



**TANGO**  
Device  
Server

# **Diamond monochromator for ID14-3**

## **User's Guide**

### **DiamondID14eh3 Class**

**Revision: DiamondID14eh3-Release\_3\_0 - Author: meyer**  
**Implemented in C++ - CVS repository: ESRF**

## **Introduction:**

The single crystal diamond monochromator of the ID14-3 beamline is used to select an energy on the X ray beam. The energy is depending on the angle of a crystal inserted in the beam. we can tune the angle, tilt the crystal and do a lateral translation. There is also a possibility to select one crystal over 3. The device is cooling by a water circuit from which we can read the temperature at several points. A platinum foil associated to a pin diode can be temporarily inserted in the beam to calibrate the energy. All the motors are controlled by Paragon controllers. Input and output are made via a Wago field bus.

## **Class Inheritance:**

- Tango::Device\_4Impl
  - DiamondID14eh3

## Class Description:

## Properties:

| <b>Class Properties</b> |                      |                       |
|-------------------------|----------------------|-----------------------|
| <b>Property name</b>    | <b>Property type</b> | <b>Description</b>    |
| <b>Standard_energy</b>  | Tango::DEV_DOUBLE    | standard energy in Ev |

## Device Properties

| Property name                | Property type     | Description  |
|------------------------------|-------------------|--|
| <b>Tilt_motor_name</b>       | Tango::DEV_STRING | name of the tilt motor device  |
| <b>Theta_motor_name</b>      | Tango::DEV_STRING | name of the theta motor device   |
| <b>Hpos_motor_name</b>       | Tango::DEV_STRING | name of the horizontal position motor device   |
| <b>Crystal_motor_name</b>    | Tango::DEV_STRING | name of the motor device for the crystal change axe  |
| <b>Wago_name</b>             | Tango::DEV_STRING | name of the pin diode jack relay device  |
| <b>Pindiode_name</b>         | Tango::DEV_STRING | name of the pindiode adc reading device  |
| <b>Digital_in1_module</b>    | Tango::DEV_SHORT  |  |
| <b>Digital_in2_module</b>    | Tango::DEV_SHORT  |  |
| <b>Digital_out_module</b>    | Tango::DEV_SHORT  | number of the digital output wago module used for the jack control   |
| <b>Waterflow_module</b>      | Tango::DEV_SHORT  | number of the frequency counter wago module used for the waterflow measure   |
| <b>Tilt1_enc_module</b>      | Tango::DEV_SHORT  | number of the SSI wago module used to read the first absolute encoder for the tilt   |
| <b>Tilt2_enc_module</b>      | Tango::DEV_SHORT  | number of the SSI wago module used to read the 2nd encoder of the tilt   |
| <b>Crystal_temp_module</b>   | Tango::DEV_SHORT  | number of the thermocouple wago module used for measuring the crystals temperature   |
| <b>Water_temp_module</b>     | Tango::DEV_SHORT  | number of the wago module used to measure the temperature  |
| <b>Bragg_temp_channel</b>    | Tango::DEV_SHORT  | channel of the bragg crystal thermocouple  |
| <b>Laue_temp_channel</b>     | Tango::DEV_SHORT  | channel of the laue crystal thermocouple   |
| <b>Waterin_temp_channel</b>  | Tango::DEV_SHORT  |  |
| <b>Waterout_temp_channel</b> | Tango::DEV_SHORT  |  |
| <b>Screen_cmd_channel</b>    | Tango::DEV_SHORT  | channel of the command for inserting the fluorescent screen  |
| <b>Diode_cmd_channel</b>     | Tango::DEV_SHORT  | channel of the command for inserting the pin diode   |
| <b>Standard_energy</b>       | Tango::DEV_DOUBLE | standard energy in Ev  |
| <b>Interatomic</b>           | Tango::DEV_DOUBLE | interatomic distance of the crystal. the default value for the diamond 111 = 2.059 Angstrom the wavelength in angstrom = 2 interatomic sin (theta). theta = arcsin |
| <b>Laue_pos</b>              | Tango::DEV_DOUBLE | central position of the laue crystal   |
| <b>Bragg_pos</b>             | Tango::DEV_DOUBLE | central position of the bragg crystal  |
| <b>PulsePerLiter</b>         | Tango::DEV_DOUBLE | number of pulse per liter  |
| <b>Tilt2_motor_name</b>      | Tango::DEV_STRING | name of the 2nd motor for the tilt control   |
| <b>Platinum_inflexion</b>    | Tango::DEV_DOUBLE | Value of the last calibrated platinum infexion point.  |

