



LW217 / LW218

Optical fiber modules for transmission of SSI encoders and measuring systems

Product features:

- The optical fiber modules for data transmission of SSI signals by means of optical fibers
- For use with all encoders and sensors with a synchronous serial interface (SSI)
- Safe and reliably transmission of signals, up to a distance of 2000 meters
- The optical fiber cable can be routed through explosive areas as well
- Input / Output data rate of max. 2 Mbit/s (transmitter and receiver)
- Resistant against extremely strong electromagnetic fields
- Glass fiber cables are available ready assembled
- Free adjustable SSI resolution from 1 to 99 bit
- Power supply either 5 VDC or 10 to 30 VDC
- Compact mounting on a 35 mm top hat rail

Available Systems:

LW217 / LW218:

Optical Fiber Module pair
(transmitter and receiver)

- 5 VDC power supply voltage
- 850 nm wave length
- transmission distance up to 2000 meters

LW217-1 / LW218-1:

Optical Fiber Module pair
(transmitter and receiver)

- 10 ... 30 VDC power supply voltage
- 850 nm wave length
- transmission distance up to 2000 meters

Version:	Description
LW21701a/pp/02_2012	First edition
LW21701b/pp/11_2012	Small change
LW21702a/pp/nw/08_13	Adjustment due to a new device generation
LW21702b/tj/nw/02_14	Adjustment of pin assignment LW218
Lw21702c_oi/ag/Apr. 15	- Diverse corrections on page 6, 7 and 8 - Technical Specifications and Safety Instructions renewed - Design and tables updated
Lw217_02d_oi /ag/Apr. 15	Some small technical and optical corrections
LW217_02e_oi/Oct 16	Technical correction page 10

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1. Safety Instructions and Responsibility

1.1. General Safety Instructions

This operation manual is a significant component of the unit and includes important rules and hints about the installation, function and usage. Non-observance can result in damage and/or impairment of the functions to the unit or the machine or even in injury to persons using the equipment!

Please read the following instructions carefully before operating the device and observe all safety and warning instructions! Keep the manual for later use.

A pertinent qualification of the respective staff is a fundamental requirement in order to use these manual. The unit must be installed, connected and put into operation by a qualified electrician.

Liability exclusion: The manufacturer is not liable for personal injury and/or damage to property and for consequential damage, due to incorrect handling, installation and operation. Further claims, due to errors in the operation manual as well as misinterpretations are excluded from liability.

In addition the manufacturer reserve the right to modify the hardware, software or operation manual at any time and without prior notice. Therefore, there might be minor differences between the unit and the descriptions in operation manual.

The raiser respectively positioner is exclusively responsible for the safety of the system and equipment where the unit will be integrated.

During installation or maintenance all general and also all country- and application-specific safety rules and standards must be observed.

If the device is used in processes, where a failure or faulty operation could damage the system or injure persons, appropriate precautions to avoid such consequences must be taken.

1.2. Use according to the intended purpose

The unit is intended exclusively for use in industrial machines, constructions and systems. Non-conforming usage does not correspond to the provisions and lies within the sole responsibility of the user. The manufacturer is not liable for damages which has arisen through unsuitable and improper use.

Please note that device may only be installed in proper form and used in a technically perfect condition (in accordance to the Technical Specifications). The device is not suitable for operation in explosion-proof areas or areas which are excluded by the EN 61010-1 standard.

1.3. Installation

The device is only allowed to be installed and operated within the permissible temperature range. Please ensure an adequate ventilation and avoid all direct contact between the device and hot or aggressive gases and liquids.

Before installation or maintenance, the unit must be disconnected from all voltage-sources. Further it must be ensured that no danger can arise by touching the disconnected voltage-sources.

Devices which are supplied by AC-voltages, must be connected exclusively by switches, respectively circuit-breakers with the low voltage network. The switch or circuit-breaker must be placed as near as possible to the device and further indicated as separator.

Incoming as well as outgoing wires and wires for extra low voltages (ELV) must be separated from dangerous electrical cables (SELV circuits) by using a double resp. increased isolation.

All selected wires and isolations must be conform to the provided voltage- and temperature-ranges. Further all country- and application-specific standards, which are relevant for structure, form and quality of the wires, must be ensured. Indications about the permissible wire cross-sections for wiring are described in the Technical Specifications.

Before first start-up it must be ensured that all connections and wires are firmly seated and secured in the screw terminals. All (inclusively unused) terminals must be fastened by turning the relevant screws clockwise up to the stop.

Overvoltages at the connections must be limited to values in accordance to the overvoltage category II.

