



TOPIC

Temperature measurement with SHT31 SMART GADGET

8

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THL15WI Series operates at 15W power in smaller case



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W6100 is ready for IPv6



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SOSnews

informative bulletin for current and future SOS electronic customers

It is time to learn and gain experience before planning



Pavel Krátky
Country Sales Manager CZ

Dear readers, customers, business friends,

At the end of the year, the future is measured, evaluated and also planned. And just before planning it is great to learn something new, try and verify something in practice and confirm - yes, that's exactly what I want to plan. This can truly increase the likelihood that you are going in the right direction.


Recently I was in charge of the TE Connectivity assortment campaign. My colleagues and I chose Lumawise as the main connector system, which is mainly used in the field of modern street lighting and smart measuring applications. During this campaign, we have gained experience with details such as the cap or seal ring. We have found out that for many applications it is important to have a condensate drain hole in the connector. It is just those important millimetres that ultimately determine the success of the project. Without this experience, it would not have been possible to plan the future well.


When I, along with sales representatives, go to visit our customers, I see that you, with just a few exceptions, do not have time to gain experience as in the past. Even some tenders do not allow real application testing during operation. It is quite obvious that you are being pushed into faster decision making, especially in the field of NB IoT, single-board PCs and so on. We work in a field that is beautiful thanks to its rapid development and change. On the other hand, it forces us all to keep educating, improving and making faster decisions. Speed is more and more important in order to be successful. This is what I hear quite a lot during our meetings: "Mr. Krátky, I will not develop equipment for several months, it is a big expense and very time-consuming for me. I will rather buy this module from you and I'm all set". Development is also affected by the managerial view, the number of pieces is important for the cost distribution. The world of components is getting simplified, even though the module solution is very complex in the core, but for the manufacturer, not the customer. Modules are successful from resources through control to display and communication and contribute to the acceleration of development.

In this issue, you will find articles and information for inspiration and support of your education. We try to help you introduce new modern components into your applications and this is one of the options. We are trying to recede from the printed version and digitize what is possible, but the printed version is sometimes good to use, for example for the discussion with our sales representative, in the workshop, in development. In the end, whether electronic or printed, content is always what really matters.

I wish you success in 2020 thanks to good planning and introduction of something new to your production. At the very end, I wish you patience and your own conviction. About a year ago, I started jogging professionally with a weight of 93kg and today I hear this quite often - "You lost a lot of weight, do you eat less?" You can also feel discouraged when developing new components. Therefore, it's necessary to be patient in your conviction and pursue your dream goal, your new product.

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Youth is important



Electronics can be fun even without a mobile phone and tablet! We convinced young high school students from SSOŠ in Poprad about it. We decided to broaden their knowledge of electronics, electrical engineering, electrical components in a fun and easy way, and show them that "electro..." is not just boring information and physical laws!



For few hours we played to be their teachers and showed them how to detect who had a garlic baguette for breakfast using sensors or how to find the "most repulsive" classmate using a multimeter. Many of them have seen the WIFI module live for the first time and have also tried some practical tasks. Our greatest reward was the great interest of young students that was not interrupted even by the bell ring at the end of the lesson.

We love unconventional solutions



... and thus we decided to increase the work efficiency of our sales representatives... Are you curious how? Easily! This time, we did not travel to see our customers, but invited our customers to working lunch. And since not only work keeps a man alive, we have improved our working lunch with a little training in golf basics and skills. We are delighted to have had the opportunity to sit with you, our customers, in a beautiful environment, to talk about business, share their successes, and learn something new. And the result? Everyone was satisfied



with the smiles on their faces. And maybe in addition to the love of electronics, we have also aroused the interest in golf.



Evertiq Expo

17. 10. 2019 Krakow, Poland

Yes, we admit. We enjoy Evertiq Expo! For the third time in a row, we have participated in this great event in Poland and every year we are more and more convinced that to be part of it makes sense.

We meet our business partners there; it is also great opportunity to establish valuable business relationships and also spend some time talking to everyone who stops by. Whether we were talking about the product range or you were interested in our new video about SOS electronic projected on screen, we were happy to see you all.

We look forward to seeing you again in May 2020, in Warsaw.



We taught you during webinar! How to set PICO-PI-IMX8M for Qt application

We promised you more detailed information about embedded devices and we kept our promise in September 2019.

On September 11, 2019, Tomasz Swatowski and Henri Parmentier from TechNexion led a webinar on PICO-PI-IMX8M-MINI-2G development kit.

Before the webinar we asked you to let us know what you do not understand about PICO-PI kit and Qt applications, what more you need to know about embedded devices and so on. You have taken the opportunity and we are very happy!

At the beginning of the webinar, Tomasz and Henri put the development kit together piece by piece and showed you that uploading a demo image to the



kit is really simple. A part of the webinar was dedicated to already available but also planned new TechNexion products.

In case you couldn't attend the webinar for various reasons, don't worry. We recorded it and we will soon upload it on our YouTube channel. We will pro-

cess the topic in the upcoming days and publish it in the article.

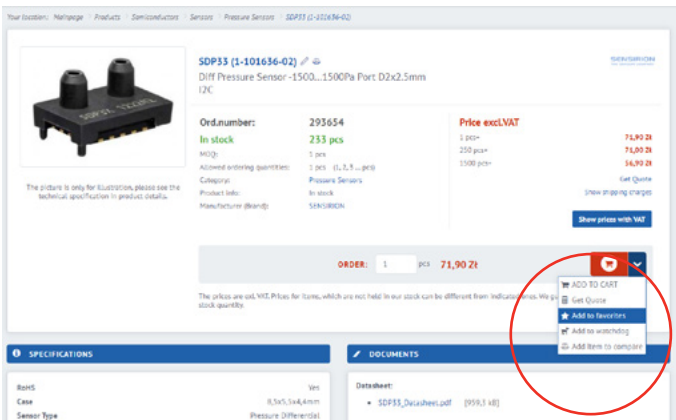


Do you often buy the same items?

If your answer is yes, then you will like the new function in our OnLine shop. Simply, add these products on a list of your favourite items and save your time with the next order.

What are the advantages?

- frequently bought products are placed together
- they are easily accessible
- there is no more need for product searching
- regularly bought components e.g. for the production of the same PCB, can be gathered into a group with an appropriate name and after that added into a shopping cart easily with a single click
- possibility of the bulk change of items in a shopping cart when it is needed

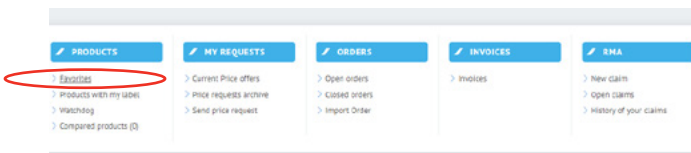


How to add an item to favourites?

Easily. Click on "Add to Favourites" in a "Product line", "Details" and in the "Cart".

At the same time please set the quantity of the item and its target group.

How can be "MyFavourites" reached?



The file "MyFavourites" is available in the blue top menu of the webshop. You can find there a list of your favourite groups with your favourite products you have created.

- entered products can be edited
- can be bulk inserted into the shopping cart
- can be deleted from the file

Beware, favourite items are only active when you are signed in.



We will let you know if you make a typo when searching

You can easily misspell part names when searching. The names are pretty long, there are many unrelated letters and numbers. We'll notify you of a possible typo and offer you similar results.

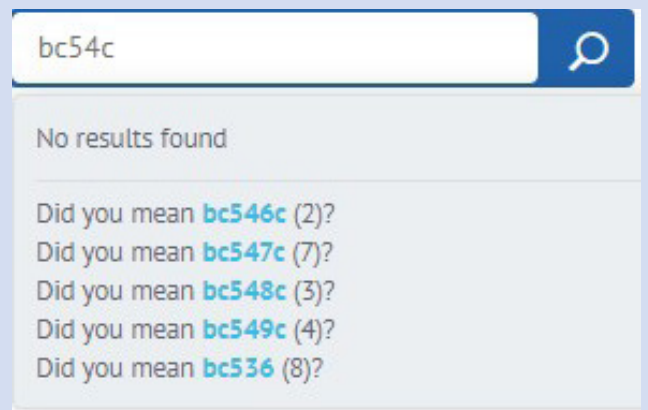
We are always looking for ways to help you and lend a hand even in cases like misspellings - the result is a helper - "Maybe you were looking for...".

How does it work?

If the search engine does not find a result, it will try to look at a list of the most similar words that have some search results.

If it finds some, it lists them. In brackets, you'll see the number of products that are in the search results for the given similar word.

You can simply click on the offered words to see the results.



3 reasons for the TRI Series DC/DC converters



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 perfect choice for demanding applications in industrial, transportation and instrumentation sectors.

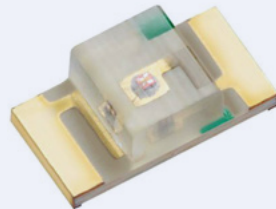


TRACO POWER

Do you know a LED with zero height?



Kingbright KPTR series, suitable for reverse mounting, makes it possible to achieve that the LED is hidden in the PCB.



Kingbright
Kingbright Electronic Europe GmbH

The SUNNY side of life - Reliable manufacturer of adapters and power supplies



Technically every application needs a power supply. It matters which adapter or power supply we use. It needs to be durable and have low power consumption in an idle state, it needs to have interesting design and its manufacturer needs to have all the required certificates.



Sunny
Sunny GmbH

Kontakt Trio - set for perfect contact treatment



A strong trio of Kontakt Chemie sprays for quality and reliable contacts, in a discounted package.

PROFESSIONAL CONTACT CLEANING AND MAINTENANCE
The optimal restoration of electrical contacts in 3 steps.

- Fast • Reliable • Economical



KONTAKT CHEMIE

ESKA - our favourite fuses



70 years of experience and quality "Made in Germany" - this is ESKA fuses. Check out how to choose a suitable fuse for your application. Also, find the most common ESKA cartridge fuses series in our stock range.



ESKA

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.



ROHDE & SCHWARZ

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.

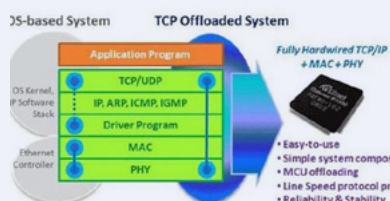


MARQUARDT

Do you find your feet in Ethernet chips?



Wiznet certainly does! In the overview of wired Ethernet controllers, you will not only find out more, but you will also find a suitable solution for a safe and stable Internet connection.

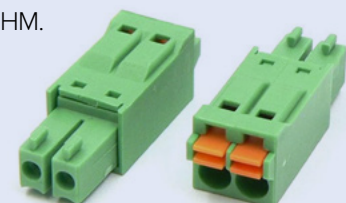


WIZnet

Comeback of SHM Series, slim version



About how the producer does his best to make the customers satisfied. Since you have shown your interest in it, Euroclamp resumed the production of the slim version of screwless connectors of the Series SHM.



euroclamp



SENSIRION
THE SENSOR COMPANY

Temperature measurement with SHT31 SMART GADGET

Step-by-step instructions on how to easily and without big investments get the overview of the change of the temperature or the humidity with Sensirion's development kit via Bluetooth and its application straight in your smartphone.

