## Transaction Information

| | |
|---|---|
| **Tool ID** | MAL2580 |
| **Tool Status** | Connected |
| **Location** | Malta, USA |
| **Wafer Size** | NA |
| **Fab Section** | Failure Analysis |
| **Tool Available Date** | 2024-08-27 |

## General Product Information

| | |
|---|---|
| **Vendor Supplier** | KOBELCO |
| **Model** | NA |
| **Vintage** | 2013 |
| **Serial No** | ED10020 |
| **Asset Description** | MAL2580 Kobelco HRBS |
| **Software Version** | Windows 7 |
| **CIM** | NA |
| **Process** | High Resolution Rutherford Backscattering |

## Hardware Configuration (Fab)

| System Type | Description | Quantity | Status |
|---|---|---|---|
| Main System | NA | | |
| Handler System | NA | | |
| Factory Interface | NONE | | |
| Options System | NA | | |
| Others | NA | | |

## Hardware Configuration (Subfab / Auxilliary Units)

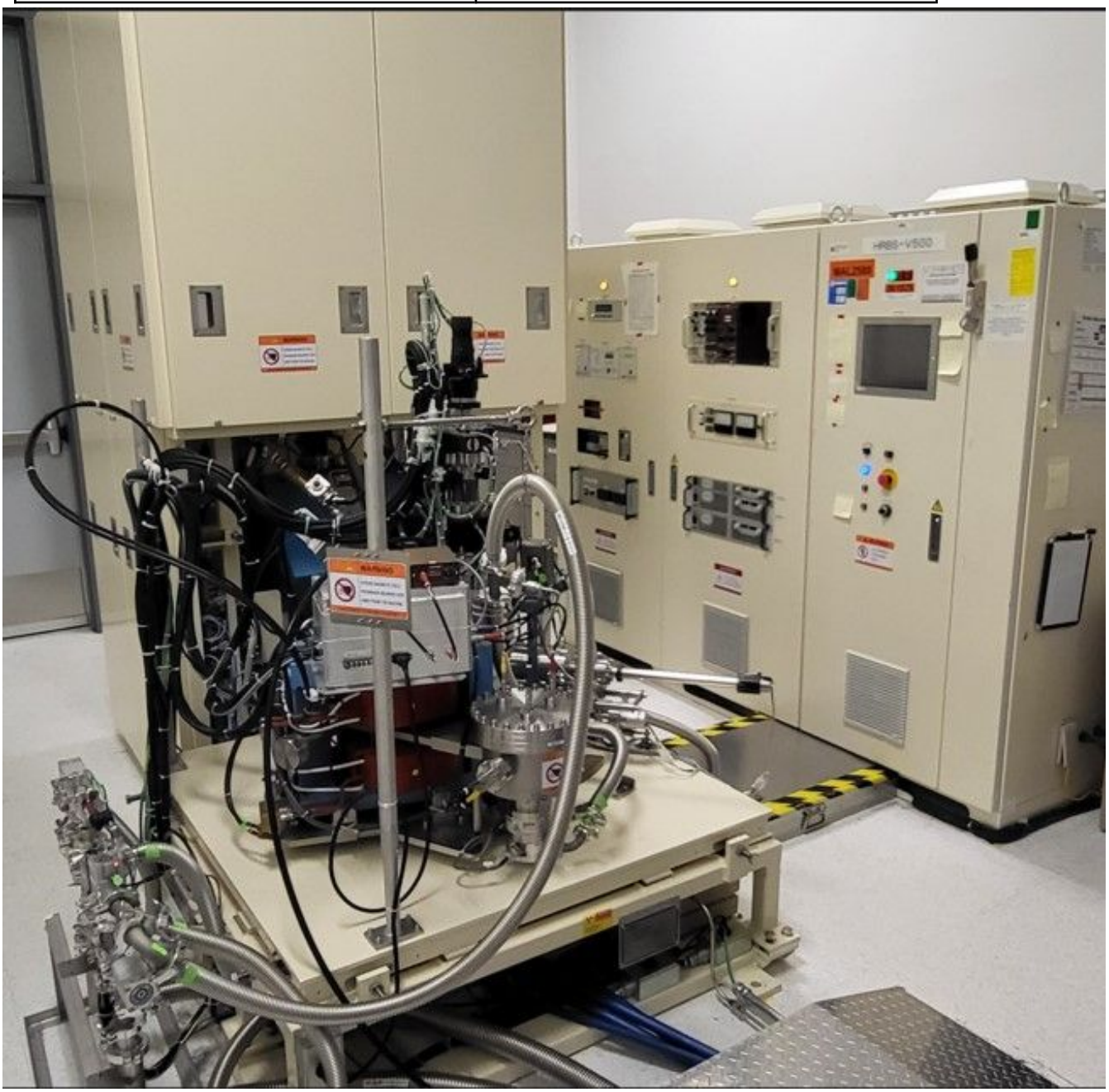
| Description | Quantity | Status |
|---|---|---|
| NA | | |

