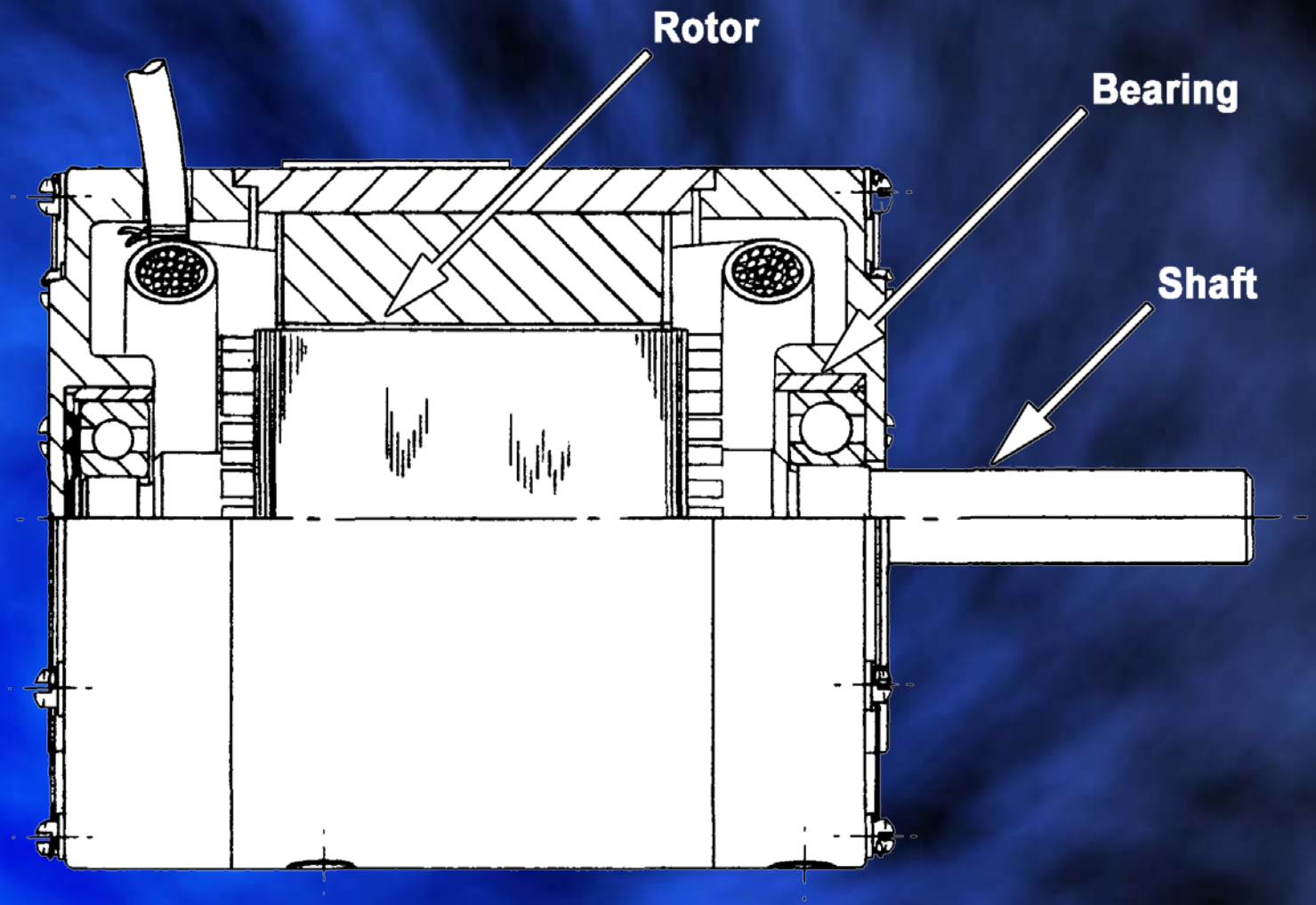
AC Induction Motor Cross Section



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Motor Housing Types

Motor Housing Enclosure Types- TENV- Totally enclosed non-ventilated

TEAO- Totally enclosed air over

VEP- Ventilated explosion Proof

VEPOA-Ventilated Explosion Proof Air Over

Shaft Rotation-CCW viewed from the shaft end

Applications: Fans

Pumps

- Brushless DC Motors

  Permanent Magnet Rotor Assembly- Neodymium-Iron-Boron

