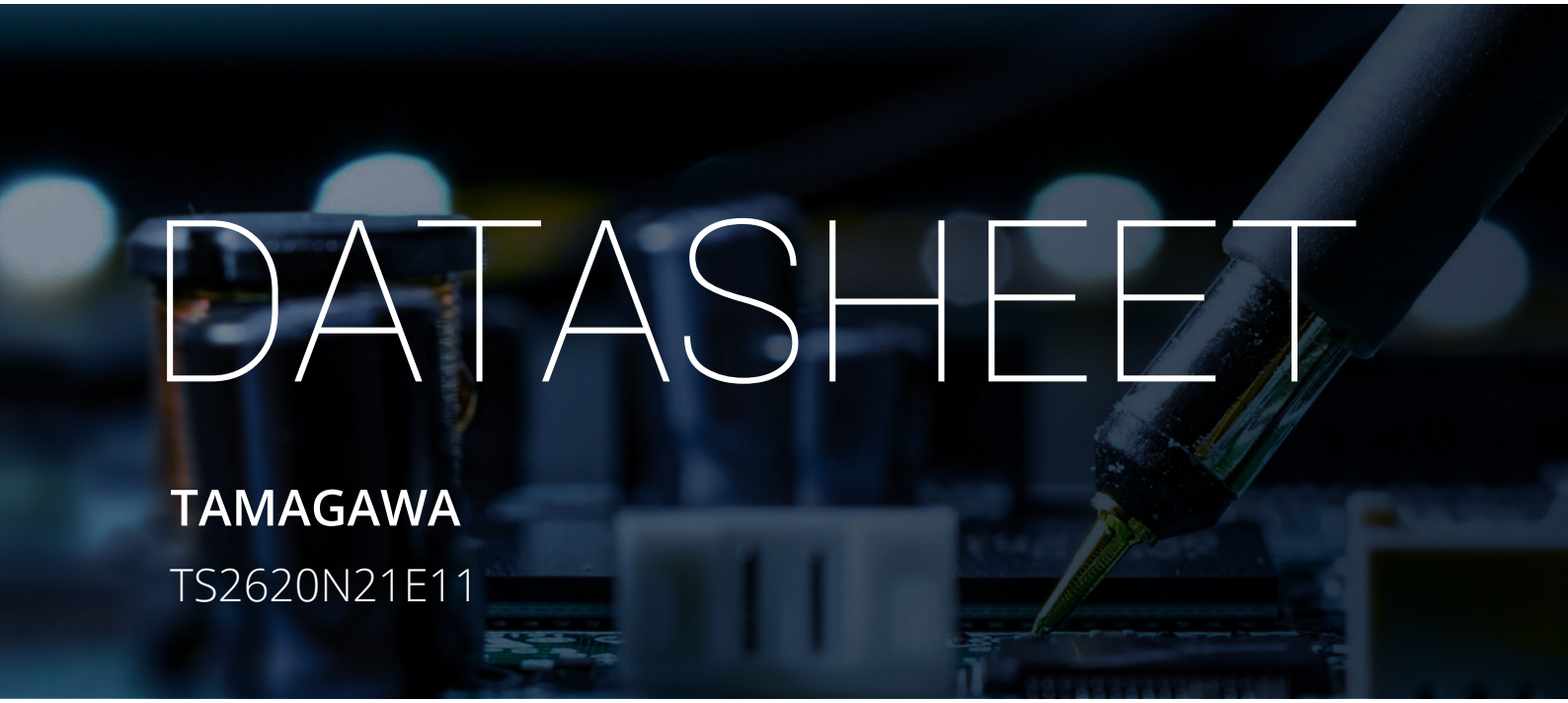
RGB ELEKTRONIKA
Centrum automatyki przemysłowej



DATASHEET

TAMAGAWA

TS2620N21E11

OTHER SYMBOLS:

RGB ELEKTRONIKA AGACIAK CIACIEK SPÓŁKA JAWNA

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Poland

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+48 71 325 15 05

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www.rgbautomatyka.pl

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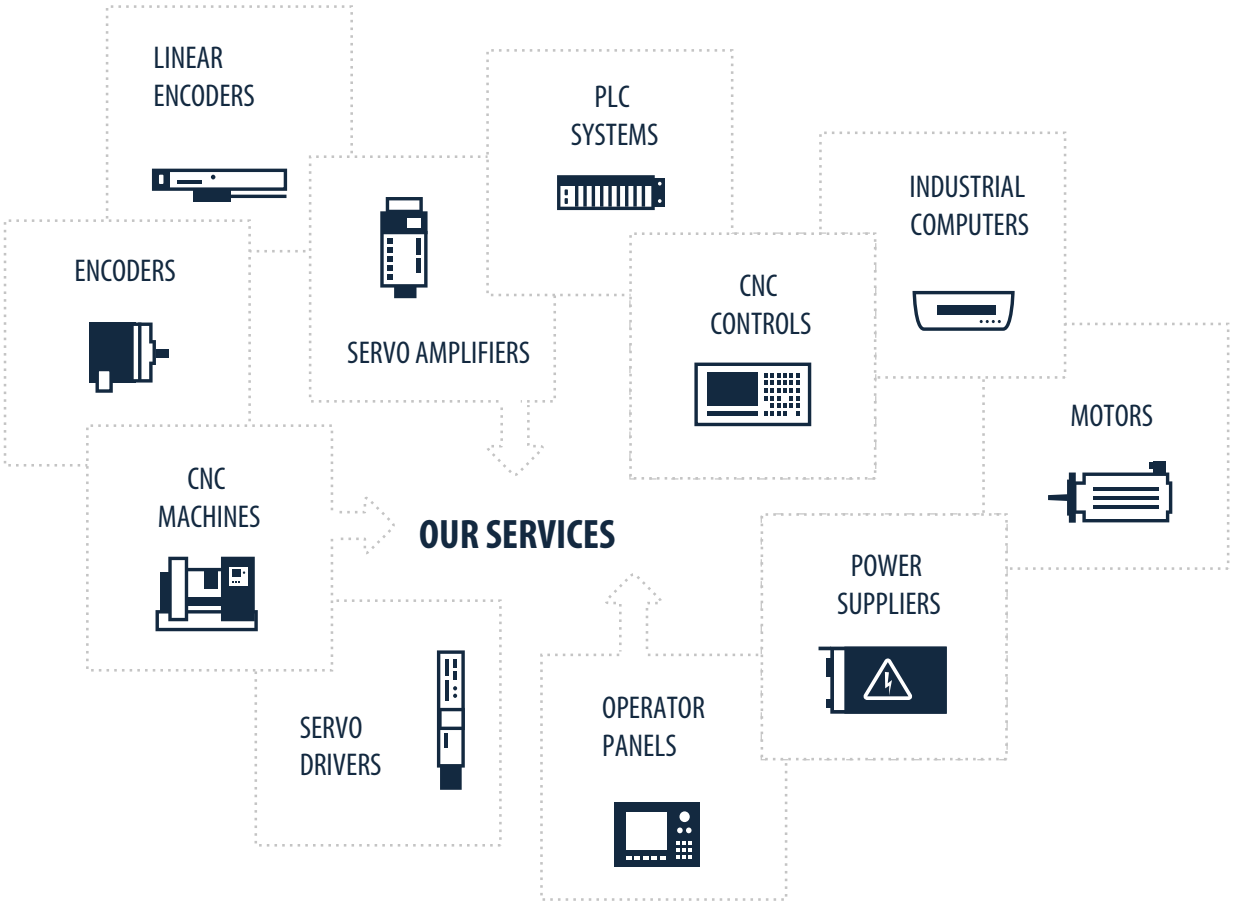

