A brief Introduction to the Principles and Practices of Fire Dampers

Fire Dampers
Types
Fusible Links
MFD
Actuator
Tests
Classifications

- Although at times Fire Dampers and Smoke Control Dampers can be seen as a confusing area of ventilation as there's lots of different types of models and combinations.
- The actual engineering installation aspect is quite simple.
- There's jointing methods to ductwork sections, fixings to floors, ceilings and walls, and drop rods, supporting brackets and cleats.
- The confusion occurs with a lack of information, communication and knowledge, with what type, classification, and method of installation is required and where, hopefully the information presented here will offer a little clarity.

Manufacturers - Dampers

actionair by Swegon

BSB

TROX® TECHNIK

ADVANCEDAIR

MANDÍK®

Fire Damper – Smoke Control Damper

- Fire dampers are an integral part of the fire protection systems that ensure compartmentalisation in the event of a fire.
- The BSEFSD occupational standards and the BS 9999 code of practise can give guidance in installation, inspection, testing and maintenance of fire dampers.

- In all situations fire dampers, motorized fire dampers and smoke control dampers are designed to protect the occupants of the building from fire and smoke and maintain the integrity of the fire compartments in the event of a fire.

- **FIRE DAMPERS ARE A LIFE SAFETY SYSTEM***
- **Life Safety System Definition-applies to any system incorporated into a building whose purpose is the protection and preservation of human life during an emergency*

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Fire Damper – Smoke Control Damper

- **Fire Dampers:**
- Dampers tested to Fire test standard: 1366-2 Product standard: **BS EN 15650**
- These have Fusible Links & Fail closed
- Fire Damper:- definition in BS EN 15650 – Ventilation for buildings Fire Dampers
- *"A Fire Damper is used to prevent fire and reduce smoke spreading from one compartment to another through the air ductwork system which may penetrate fire separating walls and floors"*
- When with an actuator it's mistakenly called a fire/smoke damper

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- **Smoke Control Dampers**
- Dampers tested to Fire test standard 1366-10 Product standard **BS EN 12101-8**
- These **do not** have Fusible Links and are DO/DC Actuator only
- Smoke Control Damper:- definition in BS EN 12101-8 Smoke & Heat control systems, Smoke control dampers
- *"Device, intended to operate as part of a pressure differential system or smoke and heat control system."*
- Also mistakenly called a fire/smoke damper

Other Dampers - VCD – MD – Regulates Air Flow - Not FD

Fire Damper Variations

- Such as with cars there is with fire dampers different manufacturers and different models.
- Each fire damper has a specific way in which it should be installed these are called the manufacturers fitting instructions.
- However, there are certain components that can be identified and named on each variation.
- There are also variations in the types of fusible links that a fire damper can have installed on them.

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Types

- What is a mechanical fire damper?
- A fire damper is a mechanical device that triggers at 72°C(+/- 4°C) and prevents the spread of fire by sealing the compartment.

