



# GLL Professional

5-40 E | 8-40 E

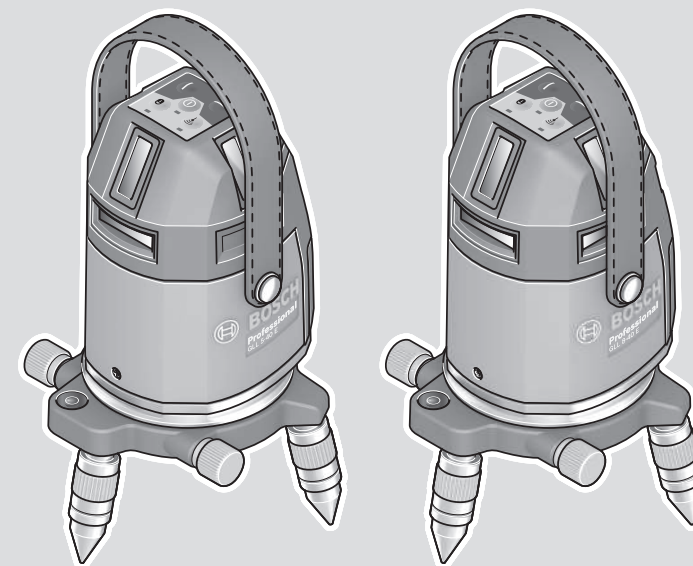
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1 609 92A 58T (2020.08) T / 49



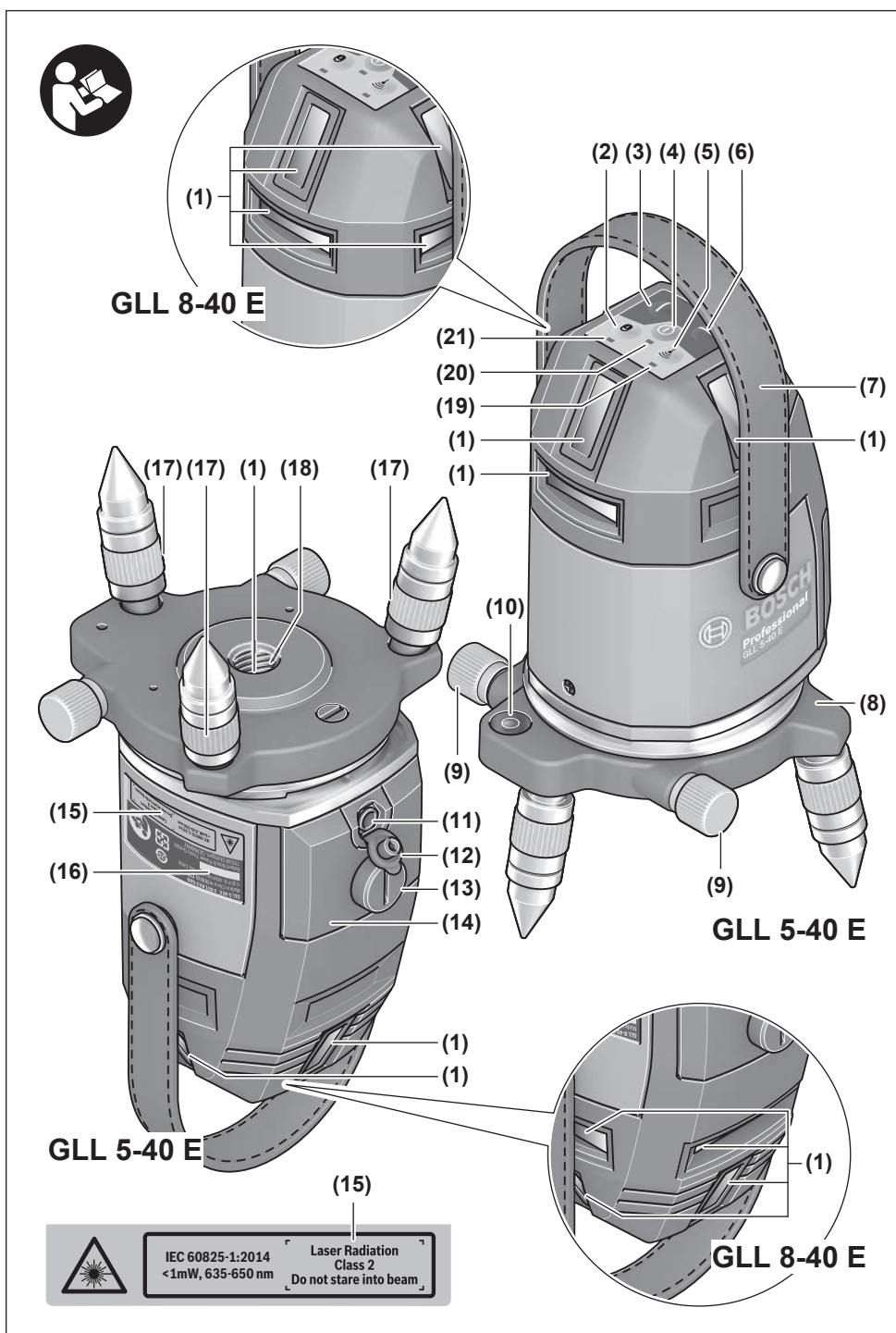
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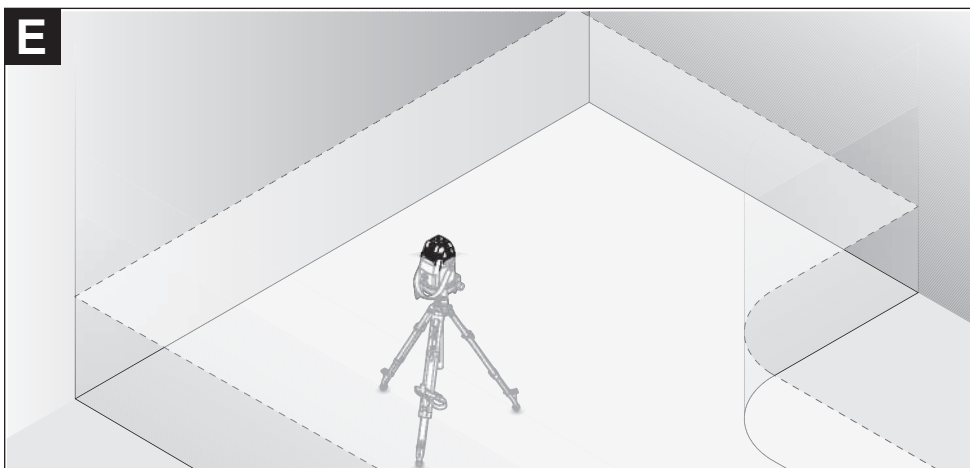
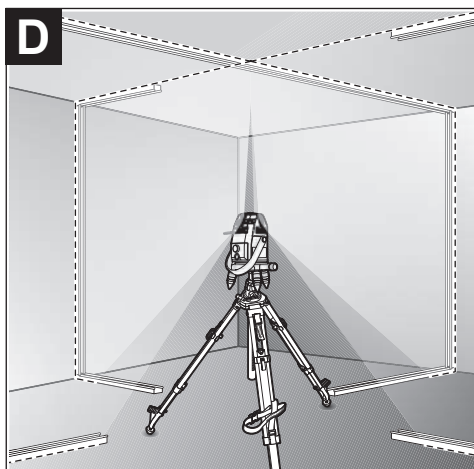
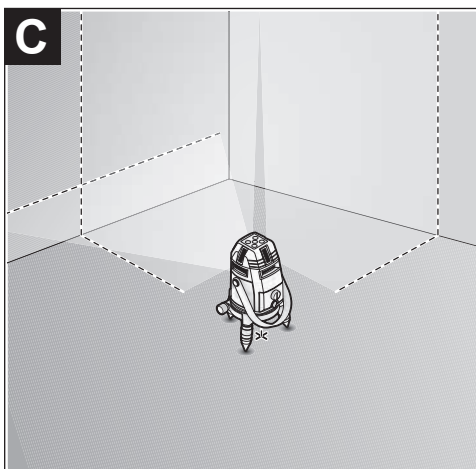
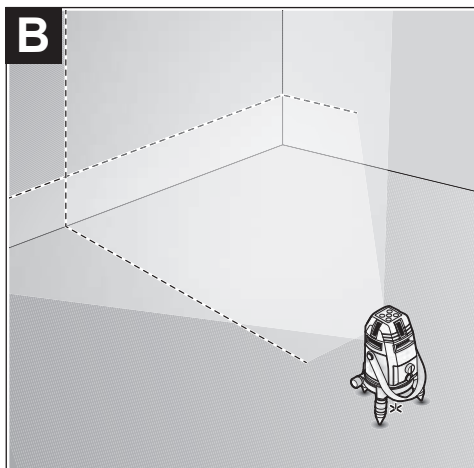
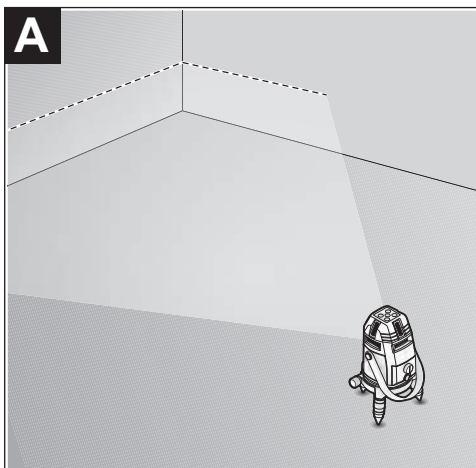


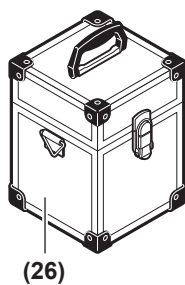
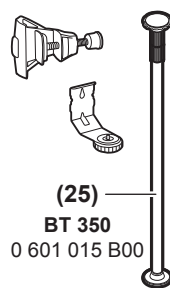
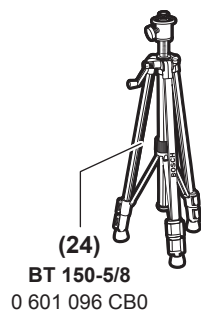
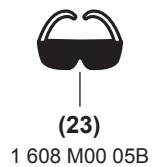
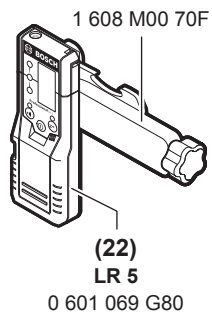
- en Original instructions
- zh 正本使用说明书
- zh 原始使用說明書
- ko 사용 설명서 원본
- th หนังสือคู่มือการใช้งานฉบับต้นแบบ
- id Petunjuk-Petunjuk untuk Penggunaan Orisinal
- vi Bản gốc hướng dẫn sử dụng



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## English

### Safety Instructions



All instructions must be read and observed in order for the measuring tool to function safely. The safeguards integrated into the measuring tool may be compromised if the measuring tool is not used in accordance with these instructions. Never make warning signs on the measuring tool unrecognisable. **SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE AND INCLUDE THEM WITH THE MEASURING TOOL WHEN TRANSFERRING IT TO A THIRD PARTY.**

- ▶ **Warning!** If operating or adjustment devices other than those specified here are used or other procedures are carried out, this can lead to dangerous exposure to radiation.
- ▶ The measuring tool is delivered with a laser warning sign (marked in the illustration of the measuring tool on the graphics page).
- ▶ If the text of the laser warning label is not in your national language, stick the provided warning label in your national language over it before operating for the first time.



**Do not direct the laser beam at persons or animals and do not stare into the direct or reflected laser beam yourself.** You could blind somebody, cause accidents or damage your eyes.

- ▶ If laser radiation hits your eye, you must close your eyes and immediately turn your head away from the beam.
- ▶ Do not make any modifications to the laser equipment.
- ▶ Do not use the laser goggles (accessory) as protective goggles. The laser goggles make the laser beam easier to see; they do not protect you against laser radiation.
- ▶ Do not use the laser goggles (accessory) as sunglasses or while driving. The laser goggles do not provide full UV protection and impair your ability to see colours.
- ▶ Have the measuring tool serviced only by a qualified specialist using only original replacement parts. This will ensure that the safety of the measuring tool is maintained.
- ▶ Do not let children use the laser measuring tool unsupervised. They could accidentally dazzle someone.
- ▶ Do not use the measuring tool in explosive atmospheres which contain flammable liquids, gases or dust. Sparks may be produced inside the measuring tool, which can ignite dust or fumes.
- ▶ Use only a power supply with an output voltage of 6 V (direct current). Read and strictly observe the safety instructions and working advice for the power supply.

## Product Description and Specifications

Please observe the illustrations at the beginning of this operating manual.

### Intended Use

The measuring tool is intended for determining and checking horizontal and vertical lines and plumb points.

The measuring tool is suitable for indoor and outdoor use.

### Product Features

The numbering of the product features shown refers to the illustration of the measuring tool on the graphic page.

- (1) Laser beam outlet aperture
- (2) Pendulum lock button
- (3) Vertical mode button
- (4) On/off button
- (5) Receiver mode button
- (6) Horizontal mode button
- (7) Carrying strap
- (8) Rotating platform
- (9) Fine adjustment screw of the rotating platform
- (10) Spirit level of rotating platform
- (11) 6 V charging socket
- (12) Charging socket cover
- (13) Battery compartment cover locking mechanism
- (14) Battery compartment cover
- (15) Laser warning label
- (16) Serial number
- (17) Height adjustment screw of the rotating platform
- (18) 5/8" tripod mount
- (19) Receiver mode indicator
- (20) Status indicator
- (21) Pendulum lock indicator
- (22) Laser receiver
- (23) Laser viewing glasses
- (24) Tripod<sup>A)</sup>
- (25) Telescopic rod<sup>A)</sup>
- (26) Case

A) Accessories shown or described are not included with the product as standard. You can find the complete selection of accessories in our accessories range.

### Technical Data

Line laser	GLL 5-40 E
Line laser	GLL 8-40 E
Article number GLL 5-40 E	<b>3 601 K63 G..</b>
Article number GLL 8-40 E	<b>3 601 K63 H..</b>

Line laser	GLL 5-40 E
Line laser	GLL 8-40 E

Working range <sup>A)</sup>	
– Standard laser lines	15 m
– Laser lines with receiver mode	10 m
– Laser lines with laser receiver	40 m
– Plumb point	2 m
Laser line levelling accuracy <sup>B)</sup>	±0.1 mm/m
Typical self-levelling range	±3°
Operating temperature	–10 °C to +50 °C
Storage temperature	–20 °C to +70 °C
Max. altitude	2000 m
Relative air humidity max.	90 %
Pollution degree according to IEC 61010-1	2 <sup>C)</sup>
Laser class	2
Laser type	635–650 nm, < 1 mW
C <sub>6</sub>	1
Divergence	
– Laser line	0.5 mrad (full angle)
– Plumb point	1.2 mrad (full angle)
Pulse duration	50 µs
Pulse repetition rate	10 kHz
Tripod mount	5/8"
Power supply	
– Non-rechargeable batteries (alkaline manganese)	4 × 1.5 V LR6 (AA)
– Power supply	6 V <sup>–</sup> , ≥ 500 mA
Approx. operating time with batteries	
– with 1 laser line	24 h
– with 5 laser lines	5 h
– with 8 laser lines (GLL 8-40 E)	2.5 h
Weight according to EPTA-Procedure 01:2014	1.1 kg
Dimensions (length × width × height)	136 × 136 × 210 mm
Protection rating (only with rotating platform fitted)	IP 54 (dust and splash-proof)

A) The working range may be reduced by unfavourable environmental conditions (e.g. direct sunlight).

B) ex-works

C) Only non-conductive deposits occur, whereby occasional temporary conductivity caused by condensation is expected.

The serial number (16) on the type plate is used to clearly identify your measuring tool.

## Assembly

### Measuring Tool Power Supply

The measuring tool can be operated either with commercially available batteries or with a commercially available power supply with an output voltage of 6 V (direct current). If batteries are inserted while a power supply is also connected, the measuring tool is supplied with power by the power supply.

#### Operation with Non-Rechargeable Batteries

It is recommended that you use alkaline manganese batteries to operate the measuring tool.

Turn the locking mechanism (13) (e.g. using a coin) to open the battery compartment cover (14). Remove the battery compartment cover. Insert the batteries.

When inserting the batteries, ensure that the polarity is correct according to the illustration on the inside of the battery compartment.

If the batteries become weak, the status indicator (20) will flash. It is still possible to work with the measuring tool.

Once the batteries are drained, the measuring tool will no longer react if a button is pressed. The status indicator (20) will flash for another 40 s, then the measuring tool will automatically switch itself off.

Always replace all the batteries at the same time. Only use batteries from the same manufacturer and which have the same capacity.

► **Take the batteries out of the measuring tool when you are not using it for a prolonged period of time.** The batteries can corrode and self-discharge during prolonged storage in the measuring tool.

#### Operation with power supply

Open the cover (12) of the 6 V charging socket (11). Plug the charging connector of a commercially available 6 V power supply into the charging socket (11). Connect the power supply to the mains supply.

After removing the charging connector, close the cover (12) again to protect against dirt.

### Working with the rotating platform

Unscrew the legs of the rotating platform (8) with the height adjustment screws (17).

Roughly align the rotating platform using the spirit level (10).

You can use the fine adjustment screw (9) to align vertical laser lines precisely with reference points.

Contact an authorised **Bosch** after-sales service centre if you want to use the measuring tool without the rotating platform. The precision of the measuring tool may be compromised if the calibration is not adapted for operation without the rotating platform.

## Operation

### Starting Operation

- ▶ **Protect the measuring tool from moisture and direct sunlight.**
- ▶ **Do not expose the measuring tool to any extreme temperatures or fluctuations in temperature.** For example, do not leave it in a car for extended periods of time. If it has been subjected to significant fluctuations in temperature, first allow the measuring tool to adjust to the ambient temperature and then always carry out an accuracy check before continuing work (see "Accuracy Check of the Measuring Tool", page 9).  
The precision of the measuring tool may be compromised if exposed to extreme temperatures or fluctuations in temperature.
- ▶ **Avoid substantial knocks to the measuring tool and avoid dropping it.** Always carry out an accuracy check before continuing work if the measuring tool has been subjected to severe external influences (see "Accuracy Check of the Measuring Tool", page 9).
- ▶ **Switch the measuring tool off when transporting it.**  
The pendulum unit is locked when the tool is switched off, as it can otherwise be damaged by big movements.

### Switching on/off

To **switch on** the measuring tool, press the on/off button **(4)**. The status indicator **(20)** lights up. Immediately after switching on, the measuring tool sends a horizontal laser line out of the front outlet aperture **(1)**.

- ▶ **Do not direct the laser beam at persons or animals and do not stare into the laser beam yourself (even from a distance).**

To **switch off** the measuring tool, press the on/off button **(4)** again. The status indicator **(20)** goes out. The pendulum unit is locked when the tool is switched off.

- ▶ **Never leave the measuring tool unattended when switched on, and ensure the measuring tool is switched off after use.** Others may be blinded by the laser beam.

### Deactivating the Automatic Shut-Off Function

If no button on the measuring tool is pressed for approx. **30 minutes**, the measuring tool will automatically switch off to save energy.

To deactivate the automatic shut-off function, hold down the horizontal mode button **(6)** for at least 3 seconds when switching on the measuring tool. The laser beams will flash briefly after 3 seconds if the automatic shut-off function is deactivated.

To activate the automatic shut-off function, switch the measuring tool off and on again (without holding down a button).

### Operating Modes

The measuring tool has several operating modes, which you can switch between at any time. The horizontal and vertical modes can be switched on and off independently of each

other. After switching on, the measuring tool is in horizontal mode with a laser line forwards.

All operating modes can be selected with both automatic levelling or the pendulum lock.

#### Horizontal mode (GLL 5-40 E) (see figure A)

In horizontal mode, the measuring tool sends out a horizontal laser line pointing forwards.

To switch the horizontal laser line off or on, press the horizontal mode button **(6)**.

#### Horizontal mode (GLL 8-40 E) (see figures A and E)

The measuring tool has multiple horizontal modes:

- Horizontal laser line forwards
- Horizontal laser line forwards and to the right-hand side
- Horizontal laser lines to all four sides

To switch the horizontal mode on/off or to change the horizontal mode, press the horizontal mode button **(6)** repeatedly until the required operating mode is reached.

#### Vertical mode and plumb point (see figures B-D)

The measuring tool has multiple vertical modes:

- Vertical laser line forwards
- Vertical laser line forwards and to the right-hand side
- Vertical laser line forwards and backwards
- Vertical laser lines to all four sides

A plumb point is additionally projected downwards in vertical mode.

To switch the vertical mode on/off or to change the vertical mode, press the vertical mode button **(3)** repeatedly until the required operating mode is reached.

#### Receiver Mode

Receiver mode must be activated when working with the laser receiver **(22)**, regardless of which operating mode is selected.

In receiver mode, the laser lines flash at a very high frequency, enabling them to be detected by the laser receiver **(22)**.

To switch on receiver mode, press the receiver mode button **(5)**. The receiver mode indicator **(19)** lights up red.

When receiver mode is switched on, the laser lines are less visible to the human eye. Therefore, switch receiver mode off by pressing the receiver mode button **(5)** again to work without a laser receiver. The receiver mode indicator **(19)** will go out.

### Automatic Levelling

#### Working with automatic levelling

To work with automatic levelling, the pendulum lock indicator **(21)** must not light up continuously. If necessary, switch automatic levelling on again by pressing the pendulum lock button **(2)** so that the pendulum lock indicator flashes or goes out.

Position the measuring tool on a level, firm support or attach it to a tripod **(24)**.

The automatic levelling function automatically compensates irregularities within the self-levelling range of  $\pm 3^\circ$ . The pendulum lock button **(21)** flashes during levelling. The levelling is finished as soon as the pendulum lock indicator goes out.

If automatic levelling is not possible, e.g. because the surface on which the measuring tool stands deviates by more than  $3^\circ$  from the horizontal plane, the pendulum lock indicator **(21)** flashes continuously.

If this is the case, set up the measuring tool in a level position and wait for the self-levelling to take place. Once the levelling is finished, the pendulum lock indicator **(21)** goes out.

It is not possible to work with automatic levelling outside the self-levelling range of  $\pm 3^\circ$ , as the levelling accuracy of the laser beams cannot be guaranteed and it cannot be guaranteed that the laser beams are perpendicular.

In case of ground vibrations or position changes during operation, the measuring tool is automatically levelled again.

Upon re-levelling, check the position of the horizontal or vertical laser line with regard to the reference points to avoid errors by moving the measuring tool.

### Working with the pendulum lock

To work with the pendulum lock, press the pendulum lock button **(2)**. When working with the pendulum lock, the pendulum lock indicator **(21)** is continuously lit.

For work with the pendulum lock, the automatic levelling is switched off. You can hold the measuring tool freely in your hand or place it on a sloping surface. This means that the laser lines are no longer levelled and no longer necessarily run perpendicular to one another.

## Accuracy Check of the Measuring Tool

### Influences on Accuracy

The largest influence is exerted by the ambient temperature. In particular, temperature differences that occur from the ground upwards can refract the laser beam.

Since the temperature stratification is greatest at ground level, you should always mount the measuring tool on a tripod for measuring distances of 20 m or more. In addition, position the measuring tool in the centre of the work surface, wherever this is possible.

In addition to external influences, device-specific influences (e.g. falls or heavy impacts) can also lead to deviations. For this reason, check the levelling accuracy each time before beginning work.

First check the height accuracy and levelling accuracy of the horizontal laser line, then the levelling accuracy of the vertical laser line.

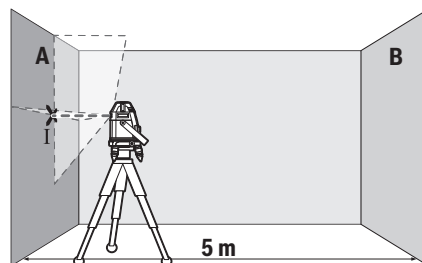
Should the measuring tool exceed the maximum deviation during one of the tests, please have it repaired by a **Bosch** after-sales service.

### Checking the height accuracy of the horizontal lines

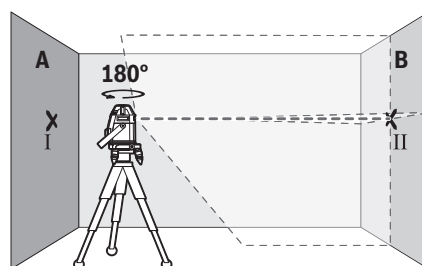
For this check, you will need a free measuring distance of 5 m on firm ground between two walls (designated A and B).

- Mount the measuring tool close to wall A on a tripod **(24)**, or place it on a firm, flat surface. Switch on the measuring

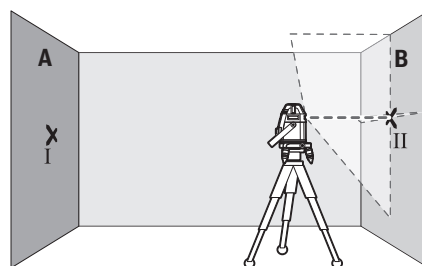
tool in the mode with automatic levelling. Switch on horizontal mode and vertical mode with a laser line forwards.



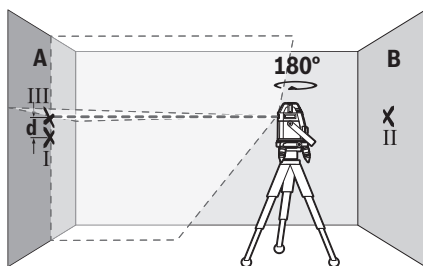
- Aim the laser at the closer wall A and allow the measuring tool to level in. Mark the middle of the point at which the laser lines cross on the wall (point I).



- Turn the measuring tool  $180^\circ$ , allow it to level in and mark the point where the laser lines cross on the opposite wall B (point II).
- Position the measuring tool – without rotating it – close to wall B, switch it on and allow it to level in.



- Align the height of the measuring tool (using the tripod or by placing objects underneath as required) so that the point where the laser lines cross exactly hits the previously marked point II on wall B.



- Turn the measuring tool 180° without adjusting the height. Aim it at wall A such that the vertical laser line runs through the already marked point I. Allow the measuring tool to level in and mark the point where the laser lines cross on wall A (point III).
- The discrepancy **d** between the two marked points I and III on wall A reveals the actual height deviation of the measuring tool.

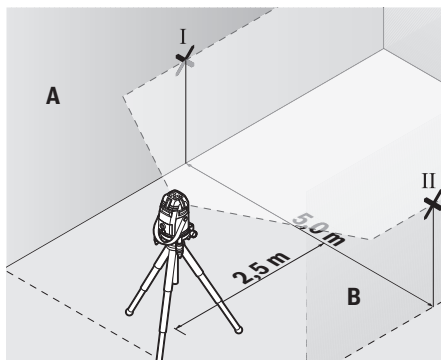
The maximum permitted deviation on the measuring distance of  $2 \times 5 \text{ m} = 10 \text{ m}$  is as follows:

$10 \text{ m} \times \pm 0.1 \text{ mm/m} = \pm 1 \text{ mm}$ . The discrepancy **d** between points I and III must therefore amount to no more than **1 mm**.

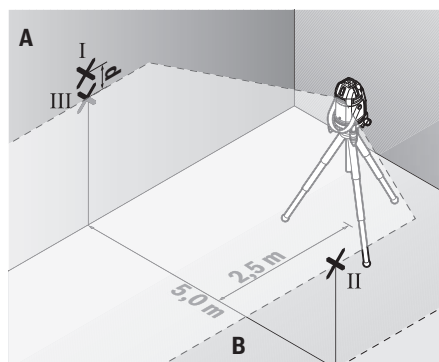
#### Checking the levelling accuracy of the horizontal lines

For this check, you will need a free area of  $5 \times 5 \text{ m}$ .

