



DIRECT DRIVE TECHNOLOGY
Product Catalogue
VERSION 4.1.1



PLA SERIES

LINEAR SERVO MOTOR ACTUATOR

- PLAY VIDEO -

PLA SERIES

LINEAR SERVO MOTOR ACTUATOR



Faster Settling, Accuracy and Highly Repeatable Positioning

PBA's PLA series linear servo motor actuators are "plug and play" center driven linear

solutions that combine ironless and iron core linear motor technology to offer a modular

actuator inclusive of precision linear encoders and linear guideways.

These modules offer optimal acceleration/velocity possibilities and rigidity that allows for

faster settling, accuracy and highly repeatable positioning.

PLA actuators is configurable as open frame systems for basic applications as well as

partially enclosed and fully sealed bellow covers.

- Velocity to 3 m/sec
- Acceleration up to 5Gs
- Encoder Resolution to 0.8nm (Depends on drive)
- Effective stroke up to 2m

**Technical specifications subject to change without prior notice*

PART NUMBERING SYSTEM

COIL ASSEMBLY

DXB/BT
PIX
PSM/PSME
CVC
CVCA
RVCA
PDDR
PCA
PWA
PLA
PDAB
PIAB
OCTO
PRG
LINEAR ENCODER
SERVO AMPLIFIER

PLA - D2 - C2 - S - TC - 1.0 - FC - HC - E1.0 - O - 740 - 00

ACTUATOR MODEL

MOTOR MODEL

D2 DX20B

MOTOR SIZE

C2
C3
C4
C5

CONNECTION TYPE

S Series
P Parallel

THERMAL PROTECTION

TC* PT 100 Sensor

CABLE LENGTH***

0.5 0.5m
1.0 1.0m
2.0 2.0m
3.0 3.0m
4.0 4.0m
5.0 5.0m

POWER CABLE OPTIONS

NF No Ferrite Core
(Flying Leads)
FC Ferrite Core
(Recommended)
9NF No Ferrite Core, D
Sub 9 pins
Female Connector
CNF No Ferrite Core,
Circular Quick
Lock 6 pins Male Connector

DESIGN VERSIONS

00 Standard
01 Customized Version
:

EFFECTIVE STROKE (mm)

140
200
260
320
380
440
500
560
620
680
740

COVER

O Open
C Covered

ENCODER RESOLUTION

EA Analog
E0.5 0.5um
E1.0 1.0um

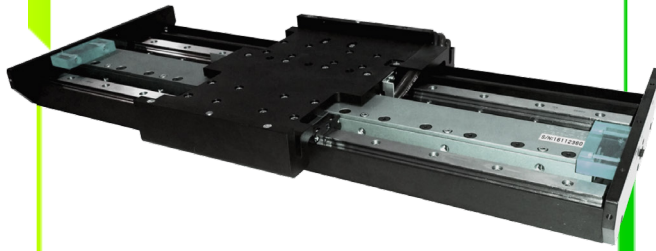
HALL SENSOR AND CONNECTOR OPTIONS

H Flying Leads
(No Connector)
HC 9 pins D Sub
(Male Connector)
CHC 5 Pins Circular
(Quick Lock Male Connector)
HCL 9 pins D Sub
(Male Connector with Line Driver)

* TC - Sensor output to temperature controller
** Encoder, power & hall cable

PLA SERIES

MULTI-AXIS ACTUATOR



PLA-D2

- Linear Actuator
- Peak force to 137N, Continuous force to 27N

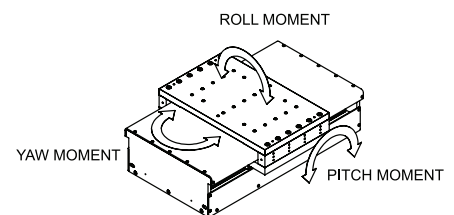
SPECIFICATION		MODEL			
		PLA-D2-C2		PLA-D2-C3	
Motor Parameters	Unit	S	P	S	P
Peak Force	N	92		137	
Continuous Force @ 120°C*	N	18		27	
Peak Power @ 120°C	W	24		36	
Continuous Power @ 120°C*	W	744		1116	
Peak Current	Apk	10.5	21	10.5	21
Continuous Current @ 120°C*	Apk	2.1	4.2	2.1	4.2
Continuous Stall Current @ 120°C*	Arms	1.40	2.80	1.40	2.80
Force Constant	N/Apk	8.7	4.4	13.1	6.5
Back EMF Constant	Vpk/m/s	10	5	15	7.5
Coil Resistance L-L @ 25°C	Ohm	6.5	1.6	9.8	2.4
Coil Resistance L-L @ 120°C*	Ohm	9.0	2.2	13.5	3.4
Inductance L-L @ 1kHz	mH	1.53	0.38	2.3	0.57
Motor Constant @ 25°C*	N//W	3.95		4.84	
Motor Constant @ 120°C*	N//W	3.36		4.11	
Max. Terminal Voltage	Vdc		400		
Thermal Resistance @ 120°C*	°C/W	3.19		2.13	
Max. Coil Temperature	°C		120		
Electrical Cycle Length	mm		30		

