Important Advice

Before you start using ChipGenie® edition TSO, please take time to review the entire user manual and follow safety instructions at all times. Misuse of ChipGenie® edition TSO can lead to severe injuries or damage to the device and equipment.

Caution! ChipGenie® edition TSO contains heating blocks, which can reach temperatures of 120°C and above. Never touch heating blocks after heating functions has been enabled. Do not insert foreign equipment into ChipGenie® edition TSO that is not intended for use within the device.

microfluidic ChipShop is always happy to advise. Contact us with any questions that might arise when utilizing the ChipGenie® edition TSO, using the contact information below.

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Stockholmer Str. 20
07747 Jena
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Fax: + 49 (0) 36 41 – 347 05 90
inquiries@microfluidic-ChipShop.com
www.microfluidic-ChipShop.com
1 Safety

Caution! The ChipGenie® edition TSO is an electromechanical device.
- Do not access any electrical parts or open housing while device is connected to main power supply.
- Ensure adequate power supply. Verify required voltage settings by checking the specifications on the device.
- Always disconnect the device from the main power supply before cleaning it.
- Only authorized service personnel are permitted to service and repair the device. Never attempt to access internal elements of the device.
- Do not attempt to manipulate the internal safety switches.

Caution! The ChipGenie® edition TSO contains surfaces that rapidly reach temperatures up to 120°C.
- Device lid must be closed at all times when instrument is operating.
- Never touch heating blocks after heating functions has been enabled.
- Equipment that is not resistant to high temperature above 100°C should never be inserted into the device.
- Only use microfluidic chips recommended for use with the ChipGenie® edition TSO.

Caution! Danger of explosion through sparks.
- Keep all potentially explosive or inflammable reagents and material away from the device.

Caution! Liquids are not to be handled inside ChipGenie® edition TSO.
- Always load reaction vessels or microfluidic chips outside the instrument.
Caution! The ChipGenie® edition TSO requires air ventilation.
• Always ensure airflow through ventilation slots at the side of the device.
• Never obstruct ventilation system. Never place anything in front of the ventilation slots.

Caution! ChipGenie® edition TSO is an experimental device for research use only.
• Only use the device for the intended research applications with recommended materials.
• Always wear protective goggles and gloves while handling hazardous materials
• Local regulations and laws may apply for the use of chemicals for the intended applications. Please make sure to comply with all applicable regulations.

Warning: If the device is not used according to the instructions, a secure handling cannot be guaranteed.
2 Packing List

The device is delivered with the following components:

1 ChipGenie® edition TSO instrument
2 External power supply 16 V 10 A DC
3 Power cord
4 USB flash drive with instrument software
5 Mini USB cable

Please make sure that all components are included and do not show visual damages. Otherwise, contact our support using the following contact information.

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The ChipGenie® edition TSO device has the following characteristics:

- PCR system for stationary on-chip PCR
- Used with microfluidic chips in slide format (25 x 75 mm)
- Reaction volumes from 2.5 µl to 50 µl
  - Up to 16 chambers (dependent on chamber volume)
- Detector for two fluorescence labels
  - Emission peak 520 nm; excitation peak 470 nm
  - Emission peak 680 nm; excitation peak 625 nm
  - Compatible with all dyes that match emission and excitation windows
  - We recommend fluorescence dyes Fluorescein (6-Fam) and Indodicarbocyanine (Cy™5)
The installation of the ChipGenie® edition TSO system requires two steps. The first step is the installation of the control software; in the second step the hardware drivers for ChipGenie® edition TSO are installed. Please follow the installation instructions very carefully, otherwise the system may not function properly.

### 4.1 Software Installation

All required software and drivers can be found on the included USB flash drive. Connect the USB flash drive to your PC and follow the installation instructions below to install the ChipGenie® edition TSO control software on your computer. It is not necessary to connect the ChipGenie® edition TSO device to your PC for the software installation.