At our premises in Wrocław, we have a fully equipped servicing facility. Here we perform all the repair works and test each later sold unit. Our trained employees, equipped with a wide variety of tools and having several testing stands at their disposal, are a guarantee of the highest quality service.

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Motro Compo

TAMAGAWA SEIKI CO., LTD.

BRUSHLESS RESOLVERS

Smartsyn®
FA-SOLVER®

BUILT-IN RESOLVERS
SHAFT RESOLVERS
HOLLOW SHAFT RESOLVERS

BRUSHLESS RESOLVERS

MEET YOUR NEEDS IN MOTION CONTROL APPLICATIONS

Wide Range of Built-in types
for Direct Mounting onto Motors

Smartsyn, and brushless resolvers, are to offer you highly enhanced reliability which has been enabled by excluding human-dependent works in the major production / inspection procedures from parts processing, assembling to shipping.

We'd like to offer the resolvers for such applications as follows.
- Commutation of brushless motors
- Feedback sensor of servo systems
- Robots
- Machine tools
- Aerospace servo systems
- Others where harsh environmental condition is involved

Smartsyn is a name of our brushless resolvers of a new type. They have their inherent characteristics as a resolver : maintenance-free brushless design, immunity to noise, vibration, shock, and high temperature.
And now they have more to offer : homogeneity in the ever-variable parameters like accuracy, transformation ratio, phase shift, etc, which has been realized by highly automated production. Now this new quality can be taken for granted.

FEATURES

- Wide Operating Temperature Range
  – 55 to +155°C (Built-in type)
  – 30 to +100°C (All Shaft types, TS2028, and TS2054)
- Usable in Demanding Environments
  Vibration : 196m/s^2 (20G) at 10~500Hz
  Shock : 981m/s^2 (100G) for 11ms
  Humidity : 90% Rh Min. at 60°C
- High reliability and long life owing to having no brush
- Operating speed up to :
  10,000~30,000min^{-1} (Built-in type)
  6,000min^{-1} (Shaft type)
- Free from electrical and mechanical noise

MOUNTING REQUIREMENTS

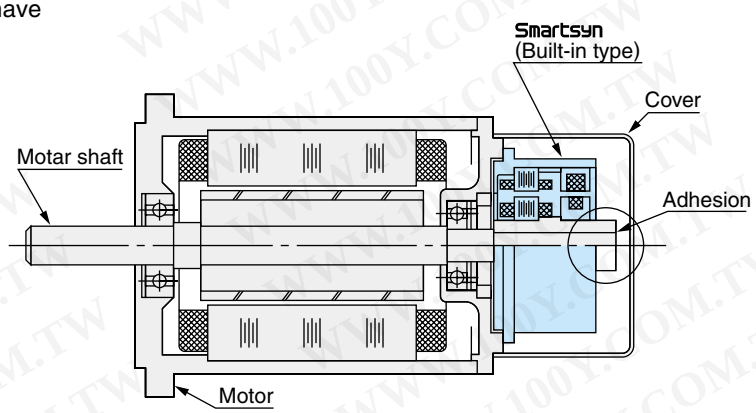
The following mounting requirements should be kept to satisfy the specifications.

- Shaft Run-out
  A motor shaft on which Rotor is mounted should have a run-out less than 0.050mm (TIR).

- Concentricity
  Centers of resolver and motor shaft should be aligned within 0.050mm (TIR).

- Perpendicularity
  Resolver case should be perpendicular to the motor shaft within 0.050mm (TIR).

- Axial Alignment
  For built-in types, Stator and Rotor should be axially aligned within the tolerance of MTG.DIM.



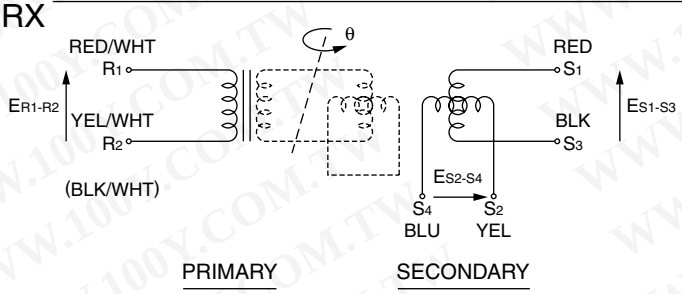
PRINCIPLE

Resolver is a rotary transformer, which outputs AC voltage in accordance with angular position of the shaft.There are two types of resolvers, BRX and BRT, having different types of winding.

