



ELECTRIFICATION – DISTRIBUTION SOLUTIONS BUSINESS LINE, 2021

ABB Ability™ Condition Monitoring for switchgear

SWICOM: modular diagnostic unit for your assets



Short introduction

Current market and transition

Current Market

- Focus on switchgear, breakers and relays
- Minimum life of 30 years for primary equipment and 15 years for electronic equipment
- Robust with low failure rates
- Higher consequence in case of failure

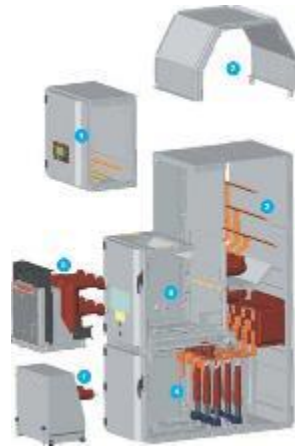
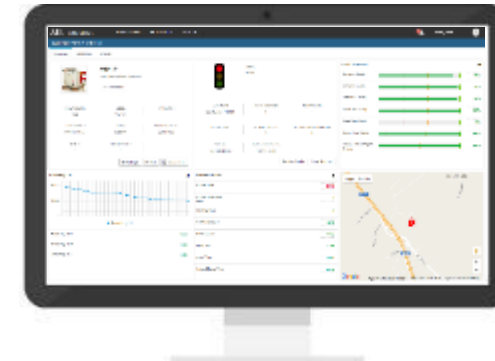


ABB Ability™

ABB offers more with digital solutions:

- Sensing equipment on board
- Software based solutions
- Communication between different layers and tools



Electrical distribution digitalization: an ABB Ability™

Asset management

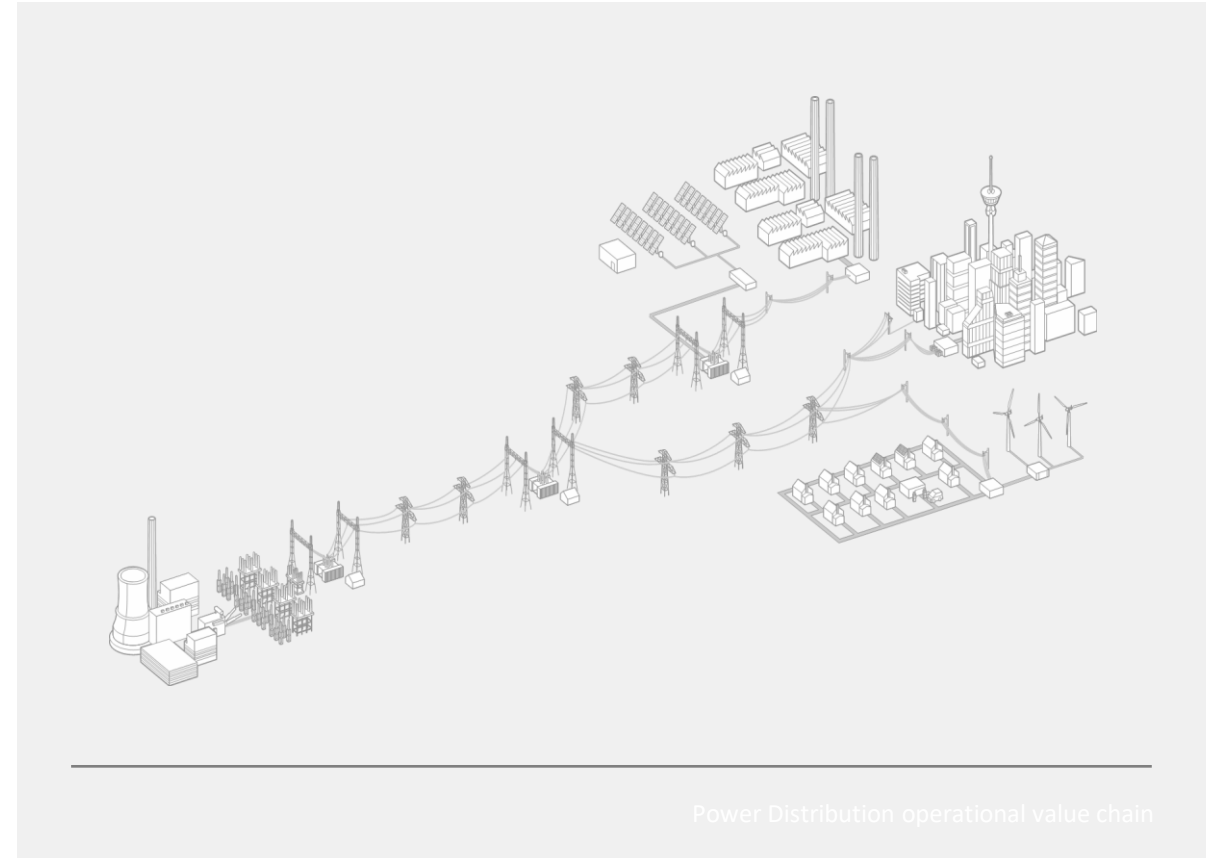
Find the optimum balance

Effective asset management

Effective asset management requires investment planning.
The owners need to be aware of:

