SINTEF

SINTEF Certification

Technical Approval

No. 2516

Issued first time:	16.11.2007
Revised:	30.11.2018
Amended:	31.10.2019
Valid until:	01.06.2026

Provided listed on www.sintefcertification.no

SINTEF confirms that

Guardian 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

Guardian B.V.
Grasbeemd 14
5705 DG Helmond
The Netherlands
www.guardian.nl

2. Product description

Guardian Fastening System is a system for mechanical fastening of roof membranes and thermal insulation in external roof constructions. Guardian Fastening System consists of the following components, fig 1-32:

- Guardian tubes made of polypropylene and polyamide (used together with screws and concrete nails), fig. 1-5.
- Guardian metal pressure plates (made of Sendzimir zink coated steel), fig. 6-11.
- GuardianWeld induction system, fig. 12-14.
- Guardian fasteners for concrete (made of stainless or Enduroguard coated steel), fig. 15-19
- Guardian fasteners for lightweight concrete, fig. 20-21.
- Guardian fasteners for profiled steel decking substrate, made of stainless or Enduroguard coated steel, fig. 22-30.
- Guardian fasteners for wooden substrates, fig. 31-32.

3. Fields of application

Guardian Fastening System is used as mechanical fastening of thermal insulation for flat roofing, bitumen based multilayer, single ply roof coverings or plastic based single ply roof coverings onflat or pitched roof constructions made of profiled steel decks, concrete, light weight concrete or wood.

4. Properties

Anchor load capacities

Design load capacities for tube washers used with various types of roofing membranes are shown in Table 1. Table 2 and 3. The tables show the pullout design capacities for screws and nails from the substructure.

Corrosion protection

All steel components in the Guardian Fastening System have a corrosion protection corresponding to application category KLA as defined in SINTEF Byggforsk Design Sheet No. 544.206, and which also corresponds to corrosion protection according to ETAG 006-3.1 Annex D, 15 kesternich-cycles.

All screws in the Guardian Fastening System are made of stainless- or carbon steel coated with Enduroguard 15 which has a zinc rich base and a multilayer top coat. Metal pressure plates is coated with Sendzimir zink, 275g/m^2.

Safety against selfunwinding

All steel sheet screws belonging to Guardian Fastening System are tested and evaluated regarding safety against selfunwinding. The screws are considered safe used together with Guardian tube washers.

Application properties

Guardian Fastening System has been evaluated as being acceptable for use under the following conditions:

- Installation at temperatures down to –20 °C.
- Oblique loading when fastened at the edge of membrane sheets or at flaps.
- Strength against loads caused by dynamic wind loads.
- Torch welding of bitumen roofing membranes.
- Ageing together with PVC roofing sheet and bitumenious roof coverings.

5. Environmental aspects

Substances hazardous to health and environment

The product 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.

Waste treatment/recycling

The products shall be sorted as metal waste or residual waste. The products shall be delivered to an authorized waste treatment plant for material or energy recovery.

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Environmental declaration

No environmental declaration according to EN 15804 has been worked out for Guardian Fastening System.

6. Special conditions for use and installation

Anchor load design capacities

The anchor load design capacities in Table 1 are given for use in Norway and includes a safety factor (γ_m) of 1,3.

The number of fixing points is calculated according to SINTEF Byggforsk Design Sheet No. 544.206 and "TPF informs No. 5", using the design capacities shown in Table 1 and 2.

Where a value in Table 2 and 3 is lower than the corresponding value in Table 1, the lowest value must be used.

Fastening in concrete

The drill hole diameter shall be 5,0 mm when fixing concrete screw CS 6,1. The drill hole depth should be 30 mm, unless special precautions are taken regarding inspection. Minimum anchorage depth shall be 20 mm. Fixings in 50mm thick concrete without penetration requires precise length/depth control.

Fastening in light weight concrete

The anchorage depth must be minimum 65 mm when installing the Guardian light weight concrete screws LBS-6.0, LBS 8.0

Fastening in metal sheets

Loadbearing profiled steel sheets shall have a minimum thickness of 0.7 mm. In particularly exposed areas the recommended minimum thickness is 0.8 mm for fixing roofing membranes to the steel sheets.

Fastening with GuardianWeld induction system

The GuardianWeld induction system must be applied according to the manufacturer's user manual.

Guardian Tubes

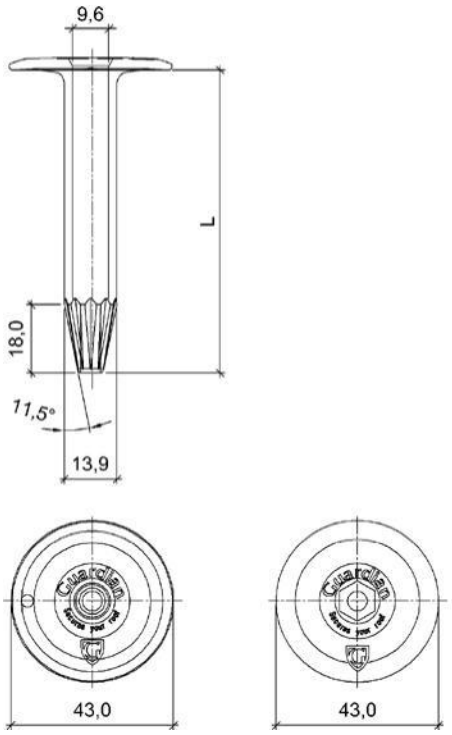

Fig. 1
Tube washer R-45
Tube washer HR-45 with hexagonal internal tube shape (used together with ACS 6.1)

