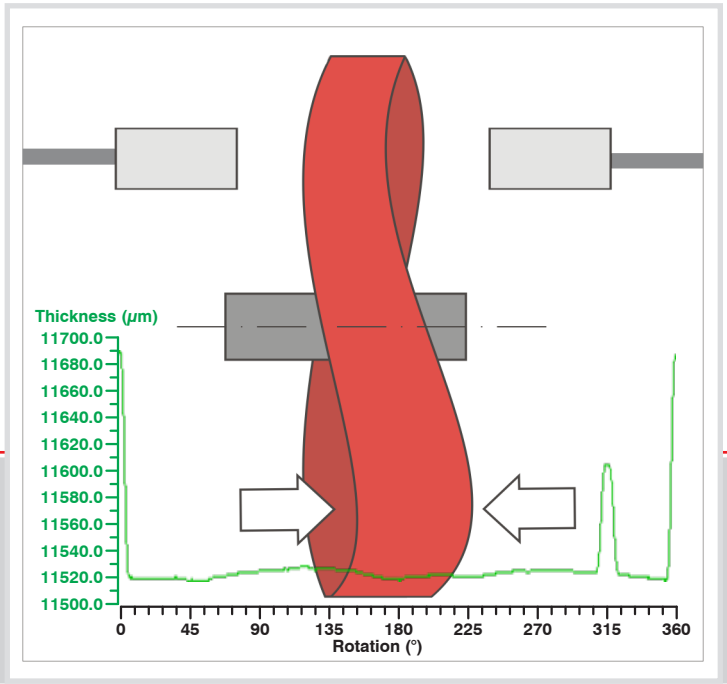
MICRO-EPSILON



Instruction Manual
Software

Disc Thickness Variation Measurement

V1.0.0

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Certified acc. to DIN EN ISO 9001: 2008

Software version V1.0.0

Inhalt

1. Introduction

1.1 Symbols Used

The following symbols are used in the instruction manual.

➡	Indicates a user action.
i	Indicates a user tip.
`Measure`	Indicates a hardware or a button/menu in the software.

1.2 Measurement Principle Thickness Measurement

Disc Thickness Variation Measurement is a system for quality inspection of rotating disks e.g. of brake disks. (1). The DTV application semi-automatically acquires thickness profiles of rotating disks with a DT6200 series controller. The thickness D1 and the 360° rotations are calculated automatically from the measurement values of the displacement sensors A1 and A2.

1	Brake disk
2	Capacitive displacement sensors
D	Desired thickness
D1	Actual thickness
A1, A2	Distance signal displacement sensors
C	Gap between the two measurement range start points of the two displacement sensors

