

# Smart IoT Device RAM-1

Remote monitoring and advanced analysis of surge arresters and power grids



Technological  
Innovation  
**iRAM**

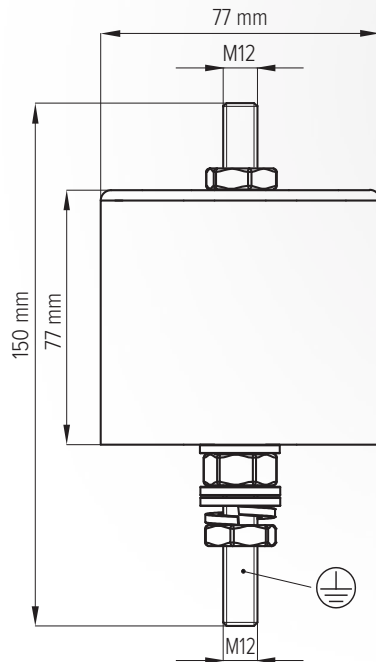
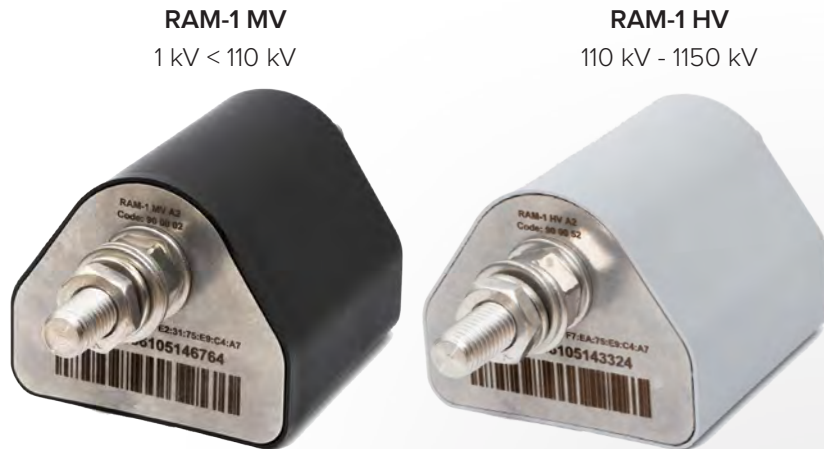
**IZOELEKTRO**

# Smart IoT Device RAM-1

The smart IoT device RAM-1 is intended for remote monitoring and advanced analysis of surge arresters and power grids. Power grids become smart with the use of the RAM-1 device, which improves the operating process and the reliability and stability of the electricity transmission and distribution networks.

If attached to a gapless surge arrester with a continuous operating voltage above 1 kV ewq, the RAM-1 device can measure the resistive component of the leakage current. This innovative method of extracting the resistive component of the leakage current conforms to the standard IEC 60099-5. Measurements can be tracked either via a web, mobile application or integrated to SCADA systems.





## Characteristics

### The Smart IoT device RAM-1 offers:

- Machine learning
- Simple installation
- Communication: mobile network 4G, 5G or LoRaWAN
- On-site measurements reading: bluetooth (BLE app)

