MR361-2 Series
Fiber Optic Transmission Link
For SSI Absolute Encoders

User Manual

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1. Revision History

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2. Product Description

Figure 1. MR361-2 Series XMTR/RCVR Module Set shown with DSUB9 Option

2.1 Description

The MR361-2 series Fiber Optic Transmission Link System increases the reach of conventional electronics-based rotary and linear SSI absolute encoders up to distances of 2000 meters via a fiber optic link. This solution allows clean optical transmission of sensitive encoder signals over long distances, through noisy electrical areas or when routed in parallel with noisy VFD or High Voltage motor drive lines. The system works with both optical and magnetic encoders and operates with complete transparency to the motion control or motor drive system.

The system is made up of a MR361-2 fiber optic transmitter and a MR361-2 fiber optic receiver. The transmitter module converts the electrical data of a usual absolute encoder equipped with a synchronous serial interface (SSI) into optical fiber signals. The optical receiver module converts the optical signals back into electrical SSI signals. One single glass fiber is sufficient to transmit the absolute values reliably at distances up to 2000 meters. A rotary switch on the front side of the module allows setting the resolution between 1 and 99 bits. Both modules are equipped with statis LEDs, allowing diagnosis of operating troubles. In addition, the receiver module also has a general alarm output.

The optical fiber cable is fail-safe, it does not constitute any danger in case of . 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 a broken glass fiber. The optical fiber cable can be routed through explosive areas.

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

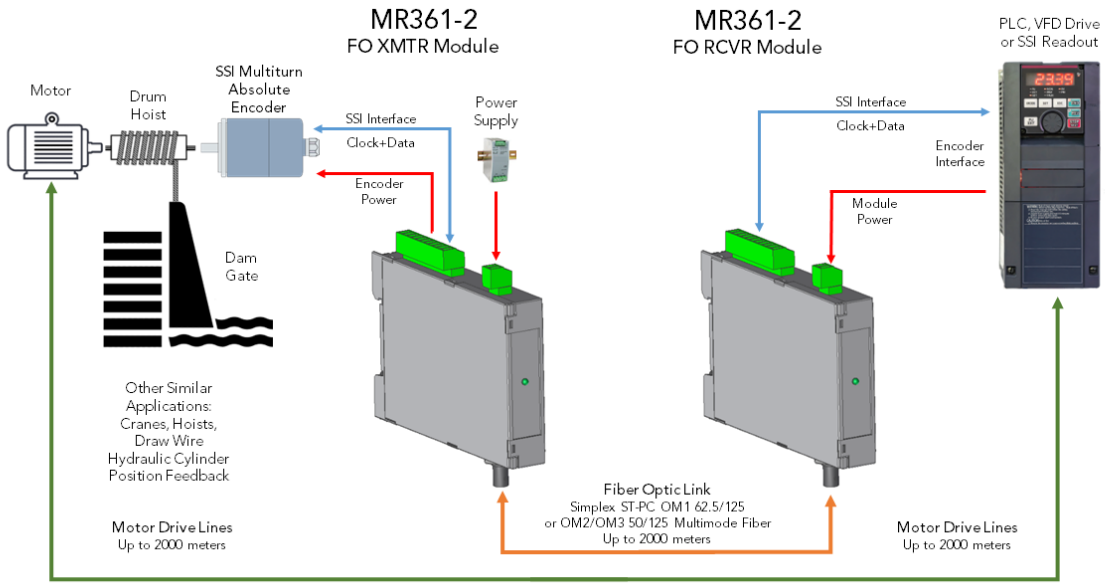

Figure 2. Typical VFD/Dam Gate Control application using the MR361-2 Series FO Encoder Extender System

2.2 Applications

- Applications sensitive to interference
- Process control & automation systems
- Cranes and hoist systems (drum or draw wire)
- Dam gate systems (drum or draw wire)
- Motor drives
- High voltage plants
- Rolling mills

2.3 Features

- Provides interference free transmission up to 2000m
- Encoder signals pass safely through hazardous areas
- SSI Clock rate up to 1 MHz
- Status LED for monitoring of power supply and clock
- Compact DIN rail mount modules

3. Ordering Information and Contents

As shown in the reference drawings of Section 5 there are two wiring versions of the MR361-2 transmission modules, Wire Terminals versus DSub9 connector.

