

JSC "SRI "Vector»

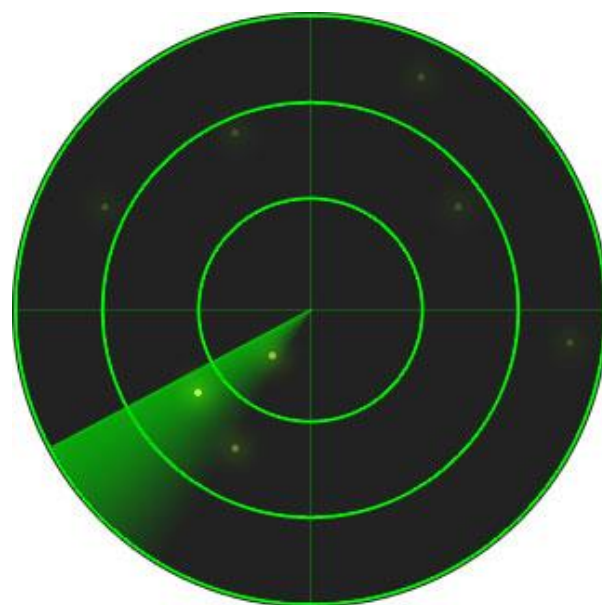
A promising civilian products



# UAV countermeasures system

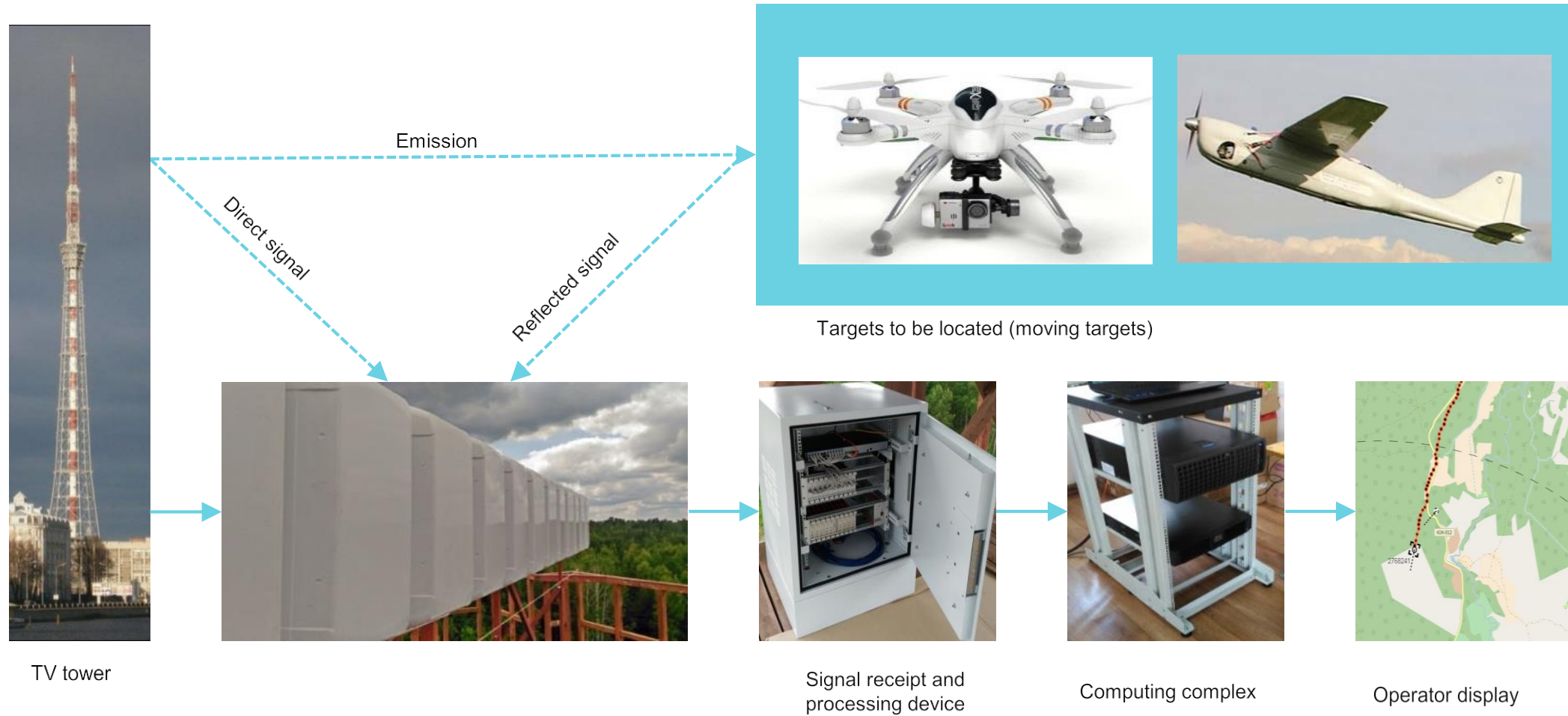
PCL (passive coherent locator) is intended for high accuracy monitoring of environment, detection and coordinates evaluation of moving aerial and surface targets, including UAV.

