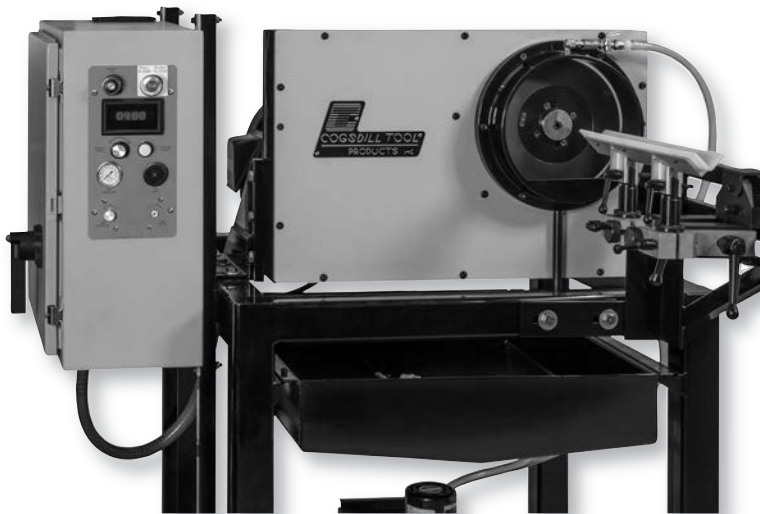


External roller burnishing machines



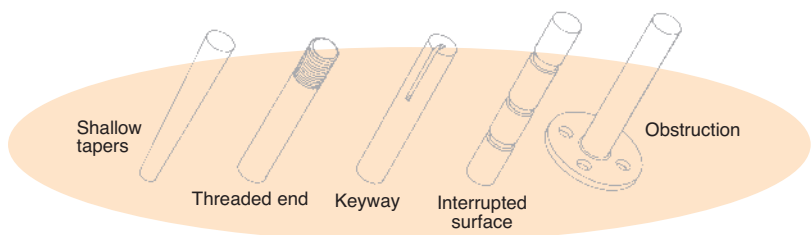
CX-2000



CX-3000

Machines shown above are not to scale.

Cogsdill's CX machines roller burnish cylindrical diameters of any length in seconds. Parts are sized, finished and work hardened by highly polished, precision rollers in one quick pass. Fatigue life, corrosion resistance and appearance are enhanced as your parts are accurately sized and finished. Various model options are designed to meet your manufacturing requirements. Equipment options are available to accommodate through-feed applications, parts with obstructions, and part-to-part size variations.



Shown above are examples of various types of parts which are processed by CX external roller burnishing.

Product features

Versatility

All ductile or malleable metals with hardness up to R/C 40 can be roller burnished. Cylindrical parts of any length, bars, tubing, wire and stranded cable may all be processed with Cogsdill's self-contained, self-feeding roller burnishing machines. A continuously variable speed drive allows the operator to select the optimum production rate for obtaining the desired size and finish. An adjustable tilt base makes it possible to select the ideal feed angle for automatic or manual loading.

Several sub-assembly options are available to suit various application requirements (see page 37, "CX Sub-Assembly Options").

Coolant systems are designed and recommended to supply the necessary part lubrication for burnishing. Part supports, consisting of V-guides faced with teflon, are available for thru-feed applications where long parts require support, or as an aid in workpiece alignment during high production runs. Various power options are available to meet your electrical requirements. The CX-2000 is a heavy duty, high production machine that is ideally used where size or portability is a factor. The CX-3000 is a heavy duty, high production machine designed for permanent installation on the production floor.

These options, combined with the standard features, make the Cogsdill CX machine a useful and versatile machine tool. However, should the wide array of options available with our standard tooling and equipment fail to meet your particular requirements, a variety of special tooling is available on special order. Please submit a part print and request a quotation.

Accurate sizing

Tolerances within .0001 inch (.0025mm) are attainable, depending on variables such as material type, hardness, pre-machining method, and the finish on the part prior to burnishing. A prepared tolerance of .002 inch (.05mm) can usually be reduced by 50 % (.001 inch /.02mm).