## Missing/Faulty Parts / Accesorries List

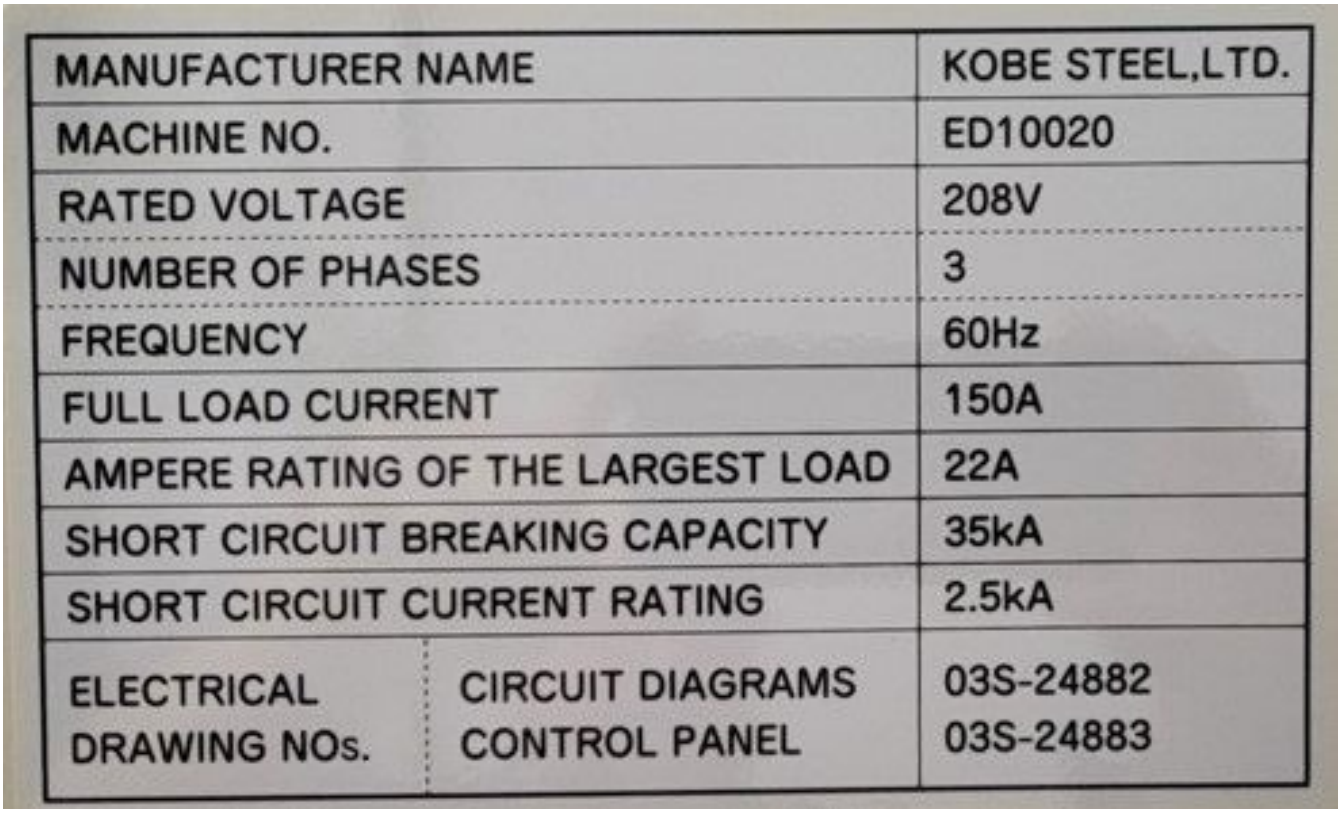
| Description | Quantity |
|---|---|
| NA | |

## Tool Pictures

| General | MAL2580 Kobelco HRBS |
| --- | --- |



| Manufacture Serial | MAL2580 Kobelco HRBS serial plate |
|---|---|



| | | |
|---|---|---|
| MANUFACTURER NAME | | KOBE STEEL,LTD. |
| MACHINE NO. | | ED10020 |
| RATED VOLTAGE | | 208V |
| NUMBER OF PHASES | | 3 |
| FREQUENCY | | 60Hz |
| FULL LOAD CURRENT | | 150A |
| AMPERE RATING OF THE LARGEST LOAD | | 22A |
| SHORT CIRCUIT BREAKING CAPACITY | | 35kA |
| SHORT CIRCUIT CURRENT RATING | | 2.5kA |
| ELECTRICAL DRAWING NOs. | CIRCUIT DIAGRAMS<br>CONTROL PANEL | 03S-24882<br>03S-24883 |

# Additional Tool Data Files

KOBELCO

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# HIGH RESOLUTION RBS
# (Rutherford Backscattering Spectrometry) SYSTEM(HRBS-V500)

# TECHNICAL SPECIFICATIONS

prepared for

MESSRS. **Global Foundries**

ESTIMATE No. E2AB225−0A

DOCUMENT No. EE13−001−R0

MODEL HRBS-V500

DATE Feb. 13th, 2013

KOBE STEEL, LTD.

