

Stacker

Operating Manual for Stacker 902

Revision E

Stacker

The Stacker is designed for use with BMG LABTECH microplate readers. In order to minimize manual microplate handling, you can load up to 50 microplates in a single batch. With the continuous load feature, you can add even more microplates during an active run.



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This manual was designed to guide Stacker users through the basic hardware features of this automatic plate handling instrument.

Although these instructions were carefully written and checked, BMG LABTECH cannot accept responsibility for problems encountered when using this manual. Suggestions for improvement will be gratefully accepted.

BMG LABTECH reserves the right to change or update this manual at any time. The revision number is stated at the bottom of every page.

For contact information please visit our website at www.bmglabtech.com or send an email to germany@bmglabtech.com.

Intended Use

The Stacker is intended for professional laboratory research use by trained personal.

The instrument may be used only for research and development or other non-clinical purposes.

For validation of the entire system it is recommended that Good Laboratory Practices (GLP) are followed to ensure reliable analyses

Disclaimer note:

The information contained in this documentation is subject to change without notice. BMG LABTECH shall not be liable, to any extent whatsoever, for any damages resulting from or arising out of the use or performance of this system and related documentation or the procedures specified in this manual, regardless of foreseeability or the form of action, whether in contract, tort (including negligence), breach of warranty, strict liability or otherwise, and including but not limited to damages resulting from loss of data, loss of anticipated profits, or any special, indirect, incidental or consequential damages. BMG LABTECH is not responsible for any damage to this equipment or personal injury that may result from the use of this equipment or of an accessory not manufactured by BMG LABTECH. The user assumes full responsibility for the results obtained from the use of this system and related documentation and for application of such results.

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1 Technical Specifications

Operating modes	Continuous Plate Loading Batch Mode Single Plate Mode Plate Movement (Restacking)
Plate capacity	50 microplates per magazine
Control Interface	Stacker communication is connected to used reader RS232, 9600 baud, binary communication protocol
Power requirements	Auto ranging power supply 85 to 240V AC, 50 to 60 Hz, 100 VA Fuses: T1.25A/250V for main power 85 to 240V AC (use original type Wickmann only)
Dimensions	Width 45 cm, depth 68 cm, height 19 cm height with magazines 86 cm
Weight	15 kg
Ambient conditions	Operating Temperature: 15°C ... 35°C Storage Temperature: -10°C ... 50°C Humidity of atmosphere: 20% ... 80% Non condensing environment
Instrument conforms to	Protection class I Over voltage category II Contamination class II
Barcode Reader (optional)	barcodes can be read on left and front side (front middle and front left) of microplate Complies with: Code 128, Code 39, Codabar, Code 11, UPC/EAN and 2/5 Interleaved and further barcodes The Barcode reader uses a Class 2 laser that complies with US 21CFR1040.10, and IEC825-1: 1993, EN60825-1:1994+A11:1996. Wavelength 630-680 nm; max. output 1.0 mW. Class 2 lasers use a low power, visible light diode. Do not stare into the light beam. Momentary exposure to a Class 2 laser is not known to be harmful.

Specifications are subject to change without notice.

2 Safety Information

2.1 Description of Warnings



A general warning calls attention to a circumstance which is described below. User must follow corresponding instructions strictly.



Warning for laser beam.



Danger of crushing hazard.

2.2 General Information



This instrument must be installed and used as outlined in this Operating Manual. Installation, service and any operation which requires opening of the instrument must be performed only by trained and certified personnel from BMG LABTECH. Failure to comply with these instructions will invalidate the warranty and can lead to unsafe operation of this equipment.



The area designated for the instrument should be free of dust, liquids and acidic vapor. The surface of the table should be flat and even. Avoid areas subject to vibrations and direct sunlight.



Prior to turning on the instrument the first time, let the instrument adapt to room temperature for at least 3 h to avoid condensation which can cause a short circuit. BMG LABTECH will void the warranty if damage occurs to electrical and/or mechanical parts in cases where the instrument was turned on before the recommended accommodation time.



Handling and operation of the equipment must be carried out only by qualified personnel and staff trained by an official BMG LABTECH representative.



Microplates and related accessories (e.g. LVis Plate) operated at temperatures higher than 55°C must cool down below 55°C before being handled and removed from the instrument.



Samples and reagents, be it in solid, liquid, or gaseous form, must be removed from the instrument immediately after measurement to avoid corrosion and accumulation of hazardous substances inside the instrument.



Never put fingers into magazine opening when Stacker system is active. The Stacker is active when the power LED of the Stacker is blinking slowly or on continuously. The Stacker can become active at any time during a measurement protocol and/or when the power LED of the reader is blinking.



In case of a lost or jammed microplate: turn off the Stacker and the reader by switching off mains power. Then carefully retrieve the microplate. If necessary, the Stacker table and the reader microplate carrier can be moved manually.

2.3 Environmental Safety Standards

The environmental safety standards for operation under norm IEC 61010-1 are met under the following conditions:

Indoor use (adhere to the Occupational Exposure Limit Values for ECM, UPS, vibration, and sunlight when setting up the instrument in the laboratory).

- Altitude (up to 2000 m)
- Temperature (+15°C to +35°C)
- Relative Humidity (Maximum 80% at 31°C non condensing then decreasing linearly to 50% at 40°C)
- Mains supply voltage fluctuation (+/- 10%)
- Overvoltage category (II) acc. to IEC 60364-4-443
- Pollution degree (2) acc. to IEC 61010-1

2.4 Electrical Safety

- Connect the unit only to a grounded supply socket. The instrument is class 1 construction and must be grounded.
- Connect the unit only to a power supply with a designated voltage rating corresponding to the label on the back of the instrument.

2.5 Light and Laser Safety

A laser light sources Class 2 is used in the barcode reader.

- Complies with 21CFR1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001
- EN60825-1:1994+ A1:2002 +A2:2001
- IEC60825-1:1993+A1:1997+A2:2001
- Caution: Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.



Barcode reader with laser diode – laser class 2. Emits light at a continuous wavelength of 630 nm to 670nm with <1 mW and will not injure the eye if exposure is limited to max. 0.25 sec. Nevertheless, avoid looking at the laser light directly.

Class 2 laser scanners use a low power, visible light diode. As with any very bright light source, such as the sun, the user should avoid staring directly into the light beam. Momentary exposure to a Class 2 laser is not known to be harmful.



