

For grinding, agitating and dispersing samples

# Cryogenic Mill < IQ MILL-2070 >

Japanese patent No. 7064786

Easy operation

Quick, effective and quiet grinding

Energy saving sample cooling kit included



< Small portable IQ MILL-2070 >

# Perfect for sample pretreatment

- Specifically designed for grinding, agitating, and dispersing samples -

In sample pretreatment, grinding samples into fine powders is a time-consuming and labor-intensive task. The newly developed IQ MILL-2070 makes this a simple process. Especially in microanalysis, grinding samples is a required pretreatment for sample uniformity, homogeneity, and reproducibility. Various methods have been devised, but they have problems such as a large

amount (e.g., 5 L) of liquid nitrogen consumption, a grinding time of more than ten minutes, and a noise level of 90 dB during that time. The "IQ MILL-2070" is a benchtop grinding, agitating, and dispersing device that uses a special high elastic belt\* to achieve a rapid reciprocating torsional motion to solve these problems. (\*Japanese patent No. 7064786)

## IQ MILL-2070 features

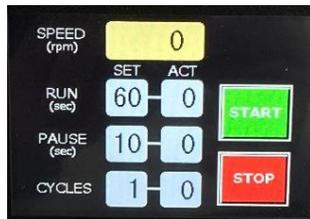
### 1 Simple operation

- Grinding samples by simple operation

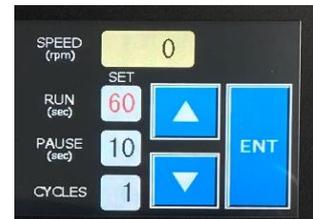
Required settings are only : Grinding speed, Grinding time, Number of cycles, and Pause time. All of these settings can be easily done through the rotary knob and touch panel.



Setting grinding speed



Touch panel operation



Setting grinding parameters

### 2 Fast and efficient grinding

- Grinding up to three samples at a time in the same program

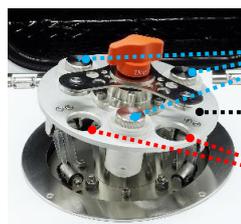
Equipped with a holder that holds up to three sample containers for efficient grinding.

- Powerful impact and shear grinding capabilities bring significant reduction of grinding time

Rapid reciprocating torsional motion enables sample grinding in a short period of time.

- Quiet operation

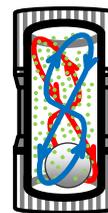
Noise level during grinding is only around 55 dB and will not interfere with conversation.



Sample containers (3 locations)

Holder base

Grip holes (2 locations)



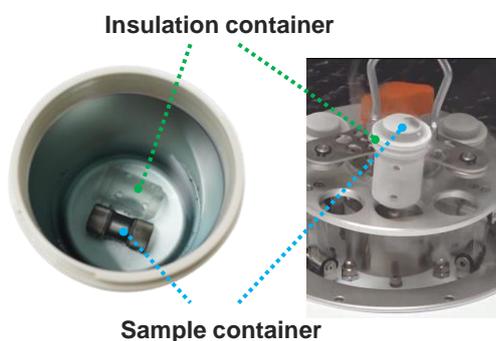
Rapid reciprocating torsional motion of a grinding ball in a sample container

### 3 Energy saving sample cooling kit included

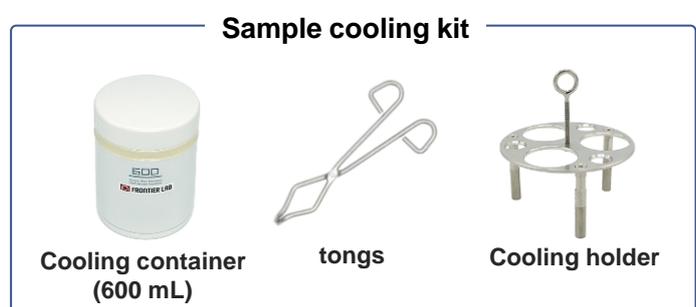
(grindable even at room temperature)

- Low liquid N2 consumption of 300 mL (one sample container with sample and a grinding ball)

The standard sample cooling kit includes cooling container, tongs, and a cooling holder.



Sample container



Cooling container (600 mL)

tongs

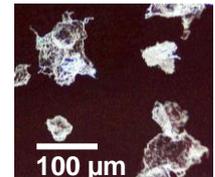
Cooling holder

# Synthetic/ Biopolymer grinding applications

**Low density polyethylene**  
0.48 g  
(Extremely hard to grind)



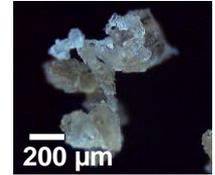
3000 rpm for 30 sec  
**Cryogenic grinding**  
2 cycles, 3 repetitions



**Polyisoprene**  
0.53 g  
(Extremely hard to grind)



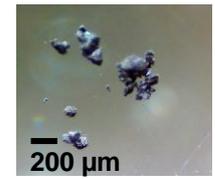
2500 rpm for 10 sec  
**Cryogenic grinding**  
1 cycle, 1 repetition



**O-ring**  
0.35 g  
(Hard to grind)



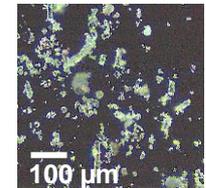
3000 rpm for 10 sec  
**Cryogenic grinding**  
1 cycle, 1 repetition  
(Grinding rod used)



