Otoflash G171

UV-flash curing device

Instruction Manual

Index

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MKT-19118-Ver1-08/23

1) Device description

The Otoflash G171 device may be used for the curing of light-curable resins light-induced polymerization. There are 2 bottom-mounted flash-lamps, operating at a frequency of 10 flashes per second.

Compared to polymerisation through continuous exposure, the curing by means of flashes of light has the following advantages:

1.) At the same radiation dosage, the light intensity is between 1,000 to 10,000 times higher (for the duration of the flash period of approximately 200 µs). Due to the higher intensity, a correspondingly greater amount of free radicals are formed so that, subsequently, there are more opportunities for recombination of the excited molecules. As a result, longer polymer chains are formed and fewer residual monomers remain as compared to other sources of light. This, in turn, leads to better biocompatibility. Furthermore, the process leads to improved physical characteristics such as a higher Young's modulus and a higher Vickers hardness. The high intensity of the flashes also allows deeper penetration into the polymerization material as a sufficiently large number of excited light quanta reach deeper layers. This is particularly important for opaque materials.

Moreover, flash curing devices perform the curing process more quickly compared to other devices. For example, compared to fluorescent tube devices, the curing may be up to 10 times faster.

2.) Wavelengths of the light generated in the flashes spans across 280-700 nm. By covering such a large part of the electromagnetic spectrum, the excitation of all common photo-initiators is ensured, regardless of material manufacturer, thereby avoiding that the photo-initiator and the light curing device are not matched to each other.

3.) The use of protective gas offers further advantages: by using protective gas (principally nitrogen gas, N_2) during the curing process to displace the oxygen in the polymerization chamber, curing of the material without development of an inhibition (or adhesive) layer at the surface is ensured. This, in turn,
- eliminates the need for further steps to later remove the inhibition (or adhesive) layer,
- produces a harder, more scratch-resistant surface,
- produces a smoother and more accurately fitting surface (of particular importance in the production of precise cast pieces in dental, jewellery or industrial applications), and
- reduces the amount of residual monomers at the surface, improving bio-compatibility.

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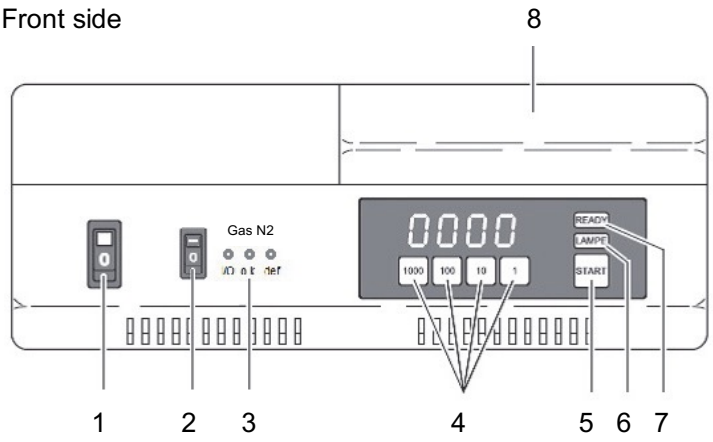
2) Initial operation of device

Before initial operation, adjust the device to the correct voltage using the voltage selector switch on the back of device (12).

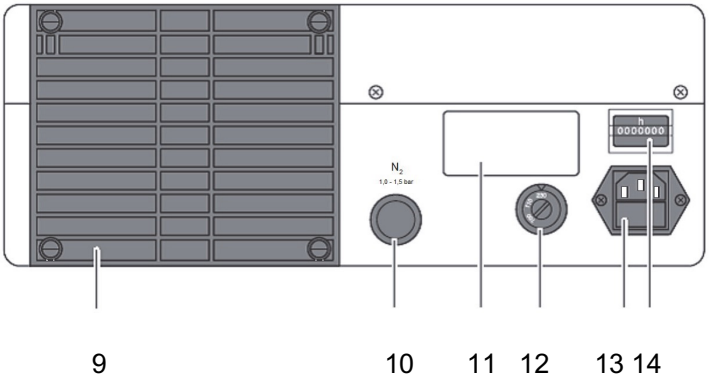
When moving the Otoflash device from colder to warmer ambient temperature (e.g. transport during winter), allow the device to acclimatize for a minimum of 2 hours before switching it on (otherwise risk of flash-overs inside the device).

