

NUMERIK
JENA

OPTICAL
ENCODERS



ABSOFLEX ADAPTER

Accessory for Linear Absolute Encoders

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1. Overview

Position encoders in drive systems have to meet high and controversial demands, especially in linear drive systems. The demands opposing each other are high accuracy and resolution on the one hand and low mass, small dimensions and high measuring speed on the other hand.

The LAK and Kit LA encoders from NUMERIK JENA are equipped with features that fulfill these high requirements in an ideal manner. The special combination of incremental and absolute encoder does not only guarantee stable operation but also enables high speed measuring with high resolution while still maintaining very small dimensions. Furthermore NUMERIK JENA set great value to customization possibilities during the development. Therefore the LAK and Kit LA measuring system offers a large number of customization options as well as various interfaces:

- Possibility of an electronic adjustment after mounting to reduce static mounting errors
- Kit version for customer-specific housings/frames
- Individual measuring lengths of the scales available (up to 1.20 m)
- Several interfaces usable
- Wide range of supply voltages to compensate conduction losses
- Extensive diagnostic and monitoring functions (e.g. read head temperature)
- High control dynamics due to low calculation time
- Two absolute tracks and two incremental sensors ensure high contamination immunity

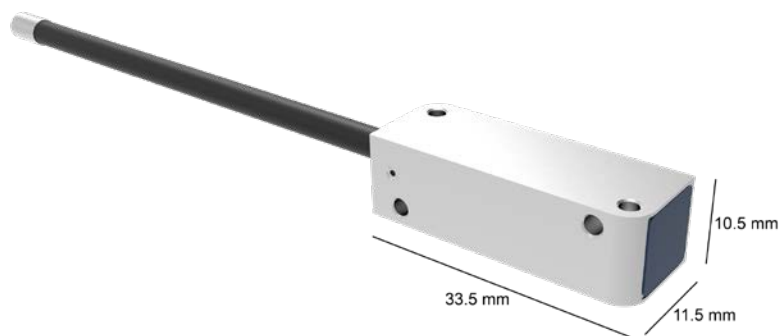


Abbildung 1

2. Application Examples

- Production and inspection machines for the semiconductor industry
- Linear units and linear drives
- Coordinate tables
- Measuring machines and measuring microscopes
- Robotics
- Precision devices in reprography
- Precise machining
- Positioning and measuring devices in medical technology

3. Safety

3.1 General Information

- Make sure to familiarize yourself thoroughly with the contents of these installation instructions before installing and starting up the encoder!
- Please contact the support of NUMERIK JENA GmbH or an authorized representation for further information. Please visit the NUMERIK JENA website to get the contact information.
- NUMERIK JENA GmbH is not liable for damages caused by unauthorized handling of the encoders. Any unauthorized handling leads to forfeiture of all warranty claims.
- The encoders are guaranteed to function if the mounting and operating conditions are maintained as stated in these mounting instructions.
- Make sure to follow the right sequence of the mounting steps during mounting.
- NUMERIK JENA GmbH does not assume any liability for any damages or operating errors caused by incorrect installation or operation.
- The stated tolerances must be maintained in order to achieve the accuracies listed in the specifications!
- If the machine tolerances exceed the tolerances stated in the mounting instructions, errors can occur in both the operation and during measuring. NUMERIK JENA GmbH assumes no liability for this.
- Please refer to the operating manuals and safety instructions included with the devices to ensure the reliable operation of the encoder systems, especially pertaining to:
 - Auxiliary electronic units
 - Counters
 - Displays
 - Controllers
 - Encoders
 - Base mechanical devices (machine tools)
- Please pay attention to the safety instructions and warning symbols!



Danger to the device or to the function of the device!



Pull the plug!



Highly inflammable!

3.2 Notes on Legal Requirements

- The NUMERIK JENA encoders conform to EC standards and carry the CE mark.
- NUMERIK JENA encoders fulfill the requirements of the (German) Product Safety Act (ProdSG) from November 8th, 2011.
- Connect NUMERIK JENA encoders only to subsequent electronics whose power supply is generated from PELV systems (EN 50178).
- NUMERIK JENA encoders fulfill the requirements of standard IEC 61010-1 only if the power is supplied from a secondary circuit with current limitation as per IEC 61010^{3rd Ed.}, Section 9.4 or with power limitation as per IEC 60950-1^{2nd Ed.}, Section 2.5 or from a Class 2 secondary circuit as specified in UL1310.*
- This user manual supersedes all previous editions, which thereby become invalid. The basis for ordering from NUMERIK JENA is always the user manual edition valid when the contract is made.
- Standards (ISO, EN, etc.) apply only where explicitly stated in the user manual.

* In place of IEC 61010-1^{3rd Ed.}, Section 9.4, the corresponding sections of standards DIN EN 61010-1, EN61010-1, UL 61010-1 and CAN/CSA-C22.2 No. 61010-1 can be applied and in place of IEC 60950-1^{2nd Ed.}, Section 2.5 the corresponding sections of standards DIN EN60950-1, EN60950-1, UL60950-1, CAN/CSA-C22.2 No. 60950-1 can be applied.

3.3 Notes on Operation



- Do not connect or disconnect plugs if the power is on!
- Only operate the encoder with the supply voltage stated in this product data sheet.
- Comply with applicable PIN assignment if auxiliary electronic units are connected (e.g. controller or display)!
- Integrate exposed encoders in instruments, devices or machines in such a way that these are protected against contamination.
- Protect the scale tape against mechanical damage.
- Protect the scanning head against shock, impact and humidity.

3.4 Notes on Maintenance

- The encoder requires no maintenance whatsoever, but must be cleaned occasionally, depending on the ambient conditions.
- Modifications and repairs of the encoder may only be carried out by NUMERIK JENA GmbH or appropriately authorized persons.
- NUMERIK JENA GmbH is not liable for damages caused by unauthorized handling of the encoder. All warranty claims are forfeited by unauthorized handling.
- Exposed measuring systems are sensitive to contamination, especially the scale surface and the scanning windows on the scanning head.
- Particularly critical are rough and irregular contamination and deposits (e.g. oil, grease or water).
- The user has to protect the encoder from contamination by way of appropriate design measures.



- **When cleaning the encoder, ensure that no solvent flows under the scale tape!**
- **When cleaning the components, ensure that the scanning window and scale tape are not scratched by any deposited particles!**

4. USB 2.0 Interface

USB 2.0 is integrated in the LAK and Kit LA read head, which allows to have access to the read head via diagnostic software.