PCL is a passive location system. It uses emission of TV tower. Based on this, PCL does not have active emitter, that makes it hidden for other detection means. Emitter absence allows to install PCL and use it without special permissions or approvals.



**DVB T2**  
TERRESTRIAL

470-790 МГц

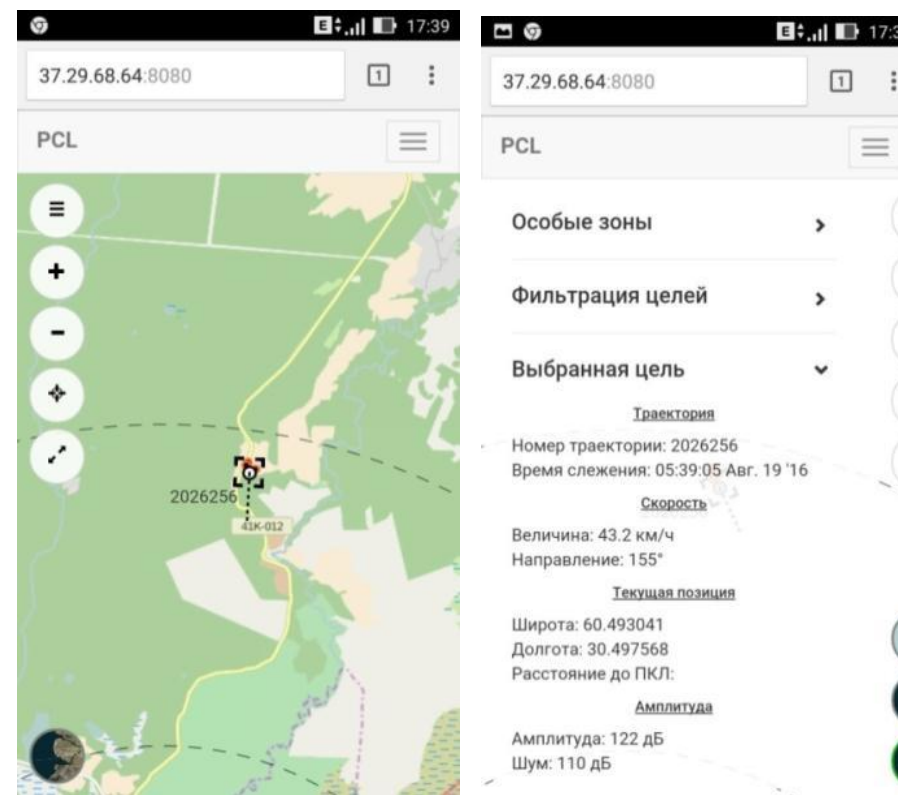


# PCL operation: quadcopter DJI Phantom 3 detection

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Distance from PCL location: 9 km

Distance from signal emitter (TV tower): 58 km



PCL information display, including target tracking on the monitor, and characteristics such as speed, direction, etc.