- Mount the measuring tool in the middle between walls A and B on a tripod (24), or place it on a firm, level surface. Switch on the measuring tool in the mode with automatic levelling. Switch on horizontal mode with a laser line forwards and allow the measuring tool to level in.



- At a distance of 2.5 m from the measuring tool, mark the centre of the laser line on both walls (point I on wall A and point II on wall B).



- Set up the measuring tool at a 5 m distance and rotated by 180° and allow it to level in.
- Align the height of the measuring tool (using the tripod or by placing objects underneath as required) so that the centre of the laser line exactly hits the previously marked point II on wall B.
- Mark the centre of the laser line on wall A as point III (vertically above or below point I).
- The discrepancy **d** between the two marked points I and III on wall A reveals the actual horizontal deviation of the measuring tool.

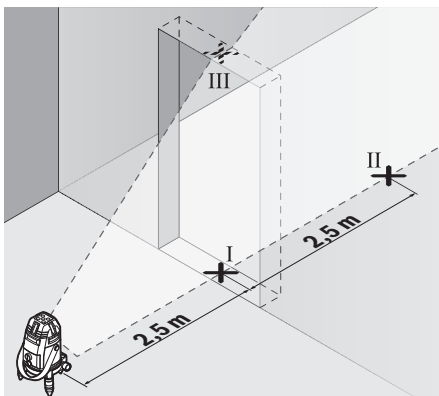
The maximum permitted deviation on the measuring distance of  $2 \times 5 \text{ m} = 10 \text{ m}$  is as follows:

$10 \text{ m} \times \pm 0.1 \text{ mm/m} = \pm 1 \text{ mm}$ . The discrepancy **d** between points I and III must therefore amount to no more than **1 mm**.

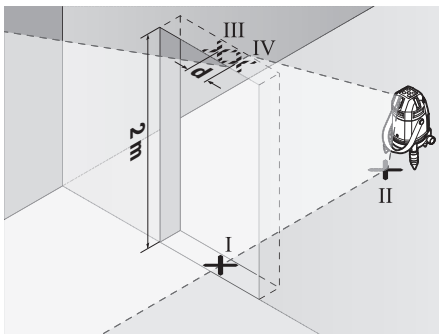
#### Checking the levelling accuracy of the vertical lines

For this check, you will need a door opening (on solid ground) which has at least 2.5 m of space either side of the door.

- Place the measuring tool 2.5 m away from the door opening on a firm, flat surface (not on a tripod). Switch on the measuring tool in the mode with automatic levelling. Switch on vertical mode with a vertical laser line forwards and aim the vertical laser line at the door opening. Allow the measuring tool to level in.



- Mark the centre of the vertical laser line on the floor of the door opening (point I), 5 m away on the other side of the door opening (point II) and on the upper edge of the door opening (point III).



- Rotate the measuring tool 180° and position it on the other side of the door opening, directly behind point I. Allow the measuring tool to level in and align the vertical laser line in such a way that its centre passes through points I and II exactly.
- Mark the centre of the laser line on the upper edge of the door opening as point IV.
- The discrepancy  $d$  between the two marked points III and IV reveals the actual vertical deviation of the measuring tool.
- Measure the height of the door opening.

You can calculate the maximum permitted deviation as follows:

Doubled height of the door opening  $\times 0.1$  mm/m

Example: At a door opening height of 2 m, the maximum deviation amounts to

$2 \times 2 \text{ m} \times \pm 0.1 \text{ mm/m} = \pm 0.4 \text{ mm}$ . The points III and IV must therefore be no further than 0.4 mm from each other.

### Working Advice

- **Only the centre of the laser point or laser line must be used for marking.** The size of the laser point/the width of the laser line changes depending on the distance.

### Working with the Tripod (Accessory)

A tripod offers a stable, height-adjustable support surface for measuring. Place the rotating platform with the 5/8" tripod mount (18) on the thread of the tripod (24) or a commercially available building tripod. Tighten the rotating platform using the locking screw of the tripod.

Roughly align the tripod before switching on the measuring tool.

### Working with the laser receiver (accessory)

Use the laser receiver (22) to improve detection of the laser lines in adverse lighting conditions (bright environment, direct sunlight) and over greater distances. When working with the laser receiver, switch on receiver mode (see "Receiver Mode", page 8).

### Laser Goggles (Accessory)

The laser goggles filter out ambient light. This makes the light of the laser appear brighter to the eye.

- **Do not use the laser goggles (accessory) as protective goggles.** The laser goggles make the laser beam easier to see; they do not protect you against laser radiation.
- **Do not use the laser goggles (accessory) as sunglasses or while driving.** The laser goggles do not provide full UV protection and impair your ability to see colours.

### Example applications (see figures A-E)

Examples of possible applications for the measuring tool can be found on the graphics pages.

## Maintenance and Service

### Maintenance and Cleaning

Keep the measuring tool clean at all times.

Never immerse the measuring tool in water or other liquids.

Wipe off any dirt using a damp, soft cloth. Do not use any detergents or solvents.

The areas around the outlet aperture of the laser in particular should be cleaned on a regular basis. Make sure to check for lint when doing this.

Only store and transport the measuring tool in the case (26).

If the measuring tool needs to be repaired, send it off in the case (26).

### After-Sales Service and Application Service

Our after-sales service responds to your questions concerning maintenance and repair of your product as well as spare parts. You can find explosion drawings and information on spare parts at: [www.bosch-pt.com](http://www.bosch-pt.com)

The Bosch product use advice team will be happy to help you with any questions about our products and their accessories.

In all correspondence and spare parts orders, please always include the 10-digit article number given on the nameplate of the product.

**Malaysia**

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**You can find further service addresses at:**

www.bosch-pt.com/serviceaddresses

**Disposal**

Measuring tools, accessories and packaging should be recycled in an environmentally friendly manner.



Do not dispose of measuring tools or batteries with household waste.

**中文****安全规章**

必须阅读并注意所有说明，以安全可靠地操作测量仪。如果不按照给出的说明使用测量仪，可能会影响集成在测量仪中的保护功能。测量仪上的警戒牌应保持清晰可读的状态。请妥善保存本说明书，并在转交测量仪时将本说明书一起移交。

- ▶ **小心** – 如果使用了与此处指定的操作或校准设备不同的设备，或执行了不同的过程方法，可能会导致危险的光束泄露。
- ▶ 本测量仪交付时带有一块激光警戒牌（在测量仪示意图的图形页中标记）。
- ▶ 如果激光警戒牌的文字并非贵国语言，则在第一次使用前，将随附的贵国语言的贴纸贴在警戒牌上。



不得将激光束指向人或动物，请勿直视激光束或反射的激光束。可能会致人炫目、引发事故或损伤眼睛。

- ▶ 如果激光束射向眼部，必须有意识地闭眼，立即从光束位置将头移开。
- ▶ 请不要对激光装置进行任何更改。
- ▶ **激光视镜（附件）不得用作护目镜。**激光视镜用于更好地识别激光束；然而对激光束并没有防护作用。
- ▶ **激光视镜（附件）不得用作太阳镜或在道路交通中使用。**激光视镜并不能完全防护紫外线，还会干扰对色彩的感知。
- ▶ 仅允许由具备资质的专业人员使用原装备件修理测量仪。如此才能够确保测量仪的安全性能。

- ▶ **不得让儿童在无人看管的情况下使用激光测量仪。**可能意外地让人炫目
- ▶ **请勿在有易燃液体、气体或粉尘的潜在爆炸性环境中使用测量仪。**测量仪器内可能产生火花并点燃粉尘和气体。
- ▶ **只能使用输出电压为6伏（直流电）的插头电源。**阅读并严格遵守插头电源的安全和操作说明。

**产品和性能说明**

请注意本使用说明书开头部分的图示。

**按照规定使用**

测量仪用于确定和检测水平线、垂直线以及下对点。

本测量仪适合在室内和室外使用。

**插图上的机件**

机件的编号和仪器详解图上的编号一致。

- (1) 激光束发射口
- (2) 摆动止动件按键
- (3) 垂直模式按键
- (4) 电源开关
- (5) 接收模式按键
- (6) 水平模式按键
- (7) 拎环
- (8) 旋转平台
- (9) 旋转平台微调螺栓
- (10) 旋转平台的水准仪
- (11) 6伏充电插座
- (12) 充电插座的盖子
- (13) 电池盒盖的固定扳扣
- (14) 电池盒盖
- (15) 激光警戒牌
- (16) 序列号
- (17) 旋转平台的高度调节螺栓
- (18) 5/8英寸三脚架接口
- (19) 接收模式指示灯
- (20) 状态指示灯
- (21) 摆动止动件指示灯
- (22) 激光接收器
- (23) 激光护目镜
- (24) 三脚架<sup>A)</sup>
- (25) 伸缩杆<sup>A)</sup>
- (26) 箱子

A) 图表或说明上提到的附件，并不包含在基本的供货范围中。本公司的附件清单中有完整的附件供应项目。

## 技术参数

线段激光测量仪	GLL 5-40 E
线段激光测量仪	GLL 8-40 E
物品代码 GLL 5-40 E	<b>3 601 K63 G..</b>
物品代码 GLL 8-40 E	<b>3 601 K63 H..</b>
工作范围 <sup>A)</sup>	
- 标准激光线	15米
- 带接收模块的激光线	10米
- 带激光接收器的激光线	40米
- 下对点	2米
激光线找平准确性 <sup>B)</sup>	±0.1毫米/米
一般自找平范围	±3度
工作温度	-10摄氏度至 +50摄氏度
仓储温度	-20摄氏度至 +70摄氏度
基准高度以上的最大使用高度	2000米
最大相对湿度	90 %
脏污程度符合 符合 IEC 61010-1	2 <sup>C)</sup>
激光等级	2
激光种类	635-650纳米, <1毫瓦
C <sub>6</sub>	1
发散角	
- 激光线	0.5毫弧度 (全角)
- 下对点	1.2毫弧度 (全角)
脉冲时间	50微秒
脉冲重复率	10千赫
三脚架接头	5/8英寸
供电	
- 电池 (碱-锰)	4 × 1.5伏特 LR6 (AA)
- 插头电源	6伏 <sup>≡</sup> , ≥ 500毫安
使用电池的运行时间约	
- 使用1束激光线	24小时
- 使用5束激光线	5小时
- 使用8束激光线 (GLL 8-40 E)	2.5小时
重量符合 EPTA-Procedure 01:2014	1.1千克
尺寸 (长 × 宽 × 高)	136 × 136 × 210毫米

线段激光测量仪 GLL 5-40 E

线段激光测量仪 GLL 8-40 E

防护类型 (仅限安装了旋转平台时) IP 54 (防尘、防溅)

A) 工作范围可能会因为环境条件不利 (比如阳光直射) 而缩小。

B) 出厂时的设定。

C) 仅出现非导电性污染, 不过有时会因为凝结而暂时具备导电性。

型号铭牌上的序列号(16)是测量仪唯一的识别码。

## 安装

### 测量仪电源

本测量仪可以通过市售电池驱动, 也可以通过输出电压为6伏 (直流电) 的市售插头电源驱动。

如果已装入电池且连接了插头电源, 则测量仪通过插头电源供电。

### 以电池驱动

建议使用碱性电池运行测量仪。

如需打开电池盒盖(14), 请用硬币等类似物体拧开止动件(13)。取下电池盒盖。装入电池。

根据电池盒内部的图示, 注意电极是否正确。

如果电池电量低, 状态指示灯(20)会闪烁。还可以使用测量仪进行操作。

当电池电量耗尽时, 按压按钮, 测量仪也不会响应。状态指示灯(20)继续闪烁40秒, 然后测量仪自动关闭。

务必同时更换所有的电池。请使用同一制造厂商所生产的相同容量电池。

► **长时间不用时, 请将电池从测量仪中取出。** 在长时间存放于测量仪中的情况下, 蓄电池可能会腐蚀以及自行放电。

### 使用电源适配器驱动

打开6伏充电插座(11)的盖子(12)。将市售6伏插头电源的充电插头插入充电插座(11)。将电源适配器连接到电源上。

如果取下充电插头, 要重新关闭盖子(12)以防脏污。

### 使用旋转平台进行操作

使用高度调节螺栓(17)拧出旋转平台(8)的支脚。

借助水准仪(10)大致对齐旋转平台。

使用微调螺栓(9)可以精确地将垂直激光线与基准点对齐。

如需使用不带旋转平台的测量仪, 请联系授权的 **Bosch** 客户服务中心。不使用旋转平台进行操作时, 若不匹配校准装置, 则可能影响测量仪的精度。

## 工作

### 投入使用

- ▶ **不可以让湿气渗入仪器中，也不可以让阳光直接照射在仪器上。**
- ▶ **请勿在极端温度或温度波动较大的情况下使用测量仪。** 比如请勿将测量仪长时间放在汽车内。温度波动较大的情况下，先让测量仪的温度稳定下来，在继续加工前应先进行精度检查(参见“测量仪精度检查”，页 15)。  
如果仪器暴露在极端的气候下或温差相当大的环境中，会影响测量仪的测量准确度。
- ▶ **避免让测量仪发生剧烈碰撞或将其跌落。** 测量仪受到强烈的外部作用之后，在重新使用之前务必进行精度检查(参见“测量仪精度检查”，页 15)。
- ▶ **运输时，请关闭测量仪。** 关机后摆动零件会被锁定，否则摆动零件可能因为强烈的震动而受损。

### 接通/关闭

如要**接通**测量仪，请按压电源开关**(4)**。状态指示灯**(20)**亮起。启动后，测量仪立即从当前放射口**(1)**射出一条水平激光线。

- ▶ **不得将激光束对准人或动物，也请勿直视激光束，即使和激光束相距甚远也不可以做上述动作。**

如要**关闭**测量仪，请重新按压电源开关**(4)**。状态指示灯**(20)**熄灭。关闭状态下，摆动单元会被锁止。

- ▶ **测量仪接通后应有人看管，使用后应关闭。** 激光可能会让旁人炫目。

### 关闭仪器的自动关机功能

如果在约**30分钟**的时间内没有按下测量仪上的任何按键，则测量仪自动关闭以节能。

如需停用自动断开装置，请在测量仪接通时按住水平模式按键**(6)**3秒钟。若停用了自动关机功能，激光束会在3秒后短暂闪烁。

如需激活自动关机功能，请关闭测量仪然后再次接通（无需按压按键）。

### 运行模式

本测量仪有若干种不同的运行模式，可以随时进行转换。水平和垂直模式可以彼此独立地接通和关闭。接通后，测量仪处于水平模式，向前发出一条激光线。

在所有运行模式中均可选择使用自动找平功能或使用摆动止动件。

#### 水平模式 (GLL 5-40 E) (参见插图A)

测量仪在水平模式中向前发出一根水平激光线。

如要接通或关闭水平激光线，请按压水平模式按键**(6)**。

#### 水平模式 (GLL 8-40 E) (参见插图A和E)

本测量仪有若干种不同的水平运行模式：

- 向前发出水平激光线，
- 向前和向右侧发出水平激光线，
- 向四周发出水平激光线。

如要接通或关闭水平模式以及切换水平模式，请多次按压水平模式按键**(6)**，直至所需的运行模式。

#### 垂直模式和下对点 (参见插图B-D)

本测量仪有若干种不同的垂直运行模式：

- 向前发出垂直激光线，
- 向前和向右侧发出垂直激光线，
- 向前和向后发出垂直激光线，
- 向四周发出垂直激光线。

在垂直模式中，始终会向下投射一个下对点。

如要接通或关闭垂直模式以及切换垂直模式，请多次按压垂直模式按键**(3)**，直至所需的运行模式。

#### 接收模式

为操作激光接收器**(22)**，无论选择何种运行方式，都必须激活接收模式。

在接收模式中，激光线以较高频率闪烁，以便激光接收器**(22)**找到。

如要接通接收模式，请按压按键接收模式**(5)**。接收模式指示灯**(19)**亮起红色。

为保护眼睛，接通接收模式时降低了激光线的可见性。因此，对于无需激光接收器的操作，重新按压接收模式按键**(5)**关闭接收模式。接收模式**(19)**指示灯熄灭。

### 自动找平功能

#### 使用自动找平功能进行测量

使用自动找平功能进行操作时，摆动止动件指示灯**(21)**不允许常亮。必要时请通过按压摆动止动件按键**(2)**再次接通自动找平功能，使摆动止动件指示灯闪烁或熄灭。

将测量仪放到一个水平的、稳固的底板上或将其固定到三脚架**(24)**上。

在 $\pm 3$ 度的自找平范围内自动校平。找平期间，摆动止动件指示灯**(21)**闪烁。一旦摆动止动件指示灯熄灭，就表示找平完成。

如果无法自动找平，比如因为测量仪的支承面与水平偏差超过**3度**，摆动止动件指示灯**(21)**就会持续闪烁。

发生上述情况时，必须先水平放置测量仪，然后等其自动找平。一旦找平完成，摆动止动件指示灯**(21)**就会熄灭。

在工作时无法在 $\pm 3$ 度的自调平范围外使用自动找平功能，否则无法确保激光束的找平准确性和激光束之间的正确角度。

运行中若出现抖动或位置改变，测量仪会自动再次找平。重新找平后基于参考点检查水平或垂直激光线的位置，以避免由于测量仪移动而导致的错误。

#### 操作时使用摆动止动件

如要使用摆动止动件进行操作，请按压摆动止动件按键**(2)**。使用摆动止动件进行操作时，摆动止动件指示灯**(21)**持续亮起。

使用摆动止动件操作时自动找平功能则关闭。您可以把测量仪握在手上或者放在倾斜的底垫上操作。此时激光线段不再找平以及强制性地彼此垂直。

## 测量仪精度检查

### 影响精度的因素

操作环境的温度是最大的影响因素。尤其是由地面往上延伸的渐进式温度差异可能会转移激光束。

由于接近地面的温度积层最大，所有当测量距离超过20 米时最好把仪器安装在三脚架上。另外，尽可能把测量仪摆在测量场所的中央。

除了外部影响，对设备特殊的影响（例如掉落或强烈撞击）也会导致出现偏差。因此，每次工作前都要检查校准准确性。

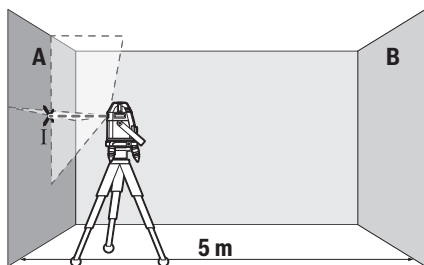
首先检测水平激光线的高度和找平准确性，然后检测垂直激光线的找平准确性。

如果在检查时发现测量仪的偏差超过最大极限，则将其交给Bosch客户服务处进行修理。

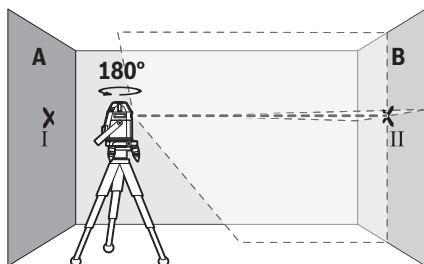
### 检测水平激光线的高度准确性

针对这项检查，您必须找一段无障碍物的5米长线段，而且该测量线段必须介于两面墙A和B之间。

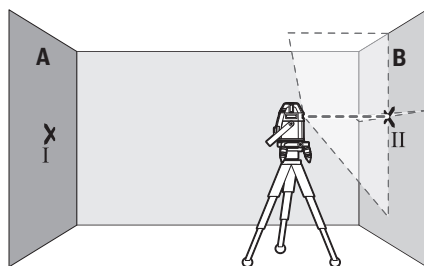
- 将测量仪安装在靠近墙面A的三脚架(24)上，或将测量仪放置在稳固的平整基底上。在带自动找平功能的模式中接通测量仪。接通分别向前发射激光线的水平模式和垂直模式。



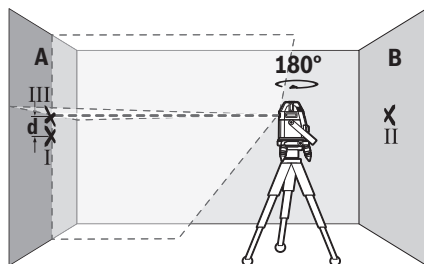
- 把激光束对准比较靠近的墙A并让测量仪找平。找到激光束在墙面上交叉的那一点（点I），并标记该点的中心位置。



- 将测量仪旋转180°，找平，然后在对面的墙B上标记激光束的交叉点（点II）。
- 靠近墙B放下测量仪，不要旋转，接通，找平。



- 调整测量的高度（借助三脚架，必要时通过垫板），使激光线的交叉点正好与墙B上之前标记的点II重合。



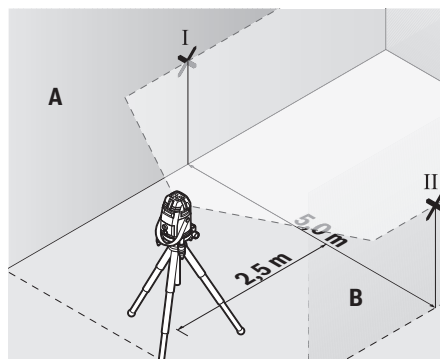
- 将测量仪旋转180°，不要改变高度。将测量仪对准墙A，使垂直激光线穿过标记的点I。让测量仪找平并标记激光线在墙A上的交叉点（点III）。
- 墙A上标记的点I和点III之间的差值d就是测量仪的实际高度差。

在2 × 5米 = 10米的测量距离内允许的最大偏差为：  
 $10\text{米} \times \pm 0.1\text{毫米/米} = \pm 1\text{毫米}$ 。就是说，点I和点III之间的差值d最大允许为1毫米。

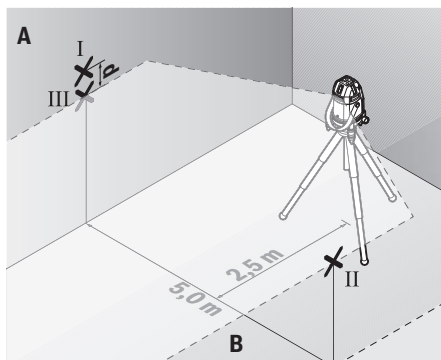
### 检测水平激光线的找平准确性

针对这项检测，必须找一块约5 × 5米的空闲区域。

- 将测量仪安装A和B墙面之间的三脚架(24)上，或将测量仪放置在稳固的平整基底上。在带自动找平功能的模式中接通测量仪。接通向前发射激光线的水平模式，使测量仪找平。



- 在距测量仪2.5米的两墙上标记激光线的中心（在墙A上标记点I，在墙B上标记点II）。



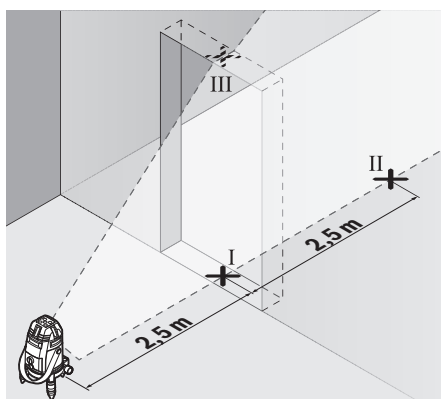
- 将测量仪旋转180°放到5米的距离外，让其自动找平。
- 调整测量仪的高度（借助三脚架，必要时通过垫板），使激光线的中心正好与墙B上之前标记的点 II 重合。
- 在墙A上将激光线的中心标记为点 III（垂直于点 I 上方或下方）。
- 墙A上标记的点 I 和点 III 之间的差值 **d** 就是测量仪与水平面之间的实际偏差。

在  $2 \times 5 \text{ 米} = 10 \text{ 米}$  的测量距离内允许的最大偏差为：  
 $10 \text{ 米} \times \pm 0.1 \text{ 毫米/米} = \pm 1 \text{ 毫米}$ 。就是说，点 I 和点 III 之间的差值 **d** 最大允许为 1 毫米。

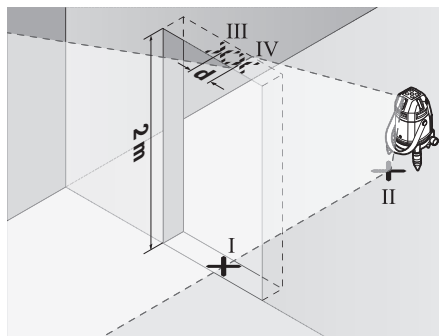
#### 检查垂直方向的激光束的找平精度

检查时需要一个门孔，（在稳固基底上）检查时门孔各侧至少有 2.5 米的位置。

- 将测量仪放置在距离门孔 2.5 米远的稳固、平坦的基底上（而不是在三脚架上）。在带自动找平功能的模式中接通测量仪。接通向前发射垂直激光线的模式，并将激光线对准门孔。让测量仪找平。



- 在门孔底（点 I）、距门孔侧面 5 米（点 II）和距门孔上边缘 5 米（点 III）处分别标记垂直激光线的中心。



- 将测量仪旋转180°，然后将其放到门口的另一侧，正好位于点 II 的下方。让测量仪找平，以校准垂直激光线，使激光线的中心正好贯穿点 I 和点 II。
- 将门孔上边缘的激光线中心标记为点 IV。
- 点 III 和点 IV 之间的差值 **d** 就是测量仪在垂直方向的实际偏差。
- 测量门孔的高度。

请按如下步骤计算所允许的最大偏差：

两倍的门孔高度  $\times 0.1 \text{ 毫米/米}$

例如：门孔高度为 2 米，则允许的最大偏差

$2 \times 2 \text{ 米} \times \pm 0.1 \text{ 毫米/米} = \pm 0.4 \text{ 毫米}$ 。就是说，点 III 和点 IV 之间最多相距 0.4 毫米。

#### 工作提示

- 仅使用激光点或激光线中心来标记。激光点的大小或激光线段的宽度会随距离而改变。

#### 三脚架的使用（附件）

三脚架提供稳定且高度可调的测量底座。将旋转平台用 5/8 英寸三脚架接头 (18) 安装到三脚架 (24) 或市售组合式三脚架的螺栓上。使用三脚架的固定螺栓拧紧旋转平台。

在开动测量仪之前，先大略地调整好三脚架的位置。

#### 使用激光接收器（附件）进行操作

在光线不佳（周围环境明亮，阳光直射）且距离更远的情况下使用激光接收器 (22) 以更好地找到激光线。使用激光接收器时，请接通接收模式（参见“接收模式”，页 14）。

#### 激光辨识镜（附件）

激光辨识镜会过滤周围环境的光线。因此激光束会显得更亮。

- 激光视镜（附件）不得用作护目镜。激光视镜用于更好地识别激光束；然而对激光束并没有防护作用。
- 激光视镜（附件）不得用作太阳镜或在道路交通中使用。激光视镜并不能完全防护紫外线，还会干扰对色彩的感知。

#### 工作范例（参见插图 A-E）

有关测量仪的使用范例请参考说插图说明。

## 维修和服务

### 维护和清洁

测量仪器必须随时保持清洁。

不可以把仪器放入水或其它的液体中。

使用潮湿、柔软的布擦除仪器上的污垢。切勿使用任何清洁剂或溶剂。

务必定期清洁激光出口，清洁时不可以出口残留绒毛。

只能使用箱子(26)存储和运输测量仪。

需要维修时，请将测量仪装入箱子(26)邮寄。

### 客户服务和应用咨询

本公司顾客服务处负责回答有关本公司产品的修理、维护和备件的问题。备件的展开图纸和信息也可查看：[www.bosch-pt.com](http://www.bosch-pt.com)

博世应用咨询团队乐于就我们的产品及其附件问题提供帮助。

询问和订购备件时，务必提供机器铭牌上标示的10位数物品代码。

### 中国大陆

博世电动工具（中国）有限公司  
中国 浙江省 杭州市

滨江区 滨康路567号

102/1F 服务中心

邮政编码：310052

电话：(0571)8887 5566 / 5588

传真：(0571)8887 6688 x 5566# / 5588#

电邮：[bsc.hz@cn.bosch.com](mailto:bsc.hz@cn.bosch.com)

