Instructions for use

Horizontal Electrophoresis Units

N817.1 MINI-easy Electrophoresis Unit

N562.1 MINI Electrophoresis Unit

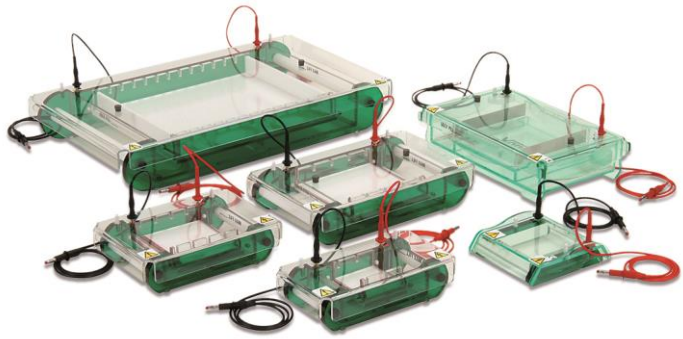
N576.1 MIDI-1 Electrophoresis Unit

AE17.1 VARIA 1-Electrophoresis Unit

HP70.1 MIDI-PLUS-Electrophoresis Unit

N596.1 u. N618.1 MIDI-2 Electrophoresis Unit

N610.1 u. N619.1 MAXI-Electrophoresis Unit



Warning: Like all apparatus run by electricity these units are capable of delivering potentially lethal voltage when connected to a power supply. They should be operated only by qualified technically trained personnel.
The horizontal electrophoresis units from ROTH are designed for long term laboratory use and to obtain reproducible results. Please spend a few moments reading the instruction manual thoroughly.

These units comply with the statutory CE safety rules:
73/23/EEC: Low voltage directive: IEC 1010-1:1990 plus amendment 1:1992
EN 61010-1:1993/BS EN 61010-1:1993

Please verify, that you received the unit completely and without any damage. Any faults or losses have to be reported to ROTH immediately. ROTH can not accept responsibility for goods, that were sent back without informing them.

Please take a look at the packing list and check whether all components and accessories are present

Please retain all packaging material until the warranty period has expired.

SPECIFICATION

Technical features

- Durable acrylic construction
- All acrylic joints chemically bonded
- Doubly insulated cables, rated safe up 1000 volts
- Gold plated electrical connectors, corrosion-free and rated safe up to 1000 volts
- Recessed power connectors, integral with the safety lid
- 0.2 mm diameter platinum electrodes, 99.99 % pure
- Removable UV transparent gel casting trays
- Additional gel casting units
- Combs colour coded for thickness: 1.0 mm – white, 1.5 mm – red, 2.0 mm - blue
- Most combs adjustable in height

Environmental Conditions

- This apparatus is intended for indoor use only.
- The unit can be operated safely at an altitude of 2000 m.
- The normal operating temperature range is between 4 °C and 65 °C.
- Maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C.

All ROTH products are supplied having passed rigorous quality control procedures.
For additional questions please give us a call: ++49-721-5606-0

PACKING LIST

Art. No.	Unit	Buffer Chamber	Safety Lid with Integr. Cables	Gel Casting Tray (1) B x L (cm)	Gel Casting Gates (2)	Combs(2)
N817.1	MINI easy	+	+	8 x 10	+	1.5 mm, 8 teeth
N562.1	MINI	+	+	6 x 7.5	-	1 mm, 8 teeth
N576.1	MIDI 1	+	+	10 x 11.5	-	1 mm, 16 teeth
AE17.1	VARIA 1	+	+	10 x 15	+	1 mm, 15 teeth
HP70.1	MIDI-PLUS	+	+	15 x 15	+	1 mm, 16 teeth
N596.1	MIDI 2	+	+	20 x 20	+	1 mm, 16 teeth
N610.1	MAXI	+	+	25 x 30	+	1 mm, 26 teeth

