"U" CHANNEL LINEAR MOTORS

USER'S MANUAL

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If you should have any questions about the "U" Channel motors or comments regarding the documentation, please refer to Aerotech online at:
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CHAPTER 1: INTRODUCTION AND USE

In This Section:

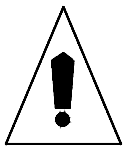
1.1. Safety Information

The "U" channel Brushless Linear Motor (BLM) series is a unique motor design that requires the user to strictly adhere to the following safety guidelines.

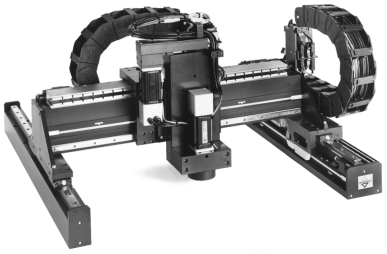
Do not attempt to disassemble the MT series magnet track for cleaning or repair. The magnet track contains powerful magnets that can suddenly clamp together with extreme force. Loosening the magnet track assembly can result in serious injury.

The forcer coil may operate at temperatures as high as 155° C. Do not touch the forcer coil during or following operation. This can result in serious injury.

The linear motor is capable of very high speeds and acceleration. Exercise care when working near moving machinery.



1.2. Product Overview



Gantry System

Air Bearing System

The "U" channel linear motor series is a unique transmission system that provides extremely fast response (speeds up to 400in/sec (10m/sec)) and exceptional positioning accuracy. Resolution and accuracy of the BLM series are limited only by the user's position transducer, bearing, and servo control, providing the user with unlimited resolution. The motor construction consists of a coil and a rare earth magnet track that eliminates backlash, windup, and wear most commonly associated with ballscrews, belts or racks. The linear motors can be incorporated into gantry systems or into positioning stages with mechanical or air bearings. The linear motors are well suited for both general purpose positioning and ultra precision applications such as:

- PC board insertion machinery
- Pick and place robots
- Laser marking
- X-ray and E-beam lithography
- Semiconductor laser direct writing
- and precision diamond cutting

The BLM series motor assembly is illustrated below in Figure 1-1. The BLMUC or ultra compact linear motor is illustrated in Figure 1-2, the BLMC or compact linear motor is illustrated in Figure 1-3, the BLMH (high power) linear motor is shown in Figure 1-4 and the BLMX linear motor is illustrated in Figure 1-5.

Figure 1-1. BLM Series Linear Motor

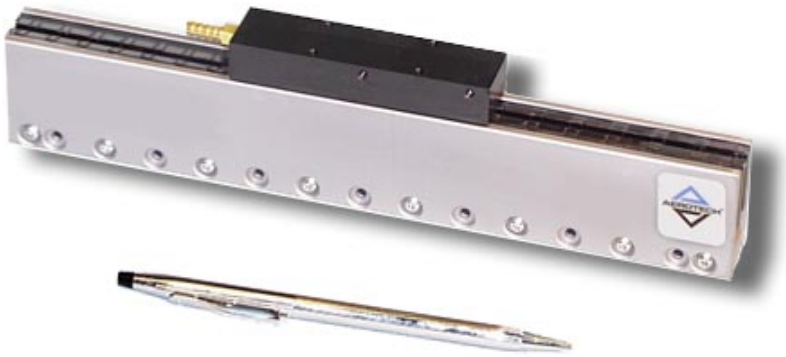


Figure 1-2. BLMUC Series Linear Motor

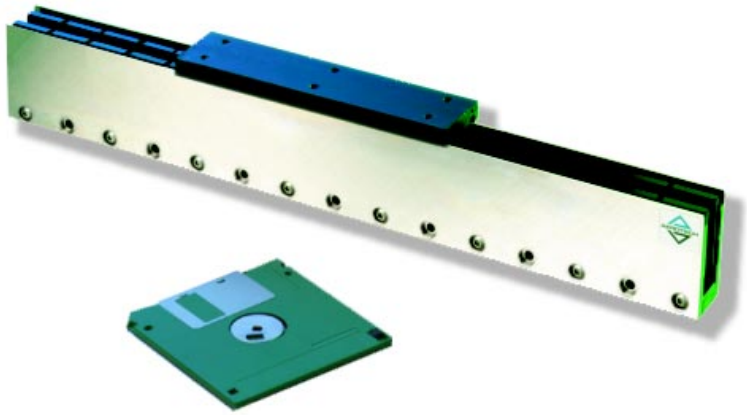


Figure 1-3. BLMC Linear Motor

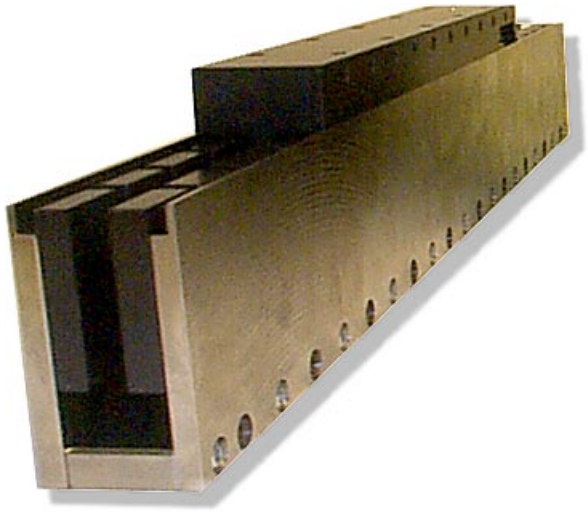


Figure 1-4. BLMH Linear Motor

Figure 1-5. BLMX Series Linear Motor

1.3. "U" Channel Models

There are currently five series of "U" channel linear motors: BLM, BLMUC, BLMC, BLMH, and BLMX.

1.3.1. BLMUC Series

The BLMUC series motors are available in four different models each consisting of one coil and one or more magnet tracks. A list of the models and magnet track assemblies available is shown in Table 1-1.

Table 1-1. BLMUC Models and Tracks

Model	Description
BLMUC -79-A	Linear motor coil 8.19 lbs. (36.4N) continuous, with HED and temperature sensor.
BLMUC-95-A	Linear motor coil 10 lbs. (44.5N) continuous, with HED and temperature sensor.
BLMUC-111-A	Linear motor coil 11.8 lbs. (52.5N) continuous, with HED and temperature sensor.
BLMUC-143-A	Linear motor coil 16.7 lbs. (74.3N) continuous, with HED and temperature sensor.
Track Assembly	**Description**
MTUC96	Magnet track, 96mm (3.8 inches) length.
MTUC224	Magnet track, 224mm (8.8 inches) length.
MTUC352	Magnet track, 352mm (13.9 inches) length.
MTUC416	Magnet track, 416mm (16.4 inches) length.

1.3.2. BLMC Series

The BLMC series motors are available in four different models each consisting of one coil and one or more magnet tracks. A list of the models and magnet track assemblies available is shown in Table 1-2.

Table 1-2. BLMC Models and Tracks

Model	Description
BLMC -92-A	Linear motor coil 12.3 lbs. (27N) continuous, with HED and temperature sensor.
BLMC-142-A	Linear motor coil 24 lbs. (102N) continuous, with HED and temperature sensor.
BLMC-192-A	Linear motor coil 34.7 lbs. (159N) continuous, with HED and temperature sensor.
BLMC-267-A	Linear motor coil 40.4 lbs. (180N) continuous, with HED and temperature sensor.
Track Assembly	**Description**
MTC150	Magnet track, 150mm (5.9 inches) length.
MTC250	Magnet track, 250mm (9.8 inches) length.
MTC350	Magnet track, 350mm (13.8 inches) length.
MTC500	Magnet track, 500mm (19.7 inches) length.
MTC800	Magnet track, 800mm (31.5 inches) length.

1.3.3. BLM Series

The BLM series motors are available in five different models each consisting of one coil and one or more magnet tracks. A list of the models and magnet track assemblies available is shown in Table 1-3.

Table 1-3. BLM Models and Track Assemblies

Model	Description
BLM-142-A	Linear motor coil 35 lbs. (156N) continuous, with HED and temperature sensor.
BLM-203-A	Linear motor coil 48 lbs. (214N) continuous, with HED and temperature sensor.
BLM-264-A	Linear motor coil 57 lbs. (254N) continuous, with HED and temperature sensor.
BLM-325-A	Linear motor coil 66 lbs. (294N) continuous, with HED and temperature sensor.
BLM-386-A	Linear motor coil 73 lbs. (325N) continuous, with HED and temperature sensor.
Track Assembly	**Description**
MT240	Magnet track, 243,8mm (9.6 inches) length.
MT300	Magnet track, 304,8mm (12 inches) length.
MT360	Magnet track, 365,8mm (14.4 inches) length.
MT420	Magnet track, 426,7mm (16.8 inches) length.
MT480	Magnet track, 487,7mm (19.2 inches) length.
MT600	Magnet track, 609,6mm (24.0 inches) length.
MT790	Magnet track, 792,5mm (31.2 inches) length.
MT910	Magnet track, 914,4mm (36.0 inches) length.

All tracks are stackable.

1.3.4. BLMH Series

The BLMH series motors are available in five different models each consisting of one coil and one or more magnet tracks. A list of the models and magnet track assemblies available is shown in Table 1-4.

Table 1-4. BLMH Models and Tracks

Model	Description
BLMH-142-A	Linear motor coil 55.9 lbs. (248.7N) continuous, with HED and temperature sensor.
BLMH-202-A	Linear motor coil 80.1 lbs. (356.4N) continuous, with HED and temperature sensor.
BLMH-262-A	Linear motor coil 99.3 lbs. (441.8N) continuous, with HED and temperature sensor.
BLMH-322-A	Linear motor coil 114 lbs. (507N) continuous, with HED and temperature sensor.
BLMH-382-A	Linear motor coil 170lbs. (756N) continuous, with HED and temperature sensor.
Track Assembly	**Description**
MTH360	Magnet track, 360mm (14.17 inches) length.
MTH480	Magnet track, 480mm (18.90 inches) length.
MTH600	Magnet track, 600mm (23.63 inches) length.
MTH720	Magnet track, 720mm (28.35 inches) length.

The coil length is given by the part number, (e.g., a BLMH-382, the coil length is 382mm long). The base of the motor is 10mm longer than the coil. This 10mm is used to strain relief the cables.

1.3.5. BLMX Series

The BLMH series motors are available in two different models each consisting of one coil and one or more magnet tracks. A list of the models and magnet track assemblies available is shown in Table 1-5.

Table 1-5. BLMX Models and Tracks

Model	Description
BLMX-382-A	Linear motor coil 229 lbs. (1020N) continuous, with HED and temperature sensor.
BLMX-502-A	Linear motor coil 266 lbs. (1186N) continuous, with HED and temperature sensor.
Track Assembly	**Description**
MTX480	Magnet track, 480mm (14.17 inches) length.
MTX600	Magnet track, 600mm (18.90 inches) length.
MTX720	Magnet track, 720mm (23.63 inches) length.

The coil length is given by the part number, (e.g., a BLMX-382, the coil length is 382mm long). The base of the motor is 10mm longer than the coil. This 10mm is used to strain relief the cables.

1.4. Hardware Overview

A linear motor consist of three main components: The magnet assembly (magnet track), the forcer or coil assembly, and the Hall effect devices (HEDs). The magnet assembly supplies the magnetic force which the coil assembly acts upon. The coil assembly combined with the amplifier and control electronics produce the magnetic force for the motor. The Hall effect devices are required for proper commutation of a brushless linear motor and are integrated into the coil assembly.

There are two ways to achieve linear motion. The magnet track can be held stationary while the forcer moves or the forcer can be held stationary while the magnet track moves. This provides the user with a high degree of flexibility.

1. 5. Power and Control Connections

All the power and control connections are made through the linear motor's coil or forcer assembly. For an example of an integrated configuration using the linear motor and Aerotech's amplifiers and controllers, refer to Figure 1-6.

