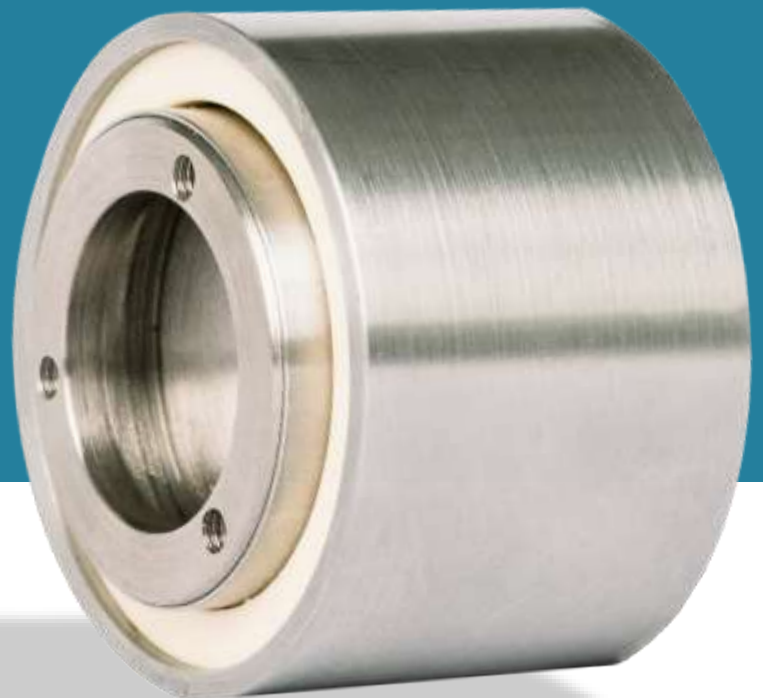


**MAGNETIC  
INNOVATIONS**

# **LINEAR VOICE COIL ACTUATOR & CONTROLLER**

**MI-MMA / MI-MMB  
Series**



**the direct drive  
motor company**

# MOVING MAGNET VOICE COIL ACTUATOR

## Are you having problems with?

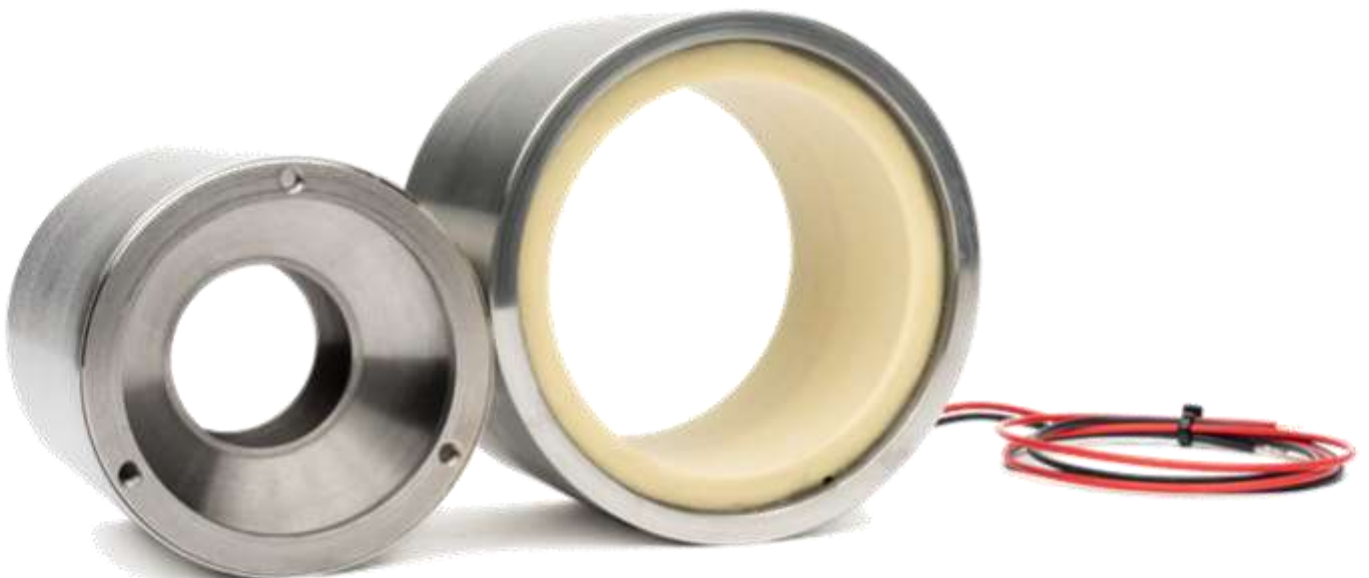
- High system cost
- High maintenance cost
- Moving wires, causing system failure
- Control complexity
- Poor motor life

## If so, you are looking for our Voice Coil Actuators!

The design of the Moving Magnet Voice Coil Actuators have been proven in various high end industrial equipment. These actuators can are a perfect fit where a combination of high speed and high force density are required.

