



Modular
Instrument
System
Kern



Electro-Optical Distance Meters **DM 504/DM 550**

Setting the Standards Worldwide





Kilometer-Long Traverses

Kern Series 500 Distance Meters: Setting the Standards Worldwide

Over the past ten years, Kern has developed a unique modular instrument system which also incorporates the successful series 500 electro-optical distance meters.

Sophisticated Modularity

Birds of a feather flock together! Kern distance meters can be attached to all Kern engineer's and one-second theodolites. The built-in flexibility offers **a cost-effective solution to any surveying problem.**

The measured distances are transmittable on-line to the Kern RD10 remote receiver, ALPHACORD field computer, HP-41 pocket calculator or any other calculator with an RS-232 interface.

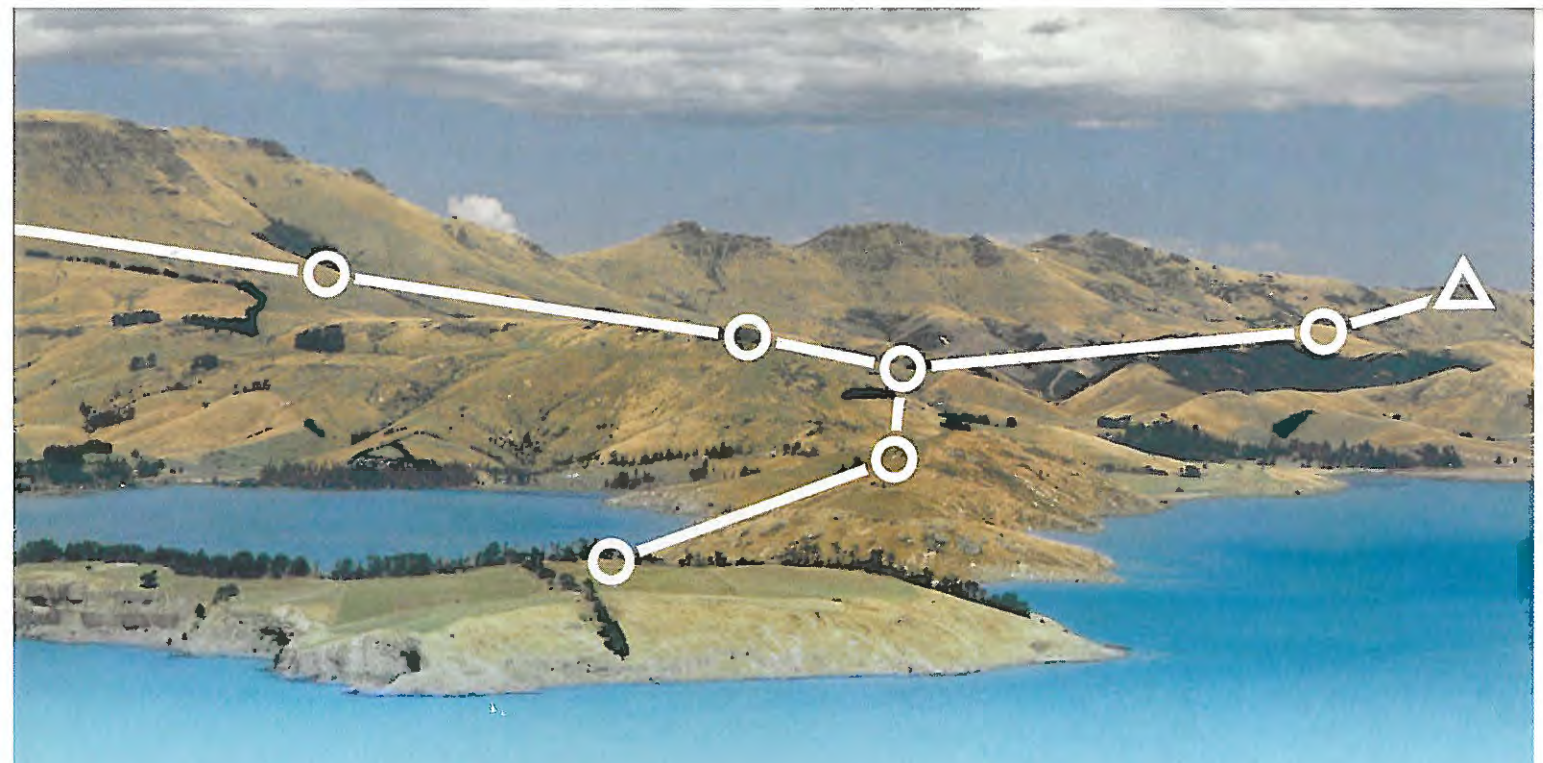
Fully Transitable

Look at it from this angle: the main thing is that you can take angle measurements quickly and reliably in both telescope positions. Thanks to the internal power supply and the ingeniously arranged transmitter and receiver, no tiresome counterweights are required and the telescope remains fully transitable.

Reduced Power Consumption

Thanks to the new CMOS technic, the power consumption in comparison to that used with earlier distance meters has been reduced by a fifth. This means longer operating time using the same battery.





Universal Reflector

