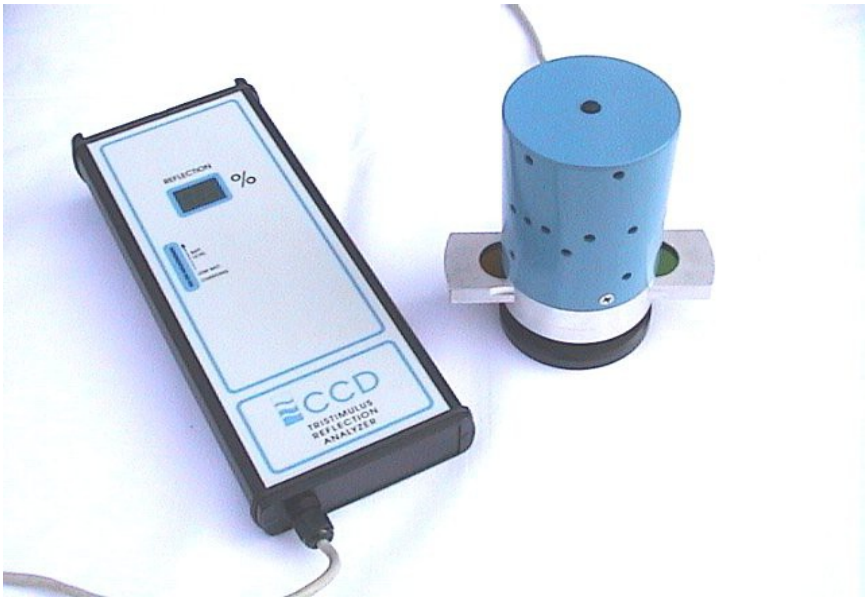
USER MANUAL

Tristimulus Reflection analyser TRA-2000

Version: 19.12.01.



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User Manual Tristimulus Reflection analyser TRA-2000

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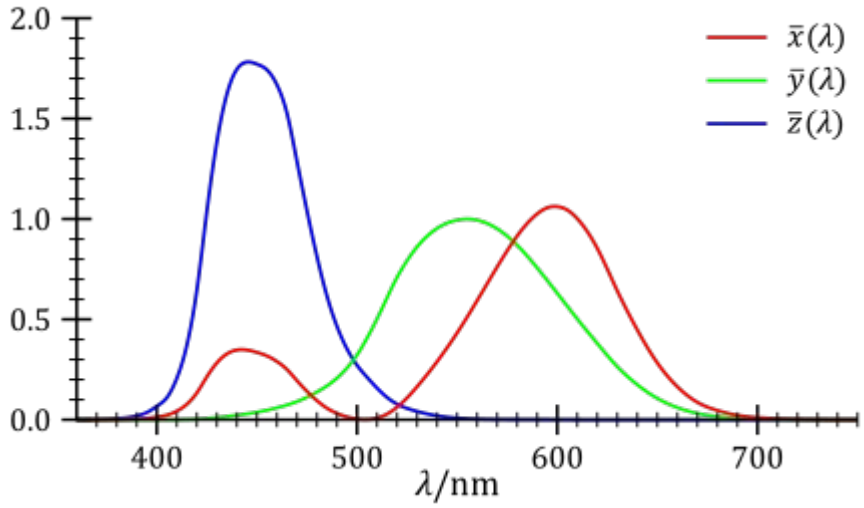
1. General description of the TRA-2000

The Tristimulus Reflection Analyzer (TRA) is a portable instrument for measuring whiteness, stain removal and tristimulus reflection of textile and other materials.
This version of the TRA can easily be operated, and can be used independent of external power supply. The analyzer is microprocessor driven. This microprocessor calculates the measured values, and can be interfaced with a personal computer. With the TRA-software the values can be stored and processed.

1.1 Principle

The analyzer consists of an optical sensor unit and an electronic measuring device. This sensor unit contains a light source which transmits light through a filter on the object to be measured. The object reflects an amount of this light, depending on the properties of the object. This amount is measured and calculated as a percentage (0% = absolute black, 100% = perfect diffuser).
The colours (green, blue and amber) are switchable by changing the filters mounted on the sensor unit. The analyzer automatically adapts to the chosen colour. The analyzer is based on the CIE colorimetric functions of the standard observer. It is compliant with standard ISO 4312 and other.

1.2 Tristimulus background



The tristimulus system is based on visually matching a colour under standardized conditions against the three primary colours: red, green, and blue; the three results are expressed as *X*, *Y*, and *Z*, respectively, and are called tristimulus values. The tristimulus values of the emerald-green pigment are *X* = 22.7, *Y* = 39.1, and *Z* = 31.0. These values specify not only colour but also visually perceived reflectance, since they are calculated in such a way that the *Y* value equals a sample's reflectivity (39.1 percent in this example) when visually compared with a standard white surface by a standard (average) viewer under average daylight. The tristimulus values can also be used to determine the visually perceived dominant spectral wavelength (which is related to the hue) of a given sample.

1.3 Application per colour

Blue:
Measurment Soil and Stain Removal Monitors (see § 4.3)

Green:
Whiteness measurement of textile

The following indicators can also be determined:
- Greying : Z – green remission
- Yellowing : green remission - blue remission
- Whiteness in artificial light : 2 x blue remission – amber remission

Z = maximum possible green remission of the several textiles, fi.:
Cotton 92 Polyester 82 Poly/Cot (70/30) 88 Polyamide/Nylon 86

1.4 Applications

This analyzer is specially developed for measuring textile and other non-flat materials. Used in combination with the Soil and Stain Removal Monitors, Multi Soil Monitors or other artificially soiled testfabrics developed by Cleaning Consultancy (CCD), an objective judgement of laundry processes can be made.
The analyzer is also suitable for measuring the whiteness of textiles.
Due to the compact and rigid design, the analyzer is perfect for applications in the field by for instance laundry's, consultants and detergent manufacturers.

1.5 Purpose & Functionality TRA-2000 software

The software is specially written for use with the TRA2000 Tristimulus Reflection Analyzer. Do not use this software with other types of analyzers!
The program communicates through the serial RS232 port (or optionally through the USB-port with the CCD-USB converter) with the TRA. This communication contains measured values and status information like calibration data, serialnumber, lampvoltage. All values are measured on the background.

2. Using the TRA-2000 Stand-alone (without connection to a computer)

Switching on

The analyzer is switched on with the main switch. After this the lamp is slowly turned on. This takes about 30 seconds (soft start). Before measurements can be carried out the analyzer must stabilize for approx. 5 minutes. Please confirm that the battery has sufficient capacity left.

