

Creating innovations
FOR THE FUTURE



آروند انرژی

FIBRAIN ®
Fiber Optic Solutions



EUROPEAN SOLUTIONS, EUROPEAN QUALITY

FIBRAIN®

Fiber Optic Solutions

Fibrain is a dynamically growing independent Polish manufacturer of fiber-optic telecommunications systems and solutions (including systems dedicated for the FTTx networks), regularly noting revenue growth of the order of several tens of percent, year-on-year. Fibrain is also the internationally recognized brand used for our products.

Years 2011-2013 were critical for the company development – the company has opened the Manufacturing and Laboratory Center in AEROPOLIS, the Subcarpathian Science and Technology Park and launched a new, state-of-the-art optical cable factory. This dynamic development has been possible thanks to our focus and commitment to R&D and innovations. The company operates an internal, very well-equipped development and qualification lab (which is being continuously expanded to meet the market requirements), several R&D teams and also cooperates with many leading European and Polish technical universities (including Marie Curie-Skłodowska University in Lublin or Military University of Technology in Warsaw). The company puts a great emphasis onto developing novel photonic technologies, which are widely regarded (for example by the European Commission) as crucial for the sustainable growth of the European economy. Being at the forefront of photonics commercialization in Poland, the company was one of the founding members of the Polish Photonics Cluster and is actively acting to promote technology transfer between Polish universities and the industry.

One of the consequences of the innovation-fueled growth is also a fast increasing company's importance in overseas markets – not only European but also African or North and South American. This international expansion has been marked by an opening of a new branch in Mexico in 2012, as well as by the rapidly growing export value and close cooperation links with the largest passive optical telecommunications infrastructure suppliers in the world.

Fibrain Sp. z o.o.

ul. Wspólna 4a, 35-205 Rzeszów, Poland
tel. +48 17 866 08 12-14, fax. +48 17 866 08 11

www.fibrain.com
info@fibrain.com

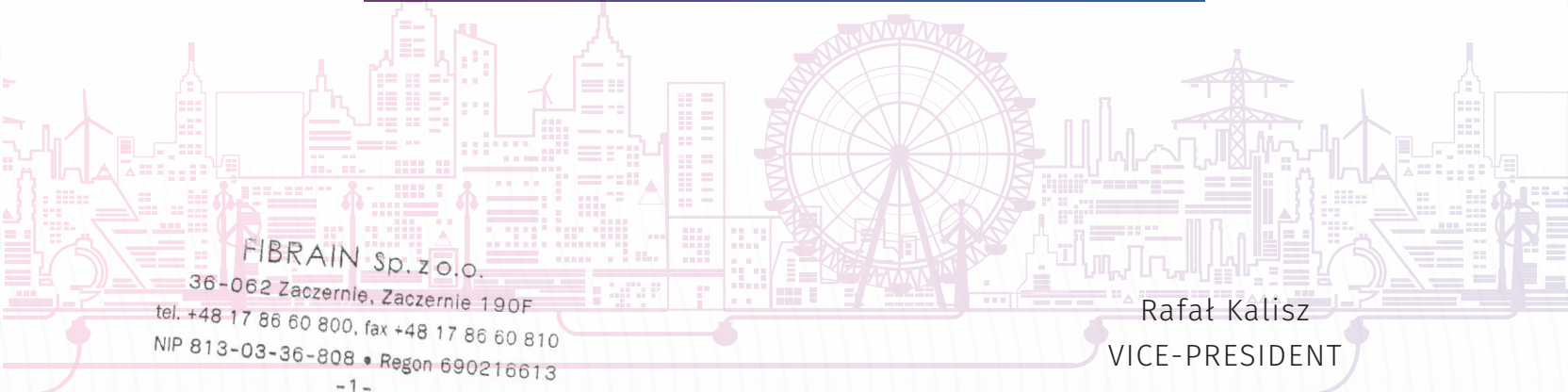


CERTIFICATE OF PARTNERSHIP

Hereby, **FIBRAIN Sp. z o.o.**
with its seat in Zaczernie, Poland
confirms that

ARVAND ENERGY Co.

with its seat in **Apt.10, 3th Floor, No.105**
Qeytariyeh St., Tehran, Iran



FIBRAIN Sp. z o.o.

