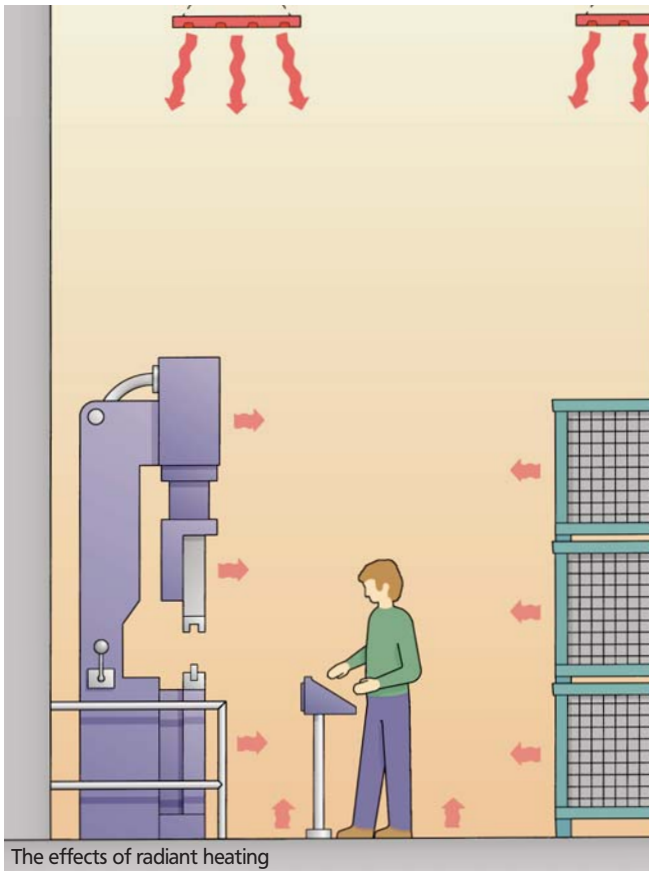


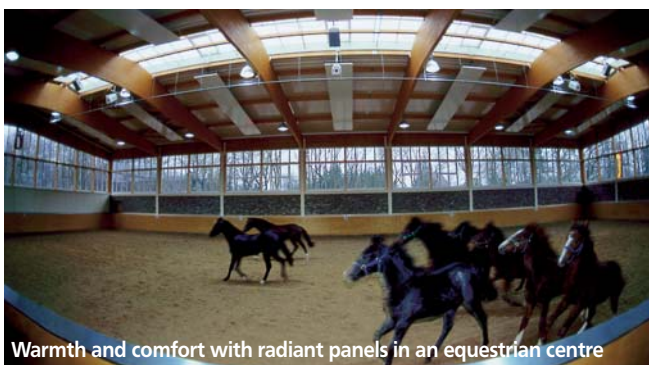


Applications

Heat distribution is very important when it comes to achieving a warm, comfortable interior and radiant panels produce a positive temperature profile from floor to ceiling.

An optimum heating system for high-ceilinged buildings is one that provides most heat at ground level where the users are to be found. This type of building includes:

- Sports and tennis halls, riding arenas
- Retail warehouses, exhibition halls, factories and warehouses
- Open areas, such as retail passageways
- High-bay warehousing, shipyards, aircraft hangars
- Industrial production units
- Laboratories and electronics clean rooms
- Explosion-risk rooms, partially heated premises



Energy savings

In a building heated by radiant panels, the temperature felt by the users at ground level is felt to be between 2 and 4 K higher with the result that the heat requirement is reduced. The energy required to bring the whole system up to temperature is thus reduced by 10 to 25 %.

Temperature stratification is minimised to approx. 0.2 K/m. This reduces heat losses, particularly at ceiling level, resulting in further energy savings.

Advantages

The main advantages of ceiling radiant panels are:

- Perception of a comfortable temperature through heat radiation
- Minimal air movements
- No flurries of dust
- No fire or explosion risk
- Maintenance-free operation
- No build-up of noise
- No electrical connections required
- Take up no floor or wall space
- Minimal stratification (approx. 0.2 K/m)
- Low water content for easy control.

Warmth and comfort

With radiant heating systems, the actual air temperature plays only a minor role in the perception of the user.