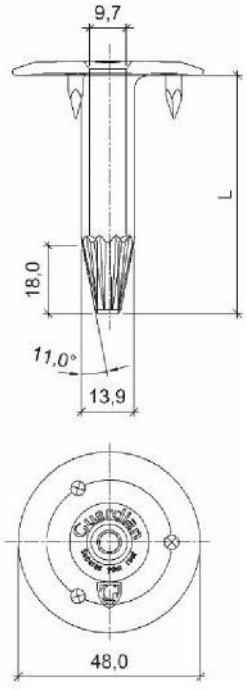

Fig. 2
Tube washer RB-48 with three barbs

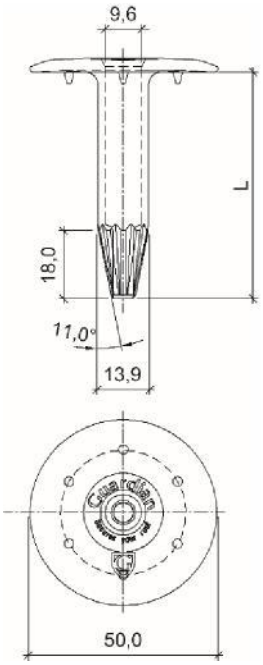

Fig. 3
Tube washer RBS-50 with six barbs

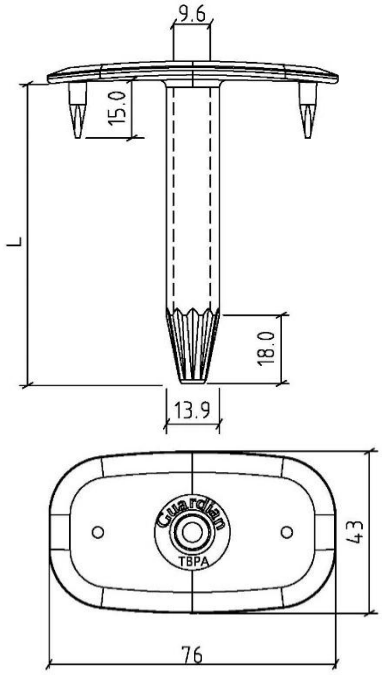

Fig. 4
Tube washer TBPA-8040 with two barbs (Polyamide)
Tube washer TBPP-8040 with two barbs (Polypropylene)

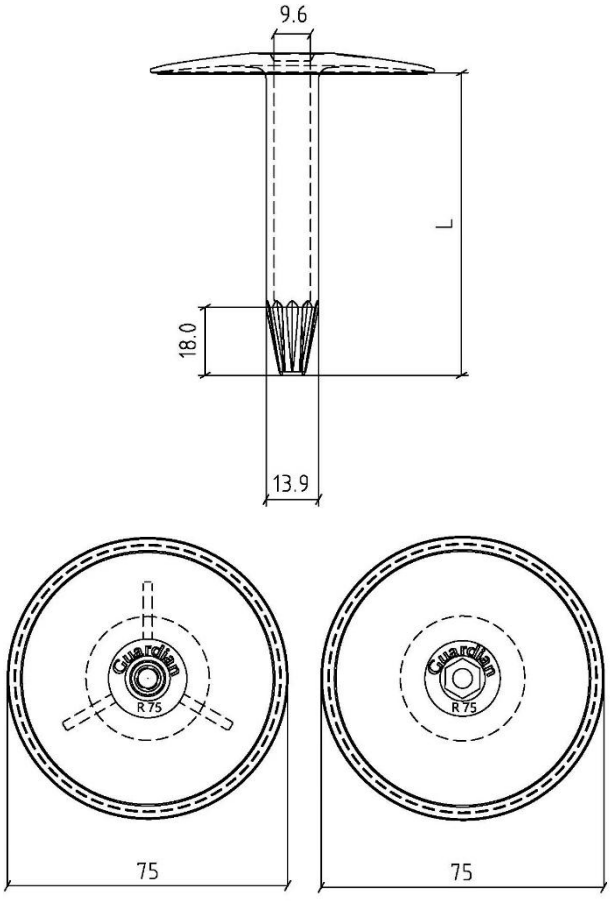

Fig. 5
Tube washer R-75
Tube washer HR-75 with hexagonal internal tube shape (used together with ACS 6.1)

