



# Rare Earth Magnet

Product Catalogue



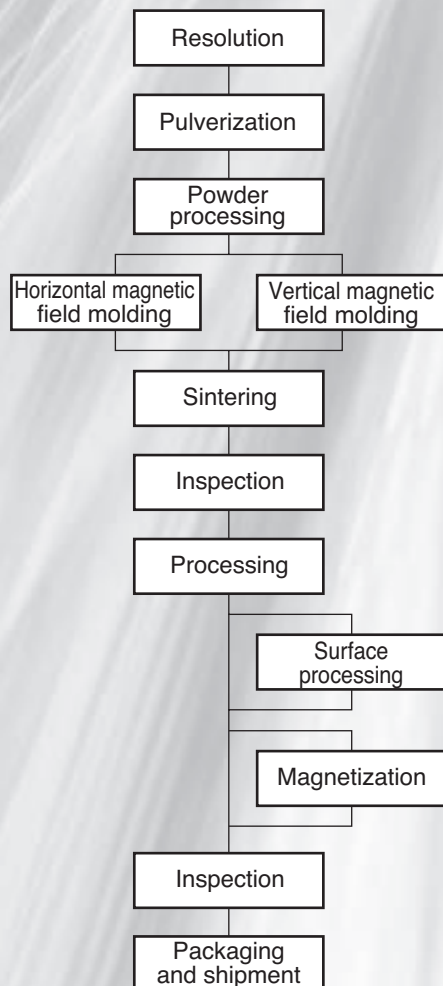


**Manufactured by an integrated process extending from raw materials to finishing, our DIANET is a samarium-cobalt (SmCo) magnet offering high performance, accuracy, and quality. DIANET is used in stepping motors for wristwatches, but it is used in other, ever expanding, applications, including microelectronic parts for audio and telecommunications devices; reflow-mounted thin, compact devices; and microelectromechanical systems (MEMS).**

## Features of DIANET

- Superior heat resistance and reflow mountable
- Superior corrosion resistance, without deterioration of magnetic properties
- No processing-related deterioration of magnetic properties, thus contributing to equipment downsizing and reduced energy consumption
- Useful in applications having a dimensional tolerance on the scale of microns, made possible by our proprietary precision processing technology
- Minimum magnetic characteristic variations, made possible by our proprietary manufacturing technology, thus contributing to device stabilization
- Simple, ultra-precise compact shape, so cost performance is excellent, made possible by our proprietary near net shape processing technology

## Manufacturing process



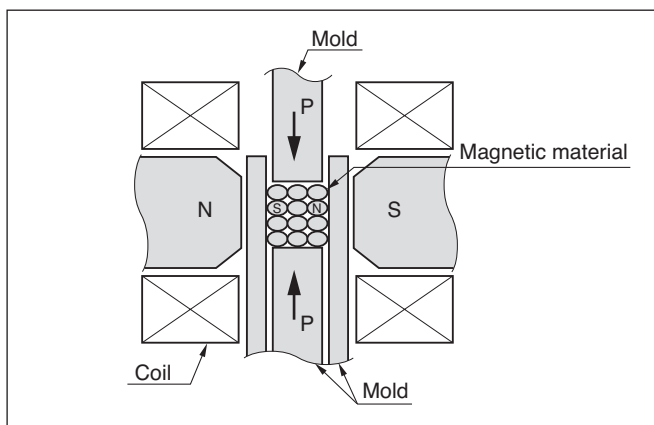
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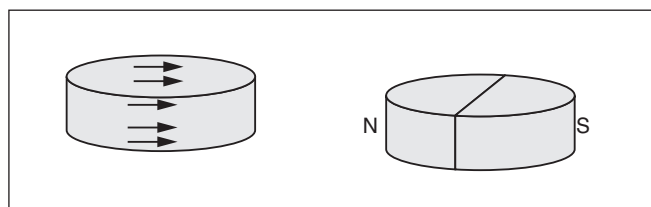
## HORIZONTAL MAGNETIC FIELD MOLDING



