



In cooperation with



FIRE PENETRATION SEALS IN SANDWICH PANEL CONSTRUCTION



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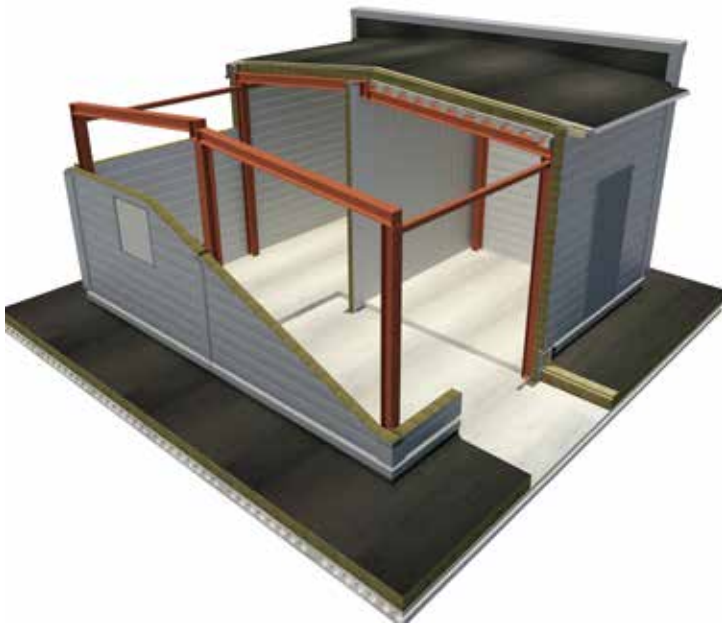
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INTRODUCTION

Prefabricated internal walls shorten construction cycles

Many owners of large commercial and industrial projects are capitalizing on the benefits of shorter construction cycles thanks to sandwich panels wall systems. The light, prefabricated panels can be easily transported to site and quickly erected, allowing other trades to begin their work immediately. In facilities such as data centers where every additional day of uptime counts, these fast-track construction methods are helping improve and accelerate the return on their construction investment.



The challenge

Unfortunately, the existing standards for fire testing penetration seals in sandwich panels has frustrated many designers looking for solutions in these types of walls. Firestop manufacturers cannot compare results across panel types or manufacturers, making widespread testing cost prohibitive and leading to an industry-wide lack of tested systems in these wall construction types.

The Future Solution

To meet the current market demand, Hilti Firestop has cooperated with Paroc Panel System and Rf-Technologies Fire Dampers to test a wide range of applications for certified fire protection solutions in sandwich panel construction.



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DESIGN OF PAROC PANEL SYSTEM SANDWICH PANELS

Design of Paroc Panel System sandwich panels

With large span widths, unique fire-door support testing and a wide range of panels for various applications, Paroc Panel System has a solution for every facility. Hilti and Rf-Technologies have partnered to provide a portfolio of solutions for the most common mechanical, electrical and telecoms penetrations in industrial facilities. To help ensure the most cost-efficient design of your sandwich panel construction, contact the manufacturers early in the design process. Especially as it relates to Firestop and Fire Dampers, early consideration of the tested system parameters will reduce the need for time-consuming Engineering Judgments and the risk of costly delays to timelines, rework or problems during commissioning.

Paroc Panel System panels are manufactured using AST® Technology that helps ensure their high tensile strength, reliable longevity and fire resistance. Five various Paroc Panel System sandwich panels have been certified for fire penetration seals. Panel type should be chosen according to required strength, fire and thermal insulation properties:

- AST S for internal walls with normal fire requirements
- AST F, AST F+ and AST S+ for internal walls with high fire requirements
- AST E for walls with higher strength and fire requirements

Technical performance of Paroc Fire Proof Panels

Panel Type	Panel Properties					
	Nominal thickness, mm	100	120	150	175	200
	Actual thickness, mm	99	120	151	173	202
AST L	Fire rating, max ²⁾ horizontal/vertical	NPD	NPD	EI120/EI180	EI120/EI180	EI120/EI180
	Weight, kg/m ^{2 3)}	17	18	21	22	24
AST S	Fire rating, max ²⁾ horizontal/vertical	EI60/EI60	EI90/EI90	EI180/EI180	EI180/EI180	EI240/EI240
	Weight, kg/m ^{2 3)}	19	21	23	25	28
AST S+	Fire rating, max ²⁾ horizontal/vertical	EI120/EI120	EI120/EI120	-	-	-
	Weight, kg/m ^{2 3)}	19	21	-	-	-
AST F	Fire rating, max ²⁾ horizontal/vertical	EI45/EI120	EI45/EI120	EI240/EI240	EI240/EI240	EI240/EI240
	Weight, kg/m ^{2 3)}	21	24	27	30	33
AST F+	Fire rating, max ²⁾ horizontal/vertical	EI120/EI120	EI120/EI120	-	-	-
	Weight, kg/m ^{2 3)}	21	24	-	-	-
AST E	Fire rating, max ²⁾ horizontal/vertical	EI45/EI120	EI45/EI120	EI240/EI240	EI240/EI240	EI240/EI240
	Weight, kg/m ^{2 3)}	22	24	28	31	34

- = Not available

²⁾ Fire resistance – contact please Paroc Panel System for more information regarding details and spans. Paroc Panel System's AST® panels are non-combustible and classified Euroclass A2-s1,d0 in accordance with the standard EN 13501-1.

FIRE-RATED WALLS

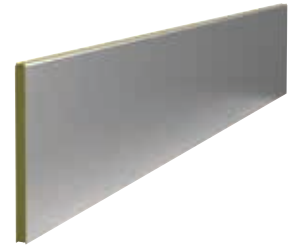
General

Paroc Fire Proof Panels are non-combustible, Euroclass A2-s1,d0 in accordance with the standard EN 13501-1. Fire resistance for Paroc Panel System structures has been classified according to the standards EN 13501-2, EN 15254-5 and EN 15254-7.



Fire-rated walls

Fire-rated walls are non-loadbearing, which means that loads may not be transferred from e.g. roof structures down onto a Paroc Fire Proof Panel wall. Fire classifications are subject to restrictions on span widths. Contact Paroc Panel System or visit www.parocpanels.com. Separate rules apply for acoustic panels and panels with facings of stainless or galvanized steel.



Openings and cut-outs

When dimensioning Paroc Fire Proof Panels panels, account for strength loss that occurs due to openings and cut-outs for doors, windows, pipe penetrations, etc. Design panels with cut-outs to take the loads they are subject to irrespective of the openings. If this is not possible, loads directed on the panels are to be transferred to adjacent panels or using auxiliary structures to the building frame. In case of large openings, the structures can be made of steel profiles transferring the load to the building main frame.

The maximum opening sizes for single service penetrations do not reduce the strength of Paroc Fire Proof Panels panels sufficiently to require special measures. However, multiple cut-outs within a panel must be considered cumulatively. If required, panels with higher strength classes may need to be used at openings.

If the degree of cut-out exceeds the ratio q/q_{all} , the load is either to be transferred to adjacent panels in accordance with figure 2, or, if this is not possible, to be directed on the load-bearing frame by auxiliary structures.

Consider maximum opening sizes noted on typical details in this brochure to remain within tested system parameters.

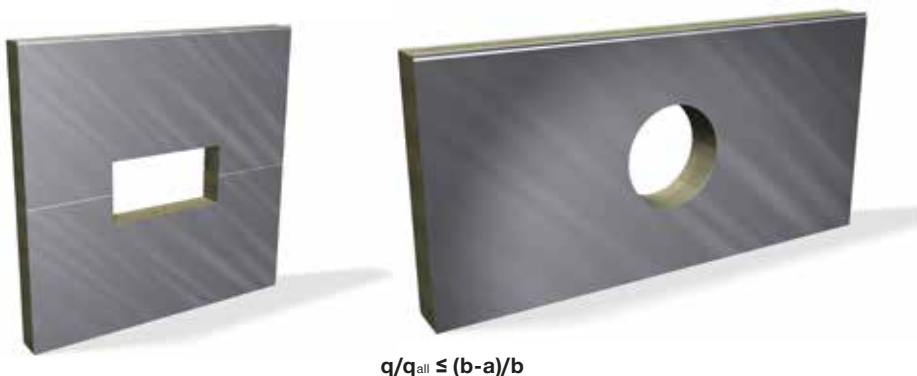


Figure 1

Maximum load for panels with cut-outs q . Allowed load capacity for the whole panel q_{all} can be taken from the dimensioning curves at the actual span and with largest support width.



Figure 2

Load distribution factors.

APERTURE FRAMING, JOINT STITCHING & THERMOPROFILES

Aperture framing

All rectangular openings must be framed on both sides of the wall with 30x30-L angles, fixed to panel facing with self-drilling screws at distances of 125 mm. Seal behind L-angles with Hilti CFS-S ACR acrylic sealant.

Joint stitching

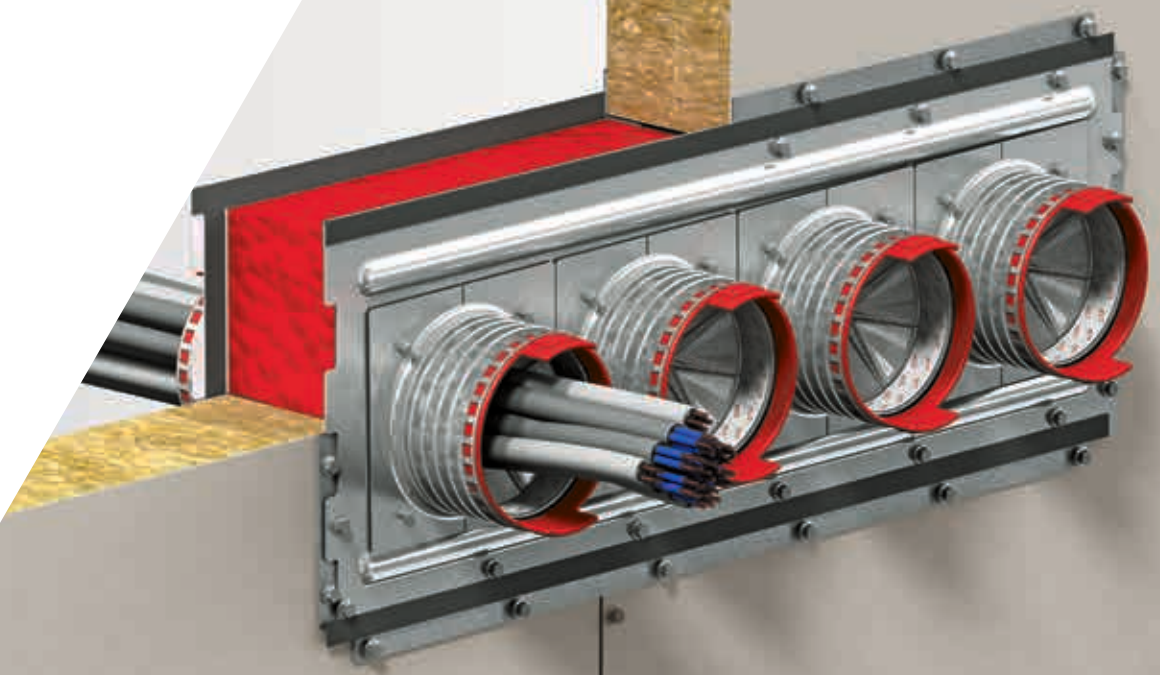
Where openings bisect joints in the sandwich panels, the joints must be stitched with self-drilling screws every 150 mm to a distance of 600 mm on each side of the opening. Additionally, any panel joints within 600 mm of an opening should be similarly stitched.

