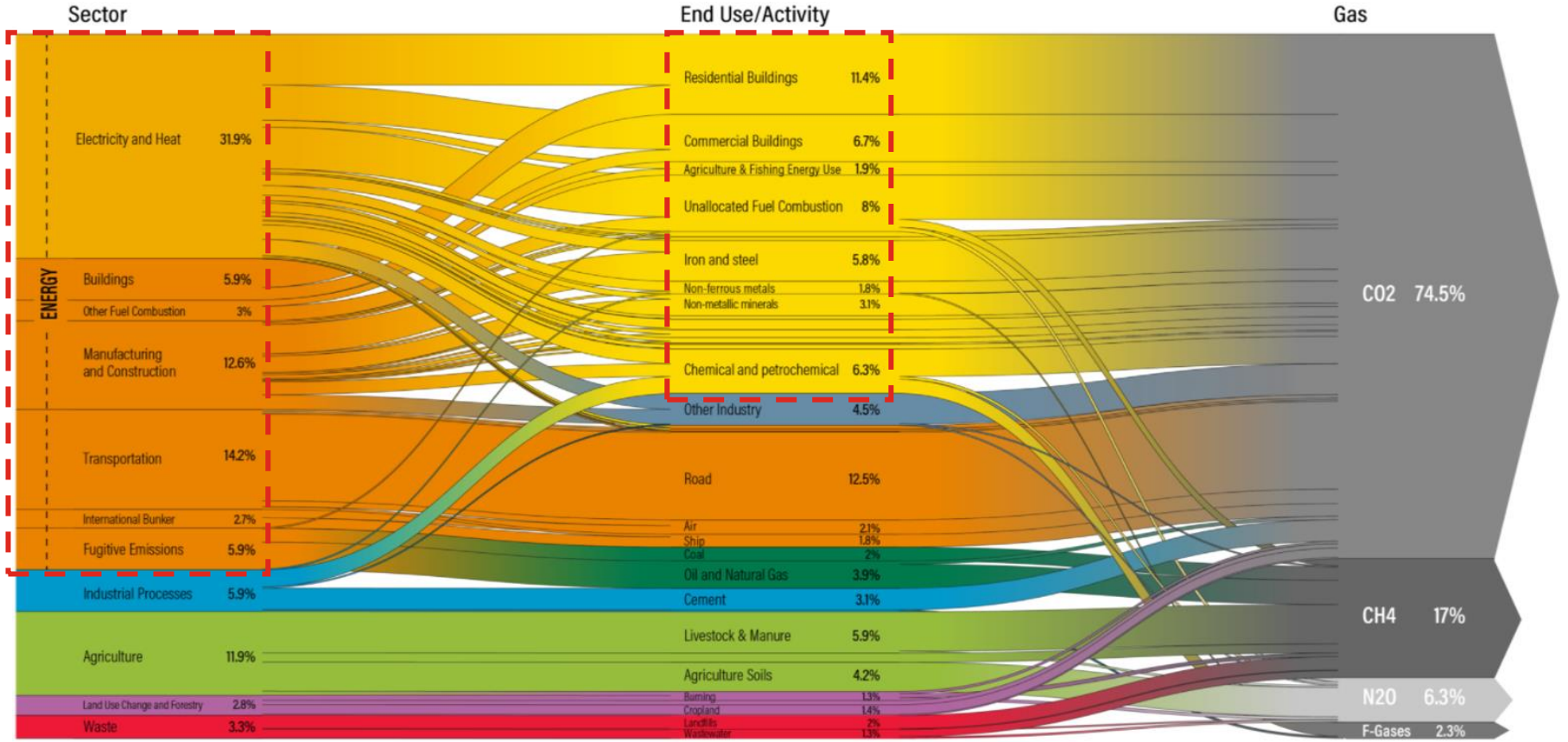
Solving electrical outages: Continuous Thermal Monitoring Solution

Unlock safer, more resilient and efficient operations

Onur Özcan | Critical Infrastructure Segment Leader (EMEA) – Country Sales Leader (Türkiye, France & Balkans)

Final World Greenhouse Gas Emissions 2018

Energy Use Causes 75% of Greenhouse Gas Emissions

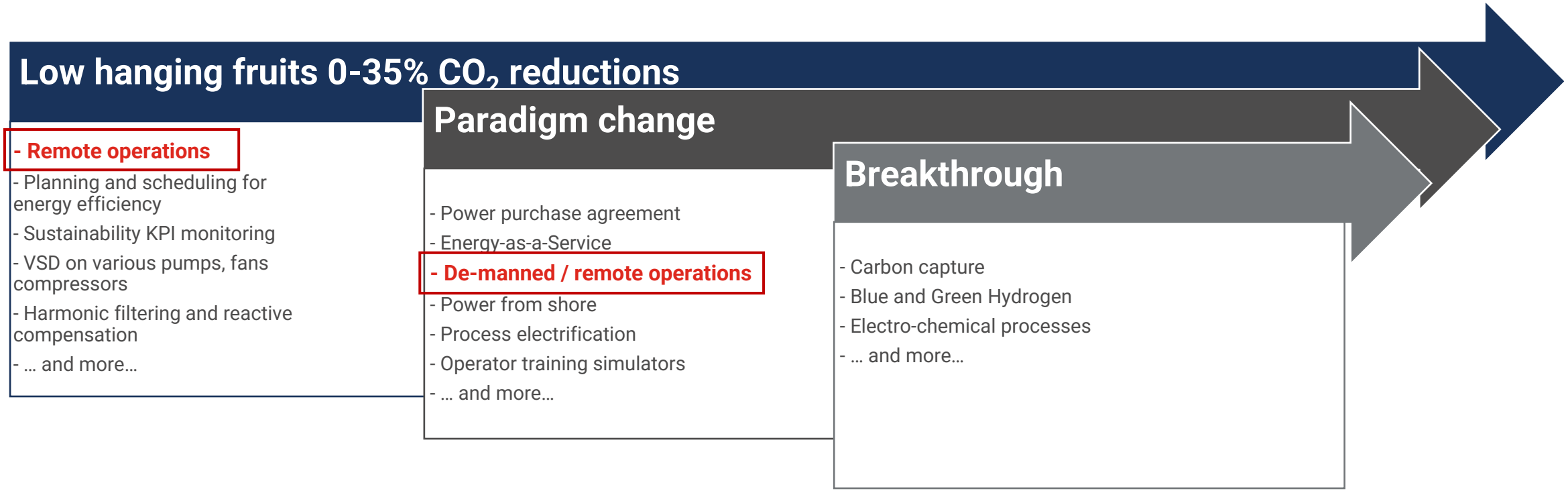


The 1.5 degree trajectory requires us to reduce 90% of our emissions by 2050.

Source: World Resources Institute, Greenhouse Gas Emissions on Climate Watch

Decarbonization journey towards Net Zero Ops

Energy Use Causes 75% of Greenhouse Gas Emissions



Severity and consequences of an electrical failure

Physical – financial – legal – social

~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*

1% = 3.65 days
OR **$5 million**

$38M

ANNUALLY

1% Unplanned downtime (3.65 Days) can cost over $5 million. Average is approx 27 days of downtime each year = $38 million annually in financial impacts.

Average is 27 days
OR **$38 million**

$88M

ANNUALLY

For the worst performers, the negative financial impact can be upwards of $88 million annually

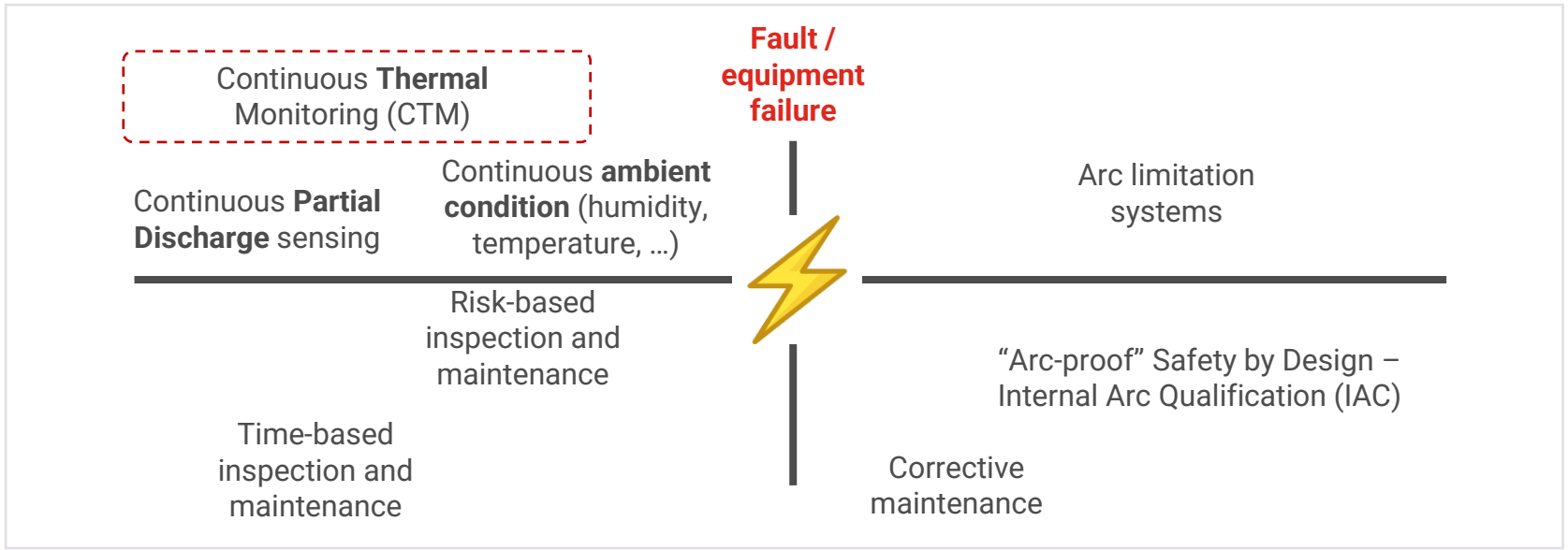
POWER ON. PEACE OF MIND

Source: www.ecmweb.com/contractor/electrical-safety-foundation-international-unveils-how-do-you-know-workplace-safety-progr
*A 1999 Electric Power Research Institute (EPRI) study pegged total direct and indirect costs of an arc flash incident

