Technical Catalogue

TERMO TEKNiK®

PANEL RADIATORS

EN 442 ISO 9001:2000

INTRODUCTION

This catalogue, in general, is to give our customers technical information on choosing, using and installing Termo Teknik panel radiators.

Termo Teknik is a subsidiary of the UK based Caradon Radiators Ltd., which has radiator factories throughout Europe and a Research&Development Division and heat testing laboratory in Belgium.

Termo Teknik radiators are produced by the most modern machinery. All the radiators are tested at maximum 13 bars, and are first painted with primer paint then with electrostatic powder paint. The principal goal of our Quality Assurance System is to provide our customers with affordable and high quality radiators which will fulfill their heating requirements for many years.

Termo Teknik was one of the first radiator factories in Europe to achive ISO 9000 certification. Currently Termo Teknik’s factory and production has BS ISO 9001:2000 accreditation and the radiators are certified according to BSI, DIN, NF, EMI, GOST,AR, UkrSEPRO, BAGUV, TSE and several other national standards, as well as the international EN 442 steel radiator standard.

TECHNICAL INFORMATION

Termo Teknik panel radiators are produced in accordance with the internationally accepted EN 442 standard. Cold rolled steel conforming to EN 10130 is used in the production; surface treatment and painting processes takes place in accordance with DIN 55900-1 standard.

Steel thicknesses used in panel radiator production:

Panel production	: 1.20 ± 0.09 mm
Fin production	: 0.45 ± 0.09 mm
top and side covers	: 0.75 ± 0.09 mm
Radiator test pressure	: Maximum 13 bars = 13 kgf / cm^2
Radiator working pressure	: Maximum 10 bars
Paint:	
Primer (dip) paint	: white, water-based epoxy ester
Powder paint	: RAL 9016, 75 gloss, epoxy polyester

The fins are welded on top of 33.3 mm pitched water circulation canals to ensure that you get the highest performance from our panel radiators.

The environmentally friendly water based primer paint is cured at 160 °C and the second coat of high quality epoxy polyester powder paint is cured at 180 °C.

ACCESSORIES

* Screws and plastic wall plugs
* Wall hangers
* Blanking plug G 1/2"
* Airvent plug G 1/2"
* Side panels (mounted onto the panel radiator)
* Grills (mounted onto the panel radiator)
* Various other models of wall hangers and floor stands available upon request.

PACKAGING

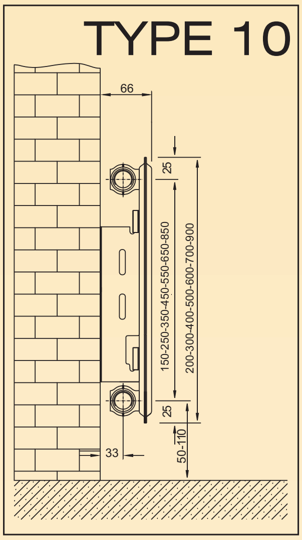
Hangers, welded at the back of the radiators, are protected by supports against damages. Sides of the panels are supported with grooved card-board protectors against possible harms from external effects EAN Barcodes are printed on the model / type label. Finally, the radiators are wrapped with shrink-wrap plastic against wetness, humidity, dust. This heavy duty packaging minimizes the risk of damage during transportation or at the construction or installation sites. In order to prevent damages to the radiator surface and paint, it is advised that the wrapping of the radiator should be kept on until all construction work at the site is completed.

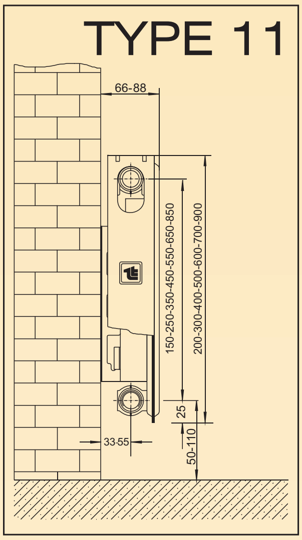
LENGTHS AND HEIGHTS OF PANEL RADIATORS

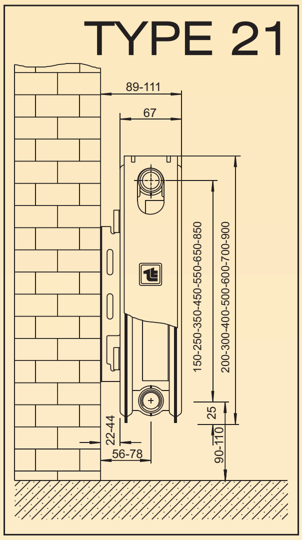
The standard lengths of the panel radiators: L (mm)
400 to 3000 in steps of 100 mm.

