道路工程英语

赵永平　主编
苏　群　主审

人民交通出版社

ENGLISH ON HIGHWAY ENGINEERING

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内 容 简 介

《English on Highway Engineering》(道路工程英语)是为了适应高等工程专科学校路桥工程类专业英语的教学需要而编写的。

本书选材较广泛，涉及工程力学、工程地质、土力学与地基基础、测量学、建筑材料、路基工程、路面工程、桥梁工程、交通工程、工程监理及计算机应用等学科。本书共分20个教学单元(Units)，每单元包括精读课文(Text)、单词与词组(Words and Expressions)、练习(Exercises)、阅读材料(Reading material)及阅读材料参考译文。在每单元的练习中包括阅读与理解多项选择题、词汇练习多选题及汉译英等内容。

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前　言

为了适应高等工程专科学校路桥工程类专业英语的教学需要，根据高等工程专科学校培养目标的要求，编写了《English on Highway Engineering》(《道路工程英语》)。本书的目的是培养学生专业英语阅读能力及专业英语文献翻译的初步能力，使用对象为已学完基础英语的公路与桥梁工程类的大学专科学生，以第5、6学期为宜。本书可适合于80～100学时的教学安排，在使用时应根据教学计划及学时情况灵活掌握，选择其中部分内容进行教学。本书也可供土木工程技术人员作为进一步提高专业英语阅读能力的参考读物。

《English on Highway Engineering》选题面较广泛，涉及工程力学、工程地质、土力学与地基基础、测量学、建筑材料、路基工程、路面工程、桥梁工程、交通工程、工程监理及计算机应用等学科。在编写中吸取了我国专业英语教材的优点和公共英语教学的经验。本书共分20个教学单元(Units)，每单元包括精读课文(Text)、单词与词组(Words and Expressions)、练习(Exercises)、阅读材料(Reading material)及阅读材料参考译文。在每单元的练习中包括阅读与理解多项选择题、词汇练习多选题及汉译英等内容，以便于基础英语与专业英语的衔接和过渡，提高学生的学习兴趣。阅读材料附有参考译文，可供学生课外自学阅读及翻译训练之用。

本书由黑龙江交通高等专科学校赵永平主编，由黑龙江交通高等专科学校苏群主审。

参加本书编写的有：黑龙江交通高等专科学校赵永平(第1、3、7、8、9、10、16、17单元)，浙江省交通学校戴庆星(第13、14、18单元)，黑龙江交通高等专科学校于娇(第2、19、20单元)，黑龙江交通高等专科学校徐胜(第5、6、11单元)，黑龙江交通高等专科学校叶树江(第4、12、15单元)。

在本书的编写过程中，曾得到各兄弟院校及有关单位的帮助和支持，在此谨表谢意。

由于水平所限，本书难免存在不少的缺点和错误，诚请读者提出宝贵的批评和建议。

编　者

一九九七年六月

CONTENTS

Unit 1

Text

Surveying

Before any civil engineering project can be designed, a survey of the site must be made. Surveying means measuring -and recording by means of maps-the earth's surface with the greatest degree of accuracy possible. Some engineering projects-highways, dams, or tunnels, for example-may require extensive surveying in order to determine the best and most economical location or route.

There are two kinds of surveying: plane and geodetic. Plane surveying is the measurement of the earth's surface as though it were a plane (or flat) surface without curvature. Within areas of about 20 kilometers square -meaning a square, each side of which is 20 kilometers long- the earth's curvature does not produce any significant errors in a plane survey. For larger areas, however, a geodetic survey, which takes into account the curvature of the earth, must be made.

The different kinds of measurements in a survey include distances, elevations (heights of features within the area), boundaries (both man-made and natural), and other physical characteristics of the site. Some of these measurements will be in a horizontal plane; that is, perpendicular to the force of gravity. Others will be in a vertical plane, in line with the direction of gravity. The measurement of angles in either the horizontal or vertical plane is an important aspect of surveying in order to determine precise boundaries or precise elevations.

