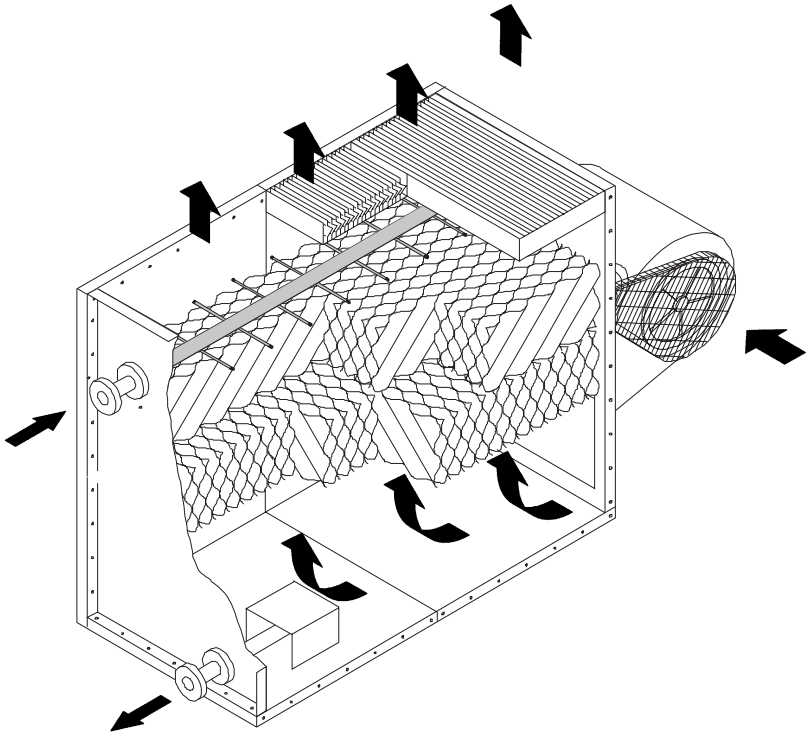
Brochure dt 25e/1

Cooling Tower

With Synthetic-Wet Deck Fill: Unit Height 1750 / 2000 mm

Applications for cooling towers – open circuit operation

A DT-line cooling tower can be installed in association with refrigeration machines using water in large quantities. Examples are: Cold storage rooms, slaughter-houses, breweries, dairies, skating rinks, freezing storage rooms, air conditioning, air cooling, water cooling and ice bank, supermarkets and chemical plants.
Cooling water in industry is used to cool air compressors, diesel engines, generators, warm rolled metals, lubricating oils and cooling emulsions.



Operation

The application of a cooling tower to recool water is based on the latent heat of the water. The latent heat of approximately 2407 KJ = 0,67 kWh is required to evaporate one kilogram of water at the corresponding evaporation temperature. If this heat is not available from outside sources it will be extracted from the environment until the environment attains theoretically the evaporation temperature.
In this particular case the water sprayed into the cooling tower acts as the environment thus the circulating water is cooled by extracting the heat through evaporation of a small percentage of the water. The wet-bulb temperature of the ambient air must of course, be lower than the temperature of the water to be cooled. The air absorbs the water vapour and leaves to the tower with an accordingly higher wet-bulb temperature.

90 to 98 % Watersaving

In most cases 90/98 % of water can be saved with a cooling tower system if compared to a once through cooling system.

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Table 1

Technical Data

Number of fans	Unit size	Nominal cooling capacity Q_N kW	Nominal water flow rate G_N kg/h	Air volume m³/h	Centrifugal fan selected for an external pressure of: 0 to 40 Pa			40 to 80 Pa			80 to 130 Pa			130 to 180 Pa		
					absorbed power kW	E-Motor (1500 min⁻¹) kW	sound pressure level at 3 m dB(A)	absorbed power kW	E-Motor (1500 min⁻¹) kW	sound pressure level at 3 m dB(A)	absorbed power kW	E-Motor (1500 min⁻¹) kW	sound pressure level at 3 m dB(A)	absorbed power kW	E-Motor (1500 min⁻¹) kW	sound pressure level at 3 m dB(A)
1	6 Z	79	11816	4600	0,7	1,1	54	0,79	1,1	56	0,88	1,1	58	0,97	1,1	59
	8 Z	90	13461	5600	1,1	1,5	56	1,2	1,5	58	1,3	1,5	59	1,4	1,5	60
	10 Z	101	15106	6000	0,6	0,75	58	0,7	1,1	60	0,8	1,1	62	0,9	1,1	63
	12 Z	124	18546	8000	1,2	1,5	63	1,3	1,5	64	1,5	2,2	65	1,6	2,2	66
	13 Z	164	24529	9800	1,5	2,2	57	1,7	2,2	59	1,8	2,2	61	1,9	2,2	62
	16 Z	183	27370	11800	2,7	3,0	60	2,9	4,0	61	3,1	4,0	62	3,4	4,0	63
	18 Z	176	26323	10000	1,0	1,5	60	1,2	1,5	61	1,4	2,2	62	1,6	2,2	63
	21 Z	200	29913	12000	1,8	2,2	62	2,0	3,0	63	2,2	3,0	64	2,4	3,0	65
	23 Z	225	33652	14000	2,8	4,0	64	3,0	4,0	65	3,2	4,0	66	3,4	4,0	67
	25 Z	246	36793	16000	3,8	4,0	67	4,1	5,5	68	4,4	5,5	68	4,7	5,5	69
	20 Z	253	37840	15000	2,6	3,0	60	2,8	3,0	61	3,0	4,0	62	3,2	4,0	63
	26 Z	286	42776	18000	4,5	5,5	64	4,8	5,5	65	5,1	5,5	66	5,4	7,5	67
	28 Z	288	43075	16500	1,1	1,5	61	1,4	1,5	62	1,7	2,2	63	2,0	3,0	64
	33 Z	334	49955	20000	2,0	3,0	63	2,3	3,0	64	2,6	3,0	65	2,9	4,0	66
	36 Z	368	55040	23500	3,0	4,0	66	3,3	4,0	67	3,7	4,0	68	4,1	5,5	69
	39 Z	412	61621	27000	4,3	5,5	69	4,7	5,5	70	5,1	5,5	71	5,5	7,5	71
	37 Z	380	56835	22000	1,9	2,2	64	2,2	3,0	65	2,6	3,0	65	3,0	4,0	66
	42 Z	428	64014	26000	3,0	4,0	66	3,4	4,0	67	3,8	4,0	68	4,3	5,5	68
	45 Z	477	71343	30000	4,6	5,5	69	5,0	5,5	69	5,5	7,5	70	6,0	7,5	71
	50 Z	522	78073	34000	6,5	7,5	72	6,9	7,5	72	7,4	11,0	73	7,8	11,0	73
	46 Z	443	66257	25000	2,4	3,0	65	2,9	4,0	66	3,4	4,0	67	3,7	4,0	67
	52 Z	507	75830	30000	4,2	5,5	69	4,7	5,5	69	5,2	7,5	70	5,6	7,5	71
	58 Z	558	83457	35000	6,3	7,5	72	6,8	7,5	72	7,3	11,0	73	7,8	11,0	73
	63 Z	612	91534	40000	8,7	11,0	75	9,3	11,0	75	10,0	11,0	76	10,7	11,0	76
	57 Z	541	80915	30000	2,6	3,0	63	3,0	4,0	64	3,4	4,0	65	3,9	5,5	66
	64 Z	615	91983	36000	4,0	5,5	67	4,6	5,5	68	5,2	7,5	69	5,8	7,5	69
	70 Z	683	102153	42000	6,2	7,5	70	6,8	7,5	70	7,5	11,0	71	8,2	11,0	71
	77 Z	748	111875	48000	8,9	11,0	72	9,6	11,0	72	10,5	15,0	73	11,2	15,0	74
	82 Z	817	122195	54000	12,3	15,0	74	13,1	15,0	74	13,8	15,0	75	14,7	18,5	76
2	2/33 Z	668	99910	40000	2x2,0	5,5	65	2x2,3	5,5	66	2x2,6	5,5	67	2x2,9	7,5	68
	2/36 Z	736	110080	47000	2x3,0	7,5	68	2x3,3	7,5	69	2x3,7	7,5	70	2x4,1	11,0	71
	2/39 Z	824	123242	54000	2x4,3	11,00	71	2x4,7	11,0	72	2x5,1	11,0	73	2x5,5	15,0	73
	2/37 Z	760	113670	44000	2x1,9	5,5	66	2x2,2	5,5	67	2x2,6	5,5	67	2x3,0	7,5	68
	2/42 Z	856	128028	52000	2x3,0	7,5	68	2x3,4	7,5	69	2x3,8	11,0	70	2x4,3	11,0	70
	2/45 Z	954	142685	60000	2x4,6	11,0	71	2x5,0	11,0	71	2x5,5	15,0	72	2x6,0	15,0	73
	2/50 Z	1044	156146	68000	2x6,5	15,0	74	2x6,9	15,0	74	2x7,4	18,5	75	2x7,8	18,5	76
	2/46 Z	886	132515	50000	2x2,4	5,5	68	2x2,9	7,5	68	2x3,4	7,5	69	2x3,7	11,0	70
	2/52 Z	1014	151659	60000	2x4,2	11,0	71	2x4,7	11,0	71	2x5,2	11,0	72	2x5,6	15,0	73
	2/58 Z	1116	166915	70000	2x6,3	15,0	74	2x6,8	15,0	74	2x7,3	15,0	75	2x7,8	18,5	76
	2/63 Z	1224	183068	80000	2x8,7	18,5	77	2x9,3	22,0	77	2x10,0	22,0	78	2x10,7	22,0	79
	2/57 Z	1082	161830	60000	2x2,6	7,5	65	2x3,0	7,5	66	2x3,4	7,5	67	2x3,9	11,0	68
	2/64 Z	1230	183965	72000	2x4,0	11,0	69	2x4,6	11,0	70	2x5,2	11,0	71	2x5,8	15,0	71
	2/70 Z	1366	204306	84000	2x6,2	15,0	72	2x6,8	15,0	72	2x7,5	18,5	73	2x8,2	18,5	73
	2/77 Z	1496	223750	96000	2x8,9	18,5	74	2x9,6	22,0	74	2x10,5	22,0	75	2x11,2	30,0	76
	2/82 Z	1634	244390	108000	2x12,3	30,0	76	2x13,1	30,0	76	2x13,8	30,0	77	2x14,7	30,0	78

The limiting continuous operation temperatur should be max. 70 °C for wet deck fill.

The cooling capacities are guaranteed according to DIN 1947. At the spray tree inlet of the unit, there must be a water pressure of 0,5 bar. The full cooling capacity will only be achieved after some days of operation, when the wet deck fill has been fully wetted. Cooling capacities when using two-speed motors:
In changing speed from 1500 r.p.m. to 750 r.p.m. the cooling capacity drops to about 55 %. If the cooling tower fan is switched off, the cooling capacity will only be about 15 %.

