

Engineering Guide

Cooling, Securing & Powering, Energy Efficient Data Centers

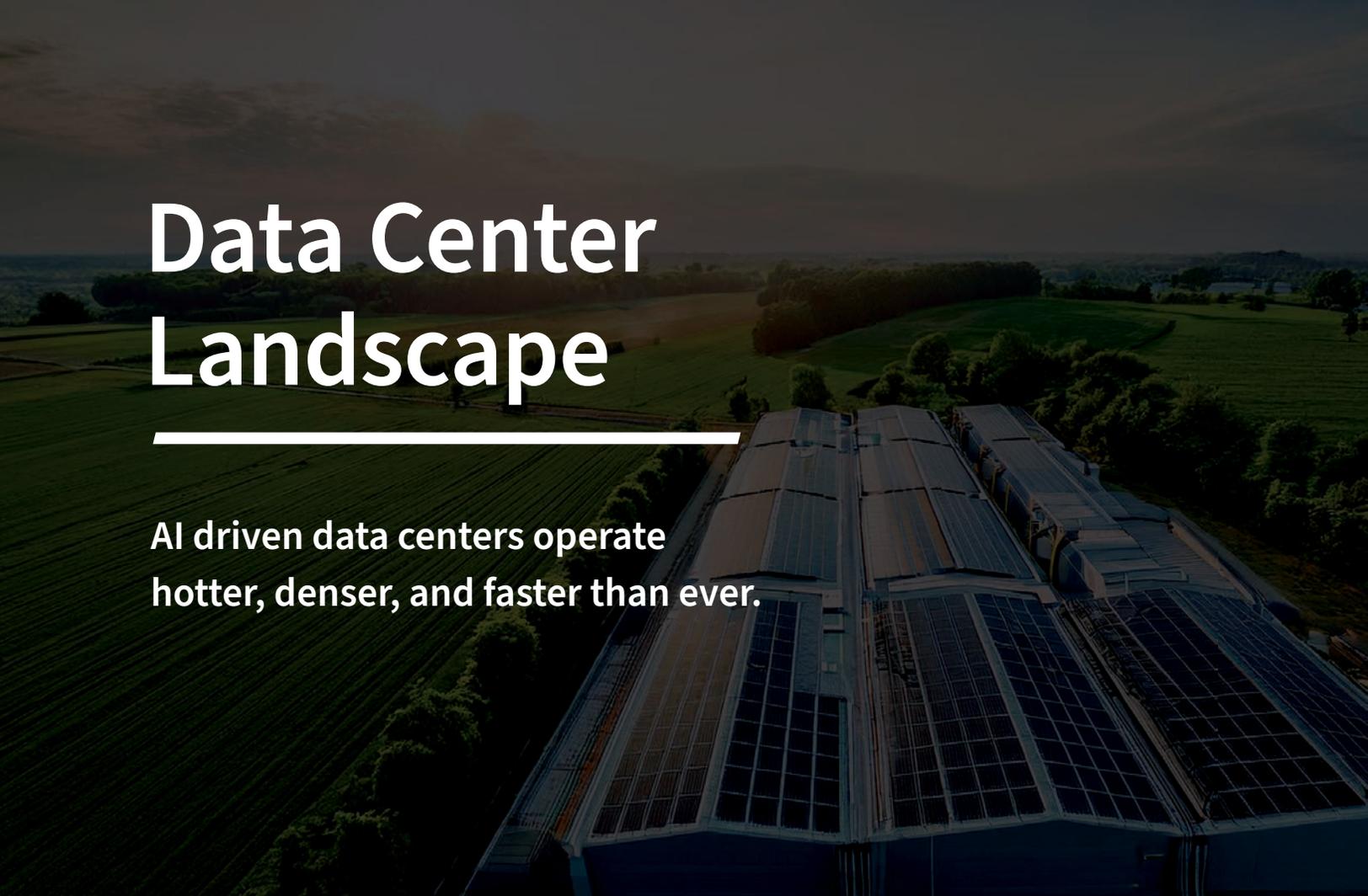


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Data Center Landscape

AI driven data centers operate
hotter, denser, and faster than ever.



SENSOR INTEGRATION FOR AI DRIVEN, ENERGY EFFICIENT DATA CENTERS

AI driven data centers operate hotter, denser, and faster than ever. This guide provides engineers with practical, actionable insight into selecting and integrating energy efficient, passive sensing technologies to support uptime, cooling stability, and access security in next generation facilities.

