

Professional Bike-Energy-Harvester with Integrated Buffer Battery

The New Smart-Phone Supply for your Bike

New: Improved Charging Power from Dynamo*

Features

- Professional supply for charging and operating your smartphone during biking
- Connected directly to the hub dynamo
- Connector for dynamo cable inclusive
- 5V-USB output (USB-C or Micro-USB-connector)
- Output current up to 1.5A, buffered by battery
- Overload protection for USB output
- Charging input
 - o Hub dynamo 6V/3W (cable approx. 1m incl.)
 - o 12V/AC (optional mains charger, not included)
- LED display for
 - o Ready for operation (green)
 - o 4-level battery status display (green)
 - o Ready for operation, 75% discharged (both red and green)
 - o Battery discharged (red)
 - o Charging (blue)
 - o Sleep modus (red or green blinking)
 - o Overload (2 x red blinking)
- Battery capacitance: 2 x 1.2Ah, Type LiIon 18650/3.7V*
- Harvester Package: 159 x Ø22mm, simple mounting at the bike
- Water proof IP67 (please check guarantee conditions on page 4)
- Weight: Harvester: 100gr, mains charger: 320gr



Application

- For high power consuming equipment and long permanent operation
- Improved charging from hub dynamo, optimized for speeds between 15 und 35km/h
- Simple mounting at the bike

Optional Accessories you will find in the Shop

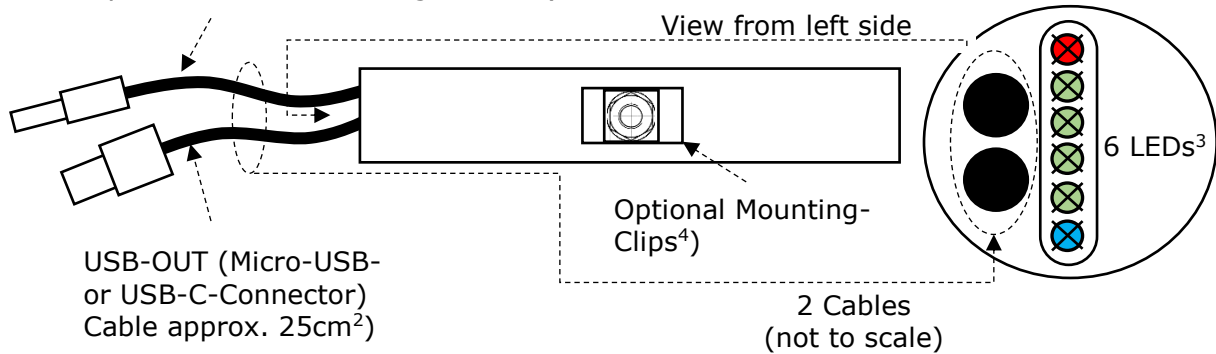
- Optional mounting clips **
- Detachable Mounting Kit (Typ USB-HPM) **
- Optional waterproof connector or SON coax connector for the dynamo cable **
- Mains charger 12V AC, with 1.8m cable
- Battery change at Lumi-Con

*) Due to the Dual Battery Design we could nearly double the power charge from dynamo compared to PM-design. The total implemented battery capacitance is smaller.

**) Only available together with Harvester

1. Functional Overview

AC input with connector, approx. 10cm (SON Coax connector with custom length) ¹⁾
(Input for dynamo and mains charger 12Vac)



¹⁾ AC: Input, interconnect for dynamo, connector and 1m-cable included (not for SON Coax), various connectors available, also for 12V AC mains charger (not included)

²⁾ USB-OUT: Output Micro-USB- or USB-C-connector, cable length approx. 25cm

³⁾ 6 LEDs: red (battery empty or overload), blue (charging), 4 x green (normal operation, battery status)

⁴⁾ 1 clip, rotating (see. Fig. 5), please rotate only clockwise, do not remove the screw; 2 Clips only when detachable mounting set USB-HPM is ordered

