



Institut für Brandschutztechnik
und Sicherheitsforschung

CLASSIFICATION REPORT

in acc. with EN 13501-2:2016

Product name: “**Hilti CFS-F FX in timber building components**”

Classification Report No.: 319091602-F / FX-en

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Engineer: Manfred EGLAUER / AM

EXT: 871

Customer: **Hilti Aktien Gesellschaft**
Feldkirchner Strasse 100
FL-9494 Schaan
Liechtenstein

Prepared by: IBS - Institut für Brandschutztechnik
und Sicherheitsforschung GmbH
Petzoldstraße 45, A-4020 Linz

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1. Introduction

This Classification Report defines the fire resistance class assigned to the installation situations of “Hilti CFS-F FX in **timber building components**” in compliance with the procedures given in EN 13501-2:2016.

2. Details of classified building components and products

2.1. Function type

The function of the Hilti construction products listed in this Classification Report is to resist fire in horizontal and vertical orientations in solid timber constructions in accordance with the characteristic product behaviour defined in section 5 of EN 13502-2:2016.

2.1.1. Hilti CFS-F FX

The firestop foam Hilti CFS-F FX is defined as a mixed penetration seal. Hilti CFS-F FX firestop foam is also used in conjunction with electric cables, cable bundles, cable trays and cable ladders, as well as with plastic and metal pipes with or without combustible or non-combustible insulation.

2.2. Descriptions

The installation situations of “Hilti CFS-F FX in **timber building components**” are fully described in the test reports referred to in section 3 of this Classification Report.

2.2.1. Products

2.2.1.1. Hilti CFS-F FX

The building product Hilti CFS-F FX is a 2K intumescent foam.

Hilti CFS-F FX is assigned the following classification with regard to its reaction to fire in accordance with EN 13501-1:

Reaction to fire performance class E

(ETA-10/0109 of 17.04.2015, Sintef)

2.2.2. Pipes

2.2.2.1. Metal pipes (hmp):

Copper	Heat conductivity $\lambda \sim 380 \text{ W/(m}\cdot\text{K)}$
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2.2.2.2. Coated metal pipes (Imp):

Geberit Mepla	Application:	Potable water, heating
	Material:	PE-RT/aluminium/PE-RT

2.2.2.3. Single-layer plastic pipes:

PE	Application:	Sewage pipe or pressure pipe
	Material:	PE-HD
	Product standard:	DIN EN 1519-1
PP-H	Application:	Sewage pipe or pressure pipe
	Material:	PP-H
	Product standard:	DIN EN 1451-1
PVC-U	Application:	Sewage pipe or pressure pipe
	Material:	PVC-U
	Product standard:	DIN EN 1452-2
BEHKALIT PVC-U	Application:	Condensate drainage
	Material:	PVC-U
	Product standard:	DIN EN 1452-2

2.2.2.4. Electrical installation pipes:

Fränkische FPKu-EM-F-H0	Application:	Cable protection pipe
	Material:	Polypropylene
	Product standard:	DIN EN 61386-21
Fränkische FFKu-EL-F-LS0H	Application:	Cable protection pipe
	Material:	Polyolefin mod.
	Product standard:	DIN EN 61386-22

2.2.3. Insulations

Armacell AF/Armaflex®	Elastomeric insulation, Euroclass B/BL-s3, d0
Armacell Tubolit®	PE insulation, Euroclass CL-s1, d0
Frigotec Frigoline	PE insulation, Euroclass BL-s1, d0

2.2.4. Test specimen description

2.2.4.1. Key

Test report No. – Penetration seal type – test specimen numbers of the current page																							
Test specimen No.	No.	Material	Dimensions (mm) Cable load	Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12												
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside Diameter [mm]	Active components			Installation	Joint sealant depth [mm]	Fastening					
Plastic or metal type	Manufacturer type designation	Cable group acc. to EN 1366-3:2009 Table A.1/2	Number x outside diameter / wall thickness	Cable designation acc. to EN 1366-3:2009 Table A.1/2	Spec. designation of cables / coaxial cables or waveguides deviating from EN 1366-3:2009	Deviating cables /coaxial cables or waveguides	Angle between test specimen and supporting structure	Pipe-end configuration acc. to EN 1366-3:2009 Table 2	Manufacturer type designation	Pipe insulation acc. to EN 1366-3:2009 Table 1	Length of insulation on both sides of penetration seal	Insulation thickness	Type designation / dimensions	Type designation of pipe sealing system	Inside diameter of pipe sealing system				Number of active insert layers	Total thickness of active insert layers	Length of the active insert according to EN 1366-3:2009 Illustration H.3	HS- Hot side(fire-exposed side) CS- Cold side (unexposed side) 2S- exposed on both sides CEN - centred	Type designation, filling depth

2.2.4.2. Test Report No. 318092507-1,Rev2

Tested in:	80 mm thick cross laminated timber ceiling (Binderholz BBS XL) with 3-layered structure Lamella thickness per layer 20 / 40 / 20 mm
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TR 318092507-1,Rev2																									
No.	Material	Dimensions (mm) Cable load		Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12														
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation	Joint and gap seal- ing, depth [mm]	Fastening							
													Layers	Thickness [mm]	Length [mm]										
P42.1-4	Cable group 1 ¹	A1	3	90°	-	-	-	-	-	CFS-F FX / 400 x 400 x 80	-	-	-	-	-	-	-								
		A2	3																						
		A3	3																						
		B	1																						
P42.5-8	Cable group 2 ¹	C1	1	90°	-	-	-	-	-									CFS-F FX / 400 x 400 x 80	-	-	-	-	-	-	-
		C2	1																						
		C3	1																						
		E	1																						
P42.9	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16	unloaded	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 80	-	-	-	-	-	-	-								
		3 x Ø25																							
	4 x Ø32																								
	Total Ø100																								
P42.10	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16	Empty A1-3 A1-3 + B	90°	U/C	-	-	-	-									CFS-F FX / 400 x 400 x 80	-	-	-	-	-	-	-
		3 x Ø25																							
		4 x Ø32																							
	Total Ø100																								

¹ In non-perforated cable tray made of steel 200 x 60 mm; 1.5 mm wall thickness

TR 318092507-1,Rev2																				
No.	Material		Dimensions (mm) Cable load		Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN 1366-3 3.12								
							Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Joint and gap sealing, depth [mm]	Fastening		
											Layers	Thickness [mm]	Length [mm]	Installation						
P43.1	Bundle Fränkische FFKu-EL-F-LSOH		1 x Ø16	unloaded	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 80	-	-	-	-	-	-			
			3 x Ø25															Total Ø100	-	-
4 x Ø32	Empty A1-3	90°	U/C	-	-	-	-	-	-	-		-	-	-	-	-				
Total Ø100	A1-3 + B																Total Ø100	-	-	-
P43.3-7	Clima split ¹	Copper	2 x Ø18 / 1	90°	C/U	Tubolit	CS	∞	9	-		-	-	-	-	-	-			
		Behkalit PVC	1 x Ø25 / 4.3		U/U	-	-	-	-									-	-	
		Cable	2 x A1		-	-	-	-	-									-	-	
P43.8-12	Clima split ¹	Copper	2 x Ø18 / 1	90°	C/U	Frigo- line	CS	∞	9	-		-	-	-	-	-	-	-		
		Behkalit PVC	1 x Ø25 / 4.3		U/U	-	-	-	-										-	
		Cable	2 x A1		-	-	-	-	-										-	

¹ Clima split cable bundles on both sides of the penetration seal, additionally insulated by AF/Armaflex 9 mm on a section of 250 mm (LI)

2.2.4.3. Test Report No. 318092507-2,Rev2

Tested in:	140 mm thick cross laminated timber ceiling (Binderholz BBS XL) with 5-layered structure Lamella thickness per layer 40 / 20 / 20 / 20 / 40 mm
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TR 318092507-2,Rev2																		
No.	Material	Dimensions (mm) Cable load		Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN 1366-3 3.12							
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, depth [mm]	Fastening
													Layers	Thickness [mm]	Length [mm]			
P44.1-4	Cable group 1 ¹	A1	3	90°	-	-	-	-	-	CFS-F FX / 400 x 400 x 200	-	-	-	-	-	-	-	
		A2	3															
		A3	3															
		B	1															
P44.5-8	Cable group 2 ¹	C1	1	90°	-	-	-	-	-	CFS-F FX / 400 x 400 x 200	-	-	-	-	-	-	-	
		C2	1															
		C3	1															
		E	1															
P44.9	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16 3 x Ø25 4 x Ø32	unloaded	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 200	-	-	-	-	-	-	-	
		Total Ø100																
P44.10	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16 3 x Ø25 4 x Ø32	Empty A1-3 A1-3 + B	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 200	-	-	-	-	-	-	-	
		Total Ø100																

¹ In non-perforated cable tray made of steel 200 x 60 mm; 1.5 mm wall thickness

TR 318092507-2,Rev2																	
No.	Material		Dimensions (mm) Cable load		Cable orientation	Pip-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12					
							Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation
										Layers	Thickness [mm]	Length [mm]					
P45.1	Bundle Fränkische FFKu-EL-F-LSOH		1 x Ø16	unloaded	90°	U/C	-	-	-	-	CF-S-F FX / 400 x 400 x 200	-	-	-	-	-	-
			3 x Ø25														
P45.2	Bundle Fränkische FFKu-EL-F-LSOH		1 x Ø16	Empty A1-3 A1-3 + B	90°	U/C	-	-	-	-	CF-S-F FX / 400 x 400 x 200	-	-	-	-	-	-
			3 x Ø25														
P45.3-7	Clima split ¹	Copper	2 x Ø18 / 1		90°	C/U	Tubolit	CS	∞	9	CF-S-F FX / 400 x 400 x 200	-	-	-	-	-	-
		Behkalit PVC	1 x Ø25 / 4.3			U/U	-	-	-	-							
		Cable	2 x A1			-	-	-	-	--							
P45.8-12	Clima split ¹	Copper	2 x Ø18 / 1		90°	C/U	Frigoline	CS	∞	9	CF-S-F FX / 400 x 400 x 200	-	-	-	-	-	-
		Behkalit PVC	1 x Ø25 / 4.3			U/U	-	-	-	-							
		Cable	2 x A1			-	-	-	-	--							