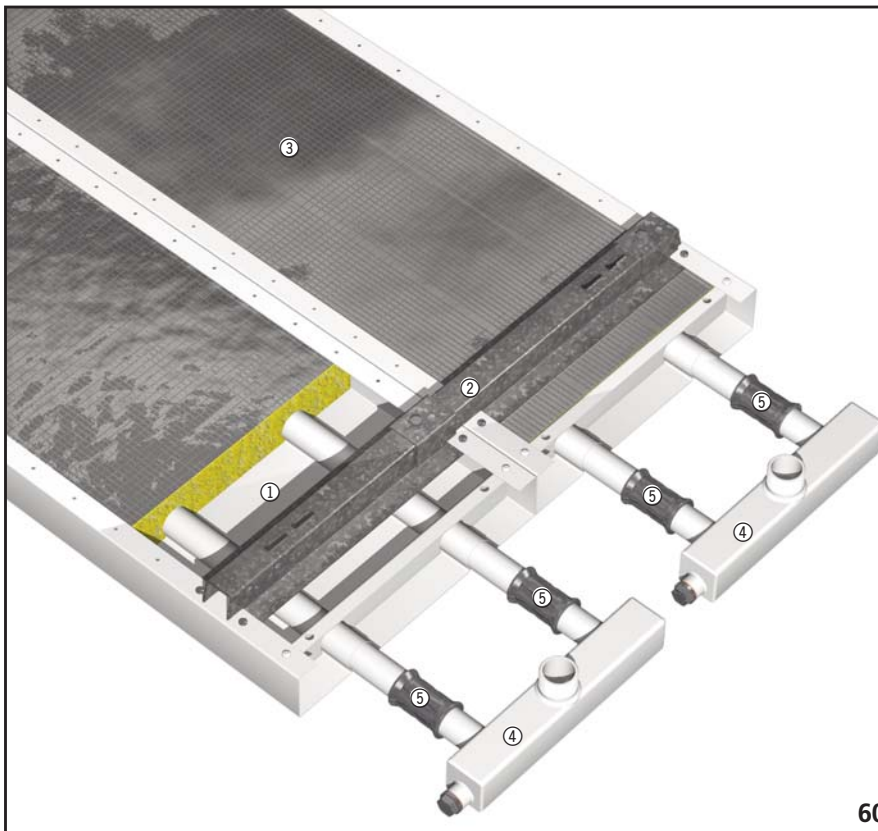
This is illustrated by the fact that the air temperatures in the sun and in the shade are the same and yet temperatures of 0 °C only feel tolerable in the sun because of the additional radiated heat. The temperature actually felt corresponds to the mean value of the air temperature and the average temperature of the surrounding surfaces (DIN 4701 part 1).

Direct radiation and the increase in the temperature of surrounding surfaces by heat radiation means that the air temperature can be kept lower without this influencing the warm, comfortable feeling.

If the ambient temperature is 20 °C, the surrounding surfaces are usually cooler at around 15 °C without radiated heat. But if radiant panels heat up the surrounding surfaces to a temperature of 20 °C, the air temperature can be kept at 2 - 4 K lower. The result is that people usually feel just as warm and comfortable at air temperatures of 16 to 18 °C.

Technical data Plan

Length m	Width mm	Pipe spacing mm	Design heat output Plan $\Delta t = 55 \text{ K, W/m}$
4-50	300	150	166/188
	600	150	310/347
	900	150	449/495
	1200	150	587/638