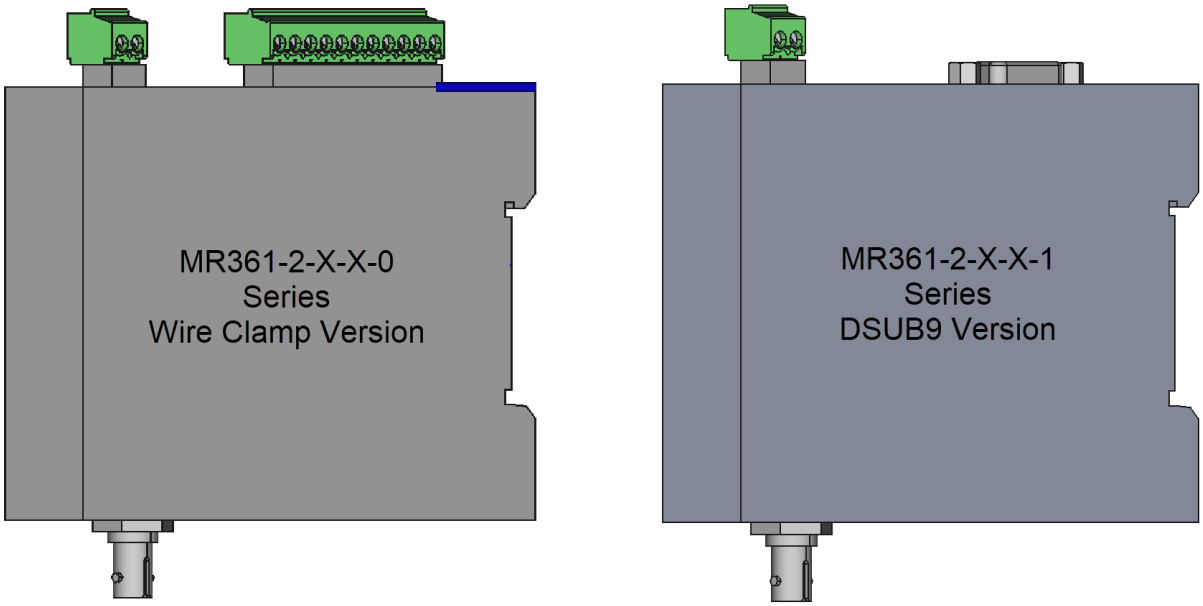

Figure 3. Two versions of the MR361-2 Modules - Wire Clamp vs. DSUB9 Connection

3.1 Model Numbers

Encoder Types	XMTR Modules		RCVR Modules	
	With Terminal Clamps (SAP P/N)	With DSUB9 Receptacle (SAP P/N)	With Terminal Clamps (SAP P/N)	With DSUB9 Receptacle (SAP P/N)
Encoder Type 0 +10-30 VDC Input Power with SSI Clock/Data RS422 Differential Line Driver Outputs	MR361-2-0-0-0 (9780.00.000)	MR361-2-0-0-1 (9780.00.100)	MR361-2-1-0-0 (9780.10.000)	MR361-2-1-0-1 (9780.10.100)
Encoder Type 1 +5VDC Input Power with SSI Clock/Data RS422 Differential Line Driver Outputs	MR361-2-0-1-0 (9780.01.000)	MR361-2-0-1-1 (9780.01.100)	MR361-2-1-1-0 (9780.11.000)	MR361-2-1-1 (9780.11.100)

Note: The XMTR and RCVR modules do not have to be for the same encoder type. Specifying a different RCVR module allows adapting signals to mismatched equipment/encoder interfaces. This is not a recommended practice but is a solution for those applications where the actual Encoder is incompatible with the downstream Encoder Interface on the motor drive.

Commercial grade ST-to-ST simplex fiber optic cable assemblies may be specified using the ordering code MR398-T16-AAxxx where xxx is the length in meters.