¹ Clima split cable bundles on both sides of the penetration seal, additionally insulated by AF/Armaflex 9 mm on a section of 250 mm (LI)

2.2.4.4. Test Report No. 318092507-3,Rev2

Tested in:	100 mm thick cross laminated timber ceiling (Binderholz BBS XL) with five-layered structure Lamella thickness per layer 20 / 20 / 20 / 20 / 20 mm
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TR 318092507-3,Rev2																																
No.	Material	Dimensions (mm) Cable load		Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12																					
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components		Installation	Joint and gap sealing, depth [mm]	Fastening															
										Layers	Thickness [mm]	Length [mm]																				
P34.1	Bundle Fränkische FPKu-EM-F- HO	1 x Ø16	unloaded	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	-															
		3 x Ø25																														
		4 x Ø32																														
		Total Ø100																														
P34.2	Bundle Fränkische FPKu-EM-F- HO	1 x Ø16	Empty A1-3 A1-3 + B	90°	U/C	-	-	-	-			-	-	-	-	-	-	-														
		3 x Ø25																														
		4 x Ø32																														
		Total Ø100																														
P34.3-6	Cable group 1 ¹	A1	3	90°	-	-	-	-	-			-	-	-	-	-	-	-														
		A2	3																													
		A3	3																													
		B	1																													
P34.7-10	Cable group 2 ¹	C1	1	90°	-	-	-	-	-		-	-	-	-	-	-	-															
		C2	1																													
		C3	1																													
		E	1																													

¹ In non-perforated cable tray made of steel 200 x 60 mm; 1.5 mm wall thickness

TR 318092507-3,Rev2																	
No.	Material	Dimensions (mm) Cable load		Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12						
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, depth [mm]
							Layers	Thickness [mm]	Length [mm]								
P35.1	Bundle Fränkische FFKu-EL-F- LSOH	1 x Ø16	un- loaded	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	
		3 x Ø25															Total Ø100
P35.2	Bundle Fränkische FFKu-EL-F- LSOH	1 x Ø16	Empty A1-3 A1-3 + B	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	
		3 x Ø25															Total Ø100
P35.3-7	Clima split ¹	Copper	2 x Ø18 / 1	90°	C/U	Tubolit	CS	∞	9	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	-
		Behkalit PVC	1 x Ø25 / 4.3		U/U	-	-	-	-								
		Cable	2 x A1		-	-	-	-	-								
P35.8-12	Clima split ¹	Copper	2 x Ø18 / 1	90°	C/U	Frigoline	CS	∞	9	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	-
		Behkalit PVC	1 x Ø25 / 4.3		U/U	-	-	-	-								
		Cable	2 x A1		-	-	-	-	-								

¹ Clima split cable bundles on both sides of the penetration seal, additionally insulated by AF/Armaflex 9 mm on a section of 250 mm (LI)



2.2.4.5. Test Report No. 318092507-4

Tested in:	80 mm thick cross laminated timber ceiling (Binderholz BBS XL) with three-layered structure Lamella thickness per layer 20 / 40 / 20 mm
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TR 318092507-4					
No.	Type		Dimensions l x w x h [mm x mm x mm]	Installation	Remarks
P13	Penetration	CFS-F FX	400 x 400 x 80	BS-I	-

2.2.4.6. Test Report No. 318092507-5

Tested in:	100 mm thick cross laminated timber ceiling (Binderholz BBS XL) with 5-ply structure Lamella thickness per layer 20 / 20 / 20 / 20 / 20 mm
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TR 318092507-5					
No.	Type		Dimensions l x w x h [mm x mm x mm]	Installation	Remarks
P25	Penetration	CFS-F FX	400 x 400 x 150	HS-I	Additional framing around the opening on both sides of the wall, using wooden sticks dimension 50 x 40 mm
P26	Penetration	CFS-F FX	400 x 400 x 200	HS-I	Additional framing around the opening on both sides of the wall, using wooden sticks dimension 100 x 120 mm

2.2.4.7. Test Report No. 319091602-1,Rev1

Tested in:	100 mm thick cross laminated timber wall (Binderholz BBS XL) with five-layered structure Lamella thickness per layer 20 / 20 / 20 / 20 / 20 mm
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TR 319091602-1,Rev1																		
No.	Material	Dimensions (mm) Cable load		Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12							
						Type	Test set-up	Length [mm]	Insulation thick- ness [mm]		Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, depth [mm]	Fastening
													Layers	Thickness [mm]	Length [mm]			
P23.1-4	Cable group 1 ¹	A1	3	90°	-	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	-	
		A2	3															
		A3	3															
		B	1															
P23.5-8	Cable group 2 ¹	C1	1	90°	-	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	-	
		C2	1															
		C3	1															
		E	1															
P23.9	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16 3 x Ø25 4 x Ø32	unloaded	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	-	
		Total Ø100																
P23.10	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16 3 x Ø25 4 x Ø32	Empty A1-3 A1-3 + B	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	-	
		Total Ø100																

¹ In non-perforated cable tray made of steel 200 x 60 mm; 1.5 mm wall thickness

TR 319091602-1,Rev1																	
No.	Material	Dimensions (mm) Cable load	Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12							
					Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, depth [mm]	Fastening
												Layers	Thickness [mm]	Length [mm]			
P26.1	Copper	1 x Ø28 / 1	90°	C/U	-	-	-	-	CFS-F FX / 340 x 400 x 200	-	-	-	-	-	-	-	
P26.4	PP-H	1 x Ø50 / 1.8	90°	U/U	-	-	-	-		-	-	-	-	-	-	-	-
P26.5	PVC-u	1 x Ø50 / 5.6	90°	U/U	-	-	-	-		-	-	-	-	-	-	-	-
P26.6	PVC-u	1 x Ø50 / 5.6	90°	U/U	-	-	-	-		-	-	-	-	-	-	-	-
P26.8	Geberit Mepla	1 x Ø32 / 3	90°	U/C	-	-	-	-		-	-	-	-	-	-	-	-

2.2.4.8. Test Report No. 319091602-2,Rev1

Tested in:	100 mm thick cross laminated timber wall (Binderholz BBS XL) with five-layered structure Lamella thickness per layer 20 / 20 / 20 / 20 / 20 mm
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TR 319091602-2,Rev1																		
No.	Material	Dimensions (mm) Cable load		Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12							
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, depth [mm]	Fastening
													Layers	Thickness [mm]	Length [mm]			
P29.1	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16 3 x Ø25 2 x Ø32 1 x Ø50	unloaded	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 200	-	-	-	-	-	-	-	
		Total Ø100																
P29.2	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16 3 x Ø25 2 x Ø32 1 x Ø50	Empty A1-3 A1-3 A1-3 + B	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 200	-	-	-	-	-	-	-	
		Total Ø100																

TR 319091602-2,Rev1																						
No.	Material		Dimensions (mm) Cable load	Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN 1366-3 3.12											
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, depth [mm]	Fastening				
										Layers	Thickness [mm]	Length [mm]										
P29.3	Clima split ¹	Copper	2 x Ø18 / 1	90°	U/U	Tubolit	CS	8	9	CFS-F FX / 400 x 400 x 200	·	·	·	·	·	·	·					
		Behkalit PVC	1 x Ø25 / 4.3		U/U	-	-	-	-									-	-	-	-	-
		Cable	2 x A1		-	-	-	-	-									-	-	-	-	-
P29.4	Clima split ¹	Copper	2 x Ø18 / 1	90°	U/U	Frigoline	CS	8	9	CFS-F FX / 400 x 400 x 200	·	·	·	·	·	·	·					
		Behkalit PVC	1 x Ø25 / 4.3		U/U	-	-	-	-									-	-	-	-	
		Cable	2 x A1		-	-	-	-	-									-	-	-	-	

¹ Clima split cable bundles on both sides of the penetration seal, additionally insulated by AF/Armaflex 9 mm on a section of 250 mm (LI)

2.2.4.9. Test Report No. 319091602-3,Rev1

Tested in:	80 mm thick cross laminated timber wall (Binderholz BBS XL) with three-layered structure Lamella thickness per layer 20 / 40 / 20 mm
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TR 319091602-3,Rev1																
No.	Material	Dimensions (mm) Cable load		Cable orientation	Pipe -end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN 1366-3 3.12					
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation
										Layers	Thickness [mm]	Length [mm]				
P23.1-4	Cable group 1 ¹	A1	3	90°	-	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-
		A2	3													
		A3	3													
		B	1													
P23.5-8	Cable group 2 ¹	C1	1	90°	-	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-
		C2	1													
		C3	1													
		E	1													
P23.9-11	Clima split ²	Copper	2 x Ø18 / 1	90°	C/U	Tubolit	CS	8	9	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-
		Behkalit PVC	1 x Ø25 / 4.3		U/U	-	-	-	-							
		Cable	2 x A1		-	-	-	-	-							

¹ In non-perforated cable tray made of steel 200 x 60 mm; 1.5 mm wall thickness

² Clima split cable bundles on both sides of the penetration seal, additionally insulated by AF/Armaflex 9 mm on a isolated length of 250 mm (LI)