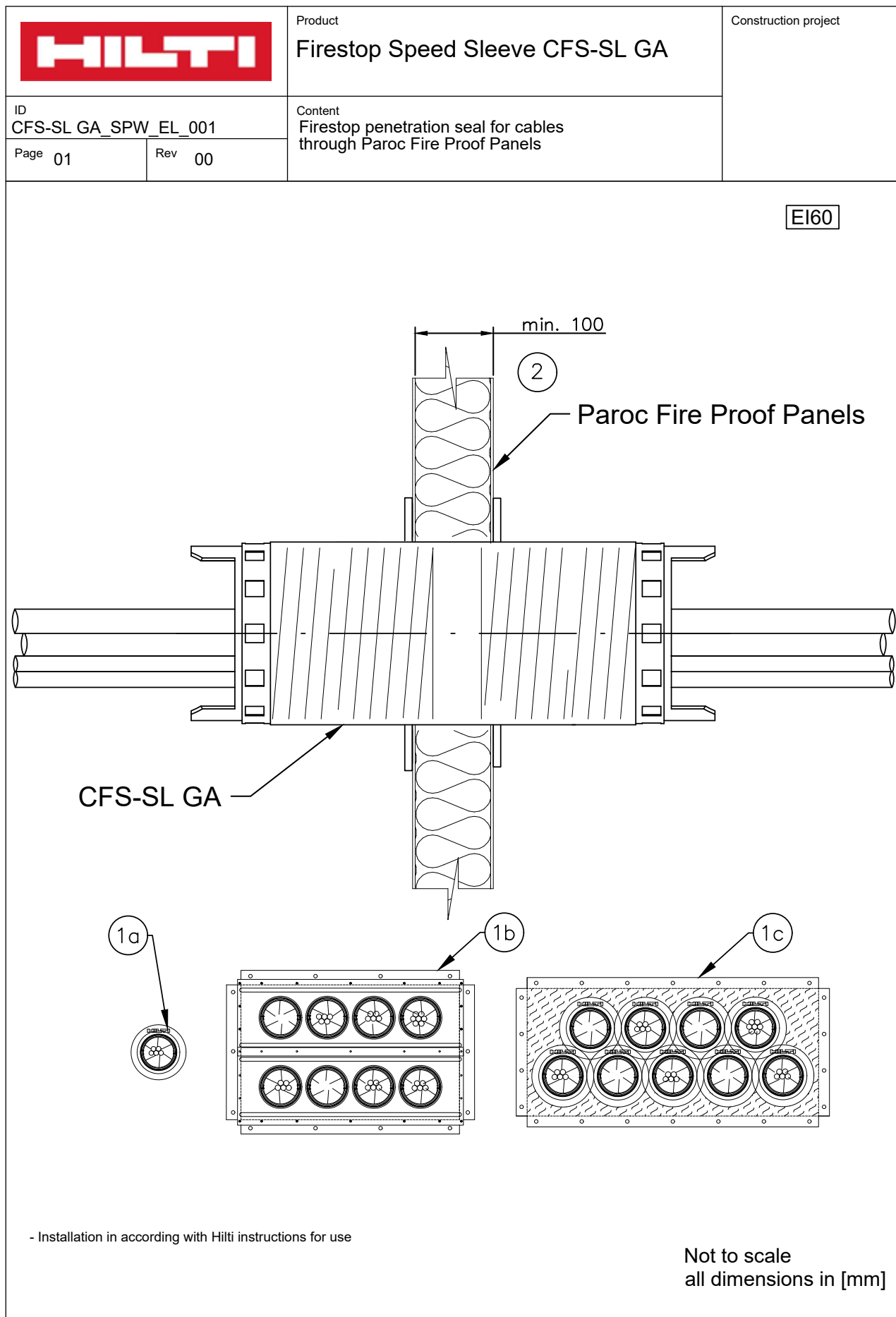
If an opening bisects more than 2 panel joints, install 100 mm Paroc Fire Proof Panels MIT thermo-profiles every 600 mm behind the L-angle aperture framing.




Paroc Fire Proof Panels with AST® core used for wall

LOW-VOLTAGE





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		Product	Firestop Speed Sleeve CFS-SL GA	Construction project
ID CFS-SL GA_SPW_E_001		Content		
Page 02	Rev 00	Firestop penetration seal for cables through Paroc Fire Proof Panels		

① Installation

Pos	Penetrant	Dimensions [mm]	Firestop material	Opening size [mm]	Annular gap	Pipe insulation and / or cable protection	Min. seal depth [mm]
1a	All cables	$\varnothing \leq 21$	CFS-SL GA M	$\varnothing 115$	none	-	100
1b	All cables	$\varnothing \leq 21$	CFS-SL GA M + CFS-SL GP	660 x 370	Fill entire cavity between gangplates with CFS-FX	-	100
1c	All cables	$\varnothing \leq 21$	CFS-SL GA M + CFS-CT	800 x 350	CFS-S ACR to depth of 10 mm	-	100

② Construction: This Typical is relevant for the following construction material

Fire-resistance criteria for the respective construction materials must be also considered.
The tested wall thickness represents a minimum thickness required for the penetration fire-resistance rating.
Where openings bisect joints in the sandwich panels, the joints must be stitched with self-drilling screws every 150mm to a distance of 600mm on each side of the opening and filled with CFS-S ACR sealant to a distance of 100mm from the aperture edge.

Base material	Paroc Fire Proof Panel AST S, S+, E, F, F+
Aperture Frame	Steel angle (L-shape) 30x30x2mm around perimeter of the opening sealed with CFS-S ACR Sealant between steel angle and wall, and affixed with self-drilling screws every 100mm. Only applicable for rectangular openings as shown in cases 1b and 1c.

③ Information about the firestop

Hilti Firestop Speed Sleeve CFS-SL GA M
- Application for cables and cable bundles
- CFS-SL Gangplate affixed to wall with Hilti S-DD 03Z self-drilling screws of length ≥ 25 mm

④ Distance

First service support: ≤ 500 mm

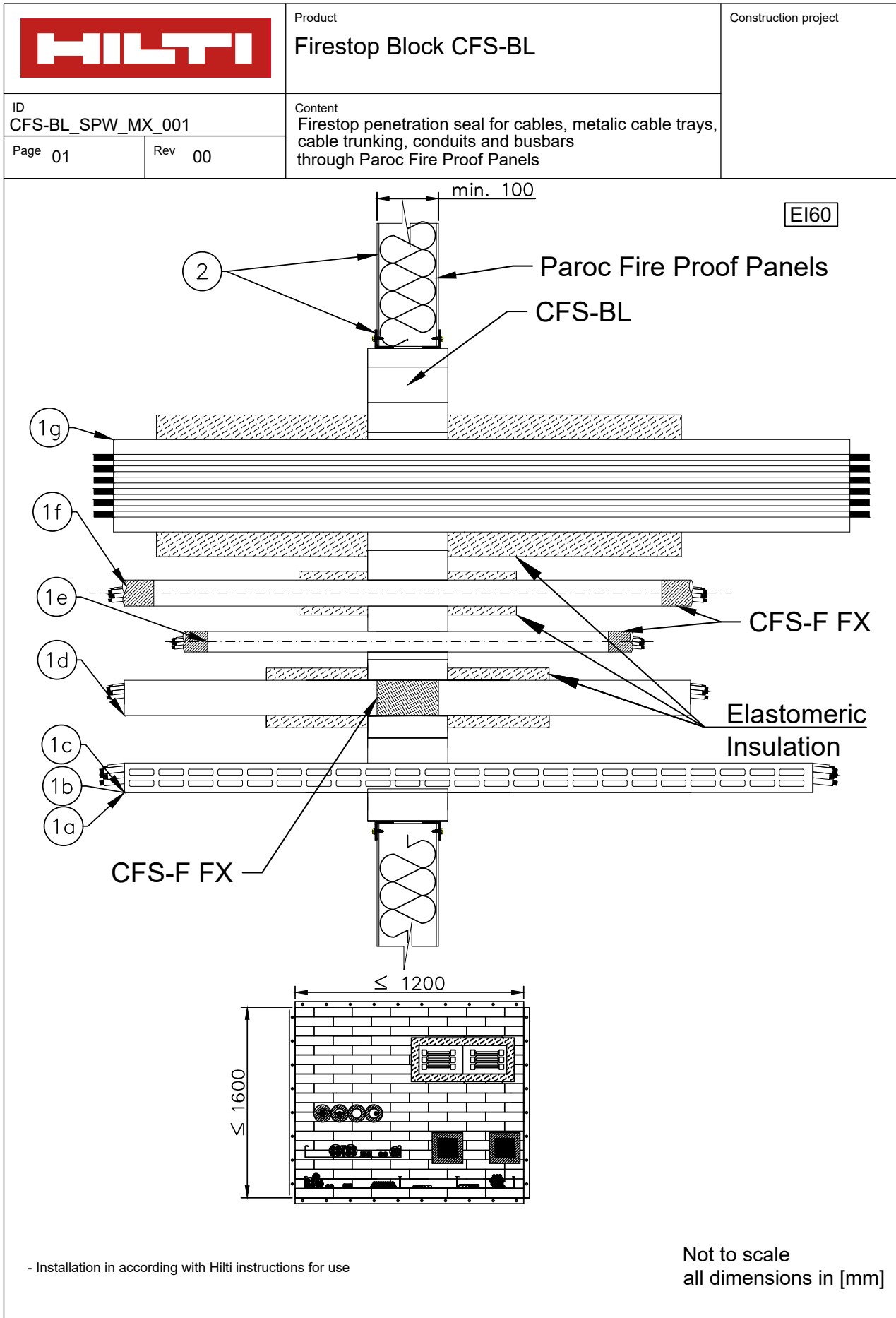
Distances between openings [mm]

