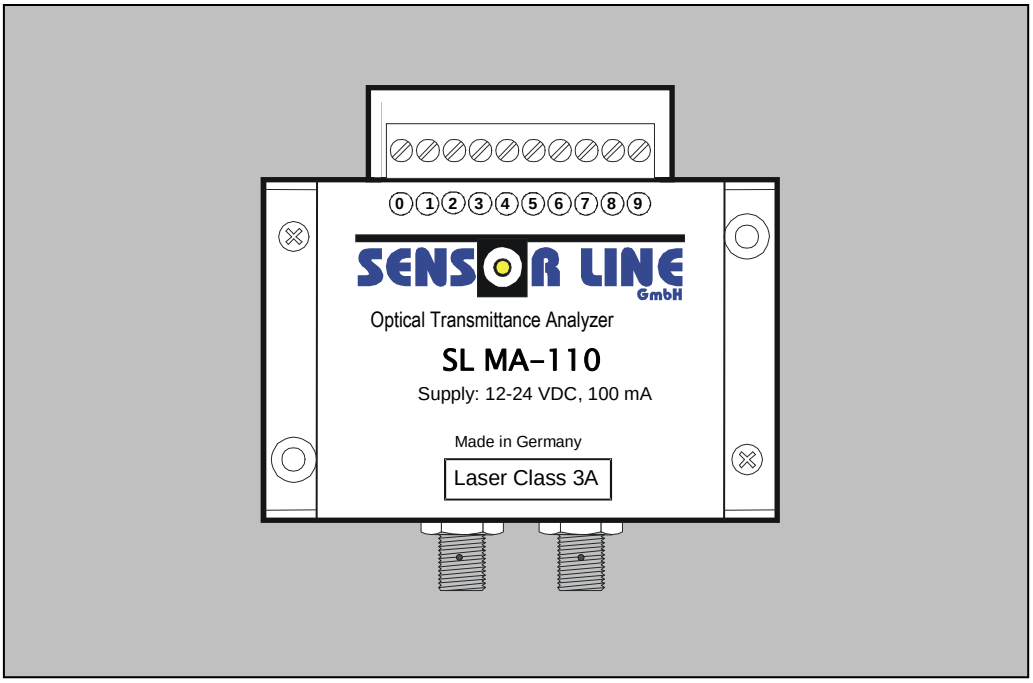
Optical Transmittance Analyzer

SL MA-110



User's Manual

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1. General

The SL MA-110 Optical Transmittance Analyzer (OTA) is an electronic interface that supplies and evaluates fiber optic load sensors. The SL MA-110 serves as the interface between the fiber optic sensor and the processing unit. It should be installed indoors or inside a weatherproof road side cabinet. A complete sensor system consists of the SL MA-110 interface with transmitter (LED) and receiver (photodetector) connected by fiber optic feeder cable to the fiber optic load sensor.

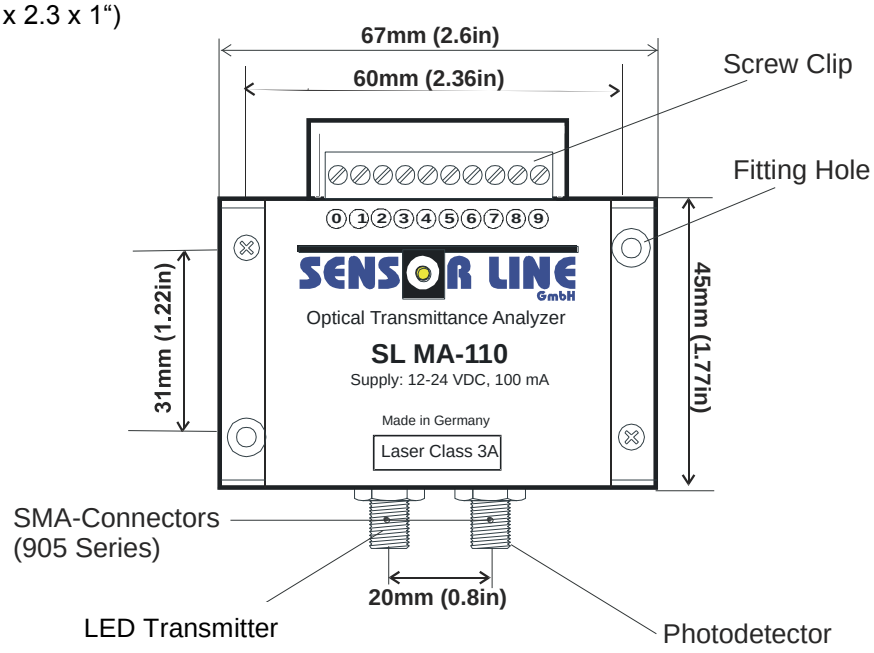
Function:

