

# Military / Aerospace Resolvers

## TYPICAL APPLICATIONS

Where precise position indication is required to interface with resolver to digital converters

- Target acquisition systems
- Gun trunnions
- Forward-Looking-Infra-Red (FLIR) systems
- Electro-optical systems
- Radar systems
- Missile seekers
- Motor commutation

## FEATURES

- 1, 2, 4, 8, 16, 32 and 36 speeds standard; others available
- 400 – 5,000 Hz frequency range standard; frequencies up to 20,000 Hz available
- High immunity to electrical noise
- Rugged design to meet demanding environments – no glass discs or optics to fail
- Compact design
- Mounts directly to shaft and housing – no coupling devices needed
- Brush or brushless designs
- High reliability – long-life design; no bearings or electronics
- Custom modifications available

## INTEGRATION CAPABILITIES

- Ideal for vertical integration with brushless motors and slip ring assemblies
- Commutation of brushless motors
- Feedback sensor for servo systems
- Compatible with R / D converters

*For position, commutation, and velocity feedback*



***Rugged, reliable - ideal for demanding environments***

Resolvers provide accurate position and velocity feedback as well as commutation in precision equipment, without the structural or temperature restrictions imposed by other electronic feedback devices. They are resistant to the shock and vibration levels often encountered in military and aerospace applications.

These resolvers are available in standard sizes, or with custom modifications. Our engineering department is available for consultation to help tailor a resolver to fit your needs.

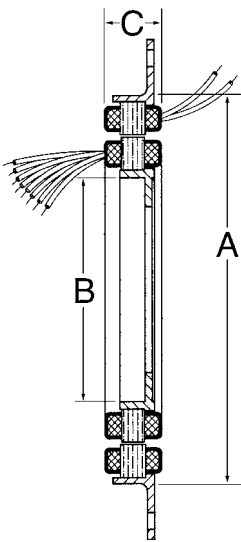
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## MECHANICAL PARAMETERS AND SCHEMATICS OF RESOLVERS

### Types of Resolvers

#### Pancake Resolvers

Pancake resolvers are so named for their physical dimensions – they typically have a diameter that exceeds their axial length. Pancake resolvers are supplied as separate rotor and stator assemblies, which are then mounted directly in the user's system. They are often supplied with a custom ring on the stator and hub on the rotor which facilitate mounting in the user's system. This also improves performance in the operating temperature ranges typically found in military systems. *Figure A* shows a typical physical configuration for a pancake resolver with a ring and hub.



**Figure A.** Dimension Configuration for Single or Multispeed Unhoused Pancake Resolvers

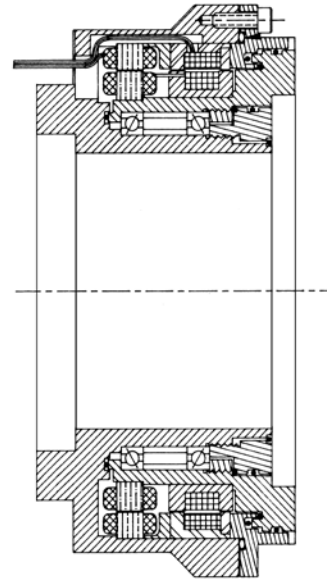
A pancake resolver can also be supplied in a multispeed configuration. Multispeeds are mechanically and electrically similar to a standard pancake, but produce "N" cycles of electrical output for each mechanical revolution of the rotor. "N" is called the ratio or speed of the resolver. For example, an 8 speed resolver has one electrical output cycle in  $360/8 = 45$  degrees of mechanical rotation. The individual electrical cycles can be distinguished from each other by inserting a single speed in the same slots with the multispeed, creating a multiple speed unit.

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*Figures B* and *C* below show typical wiring schematics for single speed and multispeed resolvers, respectively. Mounting diameters *A* and *B* and overall thickness *C* (refer to *Figure A*) as well as electrical parameters for a variety of units are tabulated on page 194.

#### Brushless Pancake Resolvers

A rotary transformer can be added to a pancake resolver so that all of the leads exit from the stationary element. Since the rotor is energized through this rotary transformer, slip rings and brushes are not required in the user's system. This type of resolver is called a brushless pancake resolver and is designated as "B/L" in the function column in the table on page 194. *Figure E* below shows a typical wiring schematic for a brushless resolver. Brushless resolvers often offer a less costly and more reliable alternative to resolvers that are energized through slip rings.