- This is a manual fire damper and is for compartmentation

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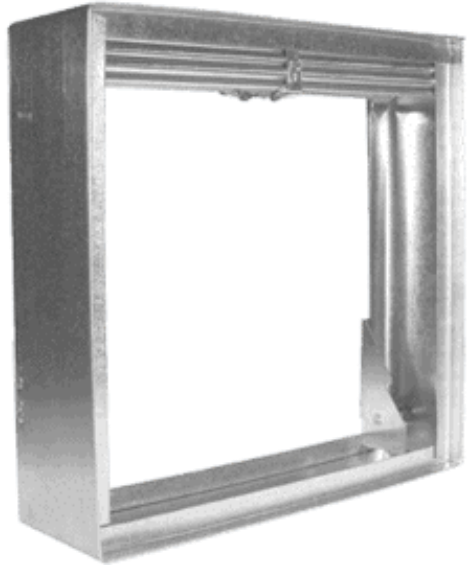
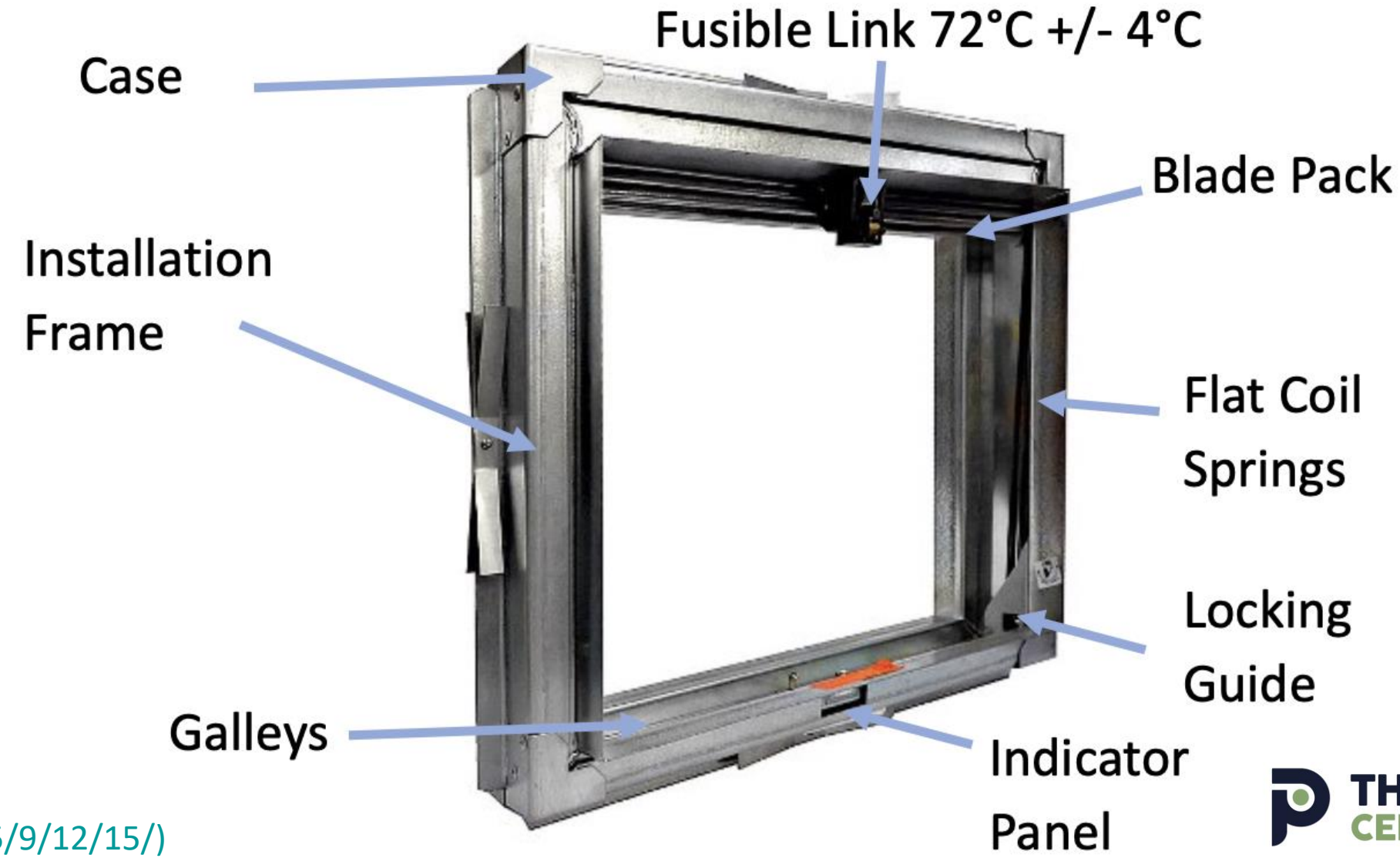
Mechanical/Manual Fire Dampers

- **Fire Dampers -** designed to close on high temperature activation (72°C).
- **Prevent the spread of fire.**
- **Failsafe Closed, normally open.** Thermal Link melts and releases sprung blades that close.



Folding curtain fire dampers are constructed so that the interlocking blades fold to the top for maximum free area in the airway, to then be released once the temperature rises (normally rated at 72C +- 4C) to fill the airway and prevent the passage of fire.

Mechanical Fire Damper Component Breakdown



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Mechanical/Manual Fire Dampers

- Fire Damper closed

Types of Fusible Links

- **Standard Latch –**
- A solid bar with either holes, studs or lips to hold the latch in place to allow the link to separate in the middle.

Types of Fusible Links

- **Gate Latch –**
- A solid bar with 2 studs locked in by 2 moving catches that release the damper to mimic activation.
- In a fire the link should separate in the idle as per the standard latch

Types of Fusible Links

- **Hook and Fusible Bar -**
- A solid bar that has 2 hooks attached to either end these can have spacer links in between were required.
- To test you need to remove one of the hooks from its fixing. In a fire the link will separate in the middle

Types of Fusible Links

- **Spring Cassette –** A spring loaded cassette that holds the damper with usually 2 large teeth.
- To activate press the button on the side of the cassette to release the teeth.
- In a fire there is a link inside the cassette that will separate releasing the teeth

Motorised Fire Damper

Motorised fire dampers are used for compartmentation in escape routes or sleep risk area's or any other areas as ABD reg 7.

