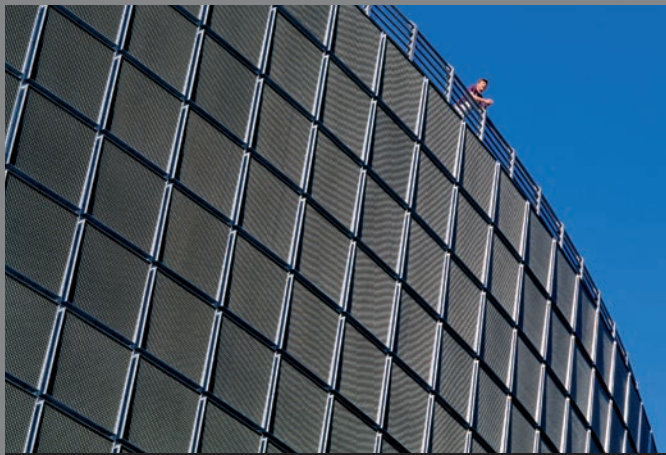


Forge-welded gratings | Pressure-locked gratings | GRP-gratings | Chequer plates | Spiral staircases  
Stairtreads | Ladder rungs | Steel Service | Galvanizing



## Flame-retarding covering Special covering type BP-H



Parking garage with galvanised full-cell gratings



Landing stage of perforated metal planks



Ceiling gratings at a public library

## Lichtgitter – Everything from one source A bright outlook since 1929

Lichtgitter was established in 1929 in order to carry out the specialized manufacturing of gratings. By the continuous monitoring of our performance, and quality systems, together with innovation in manufacturing techniques, we have ensured Lichtgitter's place in the forefront of manufacturers of industrial floor coverings. Besides the production of pressure-locked gratings, forge-welded gratings and perforated metal planks, a various offer of GRP products are part of the production range.

Our current product range also includes profiled chequer plates, spiral staircases, straight staircases and ladder rungs. Together with our steel slitting service centre and hot dip galvanizing plants we provide a complete fabrication facility to our customers.

Lichtgitter is certified according to DIN EN 9001:2008, and complies with all European and International Standards.





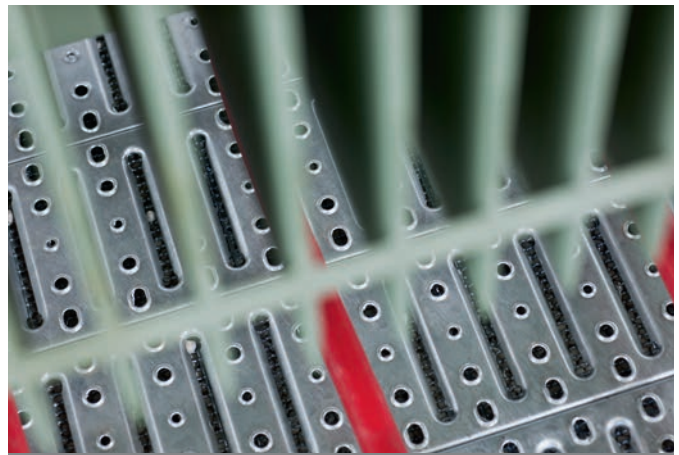
Transformer covering type BP-H



Fire test



Transformer construction



Flame-retarding covering

## Transformer coverings

### Environment protection – Up to date and safe

Transformers in outdoor installations are an important part of our industry to grant the electric power supply. Transformer oil is used as cooling for these installation parts. The transformer could be damaged by external influences (f. ex. lightning) and thereby the free-flowing oil could pollute the groundwater. Therefore there is a pan installed underneath the transformer wherein the oil and rain or fire water can be collected in case of disturbances and possible leakages.

To suffocate the flames in case of a fire in the collecting pan, these pans were covered in the past by gratings and filled with broken stones up to a height of approximately 25 cm. The instructions of the German water law are requiring from the operator of transformer installations to check regularly the leak tightness of the installation. To do these tests it is necessary to remove these coverings what causes however high labour costs and long switching-off periods.