The interface responds to the optical sensor signal in a dynamic (AC-coupled) manner, i.e. the electrical signal caused when a load is applied to the sensor decreases to zero as the load remains applied. At a threshold, a digital trigger signal is generated. This signal is automatically reset after a certain time period. These characteristics allow the SL MA-110 interface to operate without the need for adjustment.

If the interface detects an interruption in the light transmission path, it generates a digital error signal. Both digital signals are transmitted via optocouplers which behave similar to relays, allowing the use of a variety of output circuitry. The dynamic analogue load signal and the light power monitor signal also have their own output clips.

Features:

- Dynamic interface for detection of light power changes
- Optocoupler digital outputs
- Trigger output (optocoupler)
- Error indication output
- Analog output
- Monitor output for normalizing the analog signal
- Reverse power protection
- Short circuit protection
- Housing 67x58x25mm (2.6 x 2.3 x 1“)
- IP 30 (NEMA 2) enclosure
- 10-pin screw clip



2. Connections

Electrical

Pin No	Signal	Description
0	12 ... 24 VDC	Supply Voltage
1	GND	Ground
2	GND	Ground
3	Vref	Reference Voltage (about 5 V)
4	Vmon	Analog Monitor Signal
5	Vanalog	Analog Load Signal
6	–ERROR	Negative Error Optocoupler Output
7	+ERROR	Positive Error Optocoupler Output
8	–TRIGGER	Negative Trigger Optocoupler Output
9	+TRIGGER	Positive Trigger Optocoupler Output

Optical

SMA-Connectors
(SMA series 905)

LED Transmitter, Photodetector

3. Signals

3.1. The Analog Load Signal

This signal shows the light changes which occur due to the load applied on the sensor in an "AC-coupled“ manner.

To obtain the load signal connect Vanalog (pin 5) and Vref (pin 3) to a measuring device. Either use Vref as reference voltage or measure both Vanalog and Vref with reference to GND (Pin 2). In this case do the computation

Load Signal = Vanalog – Vref

3.2. The Analog Monitor Signal

In case the load signal is zero this signal shows the absolute light power transmitted by the sensor. It is obtained as is the load signal but it is negative with reference to Vref.

Monitor Signal = – (Vmon – Vref)

As the light changes caused by the load are much smaller than the whole light power the monitor voltage is amplified by a factor of 20 less than the load signal. In either case the complete transmitted light power is proportional to the value

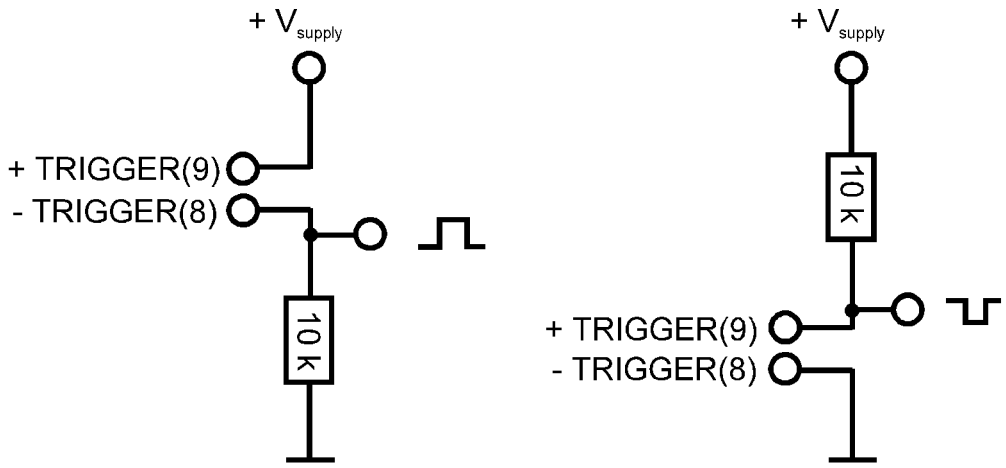
Monitor Signal – Load Signal / 20

To obtain a normalized load signal independent from the particular sensor's attenuation, do the computation

$$\text{Normalized Load Signal} = 5 \times \frac{\text{Load Signal}}{\text{Monitor Signal}} \text{ in \%}$$

