

***RUNNER 20/24***



***User Manual***

***English***

***Version 1.0***

***Leica***  
**Geosystems**

**Congratulations on your purchase of a new Leica Geosystems automatic level.**



This manual contains important safety directions (*refer to section "Safety directions"*) as well as instructions for setting up the instrument and operating it.

Please read this User Manual carefully to achieve maximum efficiency from your Instrument.

## ***Product identification***

---

The type of your product is indicated on the label on the bottom of the base plate. The serial number is on the right side of your product.

Write the type and serial number of your instrument in the space provided below, and always quote this **information** when you need to contact your **agency** or **service workshop**.

Type: \_\_\_\_\_ Serial no.: \_\_\_\_\_

## ***Symbols used in this manual***

---

The symbols used in this User Manual have the following meanings:



**DANGER:**

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



**WARNING:**

Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.



**CAUTION:**

Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor or moderate injury and / or appreciable material, financial and environmental damage.



Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

## ***View of chapters***

---

<b>Introduction .....</b>	<b>7</b>
<b>Measurement preparation .....</b>	<b>10</b>
<b>Measuring .....</b>	<b>14</b>
<b>Checking and adjusting .....</b>	<b>19</b>
<b>Care and Storage .....</b>	<b>21</b>
<b>Safety Directions .....</b>	<b>24</b>
<b>Accessories .....</b>	<b>31</b>
<b>Technical Data .....</b>	<b>32</b>
<b>Index .....</b>	<b>33</b>

## Contents

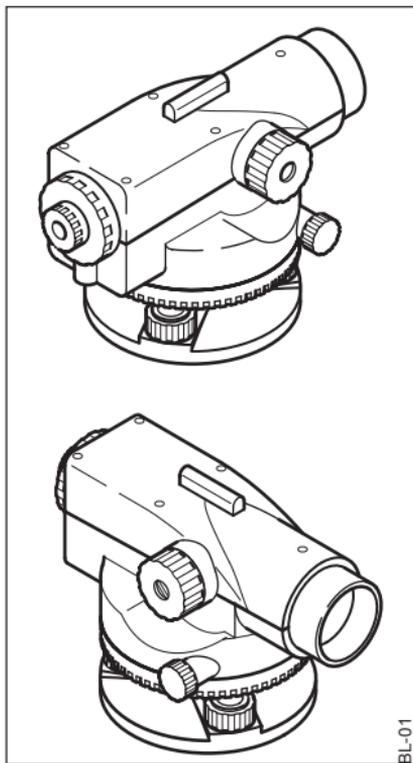
<b>Introduction</b> .....	7	Checking and adjusting of the line-of-sight .....	20
Special features .....	7	<b>Care and Storage</b> .....	<b>21</b>
Important parts .....	8	Transport .....	21
Technical terms and abbreviations .....	9	In the field .....	21
<b>Measurement preparation</b> .....	<b>10</b>	Inside vehicle .....	22
Unpacking .....	10	Shipping .....	22
Setting up the tripod .....	11	Storage .....	22
Levelling up .....	12	Cleaning .....	23
Focusing telescope .....	13	<b>Safety Directions</b> .....	<b>24</b>
Centring .....	13	Intended use of instrument .....	24
<b>Measuring</b> .....	<b>14</b>	Permitted uses .....	24
Height reading .....	14	Adverse uses .....	24
Distance measuring .....	15	Limits of use .....	25
Angle measuring .....	15	Responsibilities .....	26
Line levelling .....	16	Hazards of use .....	27
Area levelling .....	17	<b>Accessories</b> .....	<b>31</b>
Levelling total station measuring .....	18	<b>Technical Data</b> .....	<b>32</b>
Levelled stakeout .....	18	<b>Index</b> .....	<b>33</b>
<b>Checking and adjusting</b> .....	<b>19</b>		
Tripod .....	19		
Circular level .....	19		

## Introduction

The RUNNER 20/24 is a member of a new generation of construction levels. Its innovative technology makes the daily surveying jobs easier.

The instrument is ideally suited for all applications of a reliable and robust construction level.

The easy operation of the instrument functions can be quickly learned even by inexperienced surveyors.

