MAQUET
GETINGE GROUP

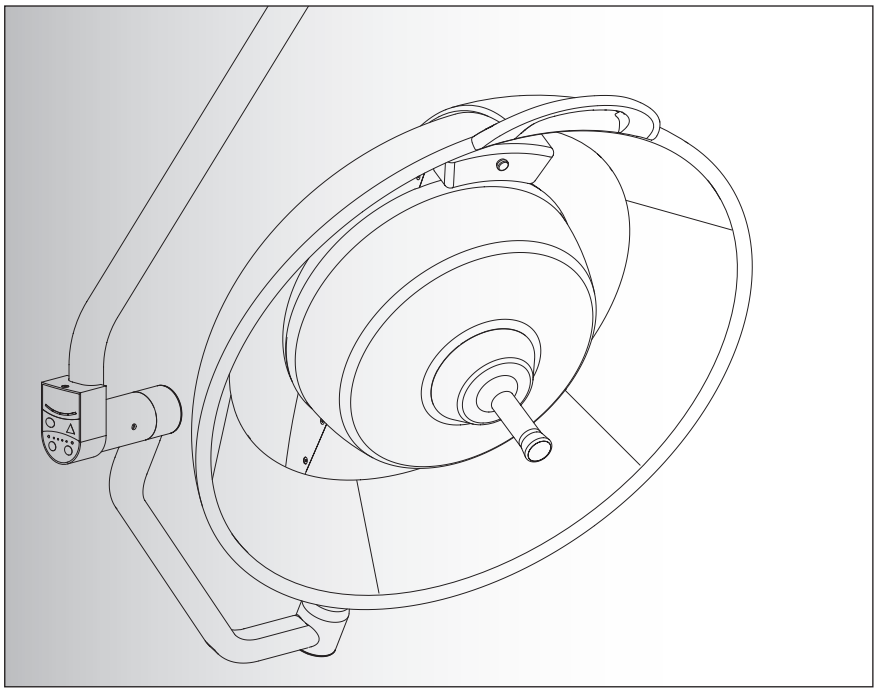
Evolution

Surgical light

手术无影灯

User's manual EN

用户手册 ZH



G8e NU EN ZH 0138101 Ed1G 02/12

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INTRODUCTION

Dear customer,

Thank you for choosing the G8 Evolution surgical light.

MAQUET has designed this product line to ensure the most comfortable working conditions for surgical teams and optimal safety conditions for patients.

The G8 Evolution follows on from its illustrious predecessor, offering even more comfort and efficiency.

- new discharge bulb with ceramic burner, for improved colorimetry and service life
- new motorised bulb holder, enabling reversible switching between the main and backup bulbs
- new electronics, enabling motorised bulb holder control
- new optical filters, reducing the energy radiation particularly in backup mode
- new mirrors, identical for improved spot definition
- new hinged aluminium bulb access hatch, for an improved finish and ergonomics when replacing bulbs
- new product colour for compatibility with the new accessories.

Please read this manual thoroughly in order to fully understand the features of your G8 Evolution light and maintain it properly.

Do not hesitate to contact MAQUET if you have any questions about the G8 Evolution surgical light or our other products.

简介

尊敬的用户：

非常感谢您选择 G8 Evolution 手术无影灯。

MAQUET 设计的这款产品旨在为手术组提供最舒适的工作环境，最大限度地保证患者安全。

G8 Evolution 继承了其前身产品的卓越优点，更加舒适高效。

- 配备陶瓷点火器的新型放电灯泡，色度更佳，使用寿命更长
- 全新自动灯座，可以逆向切换主灯泡和备用灯泡
- 新型电子装置，可自动控制灯座
- 新型滤光器，可以降低能量辐射（尤其是在备用模式下）
- 新型反射镜，一致的反射效果可以提高光斑清晰度
- 新型铰链式铝制灯泡检查孔，使灯泡更换更简便，符合人机工程学
- 新颖的产品颜色，与新配件更相配。

请仔细阅读本手册，充分了解 G8 Evolution 手术无影灯的特性并对其进行正确的维护。

如果您对 G8 Evolution 手术无影灯或我们的其他产品有任何疑问，请随时联系 MAQUET。

QUALITY STANDARDS COMPLIANCE

Certification of MAQUET SA quality system

LNE/G-MED certifies that the quality system developed by MAQUET SA for design, implementation, sales, installation and after-sales service of surgical lights complies with the requirements of the following international standards:

• ISO 9001:2000

• NF EN ISO 13485:2004

Reference standards

The HLX 3000 surgical light was designed to comply with the following standards:

• EN ISO 14971:2000 Medical devices - Application of risk management to medical devices (ISO 14971:2000)

• EN ISO 14971:2000/A1:2003

• EN 60601-1:1990 Medical electrical equipment - Part 1: General requirements for safety
Amendment A1:1993 to EN 60601-1:1990
Amendment A2:1995 to EN 60601-1:1990
Amendment A13:1996 to EN 60601-1:1990

• EN 60601-1-2:2001 Medical electrical equipment - Part 1-2: General requirements for safety - Collateral standard: Electromagnetic compatibility - Requirements and tests

• EN 60601-1-4:1996 Medical electrical equipment - Part 1-4: General requirements for safety - Collateral standard: Programmable electrical medical systems
Amendment A1:1999 to EN 60601-1-4:1996

• EN 60601-1-6:2004 Medical electrical equipment - Part 1-6: General requirements for safety - Collateral standard: Usability

• EN 60601-2-41:2000 Medical electrical equipment - Part 2-41: Particular requirements for the safety of surgical luminaires and luminaires for diagnosis

CE Marking/Intended use

Compliance with the requirements of Directive 93/42/EEC relating to medical devices has been assessed and approved by LNE/G-MED. The G8 Evolution surgical light is a class I device in accordance with Annex IX of Directive 93/42/EEC.

The range includes single, double or triple ceiling-mounted configurations, with or without a pre-installed video system (HANAUVISION). Possible options include a double fork, flat screen support and separate camera support.

采用的质量标准

MAQUET SA 质量体系认证

MAQUET SA 为其手术无影灯的设计、制造、销售、安装和客户服务而建立的质量体系经过 LNE/G-MED 认证，符合以下国际标准:

- ISO 9001: 2000
- NF EN ISO 13485: 2004

参考标准

HLX 3000 手术无影灯符合以下标准:

- EN ISO 14971:2000 医疗器械 - 风险管理对医疗器械的应用 (ISO 14971:2000)
- EN ISO 14971:2000/A1:2003
- EN 60601-1:1990 医用电气设备 - 第 1 部分: 通用安全要求
  Amendment A1:1993 to EN 60601-1:1990
  Amendment A2:1995 to EN 60601-1:1990
  Amendment A13:1996 to EN 60601-1:1990
- EN 60601-1-2:2001 医用电气设备 - 第 1-2 部分: 通用安全要求 - 并列标准: 电磁兼容性 - 要求和试验
- EN 60601-1-4:1996 医用电气设备 - 第 1-4 部分: 通用安全要求 - 并列标准: 可程序化的医用电气设备
  Amendment A1:1999 to EN 60601-1-4:1996
- EN 60601-1-6:2004 医用电气设备 - 第 1-6 部分: 通用安全要求 - 并列标准: 可用性
- EN 60601-2-41:2000 医用电气设备 - 第 2-41 部分: 外科手术灯和诊断用灯的安全专用要求

CE 标志/用途

经过 LNE/G-MED 的评估和认可，符合医疗器械指令 93/42/EEC 的要求。本 G8 Evolution 手术无影灯属于一级设备，符合 93/42/EEC 指令附录 IX 的要求。

本产品包括单头、双头或三头吊顶式配置，有些配有摄像装置 (HANAUVISION)。可选配件包括双固定夹、液晶监视器支架和外置摄像头支架。

SYMBOLS USED ON PRODUCT

产品上使用的符号

Symbol/ 符号	Meaning	含义
	**Danger:** read the documentation for the unit thoroughly.	危险：请仔细阅读本设备手册。
REF. SN.	Technical designation and serial numbers	技术指定和序列号
	CAUTION: Hot surface	注意：表面烫手
	This device must not be disposed of with domestic waste as it is subject to selective collection measures leading to reuse or recycling	本设备需要进行选择性收集以重新使用或回收，不得与生活垃圾一起处理
CE	**CE label:** The device complies with the requirements of European Directive 93/42/EEC relating to medical devices	CE 标志：本设备符合欧盟指令 93/42/EEC 中有关医疗设备的要求。

SYMBOLS USED IN MANUAL

本手册中使用的符号

Symbol/ 符号	Meaning	含义
	**Mandatory:** may endanger patient or user safety	强制要求：可能危害患者或用户的安全
	**Recommendation:** risk of damage to unit or accessories	建议：有损坏设备或配件的风险
	**Environment**: notes on disposal	环保：废弃处理提示
CE	**CE label:** The device complies with the requirements of European Directive 93/42/EEC relating to medical devices	CE 标志：本设备符合欧盟指令 93/42/EEC 中有关医疗设备的要求。

WARNINGS

Light energy can potentially dry tissue. Users must adapt lighting levels to the needs of the operation to be performed, in particular when several cupolas are used in combination.

Do not look directly at the light source due to its high intensity.

In the event of a power failure, only cupolas connected to a backup power supply system will remain operational.

When changing a blown bulb:
- Switch off the power supply and leave the cupola to cool with the cover open for 45 minutes.
- Only use the recommended model of MAQUET bulb.
- Handle bulbs carefully using a clean, dry cloth.
- Never touch bulbs with bare hands.

Grease on bulbs can shorten their life or even cause them to break.

Before each operation check that the sterilisable handle (light colour on black handle) is in place. During operations this handle must only be used by the surgical team in order to guarantee aseptic conditions.

After each sterilisation and before using the sterilisable handle again:
- Check that there are no cracks.
- Check that the handle operates correctly on the light.

Do not use the unit in the presence of inflammable anaesthetic gases.

The unit must be operated with the cover closed. When conducting maintenance, take appropriate precautions to avoid touching surfaces labelled as hot.

Dismantling certain elements may affect operation and safety.
Examples include:
- Servicing the electrical power supply,
- Servicing the suspension arm and balance system,
- Servicing the optical system of cupolas equipped with filters designed to eliminate radiation not visible to the patient. Surgical lights must never be used without these filters.

Do not use the surgical light suspension arm to suspend or lift objects. Do not hang on the light.

