



# Operating Manual

## TRACSCAN 2.0



The latest version of this document, software updates, videos on how to use the instrument and additional information can be found under

[www.tracscan.de](http://www.tracscan.de)

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## 1. Safety Instructions



To reduce the risk of injury or damage, read these safety instructions carefully and keep them at hand when setting up, using, and maintaining this instrument.

- The instrument weighs about 7.5 kg. Always use the handle to carry the instrument. When transporting the instrument longer distances, use the case.
- This instrument is not a toy. Do not sit or stand on this instrument. Do not place anything on top of this instrument (except a power bank).
- Do not turn the instrument while standing. The rubber ring of the rear wheel could slip off the wheel and jam it.
- You may use a power bank any time, but do not start a measurement while an USB cable is plugged.
- Make sure that the instrument can move along the entire path without obstruction. Do not start a measurement while the instrument is placed on a table or a place where it could fall down.
- Do not touch the wheels, especially the driven front wheels while the instrument is moving.
- The instrument can be operated on wet surfaces. However, avoid standing water and splash water. Never moisten the top side of the test foot (see page 21) and do not submerge the test foot.
- To avoid wheel slip, clean the wheels' rubber rings before starting a measurement. Use a cloth dampened with water or a mild cleaning detergent.
- The wheels' rubber rings are made of a special anti-slip material. As they leave marks on the surface, put the instrument back in its case after use.
- Clean the instrument with a cloth dampened with water or a mild cleaning agent.
- Store and operate this instrument in suitable environments only. The operating conditions are listed on page 33.
- For instructions on the test foot, see page 21.
- Do not open the instrument. Contact your distributor in case of damage or failure.



Do not dispose of electrical appliances as unsorted municipal waste; use separate collection facilities. Contact your local authority for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with new ones, the retailer is legally obliged to take back your old appliance for disposal at least free of charge.

## 2. Introduction

The **TRACSCAN 2.0** instrument is a measuring instrument for precise testing of the static (SCOF) and dynamic coefficient of friction (DCOF) of walkway surfaces.

The instrument supports a range of methods for both wet and dry testing. It is equipped with a thermal printer that can be used to print out measurement results and all parameters. For later retrieval or print out, the instrument stores all measurements in a data archive.

This manual describes how to operate and maintain the instrument. It also describes the Trac-Man software. This software allows data retrieval from the instrument's data archives and supports firmware updates for the instrument.

The terms, concepts and abbreviations used throughout this manual are explained in the [Glossary].



Before use, please charge the internal battery using the enclosed battery charger. Charge until the LED light to the right of the charging port turns solid green. This can take up to 12 hours. When the charging light is flashing green, the unit is below its full charge.

### 3. Quick Guide

#### 1. Select Measurement Location and Prepare Instrument

Choose your location based on the measurement task. Ensure that all drive wheels are dry and free of dust or sand. Clean the wheels with a damp cloth and dry them before starting a measurement.

#### 2. Select and Prepare Test Foot

Depending on the measurement task, select the right test foot (SBR, leather, etc.). If necessary, prepare the test foot (see section [Preparation] on how and why to prepare the test foot). Insert the prepared test foot in the underside of the instrument.

#### 3. Prepare Test Path



If a wet measurement shall be taken, create a moistened test path with enough width and length for the entire test distance. For details refer to the requirements of the method, see section [3.6.4].

#### 4. Place Instrument

Place the instrument on the walkway surface / test tile, pointing in the desired direction. Ensure that the instrument can move along the entire path without obstruction. If a wet measurement shall be taken, make sure that the wheels are kept dry.

#### 5. Start Measurement

Start the measurement by pressing button 1 or button 2.


	Start program 1; default is: DCOF, 15 cm, scale NFSI B101.3
	Start program 2, default is: SCOF, 5 samples, scale NFSI B101.1

#### 6. Optional Location Code

If the location code feature is enabled, the user is prompted to enter a location code that identifies the measurement location. See section [3.5] for the location code feature.

#### 7. Optional Paper Printout

Once the measurement has been completed, press the Print button to print out the measurement results.

	Print results from most recent measurement.
---	---

#### 8. Remove Test Foot and Put Back Instrument

In order to protect the instrument and the test foot from damage, remove the test foot from the instrument after use.

The wheels' rubber rings are made of a special anti-slip material. As they leave marks on the surface, put the instrument back in its case.

## 4. Instrument

### 4.1. Overview

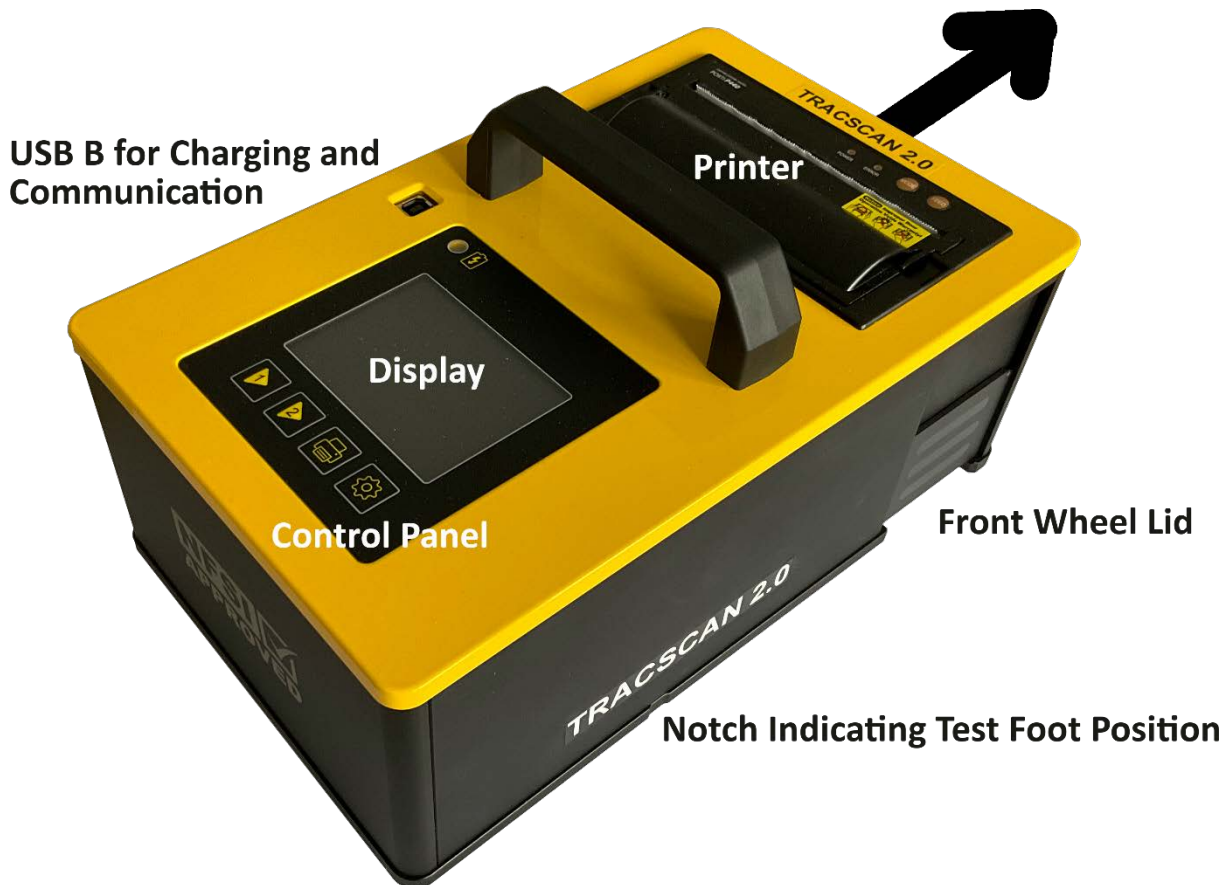






Figure 1: TRACSCAN Top View



#### 4.1.1. Control Panel

The control panel comprises the battery charging indicator LED, the display and 4 buttons to operate the instrument. If the instrument is off, the buttons have the following functions:

	Start program 1, see section [3.6.4] for default settings and how to change them
	Start program 2, see section [3.6.4] for default settings and how to change them
	Print results from most recent measurement, see section [3.6.5] for default setting and how to change them
	Open the main menu for program and instrument settings, see section [3.6]

To avoid unintended operation, a button has to be pressed for 2 seconds at least.

