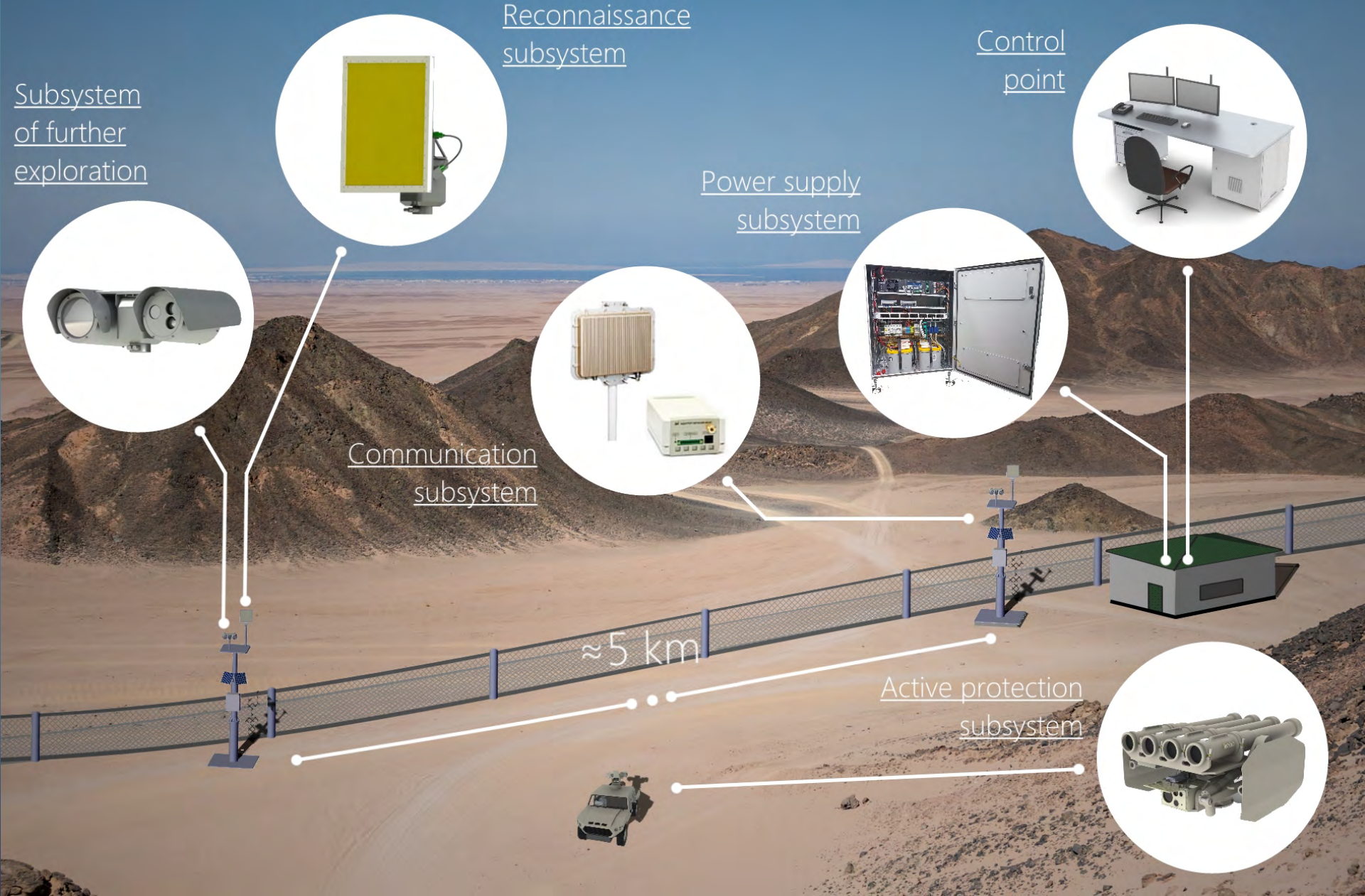


# **COMPLEX SOLUTION FOR BORDER AND FACILITIES PROTECTION**

**2017**

# Schematic plan of the area with Border protection solution:



# COMPLEX SOLUTION

Complex solution for border and facilities protection, specialists allows to ensure a high probability of detection, recognition and tracking of different objects regardless of weather conditions; provide, if necessary, fire support for an active action to protect the border areas and important facilities.

## OUR PROPOSAL:

*For example for protection of important areas or state border of **50 km** length, «ZORKI» systems need to be installed once every **5 km** for the effective detection and identification of objects. To transfer data to the command center, it is recommended to use a **fiber-optic data transmission line** - as the best solution according to noise immunity and communication quality. Data can be transmitted using **wireless communication channel**. To ensure the power supply one can use the existing 220V electric network or a system of autonomous power supply on the basis of solar cells.*

## Main elements and tasks:

Reconnaissance subsystem (radar module from the «ZORKI» complex)



Task: detection of ground or air targets, target designation for the optoelectronic module and tracking of the detected objects.

Version: stationary - on the mast along the border or along the perimeter of the object; mobile - on a sliding mast of a car.



