POF (Plastic Optical Fiber) Meters

FPM = Fiber Power Meter

PM = Power Meter

AM = Attenuation Meter

Operating Manual - Version V1.2, Date: 21.07.2011

Figure 1: FPM dual optical channel

Contents

Remarks:

1. The description of the new future (LED source) is marked red.
2. The description of the controlled LED source is in the chapter “7.4 Examples of commands”.

0. Declaration of Conformity

The manufacturer,

VELICKOV Engineering

Clermont-Ferrand-Allee 36

93049 Regensburg, Germany

declares, that the FPM, as described in operating manual, conforms with European standards as follows:

EMC: EN55022 (1991), Group 1, Class B

EN50082-1 (1992) / IEC 801-4

The product herewith complies with the requirements of EMC Directive 89/336/EEC and CE markings have been affixed on the devices accordingly.

1. Safety

Attention!

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly.

2. Warranty

VELICKOV Engineering warrants material and production of the FPM modules for a period of 6 months starting with the date of shipment. During this warranty period **VELICKOV** Engineering will see to defaults by repair or by exchange if these are entitled to warranty.

For warranty repairs or service the unit must be sent back to **VELICKOV** Engineering. The consumer will carry the shipping cost to **VELICKOV** Engineering,

in case of warranty repairs **VELICKOV** Engineering will carry the shipping costs back to the customer.
If no warranty repair is applicable the customer also has to carry the costs for back shipment.
In case of shipment from outside EU duties, taxes etc. which should arise have to be carried by the customer.

VELICKOV Engineering warrants the hard- and software determined by **VELICKOV** Engineering for this unit to operate fault-free provided that they are handled according to our requirements. However, **VELICKOV** Engineering does not warrant a faulty free and uninterrupted operation of the unit, to soft- or firmware for special applications nor this operation manual to be error free.

VELICKOV Engineering is not liable for consequential damages.

2.1 Restriction of warranty

The afore mentioned warranty does not cover errors and defects being the result of improper treatment, software or interface not supplied by us, modifications stated by us or unauthorised maintenance.

Further claims will not be consented to and will not be acknowledged. **VELICKOV** Engineering does explicitly not warrant the usability or the economical use for certain cases of application**.**

VELICKOV Engineering reserves the right to change this operating manual or the technical data of the described unit at any time.

3. Introduction

This manual is provided as a help in operating the POF Meter device. POF Meter is a stand-alone instrument that makes it possible to measure the actual, average, maximum and minimum light power on the input or output side. The measurement mode and average light power are displayed on the LCD. All others lights values and settings are accessible by the remote interface (RS232).

3.1 POF Meters configurations

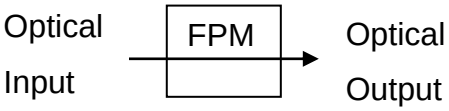

Fig. 2a: FPM = Fiber Power Meter

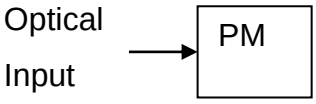

Fig. 2b: **PM** = **P**ower **M**eter

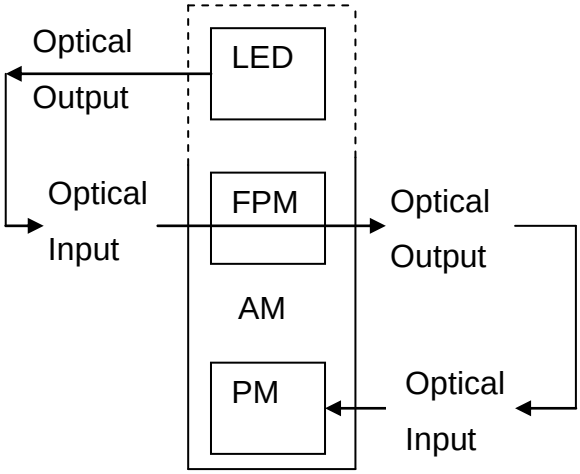

Fig. 2c: **AM** = **A**ttenuation **M**eter

Configuration table

Configration	Opt. Inputs per 1 opt. channel	Opt. Outputs per 1 opt. Channel	Optical channels	LED Source
FPM	1	1	1 or 2	Possible
PM	1	–	1 or 2	Possible
AM	2	1	2 (FPM+PM)	Useful

4. Function diagram

The POF Meter is composed of a detector, a logarithmic amplifier, a microcontroller and an power supply (Fig.3). The light goes from the input connector to the output connector by the FPM or direct to the detector diode by the PM. By FPM is a small part of light split to the detector diode.

