IRZ (Izhevskiy Radiozavod) is one of the leading electronics manufactures in Russia implementing domestic and international projects related to aerospace, oil-and-gas industries, railway transport, navigation and telecommunication.

- Turn-key projects
- 60+ years of experience in electronics production
- Compliance to international standards
- 5500 employees
## IRZ group of companies

### Joint-stock company “Izhevskiy radiozavod” (IRZ)

### IRZ
- Space-related electronics for on-board and ground segments
- Microwave products
- Hybrids production
- Telecommunication equipment
- Robotics and sensors

### IRZ TEK
- Oilfield equipment
- Oil production process control and management systems
- Power electronics

### IRZ-Svyaz
- Navigation equipment
- Communication systems
- Onboard and ground communication and control systems
- Check-out equipment

### IRZ-Foton
- PCB Production
- Automated mounting (PCB assemblies)

### IRZ-TEST
- Electronic components accredited testing center
- Electronic components qualified supplier
- Certification body in the Space Technology Federal certification system
- Electronic components quality assessment center

### IRZ-Lokomotiv
- Railway automatics and safety systems

### IRZ-Rinkos
- Mechanical parts production
**Product lines**

- **Space-related electronics for on-board and ground segments**
- **Railway automatics and safety systems**
- **Telecommunication systems**
- **Navigation equipment**
- **Vehicle power electronics, energy industry equipment**
- **Check-out systems**
- **Equipment for oil & gas industry**
- **Robotics and sensors**
Space-related electronics for on-board and ground segments

Equipment for spacecraft, launchers, upper-stages, space stations, and ground applications

Telemetry and onboard data gathering subsystems
Onboard digital computers
Telemetry, command and ranging subsystems
Equipment for International Space Station automatic docking system
Radio subsystems for integrated control and telemetry system
Video monitoring systems for spacecraft
Space-related electronics for onboard and ground segments

**Implemented projects**

**Spacecraft equipment**

**Spacecraft and space stations equipment**
Vostok, Soyuz, Progress, ATV, Salyut, Mir, ISS

**Ground segment equipment**
SKS satellite communication system, Bankir-2, Gonetz-M

**Launchers and upper-stages equipment**
Molniya, Zenit, Energia, Rokot, Proton, Soyuz, Angara, Fregat, Briz, DM, Volga

IRZ equipment is used in major Russian space programs. IRZ has more than 50 years experience in space industry.

**Our partners**
- State Space corporation ROSCOSMOS
- NPO Lavochkin
- Chrunichev state research and production space center
- ISS Reshetnev company
- S.P.Korolev Rocket and Space Corporation Energia
- Russian Space Systems
- Research Institute of Precision instruments
- Thales Alenia Space and others
Railway automatics and safety systems

Onboard, track and station systems

KLUB-U automatic train safety system

KLUB-UP safety system for motorized I and II category rolling stock

Interval control signaling systems

SOB-400 automatic train safety system

Systems for control and record of driving parameters

Time countdown panels for level crossing signaling systems
Railway automatics and safety systems

Implemented projects

**Automatics and safety systems for rolling stock**
- Russian Railways, CIS and Baltic States railways
- Siemens (Sapsan project), General Electric, Alstom (Allegro project), Skoda, PESA, Talgo, Hyundai, Stadler, Zhuzhou Electric Lokomotive, Datong Electric Lokomotive Co., Dalian Lokomotive Co., Plasser
- Metro railcars

**Rolling stock devices control and diagnostics equipment**
- Russian Railways

**Interval control signaling systems**
- Railways of Russia and CIS countries

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**Our partners**
- Russian Railways (RZD)
- Moscow Metro
- Kazakhstan Railways (KTZ)
- Siemens
- Škoda Auto
- Pesa
- CSR Corporation Ltd.
- General Electric
- Alstom Transport and others

Most of the Russian Railways locomotives are equipped with IRZ safety systems
Telecommunication systems

Radio communication and data transmission systems
Telecommunication systems

Radio communication and data transmission systems

Railways

• Russian Railways, CIS and Baltic States railways
• Regional Russia railways
• Siemens (Sapsan, Lastochka projects), General Electric, Alstom (Allegro project), Skoda, PESA, Talgo Stadler, Zhuzhou Electric Lokomotive, Datong Electric Lokomotive Co., Dalian Lokomotive Co., Plasser, and others
• Metros of Moscow, Saint-Petersburg, Ekaterinburg, Baku and Tashkent

