

Hight Performance Paints

“THERMOSIN”®



高機能塗料

サーモジン

High Performance paints THERMOSIN

Tokyo Thermochemical IND.CO.,LTD

Kawagoe City : The Festival here is a World Heritage

A city with a population of about 350K located in the southwestern part of Saitama Prefecture. It is the third largest city in Saitama after Saitama and Kawaguchi city.

In the Edo period, the city flourished as a castle town of the Kawagoe clan, and also known as “Koedo” as a small historic Tokyo.

There are many castle ruins, shrines, temples, historic sites and buildings, and the number of cultural properties is second only to Kamakura, Kanagawa, and Nikko, Tochigi in the Tokyo area.

The city is a tourist city that attracts about 7.3 million tourists in 2018.



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1. About us

▪ NITCHITSU Group Overview :

Trade name: NITCHITSU CO., LTD

Established: August 1, 1950

Capital: 1.1 billion yen

Headquarter: 1-11-30 Akasaka, Minato-ku, Tokyo

Number of employees: 366

Sales: 8,750 million yen (fiscal year 2018)

Business overview: Machinery business; Mining resource development business;
Material business (Including High performance paint)

History :

▪ Founder : Mr. Noguchi Shitagau (1873-1944 Father of Electrochemistry)

Y 1903 Produced Japan's first carbide products

Y 1908 Japan Nitrogen Fertilizer (now Chisso) established

Y 1929 Nippon Bemberg Silk (Asahi KASEI) established

*Substantial founders of (Shin-Etsu Chemical and Sekisui Chemical)

Y 1946 Nitchitsu Group was dismantled by GHQ

Y 1950 Established Nitchitu Kogyo(now NITCHITSU CO.,)

Y 1951 Listed on the Tokyo Stock Exchange



N1-(2) NITCHITSU Group

NITCHITSU CO.,LTD.

Administrative Division	Equipment-related business	Resource-related business	Real estate related business	Material-related business
	<p>Machine Division Chichibu Works Chichibu Office</p> <p>Minks Co. Ltd</p> <p>江蘇金羊能源環境工程有限公司 in China</p>	<p>Resource Development Division</p> <p>High Silica Business Division KATORI site KOUGEI site</p> <p>Building Materials Division</p>		<p>Tokyo Thermochemical IND.CO.,LTD</p> <p>Sansen Machine CO.,LTD</p>

1-(3) Tokyo Thermochemical IND.CO.,LTD

Tokyo Thermal Chemical Co., Ltd., is a manufacturer in the niche high performance coating market under reliable brand name of “**Thermosin®**” as a consolidated member of NICHITU GROUP.

For sustainable future, we propose **water-based** heat-resistant paints for VOC reduction to improve the painting work environment and air quality.

Our Business

- 1) Designing, Innovating , Manufacturing and Sales of high-performance paints and inks
- 2) Painting and Heat treatment for coating products



1-(4) History

October 1965: Nitchitsu Research Institute, Inc. in Noguchi Research Laboratory started research and development of heat-resistant and fire-resistant paint

Y1966 Established Tokyo Thermo Chemical Industry Co., Ltd.

Y1966 General heat-resistant paint released

Y1973 Kawagoe Factory completed

Y1976 Launch of long-term exposure paint

Y1988 Paint for cooking ware released

Y1989 Paint for exhaust parts released

Y1992 Launched far-infrared paint for home appliances

Y1996 Launched heat-resistant insulation paint

Y2004 Head office relocated from Tokyo to Kawagoe Factory

Y2018 Launch of environmentally friendly water-based paint

1-(5) Production Facilities and Equipment

Production capacity: 1,000 tons / year

Main manufacturing equipment:

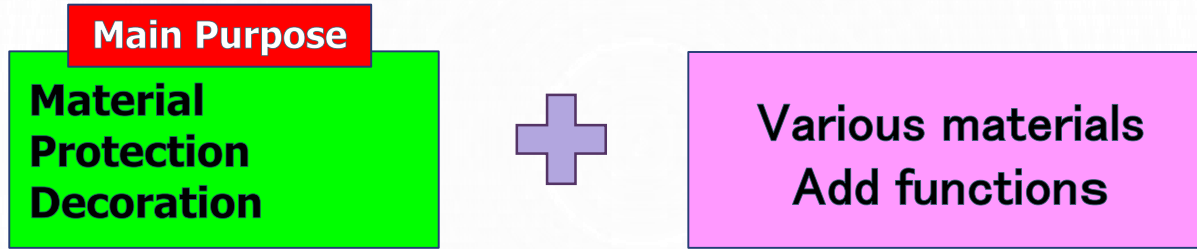
**Ball mill , Glen mill ,Spike mill , Disperse, Tanks ,
Solvent tank for xylene storage, solvent recovery device**

Main test equipment and measuring instruments :

**Hot air circulation dryer, electric furnace, color difference , paint
thickness , gloss meter, surface roughness , surface resistivity.**

**Dupont impact tester, wear tester, salty steam spray tester,
Viscometer etc.**

2. What is Our High-Performance Paints

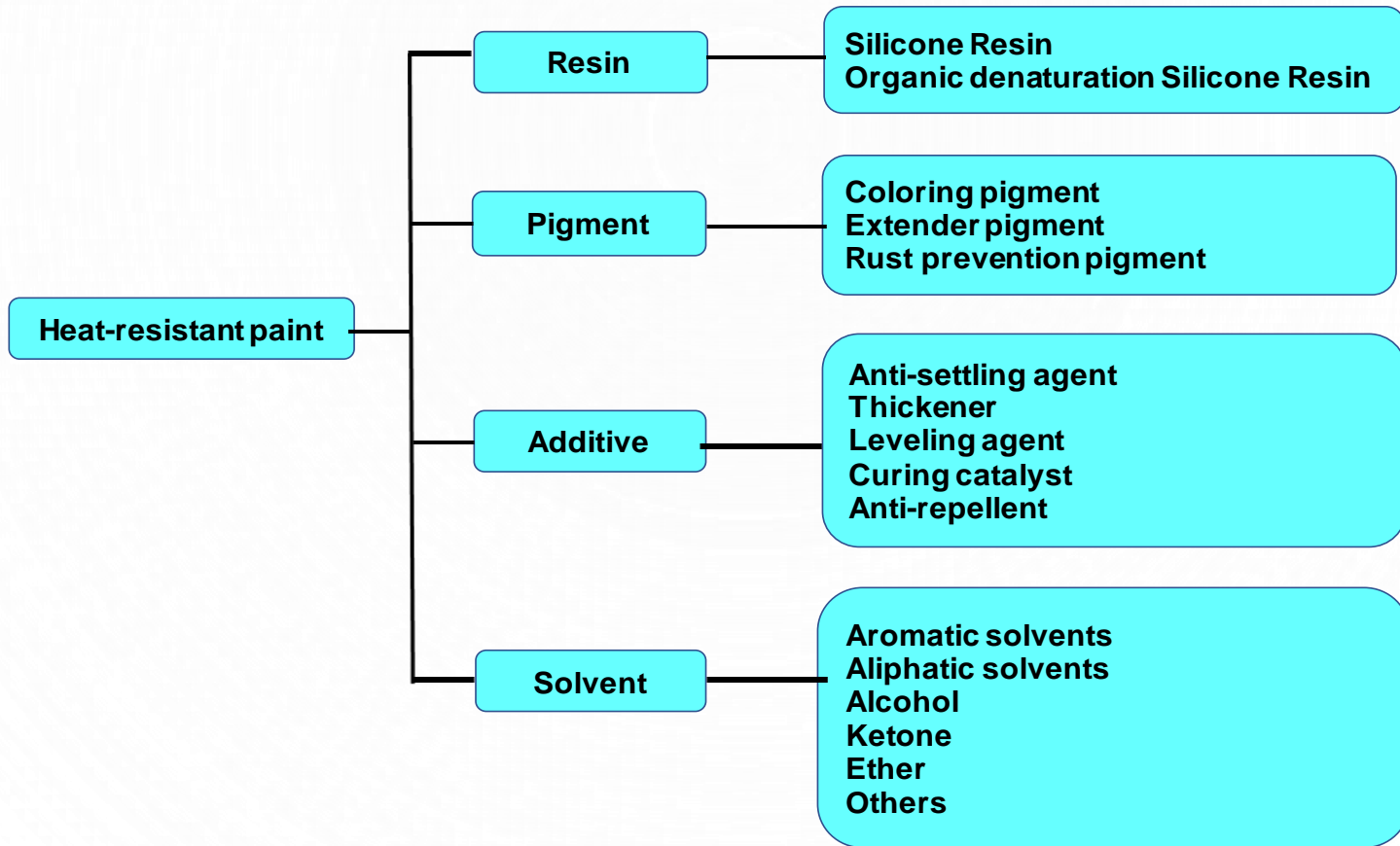


Main additional functions

- (1) Optical functions (fluorescence, phosphorescence, heat ray absorption, UV absorption etc.)
- (2) Electric and electronic functions (insulation, antistatic, radio wave absorption / shielding, etc.)
- (3) Thermal function (heat resistance, heat insulation, heat absorption, heat insulation)
- (4) Physical and chemical functions (heavy corrosion protection, antifouling, weather resistance, water repellency, hydrophilicity, sliding, etc.)
- (5) Environmentally friendly functions (water, powder, photocatalyst, natural materials, etc.)

Heat resistance is a basic function, and other functions can be selected.

2-(2) Composition of heat-resistant paint



2-(3) Resin used for heat-resistant paint

Type of Paint	Softening Temperature (°C)	Discoloration Temperature (°C)	Deterioration temperature (°C)	Color
Straight Silicone Resin		300~400	<500	Colorless and Transparent
Polyester modified Silicone Resin		<250	<300	Colorless to Pale Yellow
Acrylic Resin	80	<200	<200	Colorless and Transparent
Epoxy Resin		<180	<250	Pale yellow Transparent
Polyurethane Resin		<150	<180	Colorless to pale yellow
Polyamide-Imide Resin			<300	Brownish transparent