EXERTHERM®

Areas of focus for operational improvement

… and where Exertherm plays

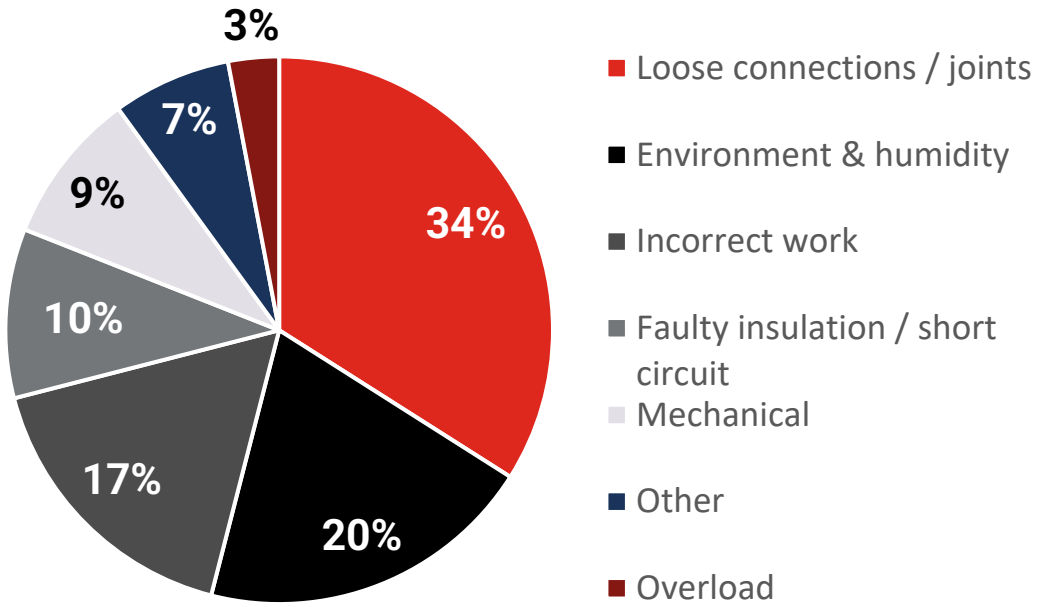


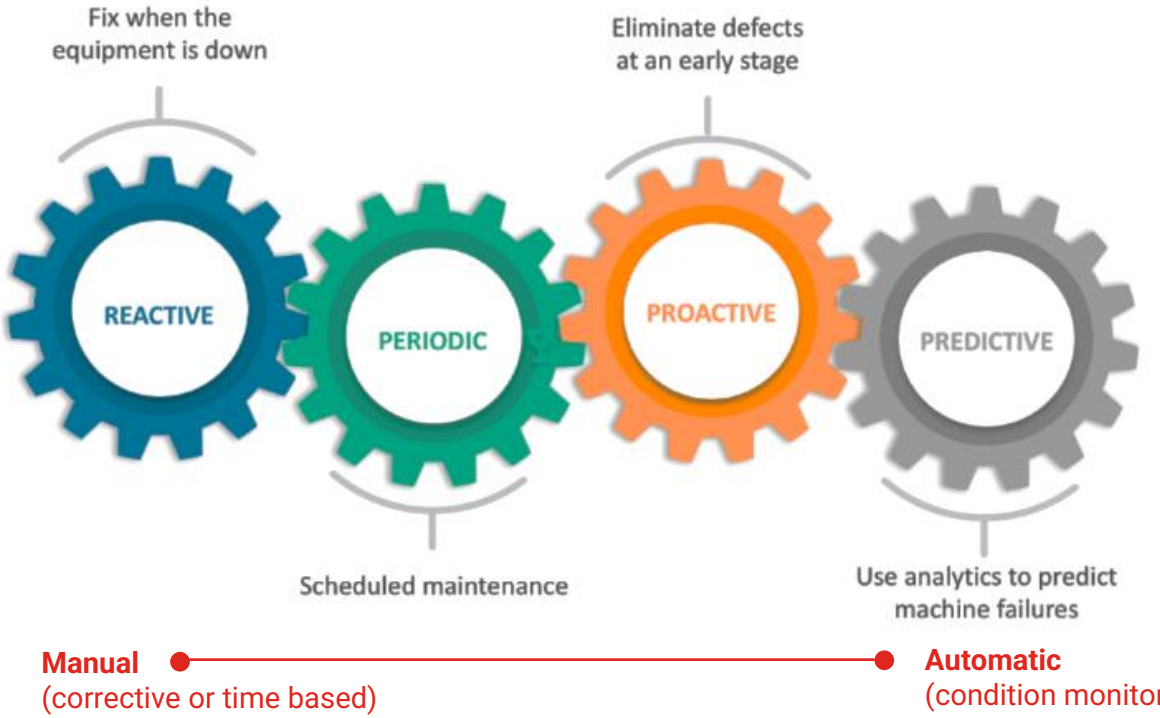
Before fault –
inspection & maintenance strategies

After fault –
arc limitation / effect mitigation

Maintenance strategy evolution

Failure causes and mitigation approaches





EXERTHERM

The complete solution

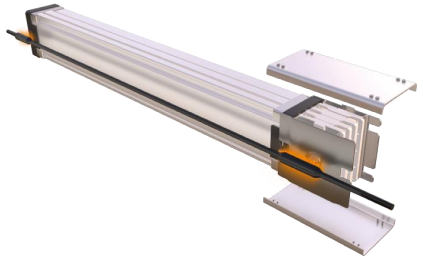
MV & LV Switchgear

Transformers

MCC

UPS & PDU

Busduct



- UNIFORMITY OF DATA
- INCREASED SAFETY
- INCREASED UPTIME & EFFICIENCY
- ON-GOING VALUE
- REDUCED RESOURCES

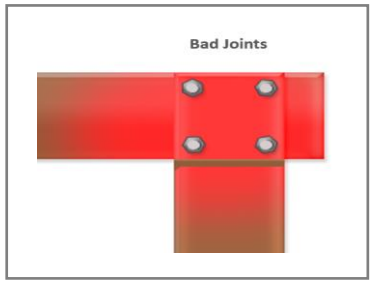
LV / MV Switchgear

24x7 Thermal Condition Monitoring

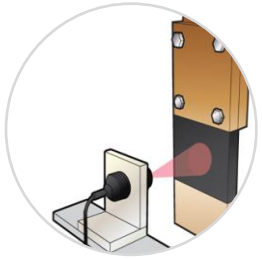
Exertherm – the complete solution

LV & MV Switchgear

Bus



Cable



IR Sensors

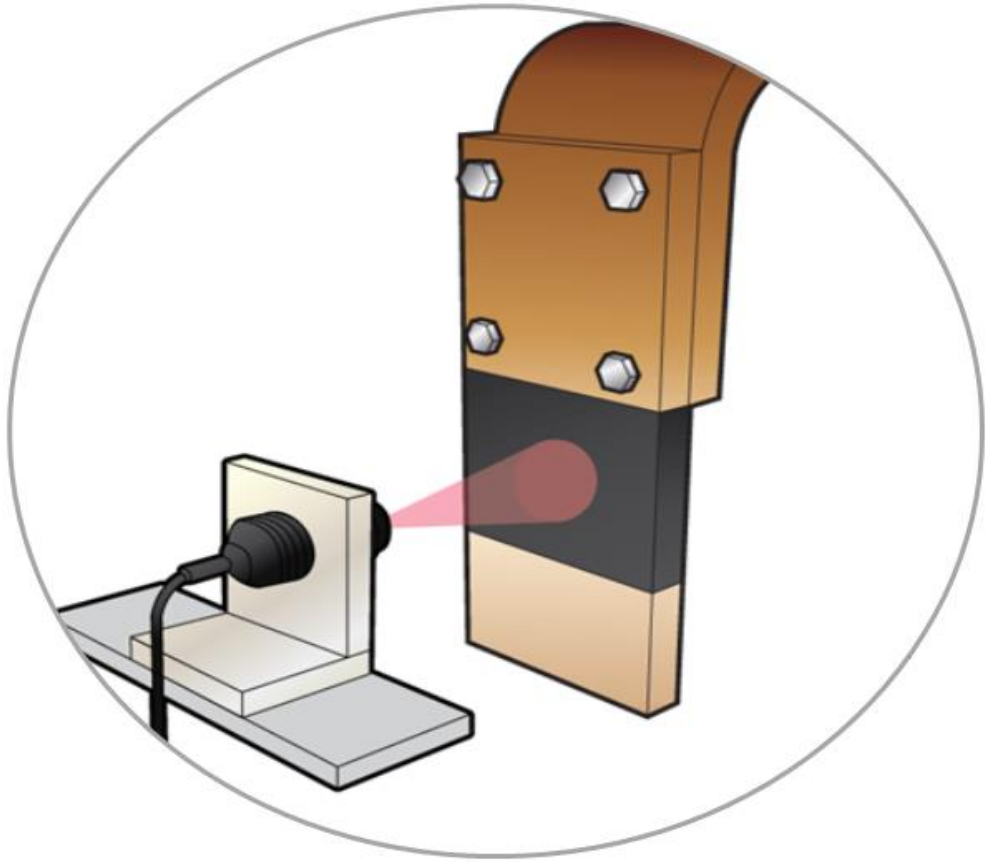
EM Cable Sensors

Modbus Datacards

ARM XL (LoadMap)