One size fits all! A universal reflector has been developed for use **with all distance meters in the Kern modular instrument system**. For greater ranges, several universal reflectors are connected together with bayonet couplings. Thanks to the Kern MULTIBASE system, the universal reflectors can also be used with other well-known centring systems.

The signal red target marks on the front side of the reflector are clearly visible, even over extended distances. A Kern reflector light source is available for very long distances and poor visibility.

Miniature Reflector

You can measure more conveniently and flexibly with the new Kern reflector set (reflector diameter 24 mm) distances up to 300 m. A number of readycut threads enable the reflector to be attached to any desired location on workpieces and structures.

A beam translating prism—simply pushed into position on the theodolite telescope—guides the measuring beam into the target axis. As soon as the reflector is sighted, distance and angular value can be determined in the same operation.

Eccentric setting up is avoided when the Kern miniature reflector set is used (see brochure No. 108).





Large-Area Topographic Surveying

Kern DM 504 and Kern DM 550 in Detail

Five Attachment Modes – No Limitations

The DM504 and DM550 electro-optical distance meters can be attached to the Kern DKM 2-A, K1-M and K1-S opto-mechanical theodolites as well as to the Kern E12 (E1) and E2 electronic theodolites.

Four Measuring Programs

Standard Measuring: During a standard measurement, approximately half a million precision measurements are carried out. The distance appears in the display with millimeter accuracy only a few seconds after the measurement has been initiated.

