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WOP-12ac

User manual,
Version 1.8 (09.2016)

Wireless access point

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Version 1.8	20.09.2016	Synchronization with firmware version 1.8.0
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Version 1.1	10.02.2015	Added: Technical parameters of antennas
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CONTENTS

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-12ac device is a Wi-Fi access point of Enterprise class. Construction of the device has hermetic enclosure that allows you to use the device as an outdoor access point in different climate conditions at temperature from -40 to +60 ^{0}C.

This instruction manual specifies intended purpose, main technical parameters, design, installation procedure, safe operation rules and installation recommendations for   WOP-12ac wireless access point.

1.2 Symbols

Symbol	Description
Semi-bold	Notes and warnings, chapter titles, headings and table headings are printed in semi-bold.
Italic	Information which requires special attention is printed in italic.

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 Propose

WOP-12ac 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.

WOP-12ac provides connection of up to 400 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 and etc.) and it is the ideal platform for organization connection in cottage settlements and remote communities.

Power supply of the access point is realized by PoE technology. Also, alternate supply is available (220 V or 48 V).

2.2 Device specification

Interfaces:

- 2 Ethernet 10/100/1000 Base-T(RJ-45) ports where 1 port for PoE+ power supply;
- 1 100/1000Base-X port (optionally);
- Console (RS232);
- 6 N – type (female) connectors to connect external antennae (nondirectional, sectoral and narrow-band). Access point model selection depends on its use. It is required to select narrow-band antennae for long-range wireless bridges and sectoral or nondirectional antennae are used for base stations.

Functions:

- *WLAN capabilities:*

  - support IEEE 802.11 a/b/g/n/ac standards;
  - 2 independent radio interfaces;
  - operation in two frequency ranges simultaneously (2.5 GHz and 5 GHz);
  - support MIMO 3x3 on each radio interface;
  - WMM-based traffic prioritization;
  - third-party access point detection;
  - dynamic frequency selection (DFS);
  - support concealed SSID;
  - 32 virtual access point for WOP-12ac;
  - APSD;
  - Power control of transmitted signal;
  - WDS;
  - Workgroup bridge.

- *Network functions:*

  – Autonegotiation of speed, duplex mode and switching between MDI and MDI-X modes;
  – Support VLAN;
  – Authentication support 802.1X;
  – Support 802.11r;
  – DHCP client;
  – Support IPv6;
  – LLDP;
  – ACL.

- *Cluster operation mode:*

  – Organizing a cluster with capacity of up to 64 access points;
  – 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 between access points.

- *QoS functions*

  – Priority and profile-based packet scheduling;
  – Capacity limitation for each SSID;
  – Changing WMM parameters for each radio interface;
  – Support prioritization by CoS and DSCP;
  – Opportunity to set priority on the base of IP, Ethertype, TCP/UDP port and etc.

- *Safety*

  – E-mail informing about system events;
  – Centralized authorization via RADIUS server (WPA Enterprise);
  – WPA/WPA2 data encryption;
  – Support Captive Portal.

2.3 The device technical parameters

Table 2.1 – The device main technical parameters

WAN-interface Ethernet parameters	
Number of ports	2
Connector	RJ-45, 10/100/1000, auto-sensing, BASE-T
Wireless interface parameters	
Standards	802.11 a/b/g/n/ac
Frequency range, MHz	2412 - 2472 MHz, 4900- 5850 MHz
Modulation	CCK, BPSK, QPSK, 16QAM, 64QAM, 256QAM
Operating channels	802.11 b/g/n: 1-13 (2412-2472 MHz) 802.11 a/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-MCS23, MCS0-9 NSS1, MCS0-9 NSS2 802.11 n: up to 216,7 Mbps (20 MHz channel), up to 450 Mbps (40 MHz channel) 802.11 ac: up to 1300 Mbps (80 MHz)
Maximal transmitter power	2.4 GHz: up to 19 dBm 5 GHz: up to 19 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 encryption Support Captive Portal E-mail informing about system events
Selection of antenna model depends on access point usage	
Support 3x3 MIMO	
2 integrated controller WLAN controllers Broadcom BCM43460	
Console interface parameters	
Type	RS-232
Data rate	115200 bd
Data format	8 bits
w/o parity, 1 stop, w/o stream control	
Control	
Remote control	Web interface, Telnet, SSH, SNMP, EMS management system. Firmware updating and configuring by DHCP Autoprovisioning
Access restriction	By password, by IP address
General parameters	
Processor	Broadcom BCM53016
NAND	128 MB NAND Flash
RAM	256 MB RAM DDR3
Power supply	- 48 B DC-PoE+ (IEEE 802.3at-2009) - DC 48 B (optionally) - AC 220 B (optionally) Power adapter has a protection function against power line surges by using smoothing filter
IP protection class	IP-57
Electromagnetic compatibility	CE
Power consumption	Up to 14 W
range of operation temperatures	From -40 to +60°C