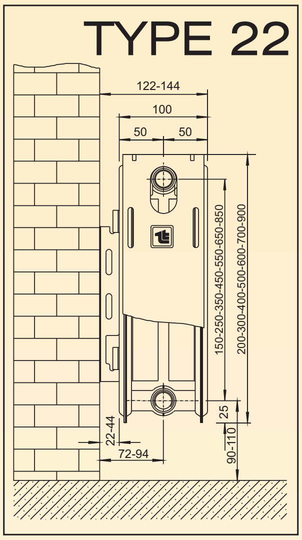
The standard heights of the panel radiators: H (mm)
H =200, 300, 400, 500, 600, 700, 900

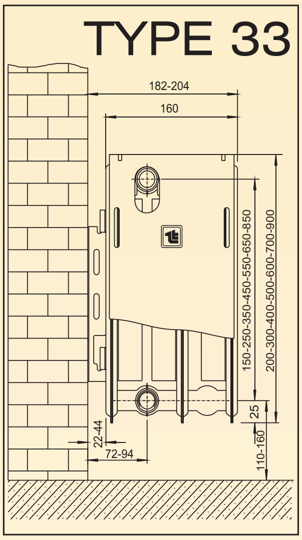
PANEL RADIATOR TYPES

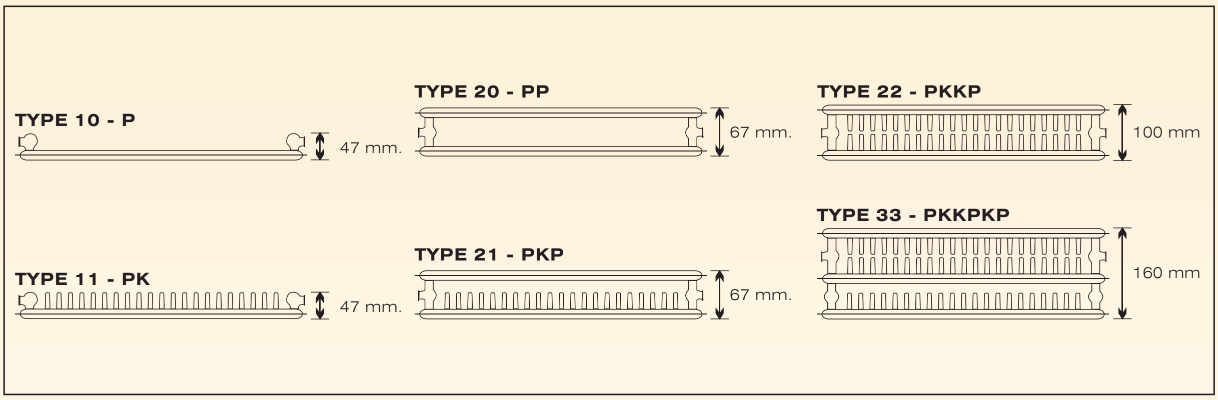




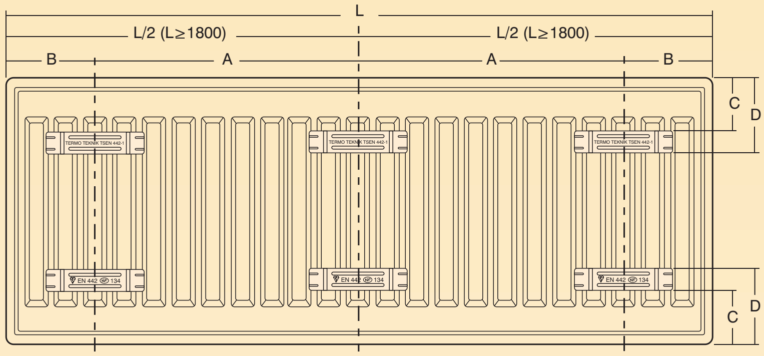


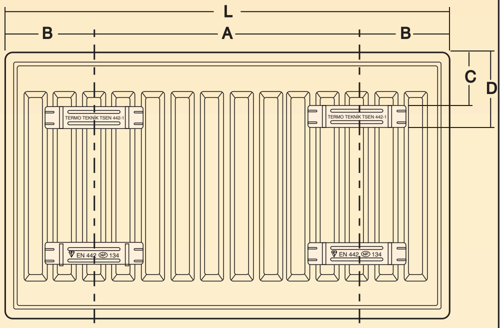






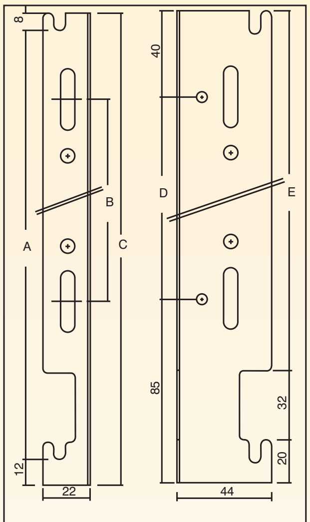
PANEL RADIATOR HANGER DIMENSIONS





L (mm)	A (mm)		B (mm)		C (mm)	D (mm)	Row of Hangers
	11 Type	10,20,21, 22,33 Type	11 Type	10,20,21, 22,33 Type			
400	170	200	115	100	60	85	2
500	270	300	115	100	60	85	2
600	370	400	115	100	60	85	2
700	470	500	115	100	60	85	2
800	570	600	115	100	60	85	2
900	670	700	115	100	60	85	2
1000	770	800	115	100	60	85	2
1100	870	900	115	100	60	85	2
1200	970	1000	115	100	60	85	2
1400	1170	1200	115	100	60	85	2
1600	1370	1400	115	100	60	85	2
1800	785	800	115	100	60	85	3
2000	885	900	115	100	60	85	3
2200	985	1000	115	100	60	85	3
2400	1085	1100	115	100	60	85	3
2600	1185	1200	115	100	60	85	3
2700	1235	1250	115	100	60	85	3
2800	1285	1300	115	100	60	85	3
3000	1385	1400	115	100	60	85	3

