pba

SYSTEMS

# DIRECT DRIVE TECHNOLOGY

## Product Catalogue

VERSION 4.1.1

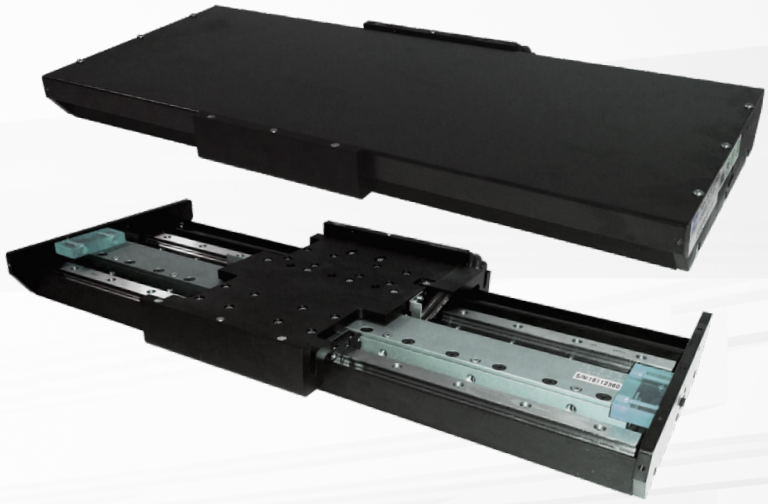
# PLA SERIES

## 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

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 |

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

**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**

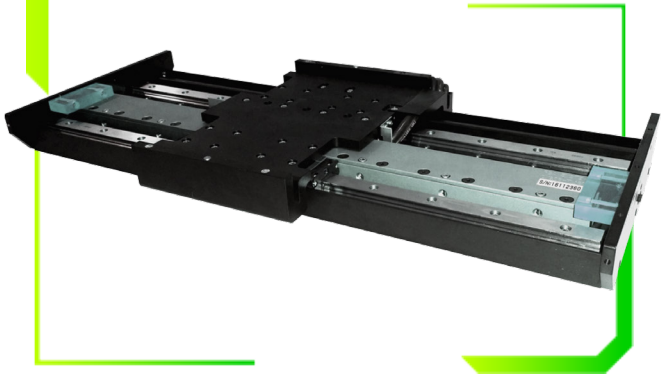
| | |
|---|---|
| EA | Analog |
| E0.5 | 0.5um |
| E1.0 | 1.0um |