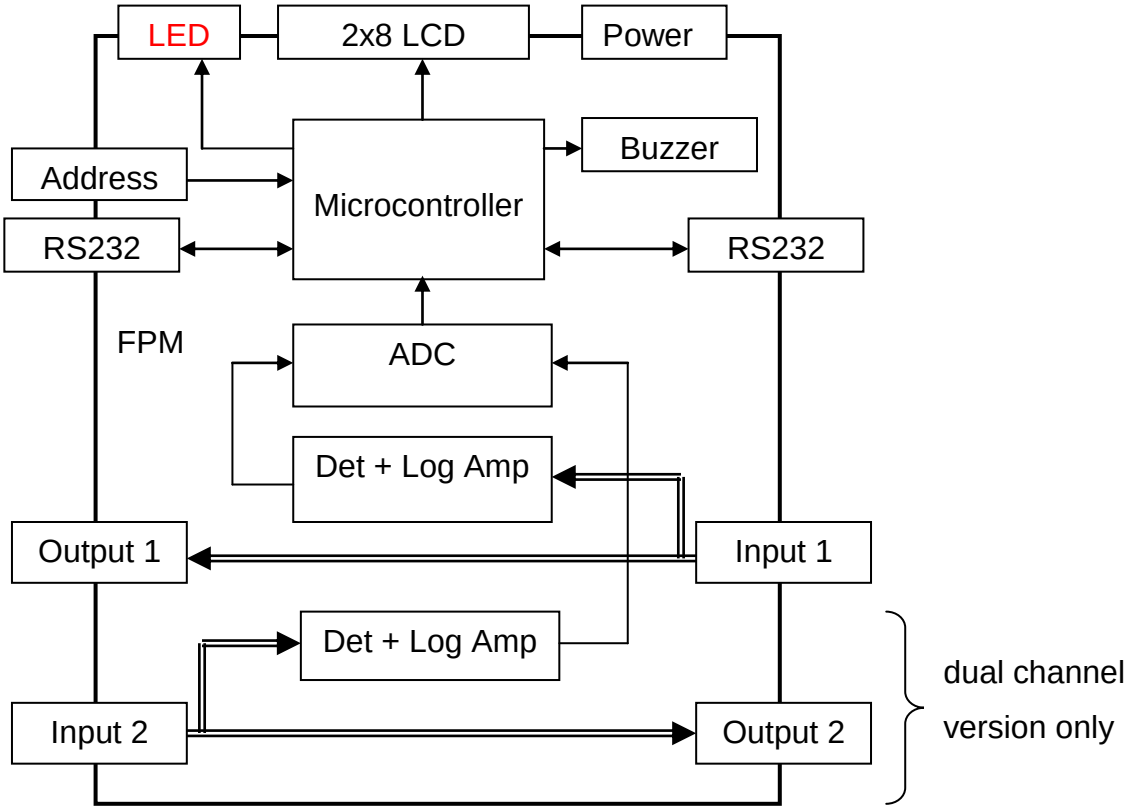

Figure 3: FPM functional diagram

ADC =	Analog to Digital Converter
Det =	Detector
LED =	controlled (RS232) LED source
Log Amp =	Logarithmic Amplifier

5. Instrument attenuation definition

The instrument attenuation (IA) includes all losses in the light pathway by the FPM.

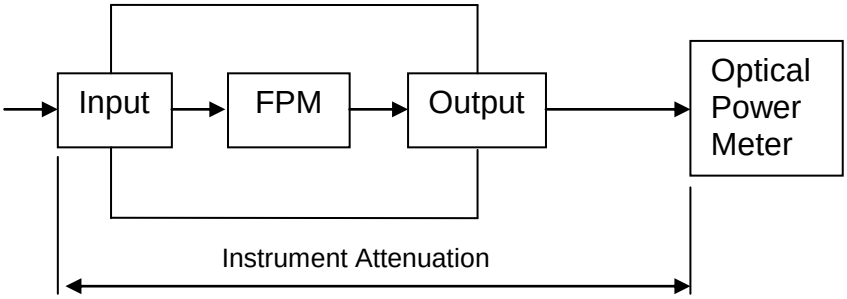

Figure 4: The instrument attenuation

The light looses result from the two connectors (Input, Output) and the FPM (Fig.4). The FPM is calibrated to the input. The value of IA is determined by calibration and pre-set by **VELICKOV** Engineering.

