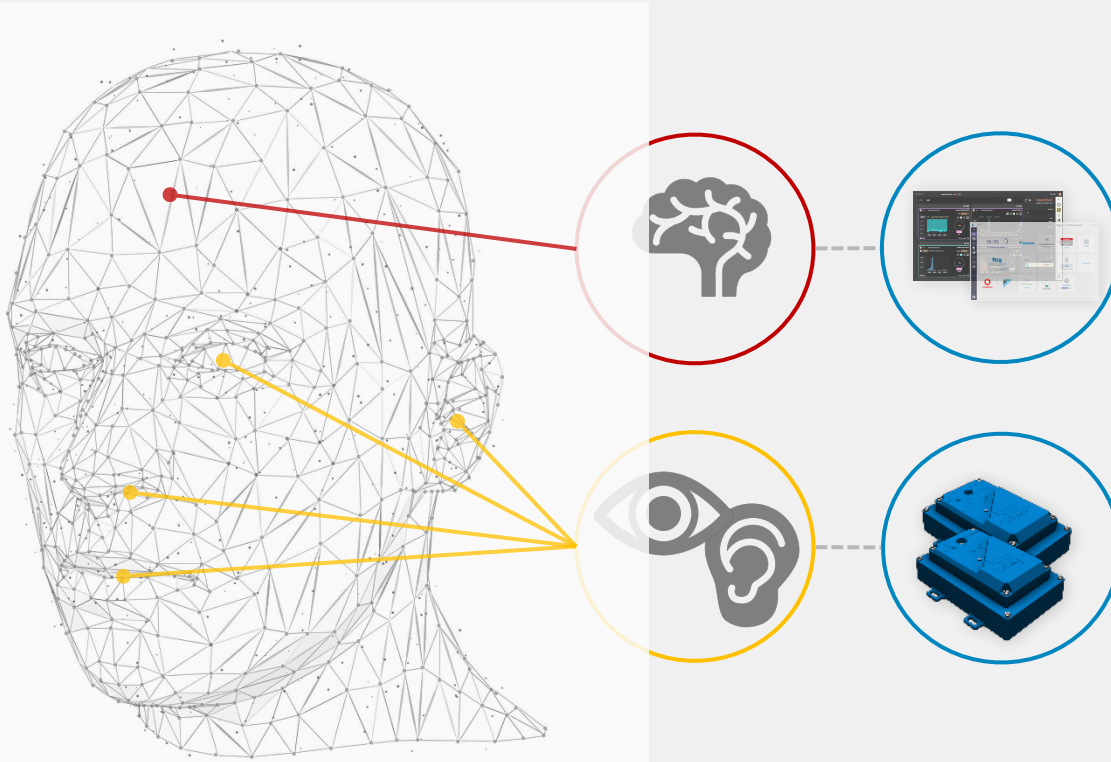


# Predictive Maintenance Solution

The solution for predictive maintenance of HVAC systems.