Key parameters of our motor Moving Magnet Voice Coil Actuators are:

- Compact design
- No heat load generated on the moving part
- Suitable for vacuum environments
- High peak and continuous force possible
- Low maintenance cost
- Very high acceleration levels can be achieved
- High reliability and lifetime due to the absence of moving wires
- A fair price



# WORKING PRINCIPLE

Voice coil actuators have been around for many years. It is a type of direct drive linear motor that consists of a moving permanent magnet assembly and a static coil assembly. They are used in a wide range of applications and can often successfully replace rotary motors with spindles and pneumatic actuators.

Voice Coil Actuators can be designed in different ways. The type that most professionals are familiar with are the moving coil type actuators. A new generations of actuators is getting more popular: the moving magnet design. In this design, the coil is fixed and the magnet assembly moves.

## Moving Magnet Voice Coil Actuator

The working principle of the Moving Magnet Voice Coil Actuator is that the moving part is a magnet. The coils are attached to the static part of the actuator which enables a good thermal path. In the basics this actuator, operates as a linear single phase DC-motor.

A key advantage of a moving magnet voice coil actuator is that they are very reliable and durable. This is, in comparison to moving coil Actuators, achieved by the lack of moving wires. Compared to other electric actuators and motors with gearboxes, they:

- Can accelerate quickly and then come to a gentle stop at a very precise point.
- Are compact.
- Have zero mechanical wear.
- Have no backlash.
- Exhibit very low mechanical friction.
- Zero maintenance.



# MI-MMA SERIES - FRAMELESS

With a Frameless Moving Magnet Voice Coil Actuator you can count on high speed, high force density, high reliability and a long lifetime. This frameless actuator family allows for a free choice of the external guiding system depending on the required linear accuracy of the system. The absence of moving wires leads to a very high reliability and does not limit the achievable accelerations and speeds.

## MMA High Speed Linear Actuator Series Performance Parameters

Parameters	Unit	1525	1555	3070	5536	9054	240-380
OD <sup>1</sup>	mm	15	15	30	55	90	240
Height <sup>1</sup>	mm	25	55	70	36	54	380
Stroke <sup>1</sup>	mm	5	18	25	8	12	36
F continuous middle position (frame)	N	2.3 <sup>2</sup>	2.6 <sup>2</sup>	15.7 <sup>2</sup>	38.5 <sup>2</sup>	140.9 <sup>2</sup>	2787.8 <sup>3</sup>
F continuous middle position (water)	N	4.6 <sup>4</sup>	6.6 <sup>4</sup>	38.4 <sup>4</sup>	83 <sup>4</sup>	336.8 <sup>4</sup>	5989.2 <sup>4</sup>
F peak	N	7.3 <sup>5</sup>	9.8 <sup>5</sup>	52.8 <sup>5</sup>	140.9 <sup>5</sup>	480 <sup>5</sup>	11092.5 <sup>6</sup>
Maximum operating Voltage	Vdc	48	48	48	48	48	400
Moving mass	Kg	0.0063	0.0175	0.090	0.175	0.700	51.5

<sup>1</sup> Standard range. Other dimensions and force ranges are available upon request.

<sup>2</sup> Continuous force at 40°C ambient and 120°C coil temperature

<sup>3</sup> Peak force for 5 sec. at 25°C ambient and 120 °C coil temperature

<sup>4</sup> Continuous force at 0.5 l/min watercooled

<sup>5</sup> Continuous force at 20°C ambient and max 110°C coil temperature

<sup>6</sup> Peak force for 5 sec. at 20°C ambient and max 110 °C coil temperature

## Features Frameless MMA High Speed Linear Actuator

- High force Density
- Low operating voltage
- High reliability and lifetime
- Single-phase DC
- Bi-directional force / movement
- Moving Magnet technology
- Frameless (external guiding is required)



Mechanical drawings are available upon request.

# MI-MMB SERIES - WITH SLIDE BEARING

The MMB series offers our most complete actuator, which comes with an integrated bearing system. The Moving Magnet Voice Coil Actuator can support high position accuracy in combination with external position sensors and motion controllers. In the basics this actuator, operates as a low voltage linear single phase DC-motor.

