

**GUIDE  
to  
YAMARI  
INDUSTRIES**



**YAMARI INDUSTRIES, LIMITED**



**METE AND MEASURE MAKE ALL MEN WISE**

*(An English Proverb in the 16th Century)*



JQA-0797

Head Office/Takatsuki Factory/Tokyo Branch  
Nagoya Sales Office/Fukuoka Sales Office

ISO 9001:2000/JQA-0797  
ISO 14001:1996/JQA-EM4107



JQA-EM4107

Takatsuki Factory



symbolizes the traceability system in accordance with the measurement law.  
The Calibration results may be accepted internationally through ILAC/APLAC MRA.



SENELEC(KEMA)



2000-T163  
2000-T164

**ISO 9001** : Since 1995, we maintain leading position as one of the reliable manufacturers of various temperature sensors under rigid quality assurance system to ISO 9001 which has compatibility with the qualification marks and logos (left).

**ISO 14001** : Beginning in July, 2004, a key objective of all of Yamari's business operations has been to reduce industrial pollution and minimize damage to the environment. The environmental protection programs we have now established form part of our commitment to continual improvement, subject to a strict environmental management system meeting all the requirements of ISO 14001

**JCSS** : In order to certify accuracy and reliability of the temperature sensors, we obtained an accreditation by IA Japan (International Accreditation Japan) in 1994 as a qualified temperature calibration service laboratory through an established traceability with the National Standard. JCSS (Japan Calibration Service System) is in conformity with ISO/IEC 17025 to provide measurement standards and measured quantities, i.e., an authorized certification of the temperature figures.

**P.L.** : Our products are fully inspected to assure quality and proper functions, but for warranty to the customers, sufficient amount of P.L. Insurance is being covered.



## Message from the President

Since the beginning of time, people have constantly strived to find new sources of energy and endeavoured to utilize various types of energy. In all ages, a tribe or nation which made the best use of energy gained the upper hand. Thermal energy is the one from which mankind has derived great benefits in various forms throughout the ages.

Since its founding in 1955, our company has specialized in the manufacture of temperature sensors used in equipment or plants for control of thermal energy in various fields of industry. We do custom-design these sensors by taking into consideration such factors as chemical and physical properties of the objects of which temperatures are to be measured, the atmosphere where the temperature measurement is to be carried out, size of the plant, range of operating temperatures, and so forth.

With the rapid advance of industry, ever greater accuracy is required on such temperature sensors, and in order to meet the needs, we are making every effort to acquire expertise and technology in all the fields that include precise calibration services to verify accuracy of temperature sensor under J.C.S.S. accreditation with which traceability is established between National Laboratory.

We have introduced mechanization as far as practicable into the latest manufacturing processes so that uniformity in the quality at our factory may be ensured, and at the same time, we exercise strict quality control and assurance to ISO 9001. Thus, we furnish industry with high reliability products, and enjoy the full confidence of the users. I take pride in the fact that our company is making a significant contribution to the development of temperature measurement.

Besides the research work for the safe atomic power by nuclear fusion, the sources of energy for industry are now going to shift from fossil fuels to non-pollutant energies like hydraulic, tide, wind, solar, battery cell and geothermal's to protect nature from acid rain and warming climate by carbon-dioxide on a global scale while reducing consumption of energy. To keep pace and serve with these trends, we are determined to continue our efforts for research and development in the technology of temperature measurement for the new and better products, foreseeing exact needs of human life and industry.

A handwritten signature in black ink, appearing to read 'S. Noritake'. The signature is written in a cursive, flowing style.

S. Noritake, President

# OUTLINE OF THE COMPANY

## Name of the Company :

Yamari Industries, Limited

Date of Establishment : May 28, 1955

Capital : 70 million yen (Paid up)

## Head Office :

1-5-4, Mishimae,

Takatsuki-shi, Osaka, Japan, 569-0835

Tel : +81-72-678-4897

Fax : +81-72-678-3516

E-mail : [overseas\\_sales@yamari.co.jp](mailto:overseas_sales@yamari.co.jp)

URL : <http://www.yamari.co.jp>

## Takatsuki Factory :

1-5-4, Mishimae,

Takatsuki-shi, Osaka, Japan, 569-0835

Tel : +81-72-678-1313

Fax : +81-72-679-2006

- Contact From Overseas -  
Please contact directly to ;  
Overseas Marketing Section.  
Tel : +81-72-678-4897  
Fax : +81-72-678-3516  
E-mail : [overseas\\_sales@yamari.co.jp](mailto:overseas_sales@yamari.co.jp)  
URL : <http://www.yamari.co.jp>

## Tokyo Branch :

3-3-15, Shiba Mont Bldg.,

Shiba, Minato-ku, Tokyo, 105-0014

Tel : +81-3-3454-3691

Fax : +81-3-5442-7815

## Other Sales Offices & Factory :

Nagoya Sales Office

Kakogawa Sales Office

Mizushima Sales Office

Kita-Kyushu Sales Office

Fukuoka Sales Office

Nagasaki Sales Office

Ohita Sales Office

Nagasaki Factory

## Settlement of Accounts :

Once a year, at the end of September.