36-062 Zaczernie, Zaczernie 190F

tel. +48 17 86 60 800, fax +48 17 86 60 810

NIP 813-03-36-808 • Regon 690216613

-1-

Rafał Kalisz
VICE-PRESIDENT

FIBRAIN CERTIFIED REPRESENTATIVE

Kalisz

FIBRAIN ®

TECHNOLOGICAL CAPABILITIES

FIBER OPTIC CABLES MANUFACTURING

Our optical cables plant is located in the Special Economic Zone AEROPOLIS near Rzeszow and is in the direct proximity to the Jasionka International Airport and the A-4 motorway junction. The plant produces a full range of optical cables used in the next generation optical networks. The operating cabling lines are fully automatic and have been designed and manufactured by the leading industry suppliers in the world. The current production capacity is over 3000 km a month. The factory is quite possibly the newest and most modern in Europe. We control the full cable manufacturing process – from the design stage (for which we use an advanced proprietary CAD software package ELMATIX Pro, developed by our R&D department), to technology fine-tuning and implementation (technology department), product acceptance testing and qualification (done by our internal qualification laboratory), to manufacturing (manufacturing department) and the final product quality control (by internally independent quality department). Thanks to our advanced technology we are able to develop customized cable designs to meet the most stringent and unusual requirements. The current portfolio covers most optical cables types, including for example ADSS, direct burial cables, drop cables or microcables.



CONNECTORS AND FIBER OPTICS COMPONENTS MANUFACTURING

We manufacture all most popular types of optical connectors (including licensed E2000 type connectors) for singlemode and multimode applications. Our connectors production capacity is up to 15k pcs/day. The production lines are largely automatized to ensure the best possible quality and repeatability. The automatic strippers, cleaving lasers, crimping machines or polishing machines operating in our factory have been made to order by the most reputable industry suppliers. All connectors undergo rigorous quality tests before shipping to the customers, including visual microscopic checks, interferometer checks for end-face geometry and return and insertion loss testing.

We not only produce connectors and components but, perhaps most of all, design complete passive infrastructure systems and solutions. The current portfolio of comprehensive solutions contains for instance systems dedicated for FTTH networks, microducts or aerial, pole-mounted systems. Innovative approach and years of industrial experience behind us help ensuring that our solutions are installer- and end user-friendly and, at the same time, cost-effective, reliable and quick to deploy.



STRUCTURED CABLING MANUFACTURING

FibrainDATA®, our copper structured system is a well-known, fully certified solution to help you squeeze every possible bit out of your LAN or data network. Designed with assistance from network planners and installers, FibrainDATA® guarantees ease of installation and the highest performance, backed by our 25 year system warranty. The system is constantly evolving to meet the ever increasing market needs so we are confident that we always stay ahead of the requirements set out in the industry standards. Thanks to the fact that we control the full design and manufacturing process, we are also able to customize the system to meet the customer specific requirements, which may include for example patchcords or pigtailed customization.





SPECIALIZED PASSIVE OPTICS COMPONENTS MANUFACTURING

Thanks to our experienced and well qualified staff as well as well-equipped laboratories, we are one of the few European manufacturers of specialized passive optics components for CWDM or DWDM transmission. Our in-house manufacturing processes involve for example the FBT (fused biconical tapering) or TFF (thin film filters) technologies. To name just a few available products, we produce power splitters and WDM couplers in the FBT technology, which typically find applications in FTTH networks. We make CWDM and DWDM multiplexers customized to customer specification, which may include special transmission ports, OTDR monitoring ports, power monitoring ports, special low-loss design, etc. If it's physically possible, we are confident we can make it! We boast on having unique testing capabilities – all of our CWDM and DWDM products are tested with a tunable (down to several picometers

resolution), narrow-line laser sources to make sure the isolation and insertion loss values quoted in the test report are truly the worst case parameters. Consequently, our CWDM and DWDM multiplexers come with test reports containing plots with the full loss spectral profile. It should come as no surprise that Fibrain is the sole supplier of specialized telecommunications optics to several widely recognizable operators.



