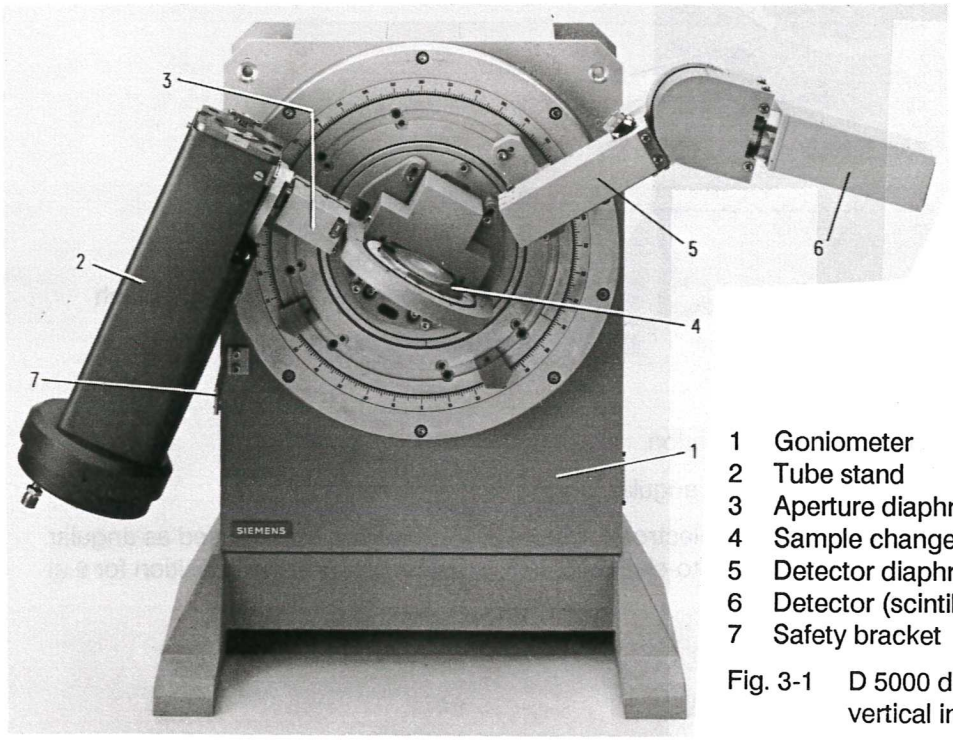
3 Design of the Θ/2Θ Diffractometer

The diffractometer (Fig. 3-1 and 3-2) consists of the goniometer (1), the tube, the tube stand (2), the diaphragm system required for the measurement and the sample changer (4).

The unit is installed horizontally or vertically in a radiation protection housing or on a separate table. When installed in a radiation protection housing, the unit meets the requirements for fully protected instruments, as laid down in the German X-ray regulations of 1.3.1973. A lead glass window at the front of the radiation protection housing enables the samples to be changed or the diffractometer mounts to be modified. The window shutter of the tube stand closes automatically when this window is opened.



1 Goniometer
2 Tube stand
3 Aperture diaphragm holder
4 Sample changer
5 Detector diaphragm holder
6 Detector (scintillation counter)
7 Safety bracket

Fig. 3-1 D 5000 diffractometer, vertical installation

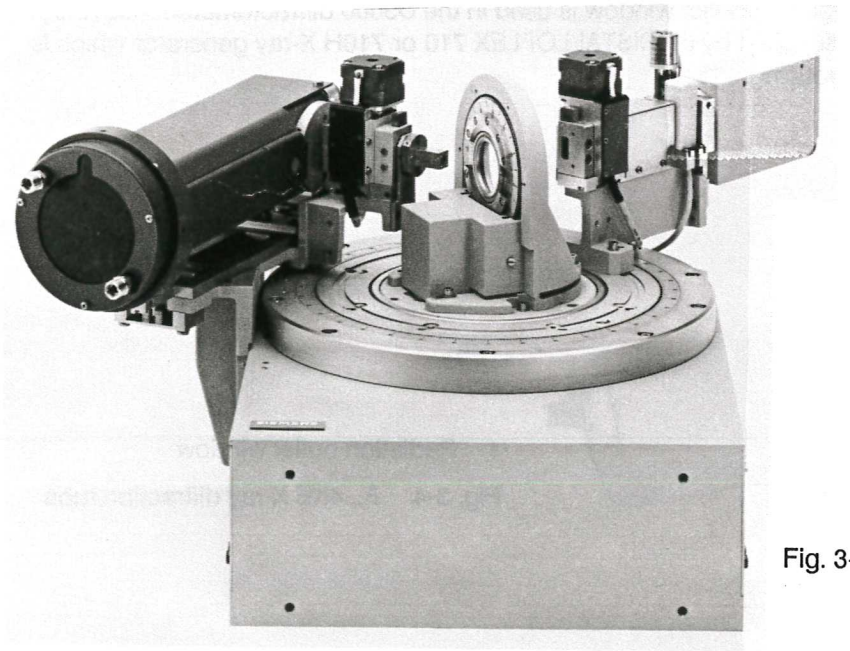
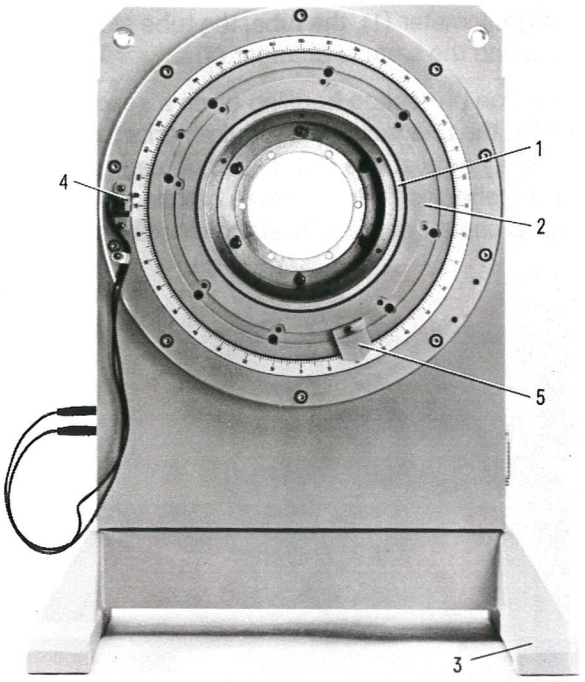


