

# Ball Screw type Linear Actuator

## Operating Instruction

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## 1 Product Introduction

KSS Linear Actuator series are compact type Linear Actuators with Ball Screw build in Stepper Motor. 3-Types of Linear Actuators are available, such as Captive, Non-Captive and External type. Wide variety of choices can be possible among Motor size, Ball Screw type and Screw lead. This series also provide high-efficiency, high accuracy and long life due to direct drive structure, which is coupling less design. KSS Linear Actuator series provide appropriate choice which fits your application.

Non-Captive type



Captive type



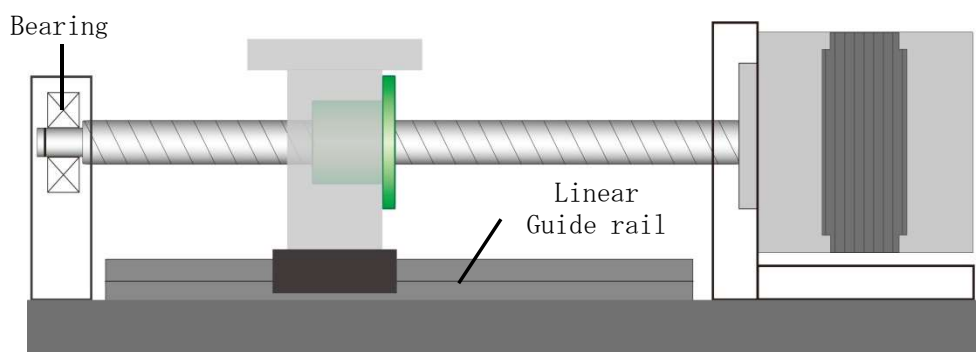
External type



<http://www.kss-superdrive.co.jp/>

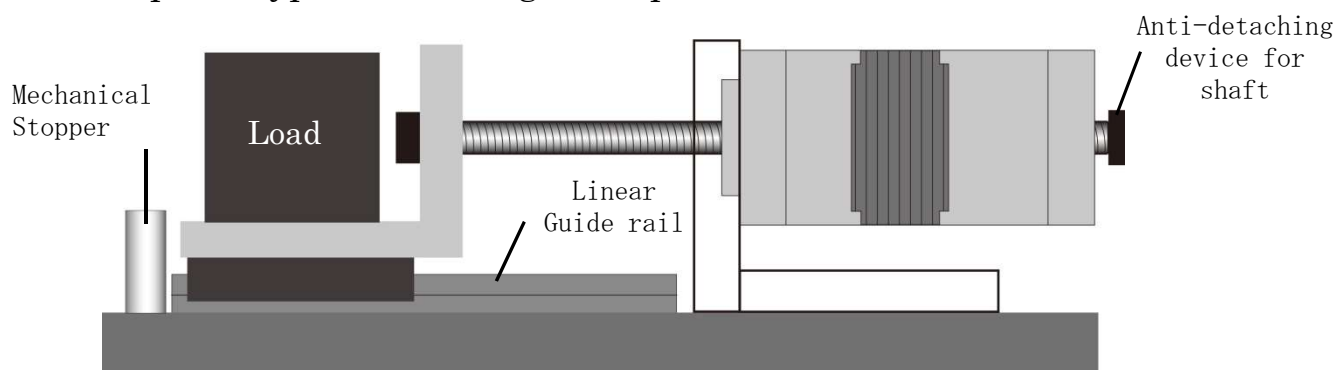
## 2 Assembling Example of Actuators

### 【External Type Assembling Example】



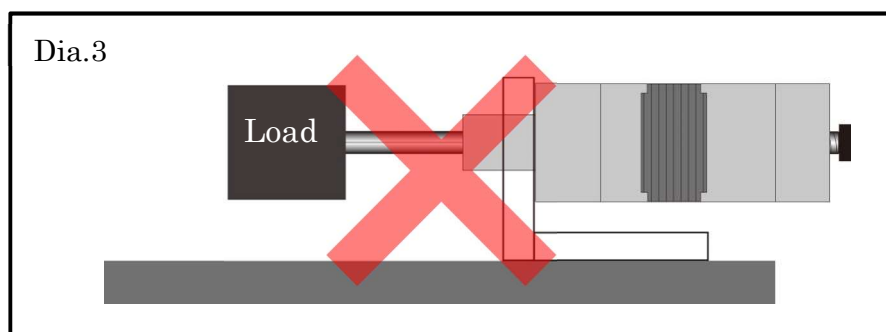
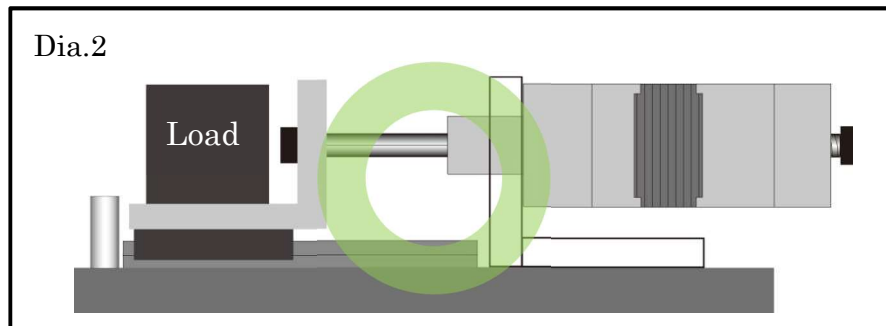
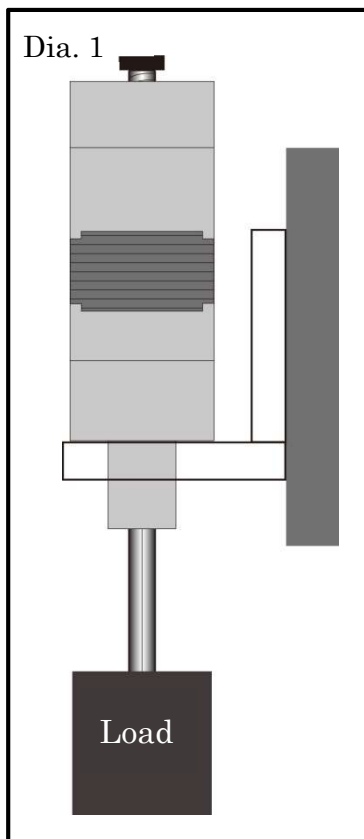
- External type does not have anti-rotating device. External anti-rotating device, such as Linear Guide rail, should be set up when usage. (see diagram above)
- Please support journal end by Bearing.

### 【Non-Captive Type Assembling Example】



- Non-Captive type does not have anti-rotating device. External anti-rotating device, such as Linear Guide rail should be set up when usage. (see diagram above)
- Do not use anti-detaching device for shaft as mechanical stopper for linear movement. It may damage the actuator by excessive force input. Anti-detaching device is for the shaft not to slip out from the Motor. Please set up mechanical stopper outside body when using.

## 【Captive Type Assembling Example】



- Radial load cannot be applied on Captive type. Please use Captive type Actuator in vertical position, as illustrated on [Dia.1] above.
- In horizontal position, configure as [Dia.2] as to apply radial load by Guide rail.
- Do not apply load as [Dia.3]. Radial load will directly apply to Ball Screw and may damage recirculation part of Ball Screw mechanism.

