Resolver 4.0 Catalog

This document describes the Resolver 4.0 Catalog, a collection of simulated, optimized, and tested plug-and-play sensor designs, and provides links to the associated PCB documentation, measurement reports, and Gerber data.

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1. Introduction

The Resolver 4.0 Catalog is a collection of plug-and-play sensor designs, which are simulated, optimized and tested. For downloading PCB documents (including BOM and PCB manufacturing data), Measurement reports, and Gerber data for each design, click the relevant links in the tables in this document.

NOTE
All reference designs of the Resolver 4.0 Catalog are compatible both with the IPS2200 and the IPS2550. For downloading the Gerber files, registration and acceptance of Renesas' legal terms and conditions are required.

2. Regular Through-Shaft Resolver 4.0

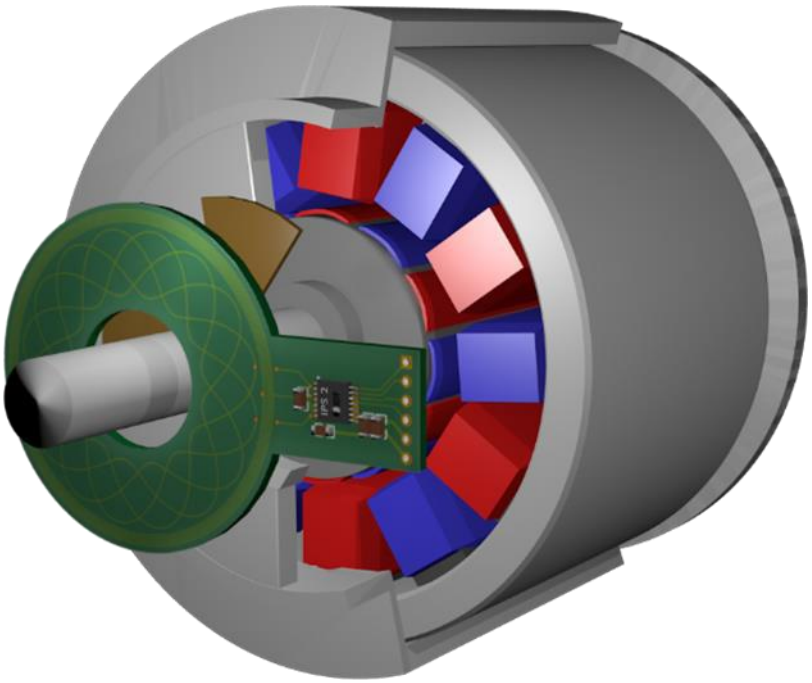


Figure 1. Example of a Regular Through-Shaft Resolver 4.0 Design

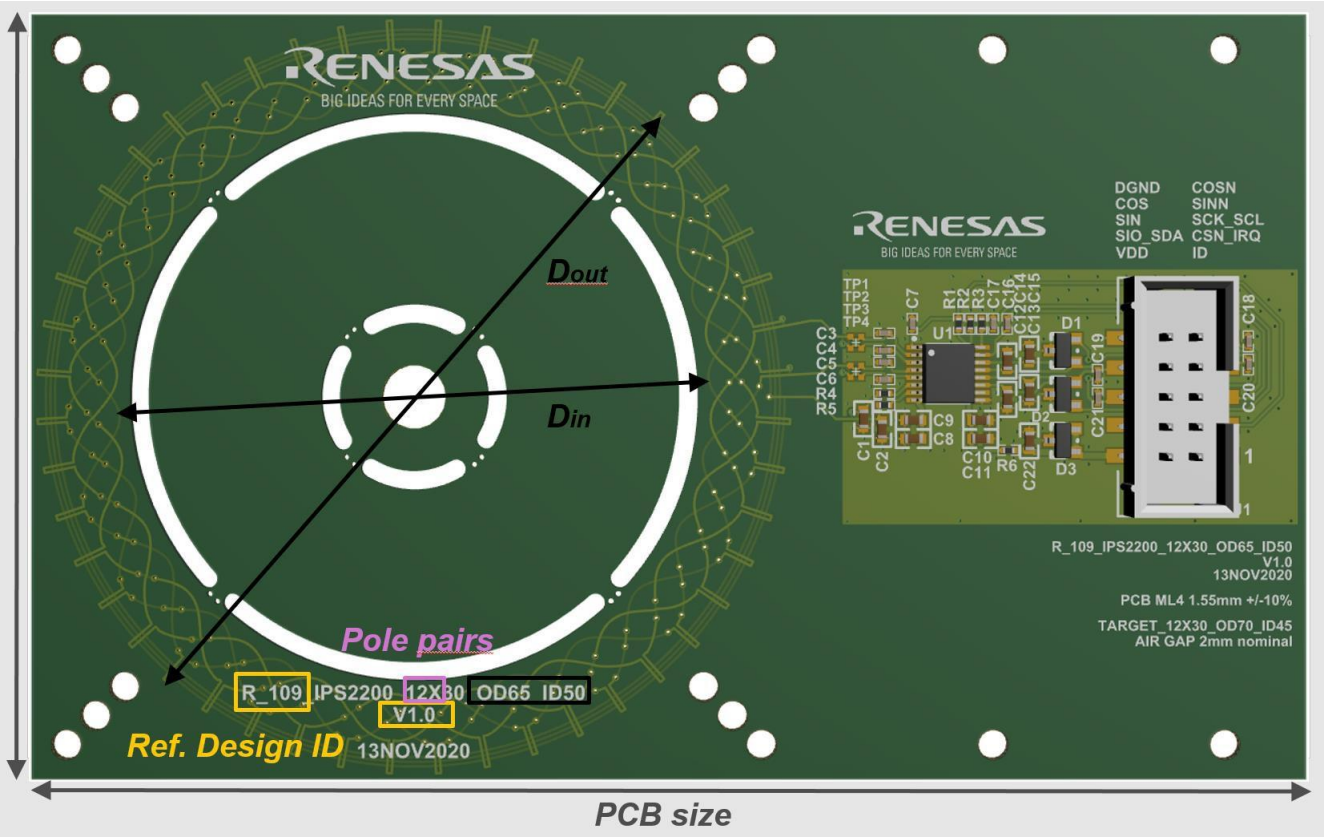


Figure 2. Example Rendered Image of a Regular Through-Shaft Resolver 4.0

Table 1. Regular Through-Shaft Resolver 4.0 Characteristics

Ref. Design ID	Single/ Redundant	No. of Pole Pairs	PCB Size [mm]	Coil Size D_{out}/D_{in} [a] [mm]	Target Size D_{out}/D_{in} [mm]	Air Gap (Nominal) [mm]	Accuracy[b] (Nominal) [deg. mech.]/ [deg. el.]	Links
R_66_V10	Single	1	64 x 40	19 / 6	24 / 6	1	±0.370 ±0.370	PCB Documentation Measurement Report Gerber Files
R_92_V10	Single	1	40 x 40	19 / 6	24 / 6	1	±0.491 ±0.491	PCB Documentation Measurement Report Gerber Files
R_67_V10	Single	2	64 x 40	19 / 6	24 / 6	1	±0.110 ±0.220	PCB Documentation Measurement Report Gerber Files
R_93_V10	Single	2	40 x 40	19 / 6	24 / 6	1	±0.112 ±0.223	PCB Documentation Measurement Report Gerber Files
R_68_V10	Single	3	64 x 40	19 / 6	24 / 6	1	±0.088 ±0.264	PCB Documentation Measurement Report Gerber Files
