7. REFERENCES

[1]. Michael F. Ashby, David R. H. Jones. “The yield strength, tensile strength, hardness and ductility”, in *Engineering materials I an introduction to their properties and applications*, Second edition, Linacre House, Jordan Hill, Oxford OX2 8DP: Butterworth-Heinemann, 1996, p. 86.

[2]. R. S. Khurmi, J. K. Gupta. *“Machine design”*. Ram Nagar, New Delhi: Eurasia Publishing House (PVT.) LTD., 2005, p. 04, pp. 120-122, pp. 128-132, pp. 349-350, p. 472.

[3]. V. B. Bhandari. “Welded joints,” in *Design of machine elements*. Second edition, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2007, pp. 300-314.

[4]. *Structural welding code - Steel,* An American national standard AWS D1.1:2000, 1999, p. 13.

[5]. American iron and steel institute, “*Welding of stainless steel and other joining methods”*. Washington, DC 20005, U.S.A: Nickel development institute, 1988, p. 05.

[6]. “Shear strength.” Available: https://en.wikipedia.org/wiki/Shear_strength, 13 Nov. 2017.

[7]. “Automatic horizontal pillow wrapping machine”. Available: https://eulsung.en.ec21.com/Products--1.html.

[8]. Mario Anthony Jakus. “Folded packaged gloves”. U.S. Patent 2015/0307263 A1, Oct. 29, 2015.

[9]. Harold Breier. “Garment folding apparatus”. U.S. Patent 9,022,259 B2, May. 5, 2015.

[10]. Juan Fernandez. “Apparel folding tool.” U.S. Patent D475, 193 S, Jun. 3, 2003.

[11]. John A. Mccabe, Gottfried Jason Hohm, Anthony A. Nelson, Zachary J. Giffey. “Apparatus and method for high speed cross folding”. U.S. Patent 2015/0202092 A1, Jul. 23, 2015.

[12]. Alexander Irle. “Method of folding paper”. U.S Patent 2015/0175384 A1, Jun. 25, 2015.

[13]. T. K. Gunawardena, P. R. Dadigamuwa and B. G. D. A. Madhusanka. “Low cost automated machine for paper gathering and folding”. *European journal of advances in engineering and technology,* vol. 2, pp. 40-43, 2015.

[14]. Russel Evan Thorson, Todd W. Wilkes, Jesus S. Banda. “Method of making disposable pants having underwear-like waistbands and pant made thereby”. U.S Patent 2015/0175384 A19,474,658 B2, Oct. 25, 2016.

[15]. Brian Nelson, Thomas Muhs, Ryan Ferguson. “Apparatus and method for folding”. U.S Patent 2016/0113821 A1, Apr. 28, 2016.

[16]. Ted Selker, Gal Rozov. “Fabric article folding machine and method”. U.S Patent 8,973,792 B1, Mar. 10, 2015.

[17]. Ryunosuke Miyamoto. “Development of system to fold T-shirt in the state of hanging”, in *Proceedings of the 2nd international conference on intelligent systems and image processing,* 2014. Pp. 408-413.