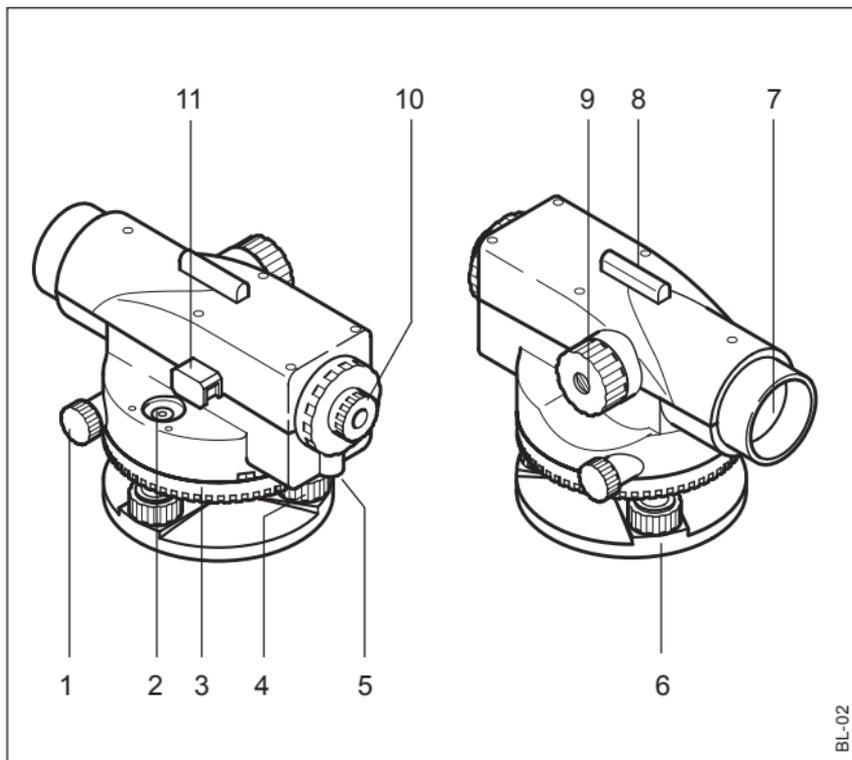


BL-01

## Special features

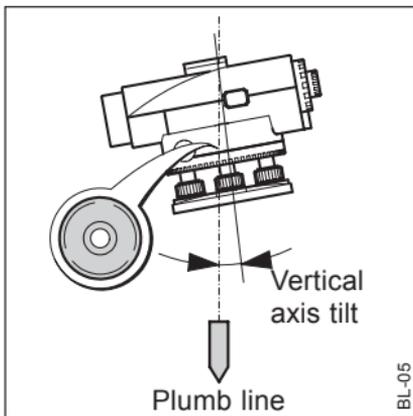
- Easy operation; quickly to learn !
- Attractive design; low weight.
- Endless drive.
- Robust and reliable.
- Enables angle measurements with horizontal circle.
- Resistant to water and dirt.
- Adaptable to all types of tripods with 5/8" central fixing screw.

## Important parts



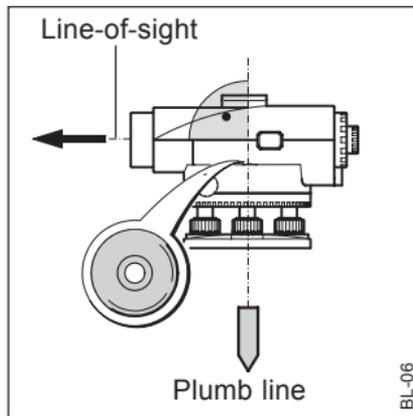
- 1 Endless drive (both sides)
- 2 Circular level
- 3 Knurled ring of adjustable horizontal circle
- 4 Footscrew
- 5 Compensator test knob
- 6 Base plate
- 7 Objective
- 8 Optical sight with point marking
- 9 Focusing knob
- 10 Eyepiece
- 11 Level prism

## Technical terms and abbreviations



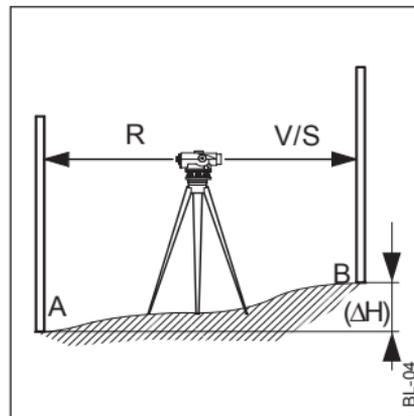
### Plumb line

By centring the circular level the instrument is nearly levelled up. A small instrument tilt remains (the vertical axis tilt).



### Compensator

The compensator in the instrument is responsible for compensating the vertical axis tilt enabling an exactly horizontal aiming.



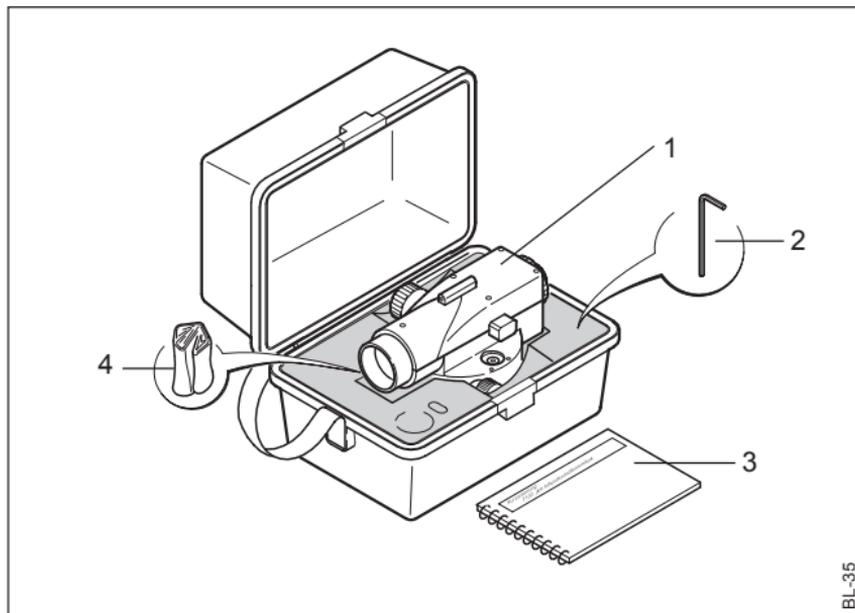
### Backsight/Foresight/ Intermediate sight

For determining the height difference ( $\Delta H$ ) between the ground points A and B the back sight (R) is measured first followed by the forward sight (V). Additional points relating to A are measured as intermediate sight (S).

