Technical description

Light Sensor V5M

Version 1.0

NORTHTEC
automation technology

Publisher:

NorthTec GmbH & Co. KG

Nylanndamm 4
24980 Schafflund
Germany

Tel.: +49 4639 7833-0
Fax: +49 4639 7833-29

eMail: info@northtec.de
Internet: www.northtec.de

Contents

1 Changes

Revision	Date	Description	Author	Reviewed by
1.0	31.10.2016	1st Edition	HGH	MHA

2 Introduction

2.1 About this description

After reading this description, you will be familiar with the equipment as well as its components, and you will have learned how to use them as intended.

You will also find all information required to assemble and commission the components.

In order to operate the equipment described in this document in a safe and proper manner, all information listed herein must be observed. This will help reduce the risk of injuries for users and third parties as well as minimise repair costs and down times, while the durability of the equipment will be increased.

2.2 Notes on handling the equipment

Care must be taken not to damage the photoelectric cells when transporting and assembling the light sensor.

The electrical installation of the light sensor must be carried out only by qualified technicians. Interchanging the wires could permanently damage the light sensor.

2.3 General notes on safety

The equipment features state-of-the-art technology and has been manufactured in accordance with approved rules of safety.

However, improper use may lead to injuries.

Please carefully read and understand the operation instructions before assembling and installing the light sensor.

Pay particular attention to the notes in Chapter 5, “Assembly and connection”.

3 Equipment view

Light Sensor V5M Type 01

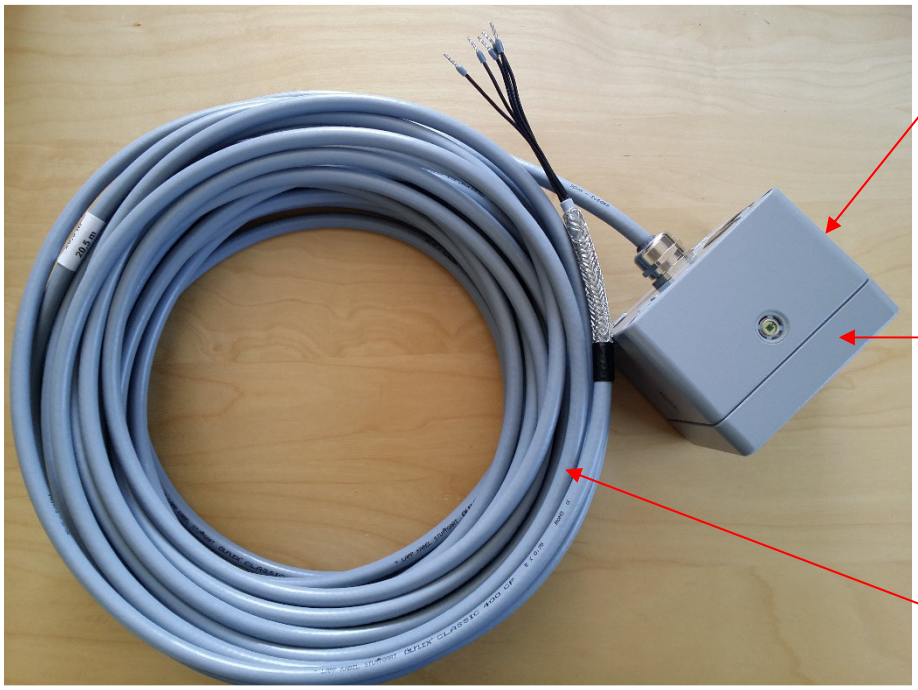


Fig. 1: standard version of light sensor with control line (20 m)

