USER MANUAL

HBS Series | Diffractive Optics

gentec-eo
PARTNERS for ACCURACY

121-16521

Warranty

The Gentec-EO inc Holographic Beam Sampler carries a one year warranty (from date of shipment) against material and / or workmanship defects, when used under normal operating conditions. The warranty does not cover damages related to misuse.

Gentec-EO inc will repair or replace, optionally, any product which proves to be defective during the warranty period, except in the case of product misuse.

Any attempt by an unauthorized person to alter or repair the product is also not covered by the warranty.

The manufacturer is not liable for consequential damages of any kind.

In the case of a malfunction, contact the local Gentec-EO inc distributor or the nearest Gentec-EO inc office to obtain a return authorization number. The material should be returned to:

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1 GENERAL INFORMATION

1.1 RECEPTION

The Gentec-EO inc HBS equipment was delivered in good condition. Once the shipment is received, it should be immediately inspected for damage. The contents of all boxes should be unpacked carefully.

Notify and file a claim with the carrier in the case of any loss or damage.

All shipping boxes must be inspected by the carrier in order to file a claim.

Send a purchase order to Gentec-EO inc in order to replace any parts damaged during shipment. The amount indicated on the replacement part invoice can then be collected from the carrier.

1.2 INTRODUCTION

The HBS offers an unprecedented range of applications for users of both low and high- power lasers. Its extraordinary versatility allows to:

- obtain multiple, spacially representative beam samples
- perform sampling in real time
- monitor on-line power/energy
- measure wavelengths
- perform output coupling
- measure pulse width
- measure temporal pulse shape
- obtain near-field and far-field measurements on the same pulse
- analyze beam profile
- analyze beam quality
- gather information on beam spectral content

The HBS is actually a diffraction grating that produces three useful pairs of transmitted orders symmetrically disposed with respect to the main beam. First order samples are fully calibrated to indicate the exact sampling ratio between the diffracted and transmitted beams. This ratio is indicated on the top of the HBS handling box. Characterization of the second order sampling ratio can be performed upon request. No characterization is available for third and higher orders.

The second order samples are produced at +/- 20° from the zero order beam (transmitted main beam) for standard HBS models, when the beam to be sampled is at normal incidence on the HBS input surface.

HBS STANDARD SPECIFICATIONS

First Order	1/100 or 1/2000 of transmitted beam (Calibration accuracy = ± 3%)
Second Order	Characterization upon request
Order Angles	1st = 10° 2nd = 20°
Coating	Anti reflection on both sides
Insertion Loss (with AR coating)	0.3% per side (typical)

HBS SUBSTRATES

SUBSTRATE	UV-Grade Fused Silica	Zinc Selenide
DIAMETER (inches)	1" and 2" (+ 0/- .005")	1" (+ 0/- .005")
THICKNESS (inches)	0.125" (+/- .005")	0.125" (+/- .005")
WEDGE	30 min. (+/- 10 min.)	30 min. (+/- 10 min.)
SURFACE FINISH	λ/4 @ 1.064 μm (2 sides)	λ/4 @ 1.064 μm (2 sides)
SCRATCH/ DIG	20-10 (2 sides)	20-10 (2 sides)
BEVEL (inches)	0.020" (+/- .005") at 45°	0.020" (+/- .005") at 45°

HBS CUSTOMIZED SPECIFICATIONS (call Gentec-EO inc for details)

Gentec-EO inc HBS custom engineered models may contain any of the following specifications:

- Wavelengths from 250 to nm to 14 µm.
- Sampling factor from 1/10 to 1/2000 of transmitted energy and power on first order samples.
- Any sampling angle for the first order samples (second order deviation angle will be twice as large as the angle chosen for the first order).
- Substrates with or without wedge.
- Anti reflection coating on incident surface to minimize loss, or more reflective coating if required for application.
- Anti reflection coating on transmitting surface (it is strongly recommended to purchase an uncoated unit and apply required coating).

2 HBS SETUP AND ALIGNMENT

Normal Incidence Setup

The relation between the incidence angle upon the HBS and the angles where the secondary beams are diffracted is determined by the properties associated with the general theory on gratings. In order to obtain the specified secondary beams (angles, sampling ratio), it is recommended to place the HBS at normal incidence with respect to the beam to be sampled.

