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EMPYREAN SERIES 2

User's Guide

3.1 INTRODUCTION

The Empyrean usually contains these items:

- Empyrean cabinet, which is the working environment. The cabinet has two major parts: the diffractometer enclosure and the electronics and support unit.
- Goniometer as the core of the diffractometer.
- X-ray tube installed on the goniometer in a tube housing.
- Optical modules for the incident and the diffracted X-ray beams. These modules can be installed on PreFIX positions on the arms of the goniometer.
- Sample stage, on which a sample is put so that its characteristics can be measured. The sample stage can be installed on a PreFIX position on the stage interface.
- Detector to measure the intensity of the diffracted X-ray beam.

All these items are given in detail in the next sections and in the Empyrean Series 2 Reference Manual, which is supplied with Data Collector.

3.2 THE PREFIX CONCEPT

The design of many of the optical and sample handling accessories for the Empyrean agree with the PreFIX concept.

PreFIX stands for: Pre-aligned Fast Interchangeable X-ray modules. The basic principle of the PreFIX concept is that the only item necessary to adjust is the X-ray tube height. When the position of the X-ray tube is correctly related to the diffraction plane, no more system alignment is necessary.

PreFIX modules and accessories are aligned in the factory. The result is that when they are removed from the system and then installed again, no more system alignment is necessary by the user. This makes it is possible to change the configuration of the system from one application-specific setup to a different setup in minutes.

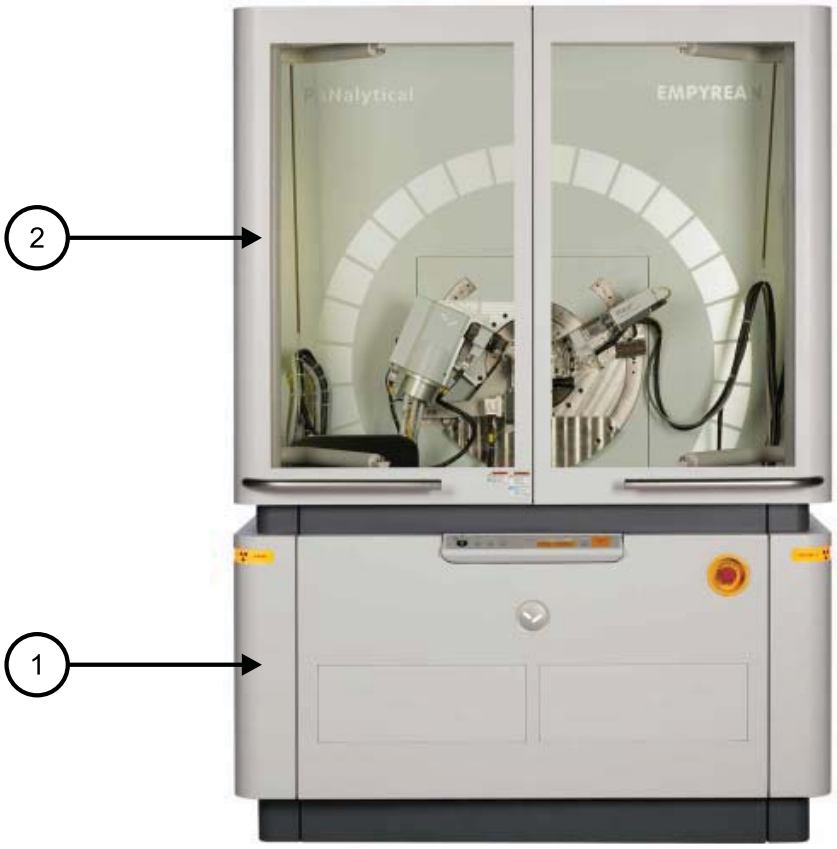
The PreFIX concept makes it possible to do the next procedures:

- Turn the X-ray tube from line focus position to point focus position and back. When the X-ray tube is changed to the line focus position, or when it is used together with an X-ray mirror or a hybrid monochromator, you must always examine the X-ray tube height. For the procedure to change the X-ray tube focus, refer to Section 4.5. For the procedure to align the X-ray tube height, refer to Section 4.7.
- Install the incident beam optical modules on the incident beam PreFIX position and lock them. For the procedure to install the incident beam PreFIX modules, refer to Section 4.8.
- Install the sample stages on the PreFIX stage interface on the Empyrean goniometer. For the procedure to change the sample stages, refer to Section 4.9.
- Install the stage accessories onto the Empyrean goniometer. A special PreFIX mounting position is available to install stage accessories as beam knives and dial gauges. For the procedure to install sample stage accessories, refer to Section 4.9.
- Install the diffracted beam optical modules on the 2theta arm of the goniometer. When a second diffracted beam PreFIX position is available on the 2theta arm, two different modules can be used in the diffracted beam path in the same configuration. For the procedure to install the incident beam PreFIX modules, refer to Section 4.8.
- Put point detectors or line and area detectors that are attached to a 0D interface into the detector interface on the diffracted beam modules. Because the X'Celerator and the hybrid pixel detectors are installed on PreFIX interfaces, they can be installed directly on the diffracted beam PreFIX position.
- Install the sample changers, that are used in Empyrean for the automatic loading and unloading of samples, on and from the sample spinner. Sample changers are PreFIX installed on the floor of the Empyrean enclosure. When they are not used, they can be removed from their position in front of the goniometer. When the sample changer is put back in its PreFIX position in front of the goniometer, no more alignment is necessary.