BRX resolver is excited by AC voltage to the rotor winding, and outputs from the stator windings sine and cosine voltages proportion to the rotaion angle θ.

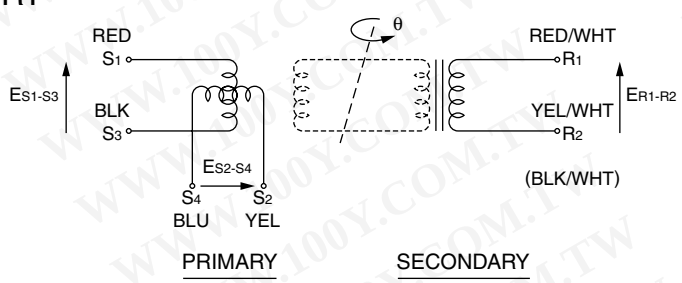
BRT resolver is excited by sine and cosine voltages to the stator windings, and outputs from the rotor winding a sine voltage phase-shifted in proportion to θ.
The difference is illustrated as follows.

BRX



Excitation : $E_{R1-R2}=E\sin\omega t$
Output : $E_{S1-S3}=K\,E_{R1-R2}\cos\theta$
$E_{S2-S4}=K\,E_{R1-R2}\sin\theta$ (Normal Type)
$E_{S2-S4}=-K\,E_{R1-R2}\sin\theta$ (Reverse Type)
K : Transformation Ratio

BRT



Excitation : $E_{S1-S3}=E\sin\omega t$
$E_{S2-S4}=E\cos\omega t$
Output : $E_{R1-R2}=K\,E_{S1-S3}\cos\theta - K\,E_{S2-S4}\sin\theta$
$=KE\sin(\omega t-\theta)$ (Normal Type)
$E_{R1-R2}=K\,E_{S1-S3}\cos\theta + K\,E_{S2-S4}\sin\theta$
$=KE\sin(\omega t+\theta)$ (Reverse Type)
K : Transformation Ratio

+θ:CCW is positive when viewed from mouting end.

Smartsyn®

United States Patent
Europatent Registered
Japan Patent Registered

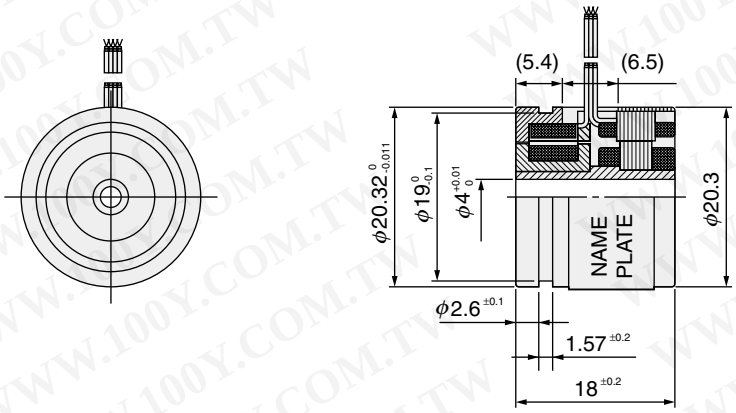
BUILT-IN RESOLVERS

SIZE		08	10	15			21	
Model No.		TS2605N1E64	TS2610N171E64	TS2620N21E11	TS2620N271E14	TS2620N691E126	TS2640N321E64	TS2640N691E125
Type		BRX	⟵	⟵	⟵	⟵	⟵	⟵
Primary		R1-R2	⟵	⟵	⟵	⟵	⟵	⟵
Input Voltage/Frequency		7Vrms 10kHz	7Vrms 10kHz	7Vrms 10kHz	10Vrms 4.5kHz	10Vrms 4.5kHz	7Vrms 10kHz	5Vrms 4kHz
Transformation Ratio		0.5±5%	0.5±5%	0.5±5%	0.5±10%	0.5±10%	0.5±5%	0.5±10%
Error		±10′ Max.	±10′ Max.	±10′ Max.	±10′ Max.	±8′ Max.	±10′ Max.	±8′ Max.
Null Voltage		20mVrms Max.	20mVrms Max.	20mVrms Max.	20mVrms Max.	20mVrms Max.	25mVrms Max.	——
Phase Shift		+10° Nom.	+5° Nom.	0° Nom.	+8° Nom.	+3～+13°	-5° Nom.	+0～+10°
Impedance	Z_{RO}	140Ω	160Ω	70+j100Ω	90+j180Ω	90+j180Ω	110+j140Ω	290Ω Nom.
	Z_{SO}	——	160Ω	180+j300Ω	220+j350Ω	220+j350Ω	150+j270Ω	——
	Z_{SS}	120Ω	130Ω	175+j257Ω	210+j300Ω	210+j300Ω	130+j240Ω	420Ω Nom.
Operating Temperature		−55~+155°C	−55~+155°C	⟵	⟵	⟵	⟵	⟵
Max. Operating Speed		30,000min.$^{-1}$	10,000min.$^{-1}$	⟵	⟵	⟵	⟵	⟵
Mass		0.028kg	0.04kg	0.06kg	0.07kg	0.065kg Max	0.22kg	025kg
Output Type		Reverse	Reverse	Normal	Normal	Reverse	Normal	Normal

