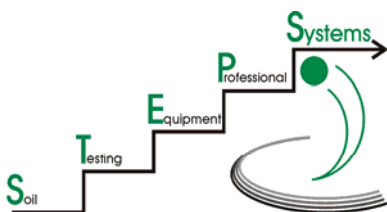


LUX Meter

Operating instructions



STEP Systems GmbH
Soil Testing Equipment - Professional Systems

All rights reserved.
Printed in Germany.
STEP Systems GmbH 2016

Duisburger Str. 44
Tel: ++49 (0) 911 96 26 05-0
Fax: ++49 (0) 911 96 26 05-9
D-90451 Nürnberg
e-mail: info@stepsystems.de
www.stepsystems.de

Dear customer,
we thank you for your acquiring the Lightmeter. With this product, you acquired a state-of-the-art device. We kindly request the user to respect this operating manual to preserve this condition and to ensure safe operation.

Prescribed Use

The Lightmeter is a high-precision measuring instrument for the precise measuring of the illuminance and the incidence of light on a particular area. The measurement is performed via a photoelectric cell and the measuring result is indicated in four measuring ranges on the LC display. The voltage supply is ensured by a 12V alkaline battery of the type A23. Do not expose the device directly to water or humidity; the housing is not water-proof! Clean the exterior of the device only with a dry and lint-free cloth. Do not use cleansing agents!

A use different from the one described above leads to damaging of this product. Furthermore, it involves dangers such as e.g. short-circuit, burns, etc. The entire product must not be opened, modified or rebuilt.

Scope of Delivery:

Digital Lightmeter with permanently installed sensor · carrying and storage case · operating manual

Safety Instructions

Any claims for guarantee will become invalid in the event of damage that results from the non-observance of the operating manual. We do not accept responsibility for such damage. Nor do we accept responsibility for damage to property or for personal injuries caused by improper use or non-observance of safety instructions. Guarantees will not be accepted in any such case.

The unauthorized conversion and/or modification of the product is inadmissible because of safety and approval reasons (CE). This device is not a toy. Keep the device out of reach of children! Do not expose the device to mechanical stress, to moisture or liquids. Only use the device outdoors under appropriate weather condition or with appropriate protection. The light sensor or the device must not be heated by the light source. Keep sufficient distance to light sources with strong heat development.

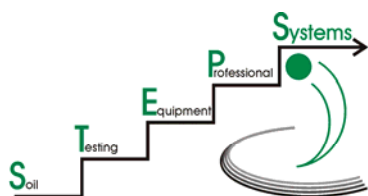
Information on the Correct Illuminance

The illuminance is measured in lux. The adaptability of the human eye is almost unlimited. This easily leads to demanding of the eye visual performance even if the illumination is not sufficient. If there is no light or the illumination is not sufficient, the eye can fulfill its visual performance only with great effort or even cannot see. Very often, this involves eye injuries the number of accidents increases. With the Digital Luxmeter you acquired a product by means of which you can verify everywhere if the illuminance is sufficient for the normal visual performance (i.e. everyday tasks). Eyesight means the detection of brightness and colour differences, form, motion as well as distance. Only with the correct illuminance, the eye can fulfil its visual performance. Therefore, sufficient illumination is so important. Concerning light, we often save at the wrong end. Dark zones give an unfriendly atmosphere. Allow yourself more light. The kind of illumination influences the information that is transmitted by the eye to the brain. Increase the illumination where precise seeing is necessary. In rooms with an illuminance inferior to 30 lux, the danger of accidents increases! Older people need more light, because their visual performance decreased. A 60-year old needs approx. twice the light of a 30-year old.

Description of the Device

(for figure see page 4)

1. Low-Bat indication: symbol for an empty battery. If this symbol appears on the display, the battery has to be replaced.
2. Indicated value of the measured illuminance. If the display indicates "1", the selected measuring range is exceeded; switch to the next measuring range.
3. Light sensor with built-in long-life photodiode and protective cap
4. 12V alkaline battery of type A23
5. On/Off and measuring range selector switch
6. Screw for opening of the housing in case of battery replacement



STEP Systems GmbH
Soil Testing Equipment - Professional Systems

All rights reserved.
Printed in Germany.
STEP Systems GmbH 2016

Duisburger Str. 44
Tel: ++49 (0) 911 96 26 05-0
Fax: ++49 (0) 911 96 26 05-9
D-90451 Nürnberg
e-mail: info@stepsystems.de
www.stepsystems.de

Carrying out Measurements

Before commissioning, please observe the instructions concerning the Prescribed Use as well as the Safety Instructions and the Technical Data.

