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13/5063

Product Sheet 1

HILTI EUROFOX RAINSCREEN SYSTEMS

HILTI EUROFOX RAINSCREEN CLADDING SUPPORT SYSTEMS

This Agrément Certificate Product Sheet⁽¹⁾ relates to Hilti EuroFox Rainscreen Cladding Support Systems, comprising a range of aluminium brackets and rail profiles used as a sub-frame to support cladding on the external or internal wall structure of new or existing buildings.

(1) Hereinafter referred to as 'Certificate'.

CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.



KEY FACTORS ASSESSED

Mechanical resistance and stability — the systems can be designed to support the cladding and to transfer the design loads to the substrate wall structure (see section 6).

Behaviour in relation to fire — the systems have an A1 reaction to fire classification in accordance with BS EN 13501-1 : 2007 (see section 7).

Drainage and ventilation — the amount of water entering the cavity depends on the cladding and the joint type. Provided provision for drainage and ventilation is made, the systems will remove any water collecting in the cavity due to rain and condensation (see section 8).

Durability — the systems will have a service life in excess of 35 years (see section 10).

The BBA has awarded this Certificate to the company named above for the systems described herein. These systems have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of Fifth issue: 21 April 2022

Originally certificated on 28 October 2013

Hardy Giesler
Chief Executive Officer

The BBA is a UKAS accredited certification body – Number 113.

The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk
Readers MUST check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.

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Regulations

In the opinion of the BBA, Hilti EuroFox Rainscreen Cladding Support Systems, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	A1	Loading
Comment:		The systems can be designed to adequately transfer the design loads from the cladding to the substrate wall structure. See sections 6.3 and 6.4 of this Certificate.
Requirement:	B4(1)	External fire spread
Comment:		The systems are unrestricted by this Requirement. See section 7.1 of this Certificate.
Regulation:	7(1)	Materials and workmanship
Comment:		The systems are acceptable. See section 10.1 and the <i>Installation</i> part of this Certificate.
Regulation:	7(2)	Materials and workmanship
Comment:		The systems are unrestricted by this Regulation. See section 7.1 of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Durability, workmanship and fitness of materials
Comment:		The systems are acceptable. See section 10.1 and the <i>Installation</i> part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	1.1(a)(b)	Structure
Comment:		The systems can be designed to adequately transfer the design loads from the cladding to the substrate wall structure, with reference to clause 1.1.1 ⁽¹⁾⁽²⁾ of this Standard. See sections 6.3 and 6.4 of this Certificate.
Standard:	2.6	Spread to neighbouring buildings
Comment:		The systems are unrestricted by this Standard, with reference to clauses 2.6.4 ⁽¹⁾⁽²⁾ , 2.6.5 ⁽¹⁾ and 2.6.6 ⁽²⁾ . See sections 7.1 and 7.2 of this Certificate.
Standard:	2.7	Spread on external walls
Comment:		The systems are unrestricted by this Standard, with reference to clause 2.7.1 ⁽¹⁾⁽²⁾ . See sections 7.1 and 7.2 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The systems can contribute to satisfying the relevant Requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation:	23	Fitness of materials and workmanship
Comment:		The systems are acceptable. See section 10.1 and the <i>Installation</i> part of this Certificate.
Regulation:	30	Stability
Comment:		The systems can be designed to adequately transfer the design loads from the cladding to the substrate wall structure. See sections 6.3 and 6.4 of this Certificate.

Regulation:	36(a)	External fire spread
Comment:	The systems are unrestricted by this Regulation. See section 7.1 of this Certificate.	

Construction (Design and Management) Regulations 2015 Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See section: 3 *Delivery and site handling* (3.2, 3.4 and 3.6) of this Certificate.

Additional Information

NHBC Standards 2022

In the opinion of the BBA, Hilti EuroFox Rainscreen Cladding Support Systems, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapter 6.9, D8 (b) *Rainscreen cladding*, 6.9.4 *Loads* and 6.9.5 *Support and fixings*.

Technical Specification

1 Description

1.1 Hilti EuroFox Rainscreen Cladding Support Systems consist of:

- MFT-MFI⁽¹⁾, MFT-FOX HI⁽²⁾ and X-Fox⁽²⁾ FOX VI/V⁽¹⁾⁽³⁾ brackets — L shaped aluminium brackets with/without a polypropylene or PVC thermal isolator pad fitted to the back
- MFT S2S⁽¹⁾ brackets – U shaped aluminium brackets with/without a polypropylene or PVC thermal isolator pad fitted to the back
- MFT S2S adapter plate (AP) – aluminium adapter plate with/without a polypropylene or PVC thermal isolator pad fitted to the back for MFT S2S large brackets⁽⁴⁾
- MFT-MW aluminium brackets — one or three holes pattern
- L, Z, T, TT, RHS and Omega rails — aluminium rails of 'L', 'Z', 'T', 'TT', RHS and Omega profiles fixed to the aluminium wall brackets using self-drilling screws (see section 1.3)
- MFT TT, RHS (PC) connectors – aluminium connection profiles for MFT TT and MFT RHS rails

(1) MFT-MFI, FOX VI/V and MFT S2S brackets are used predominantly for vertical rail assembly.

(2) MFT-FOX HI and X-Fox brackets are used predominantly for horizontal rail assembly.

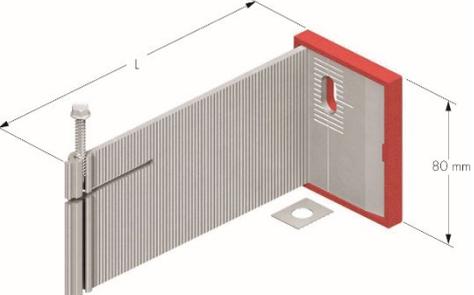
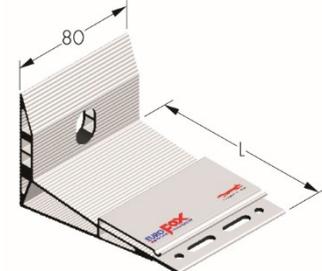
(3) FOX VI/V (small) MFT S2S (medium) brackets are used for vertical rail assembly.

