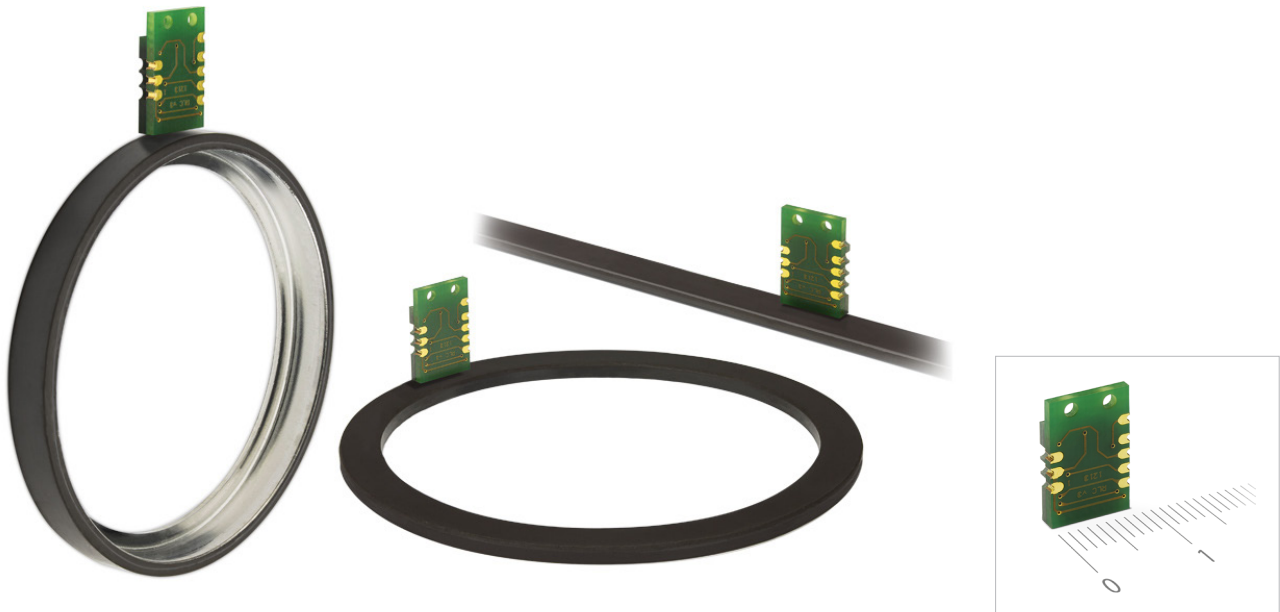


RLC2HD miniature PCB level incremental magnetic encoder sensor system



RLC2HD is a PCB level incremental encoder sensor system consisting of a PCB sensor and magnetic scale or ring. It has been designed for embedded motion control applications as a position control loop feedback element in space constraint applications.

The information carrier is a periodically magnetised scale with a pole length of 2 mm. Radial or axial reading of the ring is possible.

State of the art position sensing assures highly repeatable position measurement under wide installation tolerances and temperature ranges.

The position information is output in incremental quadrature format with the option of a periodic reference mark (every pole).

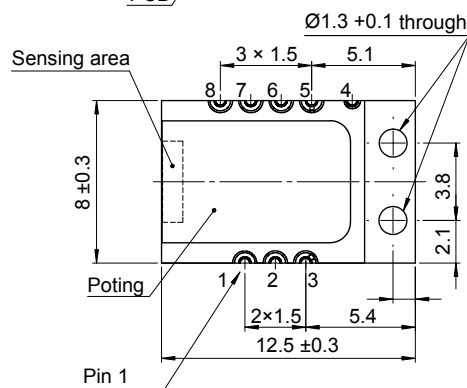
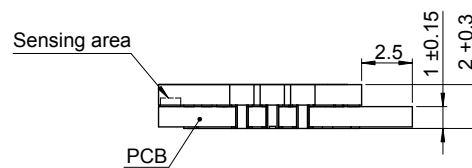
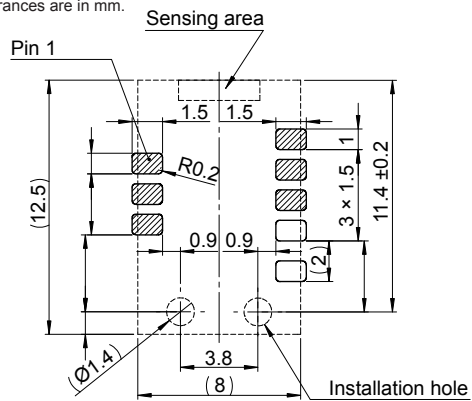
The maximum traverse velocity depends on the chosen resolution and minimum edge separation time, to 7.5 m/s at 1 μm and to 75 m/s at approx. 10 μm .

