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**MULTI-MODULE  
LINEAR MOTOR**  
直线电机

# We propose new generation Linear

新世纪新一代直线电机系统的提案 /

For long years, SHICOH had been involved in study and development, test and produce, and design for motor and linear motor. MULTI-MODULE LINEAR MOTOR for new generation meet uses for various kinds of necessities.

SHICOH长年从事各种电机及直线电机的研究、开发、设计与制品批量生产。思考的直线电机是能够自由对应多元化需求的新时代的电机系统。

SHICOHは、長年にわたりモータ及びリニアモータの研究開発・試作量産設計を数多く手がけてまいりました。マルチ・モジュールリニアモータは、多様化するニーズに対応可能な新世代リニアモータシステムです。

## 1. Simple & compact structure

结构简单小巧/コンパクトでシンプルな構造

More effective motor power transmission will be gained by direct drive structure which is simpler than ball-screw that requires complicated structure.

无需滚珠螺杆之类的复杂结构，而是采用了简单的直接驱动结构，可以实现电机输出功率的高效传送。

ボールねじのような複雑な構造を必要とせず、シンプルなダイレクトドライブ構造となるのでモータ出力の高効率な伝達が可能となります。

## 2. High rigidity & precision

高硬度及高精度/高剛性・高精度

Possible to remove disorder like backlash, and an error or delay of detection and control system. And more, full-closed control system shorten its positioning time and attain more precise positioning.

可排除机械冲击、检测控制方面的误差及延迟等干扰因素，并能通过全封闭控制缩短定位时间、提高定位精度。

機械的なバックラッシュ、検出・制御系の誤差や遅れなど外乱要素を排除する事が可能となり、さらにフルクローズド制御による位置決め時間の短縮、位置決め精度の向上が実現できます。

# motor system for new millennium

新世纪的次世代リニア モータシステムの提案

## 3. Control the plural carriages on the single axis-x

可实现同轴上的多体控制/同軸上の多頭制御が可能

Setting many movements on the single axis-results in precise control that is impossible by ball-screw.

可实现滚珠螺杆无法实现的同轴上多个移动体的控制，并进行高精度控制。

ボールネジでは実現が難しかった、一軸上での移動体多頭制御が可能となります。



## 4. Excellent acceleration · speed performance

出众的加速及速度功能/優れた加速・速度性能

High or low speed positioning and smooth constant speed can be brought out by removing the structure of changing power system which ball-screw has. And excellent acceleration is born by effective transmission.

因未采用动力转换结构，因此可以实现滚珠螺杆无法实现的高速定位、低速定位以及平滑的定速运转。另外，由于传送效率高，因此能发挥出色的加速功能。

動力変換構造がないためボールねじでは不可能な高速位置決めから低速位置決め、なめらかな一定速動作まで可能となります。また、伝達効率が高いので、優れた加速度性能を発揮します。

# Specialities of Multi- 多元模块化直线电机特点 / マルチ・

## ① Flexible setting for performance

Connecting coil plates one another results in free choice of performance. Addition of performance is also possible.

### 可自由设定规格

由于可自由连接模块化的线圈板与磁石板，因此可通过数台连接及组合自由选择规格，并可进行高自由的设计。

### 自由なスペック設定が可能

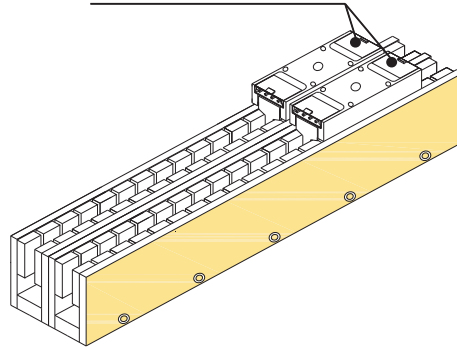
モジュール化されたコイルプレート、マグネットプレートを複数台接続、組合せることによって、幅広いスペックの設定が可能。

For example, double force will be gained by connecting two of the Multi-Module which have same force.

例如，将2个相同推力的多元模块组合，可使推力达到原来的2倍。

例えば、同推力のマルチ・モジュールを2台組み合わせることにより、推力が2倍に。

Connect freely by connector.  
通过连接器自由组合  
コネクタで自由に組み合わせる



## ② Various long strokes

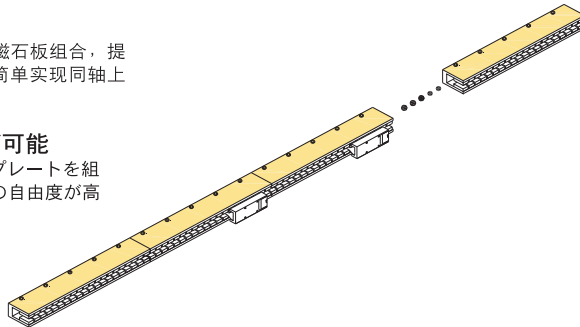
Modularized magnet plate meets uses of various strokes. The plural carriages on the single axis-x can be designed.

### 可自由设定长行程

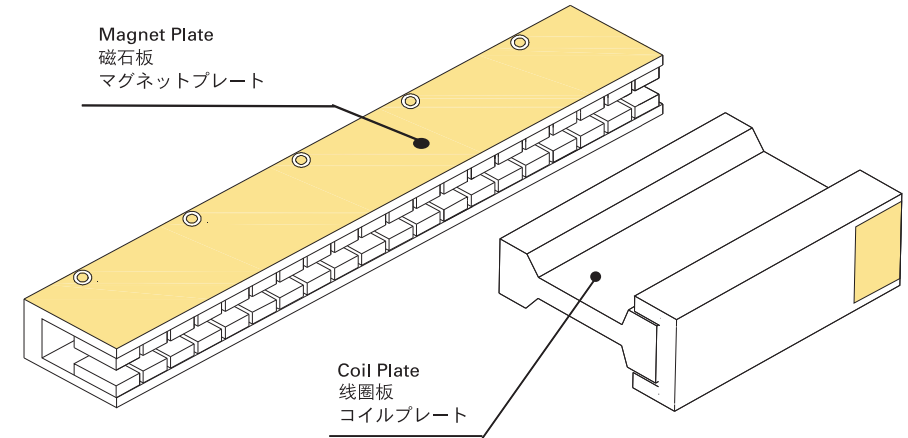
可通过150mm、300mm长的磁石板组合，提高了可动行程设定的自由度，也可简单实现同轴上的多体化。

### 自由なロングストローク設定が可能

150mm、300mm長のマグネットプレートを組合せることで、可動ストローク設定の自由度が高まり、同軸上の多頭化設計も容易に。



# module Linear Motor モジュールリニアモータの特徴



## ③ High response performance

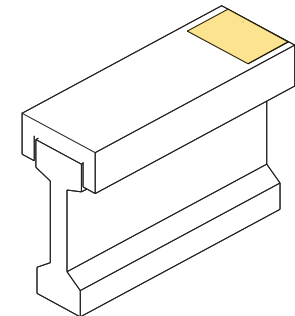
The best performance of mechanism can be gained by coreless coil and double both sides magnet which have no power of magnetic absorption. High acceleration\_high response characteristic are realized by moving-coil which make it light and compact size. Smooth movement of driving with small ripple is made possible by coreless coil, that is cogingless.