## Annual Turnover :

4,400 million yen (in the year of 2004)

## Officers :

Shohei Noritake, President

Masami Kimura, Managing Director

Mitsuo Noritake, Director

Yoshihiro Ise, Director

Kozo Hirano, Director

Kazuko Noritake, Auditor

## Affiliated Firms :

Yamari Estate Co.,Ltd.

Yamari Seiki Co.,Ltd.

Yamari Giken Co.,Ltd.

Yamari Sensor System Co.,Ltd.

Suzuki Seiki Kogyosho Co.,Ltd.

Thermo Heat Co.,Ltd.

Osaka Seiko Co.,Ltd.

M.I. Cable Technologies, Inc. (Canada)

Thermosensor Technologies Pte. Ltd. (Singapore)

## Memberships :

Japan Electrical Measuring Instrument

Manufacturers' Association ;

Academy of Technology for Automatic Controls,

Instrumentation section

Society of Technology for Process Control,

Instrumentation section

Society of Thermal power Generation

Technology ;

Japan Atomic Energy Industry Council ;

Japan Academy of Metallurgy ;

Japan External Trade Organization (JETRO)

etc.

## Qualification & Accreditation :

ISO 9001 by JQA & IQNET

ISO 14001 by JQA & IQNET

JCSS

CENELEC(KEMA)

P.L.

## Industrial Properties :

Number of patents, utility models, trademark

rights, etc., granted : 45

Number of those published by the Patent

Office of Japan : 10

Number of those under application : 77

## Number of Employees :

Sales and administrative divisions : 93

Manufacturing division : 102

(incl.25 engineers)

Total 195



Head Office

## BRIEF HISTORY OF THE COMPANY

May., 1955 : In view of the importance of temperature measurement in various fields of industry, and in order to meet industries' requirement for temperature sensors with higher accuracy, the Company launched the manufacture and sales of thermocouples and related implements.

Entered into a contract with Baker Platinum Company of England for their sole agency in Japan.

Aug., 1961 : Tokyo Branch was established.

Jan., 1962 : Under a technical tie-up with BICC of England, the Company began processing and assembling of thermocouples at its factory adjacent to the head office.

Entered into a contract with MEECO of the United States for their sole agency in Japan, and started import and sales of their moisture analyzers for industrial use.

Mar., 1963 : Developed expendable type immersion thermocouples.

Jan., 1964 : Entered into a sole agency contract with MILLETRON of the U.S., and started import and sales of their automatic two-color pyrometers.

May., 1964 : Established Kita-kyushu Sales Office.

Jan., 1965 : Construction of the new Head Office building completed.

Jan., 1969 : Nagasaki Sales Office was established.

May., 1970 : Takatsuki Factory was established and the factory adjoining the head office was transferred thereto.

Jul., 1970 : Ohita Sales Office was established.

Oct., 1970 : Succeeded in introducing an investment in the Company by the Osaka Chusho Kigyo Toshi Ikusei Kabushikigai-sha (a Special corporation for bringing up medium and small enterprises by making investments in them).

Oct., 1973 : Construction of a new machining shop completed.

Feb., 1976 : Developed METAL-OX, an oxygen probe for use with molten metals.

Aug., 1976 : Developed HT-THERMIC, a thermocouple for superhigh temperatures.

Apr., 1978 : Established an affiliate, K.K. Suzuki Seiki Kogyosho, for the manufacture of precision experimental apparatus, precision machines and instruments, and various kinds of thermometers of industrial use.

Nov., 1978 : Extension work of the Takatsuki Factory completed, started manufacture of RESIMIC, Metal Sheathed Pt Resistance Thermometers.

Apr., 1980 : Joined in the establishment of Yamari Seiki K.K., a cooperative factory under exclusive contract with the Company.

Nov., 1983 : Mizushima Sales Office was established.

Apr., 1985 : Nagoya Sales Office was established.

May., 1991 : Nagasaki Factory was established.

Apr., 1993 : An innovative Aluminum Sensor was developed for monitoring Al content in a molten Zinc plating bath.

Aug., 1994 : Accreditation of JCSS, temperature calibration service for platinum resistance thermometer(0~200°C) was granted by the National Laboratory.

May., 1995 : ISO 9001 Qualification was granted and registered. Kakogawa Sales Office was established.

Apr., 1997 : Accreditation of JCSS, temperature calibration service for glass thermometer (0~200°C) was granted by the National Laboratory.

Dec., 1997 : A joint venture, Thermosensor Technologies Pte Ltd was established in Singapore.

Jun., 1999 : Started sales of HONEYWELL temperature transmitters on a sole agent basis.

Nov., 2000 : Accreditation of JAB, temperature calibration service for thermocouple(0~1,100°C) was granted by The Japan Accreditation Board for Conformity Assessment.

Jul., 2001 : Temperature range for platinum resistance thermometer for JCSS was expanded to -40°C~420°C. Temperature range for glass thermometer for JCSS was expanded to -50°C~350°C.

Oct., 2001 : Thermosensor Technologies Pte. Ltd. moved to new factory in Tuas.

May., 2004 : Construction of the new Head Office and Factory building completed.

Jul., 2004 : ISO 14001 Qualification was granted and registered.