The RLC2HD is a moisture sensitive device. It should be soldered immediately after the transportation packaging has been opened. If not, baking procedure should be performed.

- **Miniature design**
- **Incremental quadrature TTL output signals A, B, Z**
- **Periodic, bidirectional index impulse**
- **Resolutions from 0.244 μm for linear and up to 753,664 cpr for rotary applications (76 pole ring)**
- **High speed operation**
- **RoHS compliant**

RLC2HD dimensions

Dimensions and tolerances are in mm.

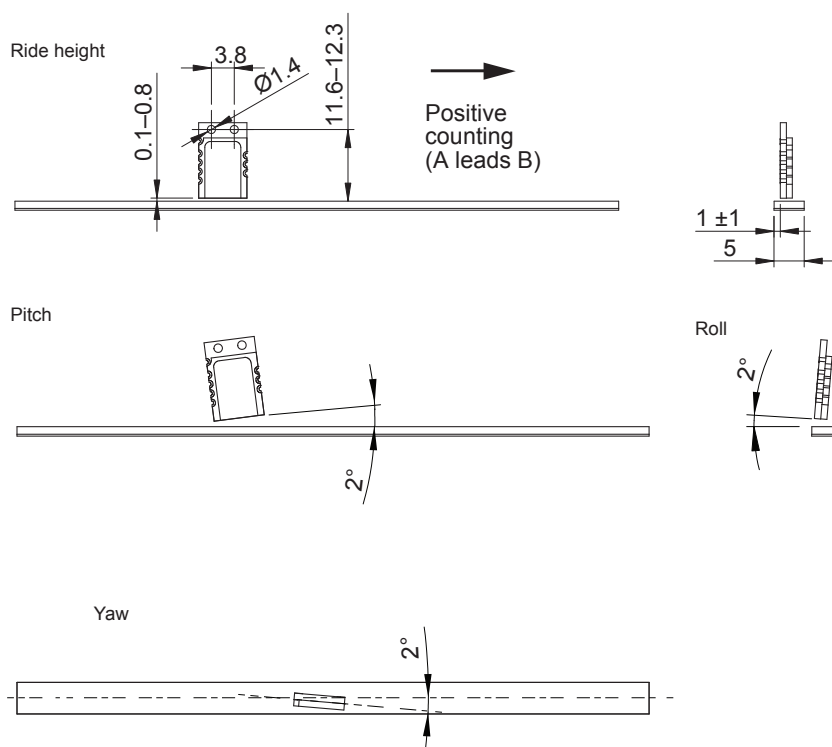


Connections

Pin	Signal
1	Vdd (+5 V)
2	Vdd (+5 V)
3	GND (0 V)
4	NC
5	NC
6	Z
7	B
8	A

RLC2HD installation tolerances

Linear application

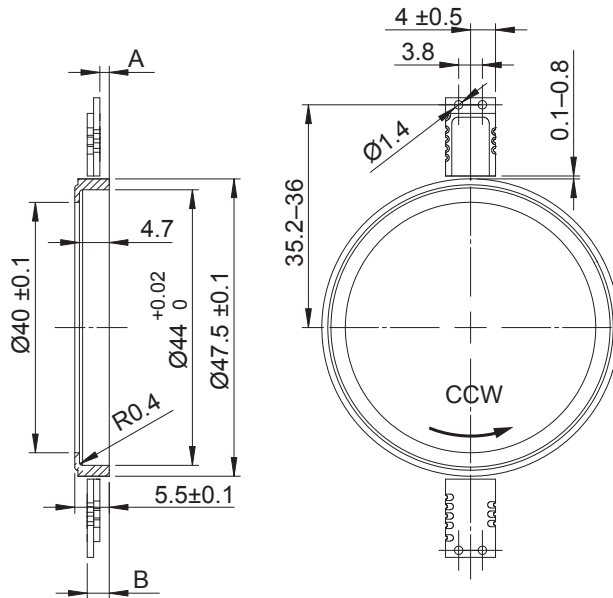


RLC2HD installation tolerances continued

Dimensions and tolerances are in mm.