Relative humidity at 25°C	from 5% to 90%, non-condensing
Dimensions	246x216x97 mm
Weight	up to 2,3 kg.

To complete a set of the device, vendor recommends the following antenna types:

Table 2.2 – The basic technical parameters of OMNI antenna

Vendor and model	Tekfun Co., Ltd F40-N
Frequency range	2.4/5GHz
Amplification	4.5dBi for 2.4GHz 7dBi for 5GHz
SWR	< 2.0
Impedance	50 Ohm
Electric wave	1/4
Size	180x22mm

Table 2.3 – The main technical parameters of a sectoral antenna

Vendor and model	itelite, SECTOR50018dual H&V
Frequency range	5.15 - 6.0 GHz
Amplification	2x18dBi
Polarization	dual H&V
Radiating angle (horizontal polarization)	90°(-3 dB), 120°(-6 dB)
Radiating angle (vertical polarization)	6°
SWR	<1,8
Impedance	50 Ohm
Front-to-back ratio	> 35 dB
Standard	IIEEE 802.11a/n/ac WLAN Systems
Size	580x125x50 mm
Weight	1.5 kg

2.4 Design

WOP-12ac has an industrial design and metal case.

Figure 1 shows the device side panel layout.
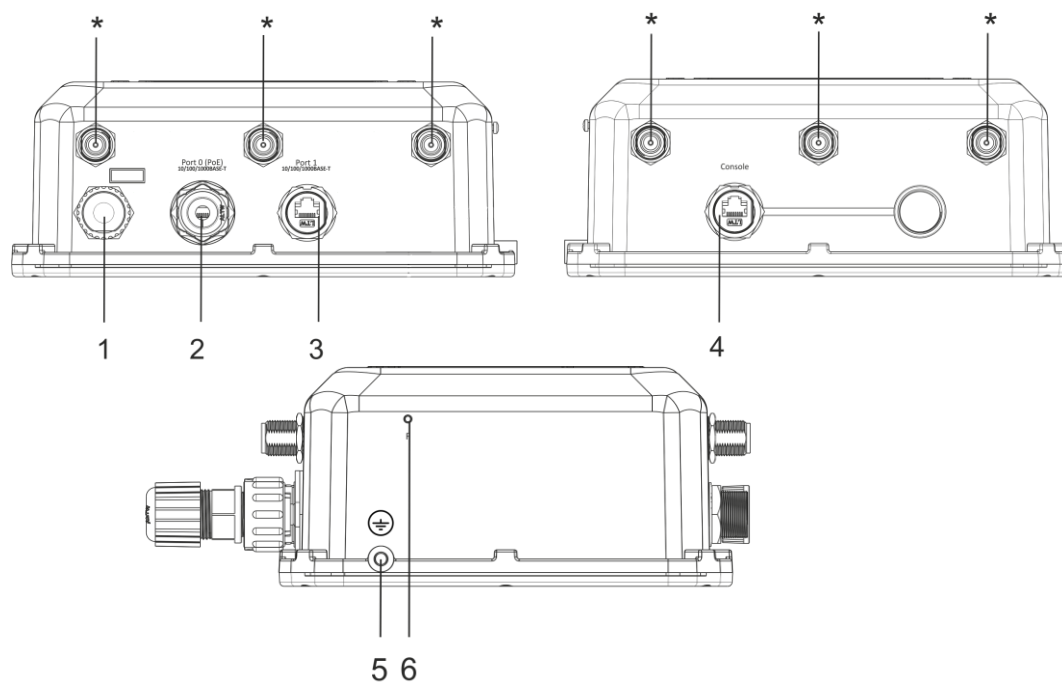
Figure 1 – WOP-12ac side panel layout

Connectors and controls located on the device panels are listed in Table Table 2.4.