Polyether Sulfone Resin			<300	Colorless and transparent

Silicone resin features both transparency and heat resistance

3. High performance paint “THERMOSIN”[®]



3.1. THERMOSIN Lineup

- Heat resistant temperature 200 °C ~ 800 °C
- Compliant with the Food and Beverage Law No. 20 (CT, TI type)

ITEM	Type B	Type CT	Type TI	Type MF
Heatproof temperature (°C)	~600 (Silver only ~800)	~300	~280	~650
Color	Color tuning applicable			Black, Silver, Gray
Applications and Features	General heat resistance for plants	Cookware outer surface Compliant with the Food Safety Law No. 20 Abrasion, contamination	Factory piping line Compliant with the Food Safety Law No. 20 Corrosion resistance, mold release	For transport (automobiles, motorcycles, etc.) Cycle heat-resistant , Pinging resistance

3.2. "THERMOSIN" Type CT

Features: Excellent properties such as abrasion resistance, stain resistance, mold release, oil resistance, etc. under color variation requests.

Example : Electric and gas heat cookers such as a steak plate, wok, frying pan, hotpot in rice cooker , toaster, cooking oven etc. under compliant with Japan Food Sanitation Act.



ITEM	CT30 BK01S
Heatproof temperature (°C)	300
Baking conditions (°C)	250~



3.3. "THERMOSIN" Type TI

Features: Fluorine resin-based coating.

Excellent release properties, corrosion resistance, heat resistance, and wear resistance.

Applications: Pots, pots, pans, and other objects and equipment that require peelability.



ITEM	TI30 BK77
Heatproof temperature (°C)	280
Baking conditions (°C)	380~

3.4. "THERMOSIN" Type MF

Features: Excellent resistance to rapid heating / cooling (heat cycle), gasoline, salt water, chipping, etc.

