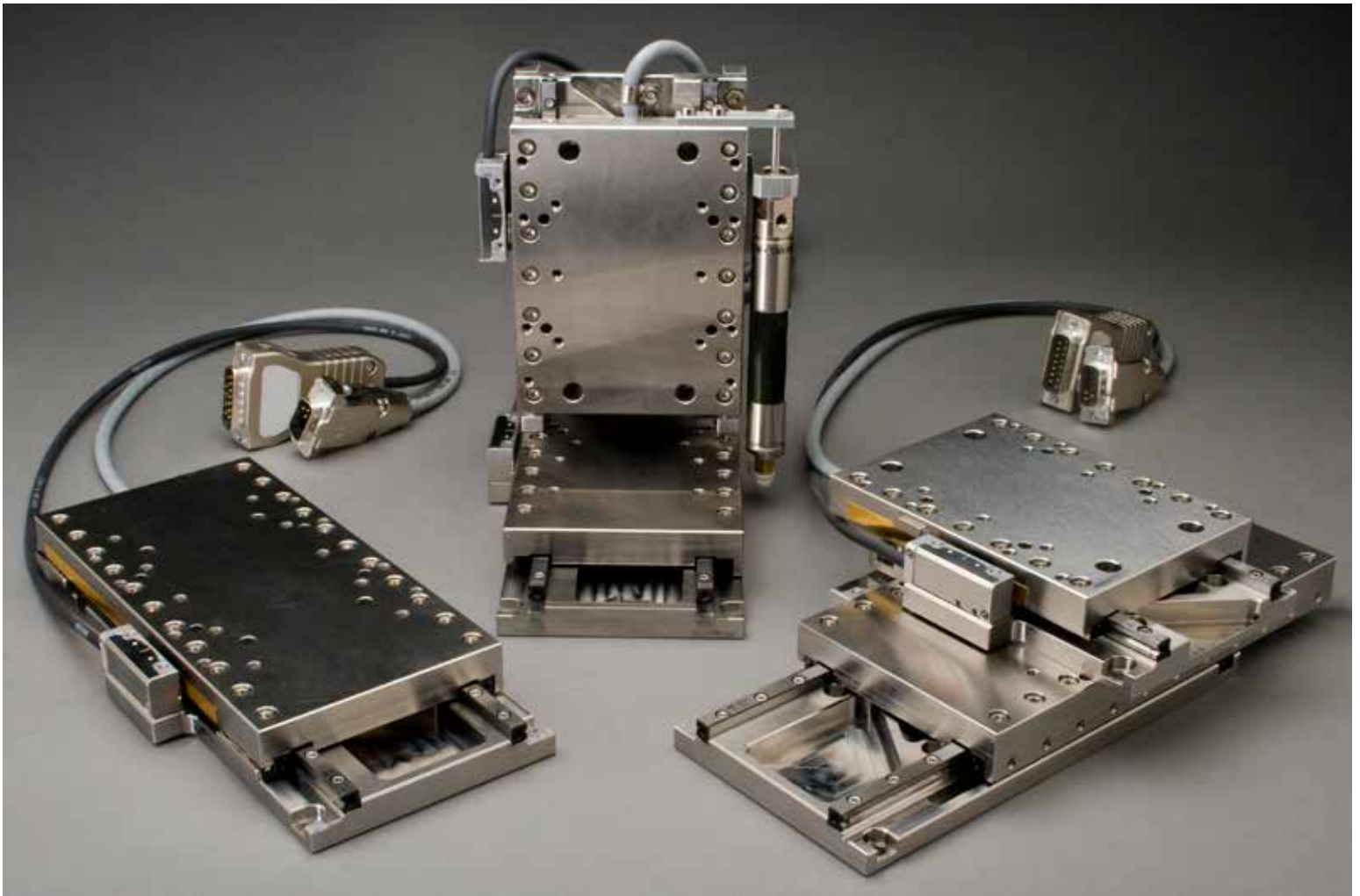


Mini-MAG Positioning Products

Miniature Linear Stage

The Mini-MAG (MMG and MMX) line of miniature linear stages blends the ultimate in performance, reliability, and value, delivering nearly twice the accuracy at virtually the same cost as standard-grade options. The new high power version, MMX, has a higher force density to deliver *5 times the force* of similar sized stages. Short lead times and predictable deliveries can speed up your time to market and support your production schedule. Dover Motion miniature linear stages will help you build a better machine—faster.