During operation, the functions of the buttons depend on the current context, i.e., will have different functions. For details, see section [3.6.1].

#### 4.1.2. Case

The TRACSCAN 2.0 is shipped in a robust case. The case offers space for the instrument and all accessories.



Figure 2: TRACSCAN Case

## 4.2. Licensing

If the device is only available on a trial basis, measurements cannot be taken if the period of operation expires. Contact your distributor to obtain a license key for unlimited operation.

## 4.3. Charging

The TRACSCAN 2.0 is fitted with a rechargeable battery. A standard USB A/B cable and charger is included for recharging the battery, see section [9] for technical data.

The charging time with the included charger is up to 12 hours. The instrument has an overload protection, but it is best not to leave the charger plugged in after the light has turned solid green (1 to 2 days maximum). This will extend the battery life.

Any standard USB power bank can be connected even during operation, both charging the battery and extending the operation time.

The LED next to the battery symbol on the control panel shows the charging state:



Color	Meaning
	Solid Green: Battery fully charged
	Blinking Green: Charging
	Solid Red: Battery or charging fault, see section [7]

Table 1: Battery Charging LED

## 4.4. Printing

The instrument is equipped with a thermal printer. It can be used to print out all instrument and program parameters as well as the measurement results on an individual basis.

What to Print	
Short Report of most recent measurement	Parameter [Function of Print Key] must be set to “Short Report”. Press Print Button if instrument is off or right after measurement has been taken.
Long Report of most recent measurement	Parameter [Function of Print Key] must be set to “Long Report”. Press Print Button if instrument is off or right after measurement has been taken.
Short Report of any archived measurement	Open Instrument Menu and navigate to Archive ... / Measurements ... Select desired record and then <b>Short Report</b>
Long Report of any archived measurement	Open Instrument Menu and navigate to Archive ... / Measurements ... Select desired record and then <b>Long Report</b>

Overview of supported standards and scales	Open Instrument Menu and navigate to Settings ... / Program Settings ... Select <b>Print Safety Limit Values</b>
All instrument and program settings	Open Instrument Menu and navigate to Printout ... Select <b>On Printer</b>
Operational Data	Open Instrument Menu and navigate to Operating Data ... / Printout ... Select <b>On Printer</b>

Table 2: What to print

## 4.5. Location Code

The user can assign so-called location codes for the various locations where measurements have been performed. This makes it possible to assign a measurement to a specific location. If the location code feature is enabled (see setting [Location Code Size]), the user is prompted to enter a location code before each measurement. It comprises up to 8 alphanumeric characters, is stored in the measurement record and is shown on the printout.

See also [NFSI B101.0-2021] for recommendations and examples on how to use the location code.

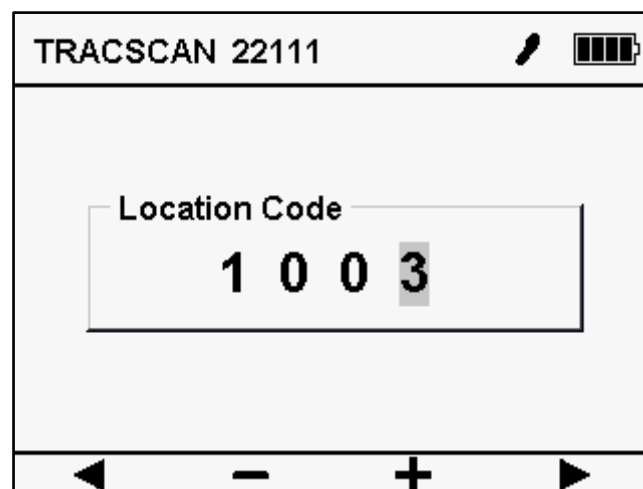



Figure 3: Location Code

## 4.6. Menu System

### 4.6.1. Operation

The instrument offers a menu system for programming, maintenance and diagnostics. To open the menu system, press the gear button for at least 2 seconds while the instrument is off.

	Open the main menu for program and instrument settings.
---	---

With the menu system all instrument and program parameters can be viewed and modified. The menu system also offers access to the measurement archive, event logs, operating counters and various system data for diagnostics.

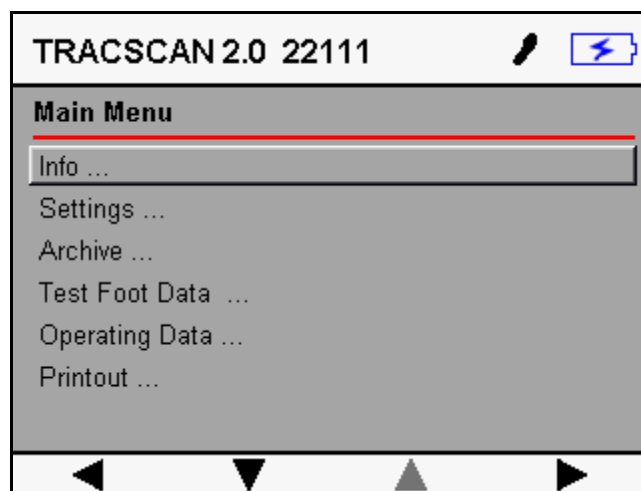


Figure 4: Main Menu

If the menu system is open, the functions of the 4 buttons are context sensitive and are shown as icons in the bottom bar of the display. If a function is not available (e.g., value cannot be edited), the icon is grayed out.













	Icon	Meaning
		Leave current menu and go back to parent menu.
		If value is being edited: Close editing, restore previous value.
		Go to next menu entry.
		If value is being edited: Decrease / decrement value.
		Go to previous menu entry.
		If value is being edited: Increase / increment value.
		If menu entry is sub-menu: Go to sub-menu.
		If value is being edited: Close editing, set new value.

Table 3: Soft keys for menu

### 4.6.2. Content

The main menu (top level menu) comprises the following sub-menus:

Main Menu	
Info	General information about the instrument (e.g., serial number, date of calibration)
Settings	Access to all program and instrument settings. See sections [3.6.4] and [3.6.5] for details.
Archive	Access to the measurement archive. See section [3.7] for details.
Test Foot Data	Access to the test foot data. See section [4.3] for details. Note that this sub-menu can only be opened if a test foot has been plugged in and its data could be read successfully.
Operating Data	Access to logged events, hour meters and operating counters. See section [3.8] for details.
Printout	Print the entire menu system (settings and all other data) either on printer or dump all via USB interface

Table 4: Main Menu

### 4.6.3. User Roles

The instrument supports two user roles:

- Role **Operator** with read-only access to program and instrument settings
- Role **Supervisor** with full access to program and instrument settings

The roles are not protected by passwords but merely shall avoid misuse or unintended modification of parameters. Use setting [Default User Role] to set the user role.

### 4.6.4. Program Settings

Each measurement program is characterized by a set of parameters. The instrument supports 2 parameter sets. Set 1 defines the program assigned to button 1, set 2 defines the program assigned to button 2.