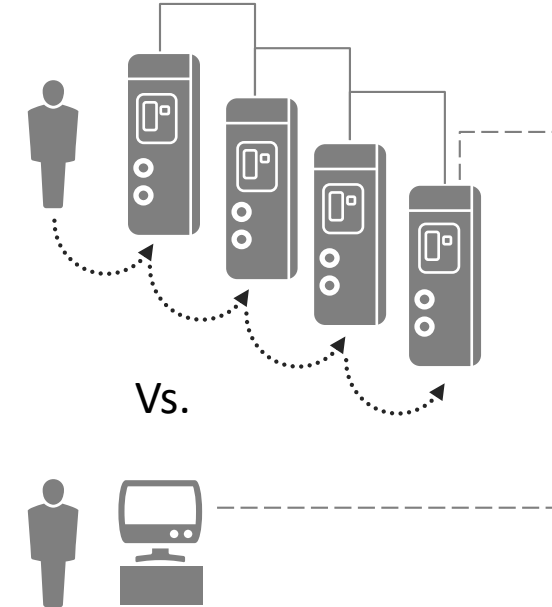
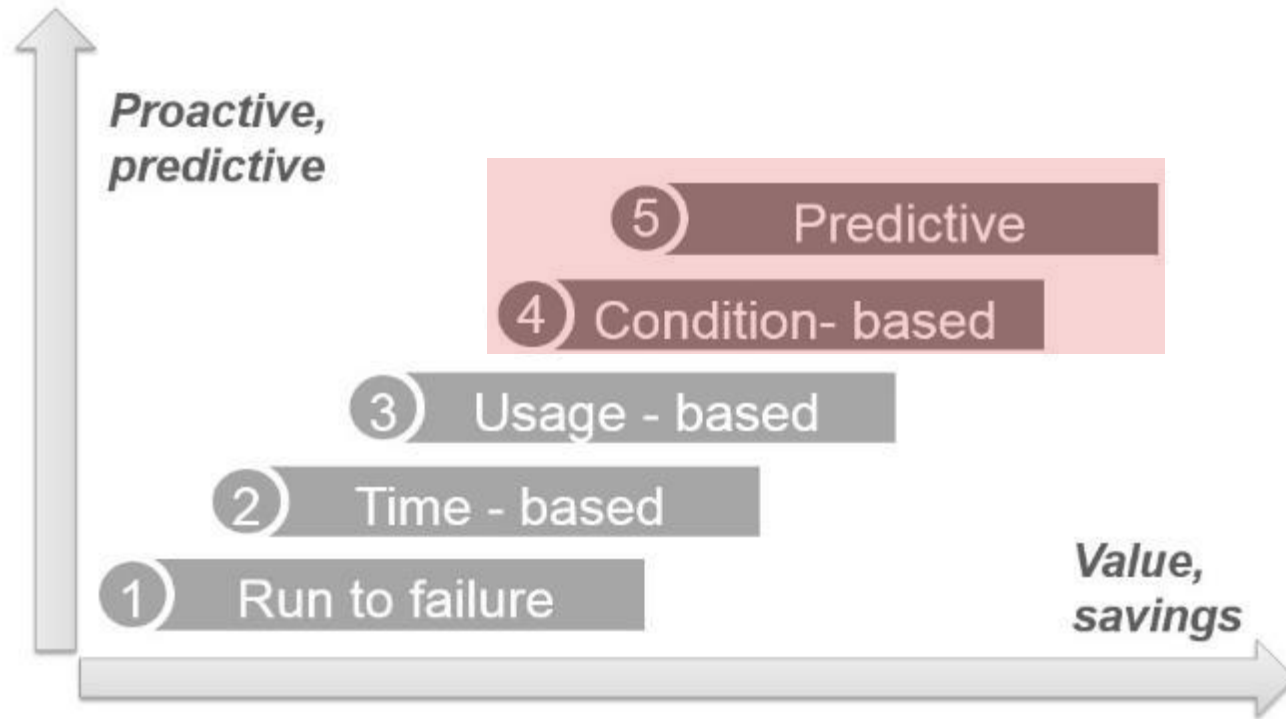
- Assets condition
- Risk level
- Failures consequences
- Life cycle status
- Retrofit investments

Optimal maintenance strategy



Asset health management

Maintenance strategies



Reduce labor costs by centralizing data collection and analysis

Value and savings at fingertips with advanced maintenance strategies

Choose a condition based maintenance solution

Reduce Opex, Maximize Uptime and Improve Safety



Transform preventive maintenance activities

By knowing real time asset health condition, manual inspection and preventive activities is not required. Perform maintenance when and where it is required.



