4.10 Inspection, Measuring and Test Equipment

(A) Does the supplier control, calibrate and maintain inspection, measuring and test equipment, whether owned by the supplier, on loan, or provided by the purchaser, to demonstrate the conformance of product to the specified requirement?

See an example of in-company standard "Control, Calibration and Maintenance of Inspection, Measuring and Test Equipment.

Control, Calibration and Maintenance of Inspection, Measuring and Test Equipment

1. Scope

This in-company standard defines the control of the inspection, measuring and test equipment/instrument used for various quality control activities for the purpose of establishing the consistent quality control systems, as well as complying with the requirement by outside bodies or customers.

2. Classification of the Equipment/Instrument

2.1 Classification of Equipment/Instrument

(1) Table 1 shows classification of the equipment/ instrument.

(2) The equipment/instrument classified herein shall not be used for upper ranks without specified precision test.

3. Responsibility

3.1 General

(1) The implementations of the system provided in this standard

Responsibility of Individual Work

No.	Item	User Organization	Calibration Section	Quality Assurance Sec.
(1)	Budgeting and request for purchases/ repairs	○		
(2)	Receipt check purchased/repaired one	○	○*	
(3)	Decision of rank classifications, assignment and identification of numbers, preparation of log (card)	○		
(4)	Proper use and control	○		
(5)	Daily checks (incl. dispositions)	○		
(6)	Request for calibration (incl. repairs)	○		
(7)	Performance of calibration and dispositions (incl. repairs)	○ lower rank	○**	
(8)	Performance of (1) ~(4) on master standards/reference standards	○ reference standards	○***	
(9)	Preparation of history data of master standards/reference standards		○	
(10)	Reporting to outside bodies (government offices)		○	
(11)	Checking and follow-up of the compliance status of regulations			○
(12)	Standardization of related work (general, common items)			○
(13)	Standardization of related work (individual items)	○		

* Receipt check by calibration if necessary
** Upper rank
*** Master standards/reference standards

are made by the organizations shown in 3.2 Responsibility of the Individual Job.

(2) Each organization designates personnel who is in charge of the implementation of this standard.

This personnel shall be responsible for the job of equipment/instrument control in his organization.

He shall report to the Calibration Section and the Quality Assurance Section whenever nonconformity to this standard occurs on the equipment/ instrument.

3.2 Responsibility of the Individual Job

3.3 Procurement of Equipment/Instrument

Upon request from the using organization to procure the equipment/instrument, the Calibration Section shall decide purchasing specification for the equipment/ instrument to be procured, preparing specification sheet and selecting the equipment/instrument manufacturer.

4. Basic Control System for Equipment/Instrument

4.1 Calibration System

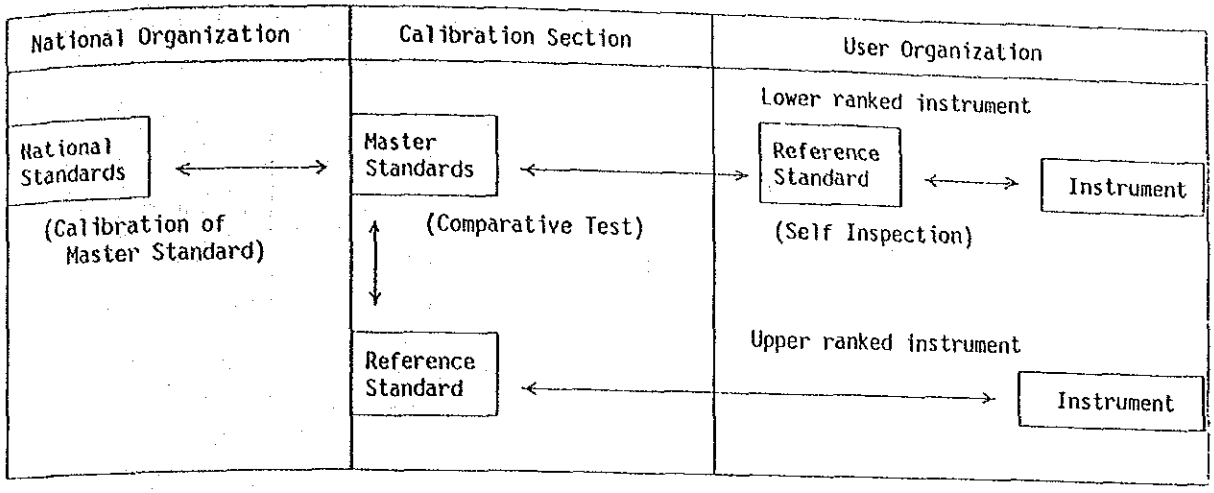
The calibration of the equipment/instrument shall be made using the reference standard which is tested in comparison with the master standard whose equipmental/instrumental error has been calibrated against the National Standard as shown below.

4.2 Control Flow of Equipment/Instrument

5. Calibration and Inspection of Equipment/Instrument

5.1 Rank of Classification and Calibration/Inspection

Cabliration of Instrument



Control flow of measuring and testing equipment

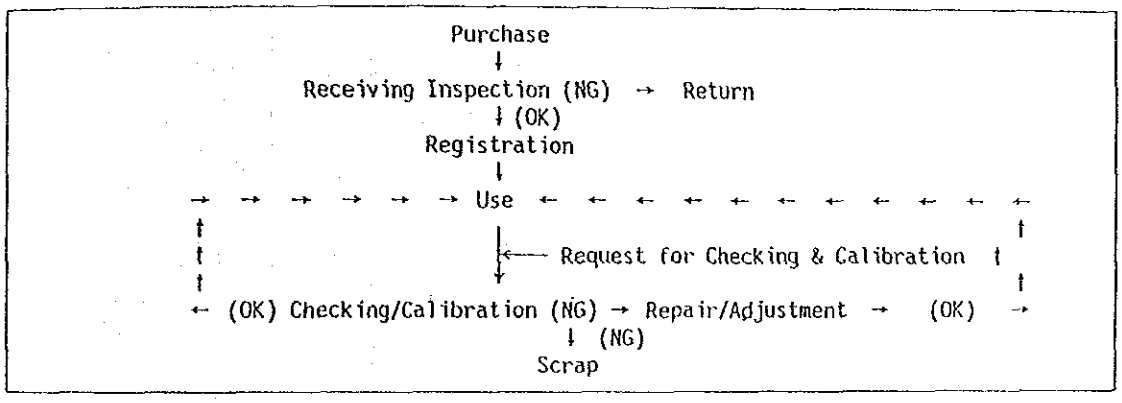


Table 1 Classification and Application of Calibration/Periodic Check for Instrument

Rank	Definition and Application	Receiving Inspection	Periodic Checking	Daily Checking
C-1	Instruments used to evaluate the quality/quantity of the final product directly. Instrument used to control the quality of the final product directly.	Checking of maker's inspection record at shipment.	Periodic calibration using master gages traceable to national std. Calibration frequency is shown in the Table.	Visual appearance check. Zero-point adjustment. Two times measuring. Checkings are made before/after use.
C-2	Instruments which have effect on quality/quantity of the final product.	- ditto -	- ditto -	- ditto -
C-3	Instruments which have no effect on quality/quantity of the final product.	- ditto -	N/A	- ditto -

(1) The using organization shall, prior to use, request Calibration Section to calibrate the equipment/instrument procured, together with calibration record card.

The Calibration Section perform receiving inspection (calibration, if necessary,) and enter the inspection/ calibration results into the card, and return them to the using organization.

(2) The expiration of calibration of the equipment/instrument is shown on it by Dymo-Tape.

(3) Equipment/Instrument shall not be used until receiving inspection is verified and accepted.

(4) The Calibration Section and the Quality Assurance Section should audit the equipment/instrument manufacturers of their quality assurance system and reliability of the inspection certificate.

5.2.2 Daily Check

Method and frequency of the daily check of equipment/instrument made by each using organization are provided in Table 1 in this standard.

5.2.3 Periodic Calibration

The periodic calibration made by Calibration Section are as follows;

(1) The calibration intervals of respective using organization shall be established in consideration of the equipment/instrument using condition and work load of calibration.

(2) The using organization shall request the Calibration Section to perform periodic calibration by submitting the applicable

Table 2 Calibration Frequency

Categories	Equipment Name	Frequency	Remarks
Length	Linear scale	1Y	
	Measure tape	"	
	Dial depth gauge	6M	
	Standard outside micrometer	"	
	Block gauge	1Y	
	Thickness gauge	6M	
Mass	Manual balance	1Y	
	Spring-type suspension balance	"	
	Pendulum-type balance	"	
Temperature	Glass thermometer	"	
	Thermoelectric thermometer	"	
	Digital thermometer	6M	
	Temperature recorder	"	
	Pyrometer	"	
Pressure/ Force	Bourdon type (deadweight gauge)	"	
	Torque wrench	1Y	
Hardness & Roughness	Shore hardness tester	6M	
	Brinell hardness tester	"	
	Vickers " "	1Y	
	Surface roughness meter	6M	
Electricity	DC voltmeter	1Y	
	AC ammeter	"	
Special Instrument #	PH meter	"	
	Gas analyser	"	
	Ultrasonic thickness meter	6M	# Only "genuine mark" accredited products can be used.
Volume meter	Mess flask	-	
	Mess cylinder	-	
Others	Angle gauge	1Y	
	Stop-watch	"	

Table 3 Acceptance Criteria for Calibration

Classification		Standardized Instrument	Non-standardized Instrument
Graduated Instrument	A	Accuracy as specified in standardized specification.	Accuracy as specified by manufacturer.
	B	About 1.5 times the accuracy of std. specification. (75% of allowable accuracy)	About 1.5 times the accuracy as specified by manufacturer. (75% of allowable accuracy)
	C	Times the whole number of 0.5 graduations, not exceeding 2 times, but near 2 times the accuracy of std. specification. (minimum± 0.5 graduations, maximum± 1.5 graduations)	Times the whole number of 0.5 graduations, not exceeding 2 times, but near 2 times the accuracy as specified manufacturer. (minimum± 0.5 graduations, maximum± 1.5 graduations)
Non-Graduated Instrument	A	Accuracy as specified in standardized specification.	Accuracy as specified by manufacturer.
	B	Accuracy of std. specification.	Accuracy as specified by manufacturer.
	C	Two times the accuracy of std. specification.	Two times the accuracy as specified by manufacturer.

(Note) A: Receiving accuracy: Accuracy to be considered as acceptance criteria for receipt of procured instrument.

B: Adjusted accuracy : Accuracy to be maintained after periodic (temporary) calibration, adjustment or repair.

C: Allowable accuracy: Accuracy to be maintained during use of the equipment.

equipment/instrument and its calibration record card.

(3) Periodic calibration shall be made within the specific month including expiration date.

(4) Acceptance criteria of the calibration results are based on permissible limit referred to new equipment/instrument and adjustable limit.

(5) The Calibration Section shall perform calibration, evaluate its acceptability, enter the results into the calibration record card, and return the calibrated equipment/instrument with the record card to the using organization.

The expiration period is shown on the equipment/instrument using Dymo-Tape.

6. Control of Calibration Log

6.1 Assignment of Identification Numbers of Equipment/Instrument

(1) The instrument number is assigned to the upper ranked C-1 and C-2 equipment/instrument (C-3 is lower ranked), and the same number is shown on the equipment/instrument and its calibration record card.

(2) Numbering is as follows;

XX(rank)-XX(using organization)- XXXX(serial number)

The number of figures in serial numbers and numbering method may specified by each using organization.

(3) In order to clarify the rank of the equipment/ instrument to prevent mis-control, the following colour identification shall be made on the equipment/instrument by label, colour paint or Dymo-Tape.

C-1(pink), C-2(green), C-3(white)

The expiration period of the equipment/instrument is also identified by same way.

6.2 Calibration Log

(1) The calibration log card is applicable for upper ranked equipment/instrument C-1 and C-2(C-3 is not applicable).

(2) The format of the card is shown in Fig. 1.

(3) The responsibility to enter each item into the card is as follows;

U: Using Organization
C: Calibration Section
(Note) As a rule, the Calibration Section fills out the Control Precision Column, however, the using organization may enter this column, when specifically needed.

(4) Any items or stamps other than those specified shall not be written into the card.

(5) In the "Note" column of the card, the "Items" under are entered to show the history of the equipment/instrument in accordance with the following definitions.

(Note) As a rule, the Calibration Section fills out those Items, however, the using organization may enter them when specifically needed.

(6) The cards are always controlled so as to be traceable to the instruments.

(7) Disposition of Nonconforming Equipment/Instrument

Fig. 1

Format No.

Instrument Log

Name of Section Adopted	Instrument No.

Type, Model	Name of Maker	Rank

Adjustable Limit	Permissible Limit	Calif. Frequency	Purchase Date	Scrapped Date

	Inspection Date	Insp. Result	Inspector	Next Calib. (month)	Note
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

See Table 4.

(B) Is equipment used in a manner which ensures that measurement uncertainty is known and is consistent with the required measurement capacity?

See above (A).

(C) Does supplier identify the measurements to be made, the accuracy required and select the appropriate inspection, measuring and test equipment?

See above (A).

(D) Does supplier identify, calibrate and adjust all inspection, measuring and test equipment and devices that can affect product quality at prescribed intervals, or prior to use, against certified equipment having a known valid relationship to nationally recognized standards?

See above (A).

(E) Does supplier document the basis used for calibration, where no such standards exist?

See above (A).

(F) Does supplier establish, document and maintain calibration procedures, including details of equipment type, identification number, location, frequency of checks, check method, acceptance criteria and action to be taken when results are unsatisfactory?

See above (A).

(G) Does supplier ensure that the inspection, measuring and test equipment is capable of the accuracy and precision necessary?

See above (A).

(H) Does supplier identify inspection, measuring and test equipment with a suitable indicator or approved identification record to show the calibration status?

See above (A).

(I) Does supplier maintain calibration records for inspection, measuring and test equipment (see 4.15 Quality REcords)?

See above (A).

(J) Does supplier assess and document the validity of previous inspection and test results when inspection, measuring and test equipment is found to be out of calibration?

See above (A).

(K) Does supplier ensure that the environmental conditions are suitable for the calibrations, inspections, measurements and tests being carried out?

See above (A).

(L) Does supplier ensure that the handling, preservation and storage of inspection, measuring and test equipment is such that the accuracy and fitness for use is maintained?

See above (A).

(M) Does supplier safeguard inspection, measuring and test facilities, including both test hardware and test software, from adjustments which would invalidate the calibration setting?

See above (A).

(N) Where test hardware (e.g. jigs, fixtures, templates, patterns) or

test software is used as suitable forms of inspection, dies supplier check to prove that they are capable of verifying the acceptability of product prior to release for use during production and installation?

See above (A).

(O) Does supplier recheck them at prescribed intervals?

See above (A).

(P) Does supplier establish the extent and frequency of such checks and maintain records as evidence of control (see 4.15 Quality Records)?

See above (A).

(Q) When required by the purchaser or his representatives, does supplier make available measurement design data for verification that it is functionally adequate?

See above (A).

4.11 Inspection and Test Status

(A) Are the inspection and test status of product identified by using markings, authorized stamps, tags, labels, routing cards, inspection records, test software, physical location or other suitable means, which indicate the conformance or nonconformance of product with regard to inspection and test performed?

See an example of Inspection/Test Status Control Sheet and Traveller Sheet shown in following pages.

When the Status Control Sheet/Traveller verifies that the product satisfies all the items of examination, inspection and testing as required by the customer's specification and that the accepted product is ready for shipment, the Shipping Permit and the

Reference Std.
Operation Procedure
XP XXXX

Process Control, Inspection and Testing Status Control Sheet

Customer's Name T

Date of Issue 1 June, 1989

Customer's Order No. 123-001

Issued by Product Design Sec.

Customer's Spec. No. AB-123

Production Instruction No. 890601

Delivery Time 30 July, 1989

Process No.	Production Steps	Acceptance Criteria etc.	Reference Std.	Instrument Used (ID. Number)	Insp./ Test Times	Lot Number	Accepted/ Rejected (Causes)	Disposition	Operator	Responsible person.	Remarks, Notice (nonconformities in past)
1	Receiving inspection EG plate Stain-less steel Perforated steel	See Production Instruction Lot No. Size, Number, Package condition	Purchasing Spec. No.xxxx		1/lot	Lot No. xxxx	Accepted		Mr. a	Mr. A	Watch for heavy rust, and heavy oily surface
2	Shearing	See Production Instruction Machine setting Size tolerance, Camber, bur	Shearing work std. No.xxxx	measuring tape: (No.xx)	1/ every start, 1/ every end		Rejected (bur)	Segregated and reworked (ground off bur)	Mr. b	Mr. B	Shearing work std. shall be revised as to shear edge adjustment.
	Marking	Model & Part No.			every piece						
3	Punching	See Production Instruction Size tolerance, bur	Punching work std. No.xxxx								

Traveller Sheet

Ref. Std. Operational Procedure XP _____

Customer's Name _____ Date of Issue _____

Customer's Order No. _____ Issued by _____

Customer's Spec. No. _____

Production Instruction No. _____

Delivery Time _____

Page 1 of

Process No.	Production Steps	Operator	Accepted/ rejected	Time	Responsible person	Remarks
1.	Receiving inspection EG plate Lot No. Size Package condition S. Steel Lot No. Size Package condition P. Steel Lot No. Size Package condition					
2.	Shearing Size tolerance, camber, bur					
3.	Punching Size tolerance, camber, bur					
4.	Notching – – –					

Inspection Certificate are issued.

The issued Inspection Certificate shall then be signed by the Inspection Section Manager or his designee prior to ship to the customer.

If the completed product is found unacceptable at the final verification, the markings already put on the product shall be erased.

The completed product meeting all the requirements of the customer's specification shall be shipped to the customer by Shipping Control Section in accordance with the order of issued Shipping Permit.

(B) Are the identification of inspection and test status maintained, as necessary, throughout production and installation of the product to ensure that only product that passed the required inspection and test is dispatched, used or installed?

See above (A).

(C) Do records identify the inspection authority responsible for the release of conforming product?

See above (A).

4.12 Control of Nonconforming Product

(A) Does the supplier establish and maintain procedures to ensure that product that does not conform to specified requirements is prevented from inadvertent use or installation?

See an example of in-company standard "Nonconformity Control and Corrective Action".

The essential of good quality is all of the planned/designed qualities are developed into the final product.

In this sense, the following two items are necessary for that purpose;

(a) The final product shall meet the customer' specification (from passive view point) or get the customers' satisfaction (from active view point).

(b) There shall be a system providing good production control and enabling designed qualities to be integrated into the quality of product.

Such a system is generally called as a "Quality System", which refers to ISO 9000 Series of "Quality Systems".

In order to assure the above mentioned (a), it is necessary that the quality system shall perfectly work.

For that purpose, it is very important to take corrective actions whenever any nonconformity to the quality systems occurs.

This word of "Nonconformity" has so an important meaning that if there is any rejects found in the final product inspection/test (so-called "QC Inspection"), that means there is something poor in the in-process quality control and poor nonconformity control in production process.

We can draw on the analogy of the medical terms on these (a) and (b).

While the above-mentioned (a) can be described as a symptomatic treatment, the item (b) can be described as a daily health care system.

This "Quality System" is getting more and more common as abases of quality management.

Without this, real good quality products cannot be produced.

It is a social duty to establish such a system objectively and to maintain it through controls based on the self-control in which actions of "Check and Balance" are made.

Otherwise, it is also impossible to take corrective actions when something nonconformity occurs.

The In-company Standard for Nonconformity Control and Corrective Actions

1. Scope

This in-company standard provides nonconformity control and corrective actions in the process of production, in-process inspection, final inspection.

This standard also covers the nonconformity control in the implementation of quality systems.

Sincere performance of nonconformity control makes the level of quality and productivity up.

2. Definition of Nonconformance

In-company standards generally impose requirements more stringent those of the customer's specifications or other external standards and codes.

The definition of Nonconformity is;

The non-fulfillment of specified requirement.

The definition covers the departure or absence of one or more quality characteristics or quality management elements from specified requirement.

Nonconformance is defined as above, any deviation from the requirements and provisions of the standard, including the provision of Quality Assurance Manual is Nonconformance.

Slight injuries which can be easily reworked are not counted as "Nonconformity" in accordance with the provision of in-company standard.

On the other hand, for example, use of poor calibrated instrument shall be counted as a "Nonconformity" even if it not bring nonconforming material, because of poor implementation of the quality systems.

3. Filling in Nonconformity Report

The operator/section who found nonconformity shall fill the column of "Nonconformity", "Causes of Nonconformity" and "Temporary Disposition" of the "Nonconformity Report" shown in Fig. 1 and send to QA Manager.

4. Segregation, Identification and Record of the Nonconformity

(1) The operator/section who found nonconformity shall identify the nonconforming material with the Tag of "Suspended" and segregate it.

(2) The operator/section who found nonconformity shall record the "Nonconformity" in operational record.

5. Final Disposition of Nonconformity

(1) QA Manager evaluates the "Nonconformity" basing the "Nonconformity Report" and decides final disposition of the "Nonconformity" in consultation with Quality Design Section and so forth.

The types of disposition are "Use as Is", "Rework", "Repair",

Issued date:

Nonconformity & Corrective Action Report		No.
Shipping to	Product Lot No.	Remarks
Grade	Process	
Size	Quantity	

Condition of Nonconformity

Temporary Disposition

Responsible person

Causes of Nonconformity

Responsible person

Final Disposition

QA manager

Corrective actions

Responsible person

Checked by

"Re-graded" or "Scrapped/Rejected" etc. and these shall be selected in consideration of various condition.

Quality Design Section has the responsibility of the disposition above.

If the "nonconformity" deviates from the requirements of the customer's specification, it shall be reported to the customer, if required.

(2) QA Manager fills the column of "Final Disposition of Nonconformity" in the report and instructs the decision of final disposition of the nonconformity including making void of "Suspended" Tag by sending the filled report to the operator/section who found the nonconformity.

(3) The operator/section who is instructed the "Final Disposition of Nonconformity" executes the disposition instructed and fills the column of "Execution of Final Disposition of Nonconformity" and sends it to QA Manager.

6. Corrective Action

QA Manager shall take an initiative to take technical measures necessary to prevent recurrence of the nonconformance in consultation with Quality Design Section and so forth.

These technical measures include initiation or revision of the incompany standards.

If the measures to be taken have basic problems and require technical improvements extensively, solutions shall be achieved through discussions with related organizations at periodical technical study meetings.

These corrective actions taken are written in the column of "Corrective Action" of the Nonconformity Report and send to QA Manager.

QA Manager shall check the implementation of the corrective action.

7. Steps of Nonconformity Control and Corrective Action

(1) Identify a Problem by,
* Brain-Storming

(2) Prove the Causes by the steps;
* Design the data sheet/check list/control chart for data gathering to prove the causes
* Gather current data concerned
* Scatter diagram making of data gathered
* Stratification of data gathered
* Histogram making of data gathered
* Pareto chart making of data gathered
* Fish-bone chart making of the brain-storming results
* And etc.

(3) Plan Corrective Actions by
* Brain-Storming

(4) Carry out the Corrective Actions and Check the effect of them by,
* as same as in (2)

(5) Standardize the Corrective Actions

(6) go back to step (1) like P-D-C-A cycle

(B) Does control provide for identification, documentation, evaluation, segregation (when practical), disposition of nonconforming product and for notification to the function concerned?