In plane surveying, principal measuring device for distance is the steel tape. In English-speaking countries, it has replaced a rule called a chain, which was either 66 or 100 feet long. The 66-foot-long chain gave speakers of English the acre, measuring ten square chains or 43,560 square feet as a measure of land area. The men who hold the steel tape during a survey are still usually called chainmen. They generally level the tape by means of plumb bobs, which are lead weights attached to a line that give the direction of gravity. When especially accurate results are required, other means of support, such as a tripod -a stand with three legs- can be used. The indicated length of a steel tape is in fact exactly accurate only at a temperature of 20°centigrade, so temperature readings are often taken during a survey to correct distances by allowing for expansion or contraction of the tape.

Distances between elevations are measured in a horizontal plane. In the diagram along side, the distance between the two hills is measured from points A to B rather than from points A to C to D to B. When distances are being measured on a slope, a procedure called breaking chain is followed. This means that measurements are taken with less than the full length of the tape.

Lining up the tape in a straight line of sight is the responsibility of the transitman, who is equipped with a telescopic instrument called a transit. The transit has plates that can indicate both vertical and horizontal angles, as well as leveling devices that keep it in a horizontal plane. Cross hairs within the telescope permit the transitman to line up the ends of the tape when he has them in focus.

Angles are measured in degrees of arc. Two different systems are in use. One is the sexagesimal system that employs 360°, each degree consisting of 60 minutes and each minute of 60 seconds. The other is the centesimal system that employs 400 grads, each grad consisting of 100 minutes and each minute of 100 seconds. A special telescopic instrument that gives more accurate readings of angles than the transit is called a theodolite.

In addition to cross hairs, transits and theodoites have markings called stadia hairs (stadia is the plural of the Greek word stadion, a measure of distance). The stadia hairs are parallel to the horizontal cross hairs. The transitman sights a rod, which is a rule with spaces marked at regular intervals. The stadia hairs are fixed to represent a distance that is usually a hundred times each of the marks on the rod. That is, when the stadia hairs are in line with a make on the rod that reads 2.5, the transit is 250 meters from the rod. Stadia surveys are particularly useful in determining contour lines, the lines on a map that enclose areas of equal elevation.

Contour maps can be made in the field by means of a plane-table alidade. The alidade is a telescope with a vertical circle and stadia hairs. It is mounted on a straight-edged metal plate that can be kept parallel to the line of sight. The surveyor can make his readings of distances and elevations on a plane (or flat) table that serves as a drawing board. When the marks representing equal elevations are connected, the surveyors has made a contour map.

Heights or elevations are determined by means of a surveyor's level, another kind of telescope with bubble-leveling device parallel to the telescope. A bubble level, which is similar to a carpenter's level, is a tube containing a fluid that has an air bubble in it. When the bubble is centered in the middle of the tube, the device is level. The surveyor sights a rule called a level rod through the telescope. The rod is marked off to show units of measure in large, clear numbers. The spaces between the marks usually are alternately black and white in order to increase visibility. The number that the surveyor reads on the level rod, less the height of his or her instrument, is the vertical elevation.

Heights are given in relation to other heights. On maps, for example, the usual procedure is to give the elevation above sea level. Sea level, incidentally, can be determined only after averaging the tides in a given area over a definite period. A survey carried out by level and rod often gives the elevation in relation to a previously measured point that is called a bench mark.

Approximate elevations can also be measured with an altimeter, which is a device that takes advantage of changes in atmospheric pressure. Readings taken with an altimeter are usually made at two, and sometimes three, different points and then averaged. The readings must be corrected for humidity and temperature, as well as the weight of the air itself.

Modern technology has been used for surveying in instruments that measure distance by means of light or sound waves. These devices direct the waves toward a target that reflect them back to a receiver at the point of origin. The length of time it takes the waves to go to the target and return can then be computed into distance. This surveying method is particularly useful when taking measurements over bodies of water.

Aerial photography is another modern method of surveying. A photograph distorts scale at its edges in proportion to the distance the subject is from being in a direct vertical line with the lens of the camera. For this reason, the photographs for an aerial survey are arranged to overlap so that the scale of one part joins the scale of the next. This arrangement is called a mosaic, after the picture that are made from hundreds of bits of colored stone or glass.

Geodetic surveying is much more complex than plane surveying. It involves measuring a network of triangles that are based on point on the earth's surface. The triangulation is then reconciled by mathematical calculations with the shape of the earth. This shape, incidentally, is not a perfect sphere but an imaginary surface, slightly flattened at the poles, that represents mean sea level as though it were continued even under the continental land masses.