3.2 Standard Contents

For a complete transmission system, be sure to order both XMTR and RCVR modules:

- XMTR module as ordered
- RCVR module as ordered
- Instruction Manual (this document, one hard copy per shipment contain both XMTR and RCVR modules)

Optional Accessories:

- MR320A ST Bulkhead Adapters for interconnecting ST Extension Cables, if required
- MR398-T16-AAxxx ST Extension Cables for extended links, if required

3.3 Damaged In Shipment

In the event of a damaged instrument, write or call your nearest MICRONOR office in the USA or Europe. Please retain the shipping container in case reshipment is required for any reason.
If you receive a damaged instrument you should:

1) Report the damage to your shipper immediately.
2) Inform MICRONOR
3) Save all shipping cartons.

Failure to follow this procedure may affect your claim for compensation.

3.4 Warranty

MICRONOR AG warrants this product to be free from defects in material and workmanship for a period of (one) year from date of shipment. During the warranty period Micronor AG will, at their option, either repair or replace any product that proves to be defective.

To exercise this warranty, write or call your local MICRONOR AG representative or contact MICRONOR AG directly. You will be given prompt assistance and return instructions. Send the instrument, transportation prepaid, to the indicated service facility. Repairs will be made, and the instrument returned transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days.

Limitations of Warranty
This warranty does not apply to defects resulting from unauthorized modification or misuse of any product or part. This warranty also does not apply to Fiber Optic Connector interfaces, fuses, power supplies or AC line cords. This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability of fitness for a particular use. MICRONOR shall not be liable for any indirect, special or consequent damages.

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4. Installation and Operation

4.1 Mounting Modules on DIN Rail

Figure 4. Modules mount on standard 35mm DIN rail

Per detail shown in Figure 6, first clip the fixed (white side) mount into one side of DIN rail. Then snap the black, spring-loaded end into place.

Figure 5. Close up of DIN rail adapter on module

4.2 Electrical Connections to the Modules

There are two versions of the modules based on type of electrical connections provided:

- MR361-2-X-X-0 series, Wire Terminals Only (11C for Encoder and 2C for Power Supply)
- MR361-2-X-X-1 series, D-Sub (for Encoder) and 2C Wire Terminals (for Power Supply)

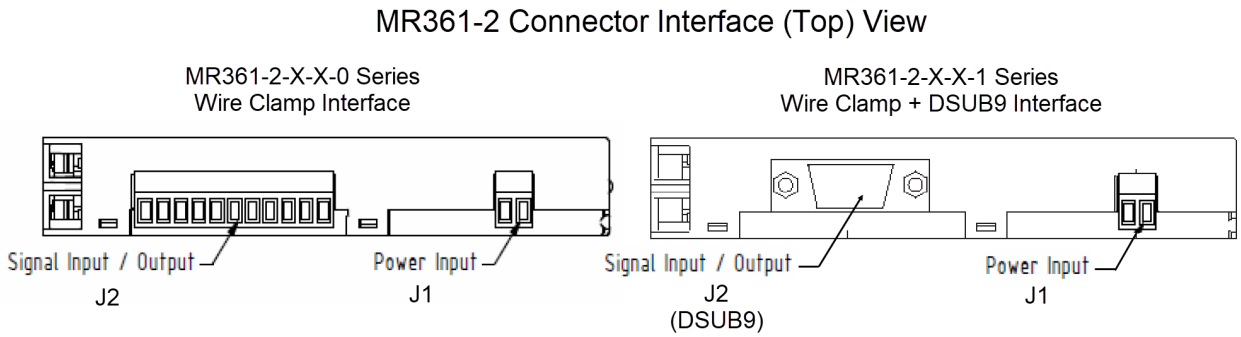


Figure 6. Views of MR361-2 Electrical Interface Options – Wire Clamp verus DSUB9

The following common guidelines should be followed for all electrical connections:

- Electrical connections should be limited to a maximum length of 10m.
- As a principle, the Data (D+ and D-) and Clock (C+ and C-) signals must always be routed as a pair, i. e. both wires of a signal must be routed in twisted pair cables (Shielded Twisted Pair STP is preferred over Unshielded Twisted Pair UTP). 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.
- The RS422 outputs on the signal receiver require a differential input impedance of 100-120Ω.
- The outputs of the of the modules are short-circuit proof to a limited extent only, so that is is absolute necessary to avoid a short circuit with each other or with the ground.
- Any exceed of the power supply for the modules with 5V power supply beyond a value of approximately 6V leads to the melting of the fuse located inside the unit and must therefore be avoided. For the modules with a power supply of 10-30V, this value is 33V. The fuse can only be replaced by the manufacturer. Any attempt to repair the device voids the warranty.