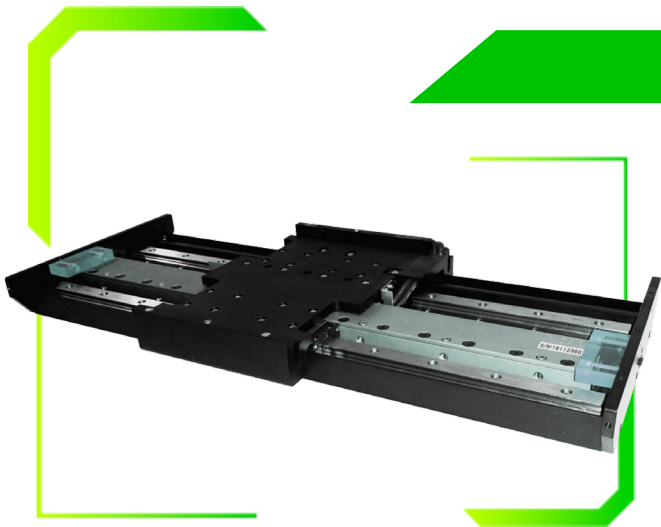
Specifications	
Repeatability**	um ±2.0
Accuracy***	um ±30um/300mm
Straightness***	um ±10um/300mm
Flatness***	um ±20um/300mm

Linear Guide Rated Load and Static Moment	
Model Code	LM Guide
Block Quantity	4
Maximum bearing load	kN 3.1
Pitch moment	Nm 191 287
Yaw moment	Nm 191 287
Roll moment	Nm 218

Notes:

1. $Apk = 1.414 \cdot Arms$; $Vpk = 1.414 \cdot Vrms$.
2. * Ambient temperature 25°C, heat dissipation by natural convection, without heat sink attached.
3. Specifications tolerance - inductance +/-30%, all others +/-10% (for motor parameters).
4. Peak force and current : 4% duty ratio and 1 second duration.
5. ** Depend on encoder resolution.
6. *** Specific accuracy, straightness and flatness requirement, contact PBA for more information.
7. For customized stroke length, contact PBA.
8. For different motor models, contact PBA.
9. Specifications are subject to change without prior notice.





PLA SERIES

MULTI-AXIS ACTUATOR

PLA-D2

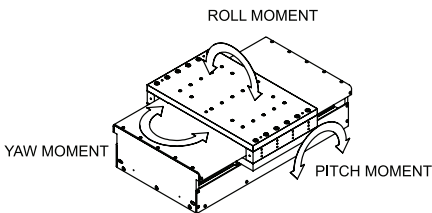
- Linear Actuator
- Peak force to 137N, Continuous force to 27N

SPECIFICATION		MODEL			
		PLA-D2-C4		PLA-D2-C5	
Motor Parameters	Unit	S	P	S	P
Peak Force	N	183		229	
Continuous Force @ 120°C*	N	37		46	
Peak Power @ 120°C	W	48		60	
Continuous Power @ 120°C*	W	1488		1860	
Peak Current	Apk	10.5	21	10.5	21
Continuous Current @ 120°C*	Apk	2.1	4.2	2.1	4.2
Continuous Stall Current @ 120°C*	Arms	1.40	2.80	1.40	2.80
Force Constant	N/Apk	17.4	8.7	21.8	10.9
Back EMF Constant	Vpk/m/s	20.1	10	25.1	12.5
Coil Resistance L-L @ 25°C	Ohm	13	1.6	16.3	4.1
Coil Resistance L-L @ 120°C*	Ohm	18.0	4.5	22.5	5.6
Inductance L-L @ 1kHz	mH	3.06	0.77	3.83	0.96
Motor Constant @ 25°C*	N//W	5.59		6.24	
Motor Constant @ 120°C*	N//W	4.75		5.31	
Max. Terminal Voltage	Vdc	400			
Thermal Resistance @ 120°C*	°C/W	1.60		1.28	
Max. Coil Temperature	°C	120			
Electrical Cycle Length	mm	30			