MACHINERY BUSINESS

| TO | | COPY |
|---|---|---|
| CLIENT | | 2 |
| | | |
| A.T.D | Sales(Tokyo) | 1 |
| | Engineering | 2 |
| | | |
| | | |
| TOTAL | | 5 |

Approved by K. Takahara

Checked by M. Murakami

Designed by S. Imure

# REVISION

| Rev. No. | DATE | PAGE | NOTE | DESIGNED | CHECKED | APPROVED |
|---|---|---|---|---|---|---|
| R0 | Feb. 13th 2013 | — | — | S. Mure | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

CONTENT




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# 1. GENERAL DESCRIPTION

The high resolution Rutherford Back Scattering Spectrometry system,**HRBS-V500**, hereinafter referred to as **the System**, that is fabricated by Machinery Business of Kobe Steel, Ltd. hereinafter referred to as **Kobe**, is an assembly production model of a 500 kV accelerating voltage-class surface-analyzing system which Kobe has newly developed using a vertical accelerator.

The System features very easy operation, outstanding productivity, easy maintenance and advanced fully automatic control functions. In addition, our quality management system of industrial machinery plant wherein the System is built has been qualified to ISO9001 quality management system standard. Therefore, we believe that our system will be accepted with satisfaction.

The System is surface-analyzing equipment featuring the high resolution Rutherford Back Scattering methods, utilizing a Spectrometer and position-sensitive detector to analyzing scattered ion , achieves high depth profile resolution of the thin films.

The System is incomparably lighter and smaller than the conventional RBS systems, and can be used to analyze films used for a variety of electronics and functional materials, which have increasingly become thinner, while maintaining the advantages in the quantitative, nondestructive, and rapid analysis offered by the conventional RBS systems. The main specifications of the System are listed below.

| | | |
|---|---|---|
| 1) | Accelerator high voltage(HV) | 300kV～500kV |
| 2) | HV stability | ±125V or less |
| 3) | Sample size(thickness) | 10mm×10mm ～20mm×20mm<br>(thickness:about 0.5mm～4mm) |
| 4) | Sample exchange | Load lock system by sample holder |
| 5) | Analyzing method | |
| | ・RBS (Conventional,SSD) | Energy resolution less than 18keV |
| | ・High resolution RBS | Energy resolution less than 2.0 keV |
| | ・High resolution ERDA * | Energy resolution less than 2.0 keV* |
| | (Using same Spectometer as HRBS) | |
| 6) | Ions | $He^+$ for RBS,HRBS ,$N^+$ for HERDA* |
| 7) | Incident ion current Ion beam size | 20nA or more at the sample surface ($He^+$)<br>1mm×1mm |
| 8) | Control and data acquisition system | Programmable logic controller & Personal computer |
| 9) | Protection for X-ray | Less than 0.6 μSv/h at the position of 100mm from accelerator panel |

Remark 1) This Specification describes the HERDA measurement system using same spectrometer as HRBS, as options which are remarked with *.

Remark 2) The System is NOT designed for installing in the clean room.


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# 2. SPECIFICATIONS OF HRBS-V500 (SCOPE OF SUPPLY)

The System layout, outline dimensions, and the internal layout of the each equipment are shown in the drawings attached. Outline of Main Unit and System Layout may be changed for improvement without prior notice.

## 2.1. HRBS-V500 equipment

The System consists of a main chamber, a load lock system for sample holder exchange, a goniometer, a vacuum pumping system, a beam-line equipment, an accelerator system, an exterior panel and a control system.

### 2.1.1. Main chamber (measuring chamber)

The main chamber, which is connected with spectrometer, is made of stainless steel.

The dimensions and the detection port angles of the main chamber are described below.

| | |
|---|---|
| Outline outside dimensions | $\phi$203×405 (Height) mm |
| Detection port angles | 62.5,85,107.5 degrees(3 ports) for detection port angles changeable system and 30 degrees for HERDA* |

The main chamber is connected with the components as below.

| | |
|---|---|
| Goniometer for sample position control | 1 |
| Spectrometer for analyzing scattered ion energy through an alternative four detection ports | 1 |
| Position sensitive detector for analyzing ion by spectrometer | 1 |
| Load lock chamber for a sample exchange | 1 |

### 2.1.2. Load lock system

Sub-chamber is connected with a main chamber through a gate-valve. Sample holder is attached or removed by a transfer-rod. The sample holder has the following specifications.

| | |
|---|---|
| Size of the sample holder | $\phi$36mm × 15.9mm (max) |
| Material of the sample holder | Stainless steel |


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### 2.1.3. Goniometer

The goniometer has 3 transfer axes and 2 angular axes driven by stepping motors. Each angular axis is controlled by programmable controller for channeling measurement. The span and resolution of each axis is shown as follows.

| | |
|---|---|
| For transfer of vertical axis to ion beam(X) | ± 10mm |
| For transfer of vertical axis to ion beam(Y) | ± 18mm |
| For transfer of ion beam direction(Z) | ± 10mm |
| For beam axis rotation | 0-360° |
| For vertical axis rotation | -140° ～+90 ° |

### 2.1.4. Spectrometer and Detector

A sector type double focused spectrometer is equipped on the end station frame and analyzing deflection chamber is connected to the detection port of main chamber. The spectrometer can be easily moved to change the detection angle by adjusting rails with the detection angle changeable system.