警告

光能可能使组织失水。用户必须根据手术需要调节灯的亮度，尤其在同时使用多个灯头时。

由于手术无影灯的光强度很高，所以请不要直视光源。

发生电源故障时，只有备用电源供电的灯头能继续工作。

更换报废灯泡的程序：
- 关闭电源，打开灯罩让灯头冷却 45 分钟。
- 仅使用推荐的 MAQUET 灯泡型号。
- 使用清洁的干布包裹灯泡，小心操作。
- 切勿用手直接接触灯泡。

油脂可能导致灯泡使用寿命缩短或破裂。

请在每次操作前检查可消毒手柄（黑色手柄的浅色部分）是否安放到位。操作期间，只允许手术组使用此手柄，以保证无菌环境。

在每次消毒之后和再次使用可消毒手柄之前：
- 确认手柄没有出现裂缝。
- 确认手柄可以在手术灯上正常操作。

切勿在有易燃麻醉气体的环境中使用本设备。

必须盖紧灯罩后方可使用本设备。进行维护时，请采取适当的预防措施避免接触标明烫手的表面。

拆除某些组件可能影响手术无影灯的功能和安全。例如：
- 维修电源时，
- 维修吊臂和平衡系统时，
- 维修灯头的光学系统时，这些灯头配有滤光器以消除病人看不见的辐射。必须有滤光器才可以使用手术无影灯。

切勿使用手术无影灯的吊臂悬挂或支撑物件。切勿在无影灯上悬挂物件。

Do not use in an MRI room.	请勿在核磁共振室中使用。
Certain light wavelengths may be incompatible with certain pathologies.	某些光的波长可能对某些疾病有害无益。
Fumigation methods are unsuitable for disinfecting the unit and must not be used.	熏蒸消毒法不适用于本设备，因此禁止使用。
In the event of a mains power failure, only the cupolas with power supplies connected to a backup power supply system will remain operational.	在主电源发生故障时，只有备用电源供电的灯头能继续工作。

1 INSTRUCTIONS FOR SAFE USE

Please note that certain operations may only be carried out by staff with the appropriate qualifications:

- **The ceiling unit may only be operated by trained medical staff.**
- This unit uses state of the art technology and is completely safe. Nevertheless dangers can arise, especially when it is operated by unqualified staff, when it is not well operated or not used as intended.
- **Cleaning of the appliance must be carried out by qualified sanitary specialists.**
- Please read these operating instructions carefully before using the unit. You will then enjoy all the advantages it can offer and protect yourself and others from harm.
- Please follow these instructions to train staff in the operation, care and safe use of the unit.
- The unit is only intended for use as mentioned in the operating instructions and is only suitable for such use. Any other use can be dangerous to life and limb and/or cause damage to the product or to other property of the operator.
- For safety reasons, no alterations or adaptations may be made on your own initiative without the agreement of MAQUET.
- For your safety, contact your supplier should any problems arise that are not fully addressed by these instructions.
- The contents of the user manual may be changed at any time without notice.

Additional equipment

- The models named in this document may be equipped with other manufacturers' end appliances (e.g. monitors). For information on operating them, please refer to each manufacturer's user manuals.

Transport and storage

- Ambient temperature: -25°C to 70°C
- Relative humidity: 10 to 75%
- Atmospheric pressure: 500 - 1060 hPa
- Do not store outside.
- Do not subject to severe vibrations.

1 安全使用说明

请注意，某些操作仅可由具备相应资格的人员执行。

- 吊顶装置仅可由受过培训的医务人员操作。
- 此设备采用一流技术，绝对安全可靠。然而，如果操作不当或者未用于设计用途，特别是由不具备相应资格的人员使用时，则可能发生危险。
- 设备的清洁工作必须由合格的专业卫生人员进行。
- 使用本设备前，请仔细阅读这些操作说明。这样，您就可以充分利用本设备的优势，保护自己和他人免受伤害。
- 请按照此处的说明对相关人员进行设备操作、维护和安全使用培训。
- 本设备仅设计用于本操作说明中所述之用途，且仅适用于这些用途。其他用途可能危及生命、损伤肢体，和/或损坏本产品或操作人员的其他财产。
- 为了安全起见，未经 MAQUET 许可，不得擅自进行变更或改装。
- 为了您的安全，如果出现这些说明不能完全解决的问题，请与供应商联系。
- 用户手册的内容可能随时修订，恕不另行通知。

其他设备

- 本文所述的产品型号可能与其他制造商的终端设备（如监护仪）配合使用。关于这些设备的使用信息，请参阅相应制造商的用户手册。

运输和储存

- 环境温度：-25°C 至 70°C
- 相对湿度：10% 至 75%
- 大气压力：500 – 1060 hPa
- 切勿露天存放。
- 切勿剧烈振动。

Operating conditions

- Ambient temperature: 10°C to 40°C
- Relative humidity: 30 to 75%
- Atmospheric pressure: 700 - 1060 hPa
- The appliance is not suitable for use in explosive atmospheres.
- G8 Evolution must be installed and commissioned in accordance with the EMC information provided on page 30.
- Portable RF communication devices may affect the operation of this equipment.
- The unit is designed for continuous operation.

Maintenance

- Maquet's warranty is only valid and the safety and integrity of the product are only guaranteed if:
  - All inspection, maintenance and repair operations are performed by Maquet engineers or trained and authorised technical support technicians.
  - Only original accessories, consumables and spare parts are used.

工作条件

- 环境温度：10°C 至 40°C
- 相对湿度：30% 至 75%
- 大气压力：700 – 1060 hPa
- 本设备不适于在有爆炸性气体的环境中使用。
- G8 Evolution 必须根据第 30 页所列的电磁兼容性信息进行安装和使用。
- 便携式射频通信设备可能影响本设备的运行。
- 本设备可连续工作。

维护

- Maquet 的保修仅在下列条件时有效，产品的安全性和完整性也仅在下列条件下才能得到保证:
  - 所有检查、维护和维修均由 Maquet 工程师或受过培训的授权技术支持人员执行。
  - 仅使用原装的附件、耗材和备件。

2 DESCRIPTION

2.1 Discharge lamps

The G8 Evolution surgical light is equipped with a discharge lamp for the main bulb and a halogen bulb for the spare bulb.

The use of a discharge lamp entails significant differences in operation compared with halogen lamps. The key parts are an electronic ballast housed in the cupola and a starter mechanism in the bulb holder.

2.2 Electronic ballast

The electronic ballast powers the bulb, ensuring the correct power supply voltage, automatically powering the spare bulb if the main bulb fails, counting the operating time of the main bulb and communicating with the control keypad.

2.3 Voltage source

The technical properties of discharge lamps are significantly different to those of halogen lamps. Halogen lamps are powered by a transformer at a constant voltage, whereas for discharge lamps the operating voltage varies depending on the operating conditions. The voltage supplied to the bulb is typically 20 V during the cold start-up phase, 80 V during normal operation, with peaks up to 20 kV during firing. In standby operation the ballast generates an output voltage of about 400 V.

For safety reasons, the entire power supply circuit is automatically cut off when the bulb change cover is open.

The voltage supplied to the discharge lamp in G8 Evolution units is controlled by the ballast.

This implies that the light output level provided by the G8 Evolution does not directly depend on the supply voltage – a major difference compared with conventional surgical lights.

2 说明

2.1 放电灯

G8 Evolution 手术无影灯为主灯泡配备了一个放电灯，为备用灯泡配备了一个卤素灯。

放电灯的使用与卤素灯大不相同。关键零件包括灯头中的电子镇流器和灯座中的起动装置。

2.2 电子镇流器

电子镇流器为灯泡提供电源，确保适当的电源电压；它自动在主灯泡发生故障时为备用灯泡供电，计算主灯泡的工作时间并与控制键盘通信。

2.3 电压电源

放电灯与卤素灯的技术特性存在显著的差异。卤素灯采用变压器以恒压供电，而放电灯的工作电压随工作条件而异。在冷起动阶段，为灯泡提供的电压通常为 20 V，正常工作期间电压为 80 V，点火时的峰值电压可达 20 kV。在待机操作时，镇流器可产生约 400 V 的输出电压。

为了安全起见，当换灯罩打开时，将自动切断整个电源电路。

G8 Evolution 设备内放电灯的电压由镇流器进行调节。

这表示 G8 Evolution 提供的光输出强度不会直接取决于电源电压 – 这是与传统手术无影灯的一个主要区别。

2.4 Specific light output level variation features

The light output level provided by the G8 Evolution is controlled solely by the ballast. Conventional external dimmers which reduce the power supply voltage will not work with this light unit as the ballast compensates the resulting voltage. Using an external dimmer may even be dangerous; if the supply voltage drops below the value which the ballast can compensate the discharge lamp will go out completely!

Accordingly the voltage supplied to the tube must always be > 24 V.

Discharge lamps have a slight reaction delay when the light output level is reduced using the keys on the control keypad. Once the light level has been adjusted, the chromaticity of the light differs somewhat from the full output level. Unlike halogen lamps, which contain a higher proportion of red light when their output level is reduced using a variator, the chromaticity of discharge lamps shifts towards green.

This difference is particularly noticeable if two G8 Evolution lights placed side by side are set to different light output levels.

It is therefore recommended that the light output level for G8 Evolution lights used in combination should be set to the same level.

2.5 Turning the light on and off (starter mechanism)

Discharge bulbs are lit by a trigger located on the bulb holder. They take several minutes to reach their intended brightness and colour.

Coloured flashes and strong colour deviations are completely normal when the lights are first turned on.

Unlike many other light units using discharge lamps, G8 Evolution surgical lights may be turned on even when hot and immediately reach their final brightness and colour.

A control keypad on the fork is used to turn the lamp on and off and vary its brightness. The keypad also comprises four indicator lights which show the service life of the main bulb. To avoid the light being turned off unexpectedly the Off button must be pressed and held for several seconds to turn off the lamp.

The service life of the bulb would be seriously reduced if turned off during the cold start-up phase. Accordingly, to protect the bulb, the light may only be controlled from the keypad once the bulb reaches its normal operating condition, after a hot or cold start-up (controls locked out for approx. 1 minute).

2.4 改变光输出强度的具体功能

G8 Evolution 提供的光输出强度仅由镇流器进行控制。由于镇流器可对产生的电压进行补偿，所以不用降低电源电压的传统外置调光器来调节该发光设备。使用外置调光器甚至会带来危险；如果电源电压降至镇流器可以补偿的值以下，放电灯将完全熄灭！

因此，向电子管提供的电压必须始终大于 24 V。

使用控制键盘上的按键降低光输出强度时，放电灯的反应略有延迟。一旦调节了光强度后，光的色度会与完全输出强度略有不同。使用变压器降低输出强度的卤素灯含有较高比例的红光，而放电灯则不同，它的色度会变为绿色。

