FIRES
The Experts On Fire Safety
Digitally signed by FIRES

FIRE RESISTANCE EXPERT JUDGEMENT REPORT WITH CLASSIFICATION FIRES-JR-078-24-NURE

Horizontal shutter with folding steel ladder, type LMF60
Horizontal shutter with folding scissor steel ladder, type LSF60
Horizontal shutter with folding timber ladder, type LWF60

FIRE RESISTANCE EXPERT JUDGEMENT REPORT WITH CLASSIFICATION

FIRES-JR-078-24-NURE

Name of the product: Horizontal shutter with folding steel ladder, type LMF60
Horizontal shutter with folding scissor steel ladder, type LSF60
Horizontal shutter with folding timber ladder, type LWF60

Sponsor:
FAKRO Sp. z o.o.
Wegierska 144a
33-300 Nowy Sacz
Poland

Prepared by:
FIRES, s.r.o.
Approved Body No. SK01
Osloboditeľov 282
059 35 Batizovce
Slovak Republic

Task No.: PR-24-0053/01
Date of issue: 07. 03. 2024

Reports: 2
Copy No.: 2

Distribution list:
Copy No. 1 FIRES, s. r. o., Osloboditeľov 282, 059 35 Batizovce, Slovak Republic
Copy No. 2 FAKRO Sp. z o.o., Wegierska 144a, 33-300 Nowy Sacz, Poland

FIRES, s.r.o., Osloboditeľov 282, 059 35 Batizovce, Slovak Republic
tel. 00421 52 285 1611, www.fires.sk
Notified Body No. 1396, Approved Body No. SK01, Member of EGOLF

1. INTRODUCTION

This expert judgement report with classification defines the resistance to fire classification assigned to Horizontal shutter with retractable steel stairs, type LMF60, Horizontal shutter with retractable scissor steel stairs, type LSF60, Horizontal shutter with retractable timber stairs, type LWF60.

At the time of fire test [1], there was no test method to determine the fire resistance of non-loadbearing horizontally oriented doors/shutters. Therefore, the testing laboratory FIRES, s.r.o. realized the fire test [1] acc. to EN 1634-1:2014+A1:2018. While the previous edition of the standard EN 1634-1: 2008 covered also the non-loadbearing horizontally oriented doors/shutters, the standard EN 1634-1:2014+A1:2018 does not mention the possibility to use this test method to determine the fire resistance of such oriented doors/shutters (this situation persists so far).

This expert judgement report defines a field of application which is outside the field of direct application according to the test standard or outside the field of extended application according to relevant extended application standard. This expert judgement expresses the opinion of the FIRES and is based on the experience or internal rules of FIRES

This expert judgement was elaborated on the basis of Fire resistance expert judgement report with classification No. FIRES-JR-024-20-NURE, issued by FIRES, s.r.o. on 04. 06. 2020.
This new document contains a constructional change - replacement of the SJ521 gasket for an alternative gasket. The change is described in cl. 2.2 of this document.

2. DETAILS OF CLASSIFIED PRODUCT

2.1 GENERAL

The elements, Horizontal shutter with folding steel ladder, type LMF60, Horizontal shutter with folding scissor steel ladder, type LSF60 and Horizontal shutter with folding timber ladder, type LWF60, are used as non-loadbearing horizontally oriented shutters with fire separating function from below. The products are installed in the ceiling of family houses, administrative and multifunctional buildings.

Normally each of the products is maintained in the closed position without a lock. In the closed position the leaf is pressed (via springs) against the gaskets in the shutter frame. Once the leaf is tilted the force decreases and a user can operate it with a little effort. The leaf is fitted with a holder that allows fastening the hook-end of a rod. To open the shutter, it is needed to pull the holder by means of the rod and overcome the force the leaf is retained with.

2.2 PRODUCT DESCRIPTION

The elements, Horizontal shutter with folding steel ladder, type LMF60, Horizontal shutter with folding scissor steel ladder, type LSF60 and Horizontal shutter with folding timber ladder, type LWF60, consist of a shutter frame and a shutter leaf with a ladder.