TR 319091602-3,Rev1																		
No.	Material	Dimensions (mm) Cable load		Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12							
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, depth [mm]	Fastening
P24.1	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16	unloaded	90°	U/C	-	-	-	-	CFS-F FX / 400 x 400 x 150	-	-	-	-	-	-	-	
		3 x Ø25																4 x Ø32
P24.2	Bundle Fränkische FPKu-EM-F-HO	1 x Ø16	Empty A1-3 A1-3 + B	90°	U/C	-	-	-	-		-	-	-	-	-	-	-	-
		3 x Ø25																
P24.3	Bundle Fränkische FFKu-EL-F- LSOH	1 x Ø16	unloaded	90°	U/C	-	-	-	-	-	-	-	-	-	-	-	-	
		3 x Ø25																4 x Ø32
P24.4	Bundle Fränkische FFKu-EL-F- LSOH	1 x Ø16	Empty A1-3 A1-3 + B	90°	U/C	-	-	-	-	-	-	-	-	-	-	-	-	
		3 x Ø25																4 x Ø32

TR 319091602-3,Rev1																						
No.	Material		Dimensions (mm) Cable load	Cable orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN1366-3 3.12											
						Type	Test set-up	Length [mm]	Insulation thickness [mm]		Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, depth [mm]	Fastening				
										Layers	Thickness [mm]	Length [mm]										
P24.5-7	Clima split ¹	Copper	2 x Ø18 / 1	90°	C/U	Frigoline	CS	8	9	CFS-F FX / 400 x 400 x 150	·	·	·	·	·	·	·					
		Behkalit PVC	1 x Ø25 / 4.3		U/U	·	·	·	·									·	·	·	·	·
		Cable	2 x A1		·	·	·	·	·									·	·	·	·	·

¹ Clima split cable bundles on both sides of the penetration seal, additionally insulated by AF/Armaflex 9 mm on a section of 250 mm (LI)

2.2.4.10. Test Report No. 319091602-4,Rev1

Tested in:	80 mm thick cross laminated timber wall (Binderholz BBS XL) with three-layered structure Lamella thickness per layer 20 / 40 / 20 mm
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TR 319091602-4,Rev1					
No.	Type		Dimensions l x w x h [mm x mm x mm]	Installation	Remarks
P15	Penetration	CFS-F FX	400 x 400 x 150	HS-I	Additional framing around the opening on both sides of the wall identical, using wooden sticks dimension 40 x 35 mm

2.2.4.11. Test Report No. 319091602-5,Rev1

Tested in:	100 mm thick cross laminated timber wall (Binderholz BBS XL) with five-layered structure Lamella thickness per layer 20 / 20 / 20 / 20 / 20 mm
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TR 319091602-5,Rev1					
No.	Type		Dimensions l x w x h [mm x mm x mm]	Installation	Remarks
P30	Penetration	CFS-F FX	400 x 400 x 150	HS-I	Additional framing around the opening on both sides of the wall identical, using wooden sticks dimension 25 x 30mm

3. Test reports and results

3.1. Test reports

Name of testing laboratory	Customer	Test Report No.	Test method
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str. 100 FL-9494 Schaan	319091602-3,Rev1 of 24.07.2020 (CLT W 80mm)	EN 1363-1: 1999 EN 1366-3: 2009
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str. 100 FL-9494 Schaan	319091602-2,Rev1 of 24.07.2020 (CLT W 100mm)	EN 1363-1: 1999 EN 1366-3: 2009
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str. 100 FL-9494 Schaan	319091602-1,Rev1 of 24.07.2020 (CLT W 100mm)	EN 1363-1: 1999 EN 1366-3: 2009
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str. 100 FL-9494 Schaan	318092507-3,Rev2 of 12.10.2020 (CLT C 100mm)	EN 1363-1: 1999 EN 1366-3: 2009
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str. 100 FL-9494 Schaan	318092507-2,Rev2 of 12.10.2020 (CLT C 140mm)	EN 1363-1: 1999 EN 1366-3: 2009
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str.100 FL-9494 Schaan	318092507-1,Rev2 of 12.10.2020 (CLT C 80mm)	EN 1363-1: 1999 EN 1366-3: 2009
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str.100 FL-9494 Schaan	318092507-4 of 22.07.2020 (CLT C 80mm)	EN 1363-1: 1999 EN 1366-3: 2009
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str. 100 FL-9494 Schaan	318092507-5 of 22.07.2020 (CLT C 100mm)	EN 1363-1: 1999 EN 1366-3: 2009
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str. 100 FL-9494 Schaan	319091602-4,Rev1 of 12.10.2020 (CLT W 80mm)	EN 1363-1: 1999 EN 1366-3: 2009
IBS Linz Petzoldstr. 45, A-4020 Linz	HILTI AG Feldkircher Str. 100 FL-9494 Schaan	319091602-5,Rev1 of 12.10.2020 (CLT W 100mm)	EN 1363-1: 1999 EN 1366-3: 2009

3.2. Resistance to fire performance

Table 1: Terms of loading

Temperature-time curve:	Standard temperature-time curve (STTC) as specified in subsection 5.1.1 of EN 1363-1:2000. 2000.
Fire load:	Horizontal penetration seal (ceiling) Vertical penetration seal (wall)

Table 2: Test results

Test Report No. 318092507-1, Rev2 of 12.10.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
		[min]			
P42.1-4	-	≥ 60	≥ 60	≥ 60	≥ 30
P42.5-8	-	≥ 60	≥ 60	≥ 60	≥ 45
P42.9	U/C	≥ 60	≥ 60	≥ 60	≥ 45
P42.10	U/C	≥ 60	≥ 60	≥ 60	≥ 60
P43.1	U/C	≥ 60	≥ 60	≥ 60	≥ 60
P43.2	U/C	≥ 60	≥ 60	≥ 60	≥ 30
P43.3 - P43.12	C/U U/U -	≥ 60	≥ 60	≥ 60	≥ 60
Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1. Ceiling constructions in cross laminated timber made from spruce with a total thickness of 80 mm.					

Test Report No. 318092507-2, Rev2 of 12.10.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
[min]					
P44.1 - P44.4	-	≥ 120	≥ 120	≥ 120	≥ 90
P44.5 - P44.8	-	≥ 120	≥ 120	≥ 120	≥ 60
P44.9 - P44.10	U/C	≥ 120	≥ 120	≥ 120	≥ 120
P45.1 - P45.2	U/C	≥ 120	≥ 120	≥ 120	≥ 120
P45.3 - P45.12	C/U U/U -	≥ 120	≥ 120	≥ 120	≥ 120

Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1.
Ceiling constructions in cross laminated timber made from spruce with a total thickness of 140 mm.

Test Report No. 318092507-3, Rev2 of 12.10.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
		[min]			
P34.1 - P34.2	U/C	≥ 90	≥ 90	≥ 90	≥ 90
P34.3 - P34.6	-	≥ 90	≥ 90	≥ 90	≥ 60
P34.7 - P34.10	-	≥ 90	≥ 90	≥ 90	≥ 45
P35.1 - P35.2	U/C	≥ 90	≥ 90	≥ 90	≥ 90
P35.3 - P35.12	C/U U/U -	≥ 90	≥ 90	≥ 90	≥ 90

Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1.
Ceiling constructions in cross laminated timber made from spruce with a total thickness of 100 mm.

Test report 318092507-4 of 22.07.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
		[min]			
P13	-	≥ 30	≥ 30	≥ 30	≥ 30
Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1. Ceiling constructions in cross laminated timber made from spruce with a total thickness of 80 mm.					

Test report 318092507-5 of 22.07.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
		[min]			
P25	-	≥ 90	≥ 90	≥ 90	≥ 90
P26	-	≥ 90	≥ 90	≥ 90	≥ 90
Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1. Ceiling constructions in cross laminated timber made from spruce with a total thickness of 100 mm.					

Test Report No. 319091602-1, Rev1 of 24.07.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
		[min]			
P23.1 - P23.8	-	≥ 90	≥ 90	≥ 90	≥ 60
P23.9 - P23.10	U/C	≥ 90	≥ 90	≥ 90	≥ 90
P26.1	C/U	≥ 90	≥ 90	≥ 90	≥ 45
P26.4 - P26.6	U/U	≥ 90	≥ 90	≥ 90	≥ 90
P26.8	U/C	≥ 90	≥ 90	≥ 90	≥ 90
Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1. Wall constructions in cross laminated timber made from spruce with a total thickness of 100 mm.					

Test Report No. 319091602-2, Rev1 of 24.07.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
		[min]			
P29.1 - P29.2	U/C	≥ 90	≥ 90	≥ 90	≥ 90
P29.3 - P29.4	U/U U/U -	≥ 45	≥ 45	≥ 45	≥ 15
Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1. Wall constructions in cross laminated timber made from spruce with a total thickness of 100 mm.					

Test Report No. 319091602-3, Rev1 of 24.07.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
		[min]			
P23.1 - P23.8	-	≥ 60	≥ 60	≥ 60	≥ 60
P23.9 - P23.11	C/U U/U -	≥ 60	≥ 60	≥ 60	≥ 60
P24.1 - P24.4	U/C	≥ 60	≥ 60	≥ 60	≥ 60
P24.5 - P24.7	C/U U/U -	≥ 60	≥ 60	≥ 60	≥ 60
Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1. Wall constructions in cross laminated timber made from spruce with a total thickness of 80 mm.					

Test Report No. 319091602-4, Rev1 of 12.10.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
		[min]			
P15	-	≥ 60	≥ 60	≥ 60	≥ 60
Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1. Wall constructions in cross laminated timber made from spruce with a total thickness of 80 mm.					

Test Report No. 319091602-5, Rev1 of 12.10.2020 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Integrity			I - Thermal insulation
		Time until cotton wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until the maximum temperature rise exceeds 180 K on the unexposed side
		[min]			
P30	-	≥ 90	≥ 90	≥ 90	≥ 90
Specific supporting structure according to the specifications of EN 1366-3:2009, subsection 7.2.1. Wall constructions in cross laminated timber made from spruce with a total thickness of 100 mm.					

4. Classification and field of application

4.1. Reference for classification

This Classification is based on section 7 of EN 13501-2: 2016.

