TOPIC

How to choose the perfect antenna in 3 steps

Heroes of the time
after 25 years

Ján Seszták
CEO

Dear friends,

Today is March 22nd; I am sitting at home, working from the home office and for the third time I started writing an editorial for our SOS news - for you. Why the third time?

First I started writing a few days ago about "April, 1st 2020 - 25th anniversary of the Slovak SOS electronic branch" (the Czech one celebrates 29th this year). I wrote about how eight colleagues came to work that day, we divided our tasks and started to assemble the shelves, the first computer network, how we created some kind of catalogue, but most importantly, we imported the first approx. 1000 types of components into the system. Full of enthusiasm, expectations, but also uncertainty about the future. I wanted to continue with the "historical" steps, which we gradually solved as we gradually changed. But I thought - Jano stop - those years were not just about us, but mainly about you, our customers. You, who have secured our existence during these times.

And so I started rewriting - this time about you. I mentioned the very first order from Mr Malast's from Inoma, our incredible collaboration with Telink, Mr Papaja's valuable advice. I also mentioned our first joint meeting with "exZPA Krížik staff" in Prešov, i.e. with Elnec, Samo, Elen, Paufex..., the place of your first "slaps and caresses" (currently called feedbacks). Or also visits of Mr Opatrný, our Czech university teacher and later our customer. I could also write about you, those we met at the Elosys, Amper, later Electronica exhibitions. However, if I gradually named everyone, what would the editorial look like? What would be its point? Maybe a little pathetic in our technocratic world - heroes who maintained and developed the Czech-Slovak electrotechnical industry?

And thus here I am, for the third time, with the topic brought by life itself. Pragmatic and up-to-date, one that currently affects our everyday lives - coronavirus.

Our whole electronics industry is currently in two places. It is you who continue to develop and produce at your workplaces. The other half of us is working from the home office, either voluntarily when we can or involuntarily when we have to. I would like to point out at least a few invisible heroes of these days. Those who are also afraid of infection, like all of us at home, but they still go to work to solve what is needed. For example, our partner at Promos in Piešťany, they produce germicidal lamps for the destruction of pathogens in prolonged 12-hour shifts. With maximum effort, Chirana

Medical Stará Turá workers manufacture lung ventilators that are currently needed all across Europe. At RMC in Nová Dubnica, led by Mr Rafaj, they have developed and manufactured electronics for breathing compressors for Ekom. I will also mention our customers abroad - LinakMajetín in the Czech Republic, a manufacturer of first-class adjustable beds, or the Hungarian Diatron, manufacturing coronavirus testers in 3-shift operation. As they say, until they destroy them, or vice versa. :)

Last but not least, I would like to express big THANKS to our warehouse staff, who prepare hundreds of packages with face masks and gloves every day.

I guess we agree that our current primary role at the electronics level is to seek solutions to fight the invisible enemy and to keep work for our people. We, at SOS electronic, try to help you find and deliver the most modern solutions in accordance with the meaning of our name - Supplier Of Solutions.

And you can find yours, those solutions you could use for your future devices, for example by reading the following pages of our SOS news magazine. I believe it will be more relax than work.

Content 1 / 2020

Technical support at your place during our "Tools Tour"

When the magazine is sent to a print, Slovakia faces the most strict days of quarantine. That's why we appreciate that we could pay you a visit with our "ToolsTour". We believe that in today's digital era, it is truly valuable to see our products live and have chance to talk about them. Moreover, technical advice is priceless.

We visited 11 customers in 2 countries in just two weeks. We travelled more than 800km. (Could you imagine that we spent 12 hours only unloading and loading boxes from the car?!) We talked to over a hundred people. We talked to people about their daily activities, work tasks and concerns. We advised not only people from production, but also their colleagues from purchasing and development.

Out of all the oscilloscopes, Rohde & Schwarz RTB2002 with 10 bit resolution with above-standard functions has been very successful. The program-mable laboratory source Rohde & Schwarz NGE102 was also a top.

During the chats we were able to advice on how to avoid soldering errors. We had a Weller WT1010 set soldering station with us that we used for demonstrations. Regarding price, it is comparable to its older predecessor, but offers much greater user comfort. It is even compatible with many older handles.

We have shown interesting and not that frequently used functions on some devices. For example, a digital multimeter with milliohmeter R-200 has the ability to measure very low resistance with a resolution of 0.1 milliohm. It is also ideal for testing cables, installation, etc.

Trying the tools right on the spot was of great importance to the participants. We also brought a set of Toolcraft 818645 crimping pliers with us. They have worked well for all common insulated and non-insulated cable lugs.

We are really glad that our discussions were so productive. The exchange of experience always moves us further.

People from SOS electronic – blood donors

We could already have the 4th anniversary of blood donation in SOS electronic if the coronavirus didn't interfere in our lives. For the last 4 years, we have called the Mobile Transfusion Unit (MTU) to come to our company. This year we cannot do this because of the coronavirus epidemic, but we have decided not to let this good habit be forgotten.

MTU is a team of medical professionals who come with complete medical equipment to the agreed place and take blood. Such collections were organized also in our company. This way, our colleagues from SOS electronic and our customers who volunteered to donate blood could do so directly in the company. This year we could not organize it on our premises, so we decided to go to the nearest transfusion station and donate blood there.

Due to the pandemic, the number of donors has fallen radically and hospitals are running out of the blood. That is why we wanted to reach out to you, our regular and irregular blood donors, and ask you to help Slovakia/your country. Transfusion stations have introduced new rules to help you donate blood safely.

Help save a life. Give the gift of blood. Thank you.

SOS electronic is celebrating 25 years in Slovakia

25 years ago, on April 1, 1995, the Slovak branch of SOS electronic s.r.o was formed… Even though we currently live in complicated times, we would like to celebrate this anniversary, as befits such occasion… and remind ourselves what we have experienced so that we do not give up!

25 years ago in Slovakia, a dedicated group of people agreed and set a noble goal: to bring electrical components to Slovakia and make them available to anyone interested.

Since then, we have raised the bar in our „es-o-es" and we are constantly trying to improve for you.

We suspect that the upcoming months in the economy will not be easy, but we believe we will make it together.

We do workshops only with the best

IoT technologies resonate everywhere around us; everyone would like to take advantage of them. We receive many questions about IoT also from our customers. Therefore, we decided to contact Microsoft in Hungary to organize the IoT workshop together.

This time we approached the workshop as a training and did not give the participants a breathing space. The presentation covered the MS AzureCloud platform in IoT and the potential of machine learning. We wanted to show the concept of AAEON's industrial devices.

Our supplier of embedded systems is AAEON and thus we brought single-board computers PICO-APL1-A10-N3350-KIT and PICO-APL3-A10-N4200-KIT with RAM and SSD from Apacer to our workshop. Single-board computers communicated via Wi-Fi with the Espressif ESP32 development module, to which humidity sensors (SHT-31), CO2 concentration (SCD30) and aerosol particle concentration (SPS30) from Sensirion were connected via the i2C interface.

Before the workshop, participants had to install the Visual Studio Code, Docker, and.net Core SDK that we worked with during the workshop. After a short introduction, we went into the practical part led by Szabolcs Baranyi.

Szabolcs gave us an overview of the Azure IoT platform, the machine learning capabilities, and the benefits of deploying AI on the Edge on industrial devices, such as the one used in a workshop.

The practical part focused on the development of IoT application for PICO-APL, powered by operating system Windows 10 IoT Enterprise LTSC 2019, leveraging the VisualStudioCodeCrossPlatform development tool. The application running on PICO-APL reads the sensor data via Wi-Fi and sent it to Azure. In the cloud, we saw how easy it is to analyze these IoT data leveraging the IoT central service. We also explained the concept of device provisioning and showed how vendors can pre-install ID's into a device and automatically connect to Azure backed.

How to choose the perfect antenna in 3 steps

Selecting the right antennas is a critical step. An antenna must be compatible with the receiver specifications and meet device requirements. Our long-time partner, 2J Antennas, has prepared an overview of areas that you might find interesting in case you are looking for the right antenna for your project.

1 Identify your needs and start with mounting types

What is the mounting type that is suitable to meet your application requirements? In order to select the most optimized antenna, begin the proces by confirming if the antenna will be integrated:

- • **Internally, for example mobile device**
- • **Externally, which often comes with housing for protection in outdoor application and installation.**

   Our producer 2J Antennas offers a large selection for internal and external single and combination antenna mounting types.

INTERNAL SINGLE AND COMBINATION ANTENNAS MOUNTING TYPES

ADHESIVE MOUNT FLEXIBLE
Small form factor antennas with flexibility for curved installation in devices.

ADHESIVE MOUNT RIGID
This mounting type is ideal for flat surface installations, using an industrial-grade adhesive layer.

SURFACE MOUNT CERAMIC
Due to high-quality ceramic, this surface mount is ideal for a wide range of environments and is compatible with surface mount technique (SMT) allowing for easy PCB integration into small devices.

SURFACE MOUNT FIBERGLASS
Fiberglass material allows for the small antenna sizes while offering cost-effective solutions to device designers and is compatible with surface mount technique (SMT) installation.

THRU-HOLE MOUNT CERAMIC
The thru-hole mount is typically in the center of the antenna offering extra security for installation for in-device integration.

SNAP-IN MOUNT MODULE
Locks the antenna in place, prevents unwanted rotation and facilitates rapid antenna installation and replacement.

SCREW MOUNT MODULE
Modular antennas that can be installed on PCB standoffs.

INTERNAL ANTENNAS

Frequency and Wavelength

What is the frequency and why is it so important?

The wireless band designated for a device to operate through is called frequency. Antennas are designed to have a range of frequencies to operate within. As an example, if a device is tuned to use Band 17(700MHz), the corresponding antenna must operate within 704 and 746 MHz for transmission and reception.

Are you sure, you know what is the wavelength?

The wavelength is the distance radio waves travel during one cycle. Designing an antenna quarter wavelength long will provide the best efficiency and deliver the highest signal quality.