### 3 Operating Precautions

- 1) Please read and understand this Instruction carefully, exactly follow the safety precautions in prior to use this item.
  - 2) Do not hit or drop the Shaft, do not apply Axial or Radial load exceeding specifications, it may cause malfunction.
  - 3) Before using, please check that the product has no defect, and product is the same as your order.
  - 4) Do not disassemble the component, dust may get inside the product. It may deteriorate accuracy.
  - 5) Please prevent from contamination such as dust or swarf. Dust or swarf may cause damage to Ball Screw/Lead Screw, which lead to deteriorating the function.
  - 6) Motor is not designed to resist water or oil. Item cannot be used in direct exposure of water or oil, or environment such as oil bath.
  - 7) Lubrication is required under the Ball Screw operation. Lubrication condition should be checked in every 2 to 3 months. If Grease is contaminated, remove old Grease and replace with new one.
  - 8) Do not use the Linear Actuator exceeding our specifications in Load or Speed.
  - 9) Care must be taken not to apply Radial load or Moment load directly on Ball Screw. This will lead to shorten the Ball Screw life remarkably. In addition, misalignment between Ball Screw and other components will lead to deterioration of function, such as accuracy, life and so on.
  - 10) Allowing Ball Screw Nut to over-run may result in malfunctioning due to Ball escaping, damage to recirculation parts, and indentation on the raceways. Continued use in this state will lead to rapid wear and damage to recirculation parts. Therefore Ball Screw Nut must never be allowed to over-run. If over-run occurs, contact KSS for an inspection with charge.
  - 11) Do not hold Motor wires. Motor lead wire is for fixation, do not use the Motor lead wire as movabilities.
  - 12) Keep away from Magnetic memory device.
  - 13) The Motor has a resonant point within the specifications. Please avoid the resonant point when in use.
- ※ Since External type Actuator is the product which integrated the Motor Shaft and the Screw Shaft, repair is not possible, if either Motor or Ball Screw is damaged.