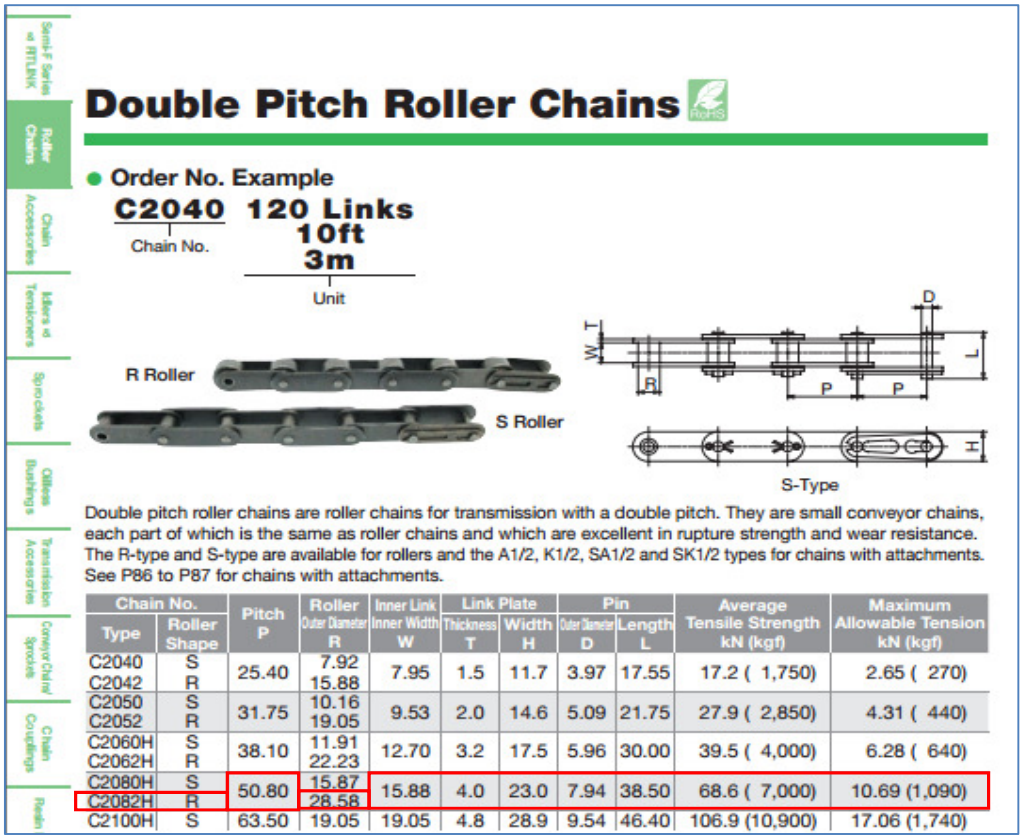
[Appendix – A: Data sheet for Compression springs]

