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LED-Lighting-Technologies

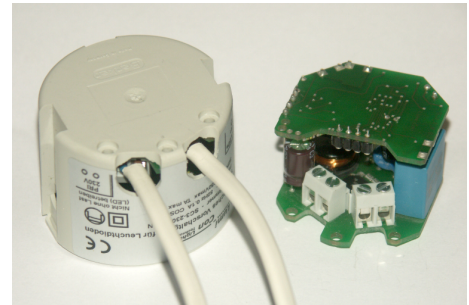*Dr. Karl Schrödinger*
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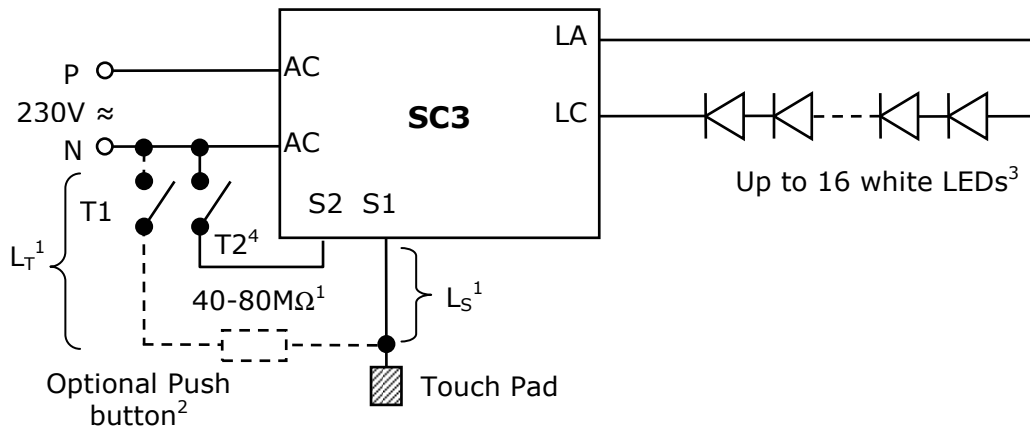# Touch DIMMER for High Power LEDs (Installation Version)

Eigenschaften

- Very compact LED-Dimmer for mounting into wall mounting
- Control of LED power via touch sensor for DIMMER function and ON/OFF
- Extension-Version (2nd input) for larger distance to (controlling) push button
- Operation of 16 High Power LEDs directly from mains voltage (230V AC≈)
- Digital storage of DIMMER value (*Flash-Version*)
- No transformer or power adaptor needed
- Soft ON/OFF control (optional)
- Integrated noise filter to guarantee relevant noise specifications
- Current und voltage supervision of LED
- Low power consumption – high efficient switch mode controller
- Automatic adaptation to optimum operating conditions
- Connection via reliable terminal clamps
- Operating class IP20 (dry ambient)

Application

- Control of high power LED lamps
- „Touch-Me"-lamps (controlling of light when touching the lamp)
- Operating of up to 16 white LEDs
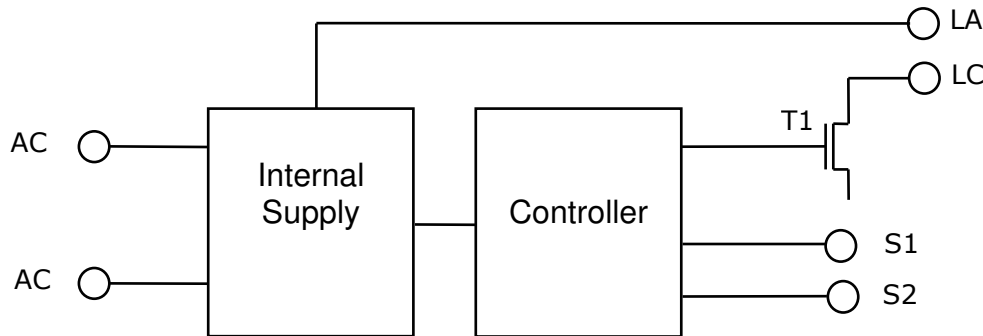- Suitable for high power LEDs with up to 300mA drive current

Beschaltung

P — AC

230V ≈

N — AC

SC3

LA

LC

Up to 16 white LEDs[3]

S2   S1

T1

L_T[1]

T2[4]

40-80MΩ[1]

L_S[1]

Optional Push button[2]

Touch Pad

1) Maximum wire length L_S at **S1** is approx. 0.5m, for extension see page 4
2) Switch (push botton, dotted line) must be connected (for safety reasons) only to grounded (neutral) power line (N) or protective earth conductor.
3) or accordingly higher number of LEDs with lower forward voltage
4) S2 / T2 only for **Extension Version**, up to 10m wire length, normally no touch function possible for S2

Caution!