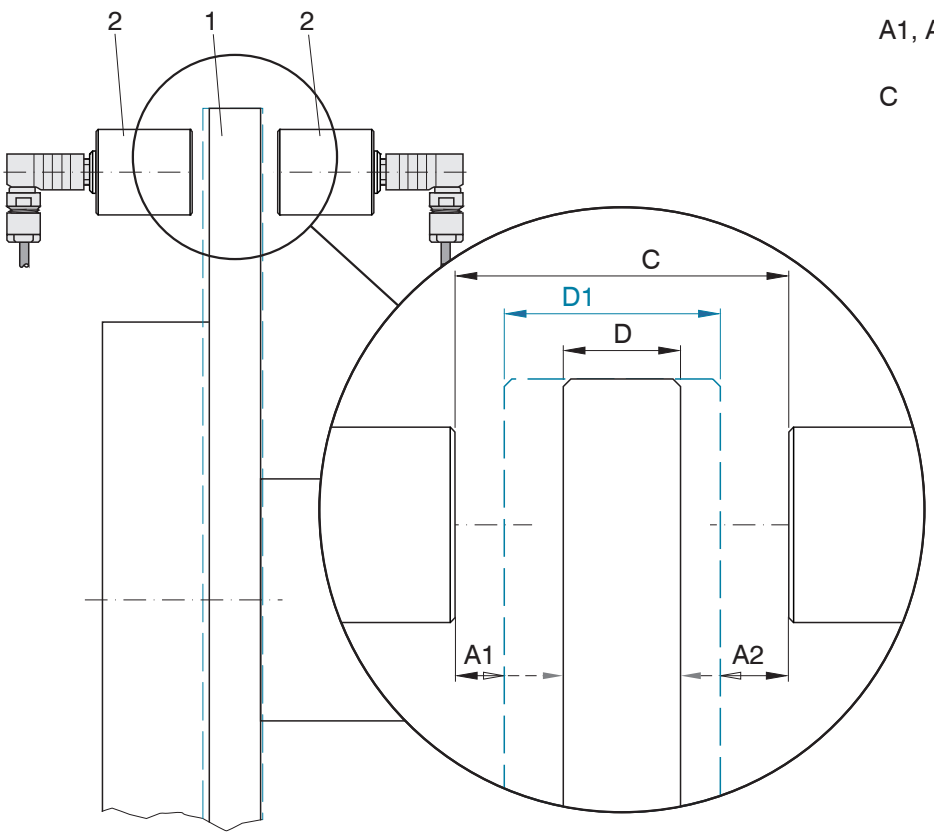


Fig. 1 Principle of thickness measurement with opposite distance measurement

If the distance (measure C) between both the capacitive displacement sensors is known, the brake disk thickness is calculated as follows:

$$D1 = C - (A1 + A2)$$

Fig. 2 Formula for thickness calculation

Archived measurement data can be visualized and printed anytime in Offline Analysis.

1.3 Ethernet Connection

Connect the controller DT62x0 to a free LAN interface on your PC or to a network.

<table>
<tr><td colspan="2">Direct connection to a PC, controller with static IP (factory setting)</td><td>Network</td></tr>
<tr><td>PC with static IP</td><td>PC with DHCP</td><td>Controller with dynamic IP, PC with DHCP</td></tr>
<tr><td colspan="2">➡ Connect the controller (“Ethernet“ female connector) and PC to a Ethernet direct connection (LAN). Therefore use a LAN cable with RJ-45 plugs.</td><td>➡ Connect the controller with a switch to a Ethernet direct connection(LAN). Therefore use a LAN cable with RJ-45 plugs.</td></tr>
<tr><td>For direct connection the controller needs a fixed IP address.
➡ Start the program SensorFinder.exe.
Find this program at http://www.micro-epsilon.de/download/software/SensorFinder.zip
➡ Click on the button <code>Find sensors</code>. Choose the desired controller from the list. Click the button <code>Change IP-Address</code> to change the address settings.
• Address type: static IP-Address
• IP address: 169.254.168.150 [1]
• Gateway: 169.254.1.1
• Subnet mask: 255.255.0.0
• Password: •••
➡ Click on the button <code>Change</code> to assign changes to the controller.
➡ Click on the button <code>Start Browser</code> to connect the controller with your standard browser. Alternatively change the IP settings according to the settings on your PC (IP address ranges have to fit togehter).
[1] Presumes that the PC LAN connection uses e.g. the following IP address: 169.254.168.1.</td><td>Wait until Windows has established a network connection (connection with limited connectivity).
➡ Start the program SensorFinder.exe.
Find this program at http://www.micro-epsilon.de/download/software/SensorFinder.zip
➡ Click on the button <code>Find sensors</code>. Choose the desired controller from the list.
➡ Click on the button <code>Start Browser</code> to connect the controller with your standard browser.</td><td>➡ Enter the controller in DHCP / report the controller to your IT department.
The controller is assigned a IP address from your DHCP server. . You can request this IP address by using SensorFinder.exe.
➡ Start the program SensorFinder.exe.
Find this program at http://www.micro-epsilon.de/download/software/SensorFinder.zip
➡ Click on the button <code>Find sensors</code>. Choose the desired controller from the list.
➡ Click on the button <code>Start browser</code> to connect the controller with your standard browser.</td></tr>
</table>

1.4 Data Channels Used

Disc Thickness Variation Measurement software uses following data channels of the controller DT62x0 for quality inspection:

- Data channel 1
- Data channel 2

The math function enables scaling of a measurement channel and mathematical combination of individual measurement channels (= MK).

Data channel = Offset + Factor MK 1 + Factor MK 2 + Factor MK 3 + Factor MK 4.