Adjustment Procedure

Before measurements can be carried out the analyzer must be adjusted (calibrated) using the supplied adjustment standard (indicated by "CC" on the display). Choose the desired measuring colour by shifting the filters.
Never exchange the standards between different analyzers. Confirm that the serial number on the adjustment standard is the same as the serial number of the analyzer (located inside the lid). Also confirm that the standard is not damaged or dirty.
Place the sensor unit on the adjustment standard and press the button on the sensor unit. The analyzer will now adjust itself by measuring the adjustment plate and calculating the reflection based on the stored values. After adjustment the display will indicate a measured value. This value must be stable. If not repeat the procedure.
When the display indicates "EE" the analyzer has detected that the correction is too large or that the value is not stable. A too large correction can occur when the sensor unit is not placed correctly on the adjustment standard, or a defect has occured (fi. lamp is defect).
When the error can not be corrected, first make sure that the sensor unit is clean and dust free and that the battery is charged. If no problems can be found, please contact your supplier.
After adjusting, measurements can be started directly. In between measurements the analyzer can be adjusted by placing the sensor unit on the adjustment standard and pressing the button on the sensor unit.
It is recommended that the analyzer is adjusted every 10 samples. If the value is not stable and drifts several percentages, please contact your supplier. The lamp may be defective. Please confirm first that the analyzer is stabilised after switching on and that the battery is charged sufficiently.
Every half year the analyzer must be calibrated. The expiration date of the calibration is indicated on a sticker placed in the lid. Contact your supplier for details.

Measuring

Measuring is very simple. The sensor unit is placed on the surface to be measured. The main unit constantly indicates the measured value, thus given the possiblity to scan a surface.
When connected to a personal computer the measured values can be stored and exported.

When the colour is changed during measuring, the analyzer must be re-adjusted.

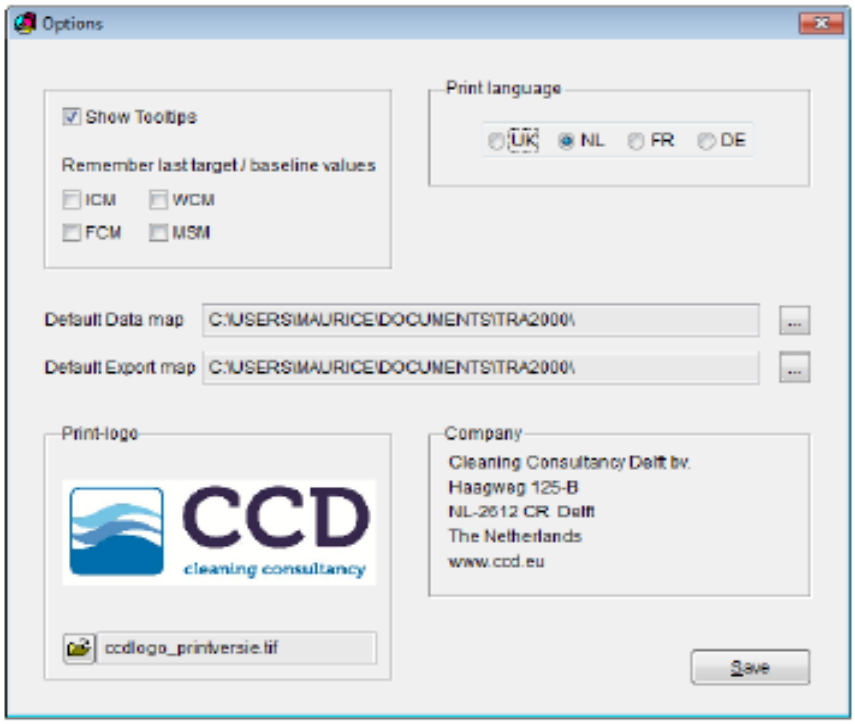
3. Using the TRA-2000 connected to PC

3.1 USB driver

Upon first installation of the software:
Before connecting the USB adapter (USB to serial) first install the driver software from the CD supplied with the USB connector or downlaod from website www.ccd.eu .

3.2 Configuring own logo, address, Target Value and language

Choose in the menu [Maintenance] and then [Options]



Show Tooltips
If turned on information will be shown when “hovering” on buttons and Links

Remember Target Values / Baseline values
If turned on the last “target values/baseline values” in the Soil and Stain Removal modules are stored automatically and will be used with the next measurement.

Print language
With this option you can choose the language in which the report will be generated.

Default Data map
The map where the TRA software will save the measuring data.

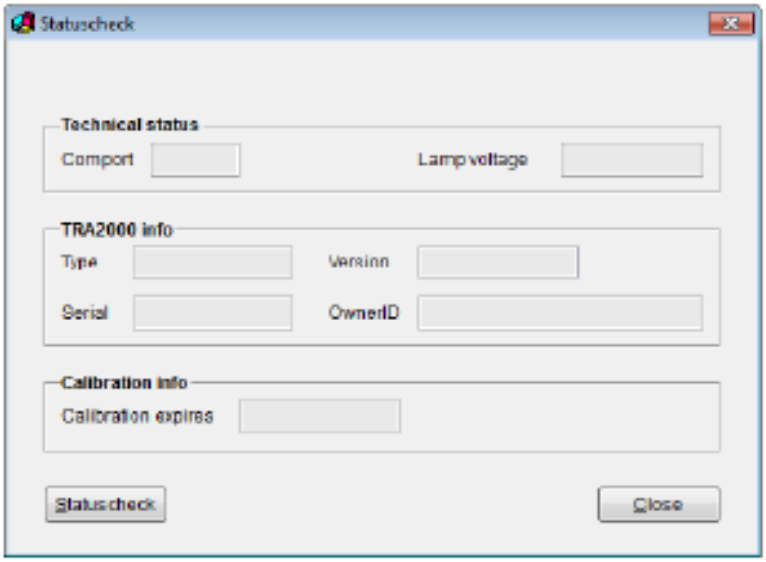
Default Export map
The map where the TRA software will save the measuring export data.

Print logo
Upload your own logo to be printed on the report

Company details
Fill in your company details to be printed on the report.

3.3 Status check

Choose in the menu [Maintenance] and then [Statuscheck]

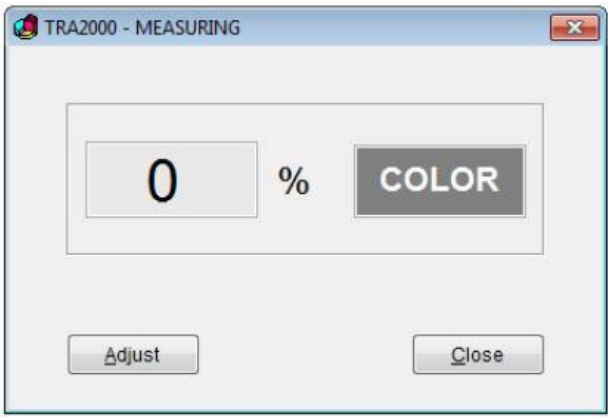


Press button [Satuscheck] and the software will check the status of the TRA.

4. Measuring

4.1 Measuring single point 

Use this option if you just need a simple display of measured values on your pc.