OPTOELECTRONICS AND FIBER OPTICS MEASUREMENTS LABORATORY

Quality, reliability, dependability – with these notions in mind years ago we have set up our internal qualification and acceptance laboratory, with the sole goal of being able to thoroughly test our products, systems and solutions before introducing them to the outside world. The Optoelectronics and Fiber Optics Measurements Lab tests our products for compliance with the IEC and ITU-T (as well as other global and industrial) norms and standards. Similarly, we qualify our products for compliance with the internal specifications, which many telecommunications or railways operators may have. The scope of tests includes optical measurements, environmental and climatic tests or mechanical endurance testing. The Lab is equipped for example with the ultra-stable insertion loss, reflectance and PDL meters (which can additionally measure spectrally-

resolved IL, RL and PDL with an extremely good spectral resolution in the 1250-1650 nm range), optical spectrum analyzers, optical reflectometers, climatic chambers (including a 13 m³ chamber), UV-resistance test station, several facilities to test for endurance against various types of mechanical stresses, water penetration testing station, vibrations endurance testing station and so on. Our Lab staff is also involved in several research projects in the field of photonics and optoelectronics, cooperating with researchers from the leading Polish and European universities.



OPTICAL SENSORS AND PHOTONICS R&D DEPARTMENT

We believe photonics is the technology of the future and that the 21st century will be the age of photonics. That's why we put a lot of effort to make sure we are not left behind in this field. Cooperating with Marie Curie-Skłodowska University in Lublin and the Military University of Technology in Warsaw, both very active in this area, we are involved in a number of long-term research projects, some of them in the basic research phase. We have established a separate R&D department whose main task is to try to look into the future of our industry and to actively shape it. Although it may still seem incomprehensible, the bandwidth available in the standard fibers will soon be insufficient to cater for the industry needs. What is the next big step? Will it be photonic or multicore fibers? What is the right technology to enable the true mass scale FTTH deployment in the developing countries? Is the currently preferred glass singlemode fiber the optimum

choice from the performance to cost ratio point of view? Watch this space, we hope our research will help answering at least some of the above questions.

TECHNICAL AND DESIGN SUPPORT

NETWORK DESIGN DEPARTMENT

Every single installation company or telecom operator understands how critical it is to have technical knowledge and experience to ensure a successful network roll-out. Very often they would invest heavily to train or recruit adequately qualified staff. Yet it may not always be the most cost-effective or fastest way. Sometimes an experienced and trusted technology partner is actually a better solution to tackle this problem. And who is a better technology partner than the manufacturer of the system to be deployed? Especially if the manufacturer has dedicated teams of network planners, designers and engineers who are able to help with technical aspects, advise on the optimum technology, cost the alternative solutions, create bill of materials and quantities and finally design and draw the physical network plan. Our network design and planning teams draw hundreds of network plans every year so you can trust they know all the little tricky details so easy to overlook at the design stage and so certain to cause problems in the future!



ACTIVE NETWORK DEVICES DEPARTMENT

No telecommunications network is operational without the active devices. After all, the purpose of the passive network infrastructure is to carry information from one network active device to another for processing. Long ago we realized that many operators seek a one stop shop partner to work with, a reliable technology partner capable of supporting both the passive infrastructure and the active devices aspects of network deployment. That's why we have established the active network devices department. Our networking experts are happy to advise on the optimum technology and solutions to exactly meet customer requirements. Some of the key technologies we support are GPON, GEAPON, WDM PON, CATV, IPTV, ETTH, Carrier Ethernet and various flavors of xWDM. This diverse range of technologies reflect our belief that there is no "one size fits all" technology and every project has to be approached individually. We not only provide help with network design but also with with maintenance and troubleshooting. The active network devices lab is equipped for example with hardware traffic generators, spectrum analyzers, multicast generators, BER testers, TV meters and so on.



FIBRAIN ACADEMY

Responding to the market demand and to help our customers absorb new knowledge and technologies we offer a series of training courses under the common brand name Fibrain Academy. The topics taught include copper and fiber optics installation techniques, optical DWDM transmission, GPON networks, microducts technology, passive optical devices for telecommunications, network design and planning or CATV and IPTV in PON networks, but the above list is by no means exhaustive. We welcome inquiries for customized training modules. As seasoned practitioners we can draw on years of experience and hundreds of projects completed so our courses are always practice-oriented. Some of the courses are best undertaken at our locations, where we can use for example our unique testing tracks for microducts, aerial or direct-bury technologies.