Set up should be done by skilled personnel only!
All circuit parts including LEDs and LED-conductors are connected to mains supply (high voltage, 230V AC)! Please read carefully the instructions on last page.

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**Data Sheet
SC3-230-x-H-xxxx-x**

**High Power Touch
DIMMER for LEDs**
Rev. 1.2 – 04/2013

1 Overview

The DIMMER module can be connected directly to mains voltage (AC 230V, 50Hz) without using a transformer. It can drive up to 16 white LEDs at a current up to 300mA. The LED power is controlled via the touch pads (S1, S2). A touch pad is a simple metal surface electrically connected to S1/S2. The controller incorporates DIMMER and ON-/OFF operation.

As shown in figure above the module consists of an internal power supply, the controller as well as the driver T1 (operating as switched mode LED supply). The power supply generates a 3.3V supply as well as the DC supply for the LED switch mode controller from mains voltage. During stand-by-operation (LED power off) only 0.4W are consumed which accumulates to only 1.7kWh per year and fulfils the EU directive *EuP 2005/32/EG (ECO Design of Energy Using Products)*. The controller monitors the touch pads and controls the switch mode controller generating the LED current. During DIMMER operation the average DC LED current can be varied from minimum to maximum current (up to 300mA, the maximum current depends slightly on the number of connected LEDs).

2 Description of Main Versions

2.1 Normal-Version (-NXX-)

The normal version is controlled via <u>one touch sensor</u> in the following way:

➢ *Short touch (0.1 to 0.4 seconds):*
  o Switching ON the LEDs to maximum current if the LEDs have been switched OFF before.
  o Switching OFF the LEDs if the LEDs have been switched ON before. It doesn't matter whether the LEDs have been in ON mode or in DIMMER mode before.
  o Touching shorter has no effect; i. e. noise is filtered out (debouncing effect).

➢ *Long touch (longer than 0.5 seconds):*
  o Starting DIMMER operation: If the LED are OFF they are switched to minimum current and the current is increased slowly as long as the sensor is touched. If the maximum current is reached the LED current is reduced again. If the minimum is reached it is increased again.
  o If the LEDs have been switched ON before the LED current is decreased or increased depending on history. If the previous operation was increasing the current, the minimum current was reached or the LED was OFF the current is increased. If the previous operation was decreasing the current or maximum was reached the current is decreased.

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High Power Touch
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2.2 Extension-Version (-EXX-)

This version may use a second interface (S2) for the dimmer operation. With this version an extended wire length of up to 10m may be used. S2 can normally only used with a push button only, no touch operation possible (see chapter 6). Both inputs are active and can be used in parallel.

3   Available Sub Versions

3.1 Flash-Version (-XFX-)

The **Flash-Version** is able to store the actual dimmer value in a non volatile memory (flash). Thus the DIMMER module "remembers" the latest driving conditions when disconnected from mains voltage. This latest driving condition is configured again after reconnecting to mains voltage. This module is therefore suitable for lamps which are switched with „normal" AC-switches while the DIMMER value is configured initially (for example to adjust the colour of a lamp). Please note that the number of LEDs must not be changed during interruption of mains supply, otherwise the circuit is reset and the DIMMER is in OFF-state after power on (due to necessary new initialization).

3.2 SOFT-ON/OFF (-XXS-)

Modules with **Soft-ON/OFF-Function** are switching the light slowly on and off. The time of the ramp is about 1 second. The dimmer operation is working as described as above.

4   Package

All versions are deliverable as packaged ("-G-") or board ("-B-") version. Please note that an appropriate isolation must be kept if the board version is mounted (see app notes for Dimmer mounting).

5   Current and Voltage Supervisor

The module contains an automatic current and voltage supervisor. It is guaranteed that the referred maximum current depending on number of LEDs connected is not exceeded (Figure 1). In addition the current is adjusted (regulated) to maximum current if the LED is in ON-mode (at the 100% level).

