



Wireless access point

# WOP-2ac

User manual

Firmware version 1.16.0

IP address: 192.168.1.1

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 device is a Wi-Fi access point of Enterprise class. The device enclosed into hermetic case which allows to use the access point outdoor in different climatic conditions – at temperatures from  $-40$  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 for provision of users' access to high-speed safe network.

The device provides high-speed and safe wireless network combining a lot of opportunities and services that are necessary for comfortable users' 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 the wide range of operation temperature and high humidity (parks, factories, stadium, etc.) and it is the perfect platform for organization of connection in cottage settlements and remote communities.

Power supply of the access point is realized by PoE+ technology.

### 2.2 Device specification

#### **Interfaces:**

- 1 port of Ethernet 10/100/1000 Base-T (RJ-45, optionally);
- 1 port of 100/1000Base-X (SFP, optionally);
- 4 N-type connectors for external antennas (Omni, sectoral, panel, etc.)

#### **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 support;

##### *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;
- autodistribution of frequency channels among access points;
- autodistribution 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.

### Safety

- e-mail notifying on system events;
- centralized authorization via RADIUS server (WPA Enterprise);
- WPA/WPA2 data encryption
- Support for Captive Portal
- IPsec.

## 2.3 The device technical parameters

Table 1 – The device main technical parameters

| <b>WAN-interface parameters</b>                          |   |
|--|---|
| 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) |
| <b>Wireless interface parameters</b>                     |   |
| Standards  | 802.11a/b/g/n/ac  |
| Frequency range, MHz                                     | 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, Mbps                         | 6, 9, 12, 18, 24, 36, 48, 54, MCS0-MCS15, MCS0-9 NSS1, MCS0-9 NSS2 802.11 n: 300 Mbps<br>802.11ac: 867 Mbps 802.11 ac:                              |
| 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  |
| Safety   | centralized authorization via RADIUS server (WPA Enterprise)WPA/WPA2 data encryptionCaptive PortalIPsec   |
| Selection of antenna model depends on access point usage |   |
| Support for 2x2 MIMO                                     |   |
| 2 integrated WLAN controllers Broadcom BCM43217          |   |

| <b>Control</b>                  |  |
|---------------------------------|--|
| Remote control                  | Web interface, Telnet, SSH, SNMP, EMS management system. Firmware updating through DHCP Autoprovisioning |
| Access restriction              | By password, by IP address   |
| <b>General parameters</b>       |  |
| Processor                       | Broadcom BCM47452  |
| NAND                            | 128 MB NAND Flash  |
| RAM                             | 256 MB RAM DDR3  |
| Power supply                    | PoE+ 48V/54V (IEEE 802.3at-2009)   |
| IP protection class             | IP-65  |
| Electromagnetic compatibility   | CE   |
| Power consumption               | no more than 19.5 W  |
| range of operation temperatures | from -40 to +65°C  |
| relative humidity at 25°C       | from 5% to 90%, non-condensing   |
| Dimensions                      | 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.