Permissble water flow rate		Overall dimensions (with water conections the units are 60 mm longer)			Weights empty weight ~ shipping weight operating weight water level = 230 mm max. weight water level up to overflow			Heaviest and largest section when delivered broken down (fan)			
maximal kg/h	minimal kg/h	length mm	width mm	height mm	empty weight mm	operating weight mm	max. weight mm	weight kg	length mm	width mm	height mm
16000	3300	1490	686	1750	240	360	390	35	610	480	580
16000	3300	1490	686	1750	240	360	390	35	610	480	580
21000	4800	1860	686	1750	290	440	480	45	730	555	680
21000	4800	1860	686	1750	290	440	480	45	730	555	680
34000	7200	2533	686	1750	400	640	710	45	730	555	680
34000	7200	2533	686	1750	400	640	710	45	730	555	680
41000	8600	1955	1256	1750	430	720	810	60	825	690	800
41000	8600	1955	1256	1750	430	720	810	60	825	690	800
41000	8600	1955	1256	1750	430	720	810	60	825	690	800
41000	8600	1955	1256	1750	430	720	810	60	825	690	800
52000	11000	3591	686	1750	560	930	1030	60	825	690	800
52000	11000	3591	686	1750	560	930	1030	60	825	690	800
66000	14000	3343	1256	1750	730	1200	1360	145	970	1000(835)	1200
66000	14000	3343	1256	1750	730	1200	1360	145	970	1000(835)	1200
66000	14000	3343	1256	1750	730	1200	1360	145	970	1000(835)	1200
66000	14000	3343	1256	1750	730	1200	1360	145	970	1000(835)	1200
85000	17000	3843	1256	1750	820	1430	1630	145	970	1000(835)	1200
85000	17000	3843	1256	1750	820	1430	1630	145	970	1000(835)	1200
85000	17000	3843	1256	1750	820	1430	1630	145	970	1000(835)	1200
85000	17000	3843	1256	1750	820	1430	1630	145	970	1000(835)	1200
100000	20000	4266	1256	1750	910	1630	1870	145	970	1000(835)	1200
100000	20000	4266	1256	1750	910	1630	1870	145	970	1000(835)	1200
100000	20000	4266	1256	1750	910	1630	1870	145	970	1000(835)	1200
100000	20000	4266	1256	1750	910	1630	1870	145	970	1000(835)	1200
123000	23000	5216	1256	2000	1190	2110	2610	200	1150	1070(880)	1420
123000	23000	5216	1256	2000	1190	2110	2610	200	1150	1070(880)	1420
123000	23000	5216	1256	2000	1190	2110	2610	200	1150	1070(880)	1420
123000	23000	5216	1256	2000	1190	2110	2610	200	1150	1070(880)	1420
123000	23000	5216	1256	2000	1190	2110	2610	200	1150	1070(880)	1420
132000	28000	3343	2429	1750	1340	2280	2600				
132000	28000	3343	2429	1750	1340	2280	2600				
132000	28000	3343	2429	1750	1340	2280	2600				
170000	34000	3843	2429	1750	1490	2710	3110				
170000	34000	3843	2429	1750	1490	2710	3110				
170000	34000	3843	2429	1750	1490	2710	3110				
170000	34000	3843	2429	1750	1490	2710	3110				
200000	40000	4266	2429	1750	1650	3090	3570				
200000	40000	4266	2429	1750	1650	3090	3570				
200000	40000	4266	2429	1750	1650	3090	3570				
200000	40000	4266	2429	1750	1650	3090	3570				
246000	46000	5216	2429	2000	2090	3930	4930				
246000	46000	5216	2429	2000	2090	3930	4930				
246000	46000	5216	2429	2000	2090	3930	4930				
246000	46000	5216	2429	2000	2090	3930	4930				
246000	46000	5216	2429	2000	2090	3930	4930				

Weight and dimensions of the heaviest and largest part when delivered broken down can be obtained from the table for single cell units with one fan.

Dimensional tolerance according to ISO 2768-v.

Sound pressure level: The indicated values in dB(A) relate to a measurement of 3 m in horizontal extension of the fan shaft (maximum noise development). Allthough the forward-curved fan impellers of the large units, with centrifugal fans, are manufactured by a reputable company and designed for particularly low-noise level at high efficiency, the dB(A) ratings must be regarded as guide values because the installation conditions of cooling towers vary widely. Permissible tolerance +/- 2 dB.

The follwing data are essential for the selection of a cooling tower:

1 water inlet temperature

2 water outlet temperature

3 water flow rate

4 wet-bulb temperature

5 plane of the available space for the installation

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Number of fans	Unit size	Nominal cooling capacity Q_N kW	Nominal water flow rate G_N kg/h	Air volume m³/h	Centrifugal fan selected for an external pressure of: 0 to 40 Pa			40 to 80 Pa			80 to 130 Pa			130 to 180 Pa		
					absorbed power kW	E-Motor (1500 min⁻¹) kW	sound pressure level at 3 m dB(A)	absorbed power kW	E-Motor (1500 min⁻¹) kW	sound pressure level at 3 m dB(A)	absorbed power kW	E-Motor (1500 min⁻¹) kW	sound pressure level at 3 m dB(A)	absorbed power kW	E-Motor (1500 min⁻¹) kW	sound pressure level at 3 m dB(A)
3	3/37 Z	1140	170504	66000	3x1,9	7,5	67	3x2,2	7,5	68	3x2,6	11,0	68	3x3,0	11,0	69
	3/42 Z	1284	192042	78000	3x3,0	11,0	69	3x3,4	11,0	70	3x3,8	15,0	71	3x4,3	15,0	71
	3/45 Z	1431	214028	90000	3x4,6	15,0	72	3x5,0	18,5	72	3x5,5	18,5	73	3x6,0	22,0	74
	3/50 Z	1566	234219	102000	3x6,5	22,0	75	3x6,9	22,0	75	3x7,4	30,0	76	3x7,8	30,0	77
	3/46 Z	1329	198772	75000	3x2,4	7,5	68	3x2,9	11,0	69	3x3,4	11,0	70	3x3,7	15,0	71
	3/52 Z	1521	227489	90000	3x4,2	15,0	72	3x4,7	15,0	72	3x5,2	18,5	73	3x5,6	18,5	74
	3/58 Z	1674	250372	105000	3x6,3	22,0	75	3x6,8	22,0	75	3x7,3	30,0	76	3x7,8	30,0	77
	3/63 Z	1836	274602	120000	3x8,7	30,0	78	3x9,3	30,0	78	3x10,0	37,0	79	3x10,7	37,0	79
	3/57 Z	1623	242744	90000	3x2,6	11,0	66	3x3,0	11,0	67	3x3,4	11,0	68	3x3,9	15,0	68
	3/64 Z	1845	275948	108000	3x4,0	15,0	70	3x4,6	15,0	71	3x5,2	18,5	72	3x5,8	18,5	72
	3/70 Z	2049	306459	126000	3x6,2	22,0	73	3x6,8	22,0	73	3x7,5	30,0	74	3x8,2	30,0	74
	3/77 Z	2244	335624	144000	3x8,9	30,0	75	3x9,6	30,0	75	3x10,5	37,0	76	3x11,2	37,0	77
	3/82 Z	2451	366584	162000	3x12,3	45,0	77	3x13,1	45,0	77	3x13,8	45,0	78	3x14,7	45,0	79
4	4/42 Z	1712	256056	104000	4x3,0	2x7,5	70	4x3,4	2x7,5	71	4x3,8	2x11,0	72	4x4,3	2x11,0	72
	4/45 Z	1908	285370	120000	4x4,6	2x11,0	73	4x5,0	2x11,0	73	4x5,5	2x15,0	74	4x6,0	2x15,0	75
	4/50 Z	2088	312292	136000	4x6,5	2x15,0	76	4x6,9	2x15,0	76	4x7,4	2x18,5	77	4x7,8	2x18,5	77
	4/52 Z	2028	303318	120000	4x4,2	2x11,0	73	4x4,7	2x11,0	73	4x5,2	2x11,0	74	4x5,6	2x15,0	75
	4/58 Z	2232	333830	140000	4x6,3	2x15,0	76	4x6,8	2x15,0	76	4x7,3	2x15,0	77	4x7,8	2x18,5	77
	4/63 Z	2448	366136	160000	4x8,7	2x18,5	79	4x9,3	2x22	79	4x10,0	2x22,0	80	4x10,7	2x22,0	80
	4/57 Z	2164	323659	120000	4x2,6	2x7,5	66	4x3,0	2x7,5	67	4x3,4	2x7,5	68	4x3,9	2x11,0	69
	4/64 Z	2460	367930	144000	4x4,0	2x11,0	70	4x4,6	2x11,0	71	4x5,2	2x11,0	72	4x5,8	2x15,0	72
	4/70 Z	2732	408612	168000	4x6,2	2x15,0	73	4x6,8	2x15,0	73	4x7,5	2x18,5	74	4x8,2	2x18,5	74
	4/77 Z	2992	447499	192000	4x8,9	2x18,5	75	4x9,6	2x22	75	4x10,5	2x22,0	76	4x11,2	2x30,0	77
	4/82 Z	3268	488779	216000	4x12,3	2x30,0	77	4x13,1	2x30	77	4x13,8	2x30,0	78	4x14,7	2x30,0	79
5	5/45 Z	2385	356713	150000	5x4,6	11,0+15,0	74	5x5,0	11,0+18,5	74	5x5,5	15,0+18,5	75	5x6,0	15,0+22,0	76
	5/50 Z	2610	390365	170000	5x6,5	15,0+22,0	77	5x6,9	15,0+22,0	77	5x7,4	18,5+30,0	78	5x7,8	18,5+30,0	79
	5/52 Z	2535	379148	150000	5x4,2	11,0+15,0	74	5x4,7	11,0+15,0	74	5x5,2	11,0+18,5	75	5x5,6	15,0+18,5	76
	5/58 Z	2790	417287	175000	5x6,3	15,0+22,0	77	5x6,8	15,0+22,0	77	5x7,3	15,0+30,0	78	5x7,8	18,5+30,0	78
	5/63 Z	3060	457670	200000	5x8,7	18,5+30,0	80	5x9,3	22,0+30,0	80	5x10,0	22,0+37,0	81	5x10,7	22,0+37,0	81
	5/57 Z	2705	404574	150000	5x2,6	7,5+11,0	66	5x3,0	7,5+11,0	67	5x3,4	7,5+11,0	68	5x3,9	11,0+15,0	69
	5/64 Z	3075	459913	180000	5x4,0	11,0+15,0	70	5x4,6	11,0+15,0	71	5x5,2	11,0+18,5	72	5x5,8	15,0+18,5	72
	5/70 Z	3415	510765	210000	5x6,2	15,0+22,0	73	5x6,8	15,0+22,0	73	5x7,5	18,5+30,0	74	5x8,2	18,5+30,0	74
	5/77 Z	3740	559374	240000	5x8,9	18,5+30,0	75	5x9,6	22,0+30,0	75	5x10,5	22,0+37,0	76	5x11,2	30,0+37,0	77
	5/82 Z	4085	610974	270000	5x12,3	30,0+45,0	77	5x13,1	30,0+45,0	77	5x13,8	30,0+45,0	78	5x14,7	30,0+45,0	79
6	6/45 Z	2862	428056	180000	6x4,6	2x15,0	74	6x5,0	2x18,5	74	6x5,5	2x18,5	75	6x6,0	2x22,0	76
	6/50 Z	3132	468438	204000	6x6,5	2x22,0	77	6x6,9	2x22,0	77	6x7,4	2x30,0	78	6x7,8	2x30,0	79
	6/52 Z	3042	454977	180000	6x4,2	2x15,0	74	6x4,7	2x15,0	74	6x5,2	2x18,5	75	6x5,6	2x18,5	76
	6/58 Z	3348	500744	210000	6x6,3	2x22,0	77	6x6,8	2x22,0	77	6x7,3	2x30,0	78	6x7,8	2x30,0	78
	6/63 Z	3672	549203	240000	6x8,7	2x30,0	80	6x9,3	2x30,0	80	6x10,0	2x37,0	81	6x10,7	2x37,0	81
	6/57 Z	3246	485489	180000	6x2,6	2x11,0	67	6x3,0	2x11,0	68	6x3,4	2x11,0	69	6x3,9	2x15,0	70
	6/64 Z	3690	551896	216000	6x4,0	2x15,0	71	6x4,6	2x15,0	72	6x5,2	2x18,5	73	6x5,8	2x18,5	73
	6/70 Z	4098	612918	252000	6x6,2	2x22,0	74	6x6,8	2x22,0	74	6x7,5	2x30,0	75	6x8,2	2x30,0	75
	6/77 Z	4488	671249	288000	6x8,9	2x30,0	76	6x9,6	2x30,0	76	6x10,5	2x37,0	77	6x11,2	2x37,0	78
	6/82 Z	4902	733169	324000	6x12,3	2x45,0	78	6x13,1	2x45,0	78	6x13,8	2x45,0	79	6x14,7	2x45,0	80
8	8/57 ZB	4328	647318	240000	8x2,6	4x7,5	66	8x3,0	4x7,5	67	8x3,4	4x7,5	68	8x3,9	4x11,0	69
	8/64 ZB	4920	735861	288000	8x4,0	4x11,0	70	8x4,6	4x11,0	71	8x5,2	4x11,0	72	8x5,8	4x15,0	72
	8/70 ZB	5464	817224	336000	8x6,2	4x15,0	73	8x6,8	4x15,0	73	8x7,5	4x18,5	74	8x8,2	4x18,5	74
	8/77 ZB	5984	894998	384000	8x8,9	4x18,5	75	8x9,6	4x22,0	75	8x10,5	4x22,0	76	8x11,2	4x30,0	77
	8/82 ZB	6536	977558	432000	8x12,3	4x30,0	77	8x13,1	4x30,0	77	8x13,8	4x30,0	78	8x14,7	4x30,0	79
10	10/57 ZB	5410	809148	300000	10x2,6	2x7,5/2x11,0	66	10x3,0	2x7,5/2x11,0	67	10x3,4	2x7,5/2x11,0	68	10x3,9	2x11,0/2x15,0	69
	10/64 ZB	6150	919826	360000	10x4,0	2x11,0/2x15,0	70	10x4,6	2x11,0/2x15,0	71	10x5,2	2x11,0/2x18,5	72	10x5,8	2x15,0/2x18,5	72
	10/70 ZB	6830	1021530	420000	10x6,2	2x15,0/2x22,0	73	10x6,8	2x15,0/2x22,0	73	10x7,5	2x18,5/2x30,0	74	10x8,2	2x18,5/2x30,0	74
	10/77 ZB	7480	1118748	480000	10x8,9	2x18,5/2x30,0	75	10x9,6	2x22,0/2x30,0	75	10x10,5	2x22,0/2x37,0	76	10x11,2	2x30,0/2x37,0	77
	10/82 ZB	8170	1221948	540000	10x12,3	2x30,0/2x45,0	77	10x13,1	2x30,0/2x45,0	77	10x13,8	2x30,0/2x45,0	78	10x14,7	2x30,0/2x45,0	79
12	12/57 ZB	6492	970977	360000	12x2,6	4x11,0	67	12x3,0	4x11,0	68	12x3,4	4x11,0	69	12x3,9	4x15,0	70
	12/64 ZB	7380	1103791	432000	12x4,0	4x15,0	71	12x4,6	4x15,0	72	12x5,2	4x18,5	73	12x5,8	4x18,5	73
	12/70 ZB	8196	1225837	504000	12x6,2	4x22,0	74	12x6,8	4x22,0	74	12x7,5	4x30,0	75	12x8,2	4x30,0	75
	12/77 ZB	8976	1342497	576000	12x8,9	4x30,0	76	12x9,6	4x30,0	76	12x10,5	4x37,0	77	12x11,2	4x37,0	78
	12/82 ZB	9804	1466337	648000	12x12,3	4x45,0	78	12x13,1	4x45,0	78	12x13,8	4x45,0	79	12x14,7	4x45,0	80

