Cole-Parmer®

CG-200/CG-400/CG-450/CG-500 Freezer/Mill®

Cryogenic Grinder Designed for Milling Tough and Temperature Sensitive Samples

Accessory Manual

For Product Information

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USE AND CARE OF VIALS

Breakage of polycarbonate (PC) cylinders during cryogenic milling is rare, but possible. The following cautions will help to prevent the loss of important samples, contamination of the Freezer/Mill, and other consequences of vial breakage. The polycarbonate cylinders are very durable and can withstand repeated use. They should always be inspected before use and discarded if any cracks are visible. Cleaning them immediately after each use with detergent and hot water is a good laboratory practice. To sterilize PC cylinders, rinse in a 10% bleach solution. Do not rinse chromium-free stainless steel end plugs *(#6771, #6871, #6883)* or impactors with bleach solution. Stainless steel parts should be washed with detergent and hot water, then immediately dried. To sterilize stainless steel, wipe down with alcohol. Test the compatibility with cleaning solutions and other chemicals with which the vials will come in contact.

Some known chemicals not compatible with polycarbonate include caustic soda (sodium hydroxide), acetone, alcohols, organic solvents (chloroform, ammonia), TriZol, phenols, and Diethylpyrocarbonate (DEPC). Polycarbonate cylinders should not be autoclaved as this will weaken the cylinders (heating above 80°C weakens PC).

DIFFICULT SAMPLES

Some samples (e.g. bone) can break PC cylinders during the grinding process, particularly the center sections of the small Freezer/Mill vials *(#6751, #6761)*. Sample pieces should be approximately 5 mm when using the small vials. Large sample pieces should be cut into smaller pieces if possible. Large sample pieces can deflect the impactor sideways into the wall of the cylinder or wedge the impactor against the wall of the cylinder causing breakage. If samples cannot be cut to smaller pieces then a large or mid-size vial may be necessary to grind sample. Stainless steel vials *(#6803, #6781S*) are the best option for grinding tough samples (e.g. bone and similar).

PRE-COOLING TIME IS TOO SHORT

Recommended minimum pre-cooling times, ranging from 10 to 15 minutes. During the first 5 minutes of pre-cooling, thermal stress is placed on the PC cylinder, stainless steel end-plugs, and impactor. Starting the grinding process during that period (first 5 min of pre-cooling) can break the PC cylinder or chip the end plugs and impactor.

END PLUGS ARE TOO TIGHT OR TOO LOOSE

PC cylinders usually fit snug when new and loosen over time with use. A loose-fitting end plug can fall out of a loaded vial at room temperature. When a cylinder fit becomes too loose, it should be discarded. End plugs can eventually widen (mushroom affect), due to the force caused by the impactor, creating a fit that is too tight with the cylinder. A tight-fitting end plug makes a vial difficult to assemble, and when the vial is chilled the PC cylinder may crack during grinding. One further cause of cracked PC cylinder is forcing an end plug into a chilled cylinder. Never overly force an end plug (warm or chilled) into the PC cylinder. Polycarbonate shrinks when chilled and can crack if stressed. If the PC cylinder has cooled to the point that the end plug fit is too tight, allow the cylinder to warm to room temperature before inserting the end plug.

CAUTION

Pressure can develop inside a chilled vial after removing it from the Freezer/Mill. As the vial warms pressure can build causing the end plug to pop out with force and sample can be lost. Handle vials with care. Do not point towards face.

USER TIP

Open chilled vial immediately after removing it from the Freezer/Mill or wrap in cloth for a few minutes allowing the vial to gradually warm.