1.2 The main system components are manufactured from aluminium alloy to the minimum grade given in Table 1.

Table 1 Component specification

Component	Material/grade	Standard
MFT-MFI and MFT-FOX HI brackets	aluminium/EN AW – 6063T66 (Al Mg 0.7Si)	BS EN 573-3 : 2019
X-Fox brackets	aluminium/EN AW – 6060T66 (Al Mg Si)	BS EN 573-3 : 2019
MFT-MW brackets	aluminium/EN AW – 6063T66 (Al Mg 0.7Si)	BS EN 573-3 : 2019
FOX VI/V brackets	aluminium/EN AW – 6063T66 (Al Mg 0.7Si)	BS EN 573-3 : 2019
MFT S2S U brackets	aluminium/EN AW – 6063T66 (Al Mg 0.7Si)	BS EN 573-3 : 2019
MFT S2S adapter plate (AP)	aluminium/EN AW – 6063T66 (Al Mg 0.7Si)	BS EN 573-3 : 2019
L, Z, T, TT, RHS and Omega rails	aluminium/EN AW – 6063T66 (Al Mg 0.7Si)	BS EN 573-3 : 2019
MFT RHS connector (PC)	aluminium/EN AW – 6063T66 (Al Mg 0.7Si)	BS EN 573-3 : 2019
MFT TT connector (PC)	aluminium/ EN AW – 6082T6 (Al Mg Mn 1.0 Si)	BS EN 573-3 : 2019

Figure 1 Component details

MFT-MFIM bracket – medium	Bracket leg length (mm) <i>L</i>	Projection range (mm) ⁽¹⁾ <i>a</i>	Code
	40	40–60	2029626
	65	65–105	2029341
	95	95–135	2029344
	125	125–165	2029347
	155	155–195	2029350
	185	185–225	2029352
	215	215–255	2029355
	245	245–285	2029358
275	275–315	2029361	
<p data-bbox="156 663 448 689"><i>MFT-MFIL bracket – large</i></p> 	40	40–60	2029623
	65	65–105	2029249
	95	95–135	2029343
	125	125–165	2029346
	155	155–195	2029349
	185	185–225	2029351
	215	215–255	2029354
	245	245–285	2029357
275	275–315	2029360	
<p data-bbox="156 1072 293 1099"><i>MFT-FOX HI</i></p> 	60	60–95	2084321
	80	75–115	2084324
	100	95–135	2084327
	120	115–155	2084330
	140	135–175	2084333
	160	155–195	2084336
	180	175–215	2084339
	200	195–235	2084342
	220	215–255	2084345
	240	235–275	2084348
	260	255–295	2084351
	280	275–315	2084354
300	295–335	2084357	
<p data-bbox="156 1648 424 1675"><i>X-Fox bracket – medium</i></p> 	70	70–110	2029363
	90	90–130	2029768
	120	120–160	2029773
	150	150–190	2029777
	180	180–220	2029781

(1) Projection range covers the permissible distance between the bracket and the rail overhang.

Figure 1 Component details (continued)

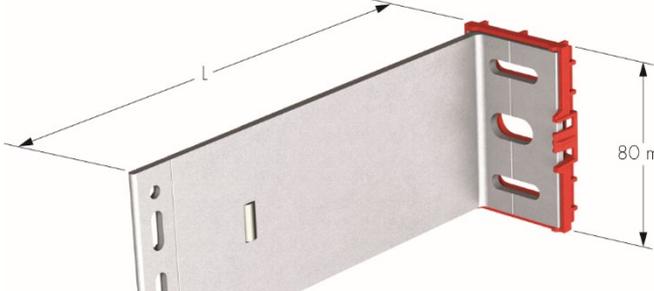
<i>MFT FOX VI/V S 6.5 bracket – small</i>	Bracket leg length (mm) – L	Code VI/V
	40	2305768/2305906
	60	2305769/2305907
	80	2305892/2305908
	100	2305893/2305909
	120	2305894/2305910
	140	2305895/2305911
	160	2305896/2305920
	180	2305891/2305919
	200	2305890/2305918
	220	2305889/2305917
	240	2305888/2305916
	260	2305887/2305921
	280	2305886/2305922
300	2305885/2305915	
<i>MFT FOX VI/V S 11 bracket – small</i>		
	40	2305884/2305914
	60	2305883/2305913
	80	2305882/2305912
	100	2305881/2305994
	120	2305880/2305767
	140	2305897/2305993
	160	2305898/2305992
	180	2305899/2305991
	200	2305900/2305990
	220	2305901/2305989
	240	2305902/2305988
	260	2305903/2305987
	280	2305904/2305986
300	2305905/2305985	
<i>MFT FOX VI/V M 6.5/11 bracket – medium</i>		
	40	2305984/2305964
	60	2305983/2305970
	80	2305982/2305969
	100	2305981/2305968
	120	2305980/2305967
	140	2305979/2305966
	160	2305978/2305965
	180	2305977/2305963
	200	2305976/2305962
	220	2305975/2305961
	240	2305974/2305960
	260	2305973/2305959
	280	2305972/2305958
300	2305971/2305957	

Figure 1 Component details (continued)

