

Wireless access point

WOP-2ac

User manual

Firmware version 1.22.2

IP address: 192.168.1.10

Username: admin

Password: password

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1 Introduction

1.1 Annotation


Modern tendencies of telecommunication development necessitate operators to search for the most optimal technologies, allowing you to satisfy drastically growing needs of subscribers, maintaining at the same time consistency of business processes, development flexibility and reduction of costs of various services provision. Wireless technologies are spinning up more and more and have paced a huge way for short time from unstable low-speed communication networks of low radius to broadband networks equitable to speed of wired networks with high criteria to the quality of provided services.


WOP-2ac is a Wi-Fi access point of Enterprise class. The device is enclosed into hermetic case which allows using the access point outdoor in different climatic conditions at temperatures from -40 °C to +65 °C.

This manual specifies intended purpose, main technical parameters, design, installation procedure, safe operation rules and installation recommendations for WOP-2ac.

1.2 Symbols

Notes and warnings

 Notes contain important information, tips or recommendations on device operation and setup.

 Warnings are used to inform the user about harmful situations for the device and the user alike, which could cause malfunction or data loss.

2 Device description

2.1 Purpose

WOP-2ac wireless access point (hereinafter the device) is designed to provide users with access to a high-speed and safe network.

The device provides easy and secure access to a high-performance wireless network combining numerous features and services that are necessary for comfortable user access to operator services in crowded areas. WOP-2ac provides connection of up to 70 users. The device is used to organize wireless network for different climate conditions in a wide range of operating temperature and high humidity (parks, factories, stadiums, etc.) and it is the perfect platform for organization of connection in cottage settlements and remote communities.

Access point power is supplied by PoE+ technology.

2.2 Device specification

Interfaces:

- 1 port of Ethernet 10/100/1000BASE-T (RJ-45, optionally);
- 1 port of 100/1000BASE-X (SFP is presented in a particular modification, specify when ordering);
- 4 N-type connectors for external antennas (Omni, sectoral, panel, etc.);
- Wi-Fi 2.4 GHz IEEE 802.11b/g/n;
- Wi-Fi 5 GHz IEEE 802.11a/n/ac.

Functions:

WLAN capabilities:

- support for IEEE 802.11a/b/g/n/ac standards;
- data aggregation, including A-MPDU (Tx /Rx) and A-MSDU (Rx);
- WMM-based priorities and packet planning;
- Dynamic Frequency Selection (DFS);
- support for hidden SSID;
- 32 virtual access points;
- third-party access point detection;
- APSD;
- WDS;
- MESH.

Network functions:

- autonegotiation of speed, duplex mode and switching between MDI and MDI-X modes;
- support for VLAN;
- 802.1X authentication support;
- DHCP client;
- LLDP;
- ACL;
- support for IPv6;
- GRE.

Cluster operation mode:

- organizing a cluster with capacity of up to 64 access points;
- load balancing among access points in a cluster;
- auto synchronization of access point configurations in a cluster;
- Single Management IP – united address to control access points in a cluster;
- automatic distribution of frequency channels among access points;
- automatic distribution of radiated power level among access points.

QoS functions:

- priority and profile-based packet scheduling;
- capacity limitation for each SSID;
- changing WMM parameters for each radio interface.

Security:

- e-mail notifying on system events;
- centralized authorization via RADIUS server (WPA Enterprise);
- WPA/WPA2 data encryption;
- support for Captive Portal;
- support for Internet Protocol Security (IPSec);
- support for WIDS/WIPS.

2.3 The device technical parameters

Table 1 – The device main technical parameters

WAN interface parameters	
Number of ports	1 (2 for WOP-2ac SFP)
Connector	1 port of Ethernet 10/100/1000BASE-T (RJ-45, optionally) 1 port of Ethernet 100/1000BASE-X (SFP, optionally) 1 port of 1000 PON (GPON, optionally)
Wireless interface parameters	
Standards	802.11a/b/g/n/ac
Frequency range	2412-2480 MHz, 5150-5850 MHz
Modulation	CCK, BPSK, QPSK, 16QAM, 64QAM, 256QAM
Operating channels	802.11b/g/n: 1–13 (2412–2472 MHz) 802.11a/ac: 36-64 (5180–5320 MHz) 100-144 (5500–5720 MHz) 149-165 (5745–5825 MHz)
Speed of data transmission	6, 9, 12, 18, 24, 36, 48, 54, MCS0-MCS15, MCS0-9 NSS1, MCS0-9 NSS2 802.11n: 300 Mbps 802.11ac: 867 Mbps
Maximum output power of the transmitter	2.4 GHz up to 18 dBm 5 GHz: up to 21 dBm
Receiver sensitivity	2.4 GHz up to -98 dBm 5 GHz: up to -94 dBm
Security	Centralized authorization via RADIUS server (WPA Enterprise) WPA/WPA2 data encryption Captive Portal IPsec
Selection of antenna model depends on access point usage	
Support for 2x2 MIMO	
Control	
Remote control	Web interface, Telnet, SSH, SNMP, EMS management system Firmware updating through DHCP Autoprovisioning
Access restriction	by password, by IP address

General parameters	
NAND	128 MB NAND Flash
RAM	256 MB RAM DDR3
Power supply	PoE+ 48 V/54 V (IEEE 802.3at-2009)
IP protection class	IP-67
Electromagnetic compatibility	CE
Power consumption	no more than 19.5 W
Operating temperatures	from -40 to +65° C
Relative humidity at 25°C	from 5% to 90%, non-condensing
Dimensions (WxHxD)	200x227x48 mm
Weight	1 kg

2.4 Design

WOP-2ac enclosed in plastic case. The layout of WOP-2ac is shown in the figure below.