**Preparation of installation:**
An installation of a .net framework runtime engine is required
1. Open the installation device folder provided with the device (E:\.net framework)
2. Run the setup installation: Microsoft .NET Framework 4.8 (Web Installer) for Windows.exe
3. Follow the instructions of the setup installation routine (the PC has to be connected to the internet)

**Installation of the device software:**
Installation of ChipGenie® edition TSO device software
1. Open the installation folder on the USB flash drive provided with the device (E:\ChipGenie edt. TsO Software)
2. Copy the entire content of the folder (ChipGenie TSO.exe, DeviceSettings.xml; SerialCom.dll) into a hard drive folder of your choice.
3. To start the software double click on the „ChipGenie TSO.exe”
4. For more convenient handling it might be useful to shortcut the „ChipGenie TSO.exe” to your desktop.
**4.1 Software Installation**

**Installation of qPCR Analyzer:**
The qPCR Analyzer is the current analysis software for Ct value interpretation
1. Open the installation folder provided with the device (E:\qPCR Analyzer)
2. Copy the content of the folder into a hard drive folder, free of choice.
3. To start the software double click on the “PCRAnalyzer.exe”
4. For more convenient handling it might be useful to link “PCRAnalyzer.exe” to your desktop.

**Storage of experimental data:**
The recorded PCR data are saved in the installation folder (on your hard disk e.g. C:\ChipGenie edt TSO). For each PCR experiment a separate folder for individual experiment tracking is created with the following string, „PCR dd-mm-yyyy—time“.

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**4.2 Hardware Installation**

To install the ChipGenie® edition TSO device, follow the instructions below:

1. Place the ChipGenie® edition TSO instrument on a lab bench/even surface.
2. Connect the external power supply to the instrument.
3. Plug in the Mini USB cable on the back of the instrument and connect it to your PC.
4. Turn on ChipGenie® edition TSO using the power switch at the rear end of the device.
5. The operation system will detect that new hardware is connected and try to install the required drivers. Windows® 10 will install all required drivers automatically.

1. To USB of PC via ChipGenie® edition TSO control software
2. To external power supply 16V 10A
4.3 System Requirements

Recommended system requirements for ChipGenie® edition TSO control software:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>1 GHz</td>
</tr>
<tr>
<td>RAM</td>
<td>512 MB</td>
</tr>
<tr>
<td>Operation system</td>
<td>Windows 10®</td>
</tr>
<tr>
<td>.Net Framework</td>
<td>version 4.8 or higher</td>
</tr>
<tr>
<td>Minimum Disk space</td>
<td></td>
</tr>
<tr>
<td>Control software</td>
<td>10 MB</td>
</tr>
<tr>
<td>.Net Framework</td>
<td>4.5 MB</td>
</tr>
</tbody>
</table>
5 Handling Procedure

The next chapter describes the general handling procedure for operating the device.

5.1 Chip Handling and Loading

Preparation of the microfluidic chip

- Place the chip on a flat laboratory benchtop.
- Load the chambers with the PCR mix using a pipette according to the volume of the respective chip. PCR mix contains PCR master mix and target nucleic acid.
- Close the chip in- and outlets with mini Luer plugs (Product code: 09-0576-0793-09).
5.1 Chip Handling/Loading

Insertion of loaded chip into the ChipGenie® edition TSO

1. Open the lid of the instrument by pushing it upwards.

2. Insert the chip while pushing the chip locking lever to the left.

3. Push the chip to the final position and release chip locking lever. Close the lid.
5.2 Compatible Microfluidic Chips

Following, you can find a selection of microfluidic chips provided by *microfluidic ChipShop GmbH* that are compatible with the ChipGenie® edition TSO. Chamber volumes of compatible chips vary between 2.5 µl and 50 µl. Dependent on the volume, up to 16 chambers can be found on one chip. For undisturbed fluorescent readouts, the reaction chamber chips feature *microfluidic ChipShop’s* bubble trapping rim design, specifically developed to keep the detection area of each chamber air bubble-free.

<table>
<thead>
<tr>
<th>Fluidic number</th>
<th>Chamber volume [µl]</th>
<th>Chamber depth [µm]</th>
<th>Number of chambers</th>
</tr>
</thead>
<tbody>
<tr>
<td>843</td>
<td>2.5</td>
<td>500</td>
<td>16</td>
</tr>
<tr>
<td>750</td>
<td>5</td>
<td>500</td>
<td>16</td>
</tr>
<tr>
<td>584</td>
<td>20</td>
<td>500</td>
<td>8</td>
</tr>
</tbody>
</table>
### Rhombic chamber chips