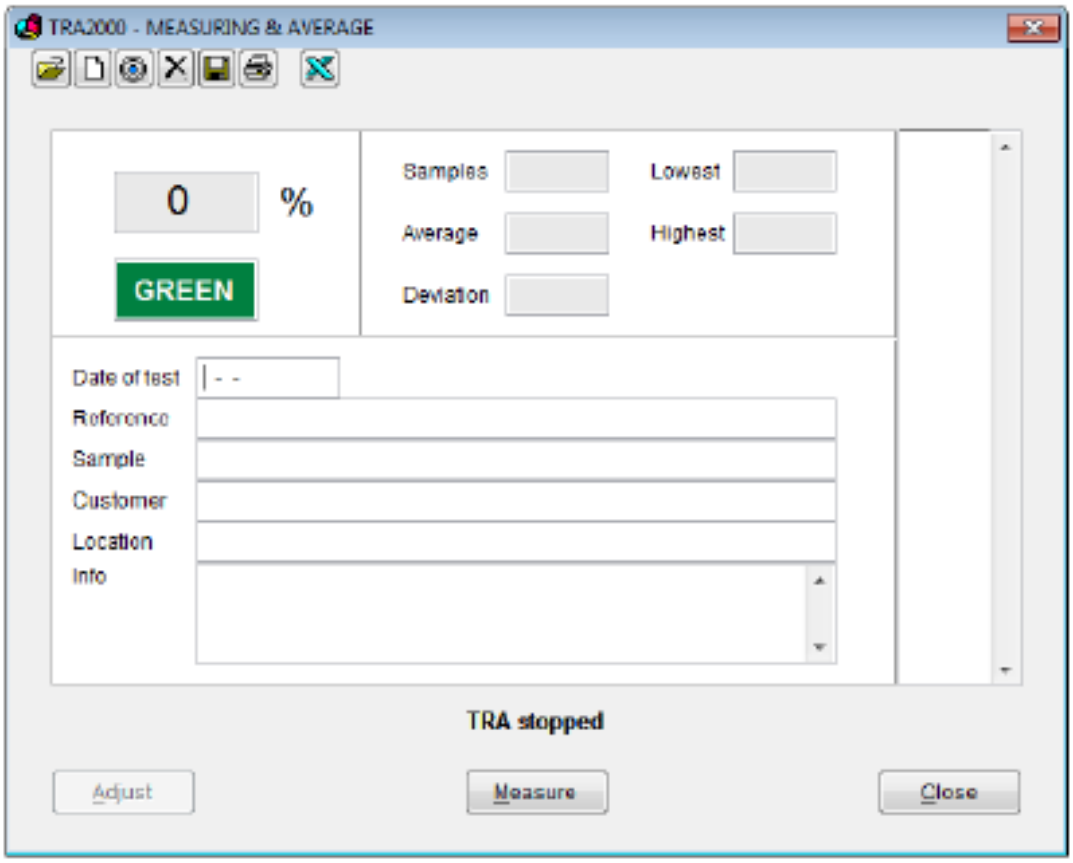
The display contains the following items:

- measured value in % reflection
- visual display of the actual selected color (green, blue or amber)
- adjust button -> first place the sensor unit on the calibration adjust
- close button

4.2 Measuring & Average

Select this item if you need a statistical evaluation of your measured values and/or if you would like to store or print the measured values for future reference.

A display will popup containing the following main parts:



sample reference:
Userinformation can be filled in as reference like Date of test, Reference, Sample, Customer, Location and Information. This information can be entered at the beginning or in a later stage in "EDIT" mode.

Prepare for measurements:

1. Select colour filter on the TRA (Green, Blue or Amber)
2. Select the button [Measure]
3. Please put the TRA on adjustment plate and adjust first
4. Select button [Adjust]

The TRA is ready to start the measurements

When ready you can save the measurements by pressing the save button and/or print the report.

For export of the data to MS Excel you can press this button. The data will be saved at the Default Directory.

4.3 Measuring Soil and Stain Removal

4.3.1 Why is measurement of soil and stain removal important?

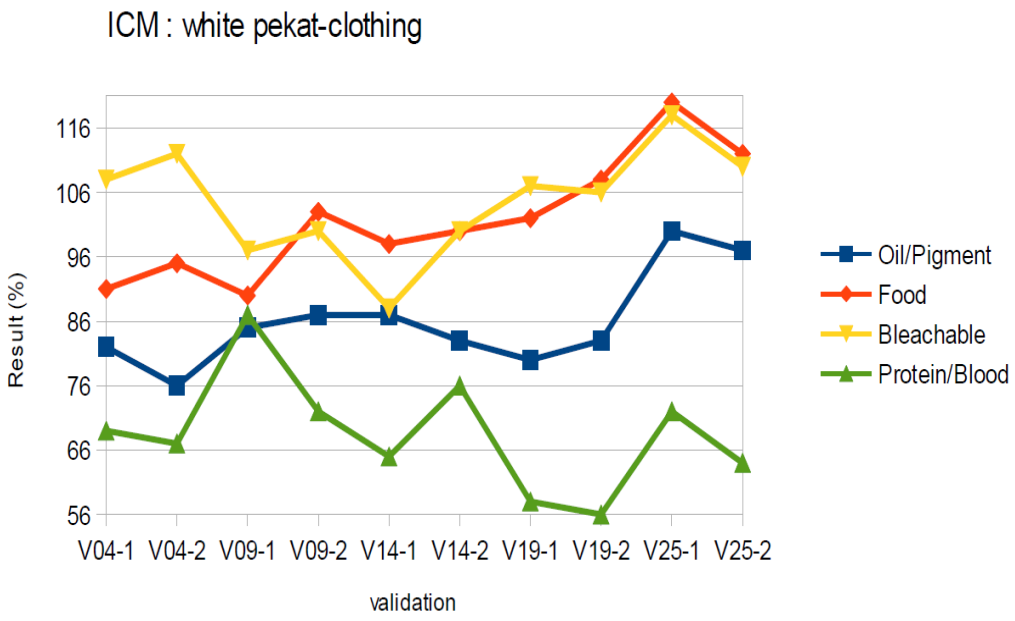
The Soil and Stain Removal Monitors from CCD are especially developed to measure the soil and stain removal of industrial laundry processes. The monitors contains different kinds of soils/stains, each one equivalent to a different kind of soil, which occur on lightly and heavily soiled laundry.

Why is measurement of soil and stain removal important?

- Scoring the degree (level) of stain removal, as well as monitoring the continuity of the verified washing processes (early insight into deviations)
- Insufficient cleaning bears risk of surviving bacteria by encapsulation in dirt and stains
- Establishing quality objectives with (end) customer substantiated with reporting
- Cumulation of poor soil removal will cause hazing of the laundry

Application of the monitors
Using the monitor is very easy. The complete set is washed once with the washing process to be tested. After drying the results can be measured. The results can be compared with the reference values or the (pre)determined quality objectives/Targets of the (end)customer.