Separation between penetration seals					
	CFS-CT Service Penetrations	CFS-CT Damper Penetrations	CFS-BL	CFS-SL GA	CFS-D
CFS-SL GA	≥ 100	≥ 200	≥ 100	≥ 0	≥ 100


⑤ Deflection solution

Stop cable tray on either side of wall,
normal deflection accommodated by unsupported cables

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		Product Firestop Block CFS-BL	Construction project
ID CFS-BL_SPW_MX_001		Content Firestop penetration seal for cables, metallic cable trays, cable trunking, conduits and busbars through Paroc Fire Proof Panels	
Page 02	Rev 00		

① Installation

Pos	Penetrant	Description/ Type	Dimensions [mm]	Firestop material	Opening size [mm]	Annular gap	Pipe insulation and / or cable protection	Min. seal depth [mm]
1a	All cables	-	$\varnothing \leq 80$	CFS-BL	$\leq 1200 \times 1600$	CFS-FIL to a depth of 10mm	-	130
1b	Cable bundles	Individual cable $\varnothing \leq 21\text{mm}$	$\varnothing \leq 100$	CFS-BL	$\leq 1200 \times 1600$	CFS-FIL to a depth of 10mm	-	130
1c	Metalic Cable trays	-	≤ 1100	CFS-BL	$\leq 1200 \times 1600$	CFS-FIL to a depth of 10mm	-	130
1d	Cable trunking	-	$\leq 110 \times 100$	CFS-BL	$\leq 1200 \times 1600$	CFS-FIL to a depth of 10mm	Trunking filled with CFS-FX to thickness of wall and locally wrapped with foamed elastomeric insulation on either side of penetration seal, T*= 32 mm, L*= 300 mm	130
1e	Small cable conduits	Plastic and/or steel	$\varnothing \leq 16$	CFS-BL	$\leq 1200 \times 1600$	CFS-FIL to a depth of 10mm	-	130
1f	Large cable conduits	Steel	$\varnothing \leq 50$	CFS-BL	$\leq 1200 \times 1600$	CFS-FIL to a depth of 10mm	Conduit capped with CFS-FX to a depth of 50mm and locally wrapped with foamed elastomeric insulation on either side of penetration seal, T*= 20 mm, L*= 200 mm	130
1g	Busbar	E+I Engineering copper busbar	5000 amp	CFS-BL	$\leq 1200 \times 1600$	CFS-FIL to a depth of 10mm	Busbar locally wrapped with foamed elastomeric insulation on either side of penetration seal, T*= 32 mm, L*= 500 mm	130

T* = Insulation thickness, L* = Insulation length

② Construction: This Typical is relevant for the following construction material

Fire-resistance criteria for the respective construction materials must be also considered.

The tested wall thickness represents a minimum thickness required for the penetration fire-resistance rating.

Blocks must always extend slightly past wall-facing. In thicker walls (e.g. 150mm), it may be necessary to turn the blocks to a seal depth of 200mm.

Where openings bisect joints in the sandwich panels, the joints must be stitched with self-drilling screws every 150mm to a distance of 600mm on each side of the opening

Base material	Paroc Fire Proof Panel AST S, S+, E, F, F+
Aperture Frame	Steel angle (L-shape) 30x30x2mm around perimeter of the opening sealed with CFS-S ACR Sealant between steel angle and wall, and affixed with self-drilling screws every 100mm

③ Information about the firestop

Hilti Firestop Block CFS-BL

- Application for cables, cable trays, trunking, conduits and busbars

④ Distance

First service support: $\leq 400\text{mm}$

Distances between penetrants [mm]

Distances between services					
	Cables / cable Supports / small conduits	Large conduits	Busbar	Trunking	Seal edge
Cables / cable Supports / small conduits	≥ 50	≥ 100	≥ 250	≥ 100	≥ 50
Large conduits	≥ 100	≥ 40	≥ 100	≥ 100	≥ 50
Busbar	≥ 250	≥ 100	≥ 100	≥ 250	≥ 50
Trunking	≥ 100	≥ 100	≥ 250	≥ 200	≥ 50

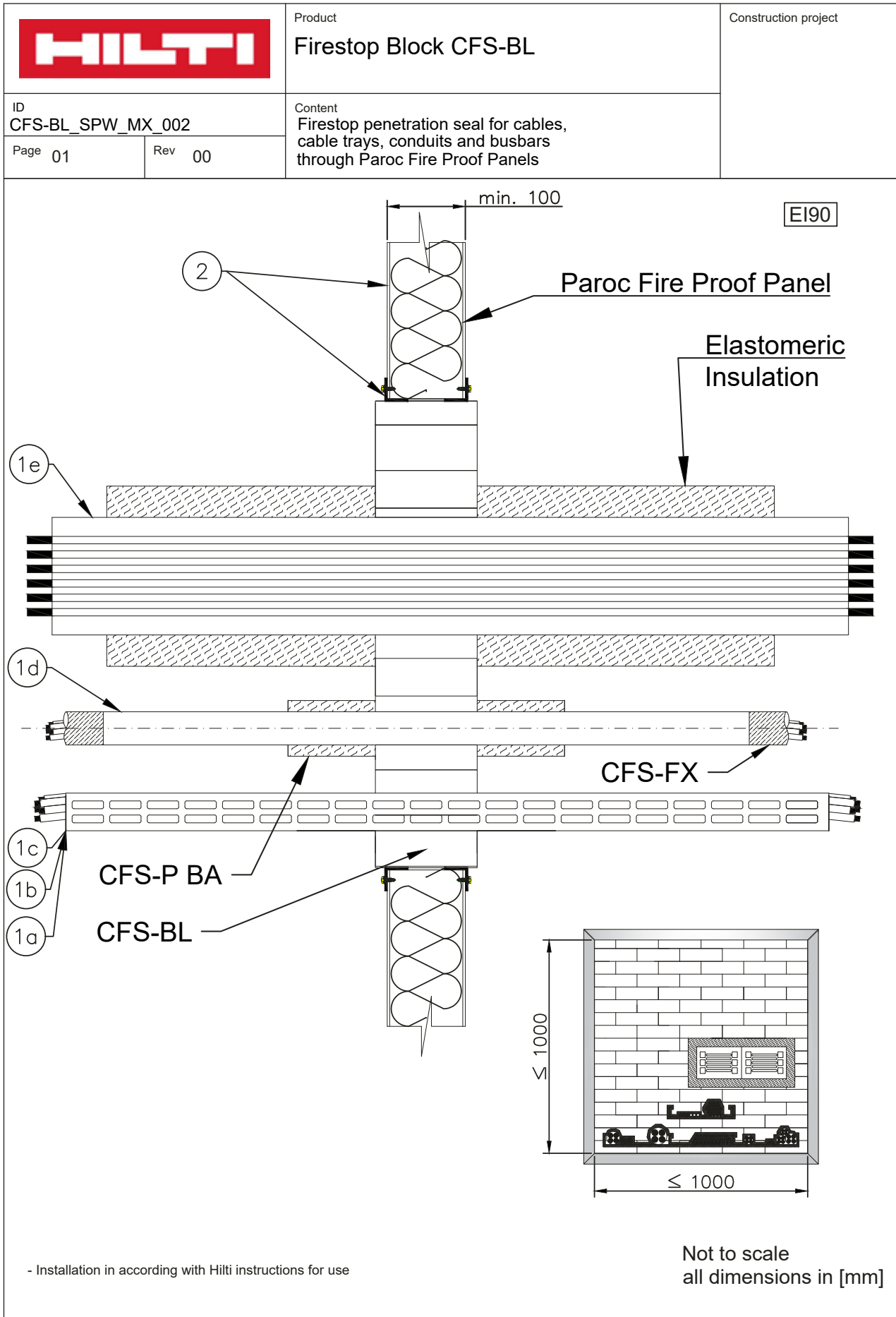
Distances between openings [mm]

Separation between penetration seals					
	CFS-CT Service Penetrations	CFS-CT Damper Penetrations	CFS-BL	CFS-SL GA	CFS-D
CFS-BL	≥ 100	≥ 200	≥ 200	≥ 100	≥ 50


⑤ Deflection solution

Firestop Blocks can accommodate moderate deflection of services. Please contact Hilti for further details.

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		Product Firestop Block CFS-BL	Construction project
ID CFS-BL_SPW_MX_002		Content Firestop penetration seal for cables, cable trays, conduits and busbars through Paroc Fire Proof Panels	
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① Installation

Pos	Penetrant	Description/ Type	Dimensions [mm]	Firestop material	Opening size [mm]	Annular gap	Pipe insulation and / or cable protection	Seal depth [mm]
1a	All cables	-	$\varnothing \leq 80$	CFS-BL	$\leq 1000 \times 1000$	CFS-FIL to a depth of 10 mm	Cables wrapped with 2 layers CFS-P BA on either side of penetration seal, L*= 200 mm	130
1b	Cable bundles	Individual cable $\varnothing \leq 21$	$\varnothing \leq 100$	CFS-BL	$\leq 1000 \times 1000$	CFS-FIL to a depth of 10 mm	-	130
1c	Metalic Cable trays	-	≤ 900	CFS-BL	$\leq 1000 \times 1000$	CFS-FIL to a depth of 10 mm	-	130
1d	Cable conduits	Plastic and steel conduits	$\varnothing \leq 16$	CFS-BL	$\leq 1000 \times 1000$	CFS-FIL to a depth of 10 mm	Conduits capped with CFS-FX to a depth of 50mm and wrapped with 2 layers CFS-P BA on either side of penetration seal, L*= 200 mm	130
1e	Busbar	EAE Electric Copper Core	4000 amp	CFS-BL	$\leq 1000 \times 1000$	CFS-FIL to a depth of 10 mm	Busbar locally wrapped with foamed elastomeric insulation on either side of penetration seal T*= 32 mm, L*= 350 mm	130

T* = Insulation thickness, L* = Insulation length

② Construction: This Typical is relevant for the following construction material

Fire-resistance criteria for the respective construction materials must be also considered.