1-800-237-5225
1-213-749-1466
Fax (213)749-3802
www.centuryspring.com

O.D. Inches	O.D. mm	CENTURY STOCK NUMBER	FREE LENGTH Inches	FREE LENGTH mm	I.D. Inches	I.D. mm	RATE Lbs./In.	RATE N/mm	SUGG. MAX. DEFL. Inches	SUGG. MAX. DEFL. mm	SUGG. MAX. LOAD Lbs.	SUGG. MAX. LOAD N	SOLID LENGTH Inches	SOLID LENGTH mm	WIRE DIA. Inches	WIRE DIA. mm	TOTAL COILS	MAT'L	ENDS	FINISH
1.375	34.93	S-1087	1.63	41.3	1.135	28.8	48	8.4	.77	19	37	163	.57	14.5	0.120	3.0	4.75	SST	CG	N
1.375	34.93	11628	1.63	41.3	1.123	28.5	41	7.2	.81	20	33	148	.82	20.8	0.126	3.2	6.50	SPR	CG	Z
1.375	34.93	S-326	1.69	42.8	1.105	28.1	63	11	.78	20	50	221	.74	18.9	0.135	3.4	5.50	SST	CG	N
1.375	34.93	3560	1.75	44.5	.991	25.2	393	69	.37	9.3	144	641	.96	24.4	0.192	4.9	5.00	SPR	CG	Z
1.375	34.93	10401	1.97	50.0	1.063	27.0	104	18	.79	20	82	366	1.01	25.8	0.156	4.0	6.50	SPR	CG	Z
1.375	34.93	12610	2.00	50.8	1.041	26.4	141	25	.71	18	100	447	1.09	27.6	0.167	4.2	6.50	SPR	CG	Z
1.375	34.93	10299	2.13	54.0	1.193	30.3	13	2.3	1.4	35	18	81	.50	12.7	0.091	2.3	5.50	SPR	CG	Z
1.375	34.93	11671	2.13	54.0	1.041	26.4	141	25	.71	18	100	447	1.09	27.6	0.167	4.2	6.50	SPR	CG	Z
1.375	34.93	12779	2.19	55.6	1.079	27.4	79	14	.92	23	72	321	1.00	25.4	0.148	3.8	6.75	HD	CG	Z
1.375	34.93	4400	2.22	56.4	1.179	29.9	15	2.6	1.5	39	23	101	.61	15.6	0.098	2.5	6.25	SPR	CG	Z
1.375	34.93	4343	2.25	57.2	1.193	30.3	10	1.8	1.7	42	17	76	.59	15.0	0.091	2.3	6.50	SPR	CG	Z
1.375	34.93	S-1388	2.31	58.7	1.191	30.3	6.8	1.2	1.6	39	11	47	.76	19.3	0.092	2.3	8.25	SST	CG	N
1.375	34.93	11839	2.34	59.5	1.187	30.1	7.6	1.3	1.6	40	12	53	.78	19.7	0.094	2.4	8.25	SST	CG	N
1.375	34.93	S-450	2.44	61.9	1.191	30.3	7.1	1.2	1.7	43	12	54	.74	18.7	0.092	2.3	8.00	SST	CG	N
1.375	34.93	10309	2.44	61.9	1.021	25.9	164	29	.73	18	119	530	1.24	31.5	0.177	4.5	7.00	SPR	CG	Z
1.375	34.93	10348	2.50	63.5	1.193	30.3	8.5	1.5	1.8	46	15	68	.68	17.3	0.091	2.3	7.50	SPR	CG	Z
1.375	34.93	12092	2.50	63.5	1.167	29.6	18	3.2	1.4	35	25	112	.73	18.5	0.104	2.6	6.00	SST	C	N
1.375	34.93	73	2.50	63.5	1.105	28.1	48	8.4	1.2	29	55	245	.98	24.9	0.135	3.4	7.25	HD	CG	Z
1.375	34.93	S-347	2.50	63.5	1.105	28.1	46	8.0	1.1	28	50	221	.91	23.1	0.135	3.4	6.75	SST	CG	N
1.375	34.93	12420	2.75	69.9	1.277	32.4	89	16	2.4	61	2.1	9.5	.34	8.7	0.049	1.2	6.00	SPR	C	Z
1.375	34.93	269	2.75	69.9	1.135	28.8	27	4.8	1.5	37	40	178	1.02	25.9	0.120	3.0	7.50	HD	C	Z
1.375	34.93	3464	2.75	69.9	1.105	28.1	31	5.5	1.3	32	40	176	1.49	37.7	0.135	3.4	10.0	HD	C	Z
1.375	34.93	54	2.75	69.9	1.021	25.9	122	21	.98	25	119	530	1.55	39.3	0.177	4.5	8.75	HD	CG	Z
1.375	34.93	10742	2.88	73.0	1.215	30.9	5.4	.95	2.3	59	13	56	.56	14.2	0.080	2.0	7.00	SPR	CG	Z
1.375	34.93	4355	2.94	74.6	1.205	30.6	4.0	.70	2.0	51	8.1	36	.91	23.2	0.085	2.2	10.8	SPR	CG	Z
1.375	34.93	S-1209	3.00	76.2	1.135	28.8	20	3.5	1.8	46	37	163	1.02	25.9	0.120	3.0	8.50	SST	CG	N

Source: Compression Spring Catalogue "Century Spring Corp." p-201.

[Appendix – B: Catalog for double pitch roller chains]