Individual types of product (LWF, LMF, LSF) differ from each other only by the ladder type.

Dimensions

Overall dimensions	(1422 x 840) mm (height x width)
Dimensions of the shutter leaf	(1396 x 814 x 85) mm (height x width x thickness) *
Dimensions of the shutter opening	(1382 x 800) mm (height x width)
Weight of shutter	29,6 kg

* There was found a discrepancy between the shutter leaf dimensions (1397 x 815 x 85) mm stated in cl. 2 of the test report [1] (see cl. 3.1 of this document) and the shutter leaf dimensions (1396 x 814 x 85) mm stated in sponsor drawings attached to that test report. At the request of sponsor the dimensions according to drawings are used for classified product. Conditions for gap width are given in cl. 6.2 of this document.

Shutter frame

The shutter frame is made of pinewood slabs with a cross section of (220 x 20) mm (width x thickness) and an average bulk density of 520 kg/m^3 (manufacturer: STOLART Sp. z o.o). The slabs are connected using a glue of type JOWACOLL 103.15 and staples (3 pieces in each corner).

NOTE: The average density of pinewood in accordance with EN 350: 2016.

Dimensions of the shutter frame rebate are of (30 x 11) mm; within the rebate a groove of (4 x 6) mm for TPS gasket of type SJ521 (manufacturer: AiB Sp. z o.o., Poland) is milled. Around the inner perimeter two grooves for santropene TPV gaskets of type SJ531 and SJ 541 (manufacturer: AiB Sp. z o.o., Poland) are milled.

Alternatively
Within the groove of (4 x 6) mm a SEBS gasket with index 18375ZZ (manufacturer: PlastArte Sp. z o.o., Poland or AiB Sp. z o.o., Poland) is applied instead of the TPS gasket SJ521.

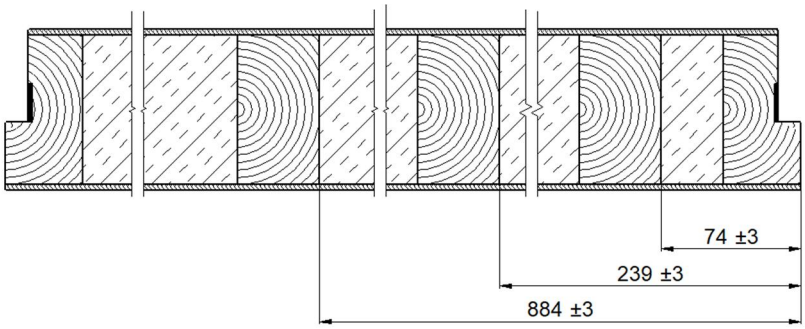
Shutter leaf

- leaf frame – made of pinewood profiles (manufacturer: STOLART Sp. z o.o) with an average bulk density of 520 kg/m^3; cross sections are as follows:
  (79 x 41) mm – perimeter profiles;
  (79 x 43) mm – intermediate transverse profiles.

NOTE: The average density of pinewood in accordance with EN 350: 2016.

The profiles are glued together with glue of type JOWACOLL 103.15.
The transverse profiles are placed in 74 mm, 239 mm, 884 mm from the back edge of the shutter leaf.

Dimensions of the leaf rebate are of (12 x 49) mm; within the rebate a groove of (20 x 2) mm for intumescent tape is milled.



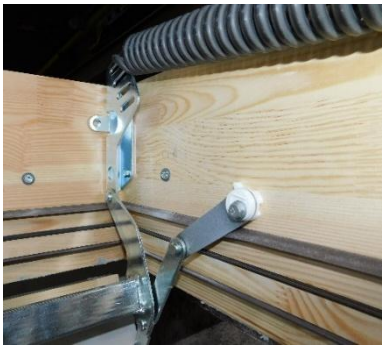
- core – mineral wool board, type ROCKLIT 150, 79 mm thick, with bulk density 150 kg/m^3 (manufacturer: Rockwool).