### MOLDING MODEL SAMPLE



### DIRECTION OF MAGNETIC FIELD



### APPLICATIONS

- Watch rotor
- Coreless motor
- Motors such as high-performance compact actuators
- Telecommunications devices

### BASIC CHARACTERISTICS

UPPER/LOWER:SI UNIT/CGS UNIT

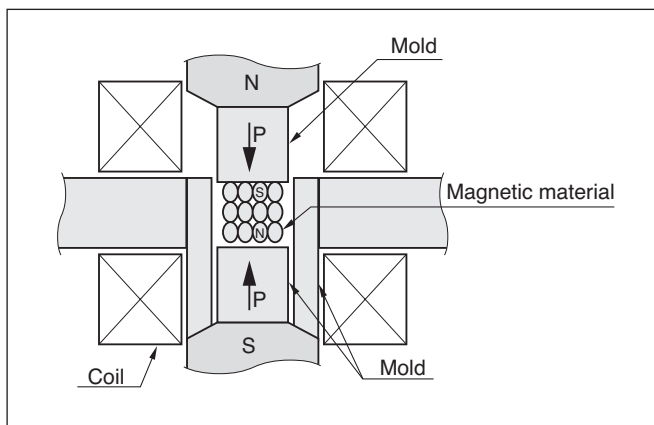
Item	Designation	UPPER/LOWER:SI UNIT/CGS UNIT				
		SmCo5 1-5 based	DM-20	DM-26	DM-30	DM-32
Magnetic Characteristics (Note)	Residual magnet flux density	Br	(T) 0.87-0.92	1.01-1.06	1.06-1.13	1.10-1.16
			(G) 8700-9200	10100-10600	10600-11300	11000-11600
	Coercive force	bHc	(kA/m) 676-732	398-557	477-796	438-756
			(Oe) 8500-9200	5000-7000	6000-10000	5500-9500
		iHc	(kA/m) > 676	> 398	> 557	> 477
		(Oe) >8500	>5000	>7000	>6000	
Mechanical Characteristics	Maximum energy product max	BHmax	(KJ/m <sup>3</sup> ) 151-167	199-215	207-239	223-255
			(MGOe) 19-21	25-27	26-30	28-32
	Reversible permeability	(μr)	1.05			
	Curie temperature	(°C)	700-750	800-850		
	Coefficient of thermal expansion	(×10 <sup>-6</sup> /°C)	8.0	9.8		
	Density	(g/cm <sup>3</sup> )	8.2-8.5	8.3-8.5		
Mechanical Characteristics	Hardness	(HV)	>530	>550		
	Stiffness	(Kg/mm <sup>2</sup> )	19±2	16±2		
	Electric Resistance	(Ω · m)	0.8×10 <sup>-6</sup>			

Note) Magnetic characteristics may be changed depending upon customer's specified dimensions and shape.  
For details, please contact us.

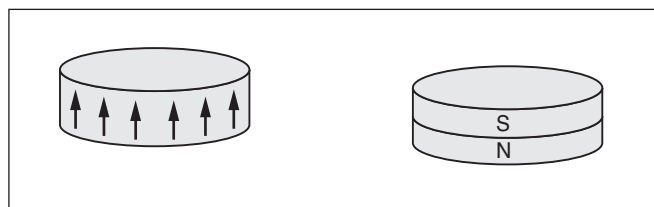
# VERTICAL MAGNETIC FIELD MOLDING



## MOLDING MODEL SAMPLE



## DIRECTION OF MAGNETIC FIELD



## APPLICATIONS

- Buzzer (ex: cellular phone)
- Optical isolator
- Inner phone
- Receiver (ex: cellular phone)
- Various sensors

