Polytec

User Manual

Image Processing Stroboscope

BVS-II Wotan

Warranty and Service

The warranty for this equipment complies with the regulations in our general terms and conditions in their respective valid version.

This is conditional on the equipment being used as it is intended and as described in this manual.

The warranty does not apply to damage caused by incorrect usage, external mechanical influences or by not keeping to the operating conditions. The warranty also is invalidated in the case of the equipment being tampered with or modified without authorization.

To return the equipment always use the original packaging. Otherwise we reserve the right to check the equipment for transport damage. Please mark the package as fragile and sensitive to frost. Include an explanation of the reason for returning it as well as an exact description of the fault.

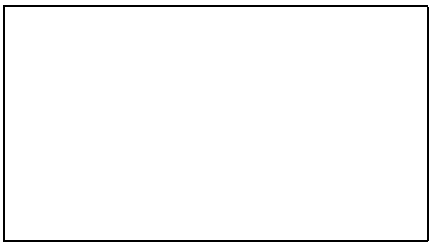
Trademarks

Brand and product names mentioned in this manual could be trademarks or registered trademarks of their respective companies or organizations.

Identification Labels

Image Processing Stroboscope

BVS-II Wotan



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1 Safety Information

1.1 General Safety Information

Notes

Please read this manual before using the instrument. It will provide you with important information on using the instrument and on safety. This will protect you and prevent damage to the instrument. Pay particular attention to the basic safety information in CHAPTER 1 and the information on installation, operation and maintenance in CHAPTER 3.

Please keep this manual in a safe place and make it available to people using the instrument. Never pass the instrument on without the manual.

In this manual the following graded safety and warning labels are used:

NOTE!

Identifies action required to simplify using the instrument!

CAUTION!

Danger from "Reason for Danger"! - Identifies the danger caused by an action which could result in damage to the instrument if it is not avoided!

WARNING!

Danger from "Reason for Danger"! - Identifies a possible danger resulting from an action which could lead to death or (serious) injury if it is not avoided!

Intended use

The instrument is intended for laboratory use and for use in an industrial environment. It may only be used within the limits given in the technical specifications (refer to CHAPTER 4).

Faultless and safe operation of the instrument depends on correct and proper transport and storage, installation and assembly as well as careful operation of the instrument.

When assembling, installing and operating the instrument, the safety and accident-prevention regulations for the respective use must be adhered to.

Qualification

This instrument may only be operated by persons who are familiar with electrical measurement equipment and have been instructed in the use of xenon flashlamps. Please pay attention to the information on safe handling with xenon flashlamps in SECTION 1.2.

Intervention for maintenance and repair work may only be carried out by the manufacturer himself or by qualified personnel authorized by the manufacturer.

Disposal

An instrument which is no longer required must be disposed of according to local regulations unless otherwise provided for by the manufacturer.

1.2 Information on Safe Handling with Xenon Flashlamps

1.2.1 Safety Information

The stroboscope is equipped with an extremely stable xenon flashlamp which is focussed into the fiber optics using an ellipsoid reflector. The light emitted from the aperture of the stroboscope and from the fiber optics is therefore extremely intense. When handling xenon flashlamps, great care should be taken in any case to make sure that the light does not enter the eye.

Due to its extreme brightness and high frequency, stroboscope light can lead to seizures or blackouts in people who are photosensitive or have an epileptic condition. For this reason, the stroboscopic light should be shielded as well as possible.

To provide maximum security, the following precautions have been taken:

NOTE!

Please see CHAPTER 4 for the detailed technical specifications!

- Polytec instruments generally comply with the standards **EN 60825-1** (DIN VDE 0837) and **CFR 1040.10** (US) respectively.
- The aperture on the front panel is covered by protective glass with an IR filter to check splinters of glass which may result from a xenon flashlamp exploding.

1.2.2 Safety Precautions

Pay attention to the following safety precautions when using the stroboscope:

- Only qualified and fully trained persons should be entrusted with setting up the instrument, adjusting and operating it!
- Avoid looking directly into the high intensive stroboscopic light with the naked eye or with the aid of mirrors or optical instruments. This applies not only to the direct flash from the instrument but also to light emitted from the fiber bundles and fiber-optic adapters used.

WARNING!

Danger from high intense light! - Do not use any reflective tools, watches etc. when you are working in the beam path of the lamp!

- Only switch the stroboscope lamp on when you need the stroboscopic light!
- Always switch the stroboscope lamp off before positioning and configuring the stroboscope!
- Only operate the stroboscope with the fiber optics connected up and shield the illuminated area completely from view!

- Ensure that the lighting is good when you are working on an active unshielded stroboscope to keep the difference in brightness emitted by the stroboscopic light to a minimum.

WARNING!

Danger from exploded splinters! - The xenon flashlamps used in the BVS series are under pressure and can explode.

NOTE!

So when exchanging the stroboscope lamp, ensure that you are wearing suitable eye and hand protection!

1.3 Information on Electrical Safety

1.3.1 Safety Information

The instrument complies with the electrical protection class 1 in accordance with the EU directive 73 /23/EEC (low voltage directive) and the protection ration IP 40 (protection against solids > 1 mm, no protection against water). With correct mains connection and intended use, exposure to electric current is prevented by the closed, grounded metal housing.

The instrument complies with the EU directive 89/336/EEC (EMC directive) and is accordingly fail-safe (refer to SECTION 4.1 and APPENDIX C).

1.3.2 Safety Precautions

Pay attention to the following safety precautions when using the instrument:

- The stroboscope may only be connected up to AC systems 50/60 Hz with a nominal voltage in the range of 85 V... 260 V using a three pin mains cable with a grounded protective conductor.
- Defective fuses may only be replaced by fuses of the same kind and the same rating. On this, refer to the information given on the back of the instrument and in CHAPTER 4.
- The instrument must not be operated with open housing!
- The instrument may **only** be opened to exchange the stroboscope lamp! Before removing parts of the housing, as a general rule, the mains plug must be unplugged and you must wait for approx. 1 minute so that all electric circuits have time to discharge completely.

WARNING!

Danger from electrical current! - Intervention for maintenance and repair work may only be carried out by the manufacturer himself or by qualified personnel authorized by the manufacturer.

NOTE!

Before removing parts of the housing for exchanging the stroboscope lamp as well as installation and servicing purposes, as a general rule the mains plug should always be unplugged.

Overload protection

The energy for the stroboscope lamp is buffered in a capacitor block of 13µF / 600V. In conjunction with certain frequency intensity combinations, this capacity can lead to non-permissible power dissipation of the xenon flashlamp. A function of the processor, the Safety Area Control, prevents such parameter combinations. If values are entered which lead to inadmissible power dissipation at the frequency limit set, then the device will not accept these values. The permissible value ranges are shown in FIGURE 1.1 and FIGURE 1.2. Setting the frequency limit is described in SECTION 3.3.

CAUTION!

Danger from overloading! - If you control the device externally via J4-Intensity Ref, please note that overload protection is not active! In this case, you must absolutely observe the values in FIGURE 1.1!

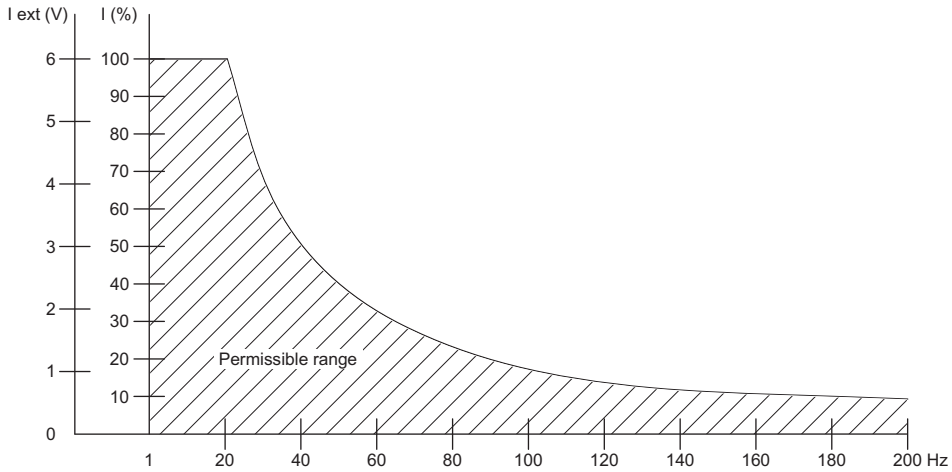


Figure 1.1: Intensity I = f (Frequency)

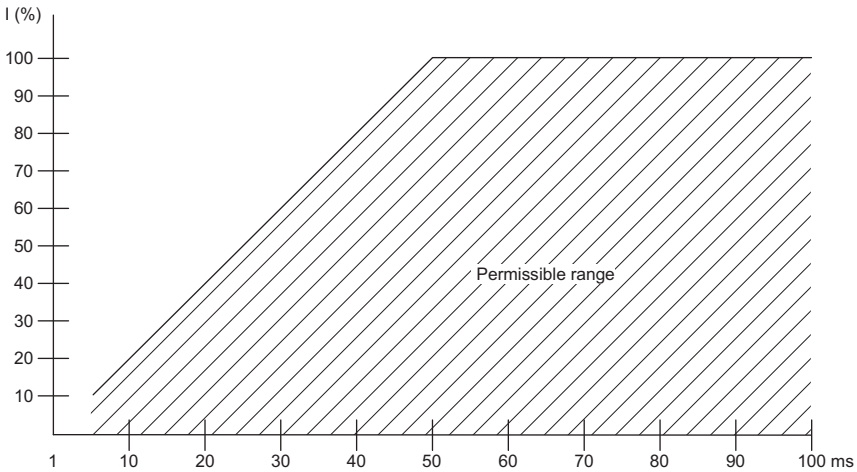


Figure 1.2: Intensity I = f (Burst Separation)

2 First Steps

2.1 Area of Application

The Polytec image processing stroboscopes are light sources for industrial image processing. In combination with appropriate fiber optics and a camera, their extremely brief and intense light pulses allow bright, high-contrast images.