## 4 Safety Precautions

- 1) If abnormal odor, noise, smoke, overheating, or vibration occurs, stop operation immediately and turn the power off.
- 2) Do not use the Actuator exceeding rated current.
- 3) Check and confirm the polarity of the power supply in prior to activate the Motor.
- 4) The Motor may overheat depending on the load condition or Driver used. Make sure that the Motor surface temperature does not exceed 80 degrees (Celsius) when in use.
- 5) Check the wire connection type, Drive systems, and phase sequence. Inappropriate connection leads to malfunction.
- 6) A ground connection must be used.
- 7) Do not bend, pull or pinch the Motor lead wire.
- 8) Do not touch moving parts during operation.
- 9) Disconnect wire from the Controller before performing dielectric withstanding voltage test of the Motor or megger test.
- 10) Please switch off the Driver, when inspection or maintenance.

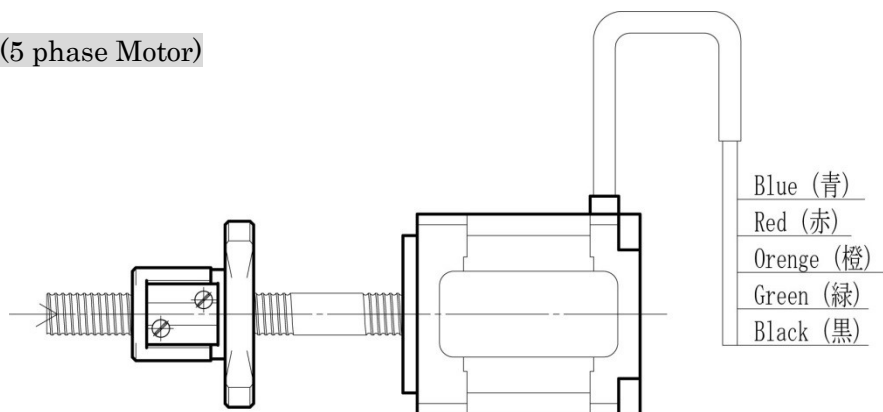
## Operating Environment

- 1) Operating environment should be 0~40 degrees (Celsius) in temperature and 20~80%RH in humidity. Do not use the Actuator under dew condensation, corrosive gas or inflammable gas environment.
- 2) Do not use the Actuator under strong electric field and strong magnetic field.
- 3) Please prevent from swarf, oil mist, cutting fluid, water/moisture, salt spray, organic solvent and other contamination.
- 4) The Actuator cannot be used under the vibration, impact, vacuum, and other special environment.