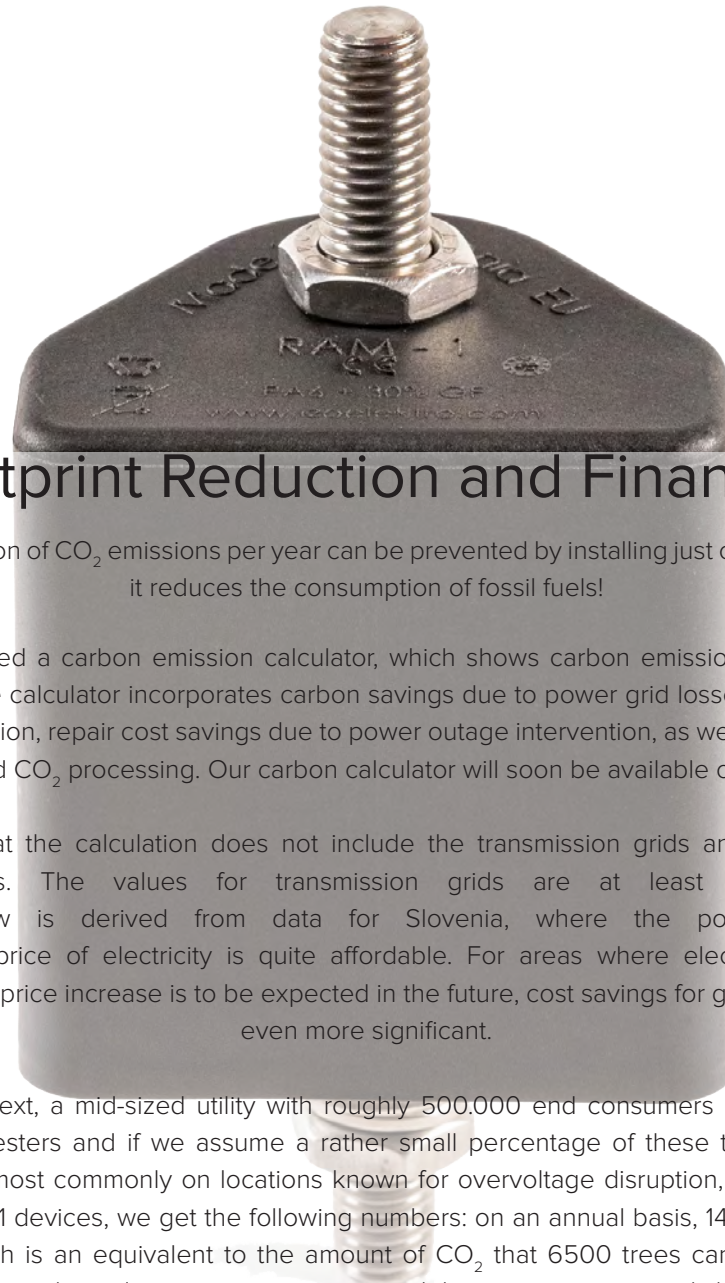
### RAM-1 reports the following parameters:

- Resistive component of leakage current
- Excessive ambient temperature (fire indication)
- Inclination/tilt or collapse of pole/tower
- Power outage (the presence of voltage)
- Lightning counter and detection of other surge manipulations in network
- Destruction of arrester
- Operation of disconnecting device
- Location of event or fault (provides navigation to the location)

### Competitive advantages:

- Remote monitoring and advanced analysis of surge arresters and electricity transmission and distribution networks
- Measurement of resistive component of leakage current of surge arrester
- Surge counter, ambient temperature and temperature of device
- Collapse or tilt of pole/tower, micro location, navigation to location
- Instant notification of critical information, autonomous operating
- Machine learning based on collected data
- Installation on all existing and new gapless surge arresters above 1 kV (regardless of the manufacturer)





## Carbon Footprint Reduction and Financial Savings

Almost a quarter of a ton of CO<sub>2</sub> emissions per year can be prevented by installing just one RAM-1 device since it reduces the consumption of fossil fuels!

Izoelektro has prepared a carbon emission calculator, which shows carbon emission savings by installing the RAM-1 device. The calculator incorporates carbon savings due to power grid losses, cost savings due to power outage prevention, repair cost savings due to power outage intervention, as well as a tree comparison demonstration and CO<sub>2</sub> processing. Our carbon calculator will soon be available online to the public.

Let us emphasize that the calculation does not include the transmission grids and applies only to the distribution networks. The values for transmission grids are at least three times higher. The example below is derived from data for Slovenia, where the power grids are well maintained and the price of electricity is quite affordable. For areas where electrical energy is more expensive or where a price increase is to be expected in the future, cost savings for grid operators would be even more significant.

To put that in to context, a mid-sized utility with roughly 500.000 end consumers has tens of thousands of installed surge arresters and if we assume a rather small percentage of these to be equipped with a smart device RAM-1, most commonly on locations known for overvoltage disruption, and settle for a round number of 1000 RAM-1 devices, we get the following numbers: on an annual basis, 141 tons of CO<sub>2</sub> emission could be saved, which is an equivalent to the amount of CO<sub>2</sub> that 6500 trees can process in the same time period. Furthermore, by reducing power outages and thus ensuring more reliable energy supply, over 700.000 € of costs could be saved annually.



