



New Brunswick™ I26/26R Shaker

Operating manual

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1 Operating instructions

1.1 Using this manual

- ▶ Read this operating manual completely before using the device for the first time. Also observe the instructions for use of the accessories.
- ▶ This operating manual is part of the product. Thus, it must always be easily accessible.
- ▶ Enclose this operating manual when transferring the device to third parties.
- ▶ You will find the current version of the operating manual for all available languages on our website www.eppendorf.com.

1.2 Danger symbols and danger levels

1.2.1 Danger symbols

	Electric shock		Crushing
	Material damage		Hazard point
	Heavy loads		Explosive
	Biohazard		

1.2.2 Danger levels



The following danger levels are used in safety messages throughout this manual.

DANGER	<i>Will</i> lead to severe injuries or death.
WARNING	<i>May</i> lead to severe injuries or death.
CAUTION	May lead to light to moderate injuries.
NOTICE	May lead to material damage.

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1.3 Symbols used

Example	Meaning
	You are requested to perform an action.
1. 2.	Perform these actions in the sequence described.
•	List.
	References useful information.

1.4 Abbreviations used

°C

Degree Celsius

cm

Centimeter

FET

Field Effect Transistor

h

Hour

Hz

Hertz

in

Inch

IR

InfraRed

kg

Kilogram

kHz

Kilohertz

L

Liter

lb

Pound

m

Meter

min
Minute

mL
Milliliter

mm
Millimeter

PWM
Pulse Width Modulation

PI
Proportional and Integral

rpm
Revolutions Per Minute

RTD
Resistance Temperature Detector

s
Second

V
Volt

VA
Volt Ampere

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2 Safety

2.1 User profile

The device may only be operated by trained lab personnel who have carefully read the operating manual and are familiar with the device functions.

2.2 Safety precautions

Before operating the shaker, verify that anyone involved with its operation has been instructed in both general safety practices for laboratories and specific safety practices for this apparatus.

- The user is also responsible for following local guidelines for handling hazardous waste and biohazardous materials that may be generated from the use of this equipment.

It is the responsibility of the user to carry out appropriate decontamination procedures if hazardous material is spilled on or inside the equipment. Before using any cleaning or decontamination method other than those suggested by the manufacturer, users should check with Eppendorf that the proposed method would not damage the equipment.



This equipment is not *explosion-proof*, and should never be used with flammable substances or used to grow organisms that produce flammable by-products.



WARNING! Risk of explosion and injury or death!

- ▶ Do not use equipment with flammable substances or organisms with flammable by-products.



NOTICE! Damage to device!

- ▶ Never run shaker without a platform.



DANGER! Explosion hazard

- ▶ Do not operate the device in areas where work is completed with explosive substances.
- ▶ Do not use this device to process any explosive or highly reactive substances.
- ▶ Do not use this device to process any substances which could create an explosive atmosphere.



CAUTION! Lack of safety due to incorrect use of materials

- ▶ Do not use this device to process any flammable materials, or use materials where the transfer of mechanical energy to glass apparatus could lead to breakage.

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Due to its design and the ambient conditions in its interior, the device is not suitable for use in potentially explosive atmospheres.

The use of substances which may contribute to a potentially explosive atmosphere is not permitted.

The final decision regarding the risks associated with using these types of substances is the user's responsibility.

2.3 Warnings for intended use

**WARNING! Heavy!**

- ▶ Do not attempt to lift the New Brunswick I26/26R by yourself.
- ▶ Ask for assistance or use suitable equipment when raising or handling the device.

**WARNING! Risk of electric shock and/or damage to unit!**

- ▶ Check that the voltage and frequency of your unit are compatible with mains/power supply.
- ▶ Remove caution label from back of unit.
- ▶ Set the circuit breaker on the right side of the unit to the OFF position.

**WARNING! Risk of electric shock and/or damage to device!**

- ▶ Use a grounded power supply.

**WARNING! Risk of electric shock and/or damage to the device!**

- ▶ Before cleaning device, turn off and unplug from mains/power supply.

**WARNING! Risk of electric shock when replacing fuses!**

- ▶ Turn off shaker and disconnect from mains/power supply.

**WARNING! Injury from hazardous biological material!**

- ▶ Use respiratory protection when cleaning spills where aerosolization is suspected.
- ▶ Wear gloves, safety glasses, and laboratory coat when cleaning.

**NOTICE! Damage to device!**

- ▶ Never run shaker without a platform.

3 Product description

3.1 Front view

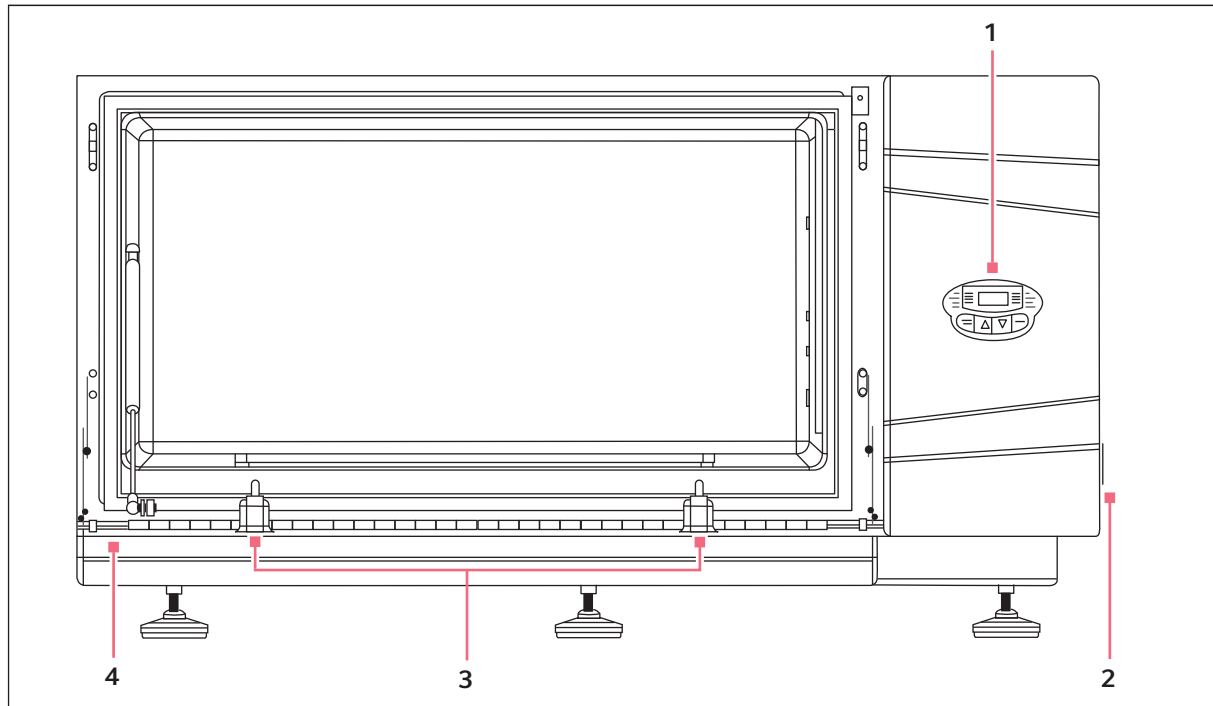


Fig. 3-1: Front view

1 User interface

Display, indicator lights and keypad

3 Platform rests

4 Door is open

2 On/Off switch

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3.2 Shaking speed control

The shaking mechanism is a triple eccentric bearing housing. The bearing housing is driven by a low voltage brushless DC motor and a multi-V belt and pulley reduction system. The approximate speed reduction is as follows:

- 4:1 for 1 in stroke housings
- 4.5:1 for both $\frac{3}{4}$ in and 1 in stroke housings

The hall sensors in the motor are used for both electronic commutation and speed feedback. A programmable logic device on the board performs the electronic commutation logic and extracts a tachometer signal from the hall sensor status. The hall sensor signals are filtered via analog means to reduce noise induced by the switching circuits, and the programmable logic employs an intelligent digital filter to reject hall sensor edge bounce.

The microprocessor:

- Converts the tachometer signal to speed feedback
- Performs a Proportional and Integral (PI) control algorithm
- Outputs a Pulse Width Modulation (PWM) signal to control the power level applied to the brushless motor

The power applied to the motor is limited in 2 ways for safety:

1. The high side Field Effect Transistor (FET) driver includes a current sensing mechanism and logic to turn the FET's off when the preset current limit is exceeded.
The microprocessor is programmed to limit the PWM command to the motor based on the actual speed. This provides a "soft-start" feature and a secondary software current limiting function.

A magnetic pickup or an InfaRed (IR) sensor is provided to count the actual number of revolutions of the counterweight in the shaking mechanism. This is only used during the auto-calibration phase to determine the exact drive belt reduction ratio. During the calibration phase the shaker runs at approximately 280 rpm for 4 min and should not be interrupted. When calibration is complete, the shaker automatically returns to normal operation and stores the new calibration value in non-volatile memory.

3.3 Temperature control

The chamber temperature is sensed by a 1000 ohm platinum RTD. The RTD signal conditioning circuitry and A/D frequency converter are contained on the main control PC board. A 16 bit zero-based A/D system is used, resulting in a useful resolution of about 1 part in 20000 °C or 0.00625 °C. A very low temperature coefficient (0.01 %) resistor provides the reference.

Each Resistance Temperature Detector (RTD) assembly is fitted with a calibration resistor selected at the time of calibration. The calibration method is the same as for previous shakers so that all shaker RTDs are interchangeable.

The New Brunswick I26/26R Shaker uses a second channel on the A/D frequency converter to measure the value of the calibration resistor, calibrated to National Institute of Standards and Technology (NIST) traceable standard.

The microprocessor reads the resistance values of the RTD and the calibration resistor, then it calculates the chamber temperature. The microprocessor then implements a PI control algorithm to close the temperature loop. A 650 W heater is PWM controlled on a 2.5 s duty cycle. This cycle time is fast enough to prevent noticeable changes in air temperature due to the cycling, and slow enough achieve a 1 part in 250 output resolution when the power switching is done by a zero voltage switching SSR. The SSR resides on the power distribution PC board (M1324-7011).

3.4 Operator interface

The operator interface consists of:

- 240 cm (94.48 in) x 128 cm (50.39 in) graphic LCD display
- START/STOP key
- ▲▲keys
- SELECT key

All of these components are interfaced to the display control PC board (M1324-7002), which has its own microprocessor programmed to provide the user interface functions.

The display board communicates with the main control board via synchronous serial link running at about 380 kHz. The main control board is the master of the link, with the display board accepting information updates from and sending back operator changes to the main board. The LCD display is backlit with a cold cathode fluorescent lamp. The display control PC board contains the DC to AC inverter that generates approximately 1000 VAC for the CCF lamp.