A voltage supervisor guarantees the correct operating mode or shuts down the module if the respective maximum voltage level is exceeded. The module is reset in this case and starts a new initialization adapting to the new Led count. If the absolute maximum voltage level (about 63V at terminals LA-LC) is exceeded the module will not turn on.

6 Operation with Switch and Larger Distance to Dimmer

If a larger distance to DIMMER is necessary **and** a switch or push button (T) is used a 40…80 MΩ resistor must be implemented to decouple the line-capacitance. The switch T must be connected to neutral line. This extension resistor is already integrated into the Extension Version.
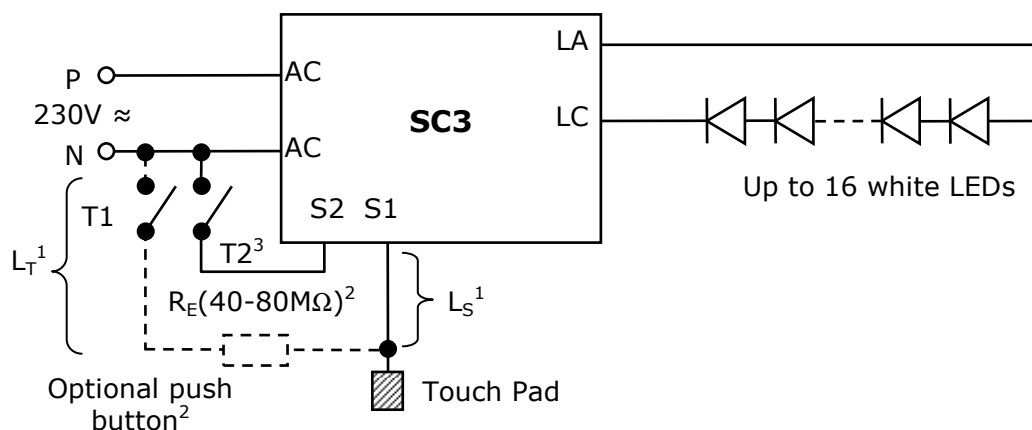
1) L_T max 10m, respective high resistance R_E necessary, L_S < 0.5m

2) For longer wire length at S1 and using push button

3) Only for Extension Version, normally no touch operation possible at S2

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7 Operating Conditions and Electrical Data

		*	Min	Typ	Max	Note
Operating temperature, ambient, packaged	T	°C	0		40	
Relative humidity	RH	%			90	1
Input / supply voltage at AC-AC	V_{AC230}	V_{eff}	200		250	
Periodic peak reverse voltage at AC-AC	V_{AC-PK}	V_{PK}			800	2
Supply (AC-AC) current (active current)	$I_{AC-WIRK-0}$	mA_{eff}		1,7		3
Supply (AC-AC) current (wattless current)	$I_{AC-BLIND-0}$	mA_{eff}		24		3
Maximum supply current (AC-AC)	I_{AC-100}	mA_{eff}		90		4
Forward voltage of the LEDS	U_{F-LED}	V	5		63	5
Maximum LED drive current, 100%-value,	$I_{LED-MAX-3}$	mA		300		6
Minimum DIMMER output power		%	2		10	7
Input resistance at S1,	R_{IN}	MΩ		10		
Input resistance at S2	R_{IN}	MΩ		30		
External capacitance at S1, S2 to GND	C_{IN}	pF			20	8
Wire length for S1	L_{S1}	m			0,5	
Wire length for S2	L_{S2}	m			10	
Timing limit for ON, OFF	t_{ON-OFF}	sec	0,1		0,4	
Timing limit for entering DIMMER mode	t_{DIMM_ON}	sec	0,5			9
Timing limit for stopping DIMMER mode	t_{DIMM_OFF}	sec	0,5			10
Duration of DIMMER Ramp	t_{DIMM_DUR}	sec		8		11
Duration of Soft-ON/OFF ramp	t_{RAMP_DUR}	sec		1		12

Anmerkungen:

1) Operation only in dry ambient; condensing ambient not allowed (operating class IP20).
2) Ein Schutz für eine begrenze Anzahl von Stromstromspitzen bis zu 1000V auf der Netzspannung ist vorgesehen (Surge Protection).
3) LEDs are OFF; active power supply current of the modules, approximately 0,4W; an additional wattles power is consumed due to the noise reduction capacitor (24mA).
4) The current consumption depends on the number of connected LEDs as well as on the DIMMER adjustment; includes wattles power.
5) At maximum operating current (300mA); if higher voltage (i.e. more LEDs) is applied the module turns off to avoid destruction; see diagram 2, page 5. If less than 2 white LEDs are connected, a higher drive current may occur initially at the output.
6) See diagram 1, page 5.
7) Depending on the number of connected LEDs.
8) Refers to a wire length of about 0.5m, significant parameter is however the external capacitance referred to GND (grounded mains conductor or protective earth conductor)
9) If the sensor S1 is touched longer than 0.5sec DIMMER operation is started. The current is slowly increased respectively decreased as long as the sensor S1 is touched.
10) If the sensor S1 is not touched for 0.5sec DIMMER operation is stopped.
11) Duration of DIMMER ramp, current increase or decrease from 0% to 100% or from 100% to 0%.
12) Only Soft-ON-OFF version (s)

*) Alle Strom und Spannungswerte sind Effektivwerte, wenn nicht anders vermerkt.

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Data Sheet
SC3-230-x-H-xxxx-x

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Diagram 1: Max LED current vs. Number of connected LEDs, white power LEDs with approx. 3.5V forward voltage
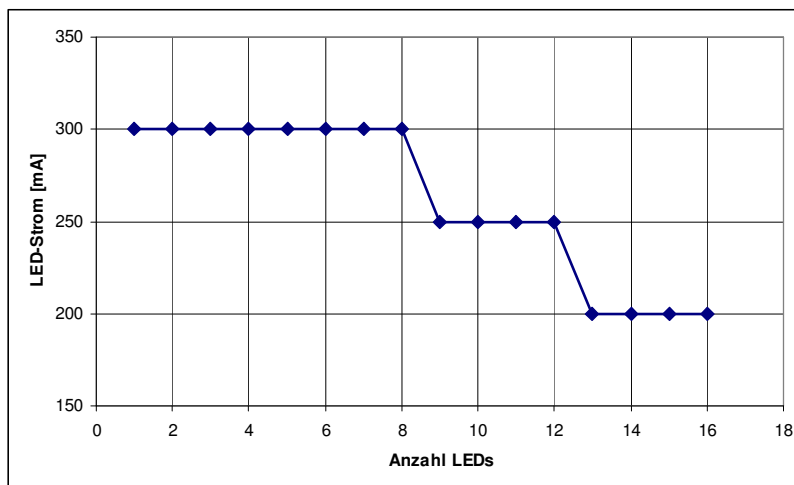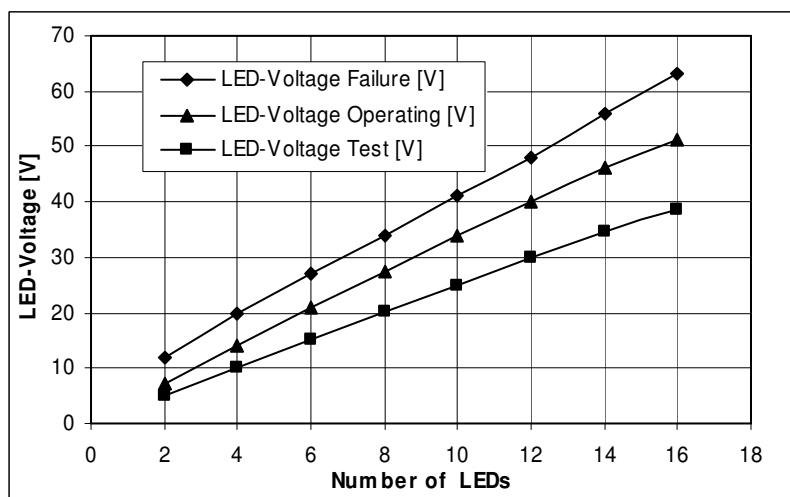

Diagram 2: LED forward voltage specification, applicable at LA/LC-terminals:

"Operating": typical LED-voltage at maximum current during operation;

"Test": LED voltage during initialization, at low current (<10%);

"Failure": at this voltage level during operation the module is (typically) shut down.

