



INSTRUCTION FOR USE
Photo slit lamp

BX 900[®]

5. Edition / 2015 – 06

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Introduction

Thank you for choosing a HAAG-STREIT device. Provided you comply carefully with the regulations in this instructions for use, we can guarantee the reliable and unproblematic use of our product.

Purpose of use

An AC-powered slit lamp biomicroscope is intended for use in eye examination of the anterior eye segment, from the cornea epithelium to the posterior capsule. It is used to aid in the diagnosis of diseases or trauma which affect the structural properties of the anterior eye segment.

Contraindications

There are no absolute contraindications known for examinations with this device. Appropriate professional assessment and caution are necessary.



WARNING!

Read the instruction manual carefully before commissioning this product. It contains important information regarding the safety of the user and patient.



NOTE!

Federal law restricts this device to sale by or on the order of a physician or licensed practitioner.



NOTE!

The Slit Lamp Imaging Guide brochure contains many useful tips on taking photographs with the BX 900 photo slit lamp. Contact your HAAG-STREIT representative or obtain a copy on our homepage at www.haag-streit.com.

Contents

1. Safety	4
1.1 Areas of application of the device	4
1.2 Ambient conditions	4
1.3 Shipment and unpacking	4
1.4 Installation warnings	4
1.5 Operation, environment	4
1.6 Light toxicity	5
1.8 Warranty and product liability	5
1.9 Symbols	5
2. Introduction	6
2.1 Overview	6
2.2 Photo components	6
2.3 Lens barrel	8
2.4 Camera housing	8
2.5 Flash unit FU 01	8
2.6 LED illumination	8
2.7 Overview of the LED illumination unit upper part	8
2.8 Blue filter	8
2.9 Shutter	8
2.10 Periphery or background illumination	9
2.11 Power supply PS-LED	9
2.11.1 Models	9
2.11.2 Description	9
3. Device assembly / installation	9
3.1 Power supply for instrument table HSM 901	9
3.2 Power supply on third-party tables	10
3.3 Instrument base with weight compensation facility	10
3.4 Setting the weight compensation facility	10
3.5 Switching on the compensation facility	10
3.6 Switching off the compensation facility	10
3.7 Regulating the clearance of the slit width control	10
3.8 Attaching/removing a camera	10

4. Commissioning	10	8 Maintenance	18
4.1 Switching on the device.....	10	8.1 Device Check.....	18
5 Operation	11	8.2 Changing the flash tube.....	18
5.1 Setting the eyepieces.....	11	8.3 Servicing.....	18
5.2 Preparing the patient.....	11	8.4 Replacing the fuses.....	18
5.3 Operating the instrument.....	11	8.4.1 Mains fuses:.....	18
5.4 Periphery or background illumination (flash).....	12	8.4.2 Flash unit fuse:.....	18
5.5 Photo diaphragm pre-selection.....	12	8.4 Cleaning.....	19
5.6 Setting the filters & diaphragms.....	12	8.6 Cleaning the slide plate and the rack rails.....	19
5.7 Fixation star.....	12	8.7 Cleaning the axle.....	19
5.8 Microscope and eyepiece.....	13	8.8 Replacing the illumination mirror.....	19
5.9 Flash unit FU 01.....	13	8.9 Dust cover.....	19
5.9.1 Error messages for flash unit FU 01.....	13	A. Appendix	19
5.10 Upper part of the illumination unit.....	13	A.1 Accessories / spare parts.....	19
5.10.1 Reduced operation.....	14	B. Legal regulations	20
5.10.2 LED display Illumination head.....	14	C. Classification	20
5.10.3 LED display (PS-LED power supply).....	14	D. Disposal	20
5.10.4 Error messages (illumination head).....	15	E. Observed standards	20
5.10.5 Error messages (PS-LED power supply).....	15	F. Information and manufacturer's declaration concerning electromagnetic compatibility (EMC)	21
6. Decommissioning	16	F.1 General.....	21
7. Technical data	16	F.2 Emitted interference (standard table 1).....	21
7.1 Slit illumination.....	16	F.3 Interference immunity (standard table 2).....	22
7.2 Stereo microscope.....	16	F.4 Interference immunity for non-life-supporting devices (standard table 4).....	23
7.3 Instrument base.....	16	F.5 Safe distances for non-life-supporting devices (standard table 6).....	24
7.4 Net weight.....	16		
7.5 Flash illumination.....	16		
7.6 Flash unit FU 01.....	16		
7.7 Mirror and diaphragm component.....	16		
7.8 Lens barrel.....	17		
7.9 Illumination.....	17		
7.10 Power supply PS-LED / PS-LED HSM 901.....	17		
7.11 Dimensions.....	17		
7.12 Camera.....	17		

1. Safety



DANGER!

Failure to comply with these instructions may result in material damage or pose a danger to patients or users.



WARNING!

These warnings must absolutely be complied with to guarantee safe operation of the device and to avoid any danger to users and to patients.



NOTE!

Important information: please read carefully.

1.1 Areas of application of the device

The device is intended for use in doctor's practices, hospitals and optometrists' and opticians' premises.

1.2 Ambient conditions

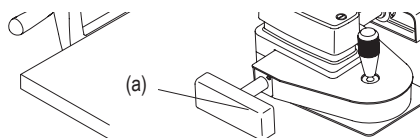
Transport:	Temperature	from	-40°C	to	+70°C
	Air pressure	from	500 hPa	to	1060 hPa
	Relative humidity	from	10%	to	95%
Storage:	Temperature	from	-10°C	to	+55°C
	Air pressure	from	700 hPa	to	1060 hPa
	Relative humidity	from	10%	to	95%
Use:	Temperature	from	+10°C	to	+35°C
	Air pressure	from	800 hPa	to	1060 hPa
	Relative humidity	from	30%	to	90%

1.3 Shipment and unpacking

- Before you unpack the device, check whether the packaging shows traces of incorrect handling or damage. If this is the case, notify the transport company that has delivered the goods to you. Unpack the device together with a representative of the transport company. Prepare a report for any possibly damaged parts. This report must be signed by you and by the representative of the transport company.
- Leave the device in the packaging for a few hours before unpacking it (condensation).
- Check the device for damage after it is unpacked. Return defective devices in the appropriate packaging.
- Store packaging material carefully, so that it can be used for possible returns or

when moving.

- The slit lamp and head rest must be installed on an electrically insulated, fire-proof table top.
- The rail covers (a) prevent the slit lamp from tilting.
- Check: Are the connection parts of the accessories in the correct position (screw connections, quick-release fasteners)?



1.4 Installation warnings



WARNING!

- Do not modify this equipment without authorization of the manufacturer. Installation and repairs may only be performed by trained specialists.
- Any third-party device must be connected in compliance with the EN 60601-1 standard.
- The device must not be stacked or placed in close proximity to other electronic devices.

1.5 Operation, environment



DANGER!

Never use the device in potentially explosive environments where volatile solvents (alcohol, petrol, etc.) and flammable anaesthetics are in use.



WARNING!

- The image in the ocular is critical for diagnosing a patient; the images taken here are only for documentation purposes!
- To avoid the risk of an electric shock, this device must be connected up to the mains with a ground connection when using power supplies assigned to protection class I.
- The device must be switched off after every use. Otherwise there is a risk of overheating when a protective dust cover is employed.



NOTE!

