



IRZ Company presentation



About company



IRZ

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**

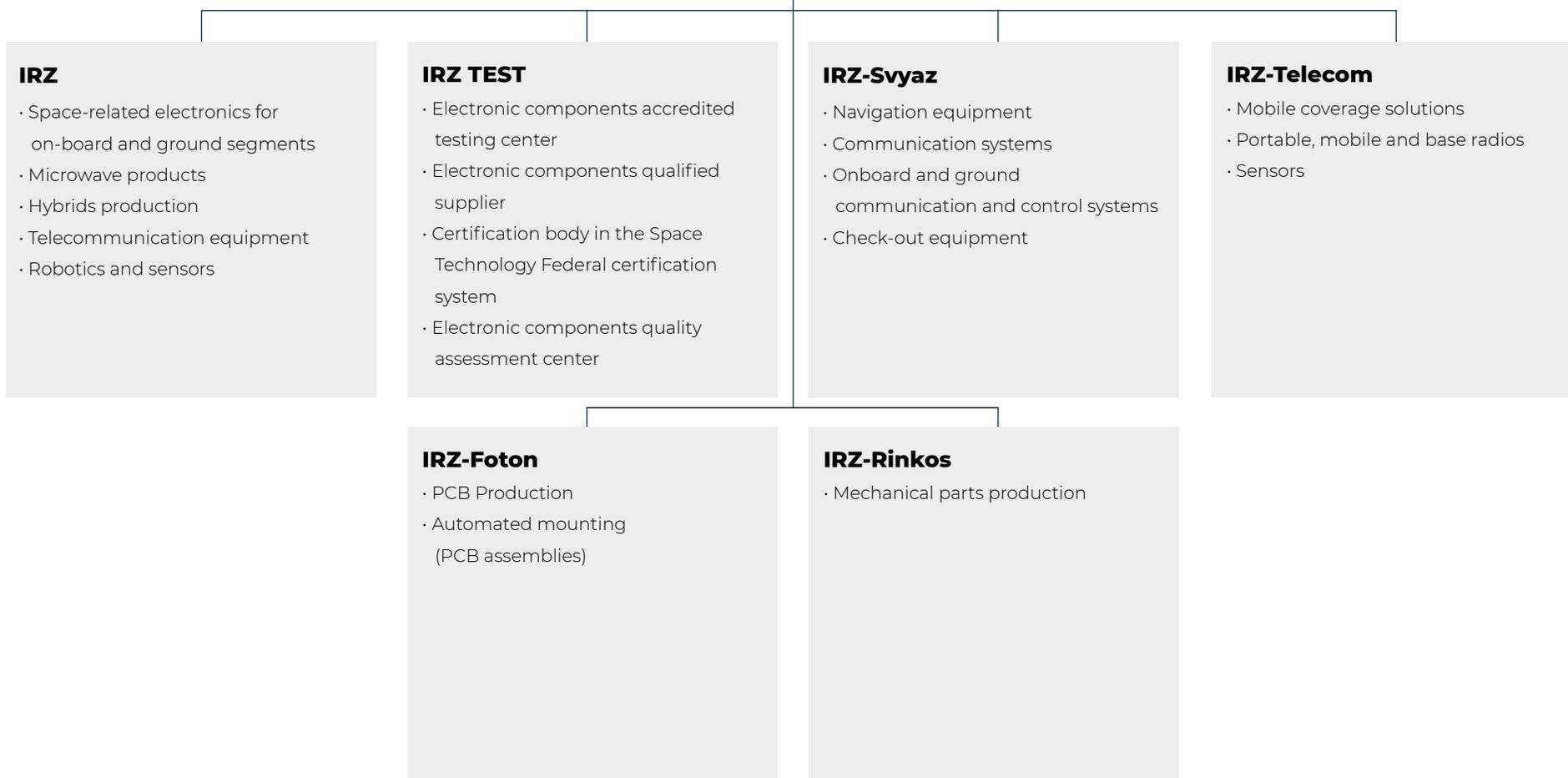


**5500
employees**

IRZ group of companies



Joint-stock company «Izhevskiy radiozavod» (IRZ)