Reduce probability of extraordinary events

Avoid extraordinary intervention through continuous supervision of the assets, which enable the possibility to plan the intervention in advance thus avoiding critical situation.

Reduce total cost of ownership

Optimizing maintenance

Asset type	SWAPs* level	Activities duration (h)	Activities duration with M&D (h)
Circuit breaker	Act	2	1.4
	Perform	2	1.4
Switchgear	See/Watch	0.5	0.35
	Act	0.75	0.525
	Perform	2.5	1.75

Legenda

S	See/ Visual
W	Watch/ In-dept Inspection
A	Act/ Basic maintenance
P	Perform/ Advance maintenance

upto **40%**

Maintenance activities cost reduction

30%

Reduction of time to do maintenance

30%

Maintenance activities duration's reduction

Standard conditions

Device/Year	0,5	1	1,5	2	2,5	3	3,5	4	4,5	5	5,5	6	6,5	7	7,5	8	8,5	9	9,5	10	10,5	11	11,5	12	12,5	13
CIRCUIT BREAKER						A				P						A				P						A
SWITCHGEAR				S		W		S		A				S		W		S		P				S		W
RELAY				W		A		W		W		W		W		A		W		P				W		A

Standard conditions with M&D

Device/Year	0,5	1	1,5	2	2,5	3	3,5	4	4,5	5	5,5	6	6,5	7	7,5	8	8,5	9	9,5	10	10,5	11	11,5	12	12,5	13
CIRCUIT BREAKER						A						P								A						P
SWITCHGEAR						W				S		A						S		W						P
RELAY				W		A		W		W		A		W		W		W		P				W		A

Reduction of unplanned labor cost maximizing uptime

Maximize uptime

Avoid unexpected failures

Before failure happen

- Digitalization informing before the system fails
- Know-how about the current asset
- Avoid possible failures help reduce production and asset loss

\$1.2M PER HOUR*

AVERAGE DOWNTIME COSTS FOR AN
AUTOMOTIVE INDUSTRY

\$740k PER OUTAGE*

AVERAGE DOWNTIME COSTS
FOR DATA CENTERS

\$4.4M PER DAY*

120,500 BARRELS OF OIL LOST
PER DAY OIL&GAS SEGMENT

\$150M PER OUTAGE

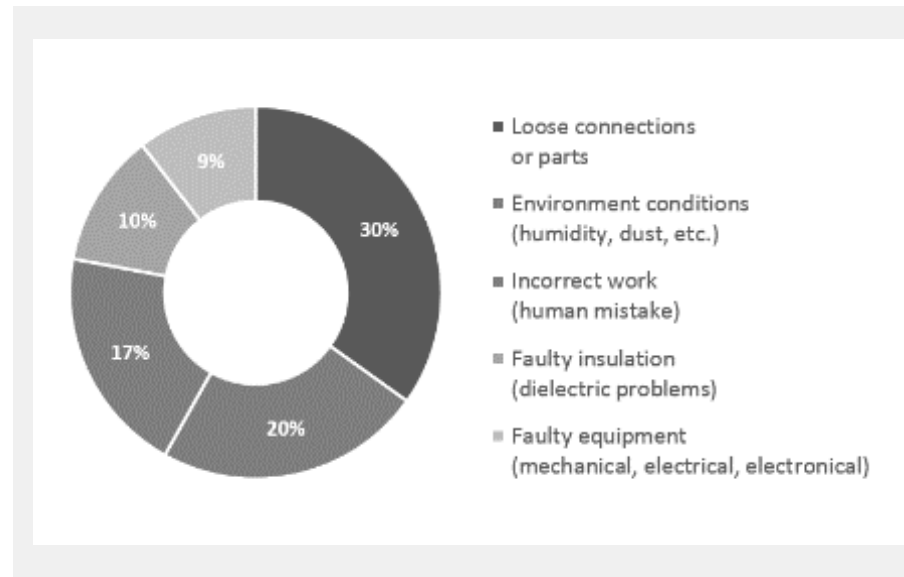
AIRLINE LOST A SWITCHGEAR WITH 3.7%
STOCK DROP IN 2 DAYS IN 2016

\$100k PER PANEL

STEEL WORKS LOSS PER YEAR PER PANEL

\$20k PER PANEL

ANNUAL LOSS IN SEMI-CONDUCTOR
PRODUCTION



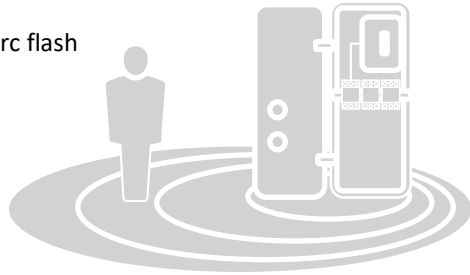
Improve safety

Avoid unexpected failures

Operate more safely

Keep your personnel out of the arc flash zone

Personnel must enter arc flash zone.
4000 injuries occur in the US each year *



Vs.