The specification of the spectrometer is as follows.

| | |
|---|---|
| Deflection radius | 150mm |
| Magnetic field | Max. 1.0 T |
| HRBS detector | MCP ( Multi Channel Plate ) |
| RBS detector | Depletion depth 100 μm, Detection area 50mm2 |

### 2.1.5. Vacuum system

Turbo molecular pump units are located at the chamber,the spectrometer,the beam-line,and the accelerator. By the vacuum pumping system, vacuum characteristics of the System will be as below.

| | |
|---|---|
| Ultimate pressure of the main chamber | $1.3\times10^{-5}$ Pa or less |
| Ultimate pressure of the accelerator & the beam-line | $5.0\times10^{-4}$ Pa or less |

The values given above are based on the condition that the System is kept at room temperature, and that no ion beam introduced and no sample holder is loaded.

The vacuum pumping system consists of the following components.

| | |
|---|---|
| Dry Scroll Pump for the load lock chamber and rough pumping of TMP 15 $m^3$/hr | 1 |
| Dry Scroll Pump for the beam-line and accelerator 15 $m^3$/hr | 1 |
| Turbo Molecular Pump (TMP) for the main chamber 800 liter/sec for $N_2$ | 1 |


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| | |
|---|---|
| Turbo Molecular Pump (TMP) for the spectrometer<br>50 liter/sec for $N_2$ | 1 |
| Turbo Molecular Pump (TMP) for the accelerator<br>300 liter/sec for $N_2$ | 1 |
| Gate valve for Load lock and main chamber | 1 |
| Gate valve for beam line and main chamber | 1 |
| L type valve | 4 |
| Leak valve | 4 |

### 2.1.6. Vacuum pressure measuring system

The System has two vacuum gauges for process control.

| | |
|---|---|
| Full range guage for high vacuum monitoring | 2 |
| Pirani gauge for low vacuum monitoring | 1 |

### 2.1.7. Beam-line equipment

The Beam-line includes the following beam optical units.

| | |
|---|---|
| Bending magnet | 1 |
| Slit (manual) | 1 |
| Mass slit (manual) | 1 |

### 2.1.8. Accelerator system

The accelerator system consists of the high-voltage generating system, acceleration tube ,and the ion source which are installed in the $SF_6$ gas tank.The gas for ion source is introduced from the out side of the accelerator tank.

| | |
|---|---|
| High-voltage generating system(Cockcroft type max. voltage 500kV) | 1 |
| Acceleration tube | 1 |
| Ion source (PIG Type) | 1 |
| Accelerator main tank (Max. pressure 0.19M Pa. ) | 1 |
| $SF_6$ gas reserve tank for accelerator maintenance | 1 |
| $SF_6$ gas transport pumping system for accelerator maintenance | 1 |
| Handlifter for accelerator maintenance | 1 |


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### 2.1.9. Control system

The control system of the System consists of the following units and functions. 1set

Control panel

The control panel includes following components.

1) A programmable controller and a graphic operation panel for the total system control
2) Vacuum gauge controller
3) NIM instrumentation system
4) Circuit breakers and a transformer for power distribution and protection of the System.

Computer system with operating software 1set

A) Software

Analysis and simulation of HRBS spectrum

Measurement of HRBS spectrum and channeling system

Analysis and simulation of HERDA spectrum*

Measurement of HERDA*

B) Hardware

PC

Monitor

## 2.2. Documents

The following documents will be submitted within three months from the contract.

| | | |
|---|---|---|
| 1) | Manufacturing specifications | 3 copies |
| 2) | Installation drawings | 3 copies |

The following documents will be submitted with the shipment of the System.

| | | |
|---|---|---|
| 3) | Instruction manual | 3 copies |
| 4) | Maintenance manual including the assembly drawings selected by Kobe and the list of recommended spare parts | 3 copies |
| 5) | Electrical drawings for maintenance | 3 copies |
| 6) | Suppliers' manuals for major purchased parts such as pumps, power supply units, etc. | 1 set |
| 7) | List of spare parts to be supplied . | 3 copies |
| 8) | Inspection certificate | 3 copies |


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## 2.3. Technical advisory service for installation at Buyer's site

Buyer shall do installation works of the System. Kobe will provide technical advisory service for checking out installation, and operation training of the System at Buyer's site. For the technical advisory service, Kobe will dispatch advisors. All travel, lodging and other expenses to be incurred in connection with dispatching such advisors shall be borne by Kobe.

## 2.4. Start-up parts

Kobe will provide start-up parts which are needed during and right after installation.

## 2.5. Consumables

Kobe will provide consumables which are needed within a year after installation.