Data channel = Digital values

Measurement channel = Analog value of a demodulator module

Data channel	1 / 2	Offset	*Value*	Range of values max. ±8-facher MB
		Factor measurement channel	*Value*	Range of values -9.9 ... +9.9

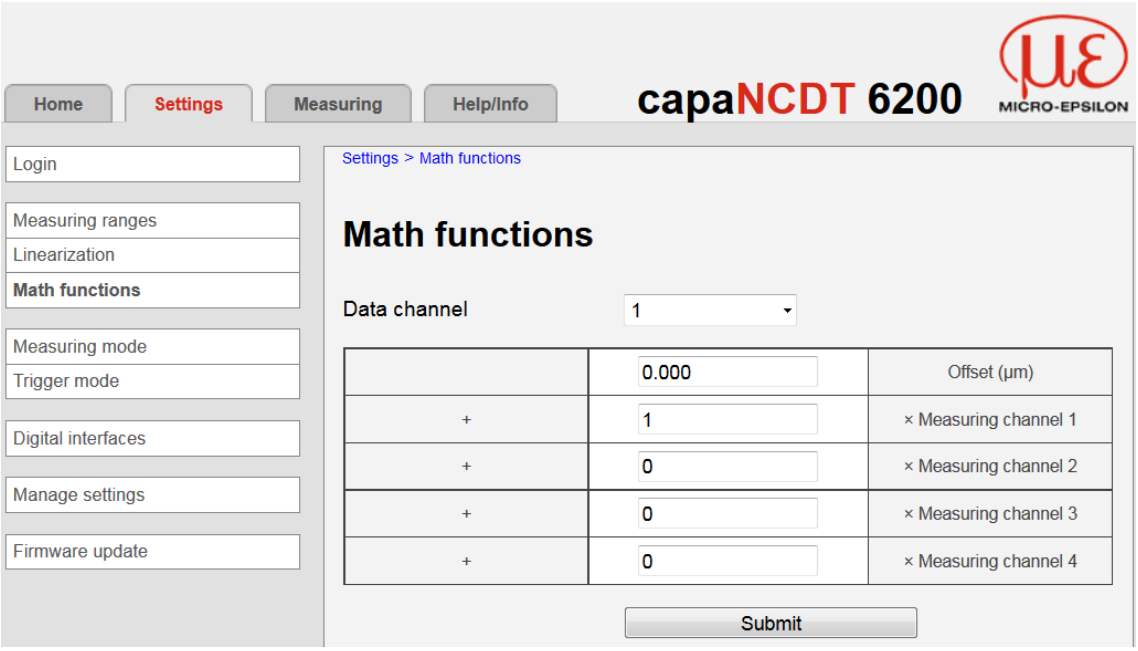


Fig. 3 Linkage of data and measurement channel

This is how you can find `Math functions`:

➡ Click on the button Raw Data View... in the main view to switch to `Raw Data`.

➡ Click on the button Open Config Page in Web Browser... in the `Raw Data` view to start the web interface of the controller DT62x0.

➡ Change to view `Settings > Math functions` and define measurement channels for thickness measurement.

2. Performing Measurement

2.1 Main View

The software automatically starts in the main view.

