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1 Introduction

1.1 Intended Use

The SpeedScan is designed to measure the fluorescence of samples contained in microplates, PCR stripes or PCR tubes. It is part of the PCR product line from Analytik Jena. Although specifically developed for evaluation of PCR samples following amplification, the SpeedScan can also be used for general fluorescence measurement where microplates are handled. It provides four measuring channels with spectral features that have been tuned to the requirements for measurement of standard PCR dyes. Its built-in LED lightsource has a rated lifetime of more than 10,000 hours and requires no maintenance, like the detector. Test samples are supplied on adapter plates which are automatically loaded into the inner product space.

ASpect FA designates a package of control and evaluation software. It allows the various test readings to be graphically or numerically represented or mathematically linked up with each other. Available software capabilities are:

- Operation control and monitoring

- Definition, importing and exporting of measuring methods

- Comprehensive options for graphical and numerical representation and analysis of data

- Pre-selectable automated data evaluation

- Exportation of data to EXCEL or WinASPECT or as ASCII file

- Cyclic (kinetic) measurement with real-time representation of results

- Definition of standards, blanks and samples on a plate for quantitative analysis, including after measurement

- Thirteen linear and non-linear models to calculate calibration graphs

- Up to twelve independent experiments (groups) on a plate

- Exportation and importation of plate-fill charts

- Configurable results listing

- User administration with three authorization levels

1.2 Advice Regarding the Use of This Manual

The following warning and advisory signs are used throughout this Manual:

Danger!

Warnings of this kind must be followed as a compulsory prerequisite for prevention of physical injury to persons.

Caution!

Warnings of this kind must be followed, in order to prevent material damage to the product.

Dangerous electrical contact voltage level!

Advisory note

Notes of this kind must be followed, in order to obtain correct measuring results.

For greater convenience, this Manual is organized as follows:

- Chapters and figures are consecutively numbered.

- Each figure has its own caption.

- Operating steps are numbered.

- Cross-references to other Manual sections are marked with an arrow (e.g. → "Advice Regarding the Use of This Manual" on page 1).

2 Safety Instructions

2.1 General Safety Instructions for SpeedScan Operation

For your own safety and to ensure failsafe operation of the SpeedScan, you are advised to carefully read this Chapter before turning power on for the first time.

Follow all safety instructions contained in this Manual and act in accordance with all report messages or prompts as may be displayed on the control screen by software control commands.

You should also observe any safety instruction that applies to a system component supplied by another manufacturer (e.g. PC, printer, sampler).

Intended use!
The product, including its accessories, must not be used in any other application than prescribed by this Operating Manual. No liability will be accepted by the Manufacturer in the event of non-conforming use, including non-conforming use of product modules or single components. The same will apply in the event of service or repair work of any kind performed by other than duly authorized service personnel. All claims for warranty, whether statutory or issued by the Manufacturer, will be null and void in this case.

Local regulations!
Comply with any local safety requirements that are applicable to product operation (e.g. industrial health and safety laws, accident prevention rules, anti-accident regulations).

No warning note of potential danger which is provided in this Manual can be regarded to replace a valid local requirement on industrial health and labour safety.

Personnel!
The product may not be operated by anyone other than duly trained and qualified personnel.

Knowledge of this Manual is a mandatory prerequisite for, and assumed to have been acquired prior to, product operation.

Shutdown in the event of emergency!
Pull the main plug from the power socket, in order to break electric power supply to the product and its components, when there is a case of emergency.

Caution! This may imply possible data loss on the PC and potential damage to the operating system!

Electrical shock!
Connect the main plug only to a power socket with earthground conductor, in

order to comply with class I standards (availability of protective conductor contact) as prescribed for product operation. Do not defeat this protective function by using an extension cable without protective conductor capability.

Turn power off and disconnect the main power plug before you access an inner product section or remove a cover panel!

Check for compatibility of the electric operating voltage which is indicated on the nameplate of the line-power module with the line voltage level provided by your power socket. Operation at voltage levels others than specified herein may desctruct the SpeedScan.

Use only fuses of specified type.

No operation in rooms with an explosive atmosphere!

Water
Make sure that no liquid can penetrate into the inner product space.
This may cause damage to the product.

Danger of corrosion
Refrain from product operation in the direct vicinity of aggressive vapours, for example, strongly etching acid or alkaline fumes! These may corrode the SpeedScan's connection ports, or its mechanical or optical components.

2.2   Standards & Directives

The product has been built and tested to comply with standard requirements and directive documentation as listed hereafter:

DIN EN 61010-1 (IEC 1010-1)

73/23/EEC

89/336/EEC.