Takatsuki Factory

## LINE OF PRODUCTS

Various Kinds of Thermometric Devices and Related Articles, including :

- M.I. Thermocouples (THERMIC) ;
- M.I. Resistance Thermometers (RESIMIC) ;

Special Thermocouples for Superhigh Temperatures (HT-THERMIC) ;

Thermocouples and Resistance Thermometers with Protection Tubes ;

Thermometer Protection Tubes, including Thermowells ;

M.I. Extension Lead cables, and Ordinary Extension and Compensating Leadwires ;

Temperature Sensor Calibration Equipment ;

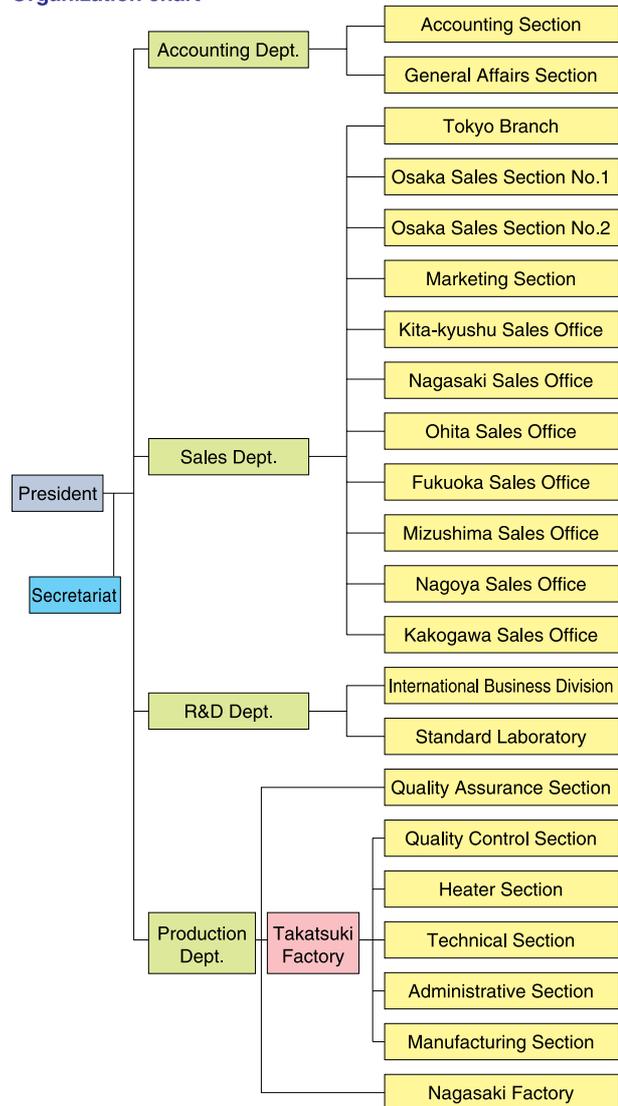
Oxygen Probes for Molten Copper (METAL-OX) ;

Dissolved Aluminum Sensors in Molten Zinc Bath (AL-SENSOR)

Precision Pitot Tubes, Yaw Probes and Fine Adjustment Traverse Machine.

Metal Turbine Blade Models for Wind Tunnel Experiments and Total Temperature, Total Pressure and Static Pressure Gauges, and Combinations Thereof.

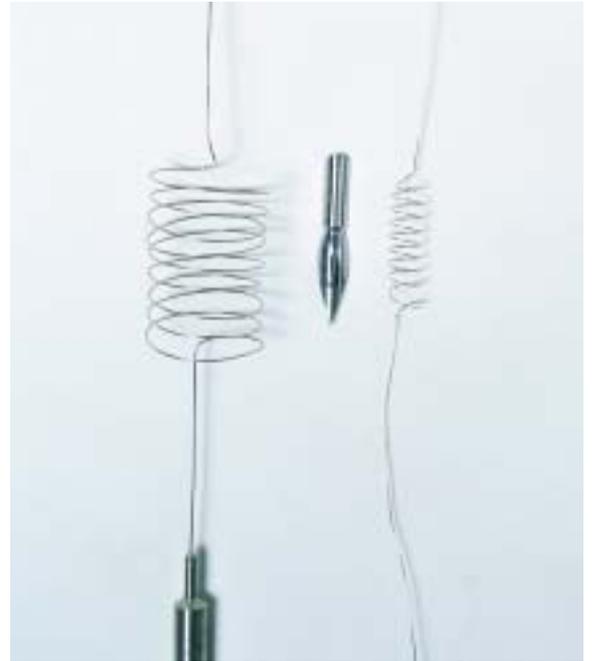
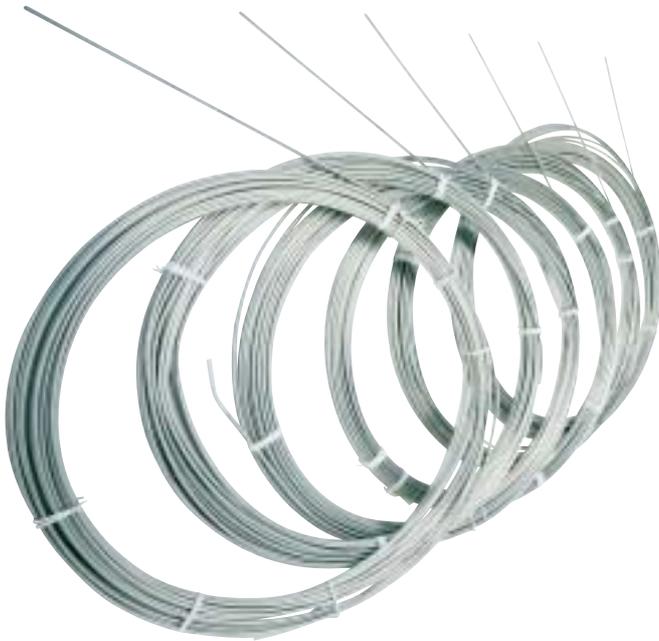
## Organization chart