Remote communications enabled, data can be safely transmitted to a remote location



~300 ANNUAL DEATHS IN US ALONE ARE CAUSED BY ENERGIZED ELECTRICAL EQUIPMENT

80% OF ALL ELECTRICAL ACCIDENTS ARE CAUSED BY ARC FLASH INCIDENTS

\$1M TO 15M

POTENTIAL COST OF ONE ARC FLASH INCIDENT*



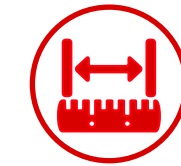
19,000°C (35,000° F) Hotter than you can imagine
Arc Flash temperatures are hotter than the sun.



1,100kmph (700 mph) Projectile-producing pressure
Arc flash can throw workers across a room. Metal and equipment become shrapnel.



+2,000 burns More than one way to burn you
Each year 2,000+ people seek treatment for serious Arc flash burns.



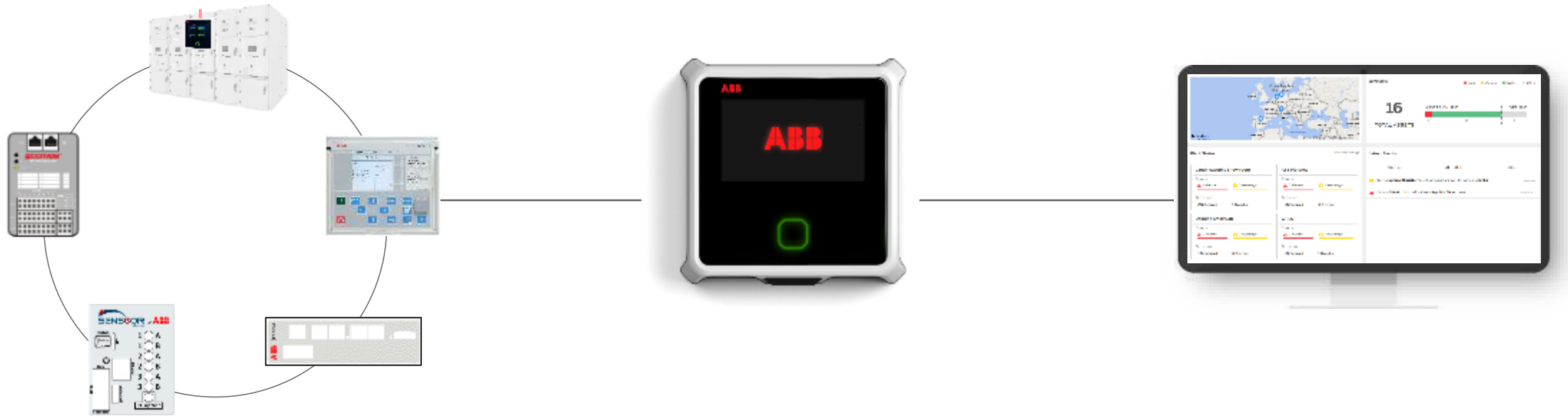
3 meters (10 feet) Too close for comfort
Arc flash can reach out 3 meters to take a life. Serious-injury zone is even larger.



140 dB An assault on your senses
Light and sound bursts can cause vision and hearing loss.

With SWICOM enable condition based maintenance for your plant

An integrated scalable system to monitor your assets.



An intelligent and connected electrical infrastructure designed for real time supervision of the asset condition

An advanced hub receiving rough data, elaborating them and transmitting the information to SCADA.

A platform to manage the whole plant, knowing the KPIs and enabling advanced maintenance

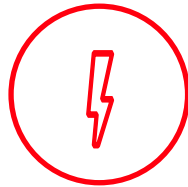
Modular and scalable maintenance of your plant

An integrated scalable system to monitor your assets.



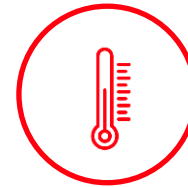
Breaker diagnostic

Discover in advance mechanical or electrical anomalies that can lead to a breaker failure



Partial discharges detection

- Prevent arc flash
- Prevent catastrophic equipment failure.



Temperature diagnostic

- Detect loose joints
- Identify load unbalance
- Prevent temperature related failures.