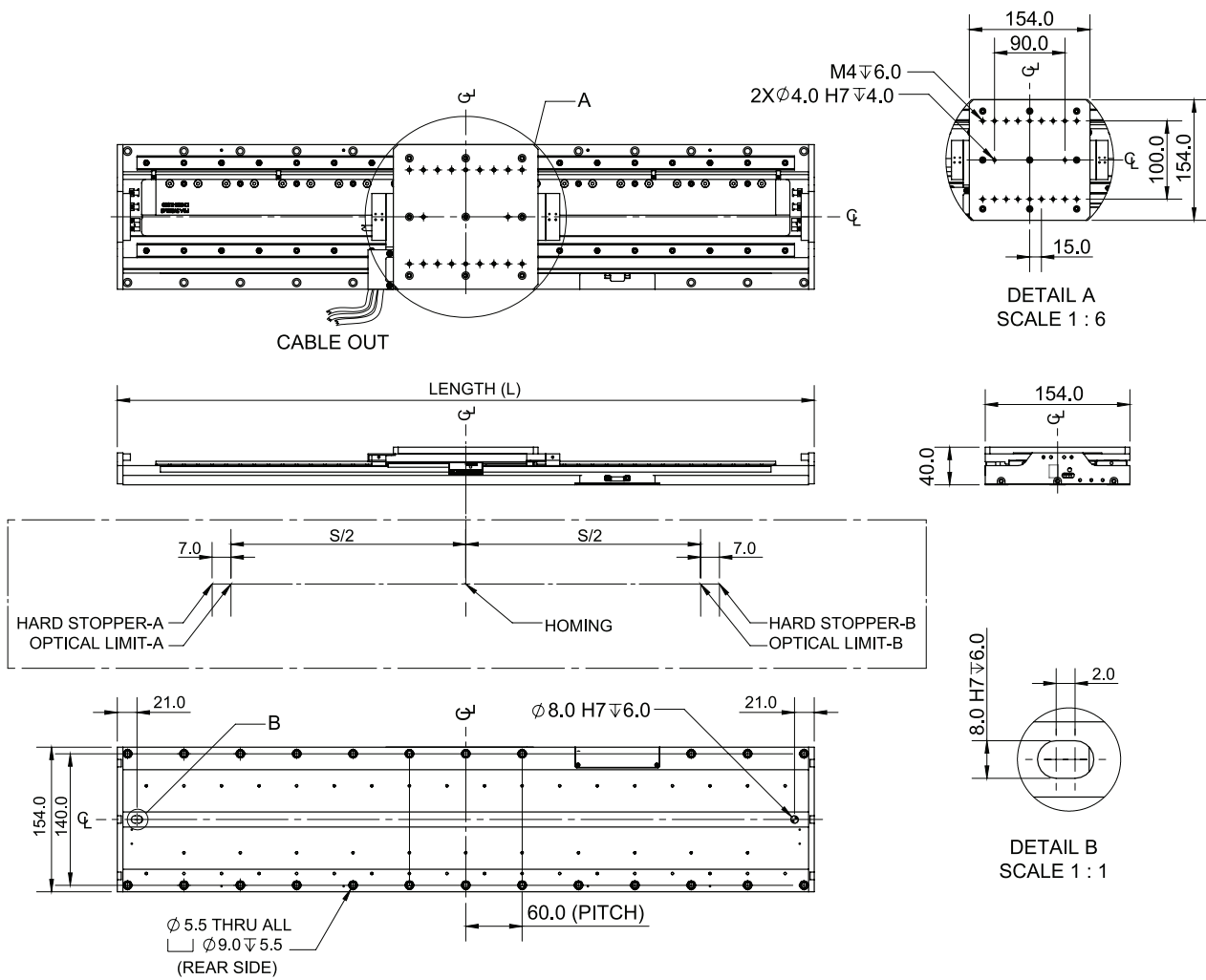
Specifications		
Repeatability**	um	±2.0
Accuracy***	um	±30um/300mm
Straightness***	um	±10um/300mm
Flatness***	um	±20um/300mm

Linear Guide Rated Load and Static Moment		
Model Code		LM Guide
Block Quantity		4
Maximum bearing load	kN	3.1
Pitch moment	Nm	287
Yaw moment	Nm	287
Roll moment	Nm	218