Front side



(1) Main switch
(2) Protective gas switch
(3) Protective gas display
(4) Display with keypad
(5) Start button
(6) Lamp control light
(7) Ready indicator
(8) Polymerisation chamber

Rear side



(9) Fan
(10) Quick coupling plug
(11) Type plate
(12) Voltage selector switch (100, 115, 230 V)
(13) Power socket with fuse
(14) Operating hour counter

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3) Important notes

- **Switch the device off and disconnect it from the power supply before carrying out any services or maintenance work (danger due to electric shock!)**

- **Do not, under any circumstances, look directly into the radiation of the flash-lamps (risk of damage to eyes).**

- **Extended periods of irradiation may cause the polymerization chamber to heat up. Therefore, it is recommended to wait a few seconds before opening the lid after the end of polymerization (the fan will continue to run).**

- **The device will only work when the flash module is completely inserted. Likewise, the lid must always be completely shut.**

- **Never operate the device without flash module.**

- **The dust filter behind the display on the front of the device should always be kept clean (risk of over-heating and contamination).**

- **Depending on how dirty the dust filter is, it should be cleaned or replaced regularly (see also point 7: Maintenance, cleaning, repair).**

4) Holding trays

There are 2 types of holding trays available: Trays with and trays without UVB-block.

The type of tray necessary to avoid yellowing of the workpiece, for example, depends on the resin you are using (please refer to requirements as specified by the manufacturer or distributor). Tray type numbers are marked on the top edges of trays:

Type 280N2 = Holding tray without UVB-block: Light with wavelengths in the rage of 280 to 700 nm can pass through the holding trays.
Type 360N2 = Holding tray with UVB-block: Light with wavelengths in the range of 360 to 700 nm can pass through the holding tray (light with wavelengths below 360 nm is blocked).

Important:

A tray insert is strictly necessary when operating the device using the protective gas function.

The holding trays are designed to be used with nitrogen (N_2). You must contact the device manufacturer (NK-Optik GmbH) if you intend to use a different inert protective gas (e.g. argon or carbon dioxide) to identify appropriate alternative trays.

Never use alcohol or alcohol-based cleaning products to clean the holding trays!

The holding trays have a limited lifetime due to the high-intensity irradiation they are subjected to. The trays should be replaced after approximately 50 hours of usage time. In addition to this, the trays should be replaced if they exhibit strong yellowing, or have been severely scratched or dirtied.

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5) Operation

Setting the timer

The device is switched on with the main switch (1). The green light indicator labelled “Ready” (7) will light up and 4-digit figure will appear on the display (4). This figure indicates the number of flashes. The number of flashes can be programmed any number between 0 and 9999 by pressing the buttons 1000, 100, 10 and 1.

Work mode

The programme is started by pressing the start button (5). The timer will start to count down with every flash. When the programmed number of flashes has been completed, an acoustic signal will sound three times and the word “End” appears on the display. Afterwards, the timer will be set to the initially programmed number of flashes again. Should the lid be opened during the process, the entire device will immediately be disconnected from the power supply (except the timer), the word “open” appears on the display and a long acoustic signal will sound. Thus, the programme can be interrupted at any time by opening the lid. After closing the lid again, the programme will return to the initially programmed number of flashes.

Error message

The red field on the display labelled “Lamp” (6) will light up if one or both of the lamps are defective.

Protective gas

Please refer to instructions under item 9: “Protective gas option” if using the protective gas option.

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6) Maintenance, cleaning, repair

- Air filter

The filter fleece (1) located directly behind the display (accessible when the lid is open) should be blown out by means of compressed air and replaced every 6 months at the latest.

- Cleaning

All external surfaces can be wiped with mild household cleaners or alcohol. But be careful: No liquids must enter the housing of the device or the power switches.

Never use alcohol or alcohol-based cleaning products to clean the holding trays!

The flash-module must only be blown-out by means of compressed air using slight over-pressure.