## Installation Instructions

Read the installation instructions carefully before starting the installation. It can be found on the back side of the packaging. The RAM-1 device must be installed on the grounding side of the surge arrester. If the RAM-1 device is installed incorrectly, the device will not function properly, damage and destruction of the device may occur.

If the device is installed without a surge arrester on to a pole/tower, installation instructions are not necessary. The device must be installed in the upper third of the pole/tower. It does not need a power supply or grounding to work.



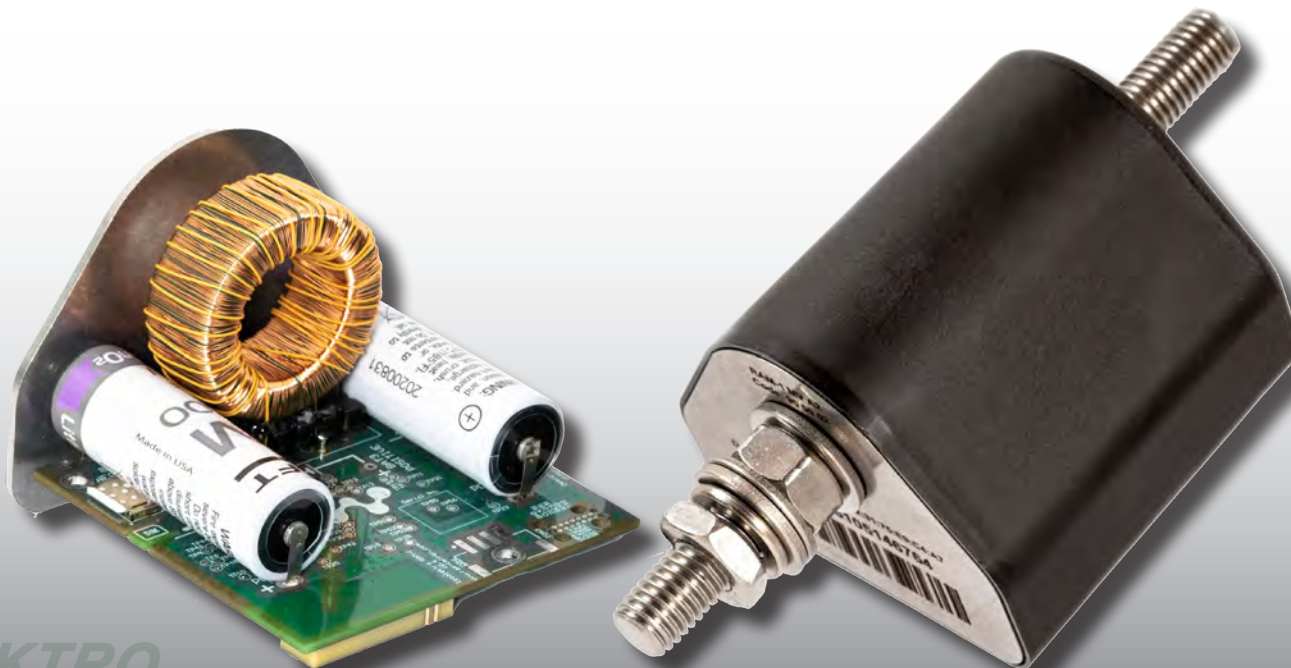




## Development with Sustainability in Mind

For Izoelektro, sustainability represents meeting the consumers electricity demands without compromising the ability of future generations to meet their own demands. We are accomplishing this by reorganizing our product portfolio with a trend to responsible consumption and production, offering high quality working conditions and generally making our products better to assure more reliable electrical system operation, thus bringing the most out of our natural resources.

The battery of the smart IoT device RAM-1 is intended for 20 years\* of operation, which is very uncommon nowadays in the field of electronic devices. Only top-quality components were chosen to assemble the device including the market leading Saft batteries, which are certified to withstand temperatures as low as -40 °C.