Quarter wavelength is calculated with the following formula:

$$\text{Quarter Wavelength (mm)} = (75/ \text{FreqMHz})*1{,}000$$

IMPORTANT: 4GLTE and 3G/2G antennas have the potential to be used in applications requiring ISM standards. 4GLTE range specification of 698-960MHz and 3G/2G from 824-960MHz, meaning the ISM 868MHz standards operate from 863-870MHz and are located within the 4GLTE and 3G/2G range. The same applies for ISM 915MHz standards that operate within 902-928MHz, or dual band 868/915MHz.

To ensure proper compatibility, please contact our SOS electronic sales department. For further analysis, we will contact directly the producer, 2J Antennas.
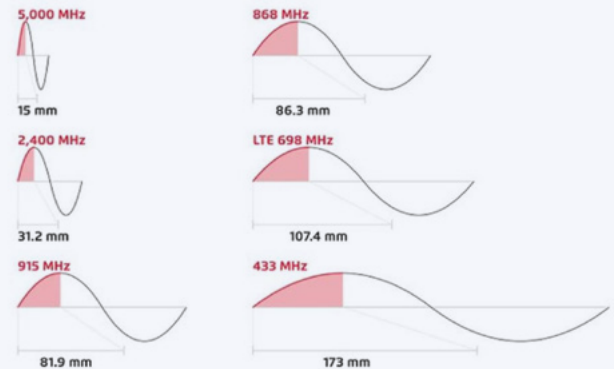
Fig.1. Examples of 1/4 wavelength; Frequency / Length graph.

Standards & Bands

In our portfolio you can find 2J Antennas that operate within many global standards. As example, our 4G LTE antennas are compatible with Cat-M, Cat-X, Cat-NB, NB-IoT and also SigFox and LoRa, known as LPWA market. The same analogy can apply often to other frequencies. As an example, WIFI antennas can be used for SigFox or LoRa in the 2.4 GHz spectrum.

GNSS antennas are available with pre-filter, mid-filter or no-filter to meet the customers' different requirements.

The pre-filter offers the highest resistance and best reception and therefore is standard on all GNSS antennas. It is important to compare active gain and noise on the amplifier of GNSS antennas.

EXTERNAL ANTENNAS

EXTERNAL SINGLE AND COMBINATION ANTENNAS MOUNTING TYPES

CONNECTOR MOUNT
typical for antennas that require direct PCB mounting solution on devices.

ADHESIVE MOUNT
Using a high-grade adhesive option makes it ideal for quick mounting applications.

SCREW MOUNT
advantage is a secure and permanent installation also in outdoor extreme conditions.

MAGNETIC MOUNT
Offers flexibility for temporary installation, strong enough for permanent installations.

WALL MOUNT
Can be used for indoor or outdoor installations.

POLE MOUNT
recommended for marine or construction applications.

MAGNETIC/ADHESIVE MOUNT
Offers option of magnetic or adhesive mounting for external installations, especially for non-magnetized metal surfaces.

WALL/ADHESIVE MOUNT
Offers option of wall or adhesive mounting for building wall installations.

VELCRO/ADHESIVE MOUNT
a solution for temporary use of the antennas.

Antenna standards from portfolio:

- 5GNR/4GLTE/FirstNet/CBRS/LPWA/3G/2G
- 4GLTE/FirstNet/NB-IoT/Cat-X-Mx-NBx/LPWA
- 3G/2G
- 2.4-5.0GHz WiFi/Bluetooth/ISM
- IRIDIUM
- GPS/GLONASS/BeiDou/QZSS/Galileo
- 433/868/915MHz/LPWA/Sigfox/LoRa/RFID/ZigBee/ISM

- TETRA/UHF/PMR/LMR
- 169MHz/ERMES/VHF
- DECAWAVE
- DSRC/C-V2X
- ORBCOMM
- AIS
- DAB
- HDTV/DVBT
- AM/FM
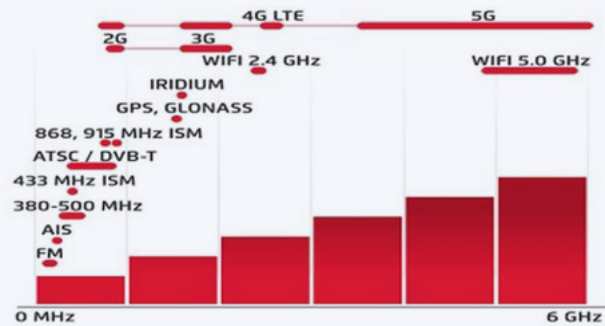
Fig.2. Frequency showing Standards Graph.

2 Terms Explanation

To make the choice easier, we have highlighted some of the key points that require closer attention. However, do you clearly understand the parameters in which the antennas are tested and measured to achieve the most reliable performance results?

Testing Parameters

Testing parameters and methods can vary from manufacturer to manufacturer. Testing methods should always be fully disclosed such as free space, metal plate, plastic plate, glass, etc. Installing antennas outside of testing parameters will result in undesired antenna performance.

For example, if a screw mount antenna is measured in free space showing optimal performance results and is installed on a metal surface in the customer device, the antenna will not operate as expected. 2J Antennas will always disclose the complete measurement conditions to assure our customers get the most accurate data making the in-device integration of an antenna successful.

In order to make a smart product selection between two manufacturers, we encourage that all testing should be completed with a standard length and high-quality cable in order to optimize antenna performance results.

No alterations during testing such as shorter or no cables should be performed. This will result in inaccurate efficiency, peak gain and average gain results.

Return Loss

The return loss is measured in decibels (dB) and represents how much energy is transferred from the device to the antenna. It can help to estimate the bandwidth and operating frequencies.

The lower the measurement the better. For a 50 Ohm system, it is recommended to have a minimum of -5dB or better measurement.

VSWR

Voltage Standing Wave Ratio (VSWR) is used to measure how much energy is transferred from the device to the antenna but with a different mathematical scale than the one used for Return Loss.

The lower the measurement the better, meaning closer to a 50 Ohm system and it is recommended to have a maximum of 3.5 VSWR. Please review the table below to learn more about the relationship between Return Loss and VSWR as well as other RF parameters and values.

Return Loss (dB)	VSWR	Reflection Coefficient, Γ	Mismatch Loss (dB)	Reflected Power (%)	Through Power (%)
-1	17.39	0.89	6.87	79.43	20.57
-2	8.72	0.79	4.33	63.10	36.90
-3	5.85	0.71	3.2	50.12	49.88
-4	4.42	0.63	2.20	39.81	60.19
-5	3.57	0.56	1.65	31.62	68.38
-6	3.1	0.50	1.26	25.12	74.88
-7	2.61	0.45	0.97	19.95	80.05
-8	2.32	0.40	0.75	15.85	84.15
-9	2.10	0.36	0.58	12.59	87.41
-10	1.92	0.32	0.46	10.00	90.00
-11	1.78	0.28	0.36	7.94	92.06
-12	1.67	0.25	0.28	6.31	93.69
-13	1.58	0.22	0.22	5.01	94.99
-14	1.50	0.20	0.18	3.98	96.02
-15	1.43	0.18	0.14	3.16	96.84
-16	1.38	0.16	0.11	2.51	97.49
-17	1.33	0.14	0.09	2.00	98.00
-18	1.29	0.13	0.07	1.58	98.42
-19	1.25	0.11	0.06	1.26	98.74
-20	1.22	0.10	0.04	1.00	99.00

Table 1. Return Loss to VSWR Conversion Table, and more RF parameters.

Bandwidth

Bandwidth is a range of frequencies. A short frequency range is a narrow band and wider frequency range is categorized as a wideband.

It is important to select the right antenna with the matching bandwidth as narrowband and wideband are not interchangeable.

Efficiency

Antenna efficiency (radiation efficiency) is the most important parameter of an antenna in mobile communications. It is a measure of the electrical efficiency in which a radio antenna converts the radio frequency power received into radiated power. In other words, it means how much energy is radiated from the antenna to the air, how good is the antenna to radiate the energy.

(100% means all energy radiated, 50% means half energy radiated, the minimum recommended is 25% but in some cases can go down to 10%, but the higher the better).

Peak Gain

The most crucial parameter in mobile communication is antenna efficiency followed by peak gain.

Antenna gain is the measurement of an antenna's ability to direct or concentrate radio frequency energy in a particular direction or pattern. This is typically measured in dBi (Decibels relative to an isotropic radiator).

Efficiency measures how much energy is in the air radiating in all directions, while peak gain is only measured in a single direction. While in fixed communication the most important parameter is the peak gain, since all the energy must be concentrated in one single direction.

This value comes from a single point in the radiation pattern being the maximum point in the 3D sphere.

Average Gain

Similar to efficiency, the average gain is represented with a different mathematical scale (dB) and takes into consideration any mismatch losses. 100% is 0 dB which is maximum radiated energy, 50% is -3 dB which is half of the radiated energy, etc. Please see below table for the relationship between efficiency and average gain:

Efficiency (%)	Average Gain(dB)
100 %	0.0 dB
90 %	-0.5 dB
80 %	-1.0 dB
70 %	-1.5 dB
60 %	-2.2 dB
50 %	-3.0 dB
40 %	-4.0 dB
30 %	-5.2 dB
25 %	-6.0 dB
20 %	-7.0 dB
10 %	-10.0 dB
1 %	-20.0 dB

Table 2. Efficiency/ Average Gain Table.
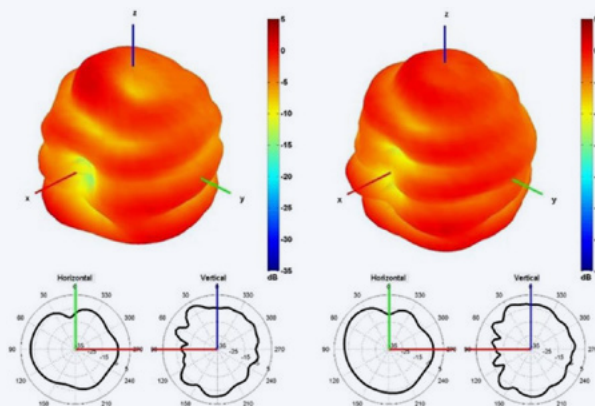
Fig.3. Radiation Pattern 3D and 2D Graph.