Demonstrate continuity washing process:
With intermittent use (eg monthly) the results can demonstrate, by means of a trend analysis reports, that the washing process in the field of soil and stain removal shows continuity, and thus corresponds to the pre-determined (quality) objectives/targets.



For detailed product info see: http://www.ccd.eu/en/products/test-materials

4.3.2 Measuring Industrial Cleaning Monitor (ICM)

The Industrial Cleaning Monitor (ICM) is especially developed to measure the soil and stain removal of industrial laundry processes. The monitor contains different kinds of soils/stains, each one equivalent to a different kind of soil, which occur on lightly and heavily soiled laundry.

Process Validation and / or adjusting (new) washing processes:
With this an assessment of current versus new washing processes can be displayed. For this purpose, the results obtained are compared with reference values. These values are based on an independent reference standard washing process (with oxygen bleach) which is highly controlled. The resulting values of this process are called: reference values. With these values it is possible to compare the results of the tested process with the standard process, giving an indication of the quality of the tested process.

Another useful application is to improve the washing process. Soil and Stain Removal Monitors results demonstrate any shortcomings of the current washing process after which a targeted improvement action can be taken.
It is also possible to use the monitors without these values for comparison of washing processes, washing machines or chemicals.

The different types of Soils and Stains ICM
One set consists of three carrier cloths made out of standard cotton to which four soil / stain types are sewn.

Oil/pigment
Oily soils occur in all kinds of laundry, even in hospital laundry. For example: ointments, paraffin, human grease, entrapped dust etc.
Food
Model for food stains. A food stain is a complex kind of soil. It contains fat, protein, carbohydrates and pigments.
Bleachable
In this case wine. The removal of this kind of stain gives also a good impression of the removal of fruit juices and tea.
Protein/blood
To check the protein/blood removal of the process. Even if there is no blood present in the laundry other soil types containing protein can be present like food stains.

The results are compared to standard reference values or the pre-determined (quality) objectives agreed upon with the (end) customer.

A. Reference value (%)

These can be obtained via CCD (please mention serial number in all communications)
These values are based on a reference standard washing process (with oxygen bleach) to (slightly soiled) healthcare textiles such as sheets, pillowcases, terry towels etc.. This reference process is carried out under carefully controlled conditions in an industrial washing machine. The reference value is a guideline to judge or compare the process(es) tested. When testing laundry processes for the same laundry type as the standard process (like hospital laundry), we advise to use an objective of at least 95% for each soil type.

B. Quality objectives
These values are determined by the laundry facilities in consultation with the (end)customer. Based on these pre-defined targets you can report whether these are achieved.

Report ICM
Process data
The test itself is generally performed by the Laundry. For this reason, the results are only reliable if the test is carried out according to the instructions. The process information is copied from information that the customer has filled in.

Target
The targets are or based on the reference value or at the agreed (pre-) quality objectives.

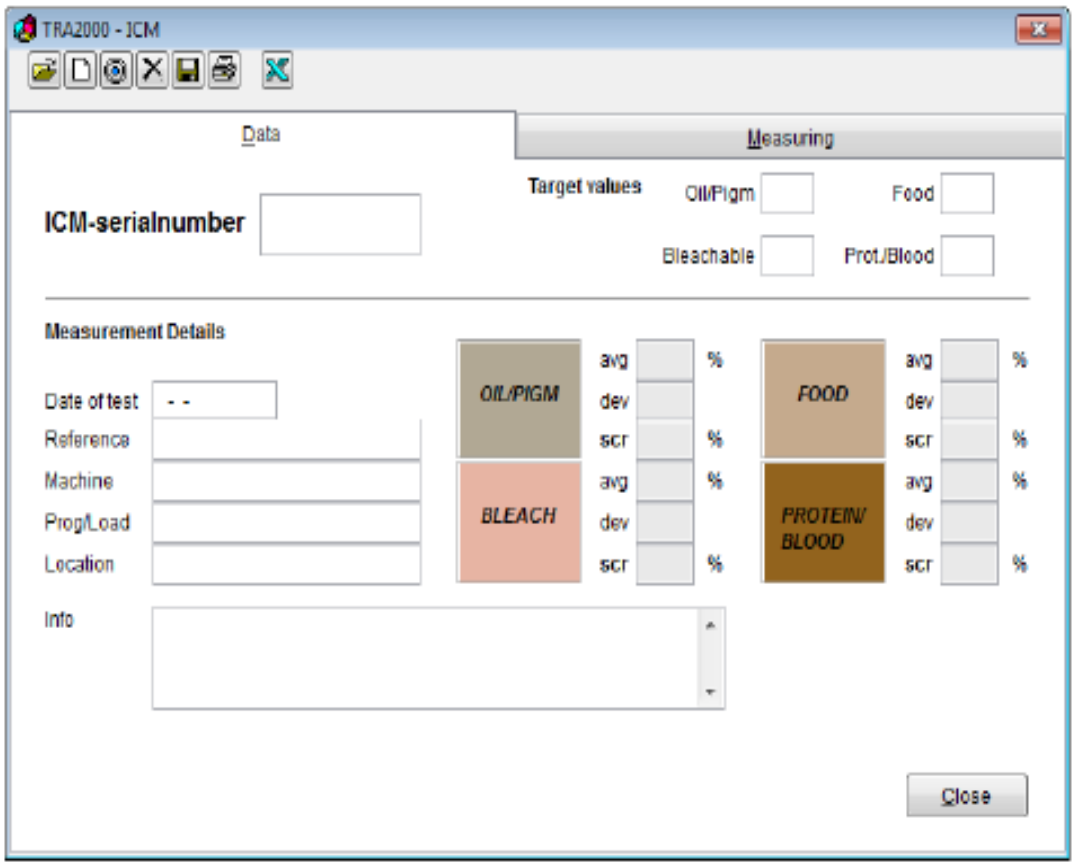
Average measured value
The average measured reflection values are given for each soil/stain type.

Result (%)

The result is the amount of soil removal indicated as a percentage of the reference value / quality objective for the type of dirt. A score above 100% means that the tested process has a better soil- and stain removal than the standard process / agreed target for this soil type. A lower score means less soil- and stain removal.