Permissble water flow rate		Overall dimensions (with water conections the units are 60 mm longer)			Weights empty weight ~ shipping weight operating weight water level = 230 mm max. weight water level up to overflow			Heaviest and largest section when delivered broken down (fan)
maximal	minimal	length	width	height	empty weight	operating weight	max. weight	
kg/h	kg/h	mm	mm	mm	mm	mm	mm	
255000	51000	3843	3602	1750	2150	3980	4580	
255000	51000	3843	3602	1750	2150	3980	4580	
255000	51000	3843	3602	1750	2150	3980	4580	
255000	51000	3843	3602	1750	2150	3980	4580	
300000	60000	4266	3602	1750	2350	4510	5230	
300000	60000	4266	3602	1750	2350	4510	5230	
300000	60000	4266	3602	1750	2350	4510	5230	
300000	60000	4266	3602	1750	2350	4510	5230	
369000	69000	5216	3602	2000	2980	5740	7240	
369000	69000	5216	3602	2000	2980	5740	7240	
369000	69000	5216	3602	2000	2980	5740	7240	
369000	69000	5216	3602	2000	2980	5740	7240	
369000	69000	5216	3602	2000	2980	5740	7240	
340000	68000	3843	4775	1750	2820	5260	6060	
340000	68000	3843	4775	1750	2820	5260	6060	
340000	68000	3843	4775	1750	2820	5260	6060	
400000	80000	4266	4775	1750	3090	5970	6930	
400000	80000	4266	4775	1750	3090	5970	6930	
400000	80000	4266	4775	1750	3090	5970	6930	
492000	92000	5216	4775	2000	3980	7660	9660	
492000	92000	5216	4775	2000	3980	7660	9660	
492000	92000	5216	4775	2000	3980	7660	9660	
492000	92000	5216	4775	2000	3980	7660	9660	
492000	92000	5216	4775	2000	3980	7660	9660	
425000	85000	3843	5948	1750	3490	6540	7540	
425000	85000	3843	5948	1750	3490	6540	7540	
500000	100000	4266	5948	1750	3830	7430	8630	
500000	100000	4266	5948	1750	3830	7430	8630	
500000	100000	4266	5948	1750	3830	7430	8630	
615000	115000	5216	5948	2000	4870	9470	11970	
615000	115000	5216	5948	2000	4870	9470	11970	
615000	115000	5216	5948	2000	4870	9470	11970	
615000	115000	5216	5948	2000	4870	9470	11970	
615000	115000	5216	5948	2000	4870	9470	11970	
510000	102000	3843	7121	1750	4160	7820	9020	
510000	102000	3843	7121	1750	4160	7820	9020	
600000	120000	4266	7121	1750	4570	8890	10330	
600000	120000	4266	7121	1750	4570	8890	10330	
600000	120000	4266	7121	1750	4570	8890	10330	
738000	138000	5216	7121	2000	5760	11280	14280	
738000	138000	5216	7121	2000	5760	11280	14280	
738000	138000	5216	7121	2000	5760	11280	14280	
738000	138000	5216	7121	2000	5760	11280	14280	
738000	138000	5216	7121	2000	5760	11280	14280	
984000	184000	10432	4775	2000	7960	15320	19320	
984000	184000	10432	4775	2000	7960	15320	19320	
984000	184000	10432	4775	2000	7960	15320	19320	
984000	184000	10432	4775	2000	7960	15320	19320	
984000	184000	10432	4775	2000	7960	15320	19320	
1230000	230000	10432	5948	2000	9740	18940	23940	
1230000	230000	10432	5948	2000	9740	18940	23940	
1230000	230000	10432	5948	2000	9740	18940	23940	
1230000	230000	10432	5948	2000	9740	18940	23940	
1230000	230000	10432	5948	2000	9740	18940	23940	
1476000	276000	10432	7121	2000	11520	22560	28560	
1147600	276000	10432	7121	2000	11520	22560	28560	
1476000	276000	10432	7121	2000	11520	22560	28560	
1476000	276000	10432	7121	2000	11520	22560	28560	
1476000	276000	10432	7121	2000	11520	22560	28560	

Weight and dimensions of the heaviest and largest part when delivered broken down can be obtained from the relative single cell units on the previous page.

The units 4/57 Z, 4/64 Z, 4/70 Z, 4/77 Z and 4/82 Z as well as the corresponding units with six fans are also available in „bipolar“ assembly, i.e. two or three fans, respectively, are arranged on opposite sides.
They share a separating wall.
On the inside they are connected by a water channel. The letter „B“ identifies them as „bipolar“, e.g. 6/70 ZB.
The above mentioned four fan units can also be shipped in „B“ design assembled.
To our knowledge, this is to date, the largest cooling tower to be shipped completely assembled – with a width of 2,42 m which is also the width of a truck-bed.
The fans of units with more than one motor on the same unit-side blow the air in one common air plenum.
Therefore the motors must be operated and switched simultaneously, however, with a time delay of max. 10 seconds. Otherwise, danger of motor overload and other disadvantages might occur (please note our information for installation and operation).

Please note our special Technical Reports!