This device must only be operated by qualified and trained personnel. The user is responsible for such training.

1.6 Light toxicity



WARNING!

- The light from this instrument may be dangerous. The risk of eye damage increases with the radiation period and number of pulses. Exposure at maximum output of longer than 90 seconds with the LED illumination and 90 pulses with the flash source will exceed the hazard guideline value.
- Using a 90 D lens reduces the exposure time to 9 seconds and the number of pulses to 10.



NOTE!

- The radiation times and number of total pulses of all light sources are cumulative.
- If the intensity of any of the light sources is reduced to 50% of the maximum intensity, the illumination time or number of pulses to reach the guideline value for radiation for the light source in question is doubled. This linear relationship can be used to determine the illumination time to reach the guideline value for radiation for the combination of slight sources at various brightness settings.
- The guideline value for the evaluated irradiation of the retina is 10 J/cm².
- Nevertheless, we recommend keeping the intensity of the light reaching the patient's retina to the minimum possible for the respective diagnosis. Children, aphakes and people suffering from eye conditions are most at risk.
- An increased risk may also occur if the retina is exposed to the same or a similar device with a visible light source within 24 hours. This specially applies if the retina has been photographed with a flashbulb in advance.

1.7 Disinfection



NOTE!

The device does not require disinfection. For more information on cleaning, please refer to the 'Maintenance' section.

1.8 Warranty and product liability

- Haag-Streit products must be used only for the purposes and in the manner described in the documents distributed with the product.
- The product must be treated as described in the 'Safety' chapter. Improper handling can damage the product. This would void all guarantee claims.
- Continued use of a product damaged by incorrect handling may lead to personal injury. In such a case, the manufacturer will not accept any liability.
- Haag-Streit does not grant any warranties, either expressed or implied, including implied warranties of merchantability or fitness for a particular use.
- Haag-Streit expressly disclaims liability for incidental or consequential damage resulting from the use of the product.
- This product is covered by a limited warranty granted by your seller.

For USA only:

- This product is covered by a limited warranty, which may be reviewed at www.haag-streit-usa.com.

1.9 Symbols



Read the instructions for use attentively



General warning: Read the accompanying documentation



Warning: dangerous voltage



Notes on disposal, see the 'Disposal' chapter



Disconnect the plug before opening the device



Test symbol of CSA with approval for USA



European certificate of conformity



This appliance fulfills the European Directive 2011/65/EU (RoHS)



Year of production



Manufacturer



Direct current



Alternating current



Earth (ground)





Protective earth (ground)

IPX0 Not protected from foreign bodies

REF HS reference number

SN Serial number


 On (Power)


 Off (Power)


 Background illumination

 Slit lamp illumination

IP_{NiN₂} Protection from penetration of water & foreign bodies

 Illumination control from another manufacturer

 After turning off the FU 01 flash unit, wait at least 15 seconds before the flash cable is removed.

 After turning off the FU 01 flash unit, wait at least 15 seconds before the slide is opened

2. Introduction

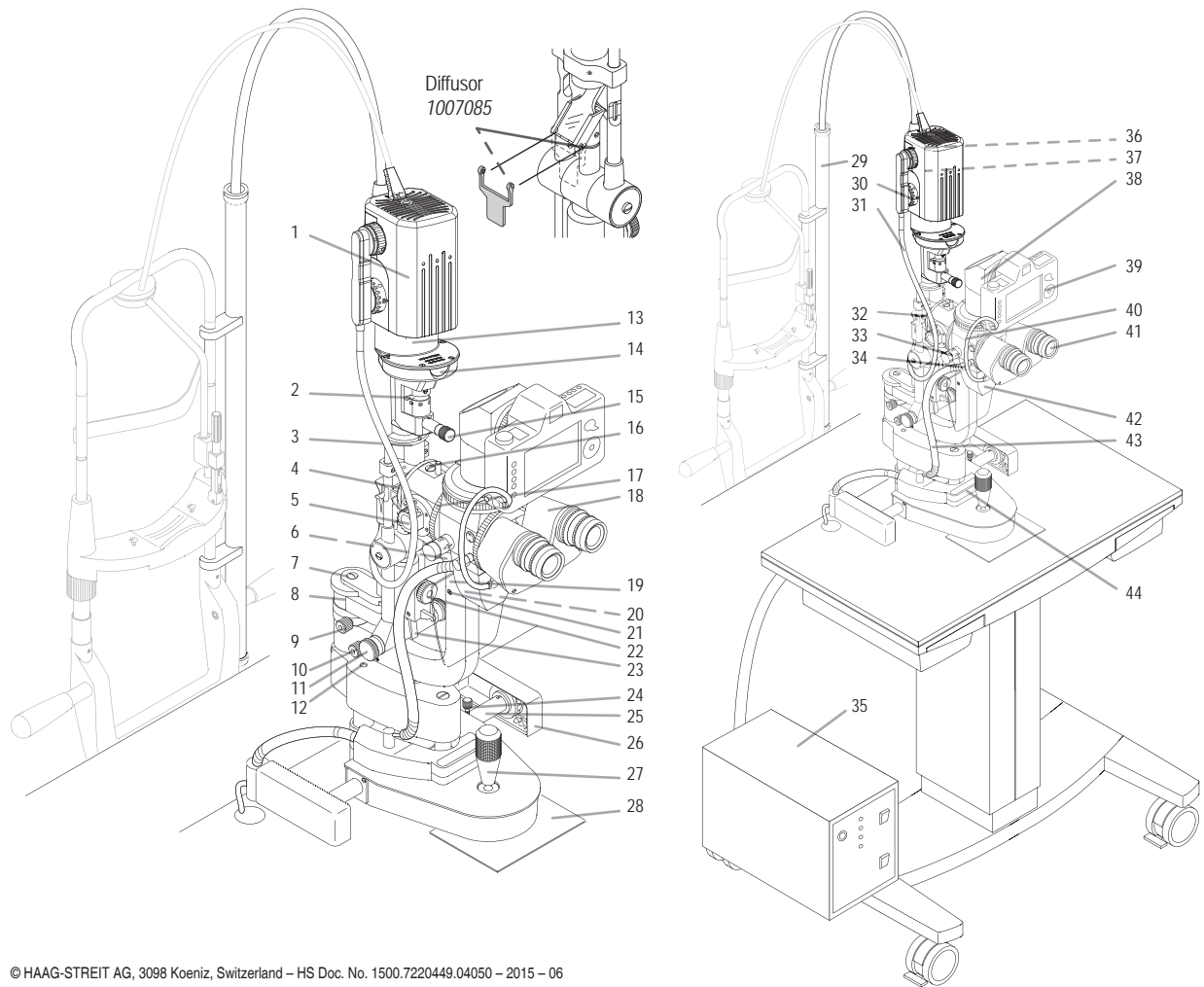
The slit lamp comprises an illumination part and a binocular microscope. The entire device can be moved in front of the eyes using the instrument base. The illumination offers a range of setting possibilities for making the practically invisible areas of the eye visible. There is also a range of accessories available for the slit lamp to allow special diagnosis possibilities in addition to the general examinations.

