SINTEF

SINTEF Certification

No. 2137

Technical Approval

Issued first time: 15.09.1997
Revised: 07.11.2019
Amended: 14.06.2021
Valid until: 01.12.2025
Provided listed on www.sintefcertification.no

SINTEF confirms that

SFS Fastening System

has been found to be fit for use in Norway and to meet the provisions regarding product documentation given in the regulation relating to the marketing of products for construction works (DOK) and regulations on technical requirements for building works (TEK), with the properties, fields of application and conditions for use as stated in this document

1. Holder of the approval

SFS intec AS
Fjellboveien 3,
NO-2016 Frogner
www.sfsintec.biz/no

2. Product description

SFS Fastening System consists of plastic washers with integrated sleeve (fastening plugs), steel washers for fastening in the roofing membrane, and accompanying nails and screws for fastening in the underlying roof. The components of the system are illustrated in Fig. 1 - 29, and include the following:

- *isotak*® fastening plugs Fig. 1-8
- SFS steel washers Fig. 9-14
- SFS screws for metal sheets Fig. 15-18
- SFS wooden screw Fig. 19-20
- SFS DT 4,8, SFS DT 6,3 Fig. 21-22
- SFS concrete screws Fig. 23-27
- SFS concrete nail Fig. 28
- *isotak*® for light weight concrete Fig. 29

isotak®fastening plugs are made of injection moulded polypropylene.

3. Fields of application

SFS Fastening System is used for mechanical fixing of bitumen- and plastic-based roofing membranes, on roofs made of profiled steel sheets, concrete, light weight concrete, or wooden materials.

4. Properties

Anchorage capacity

Table 2 and 3 shows recommended design capacities for the fastening in various roofing materials with plastic washers with integrated sleeve (fastening plugs) or steel washers.

Table 4 shows anchorage capacities for screws when fastening into steel sheets. Table 5 and 6 show anchorage capacities for screws and nails for fastening into substructures of concrete or light weight concrete.

Safety against self-unscrewing

Safety against self-unscrewing has been tested in accordance with NBI Method 162/90. The following screws are classified as being safe against self-unscrewing:

- SFS BS-4.8
- SFS BS-6.1
- SFS IR2.

Protection against corrosion

Table 1 shows the corrosion protection for the individual components of the fastening system, and the corresponding application categories as given in Building Research Design Guide No. 544.206 *Mekanisk feste av asfalt takbelegg og takfolie på flate tak*.

Durocoat corrosion protection is a multi-layer organic coating, applied and hardened at high temperature. Used together with aluminium or stainless-steel washers, the coating is assessed to give acceptable low risk for galvanic corrosion when applied in category KLA.

Application properties

The use of SFS Fastening System has been considered to be acceptable in relation to the following:

- Installation at temperatures down to –20°C.
- Oblique loading when used at the edge of membrane sheets or at flaps.
- Impact resistance at loads caused by movements in the membrane.
- Torch-on welding and moderate drying-out of asphalt roofing felt.
- Ageing in connection with PVC roofing sheet and asphalt roof covering.

Table 1
Application category as specified in SINTEF's Building Research Design Guide 544.206

Fastener	Corrosion protection	Appl. category
Steel washers		
SFS MW-40-F and FH	20 μm AlZn	KL
SFS MW-40-F	Stainless	KLAM
SFS MW-40-R	20 μm AlZn	KL
SFS MW-40-LBS	20 μm AlZn	KL
SFS IR-82x40	20 μm AlZn	KL
SFS ID-70x70	20 μm AlZn	KL
Screws for steel sheets		
SFS BS-4.8	Durocoat	KLA
SFS BS-6.1	Durocoat	KLA
SFS IR2-4.8	Durocoat	KLA
SFS IR2-S-4.8	Stainless, A4	KLAM
SFS BS3-4.8	Durocoat	KLA
SFS BS-S-4.8	Stainless, A4	KLAM
Screws for wood		
SFS IWF-5.2	Durocoat	KLA
SFS TS-6.0	Durocoat	KLA
Nails and screws for concrete and light weight concrete		
SFS DT	Durocoat	KLA
SFS DT-S	Stainless, A4	KLAM
SFS concrete screw TI/TIF	Durocoat	KLA
SFS concrete nail (BN-S)	Stainless, A2	KLAM
SFS LBS	Durocoat	KLA