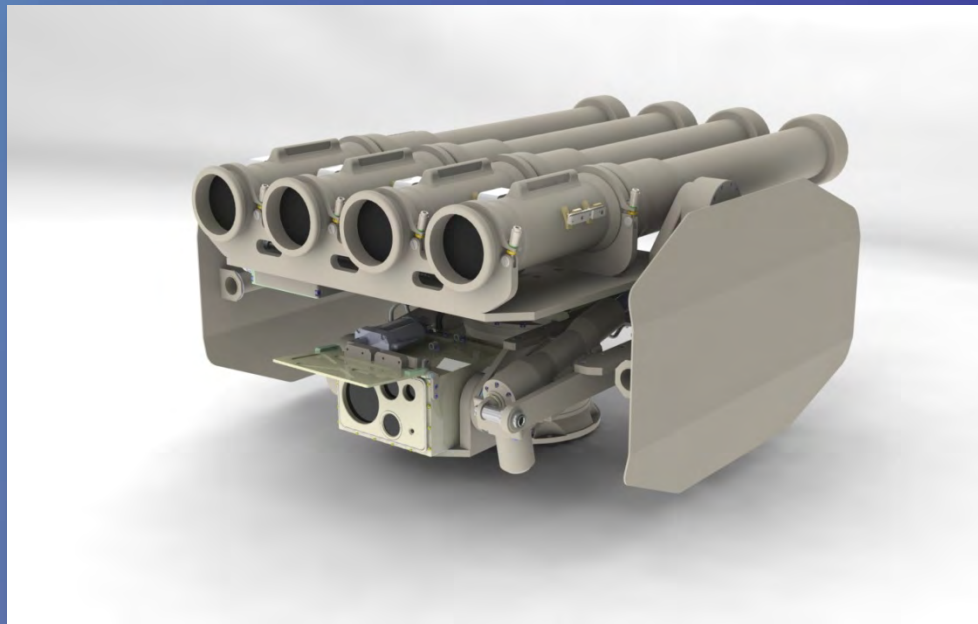
**Subsystem of further exploration  
(optoelectronic module with a television/thermal channel  
and laser rangefinder from the «ZORKI» complex)**



**Task:** visual identification of ground or air targets, aiming at the object according to target designation from the radar module.

**Version:** stationary - on the mast along the border or along the perimeter of the object; mobile - on a sliding mast of a car.

**Active protection subsystem (scanning optoelectronic system «QUAD» and its modification for firing from 7,62mm / 12,7mm machine guns or grenade launchers )**



**Task:** conducting aimed fire from 4 grenade launchers OR machine guns at stationary and moving targets.

**Version:** on a tripod in a disguised hideout or on a tower along the border or along the perimeter of an object; mobile - on a car.

## Communication subsystem (interface conversion equipment).

Task: transmission of information on detected objects, remote control of subsystems.

Version:

- copper Ethernet 1G data transmission line - the distance without repeater - up to 100m;
- fiber-optic data transmission line - the distance without repeater - up to 50km;
- wireless data transmission line - range - up to 5km.

## Power supply subsystem (equipment for power supply of subsystem elements).

Task: ensuring power supply and uninterrupted operation of reconnaissance further exploration and active protection subsystems.

Version:

- connecting subsystems of protection to the existing electrical network;
- the use of autonomous power supply systems.

## Control point (subsystems and process information management center).

Task: ensuring reception and processing of radar and optical data, management of fire systems.

Version:

- using the existing infrastructure;
- mobile (movable) control point.

**“ZORKI”**

**Border Security and Critical infrastructure objects  
protection System**



The system is intended for control of ground environment; it makes it possible to detect and recognize objects (targets) of “man, car, combat vehicle (BMP, armored vehicle, tank)” type in real-time during day and night time.

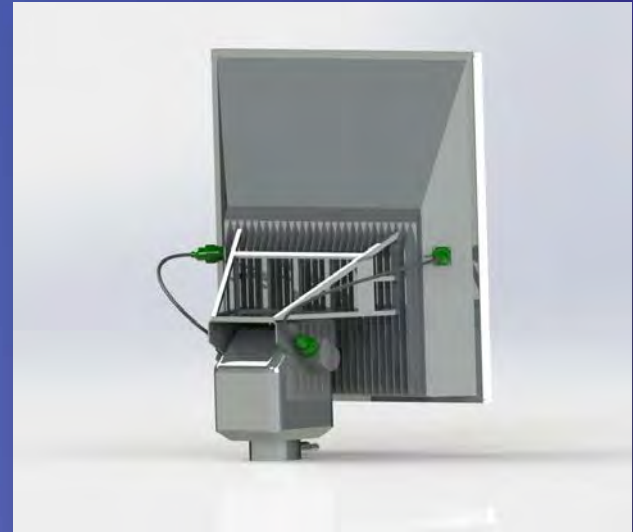
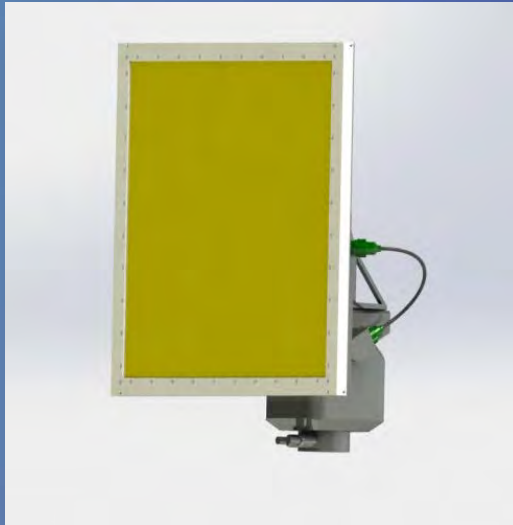
The system can be applied for the state borderline and state objects surveillance.