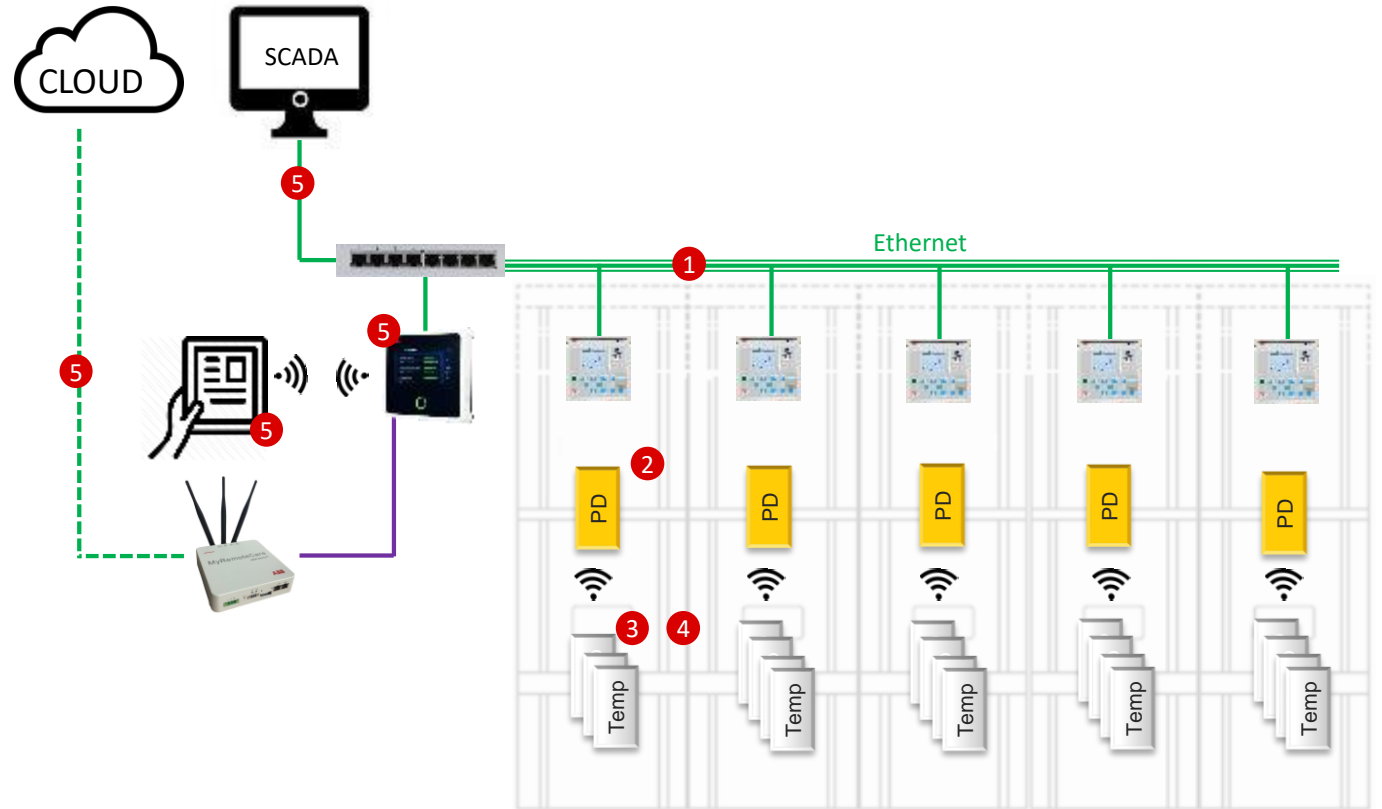


Data visualization

- Verify the overall status of the plant,
- Schedule maintenance activities wherever you are

Available offerings:

1. Breaker monitoring through Relion relays
2. Partial Discharge detection through UHF
 - I. Suitable for green and brown field applications
3. Wireless Temperature monitoring
 - I. Suitable for IEC and ANSI, AIS and GIS-(cables), ABB and non-ABB, green and brown field switchgear
4. Data visualization
 - I. SCADA
 - II. MyRemoteCare Cloud
 - III. Local HMI/Mobile APP

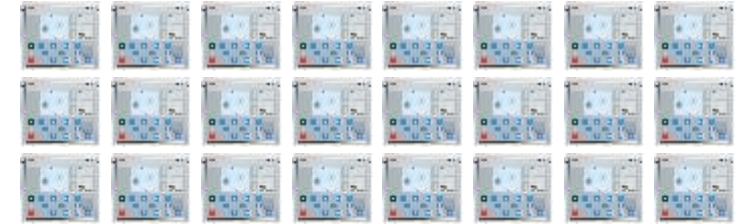


Modular and scalable maintenance of your plant

1. Breaker diagnostic



IEC 61850



1 SWICOM can be connected up to 24 numbers RE_615/620
Relays are acting as sensor

2. Partial discharge detection

3. Temperature diagnostic

4. Data visualization

SWICOM, the intelligent hub for breaker diagnostic.

Monitor your circuit breakers through retrieving rough data from RE_615-20 protection relay. Connection is achieved simply by using IEC61850 protocol through ethernet cable.



