

Operating instructions

Optical Fiber Modules for Transmission of Incremental Encoder or Sensor Signals



Module type	Input level	Power Supply
Transmitter-Module	RS422	5 Vdc ($\pm 5\%$)
	RS422	10 — 30 Vdc
	HTL (Push-pull)	10 — 30 Vdc
	HTL (Push-pull/Single-ended)	10 — 30 Vdc
Receiver-Module	RS422	5 Vdc ($\pm 5\%$)
	RS422	10 — 30 Vdc
	HTL (Push-pull)	10 — 30 Vdc



Safety Instructions

- This manual is an essential part of the unit and contains important hints about function, correct handling and commissioning. Non-observance can result in damage to the unit or the machine or even in injury to persons using the equipment!
- The unit must only be installed, connected and activated by a qualified electrician
- It is a must to observe all general and also all country-specific and application-specific safety standards
- When this unit is used with applications where failure or maloperation could cause damage to a machine or hazard to the operating staff, it is indispensable to meet effective precautions in order to avoid such consequences
- Regarding installation, wiring, environmental conditions, screening of cables and earthing, you must follow the general standards of industrial automation industry
- - Errors and omissions excepted –

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1. Description

The optical fiber modules **E4-SXXXX** and **E4-EXXXX** form together a transmission system for data transmission of industrial signals by means of optical fibers.

Both, transmitter and receiver modules, provide four channels which are completely independent of each other, with differential inputs and outputs. All four channels allow the transmission of signals with a maximum data rate of 2 Mbit/s. With their technical features, the optical fiber modules are intended for the transmission of signals from incremental encoders and sensors. Differential signals with RS-422 or Push-pull HTL levels from other sources may also be connected to these devices.

The modules are available with various wave lengths, level and supply voltage variants.

The optical fiber modules are mainly used for signal transmission in environments with strong electromagnetic interference, or when a potential separation is necessary due to high ground potential differences between signal source and signal processing equipment.

High ground potential differences generally appear in applications with long 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.

If necessary, a level conversion can be linked with the potential separation without problem. Since all devices use the same signal transmission protocol on the optical fiber cable, any transmitter can be combined with any receiver.

The optical fiber cable can be routed through explosive areas.

With 850 nm wave length, signals can be transmitted up to 2000 meters wide, and with 1300 nm wave length up to 3000 meters wide.

2. Electrical and Optical Connections

2.1. Pin Assignment

2-pin terminal:

Pin	Description
1	0 V (GND), power supply input
2	+Ub, power supply input

11-pin terminal:

Pin	Description
1	0 V (GND), encoder supply output (transmitter only)
2	+Ub, encoder supply output (transmitter only)
3	Channel A
4	Channel /A
5	Channel B
6	Channel /B
7	Channel 0 or C
8	Channel /0 or /C
9	Channel D
10	Channel /D (/ERRO for E4-XXX2X)
11	Cable shield connector

If the encoder does not have a separate power supply, pins 1 and 2 of the transmitter's 11-pin terminal can be used to supply the encoder, provided that the encoder has the same voltage class as the module.

On the receiver module the power supply can be applied to either the 2-pin terminal or to pins 1 and 2 of the 11-pin terminal.

All pin assignments are identical for the transmitter and receiver modules.

2.2. Electrical Connections

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

The cable shield must be connected at both ends, at the encoder and the optical fiber transmitter, and at the optical fiber receiver and the signal processing device. The optical fiber transmitter and receiver are equipped with the additional ground pin 11 for this purpose.

For the modules with RS-422 output (E4-EX1XX and E4-EX2XX) please make sure that the signal receiver provides a differential input with an input resistance of 100 – 120 ohms.

For modules (E4-EX3XX and E4-EX4XX), this value must be 2 kohms.

If there are no specific requirements for the output signals of the receiver modules (e.g. low transmission frequencies in the lower kHz range), the outputs may be operated as single-pole TTL or HTL outputs. However, the correct operation of this application must be checked on a case-by-case basis, and it is not supported by the manufacturer.

All modules are protected against reversed polarity, in order to avoid damage in case of wrong polarity of the power supply.

The outputs of the modules are only conditionally short-circuit proof; therefore please avoid imperatively short-circuits between modules or with the earth.

Exceeding the supply voltage of the modules E4-SX1XX and E4-EX1XX above a value of about 6 V provokes destruction of the fuse located inside of the device and must thus be avoided.

For the modules E4-SX2XX, E4-SX3XX, E4-SX4XX, E4-EX2XX and E4-EX4XX, this value is 33 V.

The fuse can only be replaced in the manufacturer's factory. Any attempt to repair the device will void the warranty.

2.3. Optical Connections

For connection of the modules a cord set of multimode optical fiber cables can be used. Alternatively any multimode optical fiber cable 50/125 μm or 62.5/125 μm will be suitable.



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 ST connector in use is indexed and has an orientation spigot which must engage the slots of the optical emitter and of the optical receiver. Please never force!