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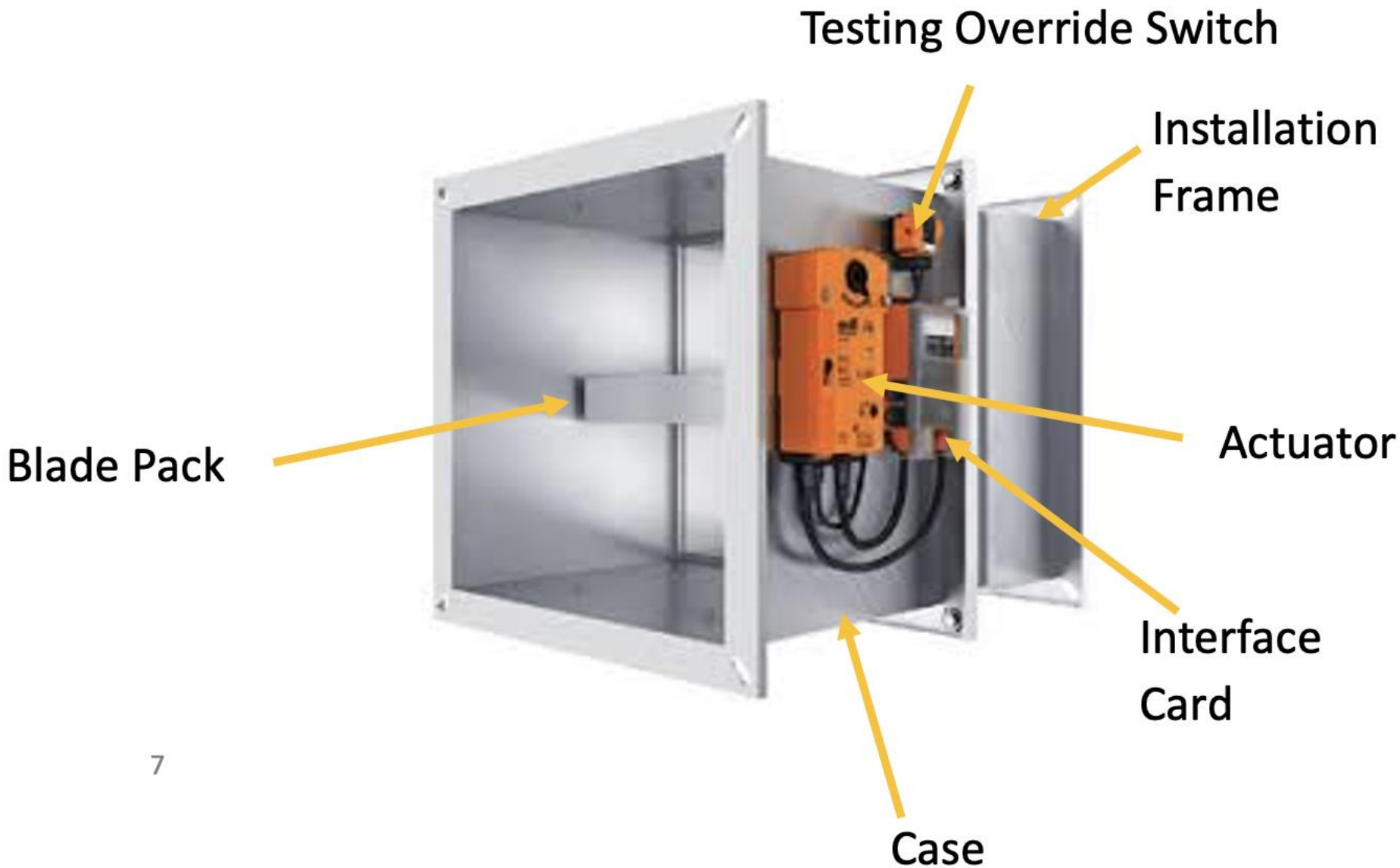
Motorised Fire Damper

Motorised Fire Dampers - designed to close on either smoke detection (early indication of fire) from fire detection systems or high temperature activation (72°C)

Electrically actuated

Motorised Fire Damper Component Breakdown



Single Blade Fire Dampers

- Single Blade Fire Dampers
- Single blade fire dampers are constructed with a single pivoting blade within a frame.
- The blade is released from its open position by means of a thermal release mechanism normally rated at 72C + - 4C.
- When the release mechanism is activated the blade pivots and moves to close the airway to prevent the passage fire.
- Test results or assessments are required for plane of installation (e.g. horizontal and vertical) and the method of installation.

