

# *LEICA TMS – System overview*



*Surveying for tunnelling professionals*

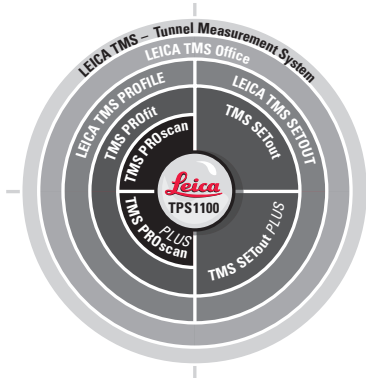
**Leica**  
Geosystems

# LEICA TMS – modular system concept

Choose from the different application modules of the LEICA TMS system

for the exact solution according to the project needs.

The "PLUS" versions provide powerful additional functions for production surveying.



## LEICA TMS PROFILE

The powerful software for automatic 3D profile measurement.

<b>On-board Software TMS PROscan</b> <b>On-board Software TMS PROscan PLUS</b>	<b>(Order number 733 410)</b> <b>(Order number 733 411)</b>	<b>TMS PROscan</b>	<b>TMS PROscan PLUS (1)</b>
Automatic scanning of vertical, horizontal and sloped 2D profiles		•	•
Automatic scanning of vertical, horizontal and sloped 3D parallel profiles		•	•
Automatic scanning of polar profiles		•	•
Automatic scanning of surfaces (4-point window definition)		•	•
Automatic tolerance control of measured points in parallel profiles		•	•
Manual profile control with reflectorless measurement		•	•
Manual profile control with prism on pole or prism with tunnel disc by ATR LOCK-Mode (2)		•	•
Free definition of measuring parameters (point density, profile offset, min./max. distance, etc.)		•	•
Definition of reference profile shapes		•	•
User selectable angle or distance spacing		•	•
Full support of standard positioning methods (free station, resection, orientation)		•	•
Relative positioning with reference to one or two axes		•	•
Project data management on total station			•
F <b>ALIGN</b> Automatic alignment of profile direction perpendicular to tunnel axis			•
Automatic profile measurement on predefined stationing			•
Numerical on-board processing during measurement with deviations to axis and theoretical profile			•
Graphical and numerical on-board processing after measurements			•
F <b>VISU</b> Visualisation of profile sectors (overprofile / underprofile) with red laser			•
Automatic visualisation of graphically selected profile points with red laser on tunnel surface			•
<b>Processing software TMS PROfit (1)</b> <b>(Order number 733 415)</b>			
Data import of profile measurements from TMS PROscan / Bever Team / DXF / ASCII		•	•
Office based editing of measured data		•	•
Preview of measured profiles with automatic assignment of correct design profile		•	•
Project and task specific configuration of processing parameters		•	•
Automatic processing of profile measurement with graphical and numerical reporting		•	•
Area computations relative to the project data (design profile) with reporting of underbreak and overbreak areas		•	•
Volume computations of excavation, overprofile and underprofile relative to project data		•	•
Distance computation between measured points and design profile		•	•
Computation of geological overbreak		•	•
Overlay and processing of measurements from different dates on identical stationing		•	•
Computation of shotcrete thickness and volume (non-destructive measurement)		•	•
Processing of profile measurements in design profile interpolation sections		•	•
Clearance profile processing with reference to track axis		•	•
Computation of least square centre point / offset co-ordinates as basis for axis optimisation		•	•
Data export to DXF or ASCII files		•	•
Input of comment notes on output		•	•
Preview of processing results on computer screen		•	•
Fully automatic reporting function for collection of measured profiles		•	•

## LEICA TMS SETOUT

The flexible system solution for automatic setting out during tunnel construction

<b>On-board Software TMS SETout</b> <b>On-board Software TMS SETout PLUS</b>	<b>(Order number 733 412)</b> <b>(Order number 733 413)</b>	<b>TMS SETout (1)</b>	<b>TMS SETout PLUS (1)</b>
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### System design

Fixed installation on console	•	•
Mobile operation from tripod	•	•
User account management with password assignment:		•
■ DESIGN mode for surveying engineer: Full access to all data and system function (recommended for mobile use and fixed installations)		
■ PRODUCTION mode for foreman: Simple operation for pre-defined set-out tasks (Recommended for the fixed installation on a console)		

(1) Requires TMS OFFICE base module

(2) Requires TPS1100 TCRA

(3) Requires TMS PROscan PLUS

(4) Requires TMS SETout PLUS

F = Function

**Automatic functions for setting out point groups (interactive or timer-controlled operation)**

F <b>CONTOUR</b> : automatic setting out of excavation profile on tunnel face		•
F <b>BLAST</b> : automatic setting out of drill pattern on tunnel face		•
F <b>JETTING</b> : automatic setting out of drill locations and alignment of boom feeder for jetting		•
F <b>ARC</b> : automatic setting out of steel arches with predefined offset values		•
F <b>BOLT</b> : automatic setting out of the rock bolt drilling pattern or radial points		•

**Interactive functions**

F <b>LASER</b> : Aligns the red laser to a predefined direction		•
Automatic setting out of single points (axis, stationing, height markers, niches, cross-passages, joints, walkways, formwork, steel arches, etc.)	•	•
Setting out of excavation profile	•	•
Installation and checking of fixed tunnel lasers	•	•
Manual profile control with comparison to design profile with prism-disc or reflector pole by using the ATR LOCK-mode (2) (3)		•
Visual guidance of roadheader machines		•
Simultaneous handling of different work-sections with one installed system		•