## **System contents**

- **Radar module on the supporting and turning platform;**
- **Electro-optical module on the supporting and turning platform;**
- **Operator's Automated Workstation;**
- **Source of secondary power and of interfaces conversion.**

## Radar module



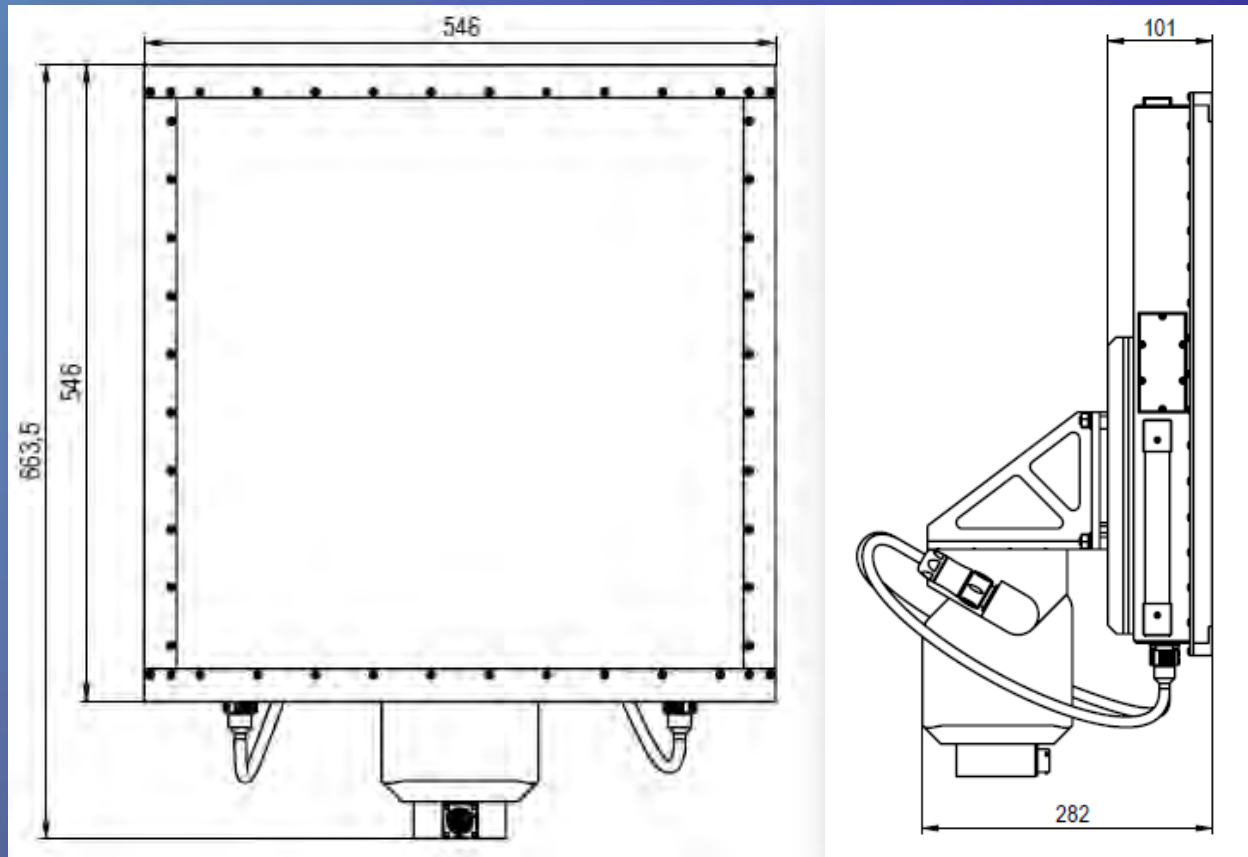
### Main functions of the radar module:

- all-round and sector survey;
- detection and primary measurements of coordinates (azimuth, range, velocity) of moving targets;
- automatic tracking of the detected targets;
- compensation of background returns with the help of adaptive algorithms;
- target detection data output to electro-optical module.

## Main technical specifications of the Radar module

No	Specification	Value
1	Wavelength band	3 cm
2	Maximum output power	9 W
3	Operating range	15km
4	Detection range	Man – 5km Car – 8km
5	Data transfer interface	Ethernet
6	Power supply voltage	24VDC
7	Overall dimensions	550mm x 670mm x 290mm
8	Weight	not more than 30kg