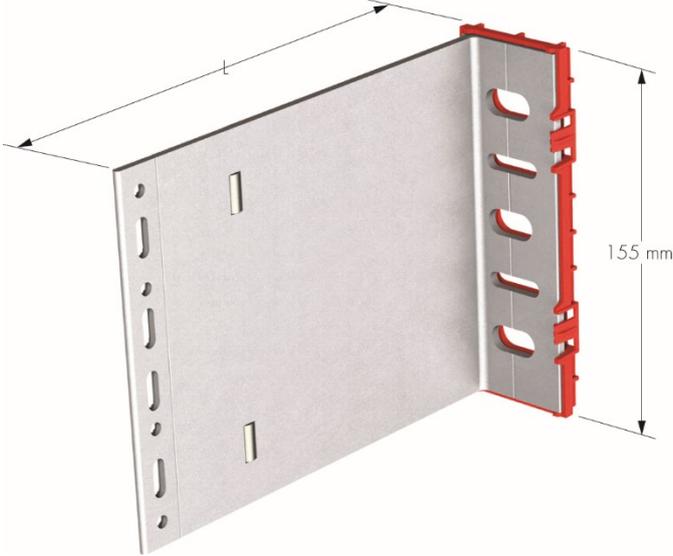
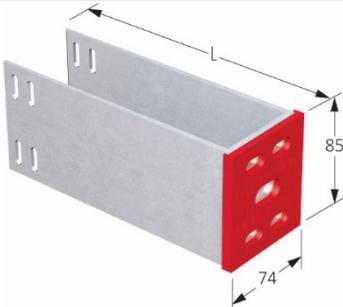
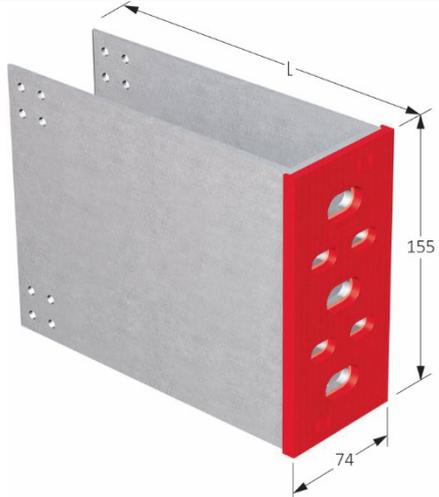
MFT FOX VI/V 6.5/11 L bracket – large		
	40	2305950/2305936
	60	2305949/2305935
	80	2305948/2305934
	100	2305947/2305933
	120	2305946/2305932
	140	2305945/2305931
	160	2305944/2305930
	180	2305943/2305929
	200	2305942/2305928
	220	2305941/2305927
	240	2305940/2305926
	260	2305939/2305925
280	2305938/2305924	
300	2305937/2305923	
MFT S2S UI/U bracket – medium		
	80	2158286/2158418
	100	2158287/2158419
	120	2158288/2158420
	140	2158289/2158421
	160	2158410/2158422
	180	2158411/2158423
	200	2158412/2158424
	220	2158413/2158425
	240	2158414/2158426
	260	2158415/2158427
	280	2158416/2158428
	300	2158417/2158429
MFT S2S UI/U bracket – large		
	80	2157966/2158388
	100	2157967/2158389
	120	2157968/2158390
	140	2157969/2158391
	160	2158380/2158392
	180	2158381/2158393
	200	2158382/2158395
	220	2158383/2158396
	240	2158384/2158397
	260	2158385/2158398
	280	2158386/2158399
	300	2158387/2158394

Figure 1 Component details (continued)

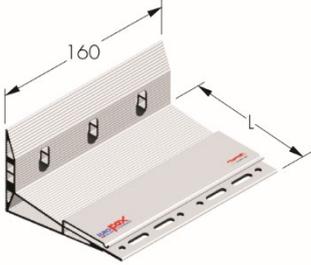
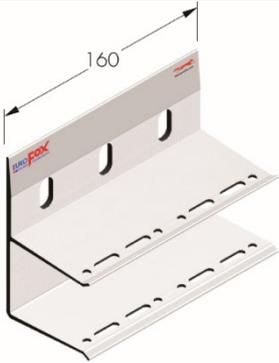
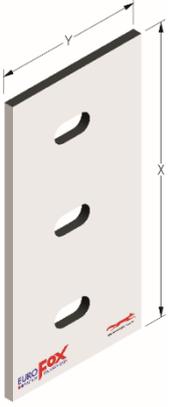
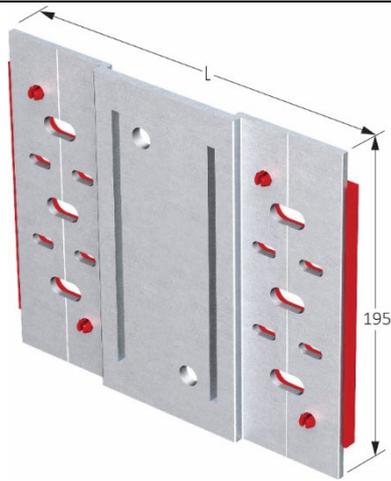
<i>X-Fox bracket – large</i>					
	Bracket leg length (mm)	Projection range (mm) ⁽¹⁾		Code	
	<i>L</i>	<i>a</i>			
		70	70–110		2029362
		90	90–130		2029766
		120	120–160		2029771
		150	150–190		2029775
	180	180–220		2029779	
<i>MFT-MW M bracket – medium</i>					
	70	70		2030896	
	90	100		2030892	
<i>MFT-MW L bracket – large</i>					
	70	70		2030894	
<i>Isolator – large</i>					
	Y (mm)	X (mm)	thickness (mm)	Code	
	80	160	5	2029365	

Figure 1 Component details (continued)

MFT S2S UI/U adapter plate – large AP



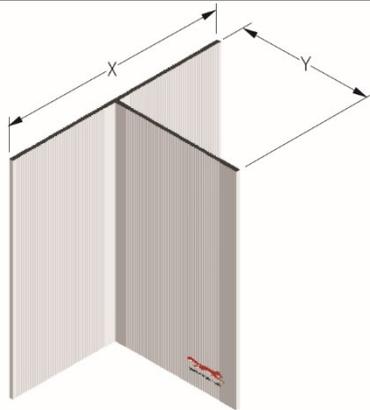
L (mm)	Thickness (mm)	Code
220	4.5	2158401/2158400