Guardian metal pressure plates

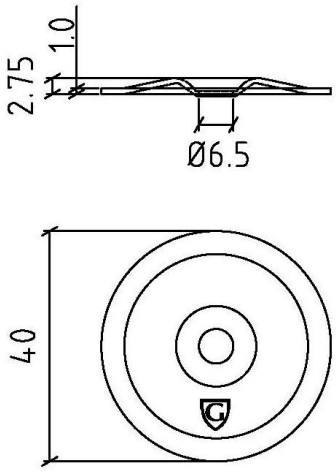

Fig. 6
SP-40-D, F, DD, FD

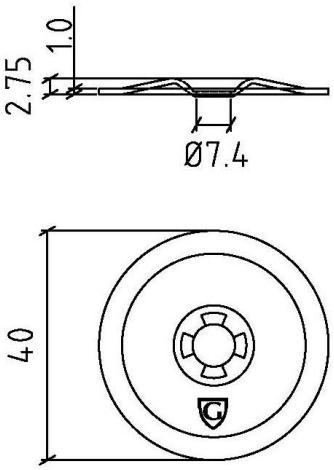

Fig. 7
SP-40-LBS

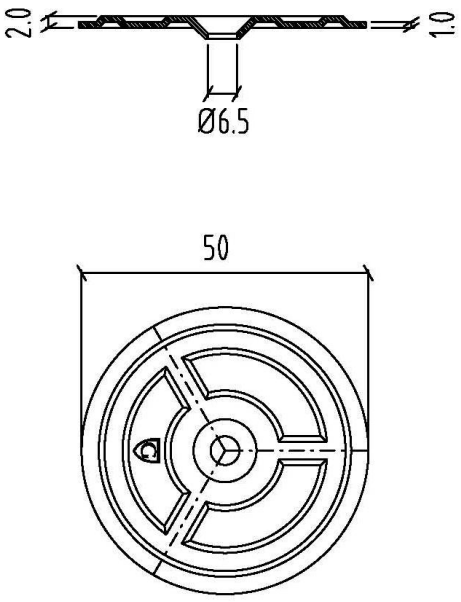

Fig. 8
SP-50-D, F, S

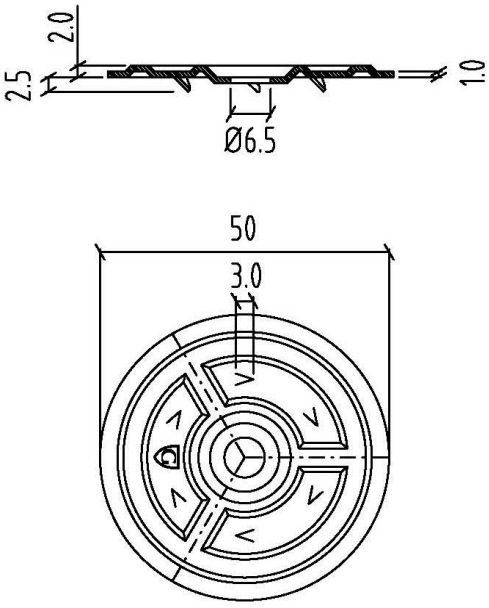

Fig. 9
SPB-50-S

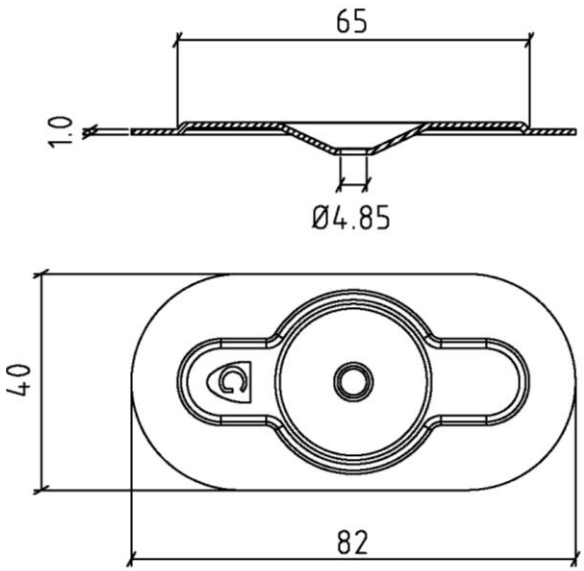

Fig. 10
SP-8240-D,F,S
SPA-8240-D, F

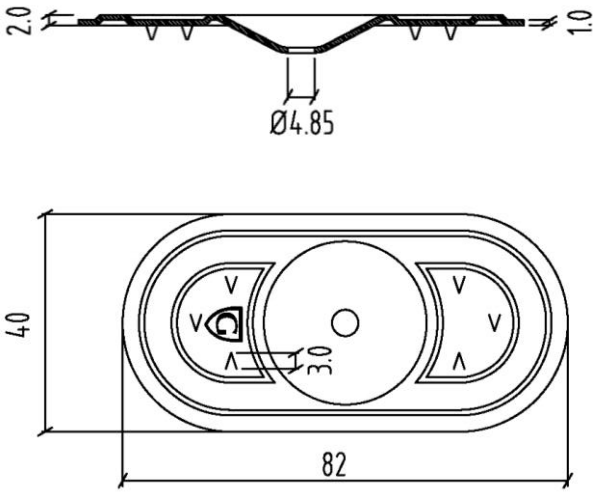

Fig. 11
SPB-8240-D
SPBA-8240-D

GuardianWeld induction system

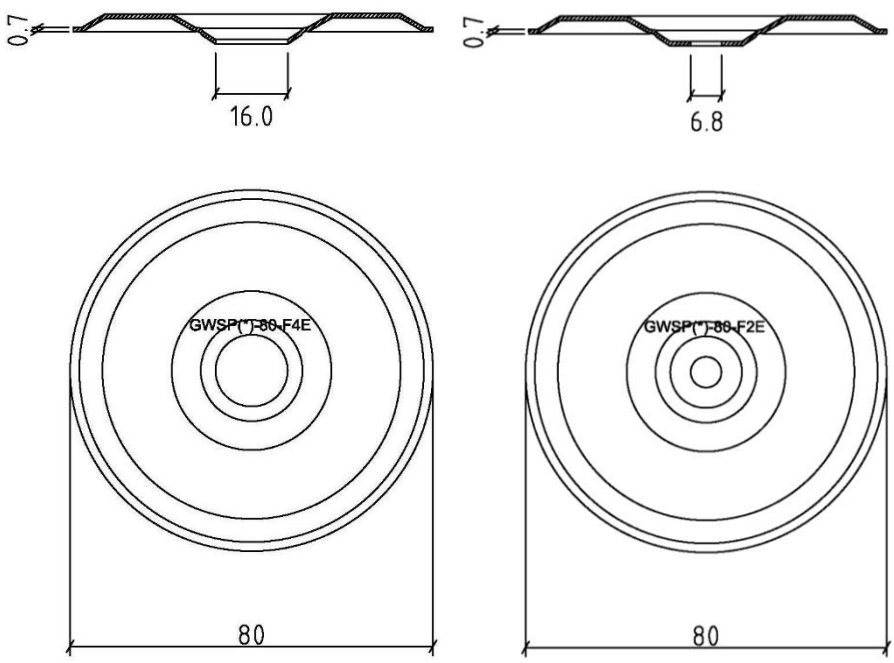

Fig. 12
GWSP(P,T,E)-80-F4E (usable with GWT fig. 15)
GWSP(P,T,E)-80-F2E

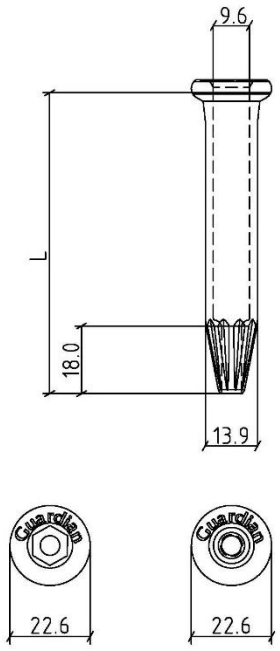

Fig. 13
GWT tube for GWSP(*)-80-F4E (Polyamide)
CT tube for STBT (Polypropylene)