Monitored parameters:

- Opening and closing times,
- spring charging time,
- slipping and failed spring charging attempt,
- number of operations,
- inactivity days,
- remaining life estimation,
- Contact wear,
- SF6 pressure,
- trip coil supervision
- ambient temperature and humidity (through Swicom)

Modular and scalable maintenance of your plant

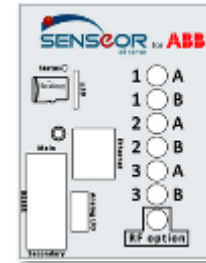
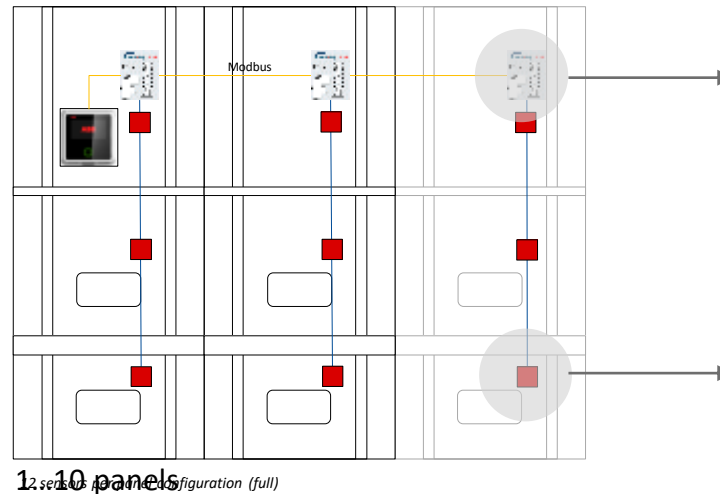
Partial discharge is the leading arc flash symptoms, use SWICOM to constantly detect it and make a timely assessment.

1. Breaker diagnostic

2. Partial discharge detection*

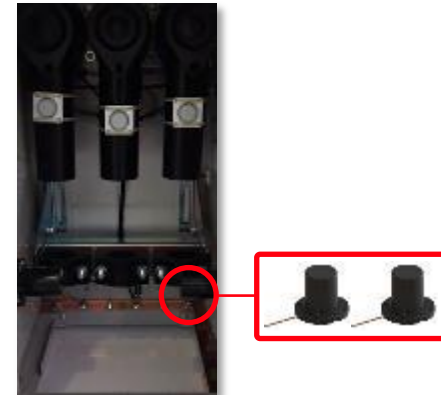
3. Temperature diagnostic

4. Data visualization



In case of partial discharge, a different power powerful reader is used.

The antenna is used to detect Partial discharge signals using UHF technology. In this case system simultaneously is used for temperature and partial discharge detection



Modular and scalable maintenance of your plant

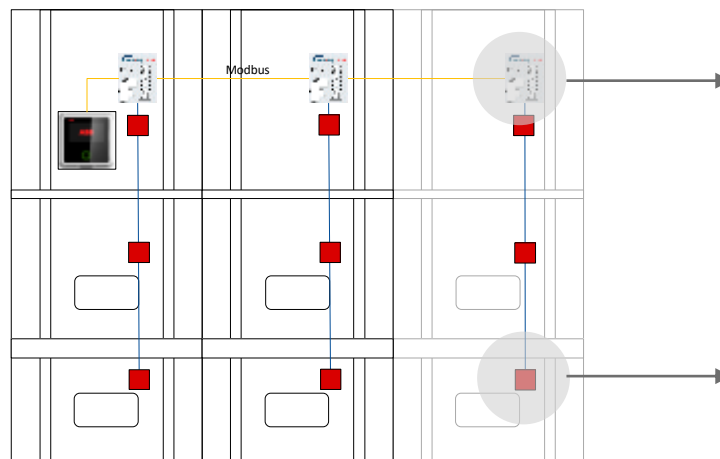
Temperature rise is a critical phenomenon that can lead to arc flashes, you can constantly monitor it with SWICOM. Applicable for AIS/GIS, Green and brownfield

1. Breaker diagnostic

2. Partial discharge detection

3. Temperature diagnostic

4. Data visualization

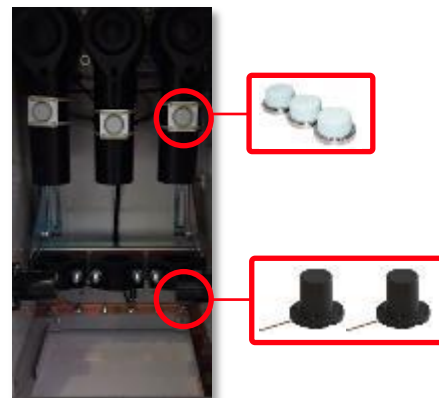


12 sensors per panel configuration (full)



The Reader acquires temperatures from power parts (it consumes less than 0,5 W)
It is installed in the LV compartment

The Sensors monitor the temperature (1 per phase)
They are wireless and batteryless, with 30 years lifecycle
They communicate via radio frequency with the Reader to provide registered measurements



The antenna is the signal amplifier.
Two antennas have to be installed in the power compartment where the sensors are installed
It allows a stable and efficient communication between the Reader and SAW sensors

Modular and scalable maintenance of your plant

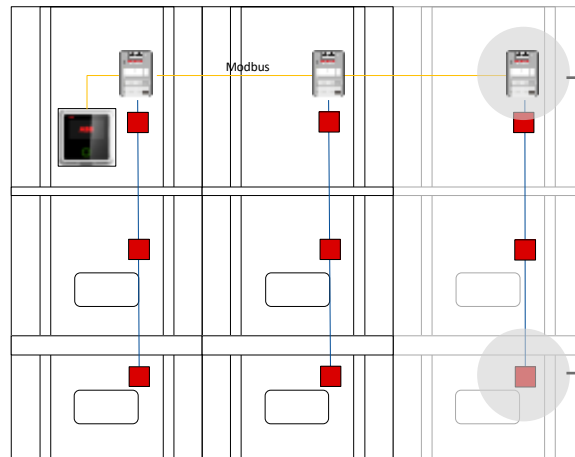
Temperature rise is a critical phenomenon that can lead to arc flashes, you can constantly monitor it with SWICOM.