如果将两个 G8 Evolution 手术无影灯并排放置并设置不同的光输出强度，这种差异尤其明显。

因此，建议组合使用 G8 Evolution 手术无影灯时将光输出强度设为一致。

2.5 打开和关闭手术灯（起动装置）

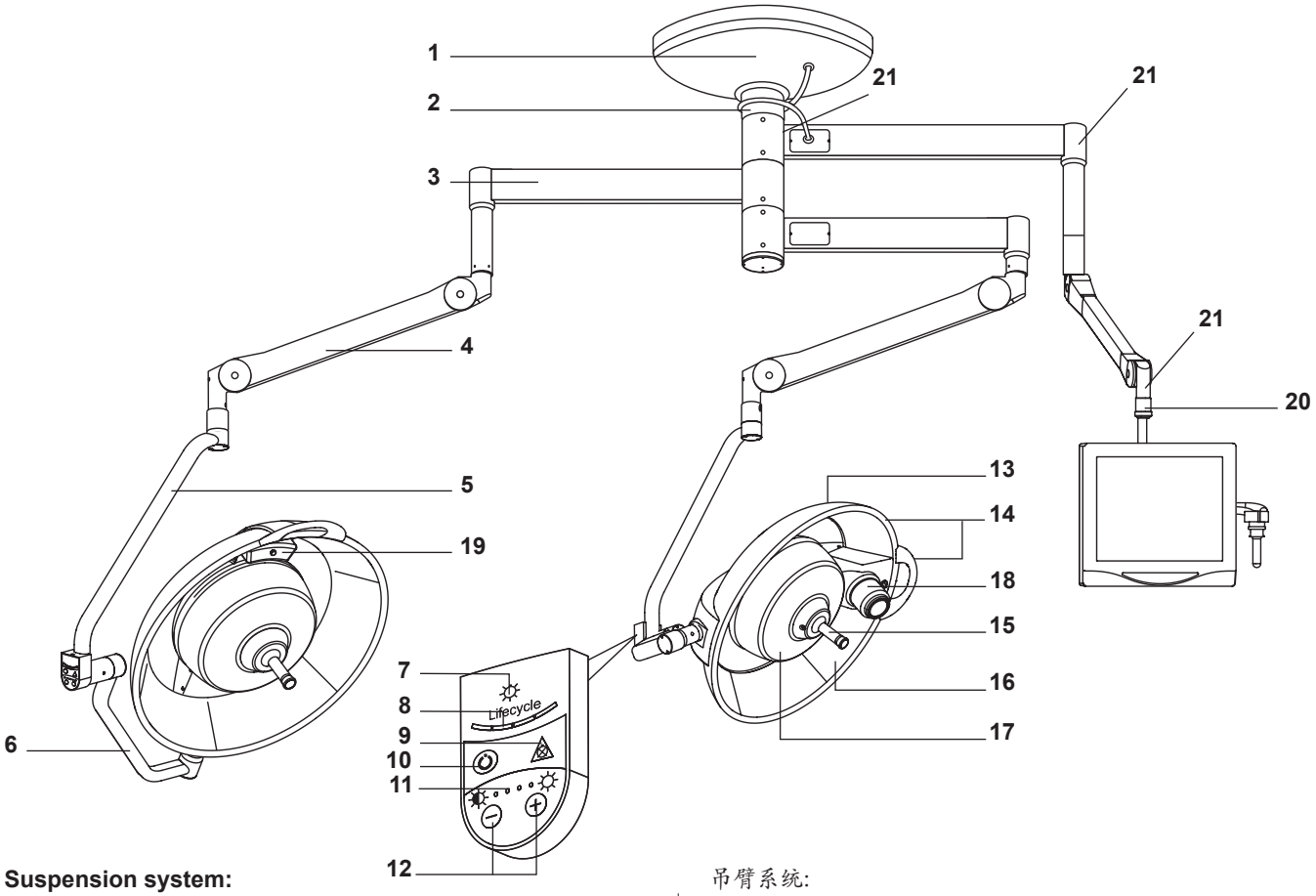
放电灯泡是使用灯座上的触发器来点亮的。达到期望的亮度和颜色可能需要数分钟。

手术无影灯初次打开时，出现彩色闪烁和强烈色差都是完全正常的。

与其他许多使用放电灯的发光设备不同，G8 Evolution 手术无影灯可在发热时打开并立即达到最终亮度和颜色。

固定夹上的控制键盘用于打开和关闭灯泡以及改变亮度。键盘还包括四个指示灯，它们显示主灯泡的使用寿命。为了避免意外关闭无影灯，必须按住“关闭”按钮几秒钟才能关闭灯泡。

如果在冷起动阶段关闭电源，将大大缩短灯泡的使用寿命。因此，为了保护灯泡，在冷启动或热启动（锁定控制 1 分钟）后，一旦灯泡达到正常工作条件，就仅使用键盘控制无影灯。



Suspension system:

1 Ceiling anchor plate with cover
2 Suspension tube and flange
3 Extension arm
4 Spring arm (standard or low ceiling)
5 Double fork (only for Comfort version)
6 Fork

Control keypad:

7 Bulb fail indicator
8 Lifecycle indicator (bulb service life)
9 Warning indicator (lit steadily to indicate a faulty main bulb or electronics unit)
10 ON / OFF button
(press and hold for 2 seconds to turn the light off)
11 Light output level indicators
(flash in turn approx. 60 seconds after start-up)
12 +/- keys for adjusting the light output level

Cupola:

13 Cupola
14 Round handle or circular strip (non-sterile)
15 Sterilisable handle
16 Reflector
17 Protective underside
18 Camera
19 Dummy camera (weight to compensate for optional camera)
20 Flat screen support
21 Rotation stop

吊臂系统:

1 带罩的吊顶吸盘
2 吊管和法兰
3 延伸臂
4 弹簧臂（标准吊顶或低吊顶）
5 双固定夹（仅用于“舒适”版）
6 固定夹

控制键盘:

7 灯泡故障指示灯
8 生命周期指示灯（灯泡使用寿命）
9 警告指示灯（持续亮起表示主灯泡或电子设备发生故障）
10 打开/关闭按钮（按住 2 秒关闭手术无影灯）
11 光输出强度指示灯（起动后依次闪烁约 60 秒）
12 +/- 键，用于调节光输出强度

灯头:

13 灯头
14 圆形手柄或环状边圈（不消毒）
15 可消毒手柄
16 反光器
17 保护底罩
18 摄像头
19 仿真摄像头（重量相当于可选摄像头）
20 液晶监视器支架
21 防旋转限位装置

3 USE

3.1 Before starting

1. Insert the sterilisable handle (15). A click confirms that the handle is correctly in place.

Check the following points before turning on the cupola (13):

1. Protective underside (17) not cracked or crazed.
2. Parts correctly attached to underside (17),
3. Handle (15) correctly inserted.

If any of the above items are defective, the surgical light cannot be operated safely:

1. Turn off the power to all poles of the surgical light and ensure that it cannot be restarted.
2. Call your MAQUET service partner.

Before each operation, check that the sterilisable handle (light colour on black handle) is in place. During operations this handle must only be used by the surgical team in order to guarantee aseptic conditions.

3.2 Turning on the light

1. Press the ON / OFF button (10).

- The lamp is turned on.
- **Cold start:**
  After a cold start, the indicators (11) flash until the operating temperature is reached (approx. 60 seconds).
- The lifecycle indicators (8) are lit (see section 2.6).
- The indicators (11) show the selected light output level (see section 2.5).

2. Orient the cupola as described in section 2.4.
3. Adjust the light output level as described in section 2.5.

Warning indicator (9):
If the warning indicator (9) is lit steadily, there is a fault on the main bulb or the electronic unit. The secondary halogen bulb is turned on.
This provides a backup system to enable the operation to be completed. It is essential to restore normal operation as described in section 5 before operating another patient.

- The cupola may hum slightly until it reaches a stable state (5 to 10 minutes).

3 使用

3.1 启动前

1. 插入可消毒手柄 (15)。听到“咔嗒”声就表示手柄已安放到位。

请在打开灯头 (13) 之前进行以下检查:

1. 保护底罩 (17) 未破裂或出现裂缝。
2. 零件被正确安装到底罩 (17),
3. 手柄 (15) 被正确插入。

如果以上任何项出现缺陷，手术无影灯都无法安全地工作:

1. 关闭通向手术无影灯所有电极的电源，并确保无法重新启动电源。
2. 请致电 MAQUET 服务合作伙伴。

请在每次操作前检查可消毒手柄（黑色手柄的浅色部分）是否安放到位。操作期间，只允许手术组使用此手柄，以保证无菌环境。

3.2 打开手术无影灯

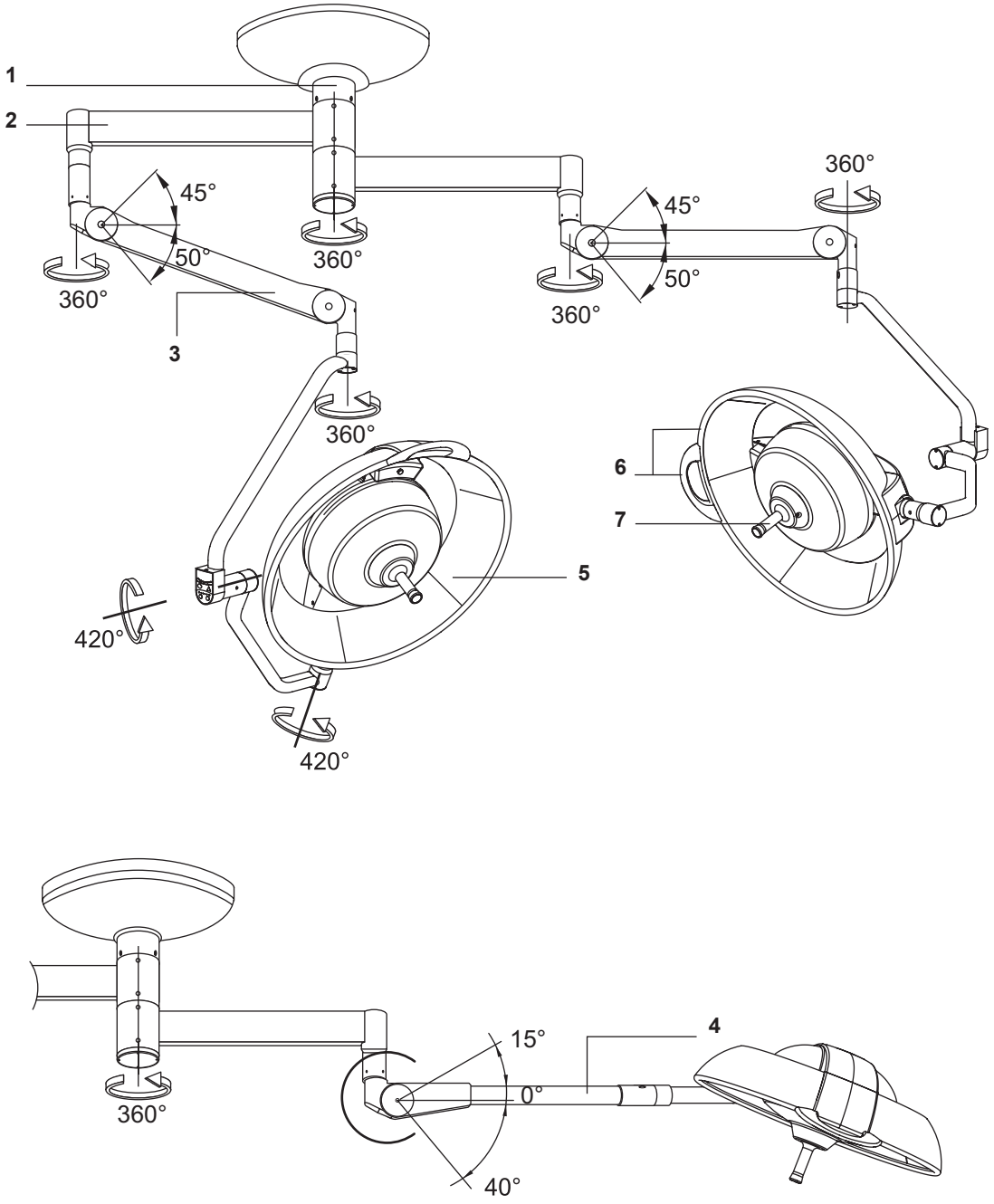
1. 按打开/关闭按钮 (10)。

- 灯被打开。
- 冷起动:
  冷起动后，指示灯 (11) 会一直闪烁，直至达到工作温度（约 60 秒）。
- 生命周期指示灯 (8) 亮起（请参见第 2.6 节）。
- 这些指示灯 (11) 显示了所选的光输出强度（请参见第 2.5 节）。

2. 按第 2.4 节所述内容放置灯头。
3. 按第 2.5 节所述内容调节光输出强度。

警告指示灯 (9):
如果警告指示灯 (9) 持续亮起，表示主灯泡或电子装置发生故障。将打开备用卤素灯。
这样提供了一个备用系统，以保证手术完成。在为其他患者手术之前，务必按第 5 节中所述恢复手术无影灯的正常操作。

- 灯头在达到稳定状态前会发出轻微的嗡嗡声（5 至 10 分钟）。



Suspension system:

1 Suspension tube
2 Extension arm
3 Spring arm
4 Spring arm (low ceiling)

Cupola:

5 Cupola
6 Round handle or circular strip (non-sterile)
7 Sterilisable handle

吊臂系统:

1 吊管
2 延伸臂
3 弹簧臂
4 弹簧臂（低吊顶）

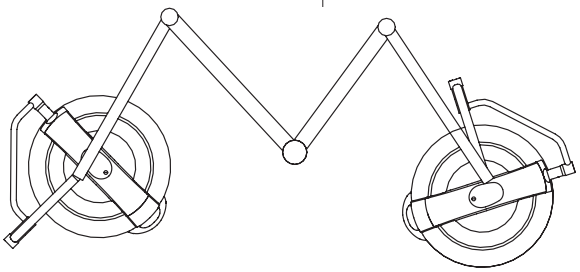
灯头:

5 灯头
6 圆形手柄或环状边圈（不消毒）
7 可消毒手柄

3.3 Positioning the light

The cupola (5) on the upper extension arm (2) may be positioned directly beneath the suspension tube (1) as required for certain types of surgery.