Applications: For mufflers for Auto`s and head lump unit for automobiles, motorcycles and construction machines, power generator, camping outfit etc.

ITEM	MF600 BRACK
Heatproof temperature (°C)	650
Baking conditions (°C)	180~(300)



3.5. "THERMOSIN"® A best seller CHIMNEY Series

- Twin-pack type special silicone resin paint
- Two grades **of up to 250 °C and 300 °C**
- Protects materials from acidic corrosive agent
- Room Temp dry without baking or dryer

User	Where applicable
Electric power company (Power Station)	Flue, Heat Exchanger, Air Heater, Chimney etc.
Waste incineration site, Boiler manufacturer, Chemical plant	Chimney of plant, big ship ,Out gas pipe or flue De-sulfurization Equipment
Steelmaking companies, environmental equipment, manufacturing companies, etc.	Sintered flue, electric dust collector , thermal storage deodorizer, hot stove in, electric furnace dust tower, electric dust collector, wet desulfurizer, damper, etc.

CHIMNEY
250



Competitor



**15% H_2SO_4 aq 5000h Dip
(Sulfuric acid resistant steel)**



3.6. “THERMOSIN AQUA” water-based heat-resistant paint

- Aqueous one liquid type by twice overcoating
- No primer paint
- Two grades with heat resistance of 200 °C and 300 °C
- Not applicable to Hazardous chemicals regulations
- Can be diluted with tap water

ITEM	A2101 SL01M	A3301 SL01M
Heatproof temperature (°C)	~200	~300
Appearance	Silver Liquid	Silver Liquid
Drying at the room temperature	◎	◎



A2101 SL01M

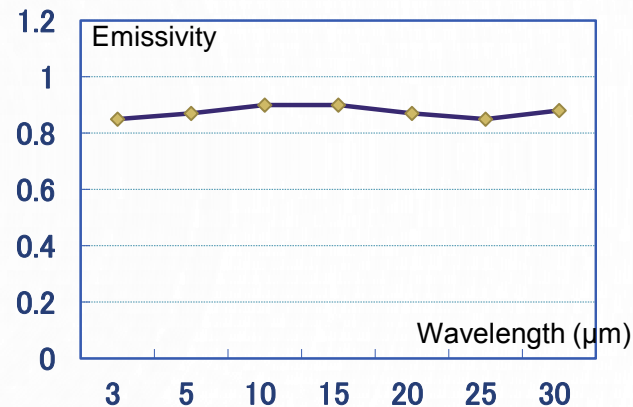
240h continuous
Salt Spray test
(SPCC-SD 1 class)

3.7. “THERMOSIN” Type FIR-H Far-infrared radiation paint

- High far-infrared emissivity in the range of 3 to 30 μm is stable and effective for heat transfer.

Use: Room heater, hair dryer, cooking equipment and kitchen utensils etc.

