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Thermocouples & Sensing Solutions since 1920

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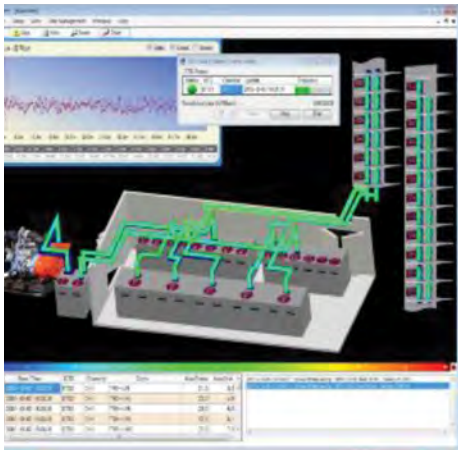
by Cleveland Electric Labs
LIGHT CAPTURING MOTION

FIBER OPTICS • INNOVATION •

Data Center – CxTM

(Continuous Temperature Monitoring)



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Temperature Monitoring in Data Centers

Continuous Bus Duct and Switchgear Temperature Monitoring (CBTM, CSTM)

Temperature Monitoring your assets:

- Good design alone does not guarantee efficient data center operation over it's life span.
- FiberStrike offering: Using DTS for 24/7/365 monitoring, hidden assets monitored, peace of mind.
- Thermography alternative:
- Varying SLA: maintenance services delivered by contractor
- Missed service: Irregular, once or implement several times per year as per business needs.
- Line of sight: problem with hidden assets, i.e. those enclosed within cabinets.
- Inconsistency: Require trained technician using IR thermometer and/or PQM

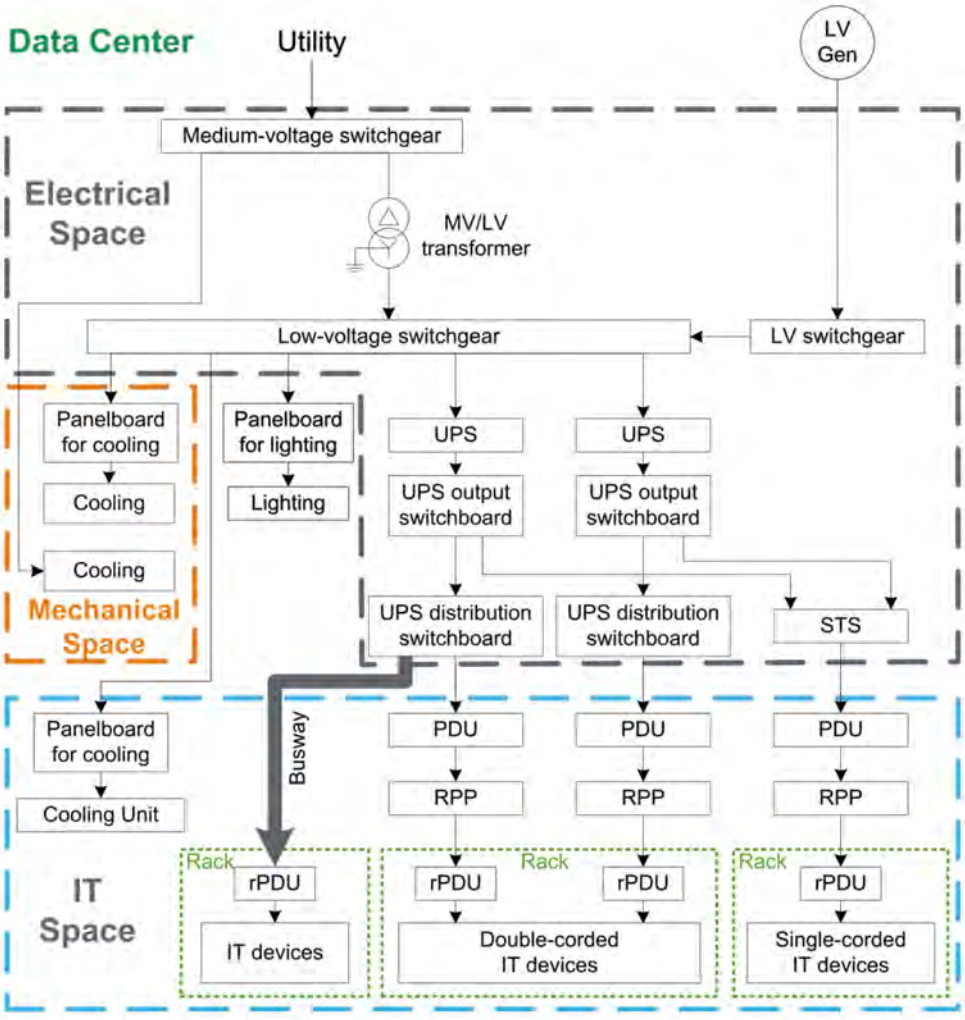
Thermography for LVSG & MVSG

Phase Unbalance (PQA)

