Simplified Integrated Amount of Solar Radiation Measuring System

OptoLeaf Measuring Instrument D-Meter RYO-470

Instruction Manual

(2016.11.02)

Before use, read this instruction manual carefully and understand the contents well.
Save this manual for future reference.

Contents

大成ファインケミカル株式会社

Taisei Fine Chemical Co., Ltd.

Function product Division

3-5-1, Nishi-shinkoiwa, Katsushika-ku,

Tokyo 124-8535, JAPAN

http://www.taisei-fc.co.jp

Introduction

Thank you very much for purchasing our simplified integrated amount of solar radiation measuring system, OptoLeaf and OptoLeaf measuring instrument. This system is an instrument to measure the amount of solar radiation based on the degree of color fading of a colored film.

Before use of this system, please read this manual carefully and handle this system appropriately to make this system function properly.

Make sure to note the following points:

- The specifications of this device and the contents of this manual are subject to change without notice.
- Be aware that we will not bear any responsibility for any damage caused by the use of this device.
- Be aware that we will not bear any responsibility for the results produced by abuse, misuse, or improper use of this device.
- Our responsibility for guarantee shall not exceed the cost of repairing this device or replacing any part in any case.
- We will try to bring the contents of this manual to perfection, but if any point is unclear or incorrect, please contact us.
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Directions for use

Warning

Failure to observe the following may cause breakdown, smoking, ignition, injury, and more.

1. Do not disassemble or remodel the product.
2. Do not insert a foreign substance, such as an iron plate, plastic, or paper.
3. Do not use this product in a dusty or water-splashing environment.
4. Do not throw the product into fire.
5. Keep this product out of the reach of infants.

Caution

Failure to observe the following may cause performance deterioration, breakdown, damage, deformation, and discoloration.

1. Keep this product away from direct sunlight, and high temperature and humid environments.
2. Use this product only within the temperature range of 20°C ± 15°C (5°C to 35°C).
3. When “LOBAT” is displayed on the screen, replace the existing batteries with new ones.
4. Do not apply excessive force to this product; for example, do not put an object on this product.
5. Do not expose this product to strong impacts; for example, do not drop this product from the top of a desk.
6. Do not put this product into a place where excessive force is applied such as a pants hip pocket.
7. Do not use thinner, benzene, alcohol, or the like to wipe this product.

Be aware that we will not bear any responsibility for the results produced by abuse, misuse, or improper use of this product.

Packing contents (basic set)

Simplified integrated amount of solar radiation measuring system	
OptoLeaf measuring instrument, D-Meter RYO-470 ･･･1pc. Leaf holder ･･･2pcs. Transparence ref. leaf ･･･2pcs. Instruction manual (this book) ･･･1copy AA battery ･･･ pc(s).	OptoLeaf (R-3D･Y-1W･O-1D) ･･･ roll(s) * The rolls ordered with the main unit will be included. * The explanation of how to use OptoLeaf and OptoLeaf color fading curves are packed with OptoLeaf.

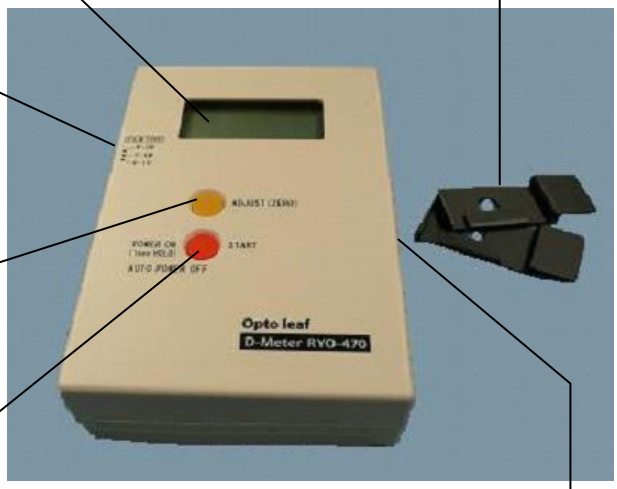
Names and functions of OptoLeaf measuring instrument, D-Meter

LCD panel

Displays absorbance, and more.

Leaf holder

Catches a leaf to be measured.



Leaf selection slide switch

Selects a leaf to be measured from R-3D, Y-1W, and O-1D.

ADJUST (ZERO) switch

Starts zero adjustment.

START switch

Turns on the power or starts absorbance measurement.

Leaf inlet

Accepts a leaf with the leaf holder to the end.