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3.4.1 Keypad

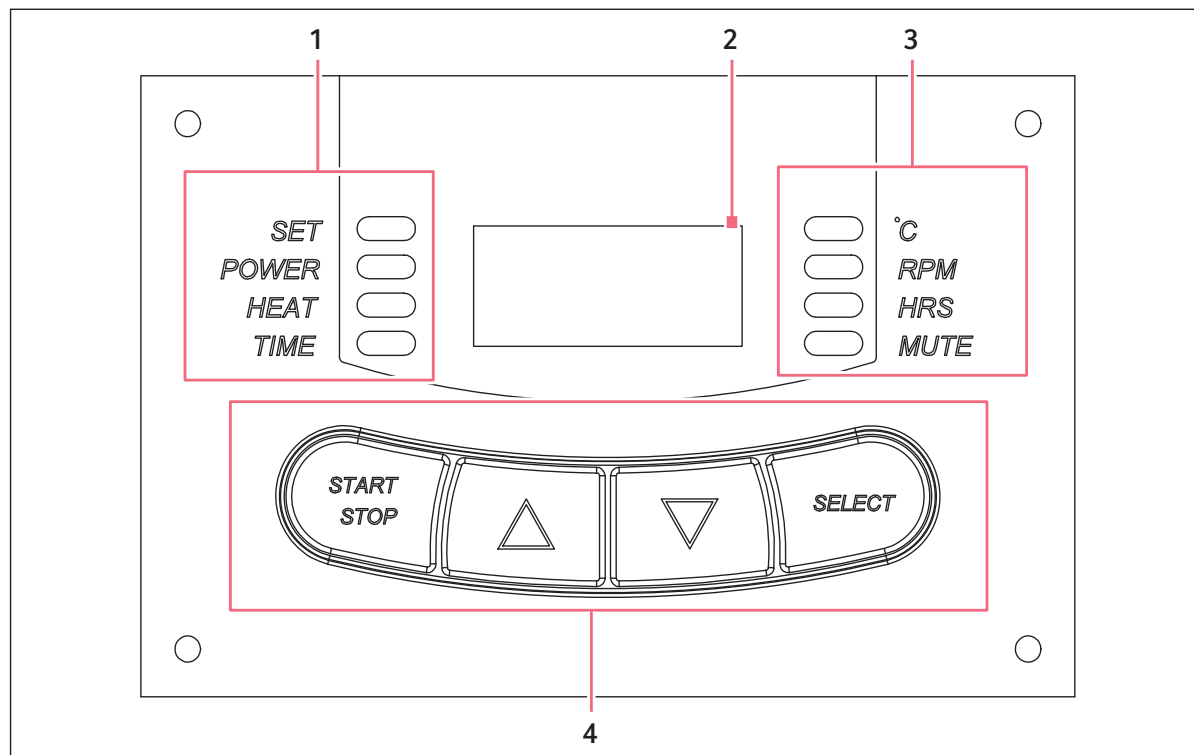


Fig. 3-2: Keypad

1 Status indicators

(see *Status indicators* on p. 15)

2 Display

(see *LED display* on p. 14)

3 Function indicators

(see *Function indicators* on p. 15)

4 User interface keys

(see *User interface keys* on p. 15)

3.4.2 LED display

The digital display on the control panel is a three-digit LED display. During normal shaker operation, the display indicates:

- Shaker status (On/Off)
- Shaking speed
- Chamber temperature
- Setpoints
- Hours remaining (in a timed run)
- Door ("Lid") open

If the shaker enters into an unstable operating condition (e.g., unbalanced load causing excess vibration and unlevel floor), the warning message "tLt" appears in the LED display and the tilt switch shuts off the shaker.

3.4.3 User interface keys

Tab. 3-1: User interface keys

START/STOP	<ul style="list-style-type: none"> • Used to start or stop the shaker • Activates or stops the timer when a timed run is desired
SELECT	<ul style="list-style-type: none"> • Used to change the displayed parameter
▲ ▼	<ul style="list-style-type: none"> • Used to adjust the setpoint of a displayed parameter up or down • Allows the user to enter the SET mode for setpoint changes

3.4.4 Status indicators

Four status indicator lights are located to the left of the LED display. They are:

Tab. 3-2: Status indicators

SET	<ul style="list-style-type: none"> • Indicates that the shaker is in the SET mode, when setpoints are being displayed and can be altered • Activated by the SELECT key or by pressing the ▲ or ▼ key
POWER	<ul style="list-style-type: none"> • Illuminates and blinks during power up or if power is interrupted during a run • To turn off this indicator, press the SELECT key and change to another function
HEAT	<ul style="list-style-type: none"> • Illuminates to indicate that the heater is on
TIME	<ul style="list-style-type: none"> • Indicates that the timer is in operation • The shaker can be programmed to run for a preset time from 0.1 h – 99.9 h • The timer can be disengaged without stopping an ongoing run

3.4.5 Function indicators

Tab. 3-3: Function indicators

° C	<ul style="list-style-type: none"> • Interior chamber temperature • Can be set from 4 °C – 60 °C when in SET mode, using the ▲ or ▼ key • Indexes at 0.1 °C increments unless the key is pressed for 4 s, after which it indexes in 1 °C increments
------------	---

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RPM	<ul style="list-style-type: none"> • Revolutions per minute • When in SET mode, use the ▲ or ▼ key to change the speed • Indexes at 1 rpm increments unless the key is pressed for 4 s, after which it indexes by increments of 10 rpm
HRS	<ul style="list-style-type: none"> • Time remaining in a timed run • Can be set from 0.1 h – 99.9 h, in 0.1 increments or, if the ▲ or ▼ key is pressed for 4 s, in increments of 5 h • The countdown begins when the START/STOP key is pressed; if the START/STOP key is pressed again, the shaking stops (but temperature is maintained) and the timer pauses until the START/STOP key is pressed again • When a timed run ends, the HRS indicator blinks • To turn off this indicator, press the SELECT key and change to another function
MUTE	<ul style="list-style-type: none"> • This feature is controlled by the SELECT key • When activated, the audible alarm is muted, remaining so until it is reactivated • If MUTE is activated when the shaker is turned off using the On/Off switch, MUTE engages when it is powered up again • To activate (or deactivate) the MUTE function, press the SELECT key until the MUTE indicator illuminates; press the ▲ or ▼ key to display ON or OFF as desired, then press the SELECT key

3.5 Power failure

In the event of a mains/power failure, the New Brunswick I26/26R Shaker is equipped with an automatic restart function. If the shaker was in operation at the time of the mains/power failure, the shaker begins to operate at its last setpoint. The LED display flashes, indicating that a power failure has occurred. To stop the flashing of the LED display, press any key.

4 Installation

4.1 Inspection of boxes

After you receive your order from Eppendorf, inspect the boxes carefully for any damage that may have occurred during shipping. Report any damage immediately to the carrier and to your local Eppendorf Customer Service Department.

4.2 Packing list verification

Verify against your Eppendorf packing list that you have received all of the correct materials.

4.3 Unpacking equipment



WARNING! Heavy!

- ▶ Do not attempt to lift the New Brunswick I26/26R Shaker by yourself.
 - ▶ Ask for assistance or use suitable equipment when raising or handling the device.
-

To unpack the New Brunswick I26/26R Shaker, you need the following:

- Hammer
- Forklift or other lifting equipment to lift 168 kg (370 lb) or more
- Shears to cut 12.7 mm (½ in) wide plastic strapping
- Tool to remove 7.6 cm (3 in) metal staples

4.4 Physical location

The unit must be situated in an area where there is sufficient space for the shaker and platform to clear walls and obstructions during operation. The surface on which the unit is placed must be smooth, level, and able to support the shaker under full load operating conditions.



WARNING! Risk of injury!

- ▶ Do not attempt to lift the shaker by hand. Always use a lifter or other suitable equipment when raising or handling the unit.
-

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4.4.1 Space requirements



Be sure to allow 10 cm (4 in) around the shaker for proper ventilation, and 61 cm (24 in) on the right side for service access to fan and refrigeration assemblies.

Tab. 4-1: Dimensions

Depth	77 cm (30.32 in)
Width	128.3 cm (50.5 in)
Height	70 cm (27.56 in)
Door width	99.5 cm (39.16 in)
Door extension	48.4 cm (19.05 in)

4.5 Tools required for installation

To install the New Brunswick I26/26R Shaker on an optional base, or to stack I26/26R units, the following tools are needed:

- Number 2 Phillips® head screwdriver
- Level, around 25.4 cm (10 in)
- 2 adjustable wrenches
- Forklift or other lifting equipment to lift more than 168 kg (370 lb)
- Metal leveling shims

4.6 Leveling a single shaker

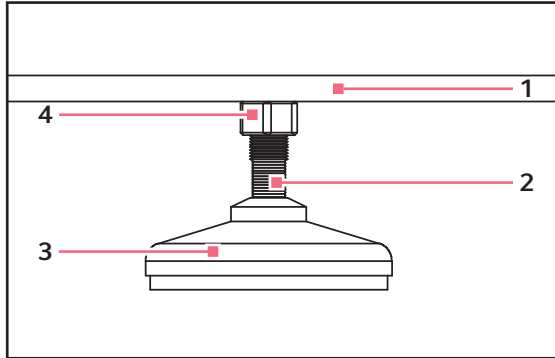


Fig. 4-1: Adjustable foot

- | | |
|---------------------------|-------------------|
| 1 Bottom of unit | 3 Foot |
| 2 Flats for wrench | 4 Lock nut |

Make sure that the shaker is placed on a level surface and that all 4 feet are solidly on the surface. If the shaker is not level, adjust the feet as needed to achieve leveling:

1. To keep the threaded stud from falling out, immobilize the top lock nut against the unit with one wrench when you adjust the foot.
2. With a second wrench against the flats of the threaded stud, just above the foot: rotate clockwise to lower the foot or counter-clockwise to raise the foot.
3. Place a level on the top of the unit.
4. If necessary, make further adjustments by repeating all steps until the unit is level.
5. Fully load the shaker, and do a test run at normal speed. Make additional leveling adjustments if necessary.



The maximum foot height adjustment is ~ 6.4 mm (1/4 in). If a higher adjustment is required, you need to add metal shims.

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4.7 Adding a base

There are 3 bases available for the New Brunswick I26/26R Shaker. The height of the base depends on whether you are installing one unit on the base, or stacking 2 or 3 units:

Tab. 4-2: Bases

Number of shakers	Base height
1	43.2 cm (17 in) One 10.2 cm (4 in) base and one 33.0 cm (13 in) base, bolted together at the factory
2 stacked	33.0 cm (13 in)
3 stacked	10.2 cm (4 in)

4.8 Preparing the optional base

1. Place the base on a sturdy (capable of bearing the weight of the combined base shakers and shaker contents), level surface, making sure that all four corners are solidly on the surface.
2. If the base is not level, place metal shims as needed under the base until it is level.
3. If you are mounting a single shaker, use the 43.2 cm (17 in) base (see Fig. 4-3 on p. 21). Bolt the shaker to the base using the hardware provided.