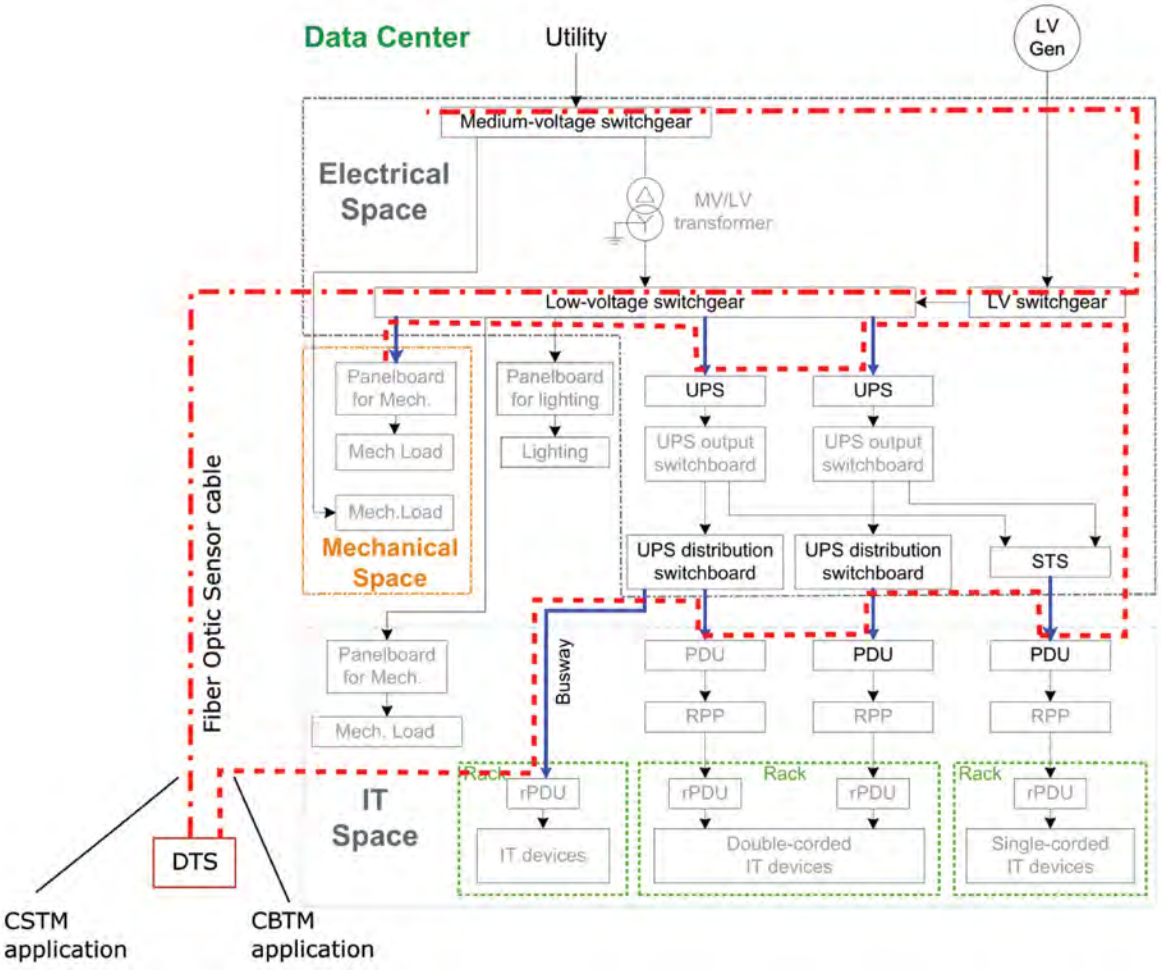
Bus Duct/Bar Hot Spot

CSTM ⟷ **CBTM**

Electrical Power Distribution Infrastructure at Data Center



Temperature Monitoring of Switch Gear and Bus Duct



Fiber Optic Sensor Cable

CBTM: Continuous Bus Duct Temperature Monitoring

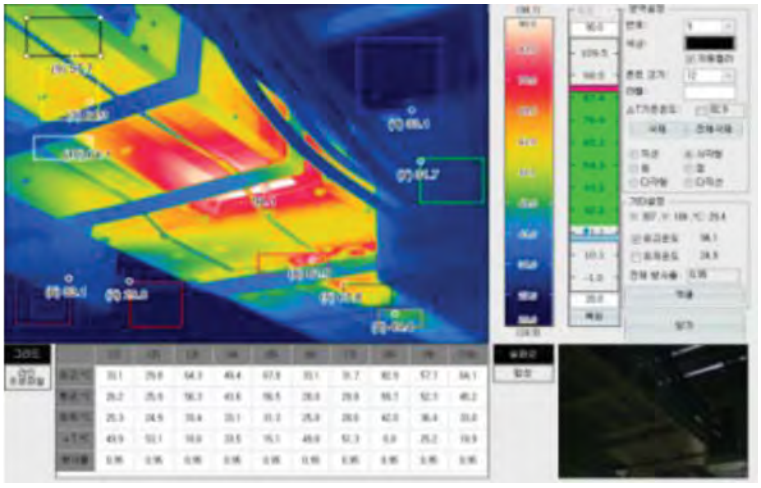
Holistic View On Asset Monitoring

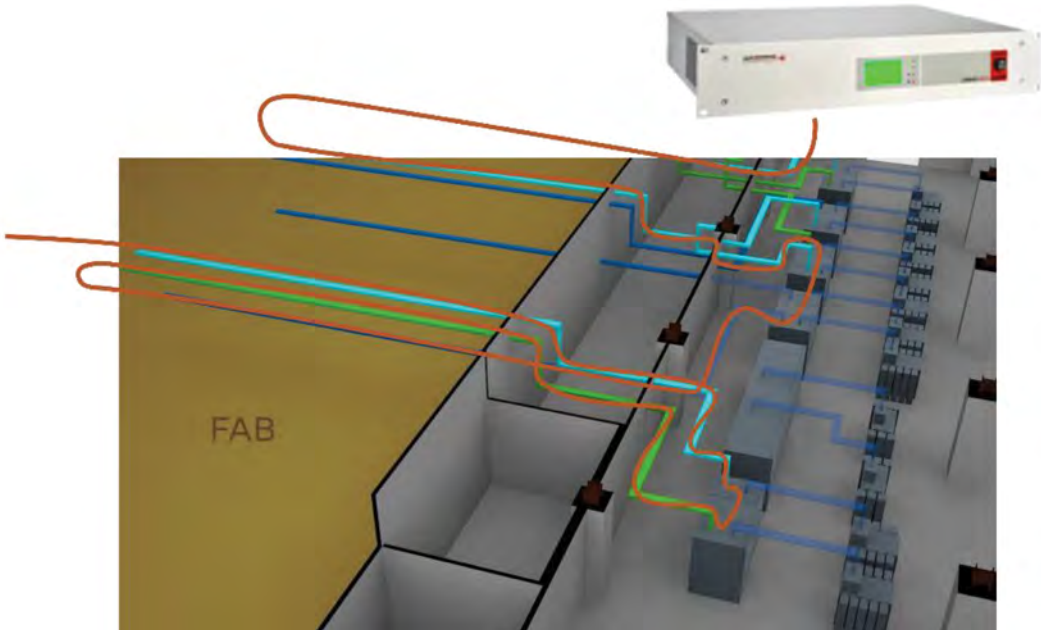
Temperature is a good indicator of Bus Duct health:

- **Material –** thermal aging, resistance
- **Design –** Thermal insulation
- **Fault –** Overload condition
- **Aging –** Connection instability

Tradition monitoring solutions:

- **IR cameras –** not gapless
- **Point sensors –** not gapless
- **Manual surveillance –** high cost, labor intensive