4.2. Reference for field of application

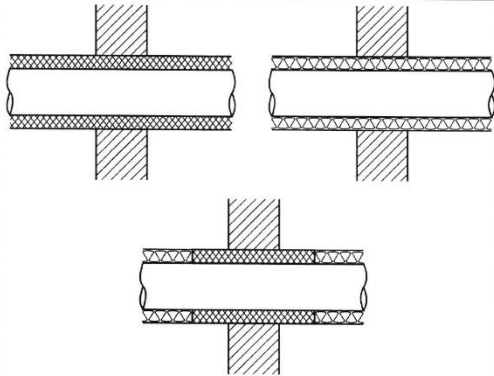
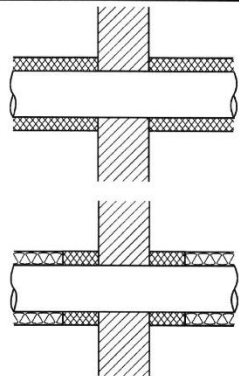
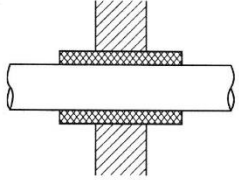
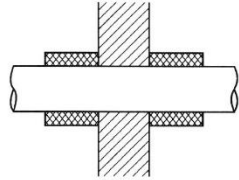
The field of direct application is based on EN 1366-3:2009.

The extended field of application is based on EN 15882-3:2009.

4.3. Definitions

4.3.1. Pipe insulation

This table contains terms that are used throughout the classification report for the various pipe insulation configurations.

	Durchlaufend	Unterbrochen
Durchgehend über die Rohrlänge	 Fall CS Fall CI	 Fall CI Fall LI
Lokal („Streckenisolierung“)	 Fall LS	 Fall LI

4.3.2. Positioning of sectional insulation in the supporting structure

For both wall and ceiling application or penetrants, the sectional insulation must be positioned symmetrically to the supporting structure.

4.3.3. Length of sectional insulation

The length of the local insulation may be increased but not decreased.

4.3.4. Pipe orientation

4.3.4.1. Metal pipes with an insulation material of class A1 or A2

When a single metal pipe is tested perpendicular to the supporting structure, all angles between 90° and 45° are covered in accordance with EN 1366-3:2009 E.1.5.6.8.

4.3.4.2. Metal pipes with an insulation material of class B to F

When a pipe is tested perpendicular and at an angle to the supporting structure, all angles between 90° and the tested angle shall be covered in accordance with EN 1366-3:2009 E.1.5.7.7.

4.3.4.3. Plastic pipes

When a pipe is tested perpendicular and at an angle to the supporting structure, all angles between 90° and the tested angle shall be admissible in accordance with EN 1366-3:2009 E.2.7.6.

4.3.5. Pipe support

Pipes and cables must be supported on both sides of the wall constructions or on the surface of the ceiling constructions at a distance of ≤ 350 mm.

4.3.6. Pipe-end configuration

Tests performed with pipe-end configuration U/U shall also cover the configurations C/U, U/C and C/C.

Tests performed with pipe-end configuration C/U shall also cover the configurations U/C and C/C.

Tests performed with pipe-end configuration U/C shall also cover the configuration C/C.

		tested			
		U/U	C/U	U/C	C/C
covered	U/U	Y	N	N	N
	C/U	Y	Y	N	N
	U/C	Y	Y	Y	N
	C/C	Y	Y	Y	Y
Y = permitted, N = not permitted					

4.3.7. Supporting structure (wall/ceiling)

Test results that describes a specific supporting structure shall apply to separating building components made of the same material and with the same composition, at least with the same thickness and density, as the tested ones.

The covering of a horizontal supporting structure with inorganic materials (e.g. concrete covering) is covered.

Building components (supporting structures) shall be classified in relation to their fire resistance in compliance with EN 13501-2.

4.4. Hilti CFS-F FX

4.4.1. Minimum distances

Cables and conduits	Supporting construction	20 mm
	Clima split cable bundle	50 mm
	Conduit (rigid) Rigid conduit bundle	50 mm
	Flexible conduit Flexible conduit bundle	
Clima split cable bundle	Supporting construction	50 mm
	Conduit (rigid) Rigid cable bundle	
	Flexible conduit Flexible conduit bundle	
All other spacings		≥ 100 mm

4.4.2. Cross laminated timber ceiling ≥ 80 mm

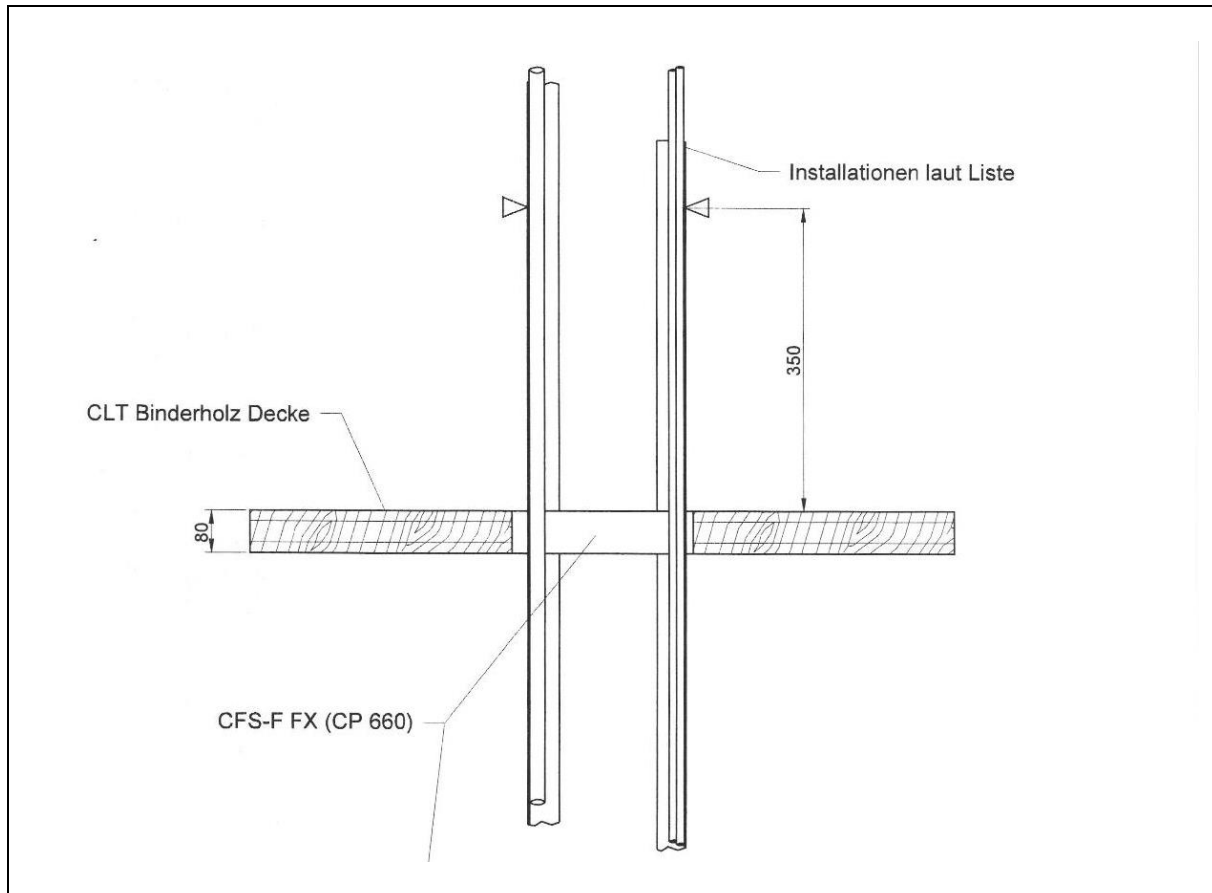
4.4.2.1. Definition of supporting structure

The ceiling must be ≥ 80 mm thick and have ≥ 3 layers of softwood, provided that each outer layer exhibits a thickness of ≥ 20 mm. Both PU and MUF adhesives are permitted. Edge glueing is not required.

4.4.2.2. Maximum penetration seal size

Length	400	318092507-4 P13	EI 30
Width	400		
Thickness	80		

4.4.2.3. Detailed illustration



4.4.2.4. Cable

Penetration seal Hilti CFS-F FX at an installation depth of ≥ 80 mm			
Single cable ¹	$\varnothing \leq 21$ mm	EI 30	318092507-1, Rev2 P42.1-8
	$\varnothing \leq 50$ mm		

Cable supporting structure

The classified cables may be routed through the penetration seal in non-perforated steel cable trays with the dimensions $\leq 200 \times 60$ mm and a sheet thickness of $t \geq 1.5$ mm. All other types of cable supporting structures (perforated cable trays, cable ladders, coated variants, ...) must stop at a distance of maximum 150 mm from the surface of the penetration seal (prEN1366-3:2020, A.4.4.3).

¹ Single or multi-core conduits with individual insulation of cables and an additional protection sleeve for the cable bundle. Optical fibre cables are covered.

4.4.2.5. Conduits

Penetration seal Hilti CFS-F FX at an installation depth of ≥ 80 mm			
Single, rigid conduit	$\varnothing \leq 32$ mm	EI 30 – U/C	318092507-1,Rev2 P42.9-10
Bundled, rigid conduit	$\varnothing \leq 100$ mm		
Single, flexible conduit	$\varnothing \leq 32$ mm	EI 30 – U/C	318092507-1,Rev2 P43.1-2
Bundled, flexible conduit	$\varnothing \leq 100$ mm		

Approved cable load:

The mentioned cable conduits (single or bundled) are classified with and without cable occupancy according to Table C3 in C1.2.4 of EN 1366-3:2020.

Direct field of application according to C1.3.1.2: All cables currently in use in Europe that fit into the cable conduits. Coaxial cables are limited to a maximum diameter of 28 mm. Non-sheated cables (wires) are excluded.

Material:

PO (polyolefins) cover all plastics. Refer to C.1.3.3.2: all other plastics in the same flexibility group are covered.

Flexibility group:

Both rigid and flexible pipes were tested.