Table 2.4 – Description of ports and controls

Front panel element		Description
*		6 connectors to connect external antennae
1		Connector for power supply connection
2	Port 0 (PoE)	10/100/1000 Base-T port (RJ-45 with PoE+ support)
3	Port 1	10/100/1000 Base-T port (RJ-45 connector)
4	Console	Connector for console cable connection (RJ-45 connector)
5	⏚	ground
6	F	Functional button closed by hermetical screw

2.5 The device schematic diagram

Figure 2 shows WOP-12ac schematic diagram.
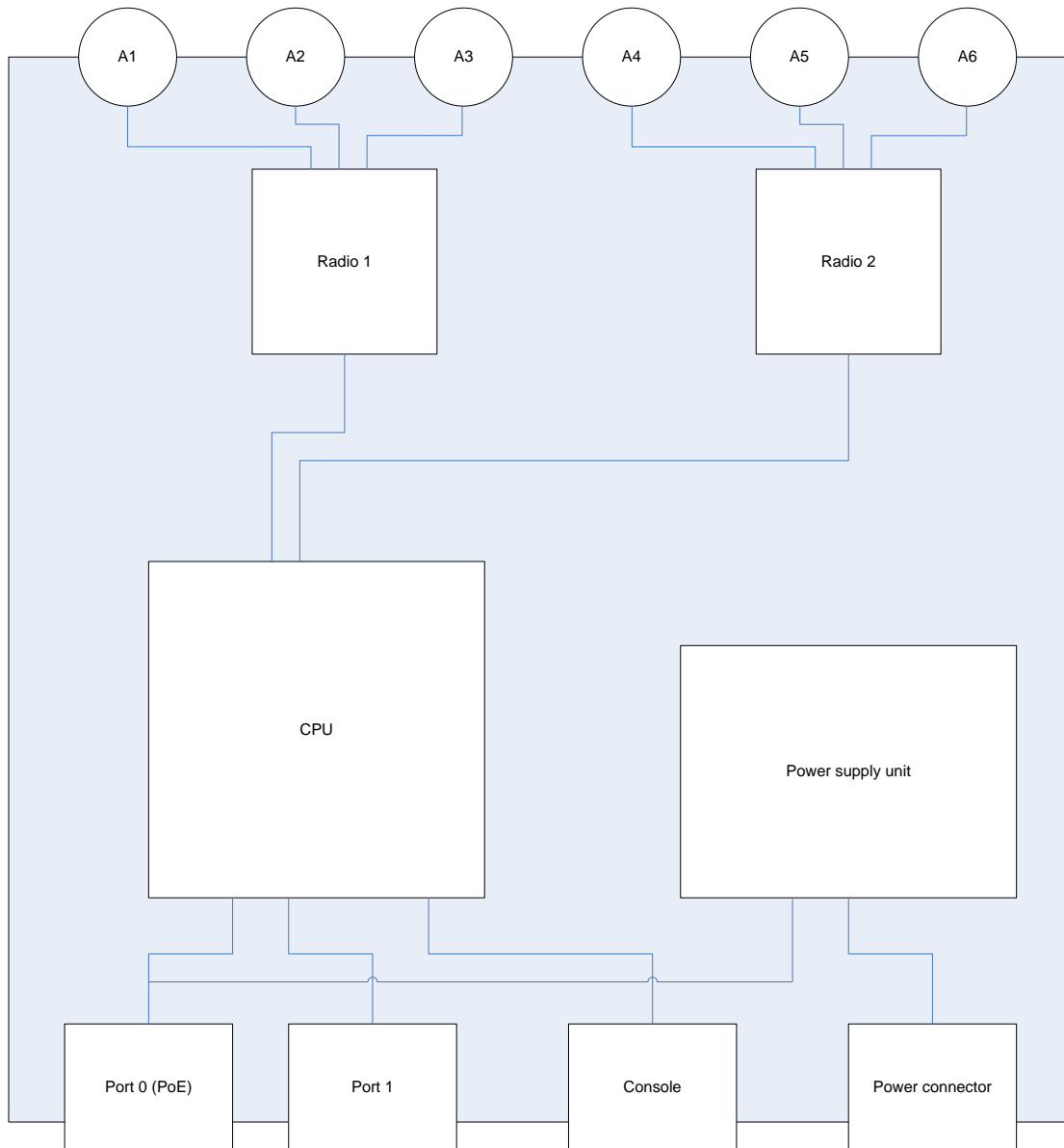
Figure 2 – WOP-12ac schematic diagram