Parameter	Description	Type
Scale / Standard	The scale respectively standard. The instrument supports the following scales / standards: NFSI B101.1-2022, NFSI B101.3-2022, ANSI A326.3-2021, Standard Mathematical Scale 0.1, German Ramp, bfu Switzerland, NFSI 101-C, James Machine and Wuppertal Safety Limits. See appendix Test Methods for more details.	-
COF Type	DCOF, SCOF or TCOF	-

Parameter	Description	Type
Wet Measurement	Defines if the test is performed on (or requires) wet or dry surfaces. This parameter is informal, only. It does not have any effect on the calculation of the COF value but is part of the measurement record and is shown on the printout.	All
Ramp	<p>Defines if the test may be performed on a level surface or an inclined surface, i.e., ramp. The instrument uses the built-in inclination sensor to detect the slope.</p> <p>Possible settings are <b>Auto Detect</b>, <b>Level Only</b> or <b>Ignore</b>.</p> <ul style="list-style-type: none"> <li>• With Auto Detect, the instrument determines automatically if the surface is a level surface (slope 0 to 1:20) or a ramp (slope 1:20 to 1:12).</li> <li>• With Level Only, a level surface is allowed, only. If the slope exceeds 1:20, the measurement is aborted.</li> <li>• With Ignore, the instrument determines and records the slope but does not check the thresholds 1:20 and 1:12.</li> </ul> <p>The slope thresholds are defined by NFSI B101.3-2022.</p>	All
Residence Time	The delay between the time the test foot is lowered and the time the instrument starts to move. Maximum time is 20 seconds, resolution is 0.1 seconds.	DCOF, SCOF
Number of Samples	Number of samples for average SCOF value. Up to 10 samples are supported.	SCOF
Distance	Measurement distance. Distances between 10 cm and 100 cm are supported.	DCOF, TCOF
Discard First Sample	Defines if the first sample is taken into account or not. If <b>Yes</b> is set, the number of performed samples is 1 + Number of Samples.	SCOF
Lift / Lower Between Samples	Defines if the test foot shall be lifted after and lowered before each SCOF sample.	SCOF

Table 5: Program Settings

In most cases, the scale / standard parameter defines the values of the remaining parameters, especially the COF Type. In these cases, the parameters cannot be altered.

If the scale / standard parameter is modified, the instrument sets all other program parameters to their default values. I.e., by setting the scale / standard, the corresponding program is restored to its default. The defaults are shown in the following tables.

Test Program NFSI B101.3-2022		
Parameter Name	Default Value	Can be altered
Scale / Standard	NFSI B101.3-2022	
COF Type	DCOF	

Test Program NFSI B101.3-2022		
Parameter Name	Default Value	Can be altered
Wet Measurement	Yes	
Ramp	Auto Detect	✓
Residence Time	0.1 s	✓
Distance	15 cm	✓
<i>Required Test Foot Type</i>	<i>SBR, see section [4].</i>	

Table 6: Test Program NFSI B101.3-2022

Test Program NFSI B101.1-2022		
Parameter Name	Default Value	Can be altered
Scale / Standard	NFSI B101.1-2022	
COF Type	SCOF	
Wet Measurement	Yes	
Ramp	Level, only	✓
Residence Time	0.1 s	✓
Number of Samples	5	✓
Discard 1 <sup>st</sup> Sample	Yes	✓
Lift / Lower Between Samples	No	✓
<i>Required Test Foot Type</i>	<i>SBR, see section [4].</i>	

Table 7: Test Program NFSI B101.1-2022

Test Program ANSI A326.3-2021		
Parameter Name	Default Value	Can be altered
Scale / Standard	ANSI A326.3-2021	
COF Type	DCOF	
Wet Measurement	Yes	✓
Ramp	Auto Detect	✓
Residence Time	0.1 s	✓
Distance	15 cm	✓
<i>Required Test Foot Type</i>	<i>Any</i>	

Table 8: Test Program ANSI A326.3-2021

Test Program Wuppertal Safety Limits, 2008		
Parameter Name	Default Value	Can be altered
Scale / Standard	Wuppertal 2008	
COF Type	DCOF	✓
Wet Measurement	Yes	✓
Ramp	Auto Detect	✓
Residence Time	0.1 s	✓
Distance	20 cm	✓
<i>Required Test Foot Type</i>	<i>Any</i>	

Table 9: Test Program Wuppertal Safety Limits 2008

Test Program German Ramp		
Parameter Name	Default Value	Can be altered
Scale / Standard	German Ramp	
COF Type	SCOF	
Wet Measurement	Yes	✓
Ramp	Level, only	✓
Residence Time	0.1 s	✓
Number of Samples	1	✓
Discard 1 <sup>st</sup> Sample	No	✓
Lift / Lower Between Samples	No	✓
<i>Required Test Foot Type</i>	<i>Any</i>	

Table 10: Test Program German Ramp

Test Program NFSI 101-C		
Parameter Name	Default Value	Can be altered
Scale / Standard	NFSI 101-C	
COF Type	TCOF	
Wet Measurement	No	
Ramp	Auto Detect	✓
Distance	15 cm	✓
<i>Required Test Foot Type</i>	<i>SBR, see section [4].</i>	

Table 11: Test Program NFSI 101-C



Test Program James Machine		
Parameter Name	Default Value	Can be altered
Scale / Standard	James Machine	
COF Type	SCOF	
Wet Measurement	No	
Ramp	Auto Detect	✓
Residence Time	0.1 s	✓
Number of Samples	1	
Discard 1 <sup>st</sup> Sample	No	
Lift / Lower Between Samples	No	✓
Required Test Foot Type	Leather, see section [4].	

Table 12: Test Program James Machine

Modified program settings are saved automatically when the instrument shuts down.

#### 4.6.5. Instrument Settings

Parameter	Description
<b>Basic Settings</b>	
Language	Selects the language for Operation and Menu. Currently, <b>German</b> and <b>English</b> are supported.
Brightness	Sets the Display Brightness to a value between <b>20%</b> and <b>100%</b> .
Sound	The instrument can generate an acoustic warning signal while in operation, i.e., while a measurement is being taken. Value <b>On</b> enables the signal.
Function of Print Key	This parameter defines the function of the Print Key, i.e., what will be executed if the instrument is turned on by pressing the Print Key. The function can be programmed to <b>Disabled</b> (no function), <b>Short Report</b> or <b>Long Report</b> .
<b>Advanced Settings</b>	
Units of Measure	Defines the Units of Measure for distances and temperatures. The instrument supports <b>Metric</b> and <b>US Customary</b> . If US Customary is set, distances will be shown both in Metric (cm) and US Customary (inch) unit.
Shut Down After Measurement	Per default, the instrument shuts down after a measurement has been taken. To avoid delays while taking a series of measurements, the instrument can be kept alive and a subsequent measurement can be started while the result of the current measurement still is displayed (value <b>No</b> ).

Parameter	Description
Default User Role	Defines if the user can only take measurements (role <b>Operator</b> ) or can also modify the program and instrument settings (role <b>Supervisor</b> ).
Location Code Size	The length of the location code that can be entered before each measurement. Maximum size is <b>8 characters</b> . Value <b>0</b> disables the location code feature, i.e., the user will not be prompted for a code.
Location Code Type	The location code can either be <b>Numeric</b> (characters 0 ... 9 or blank) or <b>Alphanumeric</b> (0 ... 9, A ... Z or blank).
Store Invalid Results	Specifies if invalid measurements shall be stored in the archive (value <b>Yes</b> ) or shall be discarded (value <b>No</b> ). A measurement is set to result "invalid", if it has been aborted by the user or cannot be completed due to an error (e.g., wheel spin).
Show Minimum Value in Report	Defines if the minimum COF value of a measurement shall be shown in the short or long report. Note that minimum values are never shown for ANSI and NFSI measurements, despite of the setting of this parameter.
Bluetooth	The Bluetooth Controller of the instrument can be <b>Disabled</b> , can be turned on if the instrument is turned on (value <b>On Demand</b> ) or can be turned on if the instrument is turned on or is powered by USB (value <b>Always On</b> ). <b>Note that the Bluetooth feature is not yet fully implemented.</b>
<b>Date and Time</b>	
UTC Offset	The real time clock of the instrument provides a Coordinated Universal Time (UTC). The measurement timestamps are stored as UTC timestamps.  In the (printed) reports, the local time is displayed. The local time is defined by an UTC Offset, e.g., +01:00 hour for Western European Time.
Date Format	The instrument supports several date formats that define how the date is displayed.
Time Format	The instrument supports several time formats that define how the time is displayed.