4.2.1 Electrical Connections for Modules with Wire Terminals

Figure 2 shows top, bottom and side views of the transmission modules with WIRE TERMINALS ONLY, part numbers XMTR Module MR361-1-0-X-X and RCVR modules MR361-1-1-X-X. Wire Terminals 1-6 on located on the top with Terminals 7-12.

- Wire length should not exceed 10m
- Min/Max conductor cross section is 0.14 mm^2 to 1.5 mm^2
- Min/Max conductor cross section is 28 AWG to 16 AWG
- Cable shield to be connected to 0V on both ends
- All modules are protected against reversed polarity, which can avoid any damage in case of wrong polarity.
- The outputs of the modules are only short-circuit-proof in certain conditions; avoid imperatively short-circuits between modules or with the earth.

The following table shows wiring connections to both XMTR and RCVR modules:

J1 Connector (Phoenix 1840366)	Terminal	XMTR Module Signal Description	RCVR Module Signal Description
Wire Terminals	1	0V In (power supply input)	0V In (power supply input)
	2	+Vin (power supply input)	+Vin (power supply input)

J2 Connector (Phoenix 1840450)	Terminal	XMTR Module Signal Description	RCVR Module Signal Description
Wire Terminals	1	0V- (pass through to Encoder)	0V- from Encoder Interface, alternate power supply input
	2	+Vin (pass through to Encoder	+Vin from Encoder Interface, alternate power supply input
	3	C+ (Clock output to Encoder_	C+ (to Drive)
	4	C-+ (Clock output to Encoder)	C- (to Drive)
	5	D+ (Data output from Encoder)	D+ (to Drive)
	6	D- (Data output from Encoder)	D- (to Drive)
	7	Input/Error status	Output/Error status
	8	---	---
	9	---	---
	10	---	---
	11	GND (chassis)	GND (chassis)

4.2.2 Electrical Connections for Modules with DSUB9 Interface

The righthand reference drawing of Figure 4 shows the location of the D-Sub connector (for encoder signals) and Wire Terminals 1-2 (for power supply connection), both along the top of the module. This configuration corresponds to part numbers XMTR Module MR361-1-0-X-1 and RCVR modules MR361-1-1-X-1. The following tables show wiring of the two connectors.

- Wire length should not exceed 10m
- Cable shield to be connected to 0V on both ends
- All modules are protected against reversed polarity, which can avoid any damage in case of wrong polarity.
- The outputs of the modules are only short-circuit-proof in certain conditions; avoid imperatively short-circuits between modules or with the earth.

J1 Connector (Phoenix 1840366)	Terminal	XMTR Module Signal Description	RCVR Module Signal Description
Wire Terminals	1	0V In (power supply input)	0V In (power supply input)
	2	+V (power supply input)	+Vin (power supply input)

J2 Connector (DSUB9)	Pin	XMTR Module Signal Description	RCVR Module Signal Description
DSUB	1	0V (internally connected to J1-1, pass-through to Encoder)	0V (from Encoder Interface, alternate power supply input, connected to J1-1)
	2	+V (internally connected to J1-2, pass-through to Encoder	+V from Encoder Interface, alternate power supply input, connected to J1-2)
	3	Input/Error status	Output/Error status
	4	D+ (Data output from Encoder)	D+ (to Encoder Interface)
	5	D- (Data output from Encoder)	D- (to Encoder Interface)
	6	C+ (Clock input to Encoder)	C+ (from Encoder Interface)
	7	C- (Clock input to Encoder)	C- (from Encoder Interface)
	8	---	---
	9	GND (chassis)	GND (chassis)

4.3 Fiber Optic Connections to the Modules

The MR361-2 modules feature a bayonet-style ST-PC optical interface located on the bottom. Be sure that the ST plug end face is clean before being installed into the ST receptacle. To prevent potential interface damage, be sure to align the key on the plug with the slot on the receptacle before beginning to insert the connector.

