THE ROLE OF DAMPERS IN MULTI-COMPARTMENT SMOKE & HEAT CONTROL SYSTEMS

MCR FID B PRODUCT ANALYSIS

An advantage of using compartment (fire) dampers with manual control after automatic triggering of the multi-compartment smoke and heat control system in a building (fire damper feature MA) is full control of the building's system during a fire suppression and emergency response. A multi-compartment smoke and heat control system with these dampers is very flexible, which greatly improves the fire safety of the building's occupants.

Further in this article you will learn the differences between the dampers with feature MA and feature AA.

Dampers for smoke and heat control are certified for conformity with the European standard EN 12101-8 for smoke and heat control by the application of compartment (fire) dampers. The standard specifies a number of characteristics for which the unique features of the products can be certified. The most important are: fire integrity and isolation, smoke tightness, operating reliability, activation method, and operation mode of the damper during a fire.

According to the European standards' nomenclature, the latter feature of dampers is called "feature AA".

For the dampers tested and classified with feature AA, the damper is actuated automatically in an emergency. The isolation partition (the blade) of the damper changes its position once and remains in the changed position for the duration of fire and of the emergency and suppression response.

What happens if this assumed operating scenario must be changed for the multi-compartment smoke & heat control system during a fire or if the system is automatically triggered to operate in a wrong fire compartment (zone)?

You will find the answer in this article.

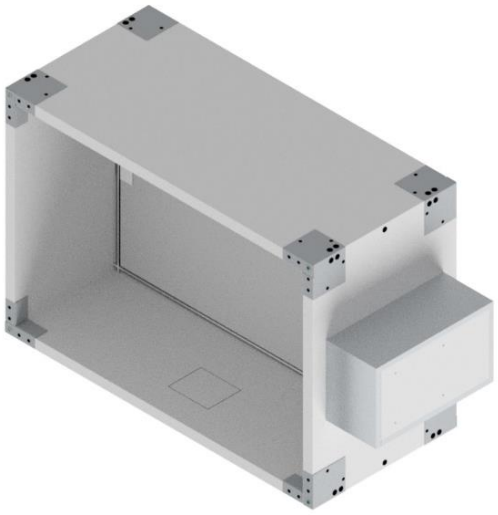


Fig. 1. 3D model of the mcr FID B single-blade damper.

Each EN 12101-8 certified damper [1] must pass the relevant testing and be classified. Performance of dedicated tests shall be in accordance with EN 1366-10 concerning fire resistance testing of dampers [2] and classification of the product shall be in accordance with EN 13501-4 concerning the fire classification by the results of the fire resistance testing applied to smoke control system components [3].

All of the references given so far are intended to confirm that the specific damper type can be used in smoke control systems for:

- handling one or more fire compartments (zones);
- manually activated systems (feature MA) or automatically activated systems (feature AA);
- isolation partition (damper blade) position change at exposure to high temperatures;
- maintenance of the required clear cross-section at exposure to high temperatures;
- maintenance of the required integrity.

switch over to open and enable efficient extraction of smoke and heat. This way the dampers in all other compartments are commanded to close (if open) or remain closed.

This scenario is shown in Fig. 2. The dampers on the level on fire open, while the dampers on the level without any fire remain closed.

The dampers installed in smoke and heat control systems can be actuated to operate with either of the two methods detailed in EN 1366-10 [2].

The first method is automatic actuation of dampers. The dampers installed in a smoke and heat control system receive a fire alarm signal, which commands them to switch to the safety state in execution of the fire scenario designed for the building. Specific dampers open while others close or remain closed and it is not possible to alter the fire scenario in any way, such as manual override and control over specific dampers or modification of the fire scenario sequence.

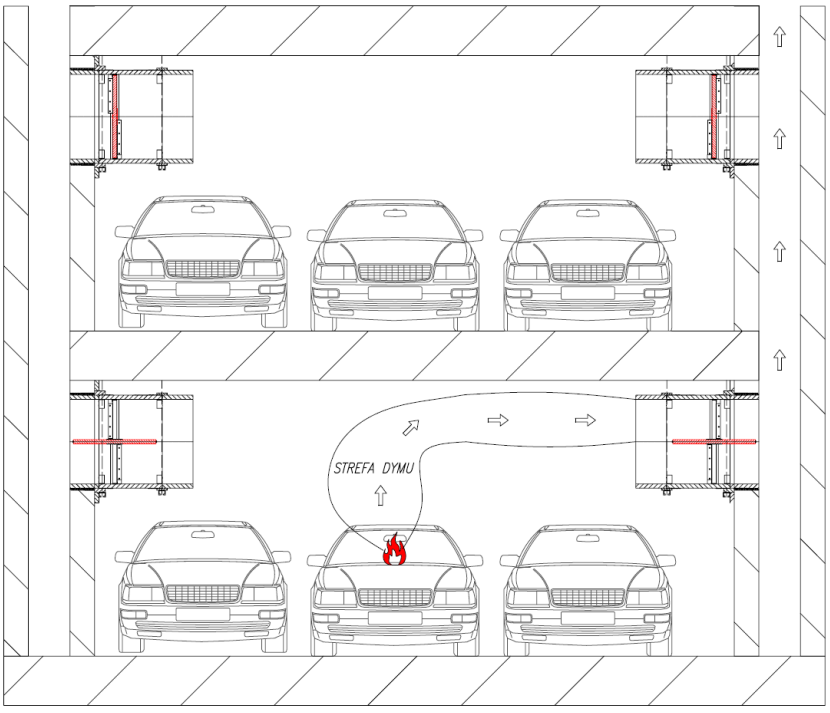


Fig. 2. Actuation diagram of fire dampers during a fire.

The dampers dedicated for operation in these systems are identified with feature "AA", as per the classification code established in EN 13501-4 [3].

