Laser Levels Online

Setting a Slope (Fall/Grade)

Handy Tips & Advice

HOW TO SET SLOPES (FALLS/GRADES)

Working Example

The following description in this guide, explains the general principles of setting a Slope (Fall/Grade) when using a Rotary Laser Level with a Remote Control.

Equipment
You will need the Laser Level, a surveying tripod, measuring staff (rod) with mm scale and a laser detector/receiver. You will also need the remote control or if you have arrow keys on the laser keypad those can be used instead. ***If your Laser Level does not have arrow keys on the Laser keypad, you will also need a remote control as you cannot set a gradient and slope without this.***

Site Conditions
There are many different work site scenarios. As an example, we are assuming that you are outside on a site with a clear field of view and planning to set drainage falls.

All above ground and below ground drainage pipes should be laid to an adequate gradient. The fall in a pipe is defined as the vertical height by which the pipe drops over a known distance. e.g. a 2.5% gradient is a fall of 1m over 40m or 1:40. (1 in 40).
Typically, surface water or foul water drainage pipes are set between 1:40 to 1:80.

If a gradient is too steep i.e. steeper than 1 in 40, the liquid may run faster than the solids in a foul water pipe thus leaving the solids stranded, which could then block the pipe. Conversely, if a gradient is not steep enough (usually less than 1 in 110), then the pipe may still block, if the solids slow down and become stranded.

Procedure
Place the Laser Level horizontally on the surveying tripod, switch it ON and allow it to auto (self) level. Note the X-axis / Y-axis markings on the top cover of the laser.

Setting a 1:40 gradient: Position the measuring staff at 10m away from the tripod, held vertically and move the laser detector (receiver) along the staff to find the set level position, usually by giving a continuous audible tone. By proportion, a 1m fall at 40m is only 250mm at 10m, so carefully noting the set level dimension on the rear of the staff, move the detector **down** by 250mm and clamp tight.

Using the remote control (from the staff location) or a colleague at the laser, press the Manual Override button and have the axis to be adjusted facing the measuring staff.

Hold the “down arrow” button on the remote control or laser’s keypad, to slope the laser beam down the measuring staff until it gives a continuous tone again, having found set level on the detector. **This has now set a 1:40 fall.**
Return the laser detector to the original set level dimension on the staff.
Dig out ground & lower staff until the laser detector picks up the laser beam again.

HOW TO SET SLOPES (FALLS/GRADES)

Working Example (Continued)

Important note: All "grade facility" rotary lasers revert back to the auto (self) level condition if switched **Off** without retaining the gradient set. So its recommended to complete the ground-works before switching the laser Off.

Once this 1:40 fall is set, the User can use this inclined laser beam as a datum to set the depth of either the crown of the drainage pipe or the Invert level, anywhere in range of the laser – along that same axis.

Invert level of a pipe – is the level taken from the bottom of the inside of the pipe.
Crown of a pipe – is the Invert level plus the internal diameter of the pipe plus the pipe wall thickness. It may be necessary to use this in calculations when level measurements are taken from the crown of a pipe.

Manhole / Access Chambers:
A manhole or access chamber is required to gain access to a drainage system for un-blocking, cleaning, rodding or inspection. (Land drainage systems excluded). They can be manufactured in PVC, masonry or pre-cast concrete.

When setting appropriate drainage gradients it is important to allow for the depth down to either the crown of the pipe (or the Invert level) from ground level, when using these manholes.

Dual Grading:
A rotary laser level with dual grading facility can be used for setting out driveways, car-parks or areas with slopes (falls) in BOTH the X & Y axis.

The same procedure is adopted as above for drainage runs, except a second step in the process is undertaken to set the laser to a fall in the other axis, to complete the dual grade setting-out.

Cut & Fill Machine control work:
If slopes of more than 10% (1:10) are required, which is outside the range of electronic adjustment of the rotary laser's prism; then simply switch the laser to Manual & fit a "Laser Grade Adapter" between the top face of the tripod & the base of the laser. Then set the required slope. Search our website for more details.

CHECKING THE CALIBRATION

Controlled Test

If you believe the Laser is not giving accurate datums (after ensuring you have completely ruled out refraction of the laser beam explained on page **5**), please carry out the following controlled test in your office, or another indoor location.