PANEL RADIATOR WALL HANGER DIMENSIONS

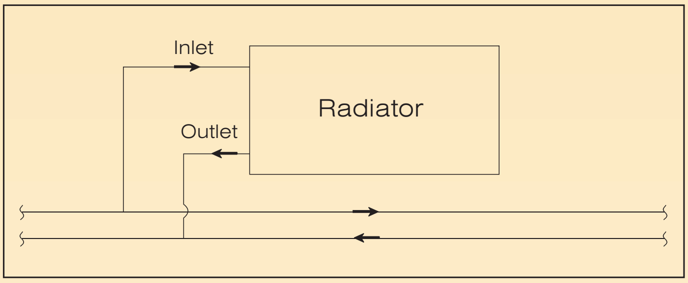


	200	300	400	500	600	700	900
A	55	155	255	355	455	555	755
B	-	50	150	250	350	450	650
C	75	175	275	375	475	575	775
D	-	-	150	250	350	450	650
E	23	123	223	323	423	523	723

INSTALLATION METHODS FOR PANEL RADIATORS

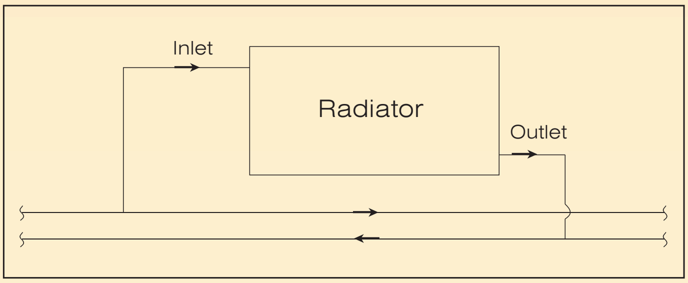
Generally radiators are connected in one of the below methods:

1 -



Hot water enters from the top and exits from the bottom of the same side. It is the most advised and used method, and in most cases the most energy efficient.

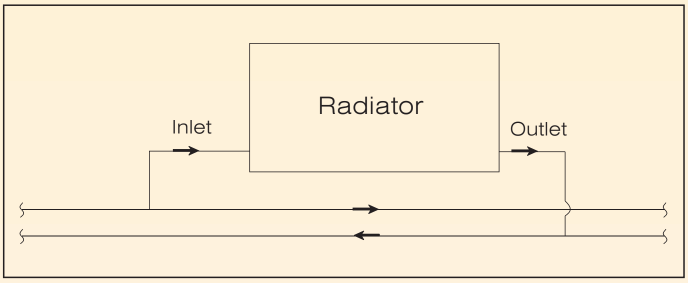
2-



This method is generally advised for long raditors where the length of the panel radiator is 3 times more than the height.

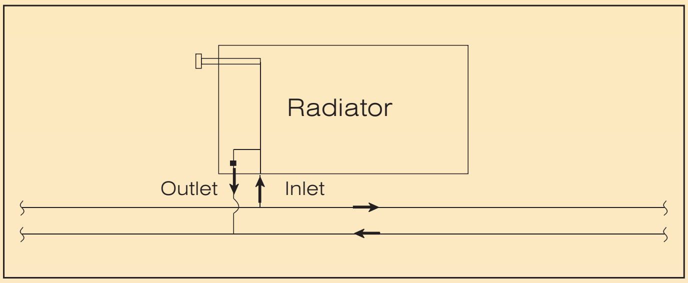
Example: This method is advised for 500 mm high radiator with lengths of greater than 1500 mm (500 x 3 = 1500 mm).

3 -



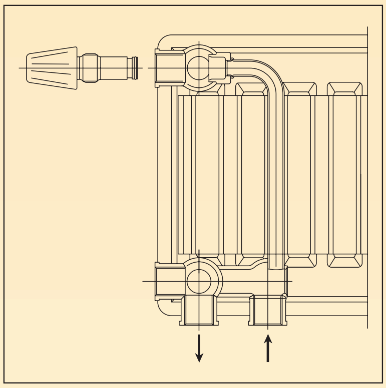
This method is also allowed by the EN 442 standard.

4 -

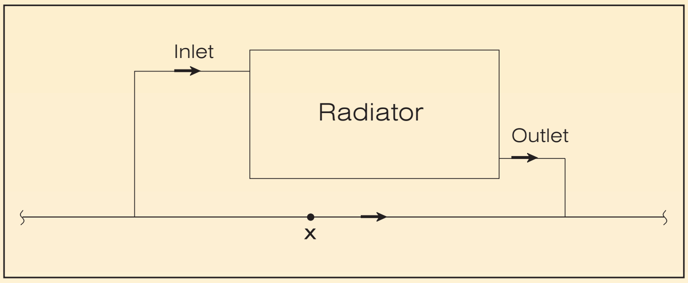


Special connection elements are used in this method. This method is used when the pipes come directly from the floor.

