

# DialInspect-P



**Operating manual**

Version 8.1.9

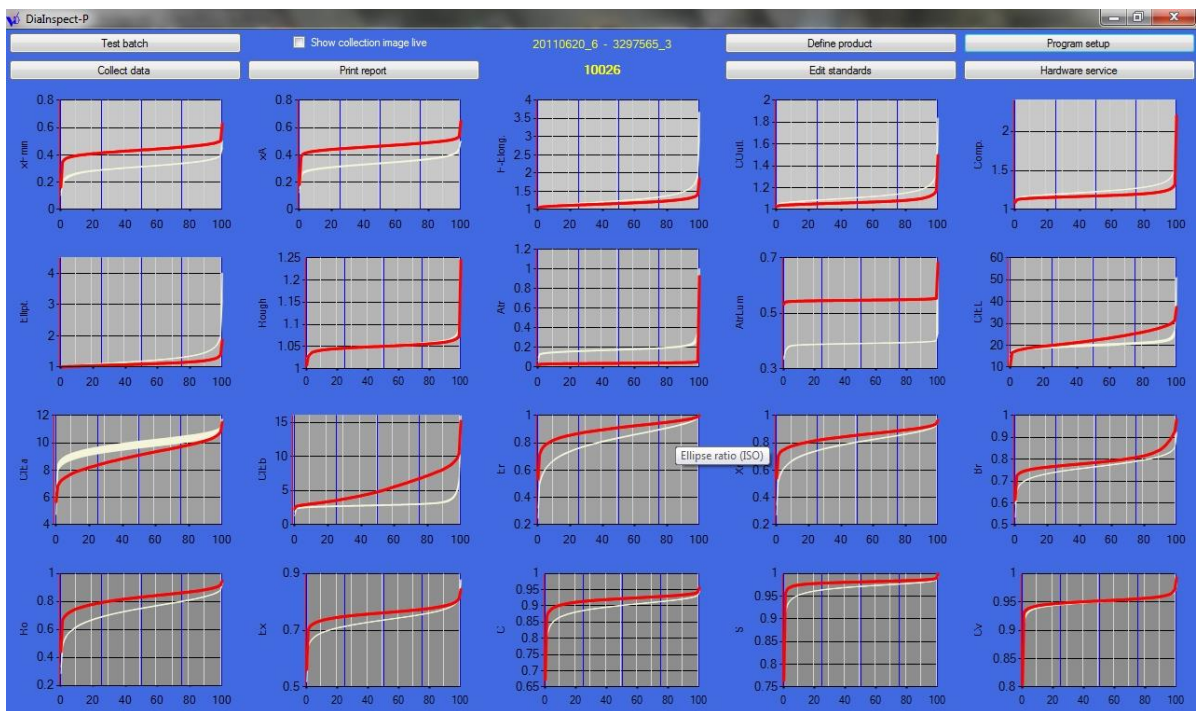
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# 1. Application of the device

Dialnspect-P is a fast working optical particle analyser, optimised for the analysis of a large number of particles in a short period of time. The device delivers stable information about powders based on a representative sample size. As typical properties of a powder product the device delivers the numerical distributions of size and shape parameters. The shape of these distributions is used as typical property of a particular product.