## THERMIC M.I. THERMOCOUPLES

THERMIC is a trade name (trade mark registered) of various metal sheathed thermocouples manufactured by us which embody many of the latest improvements over BICC products and have enjoyed a high reputation among users since they were first placed on the market in 1962.

THERMIC cable is an integrated thermocouple material comprised of a metal sheath in which the thermoelectric elements are embedded in highly compacted magnesium oxide (MgO) insulation. The construction guarantees a superb insulating quality and a high resistance to pressure and has, in addition, an excellent flexibility which has been given to it by annealing in a proper method.



## SUPERFINE THERMIC M.I. THERMOCOUPLES

Sheath O.D. : 0.25 to 0.50 mm

Features: Rapid response to very small changes in temperature; and is highly flexible.

Because of the small heat mass and high thermal conductivity, it is possible to measure temperatures of even very small objects at high accuracy with the least heat disturbance.



Various types of Thermocouple Assemblies

## HT-THERMIC FOR SUPERHIGH TEMPERATURES

Recently there has been remarkable advance in the technology of heat treatment, surface treatment and sintering at very high temperatures, and the necessity of sensors for measurement of highly elevated temperatures is now widely recognized.

In view of this, we have been deeply involved in the research and development of the sensors for high temperature applications in appreciation of their importance for precision control technology.

Now based on a unique patented process, we have succeeded in introducing a new Argon sealed-in high temperature thermocouple, Model HT-THERMIC for use under vacuum, inert and H<sub>2</sub> reducing atmospheres, where all the Platinum-Rhodium type thermocouples are severely corroded.

Use of these HT-THERMIC series of thermocouples will enable you to carry out measurement of high temperatures up to 2000°C over a long period of time in a stable condition.

In 1992, a heavy duty version of HT-THERMIC, "HT-270" has been developed for petro-chemical and other critical high temperature applications. "HT-270" can be used both in moisture free oxidizing and reducing atmospheres up to 1500°C without need of "Gas Purge" system .



## THERMIC M. I. THERMOCOUPLE FOR TUBE SKIN TEMPERATURES

This is a metal sheathed thermocouple specially designed for attachment to the boiler tube surface for true "Tube Skin" temperature.

This improves the durability and accuracy of skin temperature measurement.

This thermocouple offers a great advantage at thermal power stations, and heat exchangers, etc., for accurate measurement of the surface temperature of various types of furnace tubes. It is quite useful from the viewpoint of energy saving and improvement in monitoring deposit of scale inside the tubes.

## SPRING-LOADED M. I. THERMOCOUPLE

This is used in cases where a protection tube, for example a thermowell, is employed, to ensure a close contact between the thermocouple and the bottom of the protection tube, and as well as preventing damage to the thermocouple from vibrations.

Our Spring-Loaded THERMIC is of such a construction that allows to simply and easily replace only the thermocouple.



## THERMOWELLS AND WELDED PROTECTION TUBES

Equipped with a new efficient Dual-shaft Gun Drilling Machine, we furnish high reliability, solid bar stock type thermowells in various designs.

We are one of the few sources in the world for long thermowells and can produce up to a maximum length of 3000mm at our factory. Rigid inspections are conducted throughout the process including X-ray photograph, dye penetration and hydrostatic tests to ensure the integrity of our thermowells.

Our weld-closed protection tubes are processed by a special hot spinning device developed at our factory. With this technology, perfect uniformity in metal structure and wall thickness of the end closure are ensured to give an optimum service life in the field. Available in every grade of stainless steel, non-ferrous and a variety of high temperature super alloys.

## THERMOCOUPLE WIRES OF VARIOUS TYPES

In addition to the standardized thermocouple wires in accordance with the JIS (Japanese Industrial Standards), IEC, ANSI, ASTM, BS and DIN, such as K, J, E, T, N, R, S, B, and W5 types, we also furnish various types of special thermocouple wires including Nickel-Molybdenum, platinum and cryogenic Chromel-AuFe combinations, etc.



## RESIMIC M.I RESISTANCE THERMOMETER

RESIMIC M.I. Resistance Thermometer (trade mark registered) is an integrated unit consisting of a resistance element and an MI extension lead cable.

Compared with resistance thermometers previously in the market, it features quicker response and a longer service life under very severe operating conditions.

Other features of the RESIMIC include :

### Good Resistance to Vibration

As RESIMIC is of one-piece construction comprised of the heat-resistant metal sheath, tightly compacted with insulating powder and high purity conductors offers excellent resistance to vibration.