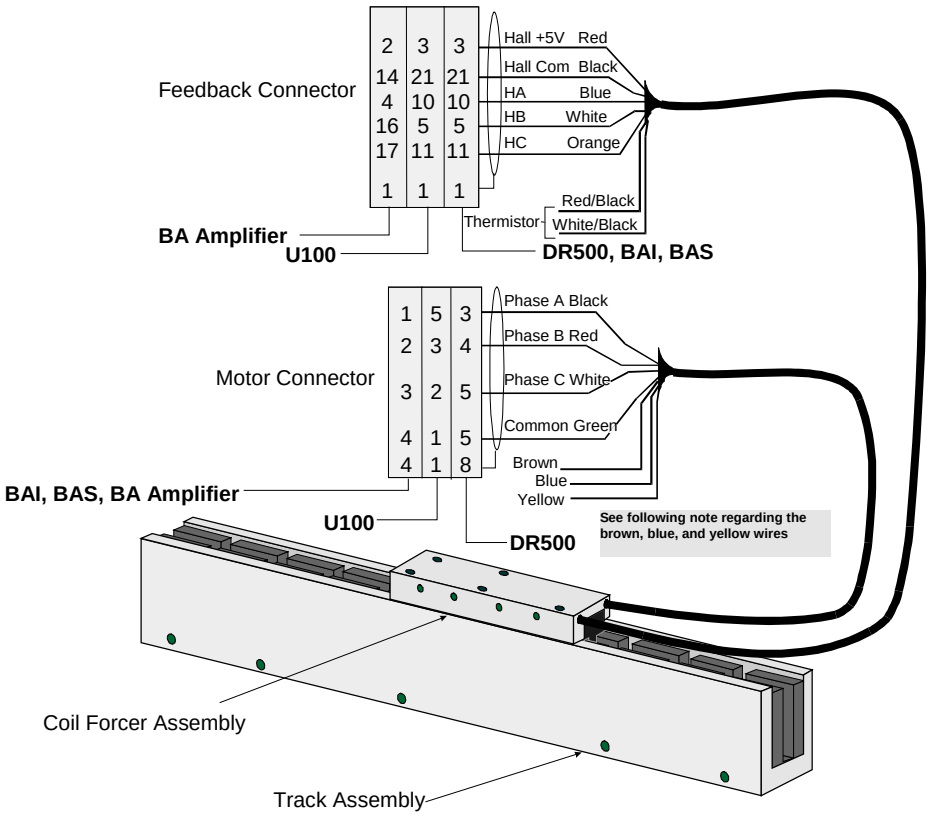


Figure 1-6. Integrated Configuration and Hardware Overview

IMPORTANT

The BLMC, BLMH,BLMUC, and the BLMX employ a six wire coil design. It is necessary to connect the brown, blue, and yellow wires together. This connection **must never** be connected to any other circuit or to an earth connection. All questions regarding this matter must be directed to the factory.

1.6. Installation Guidelines for the "U" Channel Motors

Listed below are several key issues to consider when installing a frameless linear motor.

- Bearing system to support forcer coil and load
- Straightness and flatness tolerance of overall travel range
- Mechanical arrangement of the magnet track
- Position transducer and resolution
- Cable management
- Environmental considerations
- Motor heating
- Stacking Tracks

1.6.1. Bearing System

Like a ballscrew carriage, the linear forcer coil must be supported by a linear bearing system. The linear bearing system must be capable of supporting the load/heatsink and forcer coil. The forcer coil on the linear motors consist of an epoxy material and consequently, the magnet track does not attract the forcer coil. Figure 1-7 is a typical linear motor configuration with bearing slides.

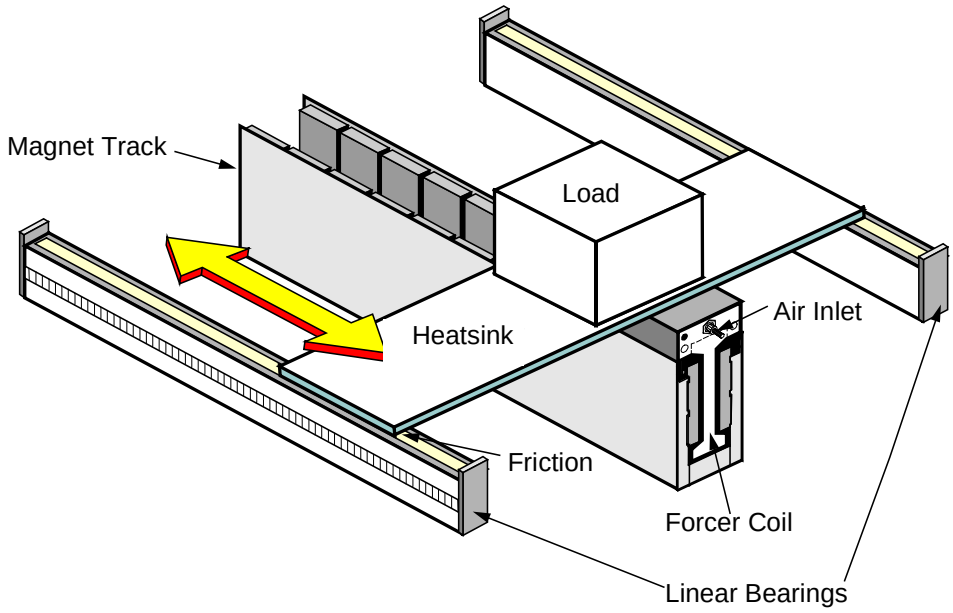


Figure 1-7. Linear Motor with Slide Rails

1.6.2. Straightness and Flatness Tolerance

The straightness and flatness tolerance is the deviation from a straight line in two dimensions during travel.

There are two separate alignment tolerances; straightness (side-to-side) and flatness (in-and-out) of the "U" channel track. Generally, the linear motor operates, provided the forcer coil does not make contact with the magnet track over the entire length of travel.

1.6.2.1. BLMUC Tolerances

With the forcer aligned as it is in Figure 1-8, the air gap in the "U" channel is 0.030" (7.62mm) on either side of the forcer coil. The straightness can deviate left or right to ±0.010" (0.25mm) from the center line. This would leave 0.020" (0.51mm) air gap on one side and 0.040" (1.0mm) on the other side.

The nominal forcer height out of the track is 0.079" (2.0mm), see Figure 1-8. The flatness can deviate *up* an additional 0.010" (0.25mm) for a total of 0.140" (3.556mm) from track edge to forcer coil edge. Also, the flatness can deviate *down* 0.010" (0.25mm) for a total of 0.069" (1.8mm) from track edge to forcer coil edge.

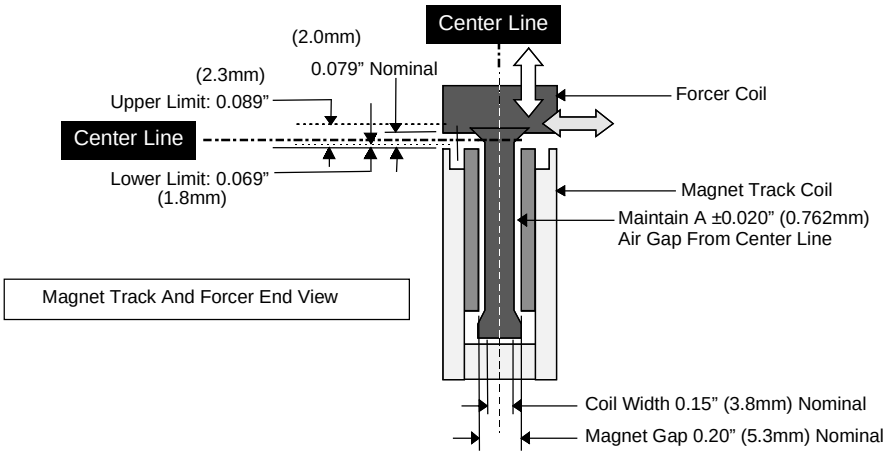


Figure 1-8. BLMUC Straightness and Flatness Tolerances

1.6.2.2. BLMC Tolerances

With the forcer aligned as it is in Figure 1-9, the air gap in the "U" channel is 0.30" (7.62mm) on either side of the forcer coil. The straightness can deviate left or right to ±0.015" (0.381mm) from the center line. This would leave 0.015" (0.381mm) air gap on one side and 0.045" (1.143mm) on the other side.

The nominal forcer height out of the track is 0.050" (1.27mm), see Figure 1-9. The flatness can deviate *up* an additional 0.015" (0.381mm) for a total of 0.065" (1.651mm) from track edge to forcer coil edge. Also, the flatness can deviate *down* 0.015" (0.381mm) for a total of 0.035" (0.889mm) from track edge to forcer coil edge.

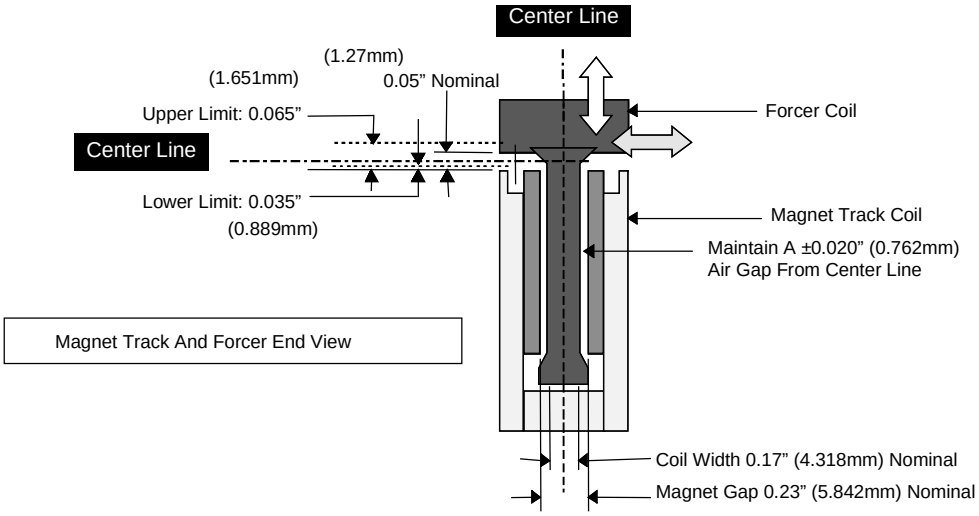


Figure 1-9. BLMC Straightness and Flatness Tolerances

1.6.2.3. BLM Tolerances

With the forcer aligned as it is in Figure 1-10, the air gap in the "U" channel is 0.05" (1.27mm) on either side of the forcer coil. The straightness can deviate left or right to ±0.04" (1.016mm) from the center line. This would leave 0.01" (0.254mm) air gap on one side and 0.09" (2.286mm) on the other side.

The nominal forcer height out of the track is 0.10" (2.54mm), see Figure 1-10. The flatness can deviate *up* an additional 0.055" (1.397mm) for a total of 0.155" (3.937mm) from track edge to forcer coil edge. Also, the flatness can deviate *down* 0.04" (1.016mm) for a total of 0.01" (0.254mm) from track edge to forcer coil edge.

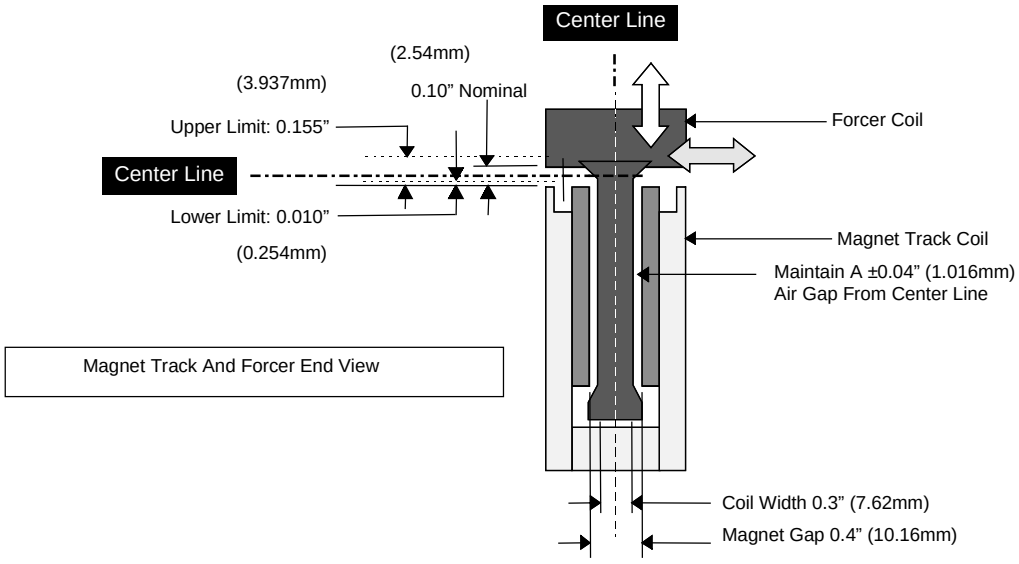


Figure 1-10. BLM Straightness and Flatness Tolerances

1.6.2.4. BLMH Tolerances

With the forcer aligned as it is in Figure 1-11, the air gap in the "U" channel is 0.045" (1.27mm) on either side of the forcer coil. The straightness can deviate left or right to ±0.035" (0.889mm) from the center line. This would leave 0.015" (0.381mm) air gap on one side and 0.085" (2.159mm) on the other side.