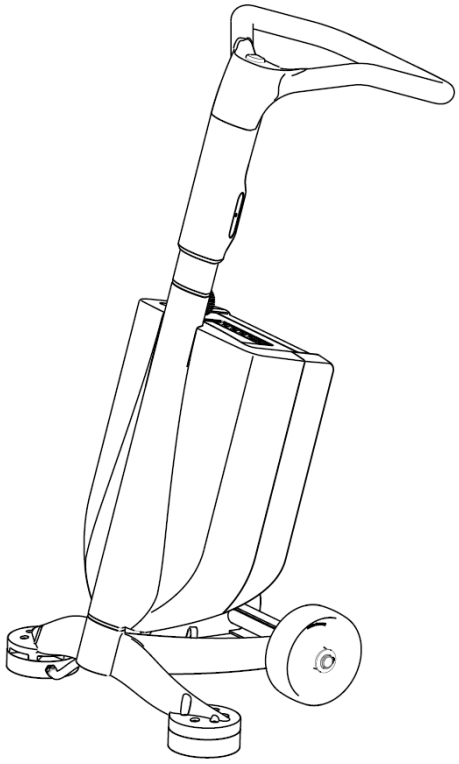

Fig. 14
GuardianWeld induction machine
Welds the GWSP(*)-80-F2E/F4E to PVC, TPO and EPDM membranes

Guardian Fasteners for concrete

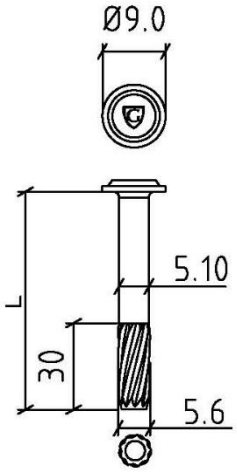

Fig. 15
BN 5.6 Concrete nail

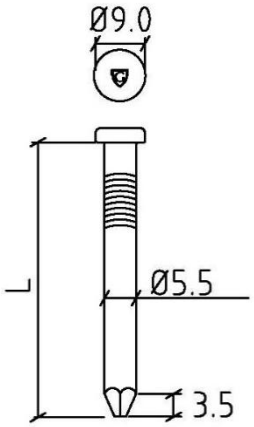

Fig. 16
BNRF 5.5 Stainless concrete nail

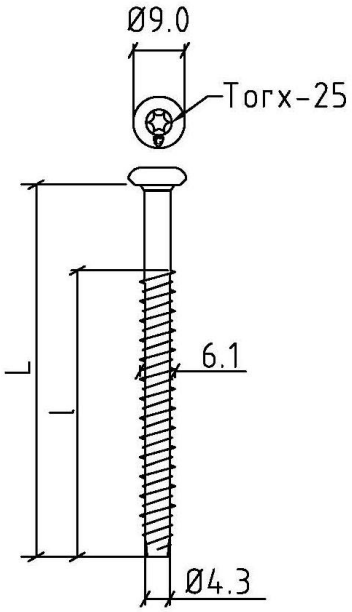

Fig. 17
CS 6.1 Concrete screw
(with flat or sharp point)

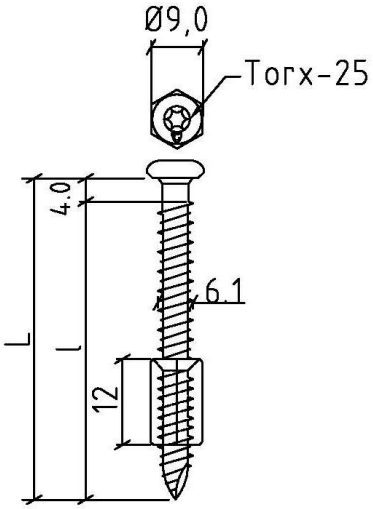

Fig. 18
ACS 6.1 Adjustable concrete screw
(used together with tube washer HR versions)

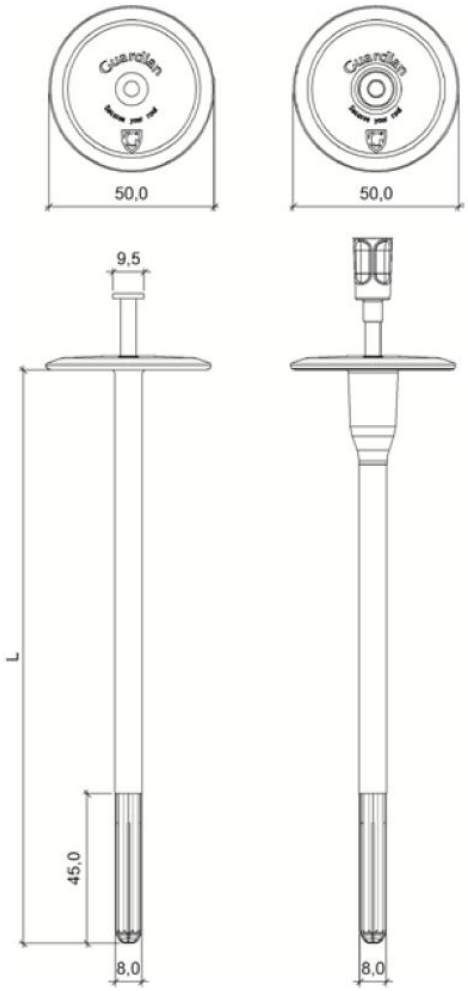

Fig. 19
CPN-8 Concrete plug
CP-8 Concrete plug with energy bridge stop (also usable with SP-70-CP)