  Need amplifier (controller) in order to commutate windings

  1. Integrated Controller/Amplifier
  2. External Controller/Amplifier

  Compatible with BEMF (back electromotive force) commutation

  Speed sensing capability with external speed detection sensor

  Rigid construction

  ABEC 7 Bearings

  Speed range- 8,100-24,000rpms

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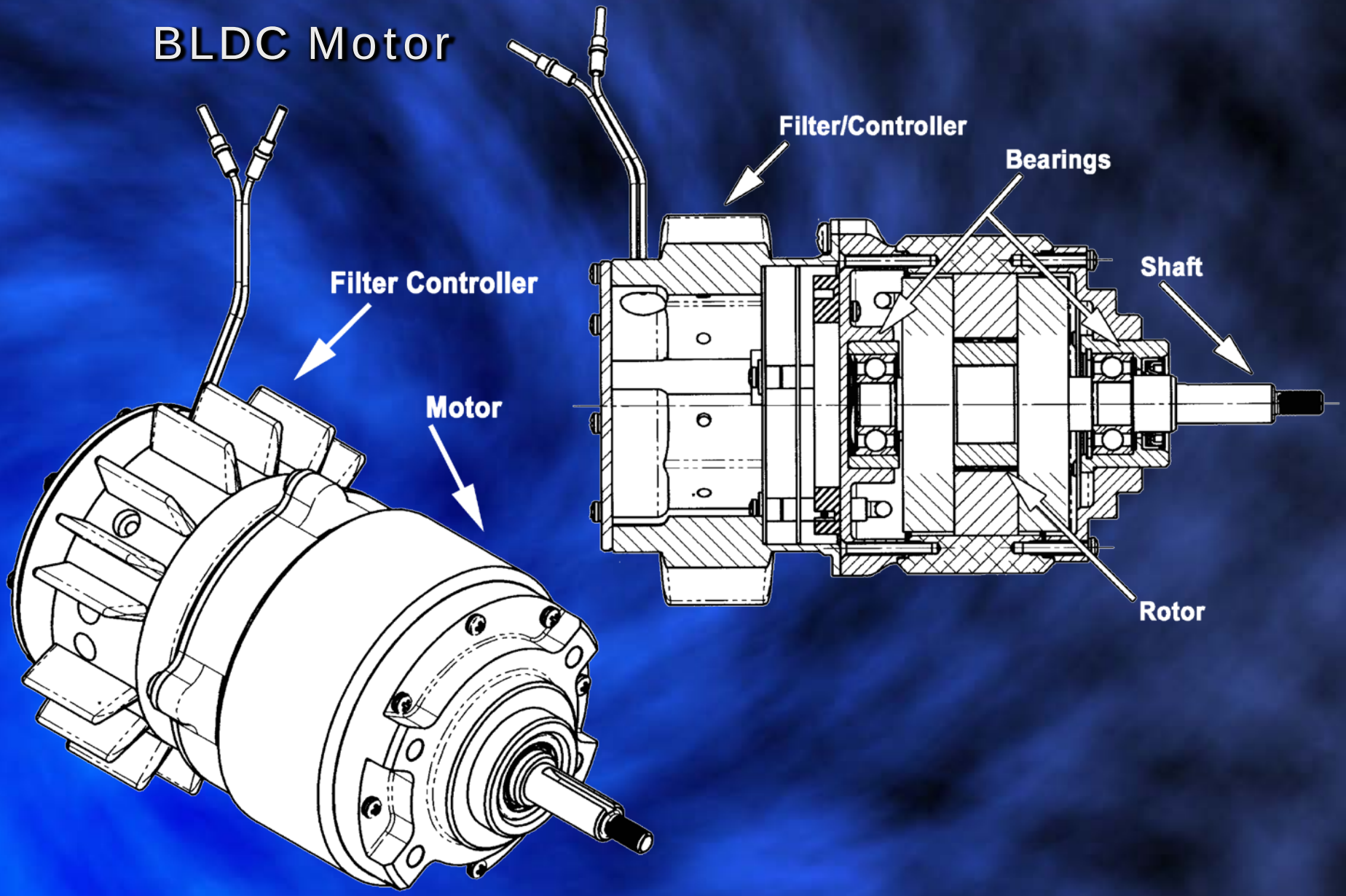
BLDC Motor



