

European Technical Assessment

ETA-23/0859
of 19/03/2024

General Part

Technical Assessment Body issuing the European Technical Assessment

SINTEF AS by its institute SINTEF Community

Trade name of the construction product

SFS Flat roof fasteners

Product family to which the construction product belongs

Fasteners for mechanically fastened flexible roof waterproofing sheets

Manufacturer

SFS Group Schweiz AG
Division Construction
Rosenbergsaustrasse 10
CH-9435 Heerbrugg
Switzerland,
www.sfs.com

Manufacturing plants

Factories of SFS Group Schweiz AG

This European Technical Assessment contains

32 pages including 2 Annexes which form an integral part of this assessment

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of

EAD 030351-00-0402, Systems of Mechanically Fastened Flexible Roof Waterproofing Sheets

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Specific parts

1. Technical description of the product

SFS Flat roof fasteners are used as mechanical fastening of insulation, bitumen based single/multi-layer or single ply waterproofing membranes, or polymeric single ply waterproofing membranes, for flat roofing. The supporting roof structure may be of profiled steel sheets, aluminium sheets, concrete, aerated concrete, pumice panel or a timber-based construction as defined in EAD 030351-00-0402, February 2019, *Systems of mechanically fastened flexible roof waterproofing sheets* (MEFAWAS), paragraph 1.1.

The range of fasteners consists of washers, washers with integrated sleeve, screws, nails, and plugs as illustrated in Annex 1.

The fasteners are introduced to the market separately from the other components of roof waterproofing membrane kits, and this ETA covers only the performance characteristics of the *SFS Flat roof fasteners*. A separate ETA according to EAD 030351-00-0402 is necessary in order to cover an entire kit for mechanically fastened roof waterproofing sheets.

2. Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)

Installation and design:

2.1. General

The fasteners must be installed according to the manufacturer's instructions. It is the manufacturer's responsibility to provide correct information about the application of the products to the users.

Fastening with steel washers may be applied on stiff substrates, i.e. on timber-based roof substrate, non-compressible insulation or on concrete.

Plastic fasteners with integrated sleeve or step secured steel washers (steel washers together with screws equipped with a separate threading which avoid the washer to be pressed down) are recommended on thermal insulation.

Measures should be taken during design to ensure that galvanic corrosion between metal parts, especially between substrate and screw, does not occur. Likewise, use of insulation materials containing substances which can affect the performance of the fasteners must be avoided.

2.2. Fastening in steel sheets

Characteristic pull-out values and fixing details for the different fasteners, as well as material properties for steel substrates are given in table 1 found in annex 2 of this ETA. A site pull-out test is recommended if the properties of the steel sheet substrate are unknown.

2.3. Fastening in aluminium sheets

Characteristic pull-out values and fixing details for the different fasteners, as well as material properties for aluminium substrates are given in table 1 found in annex 2 of this ETA. A site pull-out test is recommended if the properties of the aluminium sheet substrate are unknown.

2.4. Fastening in timber-based constructions

Characteristic pull-out values and fixing details for the different fasteners, as well as material properties for timber-based construction substrates are given in table 2 found in annex 2 of this ETA. A site pull-out test is recommended if the properties of the timber-based substrate are unknown.

2.5. Fastening in concrete

Characteristic pull-out values and fixing details for the different fasteners, as well as material properties for concrete substrates are given in table 2 found in annex 2 of this ETA. A site pull-out test is recommended if the properties of the concrete substrate are unknown.

2.6. Fastening in aerated/light weight concrete

Characteristic pull-out values and fixing details for the different fasteners, as well as material properties for aerated/light-weight concrete substrates are given in table 2 found in annex 2 of this ETA. A site pull-out test is recommended if the properties of the aerated/light weight concrete substrate are unknown.

2.7. Fastening in pumice panel

Characteristic pull-out values and fixing details for the different fasteners, as well as material properties for pumice panel substrates are given in table 2 found in annex 2 of this ETA. A site pull-out test is recommended if the properties of the pumice panel substrate are unknown.

2.8. Working life/durability

The provisions made in this ETA are based on an assumed working life of the component of at least 10 years. The actual working life is also dependent on the design of the roof and the waterproofing systems.

The indications given on the working life cannot be interpreted as a guarantee given by the producer but has to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3. Performance of the product and references to the methods used for its assessment

3.1. Safety in case of fire

No performance determined.

3.2. Hygiene, health, and environment

The manufacturer declares that raw material, components, production processes and surface treatment are in accordance with current, relevant national and international regulations and laws.

3.3. Safety in use

The fasteners have been tested for axial pull out performance from substrates and pull through performance between fasteners and washers, see Annex 2. The fasteners have been tested for wind uplift according to EN-16002:2010, ETA Guideline No. 006 edition March 2000, amended November 2012 and EAD 030351-00-0402 The wind uplift performance of roof waterproofing kits is mainly determined by the roofing membranes. Several full-scale wind load tests with bituminous and polymeric membranes have been executed.

The membranes are fixed with washers, washers with integrated sleeves and barbed washers in combination with fixings to substrates of steel sheets, aluminium sheets, timber, concrete, aerated concrete, and pumice panel. The complete test reports may be obtained from SFS Group Schweiz AG.

The screws are considered safe against unwinding.

3.4. Aspects of durability

The SFS tube washers produced of polypropylene and polyamide satisfy the aspects of durability and have acceptable resistance to brittleness according to EAD 030351-00-0402, chapter 2.2.3.3 and A.2.3.

All metallic *SFS Flat roof fasteners* components correspond to corrosion protection according to EAD 030351-00-0402, chapter A.2.4, see Annex 2. Test-procedure for these products is 15 exposure cycles (humid atmosphere 2 litres of sulphur dioxide). Carbon steel fasteners have a corrosion protection of Chrome 6 free Durocoat®. Stainless steel fasteners are made in grade SS304/A2 or SS316/A4.

3.5. Identification

SFS Flat roof fasteners components are identified by dimensions, designation, drawings, performances, as given in annex 1 and 2 in this ETA. The components belonging to *SFS Flat roof fasteners* are marked with the designation according to figures in annex 1. All packaging is marked with product type and batch number, including CE marking.

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to Decision 98/143/EC by the European Commission, the system 2+ of assessment and verification of constancy of performance applies. See Annex V to Regulation (EU) No. 305/2011.

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at SINTEF AS.

Issued in Oslo on 19/03/2024

By

SINTEF AS by its institute SINTEF Community



Anne-Jorunn Enstad

Certification Manager

Annex 1

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TSU	26
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Sarnafast Tube SFT-50	27
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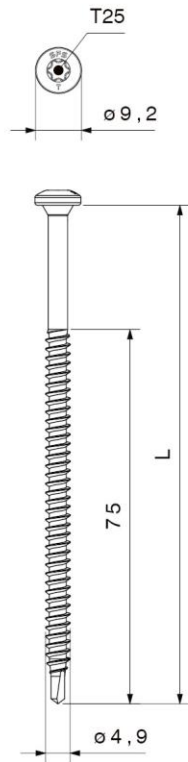
¹⁾ Single products without combinations

²⁾ For product drawing

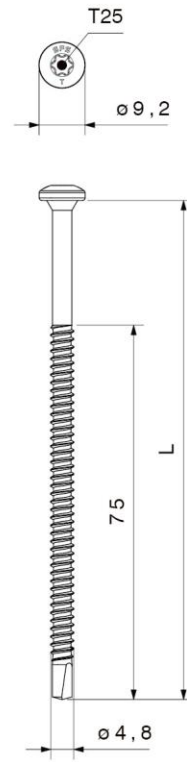
³⁾ Expanding plug (fastener) incl. sleeve

Fasteners

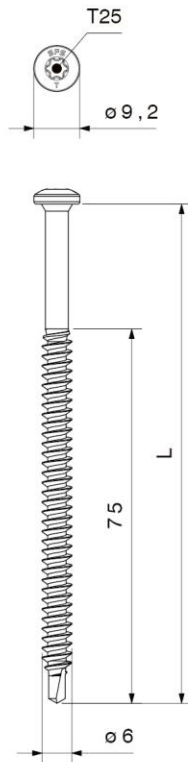
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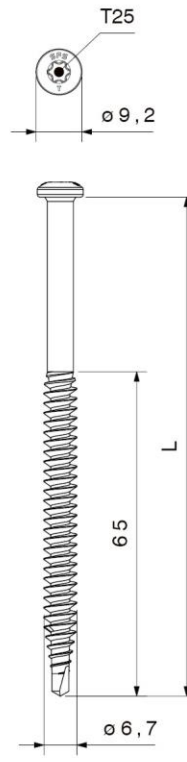
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BS-6,1



