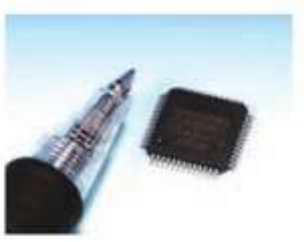
Catalogue No.T11-1507N11

Smartsyn®

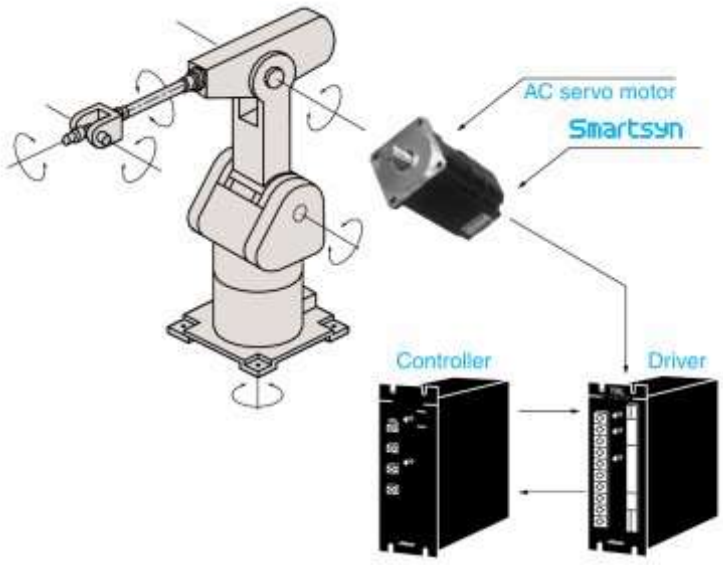
Smart Coder®



Tamagawa TAMAGAWA SEIKI CO.,LTD.