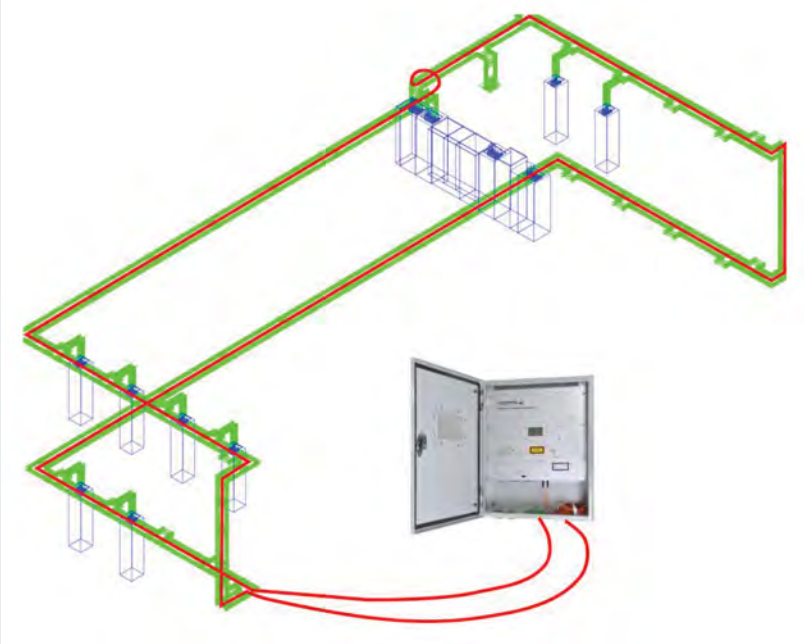
CBTM Fiber Optic Sensor Deployment

Continuous Bus Duct Temperature Monitoring (CBTM)

Guidance for Sensor Fitting to Bus Duct Housing

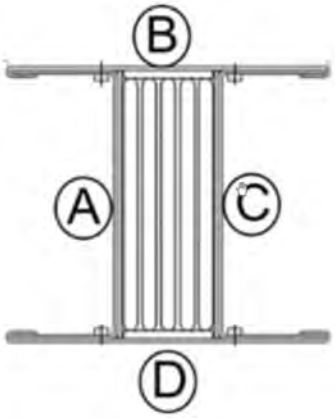
Assist with “Red Line drawing”:

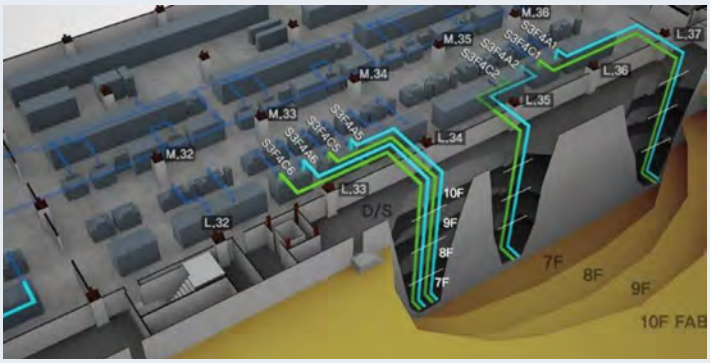
- Alarm Granularity requirement
- Sensor cable routing
- DTS consideration

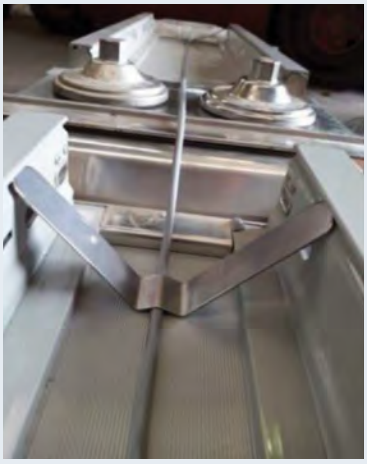


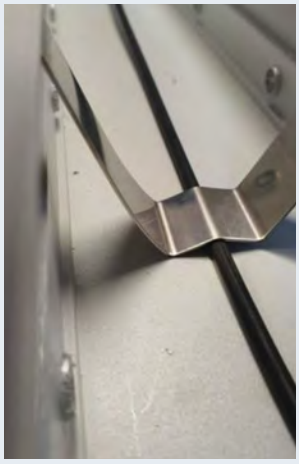
Deployment Considerations

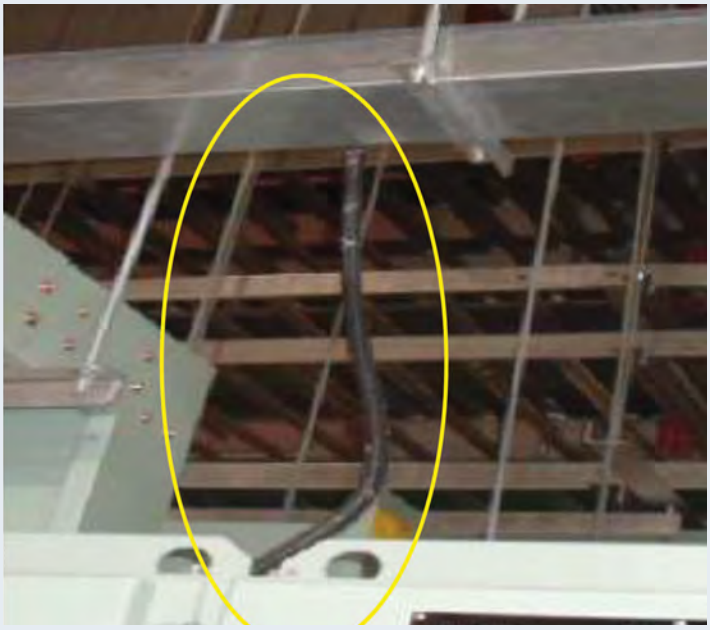
- Implementation in High Rise Buildings, Factories, Data Centers, Hospitals…
- Plan sensor cable route, zoning, joint identification
- Design appropriate fixing
- Documentation, commissioning, calibration
- Typical sensor cable positions A/C





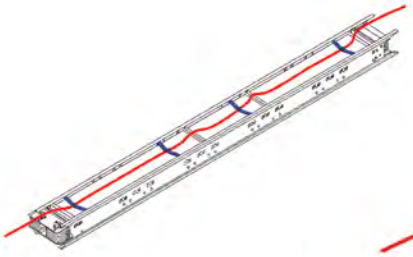


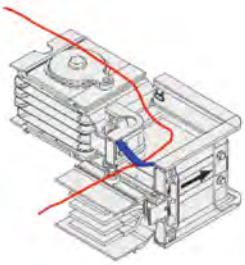


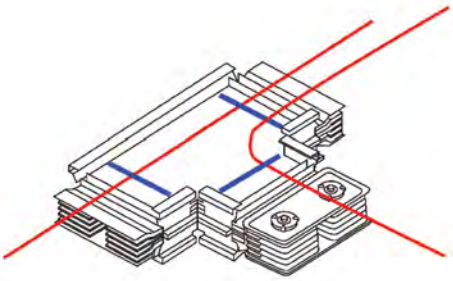


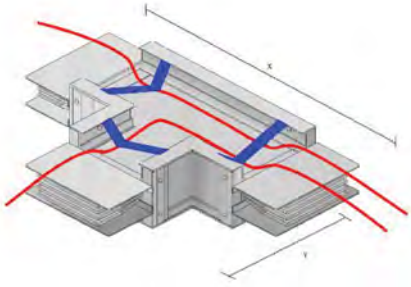
Deployment Considerations

- ✔ Consider routing details, i.e.:
  - Feeder joints
  - T-junctions
  - Elbows
  - Flanges

