Edmund Bühler

Bedienungsanleitung
Operating Instructions
Mode d´emploi

Schüttler / Shaker / Agitateur

KS 15 control
SM 30 control

TiMix 5 control
VKS 75 control

Art.-Nr. 0091010

Edmund Bühler

Operating Instructions
Schüttler

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Thank you for having chosen an original Bühler product.

KS 15 control
SM 30 control
TiMix 5 control
VKS 75 control

Content

Edmund Bühler

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1. General notes

You have chosen a Bühler high-quality product for supporting you in your work. All Bühler shakers were developed for the use in laboratories in a neutral environment. To ensure a long life and optimal operation of the device we recommend to observe the following points.

Read the operating manual carefully before initial operation.

The user must acquaint himself with the safety instructions and operating conditions in order to avoid damage / injuries to material and personnel.

Liability and all claims under warranty end immediately in case of damages which result from misuse and / or abuse.

The devices were carefully checked for perfect functioning and condition before delivery.

Necessary servicing or repair work may only be done by
- personnel of the manufacturer (Edmund Bühler GmbH)
- their authorized agents
- personnel trained by Bühler

For shipping, the device must be adequately and safely packed. If possible, use the original packing.

If the device is returned to Bühler for repair, it should be cleaned and free from any harmful substances or residues.

1.1 General Notes Concerning Areas of Application and Mode of Operation

The devices can be used in all laboratory fields in which it is necessary to mix and shake homogeneously under constant and defined conditions.

Areas of Application (Examples)

- Homogeneous mixing of different liquids as well as of solid and liquid components (e.g. nutrient solutions)
- Shaking of kits for diagnostic tracing reactions
- Solvent extraction of different phases in separating funnels for chemical investigations
- Evenly changing agitation of liquid phase (nutrient solutions) or gaseous phase (cell culture in Petri dishes)
- Coloring and decoloring of gels

Thanks to their different motions and high loading capacities, and especially their variable „Combifix“ rack systems, Bühler shakers offer solutions both for general as well as individual shaking tasks.

For keeping the samples at constant temperatures, the shaker models SM 30, KS 15 and TiMix 5 can be equipped with an additional incubator hood.
Temperature range: +5°C above ambient up to +50°C, optionally up to +60°C.
A cooling coil for connection of an external flow-through cooler is available as an option (TH 30).

Incubator Hood TH 15 (Order No. 6161 000)
Incubator Hood TH 30 (Order No. 6162 000)

In case of enquiries please contact the Export Sales Department
Phone: 0 74 71 / 98 64 - 0
e-mail: info@edmund-buehler.de

1.2 Safety Instructions

When shaking aggressive liquids / substances there is a risk of injuries caused by splashing or spilling. Work with adequate protective equipment only. In general, avoid splashing by choosing a suitable shaking speed.

Due to the movements of the device there is danger of clothing or body parts getting caught. During operation pay attention that neither clothing nor jewellery get into contact with moving parts.

The maximum permissible shaking speed depends on the load. See chapter 11 for max. shaking speeds.

2. Transport Instructions

Safe transport of the devices is only ensured if original packaging is used.
If they are bumped hard or put down roughly, damages can occur.

Do not lift the devices at the shaking plate (tray)!
Transport the devices by holding them at the housing only!

3. Installation and Connection

Place the shaker on a level, smooth and firm surface so that it stands firmly also at high shaking frequencies.

For connection requirements and operating voltage see technical data as well as the rating plate at the back of the device.

The system may only be connected to a mains with protection earth!

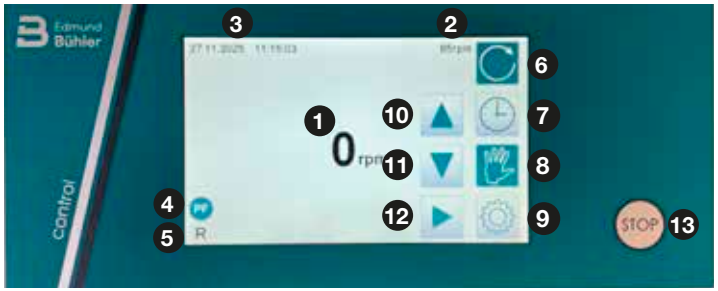
When installing the devices make sure that they are protected against splash water.

The safety distance between the device and other instruments or a wall must be chosen in such a way that the shaking plate is freely movable and that the operating personnel cannot be injured when the shaker is switched on or during operation.
If other tasks are performed by personnel in immediate vicinity of the shaker, the shaker must be switched off for reasons of safety.

The shaker models VKS 75 are designed for floor operation only.
We strongly recommend to fasten the fixing rings which are included in the delivery to the floor.
They prevent the shaker from shifting during operation.

4. Operating the models

4.1 Display layout



1	Actual value for rpm or runtime
2	Set value for rpm or runtime
3	Date/time or remaining runtime
4	Symbol for activating the powerfail function
5	Direction of rotation (default R = right = clockwise)
6	Button for activating the rpm display (=default display when the device is switched on)
7	Button for activating the time display
8	“Mode” button for changing the operating mode Manual operation Automatic
9	Button for activating setting menu 1 and 2
10	Button for increasing the rpm or runtime
11	Button for reducing the rpm or runtime
12	“Play” button for starting the shaking movement or the runtime
13	Stop button for cancelling the shaking process

4.2 On/Off switch

The devices KS 15 control, TiMix 5 control, SM 30 control and VKS 75 control are equipped with an On/Off switch.
This switch is positioned on the right-hand side of each device.

4.3 Operating modes

There are 2 different operating modes to choose from.

4.3.1 Manual operating mode

In this operating mode, the set values for rpm and runtime are manually set via the touch display. The values can be changed at any time during the shaking process. After the end of the shaking process, the
set values are stored until the shaker is switched off.

4.3.2 Automatic operating mode

In this operating mode, user-specific shaking programs can be stored. A shaking program consists of different segments. A segment is defined by rpm, runtime and direction of rotation.
This operating mode is described in detail in Ch. 6

4.4 Switching on the device and selecting the operating mode

The device is switched on using the On/Off switch (on the right-hand side).
A switching-on routine and a self-test are performed.
During the switching-on routine, the following information is displayed for approx. 5 seconds.

- General shaker image
- Shaker type
- Software version
- Device number

Example

For approx. 5 seconds, the display shows the shaker type, the software version and the device number.

After the switching-on routine, the device enters the operating mode that was active before it was switched off.
Assumption in this case: The manual operating mode was active before the device was switched off.

The device is in manual operating mode.
The rpm display shows the current rpm actual value (=0).

Click the “Mode” button to open the mode selection in the display. The manual operating mode “Manual operation” is shown with the colour inverted. Click the “Automatic” button to select automatic operation.Click the “Mode” button again to go back to the rpm display.

Click the button to open the menu selection in the display. Menu 1 is freely accessible. Menu 2 is password-protected.

5. Manual operating mode

After it is switched on, the device is in the operating mode that was active when it was last switched off (in this case, manual operating mode).
The rpm display shows the current actual value for the rpm (=0).
The direction of rotation is displayed at the bottom left.
The operator can specify this in the M1 menu (Ch. 10).

Click the “arrow up” button to specify the set rpm at the top right. A “Play” button appears. Click this button to start the shaker.
The set rpm is displayed in the upper area until it is reached. This display field then disappears.
By clicking the “arrow down” button, you can still reduce the set rpm while the device is running up to rpm, for example, if you mistakenly entered too high an rpm. You must confirm the reduced rpm by clicking the “Play” button again.
The rpm for the types KS 15, SM 30 and VKS 75 is generally entered in increments of 5 rpm. On the type TiMix 5, the rpm is entered in increments of 10 rpm.

After the shaker stopped, the set rpm remains stored. You could restart the shaker with the same rpm by clicking the “Start” button.
To delete the set rpm and the set runtime, click the actual rpm (here = 0) for 2 seconds.

The set rpm is deleted. The “Start” button has disappeared.

Alternatively, you can click the rpm to open a keypad.
You can also specify the actual rpm using this keypad.
You must confirm the specified rpm with “Enter”. The keypad disappears again. However, the shaker does not yet start.
Specified speeds below the minimum rpm and above the maximum rpm are not accepted.
Specified speeds that fall between 2 rpm increments will be rounded up or down (e.g. 108 is rounded to 110, 107 is rounded to 105).
The rpm can also be specified while the shaker is running.