# Works like an experienced maintenance technician



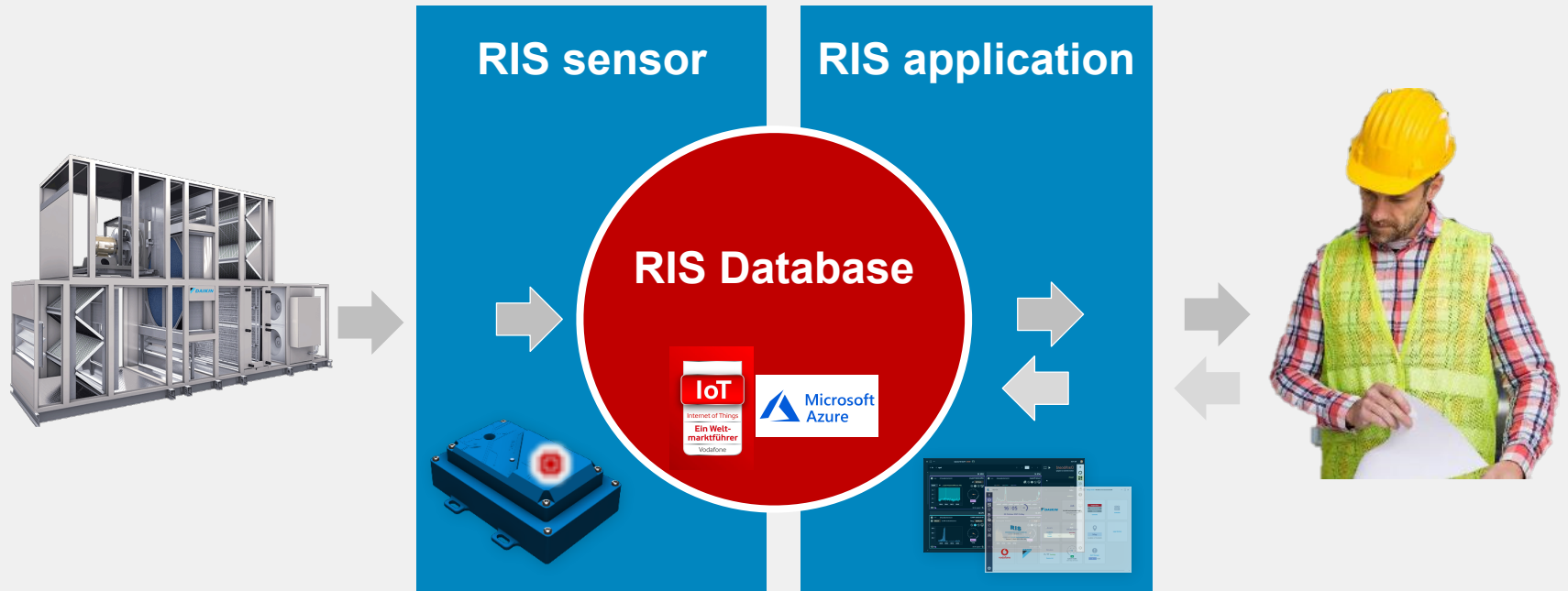
## Artificial intelligence

- based intelligent data platform
- Deep analysis results
- Ongoing optimisation

## Sensors

- Better perception as a human being
- Vibrations, noises
- Temperatures

# Predictive maintenance solution

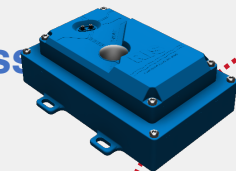


# Sensors

## Air filtration

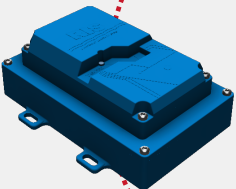
### Differential pressure

- Filter resistance
- Energy efficiency



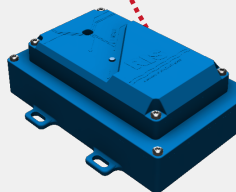
### Particles

- Air quality
- Filter service life



### Environment

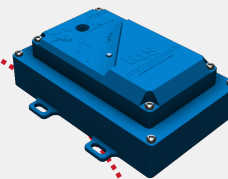
- Humidity
- Temperature



## Drives

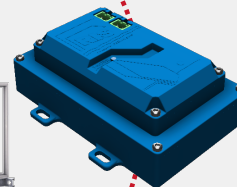
### Acoustics

- Rolling bearings
- V-belt



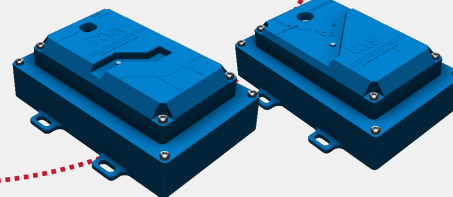
### Direct current

- Installation in control cabinets
- Power supplies



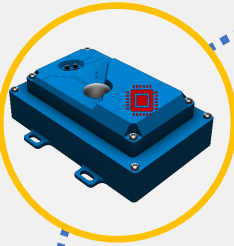
### Infrared temperature, thermal image sensor

- motors
- Surface temperature



# Digital data generation

**Measurement**  
Sensors provide data on the condition of the HVAC systems



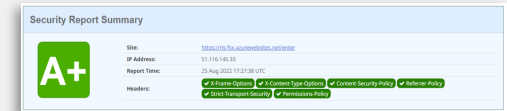
## Data transmission

Sensor measurement data is sent to the backend via **NarrowBand IOT**



## Data storage

The data is stored in the **Microsoft Azure Cloud** in accordance with the highest security standards.