Fig. 1: Harvester-Interconnects

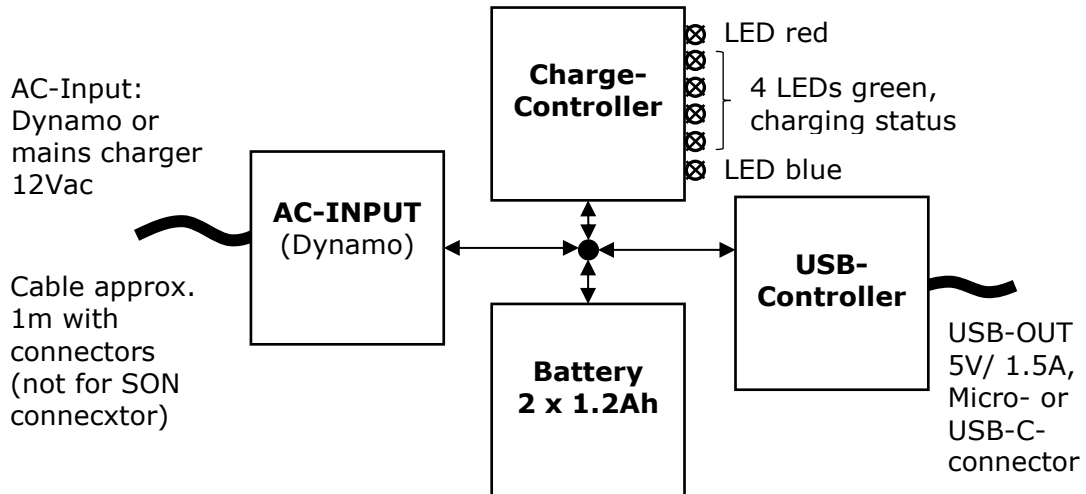



Fig. 2: Harvester-Functionality

You can connect a typical hub dynamo (6V, 3W, e.g. Shimano) or the optional mains charger (12Vac) to the harvester AC-input. An integrated charge controller guarantees a proper long life operation of the built in LiIon cells (no overcharging or discharging below limits).

The harvester incorporates a very powerful hub dynamo charging-unit (AC) optimized for speeds from 15 to 35km/h (0.9A typically between 18 ... 35km/h, see fig. 3). The dynamo input includes a safety circuit to prevent from overload (high voltage during no load).

The USB controller (USB output) generates a stable output of 5V at a maximum current of 1.5A and has a high efficiency. At overload (>1,6A) the output is switched off. At a battery charge below 25% the output current is limited to 750mA.

	Lumi-Con		LED-Lighting-Technologies		Datasheet USB-PMX Bike-Energy-Harvester Professional Bike-Smartphone-Supply Rev. 1.1 – 07/2023
	www.lumi-con.de		Dr. Karl Schrödinger Setheweg 12 D-14089 Berlin		

2. Operating Modes

The 6 LEDs indicate the following operating modes:

a) Sleep Mode: no input or output, testing operating mode every 10 seconds

- 1) Battery empty (voltage < 3V): switch off all functions, red LED flashes every 10 seconds
- 2) Battery not empty (4.2V > voltage > 3V*) no output: switch off all functions, green LED flashes every 10 seconds, output voltage (USB) on.
- 3) If input or output current is detected and battery is not empty the Harvester leaves sleep mode.

b) Dynamo Charge Mode: for all battery voltages, testing operating mode every seconds

- 1) Battery empty (voltage < 3V): output voltage (USB) off, blue and red LED on
- 2) Battery not empty (4.2V > voltage > 3V*), input current > output current: output voltage on (USB), blue and green LED on
- 3) Battery not empty (4.2V > voltage > 3V*), input current < output current: output voltage on (USB), blue LED flashing and green LED** on
- 4) Battery full > 4.2V: output voltage (USB) on, charging off, blue LED off and green LEDs** on

c) Output Mode: no charge current, testing operating mode every seconds

- 1) Battery not empty (4.2V > voltage > 3V*), no input current, output current on (e. g. Smartphone connected, > 100 mA): output voltage on, green LEDs** on
- 2) as c) 1) output current < 100mA: → sleep mode, a) 2)
- 3) Battery empty (voltage < 3V): → sleep mode, a) 1)

d) Overload Mode, tested every second

At overload (output current > 1.6A) for modes b) or c) the output voltage is disabled: red LED blinks twice. Please remove overload immediately.

*) If battery is discharged by 75% (3.25V > voltage > 3.0V) both red and green LED is switched on.

