

Revision: 3
Date: 01-11-2003

INTERGRATE[®] Grating Specifications

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2 USED MATERIAL

The GRP gratings supplied will be produced with materials equal to the below listed component.

2.1 Resin

Seven standard resin systems are available:

- ECO-NFR:**
- Orthophtalic resin
 - Hallogenfree
 - Colour: Steel grey (RAL 9006)
- ECO-FR:**
- Orthophtalic **F**ire **R**etardant resin
 - Fire retardant, hallogenfree
 - Self-extinguishing
 - Colour: Blue grey (RAL 7031)
- ISO-FR:**
- **I**sophtalic **F**ire **R**etardant
 - Resin quality: Isophtalic polyester resin
 - Fire retardant, hallogenfree
 - Self-extinguishing
 - DNV - approved
 - Colour: Green (RAL 6010)
- FD-FR:**
- **F**ood Approved Isophtalic **F**ire **R**etardant
 - Resin quality: isophtalic polyester resin
 - Fire retardant, hallogenfree
 - Self-extinguishing
 - Colour: Light-Grey (RAL 7040)
- VE-FR:**
- **V**inylester **F**ire **R**etardant
 - Resin quality: Vinylester resin
 - Fire retardant, hallogenfree
 - DNV - approved
 - Self-extinguishing
 - Colour: Orange (RAL 2002)
- ISO-XFR:**
- **I**sophtalic **e**xtra **F**ire **R**etardant
 - Resin quality: Isophtalic polyester resin
 - Extreme Fire retardant,
 - Self-extinguishing
 - Colour: Dark Grey (RAL 7043)
- IGF-FR:**
- **P**ultruded Phenolic **F**ire **R**etardant Grating
 - Resin quality: Phenolic
 - Fire retardant, self-extinguishing
 - Extreme Low Smoke emission
 - US Coast Guard approved
 - ABS certified.
 - Colour: Light brown.

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ECO-NFR:	Orthophtalic, developed for applications that only require outstanding corrosion resistance.
ECO-FR:	Orthophtalic Fire retardant, developed for applications that only require outstanding corrosion resistance.
ISO-FR:	Isophtalic Fire Retardant, for most applications in corrosive environments.
FD-FR:	Isophtalic Fire Retardant, special resin mix for the Food & Beverage industry.
VE-FR:	Vinylester Fire Retardant, for higher chemical (corrosion) resistance.
ISO-XFR:	Isophtalic Extra Fire Retardant, developed for applications that require outstanding fire retardancy capabilities.
IGF-FR:	Phenolic Fire Retardant, extreme Low Smoke emission. (US Coast Guard approved)

2.2 Glass

The reinforcement of the gratings consists of continuous bi-directional filament rovings (E-glass). The resin/glass ratio of the gratings is approximately 70 / 30 % by weight, in order to obtain a high level of corrosion resistancy.

3 COLOUR

Standard colours for the four resinsystem:

ECO-NFR:	steel grey	(RAL 9006)
ECO-NR:	blue grey	(RAL 7031)
ISO-FR:	green	(RAL 6010)
FD-FR:	light-grey	(RAL 7040)
VE-FR:	orange	(RAL 2002)
ISO-XFR:	dark grey	(RAL 7043)
IGF-FR:	light brown	

Other colours are availabe on request.

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4 DIMENSIONS

4.1 Standard panel sizes

Width [mm]	Length [mm]	Name	Thickn. [mm]	Mesh [mm]	Open area [%]	Weight [kg / m ²]	Weight per panel [kg]
1225	4580	Screengrid [®]	13	51	78	3.9	21.9
914	3048		26	38	70	12.2	34.0
1219	2438		26	38	70	12.2	36.5
1000	1990	Micromesh [®]	30	19	48	17.0	34.0
1000	2980	Micromesh [®]	30	19	48	17.0	50.7
1225	2980		30	38	70	14.1	51.5
914	3048		38	38	70	18.3	51.0
1219	2438		38	38	70	18.3	54.5
1219	3658		38	38	70	18.3	81.5
1524	3048		38	38	70	18.3	85.0
1645	2978	Micromesh [®]	38	19	48	21.9	107.3
1219	3658		51	51	72	19.5	87.0
585	2980	Safestep [®]	38	38	70	18.3	31.9
914	6096	Pultruded	38	38	60	15.6	86.9
1219	6096	Pultruded	38	38	60	15.6	115.9