**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) |

# PLA SERIES

MULTI-AXIS ACTUATOR

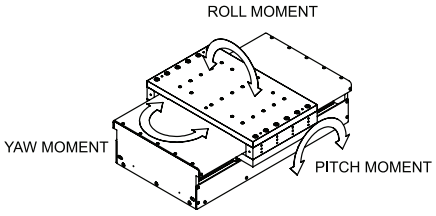


## PLA-D2

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

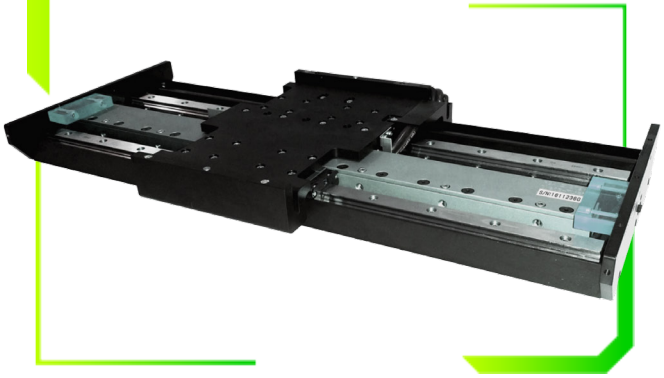
| SPECIFICATION | | MODEL | | | |
|---|---|---|---|---|---|
| | | PLA-D2-C2 | | PLA-D2-C3 | |
| **Motor Parameters** | **Unit** | **S** | **P** | **S** | **P** |
| Peak Force | N | 92 | | 137 | |
| Continuous Force @ 120°C* | N | 18 | | 27 | |
| Peak Power @ 120°C | W | 24 | | 36 | |
| Continuous Power @ 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 * Arms; Vpk = 1.414 * 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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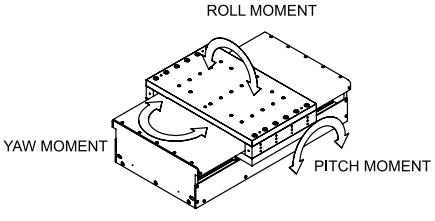
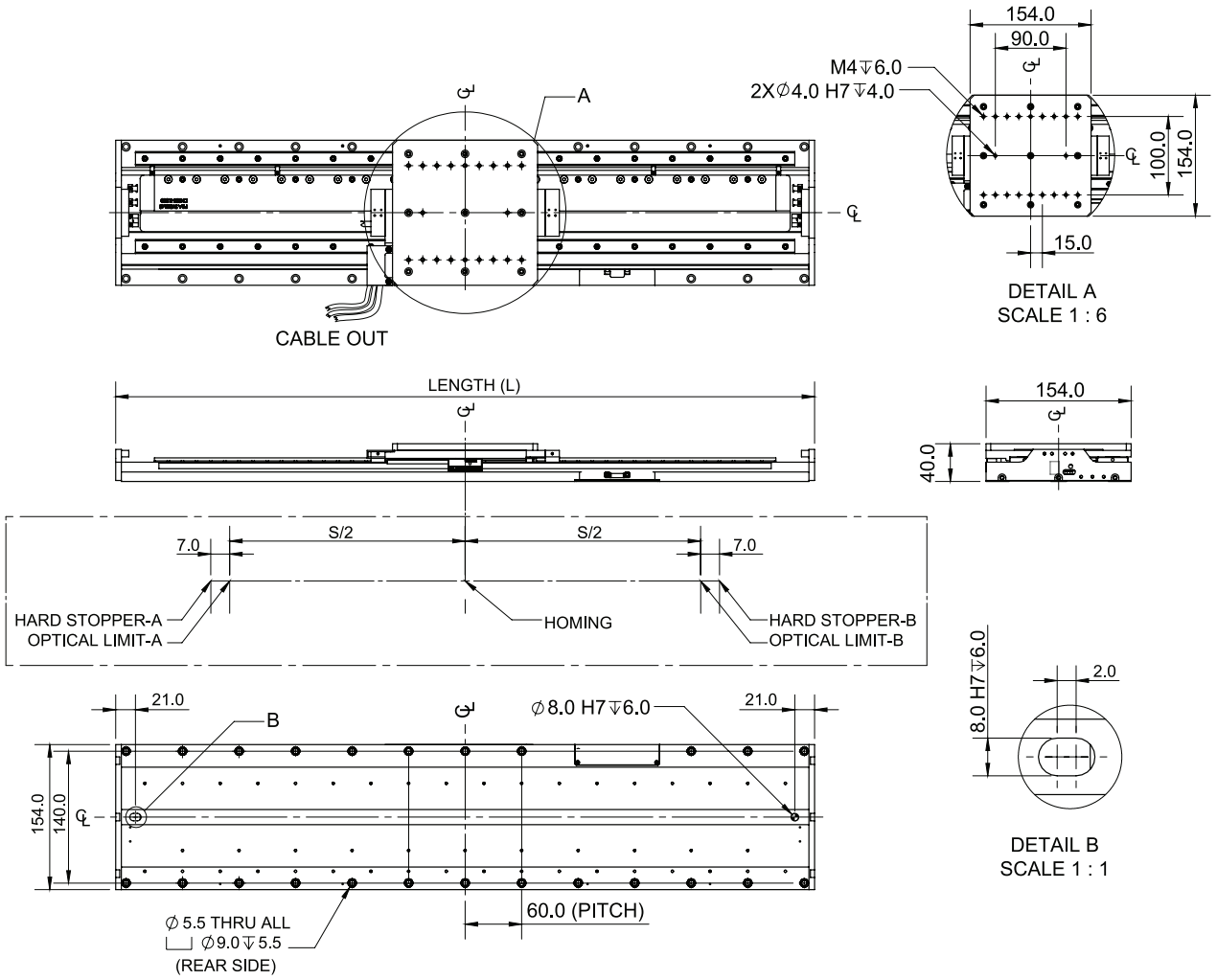


