

**SOKKIA**



**AUTOMATED 3D STATIONS**

# **NET05 NET1**

For 3D COORDINATE MEASURING SYSTEM **MONM03**

# A Giant Leap in the Precision Measurement of Mammoth Structures

Since its groundbreaking debut in 1990, SOKKIA's NET series 3D Stations have been evolving in precision, functionality and versatility to meet the changing needs of precision measurement applications. Featuring the latest technological breakthroughs, NET05 and NET1 offer unprecedented precision as well as the automated capability to satisfy the most demanding measurement tasks.



## Angle & Distance Measurement Performance

Model	NET05	NET1	
<b>Angle measurement</b>			
Accuracy	0.5" / 0.15mgon	1" / 0.3mgon	
Minimum display	0.1" / 0.02 mgon / 0.0005 mil		
IACS	Provided (Independent Angle Calibration System)		
<b>Distance measurement</b>			
Accuracy	Reflective sheet	(0.5 + 1ppm x D)mm	(1 + 1ppm x D)mm
	AP/CP prism	(0.8 + 1ppm x D)mm	(1 + 1ppm x D)mm
	Reflectorless	(1 + 1ppm x D)mm	(3 + 1ppm x D)mm
Minimum display	0.01mm / 0.0001ft. / 1/64in.	0.1mm / 0.001ft. / 1/16in.	
Measuring range	Reflective sheet	1.3 to 200m (650ft.)	1.3 to 300m (980ft.)
	One AP prism	1.3 to 3,500m (11,480ft.)	1.3 to 3,500m (11,480ft.)
	CP prism	1.3 to 800m (2,620ft.)	1.3 to 1,000m (3,280ft.)
	Reflectorless	0.3 to 40m (130ft.)	0.3 to 200m (650ft.)
Measuring time	Fine: 2.4s, Rapid: 2.0s		

## NET05 — A Ultra-Precision 3D Station

### 0.5" Angle Accuracy

NET05

The NET05 employs SOKKIA's unique Independent Angle Calibration System (IACS) technology for unparalleled measurement reliability. Combined with market-proven absolute encoders that incorporate advanced coding and digital-processing technologies, the NET05 provides the industry's highest\* 0.5" (0.15mgon) angle measurement precision.

\* As of April 1, 2009.

### The Sub-millimeter EDM Opens the Door to Unprecedented Precision

NET05

SOKKIA's cutting-edge distance measurement technology ensures unmatched comprehensive performance. Using reflective sheet targets, the NET05 provides sub-millimeter accuracy in a range of up to 200m. With its 3.5km long-range capability and fast measurement speed, the NET05 also satisfies every requirement for the reference EDM that is employed for precise baseline calibration.

- Sub-millimeter 0.5mm + 1ppm accuracy using reflective sheets within the range of 200m (650ft.).
- NET05 measures prisms with 0.8mm + 1ppm precision up to 3,500m (11,480ft.).
- Reflectorless measurement can be performed with 1mm + 1ppm precision.

## NET1 — A Long-range and Versatile 3D Station

### 1" - 1mm Accuracy

NET1

NET1 measures angles with 1" (0.3mgon) accuracy and distances with 1mm + 1ppm using prisms or reflective sheet targets. This level of precision is designed to answer the needs of various applications.

### Wide Measurement Range

NET1

- A 200m (650ft.) reflectorless measurement capability gives NET1 further versatility for applications where reflectors cannot be placed.
- NET1 measures up to 300m (980ft.) with 50 x 50mm reflective sheet targets.
- Long-range capability reduces the need for changing instrument positions, resulting in higher work efficiency.