4.2 Mesh

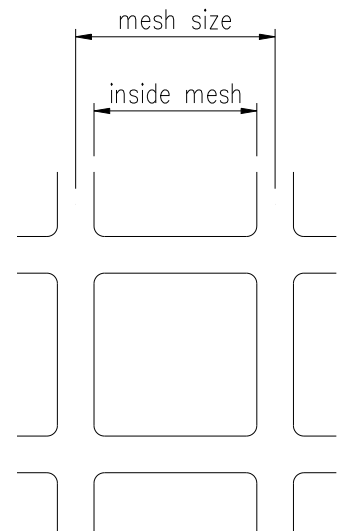
The gratings have a square mesh pattern to obtain multidirectional strength.

The mesh size is approximately 38 x 38 mm. resulting in an open area of ±70%.

The 51 mm thick gratings have a mesh pattern of 51x51 mm. resulting in an open area of ±72%.

Gratings on platforms and walkways crossing a passageway, workplace or equivalent beneath, shall not allow a ball with 15 mm diameter to pass through. Therefore the Micromesh[®] has an inside mesh dimension of approx. 13 mm.

The meshsizes listed are the dimensions from bar to bar. The inside mesh dimensions are therefore smaller:



Thickness [mm]	Mesh [mm]	Inside mesh [mm]
13	51 x 51	45 x 45
26 / 30	38 x 38	32 x 32
30 (Micromesh [®])	19 x 19	13 x 13
38 (Micromesh [®])	19 x 19	13 x 13
51	51 x 51	43 x 43
38 (Pultruded)	38 (1 1/2") *	23

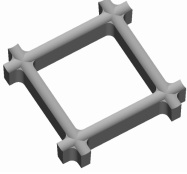
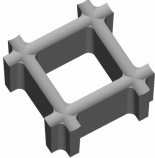
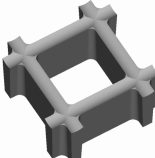
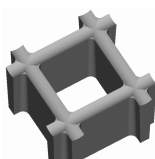
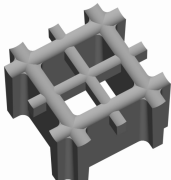
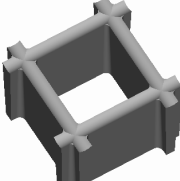
* bearing bar centers

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5 THICKNESS

Thicknesses range from 13 to 51 mm.

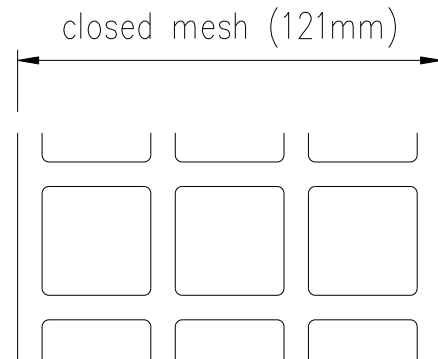
In the pictures below the thickness and mesh sizes can be compared.

	13 mm. thickness, 51 x 51 mm. mesh, "Screengrid®"
	26 mm. thickness, 38 x 38 mm. mesh
	30 mm. thickness, 38 x 38 mm. mesh
	30 mm. thickness, 19 x 19 mm. mesh, "Micromesh®"
	38 mm. thickness, 38 x 38 mm. mesh
	38 mm. thickness, 19 x 19 mm. mesh, "Micromesh®"
	51 mm. thickness, 51 x 51 mm. mesh
	38 mm. thickness, bearing bar centres: 38 mm (1 1/2"). <i>(special type for Norwegian off-shore available with width between bars: < 15 mm to match ball-test 15 mm.)</i>

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5.1 Closed mesh dimensions

To obtain cutted gratings with closed mesh on both opposite sides (see figure), the below listed values have to be taken into account.