### Excellent Flexibility

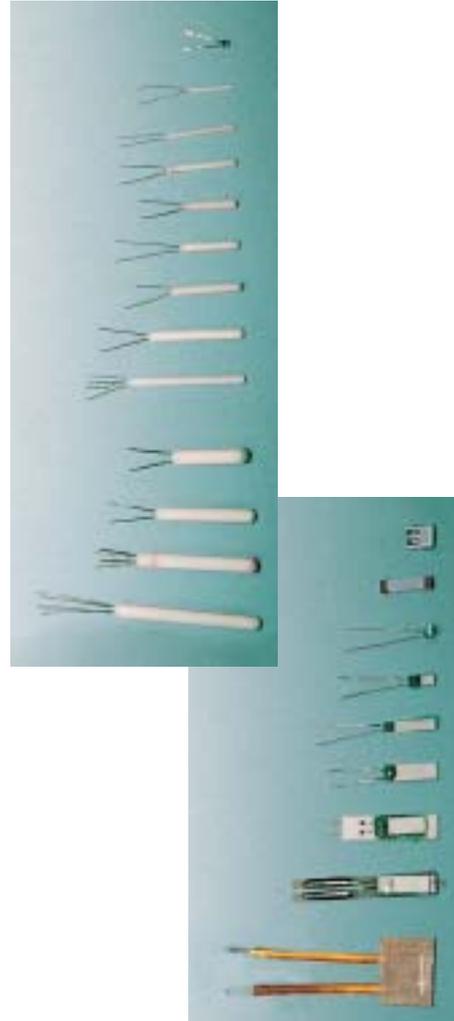
With the exception of its sensor tip, 100mm from the hot end, it can be freely bent up to two times the radius of the sheath O.D., without impairing its function.

### Wide Measuring Range

It permits measurement of temperatures in the range of  $-200$  to  $+550^{\circ}\text{C}$ . Thus, it can be used as well, for middle high temperature range at which a thermocouple has previously been used.

### Quick Response

Since its overall diameter is very small as ranged from 1.0 to 8mm O.D., and is made of a pure insulating material with high thermal conductivity, it provides quick response to even very small changes in temperature.



## RESISTANCE THERMOMETERS OF VARIOUS TYPES

Resistance thermometers are, in general, superior in resolution and accuracy to other means of measuring temperature and are in wide use for a temperature range of up to  $500^{\circ}\text{C}$ .

We design and manufacture a wide range of resistance thermometers, as well as supply of resistance detector elements of the types of mica-wound, glass sealed and ceramic body precision RESICERAM, in diameters from 0.75 to 4.5mm, which can be custom designed to suit for the user's specific application.

## EXTENSION LEAD WIRES & COMPENSATING CABLES

We supply extension leads and compensation wires and cables for all kinds of thermocouples including metal sheathed THERMIC extension leads and multi-pair types. Orders for lead wires to special specifications, other than to JIS, ANSI, DIN and BS standards are also welcome.



## METAL FREEZING POINT TEMPERATURE STANDARDS AND FULL RANGE OF CALIBRATION EQUIPMENT TO JCSS ACCREDITATION

Although the following products are not included in ISO 9001 quality system yet in Japan, the temperature sensor calibrators have been developed by Isothermal Technologies, Ltd., U.K. having qualifications of ISO 9002, BSI and NAMAS calibration services. The apparatus are for precise temperature calibration utilizing the freezing points of various metals, and are employed for calibration standard of temperature sensors. Samples of extremely pure metals used in this apparatus are in conformity with specifications of NPL, U.K. and NIST, U.S.A., based on International Temperature Scale (ITS-90). In addition to the Metal Freezing point standards, we are equipped with precision calibration baths, Spherical furnaces and Triple point standards of water and Mercury at our JCSS Temperature Laboratory with the established traceability from the National standards. Please visit our laboratory. Authorized calibration services are available upon request.



# FACTORY EQUIPMENT

## Principal Processing Equipment

C.A.D. Processing System	10
BICC TIG Automatic Arc Welder	2
Direct Current TIG Arc Welder	5
Direct Current Micro-Tig Welder	3
Precision Plasma Arc Welder	4
Alternating - Direct Current MIG/Tig Welder	2
High Dependability Vacuum Chamber for Sensor Processing	1
High Frequency Induction Brazing Device	1
Bench Resistance Welder	2
Full Automatic Resistance Welder	2
Water Welder	4
Cold Welder	2
Positioner for Welding	4
Oxy - acetylene Welder	8
YAG Laser Welder	4
Planetary Tube Welder	3
Sheath/Wire Cutters	4
Sheath Strippers	5
Sheath Blasting Device	2
Electrically Driven Magnesia Removing Device	5
Shot Blasting Equipment	2
Pneumatic Hydraulic Press	4
Duplex Head Grinder	4
Belt Grinder	3
Buffing Machine	3
Toggle Press	8
Diamond Cutter	2
Cement Kneader	2
Dust Collector	8
Computer for Process Filing	6
Drying Furnace & Oven	9
Marking Machine	3
Air Compressor	5
Workshop Microscope	6
Pneumatic Tool	22
Special Jig and Tool	35
Measuring Instrument	25



## Machine, Tools and Accessory Equipment

NC Automatic Lathe	5
Lathe	10
N/C Machining Center	1
Milling Machine	3
Dual-shaft 1.5 Meter Gun Drilling Machine	1
Drilling Machine	6
Swaging Machine	2
Drawing Bench	1
AC/DC Tig Arc Welder	3
Ultrasonic Cleaning Tank	1
Triclene Recovery Equipment	1
Grinder	6