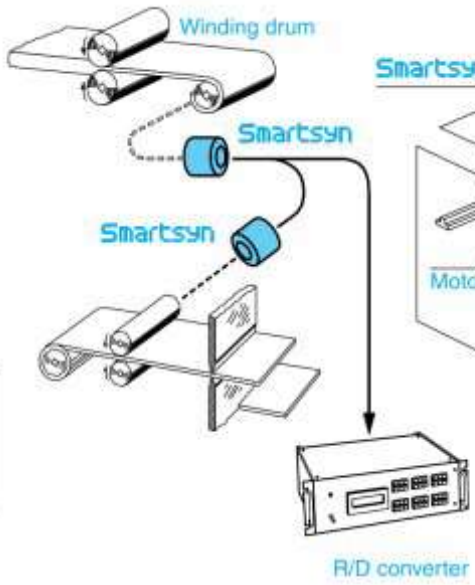
Examples of Applications

For driving robot wrists and body

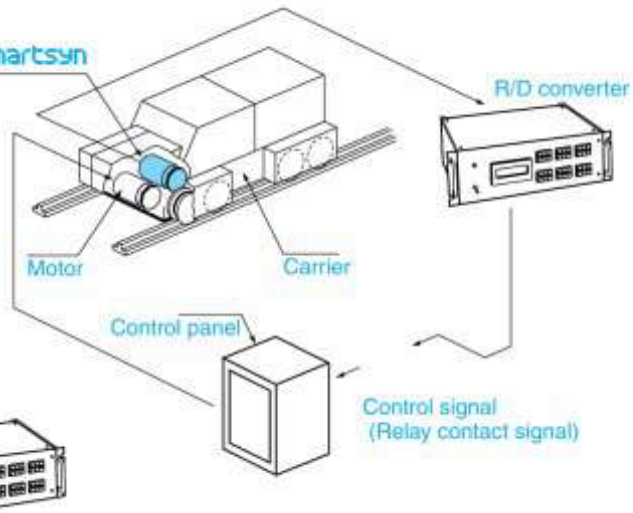


Detection of winding length

Detection of roll interval

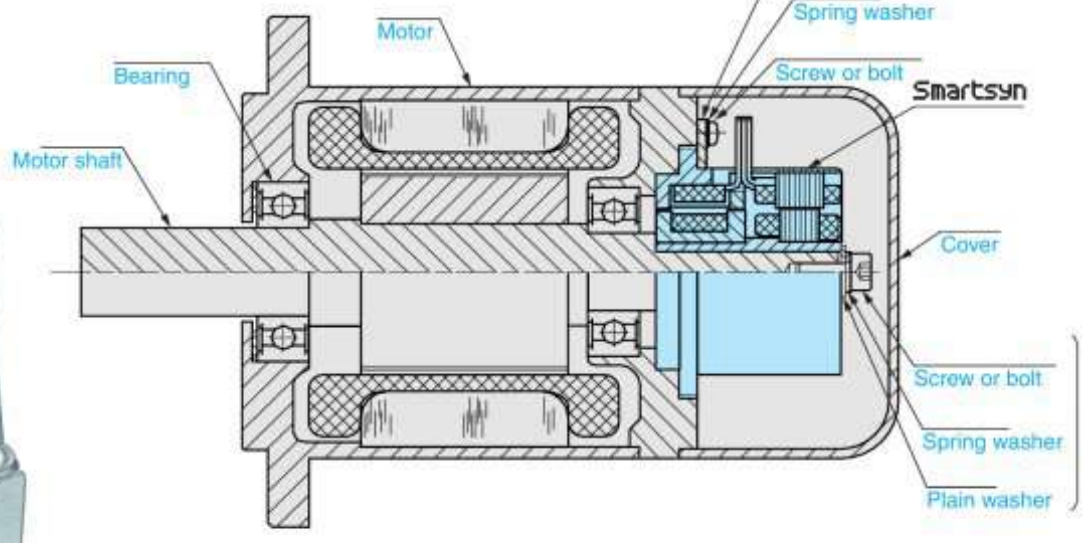


Detection of traveling postion of automatic carrier



Mounting method and accuracy

Mounting method (Built-in type)



Fixable by anaerobic adhesive only (e.g. Loctite 648, Three Bond 1373B, etc.) without screws and washers. Combined usage of screws and adhesive is also allowable.

Mounting accuracy

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To maximize the performance of Smartsyn, take care to achieve the following accuracies in mounting Smartsyn.

Axial runout: Runout of the motor shaft must be 0.05mm or less. (Size 08: 0.03mm or less)

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Coaxiality: The coaxiality of the case mounting surface of Smartsyn with the motor shaft must be 0.05mm or less. (Size 08: 0.03mm or less)

Smartsyn

Perpendicularity: The perpendicularity of the case mounting support surface of Smartsyn to the motor shaft must be 0.05mm or less. (Size 08: 0.03mm or less)

Axial travel: The relative dislocation in the axial direction between the rotor and stator of Smartsyn must be within 0.25mm.

Specifications

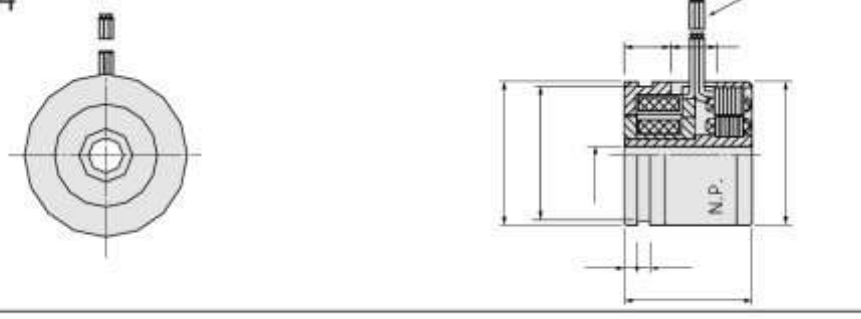
Size	08	10	15		21	34
Model						
Type						
Primary				Rotor		
Input voltage						
Transformation ratio [K]						
Electrical error (Accuracy)						
Residual voltage						
Phase shift						
Input impedance —						
Output impedance —						
Output impedance						
Allowable rotation speed						
Operating temperature range						
Dielectric strength			500V AC rms for one minute			
Insulation resistance						
Mass						
Output type (output voltage equation)	type		type			