### 通过可动线圈方式实现的无芯型

无芯和两侧磁石方式的采用之外，通过轻量的可动线圈实现了平滑运转和高应答性。

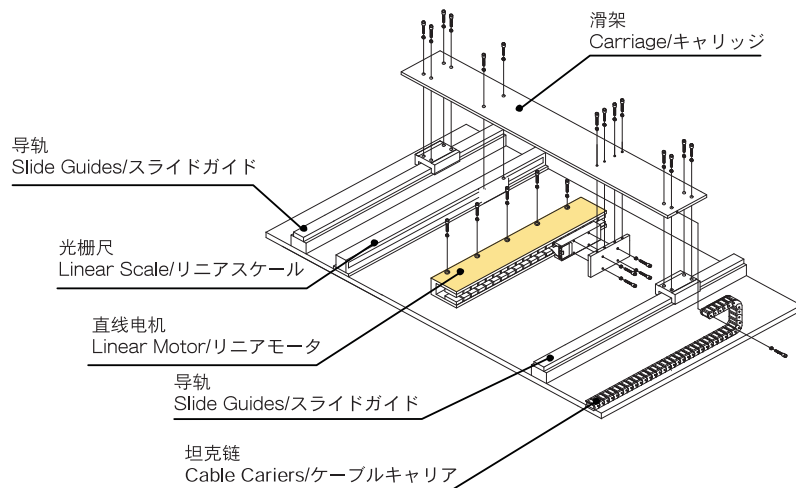
### 高い応答性能

コアレス+両側磁石方式の採用に加えて、軽量な電機子側を可動子とすることで、滑らかな動作と、高加速・高応答性を実現。

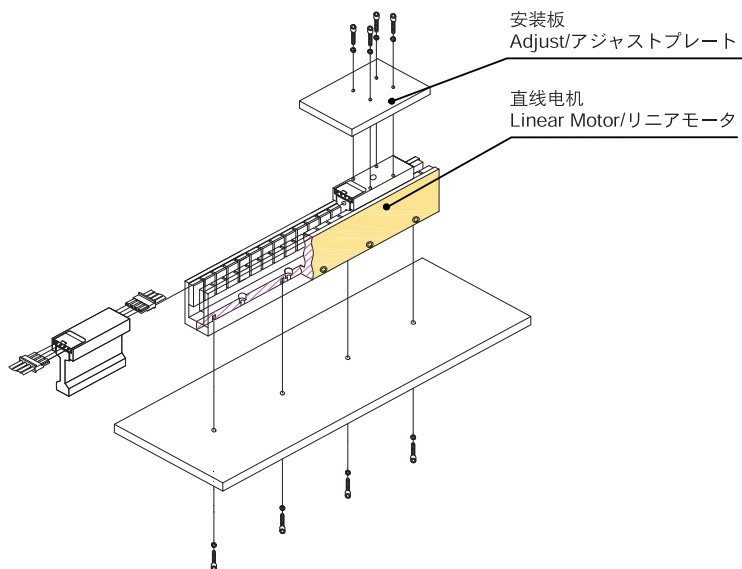


## 安装参考图 (Installation reference chart/取り付け参考図)

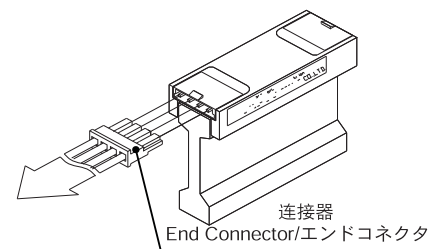
### ●横置 (Horizontal putting/横置き)



### ●纵置 (Length putting/縦置き)



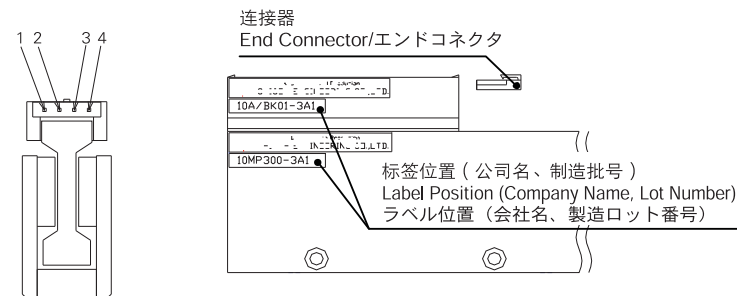
### ●连接器部详细 (Connector details/コネクタ部詳細)



从连接器各线 (U相、V相、W相、FG) 连接到电机控制器  
 Each Connecting Wire (U, V, W, FG) run to the motor's controller.  
 コネクタの各線 (U相・V相・W相・FG) からモータコントローラへ

### ●连接器针配置 (Each Connector pin arrangement./コネクタピン配置)

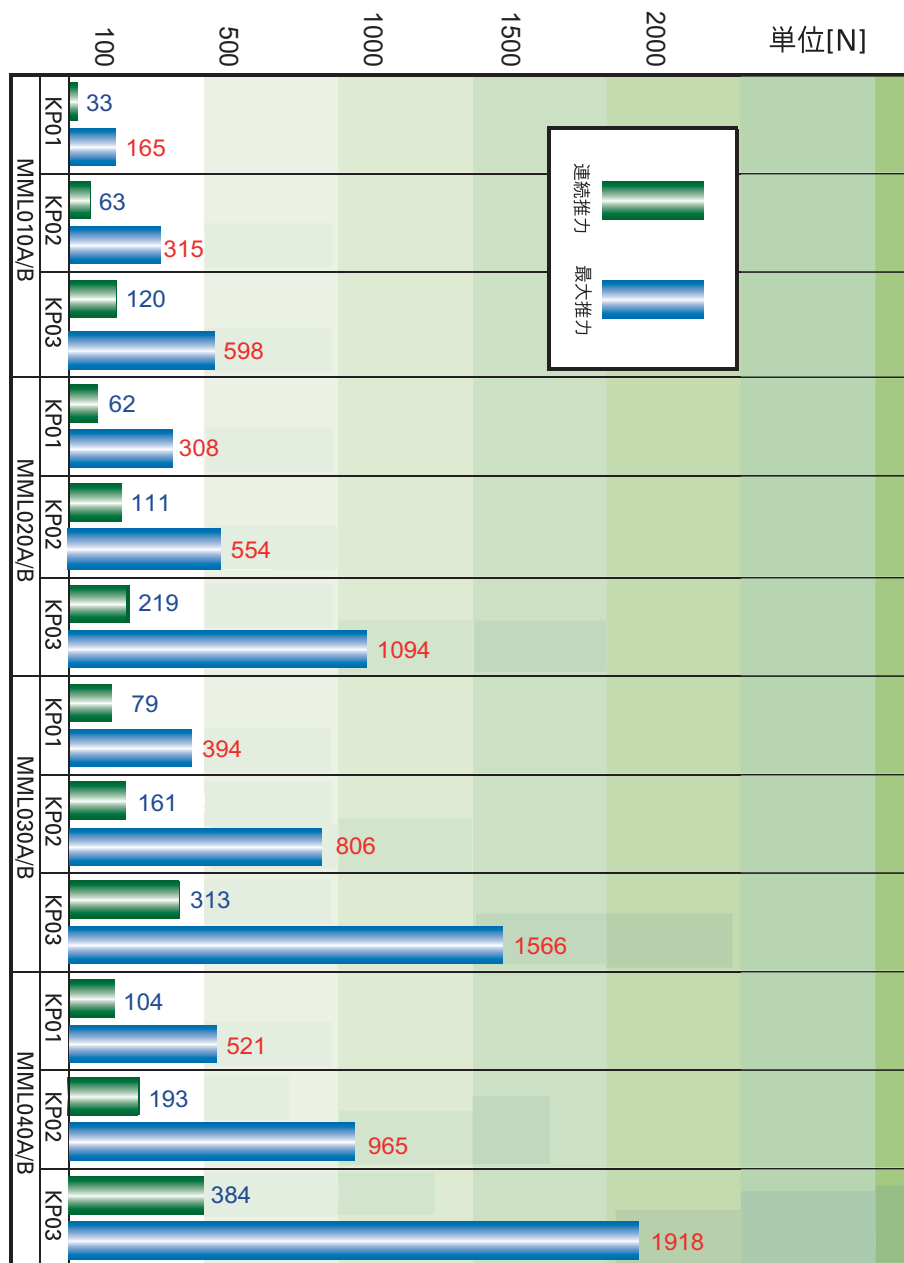
针 No.	名称
1	U相
2	V相
3	W相
4	FG





# 多元模块化推力 列表

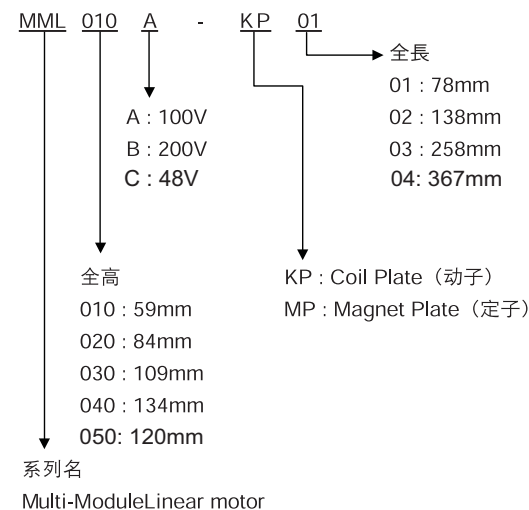
(Force reference chart / マルチモジュールリニアモータ推力一覧表)