Radiation Patterns

The radiation pattern of an antenna is the strength of radio waves transmitted by the antenna traveling in different directions and angles.

Omnidirectional antennas offer a 360-degree doughnut-shaped radiation pattern that is uniformly distributed in all directions and are ideal for connecting devices that are on the same plane and to either side of each other.

Hemispherical antennas distribute their radiation over a hemisphere (half of the space).

Directional antennas radiate into one targeted direction allowing for longer transmission distances with less interference.

The plot graph shows how the energy is being radiated to the air in 3 dimensional or 2 dimensional pattern. In 2D graph pattern, the horizontal and vertical planes are shown. Fig.3.

Polarization

Polarization is the orientation of the electric field of an electromagnetic wave. The two most common polarizations are linear and circular.

With linear polarization, the electric field vector stays in the same plane were with circular polarization, the electric field vector is rotating with circular motion completing a full turn for each RF cycle. This rotation can be completed right-hand (RHCP) or left-hand (LHCP).

Measurement and changes of polarization are determined in which the wave transmits through the environment from the transmitting to the receiving antenna.

3 Specification

Ground Plane

A ground plane is a surface area or metal that acts as a conductor and reflects the radio waves from other antenna components. The shape, size and the required clear area of the ground plane play an important role in determining radiation characteristics and gain.

Our portfolio of 2J Antennas offers both, ground plane dependent and ground plane independent antennas.

Low-frequency antennas such as broadcast antennas accept large conducting masses such as the earth or ocean as a sufficient ground plane. For very high frequency (VHF) and ultra-high frequency (UHF) antennas, the ground plane can be smaller and a metal disk, screen or wire is used as a ground plane. In automotive, marine and air equipment metal housing (car / airplane / boat) can serve as a sufficient ground plane.

As a general rule, **the conduction surface must be at least a quarter of the wavelength of the radio waves in diameter** and in ideal condition the bigger the ground plane, the better control of the electrical performance is achieved.

Maximum Input Power

The Maximum Input Power is the maximum amount of power (in Watts) that can be transmitted to one antenna port without damaging it while maintaining performance.

Cable and Connector Types

The correct selection of RF cable and connector types is critical to proper antenna function. **The connector serves as a mechanical connection between the antenna and RF system** and the cable is the transmission line for radio frequency signals connecting transmitters and receivers. The cable lengths impact signal quality and strength.

Selecting a high-quality cable and connector that is compa-

tible with the antenna will ensure optimal antenna performance. When considering a product, it is important to determine the correct connector gender, polarity and geometry as well as the cable length prior to a quote request.

2J Antennas is our longstanding partner in the field of antennas. Their valuable experience is a great asset for us as a project-oriented distributor. Many of our customers' projects have been built taking advantage of their wide range portfolio, as well as custom-made solutions from their professionals.

If you are looking for the perfect antenna, please contact us. We will be glad to help you with the selection at _sales@soselectronic.com._

Source: 2J Antennas

HMH

We help to prevent train collisions

Experience exchange is very often the biggest source of inspiration. Therefore, in this new section, we would like to gradually present the success stories of our customers.
The last time you travelled by train, your safety may have been overseen by the control system in the locomotive developed and manufactured by HMH s.r.o. Due to the coronavirus situation that arose during the preparations for this issue, we spoke with Marek Cidorík, HMH production manager, via videoconference.

How would you simply describe HMH to your wife?

The area that HMH deals with is electronics, automation, and informatization. When my wife visited me at work for the first time, she said: "This place reminds me of a radio, so many components and cables." :-) I will just add that it overlaps with the area of locomotives and railcars. Our products increase the operational safety of these vehicles and can be compared to autopilots. That means that the driver is assisted by a device that identifies what he can potentially overlook or not capture with his senses.

That means that the purpose of this device is to prevent train collisions?

Correct. This is the very first task that this security system has to perform.

In terms of the number of employees, how big HMH is?

When I joined the company in 2002, the company was significantly smaller, only about 20 people, and I just entered the growth phase. I started as an electronics specialist and in a short time, I moved to the position of head of the department covering the production, warehousing and purchasing. This department employs 20 people out of a total of approximately 80 employees. However, there are more than 90 positions; we are continually growing and looking for new people.

We equip about 400 locomotives with our control system per year.

How does it look like in HMH? What would we see if we did this interview directly at your workplace?

We are one team, concentrated in one place within one business centre building. We do not have a typical production in the hall; our production premises look more like a larger technical laboratory. The initial phase of production is subcontracted. We receive semi-finished products, we put them together, upload service software and finalize the product. Our main focus is on having the ending under control - the output control, in order to be able to guarantee a high-quality level.

When did it all start in HMH?

The HMH company was established in 1993 at the "Faculty of Electrical Engineering", when our CEOs Ing. Tomáš Horváth and Ing. Marián Matejovič already had a very clear vision of a comprehensive control system for locomotives. Around 1998, this vision became reality with the first real installations for the installations. Gradually, the design of our equipment stabilized, and in 2003 we celebrated the first major milestone - 100 locomotives equipped with our control system. Paradoxically, this huge success at that time sounds a bit funny today, because we currently equip about 400 locomotives a year with our system.

Truly impressive number. But we assume that the 400 locomotives are not only in one country, right?

Correct. We operate mainly in Central Europe, i.e. in the surrounding countries.

How could we imagine your typical customer?

These are mainly railcars operators, various carriers, whether passenger or freight, but of course also the manufacturers of such vehicles.

Let's get back to your solution for a comprehensive control system for locomotives. How does it all work?

The core of our entire solution is the modular MIREL system, it is a registered trademark. The modularity of the system

lies in the fact that the entire system is easily configurable and can be created according to customer requirements. I.e., we create a set of cards - for example, control processor cards, analogue and binary input cards, cards configurable according to the on-board voltage in the locomotive (24V or 48V), various measuring cards, custom-made cards, etc.

How are you different from other modular automated systems?

Speaking of the hardware part of industrial automation, a lot has already been invented in general. A substantial part of our added value is the software part, and obviously safety and precision, a guarantee of high-quality standards in production.

Perhaps only a few people know that HMH is also behind the established AT & P journal, which focuses on industrial automation and business information systems.

Yes, our CEOs' love for industrial automation led them in 1994 to the idea of establishing a professional magazine. The co-founders were several departments of STU and also the company PPA Controll. It is a monthly magazine and is sent to registered subscribers free of charge. And even though the print media is currently doing less well during these Internet times, we believe that this magazine enriches technical "culture". :-)

What do you consider to be the biggest milestones in HMH's development? What moved you the most forward?

A strong moment that I perceived was the move of our activities in abroad. It was 2004, and with our tailor-made development, we also attracted a big player in this field - Siemens. Cooperation with them began to develop, and in 2005 we already had our first deliveries. It was quite a challenge for us was to move to European standards, but we managed it. We learned a lot, and in 2006/2007, we gradually started to deliver our solutions to countries such as Germany and Austria. This has opened up further opportunities for our growth.

And if you were to reveal something less positive, some short-term failure which taught you a lot?

The biggest test for us was the move to the European area itself. We learnt a lot of lessons there. For example, when German customers began to "teach" us that they did not imagine the packaging of goods to be this way. That plastic has no place there and it needs to be replaced by ecologically degradable materials. Or when we broke out in a cold sweat during

the first upgrades of our software, when the customer called that basically nothing works on dozens of locomotives. However, with our high commitment, we discovered the cause and were able to eliminate the problems very quickly. And we also consider the customer audit of quality management, which Siemens did in our country in 2016, to be a legendary lesson in the company. The evaluation we received significantly shook our self-confidence for a while. :-) We got half a year to fix what needed to be fixed, and during those months we changed a lot in our business processes. The audit retake has already turned out to be excellent.

Aren't you thinking about expanding outside Europe?

As of now, not really, because what we are doing now makes us sufficiently busy

We believe that we enrich technical „culture" with our professional magazine.

and at the same time rewards us. :-) We try to meet the challenges and commitments we have and make them well. We believe that slower growth is more stable and healthier for the company. In recent years, we have a year-on-year growth of somewhere around 20-25%, and this is what we can do without any reduction in the high-quality standard.

It is not a secret that the success of the company is mainly about the people, employees. What do you do to keep the key employees?

We have invested a lot of time and resources in this area within the last 10 years. The company's management is constantly being trained on how to create a good work environment and how to properly communicate with people. We also place great emphasis on annual interviews, where we receive a lot of feedback and suggestions for improvement from

people. We try to create conditions for the team, where everyone feels good and is accepted by the team. At the same time, it is a team that creates a social environment, so people have their colleagues as friends. In addition, we pay great attention to keep the work-life balance of our employees. We give people a lot of freedom at work, but of course, we also expect responsibility from them at the same time.

Well and in the end, we have to ask :-) How do you evaluate cooperation with SOS electronic?

It's a long-term relationship, I know your company from the beginning. In 2002, resp. 2006, when I also took over the purchase, you were already our well-established supplier. Personally, I really appreciate your personal contact. It is a fundamental difference compared to catalogue e-shops. Of course, through the e-shop it's fast, but just as the e-shop is fast, it's also cold, prices are fixed, and other options are limited. Our business relationship went through various situations, together we also managed some complaints. Deliveries are regular, and we use you as an important source for our production.

Multi Connection System – connectors with endless possibilities

WAGO

If there is any series of connectors with countless combinations, then it is the WAGO Multi Connection System (MCS) series. And how many are countless? Exactly 433 pages in the printed catalogue in A4 format.

2. MCS MINI, MCS MINI HD, MCS MINI SL

- Conductor cross-sections from 0,08 mm² up to 1,5 mm². Maximum current 10 Amps. The nominal voltage for overvoltage category III and 3rd degree of pollution is 160V.
- Two-pin spacings can be easily distinguished by colour. The metric 3,5 mm is grey, and the imperial 3,81 mm is orange. These two colours help identify metric and imperial pitches for WAGO in general.
- Regarding the technologies, there are connectors with CAGE CLAMP – without pushbuttons and then with PUSH-IN CAGE CLAMP. Gray connectors have orange pushbuttons, and orange connectors come with grey pushbuttons.
- This series offers different versions - with locking lever, with screw flange even with snap-in feet for DIN-Rail mounting.
- Series MCS MINI HD is black, with two rows and with CAGE CLAMP technology
- Series MCS MINI SL is black too, but single row and with "PUSH-IN CAGE CLAMP" technology (black with orange pushbuttons. This series is very slim - only 7,8 mm.