Nominal value
Reference value

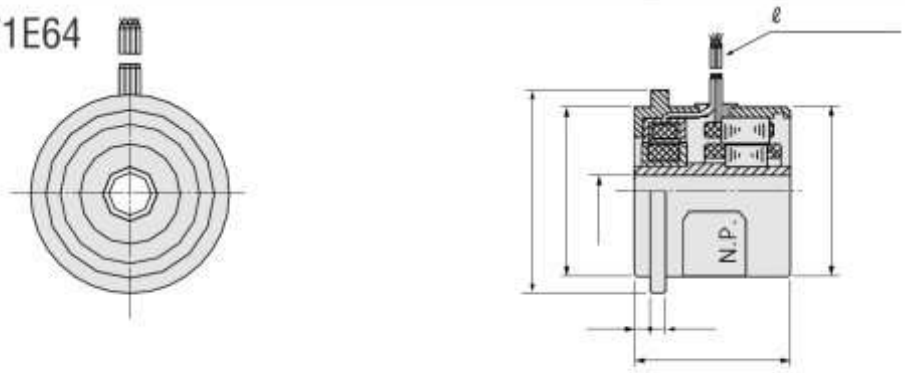
Structure

Outline

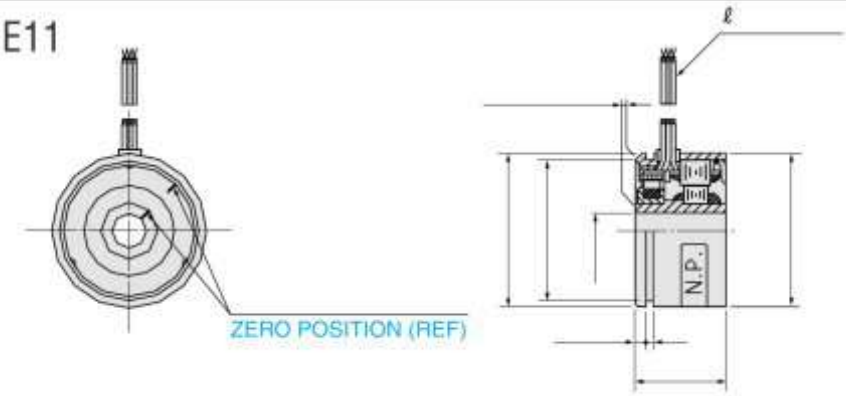
SIZE 08 TS2605N1E64



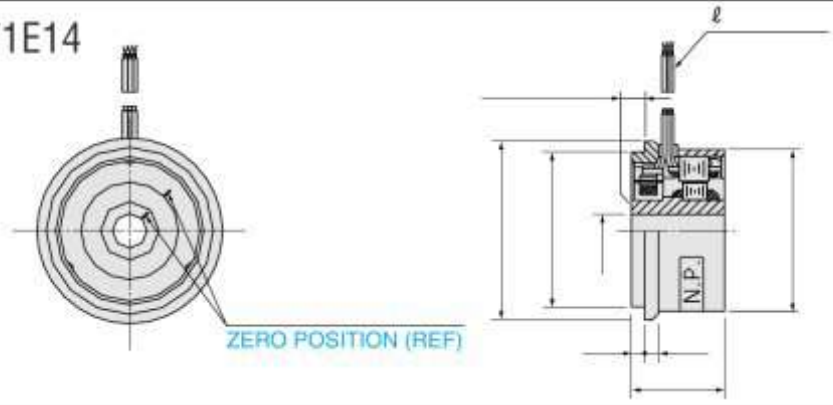
SIZE 10 TS2610N171E64



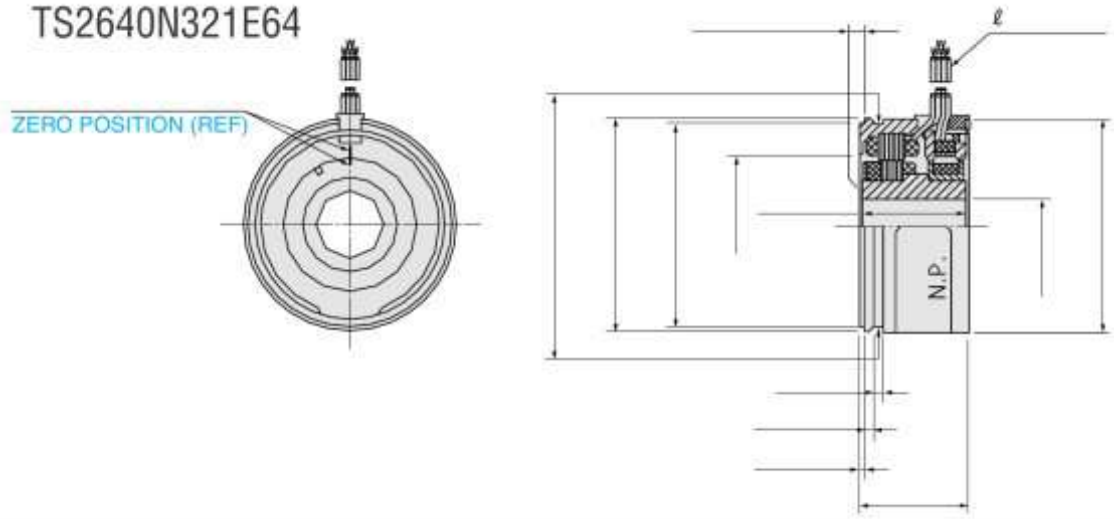
SIZE 15 TS2620N21E11



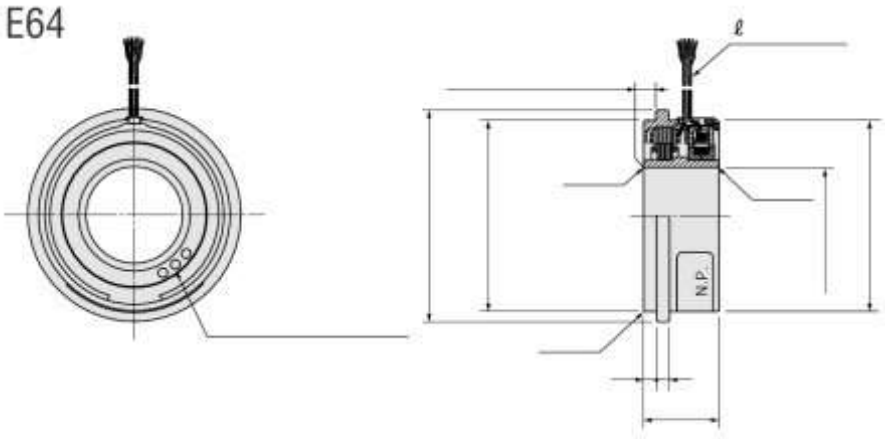
SIZE 15 TS2620N271E14



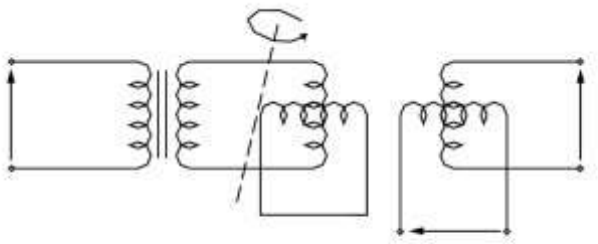
SIZE 21 TS2640N321E64



SIZE 34 TS2660N31E64



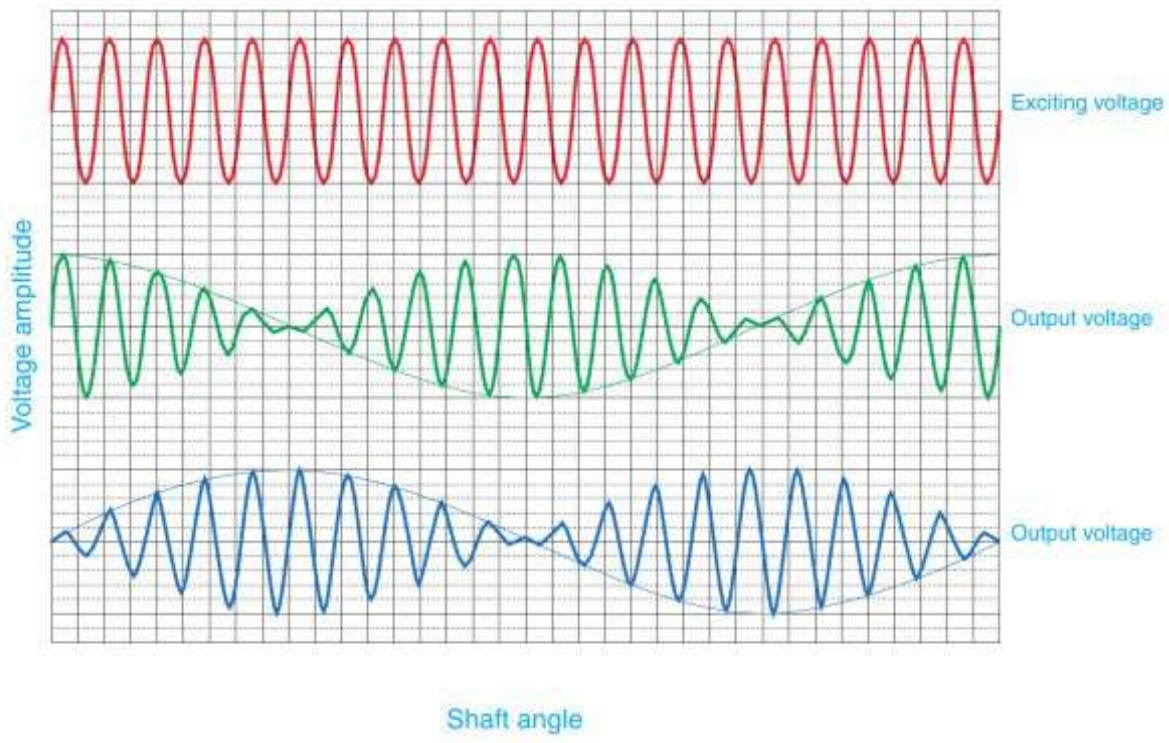
Smartsyn



The principle of Smartsyn (resolver) is almost the same as that of a transformer. But it differs in the point that its iron cores are divided into a rotor section and a stator section.