## Measurement preparation

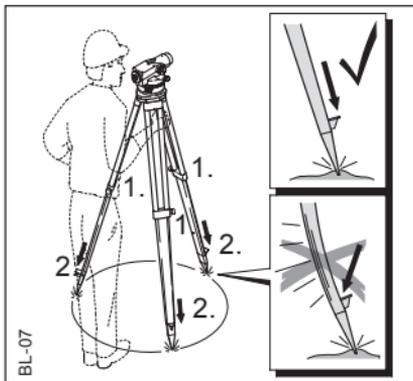
## Unpacking

Remove RUNNER 20/24 from the case and check for completeness:

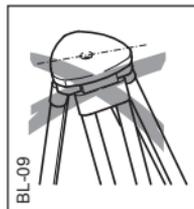
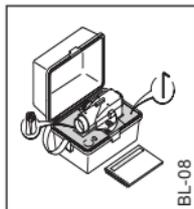


- 1 Level
- 2 Allen key
- 3 User Manual
- 4 Protective cover

## Setting up the tripod

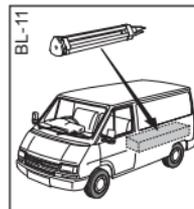
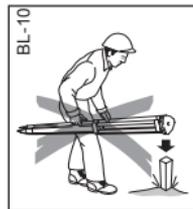


1. Loosen screws of tripod legs, pull out to required length and tighten screws.
2. In order to guarantee a firm foothold sufficiently press the tripod legs into the ground. When pressing the legs into the ground note that the force must be applied along the legs.



When setting up the tripod pay attention to a horizontal position of the tripod plate.

Heavy inclinations of the tripod must be corrected with the footscrews of the tribrach.



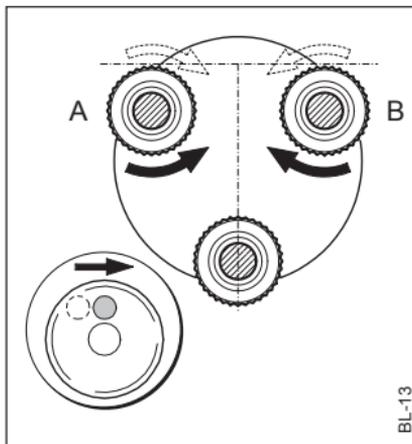
### Careful handling of tripod

- Check all screws and bolts for correct fit.
- During transport always use the cover supplied. Scratches and other damages can result in poor fit and measuring inaccuracies.
- Use the tripod only for surveying jobs.

## Levelling up

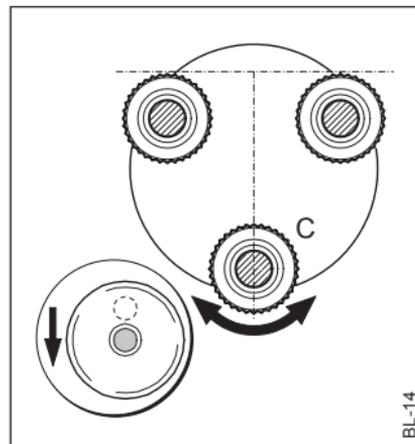


1. Place level onto tripod head.  
Tighten central fixing screw of tripod.
2. Turn footscrews of tribrach into its centre position.
3. Centre circular level by turning the foot screws.



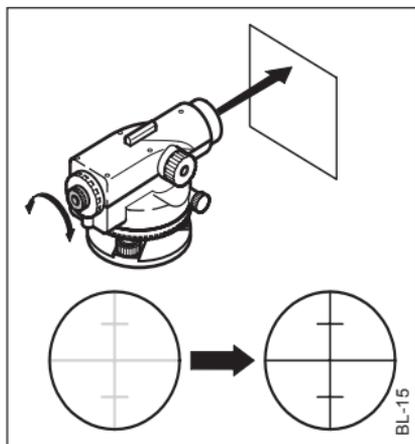
### Centring the circular level

1. Turn foot screws A and B simultaneously in the opposite direction until bubble is in the centre (on the imaginary "T").

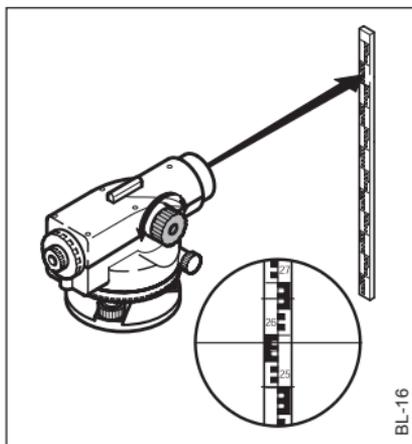


2. Turn foot screw C until bubble is centred.

## Focusing telescope

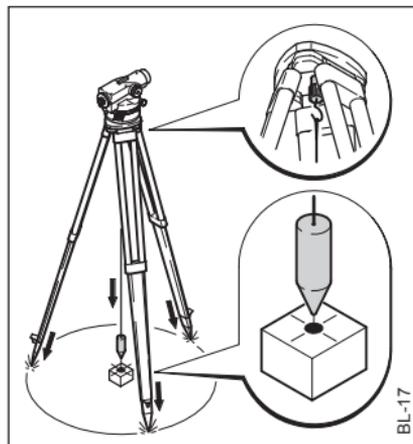


1. Aim telescope against a bright background (e.g. white paper).
2. Turn eyepiece until reticle is sharp-focussed and deep black. Now the eyepiece is adapted to your eye.



3. Aim telescope on staff using the optical sight.
4. Turn focussing knob until image of staff is sharply focussed. If the eye is moved up and down behind the eyepiece the image of the staff and the reticle may not be displaced against each other.

## Centring



For possible centring over a ground point:

1. Attach plumb bob.
2. Loosen central fixing screw slightly and shift instrument parallel on tripod until the plummet is exactly over the point.
3. Tighten central fixing screw.