Parameter	Value
Detection range, km (for target with RCS 1 м <sup>2</sup> , signal / noise ratio by power 129)	21
Horizontal field of view, deg	76,5
Vertical field of view, deg	54
Guaranteed resolution range, м	100
Velocity resolution, м/s	2,8
Target coordinate error in horizontal field, m	88
Error of target velocity assessment in horizontal field, m/s	2,8
Number of simultaneously tracked targets, not less	18
Minimal speed of tracked target, km/h	10
Maximal speed of tracked target, km/h	640
Maximal target acceleration, m/s <sup>2</sup>	7
Maximum target lock time, s	11
Power supply	~ 200-240 V, 50 Hz
Maximum power consumption, kVA	1,8
Average error free running time, hours	4000
Warranty period, years	1



External view



Receiving module of  
30 – 3000 MHz diapason



Antenna view

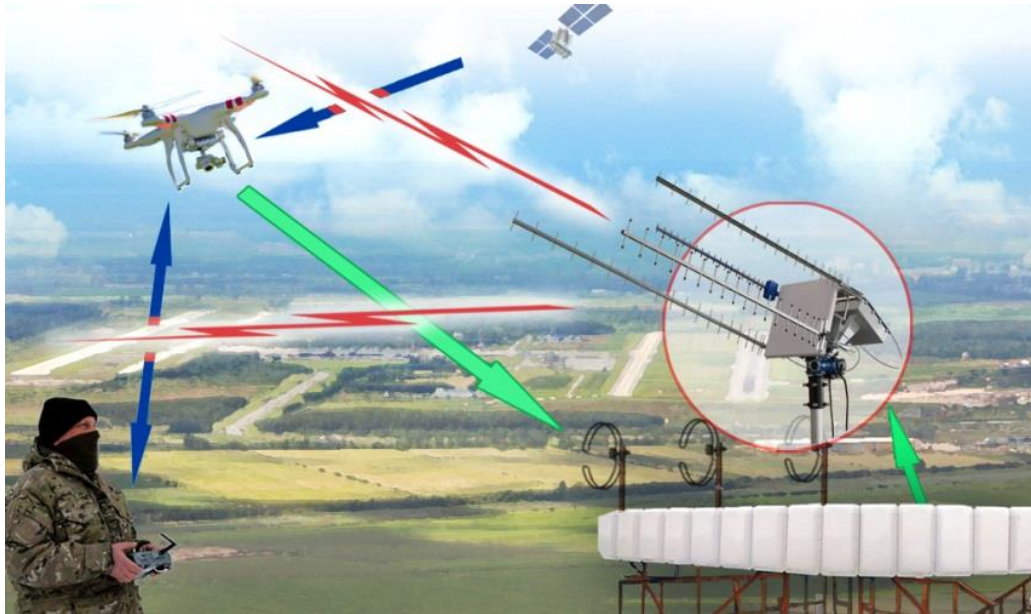
## Assignment

- ✓ Breaking of UAV control channel and operator target detection (while use in complex);
- ✓ Energy detection and receipt of signal-code structures;
- ✓ Express-analysis and classification of different transmission types;
- ✓ Demodulation and decoding of radio signals;
- ✓ Time-and-structure analysis of signal-code structures;
- ✓ Automated receipt of microphone types of transmission;
- ✓ Information register about radio signals and semantic information;
- ✓ Setting direction towards signals source;
- ✓ Acting as a part of combined radio monitoring means complex;
- ✓ Possibility to operate in combination with PCL.

Technical characteristics

Parameter	Value
Quantity of receiving channels of receipt module in 30 – 3000 MHz diapason	2
Quantity of wideband channels 60 MHz	1
Time of circular buffer record 60 MHz, hour	8
Number of virtual channels, created at stations in 60 MHz band	100
Possibility to work with circular buffer 60 MHz	Available
Quantity of receiving devices AY045 (target detection) in 30 – 1300 MHz diapason	1
Band of immediate frequency-azimuth detection and direction finding, MHz	60
Simultaneous direction finding of emitters in 60 MHz band	More than 100
Instrumental root-square deviation of emitter target detection, degrees	
in 30 - 80 MHz diapason	5
in 80 - 300 MHz diapason	3
in 300 - 1300 MHz diapason	1
in 1300 - 3000 MHz diapason	Not rated





«Serp» device is intended to suppress control channels of UAV and its airborne GPS signals receiving module.

As a result of «Serp» operation, UAV operator loses control over UAV, and UAV stops getting GPS coordinates and can not continue its flight assignment in standalone mode.