By:
doc. Ing. Milan Guzan, PhD.
Department of Theoretical and Industrial Electrical Engineering, FEI, Technical University of Košice, Slovak Republic.

do you get an overview of temperature changes? There are several options - from expansion thermometers, through cheap handheld multimeters with temperature sensors, non-contact temperature meters, to expensive benchtop multimeters with a choice of several types of temperature sensors.

but they provide a larger range of measured temperatures. Such devices are available for price up to € 200.

Benchtop multimeter, e.g. Rigol 3068 (6 ½ digits) allows the transfer of measured data to a PC via LAN, GPIB and RS232 with the ability to store data on USB (up to 5000 samples). The measurement error ranges from 0.08 °C to 0.6 °C depending on the sensor used. However, this is more expensive solution because the price of the multimeter and temperature sensor may exceed € 1000.

However, Sensirion offers an interesting solution for measuring temperature and humidity at a very good price (23 €) - SHT31 SMART GADGET. More information can be found in our article Speed-Up your Development with SHT31 Humidity and Temperature Sensor.

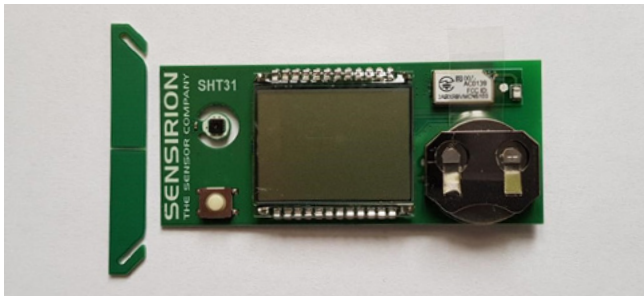


In metrological practice, depending on the type of measurement, it is sometimes necessary to monitor the ambient temperature. If measurements are not performed under laboratory conditions, the temperature is the influence that can contribute to the uncertainty of the measurement result. How, however,

Of course, the choice of the measuring instrument is based on the range of measured temperatures and measurement accuracy requirements. Considering the need to transfer the measured data to PC, the expansion thermometers and handheld multimeters are left out. The accuracy of measurements with handheld multimeters with temperature sensor ranges from 0.8% to 2% + 3 to 10 least significant digits with a fairly common resolution of 1 °C. Better resolution offers, for example, multimeter MS 8209 (0.1 °C), but with an accuracy of 2% + 1 °C. The cost of such a device can be up to € 100. The accuracy of non-contact measuring instruments is lower,

SHT31 SMART GADGET

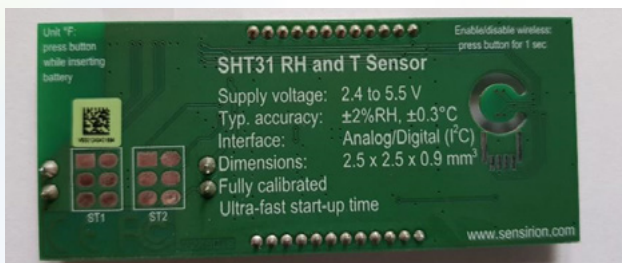
The SHT31 Smart Gadget is supplied in a small green box (typical Sensirion colour), which includes brief manual, brackets (need to break), and the device itself. The device at this stage is not yet ready for use.



When you pull out the insulation film under the battery CR 2032, measurement begins. What may surprise you when you first time look at the device display is that both data (humidity and temperature) are displayed to **two decimal places**.



However, the back of the printed circuit board includes, among other things, the following information: Typ. accuracy: $\pm 2\%$ RH, $\pm 0.3\text{ }^{\circ}\text{C}$



The sensor measures the temperature in range $-10\text{ }^{\circ}\text{C}$ to $60\text{ }^{\circ}\text{C}$. With regard to the declared accuracy of the temperature measurement of $\pm 0.3\text{ }^{\circ}\text{C}$, it could appear that the hundredths are only the marketing trick. As it turns out later, the reality is different. The fact that it is a really **sensitive sensor** proves the change of both measured variables with a light wave of hands. In addition, from the above page or from the manual, it is possible to find out that the SHT31 Smart Gadget is

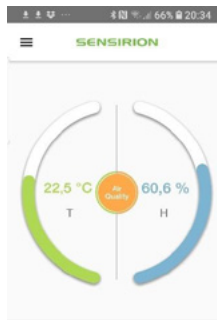
capable of communicating with a mobile phone via **Bluetooth 4.0** using the Sensirion **MyAmbience app** available on Google Play. The application requires Android 4.3 and iOS 8 or newer. In addition, from the start of the measurement, the measured data are automatically stored in the device memory. The default storage interval is 10 minutes.

Application Sensirion MyAmbience

To communicate with your mobile phone via Bluetooth, you need to hold the white button at the bottom left down until the display shows "rFon" and the last 4 characters of the MAC address on the bottom line.



After launching the MyAmbience app, a launcher screen with **+ Add new device** icon appears on the mobile phone display. When you click on it, the device is detected and the current measured values of temperature and relative humidity are displayed after pressing **Connect**. The image below shows **Dashboard** screen with detected devices.

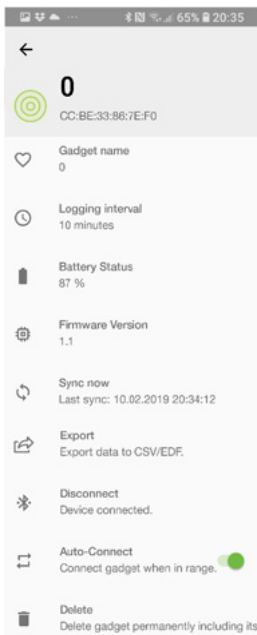


After a longer measurement, the **Plot** option displays the temperature (T option) and humidity (H options). At the same time, it is possible to move forward or backward after selected intervals of 10 minutes, 1 hour, 6 hours, 1 day, 1 week and 4 weeks. The graph displayed on the screen can be printed using the **printscreen** function.



The measured values can also be exported in a Microsoft Excel-compatible format using *Export* function.

When you click on the setting icon (gray sprocket), the menu appears where:



Gadget name allows you to change the device name. We have previously chosen the name: 0,

Logging interval – offers a choice of measuring interval 1s, 10s, 1 min, 5 min, 10 min, 1 h, 3 hrs.

Battery Status – shows battery status in %,

Firmware version – shows current firmware version,

Sync now – indicates the date and time of the last synchronization of the mobile device with the device,

Export – allows export of measured values,

Connect – allows device to connect to SHT31 Smart Gadget,

Auto-Connect – if gadget is within reach of BT, it automatically connects it via BT to the mobile phone,

Delete – removes the current device from the device list.

Measured values export

Measured temperature and relative humidity data can be exported as two text files in the email attachment. Files have an *.edf extension. The header takes up the first five rows. Measured data begins at the sixth line with UNIX time (Epoch time) in the first column and measured values in the second column. An example of the first ten lines of the exported file with the measured temperature:

# Date=2019-02-0T21:28:51Z	
# EdfVersion=4.1	
# SensorId=CCBE33867EF0	
# unit=s, Type=float	unit=degC,Type=float
Epoch.UTC	
T_SHT	
1546864598,354	22.97
1546864946,938	22.99
1546865284,134	23.01
1546865618,475	23.07
1546865957,944	23.07

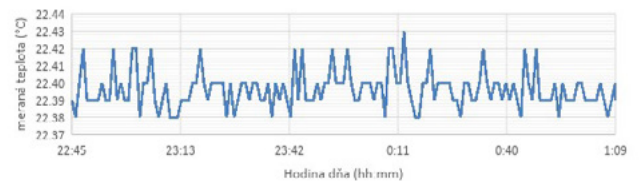
UNIX time is the number of seconds that have passed from 00:00:00 01/01/1970 UTC. To convert it to standard date time format Excel formula bellow can be used.

$(\text{UNIX time}/86400)+\text{DATE}(1970; 1; 1)$

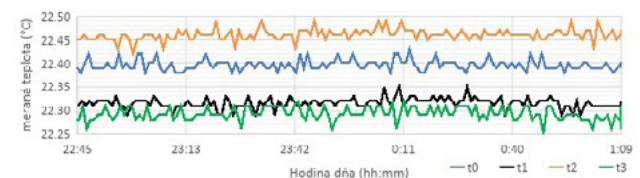
UNIX time 1546864598,354 after conversion gives us: 43472,525. To display correct date and time in excel it is necessary set cell format to *d.m.yyyy h:mm:ss,000*. Result will then be: *7. 1. 2019 12:36:38,354*.

Visualization of measured values

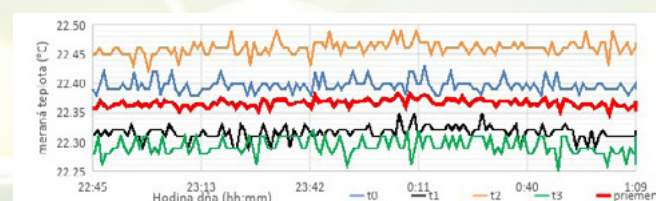
After exporting from the gadget (up to 17,000 measurements can be stored in memory), a chart was created in Excel. The measured data was recorded every 60s. The measurement took several days. The picture is a section from 22:45 to 1:15 when the temperature was stable. This example contains 150 points. It is clear from the graph that the measured temperature varies from 22.38 °C to 22.43 °C. Due to the declared accuracy of the thermometer ± 0.3 °C, the variation of the measured temperature is small. But how will multiple devices measure at the same time? Will the measured values vary? Because each temperature sensor has variations in its parameters, we can assume some differences in measured temperatures. What will be the difference in the measured temperatures?



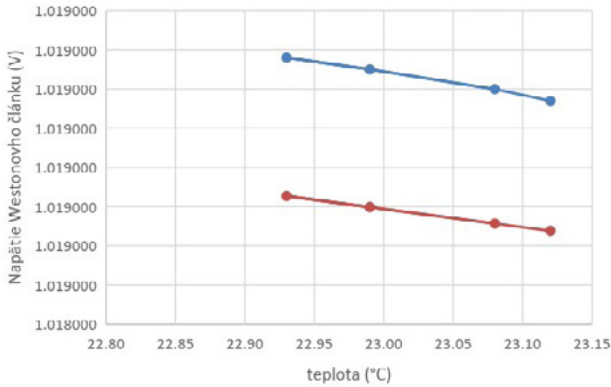
Because the testing workspace does not have a thermal chamber, to ensure the same temperature and to prevent the "wave of the hand" effect, four tested gadgets were placed in the box which was placed in a cabinet. The result of the measured temperatures is in the following chart. It is evident that the difference between tmax and tmin is up to 0.24 °C. Individual devices were named t0 to t3.



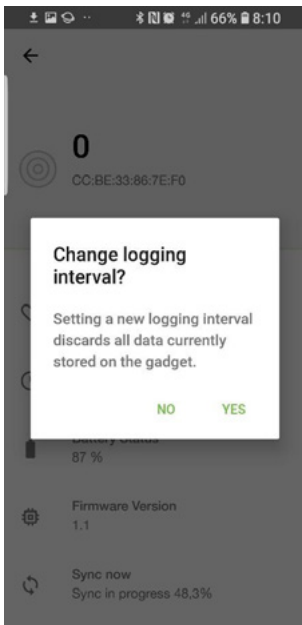
Which of these values will we consider relevant at a particular moment? The best way is to measure with a larger number of devices and then calculate the average value. The following chart shows the average temperature of the four gadgets in red. This time, tmax - tmin is equal to 0.036 °C, so we can say that during the time measurement from 22:45 to 1:15 pm, the temperature change was only 0.036 °C. If we calculate the average temperature and the standard deviation, it would be 22,366 °C and $\pm 0,006$ °C.



