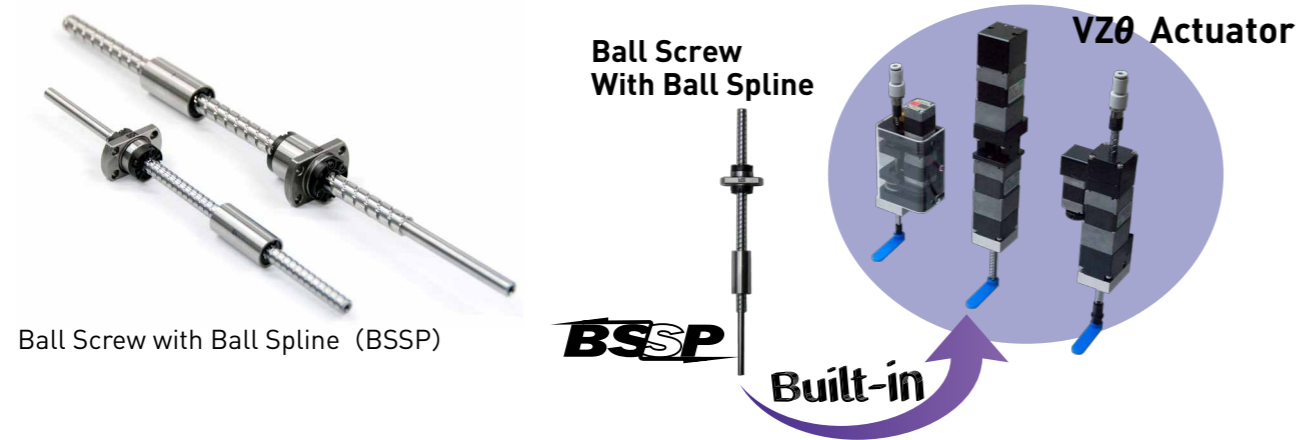


# VZθ Actuator

## VZθ Series

The brand new products which applied the KSS miniature Ball Screw with Ball Spline (BSSP), and realized three functions, linear motion(Z), rotary motion(θ), and vacuum(V), with one product.



### Types and Features

KSS provides 3-types of VZθ Actuator, which are Direct Drive type, Hybrid Drive type, and Belt-Drive type including high speed type. It is possible to select one of them according to your specifications or application.



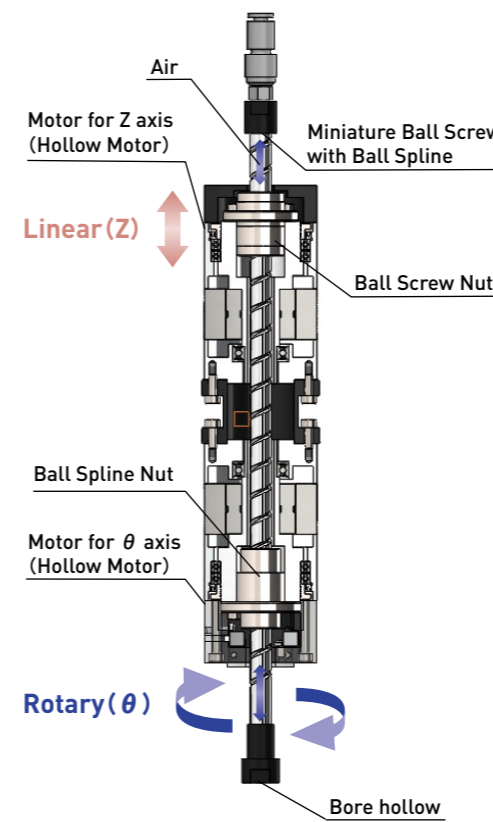
### Specifications

Model	Shaft dia. (mm)	Lead (mm)	Travel (mm)	Max. Speed(Z) (mm/sec)	Max. speed(θ) (rev/sec)	Thrust Force (N)	Max. Permissible Moment (kg·m <sup>2</sup> )
Direct Drive type	φ6	10	50	120	3	5	0.15×10 <sup>-4</sup>
	φ8	10	50	200	3	25	0.15×10 <sup>-3</sup>
Hybrid Drive type	φ6	10	60	200	3	5	0.15×10 <sup>-4</sup>
Belt-Drive type	φ4	4	60	80	3	5	0.8×10 <sup>-5</sup>
	φ6	10	60,120	200	3	10	0.4×10 <sup>-4</sup>
	φ8	10	120	200	3	15	0.1×10 <sup>-3</sup>
Belt-Drive High speed type	φ6	10	80	500	25	3	0.15×10 <sup>-4</sup>

### Structures

#### [Direct Drive type]

Slim form is realized by driving a Ball Screw and a Ball Spline Nut directly built in a Hollow Motor.



#### -Principle of operation-

##### Linear motion (Z)

Linear motion by driving a Z-axis Motor and rotating the Ball Screw Nut. At this time, the Ball Spline Nut plays a role of anti-rotating device and slide guide of a Screw Shaft.

##### Rotary Motion (θ)

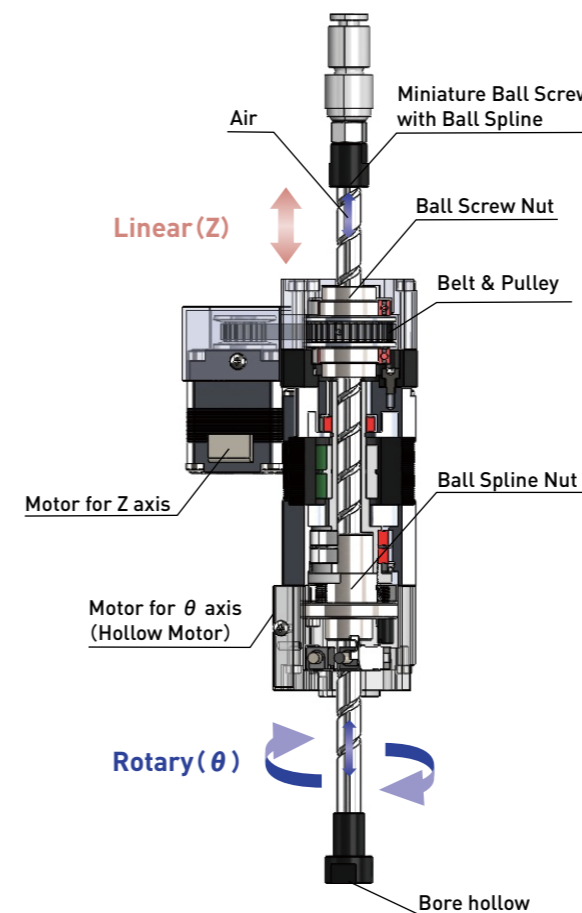
Turn the Ball Screw Nut and Ball Spline Nut at the same time, same speed and direction, the Shaft rotates without moving up & down.

##### Vacuum (V)

Bore Hollow can be multi uses. For example vacuum and blow function.

#### [Hybrid Drive type]

Combination of the Hollow Motor and Normal Motor gives dramatically short length of Actuator Body.



#### -Principle of operation-

##### Linear motion (Z)

For linear motion, drive the Ball Screw Nut by Z-axis Motor through the Belt & Pulley. In this case, Ball Spline Nut plays a role of slide guide & anti-rotating device.