DOVER 
MOTION

A division of Invetech

Overview

The Dover Motion MMG series miniature linear stage combines the ultimate in performance, reliability, and value. The new high power version, MMX, has a higher force density to deliver *5 times the force* of similar competitive products. Both stage designs use high precision anti-creep crossed roller guideways for extremely smooth motion, high stiffness, and reliability in a low profile package. Its brushless linear servo motor allows for high speeds with no maintenance, making it ideal for use in high throughput applications.

Miniature linear stages can be combined into multi-axis assemblies including Z configurations with an integral compressed air counterbalance or Dover Motion's new magnetic counterbalance. For the 25 mm travel version a single phase motor is available for reduced amplifier cost, reduced complexity, and a more compact size. The new MMX has a completely ironless motor to deliver cog free smooth motion as well as more power to move larger payloads.

The miniature linear stage also provides externally adjustable limit sensors using a simple adjustable mount. The stages are available in either steel, clear anodized, or black anodized aluminum.

- Increase throughput time with the most powerful servo motor design in a small form factor
- Achieve stable scan motion through Dover Motion patent pending smooth motor design
- High accuracy from precision encoder feedback and servo control
- Best in class vertical load capacity of 500 g without a counterbalance
- Customizable and stackable design ensures fit within unique applications



Dover Motion has implemented a Quality Management System in accordance with ISO 9001:2008 for the Design and Manufacture of Precision Positioning Products and Motion Systems

Specifications - MMG Miniature Linear Stage

Travel (mm)	MMG-25	MMG-25	MMG-50	MMG-100	MMG-150
Motor Type	1 Phase	3 Phase	3 Phase	3 Phase	3 Phase
Accuracy ($\mu\text{m TIR}$) ¹	6	6	10	12	12
Feedback Device Options- Encoder Resolution	Analog or Digital 1 μm , 0.1 μm , 0.001 μm				
Bi-directional repeatability. ($\pm \mu\text{m}$)	0.4	0.4	0.4	0.4	0.4
Load Capacity (for all, kg) ²	10				
Maximum Acceleration (m/s^2) ³	55	50	45	30	25
Maximum Velocity (m/s) ³	1.1	1.1	2.0	2.0	2.0
Flatness & Straightness ($\mu\text{m TIR}$)	3	3	3	6	6
Moving Mass (kg)	0.4	0.5	0.5	0.8	1.0
Total Mass (kg)	0.6	0.8	0.8	1.2	1.4

¹ With 0.1 μm resolution encoder; contact our Applications Engineers for higher accuracy applications

² Please contact our Applications Engineers for loads exceeding 10kg.

³ The maximum acceleration and velocity is encoder and load dependent.

⁴ Contact the factory if higher performance version required.

⁵ Travel Life greater than 1,000,000 km

Motor Specifications for	MMG		3 Phase	1 Phase
Rated Performance	Symbol	Units	Value	Value
Peak Force ¹⁵	F_p	N	25.0	23.0
Continuous Force	F_c	N	9.0	7.7
Motor constant	K_m	N / W ^{0.5}	2.4	2.0
Max cont. power dissipation	P_c	W	14.6	20.7
Electrical Specifications	Symbol	Units	Value	Value
Peak current	I_p	A	5.4	4.5
Continuous current ¹⁵	I_c	A	1.8	1.5
Electrical Resistance ³	R	Ω	4.5	7
Inductance ⁴	L	mH	2.1	3.95
Back EMF (Sine RMS) ²	K_e	V / m / s	5.0	5.1
Force Constant (Sine RMS) ³	K_f	N / A	4.8	5.1
Force Constant (Sine Peak)	K_p	N / A	3.4	5.1
Max Allowable coil temp	T_{max}	$^{\circ}\text{C}$	100	100
Max Voltage	V_{max}	V	72	72
Pole Pitch	P	mm	25.4	-