See above (A).

4.12.1 Nonconformity Review and Disposition

(A) Are the responsibility for review and authority for the disposition of nonconforming product define?

See 4.12.

(B) Are nonconforming product reviewed in accordance with documented procedures for the product;

a) reworked to meet the specified requirements?
b) accepted with or without repair by concession?
c) re-graded for alternative application?
d) rejected or scrapped?

See 4.12.

(C) When required by the contract, are the proposed use or repair of product {4.12.1 b)} which does not conform to specified requirements reported for concession to the purchaser or his representative?

See 4.12.

(D) Is the description of nonconformity that has been accepted, and of repairs, recorded to denote the actual condition?

See 4.12.

(E) Are repaired and reworked product re-inspected in accordance with documented procedures?

See 4.9 Inspection and Testing.

"Process Control, Inspection and Testing Status Control Sheet" shall be newly issued.

4.13 Corrective Action

(A) Does supplier establish, document and maintain procedures for

a) investigating the cause of nonconforming product and the corrective action needed to prevent recurrence?

b) analyzing all processes, work operations, concessions, quality records, service reports and customer complaints to detect and eliminate potential causes of nonconforming product?

c) initiating preventative actions to deal with problems to a level corresponding to the risks encountered?

d) applying controls to ensure that corrective actions are taken and that they are effective?

e) implementing and recording changes in procedures resulting from corrective action?

See 4.12.

4.14 Handling, Storage, Packaging and Delivery

4.14.1 General

(A) Does the supplier establish, document and maintain procedures for handling, storage, packaging and delivery of product?

See 4.4 (Document Control)'s table In-Company Standard XK, XTO.

4.14.2 Handling

(A) Does the supplier provide methods of handling that prevent damage or deterioration?

See above.

4.14.3 Storage

(A) Does the supplier provide secure storage area or stock rooms to prevent, damage or deterioration of product, pending use or delivery?

See an example of in-company standard XK, XTO shown in 4.4 (Document Control)'s table, in which the above matters are standardized.

The Technical Standard, XK, XTO said above, which controlled by Shipping Control Section, specify the measures to prevent the semi-finished/completed steel product from being deteriorated or damaged during storage and transportation.

Unless otherwise required by customer, these Technical Standards are followed in general.

These Technical Standard provide following items (for steel product).

(1) Regarding storage;

* Some types of products are placed indoor (to prevent rain water).
* To place products at a flat place.
* To prevent heavy items placing on top of products.
* To ensure identification of products.
* Periodical check of condition of products.

(2) Regarding transportation;

* Special lifting lugs and handling devices, such as a nylon sling, to be used.

* Special products control in products yard, at loading and storaging.
* Strict disposition for abnormal condition.
* Special control for transportation.

(B) Are appropriate methods for authorizing receipt and the dispatch to and from such areas stipulated?

See 4.11 (Inspection and Test Status) and 4.12 (Control of Nonconforming Products).

(C) In order to detect deterioration, is the condition of product in stock assessed at appropriate intervals?

See above (A).

4.14.4 Packaging

(A) Does the supplier control packing, preservation and marking process (including material used) to the extent necessary to ensure conformance to specified requirement?

See an example of the matter under, from the in-company standard of "Packaging Standard".

Packaging method to prevent damage which may occur during transportation to the customer are specified in the "Packaging Standard" identified as XK in 4.4' table.

The general Packaging Standard describes various packaging styles.

An appropriate packaging style shall be selected, unless otherwise specifically required by the customer.

When required specifically by the customer, the Quality Design Section shall draw up a new packaging style to satisfy the customer's specific requirement.

The new packaging style is then standardized as a new/revised Packaging Standard (XK) by Quality Design Section.

The shipping marks are also specified in the Packaging Standard (XK).

Appropriate shipping marks are selected and applied to the products by supplier in generally, unless otherwise required by the customer.

When specifically required by the customer, Quality Design Section shall determine new shipping marks to meet the customer's specific requirement, and specify them into a new/revised Production Standard (XP).

In afterwards, the newly established shipping marks, which can be generally used, are standardized as a new/revised Packaging Standard (XK).

(B) Does the supplier identify, preserve and segregate all product from the time of receipt until the supplier's responsibility ceases?

See 4.11 (Inspection and Test Status) and 4.12 (Control of Nonconforming Product).

4.14.5 Delivery

(A) Does the supplier arrange for the protection of the quality of product after final inspection and test?

See 4.14.3 Storage.

(B) Where contractually specified, is this protection extended to include delivery to destination?

See 4.3 (Contract Review) and "Process Control, Inspection and Testing Status Control Sheet) shown in 4.8 (Process Control).

4.15 Quality Records

(A) Does the supplier establish and maintain procedures for identification, collection, indexing, storage, maintenance and disposition of quality records?

See an example of in-company standard "Control of Quality Records".

Control of Quality REcords

1. Scope

This in-company standard provides the Control of Quality Records which affirm that the product completely satisfies the requirements of the customer's specifications and applicable material specifications.

The quality records in this company are summarized into the form of the Inspection Certificate finally, unless otherwise required by the customer.

2. Format and Issuance of Inspection Certificate

The format of the Inspection Certificate and its insurance procedures are specified in the in-company standard "Inspection Certificate" (identified as XX-XXXX).

Inspection Certificates are issued only when the customer's order of which "Manufacturing Order Sheet" specifies "Inspection Certificate Required" in its specified column.

The QA Section Manager is responsible to issue the Inspection Certificate using specified format.

3. Items to be Included in the Inspection Certificate

Items to be included in the Inspection Certificate are as follows.

3.1 Relating to Identification and Quantity of the Product (an example of steel product)

The following items shall be written into the Inspection Certificate, unless otherwise required by the customer, in accordance with the provision of the in-company standard.

These items are;
Certificate number, Manufacturer's name, Factory name, Factory's address, End-user's name, End-user's control number, Trading company's name, Trading company's reference number, Manufacturer's contract number (Order number), Product name, Identification number of specification, Production number, Heat number, Product number, Dimension/Quantity/Weight of product and Issue date of the Inspection Certificate.

3.2 Relating to the results of examinations, inspections and tests based on the requirements of applicable material standard and the customer's specification (an example of steel product).

The following items shall be written into the Inspection Certification, unless otherwise required by the customer, in accordance with the provisions of the in-company standards.

These are;
Chemical composition (including Ladle analysis and Product analysis), Tensile test (including Yield pointer Yield strength, Tensile strength, Elongation at breakage and Yield ratio), Bend test, Impact test, Hydrostatic test, Nondestructive examination (INcluding UST, MPT, PT, RT and ECT), Visual/Dimensional inspection, Austenitic grain size, Hardness test, and Heat-treatment conditions (if required).

3.3 Other Items

(1) A statement to the effect that the materials stated are completely met the requirement of the customer's specification.

(2) Signature of the QA Section Manager and his designee.

(3) Signature of the customer's representative or his designee (in case of witnessed tests).

4. Document to be Attached

When detailed records of manufacture, examination, inspections and tests are submitted to the customer, when required, they shall be attached to the Inspection Certificate.

5. Issuance of Inspection Certificate

The QA Section shall prepare the Inspection Certificate only for the products for which overall evaluation results of all required examinations, inspections and tests are found satisfactory.

After that, the Inspection Certificate shall be signed off by the QA Section Manager or his designee and issued.

6. Retention of original Inspection Certificate and of original attached document

The Inspection Section shall retain original Inspection Certificates for a period of three to ten years, considering the importance of product, in accordance with provisions of incompany standard "Inspection Certificate".

The attached document to the Inspection Certificate stated in 4. above shall be retained of original one for the period as same

above.

7. Records of examinations, Inspections and Tests

Records of examinations, inspections and tests are destroyed at the time when the product is shipped and the Inspection Certificate is issued, unless, otherwise specifically required.

When the records of examinations, inspections and tests are submitted to the customer together with the Inspection Certificate as required by the customer, the duplications of the records are retained for the same period as required for the Inspection Certificate.

4.16 Internal Quality Audits

(A) Does the supplier carry out internal quality audits to verify whether quality activities comply with planned arrangements and to determine the effectiveness of the quality system?

See an example of in-company standard of "Internal Quality Audits"

Internal Quality Audit

1. Scope

This in-company standard provides an audit system to be used to verify the implementation of the Quality System Program stated in the Quality System Manual.

All the organization/personnel related to the provision of the Manual shall be audited for the specific job area of their assigned responsibilities.

2. Categories of Internal Quality Audits

The internal quality audits are categorized into two, which are that made by management and by QA Section.

(1) Management Audit

Management audit shall be made once in every six months by management from the comprehensive view point of the Implementation of Quality Systems stated in the Manual from its beginning "Quality Policy" to end.

(2) QA Section Audit

QA Section Audit shall be made periodically once in every half a month, and occasionally when it is needed.

QA Section Audit shall be made by Quality Assurance Manager and his staffs (Quality System Engineers), intending in-depth audits on each individual contents of the Manual.

3. Audit Team Members

(1) Management Audit Team

* Managing Director
* Quality Assurance Manager
* Quality System Engineer
* Representative who is not closely related to the area to be audited.

(2) QA Section Audit Team

* Quality Assurance Manager
* Quality System Engineers

Note; Quality System Engineer shall be qualified beforehand in accordance with the requirements of in-company

standard (see 4.17 Training).

4. Audit Methods

Periodical audit shall be conducted in accordance with an annual audit schedule prepared in April of each year.

Prior to an audit, the check list (see an example in the following pages) covering the items from all the elements of the Manual is prepared and the audit is conducted using the check list.

All the items found unsatisfactory as a result of the audit are subjected to the corrective actions and re-audit.

5. Corrective Actions

For the items required to take the corrective actions as a result of an audit, the manager who is responsible for the items shall establish the corrective actions to them and submit them in writing to the QA Manager, irrespective of the management audit or QA Section audit, within two weeks from when corrective actions requested.

6. Re-Audit

The purpose of re-audit is to verify the completion/ implementation of proposed corrective actions.

The re-audit shall be conducted within one month from the completion date of such corrective action.

7. Audit Report

The audit team shall document the audit results into the Audit Report.

The duplications of which are sent to Managing Director,

Internal Quality Audit Check List (example)

Area audited _____

Audit date _____

Subject _____

Auditor _____

Appraisal Grade

Grade 5 ..... Very good
4 ..... Good, higher level
3 ..... Fair, normal level
2 ..... Further improvements needed
1 ..... Radical reform needed
N/A ..... Not applicable

Subjects	Check Items	Appraisal grade					N/A	Remarks
		5	4	3	2	1		
1. Quality policy	1) Is the quality policy well understood by each related organization/ personnel such as quality assurance, product designing, product scheduling, production, in-process quality control, quality cost control, inspection/test, maintenance of production facilities, calibration, nonconformity control & corrective actions?							
	2) Is there a climate conductive to implementing quality systems?							
2. Quality system manual	1) Does the manual provide the system in comply with the requirements of latest version of ISO 9002?							

Subjects	Check Items	Appraisal						Remarks
		Grade					N/A	
		5	4	3	2	1		
continued	2) Is the manual reviewed and approved by QA personnel? 3) Are supporting in-company standards referred in the manual also reviewed? 4) Is the distribution of the manual to the related organizations/ personnel controlled? 5) Are the indoctrination/training of the manual performed?							
3.Organization	1) Is the job assignment clearly defined and are responsibility and authority of the related organization/personnel established? 2) Is the functional chart provided, well implemented and well maintained? 3) Are the in-house verification requirements identified? 4) Are the matters which shall be reported to managing director for his review defined and well implemented? 5) Do the managers concerned with the implementation of the quality system program set out in the manual prepare individual procedures to fulfill their assigned responsibilities as set out in the manual?							

Subjects	Check Items	Appraisal						Remarks
		Grade					N/A	
		5	4	3	2	1		
4. Document control	1) Are there in-house procedures/ instructions for production and inspection/test? 2) Are the customer's specifications checked by organization/personnel assigned in the functional chart? 3) Is the revision of in-house procedure/instruction controlled? 4) Is there a provision for custody of document? 5) Does QA personnel check that only latest version of procedures/ instructions are distributed to the locations concerned?							
5. Control of production processes	1) Do the in-house procedures/ instructions for production specify the operational criteria applicable to the production? 2) Do they use a table sheet in order to control production status? 3) Is there the established rule for raw material control? 4) Are there statistical in-process control (such as $\bar{x}$-R chart) performed? 5) Is there the established rule for shipment?							
6. Control of inspection/ test	1) Do the in-house procedures/instructions for inspection/test cover customer's specifications properly?							

Subjects	Check Items	Appraisal						Remarks
		Grade					N/A	
		5	4	3	2	1		
continued	2) Are the inspections/tests performed by qualified personnel? 3) Do they use a table sheet in order to control inspection/test status? 4) Is there a provision for custody of inspection/test record? 5) Are the inspection/test results technically compiled and analyzed?							
7. Identification control	1) Is the identification control properly made on each piece or lot of products? 2) Is the traceability among product and its work instructions and its daily work record verified? 3) Are the identification methods adequate so as to prevent being erased? 4) Are samples taken identified with their population? 5) Is there in-house procedures for identification of materials from raw material to final products?							
8. Nonconformity control	1) Is in-house control standard of nonconformity established? 2) Are the nonconformity materials clearly identified? 3) Are the nonconformity materials, if necessary, notified to managing director?							

Subjects	Check Items	Appraisal						Remarks
		Grade					N/A	
		5	4	3	2	1		
continued	4) Are corrective actions for non-conformities taken? Are those taken both on quality characteristics and quality systems elements? 5) Are there any climate to execute sincere "corrective actions on nonconformities?							
9. Control of measuring and test equipment	1) Is there any in-house standard for measuring and test equipment control? 2) Are there any in-house standards for calibration of the equipment? Is the calibration frequency of equipment adequate? 3) Are the measuring and test equipment identified, by such label as showing validity of calibrations? 4) Are there control ledgers to show the history of calibrations? 5) Are the master gauges, if used, properly controlled and calibrated in the way traceable to national standard?							
10. Maintenance of manufacturing facilities	1) Is there any in-house standard for manufacturing facilities maintenance? 2) Do organizations/personnel in charge of maintenance work well? 3) Are there statistical in-process control (such as a trend analysis chart = $\bar{x}$ - R chart) performed? 4) Are there daily checking system for facilities established?							

Subjects	Check Items	Appraisal						Remarks
		Grade					N/A	
		5	4	3	2	1		
continued	5) Are there periodic repair for facilities established?							
11. Control of subcontractors/vendors	1) Are subcontractors/vendors properly selected? 2) Is the system established that subcontracting/purchasing specifications/instructions are properly conveyed to the subcontractors/vendors? 3) Is the system established that the receiving inspection after subcontract work/purchasing properly performed? 4) Is there the established provision that any adverse to specifications are immediately reported to this company? 5) Is the system established to survey/witness the processes subcontracted?							
12. Marking, storage and shipment	1) Is there the in-house standard concerning storage of finished products? 2) Are the products stored in a manner to prevent deterioration? 3) Is the system established to check whether the marking on the product is properly performed? 4) Is there the procedure providing the protection of product during transportation? 5) Is it rechecked that whether the product satisfies the specification at the time of shipping?							

Format No. _____

Internal Quality Audit Report

Issued No. _____

Audited place _____ Issued by _____

Audit date _____ Prepared by _____

Audit Result

A		Very good
B	1	Good, higher level
	2	Fair, normal level
	3	Further improvements needed
C		Disqualified

Auditor

Headed by _____

members _____

_____

_____

Auditee

_____

_____

_____

_____

_____

Comments

Corrective actions

☐ Requested,

See attached sheet _____

☐ Not Requested,

Sent for

_____

_____

_____

_____

_____

_____

_____

_____

Format No. _____

Corrective Action Request

To _____ Issued No. _____

Term of corrective action to be taken Issued by _____

_____ Prepared by _____

Field of corrective action _____

_____

Nonconformity (attached doc. No.)

Corrective action

Causes of the nonconformity above (attached doc. No.)

Corrective actions (attached doc. No.)

Verification

☐ Satisfaction (closed date) ☐ Dissatisfaction (att'd doc. No.)

Verified by _____ Approved by _____

Quality Assurance Manager, Audit Team Members and the Manager of the Organization audited.

Re-audit results shall also be handled in the same manner.

(B) Are audits scheduled on the basis of the status and importance of the activity?

See above (A).

(C) Are the audits and follow-up actions carried out in accordance with documented procedures?

See above (A).

(D) Are the results of audits documented and brought to the attention of the personnel having responsibility in the area audited?

See above (A).

(E) Does the management personnel responsible for the area take timely corrective action on the deficiencies found by the audit (4.13 Corrective Action)?

See above (A).

4.17 Training

(A) Does the supplier establish and maintain procedures for identifying the training needs and provide for the training of all personnel activities affecting quality during production and installation?

See an example of the in-company standard "In-Company Indoctrination and Training".

In-Company Indoctrination and Training

1. Scope

The Indoctrination and training programs for all the personnel performing quality activities, which is required to ensure conformance with the specified quality requirements, are provided in this in-company standard.

2. Indoctrination and Training Program

The Personnel Section shall establish and implement the general indoctrination and training program for each technical and clerical white-collar workers and blue-collar workers.

Table 1 in this section shows general indoctrination and training program for blue-collar workers.

The general indoctrination and training of Quality Assurance and Quality Control for blue-collar workers is performed in class of "Control Skills Training" shown in the program said above.

3. Records of Indoctrination and Training

The records of indoctrination and training implemented based on 2. above are controlled by Personnel Section.

4. Indoctrination and Training of the QS Manual

Indoctrination and training of the QS Manual are planned and conducted by the Quality Assurance Section.

The QS Manual shall be indoctrinated and trained with the following items concerned.

(1) General

* Current informations and requirements of customers

* Recent nonconformities/customer's complaints and corrective actions for them
* Recent audit results by outside organizations
* Recent internal audit results (findings found)

(2) Education of Standards and Codes Relating to Quality Assurance

* The Standards and Codes of JIS, ISO, etc.
* The Standards and Codes relating to the important materials used
* The Standard and Codes relating to ordinarily used grade materials

(3) Outline of the Quality System Manual

(4) Specific part of the Quality System Manual and associated in-company standards

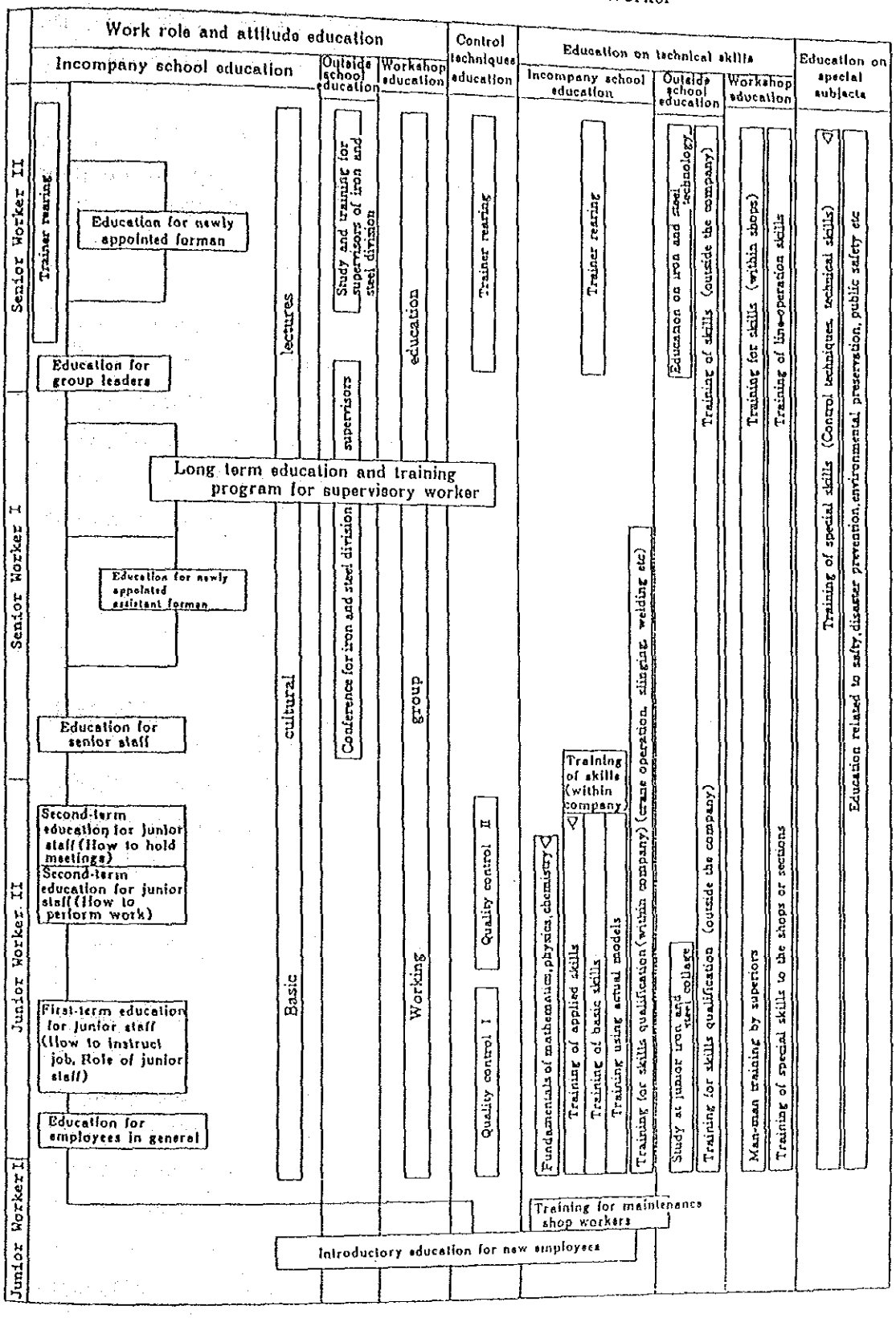
The indoctrination and training of the Manual is usually conducted at the time of internal audit.

5. Indoctrination and Training of Associated In-Company Standard with the Implementation of the Manual

Indoctrination and training of in-company standards associated with the implementation of the Manual, and strict adherence to the requirements of such in-company standards are of the responsibility of the In-Company Standards Controllers for the specific in-company standards which are distributed to them, who are disposed in each sections (See 4.4 Document Control).

Methods of the indoctrination and training of, and the strict adherence to the in-company standards include training seminars by internal lecturers, class-room type reading meetings, and small scale discussion meetings.

Education and Training Program for Blue Collar Worker



▽ Use correspondence school system

(B) Are personnel performing specific assigned tasks qualified on the basis of appropriate education, training and/or experience, as required?

See an example of in-company standard "Qualification of Personnel"

1. Scope

This in-company standard provides Qualification of Personnel.

This company maintains specified qualification and certification procedures for nondestructive examination (hereinafter referred to as NDE) personnel, visual and dimensional inspectors, material test personnels and the Quality System Engineers, as in-company standards.

2. Nondestructive Examiners

2.1 Equivalency of the In-Company Qualification to the Outside Organization's Rules

This company's Nondestructive Examiner Qualification System meets the requirements of ASME Code and SNT-TC-1A Rules.