5. Environmental aspects

Substances hazardous to health and environment

SFS Fastening System contains no hazardous substances with priority in quantities that pose any increased risk for human health and environment. Chemicals with priority include CMR, PBT or vPvB substances

Effect on soil, surface water and ground water

The leaching properties of SFS Fastening System are evaluated to have no negative effects on soil or ground water.

Waste treatment/recycling

SFS Fastening System shall be sorted as residual waste on the building/demolition site. The product shall be delivered to an authorized waste treatment plant for disposal.

Environmental declaration

No environmental declaration (EPD) has been worked out for SFS Fastening System.

6. Special conditions for use and installation

Anchorage capacity

The number of fastening points shall be calculated as shown in SINTEF's Building Research Design Guide No. 544.206, and in "TPF Informs No. 5" published by "Takprodusentenes Forskningsgruppe" and, based on anchorage capacities given in table 2 - 6.

The given design capacities are partly based on testing according to NT Build 307 and partly on testing according to EN 16002.

When the values in Tables 4 - 6 are lower than corresponding values in Table 2 and 3, the lower value must be used.

Fastening in concrete

For SFS DT 4,8, the drill hole diameter shall be 4.8 mm, and the depth minimum 35 mm. The anchorage depth shall be minimum 25 mm.

For SFS DT 6,3, the drill hole diameter shall be 6.3 mm, and the depth minimum 40 mm. The anchorage depth shall be minimum 32 mm.

For concrete screws SFS TI, TIA and TIF the drill hole diameter shall be 5.0 mm. The drill hole depth should be 30 mm, unless special precautions are taken regarding inspection. Minimum anchorage depth shall be 20 mm.

When fastening in concrete with SFS BN-S concrete nails the drill hole diameter shall be 5 mm. The drill hole depth should be 30 mm, unless special precautions are taken regarding inspection. Minimum anchorage depth shall be 20 mm.

This means that fixings in 50 mm thick concrete, without penetration, require very precise length/depth control.

Fastening in light weight concrete and aerated concrete

When installing SFS LB-45 expanding plug in aerated concrete the drill hole diameter shall be 15 mm, and the drill hole depth minimum 65 mm.

When installing screws SFS LBS the drill hole depth shall be minimum 60 mm.

Fastening in metal sheets

Load bearing profiled steel sheets must be at least 0.7 mm thick when roofing membranes are to be fastened directly to the sheets. In places with high wind conditions, 0.8 mm thickness is recommended in order to ensure sufficient anchorage for the screws.

Fastening in wood and wood-based boards

When fastening in wood and wooden boards, SFS screws for wood IWF-5,2 or TS-6,0 shall be used. No pullout values are given for these screws as long as pullout tests shall usually be performed on site.

Washers and fastening plugs

Fastening plugs with good telescope effect, minimum 30 mm, shall be used on underlays of mineral wool.

Re-roofing

In cases of re-roofing, where it may be difficult to assess the quality of the substructure, SINTEF generally recommends to perform pull-out tests on site.

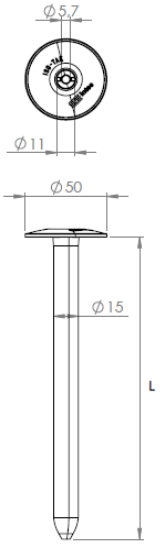

Fig.1
isotak® R50xL
Fastening plug
(figure SFS)

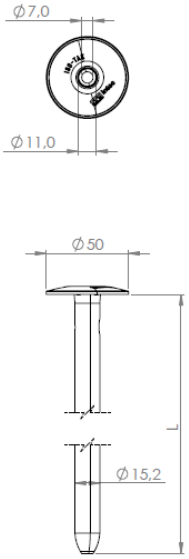

Fig.2
isotak® RG50xL
Fastening plug
As R45, but adapted for use together with lightweight concrete screw LBS-T25-8,0
(figure SFS)