Battery box

Holds two AA batteries.
The lid can be opened by sliding.

For correct use

1. Operating temperature

D-Meter is a microcomputer-embedded precision instrument; use this instrument under a normal temperature environment.

Because the CPU of the microcomputer is heat sensitive, be careful not to raise the temperature of D-Meter.

Be aware also to keep this product out of direct sunlight. In addition, be careful not to use this product in extremely low temperatures.

* Normal temperature: 20°C ± 15°C (5°C to 35°C) ... according to the definition of “normal temperature” by the Japanese Industrial Standard (JIS Z 8703)

2. Measurement range

The measurement range of D-Meter is 2.2 to 0.6.

OptoLeaf measurement shall be performed with absorbance of not less than 0.6 as a guideline.

If the absorbance deviated from this range, the accuracy is lowered. Measurement shall be performed within the range as much as possible.

(An error with a spectrophotometer is usually within ±0.05, but when the range is exceeded, the error may be within ±0.10 in some cases)

A value more than 2.3 for a high concentration and a value less than 0.5 for a low concentration are displayed as errors.

The measurement range of D-Meter is a rough range for which OptoLeaf color fading curves (calibration curve) can be used.

3. Measurement of OptoLeaf’s initial value

Be sure to measure the initial values of all OptoLeaf pieces before use.

OptoLeaf is manufactured so that the initial value falls within 2.0 ± 0.2, but a uniform concentration is considerably hard to be made, and even for the same OptoLeaf, the values may vary depending on measuring points. That is why, when plural OptoLeaf pieces are used to perform multi-point measurements at the same time, be sure to measure the initial value for each OptoLeaf before use.

OptoLeaf is used to measure the degree of color fading based on the initial value; therefore, even if the color of OptoLeaf slightly fades, OptoLeaf can be used by measuring the initial value freshly.

4. How to place OptoLeaf on leaf holder

Measure the same points of OptoLeaf before and after exposure.

When OptoLeaf is placed on the leaf holder, it is recommended to arrange it in the same directions as before exposure. During use of D-Meter, because absorbance is measured with transmitted light, there is no difference between the front and back surface of OptoLeaf if the same points are measured.

5. OptoLeaf color fading curve graph (calibration curve)

Be aware that measurement accuracy is reduced if exposure is insufficient or too much.

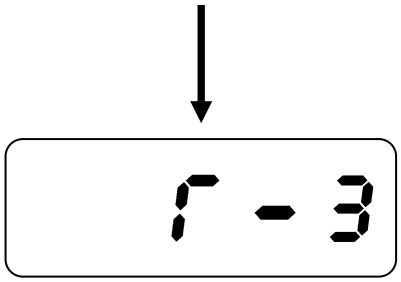
The provided color fading curve graphs (calibration curve) show values with fading OptoLeaf to some extent, and the values in the area can be obtained with an approximate expression (attached sheet). However, the approximate expression does not apply in the stage of beginning and late fading, and then, those graphs are omitted on purpose. The tendency of the values of beginning or late fading is different from the one of the fading central area, and it can be said that another curves (or expression) may exist. The measurement range of D-Meter is the central area of the color fading (color fading curve graph).

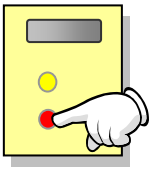
How to use D-Meter, OptoLeaf measuring instrument

1. How to turn on the power

Hold down the START switch (red button) in the center of the panel for 1 second to turn on the power.
If the START switch is released within 1 second, the operation becomes invalid. In such a case, hold down the START switch again for 1 second.
When the power is turned on, the LCD shows the currently selected OptoLeaf type that is selected with the slide switch.

Holding down START switch





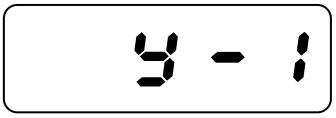
1 second

Keep on pressing the START switch until this indication appears.

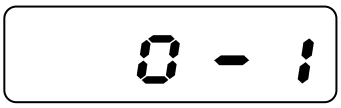
Case of selecting “R-3D” with slide switch

* Other indications are shown as follows:

Case of selecting “Y-1W” with slide switch



Case of selecting “O-1D” with slide switch



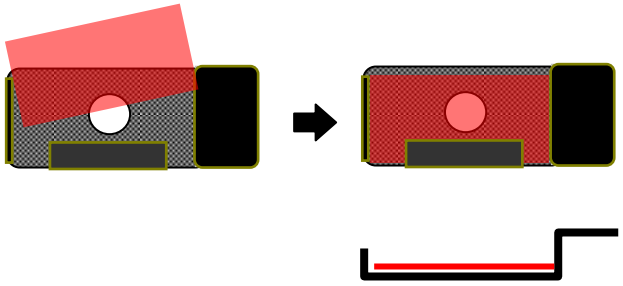
2. How to turn off the power

If no operation is performed (state of not pressing any switch) for 40 seconds, the power is automatically turned off.
Switch operation cannot turn off the power.
When nothing is shown on the LCD, the power is in the OFF state.

