

# **Manual**

## **Universal FO Interface Converter**



<b>Model</b>	<b>41215</b>
	<b>81215</b>
<b>Release</b>	<b>1.2</b>

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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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## 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.

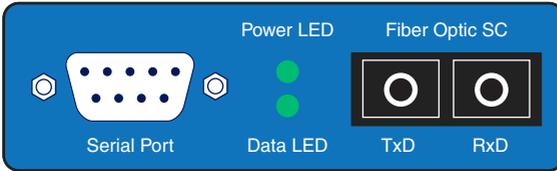
The supply voltage is polarity reversal protected and can be connected on the underside of the Interface through the included plug-in screw terminal.

### 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**

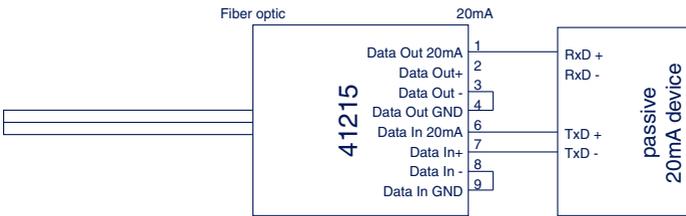
The Interfaces feature two LED's, with the *Power* LED indicating correct supply voltage and the *Data* LED data communication in both directions.

**Applications**

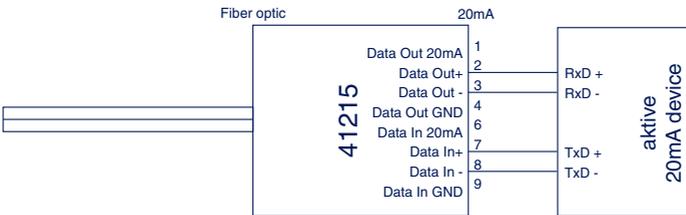
A GND level signal on Pin 5 of the TTY connector will place the 20mA interface of the converter in half-duplex mode whereby an echo of the sent signals is suppressed.

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:

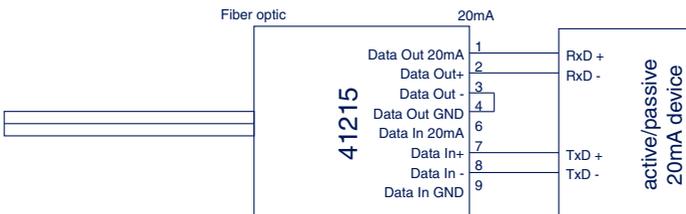
**Interface Tx an Rx loop active**



**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 9/125 $\mu\text{m}$  glass fiber optic cable or 50/125 $\mu\text{m}$  and 62.5/125 $\mu\text{m}$  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 (I)****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 $\mu\text{m}$ Duplex multi mode fiber 50/125 $\mu\text{m}$ or 62,5/125 $\mu\text{m}$
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)

**Technical Data (II)****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.

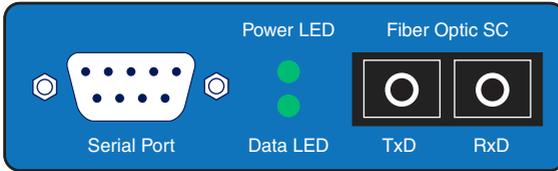
The supply voltage is polarity reversal protected and can be connected on the underside of the Interface through the included plug-in screw terminal.

**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**

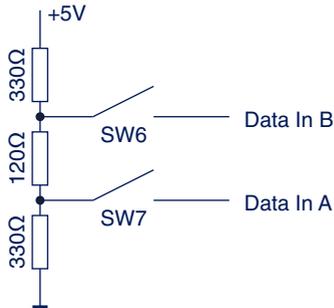
One data channel in each direction is available. The RS485 output driver is activated automatically with each transmission of data, and goes to the high impedance state again after the end of transmission. The RS485 receiving channel is deactivated when the driver is on, but is switched on when the driver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

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

<b>Operating mode</b>	<b>SW1</b>	<b>SW2</b>	<b>SW3</b>	<b>SW4</b>	<b>SW5</b>	<b>SW8</b>
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

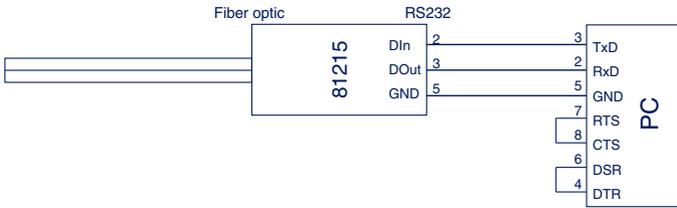
For all RS485 operating modes it is essential that the bus system be terminated with a termination network which assures a defined rest state in the high-impedance phases of bus operation. The bus system can be connected to a termination network by closing switches #6 and #7 on the interface module:



### Applications

Examples of interface switching are shown in the following drawings:

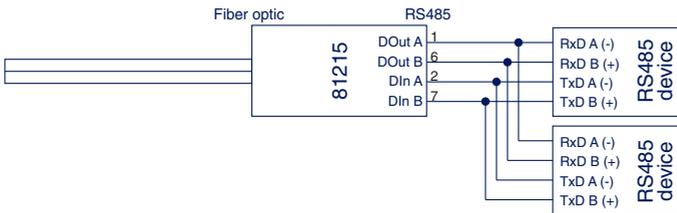
#### RS232 application



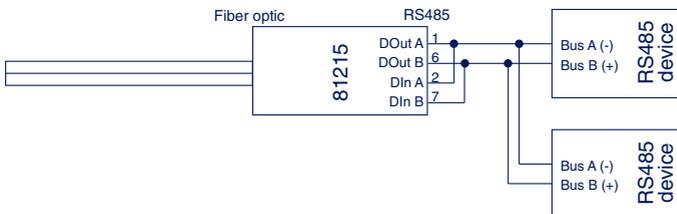
#### RS422 application



#### RS485 4-wire bus master application



#### RS485 2-wire application



## **Optical Interface**

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

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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 according to DIN EN 50022-35.

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 (I)****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 $\mu\text{m}$ Duplex multi mode fiber 50/125 $\mu\text{m}$ or 62,5/125 $\mu\text{m}$
Wavelength:	1310 nm
Laser Class:	Class 1 Laser Product
Output power:	Single mode fiber: min. -12dBm, max. -8dBm Multi mode fiber: max. -3dBm
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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)

**Technical Data (II)****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
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