

L400 Laser Instrument Manual V1.7

English



L400 Laser instrument

For accurate height- distance and angle measuring in the field.

Art no: L400 Laser Class: 1 (USA, Canada) 3A (EU, other countries)
Product conforms to all provisions of US21CFR 1040.10 and 1040.11 and IEC 60825-1. For safety instructions and precautions, please see page 16 in this manual.

Includes: Laser Measuring instrument, soft carrying case, battery and manual. Manuals are also available in PDF-format for download on www.haglofsweden.com Continuous updates and language additions are made to this site. If you cannot access the Internet, please call at +46 620 255 80 and a paper copy of the manual in your selected language will be sent to you.

Optional Accessories: Art.no TRIPOD and TRIPOD HOLDER
MAC-IR Serial IR-receiver for data input in handheld computer or PC

Product Origin: Sweden

Declaration of conformity according to the EMC Directive 89/336/EEC with amendment 92/31/EEC, Low Voltage Directive 73/23/EEC and CE Marking Directive 93/68/EEC

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The L400 Laser Instrument

The Laser L400 is a high quality measuring instrument, useful for anyone who needs reliable, fast and accurate distance-, height- or angle- measuring results. The instrument uses the proven accurate and safe measuring methods of laser and a tilt sensor into a small, flexible and unique product.

General Information: the L400 Laser instrument

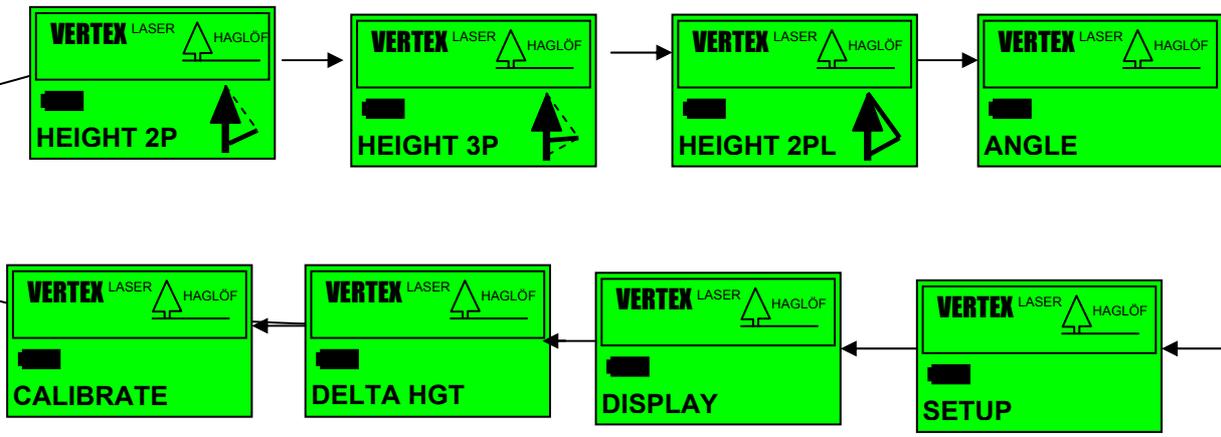
The L400 Laser instrument uses laser technology to calculate distance and a high quality tilt sensor to measure angles. The laser method can be used with or without the use of the tilt sensor and vice versa. **The laser method allows long distance measuring and a quick presentation of measuring results.**

Data on heights, distances and angles can be transferred through a built-in Infrared transmitter to a PC or HHC, for storage and further processing. For transfer of results, a serial IR receiver is available as an optional accessory to the L400 instrument.

The Laser emits invisible, eye safe infrared energy pulses that reflect off the selected target back to its optical receiver. *The laser is classified as Class 1 (USA and Canada) and as Class 3a (EU and other countries).* By measuring the time it takes for each pulse to travel from the rangefinder, to the target and back with sophisticated precision charge circuitry, the instrument instantly calculates distances. The maximum range of the Laser measuring method depends on the target's reflectivity, its colour, surface, finish, shape and size.