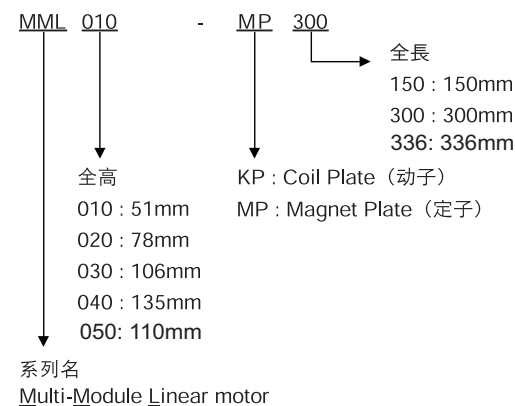
# MML型号名的定义

(Definition of MML model name / MML型式名の定義)

## ● 定子 (Coil Plate / 可動子)



## ● 定子 (Magnet Plate / 固定子)





MML010

MML010 $\Delta$ -KP□□、MML010-MP□□□□



MML系列中最轻巧的直线电机。可在有限的小空间内实现高效驱动。是最适合各种领域设备小型化的直线电机。

The MML010 is the smallest of the MML Series Linear Motor. It is a very efficient drive system that was developed to fit in the smallest possible space. This is most appropriate linear motor for the miniturization of equipment in various fields.

**标准规格/Standard Specifications**

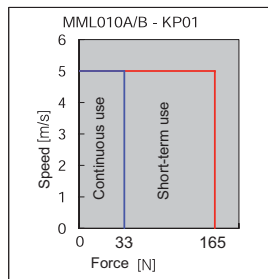
绝缘耐压/Insulation Capacity : AC1500V 1分钟 (1min)  
 周围温度/Operating Range : 0 ~ 40°C  
 冷却方式/Cooling method : 自冷 (Self-cool)  
 绝缘电阻/Insulation Resistance : DC500V 100M $\Omega$ 以上/DC500V 100MW or more  
 周围温度/Operating range (in controlled environment) : 20 ~ 80% (无结露) (No condensation)  
 最大温度/Maximum temperature : 120°C

**详细规格/Specification**

项目/Item	单位/Unit	MML010 $\Delta$ -KP01	
		A	B
额定推力/Continuous Force	N	28	
额定电流/Continuous Current	Arms	2.4	1.2
峰值推力/Peak Force	N	165	
峰值电流/Peak Current	Arms	14.4	7.2
动子重量/Weight of Coil Plate	kg	0.17	
推力常数/Force constant	N/Arms	11.6	23.2
马达常数/Motor Constant	N/ $\sqrt{W}$	5.8	5.8
线间感应电压常数/Back EMF (line to line)	Vrms/(m/s)	6.5	13.0
相间电阻/Coil Resistance (phase to phase)	$\Omega$	4.0	16.0
线间电感/Inductance (line to line)	mH	1.21	4.84
散热常数 (有散热片) Thermal Resistance (included heat sink)	K/W	1.43	
散热常数 (有散热片) Thermal Resistance (not included heat sink)	K/W	1.71	

- \*1: A为低电压输入型, B为高电压输入型。表中的 $\Delta$ 填入A或B。
- \*2: 最大推力、最大电流会根据使用的伺服控制器最大电流而变化。本数值是以转子上安装有散热片(铝板)为条件的。(散热片尺寸: 200 $\times$ 200 $\times$ 15mm)
- \*3: 电枢卷线温度为100°C时的数值。
- \*1: A = Low Voltage Model, B = High Voltage Model. The  $\Delta$  mark in the chart signifies that either A or B models could be suitable.
- \*2: The value given for the Peak Force and Peak Current may differ depending on the Peak Current of the Servo Controller utilized. Given Values are for heat sink (Aluminum) equipped Coil Plates. (Heat Sink size: 200 $\times$ 200 $\times$ 15mm)
- \*3: Given value is after the electrical wiring temperature has reached 100°C.

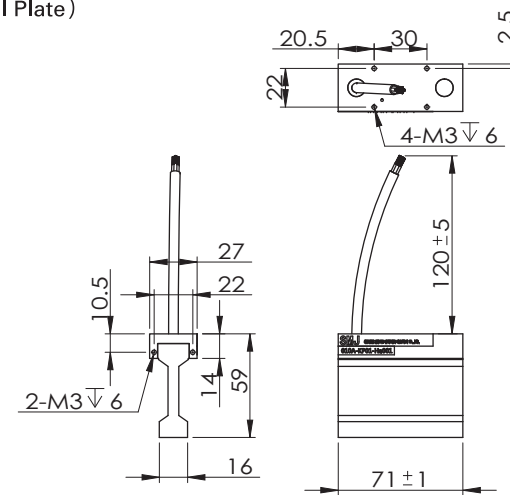
**推力-速度特性/Force/Speed Characteristics**



本特性根据伺服控制器供给至直线电机的输入电压而变化。  
 上述特性是以A型AC型AC85V、B型AC170V作为供给至直线电机的输入电压算出的。  
 The above characteristics may vary depending on the Voltage supply from the Servo Controller to the motor.  
 Listed characteristics for the Linear Motor's Input Voltage is calculated at AC85V for Type A, AC170V for Type B.  
 For further details, please contact our Sales Department.

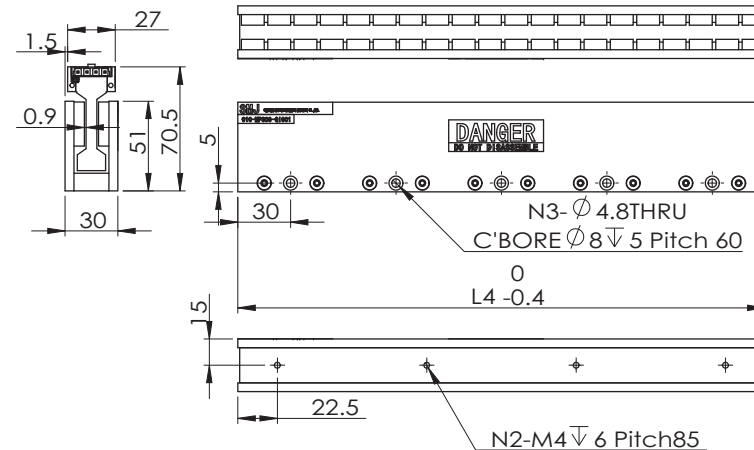
**外形尺寸/Dimensions (单位/unit : mm)**

● 动子 (Coil Plate)



接线定义 U: 红 V: 绿 W: 黑 GND: 白

● 定子 (Magnet Plate)



Type	Size[mm]		Qty[pcs]	
	L4	N2	N3	
MP150	150	2	2	
MP300	300	4	5	





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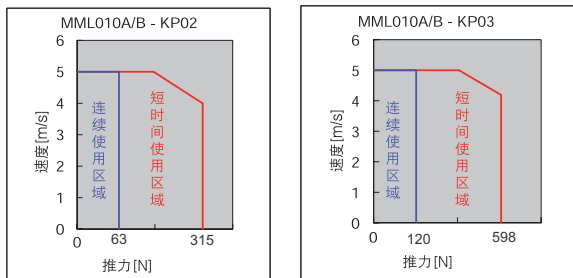
**标准规格 / Standard Specifications**

绝缘耐压 / Insulation Capacity : AC1500V 1分钟 (1min)  
 周围温度 / Operating Range : 0 ~ 40°C  
 冷却方式 / Cooling method : 自冷 (Self-cool)  
 绝缘电阻 / Insulation Resistance : DC500V 100MΩ以上 / DC500V 100MW or more  
 周围湿度 / Operating range (in controlled environment) : 20 ~ 80% (无结露) (No condensation)  
 最大温度 / Maximum temperature : 120°C