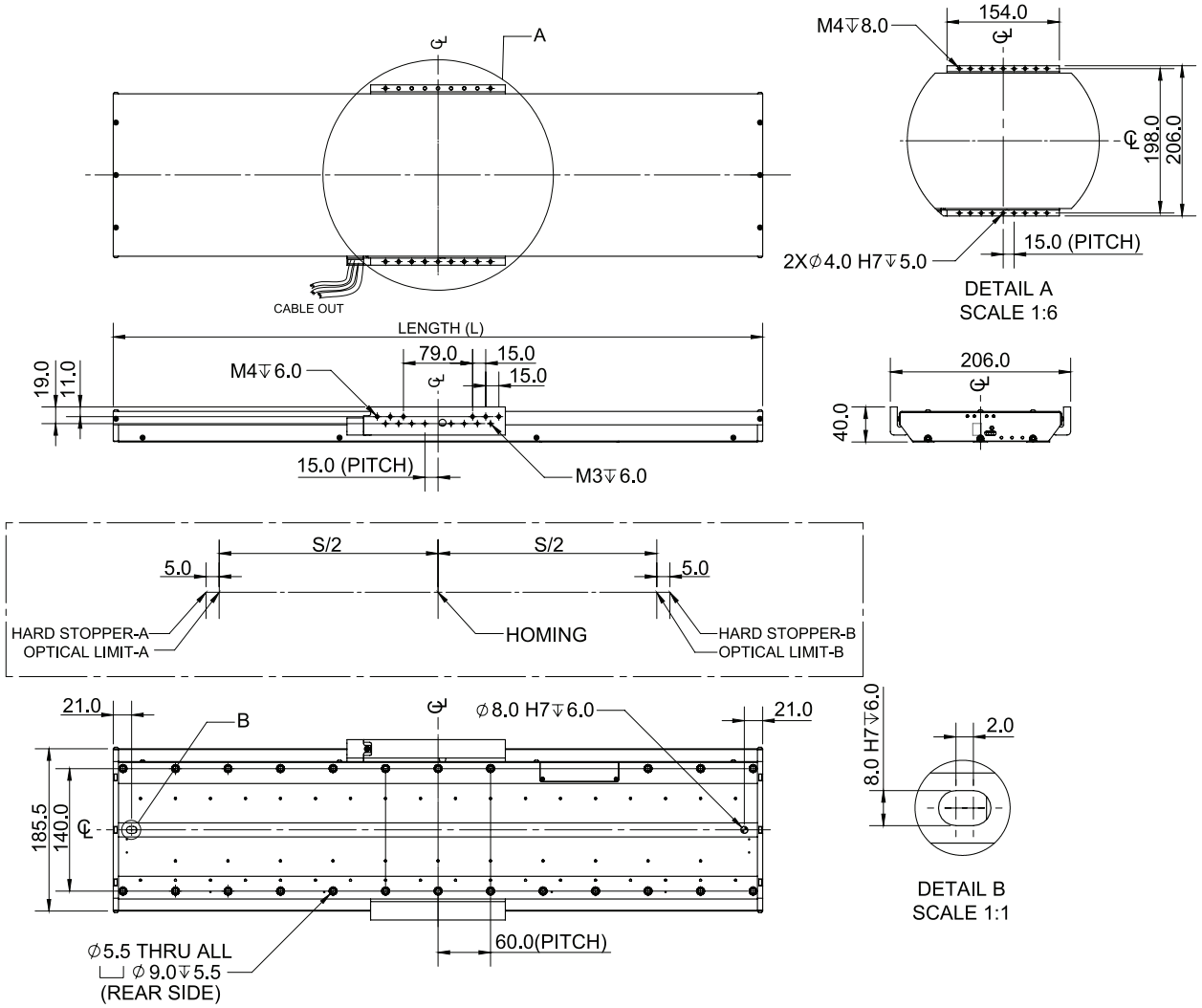
# PLA-OPEN TYPE




| 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 |
| | 740 | 952 | | | 10.6 |
| C4 & C5 | 140 | 382 | 154 | 1.9 | 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