Quick Selection Tables
Cooling capacity for the most popular conditions

Table 2

Cooling range [K]	Wet-bulb temp. [°C]	Water temp. [°C]	Unit sizes												
			6 Z [kW]	8 Z [kW]	10 Z [kW]	12 Z [kW]	13 Z [kW]	16 Z [kW]	18 Z [kW]	21 Z [kW]	23 Z [kW]	25 Z [kW]	20 Z [kW]	26 Z [kW]	28 Z [kW]
5	19	29-24	57	65	73	89	118	132	127	144	162	177	182	206	207
		30-25	66	75	84	103	136	152	146	166	187	204	210	237	239
		31-26	73	84	94	115	153	170	164	186	209	229	235	266	268
		32-27	81	93	104		169	188	181	206	232		261	295	297
		33-28	92		117		190		204	232			293		334
6	19	30-24	57	65	73	90	119	132	127	145	163	178	183	207	208
		31-25	68	77	87	107	141	157	151	172	194	212	218	246	248
		32-26	77	87	98	120	159	178	171	194	218	239	245	277	279
		33-27	86	98	110	135	179	199	192	218	245	268	276	312	314
		34-28	97	111	124		202	225	216	246	277		311	352	354
7	19	31-24	62	71	79	97	129	144	138	157	177	193	199	224	226
		32-25	73	83	93	114	151	168	162	184	207	226	233	263	265
		33-26	83	95	106	130	172	192	185	210	236	258	266	300	302
		34-27	94	107	120	148	195	218	209	238	268	293	301	340	343
		35-28	105	120	134	165	218	243	234	266	299	327	336	380	383
5	20	29-24	49	56	63	78	103	115	110	125	141	154	158	179	180
		30-25	59	68	76	93	123	137	132	150	169	185	190	215	216
		31-26	67	77	86	105	139	156	150	170	191	209	215	243	245
		32-27	75	86	96	118	156	174	167	190	214	234	240	272	274
		33-28	85		109		177	198	190	216			273		311
6	20	30-24	50	57	64	78	104	116	111	126	142	155	160	181	182
		31-25	61	69	77	95	126	140	135	153	173	189	194	219	221
		32-26	70	80	90	110	146	163	157	178	200	219	225	255	256
		33-27	80	91	102	125	166	185	178	202	227	248	256	289	291
		34-28	90	103	115	141	187	209	201	228	257	280	288	326	328
		35-29	102		130		212	236	227	258			326		372
7	20	31-24	53	60	67	83	109	122	117	133	150	164	169	191	192
		32-25	65	74	83	102	134	150	144	164	184	202	207	234	236
		33-26	77	87	98	120	159	178	171	194	218	239	245	277	279
		34-27	87	99	111	136	180	201	194	220	248	271	278	315	317
		35-28	99	113	126	155	205	229	220	250	281	308	316	358	360
		36-29	110	125	140		228	254	245	278	313		352	398	400
5	21	29-24	40	46	52	64	84	94	90	102	115	126	130	146	148
		30-25	52	59	67	82	108	121	116	132	149	162	167	189	190
		31-26	61	69	78	95	126	141	136	154	173	189	195	220	222
		32-27	69	78	88	108	143	159	153	174	196	214	220	249	251
		33-28	79	90	101		164	183	176	200	225		253	286	288
		34-29	90		115		187		201	228			288		328
6	21	30-24	39	45	50	62	81	91	87	99	112	122	126	142	143
		31-25	52	59	66	81	107	120	115	131	147	161	166	187	189
		32-26	63	72	81	99	131	146	141	160	180	197	202	229	230
		33-27	73	84	94	115	153	170	164	186	209	229	235	266	268
		34-28	84	95	107	131	174	194	187	212	239	261	268	303	305
		35-29	95	108	121		197	220	211	240	270		304	343	346
7	21	31-24	42	47	53	65	86	96	93	105	119	130	133	151	152
		32-25	56	63	71	87	115	129	124	141	158	173	178	201	202
		33-26	68	78	87	107	142	158	152	173	194	212	219	247	249
		34-27	79	90	101	124	164	183	176	200	225	246	253	286	288
		35-28	92	104	117	144	190	212	204	232	261	285	293	332	334
		36-29	103	118	132	162	215	240	231	262	295	322	331	375	377
		37-30	114	130	145		236	264	253	288	324		364	412	415
5	22	29-24	29	33	37	45	59	66	64	72	81	89	91	103	104
		30-25	42	48	54	66	88	98	94	107	121	132	136	153	154
		31-26	53	60	68	83	110	123	118	134	151	165	170	192	193
		32-27	62	70	79	97	128	143	137	156	176	192	197	223	225
		33-28	72	82	92	113	149	167	160	182	205	224	230	260	262
		34-29	83		106		172	192	185	210	236		266	300	302
6	22	30-24	27	30	34	42	55	61		67	76	83	85	96	
		31-25	41	47	53	65	86	95	92	104	117	128	132	149	150
		32-26	54	62	70	85	113	126	121	138	155	170	174	197	198
		33-27	66	75	84	103	136	152	146	166	187	204	210	237	239
		34-28	76	86	97	119	157	176	169	192	216	236	243	275	276
		35-29	88	100	112	138	182	203	195	222	250	273	281	317	320
		36-30	99		126		205	229	220	250	281		316	358	360
7	22	31-24		30		41		61			75	82		96	
		32-25	45	51	57	70	93	104	100	113	127	139	143	162	163
		33-26	59	68	76	93	123	137	132	150	169	185	190	215	216
		34-27	72	82	92	113	149	167	160	182	205	224	230	260	262
		35-28	84	95	107	131	174	194	187	212	239	261	268	303	305
		36-29	96	110	123	151	200	223	215	244	275	300	309	349	351
		37-30	107	122	136	167	221	247	238	270	304	332	342	386	389

For multi fan units multiply the cooling capacity by the number of fans.
For conditions which are not included in the quick selection tables will be determined with factors of the selection curves 1 and 2 and the nominal cooling capacity of the table 1.

Unit sizes

33 Z [kW]	36 Z [kW]	39 Z [kW]	37 Z [kW]	42 Z [kW]	45 Z [kW]	50 Z [kW]	46 Z [kW]	52 Z [kW]	58 Z [kW]	63 Z [kW]	57 Z [kW]	64 Z [kW]	70 Z [kW]	77 Z [kW]	82 Z [kW]
240	265	297	274	308	343	376	319	365	402	441	390	443	492	539	588
277	305	342	315	355	396	433	368	421	463	508	449	510	567	621	678
311	342	383	353	398	444	485	412	472	519	569	503	572	635	696	
344	379		391	441	491		456	522	575		557	633	703		
			441				514				628	713			
241	266	298	275	309	345	377	320	367	403	442	391	445	494	541	591
287	316	354	327	368	410	449	381	436	480	526	465	529	587	643	703
324	357	400	369	415	463	506	430	492	541	594	525	597	663	726	792
364	401	449	414	467	520	569	483	553	608	667	590	670	744	815	
411	453		467	526	587		545	624	686		665	756	840		
262	289	323	298	336	374	410	348	398	438	480	425	483	536	587	641
307	339	379	350	394	439	480	408	466	513	563	498	566	628	688	752
351	386	433	399	449	501	548	465	532	586	643	568	646	717	785	858
397	438	490	452	509	568	621	527	603	664	728	644	732	813	890	972
444	489		505	569	634		589	674	742		720	818	908	995	
209	230	258	238	268	299	327	277	318	349	383	339	385	428	469	512
251	276	309	285	321	358	392	332	380	419	459	406	461	512	561	613
284	313	350	323	364	405	444	377	431	474	520	460	523	581	636	694
317	350		361	407	453		421	482	530		514	584	649	711	
361			410	462			478	548			584	664			
211	232	260	240	270	301	329	280	320	352	386	341	388	431	472	516
256	282	316	291	328	366	400	340	389	428	469	415	472	524	574	627
297	328	367	338	381	425	465	394	451	497	545	481	547	608	666	727
337	372	416	384	432	482	527	447	512	564	618	546	621	690	755	825
381	420		433	488	544		505	578	636		617	701	779	853	
431			490	552			571	654			698	793			
223	245	275	253	285	318	348	295	338	372	408	360	410	455	498	544
274	301	337	311	351	391	428	363	415	457	501	443	504	559	613	669
324	357	400	369	415	463	506	430	492	541	594	525	597	663	726	792
367	405	453	418	471	525	574	487	558	614	673	595	677	751	823	899
418	460	515	475	535	596	653	554	634	698	765	676	769	854	935	
464	512		528	595	663		616	705	776		752	855	949		
171	188	211	195	219	244	267	227	260	286	313	277	315	350	383	418
220	243	272	251	282	315	345	292	335	368	404	357	406	451	494	539
257	283	317	293	330	367	402	341	390	430	471	417	474	526	576	629
291	320	358	331	372	415	454	385	441	485	532	471	535	594	651	711
334	368		380	428	477		443	507	558		541	615	683		
381			433	488			505	578			617	701			
166	183	204	189	212	237	259	220	252	277	304	268	305	339	371	405
219	241	270	249	280	312	342	290	332	365	401	354	403	447	490	535
267	294	330	304	342	382	418	354	406	446	490	433	492	546	598	654
311	342	383	353	398	444	485	412	472	519	569	503	572	635	696	760
354	390	437	403	454	506	553	470	537	591	649	573	652	724	793	
401	442		456	514	572		532	608	670		649	738	820		
176	194	217	200	226	251	275	234	267	294	323	285	324	360	394	431
235	259	290	267	301	335	367	311	356	392	430	380	432	480	526	574
288	318	356	328	370	412	451	383	438	482	529	467	531	590	646	706
334	368	412	380	428	477	522	443	507	558	612	541	615	683	748	817
387	427	478	441	496	553	606	514	588	647	710	628	713	792	868	948
438	482		498	561	625	684	580	664	731	802	709	806	895	980	
481	530		547	616	687		638	730	804		779	886	984		
121	133	149	137	155	172	189	160	183	202	221	196	222	247	270	295
179	197	221	204	229	256	280	237	272	299	328	290	330	366	401	438
224	247	276	255	287	320	350	297	340	374	410	362	412	458	501	547
261	287	321	296	334	372	407	346	395	435	477	422	480	533	583	637
304	335	375	346	389	434	475	403	461	508	557	492	560	622	681	
351			399	449			465	532			568	646			
112	124	138	128	144	160	175	149	170	187	205	182	207	229	251	274
174	192	215	198	223	249	272	231	264	291	319	282	321	356	390	426
230	254	284	262	295	329	360	305	349	385	422	373	424	471	515	563
277	305	342	315	355	396	433	368	421	463	508	449	510	567	621	678
321	353	396	365	411	458	501	425	487	536	588	519	590	656	718	784
371	408	457	422	475	529	579	492	563	619	679	601	683	758	830	
418	460		475	535			554	634	698		676	769	854		
	123	138		143	160	175		170	187	205		206	228	250	273
189	208	233	215	242	270	296	251	287	316	346	306	348	387	423	463
251	276	309	285	321	358	392	332	380	419	459	406	461	512	561	613
304	335	375	346	389	434	475	403	461	508	557	492	560	622	681	743
354	390	437	403	454	506	553	470	537	591	649	573	652	724	793	866
407	449	503	464	522	582	637	540	619	681	747	660	750	833	913	997
451	497		513	578	644		598	684	753		730	830	922		

Recommended wet-bulb temperatures for the selection of cooling towers

EUROPE

		°C
Belgium	Brussels	22,0
Denmark	Copenhagen	20,0
Germany	Berlin	20,0
	Cologne	20,0
	Frankfurt a.M.	21,0
	Hamburg	20,0
	Leipzig	20,0
	Mannheim	22,5
	Munich	20,0
	Nuremberg	19,5
	Stuttgart	21,0
England	Birmingham	19,5
	London	19,0
	Manchester	20,0
Finland	Helsinki	19,0
France	Bordeaux	23,5
	Lyon	22,5
	Marseille	23,0
	Paris	22,5
	Strasbourg	22,0
Greece	Athen	22,0
Rep.Ireland	Dublin	18,5
Iceland	Reykjavik	14,0
Italy	Florence	21,5
	Genoa	24,5
	Milan	23,0
	Naples	24,0
	Palermo	25,0
	Rome	23,0
	Turin	24,0
	Venice	24,5
Croatia	Karlovac	22,0
Netherlands	Amsterdam	19,5
	Den Haag	19,5
	Rotterdam	22,5
North Ireland	Belfast	17,5
Norway	Oslo	19,5
Austria	Graz	21,0
	Innsbruck	20,0
	Salzburg	21,0
	Villach	20,0
	Vienna	22,0
Poland	Warsaw	21,0
Portugal	Lisbon	22,5
Romania	Bucharest	22,0
Russia	Moscow	21,0
Sweden	Stockholm	17,5
Switzerland	Basel	22,5
	Bern	21,0
	Geneva	22,5
	Lucerne	21,0
	Zurich	21,0
Serbian	Belgrade	23,0
Slovakia	Bratislava	21,0
Spain	Barcelona	24,0
Czechos-lovakia	Praque	21,0
Turkey	Ankara	19,0
	Istanbul	24,0
Ukraine	Kiew	25,0
Hungary	Budapest	21,0
Belarus	Minsk	24,5
Cyprus	Nikosia	24,5

NORDAMERICA AND SOUTHAMERICA

		°C
Argentina	Buenos Aires	24,0
Brazil	Rio de Janeiro	25,5
	Sao Paulo	25,5
Chile	Santiago	22,0
Canada	Toronto	23,5
	Montreal	24,0
	Vancouver	19,5
Cuba	Havana	26,5
Mexico	Mexico City	17,0
Peru	Lima	24,5
Uruguay	Montevideo	24,0
USA	Boston	24,0
	Chicago	24,0
	Denver	18,0
	Los Angeles	21,0
	New York	24,0
	San Francisco	18,5
	Washington	25,5
Venezuela	Caracas	22,0