New Words and Expressions

civil engineering	土木工程
survey [sə(:)ˈvei] v. ;n.	测量,测量学(术,法)
route [ruːt] n.	路线
plane [plein] a.	平面的
geodetic [ˌdʒi(:)ouˈdetik] a.	大地测量(学)的
curvature [ˈkəːvətʃə] n.	弯曲,曲度,曲率
significant [sigˈnifikənt] a.	有意义的,重大的
elevation [ˌeliˈveiʃən] n.	高度,高程,海拔
boundary [ˈbaundəri] n.	边界,分界
perpendicular to [ˌpəːpənˈdikjulə]	与...垂直,成正交
horizontal [ˌhɔriˈzɔntl] a.	水平的,地平线的
vertical [ˈvəːtikəl] a.	竖直的,垂直的
steel tape	钢尺
chain [tʃein] n.	测链,链条
acre [ˈeikə] n.	英亩
plumb bob	铅锤,锤球
tripod [ˈtraipɔd] n.	三角架
centigrade [ˈsentigreid] n.	百分度,摄氏温度
expansion [iksˈpænʃən] n.	膨胀
contraction [kənˈtrækʃən] n.	收缩
slope [sloup] n.	坡度,斜坡
transit [ˈtrænsit] n.	经纬仪
cross hairs n.	十字丝
sexagesimal [ˌseksəˈdʒesiməl] a.	六十的,六十进位的
centesimal [senˈtesiməl] a.	百分的,百进制的
theodolite [θiˈɔdəlait] n.	光学经纬仪
stadia hairs	视距丝
rod [rɔd] n.	标尺,水准尺

contour ['kɔntuə] n.	等高线·轮廓线
contour line	等高线
contour map	等高线图
alidade ['ælideid] n.	照准仪
parallel to	平行于
level ['levl] n.	水平面，水准仪
bubble level	气泡水准仪
carpenter's level	木工水准尺
visibility [ˌvizi'biliti] n.	可见的
bench mark	水准基点，水准点
altimeter ['æltimiːtə] n.	测高仪，高程计，高度计
atmospheric pressure	大气压力
humidity [hju(ː)'miditi] n.	湿度
target ['tɑːgit] n.	目标，靶子
reflect [ri'flekt] v.	反射
aerial photography	航空摄影(术)
distort [dis'tɔːt] v.	变形，改变，失真，畸形
overlap [ˌouvəˌlæp] v.	重叠
mosaic [mə'zeiik] n.	镶嵌，马塞克
triangulation [traiˌæŋgju'leiʃən] n.	三角测量
reconcile ['rekənsail] v.	使符合，使一致
imaginary [i'mædʒinəri] a.	想象的，假想的
continental [ˌkɔnti'nentl] a.	大陆的

Exercises

I. Multiple choice

1. Plane surveying is means ____.
   (1) measuring a horizontal surface
   (2) measuring the earth's surface with curvature
   (3) determining the best and most economical location or rout
   (4) measuring the earth's surface without considering its curvature
2. When the areas are larger than 20 kilometers squire, ____.
   (1) the earth's curvature does not effect the accuracy
   (2) the earth's curvature should be considered in surveying
   (3) a geodetic survey is unnecessary
   (4) a geodetic survey must take into account the curvature of the earth
3. When measuring the distances and elevations, the measurements will be in ____.
   (1) horizontal plane (2) vertical plane

(3) either the horizontal or vertical plane
(4) both the horizontal and vertical plane

4. The acre is ____.
(1) the 66-foot-long chain
(2) the area of measuring ten times of chains
(3) the area of measuring 10 square chains
(4) a measure of land area

5. When the temperature is higher than 20° centigrade, the indicated length of a steel tape is____ .
(1) exactly accurate (2) longer than actual length
(3) shorter than actual length (4) need to correct distance

6. The function of the cross hairs within the telescope is ____.
(1) sighting the target (2) measuring the angles
(3) measuring the distances (4) focusing on tape

7. The heights or elevations are determined by means of ____.
(1) transit (2) altimeter (3) stadia hairs (4) level

8. On a contour map, ____ can be shown.
(1) the distance of two point (2) the elevations of point
(3) the distances and elevations (4) the boundaries of land

9. The principle of the measure distance by light or sound weaves is ____.
(1) directing the weaves toward s target
(2) calculating the time it takes weaves to go to the target
(3) measuring the time of weaves to go to the target and return
(4) measuring the distance over bodies of water