## Overall dimensions of Radar module



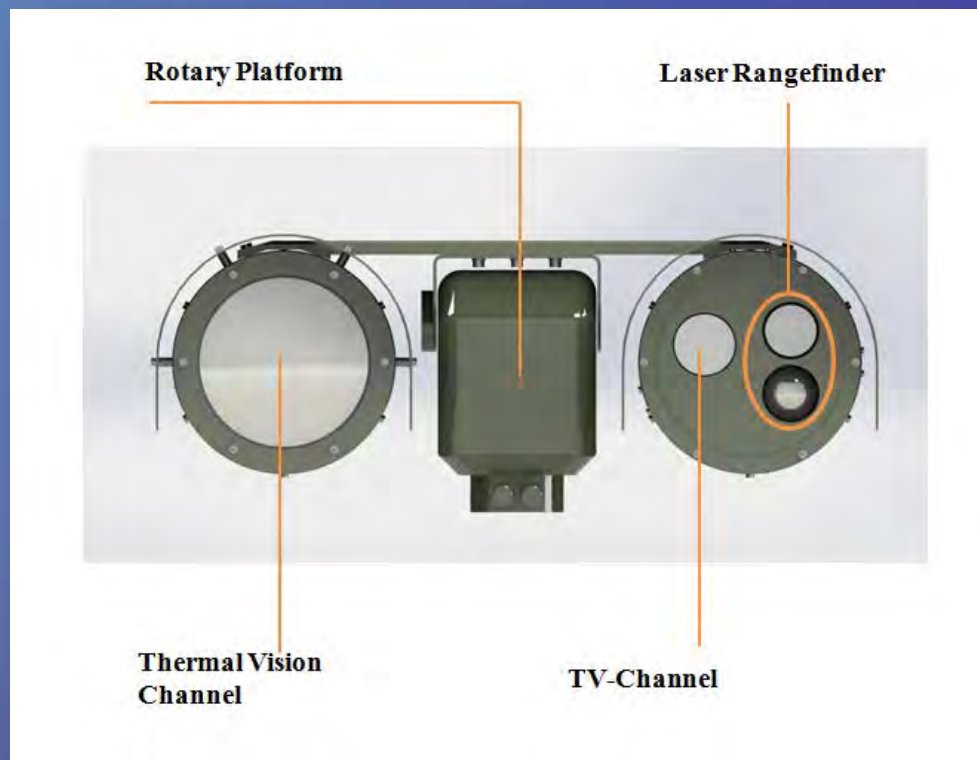
## Electro-optical module





## The module consists of:

- Television observation channel for operation in daytime;
- Thermal vision observation channel for operation at night;
- Laser rangefinder (LR);
- Supporting and turning platform (STP)



# Main technical specifications of the Electro-optical module

## General specifications of EOM

No	Specification	Value
1	Angular rotation in horizontal direction	Without limitation
2	Rotation speed in horizontal direction	Maximum 40 degr./c
3	Power supply voltage	24VDC
4	Interface for video control and transfer	Ethernet
5	Overall dimensions	627mm x 420mm x 241mm
6	Weight	not more than 30kg

## Laser rangefinder

No	Specification	Value
1	Operating wavelength	905±20nm
2	Distance measurement to target of 2,3x2,3m size by NATO standard	From 50 to 5000m
3	Absolute measurements error	±2m

# Main technical specifications of the Electro-optical module

## Television observation channel (basic model)

No	Specification	Value
1	Image type	Color or monochrome
2	Visual detection range	Man – 4km Car – 6km
3	Optical zoom	40x
4	Digital zoom	12x
5	Sensor resolution	670 TVL
6	Horizontal angle of view	from 60 to 1,6 degr.
7	Fog mode	present
8	Digital alignment of video image	present

## Television observation channel (hardware version)

No	Specification	Value
1	Image type	Color or monochrome
2	Visual detection range	Man – 10km Car – 25km
3	Optical zoom	36x
4	Digital zoom	12x
5	Sensor resolution	Full HD 1080p (1920x1080)
6	Angle of view	26.1°X19.7° ~ 0.8°X0.6°

# Main technical specifications of the Electro-optical module

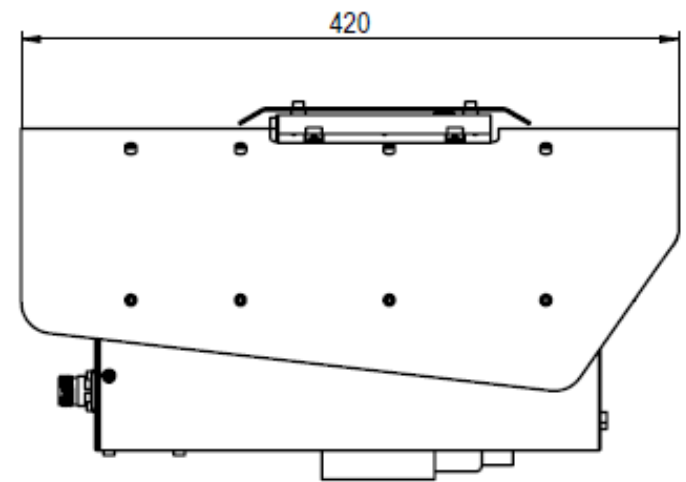
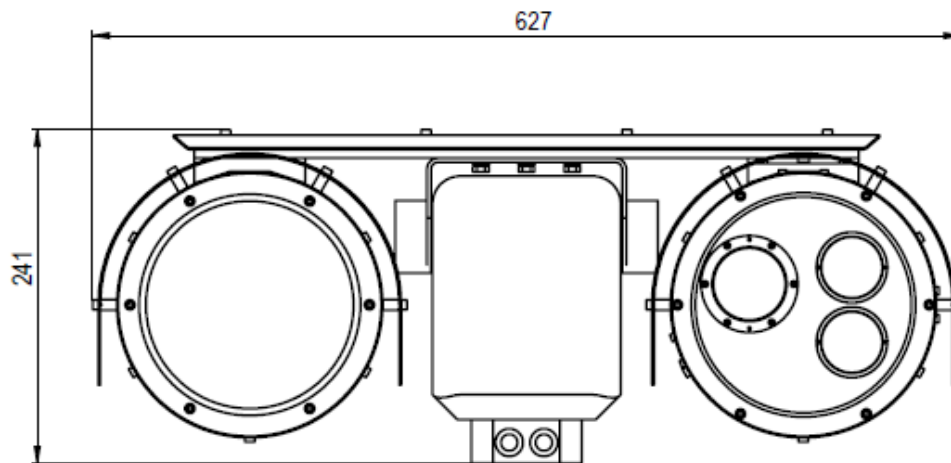
## Thermal vision observation channel (basic model)

