# SPECIFICATIONS

Qty 1 No.

A versatile, high resolution and multipurpose X-ray diffractometer is required with the following specifications.

1. Application:
   - — Chemical phase analysis (Qualitative as well as quantitative)
   - — Texture and stress measurement.
   - — Small angle scattering.
   - — Single crystal diffraction
   - — Microdiffractometry and thin film study
   - — Grazing incident diffraction reflectrometry

2. Configurations:
   - — X-ray Generator of maximum power 3kW
   - — Fine focus X-ray tubes of Cu, Fe and Mo
   - — X-ray shield: Electromagnetic shutter interlocked with radiation enclosure
   - — Safety features: for cooling water, temperature, power.
   - — Goniometer with $\theta/2\theta$ geometry and in horizontal position.
   - — Slits ( DS, SS and RS slits)
   - — Cross beam Optical unit
   - — Flexible optical system
   - — Fixed diffracted beam monochromator for Cu.
   - — X-ray detector and controller

3. Attachments
   - —Versatile attachments for SAXS and reflectometry
   - — Attachments for Texture and stress analyses, and for determination of crystal orientation
   - —Thin film measurements attachments
   - —β filter for different radiations

4. Softwares
   - — PDF -4+ powder diffraction data base for qualitative phase analysis and for access to data base with license
   - —Qualitative phase analysis software
   - — XRR Simulation software
   - — Macro stress –residual stress, Texture analysis software
   - —Standard Software (Control and application software)

## 1. X-ray generator system

### 1.1 X-ray generator

| | |
|---|---|
| (1) Maximum power: | 3KW continuous rated maximum output power |
| (2) Voltage: | 20 - 50Kv, 1Kv steps |
| (3) Current: | 2 - 60 mA, 1 mA steps |
| (4) Stability | ±0.01% against ± 10% mains fluctuation, voltage and current |

### 1.2 X-ray tube

(1) X-ray tube: Cu target tube (normal, fine, or long fine focus)
(2) Focus size: Normal focus 1.0×10 $mm^2$, from a target surface view
Fine focus 0.4×8 $mm^2$, from a target surface view
Long fine focus 0.4×12 mm2, from a target surface view
*Fine or long fine focus is recommended for $SAXS^2$ and/ or thin film Measurements

### 1.3 X-ray tube shield

(1) Shutter: Electromagnetic shutter interlocked with radiation enclosure
(2) Focus: For line focus exclusive use

### 1.4 Safety features

Abnormal cooling water flow, pressure, and temperature detection
Abnormal generator overload detection
Leak current breaker
Shutter malfunction detection

## 2. X-ray radiation enclosure

| | |
|---|---|
| (1) Type: | Two sliding doors with fail-safe control |
| (2) Window: | 0.5 mm Pb equivalent acrylic panel |
| (3) Warning light | located on the top of the radiation enclosure |

## 3. Goniometer Assembly

### 3.1 Goniometer

(1) Geometry: Vertical $\theta/\theta$ (keeps sample horizontal and stationary)

(2) Scanning axis: $\theta D, \theta D, Ts$ (Tube height), Zs (Slit height)

(3) Scanning method : $\theta D/\theta S$ *independent* or coupled -3 - +162°* (2 $\theta$)

(4) Range: $\theta D/\theta S$ coupled -3 - +162°* (2 $\theta$)

* 154° with the optical 20 mm receiving slit box

| | |
|---|---|
| $\theta S$ independent | -1.5 - +77° |
| $\theta D$ independent | -5 - +154° |
| $TS$ | -5 - + 2.5 mm |
| $ZS$ | -3 - + 1.5 mm |

(5) Min. step:

| | |
|---|---|
| $\theta D/\theta S$ coupled | 0.0002° (2$\theta$) |
| $\theta D/\theta S$ independent | 0.0001° |
| $TS$ | 0.001 mm |
| $ZS$ | 0.001 mm |

(6) Speed:

| | |
|---|---|
| $\theta D/\theta S$ coupled | 0.02 - 100°/min. (2$\theta$) |
| $\theta D/\theta S$ independent | 0.01 - 50°/min. |

These values may differ depending on configuration.

(7) Radius: 285 mm

### 3.2 Slits (For powder sample analysis)

(1) Type: Computer-controlled, programmable automatic variable slit

(2) Slit width:

| | |
|---|---|
| Divergence slit (DS) | 0.05 – 7.00 mm, 0.01 mm step |
| Scattering slit (SS) | 0.05 – 7.00 mm, 0.01 mm step |
| Receiving slit (SS) | 0.05 – 7.00 mm, 0.01 mm step |

*The DS and SS can be controlled based on divergence angle when PB is selected.

(3) Height slits: 2.0 mm, 5.0 mm, Open

(4) Kβ filter: Ni- filter for Cu radiation

### 3.3 CBO unit [option]

(1) Optical device: Parabolic multilayer mirror

(2) X-ray wavelength: Cu Kα

(3) Divergence angle: ≤0.06°

(4) Selection slits: BB, PB, SAXS [Option], Small area diffraction [Option]

### 3.4 CBO-f unit [Option]

(1) Optical device: Polycapillary

(2) Slit width: Divergence slit (DS) 0.01 – 7.00 mm

(3) Slit height: DS height (ZS) -3.0 - +1.5 mm

(4) X-ray beam footprint on sample: 0.4 mm X 0.4 mm (at 90° incident angle)

(5) Receiving optics: Angular acceptance angle 0.5°

2.3.5 Flexible Optical system (for maximum SS window size: 7 mm)

(1) Type: Incident and receiving Soller slits

(2) Incient Soller slit: Axial divergence angle 5.0

0 [OPTION]

(3) Receiving Soller slit: Axial acceptance angle 5.0

Axial acceptance angle 2.5 [OPTION]

(4) PSA (for PB): Angular acceptance angle 0.5

Angular acceptance angle 0.114 [OPTION]

2.3.5 Flexible optical system (for maximum SS window size: 20mm)

(1) Type: Incident and receiving Soller slits

(2) Incident Soller slit: Axial divergence angle 5.0

Axial divergence angle 2.5 [OPTION

(3) Receiving Soller slit: Axial acceptane angle 5.0

- Set of spares, tools, accessories and replacement parts
- Consumables: (Glass sample holders, Aluminum sample holders & etc.)
- Computer with printer
- Installation and startup, training