An adapter cable can be used to connect the encoder to a PC for configuration purposes. It is also possible to pick off data by an adapter between the LAK and Kit LA connector and the controller.

Once the connection is established the user has several options (please see chapter 6).

5. ABSOFLEX USB-Adapter

The absolute encoders from NUMERIK JENA provide a USB 2.0 interface which allows the user to connect it to a PC and use the ABSOFLEX software. The ABSOFLEX USB-Adapter allows to connect the encoders D-Sub connector directly to a USB port.



Image 2

6. Diagnose and Adjustment Software ABSOFLEX

The measuring systems supplied by NUMERIK JENA were tested and adjusted under ideal mounting conditions. The sensor modules from NUMERIK JENA offer the possibility of electronic adjustment. This lets you adapt the encoder optimally to its surroundings after it has been mounted.

NUMERIK JENA provides the diagnose software ABSOFLEX and a driver package for LAK and Kit LA.

Software - Range of Functions:

- Evaluation of the signal quality (absolute and incremental track)
- Evaluation of the mechanical mounting conditions
- Diagnostics of internal read head signal via system margins (0% ... 100%)
- Automatic adjustment of the signals to reduce the effects of static mounting errors
- Programming of the sensor module (zero position and counting direction)
- Retrieval of position information (position indicator)
- Diagnostics and monitoring

The ABSOFLEX-Software is suitable for the following NUMERIK JENA - products:

- LAK
- Kit LA

Supported Operating Systems:

- Windows 7, 8 (32 and 64 bit)
- .NET Framework 4.0

Required Components (not included):

- ABSOFLEX USB-Adapter

6.1 Installation of the ABSOFLEX Software

In general it is not necessary to install the ABSOFLEX software. The software can be executed directly from an external drive. However it is necessary to install the USB device driver through the Windows Device Manager.

The ABSOFLEX software (incl. driver package) can be downloaded for free on the NUMERIK JENA website. Visit the LAK / Kit LA product page or the download section.

6.2 Connection of the Measuring System to the ABSOFLEX USB-Adapter

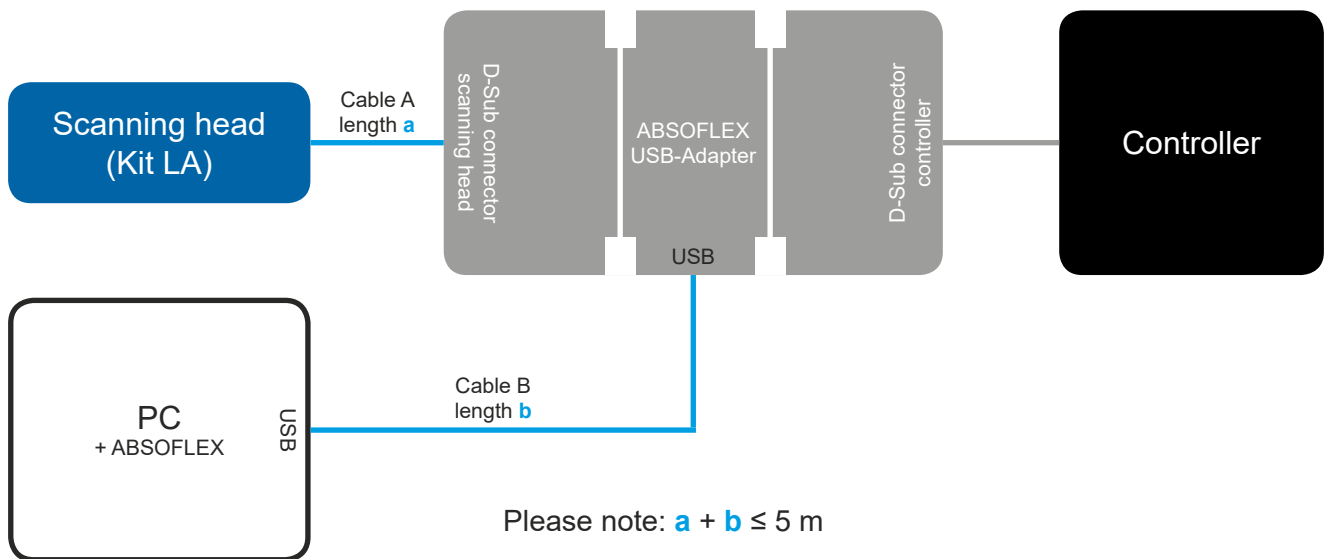


Image 3



ATTENTION! Please pay attention to the following during the signal adjustment:

During the signal adjustment the signals of the encoder should not be used to control the drive motor. Unintentional incorrect signal settings could cause wrong signal values in the controller and therefore lead to malfunction of the drive system.

The stage should be moved without motorized drive during the signal adjustment. If a motorized drive is necessary, a manual operation has to be used and the encoder feedback must not be used.

The total length of cable A + B must not be longer than 5 m (see Image 3).

For the use of the ABSOFLEX software a connection to a controller is not necessary.