## Measuring

### Height reading



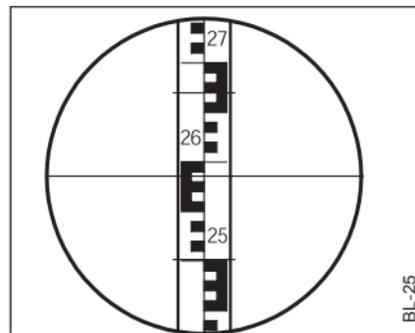
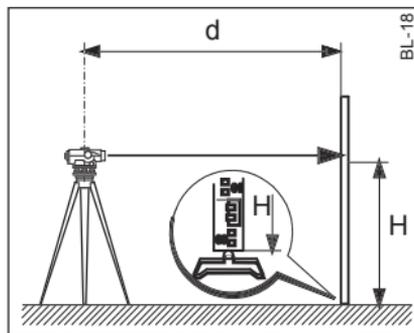
Before starting field work or after longer periods of storage/transport of your equipment check the field adjustment parameters specified in this User Manual.



Reduce possible vibrations by holding the tripod legs.

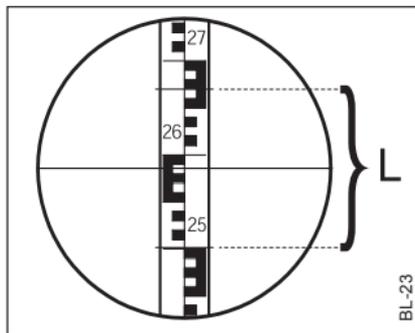


If the optical parts of your instrument are dirty or fogged, your measurements can be affected. Keep clean all optical parts of your instrument and follow the cleaning instructions specified in the User Manual.



1. Setup instrument, level and sharp-focus the reticule.
2. Setup level staff vertically (refer also to Instruction Manual of staff).
3. Roughly aim on staff using the optical sight.
4. Sharp-focus using the focussing knob.
5. Fine-aim on staff using the endless drives.
6. Check if circular level is centred (view level prism).
7. Read off height H at the centre hair of the reticule.  
Example above:  
 $H = 2.585 \text{ m}$

## Distance measuring



Carry out steps 1 to 6 according to height reading.

### Reading:

Upper distance line: 2.670 m

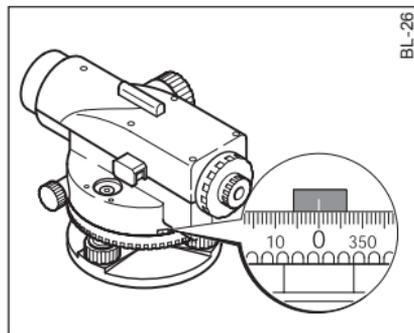
Lower distance line: 2.502 m

Difference L: 0.168 m

Distance d: 16.8 m

**Result:**  
**Distance  $d = 100 \times L$**

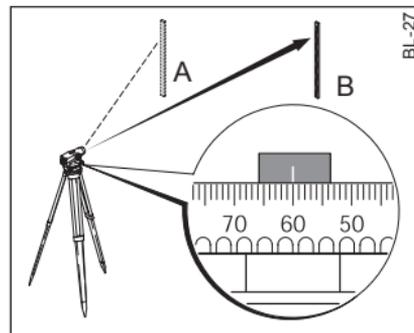
## Angle measuring



The instrument is equipped with a horizontal circle. The graduation is  $1^\circ$ .

### Wanted:

Angle between point A and point B.



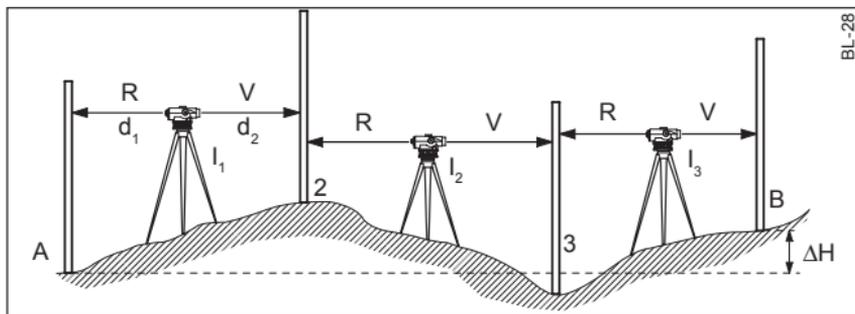
Carry out steps 1 to 6 according to height measuring. By doing so, align the vertical hair of the reticule to the staff centre.

7. Turn Hz-circle to "0".

8. Align instrument to point B and aim on the centre of the staff.

9. Read off Hz-angle from Hz-circle: Example above:  
Hz =  $60^\circ$ .

## Line levelling



### Wanted:

Height difference ( $\Delta H$ ) between point A and B.



Select instrument station and staff location by pacing off in that way, that approximately the same target distances are resulting ( $d_1 \approx d_2$ ; approx. 40 to 50m).

### Procedure:

1. Setup instrument at  $I_1$ .

2. Setup level staff vertically at point A.
3. Aim on staff and read off and take down height (backsight R).
4. Setup level at the changepoint 2, aim on staff and read off and take down height (foresight V).
5. Setup level at  $I_2$ , aim on staff at the changepoint 2 and read backsight and take down.

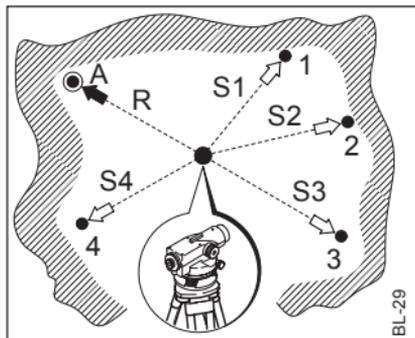
6. Carry out a foresight at changepoint 3.
7. Continue in the same way until height at point B is measured.