 Authorities

Ministry of Internal Affairs of the Russian Federation, Federal Penitentiary Service Of Russia (FSIN), Russian National Guard, Ministry of Education and Science, EMERCOM of Russia

Fuel and energy companies

Gazprom

Most of the Russian Railways locomotives are equipped with IRZ communication systems
Telecommunication systems

Mobile network systems

Distributed antenna systems (DAS)

The outdoor oDAS RADIUS system is designed to provide cellular coverage along railways, roads, oil-and-gas infrastructure and rural areas. oDAS RADIUS supports LTE (4G), UMTS (3G), GSM (2G) standards and provides serial distribution of base station (BTS) sectors using fiber optic or radio link for the distances of up to 60 km.

Radio units (RU) for base stations

Remote radio units (RU) are high power transceivers for mobile network distributed base stations. Radio units provide LTE (4G), UMTS (3G), GSM (2G), and 5G radio access networks. The equipment is designed for OpenRAN technology and can be used with traditional distributed base stations as well.

Our partners

- Telecommunication Technologies Consortium (ANO TT)
- Open Net Technologies Association
Robotics and sensors

Robotic systems, sensors, optical-electronic systems

- Radars
- Rotating electrical connectors
- Manipulators
- Remote control panels
- Li-on batteries
Navigation equipment

Satellite navigation equipment

- OEM navigation modules
- GLONASS / GPS / SBAS / QZSS / Galileo / BeiDou

- Time synchronization units for base stations

- Antenna amplifying units

- Satellite navigation equipment for highly dynamic objects
Navigation equipment

Implemented projects

Aerospace applications

• Satellite navigation equipment for Angara-1.2, and SOYUZ-5 launchers, Fregat and Persey upper-stages, small satellites
• Unmanned air vehicles navigation systems

Ground applications

LTE mobile networks synchronization equipment

Our partners

• State Space Corporation ROSCOSMOS
• Ministry of Internal Affairs of the Russian Federation
• Ministry of Science and Higher education of the Russian Federation
• Russian Railways (RZD)
• MTS

More than 100 000 equipment items were produced
Equipment for oil & gas industry

Oilfield equipment and oil production process control and management systems

- Motor drives for electric submersible pumps
- Downhole monitoring systems
- Anti-scaling systems
- Motor drives for sucker-rod pumps
- Downhole monitoring systems for dual completion wells
- Process control stations
Equipment for oil & gas industry

Implemented projects

**Downhole monitoring systems and drives**
Lukoil, TNK-BP, Surgutneftegaz, Rosneft, Slavneft, Tatneft, Bashneft, Gazpromneft, and others
Exported to: Azerbaijan, Kazakhstan, Tajikistan, China, Indonesia, India, Venezuela, South Sudan

**Equipment for dual completion wells**
Lukoil, Yuganskneftegaz, Surgutneftegaz

**Anti-scaling systems**
Lukoil

**Dispatching systems**
Udmurtneft, RN-Severnaya Neft, Belkamneft, Absheron Operating Company (Azerbaijan), RTRS, Russian Railways (RZD)

*Up to 40% of the Russian market share for downhole sensors*
Video monitoring systems

High resolution cameras and artificial vision systems

Video telemetry system for launchers and upper stages

Video camera with rolling shutter

High resolution video cameras

Video camera with global shutter
Video monitoring systems

Implemented projects

Aerospace applications
- Video monitoring for launcher (Soyuz-2.1a, Vostochny Space Center)
- Flight imitators
- Runway video monitoring systems (Sheremetyevo airport)

Transport infrastructure
- Moscow and Saint-Petersburg metro
- Sea transport

General purpose ground applications
- Administrative authorities
- Industrial facilities
- Oil & gas facilities

100% in-house development and production
Check-out systems

Customized hardware and software engineering and production, measurement equipment supply

PXI-express system unit

Testing system for cables and harnesses

Incoming inspection bench for electronic parts

Bench for environmental testing of electronic components for durability and reliability

Burn-in test system
Check-out systems

Features and advantages

Design and production

• Hardware
• Software

Advantages

• Selection of optimal multi-vendor configurations of measurement equipment for systems
• Manufacture and integration of non-standard industrial quality tooling for safe connection of an object to the system
• Customized software development for automation of the instruments integrated with the system
• Check-out systems are supplied together with a set of design documentation made in compliance to the Uniform System of Design and Software Documentation
• Measuring equipment supply upon customer’s request
• Direct agreements with global vendors