Technical characteristics

Parameter	Value
Frequency diapason, MHz	880-960, 1150-1300, 1550-1610, 2400-2480, 5200-5900
Maximum output power, not less than, W	10
Maximum speed of tracked target, not less than, km/h	100, at 100 m distance
Antenna angular pattern width, less than, degree	30
Range of GPS signals suppression, km	Up to 20
Control interface	Ethernet
Power supply, V	12±3
Power consumption, less than, W	100
Net weight, less than, Kg	45
Dimensions, l * h * w, mm	1500x1900x2000

### Critical objects:

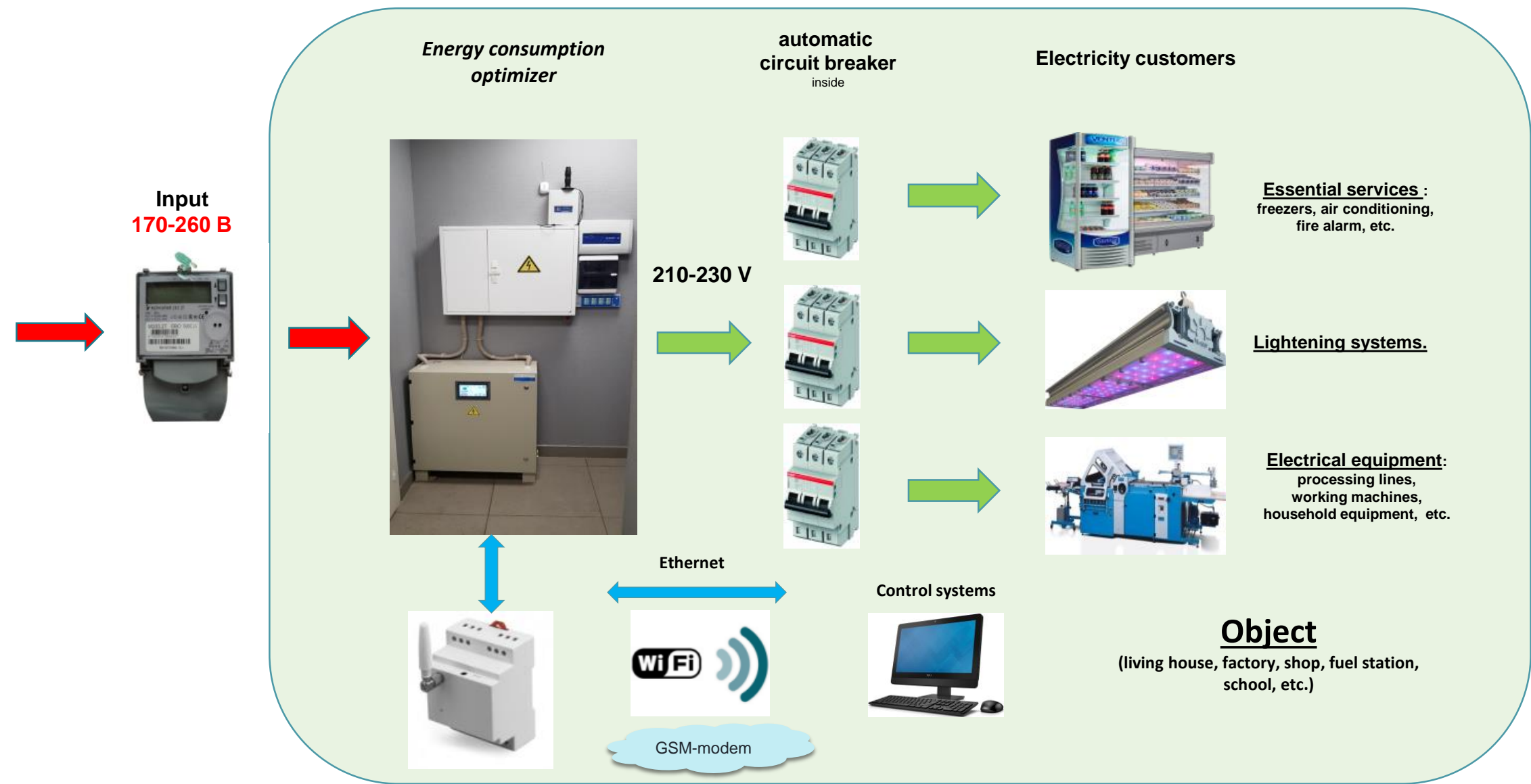
- Stadiums
- Airports
- Sea ports
- Oil and gas pipelines, oil and gas processing facilities
- Chemical manufacturing facilities
- Hydro-electric power stations
- Atomic power stations
- Forced-labor camps and jails

# Electricity quality control and energy consumption saving

- normalization (keeping) of electric potential inside operator set diapason;
- registration, archivation and sending to control room electricity quality parameters and power consumption information.