The nominal forcer height out of the track is 0.10" (2.54mm), see Figure 1-11. The flatness can deviate *up* an additional 0.040" (1.016mm) for a total of 0.140" (3.556mm) from track edge to forcer coil edge. Also, the flatness can deviate *down* 0.04" (1.016mm) for a total of 0.06" (1.524mm) from track edge to forcer coil edge.

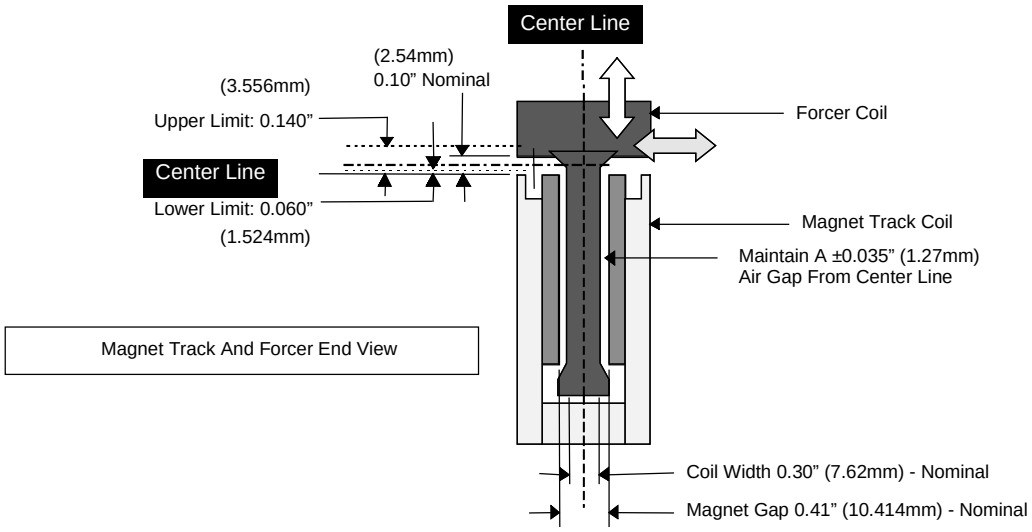


Figure 1-11. BLMH Straightness and Flatness Tolerances

1.6.2.5. BLMX Tolerances

With the forcer aligned as it is in Figure 1-12, the air gap in the "U" channel is 0.05" (7.62mm) on either side of the forcer coil. The straightness can deviate left or right to ±0.020" (0.5mm) from the center line. This would leave 0.030" (0.76mm) air gap on one side and 0.070" (1.8mm) on the other side.

The nominal forcer height out of the track is 0.010" (2.54mm), see Figure 1-12. The flatness can deviate *up* an additional 0.015" (0.381mm) for a total of 0.065" (1.651mm) from track edge to forcer coil edge. Also, the flatness can deviate *down* 0.015" (0.381mm) for a total of 0.080" (2.0mm) from track edge to forcer coil edge.

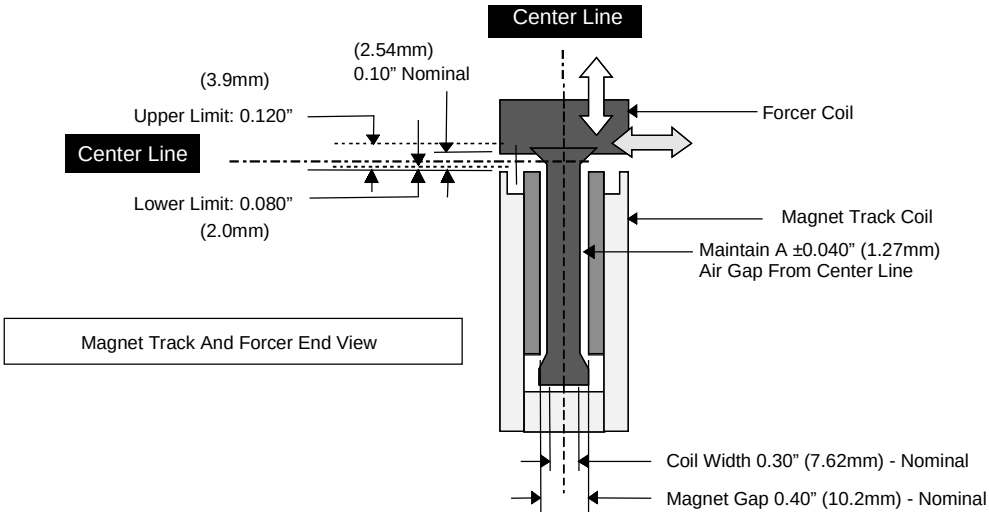


Figure 1-12. BLMX Straightness and Flatness Tolerances

1.6.3. Mechanical Arrangement of Magnet Track

The user can mount the "U" channel magnet track in any direction with the opening up, down, left, or right. The machine design usually dictates the orientation, refer to Figure 1-13.

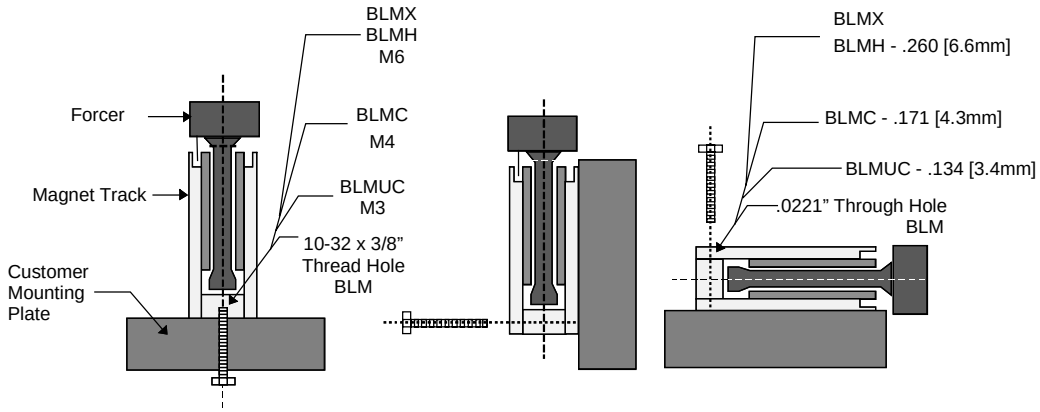


Figure 1-13. Linear Motor Mounting Configurations (end view)

Also, in some applications, it is possible to mount the forcer coil to the stationary part and the track to the moving part. This configuration does increase the load, but it simplifies cable management.

1.6.4. Stacking Tracks

To obtain unlimited travel with the linear motors, the magnet tracks can be stacked together. Due to the alternating north and south poles on the magnet track, Figure 1-14 should be used when stacking the tracks.

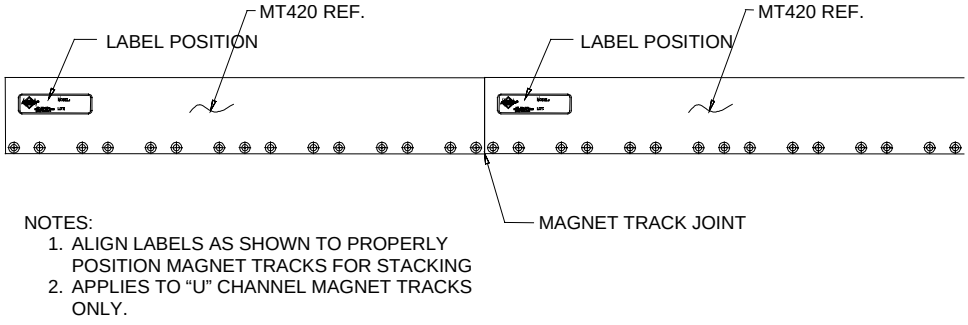


Figure 1-14. Stacking Tracks

1.6.5. Position Transducer and Resolution

To feedback the forcer coil position to the motion controller, the user requires the use of a position transducer. This is typically a linear encoder. There are two basic types of linear encoder the user can use; an enclosed type and a tape scale/readhead type. Figure 1-15 shows a tape scale connected to the stationary part of the mechanism. The readhead attaches to the moving part which in turn, connects to the forcer coil. The application usually determines the required resolution.

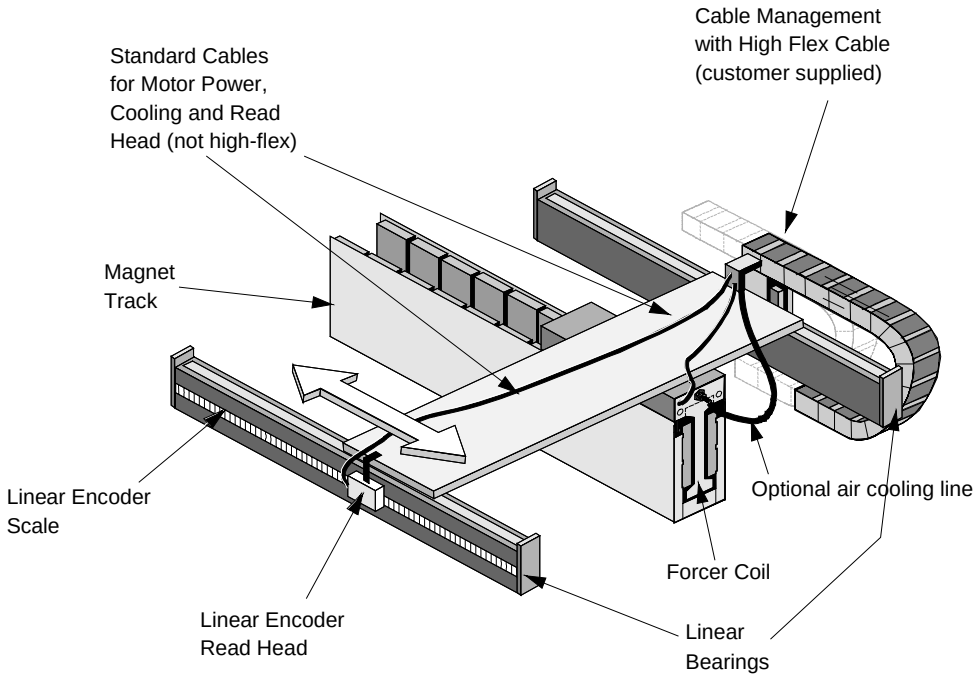


Figure 1-15. Linear Motor with Tape Scale Encoder and Cable Management

1.6.6. Cable Management

Due to the constant bending, a high-flex cable management system must be used to bring the readhead, forcer signals, and cooling lines from the moving part back to the stationary controller. The cable that exits the forcer is *not* a high-flex type, therefore it must terminate before entering the cable management track, refer to Figure 1-15. Termination of the forcer and encoder cable in most cases is through a standard D-shell connector. This connector attaches to the high-flex cable in the cable management track. This allows maintainability of the high-flex cable without removing the forcer coil.

Required for proper operation, is a good shield connection on all cabling. Terminate the shields to earth ground only on the amplifier side.

1.6.7. Environmental Considerations

The linear motor is an open design magnet track with a moving forcer coil. For this reason, there are special considerations required before installing the linear motor. The user should not use the linear motors in following environments:

- Frequent direct water wash-down areas (>80% humidity)
- Where corrosive liquids may damage the forcer coil epoxy
- Where large scraps can fall in the magnet track (especially metallic)
- Subjected to unusually high (above 65°C) or low (below 0°C) temperatures

Compressed air can be used to blow away light particles such as dust or non-magnetic machined scraps.

Do not attempt to disassemble the magnet track for cleaning or any other reason, since this can result in serious injury.

1.6.8. Motor Heating

Temperature considerations are much more critical when using linear motors than with the conventional rotary brushless motor. This is due to the confined heat generated from the forcer coil in the magnet track. The amount of force produced by any linear motor is dependent on the coil temperature rise above ambient. The thermal characteristics of the windings determine the operating force as a function of temperature.

High duty-cycle applications usually require pressurized air into the forcer for cooling. Typical pressures are 10, 20, and 40psi. The CFM varies depending on the specific forcer model used. Contact Aerotech's application engineers for help on determining cooling requirements.

1.7. Forcer Thermal Protection Device

The linear motor forcer thermal protection device is a sharp knee positive temperature coefficient thermistor. This device exhibits a rapid increase in resistance as it approaches the selected temperature point, refer to Figure 1-16. The set point chosen for proper protection of the forcer winding assembly is 100 degrees C.