Thus, all flexibility groups can be classified (C.1.3.3.2).

Groups:

The cable conduits may be laid individually or in bundles (C.1.3.1.3).

Size:

Maximum single conduits: Diameter 32 mm.

Bundle: Max. cable conduit bundle diameter: 100 mm, whereby the largest cable conduits may not exceed 32 mm.

Projecting length of electrical conduits:

The cable conduits must cover a cable length and project at least 500 mm from both sides of the penetration seal.

Cable conduit end configuration:

The cable conduits must be sealed on the upper side at a depth of 15 mm with Hilti CFS-S ACR.

4.4.2.6. Clima split cable bundles

Penetration seal Hilti CFS-F FX at an installation depth of ≥ 80 mm				
Copper pipe ⁵ , $\lambda \leq 380$ W/mK	$\leq 2 \times \varnothing \leq 18$ mm $t = 1 - 14.2$ mm	Elastomeric foam ⁶ D = 9 mm set-up LI / CI ≥ 250 mm both-sided	EI 30 – C/U	318092507-1,Rev2 P43.3-12
Insulation - CS	Tubolit 9 mm			
	Frigoline 9 mm			
PVC-U pipe ⁷ PVC-C pipe ⁸	$\leq 1 \times$ $\varnothing 25/s4.3$ mm		EI 30 – U/U	
Single cable ⁹	$\leq 2 \times$ $\varnothing \leq 14$ mm	EI 30		

4.4.3. Cross laminated timber ceiling ≥ 100 mm

4.4.3.1. Definition of supporting structure

The ceiling must be ≥ 100 mm thick and have ≥ 3 layers of softwood, provided that each outer layer exhibits a thickness of ≥ 20 mm. Both PU and MUF adhesives are permitted. Edge glueing is not required.

4.4.3.2. Maximum penetration seal size

Length	400 mm	318092507-5 P25	EI 90
Width	400 mm		
Thickness	150 mm		

4.4.3.3. Supplementary measures

Framing with 50 mm wooden sticks on the top surface of the ceiling.

⁵ Results for copper pipes also cover steel and stainless steel pipes

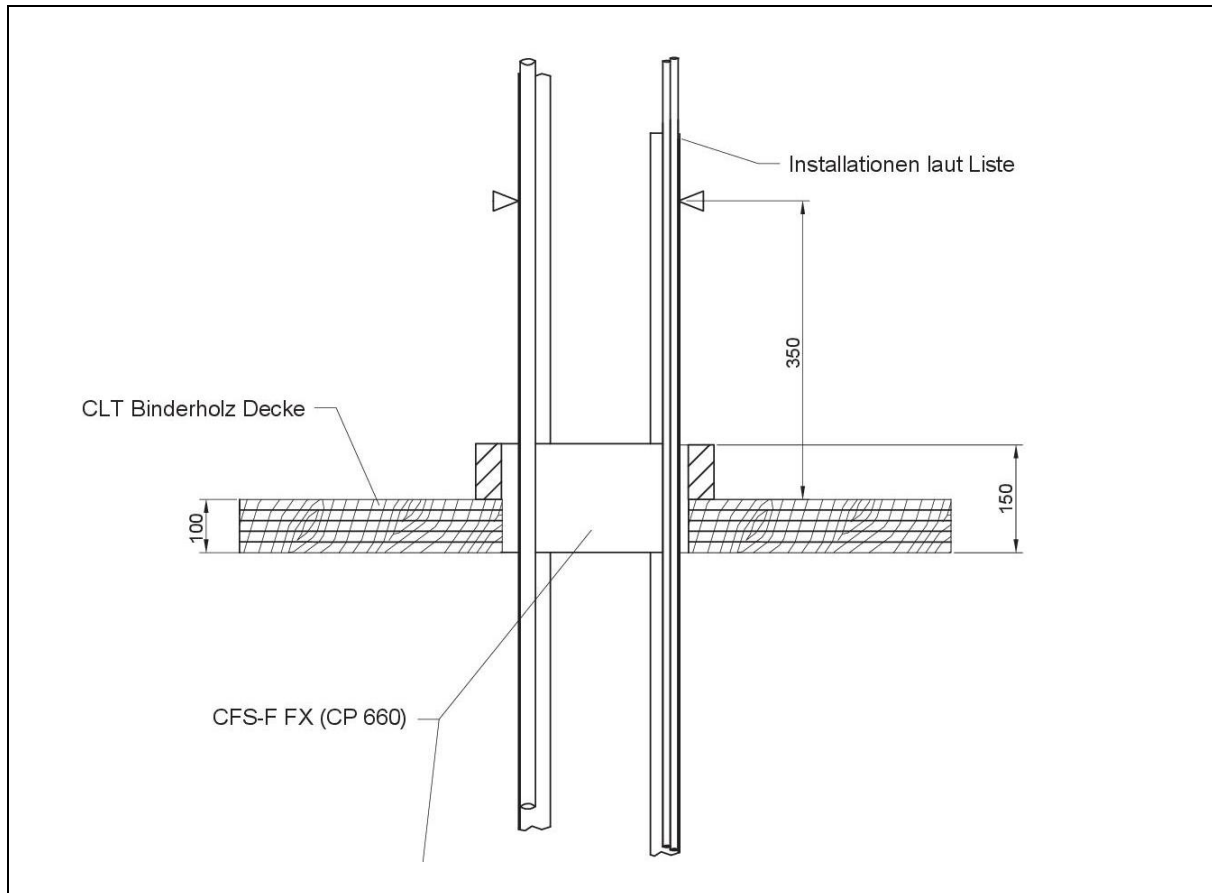
⁶ Elastomeric insulation materials of Euroclass B-s3, d0 / B-s2, d0 or B-s1, d0

⁷ PVC-U pipe as per EN 1329-1, EN 1453-1, EN 1452-1

⁸ PVC-C pipe as per EN 1566-1

⁹ Non-sheathed cable with a maximum diameter of 14 mm and a maximum copper cross section $O = 7.5$ mm²

4.4.3.4. Detailed illustration



4.4.3.5. Cable

Penetration seal Hilti CFS-F FX at an installation depth of ≥ 150 mm			
Single cable ¹	$\varnothing \leq 21$ mm	E 90 EI 60	318092507-3,Rev2 P34.3-6
	$\varnothing \leq 50$ mm	E 90 EI 45	318092507-3,Rev2 P34.7-10

Cable support structure:

The classified cables may be routed through the penetration seal in non-perforated steel cable trays with the dimensions $\leq 200 \times 60$ mm and a sheet thickness of $t \geq 1.5$ mm. All other types of cable supporting structures (perforated cable trays, cable ladders, coated variants, ...) must stop at a distance of maximum 150 mm from the surface of the penetration seal (prEN1366-3:2020, A.4.4.3).

4.4.3.6. Conduits

Penetration seal Hilti CFS-F FX at an installation depth of ≥ 150 mm			
Single, rigid conduit	$\varnothing \leq 32$ mm	EI 90 – U/C	318092507-3,Rev2 P34.1-2
Bundled, rigid conduit	$\varnothing \leq 100$ mm		
Single, flexible conduit	$\varnothing \leq 32$ mm	EI 90 – U/C	318092507-3,Rev2 P35.1-2
Bundled, flexible conduit	$\varnothing \leq 100$ mm		

Approved cable load:

The mentioned cable conduits (single or bundled) are classified with and without cable assignment according to Table C3 in C1.2.4 of EN 1366-3:2020.

Direct field of application according to C1.3.1.2: All cables currently in use in Europe that fit into the cable conduits. Coaxial cables are limited to a maximum diameter of 28 mm. Non-sheated cables (wires) are excluded.

Material:

PO (polyolefins) cover all plastics. Refer to C.1.3.3.2: all other plastics in the same flexibility group are covered.

Flexibility group:

Both rigid and flexible pipes were tested.

Thus all flexibility groups can be classified (C.1.3.3.2).

Groups:

The cable conduits may be laid individually or in bundles (C.1.3.1.3).

¹ Single or multi-core conduits with individual insulation and an additional protection sleeve for the cable bundle. Optical fibre cables are covered.

Size:

Maximum single conduits: Diameter 32 mm.

Bundle: Max. cable conduit bundle diameter: 100 mm, whereby the largest cable conduits may not exceed 32 mm

Projecting length of electrical conduits:

The cable conduits must cover a cable length and project at least 500 mm from both sides of the penetration seal.

Cable conduit end configuration:

The cable conduits must be sealed on the upper side at a depth of 15 mm with Hilti CFS-S ACR.

4.4.3.7. Clima split cable bundles

Penetration seal Hilti CFS-F FX at an installation depth of ≥ 150 mm				
Copper pipe ⁵ , $\lambda \leq 380$ W/mK	$\leq 2 \times \varnothing \leq 18$ mm $t = 1 - 14.2$ mm	Elastomeric foam ⁶ $T = 9$ mm set-up LI / CI ≈ 250 mm both-sided	EI 90 – C/U	318092507-3,Rev2 P35.3-12
Insulation - CS	Tubolit 9 mm			
	Frigoline 9 mm		EI 90 – U/U	
PVC-U pipe ⁷ PVC-C pipe ⁸	$\leq 1 \times$ $\leq \varnothing 25/s4,3$ mm		EI 90	
Single cable ⁹	$\leq 2 \times$ $\varnothing \leq 14$ mm			

4.4.4. Cross laminated timber ceiling ≥ 140 mm

4.4.4.1. Definition of supporting structure

The ceiling must be ≥ 140 mm thick and have ≥ 5 layers of softwood, provided that each outer layer exhibits a thickness of ≥ 40 mm. Both PU and MUF adhesives are permitted. Edge glueing is not required.