### Equipment main function:

Normalization/keeping electric potential inside the object in the operator set diapason;

Registration, archivation and sending to control room electricity quality parameters and power consumption information;

Non-commercial discount of electric power consumed.

### Optimizers are included to:

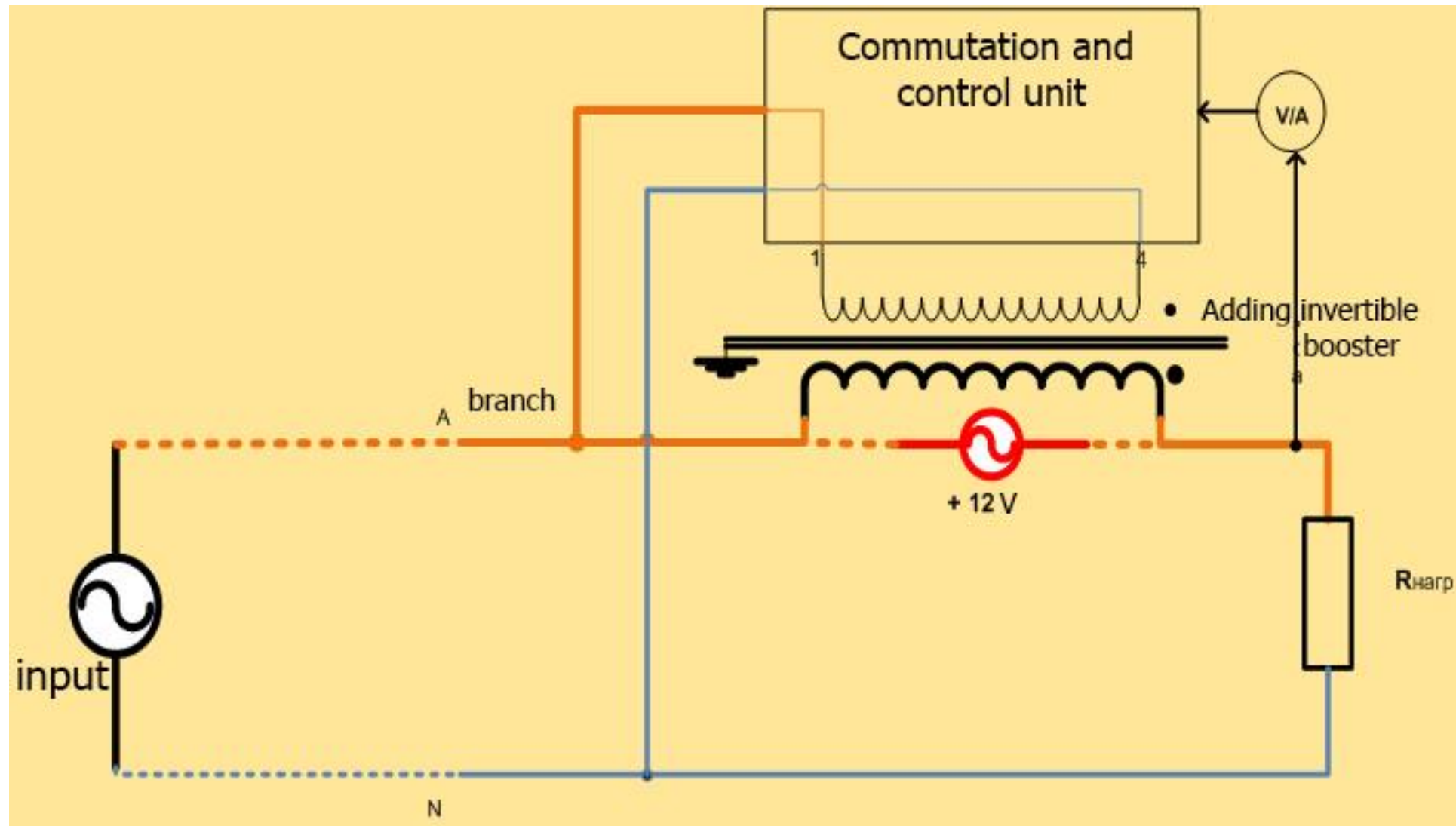
1. «Innovative and hi-technology equipment list of Moscow city» by Science, industrial politics and entrepreneurship committee of Moscow government;
2. «Energy saving and innovative equipment register» of Housing and utility sector department of Moscow government