- Notes:
1. Apk = 1.414 * Arms; Vpk = 1.414 * Vrms.
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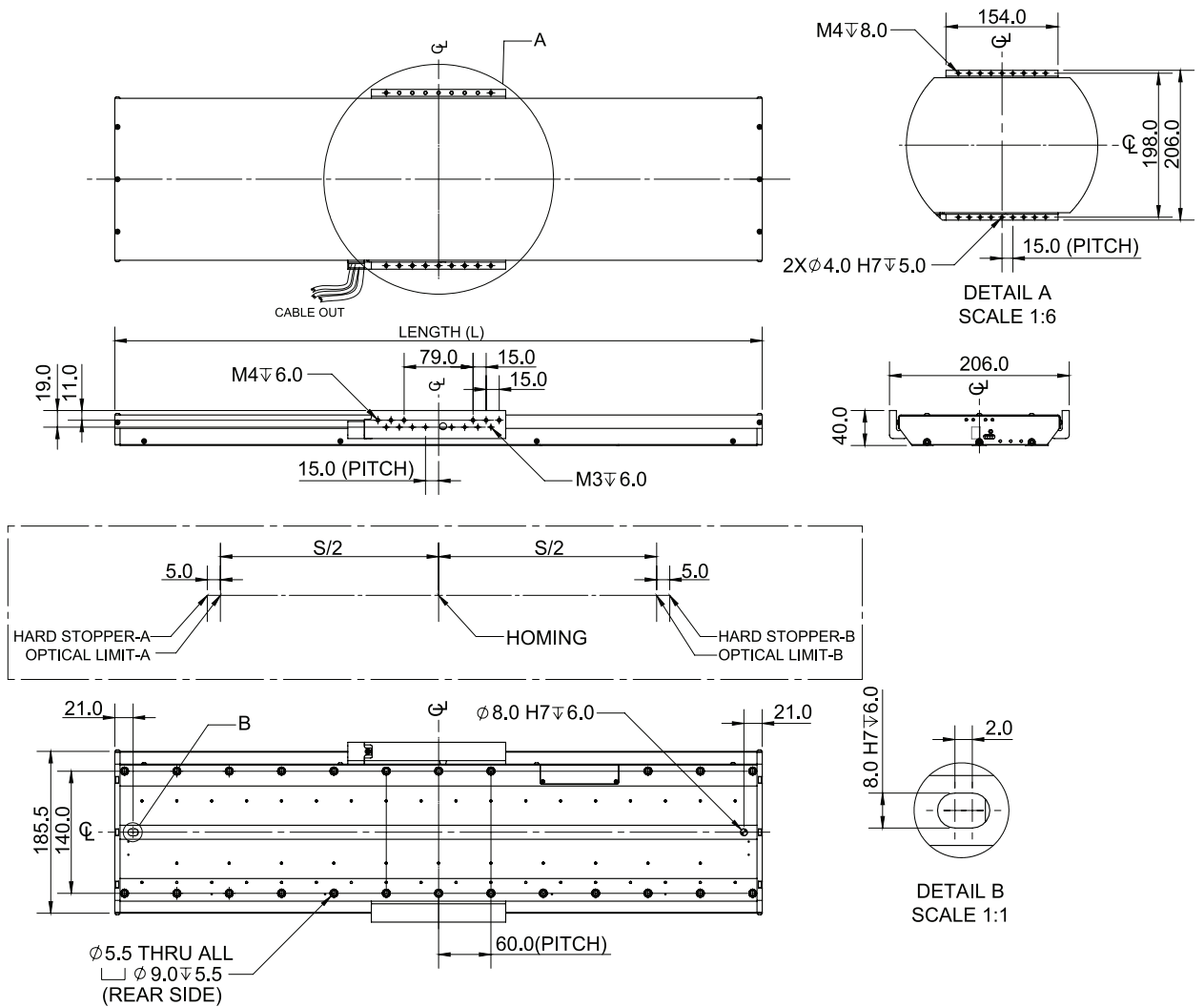
PLA-OPEN TYPE



MOTOR MODEL	STROKE (S) mm	ACTUATOR LENGTH (L) mm	CARRIAGE LENGTH (A) mm	SLIDER MASS kg	MODULE MASS kg
C2 & C3	140	352	124	1.6	4.6
	200	412			5.2
	260	472			5.8
	320	532			6.4
	380	592			7.0
	440	652			7.6
	500	712			8.2
	560	772			8.8
	620	832			9.4
	680	892			10.0
C4 & C5	740	952	154	1.9	10.6
	140	382			5.1
	200	442			5.7
	260	502			6.3
	320	562			6.9
	380	622			7.5
	440	682			8.1
	500	742			8.7
	560	802			9.3
	620	862			9.9
	680	922			10.5
	740	982			11.1