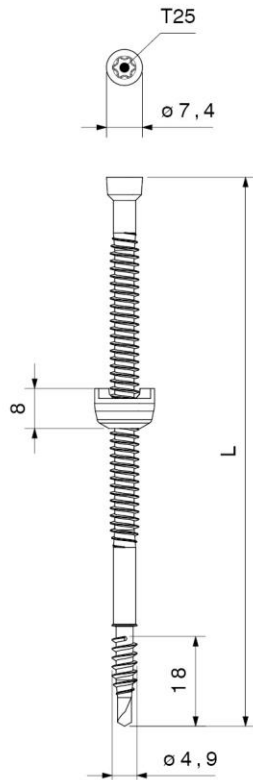
BS-6,7



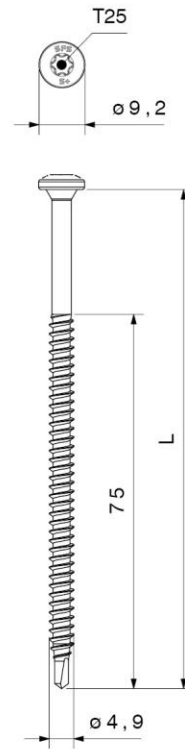
SFS Flat roof fasteners

Fasteners

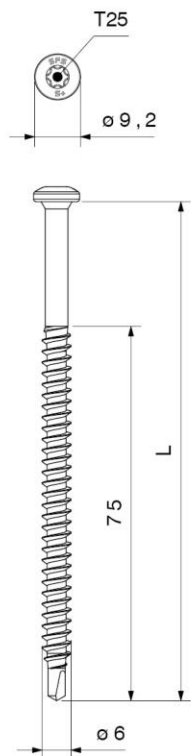
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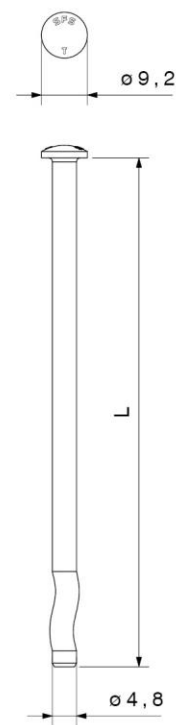
BS-S-4,8



BS-S-6,1



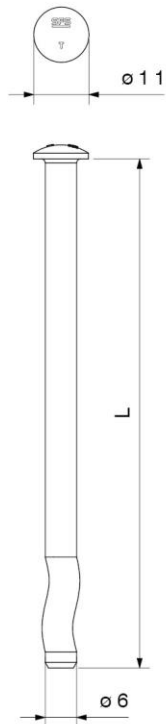
DT-4,8



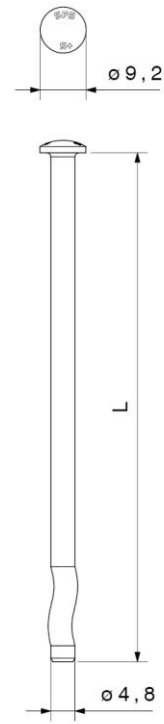
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Fasteners

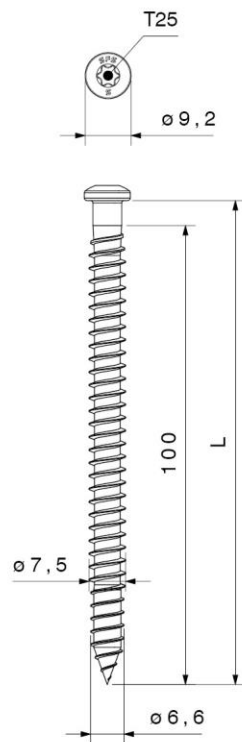
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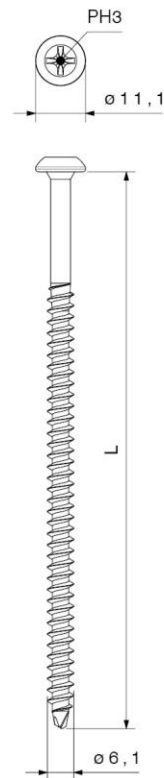
DT-S-4,8



FB-S-T25-7,5



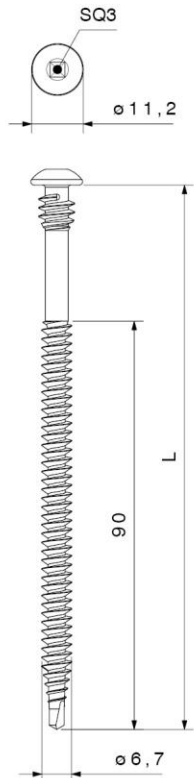
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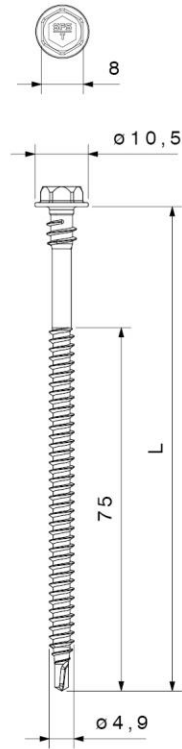
SFS Flat roof fasteners

Fasteners

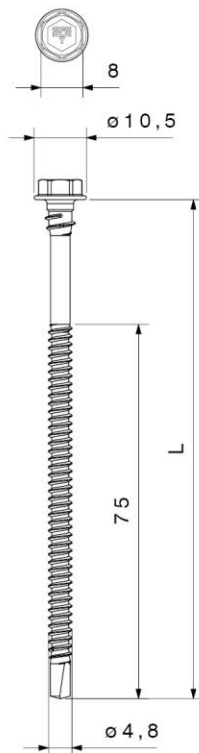
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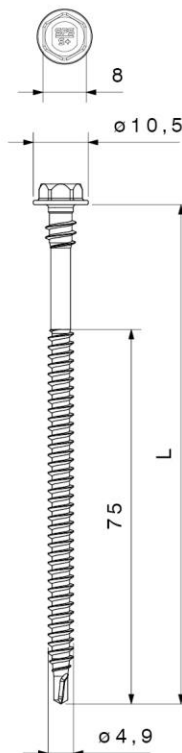
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IR3-4,8



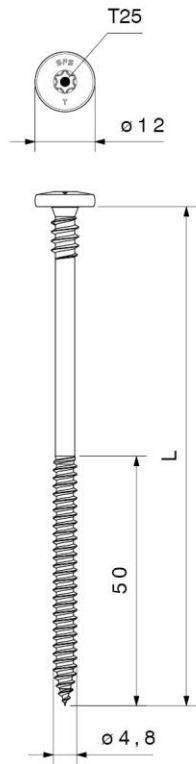
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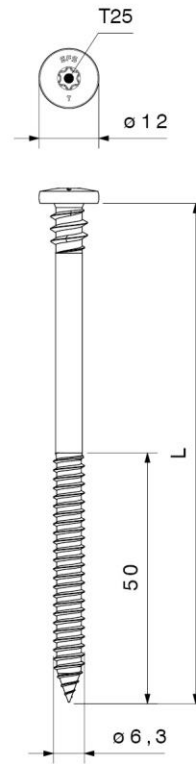
SFS Flat roof fasteners

Fasteners

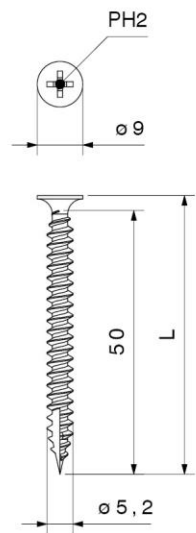
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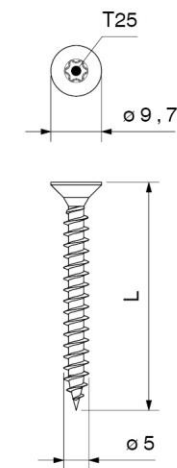
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IWF-5,2



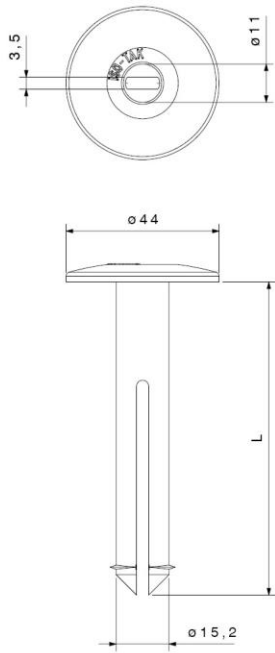
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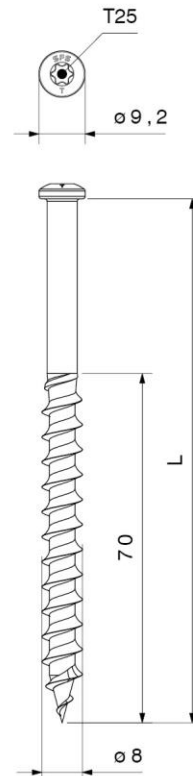
SFS Flat roof fasteners

Fasteners

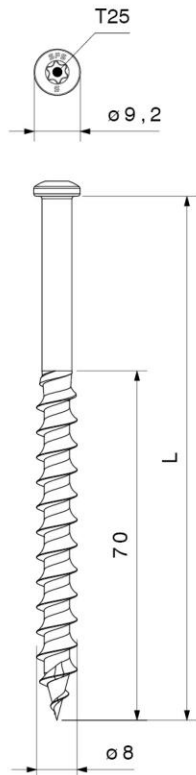
LB-45



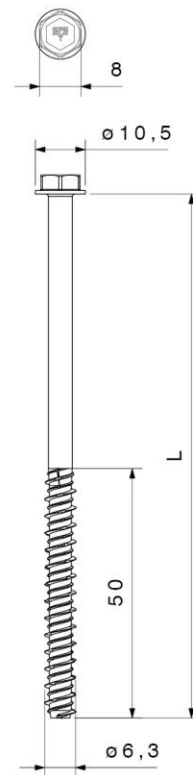
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LBS-S-T25-8,0