Radial ring application

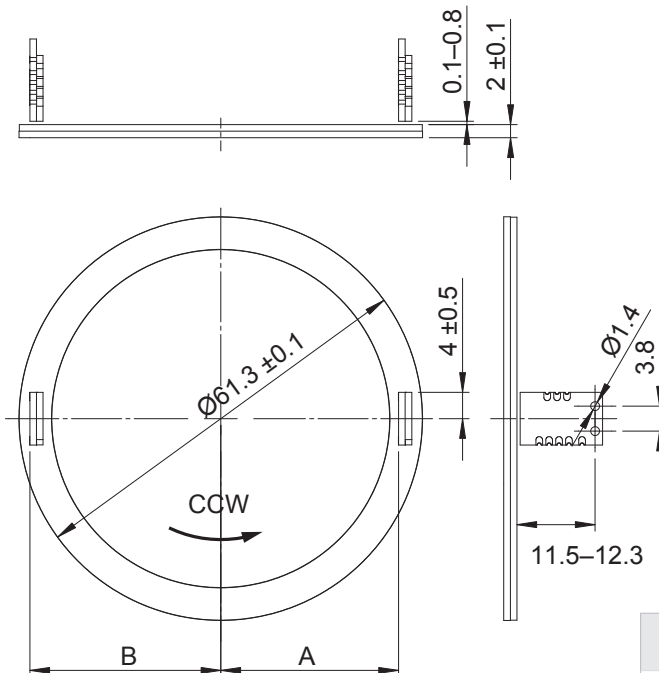
MR047B040A076B00 (76 poles)



Installation type	Distance	Counting at CCW rotation
A	2 ± 1	Positive (A leads B)
B	4 ± 1	Negative (B leads A)

Axial ring application

MR061C051A092B00 (92 poles)
MR061C051A090B00 (90 poles)



Installation type	For 90 poles	For 92 poles	Counting at CCW rotation
A	28 ± 0.1	28.4 ± 0.1	Positive (A leads B)
B	29.8 ± 0.1	30.2 ± 0.1	Negative (B leads A)