The Technology Evolution…

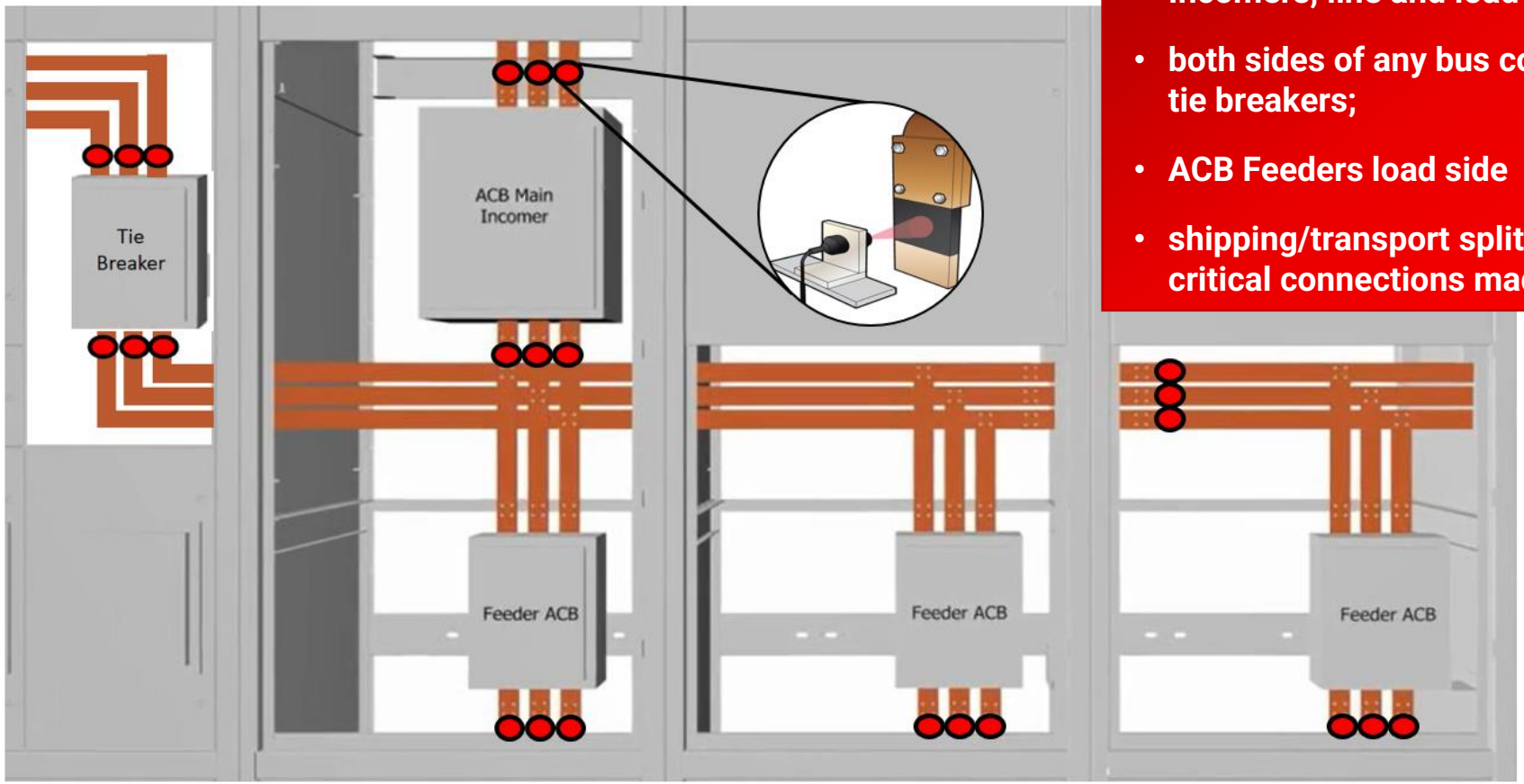
The IR Sensor – the Next Technology Step



- INFRARED / DELTA T
- NON-POWERED
- NON-CONTACT
- ZERO MAINTENACE
- LIFETIME WARRANTY

LV Switchgear

The IR Sensor



LV Busbar Joints

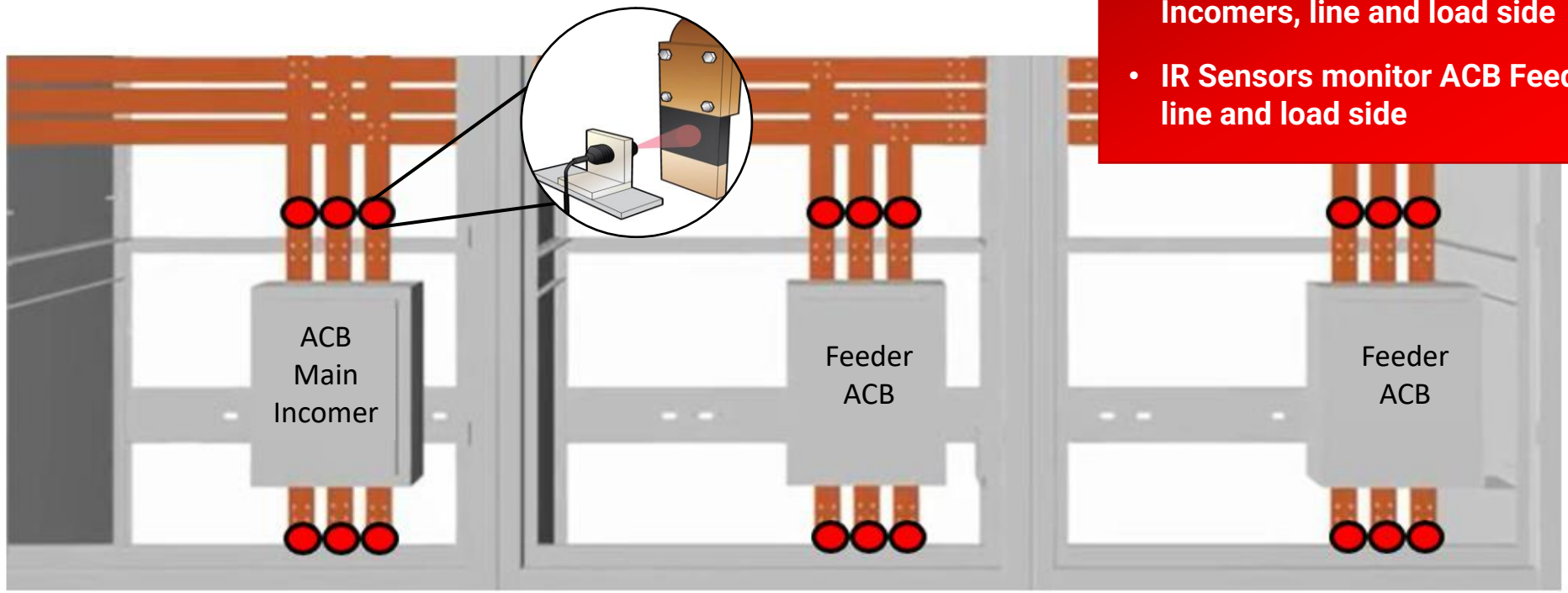
- IR Sensors monitor ACB Main Incomers, line and load side
- both sides of any bus couplers or tie breakers;
- ACB Feeders load side
- shipping/transport splits and other critical connections made on-site

MV Switchgear

The IR Sensor

MV Busbar Joints

- IR Sensors monitor ACB Main Incomers, line and load side
- IR Sensors monitor ACB Feeders, line and load side