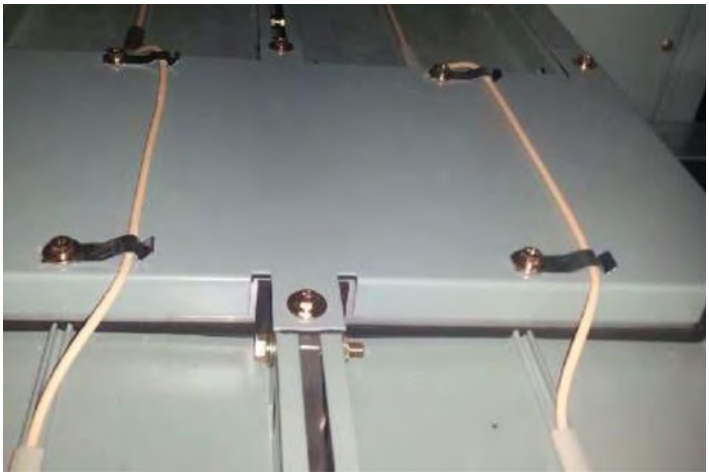




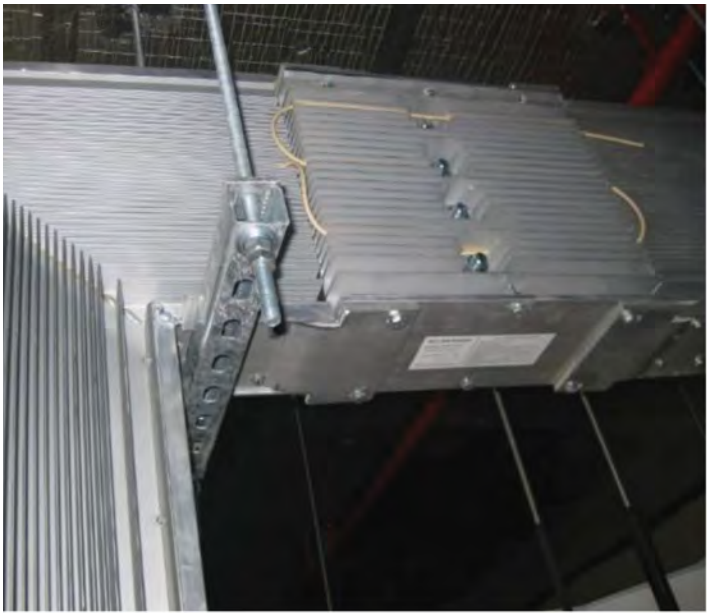


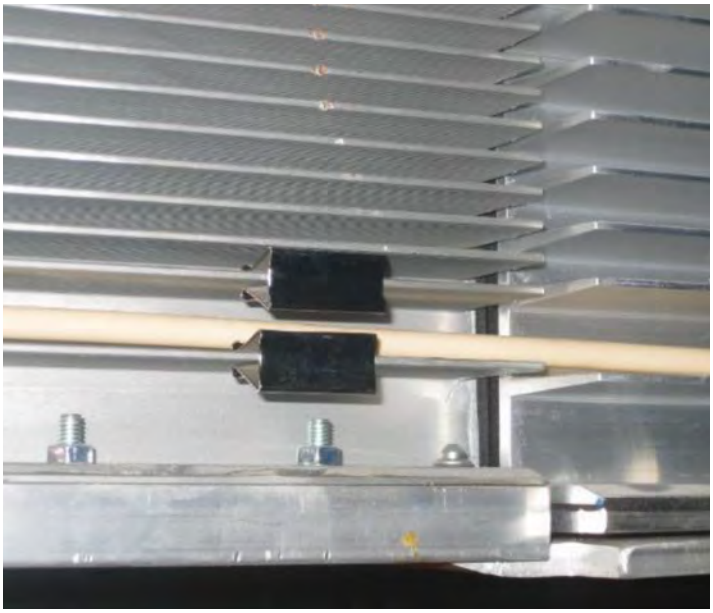


Fixing Examples



Fixing Examples





CSTM: Continuous Switchgear Temperature Monitoring

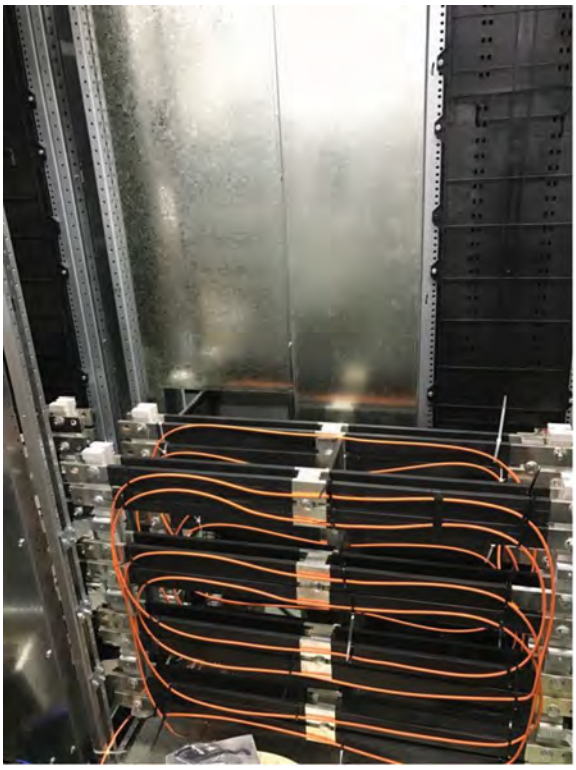
Holistic View On Asset Monitoring

Guideline for Sensor cable on LV Bus Bar:

- ✔ POI and Alarm Granularity

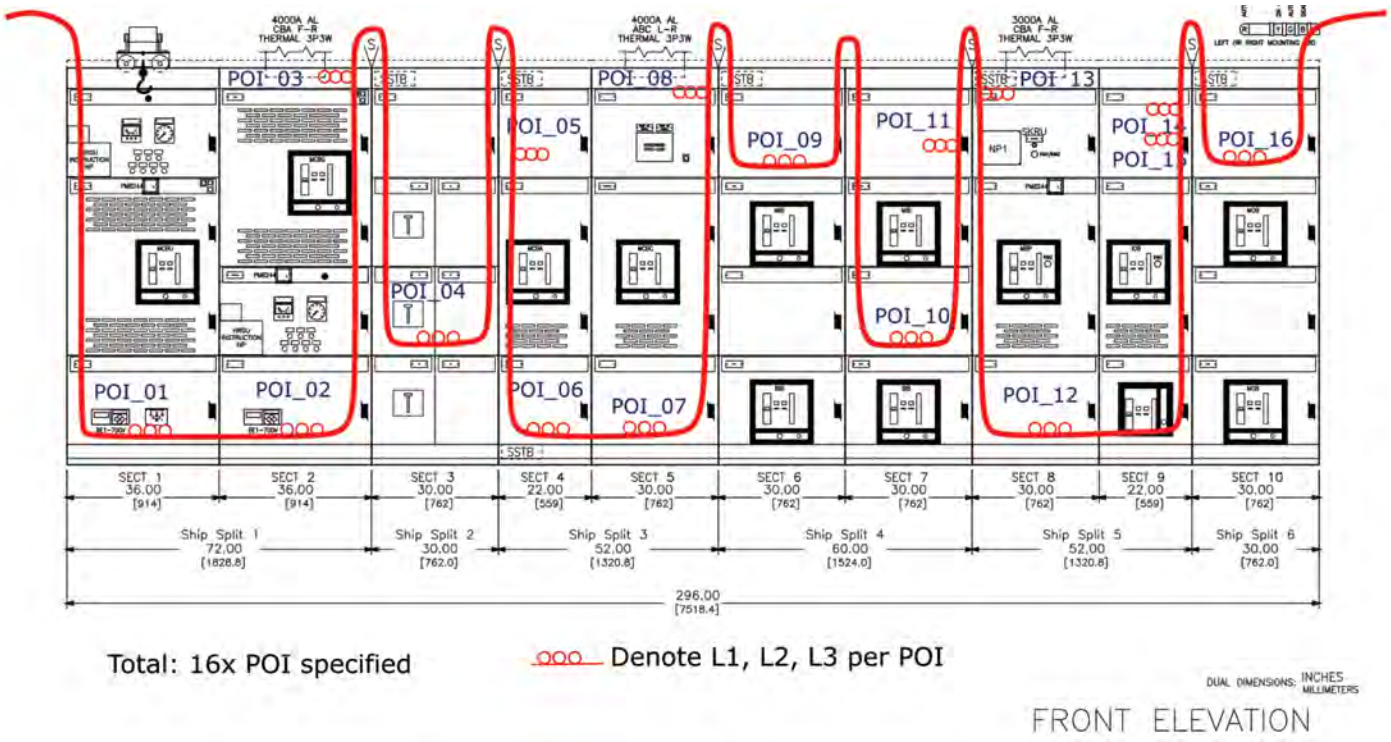
Guideline for Sensor Cable on MV Bus Bar:

- ✔ POI and Alarm Granularity

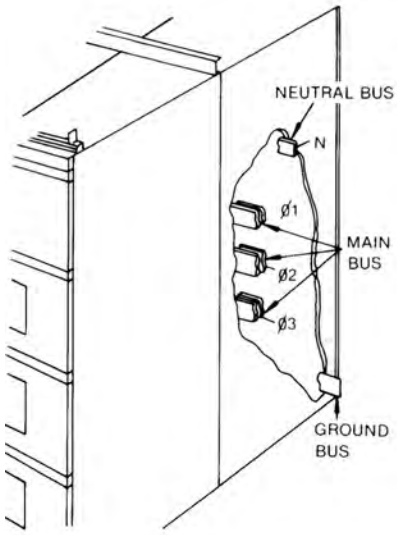


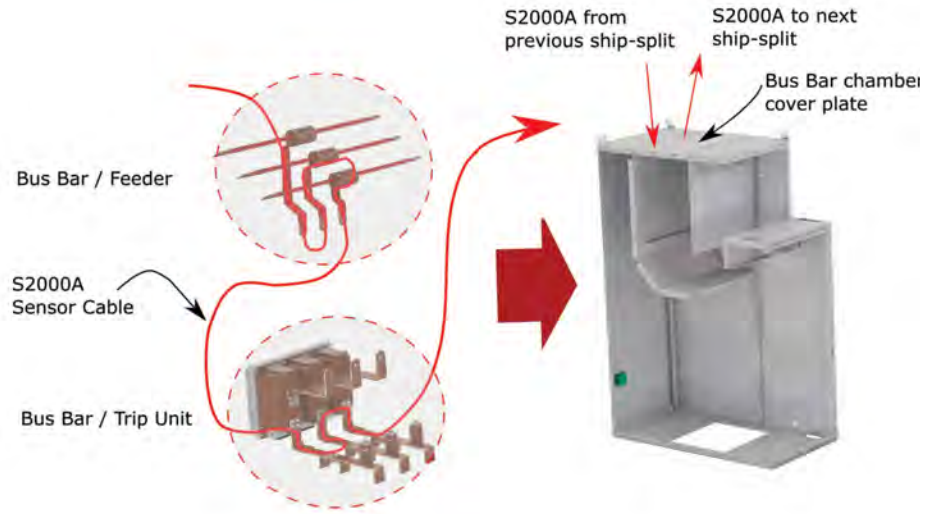
CSTM Red Line Drawing Example

At switch gear across “shipping splits”