##### Rotary Motion (θ)

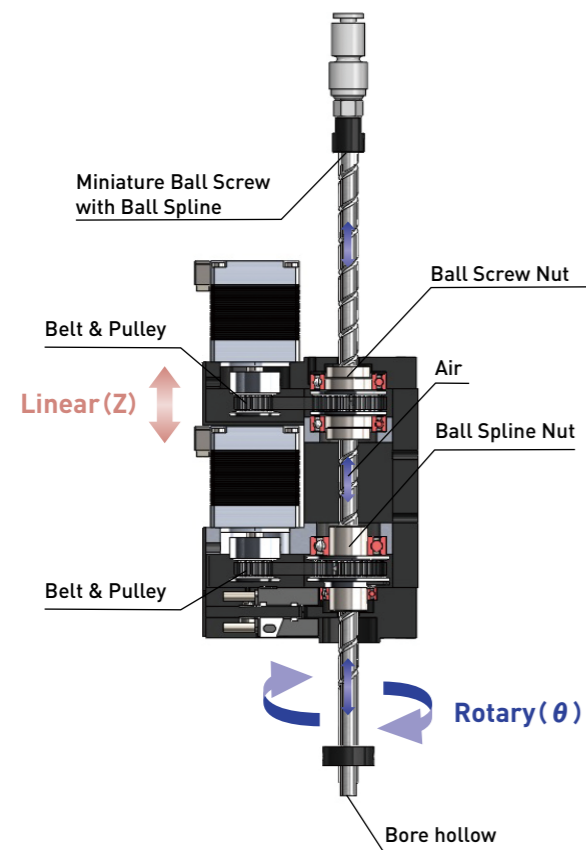
Turn the Ball Screw Nut and Ball Spline Nut at the same time, same speed and direction, the Shaft rotates without moving up & down.

##### Vacuum (V)

Bore Hollow can be multi uses. For example vacuum and blow function.

**[Belt Drive type]**

Wide variety of Motor can be set on this Actuator.  
This means various options are available based on Motor Specifications.

**-Principle of operation-****Linear motion (Z)**

For linear motion, drive the Ball Screw Nut by Z-axis Motor through the Belt & Pulley. In this case, Ball Spline Nut plays a role of slide guide & anti-rotating device.

**Rotary Motion (θ)**

Turn the Ball Screw Nut and Ball Spline Nut at the same time, same speed and direction, the Shaft rotates without moving up & down.

**Vacuum (V)**

Bore Hollow can be multi uses.  
For example vacuum and blow function.

**● Model number notation**

**[Direct Drive type / Hybrid Drive type]**

**DD** **VZ** **42** - **G** **05** - **050** **N** **XXX**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

- ① Series No.  
DD : Direct Drive type  
HD : Hybrid Drive type
- ② Actuator type  
VZ : VZ θ (VZ-theta) Actuator
- ③ Motor size  
42 : NEMA 17 Stepping Motor  
28 : NEMA 11 Stepping Motor
- ④ Lead Screw / Ball Screw type  
G : Precision Ball Screw+Ball Spline
- ⑤ Lead / Pitch (mm) : 05 means 5mm
- ⑥ Travel (mm) : 050 means 50mm
- ⑦ Connector type  
N : No connector (Bare)  
E : EI connector (TE Connectivity)
- ⑧ Extra notation

**[Belt Drive type]**

**BD** **VZ** **06** - **G** **10** - **050** **N** **01** **XXX**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

- ① Series No.  
BD : Belt Drive Actuator Series
- ② Actuator type  
VZ : VZ θ (VZ-theta) Actuator
- ③ Shaft Nominal diameter : 06 means 6mm
- ④ Lead Screw / Ball Screw type  
G : Precision Ball Screw+Ball Spline
- ⑤ Lead / Pitch (mm) : 10 means 10mm
- ⑥ Travel (mm) : 050 means 50mm
- ⑦ Connector type  
N : No connector (Bare)  
E : EI connector (TE Connectivity)
- ⑧ Motor type  
01 : NEMA 10 Stepping Motor  
02 : NEMA 11 Stepping Motor  
03 : NEMA 14 Stepping Motor
- ⑨ Extra notation

**[High Speed Belt Drive type]**

The model number nomination is as follows for High Speed Belt Drive type or custom design products which specifications and dimension significantly change from Catalogue.

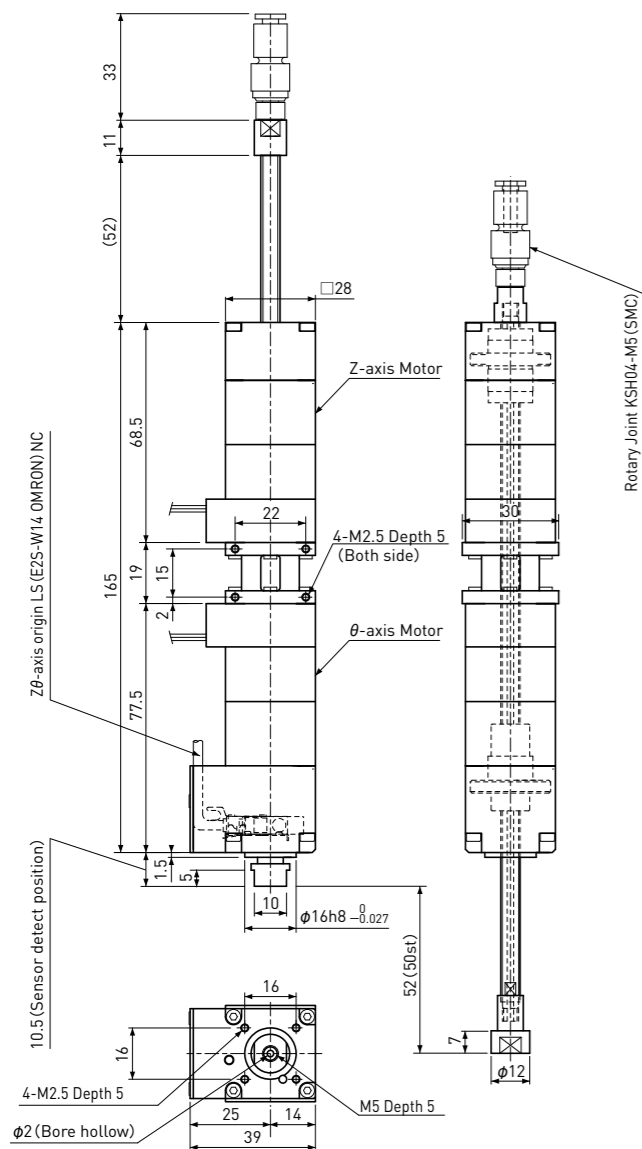
**DD** **28** - **G** **100** **100** **N2** **K** **2** **E** - **B**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

- ① Actuator type  
DD : Direct Drive Actuator Series  
HD : Hybrid Drive Actuator Series  
BD : Belt Drive Actuator Series
- ② Motor Frame size  
25 : NEMA 10    28 : NEMA 11  
35 : NEMA 14    42 : NEMA 17
- ③ Lead Screw / Ball Screw type  
G : Precision Ball Screw
- ④ Lead / Pitch (mm) : 100 means 10mm
- ⑤ Travel (mm) : 100 means 100mm
- ⑥ Motor type  
N2 : 2-phase stepping motor  
N5 : 5-phase stepping motor  
NE : Stepping motor with Encoder  
NS : Servo motor
- ⑦ Sensor type  
F : Photo-Micro    L : Limit Switch  
K : Proximity    Z : Magnetic
- ⑧ Number of Sensor  
1 : 1 sensor    2 : 2 sensors
- ⑨ Connector type  
H : HIROSE  
E : EI (TE Connectivity)  
N : No connector (Bare)
- ⑩ Option  
B : Electro Magnetic Brake  
C : for Clean room    V : Vacuum  
( ) : Motor position represented by degree