L Profile



Y (mm)	X (mm)	thickness (mm)	surface	Code
40	40	1.8	fluted	2029783
60	40	2	flat	2029372
60	40	2	flat, black	2050781
60	40	1.8	flat	2029370
60	40	1.8	flat, black	2050780
60	40	2.2	fluted	2029785
60	50	2	fluted	2029786

T-Profile



X (mm)	Y (mm)	thickness (mm)	surface	Code
80	40	1.8	fluted	2029787
80	60	1.8	fluted	2029788
100	60	2	flat	2029375
100	60	2	flat, black	2050783
100	60	1.8	flat	2029374
100	60	1.8	flat, black	2050782
100	60	2.2	fluted	2029789
120	40	2	flat	2050268
120	60	2	flat	2029378
120	60	2	flat, black	2050785
120	60	1.8	flat	2029377
120	60	1.8	flat, black	2050784
140	60	2.2	flat	2029792
140	60	2	fluted	2029791

Figure 1 Component details (continued)

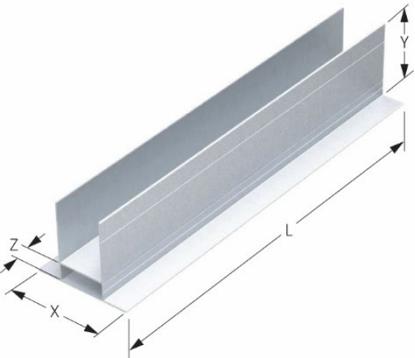
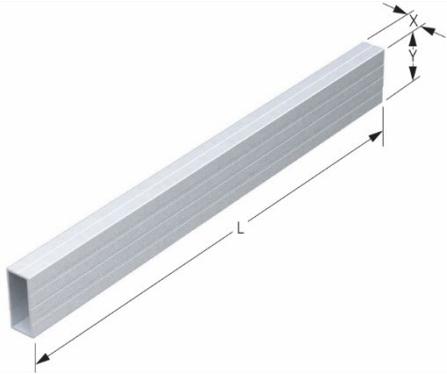
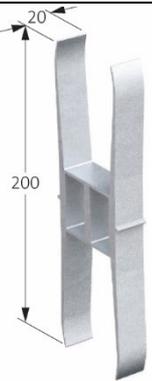
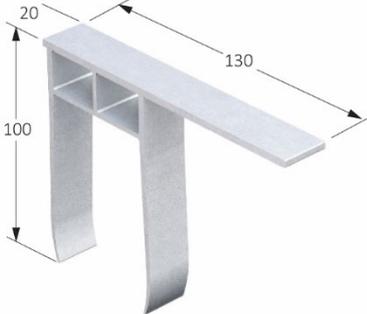
Z-Profile							
	Y (mm)	X (mm)	thickness (mm)	Code			
	40	29.8	1.9	2029382			
	40	55	2.2	2029796			
	40	70	2.2	2029797			
Omega-Profile							
	Y (mm)	X (mm)	thickness (mm)	surface	Code		
	86	25	1.9	flat	2029794		
	110	29.8	1.9	flat, perforated	2029380		
	110	29.8	1.9	flat	2029379		
TT-Profile							
	L (mm)	Y (mm)	X (mm)	Z (mm)	thickness (mm) /	Surface	Code
	6000	80	120	23	2	flat	2158360
	6000	100	120	23	2	flat	2158361
	6000	110	120	23	2	flat	2158362
	6000	135	120	23	2	flat	2158363
	6000	150	120	23	2	flat	2158364
	6000	150	100	23	2	flat	2158365
	6000	135	100	23	2	flat	2158366
	6000	110	100	23	2	flat	2158367
	6000	100	100	23	2	flat	2158368
	6000	80	100	23	2	flat	2158369
	6000	150	100	23	2.5	flat	2158370
	6000	135	100	23	2.5	flat	2158371
	6000	110	100	23	2.5	flat	2158372
	6000	100	100	23	2.5	flat	2158373
	6000	80	100	23	2.5	flat	2158374
	6000	150	120	23	2.5	flat	2158375
	6000	135	120	23	2.5	flat	2158376
	6000	110	120	23	2.5	flat	2158377
	6000	100	120	23	2.5	flat	2158378
	6000	80	120	23	2.5	flat	2158379

Figure 1 Component details (continued)

RHS-Profile							
	L	Y	X	thickness	Surface	Code	
	(mm)	(mm)	(mm)	(mm)	(mm)		
	6000	60	25	2.0	flat	2158402	
MFT S2S TT connector							
						Code 2158402	
MFT S2S RHS connector (PC)							
						Code 2158404	

1.3 The MFT-MFI, MFT-FOX HI and X-Fox, FOX VI/V systems' rail profiles are fixed to the wall brackets using Hilti self-drill screws S-AD01S 5.5 x 19 and S-AD01SS 5.5 x 19 as described in Table 2 (see also Figure 2), with a minimum edge distance of 10 mm.

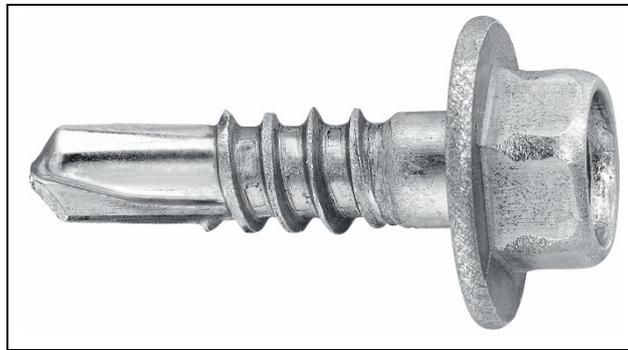
1.4 The MFT S2S systems' rail profiles are fixed to the wall brackets using Hilti self-drill screws S-AD 01 LSS 5.5 x 25 and S-AD 01 LPS 5.5 x 25 as described in Table 2 (see also Figure 2), with a minimum edge distance of 10 mm.