3. LED Function

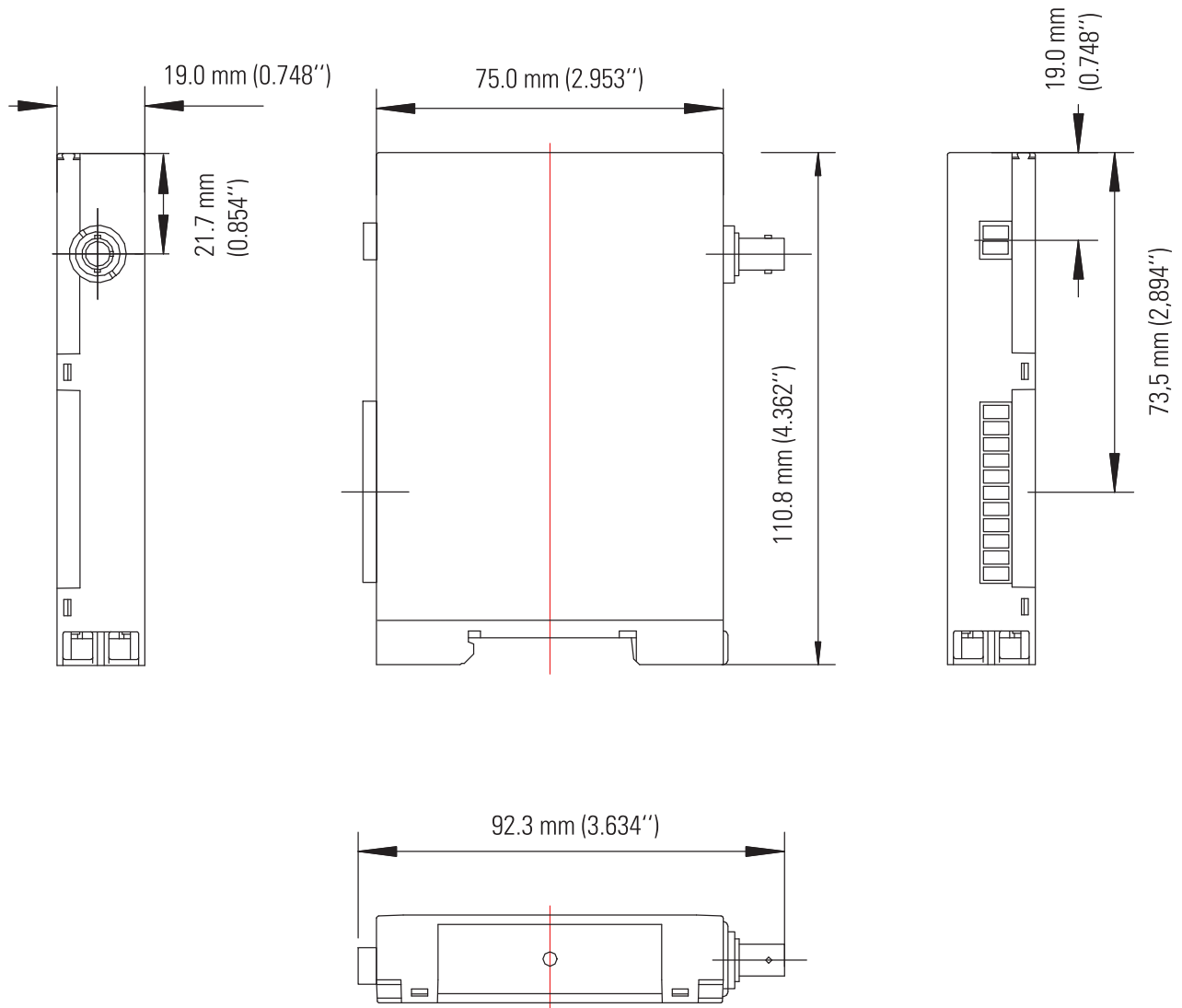
The green control LED of the transmitter must be on when the modules are connected correctly by means of a proper cable. The green LED of the receiver must also be on.

If the LED of the module is not on, make sure that the supply voltage is applied and that it is connected with the right polarity.

If the LED of the receiver module blinks, the optical fiber cable is not connected or broken.

4. Dimensions and Technical Characteristics

4.1. Dimensional Drawing:



4.2. Technical Characteristics

Designation	Characteristic
Construction	Housing for DIN rail mounting acc. To EN 50 022
Dimensions (W x L x H)	19.0 x 110.8 x 92.3 mm (0.748 x 4.362 x 3.634")
Housing Color:	Green, RAL 6018
Protection class:	IP 40, terminals IP 20
Optical fiber connection:	ST connector, Ø 9 mm, on the bottom side of the housing
Terminals:	Protected against unintended contact, max. conductor diameter: 2.5 mm ²
Glass fiber	Multimode fiber, 50/125 µm, 62.5/125 µm
Max. optical transmission distance with wave length 850 nm	2000 m (approx. 6,500 feet)
Max. optical transmission distance with wave length 1300 nm	3000 m (approx. 10,000 feet)
Optical fiber synchronization display	LED is on when the synchronization is set and blinks when the synchronization is lost or the optical fiber cable is broken
Input signals sampling rate	10 Msamples/s
Supply voltage	10 – 30 V or 5 V ± 5%
Power consumption per module	< 2 W
Operating voltage reverse connection protection	available
Electrical inputs of the transmitter and electrical outputs of the receiver	Channels A, B, C, D with inputs and outputs A, /A, B, /B, C, /C and D, /D(/ERRO)
Max. input frequency – optical fiber transmitter and output frequency – optical fiber receiver	1 MHz
Conversion time per module	max. 300ns
Input level - optical fiber transmitter	10 - 30 V or RS 422
Optical wavelength	850 nm respectively 1300 nm (multimode)
Optical transmission rate	120 MBit/s
Operating temperature range	-10 °C to +70 °C (10 °F to 150 °F)
Noise immunity:	EN 61000-6-2 : 2006
Noise emission:	EN 55011 Class B