DDVZ28 - G10 - 050 N

□28 / NEMA 11 2-phase Stepping Motor  
Lead 10mm Travel 50mm



Parts List	
Motor	NEMA 11 Hollow Stepping Motor 0.67A/phase
Drive Screw	Ball Screw φ6 (Lead 10mm)
Sliding Guide	Ball Spline φ6mm
Sensor (Linear, Rotary)	Proximity Sensor E2S-W14-1M(OMRON)

Motor (Z, θ -axis)	
A	Black
Ā	Green
B	Red
B̄	Blue

UL1061,AWG24 (300mm)

Sensor (Z, θ -axis)	
+12~24V	Brown
LS	Black
GND	Blue

1000mm

Specifications

※The numbers in table below are reference. Detail dimensions will be provided by drawing

Items	Z Axis	θ Axis
Movable Range	50mm	± 360°
Repeatability	±0.010mm	±0.03°
Resolution	50 μm (Full Step)	1.8° (Full Step)
Maximum Speed	120mm / sec	3 rev / sec
Maximum acceleration	0.6 m/sec <sup>2</sup>	150π rad/sec <sup>2</sup>
Reference Thrust Force	5N	—
Maximun Permissible Moment	—	0.15×10 <sup>-4</sup> kg·m <sup>2</sup> (※1)
Mass	540g	
Operating Temperature	0~40°C (No Condensation)	

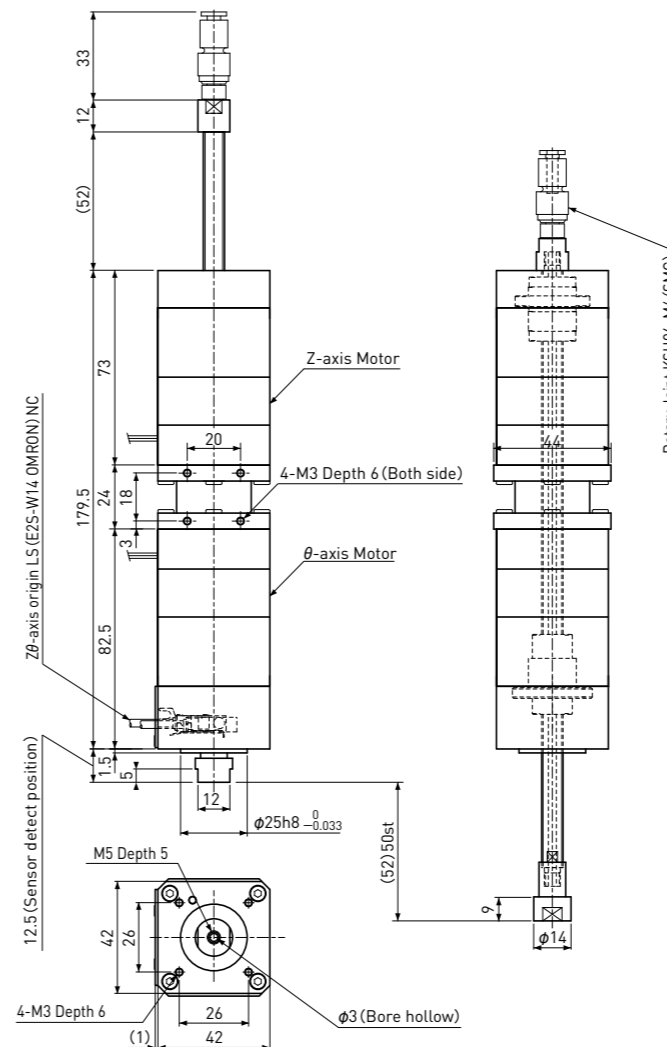
Dia.	Reference of Moment of Inertia	
	Aluminum	Steel
φ20mm	340mm (300g)	120mm (300g)
φ30mm	65mm (130g)	25mm (130g)
φ40mm	20mm (75g)	7.5mm (75g)

Precautions  
 1) The Z-axis does not have brake device. Please be careful when the power supply is switched off in case Z-axis may free-fall.  
 2) Reference of Moment of Inertia table shows the theoretical values. KSS recommends that you should apply actual moment to the machine and confirm the safety operation before use.

※1 For the Maximum Permissible Moment, see "Reference of Moment of Inertia" table above.  
 ※2 For the technical information, see "Actuator Technical Description".

DDVZ42 - G10 - 050 N

□42 / NEMA 17 2-phase Stepping Motor  
Lead 10mm Travel 50mm



Parts List	
Motor	NEMA 17 Hollow Stepping Motor 1.2A/phase
Drive Screw	Ball Screw φ8 (Lead 10mm)
Sliding Guide	Ball Spline φ8mm
Sensor (Linear, Rotary)	Proximity Sensor E2S-W14-1M(OMRON)

Motor (Z, θ -axis)	
A	Black
Ā	Green
B	Red
B̄	Blue

UL1061,AWG24 (300mm)

Sensor (Z, θ -axis)	
+12~24V	Brown
LS	Black
GND	Blue

1000mm

Specifications

※The numbers in table below are reference. Detail dimensions will be provided by drawing

Items	Z Axis	θ Axis
Movable Range	50mm	± 360°
Repeatability	±0.010mm	±0.03°
Resolution	50 μm (Full Step)	1.8° (Full Step)
Maximum Speed	200mm / sec	3 rev / sec
Maximum acceleration	1 m/sec <sup>2</sup>	150π rad/sec <sup>2</sup>
Reference Thrust Force	25N	—
Maximun Permissible Moment	—	0.15×10 <sup>-3</sup> kg·m <sup>2</sup> (※1)
Mass	1150g	
Operating Temperature	0~40°C (No Condensation)	

Dia.	Reference of Moment of Inertia	
	Aluminum	Steel
φ30mm	670mm (1300g)	240mm (1300g)
φ50mm	85mm (460g)	30mm (460g)
φ100mm	5mm (110g)	1.5mm (90g)

Precautions  
 1) The Z-axis does not have brake device. Please be careful when the power supply is switched off in case Z-axis may free-fall.  
 2) Reference of Moment of Inertia table shows the theoretical values. KSS recommends that you should apply actual moment to the machine and confirm the safety operation before use.

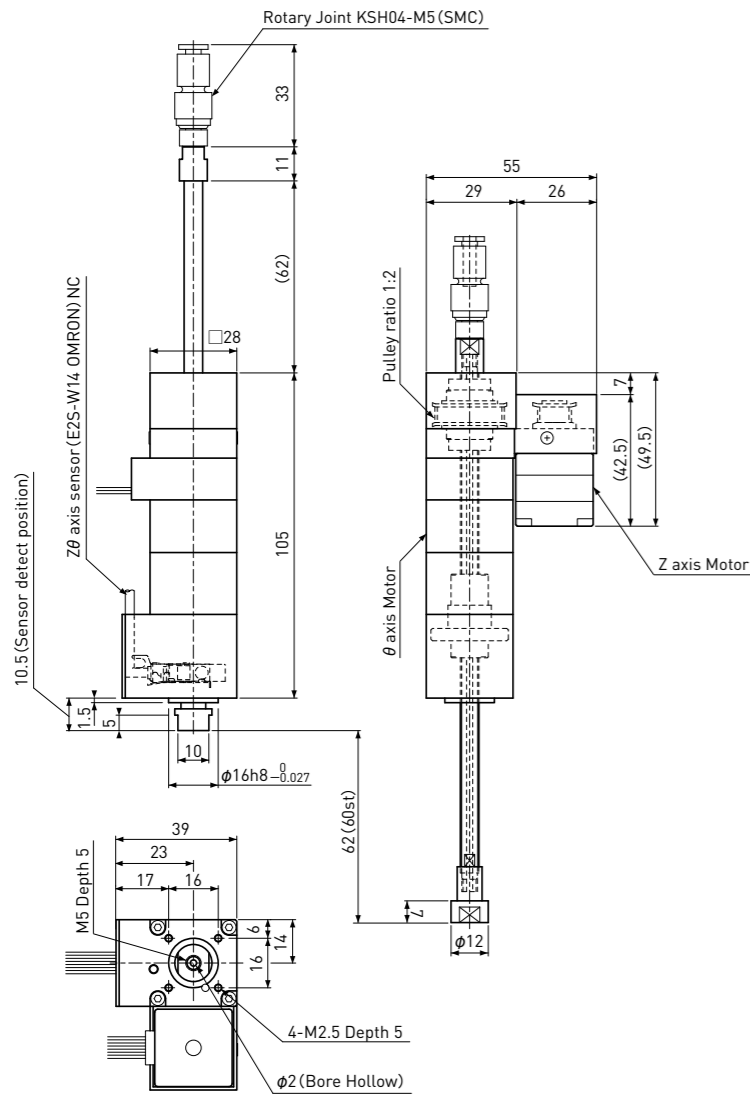
※1 For the Maximum Permissible Moment, see "Reference of Moment of Inertia" table above.  
 ※2 For the technical information, see "Actuator Technical Description".