2.1 Overview

1. LED illumination unit upper part
2. Lever for grey filter and red removal filter
3. Scale for angled position of the slit image (5° increments)
4. Illumination mirror
5. Magnification changer
6. Mounting screw for the stereo microscope
7. LED periphery or background illumination with swivel bracket
8. Illumination unit / microscope angle scale
9. Illumination arm locking screw
10. Microscope arm locking screw
11. Slit width setting screw
12. Weight compensation screw
13. Trade mark BX 900®
14. Slit length / diaphragm scale
15. Slit length, slit rotation, blue filter and fixation star control, knob for rotating the slit
16. Cover screw for accessories pin
17. Bayonet connector for accessories
18. Stereo microscope with eyepieces
19. Breath shield
20. Fastening pin for breath shield
21. Thread for fixing the tonometer
22. Centering screw
23. Inclination angle latch 0°-20°
24. Joy stick base locking screw
25. Axle
26. Rail cover
27. Control lever
28. Slide plate

2.2 Photo components

29. Flash cable (with tube and flash tube connection)
30. Filter wheel for periphery or background illumination (flash)
31. Optical light guide, branched
32. Pivoting mirror
33. Rotating knob for diaphragm pre-selection
34. Rotating knob for diaphragm actuation
35. Flash unit FU 01
36. Flash tube housing
37. Flash tube
38. Lens barrel
39. Camera housing
40. Camera cable
41. Ocular with double cross hairs
42. Mirror and diaphragm component
43. Cable trigger key for mirror/diaphragm component
44. Trigger key with cable



2.3 Lens barrel

Lens barrel for 35mm photography (38). Image taken by the right beam path of the microscope. Object image size: see Table b, Chapter 7.8, pg 17.

2.4 Camera housing

Not every camera housing (39) can be connected. HAAG-STREIT selects suitable camera models and makes the necessary adjustments. The photo slit lamp is only guaranteed to function properly if cameras recommended by HAAG-STREIT are used. Please consult your local partner for information on the supported cameras.

2.5 Flash unit FU 01

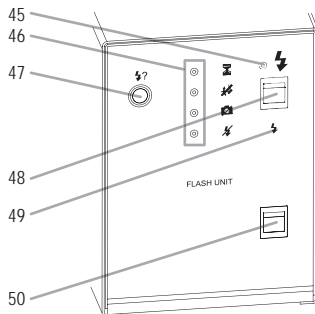


WARNING!

This device must only be operated by qualified and trained personnel.

Face plate

- 45. Flash intensity high with LED
- 46. Symbols with LED (See chapter "Error messages flash unit")
- 47. Flash test
- 48. Flash intensity
- 49. Flash intensity normal
- 50. Main switch ON (lights up) / OFF

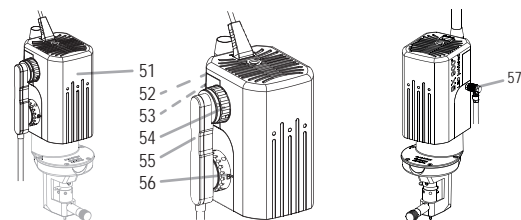


2.6 LED illumination

- The LED illumination head is made up of an LED illumination unit, a power supply, an optical light guide set for periphery or background lighting and an illumination control.
- The two-core connection cable between the power supply and illumination head transmits both the supply current for the LED as well as signals for communication between the power supply and illumination.
- The light intensity of the slit and periphery/background illumination can be regulated continuously (without increments) using the illumination controllers. These can be connected using a longer connection cable on the PS-LED power supply.

2.7 Overview of the LED illumination unit upper part

- 51. LED illumination LI 01-plus with periphery or background lighting
- 52. Flash tube connection
- 53. Flash tube
- 54. Filter wheel for constant illumination (LED) blue filter
- 55. Optical light guide connection for slit and periphery/background illumination
- 56. Filter/diaphragm wheel for periphery/background illumination (flash) This wheel is used to control the intensity of the flash periphery/background illumination and blue filter; see 5.4



2.8 Blue filter

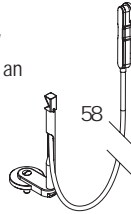
The rotating wheel (54/56) is used to pivot the blue filter. Marking points at the same height = blue filter is on.

2.9 Shutter

- 57. The shutter cable must be connected to the illumination head. This ensures that a shutter closes when the flash is triggered, in order to protect the LED from the intense radiation of the flash.

2.10 Periphery or background illumination

58. Periphery/background illumination (swiveling): This periphery/background illumination may only be used in conjunction with an LI 01-plus LED illumination.

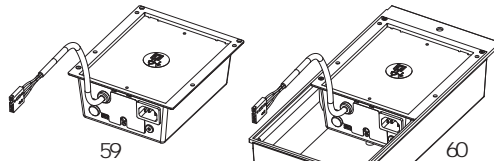


2.11 Power supply PS-LED

2.11.1 Models

59. Power supply PS-LED, for installation on third-party tables and units

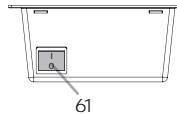
60. Power supply PS-LED HSM 901 insert, for the HSM 901 instrument table



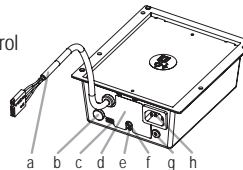
2.11.2 Description

61. Rocker switch

Switch in position 0 = 'OFF', the power supply is disconnected from the mains, and the control lamp is unlit. Switch in position 1 = 'ON', the control lamp lights green.



- Main and fixation lamp connection
- Connecting an illumination control from another manufacturer (Power Jack 2.1 mm)
- HAAG-STREIT connection for illumination control IC 01 (USB mini B)
- Type plate (on housing)
- S1, pushbutton
- L1, LED display (green / red)
- Functional earth connection (M3)
- 3-core mains connection



3. Device assembly / installation



WARNING!

This device must not be modified without the manufacturer's approval. Installation and repairs may only be performed by trained specialists. Contact your HAAG-STREIT representative for the installation, repair and modification of the system. You can find the contact information at www.haag-streit.com.

The initial installation of the device is conducted by an authorized service technician. The following adjustments can be conducted by the end user:

- Regulating the clearance of the slit width control
- Attaching/removing a tonometer (see separate instruction for use)
- Attaching/removing a camera
- Adjusting the weight compensation

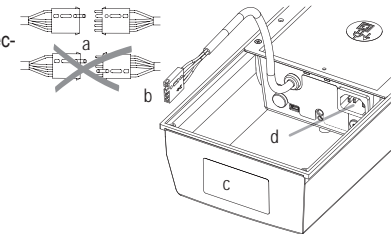
3.1 Power supply for instrument table HSM 901



NOTE!

HAAG-STREIT recommends connecting the aluminium tray to the ground conductor connection on the power supply.

- Connector orientation
- Main and fixation lamp connection
- Type plate on housing
- Mains connection



NOTE!

The 'Instrument table HSM 901' instruction for use must be followed.

3.2 Power supply on third-party tables

- Connect all cables; if necessary, use a cable tie to relieve the tension on the power cable.
- Fasten the PS-LED power supply with 4 screws.
- Connect the multi-core plug connection between the head rest and the instrument table.
- Connect the main lamp cable to the upper part of the illumination unit.



WARNING!

- Care must be taken when mounting the guide rail and head rest to ensure that there is no electrical connection to any metal part of the table. Otherwise, it will be necessary to attach a ground conductor to the head rest.
- The power supply must be connected with a ground conductor in any case!
- Cables must not be trapped as this can cause a short circuit!
- Work on cables or device parts which are in connection with the mains may only be conducted by qualified personnel.