Optimum mobility is achieved in an «M» position, with the extension arms (2) and spring arms (3) positioned as shown on the illustration.



Light energy can potentially dry tissue. Users must adapt lighting levels to the needs of the operation to be performed, in particular when several lights are used in combination.

- Use the sterilisable handle (7) or the non-sterile round handle or bar (6) to move the cupola (5) to the desired position.

The working distance is 70 to 140 cm from the surgical site.

Do not use the surgical light suspension arm to suspend or lift objects. Do not hang on the light.

The light must not be moved past the vertical position (cupola pointing upwards).

3.3 放置手术无影灯

根据某类手术的要求，上延伸臂 (2) 上的灯头 (5) 可能需要直接放到吊管 (1) 下面。

最佳移动方法是将延伸臂 (2) 和弹簧臂 (3) 呈“M”形放置，如图所示。

光能可能使组织失水。用户必须根据手术需要调节灯的亮度，尤其在同时使用多个灯时。

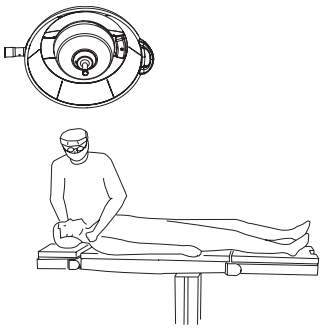
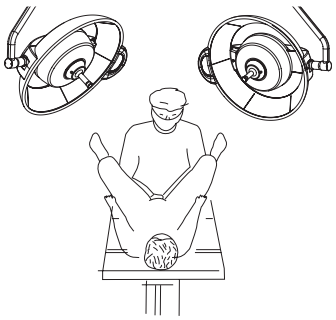
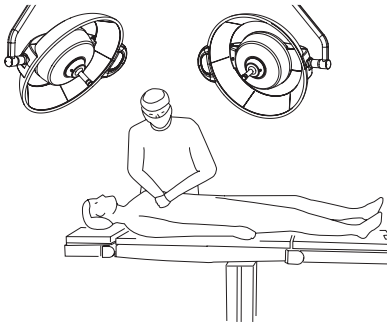
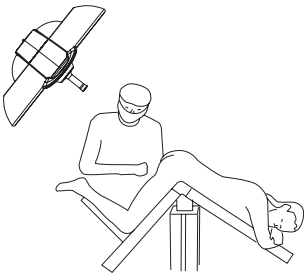
- 使用可消毒手柄 (7) 或不消毒圆形手柄或圆形杆 (6) 将灯头 (5) 移到期望位置。

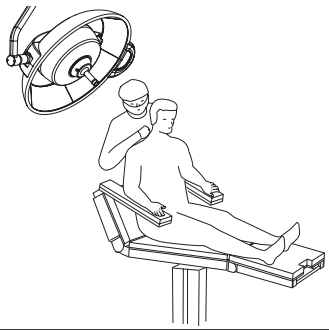
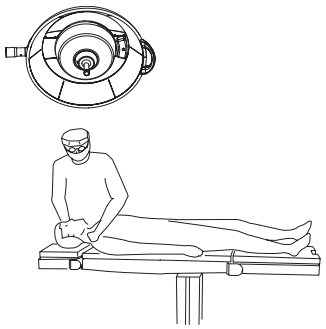
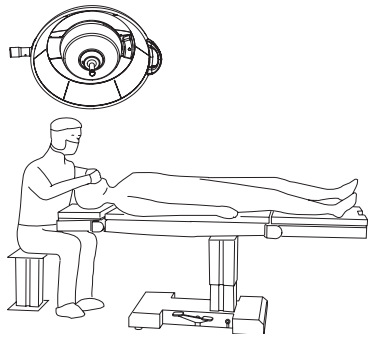
工作距离是距实施手术位置 70 至 140 厘米处。

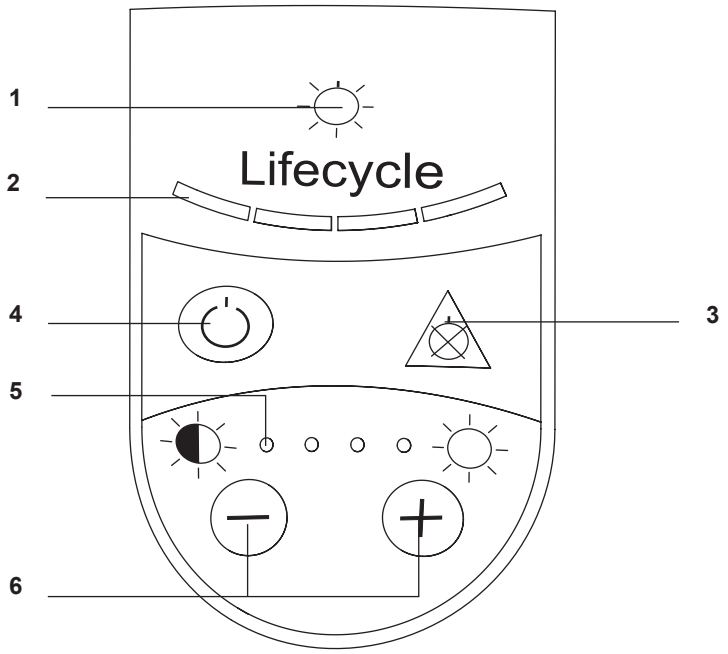
切勿使用手术无影灯的吊臂悬挂或支撑物件。切勿在无影灯上悬挂物件。

手术无影灯不得超过垂直位置（灯头朝上）。

3.4 Pre-positioning examples　3.4 放置前示例

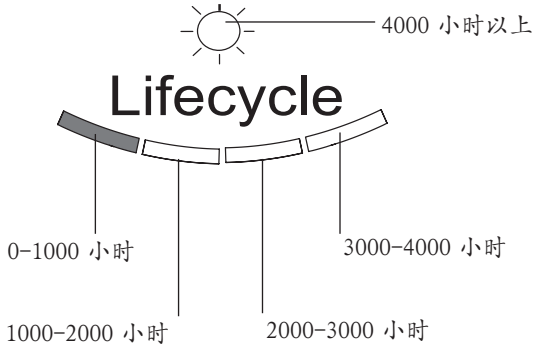
PRE-POSITIONING 准备位置	SURGICAL SPECIALITY	外科专科
1 	General surgery	普通外科
2 	Urology, transplant surgery, gynaecology, childbirth	泌尿科、 移植科、 妇科、 产科
3 	General, abdominal, digestive, thoracic surgery	普通外科、 腹部外科、 消化外科、 胸外科
4 	Proctology	直肠科

PRE-POSITIONING 准备位置	**SURGICAL SPECIALITY**	外科专科
5 	Neurosurgery	神经外科
6 	Plastic and reconstructive surgery, maxillo-facial transplant, surgical stomatology	整形修复科、 颌面移植外科、 口腔科
7 	ENT surgery, ophthalmology, dermatology	耳鼻喉科、 眼科、 皮肤科



1 Bulb fail indicator
2 Lifecycle indicator (bulb service life)
3 Warning indicator (lit steadily to indicate a faulty main bulb or electronics unit)
4 ON / OFF button
(press and hold for 2 seconds to turn the light off)
5 Light output level indicators
(flash in turn approx. 60 seconds after start-up)
6 + / - buttons to reduce/increase light output level

1 灯泡故障指示灯
2 Lifecycle 指示灯（灯泡使用寿命）
3 警告指示灯（持续亮起表示主灯泡或电子设备发生故障）
4 打开/关闭按钮（按住 2 秒关闭手术无影灯）
5 光输出强度指示灯（起动后依次闪烁约 60 秒）
6 + / – 按钮，用于降低/升高光输出强度



3.5 Setting the light output level

- The control buttons are not available when the indicators (5) are flashing.
- Due to the properties of discharge lamps the light does not react immediately when the light output level is reduced with the + / - buttons (6). At lower light levels, the colour of the light changes (higher colour temperature).
- It is preferable to select the same light output level on all cupolas. Colour reproduction is most faithful at the maximum output level.
- The light output may be adjusted to one of four levels using the + / - buttons (6); there are four indicators (5) corresponding to the four levels.
- The + / - buttons (6) are only active once the light has reached its service temperature.

Adjusting the diameter of the illuminated area:

- The diameter of the illuminated area (focus) is adjusted by turning the sterilisable handle.

3.6 Indicators on control keypad

Lifecycle indicator (2):

- The main bulb has an average service life of around 4500 hours (see section 2). This service life is shown by the indicators (2). If the rated service life is exceeded, the bulb will continue to operate but will lose power and may no longer start.

Bulb fail indicator (1):

- When the indicator above Lifecycle is lit, the bulbs must be replaced in order to maintain the light output specifications (section 6).

Warning indicator (3):

- If the main bulb or electronic unit fail, the warning indicator (3) is lit continuously and the spare bulb is activated (see section 5.1).

Light output level indicator (5):

- When the light is first turned on (cold start-up), the light output level indicators (5) flash until the maximum intensity is reached (approx. 60 seconds); thereafter the four indicators (5) show the set light output level.

3.7 Turning off the cupola

- Press and hold the On / Off button (4) for 2 seconds.
- The light features a system to prevent it being turned off accidentally. Accordingly the On / Off button (4) must be held down for 2 seconds before the light is turned off.
- To protect the discharge lamp, power down is delayed if the lamp has just been turned on (see section 2).

3.5 设置光输出强度

- 当指示灯 (5) 闪烁时，控制按钮不可用。
- 由于放电灯的特性，当使用 + / − 按钮 (6) 降低光输出强度时，手术无影灯不会立即反应。光强度较低时，光的颜色会改变（较高色温）。
- 最好为所有灯头选择相同的光输出强度。光输出强度最大时，所反应的色彩最真实。
- 可以使用 + / − 按钮 (6) 在四种强度之间调节光输出；有四个指示灯(5) 与这四种强度对应。
- 只有在灯达到工作温度时，+ / − 按钮 (6) 才可使用。

调节照明区的直径:

- 可通过转动可消毒手柄调节照明区（焦点）的直径。

3.6 控制键盘上的指示灯

生命周期指示灯 (2):

- 主灯泡的使用寿命平均约为 4500 小时（请参见第 2 节）。使用寿命由指示灯 (2) 显示。如果超过额定使用寿命，灯泡可继续工作，但会耗电且可能无法再起动。

灯泡故障指示灯 (1):

- 当 “Lifecycle” 上方的指示灯亮起时，必须更换灯泡以维持手术无影灯的输出规格（第 6 节）。

警告指示灯 (3):

- 如果主灯泡或电子装置发生故障，警告指示灯 (3) 将持续亮起并将启动备用灯泡（请参见第 5.1 节）。

光输出强度指示灯 (5):

- 初次打开（冷起动）手术无影灯时，光输出强度指示灯 (5) 会一直闪烁直到达到最大强度（约 60 秒）；然后有四个指示灯 (5) 会显示所设置的光输出强度。

3.7 关闭灯头

- 按住打开/关闭按钮 (4) 两秒钟。
- 手术无影灯有一个可防止意外关闭的系统。因此，必须按住打开/关闭按钮 (4) 两秒才能关闭手术无影灯。
- 为了保护放电灯，在放电灯刚打开时将延迟断电（请参见第 2 节）。

4 CLEANING / DISINFECTION / STERILISATION

Users must contact their hospital's sanitary specialists. The recommended products and procedures must be applied. Should there be any doubt concerning the compatibility of active agents to be used, contact the local MAQUET customer service.