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# 3. UTILITIES AND SITE CONDITIONS (Buyer's scope)

## 3.1. Site for installation

| | |
|---|---|
| Minimum space for installation | 3.9m (Width) × 5.5m (Length) × 2.7m (Height) (See Fig. 1) including maintenance space. |
| Environment | Class 100000 or equivalent |
| Temperature | 15 ～ 25℃ |
| Humidity | 60% or less |
| Remark 3) | Air conditioning of the site is recommended. |
| Floor load bearing capacity | 9.8kN/m$^2$ or more. Flat concrete floor |
| Anchor Bolts | In order to fix the System, anchor bolts (M12 ~ M16) are used. |

## 3.2. Primary power source and grounding

| | |
|---|---|
| Voltage, frequency and power capacity | AC 220V, 3 phase, 60 Hz : 50kVA |
| Ground connection | Resistance 10Ω or less ×1(independent) |
| | Resistance 100Ω or less ×1(independent) |

## 3.3. Compressed air

| | |
|---|---|
| Supply Pressure | 450～600 kPa (Gauge) |
| | Shall be dry and clean. |
| Flow rate | 20 liter /min |

## 3.4. Cooling water

| | |
|---|---|
| Flow rate | 25 liter /min. for conductivity less than 10 μ S/cm at the connecting point of the System |
| | 12 liter /min. for conductivity less than 200 μ S/cm at the connecting point of the System |
| Temperature | 20～25° C |
| Supply pressure | 350～450 kPa (Gauge) |
| Pressure of water return line | Maximum 50 kPa (Gauge) |
| pH | 6.5～8.0 |
| Remark 4) | Please install #40 mesh in-line filter to the water supply piping and keep the water temperature at the level that no condensation of humidity happens. |


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### 3.5 Nitrogen gas (as leakage gas for chamber open)

| | |
|---|---|
| Supply Pressure | 0.2～0.3MPa (Gauge) |
| | Shall be dry and clean. |
| Flow rate | 10 liter /min |

### 3.6 Vacuum pump exhaust piping

It is recommended to prepare the exhaust piping to prevent the oil mist discharged from exhaust port of dry pump, and further to allow it to be discharged to the harmless place.

### 3.7 Ion gas (He, $N_2$*, for ion source)

| | |
|---|---|
| Supply Pressure | 0.28～0.32MPa (Gauge) |
| Purity | 99.999% or more |
| Flow rate | 1 liter /min |
| He ,$N_2$*gas cylinder capacity | 10 liter |
| Regulator (for He ,$N_2$*gas cylinder) | |
| Inlet pressure | 10 MPa (Gauge) or more |
| Outlet pressure | -0.1～+1 MPa (Gauge) |
| Outlet connecting size | 1/4 VCR male |

### 3.8 $SF_6$ gas (for accelerator tank)

| | |
|---|---|
| Supply Pressure | 0.5MPa (Gauge) |
| Purity | 99.9% or more |
| Flow rate | 30 liter /min |
| $SF_6$ gas cylinder capacity | 48 liter (liquid:50kg) |
| Regulator (for $SF_6$ gas cylinder) | |
| Inlet pressure | 10 MPa (Gauge) or more |
| Outlet pressure | 1 MPa (Gauge) or more |
| Outlet connecting size | Rc 1/4 (Taper pipe threads female) |


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# 4. WORKS EXCLUDED

The following items will be excluded from the scope of Kobe's works.

1) Shop building
2) The design, works and materials involved in foundation of the System
3) The design, works, materials and facilities for supply of utilities to the System
   a) Primary power source and primary side wiring cables and work to power distribution panel
   b) Ground wiring cable and work to the chamber
   c) Compressed air sources and supplies piping
   d) Cooling water recycling system, and supply, return and drain piping
   e) Vacuum pump exhaust piping
   f) Ion source gas (He, $N_2$*), regulator and supplies piping
   g) $SF_6$ gas and regulator
   h) Ion gas (He, $N_2$*) and $N_2$ gas (for chamber open) piping to the connection of the System, leakage test and safeguard facility against explosion, ignition or lack of oxygen, etc.
4) Air conditioning and ventilation
5) General tools such as spanner, wrench, screwdriver, and hammer, etc.
6) Other items which are not described in this specification

# 5. TEST AND INSPECTION (ACCEPTANCE TEST)

## 5.1 Test and Inspection at Kobe's Site

The following test and inspection of the System will be executed by inspector(s) of Kobe at Kobe's workshop before shipment.

### 5.1.1 Appearance inspection

The appearance inspection will be carried out in accordance with Kobe's inspection standard showing the criteria of the inspections. The inspection item will be as followings.

- Appearances check of position and quantity of ports & nozzles, deformation, condition of welding and painting.
- Dimensional inspection of main chamber, spectrometer, and other parts
- Pressure test of water, air and gas lines
- Inspection of water leakage

These inspections will be executed by Kobe's inspector(s) and the results will be reported to Buyer.


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### 5.1.2 Performance test

The performance test will be carried out in accordance with Kobe's inspection standard showing the procedure, condition and criteria of the tests. The test items and the criteria for the clearance of the test shall be as followings.

| Test Item | Criteria | Measurement Condition |
|---|---|---|
| Energy resolution of RBS measurement | less than 18.0keV | $He^+$ 500keV |
| Energy resolution of high resolution RBS measurement | less than 2.0 keV | $He^+$ 400keV |
| Energy resolution of high resolution ERDA measurement* | less than 2.0 keV* | $N^+$ 500keV * |

$SiO_2$ film on Si Wafer for HRBS, Au(or equivalent) film on Si Wafer for RBS and DLC film on Si Wafer for HERDA shall be used as target samples which shall be prepared by Kobe.