Notes: 1. Slider Mass = Coil Mass + Carriage Mass

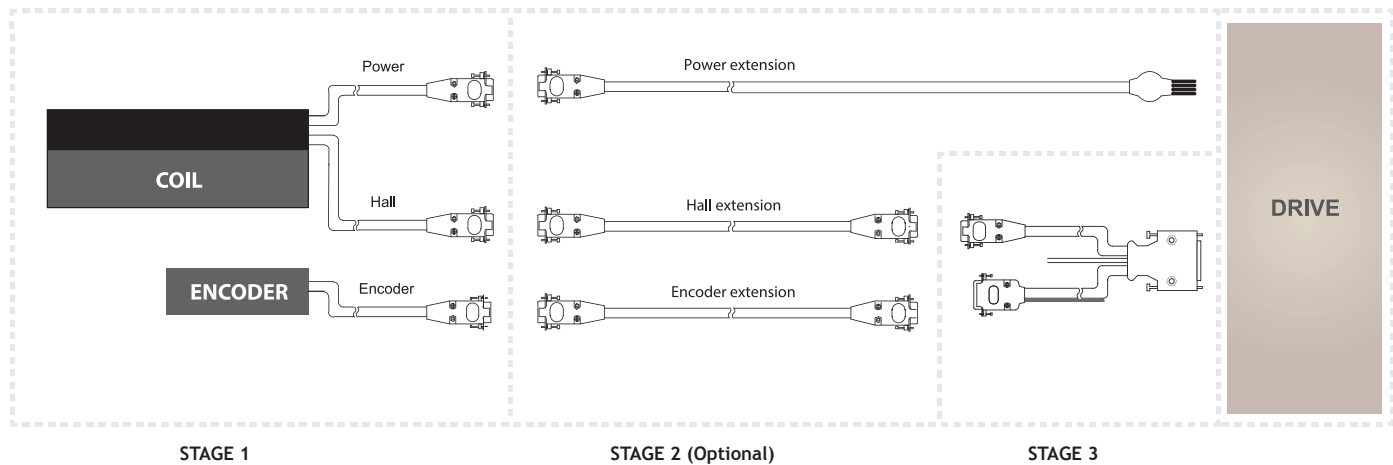
PLA-OPEN TYPE



MOTOR MODEL	STROKE (S) mm	ACTUATOR LENGTH (L) mm	CARRIAGE LENGTH (A) mm	SLIDER MASS kg	MODULE MASS kg
C2 & C3	140	352	124	1.7	5.1
	200	412			5.9
	260	472			6.7
	320	532			7.5
	380	592			8.3
	440	652			9.1
	500	712			9.9
	560	772			10.7
	620	832			11.5
	680	892			12.3
	740	952			13.1
C4 & C5	140	382	154	2.0	5.6
	200	442			6.4
	260	502			7.2
	320	562			8.0
	380	622			8.8
	440	682			9.6
	500	742			10.4
	560	802			11.2
	620	862			12.0
	680	922			12.8
	740	982			13.6

Notes: 1. Slider Mass = Coil Mass + Carriage Mass

CABLE OPTION



STAGE 1 | POWER AND HALL CABLE OPTION

PLA-D2-C1-S-TC-1.0-FC-HC-E1.0-O-740-00

POWER CABLE OPTIONS

NF

M1	Grey
M2	Brown
M3	Black
PE	Yellow
Temp sensor 1	Black
Temp sensor 2	Orange

FC

9NF

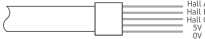
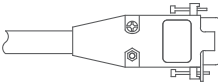
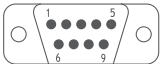
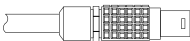
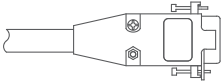
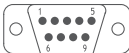
9 Pin D-sub Female

P1	M1	Grey
P2	M1	Black (jumper)
P3	M3	Black
P4	M3	Black (jumper)
P5	M2	Brown
P6	M2	Black (jumper)
P7	Temp sensor 1	Black
P8	Temp sensor 2	Orange
P9	PE	Yellow & Green

CNF

Push Pull 6 Pin Male

P1	M1	Grey
P2	M2	Brown
P3	M3	Black
P4	Temp sensor 1	Black
P5	Temp sensor 2	Orange
P6	PE	Yellow & Green

