EXTENDED APPLICATION REPORT NO. 17449A

Owner of this report:

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References:

This extended application report concerns test results obtained for a multiple damper assembly composed of four fire dampers assembled together – type: CU2/B – in accordance with the test method EN 1366-2:2015: Fire resistance tests for service installations – Part 2: Fire dampers.

The extended application process of the test results is carried out in conformity with standard EN 15882-2:2015: Extended application of results from fire resistance tests for service installations – Part 2: Fire dampers.

This extended application report consists of 15 pages and 3 annexes. The report is drafted in accordance with the standard procedure as specified in the standard EN 15725:2010.

1 Details of the building element concerned

1.1 Product description

Product technical specifications: four fire dampers assembled together mounted in a concrete wall.

The element, CU2/B, is fully described in the test reports, stated in clause 2.1, in support of this extended field of application. The drawings of the test element as it was tested, are enclosed in the annexes 1 till 3 of this classification report.

1.2 Description of the changes made

In combination with other test reports of the single CU2 fire damper the allowed width of each individual fire damper of the multiple damper assembly is increased to the maximum width tested with the single CU2 fire damper.

This means that the maximum dimensions of the fire dampers in the multiple damper assembly may be increased from the tested 1200 mm x 800 mm to 1500 mm x 800 mm and the total size of the multiple damper assembly becomes 3050 mm x 1650 mm.

2 Test reports and test results in support of this extended application report

2.1 Test reports

NAME OF LABORATORY	NAME OF SPONSOR	REF. No.	E	I	S	Direction (i – o)	Orientation (v_e, h_o)
Efectis france	Rf-Technologies nv	10 - H - 426 (CU2/B (CFTH) 2450 mm x 1650 mm)	See § 2.3			i → o	v_e
Efectis france	Rf-Technologies nv	10 - H - 432 (CU2/B (CFTH) 2450 mm x 1650 mm)	See § 2.4			o → i	v_e
Technische Universität Munchen	Rf-Technologies nv	3610/ 15/12.2011 (CU2 1200 mm x 800 mm)	See § 2.5			i ↔ o	v_e
WFRGent nv.	Rf-Technologies nv.	11846 (CU2 1500 mm x 1000 m)	See § 2.6			o → i	v_e
WFRGent nv.	Rf-Technologies nv.	12989 (CU2 1500 mm x 1000 m)	See § 2.7			o → i	v_e
WFRGent nv.	Rf-Technologies nv.	13992 (CU-LT 800 mm x 600 m)	See § 2.8			o ↔ i	v_e

Note: All tests have been carried out in accordance with EN 1366-2:1999. There is however no difference between the EN 1366-2:1999 and EN 1366-2:2015 in regards to the measuring or failure criteria. For this reason the results from reports according to the EN 1366-2:1999 can still be used as reference tests.

Exposure conditions during the fire resistance test (ref. No. 10 - H - 426):

Test standard:	EN 1366-2:1999.
Temperature/time curve:	standard as in EN 1363-1:1999.
Number of dampers:	4
Dimensions of one damper:	1200 mm x 800 mm
Orientation of the axes:	horizontal
Working pressure:	-500 Pa.
Supporting construction:	mounted in a standard concrete wall (density: 2200 ± 200 kg/m³), thickness: 110 mm.

Exposure conditions during the fire resistance test (ref. No. 10 - H - 432):

Test standard:	EN 1366-2:1999.
Temperature/time curve:	standard as in EN 1363-1:1999.
Number of dampers:	4
Dimensions of one damper:	1200 mm x 800 mm
Orientation of the axes:	horizontal
Working pressure:	-500 Pa.
Supporting construction:	mounted in a standard concrete wall (density: 2200 ± 200 kg/m³), thickness: 110 mm.

Exposure conditions during the fire resistance test (ref. No. 3610):

Test standard:	EN 1366-2:1999.
Temperature/time curve:	standard as in EN 1363-1:1999.
Number of dampers:	2 (mounted separate from one another)
Dimensions of the dampers:	1200 mm x 800 mm
Orientation of the axes:	horizontal
Working pressure:	-300 Pa.
Supporting construction:	mounted in a flexible wall construction with type F boards, thickness: 100 mm.

Exposure conditions during the fire resistance test (ref. No. 12989):

Test standard:	EN 1366-2:1999.
Temperature/time curve:	standard as in EN 1363-1:1999.
Number of dampers:	1
Dimensions of the damper:	1500 mm x 1000 mm
Orientation of the axes:	horizontal
Working pressure:	-300 Pa.
Supporting construction:	mounted in an aerated concrete wall, thickness: 100 mm.