Switch Gear Bus Bar Routing Detail

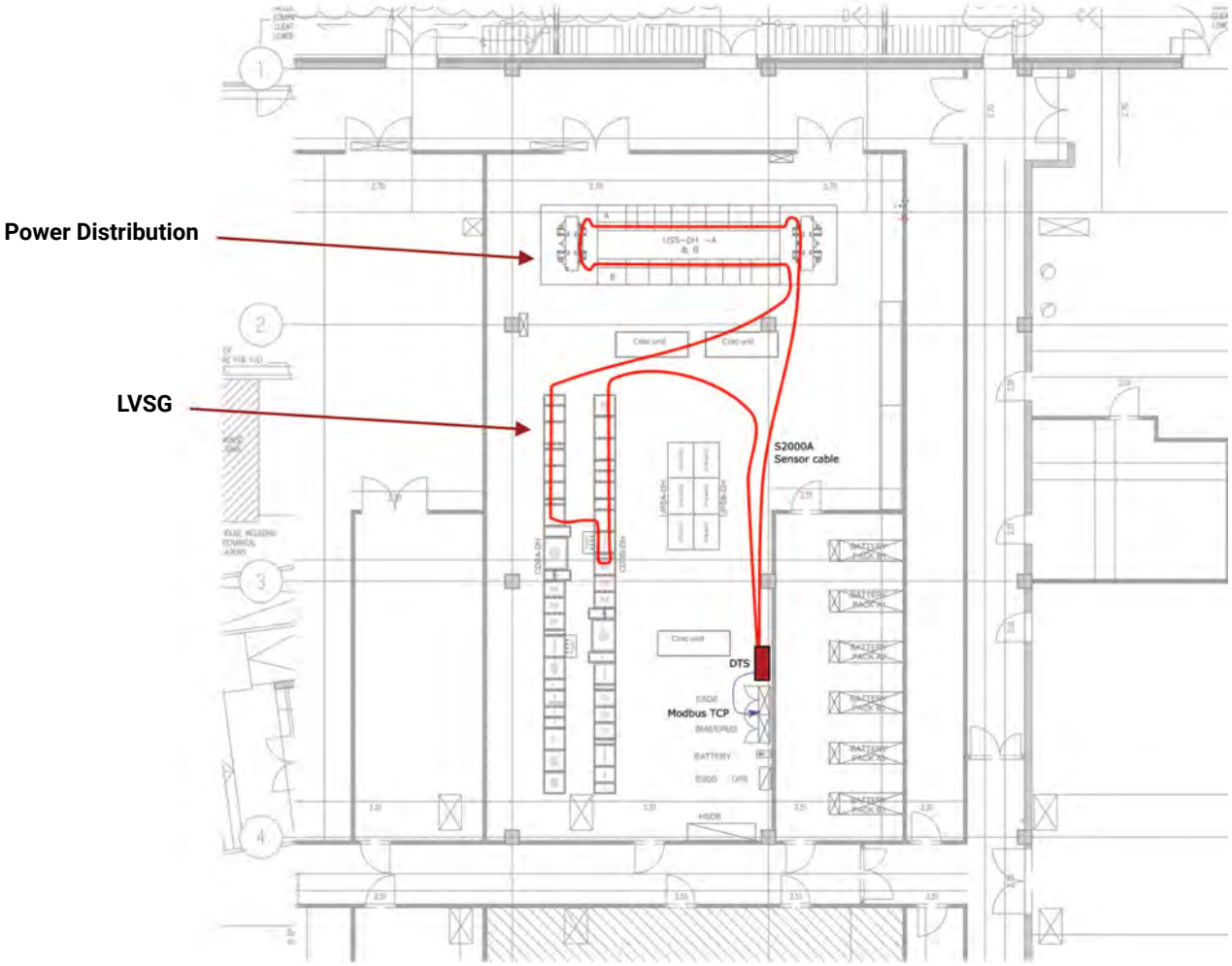




CSTM Fiber Optic Sensor Deployment Example

Switch Gear Equipment Layout

At “Electrical Room”



DTS System (Distributed Temperature Sensing)

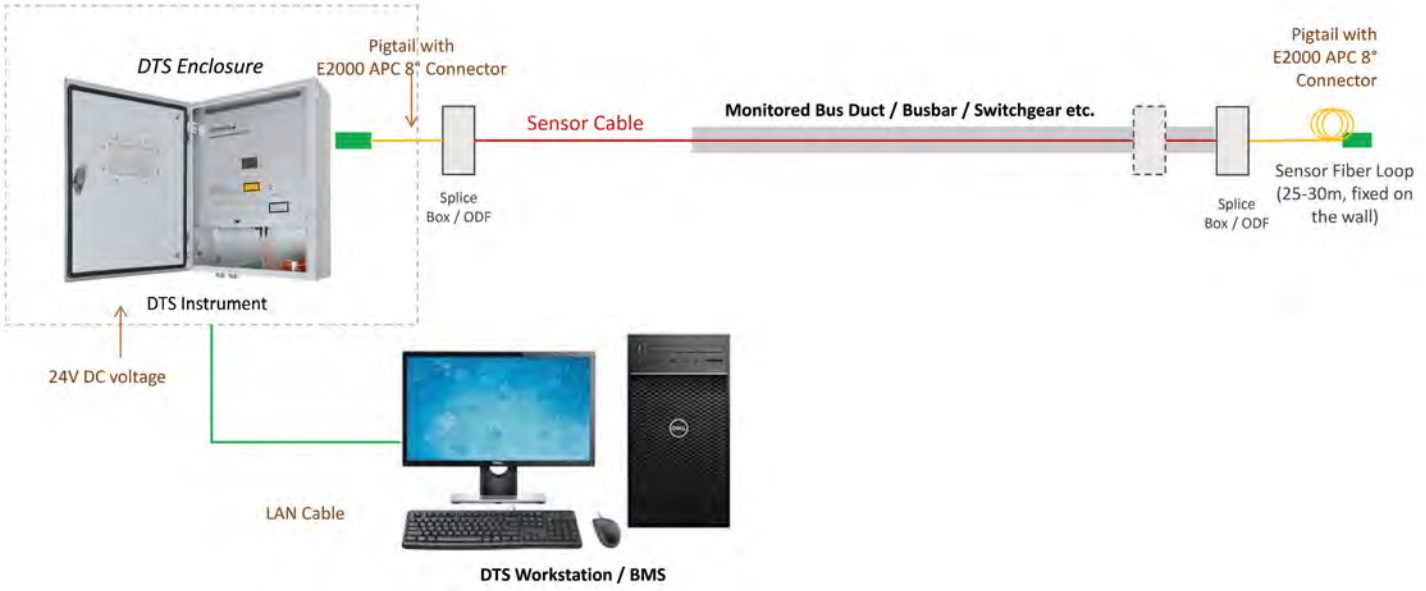
Linear Heat Series Technical Specs

- Up to 10 km monitoring range
- Up to 4 channels
- Spatial resolution: down to 0.5 m
- Relays: 44 outputs (extendable) / 4 Inputs
- 256 user definable zones with 5+2 alarm criteria
- Operating temperature range: 10 to +60 C
- USB, Ethernet, Modbus TCP interface
- Certifications (VdS, UL, FM, IECex, SIL2…)