For placement, wiring, environmental conditions as well as shielding and earthing/grounding of the supply lines the general standards of industrial automation industry and the specific shielding instructions of the manufacturer are valid. Please find all respective hints and rules on „ www.motrona.com/download.html --> [General EMC Rules for Wiring, Screening and Earthing]“.

1.4. Cleaning, Maintenance and Service Notes

To clean the front of the unit please use only a slightly damp (not wet!), soft cloth. For the rear no cleaning is necessary. For an unscheduled, individual cleaning of the rear the maintenance staff or assembler is self-responsible.

During normal operation no maintenance is necessary. In case of unexpected problems, failures or malfunctions the device must be shipped for back to the manufacturer for checking, adjustment and reparation (if necessary). Unauthorized opening and repairing can have negative effects or failures to the protection-measures of the unit.

2. Description

The optical fiber modules LW217 and LW218 form together a transmission system for data transmission of industrial signals by means of optical fibers.

The system is made of an optical fiber transmitter and of an optical fiber receiver.

The optical fiber transmitter module converts the electrical data of a usual sensor or encoder equipped with a synchronous serial interface (SSI) into optical fiber signals.

The optical fiber receiver module converts the optical signals back into electrical SSI signals.

One single glass fiber is sufficient to transmit the absolute values reliably at a distance up to 2000 m.

With the two rotary switches on the front side of the fiber optic transmitter-module the SSI resolution can be adjusted between 1 bit and 99 bits.

Both modules are equipped with LED's, allowing a wide diagnosis of operating troubles.

The modules are available in various level and supply voltage variants.

The optical fiber modules are mainly used when signals have to be transmitted in environments with strong electromagnetic interferences or when, due to high ground potential differences between the signal source and the signal processing equipment, a potential separation is necessary.

High ground potential differences generally appear also in case of large distances between the encoder/sensors and the PLC or any other processing electronics.

The optical fiber cable is failure-safe: it does not constitute any danger in case of damage. Since the light-emitting component used is not a laser, but a light-emitting diode, the transmission line is totally safe, even when looking directly into the opened connector or into the broken glass fiber.

A specific feature of the transfer mode used is the fact that the SSI signal is transmitted without the troubles due to the round-trip delays between the clock and the data. This allows also a quick reading of the encoder even when using cable lengths exceeding 2000 m.

The device system is designed to provide a fastest possible update of the encoder/sensor data.



The optical fiber cable can be routed through explosive areas.

3. Electrical and optical connections

3.1. Pin Assignment LW217 (transmitter)

11-pin connector:

Pin	Signal	Description
1	0 V (GND)	Power supply
2	+ Ub	
3	+ T	Clock to encoder/sensor
4	- T	
5	+ D	Data from encoder/sensor
6	- D	
7	/Error	
8		Not connected
9		Not connected
10		Not connected
11	PE	Connection for the cable shield

2-pin connector:

Pin	Signal	Description
1	0 V (GND)	Power supply
2	+ Ub	

3.2. Pin Assignment LW218 (receiver)

11-pin connector:

Pin	Signal	Description
1	0 V (GND)	Power supply
2	+ Ub	
3	+ T	Clock from PLC resp. target unit
4	- T	
5	+ D	Data to PLC resp. target unit
6	- D	
7	/Error	Error signal to PLC resp. target unit
8		Not connected
9		Not connected
10		Not connected
11	PE	Connection for the cable shield

2-pin connector:

Pin	Signal	Description
1	0 V (GND)	Power supply
2	+ Ub	

Depending on the local conditions the power supply can be connected either via the 2-pin connector or the 11-pin connector.

3.3. Electrical connections

As a principle, the input and output lines always must be routed as a pair, i.e. both wires of a signal must be routed in twisted pair cables. The use of bundle wires (called control cables) is not allowed, since this could not guarantee the correct transmission of the signal, nor the EMC features.

The cable shield must be connected at both ends, at the encoder and at the optical fiber transmitter, and at the optical fiber receiver and at the signal processing device.



For all fiber optic modules, make sure that the signal receiver has a differential input with an input resistance of 100 – 120 Ohm.

All modules are protected against reversed polarity, which avoids any damage in case of wrong polarity of the power supply.

The outputs of the modules are only short-circuit proof in certain conditions; avoid imperatively short-circuits between modules or with the earth.

Exceeding the supply voltage of the modules LW217 and LW218 above a value of about 6 V leads to the destruction of the fuse located inside of the device and must thus be avoided.

For the modules LW217-1 and LW218-1, this value is 33 V.