Low micro finishing

One pass through a Cogsdill CX machine can quickly reduce a 20-40 microinch Ra (0.5 to 1.0 micrometer) ground surface or an 80-120 microinch (2-3 micrometers)(Ra) turned surface to a mirrorlike 5 microinch (.125 micrometer)(Ra) finish or lower. Parts varying in size as much as .005 inch (.127mm) can be burnished to the same low microfinish with the use of an optional pressure control unit (see Versatility section). The roller burnishing process significantly improves bearing surface over other types of finishing processes and is ideal for shafts running in bushings or oil seals.

Work hardening

Surface hardening of the workpiece is achieved simultaneously with sizing and finishing. With certain materials, increases in surface hardness of up to 3 points on the Rockwell "C" scale are attainable. The smooth, dense, hardened surface produced by the roller burnishing process extends wear life, improves resistance to corrosion and reduces fatigue failures. Friction is also reduced, resulting in noise reduction where shafts are running in bushings.

Appearance improvement

Machined parts (turned or ground) can be roller burnished to lustrous, mirrorlike finishes. Subsequent plating applications will often be improved as roller burnishing removes surface patterns and blemishes resulting from prior machining operations.

Fast processing

Cogsdill CX machines process parts in seconds. Parts are sized, finished and work hardened in one pass. Cylindrical parts of any length are processed at speeds up to 30 feet/minute (9.14 meters/minute).

Roller burnishing can often eliminate time consuming and expensive finishing operations such as grinding or lapping. The result is better quality parts, produced in less time, at a lower cost.

Adjustability

Race assemblies, the working components of the CX machine, are designed to process specific nominal size workpieces. CX-1 race assemblies for diameter range .045 to 1.004 inch (1.15 to 25.50mm) are adjustable in increments of .0001 inch (.0025mm) over a range of .021 inch (.53mm) for each nominal size. CX-2 race assemblies for diameter range .963 to 2.504 inch (25.46 to 63.60mm) are adjustable in increments of .0002 inch (.0051mm) over a range of .041 inch (1.04mm) for each nominal size (see pages 34 and 36 for total range of adjustability for each CX model). Race assemblies are interchangeable within the limits of the operating range for a given model. Changing race assemblies is a 5 minute job requiring little more than the removal of four machine screws.

CX-2000 External roller burnishing machine



CX-2000

The CX-2000 External Roller Burnishing Machine offers quiet, smooth operation in a rigid and stable machine design. Two models are available: an adjustable speed model, with variable frequency drive and digital speed display; and an economical fixed speed model (which can be adjusted, if necessary). Coolant capability is standard on both models. An optional portable cabinet with integral coolant pump is offered (and recommended).

The CX-2000 uses the same interchangeable race assemblies as

the CX-3000-1 for part diameters from .045 to 1.004 inch (1.15 to 25.50mm).

An easy-access control panel is located on the front of the machine. There are three standard power options: 220V single-phase, 220V three-phase, or 440V three-phase. An adjustable tilt base allows for the ideal feed angle, from horizontal to vertical, for automatic or manual part loading. Optional part supports are available for long parts or for workpiece alignment in high-production runs.

Height: 16 inches (406mm)

Width: 31 inches (787mm)

Depth: 20 inches (508mm)

CX® External roller burnishing machines

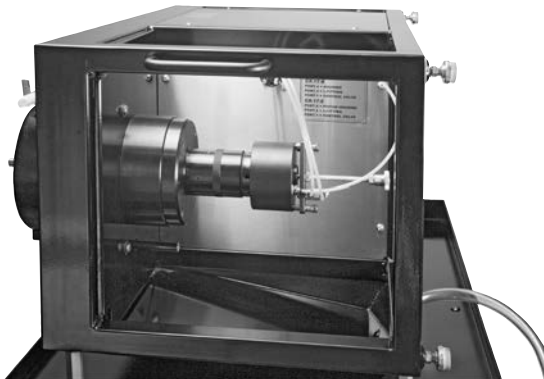
CX-2000 External roller burnishing machine