## Tracks, Analyses & Reports Immediately

- Excessive ambient temperature (fire indication)
- Inclination/tilt or collapse of pole/tower
- Power outage (the presence of voltage)
- Lightning counter and detection of other surge manipulations in network
- Destruction of arrester
- Activation of disconnecting device
- Location of event or fault (provides navigation to the location)

## Monitoring of Installation Points

### Warnings:

- Collapse or tilt of pole/tower
- Temperature of surroundings (indication of wildfire)
- Power outage (presence of voltage)
- Location of event or fault
- Navigation to location

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## Changing the Game within our Industry Sector

### Predictive maintenance

RAM-1 will definitely change the game in the electricity sector. The smart IoT device RAM-1 is intended for remote monitoring and advanced analysis of surge arresters and power grids. Monitoring the operation of power grids in general will be automatic, remote, without the need for people in the field and regular control. RAM-1 allows grid operators to remotely monitor the status of their grids and get instant real-time information about faults.

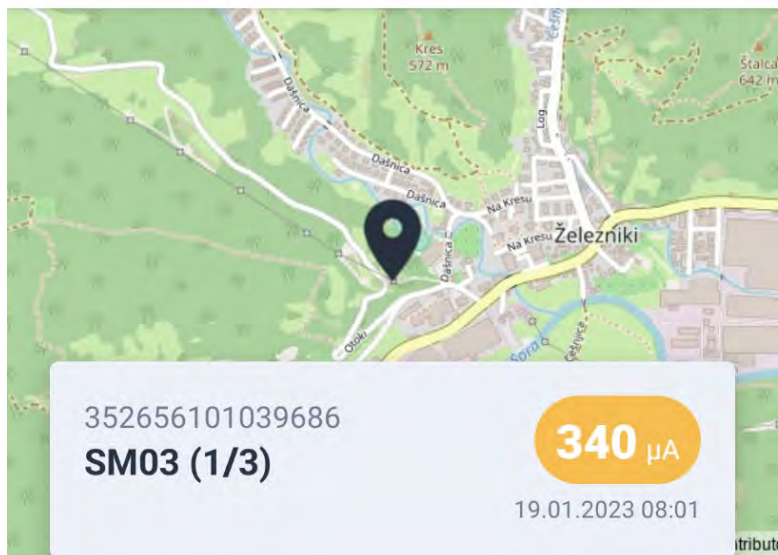
Maintenance planning. With the automatic monitoring of the state of the electrical grid, enabled by RAM-1, grid operators can predict exactly when equipment replacements is needed and how much and which equipment will need to be replaced without physical inspections. Grid operators can further reduce their costs by using our device. Certain equipment that operators would replace preventively – as they are doing now – could remain in the grid.