The tested wall thickness represents a minimum thickness required for the penetration fire-resistance rating.

Blocks must always extend slightly past wall facing. In thicker walls (e.g. 150mm),

it may be necessary to turn the blocks to a seal depth of 200mm.

Where openings bisect joints in the sandwich panels, the joints must be stitched with self-drilling screws

every 150mm to a distance of 600mm on each side of the opening and filled with CFS-S-ACR sealant to a distance of 100mm from the aperture edge.

Base material	Paroc Fire Proof AST S, S+, E, F, F+
Aperture Frame	Steel angle (L-shape) 30x30x2mm around perimeter of the opening and affixed with self-drilling screws every 100mm

③ Information about the firestop

Hilti Firestop Block CFS-BL

- Application for cables, cable trays, conduits and busbars

④ Distance

First service support: $\leq 250\text{mm}$

Distances between penetrants [mm]

Distances between services			
	Cables / Cable Supports	Busbar	Seal edge
Cables / Cable Supports	≥ 50	≥ 100	≥ 50
Busbar	≥ 100	≥ 100	≥ 50


Minimum distance to other openings: 200 mm

⑤ Deflection solution

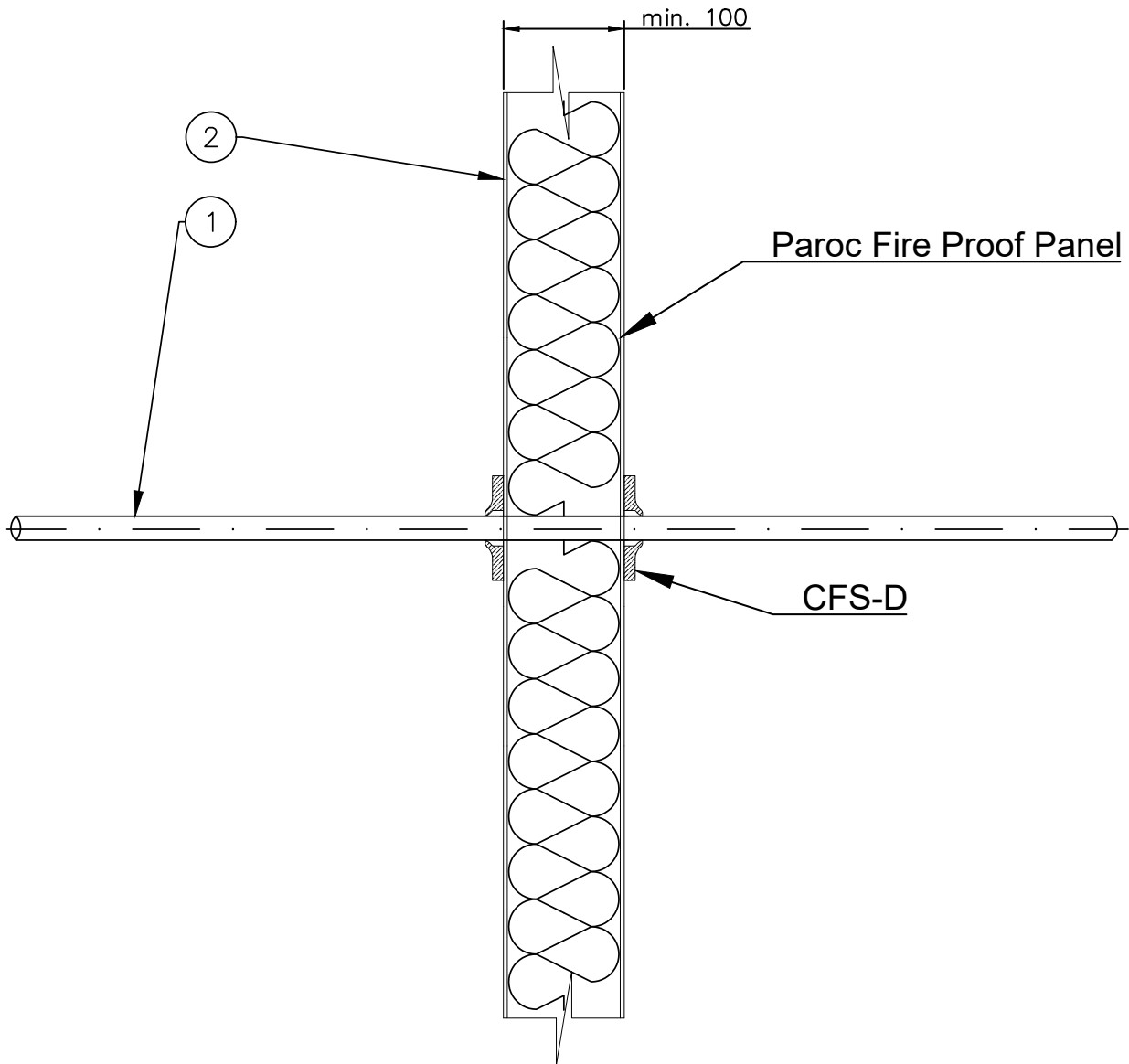
Firestop Blocks can accommodate moderate deflection of services.

Please contact Hilti for further details.

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		Product Firestop Cable Disc CFS-D	Construction project
ID CFS-D_SPW_E_001		Content Firestop penetration seal for single cables through Paroc Fire Proof Panels	
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EI60



- Installation in according with Hilti instructions for use

**Not to scale
all dimensions in [mm]**

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		Product Firestop Cable Disc CFS-D	Construction project
ID CFS-D_SPW_E_001		Content Firestop penetration seal for single cables through Paroc Fire Proof Panels	
Page 02	Rev 00		

① Installation

Pos	Penetrant	Dimensions [mm]	Firestop material	Opening size [mm]	Annular gap	Pipe insulation and / or cable protection	Min. seal depth [mm]
1a	All cables	$\varnothing \leq 21$	CFS-D	$\varnothing \leq 25$	-	-	100

② Construction: This Typical is relevant for the following construction material

Fire-resistance criteria for the respective construction materials must be also considered.
 The tested wall thickness represents a minimum thickness required for the penetration fire-resistance rating.

Base material	Paroc Fire Proof Panel AST S, S+, E, F, F+
Aperture Frame	No aperture framing required

③ Information about the firestop

Hilti Firestop Cable Disc CFS-D
 - Application for cables

④ Distance

First service support: $\leq 500\text{mm}$

Distances between openings [mm]

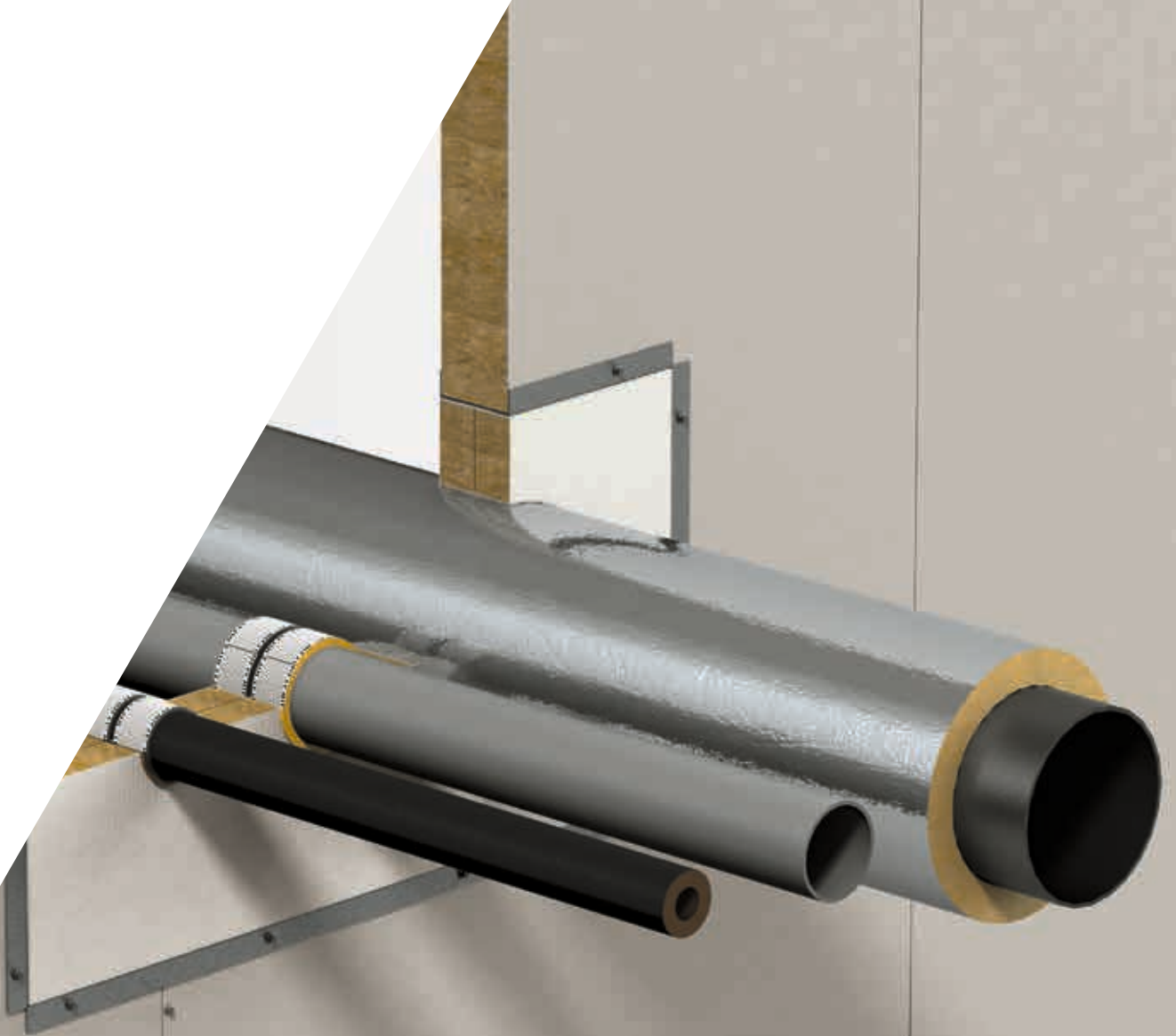
Separation between penetration seals			
	CFS-D	CFS-BL	CFS-SL GA
CFS-D	≥ 50	≥ 100	≥ 100


