PERMANOVA CSM

Cover Slide Monitor Manual

Innehållsförteckning

1 Introduction

The cover slide monitor (CSM) keeps track on the status of the cover slide unit. It detects scattered light from particles on the cover slide and measures the temperature of the unit in order to also observe contamination by smoke. The amplification of the optical signal is adjustable to suit different power levels, geometries etc.

The CSM unit comes with a sensor unit and a separate base unit to enable mounting when space is limited or freedom of movement is important.

A mounting surface has to be prepared on the cover slide holder or nozzle. A hole shall be made that overlooks the rim of the cover slide. The hole-diameter should typically be between 20 % and 80 % of the cover slide thickness.

The components are designed to comply with the European EMC demands and they follow the low voltage directives (73/23EEC).

2 Overview

2.1 Detector Principle

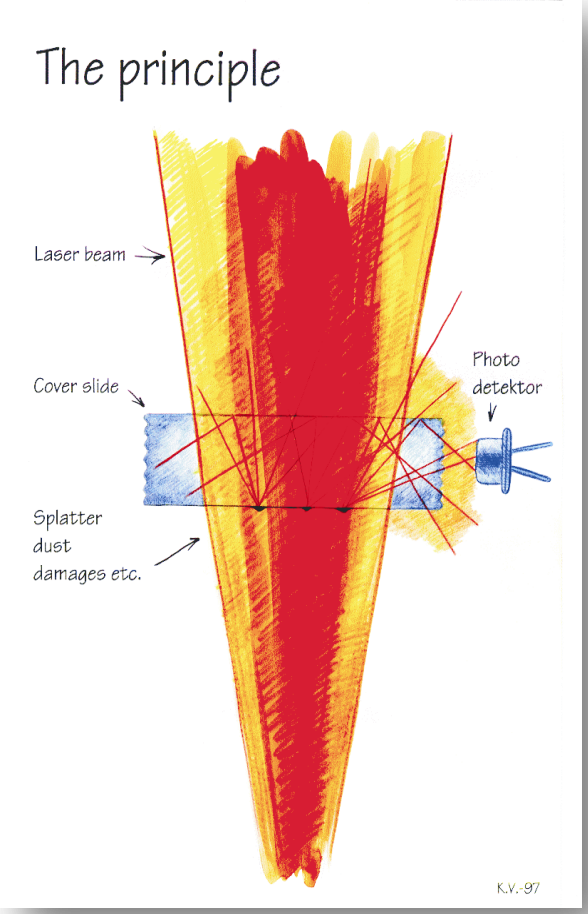


Figure 1. Schematic of how the CSM sensor works. Spatter from the process, dust and glass-damages, scatter the laser light. Some of the reflected light incidents at the photo detector and causes a voltage raise proportional to the amount of light.

2.2 Complete CSM Unit

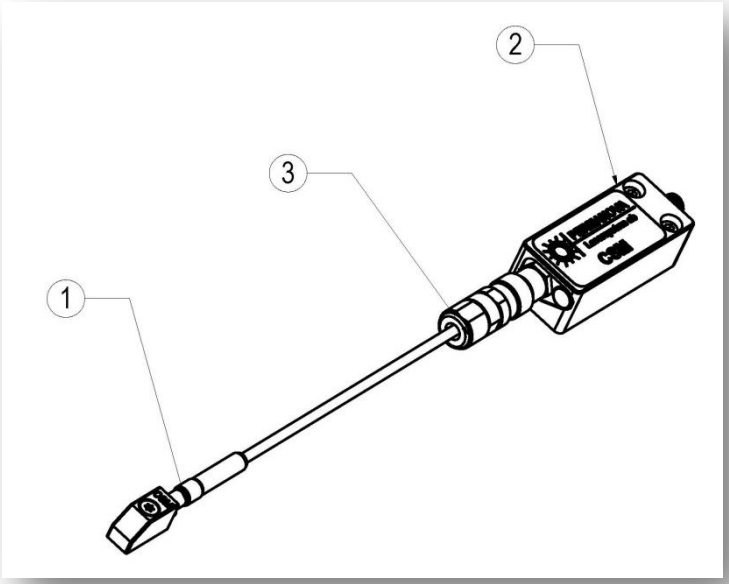


Figure 2. Complete CSM unit.

1. CSM sensor unit
2. CSM base unit
3. Connection between sensor and base unit, 4-pole cable

3 Function

The sensor unit consists of a photo sensor that detects reflected light and a thermal sensor that reads the temperature of the cover slide. Inside the base unit there are electronics that condition the sensor signals into stable analogue signals. Depending on how much light that reaches the sensor, the optical signal will vary between 0 V and 10 V. The thermal sensor gives a voltage in the same range and one degree corresponds to approximately 0.1 V. The optical signal gain of the CSM is adjustable by a potentiometer.