2.2 NDE Personnel Qualification and Certification Committee

(1) The NDE Personnel Qualification and Certification Committee (hereinafter referred to as "Committee") has been established in accordance with above mentioned Rules to maintain and control the effectiveness of the overall plan for training, and qualification and certification of NDE personnel in this company.

(2) This Committee is consisted of the Personnel Section Manager, acting as a chairman, and Level III examiners, the Quality Assurance Section Manager, and the Inspection Section Manager.

2.3 Qualification and Certification

(1) NDE examiners of all levels are qualified and certified by the Committee.

All NDE examiners are required to satisfy the following items in accordance with the above mentioned Rules.

* To receive indoctrination and training, and pass the examinations as required by ASME Code and SNT-TC-1A Rules.

* To comprehend the purpose and technical contents of the NDE concerned.

* To have enough work experience to carry out assigned NDE and working attitude suitable for a qualified NDE worker.

* To pass the annual physical test, such as visibility and color-blindness test, conducted by a medical doctor (the near-distance acuity shall be at least 0.8 on page 3 of the Universal Near Visibility Test Chart).

(2) The Committee issues the Qualification Certificate and a Badge to the qualified examiner.

The certified examiner shall wear the Badge on his working uniform while he is engaged in NDE work.

(3) Qualification and certification records and examination records for Level I, II and III examiners are retained by the Committee for the period in which the certification is valid.

3. Qualification and Certification of Visual and Dimensional Inspectors

3.1 Qualification and Certification Rules

This company maintains the Qualification and Certification Rules for Visual and Dimensional Inspectors for the personnel engaged in visual and dimensional inspections.

3.2 qualification and Certification Committee

(1) The Qualification and Certification Committee for Visual and Dimensional Inspectors (hereinafter referred to as "Committee") has been established to promote, maintain, and control qualification and certification procedures for visual and dimensional inspectors.

(2) The Committee consists of the Personnel Section Manager, acting as a chairman, the Quality Design Section Manager, the In-Process Control Section Manager, Inspection Section Manager, Quality Assurance Section Manager and his Quality System Engineers in charge.

3.3 Qualification and Certification

(1) Qualification and certification of visual and dimensional inspectors are based on specific examination, aptitude test, and physical test in accordance with above mentioned Rules, and these are as follows;

* Specific examination

The specific examination is a written examination to see the applicant's general knowledge on Quality Assurance, product Specifications and Product Applications concerned, Manufacturing Methods, Characteristics and Causes of Defects, and their Relationship to the NDE Technics and the Product Inspection Standard (XI) concerned.

* Practical Examination

The practical examination is performed to see the applicant's ability for visual and dimensional inspection, using standard samples and products referring to the Product Inspection Standards (XI) concerned.

* Aptitude Test

The aptitude test is performed to see the applicant's ability to judge and respond to the defects appeared on the product during the inspection activity, and to evaluate his aptitude for visual and dimensional inspection.

* Physical Test

The physical test is performed to see the applicant's visibility at near distance and far distance, discrimination of colors, and his health condition.

(2) The Committee issues the Qualification Certificate and a Badge to certified inspectors.

They shall wear the Badge on their working uniforms while they are engaged in visual and dimensional inspection.

(3) Qualification and certification records and examination records are retained by the Committee for the period in which the certification is valid.

4. Qualification and Certification of Material Test Personnel

4.1 Qualification and Certification Rules

This company maintains the Qualification and Certification Rule for the personnel engaged in material test.

4.2 Qualification and Certification Committee

(1) The Qualification and Certification Committee for Material Test Personnel (hereinafter referred to as "Committee") is established in accordance with above mentioned Rule to maintain and control the effectiveness of the plan for training, and qualification and certification of Material Test Personnel.

(2) The Committee is consisted of the Personnel Section Manager, acting as a chairman, Level III examiners, and the Inspection Section Manager.

4.3 Qualification and Certification

(1) Qualification and Certification are based on the written examination, which is classified into the common examination and the specific one.

* Common Examination

Knowledge on material test in general, quality control, characteristics of steel and its applications to products are examined.

* Specific Examination

Knowledge on mechanism and function of specific testing machines, and methods and purpose of mechanical test, macro-, micro-structure tests are examined.

(2) The Committee issues the Qualification Certificate and a Badge to the certified personnel.

The certified personnel shall wear the Badge on his working uniform while he is engaged in material test.

(3) Qualification and certification records and examination

records are retained by the Committee for the period in which the certification is valid.

5. Qualification and Certification of Quality System Engineer (hereinafter referred to as QSE)

5.1 Qualification and Certification Rule

This company maintains QSE Qualification and Certification Rules.

QSE is defined as Quality Assurance Personnel located in sections in charge to control/monitor the implementation of Quality Assurance System stated in this Manual.

5.2 Qualification and Certification

QSEs shall be qualified by personnel Section in accordance with above mentioned qualification rules.

QSEs shall be qualified within the personnel who do not directly control/monitor the items in charge.

(C) Are appropriate records of training maintained?

See above (A) and (B).

4.18 Statistical Techniques

Where appropriate, does the supplier establish procedures for identifying adequate statistical techniques required for verifying the acceptability of process capability and product characteristics?

See the "7 Tools and 7 Steps of Quality Activity" under

Especially the "Run/Control Chart" is useful for above purpose.

Stratification of the controlled error from the uncontrolled error is important action for above purpose.

ANNEX 5-12

SUGGESTION ON PROVISIONS TO BE EMPLOYED IN THE MEASUREMENT LAW AND PROBLEMS TO BE STUDIED

Matters provided in the measurement law and decrees (by the government) and rules (by the ministries) for implementation of the law are suggested in each box, and problems to be solves are described outside the boxes. Note that numbers of article and clause are omitted in the suggestions.

Chapter I General Provisions

(Purpose)

The purpose of this Law is to establish the standards of measurement and secure administration of proper measurements and thereby to contribute toward the development of economy and uplifting of culture.

"To establish the standards for measurement" means establishment of units for measurement as a basis for measurement. To achieve this purpose, it is necessary to set up standards for standards of quantities concerning 7 types of basic physical states. It is necessary to derivate and establish various measurement units depending on the standards."

Also, to "secure administration of proper measurement" is to secure implementation of accurate and rational measurement, and for that purpose efforts are required for introduction of various systems such as unification of measurement units, registration of manufacturers, repair shops and sellers of measuring instruments, accreditation of measuring instruments, and restrictions over measuring instruments used at home so that accurate instruments will be acquired by users. Also efforts are required for periodical check of measuring instruments, inspection, and control over measurement scale to prevent

illegal and unfair measurement as well as for introduction of official qualification for measurement engineer and specification of job site where measuring instruments are used.

It is necessary to correctly understand that the final purpose of the measurement law is to secure rationalization of and accuracy in measurement and contribute to development of economy and uplifting of culture standard by rationalizing various industrial activities and daily life of citizens through smooth and correct implementation of these systems.

Section 2 Definitions of Measurement and Measuring Units

The terms "measurement" as used in this Law shall mean to measure length, mass, time, electric current, temperature, amount of substance, luminous intensity, area, volume, speed, acceleration, force, pressure, work, power, amount of heat, angle, angular velocity, angular acceleration, solid angle, flow rate, mass flow rate, viscosity, kinematic viscosity, density, concentration, wave number, frequency, electric energy, electric power, electric charge, voltage, electromotive force, electric field strength, electric resistance, electric conductance, electrostatic capacity, inductance, magnetic flux, magnetic flux density, magnetomotive force, magnetic field strength, reactive electric power, reactive electric energy, apparent electric power, apparent electric energy, thermal conductivity, specific heat, entropy, radiant intensity, luminous flux, luminance, illuminance, radioactivity, neutron emission rate, exposure dose, absorbed dose, noise level and quantities should be decided in decrees (hereinafter referred to as "quantity of the state of physical phenomena", and the term "measuring units" shall mean the standards for measurement.

Of the 7 types of quantity and the measurement units for the quantities ranging from "length" to "light intensity defined in resolutions in the general conference of weights and measures and others, each derivated unit derivated from the basic unit, 51 types of

quantities from "area" to "noise level" must be defined in the measurement law. Other quantities having derivated units should be decided in decrees, but it is desired that the quantities are not limited to those for legal metrology and include those for industrial metrology and scientific metrology.

(Base Units and Representations)

The measuring units of length, mass, time, electric current, temperature, amount of substance and luminous intensity shall be as follows:

(1) The measuring unit of length shall be the meter.

The meter is the length equal to 1,650,763.73 times the wavelength of the light in vacuum of the radiation corresponding to the transition between the energy levels $2p_{10}$ and $5\ d_5$ of the krypton-86 atom and shall be represented by the method decided by Cabinet Order in conformity with the resolution of the General Conference of Weights and Measures.

(2) The measuring unit of mass shall be the kilogram.

The kilogram shall be the mass of the International Prototype Kilogram and shall be represented by the Prototype Kilogram delivered to Japan in accordance with the Metric Convention.

(3) The measuring unit of time shall be the second.

The second is represented as the time equivalent to 9,192,631,770 times the period of radiation corresponding to the transition between the two hyperfine energy levels of the cesium-133 atom in the ground state.

(4) The measuring unit of electric current shall be the ampere.

The ampere is represented by the Minister of International Trade

and Industry as constant electric current which flows through each of two straight linear conductors of infinite length and of negligible circular sectional area placed one meter apart in vacuum and exerts each other the force of 2/10,000,000 newton per one meter of the length of these conductors.

The ampere in alternating current shall mean the electric current equal to the root mean square of instantaneous values throughout one period, in terms of the ampere as indicated in the preceding Paragraph.

(5) The measuring unit of temperature shall be the kelvin.

The kelvin shall be 1/273.16 of the thermodynamic temperature at the triple point of water and shall be represented by the method provided for by Cabinet Order in conformity with the resolution of the General Conference of Weights and Measures.

(6) The measuring unit of amount of substance shall be the mole.

The mole shall be the amount of substance of a system composed of elementary particles or of a set of elementary particles (limited to that of a definite composition), the number of which equals to that of atoms contained in 0.012kg of carbon-12, and it shall be used by specifying the elementary particle or the set of elementary particles.

(7) The measuring unit of luminous intensity shall be the candela.

The measuring unit of luminous intensity shall be the candela.

The candela shall be the luminous intensity in the perpendicular direction, of a plane surface of 1/600,000 meter of a black body at the freezing temperature of platinum under a pressure of 101,325 newton per square meter.

The luminous intensity of the light source whose colour is different from that of the black body at the freezing

temperature of platinum provided in the preceding Paragraph shall be decided by Cabinet Order in conformity with the resolution of the General Conference of Weights and Measures.

The candela shall be represented by the standard kept in custody by the Minister of MINECOM.

(Custody of the Prototype and Auxiliary Prototype)

The prototype Kilogram in Item (2) of the preceding Article and the Auxiliary Prototype Kilograms manufactured therefrom shall be kept in custody by the Minister of MINECOM.

(Derived Measuring Units and Presentations)

The measuring units of area, volume, speed, acceleration, force, pressure, work, power, amount of heat, angle, angular velocity, angular acceleration, solid angle, flow rate, mass flow rate, viscosity, kinematic viscosity, density, concentration, wave number, frequency, electric energy, electric power, electric charge, voltage, electromotive force, electric field strength, electric resistance, electric conductance, electrostatic capacity, inductance, magnetic flux, magnetic flux density, magnetomotive force, magnetic field strength, reactive electric power, reactive electric energy, apparent electric power, apparent electric energy, thermal conductivity, specific heat, entropy, radiant intensity, luminous flux, luminance, illuminance, radioactivity, neutron emission rate, exposure dose, absorbed dose and noise level shall be as follows:

(1) The measuring unit of area shall be the square meter.

The square meter shall mean the area of a square whose sides are one meter in length.

(Auxiliary Measuring Units)

The auxiliary measuring unit of the measuring units (Base Units and Representations) and the preceding Article shall be as follows.

(1) The auxiliary measuring unit of the meter in Article 3 Item (1) shall be the micron. The micron shall mean 1/1,00,000 of the meter.

2. Besides the auxiliary measuring units prescribed in the preceding Paragraph, the auxiliary measuring units composed by multiplying 10^n (n being an integer) to the measuring units as well as the auxiliary measuring units shall be provided for by Cabinet Order.

(Symbol)

The symbols of the measuring units (Base Units and Derived Units and Auxiliary Measuring Units) (Above mentioned measuring units and auxiliary measuring units shall hereinafter be referred to as "legal measuring units") shall be provided for by the MINECOM Ordinance.

(Prohibition to Use of Non-Legal Measuring Units)

As to the quantities of the state of physical phenomena as provided for (Base Units and Representations) and (Derived Units and Representations), measuring units other than the legal measuring units shall not be used in measurements (including indications of the quantity of the state of physical phenomena) for transaction or certification, provided, however, that this shall not apply to measurements of export goods and measurements concerning import goods.

It should be clarified that the metric system is employed as units for legal metrology and other units for measurement must not be used for business transactions or for certification, and that units for measurement will be unified under the metric system. However,as for goods exported from or imported into Chile, it is necessary to allow use of units other than legal metrology units because of the circumstances in partner countries, but it is needless to say that legal units for measurement must be used when the imported goods are sold in the country.

(Definition of Transaction and Certification)

The term "transaction" as used in this Law shall mean any act in business, with or without compensation, the object of which is either the delivery of goods or the performance of services.

2. The term "certification" as used in this Law shall mean the act of certifying to the public or to other persons that a certain fact is true in the course of business.

3. The measurements, conducted by using measuring instruments prescribed by Cabinet Order, for the prevention of impairments to human lives or properties with respect to driving carriages or ships or to handling explosives, gases and other dangerous materials, shall be deemed to be certification in the application of this Law.

"Other party on jobs" means other legal bodies, and "to express that a certain fact is true" is typically a various types of certifications issued by certifying bodies.

The measuring instruments used for safety of people or prevention of danger to property include speed meters for running vessels and ships, pressure gauges, thermometers and pressure gauges for vessels for storing high pressure gas, precision balances for producing poisons

and others, volume gauges for scientific research, density meters and others.

(Definition of Measuring Instruments)

The term "measuring instruments" as used in this Law shall mean appliances, machines or equipments used for measurements, which are decided in decrees (excluding the Prototype Kilogram, the Auxiliary Prototype Kilogram and the standards).

Under the measurement laws, measuring instruments, which should become objects for verification, type approval and control, must be specified in a decree. Provisions should naturally be given in the measurement law for watt hour meters, flow rate meters (water supply meters, gas meters), and speed meters (taxi meter), which are now under control by other laws or decrees, and also the possibility to put measuring instruments to secure fair business transaction (such as length meters, mass meters, measures, volume meters, calorie meters, and illumination meters etc.) and measuring devices for health care (such as thermometer and aneroid type of pressure gauges) under control by the measurement law.

When selecting measuring instruments to be put under control by measurement law, those widely used for business transaction and certification and not satisfying the condition (1) or (2) should be selected.

1) Measuring instruments used by specialists and which are not required to be put under control by the measurement law because of advance in technology for production of the measuring instruments (such as precision measurement instruments, and machines for testing etc.)

2) Measuring instruments having rough precision, which are not required to be guaranteed by verification (household measuring cup, etc.)

Chapter II. Enterprises Relating to Measuring Instruments

Section 1. Manufacture

(Registration for Enterprise of Manufacture)

Any person who intends to engage in an enterprise of manufacture of measuring instruments (including remodelling) shall obtain the registration of Minister of MINECOM accordance with the classification of enterprises provided for by the MINECOM Ordinance. Provided, however, that this shall not apply in case that he intends to engage in the enterprise of manufacture of measuring instruments to be used for the mere purpose of his own other than transaction or certification.

(Application for Registration)

Any person who intends to obtain the registration by the preceding Article shall submit a written application stating the following matters, in the case of the measuring instruments (hereinafter referred to as "electric meter") mentioned in Item (11) through Item (13) of Article 12 (Definition of Measuring Instruments) to the Minister of MINECOM and, in case of the other measuring instruments, as stipulated by the MINECOM Ordinance, to the same Minister through the governor of prefecture:

The first requirement to secure implementation of correct measurement is to provide accurate measuring instruments. If manufacturing of measuring instruments is left free and even manufacturers not having appropriate equipment and facilities are allowed to manufacture measuring instruments, the public interest of implementation of correct and fair measurement is spoiled, and registration of the manufacturers is made so that only manufacturers

satisfying certain conditions will be allowed to manufacture measuring instruments.

The (criteria for registration) means making it a duty for registered manufacturers to own equipment and facilities for inspection of measuring instruments to be manufactured, and concrete provisions should be defined for each measuring instrument.

Decision and filing of provisions for inspection are required to secure high quality measuring instruments by diffusing spontaneous inspection, and the provisions for inspection should be as follows.

(1) Organizations for performing inspection of the measuring instruments (including important parts)

(2) Equipment and facilities for inspection and method for consolidation

(3) Method and timing for implementation of inspection of the measuring instruments

(4) Method for disposing defected measuring instruments

(5) Method for storing records of results of inspection

(6) Other items required for implementation of inspection

(Term of validity of registration) should generally be for 10 years, and re-registration should naturally be allowed.

Section 2. Repair

(Registration for Business of Repair)

Any person who intends to engage in the business of repairing measuring instruments shall obtain, in accordance with the classification of business provided for by the MINECOM Ordinance, the registration of the Minister of MINECOM and the registration of the respective governor of Province who has the jurisdiction over the area including the place wherein the person intends to carry out the business in case that it is related to the other measuring instruments. Provided, however, that this shall not apply in case that he intends to engage in the business of repairing measuring instruments to be used for the mere purpose of his own other than transaction or certification.

(Procedure of and requirements for registration) relates to application for registration and criteria for registration, and different requirements are necessary for each manufacturer, but it may be considered that other items for manufacturers can be covered by application of a decree by a ministry.

Purpose of enactment of this decree is the same as that of registration of manufacturers.

Section 3. Sales and Brokerage of Sale

(Registration of Business of Sale, Etc.)

Any person who intends to engage in the business of sale or brokerage of sale of measuring instruments (hereinafter being referred to as "sale, etc.") provided for by Cabinet Order (excluding the sale or brokerage of sale for export) shall obtain, in accordance with the classification provided for by the MINECOM Ordinance, the registration of the respective governor of Province who has the

jurisdiction over the area including the place wherein the person intends to carry out the business.

Measuring instruments specified in the decree will be selected from those under control by the measurement law, and the criteria for the selection includes the following items.

(1) Measuring instruments which are sold to general consumers and users who cannot be expected to have knowledge concerning measuring instruments.

(2) Measuring instruments widely used for fair and correct business transaction

(3) Measuring instruments for health care

For this reason, it can be considered that the measuring instruments as described below will become objects for restriction by the decree.

(1) Hand-held balance and indicator balance with the limit weight of 150 Kg or below, and weighs used in these types of balance

(2) Clinical thermometer made of glass

(3) Aneroid ashygmomanometers

Most of what was described about registration of repair shops can be applied to (procedure of and requirement for registration), but as for (criteria for registration), it can be considered that the following conditions should be satisfied.

(1) The applicant must have a shop required to perform business such as sales.

(2) The applicant must have knowledge concerning verification marks, type approval number and structure and allowance of the measuring instruments and required in the business.

Chapter III Preservation of Security of Measurement

(Duty for Conforming to Provisions in Manufacturing, Etc.)

The manufacturer of the measuring instruments which are considered as to serve mainly for the use of the daily life of general consumers and are provided for by Cabinet Order shall, in case that he intends to manufacture the relevant measuring instrument, make them conform to the technical provisions provided for by the MINECOM Ordinance. Provided, however, that this shall not apply in the case of manufacturing the relevant measuring instrument for export and in the case of making trial manufacture of the said measuring instrument.

2. Any person who intends to engage in the business of importing the measuring instrument provided for by Cabinet Order mentioned in the preceding Paragraph shall, in the case of sale of the relevant measuring instrument, sell those which conform to the technical provisions provided for by the MINECOM Ordinance. provided, however, that this provision shall not apply, in case that he intends to sell the relevant measuring instrument for export.

(Indications)

The manufacturer provided for by the preceding Article Paragraph 1 or the person who is provided for by the same Article Paragraph 2 shall, beforehand he sells the relevant measuring instrument, affix the indications thereto by the form provided for by the MINECOM Ordinance. Provided, however, that this shall not apply to the measuring instruments which are manufactured or sold under the provision of Proviso of Paragraph 1 or Proviso of Paragraph 2 of the said Article respectively and

to the measuring instruments which have passed the verification.

2. Nobody shall, except for the case of affixing the indications under the provision of the preceding Paragraph, affix to a measuring instrument the indication mentioned in the same Paragraph or an indication liable to be confounded with the said indication.

(Restrictions on Use)

Those which are not equipment, machinery or apparatus for measurements and the measuring instrument coming under any one of the following items shall not be used or possessed for making use thereof, for the purpose of measurements by legal measuring units for transaction or certification ...

(1) Measuring instruments which are neither stamped with a verification mark nor a calibration mark;

(2) Measuring instruments provided for (Term of Validity of Verification), which have passed the verification but the term of validity of verification has expired.

Of the measuring instruments which can be regarded as those used in daily life of consumers and are specified in the section concerning "duty of conforming to standards in manufacturing", measuring instruments specified in the decree are those used at home, so it is better to limit the instruments to a very few instruments such as a length meter (a scale, a tape measure), a balance, and a measuring cup. Verification of these types of measuring instrument is not necessary, and technical standards should be decided, and a duty to follow the standards should be introduced. It may be considered, however, that, of the measuring instruments used at home, clinical thermometers and ashygmomanometers are directly related to health of users and should be objects for verification.

In a decree for (restriction of use).....
For this reason, it would be better to employ a negative system where object measuring instruments for authorization are decided and other measuring instruments are specified.

(Sales by Legal Measuring Units)

Any person who sells commodities which are suitable for sale by measuring length, mass or volume shall make effort to sell such commodities by length, mass or volume in the legal measuring units.

(Indication of Length, Etc. to Commodity)

Any person who sells the commodities in the legal measuring units, after measuring length, mass or volume of the commodities in terms of the legal measuring units, shall make an effort to indicate length, mass or volume of the commodities in the relevant legal measuring units.

(Duty to Measure Accurately)

Any person who makes transaction or certification in the legal measuring units as to the quantity of the state of a physical phenomenon provided for by Cabinet Order with respect to the commodities provided for by Cabinet Order shall measure the quantity so as not to exceed the error provided for by Cabinet Order.

2. In addition to the above cases provided for by the preceding Paragraph, the person who makes transaction or certification as to the quantity of the state of a physical phenomenon in the legal measuring units shall make an effort to measure the quantity accurately.

It is necessary for a decree for (a duty to accurately measure) to include as many measuring instruments used in general business

transaction as possible for protection of consumers. The same principle can be applied to the allowable error of the measuring instruments.

(Indication of Net Content, Etc.)

When the person who sells the commodity prescribed by Cabinet Order prepares the commodity, in a container or package, in such a way that one can neither increase nor decrease the length, mass or volume thereof without breaking the container, package or seal attached thereto, he shall indicate, on the container or package, the length, mass or volume (hereinafter referred to as "net content") of the commodity in the legal measuring units as prescribed by Cabinet Order.