Multi-blade Fire Dampers

- Multi-blade fire dampers are constructed with a number of linked pivoting blades contained within a frame.
- The blades are released from their open position by means of a thermal release mechanism normally rated at 72C + - 4C.
- When the release mechanism is activated the blades pivot and move to close the airway to prevent the passage of fire.
- Test results or assessments are required for plane of installation (e.g. horizontal and vertical) and the method of installation.

What is an Intumescent Fire Damper?

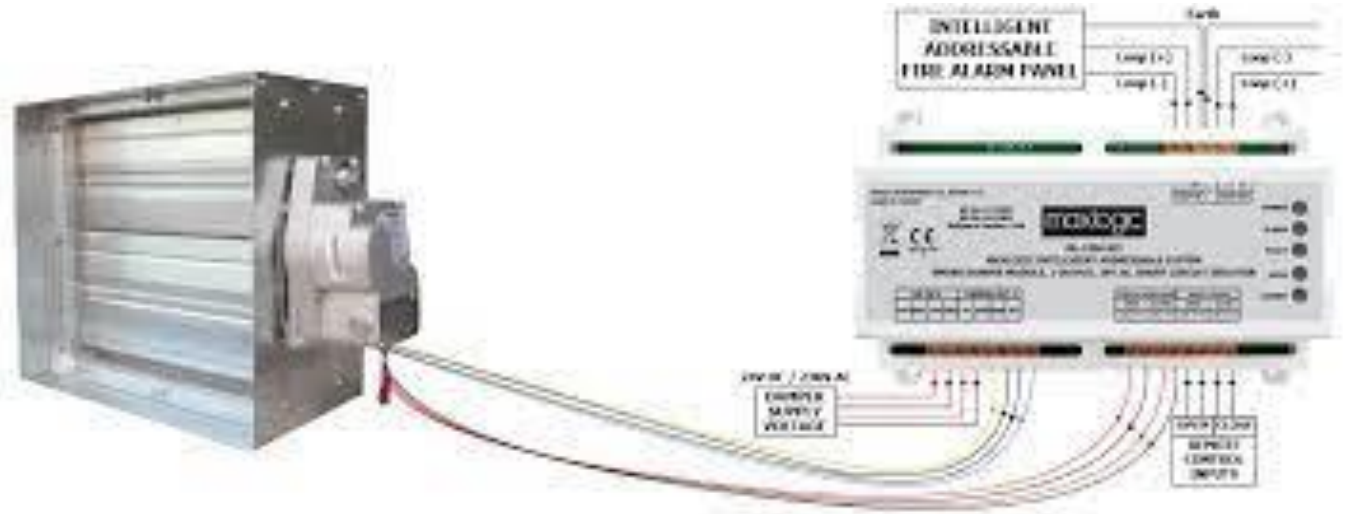
This is a device that incorporates intumescent materials that expand to seal off a compartment and prevent the passage of fire.

Activation is influenced by the type of intumescent material used.

The temperatures typically range from 120°C to 270°C test results are required for the method of installation and plane of installation (horizontal or vertical).

Motorised Fire Damper Control

- Motorised Dampers are controlled with a Control panel programmed to suit building “cause & effect”, activated from Fire Smoke detection system.



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Actuator – provides a mechanical response