1. Breaker diagnostic

2. Partial discharge detection

3. Temperature diagnostic

4. Data visualization



12 sensors per panel configuration (full)

The Reader acquires temperatures from power parts (it consumes less than 0,5 W)
It's installed in the LV compartment

The IR Sensors monitor the temperature (1 per phase) with infrared technology
They're not in contact with power part and have a 30 years lifecycle
They communicate with the Datacard to provide registered measurements

The GIS Sensors monitor the temperature (1 per phase) in the cable termination
They're tailor made for GIS switchgears.
They communicate with the Datacard to provide registered measurements

Modular and scalable maintenance of your plant



SWICOM provides a local HMI and the APP mobile, [Play Store](#), [Apple Store](#)



1. Breaker diagnostic

2. Partial discharge detection

3. Temperature diagnostic

4. Data visualization

Monitor your plant



Local



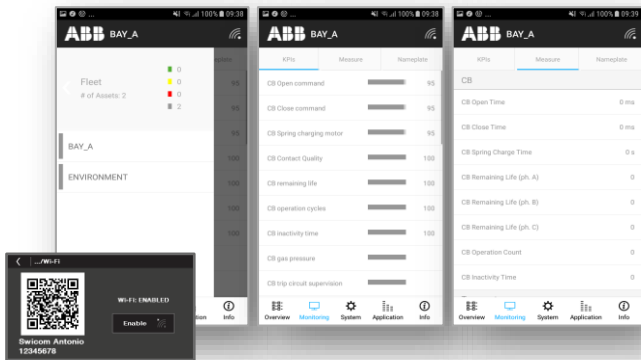
Mobile



Control room

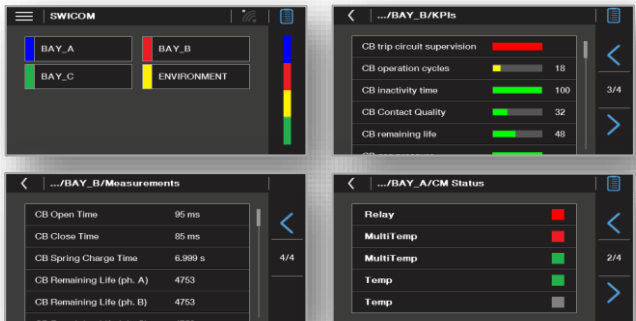


Cloud



SWICOM app

Connection via Smartphone/Tablet
Data visualization enabled wherever I am in the cabinet



Local HMI to visualize:

diagnostic, health status, measurements, KPIs
and sensors connectivity status

Modular and scalable maintenance of your plant



With SWICOM it's possible to provide KPI and measurement data control room,, using Modbus over TCP/IP or IEC61850 protocols

1. Breaker diagnostic

2. Partial discharge detection

3. Temperature diagnostic

4. Data visualization

Monitor your plant



Local



Mobile



Control room



Cloud



SWICOM provides the KPIs to the control room via IEC61850, as for REF615/620



● IEC 61850

Modular and scalable maintenance of your plant



With cloud prognostic

With MyRemoteCare cloud platform it's possible to evaluate overall plant health status by remotely, plan maintenance activities and having ABB Experts support in case of need.

1. Breaker diagnostic

2. Partial discharge detection

3. Temperature diagnostic

4. Data visualization

Monitor your plant



In loco



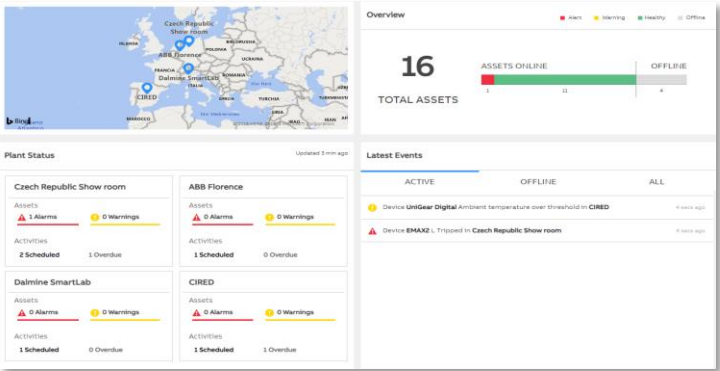
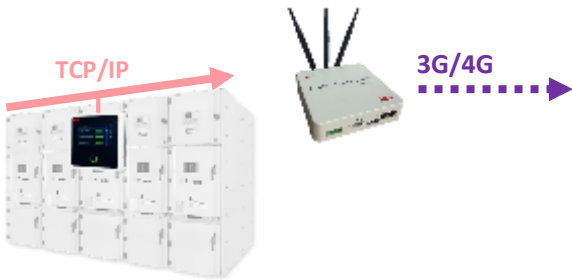
Mobile