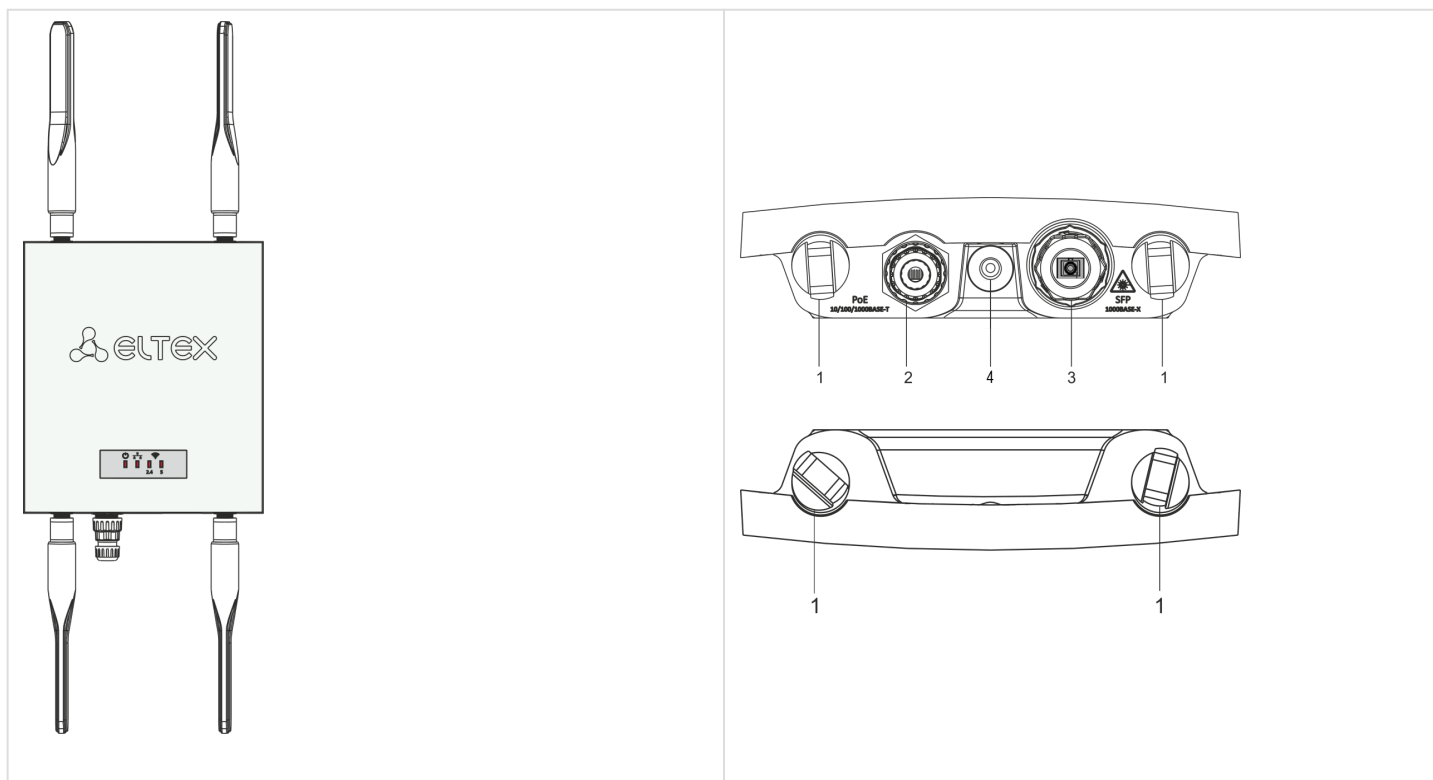


Figure 1 – WOP-2ac side panel layout

Connectors and controls located on the device panels are listed in Table 2.

Table 2 – Description of ports and controls

Panel element	Description	
1	4 connectors for external antennas	
2	Port 0 (PoE)	10/100/1000BASE-T port (RJ-45 with PoE+ support)
3	SFP	SC/UPC optical connector (only for WOP-2ac SFP) or SC/APC (only for WOP-2ac GPON)
4	F	Functional button

2.5 Light indication

The current device state is displayed by **Wi-Fi, LAN, Power** indicators. The list of indicators' possible states is given below.

Table 3 – Light indication of device state

LED	LED status	Device state
Wi-Fi	solid green	Wi-Fi network is enabled
	flashing green	the process of data transmission through a wireless network
LAN	solid green (10, 100 Mbps)/ solid orange (1000 Mbps)	the link with the connected network device is established
	flashing green	the process of packet data transmission through LAN interface
Power	solid green	the device power supply is enabled, normal operation, IP address is obtained
	solid blue	device heating is enabled, it is necessary to wait for device heating (it may take up to 25 minutes depending on ambient temperature)
	solid orange	the device is loaded but IP address is not received via DHCP
	solid red	the device is loading

2.6 The device schematic structure

Figure 2 shows WOP-2ac schematic structure.