3. How to set OptoLeaf to be measured

Set OptoLeaf to be measured on the leaf holder and cut it into an appropriate size.
The size should be appropriate for setting it on the leaf holder and hiding the entire hole in the center of the holder with it.

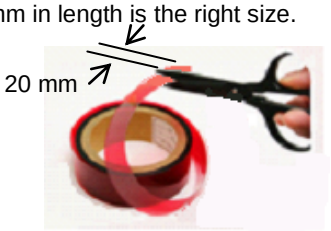
Correct setting



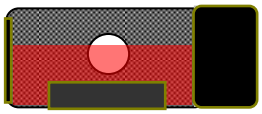
Set OptoLeaf horizontally when viewed from the side

Recommended size: 35 mm x 20 mm

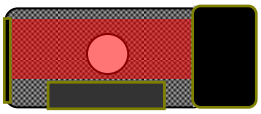
The dimensions of the OptoLeaf roll are 35 mm in width and 10 m in length, and cutting it into 20 mm in length is the right size.



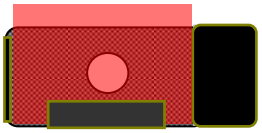
Wrong setting



(1) An opening of the hole leads to the wrong result



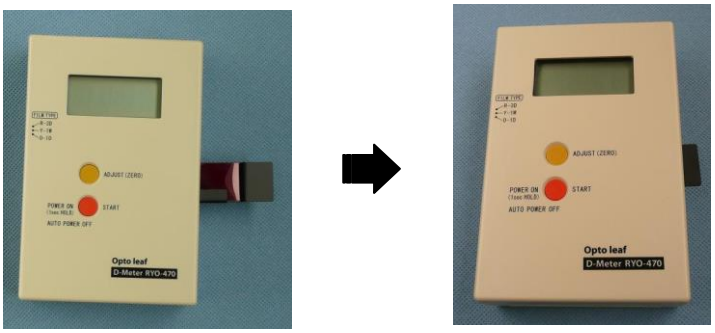
(2) Not nipping OptoLeaf may cause OptoLeaf to move



