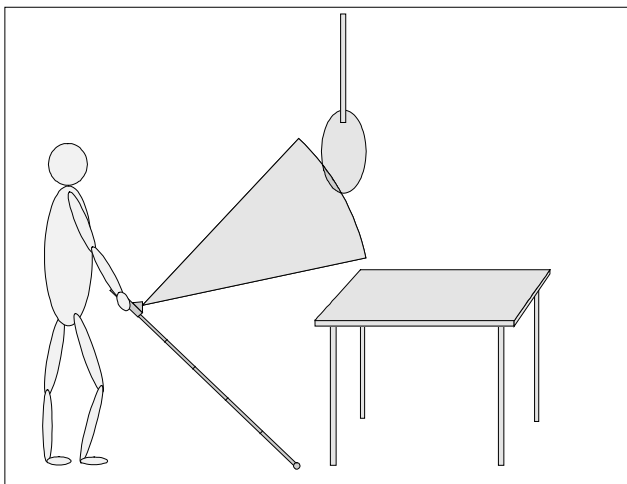


## The Laser Long Cane ...



is a long cane for the blind, with an integrated obstacle detector for protection of the head and upper body

### General description:

The Laser Long Cane provides protection, with the help of an onboard laser system, against obstacles that cannot be detected by the conventional long cane.

The additional electronic equipment and the power supply required for the laser system are contained in the handle. The front section of the handle houses a laser and a receiver which detect obstacles via the reflection of laser-light. The upper section of the handle, which serves as the grip, contains a vibrating warning system that causes the handle to vibrate when an obstacle is detected. The asymmetrical design of the handle allows the alignment of the laser-beam so that it is projected above the cane.

The laser light beams out vertically at a breadth of 30 degrees and is focused in the horizontal direction to a width of approx. 5mm. One can imagine this beam as a fan aligned forwards at an angle of 90 degrees

to the cane and projected vertically above the cane. The cane takes on an imaginary second dimension, almost as if one has a cane directed straight upwards. The range of the beam should be adjusted corresponding to the length of the cane.

Due to its alignment the beam detects only those obstacles directly above the cane in the head and chest area. As soon as light reflected by an obstacle is detected, the warning system begins to vibrate. A continuous vibration will be produced for as long as reflected light is being received, that is, for as long as an obstacle is detected above the cane in the head and chest area. The cane is, in effect, providing simple "yes/no" information. As soon as an obstacle is detected within the cane's range the warning system vibrates, forcing the user to react. Due to the fact that the laser-fan is very narrow and is projected above the cane, obstacles can be localised very accurately.

The handle of the Laser Long Cane can be used in combination with a variety of long canes.

### Technical specifications:

**Casing:** The handle is made of a synthetic material that is isolated against the cold and is sweat resistant. The surface is matted to provide a better grip. The small window for the laser emitter and detector is made from plexi glass. The casing is water resistant and sealed from dust.

#### Dimensions:

Total Length	223mm
The design of the handle is asymmetric.	
Length of grip	130mm
Diameter	$d_1=35\text{mm}$
	$d_2=26\text{mm}$

#### Sensor area:

Length	93mm
Width	25mm
Height	73mm

**Weight:** Handle with batteries approximately 210g.

**Mounting instructions:** The Laser Long Cane handle can be mounted onto a variety of standard retail long canes. The original handle must be removed from the cane and a split-pin (expanding mandrel) inserted into the open end. In the handle of the Laser Long Cane is an aluminium tube that is placed over the cane's shaft. In this tube is an expansion plug which is forced apart by the split-pin, holding the two firmly together.

Laser Measurement: The laser beam is generated by an integrated laser diode module. The light emitted is eye safe (Laser Class 1) and has been tested by Laser und Medizintechnik GmbH, Berlin. The beam is focused to fan out vertically by 30 degrees. In the horizontal plane the beam remains focused. The beam, at a distance of 1.45 meters from the lens, is shaped like a vertical line 75cm high and 5mm wide.

The distance to the next object reflecting the light is measured using laser ranging principles. The range of the beam can be set to between 120cm and 160cm in order to compensate for differences in body size and grip tendencies.

Operating safety: After switching the Laser Long Cane on, a vibration signals the start of an internal test. If all the tests are in order the cane is ready for normal use. If there is a problem a warning signal will set off (see below).

To ensure that it operates safely the unit continues to conduct internal tests during normal operation.

If the main control unit fails the Laser Long Cane is designed to vibrate until the batteries are discharged or the unit is switched off.

Warning signals: The warning signal is a strong vibration felt through the entire grip of the handle. It is accompanied by a low hum. There are two types of signal.

- 1) Continuous vibration signalling an obstacle alert
- 2) Intermittent vibration (3 short, 1 long, and 3 short, pause and so on) signalling a low battery or an internal fault. The warning will continue until the batteries are changed, the unit is switched off or the discharge protection switches of the device.

Power supply: 2 mignon rechargeable batteries (nickel metal hydride 1600mAh) deliver 4 hours continuous vibration or 24 hours of operation without vibration. The batteries can be recharged in the unit. Using the Ansmann battery charger on offer the batteries should recharge in 3,5 hours. The charging socket is located under a rubber lid that seals the socket during normal use. The charging socket is large, easy to use and, when using the Ansmann battery charger, polarity safe. The battery tube is closed off with an aluminium lid that is attached to the handle. The batteries can thus be easily changed as necessary. A pole safety mechanism for the batteries is also integrated into the system. Instead of rechargeable batteries normal Mignon AA batteries can be used.

Operational Problems: The following factors can cause operational problems with the Laser Long Cane. This possible problems are due to physical reasons and therefore can not be avoided.

Weather: The laser is so sensitive that it sends out frequent or constant warning signals in strong rain or snow. Under these conditions the unit should be switched off and the cane used as a conventional long cane.

Surfaces: In the case of clean reflective surfaces (mirror) or transparent clean surfaces (glass) the unit's range may be drastically reduced. Not enough light would be reflected back, especially when there is a low angle between the surface and the laser beam, to be detected by the unit.

Warranty: There is a two year warranty on the unit. For the laser and light detector there is a warranty for 3000 operating hours, provided that the two year time limit is not exceeded. The total number of operating hours will be determined by an internal readable counter. The rechargeable batteries can be exchanged up to six months after purchase.

### Handling:

The Laser Long Cane is used in the same way as the conventional long cane. For safe and effective handling of the Laser Long Cane it is recommended that mobility and orientation training be undertaken. At least one hour of training should be conducted under the guidance of a mobility trainer in order to obtain the correct positioning and grip.

The correct positioning of the Laser Long Cane is enabled through the asymmetrical form of the handle. The flat side of the handle must face upwards in order for the beam to project upwards.

The entire grip of the handle will vibrate.

As well as an On/Off switch the user will also find a recharging socket and an adjustment switch for the laser beam's range. These can be found under a rubber lid on the front of the handle. The lid is securely fastened via a nipple that fits into the recharging socket.

The unit's distance setting should be set before using the cane, preferably with the help of a mobility trainer. The range of the beam is adjusted by pushing a thin object, e.g. a toothpick, into the switch. By pushing the button the beam's range will be, by steps, increased or decreased.