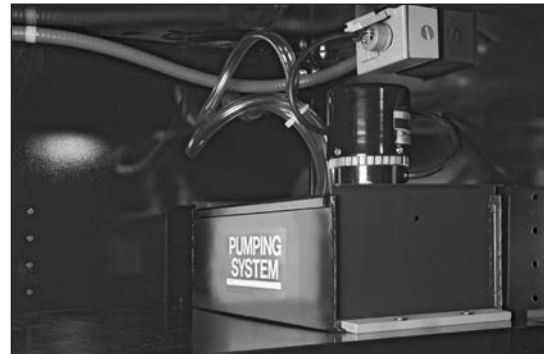
CX-2000 External Roller Burnishing Machine features product design improvements to enhance machine performance.



Interchangeable race assemblies size, finish, and work-harden parts in seconds; through-feed or up to a stop-and release.



Four sub-assembly options enhance machine versatility (interference-to-a-stop shown).



Coolant system lubricates parts and flushes away chips. When optional portable cabinet is purchased, pump comes mounted inside cabinet.



Easy-access control panel is located on the front of the machine.

CX-2000

CX-3000 External roller burnishing machine



CX-3000

The new CX-3000 External Roller Burnishing Machine replaces the former CX-1 and CX-2 model machines. The CX-3000 is designed for permanent installation on the production floor. The CX-3000 machine is available in two models: the CX-3000-1 for part diameters from .045 to 1.004 inch (1.15 to 25.50mm), and the CX-3000-2 for part diameters from .963 to 2.504 inch (25.46 to 63.60mm). The large part diameter range capacity is accomplished by using one base model machine and two interchangeable spindle assemblies

that can be changed by either the customer or by our trained technicians at our factory.

The CX-3000 machine comes standard as an adjustable speed model with variable frequency drive and digital speed display. A coolant system is also standard on the CX-3000 machine.

An easy-access control panel is located on the front of the machine. An adjustable tilt base for ideal feed angle for automatic or manual part loading is available as an option. Part supports are also available as an option for long parts or for

workpiece alignment in high-production runs.

For additional information or to obtain a quotation on the CX-3000 External Roller Burnishing Machine, please contact Cogsdill or one of our Sales Engineers. Also contact Cogsdill for more information on CX Race Assemblies for part diameters over 1.000 inch (25.4mm).

CX sub-assembly options

The CX machine is designed for versatility. Four CX sub-assembly options allow almost any part configuration to be burnished. The machine operates in one of two modes: interference or compensating.

In the interference mode, the working diameter is set slightly smaller (about .0005 inch, or .01mm) than the diameter of the workpiece.

The interference mode is used to accurately size and finish parts simultaneously in one fast pass.

The air pressure-controlled compensating unit allows the machine to automatically adjust to different part diameters, within a given range, in order to achieve a surface finish which is consistent regardless of variations in part size. The compensating mode is designed for applications where finish, rather than size, is the primary requirement. The compensating unit can accommodate a size variation of up to .005 inch (.13mm) in a single part, or from part to part. It also allows through-feed burnishing of parts with tapers or enlarged sections where the maximum diameter difference is no more than .030 inch (.76mm).

Each of the two modes is available for through-feed burnishing or with an adjustable stop-and-release mechanism for burnishing parts up to shoulders or obstructions.

The four available CX sub-assemblies are as follows:

- Sub-assembly “A”:
Interference through-feed
- Sub-assembly “B”:
Interference to a stop
- Sub-assembly “C”:
Compensating through-feed
- Sub-assembly “E”:
Compensating to a stop

CX speed and feed recommendations

The information below is intended as a starting point for selecting the speed and feed rate that will produce optimum results in CX® burnishing. Factors such as material type, part configuration, and coolant must be taken into consideration.