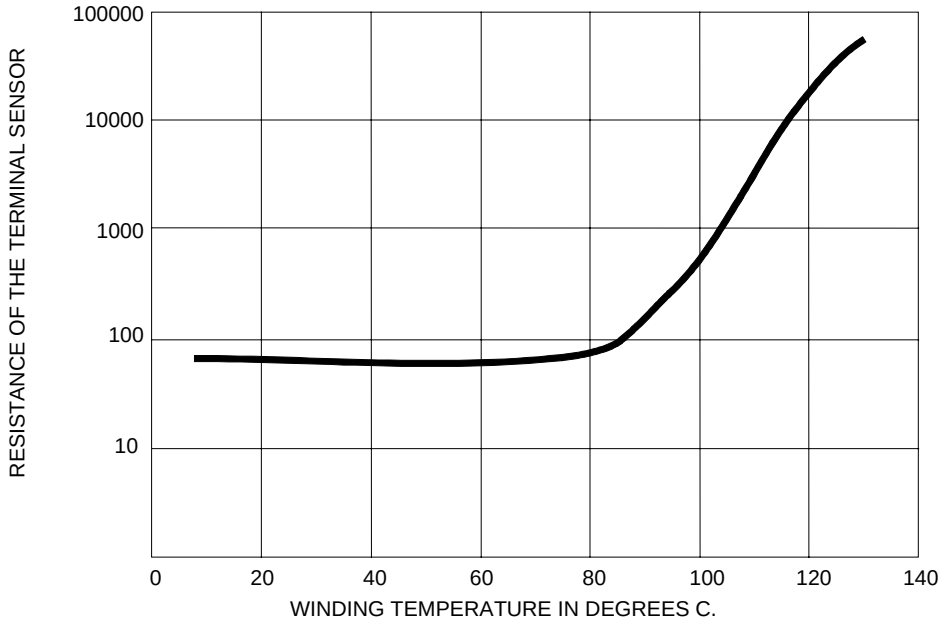


Figure 1-16. Linear Motor 100 Degree Thermal Sensor Response

The nominal resistance at 25 degrees C. is 100 ohms. At the set point of 100 degree C., the nominal resistance is 1000 ohms. Beyond the set point the resistance increases above 10000 ohms very rapidly.

This rapid increase in resistance can be used in a variety of different electronic interfaces. One method would be a simple voltage divider circuit. Figure 1-17 and Figure 1-18 are examples of such circuits. A precaution to follow when using this type of device is to avoid self heating effects. This is done by choosing a voltage source that limits the current carried by the sensor to no more than 50 milliamps.

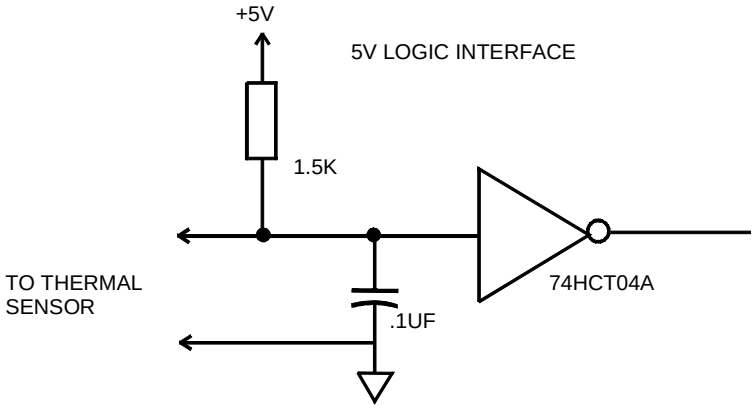


Figure 1-17. 5V Logic Interface

The trip point is approximately 105 degrees C winding temperature, refer to circuit in Figure 1-17.

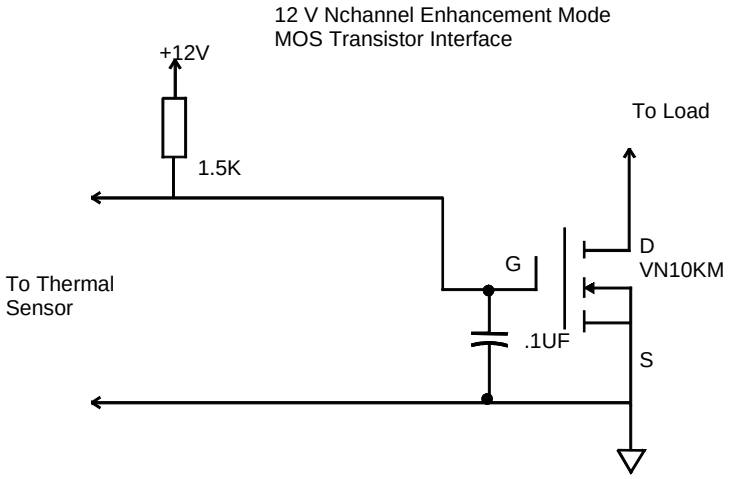


Figure 1-18. 12V Nchannel Enhancement Mode MOS Transistor Interface

Using the min, type, +max gate threshold voltage of the Siliconix part (VN10KM) with a 12V supply, the trip point will be between 105 to 110 degrees C winding temperature. The maximum load voltage should not exceed 60 VDC and the continuous current not exceed .2 Amp, refer to circuit in Figure 1-18.

1.8. Hall Effect Operation and Motor Phasing

In linear servo motors, one popular method of commutation is through Hall effect sensors. These can sense the presence of a magnetic field and provide an output proportional to the forcer position. Hall sensors are quite small and can be mounted outside the forcer to sense the magnetic field of the magnet assembly. The sensors are operated only as switches, that are "ON" or "OFF" in brushless motors to sense the changing field direction as alternate north-south poles pass by when the forcer moves. The Hall sensors are mounted 120 electrical degrees apart. Each 60° segment has a unique set of Hall sensor outputs so that the forcer position can be resolved to any six segments over the 360 electrical degrees. Hall effect sensors consist of a small semiconductor crystal where a constant current is applied. If a magnetic field is applied perpendicularly to the crystal, the current is diverted and a voltage is produced at the other set of terminals on the crystal. The magnitude and polarity of the voltage is directly proportional to the magnitude and direction of the magntic field. The Hall sensors used in the linear motors employ an open collector output. Figure 1-19 is an illustration of a Hall effect sensor. Figure 1-20 illustrates the linear motor phasing for the BLM series. Figure 1-21 illustrates the six wire motor phasing for the BLMC and BLMH series.

The HED is not needed if the controller performs commutation using an absolute linear encoder.

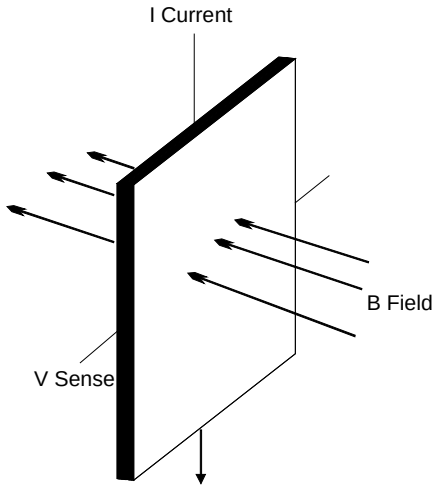
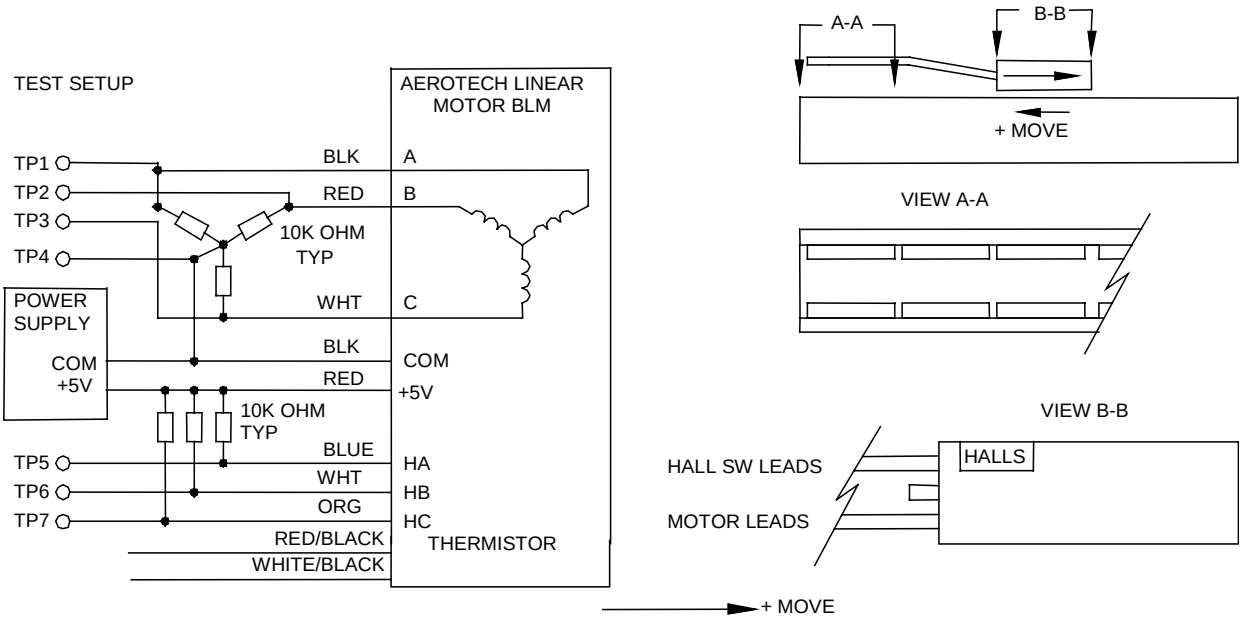
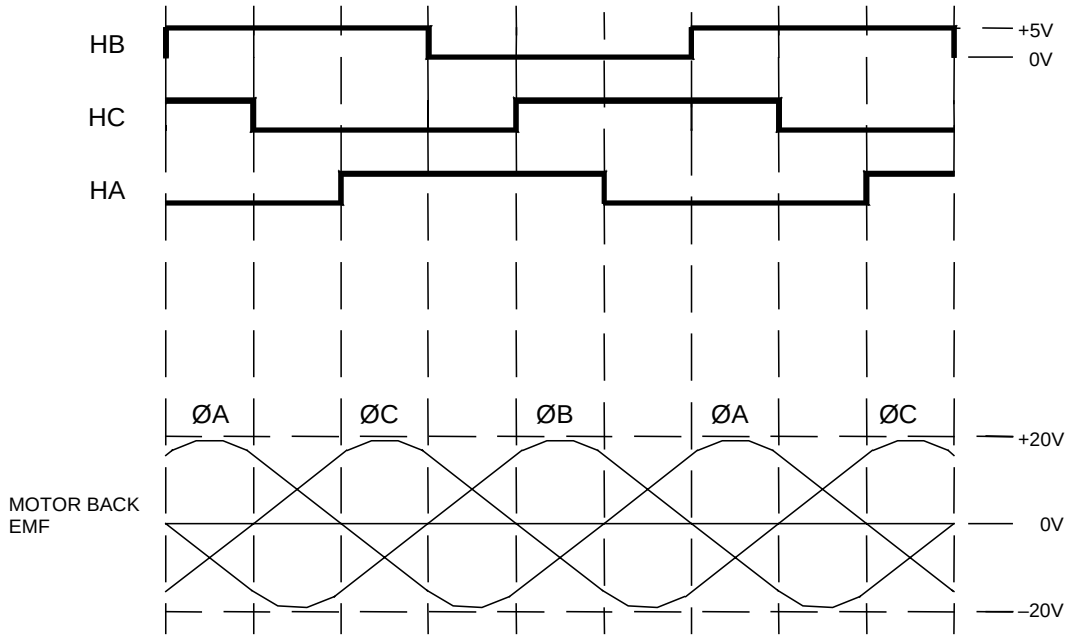