AUSTRALIA

		°C
Australia	Adelaide	20,5
	Brisbane	24,5
	Melbourne	23,5
	Sydney	22,0

ASIA

		°C
Afghanistan	Cabul	21,0
India	Bombay	28,0
	Calcutta	28,5
	Madras	28,0
	New-Delhi	25,5
Iraq	Baghdad	24,0
	Basra	27,5
Iran	Abadan	26,5
	Teheran	22,0
Israel	Haifa	26,5
	Jerusalem	22,5
	Tel Aviv	26,5
Japan	Hiroshima	28,0
	Osaka	28,0
	Tokio	26,5
Jordan	Amman	20,0
Kuwait	Kuwait	27,0
Lebanon	Beirut	25,5
Malaysia	Singapore	28,0
Pakistan	Karatchi	27,0
Philippines	Manila	26,5
Saudi	Dschidda	30,5
Arabia	Medina	26,5
	Riad	25,5
Sri Lanka	Colombo	28,0
South Korea	Seoul	26,0
Syria	Damascus	22,5
Thailand	Bangkok	28,5
People´s Rep. Of China	Hong Kong	28,0

AFRICA

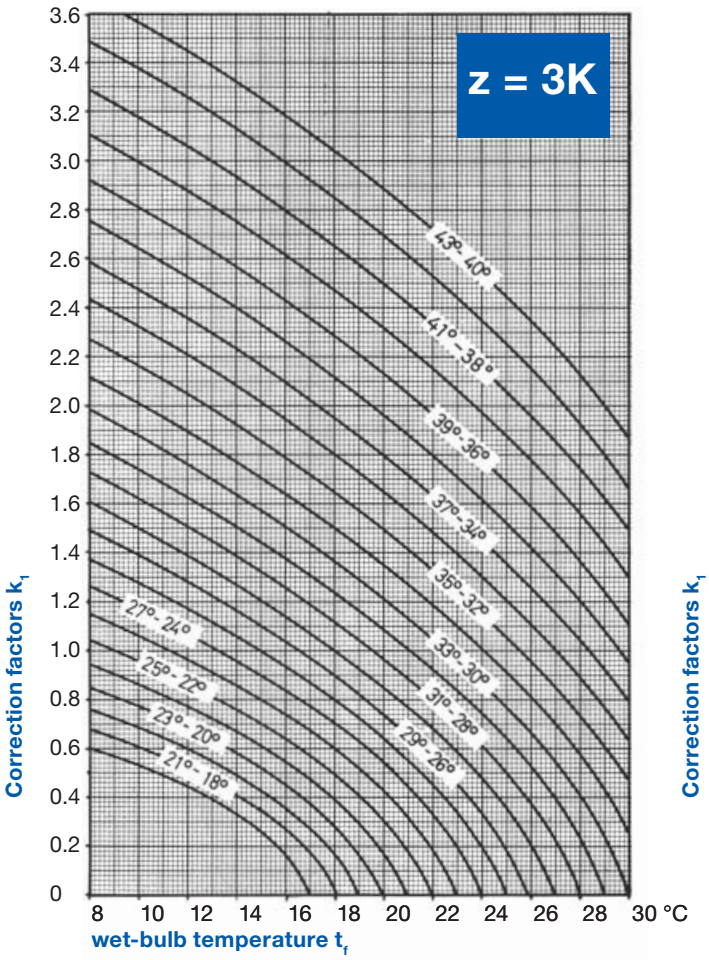
		°C
Egypt	Alexandria	26,5
	Cairo	27,0
	Luxor	26,5
Algeria	Algiers	26,0
Angola	Luanda	27,0
Ethiopia	Addis Abeba	22,0
Ghana	Accra	28,0
Kenya	Nairobi	18,5
Congo	Brazzaville	28,0
Liberia	Monrovia	28,0
Lybia	Tripolis	24,5
Madagascar	Antananarivo	22,5
Marocco	Casablanca	25,0
Namibia	Windhuk	19,5
Nigeria	Lagos	28,5
Tunesia	Tunis	25,5
South Africa	Cap Town	22,5
	Durban	24,5
	Johannesburg	20,5
	Pretoria	21,5
Sudan	Khartum	27,0
	Port Sudan	31,0

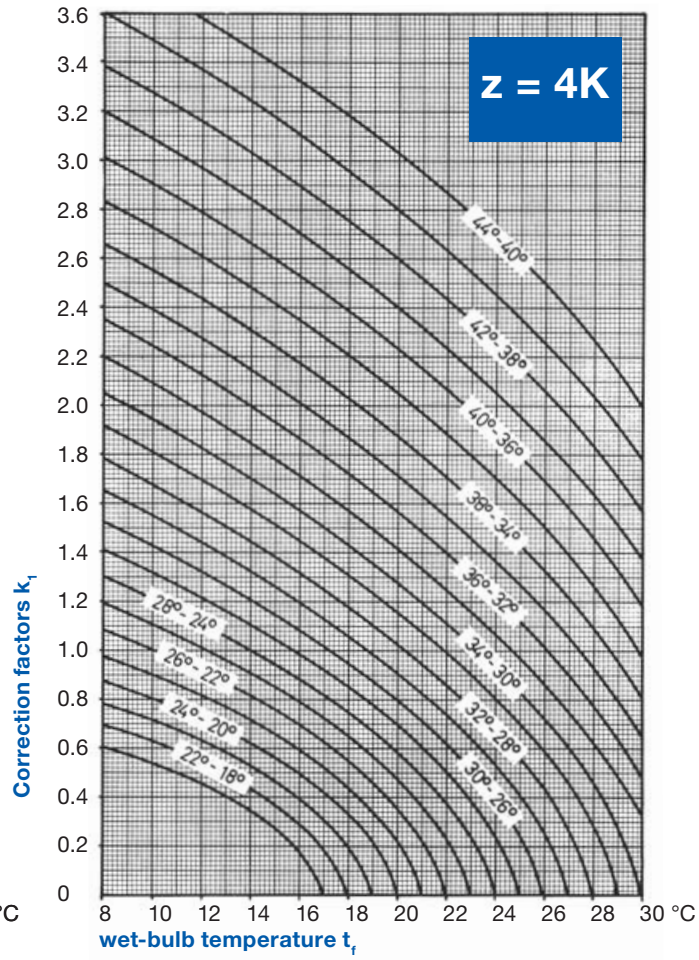
These wet-bulb temperatures are taken from known published weather data. They are no peak values, but are suitable for the selection of evaporative coolers such as cooling towers.

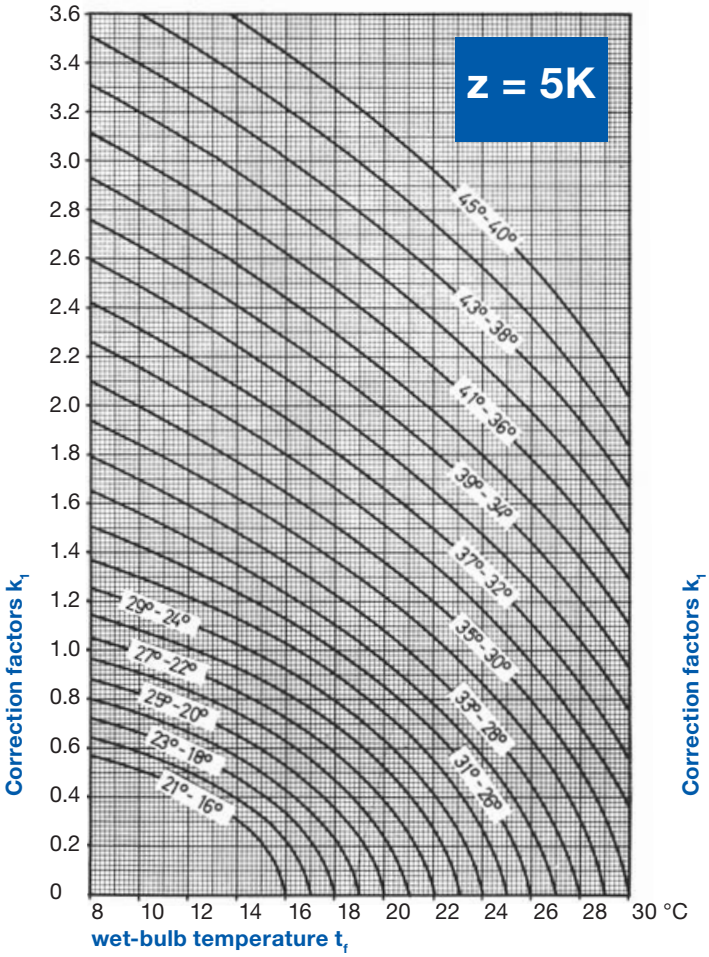
They will be reached or passed slightly four times in one statistical year. Changes due to other weather data are possible.

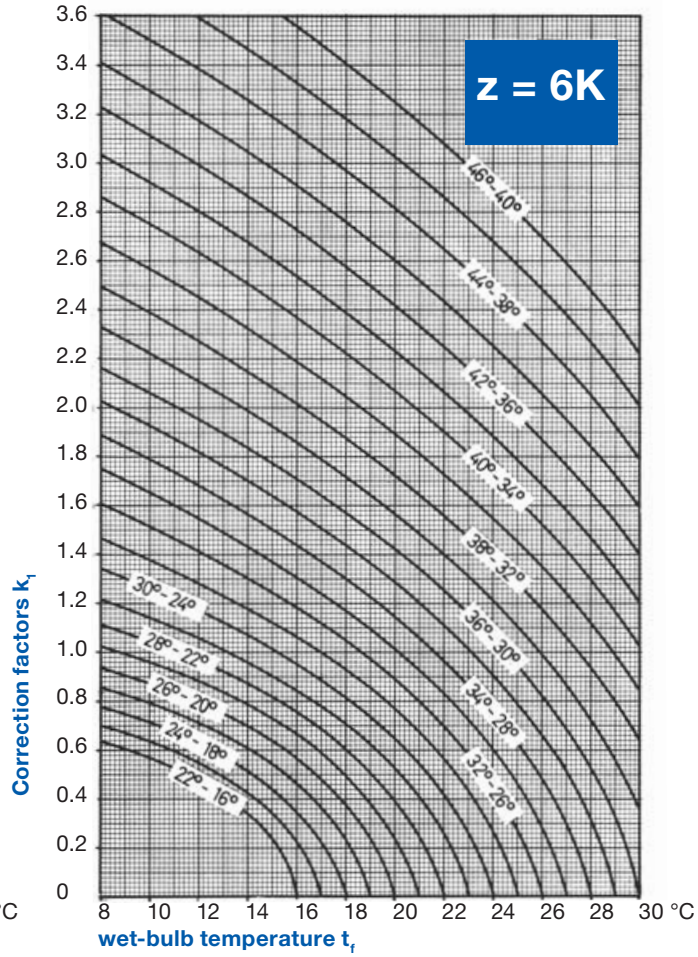
Selection Curves 1

Correction factors k_1 as a function of the wet-bulb temperature t_F for constant cooling range $z = t_{WE} - t_{WA}$. These curves make it possible to determine rapidly the cooling capacity of the cooling tower under virtually all possible operating conditions.