**Table 13: Instrument Settings**

Modified instrument settings are saved automatically when the instrument shuts down.

## 4.7. Archive

Once a measurement has been completed, the measurement data are stored in the archive. Up to 2048 measurement can be stored; the oldest record is overwritten if the maximum size has been reached.

Per default, only valid measurements are stored, but the instrument can also be programmed to store all measurements, see instrument setting [Store Invalid Results].

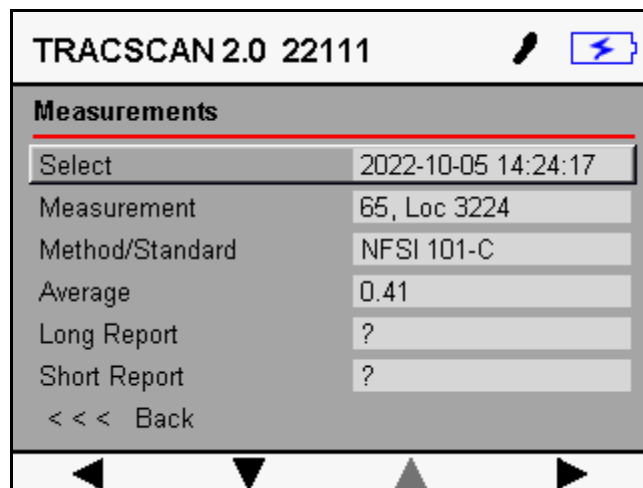


Figure 5: Measurements Menu

With menu Archive → Measurements, all archived measurements can be accessed. The menu shows the method and the average COF of the selected measurement; both a short and a long report can be printed.

## 4.8. Operating Data

### 4.8.1. General

The instrument logs events and records a number of operating counters and hour meters. All these operating data are stored in non-volatile memory. They can be displayed via menu system and can also be printed.

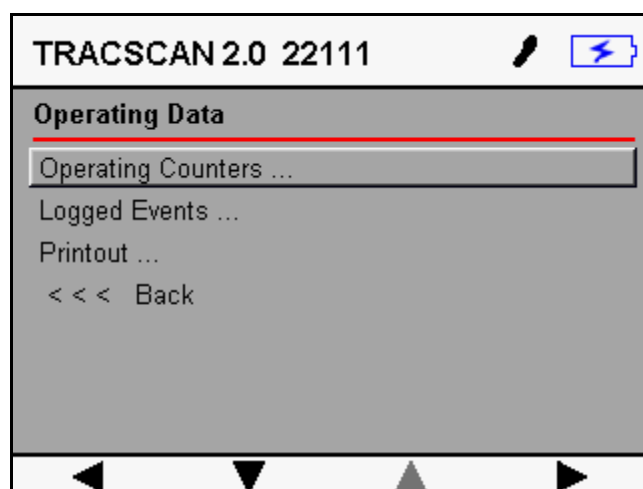


Figure 6: Operating Data Menu

Menu **Operating Data** is described in section [3.8.2], Menu **Logged Events** is described in section [3.8.3]. Menu **Printout** offers means to print all operating data on the printer or via USB.

### 4.8.2. Counters and Hour Meters

The following counters and hour meters are kept and updated by the instrument. The hour meters are updated with a resolution of one second.

Counters	
Power On	Number of power-ups
Lift	Number of test foot lift movements
Lower	Number of test foot lower movements
Printout	Number of printouts
Edit Settings	Counting how often settings have been opened
Settings Saved	Counting how often (modified) settings have been saved
Loc Code Used	Counting how often a location code has been used
Hour Meters	
USB Powered	On time while USB powered
Battery $\leq 6.5$ V	On time while battery voltage is less or equal 6.5 V.
Battery $\leq 9.5$ V	On time while battery voltage within range 6.5 V ... 9.5 V.
Battery $\leq 12.5$ V	On time while battery voltage within range 9.5 V ... 12.5 V.
Battery $\leq 15.5$ V	On time while battery voltage within range 12.5 V ... 15.5 V.
Traction Motor	Run time of traction motor

**Table 14: Operating Data**

### 4.8.3. Events

The instrument stores up to 128 event records. If the event log reaches its maximum size, a new event will overwrite the oldest event record.

## 5. Test Foot

### 5.1. General

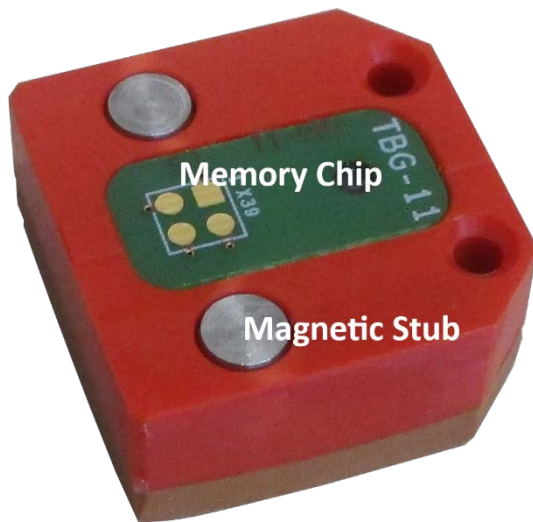


Figure 7: Test Foot Top View

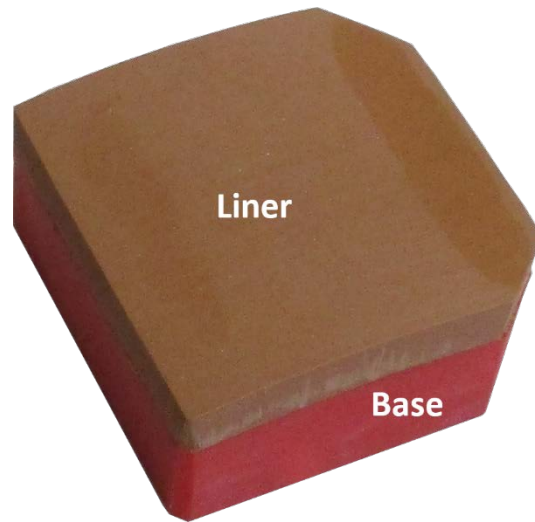


Figure 8: Test Foot Bottom View

The test foot consists of the **Base** and the **Liner**. A **Memory Chip** and two **Magnetic Stubs** are embedded in the base. The liner basically models a sole. Various liner materials are supported, see below. Some test programs (e.g., the ANSI and the NFSI programs) require a defined liner material like SBR.

The surface (shape / curve and condition) of the liner has a crucial influence on the measured COF values. Each test foot needs to be checked for abrasion, wear and hardening, as well as for general condition before each measurement. If required, the test foot must be prepared before use, see next section.

The liner should be renewed / replaced after, at most, 200 measurements. Contact your distributor for renewing, replacement or additional test feet.

Different liner materials (test foot types) are available:

- SBR. Recommended standard liner and required for all NFSI methods.