Exposure conditions during the fire resistance test (ref. No. 11846):

Test standard:	EN 1366-2:1999.
Temperature/time curve:	standard as in EN 1363-1:1999.
Number of dampers:	1
Dimensions of the damper:	1500 mm x 1000 mm
Orientation of the axes:	vertical
Working pressure:	-500 Pa.
Supporting construction:	mounted in an aerated concrete wall, thickness: 100 mm.

Exposure conditions during the fire resistance test (ref. No. 13992):

Test standard:	EN 1366-2:1999.
Temperature/time curve:	standard as in EN 1363-1:1999.
Number of dampers:	2 (mounted separate from one another)
Dimensions of the dampers:	800 mm x 600 mm
Orientation of the axes:	horizontal/vertical
Working pressure:	-500 Pa.
Supporting construction:	mounted in an aerated concrete wall, thickness: 100 mm.

2.2 Determining worst case (actuating mechanism at exposed/unexposed side)

In certain circumstances a rule can call for a new test to be undertaken. To avoid having to re-test everything, a determination shall be made of 'worst case'. (EN 15882-2:2015 § 4).

To determine worst case the test reports Nos. 10 - H – 426, 10 - H – 432 and 3610 are used.

For CU2/B multiple damper assembly:

The thermal insulation criteria for the damper with the actuating mechanism at the exposed side failed after 155 min.

The thermal insulation criteria for the damper with the actuating mechanism at the unexposed side failed after 141 min.

For CU2 single damper assembly:

The maximum temperature for the damper with the actuating mechanism at the exposed side after 90 minutes was 83°C. The average temperature was 76°C.

The maximum temperature for the damper with the actuating mechanism at the unexposed side after 90 minutes was 117°C. The average temperature was 83°C.

Therefore it can be concluded that the CU2/B multiple damper assembly with the actuating mechanism at the unexposed side is worst case. For this reason tests carried out with the mechanism at the unexposed side can also be classified for use with the mechanism at the exposed side and only the test results for a single CU2 damper (dimensions: 1500 mm x 1000 mm) with the actuator on the unexposed side are used.

2.3 Determining worst case (horizontal/vertical axis)

In certain circumstances a rule can call for a new test to be undertaken. To avoid having to re-test everything, a determination shall be made of 'worst case'. (EN 15882-2:2015 § 4).

To determine worst case the test report No. 13992 is used.

The maximum temperature for the damper with a horizontal axis after 132 minutes was 129°C.

The maximum temperature for the damper with a vertical axis after 132 minutes was 161°C.

Therefore it can be concluded that a damper, comprised of a steel casing and a calcium silicate blade tested, with a vertical axis is worst case. For this reason test results of a test carried out with a vertical axis can also be used as a test results for a damper with a horizontal axis.

2.4 Test results of the CU2/B multiple damper assembly – test No. 10 - H - 426

Parameter	Limits	Results in minutes
		i → o **Mechanism at exposed side**
Integrity (E criterion) *:		
Leakage through the fire damper	360 Nm³/h.m²	≥ 183 minutes (44.5 Nm³/h.m²)
Ignition of the cotton pad		≥ 183 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 183 minutes
Spontaneous, continuous flames		≥ 183 minutes
Thermal insulation (I criterion) *:		
A maximum temperature rise at the unexposed side (T_1, T_2, T_s)	180°C	155 minutes
An average temperature rise at the unexposed side (T_2)	140°C	≥ 183 minutes
Smoke leakage (S criterion):		
Leakage through the fire damper at an ambiant temperature	200 Nm³/h.m²	Satisfied
Leakage through the fire damper during the test*	200 Nm³/h.m²	≥ 183 minutes (44.5 Nm³/h.m²)
Actuating mechanism:		
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage
Time at which the fully-open fire damper closes	2 minutes	35 seconds
Test duration:		183 minutes

* These performance criteria apply after 5 minutes from the start of the test.