**General functions**

Import of complete project data from TMS OFFICE	•	•
Full support of standard positioning methods (free station, resection, orientation)	•	•
Adapted functionality for the total-station LEICA TPS1100, models TCRM and TCRA	•	•
Support for GUS74 laser	•	•
Support for standard RCS1100 remote control unit	•	•
High accuracy and reliable setout through full support of reflectorless distance measurement	•	•
Automatic setting out of points with or without reflectorless distance reading	•	•
Setting out of points in LOCK mode with a prism (2)	•	•
Automatic laser alignment without distance reading	•	•
Single point setting out relative to project axis	•	•
Single point setting out relative to auxiliary axis (defined by two co-ordinated points)	•	•
Interval point setting out with selectable parameters	•	•
Manual or timer-controlled setting out of interval points	•	•
Display of offset co-ordinates relative to project axis for a measurement	•	•
Availability of different projects on the same instrument	•	•
All user actions and operations are logged to file for documentation and quality assurance	•	•
Import of defined setting out task from TMS OFFICE		•
Automatic adaptation of setting out shape in interpolation section of theoretical profile		•
System design for reliable system operation when used as fixed installation		•
Simultaneous operation of different headings with one instrument.		•
Definition of radial, horizontal and/or vertical offsets for point groups		•
Automatic system self-check routines in PRODUCTION mode		•
Automatic orientation control in PRODUCTION mode (2) (menu operated with TCRM)		•
Flexible definition of tolerance threshold values for position and orientation checking		•

**LEICA TMS OFFICE**

Software platform for professional project data management of all TMS application modules

<b>LEICA TMS OFFICE</b>	<b>(Order number 733 414)</b>	
Modern system solution based on Microsoft Windows 98/2000/NT/XP		•
Database for unlimited projects and construction stages		•
Interactive project data input with immediate graphical feedback and plausibility checking		•
Hierarchical project definition allows fast access to project elements		•
Definition of unlimited project axes with elements for situation, longitudinal profile and transverse slope		•
Support of various geometry types for modern railway and road tunnel construction		•
Definition of unlimited number of theoretical profiles with unlimited segments		•
Definition of stationing sections for automatic assignment of design profiles during the processing		•
Definition of interpolation section between two different design profile types		•
Integrated management of survey control points		•
Graphical presentation of all project elements		•
Numerical and graphical reporting to printer		•
Computation of axis interval points, footer point computations for co-ordinated point		•
Creation of laser offset lists for the use of conventional fixed tunnel laser		•
Import and export of project data from/to ASCII, DXF, GSI files		•
Data export of project elements to total station for TMS PROscan PLUS and TMS SETout (PLUS)		•

**Functions for TMS SETout PLUS (4)**

Definition of complex point groups, including management of sub-groups for automatic setting out of profile contour, steel arch setting, drill pattern, jet grouting, umbrella grouting, rock-bolting		•
Definition of offset values and directions		•
Assignment of stationing ranges for the defined point groups		•
Data export of point groups for TMS SETout PLUS		•
Import of drill pattern from Bever Team software		•

## Recommended Hardware configuration for the LEICA TMS applications

Subject to the project requirements, the following system configurations are recommended.

Order No.	Description	TMS SETout PLUS		TMS SETout	TMS PROscan PLUS	TMS PROscan
		Fixed	mobile			
<b>Total station LEICA TPS1100 series</b>						
667 785	TCRM1105plus			○	○	○
723 325	TCRM1105plus, XRange	○	○			
723 324	TCRM1103plus, XRange			●	●	●
723 329	TCRA1105plus, XRange	●	●			
723 328	TCRA1103plus, XRange	■	■	■	■	■
<b>Remote control – radio modem (wireless)</b>						
667 381	RCS1100 remote control with integrated radio modem, TCPS26B radio modem, antenna, holder, soft bag, manual, y-cable, Lemo Converter)	●	■	■		
407 678	2 pcs cable ca. 1.2m Lemo0-Lemo0 (UPS12 - TCPS26B and UPS12 - TPS1100)	●				
667 318	2 pcs GEB 111 NiMH battery for RCS1100	●	■	■		
<b>Remote control – cable</b>						
667 174	RCS1100-C remote control with cable connection	○				
407 678	2 pcs cable ca. 1.2m Lemo0-Lemo0 (SB1100 - RCS1100C and UPS12 - TPS1100)	○				
on request	Cable ca. 12m Lemo0-Lemo0 (SB1100 - UPS12)	○				
<b>Accessories</b>						
667 727	GKL 122 battery charger (for TMS SB12)	○ ● ■				
733 421	AMT UPS12 uninterruptible power supply 93-264VAC / 12VDC /2.5 Ah	○ ● ■				
733 420	TMS SB1100 Service-Box, incl. installation frame for GKL122 battery charger, magnetic storage place for RCS1100 / RCS1100C, base plate and neck strap	○ ● ■				

○ = Minimum configuration      ● = Standard configuration      ■ = Professional configuration



### LEICA TMS – Tunnel Measurement System

Product pamphlet

Order no. 733 389

On-line:

leica-tms@leica-geosystems.com

www.leica-geosystems.com



### LEICA TPS1100

Product pamphlet

Order no. 732 472

On-line:

leica-tms@leica-geosystems.com

www.leica-geosystems.com



#### Rangefinder (IR), ATR and PowerSearch:

Laser class 1 according to IEC 60825-1 and EN 60825-1

Laser class I according to FDA 21CFR Ch. I §1040

EGL: LED class 1 according to IEC 60825-1 and EN 60825-1

#### Rangefinder (RL, standard range) and laser plummet:

Laser class 2 according to IEC 60825-1 and EN 60825-1

Laser class II according to FDA 21CFR Ch. I §1040



#### Rangefinder (RL, enhanced range):

Laser class 3R according to IEC 60825-1 and EN 60825-1

Laser class IIIa according to FDA 21CFR Ch. I §1040



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