**详细规格 / Specification**

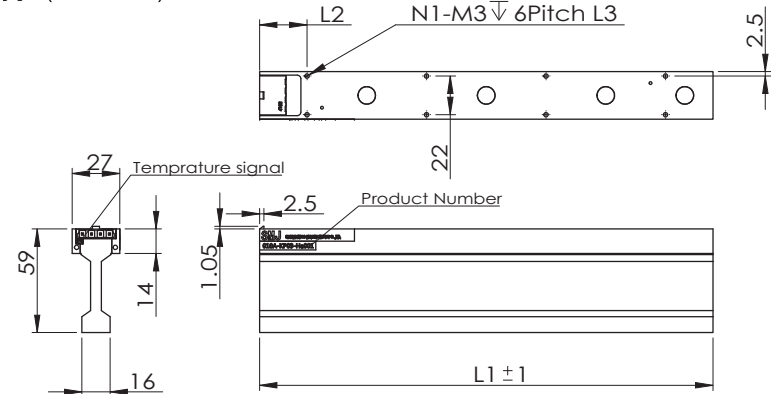
项目 / Item	单位 / Unit	MML010△○-KP02		MML010△○-KP03	
		A	B	A	B
额定推力 / Continuous Force	N	56		108	
额定电流 / Continuous Current	Arms	2.4	1.2	4.7	2.4
峰值推力 / Peak Force	N	315		598	
峰值电流 / Peak Current	Arms	13.70	6.90	26.2	13.1
动子重量 / Weight of Coil Plate	kg	0.31		0.61	
推力常数 / Force constant	N/Arms	23.0	46.0	22.8	45.6
马达常数 / Motor Constant	N/W	8.1	8.1	11.4	11.4
线间感应电压常数 / Back EMF (line to line)	Vrms/(m/s)	12.9	25.8	12.8	25.6
相间电阻 / Coil Resistance (phase to phase)	Ω	8.0	32.0	4.0	16.0
线间电感 / Inductance (line to line)	mH	2.43	9.72	1.21	4.84
散热常数 (有散热片) Thermal Resistance (included heat sink)	K/W	0.79		0.43	
散热常数 (有散热片) Thermal Resistance (not included heat sink)	K/W	0.95		0.51	

- \*1: A为低电压输入型, B为高电压输入型。表中的△填入A或B。表中 填入S表示带有温感, 不填表示不带温感。  
 \*2: 最大推力、最大电流会根据使用的伺服控制器最大电流而变化。本数值是以转子上安装有散热片(铝板)为条件的。(散热片尺寸: 200×200×15mm)  
 \*3: 电枢卷线温度为100°C时的数值。  
 \*1: A = Low Voltage Model, B = High Voltage Model. The △ mark in the chart signifies that either A or B models could be suitable. The ○ mark in the chart signifies that either S or nothing.  
 \*2: The value given for the Peak Force and Peak Current may differ depending on the Peak Current of the Servo Controller utilized. Given Values are for heat sink (Aluminum) equipped Coil Plates. (Heat Sink size: 200×200×15mm)  
 \*3: Given value is after the electrical wiring temperature has reached 100°C.

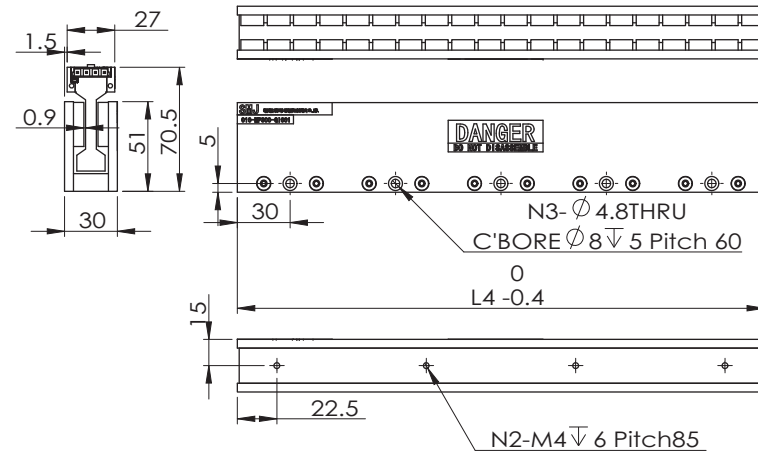
**推力—速度特性 / Force/Speed Characteristics**


本特性根据伺服控制器供给至直线电机的输入电压而变化。  
 上述特性是以A型AC型AC85V、B型AC170V作为供给至直线电机的输入电压算出的。

The above characteristics may vary depending on the Voltage supply from the Servo Controller to the motor.  
 Listed characteristics for the Linear Motor's Input Voltage is calculated at AC85V for Type A, AC170V for Type B.  
 For further details, please contact our Sales Department.

**外形尺寸 / Dimensions (单位 / unit : mm)**
**● 动子 (Coil Plate)**


Type	Size[mm]			Qty[pcs]
	L1	L2	L3	
KP02	138	32	37	6
KP03	258	27	68	8

**● 定子 (Magnet Plate)**


Type	Size[mm]			Qty[pcs]
	L4	N2	N3	
MP150	150	2	2	
MP300	300	4	5	



MML020

MML020△○-KP□□、MML020-MP□□□



可在需要精密定位、高速度、高加速度的小型半导体制造设备等有限的小空间内使用。是最适合制造设备小型化的直线电机。

This Series of Linear Motor is well suited for applications that require Precision Positioning, High Speed, Quick Acceleration such as Semiconductor manufacturing equipment. It is also able to be utilized in limited work spaces. It is the most appropriate Linear Motor design for the reduction of manufacturing equipment size.

**标准规格 / Standard Specifications**

绝缘耐压 / Insulation Capacity : AC1500V 1分钟 (1min)  
 周围温度 / Operating Range : 0 ~ 40℃  
 冷却方式 / Cooling method : 自冷 (Self-cool)  
 绝缘电阻 / Insulation Resistance : DC500V 100MΩ以上 / DC500V 100MW or more  
 周围温度 / Operating range (in controlled environment) : 20 ~ 80% (无结露) (No condensation)  
 最大温度 / Maximum temperature : 120℃

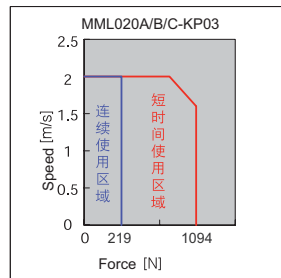
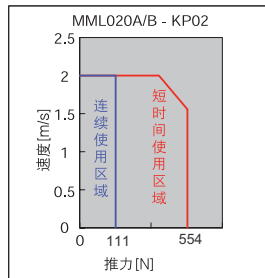
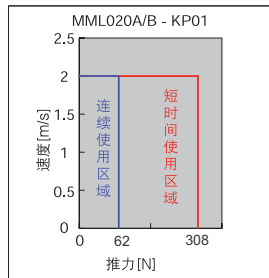
**详细规格 / Specification**

项目/Item	单位/Unit	MML020△○-KP01		MML020△○-KP02		MML020△○-KP03		
		A	B	A	B	A	B	C
额定推力/Continuous Force	N	55		111		219		
额定电流/Continuous Current	Arms	2.4	1.2	2.4	1.2	4.9	2.4	9.7
峰值推力/Peak Force	N	308		554		1094		
峰值电流/Peak Current	Arms	13.4	6.7	12.2	6.2	24.4	12.1	48.5
动子重量/Weight of Coil Plate	kg	0.22		0.43		0.8		
推力常数/Force constant	N/Arms	22.9	44.5	45.5	90.8	44.9	89.7	22.5
马达常数/Motor Constant	N/W	9.5	9.4	13.3	13.4	18.6	18.5	19.2
线间感应电压常数/Back EMF (line to line)	Vrms/(m/s)	13.2	26.2	26.3	52.4	25.9	51.8	13
相间电阻/Coil Resistance (phase to phase)	Ω	5.8	22.4	11.7	45.9	5.8	23.4	1.38
线间电感/Inductance (line to line)	mH	1.85	7.4	3.66	14.6	1.83	7.44	0.46
散热常数 (有散热片) Thermal Resistance (included heat sink)	K/W	1.14		0.67		0.34		
散热常数 (无散热片) Thermal Resistance (not included heat sink)	K/W	1.36		0.80		0.41		

- \*1: A为低电压输入型, B为高电压输入型。表中的△填入A或B或C。表中 填入S表示带有温感, 不填表示不带温感。
- \*2: 最大推力、最大电流会根据使用的伺服控制器最大电流而变化。本数值是以转子上安装有散热片 (铝板) 为条件的。  
(散热片尺寸: 200×200×15mm)
- \*3: 电极卷线温度为100℃时的数值。

- \*1: A = Low Voltage Model, B = High Voltage Model. The △ mark in the chart signifies that either A or B models could be suitable. The ◯ mark in the chart signifies that either S or nothing.
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- \*3: Given value is after the electrical wiring temperature has reached 100℃.