¹ Motor winding temperature rise, $\Delta T=75^{\circ}\text{C}$, @ 25°C ambient

² Measured @ 25°C

³ Measured line-to-line $\pm 10\%$

⁴ $\pm 20\%$ measured @ 1Khz

⁵ Stage mounted to a 100mmx100mmx12mm or larger aluminum plate

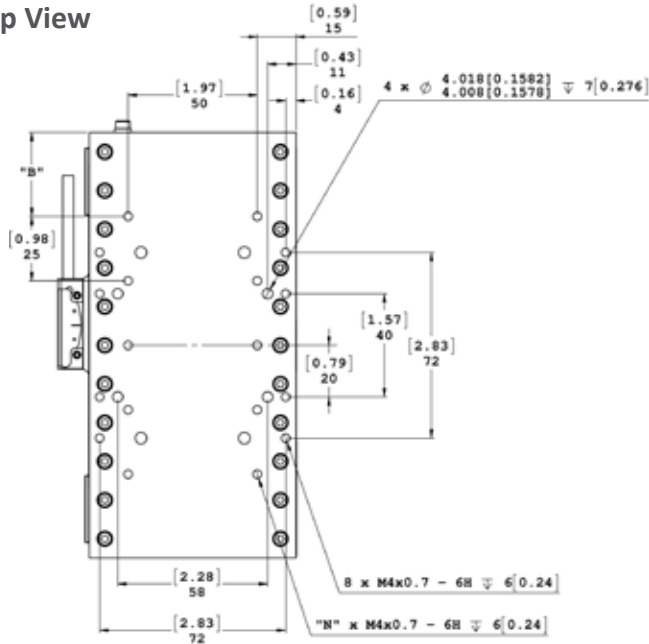
Travel (mm)	MMG Maximum Vertical Payload (kg)		
	Counterbalance Type		
	None	Magnetic	* Pneumatic
50	0.2	1	3.9
100		1	3.6
150		1	3.4

*Maximum payload is determined by pneumatic counterbalance at maximum recommended working pressure (100 psi)

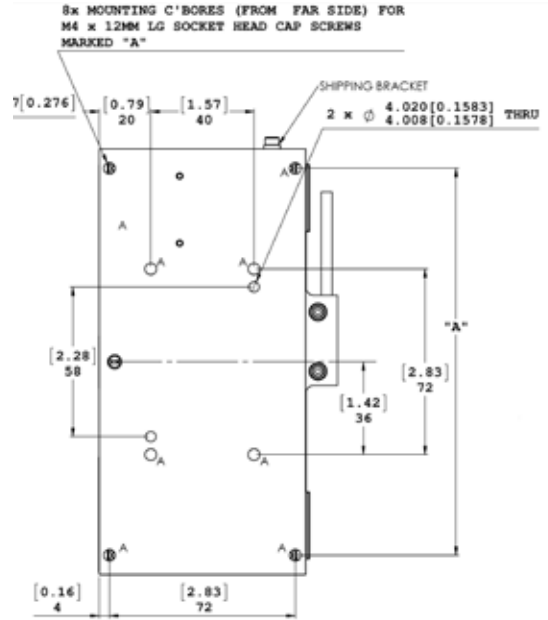


MMG Dimensional Drawings

Top View



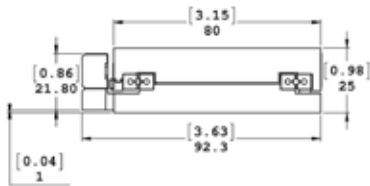
Bottom View



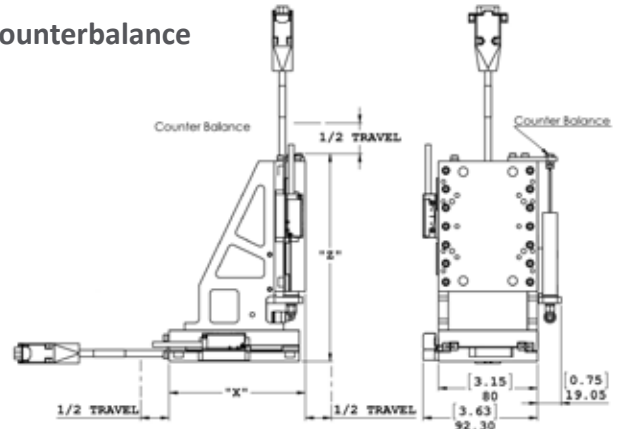
Side View



End View



Counterbalance



Stage Dimensions						
Stage	Travel (mm)	Motor	L (mm)	N	A (mm)	B (mm)
MMG-25*	25	1 Phase	80	6	72	15
MMG-25	25	3 Phase	105	6	90	27.5
MMG-50	50	3 Phase	105	6	90	27.5
MMG-100	100	3 Phase	165	10	150	32.5
MMG-150	150	3 Phase	210	14	195	30

* No inner mounting holes.