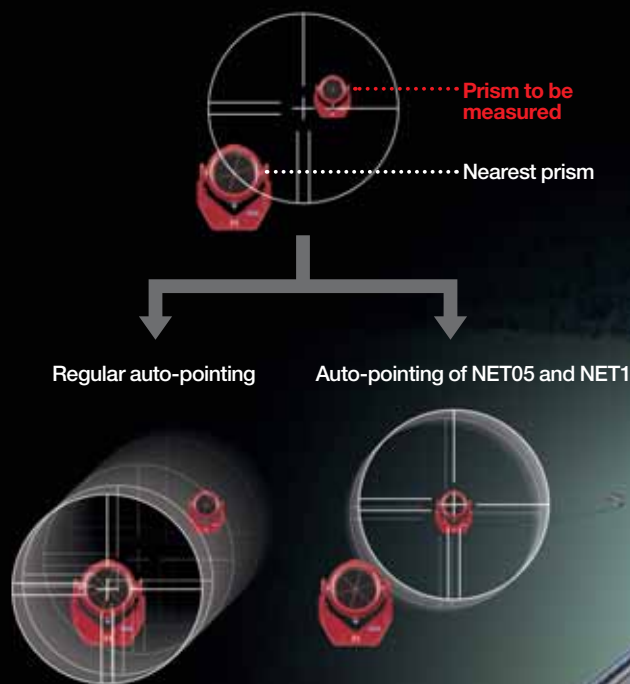
## Automated Measurement Capability Expands Application Possibilities

### MONITORING

Effectively performs displacement and deformation monitoring using the state-of-the-art automated measurement capability.

- Bridges, buildings, dams, mining sites, tunnels, railroads and other large structures, both existing and under construction, can be automatically monitored even without an operator.
- NET05 and NET1 implement an exclusive auto-pointing algorithm\* for monitoring applications. The NET automatically sights the prism closest to the telescope center regardless of the distance from the instrument even if multiple prisms or other reflective objects are in the field of view. This function remarkably enhances the reliability of periodic monitoring with predetermined prisms.

\* With a regular auto-pointing algorithm, the instrument sights the nearest target with the strongest reflection.



# TUNNELS

Measure tunnel convergence and deformation more efficiently than ever.

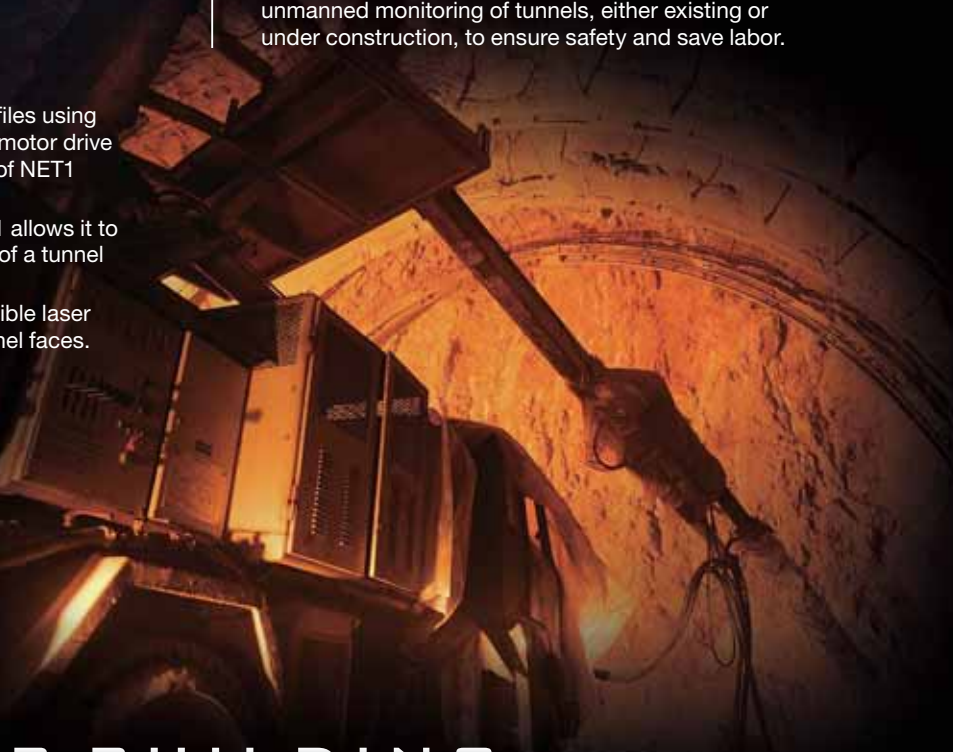
- Quickly and accurately measure the convergence of tunnel supports, crowns and walls, especially in sites using NATM.