R_94_V10	Single	3	40 x 40	19 / 6	24 / 6	1	±0.129 ±0.388	PCB Documentation Measurement Report Gerber Files

Ref. Design ID	Single/ Redundant	No. of Pole Pairs	PCB Size [mm]	Coil Size D_{out}/D_{in} [a] [mm]	Target Size D_{out}/D_{in} [mm]	Air Gap (Nominal) [mm]	Accuracy[b] (Nominal) [deg. mech.]/ [deg. el.]	Links
R_69_V10	Single	4	64 x 40	19 / 6	24 / 6	1	±0.054 ±0.218	PCB Documentation Measurement Report Gerber Files
R_75_V10	Single	5	64 x 40	19 / 6	24 / 6	1	±0.053 ±0.264	PCB Documentation Measurement Report Gerber Files
R_95_V10	Single	5	40 x 40	19 / 6	24 / 6	1	±0.060 ±0.299	PCB Documentation Measurement Report Gerber Files
R_63_V10	Single	1	64 x 40	32 / 18	36 / 12	2	±0.339 ±0.339	PCB Documentation Measurement Report Gerber Files
R_64_V10	Single	2	64 x 40	32 / 18	36 / 12	2	±0.179 ±0.359	PCB Documentation Measurement Report Gerber Files
R_56_V10	Single	3	64 x 40	32 / 18	35 / 13	2	±0.077 ±0.23	PCB Documentation Measurement Report Gerber Files
R_53_V10	Single	4	64 x 40	32 / 18	35 / 13	2	±0.119 ±0.476	PCB Documentation Measurement Report Gerber Files
R_54_V10	Single	5	64 x 40	32 / 18	35 / 13	2	±0.063 ±0.317	PCB Documentation Measurement Report Gerber Files
R_58_V10	Single	6	64 x 40	32 / 18	35 / 13	1.5	±0.061 ±0.365	PCB Documentation Measurement Report Gerber Files
R_96_V10	Single	7	84 x 42	31 / 18	36 / 12	2	±0.038 ±0.270	PCB Documentation Measurement Report Gerber Files
R_59_V10	Single	8	64 x 40	32 / 18	35 / 13	1.5	±0.028 ±0.223	PCB Documentation Measurement Report Gerber Files
R_60_V10	Single	10	64 x 40	32 / 18	35 / 13	1.5	±0.021 ±0.212	PCB Documentation Measurement Report Gerber Files
R_84_V10	Single	13	91 x 80	35 / 20	36 / 18	2	±0.030 ±0.396	PCB Documentation Measurement Report Gerber Files
R_79_V10	Single	4	75 x 50	45 / 24	50 / 19	2	±0.053 ±0.213	PCB Documentation Measurement Report Gerber Files