These tests will be executed by Kobe's inspector(s) and the results will be reported to Buyer.

## 5.2 Test and Inspection at Buyer's Site

These tests will be executed by Kobe's technical advisor including the operation.

### 5.2.1. Performance test at Buyer's Site

These tests will be executed by Kobe including adjusting the incident beam conditions.

The performance test will be carried out in accordance with Kobe's inspection standard showing the procedure, condition and criteria of the tests. The test items and the criteria for the clearance of the test shall be as followings.

| Test Item | Criteria | Measurement Condition |
|---|---|---|
| Energy resolution of RBS measurement | less than 18.0keV | $He^+$ 500keV |
| Energy resolution of high resolution RBS measurement | less than 2.0 keV | $He^+$ 400keV |
| Energy resolution of high resolution ERDA measurement* | less than 2.0 keV* | $N^+$ 500keV * |

$SiO_2$ film on Si Wafer for HRBS, Au(or equivalent) film on Si Wafer for RBS and DLC film on Si Wafer for HERDA shall be used as target samples which shall be prepared by Kobe.

These tests will be executed by Kobe's inspector(s) and the results will be reported to Buyer.


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# 6. OPTIONS

The following items are options.

## 6.1 HERDA

HERDA is the analysis to analyze hydrogen concentration with high depth resolution.

# 7. OTHERS

## 7.1 TERMS OF DELIVERY

FOB JAPAN, Kobe Port.

## 7.2 PACKING AND TRANSPORTATION

All parts and units will be export-packed in accordance with Kobe's Standard Packing Procedure.

Transportation from Kobe's factory to Kobe port is Kobe's scope.

Transportation from Kobe port to Buyer's site is Buyer's scope.

MCP (HRBS detector) will be separately transported by air by Kobe because MCP is sensitive to the atmosphere and should be held with vacuum until installation.

## 7.3 PAINTING

| | |
|---|---|
| Stainless steel parts | Unpainted |
| Flame and enclosure of the System | Kobe's standard |
| Control panel (Outside) | Kobe's standard |
| Control panel (Inside) | Kobe's standard |
| Power supply box for bending magnet | Kobe's standard |
| Purchased components | Manufacturers' standard |

## 7.4 PRODUCT SAFETY

Kobe has been manufacturing its products with special care to ensure the user's safety. Naturally, the products have been designed and manufactured with principle object of 'Intrinsic Safety' so that they are free from any danger. However, there are some points that can not be designed for intrinsic safety in relation to function/ performance. As countermeasures, Kobe provides safety devices such as covers, safety signs and labels, or describes caution indications in instruction manual and maintenance manual in order to avoid such hazards. Such signs, labels and indications are written in English.


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## 7.5 WARRANTY

Kobe warrants the System specified herein to be free from any mechanical defect and to be of good workmanship and material. Should any part of the System be proven to be defective in material, design or workmanship within the warranty period stated below, Kobe will at Kobe's option, either repair or replace such part(s) on FOB Japanese port basis as quickly as possible at Kobe's expense, provided that the System is operated and maintained under normal conditions in accordance with instruction manual and maintenance manual, and further that the proper notification of such defects is made to Kobe within the warranty period.

The following items are excluded from warranty coverage under above warranty clause as they are considered as consumable items: Valves packing, pump packing and seals in general, valve seat, etc. This warranty shall not apply to any component which, in Kobe's judgement, has been repaired, altered, misused or contaminated in any way so as to adversely affect its operation, nor which has been subject to negligence, accident or mechanical handling / loading damage.

The warranty shall be in effect for a period of thirteen(13) months from the date of shipment, or twelve(12) months from the date of operation of the equipment at site, that is completion of technical advisory service, whichever comes earlier.

Kobe shall in no event be liable to Buyer by way of indemnity or by reason of any breach of the Contract or in tort or otherwise for loss of use of the System or any part thereof or for loss of production, loss of profit, loss of contract or for any indirect special or consequential loss or damage that may be suffered by Buyer in connection with the Contract.

Despite existence of other provision(s), Kobe shall in no event be liable over the contracted amount for indemnification of loss and/or damages.

## 7.6 STANDARDS

Unless otherwise specified in this specification ,design, manufacture and test of the System will be in accordance with the following standards and codes.

Japanese Industrial Standards (JIS)

Standard of Japanese Electro-technical Committee (JEC)

The Standard of Japan Electrical Manufacturer's Association (JEM)

KOBE STEEL Standard

Other relevant standards authorized or prevailing in Japan

Japanese Cables Standard (JCS)

## 7.7MEASUREMENT

All drawings, specifications and other technical documents to be submitted by Kobe will be principally prepared in the metric system.


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## 7.8 LANGUAGE

All documents to be submitted and name plates to be provided by Kobe will be written in English.