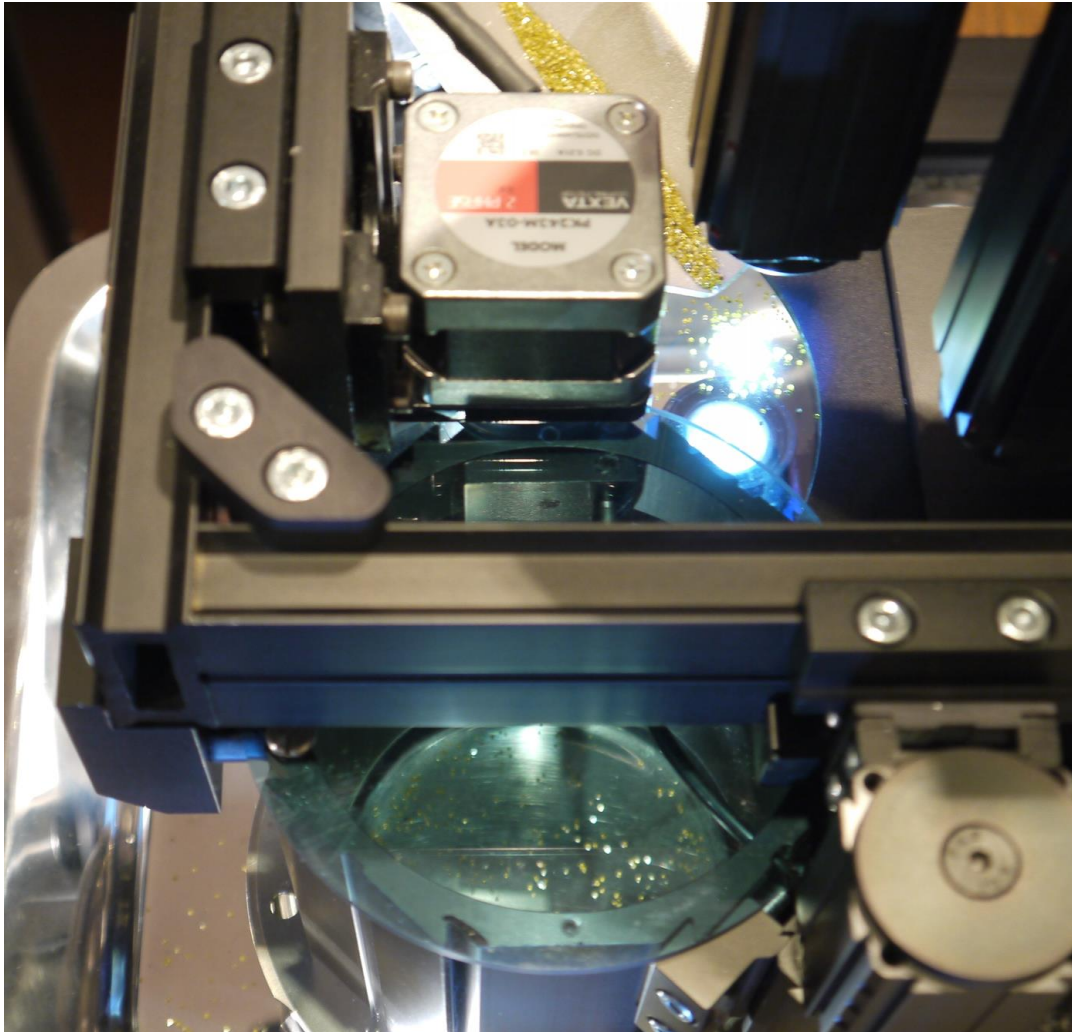
# 2. Operating concept

The operation of Dialnspect-P is optimised for an easy to handle and automated measuring procedure. This is true for both hardware and software.



Picture 1: Main panel with pushbuttons and distribution plots

## 2.1. Hardware



*Picture 2: Machine with feeder, motor, disc and collection container (from top to bottom)*

A vibration feeder moves the particles onto a rotating transparent disc. The disc carries the particles through the viewing area of a special telecentric microscope, with transmissive lighting. The disc brings the particles into a container, where an air stream removes the particles from the disc. The particles are collected in a dish and can be re-used.

The device features two swivel-mounted telecentric optical systems with different magnifications. The characteristics of the transmissive lighting is telecentric by default and can be changed to diffuse by means of an opaque glass cover.

## **2.2. Software**

The concept of the operation is focused on the product which has to be tested.

Thanks to the large number of tested particles the system can use the full distribution plot of the parameters in order to describe or to compare a batch of particles. This makes the system more sensitive to slight changes in the properties of the material.