The following graph shows the fact that the hundreds of degrees that the gadget displays are not just a noise that we do not have to consider. It shows the Weston cell voltage (blue) and Weston cell voltage calculated from its mathematical model (red) for the temperature measured by the 4-point gadget. The time interval of these four measurements is 80 minutes, the voltage measured by the 6½-digit Rigol 3068 multimeter and the change of temperature was 0.19 °C.



Working with SHT31 SMART GADGET with BT Turned On

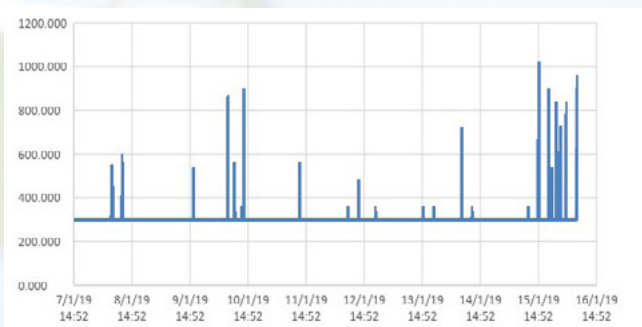


Working with the application is simple and intuitive.

When you press the *Setup* icon, the entire menu appears. Apparently, the *Logging interval* is most often used. Depending on how often we need the temperature information, we select one of the options from 1s, 10s, 1mins, 5mins, 10mins, 1hours or 3hours. With each change of the measured value of the storage interval, the application announces that: "Setting a new logging interval discards all data currently stored on the gadget". After confirming "Yes", the data is still stored in the next line. This way, it was possible to ex-

port up to **17,000 measured values**, with the difference of time being seen in the periodicity of the measured measurements. When you choose the *Delete* option, data is permanently deleted. Sometimes it happens, that data are not deleted, in such case, remove battery for a while.

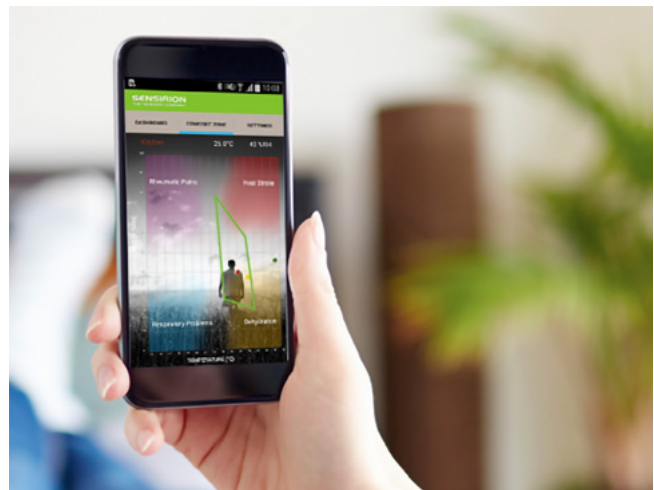
If you require a synchronous temperature measurement by various number of gadgets to calculate the average temperature, we recommend a **1s interval selection**. Then the difference between the measured values will be max. 0.5s. You can also set the synchronicity of the measurement so that at the moment when you turn off the BT on the gadget, the 1s write to the memory ends and begins writing as per the selected inter-



val. However, the measurement synchronization is not always guaranteed because sometimes the device needs some time until it reaches the periodic record.

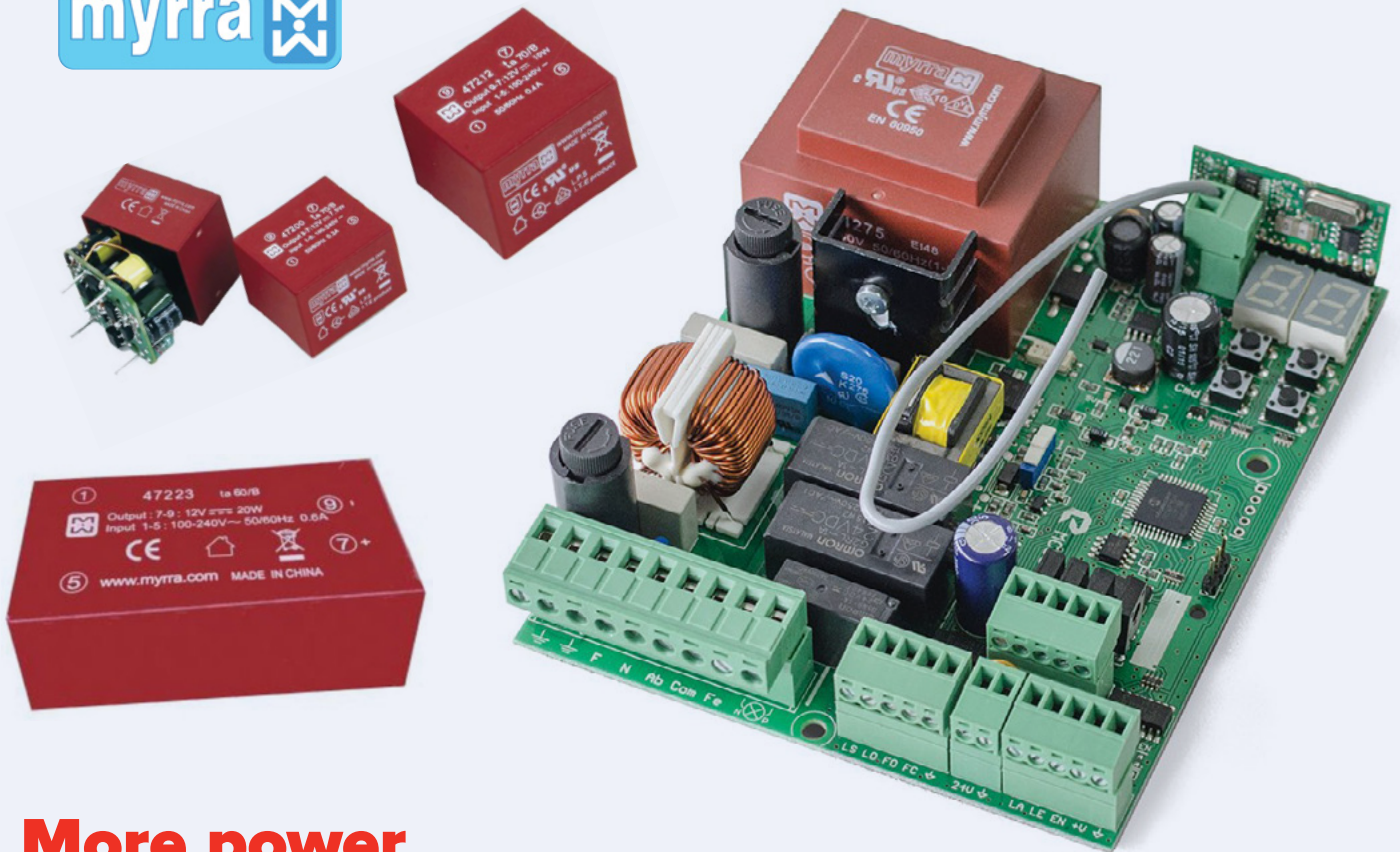
Note: In the figures where the temperature was displayed over time using devices denoted as t_0 to t_3 , the average was calculated from the values recorded in individual gadgets sequentially in the range of 46s. Such time scattering can't be considered as a synchronous temperature measurement, but it is sufficient as an example of the temperature over time from 4 gadgets.

At the time of testing, the gadget marked as t_0 was used for 2 months and the remaining $t_1 - t_3$ one month. After removing the protective film under the battery, all devices showed *Battery Status* 100%. BT was turned on only for the transmission of measured data. After the first month of measurement, t_0 battery capacity dropped to 87% and after the second month the battery level was still 87%. *Battery Status* for t_1, t_2 resp. t_3 after the one month of measurement is: 87%, 90% resp. 92%. Based on these values, we can assume that the device could be used for at least **12 months** without the need to replace the battery.



Conclusion

Due to SHT31 SMART GADGET's small size and low price compared to other temperature meters, the ability to communicate with mobile phones via BT and accuracy of $\pm 0.3 \text{ }^\circ\text{C}$ (in the temperature range from $-10 \text{ }^\circ\text{C}$ to $60 \text{ }^\circ\text{C}$), we can consider it to be a great asset in measuring temperature. Although the focus has been on measuring temperature, the same analogy also applies to relative humidity measurement. The huge advantage is mobile communication, export of measured data and also the synchronous measurement by multiple devices at the same time, which gives a good idea of the precise calculation of the measured temperature. Of course, some caution when working with gadget is needed, but overall, it is possible to evaluate the SHT31 SMART GADGET from Sensirion very positively.



More power for demanding applications

Myrra extended its product range of AC / DC converters by 20, 40 and 60W models that can be soldered directly to PCBs. Their technical parameters ensure high reliability and insulating durability.

To meet customer requirements for higher power PSs, Myrra came with three new families of **20W (4722x)**, **40W (4723x)** and **60W (4726x)** compact-sized switched mode power supplies with output voltages of 3.3, 5, 9, 12, 15, 18 and 24VDC. Input voltages are in the range of 85VAC-264VAC/47-63Hz or 120VDC-370VDC.

The very low Stand-by Power Consumption of only 0,1W meets the requirements of Energy Star and EC Code of Conduct. The encapsulated design ensures high reliability and isolation strength.

All used materials for encapsulation are UL94-V0 compliant, which is an important requirement for electronic equipment. With a very low level of conducted and radiated emissions, these

power supplies conform to EN55014 CLASS B, EN55032 CLASS B and FCC Part 15.

Wide operation temperature range allows using the 472Xx family of power supplies in harsh environments of up to **50 °C** without derating and up to 80°C with power derating.

DC Output characteristics are also exceptional with $\pm 3\%$ output voltage accuracy, $\pm 3\%$ output voltage line regulation accuracy and max 20mV p-p ripple and noise figure.

Other characteristics include overcurrent protection, output short circuit protection, and MTBF at 200k Hours minimum. Dielectric strength (Primary to Secondary) is 4kVac/5mA, max 3sec.

Main features

- Power ratings: 20W, 40W and 60W
- Single Output
- Output voltage range: 5 – 24VDC (20W model also 3.3VDC)
- Input range: 85VAC-265VAC/ 47-63Hz, 120VDC-370VDC
- Very Low Stand-by Power Consumption
- Encapsulated design, PCB mounted
- UL94-V0 certified materials
- Direct PCB mount
- Overcurrent protection
- Output short circuit protection
- MTBF >200khours
- Uiso = 4kVac
- Small dimensions: 20W: 65x35x25mm, 40W: 81x40x26,5mm, 60W: 95x47,5x29,5mm

Order no.	Type	Description	Guide price
305728	47223	AC/DC Power Supply for PCB 20W 12V/1,7A Regulated	9,20 €
305734	47233	AC/DC Power Supply for PCB 40W 12V/3,3A Regulated	13,30 €
305740	47263	AC/DC Power Supply for PCB 60W 12V/5A Regulated	18,10 €





THL15WI Series operates at 15W power in smaller case

The higher energy efficiency, maintaining the quality and a lower cost. These parameters were the cornerstones for the new THL15WI family from TRACO in a 1 x 1 x 0.4" metal case.