- Turn the On/Off switch (5) to the desired measuring range.
- Remove the protective cap from the light sensor and hold it horizontally ensuring that the light hits the light sensor vertically. Avoid shadows of your own body in direction of the sensor.
- Read the value (2) indicated on the display. In the measuring ranges of 200 and 2000 lux, the indicated value corresponds to the intensity of light in lux. In the measuring range of 20000 lux, you have to multiply the indicated value on the display by 10; in the measuring range of 50000 lux, you have to multiply it by 100 to determine the correct light intensity.
- In case of overflow indication ("1" is indicated on the display), please switch to the next measuring range to determine the correct light intensity.
- After the measuring process, please switch off the device (On/Off switch to "OFF") and put the protective cap back onto the sensor.

Replacing the Batteries

The device is already equipped with a built-in 12V alkaline battery of the type A23 when being delivered. As soon as the Low-Bat indication (1) appears on the display, please replace the battery because otherwise, the precision of the indication is no longer guaranteed. To replace the battery, proceed as follows.

- Remove the housing screw (6) on the back of the device with an appropriate screwdriver for recessed-head screws and carefully remove the back of the device.
- Remove the empty battery and replace it by a new one of the same type. Ensure correct and secure position of the battery.
- Put the back of the housing back onto the device and close the device by fastening the housing screw (6).

The user is legally obliged (old battery regulation) to return all used batteries (from round cells to lead storage batteries) to a specialist dealer's shop where there are special facilities (collecting boxes). It is forbidden to dispose of batteries in the garbage bin or litter. You can return your used batteries and storage batteries free of charge either to our subsidiaries or to our central office in Nürnberg or reusable-waste facilities which are obliged to take back old batteries. Make your contribution to environmental protection!

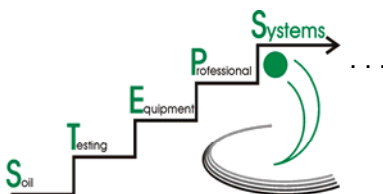
Standard Values for Illuminance	
Stairs, basement, loft	30 lux
Garage, hall, lumber rooms	60 lux
Kitchen, hobby workshops, living rooms, housework rooms, waiting rooms	250 lux
Meals, kitchen work and hobbies, office and laboratory work	500 lux
Hall, cloakroom, toilet, bathroom, children's room, storeroom	720 lux
Reading, writing, homework or handicrafts, painting, cosmetics	750 lux
technical drawing, precision work, precise testing, judging colours	7000 lux

Disposal

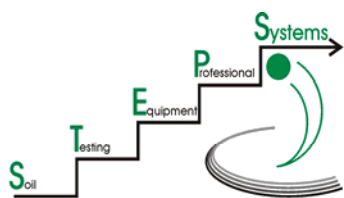
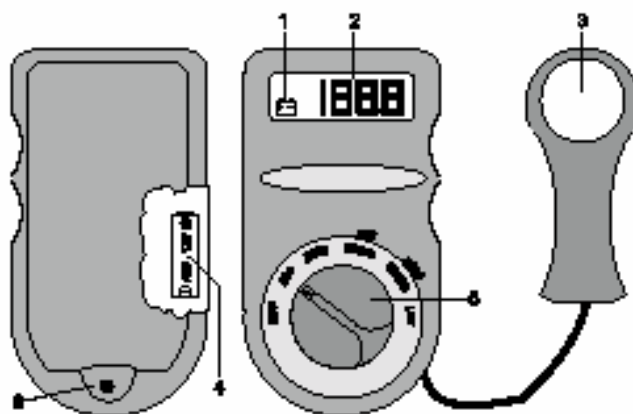
Dispose of the unserviceable device according to the relevant statutory requirements.