Menu

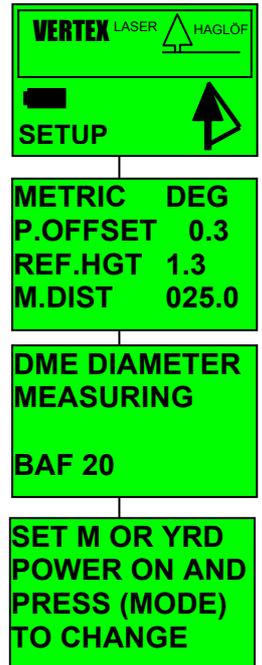
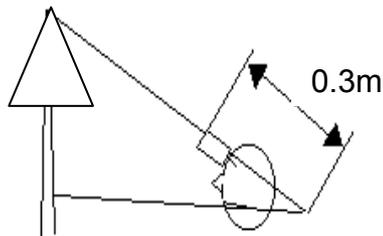


Setup

1. Press MODE to turn the instrument ON.
2. Select menu SETUP and press the Mode button.
3. Select distance and height unit. Start the Laser by pressing POWER and select unit as m or Yard by keep pressing the Mode button. The selected unit is featured in the Laser display. Step out of this menu by pressing both SHIFT and MODE.
4. Select the Angle unit as Deg (degrees), GRAD (gradients) or % (percentage) by pressing SHIFT. Confirm by pressing MODE.
5. Set the P.OFFSET with SHIFT and MODE. A cursor appears under the digit. Use the Shift button to increase this digit. Confirm the digit by pressing MODE. Repeat for the next digit until the Pivot Offset is set.
6. Set the REF.HGT

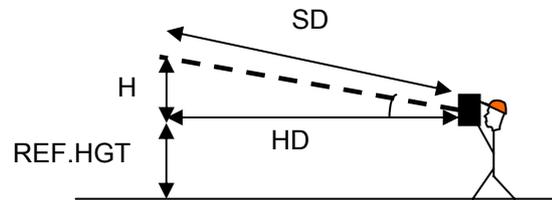
P.OFFSET

The Pivot Offset is the distance from the Vertex Laser instrument front to the virtual intersection point behind the instrument. The normal P.OFFSET is 0.3m/1.0ft.



REF.HGT

Distance to an optional reference point. REF HGT is always added to the height when measuring distance manually. When measuring distance with laser, REF HGT is not used except when using the one-shot method. Then the reference height (REF.HGT) should equal your eye height.



M.DIST

Setting a Manual Distance can be useful if a distance is already known or when the Laser can not be used for distance measuring for certain reasons – if, for example, larger objects cover the target object. NOTE! The accuracy of the entered manual distance affects the height accuracy!

Select the Distance Unit in the Laser

1. Press MODE to turn the instrument ON.
2. Select menu SETUP and keep pressing the Mode button until the last screen appears, SET M or YRD.
3. Start the Laser by pressing POWER and select unit as m or Yard by keeping the Mode button pressed. The selected unit is featured in the Laser display. Step out of this menu by pressing both SHIFT and MODE.

Buttons

Shift Button

The Shift button is used when measuring distances with ultrasound, and to change menus or variables. Shift is also used to increase or decrease the intensity of the Vertex aim.



Mode Button

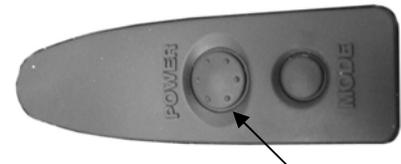
The Mode button is used when measuring angles, and works as ENTER, to execute commands in the menu. The Mode button is also used to activate IR transfer of data.



Use the Mode button to select the Laser distance setup (English or Metric). To switch unit in the Laser, select SETUP menu and SET M OR YRD (last menu in SETUP). When in this menu, keep the Mode button pressed down to switch between m or Yard. This unit is only used in the Laser display and has no function in the Vertex display, where metric or feet is used.

Power Button

Press POWER to start the Laser. To start the laser measuring, press again. Keeping the Power button pressed, the Laser performs a scanning measuring operation. This function is useful to obtain the most correct result when measuring thin targets (power lines).



The Laser has an automatic turnoff time of 8 seconds of inactivity.

Mode+Shift Buttons

Press both Mode and Shift buttons to step out of a menu and to turn the L400 Laser instrument OFF.

Vertex Aim

The red dot cross hair aim has a 1 x magnification, with a highly visible red aim point sight. This sight is preferably used for close range targets.

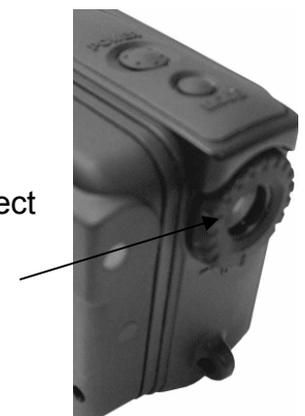


The intensity of this aim is user adjustable. Press Shift when measuring a height or an angle to increase intensity of the cross hair.