### Potential users:

1. Multiple dwelling buildings;
2. Private households, villas, housing communities;
3. Housing and utility sector enterprises;
4. Social objects (schools, nursery schools, clinics, hospitals, etc.);
5. Road maintenance organisations;
6. Street lightening systems.

## Energy consumption optimizer:

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Ministry of foreign aff  
airs building



Moscow state technical  
university dormitory

Equipment assignment	Automatic step-by-step electric potential adjustment, both increasing and decreasing, up to 20% with 5% step
Power, 3 branch totally (kVA)	Different types from 40 to 400.
Electrical network	3-branch with 380/220 V potential, 50 Hz frequency.
Possible input electric potential diapason (V)	85 - 264
Maximum adjustment output electric potential (V).	U <sub>BX</sub> +- 20%
Own power consumption against nominal consumption (P <sub>own</sub> / P <sub>user</sub> )*100	Less than 0.5%
Adjustment type	Each branch individually, without network breaking and electric potential and current intensity harmonics deformation. Number of adjustment steps – up to for, 5% each.
Equipment management	Can be conducted either by operator panel (for indoor use), or via Wi-Fi by Android-run gadgets.
Network parameters adjustment and archivation	Continuous adjustment and indication of electric potential, current intensity, watts and cos φ for each branch and generally, archivation of electric parameters for last 30 days with distant data accessibility.
Automated system of electric power commercial discount integration	Can be integrated via standard protocols via Wi-Fi, Ethernet or GSM-modem
IP rating	Not less than IP20 for indoor use
Proportion weight (kg) for 1 kVA of power	From 5 to 3
Proportion price (rubles) for 1 kVA of power	From 5 000 to 3 000

1. **Hybrid microprocessor commutation system.** Removes current and electric potential steps during commutation, allows to increase reliability of equipment operation and increases commutation elements lifetime.
2. **Special design of 4-coil voltaic boosters** with dynamic coil configuration. Allows to decrease booster size up to 30% in proportion to common boosters of the same power.



1. Equipment integrates **electric power quality analysis function**. Quality parameters are recorded every 1 second, **put to archive** on built in data storage device or **are transferred via data network** to control rooms for further processing, also for non-commercial discount of electric power consumed.
2. Equipment management can be carried out through **true color sensor panel**, that allows to show big amount of data at one time and to manage the equipment in dialog regime.
3. The equipment implements function **«Effectiveness express-test»**, that allows to check up the amount of energy saved.

1. **Direct economy** on energy consumption is approached by providing to high efficiency factor machinery with normal electrical potential and current in diapason  $U_{nom} \pm 5\%$ . (For electric motors it is about 6-7% saving, for lightning systems – up to 20%, depending on overstated current value).
2. **Indirect economy** by: current-using equipment lifetime growth, break-downs decreasing that provides decreasing of costs for repairs and maintenance.
3. **Maintenance costs economy**. The equipment practically do not need any preventive service.

**Total economy on energy consumption will be about 12-15 %**

Quarter electric energy consumption (lightening) is about 121,35 thousand kW/h

Quarter expenditures for electric energy – 922,1 thousand rubles.

In case of current decreasing in 2-branch network to 218 V, electric energy consumption will decrease by **5%**, that will lead to **8-10%** economy, or about **83 thousand rubles**.

In discussed case, 3 units ОЭП 3-100-01 will be needed, 66 kVA each, price **255 000,00 rubles** for one unit.