ITEM	FIR-H
Heatproof temperature (°C)	~500
Appearance	Black Liquid

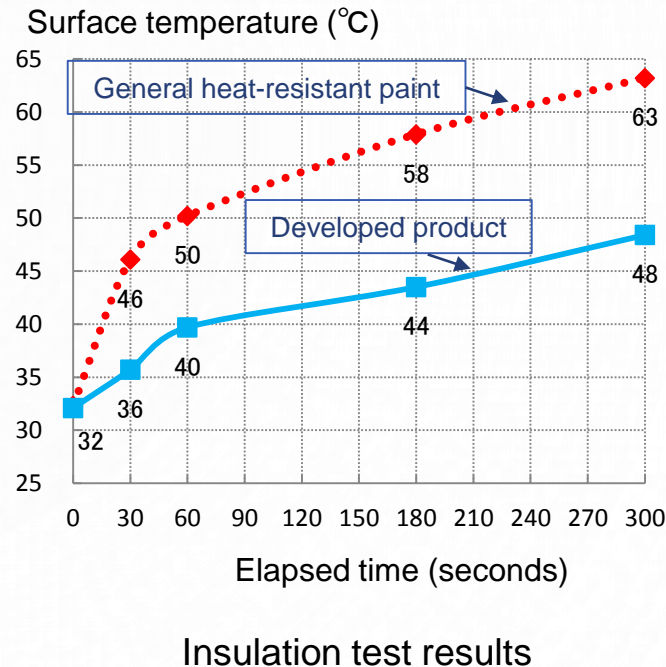


4. Introduction of Product Innovation

Thermal insulation paint

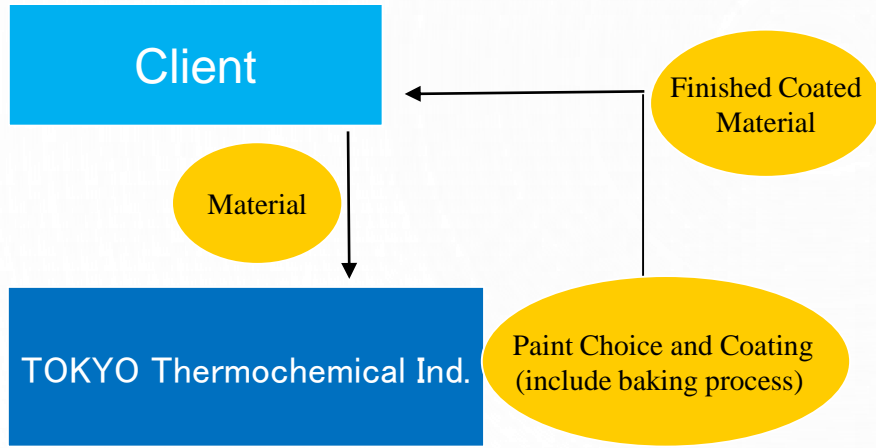
- Aqueous one-pack type heat-resistant resin paint
- Heat-resistant temperature-100°C (always used)
- Not applicable to organic regulations

ITEM	A2101 BK02S (primer paint)	A1601 GR01S (primer paint)
Appearance	Black Liquid	Gray mousse
Viscosity (KU/25°C)	> 65	—
Heating residue (%)	40±5	62±5



5. Introduction of painting test

5. Painting and baking work shop



- Optical parts painting
- Cooking ware painting
- Tube coating
- Blast processing advice
- Trial coating
- Others

Chose your necessary function and color first.

Ask us your wants and hope and dream.

You could be realized it is possible to change the value of your material such as metal non-metal ,glass or carbon by applying special coating in additional micron thickness to the material.

Thank you for your attention

Appendix

- ① **Basic properties of Silicone Resin**
- ② **Manufacturing method**
- ③ **Evaluation of coating**
- ④ **Inspection of paint**
- ⑤ **Painting method**

① Basic properties of Silicone Resin

Main chain that serves as the skeleton

-(Si-O-Si)_n- Siloxane bond (inorganic)

① Si-O Binding energy 444kj/mol

C-O Binding energy 356kj/mol

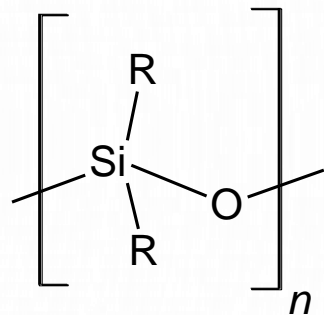
C-O Binding energy 399kj/mol

* Approximately 1.25 times higher binding force than main chain of organic polymer