MCS is a family of disconnectable terminal blocks divided into four groups according to size, i.e. maximum operating voltage and current.

And since they are WAGO products, it means they are screwless with CAGE CLAMP and PUSH-IN CAGE CLAMP technologies. PCB mating parts are obviously without these technologies.

It would take an eternity to describe the countless amount of possibilities, and thus we'll mention at least some examples:

PCB Connector can be:

- With mounting flange.
- With screw flange.
- With locking lever.
- With rotary locking lever.

Cable Connector can be:

- With screw flange for panel mount.
- With snap-in flange for panel mount.
- With screw flange for mating part.
- With locking lever.
- With rotary locking lever.
- With Snap-in mounting feet.
- With DIN-Rail mounting etc.
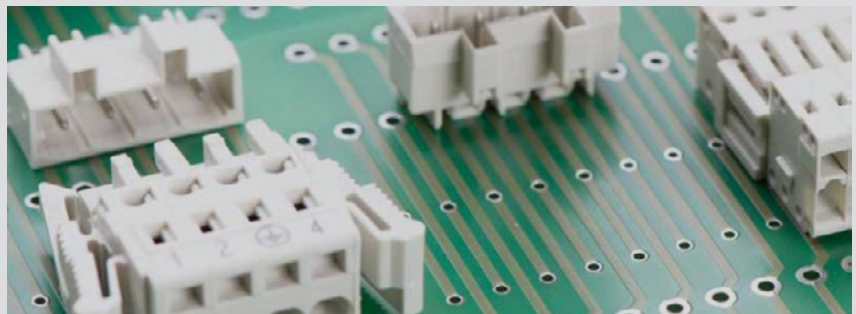
Sorting MCS series connectors by dimensions:

1. MCS MICRO Series

- These are the most compact connectors with pin spacing 2,5 mm, ideal for limited space, conductor cross-sections from 0,08 mm² up to 0,5 mm². Maximum current 6 Amps. The nominal voltage for overvoltage category III and 3rd degree of pollution is 80V for PCB connectors and 100V for cable connectors.
- Possible connections: wire-to-board and wire-to-wire. Number of poles from 2 up to 12.
- Colour: light grey, but the THR versions are black. Black is typical for almost all Wago THR solutions within MCS.

⭐ GUIDE PRICE

	231-309/037-000	3,90 €
	231-608/019-000	3,10 €
	721-602	0,99 €
	231-105/037-000/033-000	2,70 €

This is a short version of the article. The whole article can be found at web. Decode the link in QR code.

POL DC/DC
converters with an ultra-wide input voltage range

⊪ TRACO POWER

The newly developed TSR-WI Series of non-isolated DC/DC converters TRACO POWER push the limits of input voltage range up to 72VDC, which covers 99% of current and upcoming applications.

The TSR-WI line is a set of non-isolated POL (Point of Load) converters with an ultra-wide 8:1 input voltage range coming in standard SIP-3 packages.

Covering the majority of the standard bus- and battery voltages, this POL converter line is a versatile solution for many applications in distributed power systems where different input voltages have to be handled. Being able to use the same converter in many different situations effectively reduces the bill of material (BOM) of a given application.

High efficiency of up to 94% allows for an operating temperature range of -40 to +85°C and makes them excellent drop-in replacements for less efficient LMxx linear regulators. Available with 0.6 or 1A max. output current and standard features such as low standby current, precise regulation and protection against short circuit, overvoltage and overload.

Converters of the TSR-WI line are suitable for many battery and distributed power applications.
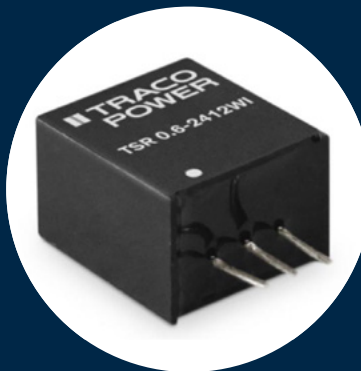
⊘ MAIN FEATURES

- Ultra-wide 8:1 input voltage range: 9-72 VDC
- Covers a majority of the standard bus- and battery voltages
- Up to 94% efficiency - no heatsink required
- Pin compatible with LMxx linear regulators (SIP-3)
- Operating temperature range -40 to +85°C
- Low standby current
- Excellent line/load regulation
- Protection against short circuit, overvoltage and overtemperature
- 3-year product warranty

☆ GUIDE PRICE

	TSR 0.6-48120WI	8,70 €
	TSR 0.6-48240WI	8,70 €
	TSR 1-48120WI	13,50 €

SENSIRION
THE SENSOR COMPANY

SLF3S-1300F
– next level
in liquid flow sensing

The radically optimized mechanical design of the SLF3S-1300F and the newest flow micro-sensor take an already outstanding functionality to the next level in terms of price-performance ratio.

Sensirion liquid flow sensors use MEMS calorimetric micro-sensor placed inside a flow channel.

Flow measurement is based on measuring the temperature of the fluid at two points.

The higher the flow rate, the higher the temperature difference. Micro-sensor itself is highly integrated and contains heater, two temperature sensors, amplifiers, ADC, signal processing, memory and I2C interface.

SLF3S-1300F

The sensor allows for the bidirectional measurement of flow rates up to 40 ml/min for both water and hydrocarbon-based fluids. The sensor is calibrated for water and IPA (Isopropyl alcohol). It uses the newest SF06 flow micro-sensor that measures both the flow and temperature. It also provides two additional status information: air-in-line and high flow.

The water flow rate measurement accuracy is 5% of the measured value for flow in range -20 to 20ml/min and 10% at 40ml/min; measurement accuracy for IPA is 10% in range -40 to 40ml/min.

After the sensor receives the "start continuous measurement" command, it enters the continuous measurement mode. Each measurement takes ~0.5 ms. Measured flow rates are averaged until you read them. The arithmetic mean is used for the first 100ms, and then the sensor uses exponential smoothing.

SLF3S-1300F uses standard fittings and I2C interface that allow simple integration into your product. For faster development and sensor testing, Sensirion offers SLF3S-1300F Kit and source code for Arduino UNO at Sensirion Developers website.

GUIDE PRICE

	SLF3S-1300F	84,50 €
	SLF3S-1300F Kit	177,00 €

⊘ MAIN FEATURES

- Straight, unobstructed flow channel without moving parts

- Micro-sensor doesn't have direct contact with the fluid

- Chemically resistant wetted materials: polyphenylene sulphide (PPS), stainless steel 316L, epoxy-based adhesive

- Response time below 20 ms

- Compact dimensions: 48 x 15.5 x 8.8mm

This is a short version of the article. The whole article can be found at web. Decode the link in QR code.

Zhaga.
Smart lighting for smart cities

Thanks to sensors and communication modules, modern LED luminaires will also be able to provide smart services. A key part of these luminaires are connectors, such as the LUMAWISE Endurance S series. They can be found in our product range under the TE Connectivity brand, a member of the Zhaga Consortium - the organization for standardization of LED lighting components for public lighting.

The Zhaga Consortium, formed in 2010, is a global organization that aims to standardize components for LED luminaire. A LED luminaire is a lighting fixture for general lighting that contains a light source based on solid-state technology. Such light sources, including LED Modules and LED Light Engines, typically consist of one or more LEDs combined with an Electronic Control Gear (LED driver). Other components of LED luminaires include LED Arrays, Holders, and connectivity fit systems.

In November 2019, there are 150 regular, associate and community members in Zhaga consortium. Zhaga's member companies include LED luminaire makers; manufacturers of LED modules, LED drivers and LED light engines, suppliers of materials and components, and testing labs. Zhaga members share their technical expertise in an open, cooperative manner. The consortium is market-oriented and works in the best interests of lighting-industry stakeholders.

Zhaga has created a set of interface specifications known as Books, which define the interfaces between a component and its environment. Each Book defines one or more components of the LED luminaire by means of the mechanical, photometric, electrical, thermal, and control interfaces of the component.

Book 1 is special in the sense that it provides common information, which is relevant to all other Books in the series. Also, Book 1 defines requirements and compliance tests, which are applicable across multiple Zhaga books.

As of now, it is Book 18 that is interesting for us. It defines the mechanical and electrical interface between a Luminaire Extension Receptacle and the Luminaire Extension Module typically applied in outdoor lighting applications. Some of newer Books are focused on smart interfaces between indoor luminaires and sensing/communication modules (Book 20) or on NFC programming (Book 24).

	Office & industry	Retail & hospitality	Outdoor
Integrated LED light engines	14 / 2,8	16	
LED modules (non-integrated)	7 / 14	12 / 3,10 / 9 / 5	4 / 15
Drivers	13	13	13
Sensor and communication modules			18

⭐ GUIDE PRICE

	2213831-2	4,80 €
	2213837-1	2,35 €
	2213858-1	3,60 €
	2328823-3	2,20 €

Get OMNI
in just 15 minutes

Are you considering panel PC, touch panel monitor or industrial PC? It takes up to 15 minutes to assemble any alternative. AAEON's modular OMNI series brings new possibilities with the new display box kit. Check for the latest updates.

Display Box Kit (OMNI-ADB-KIT)

CPU Box Kit

16:9 4:3

21.5", 15.6" 10.4", 12.1", 15", 17", 19

The OMNI modular series offers 2 CPU box kits, a Display box kit, 7 sizes of LCD panels with a resistive or multi-touch PCAP touch panel, and 11 I/O modules.

Do you need a panel PC?

Insert SODIMM RAM module into the socket, connect 2.5" SSD and fasten it to CPU BOX kit. Connect 3 cables (LVDS, Combo and DIO) from the LCD kit to CPU BOX kit, click CPU BOX kit into LCD kit and fix 3 screws – done.