10. Stadia survey is most useful in ____.
(1) making the contour maps (2) determining the distance
(3) determining the elevation (4) measuring the angle

II. Vocabulary practice

1. Within areas of about 20 kilometers <u>square</u>, the earth's curvature does not produce any significant errors in a plane survey.
(1) honest (2) multiplied by itself (3) parallel (4) right angle

2. Others will be in a vertical plane, <u>in line with</u> the direction of gravity.
(1) agreement (2) same (3) parallel to (4) straight

3. The transit has <u>plates</u> that can indicate both vertical and horizontal angles, as well as leveling devices that keep it in a horizontal plane.
(1) disk (2) medal (3) slab (4) graduated dial

4. <u>Lining up</u> the tape in a straight line of sight is the responsibility of the transitman, who is equipped with a telescopic instrument called a transit.
(1) arranging (2) forcing (3) aligning (4) queuing up

5. When the bubble is centered in the middle of the tube, the device is <u>level</u>.

(1) horizontal (2) elevation (3) parallel (4) stage

6. Sea level, incidentally, can be determined only after averaging the tides in a given area over a definite period.

(1) unimportantly (2) suddenly (3) suddenly (4) by chance

7. A survey carried out by level and rod often gives the elevation in relation to a previously measured point that is called a bench mark.

(1) magistrate (2) datum level (3) station (4) standpoint

8. These devices direct the waves toward a target that reflect them back to a receiver at the point of origin.

(1) straight (2) turn (3) control (4) point

9. A photograph distorts scale at its edges in proportion to the distance the subject is from being in a direct vertical line with the lens of the camera.

(1) deforms (2) twists (3) pulls (4) distract

10. The triangulation is then reconciled by mathematical calculations with the shape of the earth.

(1) settled (2) located (3) made compatible (4)placed

III. Translate the following into English:

1. 测量就是丈量地球表面。平面测量是将地面看成平的，不考虑地球曲度的一种测量方法。
2. 等高线是地形图上表示相同高程的各点的连线。
3. 经纬仪可以用来测量距离、水平角和垂直角。
4. 用水准仪和水准尺进行测量可以得到两点之间的相对高差。
5. 现代测量仪器可以借助光或声波来测量距离。

Reading Material

Triangulation Surveys

In chain surveying, stations may be located by building up of network of triangles measuring the lengths of the lines, but if this technique were extended to cover more than relatively small areas the errors inherent in the making of the linear measurements would become so great as seriously to reduce the accuracy of the plan. Thus, when a large area is to be surveyed , a more rigorous approach is necessary and recourse is to triangulation surveys.

This is the name given to surveys in which the area is divided into geometrical figures, the corners of which form a series of accurately located control stations from which more detailed surveys or location are carried out by the methods already described. The distinguishing features of triangulation surveying are shown in Fig. 1.1. If angles A B and C are measured, then the lengths of sides BC and CA can be calculated. In triangles ACD, DCE etc., it is then only necessary to measure the angles, the lengths of all the other sides of the whole triangulation being worked out from these observed angles (after making

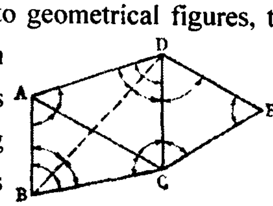

Fig. 1.1

necessary adjustments) and the length of the initial side, which is called the base line. Maximum use is thus made of the most accurate of surveying instruments, the theodolite, while linear measurement by taping , which is difficult and tedious when carried out to the same order of accuracy as good angular measurement, is reduced to the measurement of a single base line. (In practice, two or more bases are often measured to assist in distributing any errors which may occur.)

The introduction of electronic methods of distance measurement allows not only the measurements of base lines, but also the measurement of selected sides of the triangulation network, which leads to further reliability: this technique is termed trilateration.