Guardian Fasteners for lightweight concrete

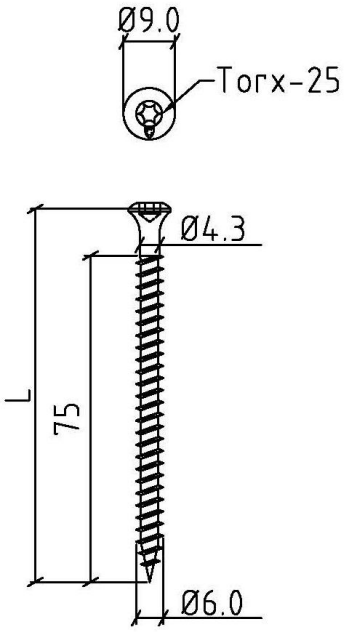

Fig. 20
LBS 6.0 screw for lightweight concrete and wooden substrates

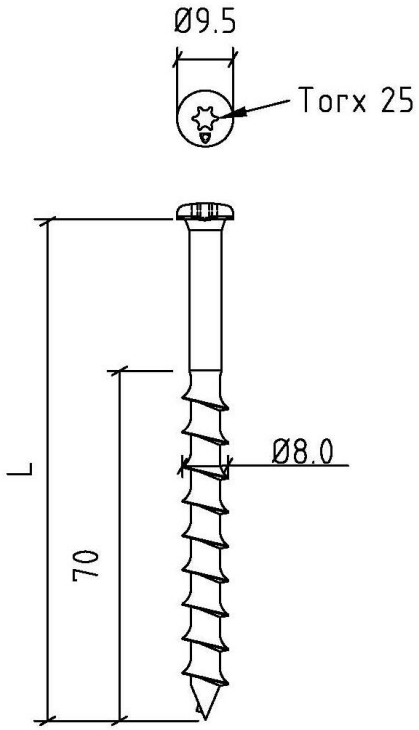

Fig. 21
LBS 8.0 screw for lightweight concrete

Guardian Fasteners for profiled metal decking substrate

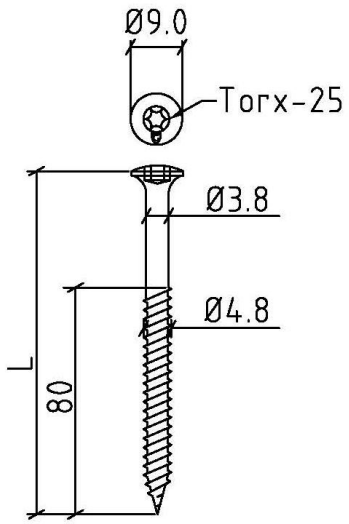

Fig. 22
PS 4.8 Screw for fixing in steel sheets

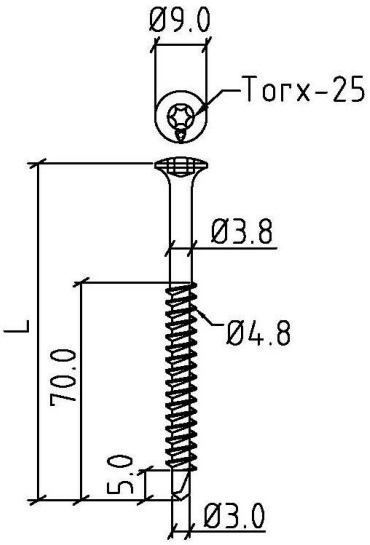

Fig. 23
BS 4.8 Screw for fixing in steel sheets

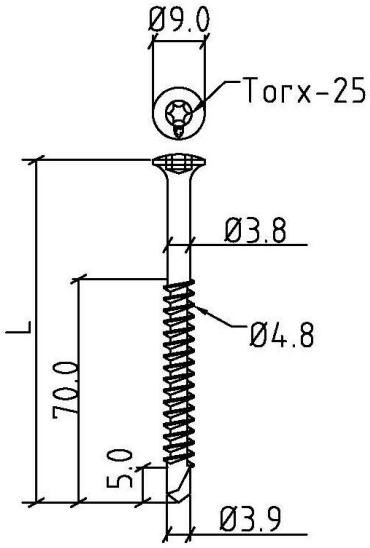

Fig. 24
BSHD 4.8 Screw for fixing in steel sheets
(steel thickness from 1,0mm up to maximum 3,0mm)

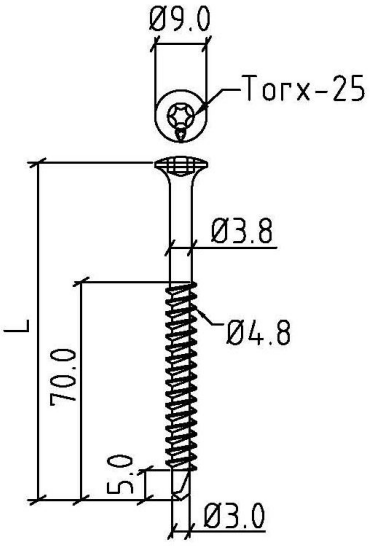

Fig. 25
BSRF 4.8 Stainless screw for fixing in steel sheets

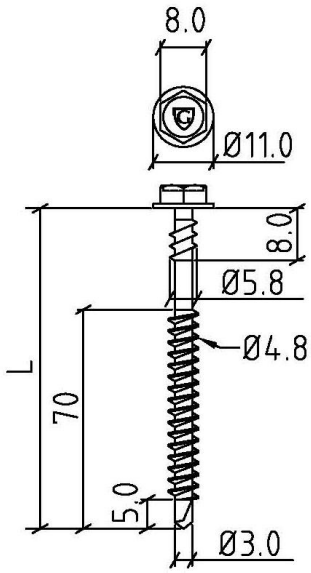

Fig. 26
DBT(A) 4.8 Screw for fixing in steel sheets (usable with automatic setting tool)