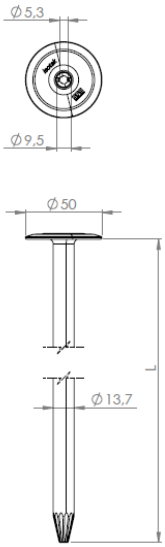

Fig.3
isotak® RP50xL
Fastening plug
(figure SFS)

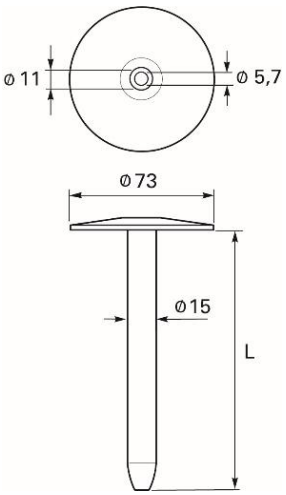

Fig. 4
isotak® R75xL
Fastening plug

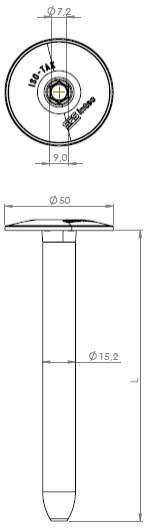

Fig. 5
isotak® RH-50
Fastening plug
As R-50, but adapted for use together with concrete screw TIF-6.3
(figure SFS)

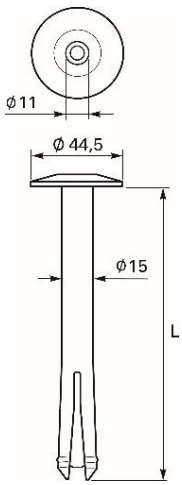

Fig. 6
isotak® LB-45xL
Light weight concrete expanding plug

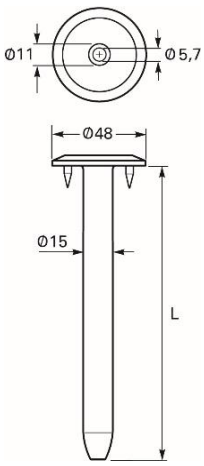

Fig. 7
isotak® R48xL-3N
Fastening plug with three studs

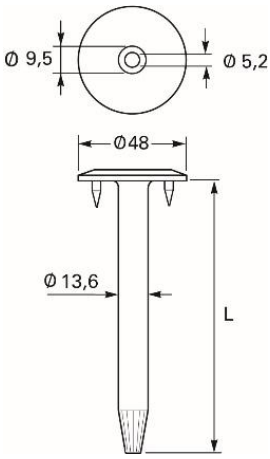

Fig. 8
isotak® RP48xL-3N
Fastening plug with three studs

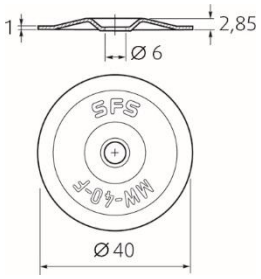

Fig. 9
SFS MW-40-F
Steel washers

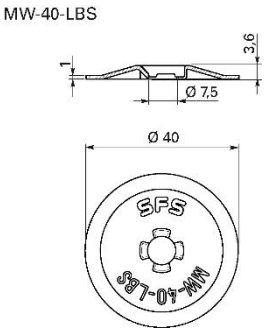

Fig. 10
SFS MW-40-LBS
Steel washers like MW-40-F, but adapted togheter with screw for light weight concrete
LBS-T25-8.0xL

