

# LUMEL

SATELLITE TIME RECEIVER

# STR



SERVICE MANUAL

CE

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## 1. Application

The STR receiver is a device designed to continuously receive a satellite signal containing highly accurate information on the current real time. The processed satellite signal is made digitally available on the built-in RS-485 interface and can be used to synchronise the real time of the device connected to this interface.



*Fig. 1. View of STR receiver with antenna connected*

## 2. STR receiver set

- STR receiver 1 pc.
- GPS antenna 1 pc.
- Detachable 5-pin screw connector 1 pc.

### 3. Basic requirements, operational safety

In terms of safety of use, the STR receiver complies with the requirements of EN 61010-1.



#### **Safety considerations**

- The assembly and installation of electrical wiring shall be done by personnel licensed for professional installation of electrical equipment.
- Before switching on the STR receiver, check that the connections are made properly.
- The STR receiver is intended for installation and operation in industrial electromagnetic environmental conditions.
- A service disconnect or circuit breaker must be installed in the building's system, close to the unit, easily accessible to the operator and appropriately marked for identification.

### 4. Installation

#### 4.1. Mounting method

The STR receiver is mounted on the wall with a screw connection.

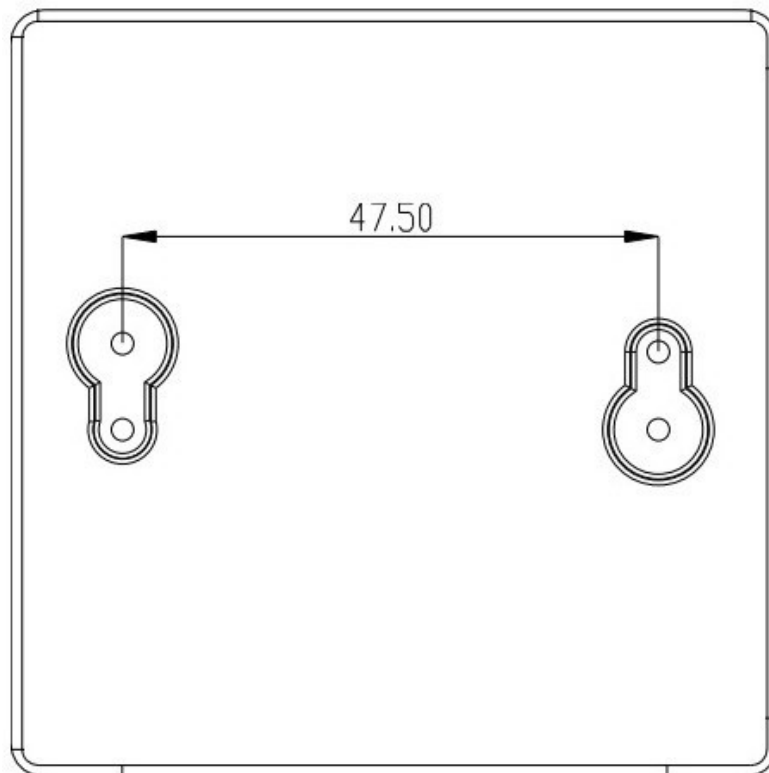
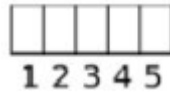


Fig. 2 Positioning of mounting holes

## 4.2. External connections

The STR receiver has one detachable 5-terminal screw socket for power and RS-485 interface, and a SMA female connector for connecting an external GPS antenna with a SMA male connector.



- |                     |                  |
|---------------------|------------------|
| 1 – GND             | 3 – RS-485 (GND) |
| 2 – Vcc (9-28 V DC) | 4 – RS-485 (A)   |
|                     | 5 – RS-485 (B)   |

Fig. 3 Power supply and RS-485 interface connector



Fig. 4. GPS antenna socket and GPS antenna

## 5. Operation

After mounting, connecting the cables, connecting the GPS antenna and switching on the power, the receiver is ready for operation. Make sure that the GPS antenna is placed where it will have a clear view of the sky. Otherwise, GPS signal reception may be obstructed or impossible.