2.5 Test results of the CU2/B multiple damper assembly – test No. 10 - H - 432

Parameter	Limits	Results in minutes
		o → i **Mechanism at unexposed side**
Integrity (E criterion) *:		
Leakage through the fire damper	360 Nm³/h.m²	≥ 235 minutes (61.8 Nm³/h.m²)
Ignition of the cotton pad		≥ 235 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 235 minutes
Spontaneous, continuous flames		≥ 235 minutes
Thermal insulation (I criterion) *:		
A maximum temperature rise at the unexposed side (T_1, T_2, T_s)	180°C	141 minutes
An average temperature rise at the unexposed side (T_2)	140°C	224 minutes
Smoke leakage (S criterion):		
Leakage through the fire damper at an ambiant temperature	200 Nm³/h.m²	Satisfied
Leakage through the fire damper during the test*	200 Nm³/h.m²	≥ 235 minutes (61.8 Nm³/h.m²)
Actuating mechanism:		
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage
Time at which the fully-open fire damper closes	2 minutes	37 seconds
Test duration:		235 minutes

* These performance criteria apply after 5 minutes from the start of the test.

2.6 Test results of the fire damper CU2 (1200 mm x 800 mm) – test No. 3610

Parameter	Limits	Results in minutes	
		i → o Mechanism at exposed side	**o → i** Mechanism at unexposed side
Integrity (E criterion) *:			
Leakage through the fire damper	360 Nm³/h.m²	≥ 90 minutes (2.1 Nm³/h.m²)	≥ 90 minutes (24.2 Nm³/h.m²)
Ignition of the cotton pad		≥ 90 minutes	≥ 90 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 90 minutes	≥ 90 minutes
Spontaneous, continuous flames		≥ 90 minutes	≥ 90 minutes
Thermal insulation (I criterion) *:			
A maximum temperature rise at the unexposed side (T_1, T_2, T_s)	180°C	≥ 90 minutes (ΔT_{max}: 83°C)	≥ 90 minutes (ΔT_{max}: 117°C)
An average temperature rise at the unexposed side (T_2)	140°C	≥ 90 minutes (ΔT_{max}: 76°C)	≥ 90 minutes (ΔT_{max}: 83°C)
Smoke leakage (S criterion):			
Leakage through the fire damper at an ambiant temperature	200 Nm³/h.m²	22.2 Nm³/h.m²	18.8 Nm³/h.m²
Leakage through the fire damper during the test *	200 Nm³/h.m²	≥ 90 minutes (2.1 Nm³/h.m²)	≥ 90 minutes (24.2 Nm³/h.m²)
Actuating mechanism:			
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage	No damage
Time at which the fully-open fire damper closes	2 minutes	40 seconds	55 seconds
Test duration:		90 minutes	

* These performance criteria apply after 5 minutes from the start of the test.

2.7 Test results of the fire damper CU2 (1500 mm x 1000 mm) – test No. 12989

Parameter	Limits	Results in minutes
		o → i **Mechanism at unexposed side**
Integrity (E criterion) *:		
Leakage through the fire damper	360 Nm³/h.m²	≥ 132 minutes (111 Nm³/h.m²)
Ignition of the cotton pad		≥ 132 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 132 minutes
Spontaneous, continuous flames		≥ 132 minutes
Thermal insulation (I criterion) *:		
A maximum temperature rise at the unexposed side (T_1, T_2, T_s)	180°C	≥ 132 minutes
An average temperature rise at the unexposed side (T_2)	140°C	≥ 132 minutes
Smoke leakage (S criterion):		
Leakage through the fire damper at an ambiant temperature	200 Nm³/h.m²	83 Nm³/h.m²
Leakage through the fire damper during the test*	200 Nm³/h.m²	≥ 132 minutes (111 Nm³/h.m²)
Actuating mechanism:		
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage
Time at which the fully-open fire damper closes	2 minutes	1 second
Test duration:		132 minutes

* These performance criteria apply after 5 minutes from the start of the test.

2.8 Test results of the fire damper CU2 (1500 mm x 1000 mm) – test No. 11846

Parameter	Limits	Results in minutes
		o → i **Mechanism at unexposed side**
Integrity (E criterion) *:		
Leakage through the fire damper	360 Nm³/h.m²	≥ 132 minutes (175 Nm³/h.m²)
Ignition of the cotton pad		≥ 132 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 132 minutes
Spontaneous, continuous flames		≥ 132 minutes
Thermal insulation (I criterion) *:		
A maximum temperature rise at the unexposed side (T_1, T_2, T_s)	180°C	81 minutes
An average temperature rise at the unexposed side (T_2)	140°C	100 minutes
Smoke leakage (S criterion):		
Leakage through the fire damper at an ambiant temperature	200 Nm³/h.m²	182 Nm³/h.m²
Leakage through the fire damper during the test*	200 Nm³/h.m²	≥ 132 minutes (175 Nm³/h.m²)
Actuating mechanism:		
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage
Time at which the fully-open fire damper closes	2 minutes	At the start of the test
Test duration:		132 minutes

* These performance criteria apply after 5 minutes from the start of the test.