Fig. 3-2 D 5000 diffractometer, horizontal installation

3.1 Goniometer



The goniometer (Fig. 3-1.1 and 3-3) consists of a housing which accepts the sample changer ring (1), the detector holder ring (2) and the drive.

Sample changer ring (1) and detector holder ring (2) are driven by one stepper motor each.

1 Sample changer ring
2 Detector holder ring
3 Foot for vertical installation
4 Limit switch
5 Cam for actuating the limit switch

Fig. 3-3 Goniometer

A foot (3) is provided for vertical installation.

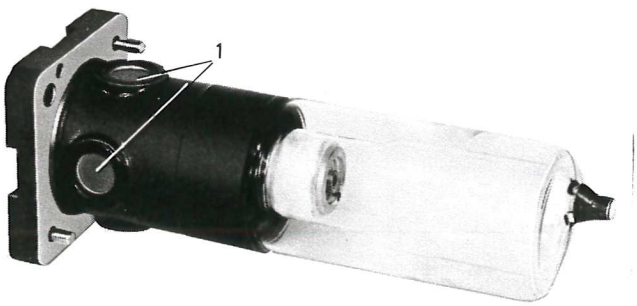
Cam (5) and limit switch (4) delimit the angular range of the goniometer.

The goniometer does not require any electronic supply. A 1° engraving can be used as angular reference. The goniometer contains opto-electronic definitions of the reference position for θ at 30° and 2θ circle at 60°.

3.2 Tube Stand and X-Ray Tube

An X-ray tube with lateral radiation outlet window is used in the D5000 diffractometer. This X-ray tube with earthed anode is supplied by a KRISTALLOFLEX 710 or 710H X-ray generator which is installed in a console-type housing.

3.2.1 X-Ray Tube



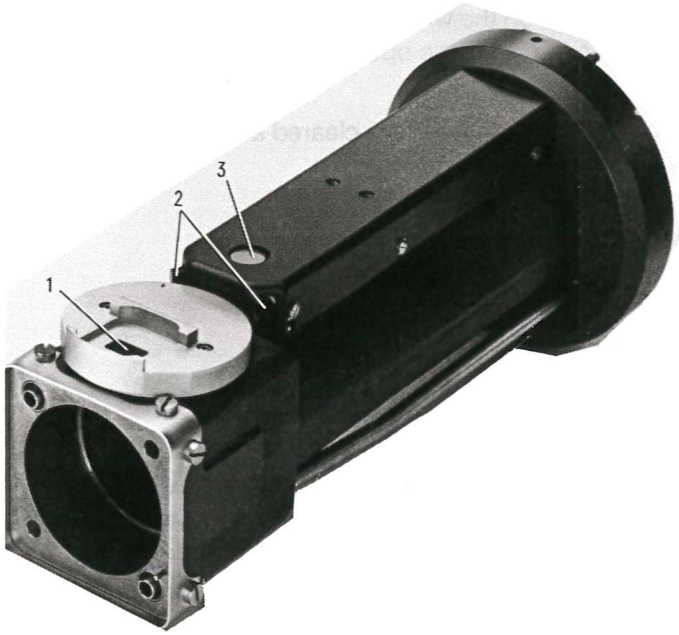
1 Radiation outlet window

Fig. 3-4 F...4KE X-ray diffraction tube

An F...4KE air-insulated X-ray diffraction tube is available with Cr, Fe, Co, Cu, Mo, Ag or W anode. The optical focus can be modified by changing the emission angle. A normal emission angle of 6° reduces the projection of the focus to 1/10 of its length.

3.2.2 Tube Stand

Radiation protection requires that the X-ray tube be housed in a tube stand (Fig. 3-1.2 and 3-5).



1 Radiation outlet
2 Radiation alarm lamps
3 Safety switch for window shutter

Fig. 3-5 Tube stand

The tube stand of the $\theta/2\theta$ diffractometer is mounted on a flange at the side of the goniometer.

The air-insulated X-ray diffraction tubes (Fig. 3-4) used in the diffractometer feature two line focuses and two square focuses, the radiation outlets (1) of which are closed by the tube holder.

An electro-mechanically operated shutter can be opened in a window with line focus (Fig. 3-5.1), used for the powder diffractometer. The other three windows are firmly closed.

Radiation alarm lamps (Fig. 3-5.2) light up when the window shutter is open. The safety switch for the window shutter (Fig. 3-5.3) is pressed down by the diffractometer safety bracket (Fig. 3-1.7).