Standard style of VZθ HD series

Hybrid type

HDVZ28 - G10 - 060 N

□25/28 (NEMA10/11) 2-phase Stepping Motor  
Lead 10mm Travel 60mm



Parts List	
Motor	Z NEMA 10 Stepping Motor 0.7A/phase
	θ NEMA 11 Hollow Stepping Motor 0.67A/phase
Drive Screw	Ball Screw φ6 (Lead 10mm)
Sliding Guide	Ball Spline φ6mm
Sensor (Linear, Rotary)	Proximity Sensor E2S-W14-1M(OMRON)

Z-axis Motor	
A	Red
Ā	Yellow
B	Blue
B̄	Orange
UL1061,AWG26 (300mm)	

θ-axis Motor	
A	Black
Ā	Green
B	Red
B̄	Blue
UL1061,AWG24 (300mm)	

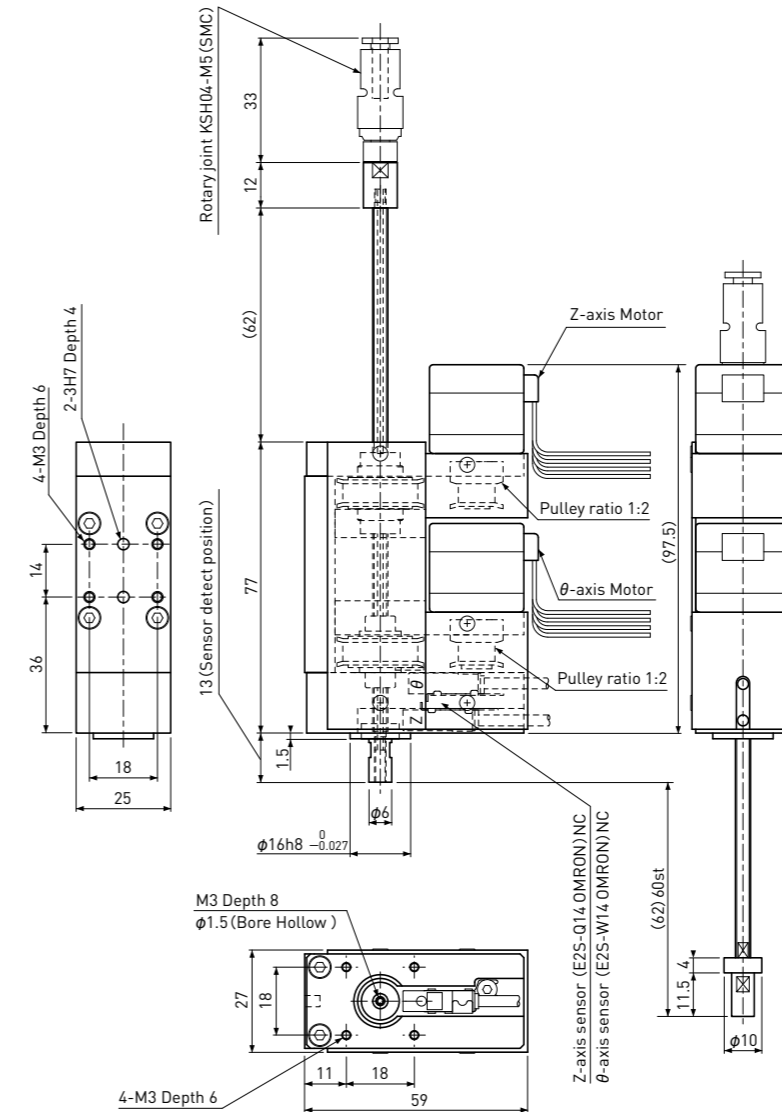
Sensor (Z, θ-axis)	
+12~24V	Brown
LS	Black
GND	Blue
1000mm	

Standard style of VZθ BD series

Belt Drive type

BDVZ04 - G04 - 060 N 01

□25/NEMA 10 2-phase Stepping Motor  
Lead 4mm Travel 60mm



Parts List	
Motor	NEMA 10 Stepping Motor 0.7A/phase
Drive Screw	Ball Screw φ4 (Lead 4mm)
Sliding Guide	Ball Spline φ4mm
Sensor	Z axis : Proximity Sensor E2S-Q14-1M (OMRON) NC
	θ axis : Proximity Sensor E2S-W14-1M (OMRON) NC

Motor (Z, θ-axis)	
A	Red
Ā	Yellow
B	Blue
B̄	Orange
UL1061,AWG26 (300mm)	

Sensor (Z, θ-axis)	
+12~24V	Brown
LS	Black
GND	Blue
1000mm	

Specifications

※The numbers in table below are reference. Detail dimensions will be provided by drawing.

Items	Z Axis	θ Axis
Movable Range	60mm	± 360°
Repeatability	±0.020mm	±0.03°
Resolution	25 μm (Full Step)	1.8° (Full Step)
Maximum Speed	200mm / sec	3 rev / sec
Maximum acceleration	1 m/sec <sup>2</sup>	150π rad/sec <sup>2</sup>
Reference Thrust Force	5N	—
Maximun Permissible Moment	—	0.15 × 10 <sup>-4</sup> kg·m <sup>2</sup> (※1)
Reduction ratio	1/2	—
Mass	440g	
Operating Temperature	0~40°C (No Condensation)	

Dia.	Reference of Moment of Inertia	
	Aluminum	Steel
φ20mm	340mm (300g)	120mm (300g)
φ30mm	65mm (130g)	25mm (130g)
φ40mm	20mm (75g)	7.5mm (75g)

Precautions  
 1) The Z-axis does not have brake device. Please be careful when the power supply is switched off in case of Z-axis may free-fall.  
 2) Reference of Moment of Inertia table shows the theoretical values. KSS recommends that you should apply actual moment to the machine and confirm the safety operation before use.

※1 For the Maximum Permissible Moment, see "Reference of Moment of Inertia" table above.  
 ※2 For the technical information, see "Actuator Technical Description".

Specifications

※The numbers in table below are reference. Detail dimensions will be provided by drawing.