An SBR test foot can be used both for wet and dry measurements. The hardness of the SBR material has a crucial impact on the measurement result. As the SBR hardens over the time, it is highly recommended to use SBR sliders that are not older than 3 years.

- Black Rubber

A rubber test foot can be used for dry measurements, only. Before using a rubber test foot, check its condition. The texture (fluting) must be clearly visible.

- Leather

For some use cases, a leather test foot can be appropriate. A leather test foot can be used both for wet and dry measurements. If used for wet measurements, the test foot must be wetted for at least 15 minutes. It takes a few days until a wet test foot slider has completely dried. A leather test foot that once got wet cannot be used for dry measurements anymore.

- For other types contact your distributor.

All test feet must be stored and handled appropriately. Do not store them near substances that evaporate (oil, any solvents). Test feet must never come into contact with oil or solvents.

## 5.2. Preparation

As already mentioned, it must be ensured that the test foot is clean and free from any contaminants or deep surface abrasions.

The test foot should be cleaned between consecutive measurements using 600 grit sandpaper. The sanding process should be done dry. To prepare the test foot, gently rotate (or pivot) the test foot as you pull it across the sandpaper applying minimal downward force. Brush the test foot to remove any dust after sanding.

When used for several measurements, the shape of the test foot surface changes, the curve flattens, it will get worn out. The originally shaped surface cannot be restored using the manual sanding as described above. To ensure accurate results throughout the lifetime of the test foot, it must be reconditioned using the test foot preparation tool, see section [5].

## 5.3. Data

Each test foot contains a temperature sensor and a microchip (non-volatile memory) that will automatically be recognized by the instrument upon start. The following data are stored in the memory:

Manufacturing Data	
Serial Number	Unique serial number of test foot
Date of Manufacture	Date of manufacture
Type / Lining	Test foot type (SBR, leather, rubber, ...)
Age of Lining	Date of manufacture of lining
Date of Re-Coating	Date of (last) renewing of the liner
Total Number of Re-Coatings	Total number of re-coatings so far
Operating Data	
Distance	Distance traveled with this test foot
DCOF Counter	Number of DCOF and TCOF measurements
SCOF Counter	Number of SCOF measurements
Counters by Temperature	Number of measurements divided by temperature range
Last Used	Date and time test foot has been last used

**Table 15: Test Foot Data**

## 6. Test Foot Preparation Tool

The Test Foot Preparation Tool is a hand-operated, sanding tool specially designed for use with the TRACSCAN 2.0 test foot. It makes the task of sanding the test foot quick and easy and always precise, matching the exact curve of the test foot.



Figure 9: Worn Test Foot



Figure 10: New Test Foot



Figure 11: Test Foot Preparation Tool

The tool shall be used as follows:

1. Depending on the test method, ensure that the tool has 400 or 600 grit sandpaper installed.
2. Take off the circular cover by pulling up on the red knob and black handle at the same time.
3. Push the red knob towards the black handle until it clicks and insert the test foot with the cut off edges facing to the left or right. **The correct arrangement is crucial**, see images below.

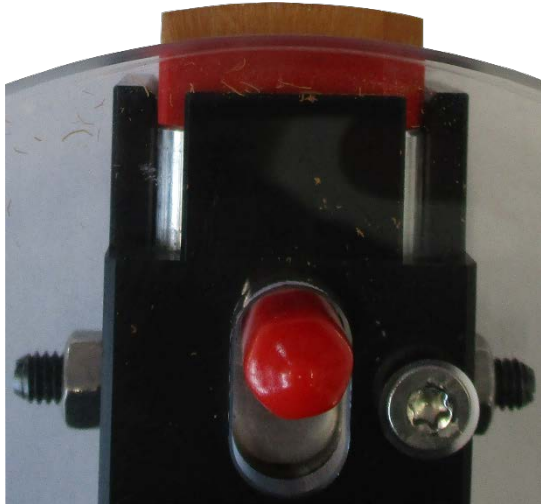


Figure 12: Test Foot OK



Figure 13: Test Foot Wrong

4. Gently re-insert the circular cover into the tool. Push the red knob away from the black handle until it stops.
5. Turn the black handle clockwise about 5 times and then counterclockwise 5 times. Check the surface so that no plain parts or notches are visible.
6. Gently remove the circular cover. Repeat step #2 above.
7. Remove the test foot by pushing the red knob away from the black handle to release the test foot.



## 7. Troubleshooting

### 7.1. Error Messages

If a measurement or a printout cannot be started or successfully completed, an error message is displayed.

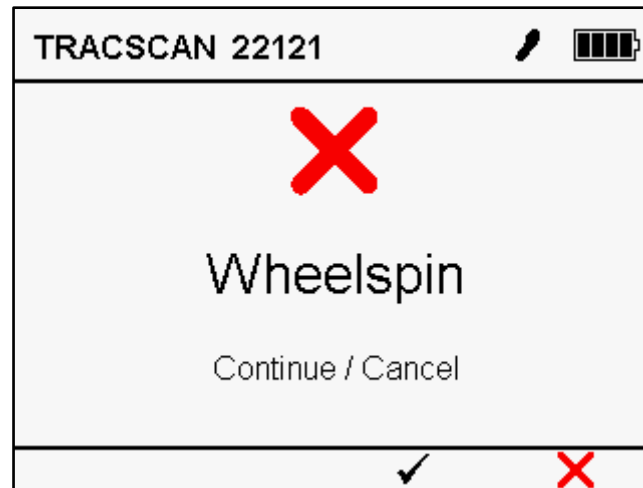


Figure 14: Error Message

The following table lists all error types, the probable error cause and how the error could be fixed.

Error	Description	How to fix
Aborted by User	Measurement or Printout has been aborted by the user.	
Battery Low	Measurement or Printout cannot be started or successfully completed because the battery voltage is less than 11 V.	Charge battery.
Traction Motor Fault	Traction motor cannot move as intended.	Turn off instrument. Check if rear wheels can be turned freely.
Test Foot Motor Fault	Test foot motor cannot move as intended; test foot cannot be lifted or lowered.	Contact service.
Wheelspin	Instrument tries to move, but wheels are spinning.	Make sure that test path is not blocked and is clean (no sand, dust, oil, etc.). Clean all wheels before starting a measurement.
Hardware Not Supported		Contact service.
Check Backup Battery/Clock	Real Time Clock has not been set or has been interrupted.	Contact service.

Error	Description	How to fix
Clock Not Available	Real Time Clock is not available; probably because the clock's battery is low.	Contact service.
Invalid License Key	Entered License Key is not valid.	Contact service.
License Expired	License has expired and must be renewed.	Contact service.
Limited Operating Period	Instrument is for trial use, only. Operating Period will expire soon.	Contact service.
License Expired	Instrument is for trial use, only. Operating Period has expired.	Contact service.
Not Calibrated	Instrument has not been calibrated.	Contact service.
Calibration Required	Calibration Period has expired. Instrument must be re-calibrated.	Contact service.
Calibration Due	Calibration Period will expire in 30 days or less.	Contact service.
Test Foot Missing	Test Foot missing or not detected.	Check if a test foot is plugged at all. Check if the test foot is plugged properly. Make sure that the contact pads are clean.
Test Foot Data Invalid	Test Foot has been detected but data could not be read or written.	Check if the test foot is plugged properly. Make sure that the contact pads are clean.
Cannot Lift Sensor	Test foot cannot be lifted.	Contact service.
Cannot Lower Sensor	Test foot cannot be lowered.	Contact service.
Invalid Request	Attempt to start unknown program.	Contact service.
Invalid Program Settings	One or several parameters of the selected program are invalid.	Make a printout of all settings and contact service.
Sample Data Overflow	The driving distance or time is longer as estimated.	Same as for Wheelspin.
Sample Data Underflow	The measurement distance (DCOF or TCOF) is too short.	Check program settings.
Strain Gauge Overload	The strain gauge is in overload, i.e., the traction force is too high.	Contact service.