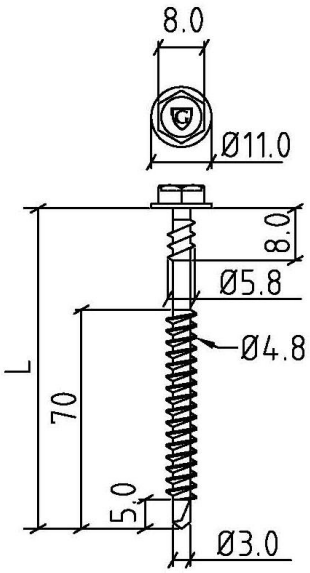

Fig. 27
DBT(A)-S 4.8 Stainless-steel A4 screw for fixing in steel sheets (usable with automatic setting tool)

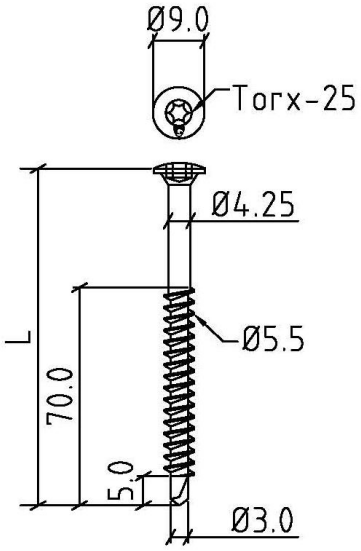

Fig. 28
BS 5.5 Screw for fixing in steel sheets

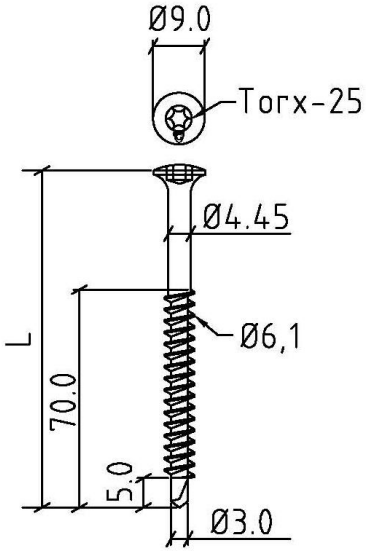

Fig. 29
BS 6.1 Screw for fixing in steel sheets

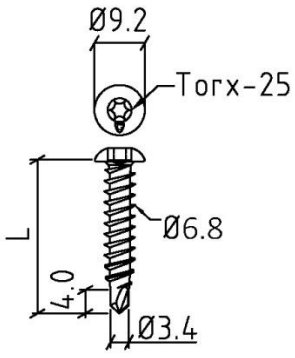

Fig. 30
BS 6.8 Screw for fixing in thin steel sheets

Guardian Fasteners for wooden substrates

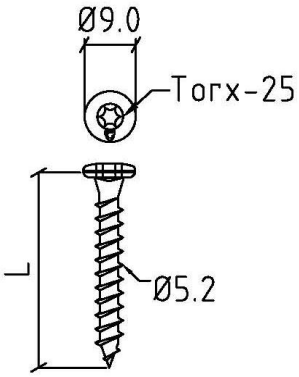

Fig. 31
TS 5.2 Screw for fixing in wood

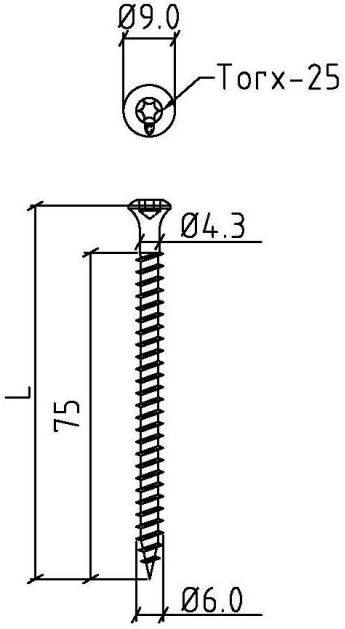

Fig. 32
LBS 6.0 Screw for light weight concrete and wooden substrates

Table 1
Design capacities at ultimate limit state for Guardian Fastening System washers, fixing various roofing membranes. The values to be used must not exceed the design fastening capacities of the substructure fastening shown in Table 2 and 3.

Roofing material	Capacity in N/fastener [1]				
	Plastic washers/plugs				
	[2]R45	RB48	RBS50	TBPA 8040	CP concrete plug
Polymeric membranes fastened along membrane edge					
Bauder Thermofol U15 1,50mm	800				
Firestone Rubbergard EPDM LSFR 1,10mm	700		900		
Icopal Monarplan PVC 1,20mm	800	1000		1050	
Protan SE 1,20mm	700	980		900	800
Renolit Alkorplan F 35076 1,20mm		900			
Sika Sikaplan 12 VGWT	700	900			
Single layer bituminous membranes					
Icopal Mono PC	1000				
Icopal Monolight NXT	750				
IKO powerflex 5500	[3]900				
Index Mineral Helasta P4	900				
Katepal Topp Tornado (Hybrid)			1000		
Katepal Tupla	900		1000		
Katepal Tupla FR	850				
Mataki Power FR	850				
Mataki UnoTech FR	900				
Soprema Sopralene MF 5500	750		850		
Technoelast K-YS 5500	750				
Double layer bituminous membranes					
Icopal double layer	900				
IKO Powerflex	[4]700				
Mataki DuoTech	700				
Technoelast Double-layer	850				
Phønix double layer (PF 3500 SBS/PF-GF 500 SBS)	750				

Table 1 continued
Design capacities at ultimate limit state for Guardian Fastening System washers, fixing various roofing membranes. The values to be used must not exceed the design fastening capacities of the substructure fastening shown in Table 2 and 3.