15W DC/DC converters are widely used in industrial applications. TRACO currently manufactures more than 10 different series of 15W board mounted DC/DC converters.

The TON15/15WI (Wide Input 4:1) are SMD versions while the TEL15, THD-15N/15WI, THL15WI, THM15/15WI, THN15/15N/15WI/15WIR are through-hole mounted versions.

The THN15WIR is railway certified ruggedized version and is suitable for railway applications for highest reliability in harsh environments. The converters have an increased resistance against electromagnetic interference, shock/vibration, and thermal shock.

The approvals according to standards EN 50155 and EN 61373 qualify them for railway and transportation systems. The qualification for the fire behaviour of components according to EN 45545-2 and the safety approval according to IEC/EN 60950-1, UL60950-1 support a potential compliance test of the application.

The THL 15WI Series is Traco Power's latest addition to the existing 15 Watt DC/DC converter range. With the focus on combining cost efficiency

and quality, this isolated high performance 15 Watt DC/DC converter is suitable for many different applications.

The series comes in an encapsulated, shielded 1" x 1" x 0.4" metal package and has a fully integrated EN55032 class A filter. High efficiency up to 91% enables the converter to operate from -40°C to +70°C without derating. All models have an ultra-wide 4:1 input voltage range and precisely regulated isolated outputs.

The series meets the latest IT safety certifications (UL 62368-1) and is thus eligible for uses in mobile equipment, instrumentation, distributed power architectures in communication and industrial electronics and everywhere where cost efficiency and quality are critical factors.

The THL15WI series includes 14 models in a version of THL15-24 (9 - 36 VDC) and THL15-48 (18 - 75 VDC) converters with 3.3V, 5V, 12V, 15V, 24V, and ±12, ±15V. These converters you can find in our range of products, available on request.



Main features

- 15 Watt converter in a 1" x 1" (25,4 x 25,4 x 10,16mm) metal package
- Cost efficient design
- Ultra wide 4:1 input voltage range: 9-36 and 18-75 VDC
- Operating temperature range -40 to +70 °C without derating
- Internal EN 55032 class A filter
- 1500 VDC I/O-isolation
- Protection against overload, overvoltage and short circuit
- Remote On/Off and Trim function
- Optional heatsink for increased temperature capabilities THL-HS1
- 3-year product warranty

Order no.	Type	Description	Guide price
313486	THL 15-2410WI	DC/DC Module 15W 9-36V/3,3V/3,4A	24,70 €
313491	THL 15-2422WI	DC/DC Module 15W 9-36V/±12V/±0,625A	24,70 €
313494	THL 15-4811WI	DC/DC Module 15W 18-75V/5,0V/3,0A	24,70 €



The Most Popular 2J Connector Mounted Antennas



A good antenna is a guarantee of success. You can have excellent coverage, the perfect IoT module, but if you don't have a good antenna, your project is at risk. And thus, do not risk and choose from the most widely used 2J connector antennas.



There are many antenna types available on the market, but probably the most used ones are connector mounted antennas. 2J manufactures several types of connector mounted antennas. Their biggest advantages are the simplicity of use, low losses due to direct mounting near the RF signal source and also the mechanical design since the connector

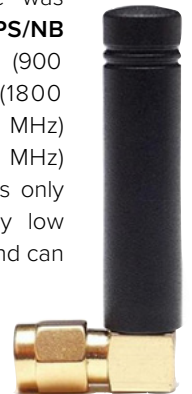
also serves as an antenna holder. Well known SMA connector is most commonly used for these antennas.

Connector mounted antennas from 2J cover wide range of frequencies starting at:

- 87MHz (FM) through 169MHz (ERMES),
- 380-500MHz (TETRA), 433MHz (ISM/TETRA/LoRa),
- 800-850MHz (AMPS/NB IoT), 900MHz (GSM),
- 800MHz (DCS), 1900MHz (PCS),

- 2,1GHz (UMTS), 2,4GHz (Bluetooth/WiFi), 1700-2700MHz (4G/LTE)
- up to 5-5,9GHz (WiFi/5G).

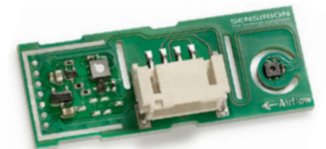
The 2J0B04-C884G/2J0B04-C885G pair with right-angled/straight SMA connector type was designed for **AMPS/NB IoT** (850 MHz), **GSM** (900 MHz), **DCS** (1800 MHz), **PCS** (1900 MHz) and **UMTS** (2100 MHz) bands. This antenna is only 44mm long, has very low VSWR down to 2.2:1 and can handle up to 25W output power.



Order no.	Type	Description	Guide price
259929	2J0B04-C884G	Cellular Antenna 3G/2G SMA M R/A Au	2,45 €
231283	2JW0124-C868B	LTE/GPS/GLONASS/GALILEO Blade Antenna SMA M BK Brass	7,65 €

SVM30 Module - a complete solution for HVAC applications

SENSIRION
THE SENSOR COMPANY



The SVM30 measures concentration of VOC, relative humidity and temperature and calculates CO2eq from measured concentration of H2. It uses SGP30 and SHTC1 sensors. At first glance, however, it seems to be quite big, check it out with us.

On the first sight, the PCB looks really huge with the big connector. Any average PCB designer can do the same on a third-sized PCB. Let's take a closer look at it.

SGP30 current consumption is approx. 50mA from 1.8V, so power dissipation is 90mW. Voltage regulator from 5V to 1.8V adds another 160mW. SHTC1 average current consumption is 8.6uA only, which is insignificant. Generated heat spreads by conduction through the PCB and convection of heated air. Good PCB design has to minimize both thermal transfers.

Sensirion's extensive experiments

allowed them to formulate a rule that a distance of around 5cm (~ 2 in.) between SGP30 and SHTx sensors and milling slits in the PCB around the SHTx is sufficient. When you look at the PCB you will see slit around SHTC1 and even two more slits because we have additional source of heat on the PCB – voltage regulator. There are only necessary tracks on the PCB side where SHTC1 is assembled and no GND ground plane to minimise transfer through copper. These measures minimise heat transfer by conduction.

The SVM30 module must be placed in the housing so that the air flows from

the SHTC1 towards the SGP30, which is also the optimum airflow marked on the PCB.

PCB size is **39x15mm**, do you still think that it is too big?

What is Onboard?

The **SGP30** gas sensor that combines multiple metal-oxide sensing elements – the pixels – on one chip, thereby allows measuring concentration of VOC (volatile organic compounds) and H2 and calculating CO2 equivalent signal (CO2eq) from measured H2 concentration. The sensing element features unmatched robustness against contamination by siloxanes often present in indoor environment, enabling unique long-term stability and low drift.

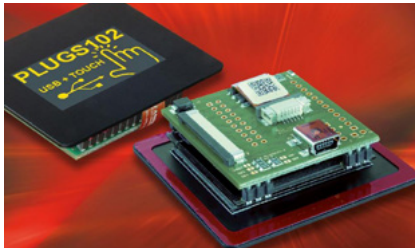
Order no.	Type	Description	Guide price
298000	SVM30-J	Module with SGP30 (VOC, CO2_eq) and SHTC1 (RH & Temperature)	12,70 €
311678	SE-SVM30-Sensor	SVM30-J module with cable for SEK Eval. Kits	22,00 €



EA PlugS - small OLED display with added value



Graphics feature support, USB interface, capacitive touch panel, aesthetic glass frame and easy to install - all the pluses for smooth and fast application development.



A new family of EA Plug OLED displays and its first representative - EA PlugL, was introduced to you recently in our article - EA PlugL – OLED Display with USB and Touch Panel.

The latest and smallest addition to the family is the PLUGS102-6. With a display area of 36 x 25 mm, it offers 102 x 64 pixels resolution.

All the basic benefits of OLED technology are most likely well known. Electronic Assembly “packed” them

with a convenient USB interface, a capacitive touch panel and a high-quality black glass frame like a tablet.

Like the EA PlugL, the latest EA PlugS supports easy-to-use "high level" graphics commands, so even though it's not an "intelligent display", it still provides a significantly easier development of the graphical environment in comparison to standard graphic displays.

The display brightness can be adjusted by software and power is either 5V via USB or 3.3 / 5V from external power.

The display module also includes a mini speaker.

EA PlugL and EA PlugS are available in 2 versions:

- EA PLUGS102-6GTC with USB and ZIFF connector for FPC cable
- EA PLUGS102-6GTCZ with USB, ZIFF and screw terminal and 26-pin IDC connector for I/O Pins

Likewise, the EA PLUGL128-6GTC and EA PLUGL128-6GTCZ are also available.

Order no.	Type	Description	Guide price
320796	EA PLUGS102-6GTC	OLED Graphic Module 1,7" 102x64 Dots Yellow CTP USB ZIFF	84,30 €
320880	EA PLUGS102-6GTCZ	OLED Graphic Module 1,7" 102x64 Dots Yellow CTP USB ZIFF IDC 26P	84,30 €



LoRa = RF modules with a long range HOPERF®

Modern spread spectrum modulation enables HoperRF LoRa modules to communicate on a long-distance or in severe environment.

Extraordinary price-attractive modules from company HOPERF Micro-electronics specializing in RF modules and a wireless signal transmission were introduced to you in our article **HOPERF - universal RF modules for surprising prices.**

This time we would like to remind you of the module RFM95SW with a „LoRa“ suffix, indicating membership with a „Long Range“ family of modules. The long-range of HoperRF LoRa modules is reached by usage of a modern efficient modulation with a spread spectrum, able to transmit data even on a noise floor level.

RFM95W solves a traditional compromise among range, immunity (selectivity) and power consumption while

conforming to limits for usage in free bands.

LoRa modulation is quite complex and a user has the possibility to adjust all three main modulation parameters in order to fully meet requirements of a given application. These parameters are spreading factor, modulation bandwidth, and error coding rate.

For example, if don't need maximum transmission speed, we can set parameters so as to gain the highest possible quality and reliability of the connection. By setting these three parameters we can choose an optimal combination for a given application.

RFM95W is ideal for OEM products with higher production series, where development costs usually get quickly

refund also thanks to a very affordable price of these modules.



Advantages / Features

- Powerful RF modules with a long-range of several 100m
- Spread spectrum LoRaTM modulation and a high selectivity
- Supports FSK, GFSK, MSK, GMSK and OOK modulations
- The high sensitivity of -148 dBm
- Communicates in 868/915 MHz free bands without license fees
- Wide configuration possibilities to reach optimal speed and transfer reliability



Order no.	Type	Description	Guide price
180936	RFM95W-868-S2	LoRa module 868/915MHz +20/-123dBm 300Kbps +1,8÷3,7V	6,40 €

Terminal blocks with screw flanges



For applications where accidental and unwanted disconnection of the terminal block is undesirable, we recommend using the terminal blocks with screw flanges. We have expanded our product offer of terminal blocks because the safety and reliability of the equipment are becoming more and more important.



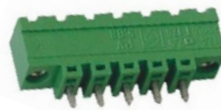
However, once we are dealing with a device that is moving or vibrating, it is quite reasonable to use terminal blocks with threaded flanges. The printed circuit board is a pin strip which has a recessed nut in the flange into which the counterpart is screwed.