Spindle speed is not a critical factor in the successful operation of CX machines. Roller burnishing tools and machines are very tolerant in regard to the effect of spindle speed on resulting surface finishes.

The feed rates are based on using a stationary cage (the part is free to rotate; the anti-rotation spacer is installed). If the thrust bearing is used (i.e., the part is not allowed to rotate) the feed rate will be approximately 1/2 of the feed rate shown.

CX® Speed and feed recommendations

PART NUMBER	RPM	CX IN./REV.	CX-B IN./REV.	CX-R IN./REV.	CX-RB IN./REV.
CX-062	1800	.063	.031	.053	.029
CX-125	1800	.074	.037	.068	.047
CX-187	1800	.084	.042	.075	.037
CX-250	1800	.094	.047	.085	.042
CX-312	1800	.104	.052	.095	.047
CX-375	1800	.115	.057	.106	.053
CX-438	1400	.145	.072	.133	.066
CX-500	1400	.156	.078	.144	.072
CX-562	1400	.166	.083	.154	.077
CX-625	1200	.176	.088	.164	.082
CX-687	1200	.187	.093	.175	.087
CX-750	1200	.197	.098	.185	.092
CX-812	1000	.220	.111	.208	.104
CX-875	900	.233	.116	.218	.109
CX-934	900	.243	.121	.228	.114
CX-1000	900	.254	.127	.238	.119

The production rate of the machine can be calculated as follows:

$$\frac{\text{PRODUCTION (inches per minute)}}{\text{IPM}} = \frac{\text{FEED RATE (inches per revolution)}}{\text{IPR}} \times \frac{\text{SPEED OF THE MOTOR (revolutions per minute)}}{\text{RPM}}$$

RACE ASSEMBLY TYPES*: CX: Interference through-feed; CX-B: Interference to a stop; CX-R: Compensating through-feed; CX-RB: Compensating to a stop