In this installation method, a thermostatic valve is used so that the heat is controlled more easily and economically.

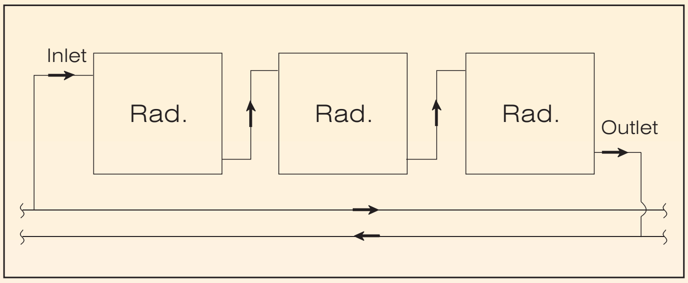


5 -



According to the single pipe connection method, “x” needs to be calculated or pumps for water pressure drop must be placed here. In this form of connection, it should be taken into consideration that every radiator will have a different average temperature.

6 -



This is a method used for connecting a series of radiators and is used very rarely. If it must be used, the total heat output of the series must not exceed 7000-8000 kcal/h, otherwise the capacity of the circulation pump will be exceeded.
The capacities of the series should be calculated carefully because of the different average water temperature between each panel.

7- Collector system - Each radiator has a different pipe going to and coming from the collector.

CAPACITIES OF THE RADIATORS IN VARYING WATER AND ROOM TEMPERATURES

Radiator heat outputs are linear. The heat output tables show the heat outputs for a 1 m long radiator. If a 1 m long radiator from the table has an output of 1200 watts than the same model of 70 cm would be 840 watts (0.70 x 1200) and a model of 2.2 m would be 2640 watts (2.2x1200).

The radiator heat output varies according to water and room temperature changes.

Heat outputs at 75/65 °C water inlet/outlet temperature and at different room temperatures are given in Table 1A and Table 1B .

Heat outputs at temperatures other than those given in Table 1A and Table 1B are calculated using F Factors (Table 2) enabling you to find the performance of standard radiator (75/65 °C and 20 °C) at different room and water temperatures. The following are two examples demonstrating usage of F Factors:

EXAMPLE 1:

The heat output for 600/22/1000 panel radiator at (75/65 °C and 20 °C) is Qn=1672 watts. What will be the heat output at 70/55 °C water inlet/outlet temperatures and 18 °C room temperature?

In F Factor table (Table 2) the first vertical column shows the incoming water temperature; the second vertical column shows the room temperature and the horizontal rows show the outgoing water temperature. When those columns are intersected, the “F” value is found.

The “F” value at 70/55 °C and 18 °C is 1,17.

The new heat output is calculated with the formula:

Q = Qn / F

Q = 1672 / 1,17

Q = 1429 watt

Q:Required heat output

Qn:Standard heat output (at 75/65 and 20 °C)

F: Capacity factor from the table

EXAMPLE 2:

This table can also be used to choose a radiator for a site (room or area) whose heat requirement has already been calculated.

Let's assume that the calculated heat requirement for a room is Q = 1500 watt. How can we select and calculate the heat output of a standard radiator at 70/55 °C water inlet/outlet temperatures and 18 °C room temperature?

The “F” value from Table 2 is 1,17.

Qn = Q x F

Qn = 1500 x 1,17

Qn = 1755 watt

Then we choose from the catalogue (at 75/65 and 20 °C) a radiator with Qn = 1755 watt.

If we straight away choose a radiator from the catalogue with a heat output of 1500 watt instead of 1755 watt, the temperature of the room would not come to the desired standard.

The above example shows how a non-standard condition can be converted to a desired standard condition.

Table 1A. Heatoutput values at 75/65 °C water inlet/outlet and various room temperatures (Watt/m - Kcal/h m)