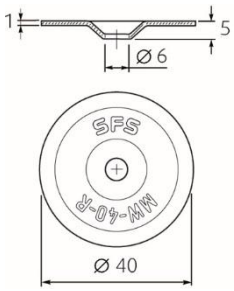

Fig. 11
SFS MW-40-R
Steel washers

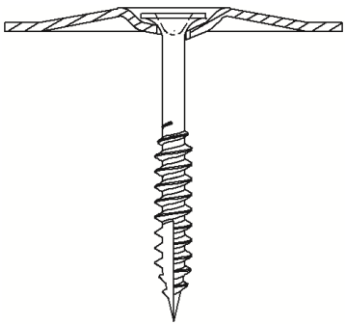

Fig. 12
SFS MW-40-FH
Steel washers supplied pre-assembled with
SFS IWF-5,2xL
screws for wooden surfaces

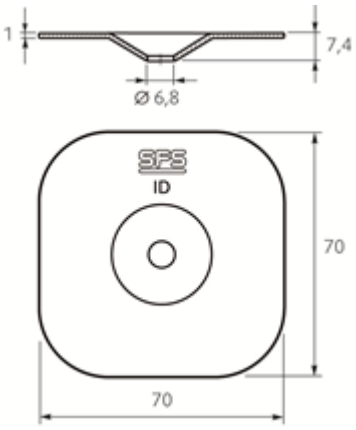

Fig 13
SFS ID-70 x 70
Steel washers

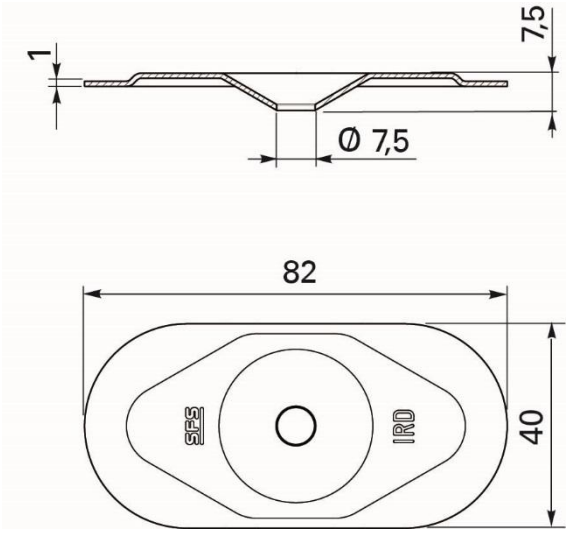

Fig. 14
SFS IRD-82x40
Steel washers

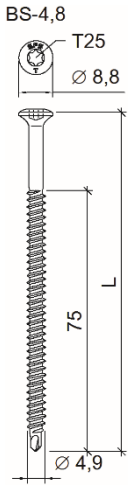

Fig. 15
SFS BS-4.8xL
Self-drilling screw for metal sheets with thickness 0,65-1,25 mm.
Exists also in
BS-S-4.8 as stainless A4

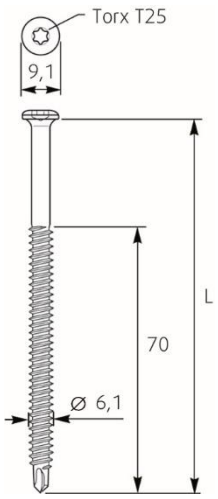

Fig. 16
SFS BS-6.1xL
Self-drilling screw for metal sheets with thickness 0,65-1,25 mm

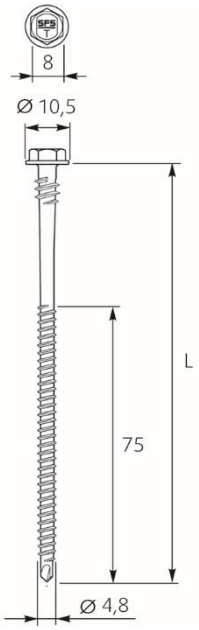

Fig. 17
SFS IR2-4.8xL
Self-drilling screw for metal sheets with thickness 0,65-1,25 mm

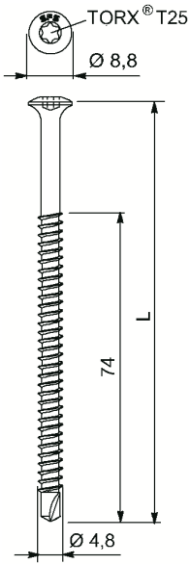

Fig. 18
SFS BS3-4.8xL
Self-drilling screw for metal sheets with thickness 1.0-1.5 mm