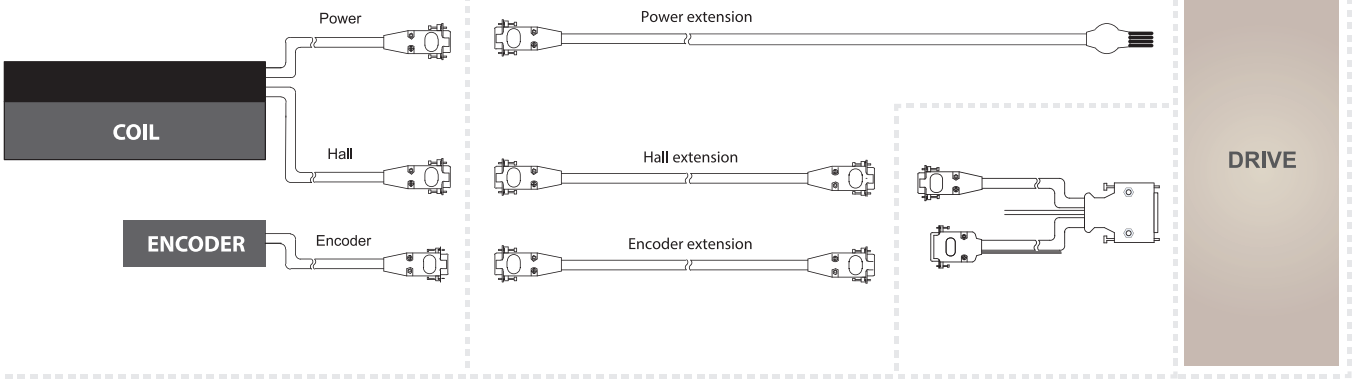
# PLA-OPEN TYPE




| 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



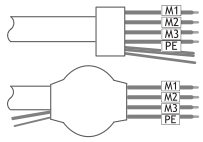

STAGE 1 | STAGE 2 (Optional) | STAGE 3

# STAGE 1 | POWER AND HALL CABLE OPTION

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

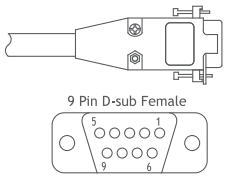
## POWER CABLE OPTIONS

### NF / FC



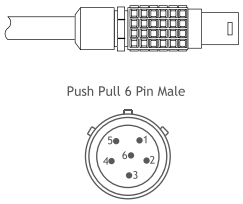

| | |
|---|---|
| M1 | Grey |
| M2 | Brown |
| M3 | Black |
| PE | Yellow |
| Temp sensor 1 | Black |
| Temp sensor 2 | Orange |

### 9NF




| | | |
|---|---|---|
| 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 |

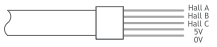
### CNF




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

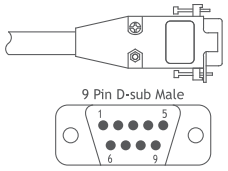
## HALL SENSOR OPTIONS

### H



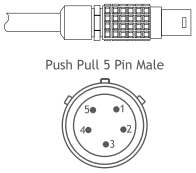

| | |
|---|---|
| Hall A | White |
| Hall B | Green |
| Hall C | Blue |
| 5V | Red |
| 0V | Black |