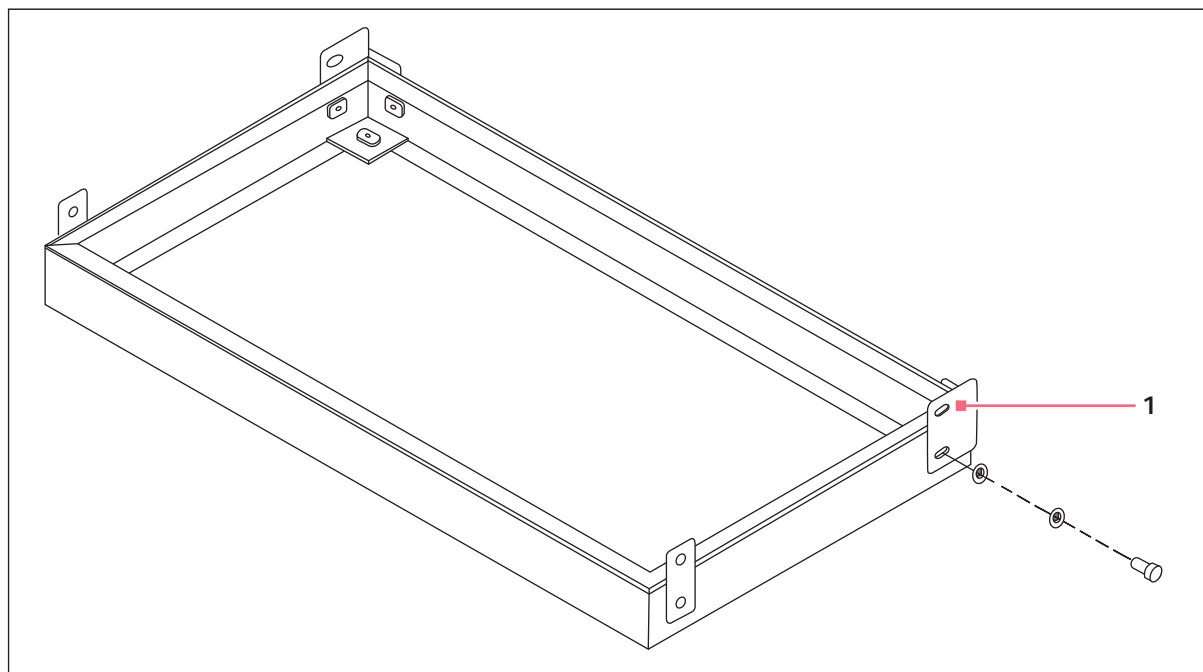


Fig. 4-2: Optional short base, 10.2 cm (4 in)

1 Rear corner brace

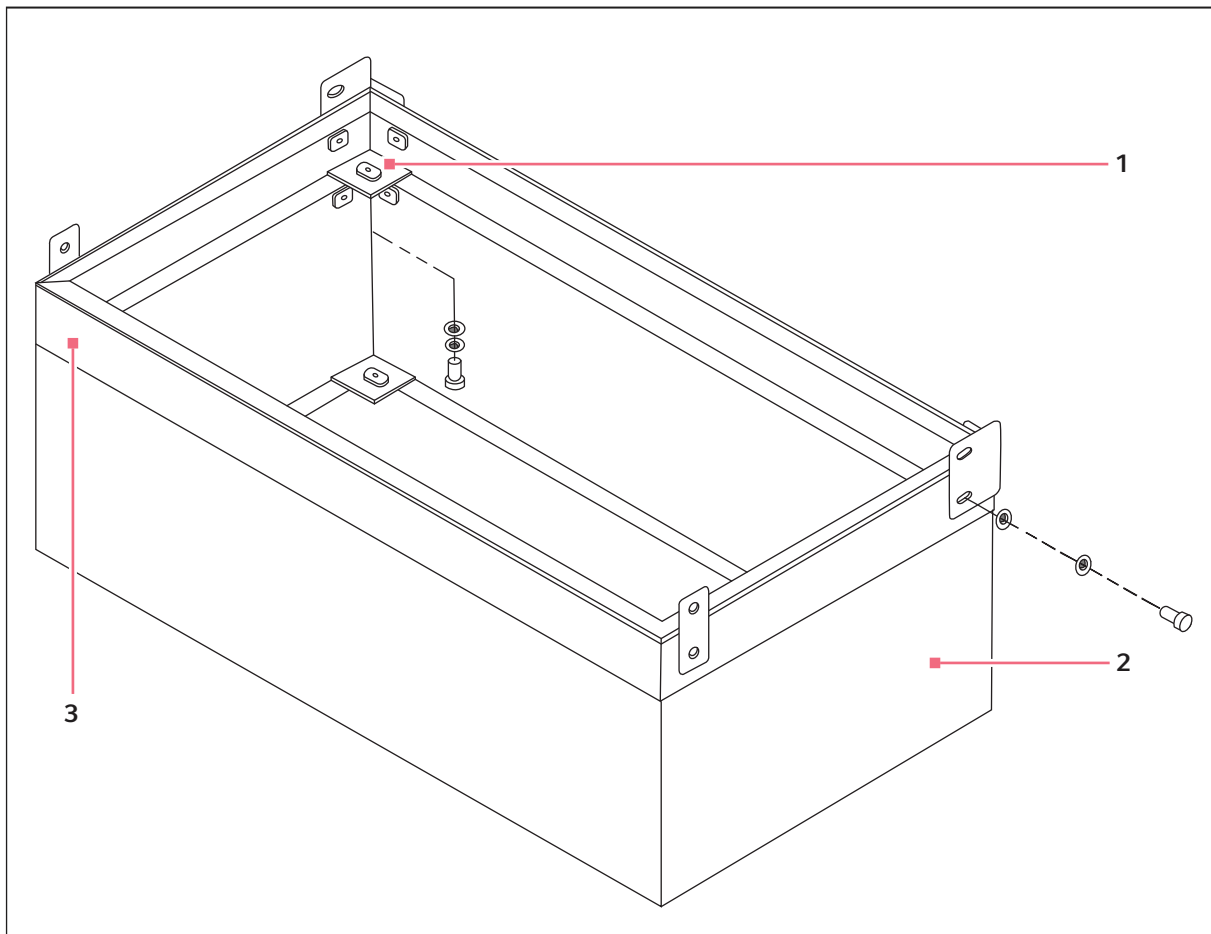


Fig. 4-3: Optional tall base, 43.2 cm (17 in)

1 Base mating supports

3 10.2 cm (4 in) base

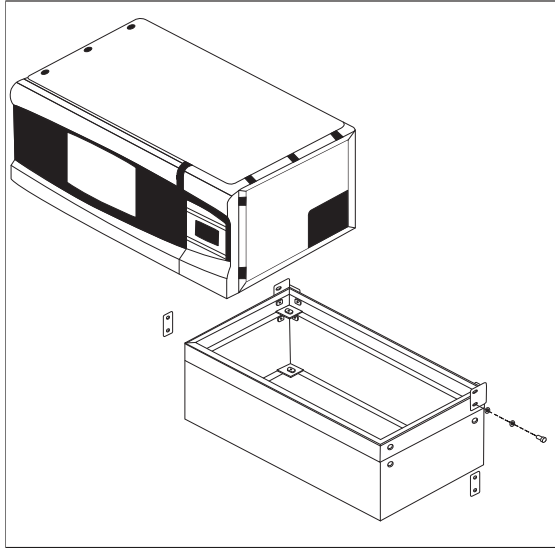
2 33 cm (13 in) base

4. (see Fig. 4-2 on p. 20) and (see Fig. 4-3 on p. 21). Depending on the height of your base, install the front side braces and rear corner braces on the base with the hardware provided, matched to the holes in the base.

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4.9 Mounting the New Brunswick I26/26R Shaker on the optional base

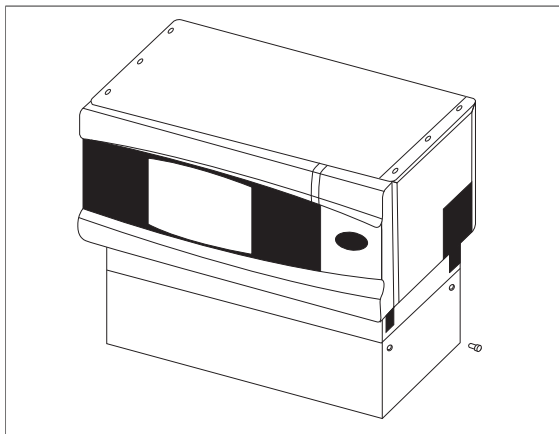


1. Using a forklift or lifter, raise the New Brunswick I26/26R Shaker so that its back end is tilted toward the rear of the base.
2. Remove all 6 feet from the bottom of the shaker. They are not needed for stacking, but you can keep them for future use.
3. With 2 assistants, each holding the shaker on one side, lower the unit onto the base, rear panel first. Slowly and gently remove the forklift or lifter and lower the front of the unit onto the base by hand.
4. Using the ½-13 x 1 ¼ in Allen® head screws, ½ in lock washers, and washers provided, secure the rear of the New Brunswick I26/26R Shaker to the corner braces in the base. With the remaining ½-13 x 1 ¼ in Allen head screws, ½ in lock washers, and washers, attach the front corner braces to the unit.

Fig. 4-4: Lower the unit



Optional handles are available to facilitate maneuvering the shaker onto the base (see *Optional handles* on p. 51).



5. Attach the front corner braces to the base using the two sets of ½-13 x 1 ¼ in Allen head screws, lock washers, and washers provided, and secure.

Fig. 4-5: Attach braces

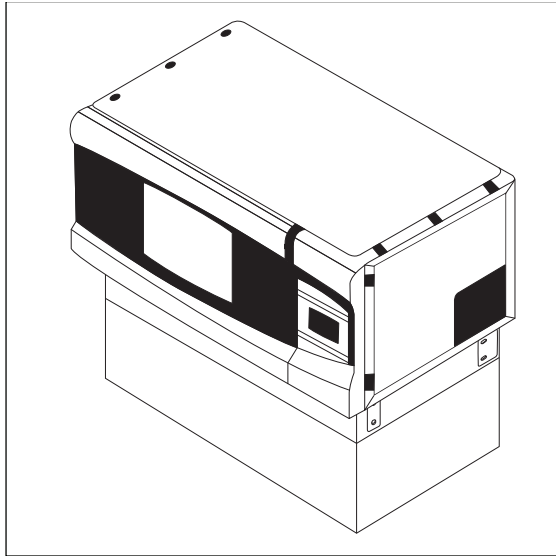


Fig. 4-6: Braces secure

6. With the corner braces securely in place, the shaker mounted on its base looks like Fig. 4-6.
7. Make sure the shaker is level; add metal shims under the base as needed to level the unit.
8. Fully load the shaker and do a test run at normal speed. Make additional leveling adjustments if necessary.