2. When the person who sells the commodity prescribed by Cabinet Order of the preceding Paragraph by length, mass or volume, in the legal measuring units indicates the net content of the commodity under the provision of the said Paragraph, he shall measure the net content in such a way that the error shall not exceed the limit prescribed by Cabinet Order provided that the indication is in either the length, mass or volume prescribed by Cabinet Order.

(Indication of a net content) In general business transaction, fairly many goods will be put under control by this provision. In the decree, provisions reflecting trends in the market of refrigerated foods and instant foods and based on considerations to form of sales of each food will be required.

Chapter IV Verification, Pattern Approval, Calibration and Inspection of Verification Standards

Section 1. Verification

(Subject of Verification)

The verification of the measuring instruments shall be performed by Ministry of MINECOM, the respective governor of Province or the body designated by Ministry of MINECOM (hereinafter referred to as "designated verification body") according to the classification as determined by Cabinet Order.

(Place of Performing Verification)

The place of performing verification shall be the verification offices established in the MINECOM or government of Province or the designated verification bodies. Provided, however, that the case mentioned in either of the following items shall be subject to the provision of respective items:

(1) The place where the measuring instrument is located when the verification cannot be performed at the verification office due to calamities or some other reasons beyond control;

(2) The place where the land, building or another structures are located in the case of the measuring instrument which must be used by fixing to a land, building or another structures and which are provided for by the Ministry of International Trade and Industry Ordinance.

(Conditions for Qualification of verification, Etc.)

When a measuring instrument, which has been verified, conforms to Item (1) through Item (3), it shall be regarded as qualified:

(1) That the measuring instrument is of a kind of the measuring instruments prescribed by Cabinet Order;

(2) That the measuring instrument is of the construction (including the quality of material, hereinafter the same) prescribed by MINECOM Ordinance;

(3) That the instrumental error does not exceed the verification tolerance prescribed by Cabinet Order.

(Term of Validity of Verification)

The term of validity of the verification of a taximeter, gas-meter, water-meter, gasoline measure, electric meter and another measuring instruments prescribed by Cabinet Order are the periods prescribed by Cabinet Order counting from the first day of the month following the month in which the verification mark has been affixed.

(Verification Mark, Etc.)

The verification mark shall be affixed to the measuring instruments which have passed the verification.

2. On the verification mark to be affixed, in accordance with the provision of the preceding Paragraph, to the measuring instruments provided for in the preceding Article, the expiration date of the term of validity of the preceding Article shall be indicated.

(Time Limit for Verification)

The Minister of MINECOM, the governor of Province or the designated verification bodies shall, when they have received an application for verification, perform the verification of measuring instruments applied for and dispose of its qualification or disqualification within twenty days from the date of the receipt of the application.

(Notice of Reasons for Disqualification)

The Minister of MINECOM, the governor of Province or the designated verification bodies shall notify the reasons for disqualification to the person who applied for the verification when the disposal of disqualification was taken after performing the verification of measuring instruments.

(Deletion of Verification Mark, Etc.)

In case a measuring instrument which has been disqualified in the verification bears a verification mark, a calibration mark or a matching number in the same paragraph, such a verification mark, calibration mark .cp3
shall either be removed or cancelled with an obliteration mark.

(Subject of verification): Verification organizations specified by the Economy Minister will become a body responsible for verification. One or several organizations should be specified for each division decided in the decree, and it is necessary to clearly specify organizations verificating equipment and facilities to be owned by the specified organizations, qualification of verification inspectors, the number of staff, and the duty to calibrate standards device for verification according to the national standards in, for instance, a decree by the Ministry of Economy.

The (term of validity of verification) should be decided in a range from 5 years to 10 years. The term of validity of verification for meters for electricity, gas meters and water supply meters should be 10 years, and such devices as taxi meters in a range from 3 to 7 years because of the necessity of calibration, usage and life of the measuring instruments. Note that the term of validity of taxi meters is 1 year in many countries. Also note that generally a term of validity is not specified for length meters and weight meters because of usage of such devices.

The allowable error in verification specified in a decree for (conditions for passing the verification) varies according to structure of, restrictions, and expected performance of the measuring instruments, but generally the allowable error should be in a range from 1 to 2 %.

Section 2. Model Certification

(Model Certification)

Provisions shall be made to enable manufacturers of measuring equipment to be eligible for Certification by the Minister of MINECOM as an alternative to verification for model testing, provided that the measuring equipment of said manufacturers complies with the following items.

(1) Said manufacturers of said measuring equipment shall manufacture the equipment concerned in factories certified by a certification entity approved and accredited by the Minister of MINECOM (hereinafter referred to as Quality System Certification Body) in pursuance with the classification laid down by Government Decree or Ordinance and on the basis of certification procedures conforming to the certification criteria laid down by Ministry of MINECOM decree.

(2) Said manufacturers of said measuring equipment shall have passed the testing and inspection procedures conducted by a designated verification/inspection body in accordance with the model testing criteria laid down by Ministry of MINECOM decree.

(Period of Validity for Model Certification)

The period of validity for model certification shall be determined on the basis of the (Term of Validity for Verification/ Inspection).

(Model Certification Mark)

A certification mark taking the form of specific stamp shall be affixed to measuring equipment having passed the model certification procedures.

2) The model certification mark affixed under the provisions of the previous sub-section to the measuring equipments designated in the previous section shall display the final date of validity of model certification as defined above.

Any further or other details, including the "scope of model certification" and "notification of non-conformity with statement of reasons(s)", shall be ruled by Ministry of MINECOM Decree.

As a principle, devices for legal measuring instrument should be verified individually. For this reason, of the measuring instruments, those not used in transaction nor in certification are not always required to be verified, but such devices as meters for electricity, water supply meters, gas meters, and taxi meters and measuring instruments for health care should be verified before delivery. For this reason, as a vast quantity of works is required for verification, and also because of the economical rationality that unnecessary cost burden should not be put on shoulders of manufacturers having the capability to correctly manufacture measuring instruments, so it would be reasonable to introduce a system of type approval in place of verification.

This certification is for factories certified by organizations certifying quality systems and measuring instruments produced in the factories, and is issued only to manufacturers who passed model testing by specified verification organizations.

Accordingly, manufacturers not satisfying the conditions, repaired or modified measuring instruments, and measuring instruments with the term of validity for certification of verified model already terminated are objects for verification.

As measuring instruments for health care are used by consumers or in hospitals, it is difficult to be verified again, and life of such devices as clinical thermometers and asphygmomanometers is not so long because of their construction, so that it is not necessary to specify the term of validity, and only verification before delivery is enough for restriction over such devices.

It will be necessary to employ the "criteria for certification" for quality systems specified in a decree by a ministry according to the ISO 9000 series so that the provisions will be accepted internationally. In addition, this "criteria for certification" must include provisions concerning adjustment of instrument errors between each unit, compulsory inspection, acquisition, proper maintenance and control of standard devices used for that purpose.

As organizations certifying quality systems for measuring instruments are required to have special technological knowledge in addition to knowledge on quality control, certification for the organizations should be different from that for industrial products.

Section 3. Inspection of Verification Standards

(Subject of Inspection of Verification Standards)

The inspection of verification standards shall be performed by the Minister of MINECOM, the National Metrological Laboratory or the body designated by Ministry of MINECOM (hereinafter referred to as "designated calibration body") according to the classification of standards as determined by Cabinet Order.

(Conditions for Qualification of Inspection of Verification Standards)

When a verification standard which has received the inspection of verification standards is in conformity with all of the item (1) to (3), it shall be regarded as qualified:

(1) That the verification standard is of a kind of standards prescribed by the Cabinet order;

(2) That the verification standard is of the construction prescribed by the Ministry of International Trade and Industry Ordinance;

(3) That the instrumental error does not exceed the tolerance of verification standards prescribed by Cabinet order.

(Term of Validity of Inspection of Verification Standards)

The term of validity of the inspection of verification standards shall be three years. Provided, however, that the verification standard prescribed by Cabinet Order shall follow the stipulation thereof.

(Mark of Inspection of Verification Standards)

A verification standard which has passed the inspection of verification standards shall be affixed with a mark of inspection of verification standards.

(Certificate of Inspection of Verification Standards)

When a verification standard is qualified in the inspection thereof, a certificate of the inspection of verification standards, on which its instrumental error is recorded, shall be delivered to the person who applied for the inspection.

2. On the certificate of the verification standard under the preceding Paragraph, there shall be written the method of correction for its instrumental error and the term of validity.

A verification standard which has passed the inspection of verification standards shall not be assigned or lended unless it is accompanied with the certificate of the inspection of verification standards.

2. A verification standard which has passed the inspection of verification standards shall be used by correcting the instrumental error in accordance with the method mentioned in the certificate of the inspection of verification standards.

(Mutatis Mutandis Application)

The provisions of (Place of Performing Verification), (Time Limitation for Verification) and (Notice of Reasons for Disqualification) shall apply mutatis mutandis to the inspection of verification standards.

The reference devices are tools, machines and devices used as references for quantities concerning physical state in verification and type approval by administrative organizations for measurement, or in in-house inspection of measuring instruments by manufacturers, repair shops and users of measuring instruments (general manufacturers and institutes).

For this reason, as these measuring instruments are used as references for quantities concerning physical states, the most strict inspection is required for these devices. Bodies for verification should be limited to national metrology laboratory or certifying/calibrating organizations performing fine calibration for industrial metrology, because specific and high level knowledge concerning advanced metrology is required for this inspection.

The allowable errors for standard devices vary according to purpose of use of each device, grades such as classes 1 and 2 should be introduced.

Also it is needless to say that the standard devices must be traceable to national standard devices.

Chapter V Measurement Certification Business

(Registration of Measurement Certification Business)

Any person who intends to engage in the business of certifying any measurement by using the legal measuring units (hereinafter referred to as "measurement certification") stated in the following, shall be registered for every workshop classified by the MINECOM Ordinance to the governor of Province exercising jurisdiction over the place of the said business. Provided, however, that the same shall not apply in the case when the government or a local public entity engages in the said measurement certification business and in the case when the person, who has been registered, designated or disposed in other ways, for doing the business according to the provisions prescribed by Cabinet Order, engages in the said business of measurement certification.

(1) The business of measurement certification of the length, mass, area, volume or amount of heat of the goods at the time of loading, unloading or warehousing of the said goods with the object of forwarding, depositioning or selling.

(2) The business of measurement certification of concentration, noise level and other physical quantities prescribed by Cabinet Order.

(Duty to Receive Inspection)

The measurement certifier shall receive the inspection with respect to the measuring instrument used for measurement certification each year from the date of obtaining the registration.

(Subject of Inspection)

The inspection under Paragraph 1 of the preceding Article shall be performed by the governor of Province who has registered the business under (Registration of Measurement Certification Business).

(Place of Performing Inspection)

The place of performing inspection under (Inspection of Registered Measuring Instrument) shall be the place wherein the said measuring instrument is located. Provided, however, that it shall be the designated place by governor of Province in case there is an application from the measurement certifier.

(Conditions for Qualification of Inspection)

The measuring instrument which received the inspection under (Inspection of Registered Measuring Instrument) shall be considered to be qualified when it conforms to all the following items:

(1) That the verification mark or the calibration mark is affixed thereto;

(2) That it has the structure provided for by the MINECOM Ordinance;

(3) The instrumental error does not exceed the tolerance in use provided for by Cabinet Order;

(4) That the term of validity of verification has not yet expired in the case of the measuring instrument which is provided for by (Term of Validity of Verification) and has been qualified in the verification.

2. Whether the measuring instrument conforms to Item (3) of Paragraph 1 shall be determined by the method provided for by the MINECOM Ordinance and by using the verification standard which has passed the inspection of verification standards.

(Inspection Mark)

The measuring instrument which has passed the inspection under Paragraph 1 (Inspection of Registered Measuring Instruments) shall be affixed with the inspection mark and the figures which indicate the

year when the inspection in the same paragraph has been performed.

(Deletion of Inspection Mark, Etc.)

When a measuring instrument which has failed in the inspection under Paragraph 1 (Inspection of Registered Measuring Instruments) bears a verification mark or a calibration mark, such an inspection mark or a calibration mark shall be either removed or cancelled with an obliteration mark.

Services for certification of measurement have been developing in association with marine transportation, and in recent years the services are frequently utilized also in transportation by railways or trucks.

Also in recent years, social interests in environment have been becoming increasingly intense, and in association with progress of projects for protection of environment, the number of service providers in the field of certification for measurement of density of hazardous materials and noise level has been increasing.

The services are also related to environmental restrictions which have been becoming increasingly strict, and now certification for weight and volume of cargoes, density of hazardous materials in air and water, and levels of noise and vibration are extremely important.

For these reasons, as it can be considered that general controlling methods such as simple site inspection are inadequate for accuracy of measuring instruments used by such service providers, persons hoping to provide services in the field of certification must make a registration to local government offices, file provisions for the enterprise concerning methods for implementation of the registered services after registration and receive inspection for measuring instruments used in the registered certification services once a year.

Chapter VI Supervision

Section 1. On-the-spot Inspection

(On-the-spot Inspection, Questioning and Taking Away)

Minister of MINECOM, or the governor of Province may within the limit necessary for the enforcement of this Law, cause his officials to enter the factory, workshop, shop, business office, office or warehouse of the manufacturer, mender, seller or the person who transacts or certifies in measuring units, to examine measuring instruments, the equipment for the inspection of measuring instruments, net content indicated commodities, quality indicated commodities, books, documents, or the method of measurements in transaction or certification, to question the persons concerned, or to take away, within the minimum necessary quantity for purposes of inspection of quality, the commodities transacted in density, concentration or viscosity in the legal measuring units.

2. When an official enters the premises in accordance with the provision of the preceding Paragraph, he shall carry with him his identification card and show it to the persons concerned.

3. The authority of on-the-spot inspection, questioning and taking away provided for in Paragraph 1 shall not be construed as being authorized for criminal investigation.

(Presentation of Measuring Instruments, Etc.)

The Minister of MINECOM or the governor of Province may, when they have caused their officials to inspect under the provision of the preceding Article Paragraph 1 and found there are measuring instruments, goods with indication of net quantity or goods with indication of quality which are recognized to be extremely difficult to inspect at the places where they are located, order the owner or the possessor thereof to present

them by fixing a period of time.

2. The state, the governor of Province shall compensate for a loss caused by the order under the preceding Paragraph to the owner or the possessor.

(Removal of Verification Mark, Etc.)

The Minister of MINECOM or the governor of Province may, when they have made their officials to inspect the measuring instruments used for measurement by the legal measuring units under the provision of Paragraph 1 (On-the-spot Inspection, Questioning and Taking Away) either remove the verification mark or cancel them with an obliteration mark:

(1) That the measuring instrument does not conform the structure which is provided for by the MINECOM Ordinance;

(2) That the instrumental error exceeds the tolerance in use provided for by Cabinet Order;

(3) That the term of validity of verification has expired in the case of the measuring instrument provided for by (Term of Validity of Verification) and had passed the verification.

2. Whether or not the measuring instrument conforms to Paragraph 1 Item (2) shall be determined by the method provided for by the MINECOM Ordinance and by using the verification standard which has passed the inspection of verification standards.

3. The Minister of MINECOM or the governor of Province shall, when they take action under the provision of Paragraph 1, notify the reason for such action to the owner or the possessor thereof.

To secure implementation of correct and fair measurement and achieve the purpose s specified in the measurement law, various systems defined in the measurement must be followed. So it is necessary to give

staff of the administrative organizations for measurement the power for site inspection.

As for the inspection, it is not necessary to decide times and intervals, but periodical inspections to sites where instruments are used is required for measuring instruments used in business transaction, such as taxi meters, gas meters, water supply meters, gasoline meters, liquefied oil weight meters, and length meters.

Section 2. Order for Improvement, ..., etc.

The Minister of MINECOM may, when he recognizes that the manufacturer provided for by Paragraph 1 (Duty to Conform to Provisions in Manufacturing) or the person who is provided for by the same Article Paragraph 2 (Duty to Conform to Provisions In Case of Selling) is violating the provision of Paragraph 1 or Paragraph 2 of the same Article, order such a violating person to take necessary measures to render the measuring instrument to be manufactured or sold conform to the technical provisions provided for by the MINECOM Ordinance mentioned in the said Article Paragraph 1.

Items to be enacted when enacting the measurement law are as described above. In addition, the following items should be provided in the measurement law.

1) Chapter 7 Specified Verificating Organization, Accredited Calibrating Organizations

It is necessary to define qualification of a specified verificating organization and an accredited calibrating organization and procedures for specification and accreditation, but these items are closely related to tradition and legal restrictions in Chile, so concrete recommendations are not presented here.

When studying contents of the restrictions, the following items should be taken into considerations.

In association with development of economical transaction and progress in industrial technologies, measuring instruments have been becoming increasingly advanced and complicated. For this reason, in the specific fields where specific capability is required for authorization and calibration, organizations in the private section should efficiently be utilized to supplement capacities of the central and local governments for verification.

So specified authorizing organizations and accredited calibrating organizations must satisfy the following requirements.

(1) The organizations must be official-interest corporations engaged in research of testing and technical matters for measuring instruments and similar machines or tools and not searching for profit.

(2) The organizations must have machines and tools specified in a decree by the Ministry of Economy, and in the organizations staff having knowledge and experience satisfying the conditions decided in a decree by the Ministry of Economy must perform works for verification.

(3) The organizations must have accounting systems required to accurately and smoothly carry out works for verification.

(4) Configuration of executives or employees, and, if the organizations are engaged in jobs other than those specified in (1), contents of the jobs should not give any bad influence the organizations' function to carry out accurate and fair verification.

As works for verification are very important for securing safety in measurement, it will be necessary to study whether provisions on the jobs, stop or abolishment of the jobs, and project plans should be put under control by the Economy Minister or not.

2) Chapter 8 Re-examination and Claims

Administrative measures based on the measurement law include such matters as registration, verification, type approval, standard devices, and inspections, but it is necessary to establish a system so that any person can apply for re-examination or present claims. The administrative measures are related to legal control, so it is necessary to study administrative procedures in similar laws and clarify the procedure in the measurement law.

Items to be provided as legal provisions when the measurement law is enacted were described above with reference to recommendation by OIML for the measurement law.

After the measurement law is enacted and physical and qualitative requirements for administrative organizations for measurement are satisfied, the following systems should be studied to further improve the metrological system in the future.

1) Metrological engineer

A national qualification should be given to people who have special knowledge concerning metrology, and it is preferable to both the country and users to assign certain jobs based on the measurement law to the people for promoting implementation of correct and accurate measurement.

(2) Job sites using measuring instruments

By specifying private facilities using measurement instruments and having a necessary capability for measurement control and utilizing capabilities of the facilities, reduction of work load to government officials and establishment of various measurement systems can be expected.

When specifying the jobs sites using measuring instruments, measurement control by metrological engineers is essential, so it

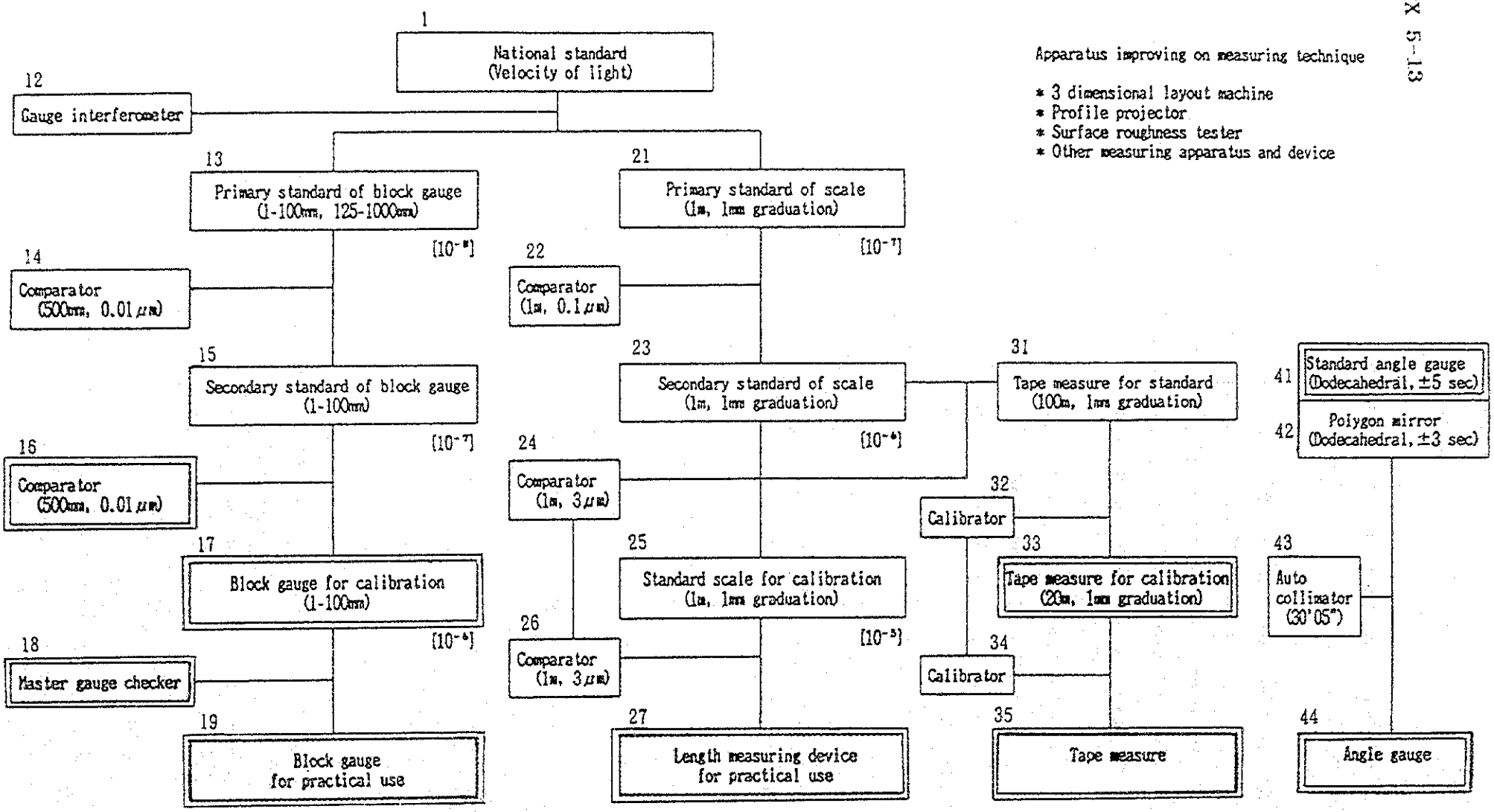
is necessary to study the possibility of introducing the system in the system.

(1) The metrological engineer system (general metrological engineers and environmental engineers) should be introduced to each type of measuring instruments to be used, and the metrological engineers must take charge of control of measuring instruments allocated to the person.

(2) The job sites must have equipment and facilities required for inspection of measuring instruments to be used.