The user has the possibility to adjust IA, e.g. an additional connecting fiber is used on the output side. For determination of the instrument attenuation connect a LED light source to the FPM input connector and an optical power meter to the output connector. Measure the input light power with the FPM (The measurement mode has to be set to the input). Then measure the output power with the external power meter. The difference between the two readings is the instrument attenuation (Eq. 1). Set this value to the FPM.

Calculation of the IA

IA [dB] = input light power [dBm] – output light power [dBm] (Eq. 1)

6. Remote control

6.1 RS232 chain concept

The standard RS232 connection allows to connect one device to the personal computer (PC) COM port, only. The next device needs an additional COM port.

The chain concept makes it possible to connect more devices to a single COM port of the PC (Fig.5).

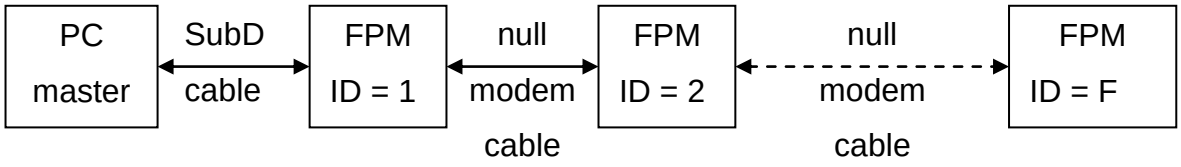

Figure 5: RS232 chain concept

Each FPM has its own identification address (ID) and two separated COM ports. All messages have recipient and transmitter addresses (‘0’~’9’,’A’~’F’). The ID Address is adjustable on the bottom of the module (Fig.6). The ID address value is displayed on the LCD after power on. By the one channel version is displayed ever. The two COM ports function as a repeater if the message has a different recipient ID.

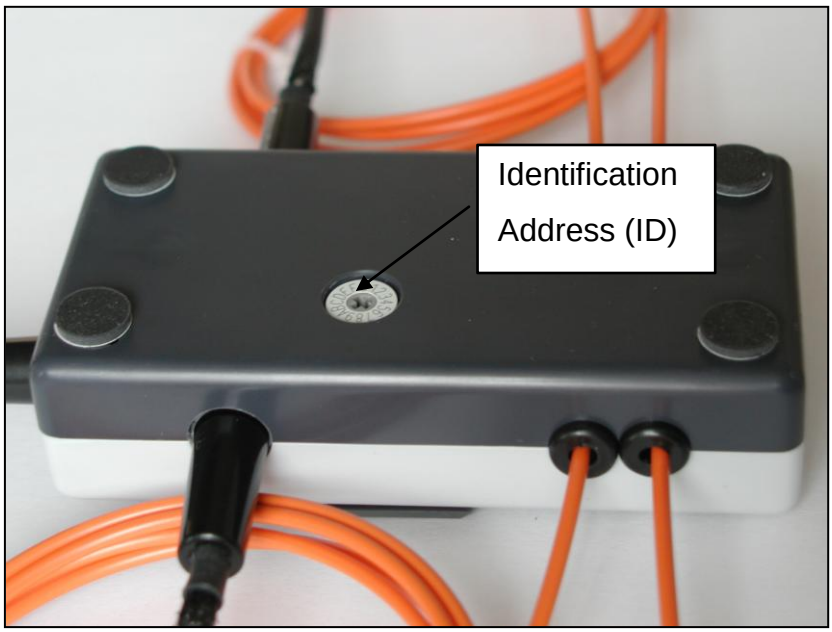

Figure 6: Address switch on the bottom side

Connection between the PC and the first FPM is realised with a SubD cable (Fig.7).