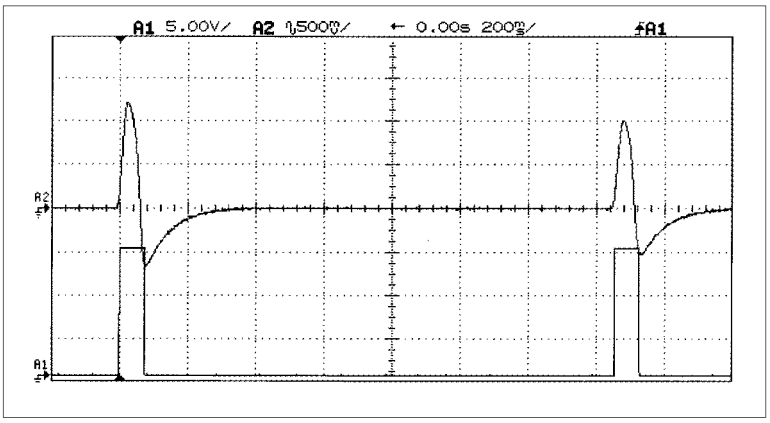
3.3. The Digital Trigger Signal

As the trigger signal is transmitted via an optocoupler one of the following circuits is required (V_{supply} may be any external power supply).



The left circuit yields a positive trigger pulse, the circuit on the right side an inverted one.

The waveforms below show the signals caused by a vehicle crossing the sensor:
Upper graph: Vanalog (pin 5) related to Vref (pin 2)
Lower graph: Signal occurred at –TRIGGER (pin 8) with +TRIGGER (pin 9) connected to +15V and a 10k pull down resistor from –TRIGGER to GND (pin 1, pin 2).



3.4. The Digital Error Signal

To obtain the Error Signal also one of the circuits on the previous page can be used.

If an Error signal occurs first check the monitor signal as described under 3.2. If this equals to zero the transmission path is interrupted. In case it is below 250 mV the attenuation of the transmission path exceeds the limit specified for proper operation of the triggering circuit. This should not occur because the sensors are tested for attenuation. The interface may then still work, but in certain cases the trigger signal may not be reset when the load is removed from the sensor. Try cleaning the fiber connectors with a soft cloth. Be sure that neither the sensors nor the feeders are bent over sharp edges. If this doesn't help the sensor or the feeders might be damaged and should be replaced.

4. Fitting and starting

1) Fit the interface with screws.

2) Remove the safety caps from LED transmitter and photodetector.

3) Connect the sensor SMA connectors with transmitter and photodetector.
When fastening the sensor SMA connectors with transmitter and photodetector a strong torque must be applied in order to guarantee smallest attenuation, but do not use any pliers. The connectors of transmitter and photodetector are allowed to be interchanged.

4) Connect the pins 0 (Supply Voltage) and 1 (Ground) to the power supply.

5) Connect the signal outputs (pin 2 to 9)

6) Turn on power supply

7) Test the installation by driving over the embedded sensor and monitor the Trigger signal (pin 8 and 9) or Vanalog signal (pin 5). Test the sensor Error signal (pin 6 and 7) by disconnecting one of the fiber connectors.

5. Specifications

Order Name	MA-110-IR
Housing:	Plastic
Size:	67 x 58 x 25 mm
Protection Class:	IP 30
Connection:	Screw clip, 10 pins
Optical Interface:	SMA 905
LED Type	IR High Power LED / GaAlAs
LED Peak Output Wavelength	850 nm IR
Relative Humidity:	80% at 25°C
Temperature Range:	-40°C to 85°C (-40°F to 185°F)
Supply Current:	< 100 mA
Supply Voltage:	+12 to +24 VDC
Analog Output:	0-10 V
Optocoupler Output max.:	60V/25mA
Velocity Range:	1 to 250 km/h
Trigger Threshold	0.33% of light transmittance drop
Feeder Length:	up to 250 meters
LED Risk Group:	RG 0 (safe) *

* According to DIN EN 62471. Please note: In spite of the official classification SENSOR LINE recommends to avoid staring into the transmitter for longer periods, regardless whether light is visible or not.

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