### Class Properties Default Values:

| <b>Property Name</b> | <b>Default Values</b> |
|----------------------|-----------------------|
| Standard_energy      | No default value      |

### Device Properties Default Values:

| <b>Property Name</b>  | <b>Default Values</b> |
|-----------------------|-----------------------|
| Tilt_motor_name       | No default value      |
| Theta_motor_name      | No default value      |
| Hpos_motor_name       | No default value      |
| Crystal_motor_name    | No default value      |
| Wago_name             | No default value      |
| Pindiode_name         | No default value      |
| Digital_in1_module    | No default value      |
| Digital_in2_module    | No default value      |
| Digital_out_module    | No default value      |
| Waterflow_module      | No default value      |
| Tilt1_enc_module      | No default value      |
| Tilt2_enc_module      | No default value      |
| Crystal_temp_module   | No default value      |
| Water_temp_module     | No default value      |
| Bragg_temp_channel    | No default value      |
| Laue_temp_channel     | No default value      |
| Waterin_temp_channel  | No default value      |
| Waterout_temp_channel | No default value      |
| Screen_cmd_channel    | No default value      |
| Diode_cmd_channel     | No default value      |
| Standard_energy       | No default value      |
| Interatomic           | No default value      |
| Laue_pos              | No default value      |
| Bragg_pos             | No default value      |
| PulsePerLiter         | No default value      |
| Tilt2_motor_name      | No default value      |
| Platinum_inflexion    | No default value      |

**States:**

| <b>States</b> |   |
|---------------|---|
| <b>Names</b>  | <b>Descriptions</b>   |
| <b>ON</b>     | the mono is running correctly   |
| <b>MOVING</b> | One of the motor is moving  |
| <b>ALARM</b>  | There is an over temperature on the crystal or in the output water. A motor returns an error. or there is a discrepancy between the 2 tilts absolute encoders |
| <b>INIT</b>   | The calibration is in progress  |
| <b>FAULT</b>  | One of the motor is uncontrollable  |

**Attributes:**

## Scalar Attributes

| Attribute name   | Data Type  | R/W Type   | Expert |
|--|------------|------------|--------|
| <b>Theta:</b> Theta angle of the diamond crystal   | DEV_DOUBLE | READ_WRITE | No     |
| <b>Energy:</b> Diamond crystal extracted energy  | DEV_DOUBLE | READ_WRITE | No     |
| <b>wavelength:</b> Wavelength  | DEV_DOUBLE | READ_WRITE | No     |
| <b>tilt:</b> difference between the 2 absolute encoders for the tilt.                      | DEV_DOUBLE | READ_WRITE | No     |
| <b>hpos:</b> horizontal position of the mono   | DEV_DOUBLE | READ_WRITE | No     |
| <b>intemp:</b> Temperature of the input water  | DEV_DOUBLE | READ       | No     |
| <b>outtemp:</b> Temperature of the output water  | DEV_DOUBLE | READ       | No     |
| <b>Tcrystal:</b> Temperature of the in beam crystal  | DEV_DOUBLE | READ       | No     |
| <b>crystalpos:</b> Current position of the crystal selection axe                           | DEV_DOUBLE | READ_WRITE | No     |
| <b>pindiode:</b> pindiode intensity  | DEV_DOUBLE | READ       | No     |
| <b>deltatilt:</b> difference between the 2 absolute encoders for the tilt.                 | DEV_DOUBLE | READ       | No     |
| <b>Platinum_inflexion:</b> The calculated energy for the platinum inflection point.        | DEV_DOUBLE | READ_WRITE | No     |
| <b>Platinum_inflexion_offset:</b> The calculated energy for the platinum inflection point. | DEV_DOUBLE | READ       | No     |
| <b>Calib_scan_start:</b> Start energy for the calibration scan                             | DEV_DOUBLE | READ_WRITE | No     |
| <b>Calib_scan_end:</b> End energy for the calibration scan                                 | DEV_DOUBLE | READ_WRITE | No     |