– *A1-A6* – connector for antenna connection;
– *Radio 1, Radio 2* – radio interfaces that performs reception and transmission of data in wireless network;
– *CPU* – controller performing the device control, monitoring and data transmission via wired network;
– *Power Supply Unit* – power supply unit of the device;
– *Port 0 (PoE)* – Gigabit Ethernet connector with PoE technology allows you to supply access point and to provide access speed of up to 1Gbps;
– *Port 1* – Gigabit Ethernet connector provides speed access of up to 1 Gbps;
– *Console* – RJ45 connector for console cable connection;
– *Power Connector* – connector for power supply connection when PoE is not available.

2.6 Reset to the default settings

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 is launched for

factory settings. If address is not received via DHCP the device will have 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:

- Wireless access point;
- DC-48B/AC220B supply cable (depends on power supply module);
- 3 x RJ45 hermetic connector for cable;
- 1 hermetical connector for power supply;
- 6 dust-protecting (hermetical) cap;
- Connector for ground;
- Mounting kit;
- Documentation.

2.8 Order specification

- WOP-12ac DC;
- Injector, 802.3at (PoE+), Ethernet 10/100/1000 Base-T;
- Pin antenna with circular pattern (Omni);
- Sectoral antenna (Sector 120 ^{0}) (antenna-feeder device in set).

3 INSTALLATION ORDER

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

3.1 Safety rules

1. Do not open the device chassis. 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 fall 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 engineering and technical personnel with special training.

10. Connect only to operational service equipment.

3.2 Installation recommendations

1. Recommended location for device installation: fix on a pole/pillar 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 and draw up corresponding act.

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-12ac 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. Increasing this level is allowed up to -75 dBm if it involves the use of VoIP, streaming video and other traffic that is sensitive to losses in wireless network.

3.3 Calculating the number of required access points

Table 3.1 describes rough attenuation values.

Table 3.1 – 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

3.4 Channel selection for neighboring access points

It is recommended to set nonoverlapping channels to avoid interchannel interference between neighboring access points.
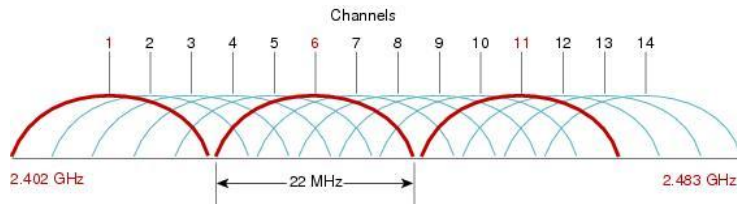
Figure 3 – General diagram of frequency channel closure in the range of 2.4 GHz

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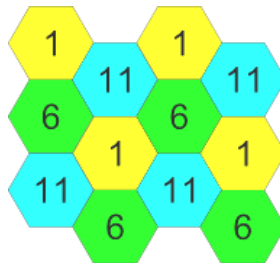

Figure 4 – Scheme of channel allocation between neighboring access points in the frequency range of 2.4 GHz when channel width is 20 MHz

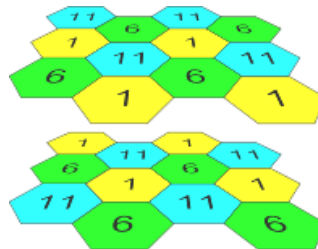Similarly, the procedure of channel allocation is recommended to save for access point allocation between floors, see Figure 5.