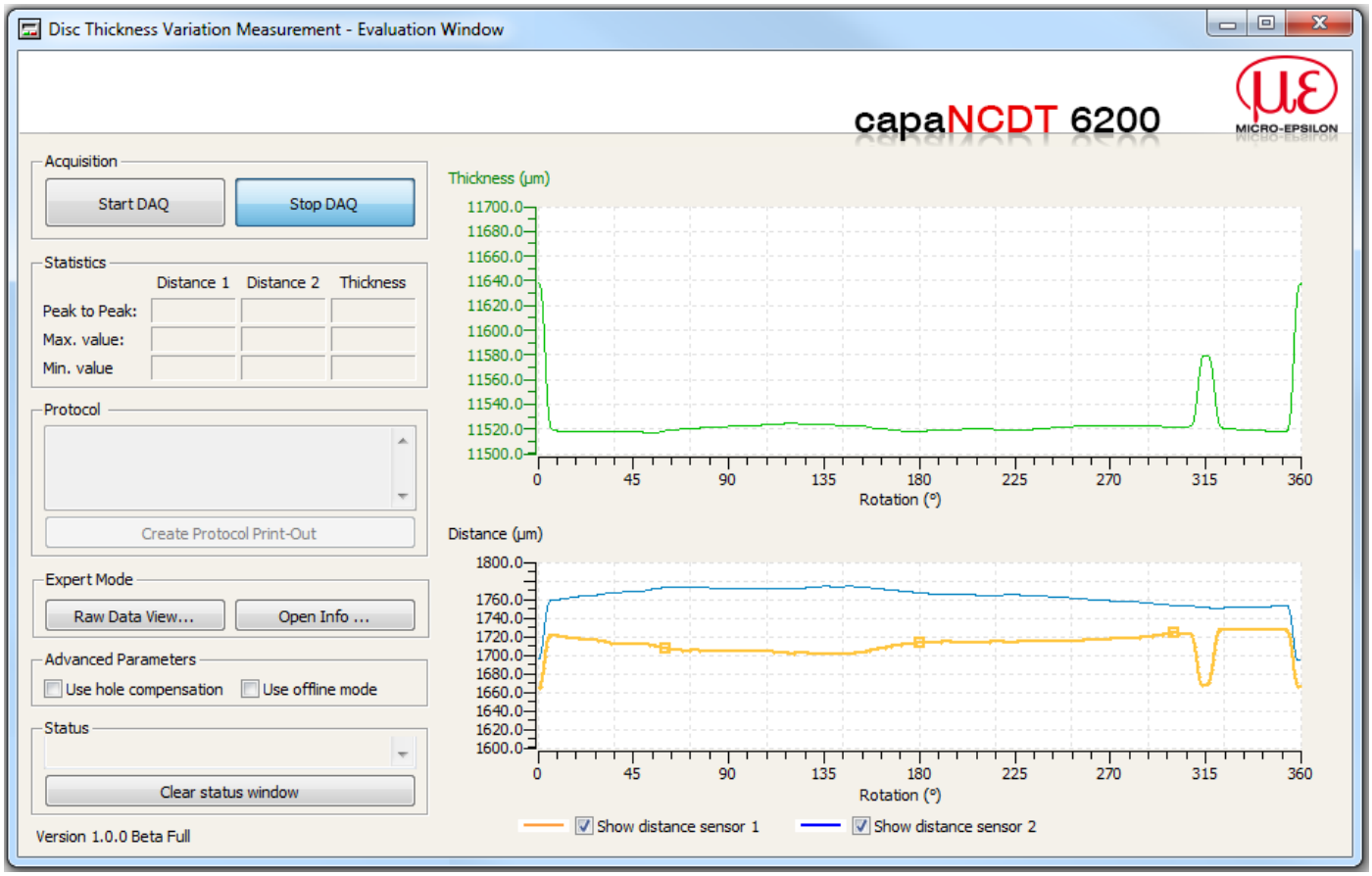
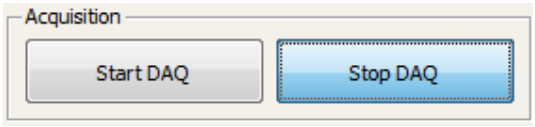
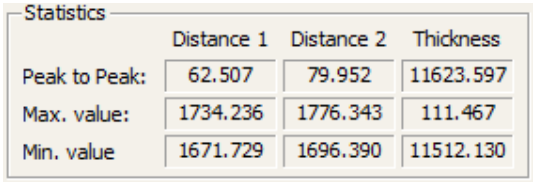


Fig. 4 Main view software



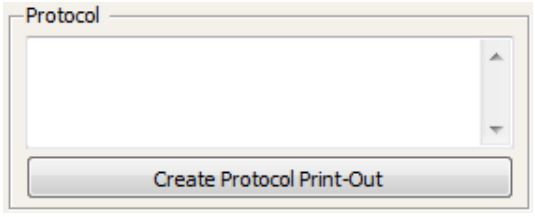
The button `StartDAQ` starts automatic data recording and calculation of disk thickness.

The button `StopDAQ` ends measurement during ongoing measurement. Meanwhile gathered values are displayed in form of a graph.