No	Specification	Value
1	Spectrum range	8...14μm
2	Sensor resolution	640x480 (uncooled sensor)
3	Visual detection range	Man – 4km Car – 6km
4	Objective type	Objective with optical zoom
5	Variable focal length	from 40mm to 150 mm FOV(L): 29.9 ~ 6.1 degr. FOV(V): 22.6 ~ 4.6 degr. Upon request it can be supplied with other objectives
6	Digital alignment of video image	present

## Thermal vision observation channel (hardware version)

No	Specification	Value
1	Spectrum range	3...5 μm
2	Sensor resolution	512 cooled sensor
3	Visual detection range	Man – 10km Car – 25km

## Overall dimensions of EOM





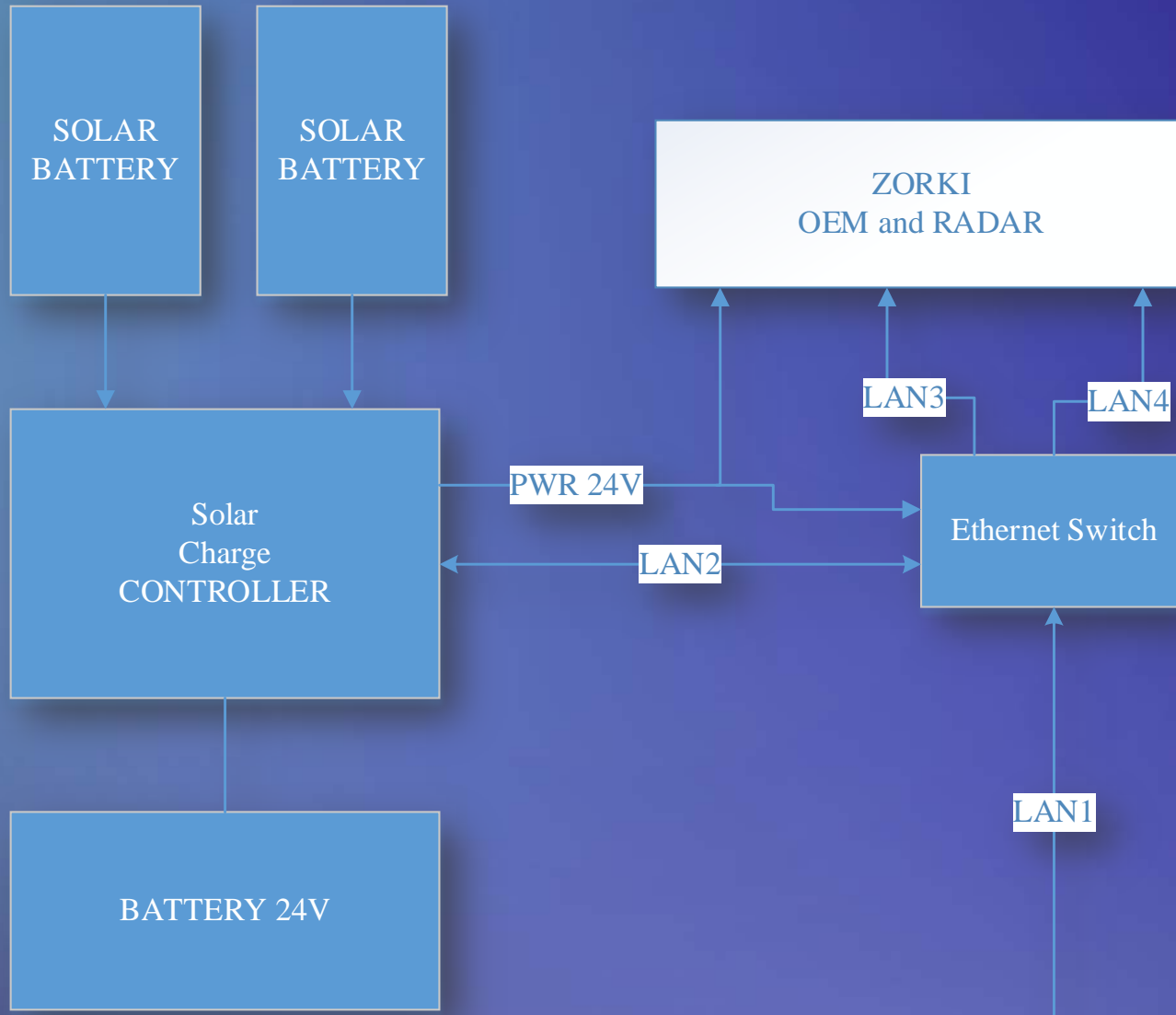
## Source of secondary power and of interfaces conversion (SSPIC)



**SSPIC consists of the following devices:**

- Two 24V power supply sources;
- Uninterruptible power supply (UPS);
- Accumulators;
- Ethernet network switch with the possibility of connection of the remote workstation by fiber optic data communication line;
- Thunderstorm protection device;
- Pulse overvoltage protection device.

# Autonomous power supply system



## Autonomous power supply system

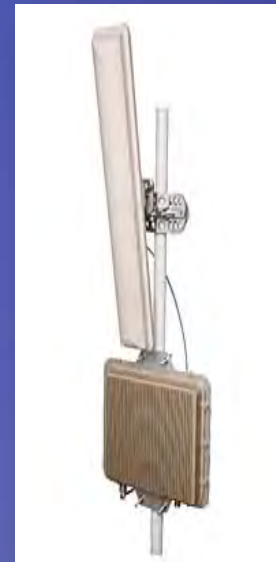
Wireless data transmission line is designed to ensure the transmission of radar and video data, management of the complex in the absence of copper or fiber-optic communication lines.