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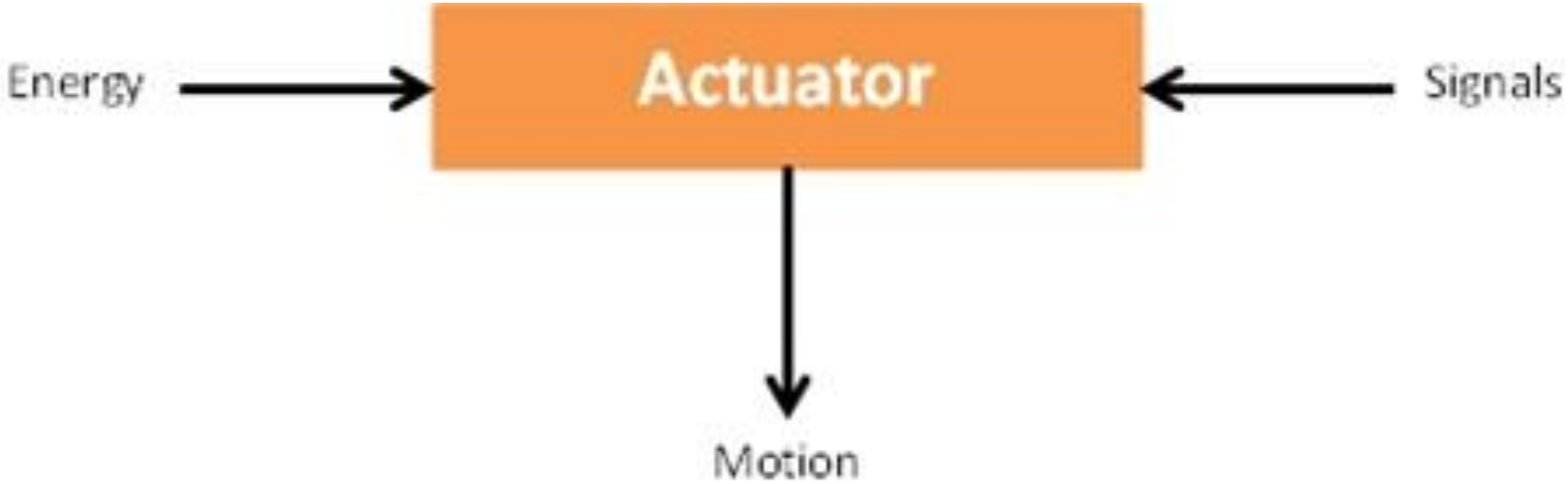
What is an actuator?

- An actuator is a device that produces a motion by converting energy and signals going into the system.
- The motion it produces can be either rotary or linear.



Damper/Actuator

- What is the difference between a damper and an actuator?
- Dampers are the final control devices for almost all airflow in HVAC systems.
- Actuators are the interface between the control system and the mechanical system and are critical to accurate control.

What does a fire damper actuator do?

- In case of fire, Belimo safety actuators for fire dampers automatically **move into their safety positions and keep the dampers closed during the fire**. –

- Responsible fire protection requires practical solutions with suitable products.

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Belimo New Smoke Control Actuators

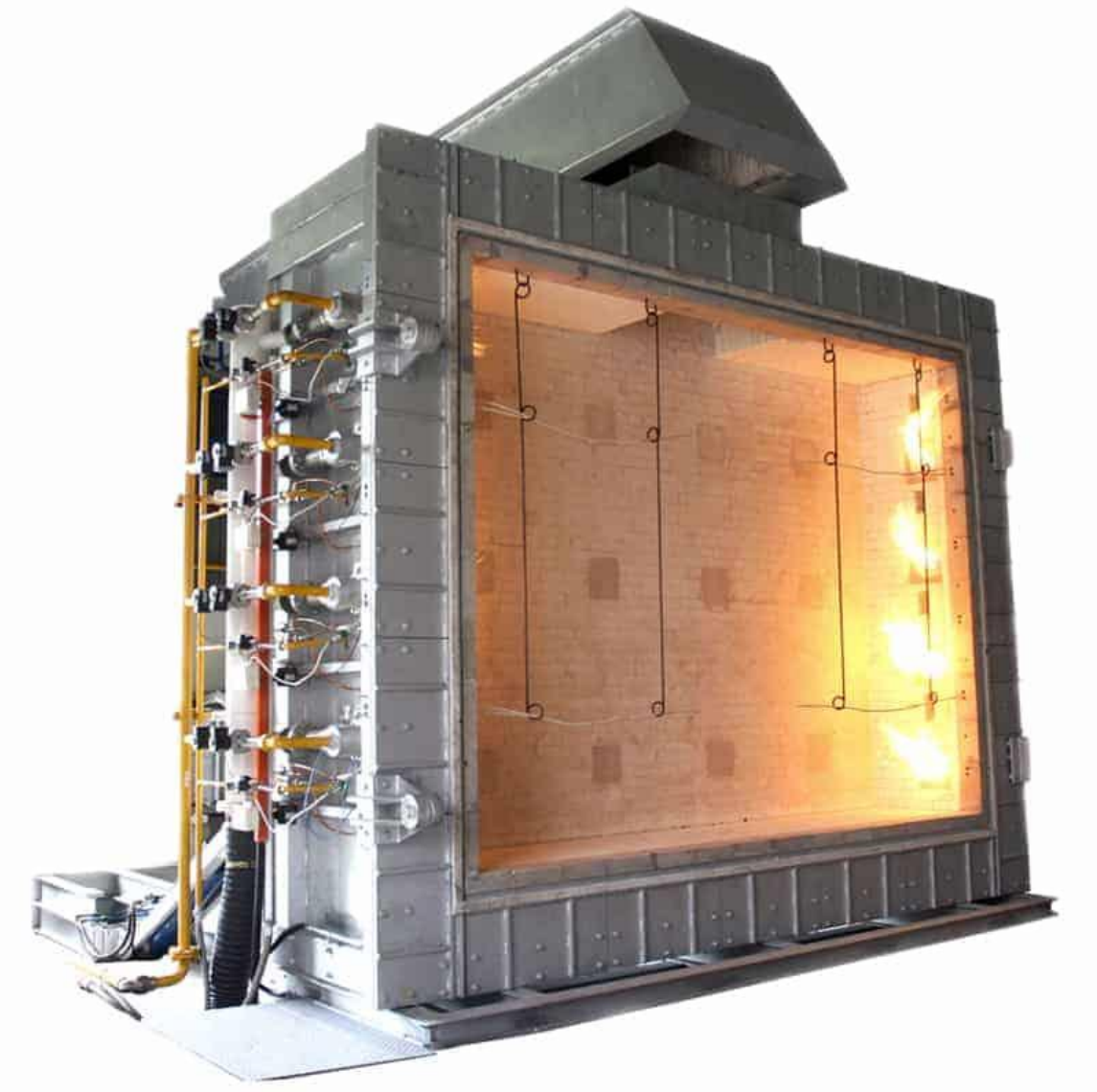
- Video 3
- https://www.youtube.com/watch?v=IrnMBUSEeTo