The light pulses are generated by an extremely stable xenon stroboscopic flashlamp; the light it emits is focused into the fiber optics using an ellipsoid reflector.

2.2 Unpacking and Inspection

The stroboscope is made up of the following components:

- Stroboscope BVS-II Wotan/BVS-II Wotan Plus
- Mains cable

Please pay attention to the following steps when unpacking:

1. Check the packaging for signs of unsuitable handling during transport.

2. After unpacking, check all components for external damage (scratches, loose screws etc.).

3. In the case of a wrong delivery, damage or missing parts, please inform your local Polytec representative immediately and give them the serial number of the instrument. The identification labels can be found on the back panel of the instrument and also on the inside cover of this manual.

4. Carefully retain the original packaging in case you have to return the instrument.

2.3 Operating and Maintenance Requirements

Ambient conditions

The stroboscope can be operated in dry rooms subject to normal climatic conditions (refer also to CHAPTER 4). Avoid condensation caused by significant temperature fluctuations. As the stroboscope lamp is filled with a pressurized gas, the stroboscope may only be used up to a geographic height of 3000 m above sea level.

Mains connection

The mains voltage input of the stroboscope is set up as a wide range input and can thus be connected to all mains voltages with nominal values in the range of 90...260 V. Defective fuses may only be replaced by fuses of the same kind and the same rating. On this, refer to the information given on the back of the instrument and in CHAPTER 4. Both fuses are active and have to be checked if there is a fault.

Assembly

The stroboscope should not be set up provisionally. Mount the instrument with the aid of the drill holes in the bottom panel onto a suitable surface.

Cleaning

The housing surfaces of the instrument can be cleaned using mild detergents or disinfectant solutions. Organic solvents must not be used.

WARNING!

Danger from electrical current! - Working on an open housing can lead to personal injury!

NOTE!

Before cleaning the instrument, switch it off and unplug the mains plug!

Opening the instrument

Interfering with the instrument other than to exchange the stroboscope lamp is not necessary when using the instrument as intended and will invalidate the warranty.

2.4 Control Elements of the Stroboscope

Front panel The front panel of the stroboscope is shown in FIGURE 2.1

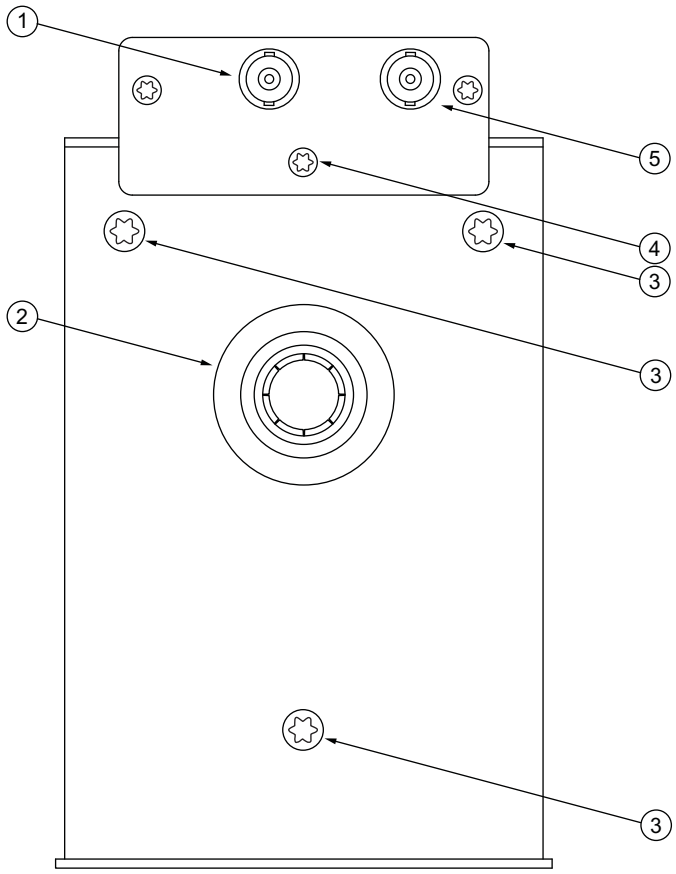


Figure 2.1: Front view of the stroboscope

1 Analog input **J4 - Intensity Ref** (BNC-Buchse)
Signal input for external control of flash intensity

2 **Light aperture** (Fiber connection with end stop)
Connector for fiber-optic adapter

3 **Adjustment screws**
Only for servicing purpose

4 **Fixing screw** for the control panel

5 Analog input **J3 - Trigger** (BNC jack)
Signal input for an external trigger signal

Back panel

The back panel of the stroboscope is shown in FIGURE 2.2.

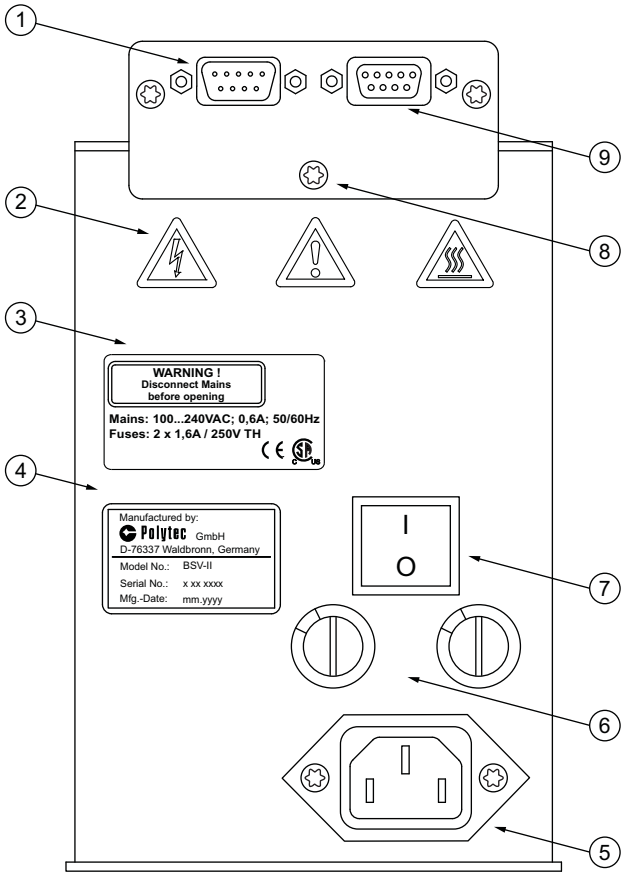


Figure 2.2: Rear view of the stroboscope

1 RS-232 interface **J2 - RS232 (out)** (9-pin Sub-D plug)
Interface output to network several instruments

2 Warning labels

3 Instrument warning label
Labels with technical information for fuses and mains connection

4 Identification label
Among other things, you will find the serial number of the instrument on the identification label.

5 Mains connection (socket for standard power cord)
The mains voltage input is set up as a wide range input.

6 Holders for the **fuses**

Only use mains fuses 1.6A/slow-blow (refer also to CHAPTER 4), regardless of the mains voltage. Both fuses are active and have to be checked if there is a fault.

WARNING!

Danger from electrical current! - Working on an open housing can lead to personal injury!

NOTE!

Before checking the fuses, always ensure that the mains plug is disconnected!

7 **Mains switch**

This switch disconnects the stroboscope from the mains (position O) and is used to switch it off in case of danger.

8 **Fixing screw** for the control panel

9 RS-232 interface **J1 - RS232 (in)** (9-pin Sub-D jack)

Interface input for communication with a PC or to network several instruments

View from above

The control panel is shown in FIGURE 2.3. By pressing a key, you change between the individual adjustment settings made with this key. The setting which is activated is the one with its respective LED lit up.