3.1 Connections

The sensor unit is connected to the base unit with use of the 4-pole cable. The base unit is connected to the power supply and analogue input via a 6-pole external cable. See figure below.

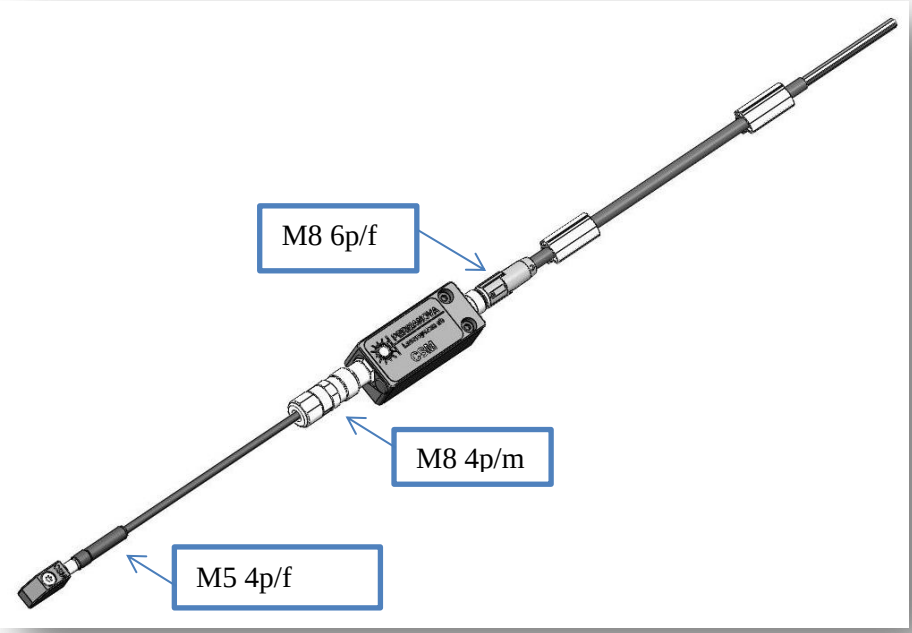


Figure 3. Connections.

3.2 Signals

The signal list for the CSM base unit is shown below in Table 1.

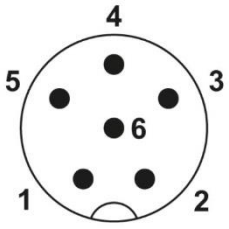
Pin	Name	Nominal Voltage	Maximum Current	Colour	Pin Assignment
1	Power supply	24 VDC	-	Brown	
2	Optical signal	0-10 V	10 mA	White	
3	Power GND	0 V (24V)	50 mA	Blue	
4	Thermal signal	0-10 V	-	Black	
5	Signal GND	0 V (sig)	10 mA	Grey	
6	Spare	-	-	Pink	

Table 1. Signal list CSM base unit.

3.2.1 Signal characteristics

Figure 4 below shows the typical maximum obtainable output voltage for the optical signal depending on the output current. The difference between the top and bottom curves shows the influence of the thermal signal output current.

We recommend an input impedance of 1-2 kΩ to reduce EMI. Observe that most analog PLC-inputs have an input impedance of 200-1000 kΩ so an extra load is often required.

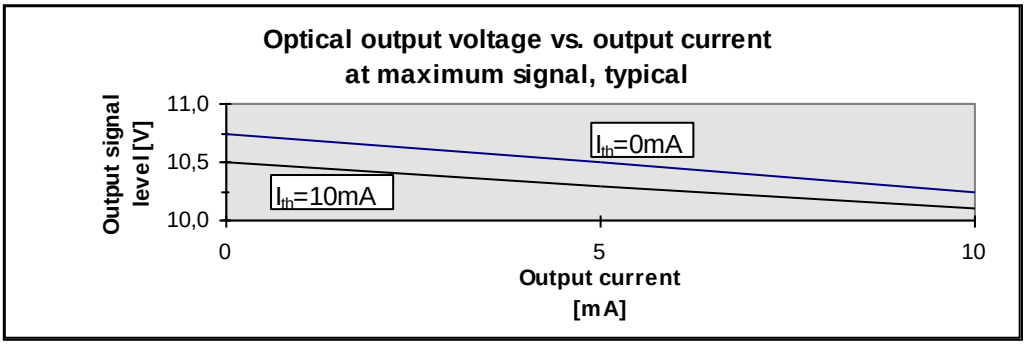


Figure 4. Optical output voltage vs. output current at maximum optical signal for two different thermal currents.