HALL SENSOR OPTIONS																		
H		<table><tr><td>Hall A</td><td>White</td></tr><tr><td>Hall B</td><td>Green</td></tr><tr><td>Hall C</td><td>Blue</td></tr><tr><td>5V</td><td>Red</td></tr><tr><td>0V</td><td>Black</td></tr></table>	Hall A	White	Hall B	Green	Hall C	Blue	5V	Red	0V	Black						
Hall A	White																	
Hall B	Green																	
Hall C	Blue																	
5V	Red																	
0V	Black																	
HC	 9 Pin D-sub Male 	<table><tr><td>P1</td><td>Hall A</td><td>White</td></tr><tr><td>P2</td><td>Hall B</td><td>Green</td></tr><tr><td>P3</td><td>Hall C</td><td>Blue</td></tr><tr><td>P4</td><td>5V</td><td>Red</td></tr><tr><td>P5</td><td>0V</td><td>Black</td></tr></table>	P1	Hall A	White	P2	Hall B	Green	P3	Hall C	Blue	P4	5V	Red	P5	0V	Black	
P1	Hall A	White																
P2	Hall B	Green																
P3	Hall C	Blue																
P4	5V	Red																
P5	0V	Black																
CHC	 Push Pull 5 Pin Male 	<table><tr><td>P1</td><td>Hall A</td><td>White</td></tr><tr><td>P2</td><td>Hall B</td><td>Green</td></tr><tr><td>P3</td><td>Hall C</td><td>Blue</td></tr><tr><td>P4</td><td>5V</td><td>Red</td></tr><tr><td>P5</td><td>0V</td><td>Black</td></tr></table>	P1	Hall A	White	P2	Hall B	Green	P3	Hall C	Blue	P4	5V	Red	P5	0V	Black	
P1	Hall A	White																
P2	Hall B	Green																
P3	Hall C	Blue																
P4	5V	Red																
P5	0V	Black																
HCL	 9 Pin D-sub Male 	<table><tr><td>P1</td><td>Hall A+</td></tr><tr><td>P2</td><td>Hall A-</td></tr><tr><td>P3</td><td>Hall B+</td></tr><tr><td>P4</td><td>Hall B-</td></tr><tr><td>P5</td><td>Hall C+</td></tr><tr><td>P6</td><td>Hall C-</td></tr><tr><td>P7</td><td>5V</td></tr><tr><td>P8</td><td>0V</td></tr></table>	P1	Hall A+	P2	Hall A-	P3	Hall B+	P4	Hall B-	P5	Hall C+	P6	Hall C-	P7	5V	P8	0V
P1	Hall A+																	
P2	Hall A-																	
P3	Hall B+																	
P4	Hall B-																	
P5	Hall C+																	
P6	Hall C-																	
P7	5V																	
P8	0V																	

Notes: All connectors shown are front view

The temperature in which the thermostat is active is shown as below:

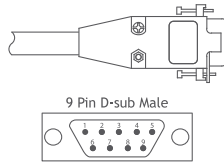
MODEL	THERMAL DEVICE TYPE	THERMOSTAT (NC) OPENS AT
DX20B	PT100	See Note 1

Note 1

- Programmable on temperature controller or analog inputs on motion controller.
- Recommended to set cut-off temperature to 100° C (max) to prevent coil damage.
- User has to ensure that the thermal protection devices are wired to appropriate electronics to ensure that the motor power cutoff is active when temperature reaches its allowable limit.

PWA CABLE PIN OUT

ENCODER CONNECTOR - 9 PIN D-SUB MALE



	RH200X / RH200Z	RH200B
P1	0V DC	0V DC
P2	A+	Sine+
P3	Z+	Z+
P4	B+	Cosine+
P5	+5V DC	+5V DC
P6	A-	Sine-
P7	Z-	Z-
P8	B-	Cosine-
P9	Inner	Inner
Casing	Outer	Outer

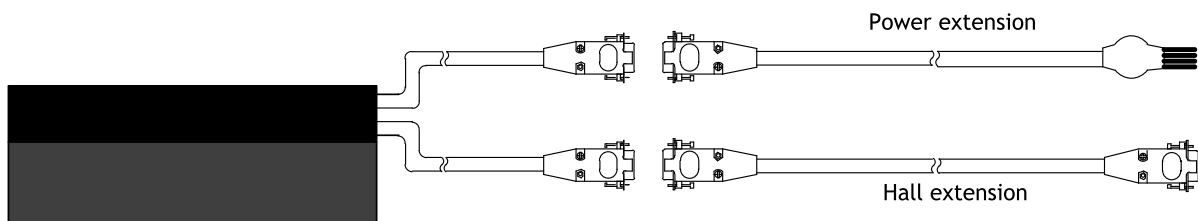
OPTICAL LIMIT SWITCH (PM-L24)

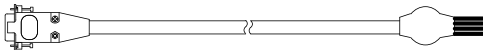
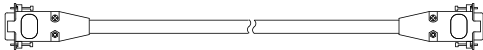


+5 to 24V DC	Brown
GND	Blue
LIGHT-ON	Black
DARK-ON	White

STAGE 2 | PLA EXTENSION CABLE

Connection example: PLA-D2-C2-S-TC-1.0-FC-HC-E1.0-O-740-00



Extension Cable			Part Number	
Power Extension Cable			CBL_EXT_PWR_DX_X.X	
			CBL_EXT_PWR_DX_CC_X.X	
Hall Sensor Extension Cable			CBL_EXT_HALL0_X.X	
			CBL_EXT_HALL0_CC_X.X	
			CBL_EXT_HALL0_DIF_X.X	
Encoder Extension Cable			CBL_EXT_REN01_X.X	

Notes: 1. X.X is the length of the cable in meters 2. For customized cable length, contact PBA

Application Form - Linear Motor Selection

Customer Name:	Date (DD/MM/YY):
Contact Email:	