4.1 Cleaning and disinfecting the surgical light

Check that the power is switched off and the light has cooled down before starting cleaning.

4.1.a General instructions concerning cleaning, disinfection and safety:

- Remove the sterilisable handles.
- Wipe the system with a cloth moistened with a surface cleaner. Follow the manufacturer's dilution and temperature recommendations.
- Rinse with a cloth moistened with water. Wipe dry.
- Wipe evenly with a cloth moistened with disinfectant. Follow the manufacturer's recommendations.
- Rinse with a cloth moistened with water to remove any residue (particularly when cleaners containing aldehydes, quaternary ammonium or surfactants are used).
- Wipe off with a dry cloth.
- Make sure that all liquid cleaning products used have been thoroughly wiped off.

4.1.b Examples of recommended products

GETINGE USA products: TEC-QUAT 256.

ANIOS products: SURFA'SAFE; HEXANIOS G + R at 0.5%; ANIOSYME P.L.A; SALVANIOS pH10 ANIOS DDSH.

Schülke & Mayr products: ANTIFECT PLUS.

4.1.c Examples of unsuitable products

Solutions containing glutaraldehyde, phenol, iodine, bleach, alcohol or chloride ions must not be used.

Do not use disinfection by fumigation methods.

4.2 Cleaning and sterilising the handles

4.2.1 Before cleaning

- Use a soft cloth immediately after use to wipe away soiling from the handle surface.
- Store handles in a place that keeps them moist to make further cleaning easier.
- Take care to store them in such a way that the inside does not get soiled.

4.2.2 Cleaning

- Soak the handles in a detergent solution.[1]
- Soak for 15 minutes to allow the solution to act, then clean by hand with a soft brush and a lint-free cloth.
- During cleaning, check regularly that the handles are fully clean and that no soiling remains on the inside or outside.
- If any soiling remains, repeat cleaning or use an ultrasonic cleaning process.
- Rinsing: Rinse thoroughly in clean water to completely eliminate the detergent solution.
- Drying: Wipe with a clean lint-free cloth.

[1] Never soak the handles in enzyme-based detergents as they may damage the material used; rinse thoroughly if these detergents are used.

4 清洁/消毒/灭菌

用户必须联系医院的专业卫生人员。必须采用推荐的产品和程序。如对活性剂的兼容性有任何疑问，请与本地的 MAQUET 客户服务部门联系。

4.1 手术无影灯的清洁和消毒

每次清洁前，确保电源已经关闭，且灯具已经冷却。

4.1.a 关于清洁、消毒和安全的一般说明:

- 取下可消毒手柄。
- 用蘸有表面清洁剂的湿布擦拭系统。采用制造商建议的稀释度和温度。
- 用蘸水的湿布进行清洗。擦干。
- 用蘸有消毒剂的湿布均匀地擦拭。遵循制造商推荐的方法。
- 用蘸水的湿布除去所有残留物（特别是使用含乙醛、季铵或表面活性剂的清洁剂时）。
- 用干布擦拭。
- 确保所有液体清洁产品已完全除去。

4.1.b 推荐产品示例

GETINGE USA 产品: TEC-QUAT 256。

ANIOS 产品: 0.5% 的 SURFA' SAFE ; HEXANIOS G+R; ANIOSYME P.L.A; SALVANIOS pH10; ANIOS DDSH。

Schülke & Mayr 产品: ANTIFECT PLUS。

4.1.c 不适用产品示例

禁止使用含戊二醛、苯酚、碘、漂白剂、乙醇或氯离子的溶液。

禁止以熏蒸方式进行消毒。

4.2 手柄的清洁和消毒

4.2.1 清洁前的准备

- 使用之后，立即用软布擦除手柄表面的污渍。
- 将手柄存放在可保持一定湿度的地方，以便于深入清洁。
- 存放时应注意不要将手柄的内侧弄脏。

4.2.2 清洁

- 将手柄浸入清洗溶液中。[1]
- 浸泡 15 分钟以溶解污渍，然后使用软毛刷和无绒布进行清洗。
- 清洗时要随时检查手柄是否完全清洁干净，确保手柄内外侧均无残留污渍。
- 如果仍有污渍残留，请重复清洁过程，或使用超声清洁法进行清洁。
- 冲洗: 用清水彻底冲洗，以完全洗去清洁溶液。
- 干燥: 使用洁净的无绒布擦拭。

[1] 切勿将手柄浸入酶基清洁剂，这样可能损坏手柄使用的材料；如已使用了这些清洁剂，则应彻底冲洗手柄。

4.2.3 Disinfection

Handles may be disinfected by machine (Clean MAQUET) and rinsed at a maximum temperature of 93°C.

Typical recommended cycles:

Stage	Temperature	Time
Pre-washing	18 - 35° C	60 sec
Washing	46 - 50° C	300 sec
Neutralisation	41 - 43°C	30 sec
Washing 2	24 - 28°C	30 sec
Rinsing	92 - 93°C	600 sec
Drying		20 min

4.2.4 Sterilisation

After cleaning the handles must be steam sterilised as set out below:

Country	Sterilisation cycle	Temperature [°C]	Time [min]	Drying [min]
USA & Canada	Prevacuum[2]	132 - 135	10	16
France	ATNC (Prion) (Prevacuum)	134	18	
Other countries	Prevacuum	Comply with national regulations		

- Check that each handle is clean before continuing the process.
- Wrap the handles with sterilisation wrapper material (double wrapper or equivalent).

  Handles may also be placed in paper or plastic sterilisation bags **for easier identification and reuse**.
- Place the handles on steriliser trays with the opening downwards.
- Package with biological and/or chemical indicators for monitoring the sterilisation process. Follow applicable regulations.
- Run the sterilisation cycle according to the steriliser manufacturer's instructions.

☞ To ensure correct sterilisation do not allow any soiling to penetrate inside the handle.

☞ Handles are not guaranteed beyond 350 sterilisation cycles with the above sterilisation parameters.

- Dispose of the handles in the same way as other hazardous products in a hospital environment.

[2] This handle is made of a porous material.
[3] Possible sterilisation bag suppliers:
Medical Action Industries
SBW Medical
Baxter International
[4] For air removal and faster drying.

4.2.3 消毒

可使用机器 (Clean MAQUET) 对手柄进行消毒，然后在最高温度 (93°C) 下冲洗。

消毒周期通常为:

阶段	温度	时间
预清洗	18 – 35° C	60 秒
清洗	46 – 50° C	300 秒
中和	41 – 43° C	30 秒
清洗 2	24 – 28° C	30 秒
清洗	92 – 93° C	600 秒
干燥		20 分钟

4.2.4 灭菌

清洁之后，必须按照以下方法对手柄进行蒸汽灭菌:

国家/地区	灭菌过程	温度 [°C]	时间 [分钟]	干燥[分钟]
美国和加拿大	预加压[2]	132 – 135	10	16
法国	ATNC（朊病毒）（预加压）	134	18	
其他国家或地区	预加压	符合国家规定		

- 在继续下一步之前，检查每个手柄是否洁净。
- 使用无菌包装材料（双层包装或类似包装）包好手柄。
  也可将手柄放入纸质或塑料消毒袋中，以便区分和再次使用。

- 将手柄的开口朝下放入灭菌托盘中。
- 在包装上使用生物和/或化学标志以监控灭菌过程。遵守适用法规。
- 按照灭菌器制造商的说明，进行灭菌过程。

☞ 切勿让任何污渍进入手柄内部，以确保适当灭菌。

☞ 手柄采用上述灭菌方法的次数不得超过 350 次。

- 按照医院中处理其他危险产品的方法处理手柄。

[2] 此手柄由多孔材料制成。
[3] 消毒袋供应商可能是:
Medical Action Industries
SBW M é dical
Baxter International
[4] 用以排出空气和快速干燥。

5 MAINTENANCE

5.1 Preventive maintenance

To preserve your surgical light's original performance and reliability, annual maintenance and inspections should be performed as follows:

- by a MAQUET technician or MAQUET-approved distributor during the guarantee period,
- by a MAQUET technician or MAQUET-approved distributor or by the hospital's technical maintenance department after the guarantee period expires,

5.2 First level maintenance

5.2.a Daily inspection

- Check that the bulbs operate correctly.
- Check that the sterilisable handle clicks and locks in place correctly.
- Check that the arms move normally and do not sag.

5.2.b Monthly inspection

- Check that the light operates correctly from the backup power supply if a power cut were to occur.
- Check that the limit stops are in place.
- Test the fallback to the spare bulb (see section 5.3).

5.2.c Annual inspection (must be performed by an authorised technician)

- Check the bulb holder. Replace the bulbs.
- Check that the limit stops are in place on the flat screen support arms and cupolas.
- Clean the internal optical items (mirrors and lenses).
- Check that the light operates for one hour if the main power supply is cut (operation on backup supply).
- Replace the fan subassembly.

Safety items

Check the following points:

- Check that there are no cracks on the upper pivot of the DF Acrobat 3000 spring arm ref. 568101988 (if manufactured between 2001 and 2006).
- If there is the slightest sign of a crack, replace the spring arm.
- If no cracks are visible, install kit ref. 368104900.
- Attachment screws on suspension tube correctly tightened, seals in position.
- Arm(s) correctly assembled..
- Limit stop segments in place on cupola attachment points. Disassemble cupolas and lubricate sleeve.
- Attachment of all covers and caps on cupolas and arms.
- All visible screws correctly tightened.
- Camera or dummy unit firmly attached.

5 维护

5.1 预防性维护

为了保持手术无影灯原有的性能和可靠性，每年应由以下人员对灯具进行维护和检查:

- 在保修期内由 MAQUET 技术人员或 MAQUET 认可的经销商执行,
- 过了保修期后由 MAQUET 技术人员或 MAQUET 认可的经销商执行，或由医院的技术维护部门完成。

5.2 一级维护

5.2.a 日常检查

- 确认灯泡工作正常。
- 确认可消毒手柄锁定到位。
- 确认各臂正常移动且无松动。

5.2.b 月度检查

- 确认断电时，手术无影灯能使用备用电源正常工作。
- 确认限位销完好。
- 测试故障时转用备用灯泡的能力（请参见第 5.3 节）。

5.2.c 年度检查（必须由授权技术人员完成）

- 检查灯座。更换灯泡。
- 确认液晶监视器支架和灯头上的限位销完好无损。
- 清洁内部光学部件（反光镜和镜头）。
- 确认手术无影灯在主电源被切断时可以工作一小时（利用备用电源工作）。
- 更换风扇组件。

安全事项

检查以下几点:

- 检查弹簧臂DF Acrobat 3000 (参考 568101988) 上轴颈是否存在裂纹（如为2001-2006年产品）
- 如有较小的可见裂纹，则更换弹簧臂
- 如无任何裂纹可见，安装368104900套件
- 吊管上的固定螺钉已旋紧，且固定到位。
- 正确组装各臂。
- 将限位组件固定到灯头固定点上。灯头和润滑套管是否可卸下。
- 将所有盖帽固定到灯头和臂上。
- 正确旋紧所有可见的螺钉。
- 摄像头和仿真摄像头安装牢固。

Other checks

- Nominal light output level: see technical data.
- Earth continuity: max. 0.1 Ohm
- Suspension tube vertical.
- Balancing system adjusted correctly: brakes tight and spring arms adjusted.
- Sterilisable handle locking mechanism.
- Adjustment of rotation limit stops.