**Result:**  
 $\Delta H = \text{sum backsight} - \text{sum foresight}$

Example for the booking:

Point No.	Back-sight R	Fore-sight V	Height
A	+2.502		650.100
2	+0.911	-1.803	
3	+3.103	-1.930	
B		-0.981	651.902
<b>Sum</b>	+6.516	-4.714	$\Delta H = +1.802$

## Area levelling



### Wanted:

Height difference of several reference points.



The required accuracy is usually not very high with such measurements. Nevertheless, from time to time read the staff on a stable intermediate point (reading must remain the same).

### Procedure:

1. Set up instrument centrally between the desired points. The instrument telescope may not be below the highest measured intermediate point.
2. Set up staff vertically at reference point A.
3. Aim on staff and read and take down height (=backsight to known point).
4. Set up staff vertically at point 1.
5. Aim on staff and read and take down height (=measuring intermediate point, intermediate sight)
6. Repeat steps 4 and 5 for additional intermediate points.
7. The height of individual points are:

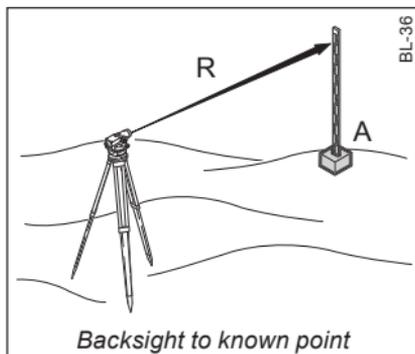
$$\text{Height} = \text{Height of station point} + \text{backsight (A)} - \text{intermediate sight}$$

Example for booking:

Point No.		Interm. sight	Height
A	592.00		
R1	+2.20		
⊗	594.20		
S1		-1.80	592.40
S2		-1.90	592.30
S3		-2.50	591.70
S4		-2.30	591.90

⊗ = Instrument horizon

## Levelling total station measuring

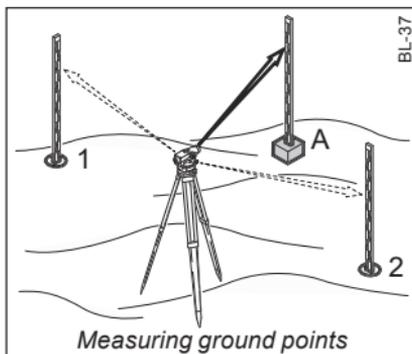


### Wanted:

Position of several ground points.



The levelling total station measuring is normally carried out during area levelling.



### Procedure:

1. Sequence of measurements is the same as with area levelling. However, beside the height read also the staff section  $L$  (see chapter "Distance measuring") and the Hz-angle.
2. Transfer measured value into the map - points are determined by position and height.

## Levelled stakeout

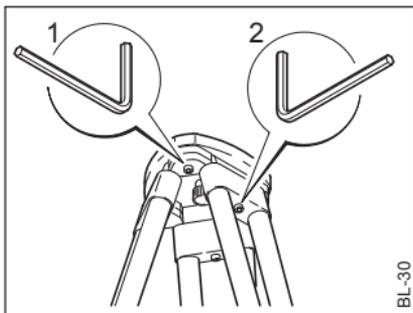
The stakeout is the counterpart to the levelling total station measuring - map points are set out in the field.

### Procedure:

1. Set up instrument at a known point, centre and level up.
2. Focus instrument and aim on known orientation point.
3. Orient horizontal circle (Hz-direction).
4. Move staff to stakeout point due to known values (distance and Hz-angle, height) and stakeout point.

## Checking and adjusting

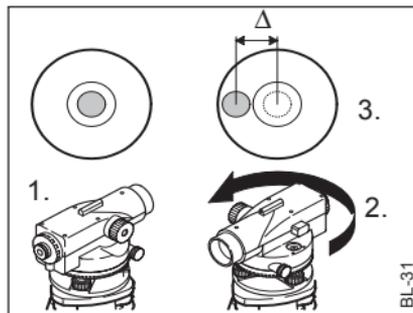
### Tripod



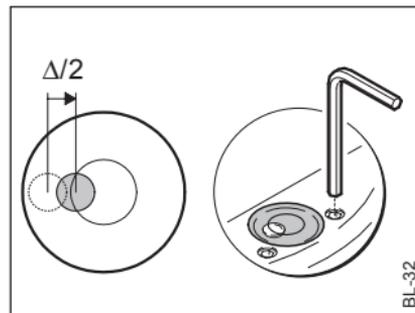
Connection of individual elements must always be tight.

1. Tighten the Allen screws (2) moderately (if available).
2. Tighten the articulated joints on the tripod head (1) just enough to keep the tripod legs open when you lift it off the ground.

### Circular level

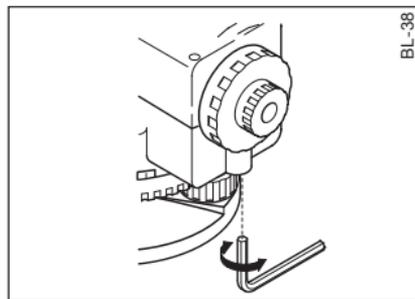
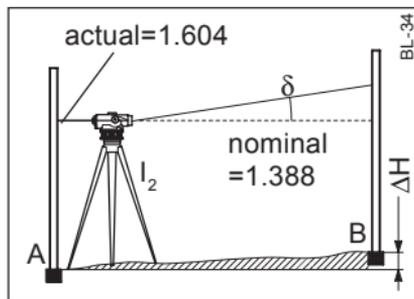
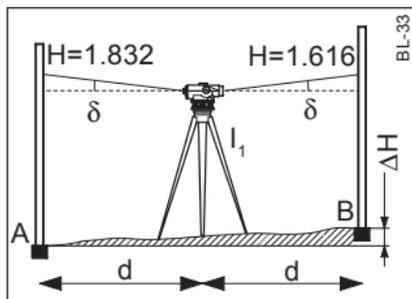


1. Level up instrument.
2. Turn instrument by  $180^\circ$ .
3. If bubble of level is outside the circle then it should be adjusted (see point 4).