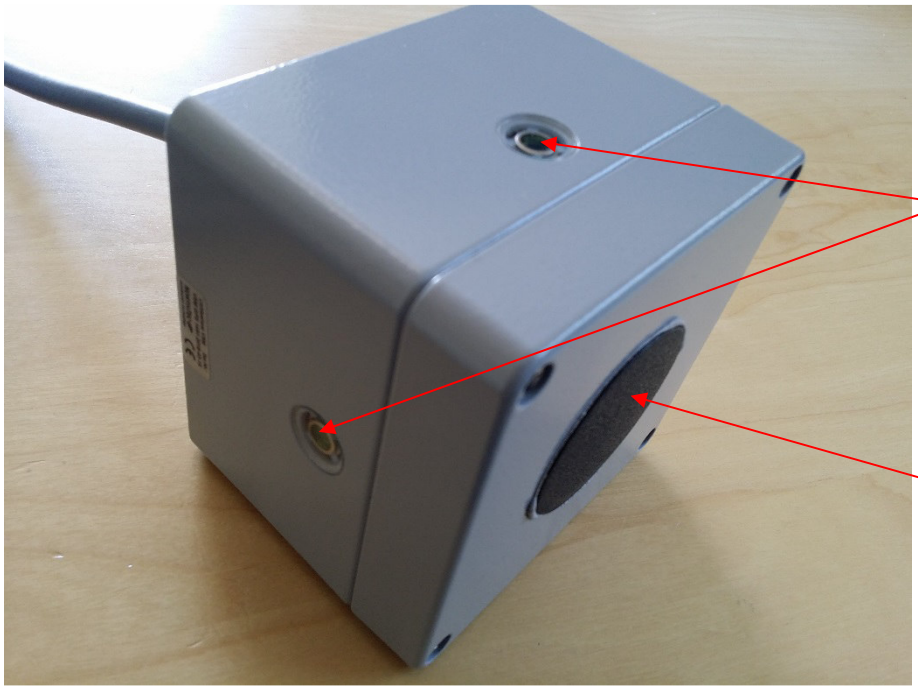


Fig. 2: cover with integrated GPS module

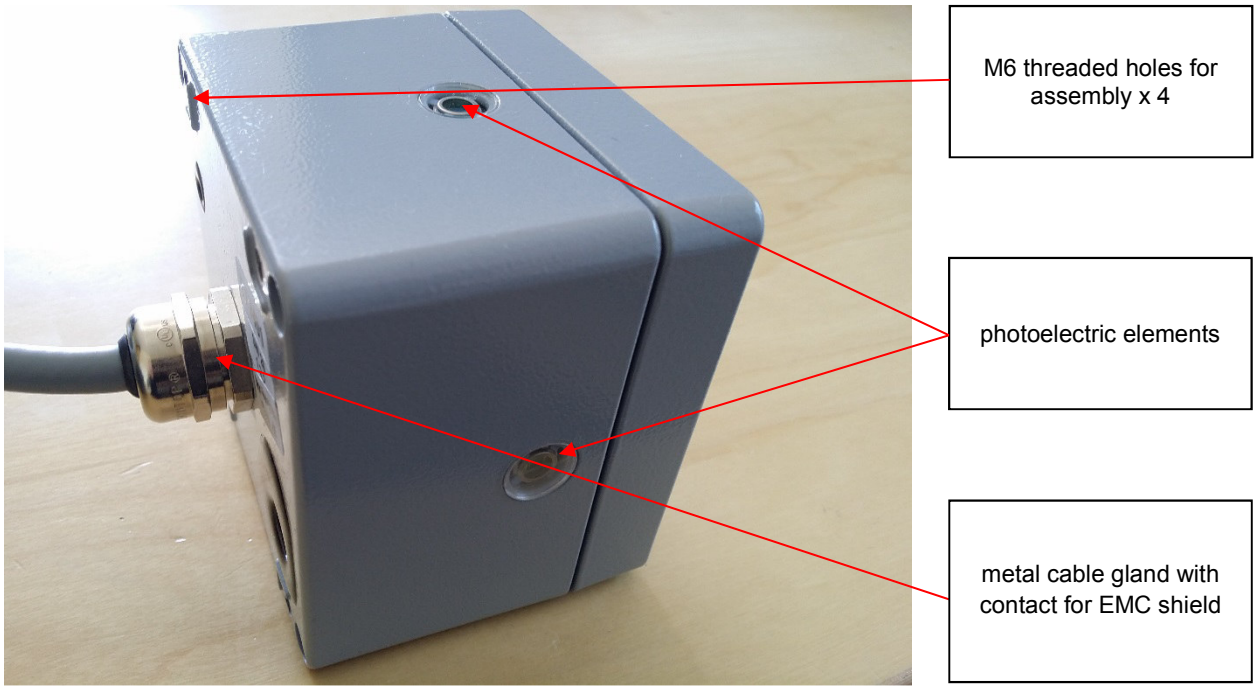


Fig. 3: housing with cable outlet and bottom side for assembly

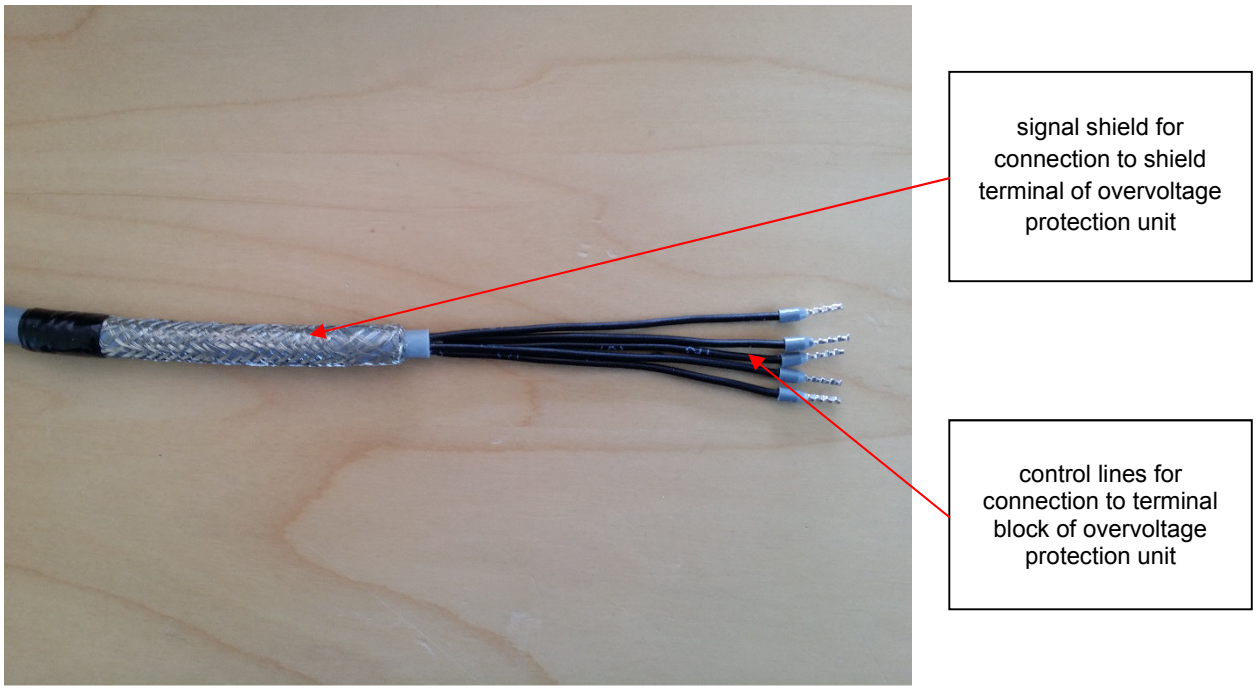


Fig. 4: pre-assembled cable end for direct connection to overvoltage protection

4 General information

The Light Sensor V5M is used to record the threshold value of the intensity of illumination. If this value is exceeded, the rotating rotor of a wind turbine may cause shadow impact at buildings (and their outer surfaces) located in the vicinity.

4.1 Description

The Light Sensor V5M comes in a seawater-resistant metal housing. Four photoelectric elements are embedded into the housing. A GPS receiver is integrated into the upper part of the light sensor.

The 5 wire cable is permanently connected to the light sensor; its standard length is 20 m.

The light sensor requires 24 VDC operating voltage. In order to allow for connectivity to the master unit of the shadow impact system, the light sensor has an RS485 interface. Network integration is possible by deploying an interface converter.

In order to prevent the light sensor from icing, it is provided with heater elements. The minimum operating temperature is -20°C (type 01) or respectively -30°C (type 03).