After you specify the set rpm using the keypad and press the “Enter” button, the set rpm is displayed in the upper area and a “Play” button appears. After you click this button, the shaker starts and the “Play” button disappears again.
If you need to specify a different rpm, you can click the rpm (here 0 rpm) to display the keypad again and enter a different rpm set value.
You can also change the set rpm while the shaker is running. However, rpm changes only take effect after you click the “Play” button.

Press the “Stop” button to stop the shaker.

Click the “Clock” button to switch to the time display. The “Clock” is shown with the colour inverted.
In this display, you can specify a runtime in hours, minutes and seconds (h, min, s).
The shaker rpm is displayed in the upper right area.
Following the expiry of this time, the shaker comes to a stop and an audible signal can be sounded as an option.

After you click the hour display, you can set the hours using the arrow buttons. If you set a runtime, a “Play” button appears that you can use to start the runtime.
Follow the same procedure to enter the “min” and “s” settings.
You can only change or delete the runtime when the shaker is stopped. After adjusting the runtime, you must restart it using the “Play” button.
In each case, the runtime starts again from the beginning.

After the runtime starts, the time in the display is counted down. The set time remains visible at the top left.

The “Pause” button appears. Click this button to stop the shaker. The remaining runtime is paused and the “Pause” button is replaced by the “Play” button.
Click this button to restart the shaker. The remaining runtime continues to count down.
You can use the “Pause” button if you only want to stop the shaker briefly without restarting the runtime from the beginning.

If you click “h” for 2 seconds when the shaker is stopped, the runtime “h” and the set rpm is reset to 00.
Follow the same procedure to reset “min” and “s”.
If you click one of the times (“h” or “min” or “s”) for approx. 3 seconds, this will initially reset the respective time unit to 0 and then the entire set time to 0.

Click the button to switch to the rpm display. The remaining runtime is displayed in the upper left area.

You can press the button Stop to stop the shaking process at any time. The set values for rpm and runtime remain stored and are shown in the upper area. Press the “Play” button to restart the shaking process with the same rpm and the same runtime.

Example

The shaking process is almost complete (remaining runtime 10s).

The shaking process is complete.
The “End” notification appears in the display for a time that can be adjusted. In addition, an optional audible signal can sound for an interval that can be adjusted.
You can configure the “End” notification in the M2 menu.

Click any point on the touch display to acknowledge the “End” notification.
The specified rpm and runtime settings will then reappear in the display.
You can restart the shaking process with these values by clicking the “Play” button.

6. Automatic operating mode

The “Automatic” operating mode enables the execution of defined shaking programs. These shaking programs consist of individual, definable segments. A single segment consists of rpm, runtime and direction of rotation. This allows samples to be shaken in a reproducible manner.

In total, you can define 10 different programs (P1–P10), each of which can consist of 10 segments (1–10).

The rpm “0” can also be defined. This allows you to define e.g. an inactive phase during the shaking process.

The “Automatic” operating mode is switched on as follows.
Assumption in this case: The manual operating mode was active before the device was switched off.

Example

Click the “Mode” button to open the mode selection in the display. The active operating mode (here “Manual operation”) is shown with the colour inverted.
Click the large “Automatic” button to select automatic operation.
If you do not wish to switch to automatic mode, click on the “Mode” button again to go back to the rpm display.

Clicking the large “Automatic” button brings you to the program overview display. There, you can see the number and name of the previously defined shaking programs.
The buttons and are not active in automatic mode.
The program numbers of previously defined programs are shown with the colour inverted.
A program does not have to have a name (see P2).

6.1 Programming a shaking program

A shaking program can consist of up to 10 segments.

To program a new shaking program, you must click a free program number in the program overview display (P4 here).

After you click the program row, a keyboard appears in the touch display.
You can use this keyboard to enter a 20-character program name.
However, a program does not have to have a name. If you do not wish to use a program name, you can simply click the OK button to continue. You can also add a program name later on.

You can now see the program display for Program 4 without a name and an empty input field for Segment 1.

You are now in change mode. The button is shown with the colour inverted. You can define Segment 1.

Click the segment row to move it down slightly and you can then define the values for segment no., rpm, runtime and direction of rotation.

Use the “arrow up” or “arrow down” buttons to specify the segment number. A numeric keypad is used to specify the rpm.
To specify the segment runtime, click the time display several times. After the first click, use the “arrow up” and “arrow down” buttons to set the hours.
Click again to set the minutes and click again to set the seconds.
The running direction is specified with the help of the “arrow up” and “arrow down” buttons.
All entries must be confirmed with the “Enter” button.

It is possible to define several segments in succession in change mode.
To define a new segment, you must click the + button.
After that, a new, neutral segment row appears in the display.

To define the new segment, follow the same procedure that you used for the first segment.
The operator can define the numbering of the segments. You must first click on the segment number. After that, you can use the arrow buttons to specify the required segment number, which you must then confirm using the button .
If the number specified by the operator is already assigned, the previously defined segments below are displaced.

After you click the button , all segments created are stored and you return to the program display.

Click the total runtime in the program display for 2 seconds and the display field is shown with the colour inverted. This means that the program repeats continuously after it is executed (endless operation) until the operator terminates the program by pressing the button Stop.
By clicking on the total running time for 2 seconds, the endless operation is switched off again. The total running time is displayed normally again.

The program appears in the program display with no., name and total runtime.
All defined segments are also visible.
If the program contains more than 4 segments, you can display the following segments by clicking on the “down” arrow button.
Click the “Play” button to start the program.
Click the button to go back to the program overview display.

The P4 program is now defined, appears in the program overview display with the colour inverted and can be selected.

6.1.1 Password assignment for program P1

A password can be assigned for program P1 in menu 2 (default value = 0). After specifying the password, the operator can only work in automatic mode and can only start and stop the P1 program.
No other functions are possible. Full functionality will only be restored when the password for P1 is set to 0.

After clicking the “Play” button, the program starts. A pause function is not possible. The program can only be stopped by pressing the Stop button.

6.2 Starting a shaking program

After clicking a program in the program overview display (here program P1), you enter the program display. The program number, name and total runtime are displayed.
If the total runtime is shown with the colour inverted, the program is repeated until the operator stops the program.

Click the “Play” button to start the program.
The program number is displayed blinking. The remaining runtime is displayed in the upper area.
The active segment is displayed with its remaining runtime in the lower area. When the program is running, the buttons on the right in the touch display are locked.
You can use the button Stop to stop the program at any time.

When endless operation is activated, the endless symbol is shown in the bottom left corner.

If you preselect the “Powerfail 01” or “Powerfail 02” setting, the corresponding symbol appears permanently in the lower left-hand area of the display.
The symbol is only visible if the program has been started.
For additional information about the “Powerfail” function, refer to Chapter 10 about the M2 menu

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6.3 Changing a shaking program

Click the button when the shaker is stopped to make a program change.
All segments of the program are displayed.
To change or delete a segment, you must click the corresponding segment row.
To make a change to a program, follow the same procedure that you used to define a shaking program.
Click the button to exit the change mode without saving the changed data.

After you click a segment, it can be changed or deleted.
Click the rpm to display a keypad that you can use to enter the set rpm. The runtime is set using the arrow buttons. To do this, you must click the runtime. After that, you can set the hours. After repeated clicks on the runtime, you can set the minutes and seconds. The direction of rotation is also set using the arrow buttons.

Use the button to accept the changed value.
After confirming all changes, click the button to go back to the program display.
If you change the segment number, the other existing segment numbers are adjusted accordingly.

After you click the button , the segment can be deleted.
A security prompt is displayed, which you must confirm with the button .
If you delete a segment, the other existing segment numbers are adjusted.
If you do not wish to delete the segment, you can use the button to jump back to the previous display.

After clicking the button , you can add a segment to a program.
By default, the next free number is suggested as a segment number. After you click the segment number, you can change it using the arrow up/down buttons.
To define the rpm, you must click the rpm field and then enter the required rpm using the keypad.
After confirming the final entry using the button , click the button again to accept the additional segment and go back to the program display.
If the newly defined segment is not at the end of the program, the new segment is placed in the required position and the existing segment numbers are adjusted accordingly.

6.4 Deleting a shaking program

After clicking a program in the program overview display (here program P1), you enter the program display.

After you click the button , the program can be deleted.

A security prompt is displayed, which you must confirm with the button .
The program is deleted and the display switches back to the program overview display.
When you delete the program, other program numbers are not changed.
If you do not wish to delete the program, you can use the button to jump back to the program display.

6.5 Delayed start

This function enables you to delay the start of the shaker.
This can be useful, for example, if a program has to finish at a specific time and the starting time needs to be at night.

Please note: This function is only possible in the “Automatic” operating mode.