It meets the rules for internal protection degree IP 20.

3   Performance Specifications

Operating principle	Epi-fluorescence photometer
Lightsource	High power RGB-LDE
Detector	Low-noise photo diode with integrated pre-amplifier
Excitation wavelengths	Color1: 470 nm Color2: 520 nm Color3: 534 nm Color4: 636 nm
Detection wavelengths	Color1: 526 nm FAM, SybrGreen or similar
	Color2: 587 nm HEX; JOE; VIC; TET; TMR; NED; YakimaYellow or similar
	Color3: 633 nm ROX; TexasRed; Cy3.5; ethidium bromide or similar
	Color4: 720 nm Cy5 or similar
Detection limit	1 nnM of FAM in a min. of 10 µL (equiv. to 10 fmol of FAM)
Dynamic range	1:1,000 within a given gain step
	1:10,000 overall
Reproducibility	2% CV
Measuring rate	50 sec. for 96 wells (one color, 1 meas. per well)
Platen formats	36-well SpeedCycler PCR-plate
	96-well SpeedCycler PCR-plate
	96-well standard PCR-plate
	96-well standard microplate
	384-well PCR-plate
	384-well standard microplate
	200 µL stripes and tubes

Operating voltage	24 V supplied via external power module
Power consumption	20 W, maximum rate
Dimensions (WxDxH)	222mm x 238 mm x 205 nm
Weight	About 4kg
Line voltage supply to external power module	100...240 V, 50...60 Hz, autosensing
Electric fusing	2 A T
Radio-interference suppression	EN 55011 A
Noise immunity	DIN EN 50082-1
Protection standard	Class A protection

Performance Specifications

Data communication	RS 232
PC-requirements on software	Pentium lll, 900 MHz or higher
Operating system	Windows 2000 / XP (SP2) / VISTA

4 Transportation & Installation Requirements

4.1 Requirements on Transportation & Storage

For transportation and storage, the following environmental requirements must be met:

- Temperature range: -40°C..+70°C
- Rel. air humidity: up to 95%

4.2 Installation Requirements

Caution! Comply with mandatory installation requirements!
Do not place objects onto the product!

Refrain from product operation in rooms where there is potential danger of explosion!

Make sure that no aggressive vapours, e.g. strongly etching acid or alkaline fumes, are present in the direct product surroundings.

The installation site should be selected to meet the following requirements:

- Operating site must warrant absence of draught, dust, etching fumes and mechanical vibration.
- No product operation near electro-magnetical fields (e.g. motors).
- Avoid operation in the vicinity of drip-water or splash-water sources.
- Do not expose the SpeedScan to direct insulation or heat emitted by thermal radiators.

- Temperature range for operation: + 15°C ... + 35°C
- Rel. air humidity for operation: up to 90% (at + 30°C)

Footprint requirements

The SpeedScan requires a footprint area of 250 mm x 300 mm x 220 mm. There must be a free space of about 200 mm available in front of the SpeedScan for convenient loading of adapters filled with samples.