*corresponding to sub-assembly options



CX 2000 Machine Race Assemblies

INTERFERENCE - STYLE					
INCHES	MM	RACE ASSEMBLY #	ROLL #	RACE #	CAGE #
.045 - .066	1.14 - 1.68	CX-1S-00062-RA	R-00500-D14 3 REQUIRED PER SET	CX-1S-00062-D02	CX-1S-00062-D03
.061 - .082	1.55 - 2.08	CX-1S-00078-RA		CX-1S-00078-D02	CX-1S-00078-D03
.077 - .098	1.96 - 2.49	CX-1S-00094-RA		CX-1S-00094-D02	CX-1S-00094-D03
.092 - .113	2.34 - 2.87	CX-1S-00109-RA		CX-1S-00109-D02	CX-1S-00109-D03
.108 - .129	2.74 - 3.28	CX-1S-00125-RA		CX-1S-00125-D02	CX-1S-00125-D03
.124 - .145	3.15 - 3.68	CX-1S-00141-RA		CX-1S-00141-D02	CX-1S-00141-D03
.139 - .160	3.53 - 4.06	CX-1S-00156-RA		CX-1S-00156-D02	CX-1S-00156-D03
.154 - .175	3.91 - 4.45	CX-1S-00171-RA		CX-1S-00171-D02	CX-1S-00171-D03
.170 - .191	4.32 - 4.85	CX-1S-00187-RA		CX-1S-00187-D02	CX-1S-00187-D03
.186 - .207	4.72 - 5.26	CX-1S-00203-RA		CX-1S-00203-D02	CX-1S-00203-D03
.202 - .223	5.13 - 5.66	CX-1S-00219-RA		CX-1S-00219-D02	CX-1S-00219-D03
.217 - .238	5.51 - 6.05	CX-1S-00234-RA		CX-1S-00234-D02	CX-1S-00234-D03
.233 - .254	5.92 - 6.45	CX-1S-00250-RA	R-00500-D14 5 REQUIRED PER SET	CX-1S-00250-D02	CX-1S-00250-D03
.249 - .270	6.32 - 6.86	CX-1S-00266-RA		CX-1S-00266-D02	CX-1S-00266-D03
.264 - .285	6.71 - 7.24	CX-1S-00281-RA		CX-1S-00281-D02	CX-1S-00281-D03
.280 - .301	7.11 - 7.65	CX-1S-00297-RA		CX-1S-00297-D02	CX-1S-00297-D03
.295 - .316	7.49 - 8.03	CX-1S-00312-RA		CX-1S-00312-D02	CX-1S-00312-D03
.311 - .332	7.90 - 8.43	CX-1S-00328-RA		CX-1S-00328-D02	CX-1S-00328-D03
.327 - .348	8.31 - 8.84	CX-1S-00344-RA		CX-1S-00344-D02	CX-1S-00344-D03
.342 - .363	8.69 - 9.22	CX-1S-00359-RA		CX-1S-00359-D02	CX-1S-00359-D03
.358 - .379	9.09 - 9.63	CX-1S-00375-RA		CX-1S-00375-D02	CX-1S-00375-D03
.375 - .395	9.53 - 10.03	CX-1S-00391-RA		CX-1S-00391-D02	CX-1S-00391-D03
.389 - .410	9.88 - 10.41	CX-1S-00406-RA		CX-1S-00406-D02	CX-1S-00406-D03
.405 - .426	10.29 - 10.82	CX-1S-00422-RA		CX-1S-00422-D02	CX-1S-00422-D03
.420 - .441	10.67 - 11.20	CX-1S-00438-RA	CX-1S-00438-D02	CX-1S-00438-D03	
.436 - .457	11.07 - 11.61	CX-1S-00453-RA	CX-1S-00453-D02	CX-1S-00453-D03	
.452 - .473	11.48 - 12.01	CX-1S-00469-RA	CX-1S-00469-D02	CX-1S-00469-D03	
.467 - .488	11.86 - 12.40	CX-1S-00484-RA	CX-1S-00484-D02	CX-1S-00484-D03	
.483 - .504	12.27 - 12.80	CX-1S-00500-RA	CX-1S-00500-D02	CX-1S-00500-D03	
.499 - .520	12.68 - 13.21	CX-1S-00516-RA	CX-1S-00516-D02	CX-1S-00516-D03	
.514 - .535	13.06 - 13.59	CX-1S-00531-RA	CX-1S-00531-D02	CX-1S-00531-D03	
.530 - .551	13.46 - 14.00	CX-1S-00547-RA	CX-1S-00547-D02	CX-1S-00547-D03	
.545 - .566	13.84 - 14.38	CX-1S-00562-RA	R-00750-D14 5 REQUIRED PER SET	CX-1S-00562-D02	CX-1S-00562-D03
.561 - .582	14.25 - 14.78	CX-1S-00578-RA		CX-1S-00578-D02	CX-1S-00578-D03
.577 - .598	14.56 - 15.19	CX-1S-00594-RA		CX-1S-00594-D02	CX-1S-00594-D03
.592 - .613	15.03 - 15.57	CX-1S-00609-RA		CX-1S-00609-D02	CX-1S-00609-D03
.608 - .629	15.44 - 15.98	CX-1S-00625-RA		CX-1S-00625-D02	CX-1S-00625-D03
.624 - .645	15.85 - 16.38	CX-1S-00641-RA		CX-1S-00641-D02	CX-1S-00641-D03
.639 - .660	16.23 - 16.76	CX-1S-00656-RA		CX-1S-00656-D02	CX-1S-00656-D03
.655 - .676	16.64 - 17.17	CX-1S-00672-RA		CX-1S-00672-D02	CX-1S-00672-D03
.671 - .692	17.04 - 17.58	CX-1S-00688-RA		CX-1S-00688-D02	CX-1S-00688-D03
.686 - .707	17.42 - 17.96	CX-1S-00703-RA		CX-1S-00703-D02	CX-1S-00703-D03
.702 - .723	17.83 - 18.36	CX-1S-00719-RA		CX-1S-00719-D02	CX-1S-00719-D03
.717 - .738	18.21 - 18.75	CX-1S-00734-RA		CX-1S-00734-D02	CX-1S-00734-D03
.733 - .754	18.62 - 19.15	CX-1S-00750-RA	CX-1S-00750-D02	CX-1S-00750-D03	

All CX race assemblies are self-feeding: For bottoming applications, replace "1S" with "1B" for RA and cages. Designate rolls a "B".