5.1.1 38 x 38 mesh

45	655	1264	1874	2484	3093
83	693	1302	1912	2522	3131
121	731	1341	1950	2560	3169
159	769	1379	1988	2598	3207
198	807	1417	2026	2636	3246
236	845	1455	2064	2674	3284
274	883	1493	2103	2712	3322
312	921	1531	2141	2750	3360
350	960	1569	2179	2788	3398
388	998	1607	2217	2826	3436
426	1036	1645	2255	2865	3474
464	1074	1683	2293	2903	3512
502	1112	1722	2331	2941	3550
540	1150	1760	2369	2979	3588
579	1188	1798	2407	3017	3626
617	1226	1836	2445	3055	

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5.1.2 51 x 51 mesh

57	819	1581	2343	3105	3867
108	870	1632	2394	3156	3918
159	921	1683	2445	3207	3969
209	971	1733	2495	3257	4019
260	1022	1784	2546	3308	4070
311	1073	1835	2597	3359	4121
362	1124	1886	2648	3410	4172
413	1175	1937	2699	3461	4223
463	1225	1987	2749	3511	4273
514	1276	2038	2800	3562	4324
565	1327	2089	2851	3613	4375
616	1378	2140	2902	3664	4426
667	1429	2191	2953	3715	4477
717	1479	2241	3003	3765	4527
768	1530	2292	3054	3816	4578

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5.2 Tolerances

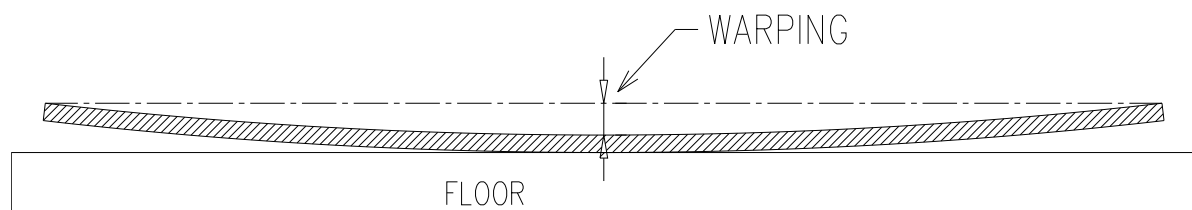
The following tolerances have to be taken into account:

5.2.1 Standard panels

- Length: ± 1 mm.
- Width: ± 1 mm.
- Thickness: ± 2 mm.
- Warping: < 10 mm / m¹. (Not valid for 13 mm thickness an HLU-panels).

5.2.2 Cut to size panels

- Length: ± 4 mm.
- Width: ± 4 mm.
- Thickness: ± 2 mm.
- Warping: < 10 mm / m¹. (Not valid for 13 mm thickness).



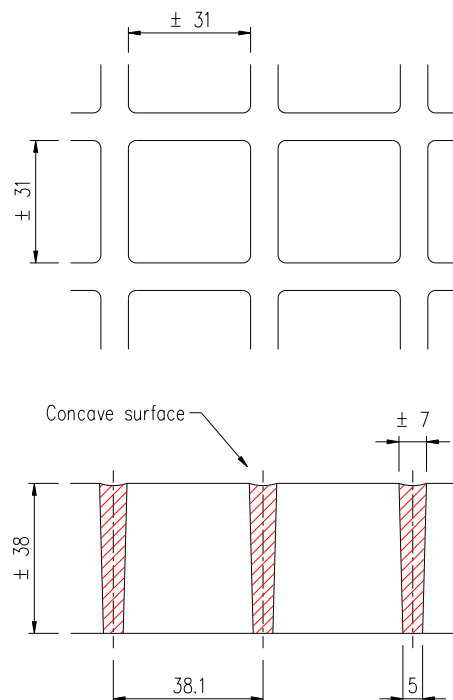
6 SLIP RESISTANCY

6.1 Concave surface

The gratings have a concave surface to obtain slip resistancy.