## Visualisation

Recognise anomalies in real time.  
Take countermeasures from any location.



# IoT 4.0 - Vodafone

## LTE - narrowband network

- based on existing mobile networks
- high radio coverage
- Low energy consumption

## No gateway

- Unlike other providers, no gateway is required for data transmission
- Each device sends the data directly and encrypted to our cloud solution

## Battery operation

- Powerful battery packs for at least 3 years
- in a transmission interval of 24 hours



## Deep indoor capable

- Deep penetration of buildings
- through modulation processes and multiple transmissions
- Over 20 decibels higher power density than cellular networks

## National roaming

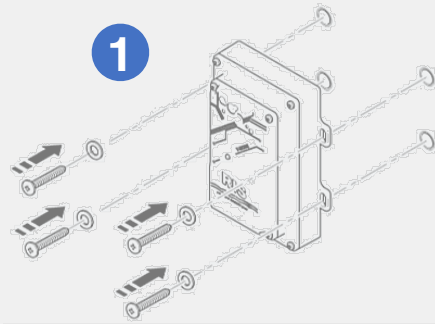
- If the signal is poor, devices change the network to another provider

## Autonomous functionality

# Installation and commissioning

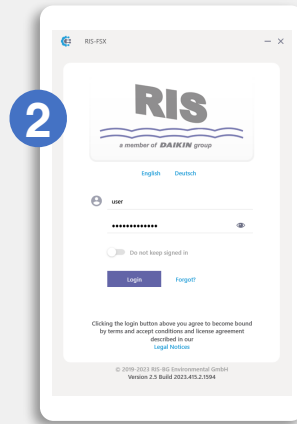
## Mounting the sensors

The sensors can also be attached to a suitable location using double-sided adhesive tape if screws are difficult to use.



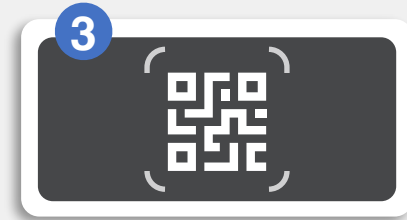
## Log in

to the preset Smart Data Platform environment using the login details provided.



## Scan the QR code

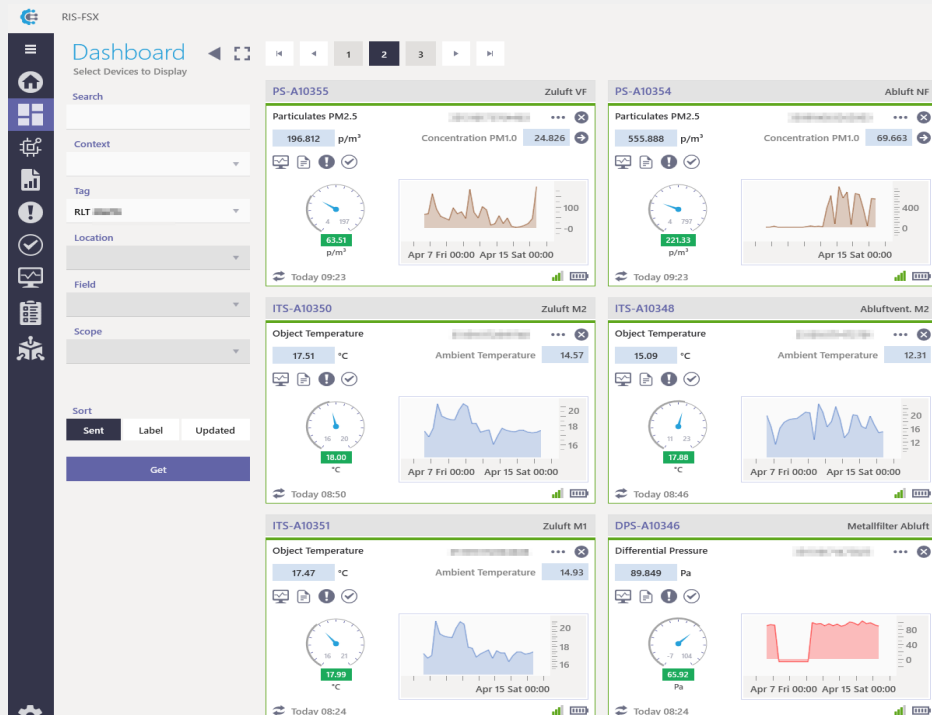
to add the sensor to the Smart Data Platform environment.