Ref. Design ID	Single/ Redundant	No. of Pole Pairs	PCB Size [mm]	Coil Size D_{out}/D_{in} [a] [mm]	Target Size D_{out}/D_{in} [mm]	Air Gap (Nominal) [mm]	Accuracy[b] (Nominal) [deg. mech.]/ [deg. el.]	Links
R_102_V20	Single	5	84 x 40	38 / 22	42 / 18	2	±0.051 ±0.253	PCB Documentation Measurement Report Gerber Files
R_85_V10	Single	13	91 x 80	44 / 20	44 / 18	2	±0.032 ±0.416	PCB Documentation Measurement Report Gerber Files
R_99_V10	Single	1	110 x 66	65 / 50	70 / 45	3	±0.568 ±0.568	PCB Documentation Measurement Report Gerber Files
R_100_V10	Single	2	110 x 66	65 / 50	70 / 45	2	±0.104 ±0.208	PCB Documentation Measurement Report Gerber Files
R_76_V10	Single	3	94 x 70	65 / 50	70 / 45	3	±0.166 ±0.497	PCB Documentation Measurement Report Gerber Files
R_71_V10	Single	4	94 x 70	65 / 50	70 / 45	3	±0.096 ±0.383	PCB Documentation Measurement Report Gerber Files
R_08_V30	Single	4	94 x 70	60 / 38	66 / 32	5	±0.057 ±0.229	PCB Documentation Measurement Report Gerber Files
R_61_V12	Single	4	80 x 80	70 / 54	74 / 54	2	±0.106 ±0.423	PCB Documentation Measurement Report Gerber Files
R_87_V10	Single	5	112 x 66	60 / 24	60 / 22	3	±0.061 ±0.306	PCB Documentation Measurement Report Gerber Files
R_101_V10	Single	5	110 x 66	65 / 50	70 / 45	3	±0.065 ±0.327	PCB Documentation Measurement Report Gerber Files
R_107_V10	Single	6	110 x 66	65 / 50	70 / 45	3	±0.052 ±0.315	PCB Documentation Measurement Report Gerber Files
R_97_V10	Single	7	110 x 66	65 / 50	70 / 45	2	±0.045 ±0.316	PCB Documentation Measurement Report Gerber Files
R_108_V10	Single	8	110 x 66	65 / 50	70 / 45	2	±0.033 ±0.260	PCB Documentation Measurement Report Gerber Files
R_72_V10	Single	10	94 x 70	65 / 50	70 / 45	3	±0.022 ±0.224	PCB Documentation Measurement Report Gerber Files

