

THE ENERTECH EDGE

Fire & Air: The Damper Series

By Kent Maune

Today's Motorized Life Safety Damper Reliability

Modern motorized fire, smoke, and combination fire/smoke dampers have evolved significantly since their introduction in the 1970s. Advances in design, materials, and testing standards have transformed them from basic mechanical devices into highly engineered life safety components that deliver greater accuracy, reliability, and simplified maintenance.

From Basic Controls to Engineered Life Safety Systems

When motorized dampers first entered the market, they were essentially standard control dampers adapted for fire applications. Early models relied on blade locks to remain closed and were tested under the third edition of **UL 555, Standard for Fire Dampers**, and the first edition of **UL 555S, Standard for Smoke Dampers**.

Testing at the time focused on fire exposure, 250-cycle operational testing, and heat-degradation performance. However, there was no defined UL test standard for actuators. Manufacturers used whatever motor could operate the damper.

Because these actuators were not designed to function during a fire event, early systems depended on a fusible link. When exposed to high heat, the link melted, releasing a spring that forced the blades closed while a locking mechanism secured them in place. This design required direct physical access to each damper for inspection and periodic testing.

The Evolution of Standards and Design

As building systems became more sophisticated and life safety codes advanced, performance expectations increased.

Under the current fourth edition of **UL 555S**, dampers and actuators are tested as integrated assemblies engineered to perform under extreme heat and airflow conditions. Modern dampers are no longer modified control devices; they are purpose-built life safety components capable of dynamic operation within smoke control and HVAC systems.

The fusible-link approach has been eliminated in motorized designs. Today's dampers use a solid jackshaft connection between the actuator and blades, securely locking them in position when closed.

Actuator technology has also progressed dramatically. Older oil-filled, foot-mounted motors with delicate linkages have been replaced by direct-coupled, anti-slip actuators specifically designed for life safety applications. These actuators undergo rigorous UL testing, including extended cycle testing and holding-performance verification.

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Testing That Reflects Real-World Conditions

The latest UL 555 and UL 555S standards better reflect real building environments. Each damper and actuator assembly must successfully pass:

- 20,000 operational cycles
- Heated-air dynamic closure testing at 250°F (121°C)
- Air velocity testing at 2,400 fpm (10.2 m/s)
- Pressure testing at 4 in. w.g. (1 kPa)

In addition, UL conducts unannounced follow-up inspections at manufacturing facilities to verify that production units match the tested and approved assemblies.

These enhanced standards have significantly improved reliability, consistency, and performance in the field.

Installation and Remote Testing Capabilities

UL requires that current installation instructions accompany every damper shipment, ensuring contractors always have access to the latest guidance.

Once properly installed and commissioned, modern motorized dampers can be tested remotely, reducing or eliminating the need for physical ceiling access.

Several remote-testing options are now available:

- **Control Panels** – Hard-wired panels with momentary push buttons allow direct activation and status monitoring.
- **Fire Alarm Integration** – In Europe and other regions, automated testing is often required every 48 hours through the fire alarm panel, which alerts operators to any performance issues.
- **Remote or Smart Controls** – Advanced control systems, similar to building automation or home automation platforms, allow testing of UL-listed motorized dampers from handheld devices or networked systems.

The Bottom Line: Reliability, Safety, and Cost Savings

Thanks to modern engineering and integrated technology, routine ceiling access for testing is no longer necessary in many applications. Remote testing can reduce inspection costs by up to \$500 per damper while maintaining compliance and enhancing system safety.

By adopting today's motorized dampers and remote-testing solutions, building owners and engineers can reduce labor costs, strengthen performance verification, and improve overall life safety system reliability.

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