## BASIC CHARACTERISTICS

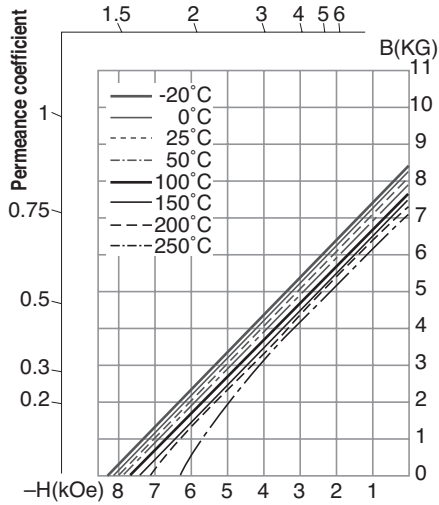
				UPPER/LOWER:SI UNIT/CGS UNIT				
				SmCo5 1-5based				Sm2Co17 2-17based
Designation				DM-16	DM-18	DM-20	DM-22	DM-30
Magnetic Characteristics (Note)	Residual magnet flux density	Br	(T)	0.77-0.82	0.81-0.87	0.84-0.90	0.87-0.94	1.06-1.13
			(G)	7700-8200	8100-8700	8400-9000	8700-9400	10600-11300
	Coercive force	bHc	(kA/m)	597-653	621-684	629-708	637-732	477-796
			(Oe)	7500-8200	7800-8600	7900-8900	8000-9200	6000-10000
	Maximum energy product max	BHmax	(KJ/m <sup>3</sup> )	111-135	119-143	135-159	143-175	207-239
(MGOe)			14-17	15-18	17-20	18-22	26-30	
Reversible permeability			(μr)	1.05				
Mechanical Characteristics	Curie temperature		(°C)	700-750				800-850
	Coefficient of thermal expansion		(×10 <sup>-6</sup> /°C)	8.0				9.8
	Density		(g/cm <sup>3</sup> )	8.2-8.5				8.3-8.5
	Hardness		(HV)	>530				>550
	Stiffness		(Kg/mm <sup>2</sup> )	19±2				16±2
	Electric Resistance		(Ω · m)	0.8×10 <sup>-6</sup>				

Note) Magnetic characteristics may be changed depending upon customer's specified dimensions and shape.  
For details, please contact us.