Laser Aim

The Laser aim point is often used for distant targets. With an 8 x magnification, the laser aim is perfect for thin objects, for example power lines. The 8 x magnification makes it useful also if a target object is located close to other objects.

Adjust the Laser aim sharpness by turning the adjustment ring around the Laser sight until desired sharpness.

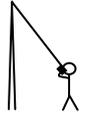


Height Measuring with L400

Measuring Heights

The L400 Laser instrument offers several different measuring methods for accurate height measuring:

One shot: Distance and angle to an optional part of the object measured with laser. To be able to work with this method, you need to be on the same level as the bottom of the object to measure.



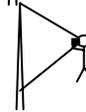
HEIGHT 3P: Distance and angle to optional part of the object measured with laser. The angle is measured at the lowest and the highest part of the object.



HEIGHT 2P: Distance and angle, to a reference point, measured with laser. The top angle is measured.

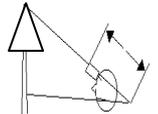


HEIGHT 2PL: Distance and angle to the bottom and to the top measured with laser. The method is ideal for leaning objects.

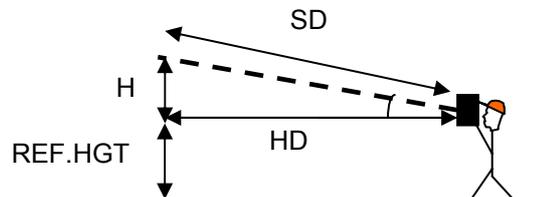


Useful and important knowledge: the L400 Laser uses two additional variables when calculating a height. Those variables can be changed in the SETUP menu.

P.OFFSET: Distance from the L400 Laser front to the intersection point.



REF.HGT: Distance to an optional reference point. When measuring distance with laser, REF HGT is not used except when using the one-shot method. Then the reference height (REF.HGT) should equal your eye height.



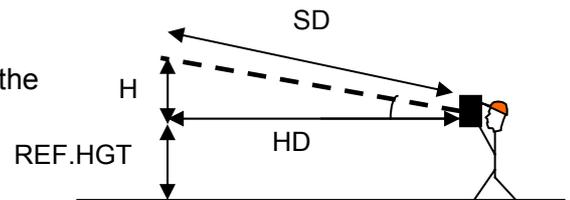
Distance and Height Measuring with Laser

1. Press POWER to turn the Laser ON.
2. Aim and press POWER to measure with Laser.

The L400 Laser instrument indicates with a short signal when a measuring result has been completed. The display features distance, horizontal distance, angle and height above horizontal plane (REF.HGT included).

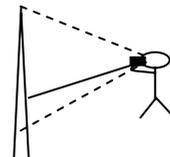
Press both Mode and Shift buttons to step out of a menu and to turn the Laser instrument OFF.

Use REF.HGT to add the distance from ground to eye to get the target's total height from the ground to the measuring point.
P. OFFSET should be set to 0.1 m/0.3 ft



Objects that are far away or thin (power lines) can be difficult to obtain results from. With the Laser scanning function, activated when pressing the Power button, the best measuring result can be achieved.

HEIGHT 3P with Laser



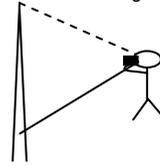
1. Press POWER to start the Laser (alternatively, turn the L400 Laser ON by pressing MODE and choose menu HEIGHT 3P)
2. Aim and press POWER to get the distance and angle. Aim until a short beep goes off. The slope distance (SD), the horizontal distance (HD), the height (REF.HGT included) and the angle are featured in the display.
3. Aim at the bottom of the target object or at a reference point. Keep pressing MODE until a beep goes off. Now release the Mode button.
4. Aim at the top of the object and keep Mode pressed until another beep goes off. Now release the Mode button.

Height (REF HGT not included) and other data are now featured in the display. More heights on the same target object can be measured by repeating point 4 above.

Press both MODE and SHIFT to step out of a menu and to turn the L400 Laser OFF.