1.5 The MFT S2S systems' rail profiles are fixed to the MFT RHS and MFT TT connector profiles using Hilti self-drill screws S-AD 01 LSS 5.5 x 25, S-AD 01 LPS 5.5 x 25, S-MD51 LS 5.5 x 25, S-MD51 LSS 5.5 x 25 and S-MD53S 5.5 x 25, with a minimum edge distance of 10 mm.

Table 2 Rail to bracket fixings

Fixing code	Grade of stainless steel to EN 10088-1 : 2005	Screw diameter (mm)	Length (mm)	Screw head diameter (mm)	Maximum fastened thickness (mm)
S-AD01S	1.4567	5.5	19	8	11
S-AD01SS	1.4578	5.5	19	8	11
S-AD01LSS	1.4578	5.5	25	8	12
S-AD01LPS	1.4578	5.5	25	12 (TX 25)	12
S-MD51LS	1.4567	5.5	25	8	5
S-MD51LSS	1.4578	5.5	25	8	5
S-MD53S	1.4567	5.5	25	8	7

Figure 2 Self-drilling screws – rail to bracket



1.6 Ancillary items specified for use with the systems and recommended by the Certificate holder, but outside the scope of this Certificate, include:

- S-MD, S-MS and S-MP fastening screws — self-drilling and self-tapping screws made of stainless steel or case-hardened carbon steel used to attach the systems to steel substrate wall as covered by ETAs 10/0182 and 18/0880
- Isolator MFT-ISO FOX H M 5 mm, Washer MFT-FOX H 11 and MFT-FOX H 5
- HRD frame anchors — anchors consisting of a plastic sleeve made of polyamide and an accompanying specific screw of electro galvanized steel, hot-dip galvanized steel or stainless steel used to attach the support systems to concrete or masonry substrate walls as covered by ETA 07/0219
- HST and HSA ultimate-performance wedge anchors — steel expansion anchors used to attach the support systems to concrete substrate walls as covered by ETAs 98/0001 and 11/0374
- HUS ultimate/high-performance screw anchors – steel screw anchors used to attach the support system to concrete substrate walls as covered by ETAs 08/0307 and 10/0005.

2 Manufacture

2.1 The systems are manufactured from aluminium using conventional metalworking techniques.

2.2 As part of the assessment and on-going surveillance of the quality of the systems components, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

3 Delivery and site handling

- 3.1 The aluminium rails are banded on pallets. Every pallet carries a label bearing the Certificate holder's name and a label bearing the BBA logo incorporating the number of this Certificate.
- 3.2 Packs of rails should be stacked horizontally on sufficient bearers to prevent distortion to a maximum height of one metre. Other components should be stored safely until ready for use.
- 3.3 The pallets should be stored on a dry, flat and level surface, suitably protected from the weather. Ancillary items should be stored in separate boxes.
- 3.4 The brackets, connectors and adapter plates are delivered to site in cartons of a size suitable for manual handling.
- 3.5 The systems' components should be handled with care. Damaged items should be discarded.
- 3.6 Protective clothing should be worn, as required, and all health and safety regulations observed. Care must be exercised when handling long lengths of rail, especially at height.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Hilti EuroFox Rainscreen Cladding Support Systems.

Design Considerations

4 Use

- 4.1 Hilti EuroFox Rainscreen Cladding Support Systems, when installed in accordance with this Certificate, are satisfactory for use in back ventilated and drained cavity rainscreen cladding systems as a sub-frame to support cladding on the external or internal wall structure of new or existing buildings. They are effective in transferring the wind loading and weight of cladding to the substrate wall.
- 4.2 The systems are applied to the outside of the external or internal wall structure of new or existing buildings. Application must be carried out strictly in accordance with this Certificate and the Certificate holder's instructions, by installers approved by the Certificate holder.
- 4.3 The substrate wall to which the systems are to be fixed must be structurally sound and watertight.
- 4.4 The brackets' insulating pads (isolators) act as thermal breaks.
- 4.5 It is important for designers, planners, contractors and/or installers to ensure that the systems have adequate structural capacity to support cladding panels in accordance with the design and installation requirements of the cladding panel supplier.

5 Practicability of installation

The systems should only be installed by installers who have been approved by the Certificate holder.

6 Mechanical resistance and stability

- 6.1 The substrate wall to which the brackets are to be fixed should be designed and constructed in accordance with the requirements of the relevant national Building Regulations and Standards. The design of the installation must be checked by a suitably qualified and experienced individual.

6.2 Assessment of structural performance of the systems for individual buildings must be carried out by a suitably qualified and experienced individual to confirm that:

- the substrate wall to which the brackets are fixed has adequate strength to resist additional loads that may be applied as a result of installing the cladding system
- the proposed system, associated fixings and layout provide adequate resistance to wind actions and self-weight of the chosen cladding
- the bearing capacity of the fixings between the brackets and rails (see section 1.3) is not exceeded
- an appropriate number of site-specific pull-out tests are conducted on the substrate of the building to determine the minimum pull-out resistance to failure of the fixings used to attach the systems to the substrate (see section 1.4). The characteristic pull-out resistance should be determined in accordance with the guidance given in ETAG 020 : 2012, Annex C
- thermal expansion effects of both the system and the cladding to be supported are taken into consideration in the design and detailing.



6.3 Design wind actions must be calculated in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex. Due consideration should be given to higher pressure coefficients applicable to corners of the building, as recommended in this Standard. In accordance with BS EN 1990 : 2002, it is recommended that a partial load factor of 1.5 is applied to determine the design wind load to be resisted by the systems.