Items	Z Axis	θ Axis
Movable Range	60mm	± 360°
Repeatability	±0.020mm	±0.03°
Resolution	10 μm (Full Step)	0.9° (Full Step)
Maximum Speed	80mm / sec	3 rev / sec
Maximum acceleration	0.4 m/sec <sup>2</sup>	150π rad/sec <sup>2</sup>
Reference Thrust Force	5N	—
Maximun Permissible Moment	—	0.8 × 10 <sup>-5</sup> kg·m <sup>2</sup> (※1)
Reduction ratio	1/2	1/2
Mass	370g	
Operating Temperature	0~40°C (No Condensation)	

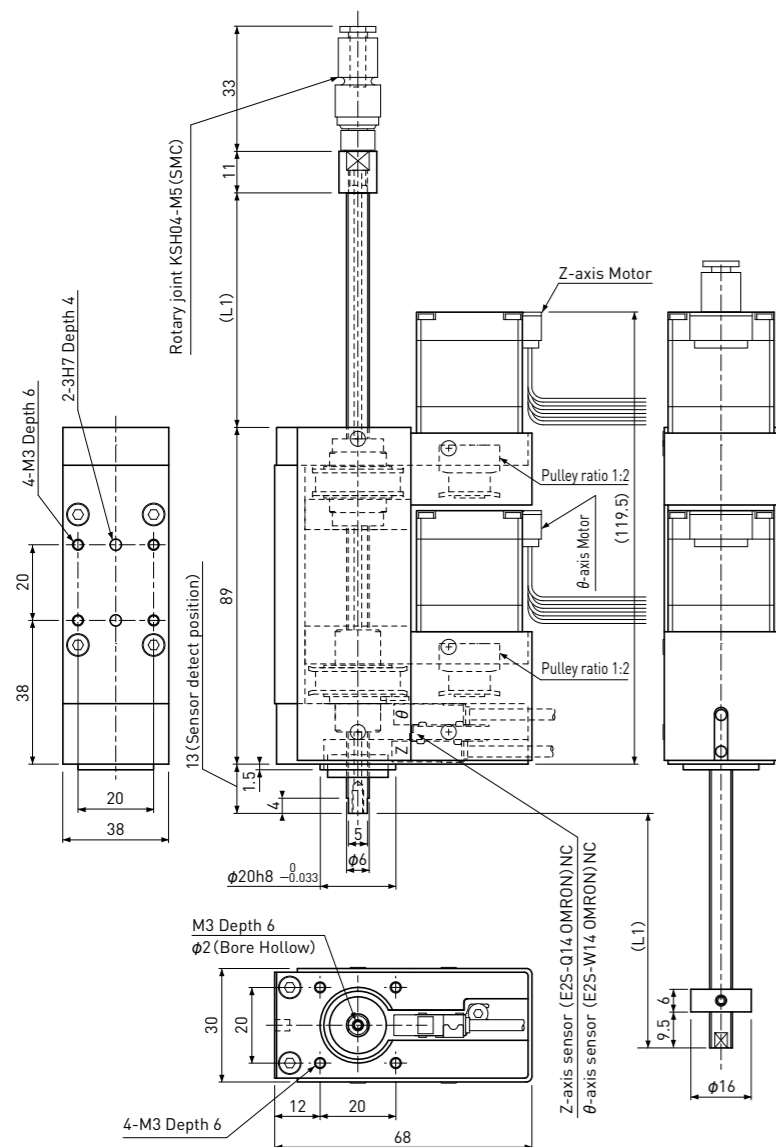
Dia.	Reference of Moment of Inertia	
	Aluminum	Steel
φ20mm	180mm (160g)	64mm (160g)
φ30mm	36mm (70g)	12.5mm (70g)
φ40mm	11mm (40g)	4mm (40g)

Precautions  
 1) The Z-axis does not have brake device. Please be careful when the power supply is switched off in case of Z-axis may free-fall.  
 2) Reference of Moment of Inertia table shows the theoretical values. KSS recommends that you should apply actual moment to the machine and confirm the safety operation before use.

※1 For the Maximum Permissible Moment, see "Reference of Moment of Inertia" table above.  
 ※2 For the technical information, see "Actuator Technical Description".

BDVZ06 - G10 - 060/120 N 02

□28/NEMA 11 2-phase Stepping Motor  
Lead 10mm Travel 60/120mm



Parts List	
Motor	NEMA 11 Stepping Motor 1.5A/phase
Drive Screw	Ball Screw φ6 (Lead 10mm)
Sliding Guide	Ball Spline φ6mm
Sensor	Z axis : Proximity Sensor E2S-Q14-1M (OMRON) NC θ axis : Proximity Sensor E2S-W14-1M (OMRON) NC

Motor (Z, θ-axis)	
A	Black
A	Green
B	Red
B	Blue

UL3265, AWG24 (600mm)

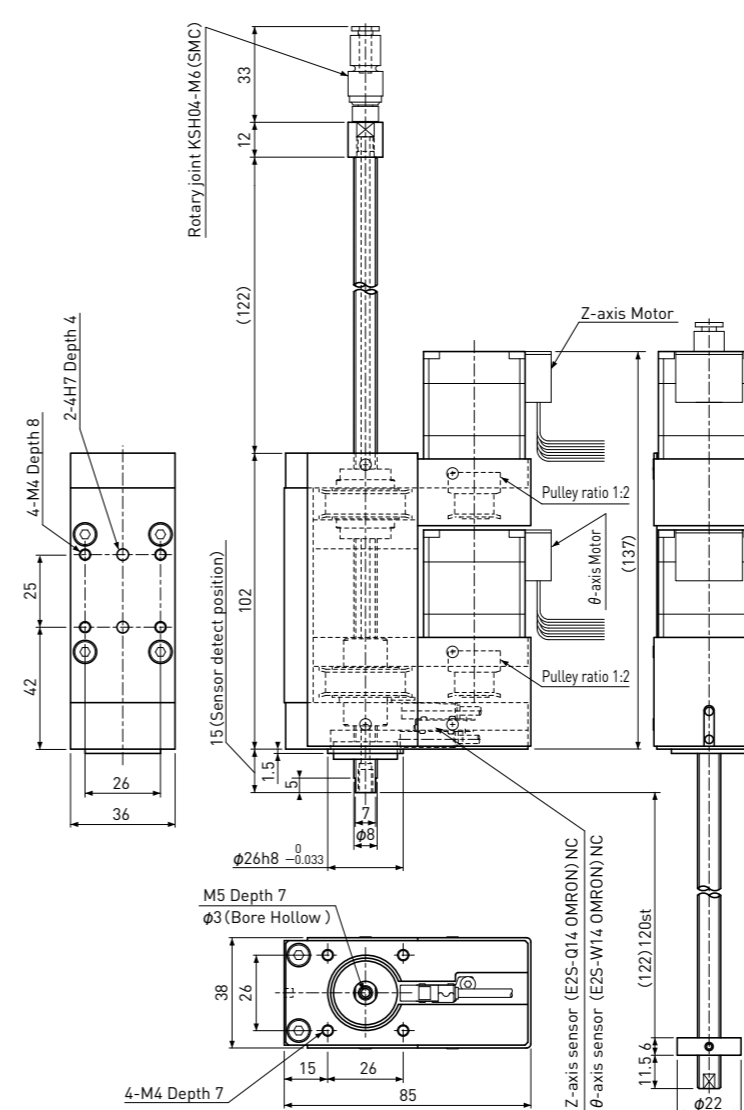
Sensor (Z, θ-axis)	
+12~24V	Brown
LS	Black
GND	Blue

1000mm

Reference of Moment of Inertia	
Travel 60mm	L1 62
Travel 120mm	L1 122

BDVZ08 - G10 - 120 N 03

□35 / NEMA 14 2-phase Stepping Motor  
Lead 10mm Travel 120mm



Parts List	
Motor	NEMA 14 Stepping Motor 1.5A/phase
Drive Screw	Ball Screw φ8 (Lead 10mm)
Sliding Guide	Ball Spline φ8mm
Sensor	Z axis : Proximity Sensor E2S-Q14-1M (OMRON) NC θ axis : Proximity Sensor E2S-W14-1M (OMRON) NC

Motor (Z, θ-axis)	
A	Black
A	Green
B	Red
B	Blue

UL3265, AWG24 (600mm)

Sensor (Z, θ-axis)	
+12~24V	Brown
LS	Black
GND	Blue

1000mm

●Specifications

※The numbers in table below are reference. Detail dimensions will be provided by drawing.