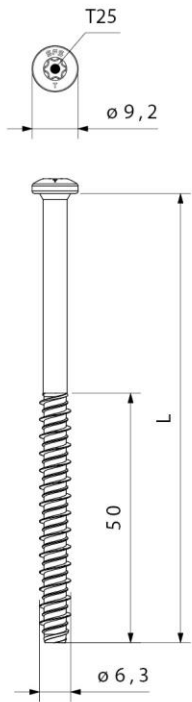
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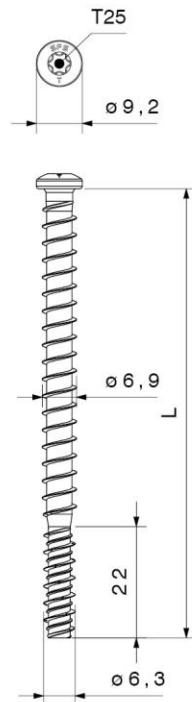
SFS Flat roof fasteners

Fasteners

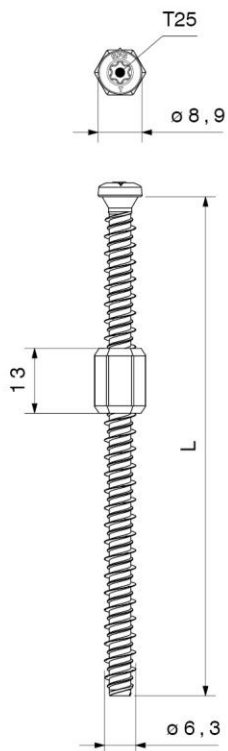
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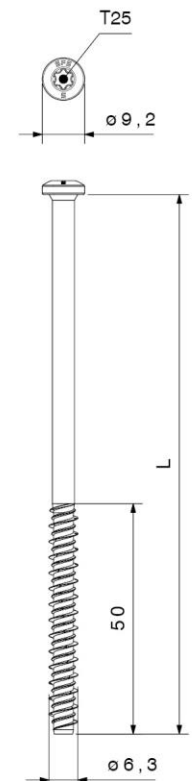
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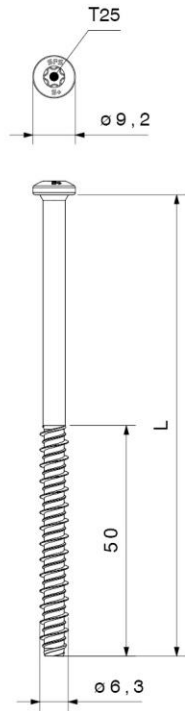
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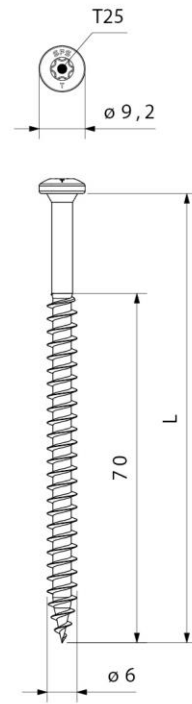
SFS Flat roof fasteners

Fasteners

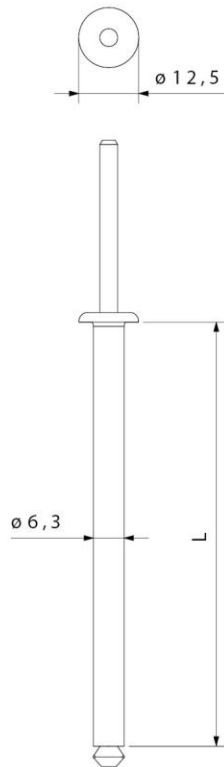
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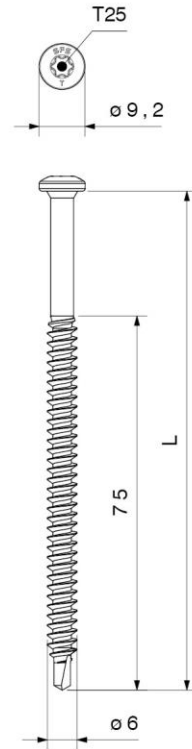
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TPR-L-6,3



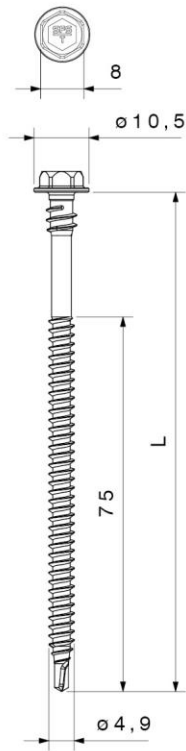
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SFS Flat roof fasteners

Fasteners

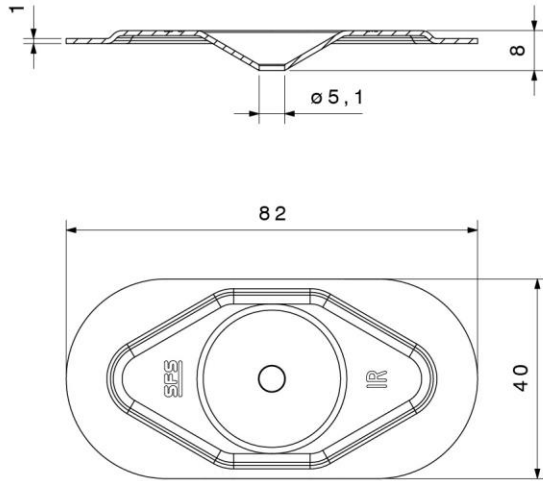
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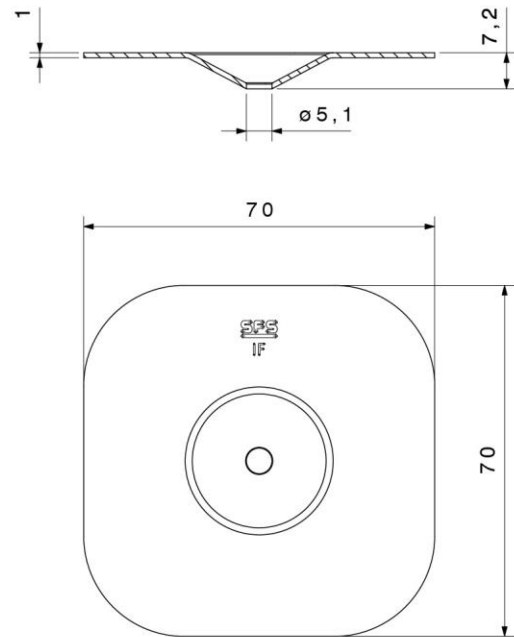
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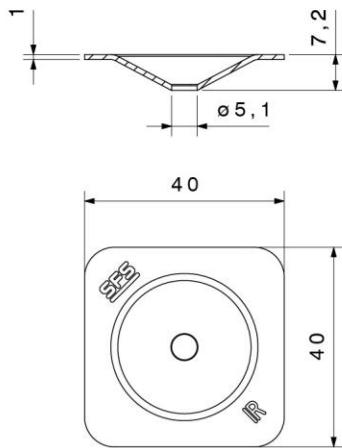
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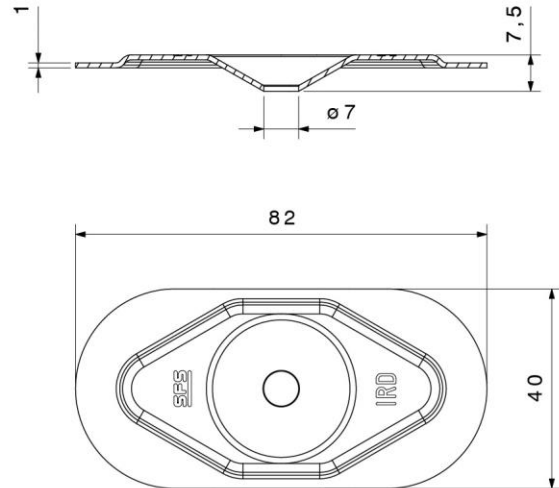
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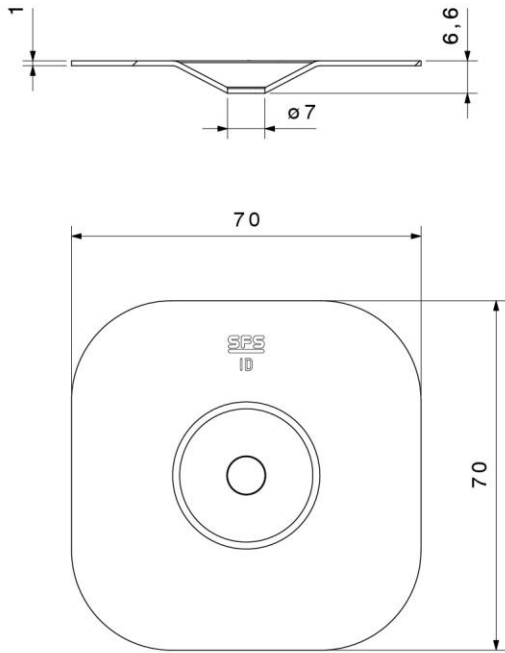
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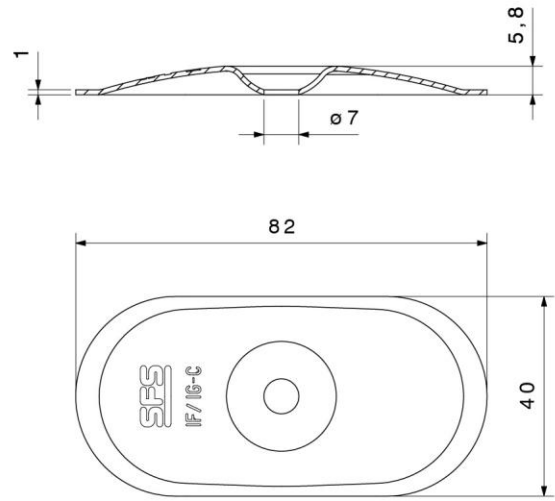
SFS Flat roof fasteners