STANDARD SYSTEM OF MEASUREMENT AND
LIST OF EQUIPMENT CORRESPONDING THERETO

(Length)



List of measuring equipment

Length

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
1				Difinition
12	Interferometer	光波干渉計	Max.Measuring Range:250mm Accuracy: >100mm- ±0.03μm 100～250mm-±0.05μm	
13	Gauge Blocks	ブロックゲージ	112 pcs. JIS B7506 class 00 with accessories	
14	Electronic comparator (Electronic micrometer)	デジタル電子測微器	Measuring range:250mm Resolution: 0.01μm	
15	Gauge Blocks	ブロックゲージ	112 pcs. JIS B7506 class 0 with accessories	
16	Electronic comparator (Electronic micrometer)	デジタル電子測微器	Measuring range:250mm Resolution: 0.01μm	
17	Gauge Blocks	ブロックゲージ	112 pcs. JIS B7506 class 1 with accessories	
18	Master for Height	デジタルハイトマスター	Range: 5 to 610mm	
	Caliper Checker	キャリパチェッカー	Range: 600mm	
	Dial gauge checker	ダイヤルゲージチェッカー	Range:25mm, Graduation:0.001mm	
	Depth Micrometer checker	ﾃﾞﾌﾟｽ･ﾏｲｸﾛﾒｰﾀｰ･ﾁｪｯｶｰ	Range: 0 to 300mm	

List of measuring equipment

Length

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Inside Micrometer Checker	内側ﾏｲｸﾛﾒｰﾀｰ･ﾁｪｯｶｰ	Range: 25 to 300mm	
	Height Gauge	ハイトゲージ	Measuring Range: 0 to 600mm	
	Dail Gauge	ダイヤルゲージ	Measuring Range: 0 to 5mm Graduation: 0.01mm	5 sets
	Degimatic Indicator	デジタルインジケータ	Measuring Range: 0 to 12mm Resolution: 0.001mm	2 sets
	Cylinder Gauge	シリンダゲージ	Measuring Range:7-10mm (6pcs.) 10-18mm (8pcs.)	2 sets
	Standard Outside Micrometer	標準外側マイクロメーター	Measuring Range: 0 to 25mm 25 to 50mm 50 to 75mm 75 to 100mm	
	Digimatic Standard Outside Micrometer	ﾃﾞｼﾞﾀﾙ標準外側ﾏｲｸﾛﾒｰﾀｰ	Measuring Range: 0 to 25mm 25 to 50mm 50 to 75mm 75 to 100mm	
	Rod Inside Micromete	棒形内側マイクロメーター	Measuring Range: 50 to 300mm 25mm step, 10pcs	
	Indicating Micrometer	指示マイクロメーター	Measuring Range: 0 to 25mm 25 to 50, 50 to 75, 75 to 100	

List of measuring equipment

Length

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Electronic Micrometer	電子マイクロメーター	Measuring Range: 0 to 25mm 25 to 50, 50 to 75, 75 to 100 Graduation: 0.01mm Instrumental error: ± 3μm	
	Digimatic Bench Micrometer	ﾃﾞｼﾞﾏﾁｯｸ･ﾍﾞﾝﾁ･ﾏｲｸﾛﾒｰﾀｰ	Measuring Range: 0 to 50mm Resolution: 0.001mm	
	Digimatic Caliper	デジマチック・キャリパー	Measuring Range: 0 to 200mm Resolution: 0.01mm	3 sets
	Standard Caliper	M形標準ノギス	Measuring Range: 0 to 200mm Vernier scale: 0.05mm	3 sets
	Dial Caliper	ダイヤルノギス	Measuring Range: 0 to 200mm Graduation: 0.01mm	2 sets
21	Standard Scale	標準直尺	Range: 1m, Graduation: 1mm H shape, stainless steel	
22	Comparator	直尺比較器	Range: 1m, Graduation: 1mm Accuracy:0.1μm	
23	Standard Scale	標準直尺	Range: 1m, Graduation: 1mm Flat shape, brass	
24	Comparator	直尺比較器	Range: 1m, Graduation: 1mm Accuracy: 3 μm	
25		標準直尺	Range: 1m, Graduation: 1mm Flat shape, brass	

List of measuring equipment

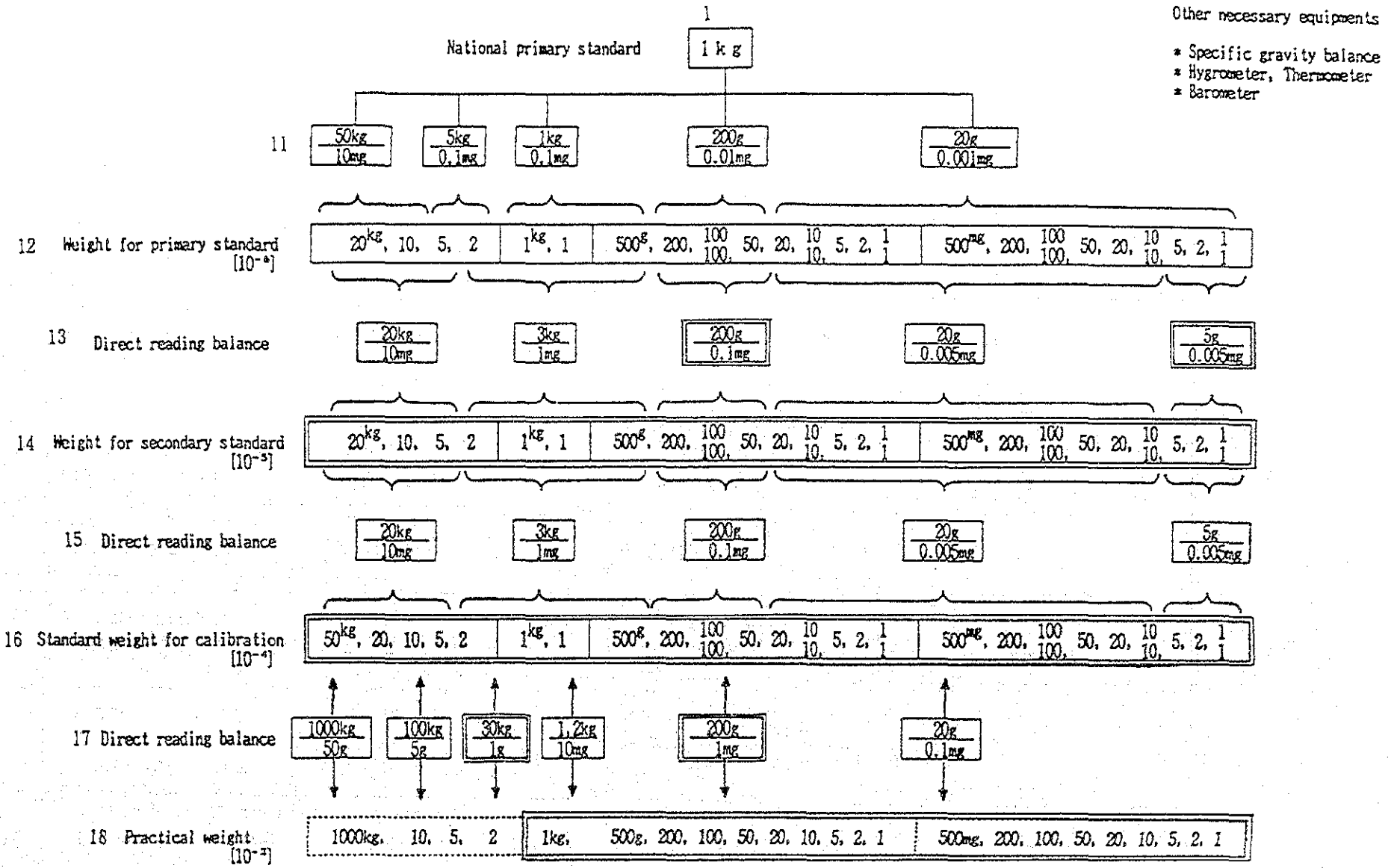
Length

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
26	Comparator	直尺比較器	Range: 1m, Graduation: 1mm Accuracy: 3 μm	
31	Standard Tape Measure	標準巻尺	Measuring Range: 100m JIS class 1, Steel	
32				
33	Standard Tape Measure	標準巻尺	Measuring Range: 20m JIS class 1, Steel	
34				
41	Standard Wedge Angle Block	標準角度ゲージブロック	Measuring Range: 0 to 90° Angle Accuracy: 3", 12 pcs.	
42	Autocollimeter & Polygon Mirror	オートコリメーター及び ポリゴン鏡	Measuring Range: 30' of arc Minimum Reading: 0.5" of arc Type: 12 faces	
43	Autocollimeter & Polygon Mirror	オートコリメーター及び ポリゴン鏡	Measuring Range: 30' of arc Minimum Reading: 0.5" of arc Type: 12 faces	
	Master for Square	スコヤマスター	Measuring Range: 0 to 450mm Straightness: 3.5μm Squareness: 9μm	
	Surface Roughness Tester	表面あらさ計	Measuring Range: 0 to 300 μm	

List of measuring equipment

Length

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Optical Parallel	オプチカルパラレル	Diameter: 30mm Thickness: 12.0, 12.12, 12.23, 12.27mm Parallelism: 0.2μm	
	Optical Flat	オプチカルフラット	Diameter: 45mm Thickness: 12mm Flatness: 0.2μm	3 kinds
	Profile projector	万能投影機	Diameter: 600mm	
	Precision Level	精密水準器	Size: 300mm Accuracy: ±0.2mm/1m	2 sets
	Base Plate	精密石定盤	Size: 300x 300x 100 JIS B7513 class 0	2 sets
	Base Plate	精密石定盤	Size: 2000x 1500x 300 JIS B7513 class 00	2 sets


1
National primary standard
1 kg
Other necessary equipments
* Specific gravity balance
* Hygrometer, Thermometer
* Barometer
11
50kg 10mg
5kg 0.1mg
1kg 0.1mg
200g 0.01mg
20g 0.001mg
12 Weight for primary standard [10⁻⁶]
20kg, 10, 5, 2
1kg, 1
500g, 200, 100/100, 50, 20, 10/10, 5, 2, 1/1
500mg, 200, 100/100, 50, 20, 10/10, 5, 2, 1/1
13 Direct reading balance
20kg 10mg
3kg 1mg
200g 0.1mg
20g 0.005mg
5g 0.005mg
14 Weight for secondary standard [10⁻⁵]
20kg, 10, 5, 2
1kg, 1
500g, 200, 100/100, 50, 20, 10/10, 5, 2, 1/1
500mg, 200, 100/100, 50, 20, 10/10, 5, 2, 1/1
15 Direct reading balance
20kg 10mg
3kg 1mg
200g 0.1mg
20g 0.005mg
5g 0.005mg
16 Standard weight for calibration [10⁻⁴]
50kg, 20, 10, 5, 2
1kg, 1
500g, 200, 100/100, 50, 20, 10/10, 5, 2, 1/1
500mg, 200, 100/100, 50, 20, 10/10, 5, 2, 1/1
17 Direct reading balance
1000kg 50g
100kg 5g
30kg 1g
1.2kg 10mg
200g 1mg
20g 0.1mg
18 Practical weight [10⁻³]
1000kg, 10, 5, 2
1kg, 500g, 200, 100, 50, 20, 10, 5, 2, 1
500mg, 200, 100, 50, 20, 10, 5, 2, 1

List of measuring equipment

Mass

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
1	1kg	1kg 原器		
11	High Precision Hand Operated Balance	高精度天秤	Capacity: 50kg Readability: 10mg	
	Direct Reading Balance	直示天秤	Capacity: 5000g Readability: 0.1mg	
	Direct Reading Balance	直示天秤	Capacity: 1000g Readability: 0.1mg	
	Direct Reading Balance	直示天秤	Capacity: 200g Readability: 0.01mg	
	Direct Reading Balance	直示天秤	Capacity: 20g Readability: 0.001mg	
12	Standard Weight Set	標準分銅セット	1 ～20kg,1～500g,1～500mg Stainless Steel, class E2	
13	High Precision Hand Operated Balance	高精度天秤	Capacity: 20kg Readability: 10mg	
	Direct Reading Balance	直示天秤	Capacity: 3000g Readability: 0.1mg	
	Direct Reading Balance	直示天秤	Capacity: 200g Readability: 0.1mg	
	Direct Reading Balance	直示天秤	Capacity: 20g Readability: 0.005mg	

List of measuring equipment

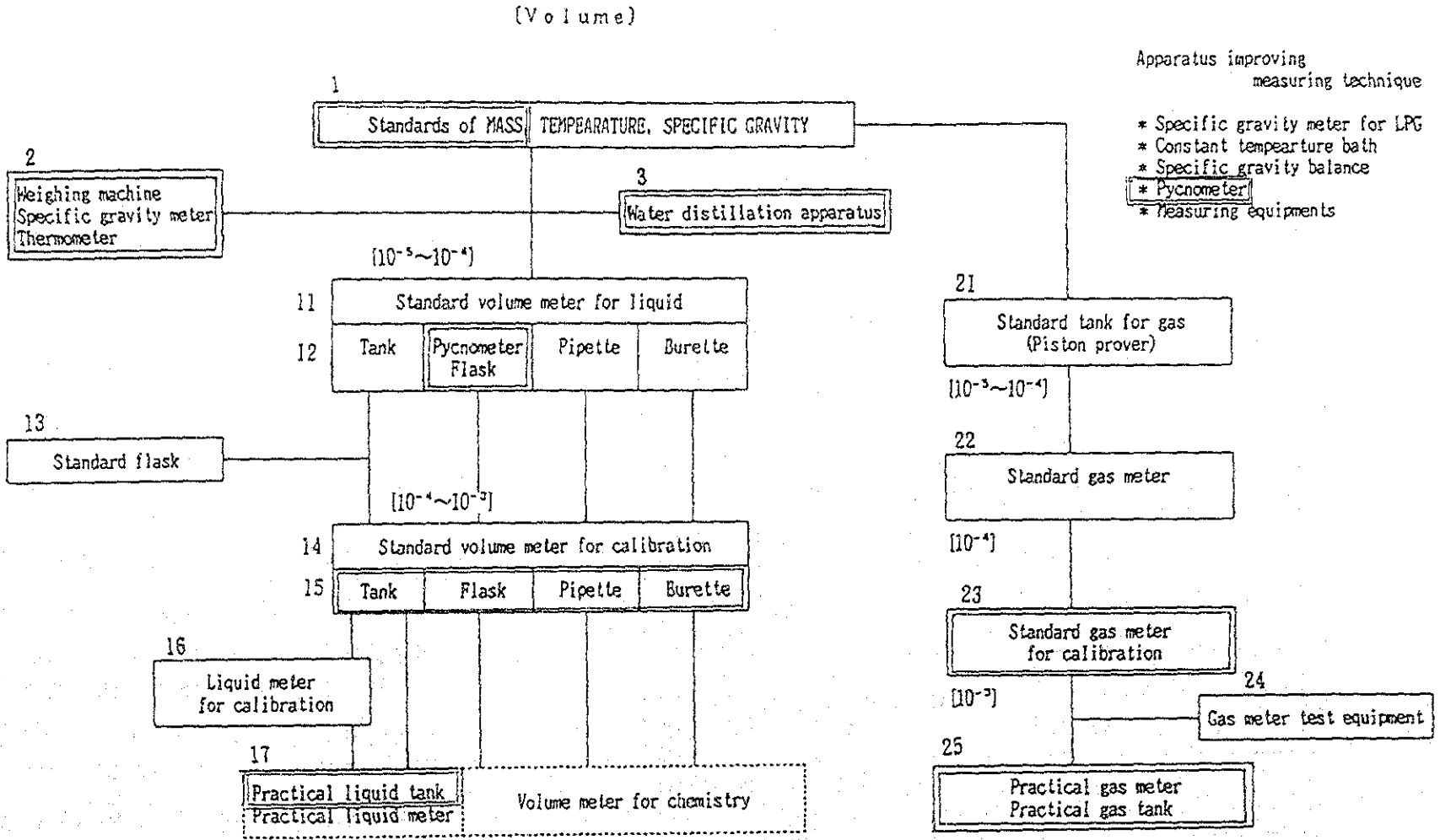
Mass

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Direct Reading Balance	直示天秤	Capacity: 5g Readability: 0.001mg	
14	Standard Weight Set	標準分銅セット	1 ～20kg,1～500g,1～500mg Stainless Steel, Class F1	
15	High Precision Hand Operated Balance	高精度天秤	Capacity: 20kg Readability: 10mg	
	Direct Reading Balance	直示天秤	Capacity: 3000g Readability: 0.1mg	
	Direct Reading Balance	直示天秤	Capacity: 200g Readability: 0.1mg	
	Direct Reading Balance	直示天秤	Capacity: 20g Readability: 0.005mg	
	Direct Reading Balance	直示天秤	Capacity: 5g Readability: 0.001mg	
16	Standard Weight Set	標準分銅セット	1 ～50kg,1～500g,1～500mg Brass, class F2	
	Standard Weight Balance	標準分銅	20kg, Iron cast Readability: 0.001mg	25 pcs.
17	Floor Balance	精密台はかり	Capacity: 1000kg Readability: 50g	
	Electronic Floor Balance	電子台はかり	Capacity: 150kg Readability: 1g	

List of measuring equipment

Mass

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Electronic Floor Balance	電子台はかり	Capacity: 30kg Readability: 1g	
	Electronic Balance	電子天秤	Capacity: 1kg Readability: 10mg	
	Electronic Balance	電子天秤	Capacity: 200g/42g Readability: 0.1mg/0.01mg	
	Electronic Balance	電子天秤	Capacity: 300g Readability: 1mg	
	Balance Table	天秤台	Dimensions: 540x 600 x 750(mm) Balance Setting Plate: Steel	5 sets
	Balance Table	天秤台	Dimensions:1200x 600 x 750(mm) Balance Setting Plate: Steel	5 sets
	Barometer	水銀気圧計	Type: Fortin type Scale Range: 650 to 820mmHg	
	Hygrometer	アスマン通風乾湿計	Method:Assman Ventilated Psych -rometer	
	Digital Thermometer	デジタル温度計	Method: Thermister Thermometer Range: -50 to 50℃	2 sets
	Temperature/Humidity Recorder	自記式温湿度計	Temperature: -15 to 50℃ Humidity: 0 to 100%RH	


〔Volume〕
Apparatus improving measuring technique
* Specific gravity meter for LPG
* Constant tempearture bath
* Specific gravity balance
* Pycnometer
* Measuring equipments
1
Standards of MASS
TEMPEARATURE, SPECIFIC GRAVITY
2
Weighing machine
Specific gravity meter
Thermometer
3
Water distillation apparatus
[10⁻⁵~10⁻⁴]
11
Standard volume meter for liquid
12
Tank
Pycnometer Flask
Pipette
Burette
13
Standard flask
[10⁻⁴~10⁻³]
14
Standard volume meter for calibration
15
Tank
Flask
Pipette
Burette
16
Liquid meter for calibration
17
Practical liquid tank
Practical liquid meter
Volume meter for chemistry
21
Standard tank for gas (Piston prover)
[10⁻⁵~10⁻⁴]
22
Standard gas meter
[10⁻⁴]
23
Standard gas meter for calibration
[10⁻³]
24
Gas meter test equipment
25
Practical gas meter
Practical gas tank

List of measuring equipment

Volume

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
1				
2	Weighing Machine	電子台はかり	Capacity: 300kg Readability: 1g	
	Specific Gravity Meter	比重計		
	Thermometer	温度計		
3	Water Distillation Apparatus	蒸留水製造装置	Method:Ion exchange and distillation method Capacity: 0.4 to 0.7 liter/min	with accessories
11				
12	Standard Tank	標準タンク	Capacity: 50 liter Accuracy: 0.1%	
	Standard Tank	標準タンク	Capacity: 200 liter Accuracy: 0.1%	
	Standard Tank	標準タンク	Capacity: 500 liter Accuracy: 0.1%	
12	Pycnometer	ピクノメーター	Capacity:10ml,20ml,50ml,100ml, 150ml,250ml	40 pcs.