The software allows for automatic measurement of a particular product, where the hardware and software settings will be adjusted according to the predefined specifications for the product. The operator selects the actual product from a list of predefined products and enters a batch description. The following measurement routine itself runs automatically.

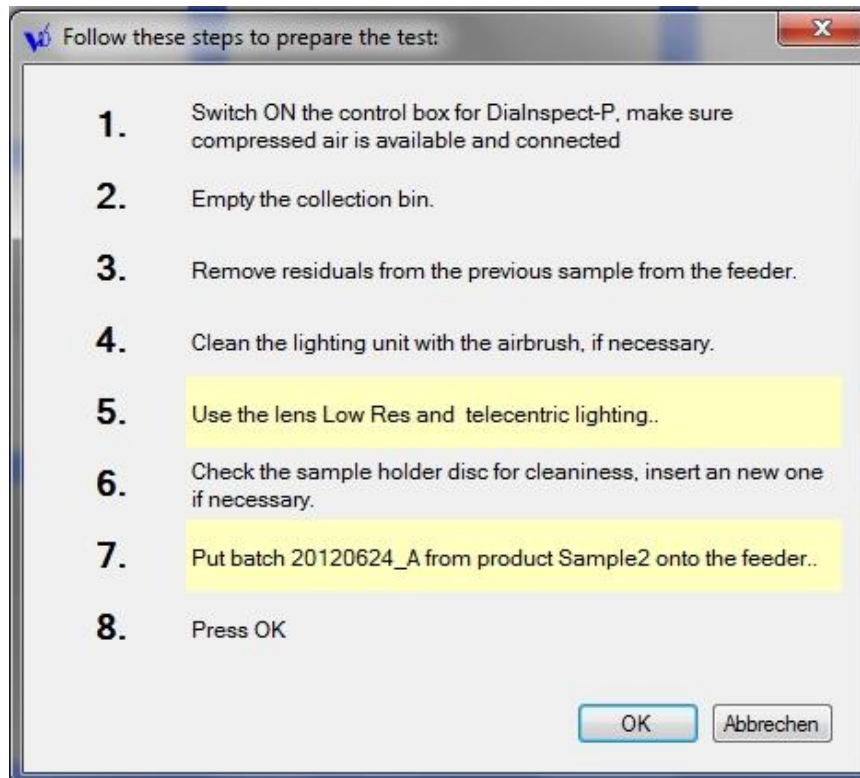
The machine setter mode allows for the definition of new products, i.e. which magnification, which type of lighting, which particle analysis filter should be used for the product. Newly defined products are available immediately for the operator.

The machine setter mode provides a tool for establishing standards based on all data which is already available for several batches of the product.

Standards are the base for tests, where batch data is compared to the standard.

The panels of the software are self-explaining. If there is a request for manual action of the operator, a window will list the required operations.

The system checks automatically if the correct setup of lighting and magnification optics is active.