Figure 5 shows the thermal signal output. This signal is supposed to be used for relative measurements only, typical repeatability is within ±0.1 V, absolute accuracy ±0.5 V.

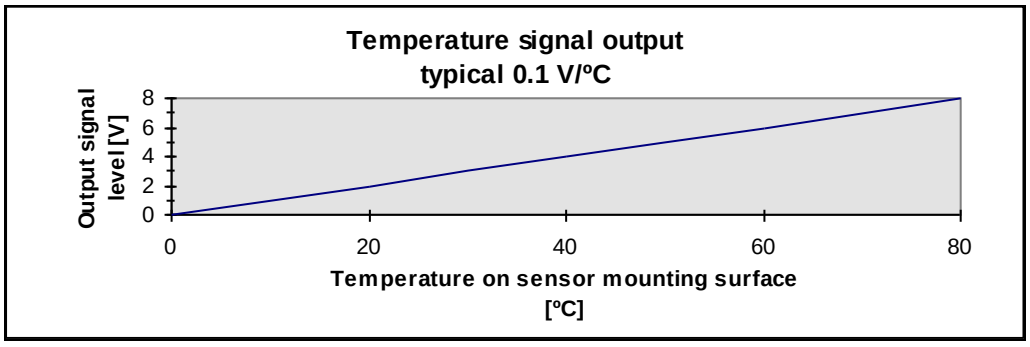


Figure 5. Typical temperature signal output.

4 Installation

4.1 Mounting

A good way to mount the sensor is in an 8 x 1 mm recess. This gives a flat surface as well as a fixed orientation. Other solutions are possible, but Permanova suggests that:

- the mounting surface is flat to secure thermal connection of the sensor.
- there is a stable mechanical support to prevent twisting of the sensor.

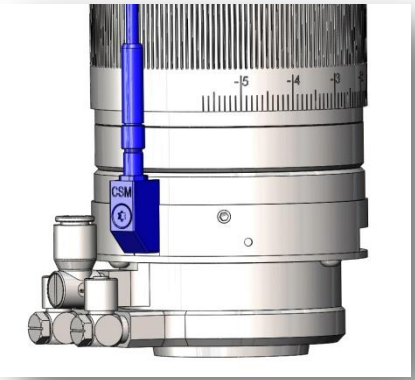


Figure 6. Sensor mounted on an optical unit.

Two examples of mounting surfaces are shown below.

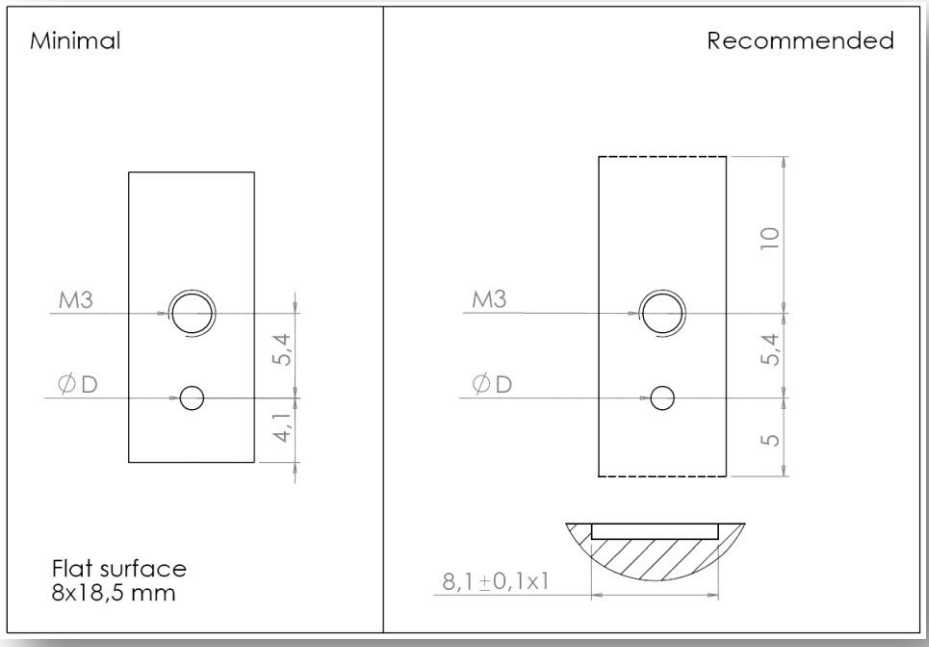


Figure 7. Exemples of mounting surfaces.

The size of the hole, ØD, in front of the sensor surface is, among other things, dependent on laser power and cover slide geometry but a 1 mm hole is a good starting point. If the optical signal level is too low for a dirty cover slide, (and cannot be increased further with adjusting potentiometer) this diameter of course has to be increased. The hole- diameter should not normally exceed 80 % of the cover slide thickness.