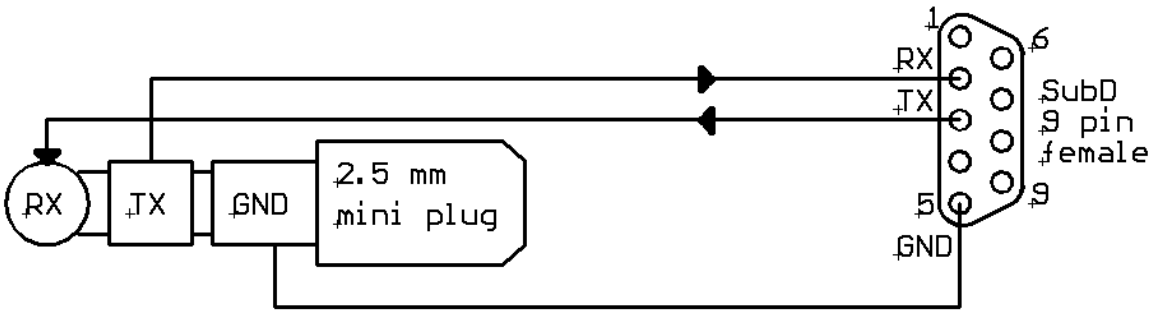

Figure 7: SubD Cable

Connection between two FPM modules is realised with a null modem cable (Fig.8).

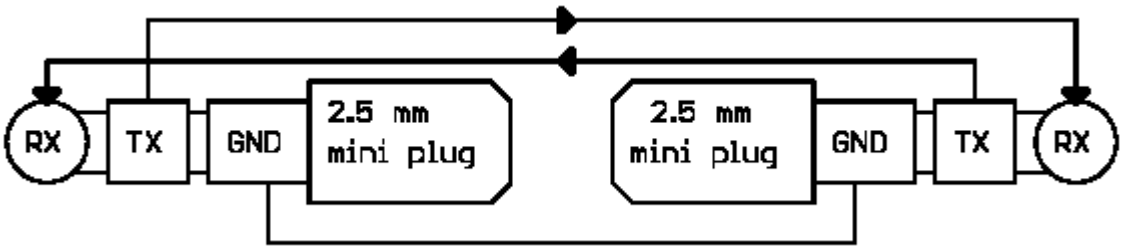

Figure 8: Null modem cable

6.2 RS232 settings

Baud rate:	9600 or 38400
Stop bit:	1
Data bits:	8
Parity:	no
Handshake:	no
Cable:	1:1

For the communication the Hyperterminal program could be used, which is integrated in the Windows operation system. See the correct port setting on figure 9 and the ASCII settings on figure 10.