Figure 1: Warning Label on barcode Reader

2.6 Chemical and Biological Safety

Daily routine use with this instrument may involve the handling and use of compounds that are toxic, flammable, or biologically harmful. When working with materials and compounds as stated, make sure to observe the following precautions:

- Handle all samples in liquid, solid, or in gaseous form according to good laboratory practice.
- Adhere to the maximum workplace concentration (MAC) and to laboratory safety regulations (e.g. BGI 850-0, formerly BGR120 in Germany).
- Wear safety goggles since spilling of liquids may occur.
- Contact your safety officer to dispose of hazardous waste solutions and when working with flammable liquids.

The Stacker must not be exposed for any length of time to chlorinated hydrocarbons at high concentration (i.e., chloroform, aromatic hydrocarbons, such as toluene or benzene, etc.) or to acetone. All warranties are void if the instrument comes in contact with organic solvents.

If using any of these substances while performing a test run, be sure to remove the sample immediately after measurement is completed. If evaporation of any of these substances occurs inside the instrument, it is important to vent the instrument for a sufficient amount of time.



Use only mild detergent or 70% ethanol for cleaning the instrument. Make sure the instrument is always in the OFF position for cleaning and servicing.

2.7 Instrument Disinfection

Please follow all instructions carefully for a successful disinfection of this instrument.

All parts of the instrument, which have the possibility of contacting patient sera or positive samples, have to be handled as if they are hazardous. For this reason, it is recommended that gloves be worn while maintaining or working with the instrument.

It is very important that the instrument is thoroughly disinfected before maintenance or before removing the instrument from the laboratory. Be sure that the instrument is disinfected before you send it to your distributor or to the manufacturer. For safety reasons, you have to fill out the Disinfection Certificate, or the instrument may not be accepted by the service center or by customs authorities.

Use suitable disinfectants, e.g. alcohol (70%).

Authorized personnel wearing disposable gloves and protective clothing should only perform the disinfection procedure. The location should be well ventilated.

Disinfection Steps

1. Disconnect the instrument from the main power supply.
2. Remove the null modem cable from the RS232 connector.
3. Clean all outside surfaces of the instrument carefully with cotton wool, which has been soaked in disinfecting solution.
4. Place the instrument in a large plastic bag along with the cotton wool that has been soaked in disinfecting solution. Ensure that the wool does not touch the instrument.
5. Close and seal the bag.
6. Keep the instrument in the plastic bag for at least 24 hours.
7. After the disinfection time has lapsed, remove the instrument from the plastic bag and clean all outside surfaces of the instrument with cotton wool that has been soaked in alcohol solution.
8. Repeat the procedure for disinfection on any accessories, which will be returned with the instrument.
9. Complete the Disinfection Certificate.

Disinfection Certification

This instrument and its inventory have never been in contact with any dangerous biological material, or if so, the instrument and its inventory have been disinfected according to the instructions given in the Operating Manual.

Name: _____

Company: _____

Date, Signature: _____

3 Installation

The shipping box for the Stacker contains the instrument and several accessory components. When unpacking the instrument, please check to ensure that all the standard components, as well as any optional parts that you requested, are accounted for.

The shipping box contains:

- Stacker instrument
- 2 Magazines
- Power cord
- RS232 cable
- Operating manual
- Software, if not already supplied
- Service parts (e.g. spare fuses and offset pin)
- Magazine release tool

Call BMG LABTECH immediately if any of these items are missing.

The area designated for the instrument should be free of dust, liquids and acidic vapors. The table's surface should be flat and even. Avoid areas subject to vibrations and direct sunlight.



The operator of the Stacker is assumed to be trained in the correct operation of the instrument and the safety issues. Throughout this manual the word 'you' refers to this trained operator.



Upon unpacking and positioning the Stacker, make sure to unlock the transport lock (section 3.1 Transport Lock) before any power connection (section 3.4 Power and Communication Connections).

3.1 Transport Lock

To prevent damage during transport the Stacker is equipped with a transport lock, which has to be unlocked before using the Stacker.

Unlock transport mechanism

Once the instrument is in its permanent location, the transport lock must be removed to free the Stacker's transport system. The transport lock is located on the front side of Stack 2 (see Figure 2). Loosen and remove the screw. Keep the screw together with the Instrument Manual. The transport lock may be needed in future when the Stacker needs to be transported again.

Lock transport mechanism

When the Stacker is shipped or moved to a different location, the transport lock should be fixed in order to prevent damage. To fix the Stacker's transport system, move it to the far right side, install and tighten the screw (see Figure 2).

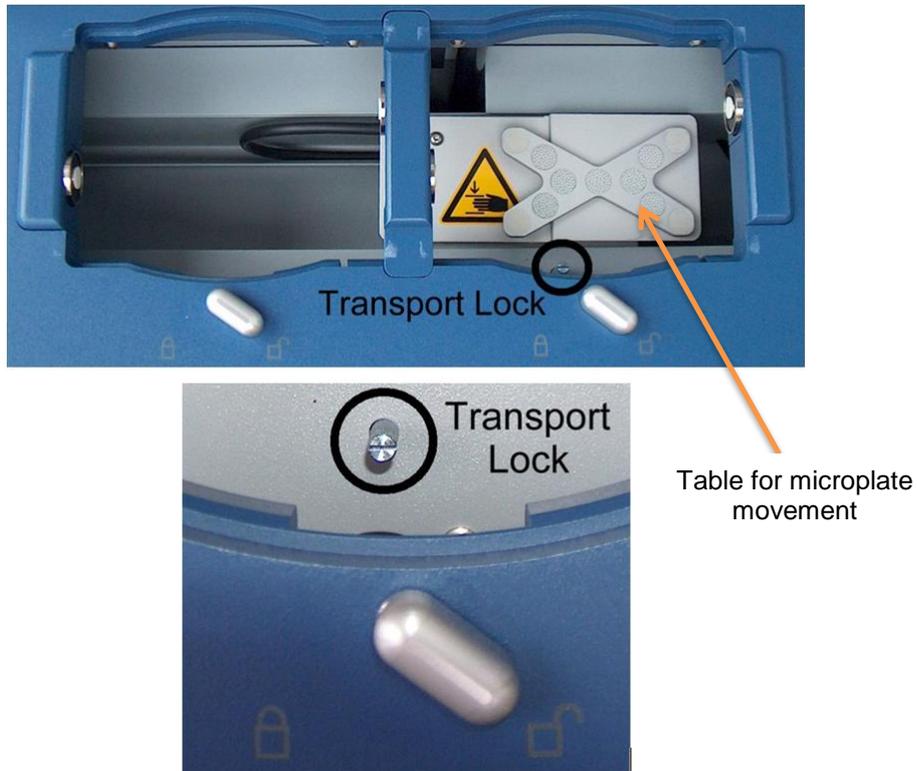


Figure 2: Top view of Stacker with installed transport lock



Never put fingers into magazine opening when the Stacker system is active. The Stacker itself is active when the power LED of the stacker is blinking. Stacker can become active at any time during a measurement protocol and/or when the power LED of the reader is blinking