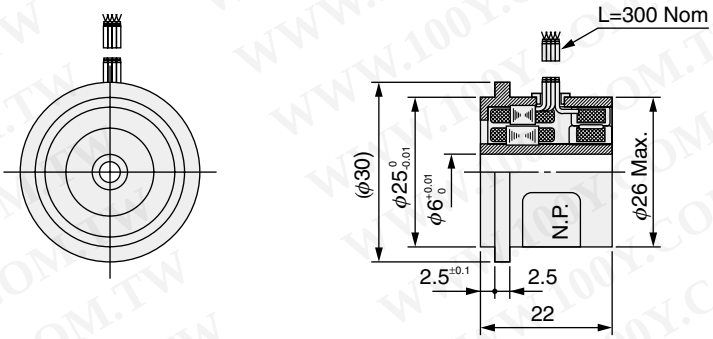
OUTLINE

(DIMENSION : mm)

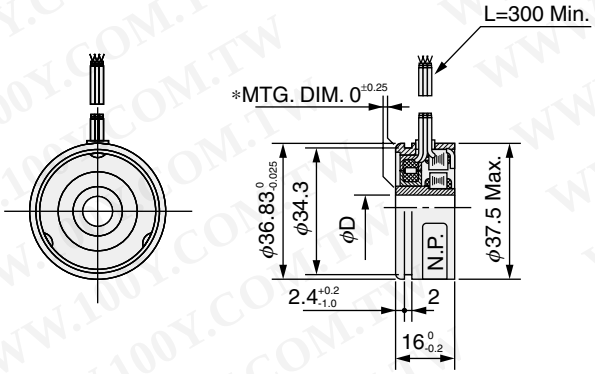
SIZE 08 TS2605N1E64



SIZE 10 TS2610N171E64

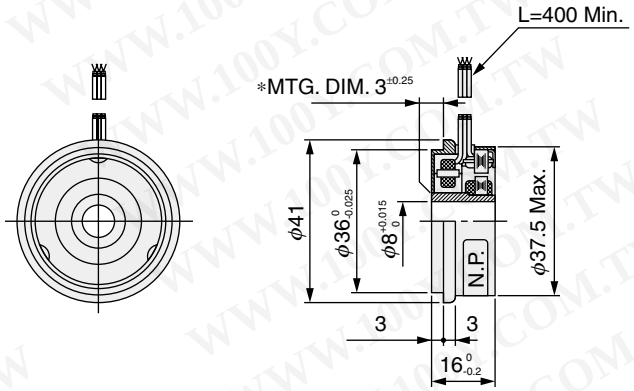


SIZE 15 TS2620N21E11, TS2620N691E126

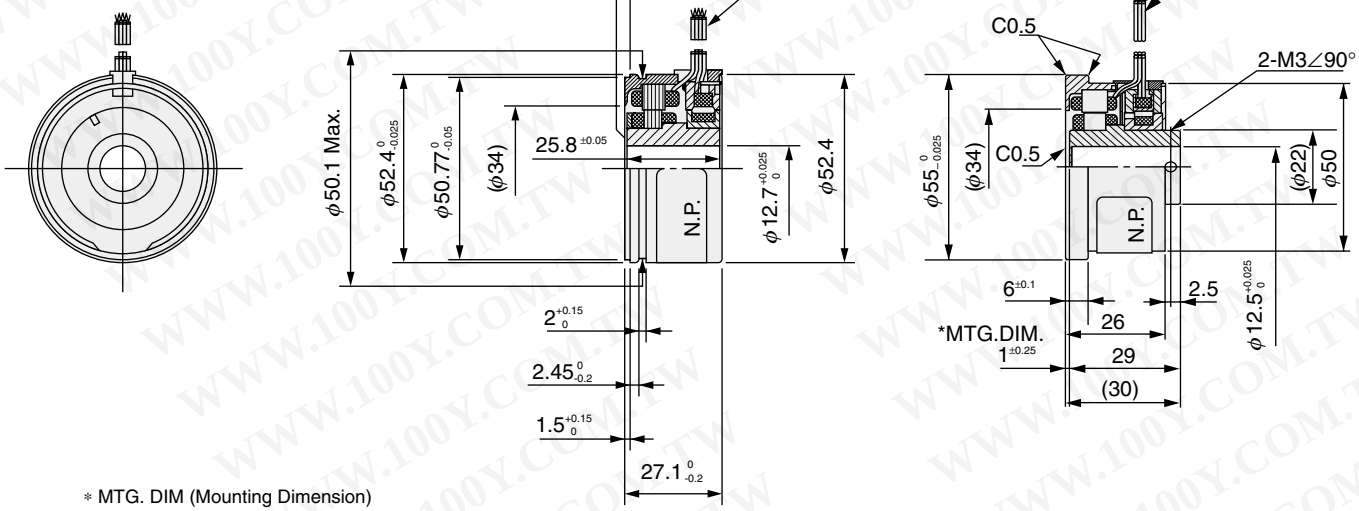


	ϕD
TS2620 N21E11	ϕ9.52 +0.015 0
TS2620 N691E126	ϕ10 +0.015 0

SIZE 15 TS2620N271E14



SIZE 21 TS2640N321E64 TS2640N691E125



* MTG. DIM (Mounting Dimension)

FA-SOLVER®

BUILT-IN RESOLVERS

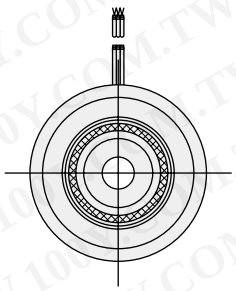
Products on this page are whithin FA-SOLVER® series.