Appearance

Check the following points:

- General condition of arm covers.
- Condition of lenses.
- Condition of seals.
- Suspension system clean.

Dismantling certain elements may affect operation and safety.
Examples include:
- Servicing the electrical power supply,
- Servicing the suspension arm and balance system,
- Servicing the optical system of cupolas equipped with filters designed to eliminate radiation not visible to the patient. Surgical lights must never be used without these filters.

Contact the authorised MAQUET after-sales service department for this type of inspection.

5.3 Recycling

Discharge bulbs, like commercial fluorescent tubes, contain a proportion of mercury and must be disposed of as special waste.

Halogen bulbs can be disposed of as domestic waste.

其他检查

- 标准光输出强度：请参见技术资料。
- 接地导通电阻：最大 0.1 Ohm。
- 吊管垂直。
- 正确调节平衡系统：紧固制动器并调节弹簧臂。
- 可消毒手柄锁定装置。
- 调节旋转限位销。

外观

检查以下几点：

- 灯臂护罩的一般状况。
- 镜头的状况。
- 密封件的状况。
- 吊臂系统的清洁情况。

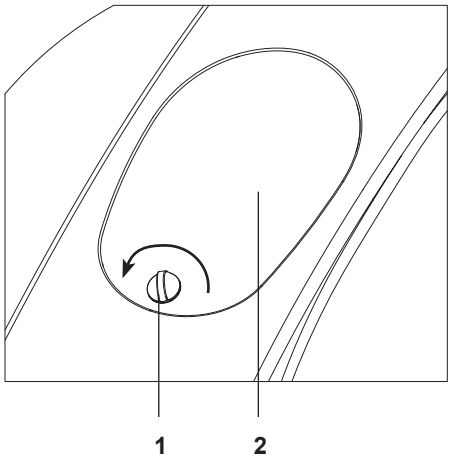
拆除某些组件可能影响手术无影灯的功能和安全。
例如：
- 维修电源时，
- 维修吊臂和平衡系统时，
- 维修灯头的光学系统时，这些灯头配有滤光器以消除病人看不见的辐射。必须有滤光器才可以使用手术无影灯。

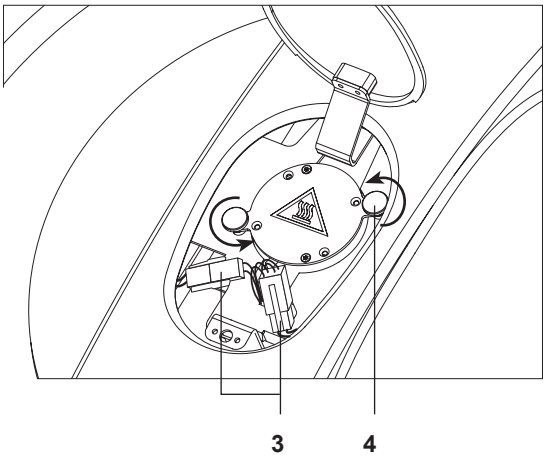
请与 MAQUET 授权的售后服务部联系，以了解此类检查。

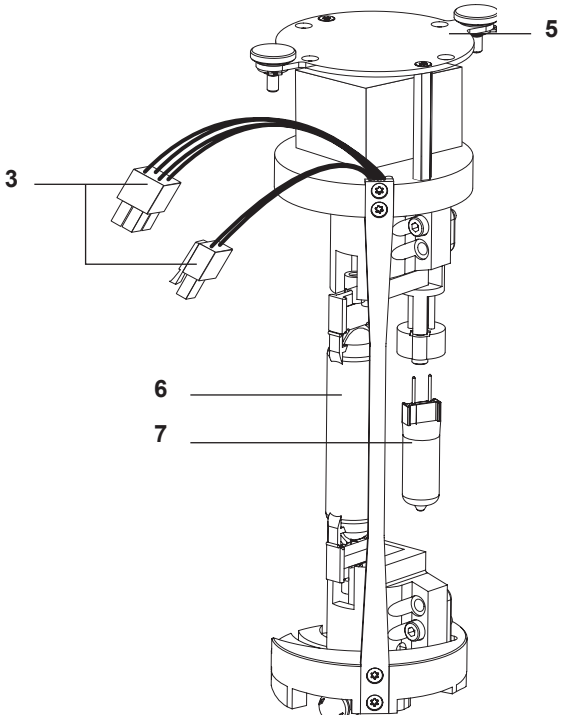
5.3 回收利用

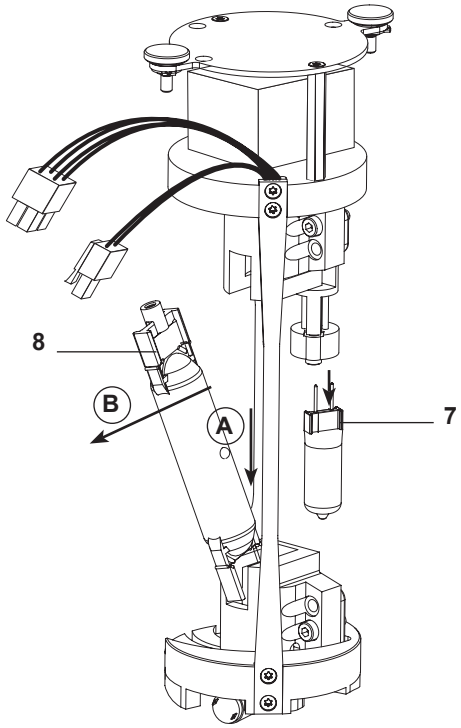
放电灯泡和日用荧光灯一样，含有一定比例的水银，须作为特殊垃圾处理。

可以将卤素灯作为生活垃圾进行处理。









1	Cover lock
2	Cover
3	Connectors
4	Bulb holder attachment screw
5	Bulb holder
6	Main bulb (discharge type)
7	Spare bulb (halogen type)
8	End of main bulb

1	灯罩锁定旋钮
2	灯罩
3	接头
4	灯座固定螺钉
5	灯座
6	主灯泡（放电灯）
7	备用灯泡（卤素灯）
8	主灯泡一端

6 CHANGING BULBS

When changing a blown bulb:

- Switch off the power supply and leave the cupola to cool with the cover open for 45 minutes.
- Only use G BULB EVOLUTION bulbs.
- Handle bulbs carefully using a clean, dry cloth.
- Never touch bulbs with bare hands.

Grease on bulbs can shorten their life or even cause them to break.

6.1 Removing the main bulb and spare bulb from the cupola

Main bulb and spare bulb

- The cupola is equipped with one main bulb (6) (discharge type) and one spare bulb (7) (halogen type).
- If the main bulb (6) fails, the spare bulb (7) is automatically turned on. The bulb holder is moved to place the spare bulb (7) at the centre of the reflector.
- When the cupola is turned off, the main bulb automatically returns to the centre.

Removing the bulbs

1. Unscrew the cover lock (1) and open the cover (2).
2. Allow the cupola to cool for 45 minutes.
3. Disconnect the connectors (3).
4. Unscrew the two bulb holder mounting screws (4).
5. Carefully withdraw the bulb holder (5) from the cupola.
6. Grasp the end of the main bulb (8) and push the bulb in to release it from the spring (A).
7. Pull out one side of the bulb, then the other (B).
8. Remove the spare bulb (7) by pulling straight down.

6 更换灯泡

更换报废灯泡的程序:

- 关闭电源，打开灯罩让灯头冷却 45 分钟。
- 仅使用 G BULB EVOLUTION 灯泡。
- 使用清洁的干布包裹灯泡，小心操作。
- 切勿用手直接接触灯泡。

油脂可能导致灯泡使用寿命缩短或破裂。

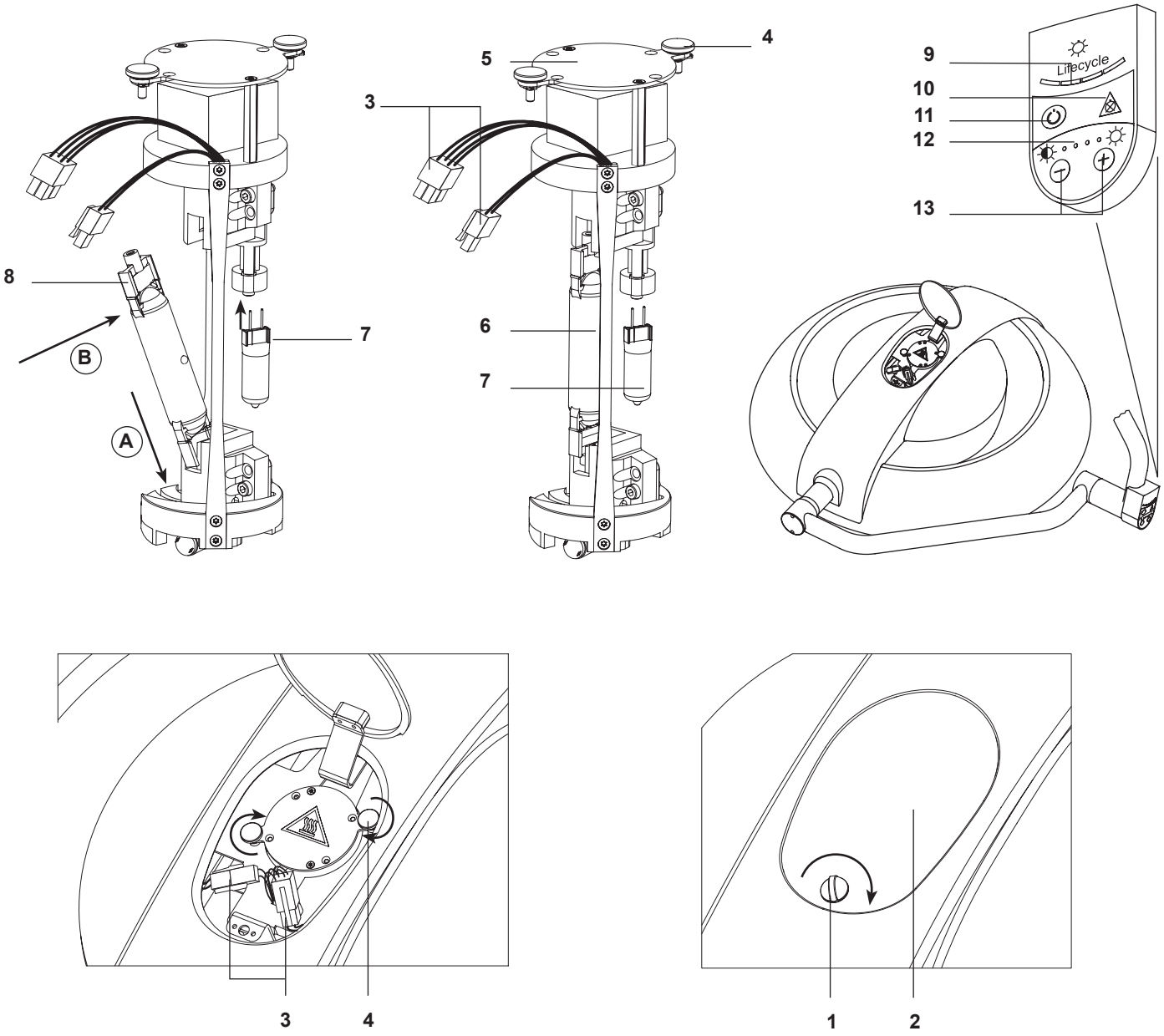
6.1 从灯头上取下主灯泡和备用灯泡

主灯泡和备用灯泡

- 灯头配有一个主灯泡 (6)（放电灯）和一个备用灯泡 (7)（卤素灯）。
- 如果主灯泡 (6) 发生故障，备用灯泡 (7) 将被自动打开。灯座被移动，使备用灯泡移到反光器的中央。
- 当灯头关闭时，主灯泡会自动回到中央位置。