**) 4 green LEDs status display: <25%: red+green, >25%:2xgreen, >50%:3xgreen, >75%:4xgreen

3. Operating Conditions and Electrical Data

			Min	Typ	Max	Notes*
Operating temperature	T	°C	0		50	ambient
Humidity	RH	%			90	1
Voltage limiter at dynamo input	V _{AC-PK}	V _{PK}		30		2
Input current from hub dynamo	I _{AC-D}	A _{eff}		0,8	1	3
Input current to AC, from mains charger	I _{AC-N}	A _{eff}		0,5		4
Output voltage USB	U _{USB}	V	4,8	5,0	5,2	5
Output current USB, U _{USB} = 5V	I _{USB}	A			1.5	6
Mode testing during normal mode	t _{STAT-N}	sec		1		7
Mode testing during sleep mode	t _{STAT-R}	sec		10		8
Time to charge via mains charger 12Vac	T _{CHARGE}	h		2		9

Anmerkungen:

- 1) Design is waterproof IP67 (short immerse in water is possible, see chapter *guarantee*, page 4).
- 2) Typical hub dynamo, no load current, light off, hub dynamo with approx. 3W power output
- 3) Average DC current into battery, see fig. 3, typical hub dynamo, 6V/3W, bike light off, the maximum permissible speed is 40km/h, it may be exceeded for a short time (28" wheels, smaller wheels correspondingly slower)
- 4) Use available mains charger, 12Vac
- 5) Maximum 1.5A load current, additional loss due to cable possible
- 6) At a load current I_{USB} > 1,6A output is disabled, at battery charge smaller 25% the output current is limited to 750mA
- 7) Red and/or green LEDs on
- 8) Red and/or green LED flashing
- 9) For 12Vac (50Hz), charge time until approx. 80% battery charge

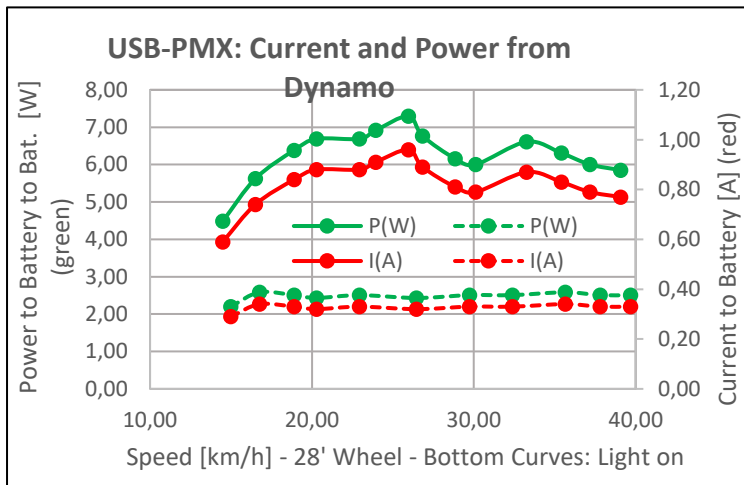


Fig. 3: Charging current from dynamo (Shimano) vs. speed, light on and off, for a typical Shimano hub dynamo (Power and current measured DC to Battery)



Fig. 4: Scope of delivery USB-PMX-HPM (Harvester PMX with detachable mounting kit, example): harvester, dynamo cable 1m with water proof connector, removable mounting kit, documentation

4. Dimensions

AC-cable with power coupler or other connector, approx. 10cm *

Dynamo cable 1m with appropriate connector incl. (not for SON connector)

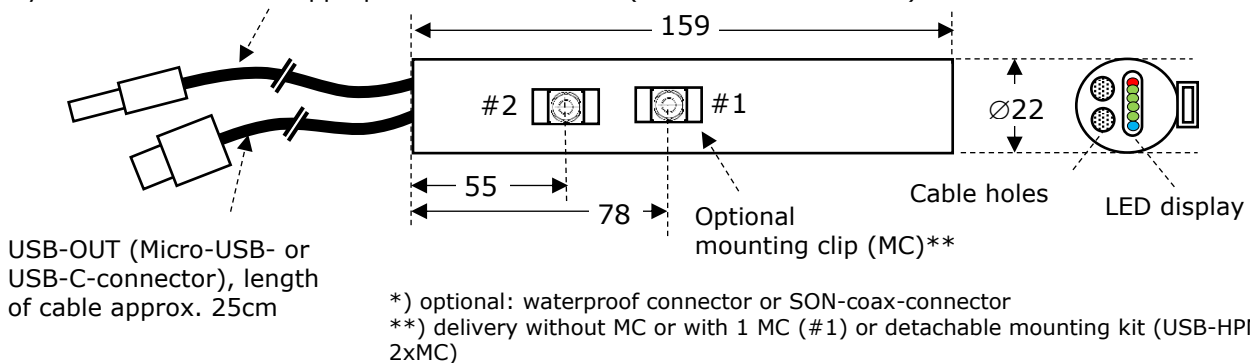


Fig. 5: Dimensions and Interfaces (not to scale, mm)