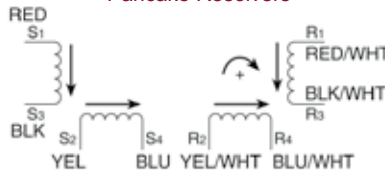
**Figure D.** Typical Outline for Housed Resolvers

#### Housed Resolvers

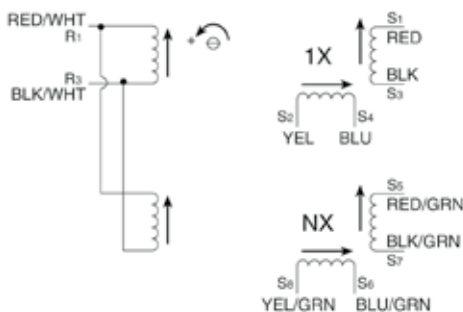
A pancake resolver can be mounted in a housing and shaft configuration that includes a set of ball bearings. Usually, the resolver housing is hard-mounted to the stationary portion of the user's system and the resolver shaft is connected to the rotating portion through a torsionally rigid flexible connector such as a bellows coupler. A housed resolver such as this can also incorporate a rotary transformer. A typical outline for a housed, brushless resolver is shown in *Figure D*. Often, a housed resolver will be more accurate than an equivalent unhoused unit because the air gap of the resolver can be ground concentric with the bearing seats.

Our engineering department is available to assist you in obtaining a mechanical configuration that will fit your system's requirements.

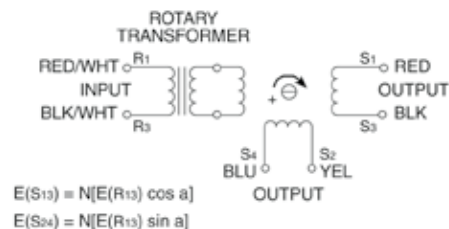
**Figure B.** Typical Schematic for Single Speed Pancake Resolvers