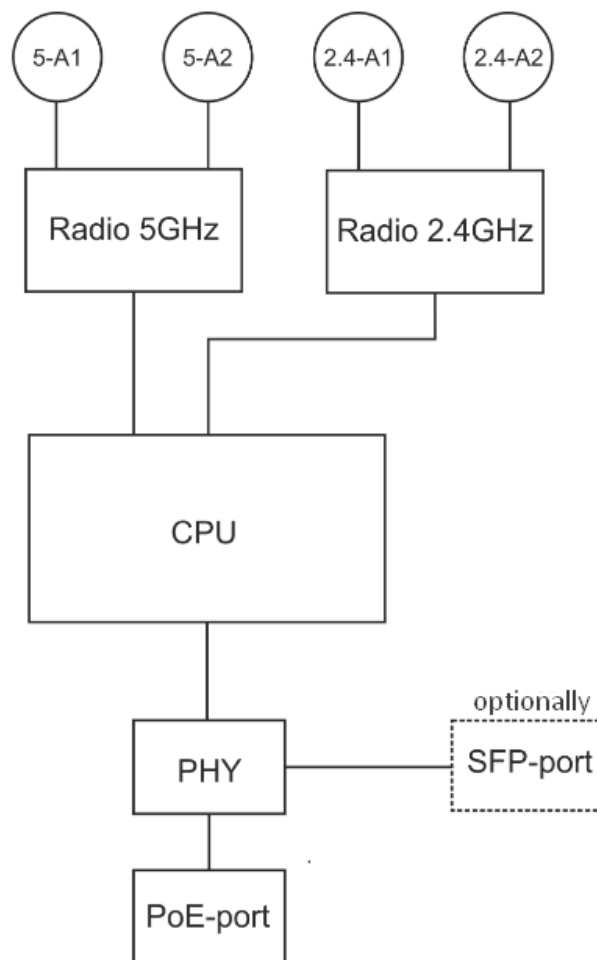


Figure 2 – WOP-2ac schematic structure

- 5-A1, 5-A2, 2.4-A1, 2.4-A2 – connectors for external antennas;
- Radio 5 GHz, Radio 2.4 GHz – radio interfaces that performs reception and transmission of data in wireless networks;
- CPU – controller performing the device control and monitoring;
- PHY – a controller performing data transmission via wired network;
- Port 0 (PoE) – Gigabit Ethernet connector with PoE technology allows you to supply access point and to provide access speed of up to 1 Gbps;
- SFP port – optical connector that provides up to 1 Gbps access rate.

Reset to factory setting

In order to reset the device to factory settings, press and hold the 'F' button within 15 seconds when the device is in loaded state. The device will be rebooted automatically. DHCP client will be launched by default. If the address is not received via DHCP, the device will have IP address – 192.168.1.10, subnet mask – 255.255.255.0 and User Name/Password to access via Web interface: *admin/password*.

2.7 Delivery package

The delivery package includes:

- WOP-2ac wireless access point;
- Mounting kit;
- 1 connector for RJ-45;
- User manual on a CD (optionally);
- Conformity certificate;
- Technical passport.

2.8 Installation order

This section defines safety rules, installation recommendations, setup procedure and the device starting procedure.

2.9 Safety rules

1. Do not open the device case. There are no user serviceable parts inside.
2. It is required to cover unused antenna connectors by safety cover included in the device delivery package.
3. Do not install the device during a thunderstorm. There is a risk of being struck by lightning.
4. Follow requirements for voltage, current and frequency specified in this manual.
5. Measuring devices and computer must be grounded before connecting to the device. Potential difference between cases of equipment and measurement devices must be no more than 1 V.
6. Check the cable integrity and security of mounting to the connectors.
7. Do not install the device near heat source and at places where temperature may reach values below -40° C or higher 60° C.
8. During installation of the device on high-rise structures, the established norms and requirements for work at height must be observed.
9. The device exploitation should be performed by specially prepared engineering and technical personnel.
10. Connect only to operational service equipment.

2.10 Installation recommendations

1. The recommended mounting position: attached to a mast/pole or a wall;
2. Before installing and enabling device, check it for visible mechanical defects. If defects are observed, stop the device installation, draw up corresponding act and contact the supplier.
3. During the device installation, follow these rules to ensure the best Wi-Fi coverage:
 - a. Install the device at the center of a wireless network;
 - b. Minimize the number of obstacles (walls, roof, furniture and etc.) between WOP-2ac and other wireless network devices;
 - c. Do not install the device near (about 2 m) electrical and radio devices;
 - d. It is not recommended to use radiophone and other equipment operating on the frequency of 2.4 GHz, 5 GHz in Wi-Fi effective radius;
 - e. Obstacles in the form of glass/metal constructions, brick/concrete walls, water cans and mirrors can significantly reduce Wi-Fi action radius.
4. During the installation of several access points, cell action radius must overlap with action radius of a neighbouring cell at level of $-65 \div -70$ dBm. Decreasing of the signal level on cells borders to -75 dBm is permitted if it involves the use of VoIP, streaming video and other traffic that is sensitive to losses in wireless network.