The sensor is completely sealed to protect it from condensation.

4.2 How the light sensor works

The light sensor measures the sunlight's intensity of illumination in the visible spectrum in four compass directions.

The integrated micro controller uses these four measurements to determine the direct portion of the intensity of illumination which is relevant for shadow impact.

The direct portion is calculated from the global intensity of light less the scattered intensity of light taking into account the angle at which the sunlight strikes the photoelectric elements as well as the colour spectrum of the sunlight as it changes over the course of the day.

Whenever the direct portion of the sunlight exceeds a certain limit value, shadow impact caused by rotating blades of a wind turbine is theoretically possible.

The master unit of the shadow impact system can cyclically retrieve the measurements by means of the light sensor's interface. The master unit can also retrieve diagnostic information and change the parameter settings of the light sensor.

5 Assembly and connection

In order to determine whether the intensity of the sunlight is high enough to allow for shadow impact effects caused by the monitored wind turbines, the shadow impact system requires at least one light sensor.

Care must be taken to ensure that the light sensor is mounted in a location where it will not at any time be shadowed by any obstacles. If this cannot be guaranteed, a second light sensor must be installed. Temporary shadowing as it may be caused by rotating blades of the wind turbine generator will be filtered out by the light sensor.

For big wind parks or if there are large distances between the WTGs and the sensor location (>1,000 m), deployment of further light sensors may be required in order to ensure that varying light conditions are reliably detected even if the sky is partly cloudy.

5.1 Assembly

Care must be taken to ensure that the light sensor is assembled **horizontally** and that the black plastic cover of the GPS receiver faces upward. Shadowing by any given obstacle must be ruled out.

We therefore recommend installing the light sensor on the nacelle of a wind turbine. Other reasons why this location should be preferred include protection against vandalism and against being shadowed by vegetation or wind turbines that might be built nearby in the future.

It is also important that the light sensor be installed in the capture range of a lightning protection system in order to minimise the risk of direct lightning strikes.

Mounting brackets needed to install the sensor to existing superstructures can be ordered from NorthTec.

All fastening screws must be secured by **spring washers** (included in delivery) to prevent them from vibrating loose!

Fig. 5: assembly example for Light Sensor V5M

5.2 Connection

The housing of the light sensor is earthed via the fastening bolts. The mounting bracket of the light sensor must be earthed.

The shield of the connection cable at the loose end should be connected to an earthed point using a shield clip. The wire assignment of the shielded 5 wire control line of the light sensor is as follows:

- wire 1 24 VDC
- wire 2 0 VDC
- wire 3 digital output
- wire 4 RS485 + (A)
- wire 5 RS485 - (B)

We recommend installing overvoltage protection modules in order to discharge induced overvoltage.

A suitable overvoltage box is available from NorthTec (order No. 150113).

6 Commissioning

Once connected, the light sensor will be commissioned using the master unit of the shadow impact system (see chapter 6.1 and 6.2). If the master unit of the shadow impact system does not yet exist, the light sensor can be commissioned using the Sensor Test – Shadow Monitoring System software (see chapter 6.3).

6.1 Commissioning using Master Unit V3.5

The functionality of the light sensor can be checked in the display of the master unit (menu items 1.2.x) provided that the light sensor has been configured in the master unit beforehand. For detailed information, please refer to the manual of the master unit.

6.2 Commissioning using Master Unit V4.0

The functionality of the light sensor can be checked using the Shadow Manager 4.x software provided that the light sensor has been configured in the master unit beforehand. For detailed information, please refer to the Shadow Manager 4.x manual.

6.3 Commissioning without Master Unit

If no master unit has been installed so far, you can carry out a communication test using the Sensor Test – Shadow Monitoring System software. However, this is only possible if the light sensor is connected to the network of the wind turbine or if a suitable converter module (RS485 to LAN) is available.