The slip resistancy meets:

R13 according to BGR 181 and DIN 51130.



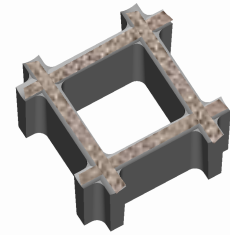
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6.2 Gritted surface

Optionally the gratings can be provided with a gritted surface.

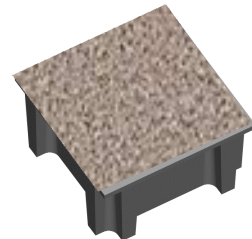
The slip resistancy also meets:

R13 according to BGR 181 and DIN 51130.



7 COVERED GRATING

The gratings can optionally be covered. Standard the surface is provided with grit. The increase of thickness of covered gratings is approx. **3 – 5 mm**.



The warping data (4.4.1 & 4.4.2) are not applicable on covered gratings.

The molding and curing of Fiberstruct HLU-gratings can produce internal stresses that may cause the panel to warp. In some cases, this warpage may increase when HLU-panels are cut into smaller pieces.

In certain situations, this out-of-flat condition can result in tripping hazards and other problems. This is one of the reasons we strongly recommend the use of hold down methods, such as clips. In situations where hold-down procedures are not possible, we do not recommend HLU-panels.

8 FIRE RESISTANCY

8.1 ASTM E-84-00 Tunnel Test:

Illustrates the performance of GRP during a fire situation. It measures the flame spread and smoke emission.

A sample of GRP material is placed in the top of a tunnel. A large gas burner is placed at the entrance while at the end a chimney is placed. Both the spread of flame and the smoke generated during the tests are compared to red oak and cement board to determine flame spread and smoke index.

8.2 M and F test:

These tests are to determine the flame spread according to the french standards: NFP 92-501 (M-test) and the smoke emission NFF 16-101 (F-test).

Our ISO-FR and VE-FR Series gratings are DNV-approved.

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When tested, the below listed results are found:

QUALITY	ASTM E84-00			NFP 92-501	
	FLAME SPREAD	SMOKE INDEX	CLASS	M	F
ECO-FR	≤ 35	680	1	M-1	F-1
ISO-FR	≤ 25	345	1	M-1	F-1
FD-FR	≤ 25	375	1	M-1	F-1
VE-FR	≤ 20	360	1	M-1	F-1
ISO-XFR	≤ 15	920	1	-	-
IGF-FR	≤ 20	10	1	-	-

9 CHEMICAL RESISTANCE

See appendix for the Chemical Resistance guide.

9.1 Operating temperature range

To avoid serious reduction of the mechanical and chemical properties of the gratings, recommended temperature ranges are given for the different resin system.

- ECO-NFR / ECO-FR: -40 / +60 °C
- ISO-FR / FD-FR / ISO-XFR: -40 / +78 °C
- VE-FR: -40 / +98 °C

These temperature ranges are only applicable in standard environments. If not, the chemical resistance guide should be consulted.

Note: for short and infrequent periods of time these values can be exceeded.

10 LOAD CAPACITIES / DEFLECTION

In the appendix, you can find the deflection table.
In the deflection table three types of loads are given:

- Concentrated Load [kg]
- Uniform distributed Load [kg/m²]
- Line Load [kg/305mm]

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- Concentrated Load: The load is applied in the middle of a standard full panel.
Uniform distributed Load: The load is applied uniformly on the whole area of the grating.
Line Load: The line load is applied on a gratings with a width of 305 mm. These values can be used to calculate the deflection on unsupported edges of a grating.

For each type of grating and each span, the load is given for a deflection of 1% :
span / deflection = 100.