Measurement and reporting Inductrial Cleaning Monitor (ICM)

Open specific Module  (Left button ICM)

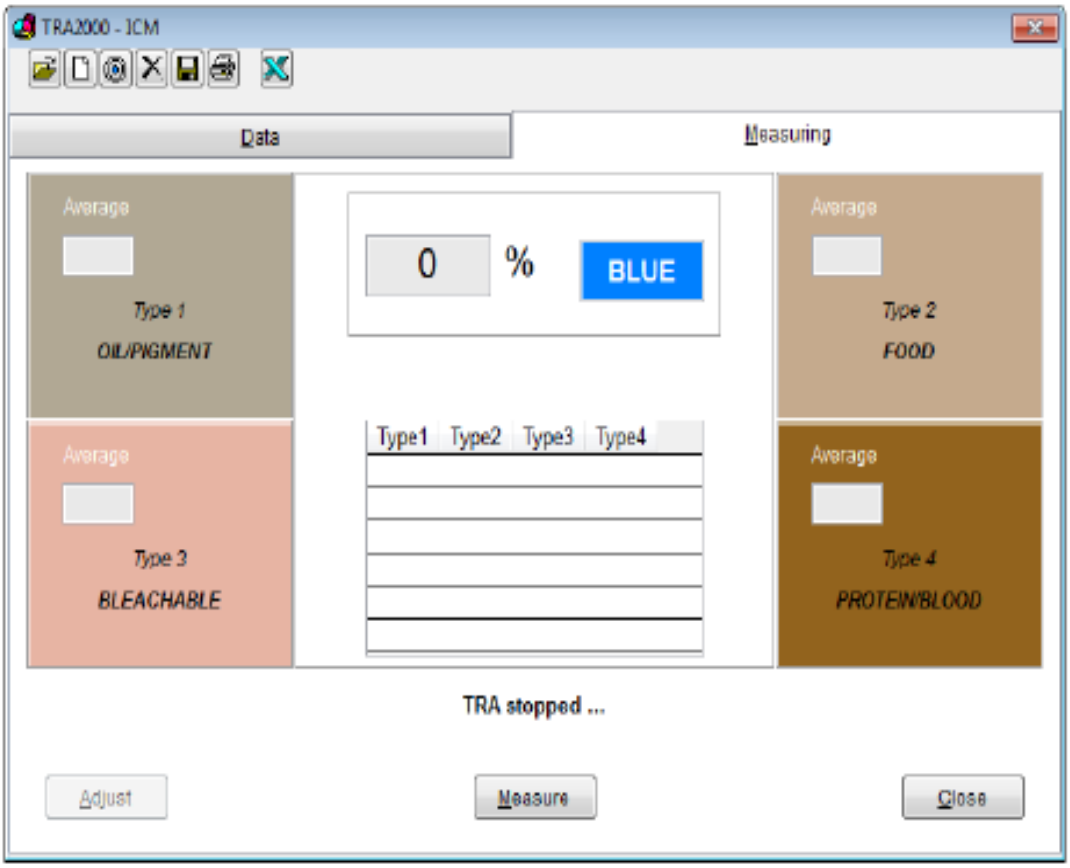


Fill-in all required data (Serial number Monitor, Target Values, Date of Test, Reference, Machine, Programme/Load, Location and Info)
Go to Tab “Measuring”

Measurement the Inductrial Cleaning Monitor (ICM)

Press Button [Measure]
Press Button [Adjust]

Start measuring Soil and Stain Removal Monitors from 1 set in the indicated direction.



When ready you can save the measurements by pressing the save button and/or print the report.

For export of the data to MS Excel you can press this button. The data will be saved at the Default Directory.

4.3.3 Measuring Soil and Stain Removal Monitors (WCM)

The Workwaer Cleaning Monitor (WCM) is developed to measure the soil and stain removal of industrial laundry processes. The monitor contains different kinds of soils/stains, each one equivalent to a different kind of soil which may occur in work clothes or such laundry, like overalls, jackets, industrial towel dispensers eg.

The different types of soil

There are four kinds of soil/stains on the monitor.

Pigments
This special kind of soil has been developed to reflect the removal of “parts” like carbon black, pigment parts, small iron parts etc.

Motor oil
This is mineral oil artificially contaminated, similar to oil from (industrial) equipment and engines.

Oil/pigments
Mineral oil to which pigments are added. The soil type is so developed that it also response on a process with a lower washing temperature (eg less than 75° C).

Sebum
Model for skin-grease indicator for contamination of clothing by the user (for example, collars and cuffs). This kind of soil is also to use as an general indicator for grease removal of the process.

Report WCM

Process data
The test itself is generally performed by the customer. For this reason, the results are only reliable if the test is carried out according to the instructions. The process information is copied from information that the customer has filled in.

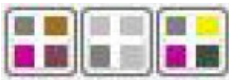
Baseline Value
The Baseline values are or based on the measurement of the soil and stains before the laundry proces. This can be obtained via CCD (please mention serial number in all communications) or measured yourself before the laundry proces.

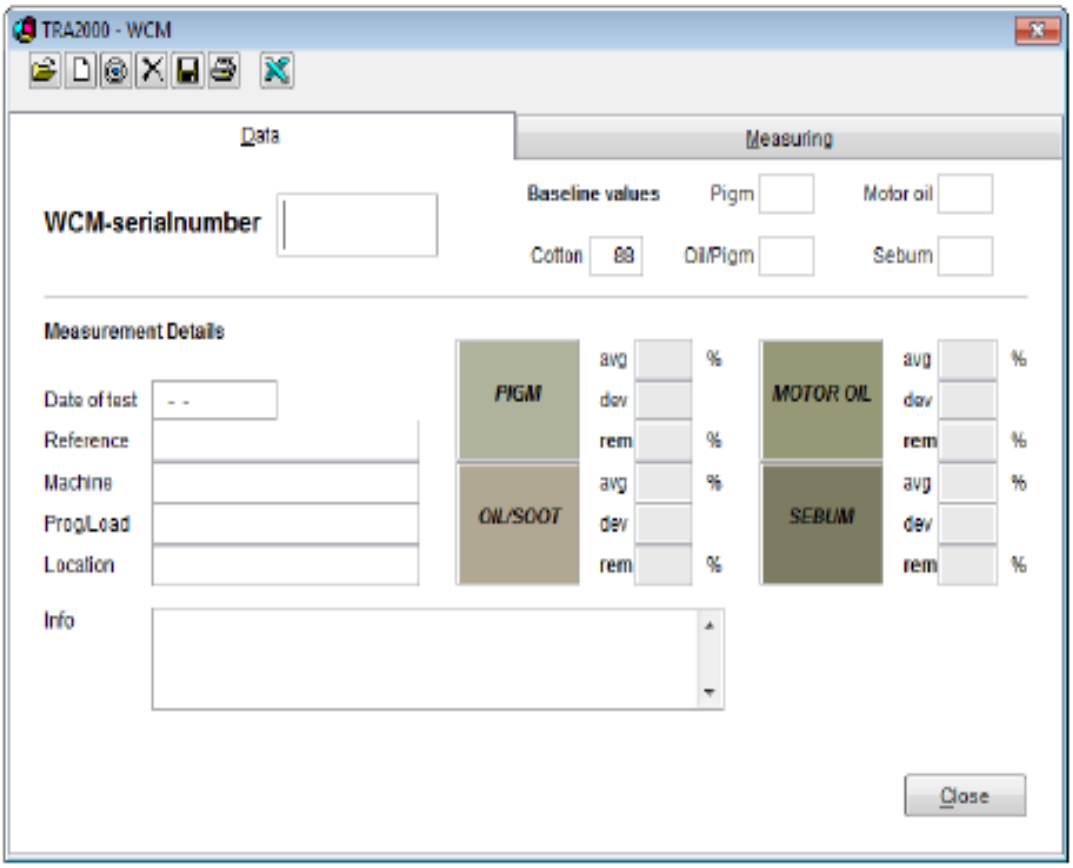
Average measured value
The average measured reflection values are given for each soil/stain type.