Moreover, for connectors with a pitch of 3.5 or 3.81 mm, it is also possible to screw the entire body (flange) with a self-tapping screw to the printed circuit board. This is because they have smaller pins - only 0.8x0.8mm compared to 1x1mm for connectors with 5 or 5.08mm pitch. Even the whole body is smaller, so the pins are more strained.

The cable is then flanged with the integrated screw.

Probably the simplest and the fastest connection of several conductors or the connection to a PCB is by means of terminal blocks, respectively connectors.

If it is a "lazy" device that doesn't move or is fixed on the wall and connected wires are not in motion, a classic solution is sufficient - eg. pin header on a PCB (male terminal block) and cable counterparts:



Order no.	Type	Description	Guide price
132290	PV02-5,08-H-K	Plug-in Connector M P5,08 12A 2P H Flange	0,40 €
154378	PV02-5,08-V-K	Plug-in Connector M P5,08 12A 2P V Flange	0,40 €
83607	SH02-5,08-K	Plug-in Connector F P5,08mm 2,5mm2 12A 2P Flange Green	0,30 €

6x6 new enclosures for your devices



If you haven't found your "size" between Hammond Series 1554 or 1555 industrial enclosures, you'll very likely find it now. Hammond offers 6 new sizes and 36 different combinations of popular plastic enclosures.



Well-known industrial Hammond enclosures of 1554 and 1555 series belong to the best in the field of rugged plastic boxes for a long time. If we are looking for a good middle way between mechanical strength, high resistance to various negative impacts and the cost,

then the 1554 and 1555 series is definitely a reliable choice.

"Standardized" types, offered by various manufacturers, have been profiled on the market with enclosures over the decades. However, when we take a closer look at the offer of various manufacturers in more detail, we find minor differences that ultimately have a substantial impact on whether the box meets our requirements and expectations or not. Wall thickness, quality of a plastic, internal PCB mounting options, accessories... these are just a few key aspects.

Hammond gave the 1554 and 1555 series everything needed and recently added 6 new sizes, which together form 36 new configurations.

Main features of both series

- ABS versions are moulded from general-purpose material which carries a flammability rating of UL94-HB. For indoor use
- Polycarbonate versions are UV stabilized for outdoor use. Gray polycarbonate carries UL94-5VA rating, while clear and smoked lids have the UL94V-0 rating
- Gasketed lid with a two-piece "tongue & groove" construction provides protection against access of oil, dust, and water
- A replaceable gasket is one piece made from high temperature, U.L. listed silicone. Supplied loose inside the enclosure (not pre-installed)
- ABS Plastic versions are designed to meet IP66
- The lid is secured with included M4 stainless steel machine screws which are threaded into integral stainless steel bushings for repetitive assembly & disassembly. All hardware is stainless steel to avoid corrosion caused by dissimilar metals

Order no.	Type	Description	Guide price
320935	1554LAGY	Enclosure ABS 105x105x90mm Grey IP66	15,80 €
320936	1554QGY	Enclosure ABS 140x140x60mm Grey IP66	16,10 €
320903	1555WGY	Enclosure ABS 180x180x60mm Grey IP66	20,90 €

Elbag – new shapes of enclosures also for applications with displays



We enhanced our offer of DIN rail plastic enclosures with several unusual enclosure types from Italian producer - Elbag.

DIN rail enclosures create a standalone group among enclosures as they differentiate from usual enclosures by one significant element – they contain a DIN rail mounting **clip integrated on their rear side**.

As these enclosures are almost always placed in a closed distribution box, they are usually not subject to such high aesthetic requirements. Maybe that's why we usually don't find elegant aluminum black-anodized enclosures within this group but mainly grey, black or green plastic enclosures.

Much more essential is the practical aspect of the enclosure, its construction,

possibilities of PCB mounting, accessories, ventilation, openings for terminals, etc. Of course, even among DIN rail enclosures, we can find many various modifications like transparent red or smoked lids (top covers) and others.

Our offer of DIN rail enclosures is continuously growing. The latest among them are various selected types from company Elbag. These enhance our offer with slightly different shapes, including significantly "flat" ones of the MX/BMX series providing a lot of space for display, switches, and LEDs on a front panel.

Basic width unit of DIN rail enclosures is so-called „**module**“, what repre-



sents **17.5 mm**. That's why, for example, the 4-module enclosure (MR4) has a width of 70mm.

Advantages / Features

- Quality plastic DIN rail enclosures
- Wide range of shapes and sizes
- Various versions available (ventilation, cut-outs, terminal openings...)



Order no.	Type	Description	Guide price
289858	MR6 BMX	Enclosure ABS 107x38x96mm Grey	6,00 €
289857	MR6 MX	Enclosure ABS 107x54x96mm Grey	6,40 €

Unsurpassed range with low power module in 2,4GHz band



The new wireless module **iM282A** from IMST GmbH enables up to **10 km** range in the license-free **2.4 GHz** band. It uses the **LoRa** modulation with frequency spread and is suitable even for battery-powered applications.



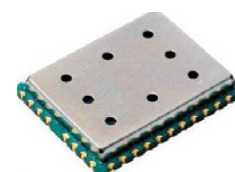
In practice, the radio applications often require high ranges in both outdoor and indoor space. In Europe, such applications are often implemented in the

license-free sub-GHz frequency ranges at 433MHz or 868MHz. Since the low attenuation characteristics prevail in these frequency bands due to the low frequencies, larger ranges can be achieved with comparable transmission levels than in the 2.4 GHz frequency band.

However, this advantage is offset by two disadvantages of these frequency bands:

- Legally allowed duty cycle. For example, the transmission duration is limited to 1 percent (that is 36s per hour).
- The fact that the sub-GHz frequency bands are not harmonized worldwide. Especially the latter can lead to enormous costs for the necessary radio approval outside of Europe.

Especially home automation applications such as lighting, heating, locking systems, air conditioners, and utility meters are often developed because of the requirement for longer range, in the sub-GHz frequency range. The limitation by the duty cycle is accepted because the application by nature rarely transmits data or the transmission frequency of the most battery-powered devices is limited by the battery capacity itself.



Order no.	Type	Description	Guide price
305761	iM282A-L	LoRaWAN Module Cortex-M3 SX1280 UART SPI I2C	18,20 €
307770	SK-iM282A	Starter / Evaluation Kit for iM282A Radio Module	On request



Apacer Brings New Technologies to SSD



New Apacer's SSDs improve already high data integrity, longevity, security, and survivability. Let's have a look at how they did it.

Data Integrity

DataRAID is a firmware algorithm that ensures data integrity by creating parity to verify the completeness and correctness of the existing data in the flash memory, developed specifically for the 3D NAND flash. If the firmware is unable to repair the data using the ECC (Error-correcting code), the RAID algorithm will use parity and repair corrupted data.

- As data passes from the computer to the SSD cache, firmware calculates CRC parity from it and appends it to the data.
- When the data with CRC parity are moved from the cache to the sector buffer, the CRC parity is checked.
- The firmware then calculates the BCH (LDPC) ECC codes for data and writes them together with the data and their CRC parity to the flash memory.

End-to-end Data Protection

It is a feature that extends error control to cover the entire path from the computer to the flash memory chips and back.

Read operation

When data is read from the NAND, the process occurs in reverse order:

- The firmware reads data with attached BCH (LDPC) error correction

Write Operation



codes, checks data and repairs errors if necessary.

- The firmware then moves data to SSD cache, calculates CRC parity and compares it with parity stored with data.

Smart Read Refresh

Read disturb

In order to read status from one cell on a bit line, all other cells on the same bit line must be turned on so that the current proportional to the charge stored in the cell can flow through the sensing amplifier. This can be achieved by applying a pass-through voltage to the word lines of unread cells.

Order no.	Type	Description	Guide price
307037	APS25AFB032G-5BT-M1GWT	Industrial 2,5" SSD 32GB SATA 3.1 MLC -40...85°C	54 €
305957	APM032GMFFN-5BT-M1W	Industrial mSATA (MO-300) SSD 32GB SATA 3.1 MLC -40...85°C	50 €



How to build smart Street Lighting System quickly and easily



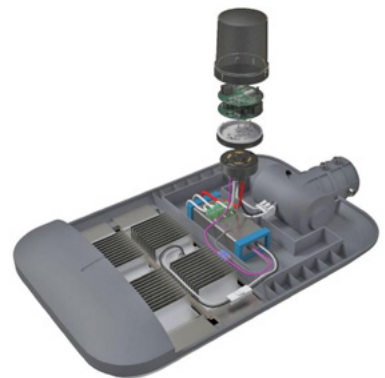
With the use of TE Connectivity standardized components, you can have a unique street lighting system. Find the new products for this area in our assortment.

For more than 50 years, TE Connectivity (TE) has supported utilities, city authorities, and contractors with safe and reliable connection boxes and accessories for lighting poles for a variety of street lighting applications including:

- Infrastructure, including harbors, airports and rail stations

Each of these types of lighting applications consists of the following elements:

- Public street lighting
- Private outdoor lights for parking lots and apartment buildings
- Industrial settings such as refineries and power plants
- The light source (light bulb, tube, panel)
- The light fixture (poles, on building facades,)
- The lighting controls



Advantages / Features

- Achieve long term reliability using TE's proven power and signal interface
- Translucent covers allow transmission of daylight to the light-sensing device
- Achieve protection against dust and heavy jet spray with an IP66 rated solution
- Meets the flammability rating with a UL 94 5-VA rated cover
- Sleeves are designed with side or topside aperture openings to accommodate directional light-sensing devices

Order no.	Type	Description	Guide price
232077	2213362-4	Dimming Receptacle Assembly Photocontrol 105C 3/4	7,65 €
224695	2213730-1	Light Controller Base Assembly D76mm 7P	5,20 €
319195	2213831-2	LED Street Light Connector LUMAWISE Base with Vent D80mm 4P 30V 1,5A IP66	4,90 €
319975	2328823-1	Dome for D80mm LUMAWISE Base, H33,43mm, Smoke Grey, Polycarbonate	1,80 €

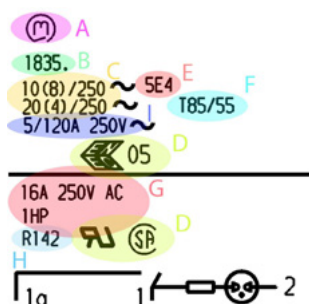


What you might not know about switches



You can find the most important information directly on the rocker switch. Well, assuming you understand the basic signs.

There is really not too much place on rocker switches to write much information. And yet you still can find quite a lot in there. So read with us what Marquardt writes to us. It will not take a lot of time and it is worth reading it.



A Marquardt logo

Order no.	Type	Description	Guide price
429	1801.1202	Rocker Switch 19x13 0-(1) SPST 4(2)A 250VAC Black F4,8	1,10 €
48785	1839.1407	Rocker Switch 30x22 (1)-0-(1) DPDT 6(4)A 250VAC Black F4,8 < O >	2,90 €
157578	1881.1105	Round Rocker Switch 1-0 SPST 12(4)A 250VAC White F4,8 - O	1,20 €

B Marquardt Series

C Rating for alternating current voltage (AC)

The electrical reference values, i.e. the maximum permissible electrical loads in continuous operation, are specified for the respective switch series. Most Marquardt switches are suitable for ohmic resistance load and motor load. In the specification of the reference power using the bracket notation, e.g. 16 (4) A 250 V AC, the value in front of the brackets indicates the switch-off current and the value in brackets the nominal motor current.