### HC



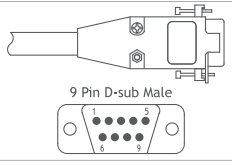

| | | |
|---|---|---|
| P1 | Hall A | White |
| P2 | Hall B | Green |
| P3 | Hall C | Blue |
| P4 | 5V | Red |
| P5 | 0V | Black |

### CHC




| | | |
|---|---|---|
| P1 | Hall A | White |
| P2 | Hall B | Green |
| P3 | Hall C | Blue |
| P4 | 5V | Red |
| P5 | 0V | Black |

### HCL




| | |
|---|---|
| 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

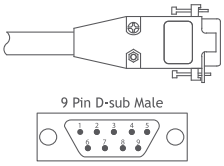
The temperature in which the thermostat is active is shown as below:

| 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.

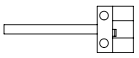
# PWA CABLE PIN OUT

## 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 |

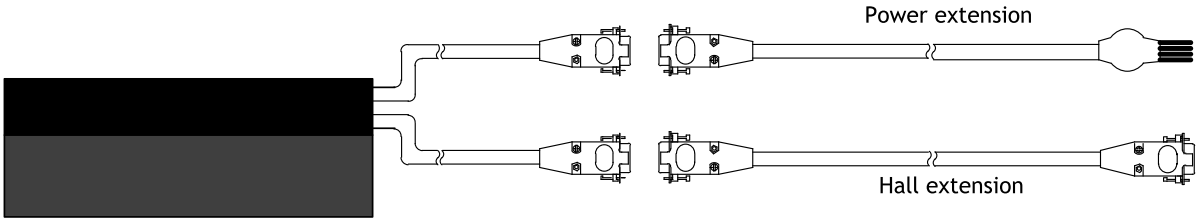
## OPTICAL LIMIT SWITCH (PM-L24)

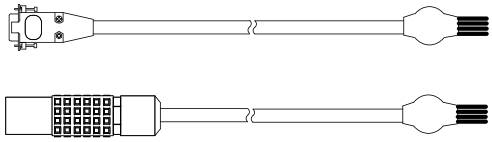
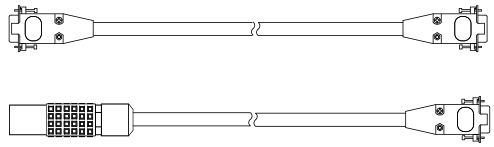
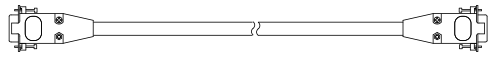


| | |
|---|---|
| +5 to 24V DC | Brown |
| GND | Blue |
| LIGHT-ON | Black |
| DARK-ON | White |

# 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<br>CBL_EXT_PWR_DX_CC_X.X |
| Hall Sensor Extension Cable |  | CBL_EXT_HALL0_X.X<br>CBL_EXT_HALL0_CC_X.X<br>CBL_EXT_HALL0_DIF_X.X |
| Encoder Extension Cable |  | CBL_EXT_REN01_X.X<br>CBL_EXT_REN01B_X.X |

| CABLE | |
|---|---|
| 00 | RGH41, VIONIC, QUANTIC Digital |
| 00A | RGH41 Analog |
| 01 | RH200 Digital |
| 01B | RH200 Analog |
| 05 | ATOM Ri Interface Digital |
| 05A | ATOM Ri Interface Analog |

| CABLE LENGTH (X.X) | |
|---|---|
| 0.5 | 0.5 meter |
| 1.0 | 1.0 meter |
| 2.0 | 2.0 meter |
| 3.0 | 3.0 meter |
| 4.0 | 4.0 meter |
| 5.0 | 5.0 meter |