6.3 ABSOFLEX - Range of Functions

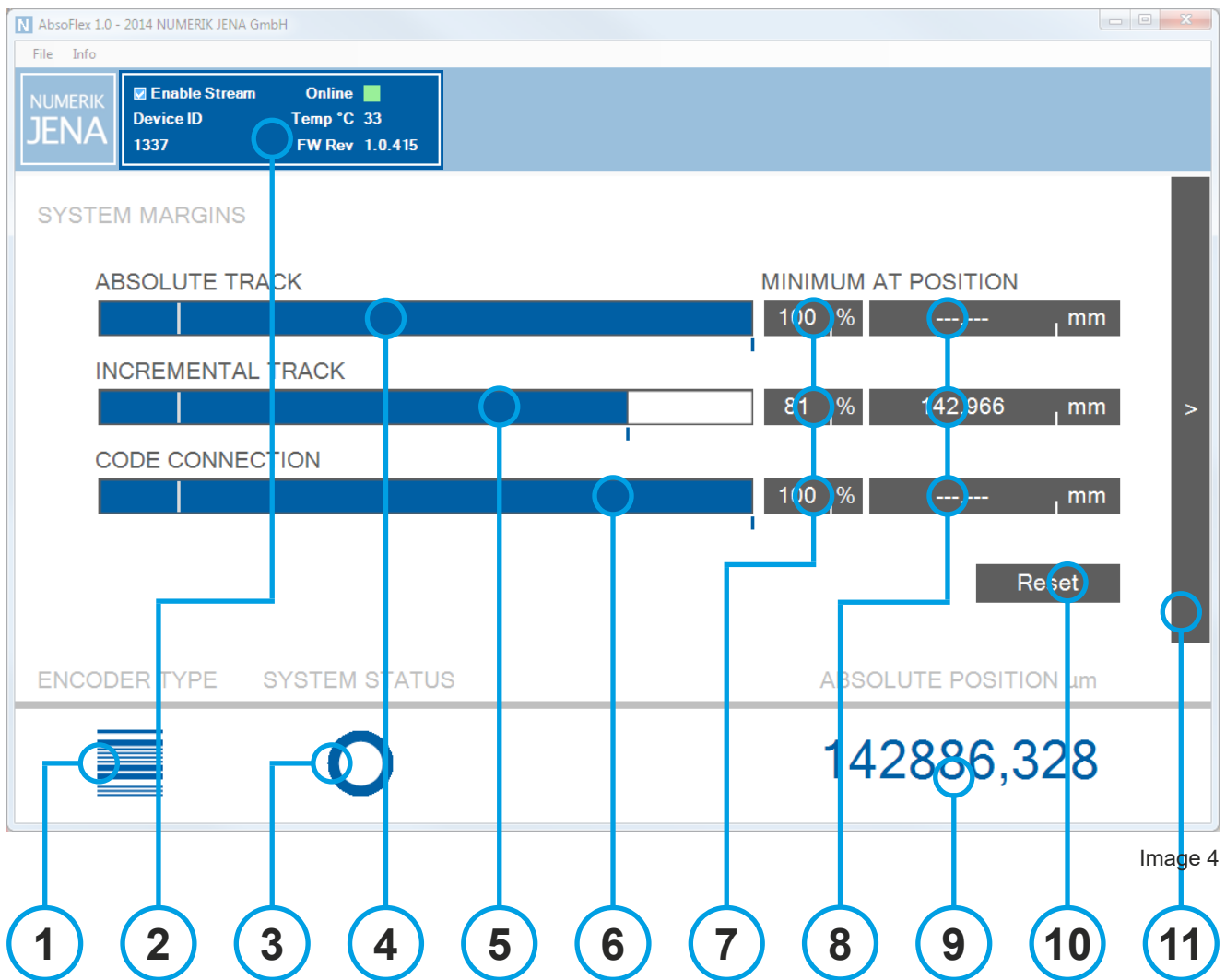


Image 4

- 1 Display for encoder type (e.g.: linear)
- 2 Status display (shows serial number, firmware version, temperature, connection status)
- 3 Cumulated system status (turns from blue to red in case of an error)
- 4 System margin for absolute track
- 5 System margin for incremental track
- 6 System margin for code connection (absolute + incremental track)
- 7 Display for worst system margin after reset
- 8 Display of the position, where the worst system margin was detected
- 9 Display for the metric absolute position
- 10 Reset - Button: system reset when errors occur
- 11 Shift - Button: switches to the adjustment panel

Signal Adjustment

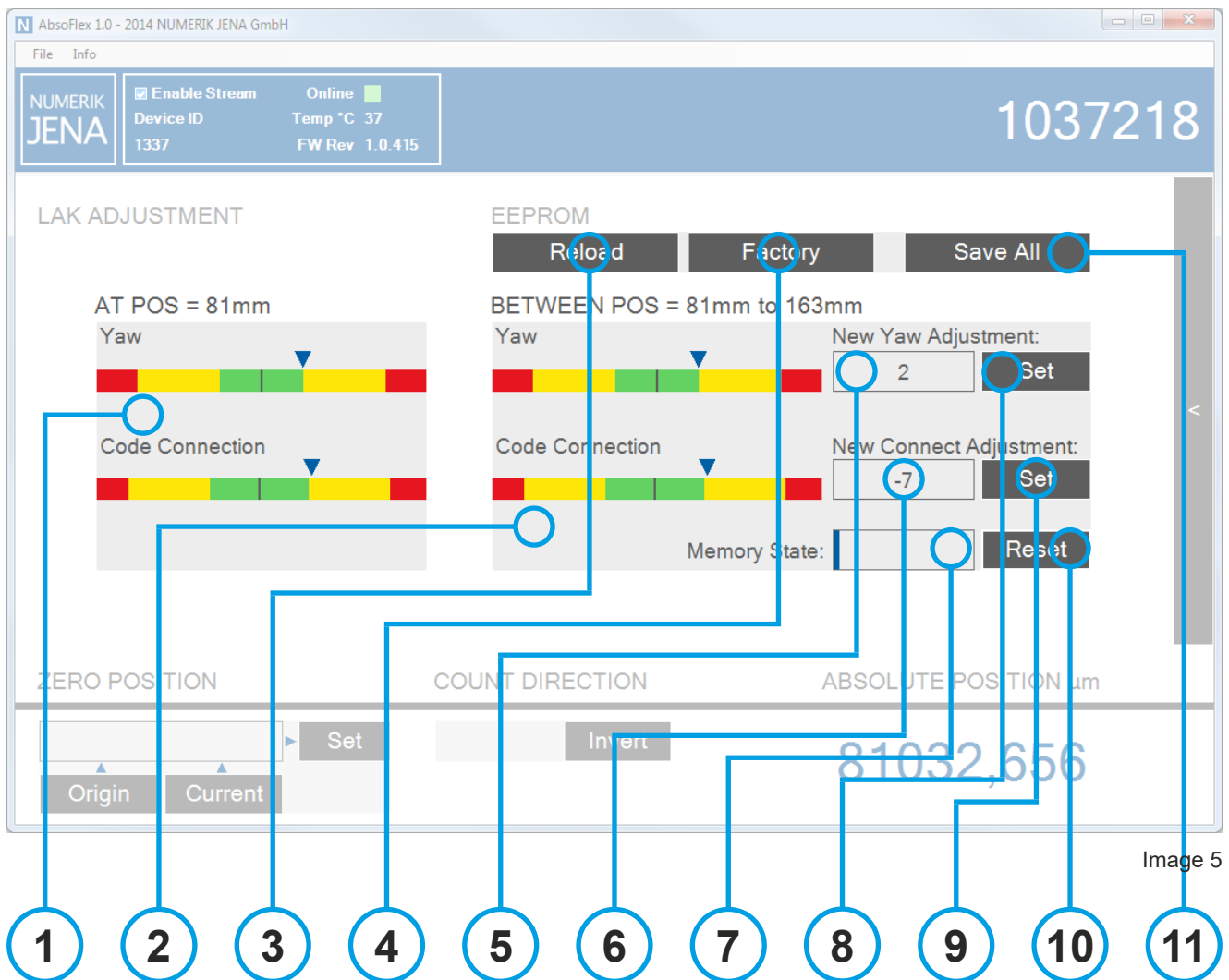


Image 5

- 1 Display for yaw and code connection errors at the current position
- 2 Display for average yaw and code connection error over the driven distance (after reset)
- 3 Reload - Button: discards changes to the device that have not been saved to the EEPROM yet
- 4 Factory - Button: loads factory settings from EEPROM
- 5 Calculated correction value for yaw error
- 6 Calculated correction value for code connection error
- 7 Used memory level during statistical calculation
- 8 Set - Button: update yaw with calculated correction value
- 9 Set - Button: update code connection with calculated correction value
- 10 Rest - Button: system reset when errors occur
- 11 Save All - Button: Save all current changes to EEPROM