List of measuring equipment

Volume

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Standard Flask	標準フラスコ	Capacity: 1 liter	3 sets
	Standard Flask	標準フラスコ	Capacity: 2 liter	2 sets
	Standard Flask	標準フラスコ	Capacity: 5 liter	2 sets
	Standard Flask	標準フラスコ	Capacity: 10 liter	2 sets
12	Standard Pipette	標準ピペット	Capacity: 10ml	4 sets
	Standard Pipette	標準ピペット	Capacity: 100ml	4 sets
12	Standard Burette	標準ビュレット	Capacity: 25ml	2 sets
	Standard Burette	標準ビュレット	Capacity: 50ml	2 sets
	Standard Burette	標準ビュレット	Capacity: 100ml	2 sets
	Standard Burette	標準ビュレット	Capacity: 100ml	2 sets
13	Standard Flask	標準フラスコ	Capacity: 1 liter	3 sets

List of measuring equipment

Volume

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Standard Flask	標準フラスコ	Capacity: 2 liter	2 sets
	Standard Flask	標準フラスコ	Capacity: 5 liter	2 sets
	Standard Flask	標準フラスコ	Capacity: 10 liter	2 sets
14				
15	Standard Tank	標準タンク	Capacity: 50 liter Accuracy: 0.1%	
	Standard Tank	標準タンク	Capacity: 200 liter Accuracy: 0.1%	
	Standard Tank	標準タンク	Capacity: 500 liter Accuracy: 0.1%	
15	Standard Flask	標準フラスコ	Capacity: 1 liter	3 sets
	Standard Flask	標準フラスコ	Capacity: 2 liter	2 sets
	Standard Flask	標準フラスコ	Capacity: 5 liter	2 sets
	Standard Flask	標準フラスコ	Capacity: 10 liter	2 sets

List of measuring equipment

Volume

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
15	Standard Pipette	標準ピペット	Capacity: 10ml	4 sets
	Standard Pipette	標準ピペット	Capacity: 100ml	4 sets
15	Standard Burette	標準ビュレット	Capacity: 25ml	2 sets
	Standard Burette	標準ビュレット	Capacity: 50ml	2 sets
	Standard Burette	標準ビュレット	Capacity: 100ml	2 sets
	Standard Burette	標準ビュレット	Capacity: 100ml	2 sets
16				
21	Piston Prover	ピストンプルーバ	Capacity: 110 liter Flow range: 0.1 to 3m³/h Accuracy: 0.005%	
22	Standard Wet Gas Meter	標準湿式ガスメーター	Capacity: 2 liter Accuracy: 0.2%	
	Standard Wet Gas Meter	標準湿式ガスメーター	Capacity: 10 liter Accuracy: 0.2%	
	Standard Wet Gas Meter	標準湿式ガスメーター	Capacity: 20 liter Accuracy: 0.2%	

List of measuring equipment

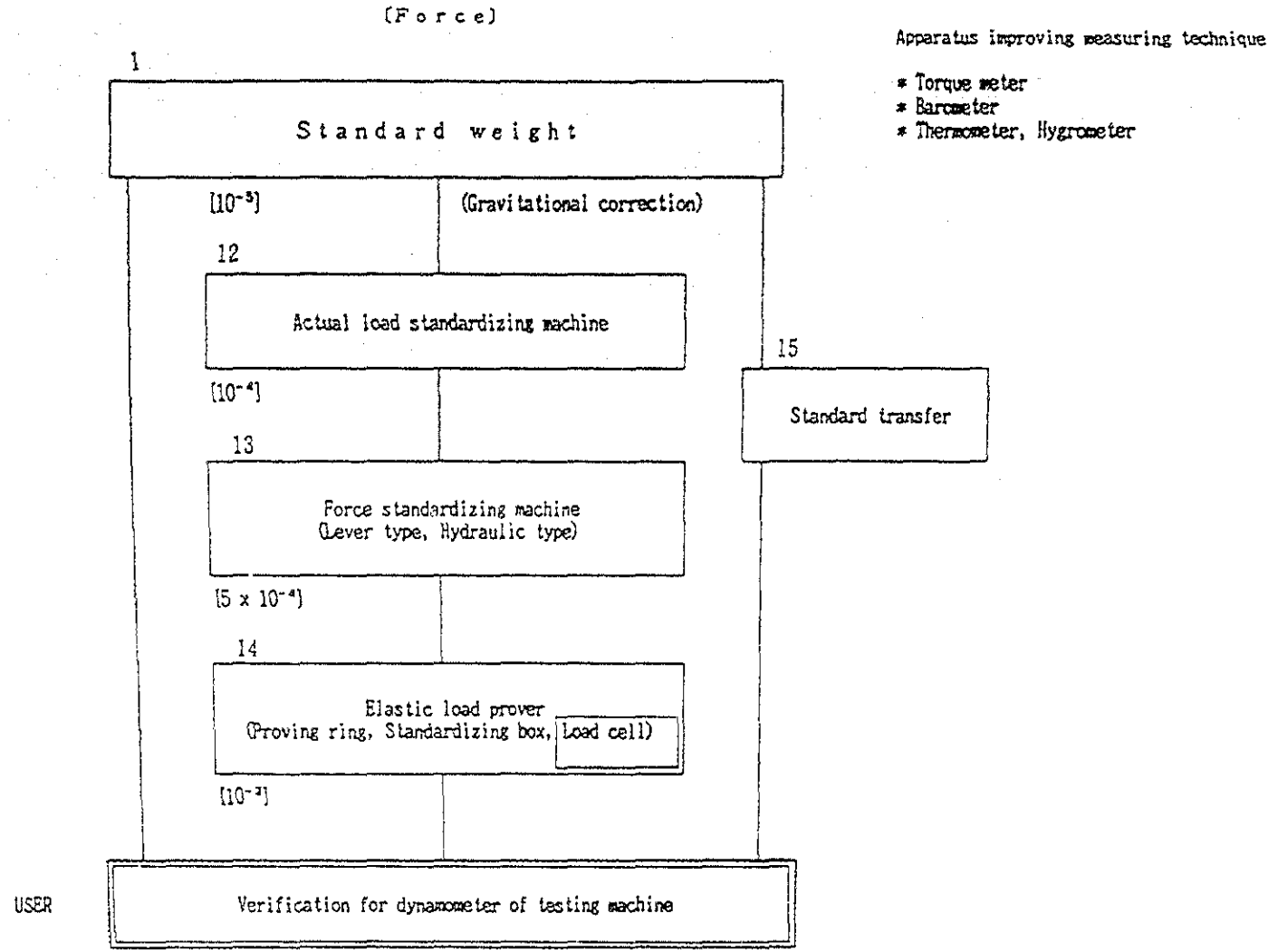
Volume

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
23	Standard Wet Gas Meter	標準湿式ガスメーター	Capacity: 2 liter Accuracy: 0.2%	
	Standard Wet Gas Meter	標準湿式ガスメーター	Capacity: 10 liter Accuracy: 0.2%	
	Standard Wet Gas Meter	標準湿式ガスメーター	Capacity: 20 liter Accuracy: 0.2%	
24	Gas Meter Test Equipment	ガスメーター試験装置	Flow Capacity: 0.2 to 4 m^3/h with accessory	
	Water Master Meter	水道マスターメーター	Flow Range: 0.2 to 1.2 m^3/h Test Pressure: 17.5 kgf/cm^2	4 sets
	Standard Density Hydrometer	標準密度計	Density Range: 0.6 to 2.0 g/cm^3 at 24 hydrometers	24 pcs.
	Specific Gravity Meter for LPG	LPG 用比重試験器	Range: 0.500 to 0.650 g/cm^3 Temperature: -10 to 40℃	2 sets
	Barometer	水銀気圧計	Type: Fortin(Mercury column) Scale Range: 650 to 820 mmHg	
	Constant Temperature Bath	恒温水槽	Temperature: RT+10 to 80℃ Temperature Control:±0.07℃ Capacity: 50liter	
	Thermometer	標準ガラス温度計	Temperature Range:-50 to 360℃ at 8 hydrometers	8 pcs.
	Thermometer	サーミスタ温度計	Temp. Range: -100 to 200℃ Resolution: ± 0.1℃	T thermocouple

List of measuring equipment

Volume

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Specific Gravity Balance	比重天秤	Capacity: 300g Readability: 1mg	
	Standard Weight Set	標準分銅	1 ～1000g, 1mg～500mg, class 1 Brass, Stainless Steel	


〔F o r c e〕
Apparatus improving measuring technique
* Torque meter
* Barometer
* Thermometer, Hygrometer
1
S t a n d a r d w e i g h t
[10⁻⁵]
(Gravitational correction)
12
Actual load standardizing machine
15
Standard transfer
[10⁻⁴]
13
Force standardizing machine
(Lever type, Hydraulic type)
[5 x 10⁻⁴]
14
Elastic load prover
(Proving ring, Standardizing box, Load cell)
[10⁻³]
USER
Verification for dynamometer of testing machine

List of measuring equipment

Force

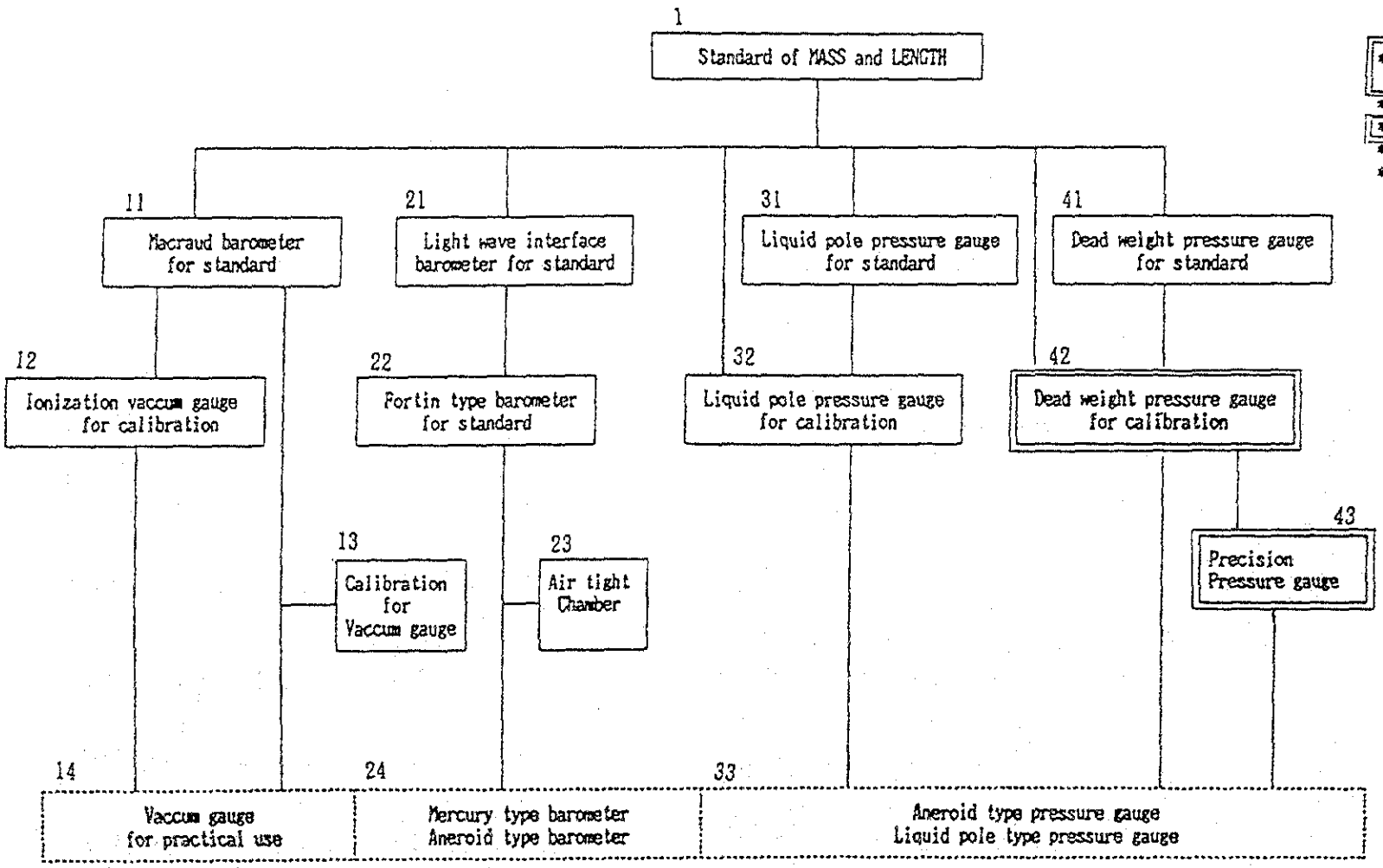
No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
1				
12				
13	Force Standard Machine	力標準機	Type: Lever type Capacity: 10 tonf	
	Force Standard Machine	力標準機	Type: Lever type Capacity: 1 tonf	
14	Standard Proving Ring	環状バネ型力計	Capacity: 100kgf(1 kN) Repeatability: >0.2%	
	Standard Proving Ring	環状バネ型力計	Capacity: 500kgf(5 kN) Repeatability: >0.2%	
	Standard Proving Ring	環状バネ型力計	Capacity: 2 tonf(20 kN) Repeatability: >0.2%	
	Standard Proving Ring	環状バネ型力計	Capacity: 5 tonf(50 kN) Repeatability: >0.2%	
	Standard Proving Ring	環状バネ型力計	Capacity: 10 tonf(100 kN) Repeatability: >0.2%	
	Standard Proving Ring	環状バネ型力計	Capacity: 50 tonf(500 kN) Repeatability: >0.2%	

List of measuring equipment

Force

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Standardizing Box	容積型力計	Type: Box Type Dynamometer Capacity: 300 tonf(3 MN)	
	Load Cell	ロードセル	Type: For Compression Capacity: 100 kgf (1 kN)	
	Load Cell	ロードセル	Type: For Compression Capacity: 1000 kgf (10 kN)	
	Load Cell	ロードセル	Type: For Compression Capacity: 10 tonf (100 kN)	
	Load Cell	ロードセル	Type: For Compression Capacity: 100 tonf (1 MN)	
	Load Cell Indicator	デジタル指示計	Sensitivity: 10V at 0.5mV/V IN with amplifier	4 sets
	Wire Strain Gauge, Strain Meter	ひずみ測定器	Range:±60000 x 10^{-6}	
	Torque Transducer	トルク変換器	Capacity: 100kgf/m Output: 1.5mV/V ±10%	
	Torque Transducer	トルク変換器	Capacity: 1000kgf/m Output: 1.5mV/V ±10%	
	Barometer	水銀気圧計	Type: Fortin Range: 650 to 850 mmHg	
	Temperature/Humidity Recorder	自記式温湿度計	Temp. Range: -15 to 50°C Humi. Range: 0 to 100%RH	

(Pressure)


1
Standard of MASS and LENGTH
11
Macraud barometer for standard
21
Light wave interface barometer for standard
31
Liquid pole pressure gauge for standard
41
Dead weight pressure gauge for standard
12
Ionization vaccum gauge for calibration
22
Fortin type barometer for standard
32
Liquid pole pressure gauge for calibration
42
Dead weight pressure gauge for calibration
43
Precision Pressure gauge
13
Calibration for Vaccum gauge
23
Air tight Chamber
14
Vaccum gauge for practical use
24
Mercury type barometer
Aneroid type barometer
33
Aneroid type pressure gauge
Liquid pole type pressure gauge
Apparatus improving on measuringtechnique
* Precision bourdon tube pressure gauge
* Digital pressure gauge
* Pressure transducer
* Differencial pressure transducer
* Distortion measuring device, etc.

List of measuring equipment

Pressure

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
1				
11	Macraud Vacuum Gauge	マクラウド真空計	Measuring Range: 10 mmHg to 1×10^{-4} mmHg	
12	Ionization vacuum Gauge	イオン真空計		
13	Calibration Apparatus for Vacuum Meter	真空計校正装置	Measuring Range: 10 mmHg to 1×10^{-4} mmHg Accuracy: 5% to 25%	
21				
22	Standard Barometer	精密水銀気圧計	Type: Fortin Scale Range: 650 to 820 mmHg	
23	Air Tight Chamber	エアータイトチャンバー	Dimension: 2000x 800x 300(mm) Pressure: Vacuum to 850mmHg	
24	Mercury type Barometer	水銀気圧計		
	Aneroid type Barometer	アネロイド型気圧計	Max.Pressure: 500mmH_2O, 0.1,1, 10;100,1000kgf/cm^2	24 pcs.
31	Liquid Column Pressure Gauge	液柱型標準圧力計	Range:0 to 1500mmHg Accuracy: 2mmHg	

List of measuring equipment

Pressure

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Liquid Column Pressure Gauge	液柱型標準圧力計	Range:0 to 2000mm H_2O Accuracy: 2mm H_2O	
32	Liquid Column Pressure Gauge	液柱型標準圧力計	Range:0 to 1500mmHg Accuracy: 2mmHg	
	Liquid Column Pressure Gauge	液柱型標準圧力計	Range:0 to 2000mm H_2O Accuracy: 2mm H_2O	
41	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 1000kg/cm^2 Accuracy: 0.2%	
	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 500kg/cm^2 Accuracy: 0.2%	
	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 100kg/cm^2 Accuracy: 0.2%	
	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 20kg/cm^2 Accuracy: 0.2%	
	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 5kg/cm^2 Accuracy: 0.2%	w/ Control Pack
42	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 1000kg/cm^2 Accuracy: 0.2%	
	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 500kg/cm^2 Accuracy: 0.2%	
	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 100kg/cm^2 Accuracy: 0.2%	

List of measuring equipment

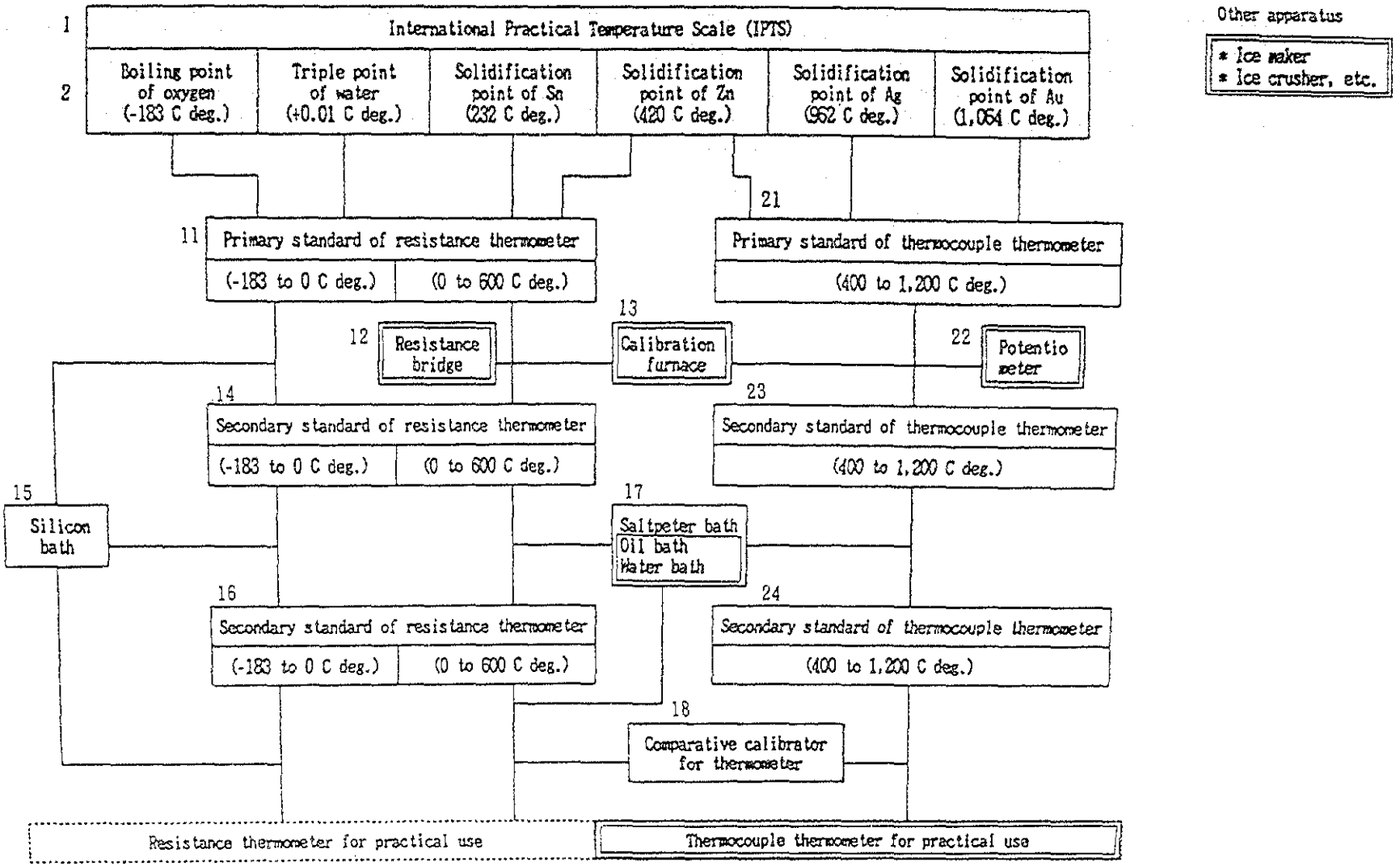
Pressure

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 20kg/cm^2 Accuracy: 0.2%	
	Dead Weight Piston Gauge	重錘型標準圧力計	Max. Pressure: 5kg/cm^2 Accuracy: 0.2%	w/ Control Pack
43				
	Precision Bourdon Tube Pressure Gauge	精密圧力計	Pressure Range: 0 to 6kg/cm^2 Accuracy: ±0.15%	
	Precision Bourdon Tube Pressure Gauge	精密圧力計	Pressure Range: 0 to 50kg/cm^2 Accuracy: ±0.15%	
	Precision Bourdon Tube Pressure Gauge	精密圧力計	Pressure Range: 0 to 100kg/cm^2 Accuracy: ±0.15%	
	Precision Bourdon Tube Pressure Gauge	精密圧力計	Pressure Range: 0 to 1 ton/cm^2 Accuracy: ±0.15%	
	Digital Pressure Gauge	デジタル圧力計	Max. Pressure: 2kg/cm^2 Accuracy: ±0.5%	3 sets
	Digital Pressure Gauge	デジタル圧力計	Max. Pressure: 2000mmH_2O Accuracy: ±0.5%	3 sets
	Digital Pressure Gauge	デジタル圧力計	Max. Pressure: 10kg/cm^2 Accuracy: ±0.5%	3 sets
	Pressure Transducer	圧力変換器	Capacity: 0 to 10kg/cm^2	2 pcs.

List of measuring equipment

Pressure

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
	Pressure Transducer	圧力変換器	Capacity: 0 to 100kg/cm^2	2 pcs.
	Differential Pressure Tranceducer	差圧変換器	Capacity: 0.1kgf/cm^2	2 pcs.
	Differential Pressure Tranceducer	差圧変換器	Capacity: 1kgf/cm^2	2 pcs.
	Strain Meter	ひずみ測定器	Range: -30000 to +30000 x 10^{-6} Resolution: 1 x 10^{-6}	


1
International Practical Temperature Scale (IPTS)
2
Boiling point of oxygen (-183 C deg.)
Triple point of water (+0.01 C deg.)
Solidification point of Sn (232 C deg.)
Solidification point of Zn (420 C deg.)
Solidification point of Ag (962 C deg.)
Solidification point of Au (1,064 C deg.)
11
Primary standard of resistance thermometer
(-183 to 0 C deg.)
(0 to 600 C deg.)
21
Primary standard of thermocouple thermometer
(400 to 1,200 C deg.)
12
Resistance bridge
13
Calibration furnace
22
Potentio meter
14
Secondary standard of resistance thermometer
(-183 to 0 C deg.)
(0 to 600 C deg.)
23
Secondary standard of thermocouple thermometer
(400 to 1,200 C deg.)
15
Silicon bath
17
Saltpeter bath
Oil bath
Water bath
16
Secondary standard of resistance thermometer
(-183 to 0 C deg.)
(0 to 600 C deg.)
24
Secondary standard of thermocouple thermometer
(400 to 1,200 C deg.)
18
Comparative calibrator for thermometer
Resistance thermometer for practical use
Thermocouple thermometer for practical use
Other apparatus
* Ice maker
* Ice crusher, etc.

