W&T

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Manual

Installation, Startup and Application

Universal Fiber Optic Interfaces

valid for:

#41215: Universal FO Interface 20mA
#81215: Universal FO Interface RS232/RS422/RS485

Release 02/2018

Subject to error and alteration:

Since it is possible that we make mistakes, you mustn't use any of our statements without verification. Please, inform us of any error or misunderstanding you come about, so we can identify and eliminate it as soon as possible.

Carry out your work on or with W&T products only to the extent that they are described here and after you have completely read and understood the manual or guide. We are not liable for unauthorized repairs or tampering. When in doubt, check first with us or with your dealer.

Glass fiber optic transmission lines are the solution of choice when you need to implement absolutely noise-free serial data transmission over long distances and/or in noisy environments.

Whereas the attenuation with plastic fiber optics places a limit of maximum 100 meters on the attainable cable length, the distances achievable with glass fiber optics are significantly greater and at a comparable cable cost.

Wiesemann & Theis offers an entire family of various fiber optic interfaces that allow you to convert critical I/O ports or serial ports into an optical port for connecting glass fiber optic cable.

This interface family is described on the following pages along with the corresponding technical data and including connection examples.

For up-to-date information on new developments, see our Internet site at http://www.wut.de or check the e-mail short notices at the W&T Interface Club, which you can also subscribe to from the W&T Homepage.

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Legal Notices

Warning note concept

This manual contains notes which must be observed for your personal safety and to prevent equipment damage. The notes are called out with a warning triangle. Depending on the hazard level the warning notes are represented in decreasing order of hazard as follows:

⚠ DANGER

Indicates a hazard which will result in death or serious injury if no appropriate safety measures are taken.

⚠ WARNING

Indicates a hazard which can result in death or serious injury if no appropriate safety measures are taken.

⚠ CAUTION

Indicates a hazard which can result in slight injury if no appropriate safety measures are taken.

⚠ NOTE

Indicates a hazard which can result in equipment damage if no appropriate safety measures are taken.

When multiple hazard levels are present the warning note for the highest level is used. If the warning triangle for personal injury is used, then a warning for equipment damage may also be added in the same warning note.

Qualified personnel

The product described in this manual may be installed and placed in operation only by personnel who are qualified for the respective task.

In addition the documentation for the respective task must be followed, especially the safety and warning notes included in it.

Qualified personnel have received training and experience which enable them to recognize risks associated with handling the described products and to avoid possible hazards.

Disposal

Electronic devices may not be disposed of with household waste, but rather be brought to a proper electronics waste disposal facility.

A complete Declaration of Conformity for the described devices can be found on the respective datasheet pages on the W&T Homepage at http://www.wut.de.

Symbols on the product and on the part label

Symbol	Explanation
CE	CE marking The produce meets the requirements of the corresponding EU Directives.
	WEEE marking The product may not be disposed of with household waste, but rather in accordance with the disposal regulations for electrical waste that prevail where the device is installed.
	Laser marking The product contains a Class 1 laser light source with a wavelength of 1310 nm (near infrared).

Safety Instructions

General precautions

This manual is intended for the installer of the described devices and must be read and understood before beginning any work. The devices are to be installed and placed in service only by an electrical specialist.

Intended use

⚠ DANGER

The Universal Fiber Optic Interfaces from Wiesemann & Theis convert data signals of serial interfaces into light signals, thereby enabling the transmission of serial data over single mode oder multi mode fiber optic cable. This allows the interfaces to suppress compensation currents which can flow as a result of potential differences between the connected devices when directly copper connections are used. Such currents can cause interference with data transmission or even destroy the interfaces.

The interfaces described in this manual are primarily designed for protecting serial ports and for ensuring noise-free data transmission over long distances. When using the interfaces for personal protection against contact with hazardous voltages, observe the relevant safety standards and regulations.

Any other use or modification of the interface convertors is not permitted.

Electrical Safety

⚠ WARNING

The power supply of the Universal Fiber Optic Interfaces must provide safe isolation of the low-voltage side from the supply network in accordance with EN60950-1. In addition, the power supply must have an LPS feature.