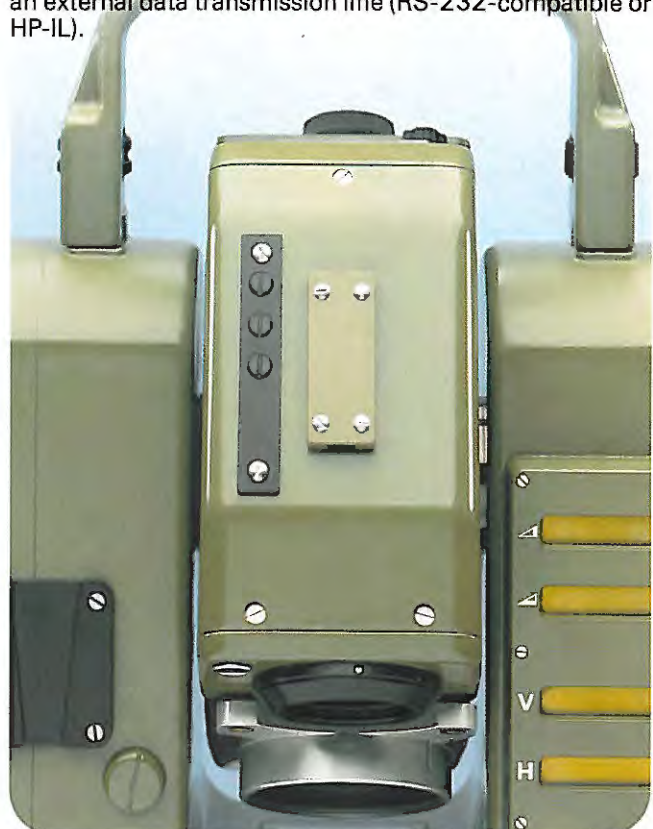
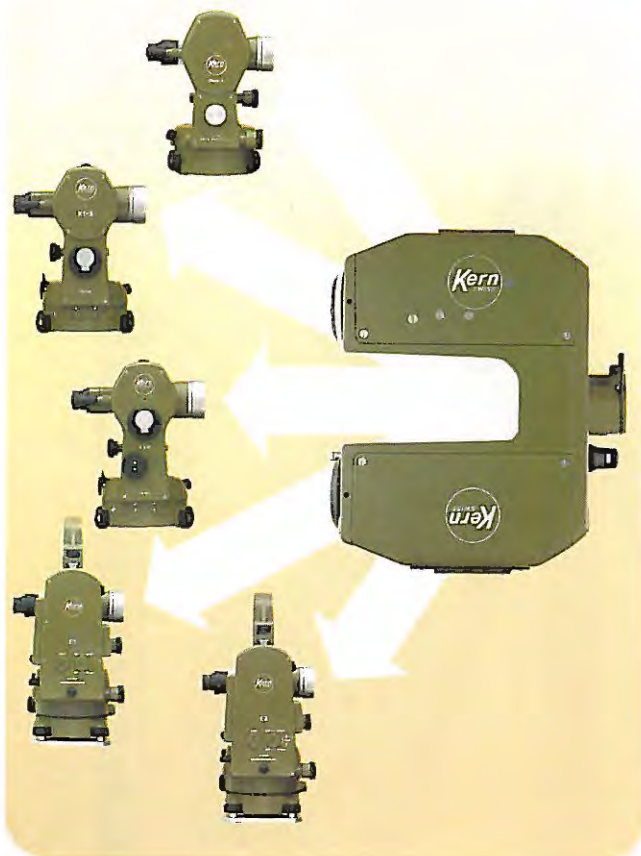
Repetition Measurement with and without averaging: The standard measurement is automatically repeated every 6.5 seconds.

In the measuring mode with averaging the continuous arithmetic mean of the measurement appears in the display.

Tracking: After the first measurement of 3.5 seconds, short measurements at 1.5-second intervals are carried out without further measuring button actuation. Tracking is particularly suitable for rapid, **coordinate-related laying out in accordance with the unique Kern method.**

Effortless Entry of Measuring Units and Scale Corrections

Conveniently accessible and secured switches allow the manual entry of units (meters or feet, gon or $^{\circ}$), ppm scale factor, addition constants as well as the selection of an external data transmission line (RS-232-compatible or HP-IL).





Easy to Service

Test programs are included as standard in the DM 504 or DM 550 for maintenance and test purposes. They enable the Kern service stations to rapidly measure the modulation frequencies. All test results are immediately printed out. That is genuine Kern service that really pays off.

Clear Readings at All Times

Due to the illuminated liquid crystal display, the distance readings can be taken under all light conditions. With three measuring frequencies, the distance can be displayed to eight significant figures allowing an unambiguous reading in the kilometer range.

Kern Telereading: More Automation, More Reliability

The DM 504 and DM 550 distance meters feature Kern Telereading: a bus system (ASB, ASCII single bus), based on half-duplex data transmission, **links several Kern instruments with a single data line**. In addition, peripherals with RS-232 interfaces, such as computers and printers, can also be directly connected to the bus system.

Automatic Test Functions

After the DM 504 or DM 550 have been activated, the display works as test monitor. After automatic internal chip function tests, the adjustable parameters such as **addition constant (37)** and **ppm scale factor (+021)** appear together with a check of measuring unit and data output – a uniquely informative data display immediately after instrument actuation!