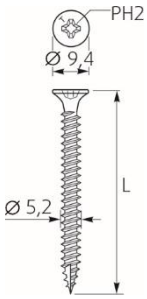

Fig. 19
SFS IWF-5.2xL
Screw for wood

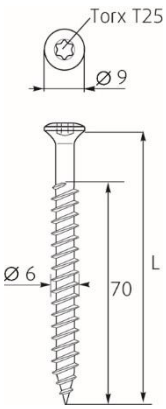

Fig. 20
SFS TS-T25-6,0xL
Screw for wood

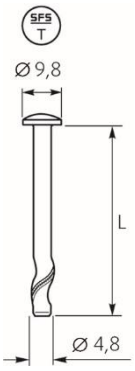

Fig. 21
SFS DT-4.8xL

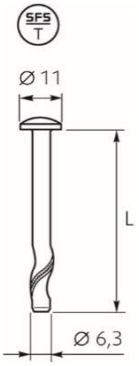

Fig. 22
SFS DT-6.3xL

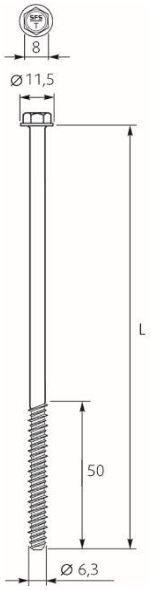

Fig.23
SFS TI 6,3
Screw for concrete

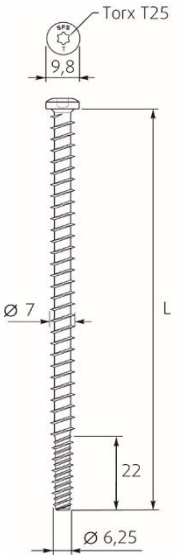

Fig.24
SFS TIA-T25-6,3xL
Screw for concrete used together with *isotak*® R45

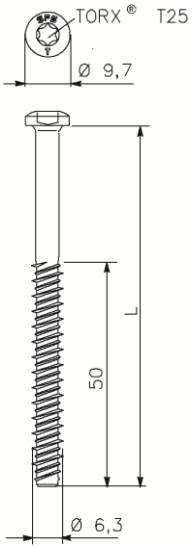

Fig. 25
SFS TI-T25-6-3xL
Screw for concrete

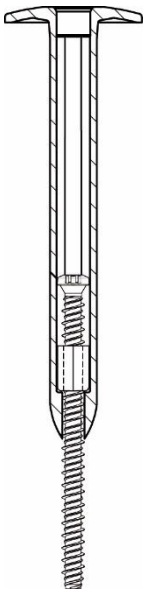

Fig. 26
SFS TIF-N-RH50
Screw for concrete with sleeve and nut. The fastener is telescopic and adjustable

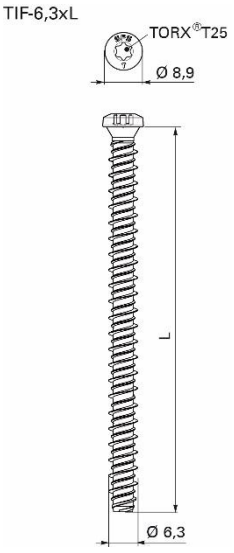

Fig. 27
SFS TIF-6.3xL
Screw for concrete.
Used toghether with sleeve and nut as shown in Fig. 25

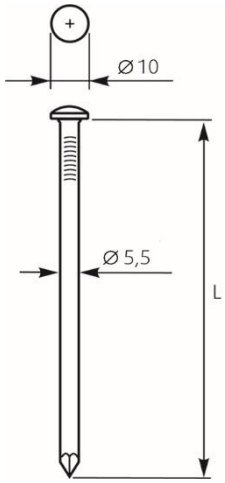

Fig. 28
SFS BN-S-5.5xL
Concrete nail

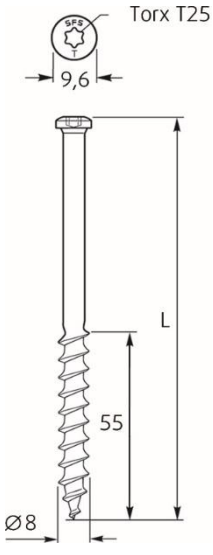

Fig. 29
SFS LBS-T25-8.0xL
Screw for light weight concrete

Table 2
Design capacities at ultimate-limit state given in N/pcs for *isotak*® Fastening System.
The capacities are given for various types of roofing materials, and must not exceed the design fastening capacities to the substructure *.