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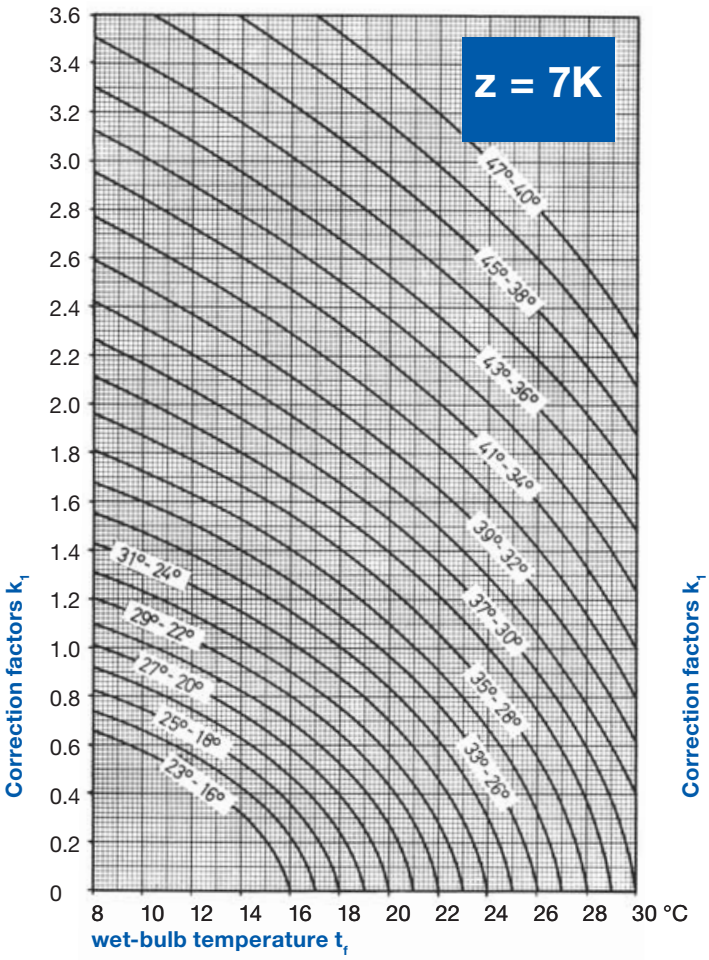

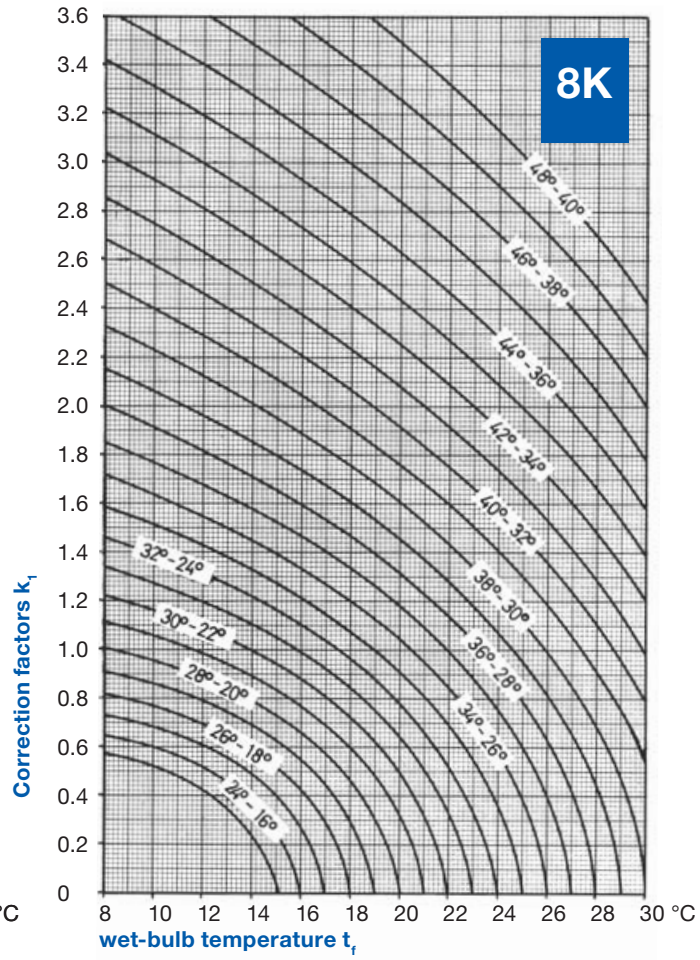

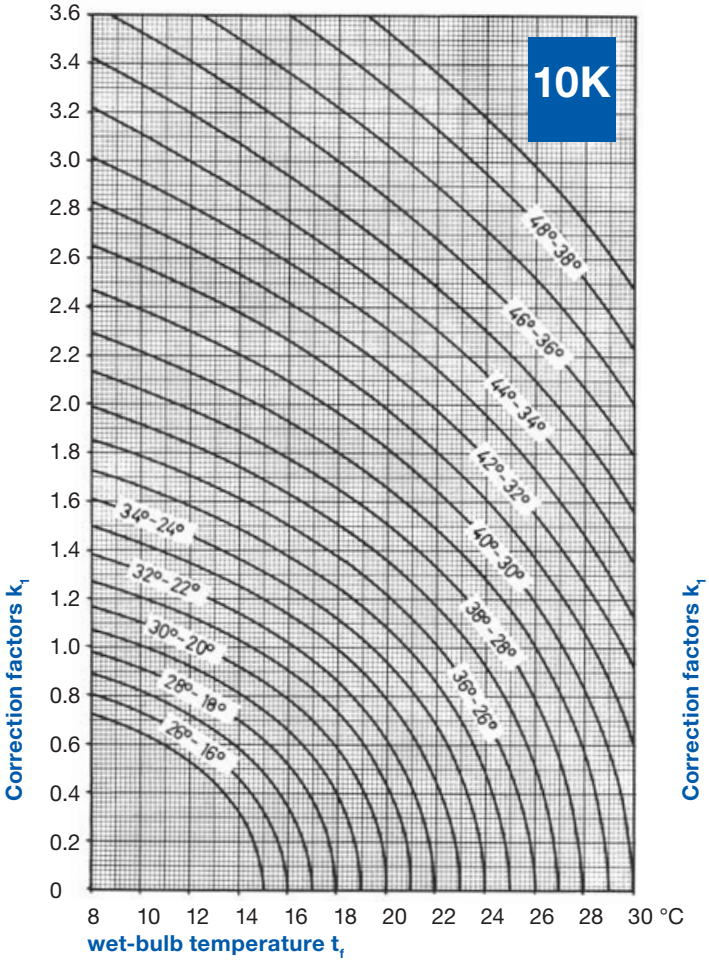

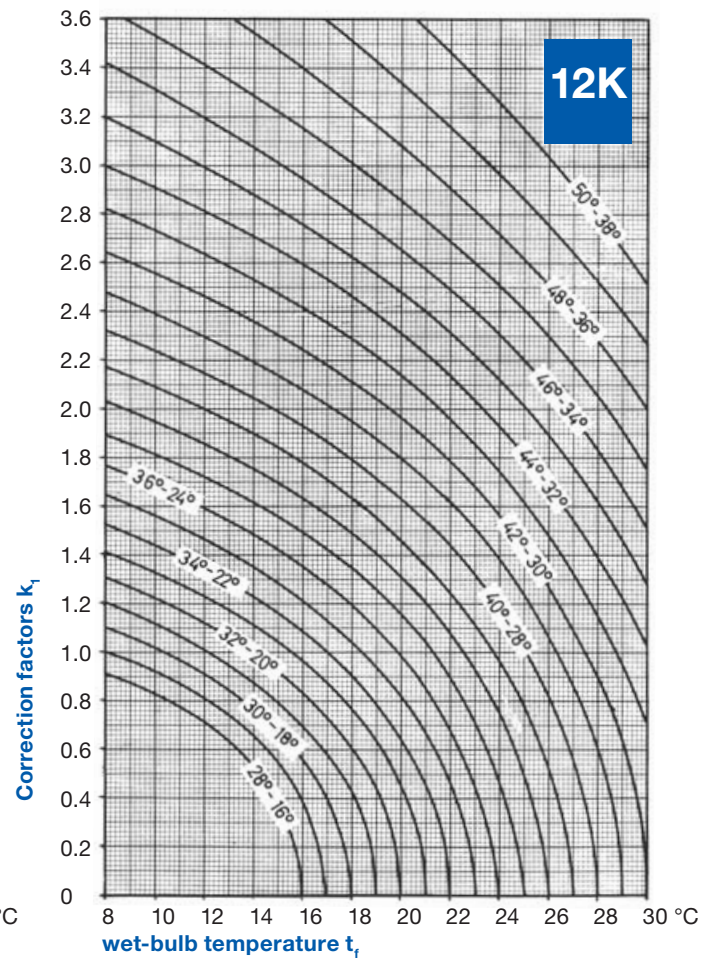

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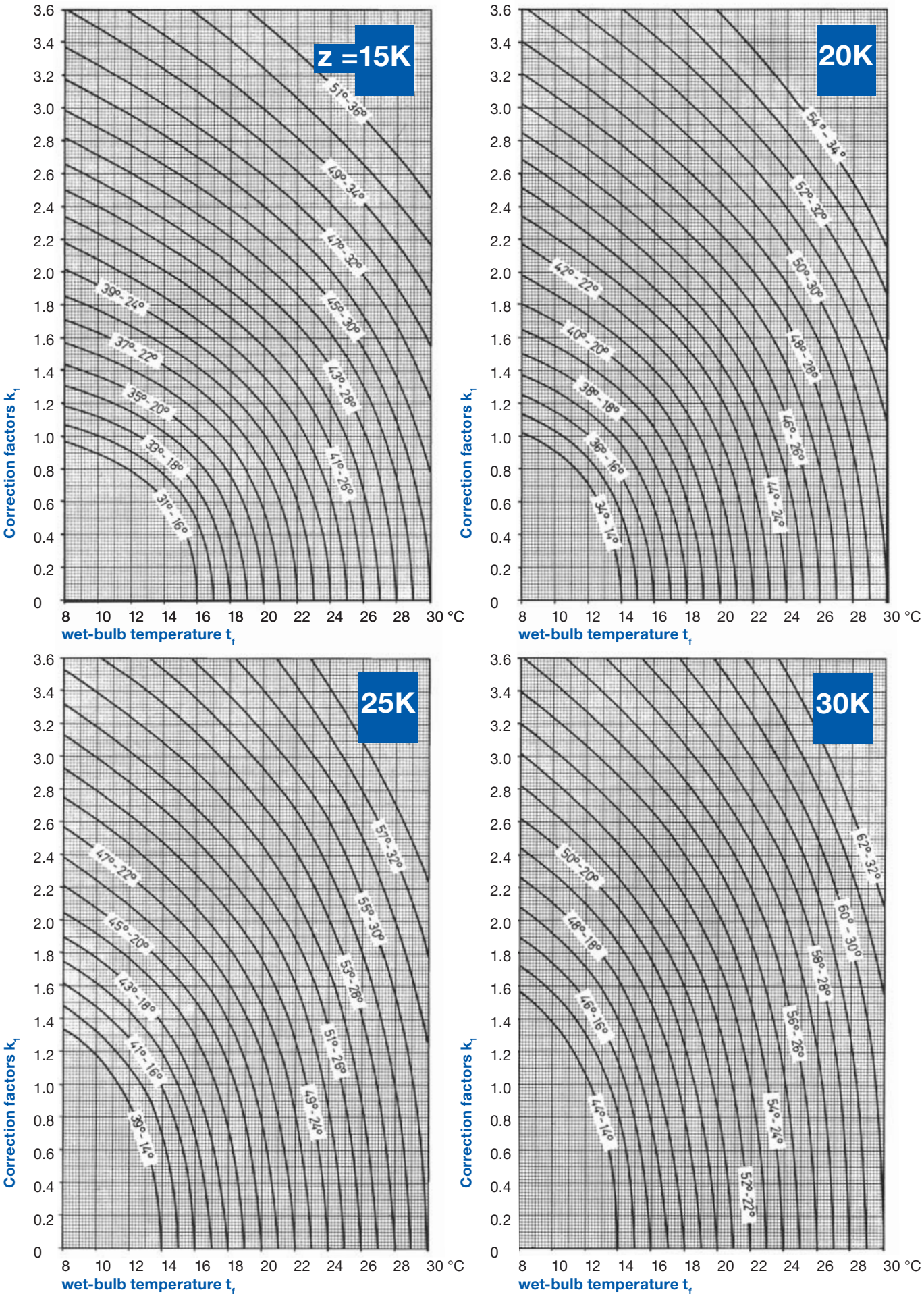