Product lines



Space-related
electronics for on-board
and ground segments



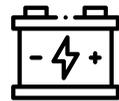
Check-out systems



Telecommunication
systems



Navigation
equipment



Vehicle power
electronics, energy
industry equipment



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



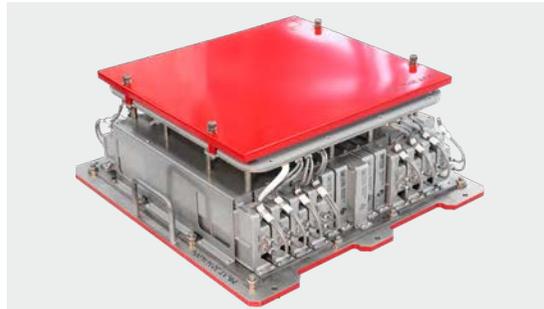
Onboard digital computers



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

Meteor, Meteor-M, Horizont, GALS, Glonass, Glonass-K, Glonass-M, Loutch, Gonetz-M, Express, Express-AM, Express-AM5, Express-AM6, Express-MD1, Express-MD2, Express-80, Express-103, Express-AM8, Loutch-5A, Loutch-5B, Loutch-5V, Spektr-R, Spektr-UF, Electro-L, Bion-M, Photon, Photon-M, Koronas-Photon, Resurs-DK, Yamal-300K, Yamal-401, SESAT, AMOS-5, TELEKOM-3, KazSat-3, Lybid

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

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

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

Interval control signaling systems

Railways of Russia and CIS countries

Rolling stock devices control and diagnostics equipment

Russian Railways

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

Our partners

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

Telecommunication systems

Radio communication and data transmission systems



DMR portable radios



Mobile DMR radios



Dispatcher consoles



DMR base stations/repeaters



Universal locomotive/fixed HF and VHF radio supporting TETRA, DMR and GSM-R



Dispatcher radio



Fixed HF and VHF radios for railway transport



VHF radio modem

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
- Metro 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.

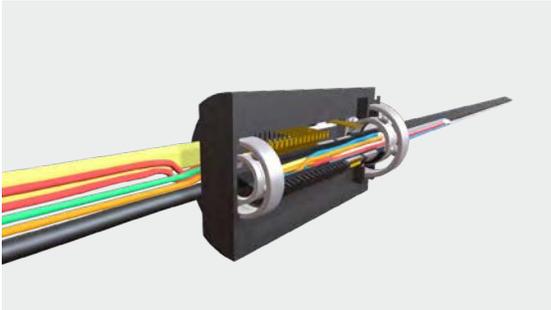
The equipment is designed for OpenRAN technology and can be used with traditional distributed base stations as well.