G Rating for alternating current voltage (AC) (USA, Canada)

In switches which are additionally approved by test bodies in the USA (UL) and Canada (CSA) the corresponding ratings according to North American standards are listed additionally. The motor loads may also be shown as (Horse Power) values according to North American conventions. Mechanically, one horsepower (1HP) is equal to 33,000 pounds being moved 1 foot in 1 minute (or 33,000ft-lb/min). One horsepower (1HP) is also equal to 746 watts of electrical power. An AC motor has six-eight times higher consumption when first turned on comparing to running engine. If a horsepower rating is listed, it indicates the switch is appropriate for the use on motor loads that are rated at the given horsepower. If there is no horsepower rating listed, switches are tested to an inductive/non-horsepower load at 75% of the power factor.

I Inrush current

Short capacitive peak currents mainly occur when switching devices with power supply units.



MSM LA Series Vandal resistant latching switches



The range of vandal resistant momentary push-button switches is relatively wide but there are fewer latching switches. We extended our stock range with basic models of vandal resistant latching switches from the MSM LA 19 Series from SCHURTER.

Basic selection means double-pole 12-Amp switches; one without illumination and two with ring red and green illumination. The abbreviation LA in the title of the MSM LA series stands for English "Latching".

Characteristics:

- Available in 2 sizes: panel cut-out 19mm for MSM LA 19 and panel cut-

out 22mm for MSM LA 22

- Following versions are available:

Standard (ST)

With Lettering (LE)

With Point Illumination (PI) - one LED, switches are delivered without a series resistor

With Ring Illumination (RI) - 6 LEDs in series for 24VDC. For MOQ 500pcs,



we can also provide versions for 5VDC and 12VDC

Available with **12 A** and **16 A** switching current, max. switching voltage 125VDC or 250VAC

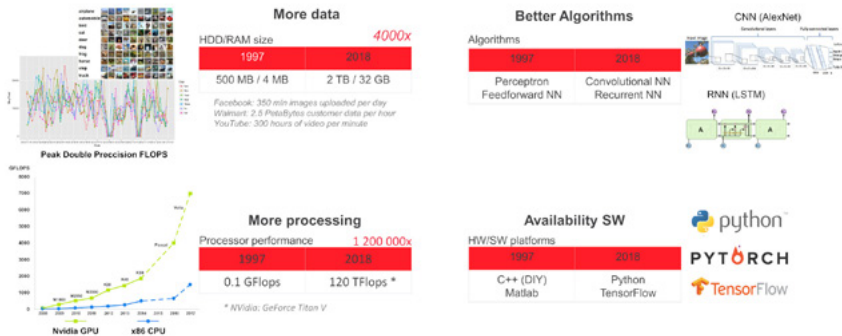
Available with **single-pole** and **double-pole** switching system



Order no.	Type	Description	Guide price
114236	1241.6821120000	Vandal Proof Latching Switch DPST 12A/250VDC, M19, IP64, Stainless Steel	12,80 €
241611	1241.68241121000	Vandal Proof Latching Switch, DPST, 12A/250VAC, IP64, Stainless Steel, LED24Vdc, Red	23,90 €
241783	1241.8550	Vandal Proof Latching Switch, DPST, 12A/250VAC, IP64, Stainless Steel, LED24Vdc Ceramic-Red	27,50 €

Artificial Intelligence on the Edge of Your Network

This is not the topic of the future; with AAEON hardware you can handle the deployment of artificial intelligence now. Read the article to find out how it all works and what you need for that.



Why Use Artificial Intelligence on the Edge

For example, the modern building contains a lot of sensors, HVAC devices, elevators, security cameras, etc. connected to the internal network. For the security, latency or robustness reasons, it is more appropriate to run artificial intelligence tasks locally, on the edge of a local network, and send only anonymized data that are necessary for taking global decisions to the cloud.

Hardware on the Edge

To deploy DNN on the edge we need a device with enough computing power and simultaneously low power consumption. The current state of technology offers a combination of low power CPU and VPU accelerator (x86 CPU SBC+ Intel Myriad X VPU) or CPU + GPU accelerator (ARM CPU + Nvidia GPU).

In the present state of technology we can train deep neural network (DNN) for a specific tasks like object and human face detection and recognition, speech recognition, language translation, games (chess, go, etc.), auto-

nomous vehicle driving, sensor status monitoring and predictive machine maintenance decisions, evaluation of X-ray images in healthcare etc. For such specialized tasks, a DNN can reach or even exceeds human capabilities.

Order no.	Type	Description	Guide price
302742	BOXER-6405-A1-1010	Ultra-slim box PC Intel Celeron N3350 w/o RAM -30...60°C	298 €
301541	AI Core (PER-TAIC-A10-001)	AI Core Movidius Myriad 22450 mPCIe	81 €
313725	UPS-EDAI-X70864-U01-DC01	UP Squared AI Vision X Developer Kit	666 €



Systematic marking saves time



Proper and high-quality marking of components is a guarantee of trouble-free and fast service. It brings system and order into complex devices and thus who's marking, doesn't need to spend time searching!



I'm sure you come across the distribution box with missing descriptions of components, terminal blocks, or cables. The orientation in such a distribution box is very difficult and it takes a long time to find what you are looking for.

I have encountered this problem many times during my career. It happens quite often that a good and high quality marking is underestimated and, for example, only a glued paper label with a handwritten description is used.

It is true that such marking is still better than none, but on the other hand, the descriptions fade in a few months, the labels peel off or are otherwise damaged and the hidden problem is here. It does not affect the functionality of the devices until an error occurs and it needs to be repaired. At this point, the lack of marking makes it very difficult to orientate and identifying components according to the

documentation is very time-consuming.

This can be avoided by using high-quality marking that will not be damaged by surrounding influences and will maintain perfect readability for the lifetime of the device in which it is used. Wago offers a comprehensive marking system to help you orientate.

Interesting features

- Simple mounting on any components
- Pre-printed label variants
- Different types of fastening: adhesive, sleeves, clips, shrink sleeves, fastening with cable tie
- With fewer labels, the possibility of manual marking with a marker resistant to abrasion. For a higher number, thermal printer printing
- The possibility to export data from CAE applications (EPLAN, WSCAD, E3).

Order no.	Type	Description	Guide price
41697	209-501	Marking system plain 1 card-100 marker for width 5-17,5mm	6,20 €
47862	793-501	Marking system plain 100x white	2,50 €
41744	210-110	Permanent Marker for Use With Marker Cards	1,80 €



PTFIX Series of distribution blocks is really alive!



And it is richer and more colorful. In addition, it has its own online tool for easy and clear configuration. Phoenix Contact really did care.

How do you know that a product or a whole series lives? Obviously, by seeing that the manufacturer is improving, grading the product, adding new items to the series, new variations, new versions, new colors... Do you want an example? Here you go. Phoenix Contact with its PTFIX series.

In September 2017, we introduced this series to you and today it is even broader and it has its own online tool - configurator. So what's its status right now?

There are 3 sizes for 3 nominal cross sections:

- 1.5 mm² (width of one element or grid 4.2 mm, nominal current 17.5A)
- 2.5 mm² (width of one element or grid 5.2 mm, nominal current 24A)
- 4 mm² (width of one element or grid 6.2 mm, nominal current 32A)

Even small conductors from 0.25 mm² can be connected reliably. At the time of the introduction of PTFIX series, the smallest one (1.5 mm²) had a slightly di-

fferent design - but today all 3 are almost the same.

All 3 sizes are in two versions:

- With a "Feed-in" connection point (input for a wire with a larger cross-section than the remaining connection points)
- Without the "Feed-in" connection point



Order no.	Type	Description	Guide price
260510	PTFIX 6/12X2,5-NS35 BN (3273098)	DIN35 Rail Vertical Block Push-in 12-cond. 2,5mm ² 24A + 1-cond. 6mm ² 57A Brown	5,30 €
260522	PTFIX 6/12X2,5-NS35A GN	DIN35 Rail Block Push-in 12-cond. 2,5mm ² 24A + 1-cond. 6mm ² 57A Green	5,70 €
260635	PTFIX 6/6X2,5-NS35A RD	DIN35 Rail Vertical Block Push-in 6-cond. 2,5mm ² 24A + 1-cond. 6mm ² 57A Red	3,60 €



Try "PlusMinus" - an ideal screwdriver for circuit breakers and terminals



Special screwdriver, which is neither slotted, nor Phillips type, but it combines the best of them both. And that's really a big PLUS.

You've certainly already got in touch with screws whose head enables to use slotted and also Phillips cross type screwdriver. It's quite handy as you'll probably never be in a situation when you won't have a usable screwdriver for a given screw by your hands.

But do you know that there is a special and the most suitable screwdriver for such screws, so called. SL/PZ (or SL/PH), also called as „PlusMinus“? It is a screwdriver with this type of blade:

The praxis proves that such „hybrid“

screwdriver has the highest resistance against slip off, already at a minimal pressure on a screw. That's especially beneficial for work on devices on DIN rail, as we



don't have to push on the screw (and thus a DIN rail, plastic older or a plastic enclosure) using uselessly excessive force.

Directly in our offer, you can find 6 types of screwdrivers with the „PlusMinus“ blade from Wiha:

- SoftFinish electric SlimFix SL/PZ1
- SoftFinish electric SlimFix SL/PZ2
- Bit Stubby 41230
- Wiha SpeedE

Advantages of "PlusMinus" screwdrivers

- The best possible torque with the least perpendicular force
- Eliminated risk of slip-off from the slot
- Protection of screw heads
- Pleasant work, professional solution



Order no.	Type	Description	Guide price
308461	28310101 Stubby 41230	SoftFinish slimVario bit Set, Slotted/Phillips/Poz.4-pcs 1000V, SL 3.5, PH2, SL/PZ2	29,75 €
160785	SoftFinish SL/PZ1 (36329)	Screwdriver SL/PZ1, Plus Minus	12,35 €
160786	SoftFinish SL/PZ2 (36330)	Screwdriver SL/PZ2, Plus Minus, 218mm	16,40 €

Quartz Crystals and Quartz Crystal Oscillators Ansen



Without crystal oscillators, there would be no wireless communication, GPS receivers or Ethernet. Therefore, we are expanding the portfolio of suppliers with the renowned ANSEN manufacturer. Although new technologies such as MEMS oscillators exist, crystal oscillators remain the dominant source of accurate and stable frequency.

Required Frequency Stability for Different Applications

- USB low speed (1,5Mb/s) $\pm 1.5\%$ (15000ppm)
- USB full speed (12Mb/s) $\pm 0.25\%$ (2500ppm)
- USB high speed (480Mb/s) ± 500 ppm
- Ethernet 10/100/1000Mb/s ± 100 ppm (± 50 ppm at 25°C, ± 50 ppm for other influences)
- Wi-Fi 802.11 a/b/g/n, Bluetooth: 20ppm

With the increasing demand for higher data rates and more efficient use of radio spectrum, the requirements for frequency stability are also increasing. For example, a base station for mobile

phones needs 50ppb (part per billion) accuracy.