3.3 Instrument base with weight compensation facility

The weight of additional accessories mounted on the microscope can be compensated using counterbalance springs. This keeps the height adjustment of the slit lamp easy.

3.4 Setting the weight compensation facility

Turn the control lever (27) to its lowest position and then slacken it slightly by a quarter turn. Swivel the microscope and illumination to the side. Apply 1-3 springs depending on the accessory.

3.5 Switching on the compensation facility

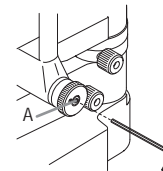
Turn anticlockwise until the screws (12) are completely released.

3.6 Switching off the compensation facility

Turn the screws (12) clockwise until you meet resistance. Verify whether the microscope arm springs back downwards if you push it upwards with your hand. This will only happen if the load is already at maximum. Generally, as many counterbalance springs should be deactivated as necessary until this spring action occurs. The weight compensation facility is set correctly once the illumination and microscope with the mounted accessories weigh slightly more than the counterbalance springs.

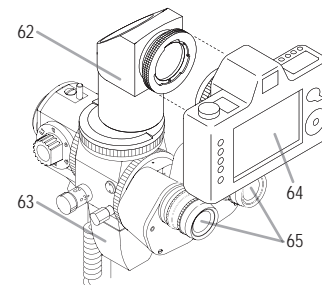
3.7 Regulating the clearance of the slit width control

The small screw in the center of the right control knob (A) allows you to regulate the friction of the turning movement of these adjusting knobs. Turning it slightly to the right (in) makes it harder, turning it left (out) makes it easier. It should at least be set so hard that the slit cannot close on its own.



3.8 Attaching/removing a camera

62. Lens barrel
63. Mirror and diaphragm component
64. Camera
65. Eyepiece



Remove the camera cover, attach the spacer ring to the camera and place the camera on the lens barrel. If the camera is removed, the connection to the lens barrel should be closed off with the cap intended for this purpose.



NOTE!

Consult your Haag-Streit representative for information on the supported cameras and their connection rings.

4. Commissioning

Connect the PS-LED power supply and FU 01 flash unit to the mains.

4.1 Switching on the device

- Throw the rocker switch on the PS-LED power supply and the main switch on the FU 01 flash unit 01 I = 'ON'. The green lights on the rocker switches will light up when the device is switched on.
- Turn the rotating knob on the illumination control to a position between '1' and '10'.

5 Operation

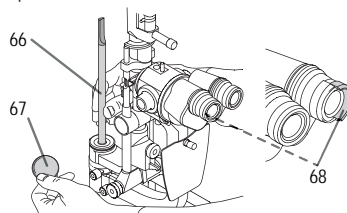
5.1 Setting the eyepieces



NOTE!

The eyepieces must be individually set prior to the first examination in accordance with the refraction of the examiner. Insert the provided focus test rod (66) in place of the protective cover (67) and turn its black projection surface at a right angle to the microscope axis. Return the illumination and microscope to the central position (0°).

Insert the 12.5x eyepiece with double crosshair into the right eyepiece mounting in the binocular tube. The depth of the double crosshair on the reticle corresponds to the film/chip level. The setting is performed from the (+) side at low magnification until the double crosshair appears sharp.



66. Test rod

67. Protective cover

68. Sliding occluders

- Each eyepiece should be set individually by turning the knurled ocular refraction ring with dioptre scale until the projected slit can be seen in focus. The setting is performed from the (+) to the (-) side at low magnification.
- The sliding occluders (68) are used to set the correct working distance for the examiner from the eyepiece.
- Examiners who do not wear glasses: Pull the occluders out as far as they will go.
- Examiners who do wear glasses: Push the occluders in as far as they will go.

5.2 Preparing the patient

- In order to attain a solid basis for the forehead and chin to rest on, the table height should be selected such that the patient sits bent over forward.
- To ensure that only the part of the eye being examined is illuminated, the slit height should be set accordingly in order to avoid objectionable radiation.
- The lamp must be switched off after every examination.

5.3 Operating the instrument



WARNING!

The device must be switched off after every use. Otherwise there is a risk of overheating when a protective dust cover is employed.



NOTE!

Head rest See separate instructions for use.

- Use the turn screw to set the chin rest in such a way that the patient's eyes are at the same height as the black mark on the sides of the head rest.
 - Adjust the eyepieces (41) in accordance with the examiner's refraction by turning the knurled rings and set the eye distance.
 - Switch on the illumination by pressing the switch on the power supply.
 - Regulating the brightness of the slit illumination / multi-level mains switch on power supply / 10% grey filter (Sect. 3.4).
 - Adjust the height of the slit lamp by turning the control lever (27) until the luminous aigrette is at eye level.
 - The magnification of the stereo microscope is changed using the rotary knob on the magnification changer (5).
 - The rigidly held control lever (27) gently inclined towards the examiner can be used to push the entire device until the slit appears approximately focused on the cornea. This initial setting is verified with the naked eye. Fine tuning is performed by tilting the control lever while observing via the stereo microscope (18).
 - The slit width is set left or right with the rotating knob (11), as is the angle between the stereo microscope and illumination.
 - The slit image can be set vertically, horizontally or as diagonal as required by turning the illumination facility on the handle (15) (locking points at 45°, 90° and 135°; stops at 0° and 180°; scale in 5° increments).
 - To ensure that unimpeded binocular fundus examination is also possible at lateral angles of between 3° and 10°, a short mirror is used, the illumination turned 90° using the locking screw (15) and tilted in 5° steps using the latch (23), and the illumination and microscope turned to the central position (0°).
 - Front-lens glasses and contact glasses are used to examine the ocular fundus.
- Diffused illumination:**
- Connecting the diffusor upstream creates diffused illumination (14). This allows monitoring of the overview and can be used to capture the overview.

Indirect illumination:

- For observation in regredient light (indirect illumination), the centering screw (22) is loosened in order to move the slit image out of the center of the visual field. Tightening the screw centers the slit image again.

Tilting the slit:

- The latch (23) can be used to tilt the illumination in 5° steps. In this way, a diagonal ray of light from below is generated when the slit is oriented horizontally. The slit orientation allows a reflection-free examination with contact glasses (fundus and gonioscopy) and magnifying glasses.

5.4 Periphery or background illumination (flash)

The flash tube in the upper part of the illumination unit supplies the periphery or background illumination via an optical fibre cable when the flash is triggered.

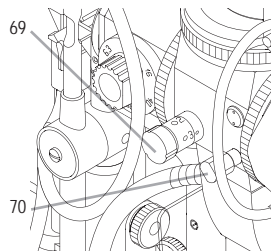
●	100% open
◐	50% open
◑	25% open
◒	10% open
◓	5% open
○	0% open (closed)
B	Blue filter

5.5 Photo diaphragm pre-selection

69. Rotating knob for diaphragm pre-selection

You may select between levels 1 through 5, each with an increasingly smaller aperture. The size of the interval is equivalent to one f-stop.