**The fuse must be replaced in the manufacturer's factory.
Any attempt to repair the device will void the guarantee.**

3.4. Optical connections

Connecting the modules together may be carried out using a cord set multimode optical fiber cables of motrona or alternatively any multimode optical fiber cable 50/125 μm or 62.5/125 μm .



Single-mode optical fiber cables cannot be used.

Please keep the dust protection covers of the optical transmitters and receivers, and put them back in place when no optical fiber cable is connected to the modules, in order to avoid any soiling by dust or any other substance.



- **Make sure here that the connector of the optical fiber cable is correctly in place and that the bayonets catch is locked.**
- **It must also be noted that the used ST connector is indexed and has an orientation spigot which must engage the slots of the optical emitter and of the optical receiver. Please never force!**

4. Operation and LED-function

4.1. LW217 (transmitter)

The LW 217 and LW 217-1 modules are local masters. That means, they generate the clock for the sensor/encoder themselves. After connecting all wires the DIL switches at the device front have to be adjusted after removing the front panel (press the latch at the top with a screwdriver gently down).

DIL - SW1	Clock for the sensor/encoder
on	1 MHz
off	500 kHz

On behalf of a fast data update the higher frequency has to be selected if the sensor/encoder does allow it.

DIL - SW2	Width between the clock pulse packages
on	40 μ s
off	20 μ s

On behalf of a fast data update the lower time has to be selected if the monoflop time of the sensor/encoder allows this adjustment. The value selected by the switch has to be greater than the monoflop time of the sensor or encoder.

The red LED can be used as setting control. If the LED lights up in the "On" position, it means the monoflop time of the device is greater than 20 μ s. Then the switch has to be set to „OFF“ and the red LED should go off.

The required number of the clock pulses of the connected sensor/encoder has to be adjusted by the rotary switches "X10" and "X1". The setting of the unit position and the decade can be adjusted by the switches „X1“ respectively „X10“. The setting range of the switches is from 1 to 99. No clock pulse will be generated with the switch setting „00“.

Example: A multiturn encoder with 25 Bit is connected. Then the switch "X10" has to be in position 2 and the switch "X1" in position 5.

LED Signalization:

LED	Operating Condition
Power (green)	Power supply is applied and polarity is correct
Error (red)	The monoflop time of the connected device is longer than the time adjusted with SW2.

4.2. LW218 (receiver)

The LW - receiver requires no settings. The number of encoder clock pulses (0 or 99) is set at the LW - transmitter and transmitted to the LW - receiver in addition to the data package. Care must simply be taken in order to set the right number of pulses on the connected controller to enable it to read the LW receiver data.

Uninterrupted sending of clock signals by the controller for constant encoder reading is not provided. If the target unit emits a greater number of pulses as set in the LW transmitter, then the data are valid up to the adjusted number of pulses. The exceeding clock pulses will be filled with ZERO.

The monoflop time of the LW receiver is $\leq 12 \mu\text{s}$.

LED Signalization:

LED	Operating Condition
Power (green) stays on	Supply voltage is applied and polarity is correct
Power (green) flashes	Supply voltage of fiber optic transmitter is missing or the optical fiber is interrupted

Error output of the LW receiver:

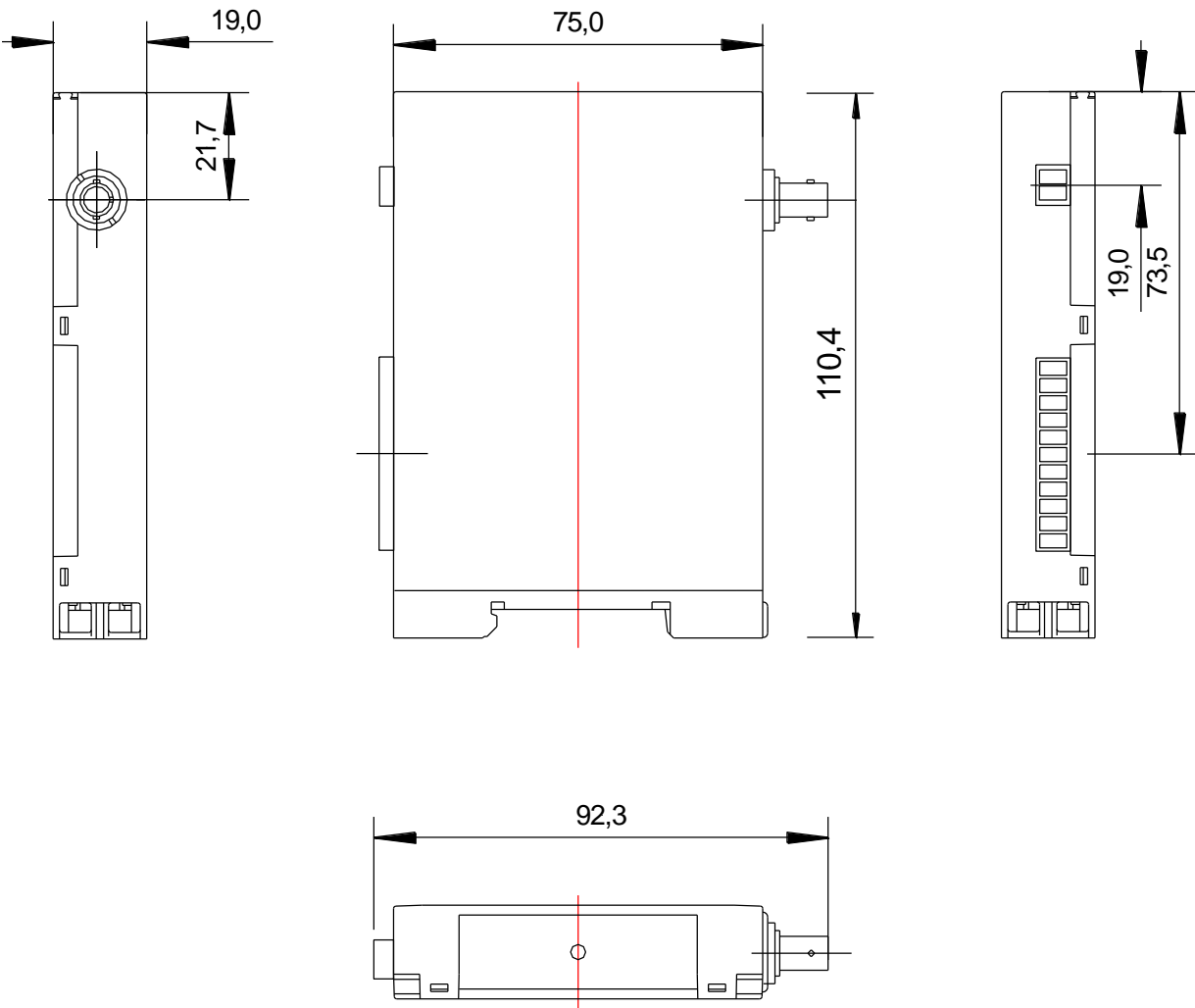
If the /Error respectively status-output of the encoder/sensor should be evaluated, the respective output is available at pin 7 of the 11-pin connector. The output is performed as an open-drain-output and active-low.

The output can be charged with 50 mA and has an own internal series resistor of 51 Ohm. The electric strength is 40 V.

For the proper function of the alarm output it is important to pay attention to the polarity of the connected circuit.

5. Dimensions and technical characteristics

5.1. Dimensions



5.2. Technical Specifications

Technical Specifications:		
Power supply:	LW217 / 218: LW217-1 / 218-1: Ripple: Protection circuit: Consumption: Connections:	5 VDC / ± 5% 10 ... 30 VDC ≤ 10 % at 24 VDC reverse polarity protection < 1 W (per module) screw terminal, 1.5 mm ² / AWG 16
Optical fiber connection:	Optical wave length: Optical transmission rate: Glass fiber: Transmission distances: Connections:	850 nm resp. 1300 nm (multimode) 120 Mbit/s Multimode - fiber, 50/125 μm, 62.5/125 μm max. 2000 m (transmitter and receiver) ST-plug (at the underside of the housing)
SSI in- and outputs:	Transmission channels: Other inputs: Other outputs: Format: Data rate (input / output):	-T, +T and -D, +D (transmitter and receiver) /Error NPN input (transmitter) Open Drain output (receiver) RS422 max. 2 Mbit/s (transmitter and receiver)
Signal processing:	Conversion time:	< 300 ns per module
Display elements:	Type: Functions:	1 x LED (green) continuously on: synchronization ok flashes : synchronization error resp. disconnected / broken optical fiber cable
Housing:	Material: Mounting: Dimensions (w x h x d): Protection class: Weight:	green plastic (RAL 6018) 35 mm top hat rail (according to EN 60715) 19 x 92.3 x 110 mm / 0.7480 x 3.634 x 4.331 inch IP40 / screw terminal: IP20 approx. 80 g
Ambient temperature:	Operation:	-10 °C ... +70 °C / 14° F ... 158° F (not condensing)
Conformity & standards:	Interference resistance: Transient emissions: Guideline 2011/65/EU:	EN 61000-6-2:2006 EN 55011 Class B RoHS-conform