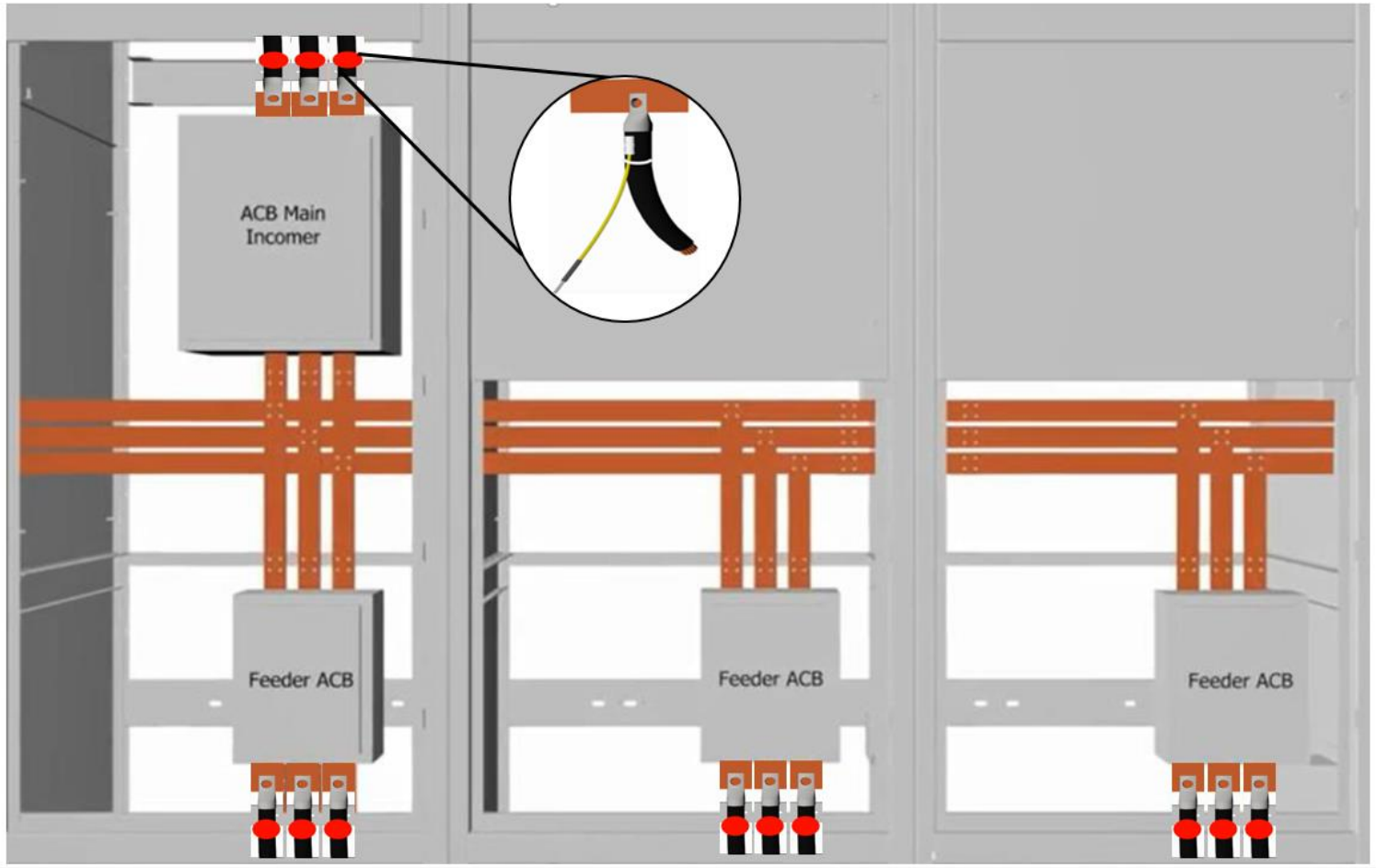
The Technology Evolution…

The EM Cable Sensor - The Next Technology Step

- DELTA T
- NON-POWERED
- ZERO MAINTENACE
- LIFETIME WARRANTY

LV Switchgear

EM Cable Sensor



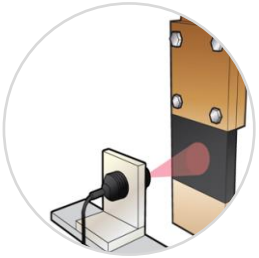
Transformer

24x7 Thermal Condition Monitoring

Exertherm – The complete solution

Transformer

Transformer

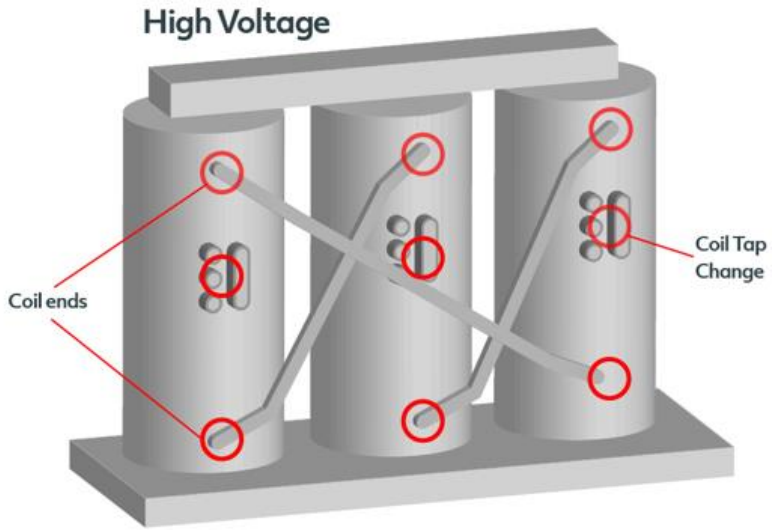


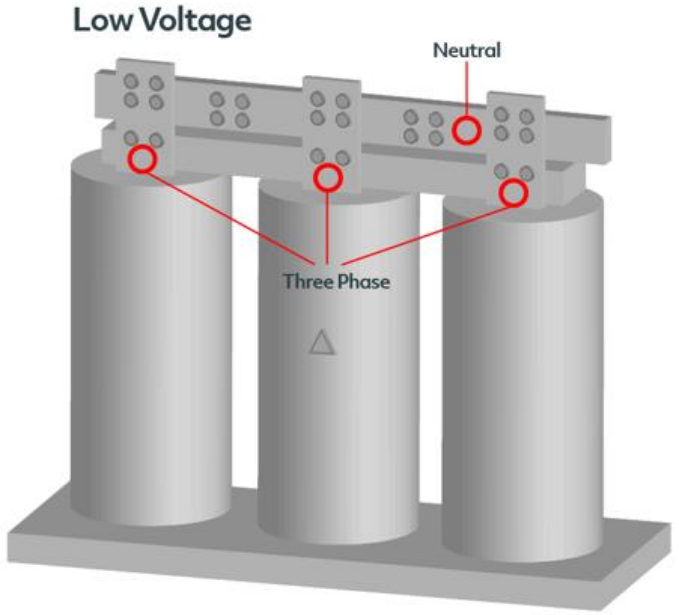
IR Sensors

Modbus
Datacards

Transformer 24x7 Thermal Monitoring

Both HV and LV sides of the transformers are monitored
Circled areas show the monitoring points:





For High Voltage:

- IR Sensors continuously monitor both ends of each coil
- also continuously monitor coil tap connection

For Low Voltage:

- IR Sensors continuously monitor the three phase and neutral

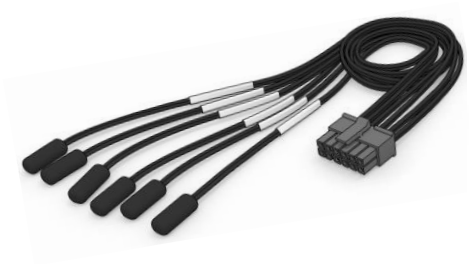
MCC (Motor Control Center)

24x7 Thermal Condition Monitoring

Exertherm – The complete solution

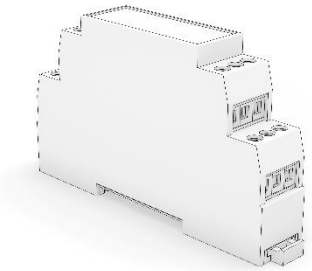
MCC

MCC

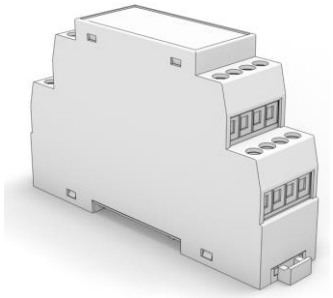


Sensor Loom

LED



MCC Modbus Datacard



MCC Modbus Aggregator

ARM XL (LoadMap)

Exertherm – the complete solution

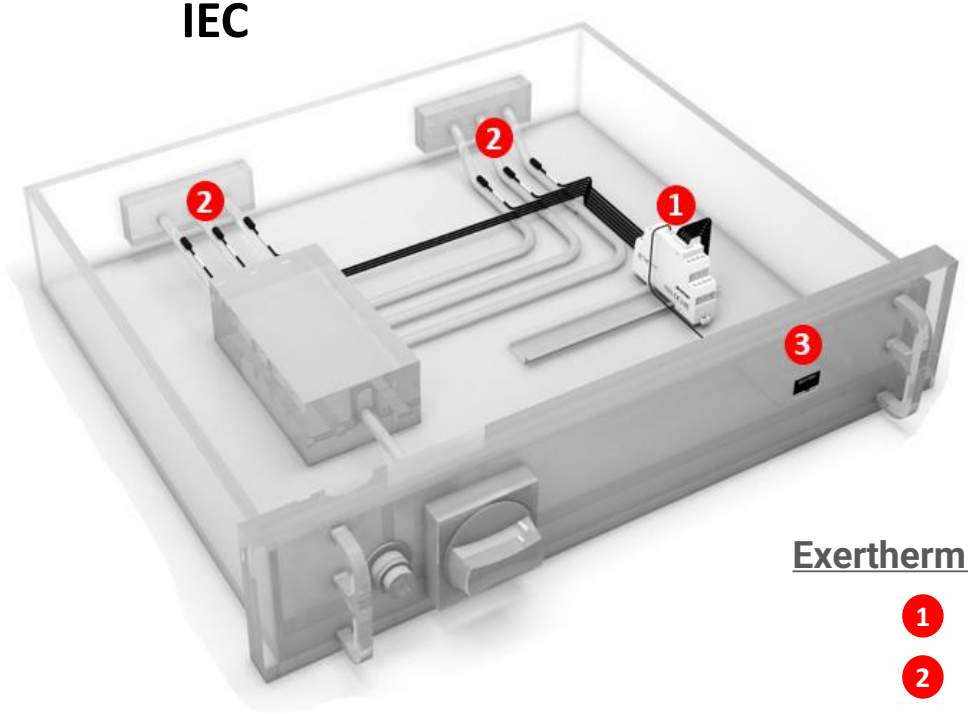
MCC (Motor Control Center)

- Vendor neutral
- Retrofit / new build
- Fit within drawer
- Require no maintenance
- Simple to install
- Low cost
- Accurately identify fault without false alarms