After clicking a program in the program overview display (here program P1), you enter the program display.

Click the “Play” button for 2 seconds to open the input field for the start delay.
The current date and time are displayed. If you click on the date and/or time, you can use the arrow buttons to set a preferred starting date or a preferred starting time. You can only set a date in the future.
You can only set a date in the future.
After you confirm the date with the button ↵, the hours display is shown with the colour inverted and can be changed. The setting is entered in the same way as the date.
After that, you can follow the same procedure to set the minutes and seconds.

After setting and confirming the start delay, the start data remains visible, the “START” designation blinks and a countdown starts.
For the last 10 seconds before the start, an audio signal sounds to warn the operator that the shaker is about to start up.
You can press the button Stop to switch off the start delay at any time.
After the start delay is switched off, you return to the program display.

7. Alarm functions

7.1 Alarm tolerance rpm

If the “tolerance rpm” alarm function is activated, an alarm message appears if an alarm occurs.

Click the “quit” button to acknowledge the alarm message.
When you acknowledge the alarm, the signal tone is switched off (if activated in the M2 menu) and the alarm display disappears. However, the alarm message will continue to appear until the cause of the alarm (e.g. tolerance rpm) has been resolved.

Click the “back” button to delete the alarm message permanently. A red bar appears on the left-hand edge of the display while the cause of the alarm still exists.

For more information about the alarm function, see Chapter 9 about the M1 menu and 10 about the M2 menu

7.2 Alarm temperature monitoring

This alarm is only relevant for the hot plate shaker SM 30 AT.

The alarm message is identical to the alarm message for tolerance rpm. The alarm limits are also set in the M2 menu.

8. Hot plate shaker function

The hot plate shaker is a version based on SM A.

In this version, the temperature of the hot plate can be controlled and displayed in addition to the existing functions.

The button for starting the temperature control is at the bottom left of the display.

The current actual temperature of the hot plate is displayed beside it to the right.

If the space for the button for switching to the temperature display and the display of the current hot plate temperature is needed for other buttons, these elements are temporarily hidden.

8.1 Hot plate shaker in manual operation

At the bottom left of the display, you can see the button for the temperature function. You can use this button to switch to the temperature display.
Beside it to the right, you can see the current actual temperature.
You can start and stop the temperature control in the temperature display.
The temperature control can be started and stopped independently of the shaker rpm.

If you stop the shaker using the “Stop” button, the temperature control continues independently. The temperature control must be stopped separately.

After you click the button , you can switch to the temperature display.
The actual and the set temperature are displayed.
The actual temperature is in the middle of the display, the set temperature at the top left.
The actual temperature in this example is equal to the ambient temperature.
You can use the arrow buttons to increase or reduce the set temperature. The minimum value for the set temperature is 20°C; the maximum value is 120°C. This value can be limited for safety reasons in the M2 menu.
Alternatively, you can click the actual temperature to activate a keypad that you can use to enter a new set temperature.
In the lower area of the display, the current output power for the temperature control is displayed.
Click the button to start the temperature control.
You can only start the temperature control if you have specified a set value beforehand.

After you specify a temperature set value and click the button , it is shown with the colour inverted and the temperature control starts.
The actual and the set temperature are displayed.
The actual temperature is in the middle of the display, the set temperature at the top left.
A red dot symbol always appears to the right of the button if the control output is active. If the actual value approaches the set value, the symbol starts to blink. Heating is then only provided in pulses.
You can use the arrow buttons to increase or reduce the set temperature.
If the actual temperature is 50°C or higher, the colour of the temperature actual value and the background colour of the button for the temperature display switch to red.
Click the button in the temperature display to stop the temperature control.
The temperature set value at the upper left initially remains unchanged. You can delete it by clicking the actual temperature for 2 seconds. However, the shaker continues running. You must click the button Stop on the right beside the display to stop the shaker movement.

Click the button to go back to the previous display (here, to manual operation).
The button for switching at the bottom left is now shown with the colour inverted.
To the right beside the button, you can see the hot plate temperature.
At a hot plate temperature of 50°C and above, the actual temperature and the button are shown in red. When the temperature control is switched off, the display of the button is reversed. The symbol is red, the background grey. If the temperature falls below 50°C, the colour of the symbol changes from red to green.

8.2 Hot plate shaker in automatic operation

The hot plate function operates independently of the segments. It is therefore not possible to specify a set temperature for the individual segments.

The button for the temperature function and the hot plate temperature are displayed at the bottom left.
To switch to the temperature display, follow the same procedure used to switch to the manual operating mode.
Both the button as well as the temperature are temporarily replaced in change mode by other symbols and are therefore not permanently visible.

9. Parameters in the M1 menu

The M1 menu is not password-protected and can be accessed by every operator. This menu provides access to the following functions:

9.1 Overview of program steps in the M1 menu

Menu step	Description	Display	Setting	Default
01	Thermohood	Thermohood TH	Yes/No	No
02	Remote operation	Remote	Yes/No	No
03	Date/time	Date/Time		
04	Alarm	Alarm	On/Off	Off
05	Signal for program end	Signal P-End	Off/5s/10s/Cont	10s
06	Signal for button activation	Signal Key	On/Off	On
07	Running direction	Direction	Right/Left	Right
08	Log file function	Logging		
09	Service information	Info		

9.2 Programming in the M1 menu

Click the button to open the menu display.
Menu 1 is freely accessible. Menu 2 is password-protected.

This overview displays the menu steps and the set values.
Use the “arrow up” and “arrow down” buttons to scroll through the menu overview.
Click the required menu step to open it and change it.

Click the row “Thermohood TH” to enter the selection menu.
Use the arrow up/down buttons to activate and deactivate the thermohood.
Click the button to confirm the setting and jump back to the menu overview.
Click the button to jump back to the menu overview without saving the new setting.

In menu step 01, you can specify whether an incubator hood TH15 or TH30 is fitted on the shaker.
If a hood is fitted, the control system can detect whether the door is open or closed.

In menu step 02, the shaker can be switched from normal operation to remote operation.
In remote operation, the shaker can only be operated via an interface.
The operator cannot enter data using the touch display.
Only the STOP button is active. After you click the STOP button, the shaker is in normal operation. Remote operation must be reactivated. Remote operation is only possible with one of the “Interface” options.

For detailed information about remote operation, refer to the separate interface description.
This is delivered if one of the interface options was ordered.

In menu step 03, you can set the date and time.
If you click on the date, hours, minutes or seconds, you can use the arrow up/down buttons to change the relevant value.

In menu step 04, you can set whether an alarm is issued in the event of a tolerance rpm or tolerance temperature (only type SM 30 AT).
Use the arrow up/down buttons to activate and deactivate the alarm function.
The alarm function is particularly relevant in conjunction with the “Safety package” option, which monitors whether the shaker is actually moving.

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In menu step 05, you can set whether and for how long a signal tone sounds after the end of the program.
The signal tone is triggered in manual as well as in automatic operation.
It is only triggered in manual operation if a specified runtime has expired.

In menu step 06, you can set whether an audible signal is sounded when a button is pressed.

In menu step 07, you can set which running direction is specified as the default running direction.
This input is only relevant for orbital shakers (type xxx A control).

Please note: Running direction right = shaker runs clockwise

In menu step 08 (log file), the last 10 relevant events are listed.
Relevant events are shaker switching on/off and alarms.
The log file is particularly important in conjunction with the “Powerfail” function.

Menu step 9 (Info) displays the shaker type, device number, software version and contact data for Bühler.
You can scan the QR code (e.g. with a mobile phone) to open Bühler’s website in English. There, you will find additional information about the specific shaker type.

10. Parameters in the M2 menu

The basic settings are defined in the M2 menu. The menu can be protected by a password. The default password when the unit is delivered is 1111.