## Spectrum Attributes

| Attribute name            | Data Type  | X Data Length | Expert |
|---------------------------|------------|---------------|--------|
| <b>CalibrationHistory</b> | DEV_STRING | 500           | No     |

## Image Attributes

| Attribute name              | Data Type  | X Data Length | Y Data Length | Expert |
|-----------------------------|------------|---------------|---------------|--------|
| <b>Platinum_scan</b>        | DEV_DOUBLE | 32768         | 2             | No     |
| <b>Platinum_energy_scan</b> | DEV_DOUBLE | 32768         | 2             | No     |

## Commands:

More Details on commands....

| Device Commands for Operator Level |             |                  |
|------------------------------------|-------------|------------------|
| Command name                       | Argument In | Argument Out     |
| <b>Init</b>                        | DEV_VOID    | DEV_VOID         |
| <b>State</b>                       | DEV_VOID    | DEV_STATE        |
| <b>Status</b>                      | DEV_VOID    | CONST_DEV_STRING |
| <b>Calibrate</b>                   | DEV_VOID    | DEV_VOID         |
| <b>Nominal</b>                     | DEV_VOID    | DEV_VOID         |
| <b>LaueCrystal</b>                 | DEV_VOID    | DEV_VOID         |
| <b>PlatinumIn</b>                  | DEV_VOID    | DEV_VOID         |
| <b>PlatinumOut</b>                 | DEV_VOID    | DEV_VOID         |
| <b>BraggCrystal</b>                | DEV_VOID    | DEV_VOID         |
| <b>Reset</b>                       | DEV_VOID    | DEV_VOID         |
| <b>Abort</b>                       | DEV_VOID    | DEV_VOID         |
| <b>Off</b>                         | DEV_VOID    | DEV_VOID         |
| <b>On</b>                          | DEV_VOID    | DEV_VOID         |
| <b>PresetTheta</b>                 | DEV_DOUBLE  | DEV_VOID         |
| <b>Apply</b>                       | DEV_VOID    | DEV_VOID         |

## 1 - Init

- **Description:** This commands re-initialise a device keeping the same network connection.  
After an Init command executed on a device, it is not necessary for client to re-connect to the device.  
This command first calls the device *delete\_device()* method and then execute its *init\_device()* method.  
For C++ device server, all the memory allocated in the *nit\_device()* method must be freed in the *delete\_device()* method.  
The language device desctructor automatically calls the *delete\_device()* method.
- **Argin:**  
**DEV\_VOID** : none.
- **Argout:**  
**DEV\_VOID** : none.
- **Command allowed for:**
  - Tango::ON
  - Tango::MOVING
  - Tango::ALARM
  - Tango::INIT
  - Tango::FAULT

## 2 - State

- **Description:** This command gets the device state (stored in its *device\_state* data member) and returns it to the caller.
- **Argin:**  
**DEV\_VOID** : none.
- **Argout:**  
**DEV\_STATE** : State Code
- **Command allowed for:**
  - Tango::ON
  - Tango::MOVING
  - Tango::ALARM
  - Tango::INIT
  - Tango::FAULT

## 3 - Status

- **Description:** This command gets the device status (stored in its *device\_status* data member) and returns it to the caller.
- **Argin:**  
**DEV\_VOID** : none.
- **Argout:**  
**CONST\_DEV\_STRING** : Status description
- **Command allowed for:**
  - Tango::ON
  - Tango::MOVING
  - Tango::ALARM
  - Tango::INIT
  - Tango::FAULT

## 4 - Calibrate

- **Description:** Does the calibration of the energy in function of the angle
- **Argin:**  
**DEV\_VOID** :
- **Argout:**



**DEV\_VOID :**

- **Command allowed for:**

- Tango::ON
- Tango::MOVING
- Tango::ALARM
- Tango::INIT
- Tango::FAULT

## **5 - Nominal**

- **Description:** go to the nominal energy which is stored as property.