Double Pitch Roller Chains

● Order No. Example

C2040 **120 Links**
Chain No. **10ft**
3m
Unit

R Roller

S Roller

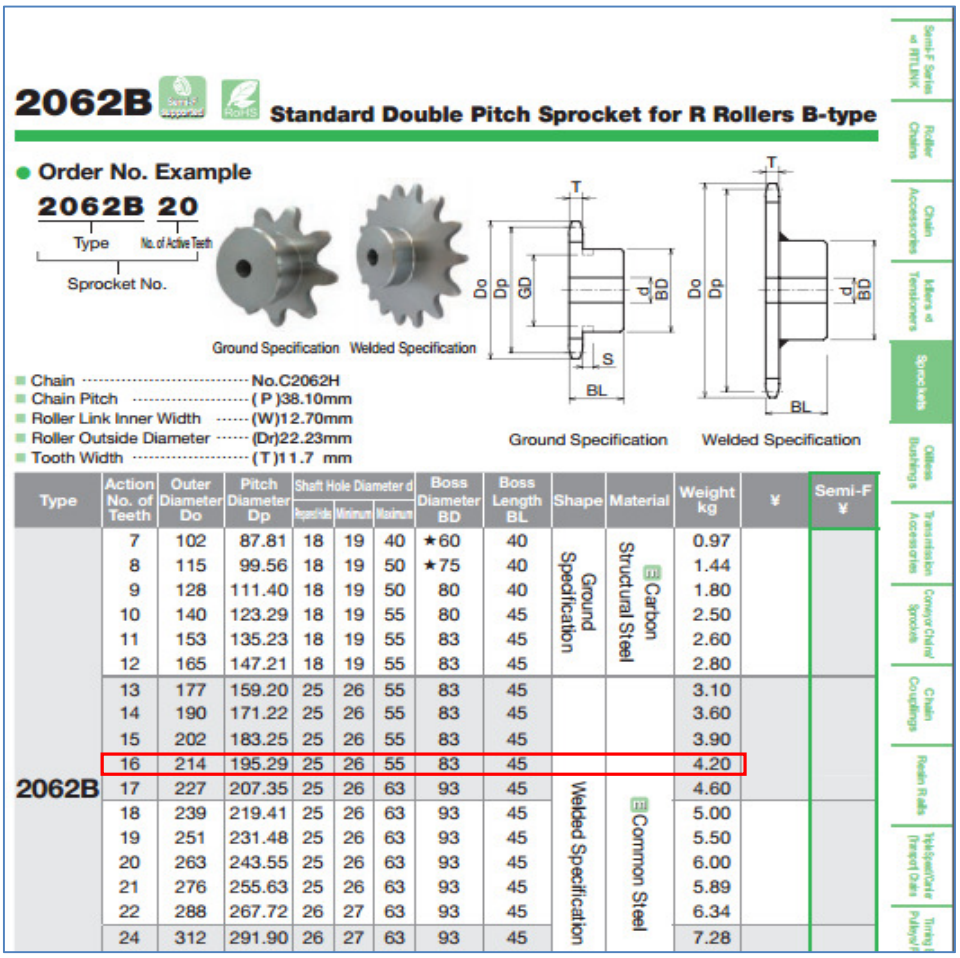
S-Type

Double pitch roller chains are roller chains for transmission with a double pitch. They are small conveyor chains, each part of which is the same as roller chains and which are excellent in rupture strength and wear resistance. The R-type and S-type are available for rollers and the A1/2, K1/2, SA1/2 and SK1/2 types for chains with attachments. See P86 to P87 for chains with attachments.

Chain No.		Pitch	Roller	Inner Link	Link Plate		Pin		Average	Maximum
Type	Roller Shape	P	Outer Diameter R	Inner Width W	Thickness T	Width H	Outer Diameter D	Length L	Tensile Strength kN (kgf)	Allowable Tension kN (kgf)
C2040	S	25.40	7.92	7.95	1.5	11.7	3.97	17.55	17.2 (1,750)	2.65 (270)
C2042	R		15.88							
C2050	S	31.75	10.16	9.53	2.0	14.6	5.09	21.75	27.9 (2,850)	4.31 (440)
C2052	R		19.05							
C2060H	S	38.10	11.91	12.70	3.2	17.5	5.96	30.00	39.5 (4,000)	6.28 (640)
C2062H	R		22.23							
C2080H	S	50.80	15.87	15.88	4.0	23.0	7.94	38.50	68.6 (7,000)	10.69 (1,090)
C2082H	R		28.58							
C2100H	S	63.50	19.05	19.05	4.8	28.9	9.54	46.40	106.9 (10,900)	17.06 (1,740)

Source: "RoHS" Double Pitched Roller Chains Catalogue, p-82

[Appendix – C: [Catalog for double pitch sprockets]



2062B Standard Double Pitch Sprocket for R Rollers B-type

● Order No. Example

2062B 20

Type — No. of Active Teeth

Sprocket No.