VIALS AND VIAL SETS

MICROVIAL AND SMALL VIALS

	**6757 Microvial Set** Set contains three Microvials *(#6757V)* arranged in a Vial Holder *(#6759)* to allow simultaneous sample processing. Each Microvial includes two Stainless Steel End Plugs *(#6757E),* one Stainless Steel Impactor *(#6757P),* and one Polycarbonate Center Cylinder *(#6757C3).* Sample capacity 100 - 500 mg.
	6753C Microvial Sample Extraction Tool Sample extraction tool for removing ground samples from microvials *(#6757).*
	**6751 Small Grinding Vial Set** Set contains everything necessary to make one complete Grinding Vial plus three spare Polycarbonate Center Cylinders. Includes one Stainless Steel Impactor *(#6751P),* two Stainless Steel End Plugs *(#6751E),* and four Polycarbonate Center Cylinders *(#6751C4).* Sample capacity 0.5 - 5 g.
	**6751C4 Small Polycarbonate Center Cylinder** Replacement Polycarbonate Center Cylinders for the small grinding vial set *(#6751 or #6761).* Sold in package of 4.
	**6751C20 Small Polycarbonate Center Cylinder** Replacement Polycarbonate Center Cylinders for the small grinding vial set *(#6751 or #6761).* Sold in package of 20.
	**6761 Small Poly-Vial Set** Small Poly-Vial Set contains everything necessary to make one complete Grinding Vial plus three spare Polycarbonate Center Cylinders. Includes one Small Polycarbonate Encapsulated Impactor *(#6761P)*, two Small Polycarbonate End Plugs *(#6761E),* and one pack of Small PC Center Cylinders *(#6751C4).* Sample capacity 0.5 - 5 g.
	**6771 Small Low Chromium Grinding Vial Set** Small Low Chromium Grinding Vial Set contains everything necessary to make one complete Grinding Vial plus three spare Polycarbonate Center Cylinders. Includes one Small Steel Impactor *(#6771P),* two Small Steel End Plugs *(#6771E),* and one pack of Small Polycarbonate Center Cylinders *(#6751C4).* Sample capacity 0.5 - 5 g.

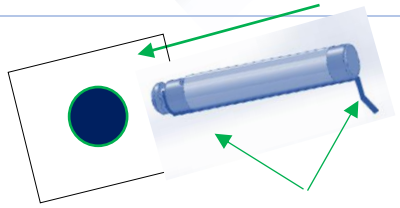
6781S Small Stainless Steel Vial Set

Small Stainless Steel Set contains everything necessary to make one complete Grinding Vial. O-rings on End Plugs seal Vial during grinding. Includes one Stainless Steel Impactor *(#6751P),* two Stainless Steel End Plugs *(#6781E),* Stainless Steel Center Cylinder, pack of 10 O-rings *(#6781O),* and Vial Extraction Tool *(#6781H)* for CG-200 Small Freezer/Mill only. Sample capacity 0.5 - 5 g.

Before use, carefully slide an O-ring onto each end plug and fit into the groove.

Twist the end plug while inserting into the steel cylinder. Pushing the end plug straight into the cylinder can damage the O-ring.

To remove an O-ring, squeeze it on opposite sides creating slack, allowing it to be easily slipped off the end plug.



Fit the crescent-shaped end of the Extraction Tool *(#6781H)* onto the grooved end plug. Be sure to hold the vial securely in the extraction tool.

Carefully Insert the vial and Extraction Tool into the CG-200 Small Freezer/Mill.

MID-SIZE VIALS

6881 Mid-Size Grinding Vial Set

Mid-Size Grinding Vial Set contains everything necessary to make one complete Grinding Vial plus three spare Polycarbonate Center Cylinders. Includes one Mid-Size Stainless Steel Impactor *(#6881P),* two Mid-Size Stainless Steel End Plugs *(#6881E),* and one pack of Mid-Size Polycarbonate Center Cylinders *(#6881C4).* Sample capacity 5 - 50 g. Requires the Mid-Size Grinding Vial Adapter *(#6887)* for grinding in the Large Freezer/Mills (CG-400/CG-450/CG-450D). Requires the Mid-Size Grinding Vial Adapter *(#6884)* for Large Extractor/Vial Opener *(#6804)* or the Adapter *(#6808M)* for the Extractor/Vial Opener *(#6808).*

6881C4 Mid-Size Polycarbonate Center Cylinder

Replacement polycarbonate center cylinders for mid-size grinding vial set *(#6881).* Sold in package of 4.

6881C20 Mid-Size Polycarbonate Center Cylinder

Replacement polycarbonate center cylinders for mid-size grinding vial set *(#6881).* Sold in package of 20.

6883 Mid-Size Low Chromium Grinding Vial Set

Mid-Size Low Chromium Grinding Vial Set contains everything necessary to make one complete Grinding Vial plus three spare Polycarbonate Center Cylinders. Includes one Mid-Size Steel Impactor *(#6883P),* two Mid-Size Steel End Plugs *(#6883E),* and one pack of Mid-Size Polycarbonate Center Cylinders *(#6811C4).* Sample capacity 5 - 50 g. Requires the Mid-Size Grinding Vial Adapter *(#6887)* for grinding in the Large Freezer/Mills (CG-400/CG-450/CG-450D). Requires the Mid-Size Grinding Vial Adapter *(#6884)* for Large Extractor/Vial Opener *(#6804)* or the Adapter *(#6808M)* for the Extractor/Vial Opener *(#6808).*