Technical Data

Measuring range : 0.01 up to 50,000 lux
 Accuracy : $\pm 5\% + 10$ digits (< 10,000 lux)
 : $\pm 10\% + 10$ digits (> 10,000 lux)
 Repeatability : $\pm 2\%$
 Measuring rate : 1.5 times per second, nominal
 Voltage supply : 12V alkaline batteries of type A23



Temperature characteristic : $\pm 0,1\%$ per $^{\circ}\text{C}$
Display : 31/2 -digit LCD
Dimensions photoelectric sensor : (115 x 60 x 27) mm
Dimensions main device : (188 x 64.5 x 24.5)
Weight : 160g

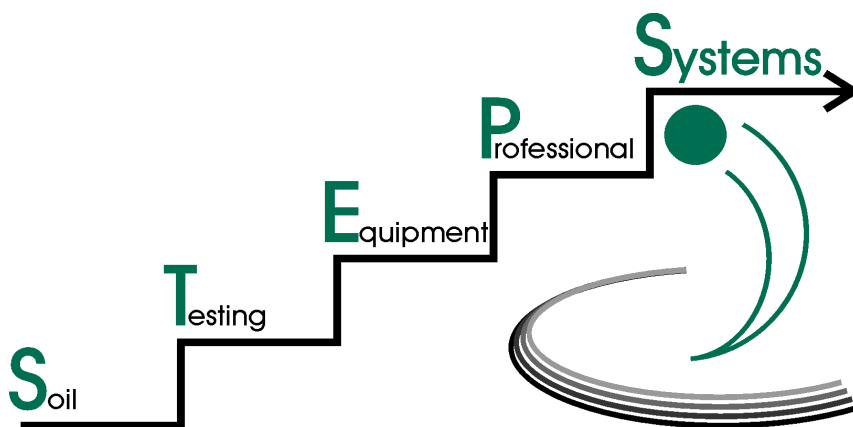


STEP Systems GmbH
Soil Testing Equipment - Professional Systems

All rights reserved.
Printed in Germany.
STEP Systems GmbH 2016

Duisburger Str. 44
Tel: ++49 (0) 911 96 26 05-0
Fax: ++49 (0) 911 96 26 05-9
D-90451 Nürnberg
e-mail: info@stepsystems.de
www.stepsystems.de

Optimal Lux Values Table



STEP Systems GmbH
Soil Testing Equipment - Professional Systems
Duisburger Str. 44
D-90451 Nürnberg

Tel: 0049 (0) 911-96 26 05-0
Fax 0049 (0) 911-96 26 05-9
e-Mail: info@stepsystems.de
Internet: www.stepsystems.de

How much light does your plant need?

Botanic Name	German Name	Minimum lux
Abutilon hybr	Schönmalve (Zimmerahorn)	2.000 Lux
Achimenes hybr.	Schiefsteller	1.500 Lux
Aechmea fasciata	Aechmea	800 Lux
Aeschynanthus commutatum	Goldrebe	1.000 Lux
Aglaonema commutatum	Kolbenfaden	300 Lux
Aglaonema commutatum 'Silver King'	Kolbenfaden	300 Lux
Aglaonema pseudobracteatum	Kolbenfaden	300 Lux
Ananas comosus	Ananas	1.200 Lux
Allamada cathartica	Allamanda	2.000 Lux
Anthurium andreanum	Flamingoblume	1.200 Lux
Anthurium crystallium	Flamingoblume mit Silberadern	1.500 Lux
Aphelandra squarrosa	Glanzkölbchen	1.500 Lux
Araucaria columnaris	Zimmertanne	2.000 Lux
Asparagus falcatus	Zierspargel	800 Lux
Aspidistra clatior	Metzgerpalme (Schusterpalme)	300 Lux
Aucuba crotonifolia/japonica	Aucube	600 Lux
Begonia masoniana 'Iron Cross'	Schiefblattgewächs	2.000 Lux
Billbergia nutans	Billbergia	300 Lux