[www.bosch-pt.com.cn](http://www.bosch-pt.com.cn)

### 制造商地址：

Robert Bosch Power Tools GmbH

罗伯特·博世电动工具有限公司

70538 Stuttgart / GERMANY

70538 斯图加特 / 德国

### 其他服务地址请见：

[www.bosch-pt.com/serviceaddresses](http://www.bosch-pt.com/serviceaddresses)

### 废弃处理

必须以符合环保要求的方式回收再利用测量仪、附件和包装材料。



请勿将测量仪和电池/蓄电池扔到生活垃圾里！

### 产品中有害物质的名称及含量

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr <sup>6+</sup> )	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
外壳的金属部分	X	O	O	O	O	O
外壳的非金属部分（包括玻璃）	O	O	O	O	O	O
组合印刷电路板	X	O	O	O	O	O
附件 <sup>A)</sup>	X	O	O	O	O	O
碱性电池系统	O	O	O	O	O	O
充电电池系统 <sup>B)</sup>	X	O	O	O	O	O
键盘	O	O	O	O	O	O
显示器 <sup>C)</sup>	O	O	O	O	O	O
激光模块 <sup>D)</sup>	X	O	O	O	O	O
内部连接电缆	O	O	O	O	O	O

A) 适用于采用附件的产品

B) 适用于采用充电电池供电的产品

C) 适用于采用显示器的产品

D) 适用于采用激光模块的产品

本表是按照SJ/T 11364的规定编制

O: 表示该有害物质在该部件所有物质材料中的含量均在GB/T 26572规定的限量要求以下。

X: 表示该有害物质至少在该部件的某一物质材料中的含量超出GB/T 26572规定的限量要求，且目前业界没有成熟的替代方案，符合欧盟RoHS指令环保要求。

产品环保使用期限内的使用条件参见产品说明书。

## 繁體中文

### 安全注意事項



為確保能夠安全地使用本測量工具，您必須完整詳讀本說明書並確實遵照其內容。若未依照現有之說明內容使用測量工具，測量工具內部所設置的防護措施

可能無法發揮應有功效。謹慎對待測量工具上的警告標示，絕對不可讓它模糊不清而無法辨識。請妥善保存說明書，將測量工具轉交給他人時應一併附上本說明書。

- ▶ **小心** - 若是使用非此處指明的操作設備或校正設備，或是未遵照說明的操作方式，可能使您暴露於危險的雷射光照射環境之下。
- ▶ 本測量工具出貨時皆有附掛雷射警示牌（即測量工具詳解圖中的標示處）。
- ▶ 雷射警示牌上的內容若不是以貴國語言書寫，則請於第一次使用前將隨附的當地語言說明貼紙貼覆於其上。



請勿將雷射光束對準人員或動物，您本人亦不可直視雷射光束或使雷射光束反射。因為這樣做可能會對他人眼睛產生眩光，進而引發意外事故或使眼睛受到傷害。

- ▶ 萬一雷射光不小心掃向眼睛，應立刻閉上眼睛並立刻將頭轉離光束範圍。
- ▶ 請勿對本雷射裝備進行任何改造。
- ▶ 請勿將雷射眼鏡當作護目鏡（配件）使用。雷射眼鏡是用來讓您看清楚雷射光束；但它對於雷射光照射並沒有保護作用。
- ▶ 請勿將雷射眼鏡當作護目鏡（配件）使用，或在道路上行進間使用。雷射眼鏡無法完全阻隔紫外線，而且還會降低您對於色差的感知能力。
- ▶ 本測量工具僅可交由合格的專業技師以原廠替換零件進行維修。如此才能夠確保本測量工具的安全性能。
- ▶ 不可放任兒童在無人監督之下使用本雷射測量工具。他們可能會不小心對他人眼睛產生眩光。
- ▶ 請不要在存有易燃液體、氣體或粉塵等易爆環境下操作本測量工具。測量工具內部產生的火花會點燃粉塵或氣體。
- ▶ 僅能使用輸出電壓 6 V 的電源變壓器（直流電）。請仔細詳讀並嚴格遵守電源變壓器的安全指示與作業注意事項。

## 產品和功率描述

請留意操作說明書中最前面的圖示。

### 依規定使用機器

此測量工具的設計適合用來確認及檢查水平線、垂直線和鉛垂點。

本測量工具可同時適用於室內及戶外應用。

### 插圖上的機件

機件的編號和儀器詳解圖上的編號一致。

- (1) 雷射光束射出口
- (2) 擺動鎖按鈕
- (3) 垂直操作鍵
- (4) 電源按鈕
- (5) 接收模式按鈕

- (6) 水平模式按鈕
- (7) 拎環
- (8) 轉檯
- (9) 轉檯微調螺栓
- (10) 轉檯水平儀
- (11) 6 V 充電插座
- (12) 充電插座的護蓋
- (13) 電池盒蓋鎖扣
- (14) 電池盒蓋
- (15) 雷射警示牌
- (16) 序號
- (17) 轉檯高度調整螺栓
- (18) 5/8" 三腳架固定座
- (19) 接收模式指示燈
- (20) 狀態指示器
- (21) 擺動鎖指示器
- (22) 雷射接收器
- (23) 雷射辨識鏡
- (24) 三腳架<sup>A)</sup>
- (25) 伸縮桿<sup>A)</sup>
- (26) 提箱

A) 圖表或說明上提到的配件，並不包含在基本的供貨範圍中。本公司的配件清單中有完整的配件供應項目。

### 技術性數據

雷射墨線儀	GLL 5-40 E
雷射墨線儀	GLL 8-40 E
產品機號 GLL 5-40 E	3 601 K63 G..
產品機號 GLL 8-40 E	3 601 K63 H..
工作範圍 <sup>A)</sup>	
– 標準雷射標線	15 m
– 具有接收模式的雷射標線	10 m
– 具有雷射接收器的雷射標線	40 m
– 鉛垂點	2 m
雷射標線的調平精準度 <sup>B)</sup>	±0.1 mm/m
自動調平範圍標準值	±3°
操作溫度	-10 °C ... +50 °C
儲藏溫度	-20 °C ... +70 °C
從基準點高度算起的最大可測量高度	2000 m
空氣相對濕度最大值	90 %
依照 IEC 61010-1，污染等級為	2 <sup>C)</sup>
雷射等級	2
雷射種類	635-650 nm, < 1 mW
C <sub>6</sub>	1

雷射墨線儀	GLL 5-40 E
雷射墨線儀	GLL 8-40 E
光束發散角	
– 雷射標線	0.5 mrad (全角度)
– 鉛垂點	1.2 mrad (全角度)
脈衝持續時間	50 µs
脈衝重複率	10 kHz
三腳架固定座	5/8"
電源供應	
– 拋棄式電池 (鹼-錳)	4 × 1.5 VLR6 (AA)
– 電源變壓器	6 V <sup>AC</sup> , ≥ 500 mA
使用電池時的連續工作時間約略值	
– 使用 1 條雷射標線	24 小時
– 使用 5 條雷射標線	5 小時
– 使用 8 條雷射標線 (GLL 8-40 E)	2.5 小時
重量符合 EPTA-Procedure 01:2014	1.1 kg
尺寸 (長 × 寬 × 高)	136 × 136 × 210 mm
防護等級 (僅適用於安裝轉檯時)	IP 54 (防塵防潑濺)
A) 工作範圍在不利的環境條件下 (例如陽光直射), 工作範圍將縮小。	
B) 出廠時的設定	
C) 只產生非傳導性污染, 但應預期偶爾因水氣凝結而導致暫時性導電。	
從產品銘牌的序號 (16) 即可確定您的測量工具機型。	

## 安裝

### 測量工具的電源供應

本測量工具可用一般市售電池或輸出電壓為 6 V 一般市售電源變壓器 (直流電) 來進行驅動。

只要裝入電池或連接上電源變壓器, 就可透過電源變壓器為測量工具提供動能。

#### 以一般電池驅動

建議使用鹼錳電池來驅動本測量工具。

若要打開電池盒蓋 (14), 請用一枚錢幣或其他類似物品轉開鎖扣 (13)。取下電池盒蓋。裝入電池。

此時請您注意是否有依照電池盒內側上的電極標示正確放入。

當電池快沒電時, 狀態指示器 (20) 便會開始閃爍。此時測量工具還可繼續使用。

當電力完全耗盡時, 測量工具便不會再對您操作按鈕有所反應。測量工具將在狀態指示器 (20) 閃爍 40 秒後自動關機。

務必同時更換所有的電池。請使用同一製造廠商, 容量相同的電池。

- ▶ **長時間不使用時, 請將測量工具裡的電池取出。**電池可能因長時間存放於測量工具中不使用而自行放電。

### 使用電源變壓器驅動

打開 6 V 充電插座 (11) 的護蓋 (12)。將一般市售 6 V 電源變壓器的充電插頭插入充電插座 (11)。將電源變壓器連接到電源上。

充電插頭拔掉後, 請將護蓋 (12) 重新蓋回, 以免髒污。

### 進行作業時使用轉檯

利用高度調整螺栓 (17), 將轉檯 (8) 腳柱旋出。

利用水平儀 (10) 將轉檯大致校準。

利用微調螺栓 (9) 即可精準地將垂直雷射標線校正至基準點上。

若是想在不使用轉檯的狀況下操作測量工具, 請洽詢本公司授權的 **Bosch** 客戶服務中心。在您尚未針對無轉檯式操作而調整校正方式之前, 測量工具的準確度可能會受到影響。

## 操作

### 操作機器

- ▶ **不可以讓濕氣滲入儀器中, 也不可以讓陽光直接照射在儀器上。**

- ▶ **勿讓測量工具暴露於極端溫度或溫度劇烈變化的環境。**例如請勿將它長時間放在車內。歷經較大溫度起伏時, 請先讓測量工具回溫, 而且一定要檢查精準度, 確認後才能繼續進行測量 (參見「測量工具精準度檢查」, 頁 20)。

如果儀器曝露在極端溫度下或溫差較大的環境中, 會影響儀器的測量準確度。

- ▶ **測量工具須避免猛力碰撞或翻倒。**測量工具遭受外力衝擊後, 一律必須先檢查其精準度, 確認後才能繼續使用 (參見「測量工具精準度檢查」, 頁 20)。

- ▶ **若要搬運測量工具時, 請先將它關閉。**開機後擺動零件應要被鎖定, 否則擺動零件可能因為強烈的震動而受損。

### 啟動/關閉

若要啟動測量工具, 請按一下電源按鈕 (4)。狀態指示器 (20) 亮起。啟動後, 測量工具立即從前方射出口 (1) 射出一道水平雷射標線。

- ▶ **雷射光束不可以對準人或動物, 操作人本身也不要直視光束, 即使和光束相距甚遠也不可以做上述動作。**

若要關閉測量工具, 請再按一次電源按鈕 (4)。狀態指示器 (20) 熄滅。關閉時, 擺動零件即遭鎖定。

- ▶ **不可放任啟動的測量工具無人看管, 使用完畢後請關閉測量工具電源。**雷射可能會對旁人的眼睛產生眩光。

### 停用儀器的自動關機功能

若持續約 30 分鐘未按壓測量工具上的任何按鈕, 本測量工具將自動關機以節省電力。

若要停用自動關機功能, 請於啟動測量工具時按住水平模式按鈕 (6) 不放, 維持 3 秒鐘。自動關機功能成功停用時, 雷射光束將於 3 秒鐘後短暫閃爍。

若要啟用此一自動關機功能，請將測量工具關閉後再重新啟動即可（不按任何按鈕）。

## 操作模式

測量工具提供多種操作模式，供您隨時進行切換。水平模式與垂直模式可各自獨立開啟或關閉。啟動後，測量工具隨即進入水平模式並向前發射一條雷射標線。

所有操作模式皆可選擇是否要使用自動調平功能或擺動鎖。

### 水平模式 (GLL 5-40 E) (請參考圖 A)

測量工具處於水平模式下時，會向前發射出一道水平雷射標線。

若要關閉或開啟此道水平雷射標線，請按水平模式按鈕 (6)。

### 水平模式 (GLL 8-40 E) (請參考圖 A 和 E)

本測量工具擁有多種水平模式：

- 向前發射的水平雷射標線、
- 向前發射以及向右發射的水平雷射標線、
- 四向發射的水平雷射標線。

若要開啟或關閉水平模式或者想要切換至其他種類的水平模式，請重複按壓水平模式按鈕 (6)，直到工具進入所需操作模式。

### 垂直模式和鉛垂點 (請參考圖 B-D)

本測量工具擁有多種垂直操作模式：

- 向前發射的垂直雷射標線、
- 向前發射以及向右發射的垂直雷射標線、
- 向前發射以及向後發射的垂直雷射標線、
- 四向發射的垂直雷射標線。

此外，在垂直模式下一律會有一個向下投射的鉛垂點。

若要開啟或關閉垂直模式或者想要切換至其他種類的垂直模式，請重複按壓垂直模式按鈕 (3)，直到工具進入所需操作模式。

## 接收模式

不論所選擇操作模式為何，如要使用雷射接收器 (22) 則必須啟用接收模式。

進入接收模式後，雷射標線會以極高頻率閃爍，以便雷射接收器 (22) 追蹤。

若要開啟接收模式，請按一下接收模式按鈕 (5)。接收模式指示燈 (19) 將亮紅燈。

接收模式開啟時，對人類肉眼而言，雷射標線能見度會變差。因此，不需使用雷射接收器時，請再按一次接收模式按鈕 (5) 以關閉接收模式。接收模式指示燈 (19) 隨即熄滅。

## 自動調平功能

### 自動調平功能開啟之測量作業

以自動調平功能執行作業時，不得讓擺動鎖指示燈 (21) 持續亮起。必要時可按下擺動鎖按鈕 (2) 再次啟動自動調平功能，如此擺動鎖指示燈將隨即閃爍或熄滅。

請將本測量工具放置在一個穩固的水平平面上，或將它固定在三腳架 (24) 上。

自動調平功能會在相差  $\pm 3^\circ$  的自動調平範圍內自動調整。執行調平期間，擺動鎖指示燈 (21) 將閃爍。擺動鎖指示燈將於調平執行完畢後熄滅。

若無法進行自動調平，例如：由於測量工具所在平面與水平差距  $3^\circ$  以上時，擺動鎖指示燈 (21) 將持續閃爍。

發生上述情況時，請將本測量工具架設在水平平面上，然後等待其自動調平。擺動鎖指示燈 (21) 將於調平執行完畢後熄滅。

自動調平範圍若落於  $\pm 3^\circ$  之外，則無法使用自動調平功能，否則將無法確保雷射光束的調平精準度以及雷射光束之間呈直角。

測量工具在運轉期間若有振動或移位，將重新進行調平。重新調平之後，請全面檢查水平或垂直雷射標線相對於基準點的位置，以免因測量工具移位而發生錯誤。

### 使用擺動鎖進行測量

若要在作業時使用擺動鎖，請按一下擺動鎖按鈕 (2)。作業時若有使用擺動鎖，擺動鎖指示燈 (21) 將持續亮起。

使用擺動鎖進行測量時，自動調平功能將關閉。您可以把測量工具拿在手上或是將它放置到合適的基座上操作。雷射標線不再進行調平，也不再強制性地彼此垂直。

## 測量工具精準度檢查

### 影響精度的因素

操作環境的溫度是最大的影響因素。尤其是由地面往上延伸的漸進式溫度差異可能會使雷射光束改變方向。

靠近地面的位置其溫度分層變化最大，因此當測量距離超過 20 m 以上，一律應將本測量工具安裝在三腳架上。此外，請您將測量工具儘量架設在作業區的中央。

除了外在因素，發生偏差的原因亦可能來自機器本身（例如機器曾翻倒或受到猛力撞擊）。因此，每次開始工作之前，請您先進行調平精準度檢查。

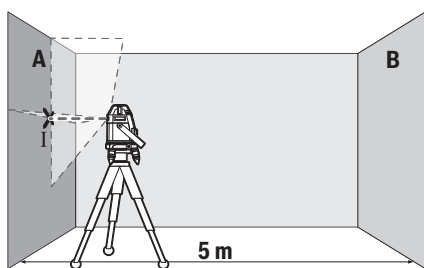
一律先檢查水平雷射標線的高度精準度及調平精準度，然後再檢查垂直雷射標線的調平精準度。

如果檢查時發現測量工具的偏差超過最大極限。必須把儀器交給 **Bosch** 顧客服務處修理。

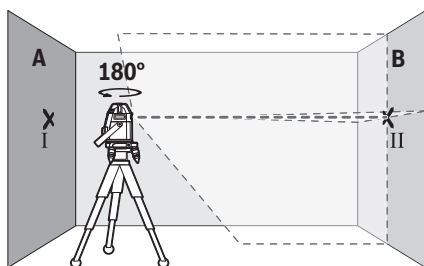
### 請檢查水平線的高度精準度

針對這項檢查，您必須在兩面牆 A 和牆 B 之間找出一段無障礙物、長度 5 m 的測量距離。

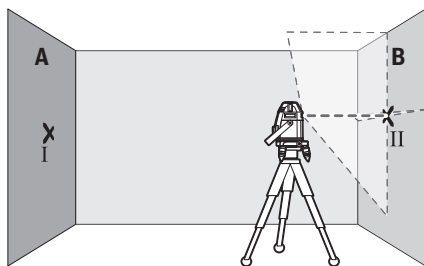
- 請將測量工具先安裝在三腳架 (24) 上後，再架設到 A 牆附近的位置，或將測量工具放置在穩固的平坦基座上。請將測量工具開啟為使用自動調平功能。開啟水平模式或垂直模式，這兩者分別都有一道向前發射的雷射標線。



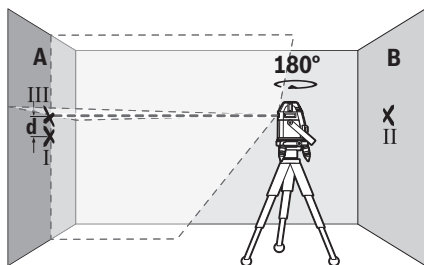
- 把雷射光束對準比較靠近的 A 牆並讓測量儀進行調平。標示出雷射標線在牆上之交叉點的中心位置 (I 點)。



- 將測量工具旋轉 180°，讓它進行調平，然後在對面的 B 牆上標出雷射標線的交叉點 (II 點)。
- 將測量工具 (不用旋轉) 移至靠近 B 牆附近，然後啟動電源，讓它進行調平。



- 調整測量工具的高度 (利用三腳架或者必要時可再墊高)，讓雷射標線的交叉點正好對準先前在 B 牆上標出的 II 點。



- 將測量工具旋轉 180°，但不用再改變其高度。這次要讓它對準那條通過 A 牆 I 點的垂直線。讓測

量工具進行調平，接著再到 A 牆上標出雷射標線的交叉點 (III 點)。

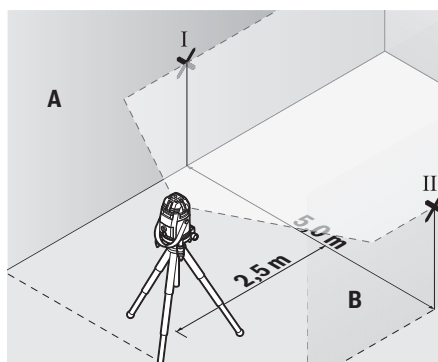
- A 牆上標出的 I 與 III 兩點相差的高度  $d$  即是測量工具的實際高度偏差。

測量距離為  $2 \times 5 \text{ m} = 10 \text{ m}$  時的最大容許偏差是：  
 $10 \text{ m} \times \pm 0.1 \text{ mm/m} = \pm 1 \text{ mm}$ 。因此，I 和 III 兩點之間相差的距離  $d$  最多只能有 1 mm。

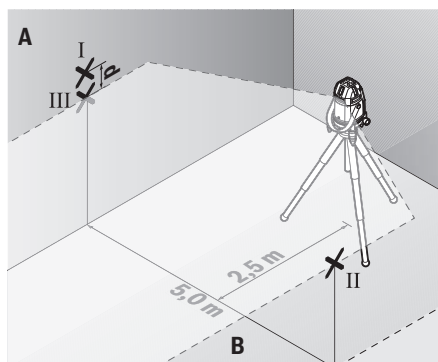
#### 請檢查水平線的調平精準度

針對這項檢查，您必須找一塊約  $5 \times 5 \text{ m}$  的無障礙物空間。

- 請將測量工具先安裝在三腳架 (24) 或類似物品上後，再架設到 A 牆與 B 牆的中間點，或將測量工具放置於穩固的平坦基座上。請將測量工具開啟為使用自動調平功能。請啟動會向前發射一條雷射標線的水平模式，然後讓測量工具進行調平。



- 請在與測量工具相隔 2.5 m 的兩邊牆面上標出雷射標線的中心點 (A 牆上為 I 點，B 牆上為 II 點)。



- 將測量工具旋轉 180° 後架設在相隔 5 m 距離的位置上，然後讓它進行調平。
- 調整測量工具的高度 (利用三腳架或者必要時可再墊高)，讓雷射標線的中心點正好對準先前在 B 牆上標出的 II 點。
- 請在 A 牆上標出雷射標線的中心點，此即為 III 點 (與 I 點呈一垂直線，可能位於 I 點之上或之下)。

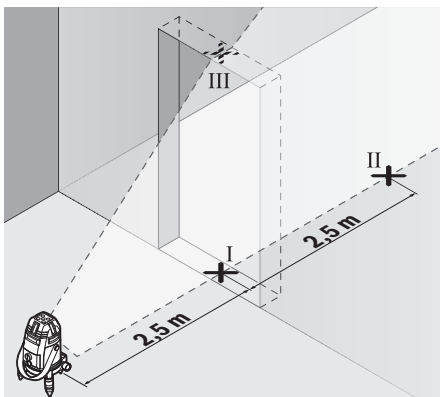
- A 牆上標出的 I 與 III 兩點相差的高度 **d** 即是測量工具的實際水平高度偏差。

測量距離為  $2 \times 5 \text{ m} = 10 \text{ m}$  時的最大容許偏差是： $10 \text{ m} \times \pm 0.1 \text{ mm/m} = \pm 1 \text{ mm}$ 。因此，I 和 III 兩點之間相差的距離 **d** 最多只能有 **1 mm**。

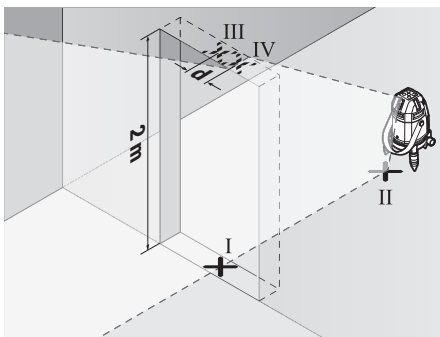
#### 檢查垂直方向的雷射標線調平精度

為進行此項檢查，您需要找出一處地面平坦穩固的門口，門的兩邊都至少有 2.5 m 的深度。

- 請將測量工具放置於穩固的平坦地面（不是三腳架）上，與門口相距 2.5 公尺。請將測量工具開啟為使用自動調平功能。請啟動會向前發射一條垂直雷射標線的垂直模式，然後將這條雷射標線對準門口。讓測量工具進行調平。



- 請在門口地面上（I 點）、在門口另一邊與目前位置相距 5 m 的位置上（II 點）以及門口上緣處（III 點），標出垂直雷射標線的中心點。



- 將測量工具旋轉 180°，並將其移至門口另一邊，正好放在 II 點後。讓測量工具進行調平，並調整垂直雷射標線的位置，讓它的中心點剛好同時通過 I 點及 II 點。
- 在門口上緣處標出雷射標線的中心點，此即為 IV 點。
- III 與 IV 兩點之間相差的距離 **d** 即是測量工具的实际垂直偏差。
- 測量門口的高度。

最大容許偏差的計算方式如下：

兩倍的門口高度  $\times 0.1 \text{ mm/m}$

舉例來說：如果門口高度為 2 m，則最大容許偏差為

$2 \times 2 \text{ m} \times \pm 0.1 \text{ mm/m} = \pm 0.4 \text{ mm}$ 。因此，III 及 IV 兩點最多可相差 **0.4 mm**。

#### 作業注意事項

- ▶ 一律只能標示雷射點／雷射標線的中心位置。雷射點的大小或雷射線段的寬度會隨著距離而改變。

#### 使用三腳架（配件）進行測量

三腳架可為您提供一個可調整高度的穩固測量基座。請將轉盤透過其 5/8" 三腳架固定座 (18) 安裝至三腳架 (24) 或一般市售土木用三腳架的螺紋孔上。利用三腳架的止付螺絲，將轉盤旋緊固定。

在啟動測量工具之前，先大略地調整好三腳架的位置。

#### 使用雷射接收器進行作業（配件）

在不利照明條件之下（周圍環境明亮、陽光直射）且距離又較遠時，為能更容易捕捉雷射標線，請使用雷射接收器 (22)。進行測量時若有使用雷射接收器，請開啟接收模式（參見「接收模式」，頁 20）。

#### 雷射視鏡（配件）

雷射視鏡可過濾掉周圍環境的光線。因此，您的眼睛看到雷射光時會覺得較亮。

- ▶ 請勿將雷射眼鏡當作護目鏡（配件）使用。雷射眼鏡是用來讓您看清楚雷射光束；但它對於雷射光照射並沒有保護作用。
- ▶ 請勿將雷射眼鏡當作護目鏡（配件）使用，或在道路上行進間使用。雷射眼鏡無法完全阻隔紫外線，而且還會降低您對於色差的感知能力。

#### 操作範例（請參閱圖 A-E）

有關測量工具的使用範例請參考說插圖說明。

## 維修和服務

### 維修和清潔

測量儀器必須隨時保持清潔。

不可以把儀器放入水或其它的液體中。

使用柔軟濕布擦除儀器上的污垢。切勿使用清潔劑或溶液。

務必定期清潔雷射射出口，清潔時射出口不可殘留毛絮。

儲放和搬運測量工具時，一定要將它放進箱 (26) 內。

如需送修，請將測量工具放入提箱 (26) 後，再轉交給相關單位。

### 顧客服務處和顧客諮詢中心

本公司顧客服務處負責回答有關本公司產品的維修、維護和備用零件的問題。以下的網頁中有分解圖和備用零件相關資料：[www.bosch-pt.com](http://www.bosch-pt.com)

如果對本公司產品及其配件有任何疑問，博世應用諮詢小組很樂意為您提供協助。

當您需要諮詢或訂購備用零件時，請務必提供本產品型號銘牌上 10 位數的產品機號。

#### 台灣

台灣羅伯特博世股份有限公司  
建國北路一段90 號6 樓  
台北市10491

電話: (02) 7734 2588

傳真: (02) 2516 1176

www.bosch-pt.com.tw

#### 製造商地址:

Robert Bosch Power Tools GmbH  
羅伯特·博世電動工具有限公司  
70538 Stuttgart / GERMANY  
70538 斯圖加特/ 德國

#### 以下更多客戶服務處地址：

www.bosch-pt.com/serviceaddresses

#### 廢棄物處理

必須以符合環保要求的方式回收再利用損壞的儀器、配件和包裝材料。



不得將測量工具與電池當成一般垃圾丟棄！

## 한국어

### 안전 수칙



측정공구의 안전한 사용을 위해 모든 수칙들을 숙지하고 이에 유의하여 작업하시기 바랍니다. 측정공구를 해당 지침에 따라 사용하지 않으면, 측정공구에 내장되어 있는 안전장치에 안 좋은 영향을 미칠 수 있습니다. 측정공구의 경고판을 절대로 가려서는 안 됩니다. 안전 수칙을 잘 보관하고 공구 양도 시 측정공구와 함께 전달하십시오.