**推力-速度特性 / Force/Speed Characteristics**



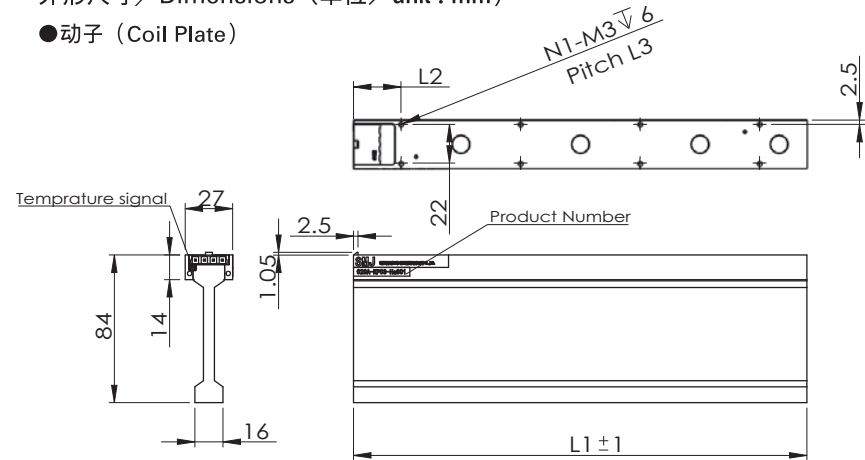
本特性根据伺服控制器供给至直线电机的输入电压而变化。

上述特性是以A型AC型AC85V、B型AC170V作为供给至直线电机的输入电压算出的。

The above characteristics may vary depending on the Voltage supply from the Servo Controller to the motor. Listed characteristics for the Linear Motor's Input Voltage is calculated at AC85V for Type A, AC170V for Type B. For further details, please contact our Sales Department.

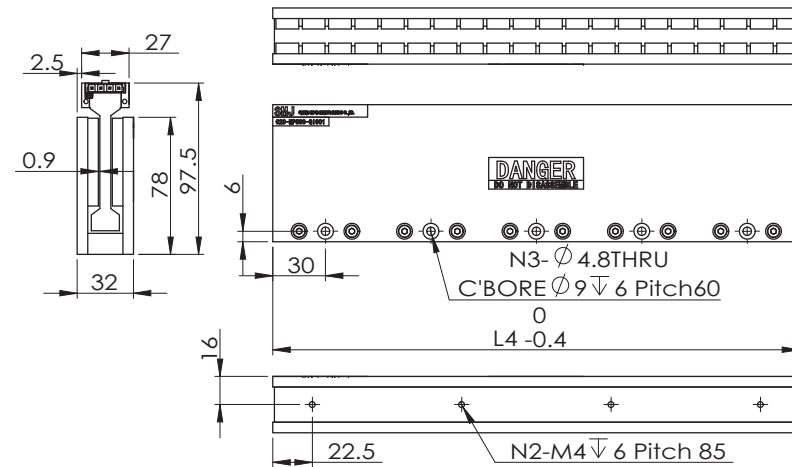
**外形尺寸 / Dimensions (单位 / unit : mm)**

● 动子 (Coil Plate)



Type	Size[mm]			Qty[pcs]
	L1	L2	L3	
KP01	78	24	30	4
KP02	138	32	37	6
KP03	258	27	68	8

● 定子 (Magnet Plate)



Type	Size[mm]			Qty[pcs]
	L4	N2	N3	
MP150	150	2	2	
MP195	195	2	3	
MP300	300	4	5	
MP660	660	8	11	





MML030

MML030△○-KP□□、MML030-MP□□□



可适用于半导体制造设备、组装机器设备等广泛的领域。  
This Model is suitable for a wide range of fields such as Semiconductor Production Equipment and Assembly Robots

**标准规格/Standard Specifications**

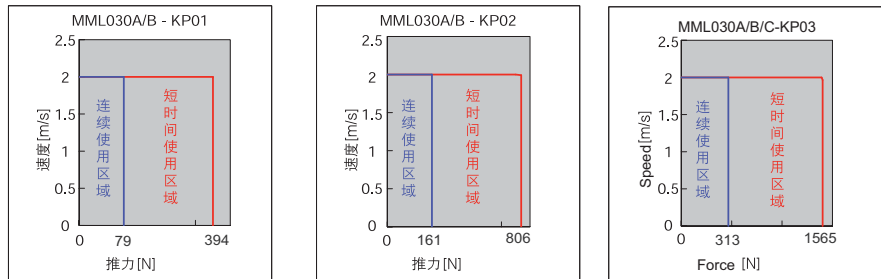
绝缘耐压/Insulation Capacity : AC1500V 1分钟 (1min)  
周围温度/Operating Range : 0 ~ 40°C  
冷却方式/Cooling method : 自冷 (Self-cool)  
绝缘电阻/Insulation Resistance : DC500V 100MΩ以上/DC500V 100MW or more  
周围湿度/Operating range (in controlled environment) : 20 ~ 80% (无结露) (No condensation)  
最大温度/Maximum temperature : 120°C

**详细规格/Specification**

项目/Item	单位/Unit	MML030△○-KP01		MML030△○-KP02		MML030△○-KP03		
		A	B	A	B	A	B	C
额定推力/Continuous Force	N	82		163		313		
额定电流/Continuous Current	Arms	2.4	1.2	3.66	1.8	7.0	3.5	10.3
峰值推力/Peak Force	N	440		815		1565		
峰值电流/Peak Current	Arms	13.0	6.5	18.0	9.0	35	17.5	51.5
动子重量/Weight of Coil Plate	kg	0.26		0.53		1.06		
推力常数/Force constant	N/Arms	34.0	68.4	45.4	88.9	45	88.9	30.4
马达常数/Motor Constant	N·V/W	12.4	12.5	18.9	18.2	26.4	25.7	27.2
线间感应电压常数/Back EMF (line to line)	Vrms/(m/s)	19.6	39.2	26.2	51.3	26.0	51.3	17.6
相间电阻/Coil Resistance (phase to phase)	Ω	7.5	30.0	5.8	23.9	2.9	12.0	1.25
线间电感/Inductance (line to line)	mH	2.4	9.5	2.1	8.0	1.05	4.0	0.44
散热常数 (有散热片) Thermal Resistance (included heat sink)	K/W	0.88		0.48		0.26		
散热常数 (无散热片) Thermal Resistance (not included heat sink)	K/W	1.06		0.59		0.31		

- \*1 : A为低电压输入型, B为高电压输入型。表中的△填入A或B或C。表中 填入S表示带有温感, 不填表示不带温感。  
\*2 : 最大推力、最大电流会根据使用的伺服控制器最大电流而变化。本数值是以转子上安装有散热片 (铝板) 为条件的。  
(散热片尺寸: 200×200×15mm)  
\*3 : 电枢卷线温度为100°C时的数值。  
\*1: A=Low Voltage Model, B=High Voltage Model. The△mark in the chart signifies that either A or B models could be suitable. The ◊ mark in the chart signifies that either S or nothing.  
\*2: The value given for the Peak Force and Peak Current may differ depending on the Peak Current of the Servo Controller utilized. Given Values are for heat sink (Aluminum) equipped Coil Plates. (Heat Sink size: 200×200×15mm)  
\*3: Given value is after the electrical wiring temperature has reached 100°C.