X-Z Dimensions		
Travel (mm)	X (mm)	Z (mm)
25 (Single phase)	97.50	167.3
25	110	167.3
50	110	167.3
100	165	248.3
150	210	318.3

25 mm Travel vertical payload capacity is 200g. For Z applications requiring larger payloads, the optional counterbalance kit is required.

Specifications - MMX High Power Miniature Stage

Travel (mm)	MMX-50	MMX-100	MMX-150
Motor Type	3 Phase	3 Phase	3 Phase
Accuracy (μm TIR) ¹	10	12	12
Feedback Device Options- Encoder Resolution	Analog or Digital 1 μm , 0.1 μm , 0.001 μm		
Bi-directional repeatability. ($\pm \mu\text{m}$)	0.4	0.4	0.4
Load Capacity (for all, kg) ²	10	10	10
Maximum Acceleration (m/s^2) ³	115	100	65
Maximum Velocity (m/s) ³	2.0	2.0	2.0
Flatness & Straightness (μm TIR)	3	6	6
Moving Mass (kg)	0.5	0.6	0.9
Total Mass (kg)	0.7	1.06	1.3

¹ With 0.1 μm resolution encoder; contact our Applications Engineers for higher accuracy applications

² Please contact our Applications Engineers for loads exceeding 10kg.

³ The maximum acceleration and velocity is encoder and load dependent.

⁴ Contact the factory if higher performance version required.

⁵ Travel Life greater than 1,000,000 km

Motor Specifications for MMX		3 Phase	
Rated Performance	Symbol	Units	Value
Peak Force ¹⁵	F_p	N	64.8
Continuous Force	F_c	N	21.6
Motor constant	K_m	N / W ^{0.5}	4.2
Electrical Specifications	Symbol	Units	Value
Peak current	I_p	A	5.4
Continuous current ¹⁵	I_c	A	1.8
Electrical Resistance ³	R	Ω	6.8
Inductance ⁴	L	mH	3.4
Back EMF (Sine RMS) ²	K_e	V / m / s	12
Force Constant (Sine RMS) ³	K_f	N / A	12
Force Constant (Sine Peak)	K_p	N / A	8.5
Max Allowable coil temp	T_{max}	$^{\circ}\text{C}$	100
Max Voltage	V_{max}	V	72
Magnetic Pole Pitch	P	mm	12.7

¹ Motor winding temperature rise, $\Delta T=75^{\circ}\text{C}$, @ 25°C ambient

² Measured @ 25°C

³ Measured line-to-line $\pm 10\%$

⁴ $\pm 20\%$ measured @ 1Khz

⁵ Stage mounted to a 100mmx100mmx12mm or larger aluminum plate

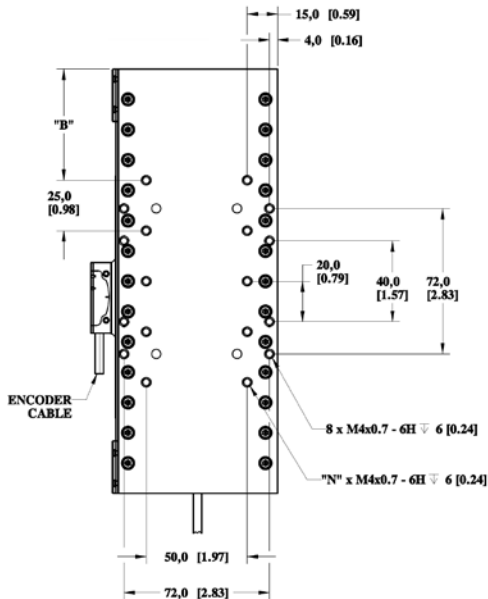
MMX Maximum Vertical Payload (kg)			
Travel (mm)	Counterbalance Type		
	None	Magnetic	* Pneumatic
50	0.5	1	3.9
100		1	3.6
150		1	3.4

*Maximum payload is determined by pneumatic counterbalance at maximum recommended working pressure (100 psi)