When it is excited by AC voltage in the exciting winding (rotor), AC voltage is induced in the output winding (stator).
Because the output voltage varies responding to the rotational angle of the rotor, the angular position of the rotor can be detected by sensing the output voltage.
Sine and cosine signals (voltage) proportional to the rotational angle can be obtained at the phase S1-S3 and S2-S4 in the output winding when the phase R1-R2 in the exciting winding is excited by the voltage of $E_{R1\text{-}R2}$=E sin t. (See Fig. 2) (A resolver used in this way is called BRX type.)
Signals obtained at the phase S1-S3 and S2-S4 are expressed by the following output equations. There are two types of equations depending on the difference of polarity.

Output signal (+ type)

Output signal (-type)



Excitation voltage (Phase R1-R2)

Output voltage (Phase S1-S3)

Output voltage (Phase S2-S4)

Excitation voltage amplitude ($V_{0\text{-}P}$)

Excitation frequency

Time

Transformation ratio

°

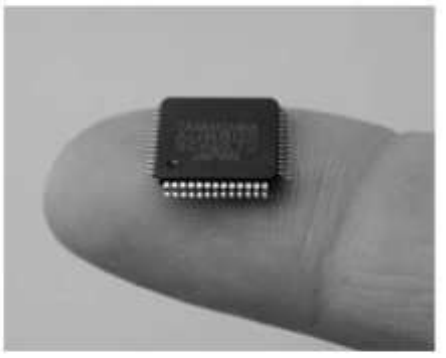
Shaft angle (when Rotor is rotating in CCW viewed from mounting end of a resolver case.)