- ▶ 주의 - 여기에 제시된 조작 장치 또는 조정 장치 외의 용도로 사용하거나 다른 방식으로 작업을 진행하는 경우, 광선으로 인해 폭발될 위험이 있습니다.
- ▶ 본 측정공구는 레이저 경고 스티커가 함께 공급됩니다(그림에 측정공구의 주요 명칭 표시).
- ▶ 처음 사용하기 전에 함께 공급되는 한국어로 된 레이저 경고 스티커를 독문 경고판 위에 붙이십시오.



사람이나 동물에게 레이저 광선을 비추거나, 광선을 직접 또는 반사시켜 보지 마십시오. 이로 인해 눈이 부시게 만들어 사고를 유발하거나 눈에 손상을 입을 수 있습니다.

- ▶ 눈으로 레이저 광선을 쳐다본 경우, 의식적으로 눈을 감고 곧바로 고개를 돌려 광선을 피하십시오.
- ▶ 레이저 장치를 개조하지 마십시오.
- ▶ 레이저 보안경(엑세서리)을 일반 보안경으로 사용하지 마십시오. 레이저 보안경은 레이저 광선을 보다 잘 감지하지만, 그렇다고 해서 레이저 광선으로부터 보호해주는 것은 아닙니다.
- ▶ 레이저 보안경(엑세서리)을 선글라스 용도 또는 도로에서 사용하지 마십시오. 레이저 보안경은 자외선을 완벽하게 차단하지 못하며, 색상 분별력을 떨어뜨립니다.
- ▶ 측정공구의 수리는 해당 자격을 갖춘 전문 인력에게 맡기고, 수리 정비 시 순정 부품만 사용하십시오. 이 경우에만 측정공구의 안전성을 오래 유지할 수 있습니다.
- ▶ 어린이가 무감독 상태로 레이저 측정공구를 사용하는 일이 없도록 하십시오. 의도치 않게 사람의 눈이 부시게 할 수 있습니다.
- ▶ 가연성 유체나 가스 혹은 분진 등 폭발 위험이 있는 곳에서 측정공구를 사용하지 마십시오. 측정공구에 분진이나 증기를 점화하는 스파크가 생길 수 있습니다.
- ▶ 출력 전압이 6 V(직류)인 전원 플러그만 사용하십시오. 전원 플러그의 안전 수칙 및 작업 지침을 잘 읽어보고 해당 내용에 유의하십시오.

## 제품 및 성능 설명

사용 설명서 앞 부분에 제시된 그림을 확인하십시오.

### 규정에 따른 사용

본 측정공구는 수평 및 수직 라인과 수직점을 측정 및 점검하기 위한 용도로 사용됩니다.

측정공구는 실내 및 실외에서 모두 사용할 수 있습니다.

### 제품의 주요 명칭

제품의 주요 명칭에 표기되어 있는 번호는 측정공구의 그림이 나와있는 면을 참고하십시오.

- (1) 레이저빔 발사구
- (2) 펜들럼 고정 버튼
- (3) 수평 모드 버튼
- (4) 전원 버튼
- (5) 수광기 모드 버튼
- (6) 수직 모드 버튼
- (7) 운반용 끈
- (8) 회전대
- (9) 회전대 미세 조정 나사
- (10) 회전대 수준기
- (11) 충전 소켓 6 V
- (12) 충전 소켓 덮개

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(13) 배터리 케이스 덮개 잠금쇠

(14) 배터리 케이스 덮개

(15) 레이저 경고판

(16) 일련 번호

(17) 회전대의 높이 조정 나사

(18) 삼각대 연결 부위 5/8"

(19) 수광기 모드 디스플레이

(20) 상태 표시기

(21) 펜들럼 고정 표시기

(22) 레이저 수광기

(23) 레이저용 안경

(24) 삼각대<sup>A)</sup>

(25) 텔레스코픽 막대<sup>A)</sup>

(26) 운반 케이스

A) 도면이나 설명서에 나와있는 액세서리는 표준 공급부품에 속하지 않습니다. 전체 액세서리는 저희 액세서리 프로그램을 참고하십시오.

## 제품 사양

라인 레이저	GLL 5-40 E
라인 레이저	GLL 8-40 E
모델명 GLL 5-40 E	<b>3 601 K63 G..</b>
모델명 GLL 8-40 E	<b>3 601 K63 H..</b>
작업 범위 <sup>A)</sup>	
- 표준 레이저 라인	15 m
- 수광기 모드로 작동된 레이저 라인	10 m
- 레이저 수광기가 장착된 레이저 라인	40 m
- 수직점	2 m
레이저 라인 레벨링 정확도 <sup>B)</sup>	±0.1 mm/m
셀프 레벨링 범위, 평균	±3°
작동 온도	-10°C ... +50°C
보관 온도	-20°C ... +70°C
기준 높이를 초과한 최대 사용 높이	2000 m
상대 습도 최대	90 %
IEC 61010-1에 따른 오염도	2 <sup>C)</sup>
레이저 등급	2
레이저 유형	635-650 nm, < 1 mW
C <sub>6</sub>	1
편차	
- 레이저 라인	0.5 mrad (전체 각도)
- 수직점	1.2 mrad (전체 각도)
펄스 지속 시간	50 µs
펄스 반복률	10 kHz

라인 레이저	GLL 5-40 E
라인 레이저	GLL 8-40 E
삼각대 홀더	5/8"
에너지 공급	
- 배터리(알칼리 망간)	4 × 1.5 V LR6 (AA)
- 전원 플러그	6 V $\overline{\text{---}}$ , ≥ 500 mA
배터리 구동 작동 시간, 약	
- 1개 레이저 라인 사용 시	24 시간
- 5개 레이저 라인 사용 시	5 시간
- 8개 레이저 라인 사용 시 (GLL 8-40 E)	2.5 시간
EPTA-Procedure 01:2014에 따른 중량	1.1 kg
치수(길이 × 폭 × 높이)	136 × 136 × 210 mm
보호 등급(회전대가 장착된 경우에만)	IP 54 (먼지 및 분무수 침투 방지)

A) 직사광선 등의 불리한 환경 조건에서는 작업 범위가 줄어들 수 있습니다.

B) 공장 출고 시

C) 비전도성 오염만 발생하지만, 가끔씩 이슬이 맺히면 임시로 전도성이 생기기도 합니다.

측정공구를 확실하게 구분할 수 있도록 타입 표시판에 일련 번호 (16) 가 적혀 있습니다.

## 조립

### 측정공구 전원 공급

본 측정공구는 시장에서 구매 가능한 일반 배터리 및 출력 전압이 6 V(직류)인 일반 전원 플러그를 이용하여 작동할 수 있습니다.

배터리도 삽입되고 전원 플러그도 연결된 경우, 측정공구에 전원 플러그를 통해 에너지가 공급됩니다.

### 배터리를 사용한 작동

측정공구 작동에는 알칼리 망간 배터리를 사용할 것을 권장합니다.

배터리 케이스 덮개 (14) 를 열려면 동전 등을 이용해 잠금쇠 (13) 를 돌려 푸십시오. 배터리 케이스 덮개를 분리하십시오. 배터리를 끼웁니다.

이때 전극이 배터리 케이스 안쪽에 나와있는 것처럼 올바르게 끼워야 합니다.

배터리가 약해지면 상태 표시기 (20) 가 깜박입니다. 측정공구를 이용해 작업은 계속 가능합니다.

배터리가 방전되면, 버튼을 눌러도 측정공구가 더 이상 반응하지 않습니다. 상태 표시기 (20) 가 40 초 정도 더 깜박인 후, 측정공구가 자동으로 꺼집니다.

모든 배터리는 항상 동시에 교체하십시오. 한 제조사의 용량이 동일한 배터리로만 사용하십시오.

▶ 오랜 기간 사용하지 않을 경우 측정공구의 배터리를 빼두십시오. 배터리를 측정공구에 오래 두면 부식되고 방전될 수 있습니다.

### 전원 플러그를 사용한 작동

6 V 충전 소켓 (11) 의 커버 (12) 를 여십시오. 일반 6 V 전원 플러그의 충전 컨넥터를 충전 소켓 (11) 에 끼우십시오. 이제 전원 플러그를 전원에 연결하십시오.

충전 컨넥터를 제거할 경우 오염 방지를 위해 커버 (12) 를 다시 닫으십시오.

### 회전대를 이용한 작업

회전대 (8) 의 다리를 높이 조정 나사 (17) 와 함께 돌려 푸십시오.

수준기 (10) 를 이용하여 회전대를 대략적으로 정렬하십시오.

미세 조정 나사 (9) 를 이용하여 수직 레이저 라인을 기준점에 정확하게 정렬할 수 있습니다.

회전대 없이 측정공구를 사용하고자 하는 경우, 공인된 **Bosch** 고객 서비스 센터에 문의하십시오. 회전대를 사용하지 않는 작동에 맞춰 캘리브레이션을 조정하지 않으면 측정공구의 정확도가 떨어질 수 있습니다.

## 작동

### 기계 시동

▶ **측정공구가 물에 젖거나 직사광선에 노출되지 않도록 하십시오.**

▶ **극한의 온도 또는 온도 변화가 심한 환경에 측정공구를 노출시키지 마십시오.** 예를 들어 장시간 차량 안에 측정공구를 두지 마십시오. 온도 편차가 심한 경우 계속 작동하기 전에 먼저 측정공구가 온도에 적응할 수 있게 하고 항상 정확도를 점검하십시오 (참조 „측정공구의 정확도 점검“, 페이지 26).

극한 온도에서나 온도 변화가 심한 환경에서 사용하면 측정공구의 정확도가 떨어질 수 있습니다.

▶ **측정공구가 외부와 세계 부딪히거나 떨어지지 않도록 주의하십시오.** 측정공구에 외부 영향이 심하게 가해진 후에는 계속 작업하기 전에 항상 정확도를 점검해야 합니다 (참조 „측정공구의 정확도 점검“, 페이지 26).

▶ **측정공구를 운반할 때는 측정공구의 전원을 끄십시오.** 스위치가 꺼진 상태에서는 레벨링 장치가 잠겨 있어 심한 움직임에 손상될 염려가 없습니다.

### 전원 켜기/끄기

측정공구의 전원을 켜려면 전원 버튼 (4) 을 누르십시오. 상태 표시기 (20) 의 불이 들어옵니다. 측정공구가 켜지면 앞쪽 발사구 (1) 에서 수평 레이저 라인이 나옵니다.

▶ **레이저빔이 사람이나 동물에 향하지 않도록 하고, 먼 거리에서도 레이저빔 안을 들여다 보지 마십시오.**

측정공구의 전원을 끄려면 전원 버튼 (4) 을 다시 누르십시오. 상태 표시기 (20) 가 꺼집니다. 전원을 끄면 레벨링 기능이 작동하지 않습니다.

▶ **측정공구가 켜져 있는 상태에서 자리를 비우지 말고, 사용 후에는 측정공구의 스위치를 끄십시오.** 레이저빔으로 인해 다른 사람의 눈이 부실 수 있습니다.

### 자동 꺼짐 기능 해제하기

약 30 분 동안 측정공구에서 작동되는 버튼이 아무 것도 없으면, 에너지 절약을 위해 측정공구가 자동으로 꺼집니다.

자동 꺼짐을 비활성화하려면 측정공구를 켤 때 수평 모드 버튼 (6) 을 3 초 간 눌러줍니다. 자동 꺼짐 기능이 비활성화되면 3 초 후에 레이저빔이 잠깐 동안 깜박입니다.

자동 꺼짐 기능을 활성화하려면 (버튼을 누를 필요 없이) 측정공구의 전원을 껐다가 다시 켜니다.

### 작동 모드

측정공구에는 여러 작동 모드가 있으며, 모드 간에 수시로 변경이 가능합니다. 수평 모드 및 수직 모드는 서로 독립적으로 켜고 끌 수 있습니다. 전원을 켜면 측정공구는 기본적으로 레이저 라인이 앞쪽으로 발사되는 수평 모드로 설정되어 있습니다.

모든 작동 모드는 자동 레벨링 및 펜들럼 고정 기능을 함께 선택할 수 있습니다.

#### 수평 모드 (GLL 5-40 E)(그림 A 참조)

수평 모드에서 측정공구는 앞쪽으로 수평 레이저 라인을 발생시킵니다.

수평 레이저 라인을 끄거나 켜려면, 수평 모드 버튼 (6) 을 누르십시오.

#### 수평 모드 (GLL 8-40 E)(그림 A 및 E 참조)

측정공구에는 여러 수평 모드가 있습니다.

- 앞쪽으로 발사되는 수평 레이저 라인,
- 앞쪽 및 우측으로 발사되는 수평 레이저 라인,
- 사방으로 발사되는 수평 레이저 라인.

수평 모드를 켜거나 끄려면 혹은 수평 모드를 변경하려면, 원하는 작동 모드가 나타날 때까지 수평 모드 버튼 (6) 을 누르십시오.

#### 수직 모드 및 수직점(그림 B-D 참조)

측정공구에는 여러 수직 모드가 있습니다.

- 앞쪽으로 발사되는 수직 레이저 라인,
- 앞쪽 및 우측으로 발사되는 수직 레이저 라인,
- 앞쪽 및 뒤쪽으로 발사되는 수직 레이저 라인,
- 사방으로 발사되는 수직 레이저 라인.

그 외에도 수직 모드에서 수직점은 항상 아래쪽으로 투사됩니다.

수직 모드를 켜거나 끄려면 혹은 수직 모드를 바꾸려면, 원하는 작동 모드가 나타날 때까지 수직 모드 버튼 (3) 을 누르십시오.

#### 수신기 모드

레이저 수신기 (22) 를 이용하여 작업할 경우 - 선택한 작동 모드와 관계 없이 - 수신기 모드를 활성화해야 합니다.

수신기 모드에서 레이저 라인이 매우 빠른 빈도수로 깜박이게 되고, 이를 통해 레이저 수신기 (22) 에 감지됩니다.

수광기 모드를 켜려면 수광기 모드 버튼 (5) 을 누르십시오. 수광기 모드 표시기 (19) 가 적색으로 점등됩니다.

수신기 모드를 켜면 사람 눈에 보이는 레이저 라인의 가시성은 떨어집니다. 따라서 레이저 수신기 없이 작업할 때에는 다시 수신기 모드 버튼 (5) 을 눌러 수신기 모드를 켜야 합니다. 수신기 모드 표시기 (19) 가 꺼집니다.

## 자동 레벨링 기능

### 자동 레벨링 기능을 이용해 작업하기

자동 레벨링 기능을 이용해 작업하는 경우, 펜듈럼 고정 표시기 (21) 가 지속적으로 점등되어서는 안 됩니다. 경우에 따라 펜듈럼 고정 버튼 (2) 을 눌러 자동 레벨링 기능을 다시 켜서 펜듈럼 고정 표시기 가 깜박이거나 꺼지도록 하십시오.

측정공구를 수평의 고정된 받침 위에 놓거나 삼각대 (24) 에 고정하십시오.

자동 레벨링 기능을 통해 셀프 레벨링 범위  $\pm 3^\circ$  내 평평하지 않은 부분이 정도 자동으로 균형이 맞춰집니다. 레벨링이 진행되는 동안 펜듈럼 고정 표시기 (21) 가 깜박입니다. 펜듈럼 고정 표시기가 꺼지면 레벨링 작업이 종료됩니다.

측정공구가 위치한 바닥면이  $3^\circ$  이상 경사져 있어서 자동 레벨링이 불가능하면 펜듈럼 고정 표시기 (21) 가 지속적으로 깜박입니다.

이 경우 측정공구를 수평이 되게 놓고 셀프 레벨링이 될 때까지 기다리십시오. 레벨링 작업이 종료되면, 펜듈럼 고정 표시기 (21) 가 꺼집니다.

셀프 레벨링 범위  $\pm 3^\circ$  를 벗어나면 자동 레벨링 기능을 이용한 작업이 불가능합니다. 레벨링 정확도 및 레이저빔 사이의 직각이 모두 확보되지 않기 때문입니다.

작동하는 동안 흔들리거나 위치가 변경되는 경우 측정공구는 자동으로 다시 레벨링됩니다. 다시 레벨링된 후 기준점에 맞춰 수평 또는 수직 레이저 라인의 위치를 점검하여 측정공구의 위치를 옮겨 오류를 방지합니다.

### 펜듈럼 고정 기능을 이용해 작업하기

펜듈럼 고정 기능을 이용하여 작업하려면, 펜듈럼 고정 버튼 (2) 을 누르십시오. 펜듈럼 고정 기능을 이용해 작업하는 경우, 펜듈럼 고정 표시기 (21) 가 지속적으로 점등됩니다.

펜듈럼 고정 기능을 이용한 작업 시 자동 레벨링 기능이 꺼져 있습니다. 측정공구를 손에 들고 있거나 경사진 바닥에 놓아도 됩니다. 레이저 라인이 더 이상 레벨링되지 않으며, 반드시 직각으로 만나지 않습니다.

## 측정공구의 정확도 점검

### 정확도에 미치는 영향

가장 큰 영향을 미치는 것은 주위 온도입니다. 특히 바닥에서 위로 가면서 달라지는 온도로 인해 레이저빔이 굴절될 수 있습니다.

바닥 가까이에서 온도 변화가 가장 심하므로 20 m 이상의 거리를 측정할 경우 반드시 측정공구를 삼각

대에 조립하여 사용해야 합니다. 또한 가능하면 측정공구를 작업 표면의 중심에 세우십시오.

외부 요인 외에도 장비에 따른 요인(예: 전복 또는 충격의 강도)에 따라 차이가 있을 수 있습니다. 따라서 작업을 시작하기 전마다 레벨링 정확도를 점검하십시오.

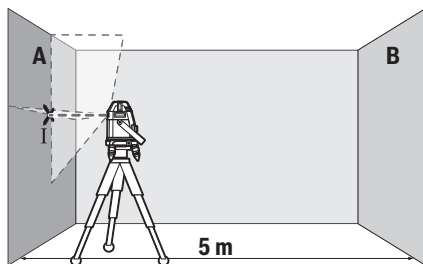
수평 레이저 라인의 레벨링 및 높이의 정확도를 우선적으로 점검한 후 수직 레이저 라인의 레벨링 정확도를 각각 점검하십시오.

점검 시 측정공구가 한번이라도 최대 편차를 초과할 경우 **Bosch** 서비스 센터에 맡겨 수리하십시오.

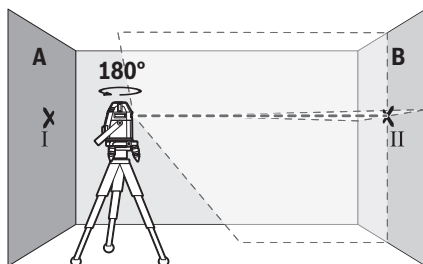
### 수평 라인의 높이 정확도 확인하기

이 테스트를 하려면 벽 A와 B 사이에 단단한 바닥이 있는 5 m 구간의 빈 공간이 필요합니다.

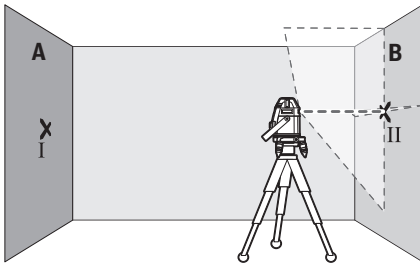
- 측정공구를 벽 A 근처의 삼각대 (24) 또는 평평하고 단단한 바닥면에 세웁니다. 측정공구의 자동 레벨링 기능을 작동하십시오. 각각 앞쪽으로 발사되는 레이저 라인 1개가 포함된 수평 모드 및 수직 모드를 켜십시오.



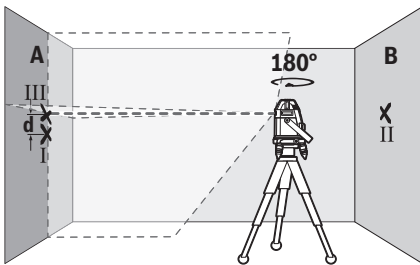
- 레이저를 가까이 있는 벽 A에 향하게 하고 측정공구를 레벨링하도록 하십시오. 레이저 라인이 벽면에서 교차되는 지점 중간을 표시하십시오(지점 I).



- 측정공구를 180° 돌려 레벨링한 후 레이저 라인의 교차 지점을 마주보는 벽 B(지점 II)에 표시하십시오.
- 측정공구를 돌릴 필요 없이 벽 B 근처에 두고, 전원을 켜 후 레벨링을 진행하십시오.



- 측정공구를 (삼각대 혹은 상황에 따라 받침대를 이용해) 레이저 라인의 교차점이 정확히 이전에 벽 B에 표시한 지점 II에 오도록 높이를 맞춰 정렬하십시오.



- 높이를 변경할 필요 없이 측정공구를 180° 회전시킵니다. 벽 A에 향하게 하고, 수직 레이저 라인이 이미 표시된 지점 I을 관통하도록 정렬하십시오. 측정공구를 레벨링한 후 벽 A(지점 III)에서 레이저 라인의 교차점을 표시하십시오.
- 벽 A에 표시된 두 지점 I 및 III의 간격 **d**로 인해 실제 측정공구의 높이 편차가 생깁니다.

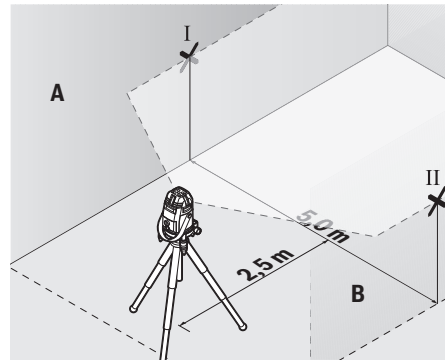
측정구간  $2 \times 5 \text{ m} = 10 \text{ m}$ 에서 최대 허용 편차는 다음과 같습니다.

$10 \text{ m} \times \pm 0.1 \text{ mm/m} = \pm 1 \text{ mm}$ . 지점 I과 III 사이의 간격 **d**는 최대 **1 mm**입니다.

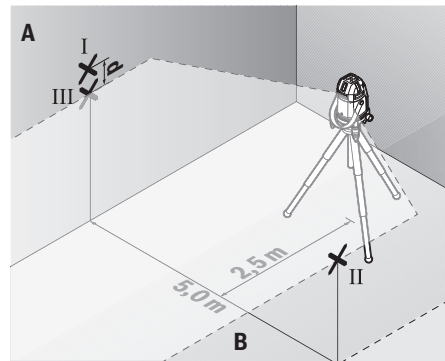
#### 수평 라인의 레벨링 정확도 확인하기

점점을 위해서는 약  $5 \times 5 \text{ m}$  정도의 빈 공간이 필요합니다.

- 측정공구를 벽 A 및 B 사이의 중앙에 있는 삼각대 (24) 에 위치시키거나, 평평하고 단단한 바닥에 세우십시오. 측정공구의 자동 레벨링 기능을 작동하십시오. 앞쪽으로 발사되는 레이저 라인 1개가 포함된 수평 모드를 켜 후 측정공구의 레벨링을 진행하십시오.



- 양쪽 벽에서 측정공구로부터 2.5 m 떨어진 거리에 레이저 라인의 중심을 표시하십시오(벽 A에 지점 I 및 벽 B에 지점 II).



- 5 m 떨어진 곳에서 측정공구를 180° 회전시킨 후 레벨링시킵니다.
- (삼각대 또는 필요에 따라 받침대를 이용하여) 레이저 라인의 중심이 이전에 표시한 벽 B의 지점 II에 오도록 측정공구의 높이를 정렬시키십시오.
- 벽 A에서 레이저 라인의 중심점을 지점 III(지점 I 수직으로 위쪽 또는 아래쪽)으로 표시하십시오.
- 벽 A에 표시된 두 지점 I 및 III의 간격 **d**로 인해 실제 측정공구의 수평 편차가 생깁니다.

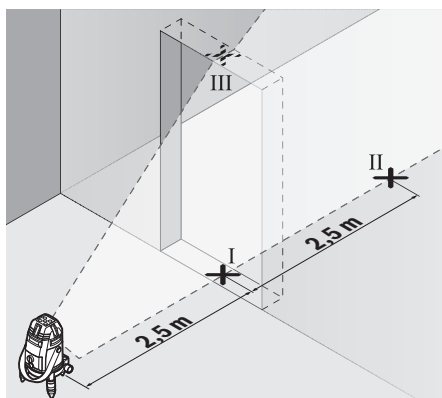
측정구간  $2 \times 5 \text{ m} = 10 \text{ m}$ 에서 최대 허용 편차는 다음과 같습니다.

$10 \text{ m} \times \pm 0.1 \text{ mm/m} = \pm 1 \text{ mm}$ . 지점 I과 III 사이의 간격 **d**는 최대 **1 mm**입니다.

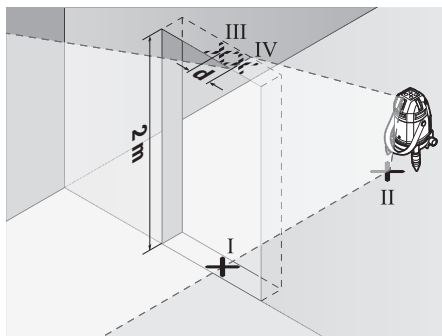
#### 수직선의 레벨링 정확도 확인하기

이 테스트를 진행하려면 (단단한 바닥) 문의 양쪽으로 최소한 2.5 m의 공간이 필요합니다.

- 측정공구를 문에서 2.5 m 거리에 단단하고 평평한 바닥에 (삼각대를 사용하지 말고) 놓으십시오. 측정공구의 자동 레벨링 기능을 작동하십시오. 앞쪽으로 발사되는 수직 레이저 라인 1개가 포함된 수직 모드를 켜 후 레이저 라인을 문 입구에 맞춰 정렬하십시오. 측정공구에서 레벨링이 진행되도록 하십시오.



- 다른 측면의 출입구(지점 II)와 출입구 상단 가장자리(지점 III)에서 5 m 떨어진 곳에서 출입구(지점 I)의 바닥에 수직 레이저 라인의 중심점을 표시하십시오.



- 측정공구를 180° 돌려 지점 II 바로 뒤쪽에 있는 출입구의 다른 측면에 세워주십시오. 측정공구를 레벨링한 후 수직 레이저 라인의 중심이 지점 I 및 II를 지나도록 정렬하십시오.
- 출입구 상단 가장자리의 레이저 라인의 중심점을 지점 IV로 표시하십시오.
- 두 지점 III 및 IV의 간격  $d$ 로 인해 실제 측정공구의 직각 편차가 생깁니다.
- 출입구의 높이를 측정하십시오.

최대 허용 편차는 다음과 같이 계산합니다:

문 입구 높이 두배  $\times 0.1 \text{ mm/m}$

예: 출입구 높이가 2 m의 경우 최대 편차

$2 \times 2 \text{ m} \times \pm 0.1 \text{ mm/m} = \pm 0.4 \text{ mm}$ 입니다. 따라서 지점 III 및 IV는 최대 0.4 mm를 벗어날 수 없습니다.

## 사용 방법

- ▶ 레이저 포인트 또는 레이저 라인 중심점은 표시 용도로만 사용하십시오. 레이저 포인트의 크기 또는 레이저 라인의 폭은 거리에 따라 달라집니다.

## 삼각대(액세서리)를 이용해 작업하기

삼각대를 사용하여 높이를 조정하며, 안정적으로 측정할 수 있습니다. 5/8" 삼각대 홀더 (18)와 함께 회전대를 삼각대 (24) 혹은 일반 건축용 삼각대의 나사부 위에 놓습니다. 회전대를 삼각대 고정 나사로 고정하십시오.

측정공구의 전원을 켜기 전에 대각 삼각대의 방향을 맞추십시오.