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 QUESTIONAIRE

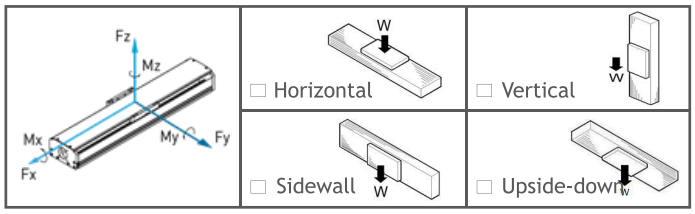
1. Application Description

1a. Application Sketch With Approx Dimensions

2. Load Parameter

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

Stage Requirements




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 | |

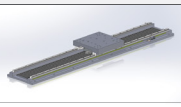
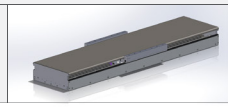
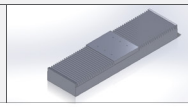
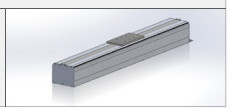
8. Working Environment

| | | |
|---|---|---|
| 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 |  | BELLOW |  | STRIP SEAL |  | |

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

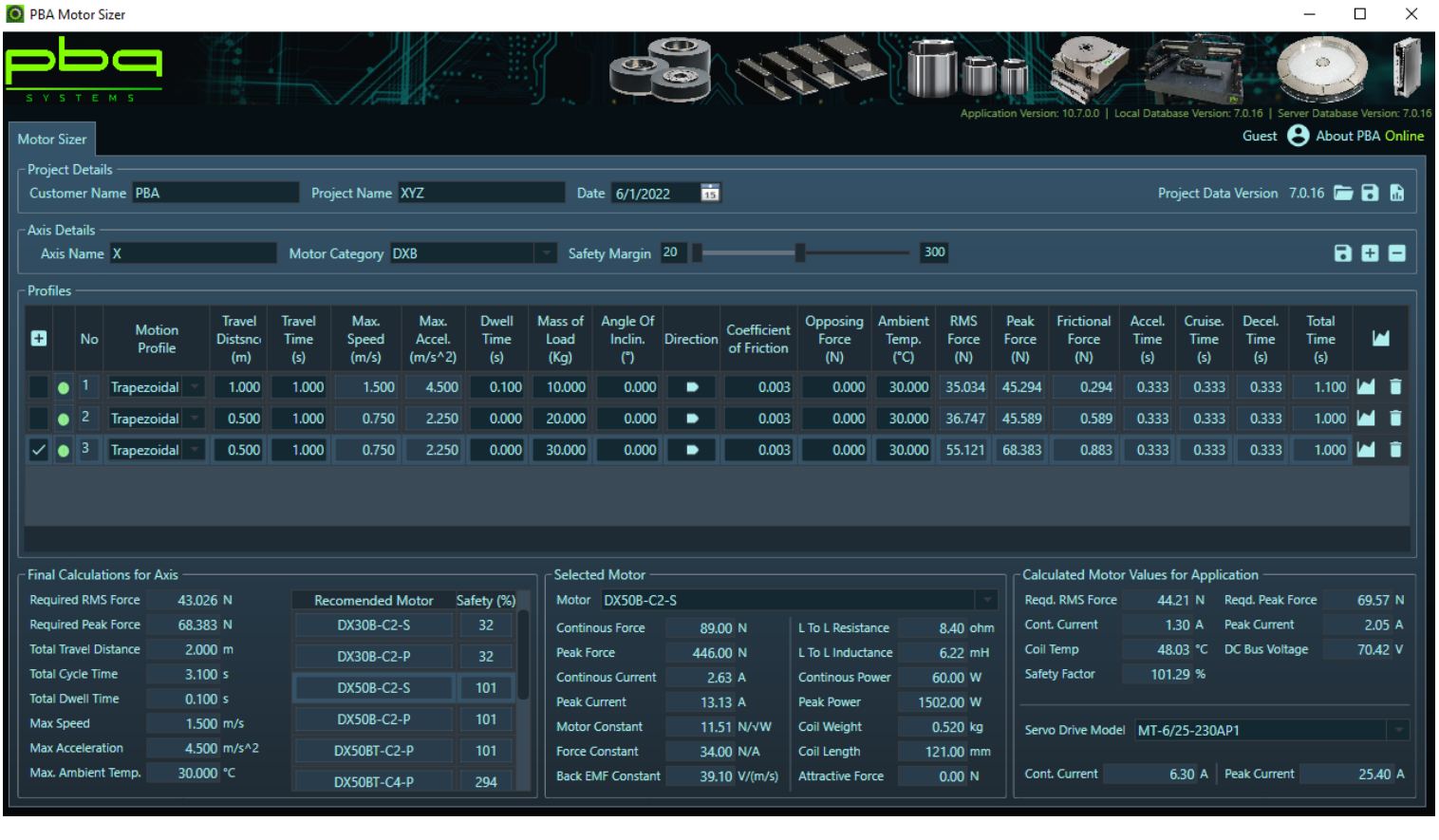