In the geodetic triangulation survey carried out by the Ordnance Survey, most of the sides of the primary triangles have lengths between 40 km and 70 km, while some, such as the three sides of the triangle whose corners are Scafell Pike, Snowdon, and Slieve Donard (Ireland), are over 150 km long. It is evident, therefore, that the greatest possible accuracy is required in such work. These large primary triangles are then broken down into smaller (secondary) triangles of somewhat lesser accuracy, the stations being 7 to 13 km apart. There is a further breakdown to third-and fourth-order points which are used for detail surveys and for providing control in large-scale photogrammetric work. The fourth-order points give closer spacing in towns -tertiary and higher- order points cover almost the whole country at a density of 0.05 trig point per km^2, with a density of about 0.1 per km^2 near towns; fourth-order points increase this density to 0.7 trig point per km^2 in towns, the stations now being some 1 to 2 km apart. For less extensive survey, i.e. topographical surveys and triangulations carried out to locate engineering works, less accuracy is required than for geodetic work, but since nowadays a similar type of apparatus for base line and angle measurement is often used in both classes of work, the principles involved are the same. In dealing with triangulation in more detail, the measurement of base lines by type will be considered, followed by the principles involved in the actual triangulation itself.

Triangulation can be used for:

(1)The establishment of accurately located control points for plane and geodetic surveys of large areas.

(2)The accurate location of engineering works such as (i) center lines, terminal points and shafts for long tunnels, (ii) center lines and abutments for bridges of long span, and (iii) complex highway interchanges,

(3)The establishment of accurately located control points in connection with aerial surveying,

(4) Measurement of deformations of structures such as dams.

[阅读材料参考译文]

三 角 测 量

在测链测量时代，测站是通过建立测量边长的三角网进行定位的，但这一技术如果应用到覆盖超过某一相对较小的区域时，直线丈量所固有的误差就会大大降低平面图的精度。因

此，当要测量一个较大区域时，就需要更高的精度，因而就需要求助于三角测量。

这是把该区域分成若干个几何图形来测量的名称，这些图形的角点形成一系列精确的定位控制测站，再从这些测站用已介绍的方法来进行更精密的测量或定位。三角测量的典型特征如图 1.1 所示。如果角 A 、 B 和 C 在三角形 ABC 中测得，并且 AB 边的长度也已测量出来，那么 BC 边和 CA 边的长度就可以计算出来。这样在三角形 ACD 、 DCE 等中，就只需要测量角度，而整个三角网中的所有其它边的长度都可以通过所观测的角值（经过必要的调整）和初始边的长度计算出来，这个初始边叫做基线。因此，绝大多数的测量是用最精确的测量仪器经纬仪来完成的，而用钢尺进行的直线丈量就被减少到了只对一个基线的测量，这一过程要想达到与良好的角度测量仪器相同的精度是很困难的、乏味的。（在实测中，通常需要测量两条或更多的基线以便协助分配任何可能出现的误差。）

电子测距方法的引入不仅可应用在基线测量中，也可用于三角网中的所选边的测量，这就导致更高的可靠性，这个方法称为三边测量。

在由英国陆军测量局完成的大地三角测量中，大多数的初级三角网的边长在 40 到 70km 之间，而有些边长超过了 150km ，例如三个角为斯可菲峰，斯诺敦和斯利维 · 唐纳的三角网的三条边。因此，很显然在这一级测量中需要尽可能高的精度。然后这些大型的初级三角网可以分成精度稍低的小三角网（二级三角网），测站间隔 7 到 13km 。还可以进一步划分出用于详细测量或为大比例航空摄影测量提供控制的第三级和第四级三角点。四级三角点可以加密城市中的三级或者更高等级的三角点，以每平方公里 0.05 个三角点的密度覆盖几乎整个国家，在城市附近的三角点密度为每平方公里 0.1 个；四级三角点使城市内的三角点密度达到每平方公里 0.7 个，此时测站的间距是 1 到 2km 。对于小范围测量，即为工程项目定位所进行的地形测量或三角测量，所需精度比大地测量低，但由于现在不同等级的测量中的用于基线和角度测量的仪器设备通常是相同的，因而所包含的原理也是相同的。在进行更细部的三角测量时，就可以考虑用钢尺进行基线测量，但要按照真正的三角测量的原理进行。

三角测量可以用于:

(1) 为大区域的平面和大地测量建立精确的定位控制点。

(2) 为工程项目进行精确定位，如:（ i ）长隧道的中心线、起终点和通风井；（ ii ）大跨径桥梁的轴线和桥台；（ iii ）复杂的公路立体交叉。

(3) 为航空摄影测量建立精确定位控制点。

(4) 结构的变形测量，例如水坝。

Unit 2

Text

Total Stations with Outstanding Performance Features

1. More efficiency in your day-to-day work with the Wild Total Stations

In building, civil engineering, construction, cadastral and detail surveys, particularly in populated areas, 99% of distance measurements are less than 500m. The need is for a small, lightweight, easy-to-use EDM that measures quickly and accurately. An EDM that stands for electronic distance measurement makes the tape redundant.