取下灯泡

1. 松开灯罩锁定旋钮 (1) 并打开灯罩 (2)。
2. 让灯头冷却 45 分钟。
3. 断开接头 (3)。
4. 松开两颗灯座固定螺钉 (4)。
5. 从灯头中小心取出灯座 (5)。
6. 抓住主灯泡的一端 (8)，推出灯泡，松开弹簧 (A)。
7. 先拉出灯泡的一端，然后拉出另一端 (B)。
8. 直接向下拉，取出备用灯泡 (7)。



1 Cover lock
2 Cover
3 Connectors
4 Bulb holder attachment screws
5 Bulb holder
6 Main bulb
7 Spare bulb
8 End of main bulb
9 Lifecycle indicator (bulb service life)
10 Warning indicator (lit steadily to indicate a faulty main bulb or electronics unit)
11 ON / OFF button (press and hold for 5 seconds to turn the light off)
12 Light output level indicators (flash in turn approx. 60 seconds after start-up)
13 + / - buttons to reduce/increase light output level

1 灯罩锁定旋钮
2 灯罩
3 接头
4 灯座固定螺钉
5 灯座
6 主灯泡
7 备用灯泡
8 主灯泡一端
9 Lifecycle 指示灯（灯泡使用寿命）
10 警告指示灯（持续亮起表示主灯泡或电子设备发生故障）
11 打开/关闭按钮（按住 5 秒关闭手术无影灯）
12 光输出强度指示灯（起动后依次闪烁约 60 秒）
13 + / – 按钮，用于降低/升高光输出强度

6.2 Inserting the main bulb and spare bulb

To avoid any failure of the surgical light during use, always replace the spare bulb at the same time as the main bulb.

1. Insert the spare bulb (7) firmly into its socket.
2. Insert the main bulb (8) by pressing in one end, then releasing it to hold the other end. Check that it is correctly in place.
3. Carefully insert the bulb holder (5) into the cupola, ensuring that the male connectors (3) on the bulb holder are on the same side as the female connectors in the cupola (3).
4. Connect the two connectors (3).
5. Tighten the two bulb holder attachment screws (4).
6. Close the cover (2) and tighten the cover locking screw (1).
7. Check that the cover (2) is correctly in place.

The unit must be operated with the cover closed. When conducting maintenance, take appropriate precautions to avoid touching surfaces labelled as hot.

8. With the light off, press the + and - buttons (13) simultaneously and hold them for 5 seconds to reset the Lifecycle counter (back to 0 hours).
9. Press the ON / OFF button to turn on the light.

- Only one indicator (Lifecycle) (9) on the control keypad should be lit. If this is not the case, repeat from operation 8.
- After a cold start, the indicators (12) flash in turn until the operating temperature is reached (approx. 60 seconds).
- If the warning indicator (10) is lit steadily, check that the main bulb (6) and spare bulb (7) are correctly in place.
- If the problem persists please contact the technical department.

6.3 Testing failover to the spare bulb

This test is used to check that the failover function operates correctly.

1. Turn on the light by pressing the ON / OFF button.
2. Once the main bulb is stable (after 60 seconds) reduce the output to the minimum level by pressing the - button (13).
3. Hold down the - button (13) for 20 seconds until the spare bulb is selected (yellower light).
4. Check that the light beam from the spare bulb is satisfactory.
5. Turn off the surgical light by pressing the ON / OFF button (11) and holding for 2 seconds.
6. Turn the light back on and check that the main bulb comes on.

6.2 安装主灯泡和备用灯泡

为了避免使用期间手术无影灯发生故障，请务必在更换主灯泡时更换备用灯泡。

1. 将备用灯泡 (7) 牢固地插入灯座。
2. 按住一端，然后放开并按住另一端，以插入主灯泡 (8)。确认主灯泡安装到位。
3. 小心将灯座 (5) 插入灯头，确保灯座上的公接头 (3) 与灯头 (3) 内的母接头位于同一侧。
4. 连接两个接头 (3)。
5. 旋紧两颗灯座固定螺钉 (4)。
6. 关闭灯罩 (2) 并旋紧灯罩锁定螺钉 (1)。
7. 确认灯罩 (2) 安装到位。

必须盖紧灯罩后方可使用本设备。
进行维护时，请采取适当的预防措施避免接触标明烫手的表面。

8. 手术无影灯关闭时，同时按住 + 和 − 按钮 (13) 5 秒可以复位 Lifecycle 计数器（返回到 0 小时）。
9. 按打开/关闭按钮打开手术无影灯。

- 控制键盘上应只有一个指示灯（Lifecycle）(9) 亮起。如果不是，请从第 8 步开始重复操作。
- 冷起动后，指示灯 (12) 会依次闪烁，直至达到工作温度（约 60 秒）。
- 如果警告指示灯 (10) 持续亮起，请确认主灯泡 (6) 和备用灯泡 (7) 是否安装到位。
- 如果问题依旧存在，请联系技术部。

6.3 测试故障时转用备用灯泡

此项测试用于检查故障时转用备用灯泡的功能是否正常。

1. 按打开/关闭按钮打开手术无影灯。
2. 主灯泡稳定后（60 秒后），按 - 按钮 (13) 将输出亮度降到最低。
3. 按住 − 按钮 (13) 20 秒直到选用了备用灯泡（黄光）。
4. 确认备用灯泡光束是否正常。
5. 按打开/关闭按钮 (11) 两秒关闭手术无影灯。
6. 再次打开手术无影灯并确认主灯泡亮起。

7 GENERAL CHARACTERISTICS OF G8 EVOLUTION SURGICAL LIGHTS
(In accordance with standard IEC 60,601-2-41)

7 G8 EVOLUTION 手术无影灯的一般特性
（符合 IEC 60,601-2-41 标准）

Characteristics of the main bulb 主灯泡的特性			**Unit** 单位	**G8 Evolution**
Central illuminance in concentrated beam 集中光束的中心照度			lx ± 7%	150 000*
Diameter d_{10} 直径 d_{10}			cm (inch) ± 1	20 (7.8)
Colour temperature 色温			K ± 10%	4 200
Colour rendering index 显色指数			± 3	94
Illumination depth 照明深度			cm (inch)	110 (43.3)
SHADOW DILUTION	阴影淡化	With one mask 带一个遮光罩	%	91%
		With two masks 带两个遮光罩	%	57%
		At base of tube 位于灯管底部	%	81%
		With one mask, at base of tube 带一个遮光罩，位于灯管底部	%	72%
		With two masks, at base of tube 带两个遮光罩，位于灯管底部	%	45%
Energy radiant 能量辐射			$mW.m^{-2}.lx^{-1}$ ± 0.3	3.5
Irradiance (Ee) 辐照度 (Ee)			$W.m^{-2}$ ± 15%	520
UV irradiance 紫外辐照度			$W.m^{-2}$	2
Characteristics of the spare bulb 备用灯泡的特性				
Nominal light output 标准光输出			lx ± 15%	85 000
Diameter d_{10} 直径 d_{10}			cm (inch) ± 1	15 (5.9)
Colour temperature 色温			K ±10%	3 200
Colour rendering index 显色指数			± 3	96
Energy radiant of spare bulb 备用灯泡的能量辐射			$mW.m^{-2}.lx^{-1}$ ± 0.5	5.4
Irradiance (Ee) of spare bulb 备用灯泡的辐照度 (Ee)			$W.m^{-2}$ ± 20%	460
UV irradiance 紫外辐照度			$W.m^{-2}$	1

* Factory set value

Note:

- The toleranced values are guaranteed on purchase of the product.
- The non-toleranced values are measured on a sample coming out of production.

* 出厂设定值

注意:

- 在购买产品时保证各项指标均在公差范围内。
- 无公差的值是对产品样本进行测量的值。

8 ACCESSORIES 8 附件

Description	说明	**Part number /** 零件号
Pack of 3 sterilisable handles	3 支装可消毒手柄	5 681 05 999
Kit with one G BULB EVOLUTION discharge bulb and one halogen bulb	一个 G BULB EVOLUTION 放电灯和一个卤素灯套件	5 681 02 990
Bulb holder	灯座	3 681 04 998

9 EMC DECLARATION

(In accordance with standard en 60601-1-2, november 2001 edition)

Table 201 - Guidance and Manufacturer's Declaration - Electromagnetic Emissions

G8 Evolution surgical lights are intended for use in the electromagnetic environment specified below. G8 Evolution customers or users should ensure that they are used in such an environment.

Immunity test	Compliance	Electromagnetic environment — directives
RF emissions CISPR 11	Group 1	G8 Evolution lights use RF energy only for their internal functions. Their RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	G8 Evolution lights are suitable for use in all establishments other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations and flicker emissions IEC 61000-3-3	Not applicable	

Table 202 - Guidance and manufacturer's declaration - electromagnetic immunity

G8 Evolution surgical lights are intended for use in the electromagnetic environment specified below. G8 Evolution customers or users should ensure that they are used in such an environment..

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment — guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient / burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV differential mode ± 2 kV common mode	± 1 kV differential mode ± 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply lines IEC 61000-4-11	< 5% U_T (dip > 95% of U_T) for 0.5 cycles 40% U_T (dip = 60% of U_T) for 5 cycles 70% U_T (dip = 30% of U_T) for 25 cycles < 5% U_T (dip = 95% of U_T) for 5 cycles	< 5% U_T (dip > 95% of U_T) for 0.5 cycles 40% U_T (dip = 60% of U_T) for 5 cycles 70% U_T (dip = 30% of U_T) for 25 cycles < 5% U_T (dip = 95% of U_T) for 5 cycles	Mains power quality should be that of a typical commercial or hospital environment. If the G8 Evolution requires continuous operation during mains interruptions, it is recommended that it be powered from an uninterruptible power supply.
Power frequency (50/60 Hertz) magnetic fields IEC 61000-4-8	3 A	3 A	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Note: U_T is the voltage of the AC supply network before applying the test level.