(3) Because of too large a size, it cannot enter the leaf inlet

(4)Warped OptoLeaf leads to the wrong result

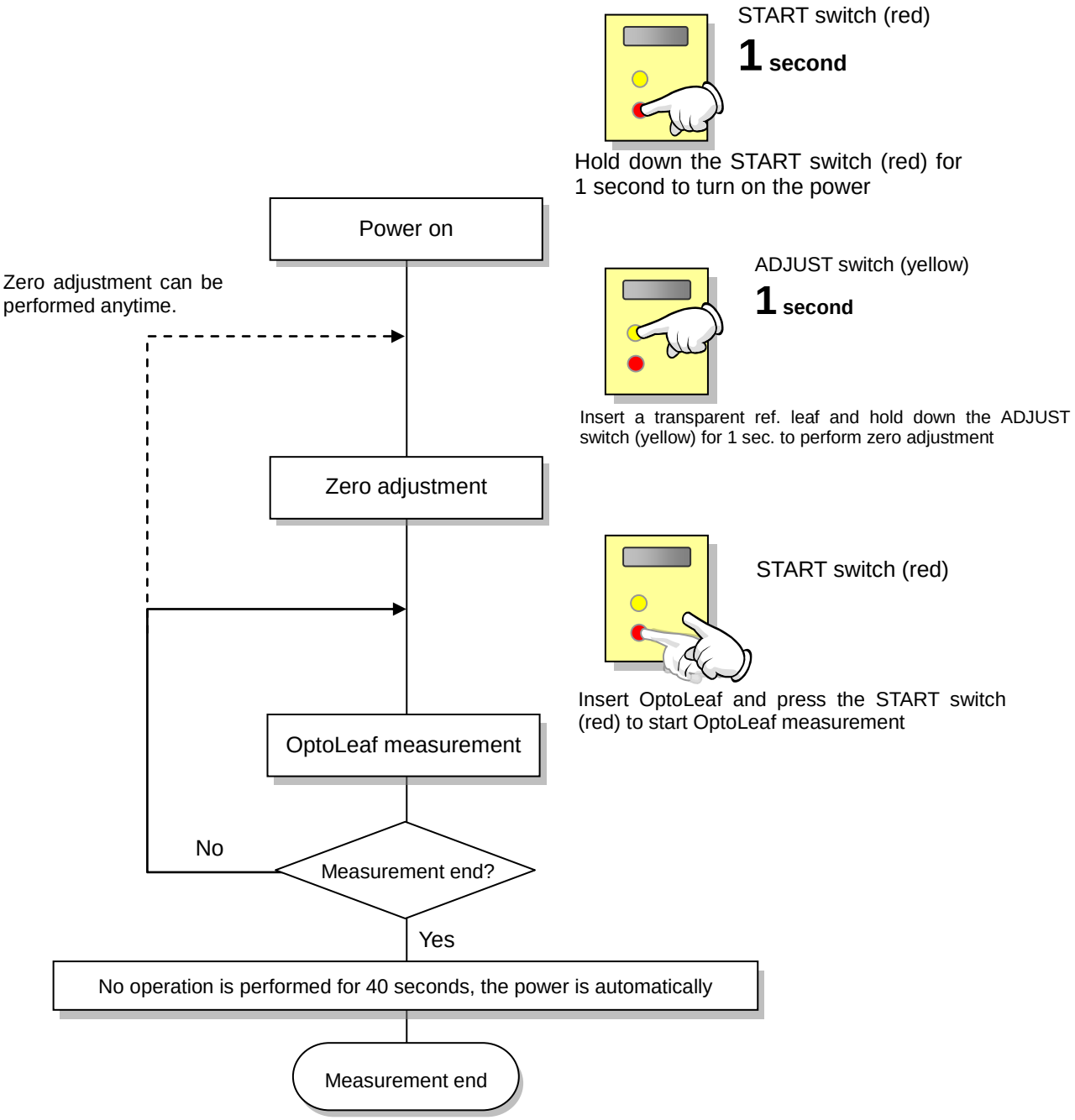
Insert the leaf holder with the OptoLeaf side upward into the leaf inlet to loading it into the D-Meter main unit.
At this moment, insertion should be performed as far as it will go.
If the leaf holder is not successfully inserted, correct measurement cannot be performed.