*Picture 3: Operator guide for starting the data acquisition*

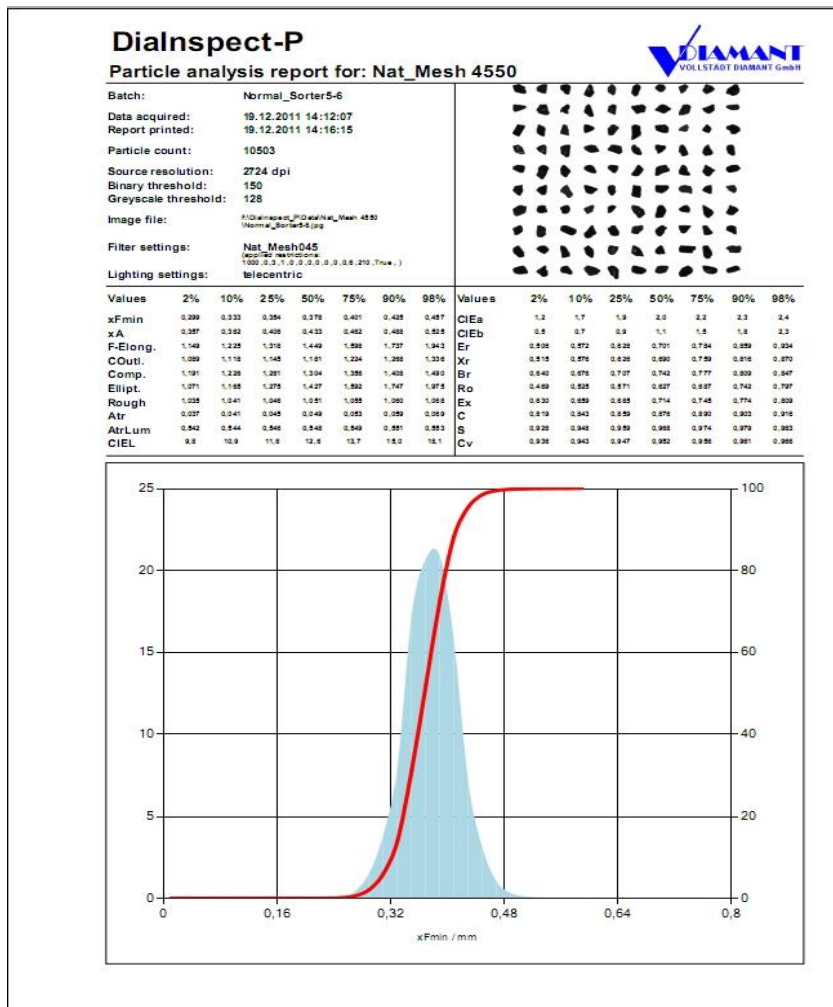
### **2.3. Data archiving**

After having finished the measurement the operator can decide, if the results should be stored in the database.

From each measurement a file containing the images of the analysed particles is created. An batch related EXCEL files holds the numerical results for every single particle. A product related EXCEL files collects for every batch the distribution curves of 20 parameters.

If a test against a product standard was made the results of the test will be added to a product related EXCEL file with test results.

Reports can be printed out.