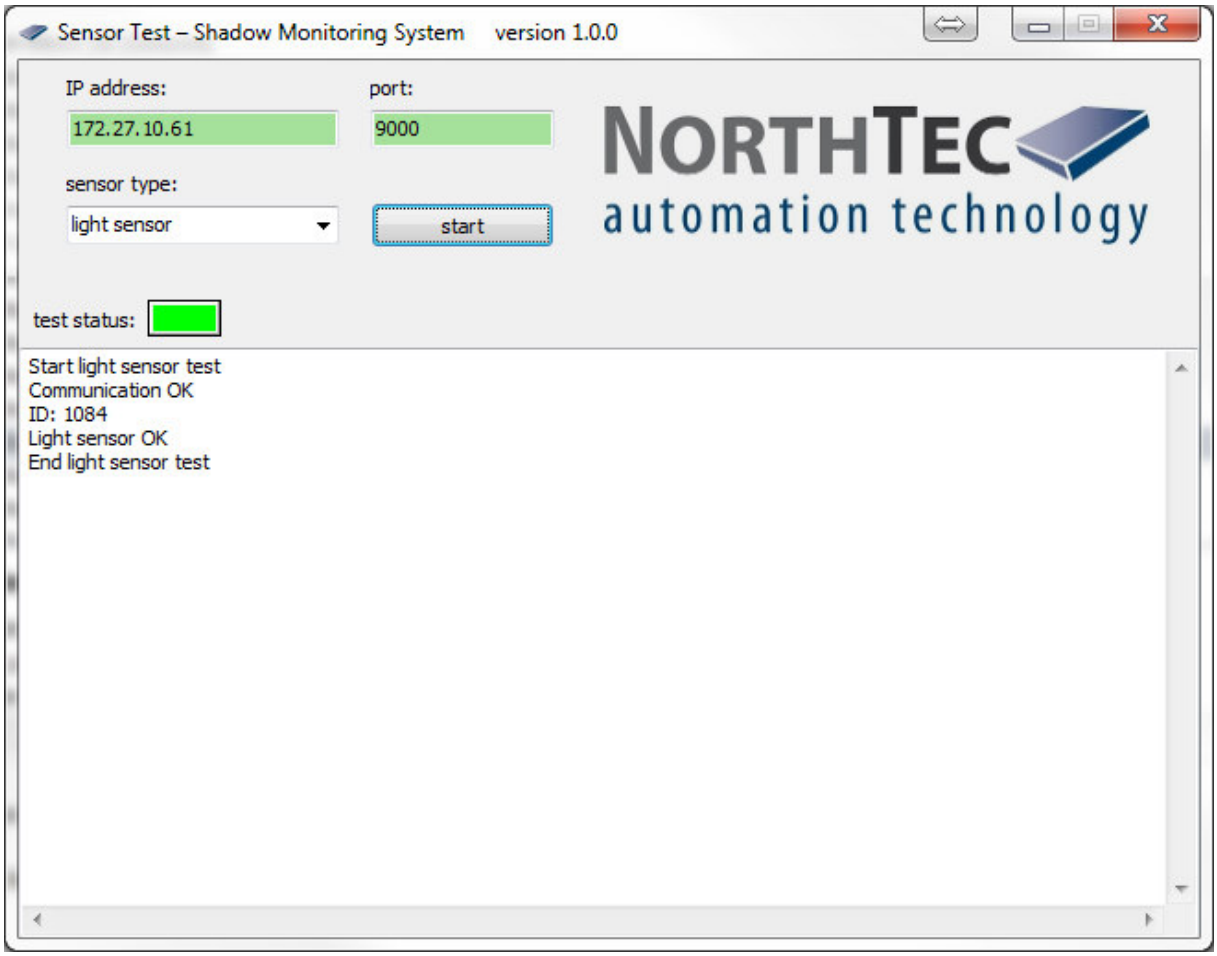


Fig. 6: light sensor test software

7 Equipment and accessories

Our light sensor portfolio comprises a wide range of products.

We offer a variety of accessories for all different types of wind turbines.

Delivery may include a sensor mounting bracket, a connection cable and assembly materials as needed.

The standard version includes the following:

Light Sensor V5M with connection line (20 m) x 1

hexagon head bolt DIN 933, M6 x 20 A2 x 4

washer DIN 125, 6.4 mm A2 x 4

spring washer DIN 127, 6 mm A2 x 4

8 Light sensor maintenance

The light sensor is more or less maintenance-free

However, it must be checked for dirt on a regular basis and carefully cleaned with a soft, damp cloth if necessary.