PBA LINEAR MOTOR SELECTION QUESTIONNAIRE

1. Application Description

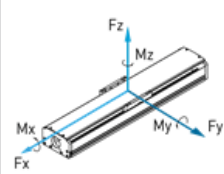
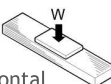
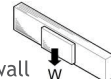
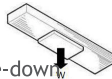
1a. Application Sketch With Approx Dimensions

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2. Load Parameter

Moving mass (without motor coil)		kg	
Frictional force		N	
Opposing force		N	
Mx	N.m	My	N.m

Stage Requirements

	☐ Horizontal 	☐ Vertical 
	☐ Sidewall 	☐ Upside-down 

3. Motion Parameter

		Profile 1	Profile 2	Profile 3
Moving distance	mm			
Moving time	s			
Moving velocity	m/s			
Acceleration	m/s ²			
Dwell time	s			

4. Command/Bus (Please Circle Accordingly)

Pulse and direction / Analog / EtherCAT / IO trigger / Other : _____
--

5. Encoder (Please Circle Accordingly)

Resolution	um	
Incremental / Absolute / Analog		

6. Motion Precision

Accuracy	um/mm	
Repeatability	um	

7. Mechanical Specification

Effective stroke	mm	
Flatness	um/mm	
Straightness	um/mm	
Space constraints (L x W x H)	mm	

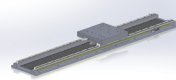
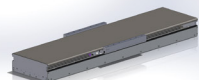
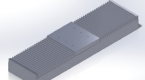
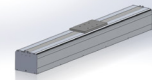
8. Working Environment

Room temperature	°C	
Clean room class		

9. Additional Requirements (Please Tick (☒) Accordingly)

Motor cable length	Controller	Amplifier	Encoder	Other: _____
m				

10. Actuator

Open Frame	Enclosed				
	PARTIAL 	BELLOWS 	STRIP SEAL 		

11. Remarks: If you have any special motion request for sizing procedure, please specify your requirement in below remarks.

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PBA SYSTEMS LINEAR MOTOR SIZER SOFTWARE



PBA Systems is a one-stop robotics provider with a focus on the development of core technology to offer a robust range of products and solutions in precision robotics and general robotics - enabling companies to thrive by making Industry 4.0 technology accessible to the market.

Our core strength is in design, development, and manufacturing of direct drive motor design and manufacturing, motion control, and precision modular assemblies.

Address:
**505 Yishun Industrial Park, A,
Singapore 768733**

Contact Us:
**Tel: +(65) 6576 6766
Fax: +(65) 6576 6768**



PBA SYSTEMS LINEAR MOTOR SIZER SOFTWARE

PBA Systems Motor Sizer Software is available to download from our website to assist in the calculation and selection.

Kindly visit us at www.pbasystems.com.sg or simply scan the QR CODE

SIMULATED PERFORMANCE CHARTS

PBA Motor Sizer

Application Version: 10.7.0.0 | Local Database Version: 7.0.16 | Server Database Version: 7.0.16

Guest About PBA Online

Motor Sizer

Project Details
Customer Name: PBA Project Name: XYZ Date: 6/1/2022 Project Data Version: 7.0.16

Axis Details
Axis Name: X Motor Category: DXB Safety Margin: 20

Profiles

No	Motion Profile	Travel Distn (m)	Travel Time (s)	Max. Speed (m/s)	Max. Accel. (m/s^2)	Dwell Time (s)	Mass of Load (Kg)	Angle Of Incl. (°)	Direction	Coefficient of Friction	Opposing Force (N)	Ambient Temp. (°C)	RMS Force (N)	Peak Force (N)	Frictional Force (N)	Accel. Time (s)	Cruise Time (s)	Decel. Time (s)	Total Time (s)
1	Trapezoidal	1.000	1.000	1.500	4.500	0.100	10.000	0.000	▶	0.003	0.000	30.000	35.034	45.294	0.294	0.333	0.333	0.333	1.100
2	Trapezoidal	0.500	1.000	0.750	2.250	0.000	20.000	0.000	▶	0.003	0.000	30.000	36.747	45.589	0.589	0.333	0.333	0.333	1.000
3	Trapezoidal	0.500	1.000	0.750	2.250	0.000	30.000	0.000	▶	0.003	0.000	30.000	55.121	68.383	0.883	0.333	0.333	0.333	1.000

Final Calculations for Axis

Required RMS Force	43.026 N	Recommended Motor	Safety (%)
Required Peak Force	68.383 N	DX30B-C2-S	32
Total Travel Distance	2.000 m	DX30B-C2-P	32
Total Cycle Time	3.100 s	DX50B-C2-S	101
Total Dwell Time	0.100 s	DX50B-C2-P	101
Max Speed	1.500 m/s	DX50BT-C2-P	101
Max Acceleration	4.500 m/s^2	DX50BT-C4-P	294
Max. Ambient Temp.	30.000 °C		