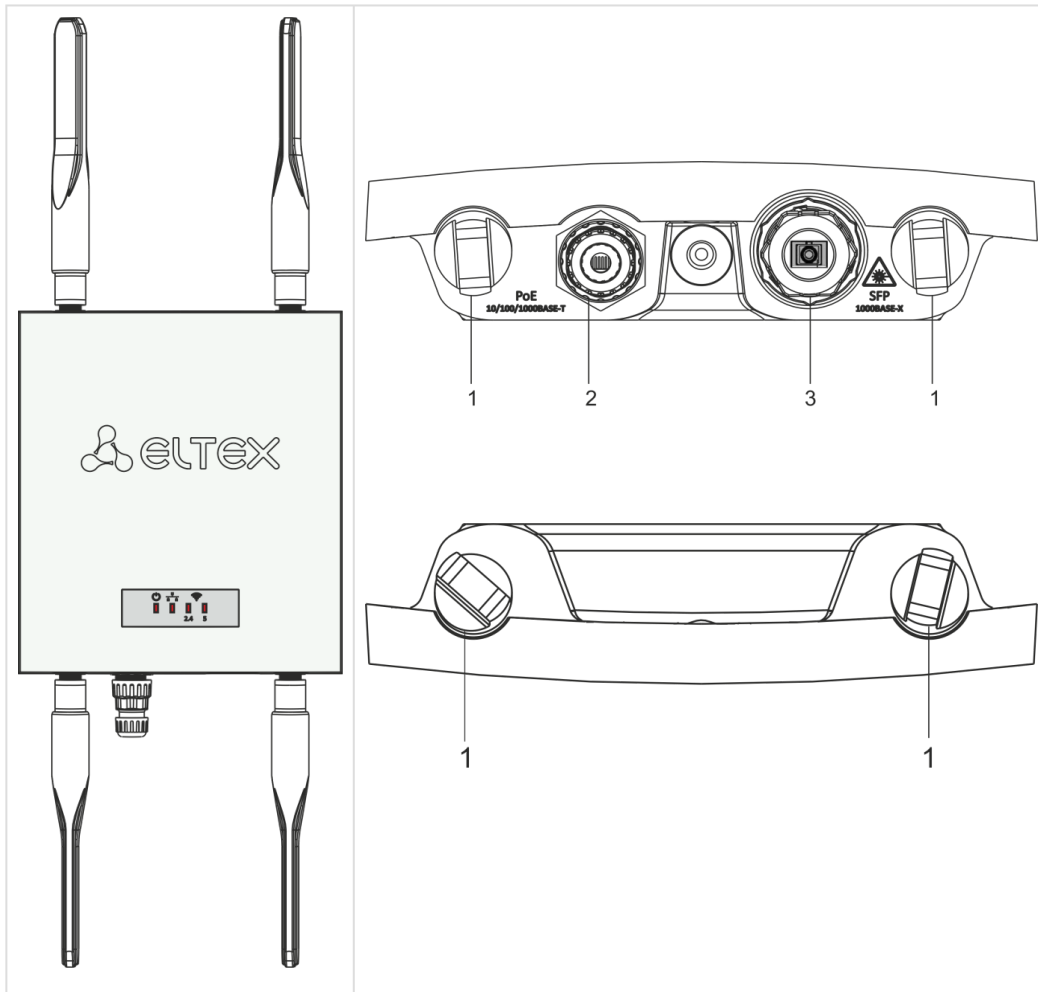


Figure 1 – WOP-2ac side panel layout

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

Table 2 – Description of ports and controls

| Front panel elements |              | Description   |
|----------------------|--------------|---|
| 1                    |              | 4 connectors for external antennas  |
| 2                    | Port 0 (PoE) | 10/100/1000 Base-T port (RJ-45 with PoE+ support)                                       |
| 3                    | SFP          | Optical connector SC/UPC (only for WOP-2ac ER SFP) or SC/APC (only for WOP-2ac ER GPON) |

## 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

| Indicator | Indicator's status                                   | Device state   |
|-----------|--|--|
| Wi-Fi     | solid green  | Wi-Fi network is enabled   |
|           | flashing green                                       | the process of data transmission trough 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 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.