10:24

46%



## Device details



Last Monitoring **19.01.2023 08:01**

Installed firmware version -

Communication mode **mobile**

Temperature & fire **0,5 °C** ●

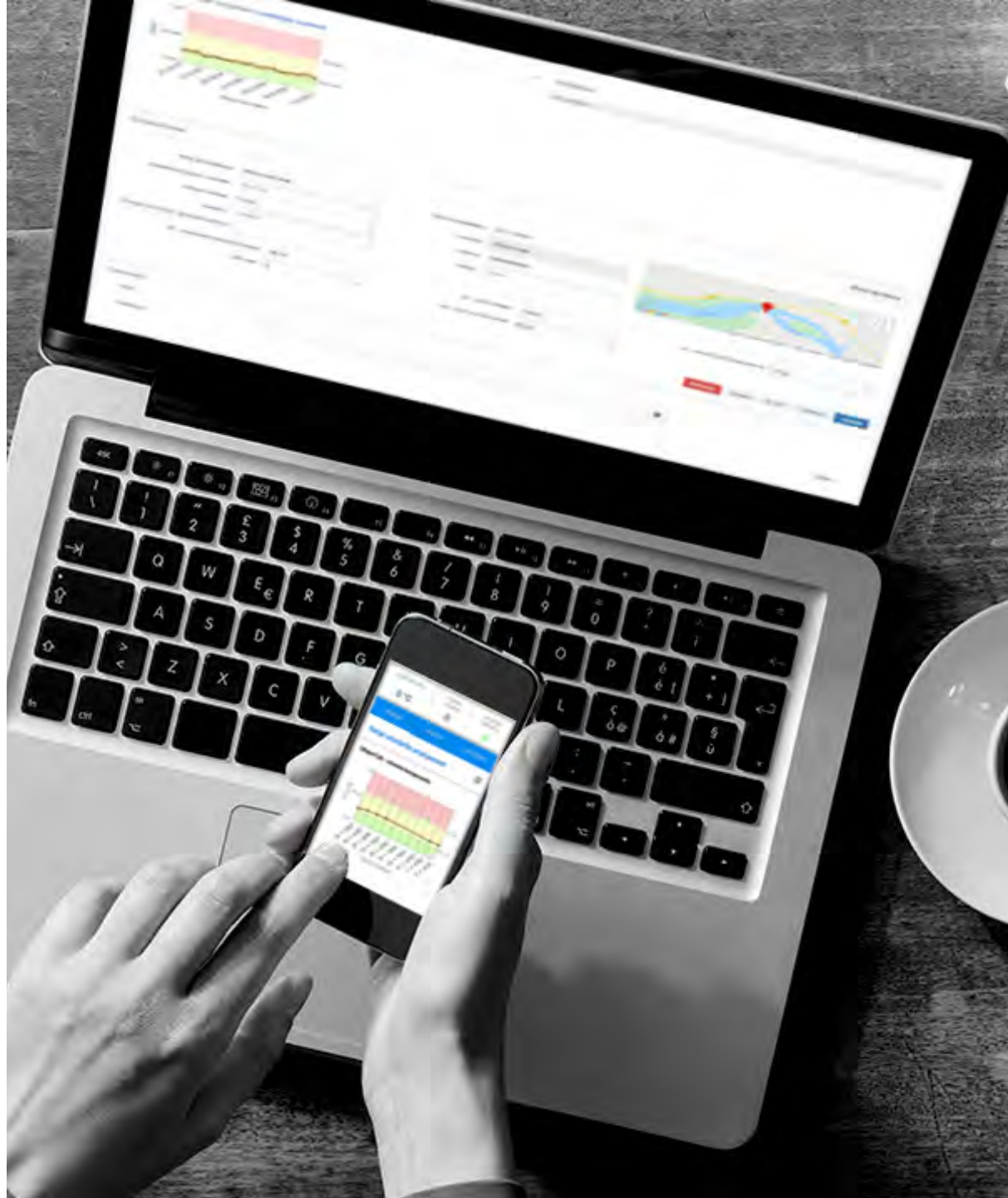
Device tilt **0,0°** ●

Surge counter **0**

System shutdown counter **0**

## Leakage current - resistive component

10  
 $\mu\text{A}$





# RAM-Center application

The official RAM-Center application from Izoelektro gives you a full overview of the installed RAM-1 devices, thus enabling monitoring of surge arresters in the power grids. RAM-Center offers detailed and graphical monitoring of measurements, a history of all previous measurements and instant push notifications in case of alerts (fire, destruction or malfunction of the surge arrester, sudden tilt, etc.) and predefined events (exceeding the leakage current threshold value). The application also provides GPS location of installed RAM-1 devices and direct navigation to the place of installation.

## Tracked Measurements:

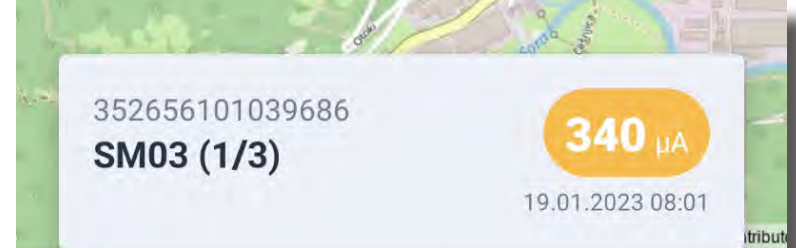
- Resistive component of leakage current
- Instant fault
- Surge counter
- Temperature
- Inclination
- Location