- facing – HDF board 3 mm thick, with bulk density (820 – 860) kg.m^{-3} (manufacturer: Kronospan Szczecinek Sp.z o.o., Poland), glued to both sides of the leaf frame and the core using JOWACOLL 103.15, density 1,10 g.cm^{-3} (manufacturer: JOWAT AG, Germany).

Intumescent tape
Promaseal PL, (2 x 20) mm (thickness x width) (manufacturer: PROMAT GmbH) around the perimeter of shutter leaf frame in the milled groove of (20 x 2) mm.

Hinges
Lever mechanism consists of
- upper crossbar complete, type 12726A3 (manufacturer: Fakro Orbita Sp z o.o),
- lower crossbar complete, type 12588A3 (manufacturer: Fakro Orbita Sp z o.o),
- bracket of type 12796A1 (manufacturer: Fakro Orbita Sp z o.o),
- springs of type 14095A0 with max. force of 2530 N (manufacturer: Mazowianka Sp zo.o.).

The mechanism is fixed with screws (Ø5 x 50) mm to the shutter leaf and with bolts (Ø6 x 22) mm and (Ø6 x 35) mm to the shutter frame.

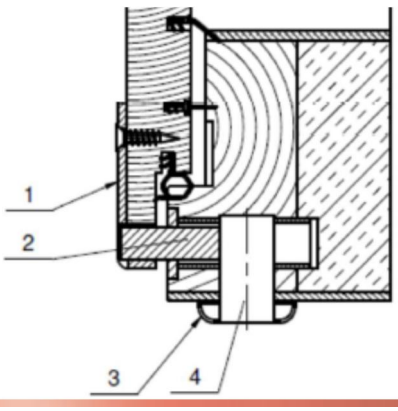




Shutter holder / lock
A shutter holder of type 12720A0, made from POM material, (manufacturer: Drok Sp. J. Krzysztof Popielnicki Ryszard Wrzesiński) is fixed with two screws of (Ø3,5 x 25) mm to the bottom side of the shutter leaf in a milled counterbore. Without a lock.

Alternatively
The shutter holder of type 12720A0, made from POM material, (manufacturer: Drok Sp. J. Krzysztof Popielnicki Ryszard Wrzesiński) is fixed with two screws of (Ø3,5 x 25) mm to the bottom side of the shutter leaf in a milled counterbore,

and

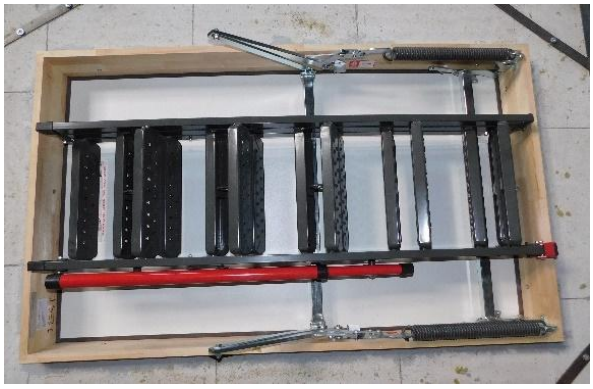
a mortice lock, type Z093 (manufacturer: Firma Jania, Stanisław Jania), is placed on the lock edge of the shutter, 300 mm from the shutter edge to the centre of dead bolt. The lock cylinder - type M&D 9/25 (manufacturer: DELMET Senftleben Sp. J.).



1 lock holder
2 lock
3 Euro cylinder cover
4 lock cylinder

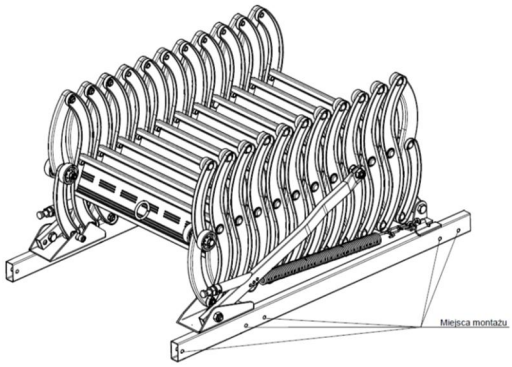
Ladder

for LMF type
A 3-sections folding ladder, type 13045A3 (manufacturer: Fakro Orbita Sp z o.o.) is placed on shutter leaf surface from the top side and fixed to the lever mechanism. The mass of the ladder is max. of 22,2 kg.