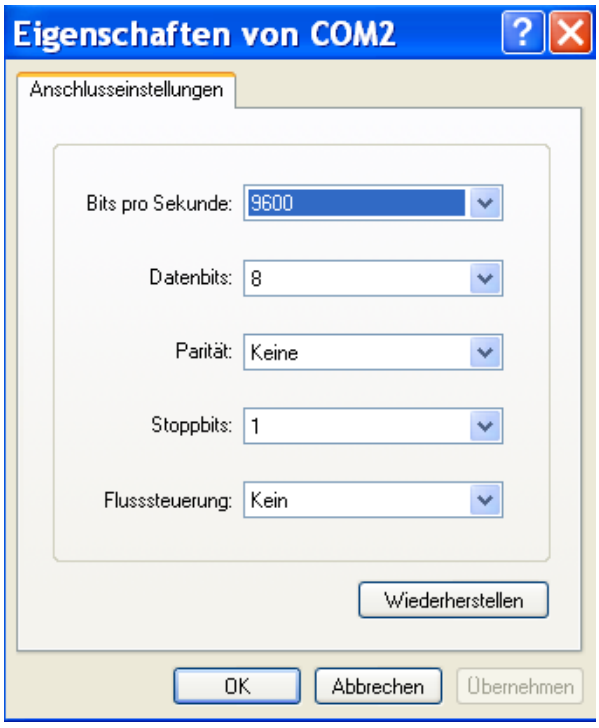

Figure 9: Port configuration

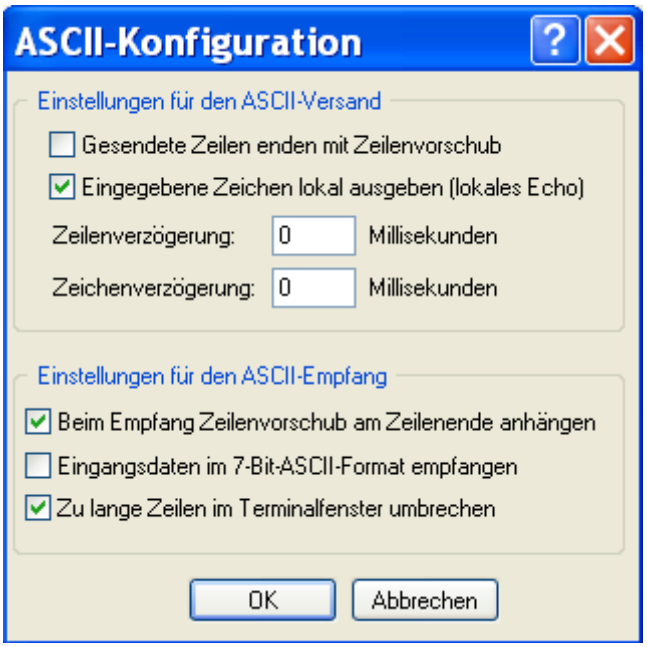

Figure 10: ASCII configuration

6.3 Command structure

Receiver char	Transmitter ID char	Command char	Parameter char	Operator char	Data string	Unit string	End of message
'2'	'P'	'1'	'v'	':', '?', '='	'10.5'	'dB'	CR

Receiver ID char = '0' ~ '9', 'A' ~ 'F': this char indicates the message for FPM

Transmitter ID char = 'P': This char indicates the addressee of the message.
(for example 'P' = Personal computer**)**

Command char: The command char identifies the command type.

Operator: The operator indicates whether the selected value

- has to be written (':', followed by data),
- has to be read ('?', without data) or
- is an answer to a read command ('=', with data).

Data: This field is filled with a data string formatted according to the command type.

End of message: CR is carriage return (=13 dec = 0D hex).

The minimal delay between two transmitted messages is 50 ms!

6.4 Command summary

Command	Cmd Char	Parameter Char	Oper. Char	Data (Range)	Units string
Channel 1 Channel 2	‘1’ ‘2’				
		‘a’ = instrument	‘?’, ’=’, ‘:’	<0.00;10.00>	dB
		.attenuation (=IA)	‘?’, ’=’, ‘:’	0 = input	dBm
		‘m’ = measurement		1= output	
		power	‘?’, ’=’	<-50.00;+14.80>	
		‘n’ = minimum power	‘?’, ’=’	<’LOW’,$Cmin_1$;	
		‘p’ = actual power		$Cmax_2$,’HIGH’>	
			none	none	
		‘r’ = min&max. reset	‘?’, ’=’	<’LOW’,$Cmin_1$;	
		,v’ = $average_3$ power		$Cmax_2$,’HIGH’>	
			‘?’, ’=’	<-50.00;+14.80>	
		‘x’ = maximum power	‘?’, ’=’, ‘:’	disp. 0 = power,	
		‘A’ = Attenuation		1= Attenuatio	
		display	‘?’, ’=’	Cmin	
		‘N’ = input calibrated			
		minimum	‘?’, ’=’	Cmax	
		‘X’ = input calibrated			
		maximum			
$Config_4$	‘c’	‘b’ = beep enable	‘?’, ’=’, ’:’	0 = off	
		‘l’ = LCD light		1 = on	
Echo	‘e’	none	‘:’	0 = off, 1 = on	
LED Light	‘$l’_5$	None	‘?’, ’=’, ’:’	<0;65535>	
Serial Num.	‘n’	none	‘?’, ’=’, ’;’	Serial Num. string	
Identify	‘IDN’	none	‘?’,’=’	Firmware string	
$Reset_6$	‘RST’	none	none	none	

Remarks

1. Cmin = Calibrated minimum,

2. Cmax = Calibrated maximum
3. An average value is calculated of the last four samples.
4. Do not communicate with another port, if you configure the device.
5. ‘l’ is small letter for ‘L’.
6. The device is reset after approx. 1 second.

For further explanations see also the next chapter with examples.

6.5 Examples of commands

The address of FPM is set to 3 for all examples.

Channel 1, Channel 2

Get attenuation of channel 1.

Get syntax	3 P 1 a ? CR
Response	P 3 1 a = 3.12 dB CR

Get measurement of channel 1.

Get syntax	3 P 1 m ? CR
Response	P 3 1 m = 0 CR

Measurement is set to the input.

Set measurement of channel 1 to the output.