Optical radiation

⚠ CAUTION

All the Universal Fiber Optic Interfaces for single- and multi-mode glass fibers described here use as the optical emitter a Class 1 laser light source with a wavelength of 1310 nm.

The following laser-specific requirements apply:

- Do not point the laser beam at persons
- Do not look into the direct or reflected beam
- No tampering with the laser device is permitted

Retain this user‘s guide and always keep it with the laser device.

EMC

⚠ NOTE

Only shielded serial signal cables should be used to connect the Universal Fiber Optic Interfaces.

The Fiber Optic Interfaces then meet the industrial noise limits and the stricter emissions limits for residential and small businesses.

Universal FO Interface 20mA, #41215

Function

The W&T fiber optic interface converter 41215 allows bi-directional conversion of an active or passive 20mA interface into a fiber optic interface with a transmission speed of up to 19.200 bps.

The interface works independently of the data format used and converts one data line in each direction.

Well-known SC connectors are used for connecting the glass fiber optic cable, whereas the serial interface is configured as a 9-pin SUB-D connector.

Power Supply

The supply voltage for the Interfaces is provided through an integrated switching regulator. This regulator has a variable input voltage range and allows the Interface to be powered by any DC voltage between 12 and 48 volts.

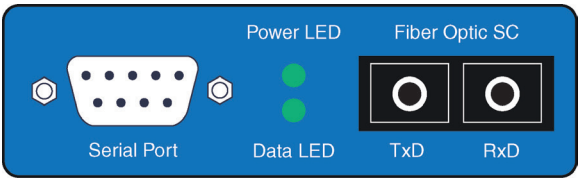
The supply voltage is polarity reversal protected and can be connected on the underside of the Interface through the included plug-in screw terminal.

Galvanic isolation and ESD protection

The serial port of the fiber optic converter is galvanically isolated from the supply voltage through a DC/DC converter with an isolation voltage of 1kV. All signal lines for the serial interface are protected by ESD-immune interface chips against static discharge for voltages up to 15 kV corresponding to IEC 801-2, Level 4.

Connectors

The fiber optic cables are connected to the converter using SC series connectors, with a DB9 plug for the serial connection. The arrangement of the signal connectors on the front panel of the interface can be seen from the following illustration:



The serial connection of the fiber optic converter is configured as a DB9 plug. The pin configuration can be seen in the following table:

Pin#	20mA signal
1	Data Out 20mA
2	Data Out +
3	Data Out -
4	Data Out GND
5	Half Duplex Control
6	Data In 20mA
7	Data In +
8	Data In -
9	Data In GND

Display elements

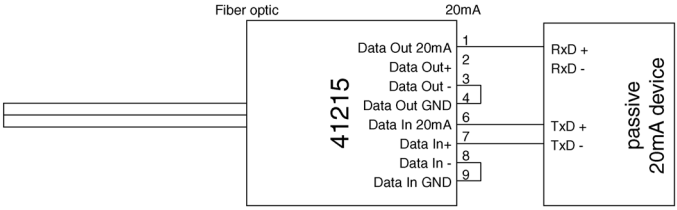
The Interfaces feature two LED's, with the *Power* LED indicating correct supply voltage and the *Data* LED data communication in both directions.

Applications

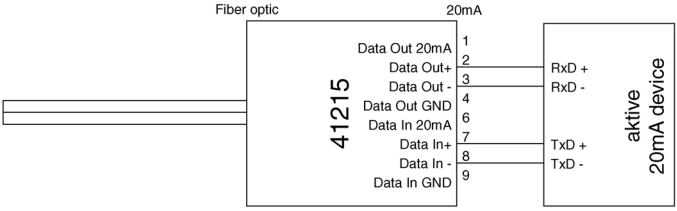
A GND level signal on Pin 5 of the TTY connector will place the 20mA interface of the convertor in half-duplex mode whereby an echo of the sent signals is suppressed.