5. Guarantee

We offer a guarantee for 2 years. Not included are the batteries and if operated outside specifications. (e. g. operation without battery, strong mechanical load (accidents)). Please note - although the part is waterproof (IP67: short immerse to water is possible) - that longer storage in high humidity or wet ambient may lead to penetration of water. Especially cold ambient, e. g. at night, can generate a low atmospheric pressure inside which pulls water into the case. This water will stay inside and most probably will not come out anymore. Therefore we propose storing the part after rainy days inside a dry ambient.

We guarantee mains charging only with Lumi-Con mains charger (12Vac). Please first connect the charger to mains and then connect to the harvester.

Please avoid discharging of the battery below the minimum battery voltage (red LED on), because the battery can be destroyed. Recharging is eventually not possible in that case.

Please note that the Harvester may get hot ($\approx 50^{\circ}\text{C}$) when charged at maximum current (1A) for longer time.

In case of malfunctions: In the shop (service page) we have listed some tips that you should check first (<https://lumi-con-bike-harvester.eshop.t-online.de/i/service>).

6. Assembly and Operation

The harvester must directly connected to the hub dynamo in parallel to the bike front lamp. Do not connect to the back light connection. Usually there are several possibilities:

A) For (mostly used) Shimano only: Clamp the harvester cable together with the light cable in the hub dynamo connector. This is a simple and elegant solution, as no special tools are necessary. See Chapter 7 for details. For other dynamos we offer also suitable connectors.

B) Connect the harvester cable somewhere in between the hub dynamo and the front light. You can use any clamps or screw terminals, as well as soldering or using any connector. This solution requires some tooling and is probably not suitable for all users (see example inside USB_D_ZUB.pdf).

The harvester needs more than $6V_{eff}$ for charging the batteries. If the light is off a typical hub dynamo provides such a level. If the bike lights are on the voltage level is reduced below $6V_{eff}$. In that case the harvester is not able to pull full current from dynamo (see fig. 3) as the lamps are using most of the power. You can however supply your smartphone from the battery.

If the harvester is not used a marginal discharge of the power bank is given (blinking LEDs). A fully loaded power bank would take many months to fully discharge the batteries. The battery must no discharge too much. If therefore the red LED is on you should immediately recharge the battery. The battery is fully loaded if the blue LED is off and mains charger or dynamo is active. The batteries are empty if the red light is on or flashing. At a charging level of 30% both red and green light are on.

We can changed a defective battery. The battery is more than empty if no LED flashes (below 2V). In this case no recharging is possible anymore as the electronic circuit is not working. Discharging below 2.8V can also destroy the battery.

Do not at all remove the mounting clips (Fig. 5).

The Harvester is waterproof (IP67). This is o.k. for „normal“ rain. Permanent humidity should be avoided (see chapter 4).

Connecting the Harvester

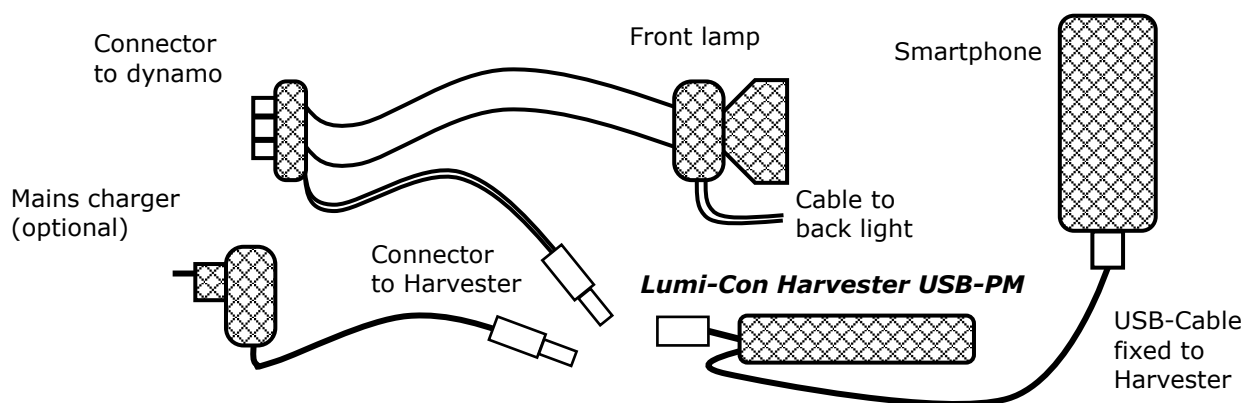
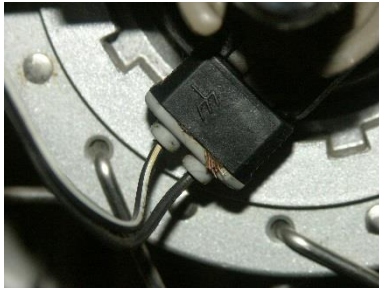
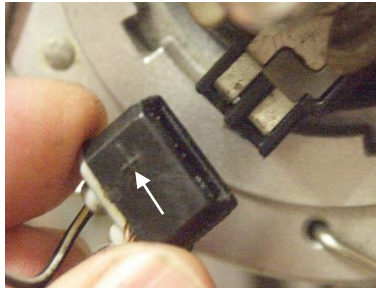