Result (%)

The results of soil removal indicated are calculated relative to the maximum possible removal (% removal of the soil kind).

Measurement and reporting Workwear Cleaning Monitor (WCM)

Open specific Module  (Middle button WCM)

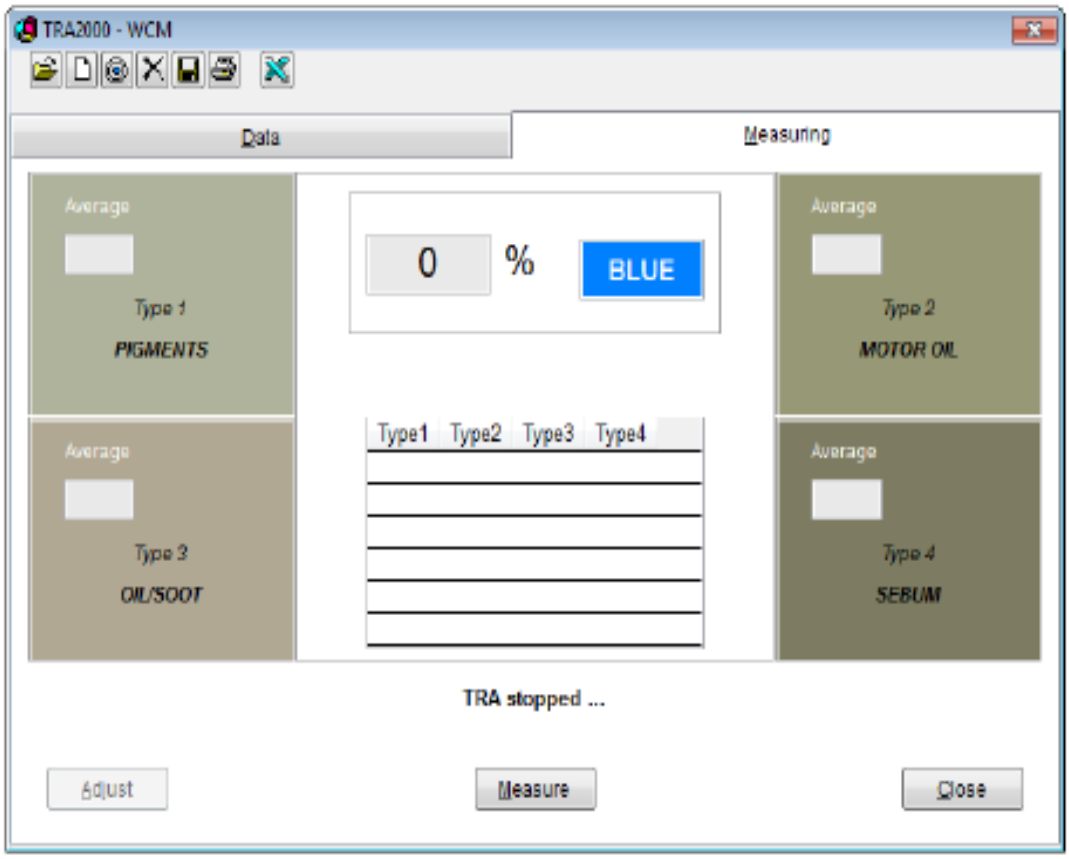


Fill-in all required data (Serial number Monitor, Baseline Values, Date of Test, Reference, Machine, Baseline value Cotton: The baseline value for 100% cotton (88) is automatically filled, if needed this can be changed.

Programme/Load, Location and Info)
Go to Tab “Measuring”

Measurement Workwear Cleaning Monitor (WCM)

Press Button [Measure]
Press Button [Adjust]
Start measuring Soil and Stain Removal Monitors from 1 set in the indicated direction.



When ready you can save the measurements by pressing the save button and/or print the report.

For export of the data to MS Excel you can press this button. The data will be saved at the Default Directory.

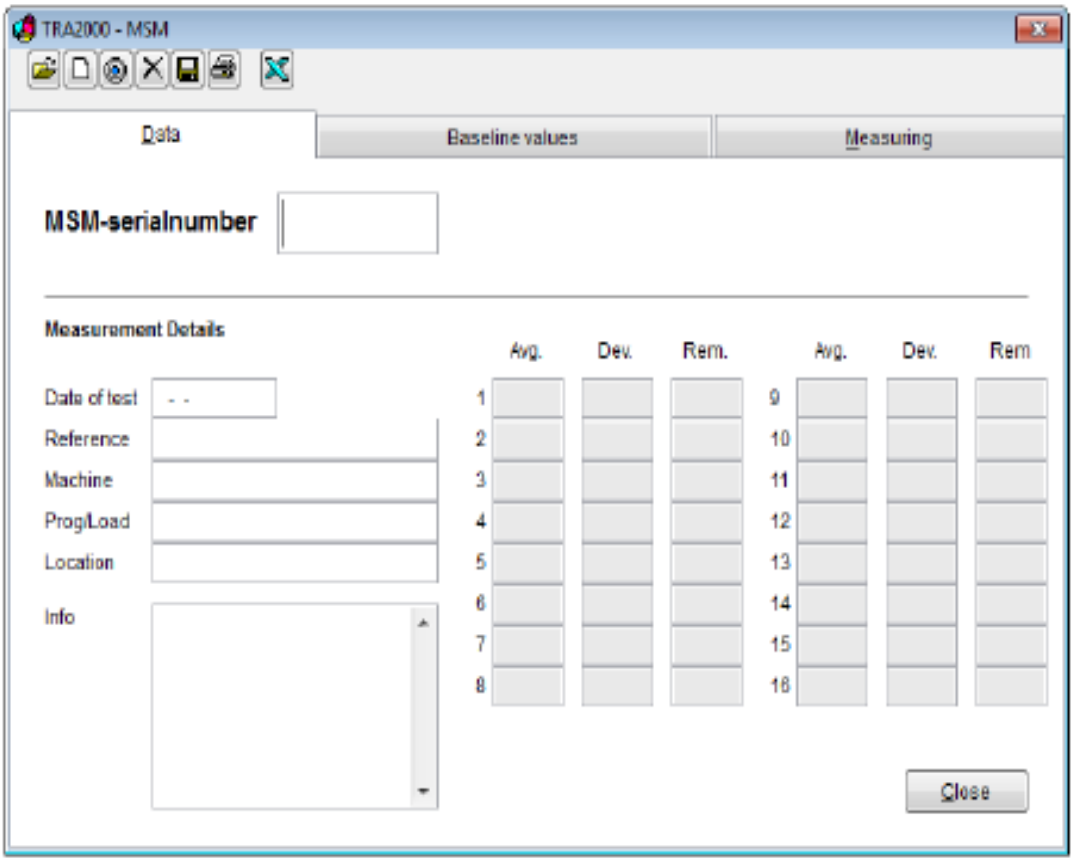
4.3.4 Soil and Stain Removal Monitor Food Cleaning Monitor (FCM) In Development

4.3.5 Soil and Stain Removal Monitor Fine Wash/Chemical cleaning (MSM)

The Multi Soil Monitor is a special monitor to determine the soil and stain removal in dry cleaning processes and in washing processes for wool, coloured fabrics and other delicate fabrics. The monitor has many different types of soil and gives therefore a good indication of the effectiveness of a process.