4.4.4.2. Maximum penetration seal size

Length	400 mm	318092507-5 P26	EI 90
Width	400 mm		
Thickness	200 mm		

⁵ Results for copper pipes also cover steel and stainless steel pipes

⁶ Elastomeric insulation materials of Euroclass B-s3, d0 / B-s2, d0 or B-s1, d0

⁷ PVC-U pipe as per EN 1329-1, EN 1453-1, EN 1452-1

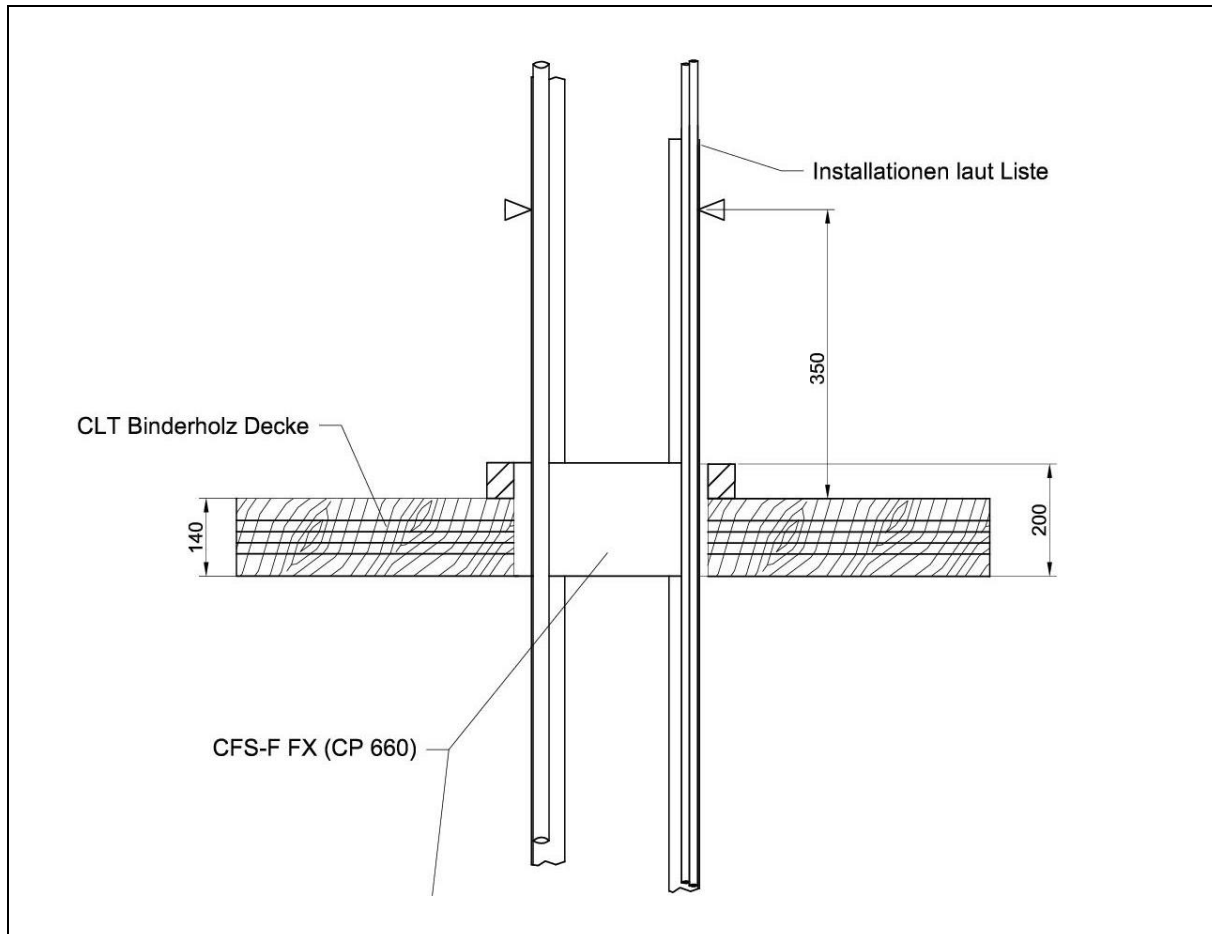
⁸ PVC-C pipe as per EN 1566-1

⁹ Non-sheathed cable with a maximum diameter of 14 mm and a maximum copper cross section $A = 7.5$ mm²

4.4.4.3. Supplementary measures

Framing with 60 mm wooden sticks on top surface of the ceiling.

4.4.4.4. Detailed illustration



4.4.4.5. Cable

Penetration seal Hilti CFS-F FX at an installation depth of ≥ 200 mm			
Single cable ¹	$\varnothing \leq 21$ mm	EI 90	318092507-2,Rev2 P44.1-4
	$\varnothing \leq 50$ mm	E 90 EI 60	318092507-2,Rev2 P44.5-8

Cable support structure:

The classified cables may be routed through the penetration seal in non-perforated steel cable trays with the dimensions $\leq 200 \times 60$ mm and a sheet thickness of $t \geq 1.5$ mm. All other types of cable supporting structures (perforated cable trays, cable ladders, coated variants, ...) must stop at a distance of maximum 150 mm from the surface of the penetration seal (prEN 1366-3:2020, A.4.4.3).

Conduits:

Penetration seal Hilti CFS-F FX at an installation depth of ≥ 200 mm			
Single, rigid conduit	$\varnothing \leq 32$ mm	EI 90 – U/C	318092507-2,Rev2 P44.9-10
Bundled, rigid conduit	$\varnothing \leq 100$ mm		
Single, flexible conduit	$\varnothing \leq 32$ mm	EI 90 – U/C	318092507-2,Rev2 P45.1-2
Bundled, flexible conduit	$\varnothing \leq 100$ mm		

Approved cable load:

The mentioned cable conduits (single or bundled) are classified with and without cable load according to Table C3 in C1.2.4 of EN 1366-3:2020.

Direct field of application according to C1.3.1.2: All cables currently in use in Europe that fit into the cable conduits. Coaxial cables are limited to a maximum diameter of 28 mm. Non-sheated cables (wires) are excluded.

Material:

PO (polyolefins) cover all plastics. Refer to C.1.3.3.2: all other plastics in the same flexibility group are covered.

Flexibility group:

Both rigid and flexible pipes were tested.

Thus all flexibility groups can be classified (C.1.3.3.2).

Groups:

The cable conduits may be laid individually or in bundles (C.1.3.1.3).

¹ Single or multi-core conduits with individual insulation and an additional protection sleeve for the cable bundle. Optical fibre cables are covered.

Size:

Maximum single conduit: Diameter 32 mm.

Bundle: Max. cable conduit bundle diameter: 100 mm, whereby the largest cable conduits may not exceed 32 mm

Projecting length of electrical conduits:

The cable conduits must cover a cable length and project at least 500 mm from both sides of the penetration seal.

Cable conduit end configuration:

The cable conduits must be sealed on the upper side at a depth of 15 mm with Hilti CFS-S ACR.

4.4.4.6. Clima split cable bundles

Penetration seal Hilti CFS-F FX at an installation depth of ≥ 200 mm				
Copper pipe ⁵ , $\lambda \leq 380$ W/mK	$\leq 2 \times \varnothing \leq 18$ mm $t = 1 - 14.2$ mm	Elastomeric foam ⁶ $T = 9$ mm set-up LI / CI ≥ 250 mm both-sided	EI 90 – C/U	318092507-2, Rev2 P45.3-12
Insulation - CS	Tubolit 9 mm			
	Frigoline 9 mm			
PVC-U pipe ⁷ PVC-C pipe ⁸	$\leq 1 \times$ $\leq \varnothing 25/s4,3$ mm		EI 90 – U/U	
Single cable ⁹	$\leq 2 \times$ $\varnothing \leq 14$ mm	EI 90		

⁵ Results for copper pipes also cover steel and stainless steel pipes

⁶ Elastomeric insulation materials of Euroclass B-s3, d0 / B-s2, d0 or B-s1, d0

⁷ PVC-U pipe as per EN 1329-1, EN 1453-1, EN 1452-1

⁸ PVC-C pipe as per EN 1566-1

⁹ Non-sheathed cable with a maximum diameter of 14 mm and a maximum copper cross section $A = 7.5$ mm²

4.4.5. Cross laminated timber wall ≥ 80 mm

4.4.5.1. Definition of supporting structure

The wall must be ≥ 80 mm thick and have ≥ 3 layers of softwood, provided that each outer layer exhibits a thickness of ≥ 20 mm. Both PU and MUF adhesives are permitted. Edge glueing is not required.