Robotics and sensors

Robotic systems, sensors, optical-electronic systems



Radars



Rotating electrical connectors



Li-ion batteries



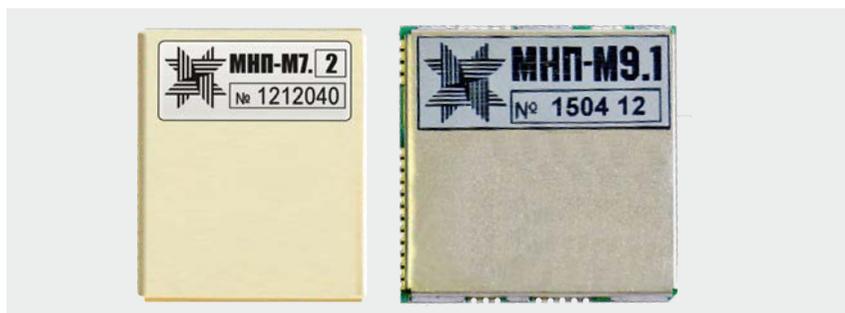
Remote control panels



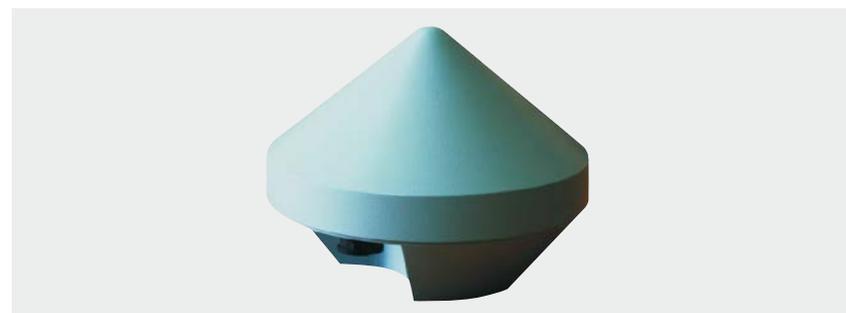
Manipulators

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, Gaspromneft, 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

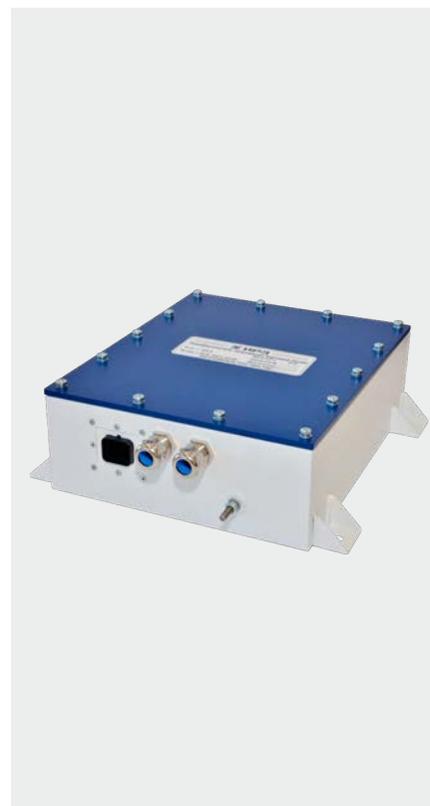
Traction and onboard converters, starter-generator systems



Traction inverters for electric buses and trucks



Traction inverters for railway transport



Onboard DC/DC converters



Starter-generator systems for gasturbine 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

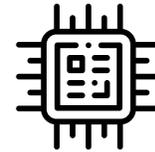
Technologies and capabilities



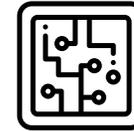
Engineering and design



Electronic components procurement and tests



LF, HF and microwave hybrids production



PCB production



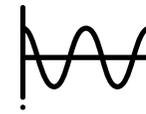
Automatic mounting (PCBA)