- Level 1 = largest aperture
(smallest depth of field)
- Level 5 = smallest aperture
(largest of field)

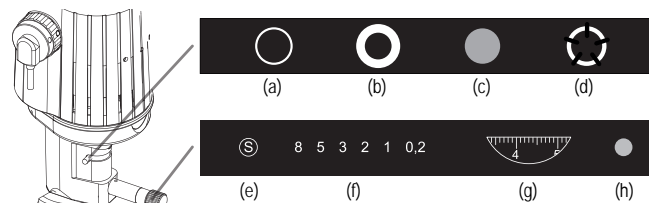


70. Rotating knob for diaphragm actuation

Turning one of the two knobs on the right and left allows you to close the diaphragms to the pre-set aperture during observation.

5.6 Setting the filters & diaphragms

- Open
- Grey filter (10%)
- Red removal filter
- Reserve opening for filter optionally $\varnothing 15$ mm (0/-0.2), thickness 2.5 mm
- Fixation star
- Apertures of 8, 5, 3, 2, 1 and 0.2 mm \varnothing
- Display of slit length in mm
- Blue filter



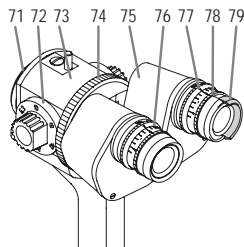
5.7 Fixation star

- Turning the diaphragm disc as far as it will go to the left switches on the fixation star and the symbol "S" appears in the window. This star is projected onto the fundus at the back of the eye in certain examinations and is visible to the patient at the same time, who is asked to focus on the hole in the center of the star. This allows the examiner to see where the patient's vision is most focused.
- A typical application of the fixation star is during laser treatments close to the macula. Similarly, it is also possible to identify microstrabismus with the projection of the fixation star. The fixation star is usually used with a red removal filter.




5.8 Microscope and eyepiece

- 71. Front lens
- 72. Rotary knob displaying the set magnification
- 73. 5-level magnification changer (Galilei system)
- 74. Knurled ring for bayonet connector
- 75. Binocular tube with convergent view, pupil distance can be set from 52 to 78 mm
- 76. Eyepiece 12.5x / field of vision \varnothing 16 mm
- 77. Index (white point)
- 78. Knurled ring with dioptré scale for setting the refraction of the examiner (± 7 D)
- 79. Sliding occluder (for people who wear glasses)



5.9 Flash unit FU 01

Capture frequency 'normal'


-  Captures 1 to 10 in a 1-second cycle
- Captures 11 to 20 in a 2-second cycle
- Captures 21 to 30 in a 3-second cycle

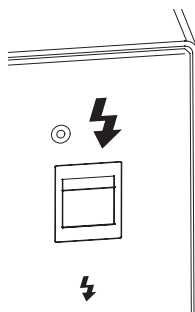


NOTE!

A pause of 210 seconds will follow.

Capture frequency 'high'

-  Captures 1 to 10 in a 1-second cycle
- Captures 11 to 15 in a 2-second cycle
- Captures 16 to 20 in a 3-second cycle
- Captures 21 to 30 in a 5-second cycle



WARNING!







After turning off the FU 01 flash unit, wait at least 2 minutes before turning it back on!



NOTE!

A pause of 210 seconds will follow.

5.9.1 Error messages for flash unit FU 01

Symbols		LED	Sound
	Wait <ul style="list-style-type: none"> • Let the flash tube cool off 		-
	Folding mirror inoperative <ul style="list-style-type: none"> • Connect cable • Make sure that the plug is seated properly 	Red	Long beep
	Camera not ready <ul style="list-style-type: none"> • Switch on camera • Empty image memory • Take camera out of sleep mode • Connect cable • Make sure that the plug is seated properly 	Red	Long beep
	Flash inoperative <ul style="list-style-type: none"> • Close flash slider • Change flash tube • Connect cable 	Red	Long beep
	NOTE! <p>Once the error in question has been rectified, the visual warning signal is deleted by pressing the release button. The device will then be back in operation.</p>		
	GENERAL ALARM! <ul style="list-style-type: none"> All red LEDs are flashing (electronic defect) • Contact customer service! 		

5.10 Upper part of the illumination unit

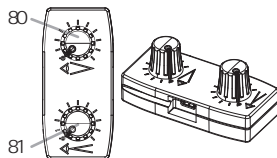
The light sources are set when the rotating knob on the illumination control is set to a position between '1' and '10'.

The light sources are shut off in the 0-position. (Standby).

- Slit and periphery/background illumination can be set independently of one another on the rotary potentiometers.
- The blue rotating wheel on the illumination head can be used to switch the periphery/background illumination between white and blue light.

80. Rotating knob, periphery or background illumination

81. Rotating knob, slit illumination

**WARNING!**

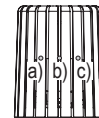
Pot cables may only be used in conjunction with an IC 01 illumination module and a PS-LED power supply. Only connect the illumination control to devices intended for this purpose!

5.10.1 Reduced operation

In order to ensure that the light sources will have a long service life, the power of the periphery/background illumination is reduced somewhat once the maximum operating temperature has been reached. Full power can be used again after a short period of time for it to cool down. This operating state is only reached if both light sources are switched on together for a long period of time.

**NOTE!**

The LED illumination can be switched off with the illumination control. The device power supply remains switched on and the switch illuminates green. To switch the system off completely, the rocker switch must be set to the 0 = 'OFF' position. This results in double-pole disconnection from the mains.

5.10.2 LED display illumination head

a) b) c)

Periphery or background illumination

Polarity

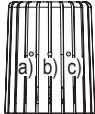
Slit illumination

Operating status	● ● ●	○ ● ○	○ ○ ●
Standby mode	Green, short flashes	X	Green, short flashes
Normal operation	Green	X	Green
Slit and periphery/background illumination on	Green, short flashes	X	Green
Only slit illumination on	Green, short flashes	X	Green, short flashes
Only periphery/background illumination on	Green, short flashes	X	Green, short flashes
Reduced periphery/background illumination operation	Green, flashing	X	Green, flashing
High LED temperature, thus reducing periphery/background illumination operation	Green, flashing	X	Green, flashing

5.10.3 LED display (PS-LED power supply)

Normal operation	green
------------------	-------

5.10.4 Error messages (illumination head)

ERROR	Error messages	Measures	a) b) c)		
			Periphery or back-ground illumination	Polarity	Slit illumination
			● ○ ○	○ ● ○	○ ○ ●
E1	Incorrect supply polarization	Contact your HAAG-STREIT representative.	X	Red	X
E2	Illumination control not recognized	Connect illumination control or replace, if necessary.	Red	X	Red
E3	Temperature is too high	The light sources' power will be reduced. Normal operation is ensured once the permissible temperature has been reached.	Red, flashing ■ ■ ■ ■ ■ ■ ■ ■	X	Red, flashing ■ ■ ■ ■ ■ ■ ■ ■
E4	No communication between power supply and illumination	Contact your HAAG-STREIT representative.	Red, flashing 2x ■ ■ ■ ■ ■ ■ ■ ■	X	Red, flashing 2x ■ ■ ■ ■ ■ ■ ■ ■
E6	General error	Send PS-LED to the appropriate service branch.	Red, flashing 4x ■ ■ ■ ■ ■ ■ ■ ■	X	Red, flashing 4x ■ ■ ■ ■ ■ ■ ■ ■

5.10.5 Error messages (PS-LED power supply)

ERROR	Error messages	Measures	LED display L1 (29)
E12	Illumination controller not recognized	Connect illumination control or replace, if necessary.	Red ■ ■ ■ ■ ■ ■ ■ ■
E14	No communication with LED illumination LI 01-plus	Contact your HAAG-STREIT representative.	Red, flashing 2x ■ ■ ■ ■ ■ ■ ■ ■
E16	General error	Send device to the appropriate service branch.	Red, flashing 4x ■ ■ ■ ■ ■ ■ ■ ■

6. Decommissioning

Throw the rocker switch on the PS-LED power supply and the main switch on the FU 01 flash unit 01 I = 'OFF'. The green lights on the rocker switches will stop illuminating when the device is switched off.