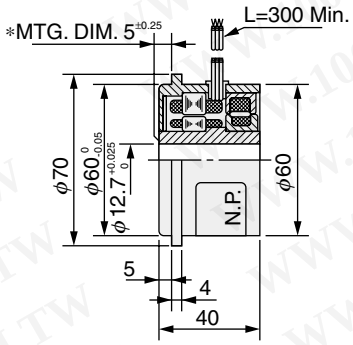
SIZE		25	30	35	43	47
Model No.		TS2013N211E57	TS2142N1E63	TS2158N21E63	TS2028N41E48	TS2054N91E51
Type		BRX	⟵	⟵	⟵	⟵
Primary		R1-R2	⟵	⟵	⟵	⟵
Input Voltage/Frequency		10Vrms 4.5kHz	7Vrms 5kHz	10V 5kHz	10V 4.5kHz	6V 10kHz
Transformation Ratio		0.5 ± 10%	0.5 ± 10%	0.5 ± 10%	0.5 ± 10%	0.28 ± 10%
Electrical Error		± 10' Max.	± 10´ Max.	± 10´ Max.	± 10´ Max.	± 10´ Max.
Null Voltage		20mVrms Max.	20mVrms Max.	30mVrms Max.	30mVrms Max.	20mVrms Max.
Phase Shift		−8° Nom.	−10° Nom.	−15° Nom.	−15° Nom.	−40° Nom.
Impedance	Z_{RO}	250+j377Ω	120+j200Ω	176Ω	200Ω	200+j345Ω
	Z_{SO}	400+j690Ω	——	——	——	——
	Z_{SS}	326+j623Ω	145+j280Ω	250Ω	285Ω	214+j338Ω
Operating Temperature		−55 ~ +155°C	⟵	⟵	−30 ~ +100°C	−30 ~ +100°C
Max. Operating Speed		10,000min.$^{-1}$	⟵	⟵	⟵	⟵
Mass		0.35kg	0.6kg	0.9kg	1.4kg	1.6kg
Output Type		Reverse	Normal	Normal	Normal	Normal

OUTLINE

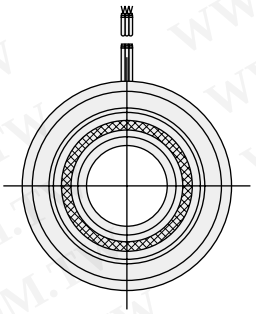
(DIMENSION : mm)

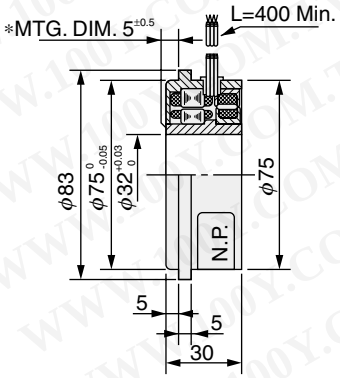
SIZE 25 TS2013N211E57



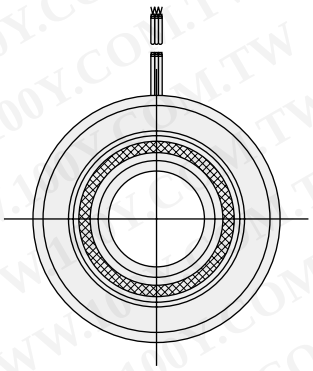


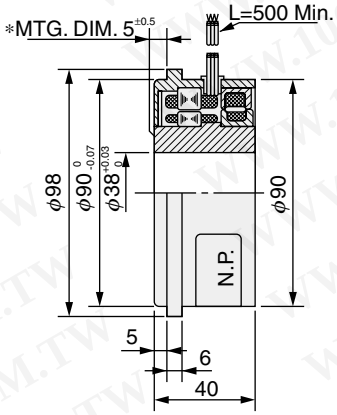
SIZE 30 TS2142N1E63



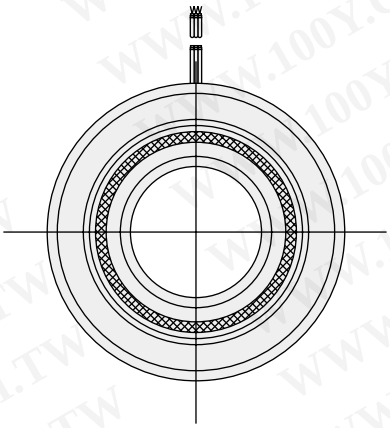


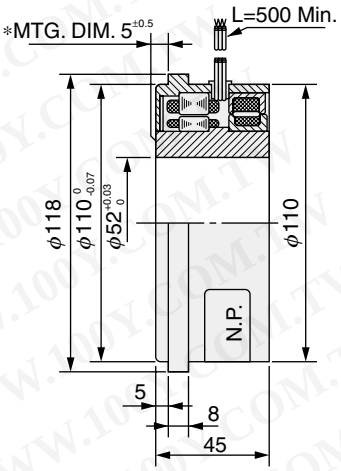
SIZE 35 TS2158N21E63



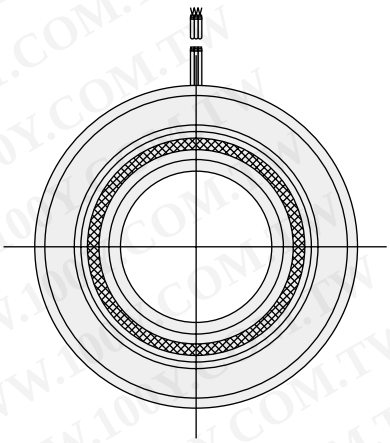


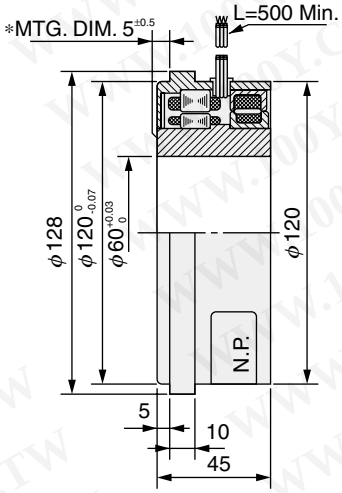
SIZE 43 TS2028N41E48





SIZE 47 TS2054N91E51

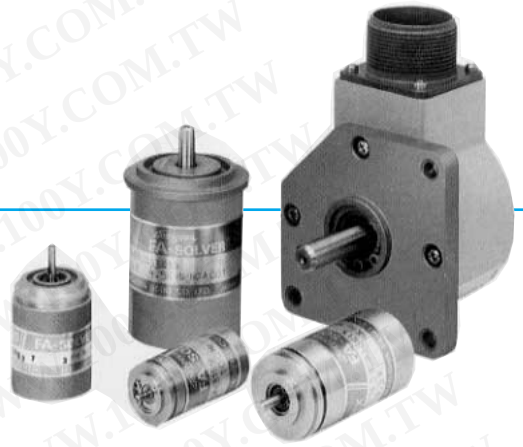




* MTG. DIM (Mounting Dimension)

FA-SOLVER®

SHAFT RESOLVERS



Products on this page are whithin FA-SOLVER® series.