Oscillators in microcontrollers

Current microcontrollers have built-in factory calibrated RC oscillator and oscillator for external quartz crystal or ceramic resonator.

Internal RC Oscillator

16MHz internal RC oscillator in modern microcontrollers, like STM32L4 family, is factory calibrated and can have total accuracy -2% to 1.5% (-20000ppm up to 15000ppm) in the temperature range -40 to 85°C. Drift over time is not specified.



Oscillator with Ceramic Resonator

- Ceramic resonator 12MHz, 3,2x1,3x-0,7mm, Murata CSTNE12M0GH-5L000R0
- Ambient Operating Temperature Range: -40...85°C
- Frequency Tolerance at 25°C: $\pm 0.07\% = \pm 700$ ppm
- Frequency Stability over Temperature: $\pm 0.11\% = \pm 1100$ ppm
- Aging: $\pm 0.07\%/10$ years at 25°C
Total frequency deviation for 10 years: 700ppm+1100ppm+700ppm= **2500ppm**

Are you interested in miliOhm and microHenry when measuring?



Measuring instruments Voltcraft LCR-100 and R-200 are able to convert estimation into accurate measurement and moreover, they are at a good price. Find them in our stock range.

You know that. You have a capacitor or inductor in your hands and you are not sure if your standard multimeter shows the right value. This is understandable since the range of "L" and "C" is usually a "bonus" rather than the main purpose of common multimeters. Typically, the greatest error to measurement is a result of the serial resistance and parasitic inductance of capacitors and the like, the series resistance and the parasitic capacity of the coils.

And what about low-value resistors? The situation is quite similar. If we need to accurately measure values such as 50 milliohms or even 1 ohm, it usually presents a considerable complication. Obviously, a skilled technician can circumvent this by indirect measurement using an accurate constant low cur-

rent source and a voltmeter, but it is a solution that cannot be described as user-friendly.

There are many different specialized devices on the market but these are usually at a higher price level. In this respect, two devices that we would like to introduce to you offer an excellent price/performance ratio. Namely Voltcraft LCR-100 and R-200.

R-200

The R-200 multimeter could almost be considered a common TRMS multimeter CATIII / 600V, but it has 3 ranges to measure the small resistances, which makes it unique: 40 Ohm, 4 Ohm, 0.4 Ohm.

In the smallest range, we find a great resolution of 0.1 milliohms (0.0001 Ohm).



And thus we can, for example, easily measure various shunts, which are now often formed just by a small PCB track, or we can check wires for big currents, etc. In order to measure such small resistances, currents in tens to hundreds of mA are needed in practice, so the R200 is powered by 6 AA batteries, not a classic 9V battery, which is unable to deliver the required current and would quickly discharge.

The device is also very suitable for measuring very small currents, as both DC and AC ranges have a resolution of 0.1 uA.

Order no.	Type	Description	Guide price
152341	R-200	Digital Milliohm-Multimeter 4000 U,I,R,C,D 50-400Hz	93,70 €
152261	LCR-100	LCR Meter, 11000, f 100/1000Hz	71,70 €

Can penguin live in desert?



Not likely. Similarly, neither an ordinary networking cable wouldn't survive in a harsh industrial environment without harm. You can prevent undesired secondary costs and ensure the safety for your network by installing a robust cable.



Industrial environments are harsh. Temperatures vary from extreme heat to extreme cold, machines create strong vibrations. Dust, water, and chemicals make the situation even worse. If you don't have a suitable cable, your network can't work reliably. And in a nowadays interconnected world, safety and reliability are very important.

In the traditional office environment, you don't have to be concerned about cable exposure to abrasive chemicals, extreme temperatures, heavy vibration or water, and other fluids. How-

ever, the situation is completely different in the environment with the machines, automation and manufacturing equipment operation.

Even the best **Commercial-**

Off-The-Shelf (COTS) Ethernet systems are not made to handle these conditions over a long period of time. Extreme conditions call for ruggedized cables.

Consider, for example, the harmful effects, which these common environmental conditions can have on network components:

- Temperature extremes.
- Chemical exposure.
- UV radiation.
- Physical stress/ Hazards.

Belden has conducted the extensive test of Ethernet cables in terms of resistance to:

- Abrasion
- Cold bend
- Cold impact
- Crushing
- Cut-through
- High temperature
- Oil-resistance
- UV exposure
- Operating with Extreme Reliability

Extensive lab testing proves that Belden industrial cables maintain transmission quality even in extreme temperatures. While ordinary cable degrades significantly, Belden Industrial-grade cable remains intact, outside and inside. Belden guarantees its cable features for **10 years**.



PICO-PI-IMX8M-PRO is more than just Development Kit

Do you need a development kit for the i.MX8M Quad processor? Do you want to quickly integrate the i.MX8M Quad solution into the final product? The development kit TechNexion PICO-PI-IMX8M-PRO will handle both.

PICO-IMX8MQ Module

Development kit contains PICO-IMX8MQ13-R20-E08-9377 module. As with all TechNexion PICO modules, this module also has guaranteed 12-year availability. Module is certified in European Union (CE, RED, and ETSI), United States (FCC), Japan (TELEC), Canada (IC) and Australia/New Zealand (RCM).

Processor

Module is based on NXP i.MX8M Quad application processor which contains four 64-bit, Armv8-A Cortex

A53 cores clocked at 1.3GHz and one Cortex M4F core clocked at 266MHz. The Cortex-A53 cores can be powered off while the low power Cortex-M4 subsystem performs the real time system monitoring. Cortex-A53 core is the successor of Cortex-A7 but with the performance similar to Cortex-A9.

Module is based on NXP i.MX8M Quad application processor. It contains four 64-bit, Armv8-A Cortex A53 cores clocked at 1.3GHz and one Cortex M4F core clocked at 266MHz.

The processor is targeted for applica-

TechNexion
INNOVATORS OF TECHNOLOGY



tions in video and audio streaming, voice control, voice assistants and human machine interface (HMI) solutions. For this kind of applications the processor offers:

- Two independent display interfaces, up to 4Kp60 resolution on the HDMI 2.0a output and 1080p60 resolution on the 4-lanes MIPI-DSI.
- Hardware acceleration for video playback 4Kp60 HEVC/H.265 main and main 10 decoder, 4Kp60 VP9 decoder, 4Kp30 AVC/H.264 decoder.
- Two 4-lane MIPI-CSI for cameras
- 20 audio in/out 32-bit channels with sampling frequency up to 384 KHz with DSD512 support.



Order no.	Type	Description	Guide price
305315	PICO-PI-IMX8M-PRO	SFF i.MX8M 2GB RAM 8GB eMMC 0...50°C	185 €

Oscilloscopes with superior features already in the basic class



The vast array of useful features and the concept of future growth; this is the Rohde & Schwarz RTB 200x series of oscilloscopes.



Only a few measuring instruments are as versatile as an oscilloscope. And only a few measuring instruments are going through continuous development as an oscilloscope. Similarly to the development in the field of components,

the development of oscilloscopes is continuing, as well as a vast amount of software (firmware) for control, decoding and various measurement efficiency functions.

Sure, your favorite 10-, 20- and even more-year-old oscilloscope can still be good and somehow special in some aspect, but the fact is that the possibilities and ease of work offered by some of today's oscilloscopes are almost incredible.

We can say that the oscilloscope is the basic and most important device for developing electronic devices. Even for developers working with almost finished blocks and developing mainly

software, the oscilloscope is the most effective device for detecting various problems or for tuning the system as a whole.

If you're used to a basic digital oscilloscope, you'll probably be amazed by many features and capabilities that modern oscilloscopes offer.

For example, the RS RTB200x oscilloscope was briefly introduced about 2 years ago when it was a hot novelty in our article "Power of Ten". Since then, it has become one of the most successful models in the value instruments segment, offering a fantastic price/performance ratio.

At first look, the RTB200x is impressive because of the fact that most of the faceplate surface is occupied by the most important thing - a large **10.1" display**.



Order no.	Type	Description	Guide price
236774	RTB2002 (RTB2K-72)	Digital oscilloscope 2ch 70MHz 2,5 GSa/s 20MSa mem	1250 €

More than 100 new active tips for each soldering joint

The largest Weller product range expansion includes three soldering handles and more than 100 tips with active heating, suitable for microscopic work to solder coolers and LEDs on PCB with aluminum base.

The Weller RT family of active tips has so far been the solution for the most precise soldering of small and medium-sized joints.

Weller is coming up with the biggest expansion in recent years. It greatly extends the possibilities of soldering the smallest as well as really big joints.

The following picture says it all. We can see various tips, from subminiature to truly big tips.

It is clear that such a huge range of tip sizes cannot be used or it would be impractical to use with one type of

handle. For the micro joints and tips, a micro tool is obviously suitable and, on the contrary, the larger joints/ tips require a bigger tool.

The result is that 3 series of tips and tools are available:

- **RT Pico with WXPP tool (40W)** - for microscopic soldering of smallest parts up to 01005. A short distance from tip to tool grip for maximum precision.
- **RT Micro with WXMP tool (40W)** - the most versatile series for micro



and standard components offering the largest selection of sizes and geometry of tips.

- **RT Ultra with WXUP tool (150W)** - for heavy work, requiring large amounts of heat and high precision. Suitable for LED soldering, solar installations, multi-layer PCBs, coolers and the like.

Advantages / Features

- 3 handles and over 100 tips
- Weller WX compatible
- The most precise temperature measurement with minimal fluctuations
- Heater integrated directly in the tip
- High performance due to optimum heat transfer
- Suitable for all kinds of soldering work, from microscopic to big joints on multi-layer boards
- Tools have a built-in motion sensor to easily use standby/sleep mode



Order no.	Type	Description	Guide price
320062	RTP 002 C (T0050103399)	RT Pico Soldering Tip Conical 0,2mm	21,90 €
320094	RTU 008 C MS (T0050105099)	RT Ultra Soldering Tip Conical 0,8mm MIL-SPEC	27,90 €
76427	RTM 004 S (RT 1 SC)	RT Micro Soldering Tip Chisel Ø 0,4x0,15mm	19,60 €

Piezo buzzer Sonitron SMA-13LV deploys maximum from a minimum

sonitron®

80 dB acoustic signal at the only 3V power supply and a really miniature size rank this component in the TOP class.



Belgian company Sonitron and its top-level products are probably familiar to you from our articles and from our

offer in this segment. We continue to extend the standard stock types offer which also includes one extraordinarily interesting type – SMA-13LV, interesting mainly for low-voltage applications.

Series of buzzers marked as "SMA" is known for its variety as it contains types with the loudness of 75-98 dB, THT, and SMT versions, and versions with stable, as well as intermittent signal. Various sizes from 13 to 30 mm with a pitch of 7.5 to 20.32 mm enable selecting the right type for a given application. In general, bigger types provide a louder signal, but it depends on a concrete type.

This series is suitable for general use wherever a reliable buzzer is neces-

sary, including industrial conditions.

For successful use, it's only necessary to connect a suitable supply voltage, which is usually in an extremely wide range (for example 1.5-15V). Usually, at the upper end of a supply voltage range for a given type, we get the highest loudness and at lower voltages a higher lifetime.

Very similar is also the SMAT series (transducers), which in contrast to the SMA series doesn't contain a driver, and therefore it needs external electronics.