CX 2000 Machine Race Assemblies

INTERFERENCE-STYLE

INCHES	MM	RACE ASSEMBLY #	ROLL #	RACE #	CAGE #
.749 - .770	19.03 - 19.56	CX-1S-00766-RA	R-00875-D14 5 REQUIRED PER SET	CX-1S-00766-D02	CX-1S-00766-D03
.764 - .785	19.41 - 19.94	CX-1S-00781-RA		CX-1S-00781-D02	CX-1S-00781-D03
.780 - .801	19.81 - 20.35	CX-1S-00797-RA		CX-1S-00797-D02	CX-1S-00797-D03
.795 - .816	20.19 - 20.73	CX-1S-00812-RA		CX-1S-00812-D02	CX-1S-00812-D03
.811 - .832	20.60 - 21.13	CX-1S-00828-RA		CX-1S-00828-D02	CX-1S-00828-D03
.827 - .848	21.01 - 21.54	CX-1S-00844-RA		CX-1S-00844-D02	CX-1S-00844-D03
.842 - .863	21.39 - 21.92	CX-1S-00859-RA		CX-1S-00859-D02	CX-1S-00859-D03
.858 - .879	21.79 - 22.33	CX-1S-00875-RA		CX-1S-00875-D02	CX-1S-00875-D03
.874 - .895	22.20 - 22.73	CX-1S-00891-RA		CX-1S-00891-D02	CX-1S-00891-D03
.889 - .910	22.58 - 23.11	CX-1S-00906-RA		CX-1S-00906-D02	CX-1S-00906-D03
.905 - .926	22.98 - 23.52	CX-1S-00922-RA		CX-1S-00922-D02	CX-1S-00922-D03
.921 - .942	23.39 - 23.93	CX-1S-00938-RA		CX-1S-00938-D02	CX-1S-00938-D03
.936 - .957	23.77 - 24.31	CX-1S-00953-RA		CX-1S-00953-D02	CX-1S-00953-D03
.952 - .973	24.18 - 24.71	CX-1S-00969-RA		CX-1S-00969-D02	CX-1S-00969-D03
.967 - .988	24.56 - 25.10	CX-1S-00984-RA	CX-1S-00984-D02	CX-1S-00984-D03	
.983 - 1.004	24.97 - 25.50	CX-1S-01000-RA	CX-1S-01000-D02	CX-1S-01000-D03	

All CX race assemblies are self-feeding: For bottoming applications, replace "1S" with "1B" for RA and cages. Designate rolls a "B".