Ref. Design ID	Single/ Redundant	No. of Pole Pairs	PCB Size [mm]	Coil Size D_{out}/D_{in} [a] [mm]	Target Size D_{out}/D_{in} [mm]	Air Gap (Nominal) [mm]	Accuracy[b] (Nominal) [deg. mech.]/ [deg. el.]	Links
R_109_V10	Single	12	110 x 66	65 / 50	70 / 45	2	±0.027 ±0.324	PCB Documentation Measurement Report Gerber Files
R_116_V10	Single	16	108 x 66	60 / 32	64 / 28	2.5	±0.028 ±0.446	PCB Documentation Measurement Report Gerber Files
R_90_V10	Single	32	108 x 66	60 / 32	64 / 28	1	±0.011 ±0.366	PCB Documentation Measurement Report Gerber Files
R_110_V10	Single	1	142 x 92	97 / 66	100 / 62	3	±0.310 ±0.310	PCB Documentation Measurement Report Gerber Files
R_111_V10	Single	2	142 x 92	97 / 66	100 / 62	3	±0.112 ±0.225	PCB Documentation Measurement Report Gerber Files
R_112_V10	Single	3	142 x 92	97 / 66	100 / 62	3	±0.077 ±0.230	PCB Documentation Measurement Report Gerber Files
R_73_V10	Single	4	120 x 120	97 / 66	100 / 62	3	±0.092 ±0.368	PCB Documentation Measurement Report Gerber Files
R_65_V10	Single	5	120 x 120	97 / 66	100 / 62	3	±0.066 ±0.329	PCB Documentation Measurement Report Gerber Files
R_113_V10	Single	6	142 x 92	97 / 66	100 / 62	3	±0.037 ±0.222	PCB Documentation Measurement Report Gerber Files
R_98_V10	Single	7	142 x 92	97 / 66	100 / 62	3	±0.035 ±0.246	PCB Documentation Measurement Report Gerber Files
R_114_V10	Single	8	142 x 92	97 / 66	100 / 62	3	±0.029 ±0.234	PCB Documentation Measurement Report Gerber Files
R_74_V10	Single	10	120 x 120	97 / 66	100 / 62	3	±0.031 ±0.313	PCB Documentation Measurement Report Gerber Files
R_115_V10	Single	12	142 x 98	97 / 66	100 / 62	3	±0.019 ±0.228	PCB Documentation Measurement Report Gerber Files

[a] D_{out} refers to the outer diameter, and D_{in} refers to the inner diameter.

[b] The typical accuracy is obtained as the maximum of the absolute full-scale error at the nominal air gap.

3. Backward Compatible Resolver 4.0

In every Backward Compatible Resolver 4.0 design, the sensing element and all components including IPS2 and connector are placed on the same area (ring). Therefore, no extra PCB area is needed for the components, and the design represents a backward compatible resolver solution.

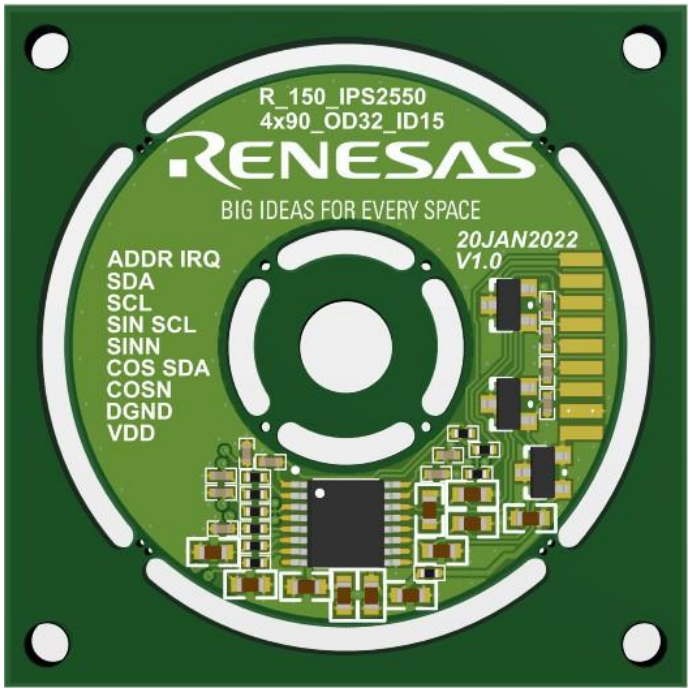


Figure 3. Example Rendered Image of a Backward Compatible Resolver 4.0 – Top View

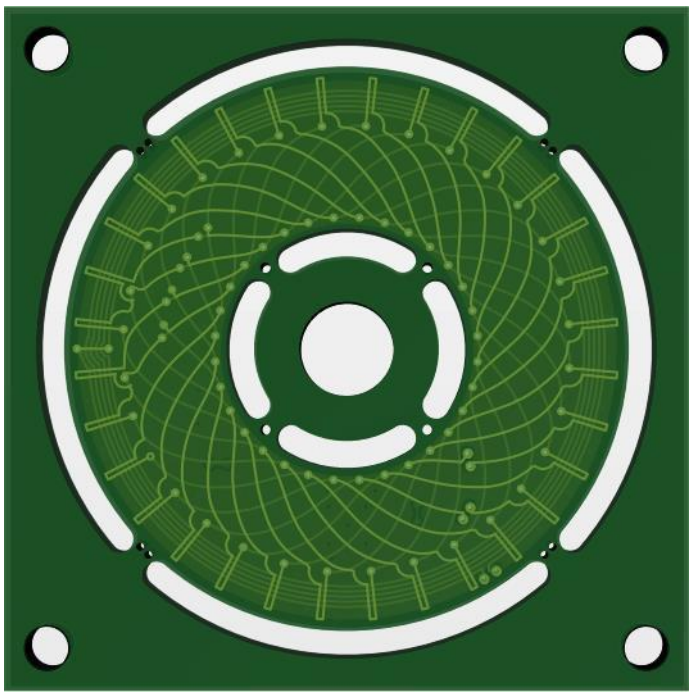


Figure 4. Example Rendered Image of a Backward Compatible Resolver 4.0 – Bottom View