Tab.1 Operational data

Art. No.	normal operating voltage (V)	normal operating current (mA)	approx. gel volume (ml)	approx. buffer volume (ml)	electrode distance (mm)
N817.1	70-90	50	40	50	100
N562.1	70-90	75	20	325	130
N576.1	75-125	100	60	450	145
AE17.1	75-150	100	50-150	700	235
HP70.1	100-125	100	100	1200	220
N596.1	150-175*	200	200	2200	340
N610.1	150-200*	250	380	3000	370

* Plus 50 volts for cooled version

USING THE HORIZONTAL GEL ELECTROPHORESIS UNITS

A. Safety Precautions

Please read the entire instruction manual thoroughly before using the apparatus.

Always isolate electrophoresis units from their power supply before removing the safety cover.
Isolate the power supply from the mains first then disconnect the leads.
Do not exceed the maximum operating voltage or current (see table 1).

Please wear always protective gloves while working.

Do not fill the unit with running buffer above the maximum fill lines.
Do not move the unit when it is running.

CAUTION: During electrophoresis very low quantities of various gases are produced at the electrodes. The type of gas produced depends on the composition of the buffer employed.
To disperse these gases, make sure that the apparatus is run in a well ventilated area.

B. General Care and Maintenance

Clean the apparatus with distilled water only.
Important: Acrylic plastic is not resistant to aromatic or halogenated hydrocarbons, ketones, esters, alcohols (over 25 %) and acids (over 25 %), they will cause „crazing“ especially of the UV transparent plastic and should not be used for cleaning. Do not use abrasive creams or scourers.

Dry components with clean tissues prior to use, e.g. ROTH tissues (Art. No. 0087.1)

Before use, and then on a monthly basis, check the unit for any leaks at the bonded joints. Place the unit on a sheet of dry tissue and then fill with distilled water only to the maximum fill line. Any leakage is seen do not attempt to repair or use the apparatus, but notify Carl Roth GmbH & Co. KG immediately.

The replacement platinum electrodes are partially shrouded for protection. However, when cleaning the main tank do not use cleaning brushes in the electrode area. Usually a thorough rinse with distilled water is all that is required.

Ensure that the connectors are clean and dry before usage or storage.

Filling the Base Cooling unit (only for units with base cooling core)
The base cooling core can be used in two ways. Static cold water can be used as a simple heat sink or the tank can be actively regulated using flowing water from a tap or a water bath.

Static Temperature Regulation
1. Attach a short length of rubber hose to each connector.
2. Fill the cooling device with fully-desalinated water containing 0.02% sodium azide or water preservative.
3. Hold the unit in a tilted position and close the tubes with strong clamps.
4. The unit can be cooled to 4 °C prior to electrophoresis. Attention: Do NOT freeze!

Active Temperature Regulation:
1. Connect one tube with the water tap. Fix the other tube to the sink ensuring that it doesn't slip. Alternatively, both tubes can also be connected to the feed inlet and outlet of the cooling water bath.
2. The maximum recommended water flow is 1 litre / min. Do not exceed this figure.
3. If you are using a circulating water bath, which exceeds this flow rate you can attach a T-connector in line. One branch of the connector can return water to the bath and the other can flow to the cooling core and incorporate a flow regulator such as an adjustable tubing clamp.
   Measure and adjust the flow rate before attaching the line to gel unit.

Storing the water-cooled units
Should storage be necessary for a few days only (e.g. over the weekend), the water-cooled units can remain connected to the cooling water. Please take care, however, that the water supply has been turned off tightly. If the unit is being operated with a stagnant water tank (with 0.02% sodium azide), it can be covered up and stored with the cooling water. In case any algae forms, fill the cooling water tank with a neutral disinfectant and allow it to react overnight. Please rinse the cooling device thoroughly with clear water before using the unit again and fill it with fully-desalinated water (with sodium azide or a stabilizer). In case the unit is to be stored away for a longer period, please disconnect the tubes and allow the water to drain off. Assemble the machine to dry for a day.