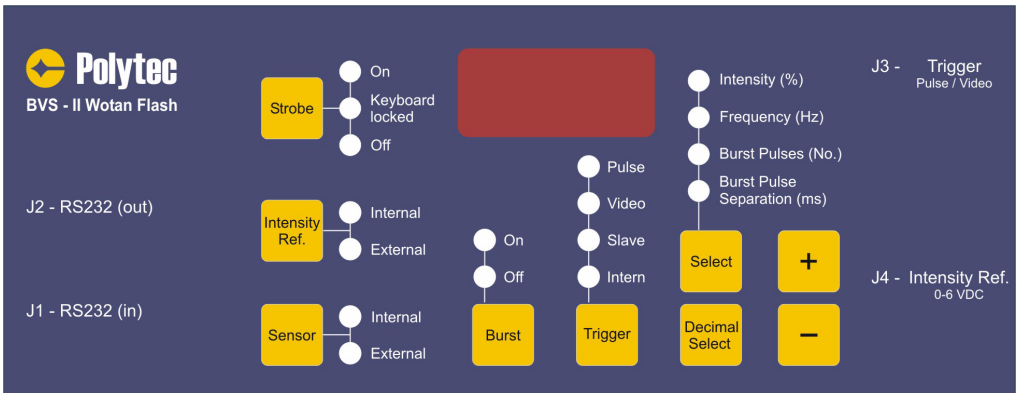


Figure 2.3: Foil keyboard of the control panel

1 **Strobe** key

You use this key to switch the stroboscope lamp on or off (refer to SECTION 3.1).

On	Stroboscope lamp is switched on.
Keyboard locked	Input is not possible as the key lock has been activated (refer to SECTION 3.2).
Off	Stroboscope lamp is switched off.

2 **Intensity Ref** key

You use this key to choose between internal and external control of the flash intensity.

Internal	Flash intensity can be configured internally using the control panel or via the RS-232 interface.
External	Flash intensity can be configured via an external signal through the BNC jack J5 - Intensity Ref.

3 Four digit LED **display**

The LED display shows the current value set for the parameter selected with the Select key.

4 **Select** key

Use this key to select one of the four adjustable parameters of the stroboscope. The value set currently for the selected parameter is shown in the LED display.

Intensity (%)	Value of flash intensity in %
Frequency (Hz)	Frequency of the internal frequency generator in hertz
Burst Pulses (No.)	Number of pulses in a burst
Burst Pulse Separation (ms)	Time delay between the individual pulses of a burst in milliseconds

5 Adjustment keys **+** / **–**

You use these keys to change the settings to higher (+) or lower (–) values.

6 **Decimal Select** key

Use this key to select the position in the LED display which you want to change with the adjustment keys. The selected position flashes.

7 **Trigger** key

Use this key to select one of the four possible trigger sources.

Pulse	Trigger pulse at input J3 - Trigger
Video	Trigger signal from a video signal at the input J3-Trigger
Slave	Trigger pulse via J1 - RS232 (in) from an upstream stroboscope
Intern	Internally generated trigger signal

8 **Burst** key

You use this key to choose between individual flash and the burst function.

On	Burst function switched on
Off	Burst function switched off, simple stroboscope operation

9 **Sensor** key

Not used, settings have no effect on operation.

2.5 Installation and Functional Test

Installation

To install and then carry out a first functional test on the stroboscope, please proceed as follows:

1. Mount the instrument with the aid of the drill holes in the bottom panel onto a suitable level surface.
2. Connect up the fiber optics to the aperture on the front panel of the stroboscope.
3. Connect up the mains cable to the back of the stroboscope and to an earthed socket.

Functional test

4. Switch on the stroboscope with the mains switch on the back (position I).
5. By repeatedly pressing the Trigger key, select the trigger source Intern. If this input is not accepted and the message LOC appears in the LED display, then the control panel of the instrument is locked. In this case, first of all switch the key lock off as described in SECTION 3.2.
6. By repeatedly pressing the Intensity Ref key, select the reference option Internal.
7. By repeatedly pressing the Strobe key, switch the stroboscope lamp on (LED On).

   The stroboscope should now emit stroboscopic light.

If the functional check was successful, you can now use the stroboscope as described in CHAPTER 3.

If any errors occurred during the functional check, if required contact your nearest Polytec representative.

3 Operation

3.1 Switching On and Off

Stroboscope

The stroboscope is switched on with the mains switch on the back of the instrument (position I). After switching it on, the current firmware version briefly appears in the LED display and then the operating status most recently used is automatically reinstated. The settings last selected are still remembered even if the instrument has been disconnected from the mains for a long time.

Stroboscope lamp

You switch the stroboscope lamp on (LED On lights up) and off (LED Off lights up) by pressing the Strobe key.

WARNING!

Danger from high intense light! - Avoid looking into the high-intensity stroboscopic light or being exposed to it for a long period of time! Remember the safety information in CHAPTER 1!

Input can be made via the control panel whether the stroboscope lamp is switched on or off, providing the control panel has not been locked (refer to SECTION 3.2).

3.2 Locking the Control Panel<Idx id="4"/>

The stroboscope can be locked to prevent unintentional changes being made to the settings. The key for locking the control panel is at the side of the control panel.

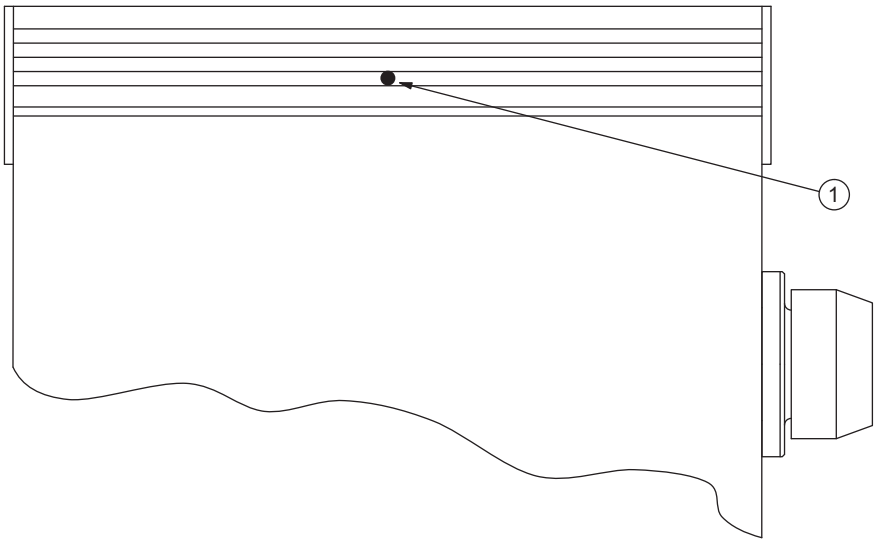


Figure 3.1: Side view of the stroboscope showing the opening for locking the control panel

You can press the key with a thin, nonmetallic object through opening **1** at the side of the control panel. By pressing the key, you can switch between the two states locked and open. If the keys are locked (status locked), then the LED Keyboard locked in the field Strobe on the control panel of the stroboscope lights up. If any key is pressed on a locked control panel, then the message LOC will appear in the LED display.

It is still possible to control the stroboscope via the RS-232 interface, even if the control panel is locked.

3.3 Setting the Frequency Limit

Before configuring the stroboscope, set a frequency limit which includes the highest expected frequency at which you will be operating the stroboscope. The energy for the stroboscope lamp is buffered in a capacitor block, the capacity of which, in conjunction with certain frequency-intensity combinations, could lead to inadmissible operating modes. The function Safety Area Control (refer also to SECTION 1.3) uses the frequency limit entered to calculate the corresponding admissible values for both the intensity and the pulse separation in a burst and blocks the instrument against inadmissible values. To set the frequency limit, please proceed as follows:

1. Press the Select key and while holding it, press the key + repeatedly until FrLi appears in the LED display.

2. Release the Select key and using the Decimal Select key, select a position in the LED display which you would like to change.

   The respective position in the LED display flashes.

3. Change the selected position with the aid of the adjustment keys **+**/**–**.

   The function Safety Area Control *now only allows values which are within the permissible power loss range for all subsequent settings.*

4. To quit the menu, press the Select key and while holding it, press the key + φρομrepeatedly until End appears in the LED display. Release the Select key.

Or:

Press both the Select key and the – key at the same time to quit the menu.

The frequency limit is adjustable from 20.0 Hz to 200.0 Hz. The values allowed by the function Safety Area Control correspond to the following system:

8.0 %	≤	Intensity (internal, external)	≤	(2000/FrLi) corresponds to 100%
1.0 Hz	≤	Frequency	≤	FrLi
(1/FrLi)s	≤	Pulse separation	≤	250 ms

NOTE!

Settings which have already been made - which fall outside the permissible power loss range as a result of changing the frequency limit - are automatically overwritten by the function Safety Area Control.

3.4 Setting Single Flash Frequency

The single flash frequency of the stroboscope can be set from 1 Hz to 200 Hz. The step size is 0.1 Hz. To change the single flash frequency, please proceed as follows:

1. Use the Select key to select the LED Frequency.
2. Use the Decimal Select key to select the position in the LED display that you want to change.

   The respective position in the LED display flashes.
3. Change the value of the selected position with the aid of the adjustment keys **+**/**–**.

If the desired value can not be set, then it is outside the permissible performance values of the xenon flashlamp and is therefore blocked by the function Safety Area Control. You will find more detailed information on this in SECTION 1.3 or SECTION 3.3 respectively.

3.5 Setting the Flash Intensity

External reference

The flash intensity can be controlled using an external power supply. To do so, proceed as follows:

1. Use the Intensity Ref key to select the LED External.

   The stroboscope is now set to the external intensity control.
2. Connect up the external intensity reference signal to the BNC jack J4-Intensity Ref.