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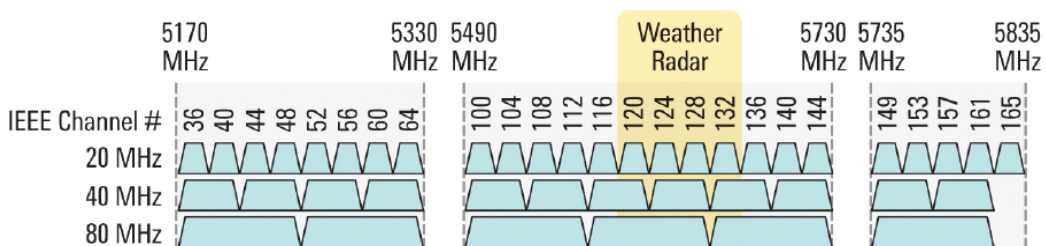
Figure 6 – Channels used in range of 5GHz when channel width is 20, 40 or 80 MHz

3.5 The device installation

The device is attached to pole/pillar 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 pole/pillar and wall.

The device installation order:

1. Mounting brackets to the device;
2. Attaching the device to a pole/pillar or wall;
3. Grounding the device;
4. Connecting cables to the device connectors;
5. Antenna setup.

3.5.1 Procedure of attaching brackets to the device

Attach brackets (included in the delivery package) to the device before starting the device installation on pole/pillar or wall.

> **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.**
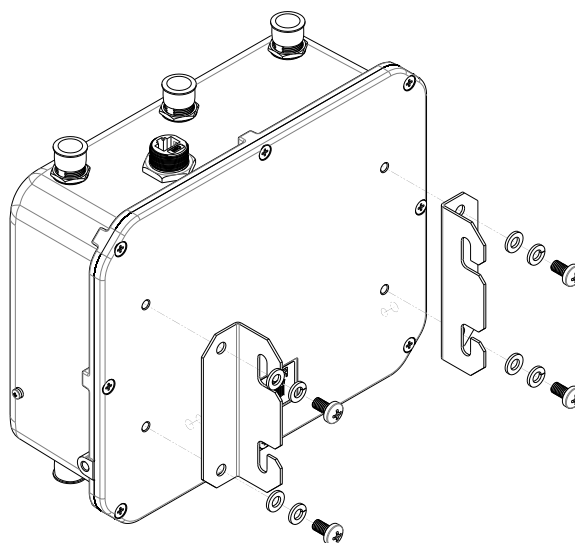
Figure 7 – Mounting brackets to the device

    a. Figure 7 shows position of brackets.
    b. Align four boltholes on brackets with the same boltholes on the device. Attach brackets with screws to the device by using screw-driver.

3.5.2 Order of the device mounting to a pole/pillar

1. Mount the bracket for attaching to a pole:
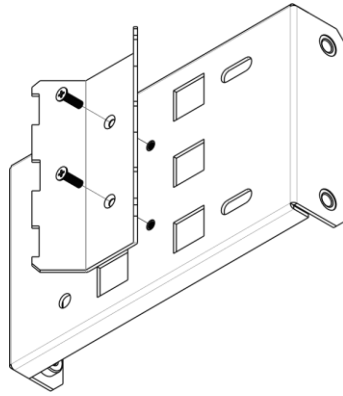
Figure 8 – Bracket for attaching to pole

    a. Connect bracket that will be attached to a pole to bracket that will be attached to the device, as shown in Figure Figure 8.
    b. Align two boltholes of both brackets. Attach together brackets by using screwdriver.