VERTEX LASER HAGLOF	
HEIGHT 3P	
SD	21.5
HD	21.4
H	-1.7
DEG	-4.6
BOTTOM	
DEG	-20.8
SD	21.5
HD	21.4
DEG	-4.6
H	19.3

HEIGHT 2P Laser with Target

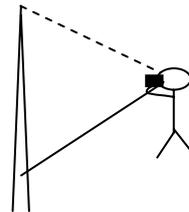


1. Press MODE to turn the instrument ON.
2. Select menu HEIGHT 2P and press the Mode button.
3. Turn the Laser ON by pressing POWER.
4. Aim at the reference point and press POWER to get the distance and angle to the object. Aim until a short beep goes off. Slope distance (SD), horizontal distance (HD) height (REF HGT included) and angle are featured in the display. Release the Mode button.
5. Aim at the top of the target object and keep MODE pressed until a beep goes off. Now release the Mode button.

Height (REF HGT not included) and other data are featured in the display. More heights on the same target object can be measured by repeating point 5 above. To measure heights of a new target object, repeat from point 4 above, and using the HEIGHT 3P method.

VERTEX LASER HAGLÖF	
HEIGHT 2P	
M.DIST 25.0	
DME (MODE) LASER (POWER)	
SD	15.0
HD	14.9
H	-1.9
DEG	-7.3
SD	15.0
HD	14.9
DEG	-7.3
H	20.3

HEIGHT 2P Manual Distance



1. Press MODE to turn the instrument ON.
2. Select menu HEIGHT 2P and press the Mode button.
3. Accept the manual distance now shown in the display by a quick press of the Mode button.
3. Aim towards the reference point and press Mode to get the correct angle. Aim until a short beep goes off. Now release the Mode button
4. Aim at the top of the object and keep Mode pressed until a beep goes off. Now release the Mode button.

Height (REF HGT included) and other data can now be seen in the display. More heights on the same object can be measured by repeating point 4 above.

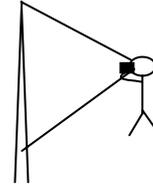
Press both MODE and SHIFT to step out of a menu and to turn the L400 Laser OFF.

NOTE! The accuracy of the entered manual distance affects the height accuracy!

VERTEX LASER HAGLÖF	
HEIGHT 2P	
M.DIST 25.0	
DME (MODE) LASER (POWER)	
SD	25.0
HD	24.6
DEG	-10.6
H	20.1

HEIGHT 2P Laser 2-point measuring

1. Press MODE to turn the instrument ON.
2. Select menu HEIGHT 2P and press the Mode button.
3. Turn the Laser ON by pressing POWER.
4. Aim at the bottom of the target (or other reference) and press POWER to get the distance and the angle. Aim until a short beep goes off.
5. Aim at the top of the target and press POWER to get the distance and angle. Aim until a short beep goes off.



VERTEX LASER HAGLÖF	
HEIGHT 2P	
SD	15.5
HD	
H	
DEG	-1.4
SD	16.0
HD	
H	
DEG	15.4
SD	15.5
SD	16.0
DEG	13.0
H	3.7

Height (REF HGT not included) and other data are now featured in the display.

Press both MODE and SHIFT to step out of a menu and to turn the L400 Laser OFF.

DELTA HEIGHT

The Delta Height Function is used to calculate the height difference of a point at an imagined straight line between two fixed positions, and a third point, for example at a power line, where the line sag is closest to the ground. (More details at next page)

1. Go to the position where the line sag is closest to ground. Measure H1 using the 1-point laser method.

2. Measure H2 using the 1-point laser method

3. Accept H1 and H2 and H by pressing Mode. H is the calculated height to the point above the power line.

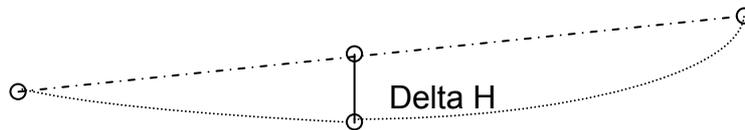
VERTEX LASER HAGLÖF	
DELTA HGT	
SD	15.5
HD	
H	
DEG	-1.4
SD	16.0
HD	
H	
DEG	15.4
HD	15.5
HD	15.4
H 8.0	H 9.9
H 8.9	
HD	15.5
HD	15.4
H 8.0	H 9.9
H	0.5

4. Measure the height h to the power line using the 1-point laser method. The Delta Height (H-h) is calculated and featured in the display.