## 레이저 수광기(액세서리)를 이용한 작업

조명 상태(밝은 환경, 직사광선)가 좋지 않고 거리가 많이 떨어져 있는 경우 레이저 라인을 잘 감지할 수 있도록 레이저 수신기 (22)를 사용하십시오. 레이저 수신기를 이용해 작업할 경우 수신기 모드를 켜십시오 (참조 „수신기 모드“, 페이지 25).

## 레이저용 안경(액세서리)

레이저용 안경은 주변 조명을 걸러냅니다. 이를 통해 레이저의 빛이 더 밝게 보입니다.

- ▶ 레이저 보안경(액세서리)을 일반 보안경으로 사용하지 마십시오. 레이저 보안경은 레이저 광선을 보다 잘 감지하지만, 그렇다고 해서 레이저 광선으로부터 보호해주는 것은 아닙니다.

- ▶ 레이저 보안경(액세서리)을 선글라스 용도 또는 도로에서 사용하지 마십시오. 레이저 보안경은 자외선을 완벽하게 차단하지 못하며, 색상 분별력을 떨어뜨립니다.

## 작업 실례(그림 A-E 참조)

측정공구의 사용방법의 실례는 그림이 나와있는 면을 참고하십시오.

## 보수 정비 및 서비스

### 보수 정비 및 유지

항상 측정공구를 깨끗이 유지하십시오.

측정공구를 물이나 다른 액체에 넣지 마십시오.

물기있는 부드러운 천으로 오염된 부위를 깨끗이 닦으십시오. 세척제 또는 용제를 사용하지 마십시오.

특히 레이저빔 발사구 표면을 정기적으로 깨끗이 하고 보푸라기가 없도록 하십시오.

측정공구를 항상 함께 공급되는 운반 케이스 (26)에 넣어 보관하거나 운반하십시오.

수리해야 할 경우 측정공구를 운반 케이스 (26)에 넣어 보내십시오.

### AS 센터 및 사용 문의

AS 센터에서는 귀하 제품의 수리 및 보수정비, 그리고 부품에 관한 문의를 받고 있습니다. 대체 부품에 관한 문해 조립도 및 정보는 인터넷에서도 찾아볼 수 있습니다 - [www.bosch-pt.com](http://www.bosch-pt.com)

보쉬 사용 문의 팀에서는 보쉬의 제품 및 해당 액세서리에 관한 질문에 기꺼이 답변 드릴 것입니다.

문의나 대체 부품 주문 시에는 반드시 제품 네임 플레이트에 있는 10자리의 부품번호를 알려 주십시오.

콜센터

080-955-0909

다른 AS 센터 주소는 아래 사이트에서 확인할 수 있습니다:

www.bosch-pt.com/serviceaddresses

## 처리

측정 공구, 액세서리 및 포장 등은 친환경적인 방법으로 재활용될 수 있도록 분류하십시오.



측정공구 및 배터리를 가정용 쓰레기에 버리지 마십시오!

## ไทย

### กฎระเบียบเพื่อความปลอดภัย



ส่งเครื่องมือวัดให้ช่างผู้เชี่ยวชาญตรวจสอบและใช้อะไหล่เปลี่ยนของแท้เท่านั้น หากไม่ใช่เครื่องมือวัดตามคำแนะนำเหล่านี้ ระบบป้องกันเบ็ดเสร็จในเครื่องมือวัดอาจได้รับผลกระทบ

อย่าทำให้ป้ายเตือนที่อยู่บนเครื่องมือวัดนี้ลบเลือน เก็บรักษาคำแนะนำเหล่านี้ไว้ให้ดี และหากเครื่องมือวัดนี้ถูกส่งต่อไปยังผู้อื่น ให้ส่งมอบคำแนะนำเหล่านี้ไปด้วย

- ▶ ข้อควรระวัง - การใช้อุปกรณ์ทำงานหรืออุปกรณ์ปรับเปลี่ยนอื่นๆ นอกเหนือไปจากที่ระบุไว้ในที่นี่ หรือการใช้วิธีการอื่นๆ อาจนำไปสู่การสัมผัสกับรังสีอันตรายได้
- ▶ เครื่องมือวัดนี้จัดส่งมาพร้อมป้ายเตือนแสงเลเซอร์ (แสดงในหน้าภาพประกอบของเครื่องมือวัด)
- ▶ หากข้อความของป้ายเตือนแสงเลเซอร์ไม่ได้เป็นภาษาของท่าน ให้ติดสติ๊กเกอร์ที่จัดส่งมาที่พิมพ์เป็นภาษาของท่านทับลงบนข้อความก่อนใช้งานครั้งแรก



อย่าเล็งลำแสงเลเซอร์ไปยังคนหรือสัตว์ และอย่าหันเองอย่างจงใจมองเข้าไปในลำแสงเลเซอร์โดยตรงหรือลำแสงเลเซอร์สะท้อน การกระทำดังกล่าวอาจทำให้คนตาบอด ทำให้เกิดอุบัติเหตุ หรือทำให้ดวงตาเสียหายได้

- ▶ ถ้าแสงเลเซอร์เข้าตา ต้องปิดตาและหันศีรษะออกจากลำแสงในทันที
- ▶ อย่าทำการเปลี่ยนแปลงใดๆ ที่อุปกรณ์เลเซอร์
- ▶ อย่าใช้แว่นสำหรับมองแสงเลเซอร์ (อุปกรณ์เสริม) เป็นแว่นนิรภัย แว่นสำหรับมองแสงเลเซอร์ใช้สำหรับมองลำแสงเลเซอร์ให้เห็นชัดเจนยิ่งขึ้น แต่ไม่ได้ช่วยป้องกันรังสีเลเซอร์
- ▶ อย่าใช้แว่นสำหรับมองแสงเลเซอร์ (อุปกรณ์เสริม) เป็นแว่นกันแดดหรือใส่ซันบรอนนแดดแว่นสำหรับมองแสง

เลเซอร์ไม่สามารถป้องกันรังสีอัลตราไวโอเล็ต (UV) ได้อย่างสมบูรณ์ และยังลดความสามารถในการมองเห็นสี

- ▶ ส่งเครื่องมือวัดให้ช่างผู้เชี่ยวชาญตรวจสอบและใช้อะไหล่เปลี่ยนของแท้เท่านั้น ทั้งนี้เพื่อให้มั่นใจได้ว่าจะสามารถใช้งานเครื่องมือวัดได้อย่างปลอดภัยเสมอ
- ▶ อย่าให้เด็กใช้เครื่องมือวัดด้วยเลเซอร์โดยไม่ควบคุมดูแล เด็กๆ อาจทำให้คนตาบอดโดยไม่ตั้งใจ
- ▶ อย่าใช้เครื่องมือวัดในสภาพแวดล้อมที่เสี่ยงต่อการระเบิด ซึ่งเป็นที่มีของเหลว แก๊ส หรือฝุ่นที่ติดไฟได้ในเครื่องมือวัดสามารถเกิดประกายไฟซึ่งอาจจุดฝุ่นละอองหรือไอระเหยให้ติดไฟได้
- ▶ ใช้เฉพาะแหล่งจ่ายไฟที่มีแรงดันเอาต์พุต 6 V (กระแสตรง) อ่านและปฏิบัติตามคำแนะนำเพื่อความปลอดภัยและการทำงานอย่างเคร่งครัดสำหรับปลั๊กจ่ายไฟฟ้า)

### รายละเอียดผลิตภัณฑ์และข้อมูล

#### จำเพาะ

กรุณาดูภาพประกอบในส่วนหน้าของคู่มือการใช้งาน

#### ประโยชน์การใช้งานของเครื่อง

เครื่องมือวัดนี้ใช้สำหรับกำหนดและตรวจสอบเส้นแนวนอนและเส้นแนวตั้ง รวมทั้งจุดตั้ง เครื่องมือวัดนี้เหมาะสำหรับใช้งานทั้งภายในและภายนอกอาคาร

#### ส่วนประกอบที่แสดงภาพ

ลำดับเลขของส่วนประกอบอ้างอิงถึงส่วนประกอบของเครื่องมือวัดที่แสดงในหน้าภาพประกอบ

- (1) ช่องทางออกลำแสงเลเซอร์
- (2) บุ่มลูกตุ้มล้อ
- (3) บุ่มการทำงานในแนวตั้ง
- (4) บุ่มเปิด/ปิด
- (5) บุ่มโหมดอุปกรณ์รับ
- (6) บุ่มการทำงานในแนวนอน
- (7) สายหัว
- (8) แท่นหมุน
- (9) สกรูปรับละเอียดของแท่นหมุน
- (10) ระดับน้ำของแท่นหมุน
- (11) ซ็อกเก็ตชาร์จ 6 V

- (12) ฟาปิดพอร์ตชาร์จ  
 (13) ตัวล๊อคฝาช่องใส่แบตเตอรี่  
 (14) ฝาช่องใส่แบตเตอรี่  
 (15) ป้ายเตือนแสงเลเซอร์  
 (16) หมายเลขเครื่อง  
 (17) สกรูปรับความสูงของแท่นหมุน  
 (18) ช่องประกอบของขาตั้งแบบสามขาขนาด 5/8"  
 (19) ไฟแสดงโหมดอุปกรณ์รับ  
 (20) ไฟแสดงสถานะ  
 (21) ไฟแสดงการล๊อคแป้น  
 (22) อุปกรณ์รับแสงเลเซอร์  
 (23) แวนสำหรับมองแสงเลเซอร์  
 (24) ขาตั้งแบบสามขา<sup>A)</sup>  
 (25) ก้านแบบชักยัดได้<sup>A)</sup>  
 (26) ทึบ

A) อุปกรณ์ประกอบที่แสดงภาพหรืออธิบายไม่รวมอยู่ในการจัดส่งมาตรฐาน  
 กรุณาดูอุปกรณ์ประกอบทั้งหมดในรายการแสดงอุปกรณ์ประกอบของเรา

### ข้อมูลทางเทคนิค

เลเซอร์แบบเส้น	GLL 5-40 E
เลเซอร์แบบเส้น	GLL 8-40 E
หมายเลขสินค้า GLL 5-40 E	<b>3 601 K63 G..</b>
หมายเลขสินค้า GLL 8-40 E	<b>3 601 K63 H..</b>
ย่านการทำงาน <sup>A)</sup>	
– เส้นเลเซอร์มาตรฐาน	15 ม.
– เส้นเลเซอร์พร้อมโหมดอุปกรณ์รับ	10 ม.
– เส้นเลเซอร์เมื่อมีอุปกรณ์รับแสง	40 ม.
– จุดตั้ง	2 ม.
ความแม่นยำการหาระดับเส้นเลเซอร์ <sup>B)</sup>	±0.1 มม./ม.
ย่านการหาระดับอัตโนมัติ ปกติ	±3°
อุณหภูมิใช้งาน	-10 °C ... +50 °C
อุณหภูมิเก็บรักษา	-20 °C ... +70 °C

เลเซอร์แบบเส้น	GLL 5-40 E
เลเซอร์แบบเส้น	GLL 8-40 E
ความสูงใช้งานเหนือระดับอ้างอิงสูงสุด	2000 ม.
ความชันสัมพัทธ์ สูงสุด	90 %
ระดับมลพิษตาม IEC 61010-1	2 <sup>C)</sup>
ระดับเลเซอร์	2
ชนิดเลเซอร์	635-650 นวัตกรรม, < 1 มิลลิวัตต์
C <sub>6</sub>	1
การบานออกของลำแสง	
– เส้นเลเซอร์	0.5 mrad (มุมเต็ม)
– จุดตั้ง	1.2 mrad (มุมเต็ม)
ช่วงเวลาปล่อยแสงเลเซอร์	50 µs
อัตราการซ้ำของพัลส์	10 kHz
ช่องประกอบของขาตั้งแบบสามขา	5/8"
แหล่งจ่ายไฟฟ้า	
– แบตเตอรี่ (อัลคาไลน์-แมงกานีส)	4 × 1.5 โวลต์ LR6 (AA)
– ปลั๊กจ่ายไฟฟ้า	6 V~, ≥ 500 mA
ระยะเวลาทำงานโดยประมาณซึ่งมีแบตเตอรี่	
– กับเส้นเลเซอร์ 1 เส้น	24 ชม.
– ใช้เส้นเลเซอร์ 5 เส้น	5 ชม.
– กับเส้นเลเซอร์ 8 เส้น (GLL 8-40 E)	2.5 ชม.
น้ำหนักตามระเบียบการ EPTA-Procedure 01:2014	1.1 กก.
ขนาด (ความยาว × ความกว้าง × ความสูง)	136 × 136 × 210 มม.

เลเซอร์แบบเส้น	GLL 5-40 E
เลเซอร์แบบเส้น	GLL 8-40 E
ระดับการป้องกัน (เฉพาะเมื่อติดตั้งกับแท่นหมุน)	IP 54 (ป้องกันฝุ่นและน้ำกระเด็นเปื้อน)

A) ย่านการทำงานอาจลดลงหากมีสภาวะแวดล้อมที่ไม่เหมาะสม (ต.ย. เช่น แสงอาทิตย์ส่องโดยตรง)

B) จากโรงงาน

C) เกิดขึ้นเฉพาะผลิตภัณฑ์ที่ไม่นำไฟฟ้า ยกเว้นบางครั้งนำไฟฟ้าได้ชั่วคราวที่มีสาเหตุจากการกลั่นตัวที่ไคค่าว่าจะเกิดขึ้น

สำหรับการระบุเครื่องมือวัดของท่านอย่างชัดเจน กรุณาดูหมายเลขเครื่อง (16) บนแผ่นป้ายรุ่น

## การติดตั้ง

### แหล่งจ่ายพลังงาน เครื่องมือวัด

สามารถใช้เครื่องมือวัดกับแบตเตอรี่มาตรฐานได้เช่นเดียวกับปลั๊กจ่ายไฟฟ้ามาตรฐานที่มีแรงดันเอาต์พุต 6 V (กระแสตรง)

หากใส่แบตเตอรี่ทั้งสองและเชื่อมต่อปลั๊กจ่ายไฟฟ้า เครื่องมือวัดจะรับพลังงานผ่านปลั๊กจ่ายไฟฟ้า

### การทำงานกับแบตเตอรี่

สำหรับการใช้งานเครื่องมือวัด ขอแนะนำให้ใช้แบตเตอรี่อัลคาไลน์แมงกานีส

ในการเปิดฝาช่องใส่แบตเตอรี่ (14) ให้หมุนตัวล็อก (13) ด้วยเหรียญหรือวัตถุที่คล้ายคลึงกัน ถอดฝาช่องใส่แบตเตอรี่ใส่แบตเตอรี่เข้าไป

ขณะใส่แบตเตอรี่ต้องดูให้ขั้วแบตเตอรี่อยู่ในตำแหน่งที่ถูกต้องตามที่กำหนดไว้ที่ด้านในช่องใส่แบตเตอรี่

หากแบตเตอรี่อ่อน ไฟแสดงสถานะจะกะพริบ (20) ยังคงสามารถทำงานกับเครื่องมือวัดได้

หากแบตเตอรี่หมด เครื่องมือวัดจะไม่ตอบสนองต่อการกดปุ่มอีกต่อไป ไฟแสดงสถานะ (20) กะพริบอีก 40 วินาที จากนั้นเครื่องมือวัดจะปิดโดยอัตโนมัติ

เปลี่ยนแบตเตอรี่ทุกก้อนพร้อมกันเสมอ โดยใช้แบตเตอรี่จากผู้ผลิตรายเดียวกันทั้งหมดและมีความจุเท่ากันทุกก้อน

► **เมื่อไม่ใช้งานเครื่องมือวัดเป็นเวลานาน ต้องถอดแบตเตอรี่ออก** แบตเตอรี่ในเครื่องมือวัดอาจกัดกร่อนในระหว่างเก็บรักษาเป็นเวลานาน และปล่อยประจุออกเองได้

### การทำงานกับปลั๊กจ่ายไฟฟ้า

เปิดฝาครอบ (12) ของช็อกเก็ตการชาร์จ 6 V (11) เสียบปลั๊กชาร์จของแหล่งจ่ายไฟปลั๊กอื่น 6 V มาตรฐานลงในช่องเสียบชาร์จ (11) เชื่อมต่อปลั๊กจ่ายไฟเข้ากับแหล่งจ่ายไฟหลัก

เพื่อป้องกันสิ่งสกปรกให้ปิดฝาครอบ (12) เข้าอีกครั้งเมื่อคุณถอดปลั๊กชาร์จ

## การทำงานกับแท่นหมุน

คลายสกรูของแท่นหมุน (8) ออกด้วยสกรูปรับความสูง (17) จัดแนวแท่นหมุนด้วยระดับน้ำ (10)

ท่านสามารถปรับแนวเส้นเลเซอร์ในแนวตั้งที่จุดอ้างอิงอย่างเที่ยงตรงด้วยสกรูปรับละเอียด (9)

หากคุณต้องการใช้เครื่องมือวัดที่ไม่มีแท่นหมุนโปรดติดต่อศูนย์บริการลูกค้าที่ได้รับอนุญาต **Bosch** หากไม่ปรับการเปรียบเทียบให้เข้ากับการใช้งานโดยไม่ใช้แท่นหมุน อาจส่งผลกระทบต่อความแม่นยำของเครื่องมือวัด

## การปฏิบัติงาน

### การเริ่มต้นปฏิบัติงาน

► **ป้องกันไม่ให้เครื่องมือวัดได้รับ ความชื้นและโดนแสงแดดส่องโดยตรง**

► **อย่าให้เครื่องมือวัดได้รับอุณหภูมิที่สูงมาก หรือรับอุณหภูมิที่เปลี่ยนแปลงมาก** ต.ย. เช่น อย่าปล่อยเครื่องไว้นอกรถยนต์เป็นเวลานาน หากเกิดความผวนของอุณหภูมิสูงขึ้น ปล่อยให้เครื่องมือวัดปรับอุณหภูมิก่อนและตรวจสอบความแม่นยำก่อนดำเนินการต่อ (ดู "การตรวจสอบความแม่นยำของเครื่องมือวัด", หน้า 33)

► **หลีกเลี่ยงอย่าให้เครื่องมือวัดตกหล่นหรือถูกกระแทกอย่างรุนแรง** เมื่อเครื่องมือวัดถูกกระแทกจากภายนอกอย่างรุนแรง ขอแนะนำให้ทำการตรวจสอบความแม่นยำทุกครั้งก่อนนำมาใช้งานต่อ (ดู "การตรวจสอบความแม่นยำของเครื่องมือวัด", หน้า 33)

► **ปิดเครื่องมือวัดเมื่อขนย้าย** เมื่อปิดสวิตช์ ชุดที่ระดับจะถูกล็อก ถ้าไม่เช่นนั้นการเคลื่อนไหวยังรุนแรงอาจทำให้ชุดที่ระดับเสียหายได้

### การเปิด-ปิดเครื่อง

**เปิดสวิตช์** เครื่องมือวัดโดยกดปุ่มเปิด-ปิด (4) ไฟแสดงสถานะ (20) จะสว่างขึ้น เครื่องมือวัดจะปล่อยเส้นเลเซอร์แนวระนาบออกจากช่องทางออกด้านหน้า (1)

► **อย่าส่องลำแสงเลเซอร์ไปยังคนหรือสัตว์ และอย่าจ้องมองลำแสงเลเซอร์แม้จะอยู่ในระยะไกล**

**ปิดสวิตช์** เครื่องมือวัดโดยกดปุ่มเปิด-ปิด (4) อีกครั้ง ไฟแสดงสถานะ (20) จะดับลง เมื่อปิดสวิตช์ชุดล็อกตั้งจะถูกล็อก

- **อย่าวางเครื่องมือวัดที่เปิดสวิตช์ทิ้งไว้โดยไม่มีผู้ดูแล และให้ปิดสวิตช์เครื่องมือวัดเมื่อเลิกใช้งาน** คนอื่นอาจ ตาพร่าจากแสงเลเซอร์ได้

### การยกเลิกการปิดอัตโนมัติ

หากไม่มีการakupmใดๆ บนเครื่องมือวัดประมาณ 30 นาที เครื่องมือวัดจะปิดสวิตช์โดยอัตโนมัติเพื่อประหยัดพลังงาน เมื่อต้องการยกเลิกการปิดอัตโนมัติ ให้กดปุ่มสำหรับการ ทำงานตามแนวนอน (6) ค้างไว้ 3 วินาทีเมื่อเปิดสวิตช์เครื่องมือวัด เมื่อการปิดสวิตช์โดยอัตโนมัติถูกยกเลิกแล้ว หลังจากนั้น 3 วินาทีที่แสงเลเซอร์จะกะพริบสั้นๆ เมื่อต้องการเรียกใช้งานการปิดสวิตช์โดยอัตโนมัติ ให้ปิดสวิตช์เครื่องมือวัดและเปิดสวิตช์อีกครั้ง (โดยไม่ไดกดปุ่มไว้)

### รูปแบบการทำงาน

เครื่องมือวัดนี้มีหลายรูปแบบการทำงาน ซึ่งท่านสามารถ สลับใช้ได้ตลอดเวลา สามารถเปิดและปิดสวิตช์การทำงาน ตามแนวนอนและแนวตั้งได้แยกกันได้อย่างอิสระ หลังจาก เปิดสวิตช์ เครื่องมือวัดจะอยู่ในโหมดการทำงานตามแนวนอน โดยแสงเลเซอร์ทางด้านหน้า

ท่านสามารถเลือกทำงานด้วยการปรับระดับอัตโนมัติและ โดยที่เป็นล็อกอยู่

### การทำงานตามแนวนอน (GLL 5-40 E) (ดูภาพประกอบ A)

ในการทำงานตามแนวนอน เครื่องมือวัดจะส่งแสงเลเซอร์แนว นอนไปทางด้านหน้า

กดปุ่มการทำงานตามแนวนอน (6) เพื่อเปิดหรือปิดสวิตช์แสง เลเซอร์แนวนอน

### การทำงานตามแนวนอน (GLL 8-40 E) (ดูภาพประกอบ A และ E)

เครื่องมือวัดนี้มีประเภทการทำงานตามแนวนอนหลายรูปแบบ:

- แสงเลเซอร์แนวระนาบไปทางด้านหน้า
- แสงเลเซอร์แนวระนาบไปทางด้านหน้าและด้านข้างขวา
- แสงเลเซอร์แนวระนาบไปทั้งสี่ด้าน

ในการเปิดหรือปิดสวิตช์การทำงานตามแนวนอน รวมถึงการ การเปลี่ยนสู่โหมดการทำงานตามแนวนอน ให้กดปุ่มการ ทำงานตามแนวนอน (6) ซ้ำๆ จนถึงโหมดการทำงานที่ ต้องการ

### การทำงานในแนวตั้งและจุดตั้ง (ดูภาพประกอบ B-D)

เครื่องมือวัดนี้มีประเภทการทำงานตามแนวตั้งหลายรูปแบบ:

- แสงเลเซอร์แนวตั้งไปทางด้านหน้า,
- แสงเลเซอร์แนวตั้งไปทางด้านหน้าและด้านข้างขวา
- แสงเลเซอร์แนวตั้งไปทางด้านหน้าและด้านหลัง

- แสงเลเซอร์แนวตั้งไปทั้งสี่ด้าน
- นอกจากนี้จุดตั้งจะถูกฉายลงด้านล่างในการทำงานในแนวตั้ง ในการเปิดหรือปิดสวิตช์การทำงานตามแนวตั้ง รวมถึงการ การเปลี่ยนสู่โหมดการทำงานตามแนวตั้ง ให้กดปุ่มการทำงาน ตามแนวตั้ง (3) ซ้ำๆ จนถึงโหมดการทำงานที่ต้องการ

### โหมดอุปกรณ์รับ

เมื่อทำงานกับอุปกรณ์รับแสงเลเซอร์ (22) ต้องเรียกใช้งาน โหมดอุปกรณ์รับ – ไม่ว่าจะเลือกรูปแบบการทำงานใดก็ตาม ในโหมดอุปกรณ์รับ แสงเลเซอร์จะกะพริบที่ความถี่สูงมาก และด้วยเหตุนี้อุปกรณ์รับแสงเลเซอร์ (22) จึงสามารถค้นพบ แสงเลเซอร์

เมื่อต้องการเปิดสวิตช์โหมดอุปกรณ์รับ ให้กดปุ่มโหมดอุปกรณ์ รับ (5) ไฟแสดงโหมดอุปกรณ์รับ (19) สีแดงจะติดขึ้น

เมื่อโหมดอุปกรณ์รับเปิดสวิตช์อยู่ ความสามารถของตามนุษย์ ในการมองเห็นแสงเลเซอร์จะลดลง ดังนั้นเมื่อทำงานโดยไม่ ใช้อุปกรณ์รับแสงเลเซอร์ จึงต้องปิดสวิตช์โหมดอุปกรณ์รับ โดยกดปุ่มโหมดอุปกรณ์รับ (5) อีกครั้ง ไฟแสดงโหมด อุปกรณ์รับ (19) จะดับลง

### การทำการระดับอัตโนมัติ

#### การทำงานด้วยการทำการระดับอัตโนมัติ

เมื่อทำงานกับการปรับระดับอัตโนมัติด้วยซีลอคลูกตุ้ม (21) จะต้องไม่สวางขึ้นอย่างถาวร หากจำเป็นให้กดปุ่มซีลอคลูก ตู้ม (2) เพื่อเปิดการปรับระดับอัตโนมัติอีกครั้ง และไฟแสดง สถานะซีลอคลูกตุ้มจะกะพริบหรือดับลง

วางเครื่องมือวัดบนพื้นที่ยึดและราบเสมอกันหรือติดตั้งเข้า บนขาตั้งแบบสามขา (24)

การทำการระดับอัตโนมัติจะปรับความไม่ราบ เรียบให้สมดุลภายในการปรับระดับอัตโนมัติ  $\pm 3^\circ$  ได้เอง ระหว่างการปรับระดับ ไฟแสดงสถานะซีลอคลูกตุ้มจะ กะพริบ (21) การทำการระดับเสร็จสิ้นทันทีที่ไฟแสดงสถานะซีลอค ลูกตุ้มดับไป

หากฟังก์ชันการทำการระดับอัตโนมัติไม่สามารถทำงานได้ ต. ย. เช่น เนื่องจากพื้นผิวที่เครื่องมือวัดตั้งอยู่เอียงเบนมากกว่า  $3^\circ$  จากระนาบราบ ไฟแสดงสถานะซีลอคลูกตุ้ม (21) จะกะพริบ อย่างต่อเนื่อง

ในกรณีนี้ให้ตั้งเครื่องมือวัดให้ราบเสมอกัน และรอให้เกิดการ ทำการระดับอัตโนมัติ ทันทีที่ทำการทำการระดับเสร็จสิ้น ไฟแสดงสถานะ ซีลอคลูกตุ้ม (21) จะดับไป

นอกเหนือในย่านการทำการระดับอัตโนมัติอีกครั้ง  $\pm 3^\circ$  จะไม่ สามารถดำเนินการทำการระดับอัตโนมัติสำหรับแสงเลเซอร์ เนื่องจาก ไม่สามารถรับประกันความแม่นยำของแสงเลเซอร์และมุม ระหว่างแสงเลเซอร์ได้

ในการที่พื้นสั่นสะเทือนหรือเปลี่ยนตำแหน่งขณะทำงาน เครื่องมือวัดจะทำการระดับโดยอัตโนมัติอีกครั้ง เมื่อทำการระดับซ้ำอีกครั้ง ให้ตรวจสอบตำแหน่งของเส้นเลเซอร์ในแนวนอนหรือแนวตั้งที่เกี่ยวข้องจุดอ้างอิงเพื่อหลีกเลี่ยงความผิดพลาด เนื่องจากได้เลื่อนเครื่องมือวัด