Convergence measurement



- NET05/NET1 can be employed for automatic or unmanned monitoring of tunnels, either existing or under construction, to ensure safety and save labor.

- Rapidly measure tunnel cross-section profiles using the combination of reflectorless EDM and motor drive functionality. The long reflectorless range of NET1 makes it an ideal solution.
- The auto-tracking function of NET05/NET1 allows it to precisely control the position and attitude of a tunnel shield machine.
- The LSP1 optional Laser Guide emits a visible laser beam for profile contour projection on tunnel faces.



# SHIP BUILDING

The NET05/NET1 dramatically increases construction efficiency and accuracy with its superior measurement capability in combination with unique target systems.

- Precise geometry measurement enables accurate manufacture of ship blocks, resulting in smoother assembly with minimum on-site trimming.
- Accurate positioning of each block results in improved overall ship quality.



## BRIDGES

Precise measurements using reflective sheet targets and compact prisms enable high-quality bridge construction with short lead times.

- In-process measurement of framework members ensures the accurate manufacture of each part, increasing productivity in on-site assembly.
- Automatically monitor displacement and deformation of existing bridges for maintenance and safety purposes.



## PLANTS

Position, geometry and dimensions of complex members of various plants can be measured with sub-millimeter to millimeter accuracy.

- For as-built measurement where real precision is required.
- For precise positioning, leveling, vertical and in-line alignment of pipes, machineries, wind power generators and other components.



## VEHICLES & AIRCRAFT

The NET05 provides a flexible solution for the precise measurement of dimensions and geometry of various vehicles and aircraft in each stage of manufacturing, service and maintenance.

- NET05 measures points with sub-millimeter accuracy using reflective sheet targets that can be directly applied to the measuring points.
- The easy-to-setup mobile system provides maximum convenience in 3D measurement from multiple positions.



# Auto-pointing, Auto-tracking, Motor Drive, and Laser Option

Fully equipped with advanced features to enhance measurement efficiency

## Auto-Pointing

The auto-pointing function using reflective prisms or sheet targets\* realizes automatic measurement for applications such as unmanned deformation monitoring.

- 1,000m (3,280ft.) Auto-Pointing range using one AP prism.
- An exclusive Auto-Pointing algorithm ensures reliable measurement to the predetermined prisms in periodic monitoring applications.

\* Excluding half-type sheet targets.

## Auto-Tracking

The NET05/NET1 constantly tracks a moving prism up to 90kmph at a distance of 100m (56mph at 320ft.), or 18kmph at 20m (11mph at 65ft.).

- For continuous measurement of moving objects.
- For precise position and attitude control of tunnel shield machines.
- For high-precision setting-out tasks.

## Perfectly Aligned Laser Pointer

- The red laser pointer utilizes the EDM measuring beam, and is therefore perfectly aligned with the EDM and telescope axes.

## Target Illumination

- Prisms or sheet target can be located easily in dim lighting conditions using the high-intensity white LED built into the telescope.
- Brightness and illumination pattern (blink or on) can be selected according to the environment.



## Windows CE

- NET05/NET1 incorporates the flexible Windows CE operating system.
- A large TFT color LCD display provides an easy to use intuitive graphic interface and touch screen operation.