In case of a lost or jammed microplate: turn off the Stacker and the reader by switching off mains power. Then carefully retrieve the microplate. If necessary, the Stacker table and the reader microplate carrier can be moved manually.

3.2 Positioning the Reader on top of the Stacker

After unlocking the transport lock (see section 3.1), place the BMG LABTECH reader on top of the Stacker. The reader is in the correct position when the 4 feet of the instrument fit securely into the 4 holders of the Stacker.



Figure 3: Bottom of PHERAstar Plus



Figure 4: corresponding adapter feet on Stacker

Additionally, if the transport lock of the reader is in the locked position, it has to be unlocked (see reader operating manual for the procedure).

3.3 Power and Communication Connections

Make sure that the mains voltage in your laboratory is within the given voltage range on the label on the back of the Stacker. Additionally, make sure to connect the Stacker to the protective earthed conductor of the local mains power with the supplied cable.

After positioning the reader on top of the Stacker, connect the power cable.

- **Communication connections**



Only connect computers corresponding EN 60950 and UL 1950 for data processing instruments

Connect the RS232 cable from the Stacker to the reader data connection. This RS232 cable is a 9-pin D-Sub extension type cable with male and female connectors.

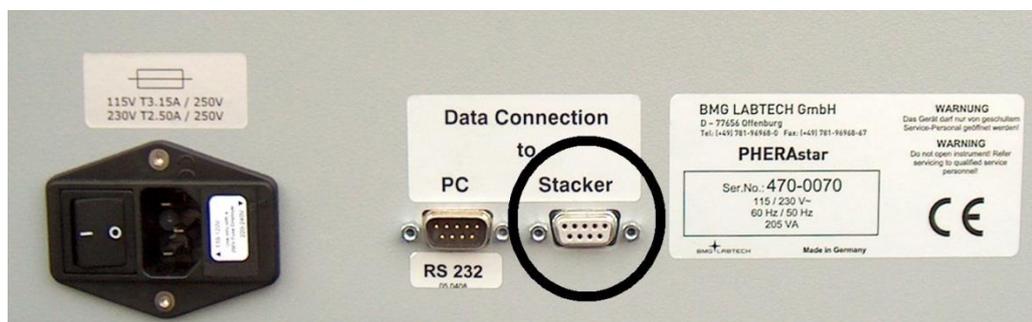


Figure 5: Stacker port on BMG LABTECH Reader (example PHERAstar Plus)

3.3.1 Connection Check

After installing the software, connect the reader to the computer using a USB cable. Select the reader using the **'Connection'** function which is located under the **'Settings'** Tab in the Reader menu group.

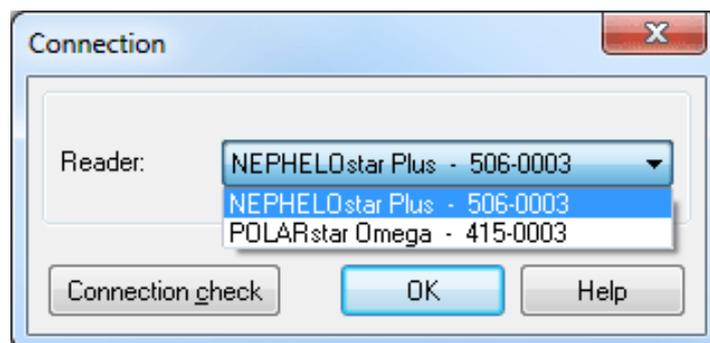


Figure 6: Reader software 'Connection'

Check the connection by clicking the **'Connection check'** button. If there is no communication between the computer and the instrument, a message box will appear:



Figure 7: Reader software

In this case, check that the power to the instrument is switched on and that the cables are connected.

3.4 Stacker Self-Test

The Stacker Self-Test function shows if the Stacker itself is working properly.

The Stacker Self-Test dialogue is accessible using the 'Settings | Stacker Self-Test' menu command.

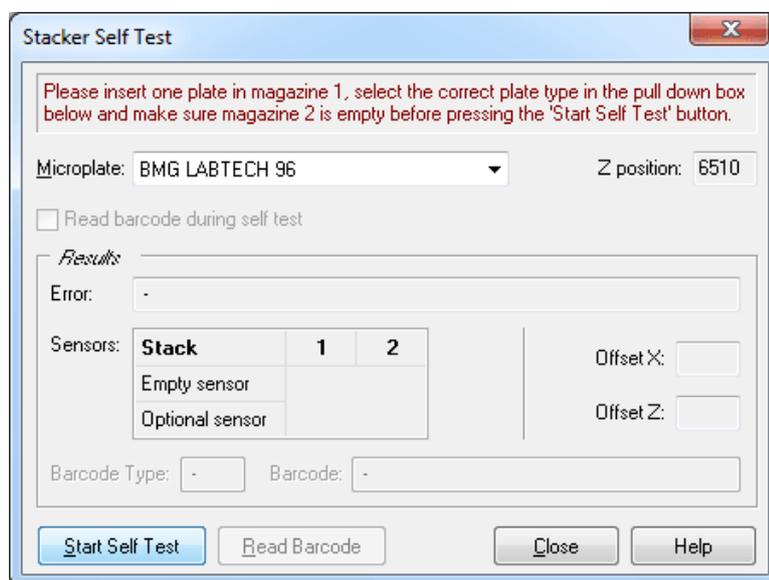


Figure 8: Reader Control software: 'Stacker Self Test'

Please insert one microplate into magazine 1 and make sure that magazine 2 is empty. Make sure that both magazines are locked and that the reader microplate carrier is inside the reader. Select the correct microplate type.