Examples for Application

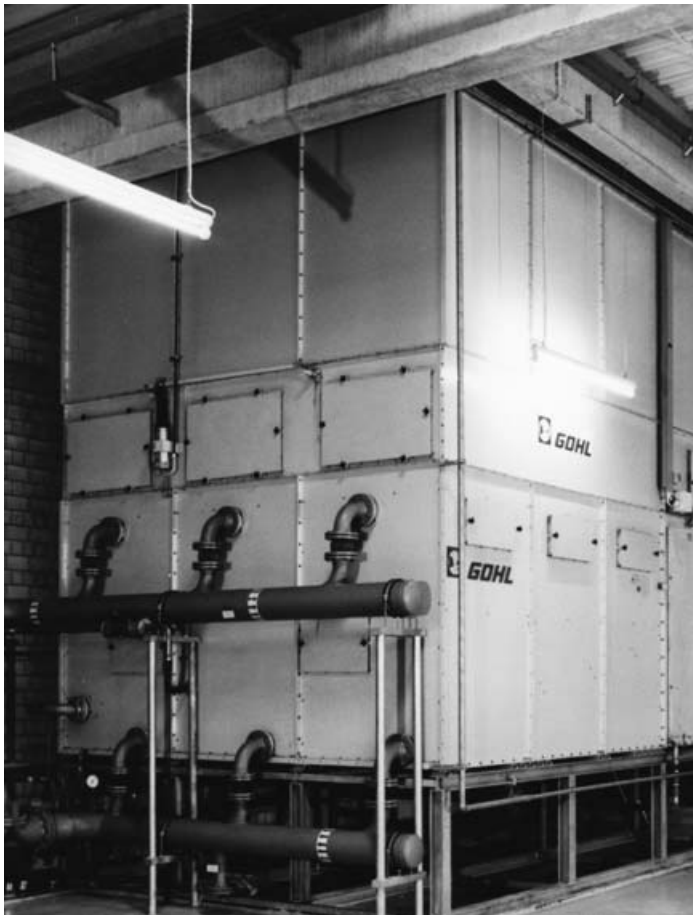


Illustration 1: 1 DT 3/77 Z

Illustration 1 shows the indoor installation of a cooling tower with air inlet and outlet at the top (oa).
Further informations see at our Bulletin oa 1.

The unit is fitted with follow accessories:
- Fan enclosure „oa“
- Inspection duct connecting piece
- Duct connecting piece for air inlet and outlet at the top with integrated inlet and outlet silencer
- Omega spring rails
- Inspection hatch lamps

Remarks to the design:
- The disign needs only one cut out in the ceiling.
- The cooling tower with omega spring rails must be connected with bellow expansion joints.
- The pipework must be installed without stresses and free from vibrations.

Illustration 2 shows the outdoor installation of two cooling towers. Two cooling towers installed together.

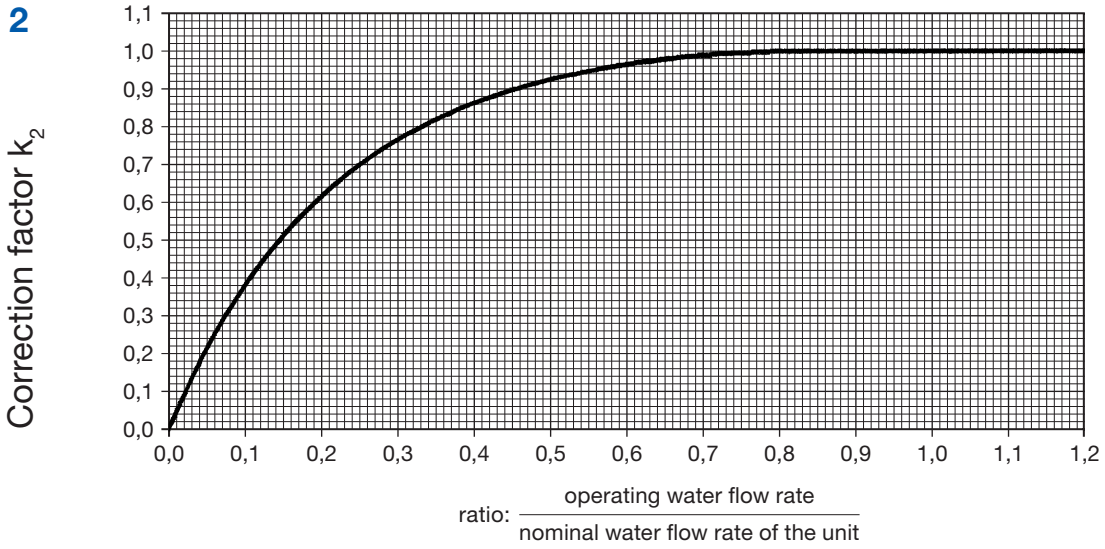
The units are fitted with follow accessories:
- Fan enclosure
- Inlet silencer
- Outlet silencer
- Inspection hatch

Remarks to the design:
- The cooling tower with omega spring rails must be connected with bellow expansion joints.
- The pipework must be installed without stresses and free from vibrations.

Illustration 2: 2 x DT 3/52 Z

The temperatures of the water as well as the wet-bulb temperature, are the deciding factor for determing the correction factor k_1. The higher the water temperatures and the lower the wet-bulb temperature the higher is k_1. The relative water loading is be considered with the correction factor k_2 which can be determined from the selection curve 2.

Selection curve 2



Selection procedure

Steps of selection

1 Determination of operating cooling capacity $Q_{B.}$

2 Correction factor k_1 from selection curve 1. Interpolation if necessary.

3 Determine nominal cooling capacity $Q_{N.}$

4 Correction factor k_2 is set at 1,0.

$$Q_N = \frac{Q_B}{k_1 \cdot k_2} = \frac{Q_B}{k_1}$$

4 Choose a unit with a equal or higher nominal cooling capacity.

5 Divide the operating water flow rate by the nominal water rate of the unit.

6 Find the correct correction factor k_2 on the selection curve 2.

7 Calculate the nominal cooling capacity Q_N with both correction factors k_1 and $k_{2.}$

8 The selection is correct, if the calculated nominal capacity is equal or lower than that of the unit table 1. If it is higher the calculation should be repeated from the step 4 with next size unit.

9 The operating water flow rate must lie within the permissible water flow rate indicated in table 1.

Selection examples

Example 1

Given: Operating water flow rate $m_W = 55000$ kg/h
Water inlet temperature $t_{WE} = + 35$ °C
Water outlet temperature $t_{WA} = + 27$ °C
Wet-bulb temperature $t_F = + 20$ °C

These operation conditions you can`t find in the quick selection tables!

Result:

1 $Q_B = \frac{55000}{3600} \cdot 4{,}186 \cdot (35–27) = 511{,}6$ kW

2 $k_1 = 1{,}18$ (selection curve for 8 K cooling range)

3 $Q_N = \frac{511{,}6 \text{ kW}}{1{,}18} = 433{,}6$ kW

4 Unit selected: DT 45Z with $Q_N = 477$ kW

5 $\frac{\text{operating water flow rate}}{\text{nominal water flow rate of the unit}} = \frac{55000 \text{ kg/h}}{71343 \text{ kg/h}} = 0{,}77$

6 $k_2 = 1{,}0$ from selection curve 2

7 $Q_{req} = \frac{511{,}6 \text{ kW}}{1{,}18 \cdot 1{,}0} = 433{,}6$ kW

8 The choise stays with unit DT 45 Z with $Q_N = 477$ kW

9 The permissible water flow rate lies between 17000 and 85000 kg/h. 55000 kg/h is between these figures.

Alternativ you can select the unit DT 46 Z mit $Q_N = 443$ kW. This unit necessitate larger floor/space and is more expensive. But the absorbed fan power and the noise are lower.

Example 2

Given: Operating water flow rate $m_W = 55000$ kg/h
Water inlet temperature $t_{WE} = + 45$ °C
Water outlet temperature $t_{WA} = + 25$ °C
Wet-bulb temperature $t_F = + 21$ °C

These operation conditions you can`t find in the quick selection tables!

Result:

1 $Q_B = \frac{55000}{3600} \cdot 4{,}186 \cdot (45–25) = 1279$ kW

2 $k_1 = 1{,}48$ (selection curve for 20 K cooling range)

3 $Q_N = \frac{1279 \text{ kW}}{1{,}48} = 864$ kW

4 Unit selected: DT 2/45Z with $Q_N = 954$ kW

5 $\frac{\text{operating water flow rate}}{\text{nominal water flow rate of the unit}} = \frac{55000 \text{ kg/h}}{142685 \text{ kg/h}} = 0{,}385$

6 $k_2 = 0{,}86$ from selection curve 2

7 $Q_{req} = \frac{1279 \text{ kW}}{1{,}48 \cdot 0{,}86} = 1004{,}9$ kW

8 The selected unit is too small! Repeat with the next size unit.

4* New unit DT 2/50Z with $Q_N = 1044$ kW

5* $\frac{\text{operating water flow rate}}{\text{nominal water flow rate of the unit}} \quad \frac{55000 \text{ kg/h}}{156146 \text{ kg/h}} = 0{,}352$

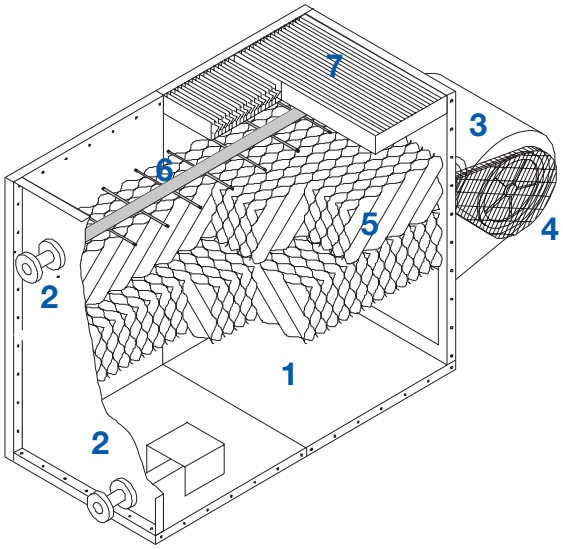
6* $k_2 = 0{,}83$ from selection curve 2

7* $Q_{req} = \frac{1279 \text{ kW}}{1{,}48 \cdot 0{,}83} = 1041{,}12$ kW

8* The choise stays with unit DT 2/50Z with $Q_{N\,is} = 1044$ kW

9 The permissible water flow rate lies between 34000 and 170000 kg/h. 55000 kg/h is between these figures.

Technical Specification



Technical data

D-line cooling tower, unit size

Cooling capacity	kW
Water inlet temperature	°C
Water outlet temperature	°C
Wet-bulb temperature	°C
Water flow rate	m^3/h
Required water pressure at water inlet	bar
Fresh water consumption by evaporation (approx 1,49 kg/kW)	m^3/h
Recommended additional bleed-off water	m^3/h
by blowdown water limiting value according to VDI 3803 and thickening factor 3	
Additional static pressure of the fan	Pa
Air volume	m^3/h
Absorbed fan power	kW
Fan speed	min^{-1}
Fan motor 230/400 V or 400/690 V, 50 Hz	kW
Shipping weight	kg
Operating weight (at a water level up to overflow)	kg
Dimensions	mm
Noise at 3 m horizontally in extension of the fan shaft, with free acoustic propagation approx.	dB(A)

The supply should comply with follwing conditions:
Unit completely assembled, or broken down in individual components, or partially broken down into cooling tower casing and fan assembly.