IRZ is a system integrator of the HI-END class check-out systems and measuring equipment
Vehicle power electronics, energy industry equipment

Traction and onboard converters, starter-generator systems

- Traction inverters for electric buses and trucks
- Traction inverters for railway transport
- Onboard DC / DC converters
- Starter-generator systems for gas-turbine installations
Vehicle power electronics, energy industry equipment

Features and capabilities

Power electronics for energy industry
• Versatile drives with active front end (AFE) and vector software (for pumps, lifting devices, heavy traction electric drives; power range from 100 to 800 kW)
• Customized converters for starter-generators in gas-turbine installations:
  – Project on upgrading the pipe line gas turbine sets
• Industrial uninterruptable power supply systems based on:
  – Li-ion batteries
  – Ionistors
  – Flywheels

Power electronics for vehicles
• Traction invertors ranging from 60 to 400 kW:
  – Diesel locomotives upgrade
  – Electric buses, trucks
  – Electric motorcycles
  – Hybrid front loaders
  – Rail tractors
• Onboard DC/DC and AC/DC converters ranging from 2 to 10 kW:
  – with liquid cooling
  – with air cooling
• Fast-charging stations for electric vehicles

Our partners
• Ruselprom
• GAZ
• Kamaz
• Moscow metro
Technologies and capabilities

- Engineering and design
- Electronic components procurement and tests
- LF, HF and microwave hybrids production
- PCB production
- Automatic mounting (PCBA)
- Mechanical production
- Assembly and integration
- Testing facilities
Full production cycle

- 850 engineers
- Logistic experts
- Testing center
- Production

R&D → Parts procurement → Parts certification, tests → Mechanical parts production → Assembly and integration → Product tests → 100% control

S and LEAN approach
Electronic components procurement

Electronic components procurement
- All general types of domestic and foreign electronic components
- Comprehensive logistics
- Replenishable warehouse
- Advance orders

Certified supplier

Advantages
- Direct agreements with manufacturers
- Bulk purchases and costs minimization
- Quality claims follow-up with manufacturers
Electronic components tests

Testing center expertise
- Accredited testing center
- Certification body in the Federal System of Space Technology Certification
- Center of electronic components quality analysis

Capabilities
- Electronic components tests
  - Incoming inspection
  - Additional tests
  - Certification tests
  - Total radiation doze tests
  - Information security tests
  - Development and approval of test programs and procedures, electronic components analysis and optimization
  - In-house design and production of tooling and software development

- Electronic components failure analysis
- Defining the causes of failures due to quality issues or violation of operational requirements

Full cycle testing and certification according to the Federal System of Space Technology Certification
LF, HF, and microwave hybrids production

**Products**

- **Microstrip boards:**
  - substrates materials: polycore, glass ceramics, ferrite, barium titanate, ceramics
  - polycore substrates with transitional metalized holes: three-, four-, and five-sided metallization

- **Discrete passive components:**
  - Thin-film resistors, capacitors based on leucosapphire
  - Polycore induction coils

- **Microstrip boards based on metal-coated RT / Duroid dielectric material**

- **Metal coated masters**
  - Iron oxide
  - Chromium

- **Hybrids**
  - Polycore, glass ceramics, ceramics
  - Packaged hybrids

- **Electronic semiconductor assembly units, crystal-based transistors**

**Capabilities**

- **Dimensions:**
  - Polycore microstrip boards: from 1 x 2 mm to 60 x 48 mm and up to 60 x 120 mm on RT / Duroid
  - Film conductors: from 1 to 23 µm, minimum width – 25 µm
  - Discrete passive components: from 2 x 2 mm
  - Hybrids: from 2 x 5 mm to 60 x 48 mm
  - Electronic assembly units: from 1 x 1 mm, pins diameter from 20 µm
  - Master elements: from 3 µm

- **Protective electroplating:**
  - Gold
  - Tin-bismuth
PCB production

Products
- Single-sided, double-sided, multilayer PCBs
- Flexible cables and PCBs
- Flex-rigid PCBs
- Microwave PCBs including multilayer boards
- Aluminium-based PCBs including double-sided, with metalized holes
- Antennas and emitters on dielectric base
- Leads from the copper-bearing alloy strip of 0.05-0.2 m thickness