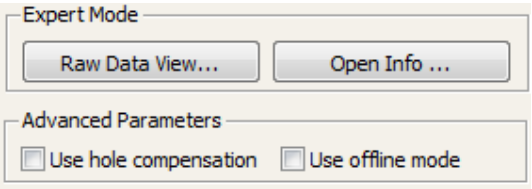


Calculation of the statistic characteristic values of a measurement series is activated by starting measurement.

The statistic values display extreme values of a recognized rotation. If the evaluation range is changed by means of sliders in `Raw Data` view, statistic values are also adjusted.



The function `Create Protocol Print-Out` advises your standard printer to print statistic values and both graphs. Comments in the text box are also printed.

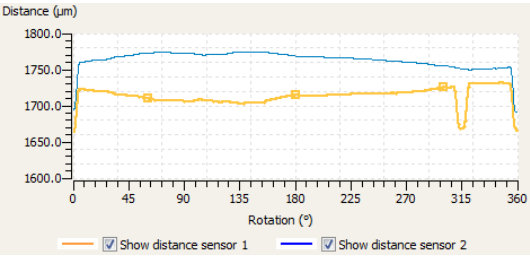


`Raw Data View`: Starts `Raw Data` view.

`Open Info`: This button displays the settings of the controller DT62x0 in a separate dialog. This dialog can also be used to register a product key.

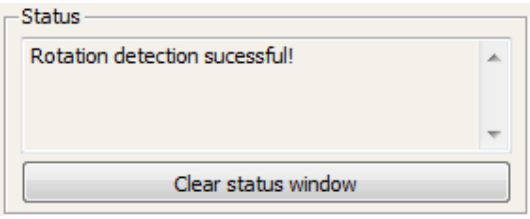
`Use hole compensation`: This function suppresses nuts and drilled holes in the disk while analyzing.

`Use offline mode`: Plays back measurement values from a file that can be specified in the Raw Data view dialog The buttons `Load` or `Start DAQ` start the Offline Analysis.



Measurement in process: The Plots for distance and thickness values display measurement values next to the dedicated position points.

Measurement ended: The known rotation is scaled to the main view from 0 up to 360 °. If the evaluation range in `Raw Data` view was changed with sliders, graphs are also adjusted.



The area Status informs about the process of a measurement.

2.2 Raw Data View

Click in the main view on the button `Raw Data View` to start the `Raw Data` view.