List of measuring equipment

Temperature

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
1 2	Thermocouple/Resistance Thermometer Fixed Point Calibration Equipment	熱電対・抵抗体定点 校正装置	Boiling Point of O_2:90.188K Accuracy: ±0.01K Triple Point of H_2O:273.16K Accuracy: ±0.001K Solidification of Sn:232℃ Solidification of Zn:420℃ Solidification of Ag:962℃ Solidification of Au:1,064℃	
11	Standard Resistance Thermometer	標準白金測温抵抗体	Range: 13.81K to 231.91 ℃ Range: 90.188K to 630.74℃ Range: 90.188K to 961.93℃	
	Comparative Calibration Equipment for Resistanse Thermometer	抵抗体比較校正装置	Range: 90K to 650℃	
12	Resistance Bridge (Electronic micrometer)	精密ブリッジ		
13	Calibration Furnace	校正用炉	Temperature: 50 to 450℃ Stability:±0.15K/30min	
			Temperature: 200 to 1050℃ Stability:±0.25K/30min	
			Temperature: 800 to 1450℃ Stability:± 0.5K/30min	
14	Standard Resistance Thermometer	標準白金測温抵抗体	Range: 13.81K to 231.91 ℃ Range: 90.188K to 630.74℃ Range: 90.188K to 961.93℃	

List of measuring equipment

Temperature

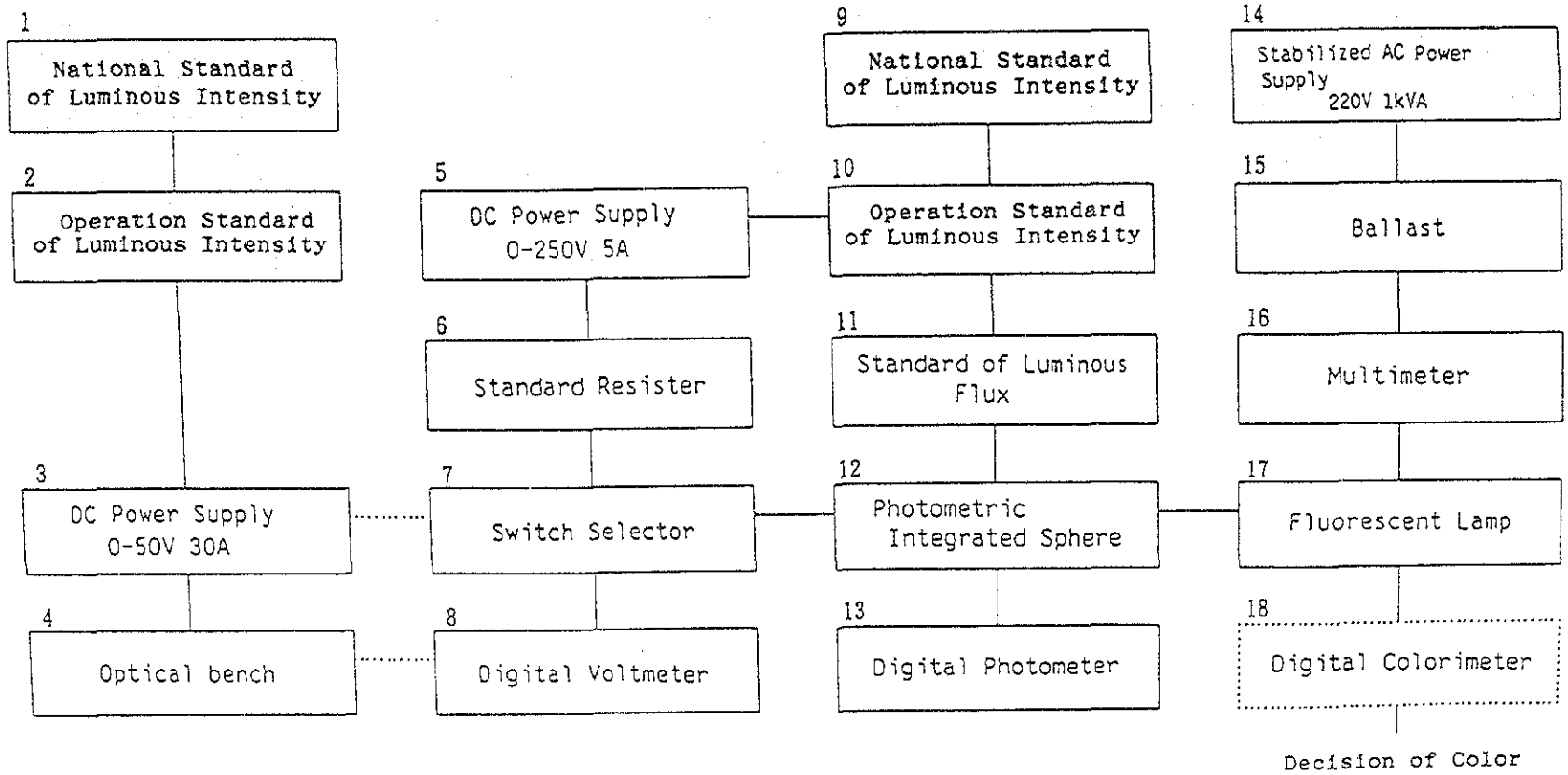
No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
15	Silicon Bath	シリコンバス		
16	Standard Resistance Thermometer	標準白金測温抵抗体	Range: 13.81K to 231.91 ℃ Range: 90.188K to 630.74℃ Range: 90.188K to 961.93℃	
17	Saltpeter Bath			
	Oil Bath			
	Water Bath			
18				
21	Standard Thermocouple	標準熱電対	Max.Temperature: 1064.43℃	
	Comparative Calibration Equipment for Thermocouple Thermometer	熱電対比較校正装置	Range: 600℃ to 1400℃	
22	Potentiometer			

List of measuring equipment

Temperature

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
23	Standard Thermocouple	標準熱電対	Max.Temperature: 1064.43℃	
24	Standard Thermocouple	標準熱電対	Max.Temperature: 1064.43℃	
	Ice Maker	製氷器		
	Ice Crusher	砕氷器		

(Luminous intensity)



List of measuring equipment

Luminous intensity

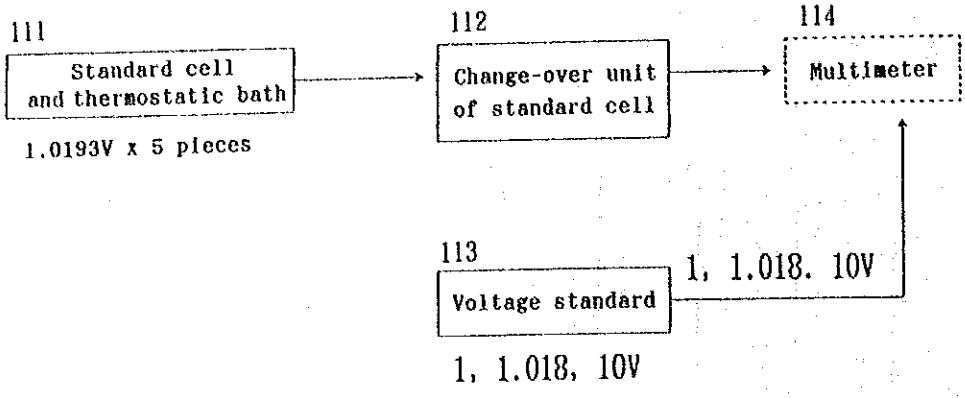
No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
1	Standard Lamp of Luminous Intensity	標準電球（光度）	Color temperature:2850K	10 pcs.
2	Standard Lamp of Luminous Intensity	標準電球（光度）	Color temperature:2850K	10 pcs.
3	DC Power Supply	直流電源	0 to 50V, 30A, resolution:0.002V	
4	Optical bench	光学ベンチ	Length:6m 3 holders	
5	DC Power Supply	直流電源	0 to 250V, 5A, resolution:0.1V	
6	Standard Resister	標準抵抗	0.001ohm:50A, 0.01ohm :10A 0.1ohm : 3A, Accuracy:0.01%	
	Water bath	水槽		
7	Switch Selector	スイッチ・セレクター		
8	Digital Voltmeter	デジタル電圧計		
9	Standard Lamp of Luminous Intensity	標準電球（光束）	200W	10 pcs.
10	Standard Lamp of Luminous Intensity	標準電球（光束）	200W	15 pcs.

List of measuring equipment

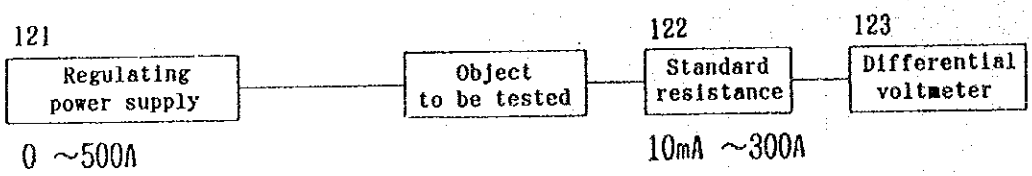
Luminous intensity

No	Equipment Name(Eng.)	Equipment Name(Jpn.)	Specification	Remarks
11	Standard of Luminous Flux	標準電球（光束）	25 to 500W	100 pcs.
12	Photometric Integrated Sphere	積分球	Diameter:2.5m	w/accessories
13	Digital Photometer	デジタル光束計		w/filters
14	Stabilized AC Power Supply	交流安定化電源	220V, 1kVA Stability : 0.01%	
15	Reference Ballast	標準安定器		20 pcs
16	Multimeter	マルチメーター		
17	Fluorescent Lamp	蛍光灯		20 pcs
18	Digital Colorimeter	デジタル色彩計		

11
Calibration of voltage standard

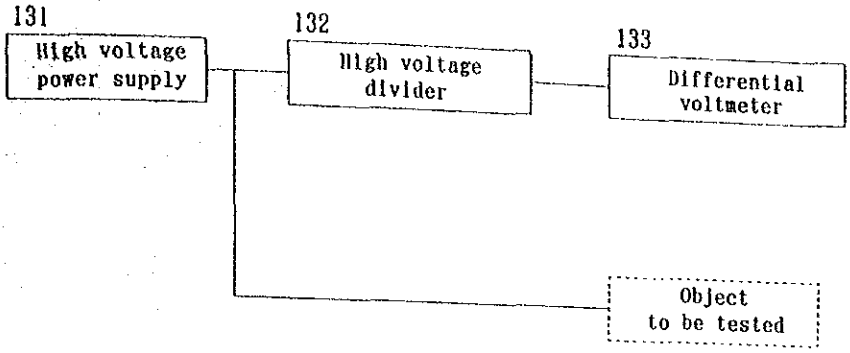


12
DC large current calibration system



13

DC high voltage calibration system

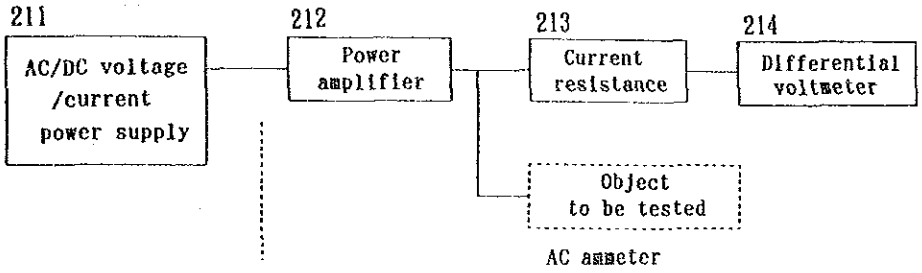


2

AC voltage/current measurement

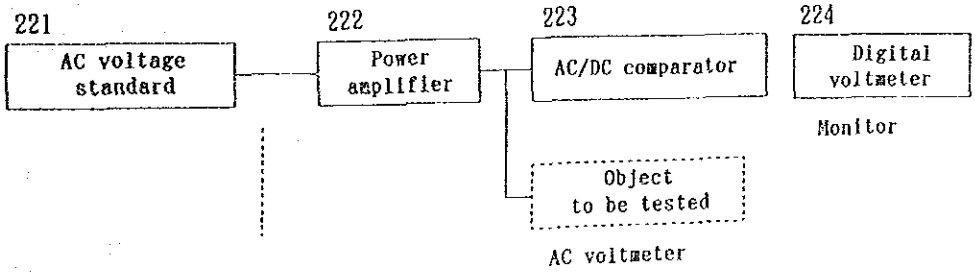
21

〈AC current measuremtn〉

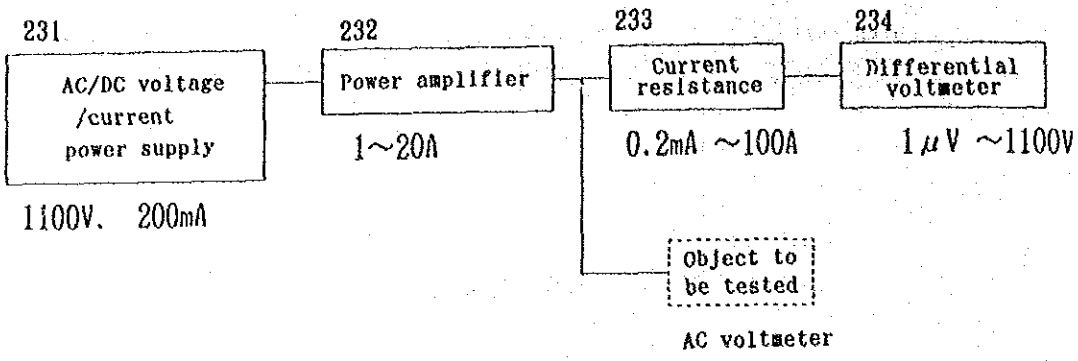


22

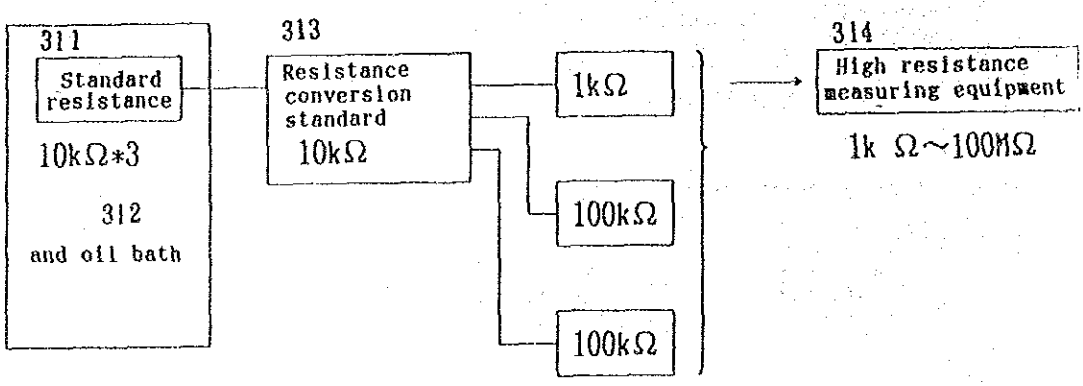
〈AC voltage measurement〉



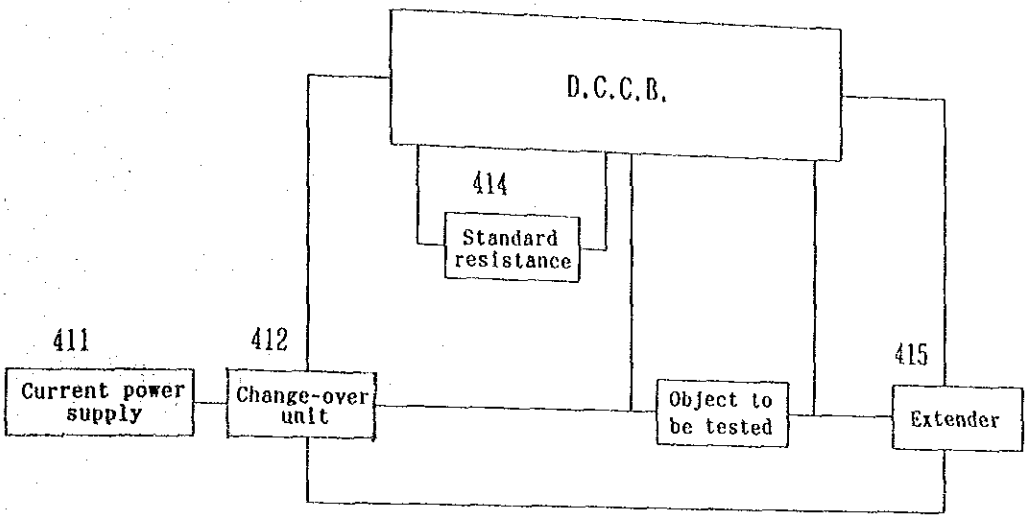
23
AC current calibration



3
Resistance measurement

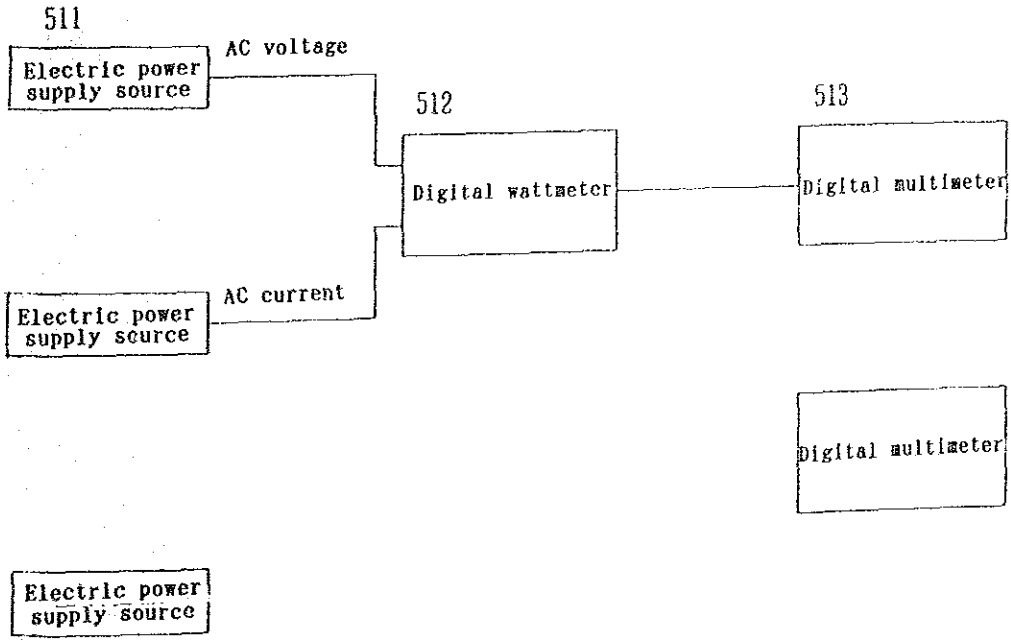


4
Resistance calibration system



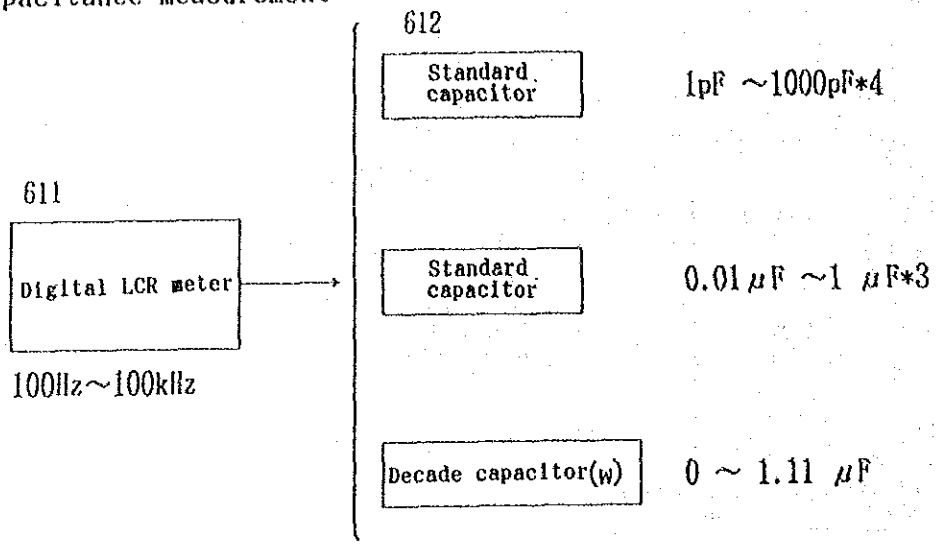
D.C.C.B.: Direct Current Comparator Resistance and Temperature Bridge
(直流電流比較器)