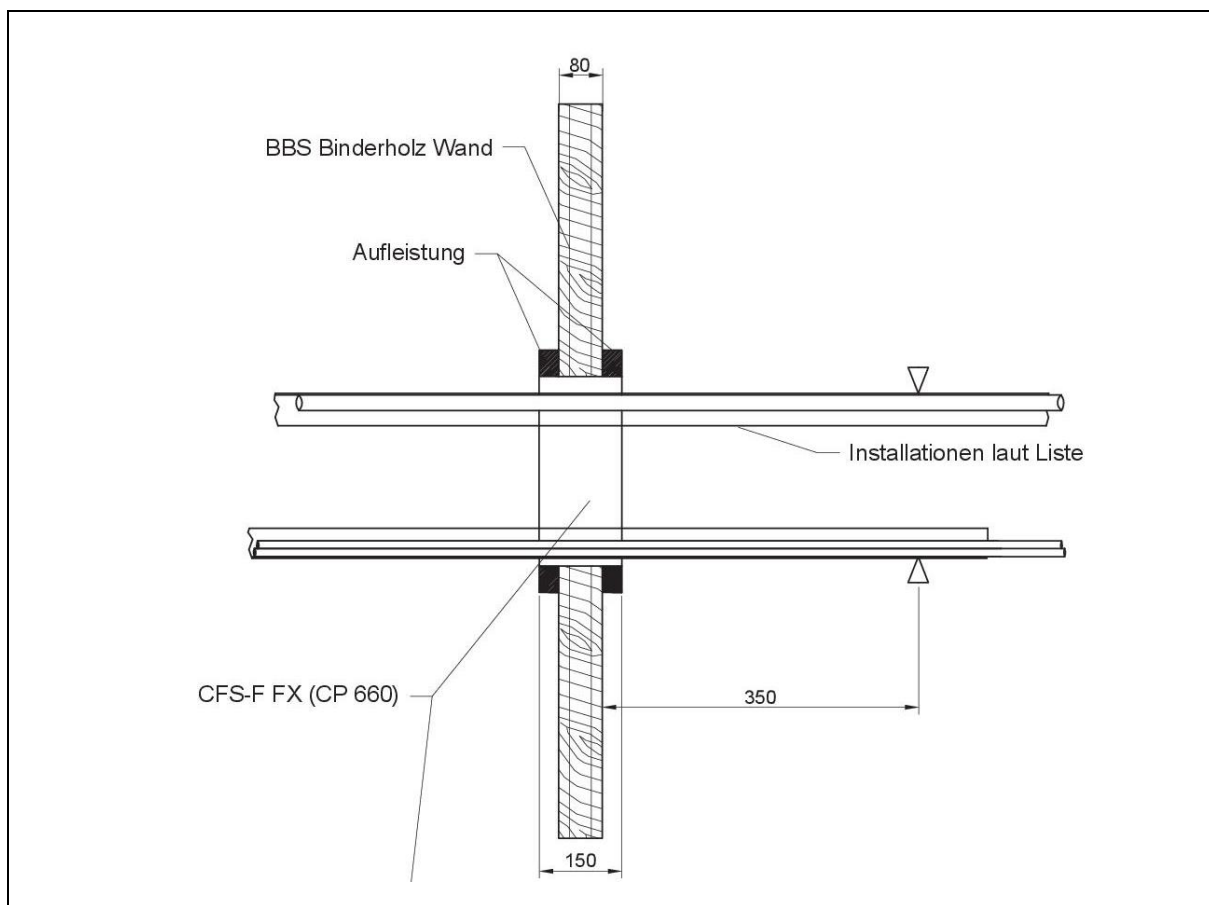
4.4.5.2. Maximum penetration seal size

Length	400 mm	319091602-4, Rev1 P15	EI 60
Width	400 mm		
Thickness	150 mm		

4.4.5.3. Supplementary measures

Framing on both sides of the wall with 35 mm wooden sticks.

4.4.5.4. Detailed illustration



4.4.5.5. Cable

Penetration seal Hilti CFS-F FX at a depth of ≥ 150 mm			
Single cable ¹	$\varnothing \leq 21$ mm	EI 60	319091602-3,Rev1 P23.1-8
	$\varnothing \leq 50$ mm		

Cable support structure:

The classified cables may be routed through the penetration seal in non-perforated steel cable trays with the dimensions $\leq 200 \times 60$ mm and a sheet thickness of $t \geq 1.5$ mm. All other types of cable supporting structures (perforated cable trays, cable ladders, coated variants, ...) must stop at a distance of maximum 150 mm from the surface of the penetration seal (prEN 1366-3:2020, A.4.4.3).

Conduits:

Penetration seal Hilti CFS-F FX at a height of ≥ 80 mm			
Cable conduit starr	$\varnothing \leq 32$ mm	EI 60 – U/C	319091602-3,Rev1 P24.1-2
Cable conduit bundle starr	$\varnothing \leq 100$ mm		
Cable conduit flexible	$\varnothing \leq 32$ mm	EI 60 – U/C	319091602-3,Rev1 P24.3-4
Cable conduit bundle flexible	$\varnothing \leq 100$ mm		

Approved cable load:

The mentioned cable conduits (single or bundled) are classified with and without cable load according to Table C3 in C1.2.4 of EN 1366-3:2020.

Direct field of application according to C1.3.1.2: All cables currently in use in Europe that fit into the cable conduits. Coaxial cables are limited to a maximum diameter of 28 mm. Non-sheated cables (wires) are excluded.

Material:

PO (polyolefins) cover all plastics. Refer to C.1.3.3.2: all other plastics in the same flexibility group are covered.

Flexibility group:

Both rigid and flexible pipes were tested.
Thus all flexibility groups can be classified (C.1.3.3.2).

Groups:

The cable conduits may be laid individually or in bundles (C.1.3.1.3).

Size:

Maximum single conduit: Diameter 32 mm.
Bundle: Max. cable conduit bundle diameter: 100 mm, whereby the largest cable conduits may not exceed 32 mm

¹ Single or multi-core conduits with individual insulation of cables and an additional protection sleeve for the cable bundle. Optical fibre cables are covered.

Projecting length of electrical conduits:

The cable conduits must cover a cable length and project at least 500 mm from both sides of the penetration seal.

Cable conduit end configuration:

The cable conduits must be sealed on the upper side at a depth of 15 mm with Hilti CFS-S ACR.

4.4.5.6. Clima split cable bundles

Penetration seal Hilti CFS-F FX at a depth of ≥ 150 mm				
Copper pipe ⁵ , $\lambda \leq 380$ W/mK	$\leq 2 \times \varnothing \leq 18$ mm $t = 1 - 14.2$ mm	Elastomeric foam ⁶ D = 9 mm set-up LI / CI ≥ 250 mm both-sided	EI 60 – C/U	319091602-3,Rev1 P23.9-11 P24.5-7
Insulation - CS	Tubolit 9 mm			
	Frigoline 9 mm			
PVC-U pipe ⁷ PVC-C pipe ⁸	$\leq 1 \times$ $\varnothing 25/s4.3$ mm		EI 60 – U/U	
Single cable ⁹	$\leq 2 \times$ $\varnothing \leq 14$ mm	EI 60		

4.4.6. Cross laminated timber wall ≥ 100 mm

4.4.6.1. Definition of supporting structure

The wall must be ≥ 100 mm thick and have ≥ 5 layers of softwood, provided that each outer layer exhibits a thickness of ≥ 20 mm. Both PU and MUF adhesives are permitted. Edge glueing is not required.

4.4.6.2. Maximum penetration seal size

Length	400 mm	319091602-5, Rev1 P30	EI 90
Width	400 mm		
Thickness	150 mm		

4.4.6.3. Supplementary measures

Framing with 25 mm wooden sticks on both sides.

⁵ Results for copper pipes also cover steel and stainless steel pipes

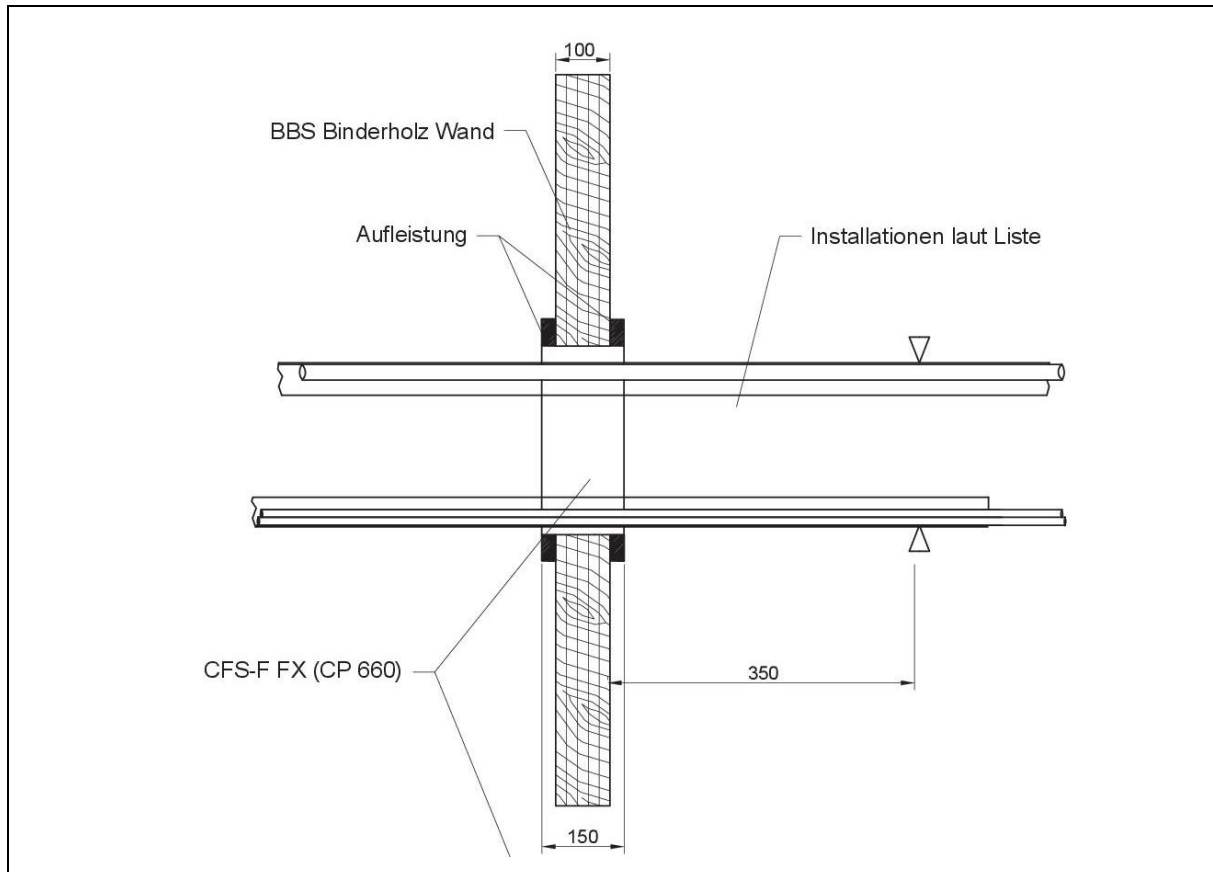
⁶ Elastomeric insulation of Euroclass B-s3, d0 / B-s2, d0 oder B-s1, d0

⁷ PVC-U pipe as per EN 1329-1, EN 1453-1, EN 1452-1

⁸ PVC-C pipe as per EN 1566-1

⁹ Non-sheathed cable with a maximum diameter of 14 mm and a maximum copper cross section $A = 7.5$ mm²

4.4.6.4. Detailed illustration



4.4.6.5. Cables

Penetration seal Hilti CFS-F FX at a depth of ≥ 150 mm			
Single cable ¹	$\varnothing \leq 21$ mm	E 90 EI 60	319091602-1,Rev1 P23.1-8
	$\varnothing \leq 50$ mm		

Cable support structure:

The classified cables may be routed through the penetration seal in non-perforated steel cable trays with the dimensions $\leq 200 \times 60$ mm and a sheet thickness of $t \geq 1.5$ mm. All other types of cable supporting structures (perforated cable trays, cable ladders, coated variants, ...) must stop at a distance of maximum 150 mm from the surface of the penetration seal (prEN1366-3:2020, A.4.4.3).