Fig. 6: Connecting the *Lumi-Con-Harvester*

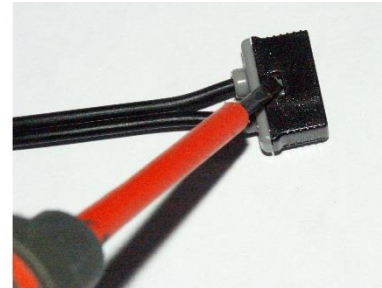
1. Mounting Example with Shimano Connector



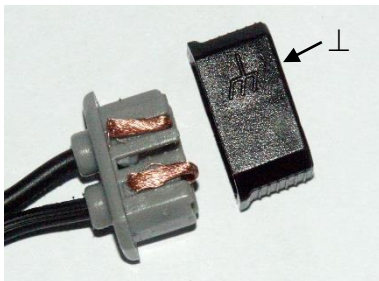
1) Look for connector at wheel hub



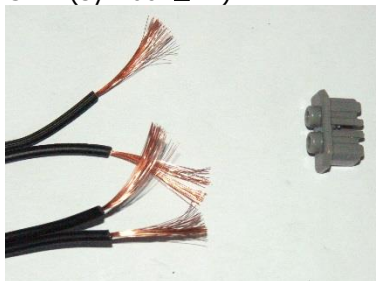
2) Disconnect and remember the wire which was connected to GND (symbol \perp **))



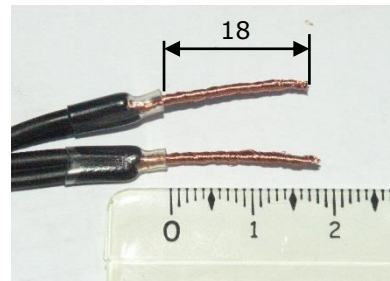
3) press flap with suitable tool (e.g. small screwdriver)



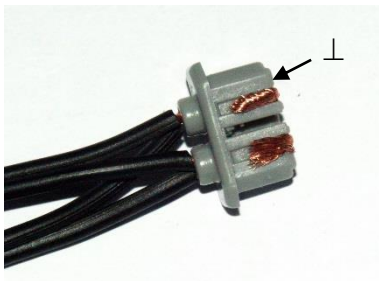
4) Remove connector cap



5) Strip isolation for all wires by 20-25mm



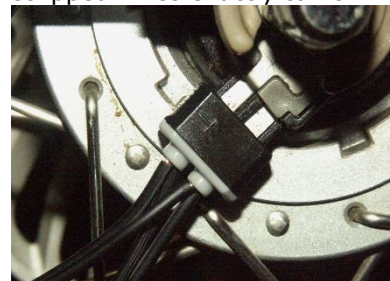
6) Twist wire pairs and cut stripped wires exactly to 18mm



7) Pull in the two wire ends into connector and care for polarity (GND \perp , see 2)) *



8) Slide on connector cap



9) Connect again on dynamo and fix cable at the bike frame

*) The stripped wires shall reach the back end of the connector. Please check for shorts due to single thin wires from one cord to the other. No certain polarity for harvester needed – may be the light needs a certain polarity.

**) or similar symbol



Attention please!

The information herein is given to describe certain components and shall not be considered as warranted characteristics.

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