2.11 Calculating the number of required access points

Table 4 – Attenuation values

Material	Change of signal level, dB	
	2.4 GHz	5 GHz
Organic glass	-0,3	-0.9
Brick	-4.5	-14.6
Glass	-0.5	-1,7
Plaster slab	-0.5	-0.8
Wood laminated plastic	-1.6	-1.9
Plywood	-1.9	-1.8
Plaster with wire cloth	-14.8	-13.2
Breezeblock	-7	-11
Metal lattice (mesh 13*6 mm, metal 2mm)	-21	-13

2.12 Channel selection for neighboring access points

It is recommended to set nonoverlapping channels to avoid interchannel interference among neighboring access points.

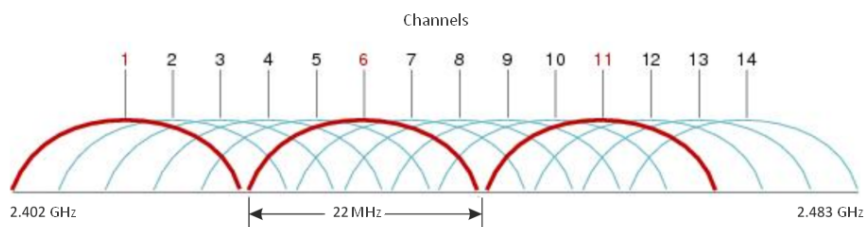


Figure 3 – General diagram of frequency channel closure in the range of 2.4 GHz

Example of channel allocation scheme among neighbouring access points in frequency range of 2.4 GHz when channel width is 20 MHz, see Figure 4.

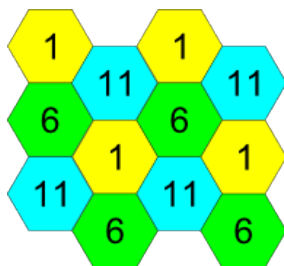


Figure 4 – Scheme of channel allocation among neighbouring access points in the frequency range of 2.4 GHz when channel width is 20 MHz

Similarly, the procedure of channel allocation is recommended to save for access point allocation between floors, see Figure 5.

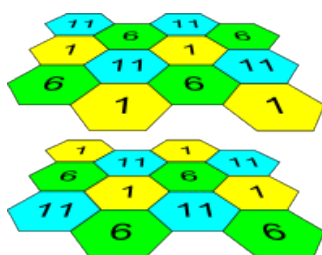


Figure 5 – Scheme of channel allocation between neighbouring access points that are located between floors When width of used channel is 40 MHz there is no non-overlapping channels in frequency range of 2.4 GHz. In such cases, you should select channels maximally separated from each other.

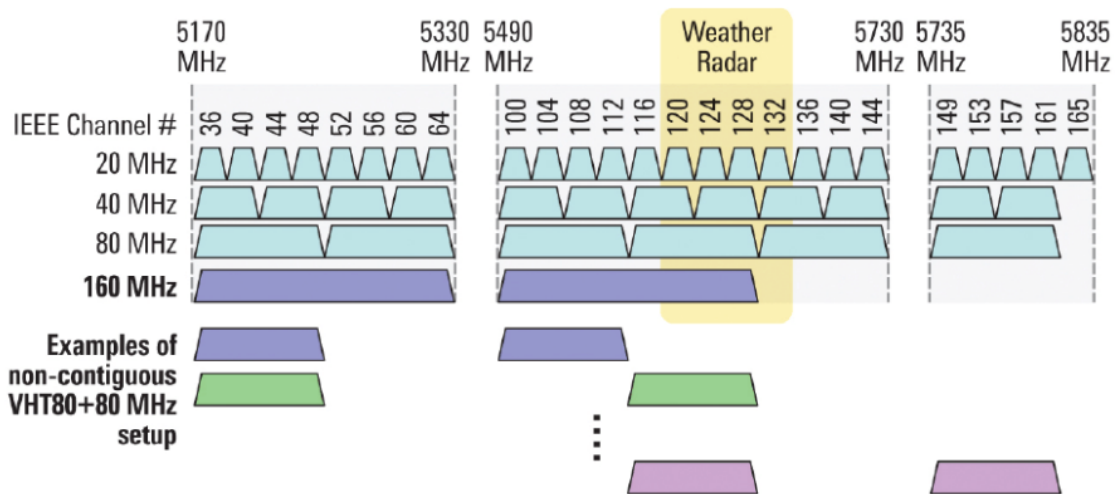


Figure 6 – Channels used in range of 5 GHz when channel width is 20, 40 or 80 MHz

2.13 The device installation

The device should be attached to a mast/pole or a wall in accordance with the safety instruction and recommendations listed above.

The device delivery package includes required mounting kit to attach the device to a mast/pole and wall.

The device installation order:

1. Mount brackets to the device;
2. Attach the device to a mast/pole or wall;
3. Connect cables to the device connectors;
4. Set up antennas.