Figure 7. Location of ST optical interface on XMTR and RCVR Modules

- The modules may be connected using either 50/125 (OM2 or OM3) or 62.5/125 (OM1) multimode optical fiber cables. Single mode optical fibers cannot be used.
- Keep the dust protection covers of the optical transmitters and receivers, and put them back in place when no optical fiber is connected to the modules.
- Dust build-up on the optical interface can inhibit operation.
- ST connectors should be cleaned and visually inspected with an Inspection Microscope before connecting to optical interface.

4.4 Operating the Transmitter (XMTR) Module

Figure 8 shows the front controls of the XMTR and RCVR Modules.

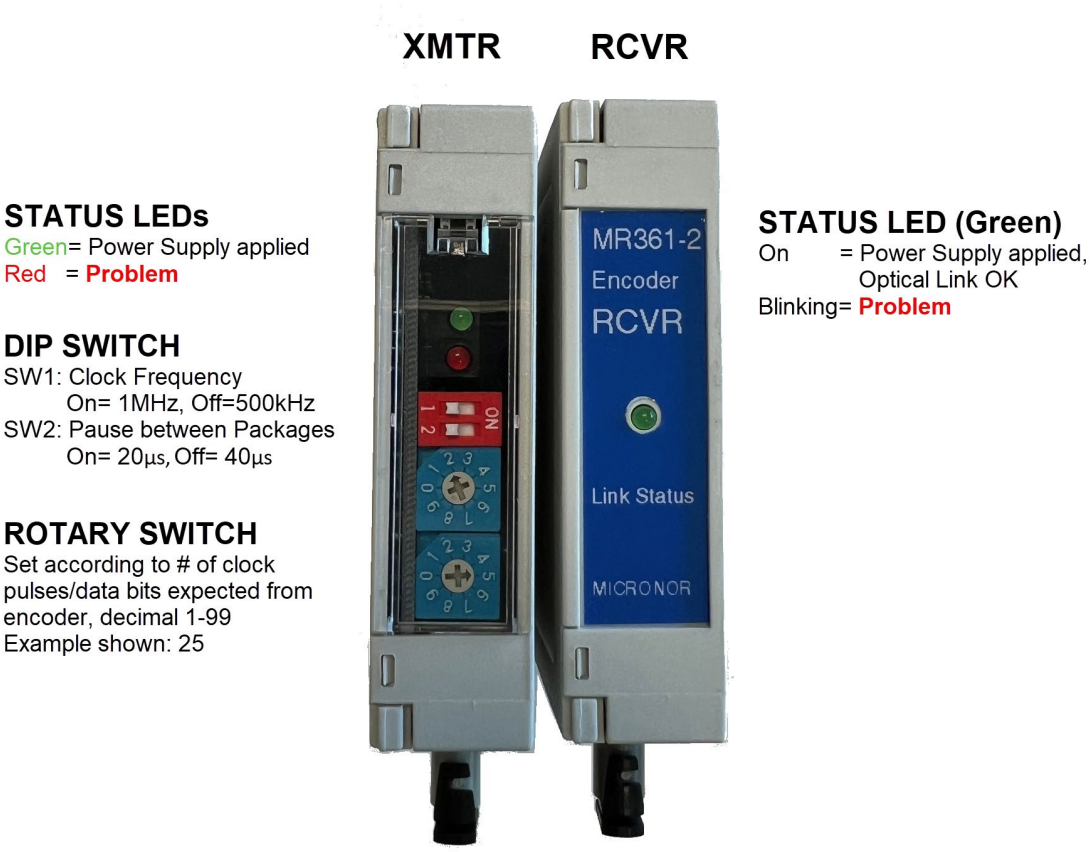


Figure 8. Front View and Controls/Status LEDs of the XMTR and RCVR Modules

After the connection of all lines, the DIP switches are to be set accordingly on the front side of the transmitter after removing the front panel (carefully press latch on the upper side down with a screwdriver).

DIP Switch SW1	Clock frequency for the sensor/encoder
On	1 MHz
Off	500 kHz

In the interest of a fast data update, the short time to be selected if the sensor/encoder allows this

DIP Switch SW2	Pause between the clock pulse packages
On	20 µs
Off	40 µs

In the interest of a fast data update, the shorter time is to be selected, provided that the monoflop time of the sensor/encoder allows this. The selected value must be larger thatn the monoflog time of the sensor or rotation encoder.