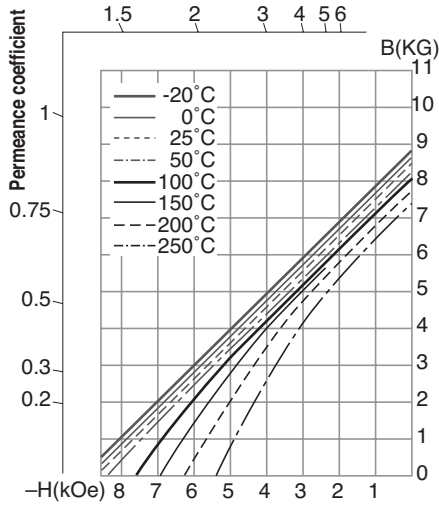
### RELIABILITY DATA

#### TEMPERATURE CHARACTERISTIC

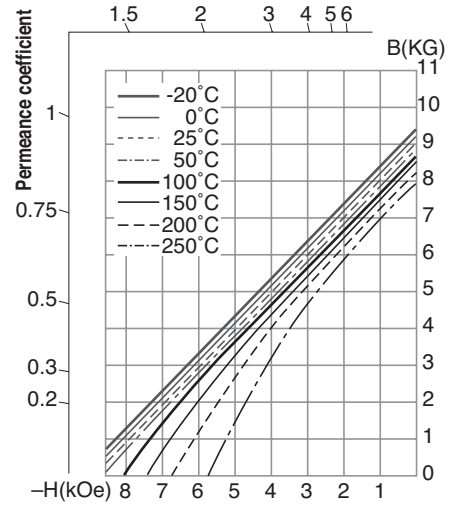
DM16 B-H



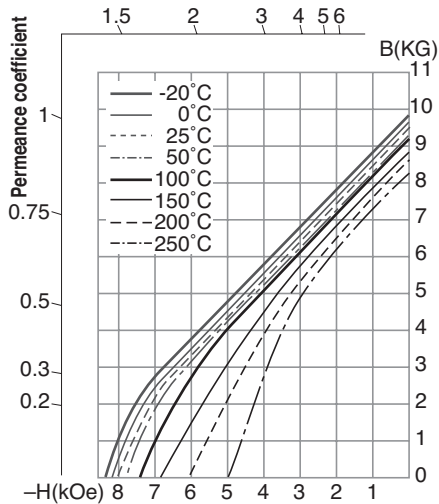
DM18 B-H



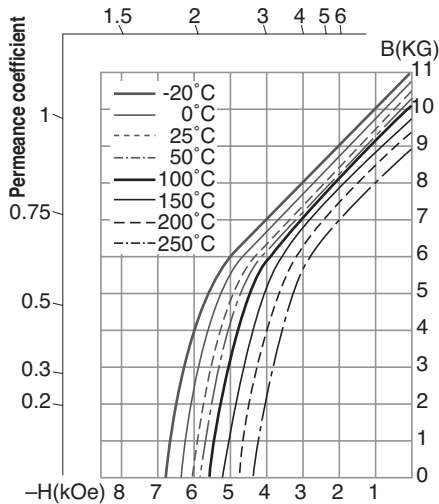
DM20 B-H



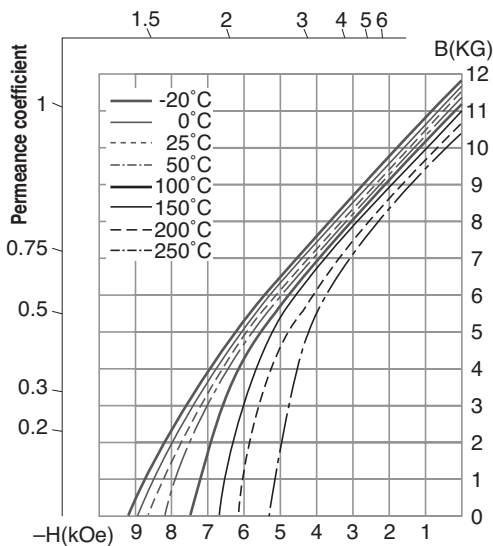
DM22 B-H



DM26 B-H



DM30/32 B-H

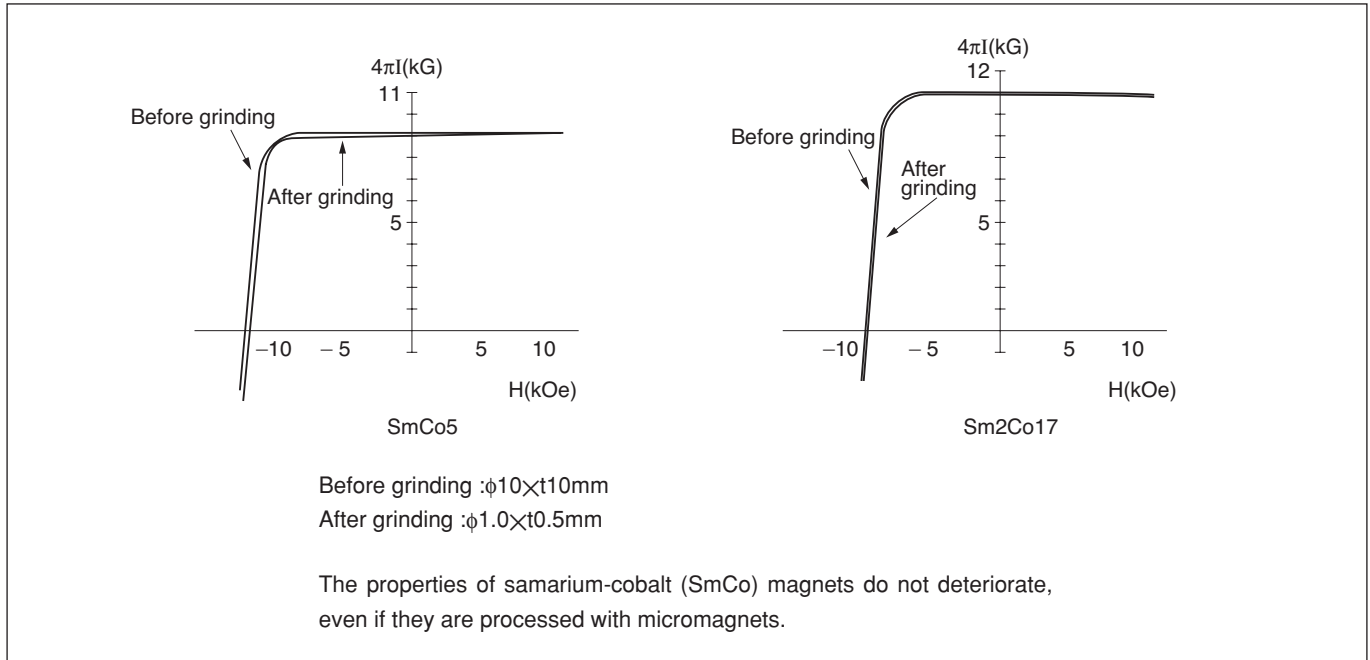


**SURFACE PROCESSING**

Depending on usage, we recommend Ni plating to be conducted.

- Guards against magnetic powder from being generated by breaking or chipping
- Improves magnetic strength

**THE EFFECT OF GRINDING TO MAGNETIC PROPERTIES**



**ENVIRONMENTAL TEST**

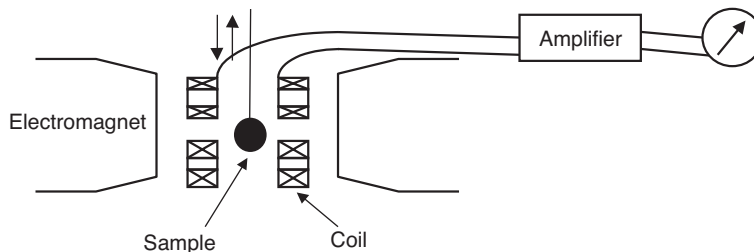
For guaranteed reliability of contents, please arrange a separate meeting.

## MEASURING METHOD OF DIANET

### MEASUREMENT OF DEMAGNETIZATION CURVES

#### Vibrating sample magnetometer

Vibrating sample magnetometers measure residual flux density, coercive force, and maximum energy product.