## Features:

- Monitoring of surge arrester's condition
- Navigation to the place of installation
- Adding photos and specifications of the place of installation

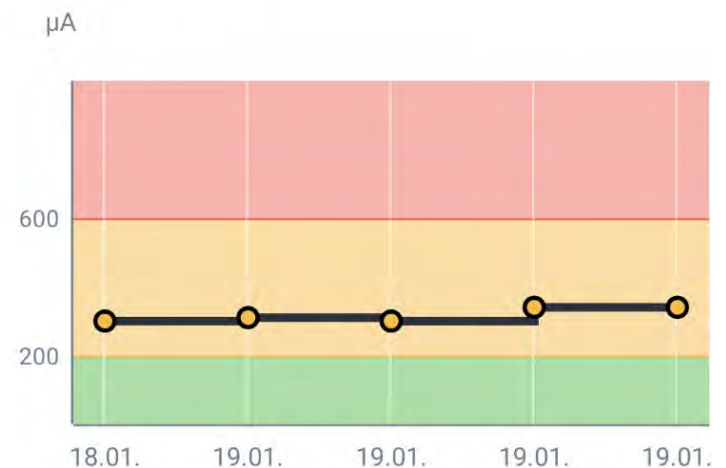
## Status and management:

- Receive the current status of installed surge arresters
- Receive instant push notifications in case of exceeding the threshold value of leakage current or other predefined events/alerts (destruction or malfunction of surge arrester, fire, sudden tilt, etc.)
- Manage the RAM-1 device's settings
- Upgrade RAM-1 firmware with new functionalities wirelessly (FOTA)



Last Monitoring	19.01.2023 08:01
Installed firmware version	-
Communication mode	mobile
Temperature & fire	0,5 °C ●
Device tilt	0,0° ●
Surge counter	0
System shutdown counter	0