Conduits:

Penetration seal Hilti CFS-F FX at a height of ≥ 80 mm			
Single, rigid conduit	$\varnothing \leq 32$ mm	EI 90 – U/C	319091602-1,Rev1 P23.9-10
Bundled, rigid conduit	$\varnothing \leq 100$ mm		
Single, flexible conduit	$\varnothing \leq 32$ mm	EI 60 – U/C	319091602-3,Rev1 P24.3-4
Bundled, flexible conduit	$\varnothing \leq 100$ mm		

Approved cable load:

The mentioned cable conduits (single or bundled) are classified with and without cable load according to Table C3 in C1.2.4 of EN 1366-3:2020.

Direct field of application according to C1.3.1.2: All cables currently in use in Europe that fit into the cable conduits. Coaxial cables are limited to a maximum diameter of 28 mm. Non-sheathed cables (wires) are excluded.

Material:

PO (polyolefins) cover all plastics. Refer to C.1.3.3.2: all other plastics in the same flexibility group are covered.

Flexibility group:

Both rigid and flexible pipes were tested.

Thus all flexibility groups can be classified (C.1.3.3.2).

Groups:

The cable conduits may be laid individually or in bundles (C.1.3.1.3).

Size:

Maximum single conduit: Diameter 32 mm.

Bundle: Max. cable conduit bundle diameter: 100 mm, whereby the largest cable conduits may not exceed 32 mm

¹ Single or multi-core conduits with individual insulation of cables and an additional protection sleeve for the cable bundle. Optical fibre cables are covered.

Projecting length of electrical conduits:

The cable conduits must cover a cable length and project at least 500 mm from both sides of the penetration seal.

Cable conduit end configuration:

The cable conduits must be sealed on the upper side at a depth of 15 mm with Hilti CFS-S ACR.

4.4.6.6. Clima split cable bundles

Penetration seal Hilti CFS-F FX at a depth of ≥ 150 mm				
Copper pipe ⁵ , $\lambda \leq 380$ W/mK	$\leq 2 \times \varnothing \leq 18$ mm $t = 1 - 14.2$ mm	Elastomeric foam ⁶ T = 9 mm Set-up LI / CI ≥ 250 mm both-sided	EI 60 – C/U	319091602-3,Rev1 P23.9-11 P24.5-7
Insulation - CS	Tubolit 9 mm			
	Frigoline 9 mm			
PVC-U pipe ⁷ PVC-C pipe ⁸	$\leq 1 \times$ $\varnothing 25/s4.3$ mm		EI 60 – U/U	
Single cable ⁹	$\leq 2 \times$ $\varnothing \leq 14$ mm	EI 60		

⁵ Results for copper pipes also cover steel and stainless steel pipes

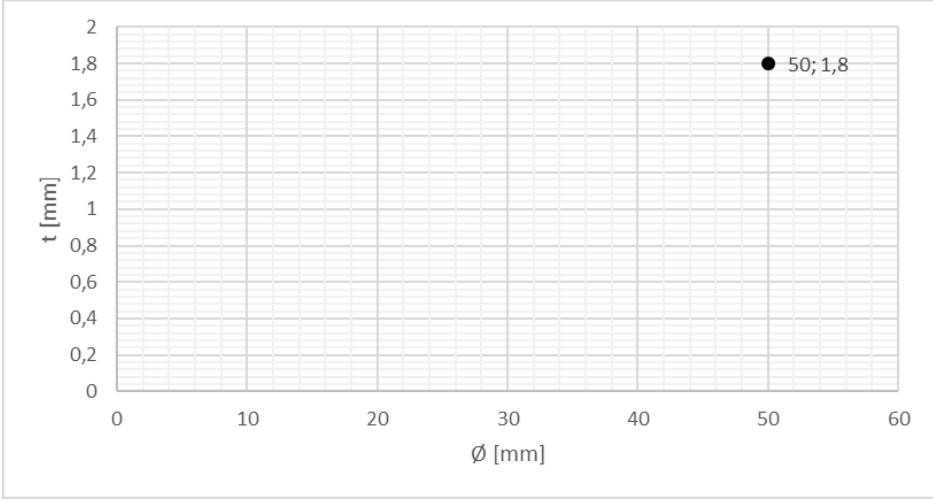
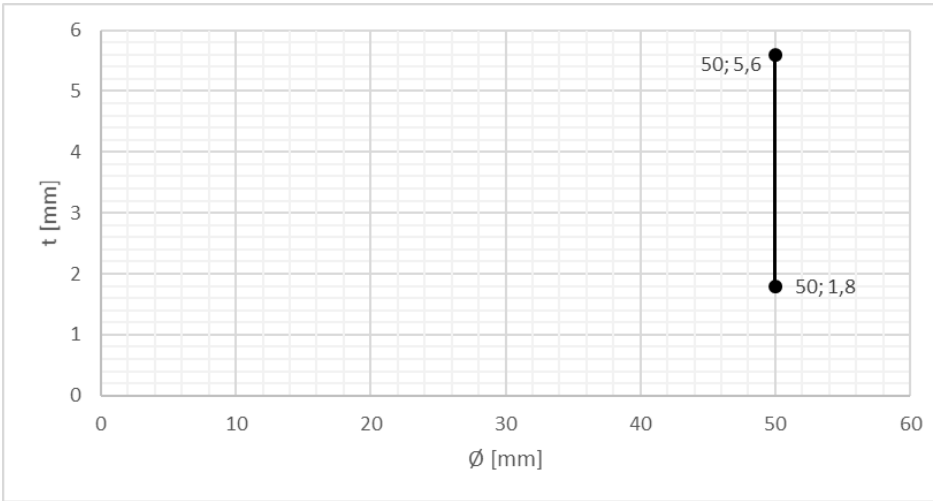
⁶ Elastomeric insulation materials of Euroclass B-s3, d0 / B-s2, d0 or B-s1, d0

⁷ PVC-U pipe as per EN 1329-1, EN 1453-1, EN 1452-1

⁸ PVC-C pipe as per EN 1566-1

⁹ Non-sheathed cable with a maximum diameter of 14 mm and a maximum copper cross section $A = 7.5$ mm²

4.4.6.7. Plastic pipes

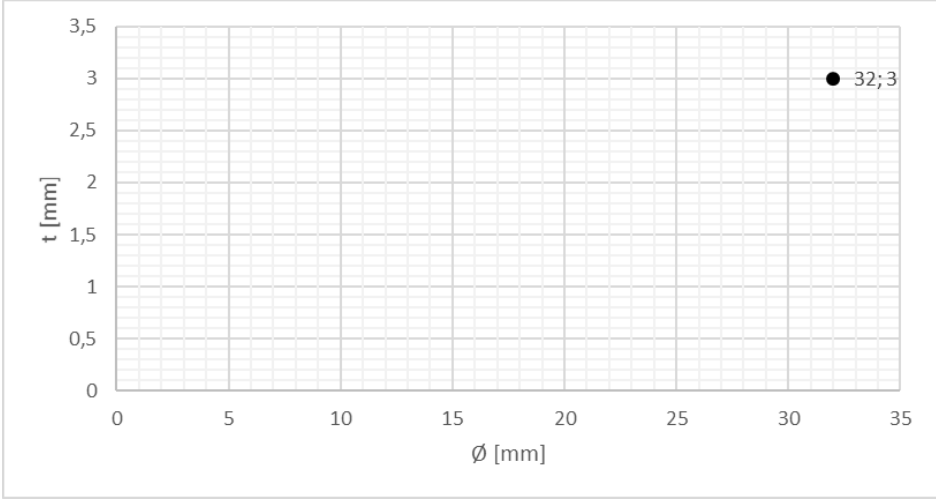
PP-H ¹	$\varnothing = 50 \text{ mm}$ $t = 1.8 \text{ mm}$	EI 90 – U/U
		319091602-1,Rev1 P26.4
PVC-U ² PVC-C ³	$\varnothing = 50 \text{ mm}$ $t = 1.8 - 5.6 \text{ mm}$	EI 90 – U/U
		319091602-1,Rev1 P26.5, P26.6

¹ PP-H pipe as per EN 1451-1

² PVC-U pipe as per EN 1329-1, EN 1453-1 or EN 1452-1

³ PVC-C pipe as per EN 1566-1

4.4.6.8. Coated metal pipes without insulation

Geberit Mepla	$\varnothing = 32 \text{ mm}$ $t = 3.0 \text{ mm}$	EI 90 – U/U
 <p>The graph plots thickness t [mm] on the y-axis (0 to 3.5) against diameter \varnothing [mm] on the x-axis (0 to 35). A single data point is plotted at $\varnothing = 32$ mm and $t = 3$ mm, labeled '32;3'.</p>		319091602-1, Rev1 P26.8

5. Limitations

The classification given above result from the direct field of application according to EN 1366-3:2009-05 for “Hilti CFS-F FX in timber building **components**”

5.1. Warning

This report does not constitute any type approval or certification of the tested product.

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

Mr Manfred EGLAUER
Engineer

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

Mr Ulrich STÖCKL
Monitoring