⚠ Dust-protecting covers must be installed on the antenna connectors included in the device delivery package. The covers must be removed immediately before connecting to the antenna connectors.

2.13.1 Algorithm of device mounting to a mast/pole

1. Mount the bracket for attaching to a mast/pole:

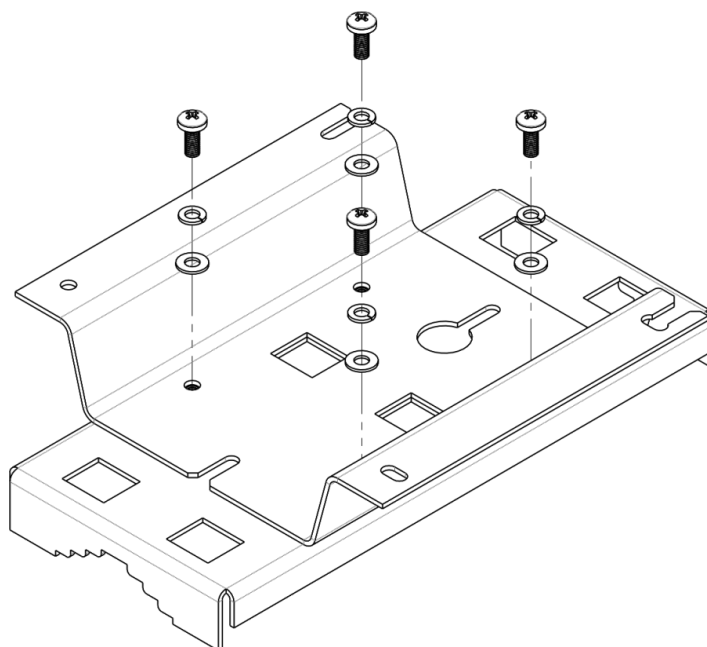


Figure 7 – Bracket for attaching to mast/pole

- a. Connect bracket, that will be attached to a mast/pole, to bracket, that will be attached to the device, as shown in Figure 7.
- b. Align two screw holes of both brackets. Attach brackets together by using screwdriver.

2. Attach the bracket to a mast/pole:

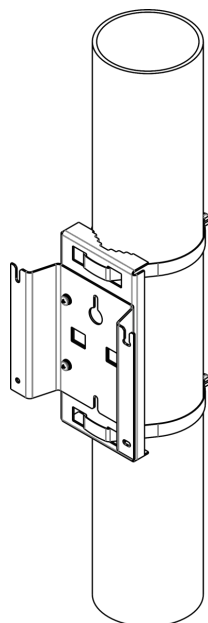


Figure 8 – Mounting bracket on a mast/pole

a. Fix bracket on mast/pole by using clamps, see Figure 8.

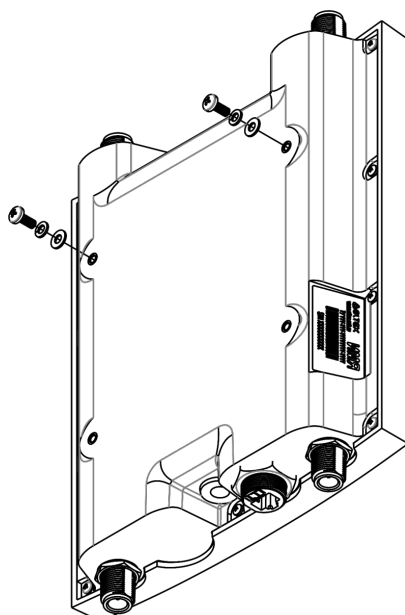


Figure 9 – Mounting screws to the device

b. Install DIN7985 M6 screws in the top holes. Do not screw them fully. Leave at least 3 mm gap, see Figure 9.

3. Attach the device to a mast/pole:

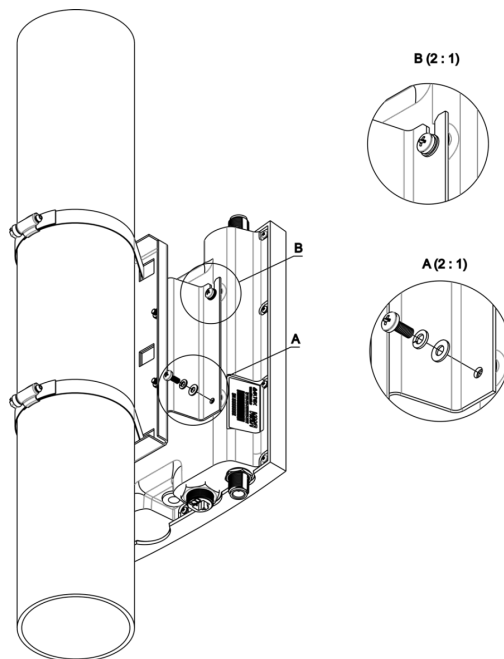


Figure 10 – Mounting the device on a mast/pole

- Install the device on the top untwisted screws of a bracket attached to a mast/pole, see Figure 10.
- Install screws to the bottom bolthole, see Figure 10.
- Tight up the top and bottom screws by using screwdriver.