The red LED is used for checking the setting; if it lights up in the "On" setting, the monoflop time of the connected devices is larger than 20 µs. The switch is then to be set to "Off", after which the red LED must go out.

The rotary switches "X10" and "X1" allow setting the number of clock pulses. The setting range of the switches reaches from 1 to 99 bits. In switch position "00", no pulse is output; the clock output remains on logical High.

Example: a 25-bit multiturn encoder si connected. Switch "X10" is to be switched to setting2, switch "X1" to setting 5.

LED Signaling	Operating state
Power (green)	Power supply applied and poled correctly
Error (red)	Monoflop time of the connected device larger than the time set with SW2

4.5 Operating the Receiver (RCVR) Module

The optical fiber receiver does not require any settings. It is provided with the necessary control information together with the data from the transmitter.

Make sure that the correct pulse number is submitted for the read-out of the optical fiber receiver.

A round-loop operation with continuous clock pulse from the control is not provided.

If the control submits a greater pulse number than set on the transmitter, the data is output correctly up to the set pulse number. All further clock pulses from the clock lead to the output of zeroes at the data output.

The monoflop time of the optical fiber receiver is shorter than 12µs.

LED Signaling	Operating state
Power (green) light up permanently	Power supply applied and poled correctly; optical link is established
Power (green) flashes	Power supply of the optical fiber transmitter is missing or optical fiber breakage

Optical fiber receiver error output

- If the /Error and Status output of the encoder/sensor is to be evaluated, this output is availableon Pin 7 (11C Terminal Clamp) and Pin 2 (SubD). As on the sensor/encoder, it is implemented as an open-drain outlet with low active.
- The output can be loaded with 50mA and has a series resistance of 51Ω.
- For the proper operation of the output, the correct polarity of the connected electric circuit must be ensured.

4.6 Maintenance

- CLEANING: When switched off, the device can be cleaned using a dry cloth or cloth moistened with a soapy solution. In no case, use aggressive or solvent-containing substances to clear the device.
- MAINTENANCE: The modules are maintenance-free. It is forbidden for the user to carry out and repair work in case of damages due to transportation or storage or operation.
- WARRANTY: The warranty is void if the device is opened.