RLC2HD technical specifications

System data											
Pole length			2 mm								
Available resolutions and maximum speed			For rotary applications: See tables on pages 5 and 6 For linear applications:								
Ordering code	Interpolation factor	Resolution (μm)	Maximum speed (m/s)								
13B	8192	0.244140625	1.82	0.91	0.23	0.11	0.06	0.03	0.02	0.01	0.01
12B	4096	0.48828125	3.65	1.82	0.46	0.23	0.12	0.06	0.05	0.02	0.01
11B	2048	0.9765625	7.30	3.65	0.91	0.46	0.24	0.12	0.10	0.05	0.02
2D0	2000	1	7.47	3.73	0.93	0.47	0.24	0.12	0.10	0.05	0.02
1D6	1600	1.25	9.33	4.67	1.17	0.58	0.30	0.16	0.12	0.06	0.03
10B	1024	1.953125	14.58	7.30	1.82	0.91	0.48	0.24	0.19	0.10	0.05
1D0	1000	2	14.93	7.47	1.87	0.93	0.49	0.25	0.20	0.10	0.05
D80	800	2.5	18.67	9.33	2.34	1.17	0.61	0.31	0.25	0.12	0.06
09B	512	3.90625	29.17	14.58	3.65	1.82	0.95	0.49	0.38	0.19	0.10
D50	500	4	29.87	14.93	3.73	1.87	0.97	0.50	0.39	0.20	0.10
D40	400	5	37.33	18.67	4.67	2.34	1.22	0.62	0.49	0.25	0.12
D32	320	6.25	46.67	23.33	5.84	2.91	1.52	0.78	0.61	0.31	0.16
08B	256	7.8125	58.34	29.17	7.30	3.65	1.90	0.97	0.77	0.39	0.19
D20	200	10	74.67	37.33	9.33	4.67	2.43	1.24	0.98	0.50	0.25
D16	160	12.5	46.67	23.33	5.84	2.91	1.52	0.78	0.61	0.31	0.16
07B	128	15.625	80.00	58.34	14.58	7.30	3.81	1.94	1.53	0.77	0.39
D10	100	20	74.67	37.33	9.33	4.67	2.43	1.24	0.98	0.50	0.25
D08	80	25	46.67	23.33	5.84	2.91	1.52	0.78	0.61	0.31	0.16
06B	64	31.25	80.00	80.00	29.17	14.58	7.62	3.89	3.07	1.55	0.78
D04	40	50	46.67	23.33	5.84	2.91	1.52	0.78	0.61	0.31	0.16
05B	32	62.5	80.00	80.00	58.34	29.17	15.22	7.78	6.14	3.10	1.56
04B	16	50	NA	80.00	80.00	58.34	30.43	15.56	12.28	6.19	3.11
03B	8	125	NA	NA	80.00	80.00	60.86	31.11	24.56	12.39	6.23
Edge separation (μs)			0.07	0.12	0.50	1	2	4	5	10	20
Minimum count frequency (MHz)			15	8	2	1	0.5	0.25	0.2	0.1	0.05
Part numbering			K	A	B	C	D	E	F	G	H
Accuracy grade for MS scales			±40 μm/m								
Repeatability			Better than unit of resolution for movement in the same direction								
Hysteresis			< 2 μm up to 0.2 mm ride height								
Electrical data											
Power supply			5 V ± 0.25 V								
Power consumption (without load)			< 20 mA								
Output signals			Digital – TTL-level (A, B, Z)								
			Saturation voltage hi (I = −4 mA)			V _{dd} − 0.4 V					
			Saturation voltage lo (I = 4 mA)			0.4 V					
			Rise and fall time (c _c = 50 pF)			60 ns					
ESD susceptibility of all pins			2 kV (HBM 100 pF, discharge through 1.5 kΩ)								
Maximum AWG for connection wires			21								
Mechanical data											
Mass			RLC: 1.25 g; MR050C: 8 g; MR047B: 9 g								
Environmental conditions											
Temperature			Operating −30 °C to +85 °C								
			Storage −40 °C to +85 °C								
Vibrations (55 Hz to 2000 Hz)			300 m/s² (IEC 60068-2-6)								
Shocks (11 ms)			300 m/s² (IEC 60068-2-27)								
Moisture level			MSL6 (IPC/JEDEC-J-STD-020)								
Baking procedure			48 h/125 °C or according to IPC/JEDEC-J STD_033								

Available resolutions and maximum speed for MR047B040B076B00 (radial ring, 76 poles)

Ordering code	Resolution (cpr)	Interpolation factor	Maximum speed (rpm)								
			720	360	90	45	23	12	9	5	2
13B	753,664	8,192	720	360	90	45	23	12	9	5	2
12B	376,832	4,096	1,440	720	180	90	47	24	19	10	5
11B	188,416	2,048	2,880	1,440	360	180	94	48	38	19	10
001	184,000	2,000	2,949	1,472	368	184	96	49	39	20	10
1D6	147,200	1,600	3,682	1,844	461	230	120	61	48	24	12
10B	94,208	1,024	5,754	2,880	720	360	188	96	76	38	19
002	92,000	1,000	5,893	2,949	739	368	192	98	78	39	20
D80	73,600	800	7,371	3,682	922	461	240	123	97	49	25
09B	47,104	512	11,514	5,754	1,440	720	375	192	151	76	38
D50	46,000	500	11,792	5,893	1,472	739	384	196	155	78	39
005	36,800	400	14,735	7,371	1,844	922	481	246	194	98	49
D32	29,440	320	18,423	9,208	2,305	1,149	601	307	242	122	61
08B	23,552	256	23,027	11,514	2,880	1,440	752	384	303	153	77
010	18,400	200	29,476	14,735	3,682	1,844	960	491	388	196	98
D16	14,720	160	18,423	9,208	2,305	1,149	601	307	242	122	61
07B	11,776	128	32,508	23,027	5,754	2,880	1,503	768	606	306	154
020	9,200	100	29,476	14,735	3,682	1,844	960	491	388	196	98
D08	7,360	80	18,423	9,208	2,305	1,149	601	307	242	122	61
06B	5,888	64	32,508	32,508	11,514	5,754	3,006	1,535	1,212	611	307
050	3,680	40	18,423	9,208	2,305	1,149	601	307	242	122	61
05B	2,944	32	32,508	32,508	23,027	11,514	6,006	3,070	2,424	1,222	614
04B	1,472	16	NA	32,508	32,508	23,027	12,013	6,141	4,847	2,445	1,229
03B	736	8	NA	NA	32,508	32,508	24,025	12,282	9,695	4,889	2,458
Edge separation (µs)			0.07	0.12	0.50	1	2	4	5	10	20
Minimum count frequency (MHz)			15	8	2	1	0.5	0.25	0.2	0.1	0.05
Part numbering			K	A	B	C	D	E	F	G	H