HIGH STORAGE WAREHOUSE AND LOGISTICS DEPARTMENT

The central part of our logistic headquarters is the high storage warehouse with over 1000 pallet bays. There are also specialized bays for storing cable and microduct drums, which allow us, together with the automatized cable rewinders, to quickly prepare to order the exact required cables or microducts lengths. Typically, our cables stock is about 1200 km so we are able to cater for most urgent demands. The close proximity to the Jasionka International Airport and to the A4 motorway junction speeds up and simplifies logistics. Our logistics staff speak English, French, Russian, German and Spanish so there are very good chances you can quickly find common understanding!



PROFESSIONAL SERVICE



DOMESTIC SALES DEPARTMENT

Our strong force of technical sales consultants is always ready to assist. In Poland we have sales offices in Rogoznica near Rzeszow, Warsaw, Lodz, Cracow and Katowice. We also have a network of long-term distributors in other major Polish cities. Our business model is similarly based on long-term relationships with our customers, when both parties can treat each other with mutual trust. With over 20 years of company history, we believe that this approach is the only one to ensure the continuing market success. Every customer is assigned a personal sales consultant so we can immediately respond to your needs and we pride ourselves on our flexibility and ability to offer the exact solution to meet your requirements. Because your success is our success!



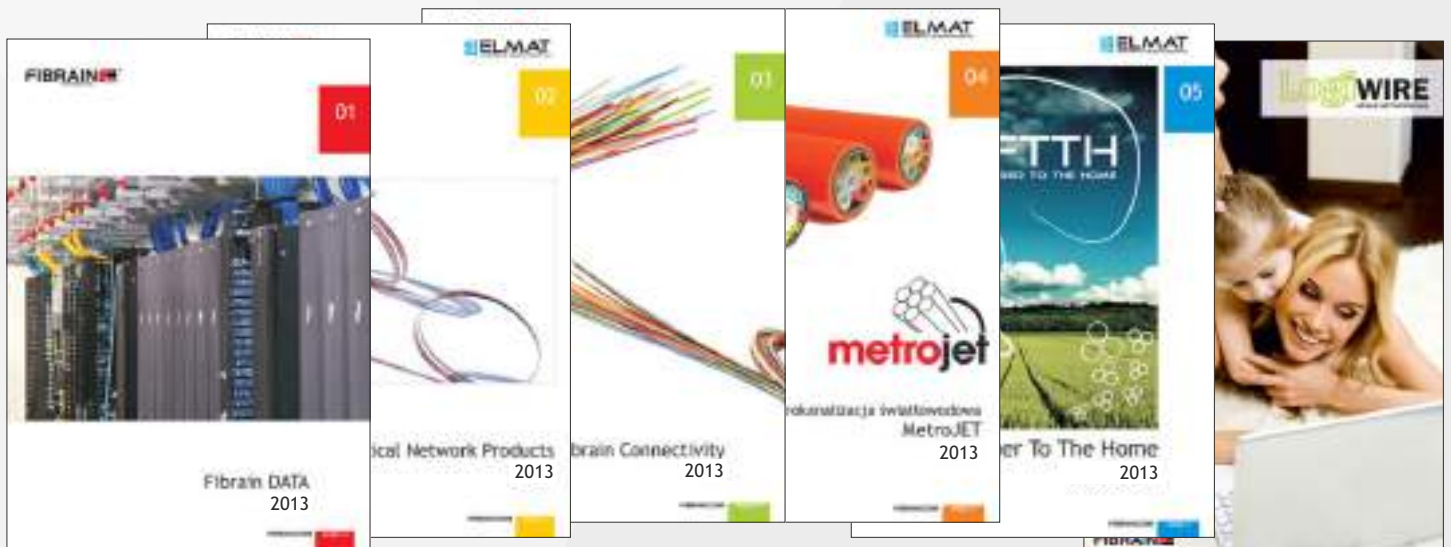
EXPORT DEPARTMENT

We are stable and credible partner for your international business. We have experience working with small and medium companies, as well as with the largest world corporations. Not only we produce and export under our own brand, Fibrain, but we also offer OEM services. We have OEM relationships with most large European optical passive infrastructure suppliers. We are involved not only in typical telecommunications projects (like FTTH or FTTA projects), but also in railways or energy sector projects, where our systems and solutions are used for example to transmit monitoring and control signals.

Our international presence is fast growing. We are currently present in all European markets (often via local distributors) and we also export to North Africa and Middle East or North and South America. The key to our international success is flexibility and

adaptability – we prefer close cooperation and technical discussions with the customer to make sure we can offer a (perhaps customized) solution that optimally fulfills the expectations.