Type	Room Temperature (°C)	200	300	400	500	600	700	900
10-P	15	---	378/325	477/410	573/493	666/573	758/652	940/808
	18	---	352/303	443/381	532/458	618/531	704/605	872/750
	20	---	334/287	421/362	505/434	587/505	668/574	828/712
	22	---	317/273	399/343	479/412	556/478	633/544	784/674
	24	---	299/257	377/324	452/389	526/452	598/514	741/637
11-PK	15	372/320	572/492	732/630	882/759	1025/882	1162/999	1417/1219
	18	345/297	532/458	681/586	821/706	953/820	1080/929	1316/1132
	20	328/282	506/435	647/556	780/671	906/779	1026/882	1250/1075
	22	311/267	480/413	614/528	740/636	859/739	973/837	1185/1019
	24	294/253	454/390	581/500	700/602	813/699	920/791	1120/963
21-PKP	15	612/526	827/711	1035/890	1234/1061	1427/1227	1615/1389	1982/1705
	18	569/489	769/661	962/827	1147/986	1325/1140	1499/1289	1839/1582
	20	540/464	731/629	914/786	1089/937	1258/1082	1423/1224	1745/1501
	22	512/440	694/597	867/746	1032/888	1192/1025	1348/1159	1653/1422
	24	484/416	657/565	820/705	976/839	1126/968	1274/1096	1561/1342
22-PKKP	15	743/639	1073/923	1364/1173	1638/1409	1897/1631	2143/1843	2602/2238
	18	691/594	997/857	1267/1090	1521/1308	1761/1514	1989/1711	2414/2076
	20	656/564	947/814	1203/1035	1444/1242	1672/1438	1888/1624	2290/1969
	22	622/535	898/772	1140/980	1368/1176	1584/1362	1788/1538	2168/1864
	24	588/506	849/730	1078/927	1293/1112	1497/1287	1690/1453	2048/1761
33-PKKPKP	15	1059/911	1524/1311	1925/1656	2310/1987	2679/2304	3037/2612	3725/3204
	18	985/847	1417/1219	1789/1539	2145/1845	2487/2139	2819/2424	3454/2970
	20	936/805	1346/1158	1699/1461	2037/1752	2361/2030	2675/2301	3277/2818
	22	888/764	1276/1097	1610/1385	1930/1660	2237/1924	2533/2178	3102/2668
	24	840/722	1207/1038	1523/1310	1825/1570	2114/1818	2394/2059	2929/2519

Table 1B. Heatoutput values at 90/70 °C water inlet/outlet and various room temperatures (Watt/m - Kcal/h m)

Type	Room Temperature (°C)	200	300	400	500	600	700	900
10-P	15	---	471/405	594/511	713/613	830/714	945/813	1174/1010
	18	---	443/381	558/480	670/576	780/671	888/764	1102/948
	20	---	424/365	535/460	642/552	747/642	850/731	1055/907
	22	---	406/349	512/440	614/528	714/614	813/699	1009/868
	24	---	387/333	489/421	586/504	682/587	776/667	963/828
11-PK	15	463/398	710/611	908/781	1095/942	1273/1095	1444/1242	1764/1517
	18	435/374	668/574	854/734	1030/886	1197/1029	1358/1168	1658/1426
	20	417/359	640/550	819/704	988/850	1148/987	1301/1119	1588/1366
	22	399/343	613/527	784/674	945/813	1098/944	1245/1071	1519/1306
	24	381/328	586/504	749/644	903/777	1049/902	1189/1023	1451/1248
21-PKP	15	763/656	1025/882	1286/1106	1537/1322	1781/1532	2016/1734	2476/2129
	18	717/617	964/829	1209/1040	1444/1242	1673/1439	1893/1628	2325/2000
	20	687/591	925/796	1159/997	1383/1189	1602/1378	1813/1559	2225/1914
	22	657/565	885/761	1109/954	1323/1138	1531/1317	1733/1490	2127/1829
	24	612/526	846/728	1059/911	1264/1087	1462/1257	1654/1422	2030/1746
22-PKKP	15	925/796	1335/1148	1698/1460	2042/1756	2368/2036	2677/2302	3255/2799
	18	869/747	1255/1079	1596/1373	1918/1649	2224/1913	2514/2162	3055/2627
	20	833/716	1202/1034	1529/1315	1837/1580	2129/1831	2406/2069	2924/2515
	22	797/685	1150/989	1462/1257	1757/1511	2036/1751	2300/1978	2794/2403
	24	761/654	1098/944	1396/1201	1677/1442	1943/1671	2195/1888	2666/2293
33-PKKPKP	15	1316/1132	1895/1630	2396/2061	2879/2476	3344/2876	3794/3263	4663/4010
	18	1238/1065	1781/1532	2252/1937	2705/2326	3141/2701	3563/3064	4376/3763
	20	1186/1020	1707/1468	2158/1856	2591/2228	3007/2586	3411/2933	4187/3601
	22	1135/976	1633/1404	2064/1775	2477/2130	2875/2473	3260/2804	4001/3441
	24	1085/933	1560/1342	1971/1695	2365/2034	2744/2360	3111/2675	3816/3282

Table 2 . F Factor Table
Radiator Capacity Factors at Different Room and Water Temperatures