10.1 Overview of menu steps in the M2 menu

Menu step	Description	Setting	Display	Default
01	Operating hours counter (Display On Time) The time in hours for which the shaker has been running (“Shaking operation started”)	No input possible	On time	
02	Maximum rpm	30 – 1400 rpm The highest maximum value to be entered depends on the device type.	rpm max	Maximum shaker rpm
03	Alarm Tolerance rpm	00 – 50 rpm The values can be +/- Entry 0 = Parameter is not monitored	rpm alarm	00
04	Alarm output	**00** Output only in the display **01** Output in display and audible **02** Output in display, audible, via interface and via static signal	alarmmode	00
05	Behaviour after a voltage outage	**00** Device remains stopped after powerfail (and voltage restoration) **01** After powerfail, device continues program from the point at which powerfail occurred. **02** Device starts program again from beginning after powerfail **10** Device remains stopped after powerfail (and voltage restoration) even if external start signal is pending. Device starts program again from beginning if a low-high edge is received from the external control system. **11** Device remains stopped after powerfail (and voltage restoration) even if external start signal is pending. Device restarts the segment from the beginning if a low-high edge is received from the external control system. Powerfail cases 10 and 11 are suitable for shakers in external control operation.	powerfail	00
07	Activation of interface	None no interface active USB USB interface active RS232 RS232 interface active	interface	none
08	Control type	**00** Normal remote control with rpm specified via program in automatic operation **01** Rpm specification via analogue input 0 – 10V **02** Control via RS232C interface	remote type	00

09	Signal output status relay K2	**00** Shaker in position: K2 is in pos. NC Shaker running or not in position: K2 is in pos. NO **01** Shaker in position: K2 is in pos. NO Shaker running or not in position: K2 is in pos. NC	signal status	00
10	Rpm specification for position search	Numerical input from 05–30 in increments of 1 1 step is equivalent to 50 mV 05 = 250 mV . . 07 = 7 x 50 mV = 350 mV 30 = 30 x 50 mV = 1500 mV	rpm position	
11	Hall sensor for defined stop	Specification as to whether or not a Hall sensor is available for the position search. Off --> no Hall sensor Magnet responds simultaneously with rpm specification for position search (as previously with TiMix with defined stop) On --> Hall sensor available Magnet only responds if signal received from Hall sensor	sensor def. stop	off
12	Activation of brake function for a defined stop	Select whether or not the motor is braked during or after positioning in defined stop. (Braking = activation of high-side output R) Off --> no brake function On --> brake function active	brake	off
13	Delay time T1 For defined stop	Numerical input from 00–20 in increments of 1 1 step is equivalent to 100 ms (10 = 1 s) Delay time for setting the high-side output R after the rpm is reset to zero. Requirement: “on” is set in menu step 11.	delay def stop	00

14	Specification of proportional parameter P for hot plate shaker	Specification of control parameter P for the hot plate shaker A precise definition is required	PID-P hot plate	N. N.
15	Specification of integral parameter I for hot plate shaker	Specification of control parameter I for the hot plate shaker A precise definition is required	PID-I hot plate	N. N.
16	Specification of differential parameter D for hot plate shaker	Specification of control parameter D for the hot plate shaker A precise definition is required	PID-D hot plate	N. N.
17	Specification of cycle time	Specification of the cycle time for activating the hot plate on the hot plate shaker	PID cyc. Time	
18	Lower temperature for temperature offset	Input of the temperature at which the lower temperature offset is to take effect	T1 offset hot plate	50°C
19	Temperature offset lower temperature	Input of the tolerance temperature in °C at the lower temperature (Externally measured hot plate temperature – sensor temperature)	offset T1 hot plate	2
20	Upper temperature for temperature offset	Input of the temperature at which the upper temperature offset is to take effect	T2 offset hot plate	120°C
21	Temperature offset upper temperature	Input of the tolerance temperature in °C at the higher temperature (Externally measured hot plate temperature – sensor temperature)	offset T2 hot plate	2
22	Maximum hot plate temperature	Input of the maximum permissible hot plate temperature	Max. Temp hot plate	120°C
23	Alarm tolerance temperature	00–10°C The values can be +/- Input 0 = alarm function not active	Alarm °C	5
24	Password	Issue new password	password	0000
29	Sensitivity stop button	Determination of the sensitivity for the stop button	Sensitivity STOP	5
30	Password P1	Password assignment for program P1	Code program 1	0000

10.2 Programming in the M2 menu

Click the button to open the menu display.

After clicking the button for menu 2, you must enter a 4-character password and confirm it with the button.
The factory setting for the password is 1111.
A 5-digit password is visible although the first digit is always 0 and can be ignored.
Click the button to jump back to the menu display.

If you forget the password, you can no longer enter the M2 menu. In this case, please contact customer service at Edmund Bühler GmbH.

After entering the password, you can access the menu overview.
This overview displays the menu steps and the set values.
Use the “arrow up” and “arrow down” buttons to scroll through the menu overview.
Click the required menu step to open it and change it.
Exception: Menu step 01 Operating hours display (“On time”). This value can only be read from the menu overview.

In menu step 02, you can enter the maximum possible rpm. This rpm can only be below the maximum rpm specific to each type.

The rpm reduction may be necessary, e.g., for safety reasons.

The rpm may only be reduced to the minimum rpm of the respective device type.

The maximum permissible tolerance rpm is defined in menu step 03.
Values that fall below or exceed the permissible tolerance will trigger an alarm message.
If “0” is entered, the alarm function is not active.

The alarm mode is set in menu step 04.

00
Output only in the display. The alarm symbol blinks.

01
Output in display and audible. An audible signal also sounds.

02
Output in display, audible and via interface. The output via interface requires the interface option.

The behaviour of the device after voltage outage (and restoration “Powerfail”) is configured in menu step 05.
There are 3 input possibilities:

00 Stop
(Default setting)
The shaker does not restart after a voltage outage. The operator must start the shaker manually.

01 Start
The shaker restarts automatically after a voltage outage and starts the set program again from the beginning (automatic operating mode).
In the manual operating mode, the set runtime starts running again from the beginning. The operator is warned by an audio signal before the start.

02 Continue
The shaker restarts automatically after a voltage outage and continues the set program from the point at which the voltage outage occurred (automatic operating mode).
In the manual operating mode, the set runtime continues from the point at which the voltage outage occurred. The operator is warned by an audio signal before the start.

The display shows the symbol PF if the setting 01 is active and the symbol PF if the setting 02 is active. This notifies the operator of the start-up behaviour.
After a voltage outage, the relevant symbol continues to blink until a button is pressed. This allows the operator to recognise that a powerfail situation has occurred during a shaking process.
The times of the voltage outage and voltage restoration are visible in the log file (see menu 1).

The serial interface is configured in menu step 07.

none: no interface active
USB: USB interface active
RS232: RS232 interface active

See menu step 08 to configure the control interface.

For detailed information about the interfaces, refer to the separate interface description. This is delivered if one of the interface options was ordered.

The set value specification for remote operation is defined in menu step 08.
00
The program can be started and stopped using the static start/stop command.
01
Rpm specification via analogue input 0–10V. Start/stop command via static signal.
02
Activation via USB interface or serial RS232C interface

The signal status for the defined stop is specified in menu step 09.
00
Shaker in position:
K2 is in pos. NC

Shaker running or not in position:
K2 is in pos. NO
01
Shaker in position:
K2 is in pos. NO

Shaker running or not in position:
K2 is in pos. NC

Only relevant for remote operating mode 01.
The rpm for the position search for a defined stop is specified in menu step 10.

Numerical input from 05–30 in increments of 1
1 step is equivalent to 50 mV
05 = 250 mV
.
.
07 = 7 x 50 mV = 350 mV
30 = 30 x 50 mV = 1500 mV

In menu step 11, you can define whether or not a sensor is available for the position search for a defined stop.

Off
No Hall sensor
Magnet responds simultaneously with rpm specification for position search (as previously with TiMix with defined stop)
On
Hall sensor available
Magnet only responds if signal received from Hall sensor

In menu step 12, you can select whether or not the motor is braked during or after positioning in the defined stop. (Braking = activation of high-side output R)

Off
No brake function
On
Brake function active

The delay time between the rpm specification 0 and braking by the setting of the high-side output R is defined in menu step 13.
Numerical input from 00–20 in increments of 1
1 step is equivalent 100 ms (10 = 1s)

This menu step is only relevant if “On” is set in menu item 12.

Only relevant for the hot plate shaker
The P parameter for temperature control of the hot plate is entered in menu step 14.

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Only relevant for the hot plate shaker
The I parameter for temperature control of the hot plate is entered in menu step 15.

Only relevant for the hot plate shaker
The D parameter for temperature control of the hot plate is entered in menu step 16.

Only relevant for the hot plate shaker
The cycle time for activating the hot plate is entered in menu step 17.

Only relevant for the hot plate shaker
In menu step 18, you can specify the temperature value T1 at which the lower temperature offset value is set.

Only relevant for the hot plate shaker
The offset for the sensor temperature specified in menu step 18 is set in menu step 19.

This value balances tolerance temperatures between the centre of the hot plate and the temperature sensor at the sensor temperature entered in menu step 18.
After you click the display field, you can adjust the value using the arrow buttons.

Only relevant for the hot plate shaker
In menu step 20, you can specify the temperature value T2 at which the upper temperature offset value is set.