4.10 Installing the New Brunswick I26/26R Shaker stacking kit



If the shaker you place on the bottom is already mounted on a 43.2 cm (17 in) base, follow these instructions first:

To stack two shakers:

1. Remove the 10.2 cm (4 in) high section of the base.
2. Remove the base mating supports.
3. Move the corner braces from the 10.2 cm (4 in) base to the 33.0 cm (13 in) base
Reinstall the shaker on the 33.0 cm (13 in) base.

To stack three shakers:

1. Remove the 33.0 cm (13 in) high section from the bottom of the base.
Remove the base mating supports.

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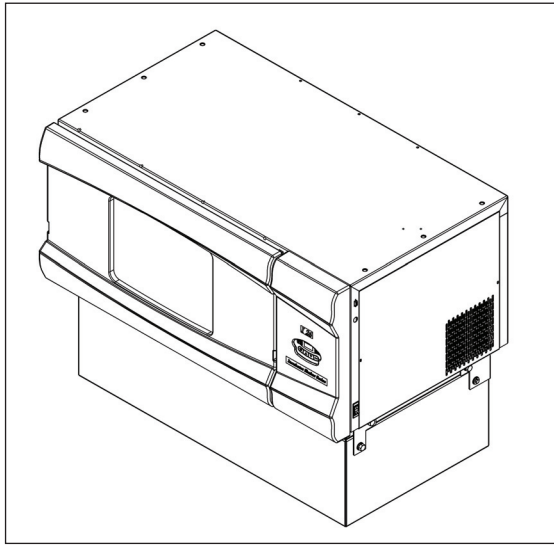


Fig. 4-7: Remove screws

1. Remove the six $\frac{1}{2}$ in plastic slotted set screws and the three $\frac{1}{4}$ in plastic socket set screws from the top of the shaker installed on the base.

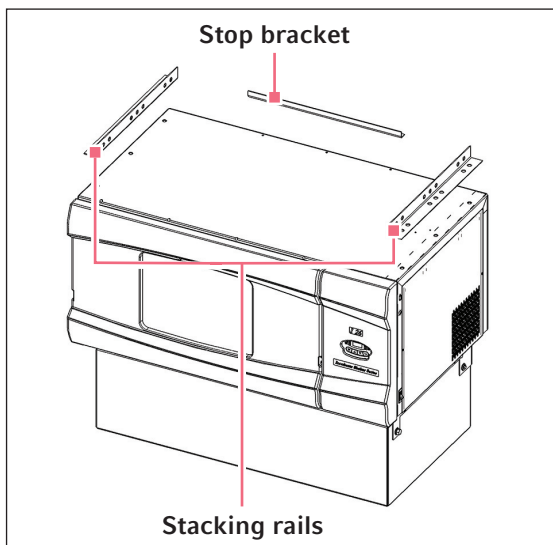


Fig. 4-8: Stacking rails and stop bracket

2. Using the six $\frac{1}{2}$ -13 x 1 in hex head screws, lock washers, and washers provided, attach the stacking kit stacking rails to the top sides of the unit installed on the base. Secure the rails in place.

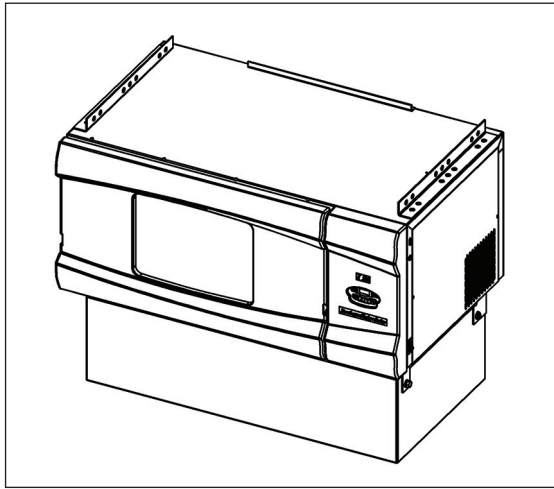


Fig. 4-9: Rails and bracket installed

3. Install the stacking stop bracket to the top back of the unit installed on the base, using the three $\frac{1}{4}$ -20 x 5/8 in hex head screws, lock washers, and washers provided.

4.11 Stacking the New Brunswick I26/26R Shaker

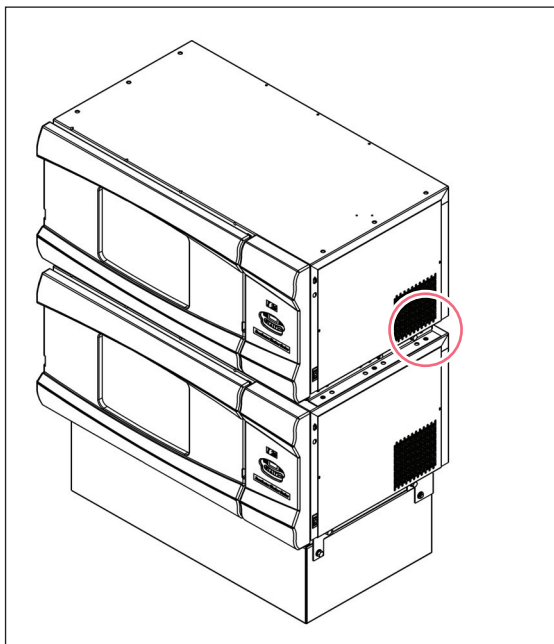


Fig. 4-10: Secure unit to stacking rails

1. Using a forklift or lifter, raise the shaker to be stacked so that its back end is tilted toward the rear of the mounting brackets.
2. Remove the feet from the unit. They are not needed for stacking, but you can keep them for future use.
3. With 2 assistants, each holding the unit on one side, lower the shaker onto the mounting brackets, rear panel first. Slowly and gently remove the forklift or lifter and lower the front of the unit onto the mounting brackets by hand.
4. Secure the bottom of the upper shaker the side stacking rails using the six $\frac{1}{2}$ -13 x 1 in screws, lock washers, and washers provided (circled in red in Fig. 4-10). Also secure the upper unit to the stop rail using three $\frac{1}{4}$ -20 x 5/8 in hex head screws, lock washers, and washers.
5. As before, make sure the shakers are level; add metal shims under the base if needed.
6. Fully load the shaker and do a test run at normal speed. Make additional leveling adjustments if necessary.

4.12 Stacking a third New Brunswick I26/26R Shaker

Be sure to use the 10.2 cm (4 in) base only when you stack 3 shakers.

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When stacking 3 shakers, it is imperative that all shaker loads be balanced. These shakers operate best at maximum speed with a load of 15.5 kg \pm 1.4 kg (34 lb, \pm 3 lb), which includes all platforms, clamps, and filled glassware (see *Load and speed graphs* on p. 46).

To stack a third shaker, repeat the procedures to install the stacking kit (see *Installing the New Brunswick I26/26R Shaker stacking kit* on p. 23)(see *Stacking the New Brunswick I26/26R Shaker* on p. 25), stack the shaker, and level the entire assembly.

4.13 Platform assemblies

The New Brunswick I26/26R Shaker can be used with a universal, dedicated, or Sticky Pad® platform. Universal platforms accept a variety of clamps for flasks and test tubes. Dedicated platforms are supplied with clamps already installed. Sticky Pad platforms do not have holes because they do not require clamps; the adhesive quality of the Sticky Pad or sticky tape applied to the platform holds flasks in place.



Sticky Pad and sticky tape are options that are sold separately.

A platform is a separate item, not included with the shaker assembly, but which is required for operation (see *Available platforms* on p. 49), (see *Platform installation for standard and lighter loads* on p. 28) and (see *For heavier loads* on p. 29).

4.14 Install flask clamp



If you are not using a universal platform, skip this section.

Flask clamps purchased for use with universal platforms require installation. Clamps are installed by securing the base of the clamp to the platform with the correct type and number of screws. All clamps are shipped complete with hardware.

Clamps for 2 L and 2.8 L flasks are shipped with an additional girdle to keep the flasks in place.

The use of this additional girdle keeps the flask from spinning inside the clamp. The girdle is an assembly of springs and sections of girdle tube. One girdle is already in place on the clamp, the other is packed separately.

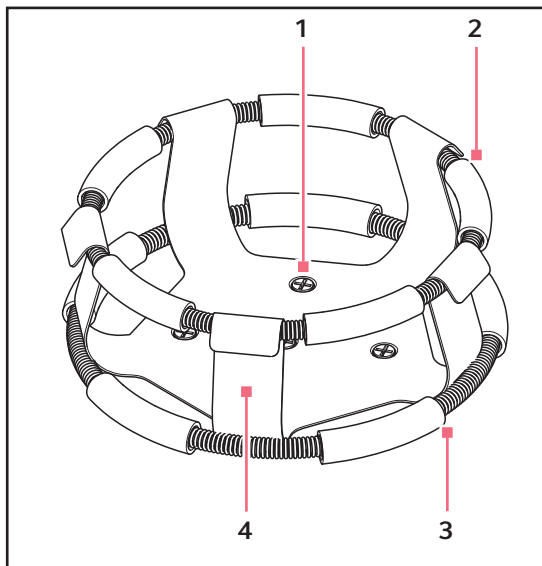


Fig. 4-11: Double girdle clamp

- | | |
|--|--|
| <p>1 Clamp mounting holes
With screws</p> <p>2 Upper girdle with girdle tubes
Secures the flask within the clamp</p> | <p>3 Lower girdle with girdle tubes
Prevents the flask from spinning</p> <p>4 Clamp body
Legs and base</p> |
|--|--|



Fig. 4-12: Clamp fastener

To install these double girdle clamps:

1. Place the clamp on the platform, aligning its mounting holes with holes on the platform. Secure the clamp in place using the flat Phillips head screws provided (#S2116-3051, 10-24 x 5/16 in).
2. With the first girdle in place as delivered, insert an empty flask into the clamp.
3. After making sure the sections of tubing are located between the clamp legs, roll the first girdle down the legs of the clamp as far as it can go. The tubing sections rest against the platform, and the springs are under the clamp base.
4. Place the second girdle around the upper portion of clamp body (just as the first girdle was initially). Make sure that its spring sections rest against the clamp legs, while its girdle tube sections sit against the flask, in between the clamp legs.



The upper girdle secures the flask within the clamp, and the bottom girdle keeps the flask from spinning.

Installation

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4.15 Platform installation for standard and lighter loads

Eppendorf recommends using this platform installation procedure if you plan to operate the shaker with any load that uses flasks 1 L in volume or below.