3.3 EMPYREAN CABINET

The Empyrean cabinet is the working environment for a standard Empyrean X-ray diffraction system. The Empyrean cabinet has two primary parts:

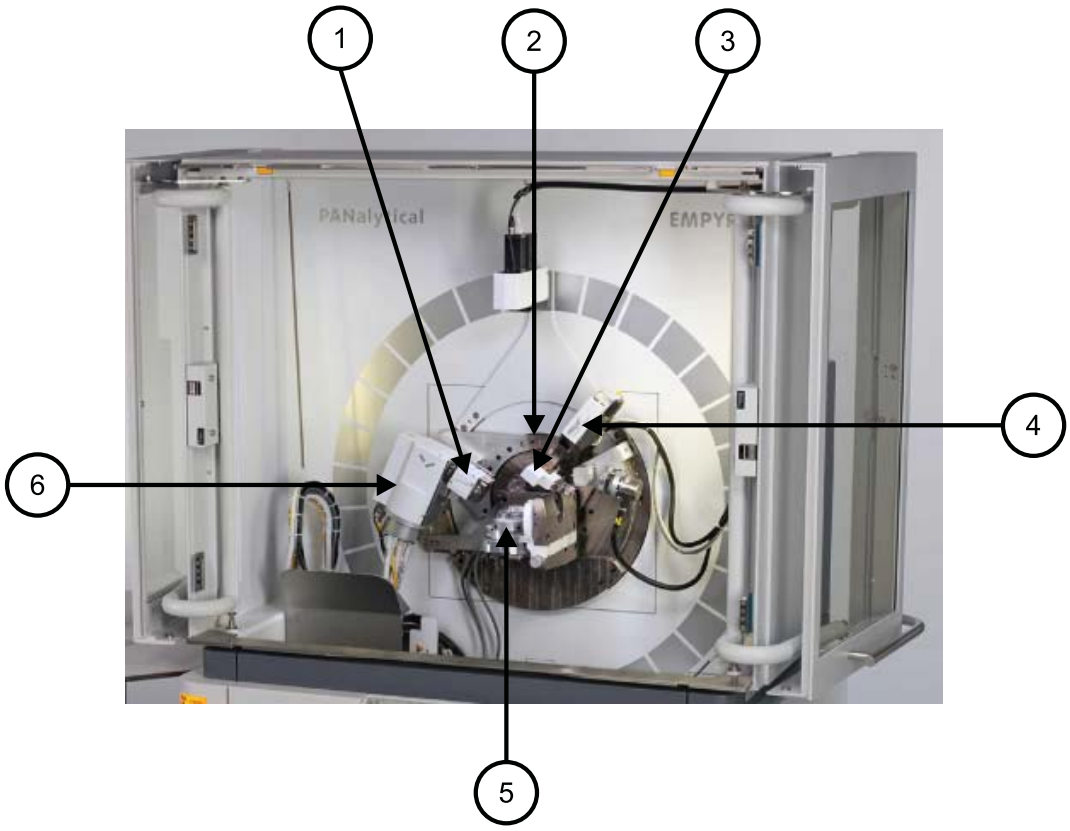
- The top part is the diffractometer enclosure, refer to Section 3.4.
- The lower part is the electronics and support unit, refer to Section 3.5.



1. Electronics and support unit
2. Diffractometer enclosure

Figure 3.1 Empyrean Cabinet Components

3.4 DIFFRACTOMETER ENCLOSURE



1. Incident beam optical module
2. Goniometer
3. Diffracted beam optical module
4. Detector
5. Sample stage
6. Tube housing with X-ray tube

Figure 3.2 Diffractometer Enclosure Components

The diffractometer enclosure has an Empyrean diffractometer. The diffractometer enclosure is made from steel and is shown with the front doors open in Figure 3.2. The parts of the enclosure that are in the direct X-ray beam are 13 mm thick. You can get access to the inner part of the enclosure through two fully interlocking doors at the front of Empyrean cabinet. The windows in the front doors are made of lead glass with an X-ray absorption equivalent to 1 mm of lead.

The goniometer is the core of the diffractometer. For information about the Empyrean goniometer platforms, refer to the Empyrean Series 2 Reference Manual.