Table 2. Backward Compatible Resolver 4.0 Characteristics

Ref. Design ID	Single/ Redundant	No. of Pole Pairs	PCB Size D_{out}/D_{in} [a] [mm]	Coil Size D_{out}/D_{in} [mm]	Target Size D_{out}/D_{in} [mm]	Air Gap (Nominal) [mm]	Accuracy [b] (Nominal) [deg. mech.]/ [deg. el.]	Links
R_77_V20	Single	4	29 / 5.7	22 / 6	24 / 6	1.5	±0.118 ±0.474	PCB Documentation Measurement Report Gerber Files
R_147_V10	Single	1	33 / 14	32 / 14.9	33 / 12	1.5	±0.255 ±0.255	PCB Documentation Measurement Report Gerber Files
R_148_V10	Single	2	33 / 14	32 / 14.9	33 / 12	1.5	±0.119 ±0.237	PCB Documentation Measurement Report Gerber Files
R_149_V10	Single	3	33 / 14	32 / 14.9	31 / 12	1.5	±0.082 ±0.247	PCB Documentation Measurement Report Gerber Files
R_150_V10	Single	4	33 / 14	32 / 14.9	33 / 12	1.5	±0.080 ±0.322	PCB Documentation Measurement Report Gerber Files
R_151_V10	Single	2	63 / 37	62 / 38	60 / 36	2.5	±0.126 ±0.251	PCB Documentation Measurement Report Gerber Files
R_152_V10	Single	3	63 / 37	62 / 38	60 / 36	2.5	±0.084 ±0.251	PCB Documentation Measurement Report Gerber Files
R_153_V10	Single	4	63 / 37	62 / 38	60 / 36	2.5	±0.056 ±0.225	PCB Documentation Measurement Report Gerber Files
R_154_V10	Single	5	63 / 37	62 / 38	60 / 36	2.5	±0.039 ±0.193	PCB Documentation Measurement Report Gerber Files
R_155_V10	Single	6	63 / 37	62 / 38	60 / 36	2.5	±0.025 ±0.148	PCB Documentation Measurement Report Gerber Files
R_156_V10	Single	7	63 / 37	62 / 38	60 / 36	2.5	±0.030 ±0.210	PCB Documentation Measurement Report Gerber Files
R_157_V10	Single	8	63 / 37	62 / 38	60 / 36	2.5	±0.021 ±0.167	PCB Documentation Measurement Report Gerber Files
R_158_V10	Single	9	63 / 37	62 / 38	60 / 36	2.5	±0.033 ±0.297	PCB Documentation Measurement Report Gerber Files

Ref. Design ID	Single/ Redundant	No. of Pole Pairs	PCB Size D_{out}/D_{in} [a] [mm]	Coil Size D_{out}/D_{in} [mm]	Target Size D_{out}/D_{in} [mm]	Air Gap (Nominal) [mm]	Accuracy [b] (Nominal) [deg. mech.]/ [deg. el.]	Links
R_159_V10	Single	10	63 / 37	62 / 38	60 / 36	2.5	±0.022 ±0.223	PCB Documentation Measurement Report Gerber Files
R_160_V10	Single	12	63 / 37	62 / 38	60 / 36	2.5	±0.019 ±0.227	PCB Documentation Measurement Report Gerber Files

[a] D_{out} refers to the outer diameter, and D_{in} refers to the inner diameter.

[b] The typical accuracy is obtained as the maximum of the absolute full-scale error at the nominal air gap.

[c] Ring shaped rotary design, 3.2mm PCB thickness, blind vias. Measured with IPS2550 which is compatible with IPS2200 either by crossing out pins 3 and 4 in the schematic and layout designs or by changing the registers to IPS2200 mode in the IPS ComBoard GUI.