Picture 4: DialInspect-P analysis report

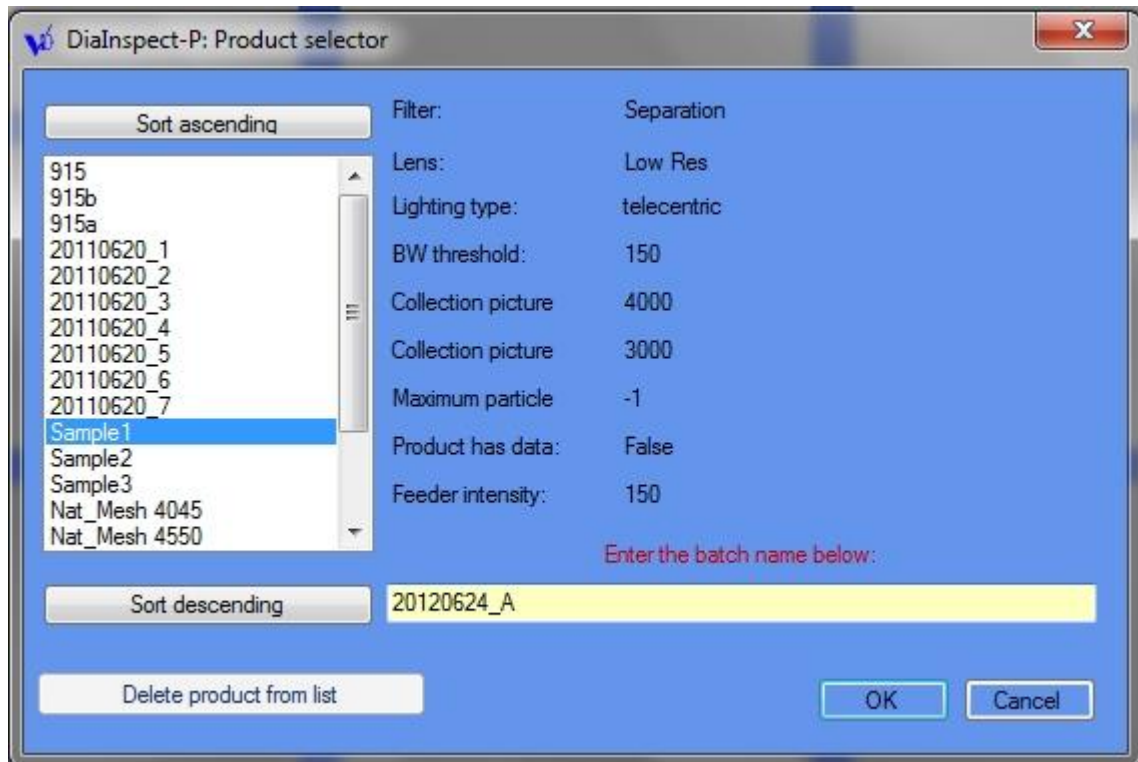
### 3. Functions in operators mode

The operator can choose from the following functions:

- collect data from batches of predefined products
- test batches against a predefined standard for the product
- print reports with data or test result

The operators mode is automatically active, if the user didn't enter the correct password on the welcome screen. All functions of the machine setter mode are not accessible for the operator.





Picture 5: Product selection and batch specification in operators mode

## 4. Functions in machine setter mode

The machine setter mode becomes active, when the correct password was entered on the welcome screen. This mode provides all functions of the operators mode, in addition it allows for the complete configuration of the system.



Picture 6: Additional functions in machine setter mode

### 4.1. Establish a product definition (Button "Define Product")

This dialogue defines, how a product should be measured.

The product name should describe the product and the size as good as possible.

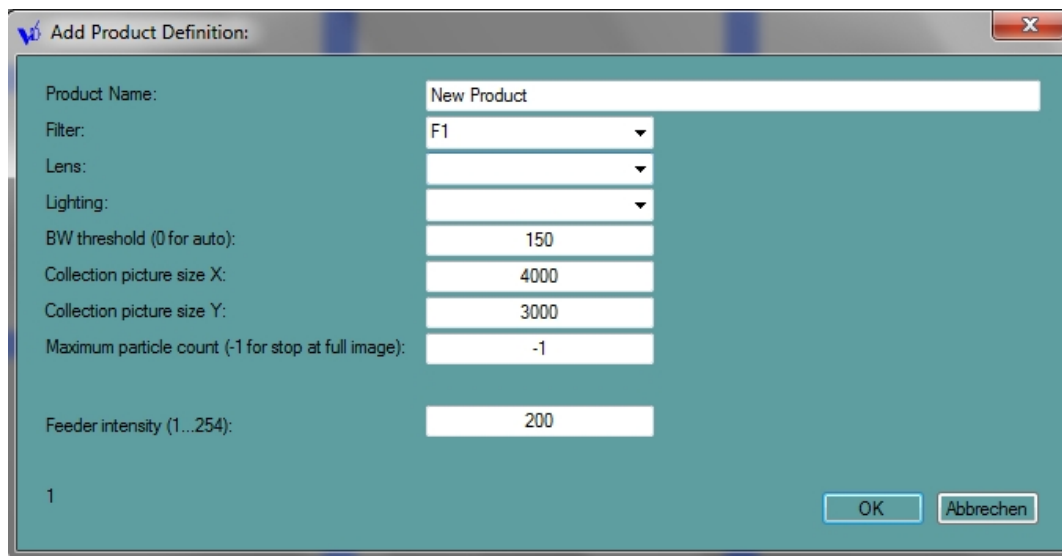
The system automatically creates a folder with the product name on the harddisc, therefore the product name should not contain one of the following



characters: **\*: / \ & < > ? | "**

The maximum particle count should be larger than 5000. A value of -1 will stop the measurement as soon as the collection image for the particles is full.