Full flat design, no gaps between display and frame

Do you need a touch monitor?

Connect 3 cables (LVDS, Combo and DIO) from the LCD kit to Display BOX kit, click Display BOX kit into LCD kit and fix 3 screws – done.

Do you need an industrial PC?

Insert SODIMM RAM module into the socket, connect 2.5" SSD and fasten it

to CPU BOX kit. Click CPU BOX kit into M0421550A0 bottom cover and fix 3 screws – done.

CPU box kit

CPU boxes are based on Intel processors from Celeron N2807 to Core i7-6600U. All kits feature fan-less design, wide power supply voltage 9 to 30V DC and ambient operating range from -10 up to +55°C. CPU boxes can be transformed into a box PC by adding bottom cover. Kits are shipped without RAM and SSD. But don't worry, we have a solution - industrial Apacer RAM and SSD.

CPU box kits can run any Linux distribution with kernel 2.6 or newer or Windows 7, 8 or 10. In case of Windows OS, please consider using Win10 IoT Enterprise LTSB 2016, which is optimized for industrial applications.

Display BOX kit

The kit allows you to connect the monitor to a PC via HDMI or VGA and USB (touch panel). The touch panel drivers support Windows and Linux operating systems; you can find them on the enclosed CD.

LCD kit

- 7 LCD panel sizes - 10.4", 12.1", 15", 17" and 19" with 4:3 aspect ratio and 15.6" and 21.5" with 16:9 aspect ratio
- Robust aluminium front frame
- Full-flat front frame design prevents accumulating of water and dust
- IP65 rated front panel - 5-wire resistive and multi-touch PCAP touch panel

---

⊘ MAIN FEATURES

- CPU BOX kits, Display BOX kit and LCD kits or assembled together.

- Wide processor range, from Intel Celeron N2807 to Core i7-6600U.

- Fan-less cooling.

- Full-flat front frame design, which prevents accumulating of water and dust on the display.

⊛ GUIDE PRICE

	OMNI-SKU-KIT-A1-1010	915,00 €
	OMNI-SKU-KIT-A2-1110	467,00 €
	OMNI-SKU-KIT-A4-1110	661,00 €

This is a short version of the article. The whole article can be found at web. Decode the link in QR code.

Robust enclosures with elegant design

HAMMOND MANUFACTURING.

The new Hammond 1557 Series offers a surprisingly attractive industrial waterproof enclosure solution with three mounting options, for different control panels or monitoring units.

The latest series of industrial enclosures solves two important enclosure requirements – the aesthetic aspect as well as easy wall mounting. The 1557 Series is characterized by elegance and you will surely be proud of having the device in such an enclosure even if it is mounted on the wall on a visible place.

When we mention the wall mounting, the manufacturer bore that in mind too. It is assumed that one of the segments of possible enclosure applications may be different control panels or monitoring units, and thus we have two options for wall mounting.

The four feet that are included in the delivery of each enclosure of the 1557 series provide two wall-mounting options and one alternative:

1. Light - Easy mounting using only two legs fastened to the wall with screws and the enclosure simply „clicks" on them.

2. Heavy Duty - mounting by screwing four legs on the sides of the box and then mounting with four screws into the wall.

3. The last option is to use the enclosure for table-top applications for which we use four self-adhesive transparent rubber feet, which are also included in the enclosure packing.

The screws fixing the bottom and top part together are located on the bottom part so that they cannot be seen when the enclosure is placed on the wall. Only after a detailed look at the technical datasheet or after a grab in a hand, we find that the enclosure has considerably thick walls - at least 3.0 mm and is considerably heavier and more robust than conventional enclosures of a given size. An advantage is also the silicone lid gasket, which is made of one piece. The 1570 enclosures belong to the so-called 4/4X 6/6P (NEMA rating) industrial enclosures.

There are 4 sizes and 2 heights (45 and 60mm) to choose from:

- 80x80 mm
- 120x120 mm
- 160x160 mm
- 200x200 mm

Regarding materials and colours, there are 4 options, too:

- black ABS,
- light gray ABS,
- black Polycarbonate (UL), and
- light gray Polycarbonate (UL).

Polycarbonate versions are UV stabilized and are also suitable for outdoor use (IP68). Enclosures in the ABS version meet IP66 rating. All screws and internal thread bushings (M4) are made of stainless steel, ensuring very high corrosion resistance.

⊛ GUIDE PRICE		
	1557BGY	9,50 €
	1557BAGY	9,60 €
	1557DGY	10,90 €

TDK·Lambda

TDK-Lambda power supplies
Aimed at TCO

One of the world's largest manufacturers of power supplies offers innovative and reliable power supplies for the widest spectrum of applications – medical, industrial, comms, broadcast, renewable, COTS, LED. Choose TDK-Lambda for excellent service and technical solutions for all your power needs.

TDK-Lambda's philosophy is to bring a product with a competitive TCO to market (not with the lowest price) which automatically guarantees the highest available quality for the customer and longest lifetime of the equipment. Power supplies are always key components in electronic systems and therefore having a reliable power supply is of the highest priority.

The total cost of ownership (TCO) is a financial estimate intended to help buyers and owners determine the direct and indirect costs of a product or system. It is a management accounting concept that can be used in accounting or even ecological economics where it includes social costs.

TDK-Lambda products can be divided into the following groups:

1. Power supplies:

- DIN rail mount AC/DC converters from 10W up to 1kW of output power
- Chassis mount AC/DC converters from 100W up to 4kW of output power
- PCB mount AC/DC converters from 5W up to 1kW of output power
- Rackmount AC/DC power supplies from 860W up to 2,5kW of output power
- External (desktop) AC/DC converters for portable electronics from 40W up to 300W output power
- Custom solutions

2. DC/DC converters:

- Chassis mount types
- Isolated DC/DC converters for PCB mounting from 1,5W up to 500W of output power -DIN rail mounted DC/DC converters from 15W up to 60W
- POL non-isolated DC/DC converters up to 110W of output power
- Custom solutions

3. Programmable power supplies:

- Bench and chassis mount (Genesys 1U, 2U, Half-rack sizes), ZUP and Z+ series
- Rackmount (Genesys +), up to 15kW of output power programmable power supplies -Custom solutions

⭐ GUIDE PRICE

	DPP100-24	53,00 €

This is a short version of the article. The whole article can be found at web. Decode the link in QR code.

Robust industrial connectors - more colours for better price

HIRSCHMANN
A **BELDEN** BRAND

Connectors of the CA series have a reinforced plastic housing, making them a high-quality and efficient alternative to connectors with metal housings. They are reliable even in harsh environments with high levels of humidity and dust but still easy to connect and install. Practical colour resolution is convenient for both installation and maintenance.

If you want to be 100% sure that you did maximum for the security of your connections, use the CA series connectors. This series of circular industrial connectors from Hirschmann (a member of Belden group) meets all requirements for industrial connectors. Dust and moisture are no problem (IP67), secure connection and easy manipulation even in gloves is self-evident.

CA series is used in many applications. The plastic body is made of durable polyamide reinforced by glass fibres. This material is, in many cases, more advantageous than metal and also eliminates problems with possible corrosion in a harsh environment (chemical industry, moist environment, agriculture, renewable energy sources...).

A designer has a free hand to choose a suitable cable because the connectors are supplied with two sealings to allow the use of cables with diameter from 6 up to 12 mm. One sealing for 6-9 mm cables and the other for 9-12mm.

CA connectors are produced in versions CA3 (3 poles + PE) and CA6 (6 poles + PE). Similarly, like every decent connector, even the CA3/CA6 is designed in the way that PE pins are the first to connect, which ensures reliable protection already at connecting and the equalization of ground potentials at the same time (increased ESD protection). Reliable electrical contact is ensured by silver-plated contacts.

The main difference between CA3 and CA6 series is the maximum current and voltage. At the same time, the 3 pole version has screw terminals, while the 6-pole version has solder ones. It can be said that it is worth to put your hands on the CA series. Precise construction and a simple usage will probably convince you. The CA series is suitable for mains applications and can be used to power supply any devices with current up to 16 A(AC).

Apart from the standard black colour, you can now have the CA3LS in red and white colour too. And while the stock lasts, even at much better prices.

It is very useful to mark each channel with a different colour in multichannel applications. It helps at installation and maintenance. Detailed information can be found in datasheets of the individual connector types.

⊘ MAIN FEATURES

- Proven industrial circular connectors
- 3-pole+PE versions - screw type
- 6-pole+PE versions - solder type
- Straight and angled designs
- 400VAC /16A - CA3
- 250VAC/10A - CA6
- Silver-plated contacts
- Protection class IP67 when mounted
- Connector housing from an impact-resistant PA reinforced by glass fibres
- UL 94V-0 (self-extinguishing)
- operating temperature range from -40°C to +90°C

✩ GUIDE PRICE

	CA 3 LS RED	2,40 €
	CA 3 GD	3,50 €
	CA 00 SD 1	2,65 €

9" intelligent embedded display

uLCD-90

4D SYSTEMS
TURNING TECHNOLOGY INTO ART

Apart from the simple and fast development of graphics applications, a larger display has been added to the pool of benefits of working with 4D Systems displays. New 9" module with resistive or capacitive touch panel and with adapters for Raspberry Pi and Arduino.

Intelligent displays with powerful (free) software for the simplest possible development of applications may already be familiar to you from several of our articles.

Display modules from 4D Systems have attracted many fans especially for the ability to easily and quickly develop an application in 4DGL (C-like) graphics or even graphically, practically by "drag and drop" method using a wide range of ready-to-use widgets.

The proprietary graphics processor (Diablo 16) provides enough power and I/O functionality to control the surrounding electronics. Thus for not very complex applications, these modules can replace the Host processor and become the core of the application.

The 4D Workshop 4 IDE development environment provides a variety of ready-to-use buttons, sliders, switches, analogue gauges and other graphics that, thanks to a touch panel, can be used to replace classic electromechanical compo-

nents to simplify wiring, reduce costs and increase device reliability.

Even 4.3" and 7" display can accommodate a fair number of different indicators and controls to create powerful graphical manipulation (HMI). This is even truer for the new 9-inch uLCD-90DT and uLCD-90DCT, which has a 1.7x larger area than the 7-inch module.