<table>
<thead>
<tr>
<th>Fluidic number</th>
<th>Chamber volume [µl]</th>
<th>Chamber depth [µm]</th>
<th>Number of chambers</th>
</tr>
</thead>
<tbody>
<tr>
<td>132</td>
<td>6</td>
<td>200</td>
<td>7</td>
</tr>
<tr>
<td>133</td>
<td>24</td>
<td>400</td>
<td>4</td>
</tr>
</tbody>
</table>

**Attention!** Due to chamber volume and geometry, some of the microfluidic chips are not symmetrical (e.g. compare Fluidic 584 and 750). Insert the chips always with the chamber volume inscription oriented towards the back of the instrument to ensure a proper detection.
The detection positions of the instrument correspond to following positions on the chip:

**Asymmetric microfluidic chips**  
*e.g. Fluidic 584*

- Instrument front
- Chamber 1
- Chamber 2
- Chamber 3
- Chamber 4
- Chamber 5
- Chamber 6
- Chamber 7
- Chamber 8

**Symmetric microfluidic chips**  
*e.g. Fluidic 750*

- Instrument front
- Chamber 1
- ...  
- Chamber 16
To start a PCR protocol, please follow the steps below:

1. Open the ChipGenie® edition TSO Software
2. Select or modify the PCR profile by clicking on “PCR Settings”
   a. Load an existing profile
      i. Click the “Load” button
      ii. Navigate to the protocol folder on your computer
      iii. Click the open button to load the PCR profile
      iv. Click the “Set” button to load PCR configuration to device
   b. Configure a new Profile
      i. Configure the PCR profile according to your needs
      ii. Click the “Save” button
      iii. Navigate to your protocol folder on your computer
      iv. Click the “Save” button to save the profile on your computer
      v. Click the “Set” button to load PCR configuration to device
   c. You can close the “PCR Parameter” interface by clicking the X in the upper right corner of the window
3. Configure the “Detection Settings” by clicking on the respective button in the “Main Menu”
   a. Use the dropdown menu to select a chip profile
   b. Define the detection chambers and channels by selecting them in the checkboxes
      i. Fluo 1: emission peak 520 nm; excitation peak 470 nm
      ii. Fluo 2: emission peak 680 nm; excitation peak 625 nm
   c. Click the “Save” button
   d. Navigate to your protocol folder on your computer
   e. Click the “Save” button to save the profile on your computer
   f. Click the “Set” button to load detection configuration to device
   g. You can close the “Chambers” interface by clicking the X in the upper right corner of the window
4. Start the PCR by clicking the “PCR” button in the “Main Menu”
   a. The Temperature log window and the PCR log window will open and display the status of the PCR protocol
5. After the protocol has ended, calculation of Ct values starts automatically
   a. The “Analysis Summary” window displays all results of the PCR experiment
6.1 The Main Menu

The software “Main Menu” provides the following functions:

- **PCR**
  Starts the PCR protocol with last saved PCR profile

- **Stop PCR**
  Stops current PCR program (only active while PCR is running)

- **PCR Settings**
  Opens the graphical PCR protocol configuration interface

- **Detection Settings**
  Open the chip selection interface

- **System Settings**
  Not active in current software Version

- **About**
  Shows software information window

**Attention!** Clicking on the “Stop PCR” button will immediately interrupt the PCR protocol; the last set temperature will be maintained!
6.2 PCR Parameter Interface

To configure the PCR protocol, the “PCR Parameter” interface is used.

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**Temperature Pre-Phase [°C]**
Temperature configuration for additional incubation step prior to Pre-Denaturation; can be used for example for reverse transcriptase reaction during one-step RT-qPCR; in °C

**Time Pre-Phase [sec]**
Time configuration for additional incubation step prior to Pre-Denaturation, in seconds

**Temperature Pre-Denaturation [°C]**
Temperature configuration Pre-Denaturation; in °C

**Time Pre-Denaturation [sec]**
Time configuration for Pre-Denaturation; in seconds

**Temperature Denaturation [°C] & Time Denaturation [sec]**
Temperature configuration Denaturation; in °C & Time configuration for Denaturation; in seconds
6.2 Parameter Interface

Temperature Annealing [°C] & Time Annealing [sec]
Temperature configuration Annealing; in °C & Time configuration for Annealing; in seconds