⑤ Deflection solution

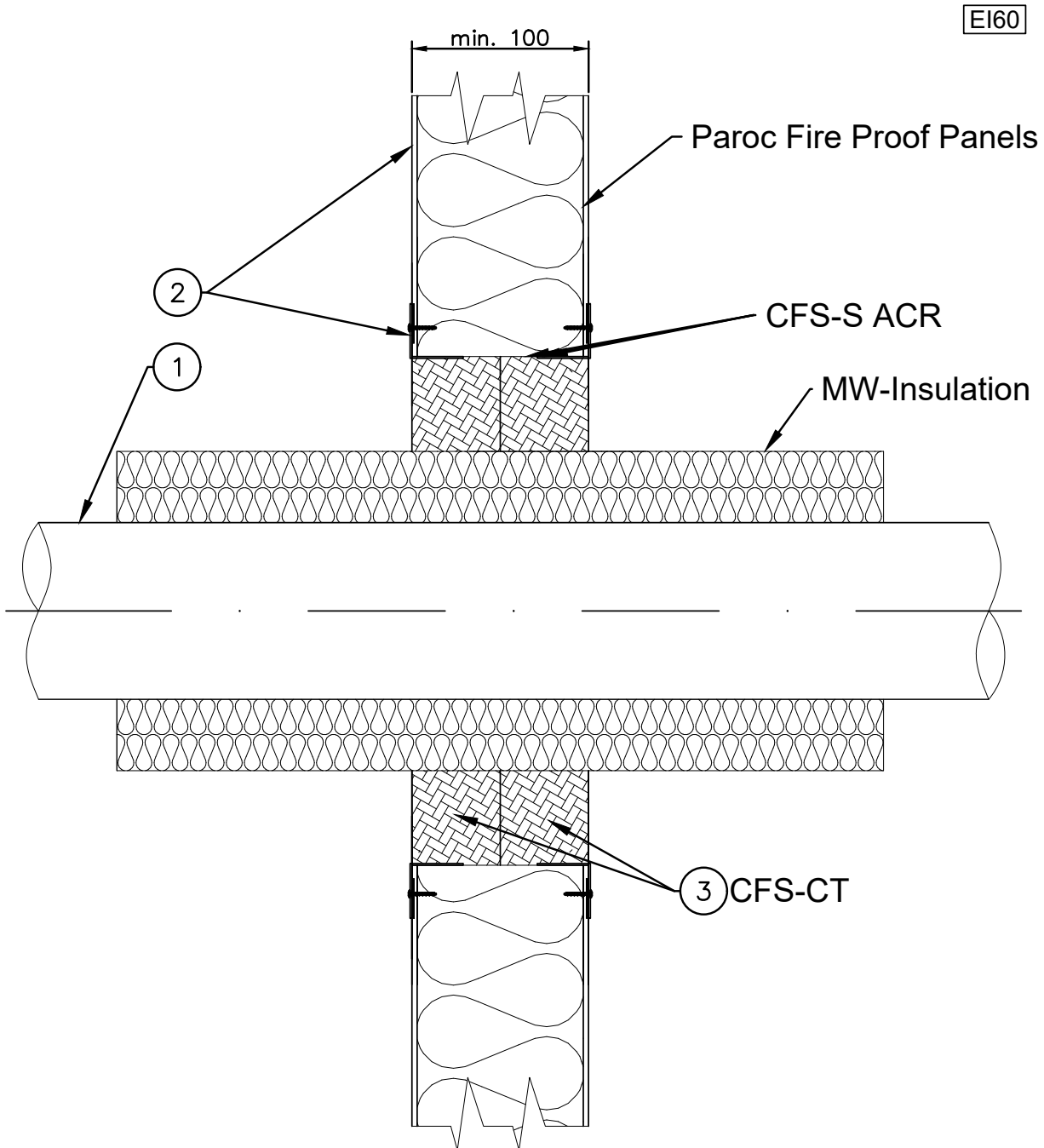
Stop cable tray on either side of wall,
 normal deflection accommodated by unsupported cables.

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MECHANICAL PIPING




		Product Firestop Coated Board System CFS-CT	Construction project
ID CFS-CT_SPW_NCP_001		Content Firestop penetration seal for single and multiple non-combustible pipes through Paroc Fire Proof Panels	
Page 01	Rev 00		



- Installation in according with Hilti instructions for use

Not to scale
all dimensions in [mm]

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		Product Firestop Coated Board System CFS-CT	Construction project
ID CFS-CT_SPW_NCP_001		Content Firestop penetration seal for for single and multiple non-combustible pipes through Paroc Fire Proof Panels	
Page 02	Rev 00		

① Installation

Pos	Penetrant	Description/Type	Dimensions [mm]	Firestop material	Opening size [mm]	Annular gap	Pipe insulation and /or cable protection	Min. Seal depth [mm]
1a	Non-combustible pipe	Copper, steel, stainless steel and cast iron	$10 < \varnothing \leq 54$	CFS-CT	2000 x 600	CFS-S ACR to depth of 10 mm	Aluminium-backed mineral wool, insulated continuously through penetration seal $T^*=30\text{mm}$, $L^*\geq 750\text{mm}$	100
1b	Non-combustible pipe	Steel, stainless steel and cast iron	$54 < \varnothing \leq 324$	CFS-CT	2000 x 600	CFS-S ACR to depth of 10 mm	Aluminium-backed mineral wool, insulated continuously through penetration seal $T^*=40\text{mm}$, $L^*\geq 750\text{mm}$	100

T^* = Insulation thickness, L^* = Insulation length

② Construction: This Typical is relevant for the following construction materials:

Fire-resistance criteria for the respective construction materials must be also considered.
 The tested wall thickness represents a minimum thickness required for the penetration fire-resistance rating.
 Where openings bisect joints in the sandwich panels, the joints must be stitched with self-drilling screws every 150 mm to a distance of 600 mm on each side of the opening.

Base material	Paroc Fire Proof Panel AST S, S+, E, F, F+
Aperture Frame	Steel angle (L-shape) 30x30x2mm around perimeter of the opening sealed with CFS-S ACR. Sealant between steel angle and wall, and affixed with self-drilling screws every 100mm

③ Information about the firestop

Hilti Firestop Coated Board System CFS-CT
 - Application for non-insulated and MW-insulated non-combustible pipes,
 non-insulated pipes to be wrapped with local mineral wool insulation to the length specified

④ Distance

First service support: ≤ 250 mm


Distances between penetrants [mm]

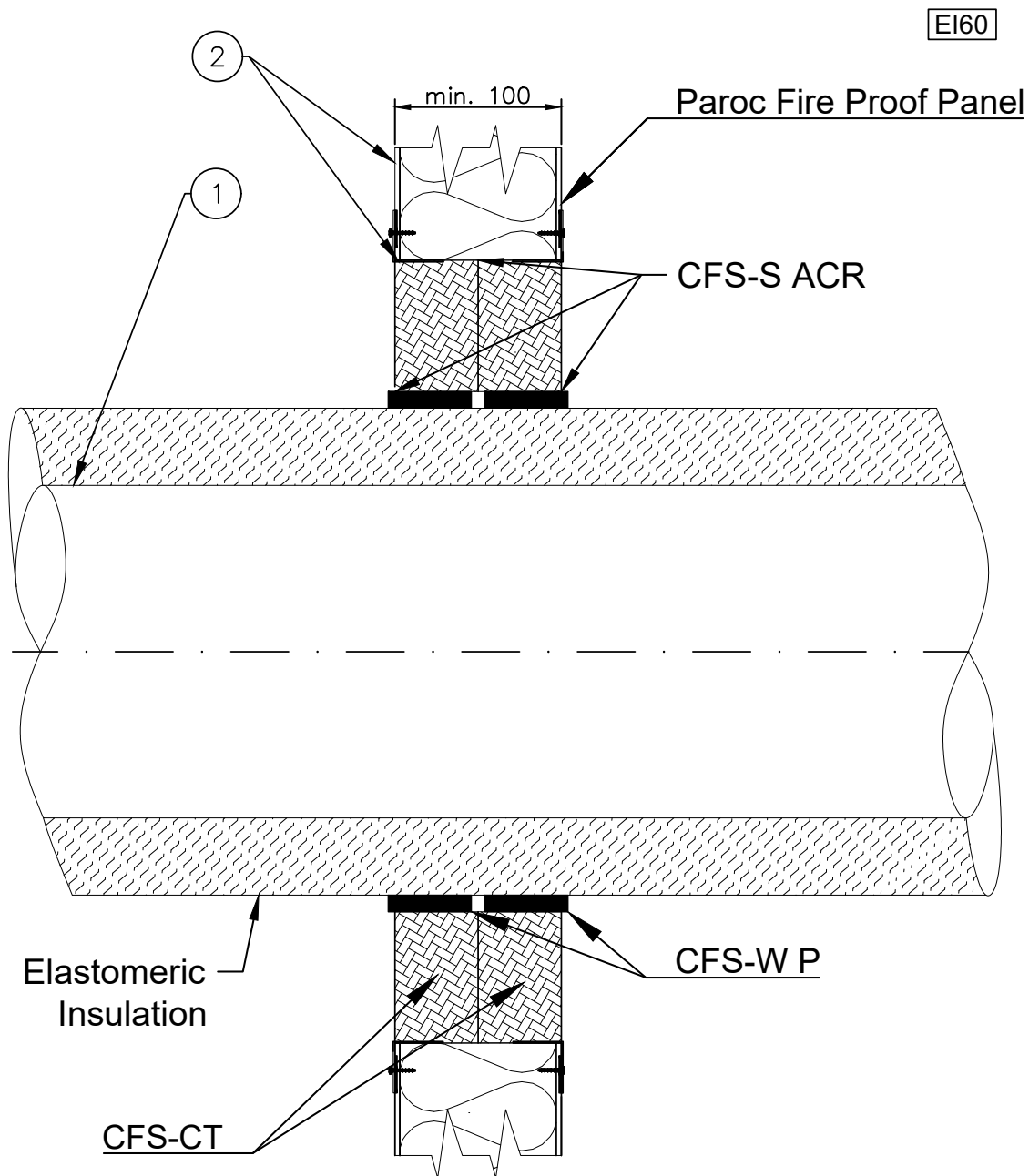
Separation between services			
	Metal pipes / Pipe insulation	Plastic Pipes / Pipe Closure Devices	Seal Edges
Metal Pipes	≥ 50	≥ 50	≥ 50
Plastic Pipes / Pipe Closure	≥ 50	≥ 50	≥ 50
Seal Edges	≥ 50	≥ 50	≥ 50

Distances between openings [mm]

Separation between penetration seals					
	CFS-CT - Service Penetrations	CFS-CT - Damper Penetrations	CFS-BL	CFS-SL	CFS-D
CFS-CT - Service Penetrations	≥ 100	≥ 200	≥ 100	≥ 100	≥ 100

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		Product Firestop Wrap CFS-W P in Firestop Coated Board System CFS-CT	Construction project
ID CFS-W P_CFS-CT_SPW_NCP_001		Content Firestop penetration seal for single and multiple non-combustible pipes with combustible insulation through Paroc Fire Proof Panels	
Page 01	Rev 00		



- Installation in according with Hilti instructions for use

Not to scale
all dimensions in [mm]

A „Typical“ is a preconfigured fire protection solution, consisting of certain components and for certain applications, which is assigned an adopted fire resistance duration. Typicals will be chosen according to its fire resistance duration and are subject to the technical product documentation and the underlying product approvals which will be published by Hilti from time to time, underlying the generic adoption and won't be selected project- or design specific. For this reason the suggested Typicals might not correspond the project- or design specific requirements, and have to be rated by the costumer or an expert ordered by the costumer with regard to the actual project specific design criteria and requirements.