#### การทำงานโดยที่มั่นคงอยู่

สำหรับการทำงานกับล้อยคลุกตุ้ม ให้กดปุ่มล้อยคลุกตุ้ม (2) ในการทำงานกับล้อยคลุกตุ้ม ไฟแสดงสถานะล้อยคลุกตุ้ม (21) สว่างขึ้นอย่างถาวร

สำหรับการทำงานโดยที่มั่นคงอยู่ การปรับระดับอัตโนมัติจะปิดทำงาน คุณสามารถถือเครื่องมือวัดไว้ในมือหรือวางไว้บนพื้นผิวที่ลาดเอียง เส้นเลเซอร์จะไม่ปรับระดับอีกต่อไปและไม่จำเป็นต้องวิ่งในแนวตั้งตรงซึ่งกันและกันอีกต่อไป

#### การตรวจสอบความแม่นยำของเครื่องมือวัด

##### ผลกระทบต่อความแม่นยำ

อุณหภูมิรอบด้านมีผลต่อความแม่นยำมากที่สุด โดยเฉพาะอย่างยิ่งความแตกต่างของอุณหภูมิจากพื้นขึ้นไปในระดับสูงกว่าสามารถเบี่ยงเบนลำแสงเลเซอร์ได้

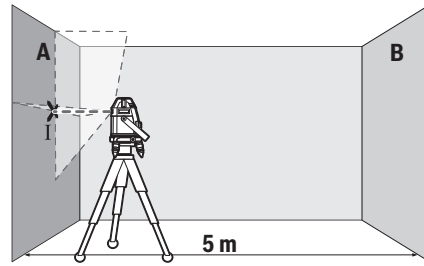
เนื่องจากบริเวณใกล้เคียงมีการผันผวนของชั้นอุณหภูมิมากที่สุด ดังนั้นเมื่อระยะทางวัดไกลกว่า 20 ม. จึงควรประกอบเครื่องมือวัดเข้ากับขาตั้งแบบสามขาเสมอ หากเป็นไปได้ให้ตั้งเครื่องมือวัดไว้กลางพื้นที่ทำงานด้วย

นอกจากสาเหตุและปัจจัยจากภายนอกแล้ว สาเหตุและปัจจัยเฉพาะตัวอุปกรณ์เอง (ต. ย. เช่น การตกหล่น หรือการกระแทกอย่างรุนแรง) อาจนำไปสู่การเบี่ยงเบนได้ด้วย ดังนั้นให้ตรวจสอบความแม่นยำการทำการระดับทุกครั้งก่อนเริ่มทำงาน ในเบื้องต้น ให้ตรวจสอบความแม่นยำความสูงและความแม่นยำการทำการระดับของเส้นเลเซอร์แนวนอน จากนั้นจึงตรวจสอบความแม่นยำการทำการระดับของเส้นเลเซอร์แนวตั้ง หากเครื่องมือวัดเบี่ยงเบนเกินค่าเบี่ยงเบนสูงสุดในระหว่างการทดสอบครั้งใดครั้งหนึ่ง ให้ส่งเครื่องมือให้ศูนย์บริการหลังการขาย **Bosch** ซ่อมแซม

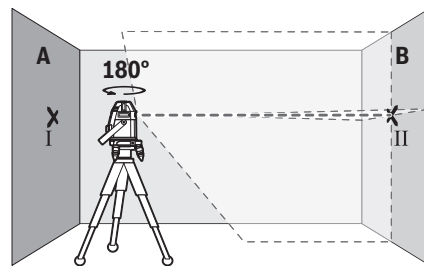
##### การตรวจสอบความแม่นยำความสูงของเส้นแนวนอน

สำหรับการตรวจสอบ ต้องใช้ระยะทางวัดวางเปล่า 5 ม. บนพื้นผิวที่มั่นคงระหว่างผนัง A และ B

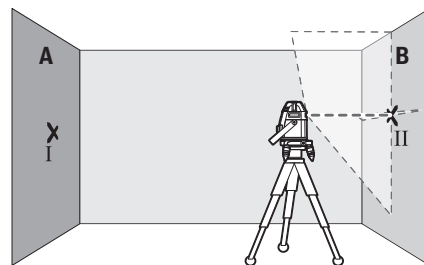
- ประกอบเครื่องมือวัดเข้ากับขาตั้งแบบสามขา (24) หรือวางเครื่องมือบนพื้นผิวที่มั่นคงและราบเสมอกันใกล้กับผนัง A เปิดสวิตช์เครื่องมือวัดในรูปแบบการทำงานด้วยการทำการระดับอัตโนมัติ เปิดสวิตช์การทำงานตามแนวนอนและการทำงานตามแนวตั้ง ด้วยเส้นเลเซอร์ไปทางด้านหน้า



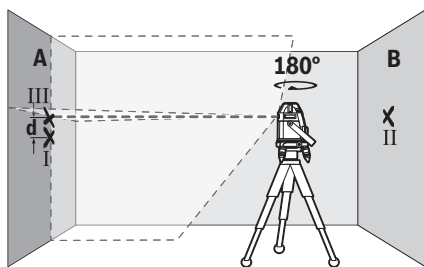
- ชี้เลเซอร์ไปยังผนังฝั่งใกล้ A และปล่อยให้เครื่องมือวัดทำการระดับ ทำเครื่องหมายตรงกลางจุดตรงที่เส้นเลเซอร์ไขว้กันที่ผนัง A (จุด I)



- หมุนเครื่องมือวัดไป 180° ปล่อยให้เครื่องมือวัดทำการระดับ และทำเครื่องหมายที่จุดไขว้ของเส้นเลเซอร์บนผนังฝั่งตรงข้าม B (จุด II)
- วางเครื่องมือวัดใกล้ผนัง B โดยไม่หมุนเครื่อง เปิดสวิตช์เครื่องมือวัดและปล่อยให้ทำการระดับ



- วางแนวความสูงของเครื่องมือวัด (โดยปรับที่ขาตั้งแบบสามขาหรือโซลิ่งของรองขาได้ หากจำเป็น) ในลักษณะให้จุดไขว้ของเส้นเลเซอร์ตกลงบนจุดเครื่องหมายอันก่อน II บนผนัง B อย่างพอดีพอดี

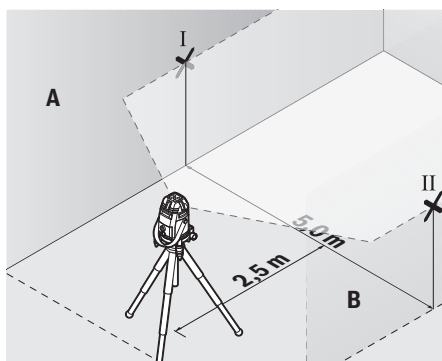


- หมุนเครื่องมือวัดไป  $180^\circ$  โดยไม่เปลี่ยนความสูงซีเลเซอร์ไปยังผนัง A ในลักษณะให้เส้นเลเซอร์แนวตั้งวิ่งผ่านจุดที่ทำเครื่องหมายไว้แล้ว | ปลอยให้เครื่องมือวัดทำระดับและทำเครื่องหมายที่จุดไขว้ของเส้นเลเซอร์บนผนัง A (จุด III)
- ความต่าง  $d$  ของจุดเครื่องหมายทั้งสอง I และ III บนผนัง A แสดงความเบี่ยงเบนความสูงที่แท้จริงของเครื่องมือวัดที่ระยะทางวัด  $2 \times 5 \text{ ม.} = 10 \text{ ม.}$  ความเบี่ยงเบนสูงสุดที่อนุญาตคือ:  
 $10 \text{ ม.} \times \pm 0.1 \text{ มม./ม.} = \pm 1 \text{ มม.}$  ดังนั้นความต่าง  $d$  ระหว่างจุด I และ III ต้องไม่เกิน 1 มม.

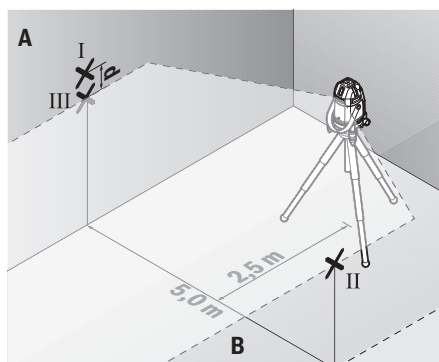
#### การตรวจสอบความแม่นยำการทำระดับของเส้นแนวระนาบ

สำหรับการตรวจสอบ ต้องใช้พื้นผิวว่างเปล่าประมาณ  $5 \times 5 \text{ ม.}$

- ติดตั้งเครื่องมือวัดเข้าบนขาตั้งแบบสามขา (24) หรือวางเครื่องมือบนพื้นผิวที่มั่นคงและราบเสมอกันระหว่างผนัง A และ B เปิดสวิตช์เครื่องมือวัดในรูปแบบการทำงานด้วยการทำระดับอัตโนมัติ เปิดสวิตช์การทำงานตามแนวตั้งด้วยเส้นเลเซอร์ไปทางด้านหน้าและให้เครื่องมือปรับระดับ



- ที่ระยะ 2.5 ม. ห่างจากเครื่องมือวัด ให้ทำเครื่องหมายตรงกลางเส้นเลเซอร์บนผนังทั้งสองด้าน (จุด I บนผนัง A และจุด II บนผนัง B)



- ตั้งเครื่องมือวัดห่างออกไป 5 ม. โดยหมุนเครื่องไป  $180^\circ$  และปลอยให้เครื่องมือวัดทำระดับ
- ปรับความสูงของเครื่องมือวัด (โดยปรับที่ขาตั้งแบบสามขาหรือใช้สิ่งของรองข้างใต้ หากจำเป็น) ในลักษณะให้จุดกลางของเส้นเลเซอร์ตกลงบนจุดเครื่องหมายอันก่อน II บนผนัง B อย่างพอดีพอดี
- ทำเครื่องหมายตรงกลางเส้นเลเซอร์เป็นจุด III (อยู่ในแนวตรงเหนือหรือใต้จุด I) บนผนัง A
- ความต่าง  $d$  ของจุดเครื่องหมายทั้งสอง I และ III บนผนัง A แสดงความเบี่ยงเบนของเครื่องมือวัดจากระนาบในขณะนั้น

ที่ระยะทางวัด  $2 \times 5 \text{ ม.} = 10 \text{ ม.}$  ความเบี่ยงเบนสูงสุดที่อนุญาตคือ:

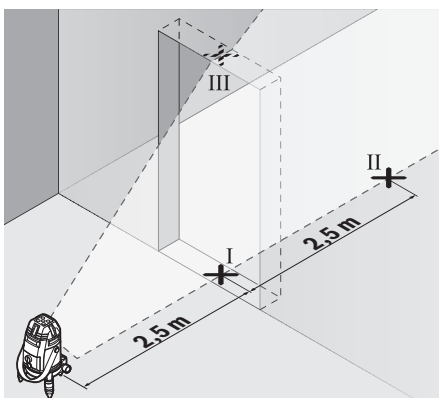
$$10 \text{ ม.} \times \pm 0.1 \text{ มม./ม.} = \pm 1 \text{ มม.}$$

ดังนั้นความต่าง  $d$  ระหว่างจุด I และ III ต้องไม่เกิน 1 มม.

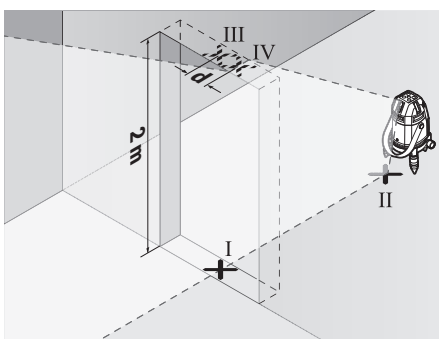
#### การตรวจสอบความแม่นยำการทำระดับของเส้นแนวตั้ง

สำหรับการตรวจสอบ ต้องใช้ช่องประตูที่มีพื้นที่ว่างแต่ละด้านห่างจากประตูอย่างน้อย 2.5 เมตร (บนพื้นผิวที่มั่นคง)

- วางเครื่องมือวัดไว้บนพื้นผิวที่มั่นคงและราบเสมอกัน (ไม่วางบนขาตั้งแบบสามขา) โดยให้ห่างจากช่องประตู 2.5 ม. เปิดสวิตช์เครื่องมือวัดในรูปแบบการทำงานด้วยการทำระดับอัตโนมัติ เปิดสวิตช์การทำงานตามแนวตั้งด้วยเส้นเลเซอร์ไปทางด้านหน้า และซีเลเซอร์ไปที่ช่องเปิดที่ประตู ปลอยให้เครื่องมือวัดทำระดับ



- ทำเครื่องหมายตรงกลางเส้นเลเซอร์แนวตั้งที่พื้นของช่องประตู (จุด I) ที่ระยะห่างออกไป 5 เมตรเลยไปอีกด้านหนึ่งของช่องประตู (จุด II) และที่ขอบด้านบนของช่องประตู (จุด III)



- หมุนเครื่องมือวัดไป 180° และวางเครื่องมือวัดอีกด้านหนึ่งของช่องประตูตรงเพ่งหลังจุด II ปล่อยให้เครื่องมือวัดทำระดับ และวางแนวเส้นเลเซอร์แนวตั้งในลักษณะให้จุดกลางของเส้นเลเซอร์วิ่งผ่านจุด I และ II อย่างพอดีพอดี
- ทำเครื่องหมายตรงกลางเส้นเลเซอร์ที่ขอบด้านบนของช่องประตูให้เป็นจุด IV
- ความต่าง d ของจุดเครื่องหมายทั้งสอง III และ IV แสดงความเบี่ยงเบนที่แท้จริงของเครื่องมือวัดจากแนวตั้ง
- วัดความสูงของช่องประตู

ความเบี่ยงเบนสูงสุดที่อนุญาตคำนวณดังต่อไปนี้:

สองเท่าของความสูงช่องประตู  $\times 0.1$  มม./ม.

ตัวอย่าง: ถ้าความสูงช่องประตูคือ 2 ม. ความเบี่ยงเบนสูงสุดต้องไม่เกิน

$2 \times 2 \text{ ม.} \times \pm 0.1 \text{ มม./ม.} = \pm 0.4 \text{ มม.}$  ดังนั้นจุด III และ IV

ต้องห่างจากกันไม่เกิน 0.4 มม.

## ข้อแนะนำในการทำงาน

### ▶ ทำเครื่องหมายตรงกลางจุดเลเซอร์หรือเส้นเลเซอร์

**เสมอ** ขนาดของจุดเลเซอร์และความกว้างของเส้นเลเซอร์เปลี่ยนไปตามระยะทาง

### การทำงานกับขาตั้งแบบสามขา (อุปกรณ์ประกอบ)

ขาตั้งแบบสามขาช่วยให้สามารถทำการวัดได้อย่างมั่นคงและปรับความสูงได้ สวมแท่นหมุนที่มีช่องประกอบของขาตั้งแบบสามขาขนาด 5/8 นิ้ว (18) เข้าบนเกลียวของขาตั้งแบบสามขา (24) หรือขาตั้งกล้องที่มีจำหน่ายทั่วไป ยึดแท่นหมุนโดยขันสกรูล็อกของขาตั้งแบบสามขาเข้าให้แน่น ปรับขาตั้งแบบสามขาอย่างคร่าวๆ ก่อนเปิดสวิตช์เครื่องมือวัด

### การทำงานกับอุปกรณ์รับแสงเลเซอร์ (อุปกรณ์ประกอบ)

ในสภาวะแสงที่ไม่เหมาะสม (สภาพแวดล้อมที่สว่างจ้า แสงแดดส่องตรง) และสำหรับระยะทางไกลๆ ให้ใช้อุปกรณ์รับแสงเลเซอร์ (22) เพื่อจะได้ค้นหาเส้นเลเซอร์ได้ง่ายขึ้น เมื่อทำงานกับอุปกรณ์รับแสงเลเซอร์ ให้เปิดสวิตช์โหมดอุปกรณ์รับ (ดู "โหมดอุปกรณ์รับ", หน้า 32)

### แว่นสำหรับมองแสงเลเซอร์ (อุปกรณ์ประกอบ)

แว่นสำหรับมองแสงเลเซอร์ช่วยกรองสภาวะแสงภายนอกออกไป ทำให้ตามองเห็นแสงเลเซอร์ได้ชัดเจนยิ่งขึ้น

▶ **อย่าใช้แว่นสำหรับมองแสงเลเซอร์ (อุปกรณ์เสริม) เป็นแว่นนิรภัย** แว่นสำหรับมองแสงเลเซอร์ใช้สำหรับมองลำแสงเลเซอร์ให้เห็นชัดเจนยิ่งขึ้น แต่ไม่ได้ช่วยป้องกันรังสีเลเซอร์

▶ **อย่าใช้แว่นสำหรับมองแสงเลเซอร์ (อุปกรณ์เสริม) เป็นแว่นกันแดดหรือใส่ซันบรินด์** แว่นสำหรับมองแสงเลเซอร์ไม่สามารถป้องกันรังสีอัลตราไวโอเล็ต (UV) ได้ อย่างสมบูรณ์ และยังลดความสามารถในการมองเห็นสี

## ตัวอย่างการปฏิบัติงาน (รูปภาพประกอบ A-E)

ตัวอย่างการใช้งานที่เป็นไปได้ของเครื่องมือวัด

กรุณาดูในหน้าภาพประกอบ

## การบำรุงรักษาและการบริการ

### การบำรุงรักษาและการทำความสะอาด

รักษาเครื่องมือวัดให้สะอาดตลอดเวลา

อย่าจุ่มเครื่องมือวัดลงในน้ำหรือของเหลวอื่นๆ

เช็ดสิ่งสกปรกออกด้วยผ้านุ่มที่เปียกหมาดๆอย่าใช้สารซักฟอกหรือตัวทำละลาย

ทำความสะอาดพื้น

ผิวตรงช่องทางออกลำแสงเลเซอร์เป็นประจำ และเอาใจ

ใส่อย่าให้ขุ่ยผาดิด

เก็บรักษาและขนย้ายเครื่องมือวัดโดยบรรจุลงในหีบ (26) เท่านั้น

สำหรับการซ่อมแซม ต้องส่งเครื่องมือวัดโดยบรรจุลงในหีบ (26) เท่านั้น

### การบริการหลังการขายและการให้คำปรึกษาการใช้งาน

ศูนย์บริการหลังการขายของเรายินดีตอบคำถามของท่านที่เกี่ยวกับการบำรุงรักษาและการซ่อมแซมผลิตภัณฑ์รวมทั้งเรื่องอะไหล่ ภาพเขียนแบบการประกอบและข้อมูลเกี่ยวกับอะไหล่ กรุณาดูใน: **www.bosch-pt.com** ทีมงานที่ปรึกษาของ บอช ยินดีให้ข้อมูลเกี่ยวกับผลิตภัณฑ์ของเราและอุปกรณ์ประกอบต่างๆ

เมื่อต้องการสอบถามและสั่งซื้ออะไหล่ กรุณาแจ้งหมายเลขสินค้า 10 หลักบนแผ่นป้ายรุ่นของผลิตภัณฑ์ทุกครั้ง

#### ไทย

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บ้านเลขที่ 10/11 หมู่ 16

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สามารถดูที่อยู่ศูนย์บริการอื่นๆ ได้ที่:

www.bosch-pt.com/serviceaddresses

### การกำจัดขยะ

เครื่องมือวัด อุปกรณ์ประกอบ และหีบห่อ ต้องนำ

ไปแยกประเภทวัสดุเพื่อส่งเข้าสู่กระบวนการรีไซเคิลที่เป็นมิตรต่อสิ่งแวดล้อม



อย่าทิ้งเครื่องมือวัดและแบตเตอรี่ลงในขยะบ้าน!

## Bahasa Indonesia

### Petunjuk Keselamatan



Petunjuk lengkap ini harus dibaca dan diperhatikan agar tidak terjadi bahaya dan Anda dapat bekerja dengan aman saat menggunakan alat ukur ini. Apabila alat ukur tidak digunakan sesuai dengan petunjuk yang disertakan, keamanan alat ukur dapat terganggu. Janganlah sekali-kali menutupi atau melepas label keselamatan kerja yang ada pada alat ukur ini. **SIMPAN PETUNJUK INI DENGAN BAIK DAN BERIKAN KEPADA PEMILIK ALAT UKUR BERIKUTNYA.**

- ▶ **Perhatian** – jika perangkat pengoperasian atau perangkat pengaturan atau prosedur lain selain yang dituliskan di sini digunakan, hal ini dapat menyebabkan terjadinya paparan radiasi yang berbahaya.
- ▶ Alat pengukur dikirim dengan tanda peringatan laser (ditandai dengan ilustrasi alat pengukur di halaman grafis).
- ▶ Jika teks pada tanda peringatan laser tidak tertulis dalam bahasa negara Anda, tempelkan label yang tersedia dalam bahasa negara Anda di atas label berbahasa Inggris sebelum Anda menggunakan alat untuk pertama kalinya.



Jangan melihat sinar laser ataupun mengarahkannya kepada orang lain atau hewan baik secara langsung maupun dari pantulan. Sinar laser dapat membutakan seseorang, menyebabkan kecelakaan atau merusak mata.

- ▶ Jika radiasi laser mengenai mata, tutup mata Anda dan segera gerakan kepala agar tidak terkena sorotan laser.
- ▶ Jangan mengubah peralatan laser.
- ▶ Jangan gunakan kacamata pelihat laser (aksesori) sebagai kacamata pelindung. Kacamata pelihat laser digunakan untuk mendeteksi sinar laser dengan lebih baik, namun tidak melindungi dari sinar laser.
- ▶ Jangan gunakan kacamata pelihat laser (aksesori) sebagai kacamata hitam atau di jalan raya. Kacamata pelihat laser tidak menawarkan perlindungan penuh terhadap sinar UV dan mengurangi persepsi warna.
- ▶ Perbaiki alat ukur hanya di teknisi ahli resmi dan gunakan hanya suku cadang asli. Dengan demikian, keselamatan kerja dengan alat ukur ini selalu terjamin.
- ▶ Jangan biarkan anak-anak menggunakan alat ukur laser tanpa pengawasan. Anda dapat secara tidak sengaja membuat orang menjadi buta.
- ▶ Jangan mengoperasikan alat ukur di area yang berpotensi meledak yang di dalamnya terdapat cairan, gas, atau serbuk yang dapat terbakar. Di dalam

alat pengukur dapat terjadi bunga api, yang lalu menyulut debu atau uap.

- **Hanya gunakan adaptor daya dengan tegangan output 6 V (arus searah). Baca dan perhatikan dengan saksama petunjuk keselamatan dan pengoperasian adaptor daya.**

## Spesifikasi produk dan performa

Perhatikan ilustrasi yang terdapat pada bagian depan panduan pengoperasian.

### Tujuan penggunaan

Alat pengukur dirancang untuk menentukan dan memeriksa garis horizontal dan vertikal dan juga titik tegak lurus.

Alat ukur ditujukan untuk digunakan di dalam maupun di luar ruangan.

### Ilustrasi komponen

Nomor-nomor pada ilustrasi komponen sesuai dengan gambar alat pengukur pada halaman gambar.

- (1) Outlet sinar laser
- (2) Tombol penguncian pendulum
- (3) Tombol mode vertikal
- (4) Tombol on/off
- (5) Tombol mode receiver
- (6) Tombol mode horizontal
- (7) Strap pengangkat
- (8) Landasan putar
- (9) Baut penyetel landasan putar
- (10) Waterpas landasan putar
- (11) Port pengisian daya 6 V
- (12) Penutup port pengisian daya
- (13) Penguncian penutup kompartemen baterai
- (14) Penutup kompartemen baterai
- (15) Label peringatan laser
- (16) Nomor seri
- (17) Sekrup penyetelan ketinggian landasan putar
- (18) Dudukan tripod 5/8"
- (19) Display mode receiver
- (20) Indikator status
- (21) Display penguncian pendulum
- (22) Penerima laser
- (23) Kacamata laser
- (24) Tripod<sup>A)</sup>
- (25) Tongkat teleskopik<sup>A)</sup>
- (26) Koper

A) **Aksesori yang ada pada gambar atau yang dijelaskan tidak termasuk dalam lingkup pengiriman standar. Semua aksesori yang ada dapat Anda lihat dalam program aksesori kami.**

### Data teknis

Laser garis	GLL 5-40 E
Laser garis	GLL 8-40 E
Nomor seri GLL 5-40 E	<b>3 601 K63 G..</b>
Nomor seri GLL 8-40 E	<b>3 601 K63 H..</b>
Area kerja <sup>A)</sup>	
– Garis laser standar	15 m
– Garis laser dengan mode receiver	10 m
– Garis laser dengan penerima laser	40 m
– Titik tegak lurus	2 m
Keakuratan perataan garis laser <sup>B)</sup>	±0,1 mm/m
Rentang perataan otomatis khusus	±3°
Suhu pengoperasian	–10 °C ... +50 °C
Suhu penyimpanan	–20 °C ... +70 °C
Tinggi penggunaan maks. di atas tinggi acuan	2000 m
Kelembapan relatif maks.	90 %
Tingkat polusi sesuai dengan IEC 61010-1	2 <sup>C)</sup>
Kelas laser	2
Jenis laser	635–650 nm, < 1 mW
C <sub>6</sub>	1
Divergensi	
– Garis laser	0,5 mrad (sudut penuh)
– Titik tegak lurus	1,2 mrad (sudut penuh)
Durasi impuls	50 µs
Nilai pengulangan impuls	10 kHz
Dudukan tripod	5/8"
Suplai daya	
– Baterai (alkali)	4 × 1,5 V LR6 (AA)
– Adaptor daya	6 V <sup>–</sup> , ≥ 500 mA
Durasi pengoperasian dengan baterai sekitar	
– dengan 1 garis laser	24 h
– dengan 5 garis laser	5 h
– dengan 8 garis laser (GLL 8-40 E)	2,5 h
Berat sesuai dengan EPTA-Procedure 01:2014	1,1 kg
Dimensi (panjang × lebar × tinggi)	136 × 136 × 210 mm

<b>Laser garis</b>	<b>GLL 5-40 E</b>
<b>Laser garis</b>	<b>GLL 8-40 E</b>
Jenis perlindungan (hanya pada landasan putar yang terpasang)	IP 54 (terlindung dari debu dan percikan air)

- A) Area kerja dapat berkurang akibat keadaan lingkungan yang tidak menguntungkan (seperti sinar matahari langsung).
- B) Penyetelan pabrik
- C) Hanya polusi nonkonduktif yang terjadi, namun terkadang muncul konduktivitas sementara yang disebabkan oleh kondensasi.

Untuk mengidentifikasi alat ukur secara jelas terdapat nomor seri (16) pada label tipe.

## Cara memasang

### Suplai daya alat ukur

Alat pengukur dapat dioperasikan dengan baterai standar serta dengan adaptor daya standar dengan tegangan output 6 V (arus searah).

Jika kedua baterai terpasang dan adaptor daya terhubung, alat pengukur akan diberi suplai energi melalui adaptor daya.

### Pengoperasian dengan baterai

Untuk pengoperasian alat ukur disarankan memakai baterai mangan alkali.

Untuk membuka penutup kompartemen baterai (14), putar pengunci (13) dengan koin atau sejenisnya. Lepaskan penutup kompartemen baterai. Pasang baterai.

Pastikan baterai terpasang pada posisi kutub yang benar sesuai gambar di dalam kompartemen baterai.

Jika baterai lemah, indikator status (20) akan berkedip. Pengerjaan dengan alat pengukur masih dapat dilakukan.

Jika baterai telah habis dayanya, alat pengukur tidak lagi merespons penekanan tombol. Indikator status (20) berkedip selama 40 detik kemudian alat pengukur mati secara otomatis.

Selalu ganti semua baterai sekaligus. Hanya gunakan baterai dari produsen dan dengan kapasitas yang sama.

- **Keluarkan baterai dari alat pengukur jika tidak digunakan dalam waktu yang lama.** Jika baterai disimpan di dalam alat pengukur untuk waktu yang lama, baterai dapat berkarat dan dayanya akan habis dengan sendirinya.