Roofing	Design capacity N/fastener[1)]			
	Fasteners of plastic			
	isotak® R / RG / RH50 / RP (and LB-45)	*isotak*® R75	*isotak*® R48-3N w/three studs	*isotak*® RP48-3N w/three studs
Bitumen roof covering:				
Icopal 2-layer	800	1400		1000
Icopal Mono PC	900			-
Isola Dobbeltlag (dual layer)	800			
Isola Mestertekk	900			1100
Isola Mestertekk Kombi single layer[2)]	900			
Derbigum SP single layer	900			1100
Derbigum Artic foundation	900			
Derbicolor Arctic single layer[3)]	1100			
Residek N4 5500 WSL[4)]	900			
Katepal Tupla	1050			
Eshaflex TOP Mono	850			
Mataki UnoTech FR[5)]	600			
Mataki Power FR[6)]	850			
Mataki Ettlags Sveisebelegg[7)]	600			
Index Supertekk				1100
Bauder double layer	600			
Phønix To-lag: Overlag PF/GF 5000 S in combination with: PF 3500 SBS PF/GF 3500 SBS 1046 PF/GF 3500 SBS PF 3500	 800 800 800 850			
SikaBit® Pro double layer[8)]	600			
SikaBit® Pro T-645 single layer[9)]	400			
NorBit Solo single layer[10)]	850			
NorBit double layer[11)]	850			
Polymeric membranes: *Fastened along membrane edge:*				
Protan SE, EX og EXG 1,2 mm	700	1400	1000	1000
Sarnafil S 328 1,2 mm	700			1000
Alkorplan 35076 1,2 mm	700			1000
Alkorflex 35096 1,2 mm	700			
Sikaplan 12 VG 1,2 mm	700			1050
Ektafol PV og PF+ (m/filt)				1000
Singleplan PVC takbelegg[12)]				700

Table 2, continued

Roofing	Design capacity N/fastener[1)]			
	Fasteners of plastic			
	isotak® R45 / RG45 / RH45 / RP45 (and LB-50)	*isotak*® R75	*isotak*® R48-3N w/three studs	*isotak*® RP48-3N w/three studs
Through membrane:				
Protan SE og EXG	1000			
Sarnafil S 328	1000			
Alkorplan 35076	1000			
Alkorplan 35096	1000			
Sikaplan 12 VG	1000			
Ektafol PV og PF+ (m/filt)	1000			
Through over-lap joint:				
Värnamo Superseal FR	1300			
Bauder Thermofol U15[13)]	400[14)]/600[15)]			
Roofing mebrane system throgh flips:				
Protan PreFab[16)]	950			

1) Design capacities are given for use in Norway and include a safety factor (γ_m) of 1,3
2) Capacity is documented in SINTEF Technical Approval 20084
3) Capacity is documented in SINTEF Technical Approval 20437
4) Capacity is documented in SINTEF Technical Approval 20657
5) Capacity is documented in SINTEF Technical Approval 20331
6) Capacity is documented in SINTEF Technical Approval 20576
7) Capacity is documented in SINTEF Technical Approval 20332
8) Capacity is documented in SINTEF Technical Approval 20688
9) Capacity is documented in SINTEF Technical Approval 20687
10) Capacity is documented in SINTEF Technical Approval 20617
11) Capacity is documented in SINTEF Technical Approval 20662
12) Capacity is documented in SINTEF Technical Approval 20545
13) Capacities is documented in SINTEF Technical Approval 20024
14) Capacity applies to R45xL
15) Capacity applies to RP45xL
16) Capacity is documented in SINTEF Technical Approval 2561

* Design capacities given in Table 2 and 3 shall be used both when the test results are given according to Nordtest method NT BUILD 307, according to EOTA ETAG 006 wind load procedure or EN 16002 when a national security factor 1.3 which is normally used in Norway.