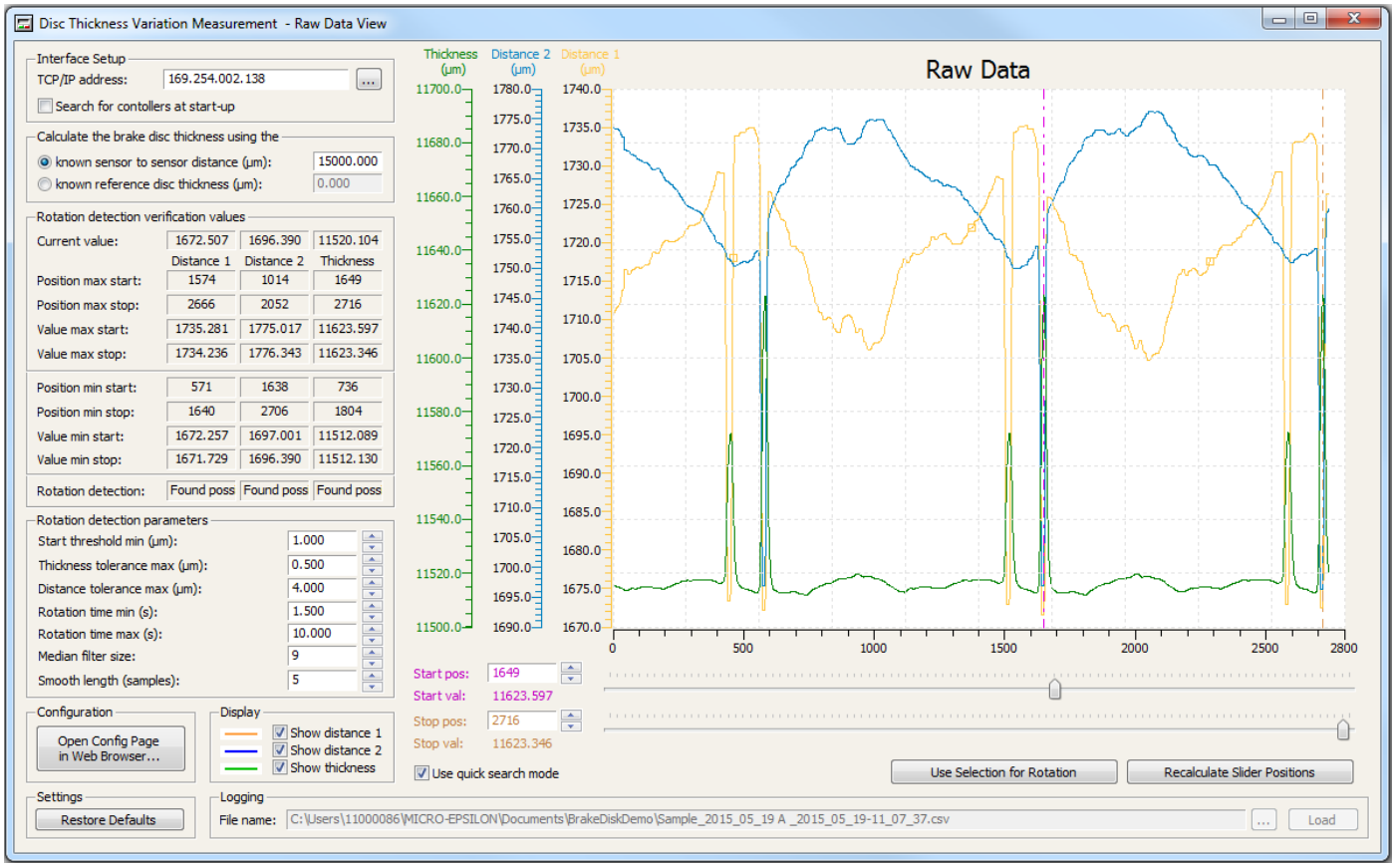
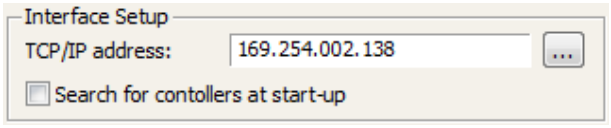


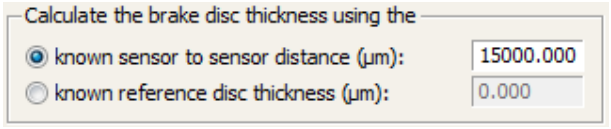
Fig. 5 Raw Data view



Selection of controller whose measurement values are used for calculating disk thickness.

This function ... starts a routine to search for connected controllers.

If checkbox `Search for controllers...` is activated, the software automatically searches for connected controllers after start.



`Known sensor to sensor distance`: The distance between both sensors is known, see Fig. 1 variable (C). The software calculates out of both distance values the thickness of the disk, see Fig. 2.

`Known reference disc thickness`: Measures the variation of the disk. The distance between both the displacement sensors needs not to be known.

Rotation detection verification values

Current value:	1672.507	1696.390	11520.104
	Distance 1	Distance 2	Thickness
Position max start:	1574	1014	1649
Position max stop:	2666	2052	2716
Value max start:	1735.281	1775.017	11623.597
Value max stop:	1734.236	1776.343	11623.346
Position min start:	571	1638	736
Position min stop:	1640	2706	1804
Value min start:	1672.257	1697.001	11512.089
Value min stop:	1671.729	1696.390	11512.130
Rotation detection:	Found poss	Found poss	Found poss

`Current value`: States the last measured distance value resp. the last calculated thickness value.

`Position max start, Value max start`: States maximum values and the dedicated position values at the beginning of a recognized rotation.

`Position max stop, Value max stop`: States maximum values and the dedicated position values at the end of a recognized rotation.

`Position min start, Value min start`: States minimum values and the dedicated position values at the beginning of a recognized rotation.

`Position min stop, Value min stop`: States minimum values and the dedicated position values at the end of a recognized rotation.