After pressing the '**Start Self-Test**' button, the Stacker will perform a complete self-test procedure (including checking the barcode reader, if installed, and if the '**Read barcode during self-test**' option is selected). If an error occurs, a message will be displayed.

The table below the error message box shows the status of built-in sensors. The empty sensor detects if there are plates in a stack (1 = no plates in). The optional sensor is used only for stack 1. It works as a sensor to check whether or not the reader plate carrier is empty.

During the self-test procedure, the x and z transport systems will be calibrated. The measured offset values will be shown.

If a barcode reader is built in, it will be used to try to read the barcode of the inserted plate.

When you press the '**Read Barcode**' button, the barcode reader will be triggered immediately. You can use this function to align the barcode reader or test its function (by checking that you can see a red laser beam). As there will be no plate movement towards the barcode read position, the built in barcode reader will not actually read a barcode value using this function.

3.5 Aligning the Stacker - Reader System with Offset Tool

For reliable operation of the reader – Stacker system it is important that the microplate carrier of the reader is properly aligned to Stack 1 and Stack 2.

The following description is based on a Stacker Omega combination. Other readers will be used in a comparable way. Please contact techsupport@bmglabtech.com if further help is needed.

If the Stacker is bought together with a reader, the Stacker - reader constellation will have been pre-aligned at the factory. The values for the alignment are predefined in the reader EEPROM. After installation, the settings should be checked as described here below.

Before starting the Reader Control software, insert the magazines into the stack positions and turn the magazine-holders to the locked position.



Figure 9: Magazine-holder in locked position

Upon starting the Reader Control software, the program will initialize the Stacker and reader.

The Stacker Configuration window (Figure 10) is protected with a password. The password is 'bmg'.

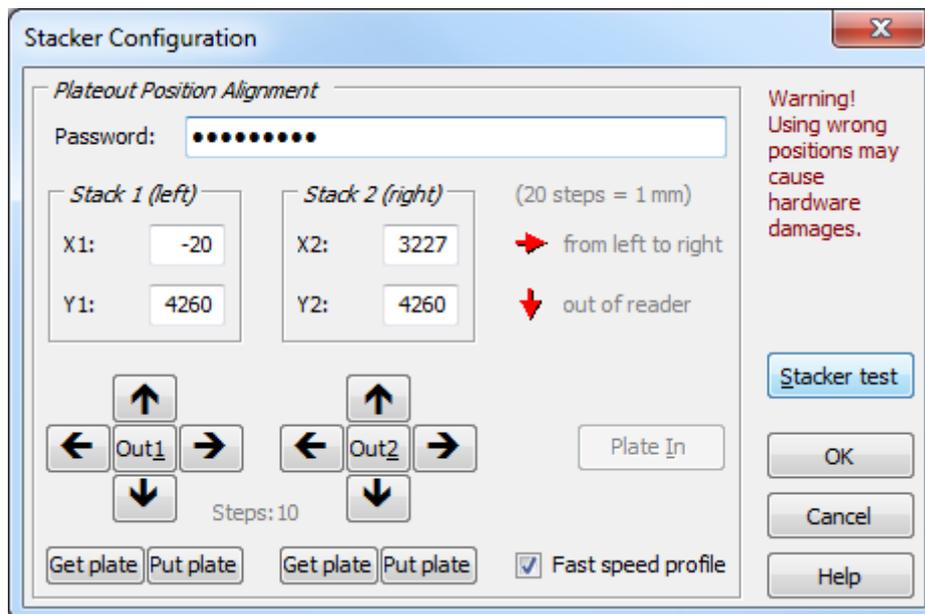


Figure 10: Stacker Configuration in menu: 'Settings | Stacker Configuration'

Use the 'Out1' button to move the reader plate carrier to the position under stack one. Insert the offset pin into the hole at the bottom right corner of stack 1 (Figure 11). The microplate carrier of the reader has a hole at the front right corner where the offset pin should fit in.

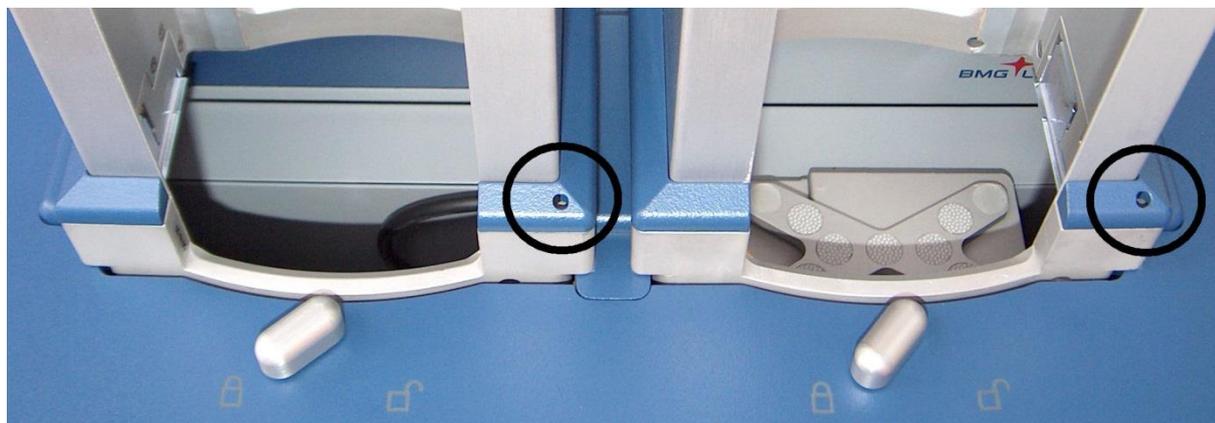


Figure 11: Top View of Stacker (circles show calibration pin positions)

If the pin does not fit into the hole of the plate carrier, the Plate-out Positions X1 and Y1 have to be changed. Use the arrow buttons to change the position step by step (Figure 10). By pressing an arrow button, the corresponding value will increase or decrease by one step (0.05 mm) and the plate carrier will move this distance. If you hold the [Ctrl] key down while using an arrow button, the value will change by 10 steps (0.5 mm) and using [Shift] will move the plate carrier 20 steps (1 mm). Additionally it is possible to type in new values into the corresponding X and Y fields. Afterwards 'Out 1' respective 'Out 2' must be clicked to initiate the movement of the plate carrier.