The interface can be used as an active or passive 20mA component. In the active mode, the interface supplies the current required by the respective 20mA loop, while in the passive mode the loop current must be supplied by the connected device. The operating mode can be selected for both loops separately. Examples of interface switching into active/passive mode are shown in the following drawings:

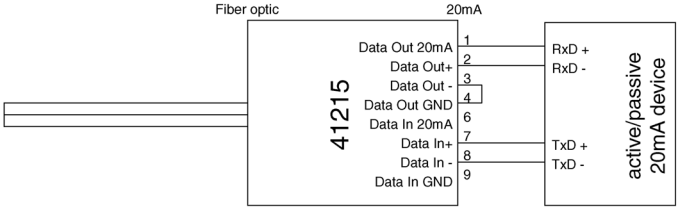
Interface Tx an Rx loop active



Interface Tx an Rx loop passive



Interface Tx loop active, Rx loop passive



Optical Interface

The W&T Interface 81215 uses common single-mode duplex 9/125µm glass fiber optic cable or 50/125µm and 62.5/125 µm multimode duplex glass fiber optic cable, which due to its wide use in network technology is easily and inexpensively available

The light used for data transmission has a wavelength of 1310 nm.

Depending on the attenuation value of the glass fiber optic cable used, data transmission over a distance of up to 20 km is possible using the Interface in its standard version.

When using the Interface on single-mode cables there are no limitations with respect to the minimum required cable length. In this mode the reserve between maximum output power of the transmitter and clipping limit of the receiver 5dB in the worst case.

If the Interface is used however on multimode cables, the high coupled power of the transmitter can result in clipping with short cable lengths.

In this case we recommend use of a 5dB attenuator on the Interface output, which can be ordered from W&T as article number 81900.

Technical Data

Serial Interface:

Operating modes:	active mode, passive mode
Baud rate:	0..19.200 bps
Data format:	any
Transmitted signals:	RxD, TxD
Serial connector:	9-pin SUB-D plug

Optical Interface

FO cable connector:	SC plug adapter ST plug adapter on request
Fiber optic medium:	Duplex single mode fiber 9/125 µm Duplex multi mode fiber 50/125µm or 62,5/125µm
Wavelength:	1310 nm
Laser Class:	Class 1 Laser Product
Output power:	Single mode fiber: min. -12dBm, max. -8dBm Multi mode fiber: max. -3dBm
Receiver sensitivity:	max. -22dBm
Maximum input power:	max. -3dBm
Optical budget:	min. 10dB
Maximum distance:	Single mode fiber: min. 20km @0,35dB/km Multi mode fiber: min. 5km @1dB/km
Minimum line attenuation:	Single mode fiber: 0dB Multi mode fiber: 3dB (with less attenuation, the use of an additional attenuator may be required, e.g. W & T # 81900)

Power supply:

Supply voltage:	12..48 V DC
Operating current:	typ. 100mA at 12V DC (in active mode for both current loops)
Power connector:	Plug-in screw terminal, 5.08mm spacing, labeled „L+“ and „M“
Galvanically isolation:	min. 1 kV between serial interface and power supply

Misc:

Ambient temperature:	Storage: -40..+70°C Operation: 0..+60°C
Permissible relative humidity:	5..95% rH (non condensing)
Housing:	Small plastic housing for top hat rail mounting
Dimensions:	105 * 75 * 22 mm
Weight:	approx. 100 g
Packing list:	1x Fiber optic interface converter 1x screw terminal

Universal FO Interface RS232/RS422/RS485, #81215

Function

The W&T fiber optic interface converter 81215 allows bi-directional conversion of an RS232, RS422 or RS485 interface into a fiber optic interface with a transmission speed of up to 500.000 bps.

The interface works independently of the data format used and converts one data line in each direction.

Well-known SC connectors are used for connecting the glass fiber optic cable, whereas the serial interface is configured as a 9-pin SUB-D connector.

Power Supply

The supply voltage for the Interfaces is provided through an integrated switching regulator. This regulator has a variable input voltage range and allows the Interface to be powered by any DC voltage between 12 and 48 volts.

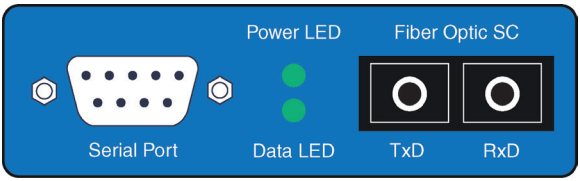
The supply voltage is polarity reversal protected and can be connected on the underside of the Interface through the included plug-in screw terminal.