The stroboscope converts the applied voltage to a flash intensity of 8.0% to 100%. The progress depends on the reference diagram set. The intensity value appears in the LED display. The following applies:

0.6 V ≡ 8 %

6 V ≡ 100%

Reference diagram

The connection between the applied voltage and the resulting flash intensity is reflected in the reference diagram. You can choose between a linear reference diagram and a square one. The standard setting for the stroboscope is the linear reference diagram. To change the reference diagram, please proceed as follows:

1. Press the Select key and while holding it, press the key + repeatedly until rEF appears in the LED display.
2. Use the adjustment key **+** to select the setting Lin (linear reference diagram) or quad (square reference diagram).
3. To quit the menu, press the Select key and while holding it, press the key + repeatedly until End appears in the LED display. Release the Select key.

Or:

Press both the Select key and the – key at the same time to quit the menu.

The reference diagram has now been selected and immediately becomes applicable to the external reference.

Internal reference

The flash intensity can also be controlled directly by the stroboscope using the control panel. To do so, proceed as follows:

1. Use the Intensity Ref key to select the LED Internal.

   The stroboscope is now set to the internal intensity control.

2. Use the Select key to select the LED Intensity.

   The intensity value currently set appears in the LED display.

3. Use the Decimal Select key to select a position in the LED display that you want to change.

   The respective position in the LED display flashes.

4. Change the selected position with the aid of the adjustment keys **+**/**–**.

The intensity is adjustable from 8.0% to 100%. The step size is 0.1%. A change does not become effective until the first time the flash condenser is reloaded, i.e. as of the second flash after the change.

NOTE!

For technical reasons, the charge level of the flash condenser is random immediately after switching on the stroboscope. The first flash of the instrument can therefore be of significantly higher intensity than set on the control panel.

If the desired value can not be set, then it is outside the permissible performance values of the xenon flashlamp and is therefore blocked by the function Safety Area Control. You will find more detailed information on this in SECTION 1.3 or SECTION 3.3respectively.

3.6 Setting a Trigger

There are four different ways to trigger the stroboscope lamp (pulse, video, slave or intern). Every trigger impulse thereby triggers a flash. If the stroboscope is run in burst mode (refer to SECTION 3.7), then every trigger impulse sets off a burst.

External trigger

To set one of the three external trigger options (pulse, video or slave), proceed as follows:

1. Use the Trigger key to select the required trigger source.

Pulse	Trigger using a pulse (rising edge)
Video	Trigger using a video signal
Slave	Trigger using the signal of an upstream stroboscope (refer also to SECTION 3.12)

2. Connect up the external trigger signal.

Pulse	Impulse into the BNC jack J3 - Trigger
Video	Video signal into the BNC jack J3 - Trigger
Slave	Trigger output signal of the upstream stroboscope into the Sub-D jack J1 - RS232 (in)

With the trigger Pulse, the rising edge of the signal pulse is evaluated; with the trigger Video the vertical trigger signal is filtered out of the video signal and evaluated (refer also to CHAPTER 4).

Internal trigger

If required, the stroboscope can also generate a trigger signal internally corresponding to the single flash frequency (refer to SECTION 3.4). To do so, use the Trigger key to select the LED Internal. A trigger output signal is then also available via the BNC jack J2 - RS232 (out) to synchronize additional stroboscopes.

The frequency of the trigger output signal corresponds to the flash frequency set.

Trigger delay

You can also set a time delay between the trigger signal and setting off the flash. To do so, proceed as follows:

1. Press the Select key and while holding it, press the key + repeatedly until dELY appears in the LED display.
2. Release the Select key and using the Decimal Select key, select a position in the LED display which you would like to change.

   The respective position in the LED display flashes.
3. Change the selected position with the aid of the adjustment keys **+**/**–**.
4. To quit the menu, press the Select key and while holding it, press the key + repeatedly until End appears in the LED display. Release the Select key.

Or:

Press both the Select key and the – key at the same time to quit the menu.

The delay time between the trigger signal and setting off the flash can be set between 0.01% and 99.99%. The step size is 0.01%. A step corresponds to 0.326 µs. Thus the following thresholds are given:

minimum delay time	= 0.326 µs
maximum delay time	= 3.254 ms

3.7 Setting the Burst Function

The stroboscope has got a burst function. To set this, please proceed as follows:

1. Use the Burst key to select the LED On.

   The stroboscope has now been switched from single flash mode to burst mode.

Burst frequency

2. Use the Select key to select the LED Frequency.

   In the LED display, the current setting of the frequency of bursts is displayed.

3. Use the Decimal Select key to select a position in the LED display that you want to change.

   The respective position in the LED display flashes.

4. Change the selected position with the aid of the adjustment keys **+**/**–**.

If the desired value can not be set, then it is outside the permissible performance values of the xenon flashlamp and is therefore blocked by the function Safety Area Control. You will find more detailed information on this in SECTION 1.3 or SECTION 3.3 respectively.

Number of pulses

5. Use the Select key to select the LED Burst Pulses (No.).

   The LED display shows the number of pulses currently set for a burst.

6. Use the Decimal Select key to select a position in the LED display that you want to change.

   The respective position in the LED display flashes.

7. Change the selected position with the aid of the adjustment keys **+**/**–**.

   The number of pulses is adjustable from 1 to 250.

Pulse separation in the burst

8. Use the Select key to select the LED Burst Pulse Separation(ms).

   In the LED display, the separation currently set between the pulses is shown in ms.

9. Use the Decimal Select key to select a position in the LED display that you want to change.

   The respective position in the LED display flashes.

10. Change the selected position with the aid of the adjustment keys **+**/**–**.

NOTE!

Please note that the overall time period of the pulse package resulting from the pulse separation and the number of pulses must be within the set frequency period for the burst.

If the desired value can not be set, then it is outside the permissible performance values of the xenon flashlamp and is therefore blocked by the function Safety Area Control. You will find more detailed information on this in SECTION 1.3 or SECTION 3.3 respectively.

3.8 Reading and Resetting the Counter

Total counter

The stroboscope has two different counters for the flashes already emitted. A static total counter counts all flashes emitted. This counter setting is saved once per hour in the flash memory of the stroboscope. To read this counter, please proceed as follows:

1. Press the Select key and while holding it, press the key + repeatedly until FLSU appears in the LED display.

2. Release the Select key.

   The number of all flashes generated by the instrument so far is shown in the LED display.

3. To quit the menu, press the Select key and while holding it, press the key + repeatedly until End appears in the LED display. Release the Select key.

Or:

Press both the Select key and the – key at the same time to quit the menu.

The counter reading in the LED display is exponential from 00E0 to 90E9. This counter reading can not be deleted.

Resetable counter

The resetable counter of the stroboscope counts the number of flashes emitted since the last reset. You can use this counter for example to estimate when the flashlamp needs to be exchanged. To read the counter, please proceed as follows:

1. Press the Select key and while holding it, press the key + repeatedly until FLco appears in the LED display.
2. Release the Select key.

   The LED display shows the number of flashes since last resetting the counter.
3. To quit the menu, press the Select key and while holding it, press the key + repeatedly until End appears in the LED display. Release the Select key.

Or:

Press both the Select key and the – key at the same time to quit the menu.

To reset the counter to zero, please proceed as follows:

1. Press the Select key and while holding it, press the key + repeatedly until FLco appears in the LED display.
2. Release the Select key.

   The LED display shows the number of flashes since last resetting the counter.
3. Press the key –.

   The counter is reset to zero.
4. To quit the menu, press the Select key and while holding it, press the key + repeatedly until End appears in the LED display. Release the Select key.

Or:

Press both the Select key and the – key at the same time to quit the menu.

Presentation of the counter reading in the LED display is exponential from 00E0 to 90E8.

3.9 Resetting the Stroboscope to its Default Settings

As of Firmware 1.11 you have the option of resetting the stroboscope to its default settings. The default settings are:

Intensity:	100%
Frequency:	1 Hz
Number of pulses per burst:	1
Separation between pulses in burst:	100 ms
Burst:	Off
Trigger:	Pulse
Intensity reference:	External
Strobe:	On

To reset the instrument to the default settings, please proceed as follows:

1. Press the Select key and while holding it, press the key + repeatedly until rES appears in the LED display.
2. Release the Select key.
3. Keep the Strobe key pressed and press the – key.

   The stroboscope is reset to the default settings.
4. To quit the menu, press the Select key and while holding it, press the key + repeatedly until End appears in the LED display. Release the Select key.

Or:

Press both the Select key and the – key at the same time to quit the menu.

3.10 Exchanging Fuses

The holders for the fuses can be found on the back of the stroboscope (refer also to FIGURE 2.2).

To check and exchange fuse, please proceed as follows:

NOTE!

Before checking and exchanging the fuses, always ensure that the mains plug is disconnected!

1. Switch off the stroboscope using the mains switch on the back and unplug the mains plug.

WARNING!

Danger from electrical current! - After switching it off, wait for one minute! Only then can you be sure that all the electric circuits of the stroboscope have discharged completely.

It is possible that the stroboscope may flash a few more times after unplugging the mains plug until the capacitor has discharge completely.