In the presence of direct radio the provided range is up to 30 km, when operating on reflections (NLOS) – up to 4-5 km. With increasing distance the modulation scheme has a decrease with decreasing bandwidth.

Wireless data transmission line is based on the topology of "point-multipoint" or "point to point" and consists of a base station and subscriber stations, connected to it via radio.



Subscriber station



Base station

# Operator's Automated Workstation

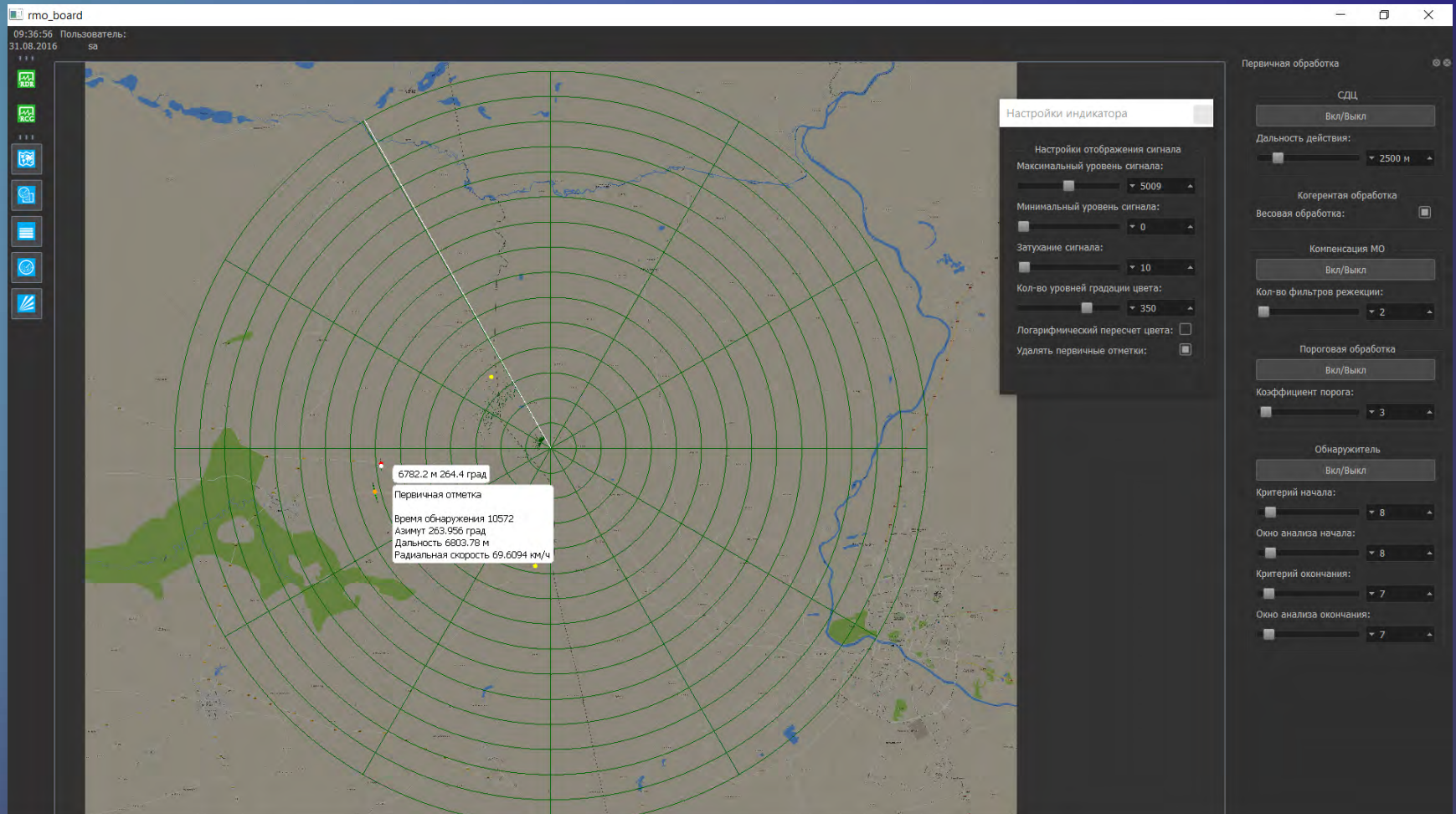


The system consists of the operator's workstation intended for control of the system settings, for the operation modes setting, displaying of radar data and of video data.

Main functions of the radar module AWS:

- remote control of RM operations modes;
- display of the radar data and of the detected targets data;
- documentation and archiving of radar data and of inside information