When you aim at the reflector with the telescope, the infra-red measuring beam, which is parallel to the telescope line-of-sight, is reflected by a prism at the other end of the line. In the five seconds it takes for a normal measurement, the Total Stations adjusts the signal strength to optimum level, makes 2048 measurements on two frequencies, carries out a full internal calibration, computes and displays the result. 0.1 - 0.3 second updates follow the initial 3-second measurement in tracking mode.

The whole sequence is fully automatic. You simply point to the reflector, touch a key and read the result. Anyone can use the Total Stations accurately, confidently and efficiently.

The liquid-crystal display is unusually large for a miniaturized EDM. Measured distances and angles are presented clearly and unambiguously with appropriate symbols for slope, horizontal distance, height, horizontal, vertical angle and setting-out. A series of bar in the display shows the progress of the measuring cycle.

In test mode, a full check is provided of the display, battery power and return signal strength. An audible tone can be activated to indicate return signal. Scale (ppm) and additive constant (mm) settings are displayed at the start of each measurement. The unit of measurement (meters or feet) is always shown. The display illuminates for work in the dark.

2. Angles, Distances, and Reduction at the Touch of a Single Key

Ideal combination of angle and distance measurement

In the Wild TC1000 and TC1600, the systems for measuring angles and distance, and the functions for reduction and recording are compactly integrated. Weighing only 5.7kg (13lb) including the internal battery. This equipment can simultaneously measure and record angles and distance up to 5 km (3mi) in just five second.

Switch on and measure

Position-coded circles form the basis for the absolute electronic angle-measuring system of the TC1000 and TC1600. They relieve the user of time-wasting initialization, because the instrument is instantly ready to measure. Angle measurement is continuous; the display is immediately updated as soon as you turn the telescope.

You can reset the horizontal circle to 0 or to any other azimuth by keyboard input and measure the horizontal angle clockwise or counterclockwise.

Outstanding angle-measurement accuracy

The standard deviation of the mean of observations on both telescope positions is 1.5"(0.0005 gon) for the TC1600 and 3"(0.001gon) for the TC1000. Because of automatic compensation for circle eccentricity the TC1600 also provides extremely accurate single-face measurement.

Measure and record as soon as you set up

As soon as you switch on your TC1000 or TC1600, its absolute angle-scanning system and powerful built-in EDM unit are ready for measurement. And just five seconds later they give you distance and reduced value. Touch the ALL key and the instrument measures angles and distance, and record them complete with the point number.

Up to 2km single-prism range

The EDM unit of the TC1000 and TC1600 measures distance up to 5km through the instrument's coaxial telescope. In average atmospheric conditions, a single reflector prism is all you need to measure distance up to 2km (1 1/4 mi) with an accuracy of 3mm+2ppm. For long range and poor weather conditions, the DIL repeat-measurement mode automatically ensures the same accuracy.

For setting-out, both total stations have a tracking mode with one second updates of displayed value and accuracy of 5mm+2ppm. If required, these distances and their angles can be reduced and recorded.

Reliable, unequivocal design of control

On the color-coded keyboard you can call up practically any typical day-to-day task, including distance measurement and date recording, at the touch of a single key.

These control panels let you control all the instrument's functions. The practice-tested design and layout are the best protection against false manipulation and make you work extremely efficient.

And you can input any essential numeric information such as point number, station coordinates etc. directly on the keyboard. To let you see better in the dark, the displays can be backlight.

3. Touch the ALL key once to measurement and record the angle and distance

The TC1000/TC1600 system has all the features you need to record measurements and other data, and process them in the field.

GIF10 data reader

This data reader is an universal interface between REC module and computer, peripheral equipment, or another REC module. Use a GIF10 to display, copy, or delete data, to transfer them to a computer, and for on-line data input to the REC module.

GRM10 plug-in REC module, the most economical way to record and store data

Instead of a second control and display panel on face 2, Wild TC1000 and TC1600 total stations are available with a slot for a plug-in Wild GRM10 REC module that takes only a few seconds to insert or take out. The REC module can store about 500 data blocks. Use as many