Error	Description	How to fix
Strain Gauge Fault	The strain gauge is broken or not connected; the traction force cannot be measured.	Contact service.
Cannot Access Archive	Archive busy or not available.	Contact service.
Drive Motor Fault	Drive motor should start but instrument does not move.	Contact service.
Out of Paper	Printer is out of paper or paper roll not inserted correctly.	Check if paper roll is not empty and is inserted correctly.
Timeout Printer	Print request cannot be handled. Printer is not responding.	Contact service.
Communication Error	Print request cannot be handled. Printer is not responding.	Contact service.
Printer Not Supported	Printer Hardware Fault.	Contact service.
Record Not Available	Requested measurement record cannot be found.	Turn off instrument and restart operation. If fault still exists, contact service.
(Internal) Update Running	Can occur right after a firmware update. Instrument is busy and cannot execute a program or print request.	Wait until the instrument is no longer busy. The instrument shuts down after the internal update has been completed.
Inclination Sensor	The inclination of the instrument cannot be determined.	Contact service.
Invalid Level/Ramp	The detected slope is not within the allowed range.	Check slope of surface. See program parameter Ramp for details.
Wrong Test Foot	The test foot type does not fit to the selected program.	Remove test foot and insert test foot with proper type. See Table 6, Table 7, Table 10 and Table 11.

**Table 16: Error Types**

## 7.2. Diagnostics

If the instrument is not working properly and the error or malfunction cannot be fixed, please contact the service partner. To assist the service partner in analyzing the problem, diagnostic data can be collected by running a diagnostic program.

To run the diagnostic program, open the menu system (press the gear button for at least 2 seconds while the instrument is off) and navigate to **Run Diagnostics** on page 3 of menu **Info**. Start the program with the right button.

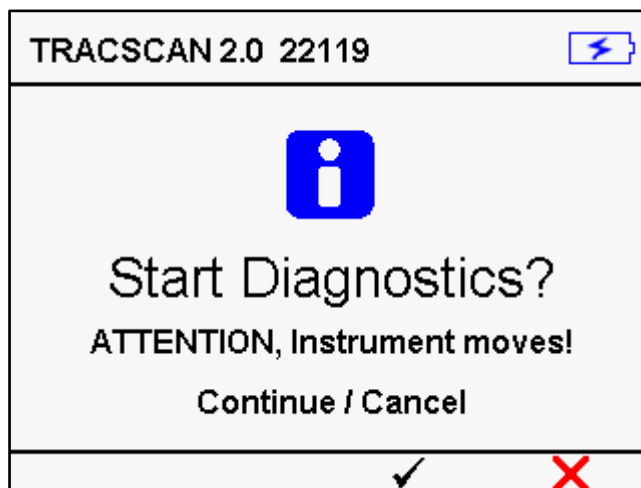


Figure 15: Start Diagnostics

As the instrument moves approximately 40 cm while the diagnostic program is running, make sure that the instrument can move along the entire path without obstruction.

After the diagnostic program has been completed, a summary of diagnostic data is displayed on the panel. It is recommended to take a picture of these data.

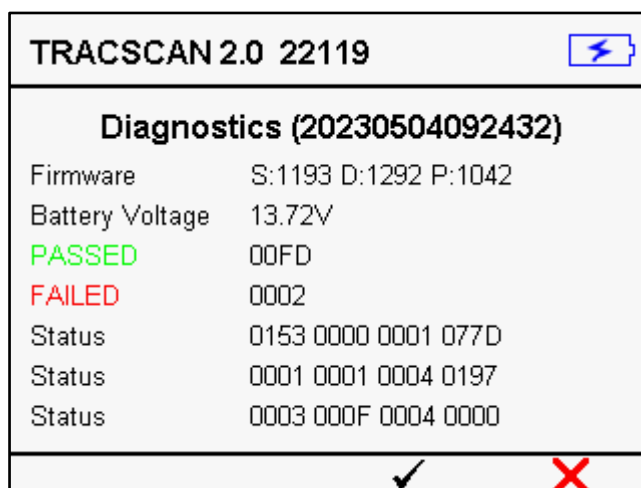


Figure 16: Diagnostic Data Summary

Use the **Print** button to print all diagnostic data. Use the **Gear** button to turn off the instrument without printing the diagnostic data.

## 8. TracMan

### 8.1. General

With program **TracMan** (TRACSCAN Manager) you can

- Manage measurement reports generated by the **TRACSCAN 2.0** instrument
- Update the firmware of the TRACSCAN 2.0 instrument

Note that TRACSCAN 1.0 instruments are not supported by TracMan.

### 8.2. System Requirements

- Windows 10
- Administrator Privileges for installation
- USB port

### 8.3. Installation

The installer for the program is distributed as .msi file (Windows Installer Package). As the installer comprises an USB driver for the TRACSCAN 2.0 instrument, administrator privileges are required to install the program.

Unplug any TRACSCAN instrument before installing the TracMan program.

Start the installation by double-clicking on the installer file and follow the instructions displayed by the installer.

### 8.4. Start Center

Connect the TRACSCAN 2.0 instrument using an USB cable (USB-B on the instrument's side). Open TracMan. The Start Center will be displayed.

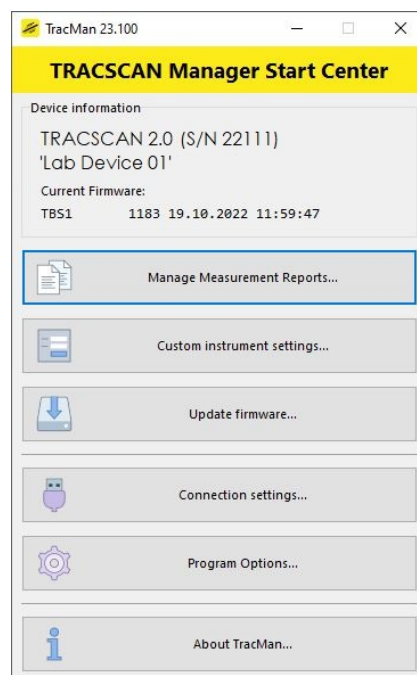


Figure 17: TracMan Start Center

TracMan scans the USB port(s) for an instrument. If an instrument is connected but is not found, open Connection Settings (see below). Once an instrument has been found, basic data of the connected instrument are displayed:

- Identification: Control board revision and serial number.
- Current Firmware: Build number and build date.