Programming

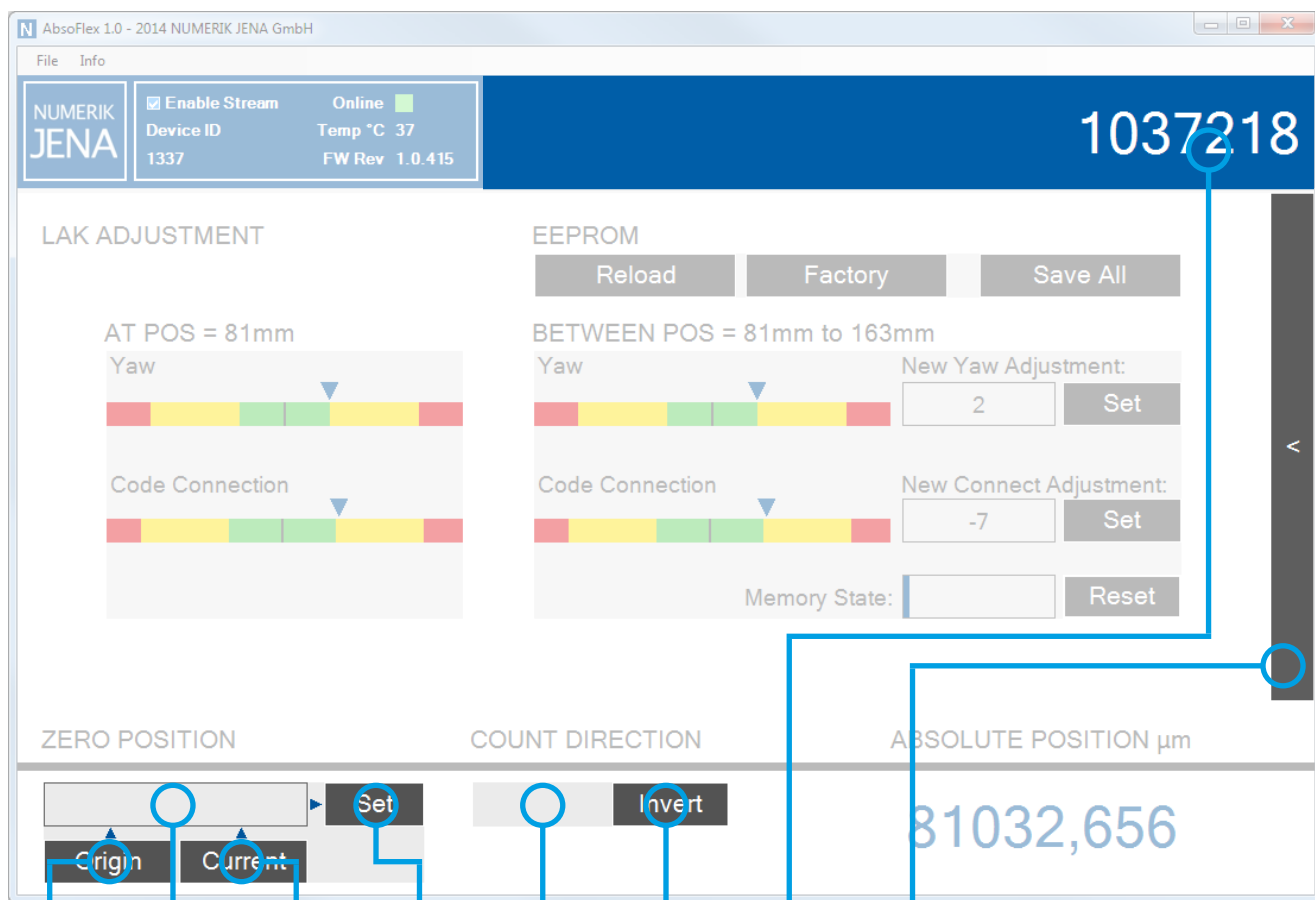


Image 6

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

- 1 Origin - Button: The beginning of the scale tape is set as zero-position
- 2 Display for the zero-position as a counter value
- 3 Current - Button: sets the current position as zero-position
- 4 Set - Button: programs the desired zero-position
- 5 Display for the current counting direction
- 6 Invert - Button: Inverts the counting direction in regard to the driving direction
- 7 Display for the absolute position as a counter value
- 8 Shift - Button: switches to the system margins panel