600 mm wide *Plan* radiant panel, plan view



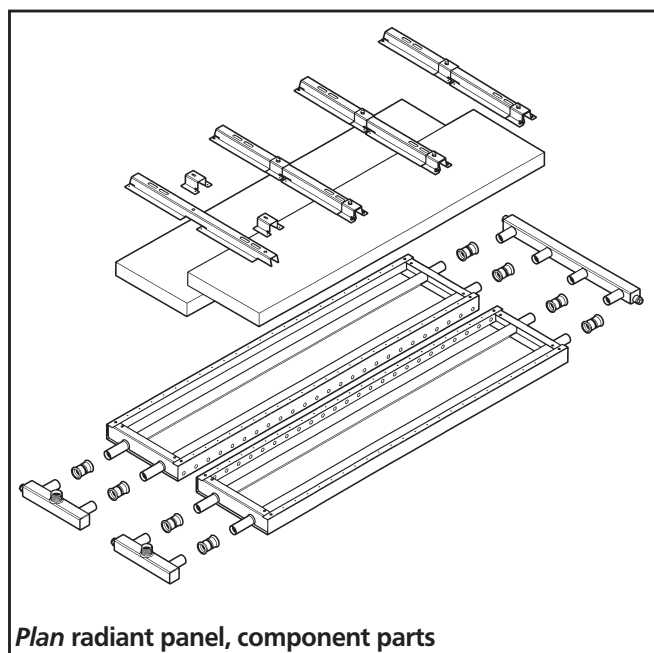
Plan radiant panel, seen from below

***Plan* – the outstanding price-output alternative**

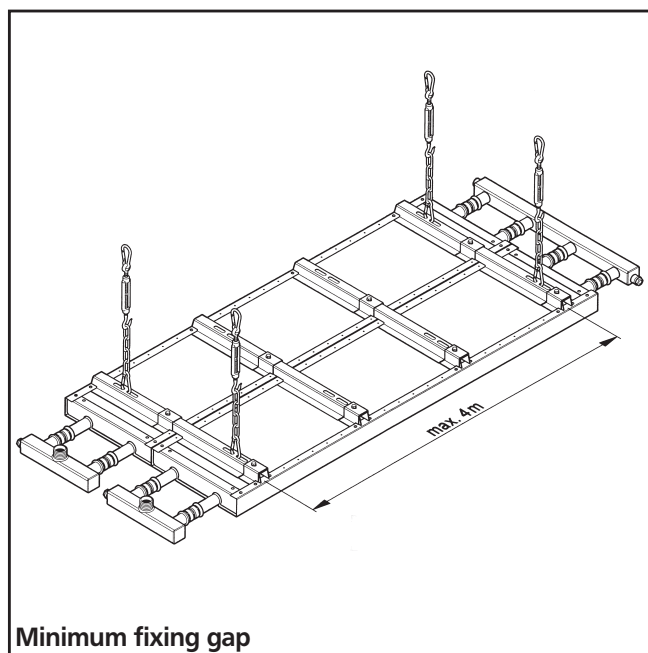
Plan is the newest groundbreaking development from Kampmann engineers - designed and manufactured to offer the best possible price - output ratio.

The innovative feature of *Plan* radiant panels is the possibility of connecting the elements using Mapress fittings - quick, reliable, clean and cost-effective. The elements can of course also be welded on site.

Plan radiant panels also offer a pioneering alternative with regard to fixing. Fixing rails supplied with the panels allow individual fixing and fitting. Simple and easy to fix to any type of building.



Plan radiant panel, component parts



Minimum fixing gap

Description

- Manufactured from 0.8 mm thick, cold-pressed steel.
- Precision steel pipes, 28 x 1.5 mm, are integrally connected to the panel for optimum heat transfer between pipe and panel. 25 % of the pipe is directly radiating.
- Available in 4 or 6 metre long 300 mm wide elements.
- The panels are connected to the required end width by means of fixing rails supplied with the panels.
- Fixing rails can be moved for versatility of fitting.
- Pipe connection headers and water return headers can be ordered separately.
- The pipes can be connected to each other or to pipe connection headers using Mapress fittings (Mapress tool required) or by welding.
- Suitable for water temperatures up to 120 °C, max. operating pressure 10 bar.
- Panels are powdercoated white (RAL 9016).
- 25 kg/m³ aluminium-coated insulation is supplied separately.

Press fittings, type 190

are used to connect the pipes to each other and to pipe connection headers. See price list for the number of fittings required.

Pipe connection headers					
Connection type		Panel width [mm]			
		300	600	900	1200
same end	Type	03501	06501	09501	12501
opposite end	Type	03502	06502	09502	12502

Type number

0	3	1	5	5	1
		1 Powdercoated white RAL 9016 (other colours on request)			
		5 Standard model, max. water temperature 120 °C, max. operating pressure 10 bar			
		15 pipe spacings 150 mm			
03		300 mm panel width			
06		600 mm panel width			
09		900 mm panel width			
12		1200 mm panel width			

Connections

The following connections are available (please state when ordering):

- 1" opposite end connection, 3/8" drain cock
- 1" same end connection, 3/8" drain cock, 3/8" air vent
- 1 1/4" opposite end connection, 3/8" drain cock
- 1 1/4" connection, 3/8" drain cock, 3/8" air vent

Fixing rails

The following are supplied according to which length of unit is ordered:

- 4 metre element : 4 no. fixing rails
- 6 metre element: 5 no. fixing rails

Maximum spacing between fixing rails is 2 metres. Maximum spacing between fixing rails to support panels is 4 metres (see above).

