TrackScan ME 4.02

Track measuring system for surveying railroad geometry with electromechanical sensors and SRX robotic total station.

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The TrackScan ME 4.02 track geometry and turnout measuring device is an easily operated track diagnostics instrument that is suitable for the measurement of track gauge, superelevation, distortion of the track, alignment, sinking as well as check-rail gauge and flangeway of turnouts. With the measuring prism installed onto the instrument and with the measuring station performing measuring of the prism the device is suitable for accurate geodesic survey of the track centre.

The device is suitable for the continuous measurement of turnouts and measurement of turnout points determined by the operator.

The geodesic measurement of track centre can be performed at points pre-determined by the operator. When reaching the measuring locations the software automatically signals at the point and after stopping the instrument measurement can be performed.

It has a rigid geometric structure and light weight proper for hand operation.

The device consists of a computer unit, a measuring frame and replacable battery and a measuring station necessary for geodesic measurement. The computer unit contains the measurement controlling computer. On the computer unit an RS 232 serial port and a USB port can be found with which measuring results can be downloaded onto a desk computer. The computer controls the measurement through a connector that can be found on its backside. According to outdoor usage it is made with a foil keyboard which suits IP 54.

On the measuring frame can be found the electronics case containing the measuring electronics, the measuring units with the sensors, the wheel provided with rotary optical encoder, prism holding unit with the installable prism, push handle for moving during measurement and lugs for lifting the device out.

The measuring sensors had been designed so that going through any turnout be unhindered from the point of view of measurement. During measurement characteristic dimensions of the track, track gauge, flangeway, check-rail gauge, radius of curvature and sinking are measured by measuring rollers contacting the rail.

Measuring the track in a 3D coordinate system is performed by the SRX1 robot measuring station and uploads data onto the measuring computer via a Bluetooth radio connection. The control of the measuring station is also performed by the central computer. The measuring station has a motor animation and automatically follows the prism mounted onto the instrument frame. The 360º prism ensures the continuous measuring station control.

Figure 1 Pass of the measuring device during measuring minimum flangeway and maximum check-rail gauge.

During measuring alignment the front track gauge measuring roller and the directing roller at the rear wheel create the basis and compared to that a feeler roller measures the alignment. The two rollers providing the basis are located on a separate rod that is pressed with a constant force to the rail directing surface. Measurement of alignment is performed simultaneously on both rails.

During the measurement of sinking the basis is provided by the running wheels. Between the the two wheels a measuring roller located in centre line of the running surface measures the actual sinking value. Measurement of sinking is performed simultaneously on both rails.

Figure 2 Longitudinal measuring frame with the radius of curvature and sinking measuring units.

Directing of the measuring rollers and the device and unhindered pass of the device is ensured by properly designed deflecting plates. The deflecting plates are corrosion-resistant and protected against mechanical effects.

The superelevation and distortion of track values are determined by the device from the built-in angle-gauge.

The measuring frame is insulated from the rail so the device does not disturb railway traffic. During measurement in a track under traffic the operator and his help can safely lift out the device from the track. The design of the device ensures that when lifting it out from the track the sensors are not damaged and it can be put back to measuring status easily in a short time.