2.9 Test results of the fire damper CU-LT (800 mm x 600 mm) – test No. 13992

Parameter	Limits	Results in minutes	
		Horizontal axis	Vertical axis
Integrity (E criterion) *:			
Leakage through the fire damper	360 Nm³/h.m²	≥ 132 minutes (4.9 Nm³/h.m²)	≥ 132 minutes (5.7 Nm³/h.m²)
Ignition of the cotton pad		≥ 132 minutes	≥ 132 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 132 minutes	≥ 132 minutes
Spontaneous, continuous flames		≥ 132 minutes	≥ 132 minutes
Thermal insulation (I criterion) *:			
A maximum temperature rise at the unexposed side (T_1, T_2, T_s)	180°C	≥ 132 minutes (ΔT_{max}: 129°C)	≥ 132 minutes (ΔT_{max}: 161°C)
An average temperature rise at the unexposed side (T_2)	140°C	≥ 132 minutes (ΔT_{max}: 83°C)	≥ 132 minutes (ΔT_{max}: 78°C)
Smoke leakage (S criterion):			
Leakage through the fire damper at an ambiant temperature	200 Nm³/h.m²	12 Nm³/h.m²	12 Nm³/h.m²
Leakage through the fire damper during the test *	200 Nm³/h.m²	≥ 132 minutes (4.9 Nm³/h.m²)	≥ 132 minutes (5.7 Nm³/h.m²)
Actuating mechanism:			
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage	No damage
Time at which the fully-open fire damper closes	2 minutes	21 seconds	21 seconds
Test duration:		132 minutes	

* These performance criteria apply after 5 minutes from the start of the test.

3 Conclusion

An increase of the width (as stated in § 1.2 of this report) of the fire dampers in the multiple damper assembly CU2/B will not have a negative influence on the results for an working pressure of -300 Pa for 120 minutes and -500 Pa for 60 minutes. A test on a single fire damper is used to prove the fire-safe design of the dampers with a larger width. The test on the multiple damper assembly is used to prove the connections and stability of the multiple damper assembly as a whole. The combination of these tests allows the increase in width of the fire dampers in the multiple damper assembly up to a maximum of the tested width of the single fire damper.

3.1 Classification

This classification has been carried out in accordance with clause 7.2.3 of EN 13501-3:2005+A1:2009.

The working pressure of the multiple damper assembly, type: CU2/B, is -300 Pa.

EI 120 (v_e i ↔ o) S

The working pressure of the multiple damper assembly, type: CU2/B, is -500 Pa.

EI 60 (v_e i ↔ o) S

3.2 Changes in the field of application

3.2.1 Field of direct application in accordance with EN 1366-2:2015

a) Size of fire damper:

The classification is applicable to the same type of multiple damper assemblies provided that the maximum dimensions of a single fire damper does not exceed **1200 mm x 800 mm** and the maximum outer dimensions of the multiple damper assembly does not exceed **2450 mm x 1650 mm**. Provided that the components remain in the same orientation as those tested.

3.2.2 Field of extended application in accordance with EN 15725:2010

a) Size of fire damper:

The classification is applicable to the same type of multiple damper assemblies provided that the maximum dimensions of a single fire damper does not exceed **1500 mm x 800 mm** and the maximum outer dimensions of the multiple damper assembly does not exceed **3050 mm x 1650 mm**. Provided that the components remain in the same orientation as those tested.

4 Duration of the validity of the extended application report

At the time the standard EN 15725:2010 was published, no decision was made concerning the duration of validity of the extended application document.