## Fully Illuminated Keyboard

Both the display and full-alphanumeric keyboard on the control panel are adequately illuminated allowing easy operation in tunnels, at night, and in low lighting conditions.



## Multiple Data Storages

- Over 1MB of internal data memory.
- CF card Type II, SD card\* and USB memory are supported.

\* CF type adapter required.

## Outstanding Environmental Protection

- Highest in its class\* IP64 dust-water resistant body stands up under dusty or wet conditions.
- Weatherproof multi-port maintains IP64 protection even with an RS-232C data cable or an external battery connected.

\* Among motorized total stations as of April 1, 2009.

## Bluetooth® Wireless Communication

- H-BT1 and RC-TS3 handles incorporates a Class 1 *Bluetooth* modem that allows wireless communication with an external controller or PC to a range of 300m (980ft.).



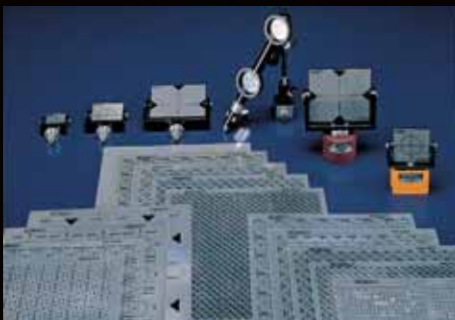
## LSP1 Laser Guide (option)

- The LSP1 – a laser beam emitter – can be built into the telescope of NET05/NET1.
- In conjunction with motor-drive capability, the NET automatically emits the visible red laser in the programmed directions.
- The bright laser beam can be utilized for automatic profile projection on tunnel faces as well as various setting out tasks in the NATM method.
- The narrow parallel beam reaches 700m (2,300ft.) in underground conditions. The beam diameter is as small as 30mm at 200m distance (1.18in. at 650ft.).
- Beam pattern can be switched between Blinking and On to optimize visibility.



## Unique and Versatile Targets

- The full line of dedicated NET series targets are designed to maximize measurement accuracy and efficiency.