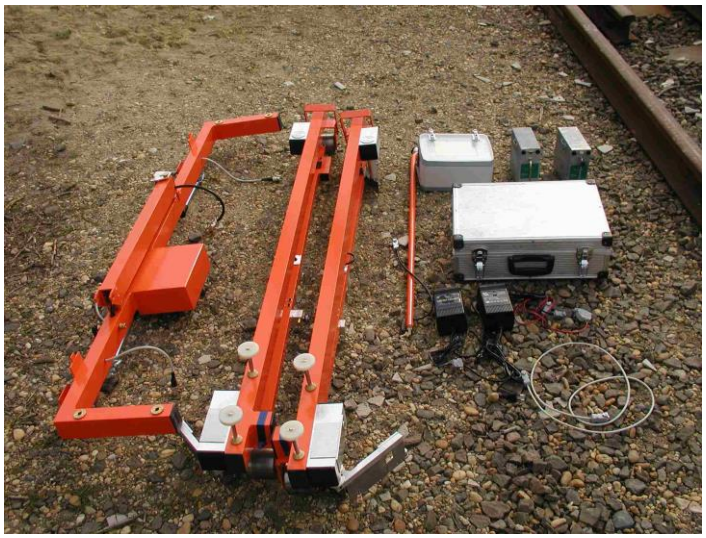

Figure 3 Measuring device in transport status

During the taking down of geodesic points the measuring station is located outside of the track centre and measures the location of the prism during measurement. From a ranging point a 200-400 metre section can be measured on an occasion then after re-positioning the measurement can be continued.

Power supply of the device is provided from a replacable battery, with one charging a minimum of 6 operating hours are provided.

Figure 4 The prism through the measuring station

The measuring software (DOS-Turbo Pascal) controls the hardware during measurement on-line, displays results on the monitor and saves data onto an internal memory card.

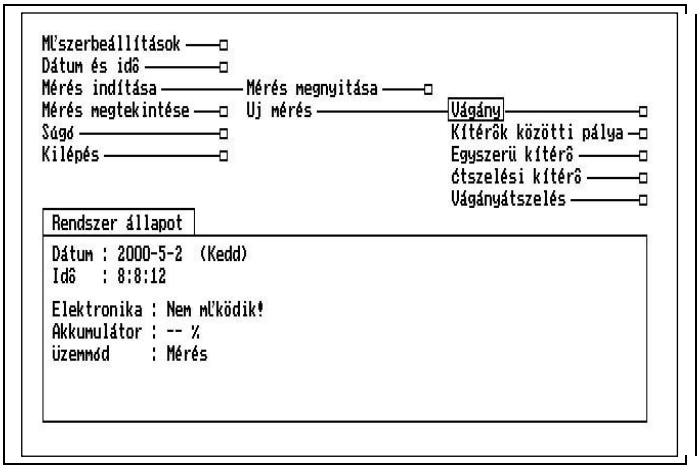

Figure 5 Measuring programme interface with the selectable functions

User friendly design of the software enables the selection of turnout type to be measured from the data block, with which the pre-set measuring points and tolerance values are assigned to the measurement and the sequential remarkable measuring point is displayed graphically on the monitor.

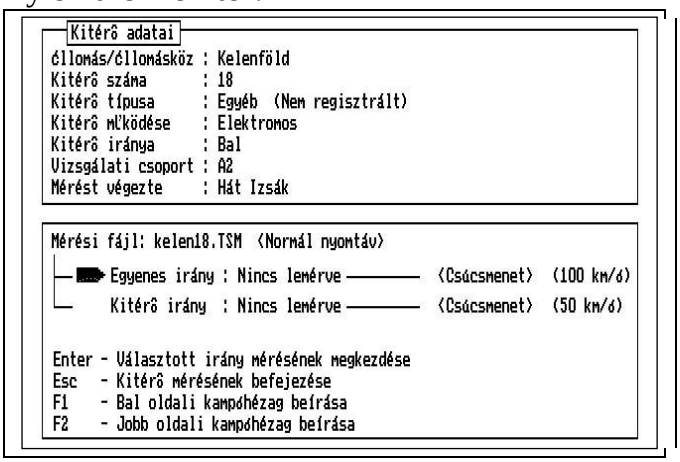

Figure 6 The measuring programme data field interface

During measurement it measures continuously the characteristic data of the track (continuous measuring points) and stores them according to the distance signal and the conventional turnout measuring points (remarkable measuring points) are stored separately by pushing a button.

The measuring programme monitors the pre-set tolerance values and gives a signal at once if they are exceeded. At measuring turnouts and track sections there is a possibility to assign remarks to different points of the track according to points of view of the survey.