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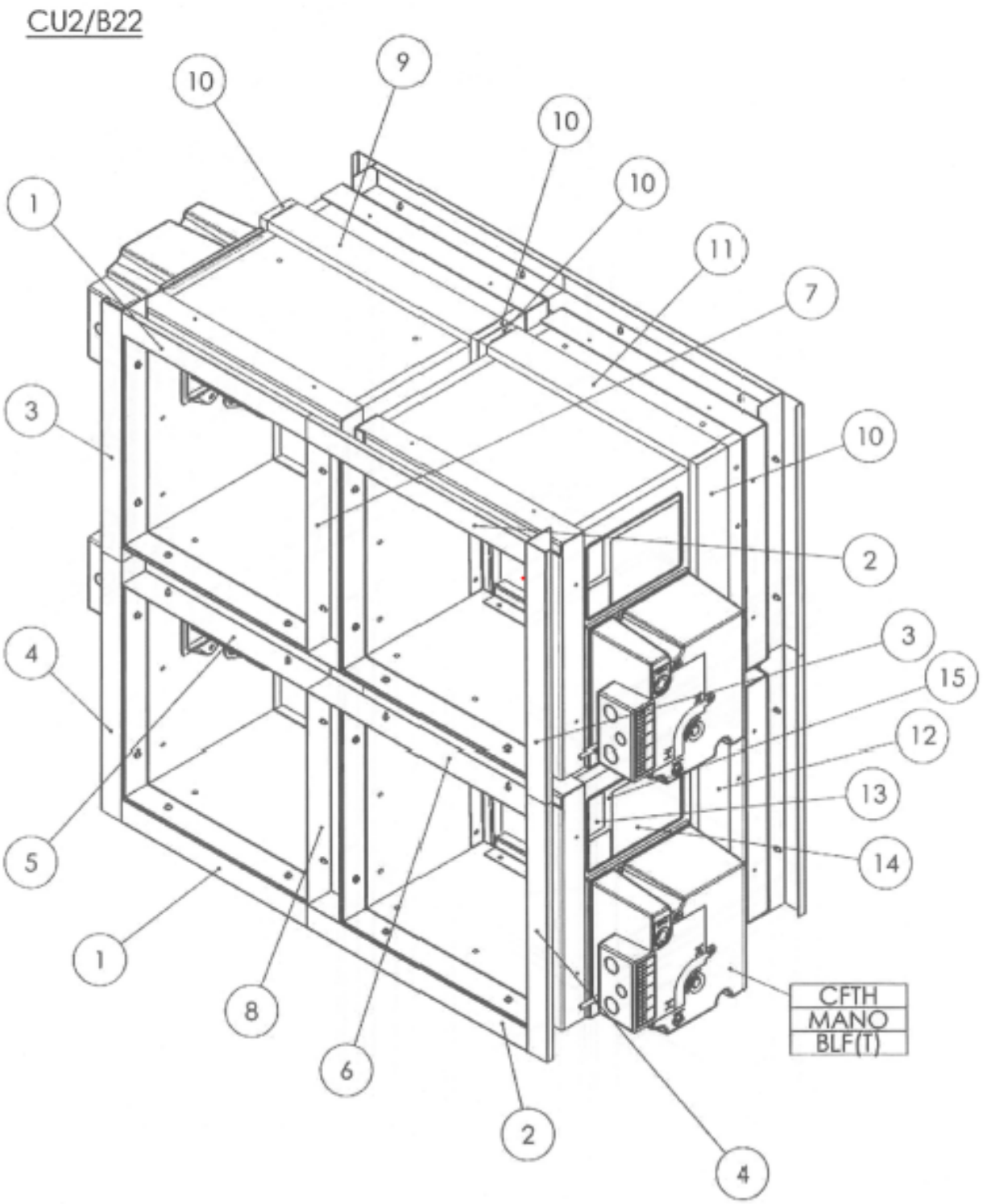