		Product Firestop Wrap CFS-W P in Firestop Coated Board System CFS-CT	Construction project
ID CFS-W P_CFS-CT_SPW_NCP_001		Content Firestop penetration seal for single and multiple non-combustible pipes with combustible insulation through Paroc Fire Proof Panels	
Page 02	Rev 00		

① Installation

Pos	Penetrant	Description/Type	Dimensions [mm]	Firestop material	Opening size [mm]	Annular gap	Pipe insulation and /or cable protection	Min. Seal depth [mm]
1a	Non-combustible pipe	Copper, steel, stainless steel and cast iron	$10 < \varnothing \leq 64$	CFS-CT CFS-W P	2000 x 600	CFS-S ACR to depth of 10mm	Continuous foamed elastomeric insulation, T* = 15.5 - 39.5 mm	100
1b	Non-combustible pipe	Steel, stainless steel and cast iron	$64 < \varnothing \leq 219$	CFS-CT CFS-W P	2000 x 600	CFS-S ACR to depth of 10mm	Continuous foamed elastomeric insulation, T* = 32 - 50 mm	100

T* = Insulation thickness

② Construction: This Typical is relevant for the following construction material

Fire-resistance criteria for the respective construction materials must be also considered.
The tested wall thickness represents a minimum thickness required for the penetration fire-resistance rating.
Where openings bisect joints in the sandwich panels, the joint must be stitched with self-drilling screws every 150mm to a distance of 600mm on each side of the opening.

Base material	Paroc Fire Proof Panel AST S, S+, E, F, F+
Aperture Frame	Steel angle (L-shape) 30x30x2mm around perimeter of the opening sealed with CFS-S ACR. Sealant between steel angle and wall, and affixed with self-drilling screws every 100mm

③ Information about the firestop

Hilti Firestop Wrap CFS-W P in Hilti Firestop Coated Board System CFS-CT
- Application for non-combustible pipes with continuous combustible insulation

Wrap Layer	
Ø [mm]	Layers
10-64	2
64-219	3

④ Distance

First service support: ≤ 250mm


Distances between penetrants [mm]

Separation between services			
	Metal pipes / Pipe insulation	Plastic Pipes / Pipe Closure Devices	Seal Edges
CFS-W P	≥ 50	≥ 50	≥ 50

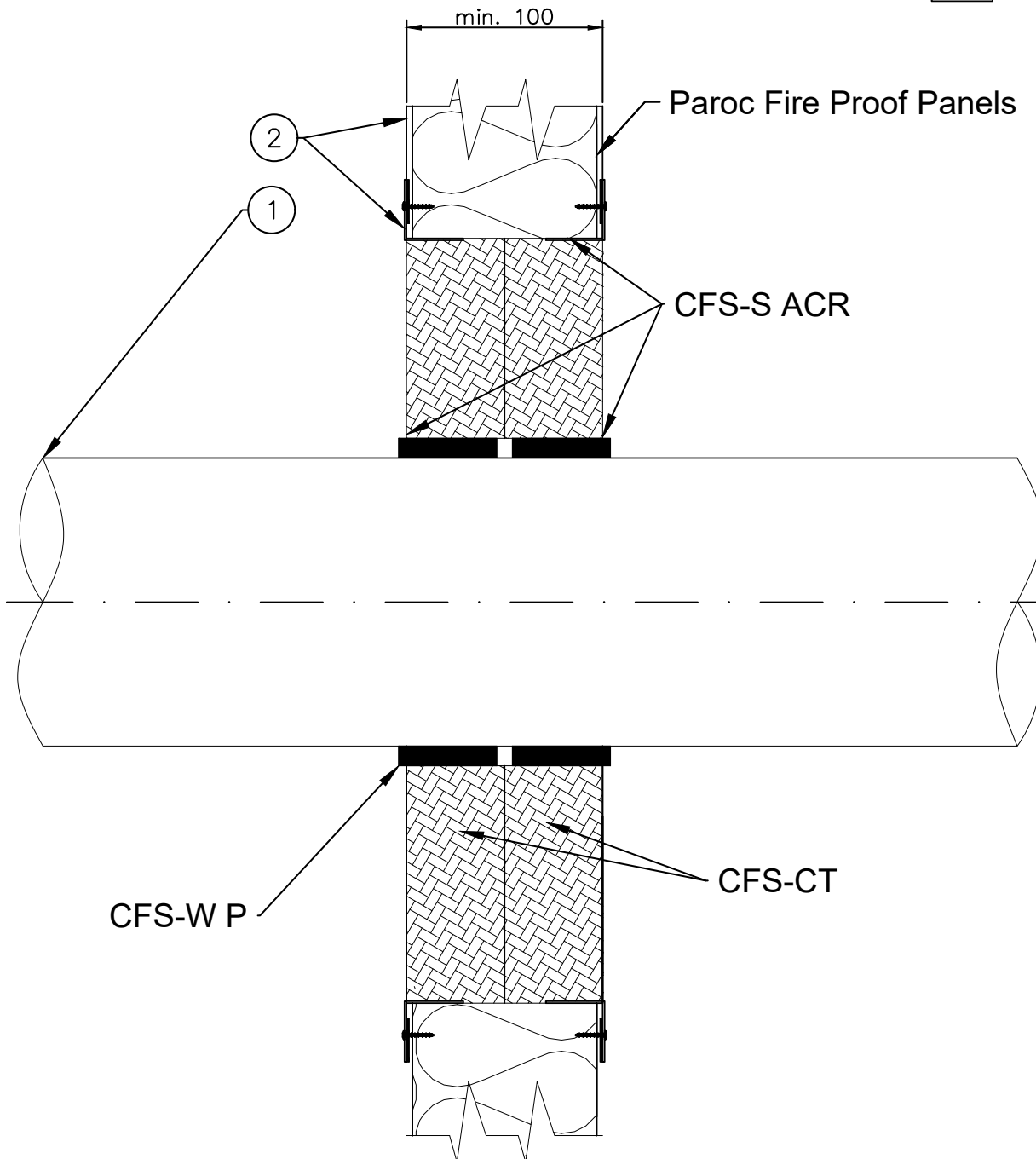
Distances between openings [mm]

Separation between penetration seals					
	CFS-CT - Service Penetrations	CFS-CT - Damper Penetrations	CFS-BL	CFS-SL	CFS-D
CFS-CT Service penetrations	≥ 100	≥ 200	≥ 100	≥ 100	≥ 100

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		Product Firestop Wrap CFS-W P in Firestop Coated Board System CFS-CT	Construction project
ID CFS-W P_CFS-CT_SPW_CP_001		Content Firestop penetration seal for single and multiple combustible pipes through Paroc Fire Proof Panels	
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EI60




CFS-W P

CFS-CT

- Installation in according with Hilti instructions for use

Not to scale
all dimensions in [mm]

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		Product Firestop Wrap CFS-W P in Firestop Coated Board System CFS-CT	Construction project
ID CFS-W P_CFS-CT_SPW_CP_001		Content Firestop penetration seal for single and multiple combustible pipes through Paroc Fire Proof Panels	
Page 02	Rev 00		

① Installation

Pos	Penetrant	Description/Type	Dimensions [mm]	Firestop material	Opening size [mm]	Annular gap	Min. Seal depth [mm]
1a	Combustible pipe	PP	$\varnothing \leq 110$	CFS-CT CFS-W P	2000 x 600	CFS-S ACR to depth of 10mm	100
1b	Combustible pipe	PVC	$\varnothing \leq 110$	CFS-CT CFS-W P	2000 x 600	CFS-S ACR to depth of 10mm	100
1c	Combustible pipe	PE	$\varnothing \leq 110$	CFS-CT CFS-W P	2000 x 600	CFS-S ACR to depth of 10mm	100

② Construction: This Typical is relevant for the following construction material

Fire-resistance criteria for the respective construction materials must be also considered.
 The tested wall thickness represents a minimum thickness required for the penetration fire-resistance rating.
 Where openings bisect joints in the sandwich panels, the joints must be stitched with self-drilling screws every 150mm to a distance of 600mm on each side of the opening.