# AWS user interface of radar module





# AWS user interface of electro-optic module

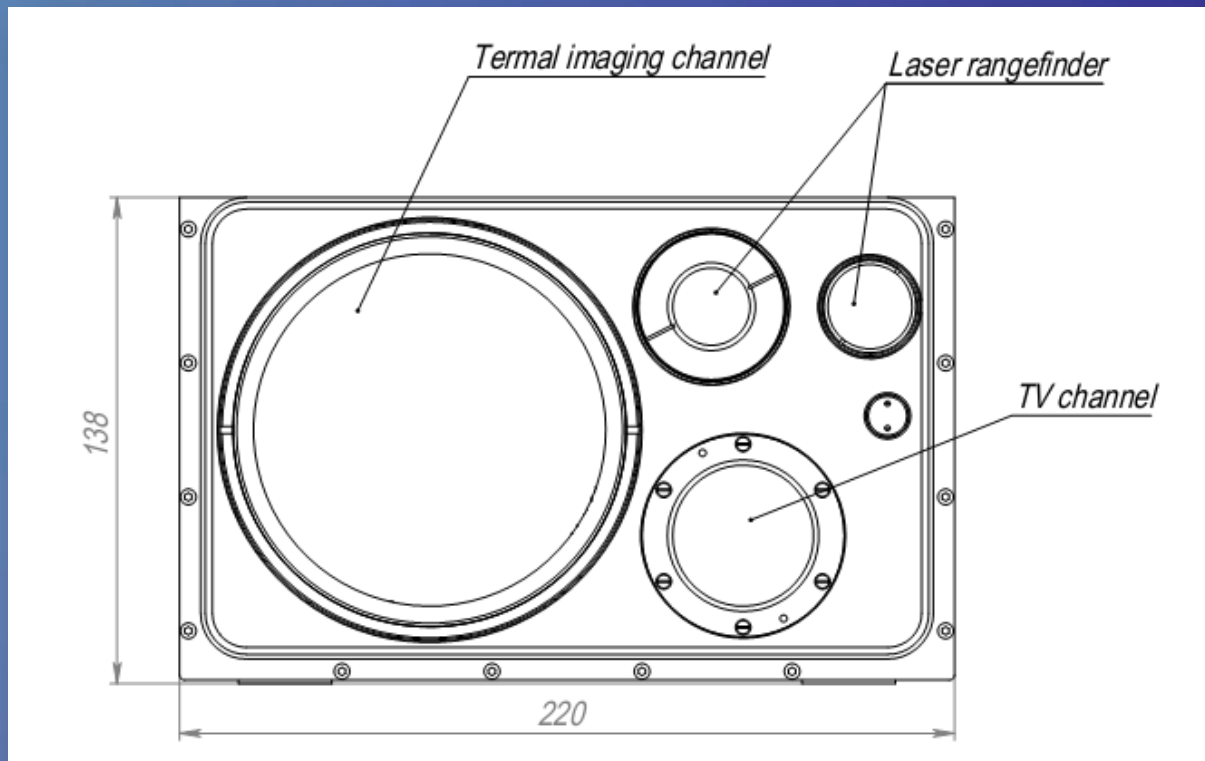


## Delivery complete set

No	Name	Quantity
1	Radar module	1 pc.
2	Electro-optical module	1 pc.
3	Source of secondary power and of interfaces conversion	1 pc.
4	Operator's automated workstation	1 pc.
5	Set of cables	1 pc.
6	Assembly kit	1 pc.
7	System assembly manual	1 pc.
8	Operating manual	1 pc.

# SCANNING OPTOELECTRONIC SYSTEM

## «QUAD»



«QUAD» system is intended for conducting aimed fire at stationary and moving targets from standing and on the move.

The system can be installed on the ground using a tripod and also on an armored vehicle. System is controlled by means of the remote control, which can be installed either in a vehicle (mobile version), or at a distance of up to 300 meters using fiber-optic cable.

# Structure of the system

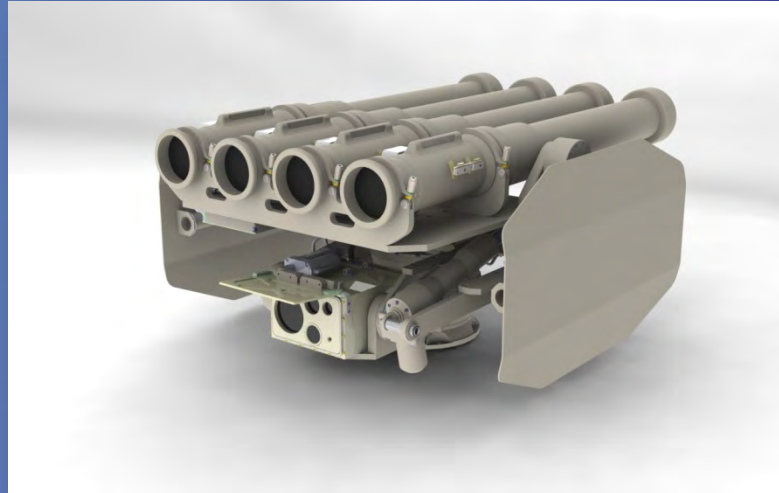
The system includes:

- Weapon (for active protection);
- Support and rotating platform (SRP);
- Optoelectronic rangefinder-sight (OEM);
- Remote Control (RC);
- Battery unit (BU)

Upon request of the Customer any weapon can be mounted on the support and rotating platform including 7,62mm or 12,7mm machine guns as well as grenade launchers.

Technical requirements for the support and rotating platform are agreed with the Customer separately.