5
Power measurement



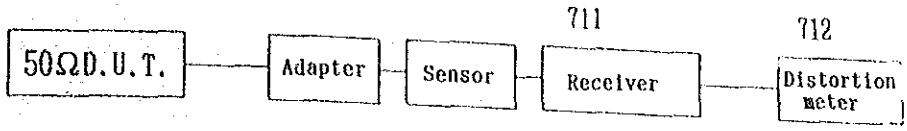
6

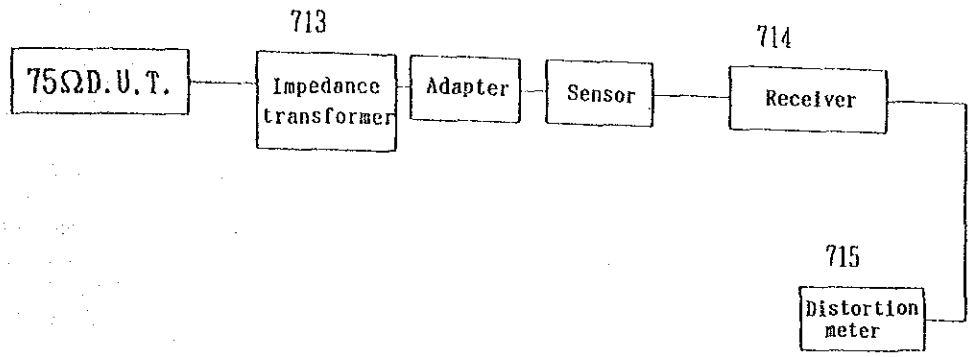
Capacitance measurement



71

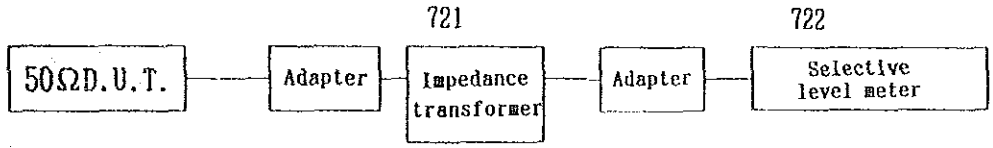
Signal generator for 2.5 to 1300Hz



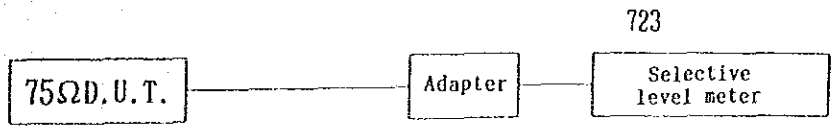


72

Signal generator for less 2.5MHz

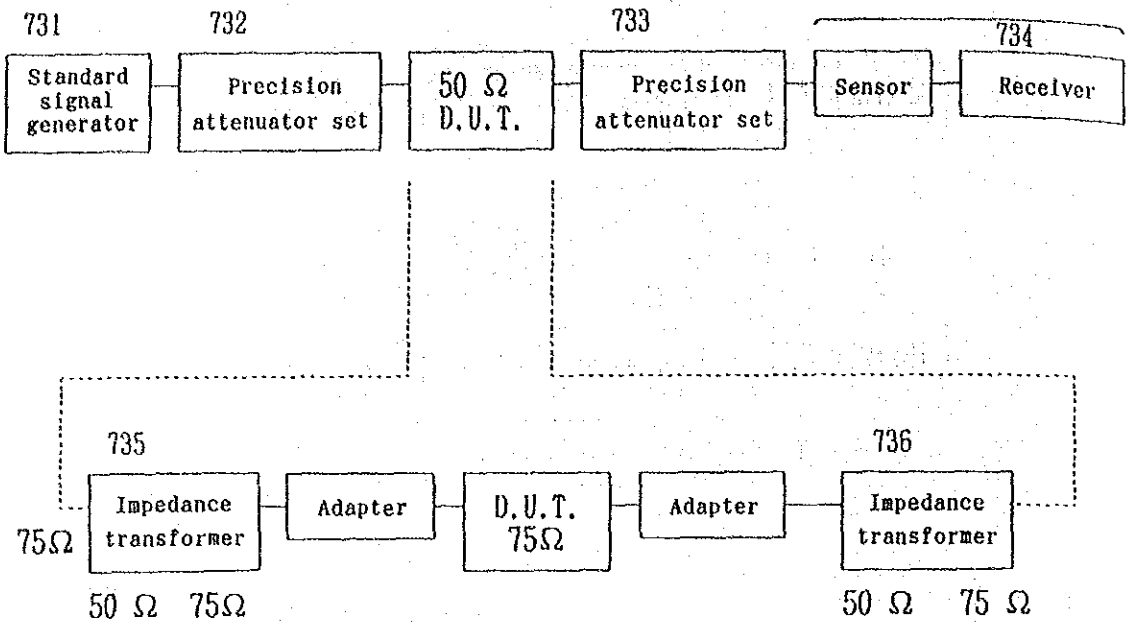


50 75



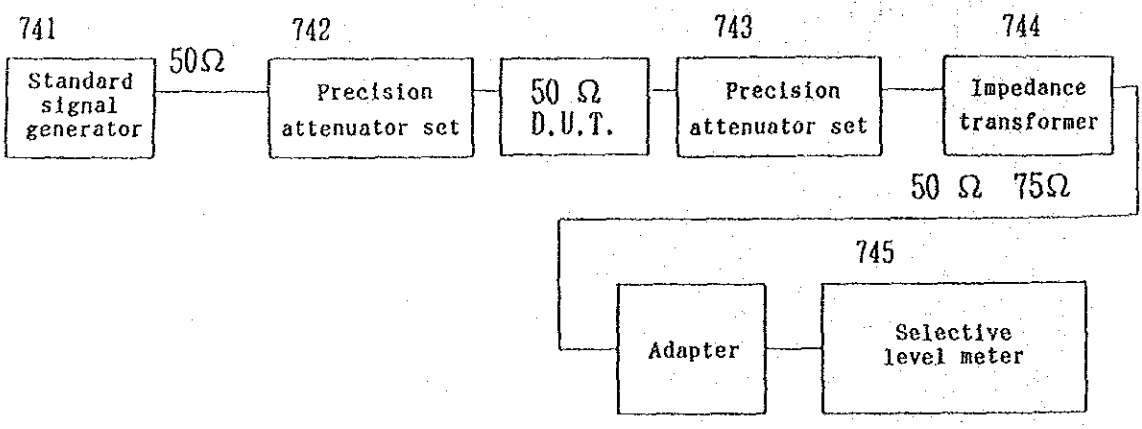
73

Attenuator of 2.5 to 1000MHz

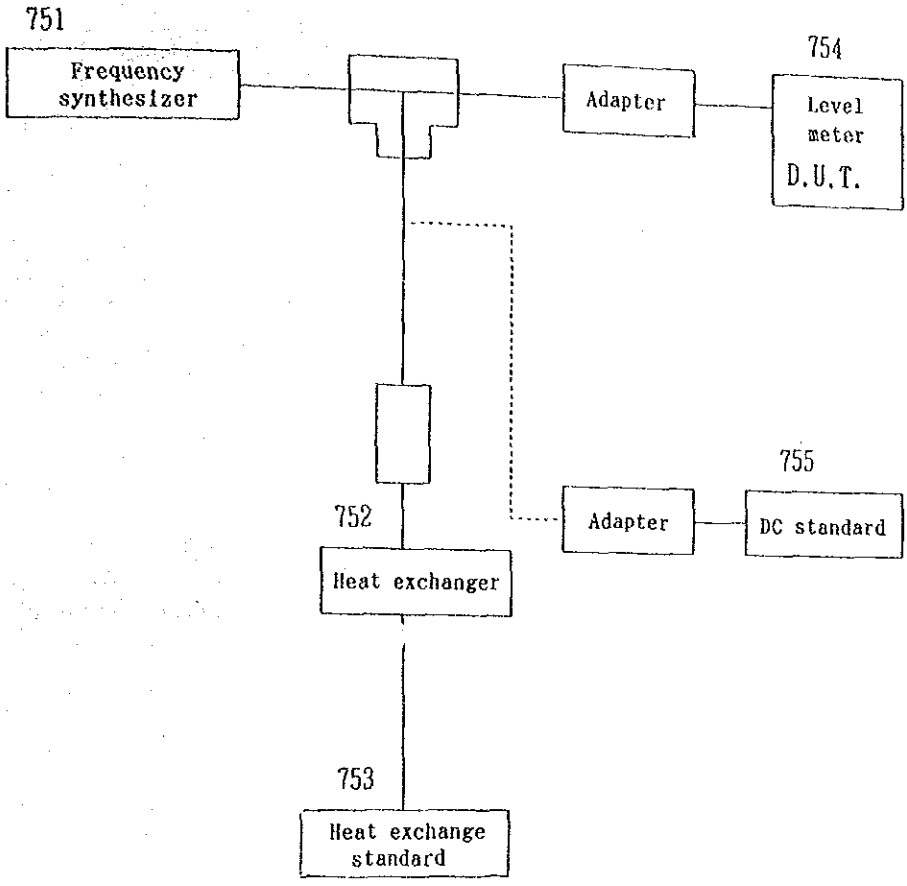


74

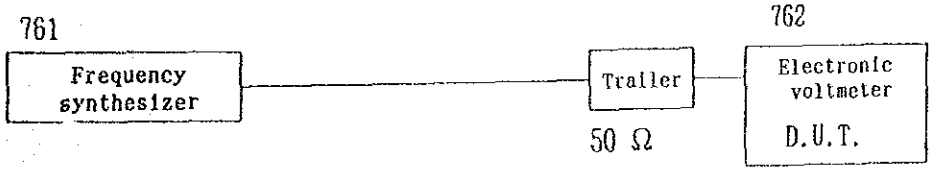
Attenuator of less 2.5MHz



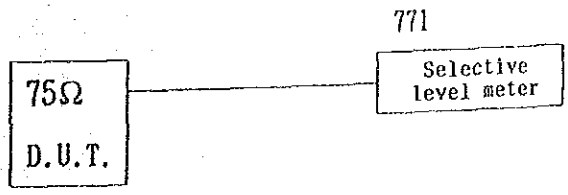
75
Level meter for less 30MHz



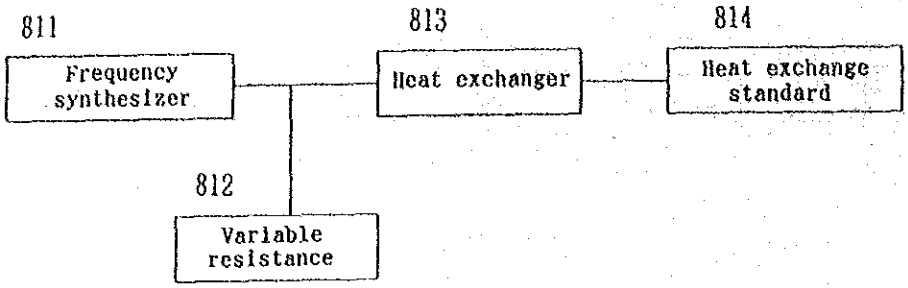
76
Electron



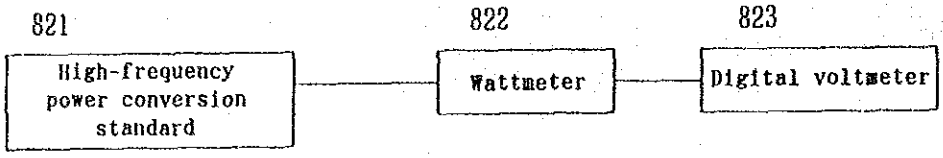
77
Low-level frequency vibration meter



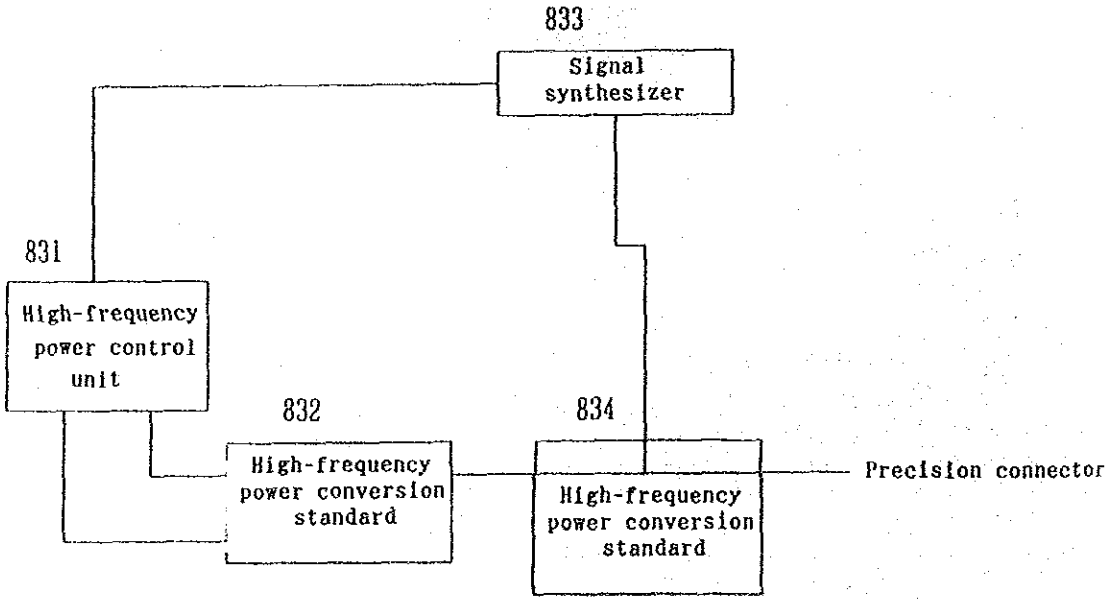
81
Calibration of frequency synthesizer



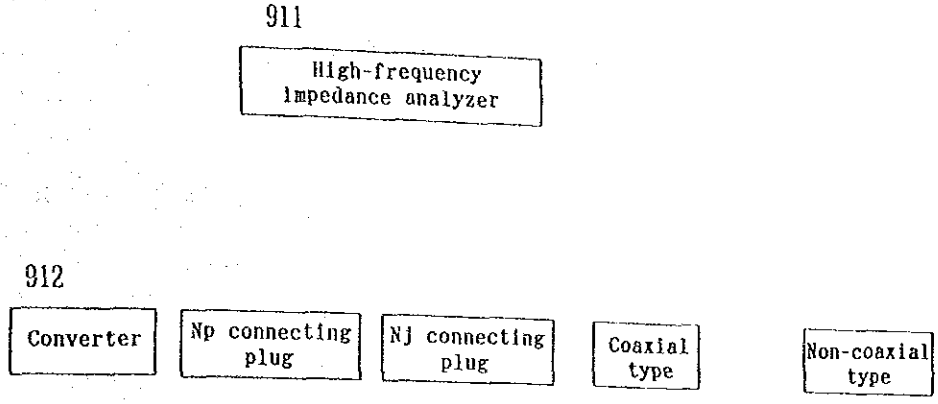
82
Standard wattmeter



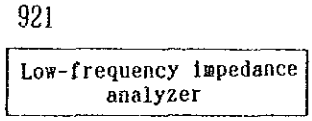
83
Wattmeter (side of electric power supply)



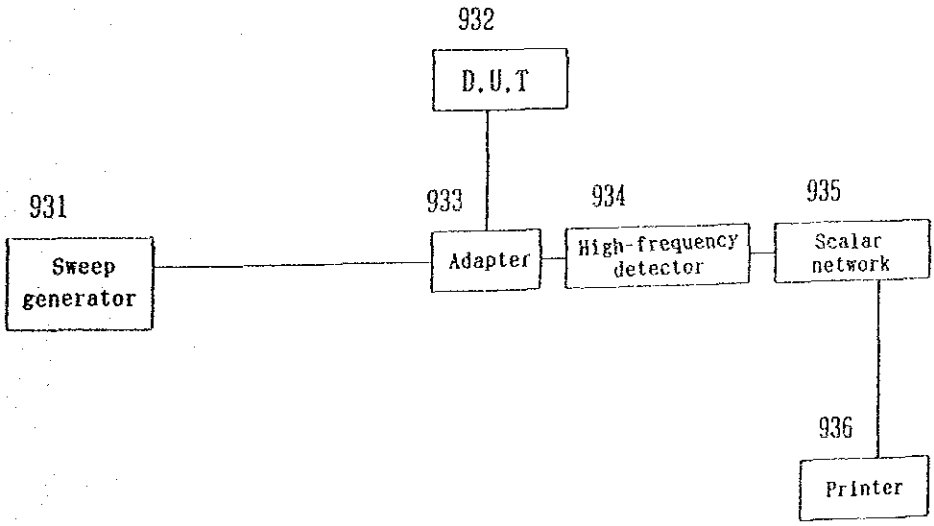
91
Impedance of less 1000MHz



92
Impedance of less 13MHz

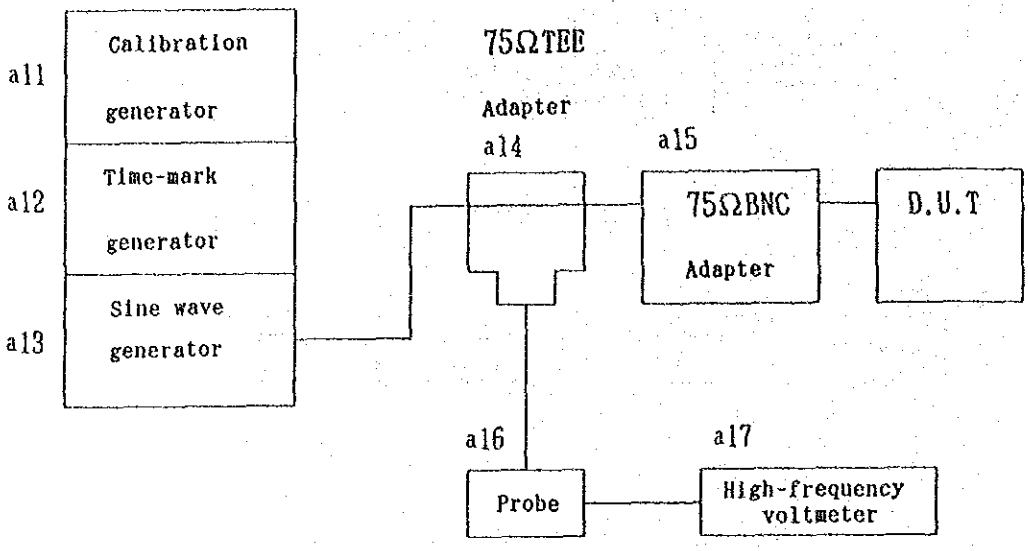


93
Impedance more than 1000MHz



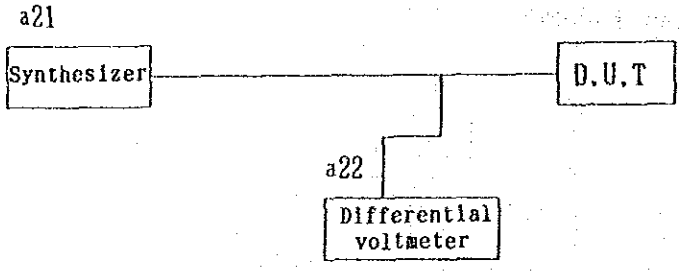
a1

Frequency characteristics of oscilloscope



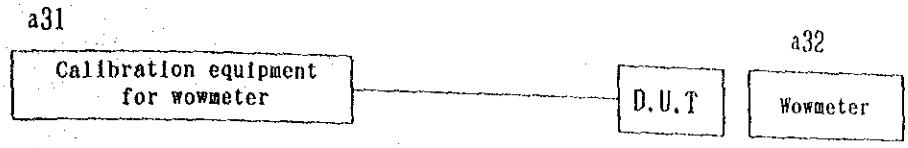
a2

Vertical sensitivity of oscilloscope



a3

Wowmeter of oscilloscope

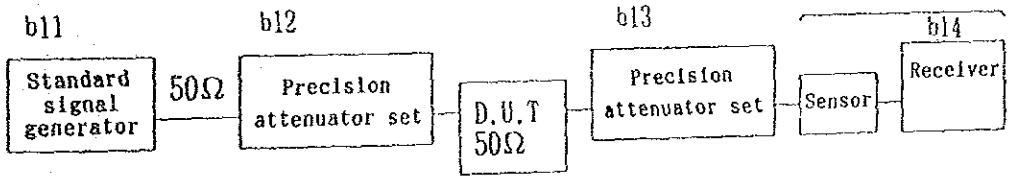


a4

Distortion meter of oscilloscope

b1

Calibration for related level of receiver



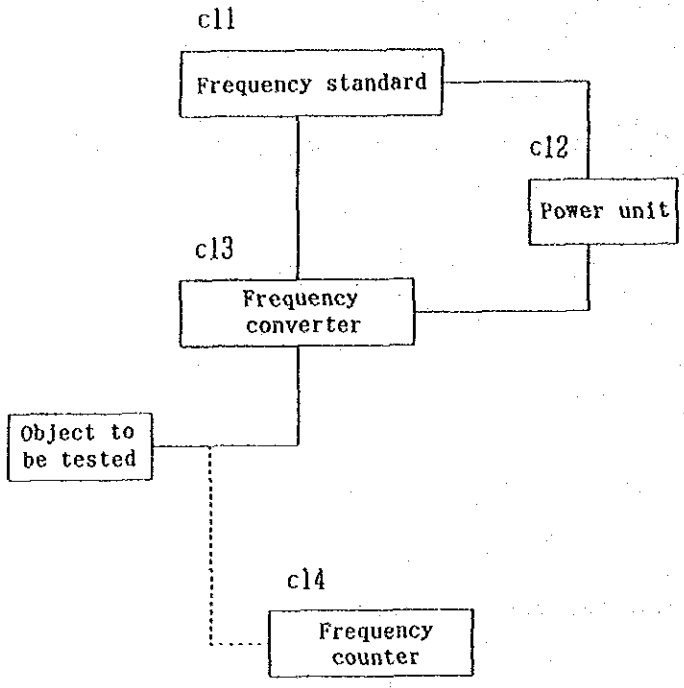
c

Power frequency characteristics of receiver

c1

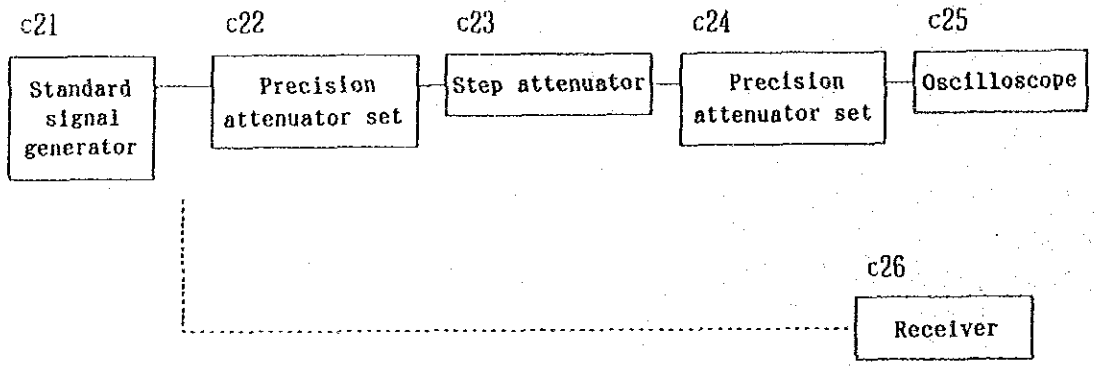
Calibration by power calibration system

< Measuring system of time and frequency >



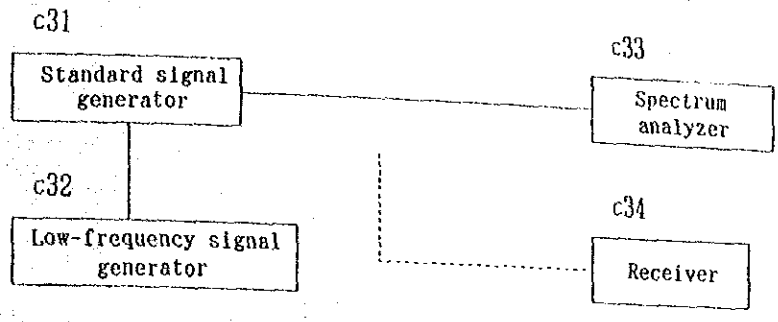
c2

Calibration of AM amplitude modulation of receiver



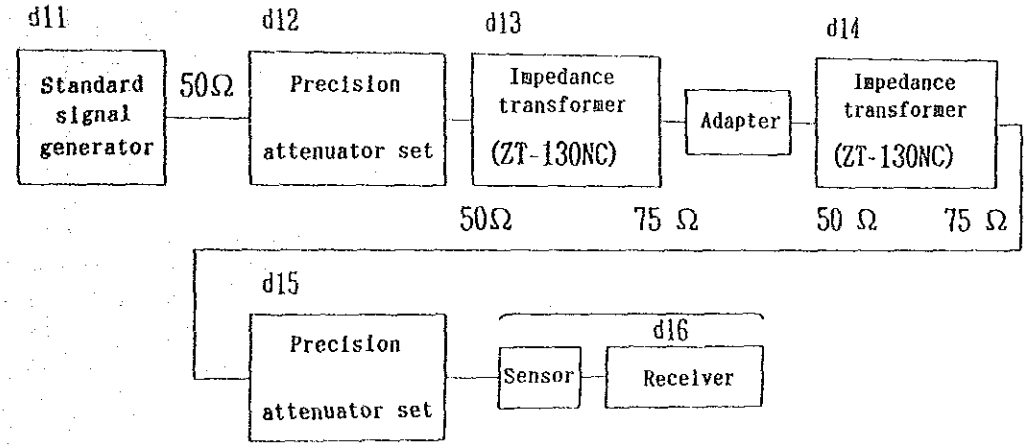
c3

Calibration of FM frequency modulation of receiver



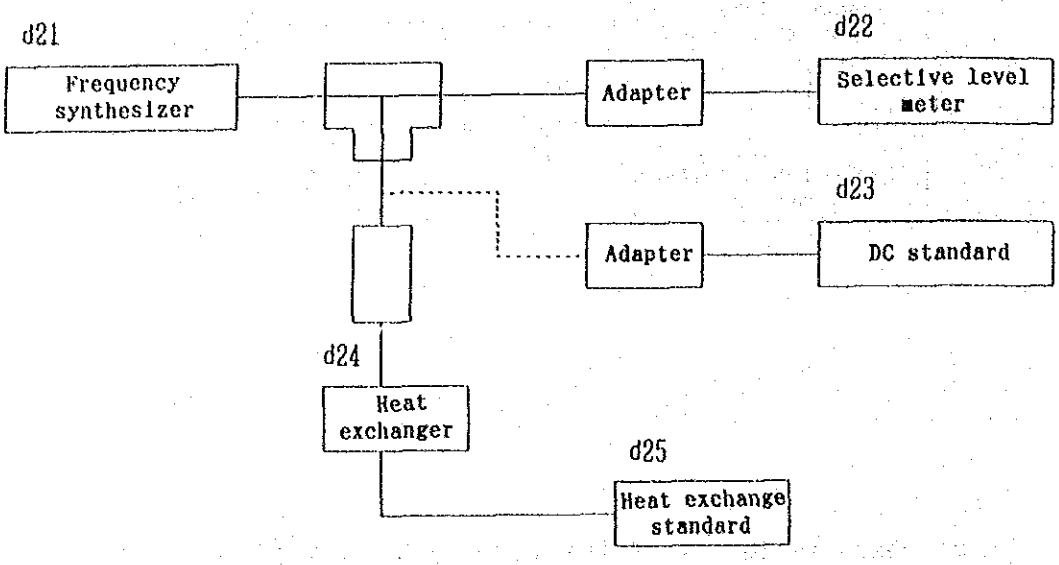
d1

Loss characteristics of impedance transformer 50/75 ohm



d2

Frequency characteristics of selective level meter



d3

Level calibration of selective level meter