Only relevant for the hot plate shaker
The offset for the sensor temperature specified in menu step 20 is set in menu step 21.

This value balances tolerance temperatures between the centre of the hot plate and the temperature sensor at the sensor temperature entered in menu step 20.
After you click the display field, you can adjust the value using the arrow buttons.

Only relevant for the hot plate shaker
The maximum permissible hot plate temperature is set in menu step 22.

The maximum possible hot plate temperature of 120°C can be limited to a lower value for safety reasons.
After you click the temperature field, you can adjust the value using the arrow buttons.

Only relevant for the hot plate shaker
The maximum permissible tolerance temperature is defined in menu step 23.
Values that fall below or exceed the permissible tolerance will trigger an alarm message.
If “0” is entered, the alarm function is not active.

A new password can be defined in menu step 24. This password is then valid the next time you enter the M2 menu.
Please note: We recommend making a note of the password and keeping it in a safe place.

The sensitivity of the STOP button can be adjusted in menu step 29 (e.g. when working with gloves)
1 = low sensitivity, 10 = high sensitivity

In menu step 30 “Code program 1” a password for program 1 can be assigned (see Chapter 6.1.1).
The password can be 1 to 4 digits.

11. Combination with Bühler thermohood TH

Thermohoods are available as options for the shaker types KS, TiMix and SM. These hoods are fitted to the shakers as options. They enable samples to be shaken at specific temperatures.

For safety reasons, the shaker must be stopped before the hood door is opened.

Running programmes are only interrupted and will resume after the door is closed.

The shaker uses a magnet on the thermohood door to detect whether a thermohood is fitted and if the door is closed.

In the M1 menu, you can specify whether a thermohood TH is fitted on the shaker.

The registration can also be performed immediately after you place a TH onto the shaker. The control system displays a query as to whether a thermohood TH should be entered in the M1 menu. The operator must click either “yes” or “no”.

If the operator clicks “yes”, the TH is permanently registered. In this case, the shaker stops if the door is opened or does not start up if the door is opened. The setting is retained even after the shaker is switched off and on again. If the thermohood function is no longer required (e.g. if the thermohood is removed), the thermohood must be de-registered in the M1 menu.

If the operator clicks “no”, the thermohood is not registered in the M1 menu. Despite this, the shaker sill stops when the hood is opened. After the shaker is switched off and back on again, the thermohood function is deleted again.

Connecting the shaker and thermohood to the mains supply:

The shaker scope of delivery includes a standard mains cable with a Schuko plug and IEC socket. Two mains cables are generally included in the scope of delivery of the TH thermohood.

Cable 1 standard mains cable with Schuko plug and IEC socket

Cable 2 connection cable with IEC plug and IEC socket

Cable no. 2 is not required. This cable is used for other shaker types that are powered by the thermohood.

The mains cables of the shaker and the thermohood must both be plugged into a socket.

11.1 Working with the thermohood TH in manual operation

Shaker with thermohood TH fitted. The thermohood is registered in the M1 menu.

The shaker runs in manual operation.

The display shows the symbol for the closed hood.

The shaker stops after the door is opened. The “Pause” button is shown with the colour inverted and is deactivated.
A symbol that shows an open TH and the set rpm appears in the lower area.
The shaker only starts up again after the hood door is closed.

You can also use the “Stop” button to stop the shaker when the hood door is open.
The “Pause” button disappears but the pre-set runtime and pre-set rpm remain visible. The symbol for the open door remains in the display. The “Start” button appears.
If you click this button while the hood door is open, it switches to the inverse “Pause” button. The shaker can only be started again after the door is closed.
After you click the “Start” button, the shaker starts, and the runtime starts from the beginning.

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11.2 Working with the thermohood TH in automatic operation

The program is running. The program number and remaining runtime are displayed.

The display shows the symbol for the closed hood.

The shaker stops after the hood door is opened. The total remaining runtime and the remaining runtime for the current segment stop.
The symbol for the opened door appears and the “Pause” button is shown with the colour inverted.
After the door is closed, the program continues to run as normal.

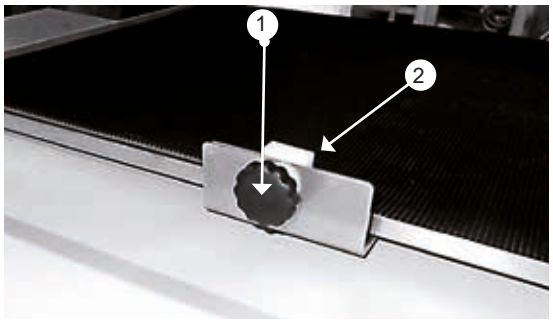
After you click the “Stop” button with the hood door open, you jump back to the program display.
The TH symbol with an open hood appears beside it.

After the hood is closed, the symbol for the closed hood appears.
You can then start the program as normal.

12. Changing the motion

12.1 Universal Shaker SM 30 C control

The motion can be changed by actuating the lever at the front of the shaking plate:



- Loosen the star-shaped knob (1) at the front of the shaking plate and move lever (2) to the desired position.

Position	Motion
Lever at the right position	To-and-fro motion
Lever at the left position	Orbital motion

- After having chosen the motion, tighten the star-shaped knob again.

Change the motion only while the device is running at minimum speed!
Changing the motion at high speed can damage the device.

12.2 Adjustment of the Counterweight (TiMix 5 control)

The shaker model TiMix 5 has an adjustable counterweight with which load changes of up to 5 kg can be compensated.

Before changing the counterweight, disconnect the device from the mains!

The finder sleeve (2) for an adjustment of the counterweight (7) is at the left side of the shaker (see drawing no. 0240 089).

- For changing the counterweight (7) the adjustment spindle (3) must be positioned exactly in the direction of the finder sleeve (2) (see. fig. 1). Switch the shaker off, turn the shaking plate (9) by hand into the furthest position at the right, then the adjustment spindle (3) and the counterweight (7) are at the left side in the direction of the finder sleeve (2). Control the position of the adjustment spindle (remove the cover (1), and look through the finder sleeve).

- Insert the tubular socket wrench (8) through the finder sleeve (2) and onto the positioning nut (4) by turning the socket wrench (8) slightly to the right or to the left so that it hooks on. Now separate the counterweight (7) from the positioning nut (4) by pressing the socket wrench (8) to the limit overcoming a slight spring pressure (see fig. 2). The travel of the spring is approx. 3 mm.

- The counterweight can now be adjusted according to the load by turning the socket wrench (8) to the left or to the right. For heavy loads (max. 5 kg) turn the socket wrench to the left. For light loads, turn it to the right.

- Before removing the socket wrench (8) make sure that the positioning pin (5) is fixed in one of the positioning drillings (6) of the positioning nut (4) by pulling the socket wrench back by approx. 3 mm (see fig. 3). In this position, the socket wrench should no longer be turnable.

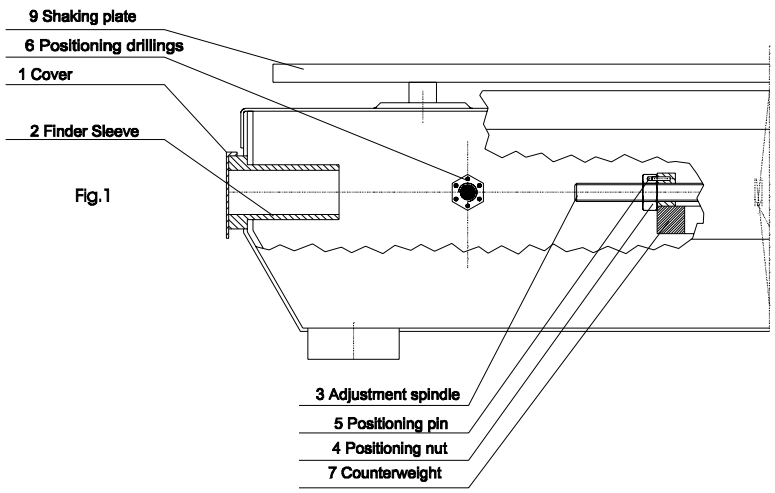


Fig.1

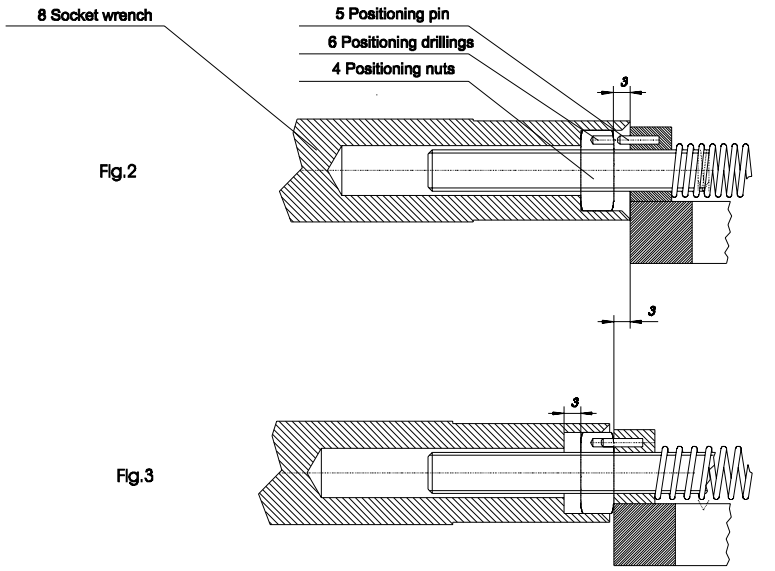


Fig.2

Fig.3

0240089

13. Exchange of Rack Systems of KS 15 control and TiMix 5 control

13.1 Compact Shaker KS 15 control

The KS 15 Control shakers can be delivered with alternative rack systems:

Rack system Combifix KS (No. 0052 071) with 3 clamping strips h or universal tray KS (No. 0051 471) for spring clamps (see Accessories / Rack Systems).

If you wish to change the rack system, proceed as follows:
For mounting the universal tray, the Combifix KS must be removed.
Remove the rubber mat and loosen the flat headed screws of the rack system.
Remove rack system. Fasten the universal tray KS with the flat headed screws and the distances which are delivered with the universal tray.

To mount the Combifix KS, proceed in reverse order.

13.2 Microplate Shaker TiMix 5 control

The TiMix 5 shakers can be combined with different rack systems for microplates or with the Combifix KS (No. 0052 071) or the universal tray KS (No. 0051 471) (see Accessories / Rack Systems).

These rack systems can be exchanged without problems.
Loosen the flat headed screws of the rack system or tray and fasten the required rack system instead.

14. Fastening of Multi-Storey Rack Systems

14.1 Microplate Shaker TiMix 5 control

The additional tray is delivered with mounted distance bolts. First remove the standard rack system from shaker (4 flat head screws M6). Then mount the additional tray with these screws onto the shaker. Then mount the standard rack system with the the delivered screws on the distance bolts of the additional tray.

14.2 Universal Shaker SM 30 A / B / C control

Mount the 2-storey top frame as described in the respective separate manual included in the delivery of the 2-storey top frame.

14.3 Multi Flask Shaker VKS 75 control

- Remove PVC plate from the shaking plate.
- Loosen the 6 flat headed screws M6 x 25 in the shaking plate and remove the shaking plate.
  (If required, i.e. for 1-storey operation, mount the shaking plate again.)
- Place the 3-storey top frame on the threaded bolts of the shaking frame and mount it with 6 Allen screws M6 x 25.

15. Maintenance and Servicing Instructions

The devices are maintenance-free; excessive soiling should be avoided.

In case of failure, please contact the Technical Service Department of the Edmund Bühler GmbH.

Edmund Bühler GmbH
Technical Service Dept.
Schindäckerstraße 8
72411 Bodelshausen

Phone: +49 7471 / 9864-0
E-mail: info@edmund-buehler.de

15.1 Exchange of the Fuse

The device is protected against overload by means of a fine fuse (see Technical Data).

The fuse holder is located at the back of the device below the mains plug.
The fuse can be exchanged after removal of the fuse insert.
The fuse insert contains 1 spare fuse.

Before removal of the fuse insert disconnect the mains plug!

15.2 Motor Protection

The capacitor drive is equipped with a thermal overload protection. In case of overload, caused e.g. by blocking or if the ambient temperature is too high, the drive is automatically switched off by the thermal protection which is directly inserted in the motor winding. When the winding has cooled down, the drive switches itself on again. The device must be switched off!

In case of defects, switch the device off and send it to the Technical Service Department of the Edmund Bühler GmbH, together with a detailed description of the defect (address: see above).

16. Maximum Shaking Speed

The below specified shaking speeds against load are approximate values. Depending on the specific properties of the substances to be shaken these values can differ marginally.

= Range not permitted.
Attention: Danger of serious damage!

16.1 Universal Shaker SM 30

Maximum load [kg] against shaking speed [rpm]
with **rack system Combifix SM** or **universal tray SM (1-storey operation)**

Type	Stroke (mm)	15 -180 rpm	200 rpm	220 rpm	240 rpm	260 rpm	280 rpm	300 rpm
SM A	26 mm*	30 kg	30 kg	30 kg	15 kg	10 kg	5 kg	5 kg
SM B	30 mm*	30 kg	30 kg	30 kg	20 kg	15 kg	10 kg	5 kg
SM B	46 mm	30 kg	20 kg	10 kg	10 kg	5 kg		
SM B	50 mm	20 kg	15 kg	10 kg	5 kg			
SM C ↻	26 mm*	30 kg	20 kg	15 kg	10 kg	5 kg		
SM C ↔	26 mm*	30 kg	25 kg	20 kg	15 kg	10 kg	5 kg	5 kg
SM AT	26 mm*	25 kg	25 kg	25 kg	15 kg	10 kg	5 kg	

with **2-storey top frame SM**

SM A	26 mm*	25 kg	20 kg	15 kg	8 kg	2 kg		
SM B	30 mm*	30 kg	30 kg	25 kg	20 kg	10 kg	8 kg	5 kg
SM B	46 mm	20 kg	10 kg	5 kg	2 kg			
SM B	50 mm	15 kg	5 kg					
SM C ↻	26 mm*	20 kg	20 kg	10 kg	5 kg			
SM C ↔	26 mm*	20 kg	20 kg	15 kg	10 kg	8 kg	5 kg	

* Standard configuration
We recommend to fasten the shaker on the floor or on the table with 4 PVC rings (part no. 0002754) when working with maximum permissible loads.

16.2 Multi Flask shaker VKS 75

Maximum load [kg] against shaking speed [rpm]
with **rack system Combifix VKS** or **universal tray VKS (1-storey operation)**

Type	Stroke (mm)	30 - 50 rpm	50 -120 rpm	140 rpm	160 rpm	180 rpm	200 rpm
VKS 75 A	26 mm*	75 kg	75 kg	75 kg	75 kg	75 kg	75 kg
VKS 75 B	36 mm	75 kg	75 kg	75 kg	75 kg	60 kg	60 kg
VKS 75 B	50 mm*	75 kg	75 kg	75 kg	60 kg	50 kg	40 kg
VKS 75 B	60 mm	75 kg	75 kg	75 kg	50 kg	25 kg	
VKS 75 B	80 mm	75 kg	75 kg	60 kg	30 kg	10 kg	

with **2-storey top frame VKS** or **3-storey top frame VKS „Giant“**

VKS 75 A	26 mm*	75 kg	50 kg	40 kg	30 kg	10 kg
VKS 75 B	36 mm	75 kg	50 kg	40 kg	30 kg	10 kg
VKS 75 B	50 mm*	75 kg	50 kg	30 kg	20 kg	
VKS 75 B	60 mm	75 kg	50 kg	30 kg	10 kg	
VKS 75 B	80 mm	75 kg	50 kg	20 kg		

* Standard configuration
We recommend to fasten the shaker on the floor or on the table with 4 PVC rings (part no. 0002754) when working with maximum permissible loads.

17. CE Declaration of Conformity

We

Edmund Bühler GmbH
Schindäckerstraße 8
72411 Bodelshausen

Manufacturers of this product, declare under our sole responsibility that this product corresponds to the EC directives 2006/42/EG (machinery directive), 2014/30/EU (EMC directive) and 2014/35/EU (Low voltage directive).

The following harmonised standards apply:

EN 61 010; EN 55 014; EN 60 204 (TiMix, KS)
EN 61 000; EN 55 011 (VKS)

For the shaker models SM 30 the following standards apply:

EN 61 000-3-2 : 2023
EN 61 000-3-3 : 2023
EN 55 011 : 2022

Responsible for the documentation:
Dipl.-Ing. (FH) Michael Schlecht

Schindäckerstraße 8
72411 Bodelshausen

Edmund Bühler GmbH
The Technical Director

18. Warranty

The Edmund Bühler GmbH warrants that this device has the properties guaranteed by contract and that it does not have any defects which rescind its value or its use for customary and usual applications or applications foreseeen by the contract.
(See General Terms and Conditions of the Edmund Bühler GmbH).