## EXAMPLE: Optoelectronic System «QUAD» with 4x RPG-32



### The main technical features of the «QUAD» system

No	Feature	Value
1	Distance of shooting	From 50m to 700m (for RPG-32)
2	The range of angles of sight, vertical	From -5° to +30°
3	The range of angles of sight, horizontal	From 0° to 360°
4	Power supply	24V
5	Total weight	90kg
6	Operating temperature range	From -20°C to +50°C



# Main technical features of the OEM

Feature	Value
<u><i>TV channel</i></u>	
Type of image	Color / black-and-white
Angular field of view	8°x6°
<u><i>TI channel</i></u>	
Spectral range	8...14 μm
Sensor resolution	640x480 Uncooled
Angular field of view	8°x6°
Recognition range of target such as "tank"	not less than 1000 m
<u><i>Rangefinder channel</i></u>	
Laser source type	diode
Operating wavelength	905±20 μm
Recognition range of target of 2,3x2,3m size	50...3000 m
Absolute measurement error	±2 m
Temperature sensor	+
Tilt angle sensor	+
All channels are located in a single unit	+
Video control and transmission interface	Ethernet
Weight, not more than	6 kg
Supply voltage	24V

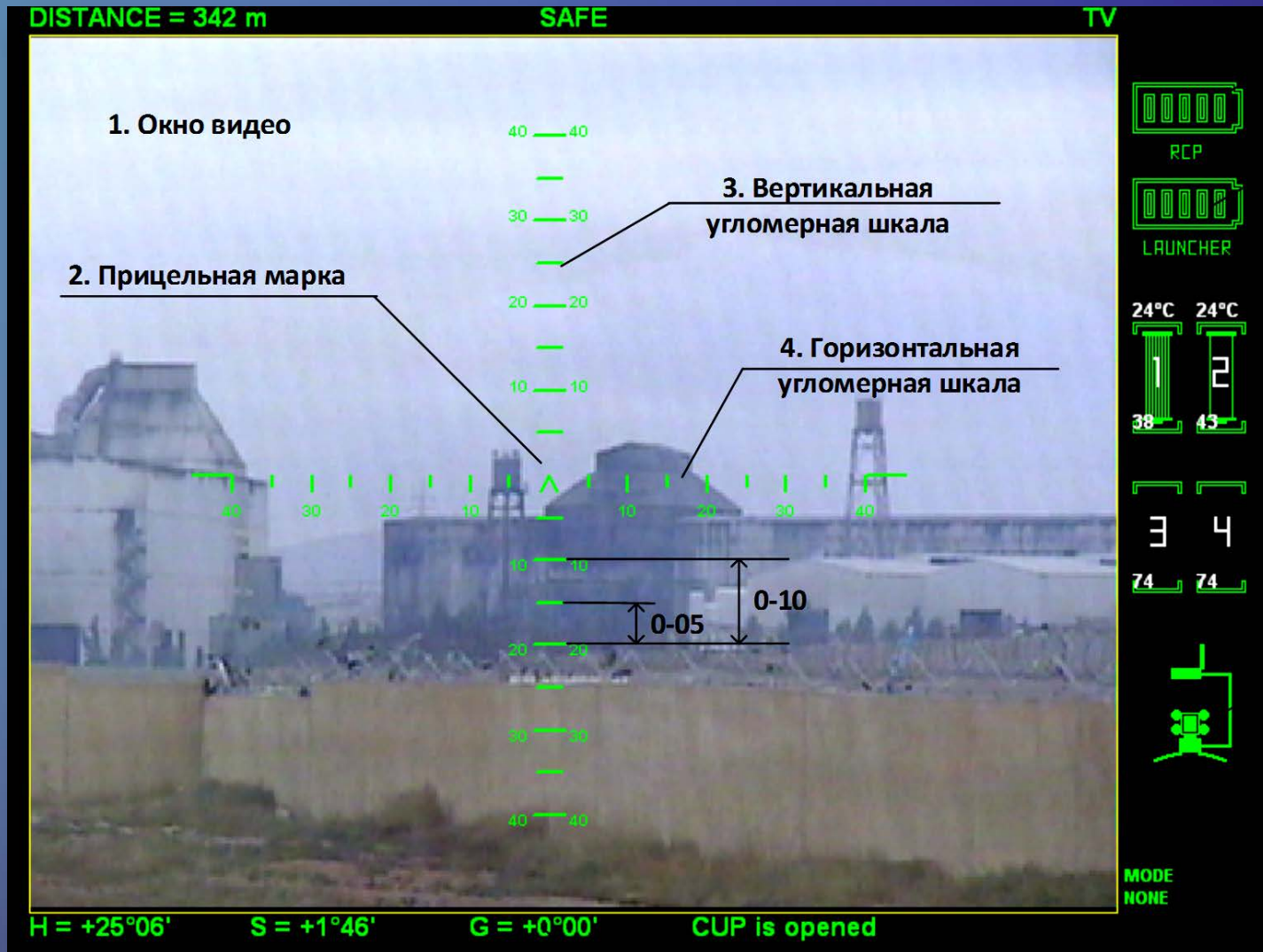
## Remote control



The remote control is designed to control support and rotating platform and optoelectronic rangefinder-sight on fiber-optic data line.

The display of the remote control shows the video image of the area, received by TV or TI cameras, the reticle, as well as service information designed to manage the system.

## EXAMPLE: User Interface (Version 1.0)



## Set of delivery

No	Description	Q-ty
1	Support and rotating platform (SRP)	1
2	Optoelectronic rangefinder-sight (OEM)	1
3	Remote Control (RC)	1
4	Battery for SRP	2
5	Battery unit (BU)	1
6	Reserve battery pack	1
7	Charging device for battery unit and battery for SRP	2
8	Mounting system for grenade launcher tubes	1
9	Set of connecting cables	1
10	Fiber-optic connection cable, 300m on a reel	1
11	Vehicle mounting kit for the SRP*	1
12	Tripod*	1
13	Spare parts, tools and accessories kit	1
14	Alignment kit	1
15	Protective case	1
16	User manual	1
17	Formular	1
18	Individual packaging (transport packaging)	1

\* - depends on usage variant.