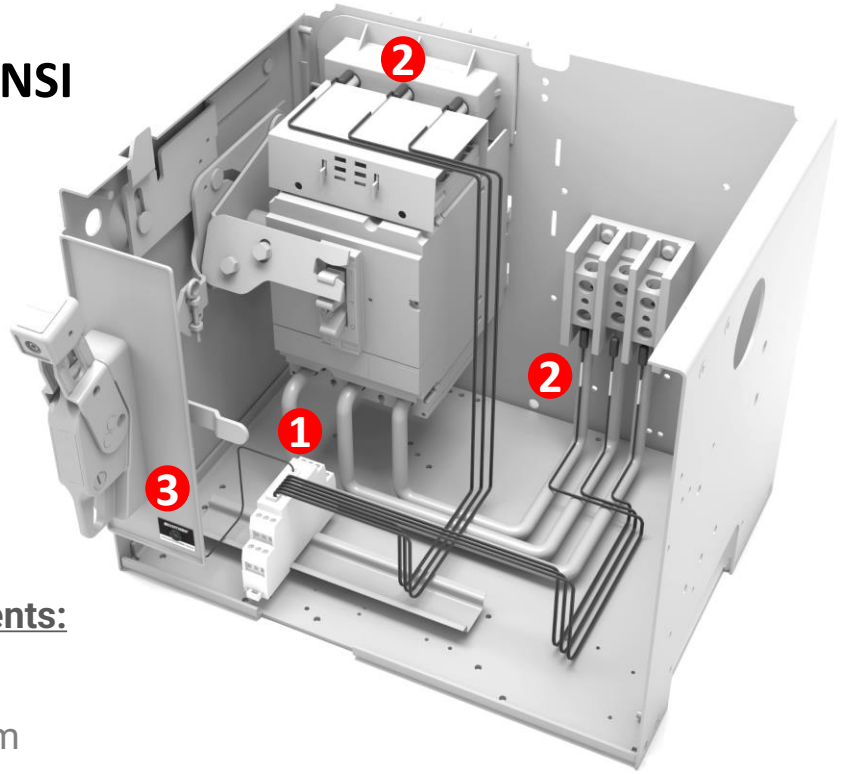
MCC ‘In-drawer/bucket’ Thermal Monitoring

Supplied in kit form per bucket

IEC



ANSI



Exertherm MCC Kit/Components:

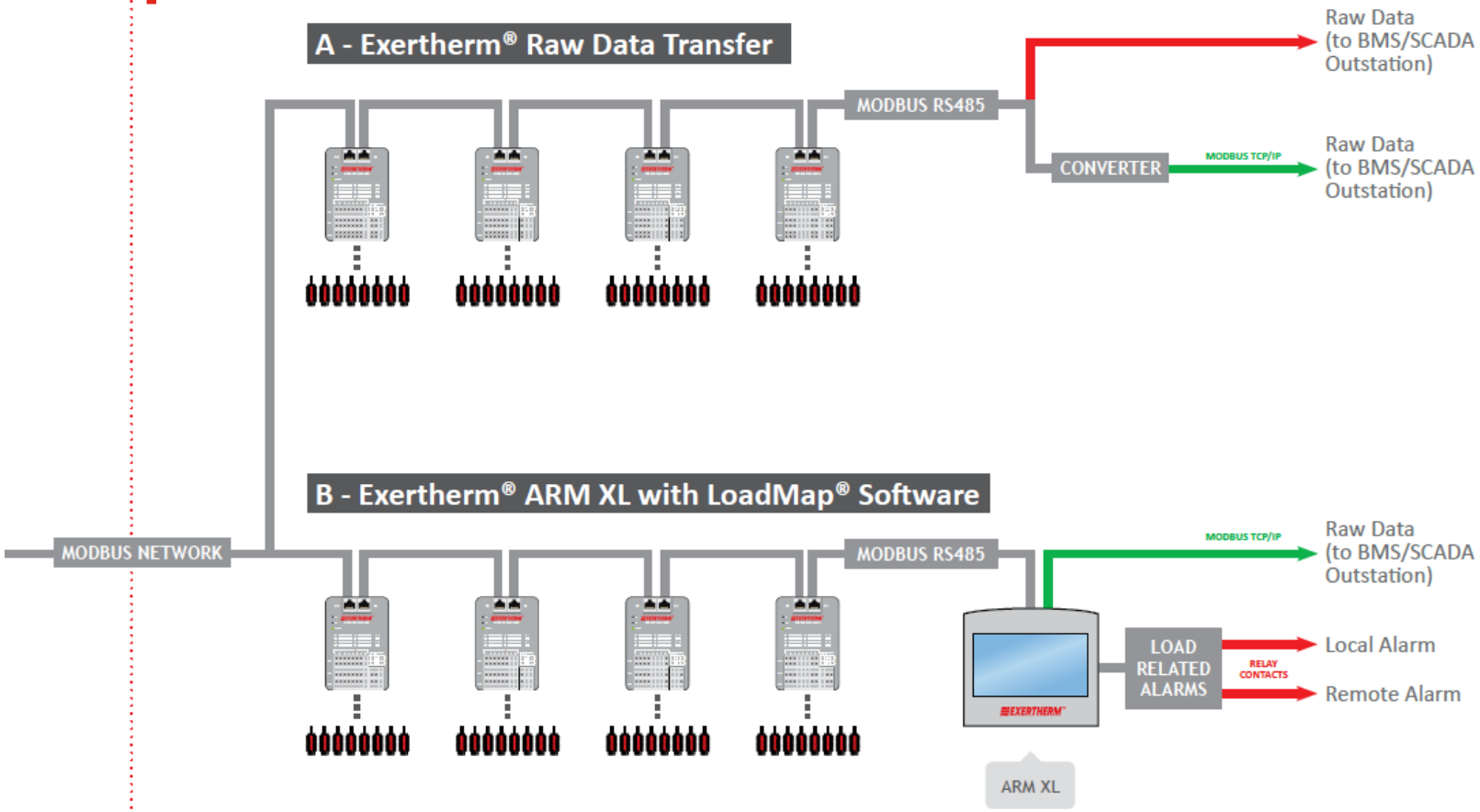
1. MCC Datacard
2. MCC Sensor Loom
3. MCC LED Unit

Integration Options

24x7 Thermal Condition Monitoring

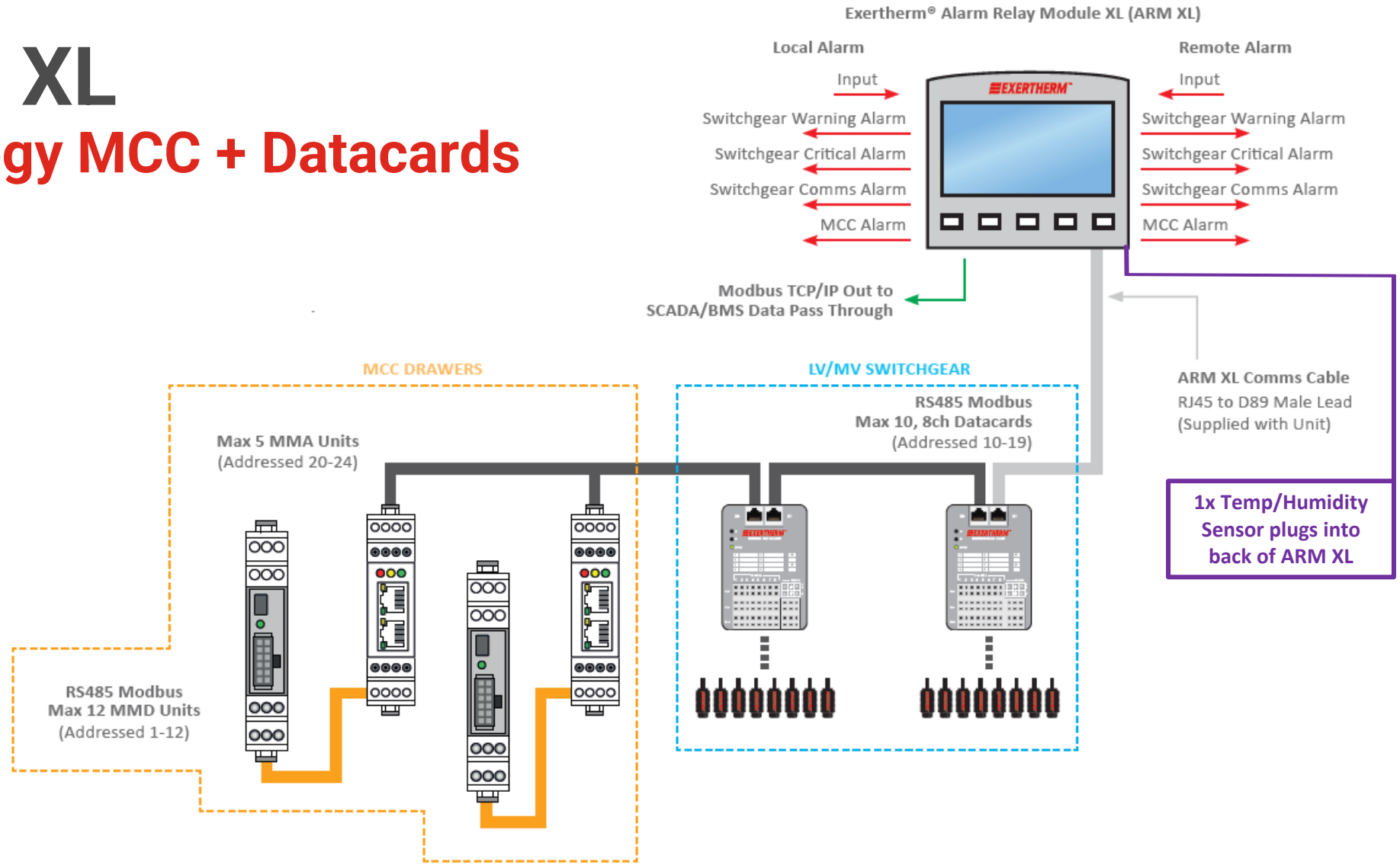
Switchgear Bus Joints 24x7 Thermal Monitoring

Integration Options



ARM XL

Topology MCC + Datacards



Exertherm LoadMap: Low Load Protection

Patented software combining temperature and load data to provide load related alarms

ARM XL

The Importance of load...