2.13.2 Order for wall-mounting brackets

1. Fix the bracket (included in the delivery package) to the wall:

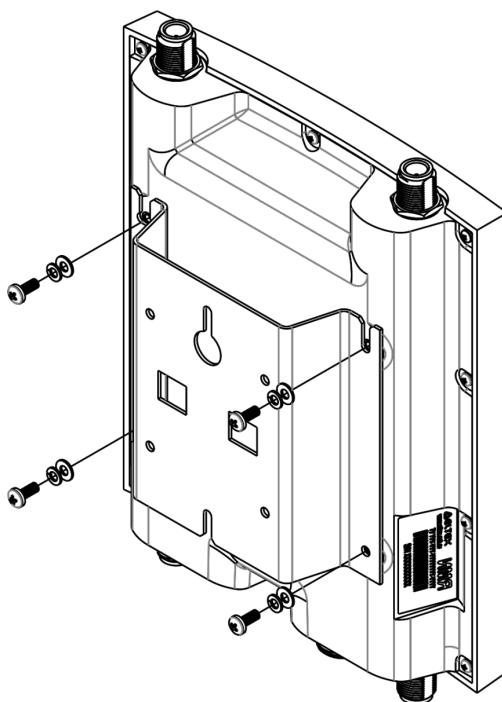


Figure 11 – Mounting bracket on a mast/pole

- a. Figure 11 shows the position of brackets on the device.
- b. Align four screw holes on bracket with the same screw holes on the device. Attach brackets with screws to the device by using screwdriver.

2. Install screws on the wall leaving 100 mm distance between each screw as shown in the Figure 12.

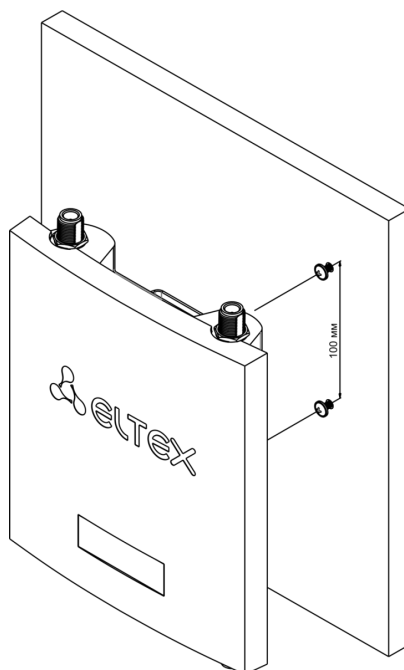


Figure 12 – Wall-mounting the device

3. Fix the device on the wall Dimensions of the device after installation corresponding mounting holes are shown in the Figure 13.

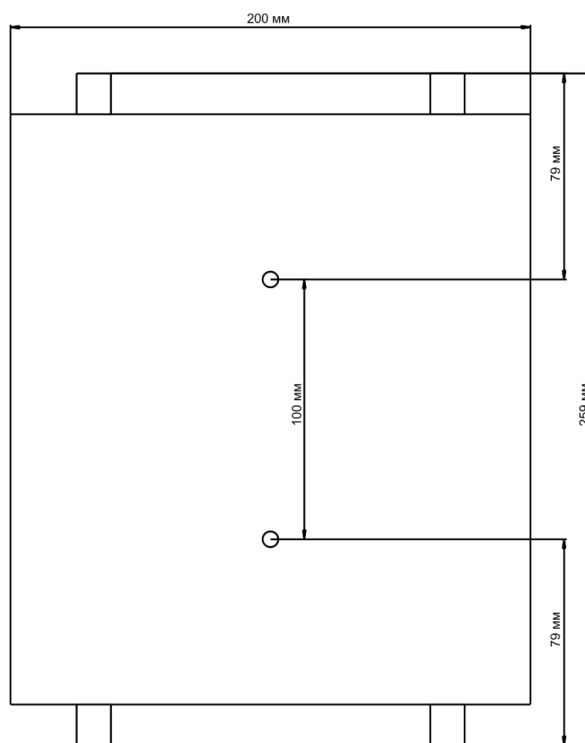


Figure 13 – Device dimensions in relation to mounting holes

2.13.3 Network cable connection

- ❗ The hardware versions 1v0, 1v1 and 1v2 use a metal connector and a metal mating part. Hardware versions 1v3 and above use the plastic connector and the plastic counterpart. Do not use the plastic counterpart with the metal connector and the metal counterpart with the plastic connector. It can lead to violation of tightness of the device.

To protect against corrosion, the delivery set of the device includes a counterpart of a hermetically sealed RJ-45 connector.



Figure 14 – Hermetically sealed RJ-45 connector of the device and counterpart in disassembled state for hardware versions 1v0, 1v1 and 1v2



Figure 15 – Hermetically sealed RJ-45 connector of the device and counterpart in disassembled state for hardware versions 1v3 and higher



Figure 16 – Counterpart of hermetically sealed metal connector

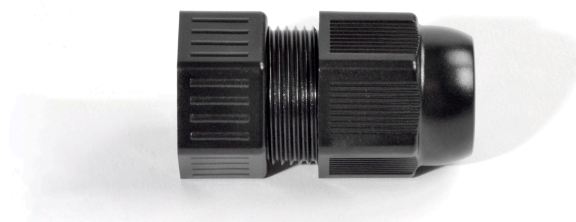


Figure 17 – Counterpart of hermetically sealed plastic connector

⚠ Installation of the counterpart of the connector on the cable should be done before crimping the cable.