Capabilities
- Number of layers: up to 24
- Board thickness: from 0.1 to 6 mm
- Minimum conductor’s width: 0.07 mm
- Minimum spacing between printed pattern elements: 0.07 mm
- Minimum hole diameter: 0.15 mm
- Hole diameter to board thickness ratio: up to 1:12
- Minimum blind hole diameter: 0.1 mm
- Blind hole diameter to depth ratio: up to 1:10
- Finish coatings: SnPb, HALS, galvanic gold, immersion gold (ENIG), galvanic silver, immersion silver (IAg)
- Foil thickness: 18, 35, 50, 70, 105, 210 microns
- Holes protection: film solder mask, copper paste
- Wave impedance tolerance control: ±10 %
- Dielectric materials: SF, STF, EILIFOM-PF, FR-4, FR-4 HiTg, FAF-4D, FLAN, ARLON, materials manufactured by ROGERS, TAIFLEX, DUPONT, Bergquist

100 % electric control
Automatic mounting (PCBA)

Technologies

- High-precision mounting of electronic components with all types of packages (BGA, CGA, LGA, CCGA, QFN)
- Convection reflow soldering
  (9-zone system: 7 heating zones, 2 cooling zones)
- Selective soldering (through hole technology)
- Ultrasonic rinsing of boards
- 100 % automatic optical inspection of solder joints quality and correct mounting
- X-ray quality control with tomography function to inspect the electronic products and components in real time with a submicron precision

Capabilities

- Chips sizes: from 01005 to 2225
- Simultaneous assembly: 320 part types
- Max. components size: 45 x 100, height up to 35 mm
- Distance between BGA leads: 0.5 mm
- Max. PCB size: 420 x 380 mm
- Mounting of PB and PB-free components
- Output: 50 000 components per hour
Mechanical processing

Capabilities

- Cutting with 6-7 quality level of accuracy with flatness tolerance of the work surface up to 0.01 / 100 mm
- **Sheet processing:** cutting-out, stamping, bending, forming, laser cutting
- **Welding, all types of welding of ferrous and non-ferrous metals:**
  - Argon-arc welding in the protective gas environment
  - Laser welding
  - Constructive soldering in the fused salt (800 x 600 x 650 mm) for complex volumetric aluminum alloy structures creation (high purity aluminum, Al-Mn)
  - Electroerosion processing of aluminum, magnesium, titanium, and other metals
- **Al die casting** from AK-12 materials with castings sizes of 200 x 200 mm, wall thickness of up to 0.5 mm and mass of up to 3 kg
- Plastic molding and press-materials processing, pressing
- **Tooling design and production** including molds, stamps, tools, fixtures, and measuring instruments
- **Electroplating and paint-coating:**
  - Zinc and cadmium coating
  - Chemical nickel plating
  - Anodic-oxide and chemical oxide coating
  - Tin-bismuth alloy coating
  - Chemical oxidation and multilayer magnesium coating
  - Coating of parts with precious metals (silver, gold, gold-nickel, palladium)
  - Application of electrically conductive coatings
  - Enamel coating, powder coating
Assembly and integration

Capabilities
- Assembly of components
  - Mounting into metalized holes
  - Micro mounting
  - Surface mounting
  - Through-hole mounting
- Electrical installation, parts shaping, electronic units assembly in various designs
- Sealing and leakage tests
- Moisture protection of mounted components
- Application of PPX coatings
- Potting with compounds
- Microwelding
- Microsoldering

Skills
- 60% of operators, tuning engineers and fitters have the highest qualification grades (from 4 to 6)
- Workplaces of tuning engineers are equipped with Hi-End class instruments from leading vendors
Products testing

Types of tests

- Product design phase tests:
  - Laboratory tests
  - Preliminary tests
  - Design development tests
  - Marginal tests
  - Lifetime tests
- For final products:
  - Qualification tests
  - Certification tests
  - Periodical tests
  - Type tests

Testing of final products

- Mechanical:
  - Vibration
  - Mechanical shock
  - Linear acceleration
  - Acoustic noise
- Environmental tests:
  - Temperature
  - Humidity
  - Atmospheric pressure
  - Sand and dust
  - Frost and dew
  - Salt (sea) fog
- Electrical:
  - Insulation strength

Confirmation of parameters

- Strength tests
- Environmental tests
- Reliability tests
- Transportation tests

Special tests of technical devices
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