In cooperation with the Lichtgitter Gesellschaft mbH the former energy provider „Vereinigte Elektrizitätswerke Westfalen AG“ (today RWE) has developed a flame-retarding covering to avoid these high labour costs and long switching-off periods. The result of this development is the Lichtgitter perforated metal plank type BP-H with welded waved grills and a filling of glass foam granulate. Various tests have proved that this covering system can be used.



Filling of glass foam granulate



Flame-retarding covering BP-H

## Flame-retarding covering type BP-H

### Europe-wide unique

#### Advantages, which speak for themselves

Better and quicker control of the collecting pan

Shorter switch-off period of the transformer

Lower assembly and disassembly time

Optimum flow time speed of oil, tempering and rain water

The filled loose material (glass foam granulate) is moisture resistant, fire-proof and stable to temperatures up to 600°. It is awarded for its environmental friendliness.

Quick possibility to remove the liquid out of the collection pan.

This system would stifle possibly beginning fire

Serial production – short delivery times

High safety level during maintenance operations

Existing installations can be rebuild without problems

The covering is especially suited for locations where in case of an accident the rescue service cannot be immediately at site.

#### Perforated metal planks type BP-H

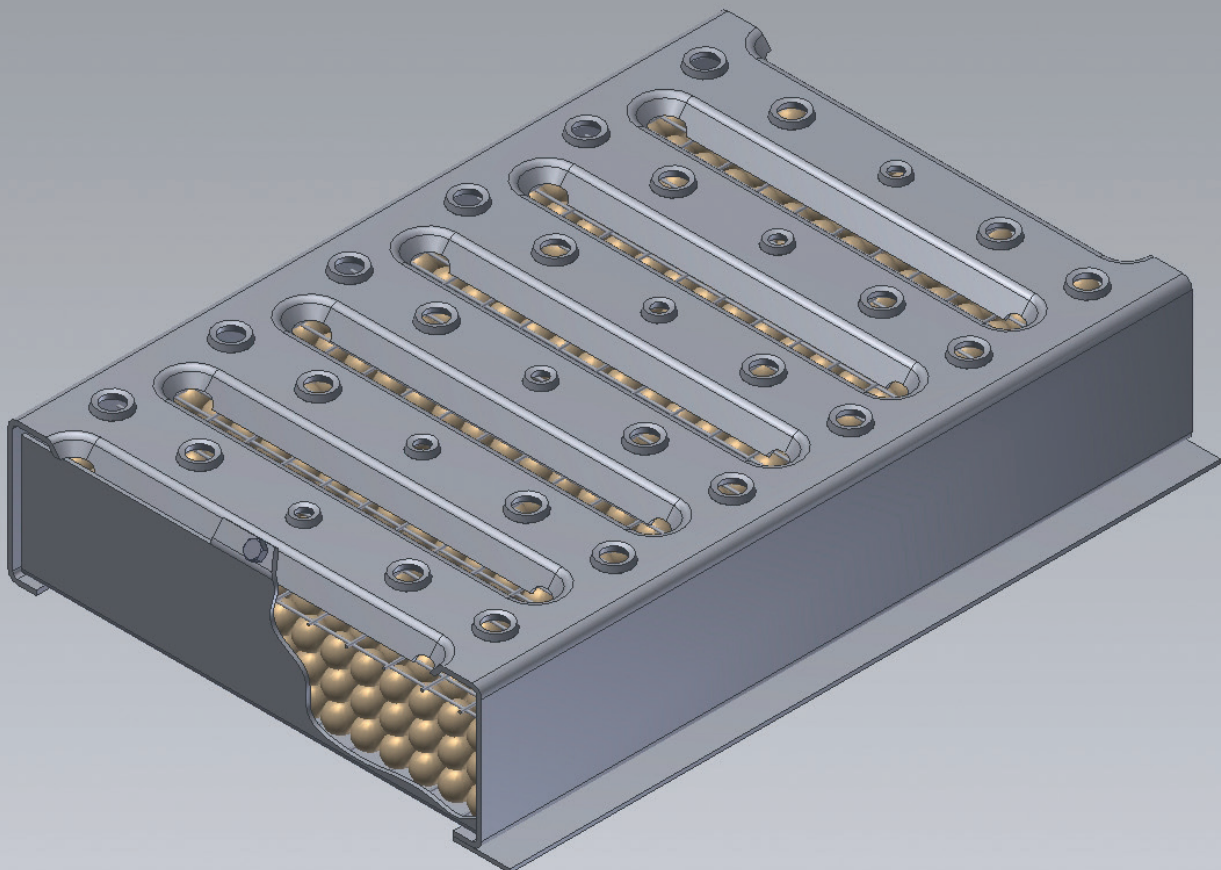
Material	S 235JR
Surface	galvanized according to DIN EN ISO 1461
Sheet thickness	2 mm
Structural module R	125 mm
Production lengths L	up to approx. 2.500 mm
Widths B	150, 200, 300 mm
Heights H	75 mm
Benting $t_u$	approx. 10 mm