2. Turn the fuse holder counterclockwise using a flat-bladed screwdriver. You can remove the fuse holder and the fuse from the instrument.

3. If the fuse is defective, exchange it for a fuse of the same type and same rating.

   You will find the technical data of the fuse on the instrument warning label on the back of the instrument and also in CHAPTER 4.

4. Use the flat-bladed screwdriver to turn the fuse holder clockwise into the housing again.

NOTE!

Both fuses are active and have to be checked if there is a fault!

3.11 Exchanging the Stroboscope Lamp

The xenon flashlamp of the stroboscope needs to be exchanged at regular intervals. On the inside of the xenon flashlamp, electrode material which has been vaporized by the arc is continuously deposited so that the luminous efficiency over life decreases. After approx. 10^8 flashes, the luminous efficiency falls to less than 70% and the lamp should be exchanged.

WARNING!

Danger from electrical current! - The stroboscope lamp may only be exchanged by electrotechnical experts.

To exchange the flashlamp, please proceed as follows:

1. Switch the stroboscope off and unplug the mains plug.

WARNING!

Danger from electrical current! - After switching it off, wait for one minute before opening the instrument!Only then can you be sure that all the electric circuits of the stroboscope have discharged completely.

NOTE!

Before exchanging the stroboscope lamp, always ensure that the mains plug is disconnected!

It is possible that the stroboscope may flash a few more times after unplugging the mains plug until the capacitor has discharge completely.

WARNING!

Danger from electrical current! - Never connect the instrument to the mains while the housing is open!

2. Unscrew the two cross-headed screws on the control panel on the front and back panel (refer also to FIGURE 2.1 and FIGURE 2.2) and remove the control panel vertically upwards.

WARNING!

Danger from exploded splinters! - The xenon flashlamps used in the BVS series are under pressure and can explode.

NOTE!

So when exchanging the stroboscope lamp, ensure that you are wearing suitable eye and hand protection!

3. Unscrew the four cross-headed screws on the housing cover and carefully remove the cover.

CAUTION!

Danger from mishandling! - The housing cover is connected to the housing via an earth cable. Make sure you do not rip it off!

4. Unscrew the cross-headed screw from the lamp connector (refer to FIGURE 3.2). We recommend that you use a magnetic screwdriver.

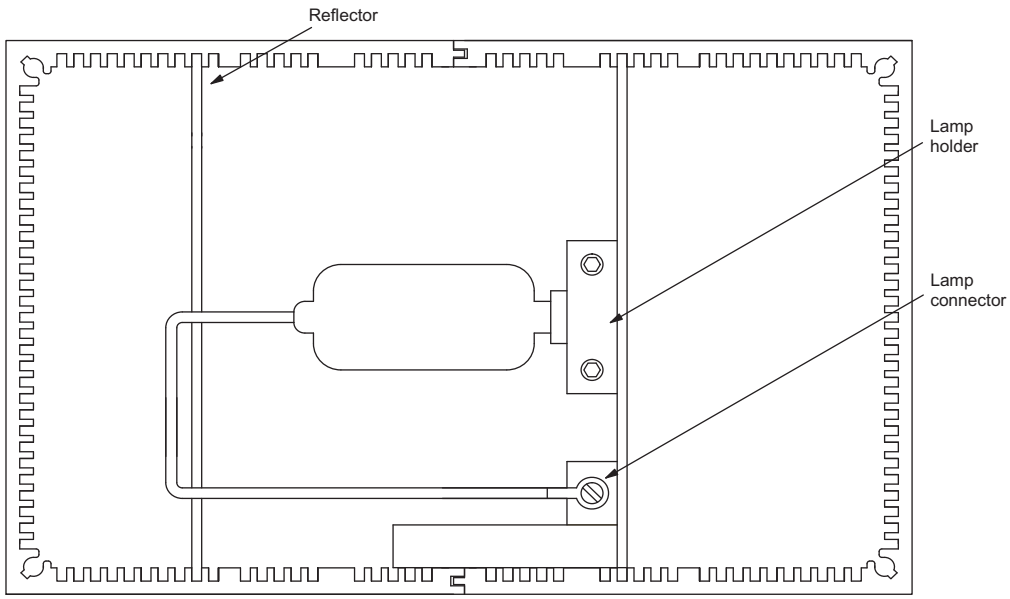


Figure 3.2: View inside the instrument with the housing cover removed

5. Undo the two Allen screws on the lamp holder using an Allen key size 2.5 (refer to FIGURE 3.2).

6. Pull the xenon flashlamp forwards out of the lamp holder and remove it upwards, out of the instrument.

7. Dispose of the defective xenon flashlamp in the packaging of the replacement lamp appropriately for harmful substances.

CAUTION!

Danger from mishandling! - When installing the new xenon flashlamp, please make sure that you do not get any fingerprints on the glass of the lamp! If you accidentally do, clean it carefully with a soft, lint-free cloth before closing the stroboscope again.

8. Bend the wire connection of the new stroboscope lamp twice at a right angle directly after the electrode pin, as shown in FIGURE 3.3.

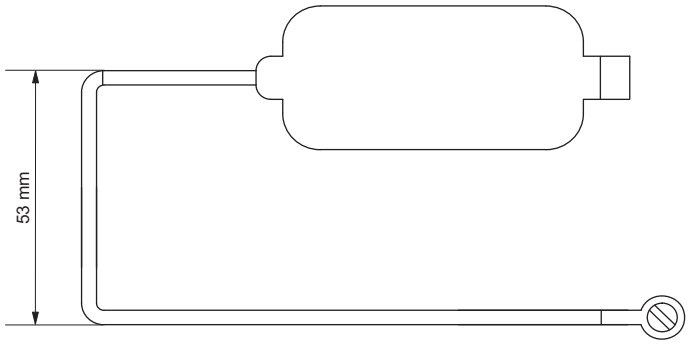


Figure 3.3: Dimensions for bends in the connecting wire

9. Position the new stroboscope lamp in the reflector again and move both together into the slot marked on the housing.

10. Now move the stroboscope lamp back into the stroboscope lamp holder until it stops and tighten the two Allen screws hand-tight again.

11. Screw the end of the connecting wire with the annunal cable lug hand-tight to the stroboscope lamp connector.

12. Now screw the housing cover back onto the stroboscope.

CAUTION!

Danger from mishandling! - In doing so, make sure that the earth cable does not get jammed!

13. Place the control panel vertically from above back onto the instrument.

CAUTION!

Danger from mishandling! - Make sure that you plug in the plug connectors on the control panel without bending them so as not to damage them!

14. Tighten the two cross-headed screws of the control panel on the back and the front panels of the instrument hand-tight.

The instrument is now ready to use again.

3.12 Networking Several Stroboscopes (Master-Slave Function)

The BVS-II Wotan/BVS-II Wotan Plus allows you to network up to nine stroboscopes. To do so, proceed as follows:

1. Select the master stroboscope and set all the necessary settings on it.

2. Connect the socket J2 - RS232 (out) of the master stroboscope to the jack J1 - RS232 (in) of the next stroboscope (RS-232 cable, 1:1).

3. Now connect the socket J2 - RS232 (out) of this stroboscope to the jack J1 - RS232 (in) of another stroboscope and so on until you have networked all the stroboscopes you need.

4. For all networked stroboscopes apart from the master stroboscope, use the Trigger key to select the LED Slave.

5. Adjust all other settings of the networked stroboscopes to those of the master stroboscope, in particular the trigger delay (refer to SECTION 3.6).

The Master-Slave function only refers to the trigger signal. The first stroboscope in the chain is the master stroboscope and acts as the trigger source. All other settings have to be made individually for each instrument in the chain.

3.13 Power Adjustment of Several Stroboscopes

For technical reasons, there are slight deviations in the flashlamps and reflectors in the stroboscopes. These deviations can lead to varying degrees of brightness from different instruments despite having the same intensity values. To balance out the differences when running several instruments, a power adjustment can be carried out for every stroboscope.

A percentage value is set for the power adjustment which determines the percentage of the power actually available to be used for a flash if the intensity on the instrument is set to 100%.

For a power adjustment on two stroboscopes, please proceed as follows:

1. Set one stroboscope as being the reference stroboscope and set its intensity to 100% (refer to SECTION 3.5).
2. Measure the power of this reference stroboscope using a photometer or using your image analysis software.

   This value is used as a reference for all other stroboscopes.
3. Set the intensity of the second stroboscope to 100% and measure its power as well.
4. Estimate the percentage to which the power of the second stroboscope has to be reduced to attain the same power as the reference stroboscope.
5. Press the Select key and while holding it, press the key + repeatedly until PoAd appears in the LED display.

   The value set until now is shown in the LED display.
6. Use the Decimal Select key to select a position in the LED display that you want to change.

   The respective position in the LED display flashes.
7. Change the selected position with the aid of the adjustment keys **+**/**–**.
8. Now measure the power of the stroboscope and compare it to the power of the reference stroboscope.
9. Repeat steps 4 to 8, until the power of the stroboscope corresponds to the power of the reference stroboscope.
10. To quit the menu, press the Select key and while holding it, press the key + repeatedly until End appears in the LED display. Release the Select key.