4. Correct the half error using an Allen key and repeat steps 2 and 3 until the bubble of level is in the centre in any telescope direction.

## Checking and adjusting of the line-of-sight



With the circular bubble centred and adjusted, the line of sight should be horizontal.

**Checking** (see example):

1. Choose a distance of appr. 30 m within a gentle terrain.
2. Set up a staff at both final points (A, B).
3. Set up the instrument at point  $I_1$  (halfway between A and B, just pass it down) and centre the bubble.

4. Read both staffs.
 

reading on A	= 1.832 m
reading on B	= 1.616 m
$\Delta H = A - B$	= 0.216 m
5. Set up the level about 1 m from staff A
6. Read staff A (eg.: 1.604 m)
7. Find nominal reading B; eg.: Reading A -  $\Delta H = 1.604 \text{ m} - 0.216 \text{ m} = 1.388 \text{ m}$
8. Read staff B, compare nominal-/actual- reading.

 When the difference nominal-/actual- reading is more than 3 mm the line of sight must be adjusted.

1. Turn the adjusting screw until the middle hair gives the required reading (eg. 1.388 m).
2. Check line of sight again.

## Care and Storage

## Transport

 When transporting or shipping the equipment always use the original packaging (transport case and shipping cardboard).

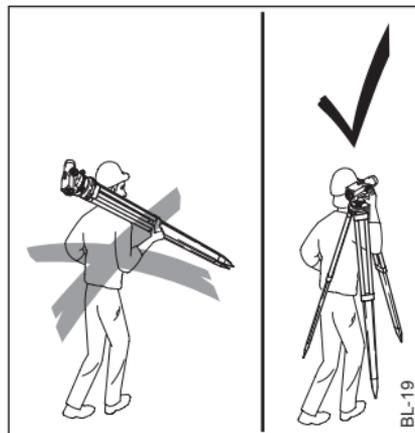
 After a longer period of storage or transport of your instrument always check the field adjustment parameters indicated in this manual before using the instrument.

### In the field



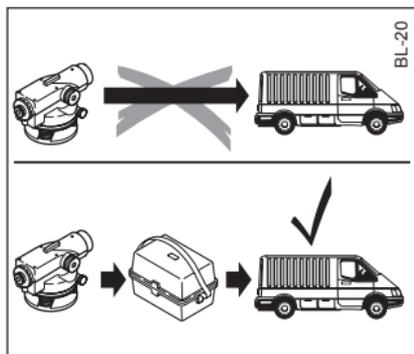
When transporting the equipment **in the field**, always make sure to

- either carry the instrument in its original transport case or,



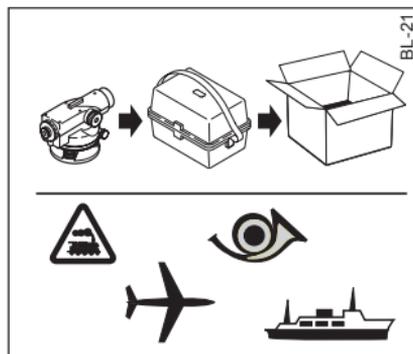
- carry the tripod with its legs splayed across your shoulder, keeping the attached instrument upright.

## Inside vehicle



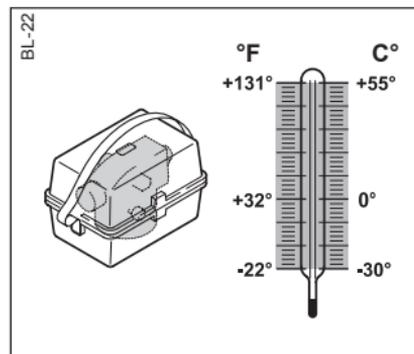
Never transport the instrument loose **inside the vehicle**. The instrument can be damaged by blows and vibrations. It must always be transported in its case and be properly secured.

## Shipping



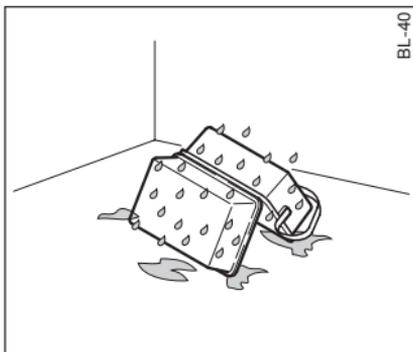
For shipping the instrument by **rail, aircraft or ship** use the original packaging (transport case or shipping cardboard) or another suitable packaging securing the instrument against blows and vibrations.

## Storage



 When storing the equipment, particularly in summer and inside a vehicle, take the **temperature limits** into account. (-30°C to +55°C / -22°F to +131°F).