Mechanical production

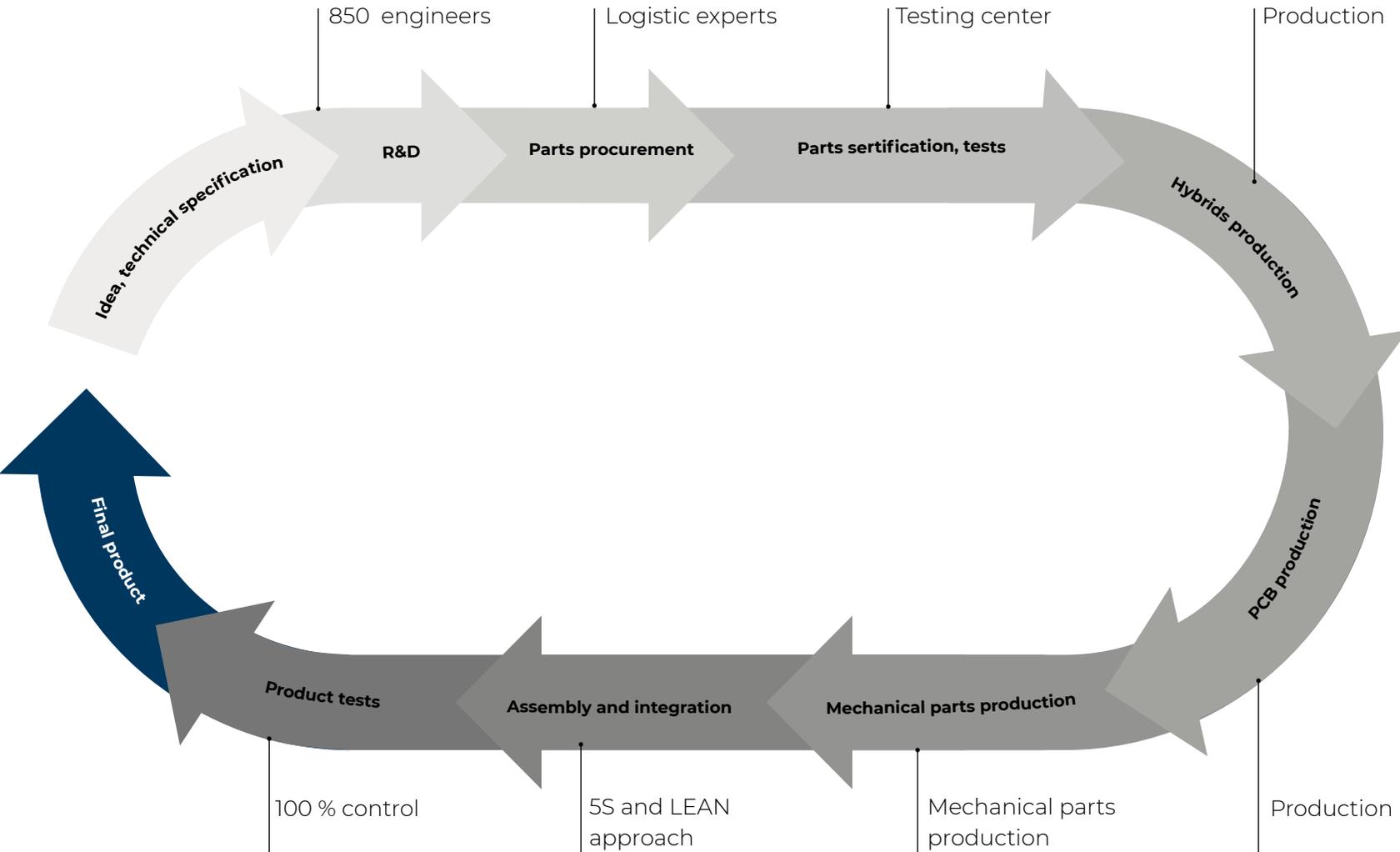


Assembly and integration



Testing facilities

Full production cycle



Electronic components procurement

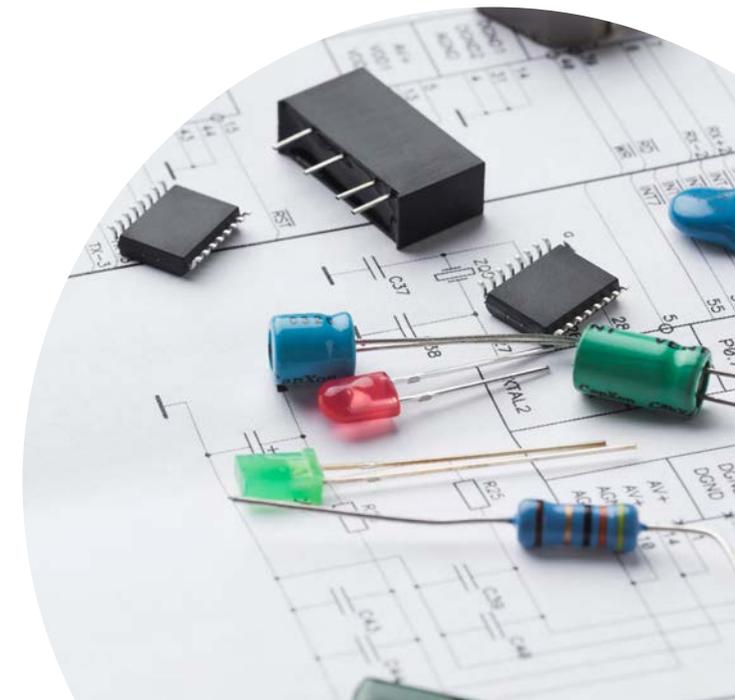
Electronic components procurement

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

Advantages

- Direct agreements with manufacturers
- Bulk purchases and costs minimization
- Quality claims follow-up with manufacturers