Available resolutions and maximum speed for MR061C051B090B00 (axial ring, 90 poles)

Ordering code	Resolution (cpr)	Interpolation factor	Maximum speed (rpm)								
			608	304	76	38	20	10	8	4	2
13B	737,280	8,192	608	304	76	38	20	10	8	4	2
12B	368,640	4,096	1,216	608	152	76	40	20	16	8	4
11B	184,320	2,048	2,432	1,216	304	152	79	41	32	16	8
001	180,000	2,000	2,491	1,243	311	156	81	41	33	17	8
1D6	144,000	1,600	3,109	1,557	389	194	101	52	41	21	10
10B	92,160	1,024	4,859	2,432	608	304	159	81	64	32	16
002	90,000	1,000	4,976	2,491	624	311	162	83	65	33	17
D80	72,000	800	6,224	3,109	779	389	203	104	82	41	21
09B	46,080	512	9,723	4,859	1,216	608	317	162	128	65	32
D50	45,000	500	9,957	4,976	1,243	624	325	166	131	66	33
005	36,000	400	12,443	6,224	1,557	779	406	207	164	83	41
D32	28,800	320	15,557	7,776	1,947	971	507	259	205	103	52
08B	23,040	256	19,445	9,723	2,432	1,216	635	324	256	129	65
010	18,000	200	24,891	12,443	3,109	1,557	811	415	327	165	83
D16	14,400	160	15,557	7,776	1,947	971	507	259	205	103	52
07B	11,520	128	25,047	19,445	4,859	2,432	1,269	648	512	258	130
020	9,000	100	24,891	12,443	3,109	1,557	811	415	327	165	83
D08	7,200	80	15,557	7,776	1,947	971	507	259	205	103	52
06B	5,760	64	25,047	25,047	9,723	4,859	2,539	1,296	1,023	516	259
050	3,600	40	15,557	7,776	1,947	971	507	259	205	103	52
05B	2,880	32	25,047	25,047	19,445	9,723	5,072	2,593	2,047	1,032	519
04B	1,440	16	NA	25,047	25,047	19,445	10,144	5,186	4,093	2,064	1,038
03B	720	8	NA	NA	25,047	25,047	20,288	10,371	8,187	4,129	2,075
Edge separation (µs)			0.07	0.12	0.50	1	2	4	5	10	20
Minimum count frequency (MHz)			15	8	2	1	0.5	0.25	0.2	0.1	0.05
Part numbering			K	A	B	C	D	E	F	G	H

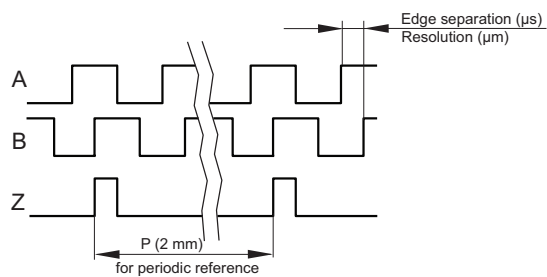
Available resolutions and maximum speed for MR061C051B092B00 (axial ring, 92 poles)