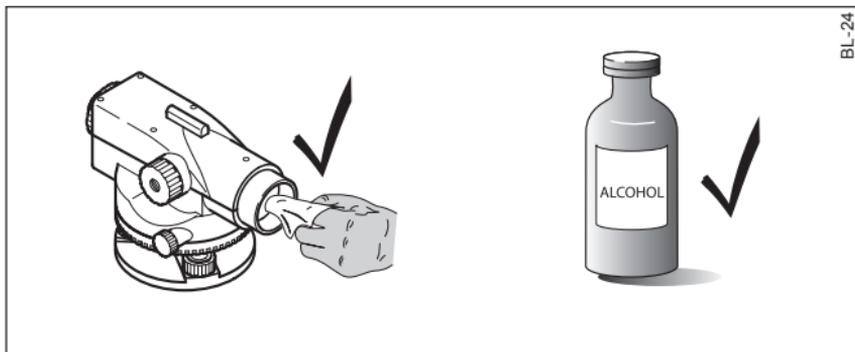
## Storage, continued



 **If the instrument becomes wet, leave it unpacked.** Wipe down, clean, and dry the instrument (at not more than 40 °C/ 104°F), transport case, foam inserts, and accessories. Pack up the equipment only when it is perfectly dry.

When using the instrument in the field always close the transport case.

## Cleaning



 **Objective, eyepiece:**

- Blow dust off lenses and prisms
- Never touch the glass with fingers
- Use only a clean, soft and lint-free cloth for cleaning. If necessary, moisten the cloth with pure alcohol.

Use no other liquids; these may attack polymer components.

The following directions should enable the person responsible and the person who actually uses the instrument, to anticipate and avoid operational hazards.

The person responsible for the instrument must ensure that all users understand these directions and adhere to them.

#### **Permitted uses**

The automatic level is intended to the following applications:

- Construction surveying
  - Line and area levellings
  - Height readings
  - Optical distance measuring with stadia readings
  - Angle measurements and staking out with horizontal circle

#### **Adverse uses**

- Use of the level without previous instruction
- Use outside of the intended limits
- Disabling safety systems and removal of hazard notices
- Opening the instrument using tools (screwdriver, etc.), unless this is specifically permitted for certain functions
- Modification or conversion of the instrument
- Use after misappropriation

## ***Adverse uses, contd.***

---

- Use with accessories from other manufacturers without the prior express approval of Leica Geosystems GR LLC
- Aiming directly into the sun
- Inadequate safeguards at the surveying site (e.g. when measuring on roads, etc.)



### **WARNING:**

Adverse use can lead to injury, malfunction, and material damage.

It is the task of the person responsible for the instrument to inform the user about hazards and how to counteract them. The equipment may only be used if the user is properly instructed.

## ***Limits of use***

---

### **Environment:**

Suitable for use in an atmosphere appropriate for permanent human habitation: not suitable for use in aggressive or explosive environments. Use in rain is permissible for limited periods (splash-water proof).



Refer to section  
"Technical Data".

## ***Responsibilities***

---

**Area of responsibility for the manufacturer of the original equipment Leica Geosystems GR LLC , Grand Rapids, MI 49546, USA:**

**(hereinafter referred to as Leica Geosystems GR LLC)** Leica Geosystems GR LLC is responsible for supplying the product, including the user manual and original accessories, in a completely safe condition.

**Responsibilities of the manufacturers of non-Leica Geosystems GR LLC accessories:**



The manufacturers of non-Leica Geosystems accessories are responsible for developing, implementing and communicating safety concepts for their products, and are also responsible for the effectiveness of those safety concepts in combination with the Leica Geosystems GR LLC product.

**Responsibilities of the person in charge of the instrument:**



**WARNING:**

The person responsible for the instrument must ensure that it is used in accordance with the instructions. This person is also accountable for the training and deployment of personnel who use the instrument and for the safety of the equipment when in use. The person in charge of the instrument has the following duties:

- To understand the safety instructions on the product and the instructions in the User Manual.
- To be familiar with local regulations relating to accident prevention.
- To inform Leica Geosystems GR LLC immediately if the equipment becomes unsafe.

## Hazards of use

---



### **WARNING:**

The absence of instruction, or the inadequate imparting of instruction, can lead to incorrect or adverse use, and can give rise to accidents with far-reaching human, material, financial and environmental consequences.

### **Precautions:**

All users must follow the safety directions given by the manufacturer and the directions of the person responsible for the instrument.



### **CAUTION:**

Watch out for erroneous measurements if the instrument is defective or if it has been dropped or has been misused or modified.

### **Precautions:**

Periodically carry out test measurements and perform the field adjustments indicated in the User Manual particularly after the instrument has been subjected to abnormal use and before and after important measurements.



### **DANGER:**

Because of the risk of electrocution, it is very dangerous to use levelling staffs and extensions in the vicinity of electrical installations such as power cables or electrical railways.

### **Precautions:**

Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.



## ***Hazards of use, continued***

---



### **WARNING:**

By surveying during a thunderstorm you are at risk from lightening.

### **Precautions:**

Do not carry out field surveys during thunderstorms.



### **CAUTION:**

Be careful when aiming your level into the sun. Direct sun radiation can hurt your eyes.

### **Precautions:**

Do not aim directly to the sun.



### **WARNING:**

Inadequate securing of the surveying site can lead to dangerous situations, for example in traffic, on building sites and at industrial installations.

### **Precautions:**

Always ensure that the surveying site is adequately secured. Adhere to the local regulations governing accident prevention and road traffic.

## ***Hazards of use, continued***

---



### **CAUTION:**

If the accessories used with the instrument are not properly secured, and the equipment is subjected to mechanical shock (e.g. blows, falling etc.), the equipment may be damaged safety devices may be ineffective or people may sustain injury.