### Pengoperasian dengan adaptor daya

Buka penutup (12) port pengisian daya 6 V (11). Pasang steker pengisian daya dari adaptor daya standar 6 V ke dalam port pengisian daya (11). Sambungkan adaptor daya pada jaringan listrik.

Untuk melindungi dari kotoran, tutup kembali penutup (12) saat steker pengisian daya dilepas.

### Bekerja dengan landasan putar

Lepaskan kaki landasan putar (8) dengan sekrup penyetelan ketinggian (17).

Sejajarkan landasan putar kasar menggunakan waterpas (10).

Garis laser vertikal dapat disesuaikan dengan tepat pada titik acuan menggunakan sekrup penyetelan halus (9).

Jika alat pengukur ingin digunakan tanpa landasan putar, hubungi layanan pelanggan **Bosch** resmi. Tanpa penyesuaian kalibrasi pada pengoperasian tanpa landasan putar, ketepatan alat pengukur dapat terganggu.

## Penggunaan

### Cara penggunaan

- **Lindungilah alat ukur dari cairan dan sinar matahari langsung.**
- **Jauhkan alat pengukur dari suhu atau perubahan suhu yang ekstrem.** Jangan biarkan alat pengukur berada terlalu lama di dalam kendaraan. Saat perubahan suhu besar, biarkan alat ukur menyesuaikan suhu lingkungan terlebih dulu dan selalu lakukan pemeriksaan akurasi sebelum melanjutkan pekerjaan dengan (lihat „Pemeriksaan keakuratan alat ukur“, Halaman 39). Pada suhu atau perubahan suhu ekstrem, ketepatan alat pengukur dapat terganggu.
- **Hindari guncangan atau benturan yang keras pada alat ukur.** Apabila setelah terjadi pengaruh eksternal yang kuat pada alat ukur, disarankan untuk memeriksa akurasi alat ukur sebelum digunakan kembali (lihat „Pemeriksaan keakuratan alat ukur“, Halaman 39).
- **Matikan alat ukur saat memindahkan.** Jika alat ukur dimatikan, unit pendulum akan terkunci yang dapat rusak jika terkena guncangan.

### Menghidupkan/mematikan

Untuk **menghidupkan** alat pengukur, tekan tombol on/off (4). Indikator status (20) menyala. Setelah dihidupkan, alat pengukur segera memancarkan garis laser horizontal dari outlet depan (1).

- **Jangan mengarahkan sinar laser pada orang lain atau binatang dan jangan melihat ke sinar laser, juga tidak dari jarak jauh.**

Untuk **mematikan** alat pengukur, tekan kembali tombol on/off (4). Indikator status (20) padam. Unit pendulum akan terkunci ketika alat pengukur dimatikan.

- **Jangan biarkan alat ukur yang aktif berada di luar pengawasan dan matikan alat ukur setelah digunakan.** Sinar laser dapat menyilaukan mata orang lain.

### Mematikan pemadaman otomatis

Jika tidak ada tombol yang ditekan pada alat pengukur selama sekitar 30 menit, alat pengukur akan mati secara otomatis untuk menghemat energi.

Untuk menonaktifkan penonaktifan otomatis, tekan dan tahan tombol mode horizontal (6) selama 3 detik saat menghidupkan alat pengukur. Jika penonaktifan otomatis dinonaktifkan, sinar laser berkedip singkat setelah 3 detik.

Untuk mengaktifkan penonaktifan otomatis, matikan alat pengukur dan hidupkan kembali (tanpa menekan tombol).

## Mode pengoperasian

Alat pengukur dilengkapi beberapa mode pengoperasian yang dapat diganti setiap saat. Mode horizontal dan vertikal dapat diaktifkan dan dinonaktifkan secara terpisah. Setelah dihidupkan, alat pengukur berada pada mode horizontal dengan garis laser ke depan.

Semua mode pengoperasian dapat dipilih dengan levelling otomatis serta dengan penguncian pendulum.

### Mode horizontal (GLL 5-40 E) (lihat gambar A)

Pada mode horizontal, alat pengukur memancarkan garis laser horizontal ke depan.

Untuk mengaktifkan atau menonaktifkan garis laser horizontal, tekan tombol mode horizontal **(6)**.

### Mode horizontal (GLL 8-40 E) (lihat gambar A dan E)

Alat pengukur dilengkapi beberapa mode pengoperasian horizontal:

- Garis laser horizontal ke depan,
- Garis laser horizontal ke depan dan ke sisi kanan,
- Garis laser horizontal ke semua empat sisi.

Untuk mengaktifkan atau menonaktifkan mode horizontal serta untuk mengganti jenis mode horizontal, tekan tombol mode horizontal **(6)** beberapa kali hingga mencapai mode pengoperasian yang diinginkan.

### Mode vertikal dan titik tegak lurus (lihat gambar B-D)

Alat pengukur dilengkapi beberapa mode pengoperasian vertikal:

- Garis laser vertikal ke depan,
- Garis laser vertikal ke depan dan ke sisi kanan,
- Garis laser vertikal ke depan dan ke belakang,
- Garis laser vertikal ke semua empat sisi.

Selain itu, titik tegak lurus selalu diproyeksikan ke bawah dalam mode vertikal.

Untuk mengaktifkan atau menonaktifkan mode vertikal serta untuk mengganti jenis mode vertikal, tekan tombol mode vertikal **(3)** beberapa kali hingga mencapai mode pengoperasian yang diinginkan.

### Mode receiver

Untuk penggunaan dengan penerima sinar laser **(22)** mode receiver perlu diaktifkan terlepas dari mode pengoperasian yang dipilih.

Pada mode receiver, garis laser akan berkedip dengan frekuensi yang sangat tinggi sehingga penerima sinar laser **(22)** dapat terdeteksi.

Untuk mengaktifkan mode receiver, tekan tombol mode receiver **(5)**. Display mode receiver **(19)** menyala merah. Garis laser akan tampak kurang jelas untuk mata manusia saat mode receiver diaktifkan. Oleh karenanya, nonaktifkan mode receiver dengan menekan kembali tombol mode receiver **(5)** pada pengerjaan tanpa penerima sinar laser. Display mode receiver **(19)** menghilang.

## Levelling otomatis

### Bekerja dengan perataan otomatis

Saat bekerja dengan perataan otomatis, display penguncian pendulum **(21)** tidak menyala secara terus-menerus. Jika perlu, aktifkan kembali perataan otomatis dengan menekan tombol penguncian pendulum **(2)** sehingga display penguncian pendulum berkedip atau padam.

Pasang alat pengukur pada permukaan yang datar dan stabil atau kencangkan pada tripod **(24)**.

Perataan otomatis akan menyeimbangkan keadaan yang tidak rata di dalam rentang perataan otomatis dari  $\pm 3^\circ$  secara otomatis. Display penguncian pendulum **(21)** berkedip selama perataan berlangsung. Perataan akan berhenti begitu display penguncian pendulum padam.

Jika perataan otomatis tidak dapat dilakukan, misalnya karena permukaan posisi alat pengukur menyimpang lebih dari  $3^\circ$  dari posisi horizontal, display penguncian pendulum **(21)** akan berkedip secara terus-menerus.

Pada situasi tersebut, letakkan alat pengukur secara horizontal dan tunggu hingga perataan otomatis dimulai. Begitu perataan berhenti, display penguncian pendulum **(21)** padam.

Di luar rentang perataan otomatis sebesar  $\pm 3^\circ$ , pengerjaan dengan perataan otomatis tidak dapat dilakukan karena jika tidak, keakuratan perataan sinar laser atau sudut kanan antara sinar laser tidak terjamin.

Jika selama pengoperasian, alat ukur diguncangkan atau dipindahkan, alat ukur akan melakukan levelling secara otomatis. Setelah melakukan levelling kembali, periksa posisi garis laser horizontal atau vertikal terkait titik-titik acuan guna menghindari terjadinya kesalahan pengukuran akibat alat ukur bergeser.

### Bekerja dengan penguncian pendulum

Tekan tombol penguncian pendulum **(2)** untuk bekerja dengan penguncian pendulum. Saat bekerja dengan penguncian pendulum, display penguncian pendulum **(21)** menyala secara terus-menerus.

Saat bekerja dengan penguncian pendulum, levelling otomatis dinonaktifkan. Alat pengukur dapat dipegang dengan tangan atau ditempatkan pada permukaan yang miring. Garis laser tidak lagi diratakan dan harus tegak lurus satu sama lain.

## Pemeriksaan keakuratan alat ukur

### Pengaruh terhadap ketelitian

Suhu sekitar memberikan pengaruh terbesar. Khususnya perbedaan suhu dari tanah ke atas dapat mempengaruhi sinar laser.

Berhubung perbedaan dari lapisan-lapisan suhu di dekat tanah paling besar, alat ukur mulai jarak pengukuran sebesar 20 m sebaiknya selalu dipasang pada tripod. Selain itu alat ukur sebaiknya dipasang di bagian tengah permukaan kerja. Selain pengaruh dari luar, pengaruh khusus perangkat juga dapat menyebabkan kerusakan (seperti misalnya benturan atau guncangan keras). Oleh karena itu, periksa ketepatan levelling terlebih dahulu sebelum memulai proses.

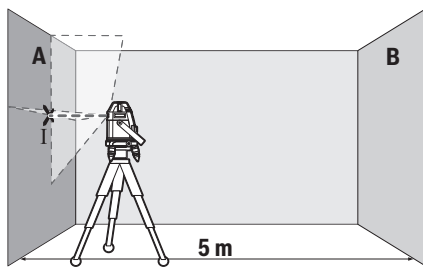
Pertama periksa tingginya serta ketepatan perataan garis laser horizontal, kemudian ketepatan perataan garis laser vertikal.

Jika pada pemeriksaan akurasi ternyata hasil pengukuran melebihi ambang batas maksimal, bawa alat pengukur ke Service Center **Bosch** untuk reparasi.

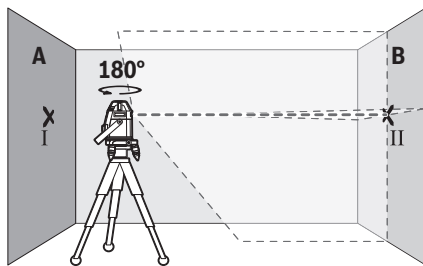
#### Periksa keakuratan ketinggian garis horizontal

Untuk melakukan pemeriksaan ini diperlukan jarak kosong sepanjang **5 m** pada permukaan yang stabil di antara dua dinding A dan B.

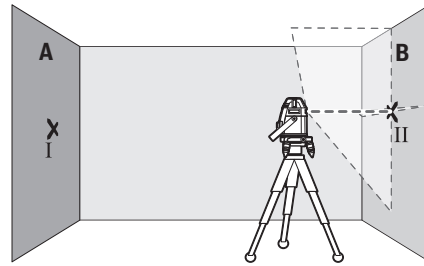
- Pasang alat pengukur di dekat dinding A pada tripod (**24**) atau letakkan pada permukaan yang stabil dan rata. Hidupkan alat pengukur dalam pengoperasian dengan perataan otomatis. Aktifkan mode horizontal dan mode vertikal masing-masing dengan garis laser ke depan.



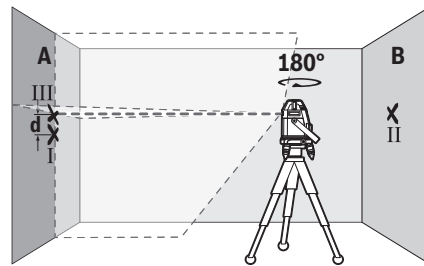
- Bidikan laser pada dinding A dan biarkan alat ukur melakukan levelling otomatis. Tandai bagian tengah titik di mana garis laser akan saling berpotongan pada dinding (titik I).



- Putar alat ukur sebesar  $180^\circ$ , biarkan alat ukur melakukan levelling otomatis dan tandai titik persimpangan garis laser di dinding B (titik II).
- Letakkan alat ukur tanpa diputar di dekat dinding B, aktifkan alat ukur dan biarkan alat ukur melakukan levelling otomatis.



- Sesuaikan tinggi alat ukur (dengan bantuan tripod atau jika perlu ditopang) sehingga titik perpotongan garis laser tepat menyentuh titik yang ditandai sebelumnya II pada dinding B.



- Putar alat ukur sebesar  $180^\circ$  tanpa mengubah ketinggian. Arahkan alat ukur pada dinding A sehingga garis laser vertikal melewati titik yang telah ditandai I. Biarkan alat ukur melakukan levelling secara otomatis dan tandai titik persimpangan garis laser di dinding A (titik III).
- Selisih **d** dari kedua titik yang ditandai I dan III pada dinding A memberikan deviasi ketinggian alat ukur yang sebenarnya.

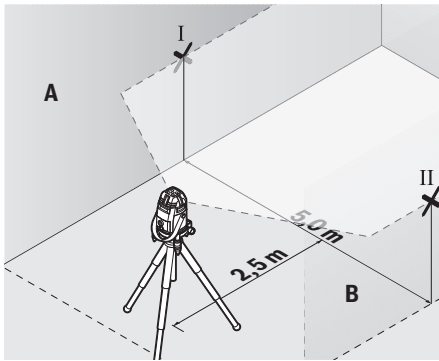
Pada jarak ukur  $2 \times 5 \text{ m} = 10 \text{ m}$  simpangan maksimal yang diperbolehkan adalah sebesar:

$10 \text{ m} \times \pm 0,1 \text{ mm/m} = \pm 1 \text{ mm}$ . Selisih **d** antara titik I dan III hanya diperbolehkan maksimum **1 mm**.

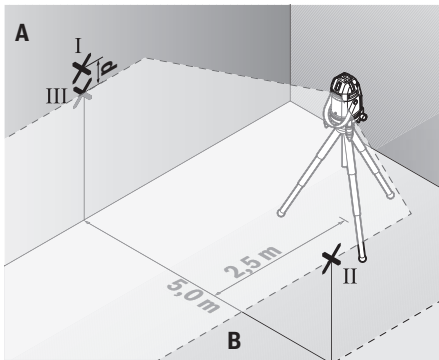
#### Periksa keakuratan perataan garis horizontal

Untuk pemeriksaan, diperlukan permukaan kosong sekitar  $5 \times 5 \text{ m}$ .

- Pasang alat pengukur di bagian tengah antara dinding A dan B pada tripod (**24**) atau letakkan pada permukaan yang stabil dan rata. Hidupkan alat pengukur dalam pengoperasian dengan perataan otomatis. Hidupkan mode horizontal dengan garis laser ke depan dan biarkan alat pengukur melakukan perataan.



- Pada jarak 2,5 m dari alat ukur, tandai titik tengah garis laser (titik I pada dinding A dan titik II pada dinding B) pada kedua dinding.



- Pasang alat pengukur dengan diputar sebesar  $180^\circ$  pada jarak 5 m dan biarkan alat ukur melakukan levelling.
- Sesuaikan alat ukur pada ketinggian yang cukup (dengan bantuan tripod atau dengan alas jika perlu), hingga titik tengah garis laser tepat berada sebelum titik II dan pada dinding B.
- Tandai titik tengah garis laser pada dinding A sebagai titik III (vertikal melalui dan di bawah titik I).
- Selisih  $d$  dari kedua titik yang ditandai I dan III pada dinding A memberikan alat pengukur pada garis horizontal.

Pada jarak ukur  $2 \times 5 \text{ m} = 10 \text{ m}$  simpangan maksimal yang diperbolehkan adalah sebesar:

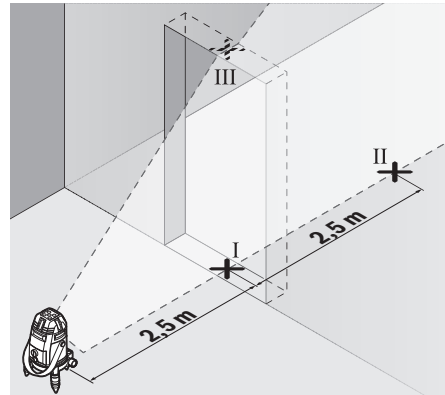
$10 \text{ m} \times \pm 0,1 \text{ mm/m} = \pm 1 \text{ mm}$ . Selisih  $d$  antara titik I dan III hanya diperbolehkan maksimum 1 mm.

#### Memeriksa keakuratan perataan garis vertikal

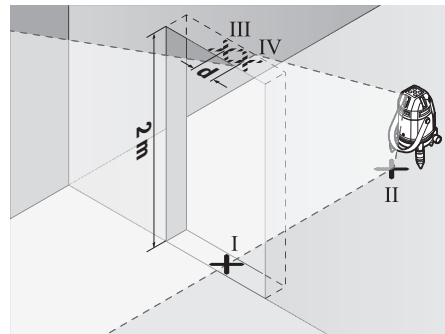
Untuk melakukan pemeriksaan ini diperlukan bukaan pintu dengan setiap sisi pintu minimal 2,5 m.

- Pasang alat pengukur pada jarak 2,5 m dari bukaan pintu di atas permukaan tanah yang stabil dan rata (tidak di atas tripod). Hidupkan alat pengukur dalam pengoperasian dengan perataan otomatis. Aktifkan mode vertikal dengan garis laser vertikal ke depan dan arahkan

garis laser pada bukaan pintu. Biarkan alat pengukur melakukan perataan.



- Tandai tengah garis laser vertikal di bagian bawah bukaan pintu (titik I), pada jarak 5 m di sisi lain pada bukaan pintu (titik II) dan di tepi atas bukaan pintu (titik III).



- Putar alat ukur sebesar  $180^\circ$  dan letakkan pada sisi lain dari bukaan pintu tepat di belakang titik II. Biarkan alat ukur melakukan levelling dan sesuaikan garis laser vertikal sehingga titik tengahnya tepat melewati titik I dan II.
- Tandai titik tengah garis laser di bagian atas bukaan pintu sebagai titik IV.
- Selisih  $d$  dari kedua titik yang ditandai III dan IV menyatakan deviasi alat ukur untuk garis vertikal.
- Ukur tinggi bukaan pintu.

Simpangan maksimal yang diperbolehkan dihitung sebagai berikut:

dua kali tinggi bukaan pintu  $\times 0,1 \text{ mm/m}$

contoh: Pada ketinggian bukaan pintu 2 m simpangan maksimal diperbolehkan sebesar

$2 \times 2 \text{ m} \times \pm 0,1 \text{ mm/m} = \pm 0,4 \text{ mm}$ . Titik III dan IV dapat terpisah maksimal sejauh 0,4 mm.

#### Petunjuk pemakaian

- Selalu hanya gunakan bagian tengah titik laser atau garis laser untuk menandai. Besarnya titik laser atau

lebarnya garis laser berubah sesuai dengan perubahan jarak.

### Bekerja dengan tripod (aksesori)

Tripod memberi posisi pengukuran yang stabil dan ketinggian yang dapat diatur. Letakkan landasan putar dengan dudukan tripod 5/8" (18) pada ulir tripod (24) atau tripod konstruksi standar. Kencangkan landasan putar dengan sekrup pengencang tripod.

Atur tripod sebelum menghidupkan alat ukur.

### Pengerjaan dengan penerima laser (aksesori)

Gunakan penerima laser (22) pada kondisi pencahayaan yang kurang baik (keadaan sekitar yang terlalu terang, paparan sinar matahari langsung) dan pada jarak yang lebar agar garis laser dapat terdeteksi dengan lebih baik. Aktifkan mode receiver (lihat „Mode receiver“, Halaman 39) dengan penerima laser saat melakukan pekerjaan.

### Kacamata laser (aksesori)

Kacamata laser berfungsi menyaring sinar yang berada di sekitar. Dengan demikian, sinar laser akan terlihat lebih terang untuk mata.

- ▶ **Jangan gunakan kacamata pelihat laser (aksesori) sebagai kacamata pelindung.** Kacamata pelihat laser digunakan untuk mendeteksi sinar laser dengan lebih baik, namun tidak melindungi dari sinar laser.
- ▶ **Jangan gunakan kacamata pelihat laser (aksesori) sebagai kacamata hitam atau di jalan raya.** Kacamata pelihat laser tidak menawarkan perlindungan penuh terhadap sinar UV dan mengurangi persepsi warna.

### Contoh penggunaan (lihat gambar A-E)

Contoh penggunaan alat ukur dapat dilihat pada halaman bergambar.

## Perawatan dan servis

### Perawatan dan pembersihan

Jaga kebersihan alat.

Jangan memasukkan alat pengukur ke dalam air atau cairan lainnya.

Jika alat kotor, bersihkan dengan lap yang lembut dan lembap. Jangan gunakan bahan pembersih atau zat pelarut. Bersihkanlah secara berkala terutama permukaan outlet sinar laser dan pastikan terbebas dari bulu halus.

Pindahkan dan simpan alat pengukur hanya di dalam koper (26).

Masukkan alat pengukur di dalam koper (26) jika hendak direparasi.

### Layanan pelanggan dan konsultasi penggunaan

Layanan pelanggan Bosch menjawab semua pertanyaan Anda tentang reparasi dan perawatan serta tentang suku cadang produk ini. Gambaran teknis (exploded view) dan informasi mengenai suku cadang dapat ditemukan di:

**www.bosch-pt.com**

Tim konsultasi penggunaan Bosch akan membantu Anda

menjawab pertanyaan seputar produk kami beserta aksesorinya.

Jika Anda hendak menanyakan sesuatu atau memesan suku cadang, selalu sebutkan nomor model yang terdiri dari 10 angka dan tercantum pada label tipe produk.

### Indonesia

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Fax: (021) 3005 5801  
E-Mail: boschpowertools@id.bosch.com  
www.bosch-pt.co.id

### Alamat layanan lainnya dapat ditemukan di:

www.bosch-pt.com/serviceaddresses

### Cara membuang

Alat ukur, aksesoris, dan kemasan harus didaur ulang dengan cara yang ramah lingkungan.



Jangan membuang alat ukur dan baterai bersama dengan sampah rumah tangga!

## Tiếng Việt

### Hướng dẫn an toàn



**Phải đọc và chú ý mọi hướng dẫn để đảm bảo an toàn và không bị nguy hiểm khi làm việc với dụng cụ đo. Khi sử dụng dụng cụ đo không phù hợp với các hướng dẫn ở trên, các thiết bị bảo vệ được tích hợp trong dụng cụ đo có thể bị suy giảm. Không bao giờ được làm cho các dấu hiệu cảnh báo trên dụng cụ đo không thể đọc được. HÃY BẢO QUẢN CẨN THẬN CÁC HƯỚNG DẪN NÀY VÀ ĐƯA KÈM THEO KHI BẠN CHUYỂN GIAO DỤNG CỤ ĐO.**

- ▶ **Thận trọng - nếu những thiết bị khác ngoài thiết bị hiệu chỉnh hoặc thiết bị điều khiển được nêu ở đây được sử dụng hoặc các phương pháp khác được tiến hành, có thể dẫn đến phơi nhiễm phóng xạ nguy hiểm.**
- ▶ **Máy đo được dán nhãn cảnh báo laser (được đánh dấu trong mô tả máy đo ở trang đồ thị).**
- ▶ **Nếu văn bản của nhãn cảnh báo laser không theo ngôn ngữ của bạn, hãy dán chống nhãn dính được cung cấp kèm theo bằng ngôn ngữ của nước bạn lên trên trước khi sử dụng lần đầu tiên.**



**Không được hướng tia laser vào người hoặc động vật và không được nhìn vào tia laser trực tiếp hoặc phản xạ.** Bởi vì bạn có thể chiếu lóa mắt người, gây tai nạn hoặc gây hỏng mắt.

- ▶ **Nếu tia laser hướng vào mắt, bạn phải nhắm mắt lại và ngay lập tức xoay đầu để tránh tia laser.**
- ▶ **Không thực hiện bất kỳ thay đổi nào ở thiết bị laser.**
- ▶ **Không sử dụng kính nhìn tia laser (Phụ kiện) làm kính bảo vệ.** Kính nhìn tia laser dùng để nhận biết tốt hơn tia laser; tuy nhiên kính không giúp bảo vệ mắt khỏi tia laser.
- ▶ **Không sử dụng kính nhìn tia laser (Phụ kiện) làm kính mát hoặc trong giao thông đường bộ.** Kính nhìn tia laser không chống UV hoàn toàn và giảm thiểu thụ cảm màu sắc.
- ▶ **Chỉ để người có chuyên môn được đào tạo sửa dụng cụ đo và chỉ dùng các phụ tùng gốc để sửa chữa.** Điều này đảm bảo cho sự an toàn của dụng cụ đo được giữ nguyên.
- ▶ **Không để trẻ em sử dụng dụng cụ đo laser khi không có người lớn giám sát.** Bạn có thể vô tình làm lóa mắt người khác.
- ▶ **Không làm việc với dụng cụ đo trong môi trường dễ nổ, mà trong đó có chất lỏng, khí ga hoặc bụi dễ cháy.** Các tia lửa có thể hình thành trong dụng cụ đo và có khả năng làm rác cháy hay ngún khói.
- ▶ **Chỉ sử dụng phích cắm điện tiếp hợp với điện áp đầu ra 6 V (Dòng điện một chiều). Hãy đọc và tuân thủ nghiêm ngặt các hướng dẫn an toàn và hướng dẫn làm việc của phích cắm tiếp hợp.**

## Mô Tả Sản Phẩm và Đặc Tính Kỹ Thuật

Xin lưu ý các hình minh hoạt trong phần trước của hướng dẫn vận hành.

### Sử dụng đúng cách

Dụng cụ đo được thiết kế để xác định và kiểm tra các đường ngang và dọc cũng như các điểm vuông góc.

Dụng cụ đo phù hợp để sử dụng trong vùng bên ngoài và bên trong.

### Các bộ phận được minh họa

Sự đánh số các biểu trưng của sản phẩm là để tham khảo hình minh họa dụng cụ đo trên trang hình ảnh.

- (1) Cửa chiếu luồng laser
- (2) Nút cơ cấu khóa con lắc

- (3) Nút vận hành dọc
- (4) Phím Bật/tắt
- (5) Nút Chế độ bộ thu
- (6) Nút vận hành ngang
- (7) Đai xách
- (8) Đế xoay
- (9) Vít tinh chỉnh của đế xoay
- (10) Ống nivô của đế xoay
- (11) Ổ cắm sạc 6 V
- (12) Nắp đậy ổ cắm nạp điện
- (13) Lẫy cài nắp đậy pin
- (14) Nắp đậy pin
- (15) Nhãn cảnh báo laser
- (16) Mã seri sản xuất
- (17) Vít điều chỉnh cao độ của đế xoay
- (18) Điểm nhận giá đỡ ba chân 5/8"
- (19) Hiển thị Chế độ bộ thu
- (20) Hiển thị trạng thái
- (21) Hiển thị cơ cấu khóa con lắc
- (22) Thiết bị thu laser
- (23) Kính nhìn laser
- (24) Giá đỡ ba chân<sup>A)</sup>
- (25) Cây chống<sup>A)</sup>
- (26) Hộp đựng

A) Phụ tùng được trình bày hay mô tả không phải là một phần của tiêu chuẩn hàng hóa được giao kèm theo sản phẩm. Bạn có thể tham khảo tổng thể các loại phụ tùng, phụ kiện trong chương trình phụ tùng của chúng tôi.