Change the position until the pin fits into the hole of the plate carrier.

After successful adjustment, remove the pin and repeat this procedure for stack 2.

If it is not possible to move the plate carrier to a position where the pin will smoothly fall into the hole, please contact BMG LABTECH at support@bmglabtech.com.



Remember always to remove the offset pin after it has fallen into the hole.

3.6 Fine Adjustment of Stacker - Reader System

It is recommended to further fine adjust the 'Plate out positions'. For this you should use a microplate which you will use in later batches. If you have already performed the 'Stacker Self-test' with this type of Microplate please proceed. If not, perform a Stacker Self-test as described in [Chapter 3.4](#) because microplate specific data will be stored by the Stacker (e.g. plate height).

The first aim of this adjustment is to get a microplate from stack 1 into the plate carrier of the reader without it hitting the edges of the plate carrier.

The second aim is to place the microplate from the plate carrier into the stacker magazine 2 without touching the magnetic clamps, which are holding the microplates in the magazines.

To perform the alignment procedure the Stacker Configuration function in the software has to be used (Menu: 'Settings | Stacker Configuration'; Password 'bmg').

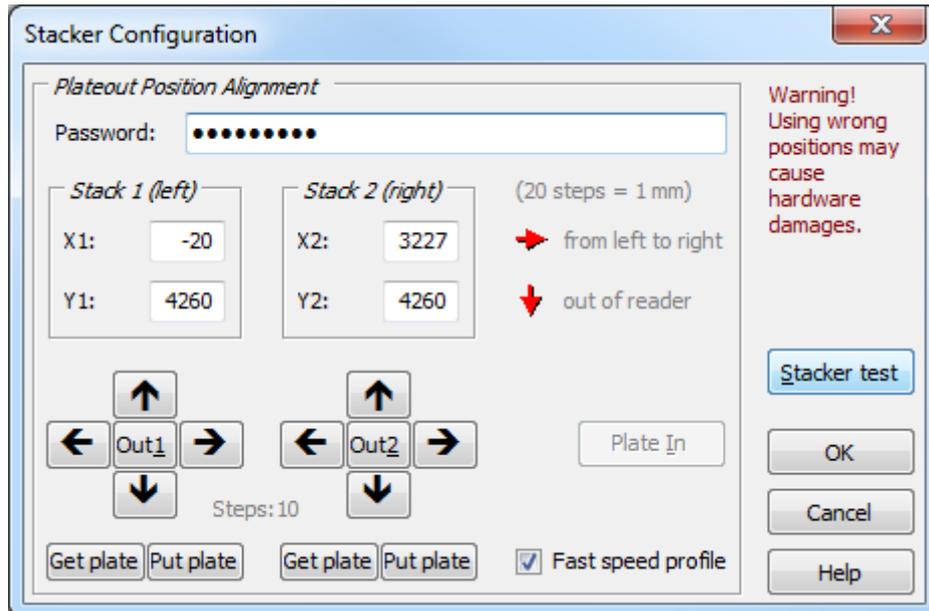


Figure 12: Reader software 'Stacker Configuration'

Reduce the stacker speed by unchecking 'Fast speed profile'.

3.6.1 Magazine 1 - Position Alignment Back Side

1. Move microplate carrier of reader under stack 1 by clicking 'Out 1'
2. Place a microplate in the center of **magazine 1**
3. Push the microplate fully towards the **back of the magazine**.

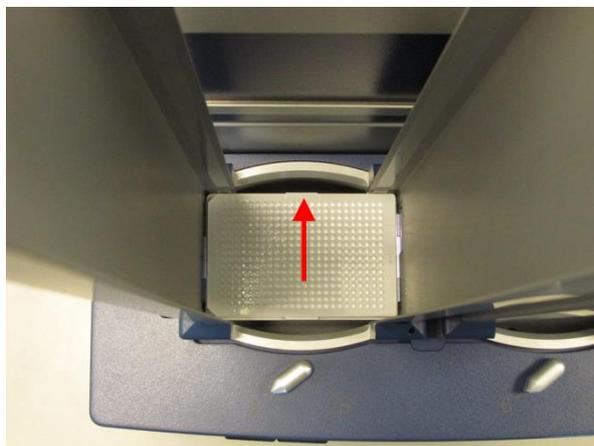


Figure 13

4. Click the 'Get plate' button of Stack 1 and watch the plate moving down (from the same angle of view, as shown in [Figure 13](#)).
 - If the plate hits the back edge of the plate carrier decrease the 'Y1' position
 - If the plate hits the front edge increase the 'Y1' position.
5. Click 'Put plate' from Stack 1 to move the plate back into the magazine.
6. Repeat from step 1 until the plate no longer hits the edges of the plate carrier
7. Write down the 'Y1' position.

3.6.2 Magazine 1 - Position Alignment Front Side

1. Place the microplate in the center of **magazine 1**
2. Push the microplate fully towards the **front of the magazine**.

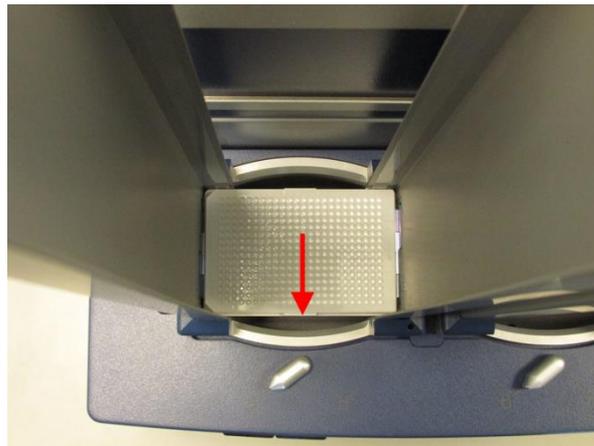


Figure 14

3. Click the 'Get plate' button and watch the plate moving down (from the same angle of view, as shown in [Figure 14](#)).
 - If the plate hits the front edge of the plate carrier increase the 'Y1' position.
 - If the plate hits the back edge of the plate carrier decrease the 'Y1' position.
4. Click 'Put plate' from Stack 1 to move the plate back into the magazine.
5. Repeat from step 1 until the plate no longer hits the edges of the plate carrier.
6. Write down the Y1 position.
7. Compare both positions. If they are different, calculate the average of the two values and enter this as 'Y1'. Click the 'OK' button to save the 'Y1' position.