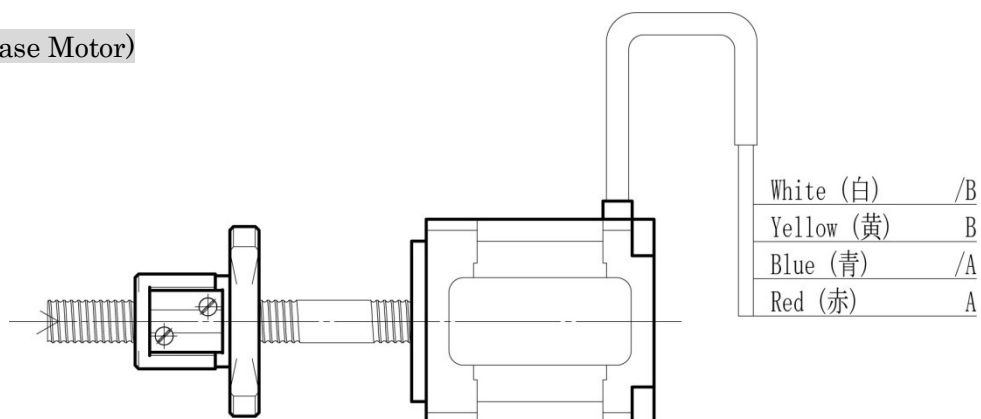
## 5 Wiring

### 【External Type】

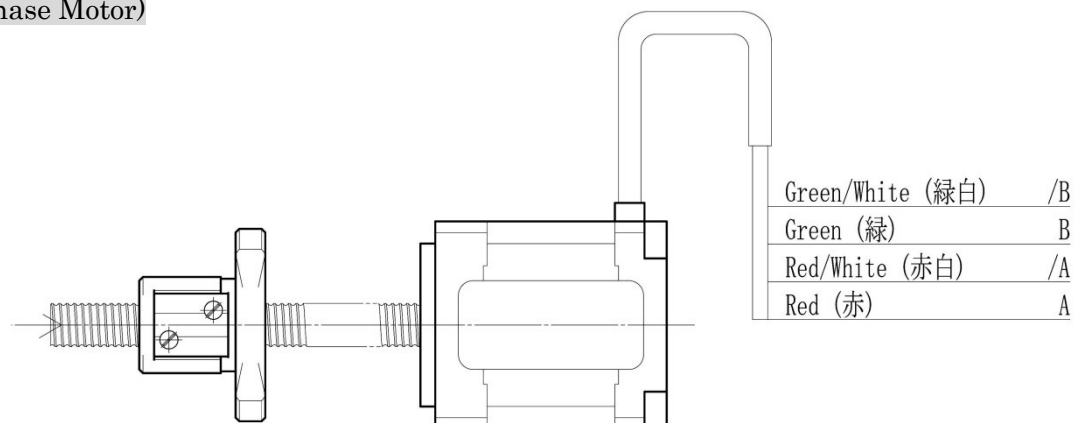
MB / TMB (5 phase Motor)



2TMB (2 phase Motor)