Open Module MSM 

Data



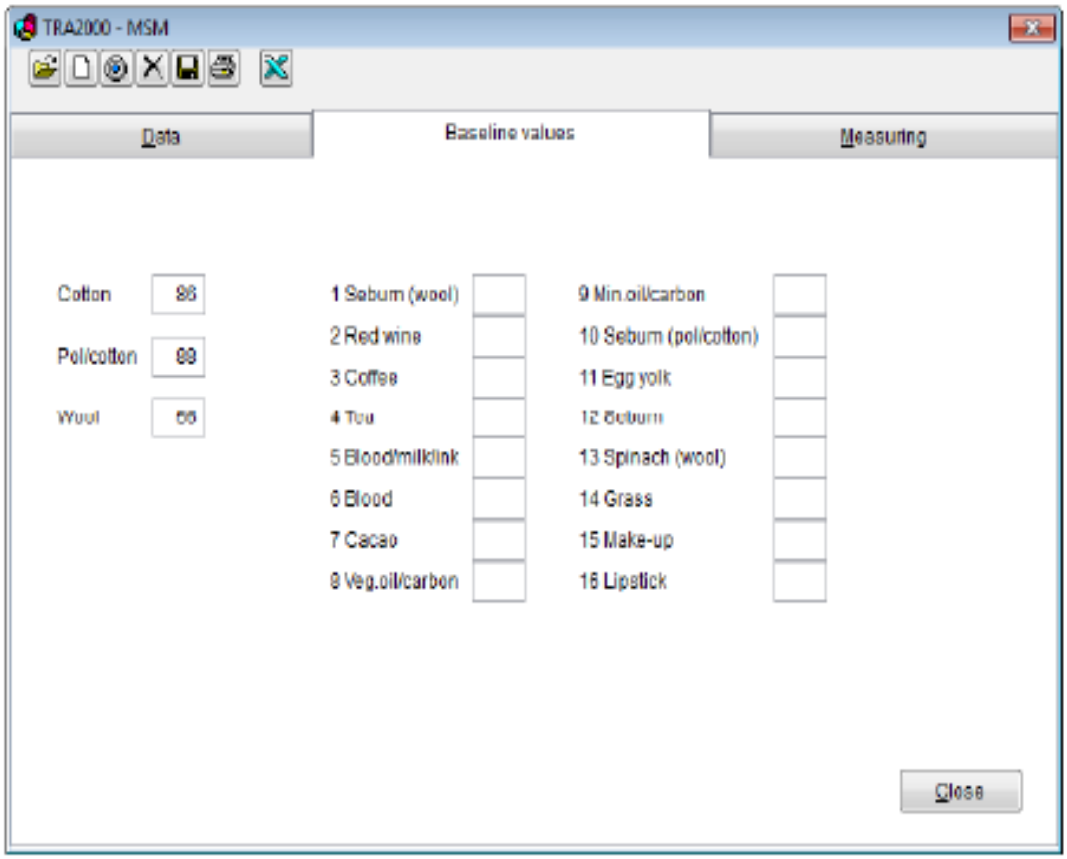
Fill-in all required data (Serial number Monitor, Date of Test, Reference, Machine, Prog-Load, Location and Info.

Go to Tab “Baseline values”

Baseline Values

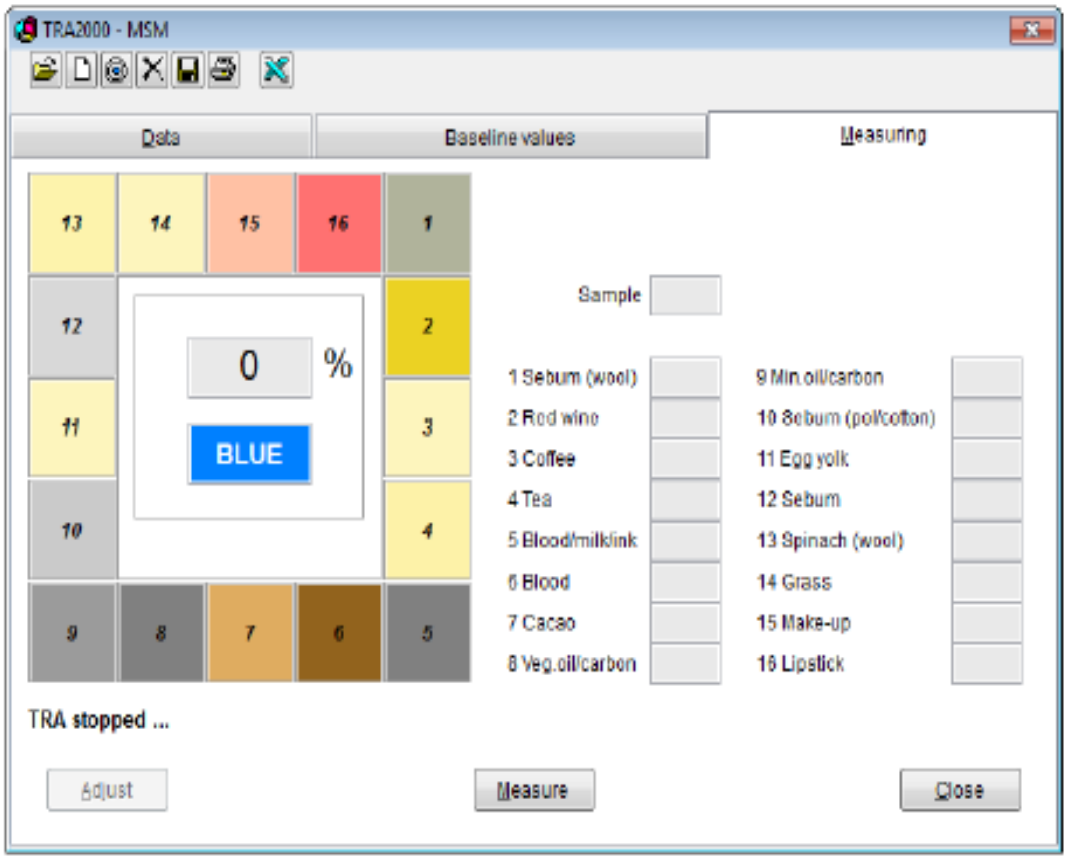
The Baseline values are or based on the measurement of the soil and stains before the laundry proces. This can be obtained via CCD (please mention serial number in all communications) or measured yourself before the laundry proces.