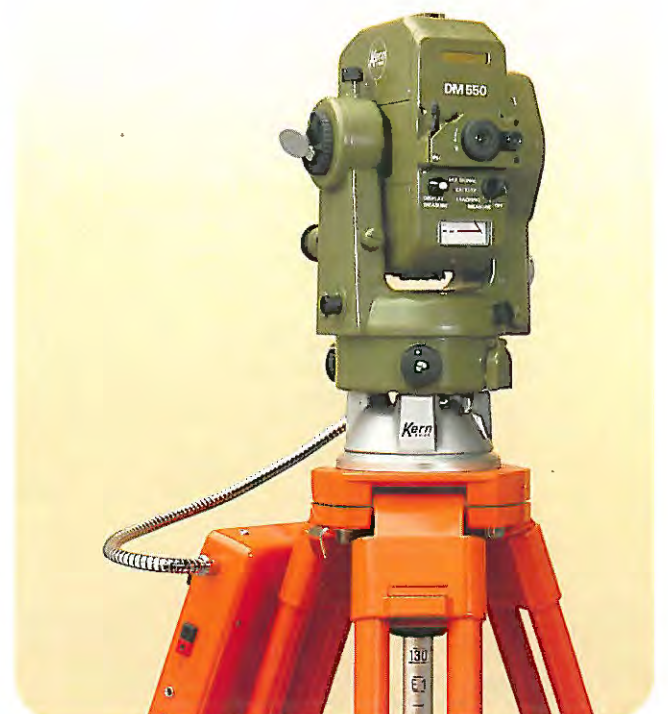


Individual Power Supply

Surveying assignments can be highly varied. Surveying instruments therefore need application-compatible power supplies. For this reason, Kern offers several options.

- For assignments requiring a high degree of mobility: **the light, rechargeable, tripod-mounted 5V battery cassette for 7 to 8 hours of operation in tracking mode**. With 2 single measurements every minute we get an operating time of 14 to 16 hours!
- For power supplied from other batteries: **Direct connection with batteries from 5 to 15 V**. A simple and cost-effective solution for long periods of operation.

Power is supplied via the theodolite base section and wiper contacts. In this manner, the theodolite is not subjected **to any cables**.



Detail Points With Millimeter Accuracy

DM 504: The Compact Mid-Range Instrument

5 km Range

Sight reflector—press the measuring button and the DM 503 measures **distances up to 5 km** in only a few seconds with a millimeter resolution. Internal test programs monitor the measuring procedure.

High Accuracy – Precisely Monitored

The standard deviation of the DM 504 is 3 mm + 2 mm/km. It can thus be used for accurate special surveying assignments. In order to guarantee such accuracy, it is necessary to intercept external influences that could adversely affect the measurements. The DM 504 registers excessive interruptions or measuring times and signals this condition with a decimal point before the last digit in the display.

Coordinate Surveying and Laying Out

The capabilities of the DM 503 can be utilized even better by connecting the Kern ALPHACORD field computer or the HP-41 pocket calculator and using them together with the Kern SICORD programs.

Horizontal distance, elevation difference, longitudinal and transverse deviations between provisional points and those to be laid out, as well as **point coordinates** can be computed in the field. The genuinely field-oriented SICORD program greatly reduces the amount of brainwork required. And when you want it in writing, you can compile a field report via the «pocket printer» (see brochures Nos. 113, 114, 115 and 143).