Pay-off period can be calculated like  $T_{pop} = P_{kv} * 100 / (\%s * I_p * U_r * T * 24)$  and will be scheduled by **24 months**

(where:  $P_{kv}$  – 1 kVA cost factor depending by the type of equipment chosen;

$\%s$  - % of savings;

$I_p$  – power index, that means time of equipment operation;

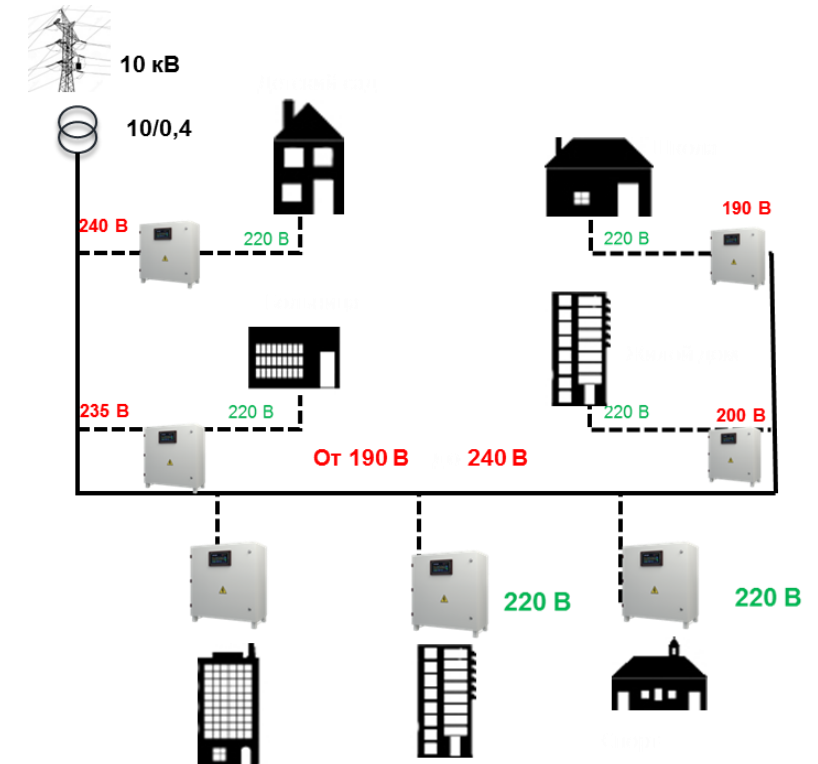
$U_r$  – utilization ratio by time;

$T$  – tariff for 1 kW/h of electric power)

This calculation is made only by using direct economy on electric energy consumption and does not include lamps lifetime and their rotation price.

Energy consumption optimizer **ensures energy consumption saving** for end-users in 0.4 kV network.

- Direct economy by electric potential decrease;
- Indirect economy by current-using equipment lifetime growth, break-downs decreasing that provides decreasing of costs for repairs and maintenance.
- Energy consumption optimizers are installed and effectively used in Moscow at:
  - X5 group of companies retail shops;
  - Moscow state technical university dormitory;
  - Ministry of foreign affairs buildings;
  - Gazpromneft and Lukoil filling stations;
  - Education department objects;
  - etc.



## 3-branch invertible booster for 0,4 kV electric networks

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Electrical potential in network, V	380/220
Nominal frequency, Hz	50
Network electrical potential diapason, when equipment can effectively work, V	110 – 264
Electrical potential regulation	4-step: : $\pm 20\%$ from $U_{in}$ with 5% step
Type of commutation	without network breaking
Sinewave deviation	no
Management (mode control, parameters adjustment, fails analysis, etc.)	In dialog mode through Android or IOS using gadget.
Measurement, archivation and data transfer (local Wi-Fi or through GSM-modem).	Electric potential, current, power consumption, each branch and in general, regime, fails register etc.
Efficiency factor at nominal load, %	99
Type of load	any
Casing IP rating	IP 55
Outside temperature, °C	From -40 to +40 if installed on power supply line bearer