Additional base area must be provided for PC, printer and keyboard.
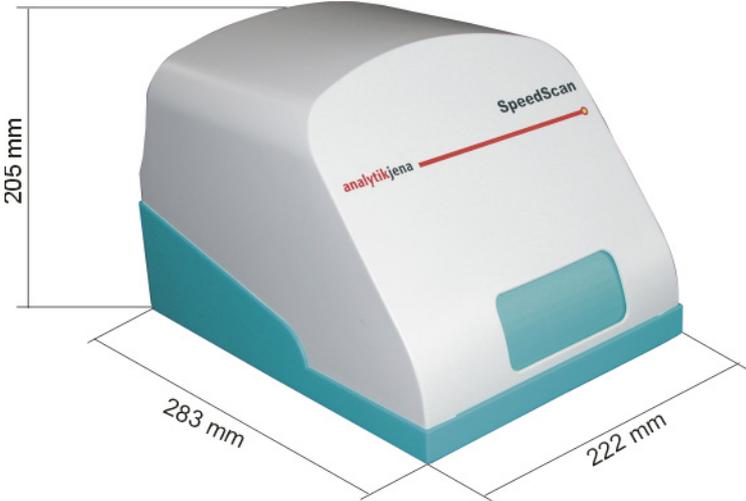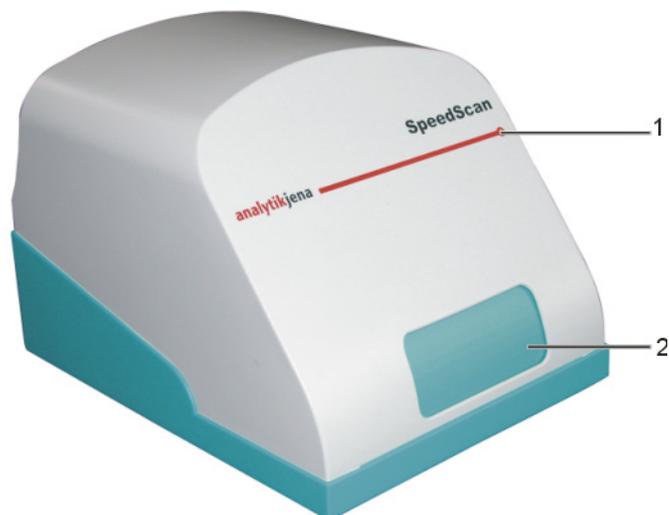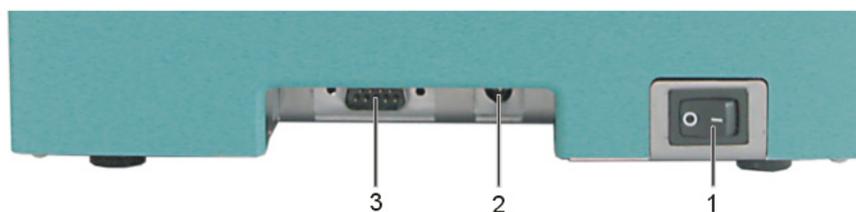
Fig. 1   Overall dimensions of SpeedScan

5 SpeedScan Components & Connection Ports

1	Light emitting diode for status display
2	Movable front door

Fig. 2   Front view of SpeedScan

1	Main switch for power On/power Off
2	Electric power supply port
3	RS232 interface for PC connection

Fig. 3   Terminals at the back of the SpeedScan

SpeedScan Components & Connection Ports

6 Installation & Starting Up

6.1 Removal of Shipping Brackets & Connecting the SpeedScan

Check for correct transporting position!
Do not transport the product otherwise than in upright position (as indicated by marker on shipping case).

Do not overturn the product case for unpacking.

Electrical shock
Check that the operating voltage levels which are indicated on the product's nameplates do conform to your local line power specs before you begin connecting the power supply module and the PC to a supply point. Operation at any other than the specified level of operating voltage may desctruct the SpeedScan.
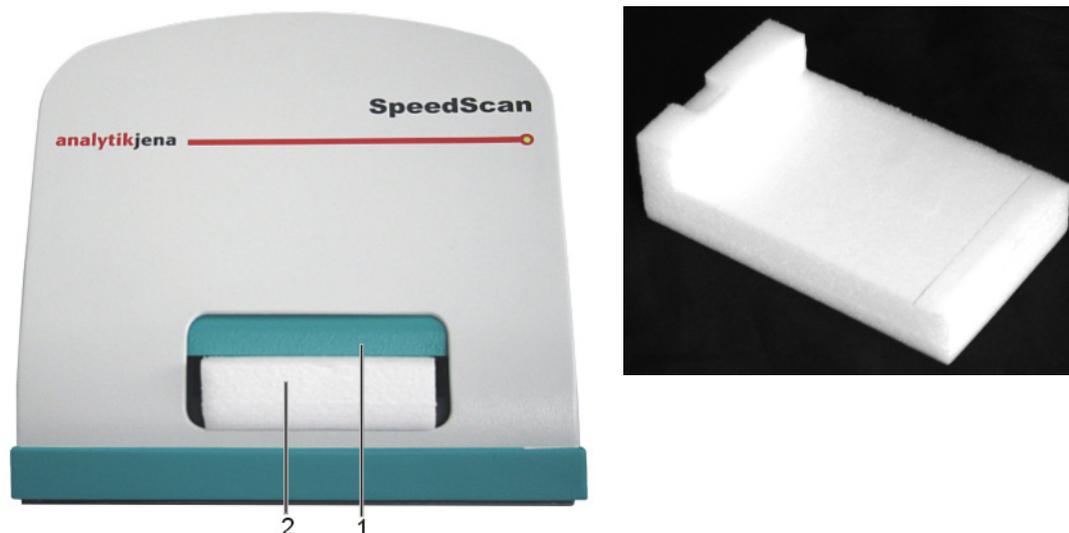
Remove shipping retainer before turning on power to the SpeedScan!
Remember to remove the shipping retainer (white block of plastic foam material) before you connect the SpeedScan to power supply. Failure to comply may result in heavy product damage.