## Leakage current - resistive component







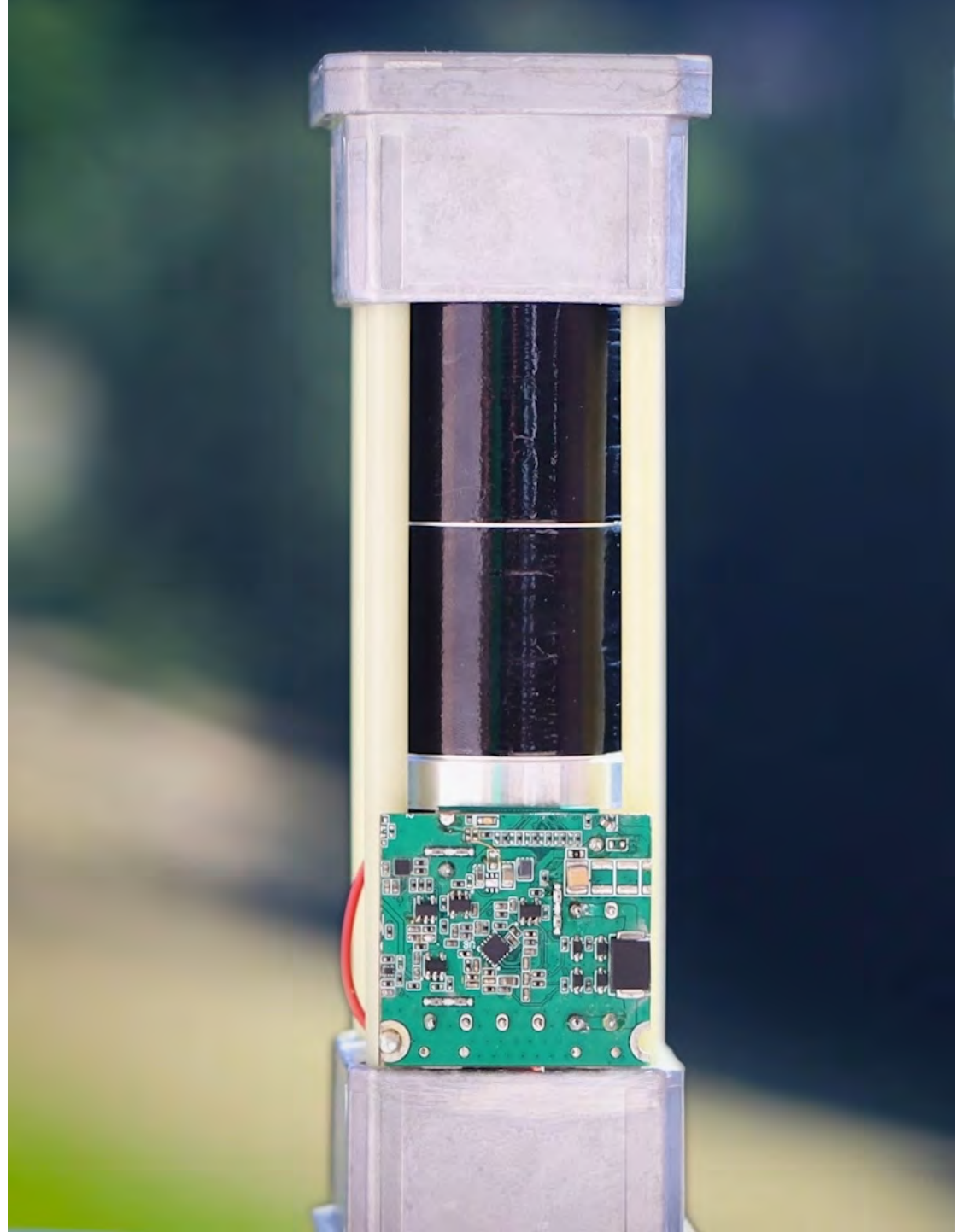
# Technical Data

<b>Use</b>	remote monitoring and advanced analysis of gapless surge arresters (regardless of the manufacturer) with a continuous operating voltage above 1 kV and power grids
<b>Basic measurement</b>	resistive component of leakage current <0.03 ... 3 mA ( $\pm 10\%$ )
<b>Standard for basic measurement</b>	IEC 60099-5
<b>Other measurements</b>	failure, wildfire, voltage, surge counter, device temperature, ambient temperature, inclination/tilt, location
<b>Temperature range</b>	from -40 °C up to +85 °C
<b>Ingress protection IP</b>	IP 67
<b>Frequency</b>	from 48 Hz up to 62 Hz
<b>User interface</b>	web and mobile application (Android, iOS)
<b>Measuring cycle</b>	1 hour
<b>Communication cycle</b>	in real time: all significant faults (fire, destruction of the arrester, exceeding the recommended measurements) once a day – UDP package; for other measurements (with default settings) once every seven days – MQTT package; for other measurements (with default settings)
<b>Communication</b>	4G/5G (LTE-M/NB-IoT with PSM) or LoRaWAN; bluetooth (for on-site device configuration and reading of measurements)
<b>Battery autonomy</b>	20 years; *using the device's default factory settings and with a stable mobile network that has the Power Saving Mode service enabled
<b>Housing material</b>	thermoplastic V-0 (UL 94), stainless steel A2 or A4
<b>Connection / material</b>	stainless steel A2 or A4
<b>Installation</b>	on grounding side of surge arrester or in the top third of the pole/tower
<b>Weight</b>	0,580 kg



## Technological Innovation iRAM

With EU co-financing, we started the development of the iRAM project. These are surge arresters with an integrated signal circuit. The measuring device and the communication module will be built into the housing of the medium and high voltage surge arresters. The signal will be received by the RAM-1, which it will forward to the SCADA systems or to a mobile/web application. The intelligent surge arrester iRAM is the first surge arrester of this kind globally.







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**Final Goal of the Project**

We are developing a new product – an intelligent system for remote monitoring of surge arresters and data analysis.

**The system consists of three key components:**

- An intelligent arrester that upgrades the standard arrester with a data collection and communication module
- A gateway device for data collection from the intelligent arresters and analysis on edge
- A cloud platform for performing complex analyses based on the microlocation of the arrester (predictive maintenance, determination of arrester condition, control of environmental parameters and mass data analysis for power grid control)

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