8 Order Numbers and Pinning

Order Number	S1	S2		Notes
High Power DIMMER				
SC3-230-X-H-NYY	√	--[1]	Touch Pad	Normal-Version
SC3-230-X-H-EYY	√	√	Push button	Extension-Version

1) S2 not connected for normal version

Explanation of the Part Number
   a. SC3: Dimmer Type
   b. 230: Mains voltage (110V on request)
   c. X: B/G: Board or Package Version
   d. H: High Power
   e. Main Version ([N/E]:F:S)
       i. Y1=N: Normal
       ii. Y1=E: Extension
   f. Subversion (F:S)
       i. F: Flash (storage of dimmer-value after separation from mains)
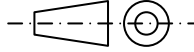   ii. S: SOFT-ON/OFF (slow LED start up and shut down)

S1: Touch Pad, maximum length 0.5m.
S2: Extension interface for push button to max wire length 10m. Both inputs are active and can be used in parallel.
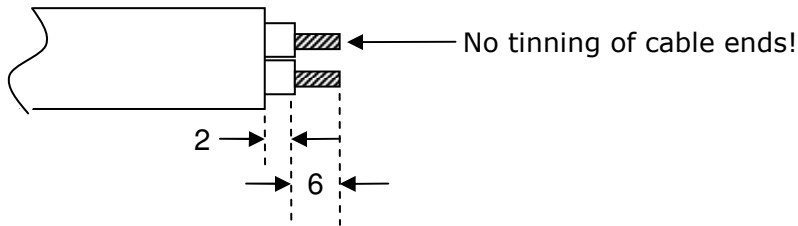
Available Versions:

Normal Version	Extension Version
Board Version	**Board Version**
SC3-230-B-H-N	SC3-230-B-H-E
SC3-230-B-H-NF	SC3-230-B-H-EF
SC3-230-B-H-NFS	SC3-230-B-H-EFS
Package Version	**Package Version**
SC3-230-G-H-N	SC3-230-G-H-E
SC3-230-G-H-NF	SC3-230-G-H-EF
SC3-230-G-H-NFS	SC3-230-G-H-EFS

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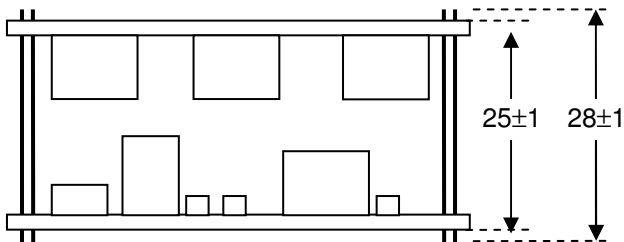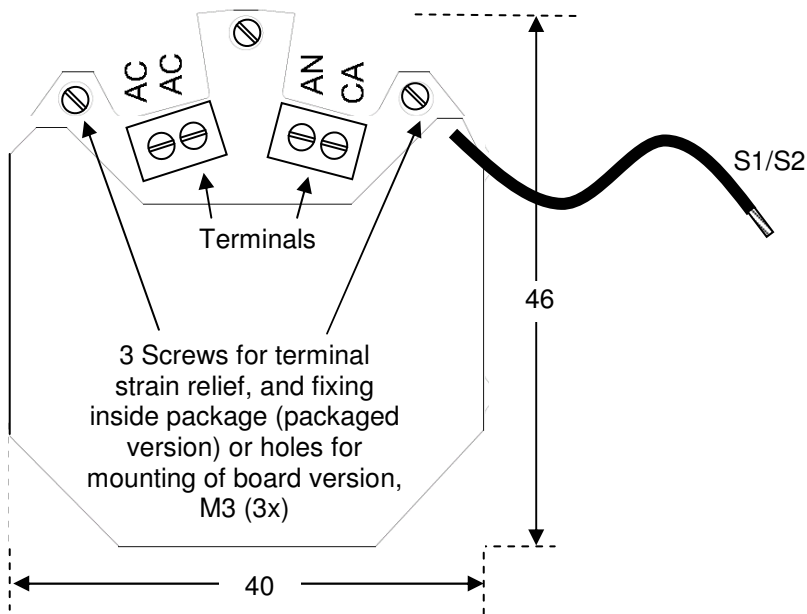## 9 Dimensions