The sensor unit is mounted with one M3 screw secured with thread locking. Temperature range of the sensor unit is 0 – 80 ºC and absolute maximum temperature is 100 ºC.

The CSM base unit is mounted with two M3 screws, c-c 15 mm, at a suitable distance from the cover slide. For dimensions, see the figure below. The temperature range of the base unit is 0 – 45 ºC.

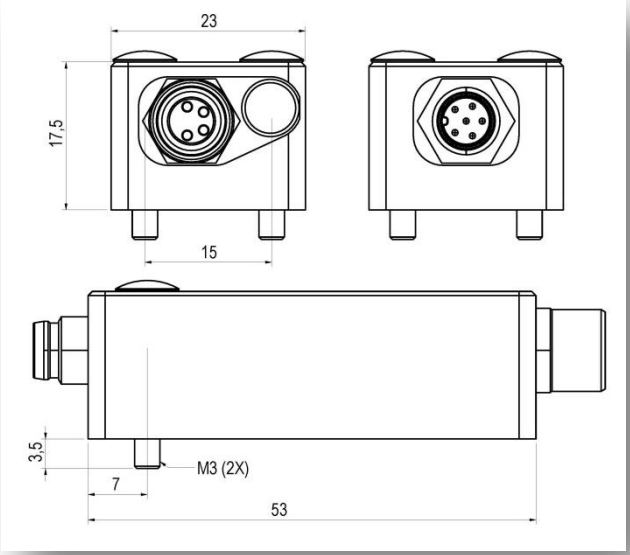


Figure 8. Dimensions of the sensor box unit.

4.2 Adjustments

The sensor will detect reflected light from the cover slide. This light comes from the laser beam and the signal level depends on the laser power and the specific process. Therefore it is not always possible use the factory settings. Adjustments of the gain in the CSM may be necessary for each specific process. The tolerated amount of spatter and smoke on the cover slide can vary from process to process and user to user. The adjustments of the system should therefore be based on used and replaced cover slides. We recommend the user to save a number of used cover slides.

4.2.1 General Procedure

The signal level can be adjusted by turning the 10-turn potentiometer situated behind the protection cap next to the 4-pole connector at the base unit. To increase the signal level remove the cap and turn the potentiometer clockwise.

4.2.2 First Adjustment

A good idea is to use cover slides with known amounts of splatter for a first adjustment of the output level. Simply put the used cover slides in the holder and run the process. Monitor the output levels for the different slides and adjust it with the potentiometer to a suitable level.

Warning! When adjusting the CSM you have to put a large amount of laser power through the laser tool and all safety regulations applicable in your facility must be followed. If you are inside the laser cell when running the laser you need to take cautions. Make sure that the laser power is dumped in a safe place.

4.2.3 Final Adjustments

To be able to set the warning levels at optimal levels a recording of the output signals over several cover slide lifetimes could be of value. A chart writer where notes of how much the slides are contaminated with spatter or smoke, how the process is affected, etc. will soon give a good knowledge of which threshold levels to use and how the output level should be adjusted. Try to use the full output signal range for your level(s). If you use one threshold level, this could be set at 8-9 V but if you use more thresholds the lowest might end up being much less. If no chart writer or similar equipment is available, manual notes can of course be the method.

4.3 Recommended Signal Levels

The recommended levels for the analogue signals are tabulated below.

	Optical signal	Temp signal	Action
1. Warning	6 V	4 V	Notify that the slide is getting dirty
2. Alarm	8 V	5 V	Stop after this sequence
3. Critical alarm	9,5 V	6 V	Immediate shutdown

Table 2. Recommended detection levels for optical and temperature signals.

5 Troubleshooting

If there are reasons to suspect that the CSM is not working properly the problem is often easy to find. Below is a list of actions to be taken.

1. Make an ocular inspection. Make sure there is no physical harm to any components.
2. Check if there is power to the system. The voltage should be 24 V (±2 V).
3. If the power is OK, check the sensor unit. Unscrew the sensor from the welding tool. Point a flashlight to the sensor. If there is still no indication, change the sensor and try again.
4. Check the sensor cable. If it is broken, change it and test the senor unit with a flashlight again.

It is important to take the actions above first, because these actions will not change the settings on the CSM unit. These settings are individual for each machine.

If the unit is not working after any of these actions it needs to be send to Permanova Laser System for a thorough investigation. The whole unit need to be shipped.

6 Customer Service

If for any reason the product is damaged or malfunctioning please contact Permanova Lasersystem ab for assistance.

Support is available by phone, fax and email:

Phone: +46 31 706 19 80
Fax: +46 31 86 46 12
Email: info@permanova.se