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## APPENDIX A : LIST OF MAJOR COMPONENT USED IN THE SYSTEM

| Component | Qt. |
|---|---|
| 1.END STATION | |
| Main Chamber | 1 |
| Spectrometer & Spectrometer chamber | 1 |
| Detection Angle Changeable System | 1 |
| Spectrometer power supply | 1 |
| MCP (Multi Channel Plate) | 1 |
| Pre-Amp. | 2 |
| Main Amp. | 2 |
| Pre-Amp for RBS | 1 |
| Main Amp. for RBS | 1 |
| Digital Signal Processor for spectro-analyzer | 1 |
| MCP Bias-Power Source | 1 |
| Tesla-meter | 1 |
| RBS detector(conventional SSD) | 1 |
| Load Lock System | 1 |
| Goniometer | 1 |
| Sample holder | 1 |
| Frame unit | 1 |
| 2.VACUUM SYSTEM | |
| Dry Scroll Pump | 2 |
| Turbo Molecular Pump(TMP) for Main Chamber (800 liter/sec ) | 1 |
| Turbo Molecular Pump (TMP) (50 liter/sec) | 1 |
| Turbo Molecular pump (TMP) for the accelerator( 300liter/sec) | 1 |
| L type valve | 4 |
| Leak valve | 4 |
| Gate valve | 2 |
| 3.VACUUM PERSSURE MEASURING SYSTEM | |
| Vacuum pressure measuring controller | 1 |
| Full range guage for high vacuum monitoring | 2 |
| Pirani gauge for low vacuum monitoring | 1 |
| 4.BEAM-LINE EQUIPMENT | |
| Bending magnet | 1 |
| Slit(4 axes,manual type) | 1set |
| Mass slit | 1 |
| Frame unit | 1 set |
| 5.ACCELERATOR SYSTEM | |
| High-voltage generating system | 1 |
| Acceleration tube | 1 |
| Ion source | 1 |
| Accelerator main tank | 1 |
| $SF_6$ gas reserve tank | 1 |
| $SF_6$ gas transport pumping system | 1 |
| Handlifter | 1 |
| 6.CONTROL SYSTEM | |
| Control panel | 1 set |
| Computer & LCD | 1 set |
| NIM Power Source | 1 |
| Power supply box for Bending magnet | 1 set |


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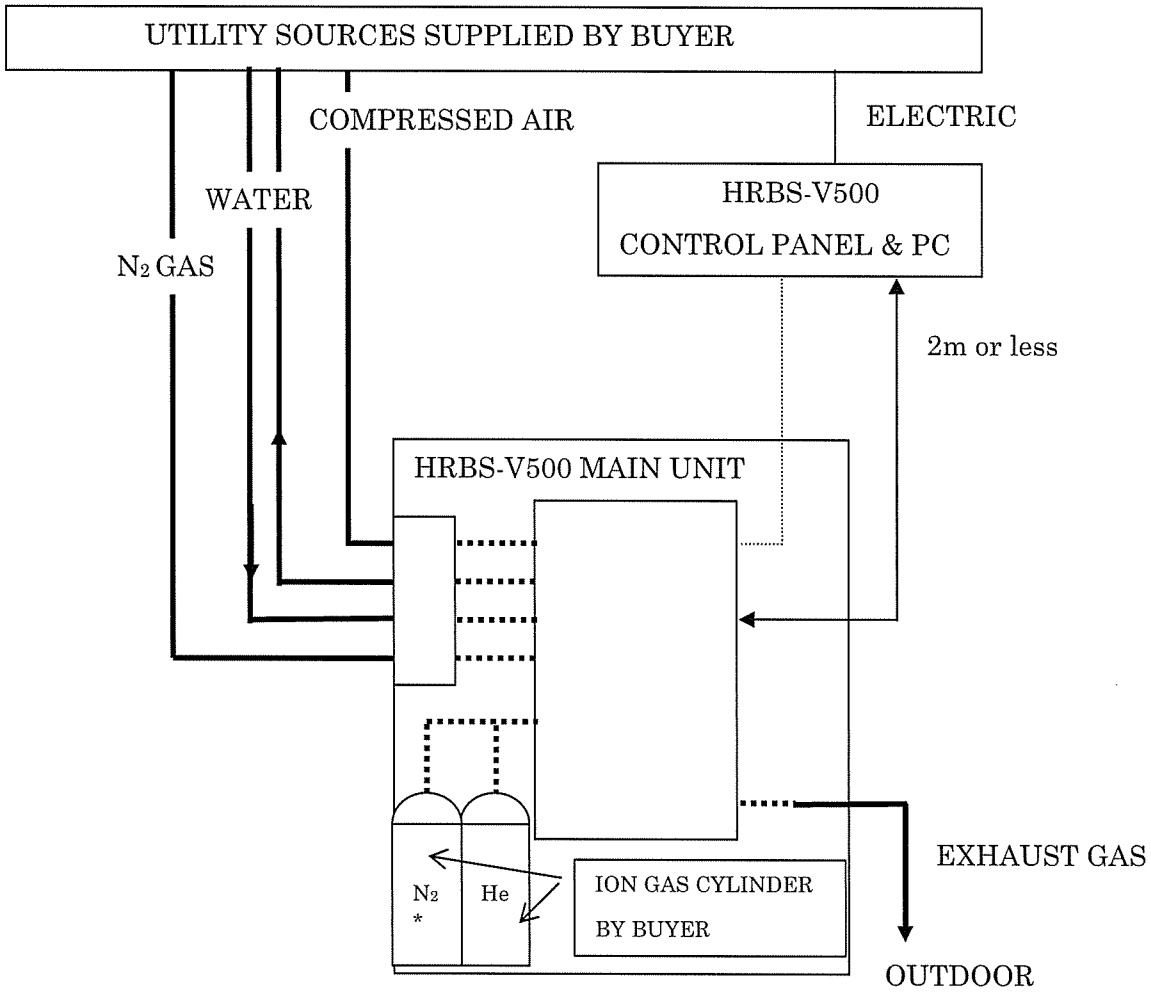
APPENDIX B: BATTERY LIMIT