Smartsyn

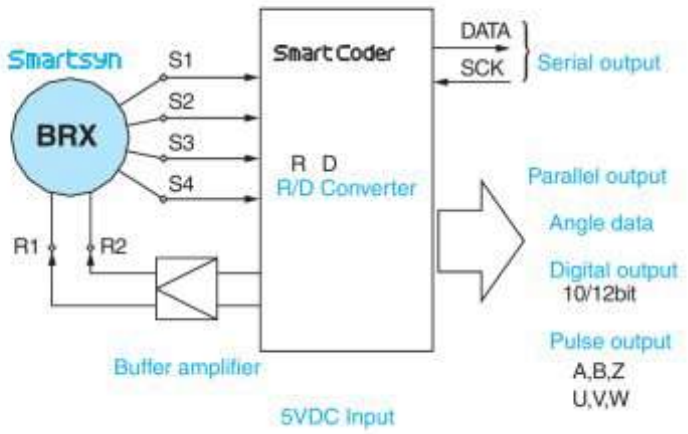
In addition, a rotary transformer is attached to the rotor to transmit signals (voltage) to the rotor. Thus Smartsyn consists of two sections; a stator section to detect output voltage according to the shaft angle and a rotor section where a rotary transformer sends signals to the rotor.

SmartCoder® (R/D Converter)

SmartCoder Smartsyn



Smartcoder is an IC to convert analog output signals of Smartsyn (resolver) into digital position (angle) signals. It is widely used as an interface for CPU digital processing, built in controllers and drivers of robots, brushless motors, etc.



(Characteristic features)

Resolution: 10 bits or 12 bits (Selectable)

Accuracy: 2LSB (10 bits), 4LSB (12 bits High accuracy)

High tracking speed: 240,000min^{-1}(rpm) (10 bits)

Operating temperature range: -40 +125

Cautions for use

Smartsyn

Smartsyn

Mount Smartsyn as described in the and accuracy on page 2 so that communication errors may not take place.

Mounting method

Use Smartsyn within the specified input voltage and frequency, so that you can obtain the specified electrical characteristics e.g. transformation ratio, electrical error, input / output impedance, phase shift.
To avoid the deterioration in the accuracy, the allowable values are as follows:

Input voltage: ±20% of the specified value.
Input frequency: ±5% of the specified value.

In case Smartsyn is not connected to the same amount of loads for each output of the two phases, the two output voltages will get disproportionate and may affect the accuracy. Therefore the loads of the two phases should be the same.

Smartsyn

Smartsyn

In case a strong magnetic field surrounds Smartsyn, it may not work properly with its magnetic flux affected.

In case a noise source is in vicinity, or in case signal transfer distance is long, twisted/shielded cables should be used. In case a noise exists on the output signals, they should be received by a differential amplifier.

In case Smartsyn is used in high humidity as close to 100% RH for a long time, its insulation materials may deteriorate. In such a case, the use of some protective cover is recommended.

Smartsyn

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Smartsyn is a brushless resolver based on an innovative winding method (National/Foreign Patent registered) our sophisticated design and production engineering developed.
The traditional winding has been performed only by hand but our new method has enabled automatic winding by machine, thus realizing high productivity, low cost, high reliability, and excellent electrical properties.

Features

Wide temperature range

Operating temperature range: -55 155

Superior environment resistance

Vibration: 196m/s²{20G} at 10Hz 500Hz, for 2 hours to each of three axes.

Shock: 981m/s²{100G} for 6ms, 3 times to each of 6 axes, 18 times in total

Humidity: 90% RH or above at 60

High speed rotation

10,000min⁻¹{rpm} (Size 08: 30,000min⁻¹{rpm})

High reliability

Extremely long life and high reliability are assured by the structure of mechanical parts and automated coil incorporation.

Absolute position detection

Long-distance transmission

Robustness against noise enables long-distance transmission

Capable of compact incorporation

The use of built-in types of Smartsyn minimizes housings of motors. Best suited for compact design

Low cost