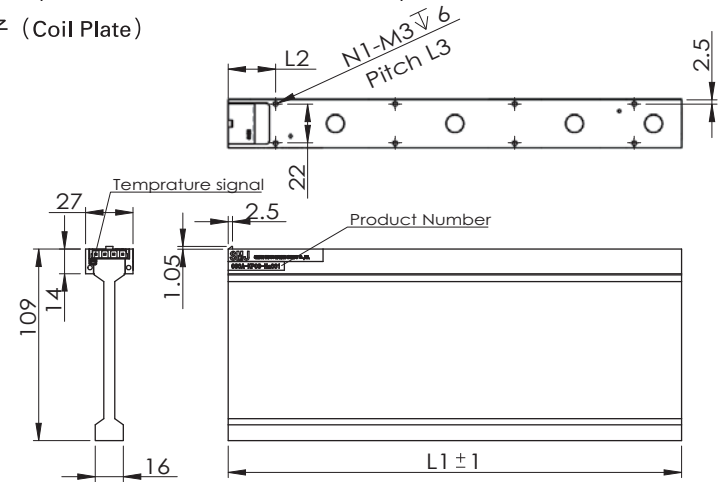
**推力—速度特性/Force/Speed Characteristics**



本特性根据伺服控制器供给至直线电机的输入电压而变化。  
上述特性是以A型AC型AC85V、B型AC170V作为供给至直线电机的输入电压算出的。  
The above characteristics may vary depending on the Voltage supply from the Servo Controller to the motor.  
Listed characteristics for the Linear Motor's Input Voltage is calculated at AC85V for Type A, AC170V for Type B.  
For further details, please contact our Sales Department.

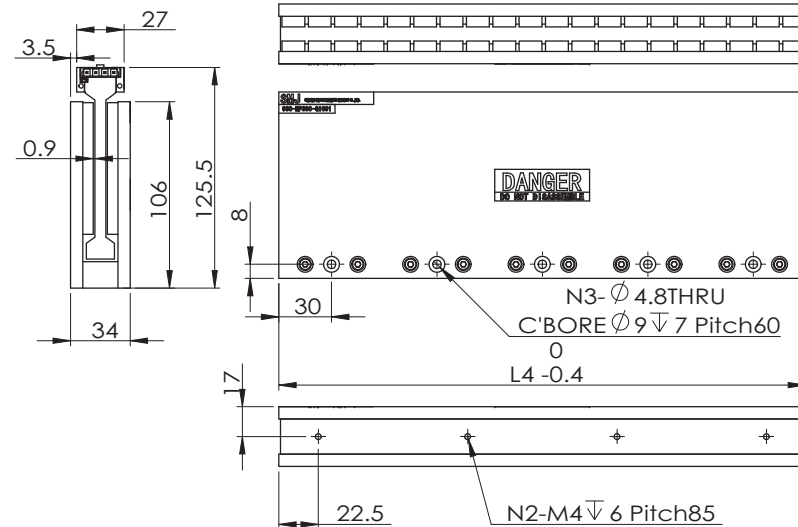
**外形尺寸/Dimensions (单位/unit : mm)**

●动子 (Coil Plate)



Type	Size[mm]				Qty[pcs]
	L1	L2	L3	N1	
KP01	78	24	30	4	
KP02	138	32	37	6	
KP03	258	27	68	8	

●定子 (Magnet Plate)



Type	Size[mm]			Qty[pcs]
	L4	N2	N3	
MP150	150	2	2	
MP300	300	4	5	



MML040

MML040△○-KP□□、MML040-MP□□□



MML系列中推力最大的直线电机。是可适用于大型制造设备等需要精密定位、高速度、高加速度、高推力领域的直线电机。

Within the MML series, this model has the most Force. It is ideally suited for applications where high amounts of force, high speed, and quick acceleration are required for operation, such as Large Scale Production Equipment and Precision Positioning Equipment.

**标准规格/Standard Specifications**

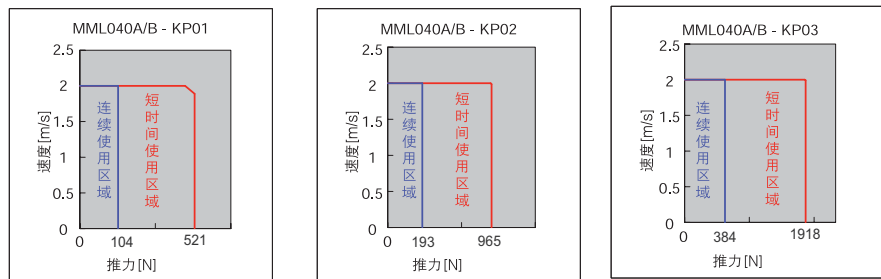
绝缘耐压/Insulation Capacity : AC1500V 1分钟 (1min)  
 周围温度/Operating Range : 0~40°C  
 冷却方式/Cooling method : 自冷 (Self-cool)  
 绝缘电阻/Insulation Resistance : DC500V 100MΩ以上/DC500V 100MW or more  
 周围湿度/Operating range (in controlled environment) : 20~80%(无结露) (No condensation)  
 最大温度/Maximum temperature : 120°C

**详细规格/Specification**

项目/Item	单位/Unit	MML040△○-KP01		MML040△○-KP02		MML040△○-KP03	
		A	B	A	B	A	B
额定推力/Continuous Force	N	110		206		403	
额定电流/Continuous Current	Arms	2.4	1.2	4.6	2.3	9.0	4.5
峰值推力/Peak Force	N	550		1030		2015	
峰值电流/Peak Current	Arms	12.0	6.0	23.0	11.5	45.0	22.5
动子重量/Weight of Coil Plate	kg	0.31		0.63		1.26	
推力常数/Force constant	N/Arms	45.7	89.8	44.8	90.4	44.8	90.6
马达常数/Motor Constant	N/√W	15.0	14.7	20.7	21.0	28.9	29.7
线间感应电压常数/Back EMF (line to line)	Vrms/(m/s)	26.4	52.8	25.9	52.2	25.9	52.3
相间电阻/Coil Resistance (phase to phase)	Ω	9.3	37.4	4.7	18.5	2.4	9.3
线间电感/Inductance (line to line)	mH	3.0	11.8	1.5	6.1	0.75	3.0
散热常数 (有散热片) Thermal Resistance(included heat sink)	K/W	0.62		0.34		0.18	
散热常数 (无散热片) Thermal Resistance(not included heat sink)	K/W	0.74		0.42		0.22	

- \*1: A为低电压输入型, B为高电压输入型. 表中的△填入A或B. 表中 填入S表示带有温感, 不填表示不带温感.
- \*2: 最大推力、最大电流会根据使用的伺服控制器最大电流而变化. 本数值是以转子上安装有散热片(铝板)为条件的.  
(散热片尺寸: 200×200×15mm)
- \*3: 电枢绕组温度为100°C时的数值.
- \*1: A = Low Voltage Model, B = High Voltage Model. The △ mark in the chart signifies that either A or B models could be suitable. The ◯ mark in the chart signifies that either S or nothing.
- \*2: The value given for the Peak Force and Peak Current may differ depending on the Peak Current of the Servo Controller utilized. Given Values are for heat sink (Aluminum) equipped Coil Plates. (Heat Sink size: 200×200×15mm)
- \*3: Given value is after the electrical wiring temperature has reached 100°C