Get syntax	3 P 1 m : 1 CR
Response	None

Get minimum light power of channel 1.

Get syntax	3 P 1 n ? CR
Response	P 3 1 n = -12.31 dBm CR

Get actual light power of channel 1.

Get syntax	3 P 1 p ? CR
Response	P 3 1 p = -10.00 dBm CR

Reset maximum and minimum value of channel 2.

Get syntax	3 P 2 r
Response	No response

Get average value of channel 1.

Get syntax	3 P 1 v ? CR
Response	P 3 1 v = LOW CR

The average power is lower than the calibrated minimum.

Get maximum light power of channel 2.

Get syntax	3 P 2 x ? CR
Response	P 3 2 x = -9.14 dBm CR

Get calibrated minimum value of channel 1.

Get syntax	3 P 1 N ? CR
Response	P 3 1 N = -39.50 dBm CR

Get calibrated maximum value of channel 2.

Get syntax	3 P 2 X ? CR
Response	P 3 2 X = 0.00 dBm CR

Configuration

FPM beeps in the following cases:

- Failure is occurred (e.g. wrong RS232 command syntax)
- Average light power is out of range (LOW or HIGH) (configurable)
  once for the channel 1
  twice for the channel 2
- Channel command via RS232 (configurable)

Get configuration of beep.

Set syntax	3 P c b ? CR
Response	P 3 c b = 0 CR

Beep enable (beep if channel request from RS232).

Set syntax	3 P c b : 1 CR
Response	No response

Beep disable (don’t beep if channel request from RS232).

Get syntax	3 P c b : 0 CR

Response	No response

Get configuration of LCD background light.

Set syntax	3 P c l ? CR
Response	P 3 c l = 0 CR

Turn on LCD background light.

Set syntax	3 P c l : 1 CR
Response	No response

Turn off LCD background light.

Set syntax	3 P c l : 0 CR
Response	No response

Echo

The echo function is used to show the transmitted commands on the terminal display.

Set or clear echo. If echo on, FPM sends all characters back.

Set syntax	3 P e : 1 CR
Response	No response

Get syntax	3 P e ? CR
Response	P 3 e = 1 CR

LED light power

The light power of the LED is current regulated. The current is controlled per RS232 relative from 0 to 65535. The actual value is displayed next to “L” character (L= Light) on the LCD: “L12345”. The device remember the value by the power off.

Set the LED light power to the value 12345.

Set syntax	3 P l : 12345 CR

Response	No response

Get actual power

Get syntax	3 P I ? CR
Response	P 3 I = 12345 CR

Serial Number

Get the serial number.

Set syntax	3 P n ? CR
Response	P 3 n = ‘serial number string’ CR

Identify

Device identify. FPM sends firmware version

Set syntax	3 P IDN ? CR
Response	P 3 IDN = ‘firmware string’ CR

Reset

Reset FPM.

Set syntax	3 P RST CR
Response	No response

7. Specification

- Wavelength: 650 nm
- Attenuation: < 3 dB
- Measurement mode: absolute value measurement (dBm)
  input or output (configurable)
- Light power functions: actual, average (displayed), minimum, maximum
- Measurement period: 4 times per second
- Measurement range: + 10,00 ~ approx. - 35.00 dBm
- Resolution: 0,01 dBm
- Accuracy: ±0,2dB (=5% in Watt)
- Display: 2 x 8 character backlight LCD
- Displayed value: measurement mode, average light power,
  address, LED power, Attenuation
- Interface: 2x RS232 (9600bps, 8 bit, 1 stop, no parity)
- ID address: '0' ~ '9', 'A' ~ 'F'
  (adjustable at the bottom of the device)
- Special functions: beep function (configurable)
  LCD background (configurable)
  controlled LED source

8. Technical data

- Accessories: Plug-in Power Supply, 230VAC / 9VDC, 50Hz, 9VA
- Housing: Plastic, 50 x 100 x 25 mm
- Optics: Fiber: Plastic, diameter 1000/1520/2300 µm
  Length approx. 1m (resp. customer specified)
  Connectors: FSMA (resp. customer specified)
- Power: Voltage: 9 VDC, 65 mA (LCD light off), 115 mA (LCD light on)
  Connector: Low voltage 5,1 mm
- Temperature: 15 ~ 35 °C
- Weight: 120 g

Specification are subject to change without notice.