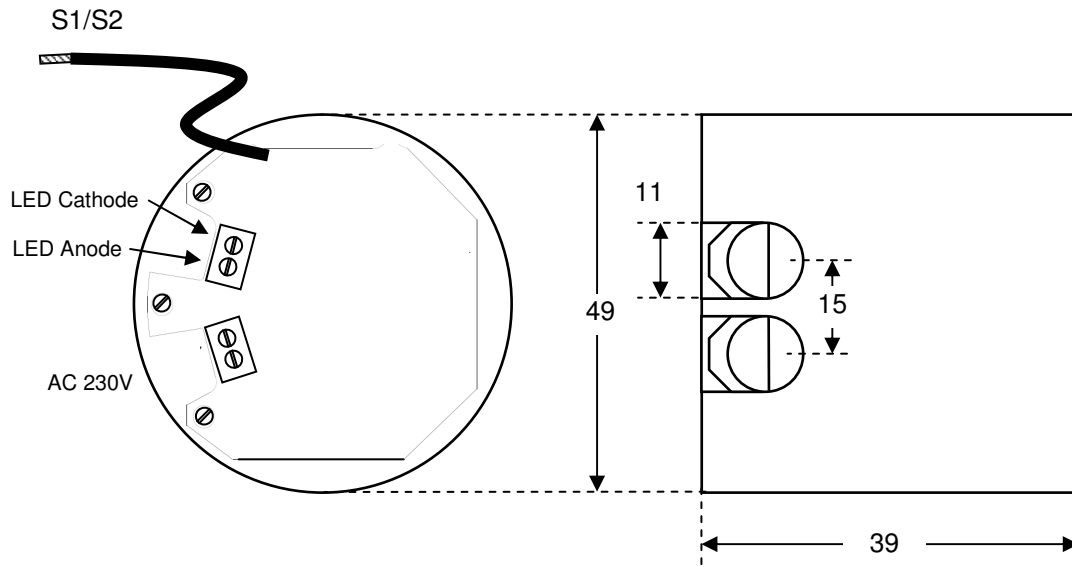### 9.1 Cable Preparation

No tinning of cable ends!

2

6

Maximum cross section for AC terminal clamps (230V) is 2.5 mm^2. We recommend two-core mains cable (2x0.75 mm^2 or 2x1mm^2) for optimum fixing at the terminal clamps.

9.2 Board-Version

(looking into package, dimensions in mm)

AC
AC
AN
CA

S1/S2

Terminals

3 Screws for terminal strain relief, and fixing inside package (packaged version) or holes for mounting of board version, M3 (3x)

46

40

25±1   28±1

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9.3 Package Version

S1/S2

LED Cathode

LED Anode

AC 230V

11

49

15

39

Dimension in mm, left picture: view into open package

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10 Installation and Precautions

The module is normally directly connected to mains voltage (230V≈). Before you connect to mains voltage (initially) please make sure that all necessary connections are correct. Assure that you have **protection against contact** (i. e. isolation) for all wires including the circuit, mains voltage wires and wires to the LEDs thus no occasional contact can happen (exception: Sensor inputs S1, S2). The module must not be operated in wet ambient or outside, except explicitly specified.

The whole circuit including the attached components (e. g. the LEDs) and wires may show up to 350V peak voltage referred to ground. **Please do not touch the circuit and the connected components including the LEDs** if the circuit is powered up. In case of failure please switch of or separate from mains voltage immediately. Do not try to repair the module even it seems simple; this includes also broken fuses.

If you use **switches** please do only connect to protective earth conductor or to the grounded conductor (as shown in the figure on 1st page).

To measure the circuit (for example the LED current) you need isolated or battery operated instruments or eventually an isolating transformer for the module mains voltage. **Caution:** During power up a transformer may generate high voltage peaks which can destroy the circuit. Hence, first switch on the isolating transformer, then connect the circuit to it.

After disconnecting the module from mains voltage the onboard capacitors are charged to high voltages. Hence please **wait one minute** until capacitors are discharged before you touch the circuit and the connected components (LEDs).

The modules fulfil the *EC Low Voltage Directive 2006/95/EC* (former 73/23/EEC), the *EC EMC Directive 2004/108/EC* as well as the RoHS compliancy (*EC Directive 2002/95/EC*). In addition they are compliant to *EuP Directive 2005/32/EG: Eco-Design of Energy Using Products*.

IP20   RoHS compliant 2002/95/EG   CE
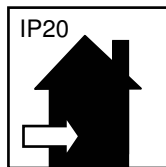
Attention please!
The information herein is given to describe certain components and shall not be considered as warranted characteristics.
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