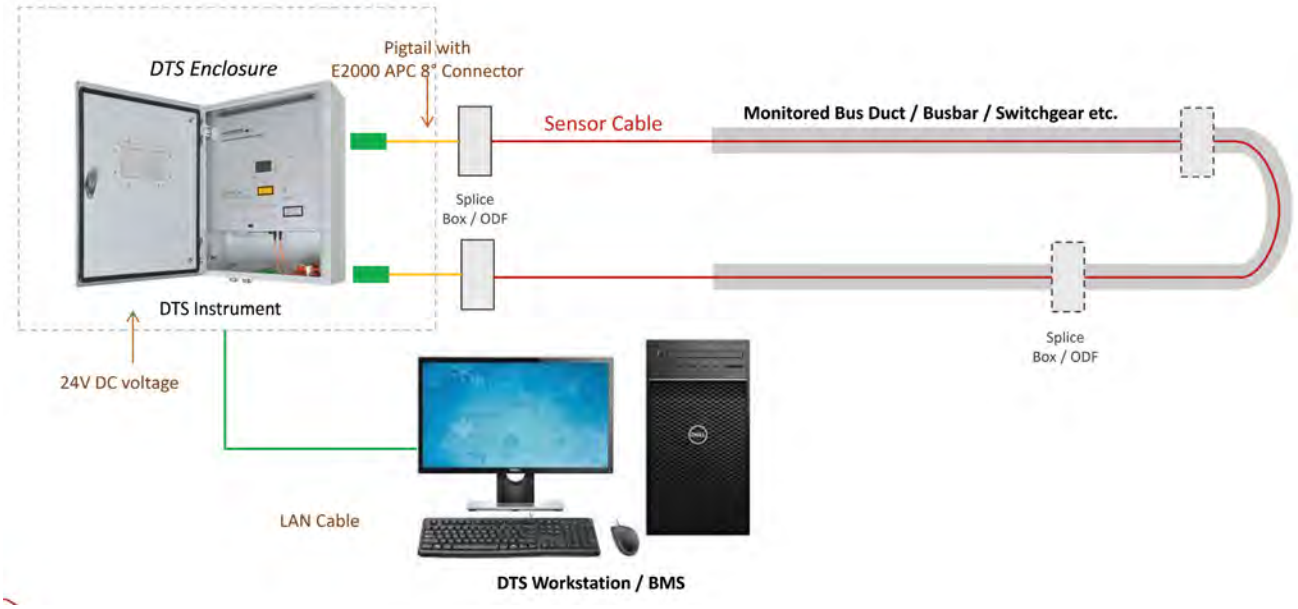
Sensor Fiber Characteristics

- Simple fiber optic cable: flexible and light
- Mechanically robust
- Completely passive sensor cable
- Inherently safe against electromagnetic disturbance
- Long lifetime and maintenance free
- Operating temperature -40 to +85 (150) °C
- Fast detection (10 measurement time)
- Precise localization (<1 m spatial resolution)
- Long reach (up to 10 km)

General Deployment Schematic Overview (Spur)



General Deployment Schematic Overview (Loop)

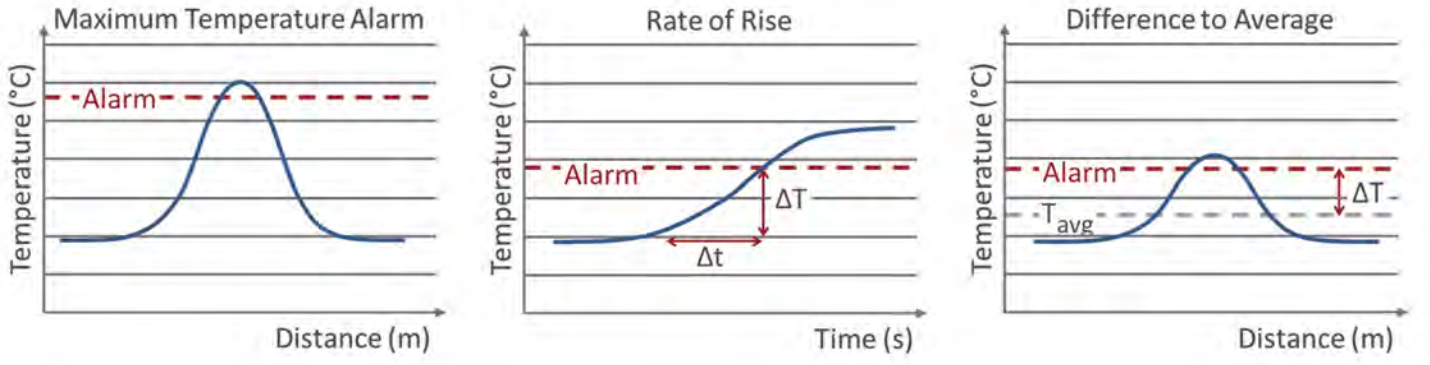


Alarm Parameters

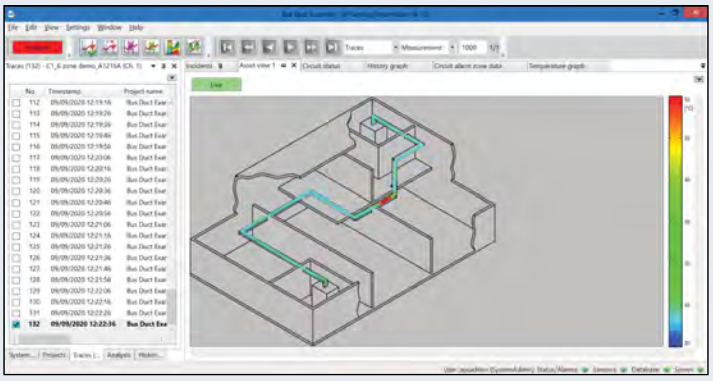
Flexible alarm zone concept allows individual sections with different alarm criteria (sensitivity) on the same sensor cable run.

Five different alarm criteria per zone are programmable, up to 256 zones.

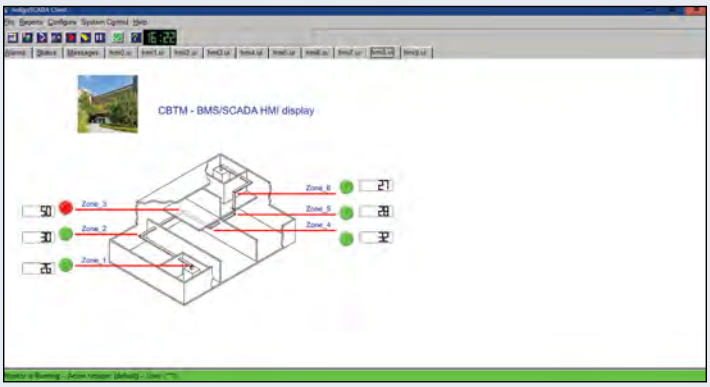
- ✔ Maximum alarm
- ✔ Rate of rise (gradient) I, II and III
- ✔ Difference to zone average (adaptive max.)