## MMB Electric Linear Actuator Series Performance Parameters

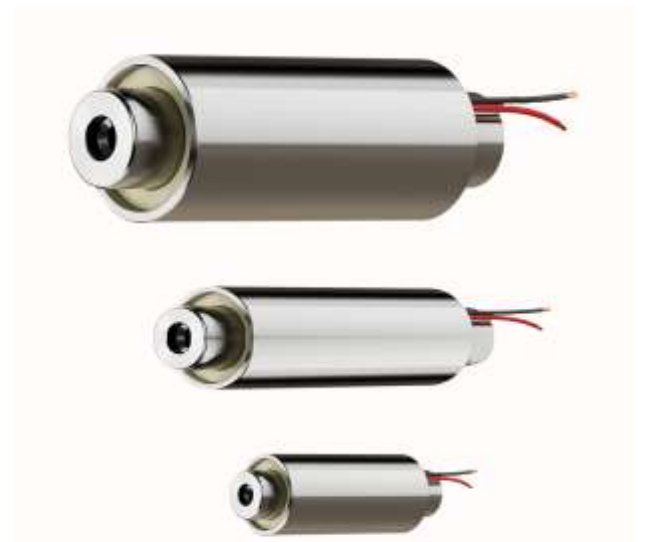
Parameters	Unit	1525	1555	3070	4090	5536	9054
OD <sup>1</sup>	mm	15	15	30	40	55	90
Height <sup>1</sup>	mm	25	55	70	90	36	54
Stroke <sup>1</sup>	mm	5	18	25	35	8	12
F continuous middle position (frame) <sup>2</sup>	N	2	2.2	13.7	30.2	31.3	127.3
F continuous middle position (water) <sup>3</sup>	N	4	5.8	33.6	70.9	72.7	294.7
F peak <sup>4</sup>	N	7.3	9.8	52.8	92.1	140.9	480
Maximum operating Voltage	Vdc	48	48	48	48	48	48
Moving mass	Kg	0.0063	0.0175	0.090	0.256	0.175	0.700

<sup>1</sup> Standard range. Other dimensions and force ranges are available upon request.

<sup>2</sup> Continuous force at 40°C ambient and 120°C coil temperature

<sup>3</sup> Continuous force at 0.5 l/min watercooled

<sup>4</sup> Peak force for 5 sec. at 25°C ambient and 120 °C coil temperature



Mechanical drawings are available upon request.

# MOVING MAGNET VCA CONTROLLER

Magnetic Innovations' Moving Magnet VCA MMB series are matched with a dedicated motor controller which is able to establish sensorless position control (no external encoder required). Hence only 2 wires are required to power and position control the actuator. The controller is an encoder and drive in one package at the size of a matchbox which can power Moving Magnet VCA's up to 1kW.

## Single phase 2-wire VCA Drive

Customers are able to program their required motion patterns into the motor controller utilizing a HMI running on a PC. After programming the motor controller, one is able to save all data onboard in non-volatile memory and the MI Moving Magnet VCA will operate standalone after power up. Activation and de-activation of the motion pattern is invoked by controlling digital inputs, allowing for simple integration with customer specific applications.



### Motion patterns

Each motion pattern can be set to only execute a pre-programmed number of cycles. Available motion patterns (executed motion with configurable filter settings to omit high frequent content):

- Sinusoidal point-to-point movement with specific frequency and amplitude
- Triangular point-to-point movement
- Block point-to-point movement
- Point-to-point movement

Two configurable analog inputs allow for external analog control of current, force or 2 configurable analog outputs allow for remote monitoring of a variety of parameters (among which position, velocity, temperature, force, etc.).



## Features VCA Motor Controller

- No encoder required.
- 2-wire actuator control.
- Stand alone industrial grade controller
- 48Vdc, 340W drive power.
- Digital I/O (4 inputs +5 outputs).
- Configurable Analog inputs (2) & outputs (2).
- Compatible w/all MI MMB Series Moving Magnet VCA's.
- Analog interface allows for remote position, force or current set point.
- Small in size: 100mm x 65mm x 21mm.
- PC based HMI software included for parameter configuration.



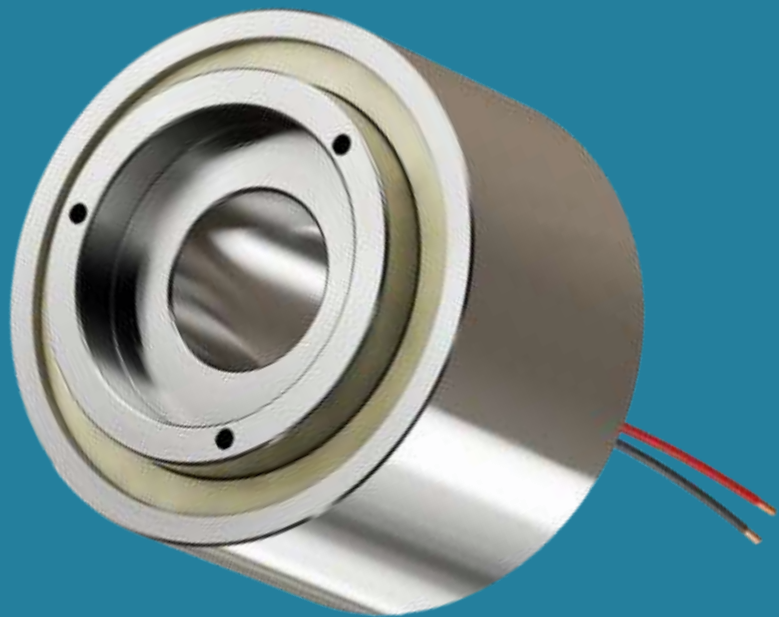
Evaluation kits are available for most MI-MMB Actuator/ Controller combinations.  
Contact Magnetic Innovations for more details!

**MAGNETIC  
INNOVATIONS**

the direct drive  
motor company

# GO DIRECT DRIVE!

Compact actuator design with  
high dynamic capability and high  
force density to suit your linear  
motion system



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