The supply will consist of:

1 Casing and pan section
The casing and pan section form one unit and consist of heavy-gauge galvanised, folded sheet metal panels, which are assembled into a box structure, using stainless steel bolts and a permanently flexible sealing compound. Galvanised steel beams carry the fill. Deflector plates distribute the air uniformly over the fill. An inspection door provides access for adjustment of eventual available armatures, and for cleaning of the pan section.

2 Water connections
All plastic coated water connections fitted to the unit, are provided with flanges, PN16 DIN2633. The galvanised make up wate and plastic coated drain connections have internal threads.

Strainer
The plastic coated strainer which has a mesh size of about 5 mm is attached to the casing in such a way that is can be removed through the inspection door.

Combined overflow-/bleed device
A special galvanised tray provided with an adjustable cover and situatied in the spray area, discharges the required quantity of bleed water directly through the overflow.
By using of a separate bleed device the cooling tower will be provided with an overflow instead of a combined overflow and a bleed device.

3 Double width double inlet centrifugal fans
Low noise level high efficiency, heavy duty fans, with forward-curved blades are used. The galvanised fan impeller is statically and dynamically balanced. The fan shaft is made of stainless steel X 20 Cr 13, material-no. 1.4021. The feather is made of steel C 45 K according to DIN 6885. The heavy duty ball bearing which are assembled in pillow blocks and equipped with lip or labyrinth seals, are provided with grease nipples led to the end of the fan housing for maintenance ease. The fan housing is made of galvanised steel and equipped with an outlet diffuser. The drive is via V-belts. The V-belt pulleys are of cast aluminium with steel hubs. The fan is located in the dry entering air and is readily accessible for maintenance purposes.

4 Belt guard and air intake guard
The guards are hot dipped galvanised after fabrication. By using of a fan enclosure the guards will not be needed.

5 Wet deck fill
The wet deck fill is manufactured from a durable synthetic material (PVC). Its special properties include a high cooling performance for low pressure drop, durability, resistance to chemical attack, and high mechanical strength. The distance between the synthetic material plates is not less than 12 mm so that under normal operating conditions blockage due to the build-up of deposits will not occur.

6 Spray system
The water is sprayed through self-cleaning, non clogging, hollow cone, spray nozzles made of anti-fouling fibreglass reinforced nylon. At a supply pressure the spray nozzles, produce a fine water spray and, because of their arrangement, ensure uniform water distribution. The spray branches and the main header are made of galvanised steel tube DIN 2440.

7 Moisture eliminators
The moisture eliminators are made of synthetic material for optimum water elimimation at a low pressure drop. In the upper part of the eliminators the air directed vertically upwards.

Corrosion protection
All galv. sheet metal parts are lightly sandblasted, heated in a furnace, and dipped into a plastic powder bed (Performance Polymer Alloy). The plastic coat is approx. 0,3 mm thick on each side. It has a homogeneous surface, it is elastic, resistant to chemical attack, light- and weatherresistant. (Not coated are: eliminators, fan wheel incl. shaft and pulleys, spray system, bolts and nuts, and all parts which are hot dipped galvanised.)

Accessories The accessories are described at a separate brochure.

Installation and Operating Instructions

Installation indoors
If a cooling tower without an air damper is set up inside a room, the water should be sprayed only when the fan is operating also. Non observance will cause fog formation and condensation in the room. Also corrosion of drive parts may occur.

Erection of several units side by side
When several units are placed side by side, please allow a space of minimum 400 mm between them in order to permit access to drive and motors. Special top-access openings are installed on those units which feature fan enclosures and air-intake silencers if specified. Allow for additional clearance space if there is a ceiling above the units.
Bipolar units (units with fans on opposite sides) must always be spaced 400 mm apart from the next unit.

Because twin-cell units can be delivered by trailer to the site fully assembled, it is often cheaper, taking the assembly costs into consideration, to use several units erected side by side, than to use a corresponding larger unit which requires site assembly.
We recommend the use of only those types of foundations which are in accordance with our suggestions.

Minimum water outlet temperature
By operation with water spray and ambient temperature lower 0 °C: 10 °C.

Required water pressure at the spray tree inlet: 0,5 bar
Maximum permissable water pressure: 1 bar. In this case the water flow rate increases by 1,5 times the operating water flow rate for which the spray nozzles of the unit are designed (not to be confused with nominal water flow rate). Lowest permissable water pressure at which the sprays will still function satisfactory: 0,1 bar. In this case the water flow rate drops to half. Then water carry-over might occur with the largest unit sizes. In neither case, however, should the max. or min. permissable water flow rates be exceeded.

Fresh water supply and consumption
The limiting value for the quality of make-up water and the bleed-off water should be adjusted that the limiting value for the quality of blowdown water according VDI 3803 table 10 may be exceeded.
Fresh water consumption includes quantity of water evapored and quantity of water bleed-off.
For a cooling performance of 1 kW evapored 1,49 kg/h blowdown water. The consumption of bleed-off water depending upon the usen thickening factor (Ez = 5 to Ez = 1,5) approx. 25 % to 200 % of the water consumption by evaporation.
Reguired water pressure at the fresh water inlet should be 1,0 to 1,5 bar. A pressure reducing valve will be recommended (placed before the fresh water inlet valve).
The fresh water pipe connection is neutralized by a rubber hose. By using of plastic pipe connection take the suitable fixing.

Bottom outlets for free water discharge
If the water leaving the cooling tower is collected in a separate tank (remote sump application) it is advisable to order the cooling tower with an oversized bottom outlet. The standard leaving water connections on the site of the unit are sized for pump operation.

Accessories
One and two speed fan motors or motors which can be used for frequency modulation, immersion heaters for the pan, neoprene rubber or spring anti vibration mountings, standard water tanks, fan enclosures, inlet- and outlet silencer, air discharge, inspection doors for the spray nozzles, and other accessories are available on request. The accessories are described at a separate bulletin.

Important instructions
1. We recommend the use of only those types of foundations which are in accordance with our suggestions. All foundations for our units (including enclosures) installed outdoors should be made water-tight. When erecting the unit in buildings both the foundation and the floor should be made water-tight designed as a pan is to be addistionalty recommended.
   A jointing solution could be added to the concrete, or a waterproof coat of paint may be applied. Also possible is the use of sheet or plastic covers.
2. Load deflection of the support beams under the unit over the entire length:
   – Maximum value: Overall length / 400
   – Maximum value when using the longitudinal sound absorbing spring rails or neoprene rubber strips: Overall length / 600
3. Acceptable deviation of installation position of the unit with regard to the horizontal:
   – Maximum value: 5 mm pro 3 m housing length
4. Units with two or more fan-motors
   These units have one common water basin. All motors must be operated simultaneously.
   A time delay of max. 10 sec. is permissable.
5. Units which might tilt must be anchored to the foundation. This applies in particular to all those equipment having a low width as compared to their overall height (exhaust duct connection pieces to be considered) as well as to equipment having a large wind surface.
6. We recommend inspection doors for spray nozzles or a duct piece with inspection door above the unit, if eliminators and the spray system are not accessible freely from above.
7. Pipelines and collectors/distributors on the part of the builder may not capacitate the plant connections and shall therefore be supported or hung on the builder‘s part. Furthermore, there may be no horizontal or vertical deviation between these pipelines and the plant connections so that assembly free of tension is ensured.
8. When ordering the omega spring rails or neoprene rubber strips, the direction of the foundations must be given.
   However, a prerequisite for an efficient sound absorbing effect is that rigid tube connections are adjusted by means of compensators.
9. Please note in the special case the respective instructions in our confirmation of order.
10. In order to place the water connections and the accessories in the correct position specify the set up of the unit in your order (e.g. installation drawings).
11. The cut out in the ceiling should be general 100 mm larger than unit dimensions so that we have at each side of the unit a space of 50 mm. The space will be closed with a flashing.
12. Foundations for our units should be made uniformly (approx. 100 mm longer than the unit dimensions).
13. For each water pump connection (size DN 100) is the water flow rate limited of 80 m3/h for a standard operating water level. Lager water connections and strainers require a larger operating water level or special measures.
14. For outdoor-installations we recommend a protection against lightning and overvoltage at the casing of the unit.
15. All dimensions are approximate value. On account of the tolerances the pipework can only be made after set up of the unit.

Special Design Features

Design
1 Blow through cooling tower. The fans are located in the dry entering air and not in the corrosive saturated discharge air.
2 The selected arrangement does not allow short-circuiting of air.
3 Pressure chamber: The fans discharge the air into a pressure chamber where an intensive heat exchange takes place between air and water.
4 The units can be dismantled completely since all parts are bolted.
5 Easy to assemble on site if necessary. Compactness through rectangular design. Therefore little floor space required.
6 Ducts can be easily connected since a flange is provided around the outlet and inlet of the unit.
7 Verry low unit height and low weight.
8 The large water quantity in the pan facilitates piping layout.
9 Variety of accessories: Two speed motors, immersion heaters for the pan, neoprene rubber or spring anti vibration mountings, standard water tanks, fan enclosures, inlet- and outlet silencers, outlet plenums, inspection doors for the spray nozzles and other accessories are available on request.

Construction
1 Corrosion protection
Robust, fire-proof housing of galvanised sheet steel, internally and extemally plastic coated (approx. 0,3 mm), giving maximum corrosion resistance.
2 The suction screen is provided with a cover plate which prevents cavitation in the water outlet.
3 Self-acting bleed device. By adjustment of the cover of a small collector tray arranged in the unit, the quantity of bleed water leaving the overflow can be regulated.

Operating
1 No water blow off, due to the use of excellent eliminators in accociation with a low air discharge velocity. The air leaves the unit undeflected, straight upwards.
2 The closed disign ensures trouble-free winter operation. Spraying of water over the side of the unit, with subsequent ice formation, does not occur. By using a transformation section the fans are located far enough away from the unit to prevent ice formation on the fan impellers.
3 Coned, non-clogging self cleaning spray nozzles of fibreglass-reinforced nylon, produce a fine water spray at a pressure of only 0,5 bar.

Maintenance
1 Because of the low installed height, the units are easily accessible for maintenance.
2 The pitch between the fill plates is about 12 mm so there is no risk of blockage, under normal operating conditions, while the assembly or dissassembly of the fill is simple.
3 Biological photogenesis (algae) is prevented because only very little light can penetrate into the interior of the unit. The coated galvanised steel construction with synthetic fill forms a poor breeding ground for biological growth.
4 A large number of trained representatives all over Europe provide an effective and first class after sales service.

Noise
1 Units employing centrifugal fans, are inherently quiet. The forward curved blades of the fan impellers enable a low fan speed to be used. Because of the considerable pressure available, silencer etc. can be fitted to the unit.
2 Because of the closed construction, the water splash noises are considerably less than in open industrial type cooling towers.

The manufactures reserve the right to make technical modifications as a result of further development and technical advances.