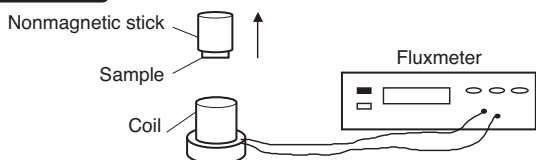
### SIMPLE MEASUREMENT

#### Measurement of finished products (magnets as actually used)

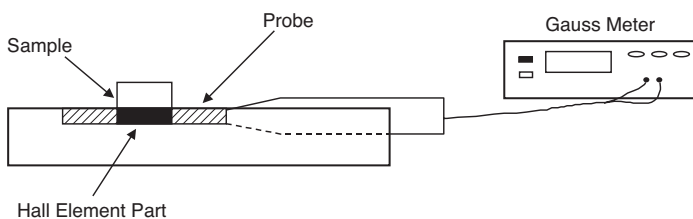
Flux meters are often used for measuring total flux and gauss meters are often used for measuring surface flux density. Calibration of search coils and hole probes is essential for these measurements. The following two methods are generally used for calibration.

- 1) Measure and select the best calibration.
- 2) Calibrate, using a high-accuracy standard sample. We recommend using a standard sample when setting magnetic characteristics.

#### Total Magnetic Flux (FLUX)



#### Surface Magnetic Flux Density (Bd)





## CAUTIONS WHEN USING MAGNETS

### WARNING

- It is extremely dangerous to place magnets near persons who have electronic medical devices such as pacemakers installed. There is a risk of damage to normal operation status of the medical device. Please use with highest caution.