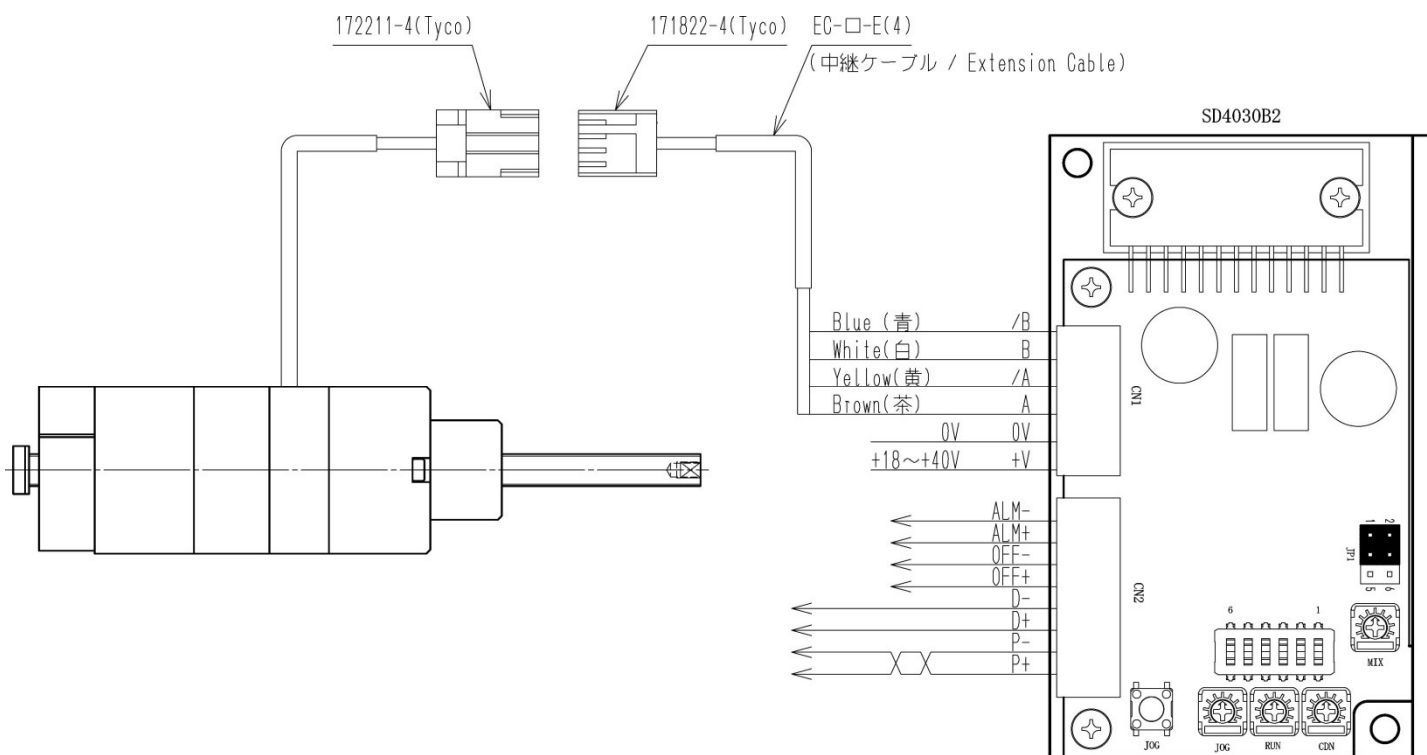


DMB (2 phase Motor)



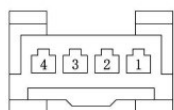


## 【Non-Captive / Captive Type】



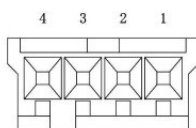
※Wiring example of KSS recommended 2 phase  
bi-polar driver “SD4030B2”.

モータケーブル172211-4 (オス)/Motor cable 172211-4 (male)



1	Stepping Motor /B (Blue/青)
2	Stepping Motor B (Red/赤)
3	Stepping Motor /A (Green/緑)
4	Stepping Motor A (Black/黒)

モータ中継ケーブル171822-4 (メス)/Motor Extension cable171822-4 (female)