Delta H

Delta height function

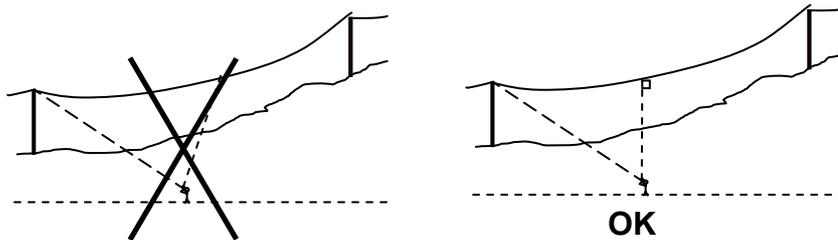
The Delta Height Function is used to calculate the height difference of a point at an imagined straight line between two fixed positions, and a third point, for example at a power line, where the line sag is closest to the ground.



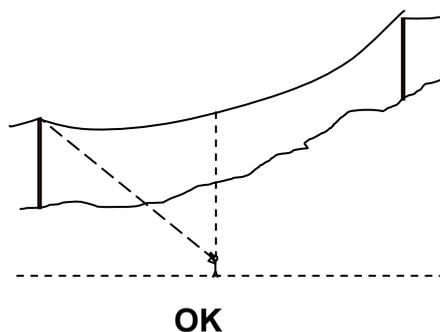
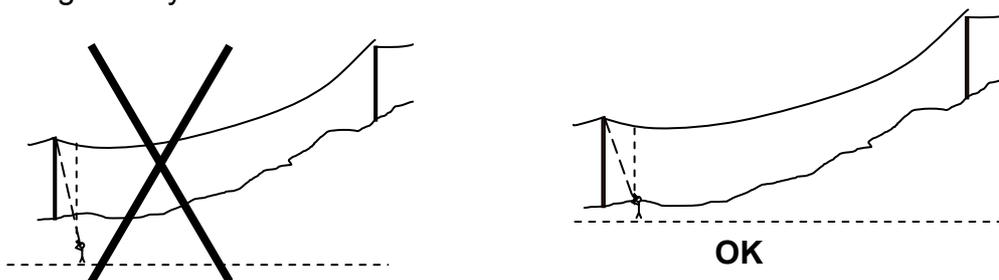
Instructions

The Delta Height Function calculates the difference between two heights. The function REF. HEIGHT in the L400 Laser is therefore not so important in this case.

Always stand in a perpendicular position at the point where the Delta Height is measured.

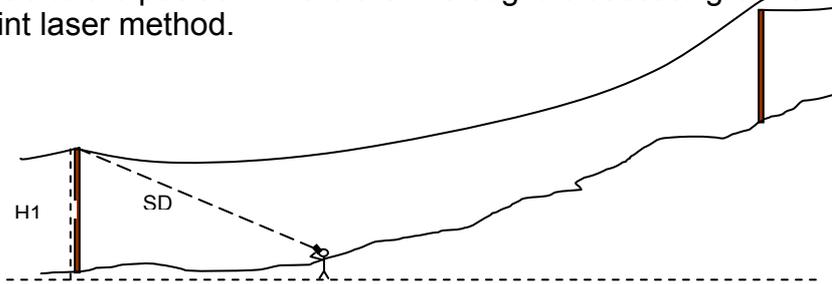


The Delta Height Function uses the horizontal distances and the heights from the two fixed positions to calculate the height to the point at the (imagined) straight line. If this point is not located in the middle of these two fixed positions, the importance of standing closely increases.