Step-by-step installation:

1. Insert the cable into the housing through the outer retaining nut as shown in figures 18 and 19. Tighten the outer retaining nut to secure the housing to the cable.



Figure 18 – Fastening the metal counterpart to the cable



Figure 19 – Fastening the plastic counterpart to the cable

2. Perform crimping of the cable using a standard RJ-45 connector.

When connecting, use the diagram shown in the figure below.

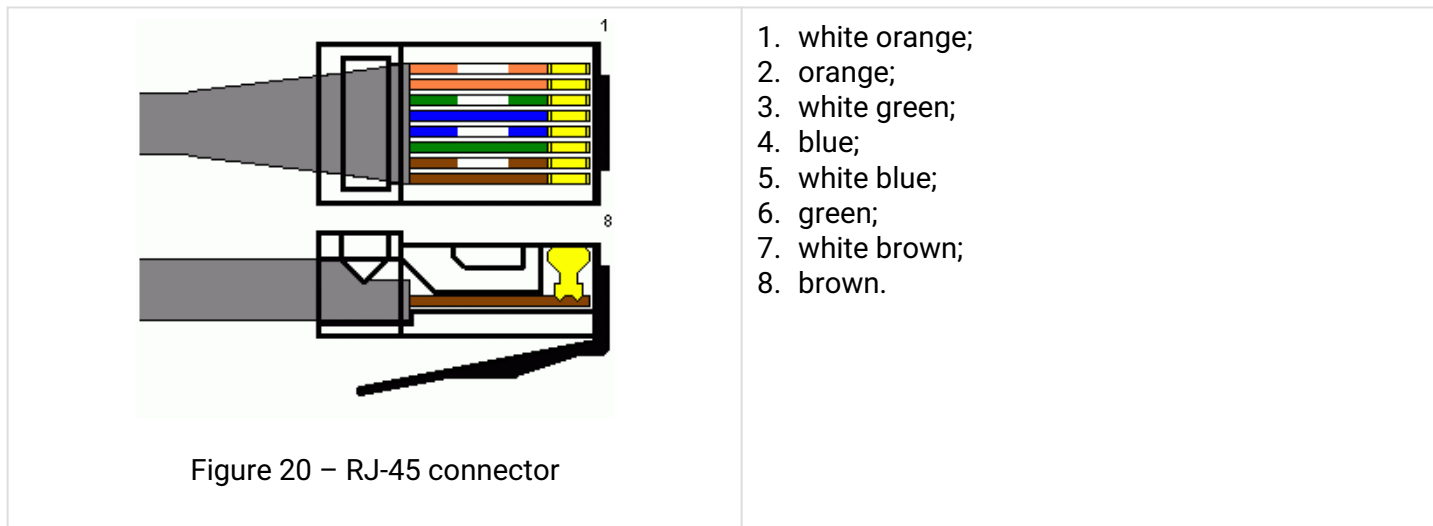


Figure 20 – RJ-45 connector

3. After crimping, loosen the outer retaining nut and insert the connector all the way into the slot of the connector counterpart. The tongue of the connector should be pressed against it. Tighten the outer retaining nut to secure and seal the connector.



Figure 21 – View of the metal counterpart attached to the cable



Figure 22 – View of the plastic counterpart attached to the cable

4. Insert the counterpart in the socket and tighten the mounting nut well. It depends on the reliability of the contact and tightness of the connector.



Figure 23 – View of the connected cable to the device network interface



Figure 24 – View of the connected cable to the device network interface

2.13.4 Antenna connector sealing procedure

⚠ Sealing should be performed on both sides of the cable.

1. Before connecting the cable to the connector, inspect the cable braid for damage and check for an O-ring in the nut of the connector, the location is shown in Figure 25 (a, b).



Figure 25a



Figure 25b

2. Connect the cable to the connector of the device (antenna) and tighten the nut, as shown in Figure 26 (a, b).



Figure 26a



Figure 26b

3. Cut the rubber sealing tape to the appropriate length: 0.15 m of waterproofing tape is required to seal one SMA connector (Figure 26a), 0.3 m of waterproofing tape is required for an N-type connector (Figure 26b), as shown in Figure 27 (a,b).

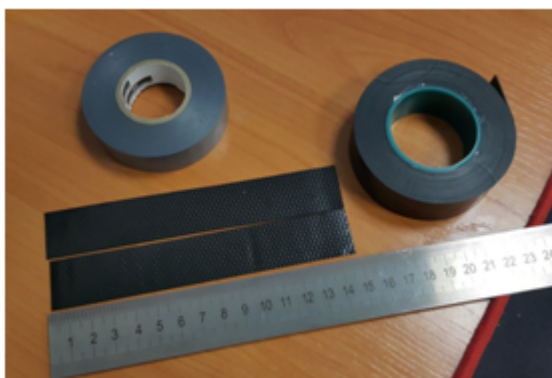


Figure 27a



Figure 27b

4. Remove the protective layer from the rubber band as shown in Figure 28.



Figure 28

5. Start wrapping from the cable side, with a 10-15 mm step away from the crimped part. Fix the end of the tape on the cable braid at an angle of 15...25 degrees to the cable axis, and, stretching the tape slightly, start wrapping the cable and the connector, advancing towards the device body. Lay the coils overlapping each other, no folds are allowed on the coils. The cable wrapping is shown in Figure 29 (a, b).