## 8.5. Manage Measurement Reports

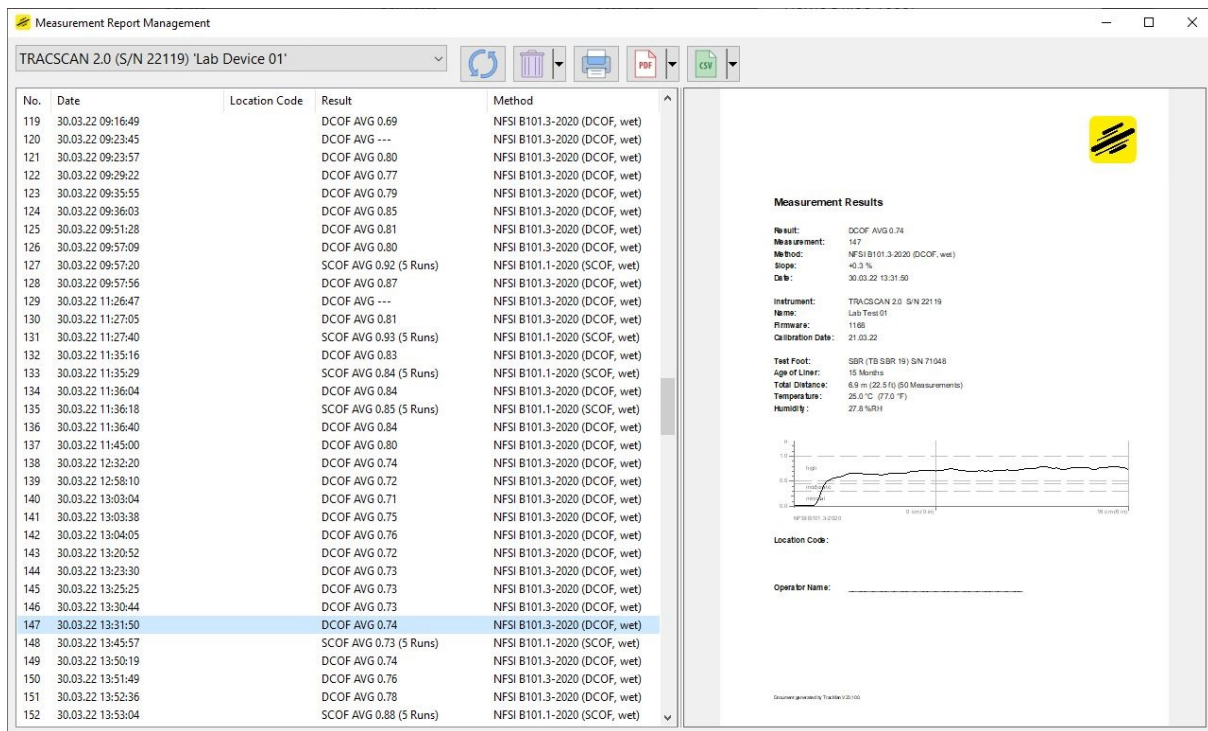


Figure 18: TracMan Measurement Report Management

With this view, the report data are managed. The view has three elements:

- **Toolbar:** Select instrument, synchronise data, delete report, print report, save report as PDF.



Figure 19: TracMan Toolbar

- **List View:** Displays all available reports of the selected instrument
- **Report View:** Displays the selected report.

TracMan can handle measurement reports of several instruments. The instruments are distinguished by their serial number. If a new instrument is connected for the first time, TracMan asks if the instrument shall be added and whether all available measurements shall be downloaded. Depending on the number of measurements, downloading may take several minutes. The download can be paused and resumed at any time.

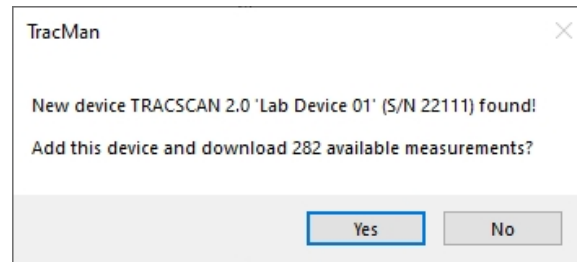


Figure 20: TracMan Found New Instrument

## 8.6. Update Firmware

With this view, the firmware of the connected instrument can be updated. Select either the firmware provided by TracMan or select a firmware file stored on the computer's file system. Click "Load this firmware into the device" and follow the instructions.

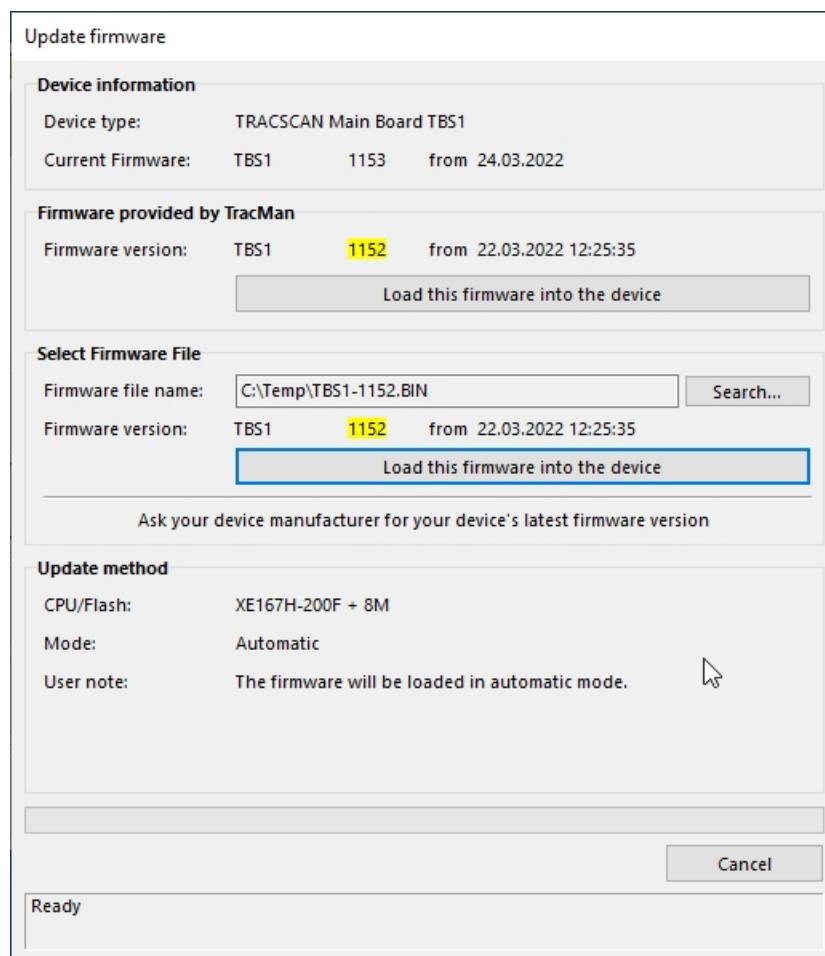


Figure 21: TracMan Update Firmware

The firmware update is running for approximately 30 seconds.

If the firmware update comprises an update for the instrument's display controller (see firmware release notes), the instrument automatically updates the display controller after it has been turned on for the first time after the firmware update. While the display controller is updated, the display flickers. The internal update of the display controller takes approximately 30 seconds (in addition to the time taken by the firmware update).

## 8.7. Connection Settings

TracMan usually detects the instrument automatically. However, if several instruments are connected or an instrument is not detected automatically, the connection settings view offers means to select the proper USB port and the connected device.

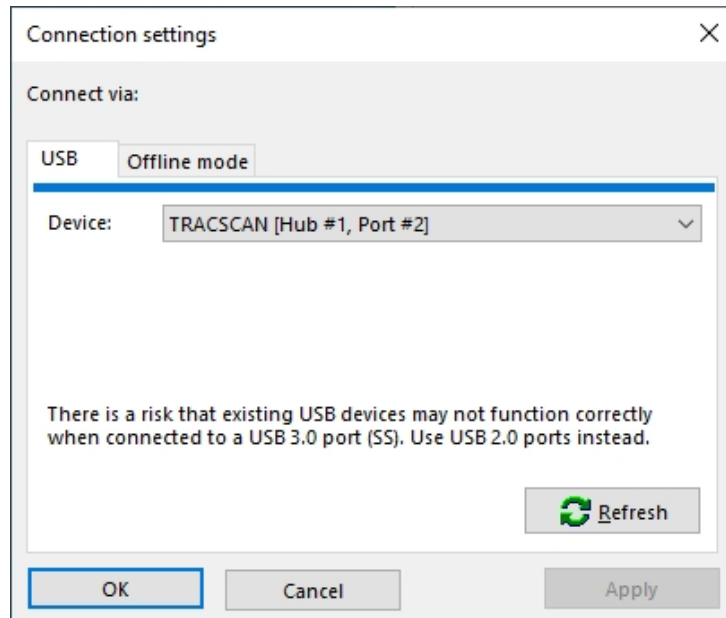


Figure 22: TracMan Connection Settings

- If no device (instrument) is displayed, press Refresh to re-scan the USB ports. If an instrument is found, it will be shown in the drop-down list.
- If a device (instrument) is shown but was not displayed in the Start Center, select the device in the drop-down list and press Apply.