Fire Resistance Test Furnace

- The performance of walls, columns, floors and other building elements when exposed to fire conditions is of extreme importance in insuring safety to both the public and neighbouring structures.
- In order to acquire information on this performance, it is necessary to measure the fire-resistive properties of the materials and assemblies in question.

Fire Resistance Test Furnace

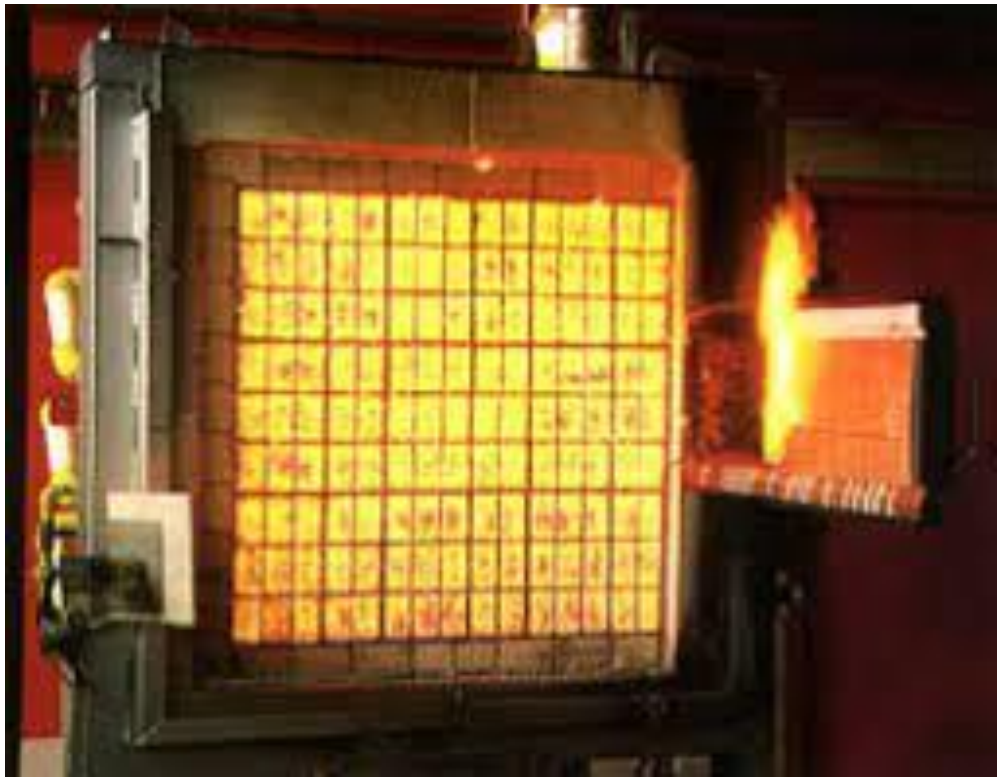
- The **FTT** Fire Resistance Test Furnace for Vertical and Horizontal Test Specimens is the apparatus needed to evaluate the fire resistance of a horizontal or vertical construction assembly, column, or support, and provides a method of quantifying the ability of products such as doors and dampers, and building materials to withstand exposure to high temperatures.
- This is done by evaluating a number of performance elements such as; the load-bearing capacity, the ability to provide fire containment and the thermal transmittance of the materials and systems.



