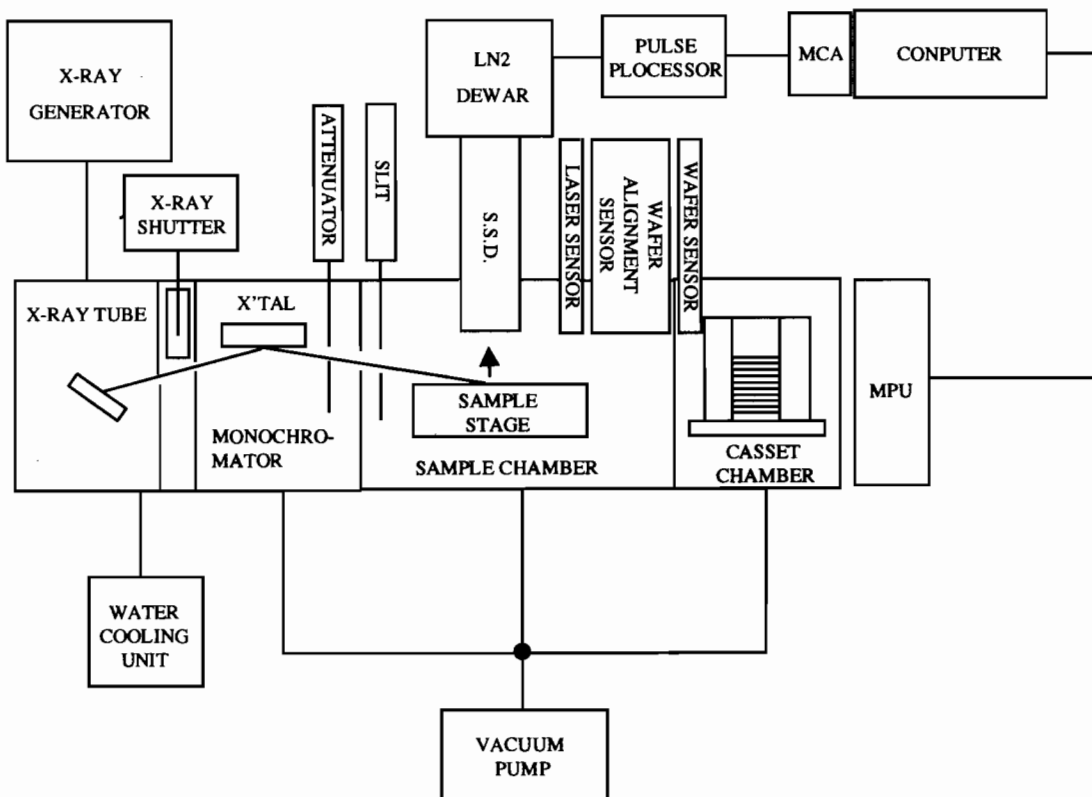


## 5. Specifications



**Block Diagram**

### 5.1. Technical Specifications

#### 5.1.1. X-ray generator

Tube voltage	: 20 to 60 kV, in 1 kV steps
Tube current	: 2 to 60 mA, in 1 mA steps
Setting method	: CPU setting and manual setting on the generator panel
Stability	: $\pm 0.01\%$ / 8 hours (for main supply voltage variation of $\pm 10\%$ )
Safety circuit	: Abnormal cooling water, abnormal line current, abnormal filament current, over-load, burnt-out X-rays on lamp, etc.
Maximum rating	: 3 kW

**5.1.2. X-ray tube**

Type	: Water cooled diffraction X-ray tube
Target material	: Au-target
Electron gun	: W filament
Focusing size	: 0.4 x 12 mm on the target
Cooling	: Target and tube housing are water cooled.
X-ray window	: Be window
X-ray shutter	: Air cylinder drive
Maximum Load	: 1.2 kW
Operating Load	: 40 kV - 24 mA (960 W)

**5.1.3. X-ray optics**

Spectroscopic system	: Multi-layer monochromator
X-ray beam	: Au-L $\beta$ ( 11.44 keV )
X-ray path	: Vacuum

**5.1.4. Sample chamber**

X-ray path atmosphere	: Vacuum
Minimum pressure	: < 13.3 Pa, = 0.1 Torr
Purge gas	: Clean nitrogen ( N <sub>2</sub> )