6885 Mid-Size Poly-Vial Set

Mid-Size Poly-Vial contains everything necessary to make one complete Grinding Vial plus three spare Polycarbonate Center Cylinders. Includes one Mid-Size Polycarbonate Encapsulated Impactor *(#6885P),* two Mid-Size Polycarbonate End Plugs *(#6885E),* and one pack of Mid-Size Polycarbonate Center Cylinders *(#6811C4).* Sample capacity 5 - 50 g. Requires the Mid-Size Grinding Vial Adapter *(#6888)* for grinding in the Large Freezer/Mills (CG-400/CG-450/CG-450D). Requires the Mid-Size Grinding Vial Adapter *(#6884)* for the Large Extractor/Vial Opener *(#6804)* or the Adapter *(#6808M)* for the Extractor/Vial Opener *(#6808).*

LARGE VIALS

6801 Large Grinding Vial Set

Contains everything necessary to make one complete Grinding Vial plus three spare Polycarbonate Center Cylinders. Includes one Large Stainless Steel Impactor *(#6801P),* two Large Stainless Steel End Plugs *(#6801E),* and one pack of Large Polycarbonate Center Cylinders *(#6801C4).* Sample capacity 10 to 100 g

6801C4 Large Polycarbonate Center Cylinder

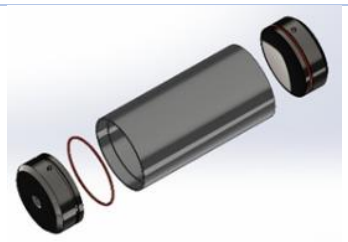
Replacement polycarbonate center cylinders for large grinding vial set *(#6801).* Sold in package of 4.

6801C20 Large Polycarbonate Center Cylinder

Replacement polycarbonate center cylinders for large grinding vial set *(#6801).* Sold in package of 4.

6803 Large Stainless Steel Vial Set

Large Stainless Steel Set contains everything necessary to make one complete Grinding Vial. O-rings on End Plugs seal vial during grinding. Includes Stainless Steel Impactor *(#6801P),* Stainless Steel End Plugs *(#6803E),* Stainless Steel Center Cylinder *(#6802),* and package of 10 Silicone O-rings *(6803S).* Sample capacity 10 to 100 g



Before use, carefully slide an O-ring onto each end plug and fit into the groove.

Twist the end plug while inserting into the steel cylinder. Pushing the end plug straight into the cylinder can damage the O-ring. fully insert end plug into the cylinder (up to Guide Pins).

To remove an O-ring, squeeze it on opposite sides creating slack, allowing it to be easily slipped off the end plug.

6871 Large Low Chromium Grinding Vial Set

Large Low Chromium Grinding Vial Set contains everything necessary to make one complete Grinding Vial plus three spare Polycarbonate Center Cylinders. Includes one Large Steel Impactor *(#6871P),* two Large Steel End Plugs *(#6871E),* and one pack of Large Polycarbonate Center Cylinders *(#6801C4).* Sample capacity 10 to 100 g.

VIAL HOLDER/ADAPTERS

6807 Vial Holder

Insert that is placed inside the CG-400/CG-450/CG-500 Freezer/Mill grinding chamber to separate and align Small Vials during grinding. Enables multiple sample processing for high-throughput applications. Holds up to four small vials or up to four microvial sets.

6887 Mid-Size Grinding Vial Adapter

Insert that is placed inside the CG-400/CG-450/CG-500 Freezer/Mill grinding chamber to position and align Mid-Size Grinding Vials *(#6881, #6883)*. Holds One Mid-Size Vial.

6888 Mid-Size Grinding Vial Adapter

Insert that is placed inside the CG-400/CG-450/CG-500 Freezer/Mill grinding chamber to position and align Mid-Size Poly Grinding Vial *(#6885)*. Holds One Mid-Size Poly Vial.

END PLUG EXTRACTORS

6754 Small Extractor/Vial Opener

Used to remove the End Plug from the Center Cylinders of Small Grinding Vial. Compatible with Small Grinding Vial Set *(#6751)*, Small Poly-Vial Set *(#6761)*, Small Low Chromium Grinding Vial Set *(#6771)*, and Small Stainless Steel Grinding Vial *(#6871S)*.