Diagnostics

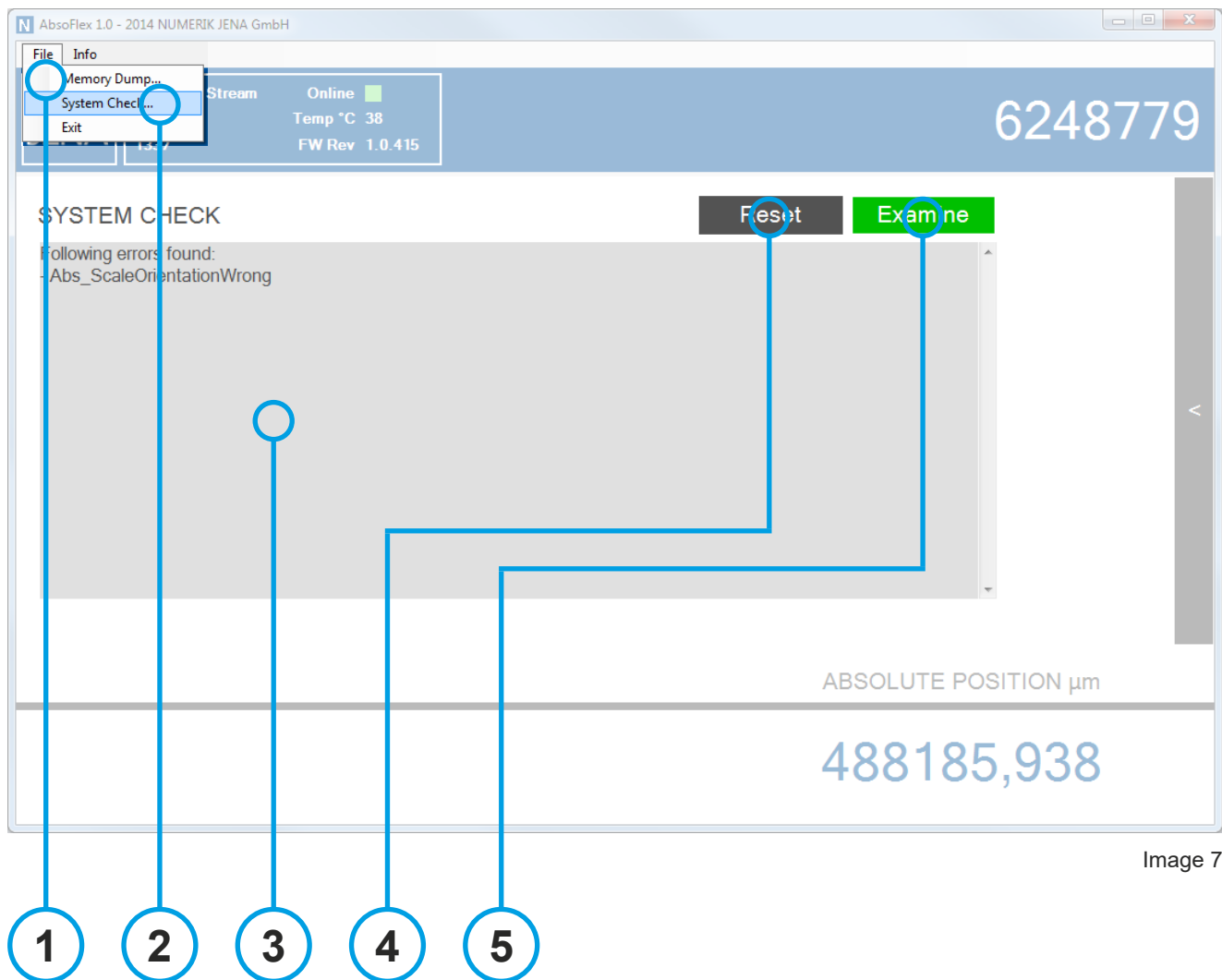


Image 7

- 1 Memory Dump: saves a copy of the entire memory in a file (for transmission to the support)
- 2 System Check: opens the software interface for error diagnosis
- 3 Log - Display: shows occurred errors
- 4 Reset - Button: resets the system when errors occur
- 5 Examine - Button: starts error analysis

6.4 Evaluation of the Signal Quality

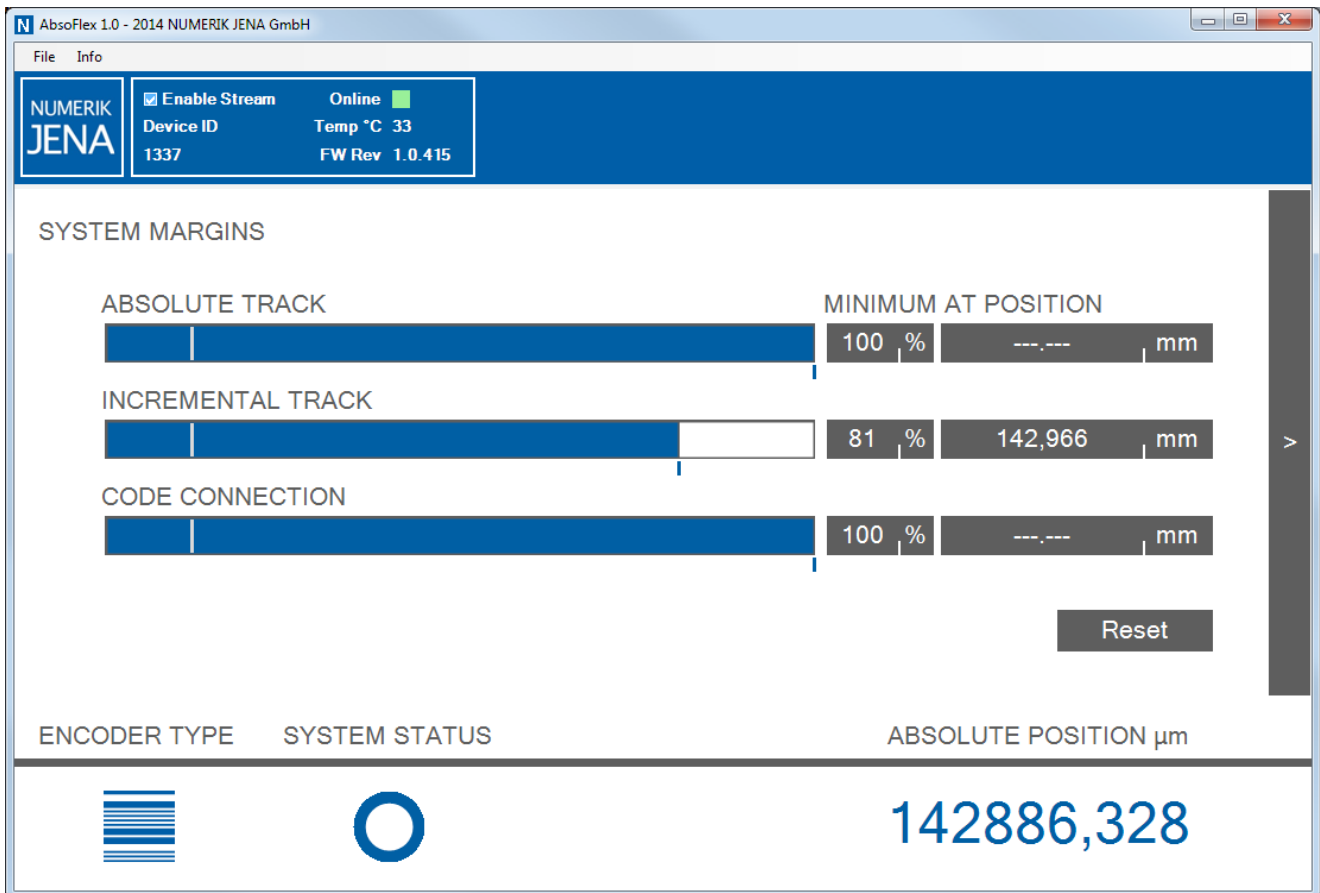


Image 8

The three blue bars show the current system margins of the device. The white line represents a system margin of 12.5%. If the current system margin value becomes less than 12.5% the device is in a “pre-warning” state. As long as the system margin stays above 0%, the device will function without any errors. When it reaches 0% it still works as long as no error bits are set. At this stage the probability is very high that an error bit is set at any moment.