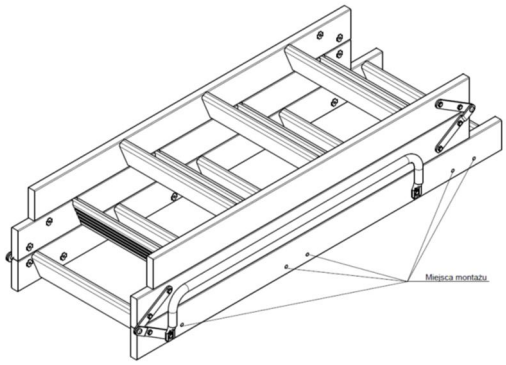


Alternatively

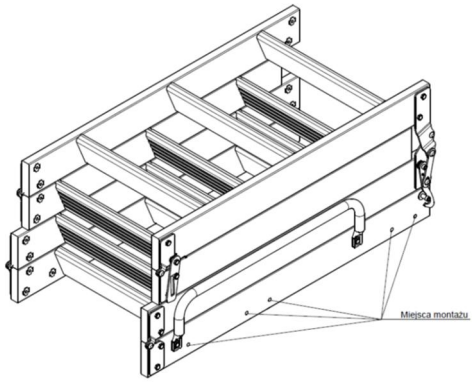
for LSF type
A steel ladder of scissor-type (manufacturer: Fakro Orbita Sp z o.o.). The mass of the ladder is max. of 20,8 kg.



for LWF type
A 3-sections timber ladder (manufacturer: Stolart Sp. z o.o.). The mass of the ladder is max. of 11 kg.



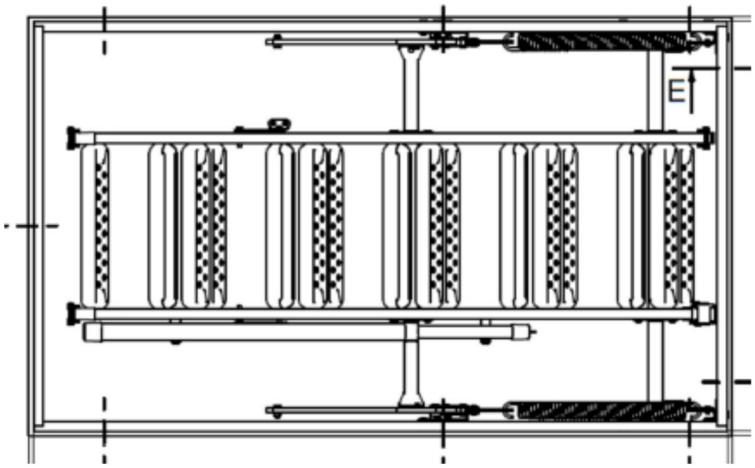
A 4-sections timber ladder (manufacturer: Stolart Sp. z o.o.). The mass of the ladder is max. of 13 kg.

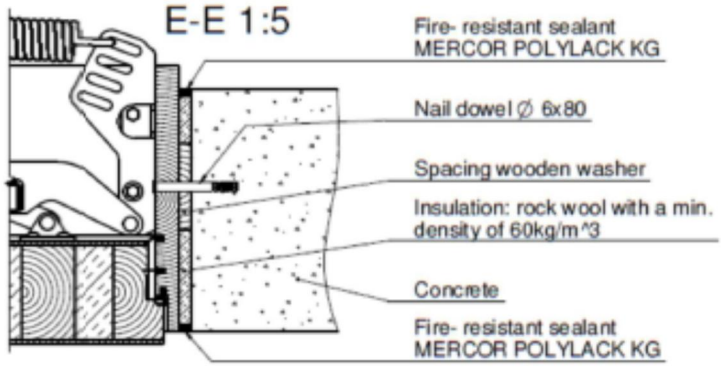


2.3 PRODUCT FIXATION

The product is installed within a ceiling rigid supporting construction made of aerated concrete blocks 150 mm thick with bulk density of 650 kg/m^3 ± 200 kg/m^3 (the manufacturer's stated value in the dried steady-state is 450 kg/m^3).