Never clean the flash-bulbs with cleaning agents or cloths! Only the reflector may be cleaned with a lint-free cloth.

- Service/Maintenance

Servicing may only be carried out by NK-Optik GmbH.

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Warning: Before carrying out any service or maintenance work, the device should be disconnected from the power supply (otherwise danger due to electric shock).

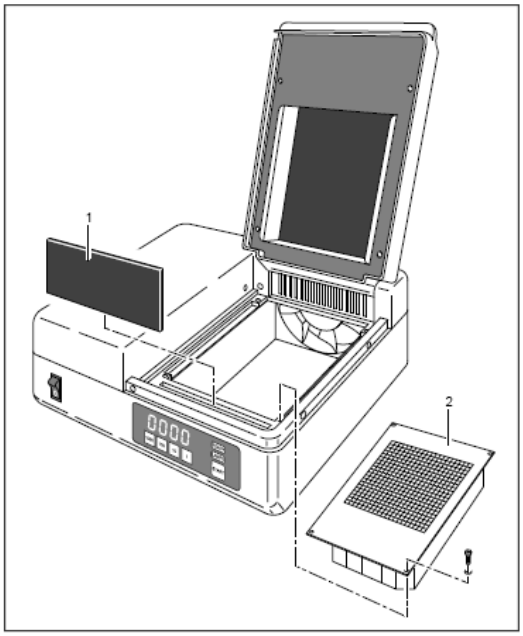
- The flash-bulbs can only be replaced by replacing the entire flash-module.
- If needed, allow old flash-bulbs to cool off by running the device in stand-by mode for approximately 1 minute.
- Disconnect the device from the power supply.
- Open the lid.
- Remove the 4 screws at the corners of the flash-module. Then, by placing your hands to the centre front of the flash-module (2) and gently wiggling it, pull up and remove the flash-module. You may use a flat screwdriver as a lever during the removal process. To do so, carefully wedge the screwdriver in the middle between the casing and the module and apply soft pressure to lift the module during removal). Carefully insert the new flash-module onto the contact carrier and replace the 4 screws.

Important:

The module must be inserted so that all individual electrical contacts fit tightly. Loose contacts run the risk of charring.

Never touch the flash bulbs with your bare fingers! Fingerprints and other marks may damage the glass surface during the flash process. If the flash bulbs were touched accidently, clean them immediately with either isopropyl alcohol or ethanol.

Disposal of the flash-bulbs: Used flash-bulbs are hazardous waste and must be disposed of in accordance with statutory regulations.



1 Air filter (to be cleaned regularly, see section 8)
2 Flash-module

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8) Transport, storing, disposal

- **Transport**

For transport and storing of up to 6 months, the following conditions apply:

Temperature: 0°C - 70°C
Relative humidity: 10% - 80%

Afterwards, values from operation conditions apply:

Temperature: + 10°C - 40°C
Relative humidity: 20% - 80%

- **Storing is only permissible in closed rooms.**

Protect device from humidity and wetness.
Do not expose device to strong jolts/shocks.

- **Disposal of the device:**

Once plastic parts and/or air grille are dismantled, floor and lid plates, as well as the anodized inner parts, flaps and tray are to be disposed of as metal waste. The rest is to be disposed of as electronic waste.

Environment relevant materials:

Component:	Material used:
Metal chassis parts:	Aluminium
Housing parts:	ABS
	Copper, iron, polyamide, polyurethane
Capacitors:	Aluminium, polypropylene, polyurethane, resin with castor oil
Conductor board:	Epoxy resin

The disposal is to occur in accordance with the respective national regulations.

Relevant disposal organizations are to be consulted.

All devices or components may also be sent back to the manufacturer for disposal purposes. In this case, shipping and handling has to be covered by sender.

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9) Protective gas option

When using the protective gas option, oxygen will be displaced from the polymerisation chamber. This prevents oxygen inhibition allowing workpieces to cure without an inhibition or adhesive residue layer at the surface (section 1, paragraph 3).

The following additional components are included in models with the Protective gas option:

On the back of the device: a quick coupling adapter (with a nominal diameter of 7.2 mm) for connection to a gas cylinder.