Roofing material	Steel washers					
	SP(A)-8240	SPB(A)-8240	SP-50	SPB-50	SP-40	GuardianWeld
Polymeric membranes fastened along membrane edge						***Field fastening***
Bauder Thermofol U15 1,50 mm	700					
Firestone Rubbergard EPDM LSFR 1,10 mm	850					
Protan SE 1,20 mm	700	1000			650	
Renolit Alkorplan F 35076 1,20 mm				750		850
Sika Sikaplan 12 VGWT	700					850
Trocal S PVC 1,50 mm	650					700
Cosmoplan F 1,20 mm				750		
Single layer bituminous membranes						
Katepal Topp Tornado (Hybrid)					900	
Katepal Tupla					900	
Katepal Tupla FR					850	
Soprema Sopralene MF 5500					850	
Trelleborg Elastofol MB 2000			750			

1) Design capacities are given for use in Norway and includes a safety factor (γ_m) of 1,3
2) Capacities are also valid for tube washer HR45
3) Capacity is documented in SINTEF Technical Approval 20385
4) Capacity is documented in SINTEF Technical Approval 20090

Table 2
Design capacities at ultimate limit state for fixings with Guardian Fastening System to concrete- and wood- substructures, based on tests according to ETAG 006 and Nordtest method NT Build 306.

Fastener	Substructure	Design capacity N/fastener
ACS 6.1	Concrete B 25	1300
BNRF 5,5	Concrete B 25	1300
BN 5.6	Concrete B 25	1050
CS 6.1	Concrete B 25	1300
CPN-8 Concrete plug	Concrete B 25	1000
LBS 6.0 (minimum anchorage depth 75 mm)	Cellular concrete 600 kg/m³	800
LBS 8.0 (minimum anchorage depth 75 mm)	Cellular concrete 600 kg/m³	800
TS 5.2	Multilayer wood 18 mm	1000
TS 5.2	Chipboard 18 mm	700
TS 5.2	Plywood 18 mm	1200
TS 5.2	OSB 18 mm	1000

Table 3
Design capacities at ultimate limit state for fixings with Guardian Fastening System to metal sheets substructures, based on tests according to ETAG 006 and Nordtest method NT Build 306.

Fastener	Substructure	Design capacity N/fastener
BS 4.8	Steel sheet 0,65 mm	850
	Steel sheet 0,70 mm	950
	Steel sheet 0,75 mm	1000
	Steel sheet 0,80 mm	1100
	Steel sheet 0,90 mm	1250
	Steel sheet 1,00 mm	1400
BSHD 4.8	Steel sheet 1,00 mm	1200
	Steel sheet 1,25 mm	1500
BS 5.5	Steel sheet 0,65 mm	900
	Steel sheet 0,70 mm	1000
	Steel sheet 0,75 mm	1050
	Steel sheet 0,80 mm	1150
	Steel sheet 0,90 mm	1300
	Steel sheet 1,00 mm	1500
BS 6.1	Steel sheet 0,65 mm	950
	Steel sheet 0,70 mm	1100
	Steel sheet 0,75 mm	1200
	Steel sheet 0,80 mm	1300
	Steel sheet 0,90 mm	1600
	Steel sheet 1,00 mm	1850
DBT 4.8	Steel sheet 0,65 mm	850
	Steel sheet 0,70 mm	950
	Steel sheet 0,75 mm	1000
	Steel sheet 0,80 mm	1100
	Steel sheet 0,90 mm	1250
	Steel sheet 1,00 mm	1400
PS 4.8	Steel sheet 0,65 mm	900
	Steel sheet 0,70 mm	1000
	Steel sheet 0,75 mm	1050
	Steel sheet 0,80 mm	1150
	Steel sheet 0,90 mm	1300
	Steel sheet 1,00 mm	1500
BSRF 4.8	Steel sheet 0,75 mm	850
DBT(A)-S4.8	Steel sheet 0,75mm	950
BS 6.8	Steel sheet 0,50 mm	650
	Steel sheet 0,60 mm	850
	Steel sheet 0,65 mm	1000
	Steel sheet 0,70 mm	1150

7. Factory production control

The tube washers are produced by Guardian B.V. in the Netherlands. The steel washers are produced in the Netherlands for Guardian B.V. The screws are produced in Taiwan and Turkey for Guardian B.V.

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

Guardian Fastening System is subject to supervisory production control according to contract for SINTEF Technical Approval.

Guardian B.V. has a quality management system which is certified by LRQA according to ISO 9001.

8. Basis for the approval

Fastening capacities in roofing membranes

Fastening capacities in membranes are based on system tests according to NT Build 307 or ETAG 006, documented in the following test reports:

- SINTEF Byggforsk report O-21802-D dated 24.10.2007
- SINTEF Byggforsk report B21802-F dated 08.05.2008
- SINTEF Byggforsk report B21802-G dated 08.05.2008
- SINTEF Byggforsk report 3D0537, dated 02.04.2009
- SINTEF Byggforsk report B 21802 K, dated 29.04.2010
- SINTEF Byggforsk report 102000706-5, dated 28.08.2013
- BDA Keuringsinstituut BV, report 0024-L-04/5 dated 27.02.2007
- BDA Keuringsinstituut BV, report 0024-L-04/7 dated 27.02.2007
- BDA Keuringsinstituut BV, report 0147-L-04/2 dated 27.02.2007
- BDA Keuringsinstituut BV, report 0275-L-06/1 dated 11.12.2006
- BDA Keuringsinstituut BV, report 0275-L-06/5 dated 08.01.2007
- BDA Keuringsinstituut BV, report 0275-L-06/7 dated 05.10.2006
- BDA Keuringsinstituut BV, report 0180-L-02/10 dated 01.03.2007
- BDA Keuringsinstituut BV, report 0180-L-02/9 dated 01.03.2007
- BDA Keuringsinstituut BV, report 0072-L-06/5 dated 01.03.2007
- BDA Keuringsinstituut BV, report 0065-L-07/1 dated 10.03.2008
- BDA Keuringsinstituut BV, report 0066-L-07/1 dated 10.03.2008
- BDA Keuringsinstituut BV, report 0065-L-07/2 dated 10.03.2008
- BDA Keuringsinstituut BV, report 0066-L-07/2 dated 10.03.2008
- BDA Keuringsinstituut BV, report 0066-L-07/3 dated 10.03.2008