NOTE!

Disconnect the power supply from the mains if you do not intend to use it for an extended period of time.

7. Technical data

7.1 Slit illumination

Slit image width	0-8 mm continuous
Slit image length	1-8 mm continuous
Illumination field circle	8 / 5 / 3 / 2 / 1 / 0.2 mm in \varnothing
Test mark	with fixation star
Slit image rotatability	$\pm 90^\circ$
Inclination of slit illumination to microscope axis	Horizontal $\pm 90^\circ$, vertical 0-20°
Filters	Blue, red removal (green), grey (10%).

UV and thermal-protection filters are installed.

7.2 Stereo microscope

Stereo angle:	13°
Magnification changer:	6.3x / 10x / 16x / 25x / 40x
Eyepiece magnification:	12.5x
Range of adjusting eye-pieces:	+7 to -7 diopters
Pupil distance:	52-78 mm
Total magnification:	6.3x / 10x / 16x / 25x / 40x
Object field \varnothing in mm:	32.0 / 20.0 / 12.7 / 8.0 / 5.1

7.3 Instrument base

Operation:	Single-handed operation of control lever in three dimensions
Adjustment of instrument base:	100 mm (length) 100 mm (side) 30 mm (height)

7.4 Net weight

12.76 kg (without power supply, head rest and options)

7.5 Flash illumination

Slit flash illumination	400 to 750nm
Background flash illumination	400 to 750nm



NOTE!

Detailed information regarding the radiation can be provided on request.

7.6 Flash unit FU 01

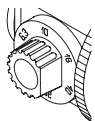
Flash capacitor capacity	'normal' 200 Ws 'high' 400 Ws
Flash frequency	See Chapter 5.9 'Flash Unit FU 01'
Mains connection	a) 115 V, 60 Hz b) 230 V, 50 Hz
Mains fuses	a) 2 x T10AL, 250V b) 2 x T6,3AL, 250V
Flash unit fuse	1 x T5AL, 250V
Power consumption	25 VA, peak 2.6 kVA

7.7 Mirror and diaphragm component

Pre-set diaphragms	5 different diaphragms
Max. depth of focus on object	see Table (a)

Depth of focus in air

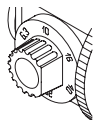
This depends on the diaphragm and magnification settings. In the transparent media of the eye, the values increase by approx. 35% (refractive index of the eye media).



(Table a)

Field of depth of field (+/- in mm) with diaphragm

	1	2	3	5	6
6.3x	1.3	1.8	2.6	3.6	5.2
10x	0.5	0.7	1	1.4	2
16x	0.2	0.3	0.4	0.5	0.8
25x	0.1	0.1	0.15	0.2	0.3
40x	0.05	0.05	0.05	0.1	0.15



(Table b)

Magnification at chip level

Lens sizes

6.3 x	0.63 x	23.8 x 35.7 mm
10 x	1 x	15 x 22.5 mm
16 x	1.6 x	9.4 x 14.1 mm
25 x	2.5 x	6 x 9 mm
40 x	4 x	3.88 x 5.6 mm

Field of view of the object

Circle: The field of view of the object observed through the microscope's eyepiece.

Rectangle: Area of photograph. Field of view specifications relate to chip size 15 mm x 22.5 mm.



7.8 Lens barrel

Focal length: f 170 mm

7.9 Illumination

Slit illumination 400 to 750nm

Background illumination 400 to 750nm



NOTE!

Detailed information regarding the radiation can be provided on request.

7.10 Power supply PS-LED / PS-LED HSM 901

Mains voltage: 100 - 240 V

Power consumption: 60 VA

Operating frequency: 50-60 Hz



WARNING!

This voltage source may only be used with PS-LED or PS-LED HSM 901.

7.11 Dimensions

PS-LED	PS-LED HSM 901
Length: 164 mm	Length: 316 mm
Width: 140 mm	Width: 146 mm
Height: 60 mm	Height: 69 mm
Weight: 450 g	Weight: 750 g

Illumination control IC 01

Length: 75 mm

Width: 35 mm

Height: 33 mm

Weight: 32

Illumination control IC 01 T

Length: 90 mm

Width: 51 mm

Height: 33 mm

Weight: 32 g

7.12 Camera



NOTE!

The camera is to be set to a shutter time of 1/60 s in MANUAL operating mode. The instruction for use for the camera must be followed for this purpose.

8 Maintenance



WARNING!

This device must not be modified without the manufacturer's approval. Installation and repairs may only be performed by trained specialists.

The LED illumination can be operated without any maintenance throughout its entire service life.

8.1 Device Check

In order to correctly check the slit lamp, proceed as follows:

- Insert test rod into the radial movement bearing, whilst at the same time aligning the surface to the microscope at a right angle
- Set slit length to 8 mm
- Set illumination strength to 50%
- Set magnification to max. in the microscope.
- Set the eyepieces in such a way that the test rod is in sharp focus. Turn the eyepiece from the (+) to the (-) side.
- The structure of the test rod must be in sharp focus in all magnifications.
- Close slit edges to approx. 0.5 mm. The borders must be in sharp focus here.
- Completely open slit edges and turn the test rod by 45°, the sharp area must be in the centre of the test rod.

8.2 Changing the flash tube



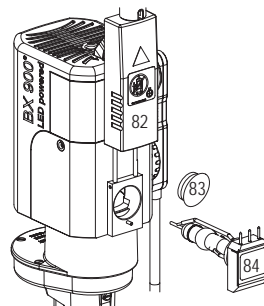
HIGH VOLTAGE!

After turning off the FU 01 flash unit, wait at least 15 seconds before opening the slide!



WARNING!

Do not touch the glass body of the flash tube.

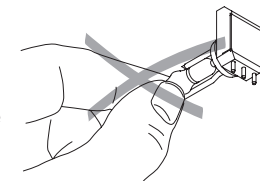


82. Coupling slide

83. Protective plug

84. Flash tube

- Slide the coupling slide upwards.
- If the split lamp is new, remove the protective plug from the flash tube housing.
- Remove the defective flash tube.
- Insert the tube without touching the glass.
- Slide the coupling slide back downward until it stops in place.



NOTE!

Only use an HS flash tube, as specified in the replacement parts list.

8.3 Servicing

To ensure a long service life, the device should be cleaned weekly as described in the 'Cleaning' chapter and covered with a dust cover when not in use. We recommend having the device inspected by an authorized service technician annually.

8.4 Replacing the fuses



WARNING – RISK OF FIRE!

Only fuses of the type indicated in the technical data may be used.



WARNING!

The mains cable must be disconnected from the mains before the cover is screwed on.