The two columns on the right show the smallest system margins that have been reached since the last reset as well as the absolute position where this event occurred. These values do not correlate with the bars unless the device is at the same position displayed at the right.

6.5 Evaluation of the Mounting Conditions and Automatic Signal Adjustment

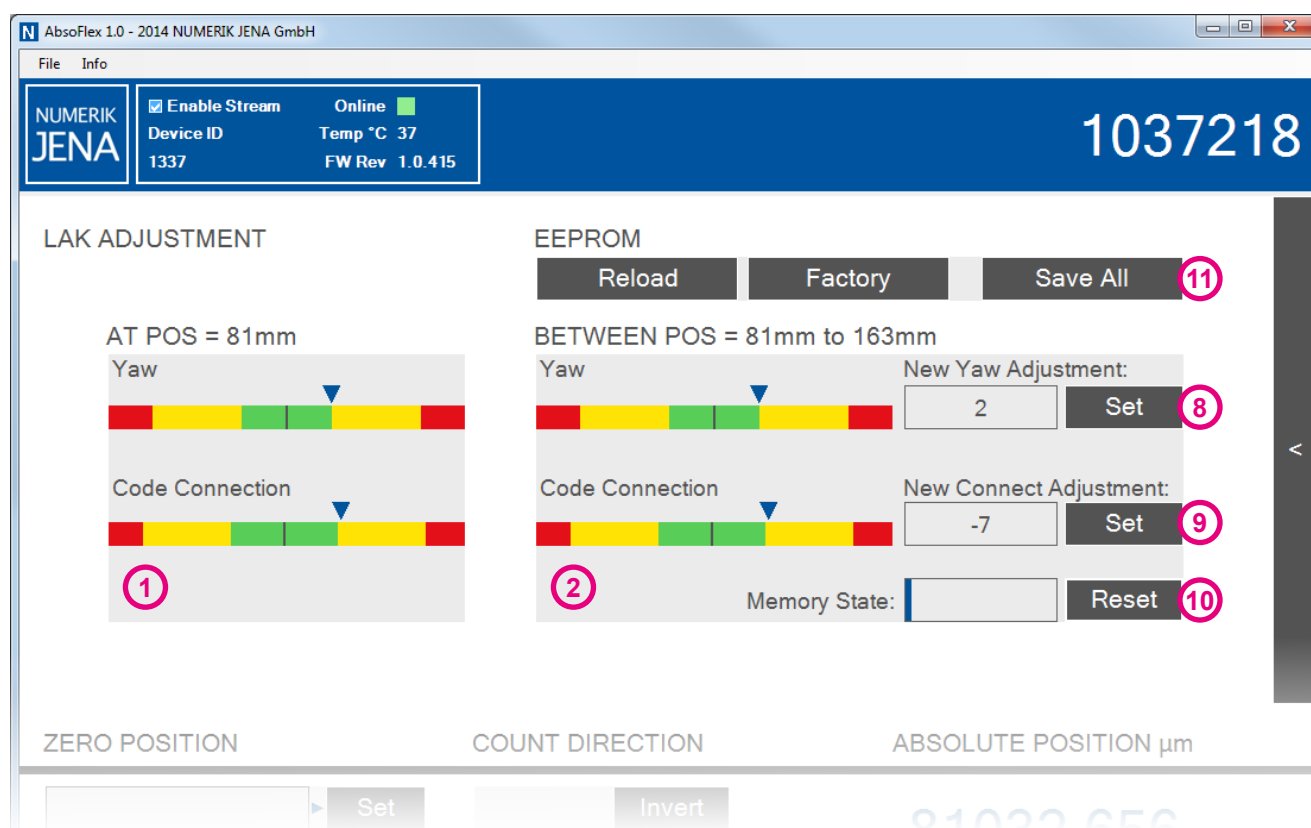


Image 9

The adjustment panel serves as a way to optimize code connection in regard to the mechanical mounting condition. As long as the distortion between head and tape is within the specified tolerances, the whole tolerance while moving the head in regard to the tape can be utilized.

1. Click the Reset - Button (10) to empty the memory.
2. Move the measuring head over the entire scale tape (multiple times, if possible).
3. The left bar graph (1) shows yaw and code connection errors at the current position. The right bar graph (2) shows the average errors over the driven distance.
4. Click the “New Yaw Adjustment” - Set-Button (8) to correct yaw errors.
5. Move the measuring head over the entire scale tape again (multiple times, if possible).
6. Click the “New Connection Adjustment” - Set-Button (9) to correct code connection errors.
7. Move the measuring head over the entire scale tape again (multiple times, if possible). The statistical error should be in the green segment (optimum).
8. Click the “Save All” - Button (11) to save the new parameters.