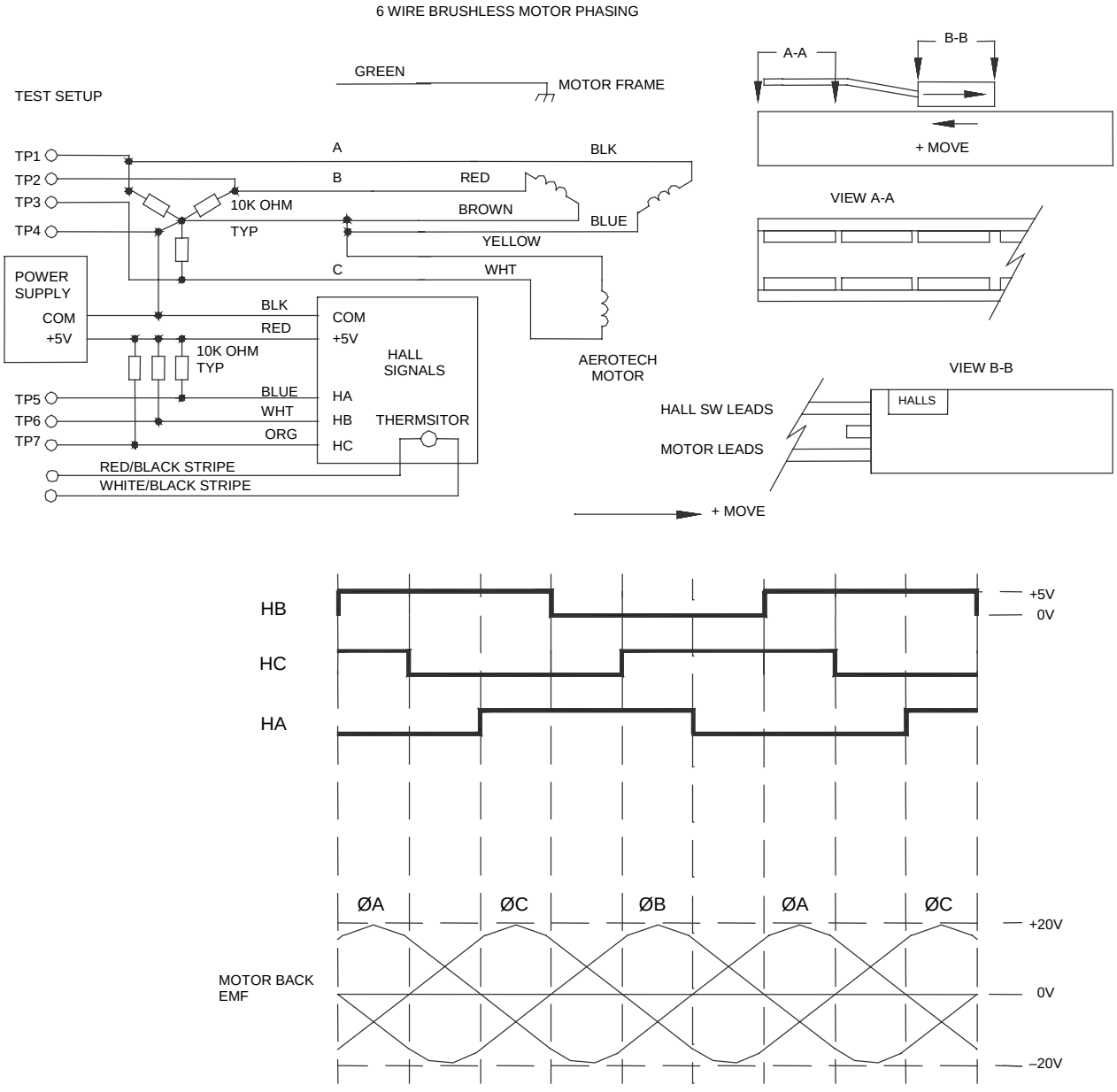
Figure 1-19. The Hall Effect Sensor





NOTES:
1. ALL VOLTAGE MEASUREMENTS ARE MADE WITH REFERENCE TO TP4, SIGNAL COMMON NEUTRAL.
2. MOTOR/HALL WIRING IS PER AEROTECH STANDARD OF 1/95.

Figure 1-20. Brushless Linear Motor Phasing (BLM Series)



NOTES:
1. ALL VOLTAGE MEASUREMENTS ARE MADE WITH REFERENCE TO TP4, SIGNAL COMMON NEUTRAL.
2. MOTOR/HALL WIRING IS PER AEROTECH STANDARD OF 1/95.
3. CW MOTION ON A LINEAR MOTOR IS MOTION IN THE DIRECTION OPPOSITE THE COIL WIRE EXIT END.

Figure 1-21. Motor Phasing Six Wire (BLMC, BLMX, BLMUC, and BLMH Series)

1.9. Part Number and Ordering Information

A typical linear motor consists of one coil plus one magnet track. Magnet tracks are compatible with all four coil models. Note that the effective motor travel length is track length minus coil length. Non-standard magnet track lengths are available in 1.2 inch (30.4mm) increments. Order information regarding part numbers, models and magnetic tracks for the BLMUC series is shown in Figure 1-22. Figure 1-23 contains information for the BLMC series. Figure 1-24 contains information for the BLM series. Figure 1-25 contains information for the BLMH series and Figure 1-26 contains information for the BLMX.

Model Numbering System	
Model	**Description**
BLMUC-79-A	Linear motor coil, 7.3 lbs. (32N) continuous, with HED and temperature sensor.
BLMUC-95-A	Linear motor coil, 9.7 lbs. (43N) continuous, with HED and temperature sensor.
BLMUC-111-A	Linear motor coil, 11.7 lbs. (52N) continuous, with HED and temperature sensor.
BLMUC-143-A	Linear motor coil, 16.5 lbs. (73N) continuous, with HED and temperature sensor.
Magnet Track Assembly	
Model	**Description**
MTUC96	Magnet track, 96mm [3.8 inches] length
MTUC224	Magnet track, 224mm [8.8 inches] length
MTUC352	Magnet track, 352mm [13.9 inches] length
MTUC416	Magnet track, 416mm [16.4 inches] length

Figure 1-22. Order Information for the BLMUC

Model Numbering System	
Model	**Description**
BLMC-92-A	Linear motor coil, 19 lbs. (82N) continuous, with HED and temperature sensor.
BLMC-142-A	Linear motor coil, 26 lbs. (114N) continuous, with HED and temperature sensor.
BLMC-192-A	Linear motor coil, 31 lbs. (138N) continuous, with HED and temperature sensor.
BLMC-267-A	Linear motor coil, 43 lbs. (193N) continuous, with HED and temperature sensor.
Magnet Track Assembly	
Model	**Description**
MTC150	Magnet track, 150mm [5.9 inches] length
MTC250	Magnet track, 250mm [9.8 inches] length
MTC350	Magnet track, 350mm [13.8 inches] length
MTC500	Magnet track, 500mm [19.7 inches] length
MTC800	Magnet track, 800mm [31.5 inches] length

Figure 1-23. Order Information for the BLMC

Model Numbering System	
Model	**Description**
BLM-142-A	Linear motor coil, 389 lbs. (168N) continuous, with HED and temperature sensor.
BLM-203-A	Linear motor coil, 52 lbs. (232N) continuous, with HED and temperature sensor.
BLM-264-A	Linear motor coil, 62 lbs. (276N) continuous, with HED and temperature sensor.
BLM-325-A	Linear motor coil, 71 lbs. (316N) continuous, with HED and temperature sensor.
BLM-386-A	Linear motor coil, 79 lbs. (352N) continuous, with HED and temperature sensor.
Magnet Track Assembly	
Model	**Description**
MT240	Magnet track, 240mm [9.6 inches] length
MT300	Magnet track, 300mm [12.0 inches] length
MT360	Magnet track, 360mm [14.4 inches] length
MT420	Magnet track, 420mm [16.8 inches] length
MT480	Magnet track, 480mm [19.2 inches] length
MT600	Magnet track, 600mm [24.0 inches] length
MT790	Magnet track, 790mm [31.2 inches] length
MT910	Magnet track, 910mm [36.0 inches] length

Figure 1-24. Order Information for the BLM

Model Numbering System	
Model	**Description**
BLMH-142-A	Linear motor coil, 59 lbs. (260N) continuous, with HED and temperature sensor.
BLMH-202-A	Linear motor coil, 90 lbs. (400N) continuous, with HED and temperature sensor.
BLMH-262-A	Linear motor coil, 128 lbs. (570N) continuous, with HED and temperature sensor.
BLMH-322-A	Linear motor coil, 158 lbs. (703N) continuous, with HED and temperature sensor.
BLMH-382-A	Linear motor coil, 185 lbs. (822N) continuous, with HED and temperature sensor.
Magnet Track Assembly	
Model	**Description**
MTH360	Magnet track, 360mm [14.2 inches] length
MTH480	Magnet track, 480mm [18.9 inches] length
MTH600	Magnet track, 600mm [23.6 inches] length
MTH720	Magnet track, 720mm [28.4 inches] length

Figure 1-25. Order Information for the BLMH

Model Numbering System	
Model	**Description**
BLMX-382-A	Linear motor coil, 231 lbs. (1030N) continuous, with HED and temperature sensor.
BLMX-502-A	Linear motor coil, 266 lbs. (1186N) continuous, with HED and temperature sensor.
Magnet Track Assembly	
Model	**Description**
MTX480	Magnet track, 480mm [18.9 inches] length
MTX600	Magnet track, 600mm [23.6 inches] length
MTX720	Magnet track, 720mm [28.4 inches] length

Figure 1-26. Order Information for BLMX

1.10. Linear Motor Specifications

The specifications for the linear motor series are listed in the following tables.

Table 1-6. BLMUC Motor Specifications

Motor Model	Units	BLMUC-79	BLMUC-95	BLMUC-111	BLMUC-143
Performance Specifications					
Continuous @ 1.36 bar Force 20 psi	N	32.4	43.3	52.2	73.1
	lb	7.31	9.7	11.7	16.5
Continuous Force, no air	N	24.8	31.5	34.8	47.9
	lb	5.56	7.35	7.87	10.7
Peak Force	N	130	173	209	292
	lb	29.2	38.9	47	66
Electrical Specifications					
Winding Designation		-A	-A	-A	-A
BEMF, line-line	V/m/s	7.87	10.24	12.99	18.11
	V/in/s	0.20	0.26	0.33	0.46
Continuous @ 1.36 bar Current 20 psi	Amp_{pk}	4.54	4.37	4.54	4.45
	Amp_{rms}	3.21	3.09	3.21	3.21
Continuous Current, no air	Amp_{pk}	3.48	3.27	3.05	2.97
	Amp_{rms}	2.46	2.31	2.16	2.10
Force Constant, Sine Drive	N/Amp_{pk}	6.87	10.04	11.60	16.05
	lb/Amp_{pk}	1.60	2.24	2.60	3.61
	N/Amp_{rms}	9.72	14.20	16.40	22.70
	lb/Amp_{rms}	2.26	3.17	3.67	5.11
Motor Constant	$N/\sqrt{W}$	3.50	4.30	4.45	5.20
	$lb/\sqrt{W}$	0.79	0.96	1.00	1.18
Thermal @ (1.36 bar, 20 psi)	°C/W	1.15	0.98	0.71	0.49
Resistance (no cooling)		1.97	1.71	1.57	1.36
Resistance, 25°C, line-line	ohms	4.0	5.2	6.5	8.9
Resistance, 125°C, line-line	ohms	5.6	7.3	9.1	12.5
Inductance, line-line	mH	0.51	0.70	0.87	1.10
Max Terminal Voltage	VDC	160	160	160	160
Mechanical Specifications					
Air Flow	m^3/s	$0.7x10^{-3}$	$1.1x10^{-3}$	$1.1x10^{-3}$	$1.3x10^{-3}$
	SCFM	1.53	2.4	2.3	2.7
Coil Weight	kg	0.10	0.12	0.14	0.20
	lb	0.22	0.26	0.31	0.44
Coil Length	mm	79.0	95.0	111.0	143.0
	in	3.11	3.74	4.37	5.63
Heat Sink Area	mm	254x254	254x254	254x254	254x254
[Thickness 25.4mm (1in)]	in	10x10	10x10	10x10	10x10
Magnet Track Weight	kg/m	4.04	4.04	4.04	4.04
	lb/ft	2.72	2.72	2.72	2.72
Magnetic Pole Pitch	mm	16.00	16.00	16.00	16.00
	in	0.63	0.63	0.63	0.63

1. All Aerotech amplifiers are rated in Amp_{pk}; use force constant in Amp_{pk} when sizing.
2. All performance and electrical motor specification s ±10%.
3. Specifications at 125°C operating temperature unless otherwise specified.