6.4 A suitably qualified and experienced design engineer should ensure that:

- any thermal expansion effects of both the system and the cladding to be supported are taken into account in the design and detailing
- the specified fixings have adequate tensile, shear and pull-out strength to resist the applied actions
- the fixing of the support brackets to the supporting wall has adequate tensile, shear and pull-out strength, and corrosion resistance (outside the scope of this Certificate).
- a check is carried out on the combinations of horizontal and vertical actions, in accordance with BS EN 1999-1-1 : 2007, BS EN 1999-1-3 : 2007, BS EN 1993-1-1 : 2005 and BS EN 1993-1-4 : 2006, and their UK National Annexes, in conjunction with BS EN 1990 : 2002 and all relevant standard parts and its corresponding UK National Annex.

6.5 The supporting substrate wall must be able to resist the full wind, as well as any racking loads, on its own. No contribution from the cladding and the systems may be assumed in this respect.

6.6 The number of wall brackets used will be dependent on the weight of the cladding to be supported and is determined on a project-specific basis by the designer.

6.7 Details of the brackets, with their design resistance, are shown in Table 3. The design resistance of the fixings between components of the systems must be greater than the design resistance as tabulated.

6.8 The design of the rails and associated connections should be such as to satisfy the requirement of BS EN 1999-1-1 : 2007, using the mechanical properties of the aluminium grade adopted. Mid-span deflections should be limited to $L/200$ and cantilever deflections limited to $L/150$.

6.9 In general, the rails should be fixed at mid-length using normal clearance holes (fixed point) and allowed to expand toward the ends using slotted holes (flexible or sliding point) (see Figure 1). To allow for expansion, a minimum gap of 2.5 mm per metre length should be provided. For standard three-metre long rails, a gap of 8 mm between adjacent rails is adequate. For calculation purposes, the coefficient of thermal expansion for aluminium may be taken as $23 \times 10^{-6} \text{ K}^{-1}$.

Table 3 Bracket design resistance⁽¹⁾

Code	Design resistance (F_{RD}) (kN)	
	Vertical	Horizontal
<i>MFT-MFIM bracket – medium</i>		
2029626	5.28	2.26
2029341	3.17	2.26
2029344	1.98	2.26
2029347	1.44	2.26
2029350	1.13	2.26
2029352	0.93	2.26
2029355	0.79	2.26
2029358	0.69	2.26
2029361	0.61	2.26
<i>MFT-MFIL bracket – large</i>		
2029623	15.97	4.17
2029249	9.58	4.17
2029343	5.99	4.17
2029346	4.35	4.17
2029349	3.42	4.17
2029351	2.82	4.17
2029354	2.39	4.17
2029357	2.08	4.17
2029360	1.84	4.17
<i>MFT-FOX HI</i>		
2084321	2.98	2.43
2084324	2.07	2.43
2084327	1.58	2.43
2084330	1.27	2.43
2084333	1.07	2.43
2084336	0.92	2.43
2084339	0.81	2.43
2084342	0.72	2.43
2084345	0.65	2.43
2084348	0.59	2.43
2084351	0.54	2.43
2084354	0.50	2.43
2084357	0.46	2.43
<i>X-Fox bracket – medium</i>		
2029363	0.51	1.65
2029768	0.50	1.65
2029773	0.48	1.65
2029777	0.45	1.65
2029781	0.38	1.65
<i>X-Fox bracket – large</i>		
2029362	1.02	3.30
2029766	1.00	3.30
2029771	0.96	3.30
2029775	0.90	3.30
2029779	0.76	3.30
<i>MFT-MWM bracket – medium</i>		
2030896	0.43	0.43
2030892	0.43	0.43
<i>MFT-MWL bracket – large</i>		
2030894	0.86	0.86
2030891	0.86	0.86

Table 3 Bracket design resistance⁽¹⁾ (continued)

Code	Design resistance (F_{RD}) (kN)		
	Horizontal		Vertical
	Tension	Compression	
<i>MFT FOX VI/V S 6.5 bracket – small⁽²⁾</i>			
2305768/2305906	2.46	4.63	-
2305769/2305907	2.52	5.41	-
2305892/2305908	2.50	4.23	-
2305893/2305909	2.53	3.29	-
2305894/2305910	2.63	2.92	-
2305895/2305911	2.65	2.32	-
2305896/2305920	2.60	1.85	-
2305891/2305919	2.83	2.37	-
2305890/2305918	2.79	2.10	-
2305889/2305917	2.85	1.61	-
2305888/2305916	2.80	1.85	-
2305887/2305921	2.94	1.59	-
2305886/2305922	2.91	1.38	-
2305885/2305915	2.88	1.33	-
<i>MFT FOX VI/V S 11 bracket – small⁽²⁾</i>			
2305884/2305914	2.46	4.63	-
2305883/2305913	2.52	5.41	-
2305882/2305912	2.50	4.23	-
2305881/2305994	2.53	3.29	-
2305880/2305767	2.63	2.92	-
2305897/2305993	2.65	2.32	-
2305898/2305992	2.60	1.85	-
2305899/2305991	2.83	2.37	-
2305900/2305990	2.79	2.10	-
2305901/2305989	2.85	1.61	-
2305902/2305988	2.80	1.85	-
2305903/2305987	2.94	1.59	-
2305904/2305986	2.91	1.38	-
2305905/2305985	2.88	1.33	-
<i>MFT FOX VI/V M 6.5/11 bracket – medium</i>			
2305984/2305964	2.91	12.61	3.42
2305983/2305970	2.99	13.01	3.57
2305982/2305969	2.95	10.10	3.36
2305981/2305968	2.79	7.62	3.07
2305980/2305967	2.85	6.56	2.81
2305979/2305966	2.84	5.28	2.32
2305978/2305965	2.77	3.97	1.95
2305977/2305963	3.04	4.70	2.24
2305976/2305962	3.12	3.77	1.93
2305975/2305961	3.16	3.08	1.68
2305974/2305960	3.27	3.50	1.81
2305973/2305959	3.04	2.95	1.60
2305972/2305958	3.20	2.54	1.43
2305971/2305957	3.21	2.42	1.36

Table 3 Bracket design resistance⁽¹⁾ (continued)