The quality status of the connection cannot be assessed unless the load is known

Standard practice for thermal imaging surveys has been to conduct the survey when operating at 40% load or greater.....

!

The difference in ΔT between **40% load** and **100% load** is **625%!**

ΔT = 40ºC at 40% load becomes ΔT = 250ºC

which is a complete failure and probable explosion!

Why change from inspection to monitoring?

It is estimated, that Industrial IoT will unlock a productivity increase of 30%

Exertherm is a data driven solution.
Data analysis drives efficiency.

- Reduces downtime
- Increases safety
- Reduces costs
- Increases understanding

Bus duct:
The fast, modular, power distribution system

POWER ON. PEACE OF MIND

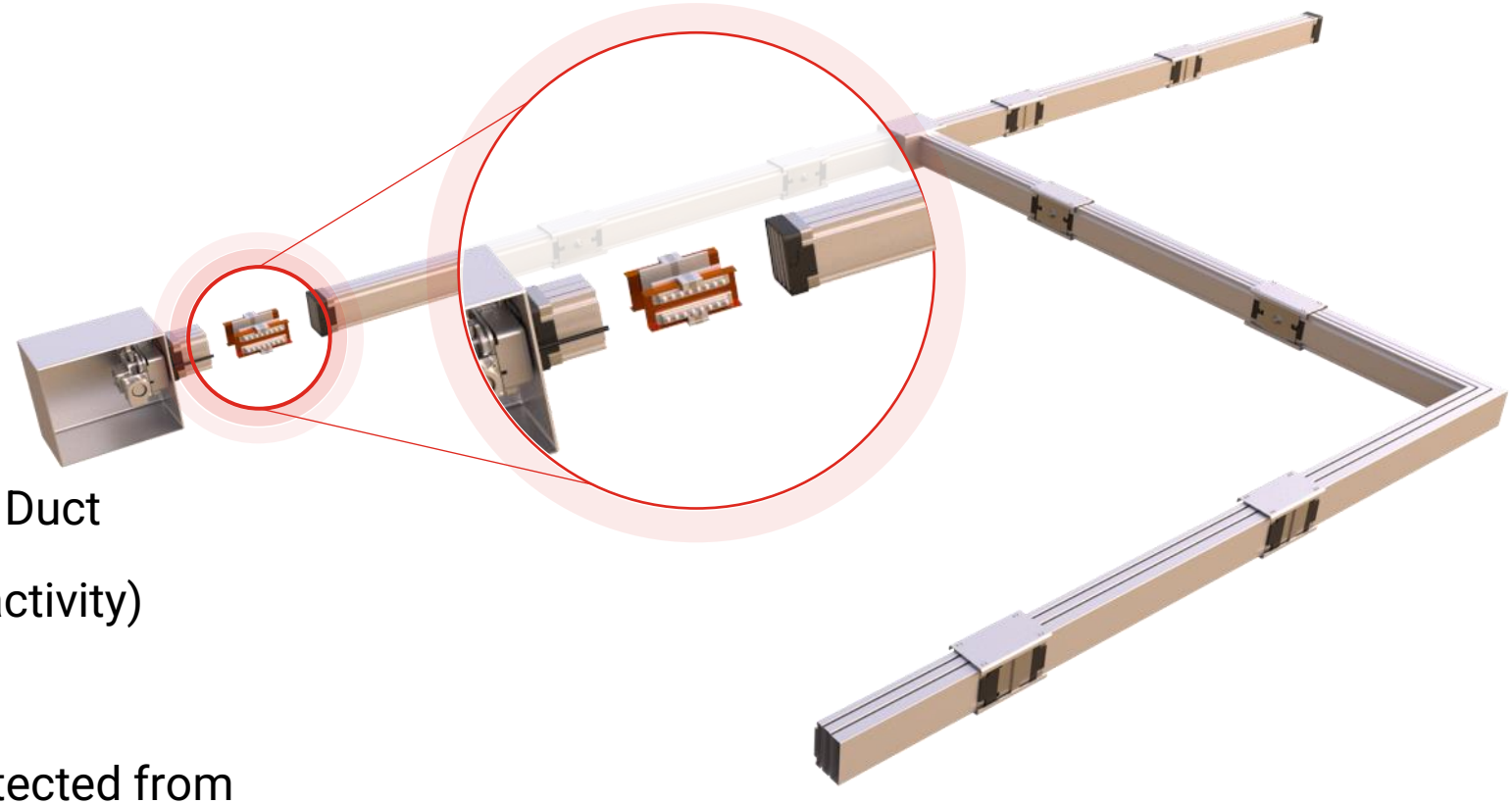
EXERTHERM®

Bus duct

Numerous advantages over cable

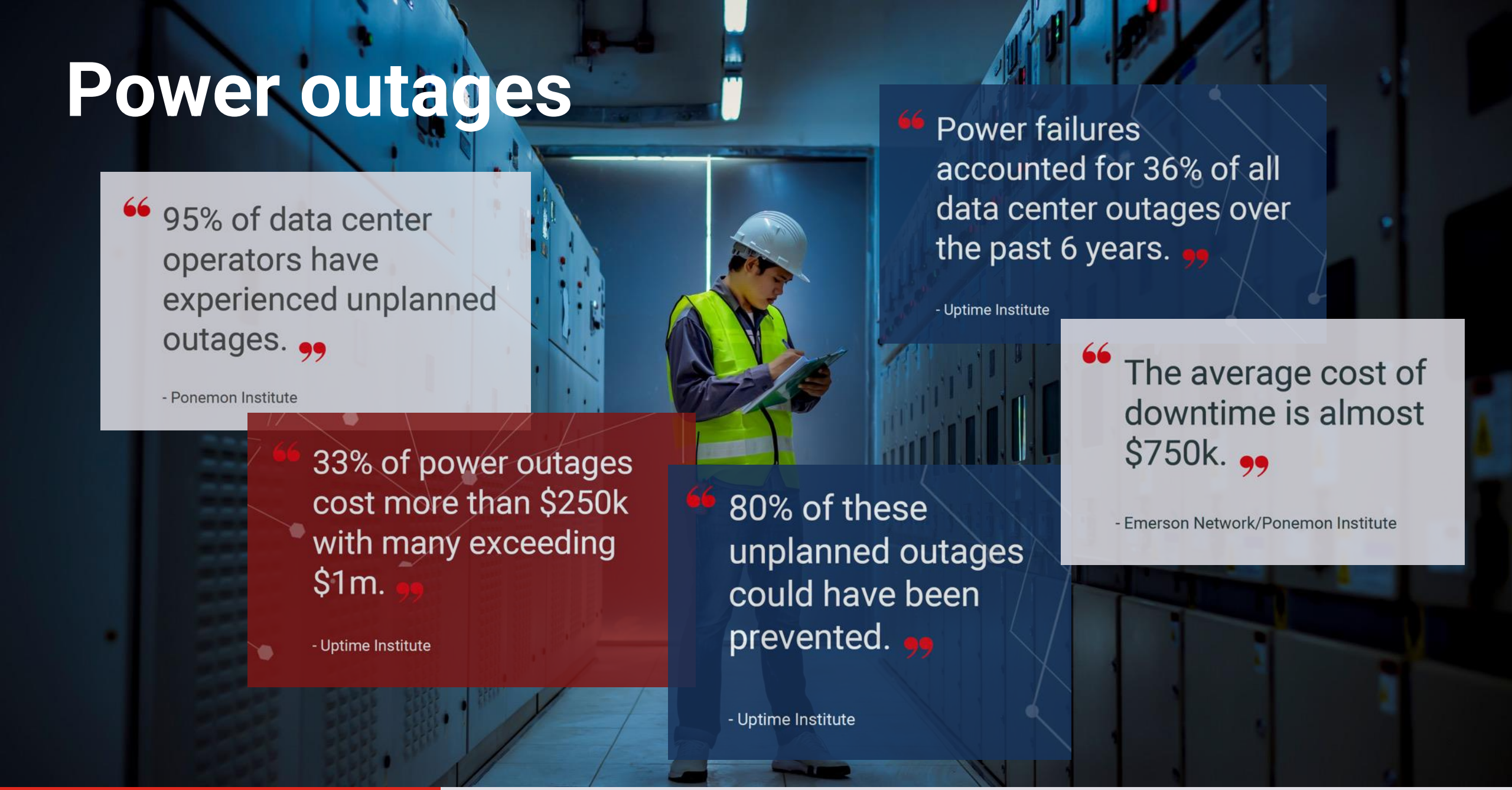
- Modular
- Simple to install - allows fast set up
- Compact, flexible and safe
- Quick repairs
- Easy upgrades
- Power tap off at any point

Bus duct
The problem



- Joints are subject to stress
  - Effects of gravity on heavy Bus Duct
  - Vibration (machinery, seismic activity)
  - Constant heating and cooling
- Compromised joints can only be detected from the excess heat they generate
- Failures will result in outages and downtime

Power outages



> 95% of data center operators have experienced unplanned outages.
>
> - Ponemon Institute

> Power failures accounted for 36% of all data center outages over the past 6 years.
>
> - Uptime Institute

> The average cost of downtime is almost $750k.
>
> - Emerson Network/Ponemon Institute

> 33% of power outages cost more than $250k with many exceeding $1m.
>
> - Uptime Institute

> 80% of these unplanned outages could have been prevented.
>
> - Uptime Institute