In locale



Cloud



Enable Cloud solution with advanced algorithms
Multiplant data visualization, optimized asset management
Dashboard, reports and alert notifications real time
Cybersecurity proof network

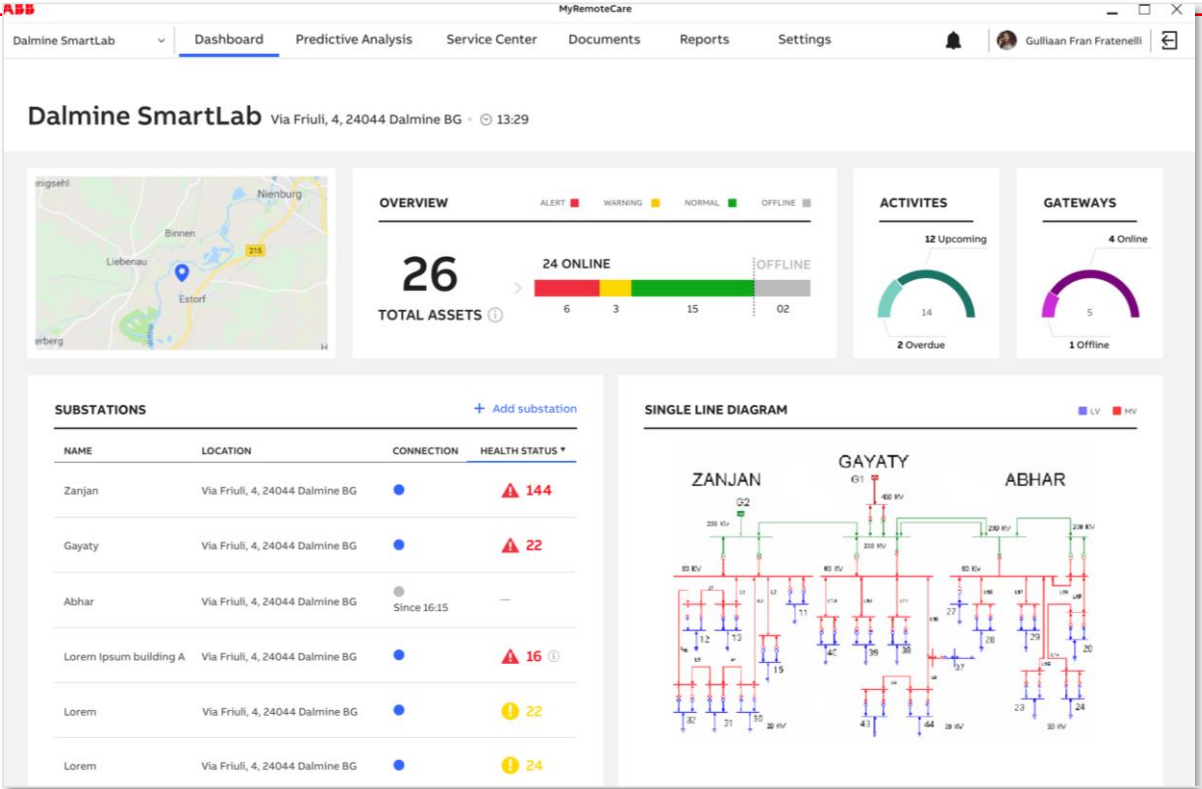
Modular and scalable maintenance of your plant

1. Breaker diagnostic

2. Partial discharge detection

3. Temperature diagnostic

4. Data visualization



With cloud prognostic



Real time plant supervision

Monitor your asset throughout its life

Mange on site activities...remotely

Plant geolocation

Schedule activities

Applications

Sector and real cases



Energy distribution companies

Utility



Industries in which process continuity is vital

Industry



Sectors and infrastructure in which it's necessary to maximize efficiency of the plants, e.g. marine

**Other
Critical Power**

Solution for new and existing switchgears



Why ABB

Technical advantages

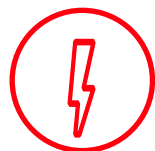


One integrator for sensors which gives overall health



Breaker diagnostic without any additional sensor

We are the forefront in our sector, using protection relays already installed in the switchgear



First to propose partial discharge detection through a cost effective solution accessible for everyone

Balance between costs and benefits, with a competitive price



Wireless sensors and without batteries

Lifecycle up to 30 years
Inspection free (every 15 years)



ABB