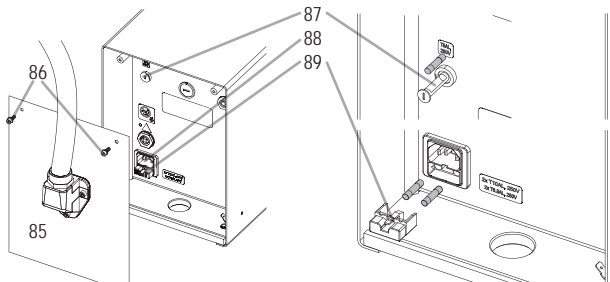
- Remove the cover (85) by loosening the two screws (86).

8.4.1 Mains fuses:

- Remove the mains plug (88), remove the fuse holder (89) and replace the fuses (fuse type according to the technical data).
- Insert fuse holder (89) and attach mains plug (88).

8.4.2 Flash unit fuse:

- Remove the mains plug (88), remove the fuse holder (87) and replace the fuses (fuse type according to the technical data).
- Insert fuse holder (87) and attach mains plug (88).



- Close the cover (85) by applying the two screws (86) and plug the mains cable into the mains.

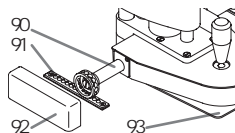
8.4 Cleaning

- Clean the housing with a dry cloth only.
- Do not employ any liquids, aggressive agents or alcohol.
- The exposed glass surfaces can be dusted with a dusting brush. Lens brush HAAG-STREIT number 1001398



8.6 Cleaning the slide plate and the rack rails

- If the slide plate (93) is dirty and the general movement of the slit lamp is impaired, rubbing the plate with a lightly oiled cloth is usually sufficient remedy.
- After removing the rail covers (92) the rack rails (91) should be dusted from time to time with a brush.



8.7 Cleaning the axle

The axle (90) should only be cleaned with a clean, lint-free cloth.

8.8 Replacing the illumination mirror



WARNING!

Only use mirrors with a LOT number.

The mirror can be most easily accessed if the microscope is swiveled away from the

illumination and the illumination inclined two points. The mirror can then be pulled out along its guide by its thin end. Push the mirror until it stops.

8.9 Dust cover

We recommend protecting the slit lamp with a dust cover when not in use.

Dust cover, small (for slit lamp) *HS item no. 1001395*

Dust cover, large (for several instruments) *HS item no. 1001434*



A. Appendix

A.1 Accessories / spare parts



WARNING!

This device must not be modified without the manufacturer's approval. Installation and repairs may only be performed by trained specialists. Connecting third-party systems to the same mains socket may compromise the system's safety.



NOTE!

An asterisk (*) indicates that you should contact your HAAG-STREIT representative for further information. Two asterisks (**) indicate a need to refer to the separate instructions for use.

Components	HS item no.
Connection ring (camera-specific)	*
Applanation tonometer AT 900 model BO/BP	7200034
Applanation tonometer AT 900 model T	7200032
Pin	3000332
Trigger key with cable	*
Illumination control, double slit and background 'in table**	1021022
Illumination control, double slit and background 'on table**	1020883
Flash tube, complete	1021972
Block of paper slips for chin rest	1001309
Cover T-0 for recess in table**	1021085
Short mirror	1001591

Long mirror	1001590
Flash unit FU 01	*
Guide plate (900-415)	1001219
Power supply for LED illumination, HSM 801 and tables from other manufacturers**	1020882
Power supply for LED illumination, HSM 901**	1020881
Instrument table HSM 901 Imaging	*
Instrument table HSM 901 Workstation	*
Cable guide	*
Camera cable (model-specific)	*
Contrast-boosting filter (yellow)	1400306
Head rest with fixation lamp	*
Lens barrel	1400313
Eyepiece 12.5x with dioptre ring	1400303
Eyepiece with double crosshair reticle 12.5x	3000470
Test rod	1001051
Mirror and diaphragm component	1007302
Dust cover, large (for several instruments)	1001434
Dust cover, small (for slit lamp)	1001395
Pin for chin rest 900-1359	1200713
5 mm Allen key	1001602
Diffusor	1007085
Background illumination with swivel bracket**	1021960
USB illumination cable 2000 mm**	1020940
USB illumination cable 5000 mm**	1020956
Movable Hruby preset lens, -58.6 diopters	1400223
Carriage for preset lenses with rail (guide plate included)	1001219
Spacer for angled eyepiece 20°	1400305

B. Legal regulations

- The BX 900 photo slit lamp has been developed and designed in accordance with the EN 60601-1 standard.
- The EN 60601-1 standard must be observed when using different medical and/or non-medical electrical devices in combination.
- Compliance of the BX 900 photo slit lamp with the Directive 93/42/EEC is confirmed by the CE mark.
- The BX 900 photo slit lamp satisfies the electromagnetic compatibility requirements of EN 60601-1-2. The device has been designed to maintain the emissions of electromagnetic interference at a level which does not exceed the statutory guidelines and which does not affect other devices in its vicinity.
- The instrument also boasts the immunity stipulated by the standard.
- Statutory accident regulations are to be observed.

C. Classification

Standard EN 60601-1	Photo slit lamp BX 900 acc. to protection class I
Water resistance	IPX0
Operating mode:	Continuous operation
CE Directive 93/42/EEC	Class I
FDA	Class II

D. Disposal

Electrical and electronic devices must be disposed of separately from household waste! This appliance was made available for sale after the 13th August 2005. For correct disposal, please contact your HAAG-STREIT representative. This will guarantee that no hazardous substances enter the environment and that valuable raw materials are recycled.



E. Observed standards

EN 60601-1	EN 60601-1-2
ISO 10939	EN ISO 15004-2

F. Information and manufacturer's declaration concerning electromagnetic compatibility (EMC)

F.1 General

The BX 900 photo slit lamp system fulfills the requirements for electromagnetic compatibility according to EN 60601-1-2. The device is built in such a manner that the generation and emission of electromagnetic interference is limited to the extent that other devices are not disturbed when used in accordance with their intended purpose, and the device itself has appropriate immunity to electromagnetic interference.



WARNING!

- Electrical medical devices and systems are subject to special EMC measures and must be installed in accordance with the EMC instructions contained in this accompanying document.
- Portable and mobile HF communication systems may interfere with electrical medical devices.
- The operation of other lines or equipment than those listed may lead to higher emissions or may reduce the device's resistance to interference.
- Third-party devices may only be connected in compliance with the EN 60601-1 standard

F.2 Emitted interference (standard table 1)

Guidance and manufacturer's declaration – electromagnetic emissions

This product is intended for use in the electromagnetic environment specified below. The customer or the user of this product should assure that it is used in such an environment.

Emission test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	This product uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11 Harmonic emissions EN 61000-3-2	Class B Class A	This product is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Voltage fluctuations / flicker emissions EN 61000-3-3	Complies	

F.3 Interference immunity (standard table 2)

Guidance and manufacturer's declaration – electromagnetic immunity

This product is intended for use in the electromagnetic environment specified below. The customer or the user of this product should assure that it is used in such an environment.