Tenant / End-Customer / FM Display Options

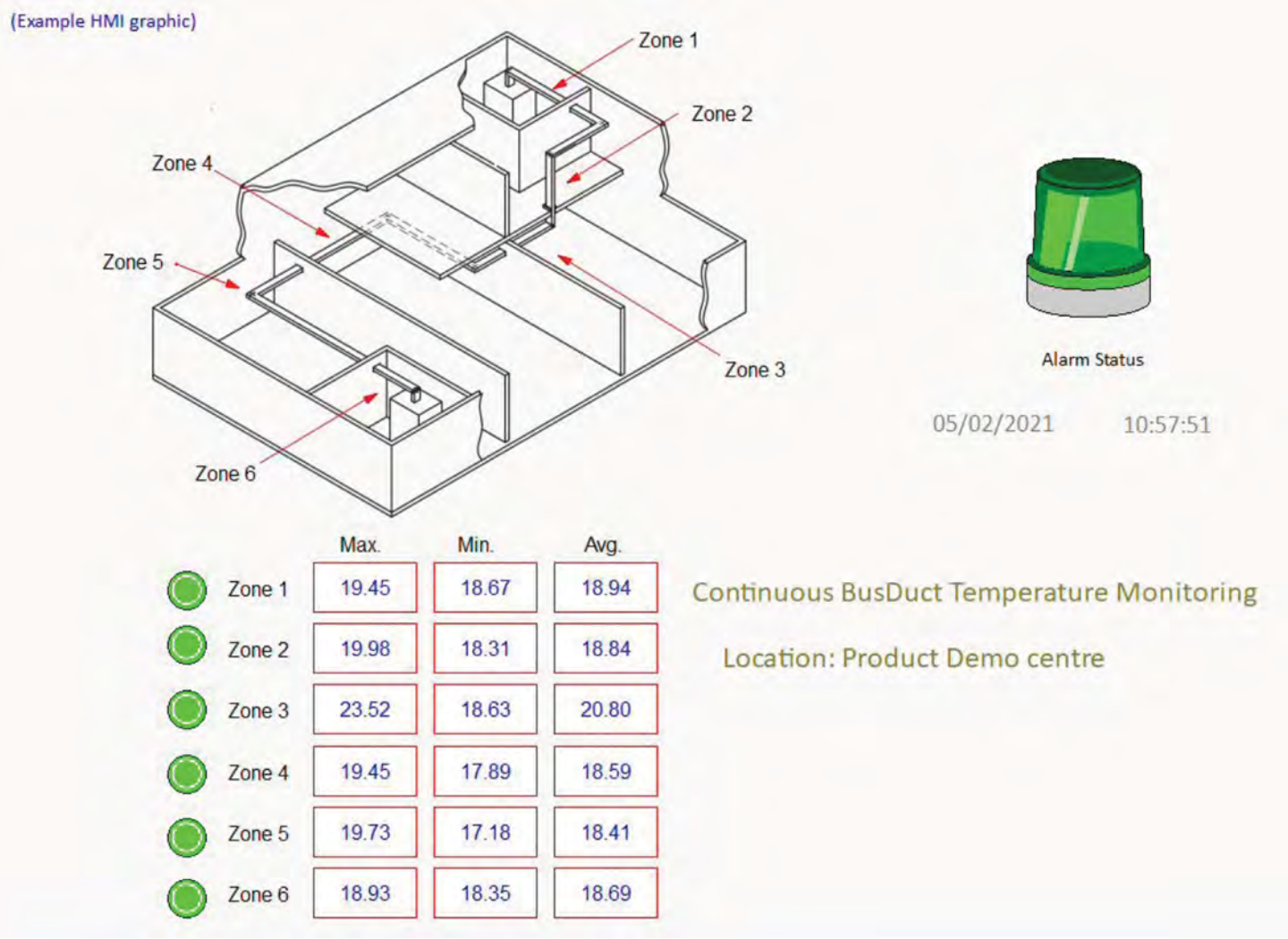


FiberStrike SmartVision



BMS/SCADA Integration By Client

Alarm Parameters

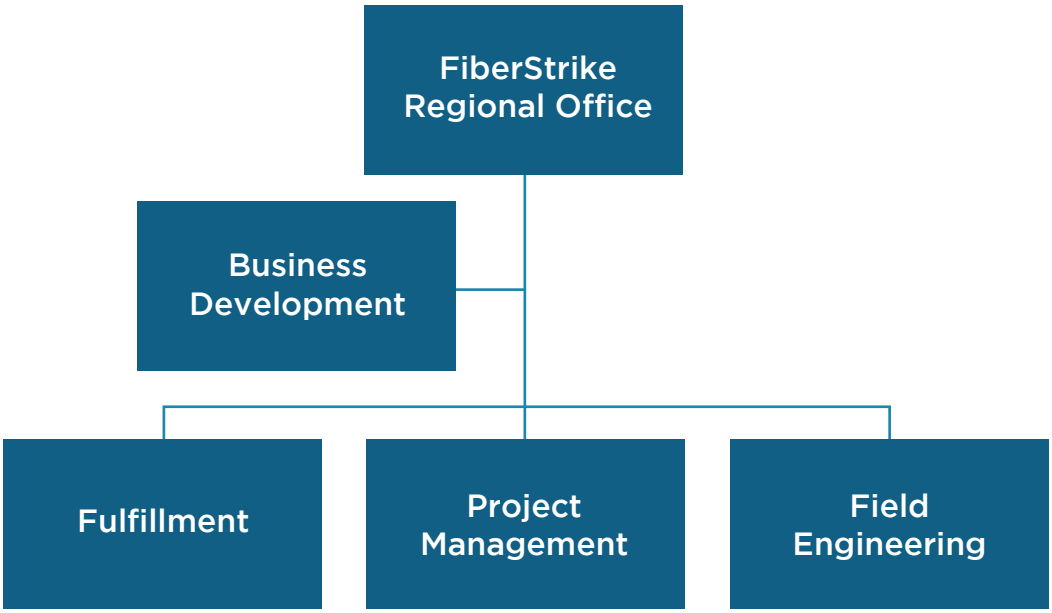


CxTM System Unique Features

- Safe passive temperature sensor for IEC 61439 LV & IEC 62271 MV asset monitoring
- Passive fiber optic cable
- Up to 1024 freely configurable Zones/POI available per system
- Many kilometers of coverage
- Continuous temperature monitoring and hot spot detection
- Immune to EMI
- Standard Modbus TCP interface to BMS/DCS/SCADA for POI temperatures and alarms
- Project managed implementation
- +10 years CxTM global deployment experience

FiberStrike and Data Center CxA & GC Alignment

- Project managed by FiberStrike
- CxL0 = Planning / Design
- CxL1 = FAT
- CxL2 = Installation QA/QC
- CxL3 = Start up Testing (DTS Mapping tasks)
- CxL4 = Functional Testing (DTS commissioning tasks)
- CxL5 = IST (BMS standby integration and heat load test)
- CxL6 = (Post Acceptance phase)
- Training (Before / After handover)



Next step: Requirements

To Maximize the Lifecycle Time of Your Power Distribution System

From client to AP-S

Review your present maintenance program and decide how much detail is required for hot spot identification.

Alarm Granularity examples:

- ✔ Resolve location to an individual “room”
- ✔ Resolve to individual bus bar run
- ✔ Resolve to individual bus bar joint(s)
- ✔ ….something else?

From client to AP-S

For CBTM:

- ✔ Provide Run length for initial quotation
- ✔ Provide Detail drawings and documents for subsequent implementation

For CSTM:

- ✔ Provide CAD drawing of physical switch gear layout identifying ship-split
- ✔ Provide SLD specifying POI

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