Stress plates

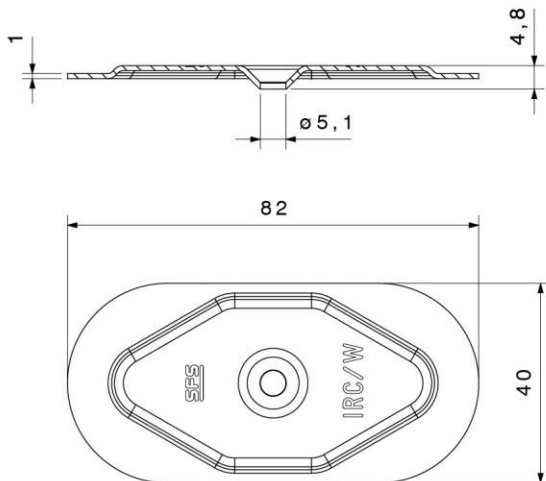
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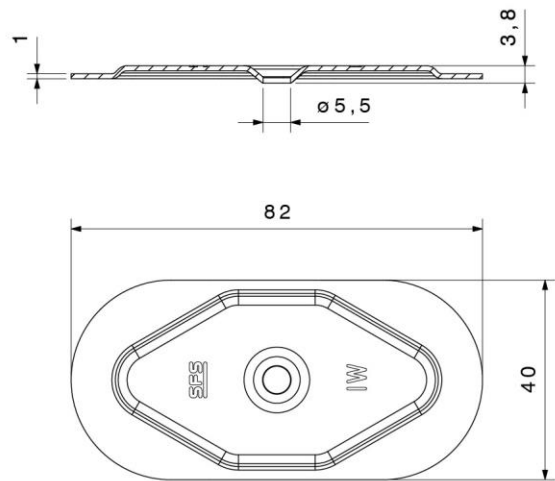
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IRC/W-82x40



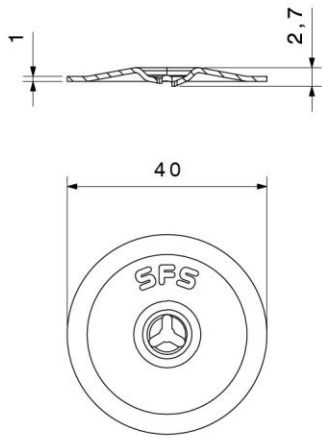
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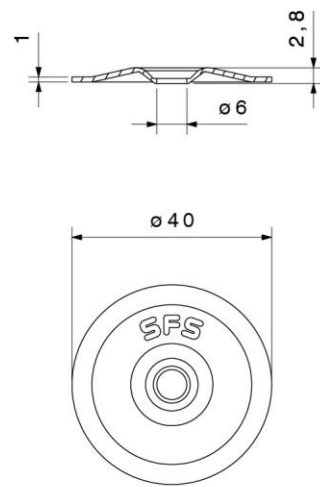
SFS Flat roof fasteners

Stress plates

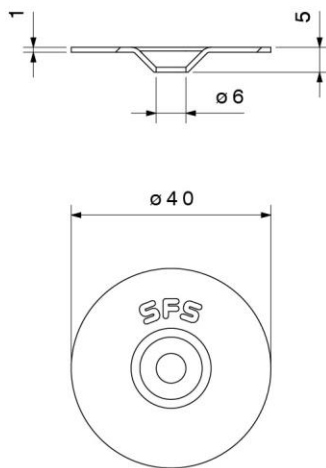
MW-40-FH



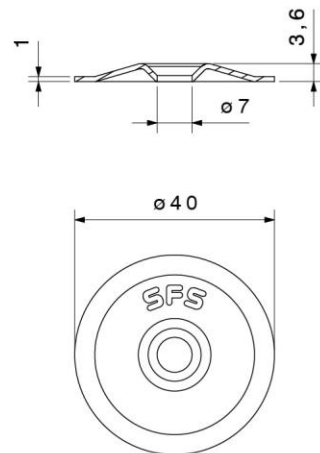
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MW-40-R



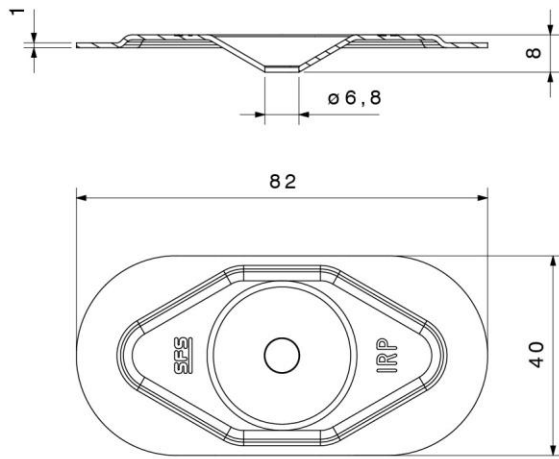
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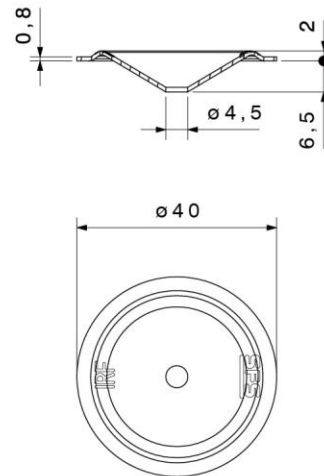
SFS Flat roof fasteners

Stress plates

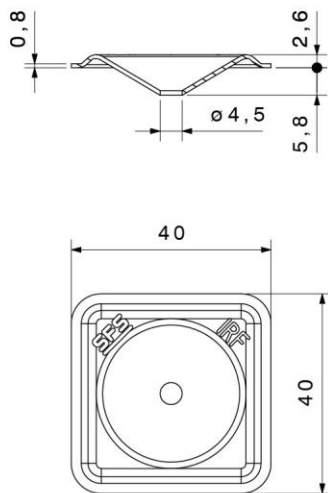
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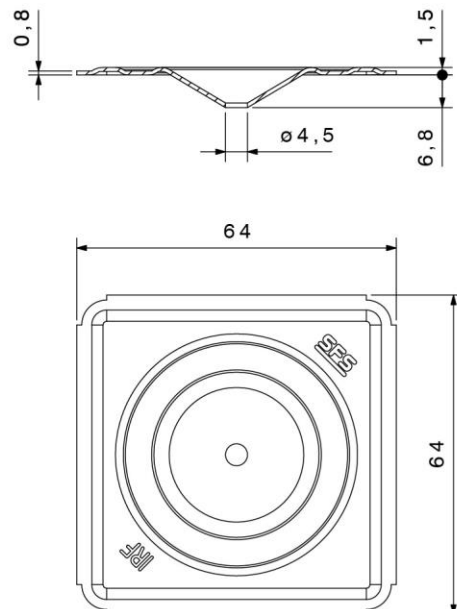
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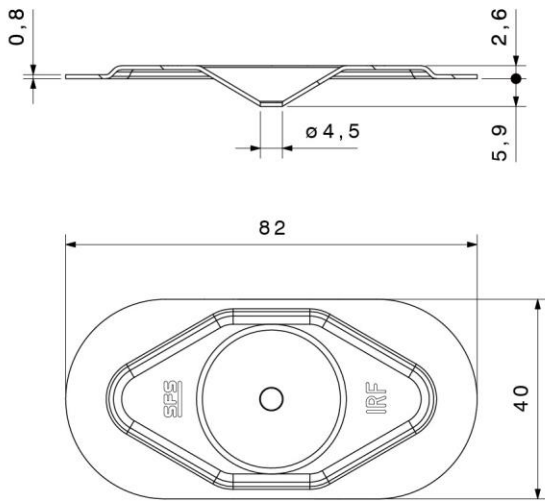
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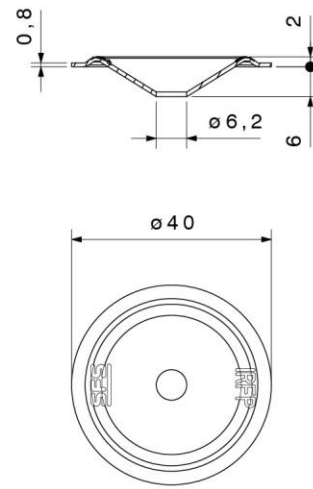
SFS Flat roof fasteners