9 电磁兼容性声明

（符合 2001 年 11 月版的 EN 60601-1-2 标准）

表 201 – 指南和制造商声明 – 电磁辐射		
G8 Evolution 手术无影灯适用的电磁环境如下所述。G8 Evolution 客户或用户应确保在这些环境中使用无影灯。		
抗扰性测试	符合	电磁环境 – 指令
射频辐射 CISPR 11	第 1 组	G8 Evolution 手术无影灯仅将射频能量用于内部功能。它们的射频辐射非常低，不会对周围的电气设备产生任何干扰。
射频辐射 CISPR 11	A 级	除家用设施和直接连到为民用建筑供电的公共低压电网的设施外，G8 Evolution 手术无影灯适用于其他所有设施。
谐波电流辐射 IEC 61000-3-2	不适用	
电压波动和闪变辐射 IEC 61000-3-3	不适用	

表 202 – 指南和制造商声明 – 电磁抗扰性			
G8 Evolution 手术无影灯适用的电磁环境如下所述。G8 Evolution 客户或用户应确保在这些环境中使用无影灯。			
抗扰性测试	IEC 60601 测试电平	符合电平	电磁环境 – 指南
静电释放 (ESD) IEC 61000-4-2	± 6 kV 接触释放 ± 8 kV 空气释放	± 6 kV 接触释放 ± 8 kV 空气释放	地板材料应为木材、混凝土或瓷砖。如果地板采用合成材料，则相对湿度至少应为 30%。
电快速瞬变/脉冲群 IEC 61000-4-4	± 2 kV 供电线路 ± 1 kV 输入/输出线路	± 2 kV 供电线路 ± 1 kV 输入/输出线路	系统供电应达到典型商用或医院环境的水准。
电涌 IEC 61000-4-5	± 1 kV 差模 ± 2 kV 共模	± 1 kV 差模 ± 2 kV 共模	系统供电应达到典型商用或医院环境的水准。
供电线路上的电压骤降、短时中断和电压变化 IEC 61000-4-11	< 5% V_T （V_T 骤降大于 95%）时，0.5 个正弦周期 40% V_T （V_T 骤降为 60%）时，5 个正弦周期 70% V_T （V_T 骤降为 30%）时，25 个正弦周期 < 5% V_T （V_T 骤降为 95%）时，5 个正弦周期	< 5% V_T （V_T 骤降大于 95%）时，0.5 个正弦周期 40% V_T （V_T 骤降为 60%）时，5 个正弦周期 70% V_T （V_T 骤降为 30%）时，25 个正弦周期 < 5% V_T （V_T 骤降为 95%）时，5 个正弦周期	系统供电应达到典型商用或医院环境的水准。如果 G8 Evolution 需要在供电线路断电时继续运行，建议使用不间断电源供电。
工频 (50/60 Hz) 磁场 IEC 61000-4-8	3 A	3 A	工频磁场的干扰应接近典型商用或医院环境的水准。
注释：V_T 是采用测试电平前交流供电网的电压。			

Table 204 - Guidance and manufacturer's declaration - electromagnetic immunity

G8 Evolution surgical lights are intended for use in the electromagnetic environment specified below. G8 Evolution customers or users should ensure that they are used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment — guidance
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 V rms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 V rms 3 V/m	Portable and mobile RF communications equipment should be used no closer to any part of the BLUE 30/80, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = [\frac{3.5}{V1}]\sqrt{P} = 1.17\ \sqrt{P}$ $d = [\frac{3.5}{E1}]\sqrt{P}$ from 80 MHz to 800 MHz = $1.17\ \sqrt{P}$ $d = [\frac{7}{E1}]\sqrt{P}$ from 800 MHz to 2.5 GHz = $2.34\ \sqrt{P}$ where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer, and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic syrvey on site[a], should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the G8 Evolution is used exceeds the applicable RF compliance level above, the G8 Evolution should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the G8 Evolution.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

表 204 – 指南和制造商声明 – 电磁抗扰性

G8 Evolution 手术无影灯适用的电磁环境如下所述。G8 Evolution 客户或用户应确保在这些环境中使用无影灯。

抗扰性测试	IEC 60601 测试电平	符合电平	电磁环境 – 指南
传导射频 IEC 61000-4-6 辐射射频 IEC 61000-4-3	3 V rms 150 kHz 至 80 MHz 3 V/m 80 MHz 至 2.5 GHz	3 V rms 3 V/m	不得在 BLUE 30/80（包括电缆）附近的建议距离以内（此距离可根据适用于发射机频率的公式计算得出）使用便携式和移动射频通信设备。 建议距离 $d = [\frac{3.5}{V1}]\sqrt{P} = 1.17\sqrt{P}$ $d = [\frac{3.5}{E1}]\sqrt{P}$（80 MHz 至 800 MHz）$= 1.17\sqrt{P}$ $d = [\frac{7}{E1}]\sqrt{P}$（800 MHz 至 2.5 GHz）$= 2.34\sqrt{P}$ 其中，P 是发射器制造商指定的发射器最大额定输出功率，以瓦特 (W) 为单位，d 是以米 (m) 为单位的建议距离。 由现场电磁测量确定的固定射频发射器的磁场强度[a]，应小于每个频率范围的符合电平。[b] 在带有下列标识的设备附近可能产生干扰:

注释 1: 当频率为 80 MHz 或 800 MHz 时，适用较高的频率范围。

注释 2: 这些准则可能不适用于所有的情况。电磁传播会受到结构、物体和人体吸收和反射的影响。

[a] 理论上说，不能准确推算无线（手机/无绳）电话和地面移动无线电、业余无线电、AM 和 FM 无线电广播和电视广播基站等固定发射器的磁场强度。要评估由固定射频发射器产生的电磁环境，应考虑采用现场电磁测量。如果在 G8 Evolution 使用位置测得的磁场强度超过上述适用的射频符合电平，则应验证 G8 Evolution 是否能够正常工作。如果观察到异常，则需要采取额外的措施，例如重新定向 G8 Evolution 或将其布设到另一个位置。

[b] 当超过 150kHz 至 80MHz 的频率范围时，磁场强度应小于 3 V/m。

Table 206 - Recommended separation distance between portable and mobile RF communication devices and G8 Evolution lights.

G8 Evolution is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the G8 Evolution can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the G8 Evolution as recommended below, according to the maximum output power of the communications equipment.

Maximum rated output power of transmitter **W**	**Separation distance depending on transmitter frequency** **m**		
	150 kHz to 80 MHz $d = [\ 1.17\ ]\sqrt{P}$	**80 MHz to 800 MHz** $d = [\ 1.17\ ]\sqrt{P}$	**800 MHz to 2.5 GHz** $d = [\ 2.34\ ]\sqrt{P}$
0 01	0.12	0.12	0.24
0.1	0.37	0.37	0.74
1	1.17	1.17	2.34
10	3.69	3.69	7.38
100	11.70	11.70	23.40

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

表 206 – 便携式和移动式射频通信设备与 G8 Evolution 手术无影灯之间的建议距离

G8 Evolution 适合在射频干扰受到控制的电磁环境中使用。G8 Evolution 的客户或用户可根据便携式和移动式射频通信设备（发射机）的最大输出功率，使通信设备和 G8 Evolution 至少保持以下建议间距，以防止电磁干扰。

发射机最大额定输出功率 W	根据发射机频率建议的间距 m		
	150 kHz 至 80 MHz $d = [\ 1.17\ ]\sqrt{P}$	80 MHz 至 800 MHz $d = [\ 1.17\ ]\sqrt{P}$	800 MHz 至 2.5 GHz $d = [\ 2.34\ ]\sqrt{P}$
0 01	0.12	0.12	0.24
0.1	0.37	0.37	0.74
1	1.17	1.17	2.34
10	3.69	3.69	7.38
100	11.70	11.70	23.40

如果以上没有列出您的发射机的最大额定输出功率，建议距离 d（单位为米 [m]）可通过适用于发射机频率的公式估算得出，其中 P 是发射机制造商指定的发射机最大额定输出功率，单位为瓦特 (W)。

注释 1: 当频率为 80 MHz 或 800 MHz 时，适用较高频率范围的间距计算方程。

注释 2: 这些准则可能不适用于所有的情况。电磁传播会受到结构、物体和人体吸收和反射的影响。

10 TROUBLESHOOTING

Anomaly	Likely cause	Corrective action
Cupola drifts	Suspension tube not vertical	Check tube verticality and ceiling structure
Cupola too stiff or does not stay in position	Balancing incorrectly adjusted	Adjust the balancing
	Ceiling structure unstable	Call MAQUET technical department
	Brakes not tight enough	Adjust the brakes
Light flickers (normal during cold start-up)	Poor contact, problems with electronics or ageing of main bulb	Call MAQUET technical department
Insufficient light output level	Main bulb faulty, electronic unit faulty, low light output selected	Check bulbs and replace if necessary, check bulb position, call technical department
Light beam not round	Incorrect type of bulb(s)	Check bulbs and replace if necessary
	Incorrect bulb or bulb holder position	Check bulb position, call technical department
Bulb service life too short	Non-compliant bulbs used	Check that the bulbs recommended by MAQUET are used
Lifecycle indicator fully lit even after replacing bulb	Lifecycle indicator has not been reset	Reset the indicator
Greenish light	Main bulb too old, main bulb faulty	Check bulbs and replace if necessary, check bulb position
	Light output level too high	Select a lower light output level
Cupola does not turn off	Off button not held down long enough	Press the Off button and hold for at least 2 seconds
	Cupola has just been turned on	Wait until the light reaches its service temperature (60 seconds) before turning it off
Cupola does not turn on	Power supply cut	Check power supply and fuses
	No bulb, bulb incorrectly installed	Lampen überprüfen und ggf. ersetzen, Lampensitz prüfen
	Electronic unit faulty	Call technical department
Cupola cover crazed or cracked	Use of too aggressive cleaning solution, cleaning or disinfection when hot	Use a different cleaning solution
Service life of sterilisable handles too short	Sterilisation procedure too harsh	Check sterilisation procedure
Sterilisable handles damaged or cracked	End of sterilisable handle service life	Replace sterilisable handles

10 故障排除

异常情况	可能的原因	纠正措施
灯头移位	吊管不垂直	检查垂直度和吊顶结构
灯头活动性太差或不能安装到位	平衡调节不当	调节平衡
	吊顶结构不稳定	致电 MAQUET 技术部
	制动不够紧	调节制动器
灯光闪动（冷起动时正常）	接触不良、电子部件出现故障或主灯泡老化	致电 MAQUET 技术部
光输出强度不够	主灯泡出现故障，电子装置出现故障，选择的光输出强度低	检查灯泡并在必要时更换，检查灯泡位置，致电技术部
光束不呈圆形	使用的灯泡类型不当	检查灯泡并在必要时更换
	灯泡或灯座位置不当	检查灯泡位置，致电技术部
灯泡的使用寿命太短	使用了不合格的灯泡	检查是否使用了 MAQUET 推荐的灯泡
即使在更换灯泡后，Lifecycle 指示灯也完全亮起	未复位 Lifecycle 指示灯	复位指示灯
灯光发绿	主灯泡太旧，主灯泡出现故障	检查灯泡并在必要时更换，检查灯泡位置
	光输出强度太高	选择一个较低的光输出强度
无法关闭灯头	按“打开/关闭”按钮的时间不够长	按住“打开/关闭”按钮至少两秒钟。
	刚刚打开灯头	等待手术无影灯达到工作温度（60 秒）然后关闭
无法打开灯头	电源被切断	检查电源和保险丝
	未装灯泡、灯泡安装不当	检查灯泡，必要时请更换，并检查灯泡是否正确安装。
	电子装置出现故障	致电技术部
灯头罩破裂或出现裂缝	使用腐蚀性太强的清洁液，在高温时清洁或消毒	使用另一种清洁液
可消毒手柄的使用寿命太短	灭菌过程太伤手柄	核对灭菌过程
可消毒手柄损坏或破裂	可消毒手柄的使用寿命终结	更换可消毒手柄

Our network is on hand to answer any of your questions.

我们的服务网络随时准备回答您的任何疑问。

CE

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