Warning: a pressure-regulating valve with a maximum adjustable pressure of 10 bar must be used. The maximum permitted pressure for the device is 8 bar.

Set the pressure-regulating valve to 1.0-1.2 bar and connect the device to the nitrogen gas container using a quick coupling (provided upon request - not included in the standard delivery).

A control panel for the protective gas option is situated on the front of the device between the main power switch and the display, comprising 1 switch and 3 LED displays).

Use the switch on this control panel to turn on the protective gas.

The switch has 3 operating positions:
- Position I (switch pointed upwards): green LED is illuminated
- Position II (switch in midway position): no LEDs are illuminated
- Position III (switch pointed down): no LEDs are illuminated

Position I (switch pointed upwards):
The protective-gas function, including pre-flooding of the polymerisation chamber (i.e. flushing of the chamber with nitrogen for a duration of 30 seconds prior to the curing process), is active.

Press the start button to initiate the pre-flooding process. Once the nitrogen flush is complete, the flash-light process begins. During the first 60 seconds of the flash-light process, the polymerisation chamber continues to be flooded with the protective gas.

While the protective gas-flow into the chamber is turned on, the yellow LED (labelled “ok”) is illuminated. In case of insufficient pressure (< 0.8 bar) or no gas flow, the yellow LED extinguishes and the red LED (labelled “def.”) lights up.

After a total of 90 seconds (30 seconds of pre-flooding and 60 seconds during the curing process) the protective gas flow stops automatically – the yellow LED extinguishes. The flow of nitrogen always stops upon completion of the programmed curing time, even if this time is less than 60 seconds.

Position II (switch in midway position):
The protective gas function is switched off. The start button now controls the flash-light process only.

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Position III (switch pointed down):
The protective gas option, without pre-flooding, is active. Press the start button to begin both the curing process and protective gas flow. The chamber continues to be filled with the protective gas for the entire duration of the curing process.

As in Position I, while the protective gas-flow into the chamber is turned on, the yellow LED (labelled “ok”) is illuminated. In case of insufficient pressure (< 0.8 bar) or no gas flow, the yellow LED extinguishes and the red LED (labelled “def.”) lights up.

Upon completion of the programmed curing time the flow of nitrogen is turned off.

Notes:

- Complete curing, in conjunction with the protective gas function, works only when the holding tray is inserted.
- Only use technical standard nitrogen gas, N_2, with a quality level of 2.6 (i.e., 99.6% purity) or higher (e.g. 3.0 at 99.9% or 5.0 at 99.999% purity) as protective gas for this device. Contact the device manufacturer (NK-Optik) before you intend to use any alternative inert gases for the protective gas function.
- The gas flow is about 10-11 litres per minute (when pressure-regulator is set to 1.0-1.2 bar).
- During the curing process the selected switch positions for the pre-flooding options of the polymerization chamber cannot be changed.

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10) Technical data Otoflash G171

Voltage:	100, 115, 230 Volts AC
Frequency:	50/60 Hz
Power consumption:	ca. 250 Watts
Dissipated power:	ca. 200 Watts
Flash frequency:	10 flashes per second
Life duration of flash bulbs	approx. 250 hours
Digital timer:	programmable from 1 to 9999 flashes
Size of polymerization chamber:	ca. 120 x 120 x 50 mm
Spectral distribution:	300 - 700 nm, maximum between 400 and 500 nm
Measurements:	ca. 310 x 310 x 140 mm
Weight:	ca. 6,5 kg
Protective gas option:	- nitrogen N2, minimum quality 2.6 or higher - pressure: 1.0-1.2 bar - flowrate: approx. 10 l/min
Consumables:	- flash-module Art.-No. 171.09-LM - holding tray, Art.-No. 360N2, material: PMMA, with UVB-block/transparent 360-700 nm - holding tray, Art.-No. 280N2, material: PMMA, without UVB-block/transparent 280-700 nm - air filter Art.-No. 171.11-LF
Accessories:	- cylinder regulator/ pressure reducing valve, designed for N2-gas bottles with max. 200 bar - housing tube, inner diameter Ø 6 mm - quick coupling NW 7,2 mm

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Status: September 2018, Rev.-No. 03