Figure 29a



Figure 29b

6. Having reached the housing of the device (antenna) by the edge of the tape, it is required to make a turn around the connector, pressing the edge of the tape to the housing as much as possible, then continue winding the tape at a different angle, moving away from the housing. When winding, do not forget to stretch the tape and press it tightly to the previously wound coils. At the tip of the tape, reduce the stretch and press it tightly against the coils on the cable braid, as shown in Figure 30 (a, b).



Figure 30a



Figure 30b

7. Cut PVC tape (duct tape) to the appropriate length: 0.28 m of duct tape is required to seal one SMA connector, 0.6 m of duct tape is required for an N-type connector. Tape is required to protect the rubber band from UV rays. The duct tape is shown in Figure 31.

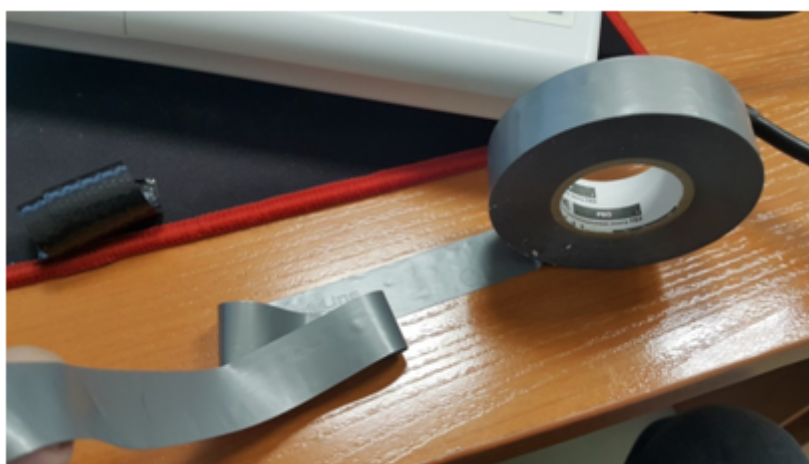


Figure 31

8. Start wrapping from the cable braid, having preliminarily stepped back from the first coil of the rubber tape by 5-10 mm. Fix the end of the tape on the cable at an angle of 15-25 degrees to the cable axis, and, slightly stretching the tape, start wrapping the cable and the connector, advancing towards the device body. Lay the coils overlapping each other, avoiding folds on the coils. The winding of the cable is shown in Figure 32.



Figure 32

9. Having reached the housing by the edge of the tape, turn around the connector pressing the edge of the tape to the housing as much as possible, then continue winding the tape at a different angle, moving away from the housing. When winding the tape tightly, avoid any folds. On the last turns of the tape, reduce the stretch to zero and lay the last turn without stretching, as shown in Figure 33 (a, b).



Figure 33a



Figure 33b

10. Check the sealed connector for visible areas of rubber tape.

3 List of changes

Document version	Issue date	Revisions
Version 1.15	03.06.2022	Synchronization with firmware version 1.22.2 Changes in section: <ul style="list-style-type: none"> • 2.3 Device technical parameters
Version 1.15	22.04.2022	Synchronization with firmware version 1.22.1
Version 1.14	03.12.2021	Synchronization with firmware version 1.21.1
Version 1.13	30.09.2021	Synchronization with firmware version 1.21.0
Version 1.12	07.12.2020	Synchronization with firmware version 1.20.0 Sections added: <ul style="list-style-type: none"> • Network cable connection
Version 1.11	09.04.2020	Synchronization with firmware version 1.19.3
Version 1.10	24.02.2020	Synchronization with firmware version 1.19.0
Version 1.9	01.10.2019	Synchronization with firmware version 1.18.1
Version 1.8	05.06.2019	Synchronization with firmware version 1.17.0
Version 1.7	12.02.2019	Synchronization with firmware version 1.16.0
Version 1.6	30.11.2018	Synchronization with firmware version 1.15.0
Version 1.5	10.08.2018	Synchronization with firmware version 1.14.0
Version 1.4	08.05.2018	Synchronization with firmware version 1.12.2 Changes in section: <ul style="list-style-type: none"> • Device specification
Version 1.3	27.12.2017	Synchronization with firmware version 1.11.4
Version 1.2	30.10.2017	Synchronization with firmware version 1.11.2
Version 1.1	02.02.2017	Synchronization with firmware version 1.9.0
Version 1.0	11.01.2017	First issue
Firmware version 1.22.2		

TECHNICAL SUPPORT

For technical assistance in issues related to handling Eltex Ltd. equipment, please, address to Service Center of the company:

<http://www.eltex-co.com/support>

You are welcome to visit Eltex official website to get the relevant technical documentation and software, to use our knowledge base or consult a Service Center Specialist in our technical forum.

<http://www.eltex-co.com/>

<http://www.eltex-co.com/support/downloads/>