**5.1.5. Sample stage**

Sample size	: 6 to 12" wafer
Chucking	: Electrostatic
Stage size	: About 138 mm diameter
Surface direction	: Upward
Driving mechanism	: External driving system
Measurement position	: X, Y ( arm rotation ) + $\theta$ ( rotation ) driving
Incident angle	: 0 to 1.5 degrees
Plane height adjustment:	0 - 3 mm
Vacuum seal	: Bellows and O-ring seal

**5.1.6. Orientation flat / Notch search**

Aligner	: Sample stage
Orientation precision	: $\pm 1$ degree
Positioning precision	: $\pm 1$ mm

**5.1.7. Wafer transfer system**

Transfer method	: Transfer robot ( vacuum type )
Position precision	: $\pm 0.2$ mm
Vacuum seal	: Magnetic seal

#### 5.1.8. Sample height sensor

Method	: Laser focusing
Range	: $\pm 0.3$ mm
Working distance	: 5 mm
Spot size	: 2 $\mu$ m
Laser power	: 20 $\mu$ W
Wavelength	: 670 nm
Mode	: Continuous
Sample	: Bare Si, Oxide Si, Nitride Si, Glass, Metal film, etc.

#### 5.1.9. Wafer cassette chamber ( C to C )

Cassette change	: Under clean room down flow at class 100 or less, or equivalent
Wafer transfer	: In vacuum
Purge gas	: Clean N <sub>2</sub> gas
Vacuum pump	: Changeover with Sample chamber pump
Gate valve	: Separation from Sample chamber
Lid	: With safety mechanism for Open / Close operation.
Automatic elevator	: Motor drive
Cassette size	: 6 to 12 "
Sample direction	: Surface Upward
Cassette detection	: Light sensor
Wafer detection	: Light sensor

#### 5.1.10. X-ray detector

Si ( Li ) solid-state detector	
Detector size	: 80 mm <sup>2</sup> ( about 10 mm diameter )
Energy resolution	: FWHM 180 eV or less for Mn-K $\alpha$
Detector window	: 12.5 $\mu$ m thickness Be
Liquid nitrogen capacity:	7.5 liter ( consumption < 1 liter / day )
Analyzing area	: 18 mm diameter ( 10 mm FWHM )

#### 5.1.11. Counting circuit

Pulse processor	
Process time	: 2.5, 5, 10, 20, 40, 80 $\mu$ second
Pile-up removal	: Available
Noise reduction	: Available
HV	: -500 V
LN <sub>2</sub> level monitor	: HV OFF for SSD protection, when LN <sub>2</sub> level under 1 liter