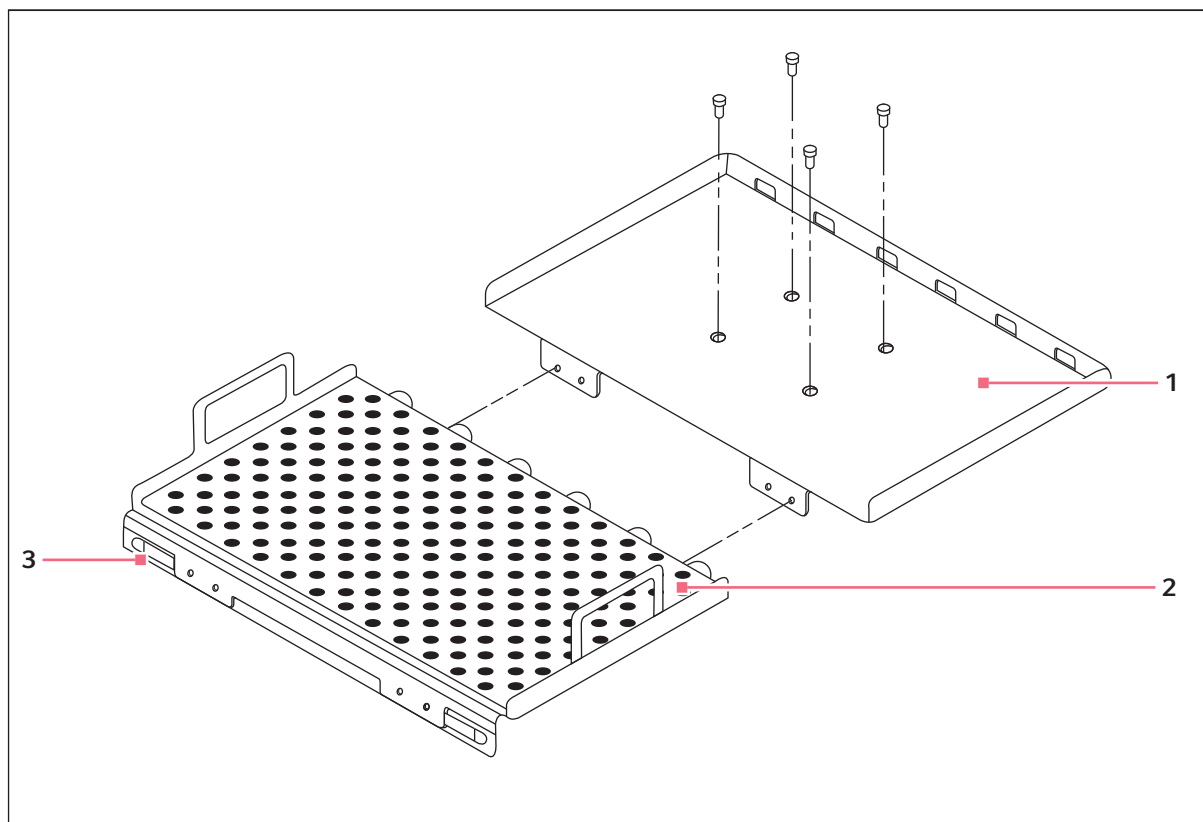


Fig. 4-13: Platform installation – standard and lighter loads

1 Sub-platform

3 Latch

2 Platform

All platforms, once installed, easily slide in and out of the shaker.

1. To pop out both latches, press the buttons on the front of the platform.
2. Using the handle on the center front of the platform, pull it forward to rest on the door guide strips. The two stop pins in the door keep the platform from falling off the sub-platform.
3. Slide it back in and be sure to securely close the latches before operating the shaker again.

4.16 For heavier loads

If you are using heavier loads, it is recommended that you use knobs to secure the platform in place. The universal, 2 L, and 2.8 L dedicated platforms include a package containing the following parts:

- 2x P0220-9341 – KNOB, THREAD HOLE, 5/16-18, NYLON, BLK
- 2x S1224-2206 – SCREW CAP ALN 5/16-18X1-1/4BLK
- Flat Washers and lock washers

To attach the knobs onto the existing platform:

1. Remove the sub-platform and flip the sub-platform upside down.
2. Insert screw as shown (see Fig. 4-14 on p. 29).

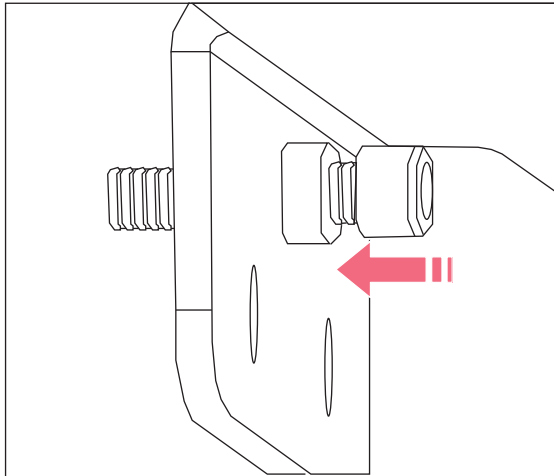


Fig. 4-14: Screw

Installation

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3. Reinstall the sub-platform.

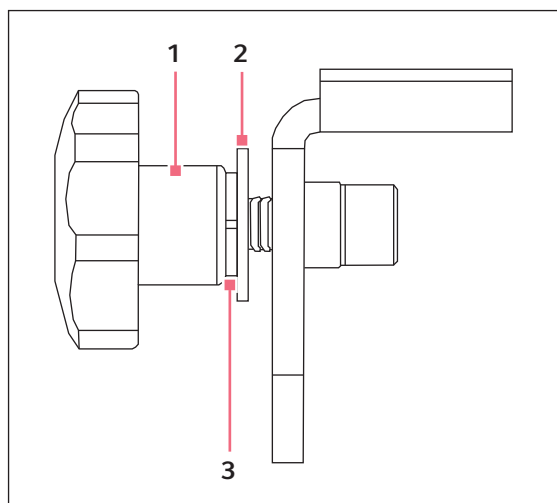


Fig. 4-15: Knob

1 Knob

3 Lock washer

2 Flat washer

4. Using the side handles of the platform (see Fig. 4-16 on p. 31), place the platform on the guide strips on the flat of the open door.
5. Push the platform toward the rear of the unit, aligning the bottom of the platform with the top of the sub-platform, and making sure the sides are squared up with the sub-platform sides.
6. When the platform is fully inserted and mated to the sub-platform, install the flat washer and the lock washer as shown, and then screw the removable knob onto the screw; tighten appropriately (see Fig. 4-15 on p. 30).
7. Verify that the platform is now secured to the sub-platform and the drive.

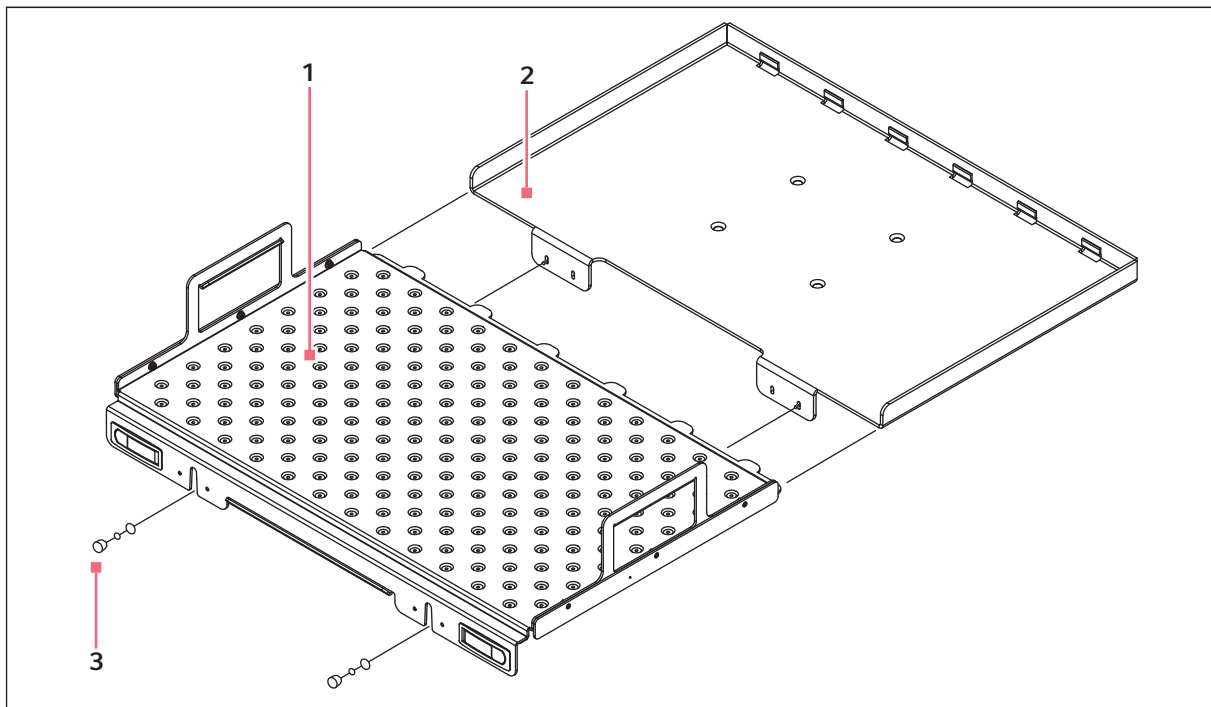


Fig. 4-16: Installing platform

1 Platform

3 Knob

2 Sub-platform

4.17 Electrical connections

Before making electrical connections, verify that the mains/power source voltage matches the voltage on the electrical specification plate and that the on/off switch is in the off position. The electrical specification plate is located on the rear panel of the unit near the power connector.

Connect the power cord to the power connector (Universal Voltage Input Module), then connect the other end to an earth/grounded receptacle.

Installation

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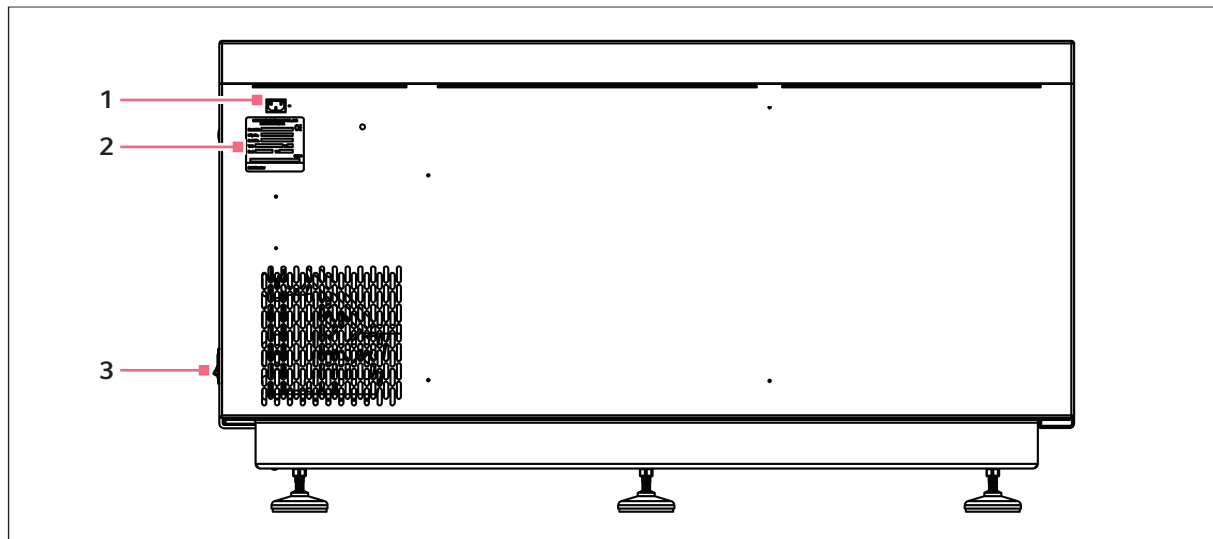


Fig. 4-17: Rear panel

1 Power connector

2 Electrical specification plate

3 On/Off switch

5 Operation

5.1 Starting the shaker

To initially start the shaker, close the door and turn the on/off switch on the right side panel of shaker to the on position.