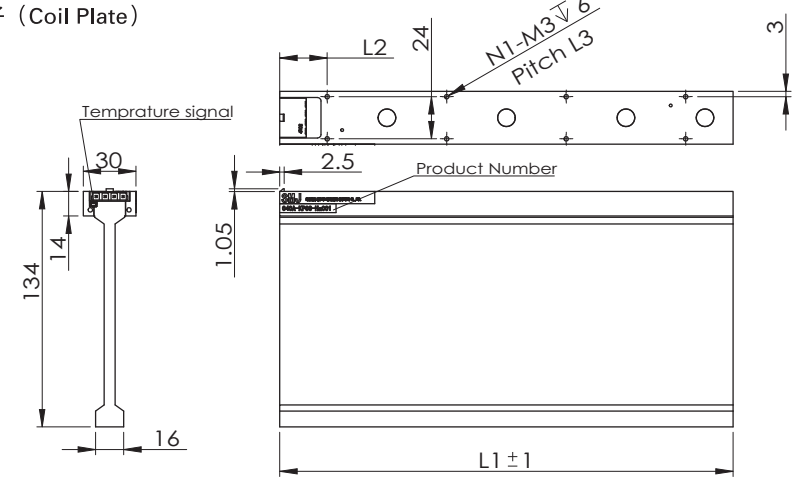
**推力-速度特性/Force/Speed Characteristics**



本特性根据伺服控制器供给至直线电机的输入电压而变化。  
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 The above characteristics may vary depending on the Voltage supply from the Servo Controller to the motor.  
 Listed characteristics for the Linear Motor's Input Voltage is calculated at AC85V for Type A, AC170V for Type B.  
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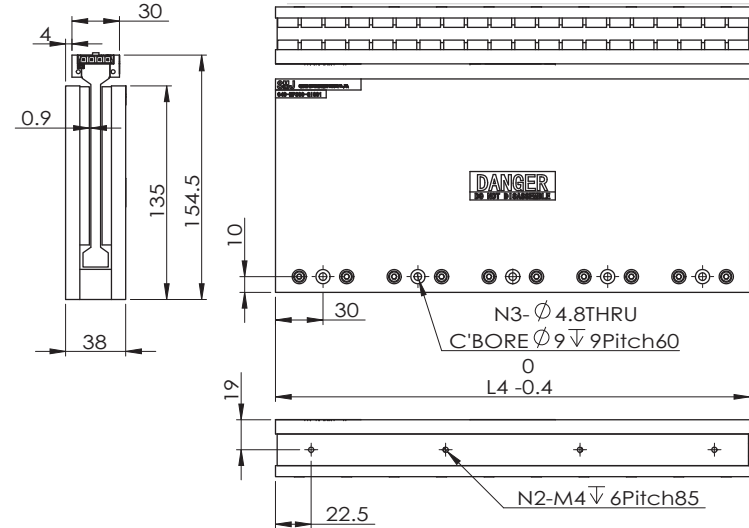
**外形尺寸/Dimensions (单位/unit: mm)**

●动子 (Coil Plate)



Type	Size[mm]				Qty[pcs]
	L1	L2	L3	N1	
KP01	78	24	30	4	
KP02	138	32	37	6	
KP03	258	27	68	8	

●定子 (Magnet Plate)



Type	Size[mm]			Qty[pcs]
	L4	N2	N3	
MP150	150	2	2	
MP300	300	4	5	



MML050

MML050△-KP□□、MML050-MP□□□

MML050-KP04 直线电机



MML系列中推力最大的直线电机。是可适用于大型制造设备等需要精密定位、高速度、高加速度、高推力领域的直线电机。

Within the MML series, this model has the most Force. It is ideally suited for applications where high amounts of force, high speed, and quick acceleration are required for operation, such as Large Scale Production Equipment and Precision Positioning Equipment.

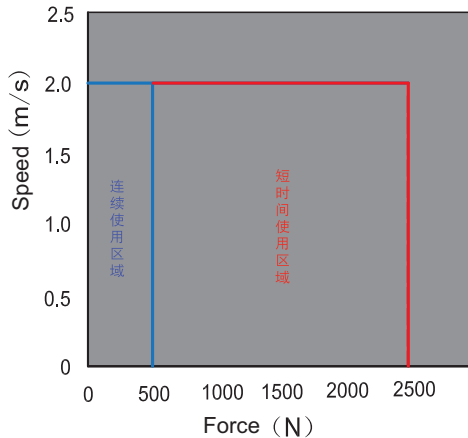
标准规格/Standard Specifications

绝缘耐压/Insulation Capacity : AC1500V 1分钟 (1min)  
 周围温度/Operating Range : 0 ~ 40°C  
 冷却方式/Cooling method : 自冷 (Self-cool)  
 绝缘电阻/Insulation Resistance : DC500V 100MΩ以上/DC500V 100MW or more  
 周围湿度/Operating range (in controlled environment) : 20 ~ 80% (无结露) (No condensation)  
 最大温度/Maximum temperature : 120°C

详细规格/Specification

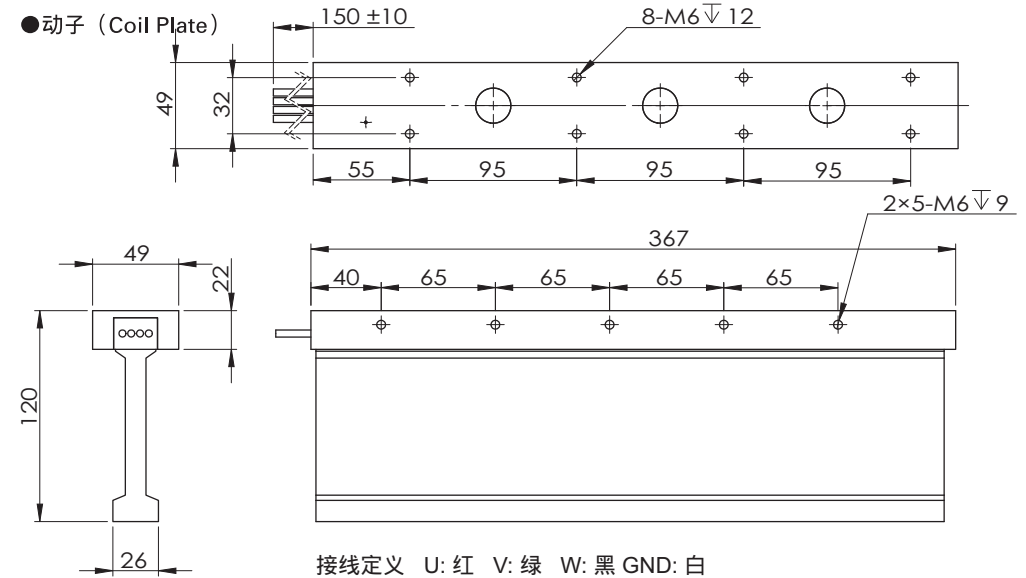
项目/Item	Unit	MML050-KP04
额定推力/Continuous Force	N	502
额定电流/Continuous Current	Arms	7.6
峰值推力/Peak Force	N	2510
峰值电流/Peak Current	Arms	37.8
动子重量/Weight of Coil Plate	kg	3.7
推力常数/Force constant	N/Arms	66.4
线间感应电压常数/Back EMF (line to line)	Vrms/(m/s)	38.3
相间电阻/Coil Resistance (phase to phase)	Ω	2.65
线间电感/Inductance (line to line)	mH	2.2

推力—速度特性/Force/Speed Characteristics

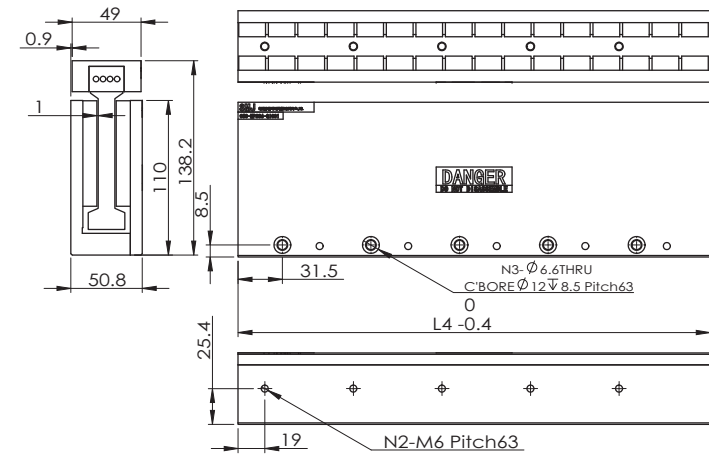


外形尺寸/Dimensions (单位/unit : mm)

●动子 (Coil Plate)

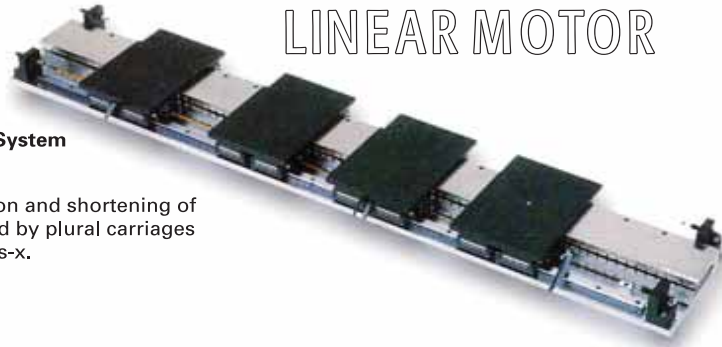


●定子 (Magnet Plate)



Type	Size[mm]		Qty[pcs]	
	L4	N2	N3	
MP168	168	3	3	
MP336	336	5	5	

# FOUR CARRIAGES LINEAR MOTOR



**Applications**  
High Precision Printing System

**Specialites**  
Printing with high precision and shortening of printing time are attained by plural carriages control on the single axis-x.