## Principal Testing Equipment

Computerized Automatic Calibration System	2
Metal Freezing Point Standard (7cells)	3
Melting Point Standard of Gallium	1
Primary Standard Thermometer	2
Cylindrical Electric Furnace for Comparison Test	5
Precision Liquid Bath	2
Black Body Furnace	1
Salt Bath for Comparison Test	3
Oil Bath for Comparison Test	2
Fluidized Solid Bath for Comparison test	2
Hot Water Bath for Comparison Test	2
Thermostatic Oven for Comparison Test	1
Ice Point Bath for Comparison Test	5
Electronic Cryostat for Comparison Test	2
Fortin's Barometer	2
Mercury - Triple Point Standard	1
Water - Triple Point Apparatus	1
Water - Boiling Point Apparatus	3
Siliconit Electrical Resistance Furnace	2
Potentiometer	5
Digital Voltmeter	6
A.C. & D.C. Ratio Bridge	3
Temperature Measuring Precision Bridge	3
Automatic Resistance Measuring Instrument	6
Circuit Tester	10
Automatic Cold Junction Apparatus	3
Withstand Voltage Tester	2
X-ray Inspection Apparatus	2
Dosimeter	2
Helium Leak Detector	2
Vacuum Gauge	3
Micro Hardness Tester	1
Specimen Grinder	1
Vibration Test Apparatus	1
Synchroscope	2
Computer for Technical Calculation	6
Computer for processing Test Data	4
X-Y Plotter	1
Heat Cycle Tester	1
Hydrostatic Tester	1
Super Megohmmeter	5
Data Logger & Recorder	8
Standard Pt Resistance Thermometer	4
Standard Thermocouple	5
Standard Mercury Thermometer	6
Pressure Gauge	12
Gauge for Inspection and Miscellaneous Tool	43

# CUSTOMERS LIST

## Iron & Steel, and Nonferrous Metals

Aichi Steel Works, Ltd.; Azuma Steel Works Co., Ltd.; Osaka Iron & Steel Co., Ltd.; Osaka Titanium Co., Ltd.; Kanto Special Steel Works, Ltd.; Kawasaki Steel Corp. Kobe Steel, Ltd.; Kokko Steel Works, Ltd.; Sanko Seiko K.K.; Nippon Steel Corporation ; K.K. Jonan Seikoshō ; Showa Aluminium K.K.; "Sky" Aluminium K.K.; Sumitomo Light Metal Industries, Ltd.; Sumitomo Electric Industries, Ltd.; Daido Steel Co., Ltd.; Dainichi - Nippon Cables Co., Ltd.; Pacific Metals Co., Ltd.; Takasago Tekko K.K.; Chubu Kohan K.K.; Tohoku Satetsu Kogyo K.K.; Tokai Steel Works Co., Ltd.; Toyo Seiko K.K.; Tokushu Seiko Co., Ltd.; Nakayama Steel Works, Ltd.; Nisshin Steel Co., Ltd.; Nippon Tungsten K.K.; Nippon Stainless Steel Co., Ltd.; Nippon Kokan K.K. Nippon Metal Industry Co., Ltd.; Nippon Koshuha Steel Co., Ltd.; Japan Steel Works, Ltd.; Nippon Light Metal Co., Ltd.; Nihon Chutanko K.K.; Nippon Mining Co., Ltd.; Nihon Kokyū Kinzoku K.K.; Japan Metals & Chemicals Co., Ltd.; Hitachi Metals, Ltd.; Fukushima Seiko K.K.; Mitsubishi Kinzoku K.K.;\_ Mitsubishi Steel Mfg. Co., Ltd.; Mitsubishi Reynolds K.K.; Mitsubishi Aluminium K.K.; Mitsui Aluminium Kogyo K.K.; Mori Kogyo K.K.; Yamato Steel Works, Ltd.; Yodogawa Steel Works , Ltd.; Yoshida Kogyo K.K.

## Electric Power and Gas

Osaka Gas Co., Ltd.; Okinawa Electric Power Co., Inc.; Kashima - Minami Kyōdo Karyōku K.K.; Kansai Electric Power Co., Inc.; Kyushu Electric Power Co., Inc.; Sakai Kyōdo Karyōku K.K.; Shikoku Electric Power Co., Inc.; Sumitomo Kyōdo Karyōku K.K.; Chugoku Electric Power Co., Inc.; Chubu Electric Power Co., Inc.; Tohoku Electric Power Co., Inc.; Tobata Kyōdo Karyōku K.K.;Tokyo Gas Co.,Ltd; Tokyo Electric Power Co., Inc.; Toho Gas Co., Ltd.; Tomakomai Kyōdo Karyōku K.K.; Toyama Kyōdo Karyōku K.K.; Nishi - Nihon Kyōdo Karyōku K.K.; Hokuriku Electric Power Co., Inc.; Hokkaido Electric Power Co., Inc.; Mizushima Kyōdo Karyōku K.K.;

## Nuclear Power Generation

Kansai Electric Power Co., Inc. - Mihama Nuclear Power Plant ; Atomic Fuel Corporation ; Sumitomo Genshiryōku Kogyo K.K.; Tokyo Electric Power Co., Inc. - Fukushima Nuclear Power Plant ; Power Reactor and Nuclear Fuel Development Corporation ; Japan Atomic Energy Research Institute ; Mitsubishi Genshiryōku Kogyo K.K.; Central Research Institute of Electric Power Industry.