When the shaker begins to operate, the LED display tracks the speed as it accelerates to the last entered setpoint. The shaking action can be started or stopped by pressing the **START/STOP** key on the keypad.

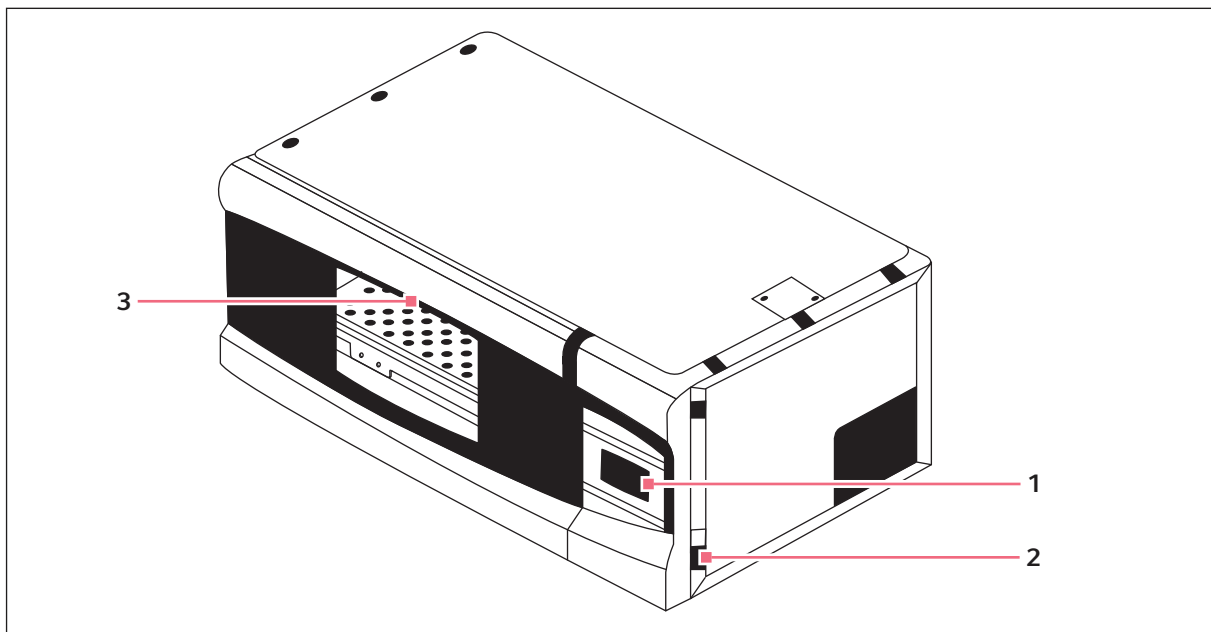


Fig. 5-1: On/Off switch location

1 Keypad
(see Keypad on p. 14)

3 Door handle
Cut-out under rim

2 On/off switch



The shaker does not operate if the door is open. This is indicated by the word **Lid** appearing in the LED display.

5.2 Continuous/unlimited run

1. If the LED displays **OFF**, press the **START/STOP** key.
2. Press the **SELECT** key until **RPM** illuminates.
3. To enter the **SET** mode, press either the ▲ or ▼ key.
The **SET** indicator illuminates.

4. Set the speed by using the ▲ or ▼ key until the desired setpoint is displayed. Holding the ▲ or ▼ key causes the setting to change more rapidly.

The setpoint can be changed at any time during a run without stopping the shaker by following Steps 2 – 4.

5.3 Checking setpoints

To check any setpoint:

1. Press the **SELECT** key until the desired indicator illuminates.
2. To enter the **SET** mode and display the current setpoint, press either the ▲ or ▼ key.



Holding the ▲ or ▼ key for more than 0.5 s causes the setpoint to change. Should this occur, resetting is necessary.

5.4 Timed functions

The shaker can be programmed to automatically stop after a preset time period of 0.1 h – 99.9 h. In order to set the timer, there must be power to the shaker. However, a timed run can be initiated while the shaker is either shaking or stopped.

5.4.1 To set the timer:

1. Press the **SELECT** key until the **HRS** indicator illuminates.
2. To enter the **SET** mode and set the desired run time (between 0.1 h – 99.9 h), press either the ▲ or ▼ key.



If the shaker is stopped, skip to Step 5. If the shaker is already running:

3. Press the **START/STOP** key.
The shaker stops and the display reads **OFF**.
4. Press the **START/STOP** key again. The **TIME** indicator illuminates and the shaker starts the timed run.



If the shaker is stopped:

5. Press the **START/STOP** key.
The shaker starts the untimed mode.
6. Press the **START/STOP** key again.
The shaker stops and the display reads **OFF**.
7. Press the **START/STOP** key a third time.
The **TIME** indicator lights up and the shaker starts the timed run.

To disable the visual alarm (flashing **TIME** indicator), press the **SELECT** key and change to any other function.

To cancel the timer while the shaker is running:

1. Press the **SELECT** key until the **HRS** indicator illuminates.
2. Press the ▼ key until **0.0** is displayed, then press the **START/STOP** key.
The display reads **OFF**, the shaker stops, and the **TIME** indicator turns off.
To continue in untimed mode, press the **START/STOP** key.

To cancel the timer while the shaker is stopped:

1. Press the ▼ key until **0.0** is displayed, then press the **START/STOP** key.
The **TIME** indicator illuminates and the shaker runs.
2. Press the **START/STOP** key again.
The shaker stops and the **TIME** indicator turns off.
3. Press the **START/STOP** key a third time.
The shaker runs in untimed mode.

5.5 Alarm functions

The New Brunswick I26/26R Shaker has an audible alarm which is activated at predetermined times.

To deactivate the audible alarm:

1. Press the **SELECT** key until the **MUTE** indicator illuminates.
2. To display **ON**, press the ▲ or ▼ key, then press the **SELECT** key.

To reactivate the audible alarm:

1. Press the **SELECT** key until the **MUTE** indicator illuminates.
2. To display **OFF**, press the ▲ or ▼ key, then press the **SELECT** key.

There is also a visual tilt alarm (see *Tilt switch on p. 38*).

5.6 Temperature setpoint

Press the **SELECT** key until the function °C indicator illuminates. The temperature can be set from 5 °C above ambient temperature to 60 °C (non-refrigerated units) or from 4 °C – 60 °C (refrigerated units). Increasing or decreasing the setpoint is accomplished with the ▲ or ▼ key.

Ambient temperature is measured 1 m from the front of the unit.


During operation, if the chamber temperature is more than 1.0 °C higher or lower than the temperature setpoint, an alarm is triggered. This alarm consists of a flashing °C indicator and audible beep. The alarm automatically deactivates as the shaker achieves the set temperature.

5.7 Temperature offset calibration

The temperature probe and the temperature controller are calibrated together at the factory. The temperature probe measures the temperature of the air at the probe's location, near the heat exchanger return vent. The controller uses the probe input to adjust air temperature, up or down, to match the temperature setpoint.

Depending on various conditions within the chamber (e.g., flask placement and size, the heat produced by growing organisms, heat losses due to liquid evaporation from flasks), the display temperature can differ from the temperatures within the flasks.

If you wish to have the temperature display (*Indicated Temperature*) match the temperature at a given point, or match the average of a series of points within the chamber (*Actual Temperature*), proceed as follows:

1. Let the unit equilibrate at or near the desired temperature. Record the Indicated Temperature.
 2. Record the Actual Temperature.
 3. Calculate the temperature correction value: Actual Temperature - Indicated Temperature = Temperature Correction Value.
 4. Press the **SELECT** key until the °C indicator illuminates.
 5. Press the ▲ and ▼ keys simultaneously.
The display indicates **CAL**.
 6. Using the ▲ or ▼ key, enter the Temperature Correction Value calculated in Step 3.
 7. To save the Temperature Correction Value to memory, press the ▲ and ▼ keys simultaneously.
- 

The °C light pulses rapidly to indicate it is not operating in the factory default mode. It pulses for a longer duration and less rapidly (with a frequency of approximately 1 s) to indicate the temperature is more than one degree above or below setpoint.
8. Press the **SELECT** key until the function °C indicator illuminates.
 9. Press the ▲ and ▼ keys simultaneously.
The display indicates **CAL**.
 10. Using the ▲ or ▼ key, set the Temperature Correction Value to 0.
 11. Press the ▲ and ▼ keys simultaneously.
The rapid pulsing of the °C indicator stops.

5.8 Speed calibration

To calibrate the shaking speed:

1. Set the shaker to a speed that can easily be measured. If you are using a strobe, the minimum speed should be 250 rpm.
2. Compare the reading on the display to the measured reading.

If an adjustment is needed:

1. Press the **SELECT** key until the **RPM** indicator illuminates.
2. Press the ▲ and ▼ keys simultaneously.
The display indicates **CAL**.
3. To change the displayed value to match the measured speed, press either the ▲ or ▼ key.
4. To save the adjustment, press the ▲ and ▼ keys simultaneously.
5. Turn the shaker off using the mains/power switch, then turn it back on.

5.9 Tilt switch

The shaker is equipped with an independent mechanical sensing tilt switch that shuts off the motor when it senses that the shaker is in an unbalanced condition, indicating **tLt** ("tilt") on the LED display.

When this happens, troubleshoot the situation to restore balance, then turn the mains/power switch off. To reset the system, turn the mains/power switch on.