6756 Small Extractor/Vial Opener

Used to remove the End Plug from the Center Cylinder of Small Grinding Vial. Compatible with Small Grinding Vial Set *(#6751)*, Small Poly-Vial Set *(#6761)*, Small Low Chromium Grinding Vial Set *(#6771)*, and Small Stainless Steel Grinding Vial *(#6871S).*

Instructional Guide

1. Place the flanged end plug (top end) into the cradle.
2. The end plug is easily removed by pressing down the extractor handle.

6758 Extractor for Microvials

Used to remove the End Plugs from the Center Cylinders of Microvials *(#6757).*

Instructional Guide

1. Place the vial (s) into the cradle (with any end).
2. The end plug (s) is easily removed by pressing down the extractor handle.

6804 Large Extractor/Vial Opener

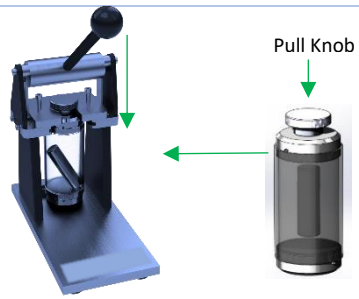
Used to remove the end plug from the Center Cylinder of Large and Mid-Size Grinding Vials. Compatible with the following Large Grinding Vials: Large Grinding Vial Set (#6801) and Large Low Chromium Grinding Vial Set *(#6871)*. Also compatible with the following Mid-Size Vials when used in conjunction with the Mid-Size Grinding Vial Adapter *(#6884)* (sold separately): Mid-Size Grinding Vial Set *(#6881)*, Mid-Size Cr-Free Grinding Vial Set *(#6883)*, and Mid-Size Poly-Vial Set *(#6885)*.

Instructional Guide

1. Place large vial into extractor socket.
2. Turn handle, screwing threaded rod into end plug. (align pins on end plug with slots in extractor)
3. The end plug is removed by squeezing the extractor handle.

6808 Large Extractor/Vial Opener

Used to remove the end plug from the Center Cylinder of Large and Mid-Size Grinding Vials. Compatible with the following Large Grinding Vials: 6801 Large Grinding Vial Set *(#6801)*, Large Steel Vial Set *(#6803)* and Large Low Chromium Grinding Vial Set *(#6871)*. The 6808 Extractor is compatible with the following Mid-Size Vials when used in conjunction with the 6808M Kit (sold separately): Mid-Size Grinding Vial Set *(#6881)*, Mid-Size Cr-Free Grinding Vial Set *(#6883)* and Mid-Size Poly-Vial Set *(#6885)*.

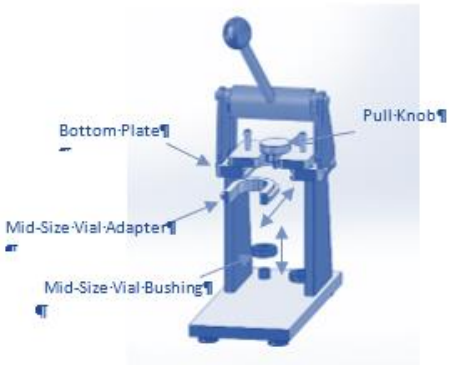


Instructional Guide

1. Screw the pull knob into the threaded end plug (either end).
2. Push handle upright and hold. Slide the into vial into the extractor.
3. The end plug is easily removed by depressing the extractor handle.

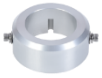
6808M Mid-Size Vial Adapter Kit for 6808 Large Extractor/Vial Opener

Adapts the 6808 Large Extractor/Vial Opener for use with Mid-Size Grinding Vials. Compatible with all Mid-Size Grinding Vials.



Instructional Guide

1. Attach the 2 bushings to base.
2. Insert U-shaped adapter into bottom plate.
3. Screw the pull knob into the threaded end plug (either end).
4. Slide the vial into the extractor.
5. The end plug is easily removed by depressing the extractor handle.



6884 Mid-Size Grinding Vial Adapter for 6804 Large Extractor/Vial Opener

Adapts Large Extractor/Vial Opener *(#6804)* for use with Mid-Size Grinding Vials. Compatible with all Mid-Size Grinding Vials.

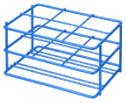
Instructional Guide

1. Attach the adapter to the mid-size vial.
   (align the pins on the end plug with the slots)
2. Place adapter/vial into extractor socket.
   (align bolts on adapter with slots in extractor)
3. Turn handle, screwing threaded rod into end plug.
   (align pins on end plug with slots in extractor)
4. The end plug is removed by squeezing the extractor handle.