4. Easy Side-Shaft Resolver 4.0

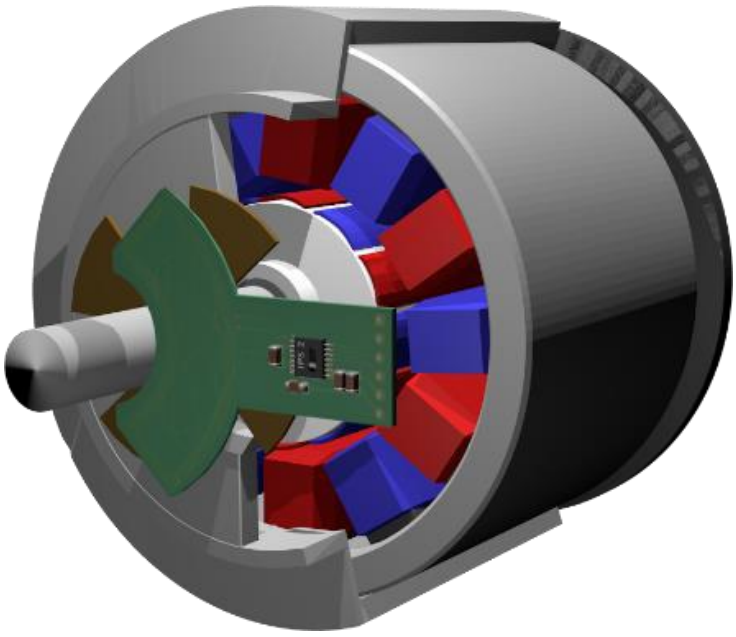


Figure 5. Example of an Easy Side-Shaft Resolver 4.0

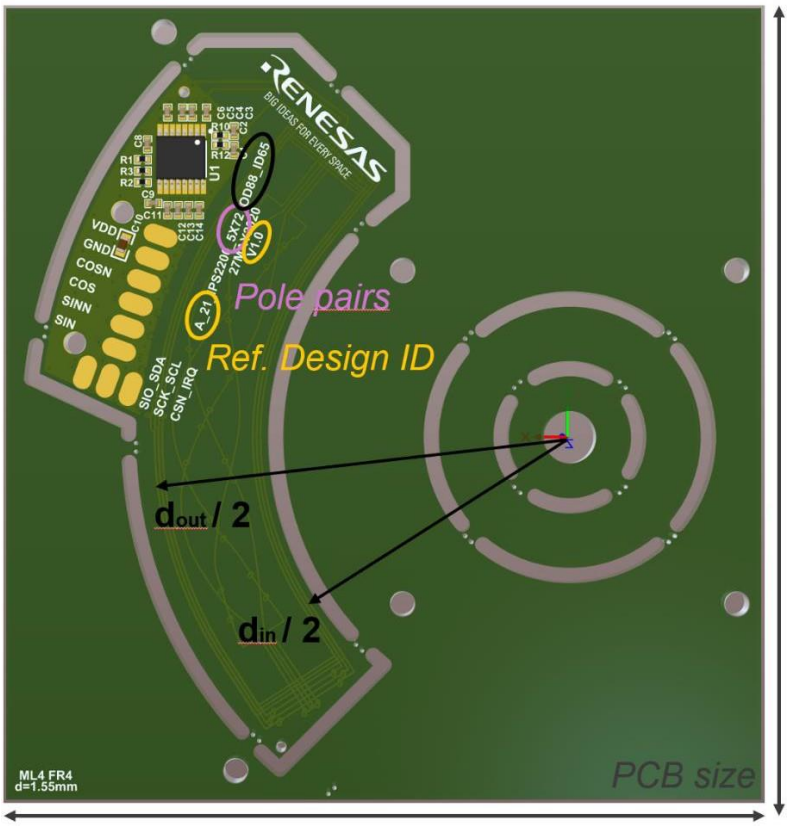


Figure 6. Example Rendered Easy Side-Shaft Resolver 4.0

Table 3. Easy Side-Shaft Resolver 4.0 Characteristics

Ref. Design ID	Single/ Redundant	No. of Pole Pairs	PCB Size [mm]	Coil Size D_{out}/D_{in} [a] [mm]	Target Size D_{out}/D_{in} [mm]	Air Gap (Nominal) [mm]	Accuracy [b] (Nominal) [deg. mech.]/ [deg. el.]	Links
A_20_V11	Single	12	118 x 60	139 / 117	143 / 114	3.5	±0.059 ±0.709	PCB Documentation Measurement Report Gerber Files
A_21_V10	Single	5	83 x 79	88 / 65	92 / 61	3	±0.159 ±0.793	PCB Documentation Measurement Report Gerber Files
A_27_V10	Single	3	33 / 14	30 / 16	31 / 14	1	±0.473 ±1.419	PCB Documentation Measurement Report Gerber Files
A_28_V10	Single	4	33 / 14	32 / 15	31 / 14	1	±0.338 ±1.353	PCB Documentation Measurement Report Gerber Files

[a] D_{out} refers to the outer diameter, and D_{in} refers to the inner diameter.

[b] The typical accuracy is obtained as the maximum of the absolute full-scale error at the nominal air gap.