➡ Large differences in absolute temperature

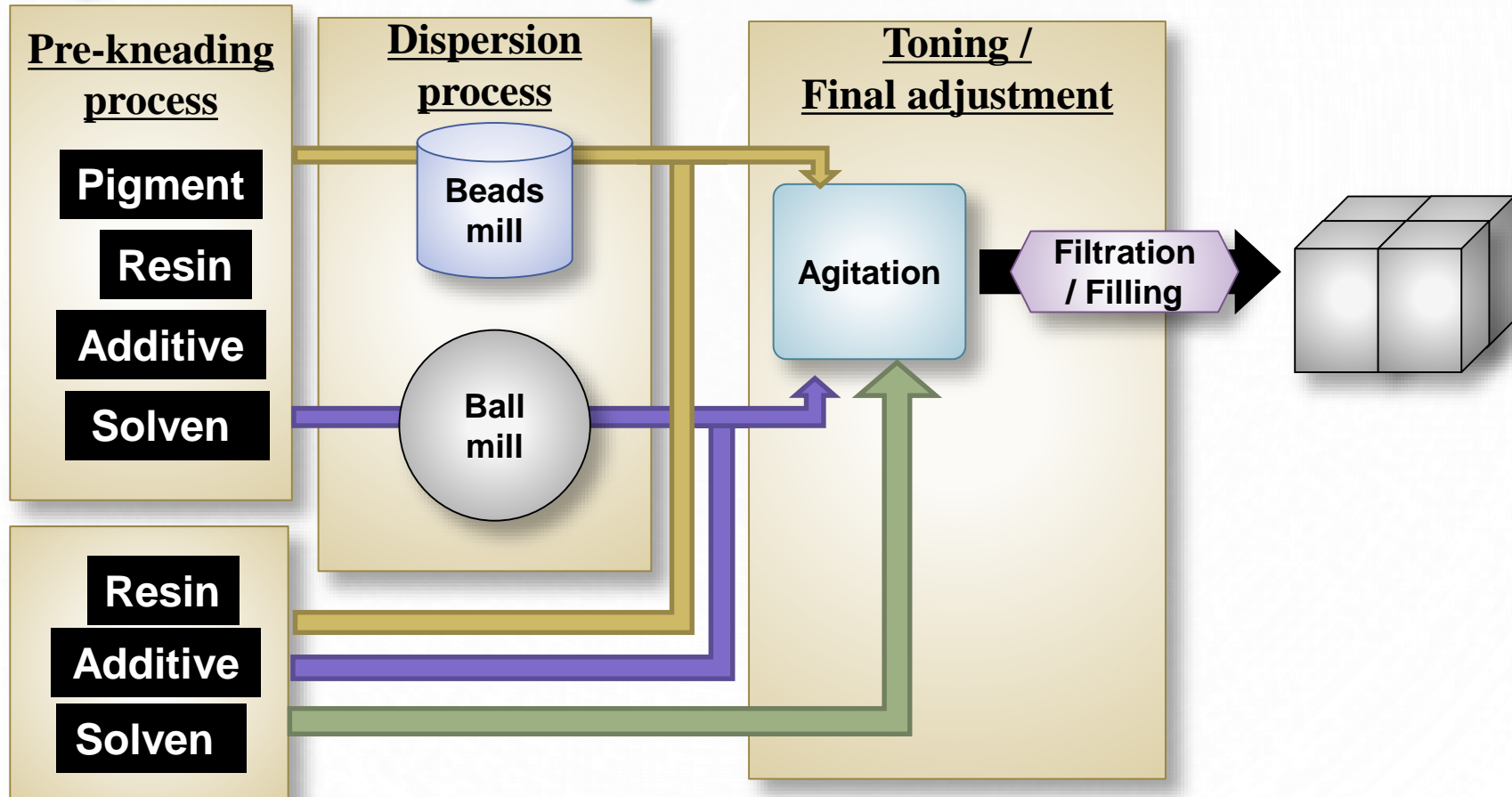
② Si-O coupling does not absorb wavelengths in the ultraviolet region below 400 nm

➡ Very little deterioration due to light



Excellent heat-resistant and weather resistance

② Paint manufacturing method



③ Evaluation of coating and Inspection of Paints

Inspection of Paints

- Viscosity
- Density
- Heating residue
- Granularity

Evaluation of coating

- Hardness
- Adhesion
- Corrosion Resistance
- Impact Resistance
- Heat Resistant