EXERTHERM bus duct monitoring solution

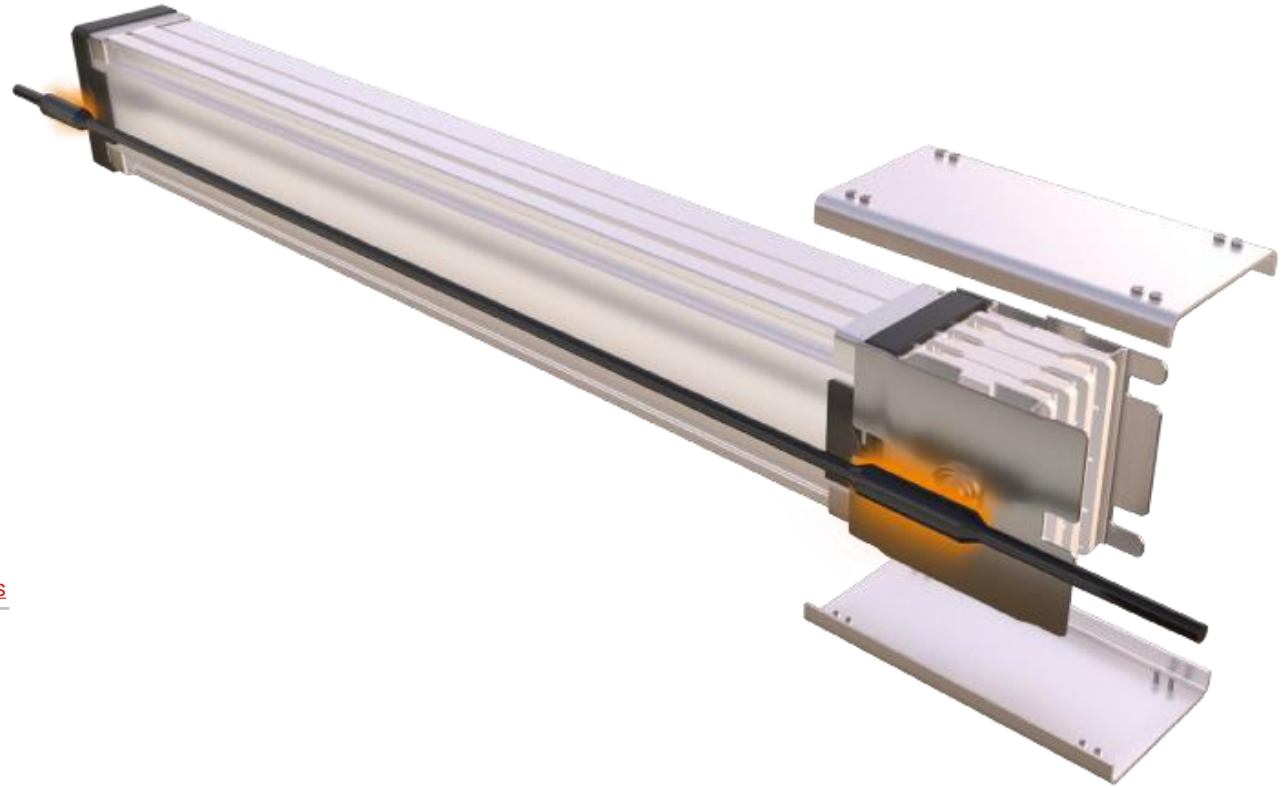
Build resilience into power distribution systems

The Bus Duct Monitoring Solution matches the modularity of bus duct for electrical power distribution. It's quick and easy to install, and just as versatile.

The solution gives users a call-to-action on a specific bus bar or bus duct joint which is potentially faulty and needs attention before a more serious problem occurs.

Continuous monitoring of these electrical joints provides a 24x7 early warning system to detect critical temperature rise and reduce the risk of power loss.

All Thermal Monitoring Applications



Key Industries:

- Data Centres
- Commercial
- Manufacturing
- Minerals and Mining

EXERTHERM bus duct monitoring solution

The components

24m sensor cable with 8 embedded sensors

Datacard

LED alarm indicator

Electrical enclosure

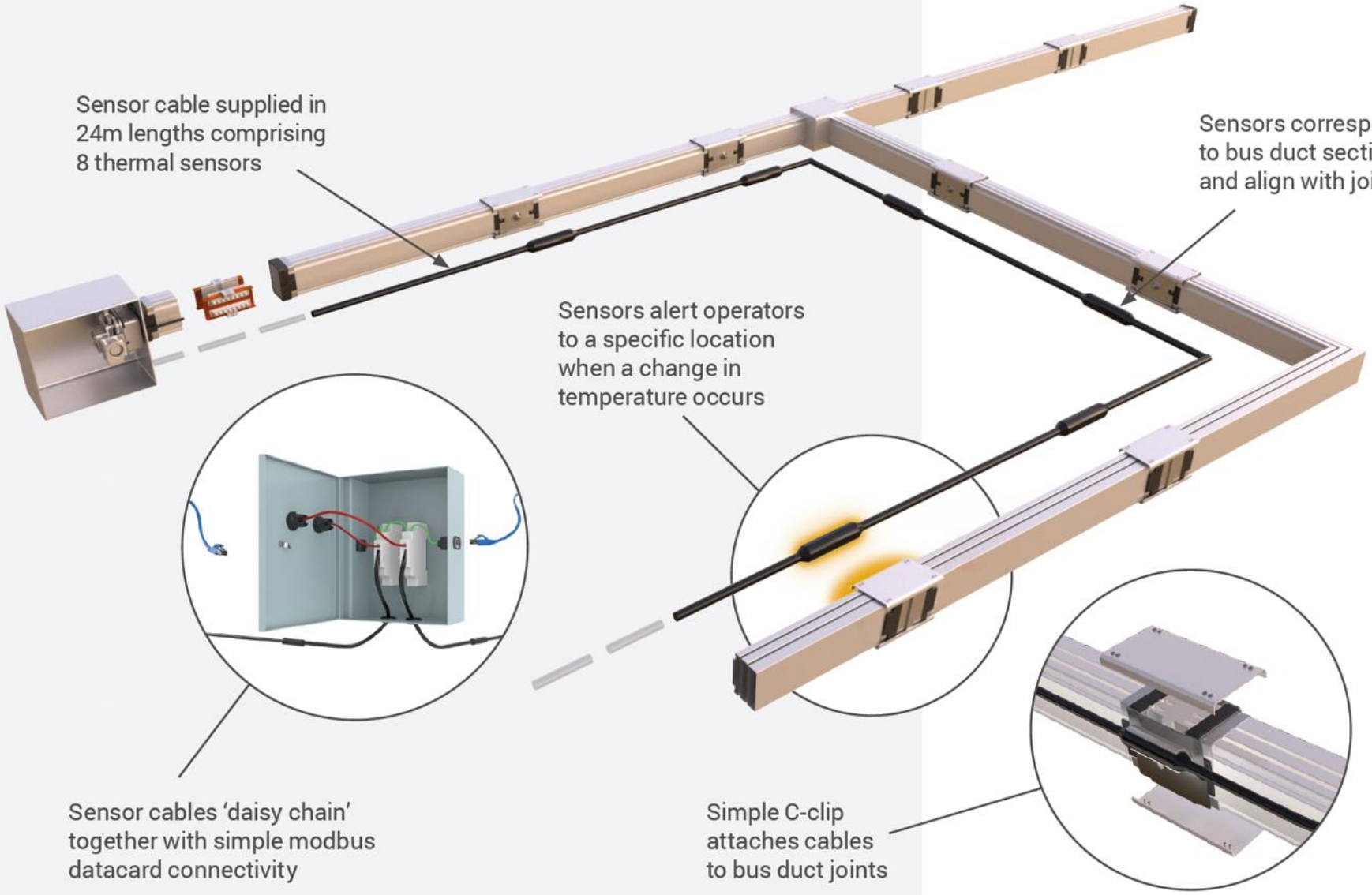
Control Box

24x7 hotspot detection

The solution

- Sensors attach to joints via simple C-clip
- C-clip can be manufactured into joint sections by OEMs