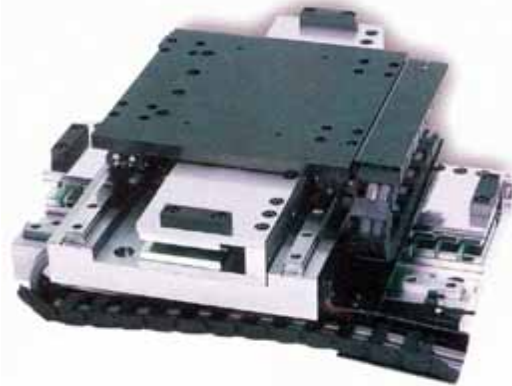
适用范例  
精密印刷设备

特点  
通过可同轴多体控制的直线电机，不仅能进行精密印刷，而且可缩短印刷时间。

适用例  
精密印刷装置

特 徵  
同軸上の多頭制御が可能であり、精密な印刷、印刷時間短縮を実現。

## Example of Multi-Module



# X-Y LINEAR MOTOR

适用范例  
打线机

特点  
滚珠螺杆难以实现的加减速功能、高速性、寿命问题通过直线电机解决。

适用例  
ワイアボンダ

特 徵  
ボールねじでは実現が難しい、加減速性能、高速性、長寿命を実現。

**Applications**  
High Precision Printing System

**Specialites**  
Printing with high precision and shortening of printing time are attained by plural carriages control on the single axis-x.

**Applications**  
High Precision Printing System

**Specialites**  
Printing with high precision and shortening of printing time are attained by plural carriages control on the single axis-x.

适用范例  
芯片貼装设备

特点  
可通过结构简单小巧的直线电机节省设备整体的空间。

适用例  
チップマウンタ

特 徵  
コンパクトでシンプルな構造により、装置全体のスペース化が可能。

## Line Motor Application



# ONE UNIT LINEAR MOTOR



# 直线电机选择方法

To select Multi-Module Linear Motor

## 容量选择

### ○使用条件

负载重量*1 Load weight	$M_L$	[kg]
行程 Stroke	$S$	[mm]
最大移动速度 Maximum speed	$V_m$	[m/s]
加速时间 Acceleration time	$T_a$	[sec]
匀速时间 Fixed speed time	$T_b$	[sec]
减速时间 Deceleration time	$T_c$	[sec]
1循环时间 1 cycle time	$T$	[sec]

\*1: 除包含工件的转子以外的重量

### ○各机种的特点

连续推力 Continuous Force	$F$	[N]
最大推力 Peak Force	$F_m$	[N]
动子重量 Mover weight	$M_p$	[kg]

### ○有效推力计算

移动时所需推力 [N]

$$F_L = \mu (M_L + M_p)g + F_n$$

$\mu$  : 摩擦系数0.01  
 $g$  : 重力加速度9.8[m/s<sup>2</sup>]  
 $F_n$  : 导线阻力1.0[N]

极限加速时间 [s]

$$T_a = \frac{(M_L + M_p) \times V_m \times K}{F_m - F_L}$$

$K$ : 安全系数1.3

加速时所需推力 [N]

$$F_a = \frac{V_m}{T_a} \times (M_L + M_p) + F_L$$

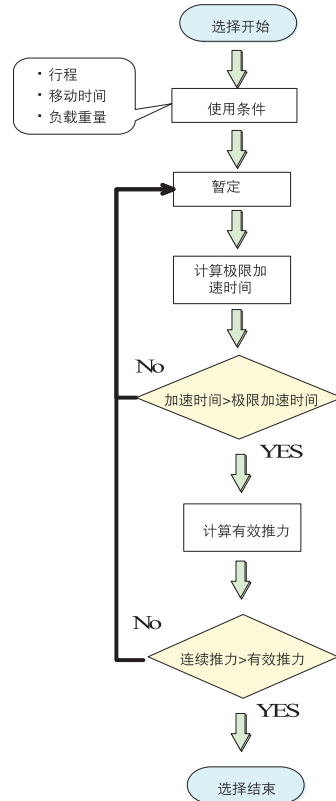
减速时所需推力 [N]

$$F_d = \frac{V_m}{T_d} \times (M_L + M_p) - F_L$$

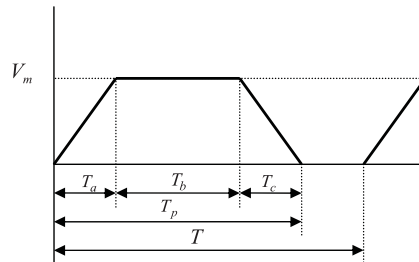
有效推力 [N]

$$F_{rms} = \sqrt{\frac{F_a^2 \times T_a + F_L^2 \times T_b + F_d^2 \times T_c}{T}}$$

### ○选择流程



### ○运转方式

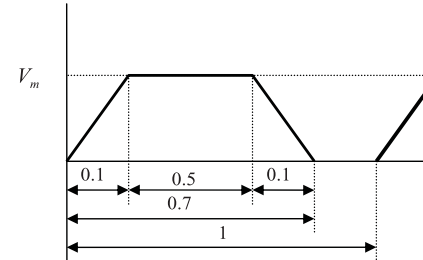


## 选择范例

### ○使用条件

负载重量 Load weight	$M_L$	10	[kg]
行程 Stroke	$S$	300	[mm]
最大移动速度 Maximum speed	$V_m$	1.0	[m/s]
加速时间 Acceleration time	$T_a$	0.1	[sec]
匀速时间 Fixed speed time	$T_b$	0.5	[sec]
减速时间 Deceleration time	$T_c$	0.1	[sec]
1循环时间 1 cycle time	$T$	1	[sec]

### 使用条件的运转方式



### ○暂定

暂定线圈板MML010A-KP02×1台，  
磁石板MML010A-MP300×2台，  
判断是否符合以下条件。

- ① 机械条件 (行程长)
- ② 时间条件
- ③ 推力条件

#### · MML010A-KP02的规格

连续推力	63	[N]
最大推力	315	[N]
动子重量	0.31	[kg]

### ①机械条件 (行程长)

根据后附的参考资料，MML010A-MP300×2台的有效行程为342[mm]。

这里，有效行程 > 所需行程  
342[mm] 300[mm]

因此可以确认，MML010A-MP300×2台的组合满足了所需行程。

### ②时间条件

匀速时所需推力

$$F_L = 0.01 \times (10 + 0.31) \times 9.8 + 1.0 = 2[\text{N}]$$

极限加速时间 (达到目标速度的最短时间)

$$T_a = \frac{(10 + 0.31) \times 1.0 \times 1.3}{156 - 2} = 0.043[\text{s}]$$

这里，加速时间 > 极限加速时间  
0.1[sec] 0.043[sec]

因此，在0.1[s]内完全可以加速达到目标速度。

### ③推力条件

使用上述w计算得出的FL值

加速时所需推力

$$F_a = \frac{1.0}{0.1} \times (10 + 0.31) + 2 = 105.1[\text{N}]$$

减速时所需推力

$$F_d = \frac{1.0}{0.1} \times (10 + 0.31) - 2 = 101.1[\text{N}]$$

有效推力

$$F_{rms} = \sqrt{\frac{105.1^2 \times 0.1 + 2^2 \times 0.5 + 101.1^2 \times 0.1}{1.0}} = 46.1[\text{N}]$$

连续推力 > 有效推力  
63[N] 46.1[N]

因此可以判断，机器可以按照所需的使用条件连续运转。



一. 行程 (mm)

	KP01×1台	KP02×1台	KP03×1台
MP150×1台	72	12	—
MP300×1台	222	162	42
KP01×1台+MP300×1台	372	312	192
MP300×2台	522	462	342

二. 线圈板重量 (kg)

	KP01	KP02	KP03
MML010A/B	0.17	0.31	0.61
MML020A/B	0.22	0.43	0.80
MML030A/B	0.26	0.53	1.06
MML040A/B	0.31	0.63	1.26

三. 磁石板重量 (kg)

	MP150	MP300
MML010A/B	1.1	2.2
MML020A/B	2.0	4.0
MML030A/B	3.0	6.0
MML040A/B	4.5	9.0