A —— Piping materials shall be prepared by Buyer. Engineering, fabricating work and installation work including fixing pipe clamps shall be performed by Buyer.

B —— Cables and wires including standard connectors and receptacles shall be prepared by Buyer. Engineering and wiring work shall be performed by Buyer.

C ····· Engineering, piping and fabricating work including piping materials shall be prepared by Kobe. Connecting and re-setting work shall be performed by Buyer.

D ····· Engineering, cables and wires including standard connectors and receptacles shall be prepared by Kobe. Installation work including wiring work shall be performed by Buyer.


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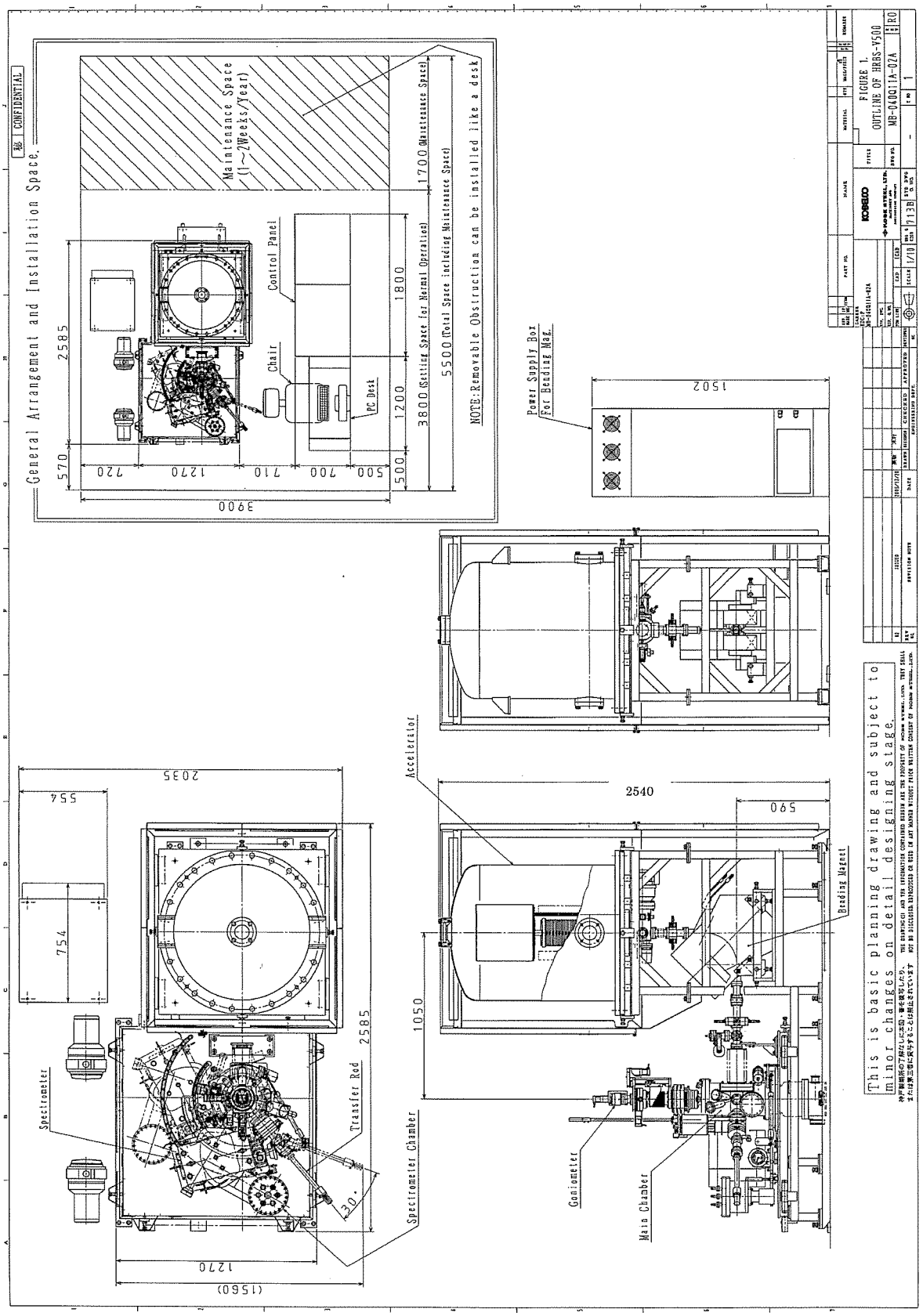
Figure 1. Outline of HRBS-V500





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