Code	Design resistance (F _{RD}) (kN)		
	Horizontal	Vertical	
	Tension	Compression	
<i>MFT FOX VI/VL 6.5/11 bracket – large</i>			
2305950/2305936	2.88	12.57	3.53
2305949/2305935	3.09	14.03	3.37
2305948/2305934	3.16	12.09	3.49
2305947/2305933	3.03	9.80	3.50
2305946/2305932	3.12	8.60	4.03
2305945/2305931	3.23	7.25	4.44
2305944/2305930	3.19	5.86	3.75
2305943/2305929	3.34	7.45	4.19
2305942/2305928	3.27	6.13	3.85
2305941/2305927	3.30	5.11	3.42
2305940/2305926	3.41	5.84	3.50
2305939/2305925	3.38	5.01	3.16
2305938/2305924	3.31	4.34	2.87
2305937/2305923	3.47	4.19	2.73

Code	Design resistance (F _{RD}) (kN)			
	Bracket		Bracket + Adapter plate	
	Vertical	Horizontal	Vertical	Horizontal
<i>MFT S2S UI/U bracket – medium⁽²⁾</i>				
2158286/2158418	-	24.55	-	-
2158287/2158419	-	24.55	-	-
2158288/2158420	-	24.55	-	-
2158289/2158421	-	24.55	-	-
2158410/2158422	-	24.55	-	-
2158411/2158423	-	24.55	-	-
2158412/2158424	-	24.55	-	-
2158413/2158425	-	24.55	-	-
2158414/2158426	-	24.55	-	-
2158415/2158427	-	24.55	-	-
2158416/2158428	-	24.55	-	-
2158417/2158429	-	24.55	-	-
<i>MFT S2S UI/U bracket – large</i>				
2157966/2158388	23.59	18.68	32.07	25.76
2157967/2158389	19.92	18.63	28.94	25.70
2157968/2158390	16.48	18.54	25.30	25.66
2157969/2158391	13.75	18.45	21.66	25.62
2158380/2158392	11.93	18.35	18.03	25.58
2158381/2158393	10.11	18.27	15.30	25.52
2158382/2158395	8.75	18.17	12.57	25.48
2158383/2158396	7.38	18.09	10.75	25.44
2158384/2158397	6.47	17.99	9.39	25.40
2158385/2158398	5.56	17.91	8.02	25.34
2158386/2158399	5.11	17.81	7.11	25.30
2158387/2158394	4.65	17.77	6.22	25.26

(1) Achieved with anchor fixings.

(2) For horizontal loads only.

Impact loading

6.10 The impact resistance of a cladding system is a function of the support framing arrangement and the cladding panel used. The building designer must ensure that the cladding system incorporating Hilti EuroFox Rainscreen Cladding Support Systems has adequate impact resistance for the support frame arrangement and cladding panels used.

7 Behaviour in relation to fire



7.1 The aluminium brackets, rails, and associated rail-to-bracket fixings have an A1 reaction to fire classification in accordance with BS EN 13501-1 : 2007 and are not subject to any restriction in building height or proximity to boundary as defined in the national Building Regulations.



7.2 Hilti EuroFox brackets incorporate polypropylene or PVC insulation pads, which are used to reduce the risk of cold bridging across the bracket/wall interface. As they are largely protected by the cladding panels and considered to be present in relatively small quantities, they are unlikely to significantly affect the overall fire performance of the cladding.

7.3 Designers should refer to the relevant national Building Regulations and guidance for detailed conditions of use, particularly in respect of requirements for cavity barriers, service penetrations, substrate fire performance and combustibility limitations for other materials and components used in the overall wall construction (for example, thermal insulation).

8 Drainage and ventilation

8.1 The systems, when incorporated in back-ventilated and drained cavity rainscreen cladding systems, will not have an adverse effect on the removal of water from the cavity by drainage and ventilation.

8.2 For the effective removal of moisture from the cavity, a minimum ventilation area of 5000 mm² per metre run of cladding must be provided at the building base point and at the roof edge. To prevent the ingress of birds, vermin, insects and/or rain, all ventilation openings should be suitably protected with a ventilation protection mesh, perforated sheet or similar, or should be baffled.

8.3 The minimum cavity width created by the support systems between the back of the specified cladding panels/tiles and the supporting wall must be a minimum of 38 and 50 mm for cladding panels with baffled or labyrinth joints, and open joints, respectively, in accordance with the requirements of the NHBC.

9 Maintenance

The systems themselves do not require special maintenance. However, they should be inspected annually to ensure that rainware is complete and in good order and that the cladding panels are in place and secure.

10 Durability



10.1 The systems, when used as prescribed in this Certificate, can be expected to have a service life in excess of 35 years in normal UK conditions.

10.2 Unprotected aluminium interacts with cement-based materials, resulting in severe corrosion. Therefore, aluminium brackets should be used with polypropylene or PVC isolator pads when used in masonry walls.