2. Attach bracket to the pole:
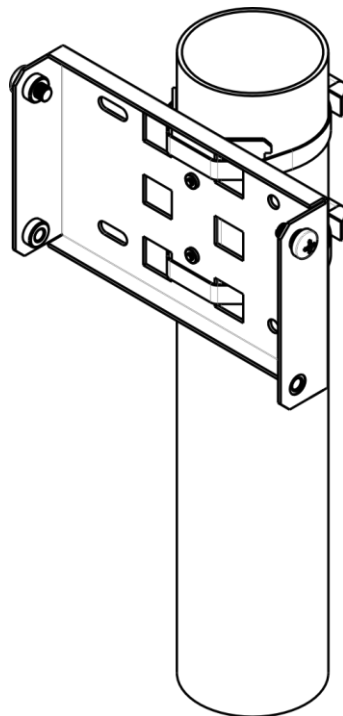
Figure 9 – Mounting bracket on a pole

    a. Fix bracket on pole by using clamps, see Figure 9.
    b. Install DIN7985 M6 screws in the top holes. Do not screw them fully. Leave 3 mm gap as minimum, see Figure 9.
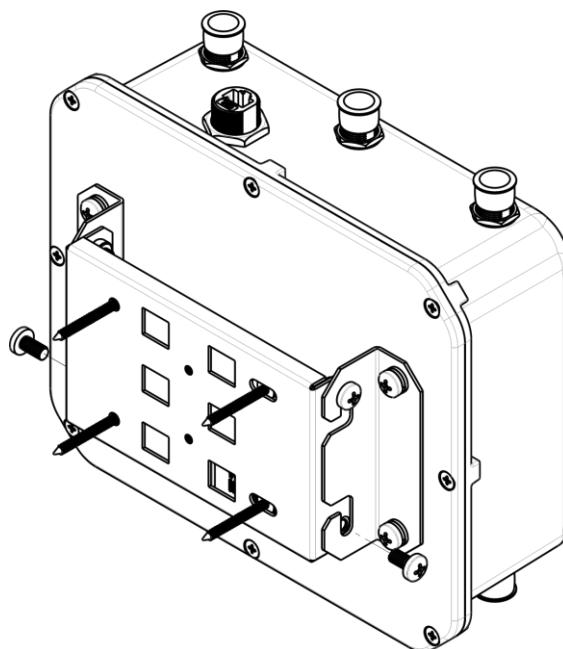
3. Attach the device to a pole:
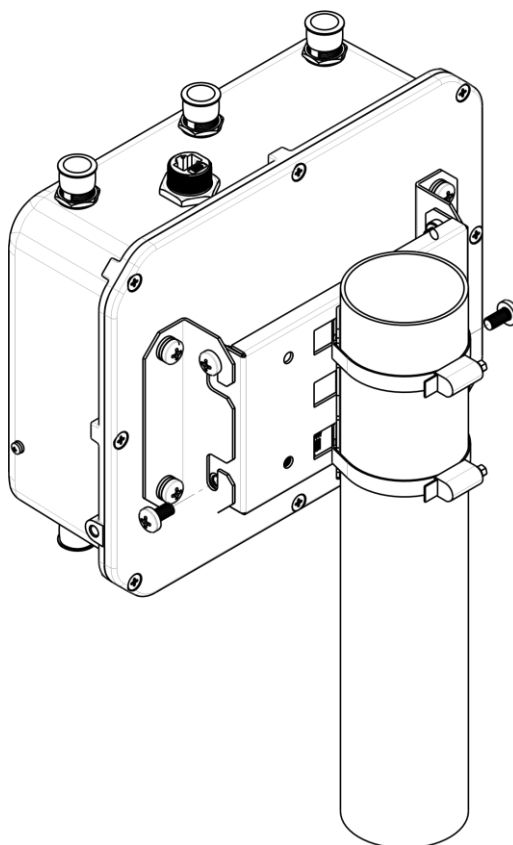
Figure 10 – Mounting the device on a pole

a. Install the device on the top untwisted screws of a bracket attached to a pole, see Figure Figure 10.
b. Install screws in the bottom bolthole, see Figure Figure 10.
c. Tight up the top and bottom screws by using screwdrive.

3.5.3 Order for wall-mounting brackets

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

DIN 968 4,2x38
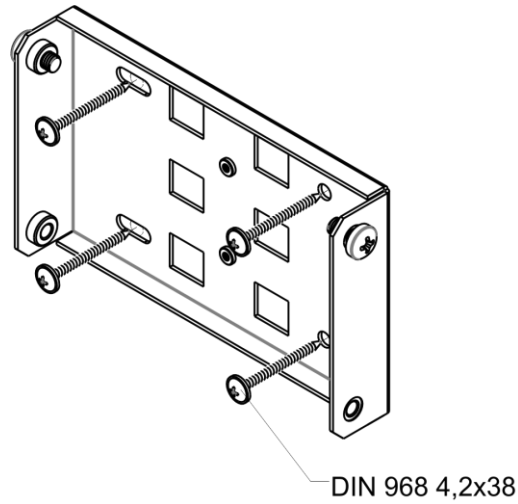
Figure 11 – Attaching bracket to the wall