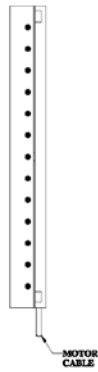


MMX Dimensional Drawings

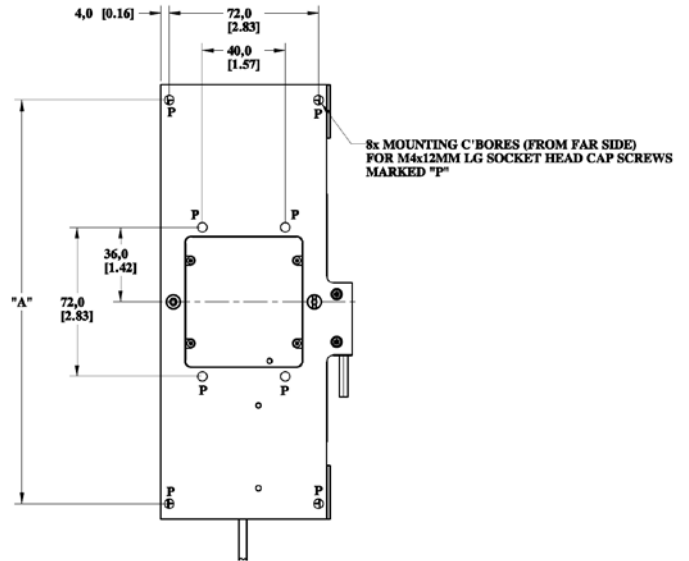
Top View



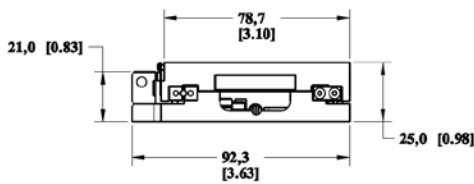
Side View



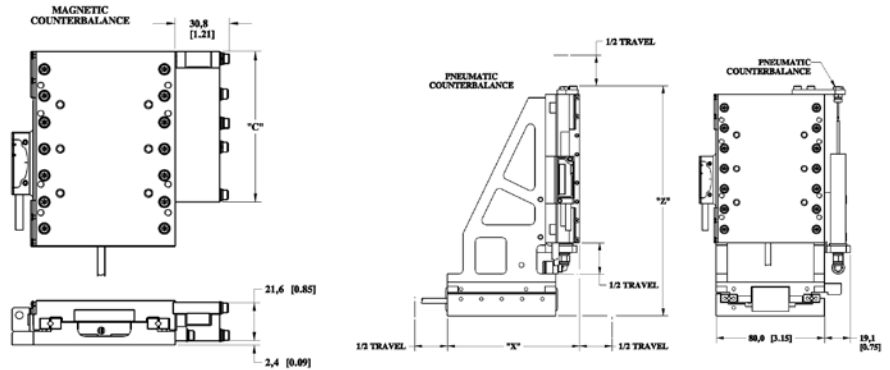
Bottom View



End View



Counterbalance



Stage Dimensions						
Stage	Travel (mm)	Motor	L (mm)	N	A (mm)	B (mm)
MMG-25*	25	1 Phase	80	6	72	15
MMG-25	25	3 Phase	105	6	90	27.5
MMG-50	50	3 Phase	105	6	90	27.5
MMG-100	100	3 Phase	165	10	150	32.5
MMG-150	150	3 Phase	210	14	195	30

* No inner mounting holes.

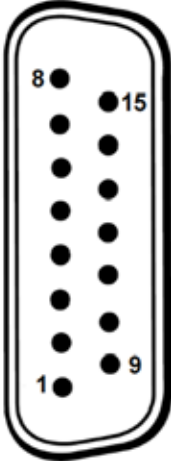
X-Z Dimensions		
Travel (mm)	X (mm)	Z (mm)
25 (Single phase)	97.50	167.3
25	110	167.3
50	110	167.3
100	165	248.3
150	210	318.3

25 mm Travel vertical payload capacity is 200g. For Z applications requiring larger payloads, the optional counterbalance kit is required.

Connector Option D1

Encoder

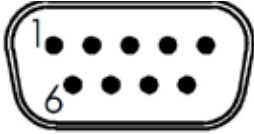
Digital & Analog Encoder Option Pinout 15 Pin Plug (Male) DSUB Connector		
Pin	DIGITAL Encoder Description	ANALOG Encoder Description
1		Cos-
2	Ground	Sin-
3		Z + (Reference Mark)
4	Z- (Reference Mark)	5V Power
5	Channel B-	5V Power
6	Channel A-	
7	5V Power	Positive Limit
8	5V Power	Negative Limit
9	Ground	Cos +
10	Negative Limit	Sin +
11	Positive Limit	Z- (Reference Mark)
12	Z + (Reference Mark)	Ground
13	Channel B +	Ground
14	Channel A +	