Ground Specification Welded Specification

Ground Specification Welded Specification

- Chain No.C2062H
- Chain Pitch ..... (P)38.10mm
- Roller Link Inner Width ..... (W)12.70mm
- Roller Outside Diameter ..... (Dr)22.23mm
- Tooth Width ..... (T)11.7 mm

Type	Action No. of Teeth	Outer Diameter Do	Pitch Diameter Dp	Shaft Hole Diameter d Preset hole	Minimum	Maximum	Boss Diameter BD	Boss Length BL	Shape	Material	Weight kg	¥	Semi-F ¥
2062B	7	102	87.81	18	19	40	★60	40	Ground Specification	Carbon Structural Steel	0.97		
	8	115	99.56	18	19	50	★75	40			1.44		
	9	128	111.40	18	19	50	80	40			1.80		
	10	140	123.29	18	19	55	80	45			2.50		
	11	153	135.23	18	19	55	83	45			2.60		
	12	165	147.21	18	19	55	83	45			2.80		
	13	177	159.20	25	26	55	83	45			3.10		
	14	190	171.22	25	26	55	83	45			3.60		
	15	202	183.25	25	26	55	83	45			3.90		
	16	214	195.29	25	26	55	83	45			4.20		
	17	227	207.35	25	26	63	93	45	Welded Specification	Common Steel	4.60		
	18	239	219.41	25	26	63	93	45			5.00		
	19	251	231.48	25	26	63	93	45			5.50		
	20	263	243.55	25	26	63	93	45			6.00		
	21	276	255.63	25	26	63	93	45			5.89		
	22	288	267.72	26	27	63	93	45			6.34		
	24	312	291.90	26	27	63	93	45			7.28		

Source: "RoHS" Standard Double Pitch Sprockets Catalogue, p-309

[Appendix – D: Technical data sheet of Motors]