Error Treatment During Signal Adjustment

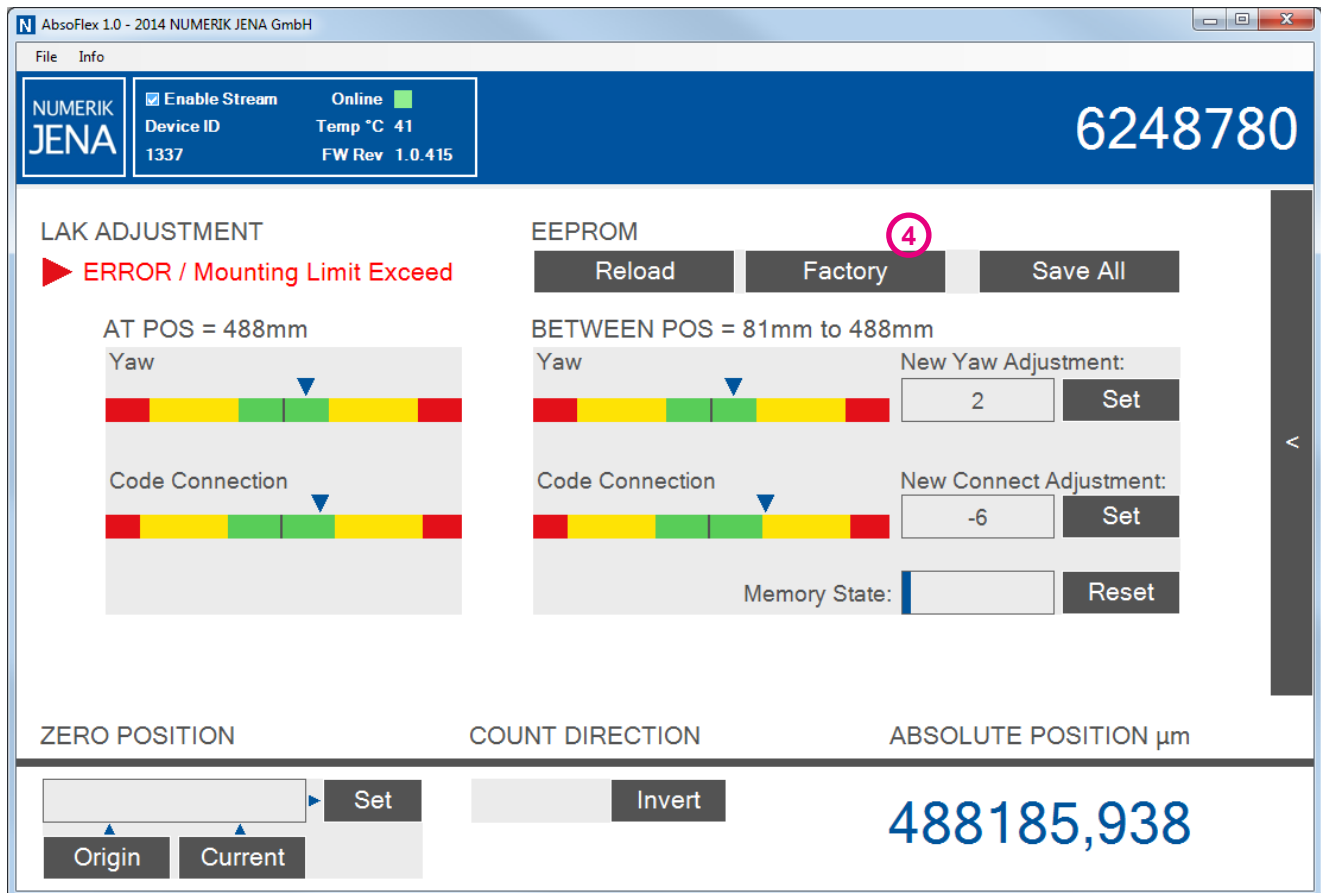


Image 10

If a "Mounting Limit Exceeded" - error message shows up after the automatic adjustment, the correction algorithms cannot handle the distortion between scale tape and measuring device. In this case it is recommended to reset the device to factory setting by clicking the "Factory" - Button (4). Check the mechanical mounting of the measuring system.

By resetting to factory settings the adjustment has to be repeated. This process is described at the beginning of this chapter.

6.6 Programming of the Logic Zero-Position and Counting Direction

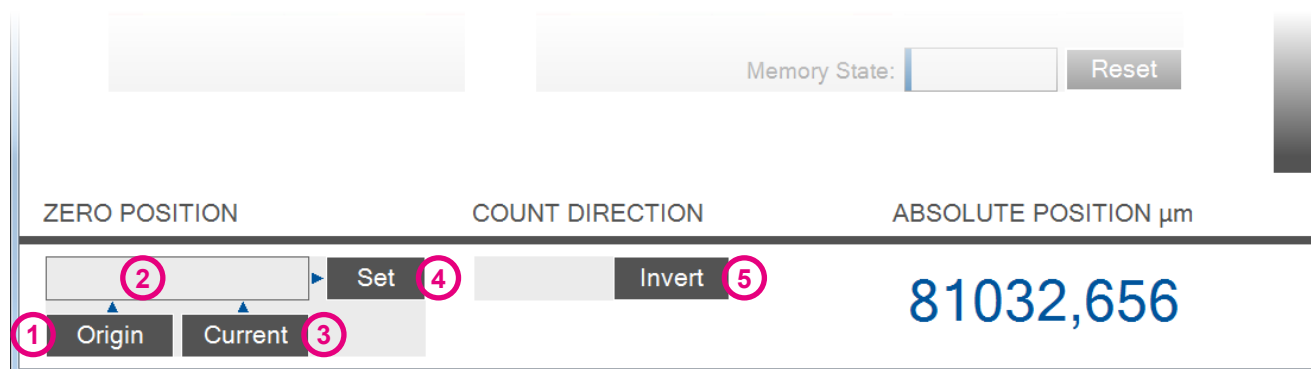


Image 11

Programming of the Logic Zero-Position*

Absolute measuring systems of NUMERIK JENA work with two separate internal position:

- Physical position which is derived from the code on the scale tape
- Logical position which is passed to the interface

It is possible to shift the logical position in regard to the physical position. This is achieved by setting a logical zero-position.

It is possible to save a physical position which is equivalent to the logical zero (2). Any counter value, that represents a valid physical position, can be entered here. Alternatively, by clicking the Origin - Button (1) this value can be set to zero or the current position can be entered by clicking the Current - Button (3).

The Set - Button (4) transmits the entered value to the measuring system.

Save all changes by clicking the Save All - Button (11)!

Programming of the Logical Counting Direction

By clicking the Invert - Button (5) the counting direction of the measuring system can be inverted.

Please note: After changing the counting direction the logical zero-position has to be programmed as well!

Save all changes by clicking the Save All - Button (11).