## Comprehensive Industrial Plants

Ishikawajima-Harima Heavy Industries Co., Ltd.; Kawasaki Heavy Industries, Ltd.; Chiyoda Chemical Engineering & Construction Co., Ltd.; Tsukishima Kikai Co., Ltd.; Toyo Engineering K.K.; Tokyo Shibaura Electric Co., Ltd.; Toray Engineering K.K.; Japan Gasoline Co., Ltd.; Hitachi, Ltd.; Hitachi Shipbuilding & Engineering Co., Ltd.; Fuji Electric Co., Ltd.; Mitsui Shipbuilding E & Engineering Co., Ltd.; Mitsubishi Heavy Industries, Ltd.

## Oil Refining, Chemical and Petrochemical Industries

Asahi Chemical Industry Co., Ltd.; Ube Industries. Ltd.; Osaka Soda Co., Kanegafuchi Chemical industry Co., Ltd.; Kyowa Carbon K.K.; Kyushu Sekiyū K.K.; Kureha Chemical Industry Co., Ltd.; Sakai Chemical Industry Co., Ltd.; Showa Denko K.K.; Shiseido Co., Ltd.; Shokubai Kasei Kogyo K.K.; Shinetsu Chemical Industry Co., Ltd.; Shin Daikyōwa Sekiyū K.K.; Sumitomo Chemical Co., Ltd.; Seibu Kagaku Kogyo K.K.; Seitetsu Kagaku Kogyo Co., Ltd.; Sekisui Kaseihin Kogyo K.K.; Sekisui Chemical Co., Ltd.; General Sekiyū Kaisha, Ltd.; Daikyo Oil Co., Ltd.; Daicel Co., Ltd.; Takiron Chemical Co., Ltd.; Takeda Chemical Industries, Ltd.; Chisso Corporation ; Denki Kagaku Kogyo K.K.; Toa Nenryō Kogyo K.K.; Toagosei Chemical Industry Co., Ltd.; Toyo Soda Mfg. Co., Ltd.; Toyo Rubber Industry Co., Ltd.; Tokuyama Soda Co., Ltd.; Toyama Chemical Industry Co., Ltd.; Nippon Mining Co., Ltd.; Nippon Oil Co., Ltd.; Japan Catalytic Chemical Industry Co., Ltd.; Japanese Geon Co., Ltd.; Nissan Chemical Industries, Ltd.; Nittetsu Kagaku Kogyo K.K.; Fuji Photo Film Co., Ltd.; Bridgestone Tire Co., Ltd.; Honshū Kagaku Kogyo K.K.; Mitsui Petrochemical Industries, Ltd.; Mitsui Toatsu Chemicals, Inc.; Mitsubishi Chemical Industries, Ltd.; Mitsubishi-Monsanto Kasei K.K.

## Electric Machines and Appliances

Okai Electric Industry Co., Ltd.; Sanyo Electric Co., Ltd.; Sharp Corporation ; Shinko Electric Co., Ltd.; Shin Nippon Denki K.K.; Shimadzu Seisakusho, Ltd.; K.K. Chino Seisakusho ; Tokyo Sanyo Electric Co., Ltd.; Tokyo Shibaura Electric Co., Ltd.; Nippon Electric Co., Ltd.; Hitachi, Ltd.; Hyōda Keiki Kogyo K.K.; Fuji Electric Co., Ltd.; Fujitsu Limited ; Furukawa Electric Co., Ltd.; Hokushin Electric Works, Ltd.; Matsushita Electric industrial Co., Ltd.; Matsushita Electric Works, Ltd.; Matsushita Denshi Kogyo K.K.; Mitsubishi Electric Corporation ; Meidensha Electric Mfg. Co., Ltd.; Yamatake-Honeywell Co., Ltd.; Yasukawa Electric Mfg. Co., Ltd.; Yokogawa Electric Works, Ltd.; Toyo Electric Mfg. Co., Ltd.;



### Industrial Machinery

K.K. Ube Tekkoshō ; Kudota, Ltd.; Kurita Water Industries Ltd.; Kurimoto Iron Works, Ltd.; Komatsu, Ltd.; Ebara Mfg. Co., Ltd.; Shiraiishi Denki K.K.; Shinko-Foudler K.K.; Sumitomo Shipbuilding & Machinery Co., Ltd.; Daikin Kogyo Co., Ltd.; Chugai Rokogyo K.K.; Toshiba Machine Co., Ltd.; Yammar Diesel K.K.

### Automobiles

Isuzu Motors Limited; Daihatsu Kogyo K.K.; Toyo Kogyo Co., Ltd.; Toyota Motor Co., Ltd.; Nissan Motor Co., Ltd.; Fuji Heavy Industries, Ltd.; Honda Motor Co., Ltd.; Mitsubishi Jidosha Kogyo K.K.; Nippon Denso. Co., Ltd. ;

### Textile Industry

Kanebo K.K.; Kuraray Co., Ltd.; Teijin Ltd.; Toho Rayon Co., Ltd.; Toray Industries, Inc.; Nippon Ester K.K.; Mitsubishi Rayon Co., Ltd.; Mitsubishi Acetate K. K.; Unitika, Ltd.