### Thông số kỹ thuật

Máy laser đường vạch	GLL 5-40 E
Máy laser đường vạch	GLL 8-40 E
Mã số máy GLL 5-40 E	3 601 K63 G..
Mã số máy GLL 8-40 E	3 601 K63 H..
Phạm vi làm việc <sup>A)</sup>	
– Với tia laser	15 m
– Với tia laser ở chế độ thu nhận	10 m
– Với thiết bị nhận tia	40 m
– Điểm chuẩn	2 m
Độ chính xác cân bằng tia laser <sup>B)</sup>	±0,1 mm/m
Phạm vi tự cân bằng	±3°
Nhiệt độ hoạt động	-10 °C ... +50 °C
Nhiệt độ lưu kho	-20 °C ... +70 °C
Chiều cao ứng dụng tối đa qua chiều cao tham chiếu	2000 m

<b>Máy laser đường vạch</b>	<b>GLL 5-40 E</b>
<b>Máy laser đường vạch</b>	<b>GLL 8-40 E</b>
Độ ẩm không khí tương đối tối đa	90 %
Mức độ ồn theo IEC 61010-1	2 <sup>C)</sup>
Cấp độ Laser	2
Loại Laser	635-650 nm, <1 mW
C <sub>e</sub>	1
<b>Phân kỳ</b>	
– Tia laser	0,5 mrad (Góc đầy)
– Điểm chuẩn	1,2 mrad (Góc đầy)
Thời gian xung động	50 µs
Tốc độ lặp xung	10 kHz
Điểm nhận giá đỡ ba chân	5/8"
<b>nguồn cung năng lượng</b>	
– Pin (kiềm-mangan)	4 × 1,5 V LR6 (AA)
– Dây cắm điện	6 V $\overline{\text{A}}$ , ≥ 500 mA
<b>Thời gian làm việc của pin</b>	
– Với 1 tia laser	24 h
– Với 5 tia laser	5 h
– Với 8 tia laser (GLL 8-40 E)	2,5 h
Trọng lượng theo Qui trình EPTA-Procedure 01:2014	1,1 kg
Kích thước (chiều dài × rộng × cao)	136 × 136 × 210 mm
Mức độ bảo vệ (chỉ khi để xoay được lắp)	IP 54 (được bảo vệ chống bụi và tia nước)

- A) Phạm vi làm việc có thể được giảm thông qua các điều kiện môi trường không thuận lợi (ví dụ như tia mặt trời chiếu trực tiếp).
- B) Giao tại nhà máy
- C) Chỉ có chất bẩn không dẫn xuất hiện, nhưng đôi khi độ dẫn điện tạm thời gây ra do ngưng tụ.

Số xêri (16) đều được ghi trên nhãn mác, để dễ dàng nhận dạng loại máy đo.

## Sự lắp vào

### Nuốn năng lượng cho dụng cụ đo

Có thể dùng pin thông thường cũng như phích cắm điện tiếp hợp có điện áp đầu ra 6 V (dòng điện một chiều) để vận hành máy.

Nếu vừa lắp pin vừa kết nối phích cắm điện tiếp hợp thì máy sẽ nhận diện năng từ phích cắm điện tiếp hợp.

### Hoạt Động bằng Pin Thường

Khuyến nghị sử dụng các pin kiềm mangan để vận hành dụng cụ đo.

Để mở nắp dây pin (14) bạn hãy xoay khóa giữ (13) bằng đồng xu hoặc tương tự. Hãy tháo nắp ngăn chứa pin. Lắp pin vào.

Xin hãy lưu ý lắp tương ứng đúng cực pin như được thể hiện mặt trong ngăn chứa pin.

Nếu pin yếu, hiển thị trạng thái (20) sẽ nhấp nháy. Lúc này vẫn còn có thể sử dụng máy.

Nếu pin cạn, dụng cụ đo sẽ không phản ứng khi nhấn phím nữa. Hiển thị trạng thái (20) nhấp khoảng 40 s tiếp theo, sau đó dụng cụ đo tự động tắt.

Luôn luôn thay tất cả pin cùng một lần. Chỉ sử dụng pin cùng một hiệu và có cùng một điện dung.

► **Tháo ắc quy ra khỏi dụng cụ đo nếu bạn không muốn sử dụng thiết bị trong thời gian dài.** Pin có thể hư mòn sau thời gian bảo quản lâu trong dụng cụ đo và tự xả điện.

### Hoạt động với Dây Cắm Điện

Mở nắp dây của (12) ổ cắm nạp điện 6-V (11).

Cắm phích cắm sạc của phích cắm tiếp hợp 6-V thông thường vào ổ cắm nạp điện (11). Kết nối dây cắm điện vào nguồn điện chính.

Đóng nắp (12) lại để chống bắn nếu bạn tháo phích cắm sạc.

### Làm việc với đế xoay

Tháo chân của đế xoay ra (8) với vít điều chỉnh chiều cao (17).

Điều chỉnh sơ bộ đế xoay bằng ống nivô (10).

Nhờ vít tinh chỉnh (9) bạn có thể chỉnh hướng các vạch laser thẳng đứng một cách chính xác tại các điểm tham chiếu.

Khi bạn muốn sử dụng máy không có đế xoay, hãy liên lạc với trung tâm dịch vụ được ủy quyền của **Bosch**. Nếu không điều chỉnh chế độ vận hành không có đế xoay, có thể làm mất độ chính xác của máy đo.

## Vận Hành

### Bắt Đầu Vận Hành

► **Bảo vệ dụng cụ đo tránh khỏi ẩm ướt và không để bức xạ mặt trời chiếu trực tiếp vào.**

► **Không cho dụng cụ đo tiếp xúc với nhiệt độ khắc nghiệt hoặc dao động nhiệt độ.** Không để nó trong chế độ tự động quá lâu. Hãy cho điều chỉnh nhiệt độ cho dụng cụ đo khi dao động nhiệt độ lớn và luôn tiến hành kiểm tra độ chính xác trước khi làm việc tiếp (xem „Kiểm tra độ chính xác của dụng cụ đo“, Trang 46).

Trong trường hợp ở trạng thái nhiệt độ cực độ hay nhiệt độ thay đổi thái quá, sự chính xác của dụng cụ đo có thể bị hư hỏng.

► **Tránh va chạm mạnh hoặc làm rơi dụng cụ đo.** Sau khi có tác động mạnh từ bên ngoài lên dụng cụ đo, cần tiến hành kiểm tra độ chính xác

trước khi tiếp tục (xem „Kiểm tra độ chính xác của dụng cụ đo“, Trang 46).

- **Hãy tắt dụng cụ đo, khi bạn vận chuyển.** Khi tắt máy, bộ phận lấy cốt thủy chuẩn được khóa lại, bộ phận này có thể bị hư hỏng trong trường hợp bị di chuyển cực mạnh.

#### Bật Mở và Tắt

Để **bật** dụng cụ đo, bạn hãy ấn phím bật/tắt (4). Hiện thị trạng thái (20) sẽ chiếu sáng. Sau khi bật, dụng cụ đo ngay lập tức phát tia laser ngang từ cửa chiếu phía trước (1).

- **Không được chia luồng laser vào con người hay động vật và không được tự chính bạn nhìn vào luồng laser, ngay cả khi từ một khoảng cách lớn.**

Để **tắt** dụng cụ đo, bạn hãy ấn lại nút bật/tắt (4). Hiện thị trạng thái (20) sẽ tắt. Khi tắt, trạm con lắc được khóa.

- **Không cho phép dụng cụ đo đang bật một cách không kiểm soát và hãy tắt dụng cụ đo sau khi sử dụng.** Tia Laser có thể chiếu vào những người khác.

#### Khử Hoạt Chức Năng Tắt Tự Động

Nếu trong khoảng 30 phút không có nút nào trên dụng cụ đo được nhấn, dụng cụ đo sẽ tự động tắt để tiết kiệm năng lượng.

Để tắt chế độ tự động ngắt, bạn hãy giữ nút chế độ vận hành ngang khi đang bật máy trong (6) 3 s. Khi ngưng chế độ tự động tắt, tia laser sẽ nhấp nháy nhanh chóng sau 3 s.

Để kích hoạt tắt tự động, bạn hãy tắt máy đo và bật lên lần nữa (không cần nhấn nút).

#### Chế độ hoạt động

Dụng cụ đo có một vài chức năng hoạt động mà bạn có thể chuyển đổi qua lại bất cứ khi nào. Vận hành ngang và dọc có thể được tắt và bật mà không phụ thuộc với nhau. Sau khi bật, dụng cụ đo ở trạng thái vận hành ngang với một tia laser về phía trước.

Tất cả chế độ hoạt động đều có thể được chọn với Chế độ tự động cân bằng và với cơ cấu khóa con lắc.

#### Chế độ vận hành ngang (GLL 5-40 E) (xem Hình A)

Trong chế độ vận hành ngang, dụng cụ đo phát ra một tia laser nằm ngang về phía trước.

Để tắt hoặc bật tia laser nằm ngang, bạn nhấn nút chế độ vận hành ngang (6).

#### Chế độ vận hành ngang (GLL 8-40 E) (xem Hình A và E)

Dụng cụ đo có một số chế độ vận hành ngang:

- tia laser ngang hướng về phía trước,
- tia laser ngang hướng về phía trước và sang bên phải,

- tia laser ngang hướng về cả bốn phía.

Để bật hoặc tắt chế độ vận hành ngang cũng như để thay đổi chế độ vận hành ngang, bạn nhấn nút vận hành ngang (6) liên tục, cho tới khi đạt chế độ vận hành mong muốn.

#### Chế độ vận hành dọc và điểm chuẩn (xem Hình B-D)

Dụng cụ đo có một số chế độ vận hành dọc:

- tia laser dọc hướng về phía trước,
- tia laser dọc hướng về phía trước và sang bên phải,
- tia laser dọc hướng về phía trước và ra phía sau,
- tia laser dọc hướng về cả bốn phía.

Ngoài ra, điểm chuẩn luôn được chiếu xuống dưới trong chế độ vận hành dọc.

Để bật hoặc tắt vận hành dọc cũng như để thay đổi chế độ vận hành dọc, bạn nhấn nút vận hành dọc (3) liên tục, cho tới khi đạt chế độ vận hành mong muốn.

#### Chế độ bộ thu

Để làm việc với bộ thu tia laser (22) phải được kích hoạt độc lập với kiểu vận hành đã chọn chế độ bộ thu.

Trong chế độ bộ thu các tia laser nhấp nháy với tần số cao và có thể phát hiện được cho bộ thu tia laser (22).

Hãy nhấn phím Chế độ bộ thu (5) để bật chế độ bộ thu. Hiện thị Chế độ bộ thu (19) phát sáng màu đỏ. Độ rõ của tia laser phải được kiểm tra phù hợp với mắt người khi bật chế độ bộ thu. Khi làm việc không có bộ thu laser bạn cần tắt chế độ bộ thu bằng cách nhấn nút Chế độ bộ thu (5). Hiện thị Chế độ bộ thu (19) tắt.

#### Lấy Cốt Thủy Chuẩn Tự Động

##### Vận Hành với Chức Năng Lấy Cốt Thủy Chuẩn Tự Động

Khi làm việc với chế độ tự động cân bằng thì hiển thị cơ cấu khóa con lắc (21) không được sáng quá lâu. Nếu cần thiết hãy nhấn nút cơ cấu khóa con lắc (2) để bật lại chế độ cân bằng tự động nếu cần, nhờ vậy mà hiển thị cơ cấu khóa con lắc nhấp nháy hoặc tắt.

Bạn hãy đặt máy đo lên một mặt nền cố định, nằm ngang hoặc cố định máy trên giá ba chân (24).

Chế độ tự động cân bằng sẽ tự động điều chỉnh bằng phẳng trong phạm vi tự cân bằng từ  $\pm 3^\circ$ .

Trong khi cân bằng, hiển thị cơ cấu khóa con lắc (21) sẽ nhấp nháy. Chế độ lấy cốt thủy chuẩn kết thúc ngay khi hiển thị cơ cấu khóa con lắc tắt.

Nếu không thể tự động lấy cốt thủy chuẩn, ví dụ vì bề mặt đặt dụng cụ đo bị dốc hơn  $3^\circ$  so với bề mặt bằng phẳng, hiển thị cơ cấu khóa con lắc (21) sẽ nhấp nháy liên tục.

Trong trường hợp này, đưa dụng cụ đo về vị trí bằng phẳng và đợi cho sự tự lấy cốt thủy chuẩn diễn ra. Ngay khi kết thúc việc cân bằng, hiển thị cơ cấu khóa con lắc (21) sẽ tắt.

Không thể làm việc cùng hệ thống lấy cốt thủy chuẩn tự động ngoài phạm vi tự cân bằng  $\pm 3^\circ$ , bởi vì cốt thủy chuẩn chính xác của tia laser hay góc bên phải giữa các tia laser không được đảm bảo.

Khi có rung động hoặc thay đổi vị trí trong lúc vận hành, máy đo sẽ tự động cân bằng trở lại. Sau khi tự cân bằng lại, hãy kiểm tra vị trí vạch laser ở phương thẳng đứng hoặc nằm ngang để tránh lỗi do di chuyển dụng cụ đo.

#### Vận Hành với cơ cấu khóa con lắc

Để làm việc với cơ cấu khóa con lắc hãy nhấn nút cơ cấu khóa con lắc (2). Khi làm việc với cơ cấu khóa con lắc, hiển thị cơ cấu khóa con lắc (21) sẽ sáng liên tục.

Khi vận hành với cơ cấu khóa con lắc, chế độ tự động cân bằng được tắt. Bạn có thể tự do cầm dụng cụ đo theo mọi cách trong tay hay đặt trên một bề mặt nghiêng. Các đường laser không còn được cân bằng và không còn hoạt động theo chiều thẳng đứng đối xứng nhau nữa.

#### Kiểm tra độ chính xác của dụng cụ đo

##### Những Ảnh Hưởng Đến độ Chính xác

Nhiệt độ chung quanh có ảnh hưởng lớn nhất. Đặc biệt là sự sai biệt của nhiệt độ xảy ra từ mặt đất hướng lên có thể làm lệch hướng luồng laser.

Bởi vì sự khác biệt lớn nhất của các tầng nhiệt độ là ở nơi gần mặt đất, nên luôn luôn lắp dụng cụ đo lên giá đỡ khi khoảng cách đo nằm ngoài tầm 20 m. Nếu có thể, cũng nên đặt dụng cụ đo vào chính giữa khu vực làm việc.

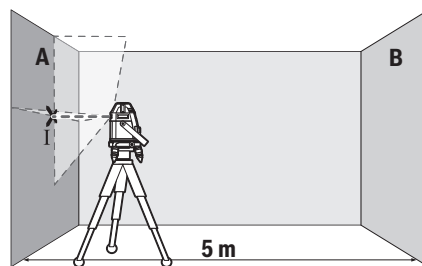
Bên cạnh các tác động ngoài, các tác động ảnh hưởng trực tiếp tới thiết bị (như rơi hoặc va đập mạnh) có thể gây ra các sai lệch. Do đó, hãy kiểm tra mức độ chính xác trước khi bắt đầu công việc. Trước tiên bạn hãy kiểm tra tương ứng chiều cao cũng như độ chính xác cân bằng của vạch laser nằm ngang, sau đó là của vạch nằm dọc.

Nếu giả như dụng cụ đo lệch hướng vượt mức tối đa tại một trong những lần kiểm tra, xin vui lòng mang đến trạm phục vụ hàng đã bán của **Bosch** để được sửa chữa.

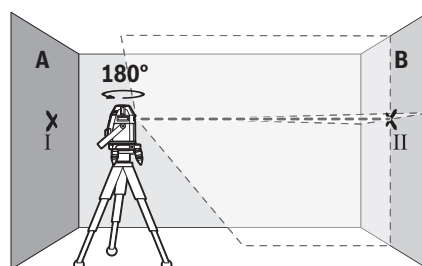
#### Kiểm tra chiều cao chính xác của vạch nằm ngang

Để kiểm tra, bạn cần một đoạn đo thoáng dài 5 m trên mặt nền vững chắc giữa tường A và B.

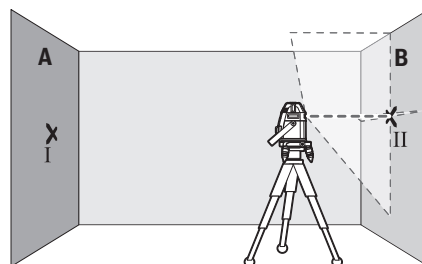
- Lắp đặt máy trên Giá đỡ ba chân cạnh bức tường A (24) hoặc đặt trên một nền đất bằng phẳng, chắc chắn. Bạn hãy bật máy đo vận hành với tự động cân bằng. Bật chế độ vận hành ngang cũng như chế độ vận hành dọc với một tia laser về trước.



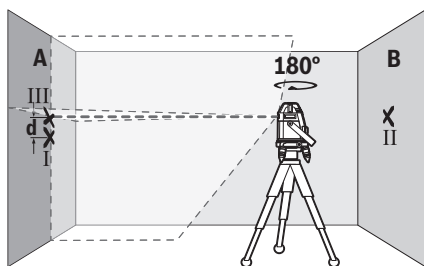
- Hướng thẳng luồng laser vào tường A gần bên và để dụng cụ đo chiếu vào. Đánh dấu điểm giữa của điểm giao nhau của các tia laser trên bức tường (điểm I).



- Hãy xoay dụng cụ đo  $180^\circ$ , để dụng cụ đo cân bằng và đánh dấu điểm giao nhau của tia laser ở tường đối diện B (điểm II).
- Hãy đặt dụng cụ đo – mà không xoay – gần tường B, hãy bật và để dụng cụ cân bằng.



- Hãy căn chỉnh dụng cụ đo ở mức độ cao (nhờ giá đỡ ba chân hoặc bằng cách đặt xuống dưới nếu cần) sao cho điểm giao nhau của tia laser gặp điểm đã đánh dấu trước đó II trên tường B.



- Xoay dụng cụ đo 180° mà không thay đổi chiều cao. Hãy hướng nó lên tường A sao cho tia laser dọc chạy qua điểm đã đánh dấu I. Hãy để dụng cụ đo cân bằng và đánh dấu điểm giao nhau của tia laser trên tường A (điểm III).
- Sự chênh lệch  $d$  của cả hai điểm đã đánh dấu I và III trên tường A dẫn đến lệch chiều cao thực tế của dụng cụ đo.

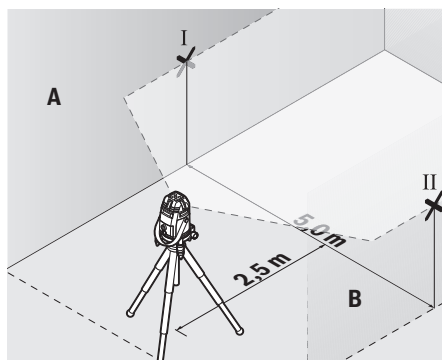
Trên đoạn đường đo  $2 \times 5 \text{ m} = 10 \text{ m}$ , biên độ chênh lệch cho phép tối đa là:

$10 \text{ m} \times \pm 0,1 \text{ mm/m} = \pm 1 \text{ mm}$ . Do đó, chênh lệch  $d$  giữa điểm I và III được phép cao nhất là 1 mm.

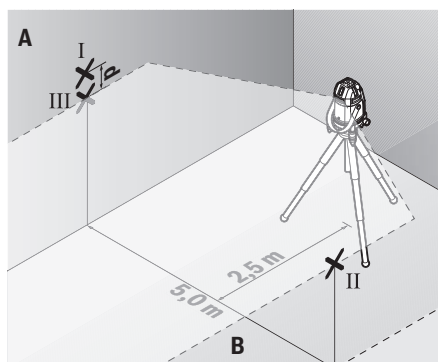
#### Kiểm tra độ chính xác khi cân bằng của vạch nằm ngang

Để kiểm tra, bạn cần một mặt phẳng thoáng khoảng  $5 \times 5 \text{ m}$ .

- Hãy lắp dụng cụ đo ở điểm giữa hai bức tường A và B trên Giá đỡ ba chân (24) hoặc để nó trên nền bằng phẳng, vững chắc. Bạn hãy bật máy đo vận hành với tự động cân bằng. Bật chế độ vận hành ngang với một tia laser về phía trước và để dụng cụ đo cân bằng.



- Hãy đánh dấu tâm điểm của vạch laze cách xa dụng cụ đo 2,5 m ở cả hai thành (điểm I trên thành A và điểm II trên thành B).



- Đặt dụng cụ đo xoay 180° cách xa 5 m và để nó tự cân bằng.
- Căn chỉnh chiều cao của dụng cụ (nhờ giá đỡ ba chân hoặc đặt nằm) sao cho tâm điểm của vạch laze chạm đúng vào điểm II đã được đánh dấu sẵn trên thành B.
- Hãy đánh dấu tâm điểm của vạch laze làm điểm III (thẳng đứng trên hoặc dưới điểm I) trên thành A.
- Chênh lệch  $d$  của cả hai điểm I và III đã được đánh dấu trên thành A chính là độ lệch thực tế của dụng cụ đo ở phương ngang.

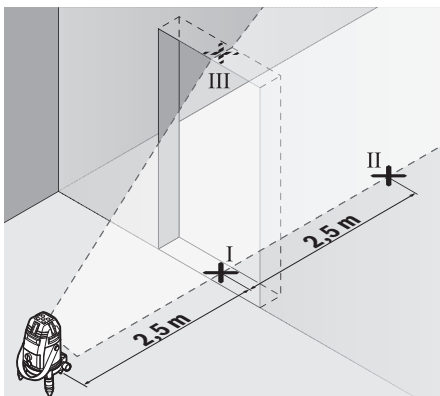
Trên đoạn đường đo  $2 \times 5 \text{ m} = 10 \text{ m}$ , biên độ chênh lệch cho phép tối đa là:

$10 \text{ m} \times \pm 0,1 \text{ mm/m} = \pm 1 \text{ mm}$ . Do đó, chênh lệch  $d$  giữa điểm I và III được phép cao nhất là 1 mm.

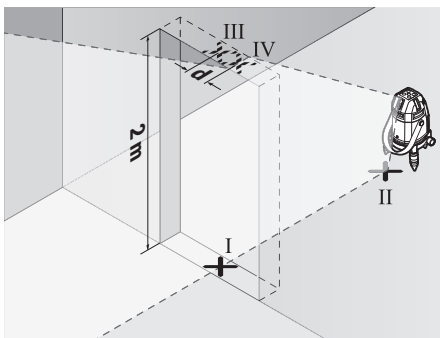
#### Kiểm Tra Cốt Thủy Chuẩn Chính Xác của các Đường Laze Thẳng Đứng

Đối với kiểm tra loại này, khung cửa trống cần mỗi bên cửa rộng ít nhất là 2,5 m (trên một bề mặt ổn định).

- Dụng máy cách cửa mở 2,5 m trên nền bằng phẳng, vững chắc (không dựng trên giá ba chân). Bạn hãy bật máy đo vận hành với tự động cân bằng. Bật vận hành dọc với một tia laser thẳng đứng hướng về trước và chỉnh hướng tia laser vào cửa mở. Hãy để máy cân bằng.



- Hãy đánh dấu điểm giữa của tia laser dọc trên sàn của khung cửa trống (điểm I), ở khoảng cách 5 m ở phía còn lại của khung cửa trống (điểm II) cũng như ở mép trên của khung cửa trống (điểm III).



- Hãy xoay dụng cụ đo  $180^\circ$  và đặt nó trên phía còn lại của khung cửa trống ngay sau điểm II. Hãy để dụng cụ đo cân bằng và hướng tia laser dọc sao cho điểm giữa của nó chạy qua điểm I và II.
- Hãy đánh dấu điểm giữa của tia laser trên mép của khung cửa trống làm điểm IV.
- Sự chênh lệch  $d$  của cả hai điểm đã đánh dấu III và IV dẫn đến độ lệch thực tế của dụng cụ đo so với phương thẳng đứng.
- Đo chiều cao của khung cửa trống.  
Hãy tính độ lệch cho phép tối đa như sau:  
hai lần chiều cao của cửa mở  $\times 0,1 \text{ mm/m}$   
Ví dụ: Khi chiều cao của cửa mở là 2 m, độ chênh lệch tối đa là  
 $2 \times 2 \text{ m} \times \pm 0,1 \text{ mm/m} = \pm 0,4 \text{ mm}$ . Các điểm III và IV được phép cách nhau nhiều nhất là 0,4 mm.

### Hướng Dẫn Sử Dụng

- Chỉ luôn sử dụng tâm của điểm laser hoặc tia laser để đánh dấu.** Kích thước của tiêu điểm

laser cũng như bề rộng của tia laser thay đổi theo khoảng cách.

### Sử dụng giá đỡ ba chân (phụ kiện)

Giá đỡ ba chân cung cấp khả năng đo ổn định và linh hoạt. Đặt để xoay với điểm nhận giá đỡ ba chân 5/8" (18) lên ren của giá đỡ ba chân (24) hoặc của một giá đỡ ba chân thông thường. Vặn chặt để xoay bằng vít cố định của giá đỡ ba chân.

Điều chỉnh sơ giá đỡ trước khi cho dụng cụ đo hoạt động.

### Làm việc với bộ thu laser (Phụ kiện)

Khi điều kiện ánh sáng không thuận lợi (vùng xung quanh sáng, ánh nắng mặt trời trực tiếp) và khoảng cách xa, bạn hãy sử dụng bộ thu laser để phát hiện tia laser tốt hơn (22). Hãy bật chế độ bộ thu (xem „Chế độ bộ thu“, Trang 45) khi làm việc với bộ thu laser.

### Kính nhìn laser (phụ kiện)

Kính nhìn laser sẽ lọc nguồn ánh sáng xung quanh. Do đó ánh sáng của laser sẽ sáng hơn đối với mắt.

- Không sử dụng kính nhìn tia laser (Phụ kiện) làm kính bảo vệ.** Kính nhìn tia laser dùng để nhận biết tốt hơn tia laser; tuy nhiên kính không giúp bảo vệ mắt khỏi tia laser.

- Không sử dụng kính nhìn tia laser (Phụ kiện) làm kính mát hoặc trong giao thông đường bộ.** Kính nhìn tia laser không chống UV hoàn toàn và giảm thiểu thụ cảm màu sắc.

### Công việc theo Thí dụ (Xem Hình ảnh A–E)

Các ứng dụng mẫu cho dụng cụ đo có thể tra cứu trên các trang hình ảnh.

## Bảo Dưỡng và Bảo Quản

### Bảo Dưỡng Và Làm Sạch

Luôn luôn giữ cho dụng cụ đo thật sạch sẽ.

Không được nhúng dụng cụ đo vào trong nước hay các chất lỏng khác.

Lau sạch bụi bẩn bằng một mảnh vải mềm và ẩm. Không được sử dụng chất tẩy rửa.

Thường xuyên lau sạch bề mặt các cửa chiếu laser một cách kỹ lưỡng, và lưu ý đến các tưa vải hay sợi chỉ.

Bảo quản và vận chuyển dụng cụ đo trong hộp đựng (26).

Gửi dụng cụ trong hộp đựng (26) trong trường hợp cần sửa chữa.

### Dịch vụ hỗ trợ khách hàng và tư vấn sử dụng

Bộ phận phục vụ hàng sau khi bán của chúng tôi trả lời các câu hỏi liên quan đến việc bảo dưỡng và sửa chữa các sản phẩm cũng như phụ tùng thay thế của bạn. Sơ đồ mô tả và thông tin về phụ tùng

thay thế cũng có thể tra cứu theo dưới đây:

**[www.bosch-pt.com](http://www.bosch-pt.com)**

Đội ngũ tư vấn sử dụng của Bosch sẽ giúp bạn giải đáp các thắc mắc về sản phẩm và phụ kiện.

Trong tất cả các phản hồi và đơn đặt phụ tùng, xin vui lòng luôn luôn nhập số hàng hóa 10 chữ số theo nhãn của hàng hóa.

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#### **Xem thêm địa chỉ dịch vụ tại:**

[www.bosch-pt.com/serviceaddresses](http://www.bosch-pt.com/serviceaddresses)

#### **Sự thải bỏ**

Dụng cụ đo, phụ kiện và bao bì phải được phân loại để tái chế theo hướng thân thiện với môi trường.



Không vứt dụng cụ đo và pin cùng trong rác thải của gia đình!