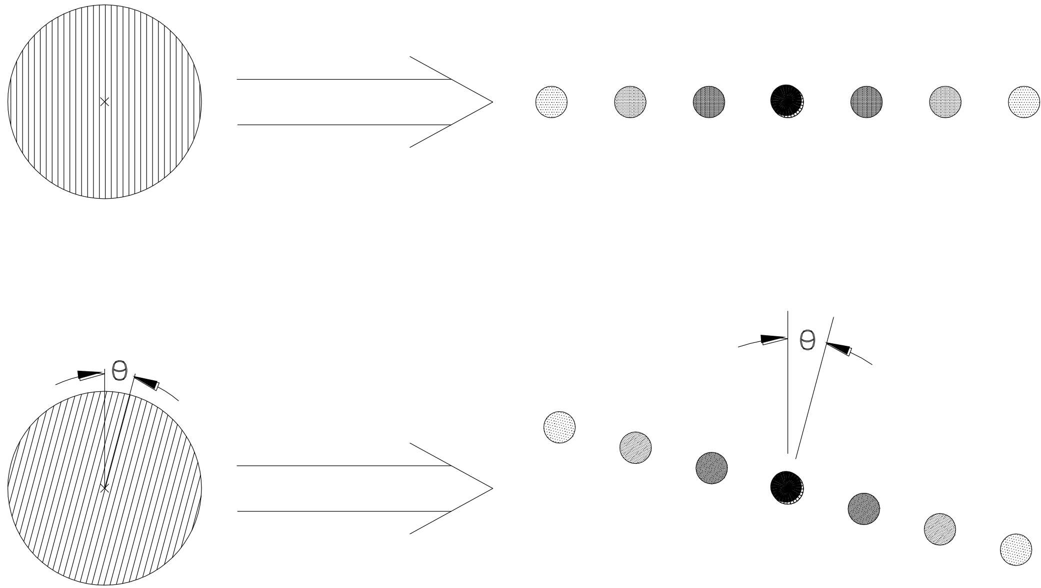
Alignment

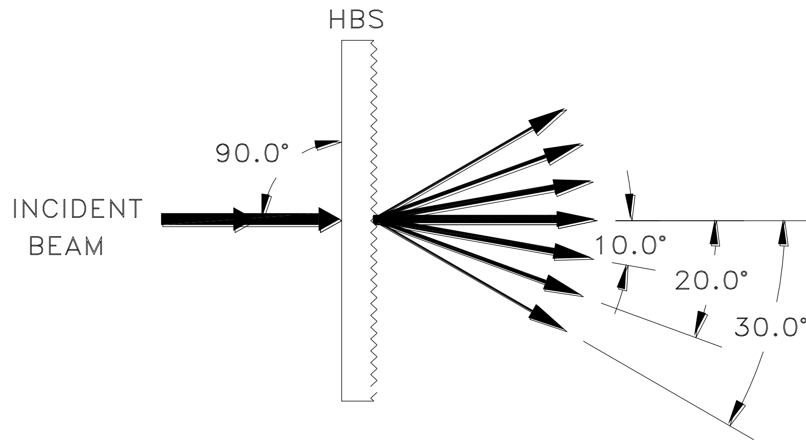
In order to avoid multiple parasitic diffracted orders between the HBS surfaces, the grating surface must be placed as the output surface.

All beams are diffracted within the same plan. The plan's normal axis is parallel to the direction of the lines engraved in the substrate. By turning the HBS around its perpendicular axis, the diffracted orders turn accordingly and always within the same plan (see Fig. 2-1).

Because of the standard substrates' weak wedge, the zero order is slightly deviated with respect to the incident axis. By turning the HBS in the above manner, the zero order should also slightly turn, especially when observed at a great distance from the alignment point.

Fig. 2–1 HBS ALIGNMENT





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3 BEAM PROFILING

HBS for Beam Profiling Purposes

In order to use the HBS for imaging a collimated beam, a special procedure is recommended. This setup is related to the fact that there exists a geometrical narrowing of the diffracted beam when viewed from a right angle in relation to its propagation direction. The beam will be slightly elliptical (see Fig. 3-1a).

The following equation should be used to correct the beam profiling:

$$d_m = d_o \cos \theta$$

For example, if the second order is used, the diameter measured in the diffractive plan will be reduced to;

$$d_2 = d_o \times 0.94$$

To overcome this effect, the camera's (or profiler's) perpendicular axis should be placed (turned) parallel to the HBS perpendicular axis (Fig. 3-1b).

Another simple method may be used to avoid elliptical narrowing: by turning the HBS 10° from the incident beam, one of the second orders will be geometrically identical to the incident beam. First orders may still be used for energy/power monitoring (Fig. 3-1c).

For more details, contact the nearest Gentec-EO inc agent or representative.