Ordering code	Resolution (cpr)	Interpolation factor	Maximum speed (rpm)								
			595	297	74	37	19	10	8	4	2
13B	753,664	8,192	595	297	74	37	19	10	8	4	2
12B	376,832	4,096	1,190	595	149	74	39	20	16	8	4
11B	188,416	2,048	2,379	1,190	297	149	78	40	31	16	8
001	184,000	2,000	2,437	1,216	304	152	79	41	32	16	8
1D6	147,200	1,600	3,042	1,523	380	190	99	51	40	20	10
10B	94,208	1,024	4,753	2,379	595	297	155	79	63	32	16
002	92,000	1,000	4,868	2,437	610	304	159	81	64	32	16
D80	73,600	800	6,089	3,042	762	380	198	101	80	40	20
09B	47,104	512	9,511	4,753	1,190	595	310	159	125	63	32
D50	46,000	500	9,741	4,868	1,216	610	318	162	128	65	32
005	36,800	400	12,172	6,089	1,523	762	397	203	160	81	41
D32	29,440	320	15,219	7,607	1,904	950	496	254	200	101	51
08B	23,552	256	19,023	9,511	2,379	1,190	621	317	250	126	63
010	18,400	200	24,350	12,172	3,042	1,523	793	406	320	162	81
D16	14,720	160	15,219	7,607	1,904	950	496	254	200	101	51
07B	11,776	128	25,047	19,023	4,753	2,379	1,242	634	501	252	127
020	9,200	100	24,350	12,172	3,042	1,523	793	406	320	162	81
D08	7,360	80	15,219	7,607	1,904	950	496	254	200	101	51
06B	5,888	64	25,047	25,047	9,511	4,753	2,483	1,268	1,001	505	254
050	3,680	40	15,219	7,607	1,904	950	496	254	200	101	51
05B	2,944	32	25,047	25,047	19,023	9,511	4,962	2,536	2,002	1,010	508
04B	1,472	16	NA	25,047	25,047	19,023	9,923	5,073	4,004	2,020	1,015
03B	736	8	NA	NA	25,047	25,047	19,847	10,146	8,009	4,039	2,030
Edge separation (µs)			0.07	0.12	0.50	1	2	4	5	10	20
Minimum count frequency (MHz)			15	8	2	1	0.5	0.25	0.2	0.1	0.05
Part numbering			K	A	B	C	D	E	F	G	H

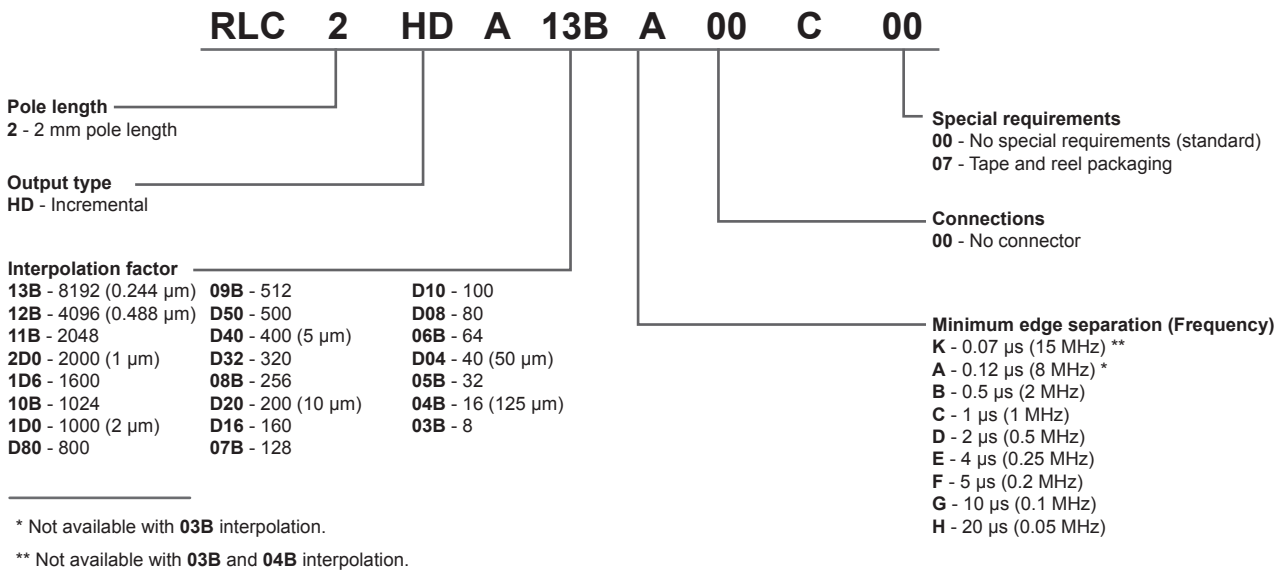
NOTE: Other ring sizes available upon request.