9 Dimensioned drawings

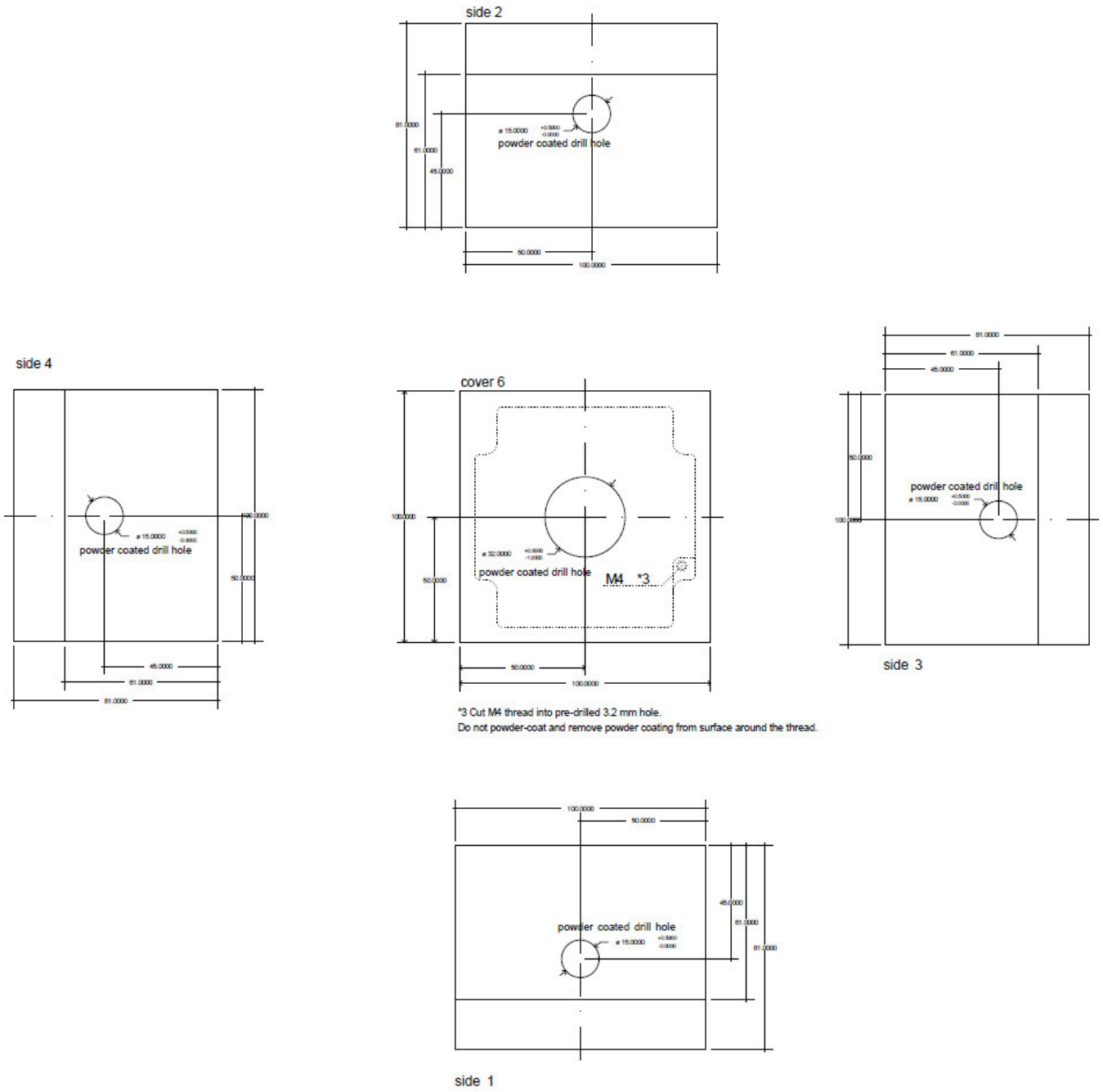
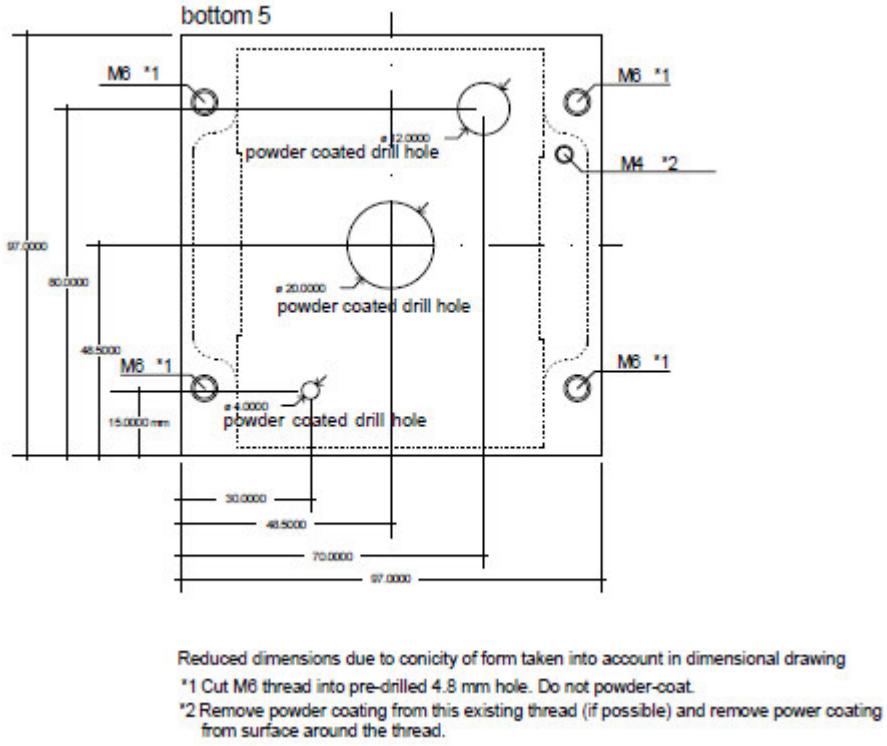