- CSTC report DE 651 XE 973, dated 14.10.2005
- Constructech Sweden AB, report 200806030837540001-6, dated 03.09.2008
- Constructech Sweden AB, report 200809110854490001-2, dated 11.09.2008
- Constructech Sweden AB, report 200810031212330001-11, dated 10.11.2008
- Constructech Sweden AB, report 200810031212330001-21, dated 17.11.2008
- Constructech Sweden AB, report 200810031212330001-31, dated 21.11.2008
- Constructech Sweden AB, report 20150127-52-3, dated 19.02.2015
- Constructech Sweden AB, report 20150127-52-5, dated 17.03.2015
- Constructech Sweden AB, report 201309091530390001-12B, dated 04.11.2015
- Constructech Sweden AB, report 201309091530390001-11, dated 28.10.2013
- Constructech Sweden AB, report 201309091530390001-14B, dated 13.11.2013
- Constructech Sweden AB, report 20171205-173-2, dated 12.12.2017
- Constructech Sweden AB, report 20170616-150-21, dated 25.06.2017
- Constructech Sweden AB, report 20170616-150-2, dated 20.06.2017
- Constructech Sweden AB, report 20180302-182-1, dated 04.03.2018
- Constructech Sweden AB, report 20180424-190, dated 26.04.2018
- Constructech Sweden AB, report 20160716-115-71, dated 18.08.2016
- Constructech Sweden AB, report 20160716-115-41, dated 28.07.2016
- Constructech Sweden AB, report 20160716-115-51, dated 31.07.2016
- Constructech Sweden AB, report 20170301-137-1, dated 02.03.2017
- Constructech Sweden AB, report 201203130748050001-21, dated 23.03.2017
- Constructech Sweden AB, report 20180412-189-1, dated 13.04.2018
- Constructech Sweden AB, report 20151208-90-4, dated 08.01.2016
- Constructech Sweden AB, report 20180412-189-2, dated 16.04.2018
- Constructech Sweden AB, report 20180121-179-1, dated 23.01.2018
- Constructech Sweden AB, report 20180121-179-2, dated 25.01.2018

Pullout resistance from the substructure

Pullout resistance from different substructures is documented in the following test reports:

- SINTEF Building and Infrastructure report O-21802-C dated 23.10.2007.
- SINTEF Building and Infrastructure report O-21802-E dated 02.11.2007.
- SINTEF Building and Infrastructure report B21802H dated 08.05.2008.
- SINTEF Building and Infrastructure report B21802J dated 20.03.2009.
- BDA Keuringsinstituut BV, report 0062-L-07/1 dated 13.06.2007.
- BDA Keuringsinstituut BV, report 0339-L-04/2 dated 01.03.2007.
- BDA Keuringsinstituut BV, report 0171-L-03/3 dated 01.03.2007.
- BDA Keuringsinstituut BV, report 0171-L-03/4 dated 01.03.2007.
- BDA Keuringsinstituut BV, report 0065-L-04/2 dated 02.03.2007.
- BDA Keuringsinstituut BV, report 0062-L-07/1 dated 07.06.2007
- Constructech Sweden AB, report 20160818-118-1, dated 18.08.2016
- Kiwa BDA Testing B.V., report 0411-L-16/1 dated 24.03.2017
- Constructech Sweden AB, report 20190409-224, dated 09.04.2019

Pull over strength between fasteners and tube washers

- Constructech Sweden AB, report 200909030850290001, dated 03.09.2009
- Constructech Sweden AB, report 201008301116400001-1, dated 31.08.2010
- Constructech Sweden AB, report 201008301116400001-2, dated 31.08.2010

Unwinding

Safety against self-unwinding is documented in the following test reports:

- Report 0063-L-07/1 dated 24.03.2007.
- Report 0081-L-04/2 dated 01.03.2007.
- SINTEF Building and Infrastructure report B21802J dated 20.03.2009.
- Kiwa BDA Testing B.V. report 0349-L16/1 dated 18.10.2016

Durability

Corrosion resistance of washers and screws has been tested in chamber with 2.0 litres of SO_2 in accordance with ETAG 006/ISO 6988/DIN 50018. The test results are documented in the following reports:

- BDA Keuringsinstituut BV, report 006-L-07/1 dated 13.06.2007.
- BDA Keuringsinstituut BV report 0277-L-06 dated 05.12.2006.
- BDA Keuringsinstituut BV report 0345-L-02/2 dated 01.03.2007.
- BDA Keuringsinstituut BV report 0303-L-02/2 dated 27.02.2007.
- BDA Keuringsinstituut BV report 0005-L-04/2 dated 27.02.2007.
- Constructech Sweden AB, report 20151118-91 dated 09.12.2015
- Constructech Sweden AB, report 20151209-94 dated 28.01.2016
- SINTEF report 102020222, dated 14.03.2019 (brittleness and strength for tube washers, fresh and aged material)

The durability of Guardian Fastening Plugs used together with bituminous and polymer membranes has been tested by SINTEF Building and Infrastructure, report O-21802-B dated 12.10.2007.

9. Marking

All fasteners, steel washers and tube washers are marked with the Guardian ”G” mark. The marking of tube washers may be combined with the Guardian name or another brand name for products produced under private label. All packaging is to be marked with product type and time of production. SINTEF’s approval mark for SINTEF Technical Approval No. 2516 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