Or:

Press both the Select key and the – key at the same time to quit the menu.

To carry out the power adjustment, you should use the weakest intensity stroboscope as the reference. Then all other stroboscopes can be adapted to it without any problems.

4 Technical Specifications BVS-II Wotan/BVS-II Wotan Plus

4.1 Standards Applied

Electrical safety	IEC/EN 61010-1:2002-08 (Safety requirements for electrical equipment for measurement, control and laboratory use)	
EMC:	IEC/EN 61000-6-2:2002-08 (EMC requirements on Emission and Immunity - Electrical equipment for measurement, control and laboratory use)	
	Emission:	Limit Class B IEC/EN 61000-6-3:2002-08
	Immunity:	IEC/EN 61000-4-2 to 61000-4-6 and IEC/EN 61000-4-11
CSA-No.:	LR 221779	

4.2 General Data

Mains Connection

Mains voltage:	85…260 VAC
Power consumption:	max. 75 VA
Fuses:	1.6 A/slow-blow
Protection class:	1 (protective grounding)
Installation:	Category II The device is designed for connection to an electrical branch circuit inside a building with a main supply voltage fluctuations not exceeding ±10% of the nominal voltage.

Ambient Conditions

Operating temperature:	+5°C…+40°C (41°F...104°F)
Storage temperature:	−40°C…+90°C (−40°F...+194°F)
Relative humidity:	max. 80%, non-condensing
Geographic height of operating location:	0 - 2000 m above sea level
Pollution degree:	2 Only non-conductive pollution occurs. Except that occasionally a temporary conductivity caused by condensation is to be expected.

Housing

Protection rating:	IP 40
Dimensions instrument:	110 mm x 200 mm x 185 mm
Dimensions base plate:	110 mm x 190 mm x 2 mm
Weight:	2 kg

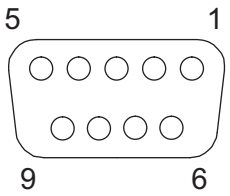
Sound Emission

Sound level:	61 dBA at 1 m distance

4.3 Signal Inputs

J1 - RS232 (in) — 9-pin Sub-D jack

Baud rate:	9600
Data format:	1 start bit, 8 data bits, 1 stop bit, no parity bit
Pin configuration:	Looking at the jack from the outside:



Pin 1	N/A
Pin 2	transmitted data TxD (→)
Pin 3	received data RxD (←)
Pin 4	N/A
Pin 5	reference potential GND
Pin 6	N/A
Pin 7	Trigger input TTL
Pin 8	N/A
Pin 9	N/A

J3 - Trigger (pulse/video)	BNC jack
Voltage range:	4 ... 27 V
Trigger level:	2.2 V
Input resistance:	11.5 kΩ
Compatibility:	TTL (5 V) SPS (24 V) PAL/CCIR video signal

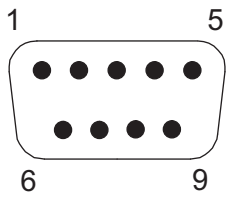
J4 - Intensity Ref	BNC jack
Voltage range:	0 ... 6 VDC
Setting range:	0.6 V (≡ 8% intensity) ... 6 V (≡ 100% intensity)
Input resistance:	40 kΩ

CAUTION!

Danger from overloading! - If you control the device externally via J4-Intensity Ref, please note that overload protection is not active! In this case, you must absolutely observe the values in FIGURE 1.1!

4.4 Signal Outputs

J2 - RS232 (out)	9-pin Sub-D plug
Baud rate:	9600
Data format:	1 start bit, 8 data bits, 1 stop bit, no parity bit
Pin configuration:	Looking at the plug from the outside:



Pin 1	N/A
Pin 2	transmitted data TxD (→)
Pin 3	received data RxD (←)
Pin 4	N/A
Pin 5	reference potential GND
Pin 6	N/A
Pin 7	Trigger input TTL
Pin 8	N/A
Pin 9	N/A

4.5 Xenon Flashlamp

Maximum energy:	max. 2.16 J electrical, at up to 20 Hz
Frequency:	max. 200 Hz
Spectrum:	approx. 300...1000 nm
Pulse-to-pulse stability:	typ. 1.5...2.5%
Service life:	10^8 flashes

The radiation spectra of the xenon flashlamp are shown in FIGURE 4.1 and FIGURE 4.2. They were captured in instruments without IR filter protection glass.

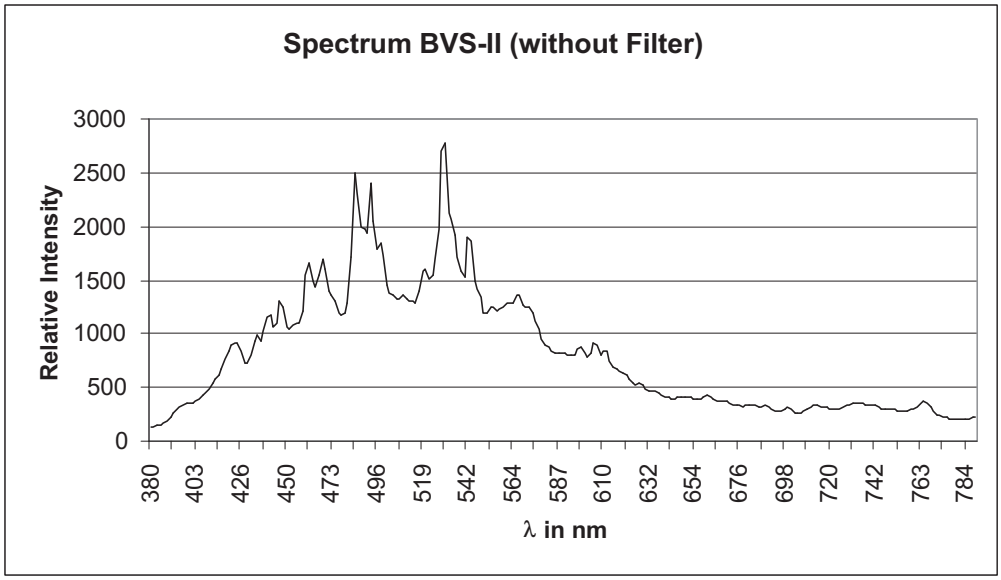


Figure 4.1: Visible spectrum of the xenon flashlamp

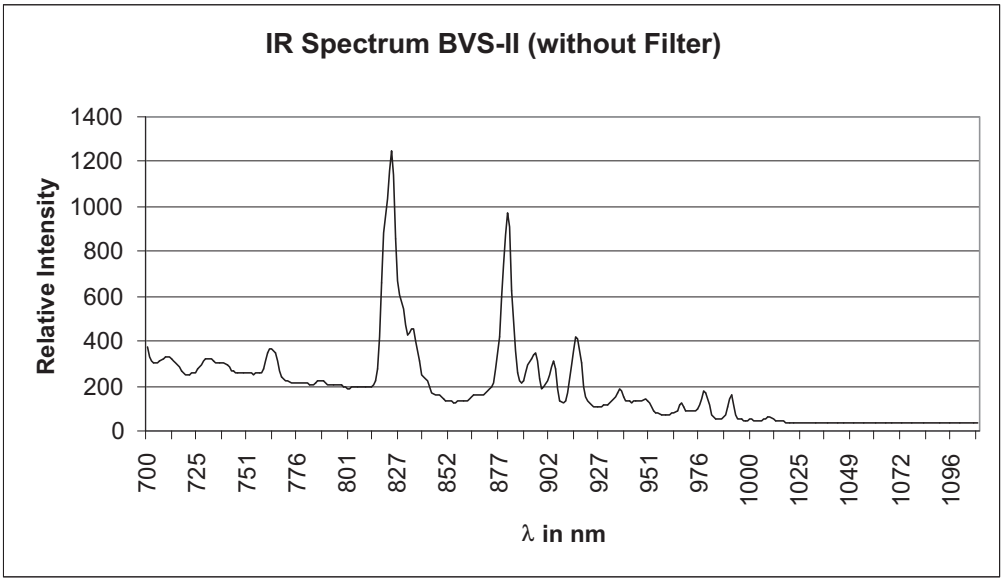


Figure 4.2: IR spectrum of the xenon flashlamp

Appendix A: Operation of Interface RS-232

A.1 Configuration of the Interface

As an alternative to operation using the control panel, all functions of the stroboscope can also be controlled via the RS-232 interface.

RS-232

The RS-232 interface has the following configuration:

- 9600 Baud
- 1 start bit, 8 data bits, 1 stop bit
- no parity bit
- no hardware or software handshake

A.2 Setting the Instrument Address

To be able to control several stroboscopes via the RS-232 interface, first of all each instrument has to have a unique instrument address allocated to it. To do so, proceed as follows:

1. Press the Select key and while holding it, press the key + repeatedly until Adr x appears in the LED display (whereby x stands for the instrument address).

2. Now use the adjustment keys **+**/**–** to set the required instrument address.

3. To quit the menu, press the Select key and while holding it, press the key + repeatedly until End appears in the LED display. Release the Select key.

Or:

Press both the Select key and the – key at the same time to quit the menu.