**Electric circuit board**  
2.1 g  
(Grindable at room temperature)



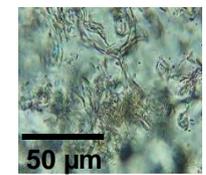
2500 rpm for 30 sec  
**Cryogenic grinding**  
10 cycles, 1 repetition



**Bark of moso bamboo shoot**  
(Hard to grind)



2000 rpm for 10 se  
**Room temp. wet grinding**  
2 cycles, 1 repetition  
\*Buffer solution used



## Further grinding applications

### Synthetic polymers

- |   |                               |
|---|-------------------------------|
| High density polyethylene                 | Nylon 6                       |
| Low density polyethylene                  | Nylon 6,6                     |
| Polypropylene                             | Polyurethane                  |
| Polystyrene                               | Polyetherimide                |
| Polycarbonate                             | Styrene-butadiene rubber      |
| Polyvinyl chloride                        | Low density polyethylene film |
| Polyvinyl chloride                        | Foamed polyethylene           |
| Polyetheretherketone                      | Foamed polystyrene            |
| Acrylonitrile butadiene styrene copolymer | Polyamide fiber               |
| Silicone rubber                           | Copy paper                    |
| Polymethyl methacrylate                   | Electronic circuit boards     |
| Polyisoprene (natural rubber)             | Cardboard                     |
| Ethylene-vinyl acetate copolymer          | Nitril glove                  |
| Polyethylene terephthalate                | Concrete chip                 |
| Polytetrafluoroethylene                   | Others                        |
| Ethylene tetrafluoroethylene copolymer    |                               |

### Biopolymers

- Boar canines (teeth)
- Fox, raccoon, raccoon dog (teeth)
- Shellfish
- Bark of moso bamboo
- Hemp cord
- Wood chip
- Cotton
- Dried squid
- Beef jerky
- Shell string
- Sea squid
- Seaweed stem
- Almond seed (shell)
- Almond seed (edible part)
- Candy
- Leaves of houseplants, and others

Visit our website for further information.

[https://www.frontier-lab.com/assets/file/products/IQMILL\\_Appbook\\_E.pdf](https://www.frontier-lab.com/assets/file/products/IQMILL_Appbook_E.pdf)



# Sample container and Grinding ball

A wide variety of containers and grinding balls are available for your specific needs!

## Sample container

Product	Material	Volume	Sample amt.
Sample container L-SS set (standard)	Carbide stainless steel	7 mL	0.05 g ~ 1 g* <sup>1</sup>
Sample container L-Ti set (option)	Titanium	7 mL	0.05 g ~ 1 g* <sup>1</sup>
Sample container S-SS set (option)	Carbide stainless steel	2 mL	5 mg ~ 50 mg* <sup>2</sup>

Recommended sample amount \*<sup>1</sup> approx. 0.5 g, \*<sup>2</sup> approx. 20 mg



## Sample container related accessories

Product	Material	Function
Insulation container (standard)	Polycarbonate	Keeps sample container cool
Insert tube (standard)	Polycarbonate	Suppresses metal particle generation



## Grinding ball

Product	Material	Dimension
Zr grinding ball (standard)	Zirconia (ZrO <sub>2</sub> )	1*, 2*, 3*, 5, 6, 10, 12 mmΦ
WC grinding ball (standard)	Tungsten carbide(WC)	1*, 2*, 3*, 5, 6, 10, 12 mmΦ

\* Optional



## Specifications

<b>Grinding temperature</b>	Room temperature or below using a refrigerant (liquid nitrogen, etc.)	
<b>Grinding setting</b>	Rotation speed (rpm)	50 to max. 3000 (stepless)
	Rotation time (sec)	10 to 60 (10 sec step)
	Pause time between cycles (sec)	10 to 600 (10 sec step)
	Number of cycles (repetitions)	1 to 10 (1 cycle step)
<b>Safety feature</b>	Malfunction prevention by microswitch and manual locking system	
<b>Dimension, weight</b>	W 270 x D 340 x H 300 (mm), 12 kg	
<b>Power (50/60 Hz)</b>	AC 100 - 120 V or 200 - 240 V (450 VA)	
<b>Standard accessory</b>	Sample container (stainless steel), Insulation container, Insert tube, Cooling container, Tongs, Cooling holder, Sieve set, Grinding balls (tungsten carbide, zirconia)	

Noise level during grinding: 55 dB\* (1 g of PS pellets ground with a 12 mmΦ Zr grinding ball at 3,000 rpm) \*Level comparable to normal conversation.

## Product lineup

Product	Product number	Contents
Cryogenic Mill IQ MILL-2070	IQ-2070-100 or IQ-2070-200	Main unit, sample container L-SS set 1 ea., grinding balls, insulation container 1 ea., sample cooling kit, sieve set, etc.
Cryogenic Mill IQ MILL-2070 With sample container L-SS starter kit	IQ-2070-100SKS or IQ-2070-200SKS	Main unit, sample container L-SS set 3 ea., grinding balls, insulation container 3 ea., sample cooling kit, sieve set, etc.
Sample container L-SS starter kit	IQ1-2062	Sample container L-SS set 2 ea., insulation container 2 ea., etc.