### Glass, Cement and Ceramics

Asahi Glass Co., Ltd.; K.K.; Ueda Sekkai Seizoshō ; Ube Industries, Ltd.; Okutama Kako K.K.; Shinagawa Fire Brick Co., Ltd.; Sumitomo Cement Co., Ltd.; Toshiba Ceramics Co., Ltd.; Nippon Sheet Glass Co., Ltd.; Nippon Denki Garasu K.K.; Nihon Cement Co., Ltd.; Nihon Sekkai K.K.

### Paper and Pulp

Oji Paper Co., Ltd.; Daio Seishi K.K.; Daiko Seishi K.K.; Daishowa Paper Mfg. Co., Ltd.; Tomoegawa Paper Mfg. Co., Ltd.; Nippon Pulp Industry Co., Ltd.; Mitsubishi Paper Mills., Ltd. .

### Food Processing

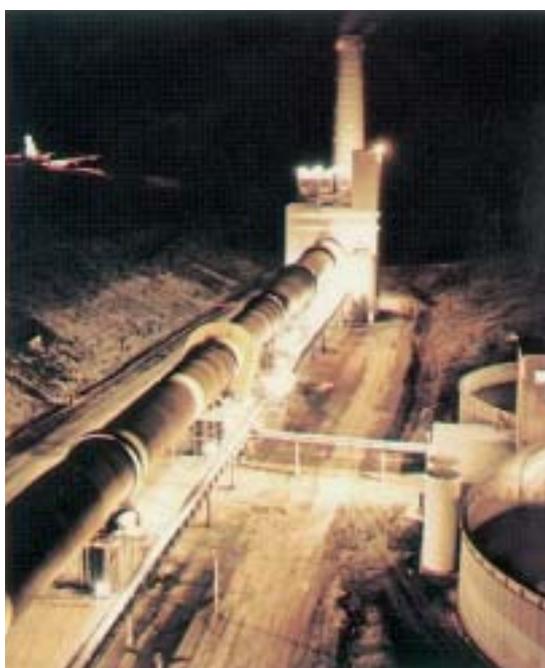
Ajinomoto Co., Inc.; General Foods K.K.; Nippon Ham K.K.; Prima Meat Packers, Ltd.; Meiji Seika Kaisha, Ltd.; Morinaga Confectionery Co., Ltd.

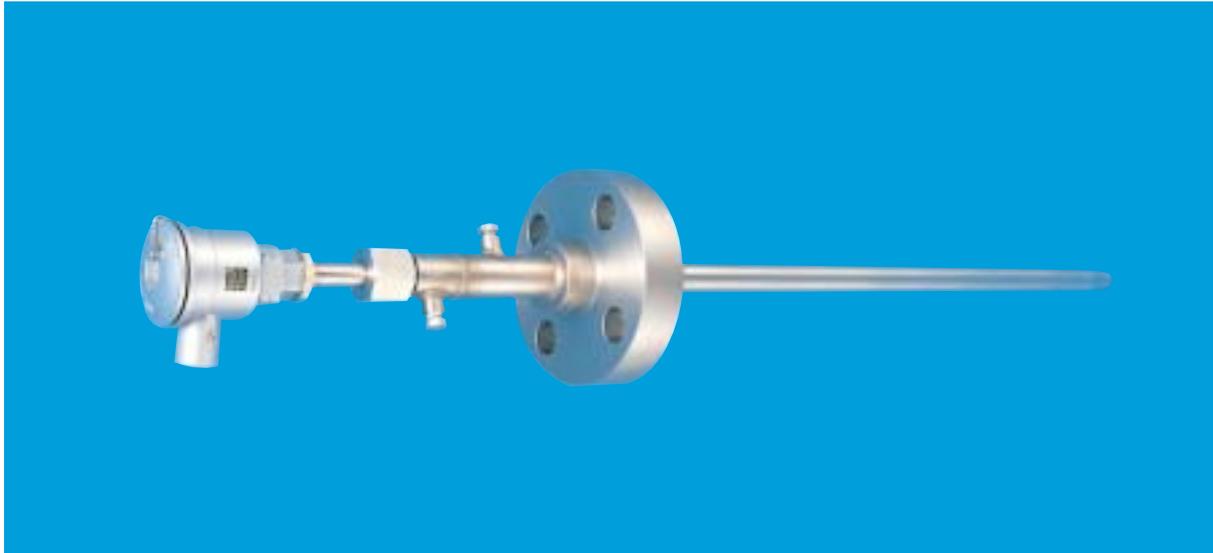
### Universities and Research Institutes

University of Osaka ; Municipal University of Osaka ; University of Kyoto ; University of Kyushu ; Keio University ; University of Kobe ; Tokai University ; Tokyo institute of Technology ; University of Tokyo ; University of Nagoya ; Nippon University ; Waseda University ; National Research Institute for Metals ; Institute for Comprehensive Researches in Electronics Technology ; Tokyo Industrial Laboratory ; Tokyo Metropolitan Industrial Technology Center ; Technical Research and Development Institute of the Defence Agency.

### Overseas Installations

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