Fig. 3-1a Cos θ NARROWING EFFECT

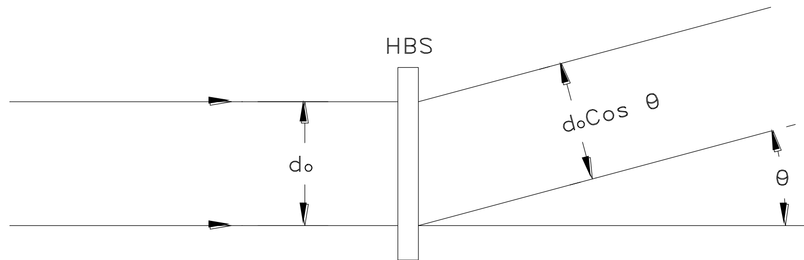


Fig. 3-1b CAMERA SETUP (FIRST POSSIBILITY)

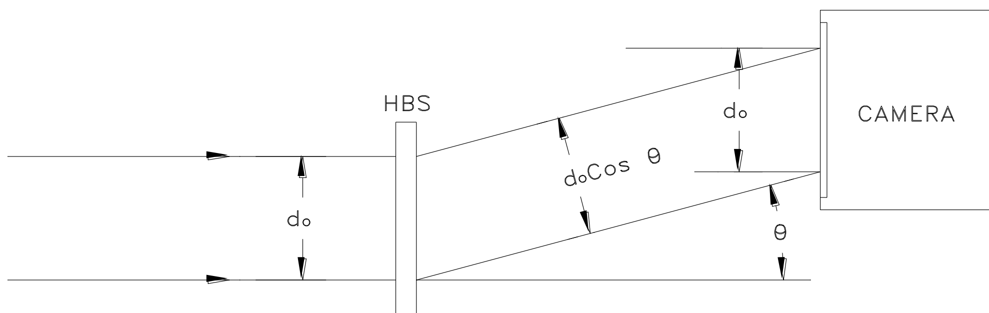
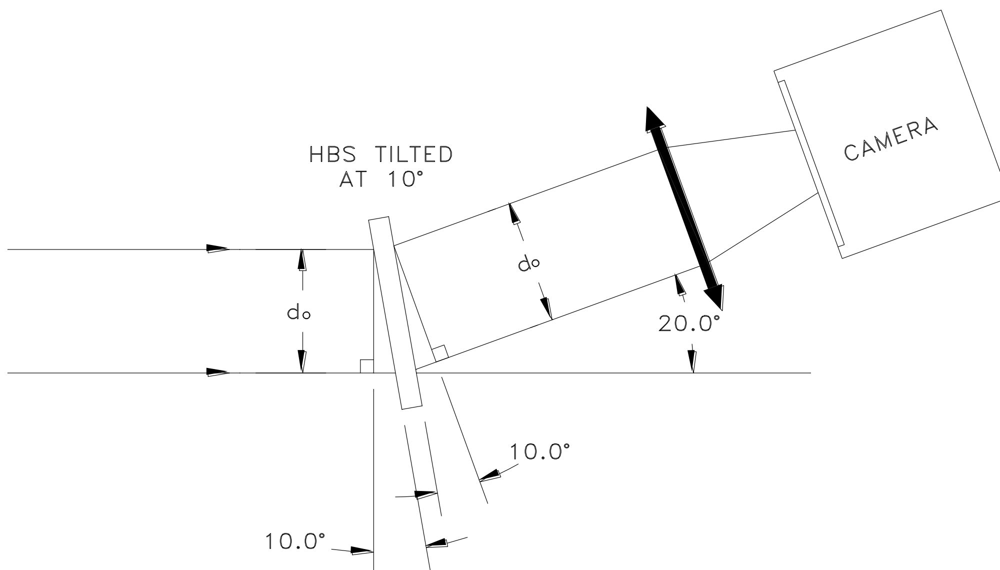


Fig 3-1c SECOND ORDER USED FOR BEAM PROFILING (SECOND POSSIBILITY)



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4 MAINTENANCE

In order to obtain maximum efficiency from the HBS, both surfaces must be kept clean and free of dust and/or oil. NEVER TOUCH SURFACES WITH BARE HANDS.

Dust can be removed with a clean stream of air. For removing dirt or oil, it is recommended to:

1) use (if available) an ultrasonic bath

or;

2) rinse both sides with spectrophotometric grade methanol or isopropanol to remove particles and complete cleaning with the drop and drag technique, using a soft lint free lens tissue with spectrophotometric grade methanol or isopropanol.

Avoid using acetone, as it may leave stains or residues on the HBS surface if not used properly.

If these cleaning methods are not sufficient to remove contamination from your HBS, contact the nearest Gentec-EO inc agent or representative.

DAMAGE TO THE MATERIAL

Damage to the material can be caused by using the HBS when the surface has been contaminated.

Tests conducted at three different wavelengths (355 nm, 532 nm and 1.064 μm) by a major US-Government-funded laboratory indicated that the HBS has the same damage threshold as the bare substrate itself.

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POWER & ENERGY METERS

BEAM PROFILING

TERAHERTZ MEASUREMENT

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