\* NET05 with *Bluetooth* enabled handle

# Summary of Specifications

Model	NET05		NET1	
Telescope	Fully transiting, Coaxial sighting & distance measuring optics Magnification: 30x, Resolving power: 2.5", Minimum focus: 1.3m (4.3ft.)			
Angle measurement	Absolute encoder scanning. Both circles adopt diametrical detection.			
Unit	Degree / Gon / Mil, selectable			
Display resolutions (selectable)	0.1" / 0.5", 0.02 / 0.1mgon, 0.0005 / 0.002 mil			
Accuracy (ISO 17123-3:2001)	0.5", 0.15mgon, 0.0025mil		1", 0.3mgon, 0.005mil	
IACS	Provided (Independent Angle Calibration System)			
Automatic dual-axis compensator	Dual-axis liquid tilt sensor, Working range: $\pm 4'$ ( $\pm 74$ mgon)			
Distance measurement	Modulated laser, Phase comparison method with red laser diode (690nm)			
Laser output*1	Reflectorless mode	Class 2 (max. 0.99mW)		Class 3R (max. 5mW)
	Prism/Sheet mode	Class 1 equivalent (max. 0.22mW)		
Measuring range*2	With reflective sheet (RS50N-R)*3	1.3 to 200m (4.3 to 650ft.)		1.3 to 300m (4.3 to 980ft.)
	With one AP prism	1.3 to 3,500m (4.3 to 11,480ft.)		1.3 to 3,500m (4.3 to 11,480ft.)
	With CP prism	1.3 to 800m (4.3 to 2,620ft.)		1.3 to 1,000m (4.3 to 3,280ft.)
	Reflectorless*4	0.3 to 40m (1.0 to 130ft.)*5		0.3 to 200m (1.0 to 650ft.)*6
Unit	Meters / Feet / US feet / US feet + inches, selectable			
Minimum display resolutions	0.00001m (0.01mm) / 0.0001ft. / 1/64in.		0.0001m (0.1mm) / 0.001ft. / 1/16in.	
Accuracy*2 *7 (ISO 17123-4:2001)	With reflective sheet*3	(0.5 + 1ppm x D)mm		(1 + 1ppm x D)mm
	With AP/CP prism	(0.8 + 1ppm x D)mm		(1 + 1ppm x D)mm
	Reflectorless*4	(1 + 1ppm x D)mm*5		(3 + 1ppm x D)mm*6
Measuring time*8	Fine: every 0.9s (initial 2.4s), Rapid: every 0.6s (initial 2.0s), Tracking: every 0.4s (initial 1.3s)			
Auto-pointing & Auto-tracking	Pulse laser transmitter and CCD detector integrated in telescope with co-axial optics			
Auto-pointing range/	With one AP prism	1,000m (3,280ft.) / 800m (2,620ft.)		
Auto-tracking range*9	With CP prism	700m (2,290ft.) / 600m (1,960ft.)		
	With ATP1 360° prism	600m (1,960ft.) / 500m (1,640ft.)		
	With reflective sheet (RS50N-R)*10	50m (160ft.) / n/a		
<b>OS &amp; Control</b>				
Operating system	Windows CE Ver.5.0			
Display	3.5in. transreflective TFT QVGA color LCD with backlight, Touch Screen, on single face			
<b>General</b>				
Dust and water protection	IP64 (IEC 60529:2001), (IP64 is maintained while connected with an RS-232C or an external power cable.)			
Operating temperature / Storage temperature	-10 to +50°C (+14 to +122°F) / -30 to +70°C (-22 to 158°F)			
Size with handle*11 & battery / Instrument height	W201 x D202 x H375 mm (W8.0 x D8.0 x H14.8 in.) / 236mm (9.3in.) from tribrach bottom			
Weight with handle*11 & battery	7.6kg (16.8 lb.)			
Power supply	7.2V DC			
BDC58 detachable battery	Li-ion rechargeable battery, 7.2V, 4.3Ah, 2 BDC58 are included as standard accessories.			
Operating time at 20°C (68°F) *12	Standard detachable battery BDC58: Approx. 3 hours External battery BDC61 (Ni-MH, 13Ah): Approx. 9 hours			

\*1 IEC 60825-1:Am2:2001, FDA CDRH21 CFR Part1040.10 & 1040.11.

\*2 Under good conditions: No haze, visibility about 40km (25 miles), overcast, no scintillation.

\*3 When squarely aligned with the target.

\*4 With Kodak Gray Card White Side (90% reflective). Reflectorless range/accuracy may vary according to measuring objects, observation situations and environmental conditions.

\*5 Measured object brightness: 5,000 lx or less (indoor, underground or dim conditions).

\*6 Measured object brightness: 30,000 lx or less (cloudy weather or similar conditions).

\*7 D=measuring distance in "mm".

\*8 Time of reflectorless measurement may vary according to measuring objects, observation situations and environmental conditions.

\*9 Under average conditions: Slight haze, visibility about 20km (12 miles), sunny periods, weak scintillation.

\*10 When the measuring beam's incidence angle is within  $\pm 15^\circ$  to the target surface, indoor conditions with sufficient contrast between the target and background.

\*11 Basic handle H-BC1

\*12 Auto-pointing with H&V 180° rotation and fine single measurement every 30s at 20°C (68°F).



**NET05**

**LASER RADIATION**  
AVOID DIRECT EYE EXPOSURE  
MAX 0.99mW LD 635-690nm  
CLASS 2 LASER PRODUCT  
IEC 60825-1 Am2:2001

**NET1**

**LASER RADIATION**  
AVOID DIRECT EYE EXPOSURE  
MAX 5mW LD 635-690nm  
CLASS 3R LASER PRODUCT  
IEC 60825-1 Am2:2001

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