5. Specifications

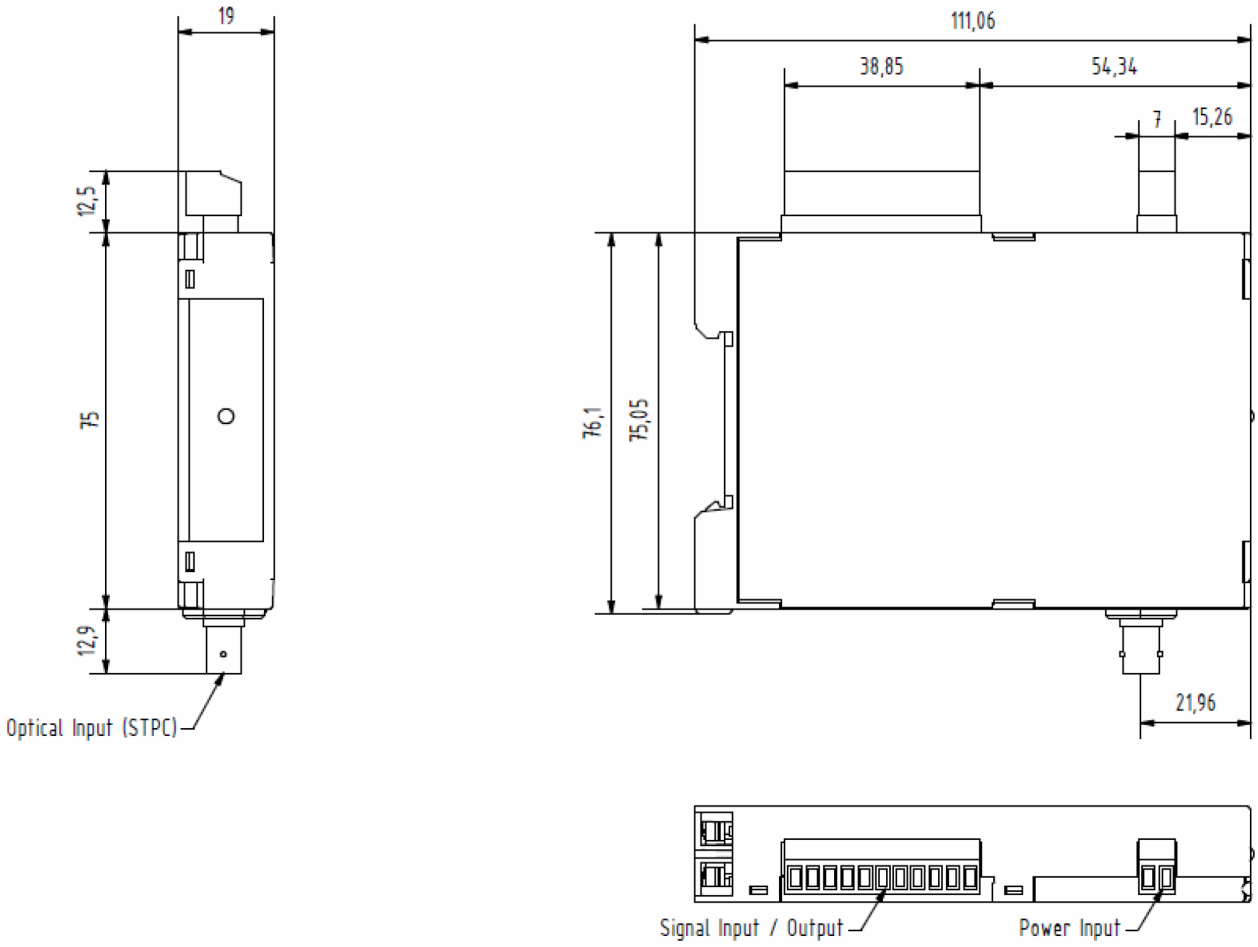
Encoder Compatibility	Type 0 10-30V DC	Type 1 5V DC
SSI Interface	*Clock, C+ and C-, RS422 Differential Line Driver* *Data, D+ and D1, RS422 Differential* Line Driver	
SSI Clock Frequency	Up to 1 MHz	
SSI Data Format	Front panel selectable, 1-99 bits	
Power Supply Requirements	+10-30V DC +Vout on Transmitter Module passes power to the SSI Encoder	+5V DC ±5% +Vout on Transmitter Module passes power to the SSI Encoder
Optical Interface	**Eye Safe, Inherently safe optical radiation**	
Optical Interface	ST-PC receptacle, located on bottom of module	
Optical Fiber Compatibility	OM1, 62.5/125µm Graded Index MMF or OM2/OM3/OM4 50/125 Graded Index MMF	
Link Distance	Lesser of 6 dB or 2 km	
Optical Transmitter	850nm, LED	
Optical Transmission Rate	10 Mbit/s	
Optical Synchronization	Indicated by LED on RCVR	
Electrical Interface	**Specification**	
Wire Terminal	Min/Max conductor cross section, 0.14 mm^2 to 1.5mm^2 Min/Max conductor gauge, 28 AWG to 16 AWG	
DSUB9	9 pin, DSub connector (also called RS232 COM Port connector)	
Power Supply Requirements	Depending on model, 5V ±5% VDC or 10-30 VDC, <1 Watts NOTE There is an internal fuse for protecting overvoltage to the modules For 5V models (exceeding 6V) or 10-30V models (exceeding 33V), exceeding this voltage leads to the destruction of the fuse located inside of the device and must thus be avoided. The fuse must be replaced by the manufacturer's factory. Any attempt to repair the device will void the warranty.	
Environmental Specifications	**Specification**	
Temperature Range	-10°C to +70°C (+14°F to +140°F)	
Humidity	0% to 90% RH (non-condensing)	
Ingress Protection	IP40, terminals IP20	
Physical Specifications	**Specification**	
Mounting	35mm DIN Rail	
Housing (W x L x H)	Wire Clamp Version: 19.0 x 111.06 x 100.4 mm (0.89 x 4.37 x 3.95 inches)	
Weight	85 g (3.0 oz)	

Specifications subject to change without notice

6. Mechanical Reference Drawings

6.1 MR361-2-X-X-0 Series (Phoenix Terminal Clamp version)

Dimensions in mm



6.2 MR361-2-X-X-1 Series (DSUB9 version)

Dimensions in mm