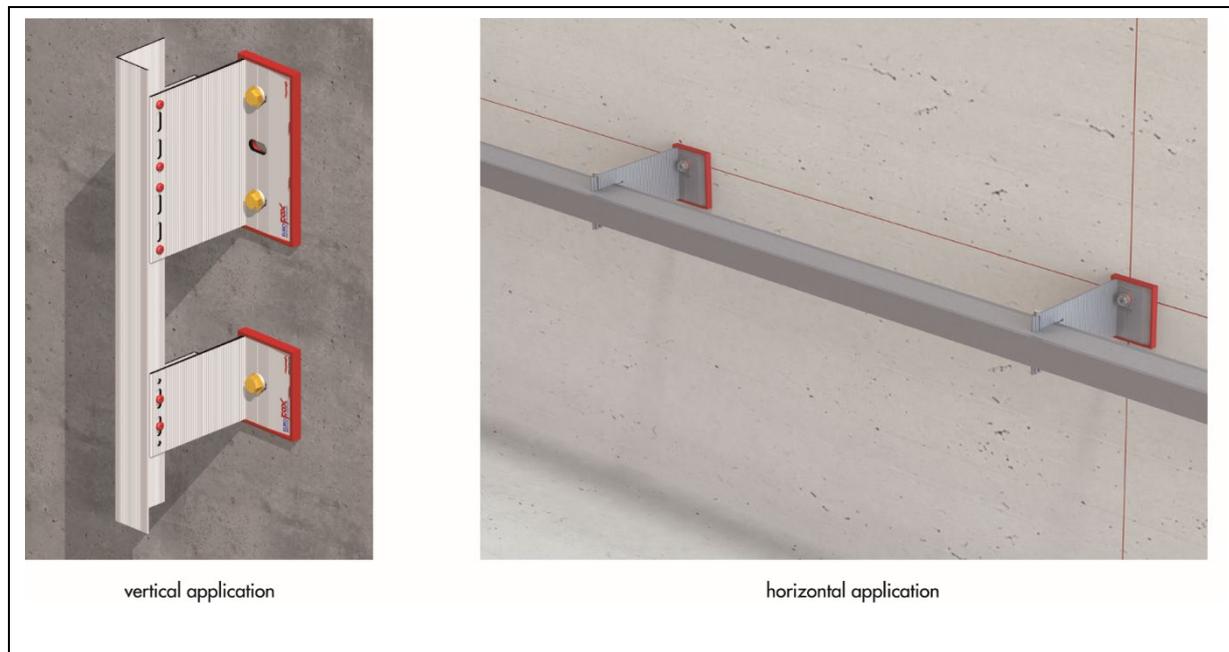
11 Reuse and recyclability

The aluminium and polypropylene components of the systems can be readily recycled.

12 General

12.1 The systems must be installed in accordance with the Certificate holder's recommendations, the requirements of this Certificate and specifications laid down by the consulting engineer. Typical applications are shown in Figure 3.

Figure 3 Typical rail/bracket arrangement



12.2 Installers must be approved by the Certificate holder, who can provide technical assistance at the design stage and at the start of the installation.

13 Procedure

13.1 Based on a preliminary survey of the wall and architectural/structural design, a grid layout for the sub-frame is first prepared.

13.2 The brackets (with/without the isolator pad) are fixed to the substrate wall using fixings of appropriate type and size as determined by design application (see sections 1.4 and 6.2). Where required, adapter plates are used.

13.3 The rails are inserted into the brackets and, after adjustment for line and level, are fixed to them using self-drilling stainless steel screws, or rivets, as determined by design.

13.4 Where rails are installed vertically, they are normally attached to the substrate wall to span one storey height. They are normally anchored at mid-span using the round holes in the brackets (fixed point/dead loads), and allowed to expand at the ends using the elongated holes in the brackets (flexible point).

13.5 Where specified, insulation should be tightly butted around the brackets and secured to the substrate wall using the appropriate fixings.

13.6 The cladding panels deemed to be compatible with the support system are appropriately fixed to the vertical or horizontal rail profiles.

14 Investigations

14.1 An assessment was made of the systems' resistance to wind and impact loading, reaction to fire and durability.

14.2 An assessment was made of the systems' behaviour in relation to fire.

14.3 The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Bibliography

BS EN 573-3 : 2019 *Aluminium and aluminium alloys — Chemical composition and form of wrought products — Chemical composition and form of products*

BS EN 1990 : 2002 + A1 : 2005 *Eurocode — Basis of structural design*

NA to BS EN 1990 : 2002 + A1 : 2005 UK National Annex for *Eurocode — Basis of structural design*

BS EN 1991-1-4 : 2005 + A1 : 2010 *Eurocode 1 — Actions on structures — General actions — Wind actions*

NA to BS EN 1991-1-4 : 2005 + A1 : 2010 UK National Annex for *Eurocode 1 — Actions on structures — General actions — Wind actions*

BS EN 1993-1-1 : 2005 + A1 2014 *Eurocode 3 — Design of steel structures — General rules and rules for buildings*

NA to BS EN 1993-1-1 : 2005 + A1 2014 UK National Annex for *Eurocode 3 — Design of steel structures — General rules and rules for buildings*

BS EN 1993-1-4 : 2006 + A1 : 2016 *Eurocode 3 — Design of steel structures — General rules — Supplementary rules for stainless steels*

NA to BS EN 1993-1-4 : 2006 + A1 2016 UK National Annex for *Eurocode 3 — Design of steel structures — General rules — Supplementary rules for stainless steels*

BS EN 1999-1-1 : 2007 + A2 : 2013 *Eurocode 9 — Design of aluminium structures — General structural rules*

BS EN 1999-1-3 : 2007 *Eurocode 9 — Design of aluminium structures — Structures susceptible to fatigue*

NA to BS EN 1999-1-3 : 2007 UK National Annex for *Eurocode 9 — Design of aluminium structures — Structures susceptible to fatigue*

BS EN 13501-1 : 2007 *Fire classification of construction products and building elements — Classification using test data from reaction to fire tests*

EN 10088-1 : 2005 *Stainless steels — List of stainless steels*

ETA 07/0219 : *European Technical Approval — Hilti frame anchor HRD*

ETA 08/0307 *European Technical Approval — Hilti screw anchor HUS*

ETA 18/0880 *European Technical Approval — Hilti S-MD; Hilti S-MP; Hilti S-MS*

ETA 10/0005 *European Technical Approval — Hilti concrete screw HUS*

ETA 10/0182 : *European Technical Approval — Fastening screws S-MD, S-MP and S-MS*

ETA 11/0374 : *European Technical Approval — Hilti stud anchor HSA*

ETA 98/0001 : *European Technical Approval — Hilti stud anchor HST*

ETAG 020 : 2012 *Guideline for European Technical Approval — Plastic anchors for multiple use in concrete and masonry for non-structural applications*

15 Conditions

15.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page – no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document – it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

15.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

15.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

15.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

15.5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

15.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.