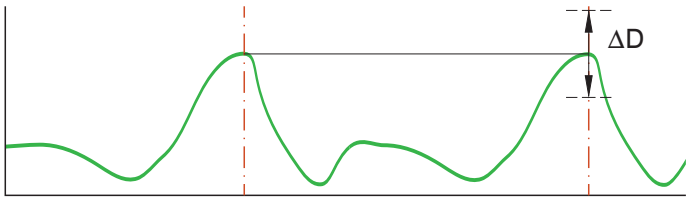
`Rotation detection`: Switches from `Scan` to `Found pos`, while measurement if a related rotation is recognized.

Rotation detection parameters

Start threshold min (µm):	1.000
Thickness tolerance max (µm):	0.500
Distance tolerance max (µm):	4.000
Rotation time min (s):	1.500
Rotation time max (s):	10.000
Median filter size:	7
Smooth length (samples):	1

`Start threshold min`: Change of thickness value so that a stagnant disk can be distinguished from a rotating disk.

`Thickness tolerance max`: Maximum allowed thickness deviation (delta D) between the start and the end point of a rotation, see figure. This parameter is used for the detection of a complete rotation.



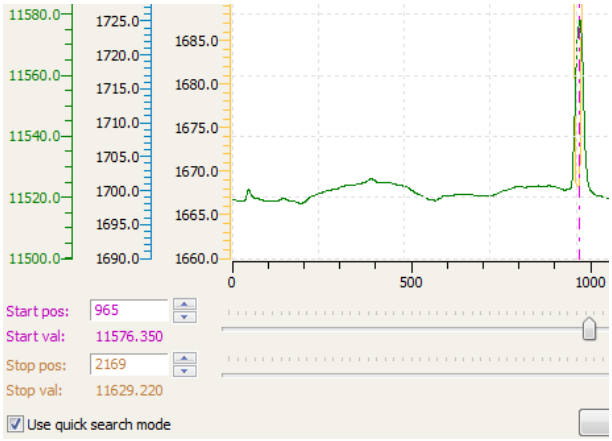
`Distance tolerance max`: Distance deviation of both sensor values to the disk.

`Rotation time min`: Minimum time to detect a complete rotation of the disk.

`Rotation time max`: Data recording ends when reaching rotation time max independent of recognizing a complete rotation. If maximum time is achieved, a related rotation could not be recognized or the maximum time is smaller than the rotation time.

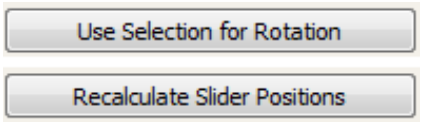
`Median filter size`: Filter is adapted to both sensor distance signals.

`Smooth length`: The recursive filter is adapted to the thickness value.



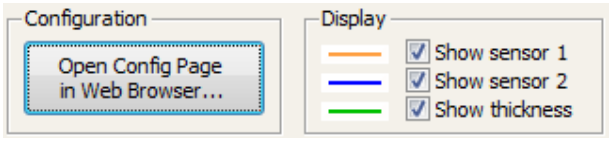
`Start pos, Start val, Stop pos, Stop val`: Displays position values of the cursor and the dedicated thickness values of the disk.

`Use quick search mode`: If the checkbox is set, the software executes only two plausibility checks. As standard three plausibility checks are executed.



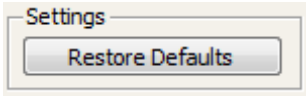
Manual selection for rotation: Set the slider to a rotation's beginning and end and click on the button `Use Selection for Rotation`. The chosen area is scaled in the main view from 0 ° up to 360 ° and the dedicated values are displayed in area `Statistics`.

The button `Recalculate Positions` resets the cursors to their original beginning and end of a rotation of the disk defined by the software if they have been moved manually.

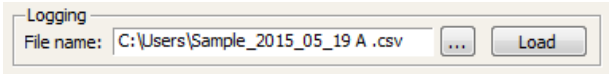


`Open Config Page ...`: This button starts the web interface of the controller DT62x0.

Display: With these check boxes you choose measurement results to be displayed in graphical representation.