The amplitude for the vibration feeder can be chosen with a fixed value from 1 to 254. A value of -1 will use an automatic feeding rate adjustment during the measurement. In this case the actual amplitude value of the feeder is displayed during operation.



*Picture 7: Product definition panel (available for the machine setter)*

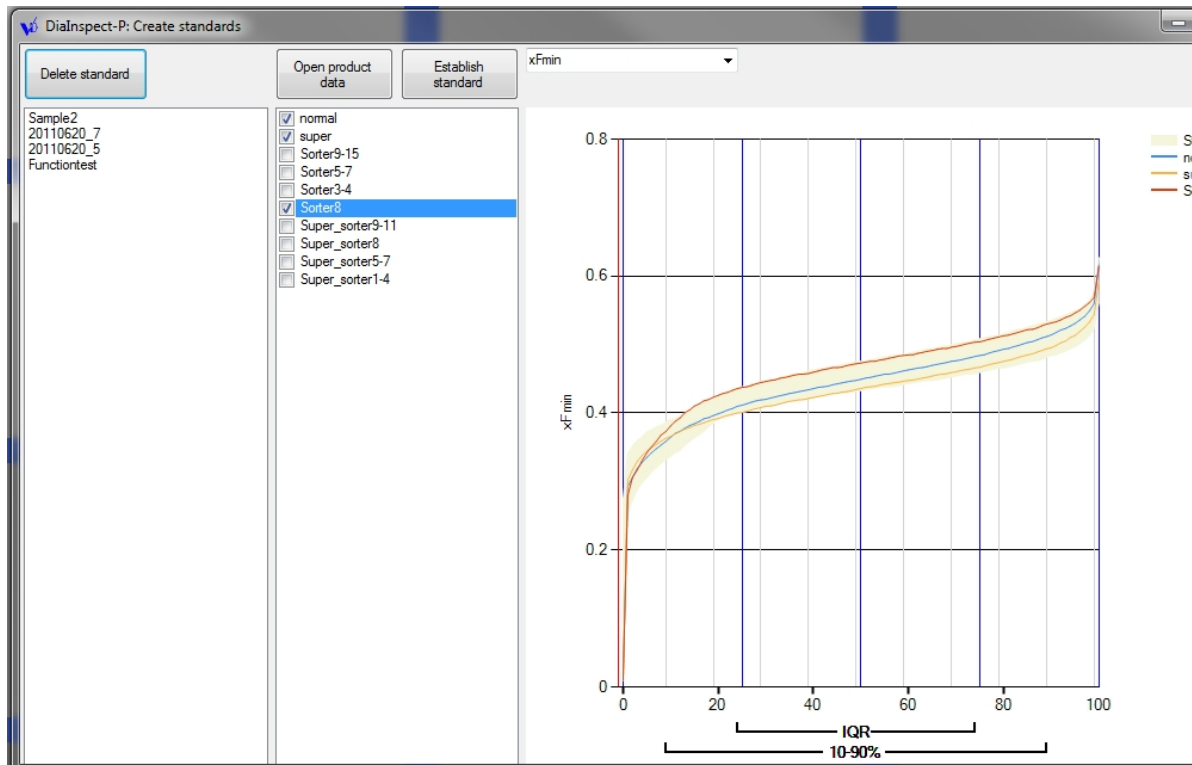
The type of lighting should be chosen according the following recommendations: Is the main focus on size and shape parameters then telecentric lighting is recommended. Telecentric lighting allows for very short shutter times of the camera, therefore fast moving particles can be captured with no problems. In telecentric lighting mode the system can capture up to thousands of particles per minute. If color and transparency are of special importance then diffuse lighting is recommended. Diffuse lighting requires much longer exposure times of the images. Capturing images of fast moving particles is no longer possible. When diffuse lighting is active, the device will switch to a measuring mode, where the disc is moving in steps and not continuously. The required measuring time increases.