3.6.3 Magazine 1 - Position Alignment Corner Check

1. Place a microplate directly into the **microplate carrier** of the reader and push it into the back right hand corner.

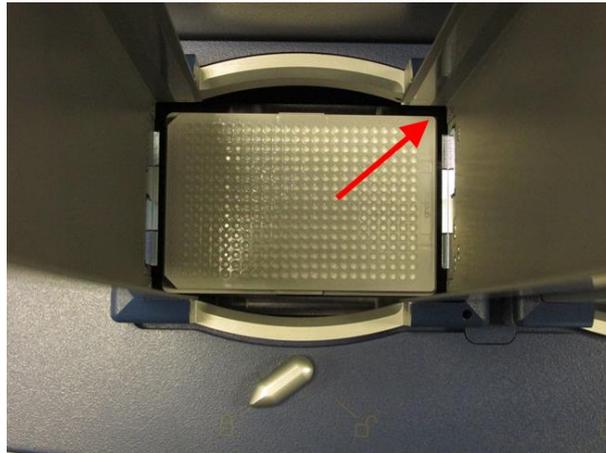


Figure 15

2. Click the 'Put plate' button and watch the plate being raised (from the same angle of view as shown in [Figure 15](#)). The plate should hit the right hand magnetic clamp.
3. Place a microplate again into the **microplate carrier** and now push it into the back left hand corner.

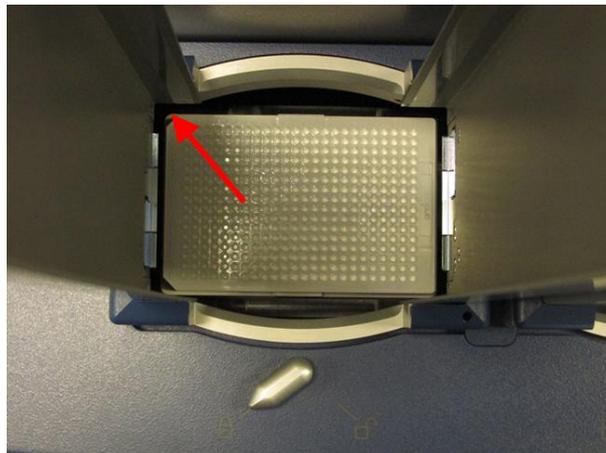


Figure 16

4. Click the 'Put plate' button and again watch the plate being raised (from the same angle of as shown in [Figure 16](#)). This time the plate should hit the left hand magnetic clamp.
5. The aim is that the microplate should hit the left and right magnetic clamps the same way. If not, then change the 'X1' position value using the arrow buttons in the stacker configuration window (see [Figure 12](#)). Repeat from step 1 until you get the desired result.
6. Click the 'OK' button to save the 'X1' position.

3.6.4 Magazine 2 - Position Alignment

1. Place a microplate into the **plate carrier** and click 'Plate in'. The microplate will be moved inside the reader.

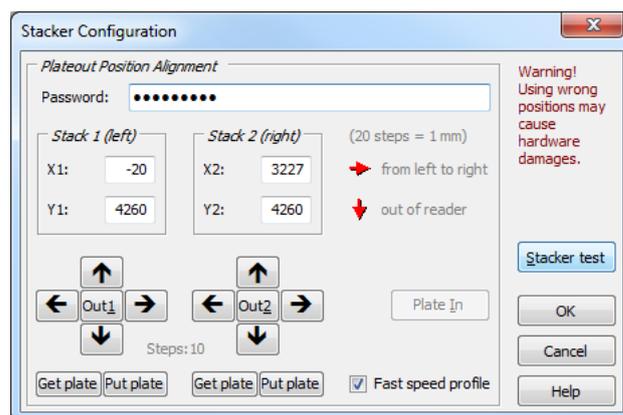


Figure 17

2. Click 'Out2' to move the microplate carrier under stack 2 position.
3. Click 'Put Plate' from stack 2 (right side) and watch the plate being raised into stack 2 (from the same angle of shown in Figure 16).
4. The microplate shouldn't touch any side of the magazine while being raised. If the plate touches the magazine at
 - a. front side: click 5 times to decrease Y2 value by 5 steps
 - b. back side: click 5 times to increase Y2 value by 5 steps
 - c. left side: click 5 times to increase X2 value by 5 steps
 - d. right side: click 5 times to decrease X2 value by 5 steps
5. Repeat from step 1 until the microplate is inserted into stack 2 magazine without touching any side of it.
6. Reset the stacker speed by checking 'Fast speed profile' check box (see Figure 17).
7. Click the 'Plate In' button and close Stacker Configuration with 'OK'.

3.6.5 Microplate Batch Run

It is recommended to perform a short batch run to check if all settings are correct.

Create a test protocol using the same microplate type as used for the alignment procedures above. Any detection mode can be used (e.g. fluorescence intensity, luminescence or absorbance). Define one well in the layout to keep measurement time short. Place a couple of plates (3-5) in magazine 1 and run the test protocol you have just created (see Software Manual of reader for details on protocol definitions).

Please watch the microplate movement procedure and check that the microplates are taken correctly from Stack1 into the reader plate carrier. After measurement the microplate must be inserted into stack 2 without touching the magazine.

4 Stacker Operation

4.1 Stacker Status Display

For a Stacker to PC RS232 connected solution: the magazine-holder must be in the 'locked' position in order for the Stacker to operate.

This is valid with or without magazines. Without magazines the reader will function as an ordinary reader and a plate can be positioned on the plate carrier through the Stackers left opening.

The LED light on the front of the Stacker will blink 2.5 times per second (typically noticed as a 'calm' blinking) to indicate that magazines are unlocked. The LED light will light continuously when the Stacker is ready for operation.

If something is wrong, the LED will blink 5 times per second, e.g. if something is blocking the operation of the Stacker.

Stacker with firmware version 2.xx or newer: the power LED blinks slowly when the Stacker is active in batch run.

Former Stacker firmware versions: the power LED lights continuously when Stacker is active in a batch run.

4.2 Single Plate Measurement

If only single plates have to be measured, they can be inserted directly into the microplate carrier without using magazines.