A.3 Interface Commands

A.3.1 Syntax of the Interface Commands

The square brackets [ ] and the spaces are not part of the command. They are used here simply to clarify and improve the readability of the individual parts of the command. Each command must be confirmed with the return key (↵).

Before the actual command you will find the address of the instrument which the command is to be applied to. If several instruments are to be addressed, then the corresponding instrument addresses have to be strung together. The command 37setint80↵ thus for example sets the intensity for the instruments 3 and 7 to 80%. If no address is set before the command, then this command applies to all stroboscopes which are connected and networked at the time.

A.3.2 Commands to Set Settings

General commands

You can set the basic functions of the instrument, as also described in SECTION 3.1 to SECTION 3.5, with the following commands.

Command	Function
[adr] stron ↵	Switches the stroboscope lamp on, input via the control panel is possible (refer also to SECTION 3.1).
[adr] stroff ↵	Switches the stroboscope lamp off, input via the control panel is possible (refer also to SECTION 3.1).
[adr] keyloc ↵	Locks all keys on the control panel of the instrument (refer also to SECTION 3.1).
[adr] keyopn ↵	Unlocks all keys on the control panel of the instrument.
[adr] setint [data] ↵	Sets the intensity to the given value in %. Value range: 8...100 (refer also to SECTION 3.5)
[adr] refint ↵	Sets the instrument to internal intensity reference (refer also to SECTION 3.5).
[adr] refext ↵	Sets the instrument to an external intensity reference via the BNC jack J5 - Intensity Ref (refer also to SECTION 3.5 and CHAPTER 4).
[adr] setfre [data]↵	Sets the frequency to the given value in Hz. Value range: 1.0 ...200.0 Step size: 0.1 (refer also to SECTION 3.4)
[adr] selref [data]↵	Sets the required reference diagram (refer also to SECTION 3.5). Possible values: 0 = Linear reference diagram 1 = Square reference diagram

Trigger commands

The four different trigger sources can be selected using the following commands:

[adr] tripul ↵	Sets the instrument to external trigger from a pulse (refer also to SECTION 3.6).
[adr] trivid ↵	Sets the instrument to external trigger from a video signal (refer also to SECTION 3.6).
[adr] trisla ↵	Sets the instrument to external trigger from an upstream instrument (refer also to SECTION 3.6).
[adr] triint ↵	Sets the instrument to internal trigger (refer also to SECTION 3.6).

You can set the signal delay between the trigger and setting off the flash using the following commands:

[adr] setdel [data] ↵	Sets a time delay between the trigger signal and setting off the flash in percent. Value range: 0.01...99.99 (refer also to SECTION 3.6)

[adr] setdelabs [dat] ↵ Sets an absolute time delay between the trigger signal and setting off the flash in ns.
Value range: 0 ... 3 000 000
Step size: 54 ns
Digital processing generates a rounding error of max. 54 ns.

Commands for the burst mode

The burst mode is configured using the following commands:

[adr] buron ↵ Switches the burst mode on (refer also to SECTION 3.7).

[adr] buroff ↵ Switches the burst mode off, the instrument then works in single flash mode again.

[adr] setpul [data] ↵ Sets the number of pulses of a burst to the given value.
Value range: 1... 999 (refer also to SECTION 3.7)

[adr] setsep [data] ↵ Sets the separation between the pulses of a burst to the given value in ms.
Value range: 1... 1000 (refer also to SECTION 3.7)

Command for the resetable counter

The resetable counter of the stroboscope is reset to zero using the following command (refer also to SECTION 3.8).

[adr] resflc ↵ Resets the counter.

A.3.3 Commands to Query Settings

Individual query You can query individual settings of an instrument using the following commands. All query commands allow only precisely **one** address to be given.

[adr] telint ↵	Queries the flash intensity set. Answer: [adr] telint: [data] ↵ Possible values: 1...100 (%)
[adr] telfre ↵	Queries the single flash frequency set. Answer: [adr] telfre: [data] ↵ Possible values: 1.0...200.0 (Hz)
[adr] telpul ↵	Queries the set number of pulses in a burst. Answer: [adr] telpul: [data] ↵ Possible values: 1...999
[adr] telsep ↵	Queries the separation set between the pulses of a burst. Answer: [adr] telsep: [data] ↵ Possible values: 1...1000 (ms)
[adr] teldel ↵	Queries the delay time set for the trigger. Answer: [adr] teldel: [data] ↵ Possible values: 0.01...99.99 (%)
[adr] telflc ↵	Queries the status of the resetable counter. Answer: [adr] telflc: [data] ↵ Possible values: Decimal
[adr] telfls ↵	Queries the status of the total counter. Answer: [adr] telfls: [data] ↵ Possible values: Decimal
[adr] telref ↵	Queries the reference diagram set. Answer: [adr] telref: [data] ↵ Possible values: 0 = Linear reference diagram 1 = Square reference diagram
[adr] telver ↵	Queries the firmware version currently being used on the instrument. Answer: [adr] telver: [wotan flash, fv=y.z] ↵ y.z thereby corresponds to the version number

Total query

To query all settings of an instrument, use the following command:

[adr] telsta ↵ Queries the overall instrument status.
Answer: [adr] telsta: [abcdefghijklmn] ↵

The letters in the instrument answer take on a value depending on the instrument status which have the following meaning:

a
0 Stroboscope lamp is switched on.
1 Stroboscope lamp is switched off, keys are locked.
2 Stroboscope lamp is switched off, keys are released.

b
0 Flash intensity is controlled internally by the instrument.
1 Flash intensity is controlled externally via the jack J4 - Intensity Ref.

c
0 Function is still in preparation.
1 Function is still in preparation.

d
0 Burst mode is switched on.
1 Burst mode is switched off.

e
0 Externally triggering by the use of a pulse signal at the jack J3 - Trigger.
1 Externally triggering by the use of a video signal at the jack J3 - Trigger.
2 Externally triggering by the use of a trigger signal from an upstream stroboscope through the jack J1 - RS232 (in).
3 Triggering by the use of an internal trigger signal.

f
0 In the field Select the LED Intensity has been selected.
1 In the field Select the LED Frequency has been selected.
2 In the field Select the LED Pulse has been selected.
3 In the field Select the LED Separation has been selected.

g x Value of the position 0 in the LED display (for the value given under **f**)

h x Value of the position 1 in the LED display (for the value given under **f**)

i x Value of the position 2 in the LED display (for the value given under **f**)

j x Value of the position 3 in the LED display (for the value given under **f**)

k
0 Value in the LED display has no decimal place.
1 The decimal place is after position 1.
2 The decimal place is after position 2.
3 The decimal place is after position 3.

l
0 Instrument is barred.
1 Instrument is not barred.

m
0 No position has been selected in the LED display.
1 The position 0 has been selected in the LED display.
2 The position 1 has been selected in the LED display.
3 The position 2 has been selected in the LED display.
4 The position 3 has been selected in the LED display.

A.3.4 Set of Commands to Link up to Other Systems

The following set of commands shows an exact reproduction of the function of the keys on the control panel. It is therefore well suited as a basis for generating a graphic user interface or another link into existing control systems.

[adr] key [1] ↵	Corresponds to pressing the Strobe key once.
[adr] key [2] ↵	Corresponds to pressing the Intensity Ref key once.
[adr] key [3] ↵	Corresponds to pressing the Sensor key once.
[adr] key [4] ↵	Corresponds to pressing the Burst key once.
[adr] key [5] ↵	Corresponds to pressing the Trigger key once.
[adr] key [6] ↵	Corresponds to pressing the Select key once.
[adr] key [7] ↵	Corresponds to pressing the Decimal Select key once.
[adr] key [8] ↵	Corresponds to pressing the **+** key once.
[adr] key [9] ↵	Corresponds to pressing the **–** key once.

As an alternative to the command [adr] key [6] ↵ the four possible settings of the Select key can also be selected directly.

[adr] selint ↵	Selects the LED Intensity (%).
[adr] selfre ↵	Selects the LED Frequency (Hz).
[adr] selpul ↵	Selects the LED Burst Pulses (No.).
[adr] selsep ↵	Selects the LED Burst Pulse Separation (ms).

Appendix B: FlashControl Panel Software (optional)

B.1 System Requirements

So that you can work optimally with your software, ensure that your PC is equipped as follows:

- Processor: Intel® Pentium® III 350 MHz
- Operating system: Microsoft® Windows® 2000 or higher
- RAM: 64 MB

B.2 Installing the Software

To install FlashControl Panel, please proceed as follows:

1. Insert the CD into your CD-ROM drive.
2. In the file manager of your operating system, please select the CD-ROM drive.
3. In the folder for the drive, double-click Setup.exe.
4. Follow the instructions.

To set up an icon on the desktop, proceed as follows:

1. Change into the folder in which you have installed FlashControl Panel.
2. Click the file Flash_Control.exe and drag it to the desktop while holding the mouse button pressed. An icon with the required link will appear on the desktop.
3. You can now set the name of the icon.

This concludes the installation. If you have any problems with the installation, please contact Polytec.

B.3 Using FlashControl Panel

NOTE!

Please ensure that no other program on your PC accesses the serial interfaces.

To start FlashControl Panel, double-click the icon on the desktop. The application window appears.