Table 1-7. BLMC Motor Specifications (Winding Temperature 125 C)

Motor Model	Units	BLMC-92	BLMC-142	BLMC-192	BLMC-267
Performance Specifications					
Continuous @ 1.36 bar	N	82.4	114	138	193
Force 20 psi	lb	18.5	25.7	31	43.2
Continuous	N	48.4	73.4	112	152
Force, no air	lb	10.9	16.5	25.2	34.2
Peak Force	N	330	458	552	770
	lb	74.2	103	124	173
Electrical Specifications					
Winding Designation		-A	-A	-A	-A
BEMF, line-line	V/m/s	10.63	17.72	25.98	36.22
	V/in/s	0.27	0.45	0.66	0.92
Continuous @ 1.36 bar	Amp_{pk}	8.68	7.40	6.22	6.01
Current 20 psi	Amp_{rms}	6.14	5.23	4.40	4.25
Continuous	Amp_{pk}	5.05	4.82	5.05	4.82
Current, no air	Amp_{rms}	3.57	3.41	3.57	3.41
	N/Amp_{pk}	9.48	15.41	22.20	31.68
Force Constant,	lb/Amp_{pk}	2.12	3.47	4.99	7.07
Sine Drive	N/Amp_{rms}	13.4	21.8	31.40	44.80
	lb/Amp_{rms}	3.00	4.91	7.05	10.00
Motor Constant	$N/\sqrt{W}$	5.52	7.10	8.90	9.80
	$lb/\sqrt{W}$	1.24	1.59	2.00	2.20
Thermal @ (1.36 bar, 20 psi)	°C/W	0.34	0.30	0.27	0.20
Resistance (no cooling)		1.55	1.03	0.70	0.45
Resistance, 25°C, line-line	ohms	2.9	4.8	6.4	10.9
Resistance, 125°C, line-line	ohms	4.1	6.7	9.0	15.3
Inductance, line-line	mH	0.83	1.33	1.90	3.40
Max Terminal Voltage	VDC	320	320	320	320
Mechanical Specifications					
Air Flow	m^3/s	$1.9x10^{-3}$	$2.0x10^{-3}$	$1.8x10^{-3}$	$2.3x10^{-3}$
	SCFM	4.0	4.3	3.8	4.9
Coil Weight	kg	0.16	0.26	0.34	0.52
	lb	0.36	0.57	0.77	1.14
Coil Length	mm	92.0	142.0	192.0	267.0
	in	3.61	5.59	7.56	10.51
Heat Sink Area	mm	254x254	254x254	254x254	254x254
[Thickness 25.4mm (1in)]	in	10x10	10x10	10x10	10x10
Magnet Track Weight	kg/m	9.06	9.06	9.06	9.06
	lb/ft	6.10	6.10	6.10	6.10
Magnetic Pole Pitch	mm	25.00	25.00	25.00	25.00
	in	0.98	0.98	0.98	0.98

1. All Aerotech amplifiers are rated in Amp_{pk}; use force constant in Amp_{pk} when sizing.
2. All performance and electrical motor specification s ±10%.
3. Specifications at 125°C operating temperature unless otherwise specified.

Table 1-8. BLM Motor Specifications (Winding Temperature 125 C)

Motor Model	Units	BLM-142		BLM-203		BLM-264		BLM-325		BLM-386	
Performance Specifications											
Continuous @ 1.36 bar	N	168.0		232.0		276.0		316.0		352.0	
Force 20 psi	lb	37.9		52.2		62.0		70.9		79.2	
Continuous	N	109.0		164.0		207.0		246.0		280.0	
Force, no air	lb	24.6		37.0		46.4		55.3		62.9	
Peak Force	N	673		902		1106		1264		1408	
	lb	151		208		248		284		316	
Electrical Specifications											
Winding Designation		-A	-B	-A	-B	-A	-B	-A	-B	-A	-B
BEMF, line-line	V/m/s	35.83	18.11	26.77	53.54	35.83	70.87	44.88	86.61	55.12	110.24
	V/in/s	0.91	0.46	0.68	1.36	0.91	1.80	1.14	2.20	1.40	2.80
Continuous @ 1.36 bar	Amp_{pk}	5.32	10.62	9.90	4.98	8.77	4.38	8.06	4.00	7.47	3.73
Current 20 psi	Amp_{rms}	3.76	7.51	7.00	3.52	6.20	3.10	5.70	2.83	5.28	2.64
Continuous	Amp_{pk}	3.49	6.97	7.07	3.49	6.59	3.31	6.22	3.13	5.88	2.96
Current, no air	Amp_{rms}	2.47	4.93	5.00	2.47	4.66	2.34	4.40	2.21	4.16	2.09
	N/Amp_{pk}	31.54	15.77	23.55	47.09	31.54	63.00	39.10	77.78	47.09	94.05
Force Constant,	lb/Amp_{pk}	7.07	3.59	5.28	10.54	7.07	14.14	8.77	17.54	10.54	21.21
Sine Drive	N/Amp_{rms}	44.6	22.3	33.3	66.6	44.6	89.1	55.3	110.0	66.6	133.0
	lb/Amp_{rms}	10.0	5.08	7.47	14.9	10.0	20.0	12.4	24.8	14.9	30.0
Motor Constant	$N/\sqrt{W}$	9.21	9.21	11.44	11.44	13.17	13.17	13.95	13.95	16.47	16.47
	$lb/\sqrt{W}$	2.07	2.07	2.57	2.57	2.96	2.96	3.36	3.36	3.70	3.70
Thermal @ (1.36 bar, 20 psi)	°C/W	0.33	0.33	0.26	0.26	0.25	0.25	0.24	0.24	0.23	0.23
Resistance (no cooling)		0.72	0.72	0.49	0.49	0.41	0.41	0.36	0.36	0.35	0.35
Resistance, 25°C, line-line	ohms	10.9	2.7	4.0	16.0	5.3	21.2	6.5	26.0	7.8	31.2
Resistance, 125°C, line-line	ohms	15.3	3.8	5.6	22.4	7.42	30.0	9.1	36.4	10.9	43.6
Inductance, line-line	mH	8.70	2.20	3.20	12.80	4.20	17.00	5.20	20.80	6.20	24.8
Max Terminal Voltage	VDC	320		320		320		320		320	
Mechanical Specifications											
Air Flow	m^3/s	$1.9x10^{-3}$		$2.0x10^{-3}$		$1.9x10^{-3}$		$2.1x10^{-3}$		$2.0x10^{-3}$	
	SCFM	4		4.2		4.15		4.45		4.3	
Coil Weight	kg	0.6		0.9		1.1		1.4		1.7	
	lb	1.3		1.9		2.5		3.1		3.7	
Coil Length	mm	142.2		203.2		264.2		325.1		386.1	
	in	5.59		8.00		10.40		12.79		15.20	
Heat Sink Area	mm	254x254		254x254		254x254		254x406		254x406	
[Thickness 25.4mm (1in)]	in	10x10		10x10		10x10		10x16		10x16	
Magnet Track Weight	kg/m	10.76		10.76		10.76		10.76		10.76	
	lb/ft	7.25		7.25		7.25		7.25		7.25	
Magnetic Pole Pitch	mm	30.48		30.48		30.48		30.48		30.48	
	in	1.20		1.20		1.20		1.20		1.20	

1. All Aerotech amplifiers are rated in Amp_{pk}; use force constant in Amp_{pk} when sizing.
2. All performance and electrical motor specification s ±10%.
3. Specifications at 125°C operating temperature unless otherwise specified.

Table 1-9. BLMH Motor Specifications (Winding Temperature 125 C)

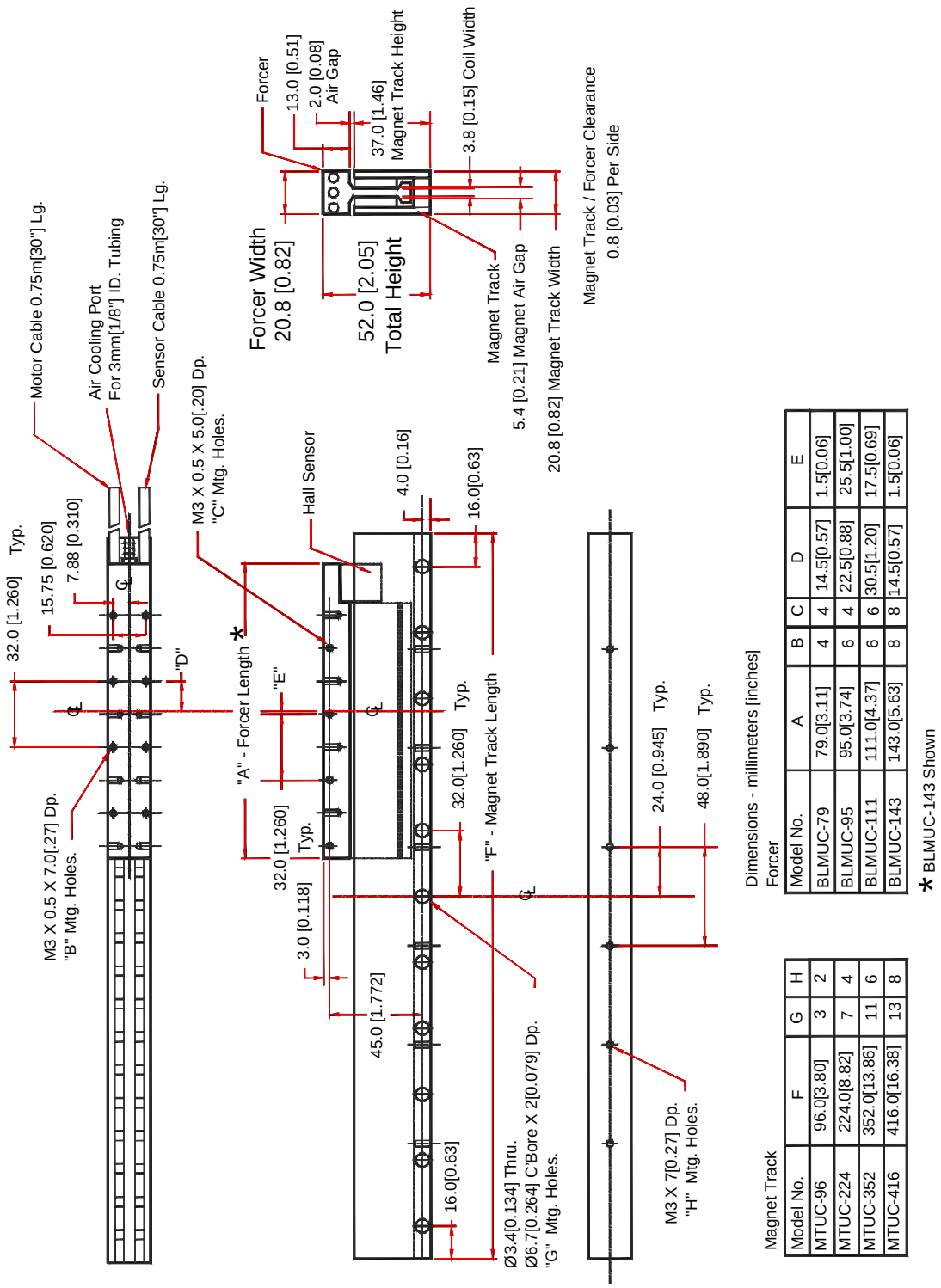
Motor Model	Units	BLMH-142		BLMH-202		BLMH-262		BLMH-322		BLMH-382	
Performance Specifications											
Continuous @ 1.36 bar	N	260.0		400.0		570.0		703.0		822.0	
Force 20 psi	lb	58.5		90.0		128.0		158.0		185.0	
Continuous	N	164.0		251.0		322.0		378.0		471.0	
Force, no air	lb	36.9		56.3		72.1		85.6		106.0	
Peak Force	N	1040		1600		2280		2812		3288	
	lb	234		360		512		632		740	
Electrical Specifications											
Winding Designation		-A	-B	-A	-B	-A	-B	-A	-B	-A	-B
BEMF, line-line	V/m/s	31.89	63.78	47.24	94.49	65.75	131.5	79.53	159.0	50.39	101.8
	V/in/s	0.81	1.62	1.20	2.40	1.67	3.34	2.02	4.04	1.28	2.56
Continuous @ 1.36 bar	Amp_{pk}	9.19	4.60	9.48	4.74	9.76	4.88	9.90	4.95	19.80	9.90
Current 20 psi	Amp_{rms}	6.50	3.25	6.70	3.35	6.90	3.45	7.00	3.50	14.00	7.00
Continuous	Amp_{pk}	5.73	2.90	5.94	2.97	5.52	2.76	5.36	2.67	11.31	5.66
Current, no air	Amp_{rms}	4.05	2.05	4.20	2.10	3.90	1.95	3.79	1.89	8.00	4.00
Force Constant, Sine Drive	N/Amp_{pk}	28.28	56.57	42.43	84.85	54.48	116.7	71.42	142.8	41.72	83.44
	lb/Amp_{pk}	6.36	12.73	9.48	18.95	13.08	26.16	15.98	31.96	9.33	18.74
	N/Amp_{rms}	40.00	80.00	60.00	120.0	82.70	165.0	101.0	202.0	59.0	118.0
	lb/Amp_{rms}	9.00	18.00	13.40	26.80	18.50	37.00	226.0	45.20	13.20	26.50
Motor Constant	$N/\sqrt{W}$	14.50		17.40		20.90		22.80		24.40	
	$lb/\sqrt{W}$	3.26		3.92		4.71		5.11		5.46	
Thermal @ (1.36 bar, 20 psi)	°C/W	0.31		0.19		0.13		0.10		0.10	
Resistance (no cooling)		0.78		0.48		0.42		0.36		0.27	
Resistance, 25°C, line-line	ohms	3.7	14.8	5.5	22.0	7.3	29.2	9.1	36.4	2.8	11.0
Resistance, 125°C, line-line	ohms	5.2	20.7	7.7	31.0	10.2	40.8	12.7	50.8	3.9	15.4
Inductance, line-line	mH	2.4	9.6	3.5	15.2	1.6	18.4	6.0	24.0	1.8	7.1
Max Terminal Voltage	VDC	320		320		320		320		320	
Mechanical Specifications											
Air Flow	m^3/s	$3.4x10^{-3}$		$4.1x10^{-3}$		$4.3x10^{-3}$		$4.7x10^{-3}$		$5.1x10^{-3}$	
	SCFM	7.7		8.8		9.2		10		10.75	
Coil Weight	kg	1.1		1.6		2.1		2.6		3.1	
	lb	2.4		3.5		4.6		5.7		6.8	
Coil Length	mm	142.0		202.0		262.0		322.0		382.0	
	in	5.6		8.0		10.3		12.7		15	
Heat Sink Area	mm	254x254		254x254		254x254		254x406		254x406	
[Thickness 25.4mm (1in)]	in	10x10		10x10		10x10		14x16		14x16	
Magnet Track Weight	kg/m	23.30		23.30		23.30		23.30		23.30	
	lb/ft	15.70		15.70		15.70		15.70		15.70	
Magnetic Pole Pitch	mm	30.00		30.00		30.00		30.00		30.00	
	in	1.18		1.18		1.18		1.18		1.18	