Table 3
Design capacities at ultimate-limit state given in N/pcs. for SFS *isofast*® washers. The capacities are given for various types of roofing materials, and must not exceed the design fastening capacities to the substructure *.

Roofing	Design capacity N/fastener[1)]			
	Steel washers			
	SFS Washers MW 40-F and MW-40-LBS	SFS Washers MW 40-R	SFS IR-82 x 40 washer	SFS ID 70 x 70 washer
Bitumen roof covering:				
Icopal Base	800	800		
Icopal Mono PC	1200	1100		
Isola Kraftunderlag			1000	1500
Derbigum SP ett-lag	1100	1000		
Derbigum Artic underlag	800[2)]/900[3)]	800[2)]/850[3)]		
SikaBit® Pro double layer[4)]	500			
NorBit Solo single layer[5)]	900			
NorBit double layer[6)]	750			

Table 3, continued

Roofing	Design capacity N/fastener[1)]			
	Steel washers			
	SFS Washers MW 40-F and MW-40-LBS	SFS Washers MW 40-R	SFS IR-82 x 40 washer	SFS ID 70 x 70 washer
Polymeric membranes: *Fastened along membrane edge:*				
Protan SE og EXG	650	650	650	
Protan EX (med filt)	900			
Sarnafil S 328	650	650		
Alkorplan 35076	650	650	650	
Alkorflex 35096	650	650		
Sikaplan 12 VG	650	650	650	
Ektafol PV	650	650		
Ektafol PF+ (m/filt)	900	850		
Carbofol	650	650	650	
Through membrane:				
Protan SE og EXG	1000	1000	1100	1500
Sarnafil S 328	1000	1000		
Alkorplan 35076	1000	1000	1100	1500
Alkorplan 35096	1000	1000	1100	1500
Sikaplan 12 VG	1000	1000	1100	1500
Ektafol PV	1000	1000		
Ektafol PF+	1000	1000		
Carbofol	800	800	900	900
Through over-lap joint:				
Värnamo Superseal FR	1300			
Bauder Thermofol U15[7)]			650	

1) Design capacities are given for use in Norway and include a safety factor (γ_m) of 1,3
2) This value is used for 100 mm welded overlap joint in the lower layer of a dual-layer system
3) This value may be used for 120 mm welded overlap joints
4) Capacity is documented in SINTEF Technical Approval 20688
5) Capacity is documented in SINTEF Technical Approval 20617
6) Capacity is documented in SINTEF Technical Approval 20662
7) Capacity is documented in SINTEF Technical Approval 20024

* Design capacities given in Table 2 and 3 shall be used both when the test results are given according to Nordtest method NT BUILD 307, according to EOTA ETAG 006 wind load procedure or EN 16002 when a national security factor 1.3 which is normally used in Norway.

Table 4
SFS steel sheet screws. Design capacities at ultimate-limit state in N/fastener for fastening in profiled steel sheets

Steel sheet thickness mm	SFS BS 4.8 x L For steel sheet thickness 0.65 – 1.25 mm	SFS BS 6.1 x L For steel sheet thickness 0.65 – 1.25 mm	SFS IR2-4.8 x L For steel sheet thickness 0.65 – 1.25 mm	SFS BS3-4.8 x L For steel sheet thickness 1.0 – 1.5 mm
0.65	850	1300	850	
0.7	1000	1350	1000	
0.8	1350	1450	1350	
0.9	1650	1550	1650	
1.0	1800	1900	1800	1600
1.25		2300		

Table 5
SFS fasteners for concrete.
Design capacities* at ultimate-limit state in N/fastener