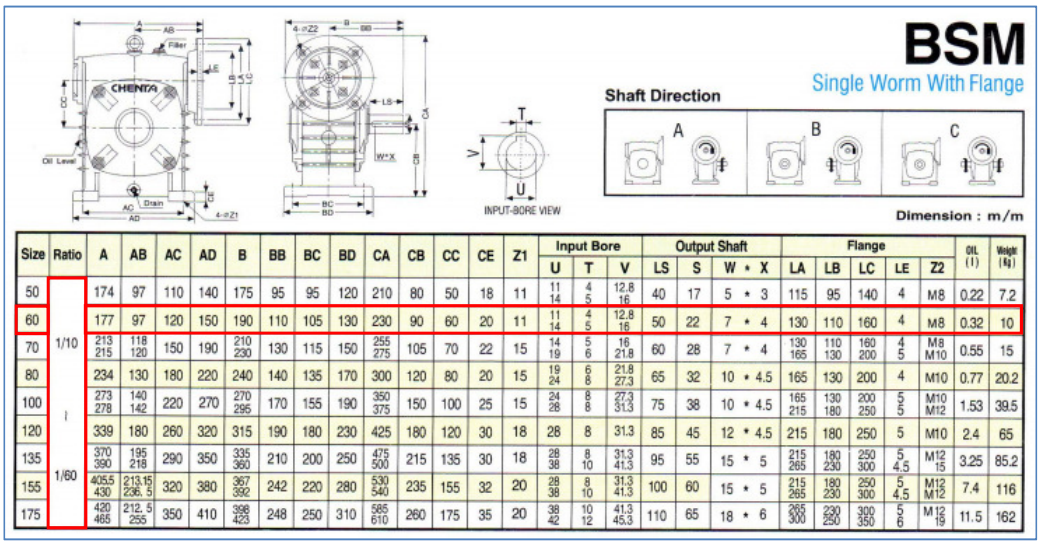
TECO e-motion **Technical data**

4-pole

Power rating	Nominal speed	Frame size Type code ALAA...	Nominal current	Locked rotor current (multiple of nominal current)	Efficiency at load points				Power factor at load points				Nominal torque	Locked rotor torque (multiple of nominal torque)	Pull up torque (multiple of nominal torque)	Break down torque (multiple of nominal torque)	Moment of Inertia	Total mass (B3 version; approx.)	Sound pressure; Noise level
P_N	n_n		I_N	I_r/I_N	η				cos φ				T_N	T_r/T_N	T_p/T_N	T_b/T_N	J	m	dB (A)
[kW]	[rpm]		[A]		[%]								[Nm]				kgm²	[kg]	
					Full load	3/4 load	2/4 load	1/4 load	Full load	3/4 load	2/4 load	1/4 load							
0,18	1375	0063M1	0,54	3,90	65,0	63,8	58,2	43,6	0,75	0,64	0,50	0,35	1,25	2,00	1,80	2,00	$0,43 \times 10^{-3}$	6,0	42
0,25	1380	0071M0	0,67	4,20	69,5	70,1	66,2	51,8	0,77	0,67	0,52	0,35	1,73	2,00	1,75	2,00	$0,67 \times 10^{-3}$	8,0	46
0,37	1385	0071M1	1,02	4,20	69,5	69,9	66,3	52,2	0,75	0,65	0,50	0,33	2,55	2,05	1,80	2,05	$0,8 \times 10^{-3}$	9,0	46
0,55	1435	0080M0	1,34	6,60	78,1	78,1	75,2	63,6	0,76	0,69	0,56	0,37	3,66	2,55	2,20	2,80	$2,6 \times 10^{-3}$	13,0	48

Source: "TECO e-motion" Technical Catalogue 2014, p-61

[Appendix – E: Technical data sheet of Gear box]



Size	Ratio	A	AB	AC	AD	B	BB	BC	BD	CA	CB	CC	CE	Z1	Input Bore			Output Shaft			Flange					OIL (l)	Weight (Kg)
															U	T	V	LS	S	W * X	LA	LB	LC	LE	Z2		
50	1/10	174	97	110	140	175	95	95	120	210	80	50	18	11	11 14	4 5	12.8 16	40	17	5 * 3	115	95	140	4	M8	0.22	7.2
60		177	97	120	150	190	110	105	130	230	90	60	20	11	11 14	4 5	12.8 16	50	22	7 * 4	130	110	160	4	M8	0.32	10
70		213 215	118 120	150	190	210 230	130	115	150	255 275	105	70	22	15	14 19	5 6	16 21.8	60	28	7 * 4	130 165	110 130	160 200	4 5	M8 M10	0.55	15
80		234	130	180	220	240	140	135	170	300	120	80	20	15	19 24	6 8	21.8 27.3	65	32	10 * 4.5	165	130	200	4	M10	0.77	20.2
100		273 278	140 142	220	270	270 295	170	155	190	350 375	150	100	25	15	24 28	8 8	27.3 31.3	75	38	10 * 4.5	165 215	130 180	200 250	5 5	M10 M12	1.53	39.5
120		339	180	260	320	315	190	180	230	425	180	120	30	18	28	8	31.3	85	45	12 * 4.5	215	180	250	5	M10	2.4	65
135	1/60	370 390	195 218	290	350	335 360	210	200	250	475 500	215	135	30	18	28 38	8 10	31.3 41.3	95	55	15 * 5	215 265	180 230	250 300	5 4.5	M12 15	3.25	85.2
155		405.5 430	213.15 236. 5	320	380	367 392	242	220	280	530 540	235	155	32	20	28 38	8 10	31.3 41.3	100	60	15 * 5	215 265	180 230	250 300	5 4.5	M12 M12	7.4	116
175		420 465	212. 5 255	350	410	398 423	248	250	310	585 610	260	175	35	20	38 42	10 12	41.3 45.3	110	65	18 * 6	265 300	220 250	300 350	5 6	M12 19	11.5	162

Source: "CHENTA Brand Speed Reducer 02.08" Technical Catalogue, p-03

[Appendix – F: Proportions of standard parallel keys]

Shaft diameter (mm) upto and including	*Key cross-section*		*Shaft diameter (mm) upto and including*	*Key cross-section*	
	Width (mm)	*Thickness (mm)*		*Width (mm)*	*Thickness (mm)*
6	2	2	85	25	14
8	3	3	95	28	16
10	4	4	110	32	18
12	5	5	130	36	20
17	6	6	150	40	22
22	8	7	170	45	25
30	10	8	200	50	28
38	12	8	230	56	32
44	14	9	260	63	32
50	16	10	290	70	36
58	18	11	330	80	40
65	20	12	380	90	45
75	22	14	440	100	50

Source: “in [2]…”p 472.