C. Gel Pouring

1. Sealing by turning the gel casting tray (MINI, MIDI 1, MIDI 2)

Make sure that the silicone rubber gasket is in position.

Carefully place the casting tray sideways into the gel unit so that the gaskets form a seal with the sides of the running unit. Push the casting tray down onto the gel platform. Position the required comb(s) into the slot(s) in the gel casting tray. Place the gel unit on a level surface, or use the ROTH levelling table (Art. No. N854.1).

Pour in the agarose to the required height (approx. 5 mm).
Important: Ensure that agarose has cooled to between 50 °C and 60 °C to prevent apparatus distortion.
Allow the agarose to set, ensuring that the gel remains undisturbed.

Carefully remove the gel casting tray from the running unit. We recommend further polymerisation of the agarose gel for approx. 10 min. in the refrigerator.

Remove the end silicone rubber gaskets.
Place the gel casting tray in the running position in the gel unit. Please ensure the correct running direction from cathode (negative pole, black) to anode (positive pole, red).

Submerse the gel in running buffer to the required depth. Do not fill above the maximum fill line.
Carefully remove the comb(s).

2. Sealing by gel casting gates (MINI*easy*, PLUS, VARIA 1, MAXI)

Insert the gel casting gates into the grooves at the side of the gel casting tray. Place the gel casting tray on a flat surface or use the Roth levelling table (Art. No. N854.1).
Insert the appropriate comb into the grooves. Cool the agarose down to 50-60 °C in order to avoid leaking of the gel during pouring and any damage to the chamber. Pour the agarose to the desired height (approx. 5 mm).
Regarding the VARIA 1: Since the gel casting gates are made of metal, the warm agarose may cause them to move slightly in the groove, resulting in leaking of some gels. We, therefore, recommend the following procedure: In order to seal and fix the casting gates, draw a streak of agarose using a Pasteur pipette at the inside of the casting gates, just where they have contact with the plastic of the gel tray. Wait for ca.10 seconds for polymerisation of this agarose streak, then pour the gel.

Do not move the casting tray until the gel has polymerised. We recommend further polymerisation of the agarose gel for approx. 10 min in the refrigerator. Place the gel casting tray and agarose gel into the electrophoresis chamber and submerse the gel in running buffer.

Important.
When working with the MINI*easy* unit (N817.1):
As the chamber is only suitable for speedy analysis, do not feed a high operating voltage (cf. Fig. 1 operational data on side 3), or in the event of higher voltage, only carry out the electrophoresis for a short period of time (e.g. 20 min). Avoid severe heating of buffer.
If required, cooled buffer may be used or the ionic strength may be increased for separation (2 x TAE or 2 x TBE as gel buffer and running buffer).
Remove the gel casting gates and comb carefully.

D. Running the Gel

Because of the numerous applications now being used in horizontal gel electrophoresis, no specific running conditions are given. As a guide to obtain the optimum resolution of DNA fragments, agarose gels should not be run greater than 5 V / cm. Specific protocols are available in the numerous laboratory handbooks and publications.

Add gel loading buffer to the DNA-samples and load the samples into the wells.
Replace the lid correctly before connecting the leads to the power supply.

Set the voltage and current to suit the electrophoretic application.
Important:
Do not exceed the recommended voltage or current as this may result in poor band resolution and may result in damage to the unit. More information provides **„Table 1 Operational“** in this manual.

Long runs may require buffer re-circulation, to prevent over heating and or buffer depletion.
Important:
When re-circulating buffer, remember that the buffer flowing through the tubing is live.
Take all necessary precautions.

E. At the End of the Run

Turn the power supply settings to zero, turn off mains supply and disconnect the power leads.

Remove safety lid at the end of the run and take gel tray out of the chamber for staining. Since all gel casting trays are UV-permeable, staining can occur without removing the gel from the tray.