The warranty period ends 24 months after delivery (date of invoice) or, for the multi-flask shaker VKS 75, after max. 8.000 hoiurs of operation (whichever comes first).

The warranty does not include wear parts. Excluded from warranty are malfunctions caused by misuse or improper use, installation, or maintenance.

Warranty ends immediately if the device is subjected to technical modifications which are not authorized **in advance** by Edmund Bühler GmbH.

19. Technical Data

	KS 15 control	SM 30 control	TiMix 5 control	VKS 75 control
Order No.	6170 000 (A) 6172 000 (B)	6100 000 (A) 6102 000 (B) 6104 000 (C)	6167 000	6111 000 (A) 6112 000 (B) 6212 000 (F)
Speed range	30-420 rpm	15 - 300 rpm	100 - 1400 rpm	30 - 200 rpm (A+B) 80 rpm (F)
Shaking amplitude (stroke)	17 mm	Standard Mod. A: 26 mm → Mod. B: 30 mm Mod. C: 26 mm Options: → Mod. B: 46 mm or 50 mm	3 mm	Standard Mod. A: 26 mm → Mod. B: 50 mm Optionen → Mod. B: 36, 60 or 80 mm Mod. F: 120, 130, 140 or 150 mm
Loading capacity	max. 15 kg	max. 30 kg	max. 5 kg	max. 75 kg
Shaking plate (WxD) mm	400 x 300	560 x 400	400 x 300	760 x 600
Runtime	programmable / 5s - 100h / ∞	programmable / 5s - 100h / ∞	programmable / 5s - 100h / ∞	programmable / 5s - 100h / ∞
Electrical supply	230 V, 50/60 Hz (optionally115 V)	230 V, 50/60 Hz (optionally115 V)	230 V, 50/60 Hz (optionally 115 V)	100 - 240 V, 50/60 Hz
Fuse	0,2 AT	1 AM 3,15 AM (SM 30 AT control)	1 AM	4,0 AM
Dimensions (WxDxH) mm	510 x 490 x 150	680 x 610 x 160	510 x 490 x 150	1050 x 835 x 250 (A+B) 1151 x 835 x 250 (F)
Weight	18 kg	33 kg	20 kg	110 kg (A+B) 160 kg (F)
Type of protection	IP 21	IP 21	IP 21	IP 21
Heat emission (approx.)	approx. 7 W	approx. 8 W	approx. 11 W	max. 15 W
Ambient temperature	5°C to 50°C	5°C to 50°C	5°C to 50°C	5°C to 50°C
Max. rel. humidity	85 %	85 %	85 %	85 %

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20. Basic Equipment

Compact Shaker KS 15 control	Basic device without shaking plate, without rack system
Microplate Shaker TiMix 5 control	Basic device without rack system; with socket wrench for adjustment of the counterweight
Universal Shaker SM 30 control	Basic device incl. shaking plate and rubber mat
Multi Flask Shaker VKS 75 control	Basic device without shaking plate; with 4 fastening rings + 8 screws for floor attachment

21. Rack Systems and Loading Capacities

21.1 Rack Systems for KS

Rack system Combifix KS

Consisting of basic rack with rubber mat and 3 clamping strips h for KS

Order No. 0052 071

Universal tray KS

For secure fastening of Erlenmeyer flasks, round bottom flasks, or beakers in single stainless steel spring clamps. The drillings (28.3 mm apart) ensure flexible loading and a high loading capacity.

The coated tray is proof against aggressive liquids.

Universal tray KS, without spring clamps

Order No. 0051 471

21.2 Additional Strips for Combifix KS

All flat-bottom vessels (Erlenmeyer flasks, beakers, test tube racks, sieves, etc.) can easily be fixed on the shaker with the clamping strips h. In addition to the clamping strips h supplied with the Combifix KS.

Clamping strip h for KS
Order No. 0050 118

The clamping strips v are used in combination with the clamping strips h in order to fasten horizontal vessels, e.g. measuring cylinders, between the strips, or as added support for high vessels (flasks, beakers, cylinders).
The maximum distance between the strips is 60 mm. In addition to the clamping strips h.

Clamping strip v for KS
Order No. 0050 477

The cramp strips and spring strips are necessary for fastening separating funnels. The necks of the separating funnels are fastened in the grey plastic clamps, the spring strip secures the stoppers. The stems of the separating funnels are placed on a clamping strip h. For a modification of the standard rack system or in addition to the clamping strips h.

Cramp strip for KS
Order No. 0050 206

Spring strip for KS
Order No. 0050 207

21.3 Spring clamps and test tube racks

Spring clamps (stainless steel)
for universal trays.

The sizes are related to Erlenmeyer flasks, but are also suitable for round bottom flasks, beakers, etc.

Size	10 ml	**Order No. 0009 642**
Size	25 ml	**Order No. 0009 643**
Size	50 ml	**Order No. 0009 644**
Size	100 ml	**Order No. 0009 645**
Size	250 ml	**Order No. 0009 646**
Size	500 ml	**Order No. 0009 647**
Size	1000 ml	**Order No. 0009 648**
Size	2000 ml	**Order No. 0009 649**
Size	3000 ml	**Order No. 0009 653**
Size	5000 ml	**Order No. 0009 652**

Test tube racks, stainless steel

The test tube racks can be fastened either on the standard rack system between the clamping strips h, or they can be screwed on the universal tray by means of a hinged foot. With this foot it is possible to vary the angle of inclination of the test tubes. With:

44 holes à 14 mm Ø
Order No. 0052 056

44 holes à 16 mm Ø
Order No. 0052 057

44 holes à 18 mm Ø
Order No. 0052 058

14 holes à 30 mm Ø
Order No. 0052 201

Hinged foot for test tube racks, stainless steel
Order No. 0052 059

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21.4 Loading Capacity of Rack System Combifix KS

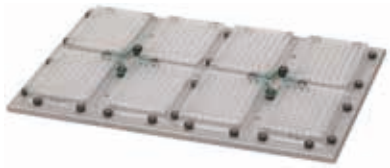
	Size	Qty (pcs)
Erlenmeyer flasks	50 ml	25[1)]
	100 ml	20[1)]
	250 ml	12[2)]
	500 ml	6[3)]
	1000 ml	4
	2000 ml	2
	3000 ml	1
	5000 ml	1
Separating funnels	100 ml	4[4)]
	250 ml	1[4)]
	500 ml	1[4)]
	1000 ml	1[4)]
	2000 ml	1[4)]
Test tube racks		2

[1)] with 3 clamping strips h (0050 118) additional [2)] with 2 clamping strips h (0050 118) additional
[3)] with 1 clamping strip h (0050 118) additional [4)] with 1 cramp strip (0050 206) and 1 spring strip (0050 207) additional

21.5 Loading Capacity of Universal Tray KS

	Size	Qty (pcs)
Spring clamps	10 ml	70
	25 ml	35
	50 ml	35
	100 ml	20
	250 ml	15
	500 ml	12
	1000 ml	5
	2000 ml	2
	3000 ml	2
	5000 ml	1
Test tube racks (with hinged foot)		3

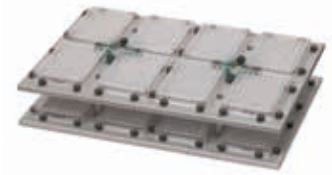
21.6 Rack Systems for TiMix 5



Standard rack system

For 8 standard microplates, microwell or deepwell plates, or other plates of the same size.

Order No. 0052 101



Additional tray

As a second storey on the standard rack system TiMix 5. Distance between the 2 trays max. 55 mm.

Order No. 0052 102

Rack system with clamping pins

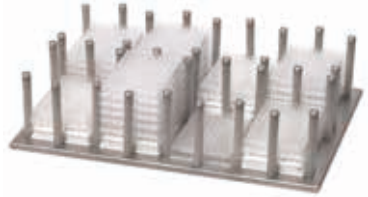
For 8 standard microplates (128 x 85 mm)

Order No. 0052 096

Rack system with high clamping pins

For max. 24 standard microplates, placed directly on top of each other

Order No. 0052 104



Rack system with metal clamping pins

For max. 48 standard microplates, placed directly on top of each other

Order No. 0052 104

Rack systems Comibfix KS and Universal tray KS

Picture, description and order no. see chapter 21.1

GB

21.7 Rack Systems for SM

Combifix SM, Assembly A

consisting of basic rack and 5 clamping strips h.

Variable rack system for fastening different vessels with flat bottom (Erlenmeyer flasks, beakers, test tube racks, sieves etc.).