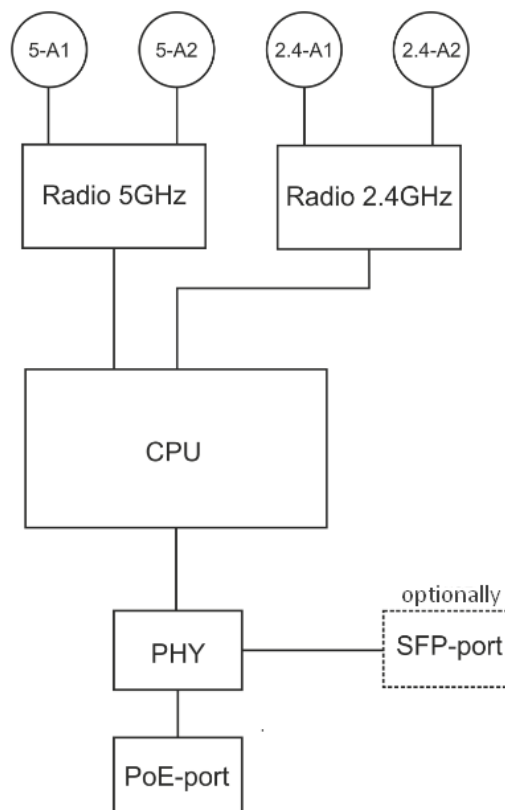


Figure 2 – WOP-2ac schematic structure

- 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 – a 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 in loaded state. 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 connectors for RJ-45;
- Operating manual (supplied on a CD);
- 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. You must follow requirements for voltage, current and frequency specified in the user 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. You should satisfy established standards and requirements for working at height during the device installation on the high-rise constructions.
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 installation: attaching to a mast/pole or wall;
2. Before you install and enable device, check the device for visible mechanical defects. If defects are observed, you should stop the device installation, draw up corresponding act and contact the supplier.
3. During the device installation to provide Wi-Fi coverage area with the best characteristics take into account the following rules:
  - a. Install the device at the center of 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 neighboring cell at level of -65 ÷ -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 wirecloth                  | -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.

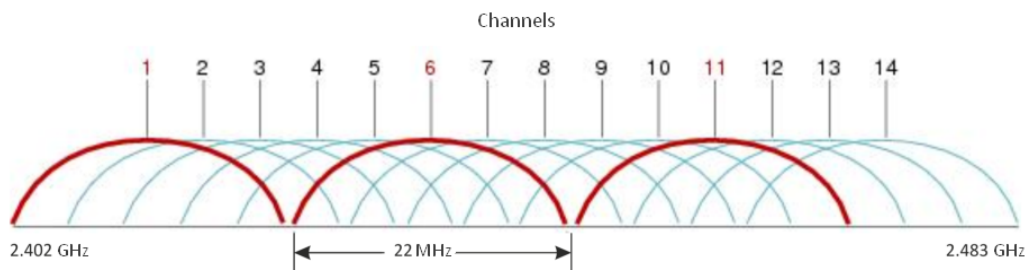


Figure 3 – General diagram of frequency channel closure in the range of 2.4 GHz

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

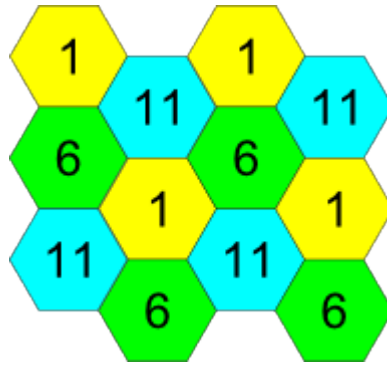


Figure 4 – Scheme of channel allocation among neighboring access points in the frequency range of 2.4 GHz when channel width is 20 MHz

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

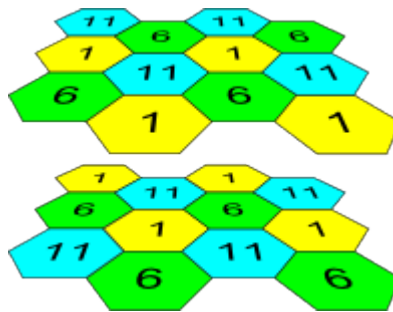


Figure 5 – Scheme of channel allocation between neighboring access points that are located between floors

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.