Remove at least the magazine in Stack 1 and leave the magazine-holders in open position. The Plate-In/Out button on front of the reader is now enabled and can be used to move the plate carrier out. The microplate can be directly inserted into the reader plate carrier. Use Plate-In/Out button or start a protocol to move the plate carrier into the reader. After measurement, the microplate can be moved out of the reader and taken out manually through Stack1 position.



Figure 18 Magazine-holder in unlocked position

4.3 Magazine Release Tool

To easily remove microplates from the stacker magazines, the Magazine Release Tools can be used. The microplates are fixed in the magazine by magnetic clamps. If the two release clamps are placed on each side of the bottom of the magazine (Figure 19) then the magazine magnetic clamps open and the microplates can be easily removed by lifting the stacker magazine (Figure 20).

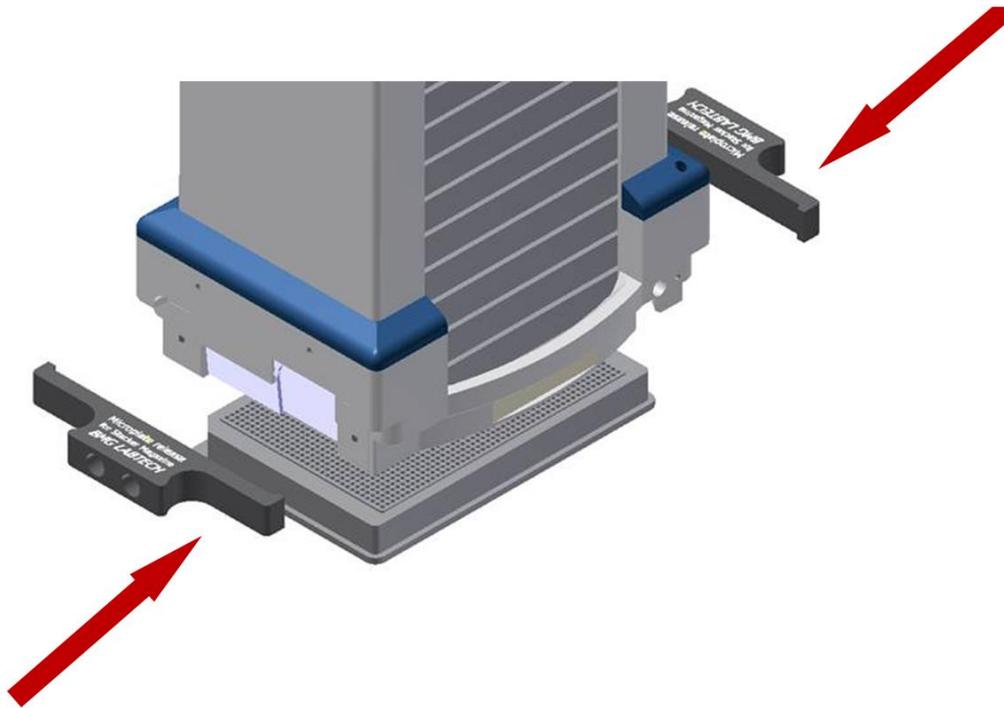


Figure 19 Magazine Release Tools



Make sure to place a microplate underneath the stacker magazine before attaching the two release clamps.

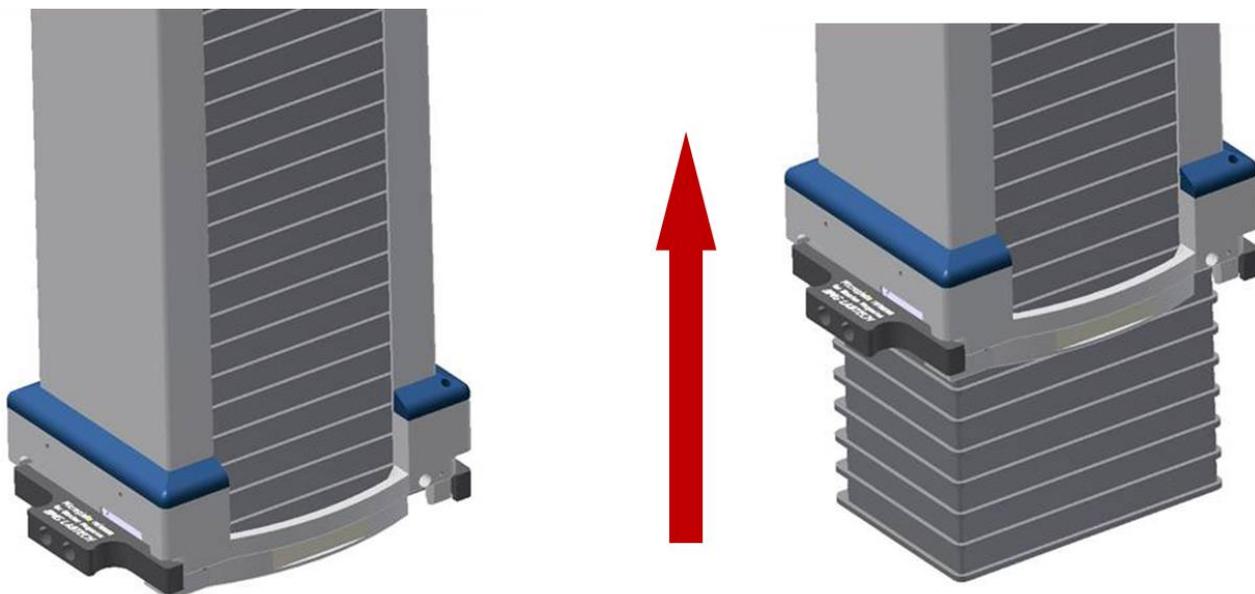


Figure 20 Unload microplates from magazines

4.4 Continuous Plate Loading

For continuous operation, microplates can be added and removed during a batch run. To load new microplates during a batch, at least 5 microplates should still be in the Stack 1. Place the new microplates on top of them. Do not drop them into the stack and do not press on the already inserted microplates. Make sure that all plates sit correct on top of each other in the center of the magazine.

It is recommended to insert the microplates while the Stacker is inactive and a test run in the reader is active. The best time to insert or remove plates is shortly after the Stacker has loaded a new microplate into the plate carrier and the reader starts a new measurement.

If the magazine in Stack 1 becomes empty, the Stacker stops the batch. After inserting new plates the batch has to be restarted in the software.