### CAUTION

- Depending on the size and shape used, a magnet may not achieve the magnetic characteristics values noted in the catalogue. Confirm in advance by using a sample, etc.
- When magnetization is performed by the customer, allocate sufficient magnetic field for the material and coercive force. When the strength of the magnetic field is insufficient, magnetic characteristics of the original design specifications may not be obtained. Consult with the manufacture for the size of the magnetic field needed for magnetization.
- Avoid using and storing magnets in the following environments. Weather resistance differs according to the material of each magnet, so consult in advance about corrosion prevention, etc.
  1. Corrosive gas atmosphere (Cl, NH<sub>3</sub>, SO<sub>x</sub>, NO<sub>x</sub>)
  2. Highly conductive environment (in water containing electrolytes, etc.)
  3. Hydrogen atmosphere
  4. Acidic, alkaline, or organic solvents, etc.
  5. In water or oil
- When using an adhesive to bond the yoke and hole piece, etc., of two magnets, confirm reliability by inspecting the type, volume, conditions, and strength, etc., of the adhesive.
- When performing processes such as press fitting or shrink fitting, there is a risk of degradation of the magnetic characteristics or cracking of the magnet or its counterpart materials. Be sure to confirm in advance by using a sample.
- A magnetized magnet absorbs debris such as iron powder, so remove it from its packing case in a dust free environment.
- Magnets are susceptible to shock, and cracking and chipping occur easily, so handle with care. When cracking or chipping occur during handling, there is a risk of degradation of characteristics or strength.
- Magnets are generally made from materials that chip easily, so handle with care. Store in a place where shock will not occur. In addition, be sure to store in a location where the magnet will not come into contact with rain-water, etc.
- Be careful not to swallow magnets. If a magnet has been swallowed, consult a physician immediately. Keep magnets out of the reach of children.
- Magnetized magnets should be covered with a non-magnetic material such as a wooden box after clearly marking the fact that the magnet is magnetized.
- When a magnet is placed close to a magnetic tape, floppy disk, prepaid card, ticket, or electronic watch, there is a risk that the magnetic recording will be damaged and that the item will become magnetized and no longer be usable. There is also a risk of cards and tickets becoming unusable due to the effect of an electronic key, so do not place electronic keys in your pocket together with cards, tickets, etc.
- Persons who are sensitive to or have allergic reactions to metal may develop rashes or redness of the skin if they come into contact with a magnet. If such reactions are known to occur, do not touch magnets.
- Typically, components of a magnet may begin to dissolve in water, so do not drink water that has been in contact with a magnet.
- Magnets typically crack easily. A magnet fragment may enter the eye or cause injury, so use caution in handling.
- The absorption force of magnets is strong, so be careful not to let your hand get pinched.
- The alloy powder of rare earth magnets is specified by fire safety law as class II (flammable solid) and class I hazardous materials. There is a danger of ignition or inflammation of fine powder generated due to friction during use of a magnet, so do not use in such a way that risks generating magnetic powder.
- There is a danger of auto-ignition with fine particles of rare earth magnets, so when processed by the customer, do not leave chips or filings in the atmosphere, and be sure to store these in a container filled with water. As a preparation in case a fire starts, have sand available for use. If a fire begins, cover the fire with the sand, and remove flammable objects.
- Avoid storing in locations with high temperature and high humidity.

All data, dimensions, characteristics and values shown in this catalogue are for reference only. Please contact your local Seiko Instruments Representative for current detailed specifications.

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## Environmental Activities at Micro-Energy Division

### Environment & Quality Policy

Seiko Instruments Inc., Micro-Energy Division is located in Ayashi, a city with beautiful nature, in Miyagi Prefecture. Our aim is to provide customer satisfaction and harmony with the environment through all our products, from Micro battery to other electronic products, and sales activities.