- **Argin:**

**DEV\_VOID :**

- **Argout:**

**DEV\_VOID :**

- **Command allowed for:**

- Tango::ON
- Tango::MOVING
- Tango::ALARM
- Tango::INIT
- Tango::FAULT

## **6 - LaueCrystal**

- **Description:** select the laue crystal, move the axe to the predefined position of the laue crystal

- **Argin:**

**DEV\_VOID :**

- **Argout:**

**DEV\_VOID :**

- **Command allowed for:**

- Tango::ON
- Tango::MOVING
- Tango::ALARM
- Tango::INIT
- Tango::FAULT

## 7 - PlatiniumIn

- **Description:** insert the platinum foil in the beam
- **Argin:**  
DEV\_VOID :
- **Argout:**  
DEV\_VOID :
- **Command allowed for:**
  - Tango::ON
  - Tango::MOVING
  - Tango::ALARM
  - Tango::INIT
  - Tango::FAULT

## 8 - PlatiniumOut

- **Description:** extract the platinum foil from the beam
- **Argin:**  
DEV\_VOID :
- **Argout:**  
DEV\_VOID :
- **Command allowed for:**
  - Tango::ON
  - Tango::MOVING
  - Tango::ALARM
  - Tango::INIT
  - Tango::FAULT

## 9 - BraggCrystal

- **Description:** select the bragg crystal, move the axe to the predefine position of the bragg crystal
- **Argin:**  
DEV\_VOID :
- **Argout:**  
DEV\_VOID :
- **Command allowed for:**
  - Tango::ON

- Tango::MOVING
- Tango::ALARM
- Tango::INIT
- Tango::FAULT

## 10 - Reset

- **Description:** send the theta axe to it's home position
- **Argin:**  
DEV\_VOID :
- **Argout:**  
DEV\_VOID :
- **Command allowed for:**
  - Tango::ON
  - Tango::MOVING
  - Tango::ALARM
  - Tango::INIT
  - Tango::FAULT

## 11 - Abort

- **Description:** stop any movment on the sub motors
- **Argin:**  
DEV\_VOID :
- **Argout:**  
DEV\_VOID :
- **Command allowed for:**
  - Tango::ON
  - Tango::MOVING
  - Tango::ALARM
  - Tango::INIT
  - Tango::FAULT

## 12 - Off

- **Description:** switch all the motor OFF
- **Argin:**  
DEV\_VOID :

- **Argout:**  
**DEV\_VOID :**

- **Command allowed for:**

- Tango::ON
- Tango::MOVING
- Tango::ALARM
- Tango::INIT
- Tango::FAULT

## 13 - On

- **Description:** Switch all the motors ON

- **Argin:**  
**DEV\_VOID :**

- **Argout:**  
**DEV\_VOID :**

- **Command allowed for:**

- Tango::ON
- Tango::MOVING
- Tango::ALARM
- Tango::INIT
- Tango::FAULT

## 14 - PresetTheta

- **Description:** allow to assign a current theta value with a calculated value

- **Argin:**  
**DEV\_DOUBLE :** actual theta value issued from calibration

- **Argout:**  
**DEV\_VOID :**

- **Command allowed for:**

- Tango::ON
- Tango::MOVING
- Tango::ALARM
- Tango::INIT
- Tango::FAULT

## 15 - Apply

- **Description:** Moves the theta motor to the inflexion point given by the platinumium\_inflexion attribute
- **Argin:**  
DEV\_VOID :
- **Argout:**  
DEV\_VOID :
- **Command allowed for:**
  - Tango::ON
  - Tango::ALARM

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