Fire Resistance Test Furnace

- The fire resistance performance of the tested specimen is assessed against **insulation, integrity and load bearing capacity**.

- **BS 476** refers to the British standard for fire tests on building materials and structures.



Fire Resistance Test Furnace

- Data obtained from a fire resistance test carried out to determine the suitability of a product, system or combinations to seal service penetrations.
- With respect to fire dampers this will be to BS EN 1366-2 with classification to BS EN 13501-3.
- Historical data to BS476-20/22 will only be applicable in certain instances (e.g. fan shut-down on detection of fire).

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Fire Resistance Test Furnace - Videos

- Video 4 https://www.youtube.com/watch?v=eNN679OrmZU&list=PLyst3wvNTOPaHvxafDOJInBuaXymqH_74&index=21

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Product, Classification and Fire Test Standards

- The fire standards currently being harmonised throughout the twenty-seven nations of the European Community — regulations that have a direct impact on the lives of millions of people in Europe and beyond — are also increasingly used worldwide as effective benchmarks.
- They provide details of the anticipated extent to which materials or products burn and contribute to the development of fire.


EUROPEAN STANDARD
EN 15650

Ventilation for buildings - Fire dampers


EUROPEAN STANDARD
EN 13501-3:2005/A1

Fire classification of construction products and building elements – Part 3: Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers


EUROPEAN STANDARD
EN 1366-2

Fire resistance tests for service installations - Part 2: Fire dampers

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European		UK	
Standard	**Classification**	**Standard**	**Classification**
ISO 1182 and ISO 1716	Class A1	BS 476: Part 4	Non combustible
ISO 1182 or ISO 1716 and EN 13823	Class A2	BS 476: Part 11	Limited combustibility
EN 13823 and EN ISO 11925-2	Class B	BS 476: Parts 6 and 7	Class 0
EN 13823 and EN ISO 11925-2	Class C	BS 476: Part 7	Class 1 & 2
EN 13823 and EN ISO 11925-2	Class D	BS 476: Part 7	Class 3
EN ISO 11925-2	Class E	BS 476: Part 7	Class 4

Fire Damper Classification – E – I – S – 120 min

- **E – Integrity** is the ability of a component of a service installation to prevent the transmission of fire as a result of the passage of significant quantities of flames or hot gases from the fire to the unexposed side, thereby causing ignition either of the non-fire exposed surface or of any material adjacent to that surface.

- **I – Insulation** is the ability of a component of a service installation to withstand fire exposure without the transmission of fire as a result of significant transfer of heat. Transmission shall be limited so that unexposed surfaces or any material in close proximity to those surfaces are not ignited. The component shall also provide a barrier to heat, sufficient to protect people near to it.

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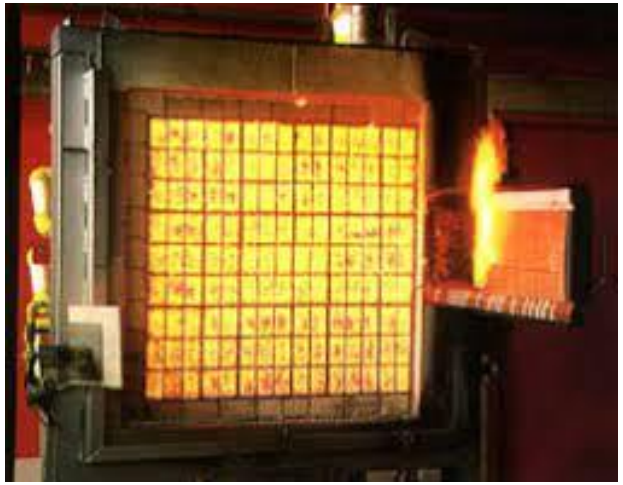

Fire Damper Classification

- **S - Smoke leakage** is the ability of the component to resist the passage of gases or smoke at ambient temperature and during exposure to the standard temperature/time test.

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- **Classification periods -** All classification periods against any of the characteristics shall be declared in minutes using one of the periods 15, 20, 30, 45, 60, 90, 120, 180 or 240.