90мм   60 мм
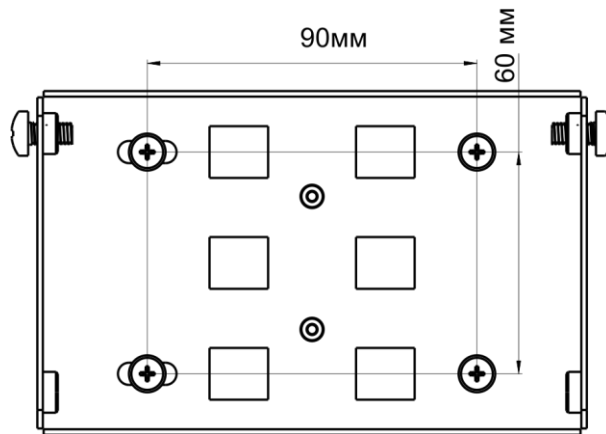
Figure 12 – Distance between boltholes

a. Figure 11 shows bracket allocation on the wall. Figure 12 shows distance between the boltholes.
b. Align together four boltholes on bracket and boltholes on the device surface. Screw the brackets to the device surface by using screwdrive.
c. Install DIN7985 M6 screws in the top holes. Do not screw them fully. Leave 3 mm gap as minimum, see Figure 11.

2. Fix the device on the wall

Figure 13 – Wall-mounting the device

   a. Install the device on the top untwisted screws of a bracket attached to a pole, see Figure Figure 13.
   b. Install screws in the bottom bolthole, see Figure Figure 13.
   c. Tight up the top and bottom screws by using screwdrive.

3.5.4 Grounding scheme of the device

After device installation, you must ground it by using 2.5 mm^2 vinyl-insulated wire. Figure 14 shows grounding scheme of the device
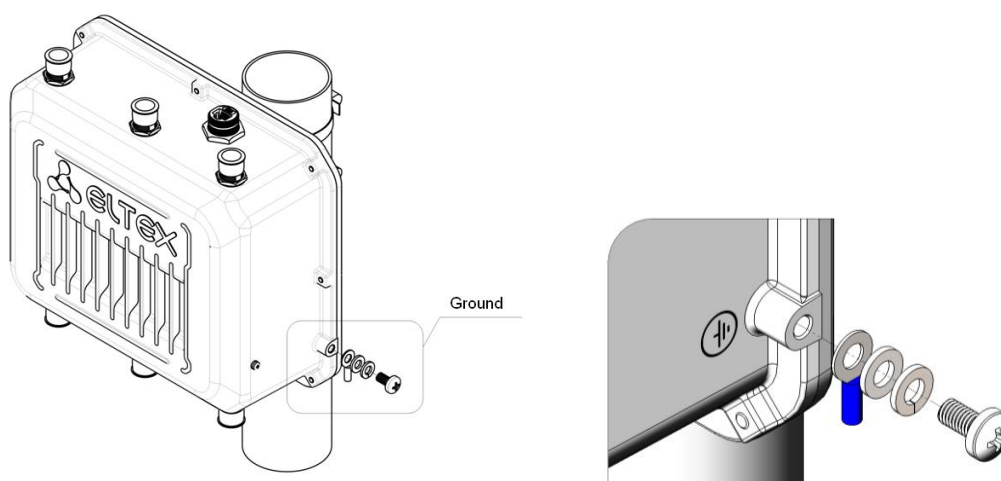

Figure 14 – The device grounding scheme
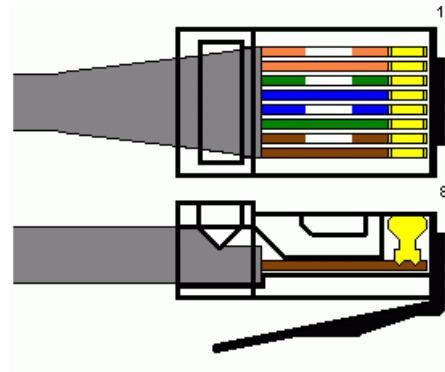
TECHNICAL SUPPORT

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

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In official website of the EltexAlatau Ltd. you can find technical documentation and software for products, refer to knowledge base, consult with engineers of Service center:

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