## 8.8. Options

Currently, the following program options are available:

- Language: Program language (English, German)

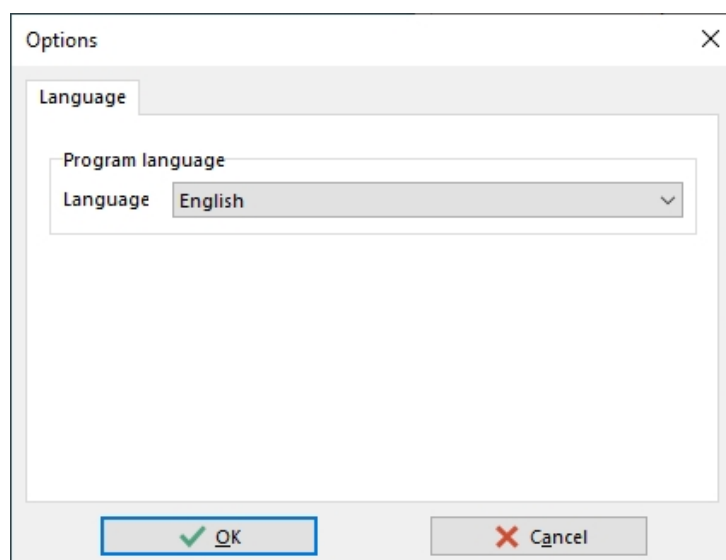


Figure 23: TracMan Options



## 9. Technical Data

TRACSCAN 2.0	
Dimensions	28.8cm (length) x 17.8cm (width) x 11.5cm (height); height is 15.4cm with handle
Weight	7720g
Max Speed	200mm/s
Test Foot Downforce	2354g (24N)
Storage Conditions	-20°C to +50°C; 5% to 85% RH without condensation
Operation Conditions	0°C to +40°C; 10% to 80% RH without condensation
Interfaces	USB B for charging and data communication; Bluetooth LE 5.1 for data communication
Archive	
Size	Up to 2048 measurements; oldest record is overwritten if maximum size has been reached.
Printer	
Type	Thermal printer
Paper	Length 16m (approximately), width 112mm
Battery	
Type	10 cells NiMH (Nickel Metal Hydride), rechargeable
Voltage	12 V
Capacity	2.0 Ah
Replacement	The battery cannot be accessed by the user. It can be replaced by the manufacturer, if required.

Table 17: Technical Data TRACSCAN 2.0

Charger	
Input	110 / 230 V, 50 / 60 Hz
Output	USB A, 5 V, 1.5 A or greater

Table 18: Battery Charger

## Test Methods

Method / Standard	Characteristics				
	Type	Wet Dry	Test Foot	COF and Appraisal	
NFSI B101.1-2022	SCOF	Wet	SBR	<b>Wet SCOF</b>	<b>Available Traction</b>
				$\mu < 0.40$	low
				$0.40 \leq \mu < 0.60$	moderate
				$\mu \geq 0.60$	high
NFSI B101.3-2022	DCOF	Wet	SBR	<b>Wet DCOF</b>	<b>Available Traction</b>
				$\mu < 0.30$	low
				$0.30 \leq \mu \leq 0.44$	moderate
				$\mu \geq 0.45$ (level surface)	high
ANSI A326.3-2021	DCOF	Any	SBR	$\mu \geq 0.50$ (ramp)	high
				<b>Classification</b>	<b>Cat</b>
				Interior Dry	ID
				Interior Wet	IW
				Interior Wet+	IW+
				Exterior Wet	EW
NFSI 101	TCOF	Dry		<b>Criteria</b>	
				Oils, Greases	O/G
				manufact. declared	manufact. declared
Wuppertal Safety Standard 2008	DCOF	Wet	SBR (recommended)	<b>Dry DCOF</b>	<b>Appraisal</b>
				$\mu < 0.50$	failed
				$\mu \geq 0.50$	passed
				<b>COF</b>	<b>Available Traction</b>
Standard 0.1	Any	Any	Any	$\mu < 0.30$	poor
				$0.30 \leq \mu \leq 0.44$	fair
				$0.45 \leq \mu \leq 0.59$	good
				$\mu \geq 0.60$	very good
German Ramp	SCOF	Wet		<b>Not applicable.</b> <b>COF is used, only.</b>	
BFU/EMPA 2008	DCOF	Wet	see standard	<b>COF</b>	<b>Appraisal</b>
				$\mu < 0.19$	N/A
				$\mu < 0.75$	N/A
				<b>Wet (Water)</b>	<b>Appraisal Group</b>
				$0.20 \leq \mu < 0.30$	GS1
				$0.30 \leq \mu < 0.45$	GS2
				$0.45 \leq \mu < 0.60$	GS3
				$\mu \geq 0.60$	GS4
				<b>Shoe (Glycerine)</b>	<b>Appraisal Group</b>
				$0.30 \leq \mu < 0.45$	GB1
				$0.45 \leq \mu < 0.60$	GB2

Method / Standard	Characteristics				
	Type	Wet Dry	Test Foot	COF and Appraisal	
				$\mu \geq 0.60$	GB3
James Machine	SCOF	Dry	Leather	<b><i>Dry SCOF</i></b>	<b><i>Appraisal</i></b>
				$\mu < 0.50$	failed
				$\mu \geq 0.50$	passed

## Glossary

COF	Coefficient of Friction, $\mu$
COF Type	The COF type. Supported types are DCOF, SCOF and TCOF.
DCOF	Coefficient of Dynamic Friction; also known as coefficient of kinetic friction $\mu_k$
Method	The instruction or procedure, how the COF shall be measured. Often published as standard. In the TRACSCAN instrument, all (applicable) parameters of a method are represented by a test program.
NFSI	National Floor Safety Institute
SBR	Styrene Butadiene Rubber. A common material for the test foot liner.
Scale	The scale that is used to visualize the Coefficient of Friction values. If the scale is defined by a standard, the scale also defines (and shows) threshold values for the appraisal of the average Coefficient of Friction.
SCOF	Coefficient of Static Friction; $\mu_0$
TCOF	Transitional Coefficient of Friction; the method associated with this coefficient is also known as Dynamic Heel Impact or Flying Start
Test Foot	The piece that is plugged to the bottom of the TRACSCAN. The test foot's liner models a shoe sole.
Test Program	The set of parameters that are used by the instrument if a measurement is started. Can be seen as representation of a method.

## References

- |                  |  |
|------------------|--|
| ANSI A326.3-2021 | American National Standard Test Method for Measuring Dynamic Co-efficient of Friction of Hard Surface Flooring Materials     |
| NFSI B101.0-2021 | National Floor Safety Institute<br>B101.0 Walkway Surface Auditing Procedure for the Measurement of Walkway Surface Traction |
| NFSI B101.1-2022 | National Floor Safety Institute<br>B101.1 Test Method for Measuring the Wet SCOF of Hard-Surface Walkways                    |
| NFSI B101.3-2022 | National Floor Safety Institute<br>B101.3 Test Method for Measuring the Wet DCOF of Hard Surface Walkways                    |
| NFSI 101-C       | National Floor Safety Institute<br>NFSI 101-C Test Method for Measuring Dry TCOF of Floor Mat Backing Materials              |

The latest version of this document, software updates, videos on how to use the instrument and additional information can be found under

[www.tracscan.de](http://www.tracscan.de)