1. All Aerotech amplifiers are rated in Amp_{pk}; use force constant in Amp_{pk} when sizing.
2. All performance and electrical motor specification s ±10%.
3. Specifications at 125°C operating temperature unless otherwise specified.

Table 1-10. BLMX Motor Specifications

Motor Model	Units	BLMX-382		BLMX-502	
Performance Specifications					
Continuous @ 1.36 bar Force 20 psi	N	1030.0		1186.0	
	lb	231.0		266.0	
Continuous Force, no air	N	669.0		816.0	
	lb	150.0		184.0	
Peak Force	N	4120		4744	
	lb	924		1064	
Electrical Specifications					
Winding Designation		-A	-B	-A	-B
BEMF, line-line	V/m/s	74.02	145.67	109.05	54.33
	V/in/s	1.88	3.70	2.77	1.38
Continuous @ 1.36 bar Current 20 psi	Amp_{pk}	16.12	8.06	12.59	25.03
	Amp_{rms}	11.40	5.70	8.90	17.70
Continuous Current, no air	Amp_{pk}	10.47	5.23	8.63	17.11
	Amp_{rms}	7.40	3.70	6.10	12.10
Force Constant, Sine Drive	N/Amp_{pk}	63.64	127.28	94.75	47.38
	lb/Amp_{pk}	14.35	28.71	21.35	10.61
	N/Amp_{rms}	90.00	180.00	134.00	67.00
	lb/Amp_{rms}	20.30	40.60	30.20	15.00
Motor Constant	$N/\sqrt{W}$	3.60		41.20	
	$lb/\sqrt{W}$	7.57		9.30	
Thermal @ (1.36 bar, 20 psi) Resistance (no cooling)	°C/W	0.11		0.11	
		0.25		0.24	
Resistance, 25°C, line-line	ohms	3.4	13.6	5.1	1.3
Resistance, 125°C, line-line	ohms	4.8	19.0	7.1	1.8
Inductance, line-line	mH	3.0	12.0	4.0	1.0
Max Terminal Voltage	VDC	320		320	
Mechanical Specifications					
Air Flow	m^3/s	$5.4x10^{-3}$		$6.4x10^{-3}$	
	SCFM	11.4		13.7	
Coil Weight	kg	3.4		4.45	
	lb	7.5		9.8	
Coil Length	mm	382.0		502.0	
	in	15.0		19.8	
Heat Sink Area [Thickness 25.4mm (1in)]	mm	254x406		254x510	
	in	10x16		10x20	
Magnet Track Weight	kg/m	37.26		37.26	
	lb/ft	25.10		25.10	
Magnetic Pole Pitch	mm	30.00		30.00	
	in	1.18		1.18	

1. All Aerotech amplifiers are rated in Amp_{pk}; use force constant in Amp_{pk} when sizing.
2. All performance and electrical motor specification s ±10%.
3. Specifications at 125°C operating temperature unless otherwise specified.



Dimensions - millimeters [inches]
Forcer

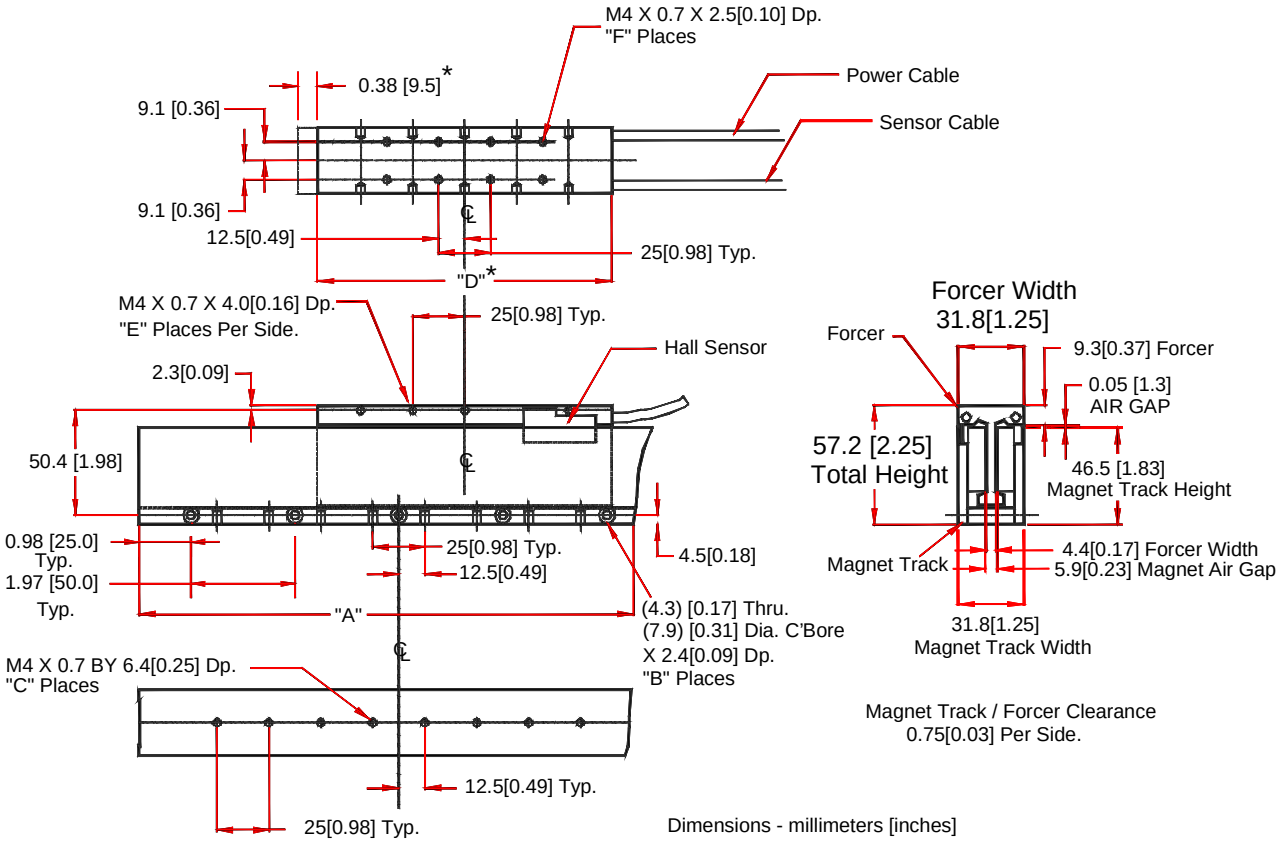
Model No.	A	B	C	D	E
BLMUC-79	79.0[3.11]	4	4	14.5[0.57]	1.5[0.06]
BLMUC-95	95.0[3.74]	6	4	22.5[0.88]	25.5[1.00]
BLMUC-111	111.0[4.37]	6	6	30.5[1.20]	17.5[0.69]
BLMUC-143	143.0[5.63]	8	8	14.5[0.57]	1.5[0.06]

* BLMUC-143 Shown

Magnet Track

Model No.	F	G	H
MTUC-96	96.0[3.80]	3	2
MTUC-224	224.0[8.82]	7	4
MTUC-352	352.0[13.86]	11	6
MTUC-416	416.0[16.38]	13	8

Figure 1-27. BLMUC Motor Dimensions



Dimensions - millimeters [inches]

Magnet Track

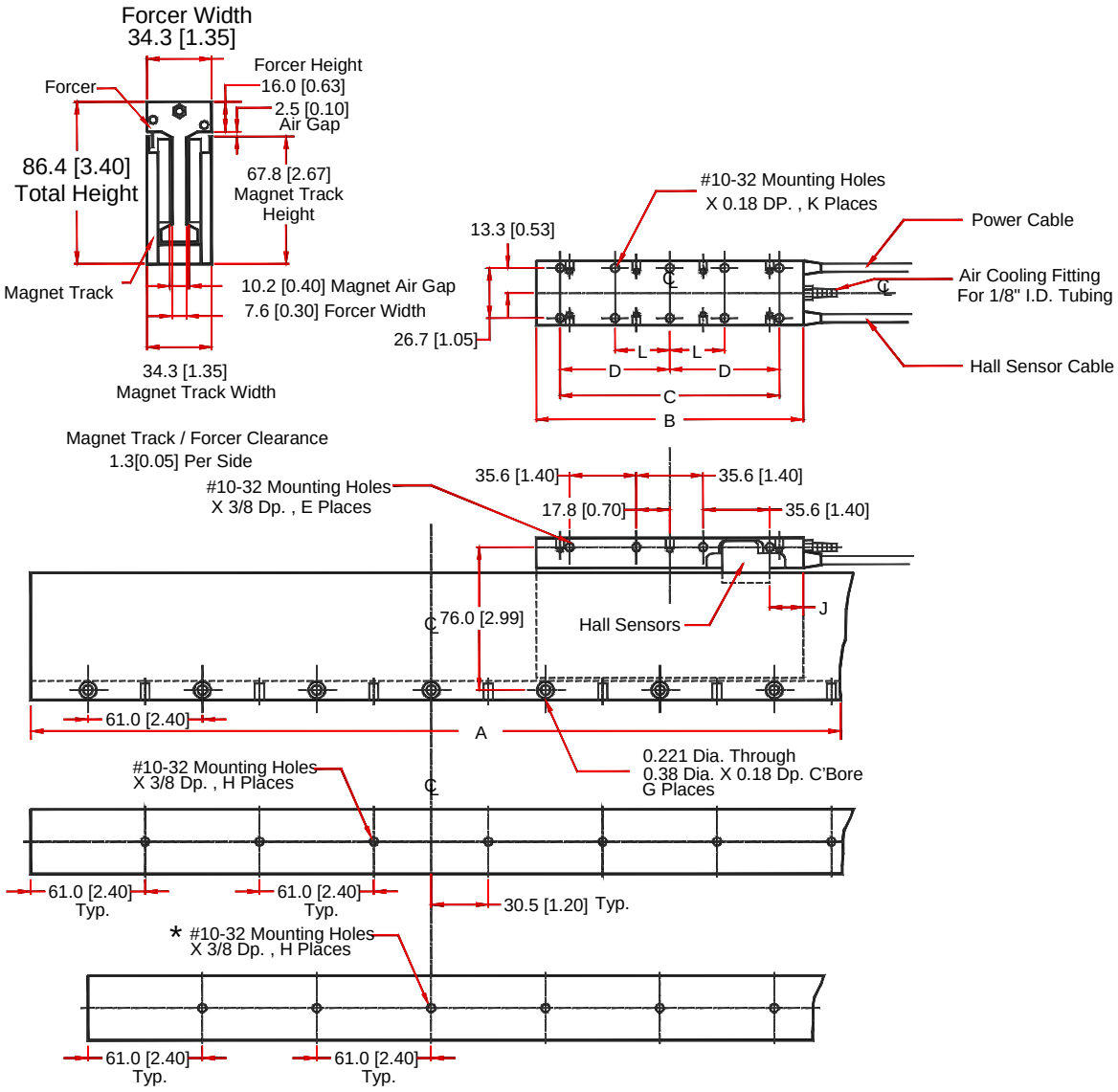
Model No.	A	B	C
MTC150	150mm 5.91"	3	4
MTC250	250mm 9.84"	5	8
MTC350	350mm 13.78"	7	12
MTC450	450mm 17.72"	9	16
MTC500	500mm 19.68"	10	18