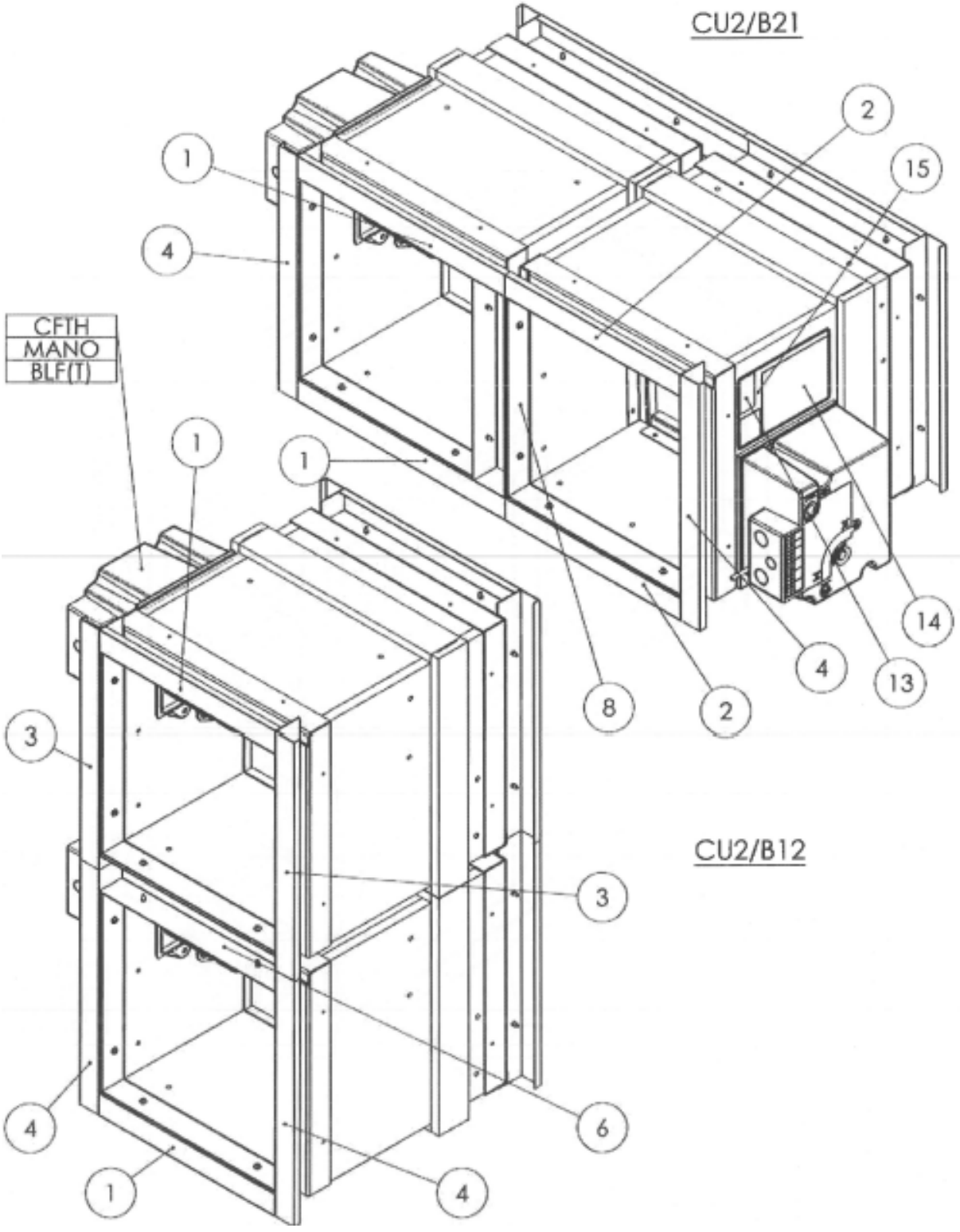

PART LIST

Markings	Description	Reference	Material	Specifications	Manufacturer
1	External frame	CU2B-D001	Galvanized steel	quantity: 4 L= B1-4	Rf-Technology
2	External frame	CU2B-D001	Galvanized steel	quantity: 4 L= B2+50	Rf-Technology
3	External frame	CU2B-D001	Galvanized steel	quantity: 4 L= H2+50	Rf-Technology
4	External frame	CU2B-D001	Galvanized steel	quantity: 4 L= H1+60	Rf-Technology
5	External frame	CU2B-D002	Galvanized steel	quantity: 2 L= B1-4	Rf-Technology
6	External frame	CU2B-D002	Galvanized steel	quantity: 2 L= B2+50	Rf-Technology
7	External frame	CU2B-D002	Galvanized steel	quantity: 2 L= H2-4	Rf-Technology
8	External frame	CU2B-D002	Galvanized steel	quantity: 2 L= H1-4	Rf-Technology
9	Promat + graphite strips	CU2B-S001	Promatect H + EX174	quantity: 4 L= B1+24	Rf-Technology
10	Promat + graphite strips	CU2B-S001	Promatect H + EX174	quantity: 4 L= H2+50	Rf-Technology
11	Promat + graphite strips	CU2B-S001	Promatect H + EX174	quantity: 4 L= B2+24	Rf-Technology
12	Promat + graphite strips	CU2B-S001	Promatect H + EX174	quantity: 4 L= H1+50	Rf-Technology
13	Control label	ETIK-D008		quantity: 1	Rf-Technology
14	Identification label	ETIK-D044		quantity: 1	Rf-Technology
15	Plate assembly label	CU2-D231	PS-HD	quantity: 1	Rf-Technology
16	Technical notice	NT-C30		quantity: 1	Rf-Technology