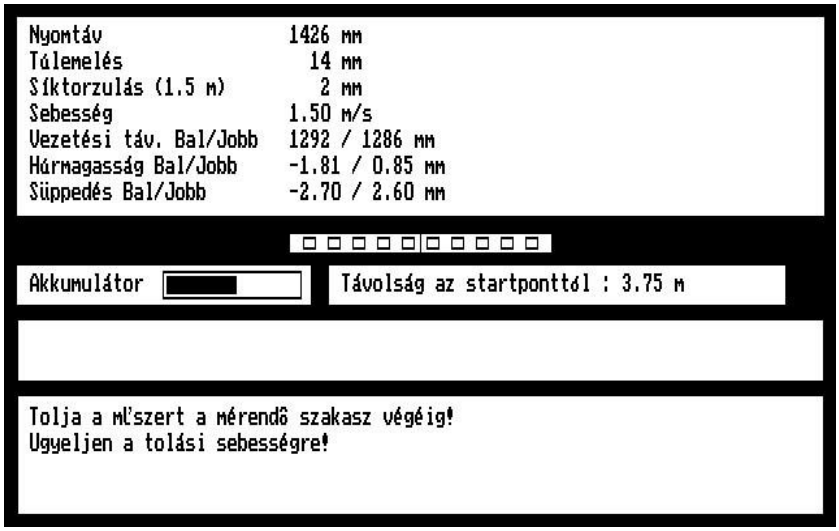

Figure 7 Programme interface during a measurement

When lifting out the device from the track the software provides a possibility to terminate the measurement then after placing the device back to continuing the measurement. Measuring results of already measured sections can be retrieved and displayed graphically.

The evaluating software (WINDOWS) provides a possibility to arrange, interlink measuring results. The previous measuring results can be compared, a chronological survey can be obtained of the measuring data. Data of sections wished to be measured can be entered in advance and they can be downloaded to the computer of the measuring instrument.

Continuous measuring results of the measured track section or turnout are printed on a graph, the remarkable points are printed in a table. The evaluating programme gives in a separate table the critical points that influence examined section status, that are greater than pre-entered limit values or close to them.

The evaluating software provides a possibility to export measuring results in a format suitable for other softwares.

The device is suitable for the measurement of the following characteristics:

Track length

Without download the maximum measuring length storable on the instrument is 100km. Resolution of the rotary optical encoder is 2mm.

Track gauge

For the measurement of rail pair distance according to specifications in the 1420…1500mm range with better than 1mm accuracy.

Flangeway

Measuring range is +30…+140mm, accuracy is better than 1mm.

Superelevation

Calculated from the measurement of angle of inclination in the ±190mm range, accuracy is better than 1mm.

Check-rail gauge

Measuring range is 1330…1405mm, accuracy is better than 1mm.

Alignment

Measurement base length is 1350mm, measuring range is ±2mm, measuring accuracy of chordal height is better than ±0.025mm.

Sinking

Measurement base length is 1610mm, measuring range is ±2mm, accuracy is better than ±0.01mm

Distortion of track

Calculated from the value of superelevation to a discretional base length.

Measuring accuracy of geodesic points

Length of a track section measurable with one measuring station on an occasion is 200-400m. Measuring accuracy of points is ± 0.5mm.

Specifications

Built-in computer		GEODE GX1 PC, 300 MHz 64 MB RAM, 128 MB CF Disc
Monitor		Monochrom VGA LCD Display with backlight
Keyboard		Foil, water resistancy IP 54
Replacable battery pack		1pc 12V-7.2Ah, 1pc 12V-3Ah
Computer connectors		RS 232, USB 2.0
Operating temperature		0...+40°C
Operating time		6 hours/batt.
Weight		40kg
Dimensions	Transporting state Measuring state	1720 x 450 x 500mm 1720 x 1600 x 900mm
Maximum measuring speed		2.5m/s at continuous measurement, at geodesic measurement 1s/measuring point
Measurement station type		Sokkia SRX1