#### **4.2. Establish a product standard (Button "Edit standards")**

The button "open product data" opens the products EXCEL table

"Productname.PRODUCT.XLS", which contains for all of the measured batches the

distribution data of 20 measured parameters. The measured batches are listed in a box and can be selected for display in the distribution chart. The gray area in the distribution chart marks the limits of the area which is enclosed by the extremal values of the measured distributions (with respect to the selected parameter). The displayed parameter can be selected from a drop-down list.



Picture 8: Establishing a product standard (available in machine setter mode)

A standard is established by selecting those batches, which are typical and acceptable for this product, and clicking "Establish standard". A successive dialogue allows for entering a span in % by which the distribution may pass over the range which is enclosed by the selected batches.

The standard is written into DialInspect\_Standards.XLS. The standard definition contains the product name and for all parameters the upper and lower limits of the allowed distribution curves along with allowed tolerance along the X-axis.

## 5. Structure of the measuring results

The system creates a new folder for every product in the data folder of DialInspect-P. The folder name is the product name.

For every batch the following files will be created in the product folder:

- batchname.jpg (Collection picture, size as defined in the product definition, contains the images of the analysed particles)
- batchname.XLS (EXCEL-file containing all values for every measured particle)

After analysing a batch the following file in the product folder will be updated:

- productname.PRODUCT.XLS (EXCEL-Workbook containing one worksheet per parameter, every worksheet holds the distribution curves of the parameter in steps of 1% for all measured batches of the product)

After testing a batch against a product standard the following file in the product folder will be updated:

- productname.TEST.XLS (EXCEL-file containing the distribution values at 2%, 10%, 25%, 50%, 75%, 90%, 98%. Deviations from the standard are shown in blue (too less) and red (too much), the test result is expressed as PASS/FAIL.

## **6. Reports**

The printed reports show the complete list of measurement settings in the header. The data area shows the distribution values of 20 parameters at 2%, 10%, 25%, 50%, 75%, 90%, 98%. A chart shows the particle size distribution based on the minimum feret diameter as histogram and integral.