De deflection is based on panels that are supported on two sides. For gratings that are supported on four sides the deflection will be less than given in the table >> consult Fiberstruct.

There is a linear relation between the load and the deflection at equal spans.

10.1 Example

For a 38 mm thick grating with a free span of 900 mm, the maximum uniform distributed load with a deflection of 1% is 776 kg/m² (See *deflection table*).

1. When the required deflection is for example 0,8% (L / D 125), the max. load can be easily found:

$$\text{max. load: } 776 \times (0,8/1\%) = 621 \text{ kg/m}^2$$

2. When the required maximum load is 850 kg, the deflection can be calculated:

$$\text{deflection: } 850 / 776 \times 1\% = 1,1\% \quad (0,011 \times 900 = 9,9\text{mm})$$

10.2 Safety factor

The deflection of the gratings is in 99% of the applications the primary design value. The deflection is limited by the safe feeling the grating has to give and not by the mechanical allowable deflection.

In the deflection table, the maximum recommended loads can be found for each grating at each span.

The ultimate capacity represents the load by wich the grating is seriously damaged.

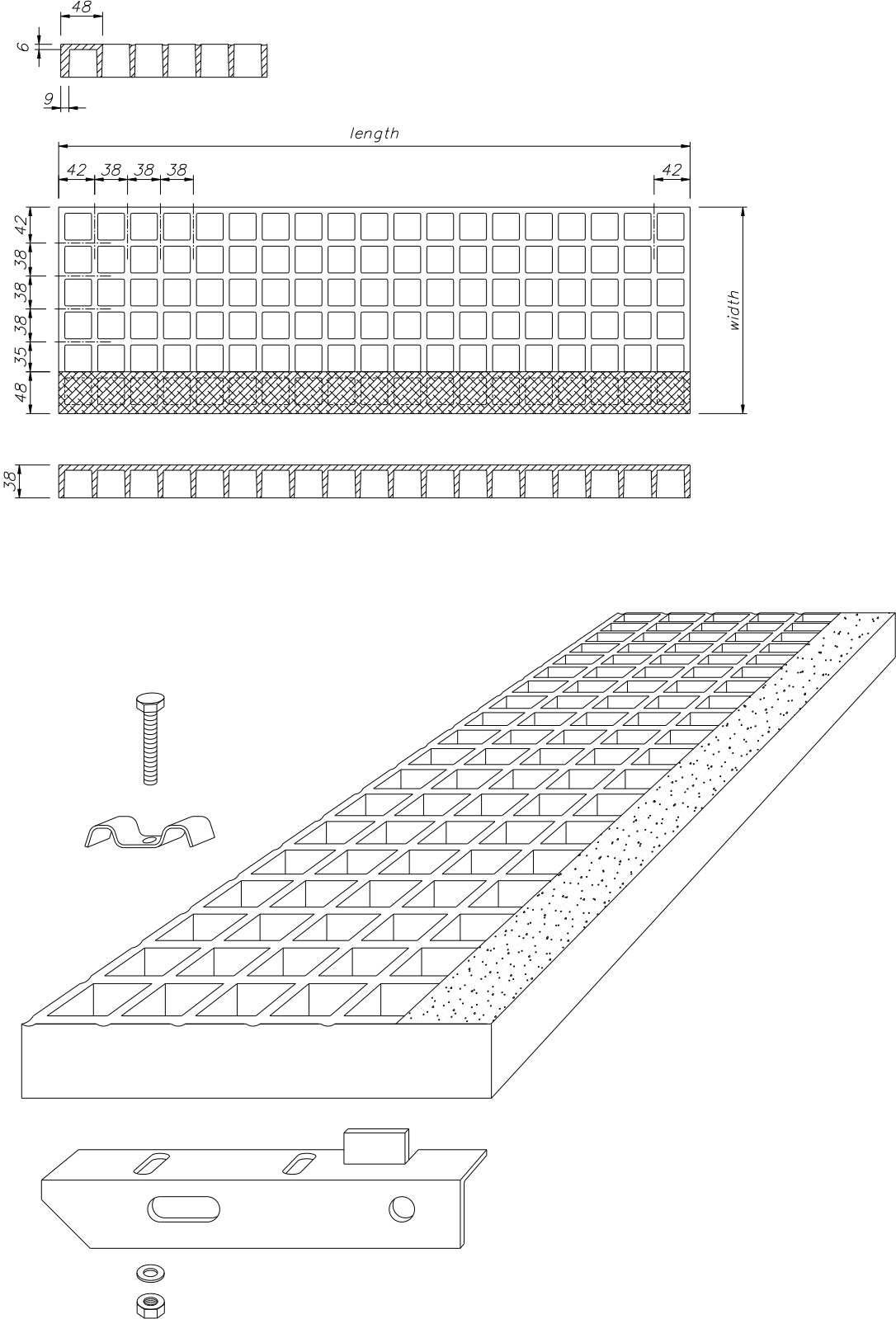
For the above example at 1% deflection, the safetyfactor would be:

$$\text{S.F.} = 8963 / 776 = \mathbf{11,6}$$

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11 SAFESTEP[®]

Safestep[®] stairtreads are specially designed gratings for stairs. The Safestep[®] stairtreads are provided with an extra-reinforced gritted nose which results in excellent anti-slip properties and minimal deflection.



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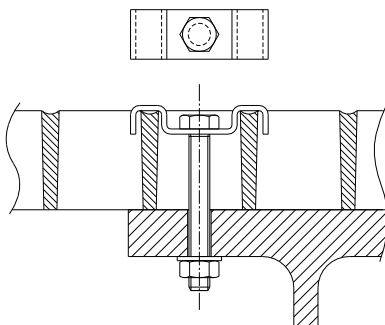
11.1 Closed mesh dimensions

Length			Width		
With these length, 8 treads (width < 277) can be cut out of a standard Safestep panel (lengthwise)	45		617	2 treads can be cut opposite to each other	48
	83		655		86
	121		693		124
	159	6 treads (width < 277)	731		162
	198		769		200
	236		807		239
	274		845		277
	312		883	1 tread can be cut widthwise	315
	350	921	353		
	388	960	391		
	426	4 treads (width < 277)	998		429
	464		1036		467
	502		1074	505	
	540		1112	543	
	579		1150		

12 MOUNTING CLIPS

Highly quality stainless steel mounting material in Austentic A4 type steel. A4 austentic stainless steel represents the most corrosion-resistant steelgroup also referred as "acid-proof". DIN 267 Teil 11 / A.

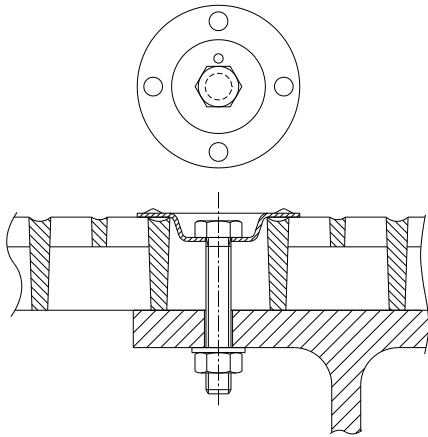
12.1 M-clips



M-clips connect the grating directly to supporting beam. The installation is easy, but the supporting beam has to be drilled.

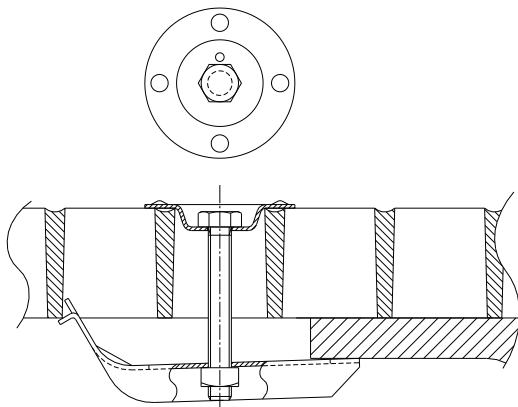
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12.2 S-clips