Base material	Paroc Fire Proof Panel AST S, S+, E, F, F+
Aperture Frame	Steel angle (L-shape) 30x30x2mm around perimeter of the opening sealed with CFS-S ACR. Sealant between steel angle and wall, and affixed with self drilling screws every 100mm

③ Information about the firestop

Hilti Firestop Wrap CFS-W P in Hilti Firestop Coated Board System CFS-CT
 - Application for single or multiple combustible pipes in square openings

Wrap layer	
\varnothing [mm]	Layers
32-56	2
63-75	3
90-110	4

④ Distance

First service support: $\leq 500\text{mm}$

Distances between penetrants [mm]

Separation between services			
	Metal pipes / Pipe insulation	Plastic Pipes / Pipe Closure Devices	Seal Edges
CFS-W P	≥ 50	≥ 50	≥ 50


Distances between openings [mm]

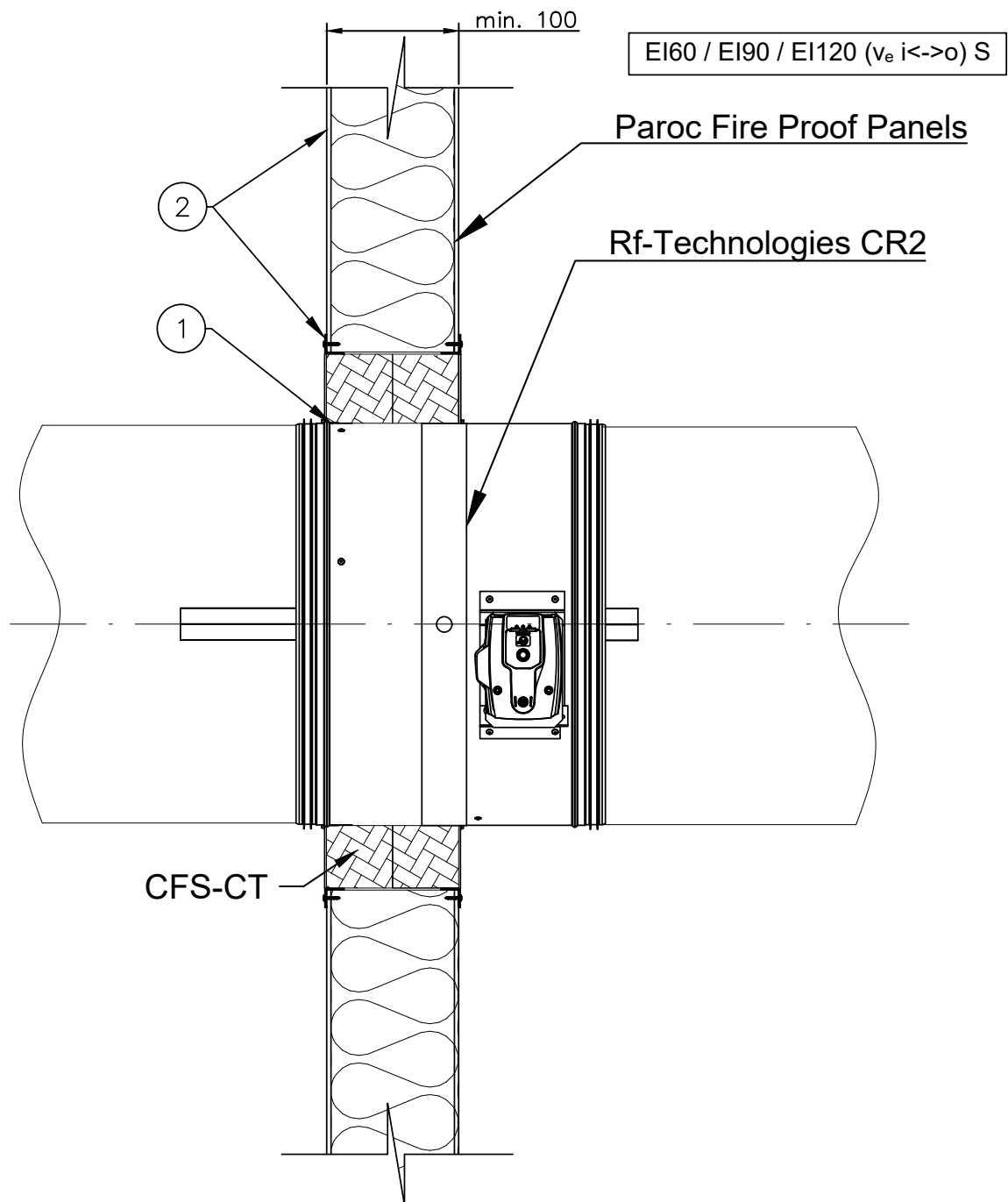
Separation between penetration seals					
	CFS-CT - Service Penetrations	CFS-CT - Damper Penetrations	CFS-BL	CFS-SL	CFS-D
CFS-T Service penetrations	≥ 100	≥ 200	≥ 100	≥ 100	≥ 100

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RF-TECHNOLOGIES FIRE DAMPERS




		Product Firestop Coated Board System CFS-CT	Construction project
ID CFS-CT_SPW_FD_001		Content Firestop penetration seal for RF-Technologies round fire dampers through Paroc Fire Proof Panels	
Page 01	Rev 00		



- Installation in according with Hilti instructions for use

Not to scale
all dimensions in [mm]

A „Typical“ is a preconfigured fire protection solution, consisting of certain components and for certain applications, which is assigned an adopted fire resistance duration. Typicals will be chosen according to its fire resistance duration and are subject to the technical product documentation and the underlying product approvals which will be published by Hilti from time to time, underlying the generic adoption and won't be selected project- or design specific. For this reason the suggested Typicals might not correspond the project- or design specific requirements, and have to be rated by the costumer or an expert ordered by the costumer with regard to the actual project specific design criteria and requirements.

		Product Firestop Coated Board System CFS-CT	Construction project
ID CFS-CT_SPW_FD_001		Content Firestop penetration seal for round RF-Technologies fire dampers through Paroc Fire Proof Panels	
Page 02	Rev 00		

① Installation

Pos	Penetrant	Description/ Type	Dimensions [mm]	Firestop material	Opening size [mm]	Annular gap	Pipe insulation and / or cable protection	Min. seal depth [mm]
1a	Round dampers	Rf-T CR2	$\varnothing \leq 630$	CFS-CT	$\leq 730 \times 730$	CFS-S ACR to a depth of 10 mm	-	100

② Construction: This Typical is relevant for the following construction material

Fire-resistance criteria for the respective construction materials must be also considered.
 The tested wall thickness represents a minimum thickness required for the penetration fire-resistance rating.
 Where openings bisect joints in the sandwich panels, the joints must be stitched with self-drilling screws
 every 150mm to a distance of 600mm on each side of the opening.

Base material	Paroc Fire Proof Panel AST S, S+, E, F, F+
Aperture Frame	Steel angle (L-shape) 30x30x2mm around perimeter of the opening sealed with CFS-S ACR Sealant between steel angle and wall, and affixed with self-drilling screws every 100mm

③ Information about the firestop

RF-Technologies Fire Damper: CR2 $\varnothing \leq 630$
 Hilti Firestop Coated Board System CFS-CT
 - Application for round fire dampers in single installation


④ Distance

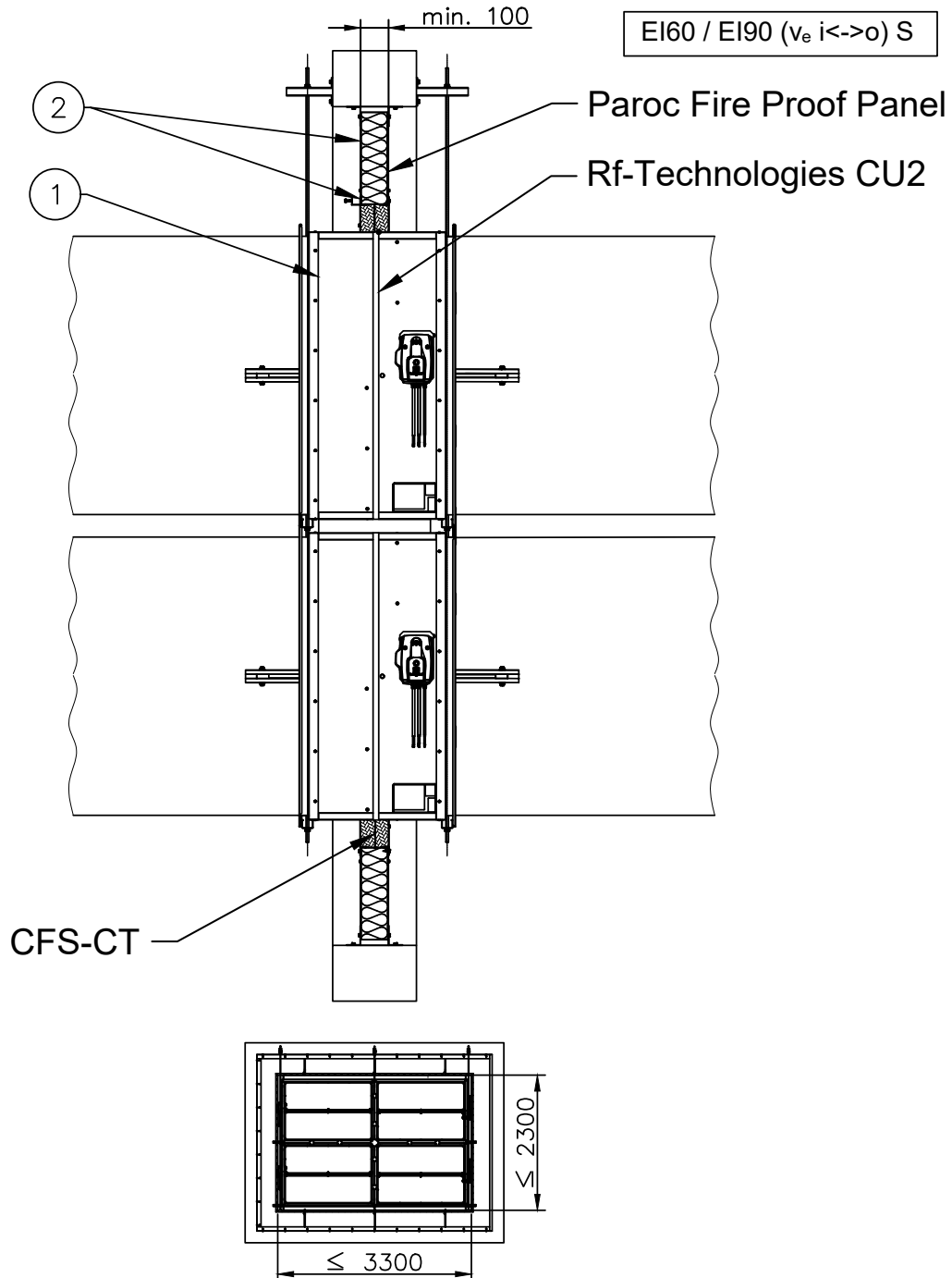
Minimum distance to other openings: 200 mm

⑤ Deflection solution

- RF-Technologies Fire dampers can be installed into sandwich panel walls in accordance with deflection requirements such as DW145.
- The fire damper must be solidarized with the wall by screw-fixing RF-Technologies made-to-measure fixing lugs.
Please contact RF-Technologies or your distributor.
- The sealing details between fire damper and wall remain unchanged.
- The connection of galvanized ductwork to the fire damper should be made with breakaway bolts or a flexible joint to
allow for movement between the damper and ductwork.