The other method of activating the dampers applied in smoke and heat control systems is automatic activation (similar to the one discussed above), where it is feasible to manually control the operation of each component of the system following its activation.

When a damper switches over into the actuated position, the position can be repeatedly and remotely changed by a fire fighter

In the case of a fire, dampers switch over to their safety positions. In a model solution, all dampers of a compartment that is on fire

responding to the emergency and depending on the spread of fire in the building.

By its design, a damper certified as per this standard can be switched over for up to 25 minutes after the fire alarm is triggered. The dampers dedicated for operation in these systems are identified with the feature "MA" as per the classification code established in EN 13501-4.

Different scenarios apply to the verification testing of the feature AA or MA. The relevant fire scenario for automatically actuated (feature AA) or manually actuated (feature MA) dampers intended for smoke and heat control systems is specified in the middle or the right column of Table 1 respectively.

The testing program requires that automatically actuated dampers (AA) receive the command signal to switch over its position within 30 seconds of the test. At the same time, an AA damper must reach its end position (the safe state) within 60 seconds from being commanded to do so.

The damper blade position switchover command is input to the MA damper in the 25th minute of the test.

The test carried out in this way can prove that the damper is capable of changing its blade position and move to the safety position even during an evolving fire.

C O N C L U S I O N

Returning to the question posed in the introduction, engineering solutions exist that facilitate designing a smoke and heat control system, which is operated automatically and permits manual intervention. Feature-MA dampers are intended for these systems. Due to the high performance requirements of the dampers, its design is different from feature-AA dampers.

An advantage of MA dampers is a versatile use, as they can be operated like AA dampers. Another advantage of applications with MA dampers in buildings is full control over the smoke and heat control system operation by the relevant authorised emergency responders during a fire rescue and suppression response. A system based on these dampers is very flexible, which greatly improves the fire safety of building occupants.

With care for the safety of people and increasingly stringent requirements applicable to smoke and heat control equipment in mind, Mercor S.A. has expanded its product range with the type mcr FID B feature MA damper for multi-compartment systems.

This way we provide design engineers with a unique smoke and heat control damper for their projects. The examples of the fire damper types are shown in Fig. 3.

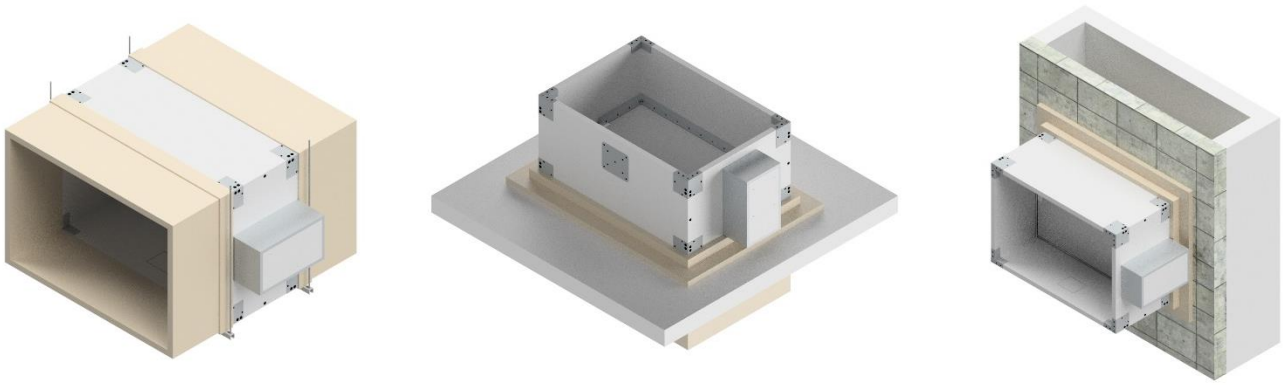
With its unique system of seals and fire-proof control system, the FID B damper was awarded

Time criterion	Automatically actuated (AA) damper scenario	Manually actuated (MA) damper scenario
Temperature reaches 50 °C	T = 0 sec.	T = 0 sec.
Input command to move to the end position	T = 30 sec.	T = 25 min
Time to reach the end position	T = 90 sec.	T = 26 min

Table 1. Comparison of fire dampers vs. the time criterion.

The more stringent actuation time criteria verified during a fire test permit application of the dampers in smoke and heat control systems for which fire scenarios allow damper position switchover.

a Certificate of Constancy of Performance, which proves compliance with the highest quality standards established for dampers with the fire resistance class EI 120 (ved h– i↔o) S1500$C_{10\,000}$ MA multi.



Installation in smoke exhaust ducting EN 1366-8 or EN 1366-9 ductwork

Installation of the fire damper away from the floor slab (above/below the slab) – above-slab installation shown

Installation of the fire damper away from rigid walls/shafts made of blocks or hollow units

Fig. 3. Examples of type FID B fire damper types.

References:

[1] EN 12101-8:2011 "Smoke and heat control systems – Part 8: Smoke control dampers"
[2] EN 1366-10: 2011 + A1:2017 "Fire resistance tests for service installations – Part 10: Smoke control dampers"
[3] EN 13501-4:2016 "Fire classification products and building elements – Part 4: Classification using data from fire resistance tests on components of smoke control systems"
[4] Type mcr FID B fire damper, MERCOR S.A. Technical Manual, rev. FID B 21.03.17.1.
[5] Type mcr FID B fire damper, MERCOR S.A. Declaration of Performance No. 001-05-CPR-2021 dated 17.03.2021

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MERCOR S.A. is one of Poland's largest enterprises in the passive fire protection industry. Our end-to-end range includes:

- smoke control systems,
- heat control systems,
- Roof light systems,
- **fire ventilation systems,**
- fire protection of building structures.

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