THE NEW DATA CENTER LANDSCAPE

Modern facilities now handle:

- High density AI clusters that increase thermal load
- Immersion cooling and hybrid liquid cooling systems
- Stricter access and compliance requirements
- Energy reduction initiatives

Sensors play a vital role in delivering:

- Continuous coolant level monitoring
- Accurate rack and cabinet access detection
- Power outage resilient safety controls
- Long lifecycle, low maintenance operation





ENGINEERING CHALLENGES THAT SENSORS ARE INTEGRAL IN SOLVING

1. Thermal Stability Under AI Workloads - AI clusters spike heat density.

Engineers must ensure these systems stay cool utilizing systems that require:

- Precise coolant level control
- Continuous monitoring of immersion tanks
- Cooling redundancy and alerts

2. Physical Security + Access Control - Unauthorized access or missed door interlocks can cause catastrophic downtime.

Magnetic proximity sensors ensure:

- Cabinet/rack door detection to monitor open/close position
- Gate and cage entry monitoring to ensure authorized access
- Power interlock triggering to turn power off for maintenance

3. Energy Efficiency Requirements - Reed based passive sensors eliminate standby power consumption, lowering operational energy cost.

4. Environmental Durability - Sensors must withstand:

- Humidity around cooling systems
- Vibration from HVAC
- Temperature fluctuations
- Dust build-up that can inhibit other technologies such as photoelectric sensors

As AI-driven data centers run hotter, denser, and faster, the entire infrastructure must evolve to keep pace. Modern facilities rely on precise, always-on monitoring to maintain cooling stability, safeguard access, and protect uptime. When every watt and every degree matters, energy-efficient passive sensors become essential quietly ensuring accurate data, secure operation, and uninterrupted performance beneath the surface of the world's most demanding compute environments.





Sensor Technologies That Enable Efficiency

MAGNETIC & FERROUS PROXIMITY SENSORS

Used for access control and power interlocks.



Benefits:

- Passive operation
- High reliability
- No MCU or constant power draw
- Accurate open/close detection

REED SWITCH TECHNOLOGY

The core of Standex Detect passive sensing.



Benefits:

- Zero power in passive state
- Non contact actuation
- Long lifecycle (10M+ cycles)
- Ideal for energy restricted architectures

LIQUID LEVEL SENSORS

Used across coolant distribution, immersion tanks, HVAC systems, and fire suppression reservoirs.



Benefits:

- Coolant systems prevent thermal runaway
- Sensors help ensure that coolant levels are at required levels for pump usage
- Sensors are compatible with multiple liquids and coolant chemistries
- Available in vertical and side mount designs



BEST PRACTICES FOR SENSOR INTEGRATION

1. Choose Passive Solutions Where Possible

Lower energy usage = lower load on power systems.

2. Prioritize Environmental Rating

Use IP67+ in cooling and HVAC regions.

3. Match Materials to Coolant Chemistry

Engineering compatibility is key to long term stability.

4. Incorporate Power Interlocks into Access Control

Eliminate accidental maintenance related failures.