Advantages / Features

- Top products from a producer with over 35 years of experience in the development and production of piezo buzzers
- Available in various versions, including SMT/THT and low voltage types (LV)
- Majority of types is usable in an extremely wide range of supply voltages



Order no.	Type	Description	Guide price
171081	SMA-13LV-P7,5	Piezo Buzzer 3VDC 3,35kHz 80dB	4,80 €
171080	SMA-13LV-S	Piezo Buzzer SMD 3VDC 3,35kHz 80dB	5,60 €

W6100 is ready for IPv6

WIZnet

With the enormous growth of IoT devices connected to the networking, it became evident that far more addresses would be needed to connect devices than the IPv4 address space had available. Wiznet has a solution.



Internet Protocol version 6 (IPv6) is the most recent version of the Internet Protocol (IP). It is the communication protocol that provides an identification and location system for computers on networks and routes traffic across the Internet.

The new W6100 chip from Wiznet solves the problem with the lack of IP addresses in IPv4.

It supports IPv4/IPv6 dual stack by adding IPv6 functions on the basis of WIZnet's patented hardwired TCP/IP core technology. W6100 supports TCP/IP protocols such as TCP, UDP, IPv6, IPv4, ICMPv6, ICMPv4, IGMP, ARP and PPPoE. W6100 also includes 10Base-T/10Base-Te/100Base-TX Ethernet PHY and Ethernet MAC Controller which makes it suitable for embedded internet-enabled devices.

W6100 has 8 independent hardwired SOCKETS and supports various SOCKET-less commands, which are for IPv6 auto-configuration, monitoring, and managing the network via ARP, PINGv4, and PINGv6. It supports two kinds of HOST interfaces; SPI and parallel sys-

tem BUS. It has 32KB internal memory for sending and receiving data.

It is designed for low power and low self-heating, W6100 provides WOL (Wake On LAN), Ethernet PHY power down mode, etc. W6100 comes in two packages, 48 LQFP, and 48 QFN; both are lead-free and these versions are PIN-2-PIN compatible with W5100S, which is a great advantage for easy migration from the older chip.

Target Application

- Home Network Devices: Set-Top Boxes, PVRs, Digital Media Adapters
- Serial-to-Ethernet: Access Controls, LED displays, Wireless AP relays, etc.
- Parallel-to-Ethernet: POS / Mini Printers, Copiers
- USB-to-Ethernet: Storage Devices, Network Printers
- GPIO-to-Ethernet: Home Network Sensors



Order no.	Type	Description	Guide price
314117	W6100-L	Ethernet Controller TCP/IP +MAC+PHY SPI 25MHz LQFP48	2,90 €
314119	W6100-EVB	W6100 Evaluation Board based on Cortex-M3	24,90 €

Multimeter with wireless display



With the **FLUKE 233** you will have the measured value always in front of your eyes without having to be at the measuring point. The measurement is therefore simple and clear.



It is often necessary to measure in the distribution box but at the same time have the freedom to move, for example to access control elements. The **FLUKE 233** multimeter with **removable display and wireless transmission** is designed for these situations.

FLUKE measuring instruments are considered to be one of the best and can be found almost anywhere. Be it

simple testers, for example in household or complex laboratory equipment. Professionals who rely on high-quality and accurate equipment for everyday machine and equipment repairs also appreciate their features.

The Fluke 233 multimeter belongs to such devices. At first glance, it is a common measuring instrument, but when you look better, you will find a removable display, which is its greatest advantage. This display is connected to the base wirelessly **up to a distance of 10m** (can be even further in practice under favourable conditions). This allows you to keep it at your fingertips so you can track the measured quantity without having to be at the point of measurement. This can be useful when repairing larger machines, for example,

when you need to perform operation during the measurement, but the controls are in a different location. Probably, every technician has certainly come across the situation in which such a device would be appreciated.

The removable display also includes several useful buttons. A very commonly used function is to freeze the current display value, which you can activate with the **HOLD button**. You can then use the buttons to display the maximum, minimum or average measured value, set the measuring range and, last but not least, to turn on the **display backlight**, which you will certainly appreciate in poor visibility.



Order no.	Type	Description	Guide price
90821	Fluke 233	Digital Multimeter 6000 counts	353 €

Check the limits of your display



TFT displays can withstand a wide range of working temperatures. However, limit values have a negative impact on their life. Do you also count with extreme conditions when choosing a display?

When selecting a display, it is important to consider the temperatures at which it will work and, in addition, allow for the extraordinary temperature conditions that may occur in the application environment.

Today's standard TFT displays usually have a working temperature range of -20 to +70°C. TFT displays with a narrower operating temperature range, e.g. 0... +70°C or 0... +50°C are quite rare.

Fortunately, we also have TFT LCD types with an extra wide temperature range of **-30 to +80 (85)°C**.

When it is advisable to use a display with an extra wide operating temperatures range?

If the application works outdoors, we are naturally also interested in the lower temperature range. Minus 20°C occurs almost every winter in European conditions. It is only a few days, but it is necessary to consider such temperature. Temperatures around -30°C occur even



more rarely, but there are years with such low temperatures. If you have a device that must be able to operate at such low temperatures, then the display with a temperature range of -30 to +80 (85)°C is a clear choice.

However, there are also cases where a short-term reduced or even minimal readability of the display operating at a temperature lower than the allowed minimum are not a problem. However, there is a catch that under these circumstances the display may be irreversibly damaged. The point is that the storage temperature range is often the same as the working temperature range, so the

manufacturer does not even allow to "store" or to expose the display to lower temperatures, even though in the off-state. This fact underlines the importance of considering the temperatures at which your equipment can work.

What effect does the high temperature have?

Here is a similar situation, LCDs at very high temperatures usually lose contrast but it depends very much on the particular display/technology.

High temperatures also load higher demands on the materials from which the LCD panel is constructed.

For example, temperatures of about 50-70°C are common for closed, non-vented vehicles cabins parked in the direct sunlight in the summer. Similarly, the displays behind the exterior glass cover, which are exposed to the sun even for a short time, are subjected to considerable temperature shocks.



Lithium batteries FANSO

- energy for IoT applications



Extremely long lifetime, high energy density and low self-discharge - these are ideal energy sources e.g. for wireless measuring sensors. Find the FANSO primary batteries in our stock products.

FANSO Battery, founded in 2002, has been one of the most qualified manufacturers of **primary lithium batteries** in China for more than 30 years thanks to experienced specialists and technicians working in this field. Experience gained over this period of time ensures a high quality of products and long operational time.

The main products of FANSO Battery are 3.6V Li-SOCI₂ and 3.0V Li-MnO₂ batteries. Equipped with 16 advanced production lines, FANSO has the production capacity of 80 million pcs annually.

LiSOCI₂ - Lithium thionyl chloride 3.6V cells have the highest energy density and voltage of all commercial lithium types, with a service life of up to 10-15 years. These cells are ideal for applications requiring very low continuous-current and/or moderate pulse-currents. Extremely long service life and low self-discharge make them ideal for remotely deployed devices such as utility meters that must be functional for many years without maintenance.



Bobbin-type vs. Spirally Wound

Two types of lithium thionyl chloride cells are available: **bobbin and spirally** wound construction.

With both versions, the non-aqueous electrolyte results in relatively high impedance. One way to solve this impedance problem is to increase the surface area by going to a wound cathode. Unfortunately, this solution brings some consequences. The drawbacks to spirally wound construction include reduced energy density (there is more inactive material within the cell) and shorter operating life (extra surface area results in a higher self-discharge rate).



Order no.	Type	Description	Guide price
314331	CR123A	Lithium Battery Li-MnO ₂ 2/3A size D17,0x-34,5mm 3,0V/1,5Ah/1000mA standard	1,30 €
314326	CR34615E	Lithium Battery Li-MnO ₂ Spiral D size D34,0x-61,5mm 3,0V/12Ah/2000mA standard	7,40 €
314307	ER14505H	Lithium Battery Li-SOCI ₂ Bobbin 1/2AA size D14,5x25,2mm 3,6V/1,2Ah/20mA standard	2,20 €
314300	SLC1025	Lithium Ion super capacitor D10,0x25,0mm 3,95V/25mAh	6,30 €

Get the best results with MEC switches



Whether you choose the current MEC button generation 5E/5G or the previous one, 3A/3C/3E/3F, it's always gonna be a great decision. MEC is a guarantee of reliability, so both generations have their place on the market.



In 2011, MEC introduced a new generation of 5E and 5G series buttons. When we signed a contract with them,

we considered only the new generation. The manufacturer's declaration was that we will prefer a new series but as long as the market still requires "old ones", we will manufacture those as well. And this holds true until today. It is clear proof that the original concept was/is excellent and that these buttons still have their place in the market.

And therefore, our assortment offers the full range of MEC which, by the way,

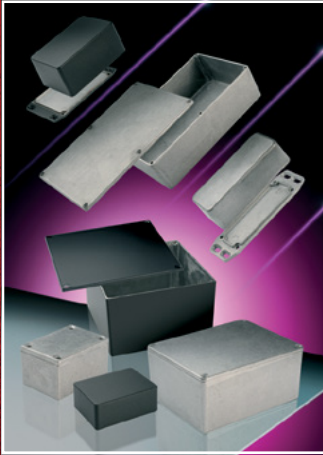
has belonged to the APEM family for over 20 years.

We should note, however, that the critical difference is "only" the cap retention and actuator. Therefore, older and newer generation caps are not compatible but can be easily distinguished by the part number. Letter "S" has been added to the new ones (e.g. 1D or 1DS).

What has changed is that MEC has stopped producing low-temperature versions of switches. So now all MEC switches have a working temperature range of **-40°C to +160°C**. Of course, the new generation has a wider range of options like choice of actuation force, LED colours, etc.

Order no.	Type	Description	Guide price
141616	3CTH9	Multimec Switch to PCB Black 10x10mm 3N 1mm	0,95 €
59523	3FTH9	Multimec Switch to PCB 10x10mm 3N 1mm	0,95 €
141611	3ATH9	Multimec Switch PCB 10x10mm 3N 1mm	0,99 €
141760	3ETH9	Multimec Switch w/o Cap to PCB 10x10mm 3N 1mm	0,93 €





1550 / 1590



1550Z / 1590Z IP66



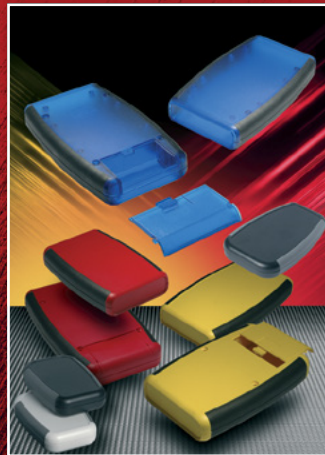
1590 TRP-STP



1455



1551



1553



1553 watertight



1554 / 1555 IP66



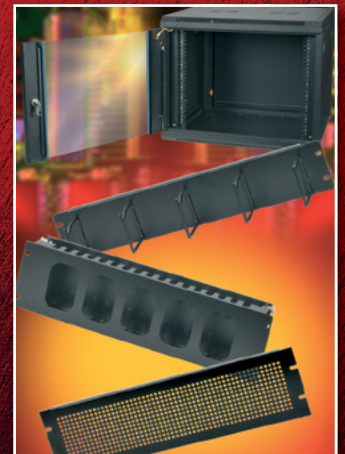
1591 / 1591XX



1599 Tablet and 1553T



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