Temperature Elongation [°C] & Time Elongation [sec]
Temperature configuration Elongation; in °C & Time configuration for Elongation; in seconds

Cycles
PCR Cycle configuration

2 Step/3 Step
Configuration of 2 or 3 step PCR protocol; if selecting “2 Step” Annealing and Elongation are combined, configuration for Annealing not necessary

Post-cycles Elongation [sec]
Time configuration for Post-Elongation step after last Elongation step; temperature of Elongation is used; in seconds

Temperature Storage [°C]
Temp. configuration storage of PCR product after PCR has finished; in °C

Load
Opens “select File…” dialog to import an existing PCR protocol file from drive

Save
Opens “save File…” dialog to save a PCR protocol file to hard drive

Set
Loads PCR configuration to device
6.3 Detection Settings Interface

Different pre-configured chip profiles can be selected in a drop-down menu. Depending on the chip selection, the number of detection chambers will change according to the selected chip design. By using the check boxes Fluo 1 and Fluo 2, the fluorescence detection channels can be configured.

The following fluorescence detection parameters are pre-defined in the device:

- Fluo 1: Emission peak 520 nm; Excitation Peak 470 nm
- Fluo 2: Emission peak 680 nm; Excitation peak 625 nm

### Chip Type

Select pre-configured chip profile

### Chamber 1 to 16

Check box below Fluo 1 and/or Fluo 2 to select detection channel and detection chamber

### Load

Import an existing Detection protocol from your hard disk via “select File…” dialog

### Save

Open “Save File…” dialog to save a Detection protocol file to hard disk

### Set

Load PCR configuration to device

### Color selection

Open the color selection dialog to select/adapt colors of the displayed PCR graphs by clicking on the colored box behind each chamber
By activating the button “PCR” in the “Main Menu”, the PCR protocol is started with the set parameters. Two windows will open that display the current protocol status in real time.

1. **Temperature log window**: Logs the PCR temperature profile
2. **PCR log window**: Logs the fluorescence detection results

### Temperature log

![Temperature log graph](image)

Temperature [°C]: Displays the current temperature of the heating plate  
Cycle: Displays the current PCR cycle  
Phase: Displays the current protocol step  
Progress: Shows progress of the protocol  
Stop PCR: Stops the PCR protocol

**Attention!** Clicking on the “Stop PCR” button will immediately interrupt the PCR protocol; the last set temperature will be maintained!
Two charts show the results of the fluorescence signals during the PCR. One chart displays the result for detection channel 1 (Fluo 1) the other chart displays the results for detection channel 2 (Fluo 2); all selected chambers of one detection channel are displayed in the same chart.

- **Cycle**: Displays the current PCR cycle
- **Phase**: Displays the current protocol step
- **Progress**: Shows progress of the protocol
- **Stop PCR**: Stops the PCR protocol

**Attention!** Clicking on the “Stop PCR” button will immediately interrupt the PCR protocol; the last set temperature will be maintained!
6.5 Analysis Summary

The calculation of the Ct values from the PCR fluorescence data starts immediately after the PCR protocol is completed. Dependent on your hardware configuration, it may take several seconds to display the data. The data are displayed in the “Analysis Summary” window as isolated charts. Each chamber and channel can be selected using the drop-down menu.

The PCR data are stored in the installation folder (on your hard disk e.g. C:\ ChipGenie edt TsO). For each PCR experiment a separate folder for individual experiment tracking is created with the following string, “PCR dd-mm-yyyy—time.xml”. The data are stored in xml format. Additionally, a graph for each chamber and channel is stored as .png image.

On the left side the calculated Ct values are displayed for each detection chamber and channel. With the drop-down menu, the results of each detection chamber and channel can be displayed. In the chart, the fluorescence measurements, smoothed curve, fitted curve, slope, baseline and Ct value are shown.
Attention! With the “Manual Mode”, the global settings of the ChipGenie® edition TSO can be changed. It is designated for system maintenance only. Changing the settings may cause serious damage to the device. It is not recommended to enter the “Manual Mode”!