Selected Motor

Motor	DX50B-C2-S		
Continuous Force	89.00 N	L To L Resistance	8.40 ohm
Peak Force	446.00 N	L To L Inductance	6.22 mH
Continuous Current	2.63 A	Continuous Power	60.00 W
Peak Current	13.13 A	Peak Power	1502.00 W
Motor Constant	11.51 N/A/V	Coil Weight	0.520 kg
Force Constant	34.00 N/A	Coil Length	121.00 mm
Back EMF Constant	39.10 V/(m/s)	Attractive Force	0.00 N

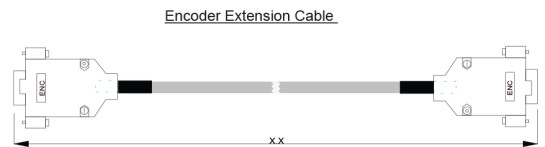
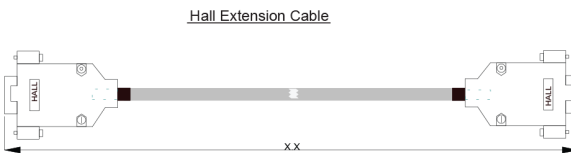
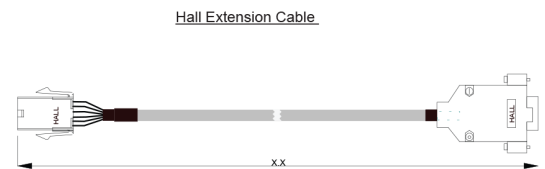
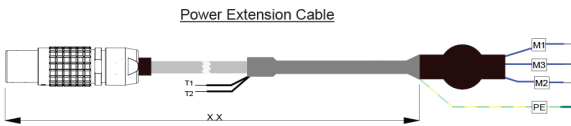
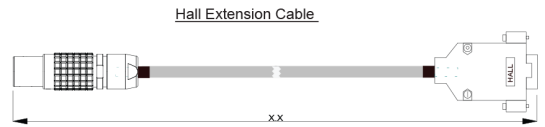
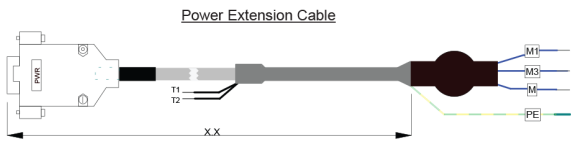
Calculated Motor Values for Application

Reqd. RMS Force	44.21 N	Reqd. Peak Force	69.57 N
Cont. Current	1.30 A	Peak Current	2.05 A
Coil Temp	48.03 °C	DC Bus Voltage	70.42 V
Safety Factor	101.29 %		

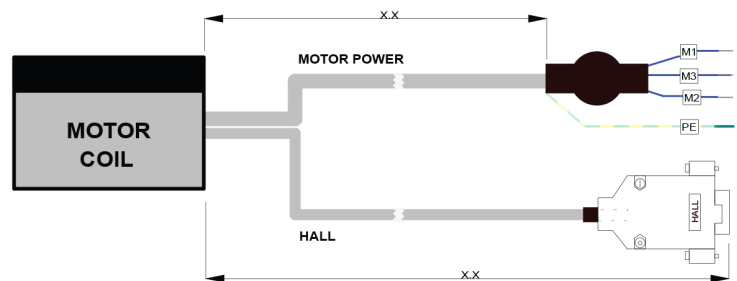
Servo Drive Model: MT-6/25-230AP1

Cont. Current: 6.30 A Peak Current: 25.40 A

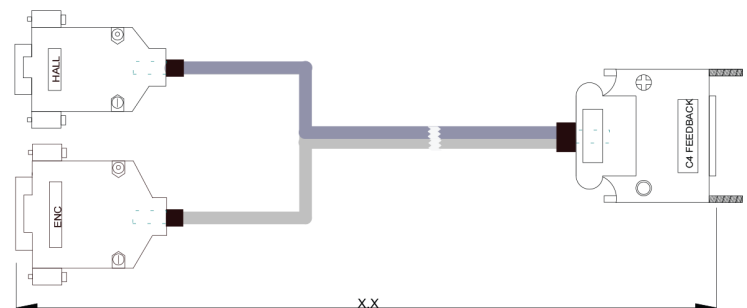
APPENDIX



MOTOR POWER HALL CABLE



MAXTUNE FEEDBACK CABLE



Notes:

1. X.X is the length of the cable in meter with a tolerance of $+0.10$ -0
2. All measurements are in meters (m) unless stated