BRX

SIZE		08	10	11	15	25
Model No.		TS510N35E18	TS520N46E9	TS530N33E10	TS540N33E12	TS2014N141E26
Type		BRX	←	←	←	←
Primary		R1-R2	←	←	←	←
Input Voltage/Frequency		7Vrms 3kHz	7Vrms 3kHz	18Vrms 5kHz	15Vrms 4kHz	10Vrms 4.5kHz
Transformation Ratio		0.5 ± 10%	0.5 ± 10%	0.5 ± 20%	0.5 ± 10%	0.5 ± 10%
Electrical Error		±15′ Max.	±10′ Max.	Spread10′	±10′ Max.	±10′ Max.
Null Voltage		15mVrms Max.	15mVrms Max.	15mVrms Max.	20mVrms Max.	15mVrms Max.
Phase Shift		+9.5° Nom.	+6.5° Nom.	−5° Nom.	+5° Nom.	−7.5° Nom.
Impedance	ZRO	860+j1,230Ω	847Ω	1,000Ω	1,030Ω	250+j377Ω
	ZSO	——	——	——	680Ω	400+j690Ω
	ZSS	205+j190Ω	252Ω	380Ω	540Ω	326+j623Ω
Operating Temperature		−30 ~ +100°C	←	←	←	←
Max. Operating Speed		6,000min.$^{-1}$	←	←	←	←
Mass		0.045kg	0.07kg	0.11kg	0.24kg	0.62kg
Output Type		Normal	Normal	Normal	Reverse	Normal

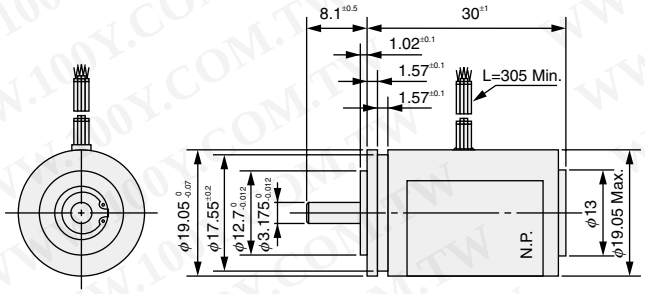
BRT

SIZE		08	10	11	15	25
Model No.		TS510N36E10	TS520N47E4	TS530N33E19	TS540N33E10	TS2014N221E1
Type		BRT	←	←	←	←
Primary		S1-3, S2-4	←	←	←	←
Input Voltage/Frequency		12Vrms 2.5kHz	7Vrms 1kHz	3.5Vrms 3kHz	10Vrms 4.5kHz	10Vrms 4.5kHz
Transformation Ratio		0.5 ±10%	0.5 ±10%	0.6 ±10%	0.5Nom.	0.3Nom.
Electrical Error		±15′ Max.	Spread 20′	±7′ Max.	Spread 10′	Spread 15′
Null Voltage		15mVrms Max.	15mVrms Max.	10mVrms Max.	15mVrms Max.	15mVrms Max.
Phase Shift		+5° Nom.	(+10° Nom.)	−3° Nom.	−5° Nom.	(−7° Nom.)
Impedance	ZRO	——	2,030Ω	1,600Ω	——	——
	ZSO	800Ω	780Ω	2,800Ω	1,600Ω	1,800Ω
	ZSS	350Ω	2,000Ω	1,200Ω	1,500Ω	3,800Ω
Operating Temperature		−30 ~ +100°C	←	←	←	←
Max. Operating Speed		6,000min.$^{-1}$	←	←	←	←
Mass		0.045kg	0.07kg	0.11kg	0.24kg	0.62kg

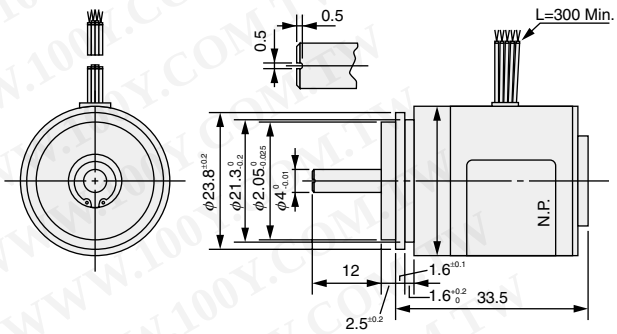
OUTLINE

(DIMENSION : mm)