GRINDING VIAL ACCESSORY PACKAGE

6870S Small Grinding Vial Accessory Package

Small Grinding Vial Accessory Package contains everything necessary to run Small Grinding Vials in the CG-400/CG-450/CG-500 Freezer/Mill. Includes one Multi-Vial Holder *(#6807)*, one Small Extractor/Vial Opener *(#6754)*, one Vial Rack for Small Grinding Vials *(6755)*.

	**6870M-1 Mid-Size Grinding Vial Accessory Package** Mid-Size Grinding Vial Accessory Package contains everything necessary to run Mid-Size Grinding Vials in the CG-400/CG-450/CG-450D Freezer/Mill. Includes one Mid-Size Grinding Vial Adapter *(#6884)* for Large Extractor/Vial Opener and one Mid-Size Vial Adapter *(#6887)*.
	**6870L Large Grinding Vial Accessory Package** Large Grinding Vial Accessory Package contains everything necessary to run Large Grinding Vials in the CG-400/CG-450/CG-450D Freezer/Mill. Includes Large Extractor/Vial Opener *(#6804)* and Vial Rack for Large Grinding Vials *(#6805).*
	**6755 Vial Rack for Small Grinding Vials** Vial Rack holds up to sixteen Small Grinding Vials for storage and handling. Durable glass-reinforced acetal construction. Autoclavable to 250°F. Do not submerse in liquid nitrogen.
	**6805 Vial Rack for Large Grinding Vials** Vial Rack holds up to six Large Grinding Vials for storage and handling. Durable epoxy-coated steel construction.

CRYOGENIC GLOVES

	**6900S Cryogenic Gloves, Size Small** Cryogenic gloves to protect hands and arms from liquid nitrogen exposure. Highly recommended when operating all Cole-Parmer Freezer/Mills®. Sold in pairs.
	**6900M Cryogenic Gloves, Size Medium** Cryogenic gloves to protect hands and arms from liquid nitrogen exposure. Highly recommended when operating all Cole-Parmer Freezer/Mills®. Sold in pairs.
	**6900L Cryogenic Gloves, Size Large** Cryogenic gloves to protect hands and arms from liquid nitrogen exposure. Highly recommended when operating all Cole-Parmer Freezer/Mills®. Sold in pairs
	**6900XL Cryogenic Gloves, Size Extra Large** Cryogenic gloves to protect hands and arms from liquid nitrogen exposure. Highly recommended when operating all Cole-Parmer Freezer/Mills®. Sold in pairs.

CRYOGENIC TRANSFER HOSES

	**6906 Short Cryogenic Transfer Hose (4 ft) or 6907 Long Cryogenic Transfer Hose (6 ft)** long flexible stainless steel hose suitable for transferring liquid nitrogen directly into all Cole-Parmer Freezer/Mills®. Fitted with a nominal diameter3/8 in. (10 mm) NPT male fitting on one end and a CGA295 female fitting on the other end.

SAMPLE REFERENCE TABLE

Sample	Sample (g)	Sample size	Freezer/Mill	Vial	Accessory	Grinding Protocol	
Bone	2 g	5 mm – 8 mm	CG-200	6751 6781S	6756 Extractor	Precool	10 min
						Grinding Cycles	3 cycles (1 min each cycle)
						Cool Time	1 min
						Rate	12 cps
Tooth	1 whole tooth	(as-is)	CG-200	6751	6756 Extractor	Precool	10 min
						Grinding Cycles	3 cycles (1 min each cycle)
						Cool Time	1 min
						Rate	12 cps
Hair (human, animal)	0.5 g	(as-is)	CG-200	6751	6756 Extractor	Precool	15 min
						Grinding Cycles	3 cycles (2 min each cycle)
						Cool Time	2 min
						Rate	12 cps
Tissue (human/animal)	0.3 g	1 mm – 2 mm	CG-200/CG-400/CG-450/CG-500	6757	6758 Extractor 6807 Holder	Precool	5 min
	5 g	10 mm	CG-200/CG-400/CG-450/CG-500	6751	6756 Extractor 6807 Holder	Grinding Cycles	2 cycles (1 min each cycle)
						Cool Time	2 min
						Rate	12 cps
Potatoes (vegetables, or similar foods)	50 g	10 mm	CG-400/CG-450, CG-400/CG-500	6801 6885	6808 Extractor 6887 Holder	Precool	10 min
	5 g	10 mm	CG-200	6751	6756 Extractor	Grinding Cycles	3 cycles (1 min each cycle)
						Cool Time	1 min
						Rate	10 cps
Meat (beef, chicken, fish)	50 g	10 mm	CG-400/CG-450, CG-400/CG-500	6801 6885	6808 Extractor 6887 Holder	Precool	15 min
	5 g	10 mm	CG-200	6751	6756 Extractor	Grinding Cycles	3 cycles (2 min each cycle)
	0.5 g	1 mm – 2 mm	CG-200	6757	6758 Extractor	Cool Time	1 min
						Rate	10 cps
Dog Treats	10 g	10 mm	CG-400/CG-450, CG-400/CG-500	6801 6885	6808 Extractor 6887 Holder	Precool	15 min
	1 g	10 mm	CG-200		6756 Extractor	Grinding Cycles	3 cycles (2 min each cycle)
						Cool Time	1 min
						Rate	10 cps
Plant Leaves	10 g	(as-is)	CG-400/CG-450, CG-400/CG-500	6801 6885	6808 Extractor 6887 Holder	Precool	5 min
	1 g	(as-is)	CG-200	6751	6756 Extractor	Grinding Cycles	3 cycles (1 min each cycle)
	0.15 g	1 mm – 2 mm	CG-200	6757	6758 Extractor	Cool Time	1 min
						Rate	10 cps