The product is fixed to the supporting construction using nail dowels of (Ø6 x 80) mm. In the gap between the shutter and supporting construction, in place of fixation, spacing wooden washers are used.
The gap between shutter frame and supporting construction is filled with a mineral wool with bulk density of 60 kg/m^3 and sealed from both exposed and unexposed side with fire resistant sealant of type MERCOR POLYLACK KG (manufacturer: Dunamenti Tűzvédelem Zrt., Hungary).





More detailed information about product construction is shown in drawings to test report [1] according to cl. 3.1 of this document.

3. TEST REPORTS AND EXTENDED APPLICATION REPORTS IN SUPPORT OF CLASSIFICATION

3.1 TEST REPORTS AND EXTENDED APPLICATION REPORTS

No.	Name of laboratory	Name of sponsor	Test report No.	Date of the test	Test method
[1]	FIRES, s.r.o., Batizovce, SR	FAKRO Sp. z o.o., Nowy Sacz, Poland	FIRES-FR-161-19-AUNS	16. 07. 2019	EN 1634 -1: 2014+A1:2018
[2]	FIRES, s.r.o., Batizovce, SR	FAKRO Sp. z o.o., Nowy Sacz, Poland	FIRES-FR-162-19-AUNS	24. 07. 2019	EN 1364-2:2018

[1] - [2] Test specimens were conditioned according to EN 1363-1 before the fire resistance test

3.2 TEST RESULTS

No./ Test method	Parameter		Results
[1] EN 1634-1	applied load		22,2 kg via the ladder which is a part of the test specimen
	supporting construction		ceiling rigid supporting construction made of aerated concrete blocks 150 mm thick with bulk density of 650 kg/m^3 ± 200 kg/m^3
	temperature curve		standard temperature time curve
	loadbearing capacity		-
	integrity	cotton pad	80 minutes
		gap gauges	81 minutes no failure
		sustained flaming	80 minutes
	thermal insulation	I_1	74 minutes
		I_2	80 minutes
	radiation		80 minutes
	mechanical action		-
	operability		passed (25 cycles)
	self closing		-
	test specimen, orientation		Shutter of LMF60 type; opening of the leaf towards the furnace (fire form below, ladder on unexposed side)
[2] EN 1364-2	applied load		22,2 kg via the ladder which is a part of the test specimen
	supporting construction		self-supporting ceiling structure laid on two supports without a fixation, each of the supports is 250 mm thick; the spacing of ceiling supports centres is of 3250 mm and the clear span between supports is of 3000 mm.
	temperature curve		standard temperature time curve
	loadbearing capacity		-
	integrity	cotton pad	95 minutes
		gap gauges	96 minutes no failure
		sustained flaming	95 minutes
	thermal insulation	average temperature	95 minutes
		maximal temperature	95 minutes
	horizontal shutter		
	thermal insulation	average temperature	95 minutes
		maximal temperature	95 minutes
		maximal temperature (supplementary procedure)	88 minutes
	radiation		95 minutes
	mechanical action		-
	operability		-
	self-closing		-
	Test specimen / orientation		wooden ceiling with horizontal shutter with folding steel ladder of type LMF60; orientation: fire from below (opening of the shutter towards the furnace, the ladder on unexposed surface)

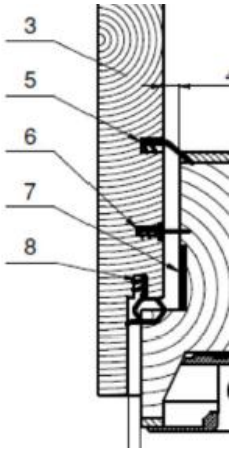
[1] The test was discontinued in 82nd minute because of integrity failure of test specimen
[2] The test was discontinued in 97th minute because of integrity failure of test specimen

4. CHANGES OF THE PRODUCT OR END USE CONDITIONS OUTSIDE OF THE FIELD OF DIRECT OR EXTENDED APPLICATION

Following changes of the product or end use conditions were permitted:
1. The alternative ladders according to cl. 2.2 of this document.
2. Application of alternative mineral wool (instead of Rockwool ROCKLIT 150) used as an insulation core in the hatch.
3. Application of mortice lock of type Z093 (manufacturer: Firma Jania, Stanisław Jania) in the shutter leaf.
4. Application of the alternative 18375ZZ gasket according to cl. 2.2 of this document.