Items	Z Axis	θ Axis
Movable Range	60mm / 120mm	± 360°
Repeatability	±0.020mm	±0.03°
Resolution	25 μm (Full Step)	0.9° (Full Step)
Maximum Speed	200mm / sec	3 rev / sec
Maximum acceleration	1 m/sec <sup>2</sup>	150π rad/sec <sup>2</sup>
Reference Thrust Force	10N	—
Maximun Permissible Moment	—	0.4 × 10 <sup>-4</sup> kg·m <sup>2</sup> (※1)
Reduction ratio	1/2	1/2
Mass	590g (60 travel) , 600g (120 travel)	
Operating Temperature	0~40°C (No Condensation)	

Dia.	Reference of Moment of Inertia	
	Aluminum	Steel
φ30mm	180mm (360g)	65mm (360g)
φ40mm	57mm (200g)	20mm (200g)
φ50mm	23mm (130g)	8.5mm (130g)

Precautions  
1) The Z-axis does not have brake device. Please be careful when the power supply is switched off in case of Z-axis may free-fall.  
2) Reference of Moment of Inertia table shows the theoretical values. KSS recommends that you should apply actual moment to the machine and confirm the safety operation before use.

※1 For the Maximum Permissible Moment, see "Reference of Moment of Inertia" table above.  
※2 For the technical information, see "Actuator Technical Description".

●Specifications

※The numbers in table below are reference. Detail dimensions will be provided by drawing.

Items	Z Axis	θ Axis
Movable Range	120mm	± 360°
Repeatability	±0.020mm	±0.03°
Resolution	25 μm (Full Step)	0.9° (Full Step)
Maximum Speed	200mm / sec	3 rev / sec
Maximum acceleration	1 m/sec <sup>2</sup>	150π rad/sec <sup>2</sup>
Reference Thrust Force	15N	—
Maximun Permissible Moment	—	0.1 × 10 <sup>-3</sup> kg·m <sup>2</sup> (※1)
Reduction ratio	1/2	1/2
Mass	1000g	
Operating Temperature	0~40°C (No Condensation)	

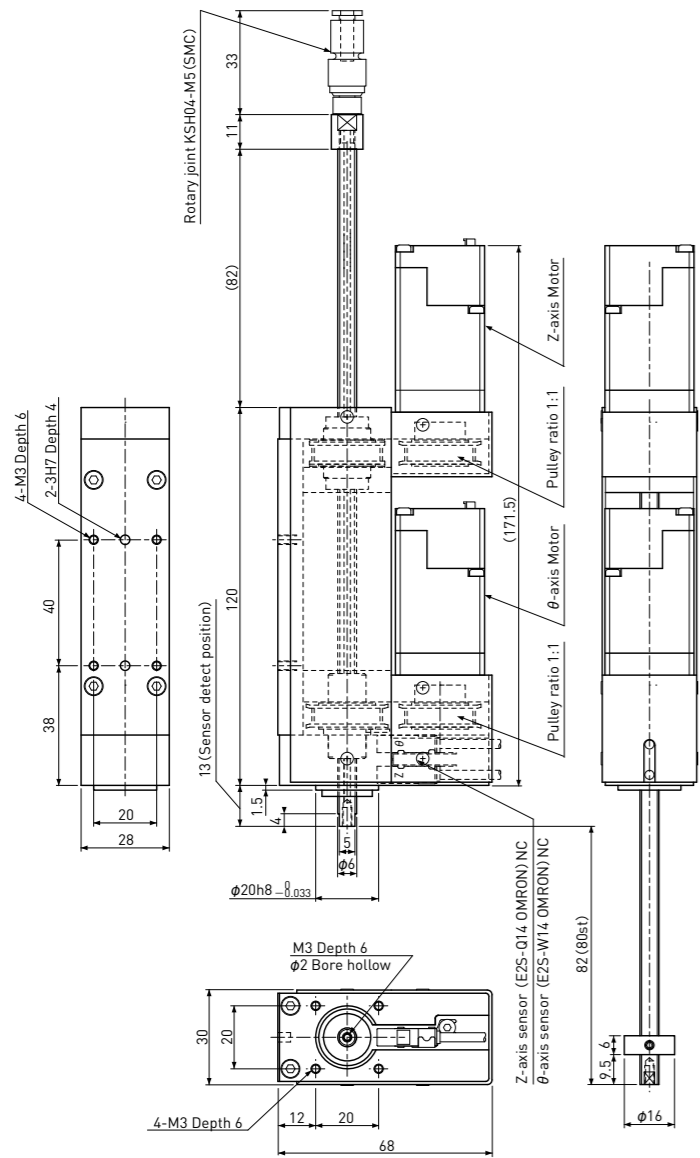
Dia.	Reference of Moment of Inertia	
	Aluminum	Steel
φ40mm	142mm (500g)	50mm (500g)
φ50mm	58mm (320g)	20.5mm (320g)
φ60mm	28mm (220g)	10mm (220g)

Precautions  
1) The Z-axis does not have brake device. Please be careful when the power supply is switched off in case of Z-axis may free-fall.  
2) Reference of Moment of Inertia table shows the theoretical values. KSS recommends that you should apply actual moment to the machine and confirm the safety operation before use.

※1 For the Maximum Permissible Moment, see "Reference of Moment of Inertia" table above.  
※2 For the technical information, see "Actuator Technical Description".

BD28-G100 080 NEK2N-V

□28 / NEMA 11 2-phase Stepping-Servo Motor type  
Lead 10mm Travel 80mm



Parts List	
Motor	NEMA 11 Stepping-Servo Motor TSM11Q-2RM
Drive Screw	Ball Screw φ6 (Lead 10mm)
Sliding Guide	Ball Spline φ6mm
Sensor	Z axis : Proximity Sensor E2S-Q14-1M (OMRON) NC θ axis : Proximity Sensor E2S-W14-1M (OMRON) NC

Sensor (Z, θ-axis)	
+12~24V	Brown
LS	Black
GND	Blue
1000mm	

●Connector Pin diagram



Pin No.	Name	Color	Description
1	Y2	Purple	Open drain outputs with freewheeling diode (30 VDC, 100 mA in max.)
2	Y1	Orange	
3	X4	White	Digital inputs (input high voltage 5~24 VDC, input low voltage below 1 VDC, signal frequency 1 MHz in max.)
4	X3	Brown	
5	X2	Yellow	Digital inputs (input high voltage 5~24 VDC, input low voltage below 2 VDC, signal frequency 1 MHz in max.)
6	X1	Gray	
7	RX-	Green and White	RS-422/485 interface differential signals
8	RX+	Green	
9	TX-	Blue and White	
10	TX+	Blue	
11	+	Red	V+ power supply (typ. 24 VDC)
12	-	Black	V- power ground (GND)

Note 1) All digital inputs & outputs are referenced to the power ground (-V-).  
Note 2) Please use Mating Cable.