Bougainvillea glabra	Bougainvillee	2.000 Lux
Brunfelsia calycina	Brunfelsie	1.000 Lux
Cactaceae	Kakteen	2.000 Lux
Caladium bicolor	Buntwurz	2.000 Lux
Calceolaria hybr.	Pantoffelblume	800 Lux
Campanula hybr.	Glockenblume	1.800 Lux
Chamaedorea elegans	Bergpalme	600 Lux
Chlorophytum comosum	Grünlilie (Graslilie)	600 Lux
Chrysalidocarpus lutescens	Palme	800 Lux
Cissus rhombifolia	Russischer Wein	600 Lux
Citrus mitis	Apfelsinenbaum	1.800 Lux
Codiaeum variegatum 'Norma/Bravo'	Wunderstrauch, Croton	800 Lux
Codiaeum variegatum andere Sorten	Wunderstrauch, Croton	1.000 Lux
Coffea arabica	Kaffeebaum	1.200 Lux
Coleus hybr.	Buntnessel	1.800 Lux
Columnnea microphylla	Feuezünglein (Rachenrebe)	1.000 Lux
Cordyline terminalis	Keulenlilie	1.000 Lux
Crassula falcata	Dickblatt (Blausichel)	1.800 Lux
Crossandra infundibuliformis	Crossandre	1.500 Lux
Cyclamen persicum	Alpenveilchen	1.000 Lux
Clivia miniata	Clivie (Riemenblatt)	300 Lux
Cyperus	Zypemgras	1.500 Lux
Dieffenbachia bausei	Dieffenbachie	1.000 Lux
Dieffenbachia maculata	Die(fenbachie	600 Lux
Diplandenia sanderi	Diplandenie	1.500 Lux
Dizygotheca elegantissima, veredelt	Fingeraralie	1.400 Lux
Dirygotheca elegantissima, unveredelt	Fingeraralie	2.500 Lux
Dracaena deremensis 'Wameckii'	Drachenbaum	500 Lux
Dracaena deremensis andere Sorten	Drachenbaum	600 Lux
Dracaena marginata	Drachenbaum	500 Lux
Echeveria falcata	Sandglöckchen	2.000 Lux
Euphorbia hermensiana	Wolfsmilch	2.000 Lux
Euphorbia trigona	Wolfsmilch	2.000 Lux
Euphorbia tirucalli	Wolfsmilch	2.000 Lux
Euphorbia pulcherrima	Weihnachtsstern, Poinsettia	2.000 Lux
Euphorbia milü	Christusdom	2.000 Lux
Euterpe edulis	Palme	80p Lux
Fatsia japonica	Zimmeraralie	600 Lux
Fatsnederia lizei	Efeuaralie	800 Lux
Ficus altissima	Feigenbaum, Gummibaum	600 Lux
Ficus boxifolia	Feigenbaum, Gummibaum	2.000 Lux
Ficus bengalensis	Feigenbaum, Gummibaum	600 Lux
Ficus benjamina	Feigenbaum, Gummibaum	1.000 Lux