5. Easy Side-Shaft Plus Resolver 4.0

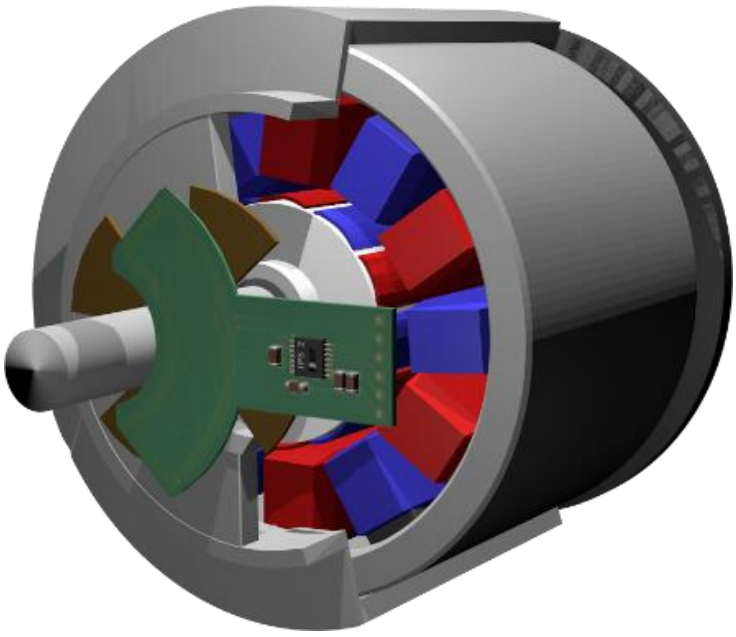


Figure 7. Example of an Easy Side-Shaft Plus Resolver 4.0

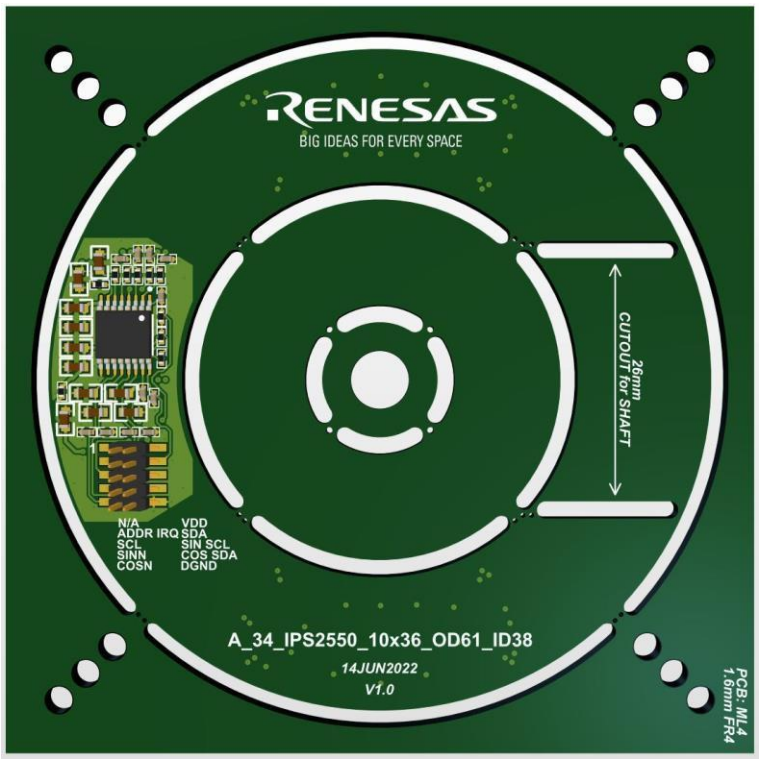


Figure 8. Example Rendered Easy Side-Shaft Plus Resolver 4.0 – Top View

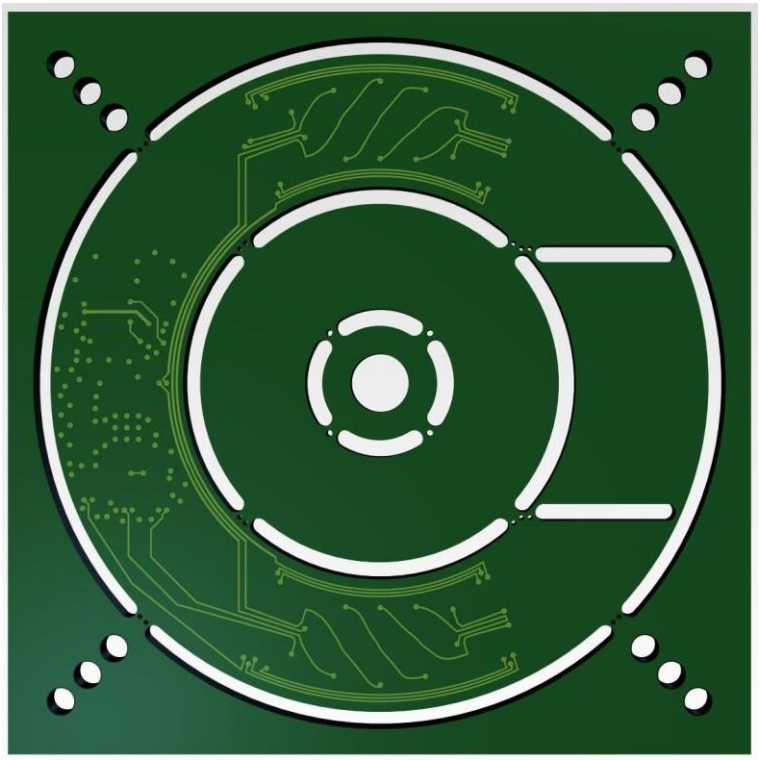


Figure 9. Example Rendered Easy Side-Shaft Plus Resolver 4.0 – Bottom View

Table 4. Easy Side-Shaft Plus Resolver 4.0 Characteristics[c]

Ref. Design ID	Single/ Redundant	No. of Pole Pairs	PCB Size D_{out}/D_{in} [a] [mm]	Coil Size D_{out} / D_{in} [mm]	Target Size D_{out}/D_{in} [mm]	Air Gap (Nominal) [mm]	Accuracy [b] (Nominal) [deg. mech.] / [deg. el.]	Links
A_29_V10	Single	4	62 / 37	60 / 43	60 / 42	2	±0.239 ±0.956	PCB Documentation Measurement Report Gerber Files
A_30_V10	Single	5	62 / 37	60 / 39	60 / 38	2	±0.102 ±0.512	PCB Documentation Measurement Report Gerber Files
A_31_V10	Single	6	62 / 37	60 / 39	60 / 38	2	±0.106 ±0.634	PCB Documentation Measurement Report Gerber Files
A_32_V10	Single	7	62 / 37	60 / 39	60 / 38	2	±0.071 ±0.494	PCB Documentation Measurement Report Gerber Files
A_33_V10	Single	8	62 / 37	60 / 39	60 / 38	2	±0.079 ±0.632	PCB Documentation Measurement Report Gerber Files
A_34_V10	Single	10	62 / 37	60 / 39	60 / 38	2	±0.064 ±0.635	PCB Documentation Measurement Report Gerber Files
A_35_V10	Single	12	62 / 37	60 / 39	60 / 38	2	±0.040 ±0.479	PCB Documentation Measurement Report

