

Selecting the Right Fiber Optic Sensing Technology: A Guide to Choosing DTS, DAS, or Integrated Sensing Solutions

1. Introduction

Fiber optic sensing technologies can solve a wide range of monitoring challenges, but selecting the right sensing approach depends heavily on the application.

Different technologies are optimised for measuring different physical phenomena:

- Temperature
- Vibration and acoustics
- Strain (where applicable in some applications)

This guide focuses on selecting between **Distributed Temperature Sensing (DTS)**, **Distributed Acoustic Sensing (DAS)**, or a combined solution.

2. Start with the Monitoring Objective

The first question is:
What problem are you trying to solve?

If you need to detect:

- Heat
- Fire
- Thermal anomalies
- Hot spots
- Temperature changes

→ Consider **DTS**

If you need to detect:

- Digging
- Intrusion
- Vibration
- Mechanical disturbances
- Acoustic events

→ Consider **DAS**

If you need both operational and security monitoring:

→ Consider **Integrated DTS + DAS**

3. Technology Selection Guide

Choose DTS when the priority is:

Fire detection

Examples:

- Tunnels
- Conveyor systems
- Warehouses
- Car parks

Asset thermal monitoring

Examples:

- Power cables
- Transformers
- Solar farms
- Industrial equipment

Leak detection

Examples:

- Pipelines
- District heating systems
- Utility pipelines

Choose DAS when the priority is:

Security monitoring

Examples:

- Perimeter security
- Border protection
- Pipeline intrusion detection

Disturbance detection

Examples:

- Excavation monitoring
- Cable route protection
- Right-of-way monitoring

Distributed event monitoring

Examples:

- Infrastructure disturbance detection
- Rail and transport monitoring
- Remote asset security

Choose combined DTS + DAS when you need:

- Condition + security monitoring
- Leak detection + intrusion detection
- Fire detection + perimeter security
- Asset monitoring + disturbance detection

Examples:

- Pipelines
- Utilities
- Data centres

4. Selection Factors to Evaluate

Risk type

What risk dominates?

- Thermal risk → DTS
- Security/intrusion risk → DAS
- Mixed risks → Combined

5. Example Selection Matrix

Application	Typical fit
Tunnel fire detection	DTS
Power cable monitoring	DTS + DAS
Pipeline leak detection	DTS
Perimeter security	DAS
Pipeline intrusion detection	DAS
Border security	DAS
Data centre security + thermal monitoring	DTS + DAS
Utility corridors	DTS + DAS

6. Questions to Consider During Technology Selection

A useful shortlist:

- What event am I trying to detect?
- Is temperature or vibration the key parameter?
- Is early warning or alarm detection the objective?
- Do I need operational monitoring, security monitoring, or both?
- What sensing range is required?
- How critical is event localisation?
- What existing systems must be integrated?
- What level of analytics is needed?

These questions often define the correct solution.

7. Common Selection Mistakes to Avoid

Choosing based only on hardware - Focus on application requirements, not just hardware specifications.

Treating DTS and DAS as interchangeable - They solve different problems.

Underestimating integration needs - Software, interfacing and data consolidation often matter as much as sensing hardware.

Designing for detection only - Some applications benefit far more from monitoring and predictive insight.

8. Why Combined Sensing is Growing

Many operators increasingly prefer integrated approaches because one sensing infrastructure can support multiple functions:

- Safety
- Integrity
- Security
- Operational monitoring

This improves:

- Coverage
- Value
- Scalability
- Return on investment

9. Conclusion

Selecting the right fiber optic sensing technology begins with understanding the risk to be managed.

- Choose **DTS** for distributed temperature monitoring
- Choose **DAS** for distributed disturbance and intrusion detection
- Choose **Integrated DTS + DAS** when both risks must be addressed

The right selection is application-driven, not technology-driven.

10. Further Information

For system design guidance, technical specifications, or application support, please contact fotas@samm.com.