Rinse the apparatus with distilled water only after the run (see section: **B General Care and Maintenance**).

Ensure that the connectors are clean and dry before usage or storage.

F. Additional Items and Reagents

Agaroses:

Standard	3810
NEEO ultra-quality	2267
Agarose-Tablets	HP67
Broad Range (for all fragment lengths)	T846
GTQ (gene technique quality – for DNA elution)	6352
Agarose HR-PLUS (for fragm. of 100 – 3000 bp)	HP30
High Resolution (for small fragment lengths)	K297
Low Melt (for gel elution and in-gel-applications) ()	6351
Agarose LM/PCR (Gel elution of fragm. < 1500 bp)	HP31
Agarose Super LM (particularly low melting temp.)	HP45
Synergel™ (Agarose additive for even better band resol.)	0184

Gel Loading Buffers:

ROTI®Load DNA 6x (Glycerol / Ficoll)	X904 / X905
ROTI®Load DNA short run 6x (with Glycerol)	0095
ROTI®Load DNA 1x (with Glycerol)	0100
ROTI®Load DNA short run 1x (with Glycerol)	0099
ROTI®Load DNA small (with Glycerol)	HP03
ROTI®Load DNA orange 1 (with Glycerol)	HP04
ROTI®Load DNA orange 2 (with Glycerol)	HP05
ROTI®Load DNA tricolor (with Glycerol)	HP06
ROTI®Load DNAstain 1 SYBR® Green (for fragments > 500 bp)	1CN5
ROTI®Load DNAstain 2 SYBR® Green (for fragments 100-2000 bp)	1CN6
ROTI®Load DNAstain 3 SYBR® Green (for fragments < 500 bp)	1CN7

Gel Running Buffers:

ROTIPHORESE®- 10 x TBE-Buffer	3061
ROTIPHORESE®- 10 x TAE-Buffer	T845
ROTIPHORESE®- 10 x TAE-Buffer *light* (for gel elution)	0122

DNA Markers: Please call ++49-0721-5606-0 for our brochure on DNA Markers

Staining reagents:

Ethidium bromide solution 1 % (10 ml)	2218
Ethidium bromide solution 0.5 % in dropper bottle	HP46
Ethidium bromide solution 0.025 % in dropper bottle	HP47
Ethidium bromide	7870
ROTI®GelStain (green fluorescent dye, substitute for eth. bromide)	3865
ROTI®GelStain Red (red fluorescent dye, substitute for eth. bromide)	0984
SYBR® Green DNA dye (green fluorescent dye, substitute for eth. bromide)	1CN2
Methylene blue staining solution	0648
Methylene blue	A514

SEKUROKA® Decon Bags (for removal of 125 mg eth. bromide from solutions)	T856

N854.1 Levelling Table

Carl ROTH levelling tables enable casting of horizontal gels of equal thickness, featuring easy-to-turn rotating feet on the corners.

Tables also have an air bubble in the center for precise horizontal alignment.

G. Combs

Combs are made from High Density Poly Styrene

N817.1 MINI*easy* Electrophoresis Unit

Art. No.	thickness (mm)	no. of samples	tooth width (mm)	tooth spacing (mm)	max. volume**
N820.1	1	8	10	2	45
N821.1	1	12	6	2	27
N819.1	1	16	4	2	18
N823.1	1.5	8	10	2	65
N824.1	1.5	12	6	2	40
N822.1	1.5	16	4	2	27

N562.1 MINI Electrophoresis Unit

Art. No.	thickness (mm)	no. of samples	tooth width (mm)	tooth spacing (mm)	max. volume**
N564.1	1	8	4.5	2	20
N565.1*	1	12	2.5	2	11
N566.1	1	16	2.2	1	10
N568.1	1.5	8	4.5	2	30
N569.1*	1.5	12	2.5	2	17
N570.1	1.5	16	2.2	1	15
N572.1	2	8	4.5	2	40
N573.1*	2	12	2.5	2	22
N574.1	2	16	2.2	1	20