Fig. 7: cover and side view of the housing



Reduced dimensions due to conicity of form taken into account in dimensional drawing

*1 Cut M6 thread into pre-drilled 4.8 mm hole. Do not powder-coat.

*2 Remove powder coating from this existing thread (if possible) and remove power coating from surface around the thread.

Fig. 8: bottom view of the housing including drilling scheme for assembly

10 Technical information

Electrical data:

Supply voltage:	24 V DC
Power consumption during normal operation:	approx. 100 mA
Power consumption during heating operation:	
Type 01:	approx. 500 mA
Type 03:	approx. 900 mA
Maximum current of digital output:	200 mA
Voltage of digital output:	24 VDC
Fuses for power supply (wire 1)	
Type 01:	1 A fast
Type 03:	1 A medium time lag
Fuse for digital output (wire 3):	200 mA fast
Operating temperature range	
Type 01:	-20°C … 50°C
Type 03:	-30°C … 50°C
Protection class:	IP66

RS 485 interface

Baud rate:	9600 Baud
Parity:	even
Data bits:	8
Stop bits:	1
Level:	RS 485 level
Protocol:	ASCII based up to 24 parties possible

Connection line

Connection line:	Lapp Kabel Ölflex Classic 400 CP 5 x 0.75

Wire assignment

1:	+24 VDC operating voltage
2:	GND
3:	digital output
4:	RS485 data + (A)
5:	RS485 data – (B)

Mechanical data:

Housing material:	aluminium with seawater resistant powder coating
Dimensions in mm (D x W x H):	100 x 100 x 81
Weight:	approx. 1,500 g (w/o supply line)
Bracket:	4 items M6 threaded hole
Layout:	rectangular 86 mm x 66 mm
Torque:	6 Nm

Conformity:

EMC conformity:	DIN EN 61326 Class A Group 1
RoHS:	Only RoHS compliant components have been used.

Order numbers:

Light Sensor V5M, Type 01:	100 993
Light Sensor V5M, Type 03:	141 471