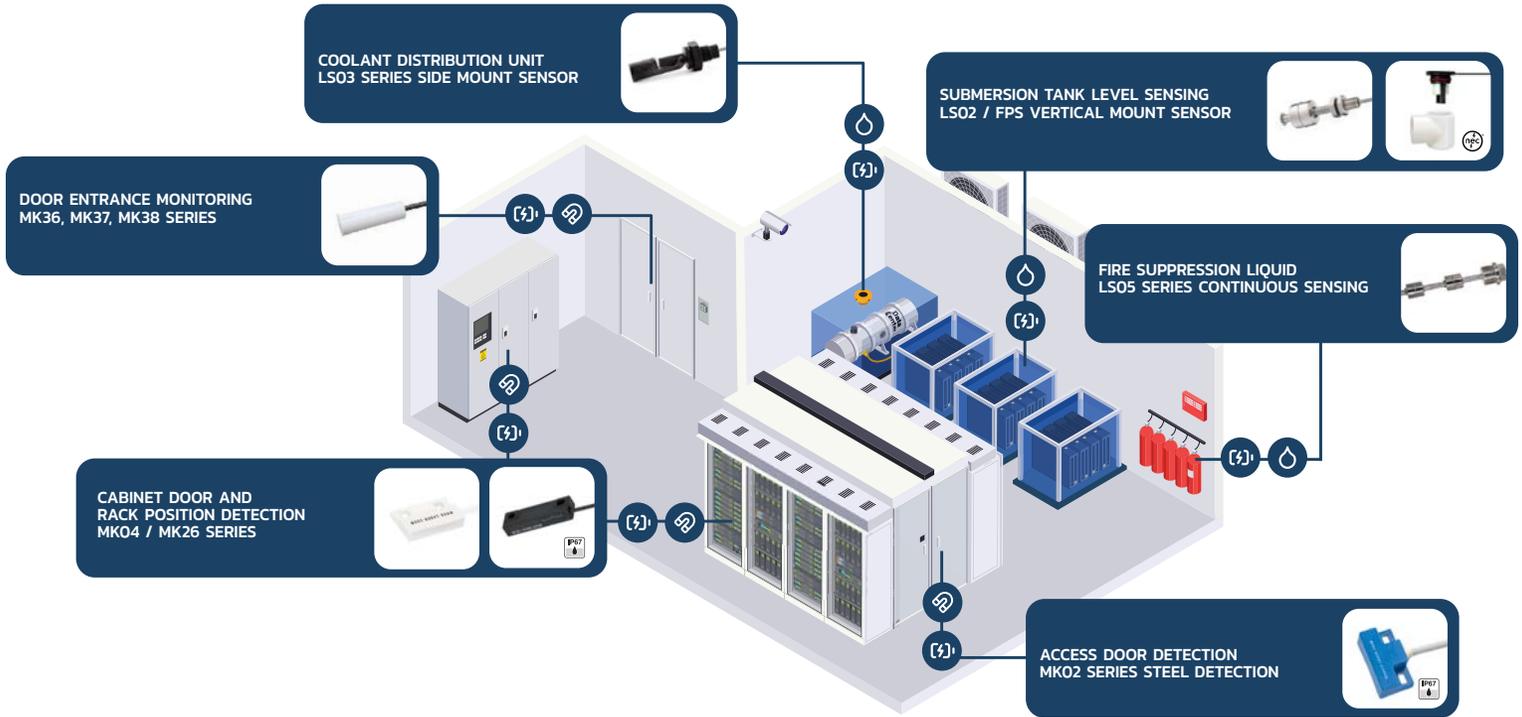
5. Place Sensors Based on Fluid Dynamics

Vertical sensors for immersion tanks, side mount for CDUs.



Recommended Sensor Series Guide

Series	Use Cases	Why Choose
MK02 / MK04 / MK26	Cabinet and rack door monitoring Access interlocks Security compliance	Slim profile, customizable length Normally Open and Normally Closed outputs available
MK36 / MK37 / MK38	Entrance gates Room level access detection	High isolation levels Durable for harsh thermal zones Easily concealed
LS02 / LS03 / LS05	Immersion tanks CDUs HVAC coolant reservoirs Fire suppression fluid tanks	Top, side, and vertical mount versatility Accurate switching without false readings



Implementation Checklist

- CONFIRM COOLANT COMPATIBILITY
- SELECT MOUNTING ORIENTATION
- VALIDATE IP RATING FOR ENVIRONMENT
- DETERMINE NO/NC LOGIC PREFERENCE
- ADD REDUNDANCY FOR CRITICAL SYSTEMS
- INTEGRATE WITH MONITORING SOFTWARE (OPTIONAL)
- TEST SWITCHING THRESHOLDS BEFORE DEPLOYMENT

CONCLUSION

Energy efficient sensing is now essential not optional.
Standex Detect enables AI ready data centers to:

- Reduce energy consumption
- Strengthen physical security
- Improve cooling precision
- Extend system lifecycle
- Maintain uptime in power critical environments

Standing at the intersection of electronics, security, and thermal management, **sensors are the silent backbone of modern infrastructure.**

**Sensors are the Silent Backbone
of Modern Infrastructure**





A Standex **Electronics** Business

The modern world pulses with silent signals that activate, safeguard, and synchronize the systems that underpin everyday life. As automation, renewable energy, transportation, and smart environments evolve into autonomous, adaptive networks, everything begins with one capability: the power to **Detect** what's next.

Standex Electronics delivers the high-performance sensing and switching solutions that enable this future. Through customer intimacy and deep technical collaboration, we listen, design, refine, and deliver solutions built for unwavering reliability.

Our expertise in reed switches, sensors, and relays enables equipment to sense position, measure speed, **Detect** presence, ensure safety, and control power with precision. We're advancing Detection at the speed of innovation for when it matters. Delivering the right design, at the right time, at the optimal cost.

Tomorrow's breakthroughs depend on our ability to Detect instantly, quietly, and reliably.

Welcome to **Standex Detect**.

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