Minimum water flow rate

Type		031551	061551	091551	121551
Panel width	mm	300	600	900	1200
Return water temperature t_{w2} in °C		Minimum water flow rate in kg/h			
Opposite end connection	30	404	808	1212	1616
	40	332	664	996	1328
	50	278	556	834	1112
	60	238	476	714	952
	70	204	408	612	816
	80	178	356	534	712
	90	158	316	474	632
	100	138	276	414	552
	110	126	252	378	504
Same end connection	30	202	404	606	808
	40	166	332	498	664
	50	139	278	417	556
	60	119	238	357	476
	70	102	204	306	408
	80	89	178	267	356
	90	79	158	237	316
	100	69	138	207	276
	110	63	126	189	252

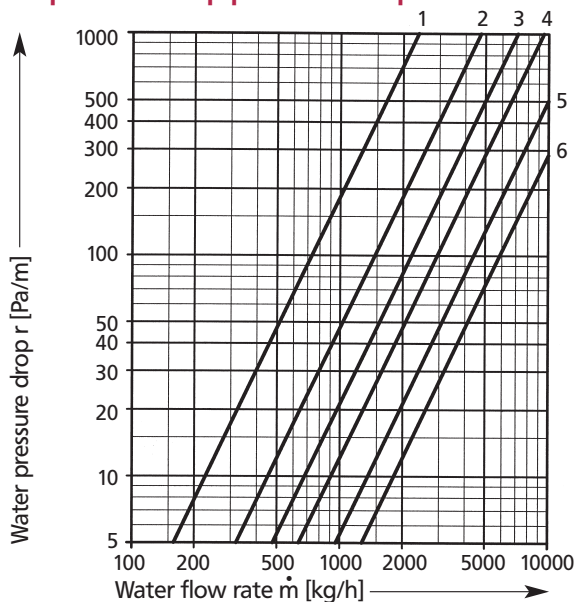
Minimum fixing height

Type		031551	061551	091551	121551
Panel width	mm	300	600	900	1200
Mean temperature Δt in °C		Minimum fixing height H_{min} in m			
30	-	-	-	-	3,5
	40	-	-	3,2	3,7
	50	-	3,1	3,4	4,1
	60	3,0	3,3	3,7	4,5
	70	3,2	3,5	4,0	4,8
	80	3,4	3,7	4,2	5,1
	90	3,6	4,0	4,5	5,5
	100	3,8	4,2	4,8	5,8
	110	4,0	4,4	5,1	6,1

Minimum height from ceiling

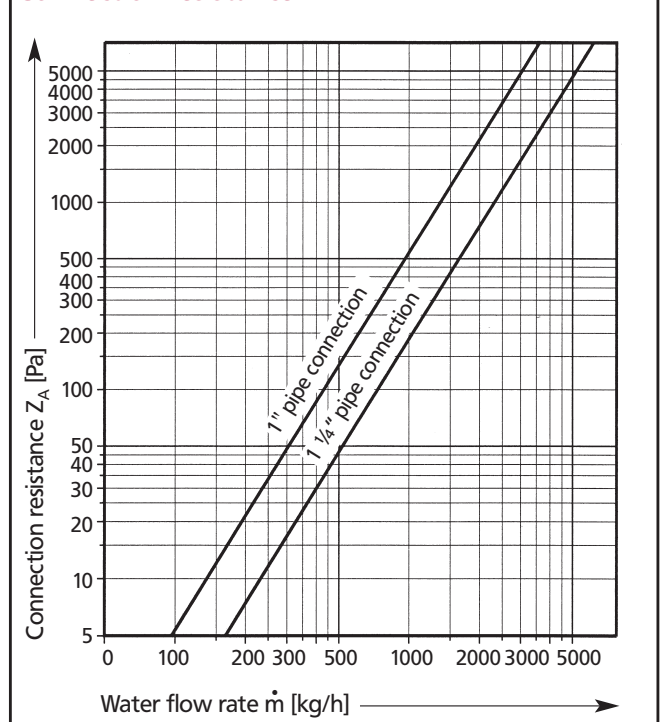
Radiant panel length L	Minimum height from ceiling in mm	
	Mean water temperature	
	< 75 °C	< 100 °C
10 m	200	210
20 m	220	240
30 m	240	270
40 m	270	310
50 m	300	350

Water pressure drop per metre of panel



Type		031551	061551	091551	121551
Panel width	mm	300	600	900	1200
Opposite end connections	Curve No.	2	4	5	6
Same end connections	Curve No.	1	2	3	4