Certified supplier



Electronic components tests

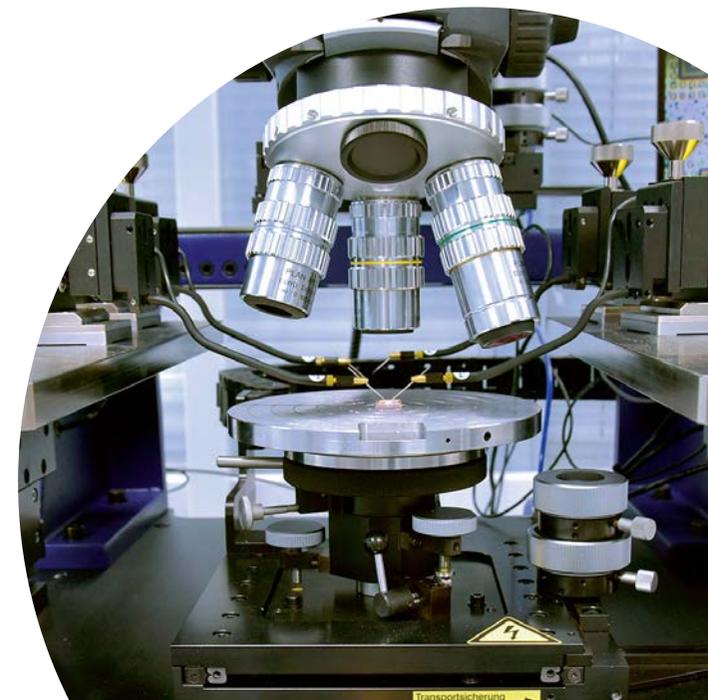
Testing center expertise

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

Full cycle testing and certification according to the Federal System of Space Technology Certification

Capabilities

- **Electronic components tests**
 - Incoming inspection
 - Additional tests
 - Certification tests
 - Total radiation dose 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



LF, HF, and microwave hybrids production

Products

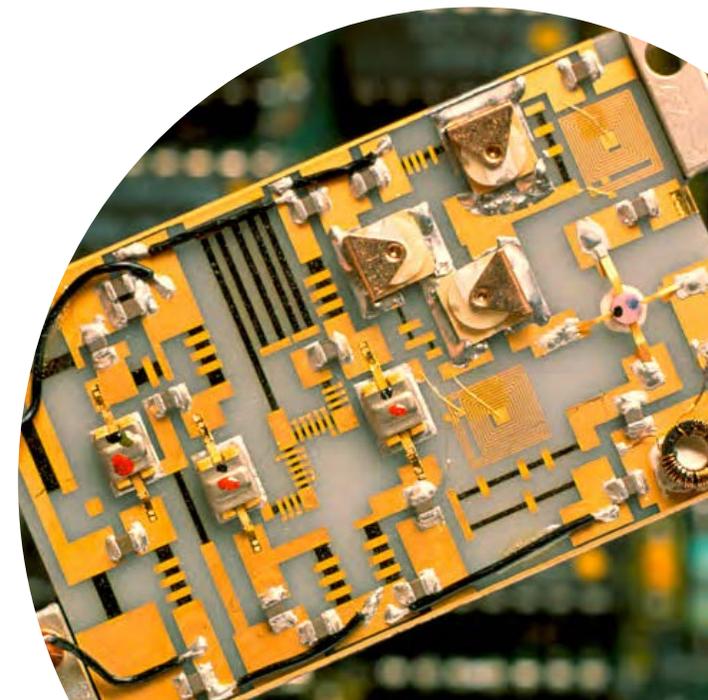
- **Microstrip boards:**
 - substrates materials: polycore, glass ceramics, ferrite, barium titanate, ceramics
 - polycore substrates with transitional metalized holes; three-, four-, and five-sided metallization
- **Discrete passive components:**
 - Thin-film resistors, capacitors based on leucosapphire
 - 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