## **7. Maintenance**

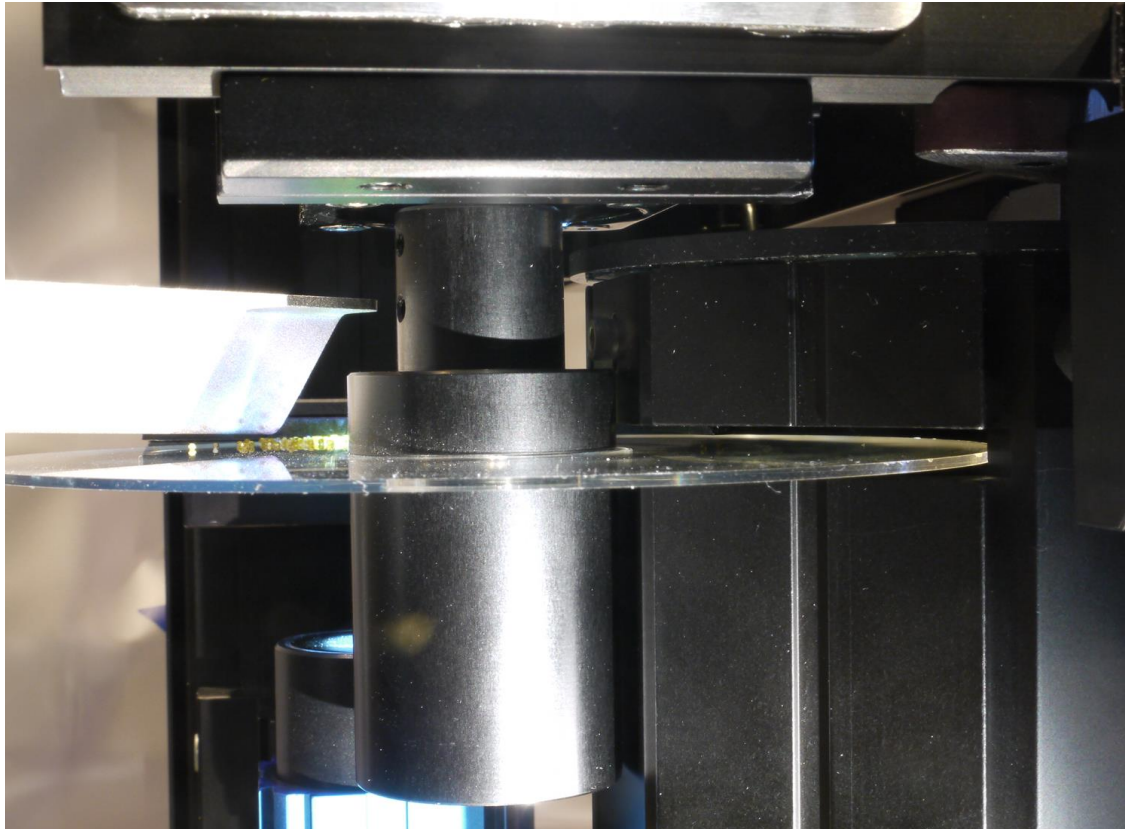
The only maintenance required is careful cleaning of the device with a brush or airbrush.

It is extremely important to remove the residuals of a measured batch prior to start a test of a new one. As we put back the measured particles into the batch container a cross contamination might occur if cleaning was skipped.

The rotating disc is a consumable, it must be exchanged if the images exhibit scratches or dust. Especially under telecentric lighting conditions dust and

scratches will show up clearly and degrade the image quality and the stability of the measured data.

For exchanging the disc just swivel away the collection container, then pull down the disc holder (magnetic fixing). Remove the disc and put a new one onto the disc holder. Plug in the disc holder into the holder on the motor axis. Don't forget to move back the collection container towards the motor.



*Picture 9: side view on feeder, disc, disc holder and collection container*

After finishing the work with DialInspect-P please use the dust cover.

## **8. Hardware requirements**

The system consists of the following components:

- main unit with optics, lighting, feeder, USB3-camera
- electronic control box
- cables (cannot be mismatched because of pinout coding)
- USB software license key

The computer must have one USB3 port available for the connection to the camera and one USB port for hosting the USB license key.

The system requires dry and oil free compressed air for removing the particles from

the transparent disc.(approx. 3 l/min at 1.5 Bar).

## **9. Software requirements**

The software can be installed on Windows 7, 8 and 10 (64 bit). For the usage of the image processing libraries a runtime license is required. This license is provided on a USB-dongle. Without a valid license the program will not run.

The program can automatically search for updates if the computer is connected to the internet. The installation of updates can be done automatically as well.

## **10. Finding the best particle analysis rules**

The panel “Hardware service” gives access to the camera and lighting control. The user can set the desired magnification and the type of lighting. The image analysis options can be chosen or they can be extended by new analysis rules. Finding the right rules for the particle analysis is essential for trustworthy analysis results.

Please refer to the document “Finding the right rules for image analysis with the DialInspect family of particle analyzers.docx”.

## **11. Calibration**

The optical resolution of your device has been calibrated already and will not change.

The lighting conditions will be checked by the software every time when a particle analysis starts. If the lighting level is found outside the allowed range a new calibration is necessary. Just follow the instructions on the screen: remove the plastic disc from the holder and continue. The camera will be adjusted to the current lighting conditions automatically.