Duisburger Str. 44
 Tel: ++49 (0) 911 96 26 05-0
 Fax: ++49 (0) 911 96 26 05-9
 D-90451 Nürnberg
 e-mail: info@stepsystems.de
 www.stepsystems.de

All rights reserved.
 Printed in Germany.
 STEP Systems GmbH 2016

Botanic Narne**German Name****Minimum lux**

Ficus Cyathistipula	Feigenbaum, Gummibaum	1.200 Lux
Ficus deltoidea	Feigenbaum, Gummibaum	1.500 Lux
Ficus elastica 'Decora'	Feigenbaum, Gummibaum	400 Lux
Ficus elastica 'Schrijveriana	Feigenbaum, Gummibaum	800 Lux
Ficus triangularis	Feigenbaum, Gummibaum	1.200 Lux
Ficus indiva	Feigenbaum, Gummibaum	1.000 Lux
Ficus strida	Feigenbaum, Gummibaum	1.000 Lux
Ficus lyrata	Feigenbaum, Gummibaum	600 Lux
Ficus pandureforae	Feigenbaum, Gummibaum	500 Lux
Ficus pumila	Feigenbaum, Gummibaum, kriechend	800 Lux
Ficus rubiginosa	Feigenbaum, Gummibaum	800 Lux
Filices	Farne	1.000 Lux
Grevillea robusta	Australische Silbereiche	800 Lux
Guzmania hybr.	Guzmanie	800 Lux
Harpephyllum qffrum	Falscher Kaffeebaum	1.000 Lux
Hedera helix	Efeu	800 Lux
Heimerfiodendron brunonianum	Pisonia	1.500 Lux
Hibiscus rosa sinensis	Roseneibisch	2.000 Lux
Hoya camosa	Wachsblume	600 Lux
Howeia forsteriana	Kentie	800 Lux
Hydrangea macrophylla	Hortensie	800 Lux
Impatiens holstü	Fleisiges Lieschen	1.800 Lux
Kalanchoe hytx.	Flammendes Käthchen	1.800 Lux
Medinilla magnifica	Medinilla	1.200 Lux
Monstera deftciosa	Philodendron, Fensterblatt	300 Lux
Musa ensete	Banane	1.000 Lux
Neoregelia	Neoregelia	800 Lux
Nerium oleandef	Oleander	2.000 Lux
Orchidaceae	Orchideen	1.800 Lux
Pachypodium	Madagaskarpalme	1.200 Lux
Pachystachis	Goldkölbchen	1.500 Lux
Pandanus	Schraubenbaum	1.000 Lux
Passiflora caerulea	Passiaisblume	1.000 Lux
Peperonia magnolifolia	Pfeffergesicht	800 Lux
Philodendron erubescens 'Queen'	Baumlieb	300 Lux
Philodendron ervbescens 'Red Eme.'	Baumlieb	300 Lux
Philodendron taciniatum	Baumlieb	600 Lux
Philodendron kmgitaminatum	Baumlieb	500 Lux
Philodendron,panduriforme, imbe	Baumlieb	300 Lux
Philodendron scandens	Baumlieb, kriechend	300 Lux
Philodendron bipinatifidum, squaniferum	Baumlieb	1.000 Lux
Philodendron pertusum	Baumlieb, Fensterblatt	300 Lux
Phönix canariensis	Dattelpalme	1.000 Lux
Pilea repens, qdierei	Karwnierblume	2.000 Lux
Platycerium alciome	Gewiehfam	800 Lux
Polyscias balfouriana	Fiederaralie	1.000 Lux
Primula obconica	Primel	800 Lux
Rhaphidophora aurea	Efeutute	300 Lux
Rhododendron sinnii	Azalee, Alpenrose	800 Lux
Saintpaulia ionantha	Usambaraveilchen	800 Lux
Sansevieria hyacinthoides	Bogenhanf	600 Lux
Sansevieria trifasciata	Bogenhanf	300 Lux
Saxifrage sarmentosa	Steinbrech, Judenbart	1.800 Lux
Sinningia speciosa	Gloxinie	1.000 Lux
Solanum hendersonü	Korallenkirsche	1.000 Lux
Spatiphyllum, hybr., wallissii	Blattfahne, Einblatt	400 Lux
Stephanotis floribunda	Kranzschlinge	1.000 Lux
Syngonium podophyllum, auritum	Purpurtute	300 Lux
Scheffleria arboricola	Schefflerie	800 Lux
Tillandsia cyanea	Tillandsia	800 Lux
Vriesea splendens	Vriesea	800 Lux
Yucca elephantipe	Palmlilie	1.000 Lux
Yucca aloifolia	Palmlilie	2.500 Lux
Zantedeschia aethiopica	Calla	1.000 Lux
Zebrina pendula	Tradescantie (Schnellläufer)	600 Lux

The following table you can use as a help while conversing the radiation (W/m²) in radiation sum (J / cm²). For example, if you measure in one hour an average radiation of 25 W / m², so it corresponds to the calculated total radiation of 9 J / cm². The table contains also a directive for measurements with a lux meter. Light intensity of 4,500 lux corresponds to an average radiation of about 100 W / m².

Measured total radiation (J / cm²), when for the duration of one hour, a certain radiation (W / m²) is measured, and the relation between lux and W / m².

W/m ²	J/cm ²	Lux-Meter
25	9	1.050
50	18	2.140
75	27	3.290
100	36	4.500
150	54	7.145
200	72	10.270
250	90	14.240
300	108	20.900
350	126	29.950
400	144	34.675
450	162	39.550
500	180	44.570
550	198	49.800
600	216	55.200
650	234	60.800
700	252	66.700
750	270	72.850
800	288	79.300
900	324	93.100
1.000	360	104.000

At 100 W/m² about 4.500 lux is measured (1:45)
 At 500 W/m² about 44,570 lux is measured (1:89,14)
 At 1,000 W/m² about 104,000 lux is measured (1:104)

The lux values are classified as follows:

- < 300 lux = growth stagnation, plants wither
- 300 lux – 1,000 lux = no growth of plants
- 1,000 lux – 3,000 lux = plants grow very slowly
- 3,000 lux – 10,000 lux = plants grow proportionally with increasing lux level
- 10,000 lux – 12,000 lux = optimum for the most plants
- > 12,000 lux = the light intensity is no longer utilized by the plants, because in most cases the heat interferes with the assimilation process.

By shading the lux values should not be reduced below 8,000 lux.
 Exception is propagation, here not less than 3000-5000 lux

Reference values in lux	Open land	Greenhouse	Under old plastics
Cloudy weather	5.000 - 15.000	3.000 - 10.000	2.000 - 8.000
Sunshine	40.000 -150.000	30.000 - 40.000	10.000 - 30.000