Ref. Design ID	Single/ Redundant	No. of Pole Pairs	PCB Size D_{out}/D_{in} [a] [mm]	Coil Size D_{out} / D_{in} [mm]	Target Size D_{out}/D_{in} [mm]	Air Gap (Nominal) [mm]	Accuracy [b] (Nominal) [deg. mech.] / [deg. el.]	Links
								Gerber Files
A_36_V10	Single	4	97 / 72	96 / 73	96 / 73	2	±0.164 ±0.657	PCB Documentation Measurement Report Gerber Files
A_37_V10	Single	10	97 / 72	96 / 73	96 / 73	2	±0.042 ±0.423	PCB Documentation Measurement Report Gerber Files
A_38_V10	Single	12	97 / 72	96 / 73	96 / 73	2	±0.039 ±0.463	PCB Documentation Measurement Report Gerber Files
A_39_V10	Single	10	128 / 103	127 / 104	128 / 104	2	±0.048 ±0.476	PCB Documentation Measurement Report Gerber Files
A_40_V10	Single	12	128 / 103	127 / 104	128 / 104	2	±0.045 ±0.537	PCB Documentation Measurement Report Gerber Files

[a] Dout refers to the outer diameter, and Din refers to the inner diameter.

[b] The typical accuracy is obtained as the maximum of the absolute full-scale error at the nominal air gap.

[c] Measured with IPS2550 which is compatible with IPS2200 by crossing out pins 3 and 4 in the schematic and layout designs or by changing the registers to IPS2200 mode in the IPS ComBoard GUI.

6. Revision History

Revision	Date	Description
3.01	Oct 30, 2026	Added document number
3.00	Aug 31, 2022	Changed name, added Backward Resolver 4.0 designs, Easy Side-Shaft Resolvers 4.0 designs, Easy Side-Shaft Plus Resolvers
2.00	Feb 23, 2021	New designs added
1.01	Jun 24, 2020	Minor fix
1.00	Mar 25, 2020	Initial version

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