The button `Restore Defaults` resets the parameters of the application to their factory settings, see Chap. 4. This includes the IP address, the basis for disk thickness and the settings in area `Rotation detection parameters.`

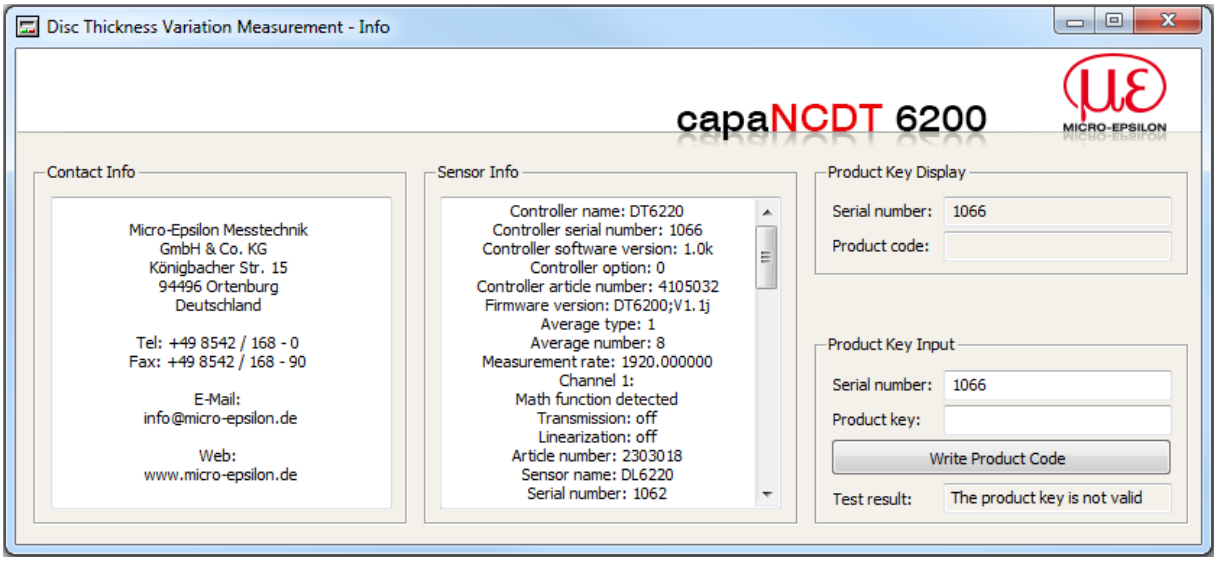


Determines the path for storing measurement series resp. chooses data for Offline Analysis.

Storage of measurement series is not possible in demo version.

3. Demo version, Full version

The Disc Thickness Variation Measurement software is limited to a duration of 30 days in demo version. If you want to use the software beyond this period, you need a valid `Product key`. It is not possible here neither to save nor to print.

Controller DT6200	Controller DT6229
➡ Request a valid product key.	The controller is already equipped with a valid product key.
➡ Click on the button Open Info ... in the main view.	
	
➡ Copy the valid product key in to the space available for `Product key`. ➡ Click on the button Write Product Code.	

4. Factory Settings

TCP/IP address	169.254.168.150
Known sensor to sensor distance (µm)	10000
Known reference disc thickness (µm)	0
Start threshold min (µm)	0.2
Thickness tolerance max (µm)	0.6
Distance tolerance max (µm)	4.0
Rotation time min (s)	1.0
Rotation time max (s)	30.0
Median filter size	0
Smooth length (samples)	0
Use known distance	0 1 = absolute thickness is defined according to sensor distances 0 = the thickness of the measuring object is known resp. irrelevant. Only relative thickness deviations are calculated.
Quick search mode	0

5. Warranty

All components of the device have been checked and tested for perfect function in the factory. In the unlikely event that errors should occur despite our thorough quality control, this should be reported immediately to MICRO-EPSILON.

The warranty period lasts 12 months following the day of shipment. Defective parts, except wear parts, will be repaired or replaced free of charge within this period if you return the device free of costs to MICRO-EPSILON. This warranty does not apply to damage resulting from abuse of the equipment and devices, from forceful handling or installation of the devices or from repair or modifications performed by third parties.

No other claims, except as warranteed, are accepted. The terms of the purchasing contract apply in full. MICRO-EPSILON will specifically not be responsible for eventual consequential damages. MICRO-EPSILON always strives to supply customers with the finest and most advanced equipment. Development and refinement is therefore performed continuously and the right for design changes without prior notice is accordingly reserved. For translation in other languages the data and statements of the German language instruction manual are to be taken as authoritative.

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