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		Product Firestop Coated Board System CFS-CT	Construction project
ID CFS-CT_SPW_FD_003		Content Firestop penetration seal for single or multiple rectangular Rf-Technologies through Paroc Fire Proof Panels	
Page 01	Rev 00		



- Installation in according with Hilti instructions for use

Not to scale
all dimensions in [mm]

A „Typical“ is a preconfigured fire protection solution, consisting of certain components and for certain applications, which is assigned an adopted fire resistance duration. Typicals will be chosen according to its fire resistance duration and are subject to the technical product documentation and the underlying product approvals which will be published by Hilti from time to time, underlying the generic adoption and won't be selected project- or design specific. For this reason the suggested Typicals might not correspond the project- or design specific requirements, and have to be rated by the costumer or an expert ordered by the costumer with regard to the actual project specific design criteria and requirements.

		Product Firestop Coated Board System CFS-CT	Construction project
ID CFS-CT_SPW_FD_003		Content Firestop penetration seal for single or multiple rectangular Rf-Technologies through Paroc Fire Proof Panels	
Page 02	Rev 00		

① Installation

Pos	Penetrant	Description/Type	Dimensions [mm]	Firestop material	Opening size [mm]	Annular gap	Min. seal depth [mm]
1a	Rectangular dampers	Rf-Technologies CU2	Individual damper: ≤ 1500 x 1000 Maximum 4 rectangular dampers in minimal distance installation	CFS-CT	Maximum 100mm annular space around damper Maximum opening for 4 dampers in minimal distance installation: ≤ 3300 x 2300	CFS-S ACR to a depth of 10 mm	100

② Construction: This Typical is relevant for the following construction material

Fire-resistance criteria for the respective construction materials must be also considered.
 The tested wall thickness represents a minimum thickness required for the penetration fire-resistance rating.
 Where openings bisect joints in the sandwich panel, the joint must be stitched with self-drilling screws every 150mm to a distance of 600mm on each side of the opening.

Base material	Paroc Fire Proof Panel AST S, S+, E, F, F+
Aperture Frame	Steel angle (L-shape) 30x30x2mm around perimeter of the opening sealed with CFS-S ACR Sealant between steel angle and wall, and affixed with self-drilling screws every 100mm. If an opening bisects more than 2 panel joints, install 100mm Paroc Panel System MIT thermo-profiles every 600mm behind the L-angle aperture framing.

③ Information about the firestop

Rf-Technologies Fire Damper: CU2 ≤ 1500 x 1000
 Hilti Firestop Coated Board System CFS-CT
 - Application for rectangular fire dampers in single and battery installations

④ Distance

Distance to other openings: 200 mm

⑤ Deflection solution

- Rf-Technologies Fire dampers can be installed into sandwich panel walls in accordance with deflection requirements such as DW145.
- The fire damper must be solidarized with the wall by screw-fixing Rf-Technologies made-to-measure fixing lugs.
Please contact Rf-Technologies or your distributor.
- The sealing details between fire damper and wall remain unchanged.
- The connection of galvanized ductwork to the fire damper should be made with breakaway bolts or a flexible joint to allow for movement between the damper and ductwork.

A „Typical“ is a preconfigured fire protection solution, consisting of certain components and for certain applications, which is assigned an adopted fire resistance duration. Typical will be chosen according to its fire resistance duration and are subject to the technical product documentation and the underlying product approvals which will be published by Hilti from time to time, underlying the generic adoption and won't be selected project- or design specific. For this reason the suggested Typical might not correspond the project- or design specific requirements, and have to be rated by the customer or an expert ordered by the customer with regard to the actual project specific design criteria and requirements.

TEST CONFIRMATION LETTERS



Hilti Ireland
c4 North City Business Park,
North Rd, Kildonan,
Co. Dublin, D11 V96E,
Ireland

Certified Fire Protection Solutions in Sandwich Panel Walls

September 30, 2020

We have seen an increase of sandwich panel construction over the past few years, especially in Data Centers.

Hilti offers a wide range of fire protection solutions with extensive testing and ETA approvals across our product lines mainly into concrete, block, masonry and plasterboard. Over the course of this year, Hilti has worked closely with Paroc Panel Systems and Rf-Technologies to extend the use of our fire protection products using sandwich panels as a base material.

There is currently no classification standard which allows Fire Protection manufacturers to classify sandwich panel testing across to other panel thickness, types or manufacturers. Sandwich panels are a complex base material which perform considerably differently from standard base materials such as concrete or plasterboard in fire situations. This makes it crucial to work together with experts to carry out the most stringent testing, to ensure we determine the performance of our products in this base material.

We have carried out 10 tests this year to ensure certified solutions for the most common telecom, electrical, mechanical pipe and Rf-Technologies damper applications in Paroc Fire Proof Panel walls.

We have been successful with our testing and the next step is now to develop the classification reports which have unfortunately been delayed due to the current pandemic. We are hopeful that we will receive these reports from the test institutes by the end of the 2020 (subject to changes due to the current circumstances).

What can Hilti provide you with in the meantime?

We have prepared a set of typical details to allow projects currently in design to consider the parameters covered by our recent testing. For projects already in construction phases, we can issue Engineering Judgements based on the recent testing. As our test reports are confidential reports with sensitive information, we are not able to share this document externally but can transmit this information to certified test bodies via secure channels where necessary. This should act as sufficient documentation to prove the suitability of the products in the specific applications stated.

If you have any additional questions, please contact our technical department

For and on Behalf of Hilti

Khadije Bah
E1 Head of Technical
Marketing and ECC

Trisha Wason
E1 Product Manager
Fire Protection

Luca Giombetti
Segment Manager
Data Centre

DECLARATION OF TEST RESULTS

No. 20545C-revision 1

A 4 fire dampers in a battery set-up mounted in a sandwich panel wall with a coated stone wool board seal

seal type around the dampers: **Firestop coated Board CFS-CT**

The element is fully described in test report No. 20545A.

Test sponsor: HILTI AG

Test date: 8th September 2020

Test Method: EN 1366-2:2015

Obtained test results:

Parameter	Limits	Results
Operating pressure:		-300 Pa
System leakage:	12 m ³ /h	11.4 m ³ /h
Test duration:		91 minutes
Thermal insulation – (I⁽¹⁾ criterion): $\Delta T_m = 140^\circ\text{C}$ $\Delta T_M = 180^\circ\text{C}$ Integrity (E⁽¹⁾ criterion): Leakage through the fire damper ⁽²⁾ Ignition of the cotton pad Fail test with the 6 mm and 25 mm gauges Spontaneous, continuous flames	360 m ³ /h.m ²	91 minutes, no failure 90 minutes 91 minutes, no failure 91 minutes, no failure 91 minutes, no failure 91 minutes, no failure
Smoke leakage (S⁽¹⁾ criterion): Leakage through the fire damper at an ambient temperature Leakage through the fire damper during the test ⁽²⁾	200 m ³ /h.m ² 200 m ³ /h.m ²	91 minutes, no failure 91 minutes, no failure
Actuating mechanism: Any sign of mechanical damage after the opening and closing test of 50 cycles Time at which the fully-open fire damper closes	2 minutes	No damage 22 seconds

⁽¹⁾ Classification according to EN 13501-3.

⁽²⁾ These performance criteria apply after 5 minutes from the start of the test.

This declaration is valid until: 8th September 2023.

WFRGENT NV

European classifications can only be proved with the official classification report No. 20545B according to EN 13501-2.

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Institut für Brandschutztechnik
und Sicherheitsforschung

HILTI Aktien Gesellschaft mbH

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IBS – Institut für Brandschutztechnik und
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Firmenbuchnummer 89116d
Landesgericht Linz / UID-Nr. ATU23289765

18 September 2020
Manfred EGLAUER / AM
+43 732 7617 - 871

Test confirmation for various fire tests

Dear Mr. Weis,

with telephone call of 17.09.2020 you asked for confirmation regarding the processing of the fire tests carried out in our company on 01.07., 03.08., 04.08., 05.08. and 16.09.2020.

We hereby confirm the following data:

The reports on the above mentioned fire tests are being processed and will be completed within the next few weeks.


The test report numbers will be as follows:


01.07.2020 → 320040703-1
03.08.2020 → 320040703-2
04.08.2020 → 320040703-3
05.08.2020 → 320040703-4
16.09.2020 → 320040703-5

Various penetration seals for pipes and cables in combination with Paroc mineral wool panel walls were tested.

The use of this confirmation is only allowed for the client.

**IBS – INSTITUT FÜR BRANDSCHUTZTECHNIK
UND SICHERHEITSFORSCHUNG GESELLSCHAFT M.B.H.**
Akkreditierte Prüf-, Inspektions- und Zertifizierungsstelle

	Unterzeichner	Manfred Eglauer
	Datum/Zeit-UTC	2020-09-21T07:55:32+02:00
	Prüfinformation	Informationen zur Prüfung der elektronischen Signatur finden Sie unter: https://www.signaturpruefung.gv.at

	Unterzeichner	DI Ulrich Stöckl
	Datum/Zeit-UTC	2020-09-21T08:00:08+02:00
	Prüfinformation	Informationen zur Prüfung der elektronischen Signatur finden Sie unter: https://www.signaturpruefung.gv.at

Manfred EGLAUER
Technician

Dipl.-Ing. Ulrich STÖCKL
Authorised signatory

Information on documents with multiple electronic signatures can be found [here!](#)



ÖÖ Landesbank AG (Hypo Oberösterreich)
IBAN AT46 5400 0000 0021 2944 / BIC OBLAAT2L
Oberbank AG
IBAN AT37 1500 0006 2100 6055 / BIC OBKLA22L



Design your passive fire protection with Hilti: Our Firestop Specialists are available to help – from first draft to detailed planning and building permit to installation and final inspection.



You will find our fire protection solutions as 2D and 3D BIM objects in the extensive Hilti BIM/CAD library.



Our technical library provides you with comprehensive documentation. To simplify the design work you can, for example, download 2D product drawings and documents such as approvals, specifications and tendering templates.



Your Hilti advantage: Hilti Fire Protection Experts will also be happy to support you in person. Just ask your Hilti Team about it.



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