Fire Damper Classification

- For example, a classification **EI 120 (ve ho i ↔o*) S** indicates a damper capable of satisfying –

- 120 m integrity E classification
- 120 m Insulation I classification
- 120 m Smoke leakage S classification

- 120 m From both sides of a compartment in a vertical
- **ve** application
- 120 m From both sides of a compartment in a horizontal
- **ho** application

Vertical – Horizontal – Fire from one side or both- (ve ho i ↔o) – inside – outside-

- The classification shall indicate if the performance criteria are satisfied by fire from one side only or from both sides, and whether it applies to vertical or horizontal orientations or both.
- The additions "i → o", "o → i" or "i ↔ o" shall be used respectively together with "ve" and/or "ho" to indicate orientation.
- For example, a classification **EI 120 (ve ho i ↔o) S** indicates a damper capable of satisfying 120 min integrity, insulation and smoke leakage, from both sides in both vertical and horizontal applications.

Classifications (recap) - EI 120 (ve ho i ↔o) S

- **E – Integrity** is the ability of a component of a service installation to prevent the transmission of fire as a result of the passage of significant quantities of flames or hot gases from the fire to the unexposed side, thereby causing ignition either of the non-fire exposed surface or of any material adjacent to that surface.

- **I – Insulation** is the ability of a component of a service installation to withstand fire exposure without the transmission of fire as a result of significant transfer of heat. Transmission shall be limited so that unexposed surfaces or any material in close proximity to those surfaces are not ignited. The component shall also provide a barrier to heat, sufficient to protect people near to it.

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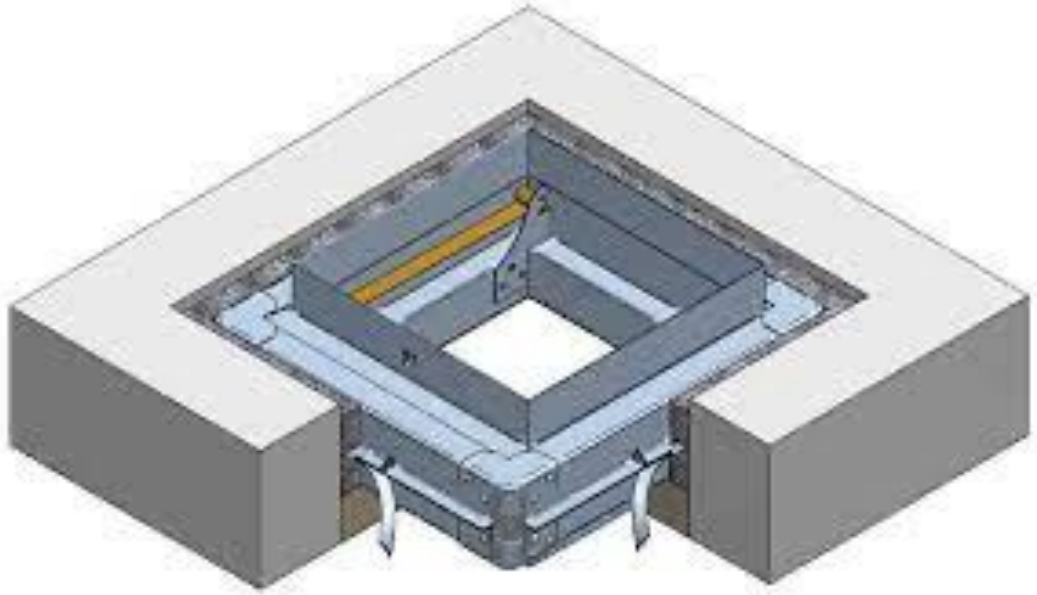
- **Classification periods -** All classification periods against any of the characteristics shall be declared in minutes using one of the periods 15, 20, 30, 45, 60, 90, 120, 180 or 240.

Classifications - EI 120 (ve ho i ↔o) S

- **ve**
- This shows that the damper can be installed vertically, i.e. in a wall.

- **ho**
- This shows that the damper can be installed horizontally, i.e. in a floor/ceiling.



Classifications - **EI 120 (ve ho i ↔o) S**

- i↔o = I defines inside, and the o defines outside.
- This shows that the damper has been tested with fire attack in both directions.

- The classification shall indicate if the performance criteria are satisfied by fire from one side only or from both sides, and whether it applies to vertical or horizontal orientations or both.
- The additions “i → o”, “o → i” or “i ↔ o” shall be used respectively together with “ve” and/or “ho” to indicate orientation.

(BSEFSD – K1/5/6/7/8/9/10/11/12/15/19/21/22)

- For example, a classification
- **EI 120 (ve ho i ↔o) S** indicates a damper capable of satisfying 120 min integrity, insulation and smoke leakage, from both sides in both vertical and horizontal applications.

Question Paper