6 Troubleshooting

6.1 Troubleshooting

Symptom	Cause	Solution
Shaker does not run	<ul style="list-style-type: none"> • No power • Display is not on • Mains/power cord is not plugged in and/or mains/power switch is off 	<ul style="list-style-type: none"> ▶ Plug in mains/power cord (to working electric outlet) and turn on mains/power switch
	<ul style="list-style-type: none"> • Door is open 	<ul style="list-style-type: none"> ▶ Close door firmly, making sure latch is engaged
	<ul style="list-style-type: none"> • Door is closed but not completely • Door magnet is not adjusted correctly • On/Off switch is not working 	<ul style="list-style-type: none"> ▶ Call for service
	<ul style="list-style-type: none"> • Tilt switch has been triggered 	<ul style="list-style-type: none"> ▶ Check to ensure the load is evenly distributed, and that the shaker is level on a solid surface ▶ Restart by pressing the START/STOP button
	<ul style="list-style-type: none"> • Fuse(s) burned out 	<ul style="list-style-type: none"> ▶ Replace
	<ul style="list-style-type: none"> • Fuse may not be seated properly 	<ul style="list-style-type: none"> ▶ Remove and reinstall the fuse carefully
	<ul style="list-style-type: none"> • Shaking speed has been set to zero by program running or by computer interface 	<ul style="list-style-type: none"> ▶ Reset shaking speed (see <i>Continuous/unlimited run on p. 33</i>)
	<ul style="list-style-type: none"> • Defective main board • Defective display controller board • Defective motor • Drive belt out of alignment or worn 	<ul style="list-style-type: none"> ▶ Call for service
	<ul style="list-style-type: none"> • Jammed shaking mechanism 	<ul style="list-style-type: none"> ▶ Check for debris ▶ Clean ▶ Call for service if necessary
Shaker runs slowly and/or no speed indication	<ul style="list-style-type: none"> • Fuse may not be seated properly 	<ul style="list-style-type: none"> ▶ Remove and reinstall the fuse
	<ul style="list-style-type: none"> • Incorrect speed calibration 	<ul style="list-style-type: none"> ▶ Reset shaking speed (see <i>Continuous/unlimited run on p. 33</i>)
	<ul style="list-style-type: none"> • Defective main board • Defective motor • Drive belt out of alignment or worn 	<ul style="list-style-type: none"> ▶ Call for service

Troubleshooting

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Symptom	Cause	Solution
Shaker does not run at set speed	<ul style="list-style-type: none"> • Shaker is overloaded and/or you are using baffled flasks 	<ul style="list-style-type: none"> ▶ Remove some contents and balance load
	<ul style="list-style-type: none"> • Defective motor • Drive belt out of alignment or worn 	<ul style="list-style-type: none"> ▶ Call for service
Operating noise	<ul style="list-style-type: none"> • Load out of balance 	<ul style="list-style-type: none"> ▶ Unload all contents and reload
	<ul style="list-style-type: none"> • Loose component(s) in platform, sub-platform and/or drive assembly 	<ul style="list-style-type: none"> ▶ Call for service
Unit does not reach set temperature	<ul style="list-style-type: none"> • Heater fuse blown 	<ul style="list-style-type: none"> ▶ Replace
	<ul style="list-style-type: none"> • Compressor fuse blown 	<ul style="list-style-type: none"> ▶ Replace
	<ul style="list-style-type: none"> • Compressor over-pressure switch activated • Defective refrigeration system • Defective heater 	<ul style="list-style-type: none"> ▶ Call for service
	<ul style="list-style-type: none"> • Ambient temperature too high or too low 	<ul style="list-style-type: none"> ▶ Cool or heat the room as needed
	<ul style="list-style-type: none"> • Incorrect temperature indication 	<ul style="list-style-type: none"> ▶ See <i>Incorrect temperature indication</i> section of this table
Incorrect temperature indication	<ul style="list-style-type: none"> • Defective RTD assembly • Defective main board 	<ul style="list-style-type: none"> ▶ Call for service

7 Maintenance

7.1 Cleaning external surfaces



WARNING!

- ▶ Always turn off the shaker and disconnect the mains/power cord from the mains/power supply before performing any maintenance on the shaker.
 - ▶ A detachable mains/power cord has been provided with your unit. Only use the cord provided and do not replace cord with an inadequately rated cord.
-

Use a cloth dampened with water or any standard, household, or laboratory cleaner to wipe down the shaker's outer surfaces.

Never use abrasive or corrosive compounds to clean this instrument, as they may damage the shaker.

Maintenance

New Brunswick™ I26/26R Shaker
English (EN)

8 Technical data

8.1 Specifications

These specifications assume a maximum load of 15.5 kg (34 lb), including platforms, clamps, glassware, and contents.

Shaking			
Speed	<ul style="list-style-type: none">• Single unit: 25 – 400 rpm• 2 or 3 units stacked: 25 – 250 rpm		
Control accuracy	<ul style="list-style-type: none">• ±1 rpm		
Indication	<ul style="list-style-type: none">• 3 digit LED, in 1 rpm increments		
Stroke/orbit	<ul style="list-style-type: none">• 2.5 cm (1 in)		
Temperature			
I26 range	<ul style="list-style-type: none">• 5 °C above ambient temperature to 60 °C		
I26R range	<ul style="list-style-type: none">• 15 °C below ambient (minimum 4 °C) to 60 °C		
Control accuracy	<ul style="list-style-type: none">• ±0.1 °C from 30 °C – 40 °C, ±0.5 °C over the remaining range		
Indication	<ul style="list-style-type: none">• 3 digit LED, in 1 rpm increments		
Heaters	<ul style="list-style-type: none">• Long-life, low-watt density resistance type heaters with high temperature thermostats		
Dimensions and weight			
	Single unit	2 units	3 units
Width	127 cm (50 in)	127 cm (50 in)	127 cm (50 in)
Depth	77 cm (30.26 in)	77 cm (30.26 in)	77 cm (30.26 in)
Height	70 cm (27.56 in)	140 cm (52.62 in)	210 cm (77.68 in)
Chamber width	<ul style="list-style-type: none">• 86.4 cm (34 in)		
Chamber depth	<ul style="list-style-type: none">• 58.4 cm (23 in)		
Chamber height	<ul style="list-style-type: none">• 39.4 cm (15.5 in) clearance above platform		
Platform width	<ul style="list-style-type: none">• 76 cm (30 in)		
Platform depth	<ul style="list-style-type: none">• 46 cm (18 in)		
Weight	<ul style="list-style-type: none">• I26 weight: 167.8 kg (370 lb)• I26R weight: 181.5 kg (400 lb)		
Altitude limit	<ul style="list-style-type: none">• 2000 m		

Technical data

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Alarms	<ul style="list-style-type: none"> • Visible and audible warning indication when speed deviates more than 5 rpm from setpoint • Visible and audible warning indication when temperature deviates more than 1 °C from setpoints • Visible and audible warning indication when timer has expired • Audible alarm can be muted • Visual tilt alarm when the shaker is out of balance 	
LED display	<ul style="list-style-type: none"> • Indicates speed • Indicates temperature • Indicates running time alarm conditions • Displays readout of internal clock (actual accumulated operating time) • Character height: 14.3 mm (9/16 in) 	
RS-232	<ul style="list-style-type: none"> • Provides access for remote data logging 	
Setpoint retention	<ul style="list-style-type: none"> • All setpoints and operating status are retained in non-volatile memory 	
Automatic restart	<ul style="list-style-type: none"> • After power is restored • Indicated by a flashing display 	
Stacking	<ul style="list-style-type: none"> • Up to 3 units may be stacked • Second and third units require stacking kits 	
Drive	<ul style="list-style-type: none"> • Triple eccentric counterbalanced drive • 9 permanently lubricated ball bearings 	
Drive motor	<ul style="list-style-type: none"> • Solid-state brushless DC motor 	
Safety	<ul style="list-style-type: none"> • Independent mechanical sensing <i>tilt switch</i> shuts off the motor in an unbalanced condition • Drive Interrupt shuts off power to shaker when door opens • Acceleration/deceleration circuit prevents sudden starts and stops, minimizing both splashing and mechanical damage 	
Electrical requirements	<ul style="list-style-type: none"> • 100 V, 50/60 Hz • 120 V, 60 Hz • 230 V, 50 Hz 	I26: 800 VA per shaker I26R: 1500 VA per shaker
ETL regulatory standards	<ul style="list-style-type: none"> • UL61010A-1 • UL61010A-2-010 	<ul style="list-style-type: none"> • CAN/CSA-C22.2 No 1010.1 • CAN/CSA-C22.2 No 1010.2.010
CE regulatory standards	See Declaration of Conformity	
Fuses	<ul style="list-style-type: none"> • (2) 8.0 A, 250 V, Slo-Blo® 	

8.2 Platform capacity

Universal platforms have multiple holes enabling you to mount an assortment of flask clamps or other accessories on a single platform. The capacities shown below reflect the maximum number of flasks in a given size that fits on the platform in a balanced pattern. Universal platforms, clamps, and accessories are sold separately.

When just one size flask is used on the shaker, (i.e., 250 mL flasks), dedicated platforms come with flask clamps already mounted. Dedicated platforms generally hold a greater number of flasks than the universal platform, but do not offer the versatility.



WARNING!

- Do not use this equipment with accessories not provided or recommended by Eppendorf, or used in a manner not specified by Eppendorf and this manual. Protection provided by the equipment may be impaired, and serious injury or death can occur.

The following table shows a list of the maximum flask capacity for both dedicated and universal platforms that measure 76 cm × 46 cm (30 in × 18 in).

Tab. 8-1: Platform capacity

Flask size	Dedicated platform	Universal platform
10 mL	--	187
25 mL	--	93
50 mL	--	93
125 mL	60	39
250 mL	40	30
500 mL	24	24
1 L	15	12
2 mL	12	8
2.8 L	6	6
Large test tube rack	--	7
Medium test tube rack	--	9
Small test tube rack	--	9
Microplate rack (stack)	--	16
Microplate rack (1 layer)	--	4

Technical data

New Brunswick™ I26/26R Shaker
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8.3 Load and speed graphs

These graphs show the maximum recommended speed for unstacked and stacked shakers, according to load.



In both figures, 20 % *full* refers to the amount of liquid in the flasks. The platforms are fully loaded with flasks.