# PBA SYSTEMS LINEAR MOTOR SIZER SOFTWARE


## 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.

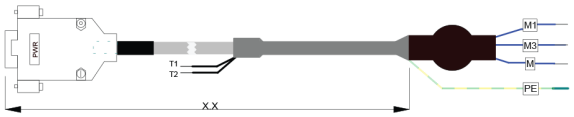
Kindly visit us at www.pbasystems.com.sg or simply scan the QR CODE

## SIMULATED PERFORMANCE CHARTS

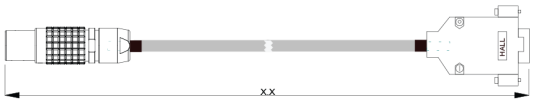


# APPENDIX

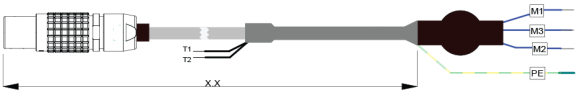
Power Extension Cable




Hall Extension Cable




Power Extension Cable

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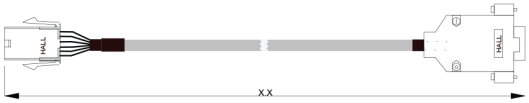


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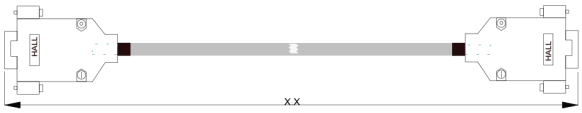
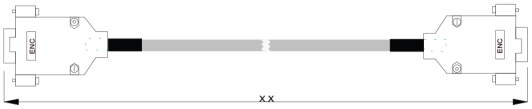
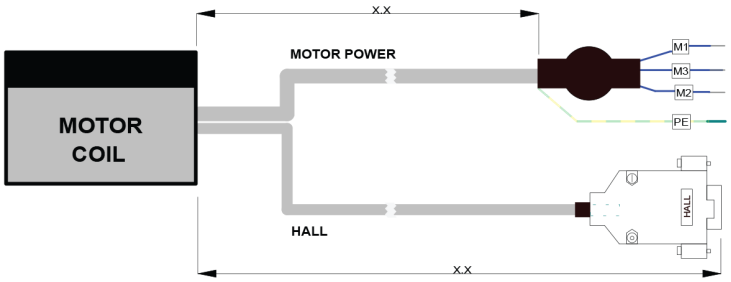


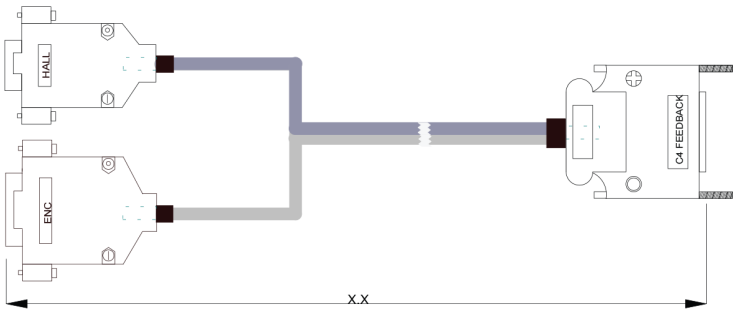

Encoder Extension Cable




## 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