1. We adhere firmly to laws, regulations and customers' specified requirements.
2. We aim to prevent pollution, to reduce CO<sub>2</sub>, and to conserve biodiversity.
3. We set goals, take actions, conduct regular reviews, and improve the system and performance continuously.
4. We contribute to the society by supporting green procurement, developing green products, and promoting green life activity.
5. We adhere to regulations and recommendations regarding Chemical substance content in our products and will promote reduction and replacement.
6. We vigorously educate ourselves and try to engage voluntarily in green life activity.

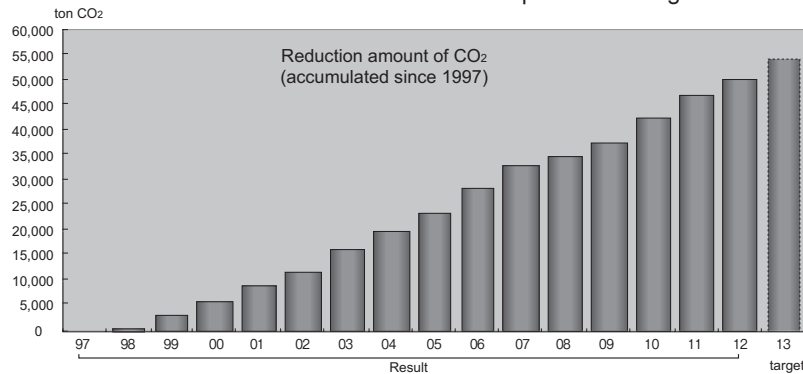
Based on the above policy, the following six environmental approaches are now being implemented throughout Micro-Energy Division.

#### 1. Enrich the line up of Eco-Products

- We introduced the SII Green Product Label System which is equivalent to the ISO 14021 Type II environmental label. At the end of FY2006, 100% of our products are certified as SII Green Products. In addition, 36 products are certified as SII "High Grade" Green Products.

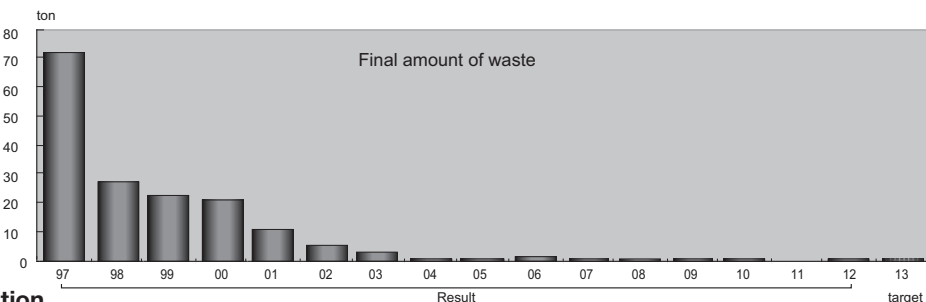
#### 2. Reduction of Greenhouse Gas

- We practice various CO<sub>2</sub> reduction measures like using Eco-machinery. Since 1997, we have successfully reduced a total of 50,300 tons of CO<sub>2</sub>. We believe our efforts contribute to the prevention of global warming.



#### 3. 3R Promotion Activity

- We have promoted the "reduce and reuse" activities and also promoted recycling at the end of the production process. With these activities, we achieved "Zero-emission" in 2004. We have reduced the non-recyclable wastes to less than 1 ton - less than 1% of our 1997 results.



#### 4. Biodiversity Conservation

- We endeavor to deepen our understanding on the relevancy between biodiversity and our business activities, and to contribute to the conservation of biodiversity by participating local community activities.

#### 5. Green Purchasing

- We adhere to a green purchasing campaign through the purchase of ingredients, manufacturing materials, and other necessary products, whenever appropriate.