Order No. 0050 154

For further extension or for modifying Combifix B or C systems, the clamping strips h are available as separate items:

Clamping strip h for SM

Order No. 0050 400

Combifix SM, Assembly B

consisting of basic rack and 4 clamping strips h + 4 clamping strips v.

Rack system for secure fastening of horizontal vessels, e.g. measuring cylinders, between the clamping strips, or as added support for high vessels (flasks, beakers, cylinders). The maximum distance between the strips is 60 mm.

Order No. 0050 155

For further extension or for modifying Combifix A or C systems, the clamping strips v are available as separate items:

Clamping strip v for SM

Order No. 0050 399

Combifix SM, Assembly C

consisting of basic rack and 2 clamping strips h, 2 cramp strips and 1 spring strip

Special rack system for separating funnels. The necks of the separating funnels are fastened in the grey plastic clamps, the spring strip secures the stoppers. The stems of the separating funnels are placed on a clamping strip h.

Order No. 0050 156

For further extension or for modifying Combifix A or B systems, the strips are also available as separate items:

Cramp strip for SM

Order No. 0050 401

Spring strip for SM

Order No. 0050 402

Universal tray SM

Coated aluminium tray. The drillings of the universal tray (28.3 mm apart) allow flexible loading with spring clamps or test tube racks.

The tray is proof against aggressive liquids.

Universal tray SM, without spring clamps

Order No. 0051 472

2-storey top frame SM

Top frame with two trays for spring clamps - or for Combifix SM systems.

For easy handling, sliding plates with Combifix SM or universal trays SM can be mounted. These allow loading of the racks away from the shaker.

2-storey top frame SM (without spring clamps or rack systems Combifix SM)

Order No. 0052 065

2-storey top frame SM/TH

Smaller top frame which can be used inside the incubator hood TH 30.

For small or flat sample vessels with a max. height of approx. 14 cm.

The top frame SM/TH can only be used in combination with universal trays SM or sliding plates SM.

2-storey top frame SM/TH (without spring clamps or rack systems Combifix SM)

Order No. 0052 117

Sliding plates SM

Combifix SM systems for multi-storey frames mounted on plates.

Description of the Combifix systems: see chapter 21.7

Sliding Plate with Combifix SM,
Assembly A
Order No. 0051 484
Assembly B
Order No. 0051 485
Assembly C
Order No. 0051 486

Spring clamps / Test tube racks

See chapter 21.3

21.8 Loading Capacity of Rack Systems Combifix SM

	Size	Qty (pcs)
Erlenmeyer flasks	50 ml	49[1]
	100 ml	42[1]
	250 ml	20[2]
	500 ml	12
	1000 ml	6
	2000 ml	6
	3000 ml	4
	5000 ml	2
Separating funnels	100 ml	10
	250 ml	6[3]
	500 ml	2
	1000 ml	2
	2000 ml	1 - 2[4]
Test tube racks		4

[1] with 3 clamping strips h (0050 400) additional [2] with 1 clamping strip h (0050 400) additional
[3] with 2 additional clamps NS29 (0001 138) for replacement
[4] Number of pieces depends on shape and dimensions of the separating funnels

21.9 Loading Capacity of Universal Tray SM

	Size	Qty (pcs)
Spring clamps	10 ml	118
	25 ml	64
	50 ml	63
	100 ml	31
	250 ml	24
	500 ml	14
	1000 ml	11
	2000 ml	6
	3000 ml	4
	5000 ml	2
Test tube racks (with hinged foot)		5

21.10 Rack Systems for VKS

Shaking plate VKS

Base plate to be fastened on the shaker, incl. supporting plate.

On this base plate, the universal tray VKS or one of the Combifix VKS systems can be mounted.

Order No. 0052 070

Combifix VKS, Assembly A

consisting of basic rack and 9 clamping strips h.

Variable rack system for fastening different vessels with flat bottom (Erlenmeyer flasks, beakers, test tube racks, sieves, etc.)

Order No. 0051 487

For further extension or for modifying Combifix B or C systems, the clamping strips are available as separate items:
Clamping strip h for VKS
Order No. 0050 387

Combifix VKS, Assembly B

consisting of basic rack and
4 clamping strips h + 4 clamping strips v.

Rack system for secure fastening of horizontal vessels, e.g. measuring cylinders, between the clamping strips, or as added support for high vessels (flasks, beakers, cylinders). The maximum distance between the strips is 60 mm.
Order No. 0051 488

For further extension or for modifying Combifix A or C systems, the clamping strips are also available as separate items:
Clamping strip v for VKS
Order No. 0050 388

Combifix VKS, Assembly C

consisting of basic rack and 2 clamping strips h, 2 cramp strips and 1 spring strip.

Special rack system for separating funnels. The necks of the separating funnels are fastened in the grey plastic clamps, the spring strip secures the stoppers. The stems of the separating funnels are placed on a clamping strip h.

Order No. 0051 489

For further extension or for modifying Combifix A or B systems, the strips are also available as separate items:

Cramp strip for VKS
Order No. 0050 390

Spring strip for VKS
Order No. 0050 389

Universal Tray VKS (1-storey)

Coated aluminium tray. The drillings of the universal tray (28.3 mm apart) allow flexible loading with spring clamps or test tube racks.

The tray is proof against aggressive liquids.

Universal Tray VKS, without spring clamps

Order No. 0051 474

3-storey top frame VKS „Giant“

Practical frame for 3 „VKS“ trays or 6 „SM“ trays. Universal trays or sliding plates with Combifix can be used.

The frame is mounted directly on the basic device.

3-storey top frame „Giant“,
without trays
Order No. 0052 068

Universal tray VKS
for 3-storey top frame „Giant“
without spring clamps
Order No. 0051 496

Sliding Plates VKS

Combifix VKS systems for 3-storey top frame „Giant mounted on plates.
Description of the Combifix systems:
see page 68, 69

Sliding Plate with Combifix VKS,
Assembly A
Order No. 0051 493
Assembly B
Order No. 0051 494
Assembly C
Order No. 0051 495

Spring clamps / Test tube racks
see Chapter 21.3

Alternative platforms

Sliding plates SM

Combifix SM systems for multi-storey frames mounted on plates.
Description of the Combifix SM systems
see 21.7

Sliding Plate with Combifix SM,
Assembly A
Order No. 0051 484
Assembly B
Order No. 0051 485
Assembly C
Order No. 0051 486

21.11 Loading Capacity of Rack Systems Combifix VKS

	Size	Qty (pcs)
Erlenmeyer flasks	50 ml	104 [1]
	100 ml	82 [2]
	250 ml	45
	500 ml	32
	1000 ml	20
	2000 ml	12
	3000 ml	9
	5000 ml	6
Separating funnels	100 ml	14
	250 ml	10
	500 ml	6 - 8 [3]
	1000 ml	6
	2000 ml	2 - 4 [3]
Test tube racks		8

[1] with 5 clamping strips h (0050 387) additional [2] with 1 spring clamp h (0050 387) additional
[3] Number of pieces depends on shape and dimensions of the separating funnels

21.12 Loading Capacity of Universal Tray VKS

	Size	Qty (pcs)
Spring clamps	10 ml	279
	25 ml	132
	50 ml	132
	100 ml	63
	250 ml	46
	500 ml	34
	1000 ml	20
	2000 ml	12
	3000 ml	8
	5000 ml	6
Test tube racks (with hinged foot)		8

22. Customized racks for VKS 75 F control

Shaking plate VKS

Base plate to be fastened on the shaker, incl. supporting plate.

On this base plate, the universal tray VKS or one of the Combifix VKS systems can be mounted.

Order No. 0052 070

Special Rack System for barrels

Basic rack with 3 fixing elements.
For fastening horizontal or vertical barrels up to 80 l capacity.

Order No. 0039 001

Special Rack System for horizontal barrels

Rack system with base plate.
For fastening horizontal barrels up to 50 l capacity

Order No. 0039 002

23. Maximum Shaking Speed for Barrel Shaker VKS 75 F control

The below specified shaking speeds against load are approximate values. Depending on the specific properties of the substances to be shaken these values can differ marginally.

Type	Stroke (mm)	80 rpm
VKS 75 F	120 mm	75 kg
VKS 75 F	130 mm	75 kg
VKS 75 F	140 mm	65 kg
VKS 75 F	150 mm	55 kg

Edmund Bühler

Edmund Bühler GmbH
Schindäckerstraße 8
72411 Bodelshausen / Germany
Tel.: +49 7471 9864-0
info@edmund-buehler.de

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www.edmund-buehler.de