4. Before measurement

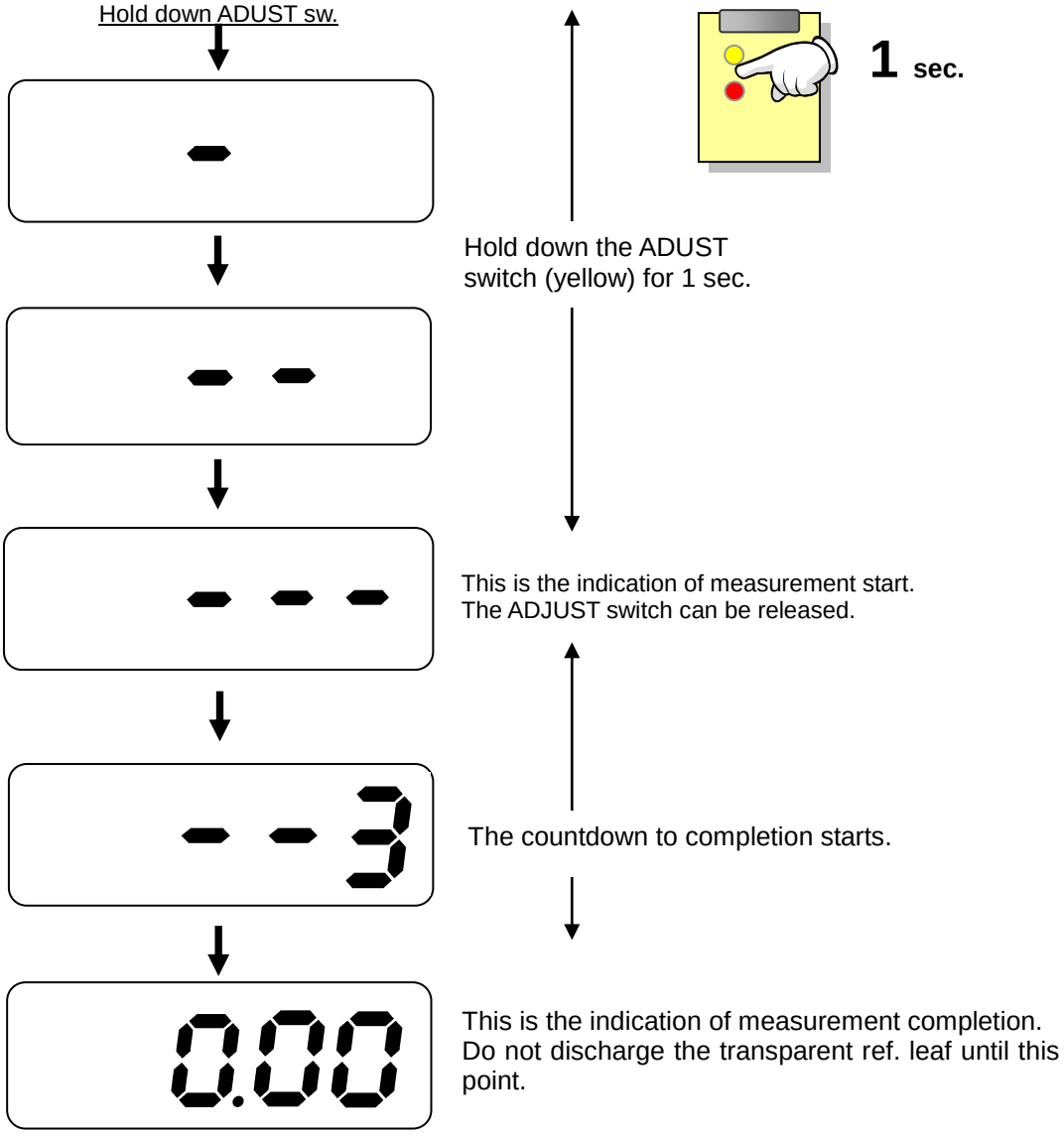
- Measurement shall be performed as follows:
  (1) Zero adjustment (for the purpose of obtaining correct measurement results)
  * Perform measurement by inserting a transparent reference leaf.
  * The results are saved even after the power is turned off. It is still recommended to perform zero adjustment once after turning on the power to grasp the instrument state.
  (2) OptoLeaf measurement
  * Insert OptoLeaf and perform measurement.

- The OptoLeaf measurement flow is shown as follows:



5. Zero adjustment

For the purpose of obtaining correct measurement results, zero adjustment shall be performed before OptoLeaf measurement.
A reference is established with use of a transparent reference leaf.
Place a transparent reference leaf on the leaf holder and insert the holder into the leaf inlet.
* Insertion shall be performed as far as it will go.
Next, hold down the ADJUST switch for 1 second, and the indication on the display panel changes as follows:



Note: (1) If the ADJUST switch is released before "---" is displayed, zero adjustment is canceled. In such a case, the reference used at the last time is active.
(2) When zero adjustment is successfully completed, the reference value is saved in the memory, and it remains even after the power is turned off.
(3) If an error occurs during the process of zero adjustment, be sure to retry zero adjustment.
If an error occurs, zero adjustment is not completed. If OptoLeaf measurement is performed under the status quo, the "E05: measurement error" occurs.

6. OptoLeaf measurement

Select an OptoLeaf type with use of the leaf selection slide switch depending on OptoLeaf to be measured. (photo)

* If the selected type of the leaf selection slide switch does not match the actual type of OptoLeaf to be measured, correct measurement cannot be performed.

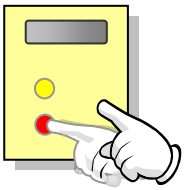
Place OptoLeaf to be measured on the leaf holder, insert the holder into the leaf inlet of the main unit, and press the START switch, and the information on the leaf selection slide switch is displayed and the absorbance is displayed on the display panel.

Place OptoLeaf

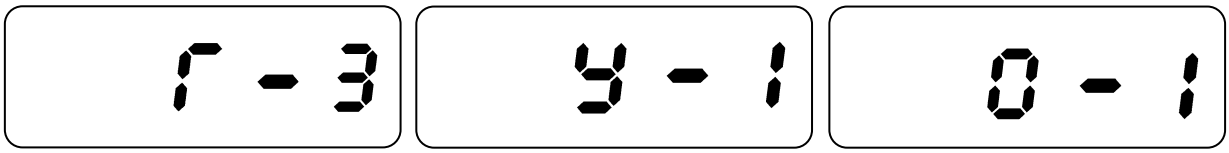
↓

Press START switch

↓

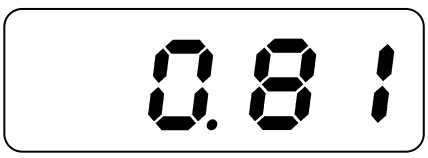


Info on current leaf selection slide switch is displayed



At selecting “R-3D” At selecting “Y-1W” At selecting “O-1D”