Forcer

Model No.	D	E	F
BLMC-92	92mm 3.62"	2	4
BLMC-142	142mm 5.59"	5	8
BLMC-192	192mm 7.56"	7	12
BLMC-264	266mm 10.50"	8	20

*Add 9.5[0.38] To Forcer Length For Optional Cooling

Figure 1-28. BLMC Motor Dimensions



Magnet Track

Model No.	A	G	H
MT240	243.8 9.6	4	3
MT 300	304.8 12.0	5	4
MT 360	365.8 14.4	6	5
MT420	426.7 16.8	7	6
MT480	487.7 19.2	8	7
MT600	609.6 24.0	10	9

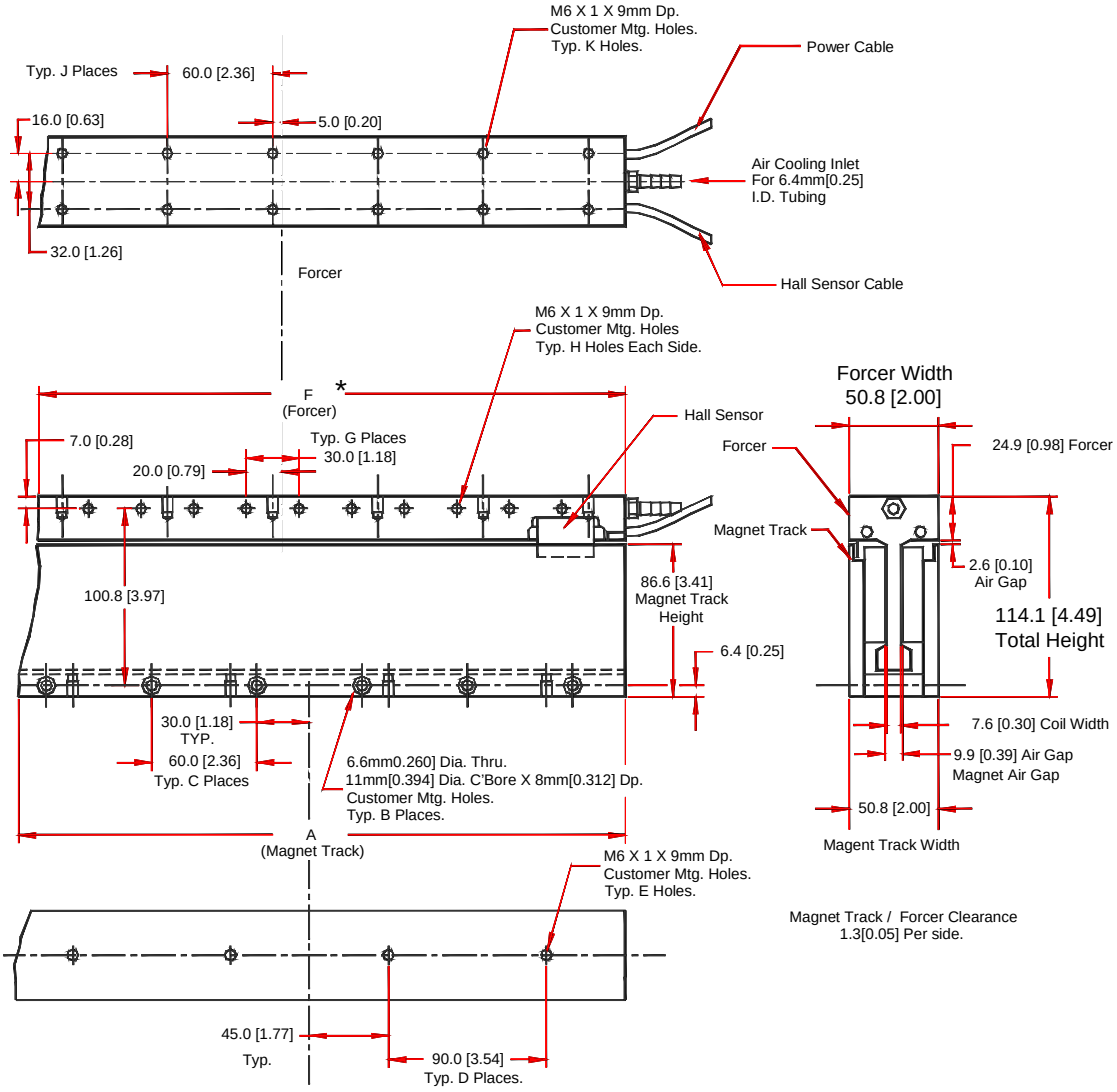
MTx custom track lengths available.

Dimensions - millimeters[inches]

Forcer

Model No.	B	C	D	E	J	K	L
BLM-142-A	142.2 5.60	116.8 4.60	58.4 2.30	8	17.8 0.70	6	NA
BLM-203-A	203.2 8.00	177.8 7.00	88.9 3.50	8	48.3 1.90	6	NA
BLM-264-A	264.2 10.40	238.8 9.40	119.4 4.70	12	43.2 1.70	6	NA
BLM-325-A	325.1 12.80	299.7 11.80	149.9 5.90	16	38.1 1.50	10	82.7 3.26
BLM-386-A	386.1 15.20	360.6 14.20	180.3 7.10	18	68.6 2.70	10	96.5 3.80

Figure 1-29. BLM Motor Dimensions



Dimensions - millimeters [inches]

Magnet Track

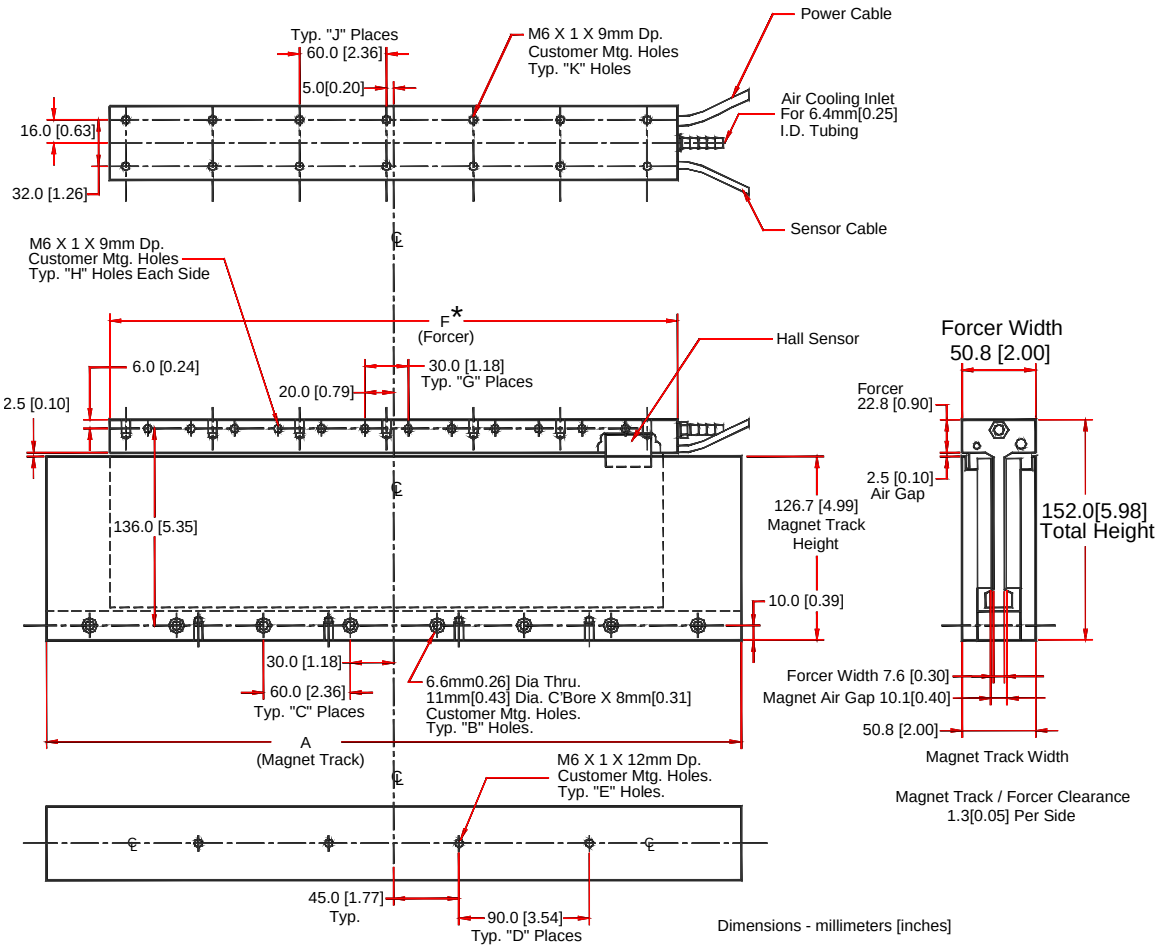
Model No.	A	B	C	D	E
MTH360	360mm / 14.17"	6	5	3	4
MTH480	480mm / 18.90"	8	7	3	4
MTH600	600mm / 23.63"	10	9	5	6
MTH720	720mm / 28.35"	12	11	7	8

Forcer

Model No.	F *	G	H	J	K
BLMH-142	142mm / 5.59"	3	4	2	6
BLMH-202	202mm / 7.95"	4	6	2	6
BLMH-262	262mm / 10.31"	7	8	4	10
BLMH-322	322mm / 12.67"	9	10	4	10
BLMH-382	382mm / 15.04"	11	12	6	14

*Add 10mm[0.39] To Forcer Length for Cable Strain Relief.

Figure 1-30. BLMH Motor Dimensions



Magnet Track

Model No.	A	B	C	D	E
MTX480	480mm 18.90"	8	7	3	4
MTX600	600mm 23.63"	10	9	5	6
MTX720	720mm 28.35"	12	11	7	8

Forcer

Model No.	F*	G	H	J	K
BLMX-382	382mm 15.04"	11	12	6	14
BLMX-502	502mm 19.76"	15	16	8	18

*Add 10mm[0.39] To Forcer Length For Cable Strain Relief.

Figure 1-31. BLMX Motor Dimensions

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APPENDIX A: WARRANTY AND FIELD SERVICE

In This Section:

Aerotech, Inc. warrants its products to be free from defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products which are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability or any claim for loss or damage arising out of the sale, resale or use of any of its products shall in no event exceed the selling price of the unit.

Laser Products

Aerotech, Inc. warrants its laser products to the original purchaser for a minimum period of one year from date of shipment. This warranty covers defects in workmanship and material and is voided for all laser power supplies, plasma tubes and laser systems subject to electrical or physical abuse, tampering (such as opening the housing or removal of the serial tag) or improper operation as determined by Aerotech. This warranty is also voided for failure to comply with Aerotech's return procedures.

Return Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within (30) days of shipment of incorrect materials. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. Any returned product(s) must be accompanied by a return authorization number. The return authorization number may be obtained by calling an Aerotech service center. Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than (30) days after the issuance of a return authorization number will be subject to review.

Returned Product Warranty Determination

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an air freight return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Returned Product Non-warranty Determination

After Aerotech's examination, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within (30) days of notification will result in the product(s) being returned as is, at the buyer's expense. Repair work is warranted for (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

Rush Service

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

On-site Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special service rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

On-site Non-warranty Repair

If any Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies:

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

Company Address

Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA 15238-2897
USA

Phone: (412) 963-7470
Fax: (412) 963-7459

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READER'S COMMENTS

"U" Channel Linear Motor User's Manual
P/N EDA 122, May, 1999

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