1. Remove the SpeedScan, the related supply module, power cable and Operating Manual with installation CD from the shipping case.

2. **Remove the shipping retainer (white block of plastic spacer foam) from the sample feed opening, once you have completed SpeedScan installation procedures.**
Moderately press against the movable sample section door to move it somewhat up and pull the plastic spacer foam block off from the front.

3. Keep the original shipping retainer and shipping container stored in a safe place for later transportation if necessary.

4. Connect the SpeedScan to the supply module, then connect the supply module to line power supply.

5. Connect the RS232 cable to the SpeedScan and the PC.

1	Movable front door
2	Shipping retainer

Fig. 4   Shipping retainer for SpeedScan transportation

Connection to a USB interface port

☞   **Note**

To operate the SpeedScan via a USB interface port of your PC, you require a USB-to-serial adapter (not included in delivery).

1. Connect the SpeedScan to your PC via this adapter.

2. Install the software which is enclosed with the adapter and select one of the available interface options.

6.2   Starting Up

1. Install ASpect FA software package on your PC, following all advisory notes contained in the software manual.

2. Start ASpect FA software operation. Then select **Extras / Options / General** to set the COM interface port you are using for communication between the SpeedScan and your PC (COM 1 is preset by default).

3. Use main power switch to turn on power to the SpeedScan.

4. Perform product initialization to establish communication between the SpeedScan and the PC.

    Click onto 🔁 in ASpect FA or trigger a **Measurement / SpeedScan Initialization** menu command.

The SpeedScan is properly connected if its movable front door opens after a few seconds.

6.3   Turning the SpeedScan Off

1. Withdraw plate adapter from the feeder opening.

2. On ramping down of ASpect FA, the movable front door will automatically close.

    Alternatively, you may close this front door by clicking or triggering a **Measurement / Parking Position** menu command during a running ASpect FA software session.

3. Use the main power switch at the back of the SpeedScan to turn power off.

4. If the SpeedScan is to remain non-operational over a longer period of time, you should disconnect the supply module from the power socket.
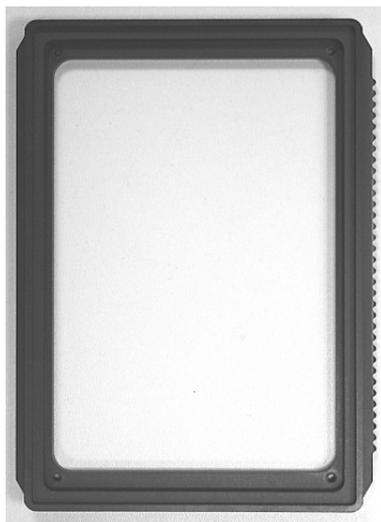
7   Inserting Samples

Adapter plates are used to hold a variety of microplate formats. Currently, four types of adapter plates are available for use with the SpeedScan under conditions as described below:

Adapter 1:   For standard microplates with 96 or 384 wells, standard PCR plates of 96 or 384 wells each

Adapter 2:   For 36-well microplates of SpeedCycler

Adapter 3:   For 96-well microplates of SpeedCycler

Adapter 4:   For PCR stripes or PCR tubes

1.   Place microplate into its designated adapter.

2.   If front panel is not yet open, open front plate by clicking onto the ⏏ icon or triggering a **Measurement / Loading Position** ASpect FA software command.

3.   Insert adapter with microplate (placed on it) into the guiding nut behind the movable front door.
     Make sure that the arrow on the adapter points in SpeedScan direction or the toothed rod of the adapted is on the right-hand side respectively.
     Well A1 must always face the movable front door.

4.   Push the adapter into the SpeedScan, until perceiving a slight resistance.

On pressing against this resistance, the adapter will be drawn in and the movable door closes automatically. On completion of measurement, the adapter with microplate automatically moves out again.

5.   Retrieve the adapter from the loadport opening and refill it.
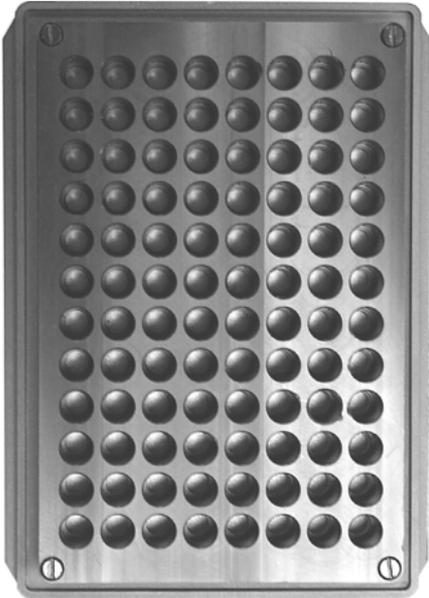
Inserting Samples