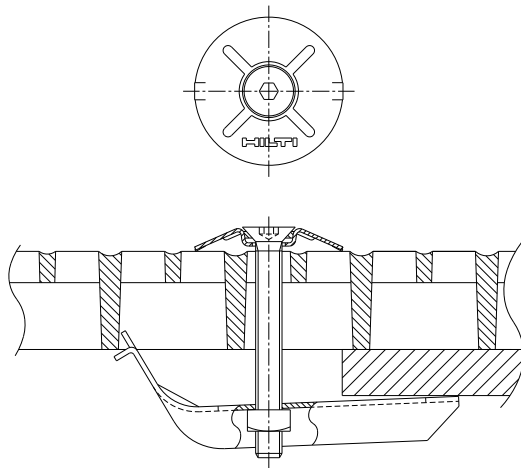


S-clips are specially designed for the Micromesh[®] gratings. Like the M-clip, which is not applicable for the Micromesh[®], the supporting beam has to be drilled. To mount this clip, the “cross” in the Micromesh[®] grating has to be removed locally.

12.3 B-clips



Type B-clips press the grating to the supporting beam. The supporting beam doesn't have to be drilled and the clip can be mounted single handed from above.

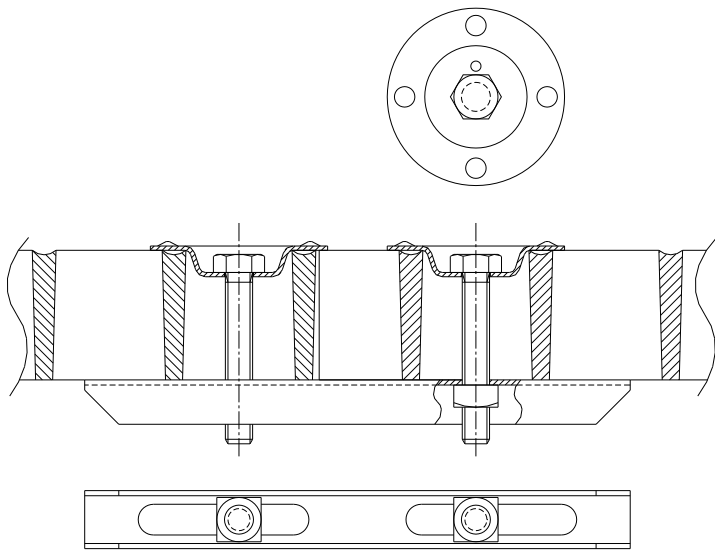


Type B-clips for Micromesh[®] panels don't have the M-saddle, but a special designed dish.

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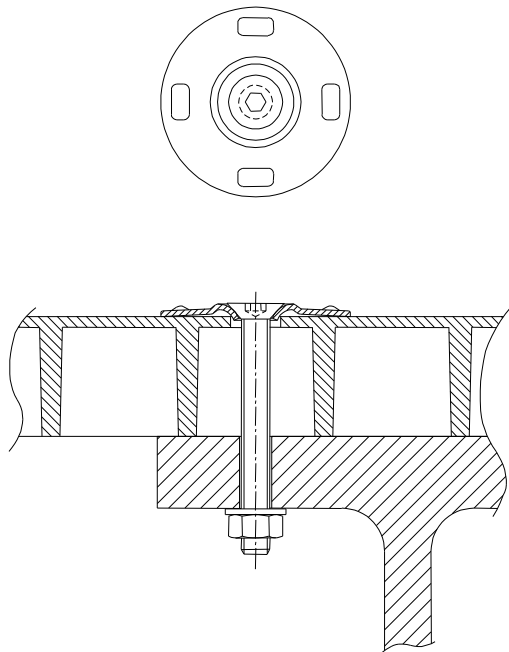
12.4 F-clips

F-clips are assembled for connecting unsupported grating-endings to each other to prevent excessive deflection.