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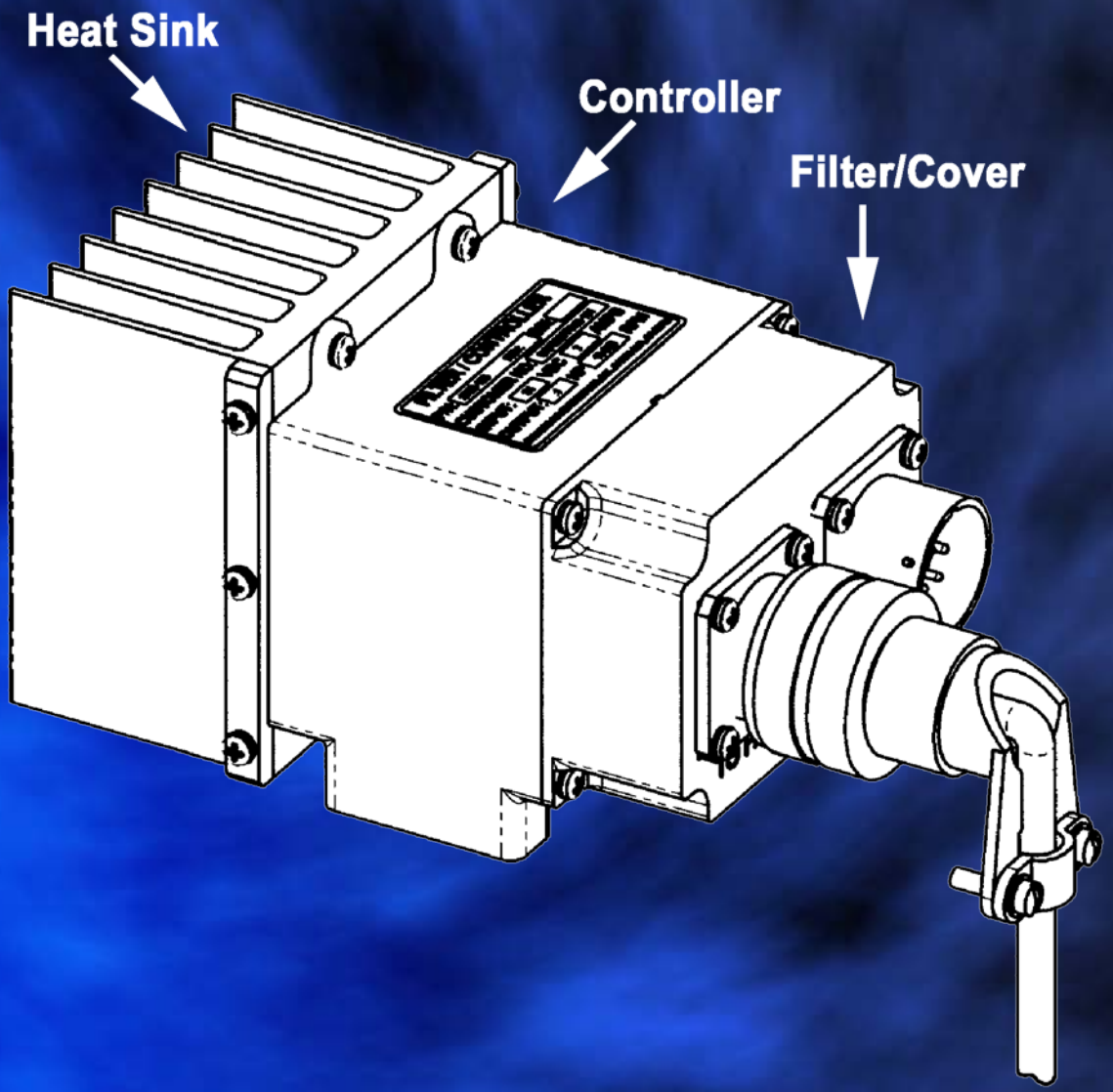
External BLDC Controller



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Reference for Motor Sizing

Motor Sizing Formulas

Inertia- a property of matter where a body offers resistance to any change in its state of rest or uniform motion.

Inertia Types: Point mass at a radius:

$$J = \frac{\text{weight} \times \text{radius}^2}{384} = \text{Lb-in-sec}^2$$

Circular body (ring)

$$J = \frac{\text{weight} \times \text{radius}^2}{384} = \text{Lb-in-sec}^2$$

Circular body (solid)

$$J = \frac{1/2\ \text{weight} \times \text{radius}^2}{384} = \text{Lb-in-sec}^2$$

Note: units in these formulas can be english or metric

Torque Required to Accelerate a load

$$T = \frac{J \times N \times \pi}{30 \times t_a} + FT$$

J=system inertia (lb-in-sec^2)

N= motor speed (rpm)

t_a = allowed time to accelerate (sec)

FT= friction Torque

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Motor Sizing Formulas

$$\text{Brake Horsepower} = \frac{\text{Torque (in-Lb)} \times \text{RPM}}{63{,}025}$$

$$\text{Hz} = \frac{\text{RPM} \times \#\text{Poles}}{120}$$

$$\text{Watts} = I \times V$$

$$\text{Electrical Efficiency} = \frac{0.746 \times \text{bhp}}{\text{kW}}$$

Note: 746 watts/HP

$$\text{Input HP} = \frac{\text{BHP}}{\text{Motor Efficiency}}$$