CATALOGUES



OFFER AND SOLUTIONS

FibrainDATA – structured cabling system, which offers high class components, unique design and the best technical solutions. Our own strict internal specifications resulted in a system with performance significantly better than the requirements defined in the ISO/IEC 11801, EIA/TIA-568, EN 50173 standards. We are confident that our broad portfolio, which includes everything from the U/UTP to F/UTP, U/FTP, F/FTP solutions for the 5a, 6, 7, 7a categories, will fully satisfy your needs regarding the structured cabling system. The system is complemented with fiber optics elements utilizing tight and loose tube cables for indoor and outdoor applications. With safety, reliability and environmental durability in mind, our system includes various cable types with different jackets and internal construction for different applications. The cables meet the most stringent requirements for non-flammability, self-extinguishing, no toxic gases emission and UV resistance. Fiber optic cables are available both with singlemode and multimode (OM1, OM2, OM3 and OM4) fibers, offering the current transmission speeds up to 10G and being future-proof for the next 40G and 100G applications.

Fibrain LogiWire – a complete system integrating structured cabling and other media, typically installed in modern buildings of our technological era. The system is targeted at single family housing and multi dwelling building, as well as at small enterprises (shops, offices). LogiWire integrates and helps organizing multimedia and low-voltage installations and is widely used by developers and housing co-operatives and associations. Thanks to its full integration with our other systems (the copper FibrainDATA and fiber optic Fibrain FTTH) it is possibly the most installer-friendly solution in the market to bring to one point and organize copper, coax and fiber optic media. A real must-have for modern intelligent houses and offices!

PON – a full portfolio of passive optical devices, mostly (but not exclusively) for telecommunications. The devices find applications in all types of optical networks, from access to long-haul DWDM networks. Our in-house technologies include FBT (fuse biconical tapering) and TFF (thin film filters). The portfolio ranges from power splitters/couplers (including asymmetric customized splitters) to attenuators, circulators, dispersion compensating modules to specialized CWDM and DWDM multiplexers.

Connectivity – the catalogue presents our connectorization capabilities. The portfolio includes all of the most often encountered types of optical connectors (for singlemode and multimode applications), cable bundles, different types of fanouts or assembled sets, patchpanels and wall boxes. The number of variants and possible alternatives is very large and we welcome inquiries for customized products. Our design teams and rapid prototyping capabilities guarantee short time to market for new products.

MetroJet – our modern microduct solution is the best response to the growing capacity demands for telecommunications duct systems. Functionally, a microduct system is a multi-conduit system with significantly reduced diameters of all of its elements, from pipes to cables and connectors. The microcables used in the microducts are installed by air-blowing. Thanks to our textured, unique design microcables, the installation distances obtained with our system are second to none. The system is fully certified and we offer up to 10 year system warranty for the certified, audited installations. Complementary to the system is our training module when the participants have the opportunity to practice full system installation (including cable blowing) on our internal test track.

FTTH – we started designing and manufacturing FTTH systems long before they have become popular in Europe, so our systems are backed by years of experience. We realize that every FTTH project is unique and there are always many reality constraints, which may make some technologies less applicable in the particular project. That's why we offer a very broad portfolio of complete passive infrastructure systems, so we are confident we have a solution optimal also for your project. The main FTTH infrastructure systems (and it is worth bearing in mind that each one may come in several variants) are:

- for outdoor last mile access

Metrojet – microducts based system.

AirTrack – aerial system, utilizing ADSS-type cables,

EAC-A8 – also an aerial system, but based on the outdoor Easy Access Cables,

DAC – system based on direct burial cables,

- for indoor last mile access

EAC-R – system based on the (typically) vertically installed, easy access riser cables,

DROP – system utilizing prefabricated and preterminated subscriber kits based on the drop cable,

VERTIJET – system based on indoor microducts, with blown-in (or pulled) prefabricated subscriber cables,

LogiWire – media-integration system, which organized copper, coax and fiber optic media, as well as low-voltage installations.

All our systems are complete and fully self-contained, with the required mounting and connecting accessories or installing tools. We also offer training for our customers, which may end with an exam to obtain installer's certificate.

 آروند انرژی

FIBRAIN ®
Fiber Optic Solutions

tel. 021 - 22694753
fax. 021 - 22206259

info@arvandenergy.com
www.arvandenergy.com