1	Stepping Motor /B (Blue/青)
2	Stepping Motor B (White/白)
3	Stepping Motor /A (Yellow/黄)
4	Stepping Motor A (Brown/茶)

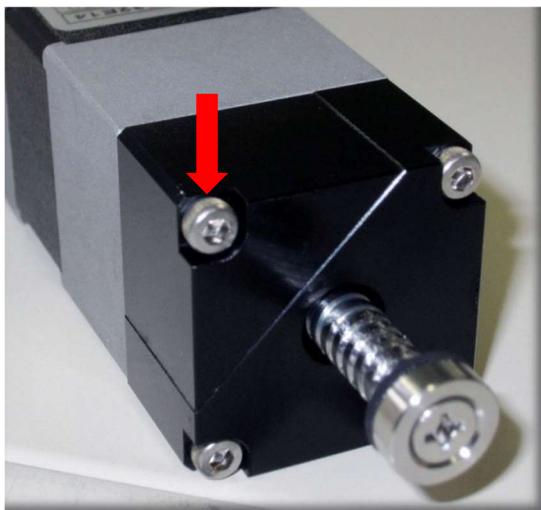
## 6 Troubleshooting

No.	Symptoms	Check	To do
1	The Motor does not move.	Is Driver working properly?	Check the power supplied properly to the Driver. Check the POWER LED is ON, after checking the connection in between the Driver and DC Power supply.
	The Motor is not excited.	Are the Motor and the Sensor wiring connected properly?	Check the connection of the Motor and the Sensor wiring. If the cable is extended, check the connection point (inside the connector) whether they have misconnection or not.
	Actuator is not moving.	Interference of moving area?	Check the interference at rotating, or linear unit.
2	Move opposite direction from signal. (Opposite movement against CW, CCW direction)	Do the same inspection as refer to No.1.	Check the connecting direction of CW pulse, and CCW pulse which they may connect in an opposite manner.
3	Operation is unstable.	Too fast or too slow in start-up speed?	Adjust the value of controller for Start-up speed and check the movement.
		Too short acceleration / deceleration time?	Provide more interval for acceleration / deceleration time.
		Too heavy loading?	Reduce load and operate again for movement.
	Step-out occurs frequently.	Right Motor is chosen?	Check the Motor power and the Screw lead for maximum loading.
		No misconnecting of wire for the Motor?	Check the wire connection for the Motor.
		Is the current for driver appropriate?	Adjust the Driver current to the Motor Rated current.
4	Abnormal vibration. (Large vibration)	Operating speed is too slow?	Possibly caused by resonance of the Motor and its load, therefore apply change in operating speed or step angle.
		Are the Motor wire and the Sensor wires connected properly?	Check the connection of the Motor and the Sensor wires.
		Is the Actuator securely placed on the flat surface?	Place the Actuator on flat surface, securely fixed to avoid any wobbling.
5	Abnormal heating of Motor. (Motor will be heated to a certain extent)	Too long operating time? Too short halt time?	Set operating program as below 50% of Operation Duty. [Operation Duty = operating time / (operating time+halt time) × 100]
		Too high temperature of working environment?	Review the temperature environment of using the Actuator.
		Is "current down function" of driver activated?	Activate "current down function" of driver.
		Current for operating the Motor is appropriate?	Adjust the Driver current to the Motor Rated current.
6	Abnormal noise.	Are the Motor wire and the Sensor wires connected properly?	Check the connection of the Motor and the Sensor wires.
		Uneven load to the Actuator?	Possible cause of early deterioration. Adjust to proper load.
7	Not moving as specifications.	Intend to operate exceed its specifications?	Check specifications, and operate below specifications in catalogue.
		Are the Motor wire and the Sensor wires connected properly?	Check the connection of the Motor and the Sensor wires.
		Motor driving current is appropriate?	Adjust the Driver current to the Motor Rated current.
8	Positioning error. (Positioning overshoot) Inconsistent Accuracy.	Too heavy loading?	Actual loading may exceed compared to the Motor power and the Screw lead. Lower the actual load and check the movement.
		Too short acceleration/deceleration time?	Provide more interval for acceleration / deceleration time.
		Motor driving current is appropriate?	Adjust the Driver current to the Motor Rated current.
		Is the Actuator assembled accurately?	Check the accuracy of assembling any related unit, as the accuracy largely depends on the assembling accuracy of each single units.
		Appropriate choice of the Motor and the drive shaft?	Check the choice of the Motor and the ball screw specifications as required.
9	Grease decoloring in screws or shaft. Early deterioration of drive shaft.	Grease maintenance is done periodically?	Immediately stop operating and apply new grease.
		Using actuator in debris of irons or fine particles?	Check the working environment.
		Uneven load to actuator?	Check the accuracy of assembling any related unit, as the accuracy largely depends on the assembling accuracy of each single units.

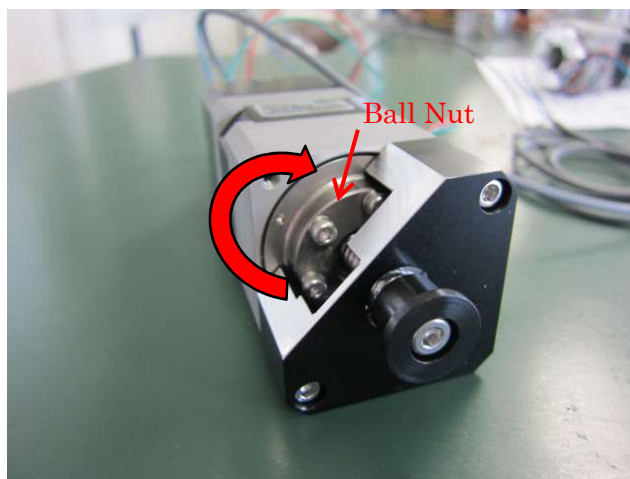
## 6 Troubleshooting (Cont'd)

Recovering from the shaft to bit inside the unit

[Pic.1]



[Pic.2]



- 1) Remove triangular cover on the back of the Actuator body by loosen the screw as indicated.

[Pic.1]

- 2) Hold Ball Nut directly and turn clockwise direction. [Pic.2]