Connection resistance



Plan radiant panels

Dimensions • Heat output • Weight

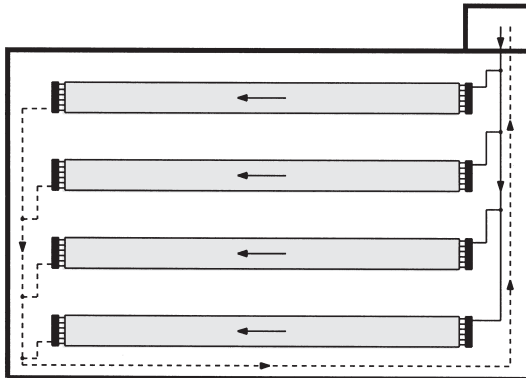
Type		031551	061551	091551	121551
Panel width	mm	300	600	900	1200
No. of pipes	piece	2	4	6	8
Nominal heat output ¹⁾	W/m	151	282	408	534
Water content of panel	l/m	1,10	2,20	3,30	4,40
Water content of chamber ³⁾	l/piece	0,39	0,78	1,17	1,56
Weight of panel ²⁾	kg/m	7,5	15,0	22,5	30,0
Weight of chamber ^{2),3)}	kg/piece	1,5	3,0	4,5	6,0
Design heat output per metre of panel according to DIN V 4706 part 2					
Mean excess temperature Δt	K	W/m	W/m	W/m	W/m
20		51	96	139	182
22		57	107	155	203
24		63	118	172	224
26		70	130	188	246
28		76	142	205	268
30		82	153	222	291
32		89	165	240	313
34		95	177	257	336
36		102	190	275	359
38		108	202	292	382
40		115	214	310	406
42		121	227	328	429
44		128	239	347	453
46		135	252	365	477
48		142	265	383	501
50		149	278	402	526
52		156	290	421	550
54		163	303	440	575
55		166	310	449	587
56		170	317	458	599
58		177	330	478	624
60		184	343	497	649
62		191	356	516	675
64		198	370	535	700
66		205	383	555	725
68		212	397	574	751
70		220	410	594	776
72		227	424	614	802
74		234	437	633	828
76		242	451	653	854
78		249	465	673	880
80		256	479	693	907
82		264	493	714	933
84		271	507	734	959
86		279	521	754	986
88		286	535	775	1013
90		294	549	795	1039
92		301	563	815	1066
94		309	577	836	1093
96		317	592	857	1120
98		324	606	878	1147
100		332	620	898	1174
102		340	635	919	1202
104		348	649	940	1229
106		355	664	961	1257
108		363	678	982	1284
110		371	693	1003	1312

¹⁾ Heat output according to DIN V 4706, part 1, with 40mm heat insulation at $t = 55K$

²⁾ Weight includes heat insulation and water content

³⁾ Includes pipe connection headers and water return headers

Example 1: Parallel feed of radiant panels with opposite end connections

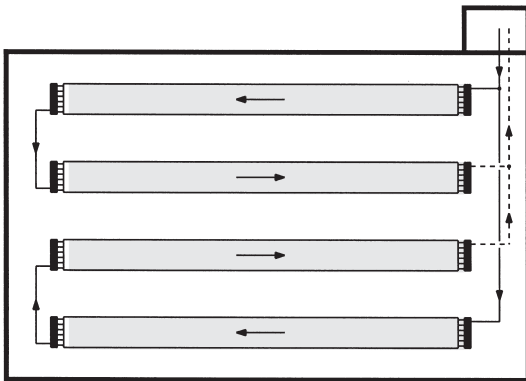


"Tichelmann" pipe feed

when

- there are long runs of panels with high water temperatures
- there are declining heat requirements towards end of panel runs i.e. drop in temperature within a production plan

Example 2: Series feed of radiant panels with opposite end connections

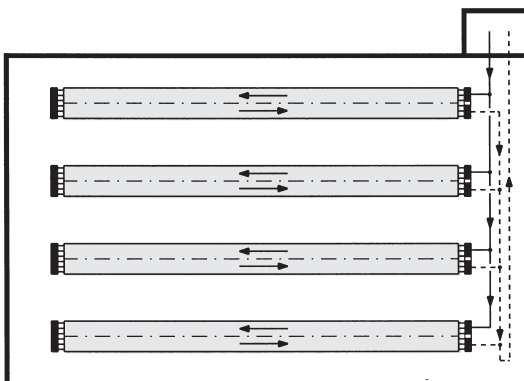


when

- similar radiant panel types are used along exterior wall and in centre of area
- there are shorter panel lengths to achieve a high flow rate.

The drop in temperature towards the centre of the room corresponds to the declining heat requirement.

Example 3: Parallel feed of radiant panels with same end connections



"Tichelmann" pipe feed

when

- there has to be an even distribution of heat given off over the entire surface of the panels