Adapter for standard 96-well or 384-well microplates, standard 96-well or 384-well PCR plates
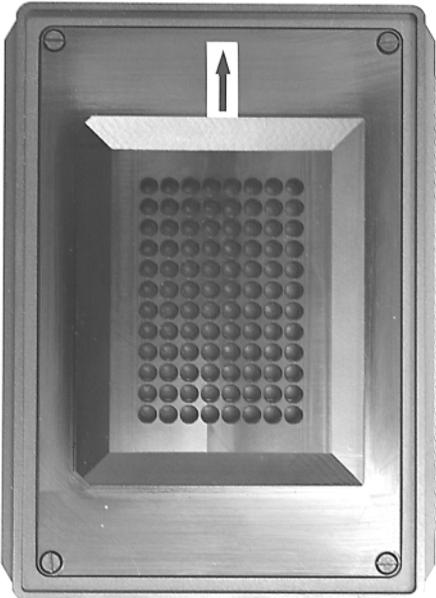
Adapter for 36-well SpeedCycler microplates

Adapter for 96-well SpeedCycler microplates

Adpater for PCR stripes and PCR tubes

Fig. 5   Available microplate adapters for SpeedScan operation

Fig. 6   Position of plate for pushing into the SpeedScan

8   Preventive Maintenance & Upkeep

The SpeedScan is largely maintenance-free.

To help you comply with laboratory certification, including product validation, requirements, we offer a maintenance contract on basic terms as follows.

Your preventive maintenance and upkeep actions will be limited to:

- Cleaning of adapter and casing.
- Replacement of fuses.

Use spare parts from Analytik Jena in all cases.

For consumables or wear and tear parts orders, you may contact our Customer Service department via phone.

In the event of product malfunction or product defects, you are requested to get in touch with our Customer Service.

8.1   Cleaning

- Sample holder areas with spilled sample residues should immediately be wiped clean with a piece of blotting paper.
- Use a clean soft piece of cloth slightly wetted with a standard neutral cleaning agent to wipe off contamination that may have settled on the product surfaces.

Cleaning in medical laboratory

Where the reader is required to analyze infectious material, special care should be used, because the reader cannot be decontaminated as a whole.

During normal operation, potential contamination or soiling is typically limited to the adapter support faces. Perceivable signs of contamination must be removed with suitable means at once. Make sure that no solvent can penetrate the inner product space as you do this.

Recommended disinfectants are:

Decosept AF spray-disinfectant   from Dr. Schuhmacher GmbH

Meliseptol HBV wipes   from B. Braun

For decontamination the SpeedScan and the adapter need to be wiped down with a piece of non-shedding (non-fluffing) cloth. Working with spray disinfectant, you should proceed with care to prevent wetting and, hence, potential damage to inscriptions or product labels.

Adapters may be cleaned with ethanol or disinfectant if necessary. They must not be cleaned by autoclaving.

Before a SpeedScan which was used for handling infectious material can be dispatched to Analytik Jena AG for necessary service work, it must undergo a documented decontamination cycle at first.

8.2   Replacement of Fuses

On product-inlet side, the power supply line is protected with a melting fuse. If this fuse has blown, the SpeedScan will not work. The green LED will not light in this case, although the supply module may be connected to power supply.

1. Remove all electric supply cables.

2. Turn the SpeedScan around and place it onto a soft base with its bottom side facing up.

3. Loosen the **four corner-position screws**.

4. Carefully turn the SpeedScan back into working position again.

5. Carefully remove the protective hood from the top. Place the hood down behind the SpeedScan.
    Proceed with care so as not rip the LED power cable off.

The fuses are located in a capsule on the left-hand side of the SpeedScan (near the main power On/Off switch).

6. Replace the fuse(s) as necessary. Use only fuses of this type:

    *   2 A, inert

7. Replace the casing (protective hood) onto the SpeedScan. Use the four screws in the bottom plate to re-attach the casing.

Fig. 7   Screws for fixing of protective hood

9　Disposal

The owner/operator of this SpeedScan will be under obligation to dispose of all volumes of waste material (sample material) accumulating as a result of measurement in accordance with statutory and local regulations.

Pursuant to valid legal provisions the SpeedScan should be disposed as electronic waste on expiry of its specified life time.

Disposal

List of Illustrations