On one side of the profile a flat steel is welded so that an area of approx. 20 mm is created. Both front sides are closed.

## Production possibilities on the demands of the clients

Lichtgitter flame-retarding coverings have proven effectually for many years their availability for the use for transformer stations and in the domain of offshore.

Besides the usual Lichtgitter quality, the lower assembly and disassembly times as well as the advantages of our own galvanizing plants, we are especially focusing on the demands of our clients. Custom-made production and special requirements like cutouts are certainly possible.



3D sketch – Flame-retarding covering type BP-H



Type BP-H	Galvanized weight in kg/m²	Load/ Deflection	Span in mm									
			500	600	700	800	900	1.000	1.100	1.200	1.300	1.400
150/75/2	52,50	Fv	211,00	146,50	107,60	82,40	65,10	52,70	43,60	36,60	31,20	26,90
		f	0,05	0,07	0,10	0,13	0,16	0,20	0,24	0,29	0,34	0,39
		FP	13,18	10,55	8,79	7,53	6,59	5,86	5,27	4,79	4,39	4,06
		f1	0,06	0,09	0,12	0,15	0,19	0,23	0,28	0,33	0,38	0,44
200/75/2	46,50	Fv	162,00	113,00	83,00	63,60	50,20	40,70	33,60	28,20	24,00	20,70
		f	0,05	0,07	0,09	0,12	0,16	0,19	0,23	0,28	0,33	0,38
		FP	10,18	8,14	6,79	5,82	5,09	4,19	4,07	3,70	3,39	3,13
		f1	0,04	0,06	0,09	0,11	0,14	0,17	0,20	0,24	0,28	0,32
300/75/2	45,00	FV	108,50	75,30	55,30	42,40	33,5	27,1	22,40	18,80	16,00	13,80
		f	0,05	0,07	0,09	0,12	0,16	0,19	0,23	0,28	0,33	0,38
		FP	10,18	8,14	6,79	5,82	5,09	4,52	4,07	3,70	3,39	3,13
		f1	0,04	0,06	0,09	0,11	0,147	0,17	0,20	0,24	0,28	0,32

## Loadtable BP- H

### Key to symbols

Fv = Load value at uniformly distributed load in kN/m²

F = Deflection in cm at load Fv

Fp = Single load in kN on an area of 200 x 200 mm

F1 = Deflection in cm at load Fp

The mentioned values are characteristically

## Extract of the report about fire technical studies at coverings for oil collecting pans of transformers

### Flame-retarding covering BP-H

#### 1. Task

The basements of big transformer stations have normally collecting pans to avoid that in case of an accident free flowing oil can reach the ground. These oil collecting pans are covered by a broken stones or flint layer with a thickness of roughly 20 cm. So it is assured that in case of fire the flames could not touch the liquid in the pan. The average size of the covering corn is around 40 to 60 mm. They density is roughly 1600 to 1037 kg/m³.