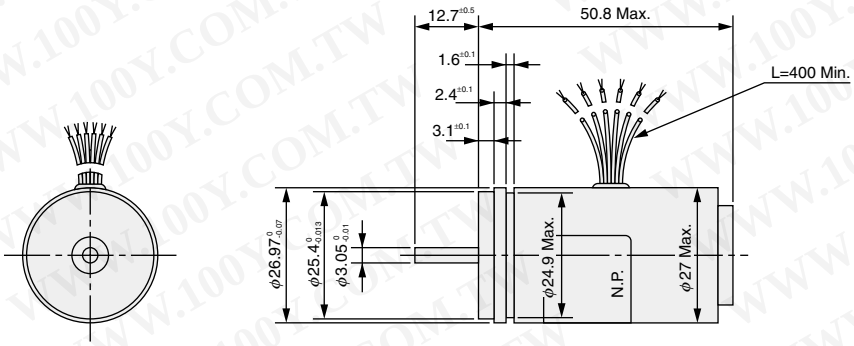
SIZE 08 TS510N35E18,TS510N36E10



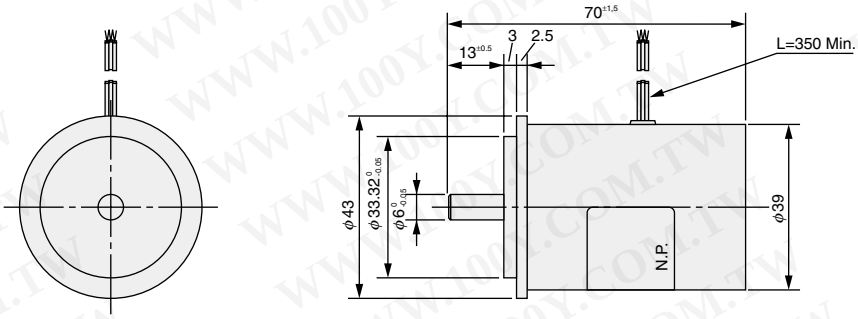
SIZE 10 TS520N46E9,TS520N47E4



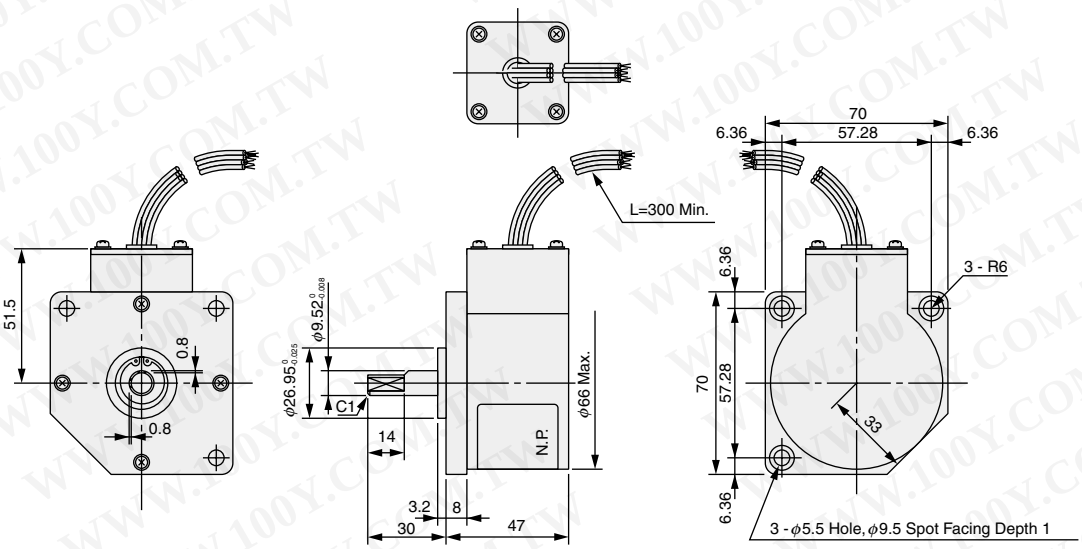
SIZE 11 TS530N33E10,TS530N33E19



SIZE 15 TS540N33E12,TS540N33E10



SIZE 25 TS2014N141E26,TS2014N221E1



FA-SOLVER®

HOLLOW SHAFT RESOLVERS

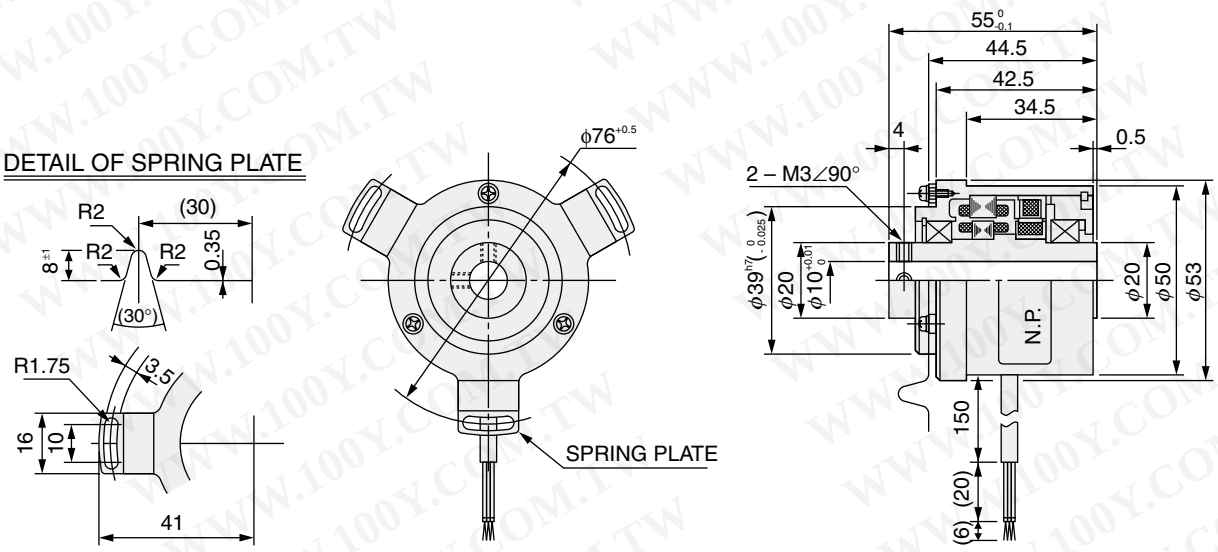
Products on this page are whithin FA-SOLVER® series.