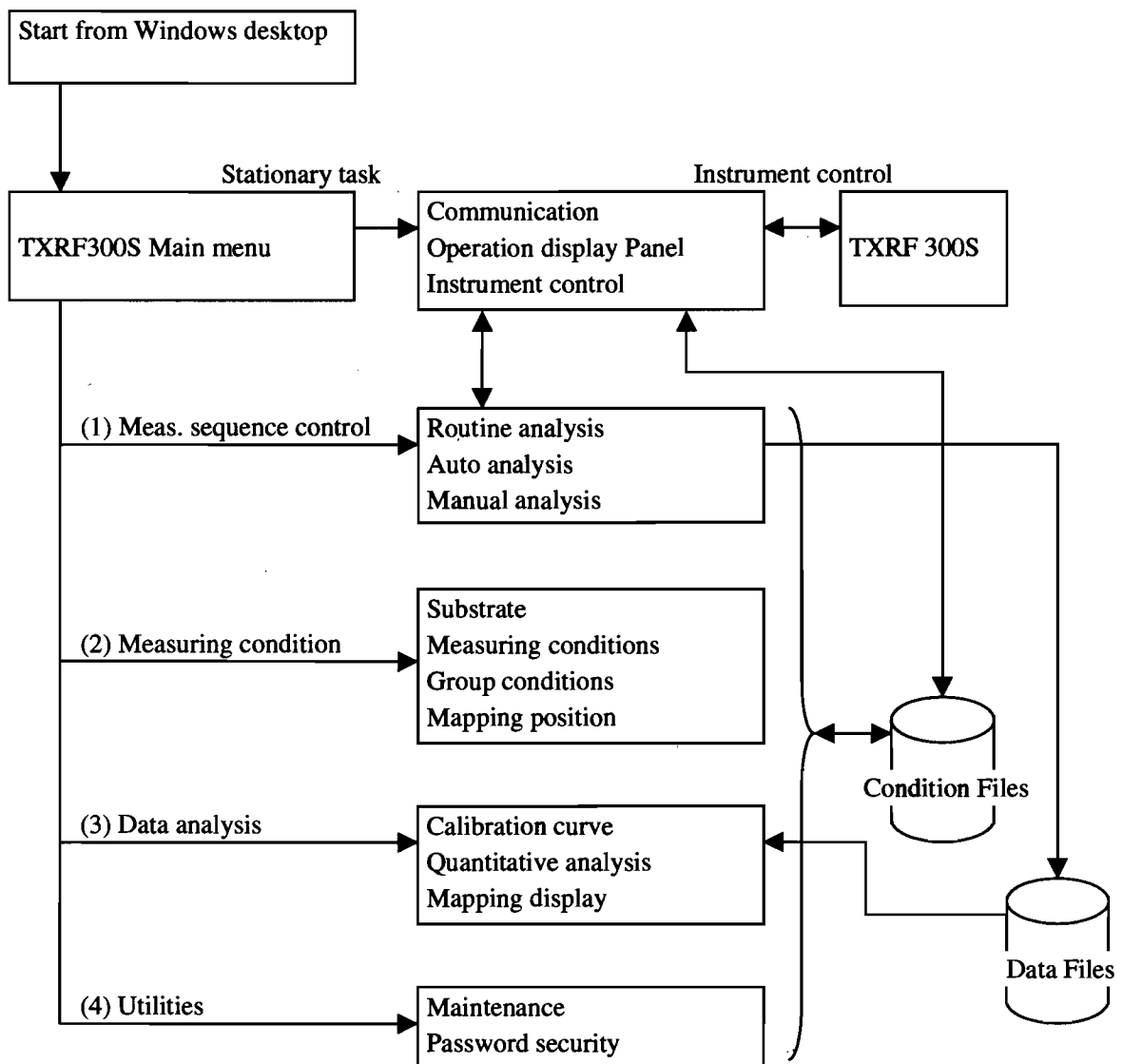
#### 5.1.12. Multi Channel Analyzer

Linearity	: within $\pm 1$ %
Preset time	: Maximum 3.2 x 10 <sup>4</sup> sec
Channel number	: 2048 channels
Live time compensation:	Available ( counting loss correction )

## 5.2. Software Specifications

### 5.2.1. Program Construction of TXRF300S Software

Main menu	Main program accessing to equipment control tasks and other tasks.
Control task	Equipment control and communication
Task	Measurement sequence control Measurement condition setting Data analysis Utility



### 5.2.2. Data Transmission to Host

- (1) Data transmission and equipment control using SECS and GEM protocols are available.
- (2) LAN transfer of data and screens using remote control software is available.

## 6. Installation requirements

**NOTE :** Required utilities are different for each installation, depending on its optional equipment.

### 6.1. Electric power supply

3 $\phi$  200/208/220 V (60 Hz / 50 Hz ) 60 A for X-ray generator

3 $\phi$  200/208/220 V (60 Hz / 50 Hz) 15 A for spectrometer and CPU

### 6.2. Earth grounding

Independent, <100  $\Omega$

### 6.3. Cooling water

Quality : City water or equivalent

Pressure : 0.4 to 0.5 MPa ( <0.05 MPa back pressure )

Temperature : 20 °C ( max.30 °C  $\pm$ 1 °C in day )

Flow rate : > 4 lit./min

### 6.4. Clean N2 gas

Cassette chamber purge : 0.05 - 0.1 MPa, 40 litter per purge. Clean N2 ( >20 l/min )

### 6.5. Compressed Air

Pressure : 0.4 to 0.45 MPa

Flow rate : 0.2 lit./min(average), 12 lit./min(peak)

### 6.6. Environment

Room temperature : 18 - 27 °C  $\pm$  2 °C or less in day

Humidity : 80 % RH or less

Atmosphere :

Main body and C to C : Clean room better than class 100 (substance 10) or equivalent

Floor vibration : < 0.02 G (  $\pm$  100  $\mu$  m p-p at 10Hz )

### 6.7. Consumption of resource

Electric : 176 kWh/day

Cooling water : 96 lit./day

Clean N2 gas : 40 lit./unload of cassette

Compressed Air : 10 lit./unload of cassette