Galvanic isolation and ESD protection

The serial port of the fiber optic converter is galvanically isolated from the supply voltage through a DC/DC converter with an isolation voltage of 1kV. All signal lines for the serial interface are protected by ESD-immune interface chips against static discharge for voltages up to 15 kV corresponding to IEC 801-2, Level 4.

Connectors

The fiber optic cables are connected to the converter using SC series connectors, with a DB9 plug for the serial connection. The arrangement of the signal connectors on the front panel of the interface can be seen from the following illustration:



The serial connection of the fiber optic converter is configured as a DB9 plug. The pin configuration can be seen in the following table:

Pin#	RS232 signal	RS422 / RS485 signal
1	n.c.	TxD A (-)
2	RxD	RxD A (-)
3	TxD	DTR A (-) (active level)
4	DTR (active level)	n.c.
5	Signal GND	Signal GND
6	n.c.	TxD B (+)
7	RTS (active level)	RxD B (+)
8	n.c.	DTR B (+) (active level)
9	n.c.	n.c.

Display elements

The Interfaces feature two LED's, with the *Power* LED indicating correct supply voltage and the *Data* LED data communication in both directions.

Serial Port

The combined RS232/RS422/485 interface of the fiber optic converter can be set to various operating modes using the DIL switches located near the serial port. These modes are described below:

RS232 mode

This mode provides one data channel each (RxD and TxD) in both directions.

RS422 mode

This mode provides one data channel each (RxD and TxD) in both directions.The RS422 sender and receiver chips are always active.

RS485 mode

In all RS485 modes there is always one data channel available in each direction. The operating modes differ only in how the RS485 driver and receiver chips are controlled.

RS422, RS485 4-wire bus master application

One data channel and one handshake channel in each direction are available. The RS422/RS485 receivers and transmitters are always active in this operating mode.

RS485 4 wire / RS485 2-wire application with echo

One data channel in each direction is available. The RS485 output driver is activated automatically with each transmission of data, and goes to the high impedance state again after the end of transmission. The RS485 receiving channel is always active in this operating mode.

RS485 2 wire application without echo

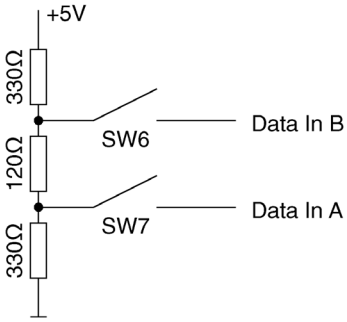
One data channel in each direction is available. The RS485 output driver is activated automatically with each transmission of data, and goes to the high impedance state again after the end of transmission. The RS485 receiving channel is deactivated when the driver is on, but is switched on when the driver is in the high impedance state.

Please see the following table for an explanation of the operating mode DIP switch:

Operating mode	SW1	SW2	SW3	SW4	SW5	SW8
RS232	OFF	OFF	OFF	OFF	OFF	ON
RS422, RS485, 4-wire bus-master	OFF	OFF	OFF	ON	OFF	OFF
RS485, 4-wire/2-wire with echo	OFF	ON	OFF	ON	OFF	OFF
RS485, 2-wire without echo	ON	ON	OFF	ON	OFF	OFF

Termination

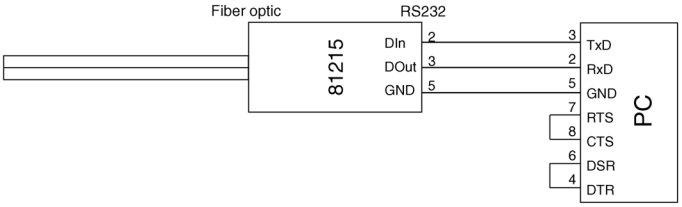
For all RS485 operating modes it is essential that the bus system be terminated with a termination network which assures a defined rest state in the high-impedance phases of bus operation. The bus system can be connected to a termination network by closing switches #6 and #7 on the interface module:



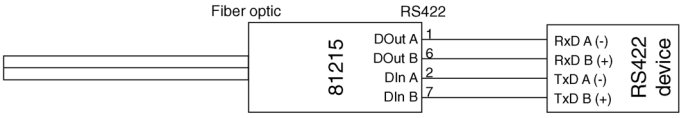
Applications

Examples of interface switching are shown in the following drawings:

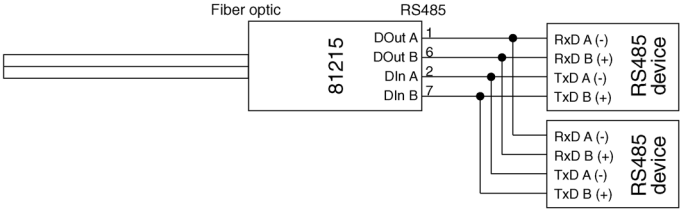
RS232 application



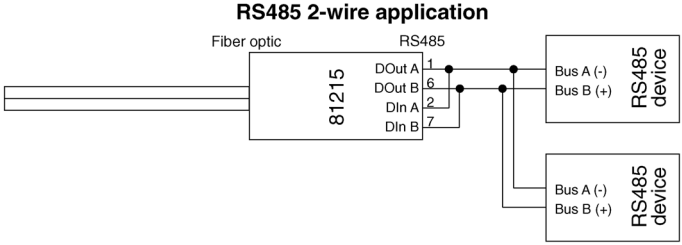
RS422 application



RS485 4-wire bus master application



RS485 2-wire application



Optical Interface

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The light used for data transmission has a wavelength of 1310 nm.

Depending on the attenuation value of the glass fiber optic cable used, data transmission over a distance of up to 20 km is possible using the Interface in its standard version.

When using the Interface on single-mode cables there are no limitations with respect to the minimum required cable length. In this mode the reserve between maximum output power of the transmitter and clipping limit of the receiver 5dB in the worst case.

If the Interface is used however on multimode cables, the high coupled power of the transmitter can result in clipping with short cable lengths.

In this case we recommend use of a 5dB attenuator on the Interface output, which can be ordered from W&T as article number 81900.

Housing

The W&T Fiber Optic Interface is contained in a plastic housing for mounting on standard rails.

To configure the RS232/RS422/RS485 Interface, the enclosure must be opened to set the mode type/termination DIL switches on the interface module.

For this purpose we recommend threading a SUB-D connector with connector body onto the Interface and use the threaded-on connector to assist in removing the housing cover from the housing body.

Technical Data

Serial Interface:

Operating modes:	RS232, RS422 RS485 4-wire & 2-wire applications
Baud rate:	RS232: 0..230 KBaud RS422/485: 0..500 KBaud
Data format:	any
Transmitted signals:	RxD, TxD
Serial connector:	9-pin SUB-D plug

Optical Interface

FO cable connector:	SC plug adapter ST plug adapter on request
Fiber optic medium:	Duplex single mode fiber 9/125 µm Duplex multi mode fiber 50/125µm or 62,5/125µm
Wavelength:	1310 nm
Laser Class:	Class 1 Laser Product
Output power:	Single mode fiber: min. -12dBm, max. -8dBm Multi mode fiber: max. -3dBm
Receiver sensitivity:	max. -22dBm
Maximum input power:	max. -3dBm
Optical budget:	min. 10dB
Maximum distance:	Single mode fiber: min. 20km @0,35dB/km Multi mode fiber: min. 5km @1dB/km
Minimum line attenuation:	Single mode fiber: 0dB Multi mode fiber: 3dB (with less attenuation, the use of an additional attenuator may be required, e.g. W & T # 81900)

Power supply:

Supply voltage:	12..48 V DC
Operating current:	typ. 30mA at 12V DC
Power connector:	Plug-in screw terminal, 5.08mm spacing, labeled „L+“ and „M“
Galvanically isolation:	min. 1 kV between serial interface and power supply

Misc:

Ambient temperature:	Storage: -40..+70°C Operation: 0..+70°C
Permissible relative humidity:	5..95% rH (non condensing)
Housing:	Small plastic housing for top hat rail mounting
Dimensions:	105 * 75 * 22 mm
Weight:	approx. 100 g
Packing list:	1x Fiber optic interface converter 1x screw terminal

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