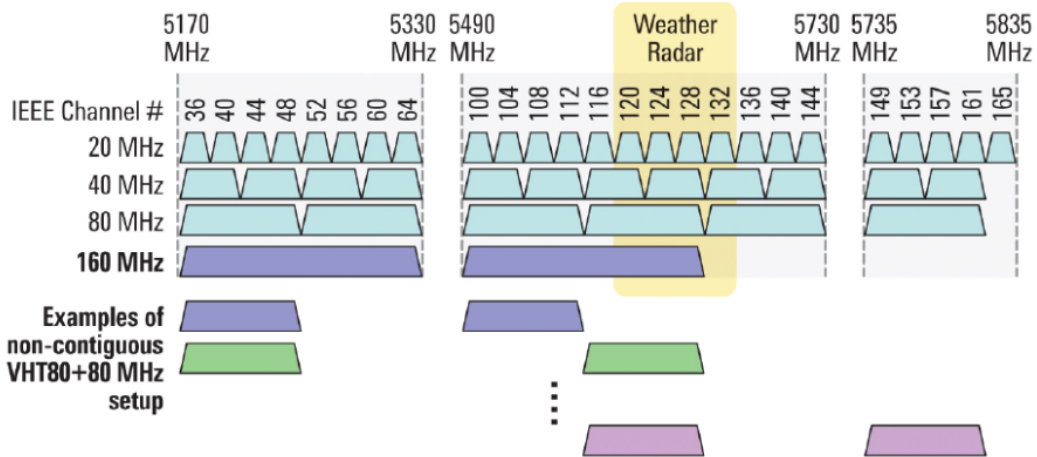


Figure 6 – Channels used in range of 5 GHz when channel width is 20, 40 or 80 MHz

### 2.13 The device installation

The device should be attached to mast/pole or 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. You may remove the covers 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:

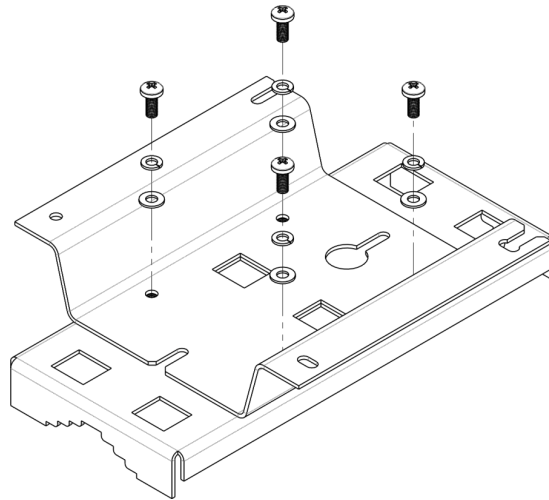


Figure 7 – Bracket for attaching to mast/pole

1.1) Connect bracket, that will be attached to a mast/pole, to bracket, that will be attached to the device, as shown in Figure 7.

1.2) Align two boltholes of both brackets. Attach brackets together by using screwdriver.

## 2) Attach the bracket to a mast/pole:

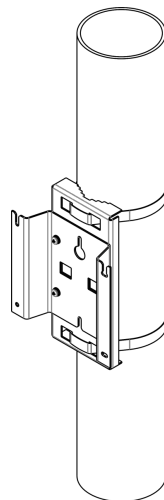


Figure 8 – Mounting bracket on a mast/pole

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

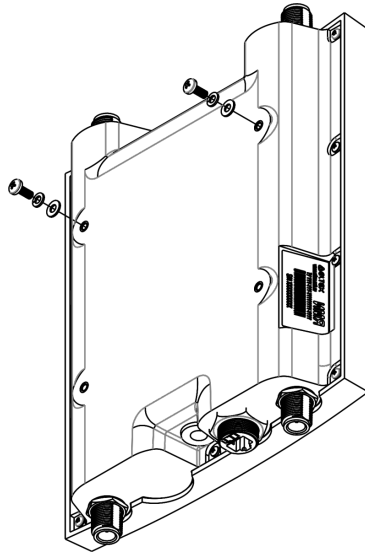


Figure 9 – Mounting screws to the device

2.2) Install DIN7985 M6 screws to the holes on the top of the case. Do not screw them fully. Leave at least 3 mm gap, see Figure 9.

3) Attach the device to a mast/pole:

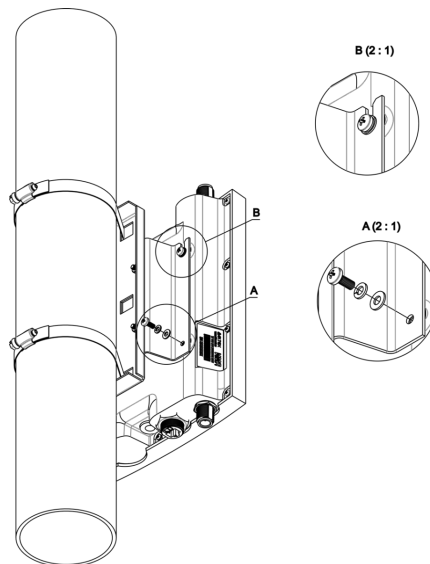


Figure 10 – Mounting the device on a mast/pole

3.1) Install the device on the top untwisted screws of a bracket attached to a mast/pole, see Figure 10.