RLC2HD – Incremental, no line driver

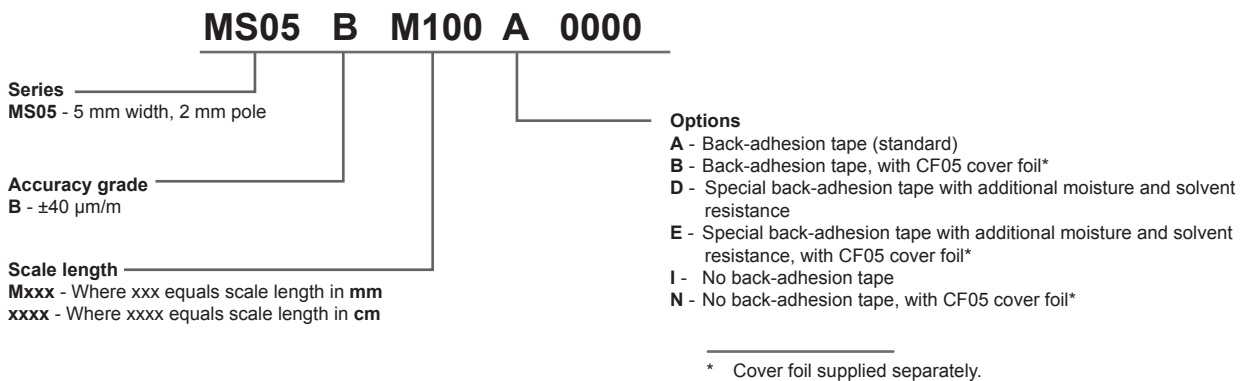
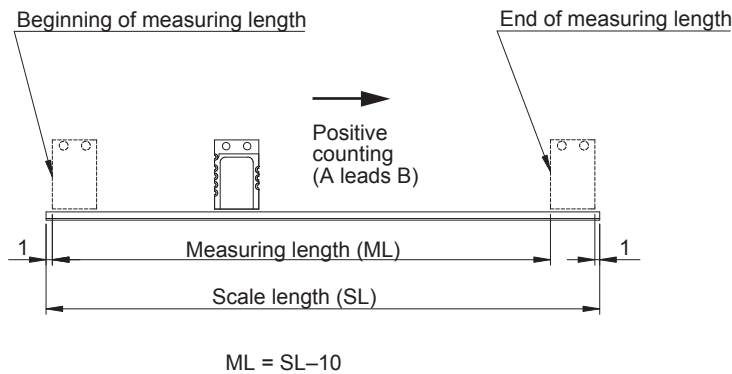
Timing diagram – Incremental, periodic reference mark



RLC2HD readhead part numbering



Magnetic scale part numbering



Cover foil part numbering

CF05 1000

Foil length
xxxx - Where xxxx equals foil length in cm (eg. 0400 equals 400 cm of foil)
Mxxx - Where xxx equals foil length in mm (eg. M040 equals 40 mm of foil)

Magnetic ring part numbering

Counts per revolution = Nr. of poles × Interpolation



Radial ring

MR 047 B 040 B 076 B 00



Axial ring

MR 061 C 051 B 092 B 00

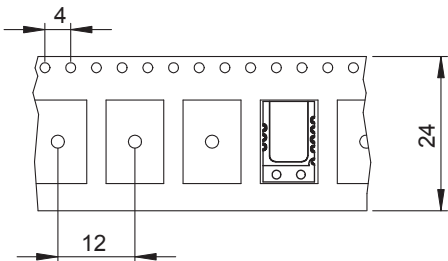
Number of poles
092 - 92 poles
090 - 90 poles

Special requirements
00 - No special requirements
02 - With back-adhesion tape

NOTE: Other ring sizes available upon request.

Tape and reel packaging - special option 07

W24/P12/T0.3 in 13" reel



Accessories part numbering



USB encoder interface
E201

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Document issues

Issue	Date	Page	Corrections made
1	22. 12. 2014	-	New document

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