Other required Coating Performance

④ Inspection and evaluation

- (1) Viscosity measurement

Test Equipment	Principle
Ford Cup Reference standards : JIS K 5400	Measure the outflow time of the sample (solution) flowing out of the cup. Viscosity can be measured accurately, easily and quickly. No.4 type is the most widely used viscometer.
Iwata Cup	Measure the outflow time of the sample flowing out of the cup. Since it is a simple test method, it has not been standardized. Measure the outflow time of the sample (solution) flowing out of the cup.
Stormer Viscometer * Reference standards : JIS K 5400	The speed of 100 revolutions per second was measured based on the resistance value of the rotor. A testing machine that determines the weight so that the rotor blades rotate 100 times in about 30 seconds, measures the time, and calculates the KU value.
B type Viscometer *Reference standards : JIS K 5400	A type of rotational viscometer. By changing the angular speed (rotational speed), the viscous behavior can be measured.



④-(2) Density Measurement (JIS K-5400-2-4)

Fill a glass specific gravity bottle or metal specific gravity cup of 20 to 100 cm³ with paint and measure the weight.

Divide the measured weight by the volume of the bottle (cup) to obtain the density.

$$\text{Density (g / cm}^3\text{)} = \text{weight (g)} / \text{volume (cm}^3\text{)}$$



④-(3) Granularity Measurement

The degree of crushing of the pigment in the paint is measured.

The grind gauge is famous as a simple measuring method.

The measurable range is generally from 10 to 200 μ m.



④-(4) Grind Gauge

The evaluation method is specified by JIS (ISO), and a gauge and a scraper are used. Apply a sample to the top surface of the gauge, and sweep the sample with a scraper (with a cutting edge on both sides). The sample film is stretched in the groove on the top surface of the gauge, and the position where the granular or linear pattern appears is read from the scale in parallel with the groove.

④-(5) Coating Membrane Evaluation (primary physical properties) 1

Hardness

The pencil core is pressed against the surface of the sample and moved, and the scratch hardness of the sample is expressed as the hardness of the pencil core according to the presence or absence of damage



Adhesiveness

Confirmation by the cross cut method is common.

Using a special cross-cut guide, make cuts in the coating like a grid.

Then, adhere the adhesive tape to the paint film and peel it off, and check the appearance.



④-(6) Evaluation (primary physical properties) 2

Impact resistance

DuPont Method

A painted plate is sandwiched between the prescribed shooting mold and the corresponding cradle, and a weight is dropped from above to give an impact to the coating film. Since there is no gap between the shooting type and the cradle, the resistance to simultaneous impact and deformation of the edge is evaluated.

Falling Weight Method

A cylindrical weight with a rounded tip was dropped along the outer cylinder to evaluate the bending and elongation resistance to the coating. The difference from the Dupont type is that there is a 3.5mm gap between the shooting type and the cradle

Falling Ball Method

A sphere is made to collide with the surface of the coating film, and the impact resistance of the coating film at that time is used to evaluate the presence or absence of cracks and peeling. Used when the deformation of the substrate is extremely small.



④-(7) Coating Membrane (secondary physical properties)

※Secondary physical property evaluation

In addition to confirming the appearance and adhesion, a user-specific standard test is performed.

– Corrosion resistance



Salt Spray Test Machine

• Water Resistance

Boiling water immersion test

Moisture resistance test

• Stain resistance

– Wear Resistance



– Heat-resistant

Continuous heating

Cycle heating

⑤ Painting method



	Proper Viscosity	Narrow Face	Wide Face	Completion	Cost	Amount of Scattering	Ancillary Equipment
Brush	Low to medium	◎	△	○	○	◎	None
Roller	Medium to high	△	○	○	○	◎	None
Ricin gun	Medium to high	△	◎	○	△	△	Compressors
Air spray gun	Low to medium	○	○	◎	△	▲	Compressors, spray booth
Airless spray gun	Medium to high	△	◎	○	△	△	High pressure paint pump
Electrostatic spray gun	Low to medium	○	○	◎	▲	○	Compressors, spray booth, power supply, etc.