3.2) Install screws to the bottom bolthole, see Figure 10.

3.3) 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:

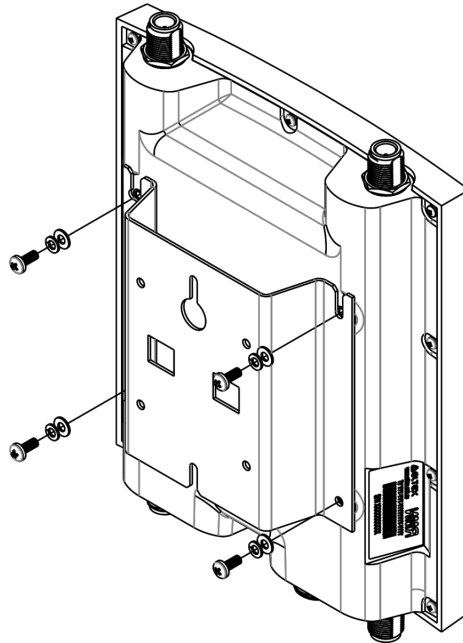


Figure 11 – Mounting bracket on a mast/pole

1.1) Install the bracket as shown in the figure 11.

1.2) Align four boltholes on brackets with the same boltholes on the device. Attach brackets with screws to the device by using screw-driver.

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

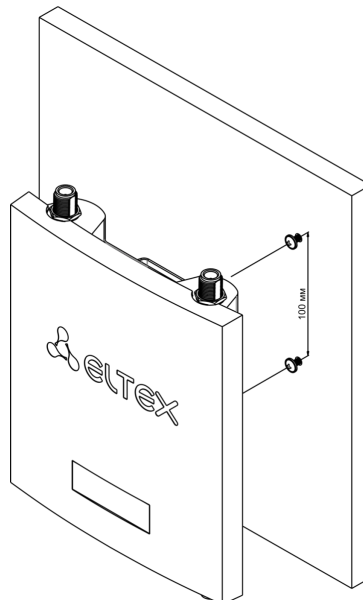


Figure 12 – Wall-mounting the device

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

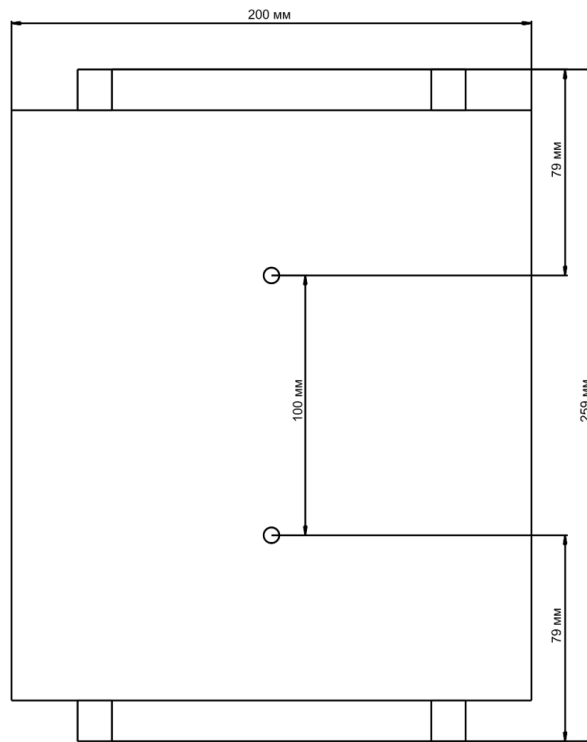


Figure 13 – Device dimensions corresponding mounting holes

### 3 The list of changes

| Document version        | Issue Date | Revisions  |
|-------------------------|------------|--|
| 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<br>Changes in section: <ul style="list-style-type: none"> <li>• Device specification</li> </ul> |
| 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 1.16.0 |            |  |



## TECHNICAL SUPPORT

For technical assistance in issues related to handling of ELTEXALATAU Ltd. equipment please address to Service Centre of the company:

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