Water Inlet Temperature (°C)	Room Temperature (°C)	Water Outlet Temperature (°C)													
		25	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**
95	24	1,54	1,41	1,30	1,20	1,12	1,04	0,97	0,91	0,86	0,81	0,77	0,73	0,69	0,66
	22	1,43	1,32	1,22	1,13	1,06	0,99	0,93	0,87	0,82	0,78	0,74	0,70	0,67	0,64
	20	1,34	1,24	1,15	1,07	1,00	0,94	0,88	0,83	0,79	0,75	0,71	0,67	0,64	0,61
	18	1,26	1,17	1,08	1,01	0,95	0,89	0,84	0,80	0,75	0,72	0,68	0,65	0,62	0,59
	15	1,15	1,07	1,00	0,94	0,88	0,83	0,79	0,75	0,71	0,67	0,64	0,61	0,59	0,56
90	24	1,69	1,54	1,41	1,30	1,20	1,12	1,04	0,97	0,91	0,86	0,81	0,77	0,73	
	22	1,57	1,43	1,32	1,22	1,13	1,06	0,99	0,93	0,87	0,82	0,78	0,74	0,70	
	20	1,46	1,34	1,24	1,15	1,07	1,00	0,94	0,88	0,83	0,79	0,75	0,71	0,67	
	18	1,36	1,26	1,17	1,08	1,01	0,95	0,89	0,84	0,80	0,75	0,72	0,68	0,65	
	15	1,24	1,15	1,07	1,00	0,94	0,88	0,83	0,79	0,75	0,71	0,67	0,64	0,61	
85	24	1,87	1,69	1,54	1,41	1,30	1,20	1,12	1,04	0,97	0,91	0,86	0,81		
	22	1,73	1,57	1,43	1,32	1,22	1,13	1,06	0,99	0,93	0,87	0,82	0,78		
	20	1,60	1,46	1,34	1,24	1,15	1,07	1,00	0,94	0,88	0,83	0,79	0,75		
	18	1,49	1,36	1,26	1,17	1,08	1,01	0,95	0,89	0,84	0,80	0,75	0,72		
	15	1,34	1,24	1,15	1,07	1,00	0,94	0,88	0,83	0,79	0,75	0,71	0,67		
80	24	2,09	1,87	1,69	1,54	1,41	1,30	1,20	1,12	1,04	0,97	0,91			
	22	1,92	1,73	1,57	1,43	1,32	1,22	1,13	1,06	0,99	0,93	0,87			
	20	1,76	1,60	1,46	1,34	1,24	1,15	1,07	1,00	0,94	0,88	0,83			
	18	1,63	1,49	1,36	1,26	1,17	1,08	1,01	0,95	0,89	0,84	0,80			
	15	1,46	1,34	1,24	1,15	1,07	1,00	0,94	0,88	0,83	0,79	0,75			
75	24	2,36	2,09	1,87	1,69	1,54	1,41	1,30	1,20	1,12	1,04				
	22	2,14	1,92	1,73	1,57	1,43	1,32	1,22	1,13	1,06	0,99				
	20	1,96	1,76	1,60	1,46	1,34	1,24	1,15	1,07	1,00	0,94				
	18	1,80	1,63	1,49	1,36	1,26	1,17	1,08	1,01	0,95	0,89				
	15	1,60	1,46	1,34	1,24	1,15	1,07	1,00	0,94	0,88	0,83				
70	24	2,70	2,36	2,09	1,87	1,69	1,54	1,41	1,30	1,20					
	22	2,42	2,14	1,92	1,73	1,57	1,43	1,32	1,22	1,13					
	20	2,19	1,96	1,76	1,60	1,46	1,34	1,24	1,15	1,07					
	18	2,00	1,80	1,63	1,49	1,36	1,26	1,17	1,08	1,01					
	15	1,76	1,60	1,46	1,34	1,24	1,15	1,07	1,00	0,94					

Note: The F factors are calculated based on average coefficients, therefore there might be a deviation from actual heat output value by less than 1%.

Table 2 . F Factor Table (cont'd)
Radiator Capacity Factors at Different Room and Water Temperatures

Water Inlet Temperature (°C)	Room Temperature (°C)	Water Outlet Temperature (°C)													
		25	30	35	40	45	50	55	60	65	70	75	80	85	90
65	24	3,13	2,70	2,36	2,09	1,87	1,69	1,54	1,41						
	22	2,78	2,42	2,14	1,92	1,73	1,57	1,43	1,32						
	20	2,49	2,19	1,96	1,76	1,60	1,46	1,34	1,24						
	18	2,25	2,00	1,80	1,63	1,49	1,36	1,26	1,17						
	15	1,96	1,76	1,60	1,46	1,34	1,24	1,15	1,07						
60	24	3,70	3,13	2,70	2,36	2,09	1,87	1,69							
	22	3,23	2,78	2,42	2,14	1,92	1,73	1,57							
	20	2,86	2,49	2,19	1,96	1,76	1,60	1,46							
	18	2,55	2,25	2,00	1,80	1,63	1,49	1,36							
	15	2,19	1,96	1,76	1,60	1,46	1,34	1,24							
55	24	4,47	3,70	3,13	2,70	2,36	2,09								
	22	3,83	3,23	2,78	2,42	2,14	1,92								
	20	3,34	2,86	2,49	2,19	1,96	1,76								
	18	2,94	2,55	2,25	2,00	1,80	1,63								
	15	2,49	2,19	1,96	1,76	1,60	1,46								
50	24	5,59	4,47	3,70	3,13	2,70									
	22	4,66	3,83	3,23	2,78	2,42									
	20	3,98	3,34	2,86	2,49	2,19									
	18	3,45	2,94	2,55	2,25	2,00									
	15	2,86	2,49	2,19	1,96	1,76									
45	24	7,32	5,59	4,47	3,70										
	22	5,88	4,66	3,83	3,23										
	20	4,87	3,98	3,34	2,86										
	18	4,13	3,45	2,94	2,55										
	15	3,34	2,86	2,49	2,19										
40	24	10,28	7,32	5,59											
	22	7,78	5,88	4,66											
	20	6,19	4,87	3,98											
	18	5,09	4,13	3,45											
	15	3,98	3,34	2,86											