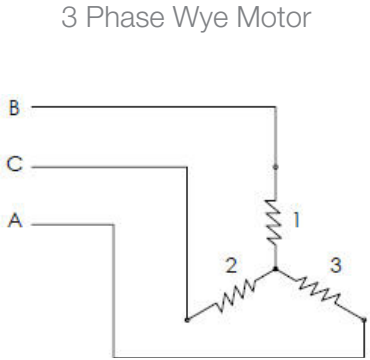
Motor

3 Phase motor is in WYE Coil Configuration

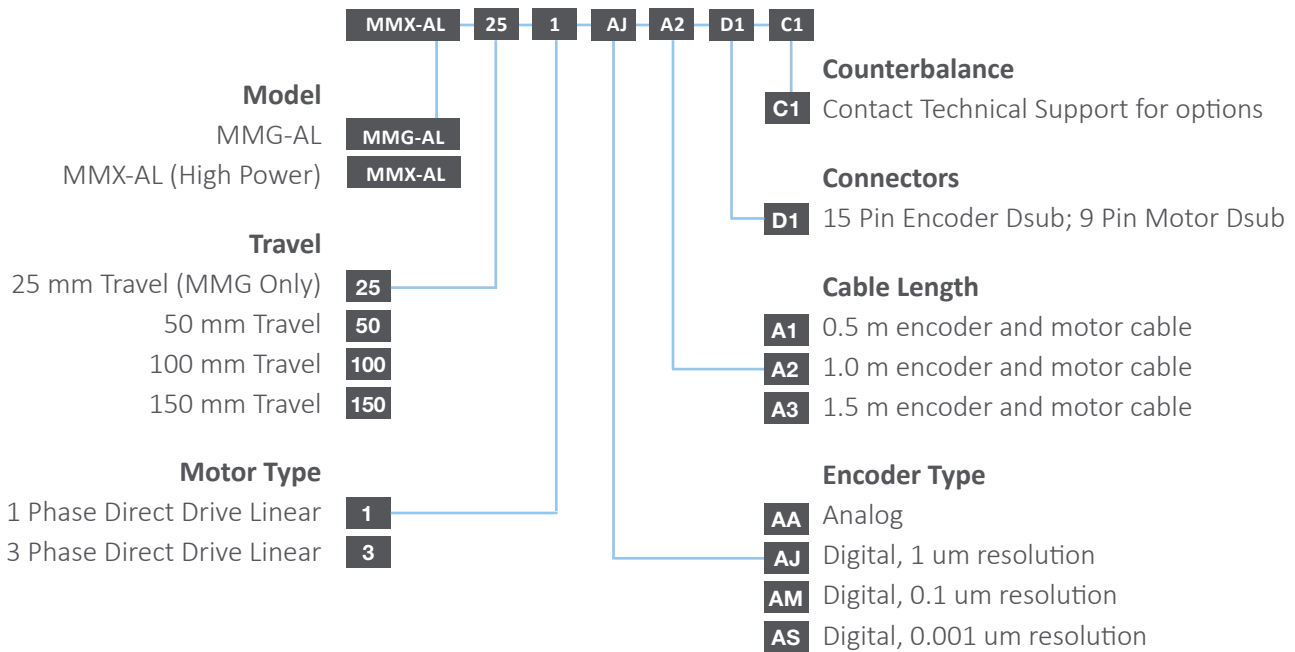
3 Phase WYE Motor Pinout 9 Pin Plug (Male) DSUB Connector		
Pin	Description	Wire Color
1	Motor Coil A	White
2	Motor Coil B	Green
6	Motor Coil C	Brown
Shell	Motor Ground	Shield



1 Phase Motor Pinout 9 Pin Plug (Male) DSUB Connector		
Pin	Description	Wire Color
1	Motor Coil +	White
6	Motor Coil-	Black
Shell	Motor Ground	Shield



Configurator



Controller Options



Dover Motion OEM Servo Drive

- Single Axis Drive
- Compact footprint, easy integration into a control cabinet
- CAN communication



AKD Packaged Servo Drive

- Single or multiple axis
- Ethernet and Ethercat communication for fast data acquisition
- Real-time performance feedback
- Graphical user interface for easy set-up and programming

Motor and Encoder Cables

- Shielded
- High flex available