N576.1 MIDI 1 Electrophoresis Unit

Art. No.	thickness (mm)	no. of samples	tooth width (mm)	tooth spacing (mm)	max. volume**
N578.1	1	8	9	2.5	40
N579.1*	1	10	7	2	30
N580.1	1	12	5.5	2	25
N581.1	1	16	3.6	2	15
N582.1*	1	20	3	1.5	12
N584.1	1.5	8	9	2.5	60
N585.1*	1.5	10	7	2	45
N586.1	1.5	12	5.5	2	35
N587.1	1.5	16	3.6	2	25
N588.1*	1.5	20	3	2	20
N590.1	2	8	9	2.5	80
N591.1*	2	10	7	2	60
N592.1	2	12	5.5	2	50
N593.1	2	16	3.6	2	30
N594.1*	2	20	3	1.5	25

AE17.1 VARIA 1 Electrophoresis Unit

Art. No.	thickness (mm)	no. of samples	tooth width (mm)	tooth spacing (mm)	max. volume**
0085.1	1	10	12.8	2	64
0089.1	1	20	5.9	2	29
0090.1	1	25	3.2	2	17
0091.1*	1	30	2.5	2	12
0105.1	1.5	20	5.9	2	43
0106.1	1.5	25	3.2	2	25
0128.1	2	20	5.9	2	58
0129.1	2	25	3.2	2	34

* compatible with multi-channel pipettors **in case of 5 mm high gels

HP70.1 MIDI-PLUS Electrophoresis Unit

Art. No.	thickness (mm)	no. of samples	tooth width (mm)	tooth spacing (mm)	max. volume**
HP73.1***	1	1+1	138	2	-
HP74.1***	1	2+1	68	2	-
HP75.1***	1	4+1	33	2	-
HP76.1	1	10	12.8	2	64
HP77.1*	1	16	6.4	2	32
HP78.1	1	20	5.9	2	29
HP79.1	1	25	3.5	2	17
HP80.1*	1	30	2.5	2	12
HP81.1***	1,5	1+1	138	2	-
HP82.1***	1,5	2+1	68	2	-
HP83.1***	1,5	4+1	33	2	-
HP84.1	1.5	10	12.8	2	96
HP85.1*	1.5	16	6.4	2	48
HP86.1	1.5	20	5.9	2	43
HP87.1	1.5	25	3.5	2	25
HP88.1*	1.5	30	2.5	2	18
HP89.1***	2	1+1	138	2	-
HP90.1***	2	2+1	68	2	-
HP91.1***	2	4+1	33	2	-
HP92.1	2	10	12.8	2	128
HP93.1*	2	16	6.4	2	64
HP94.1	2	20	5.9	2	58
HP95.1	2	25	3.5	2	34
HP96.1*	2	30	2.5	2	24

N596.1 & N618.1 MIDI 2 Electrophoresis Unit

Art. No.	thickness (mm)	no. of samples	tooth width (mm)	tooth spacing (mm)	max. volume**
N597.1	1	16	8.5	3	35
N598.1*	1	20	7	2	30
N599.1	1	28	4.8	2	20
N600.1*	1	40	2.75	2	13
N601.1	1.5	16	8.5	3	55
N602.1*	1.5	20	7	2	45
N603.1	1.5	28	4.8	2	30
N604.1*	1.5	40	2.75	2	19
N605.1	2	16	8.5	3	75
N606.1*	2	20	7	2	60
N607.1	2	28	4.8	2	40
N608.1*	2	40	2.75	2	25