Stress plates

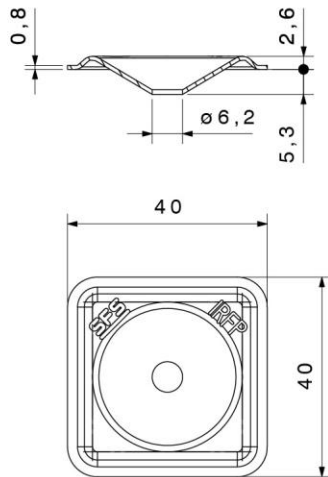
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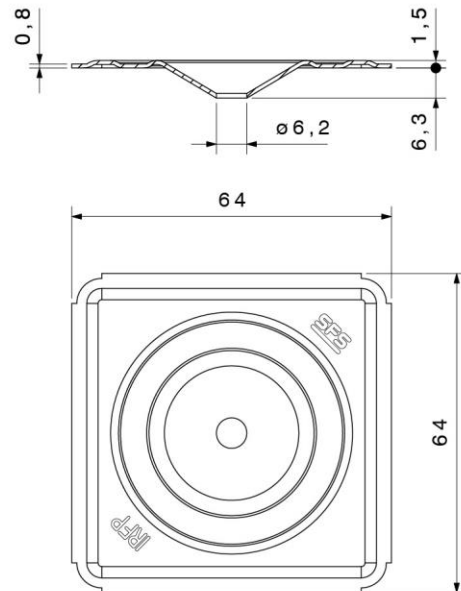
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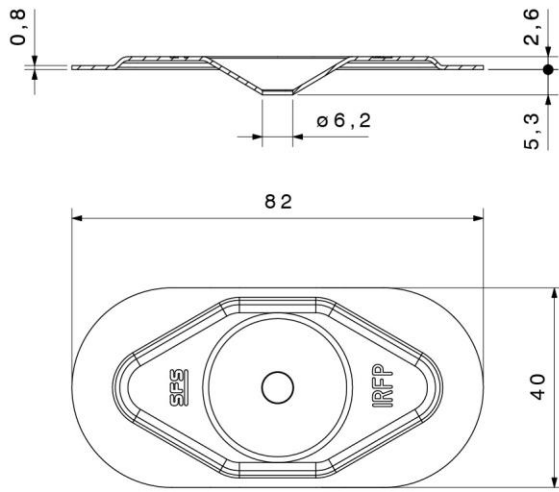
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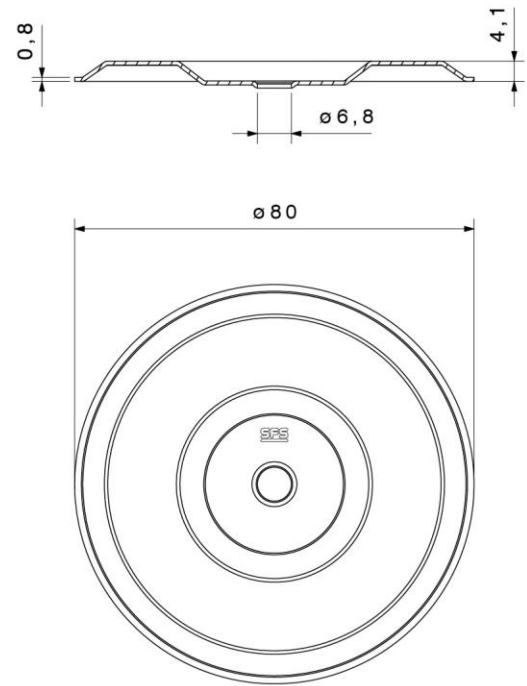
SFS Flat roof fasteners

Stress plates

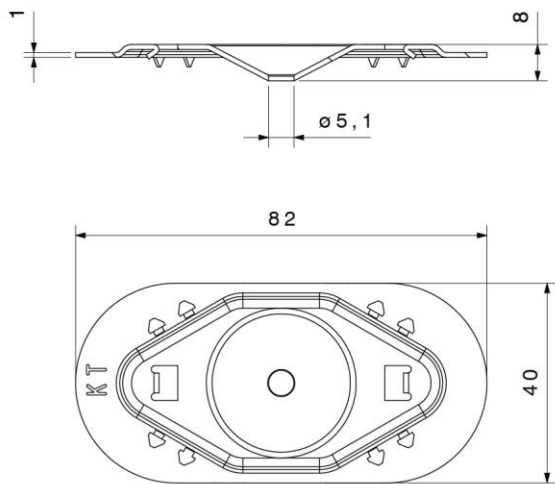
IRFP-82x40



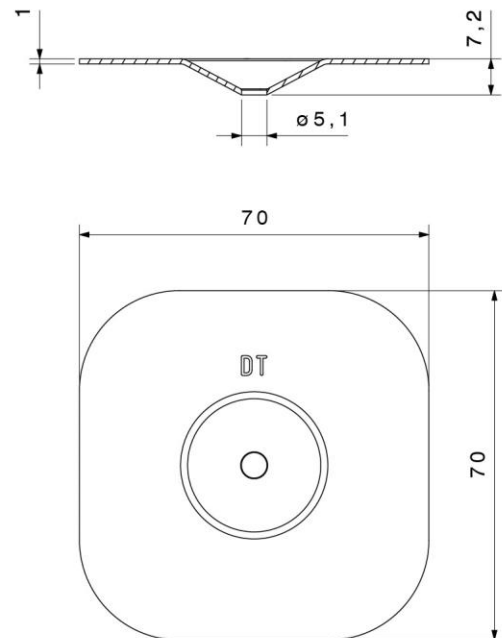
FI-P-6,8



Sarnafast KT-82x40



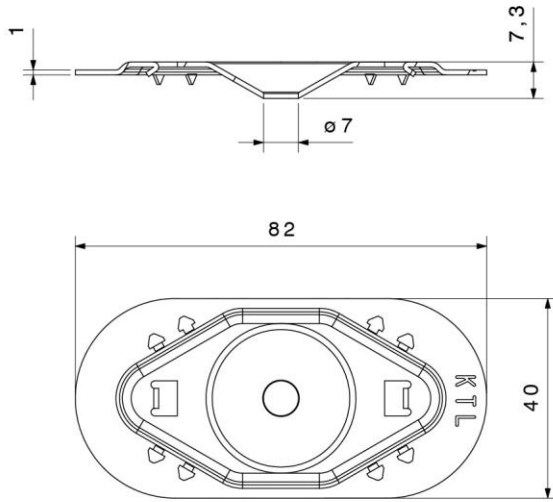
Sarnafast DT-70x70



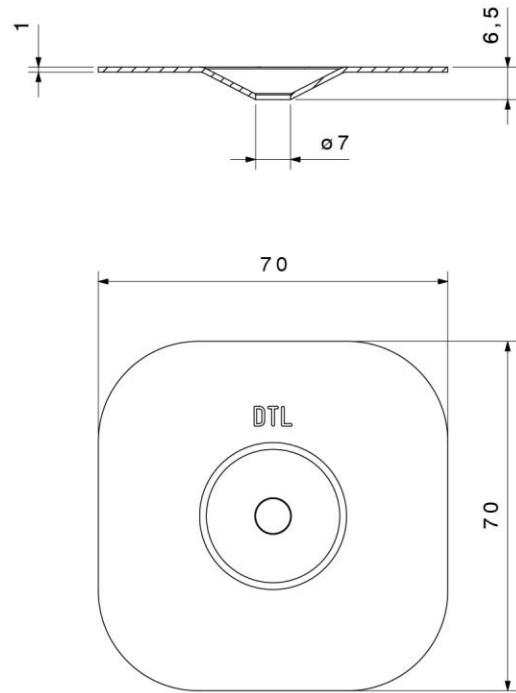
SFS Flat roof fasteners

Stress plates

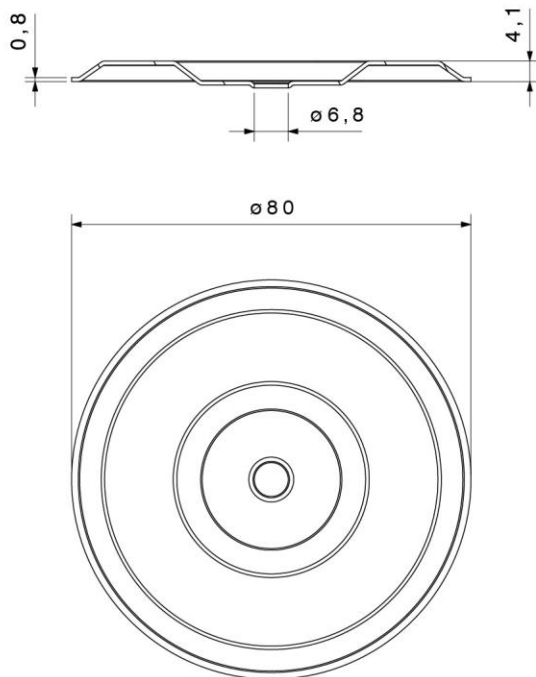
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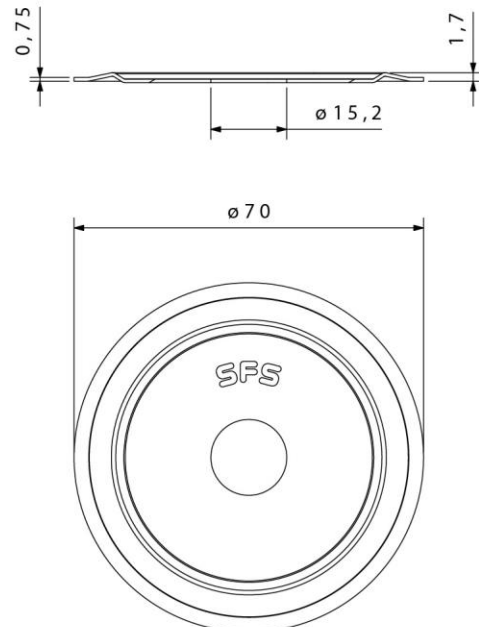
Sarnafast DTL-70x70