Already measured plates have to be removed from Stack 2. If this is not the case the plate batch can get higher than the magazine and can fall over. There is no sensor control to avoid this. A good practice is to remove at least as many plates from Stack 2 as you insert in Stack 1. Always leave at least 5 microplates in the magazine of Stack 2.



There should always be at least 5 microplates in both magazines when you want to insert or remove microplates during a batch to avoid crushing hazard. If this is not the case, let the Stacker finish the batch and restart the next batch with new microplates.

Never put fingers into magazine opening when the Stacker system is active. The Stacker can become active at any time during a measurement protocol and/or when the power LED of reader is blinking.

5 Stacker Firmware Download

The firmware of the Stacker with serial number 902-0170 or higher can be updated with a firmware download tool. Former Stackers that already have firmware version 2.xx at least can be upgraded the same way.

To download the firmware, the Stacker data communication must be directly connected to a PC using a null-modem cable with female 9pin D-Sub connectors (null-modem cable with crossed communication wires). A good quality USB to RS232 converter can be used additionally to connect the communication to a USB port.

The 'Stacker Firmware Download' software has to be installed on your computer. You also need a file that contains the new firmware, e.g. 'StackerFirmware_219.FA'.

1. Make sure that all BMG Software is closed and that the Stacker is switched on and connected as described above.
2. Run the 'Stacker Firmware Downloader' program.

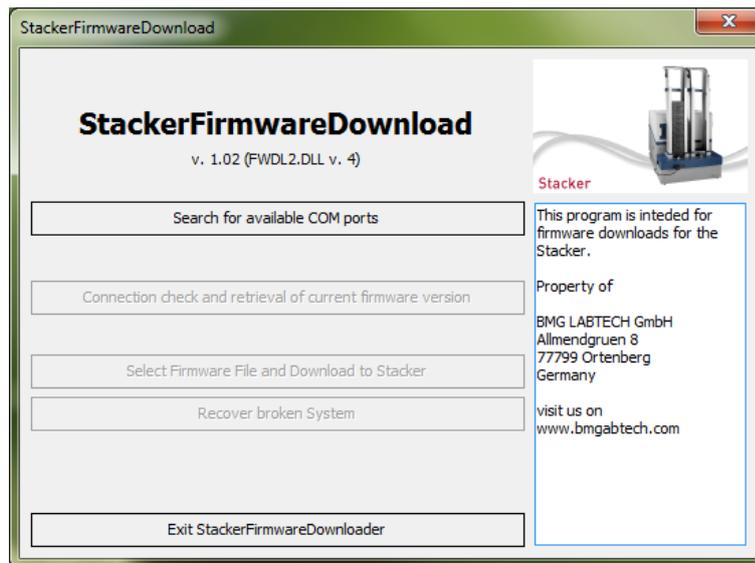


Figure 21

3. Click the 'Search for available COM ports' button and select the port that hosts your stacker.

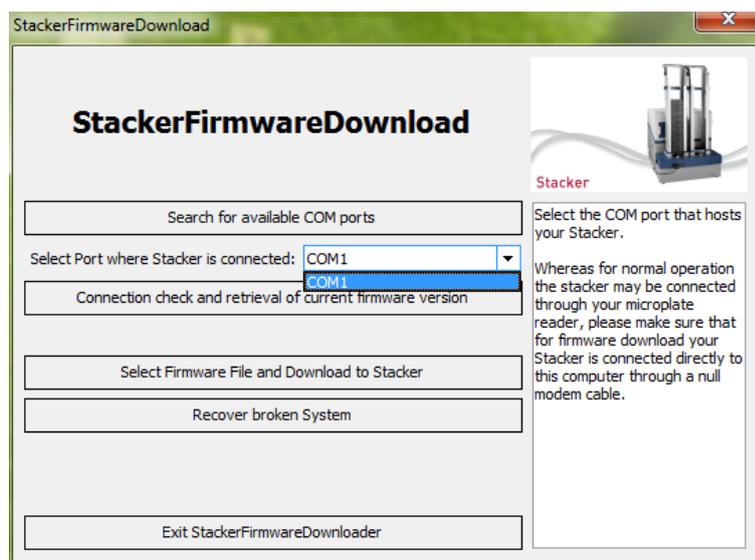


Figure 22

4. To verify that the selection is correct and to see what firmware is currently active: click 'Connection check and retrieval of current firmware version'
5. You should be able to see the current firmware version. If nothing happens, go back to step 3.
6. Click 'Select firmware File and Download to Stacker'. A dialogue appears where you can select the file. The software now puts the stacker into the bootloader mode and checks to see if the selected firmware file contains a compatible version. Select 'Download' to start.

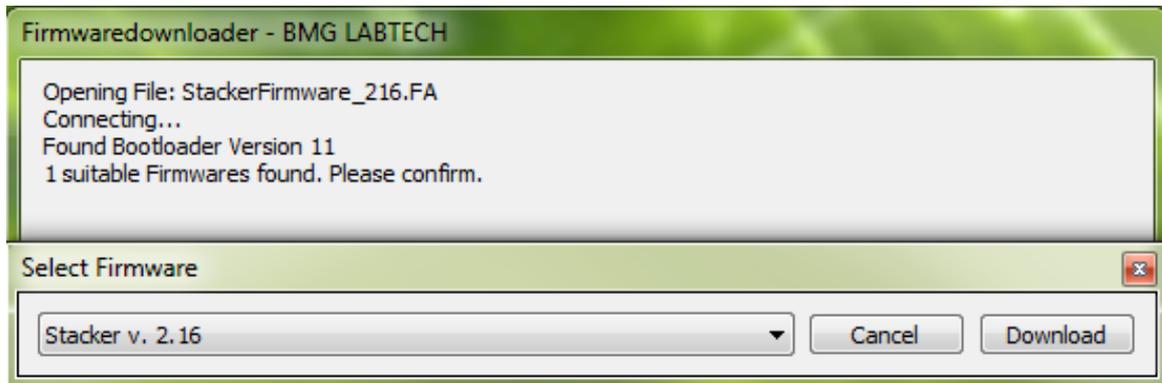


Figure 23

7. Wait until the download has completed. You can now close the program and continue to use the Stacker. In case the Stacker was connected to a reader, don't forget to restore the original connections.

If anything goes wrong, repeat the whole procedure. If the stacker is no longer responding, click on 'Recover broken system' ([Figure 22](#)) and follow the advice given by the software. If this succeeds you can retry downloading.