The gen4 uLCD family design is the same for all available modules and all have a plastic white frame as well as pins on the FPC connector. However, uLCD-90 does not have an additional white plastic frame with eyelets for side mounting for screws but these eyelets are metal and are directly part of the LCD module design.

⊘ MAIN FEATURES

- 9" intelligent RGB display module 800x480 px

- Fast application development in a powerful development environment (freeware)

- Easy to use graphics

- Slot for uSD card

- Capable of standalone operation

- Single power supply 4 to 5.5V

⊛ GUIDE PRICE

	uLCD-90DT	155,50 €
	gen4-uLCD-43DT	68,90 €

This is a short version of the article. The whole article can be found at web. Decode the link in QR code.

New TG267 & TG297

FLIR

Infrared cameras seeing
4x more details
than their predecessors

The new TG267 and TG297 infrared cameras significantly accelerate the thermal diagnostics process. The features like 160x120px resolution, MSX combined image, new laser, larger display or easy data transfer to mobile devices are now available for the better price than you would ever expect.

Infrared camera TG267

The biggest and the most important improvement of both thermal cameras is the 160x120px resolution, which is 4 times the resolution of e.g. their predecessor TG167 (80x60px).

Another great step forward, and in practice a very useful tool, is the added camera in the visual spectrum and thus the possibility of the combined picture - MSX (Infra + visible spectrum).

This feature greatly facilitates e.g. localization of hot spots on the measured object.

Other key features:

- New multipoint laser accurately indicating the temperature measuring point (spotmeter), which contributes to the accuracy of the work.

- Larger display (+ 83% area) is also a clear benefit over older models.

- Integrated white LED work, a simple but great feature if you need to measure in dark places.

- Memory for up to 50 000 images.

- „Meter link/Bluetooth (BLE)" function to transmit measured data.

- Contact measurement with integrated (supplied) thermocouple connector up to 260°C.

Infrared camera TG 297

The TG297 has the same functions as the type TG267, but it also has a high-temperature gray optical filter that allows measurements up to 1030°C.

Recent years show the growing popularity of easy transfer of measured values to mobile devices. This infrared camera also meets this requirement, as it features the Meter link/Bluetooth (BLE) function for seamless transfer of images and measurement results to FLIR Tools as well as live temperature transfer (without image).

Thanks to its features and a great price, the TG thermal cameras series is very popular and ideal for electricians, HVAC/R engineers, building inspectors and mechanical engineers.

Both new TG267 and TG297 infrared cameras offer improved sensitivity and resolution to help professionals dramatically reduce diagnostic time, and start repairing faster.

⭐ GUIDE PRICE		
	TG267	382,00 €
	TG297	782,00 €

Get to know the biggest benefits of modern power supplies

Do you know that modern power supplies can simulate real operation and significantly simplify the testing during development and production? We have summarized the most useful functions and features of Rohde & Schwarz's power supplies.

Did you also think that a laboratory power supply is a relatively simple power source working as a constant voltage source with an adjustable current limit? No wonder, such simple power supplies belong to the cheapest and most widespread ones and they are often sufficient, but not always…

But what if we need a current limitation but not for short peaks? Or limit the maximum power of the power supply to simulate the real power supply that you plan to use in the final application? Another example could be testing the analog circuits with symmetric power - in these cases, it is certainly preferable to change the output voltage by a single control element in both - the positive and negative channels at once. And if the current fuse reacts in one branch, the other channel needs to turn off automatically as well.

Modern power supplies offer considerably greater possibilities, simplify the development and greatly protect the tested equipment from destruction in case of a failure.

Let's take a look at the most useful functions and features of Rohde and Schwarz power supplies:

- **Parallel and serial operation, galvanically isolated (floating) channels** - All channels can be considered as separate (mutually isolated) channels. This allows you to connect the channels in series obtaining a high output voltage, or to connect them in parallel to gain higher output current.

- **The same voltage range for every channel** – It does not matter whether you buy 2, 3 or 4 channel unit. In all cases, the channels have identical voltage range.

- **CC (constant current) and CV (constant voltage) mode** – A typical function of every good power supply. The power supply keeps the stable voltage up to the current set by the user. From that point the power supply limits max. output current to the set level.

- **Tracking** – Enables you to change the voltage on all channels in parallel (by one setting element). Especially useful to supply and test bipolar circuits, for example, amplifiers, etc.

- **Rear connectors** – Several power supplies also have rear connectors containing all output channels and sometimes even more (sense lines). Rear connectors are useful for mounting into a rack or automated test workplace.

- **Sense** – Ensuring a precise voltage level at the load, compensating a voltage drop at connection cables. Sense pins are placed on the front or the rear panel, enabling to connect sense conductors directly to the load.

⭐ GUIDE PRICE

	NGE102B (5601.1414.02)	721,00 €
	NGE103 (5601.1414.03)	744,00 €

With or without filter?

SCHURTER
ELECTRONIC COMPONENTS

If your device is in a metal enclosure, is mains powered and consumes up to 10A, then AC power entry module with integrated EMC filter is the optimal solution for you.

Do you remember why this is so? If not, our article Why do we need a power line filter and where to place it? will remind you.

At present, almost any mains operated device uses a switched power supply. It is well known that the additional costs associated with adapting the final equipment due to non-compliance with EMC requirements are significantly higher than the costs incurred for EMC during the development of the equipment.

Even though the probability that the device meets the requirements for electromagnetic compatibility without additional EMC filter is low, the power entry module without EMC filter is significantly less expensive than a module with filter. Its use is therefore worth considering.

Schurter offers the power entry modules DD11 (without EMC filter), DD12 (with single-stage EMC filter) and DD14 (with two-stage EMC filter) for this scenario. The modules can be mounted in the same pan-

The designer considered the length of the modules when designing the equipment; no additional modifications to the equipment are necessary.

✓ MAIN FEATURES

- All modules have a two-pole switch
- One or two fuse holders 5x20mm
- Quick-connect terminals 6.3x0.8mm (DD11 4.8x0.8mm)
- Meet safety requirements for ITE according to IEC 60950 and medical equipment according to IEC 60601-1.
- Compatible with V-Lock system to prevent unintentional disconnection of the power cord

The experienced designer, therefore, considers the EMC requirements from the start of the design and designs the device so that a power entry module without EMC filter or with EMC filter can be used without modification of the device.

el cut-out, the spacing of the panel mounting holes is the same, and therefore no additional panel adjustments are necessary.

Modules differ in-depth, while DD14 with two-stage EMC filter is only 5mm longer than DD12 with one-stage EMC filter.

☆ GUIDE PRICE

	DD11.0121.1111	7,60 €
	DD12.6121.111	20,40 €
	4301.1415	2,35 €

Keep up with new technologies from Apacer

Apacer

Current manufacturing technology allows producing reliable 3D TLC NAND flash memory chips for industrial temperature range -40 to 85°C. In addition, Apacer SLC-liteX technology significantly increases program/erase cycles count.

SLC-liteX and MLC-liteX

Apacer developed SLC-lite technology which uses 2D MLC flash that can store 2 bits/cell.

When programming only one of the two bits, the least significant bit (LSB), threshold voltage distribution behaves similarly to the SLC flash memory cell. The program/erase cycle (P/E) count is then greatly increased, reaching 20,000. By comparison, the standard 2D MLC allows 3,000 P/E cycles.

Apacer used a similar concept for 3D TLC NAND Flash that can store 3 bits/cell. Programming only one of three bits (SLC-liteX) allows the increase of number of P/E cycles to 30,000. If two bits are programmed (MLC-liteX), P/E cycle count reaches 10,000.

The SLC-liteX series products are either covered by a 5-year warranty or the period ending on the date when the SSD has exceeded 30,000 Erase Count, which is indicated by Apacer's SMART software, whichever occurs first.

3D NAND flash for Industrial Temperature Range -40 to 85°C

Major flash memory chips manufacturers like Kioxia (formerly Toshiba Memory) are currently able to produce 3D NAND flash chips with endurance of 3,000 P/E cycles in industrial temperature range -40 to 85°C. This allows Apacer to launch new SSD series SV-250 a SV-170 and CV110-MSD a CV110-SD memory cards series.

Faster MicroSD and SD Cards

Apacer introduced new H2-M series of industrial MLC microSD and SD memory cards. They are available in 4 to 32GB capacity and for standard temperature range -25 to 85 °C or industrial temperature range -40 to 85°C. Cards employ page mapping FTL (flash translation layer) which allowed fulfilling the application performance Class 1 (A1) requirements (IOPS read > 1500, IOPS write > 500) for cards with capacity 8GB and higher.

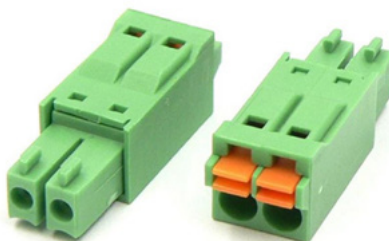| ⭐ GUIDE PRICE		
AE2.255HHC.00104	58,60 €
A32.255HHB.00108	46,50 €
A52.255HHA.00104	50,50 €

Slim connectors SHMxx-3,5-E saving space

euroclamp

Any fashionista surely knows that green makes you look slimmer. Apart from the aesthetic reasons, we are bringing you two stock types of connectors from the manufacturer Euroclamp series SHM-3,5-E. This series is only 7,15 mm thick, which is significantly slimmer compared to the earlier introduced SHM-3,5-F series, which is up to 11,7 mm.

These are disconnectable terminal block connectors, the free-hanging part. Regarding the technology, these are push-in spring connectors. This means that a solid conductor and stranded wires terminated with a sleeve can simply be pushed into the connector. And the actuator button should only be used at the release of wire or when working with stranded cables. Mating parts are from the series PVxx-3,5.

✓ MAIN FEATURES
• Pitch: 3,5 mm
• Maximum wire cross-section: 1,5 mm^2
• Maximum voltage: 160 V
• Maximum current: 8 A

⭐ GUIDE PRICE		
SHM02-3,5-E	0,40 €
SHM03-3,5-E	0,55 €

This is a short version of the article. The whole article can be found at web. Decode the link in QR code.