**Figure C.** Typical Schematic for Multispeed Pancake Resolvers



**Figure E.** Schematic and Phasing Equation of Typical Transformer Type Resolvers



# Military / Aerospace Resolvers

## SPECIFICATIONS

Part Number	Function	Primary Winding	Speed	Input (Volts/Hz)	Max Error (Accuracy) (+/-)	Trans. Ratio	Phase Shift (DEG)	Max Null V (mV)	Pin (mW)	Impedances		Unit Dimensions (See Figure A)			Notes
										Zpo	Zso	A	B	C	
												OD	ID	Overall Width	
SMH-12-A-1	RES RX	R	3X	5 / 5950	3'	0.4	23	20	40	113 + j245	33 + j75	1.19	0.56	0.37	3
SSH-12-A-2	RES RX	R	1X	10 / 3200	6'	1	8	20	32	250 + j850	330 + j1000	1.19	0.56	0.23	3
SSH-12-D-2	RES RX	R	1X	10 / 400	7'	0.434	26	15	88	225 + j455	65 + j128	1.19	0.09	0.7	3
SMH-14-A-1	RES RX	R	4X	26 / 500	6'	0.454	32	15	60	320 + j640	620 + j440	1.31	0.187	0.465	3
SMH-16-J-1	RES RX	R	2X	26 / 400	3'	0.454	40	20	814	350 + j410	157 + j165	1.56	0.81	0.38	3
SMH-17-B-3	RES RX	R	4X	26 / 500	6'	0.454	32	15	60	320 + j640	620 + j440	1.66	0.156	0.54	3
SSH-23-S-1	RES RX	S	1X	26 / 400	10'	0.454	30	30	225	900 + j1380	320 + j480	2.29	0.32	0.408	3
SMH-32-D-1	RES RX	R	16X	7 / 12500	60"	0.286	4	30	75	660	60 + j110	2.850	1.745	0.530	3
SMH-30-B-1	RES RX	R	16X	15 / 1200	30"	0.5	23	15	370	100 + j225	540 + j475	2.94	1.5	0.708	3
SMH-30-C-1	RES RX	R	8X	15 / 1200	1'	0.5	15	20	125	120 + j450	600 + j575	2.94	1.5	0.708	3
SMH-30-E-1	RES RX	S	16X	26 / 1440	30"	0.454	45	30	240	502 + j1098	935 + j1398	2.960	0.740	0.550	3
SMH-34-G-1	RES RX	S	8X	26 / 1440	30"	0.454	17.5	30	460	155 + j455	300 + j200	3.34	1.075	0.55	3
SMH-34-C-1	RES RX	R	8X	26 / 2400	2'	0.454	42	20	1200	206 + j358	—	3.39	0.875	0.914	3
SSJH-36-B-3/ P195	RES RX	R	1X and	26 / 400	15'	0.454	8	30	530	225 + j480	750 + j225	3.57	2	0.6	1, 3
			16X		1'										
SSJH-36-K-1	RES RX	R	1X and	26 / 2400	10'	0.454	4	20	40	4000 + j8800	—	3.58	1.31	1.11	3
			8X		26 / 2400										
SMH-37-A-3	RES RX	R	8X	11.8 / 400	1'	0.4	27	10	60	650 + j1270	—	3.61	0.54	0.61	3
SMH-37-J-1	RES RX	R	16X	26 / 400	30"	0.454	29	25	600	330 + j540	—	3.61	0.728	0.65	3
SSJH-37-J-4	RES RX	R	1X and	8 / 2400	60"	0.25	2.5	15	150	180 + j306	81 + j48	3.610	.728	.650	1, 3
			32X		20"						0.25				
SMH-43-E-1	RES RX	S	16X	7 / 12500	60"	0.286	2.5	30	54	51 + j206	51 + 250 MΩ	3.695	2.405	0.530	3
SSBH-40-C-1	B/L R RX	S	1X	7 / 1200	6'	0.683	3	15	65	180 + j320	313 + j487	3.95	2	1	3
SSJH-43-C-1	RES RX	R	1X and	7 / 4500	15'	0.454	0	30	16	122 + j686	530 + j545	4.245	3.175	0.545	4
			16X		7 / 4500										
SMVH-44-A-2	RES VR	S	2X	12 / 5000	2°	0.275	12	40	3125	32 + j120	42 + j245	4.4	0.945	0.65	3
SSJH-46-C-1	RES RX	R	1X and	7 / 800	10'	0.357	10	6	3	1650 + j5040	295 + j725	4.52	2.08	0.578	3
			16X		7 / 800						30"				
SSH-50-B-1	RES RX	R	1X	26 / 400	3'	0.454	3	25	120	1435 + j2530	360 + j565	4.99	3.456	0.7	4
SSJH-50-B-3	RES RX	R	1X and	26 / 2600	15'	0.454	4	25	282	162 + j602	278 + j295	4.994	3.456	0.750	4
			32X		26 / 2600						20"				
SMH-53-A-1	RES RX	R	2X	18 / 400	5'	0.656	45	18	50	760 + j1400	780 + j855	5.26	2.385	0.855	3
SSJH-60-A-1	RES RX	R	1X and	26 / 400	10'	0.454	10	25	670	145 + j352	—	6	3.455	1	1, 4
			32X		20"						0.454				
SSJH-60-D-1	RES RX	R	1X and	115 / 400	20"	0.783	5	200	330	7978 + j17680	5100 + j12228	6	3.455	1	4
			16X		115 / 400						40"				
SSJH-63-A-1	RES RX	R	1X and	26 / 400	15'	0.454	21	30	1570	152 + j203	730 + j255	6.25	5.01	0.61	1, 4
			16X		60"						0.454				
SGH-78-B-2	SYN CX	R	1X	26 / 400	4'	0.454	20	30	500	2480 + j3285	720 + j885	7.75	4.27	1.88	3
SGH-78-C-2	SYN CX	R	1X	26 / 401	4'	0.454	20	30	500	2480 + j3285	720 + j885	7.75	4.27	1.88	3
SGH-78-D-2	SYN CX	R	1X	26 / 402	4'	0.454	20	30	500	2480 + j3285	720 + j885	7.75	4.27	1.88	3
SSJH-98-A-1	RES RX	R	1X and	26 / 400	10'	0.450	7	30	120	2080 + j2700	535 + j750	9.750	6.000	1.000	3
			16X		26 / 400						60"				

### Abbreviations:

Function: RES RX = Resolver Transmitter  
 SYN CX = Synchro Transmitter  
 B/L R RX = Brushless Resolver Transmitter

Winding: R = Rotor  
 S = Stator

Accuracy: ' = arc minutes, " = arc seconds

Higher accuracy units available, please call factory.

Impedances:  
 Zpo = Impedance of the primary with the secondary open  
 Zso = Impedance of the secondary with the primary open

Other: — = please consult factory

### Notes:

1. Primary windings of both speeds are in parallel.
2. Rotation limited to ±30° due to connector.
3. These dimensions refer to the resolver **with** mounting rings and hubs. We can alter or delete the mounting rings and hubs as needed to meet your requirements. Tooling charges may apply.
4. These dimensions refer to resolver **without** mounting rings and hubs. We can add mounting rings and hubs as required to meet your requirements. Tooling charges may apply.