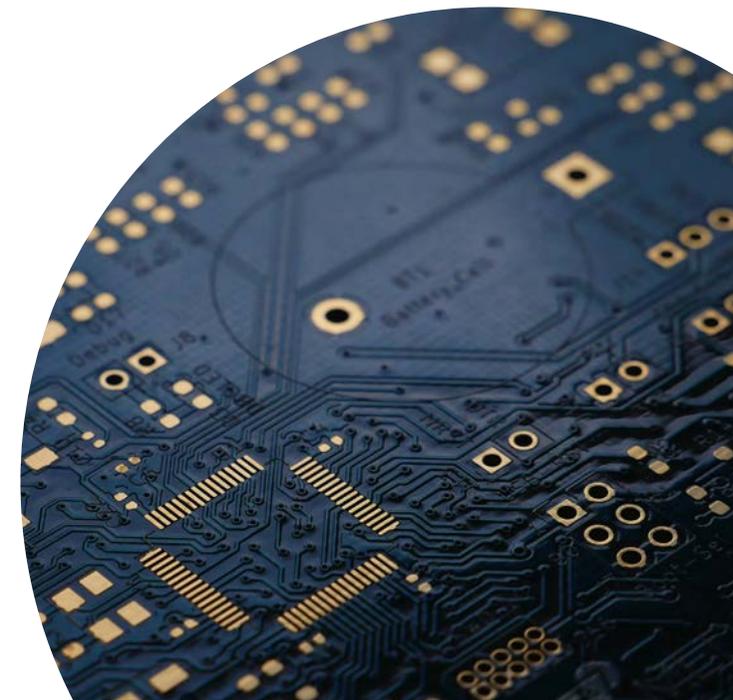
Products

- 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 mm thickness

100 % electric control

Capabilities

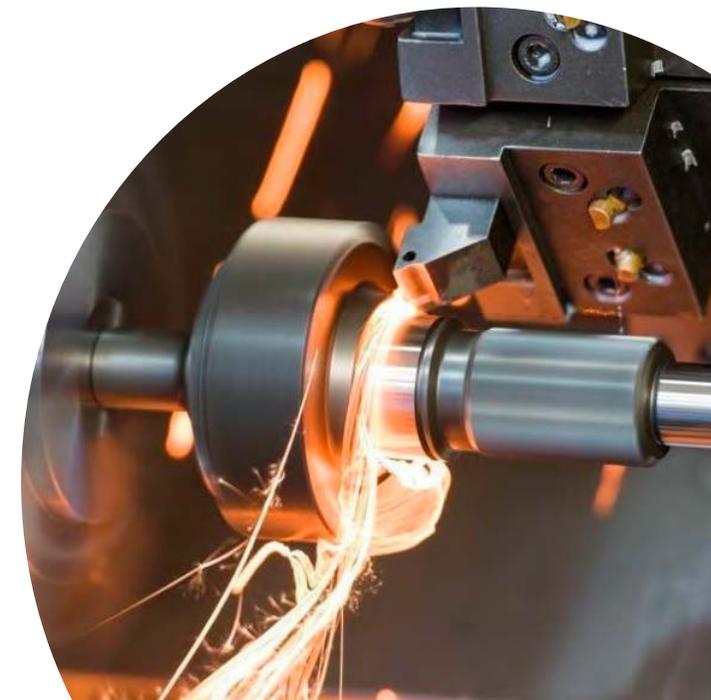
- **Number of layers:** up to 24
- **Board thickness:** from 0.1 to 6 mm
- **Minimum conductor's width:** 0,07 mm
- **Minimum spacing between printed pattern elements:** 0.07 mm
- **Minimum hole diameter:** 0.15 mm
- **Hole diameter to board thickness ratio:** up to 1:12
- **Minimum blind hole diameter:** 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:** $\pm 10\%$
- **Dielectric materials:** SF, STF, EILIFOM-PF, FR-4, FR-4 HiTg, FAF-4D, FLAN, ARLON, materials manufactured by ROGERS, TAIFLEX, DUPONT, Bergquist



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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