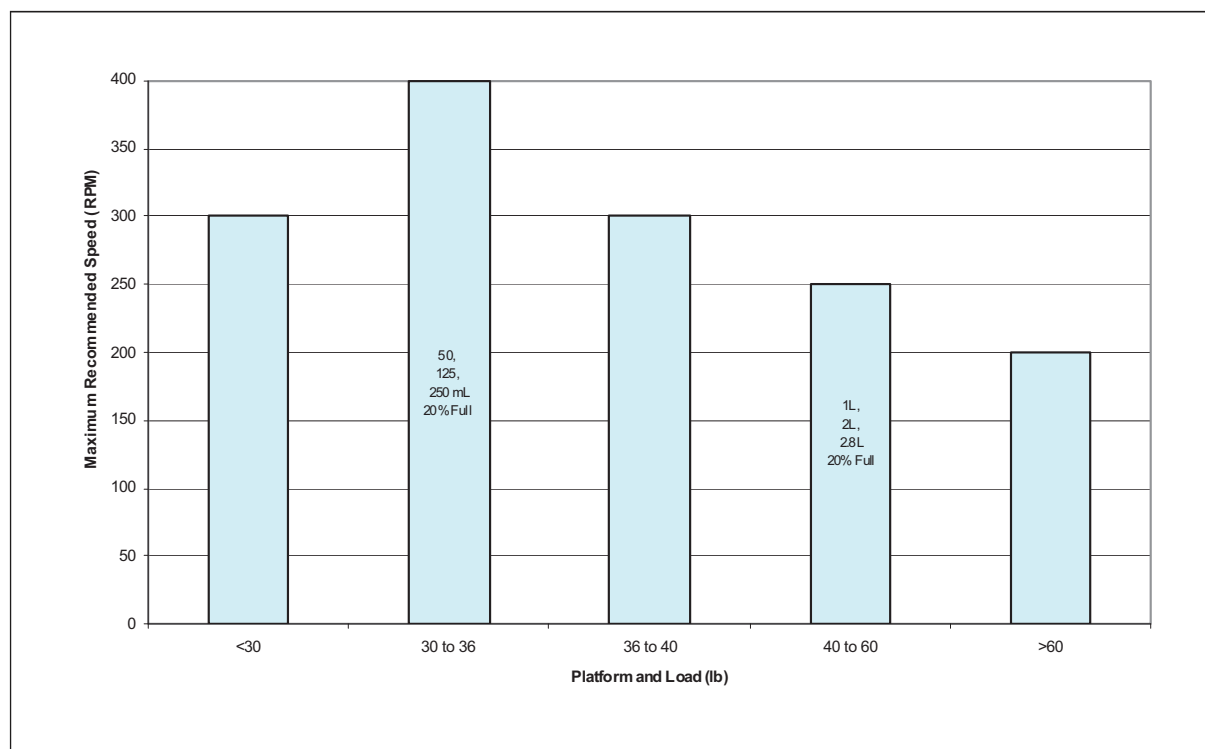


Fig. 8-1: Load and speed for 1 unstacked shaker

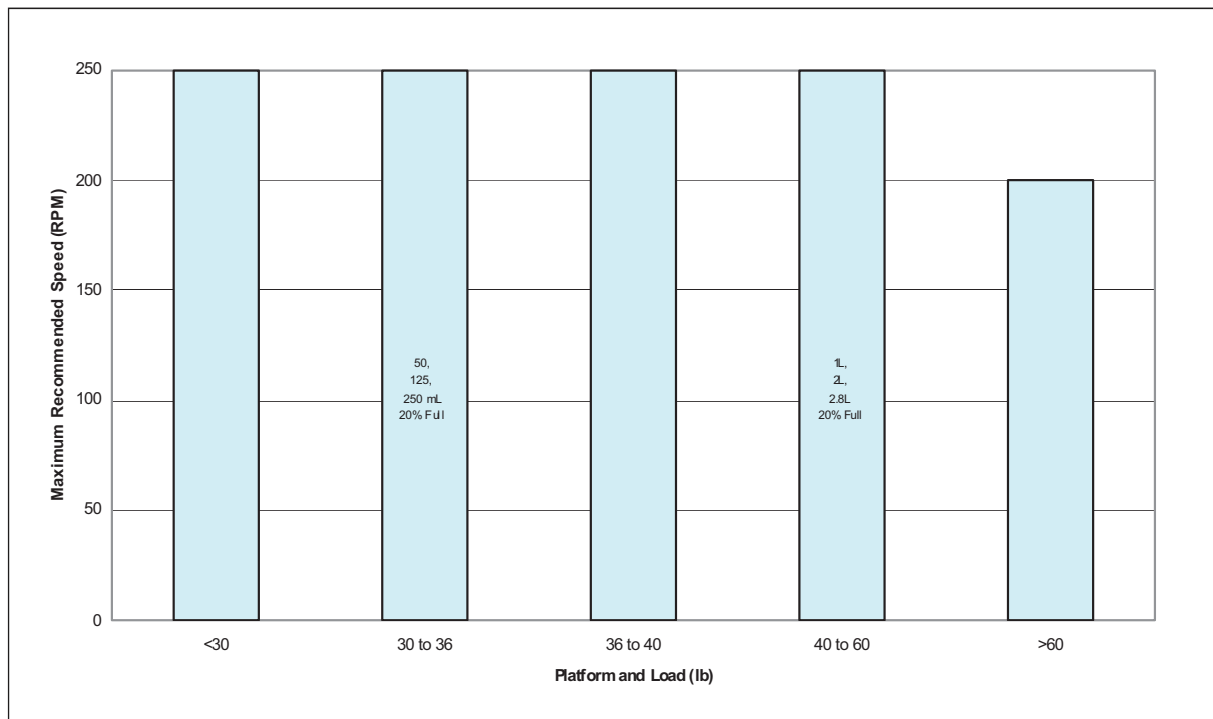


Fig. 8-2: Load and speed for stacked shakers

8.4 Certifications

The New Brunswick I26/26R Shaker has been tested to ETL standards, to comply with UL and CAN/CSA electrical safety standards.

As attested in the CE Declaration of Conformity, the New Brunswick I26/26R Shaker also conforms to the appropriate CE standards.

Technical data

New Brunswick™ I26/26R Shaker
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9 Ordering information

9.1 Ordering accessories

When ordering accessories, provide the model number and serial number of your shaker. This information is on the electrical specification plate, located on the rear panel of the unit. The serial number is also labeled in the lower right corner of the front panel, below the chamber door seal.



WARNING!

- Do not use this equipment with accessories not provided or recommended by Eppendorf, or used in a manner not specified by Eppendorf and this manual. Protection provided by the equipment may be impaired, and serious injury or death can occur.

9.2 Available platforms

For dedicated platforms that measure 76 cm × 46 cm (30 in × 18 in):

Application	Part number
125 mL Erlenmeyer flasks	M1324-9905
250 mL Erlenmeyer flasks	M1324-9906
500 mL Erlenmeyer flasks	M1324-9907
1 L Erlenmeyer flasks	M1324-9908
2 L Erlenmeyer flasks	M1324-9909
2.8 L Erlenmeyer flasks	M1324-9910

For universal platforms (M1324-9904) that measure 76 cm × 46 cm (30 in × 18 in):

Application	Part number
10 mL Erlenmeyer flask	ACE-10S
25 mL Erlenmeyer flask	M1190-9004
50 mL Erlenmeyer flask	M1190-9000
125 mL Erlenmeyer flask	M1190-9001
250 mL Erlenmeyer flask	M1190-9002
500 mL Erlenmeyer flask	M1190-9003
1 L Erlenmeyer flask	ACE-1000S
2 L Erlenmeyer flask	ACE-2000S
2.8 L Fernbach flask	ACFE-2800S

A Sticky Pad® platform (M1324-9911), eliminates the need for flask clamps. Sticky Pad® (M1250-9700) sold separately.

Ordering information

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9.3 Replacement clamp hardware

Eppendorf flask clamps come complete with mounting screws. Additional screws are available separately (S2116-3051).

Tab. 9-1: Replacement clamp hardware

Description	Part number	Quantity	Platform capacity
10-24 x 5/16 in (7.9 mm) flat Phillips® head screw	S2116-3051	1	7.9 mm (5/16 in) thick aluminum

9.4 Carriers and test tubes

Accessory description		Part number	Platform capacity
Adjustable angle test tube rack for tubes 8 mm – 11 mm diameter	80 tube capacity	M1289-0100	7
	60 tube capacity	M1289-0010	9
	48 tube capacity	M1289-0001	9
Adjustable angle test tube rack for tubes 12 mm – 15 mm diameter	60 tube capacity	M1289-0200	7
	44 tube capacity	M1289-0020	9
	34 tube capacity	M1289-0002	9
Adjustable angle test tube rack for tubes 15 mm – 18 mm diameter	42 tube capacity	M1289-0300	7
	31 tube capacity	M1289-0030	9
	24 tube capacity	M1289-0003	9
Adjustable angle test tube rack for tubes 18 mm – 21 mm diameter	30 tube capacity	M1289-0400	7
	23 tube capacity	M1289-0040	9
	18 tube capacity	M1289-0004	9
Adjustable angle test tube rack for tubes 22 mm – 26 mm diameter	22 tube capacity	M1289-0500	7
	16 tube capacity	M1289-0050	9
	13 tube capacity	M1289-0005	9
Adjustable angle test tube rack for tubes 26 mm – 30 mm diameter	20 tube capacity	M1289-0600	7
	16 tube capacity	M1289-0060	9
	12 tube capacity	M1289-0006	9
Microplate holder rack (stacked)	3 deep well or 9 standard	M1289-0700	16
Microplate holder rack (single layer)	5 deep well or standard	TTR-221	4
Angled test tube rack holder* for user-supplied test tube racks that are 10 mm – 13 mm (4 in – 5 in) wide and up to 38 mm (15 in) long		TTR-210	4

Accessory description	Part number	Platform capacity
Angled test tube rack spacer bar* for use with TTR-210 to accommodate test tubes racks that are less than 13 mm (5 in) wide	TTR-215	NA

* Universal platform required

9.5 Optional bases

Description	Part number
10.2 cm (4 in) Base (<i>Short Base</i>)	M1324-0600
33.0 cm (13 in) Base (<i>Medium Base</i>)	M1324-0800
43.2 cm (17 in) Base (<i>Tall Base</i>)	M1324-0700



The 43.2 cm (17 in) Tall Base is made of the 10.2 cm (4 in) and 33.0 cm (13 in) bases, bolted together at the factory.

9.6 Stacking kit

Description	Part number
Stacking hardware (to stack 2 units)	M1324-0500

9.7 Optional handles

Each shaker has 2 threaded holes at the bottom of both side panels. You can screw the optional handles into these holes. They are useful for lifting the shaker onto an optional base, for example.



Do not use the screw-in handles to lift the shaker if it is fastened to a base.

Description	Part number
Screw-in handles (4 pieces in kit)	M1282-5042

Ordering information

New Brunswick™ I26/26R Shaker
English (EN)

10 Transport, storage and disposal

10.1 Disposal

In case the product is to be disposed of, the relevant legal regulations are to be observed.

Information on the disposal of electrical and electronic devices in the European Community:

Within the European Community, the disposal of electrical devices is regulated by national regulations based on EU Directive 2012/19/EU pertaining to waste electrical and electronic equipment (WEEE).

According to these regulations, any devices supplied after August 13, 2005, in the business-to-business sphere, to which this product is assigned, may no longer be disposed of in municipal or domestic waste. To document this, they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU, please contact your supplier if necessary.

In Germany, this is mandatory from March 23, 2006. From this date, the manufacturer has to offer a suitable method of return for all devices supplied after August 13, 2005. For all devices supplied before August 13, 2005, the last user is responsible for the correct disposal.

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New Brunswick™ I26/26R Shaker
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Declaration of Conformity

The product named below fulfills the requirements of directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Product name:

I- 26, I- 26/R

including accessories

Product type:

Incubated / Refrigerated Shakers

Relevant directives / standards:

2006/95/EC: EN 61010- 1, EN 61010- 2- 010, EN 61010- 2- 051

UL 61010- 1, UL 61010A- 2- 010,

CAN/CSA C22.2 No. 61010- 1, CAN/CSA C22.2 No. 1010.2.010

2004/108/EC: EN 61326- 1, EN 55011, CISPR 11 Group 1, Class A

Date: September 14, 2015



Management Board



Portfolio Management

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