Sarnaweld disc 6,8



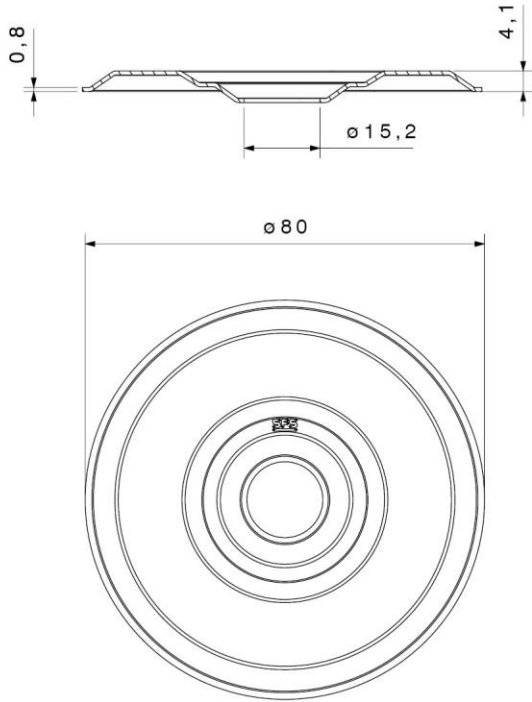
TPA-P-70



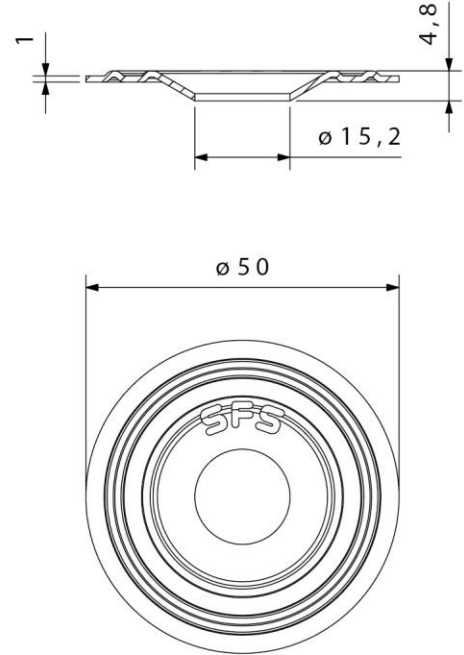
SFS Flat roof fasteners

Stress plates

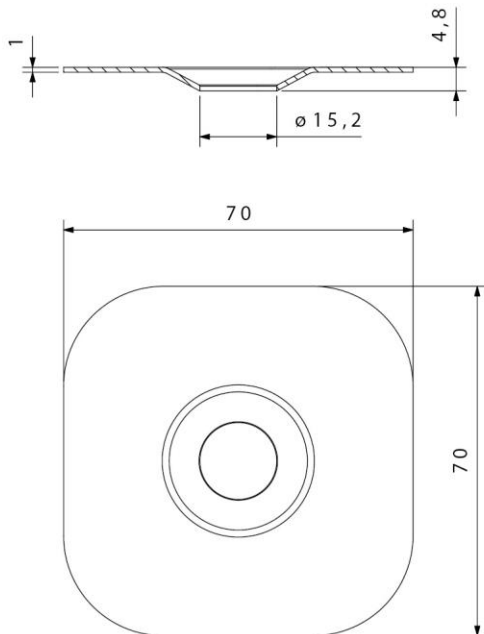
FI-P-16,0



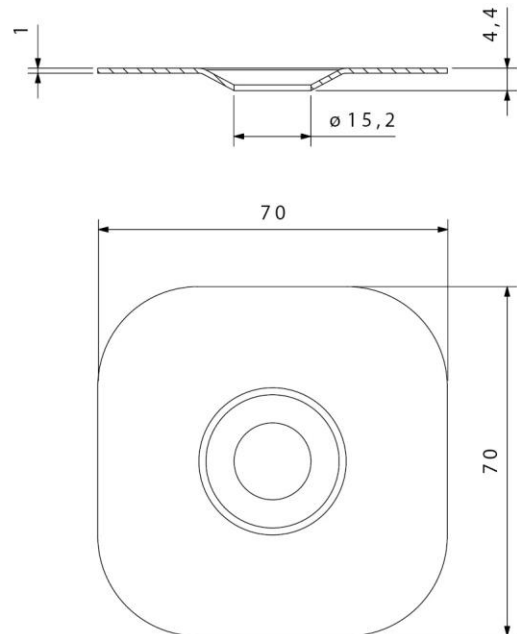
BSA-P-50



BSA-P-70x70



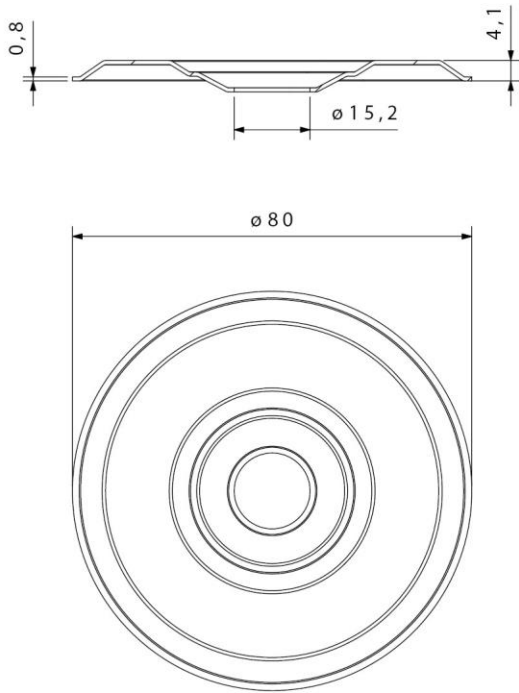
SBIW-70x70



SFS Flat roof fasteners

Stress plates

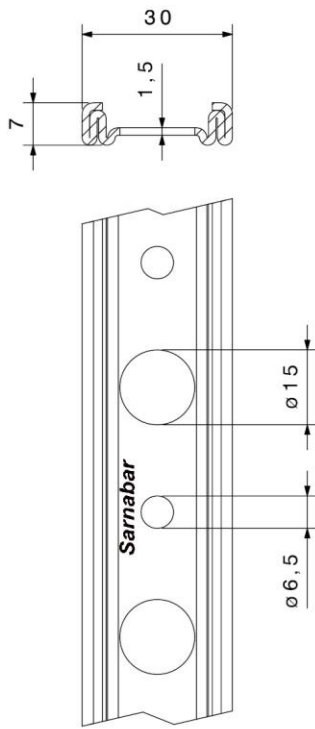
Sarnaweld disc 16



SFS Flat roof fasteners

Bar

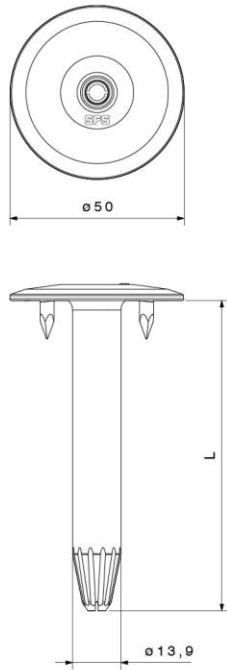
Sarnabar



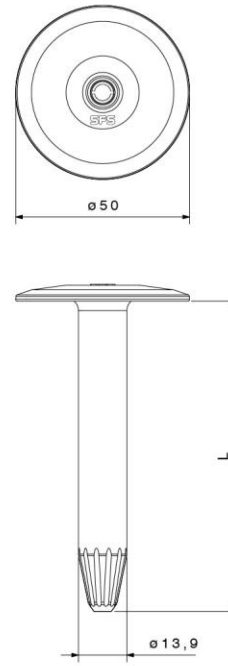
SFS Flat roof fasteners

Sleeves

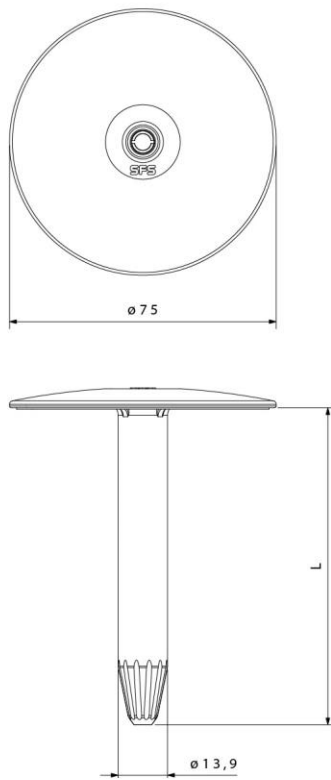
RP48



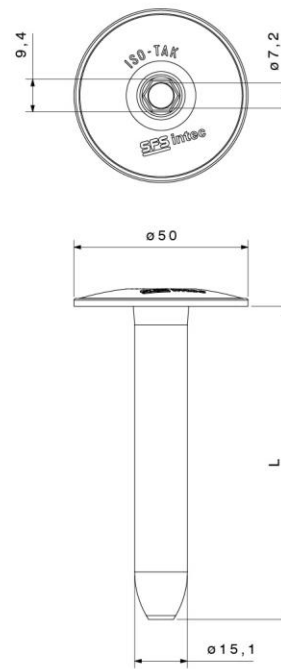
RP50



RP75



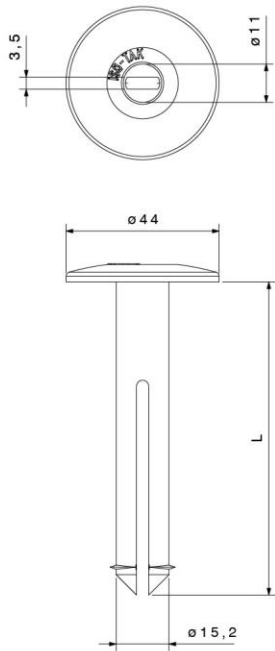
RH50



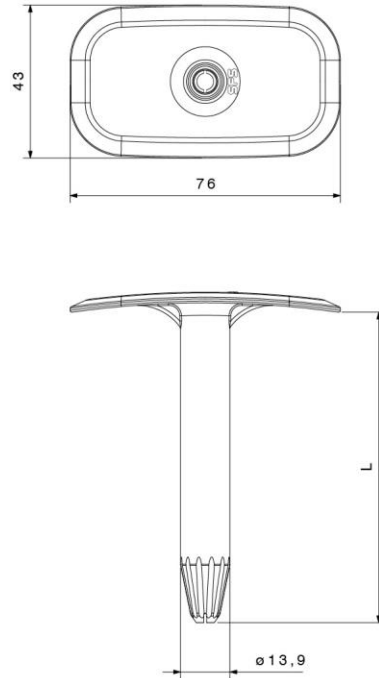
SFS Flat roof fasteners

Sleeves

LB-45



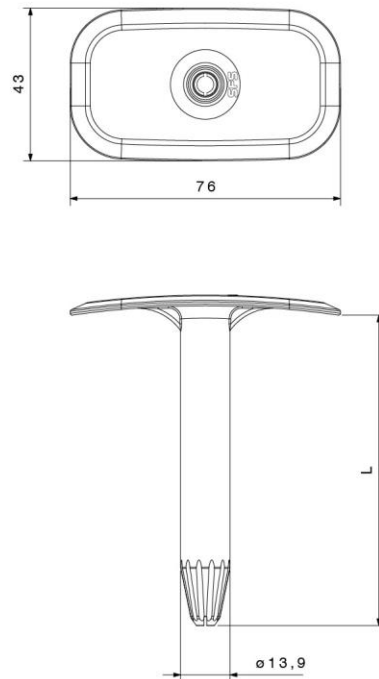
TSU



TPA50



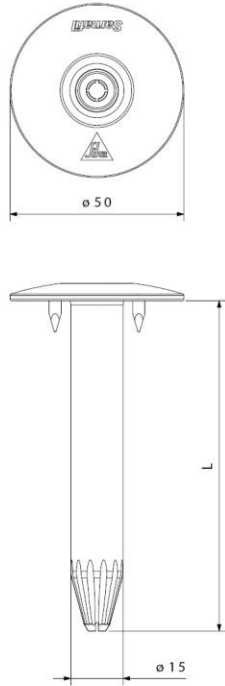
SUT



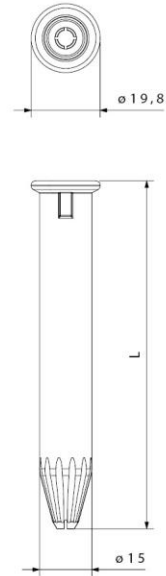
SFS Flat roof fasteners

Sleeves

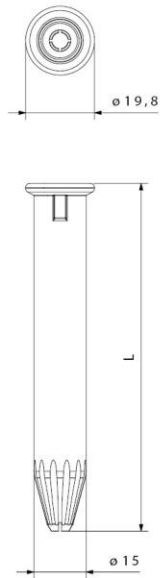
Sarnafast Tube SFT-50



FI-R-20



Sarnabar Tube SBT-20



SFS Flat roof fasteners

Annex 2

Table 1: Characteristic pull-out values of fasteners acc. EAD 030351-00-0402 Figure 3 for metallic substrates [kN]

Fastener	Steel sheet (EN 10346)																Aluminium sheet (EN 755-2)	
	S320GD ¹⁾										S350GD		S420GD		Perforated S320GD ²⁾		R _m ≥ 195 N/mm ²	
	Sheet thickness t [mm]																	
	0,50	0,60	0,63	0,70	0,75	0,80	0,88	1,00	1,25	1,50	0,60	0,70	1,00	0,60	0,65	0,75	0,75	0,60
BS-4,8		1,03	1,09	1,34	1,52	1,67	1,91	2,27	3,15		1,32	1,44	2,27	1,44	1,44	1,74		
BS3-4,8								1,28	1,95	2,56								
BS-6,1	0,97	1,17	1,17	1,38	1,53	1,63	1,80	2,04	2,91		1,44	1,58	2,19	1,44	1,57	1,92		0,50
BS-6,7	1,47	1,47															0,87	0,54
BSA-N-4,8		0,97	1,06	1,27	1,42	1,53	1,71	1,98	2,80									
BS-S-4,8		1,04	1,04	1,31	1,50	1,63	1,84	2,16										
BS-S-6,1	1,00	1,21	1,21	1,47	1,66	1,81	2,04	2,39										0,50
DT-4,8																		
DT-6,3																		
DT-S-4,8																		
FB-S-T25-7,5																		
IF2-6,1			1,11					1,16										
IFP2-6,7																	0,87	
IR2-4,8		1,03	1,09	1,34	1,52	1,67	1,91	2,27	3,15		1,32	1,44	2,27	1,44	1,44	1,74		
IR3-4,8								1,26	2,00	2,63								
IR2-S-4,8		1,04	1,04	1,31	1,50	1,63	1,84	2,16										
IRF-4,8					1,30	1,31	1,33	1,35										
IRFP-6,3																	0,91	
IWF-5,2																		