### **Precautions:**

When setting-up the instrument, make sure that the accessories (e.g. tripod, staff, staff brace, ...) are correctly adapted, fitted, secured and locked in position. Avoid subjecting the equipment to mechanical shock. Never position the instrument on the tripod baseplate without securely tightening the central fixing screw. If the screw is loosened always remove the instrument immediately from the tripod.



### **CAUTION:**

When using a vertical staff supported by one brace there is always the danger of falling (e.g. by wind gusts) and therefore danger of damage to equipment and danger of personal injuries.

### **Precautions:**

Never leave a vertical staff supported by a brace unsupervised (person at the staff).

## ***Hazards of use, continued***

---



### **WARNING:**

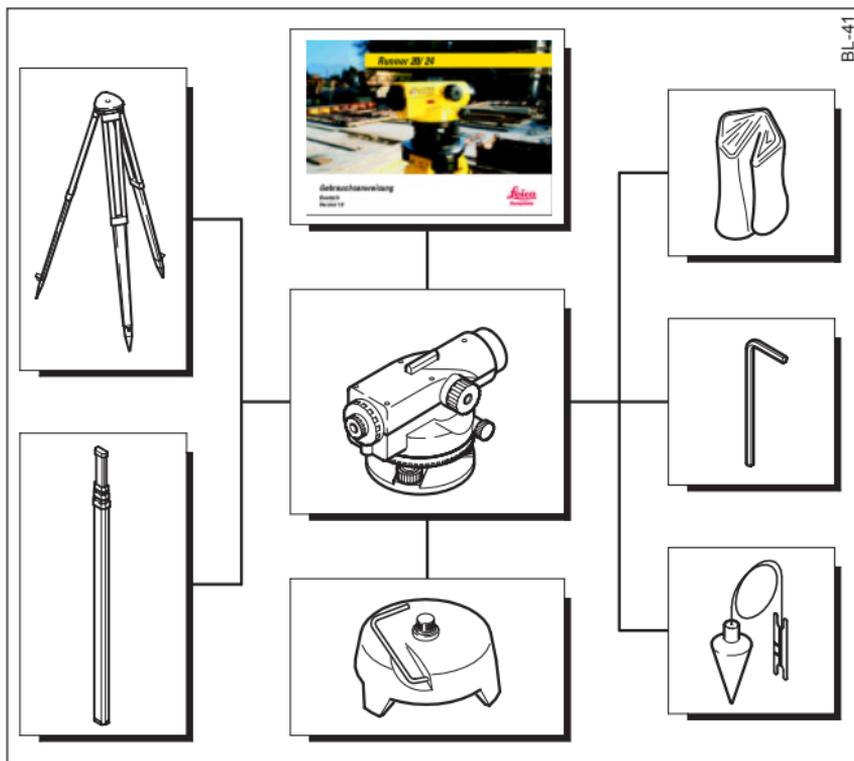
If the equipment is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gases are produced which may impair health.
- By disposing of the equipment irresponsibly you may enable unauthorized persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.

### **Precautions:**

Dispose of the equipment appropriately in accordance with the regulations in force in your country. Always prevent access to the equipment by unauthorized personnel.

## Accessories



User Manual

Protective cover

Allen key

Plumb bob (option)

Level base (option)

Standard level staff (option)

Tripod (option)

## Technical Data

### Accuracy:

- Standard deviation for 1 km double levelling  
RUNNER 20 2,5 mm  
RUNNER 24 2,0 mm

### Telescope:

- Erect image
- Magnification  
RUNNER 20 20 x  
RUNNER 24 24 x
- Field of view at 100 m > 2.3 m
- Shortest target distance from instrument axis 0,8 m

### Distance measurement:

- Multiplication factor 100
- Additive constant 0

### Compensator:

- Working range  $\pm 15'$
- Setting accuracy (standard deviation) 0,5"

### Circular level:

- Sensitivity 10' / 2 mm

### Cirkeľ:

- Graduation 360°
- Graduation interval 1°

### Adaption:

- To normal or ball head tripod

### Temperature range:

- Storage - 30°C bis + 55°C  
(-22°F bis +131°F)
- Operating - 20°C bis + 50°C  
(-4°F bis +122°F)

- A** Accident prevention ..... 28
- B** Booking ..... 16, 17  
Bubble ..... 12, 19
- C** Central fixing screw ..... 12  
Centring ..... 13  
Circular level ..... 12, 14  
Compensator ..... 9
- D** Distance line ..... 15
- E** Electrical installations ..... 27  
Environment ..... 25  
Eyepiece ..... 13
- H** Height difference ..... 9, 16, 17  
Horizontal circle ..... 15  
Hz-angle ..... 18  
Hz-circle ..... 15
- O** Optical sight ..... 13, 14
- P** Packaging ..... 22  
Plummet ..... 13  
Protective cover ..... 20
- R** Rearrangement point ..... 16  
Reticule ..... 13, 14

## ***Index, continued***

---

<b>S</b>	Safe distance .....	27
	Sharp-focus .....	14
	Shipping .....	21, 22
	Storage .....	21
	Storing .....	22
<b>T</b>	Target distances .....	16
	Transport case .....	21, 23
<b>V</b>	Vibrations .....	14
<b>W</b>	Wet instrument .....	23



**Leica Geosystems GR LLC  
is an ISO 9001  
Registered Company**

729541-1.0.1en

Printed in Switzerland -  
Copyright Leica Geosystems GR LLC,  
Grand Rapids MI 49546 USA 2003  
(Original text)



Leica Geosystems GR LLC  
6330 28th Street SE  
Grand Rapids, MI 49546  
<http://construction.leica-geosystems.com>  
[www.leica-geosystems.com](http://www.leica-geosystems.com)