Reliable pushbutton switches with easy installation

The 1840 Marquardt series panel pushbutton switches are the most practical switching solution in conventional electrical equipment thanks to the simplest push-in operation and the simplest assembly.

If you need to solve the switching mains power in common electrical equipment practically and quickly, bet on the 1840 series of Marquardt panel pushbuttons/switches.

They have the easiest possible control - push and the easiest possible assembly and preparation - drilling one hole and fastening with M12 nut.

The 1840 series consists of one- and two-pole versions in both momentary and latching switch functions. Models 1841 are single-pole, models 1843 are two-pole versions.

The single-pole switch is available in three versions - normally open contact normally closed contact and momentary changeover switch. The two-pole models are only available as a latch switch function.

All models have a cylinder-shaped actuator with a diameter of 8 mm and thus directly ready for use. An interesting accessory is the neoprene cap with an integrated nut, which ensures resistance to dust and water.

For those that do not fit the standard actuator (it is too small), models with an actuator adapted to add larger caps are available: either a 20 mm round or 11,5 x 20 mm rectangle. The second part of the order code for these models is 6101.

✓ MAIN FEATURES

- Switching voltage 250VAC
- Switching current 6 A, motor current 4 A for latching switches and 2 A for momentary switches
- IP40 degree of protection
- Mechanical life 100,000 cycles
- Electrical life at nominal load 50,000 cycles
- Operating temperature range from actuating side -20 °C to + 55 °C
- Operating temperature range from terminal side -20 °C to + 100 °C

☆ GUIDE PRICE

	1841.1201	2,80 €
	343.002.023	3,20 €

Get a lot of connectivity for the buck

WizFi360 is fast, affordable and simple plug & play WiFi module WIZnet designed for various IoT applications, mobile and wearable devices.

The WizFi360 module is a cost-effective WiFi module that supports both TCP/IP and MCUs. The connectivity is provided via 2.4Ghz wireless connection, WizFi360 is compatible with IEEE802.11 b/g/n standards and supports SoftAP, Station and SoftAP+Station modes.

This WiFi module provides time-to-market savings for your device as it's been developed as a standalone Internet-enabling solution. Despite the module is pin-compatible to the very popular ESP12 module, it is not based on Espressif 8266 SoC, but for easier integration, WizFi360 supports „Espressif AT command list".

Description

WiFi module WizFi360 is a perfect choice for mobile wireless applications such as remote monitoring and sensor applications. Ease of integration and programming can vastly reduce development time and minimize system cost. The module has been designed to provide designers with a simple Wi-Fi solution that has the following key features.

☆ GUIDE PRICE

	WizFi360-CON	2,80 €
	WizFi360-PA	2,60 €
	WizFi360io-H	4,90 €

The high-end fan at a special price

ebm**papst**

Compact axial fan 60x60mm for low profile applications up to 15 mm with power supply 12Vdc offers high performance and attractive price/performance ratio. And it's available straight away.

The 612F/2-638 fan from Ebm-Papst is designed to deliver high performance while retaining a space-saving size. This fan has sleeve bearings, which offer cost-effective protection of the central shaft from environmental factors.

This results in a simplified and economic design that is suitable for many thermal management applications. Efficient brushless drives and integrated communication electronics protect the fan from reverse polarity.

This series of fans is both reliable and easy to use. The 612F/2-638 is ideal for installation in ACTA (Advanced Tele-communications Computing Architecture), which means they are suitable for a variety of applications:

- Cabinet Cooling
- Networks Switches
- Power Systems
- Telecom
- Medical

⭐ **GUIDE PRICE**

	612F/2-638	13,60 €

WE 1010 education kit – soldering station with a bonus

Weller®

Extraordinarily affordable WE 1010 station is now available in an even more attractive set with practical accessories, ready for the immediate use.

The latest WE 1010 set is also available in so-called Educational kit that, besides the usual WE 1010 kit, also contains the following:
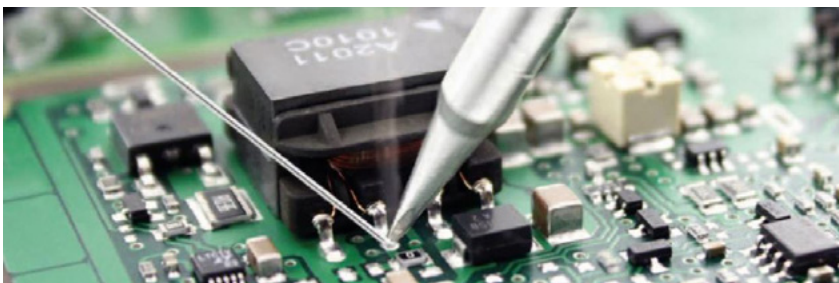
- modern soldering wire WSW SCN M1 in diameter 0,8mm/100g

- top class cutting pliers Weller Xcellite 170MN

- ET B (2,4mm) soldering tip.

WSW solder with nickel and micro alloying additives has an excellent wetting capability and is very gentle to soldering tips, thus contributes to their long lifetime.

Among the products of Weller (APEX group) we can also find Xcellite pliers that are known for their quality for decades. Namely, Xcellite 170MN are low profile, general purpose cutters, requiring only a small force of the operator and they are ESD safe.

In result, WE 1010 Educational kit offers the attractive possibility to try (together with a new station) also a modern solder wire, top quality cutting pliers and to have one 2.4mm extra for relatively bigger joints (WE 1010 is in the basic set delivered with one ET A tip).

⭐ **GUIDE PRICE**

	WE 1010 Education Kit (T0053298390)	177,00 €

This is a short version of the article. The whole article can be found at web. Decode the link in QR code.

FIS5084 easily detects HFC leakage

NISSHa
Nissha FIS, Inc.

A brief guide on how the FIS module for refrigerant leads detection works, a summary of its features, and technical details you cannot find in a publicly available datasheet.

In the 1980s, scientists began to suspect that the HCFCs, which were used as the main source of refrigerant back then, were contributing to the destruction of the ozone layer.

The Montreal Protocol, signed in 1987, called for the removal of all HCFCs by 2020.

Today, HFCs are used as the main coolant source. These chemicals do not affect the ozone layer; however, when released into the atmosphere, they cause a greenhouse effect that affects global warming. At the beginning of 2019, HFCs were included in the list of regulated chemicals that are subject to mandatory emission limits.

Nissha FIS contributes to the prevention of global warming by R32 calibrated FIS5084 module. Let's see what this module offers.

Monitoring

The module monitors the R32 concentration, checks the functionality of the sensor, updates the operating time and sets VOUT1 and VOUT2 accordingly.

Alarm

VOUT2 should signalize alarm state, if R32 concentration > 0.6%. 0.4% concentration shouldn't trigger the alarm. At 0.8% concentration of R32, the alarm is triggered within the 60s; at 3.6% of R32, in 30s.

⭐ GUIDE PRICE	
FIS5084-01NC	36,50 €

We are expanding the portfolio of IoT products with the world brand

USR IOT
Be honest, Do best

Our new supplier, USR IoT, is an expert in industrial communication IoT products with a focus on serial data networking and M2M applications. ISO9001 quality management with more than 20 years of experience in business guarantees its expertise.
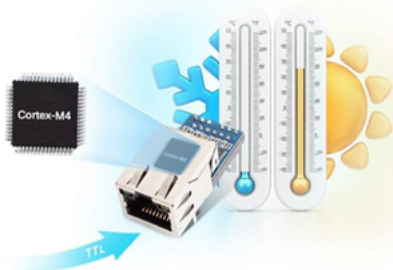
Product portfolio covers Serial to Ethernet converters, Industrial 4G Routers, Industrial Cellular Modems, Ethernet Gateways, and Embedded/WiFi Modules.

The most interesting product, from our standpoint, is probably the USR-K7 module, also known as SuperPort. It is an industrial grade TI Cortex M4 MCU based Serial to Ethernet module with a rich set of features.

This tiny module supports five working modes of TCP Client, TCP Server, UDP Client, UDP Server, and HTTP Client. The data transmission can be realized with a simple configuration.

Data submitted directly to a Web server

USR-K7 supports data interaction between the terminal device and the web server directly. Without considering the conversion process, the data request from the serial port to the HTTP server can be realized quickly, just by setting parameters.

✓ MAIN FEATURES

- Virtual COM port – solution for PC software, which is designed to use a serial port for networked devices
- Disconnection identification, automatic connection
- Easy identification of dead links and auto re-connection to prevent data loss due to power outages and disconnections
- Modbus Gateway
- Polling mechanism can effectively solve the problem of congestion caused by data concurrency (firmware 3009 or higher)

⭐ GUIDE PRICE	
USR-K7	20,80 €

LoRa remote control with outdoor range up to 8km

W I R E L E S S

Half-duplex transmitter based on LoRa modulation technique, XTR-8LR-4ZN from AUREL, is providing an ultra-long-range radio communication, high interference immunity, high sensitivity and very low power consumption.

XTR-8LR-4ZN is a keyfob with encrypted communication which, in combination with the XTR-8LR-DEC, allows you to control four outputs remotely.

Long-range solves many problems that users are confronted with using conventional solutions. Two-way communication ensures reliable feedback if the output is activated (LED blinks if the output was activated).

The power supply is provided by CR2032 button battery, and the outdoor range is up to 8km.

Applications:
- Home security
- Access control
- Burglar alarms
- Car alarms

Available models:
- 1/2/4 channels
- Black or white enclosure
- Plastic or chromed frame
- Proprietary manufacturer code

☆ GUIDE PRICE

	XTR-8LR-4ZN	40,40 €
	XTR-8LR-2ZN	40,40 €
	XTR-8LR-SOS	53,60 €

Industrial DIN rail PCs series

Lex SYSTEM

The NET and MIRO Series include a wide range of standard models. In addition, the strength of LexSystem is customization with minimal additional costs.

Customized and OEM/ODM (Original Equipment Manufacturer/Original Design Manufacturer) products make up the majority of the production. Depending on the product and the changes required, the manufacturer accepts the minimum order quantity from 30pcs.