●Specifications

※The numbers in table below are reference. Detail dimensions will be provided by drawing.

Items	Z Axis	θ Axis
Movable Range	80mm (※1)	± 360°
Repeatability	±0.020mm	±0.03°
Resolution	0.5 μm (※2)	0.018° (※2)
Maximum Speed	500mm / sec	25 rev/sec
Maximum acceleration	10 m/sec <sup>2</sup>	1000π rad/sec <sup>2</sup>
Reference Thrust Force	3N	—
Maximun Permissible Moment	—	0.15×10 <sup>-4</sup> kg·m <sup>2</sup> (※3)
Reduction ratio		1/1
Mass		740g
Operating Temperature	0~40°C (No Condensation)	

Reference of Moment of Inertia		
Dia.	Height	
	Aluminum	Steel
φ30mm	65mm (128g)	23mm (128g)
φ40mm	21mm (74g)	7.5mm (74g)
φ50mm	8.5mm (46g)	3mm (46g)

Precautions  
1) The Z-axis does not have brake device. Please be careful when the power supply is switched off in case Z-axis may free-fall.  
2) Reference of Moment of Inertia table shows the theoretical values. KSS recommends that you should apply actual moment to the machine and confirm the safety operation before use.

※1) Travel length (Movable Range) can be changed according to your request.  
※2) Default setting : 20,000 steps / rev  
※3) For the Maximum Permissible Moment, see "Reference of Moment of Inertia" table above.  
※4) For the technical information, see " Actuator Technical Description".

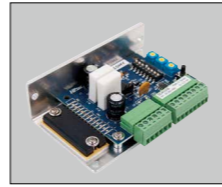
## ● Attachment

KSS provides Standard Stepping Motor Driver and Extension Cable as an option for VZθ Actuators in order to make it easy to use.

### [Stepping Motor Driver]

#### SD4030B3

This is recommended Driver for 2-phase stepping Motor.  
It has Micro-Step function with 8-step angle. (page V108)



#### ※Caution

- The factory setting of SD4030B3 is 2A.
- Please be sure to perform a current setup of Driver based on Motor Rated current before use.
- Please confirm the operation manual attached to a Driver about current setup.

### [Extension Cable]

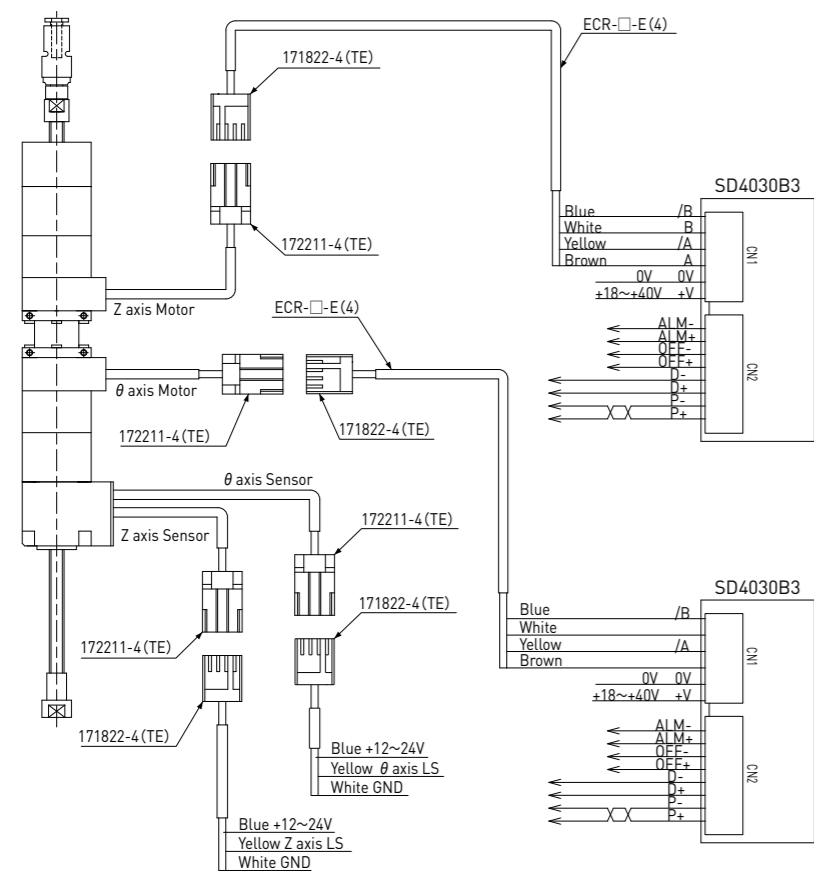
Extension Cable between VZθ Actuators and KSS recommended Stepping Motor Driver.  
Please designate Cable length and Connector type in accordance with the example below.  
Please note that one side of Extension Cable is cut endge only (Bare).

EC   R   —   2   —   E(4)  
①   ②   ③   ④

- ① Extension Cable
- ② Cable type  
R : Robot Cable
- ③ Cable length (m)
- ④ Connector type  
N : No commector (Bare)  
E(4) : EI connector 4-pins (TE Connectivity)

● Connection Diagram

□28 / NEMA11 Direct Drive type



Motor cable 172211-4 (male)

1	Stepping Motor /B (Blue)
2	Stepping Motor B (Red)
3	Stepping Motor /A (Green)
4	Stepping Motor A (Black)

Motor Extension cable 171822-4 (female)

4	3	2	1
1	Stepping Motor /B (Blue)		
2	Stepping Motor B (White)		
3	Stepping Motor /A (Yellow)		
4	Stepping Motor A (Brown)		

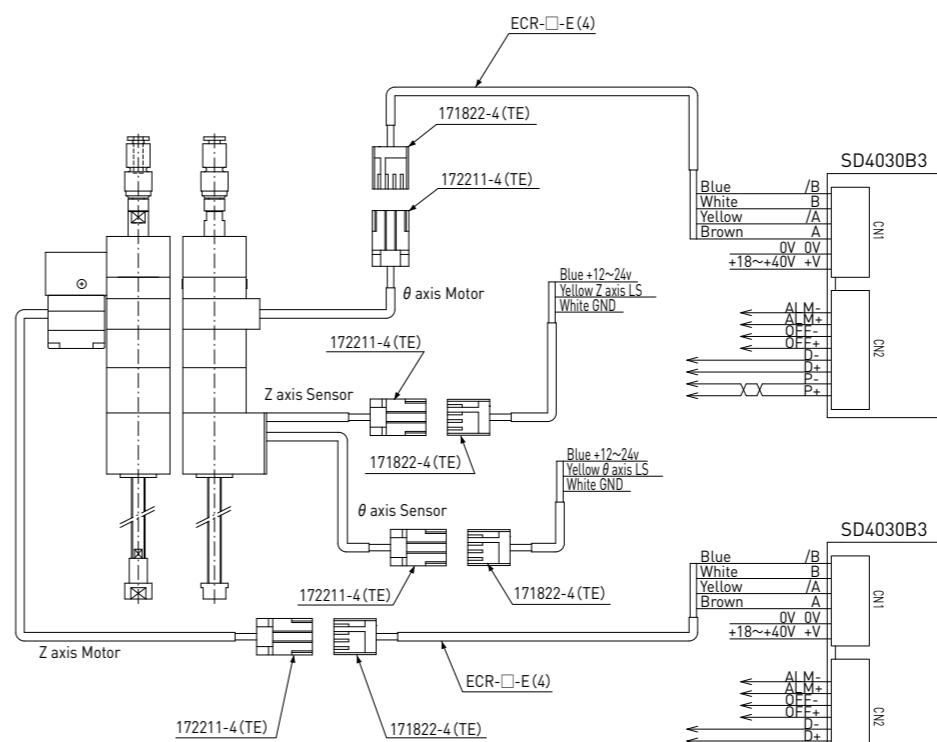
Sensor cable 172211-4 (male)