Universal Scope of Applications

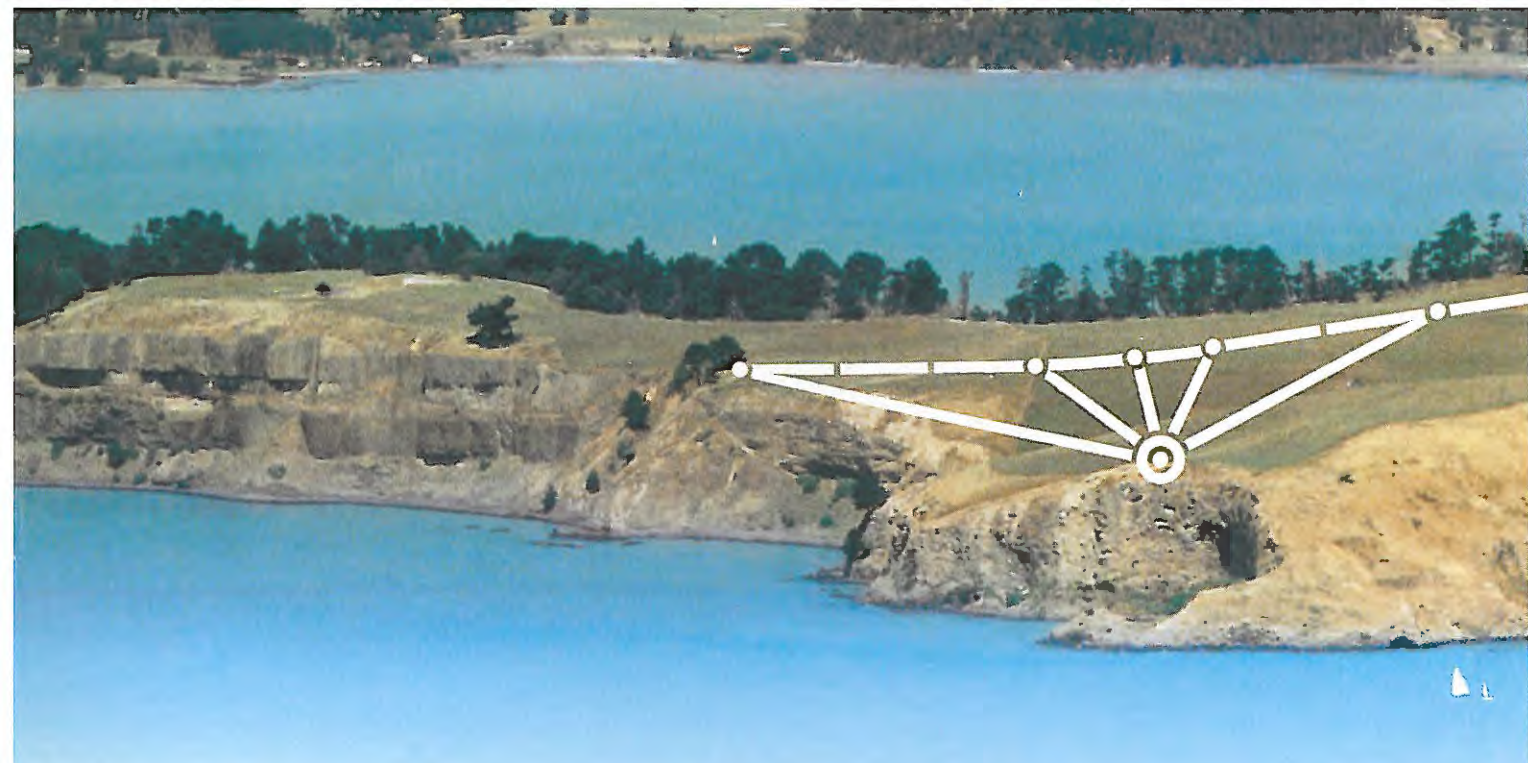
In combination with theodolites of varying degrees of accuracy, the DM 503 is an extremely cost-effective distance meter. It can be used in the most widely varying surveying sectors.

Ranges
DM 504 and DM 550

	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5 km
Number of Reflectors 1				▶					
3						▶			
5							▶		
7								▶	

Atmospheric conditions

<p>Unfavorable Very hazy Visibility range about 5 km (16 400 ft) Intensive solar radiation Heavy scintillation</p>	<p>Medium Clear to slightly hazy Visibility range about 15 km (49 200 ft) Sunny intervals Weak scintillation</p>	<p>Very good Overcast No haze Visibility range about 30 km (98 400 ft) No scintillation</p>
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Network densification: minor triangulations, traverses.
Engineering and cadastral surveying: longitudinal and cross sections, surveying, laying out, trigonometric elevation determinations, topographic surveys, point reconstructions.