N610.1 & N619.1 MAXI Electrophoresis Unit

Art. No.	thickness (mm)	no. of samples	tooth width (mm)	tooth spacing (mm)	max. volume**
N611.1*	1	26	7	2	30
N612.1*	1	52	3	1.5	13
N613.1*	1.5	26	7	2	45
N614.1*	1.5	52	3	1.5	20
N615.1*	2	26	7	2	60
N616.1*	2	52	3	1.5	25

*compatible with multi-channel pipettors **in case of 5 mm high gels
***comb with especially broad wells + narrow marker well (for preparative gels)

H. Accessories

Unit	Gel Casting Tray	Gel Casting Gates (2)
MINI easy	-	N818.1
MINI	N575.1	-
MIDI 1	N595.1	-
VARIA 1 (7 x 15 cm)	AE74.1	3690.1
VARIA 1 (10 x 15 cm)	AE75.1	3690.1
VARIA 1 (15 x 15 cm)	AE76.1	3690.1
VARIA 1 (20 x 15 cm)	AE77.1	3690.1
MIDI-PLUS	HP71.1	HP72.1
MIDI 2	N609.1	T812.1
MAXI (25 x 30 cm)	N617.1	T813.1

I. Trouble shooting

Gel leaks during casting
- Please check that the rubber seals on the gel casting tray and gel casting gates are tight.

Air bubbles in gel during casting
- Remove the bubbles **immediately** with a comb or spatula.
- Ensure that the agarose is boiled well before casting to degas it. In the event of a significant reduction in total volume, fill up with desalted water and boil again briefly.

Gel does not polymerise completely
- The agarose wasn't dissolved / boiled thoroughly enough or the temperature during polymerisation was too warm. Allow the gel to harden for 10 minutes in the refrigerator.

Gel doesn't run / no air bubbles on the electrodes
- Check all connections, plugs and switches. Ensure that the level of the buffer is just above the top side of the gel.

Samples do not run cleanly out of the wells
- The wells were damaged. Pull the combs out even more carefully and cover the gel beforehand with a thin layer of running buffer.
- The bottom of the wells are damaged. Insert the comb in such a way that there is more space between the comb and the bottom of the gel casting tray.
- The DNA-samples contained debris.

Air bubbles appear in the gel during the run
- The agarose was not degassed thoroughly enough. This is particularly important when working with highly concentrated gels. Please ensure that the agarose is boiled well before casting to degas it. In the event of a significant reduction in total volume, fill up with desalted water and boil again briefly.

Bands are not straight, the border of the run shows a curve
- The agarose was not polymerised evenly.
- The gel is uneven in height. Please ensure that the gel casting tray lies flush during polymerisation. Use the levelling table.

Vertical smears in bands
- The gel mix may have contained dirt particles. Using clean water, additionally rinse the glass vessels before preparing the agarose.
- Too much DNA was applied. Dilute the sample.

Bands are diffuse

- A very high voltage may reduce the running time, but this results in poorer separation of the DNA. Reduce the voltage during the run.
- Running capacity of buffer was exceeded. Use a fresh buffer and check the buffer stock solution.
- The agarose wasn't dissolved / boiled thoroughly enough or the temperature during polymerisation was too warm. Allow the gel to harden for 10 minutes in the refrigerator.

MINI*easy*	**Electrophoresis Unit incl. accessories**	**N817.1**
MINI	**Electrophoresis Unit incl. accessories**	**N562.1**
MIDI-1	**Electrophoresis Unit incl. accessories**	**N576.1**
VARIA-1	**Electrophoresis Unit incl. accessories**	**AE17.1**
MIDI-PLUS	**Electrophoresis Unit incl. accessories**	**HP70.1**
MIDI-2 Standard	**Electrophoresis Unit incl. accessories**	**N596.1**
MAXI Coolable	**Electrophoresis Unit incl. accessories**	**N618.1**
MAXI Standard	**Electrophoresis Unit incl. accessories**	**N610.1**
MAXI Coolable	**Electrophoresis Unit incl. accessories**	**N619.1**

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sse 06/2021