IW-S-5,0																		
LB-45 ³⁾																		
LBS-T25-8,0																		
LBS-S-T25-8,0																		
TI-6,3																		
TI-T25-6,3																		
TIA-T25-6,3																		
TIF-N-6,3																		
TI-S-T25-6,3																		
TI-S-T25-6,3-A4																		
TS-T25-6,0																		
TPR-L-6,3 ⁴⁾	0,99																	0,69
Sarnafast SBF-6,0	0,97	1,17	1,17	1,38	1,53	1,63	1,80	2,04	2,91		1,44	1,58	2,19	1,44	1,57	1,92		0,50
Sarnafast SF-4,8		1,03	1,09	1,34	1,52	1,67	1,91	2,27	3,15		1,32	1,44	2,27	1,44	1,44	1,74		

¹⁾For steel sheet S280GD the values have to be reduced to 92%

³⁾Expanding plug (fastener) incl. sleeve

²⁾Perforated steel sheet, triangular array of holes, hole diameter 5,0 mm, distance of holes 12,5 mm

⁴⁾Pre-drill Ø 7,0 mm

Table 2: Characteristic pull-out values of fasteners acc. EAD 030351-00-0402 Figure 3 for non-metallic substrates [kN]

Fastener	Timber			Concrete (EN 206-1)				Aerated concrete (DIN 4223-1)				Pumice Panel (EN 1520)		
	OSB ¹⁾	C24 ²⁾	Plywood ³⁾	C12/15	C25/30	SD ⁴⁾	Pre-drill Ø ⁵⁾	P3.3 density ≥ 0,45	P4.4 density ≥ 0,55	SD ⁴⁾	Pre-drill Ø ⁵⁾	LAC 6, D 1,0	SD ⁴⁾	Pre-drill Ø ⁵⁾
BS-4,8	1,45	1,32	2,18											
BS3-4,8														
BS-6,1	1,32	2,16	2,11	0,72	1,45	32	5,0	0,35	0,58	75				
BS-6,7														
BSA-N-4,8														
BS-S-4,8	1,12	1,90	1,88											
BS-S-6,1	1,25	2,02	2,22					0,82	1,37	75				
DT-4,8				2,40	3,34	25	4,80							
DT-6,3				2,93	4,07	32	6,30							
DT-S-4,8				2,65	3,69	25	4,80							
FB-S-T25-7,5												0,59	50	4,80
IF2-6,1	1,07	2,04	2,40	1,56	3,12	32	5,0	1,27	2,11	75				
IFP2-6,7														
IR2-4,8	1,45	1,32	2,18											
IR3-4,8														
IR2-S-4,8	1,12	1,90	1,88											
IRF-4,8														
IRFP-6,3														
IWF-5,2	1,35	1,94	2,20											
IW-S-5,0	1,08	1,12	2,04											
LB-45 ⁶⁾								1,44	1,44	65	15			
LBS-T25-8,0								0,93	1,44	60				
LBS-S-T25-8,0								0,93	1,44	60				
TI-6,3				1,83/2,73	1,83/3,79	20/30	5,0/5,0							
TI-T25-6,3				1,83/2,73	1,83/3,79	20/30	5,0/5,0							
TIA-T25-6,3				1,83	1,83	20	5,0							
TIF-N-6,3				1,83	1,83	20	5,0							
TI-S-T25-6,3				0,53	1,05	20	5,0							
TI-S-T25-6,3-A4				3,73	3,85	30	5,0							
TS-T25-6,0	1,31	1,43	2,30	0,44/3,07	0,89/3,41	32/50	5,0/5,0	1,07	1,78	75				
TPR-L-6,3														
Sarnafast SBF-6,0	1,32	2,16	2,11	0,72	1,45	32	5,0	0,35	0,58	75				
Sarnafast SF-4,8	1,45	1,32	2,18											