**Exit Manual Mode** Closes the Manual Mode

**Current Temperature [°C]** Displays the current temperature of the heating plate

**Set Temperature** Sets the temperature of the heating plate manually; in °C

**Chip Settings** Opens the chip selection interface

**Measure** Starts a manual fluorescence measurement; detection settings from the “Detection setting/Chambers” interface are used; fluorescence values are shown on the chart on the left side of the window, upper chart displays Fluo 1, lower chart displays Fluo 2

**Stop** Stops the fluorescence measurement

**Save Measurement** Saves measurements as .png

**Number of measurements** Sets the number of repeated measurements

**Average Runtime [s]** Displays the average runtime of a single measurement

**Measurement Delay [ms]** Configures the integration time of the detector (Pre-set is 300 ms), It is strongly recommended not to change this setting!

**Set Delay** Sets the designated integration time of the detector
## 6.6 Manual Mode

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Position</td>
<td>Moves the detector to a manually designated position (between 0 and -420000)</td>
</tr>
<tr>
<td></td>
<td><em>It is strongly recommended not to change this setting!</em></td>
</tr>
<tr>
<td>Set Position</td>
<td>Sets the designated motor position, the detector will move to the designated position (between 0 and -420000)</td>
</tr>
<tr>
<td>Reference Search</td>
<td>Starts the reference search routine of the detector motor</td>
</tr>
</tbody>
</table>
The PCR Analyzer is a separate tool for displaying and re-calculating Ct values of PCR experiments with the ChipGenie® edition TSO.

Installation of qPCR Analyzer:
1. Open the installation folder provided with the device (E:\qPCR Analyzer)
2. Copy the content of the folder into a hard drive folder, free of choice (C:\qPCR Analyzer\).
3. To start the software double click on the “PCRAnalyzer.exe”
4. For more convenient handling it could be useful to link PCRAnalyzer.exe” to your desktop.

Re-calculate Ct values from existing qPCR experiments:
1. Open the PCR Analyzer Software
2. Load an existing qPCR file
   a. Navigate to the storage folder on your hard drive
   b. Select a qPCR .xml file
   c. Click open
3. Selecting “Yes” in the re-calculate Ct values dialog box
   a. Analysis of data starts
   b. Analysis Summary” window displays results
4. Selecting “No” in the re-calculate Ct values dialog box
   a. Displays previously calculated values

Depending on your hardware configuration, it may take several seconds to display the data. The data are displayed in the “Analysis Summary” window as isolated charts. Each chamber and channel can be selected using a drop-down menu.

Results are stored in the installation folder (on your hard disk e.g. C:\qPCR Analyzer). For each PCR experiment, a separate folder for individual experiment tracking is created with the following string, “PCR dd-mm-yyyy — time”. The data are stored in the xml format. Additionally, a graph for each chamber and channel is stored as .png image.
## Technical Data

### Instrument dimensions

<table>
<thead>
<tr>
<th>Description</th>
<th>Dimensions (LxWxH) [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed lid</td>
<td>225 x 170 x 132</td>
</tr>
<tr>
<td>开了的盖子</td>
<td>225 x 221 x 132</td>
</tr>
</tbody>
</table>

### Heater

<table>
<thead>
<tr>
<th>Description</th>
<th>Dimensions (LxW) [mm]</th>
<th>Heating rate</th>
<th>Cooling rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater</td>
<td>78 x 26</td>
<td>8°C/s</td>
<td>8°C/s</td>
</tr>
</tbody>
</table>

### Detector

<table>
<thead>
<tr>
<th>Description</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excitation peak wave length 1 [nm] - Fluo 1</td>
<td>470</td>
</tr>
<tr>
<td>Excitation peak wave length 2 [nm] - Fluo 2</td>
<td>625</td>
</tr>
<tr>
<td>Detection peak wave length 1 [nm] - Fluo 1</td>
<td>520</td>
</tr>
<tr>
<td>Detection peak wave length 2 [nm] - Fluo 2</td>
<td>680</td>
</tr>
</tbody>
</table>

### Fan

<table>
<thead>
<tr>
<th>Description</th>
<th>Dimensions (LxWxH) [mm]</th>
<th>Air flow rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan</td>
<td>50 x 50 x 15</td>
<td>29 m³/h</td>
</tr>
</tbody>
</table>

### Miscellaneous

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data connection</td>
<td>Mini-USB</td>
</tr>
<tr>
<td>Power supply</td>
<td>16V 10A DC (160 Watts)</td>
</tr>
</tbody>
</table>