* Not in combination with EnDat 2.2

6.7 FAQ

1	<p>The adjustment (yaw and code connection) does not work. An error message keeps showing up. The arrow stays out of the green segment of the bar graph even after pressing "Set".</p> <p>The correction algorithms are used to improve the tolerance band. It is not possible to correct distortion errors that are worse than an equivalent to the width of a bit period ($>0.5^\circ$). If this threshold is exceeded, check the mechanical mounting.</p>
2	<p>There are two sections in the adjustment interface. Why?</p> <p>The left section displays errors at the current position (smoothed to some degree). The right section shows a statistical error over the driven distance. The statistical evaluation is essential for a good error correction. The best outcome is achieved by moving the measuring device over the entire scale tape.</p>
3	<p>The measuring device is mechanically adjusted optimally. Nonetheless, the absolute track is on 0% and the error bit is set. Why?</p> <p>The measuring device does not recognize the code from the scale tape. The most common reason for this error is when measuring device and scale tape are not aimed at the same direction. Check the alignment of tape and device (rotate either by 180°).</p>

6.8 System Check with the ABSOFLEX - Software

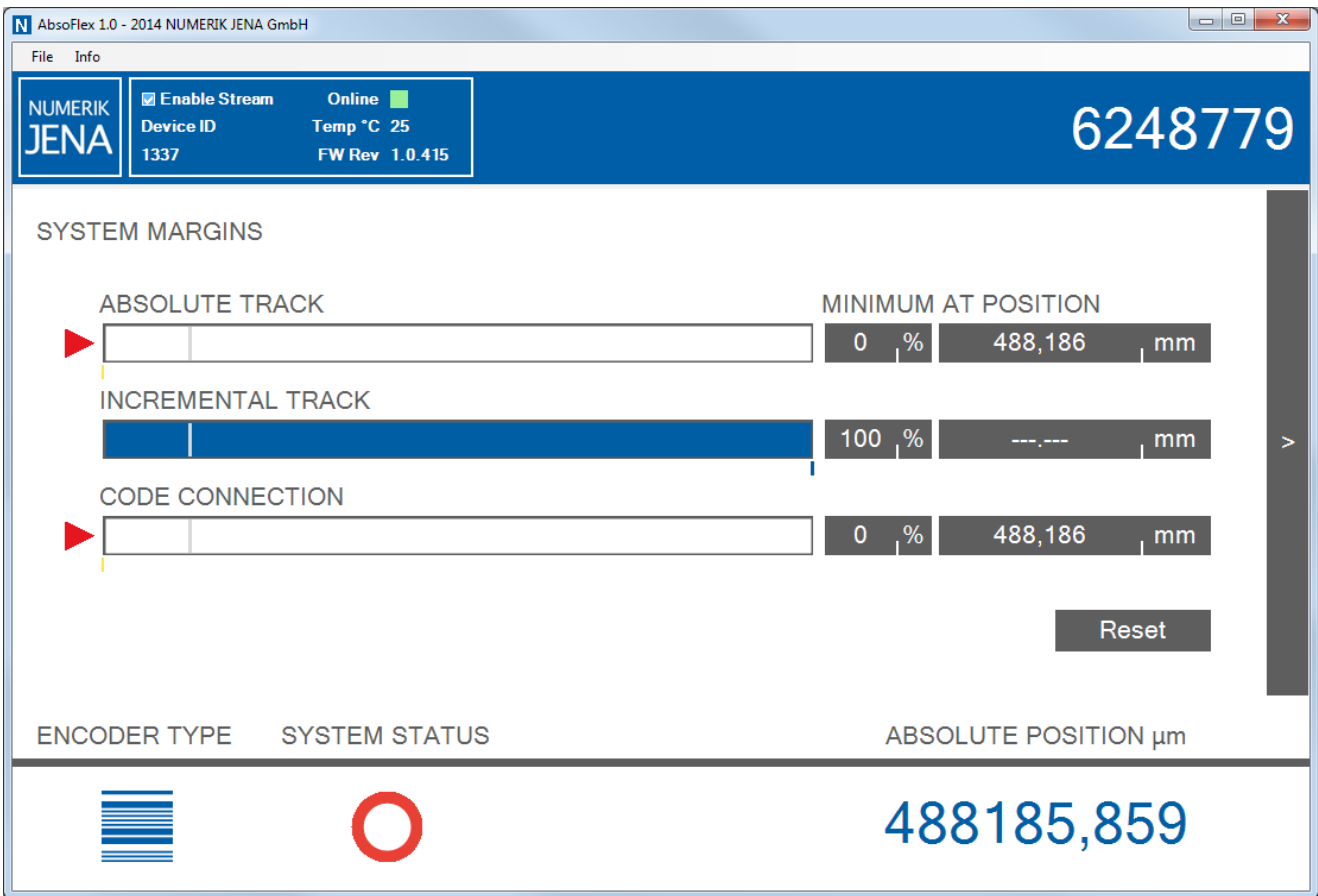


Image 12

If system errors occur, the ABSOFLEX - software provides a system check.

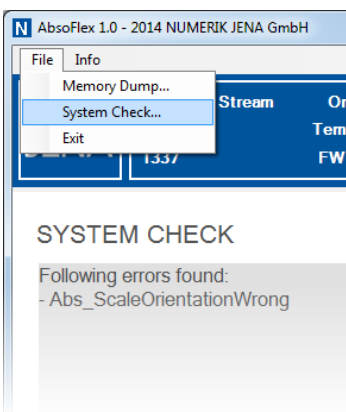


Image 13

To access it, click on "File" -> "System Check" (2) as illustrated in the image to the left. A diagnose interface will be opened.

IMPORTANT: The measuring device has to be stationary in order to perform the diagnosis correctly.

By pressing the Examine - Button (5) the diagnose starts.

The results appear in the grey log window (3). Forward these results to the technical support of NUMERIK JENA or any authorized subsidiary.

To create a copy of the internal memory of the device, click on "File" -> "Memory Dump" (1). This information might be useful for the technical support.

7. Ordering Key

7.1 ABSOFLEX Adapter

Description	Order-no.
ABSOFLEX USB-Adapter	1135558-01
USB-Kabel (1.8 m, Type A to Mini-USB Type B)	687661-01

7.2 ABSOFLEX Software

The ABSOFLEX software (incl. driver package) can be downloaded for free on the NUMERIK JENA website. Visit the LAK / Kit LA product page or the download section.

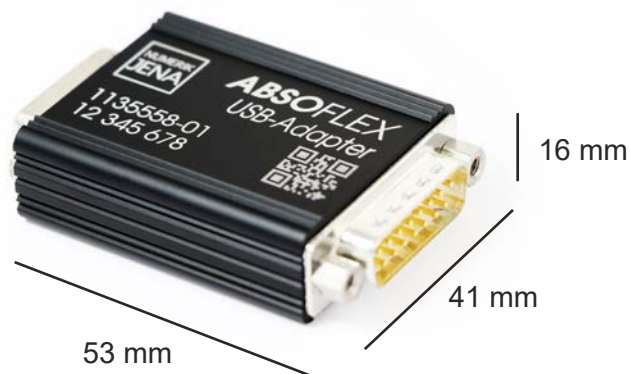


Image 13

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