Fastener and roof structure	Design capacity (N/psc)
SFS 4,8 x L	1300
6,3 x L in 50 mm slab	2900
6,3 x L in solid structure.	3900
SFS TI, TIA and TIF *concrete screw* in 50 mm slab; quality B25 and setting depth 20 mm quality B25 and setting depth 15 mm	 2500 1200
SFS CS-6.1 concrete screw	1100
SFS BN-S-5,5 concrete nail	1300

Table 6
SFS fasteners for fastening in aerated concrete and light weight concrete. Design capacities* at ultimate-limit state in N/fastener

Fastener and roof structure	Design capacity (N/psc)
SFS LBS-T25-8.0xL Light weight concrete 450 kg/m³ Light weight concrete 500 kg/m³	 500 700
SFS LB45 light weight concrete plug Light weight concrete 450 kg/m³ Light weight concrete 500 kg/m³	 500 700

*) Capacities given in table 5 and 6 require pre-drilling of holes with high accuracy. This means that equipment with guide bar has to be used.

7. Factory production control

SFS Fastening System is produced by SFS AG, Switzerland. Approved manufacturers are given in the product control description.

The holder of the approval is responible for the factory production control in order to ensure that the product is produced in accordance with the preconditions applying to this approval.

SFS Fastening System is subject to supervisory quality control according to contract regarding SINTEF Technical Approval.

SFS intec AG, Switzerland, is certified according to EN ISO 9001:2015 and EN ISO 14001:2015.

8. Basis for the approval

SFS fastening system

Fastening capacities in the roofing membranes are based on system testing in accordance with the test methods NT Build 307 and NBI 162/90, supplemented by comparable results from simplified tests according to NBI 163/91. Reports from the type testing are stored in SINTEF´s archive.

Fastening capacity in substructures made of steel sheets, concrete or aerated concrete has been tested in accordance with method NT Build 306. Reports from the typetesting are stored in SINTEF´s archive.

Corrosion protection of washers and screws has been tested in Kesternich chamber with 2.0 litres of SO_2 in accordance with DIN 50018, modified procedure. The test results are given in the following reports:

- The National Institute of Technology, report J. No. 320A-3586 (screws with Durocoat)
- Norwegian Building Research Institute, report O 8311-K2002, dated 23.09.2002. (Washer MW-40, Spike and screw IR2).
- BDA Keuringsinstituut B.V. Report 0138-L-02/3 dated 06.09.2002 and 0303-L-02 dated 02.11.2002 (washers)
- BDA Keuringsinstituut B.V. Report 0345-L-02 dated 30.10.2002 and 0303-L-02 dated 02.11.2002 (roof screws)
- Norwegian Building Research Institute. Report O 8310 - K2002 dated 23.09.2002 (*isotak*® Light Weight Concrete Screw)
- Versuchanstalt für Stahl, Holz und Steine, report 163013-1, dated 13.07.2016 (design capacity)
- IPU Ingenieurgesellschaft Karlsrue mbH, memorandum dated 23.06.2017 (design capacity)
- SINTEF report 102000859-2 2017 00506, *Design capacities and safety against self-unwinding,* dated 08.11.2017 (design capacity and self-unwinding)

The durability of *isotak*® Fastening Plugs used together with bituminous and polymer membranes has been tested by Norwegian Building Research Institute, report O 3469C dated 23.11.1989.

9. Marking

All components of the fastening system must be marked with name or symbol/abbreviation, for instance «SFS». All packaging shall be marked with the name of the holder of the approval, product name and time of production. The approval mark for SINTEF Technical Approval No. 2137 may also be applied.

9. Marking

All components of the fastening system must be marked with name or symbol/abbreviation, for instance «SFS». All packaging shall be marked with the name of the holder of the approval, product name and time of production.

SFS Fastening System is CE-marked according to ETA 08-0262

The approval mark for SINTEF Technical Approval No. 2137 may also be applied.

Approval mark

10. Liability

The holder/manufacturer has sole product responsibility according to existing law. Claims resulting from the use of the product cannot be brought against SINTEF beyond the provisions of Norwegian Standard NS 8402

for SINTEF

Hans Boye Skogstad
Approval Manager