5. ARGUMENTS IN FAVOR OF THE EXTENSION

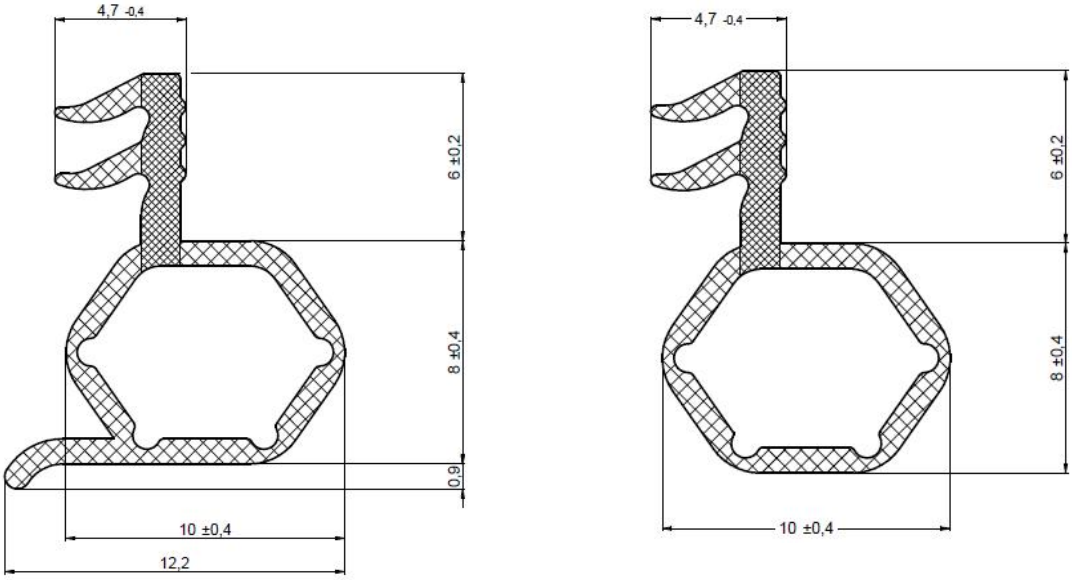
1. Each of the alternative ladders listed in cl. 2.2 of this document has a smaller weight than the ladder used in the test [1], the weight of tested ladder was of 22,2 kg. Each of the alternative ladders is fixed to the leaf and frame by the same way as in the test [1]. Under those conditions it can be supposed that the fire resistance of the shutter is not decreased.
   The ladder type defines also the shutter type designation (see cl. 2.2 of this document).
2. It is allowed to apply an alternative mineral wool (instead of Rockwool ROCKLIT 150) in the core of the shutter leaf provided that the thickness of alternative mineral wool is of 79 mm (the same as tested) and its bulk density is of (150 - 180) kg/m^3, the reaction to fire classification according to EN 13501-1 is A1 and the melting temperature of the fibers of the alternative mineral wool is at least the same as that for tested mineral wool.
3. Application of mortice lock of type Z093 (manufacturer: Firma Jania, Stanisław Jania) in the shutter leaf is allowed on the basis of the test [2] according to cl. 3.1 of this document. In the test [2] the Z093 lock was installed in a horizontal shutter of identical construction as described in cl. 2.2 but mounted in a wooden ceiling – the test [2] was carried out in accordance with EN 1364-2, however, the thermocouples on the shutter unexposed surface were arranged in accordance with EN 1634-1 so it is possible to assess the insulation performance of the shutter. The test results given in cl. 3.2 show that the shutter in the test [2] achieved better parameters than the classified product in the test [1] in the term of both integrity and insulation so it can be expected that the application of the mortice lock of type Z093 will not impair the resistance to fire performance of the classified product.
4. The alternative SEBS gasket 18375ZZ may be used instead of the tested TPS gasket SJ521 based on following reasons
   - in accordance with FAKRO declaration, the dimensions of both gasket types are comparable, so the amount of flammable material will not increase;
   - in accordance to FAKRO declaration, both TPS and SEBS materials are of reaction to fire class F;
   - the gasket in question is installed in the shutter frame rebate between the shutter frame and shutter leaf, and above this gasket, on the shutter leaf edge, the intumescent tape Promaseal PL, (2 x 20) mm is applied; it is expected that in a case of fire the intumescent tape will work in the same way as in the fire test and the integrity criterions can be met for the same period as in the test;
   - in the test [1] the integrity criterions were met for 80 minutes, i.e. there is an overrun of 20 minutes for classification period of 60 minutes, such an overrun represents 33 % of classification period.