Baseline values Cotton, Pol/cotton and Wool is is automatically filled, if needed this can be changed.
100% cotton (86)
Pol/cotton (88)
Wool: (56)



Go to Tab “Measuring”

Measuring



Press Button [Measure]
Press Button [Adjust]
Start measuring Monitors from 1 set in the indicated direction.

When ready you can save the measurements by pressing the save button and/or print the report.

For export of the data to MS Excel you can press this button. The data will be saved at the Default Directory.

4. Hardware / Functional Description

The main unit houses the battery, microprocessor and displays.
The lid can also be used to place the display in a small angle, thus facilitating the reading.

Main Display
This display normally indicates the measured tristimulus reflection (00 - 99).
After switching on, the display will indicate "CC" as a sign that the analyzer requires to be adjusted to the adjustment standard (calibration).
If an error occurs, the display will indicate "EE". This error can occur if the correction that is required to adjust the analyzer to the adjustment standard is too large. The correct values for the adjustment standard are stored in the memory of the analyzer. See for further information the section about ADJUSTMENT Chapter 2).
The display is switched off automatically when the TRA is in communication with a personal computer.

Battery Status
This led display indicates with green leds the status of the battery. When the battery is low, a red led will blink. No measurements must be carried out when this is the case. The values can be incorrect.
Another red led indicates that the analyzer is charging. After the charging period this led will be turned off.

Charging the battery
When the red battery low indication blinks, no measurement can be performed and the battery must be recharged. Insert the chargingplug of the supplied poweradapter. The charging led (red) will light. When the batterys are charged completely, the led will go out. The analyzer will switch to trickle charge.
Charging an empty battery will take about 2-3 hours.
It is also possible to charge when the analyzer is switched on. This will not affect the measurements or charging.
The battery is protected against overcharging.

Lid
On the top side a lid is located. This can be opened by pushing the lid up a little bit (press up in the middle).

The lid can also be used to place the display in a small angle, thus facilitating the reading.

Main Switch
This switch is located on the top side of the analyzer, hidden under a lid. When the TRA is not used, the main switch must be turned off. The main display will be turned off as well as the battery status indication. The charging led is not affected by the main switch.

Power Supply Entree
This entree is used to connect the supplied power adaptor and is positioned in the middle. Never use other adaptors!

PC-Connector
A standard RS232 pc-connector can also be found under the lid. Allways use the supplied interface cable and supplied USB connector to connect the TRA to a personal computer.

Sensor Unit
The sensor unit has a switchable filter slide. The filters can be changed by shifting this slide. The unit automatically adapts to the changed filter. After changing the filter colour, adjustment is allways required.
On top of the sensor unit a push button is positioned. This button has two functions.
When the analyzer is used stand alone, the button is used to adjust the analyzer to the standard.
When the analyzer is connected to a personal computer, the button is used to store a data value. Adjustment is then carried out with a key on the keyboard.

5. Maintenance and Cleaning

Calibration
The TRA needs to be calibrated at least every half year. The expiration date of the calibration is indicated on the sticker inside the lid. The TRA software automatically detects when the TRA needs te be calibrated.

Main Unit
Use a soft tissue and optionally a non agressive detergent. Avoid placing the unit in direct sunlight. The unit must be calibrated every half year, but does not require any further maintenance.

Sensor Unit
It is important that no fingerprints or dust accumulates on the filters. Cleaning is possible with a soft tissue, preferable a special lens cleaning tissue. Never use solvents or detergents.
If necessary the unit can be made dust free with clean and dry compressed air.
Avoid shocks, especially when the lamp is still warm. Allways transport the analyzer in the supplied carrying case.

Adjustment Standard
Store the adjustment standard in the dark. It must never be exposed to excessive and direct sunlight.

6. Calibration and returning the TRA

The TRA2000 must be calibrated bi-annually. For this calibration, we need the complete analyzer including adjustment plate. If necessary the lamp will be changed.
If you have to send the TRA for repair, please **first perform a** status check and send us an email containing troubleshooting information, see below for more information.

Returning the TRA for calibration or repair

- if possible deliver the TRA yourself
- make sure the TRA is packaged well
- if you send the TRA from **outside** the EEC make sure you ship it as a **REPAIR/RETURN (incoterm DDP)**, otherwise you have to pay for customs again when we return you the TRA
- the costs for calibration are excluding costs for shipment, these will be charged to you
- if you have any questions, please contact us: info@ccd.eu

For delivery addres and information please check: www.ccd.eu

7. Technical data

Measuring principle	Tristimulus, reflection under 45 deg CIE standard observer, ISO 4312
Colours	Green, Blue, Amber with automatic adaption
Measured surface	315 mm2
Accuracy	< 1.5% absolute (reflection 15% - 95%) < 5% absolute (reflection 0% -100%)
Display	LED-display for measuring values: 0 - 99 error indication (EE) calibration indication (CC)
Calculations	Microprocessor Resolution: 12 bits
Memory	EEPROM for calibrationvalues and service information
Communication	19K2 bps, TTL/RS232, TRA protocol
Ambient temperature	+5 - + 40 degC
Power supply	12 V DC with adaptor only use the supplied adaptor!
Battery	NiMh
Charging time	approx. 14 hours (when completely discharged)
Measuring time	approx. 7 hours (when completely charged)
Ledindication with	battery status, low battery, charging
Dimension	measuring device 250x150x32 mm (LxWxH) sensor unit 140xdiam. 75 mm length cord to sensor unit 1.2 m
Weight	measuring device 1.1 kg sensor unit 0.8 kg total weight including case 3.8 kg
Appurtenances	transport case mains adaptor calibration adjust software TRA interface cable calibration certificate

8. Guarantee

The Tristimulus Reflection Analyzer is guaranteed against production failures for one year.

- only the repair or replacement of parts is covered
- the lamp and battery do not fall under guarantee
- the TRA must be used correctly, according to the user manual
- alterations by the customer make the warranty void

9. Licence Agreement

Permitted is:
- Using the program on a stand-alone computer or network, on the condition that the program can only be accesed by one user at the time. This does not apply to networkversions.
- Making of copies for backup purposes

Not permitted is:
- distribution to third parties
- copying or sending for other than backup purposes
- renting or selling the program
- modifying or revising the program

Liability
No liability is taken for problems resulting the use of this program. Notification has to be done within 30 days after delivery. Changes between the program and the documentation can occur.

Up to date software can be found on: http://www.ccd.eu/en/downloads