**Done! ... and ready for immediate use.**

# Dashboard - Process control centre (PLT)

- **Faceplates**  
Customised display for each device type
- **Process control centre**  
The faceplates are a process control centre with direct access to detailed measured values, allarm lists and audit trails
- **Search filter**  
Customised sensor search

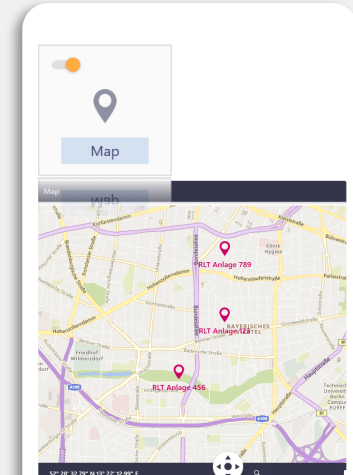
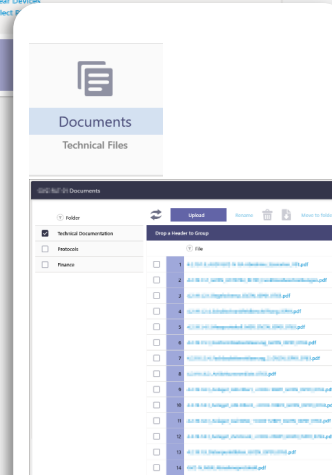
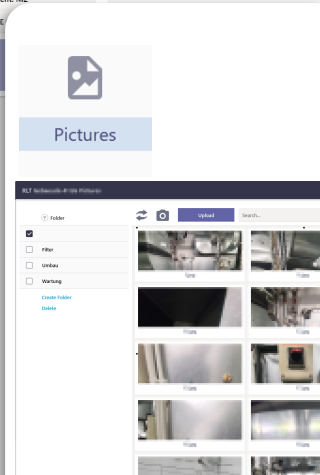
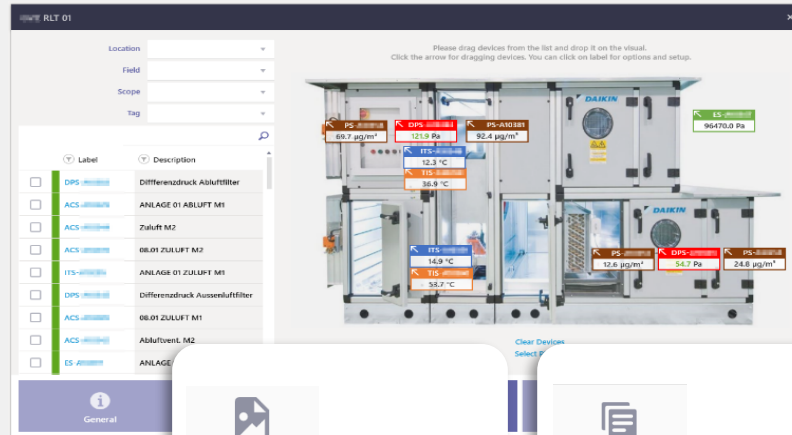




# Document management

- Photo documentation
- Maintenance log
- Filter management
- System visualisation

All documents and views are available on any type of stationary or mobile device.



# Amortisation calculation

Amortisation basis	p.a.
Saving energy	1.200 €
Filter change savings	255 €
Savings on maintenance	794 €
Savings on production downtime	2.500 €
Labour savings Operator	576 €
<b>Savings</b>	<b>5.325 €</b>
Operating costs	- 1.560 €
<b>= Amortisation (success)</b>	<b>3.765 €</b>
Investment (capital)	3.087 €



Amortisation period	Return on investment
<b>9.8 months</b>	<b>122 %</b> interest
$\frac{\text{Capital } \text{€ } 3,087}{\text{Success. } 3.765 \text{ €/J.}} = 0,82 \text{ J.}$	$\text{ROI} = \frac{\text{success } \text{€ } 3,765}{\text{Capital } \text{€ } 3,087}$



## Amortisation + interest

outstanding, due to high savings and favourable operating costs and investments

## Contact person

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