7 intumescent tape
8 gasket in question

Note: Items according to test report [1]

Position of the gasket and intumescent tape



Tested gasket profile

Alternative gasket profile

Comparation of tested and alternative gaskets

6. CLASSIFICATION AND FIELD OF APPLICATION

6.1 CLASSIFICATION

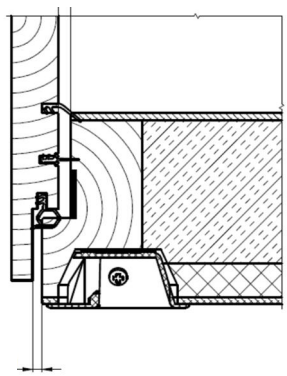
The element, Horizontal shutter with retractable steel stairs, type LMF60, Horizontal shutter with retractable scissor steel stairs, type LSF60, Horizontal shutter with retractable timber stairs, type LWF60, is classified according to the following combinations of performance parameters and classes as appropriate.

Orientation	Fire resistance classification
Fire from below (ladder on unexposed side)	**E 60; EI_1 60; EI_2 60; EW 60**

6.2 FIELD OF APPLICATION

This classification is valid for the following end use applications:

Materials and construction	- it is allowed to realize the changes described in cl. 4 and 5 of this document; - the thickness of the shutter leaf shall not be reduced nor increased, - the density of the leaf core (mineral wool) shall not be reduced and may be increased according to cl 5 of this document (max. up to 180 kg/m^3); the total increase in weight shall not be greater than 25 %; NOTE: The manufacturer is responsible for compensation of increased leaf weight using springs with the force appropriate for increased leaf weight (the leaf weight may be increased by max of 25 %). - for timber-based board products (e.g. particle board, blockboard etc.), the composition (e.g. type of resin) shall not change from that tested; - the cross-sectional dimensions and/or the density of the shutter frame (cl. 2.2) shall not be reduced but may be increased; - the number, size, location and orientation of any joints in the timber framing shall not be changed;
Decorative finishes	- decorative laminates and timber veneers up to 1,5 mm thickness may be added to the faces (but not the edges) of shutter;

Fixings	- the number of fixings used to attach the product to supporting constructions may be increased but shall not be decreased and the distance between fixings may be reduced but shall not be increased;	
Permissible size variations	- size increase is not permitted; - unlimited size reduction is permitted;	
Supporting construction	- the product may be mounted in a rigid supporting construction made of aerated concrete blocks 150 mm thick with bulk density of at least 450 kg/m^3 ± 200 kg/m^3 using the same fixing method as described in cl. 2.3 of this document.	
Gaps		Maximal permitted lower gaps: Longer edges 4,7 mm Shorter edges 4,3 mm

7. LIMITATIONS

This classification document does not represent type approval or certification of the product.

The classification is valid until 07. 03. 2029 provided that the product, field of application and standards and regulations are not changed.

Approved by:

Ing. Marek Gorlický
Head of the Testing Laboratory

Prepared by:

Ing. Anna Rástocká
Technician of the Testing Laboratory