Immunity test standard	EN 60601 test level	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) EN 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kVair	Floors should be wood, concrete or ceramic tile. If floors are covered with ynthetic material, the relative humidity should be at least 30%.
Electrical fast transient / burst EN 61000-4-4	± 2 kV for power supply lines	± 2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge EN 61000-4-5	± 1 kV for symmetrical voltages ± 2 kV for asymmetrical voltages	± 1 kV for symmetrical voltages ± 2 kV for asymmetrical voltages	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply lines EN 61000-4-11	< 5% U_T (> 95% drop in U_T) for ½ cycle < 40% U_T (> 60% drop in U_T) for 5 cycles < 70% U_T (> 30% drop in U_T) for 25 cycles < 5% U_T (> 95% drop in U_T) for 5 s	< 5% U_T (> 95% drop in U_T) for ½ cycle < 40% U_T (> 60% drop in U_T) for 5 cycles < 70% U_T (> 30% drop in U_T) for 25 cycles < 5% U_T (> 95% drop in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of this product requires continued function even in the event of interruptions in the energy supply, this product should be powered from an un-interruptible power supply or a battery.
Power frequency (50/60Hz) magnetic field EN 61000-4-8	3 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

NOTE: U_T = the AC mains voltage prior to application of the test level.

F.4 Interference immunity for non-life-supporting devices (standard table 4)

Guidance and manufacturer's declaration – electromagnetic immunity

This product is intended for use in the electromagnetic environment specified below. The customer or the user of this product should assure that it is used in such an environment.

Electromagnetic environment – guidance

Portable and mobile RF communications equipments should be used no closer to any part of this product, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.

Immunity test standard	EN 60601 test level	Compliance level	Recommended distance ^(c) :
Conducted RF EN 61000-4-6	3 V _{rms} 150 kHz – 80 MHz	3 V _{rms}	$D = 1.2 \sqrt{P}$
Radiated RF EN 61000-4-3	3 V/m 80 MHz – 2.5 GHz	5 V/m 80 MHz – 2.5 GHz	$D = 1.2 \sqrt{P}$ 80 MHz – 800 MHz $D = 2.3 \sqrt{P}$ 800 MHz – 2.5 GHz

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 site survey^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 applies.

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

- 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 this product is used exceeds the applicable RF compliance level above, this product should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating this product.
- Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.
- Possible shorter distances outside the ISM bands do not contribute to improved application in this table.

F.5 Safe distances for non-life-supporting devices (standard table 6)

Recommended safe distances between portable and mobile HF communication devices and this device.

This product is designed to be operated in an electromagnetic environment in which radiated HF interference is controlled. The customer or user of this product can help to prevent electromagnetic interference by maintaining minimum distances between portable and mobile HF communication systems (transmitters) and this product, as recommended below in accordance with the maximum output of the communication system.

Safe distance according to transmission frequency (m)

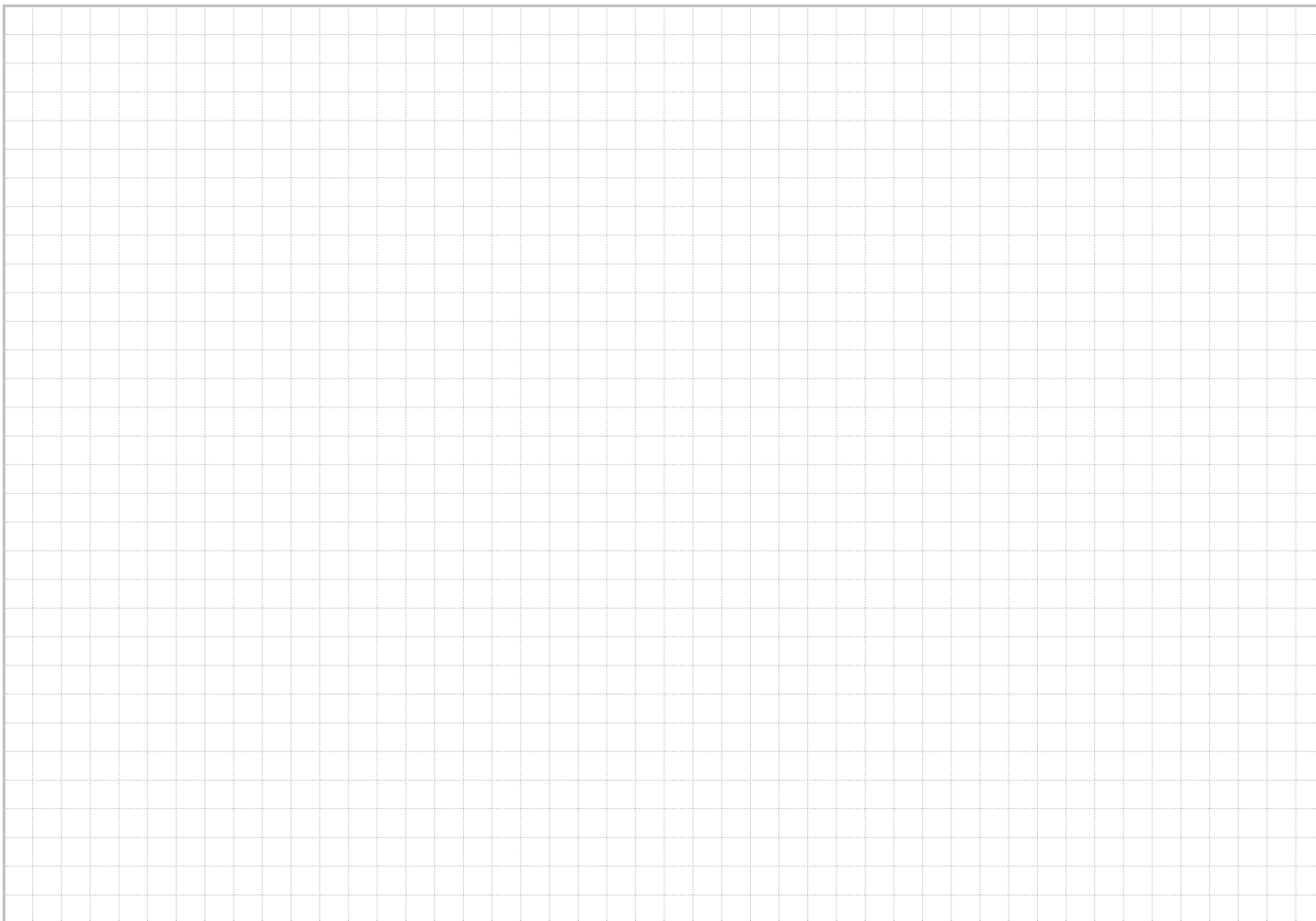
Nominal output of the transmitter (W)	Safe distance according to transmission frequency (m)		
	150 kHz – 80 MHz $D = 1.2 \sqrt{P}$	80 MHz – 800 MHz $D = 1.2 \sqrt{P}$	800 MHz – 2.5 GHz $D = 2.3 \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters with a nominal output not listed in the table above, the distance D can be calculated in meters (m) using the equation for the respective column, in which P is the nominal output of the transmitter in watts (W) according to the specifications of the transmitter manufacturer.

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

NOTE 2: To calculate the recommended safe distance of transmitters in the frequency range of 80 MHz to 2.5 GHz an additional factor of $10^{1/3}$ was used to reduce the probability of a mobile/portable communication device causing interference if inadvertently brought into the patient area.

NOTE 3: These guidelines may not apply in all situations. Electromagnetic wave propagation is influenced by absorption and reflection of buildings, objects and people.



Should you have any further questions, please contact your HAAG-STREIT dealer at:
<http://www.haag-streit.com/contact/contact-your-distributor.html>

HS HAAG-STREIT
DIAGNOSTICS

Certified Quality Management System



EN ISO 13485
Reg. Nr. 11956



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