SIZE		21	
Model No.		TS2151N1E26	TS2151N1E45
Type		BRX	⟵
Primary		R1-R2	⟵
Input Voltage/Frequency		10Vrms 4.5kHz	3.5Vrms 10kHz
Transformation Ratio		0.5 ± 5%	0.5 ± 5%
Electrical Error		±10′ Max.	±10′ Max.
Null Voltage		20mVrms Max.	20mVrms Max.
Phase Shift		+9° Nom.	−5° Nom.
Impedance	Z_{RO}	75+j95Ω	290+j505Ω
	Z_{SO}	100+j140Ω	420+j810Ω
	Z_{SS}	70+j120Ω	350+j710Ω
Operating Temperature		−30 ~ +100°C	⟵
Max. Operating Speed		6,000min.$^{-1}$	⟵
Mass		0.31kg	0.31kg
Output Type		Reverse	Reverse

OUTLINE

(DIMENSION : mm)

SIZE 21 **TS2151N1E26, E45**



APPLICATION NOTES

■The supply voltage is a rated value, and a resolver can accept a voltage from 3V to approx. 1.2 times as high as the rating. However, the supply frequency should only be altered within ±5% lest it should affect the accuracy. Electrical parameters largely very as the frequency varies as shown on the right.

■When a noise source is in vicinity, or when signal transfer distance is long, twisted/shielded pair cables should be used. When a noise still exists on the signals, they should be received by a differential amplifier.

■In BRX resolver, the two output voltages should be connected to the same amount of loads each other, or the voltages will get disproportionate, thus affect the accuracy.

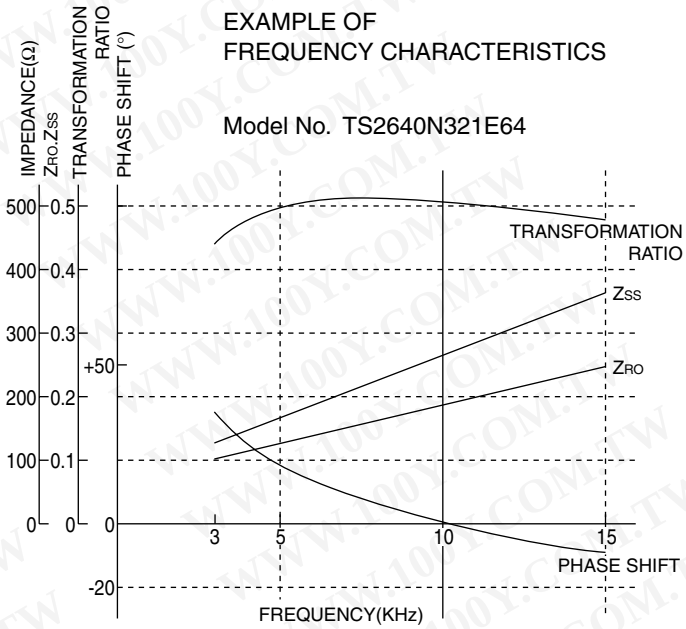
■When an intense magnetic field surrounds a resolver, it may not work properly with its magnetic flux affected.

■When a resolver is used in a high humidity as close to 100% Rh for a long time, waterproof structure should be considered lest its insulation materials should deteriorate.

■All resolver in the catalog are 1× (2 poles) resolvers. For winding modifications to other speeds, please consult us.

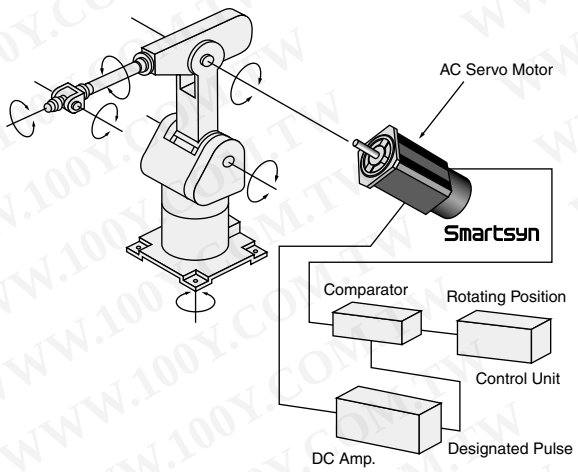
EXAMPLE OF
FREQUENCY CHARACTERISTICS

Model No. TS2640N321E64

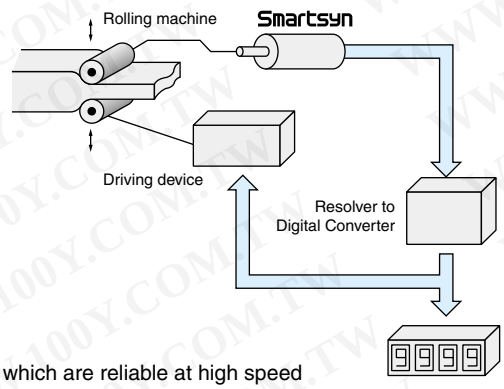


APPLICATIONS

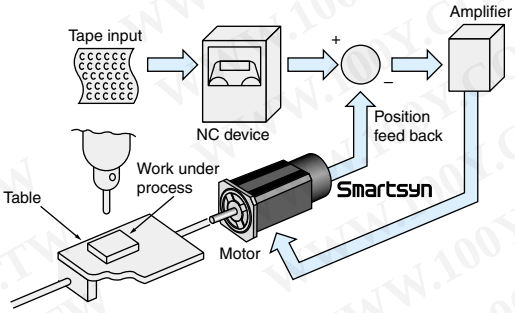
• For Driving Robot Hand and Body.



• Applicable to the roller positioning control of rolling mills.



• **Smartsyn** resolvers which are reliable at high speed are suitable for numerical control systems.



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ISO 14001 Certificate on Head office

WARRANTY
Tamagawa Seiki warrants that this product is free from defects in material of workmanship under nornal use and service for a period of one year from the date of shipment for its factory. This warranty, however, exculudes incidental and consequental damages caused by careless use of the product by the user. Even after the warranty period, Tamagawa Seiki offers repair service, with charge, in order to maintain the quality of the product. The MTBF (mean time between failures) of our product is quite long; yet, the predictable failure rate is not zero. The user is advised, therefore, that multiple safety means be incorporated in your system or product so as to prevent any consequental troubles resulting from the failure of your product.

All specifications are subject to change without notice.

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