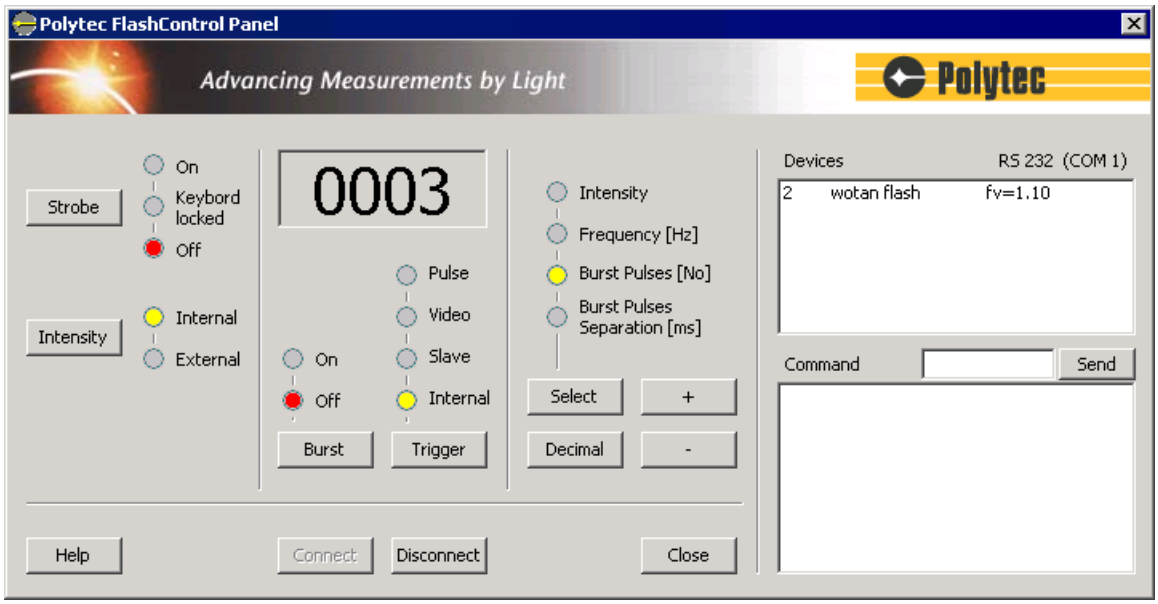


Figure B.1: Example of the application window

When the program is started, the software automatically searches for connected stroboscopes. If the stroboscope has not yet been connected to the PC when the program is started or is switched off, you can also make the connection retrospectively. To do so, click Connect at the bottom of the application window. The software will search for connected devices again.

If you want to connect an additional stroboscope, start by disconnecting the existing connection. To do so, click Disconnect at the bottom of the application window. Then you can remake the connection by clicking Connect again. The newly connected stroboscopes will then be recognized by the software.

Help

Click Help at the bottom of the application window to display the stroboscope manual on the screen. You will need Acrobat® Reader for this.

Software version and service

To display the version of the software or service information, click the Polytec logo in the blue title bar of the application window.

Exit the software

To exit the software, click Close at the bottom of the application window.

B.3.1 Controlling the Instrument with the Mouse via the Software

On the left in the application window is a picture of the control panel of the stroboscope.

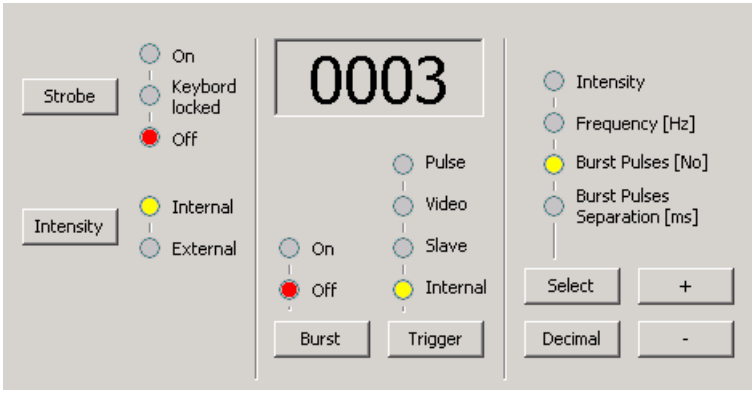


Figure B.2: Control panel of the stroboscope in the software

You control the stroboscope using the buttons in the software the same as on the control panel of the instrument (refer also to CHAPTER 3). Click the corresponding buttons.

B.3.2 Controlling the Instrument with the RS-232 Commands via the Software

You can also control the stroboscope in the software using the RS-232 commands from APPENDIX A.

Figure B.3: Example for input and output fields

Connected devices

At the top of the field Devices is a list of devices that the software found when the program was started or when connections were made. Apart from that, the firmware version of the devices is displayed. If there are several devices connected, you can select the respective device here which you want to control with the software.

Enter commands

In the field Command you enter the RS-232 control commands for the stroboscope directly (refer to APPENDIX A). To send the command, click Send or press Enter ↵.

The answer from the instrument is shown below the field Command. You will find detailed information on the individual commands and their answers in APPENDIX A.

Appendix C: Declaration of Conformity

CE

Konformitätsbescheinigung / Declaration of Conformity

für / for

Gegenstand / Object :	**Image Processing Stroboscope**
Controller Typ / Model :	**BVS-II Wotan / BVS-II Wotan Plus**

Der Hersteller / The manufacturer

Polytec GmbH
Polytec Platz 5-7
76337 Waldbronn / Germany

bestätigt das Einhalten der Richtlinien 2004/108/EG und 2006/95/EG
confirms the compliance with the directives 2004/108/EC and 2006/95/EC.

Das Gerät stimmt mit den folgenden Normen überein / The unit complies to the following standards:

EN 61010-1:2002-08	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte / Safety requirements for electrical equipment for measurement, control and laboratory use
EN 61000-6-3:2002-08	Elektromagnetische Verträglichkeit (EMV) Fachgrundnorm Störaussendung Electromagnetic compatibility (EMC) / Emission - Grenzwertklasse: Klasse B / Class B
EN 61000-6-2:2002-08	Elektromagnetische Verträglichkeit (EMV) Fachgrundnorm Störfestigkeit Electromagnetic compatibility (EMC) / Immunity - EN 61000-4-2 - EN 61000-4-3 - EN 61000-4-4 - EN 61000-4-5 - EN 61000-4-6 - EN 61000-4-11

Ausgestellt von / Issued by

Helmut Selbach

Dr. Helmut Selbach
Managing Director
Polytec GmbH

23.10.2007
Datum / Date

Figure C.1: Konformitätserklärung

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Polytec Deutschland

POLYTEC GmbH
Hauptsitz
Polytec-Platz 1-7
76337 Waldbronn

Tel.: (07243) 604-0
Fax: (07243) 69944
E-mail: info@polytec.de
Internet: http://www.polytec.de

POLYTEC GmbH
Vertriebs- und Beratungsbüro Berlin
Schwarzschildstraße 1
12489 Berlin

Tel.: (030) 6392-5140
Fax: (030) 6392-5141
E-mail: polytecberlin@polytec.de
Internet: http://www.polytec.de

International from outside Germany (D)
POLYTEC GmbH
Headquarters
Polytec-Platz 1-7
D-76337 Waldbronn

Tel.: +49 7243 604-0
Fax: +49 7243 69944
E-mail: info@polytec.de
Internet: http://www.polytec.com

Polytec International

France (F)
Polytec France S.A.S.
32 rue Délizy
F-93694 Pantin

Tel.: +33 (0) 1 48 10 39 30
Fax: +33 (0) 1 48 10 08 03
E-mail: info@polytec.fr
Internet: http://www.polytec.fr

Great Britain (GB)
Lambda Photometrics Ltd.
Lambda House, Batford Mill
GB-Harpenden, Hertfordshire AL5 5BZ

Tel.: +44 (0) 1582 764334
Fax: +44 (0) 1582 712084
E-mail: info@lambdaphoto.co.uk
Internet: http://www.lambdaphoto.co.uk

Japan (J)
Polytec Japan
Hakusan High Tech Park
1-18-2 Hakusan, Midori-ku
J-Yokohama-shi, 226-0006 Kanagawa-ken

Tel.: +81 (0) 45 938-4960
Fax: +81 (0) 45 938-4961
E-mail: info@polytec.co.jp
Internet: http://www.polytec.co.jp

USA West
Polytec, Inc., North American Headquarters
1342 Bell Avenue, Suite 3-A
Tustin, CA 92780

Tel.: +1 714 850 1835
Fax: +1 714 850 1831
E-mail: info@polytec.com
Internet: http://www.polytec.com

USA Midwest
Polytec, Inc., Midwest Office
3915 Research Park Dr., Suite A-12
Ann Arbor, MI 48108

Tel.: +1 734 662 4900
Fax: +1 734 662 4451
E-mail: info@polytec.com
Internet: http://www.polytec.com

USA East
Polytec, Inc., East Coast Office
25 South Street, Suite A
Hopkinton, MA 01748

Tel.: +1 508 544 1224
Fax: +1 508 544 1225
E-mail: info@polytec.com
Internet: http://www.polytec.com