↓

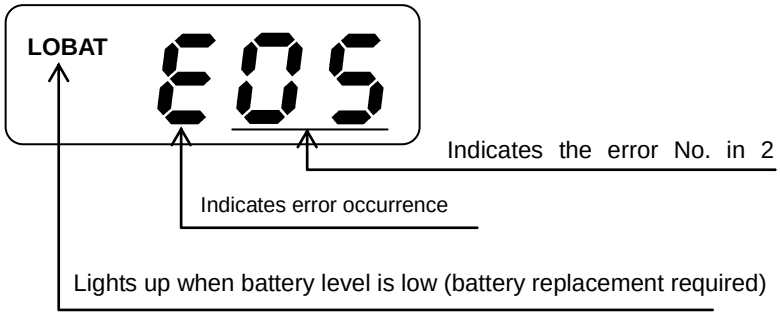


Absorbance is

Note: (1) If the selected type of the leaf selection slide switch does not match the actual type of OptoLeaf to be measured, correct measurement cannot be performed.
(2) Zero adjustment and OptoLeaf measurement can be always performed while the power is in the ON state.
(3) No operation is performed for 40 seconds, the power is automatically turned off.
(4) If OptoLeaf with excessive color fading (with the concentration close to a transparent reference leaf) is measured, the measurement error occurs.

7. Error message

When an error is displayed on the display panel, refer to the list of errors and perform the corresponding remedy.



List of errors

Error No.	Error type	Cause classification	Remedy
01	Measurement error (measured value beyond the range)	Operation	Perform measurement again
02	Zero adjustment/Measurement error (affected by external light)	Operation	Shut off external light
03	Zero adjustment error (measured value beyond the range)	Operation	Insert transparent ref. leaf again
04	System error (failure of memory in which ref. data is saved)	Instrument	Manufacturer repair is required
05	Measurement error (zero adjustment not performed)	Operation	Perform zero adjustment
06	Measurement error (measured value below the range)	Operation	Perform measurement again
07	Zero adjustment error (measured value beyond the range)	Operation	Insert transparent ref. leaf again
08	Measurement error (measured value beyond the range)	Operation	Perform measurement again
09	System error (failure of leaf selection slide switch)	Instrument	Manufacturer repair is required
20	System error (program failure)	Instrument	Repair is required

Warranty

This warranty shall apply based on the warranty provisions described below; fill in the date of purchase, the addresses, and the telephone numbers below.

－ Warranty Provisions －

(1) In the event of product failure under normal operating conditions according to the instruction manual, we will repair or replace this instrument without charge based on this warranty; therefore, please do not hesitate to contact us.

(2) We shall bear no responsibility for any damage directly or indirectly caused by the failure of this instrument or the use of this instrument.

(3) The following cases require fee to repair:

  (1) Failure or damage caused by the customer's inappropriate handling, such as dropping this product and impact on this product during transportation or movement

  (2) Failure or damage caused by the customer's misuse, improper modification, or repair

  (3) Failure or damage caused by natural disaster, such as fire, salt damage, gaseous damage, earthquake, lightning strike, or storm and flood damage, and external factors such as abnormal voltage

(4) This warranty is valid only in Japan.

(5) This warranty is not reissued. Please keep this warranty in a safe place.

Product name/Model		OptoLeaf Measuring Instrument, D-Meter RYO-470
Product No.		
Warranty period		Date of purchase One year warranty from YYYY/MM/DD
Customer	Company name or your name	
	Address	
	Telephone No.	
Dealer	Shop Address Telephone No.	

If a failure occurs during the period described above from the date of purchase, ask us for repair or replacement by presenting the product and this warranty. This warranty is our promise to repair or replace the instrument without charge based on the period and conditions specified in this document. This warranty shall not limit the legal rights of the customer. For repair, replacement, or others even after the warranty period expires, please do not hesitate to contact us.

For inquiries about unclear points or consultation, contact us as follows:

Taisei Fine Chemical Co., Ltd.
Function product Division
3-5-1, Nishi-shinkoiwa, Katsushika-ku,
Tokyo 124-8535, JAPAN
http://www.taisei-fc.co.jp