- Position the Laser Level on it's tripod in the **middle** of your office, garage, workshop etc... somewhere where you have space (10m or similar).
- Ensure there is no glazing or reflective surfaces in line of sight of the laser beam. This is to prevent the Refraction of the laser beam (See Refraction Issues section on page **5** for further details).
- Turn off all the lights and press the **ON/OFF** button once and the Laser Level will power on and begin automatically self-levelling horizontally.
- ***No other button needs to be pressed for the laser to self level.***
- This self levelling process takes around 15-20 seconds and then the prism will start spinning and will project a laser beam 360 degrees around the room.
- With the laser level keypad facing your chest (towards you) walk to the left hand wall and mark the position of the laser beam on the wall.
- With the laser level keypad facing your chest (towards you) walk to the right hand wall and mark the position of the laser beam on the wall.
- Walk back to the laser and carefully twist the laser level round so the laser keypad now faces the left wall.
- ***Be extremely careful not to overly disturb the laser when twisting it round to the point the tripod position moves or is kicked.***
- The laser will momentarily stop and re-start when turned round. This is normal. The laser will then self level again and project a laser beam 360 degrees around the room.
- Walk to the datum marks on both the left and right wall. You should see that the beam is hitting these marks.
- **If it is hitting the datum marks then the laser is operating correctly.**

If it's not hitting the datum mark's...
(and you have 100% ruled out Refraction and have not pressed Manual override)
Please contact the Service Department: **08000 869 769** who will be able to advise how to send it for repair / calibration.

REFRACTION ISSUES

Product types: All Rotary and Cross line laser levels

Although there will always be the 0.1% of products that develop a fault, 99.9% of the technical enquiries we receive relating to “incorrect levels”, “random positions”, “out-of-level” or “Detector not picking up the beam correctly” transpire to being Refraction of the laser beam.

Laser levelling equipment is used by many different industries in various work-site environments. Users should be aware of the possibility of refraction problems, when using this type of equipment.

“Refraction” is the phenomenon where light is transmitted but moves direction when it passes from one medium to another e.g. through air then glass or water. This is why a pond of water appears shallower than it actually is or when you shine a torch at a window and the beam bounces off to another position. In the same way, this refraction can affect the correct setting-out, when using laser beams.

An easy example to understand is if, for example, a rotary laser is operated with a double-glazed window behind it. The true level position can be refracted and the deviation can be appreciable, even over small distances. In some instances, a double beam position can occur and the wrong level marked.

Our advice is to be aware of this and take appropriate care when setting out with your laser level, **both** indoor & outdoors.

A simple *fix* (if the laser cannot be moved or lowered) is to position a simple brown cardboard cover over the laser level on the side towards the refraction surface.

The following surfaces can potentially be problematic:
All glazing - single, double or treble glazed units. Patio / Bi-fold glass doors etc.
Glazed office partitioning.
Vehicle or Site Plant - glass windows & windscreens. (Curved windows are the worst)
Panel van sides - wet surfaces.
Mirrors & mirrored surfaces.
Stainless steel, shiny aluminum panels & reflective Celotex panels
Water – fountains, water displays, rivers, dams and weirs etc.

In addition, please be aware of the effects of amber & green warning beacons on plant & equipment. This “strobe effect” is a known problem and can affect all types of laser detectors to give erratic readings.

Our main advice is just to be site-aware when using laser levelling equipment, to ensure the reliable and accurate setting-out of your jobs.

It’s also important to understand that refraction of the beam, occurs with all lasers regardless of cost and or brand purchased.

CARE & MAINTENANCE

Protecting the Laser Level Kit

- Your Laser Level is precision levelling equipment and should be treated as such. Always handle with care and transport within the carry case provided.
- Always turn the laser level off when transporting or moving around the job site.
- Ensure the laser & accessories are clean and dry before storing in the case.
- If wet, dry well before storing and store the case and contents at room temperature. Failure to do so may void warranty.
- ***NEVER store the Laser Level Kit in a van, car or an unheated location (workshop / shed / garage / lockup etc.) overnight. The Laser Level Kit is designed to work in cold and wet conditions but it's the storage of the product when not in use that is critical. Keeping it in a secure heated building increases the usable life of the product and reduces the possibility of theft.***
- When the laser level is not in use or is being stored long term, it is highly recommended to remove the batteries or battery pack from the base of the laser as well as the batteries in the remote control and detector.
- Ensure the protective lighthouse glass is clean and free of dust and dirt at all times.
- Only use the supplied charger with the laser. The charger is for indoor use only. If the charger becomes damaged, stop using immediately and purchase a replacement. ***Never use a generic charger with this laser.***
- Always check the accuracy of the laser level before precision levelling is attempted. Failure to do so may result in inaccurate levels. See page **20** for further details.
- If the Laser Level has received a heavy impact or has been dropped, please ensure the calibration is checked.
- There are no user serviceable parts inside the Laser Level. Warranty void if tampered.

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