AIR COMPENSATING-STYLE

INCHES	MM	RACE ASSEMBLY #	ROLL #	RACE #	CAGE #
.058 - .070	1.47 - 1.78	CX-1R-00062-RA	R-00500-D14 3 REQUIRED PER SET	CX-1R-00062-D02	CX-1R-00062-D03
.074 - .095	1.88 - 2.41	CX-1R-00078-RA		CX-1R-00078-D02	CX-1R-00078-D03
.090 - .111	2.29 - 2.82	CX-1R-00094-RA		CX-1R-00094-D02	CX-1R-00094-D03
.105 - .126	2.67 - 3.20	CX-1R-00109-RA		CX-1R-00109-D02	CX-1R-00109-D03
.121 - .142	3.07 - 3.61	CX-1R-00125-RA		CX-1R-00125-D02	CX-1R-00125-D03
.137 - .158	3.48 - 4.01	CX-1R-00141-RA		CX-1R-00141-D02	CX-1R-00141-D03
.152 - .173	3.86 - 4.39	CX-1R-00156-RA		CX-1R-00156-D02	CX-1R-00156-D03
.167 - .188	4.24 - 4.78	CX-1R-00171-RA		CX-1R-00171-D02	CX-1R-00171-D03
.183 - .204	4.65 - 5.18	CX-1R-00187-RA		CX-1R-00187-D02	CX-1R-00187-D03
.199 - .220	5.06 - 5.59	CX-1R-00203-RA		CX-1R-00203-D02	CX-1R-00203-D03
.215 - .236	5.46 - 5.99	CX-1R-00219-RA	CX-1R-00219-D02	CX-1R-00219-D03	
.230 - .251	5.84 - 6.38	CX-1R-00234-RA	CX-1R-00234-D02	CX-1R-00234-D03	
.246 - .267	6.25 - 6.78	CX-1R-00250-RA	R-00500-D14 5 REQUIRED PER SET	CX-1R-00250-D02	CX-1R-00250-D03
.262 - .283	6.66 - 7.19	CX-1R-00266-RA		CX-1R-00266-D02	CX-1R-00266-D03
.277 - .298	7.04 - 7.57	CX-1R-00281-RA		CX-1R-00281-D02	CX-1R-00281-D03
.293 - .314	7.44 - 7.98	CX-1R-00297-RA		CX-1R-00297-D02	CX-1R-00297-D03
.308 - .329	7.82 - 8.36	CX-1R-00312-RA		CX-1R-00312-D02	CX-1R-00312-D03
.324 - .345	8.23 - 8.76	CX-1R-00328-RA		CX-1R-00328-D02	CX-1R-00328-D03
.340 - .361	8.64 - 9.17	CX-1R-00344-RA		CX-1R-00344-D02	CX-1R-00344-D03
.355 - .376	9.02 - 9.55	CX-1R-00359-RA		CX-1R-00359-D02	CX-1R-00359-D03
.371 - .392	9.42 - 9.96	CX-1R-00375-RA	CX-1R-00375-D02	CX-1R-00375-D03	

All CX race assemblies are self-feeding: For bottoming applications, replace "1R" with "1RB" for RA and cages. Designate rolls a "B".