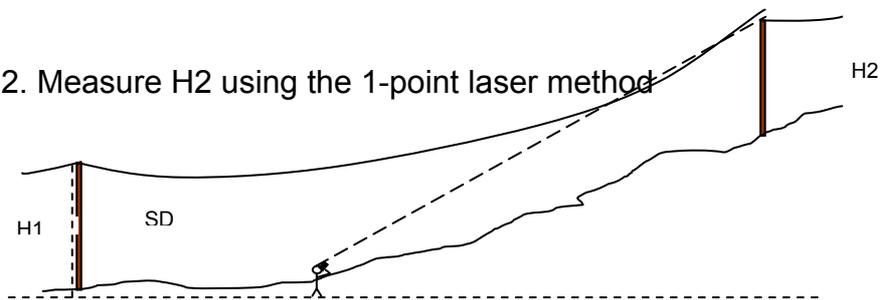


Example

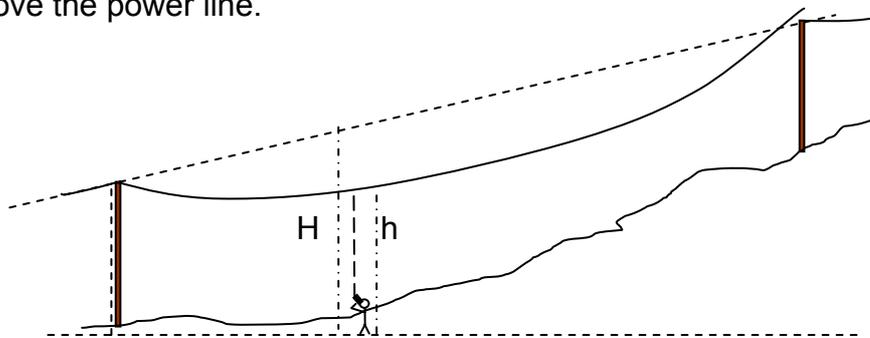
1. Go to the position where the line sag is closest to ground. Measure H1 using the 1-point laser method.



2. Measure H2 using the 1-point laser method



3. Accept H1 and H2 and H by pressing Mode. H is the calculated height to the point above the power line.



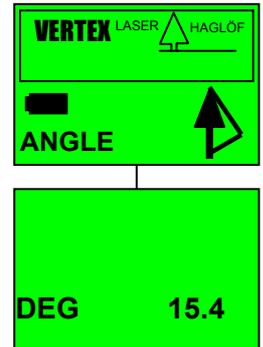
4. Measure the height h to the power line using the 1-point laser method. The Delta Height (H-h) is calculated and featured in the display.

ANGLE Measuring

1. Press MODE to turn the instrument ON.
2. Select menu ANGLE and press MODE.
3. Aim and keep MODE until a beep goes off. Release the Mode button.

The angle is now featured in the display.

Press both MODE and SHIFT to step out of a menu and to turn the L400 Laser OFF.



Transfer of Data using IR

The IR transfer can be activated in any measuring mode. Just press the Mode button once.

Data format

- '1 NNNN' Height 1 (the 2 (two) lastly measured heights are transferred)
- '2 NNNN' Height 2
- '3 NNNN' not used
- '4 NNNN' H-Dist
- 5 ANNN' Angle A='+', '-' (gradients)

Baud=1200,7 bit Data, Even Parity

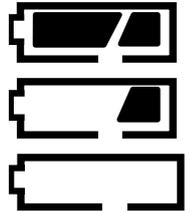


Battery Indicator in Laser display

Battery has enough power for use.

Battery power is getting low.

Battery power is low, image of battery is flashing and battery should be replaced.



Changing the battery

1. Open the battery chamber cover using a coin or similar and rotate it following the “Open/Close” indication. Due to the water and dust-resistance seal, it may not open easily.
2. Install the new battery with the [+] and [-] correctly positioned.
3. Screw the cover back in place using a coin or similar. Confirm the cover to be correctly closed.

Battery life

A new battery should last approximately 3000 measurements at 20° C/70F. The figure may differ according to temperature, target shape etc. The automatic turn-off function ensures longest possible life for the battery. The turn-off time is set to approximately 8 seconds for the Laser unit.

Technical specification

L400 Laser Instrument

Size	95 x 72 x 58 mm / 3.7" x 2.8" x 2.3"
Weight	260 g / 9 oz (battery included)
Battery	1 x CR 2 Lithium 3V
Power consumption	60mW
Temperature range	-15° to +45°C / 5F to 113F
Height	0-999 m/ft
Resolution height (display)	0.1m/ft
Meter / Feet	Yes
Buzzer	Yes

Angle

Angle range	-55 to +85deg
Deg / Grad / %	Yes
Resolution angle	0.1deg
Accuracy	0.1deg
Red dot aim	Aim point; 1x magnification

Laser

Laser Class	FDA Class 1/EN60825-1 Class 3A
Distance non-reflective target	Max. 350m/400yard (aut.setup reflect/nonreflect target)
Distance reflective target	From 130m to 900m / 150yard to 999yard
Resolution (display)	0.5m/yard at distance <100m/yard, else 1m/yard
Accuracy	±0.4m/yard at distance <100m/yard, else ±1m/yard
Rain mode	Yes, automatic
Number of measurements	approx. 3000
Laser aim	Reticule; 8 x magnification
ZipThru >140m/yards (filter)	Yes
Scan (continuous measuring)	Yes
Meter / Yards	Yes