¹⁾ OSB3 (EN 300), t ≥ 18 mm, effective setting depth (penetration length of threaded part) ≥ 18 mm, minimum density 550 kg/m³

²⁾ C24/Structural timber (EN 338), t ≥ 22 mm, effective setting depth (penetration length of threaded part) ≥ 22 mm, minimum density 350 kg/m³

³⁾ Plywood (EN 636), t ≥ 18 mm, effective setting depth (penetration length of threaded part) ≥ 18 mm, minimum density 400 kg/m³

⁴⁾ SD = Setting depth [mm]

⁵⁾ Pre-drill Ø [mm]

⁶⁾ Expanding plug (fastener) incl. sleeve

Table 3: Characteristic pull-through values of stress plates and bar acc. EAD 030351-00-0402 Figure 5 [kN]

Component	Product	Characteristic pull-through value ¹⁾	Fastener																																				
			BS-4,8	BS3-4,8	BS-6,1	BS-6,7	BSA-N-4,8	BS-S-4,8	BS-S-6,1	DT-4,8	DT-6,3	DT-S-4,8	FB-S-T25-7,5	IF2-6,1	IFP2-6,7	IR2-4,8	IR3-4,8	IR2-S-4,8	IRF-4,8	IRFP-6,3	IWF-5,2	IW-S-5,0	LB-45 ²⁾	LBS-T25-8,0	LBS-S-T25-8,0	TI-6,3	TI-T25-6,3	TIA-T25-6,3	TIF-N-6,3	TI-S-T25-6,3	TI-S-T25-6,3-A4	TS-T25-6,0	TPR-L-6,3	Sarnafast SBF-6,0	Sarnafast SF-4,8				
Stress plate	IR-82x40	5,34	•	•				•							•	•	•				•	•															•		
	IF-70x70	5,34	•	•				•							•	•	•				•	•															•		
	IR-40x40	5,34	•	•				•							•	•	•				•	•															•		
	IRD-82x40	3,96	•	•	•	•		•	•	•	•	•	•	•											•	•	•	•			•	•	•	•	•	•	•		
	ID-70x70	3,96	•	•	•	•		•	•	•	•	•	•	•	•										•	•	•	•			•	•	•	•	•	•	•		
	IF/IG-C-82x40	3,73	•	•	•	•		•	•	•	•	•	•	•											•	•	•	•			•	•	•	•	•	•	•		
	IRC/W-82x40	5,18	•	•				•													•	•																	
	IW-82x40	4,60	•	•	•			•	•	•		•									•	•	•												•		•		
	MW-40-FH	1,74																			•																		
	MW-40-F	2,85	•	•	•	•		•	•	•		•									•	•	•												•	•	•	•	
	MW-40-R	3,92	•	•	•	•		•	•	•		•									•	•	•												•	•	•	•	
	MW-40-LBS	3,54																						•	•														
	IRP-82x40	4,69													•																								
	IRF-40	5,06																					•																
	IRF-40x40	5,06																					•																
	IRF-64x64	5,06																					•																
	IRF-82x40	5,06																					•																
	IRFP-40	4,48																					•																
	IRFP-40x40	4,48																					•																
	IRFP-64x64	4,48																					•																
	IRFP-82x40	4,48																					•																
	FI-P-6,8	2,87	•	•	•	•		•	•	•	•	•	•	•								•	•		•	•		•							•	•	•	•	
	Sarnafast KT-82x40	5,34	•	•				•								•	•	•				•	•															•	
	Sarnafast DT-70x70	5,34	•	•				•								•	•	•				•	•																•
	Sarnafast KTL-82x40	3,96	•	•	•	•		•	•	•	•	•	•	•	•										•	•	•	•											
	Sarnafast DTL-70x70	3,96	•	•	•	•		•	•	•	•	•	•	•	•										•	•	•	•											
	Sarnaweld disc 6,8	2,87	•	•	•	•		•	•	•	•	•	•	•								•	•		•	•		•											
	Bar	Sarnabar	4,80	•	•	•	•		•	•	•	•	•	•									•			•	•	•	•										•

• Defined combination

¹⁾Lowest characteristic pull-through value of defined combinations considered

²⁾Expanding plug (fastener) incl. sleeve

Table 4: Characteristic pull-through values of sleeves and combinations of stress plates, bar and sleeves acc. EAD 030351-00-0402 Figure 4 [kN]

Component	Product	Characteristic pull-through value ¹⁾	Fastener																																		
			BS-4,8	BS3-4,8	BS-6,1	BS-6,7	BSA-N-4,8	BS-S-4,8	BS-S-6,1	DT-4,8	DT-6,3	DT-S-4,8	FB-S-T25-7,5	IF2-6,1	IFP2-6,7	IR2-4,8	IR3-4,8	IR2-S-4,8	IRF-4,8	IRFP-6,3	IWF-5,2	IW-S-5,0	LB-45 ²⁾	LBS-T25-8,0	LBS-S-T25-8,0	TI-6,3	TI-T25-6,3	TIA-T25-6,3	TIF-N-6,3	TI-S-T25-6,3	TI-S-T25-6,3-A4	TS-T25-6,0	TPR-L-6,3	Sarnafast SBF-6,0	Sarnafast SF-4,8		
Sleeve	RP48	1,82	•	•	•	•	•	•	•	•	•	•												•	•		•	•							•		
	RP50	1,82	•	•	•	•	•	•	•	•	•	•												•	•		•	•							•		
	RP75	1,82	•	•	•	•	•	•	•	•	•	•												•	•		•	•							•		
	RH50	1,54																																			
	LB-45 ²⁾	1,44																					•														
	TSU	1,82	•	•	•	•	•	•	•	•	•	•													•	•		•	•							•	
	TPA50	2,77	•	•	•	•	•	•	•	•	•	•													•	•		•	•							•	
	SUT	1,82	•	•	•	•	•	•	•	•	•	•													•	•		•	•							•	
Sarnafast Tube SFT-50	2,77	•	•	•	•	•	•	•	•	•	•													•	•		•	•							•		
Combination: Stress plate, Bar, Sleeve	TPA-P-70/TPA50 ³⁾	2,77	•	•	•	•	•	•	•	•	•																•	•							•		
	FI-P-16,0/FI-R-20 ³⁾	2,10	•	•	•	•	•	•	•	•	•																•	•							•		
	BSA-P-50/FI-R-20 ³⁾	2,10	•	•	•	•	•	•	•	•	•																•	•							•		
	BSA-P-70x70/FI-R-20 ³⁾	2,10	•	•	•	•	•	•	•	•	•																•	•							•		
	BSA-P-50/ Sarnabar Tube SBT-20 ³⁾	2,10	•	•	•	•	•	•	•	•	•																•	•							•		
	SBIW-70x70/ Sarnabar Tube SBT-20 ³⁾	2,10	•	•	•	•	•	•	•	•	•																•	•							•		
	Sarnaweld disc 16/ Sarnabar Tube SBT-20 ³⁾	2,10	•	•	•	•	•	•	•	•	•																•	•							•		
	Sarnabar/FI-R-20 ⁴⁾	2,10	•	•	•	•	•	•	•	•	•																•	•							•		
	Sarnabar/ Sarnabar Tube SBT-20 ⁴⁾	2,10	•	•	•	•	•	•	•	•	•																•	•							•		

• Defined combination

¹⁾ Lowest characteristic pull-through value of defined combinations considered

²⁾ Expanding plug (fastener) incl. sleeve

³⁾ Combination Stress plate/Sleeve

⁴⁾ Combination Bar/Sleeve

Figure 3 of EAD 030351-00-0402

Principle of fastener pull-out test, acc. Table 1 and 2

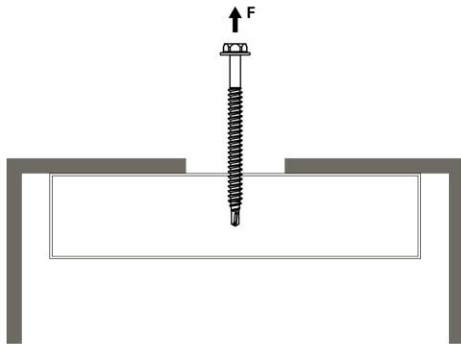


Figure 4 of EAD 030351-00-0402

Principle of plastic washer pull-through test, acc. Table 4

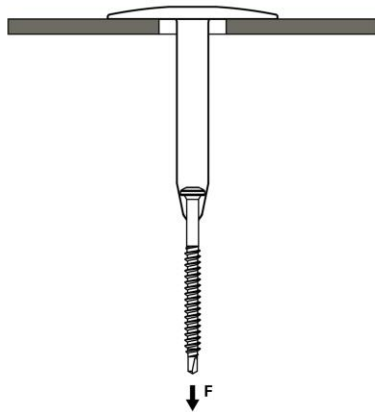


Figure 5 of EAD 030351-00-0402

Principle of metallic washer pull-through test, acc. Table 3