Deformation measurements: observation of slip areas and verification measurements on structures in the millimeter range.

DM 550: Horizontal Distance With Dynamic Inclination Sensor

The Kern DM 550 electro-optical distance meter is provided with all the capabilities of the 500 series. Its standard deviation is 5 mm+2 mm/km. In addition to the

slope distance, it also selectively displays **the horizontal distance, the elevation difference and the zenith angle** after each measurement. The inclination measurement takes place by dynamic pick-off from an oscillating sensor. Surveying assignments with opto-mechanical theodolites used as tachymeters are thereby considerably simplified.

Everything With One Button

With the DM 550, the actual measurement and computation of horizontal distances is reduced to the actuation of a single button.

As soon as the telescope of the theodolite is horizontal, the zero position of a dynamic inclination sensor is initialized by slight pressure on the measuring button. This initializes the DM 550. All measured values can be made visible with the same measuring button. One long and one short actuation will cause the following stack register to run through:

Slope distance	S.
Horizontal distance	H.
Elevation difference	L.
Zenith angle	A.
Slope distance	etc.

Simplified Laying Out

With the DM 550, the horizontal distance is continuously available. Thus, you always have a comparison with the distance you have to lay out. The long way around via an additional computer is therefore unnecessary.

If the current horizontal distance is transmitted to the Kern RD10 remote receiver, the assistant can **immediately** move to the prescribed horizontal distance.

Measuring Without Reflector

As soon as a measurement to the reflector has been completed, further elevation measurements in the same vertical line locus can be made without reflectors. The elevation difference is continuously updated in accordance with telescope inclination. This can be used to determine bench marks, for example.





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Technical Specifications of the DM 504

Principle of measurement

Emission source infrared-diode
Carrier wave length 860 nm
Intensity control of signal fully automatic

Measuring programs

Standard program 6.5 s
Standard program repeated every 6.5 s
Standard program with averaging every 6.5 s
Short measurement (tracking) every 1.5 s

Display

Measuring unit feet, meters
Values slope distance; scale correction factor,
addition constante, beam interference

Ranges

With different visibilities see table

Distance corrections

Scale factor, adjustable ± 499 ppm
Addition constant 99 mm

Accuracy

Resolution 0.01 ft, 0.001 m
Standard deviation
of the slope distance 3 mm+2 mm/km

Power supply

Battery 5 NiCd elements with charger 5 V, 7 Ah
Attachable to other batteries 5 to 15 V

Measuring time at 20°C

With 5 V, 7 Ah:

In tracking mode 7 to 8 h
2 measurements in a minute 14 to 16 h

Interface

Data output to the field computer (ALPHACORD)
and host computer Kern ASCII Single Bus (ASB),
RS-232-compatible
Data output to HP-41 interface Kern DIF 41 (BCD)

Mechanical specifications

Dimensions 7.1×6.9×2.8 in. (180×175×70 mm)
Weights 3.5 lbs. (1.6 kg)
Range of tilt fully transitable
Attachable to Kern theodolites K 1-S, K 1-M, DKM 2-A,
E 12 (E 1) and E 2

Temperature

Working range -4°F to 122°F (-20°C to 50°C)

Technical Specifications of the DM 550

Display

Measuring unit feet/meters and gon/°
Values slope distance, horizontal distance,
elevation difference, zenith angle;
scale correction factor, addition constant,
beam interference

Ranges

With different visibilities see table

Accuracy

Resolution (vertical angle) 10" (1 mgon)
Standard deviation of
the slope distance 5 mm+2 mm/km
Standard deviation of
the vertical angle 17" (5 mgon)

Measuring time at 20°C

With 5 V, 7 Ah:

In tracking mode 5 to 6 h

Convenient Accessories

Angular diopter;
All-weather proof
for reflector;
Kern RD10 remote receiver;
Extension tubes for
reflector rod