Safety and operation precautions

To avoid injury or material loss, please read these safety and operation precautions thoroughly:

- Never look directly at the laser beam or directly at the sun when using the L400 Laser instrument.
- Do not use the L400 Laser instrument together with other optical instruments, such as binoculars and lenses. Using an optical instrument together with the L400 Laser increases the danger of eye damage.
- Do not depress the POWER button while aiming with the eye or looking into the optics from the objective side.
- Do not disassemble the L400 Laser instrument. Any signs of disassembling automatically withdraw any warranties and the manufacturer does not guarantee the product.
- If the L400 Laser instrument body cover is damaged, or if the instrument emits a strange sound due to dropping, remove the battery and stop using immediately.
- Never place the L400 Laser in an unstable place.
- Never look through the L400 Laser instrument while walking.
- If you should develop any symptoms of eye irritation or skin inflammation around the eye due to use of the rubber eyecup, consult a doctor immediately.
- If the L400 Laser instrument should fail to operate correctly, discontinue use and consult the manual. If you are unable to fix the problem, contact your local dealer for instructions or where to send the instrument for repair.

CARE, STORAGE AND MAINTENANCE

- Store the L400 Laser in its soft case when carrying. Do not swing the instrument by its strap.
- Although the L400 Laser instrument is water and dust resistant, it should not be used in water and it is not waterproof.
- Use a soft, clean and dry cloth to clean the L400 Laser instrument if exposed to rain, water, sand and mud. Do not use alcohol, benzene, thinner or other organic agents to clean the instrument's main body! Always clean as soon as possible after the exposure, and always store the instrument in a dry, cool place and away from direct sunlight.
- Use a soft oil-free brush to remove dust from the lens surface. To remove stains or smudges (fingerprints etc), wipe lenses gently with a soft clean cotton cloth or oil-free lens tissue. Stubborn smudges can be removed with a small amount of pure alcohol using extra care to avoid scratching of the lens surface. The tissue should only be used one time.
- Do not expose the instrument to excessive heat or ultraviolet rays, since this may negatively affect or damage the unit.
- Avoid pushing the POWER button when not using the L400 Laser instrument.
- When exposed to sudden changes in temperature or high humidity, water condensation may appear on lens surfaces. Do not use the L400 Laser instrument until this condensation has evaporated. Dry the instrument at room temperature and store in a cool, dry place.
- Keep the instrument and any parts of and for the instrument out of reach of small children. Consult a doctor immediately if a small child has swallowed any parts of the instrument or its packing.

NOTES ON BATTERIES

- Batteries should always be removed when exhausted or during longer periods of non-use.
- Make sure that batteries are installed correctly in their + and – position.
- Rinse skin or eyes well with water if exposed to battery fluid. If swallowed, contact a doctor
- Do not short-circuit battery chamber terminals, and do not carry batteries with keys or coins in a pocket. This may short-circuit the batteries.
- Keep away from fire and water and do not disassemble batteries.
- Do not attempt to charge batteries. Avoid strong vibrations, shock or extremes in temperatures for stored batteries.
- If handled incorrectly, batteries may rupture and leak, corroding equipment and staining clothing

Troubleshooting Laser

Symptom	Check points
Laser does not turn on/ Display fails to illuminate	Depress POWER button Check and replace battery if necessary
Target range cannot be obtained	Make sure that nothing is blocking the laser emission aperture and laser detector. Make sure that the laser emission aperture and detector is clean. Clean if necessary (<i>see page 17, Care, storage and maintenance</i>). Target shape and condition may be inappropriate to reflect the laser beam. Slender targets, targets with small reflecting surface, targets with diffusing reflective surface, targets that do not reflect the laser beam, targets with pronounced depths, targets measured through glass and weather conditions such as snow, rain or fog can affect the measuring. Replace battery if necessary.
[---] appears	Hold unit steady while pressing the POWER button. Make sure the target is within the measuring range (10m/10.5yds – 400m/437yds)
Close targets cannot be measured	Be sure that nothing is blocking the target
Targets beyond a certain distance cannot be measured	Be sure that nothing is blocking the target
Measurement results are unstable	Replace battery Be sure that target shape and condition can reflect the laser beam. Hold the unit steady while pressing the POWER button Be sure that nothing is blocking the target
Incorrect results are displayed	Replace battery Be sure that target shape and condition can reflect the laser beam. Be sure that nothing is blocking the target