CX 2000 Machine Race Assemblies

AIR COMPENSATING-STYLE					
INCHES	MM	RACE ASSEMBLY #	ROLL #	RACE #	CAGE #
.387 - .408	9.83 - 10.36	CX-1R-00391-RA	R-00750-D14 5 REQUIRED PER SET	CX-1R-00391-D02	CX-1R-00391-D03
.402 - .423	10.21 - 10.74	CX-1R-00406-RA		CX-1R-00406-D02	CX-1R-00406-D03
.418 - .437	10.62 - 11.10	CX-1R-00422-RA		CX-1R-00422-D02	CX-1R-00422-D03
.434 - .455	11.02 - 11.56	CX-1R-00438-RA		CX-1R-00438-D02	CX-1R-00438-D03
.449 - .470	11.41 - 11.94	CX-1R-00453-RA		CX-1R-00453-D02	CX-1R-00453-D03
.465 - .486	11.81 - 12.34	CX-1R-00469-RA		CX-1R-00469-D02	CX-1R-00469-D03
.480 - .501	12.19 - 12.73	CX-1R-00484-RA		CX-1R-00484-D02	CX-1R-00484-D03
.496 - .517	12.60 - 13.13	CX-1R-00500-RA		CX-1R-00500-D02	CX-1R-00500-D03
.512 - .533	13.01 - 13.54	CX-1R-00516-RA		CX-1R-00516-D02	CX-1R-00516-D03
.527 - .548	13.39 - 13.92	CX-1R-00531-RA		CX-1R-00531-D02	CX-1R-00531-D03
.543 - .564	13.79 - 14.33	CX-1R-00547-RA		CX-1R-00547-D02	CX-1R-00547-D03
.558 - .579	14.17 - 14.71	CX-1R-00562-RA		CX-1R-00562-D02	CX-1R-00562-D03
.574 - .595	14.58 - 15.11	CX-1R-00578-RA		CX-1R-00578-D02	CX-1R-00578-D03
.590 - .611	14.99 - 15.52	CX-1R-00594-RA		CX-1R-00594-D02	CX-1R-00594-D03
.605 - .626	15.37 - 15.90	CX-1R-00609-RA		CX-1R-00609-D02	CX-1R-00609-D03
.621 - .642	15.55 - 16.31	CX-1R-00625-RA		CX-1R-00625-D02	CX-1R-00625-D03
.637 - .658	16.18 - 16.71	CX-1R-00641-RA		CX-1R-00641-D02	CX-1R-00641-D03
.652 - .673	16.56 - 17.09	CX-1R-00656-RA		CX-1R-00656-D02	CX-1R-00656-D03
.668 - .689	16.97 - 17.50	CX-1R-00672-RA		CX-1R-00672-D02	CX-1R-00672-D03
.684 - .705	17.37 - 17.91	CX-1R-00688-RA		CX-1R-00688-D02	CX-1R-00688-D03
.699 - .720	17.76 - 18.29	CX-1R-00703-RA		CX-1R-00703-D02	CX-1R-00703-D03
.715 - .736	18.16 - 18.69	CX-1R-00719-RA		CX-1R-00719-D02	CX-1R-00719-D03
.730 - .751	18.54 - 19.08	CX-1R-00734-RA		CX-1R-00734-D02	CX-1R-00734-D03
.746 - .767	18.95 - 19.48	CX-1R-00750-RA		CX-1R-00750-D02	CX-1R-00750-D03
.762 - .783	19.36 - 19.89	CX-1R-00766-RA		CX-1R-00766-D02	CX-1R-00766-D03
.777 - .798	19.74 - 20.27	CX-1R-00781-RA	CX-1R-00781-D02	CX-1R-00781-D03	
.793 - .814	20.14 - 20.68	CX-1R-00797-RA	CX-1R-00797-D02	CX-1R-00797-D03	
.808 - .829	20.52 - 21.06	CX-1R-00812-RA	CX-1R-00812-D02	CX-1R-00812-D03	
.824 - .845	20.93 - 21.46	CX-1R-00828-RA	CX-1R-00828-D02	CX-1R-00828-D03	
.840 - .861	21.34 - 21.87	CX-1R-00844-RA	CX-1R-00844-D02	CX-1R-00844-D03	
.855 - .876	21.72 - 22.25	CX-1R-00859-RA	CX-1R-00859-D02	CX-1R-00859-D03	
.871 - .892	22.12 - 22.66	CX-1R-00875-RA	CX-1R-00875-D02	CX-1R-00875-D03	
.887 - .908	22.53 - 23.06	CX-1R-00891-RA	CX-1R-00891-D02	CX-1R-00891-D03	
.902 - .923	22.91 - 23.44	CX-1R-00906-RA	CX-1R-00906-D02	CX-1R-00906-D03	
.918 - .939	23.32 - 23.85	CX-1R-00922-RA	CX-1R-00922-D02	CX-1R-00922-D03	
.934 - .955	23.72 - 24.26	CX-1R-00938-RA	CX-1R-00938-D02	CX-1R-00938-D03	
.949 - .970	24.11 - 24.64	CX-1R-00953-RA	CX-1R-00953-D02	CX-1R-00953-D03	
.965 - .986	24.51 - 25.04	CX-1R-00969-RA	CX-1R-00969-D02	CX-1R-00969-D03	
.980 - 1.001	24.89 - 25.43	CX-1R-00984-RA	CX-1R-00984-D02	CX-1R-00984-D03	
.996 - 1.017	25.30 - 25.83	CX-1R-01000-RA	CX-1R-01000-D02	CX-1R-01000-D03	

All CX race assemblies are self-feeding: For bottoming applications, replace "1R" with "1RB" for RA and cages. Designate rolls a "B".