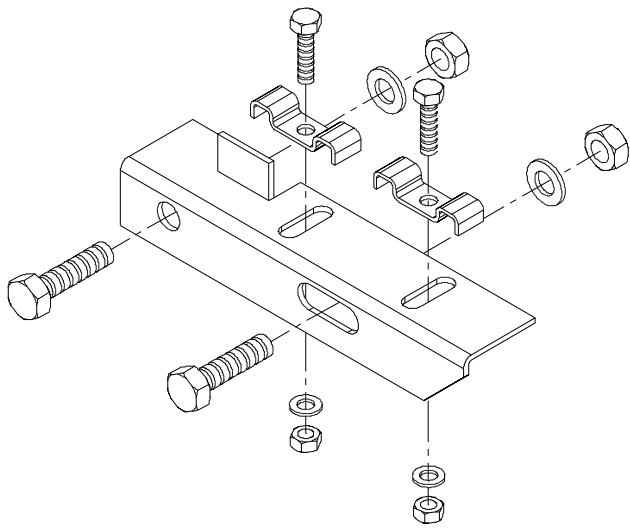
12.5 W-clips

W-clips are specially designed to mount HLU-type gratings. The cover of the HLU and the supporting beams have to be drilled.

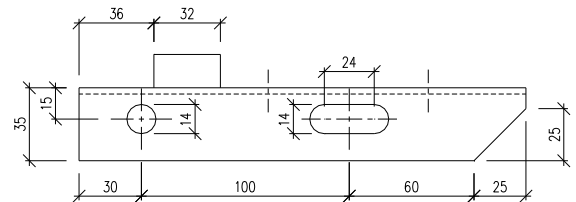
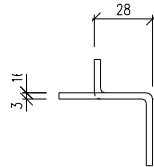
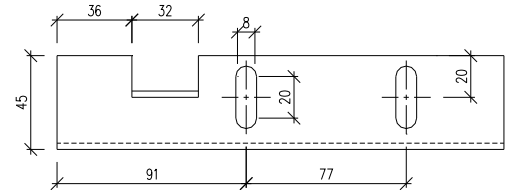


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12.6 Safestep[®] Supports



Safestep[®] supports consist of two angles, 4 M-type mounting clips and are delivered including 4 M12 bolt assemblies for mounting the angle to the stair stringer.



12.7 Overview

Type	Panelheight	Boltsize	Includes
M13	13	M8 x 50	saddle, nut, washer
M26	26	M8 x 50	saddle, nyloc nut, washer
M30	30	M8 x 50	saddle, nyloc nut, washer
M38	38	M8 x 60	saddle, nyloc nut, washer
M50	50	M8 x 80	saddle, nyloc nut, washer
S30 μ	30 Micromesh [®]	M8 x 50	recessed plate, nyloc nut, washer
B26	26	M6 x 50	recessed plate, excentric clamp, square nut
B30	30	M8 x 50	recessed plate, excentric clamp, square nut
B30 μ	30 Micromesh [®]	M8 x 70	Plate, excentric clamp, square nut
B38	38	M8 x 60	recessed plate, excentric clamp, square nut
F26	26	M8 x 50 (2*)	recessed plate(2*), U clap(2*), square nut(2*)
F30	30	M8 x 50 (2*)	recessed plate(2*), U clap(2*), square nut(2*)
F38	38	M8 x 50 (2*)	recessed plate(2*), U clap(2*), square nut(2*)
F50	50	M8 x 60 (2*)	saddle(2*), U clap(2*), square nut(2*)
W26	29 (HLU)	M8 x 70	plate, nut, washer
W30	33 (HLU)	M8 x 70	plate, nut, washer
W38	41 (HLU)	M8 x 90	plate, nut, washer
W50	53 (HLU)	M8 x 90	plate, nut, washer
Safestep [®] Support	38 Safestep [®]	M8 x 50 (4*)	saddle (4*), Angles(2*), M12 x 35 bolts(4*), washers and nyloc nuts

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