From the wide range of MIRO and NET series, we have chosen the NET-I model with dimensions of only 30 x 106 x 85mm, the MIRO-3-3 model with six COM ports and something in between, MIRO-2-2 with four COM ports.

Single-board computers (SBC) are designed in modularity and interchangeability in the mind. Fixed position of external connectors and processor assembled on the solder side allow using the same enclosure without customization for more SBCs.

Two to four of RS232 interfaces are connected to D-SUB9 connectors on the SBC's PCB, the remaining ones are connected to internal connectors. It allows connecting the remaining RS232 interface to D-SUB9 panel connectors or to COM converters that convert RS232 to RS422/485 (CC004), isolated RS232 (CC102), isolated RS422/485 (CC104) or isolated RS485 interface with screw terminal (CC105).

Super I/O chip provides digital inputs (DI) and outputs (DO) connected to connectors. This makes it easy to add 8 DI or 8DO or 4DI + 4DO with galvanic isolation by using the CIO108 module. LexSystem provides utility for Windows and Linux operating system which allows setting the DO state and read status of the DI.

Industrial DIN-rail PCs are compatible with Linux and Windows 10 64-bit operating systems. You can download Windows drivers from the Download section. Linux drivers are included with kernel, in case you would need out-of-tree drivers, please check LexWiki.

☆ GUIDE PRICE

	NET-I-2I380D-D92	293,80 €
	MIRO-2-2-2I385CW-I44	441,90 €

This is a short version of the article. The whole article can be found at web. Decode the link in QR code.

The king among Cat 4 LTE modules

QUECTEL

New Quectel EG25-G is an LTE Cat 4 module optimized specially for M2M and IoT applications. It is the worldwide 4G compatible module and thanks to adopting the 3GPP Rel. 11 LTE technology, it delivers maximum data rates up to 150Mbps downlink and 50Mbps uplink. Modul EG25-G is already available to order.

Designed in the compact and unified form factor, EG25-G is compatible with Quectel UMTS/HSPA+ UC20/UC200T module and multi-mode LTE Standard EC2x (EC25, EC21, EC20, EC20 R2.0 and EC20 R2.1)/EG21-G module, which allows flexible mutual migration both in design and in use.

EG25-G is backwards-compatible with existing EDGE and GSM/GPRS networks, ensuring that it can be connected even in remote areas devoid of 4G or 3G coverage.

The key benefit of EG25-G is the worldwide 4G compatibility and certifi-cation (GCF/CE/FCC/PTCRB/IC/Anatel/IFETEL/SRRC/NAL/CCC/KC/NCC/JATE/TELEC/ RCM/IMDA/ICASA/NBTC/FAC)

EG25-G supports Qualcomm® IZat™ location technology Gen8C Lite (GPS, GLONASS, BeiDou/Compass, Galileo and QZSS). The integrated GNSS greatly sim-plifies product design and provides quick-er, more accurate and more dependable positioning.

A rich set of Internet protocols, indus-try-standard interfaces and abundant func-tionalities (USB serial drivers for Windows 7/8/8.1/10, Linux, Android/eCall*) extend the applicability of the module to a wide range of M2M and IoT applications such as industrial router, industrial PDA, rugged tablet PC, video surveillance, and digital signage.

☆ GUIDE PRICE

	EG25GGB-MINIPCIE	53,90 €
	EG25GGB-256-SGNS	54,30 €

3 reasons for the TRI series DC/DC converters

‖ TRACO POWER

Reinforced insulation system, high common-mode transient immunity, and compact DIP-24 package. With the latest, IT security certificates, the TRACO POWER TRI Series is the per-fect choice for demanding applications in industrial, transpor-tation and instrumentation sectors.

The new TRI- line 3, 6, 10, 15 a 20W com-prises a set of high isolation, regulated DC/DC converter series which come in compact DIP-24 (3-10 Watt) or 2"x1" (15-20 Watt) packages.

The core characteristic of the TRI line is a sophisticated reinforced isolation sys-tem that is able to withstand high test voltages (9000 VDC for 1s and 5000 VAC for 60sec.) and working voltages (1000 VACrms). In addition to this high insulation capacity, the high transient immunity in the common mode is 15kV / μs.

The new design allows full integration of EN 55032 class A filter and great-ly reduces the no-load power consump-tion. High efficiencies up to 90% allow safe operation from −40°C to +65°C with-out derating and up to 85°C with derating. All models have a wide 2:1 input voltage range and precisely regulated, isolated output voltages. With the latest IT safety certifications (IEC/EN/UL 62368-1), the TRI line is the perfect choice for many demand-ing applications in the industrial, transpor-tation and instrumentation sectors.

✓ MAIN FEATURES

- Reinforced I/O-isolation 5000VAC rated for 1000 VAC working voltage
- Ultra-high isolation peak voltage 9000 VDC (1s)
- Models with 3.3, 5.1, 12, 15, 24, ±12 and ±15VDC output voltage available
- Common Mode Transient Immunity (dv/dt) 15 kV/μs

☆ GUIDE PRICE

	TRI 10-1210	55,30 €
	TRI 10-1212	55,30 €
	TRI 10-1223	57,10 €

How to request a quote from us? The fastest way – online.

Do you want to know the price and delivery time for a larger quantity than we usually have in stock? Or did you not find a price on our website? Request a quote directly from our site.

We prepare price offers for our customers quite often. The price request can be sent via email, or you can call us. Or you can do it quickly on our web using the **"Price Request"** function.

How to add the product to the request?

Adding items to your request is very similar to adding them to a classic shopping cart. For each item on our website, you will find a calculator icon and the text „Get Quote". After clicking on it, enter the quantity, you are interested in, and the item will be added to your Request shopping cart.

Do this for all the products you are interested in. If you do not find the product on our website at all, it does not mean that we are unable to provide it for you. We can offer more than what is published on the web. Enter the name of the desired product manually, add the manufacturer and quantity required. We will be happy to check such item with our suppliers.

How to complete the request?

Once all the products are added, you need to complete the request - fill in your contact details (if you are logged in, they will be filled in automatically) or mark your application with your own label for easier identification. If needed, you can leave us a comment in the note. And then send your request.

What's the status of your request?

You can check the status of your request in our e-shop. It can be in one of these three stages:

• Offer is being prepared

• Offer is ready and can be viewed (and in case of interest, you can also place an order from there)

• Requests archive – list of offers that have been prepared in the past

For the sake of completeness, please note that this list contains all the quotations, including those you have requested by phone or email.

Finally, here are two more practical features that might be quite handy:

• You can search through the archive of offers - by product name or order number

• You can create a new request from the archive menu - for the same items and quantity.
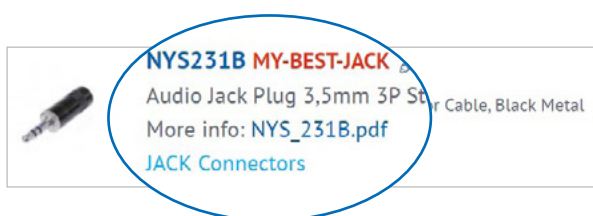
We look forward to your requests :-)

Adrián Lipták
webteam manager

Mark products with your label

If you are used to custom component marking, you no longer need to remember vendor markings. Did you know that you can also use it in our e-shop?

NYS231B MY-BEST-JACK
Audio Jack Plug 3,5mm 3P St...r Cable, Black Metal
More info: NYS_231B.pdf
JACK Connectors

Part of our e-shop is the **"Products with my label"** functionality.

You can add your tag, note, or code from your system to each item. Consequently, **your labels are highlighted in red** and are right next to our product name and are visible in the whole e-shop.

All your labels in one place

To see the list of all goods where your label is also used, please visit the **"Products with my label"** section. It is available in the "Products" section of your account. Here you can not only view the products with your label but also edit or delete them.

One more important piece of information. Your labels **will also appear on your invoices and even on every product label shipped to you.**
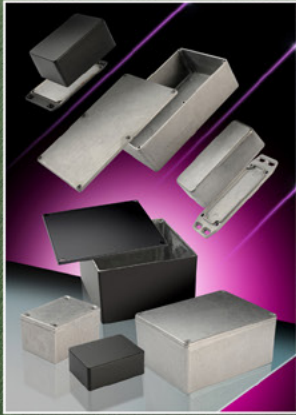

✓ ADVANTAGES OF OWN MARKING

- Easier search for goods using the usual name
- Your labels are present on invoices and also on product labels
- Easier identification of purchased goods
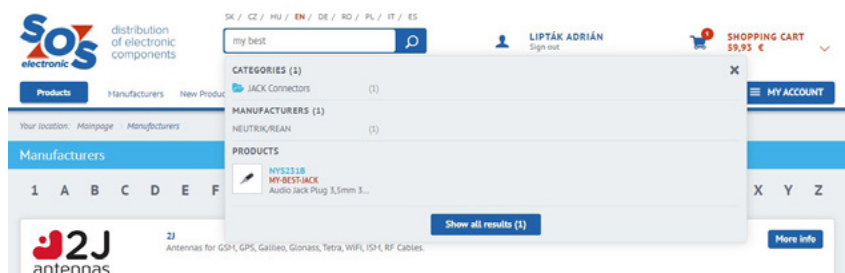
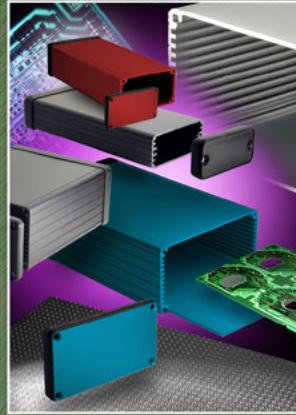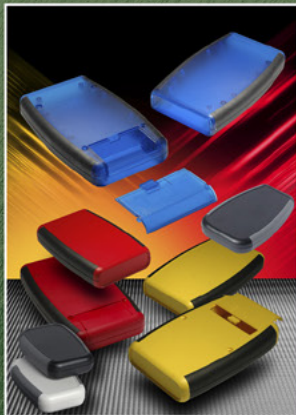Of course, you can also use them in the main e-shop search engine, and they will also be highlighted in red in the pop-up window with search results.