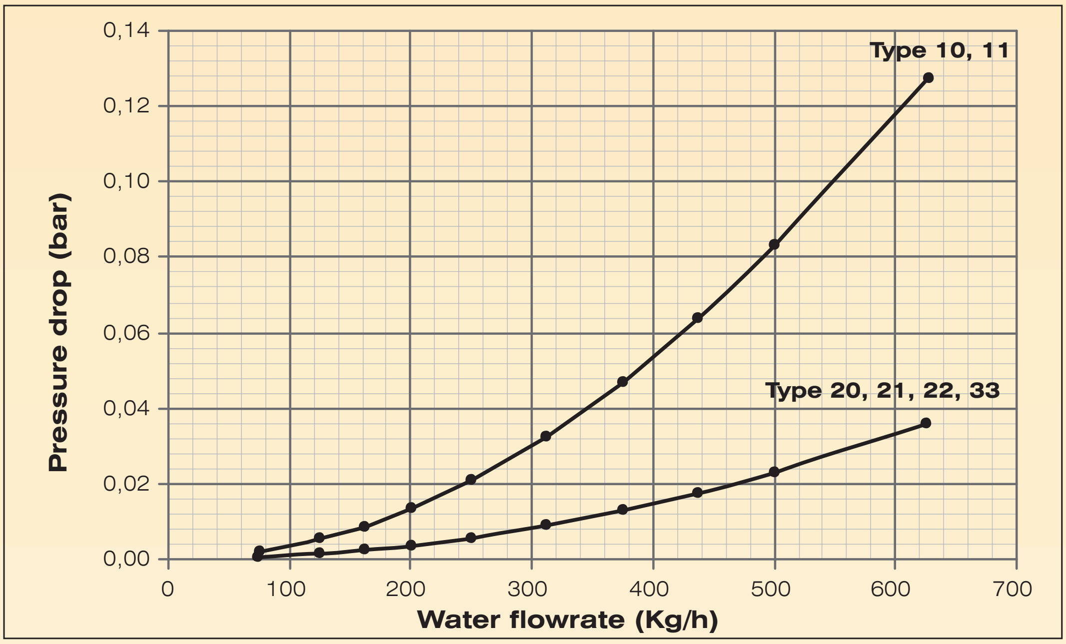
Note: The F factors are calculated based on average coefficients, therefore there might be a deviation from actual heat output value by less than 1%.

RADIATOR PRESSURE DROP:

Pressure drop in a piping system is a result of resistance to flow. Total pressure drop is a critical issue for selection of pump size. The pressure drop calculation of panel radiators, as a part of total pressure drop of the system, is given below with an example.

Pressure loss of a radiator can be found using the pressure drop graph given below.

Graph 1. Pressure Drop



EXAMPLE: What is the pressure drop on a 600/22/1000 radiator ?

Qn = 1672 watt = 1441 kcal/h for a 600/22/1000 radiator (1 watt = 0,86 kcal/h).

Water Flow Rate = Qn / (water inlet temperature-water outlet temperature)

Water Flow Rate = 1441 /(75-65)

Water Flow Rate = 144.1 kg / h

Using the graph, the pressure drop for 600/22/1000 radiator is found as follows:

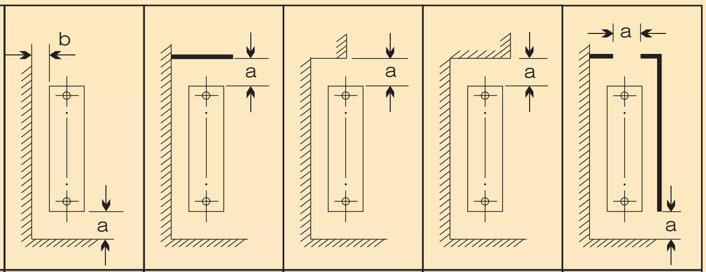
-draw a vertical line beginning from corresponding water flow rate on the x-axis (144.1 kg/h for 600/22/1000 radiator) intersecting the Type 22 line

-from this intersection point, draw a horizontal line intersecting y-axis. The intersection point is the pressure drop value.

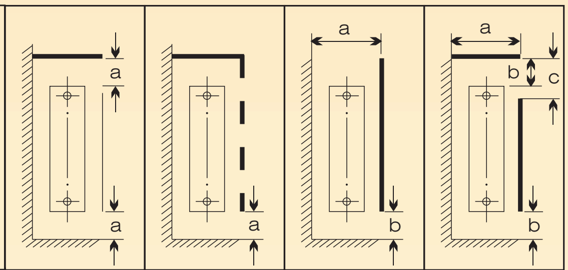
Pressure drop value is 0.002 bars for 600/22/1000 radiator.

Generally, the pressure drop of a radiator depends on the water flow rate and radiator type and size It is significant for bigger size radiators.