SAMPLE REFERENCE TABLE (continued)

Sample	Sample (g)	Sample size	Freezer/Mill	Vial	Accessory	Grinding Protocol	Sample	Sample (g)
Polyethylene [containers-High Density (HD) and Low Density (LD)]	20 g	Pellets 3 mm – 5 mm	CG-400/CG-450, CG-400/CG-500	6801 6881	6808 Extractor 6807 Holder	Precool	15 min	*15min
	2 g		*CG-200	6751	6756 Extractor	Grinding Cycles	6 cycles (2 min each cycle)	*4 cycles (2 min each cycle)
						Cool Time	2 min	*2min
						Rate	10 cps	*12 cps
Thermoplastics (recyclable), example: Plastic Bottles	2.5 g	pellets	CG-200	6751 6781S	6756 Extractor	Precool	15 min	
						Grinding Cycles	4 cycles (2 min each cycle)	
						Cool Time	2 min	
						Rate	12 cps	
Thermoset Plastic (non-recyclable) Example: Epoxy Resins, Phenolic Resins	0. 5 g	5 mm	CG-200	6781S	6756 Extractor	Precool	15 min	Typically used in electronic devices
						Grinding Cycles	6 cycles (2 min each cycle)	
						Cool Time	2 min	
						Rate	15 cps	
Plastic Toy/Baby Items	2 to 5	5 mm	CG-200	6751	6756 Extractor	Precool	10 min	
				6781S		Grinding Cycles	4 cycles (2 min each cycle)	
						Cool Time	1 min	
						Rate	12 cps	
Teflon (PTFE)	25 g	5 mm	CG-400/CG-450, CG-400/CG-500	6801 6881	6808 Extractor	Precool	15 min	15 min
	2.5 g		*CG-200	6751	6756 Extractor	Grinding Cycles	6 cycles (2 min each cycle)	*4 cycles (2 min each cycle)
						Cool Time	2 min	2 min
						Rate	10 cps	*12 cps

*Sampling reference use with Freezer/Mill CG-200

SAMPLE REFERENCE TABLE (continued)

Sample	Sample (g)	Sample size	Freezer/Mill	Vial	Accessory	Grinding Protocol	
Rubber	1g	5mm - 8mm	CG-200	6751	6756 Extractor	Precool	15 min
						Grinding Cycles	3 cycles (2 min each cycle)
						Cool Time	2 min
						Rate	15 cps
Carpet	3g	5mm	CG-200	6751	6756 Extractor	Precool	15 min
						Grinding Cycles	5 cycles (2 min each cycle)
						Cool Time	2 min
						Rate	12 cps
Wood (chips, pieces)	1.5g	5mm	CG-200	6751	6756 Extractor	Precool	15 min
	15g		CG-400/CG-450, CG-400/CG-500		6808 Extractor	Grinding Cycles	3 cycles (2 min each cycle)
						Cool Time	1 min
						Rate	12 cps
Circuit Board	1g	5mm	CG-200	6771	6756 Extractor	Precool	15 min
						Grinding Cycles	5 cycles (2 min each cycle)
						Cool Time	2 min
						Rate	12 cps