ENSTO booster  
Power – 45 kVA  
Weight – 170 kg



Booster Optimum  
Power – 90 kVA  
Weight – 150 kg



Booster TVMG 52/125-380  
Power – 52 kVA  
Weight – 750 kg

# Booster comparison chart

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Parameter	Invertible booster Optimum	ENSTO booster	Booster TVMG
Equipment assignment	Automatic step-by-step adjustment, both up and down, up to 20% with 5% step	Automatic step-by-step <b>increase</b> of electric potential for 7%, 13% or 20%.	Automatic <b>increase</b> for 15% and stabilization of electric potential .
Nominal power, 3-branch total (kVA)	Different models, from 20 to 105	Different models, from 20 to 45	Different models, from 16 to 105
Network type	3-branch network with electric potential 380/220 V, frequency 50 Hz and one branch network 220 V 50 Hz	3-branch network with electric potential 380/220 V	3-branch network with electric potential 380/220 V
Output electric potential adjustment diapason (V).	$U_{in} \pm 20\%$	$U_{in} + 20\%$	$U_{in} + 15\%$
Self power consumption, related to nominal power ( $P_{self}/P_{nom}$ )*100	1 %	2%	4%
Way of adjustment	Adjustment is performed for each branch individually, without network break and electric potential and current sinewave deviation, due to use of invertible booster convertors. Number of adjustment steps – 4, each step 5%.	Adjustment is performed for each branch individually, without network break. Due to semiconductor use, electric potential and current sinewave deviation is observed. Number of adjustment steps – 3 , each step 7%.	Adjustment (only increase) is performed for each branch individually, without network break. Due to semiconductor use, electric potential and current sinewave deviation is observed.
Way of equipment management	Equipment management is performed by operator panel (for indoor models) or via Wi-Fi through Android or IOS using gadgets or GSM-modem. Operator can distsntly change performance modes, adjustment parameters or archivation parameters.	Equipment tuning is performed at factory and parameters can not be changed during performance.	Equipment tuning is performed at factory and parameters can not be changed during performance.
Network parameters variation and archivation	Available: - continuous adjustment and indication of electric potential, current intensity, watts and $\cos \varphi$ for each branch and generally; - archivation of electric parameters for last 30 days with distant data accessibility.	Network parameters variation and archivation is not available	Network parameters variation and archivation is not available
Automated system of electric power commercial discount integration	Can be integrated via Wi-Fi and/or GSM-modem	No integration	No integration
Casing IP rating	Not less than IP20 for indoor use. Not less than IP55 if installed on power supply line bearer	IP55	IP55
Working outside temperature diapason	From -40 to +40 °C, if installed on power supply line bearer	From -50 to +60 °C	From -50 to +60 °C
Proportion weight (kg) for 1 kVA of power	From 3 to 5	From 4 to 6	From 7.5 to 25
Proportion price (rubles) for 1 kVA of power	From 5 000 to 10 000	From 15 000 to 25 000	From 15 000 to 20 000

For direct economy calculation caused by outsized electric potential normalization, it is possible to start an effectiveness built-in express-test.

While test running, optimizer switches to “bypass” mode, analyses input electric potential before normalization, and than switches to “normalization” mode.

Express test algorithm is based on comparing consumed power in “bypass” mode with consumed power in “normalization” mode.

Data is levelled with number of comparison cycles performed.

1. **Inspection** – we inspect the target user premises, find problems and calculate necessity of equipment use.
2. **Pilot project /testing/** - we can temporarily set up the equipment for making test running and analyze the effect of equipment use.
3. **Analysis and report** – after testing our engineers analyze the results and give recommendations for equipment set up and use.
4. **Contract signing** - after the decision to purchase equipment is made, we prepare the contract with all discussed conditions.
5. **Manufacture** – we manufacture contracted equipment and perform individual tuning.
6. **Supply** – we supply the equipment to the discussed in the contract place by ourselves or hired transport company.
7. **Installation or chief installation** – installation is performed by ourselves, chief installation is performed by consumer's specialists under supervision of our engineer
8. **Warranty and service** – standard conditions are given in technical documentation. Extra non-warranty service is possible under separate contract.



**Legal address:**

Akademika Pavlova street, 14a, Saint Petersburg, 197376

**Main office address:**

Kantemirovskaya street, 10, r. Saint Petersburg, 197342

tel./fax: +7 (812) 591-72-74, tel.: +7 (812) 295-10-97

E-mail: [nii@nii-vektor.ru](mailto:nii@nii-vektor.ru), URL: <http://www.nii-vektor.ru>