INSTALLATION POSITION EFFECT ON HEAT OUTPUT EFFICIENCY



Space cm	a=8 b=4	a			a			a			a		
		4	8	10	4	8	10	4	8	10	26	22	18
Efficiency %	100	95	97	98	95	96	97	89	93	94	88	87	81
	1	2			3			4			5		



Space cm	a=13	a=10	b=0.8 a	b=0.8 a c=1.5 a
Efficiency %	80	85	110	100
	6	7	8	9

The surroundings of the radiator must be clear for it to provide the outputs stated in the catalogue. If there is an obstruction in front or above the installation position of the radiator, this will affect the heat output efficiency. Above some common examples.

EXAMPLE:

If 600/22/1000 radiator is connected as in Figure 5 and if a= 18 cm, then the efficiency would be 0,81; Qn = 1672 watt (from the catalogue)

The real output will be

Qn = 1672 x 0,81

Qn = 1354 watt

A reflective surface (such as aluminium foil) on the wall behind the radiator will increase the efficiency by reflecting heat back into the radiator. This is especially important if the radiator is installed in front of a glass window or a thin uninsulated wall.

TERMO TEKNİK PANEL RADIATORS WARANTY CONDITIONS

Termo Teknik panel radiators are guaranteed against defects in material or workmanship.

The products must be installed and used according to accepted plumbing practices such as BS 5449, NF 047 or other national / local standards. Failure to do so will void the guarantee. Below items must also be followed or else the warranty may be voided:

1-) Termo Teknik panel radiators should be used in closed heating systems. Never use in open circuit (steam, thermal spring, boiled water or tap water).

2-) Do not use radiators in humid environments (swimming pool, sauna bath, green house, etc.).

3-) Avoid dropping, hitting or flexing (bending) the radiator when carrying or transporting it. Damage from transportation is not covered under the warranty.

4-) Do not over screw the stoppers, air vents or valves; otherwise the connection thread could be damaged.

5-) Keep the packaging on the radiator even after installing the radiator until all construction or renovation work is finished. The packaging will prevent scratches and damages on the radiator surface or paint.

6-) Please ensure that the connection elements are free of any dirt or burr after the installation. If necessary, flush the system to get rid of particles before testing or using the system.

7-) After the installation the systems should be tested by expertised personnel. Otherwise, damages may occur in the place of installation.

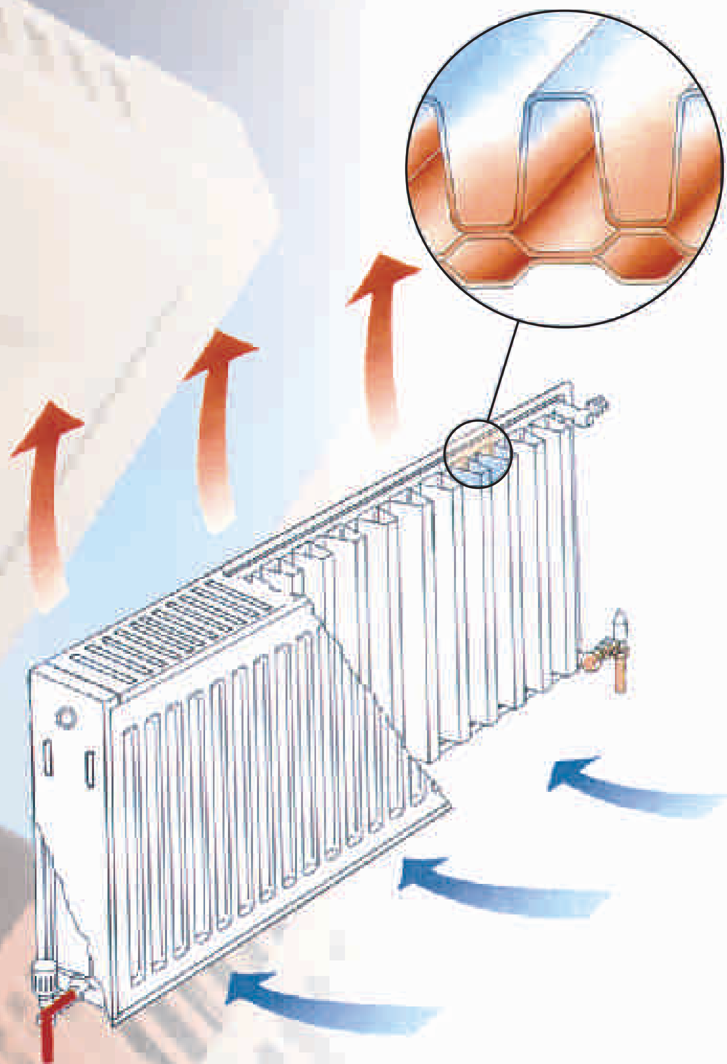
8-) Maximum working pressure of the radiators is 10 bars.

9-) While filling the radiators for the first time, the heating system controls should be closed and the system should be set to the correct pressure.

10-) Never empty the water in the heating system. Add water when needed. Each time you add or change water to your heating system corrosion occurs and its life time will decrease.

11-) Please take precautions against freezing risk.

12-) Use an anti-corrosion agent in the system if the water is aggressive or acidic.



high performance
ease of use
decorative
quality

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