1	+12V~24 (Brown)
2	GND (Blue)
3	LS (Black)
4	None

Sensor Extension cable 171822-4 (female)

3	2	1
1	+12V~24 (Blue)	
2	GND (White)	
3	LS (Yellow)	
4	None	

[Hybrid Drive type]



Z axis Motor cable 172211-4 (male)

1	Stepping Motor /B (Orange)
2	Stepping Motor B (Blue)
3	Stepping Motor /A (Yellow)
4	Stepping Motor A (Red)

Z axis Motor Extension cable 171822-4 (female)

4	3	2	1
1	Stepping Motor /B (Blue)		
2	Stepping Motor B (White)		
3	Stepping Motor /A (Yellow)		
4	Stepping Motor A (Brown)		

θ axis Motor cable 172211-4 (male)

1	Stepping Motor /B (Blue)
2	Stepping Motor B (Red)
3	Stepping Motor /A (Green)
4	Stepping Motor A (Black)

θ axis Motor Extension cable 171822-4 (female)

4	3	2	1
1	Stepping Motor /B (Blue)		
2	Stepping Motor B (White)		
3	Stepping Motor /A (Yellow)		
4	Stepping Motor A (Brown)		

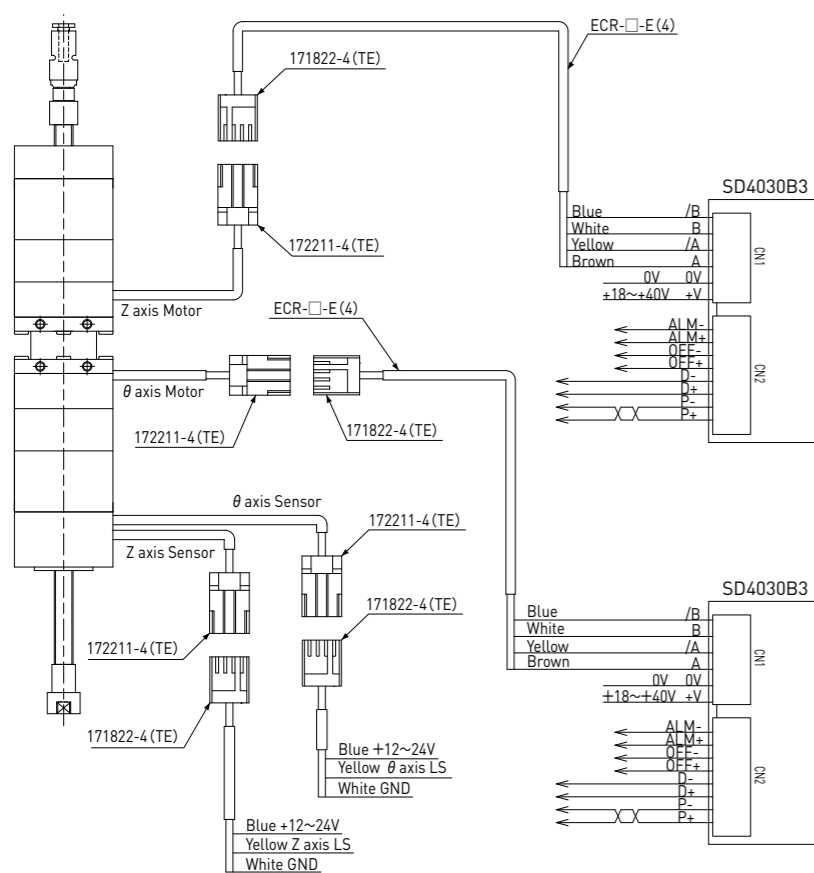
Sensor cable 172211-4 (male)

1	+12V~24 (Brown)
2	GND (Blue)
3	LS (Black)
4	None

Sensor Extension cable 171822-4 (female)

3	2	1
1	+12V~24 (Blue)	
2	GND (White)	
3	LS (Yellow)	
4	None	

□42 / NEMA17 Direct Drive type



Motor cable 172211-4 (male)

1	Stepping Motor /B (Blue)
2	Stepping Motor B (Red)
3	Stepping Motor /A (Green)
4	Stepping Motor A (Black)

Motor Extension cable 171822-4 (female)

4	3	2	1
1	Stepping Motor /B (Blue)		
2	Stepping Motor B (White)		
3	Stepping Motor /A (Yellow)		
4	Stepping Motor A (Brown)		

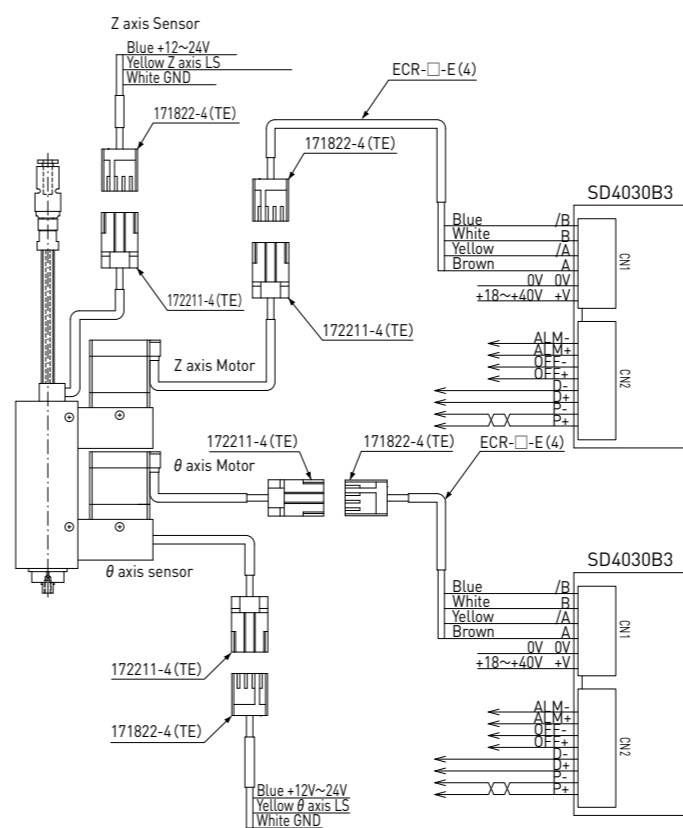
Sensor cable 172211-4 (male)

1	+12V~24 (Brown)
2	GND (Blue)
3	LS (Black)
4	None

Sensor Extension cable 171822-4 (female)

3	2	1
1	+12V~24 (Blue)	
2	GND (White)	
3	LS (Yellow)	
4	None	

[Belt Drive type]



Motor cable 172211-4 (male)

1	Stepping Motor /B (Orange)	BDVZ04	BDVZ06/BDVZ08	Blue
2	Stepping Motor B (Blue)			Red
3	Stepping Motor /A (Yellow)			Green
4	Stepping Motor A (Red)			Black

Motor Extension cable 171822-4 (female)

4	3	2	1
1	Stepping Motor /B (Blue)		
2	Stepping Motor B (White)		
3	Stepping Motor /A (Yellow)		
4	Stepping Motor A (Brown)		

Sensor cable 172211-4 (male)

1	+12V~24 (Brown)
2	GND (Blue)
3	LS (Black)
4	None

Sensor Extension cable 171822-4 (female)

3	2	1
1	+12V~24 (Blue)	
2	GND (White)	
3	LS (Yellow)	
4	None	