If there is maintenance necessary the whole covering layer of broken stones and flint has to be removed. Furthermore the transformer has to be switched-off and in some cases even a transportation of the pan to another place is necessary. This procedure requires a lot of labour work. So the target was to find an easier and manageable way of covering for the transformer stations. Laboratories tests of the German energy supplier VEW had shown that a combination of gratings with baskets filled with inorganic granulate could be a suitable solution. This glass foam granulate had an average corn size of 12 mm and a density of around 156 kg/m³.

In September/October 1989 first tests were done outside under real conditions whereby the tests were performed with broken stones as well as with granulate.

#### 2. Discussion about the results and the conclusions

It could be proved that burning oil which came out of the transformer at a quantity of 10-12l/min. does not inflame the oil which was already in the collection pan. The reason for this purpose is that the hot oil of the transformer has flown through a cover of a 40 mm thick granulate or through a 200 mm thick broken stones covering before entering the collection pan. A fire on the surface of the granulate results in a reduction of the oxygen in the pan. After 10-15 min. values of <5% were measured. In case there are somewhere leakages and therefore oxygen can enter the oil collecting pan, a burning of the oil located above and beneath the covering is possible. We therefore propose to close the flame-retarding covering on all sides to avoid a slipping of the granulate. This assures that the complete surface is covered with granulate.

Span in mm										
1.500	1.600	1.700	1.800	1.900	2.000	2.100	2.200	2.300	2.400	2.500
23,40	20,60	18,20	16,20	14,60	13,10	11,90	10,80	10,00	9,15	8,40
0,45	0,51	0,58	0,64	0,72	0,80	0,88	0,96	1,05	1,15	1,24
3,77	3,52	3,30	3,10	2,93	2,78	2,64	2,51	2,40	2,29	2,20
0,51	0,58	0,65	0,72	0,80	0,89	0,98	1,07	1,17	1,27	1,38
18,00	15,90	14,00	12,50	11,20	10,10	9,20	8,40	7,70	7,00	6,50
0,44	0,50	0,56	0,63	0,70	0,78	0,85	0,94	1,02	1,12	1,21
2,91	2,71	2,54	2,39	2,26	2,14	2,04	1,94	1,85	1,77	1,70
0,37	0,42	0,47	0,53	0,59	0,65	0,71	0,78	0,85	0,93	1,01
12,00	10,60	9,30	8,30	7,50	6,70	6,10	5,60	5,10	4,70	4,30
0,44	0,50	0,56	0,63	0,70	0,78	0,85	0,94	1,02	1,12	1,21
2,91	2,71	2,54	2,39	2,26	2,14	2,04	1,94	1,85	1,77	1,70
0,37	0,42	0,47	0,53	0,59	0,65	0,71	0,78	0,85	0,93	1,01

■ **Load limit:** According to German instruction  
Elastic deflection (in loaded state) not  $>1/200$  of the span but  
max. 4 mm at a moving single load of 1,5 kN on an area of 200  
x 200 mm. Under the precondition of a distributed payload of  
5 kN/m<sup>2</sup> the max. deflection at this load limit is 4 mm



# Lichtgitter – Product overview

Everything from one source

Please have a look at our complete product range regarding industrial floor coverings

Forge-welded gratings	Spiral staircases
Pressure-locked gratings	Stairtreads
Perforated metal planks	Ladder rungs
GRP-gratings	Steel-Service
Checkered Plates	Galvanizing

# Lichtgitter-Service

Your All-Inclusive-Package

We offer you competent, product and project linked advices with a high level of technical know-how. We support you from the beginning to the end of the project realization, i.e. from the planning to the delivery of the goods. On request we also do the measurement on site. For our clients positive and reliable experiences regarding

- : quality of our products,
- : professionalism and
- : competence of our staff

are the main arguments why choosing Lichtgitter. To guarantee this quality we are manufacturing our products under permanent attention of valid standards and instructions.

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