The STR receiver receives the satellite signal via the built-in GPS module and the GPS antenna connected to it. The current real time data from the GPS module (GPGGA-type frame compliant with the NMEA standard) is processed and, in the form of a binary frame, is cyclically transmitted via the RS-485 interface. The binary frame is 22 bytes in size and contains information on current real time, geographical position, altitude relative to mean sea level (MSL), and the number of satellites used and the validity of the data. The frame is protected by a checksum.

The format of the binary frame is shown in the table below.

Byte number	Data size	Scope of changes	Description
0	8-bit	85 (0x55)	Frame start marker, always 85
1	8-bit	0-12	Number of satellites used during positioning
2	8-bit	0-1	Positioning status: 0 - position invalid (no fix) 1 - position valid (GPS fix)
3	8-bit	0	Not used
4-7	32-bit (float)	-90.0° .. 90.0°	Geographical latitude: < 0.0° – south (S) > 0.0° – north (N)
8-11	32-bit (float)	-180.0° .. 180.0°	Geographical longitude: < 0.0° – west (W) > 0.0° – east (E)
12-15	32-bit (float)	According to WGS-84 <sup>*)</sup>	Altitude above mean sea level (MSL)
16-19	32-bit (uint32)	0-235959	Current local time (UTC)
20-21	16-bit (uint16)	0-65535	CRC16 checksum

\*) The WGS-84 defines the size and shape of the Earth, defining an ellipsoid that forms the primary datum for satellite navigation systems.

The STR receiver sends a binary frame via the RS-485 interface with a time interval determined by the time interval for receiving a GPGGA frame by the GPS module, and is approximately 1 second.

**Note:** as the STR receiver sends data via the RS-485 interface in asynchronous mode (with an interval of 1 second), it must be connected independently to the dedicated RS-485 port of the receiving device. If data from other devices appears on the RS-485 bus during frame transmission by the STR receiver, this may result in transmission interference and loss of data.

The transmission parameters for receiving the frame are:

Baud rate: **9600**

Number of data bits: **8**

Parity check: **none**

Number of stop bits: **1**

## 6. Technical Data

### Rated operating conditions:

– supply	9...28 V DC
– power consumption	< 2 VA
– ambient temperature	- 20 .. <u>23</u> -60 °C
– relative humidity:	< 95%
– class of protection provided by the housing	IP 20
– mounting method	on the wall
– weight	< 0.3 kg
– dimensions	(71 x 71 x 27) mm
– working position:	any

### GPS:

– receiver type	50 GPS L1 C/A channels
– accuracy	2.5 m CEP
– Targeting speed:	
cold start	27 s
assisted start	< 3 s
hot start	1
– sensitivity:	
tracking mode	-161 dBm
cold start	-147 dBm
hot start	-156 dBm
– antenna	passive/active

### RS-485 interface:

– protocol	binary
– baud rate	9600 bit/s
– transmission mode	8N1
– frame transmission interval	1 s

### Electromagnetic compatibility:

– immunity to electromagnetic interference	according to EN 61000-6-2
– electromagnetic interference emission	according to EN 61000-6-4

**Safety requirements according to EN 61010-1**

- installation category III
- pollution degree 2
- operating voltage to earth value 50V
- maximum installation elevation < 2000m



## 7. Ordering code

<b>STR receiver</b>	<b>XX</b>	<b>X</b>	<b>X</b>
<b>Design</b>			
Standard	00		
Special*	XX		
<b>Language version:</b>			
Polish/English		M	
other**		X	
<b>Delivery tests:</b>			
without additional requirements with quality control certificates as agreed with the customer			0
			1
			X

\* - Design in accordance with the agreement with the manufacturer.

### Code example:

**STR-00M0** stands for the STR receiver in standard design with abbreviated operation manual in Polish and English, with Quality Control certificate.

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