#### 6. Green Life

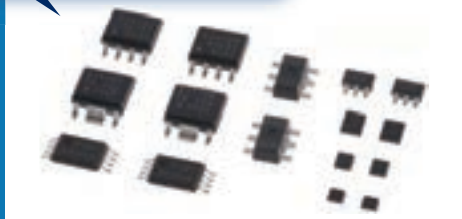
- With the participation of all of Micro-Energy Division members, we deploy a clean-up and beautification campaign in all areas surrounding our factory twice a year. In addition, we participate in the clean up activity at Hirose River once a year.

#### 7. Conflict Minerals

- Recognizing the international importance of conflict minerals issue, we prohibit the use of such minerals.

# SII Electronic Components for Any Requirement !

Super-small,  
low current consumption



## CMOS IC

ICs for various power supplies  
Memory ICs (E<sup>2</sup>PROMs)  
Sensors (temperature, magnetism, etc.)  
Mini-analog  
Real-time clocks

Best suited for  
microprocessors



## Quartz Crystal

Compact SMD tuning-fork quartz crystal unit  
Quartz crystal unit for clocks  
Quartz crystal unit for radio-controlled clocks

Compact

Energy saving

High accuracy

Low-voltage operation

High reliability

Maximum power  
in a small body!



## Micro Battery

Coin-type lithium rechargeable batteries  
Capacitors(Coin-type, Chip-type)  
Mercury-free silver oxide batteries

Small, precision  
machining and  
reflowable



## DIANET Rare Earth Magnet

Samarium-cobalt (SmCo) magnets  
Miniature precision springs  
Metal diaphragms  
etc.

Made by SII's unique  
precision machining technology



## SPRON Superior performance Co-Ni Alloy Product

**Ideal for various applications !**

Cellular phone



Game



Notebook PC



Car electronics



Digital still camera



TV





Micro-Energy Division who manufactures the products described in this catalog holds the ISO 9001 quality management system certificate, and the ISO 14001 environmental management systems certificate.



www.sii-me.com

## Seiko Instruments Inc.

Micro-Energy Division

1-8, Nakase, Mihamaku, Chiba-shi, Chiba 261-8507, Japan  
Telephone:+81-43-211-1735 Facsimile:+81-43-211-8034

### Asia

#### Seiko Instruments (H.K.) Ltd.

4-5/F, Wyler Centre 2, 200 Tai Lin Pai Rd.,  
Kwai Chung, N.T., Kowloon, Hong Kong  
Telephone: +852-2494-5111  
Facsimile: +852-2480-5479  
Email:sales@sih.com.hk  
<http://www.sih.com.hk>

#### Seiko Instruments Taiwan Inc.

12F, No.101, Sec.2, Nanking E. Rd.,  
Taipei 104, Taiwan, R.O.C.  
Telephone: +886-2-2563-5001  
Facsimile: +886-2-2563-5580  
Email:public@sii.co.jp  
<http://www.sii.com.tw>

#### Seiko Instruments (Shanghai) Inc.

Room 2701-2703, 27th Floor,  
Shanghai Plaza,  
138 Mid Huaihai Rd.,  
Shanghai 200021, China  
Telephone: +86-21-6375-6611  
Facsimile: +86-21-6375-6727

#### Seiko Instruments Korea Inc.

#507, 508, Korea City Air Terminal Bldg.,  
159-6, Samsung-dong, Gangnam-gu,  
Seoul, 135-728 Korea  
Telephone: +82-2-565-8006  
Facsimile: +82-2-565-8306  
<http://www.sii.co.kr>

### Europe

#### Seiko Instruments GmbH

Siemensstrasse 9  
D-63263 Neu Isenburg, Germany  
Telephone: +49-6102-297-0  
Facsimile: +49-6102-297-50100  
Email:info@seiko-instruments.de  
<http://www.seiko-instruments.de>

### North/Central/South America

#### Seiko Instruments U.S.A., Inc.

21221 S. Western Ave., Suite 250,  
Torrance, CA 90501, U.S.A.  
Telephone: +1-310-517-7802  
Facsimile: +1-310-517-7792  
Email:info@seikoinstruments.com  
<http://www.sii-me.com>

Contact us

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