Bus Duct Monitoring Solution

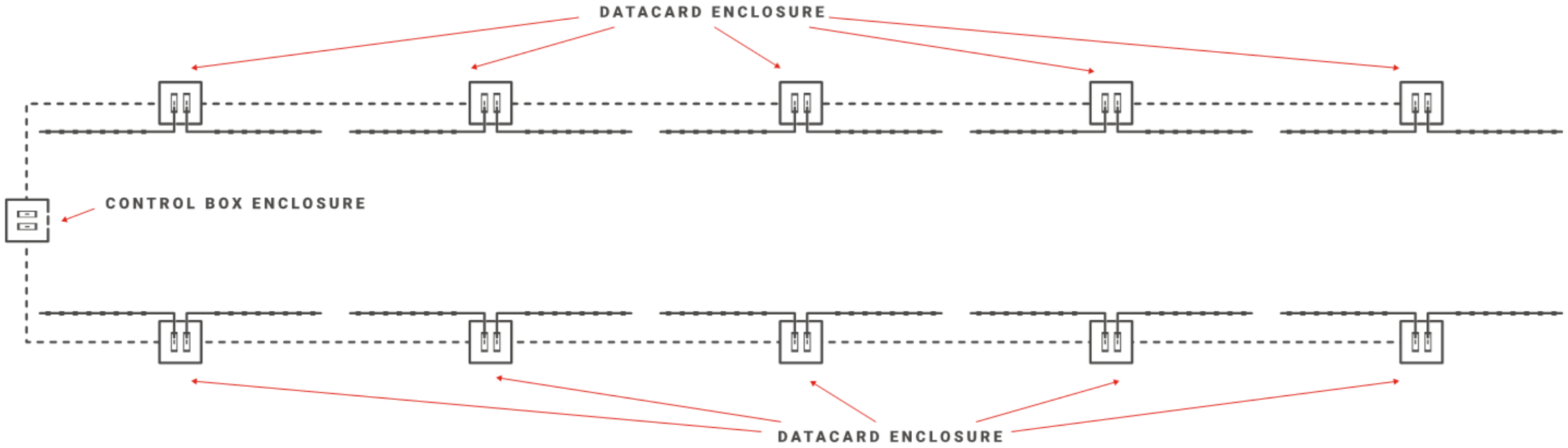


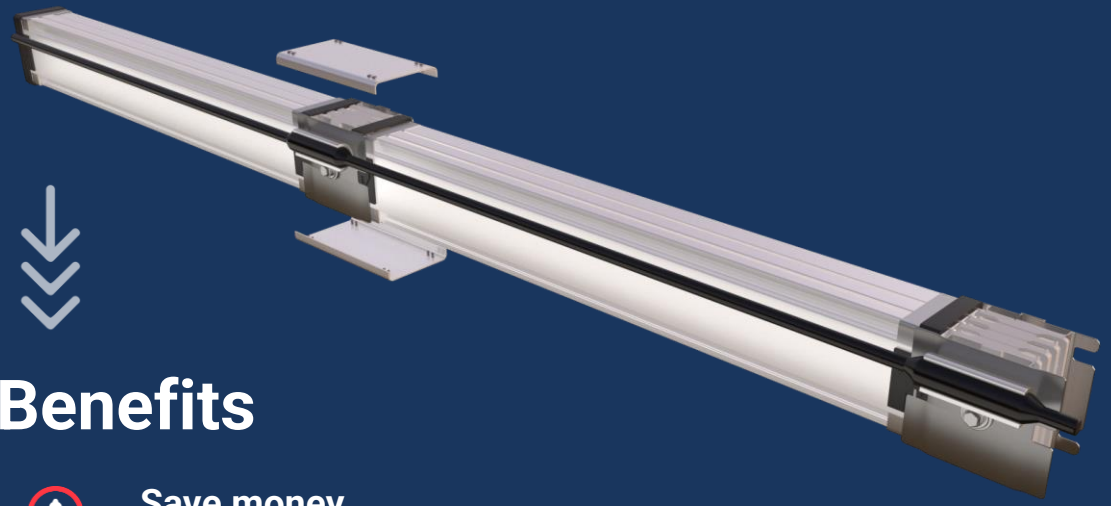
Alarms

- Healthy
- Average
- Odd Man Out
- High Temperature
- Sensor Fail

EXERTHERM bus duct monitoring solution

Daisy-chained Modbus RTU architecture





Benefits

Save money
Reduce CAPEX and OPEX by eliminating the need for thermographic inspection at the installation stage. Operators will also save by avoiding the cost of unplanned electrical outages.

Enhance safety
Improve personnel safety across your facility by minimizing the need for staff interaction with faulty, compromised, or potentially dangerous electrical assets.

Increase efficiency
Build in greater resilience by protecting your operation against the inconvenience of unplanned downtime, and the risk of failing to deliver on end customer requirements.

Features

Identify potentially faulty bus duct joints before a more serious problem occurs

Simple installation
- Works straight out of the box
- Attaches quickly and easily
- Sensors fit directly to joints
- No complex commissioning

Flexible solution
- Modular build
- Install at the same time as bus duct
- Fits all complex bus duct systems
- Maintenance free

Data integration
- Digitally transform electrical assets
- Provides 24x7 temperature and alarm data
- Modbus 485 data taken direct to EPMS/BMS
- Monitor trends over time

All Thermal Monitoring Applications

Continuous Thermal Monitoring Landscape

Just ask 3 questions

Technical

1. Wireless vs fibre optic vs hardwired solution? (EMF/EMC, cyber security, vibration & temperature >> brittling & failure)
2. Additional (multiple) ambient temperature sensors and computational calculations, or “equalized-for-ambient-temperature by design”? (measuring Delta T = only methodology accepted by NETA and thermal imaging inspectors)
3. Are the alarm thresholds load related? (or only generic claims of dynamic load management)

Commercial

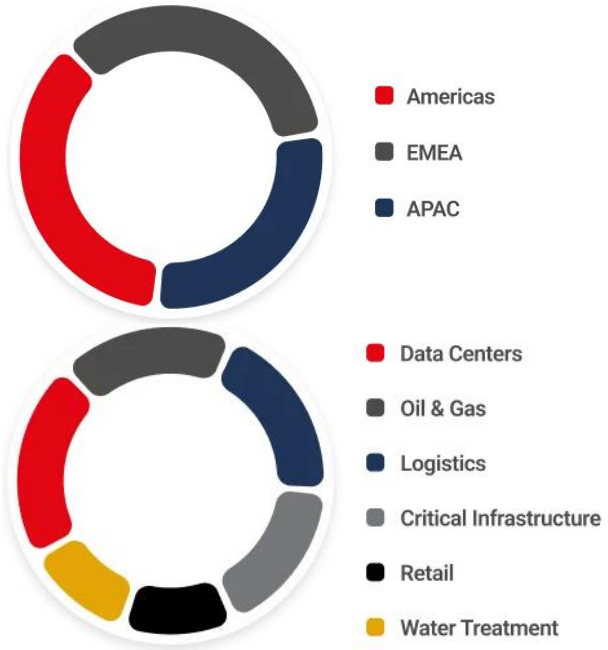
1. Commissioning at site or fully pre-commissionable in factory?
2. Powered or powerless solution? (calibration, battery replacement, etc.)
3. Contact or contactless sensor solution? (clearance, torque settings, maintenance, …)

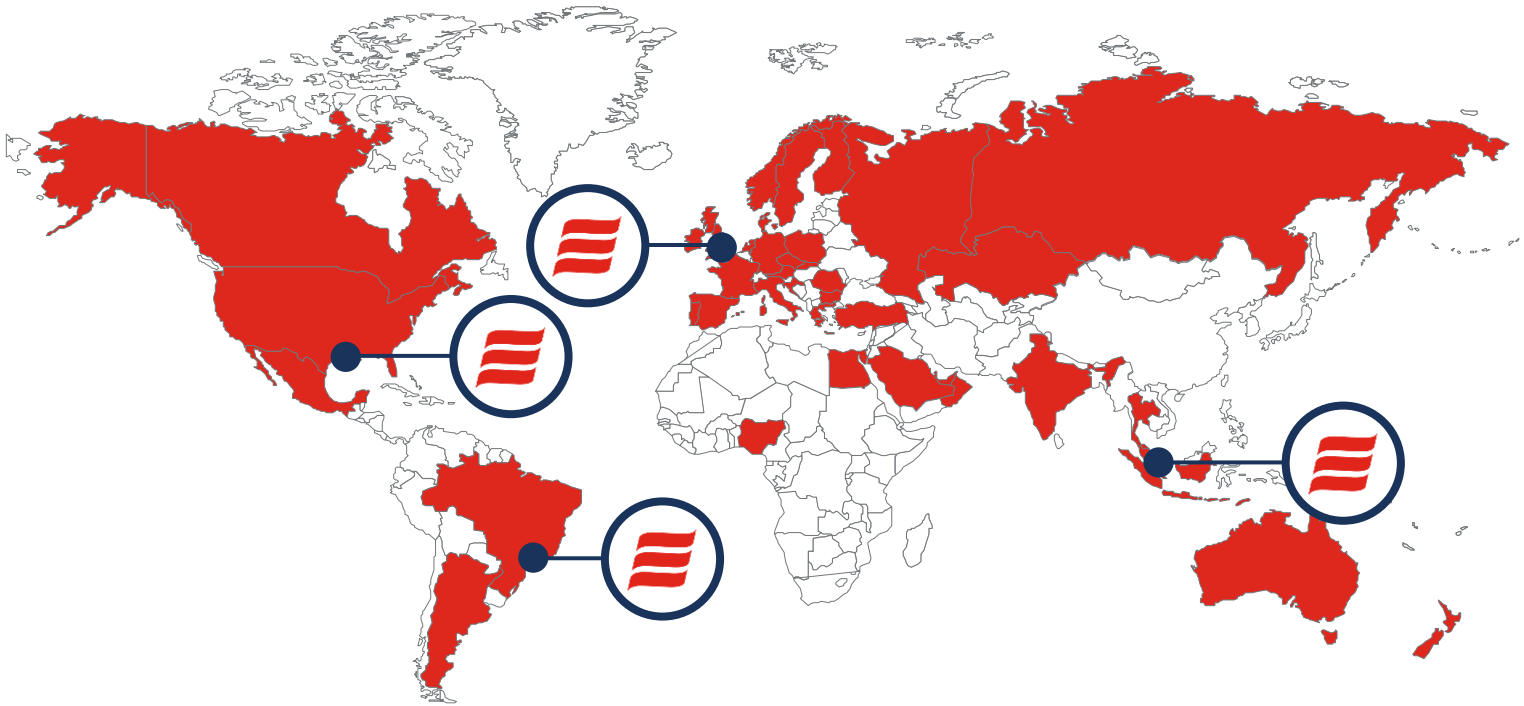
Business / operational strategy

1. Vendor agnostic solution? (unlocking consistent comparability and advanced analytics across lineups, sites, etc.)
2. Certified Lifetime Calibration? (vs powered sensors, piezoelectric sensors, etc.)
3. Sensor solution maintenance required or lifetime zero-maintenance / replacement guarantee / certified reliability?

EXERTHERM

Installed base / project reference footprint





>5000 projects **in >30 countries** **for >300 end-users** **with >50 partners** **across all industries**

EXERTHERM®

24x7 Thermal Monitoring Solutions

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